GOBIERNO DE ESPAÑA
MINISTERIO DE INDUSTRIA, TURISMO Y COMERCIO

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MINISTERIO DE INDUSTRIA, TURISMO Y COMERCIO
IDAE Instituto para la Diversificación y Ahorro de la Energía

SPAIN'S NATIONAL RENEWABLE ENERGY ACTION PLAN 2011-2020

30 June 2010

CONTENTS

RATIONALE UNDERLYING THIS PLAN

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Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources establishes the general targets of 20% share of energy from renewable sources in gross final consumption of energy in the European Union (EU) and a 10% target for energy from renewable sources to be achieved by all Member States in energy consumption in the transportation sector by 2020.

To achieve that, it sets 2020 targets for each Member State and a minimum indicative trajectory leading up to that year. In Spain, the target means that renewable sources must account for at least 20% of final energy consumption by 2020 - the same as the EU average - together with a contribution of 10% from renewable sources in the field of transport by that year.

The Directive calls on every Member State to draw up and notify a National Renewable Energy Action Plan (NREAP) for the period 2011-2020 to the European Commission (EC) by 30 June 2010 with a view to complying with the binding targets laid down in the Directive. As the Directive indicates, that NREAP must conform to the national action plan template adopted by the European Commission via the 30 June 2009 Commission Decision establishing a template for National Renewable Energy Action Plans under Directive 2009/28/EC of the European Parliament and of the Council.

For its part, Royal Decree 661/2007 of 25 May 2007 regulating activities related to electrical energy production under special regimes, provides for the drafting of a Renewable Energy Plan for implementation during the period 2011-2020 (REP 2011-2020).

The National Renewable Energy Action Plan (NREAP) presented here meets the requirements and adheres to the methodology of the renewable energies Directive and conforms to the template for national renewable energy action plans adopted by the European Commission.

The 2011-2020 REP which is concurrently being drafted, will include some of the essential elements of the NREAP as well as additional analyses not included in the latter and a detailed sectoral analysis which will contain, inter alia, the outlook for technological progress and expected cost trends. The 2011-2020 REP has already commenced the Strategic Environmental Assessment process in accordance with legislation in force in Spain. Naturally, if these additional analyses conducted in drawing up the 2011-2020 REP or the development of expected energy demand for the upcoming years should prompt a review of some of the targets laid down in the NREAP, in all cases the scenarios reviewed will comply with the minimum target laid down in the Directive for Spain in 2020 and with the indicative trajectory leading up to that year.

Approval of the 2011-2020 REP is not expected until the end of 2010, by which time the final determinations contained in the Environmental Report will have been incorporated, also leaving time to include possible suggestions from the European Commission regarding the National Renewable Energy Action Plan (NREAP) which is precisely the subject of this document.

SUMMARY OF NATIONAL RENEWABLE ENERGY POLICY

CHAPTER 1

1. SUMMARY OF NATIONAL RENEWABLE ENERGY POLICY

European and Spanish energy policy

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 liberalisation 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 liberalisation 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 these lines in ~~a harmonised fashion~~harmony with other European countries, but at the same time it presents a specific response to the main challenges that have traditionally characterised the Spanish energy sector and which can be summarised 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.

Strategies to tackle challenges identified

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 prioritised liberalisation and the fostering of market transparency, the development of energy infrastructures and the promotion of renewable energies, savings and energy efficiency.

Market liberalisation and transparency through the establishment of mechanisms to guarantee that users take their decisions with the greatest amount of available information, marks a step towards efficiency in decision-making by agents. The development of energy infrastructures bolsters security and diversifies the sources of energy supply. Important steps have been taken over the last several years by way of improving coverage indices, modernising grids, developing LNG regasification plants and building underground natural gas reservoirs and reservoirs for the strategic storage of petroleum products.

Special mention should be made of international interconnections. Development plans are envisaged over the coming years in the electricity sector to enhance interconnection with France and Portugal and in the gas sector through France with the entry into operation of the Medgaz gas pipeline. However, better interconnection is indispensable, especially in the case of electricity, in order to increase the presence of renewables in the generation mix in a technically and economically sustainable fashion. Interconnections allow for more efficient management of the balance between production and consumption, thus contributing to the integration of renewable generation during off-peak hours while at the same time reinforcing security of supply during peak hours.

The two new electricity connections planned with France – one of which is expected to be up and running in 2014 and another requiring a more precise definition of the project and temporary horizon – are insufficient to reach the 2020 target of an interconnection capacity of 10% of installed capacity, which would mean approximately 10,000 MW as described in section 4.2.6.

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. This is not a classical system of direct subsidies paid to producers. Under this scheme the cost is shared by producers of conventional energies and consumers given that prioritising the entry of renewable energy into the electricity system will bring about a price decrease in the electrical energy production market. Consumers are only financing the part of renewable production not covered by this effect.

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 internalisation of the costs shouldered by the energy system to guarantee the sufficiency and stability of supply.

- Prioritisation 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.

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.

EXPECTED FINAL ENERGY CONSUMPTION 2010-2020

CHAPTER 2

2. EXPECTED FINAL ENERGY CONSUMPTION 2010-2020

Forecasts regarding the gross final consumption of energy for 2010-2020 in Spain are presented in section 2.4 at the end of this chapter for the reference hypothesis (or reference scenario) and for the additional energy efficiency hypothesis (additional energy efficiency scenario) in accordance with the methodology called for in Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources, and the Decision of the European Commission of 30 June 2009 establishing a template for National Renewable Energy Action Plans under the aforementioned Directive.

As an aid to comprehension, these forecasts are preceded by other sections (2.1 to 2.3) dealing respectively with the historical trend and current situation of consumption of primary and final energy and the description and consumption of primary and final energy expected in the reference scenario and in the additional energy efficiency scenario in accordance with habitual EUROSTAT methodology. This explains the different values under the two headings.

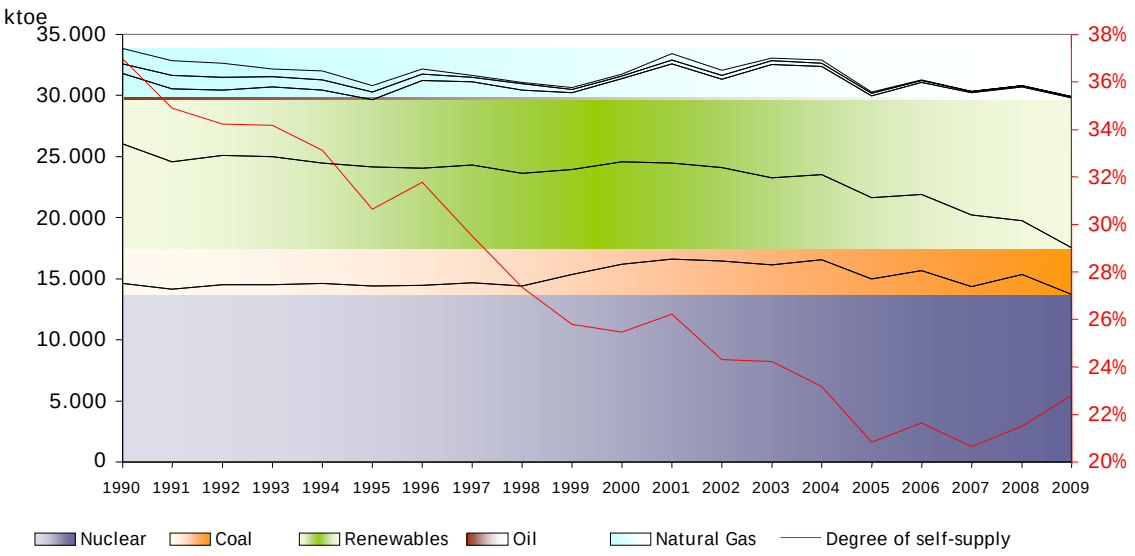
2.1 Historical trend and current situation

2.1.1 Development of consumption and energy intensity in Spain

Development to 2009 of energy production and self-supply

Regarding energy, Spain is characterised by a consumption structure dominated by petroleum products which are mostly imported, and this, together with scant contribution from autochthonous resources, has contributed to a high degree of energy dependence and a therefore a low level of self-supply. This situation began to change in 2005 within the framework of the current planning policies in connection with renewable energies and energy efficiency, which have allowed for greater penetration of renewable energies to meet domestic demand and hence an increase in the level of self-supply.

Figure 2.1-1 Development of domestic energy production and level of self-supply



Source: MITyC /IDAE (Ministry of Industry, Tourism and Trade / Institute for Energy Diversification and Saving)

Development to 2009 of primary and final energy consumption

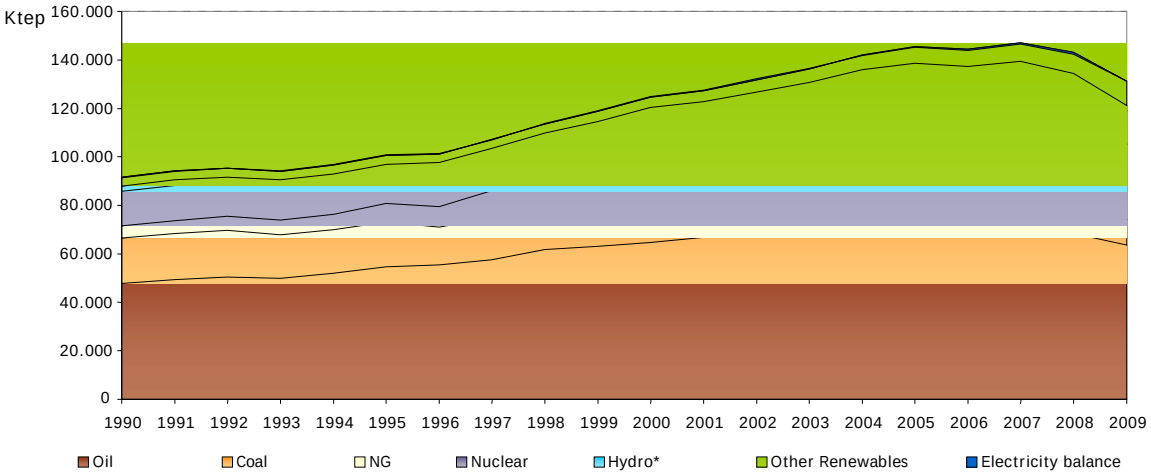
Energy demand, expressed both in terms of primary energy and final energy, has been rising over the last three decades, during which time there have been a number of world energy and economic crises that negatively impacted on the economic activity and energy demand of most developed countries. Nevertheless, at the beginning of the 1970's this circumstance served as a catalyst in most Western countries to implement policies aimed at reducing energy dependence and enhancing efficiency in consumption. Spain was almost a decade late in reacting and did not take action until the end of the 1970s.

The economic expansion enjoyed by our country since becoming a member of the EU produced a considerable rise in purchasing power and hence an increase in the number of automobiles and domestic appliances and significant development in the building sector. These and other factors have been decisive in the upward trend in energy consumption.

At the beginning of the 1990s a new crisis, this time a financial one, lowered energy demand by a small margin. Subsequent developments kept consumption on the rise until 2004, which marked a new stage in the development of demand both in terms of primary and final energy. It was at this turning point that GDP growth was not accompanied by a commensurate rise in energy consumption to sustain that economic activity, which would appear to indicate a delinking of economic activity from energy demand reflected in the fall in energy intensity.

2009, the reference year for the NREAP, is an atypical year as regards the trends observed: on the one hand, the underlying positive change over the last several years in terms of improved efficiency and, on the other, the effects of the crisis, two factors which account for a sharp fall in the demand for energy.

Figure 2.1-2 Development of primary energy consumption



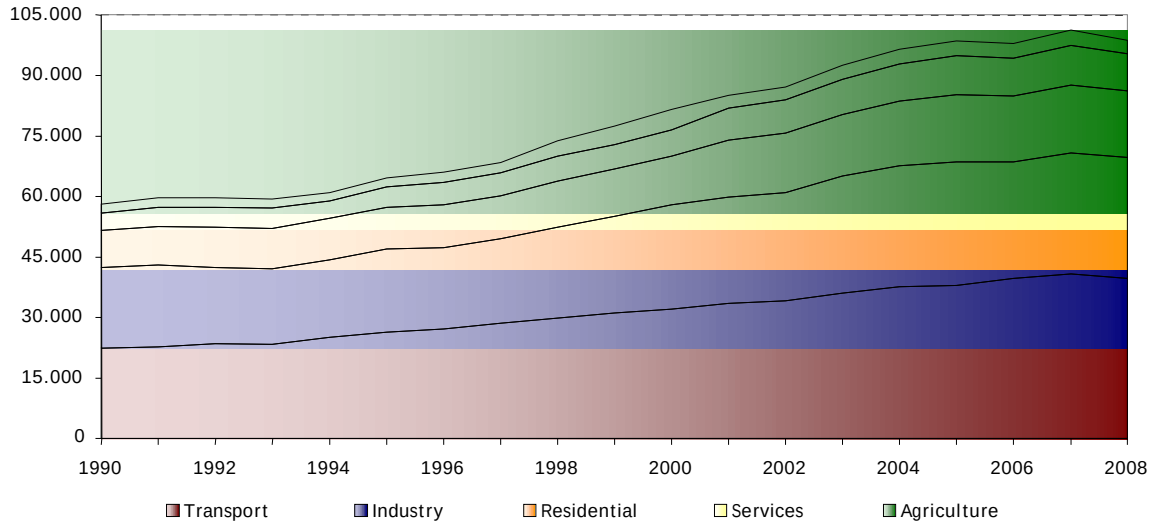
Source: MITYC/IDAE (Ministry of Industry, Tourism and Trade / Institute for Energy Diversification and Saving)
Includes Mini-hydro

The structure of domestic demand for primary energy has undergone significant change over the last several decades but is especially evident as from the second half of the 1990's when energy sources such as renewable energies and especially natural gas began to play a significant role, resulting in greater energy diversification with a

positive effect on the efficiency of the transformation system.[1] To a large extent this has been made possible by the actions comprising the different *Gas and Electricity Sector Plans*, which have entailed greater development of the energy infrastructures needed for the integration of new energy from renewable sources.

Final energy consumption has followed a similar pattern to that of primary energy and also demonstrated a trend towards stabilisation and a downturn in demand starting in 2004. A look at the sectoral breakdown of demand shows that the transport sector is the number one consumer, which accounts for 40% of the total final consumption, based mostly on petroleum products and is responsible to a large extent for the high level of domestic energy dependence. Second in importance is industry, which accounts for 30% of consumption.

Figure 2.1-3 Development of final energy consumption by sector



Source: MITyC/IDAE (Ministry of Industry, Tourism and Trade / Institute for Energy Diversification and Saving)

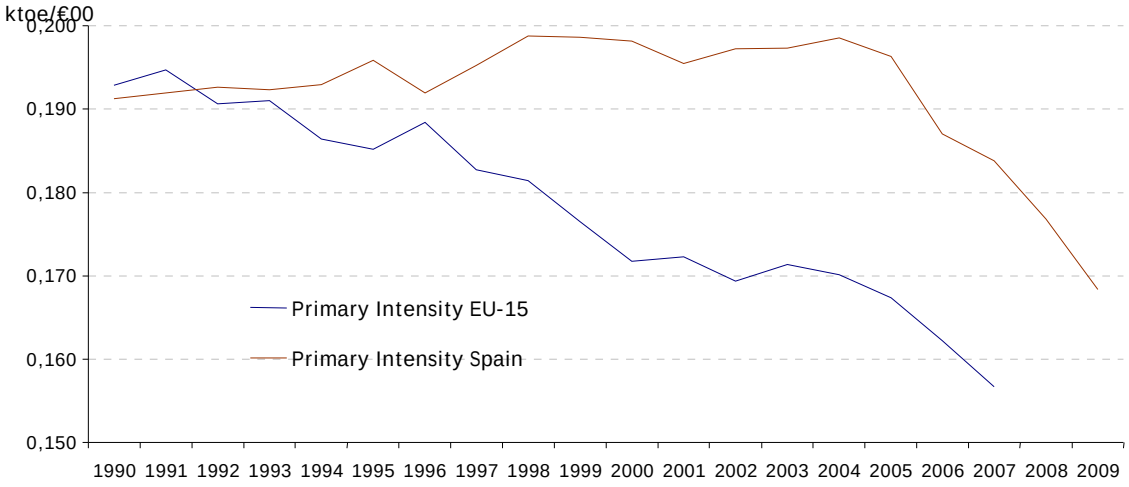
However, energy demand from these sectors has decreased slightly in favour of other sectors (the residential and services sectors), in part due to our economy's expanding tertiary sector.

Development in 2009 of energy intensity

The result of the policies pursued in reaction to the 1979 energy crisis was improved energy intensity which, however, once again worsened as a result of subsequent recovery and economic expansion in the second half of the 1980s. This situation continued during the 1990s and a growing gap opened vis-à-vis the average trend observed in the EU as a whole.

[1] Between 1995 and 2005, renewable energy's contribution to primary consumption rose from 4.5% to 5.9% while that of natural gas rose from 7.5% to 20%.

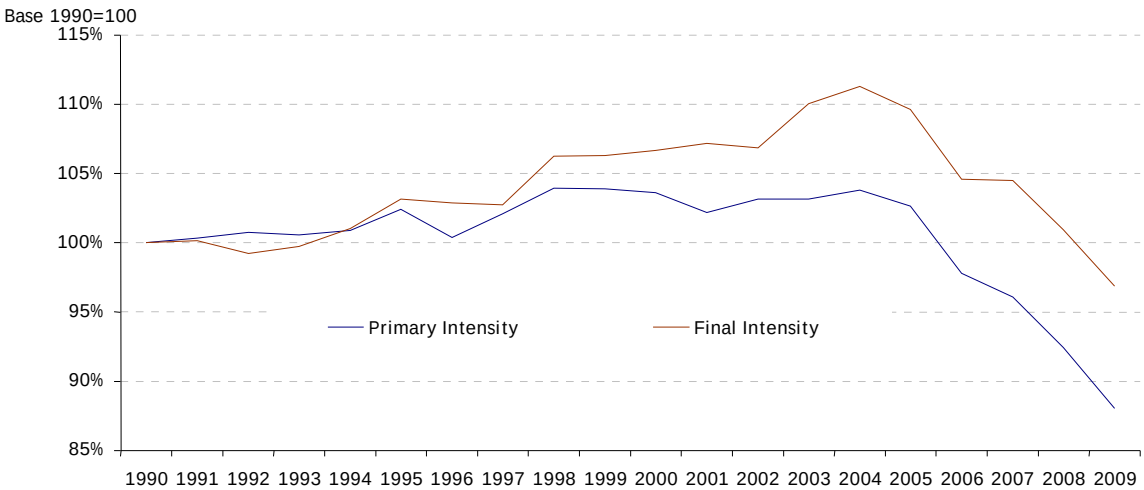
Figure 2.1-4 Development of primary energy intensity in Spain and in EU-15



Source: EnR/IDAE (Institute for Energy Diversification and Saving)

However, as from 2005 there was a considerable improvement in energy intensity due to structural effects and effects of a technological nature. While there continues to be a gap between domestic and European primary energy intensity indicators, it is closing. The situation continued to improve in a context in which the generalised economic expansion that preceded the current economic crisis stands in contrast with declining energy consumption. This has meant a cumulative improvement of approximately 15% in primary energy intensity in the 2004-2009 period. However, in the midst of this crisis situation, sustained decline in demand seems to indicate the influence of factors unrelated to the crisis which are improving energy intensity.

Figure 2.1-5 Development of primary and final energy intensity in Spain



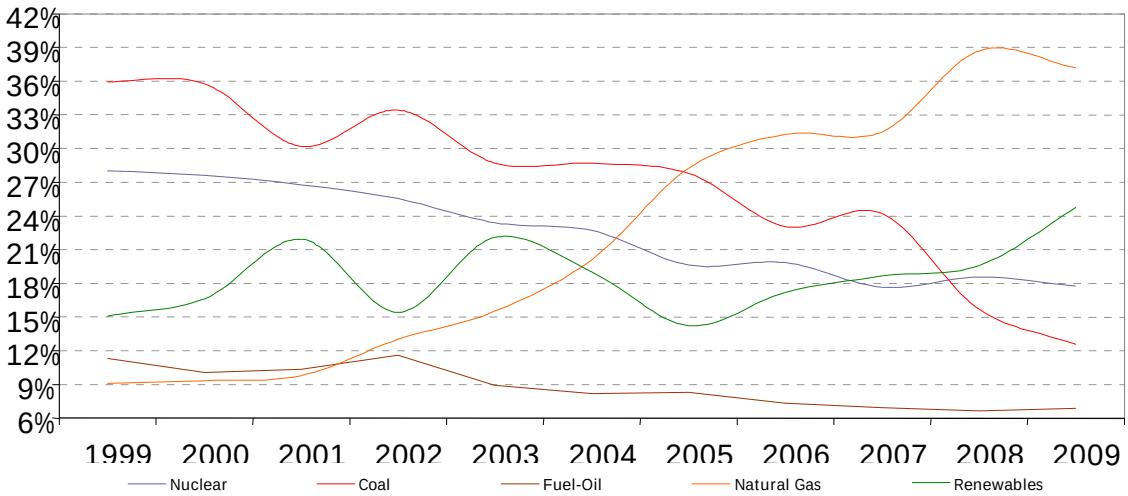
Source: MITyC/IDAE (Ministry of Industry, Tourism and Trade / Institute for Energy Diversification and Saving)

Development of the electricity generation mix up to 2009

Domestic electricity generation has undergone significant transformation since the end of the 1990s, due in part to the progressive penetration of natural gas, mainly in combined cycle plants and in cogeneration, and to renewable energies which have

been growing in importance and today account for over 24% of domestic electricity generation.

Figure 2.1-6 Contribution of different sources of energy to electricity generation



Source: IDAE/MITYC (Institute for Energy Diversification and Saving/Ministry of Industry, Tourism and Trade)
Note: Pumping excluded from renewable electricity production as from 2005

This situation has led to a decrease in the relative weight of other energy sources such as coal, fuel-oil and even nuclear (electricity from renewable sources has actually consistently outpaced nuclear generation since 2006), and over the last several years exceeding coal fired generation as well.

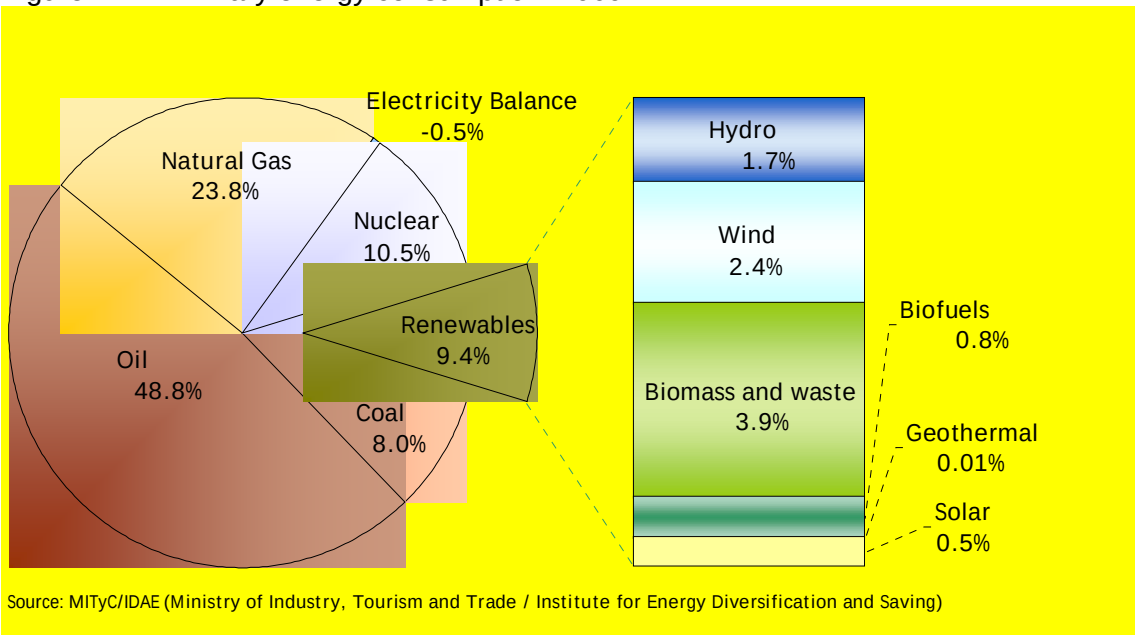
2.1.2 Development of renewable energies. The situation at the end of 2009

Development of primary and final consumption of renewable energies up to 2009

Renewable energies in Spain have increasingly contributed to the energy system and this is evident in the coverage of demand expressed in terms of both primary and final energy. This increased contribution has been especially noteworthy since 2005.

In 2009, the reference year for the compiling of the NREAP, renewable energies accounted for 9.4% of the primary energy supply and over 12% in terms of gross final energy in accordance with the new methodology for calculating the contribution of renewable energies to the gross final consumption of energy.

Figure 2.1-7 Primary energy consumption. 2009

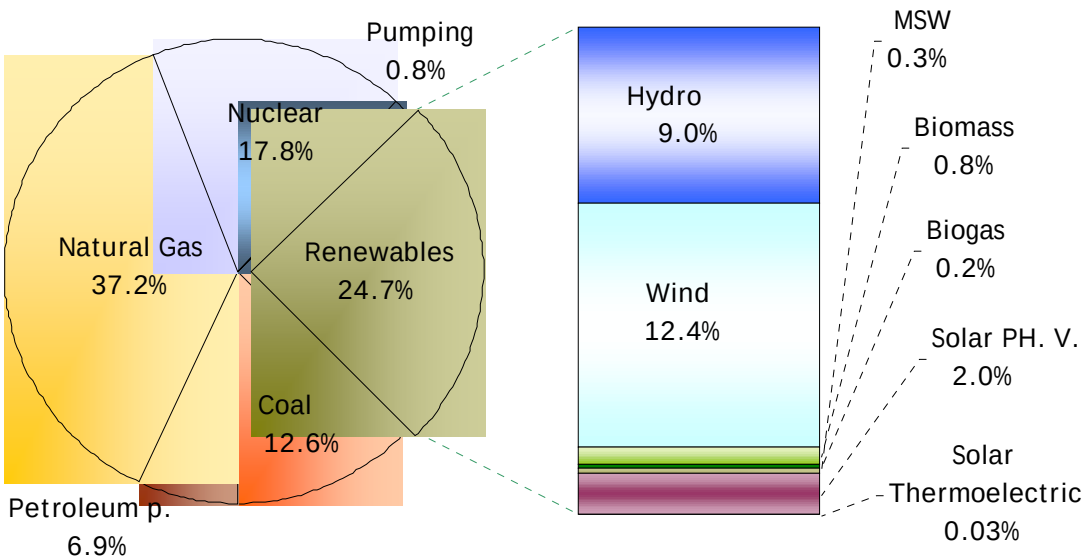


Source: MITyC/IDAE (Ministry of Industry, Tourism and Trade / Institute for Energy Diversification and Saving)

Development of electricity generation using renewable energies up to 2009

Electricity generation from renewable sources, which is variable due to climate variations affecting rainfall, has been more stable and on the rise since 2005.

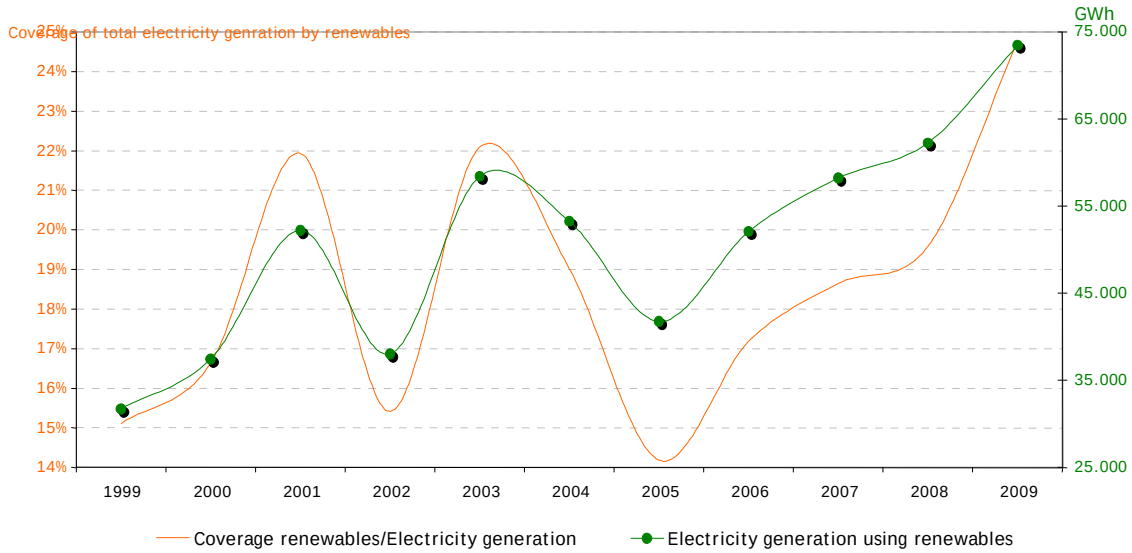
Figure 2.1-8 Electricity generation broken down by source. 2009



Fuente: MITyC / IDAE (Ministry of Industry, Tourism and Trade / Institute for Energy Diversification and Saving)

Over the last ten years, electricity generation from renewable sources has risen by over 40% and by 2009 accounted for 24.7% of Spain's gross electricity production.

Figure 2.1-9 Coverage using renewable energies / total electricity generation



Fuente: MITyC/IDAE (Ministry of Industry, Tourism and Trade / Institute for Energy Diversification and Saving)

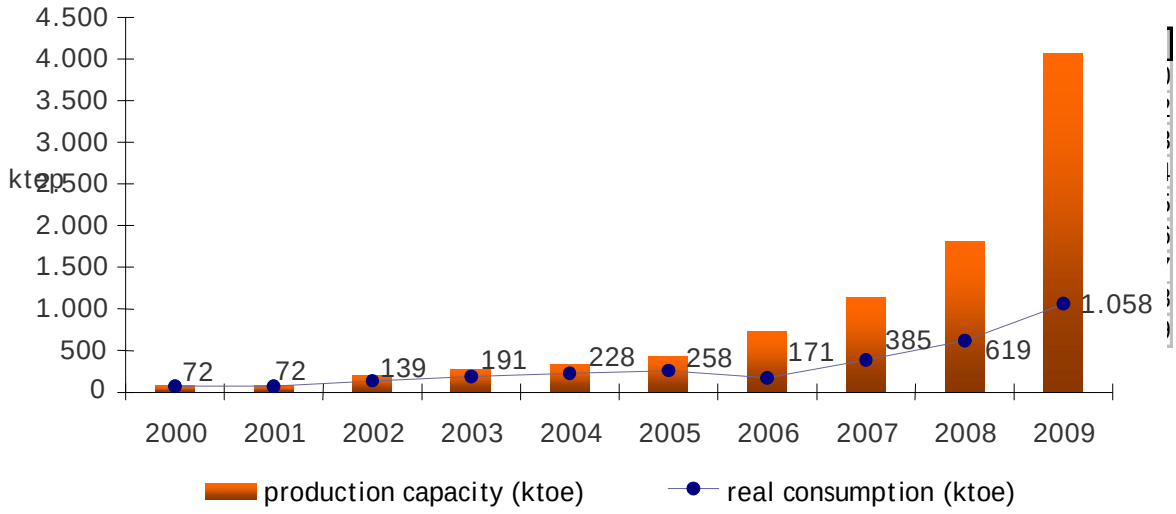
Note: Pumping excluded from renewable electricity generation as from 2005

Development of the consumption of biofuels up to 2009

Progress made in Spain over the last several years in the production capacity of biofuels has been one of the most important advances made in the field of renewable energies. In 2009, biofuel plants in our country reached an annual production capacity of over 4 million toe.

However, growth in production capacity has not gone hand-in-hand with consumption of biofuels. Several incentive measures were taken to encourage the use of these fuels, particularly the approval of Order ITC/2877/2008 of 9 October 2008 setting up a mechanism to encourage the use of biofuels and other renewable fuels used for transport. Consolidation of the scheme laid down in this Ministerial Order, along with the actions implemented by the European Commission to protect the European market from unfair commercial practices, is expected to have a positive effect on Spanish production plant activity.

Figure 2.1-10 Development of Biofuels (consumption and production capacity)



Source: MITyC/IDAE (Ministry of Industry, Tourism and Trade / Institute for Energy Diversification and Saving)

2.2 Reference scenario

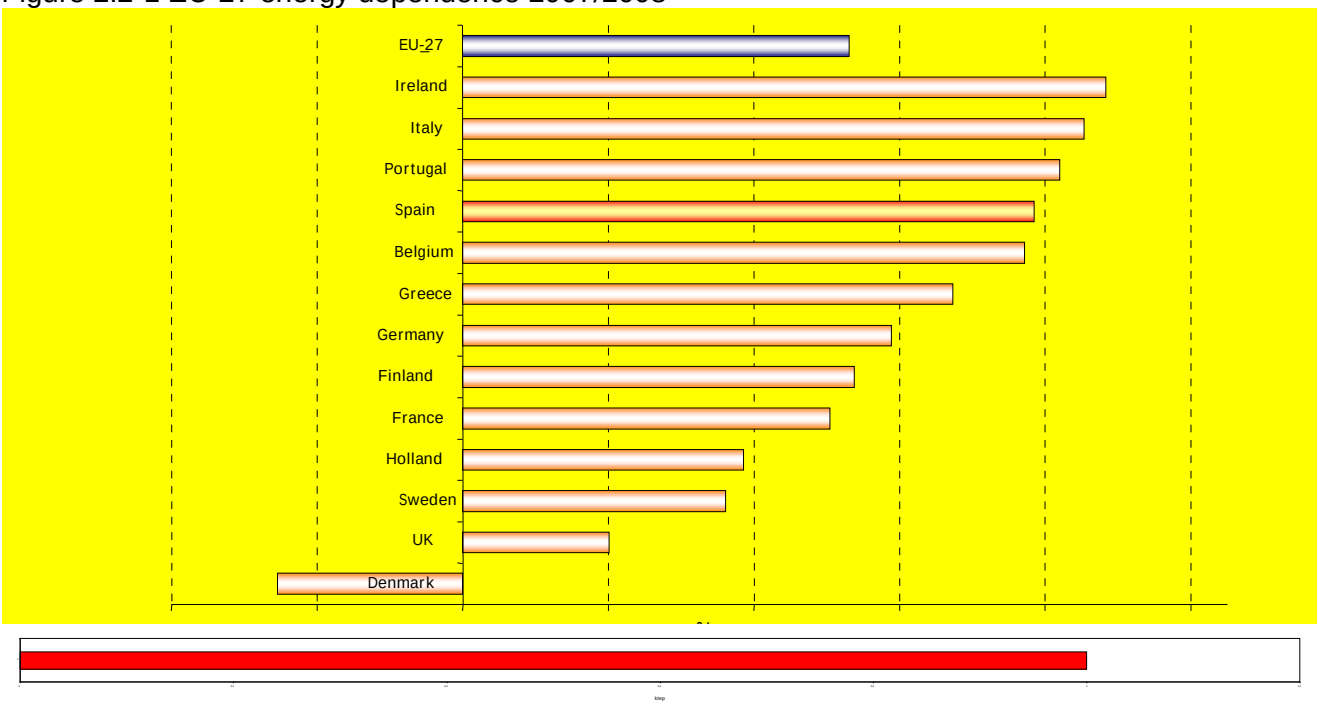
2.2.1 Description of the reference scenario

World energy consumption from now until 2030 will increase by approximately 40% according to International Energy Agency (IEA) forecasts, largely due to the growing demand from emerging economies, especially China and India which account for over 50% of the growth in demand. In this scenario, fossil fuels will continue to cover 80% of the world's energy demand with consumption shifting to Asia and the Middle East where the bulk of the increase in the demand for natural gas will be located.

The expected rise in energy demand together with the geographical redistribution of consumption will deplete fossil energy reserves and push up prices in response to an increasing imbalance of supply and demand. Moreover, the environmental impact will foreseeably increase due to growing greenhouse gas emissions associated with increased consumption of fossil fuels.

The European Union, whose energy dependence now stands at 53%, has taken note of its increasing energy consumption and energy imports and is concerned about present trends.

Figure 2.2-1 EU-27 energy dependence 2007/2008



In Spain, which shares energy characteristics with the EU, the presence of oil and its derivatives in primary energy consumption is considerably higher than the European average. As a consequence of this, and of low domestic energy production, based almost exclusively on renewable energy resources, nuclear generation and a small contribution from domestic coal, Spain's dependence on outside supply is close to 80%.

Historically, Spain has devised energy efficiency and renewable energy plans. The ones currently in force are the Energy Savings and Efficiency Strategy 2004-2012 (E4) implemented through its 2005-2007 and 2008-2012 Action Plans, and the Renewable Energy Plan 2005-2010.

In order to forecast future energy consumption scenarios, a prospective exercise was conducted in two energy scenarios: one called the reference scenario and the other the additional energy efficiency scenario.

Both scenarios predict the same future course of the main socio-economic variables – i.e. population and gross domestic product (GDP) – and of international oil and natural gas prices, but differ in the savings measures and energy efficiency contemplated.

Population, growth between 2010 and 2020 is expected to be much lower than in the first decade of this century. The projected 2020 population is close to 48 million inhabitants, that is an increase of approximately one million inhabitants vis-à-vis 2010.

Following two years of recession, positive GDP growth is expected as from 2011 with average annual growth in the vicinity of 2.2% for 2011, 2012 and 2013 and an annual increase of 2.5% from 2014 to 2020.

Although three possible scenarios were contemplated for the prices of the main energy raw materials (oil and natural gas), in line with the forecasts made by the main international organisations the analyses used to compile the NREAP were conducted

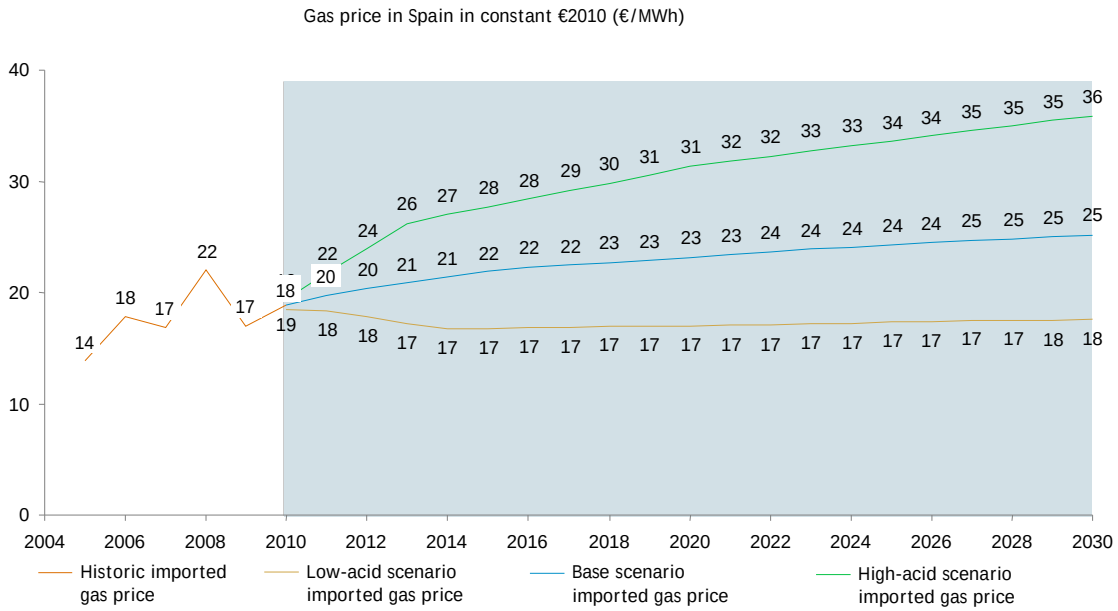
with reference to the base scenario, with a moderate rise in prices over the plan's time horizon. In accordance with this approach, Brent crude oil prices in 2020 will be in the vicinity of $100 at constant 2010 prices.

Figure 2.2-2 Brent crude oil price forecasts

Source: Boston Consulting Group, "Technological development and cost perspectives for renewable energy technologies from 2020 to 2030".

Within this same scenario, natural gas imported to Spain would reach a price of €23/MWh (constant 2010 prices) at an exchange rate of $US 1.35 per euro.

Figure 2.2-3 Forecast of natural gas prices in Spain



Source: Boston Consulting Group, "Technological development and cost perspectives for renewable energy technologies from 2020 to 2030".

The reference scenario assumes the energy hypothesis that up to 2009 the measures envisaged in the E4 and its 2008-2012 Action Plan remain stable with no additional energy efficiency measure being incorporated between 2010 and 2020. The only efficiency gains made during this last period are the result of the measures adopted under the E4 up to 2009, which will continue to generate efficiency gains during the useful life of the equipment employed. Primary energy consumption envisaged under this scenario is expected to reach 156.9 Mtoe.

Also, the additional energy efficiency scenario, based on the preceding Reference Scenario, includes an important package of efficiency measures.

Consumption of renewable energies in the Reference Scenario is assumed to be the same as that of the Efficiency Scenario.

2.2.2 Development of consumption and energy intensity 2010-2020 in the reference scenario

Within the context of the Reference Scenario, a 20% increase in the consumption of primary energy is expected vis-à-vis the 2010 level, which suggests an annual average growth in demand of close to 2%. In terms of energy sources, we would draw attention to the development of renewable energies, for which demand is expected to double by 2020. Next in importance is natural gas with cumulative growth of 40% between 2010 and 2020. This development is especially significant in the case of renewable energies, whose contribution to primary demand will grow from close to 11% in 2010 to nearly 18% in 2020.

Table 2.2-1 Primary energy consumption
(Reference scenario)

Ktoe	2005	2010	2015	2020
Coal	21,183	9,198	10,641	10,533
Oil	71,765	60,594	58,132	59,360
Natural Gas	29,116	32,314	38,402	45,141
Nuclear	14,995	14,594	14,490	14,490
Renewable Energies	8,371	13,966	19,798	28,095
Elec. Balance (imp-exp)	-116	-688	-688	-688
Total Primary Energy	145,314	129,978	140,775	156,930

Having regard to the initial hypothesis for the definition of this scenario, the lack of new energy efficiency measures as from 2010 could stimulate an increase in final energy consumption at an average annual rate of approximately 1.9% between 2010 and 2020, which would mean an annual improvement in final energy intensity of 0.4%.

The energy sources most contributing to growth of final energy consumption, in order of magnitude, are thermal demand from renewable energies and electricity, which are expected to register cumulative increases of 67.5% and 46% respectively during this period.

Table 2.2-2 Final energy consumption
(Reference scenario)

Ktoe	2005	2010	2015	2020
Coal	2,424	1,650	2,173	2,162
Petroleum products	54,376	46,579	45,423	46,651
Natural Gas	17,145	15,532	18,112	20,227
Electricity	20,836	21,157	25,186	30,891
Renewable Energies	3,804	5,467	6,875	9,158
Total Energy Uses	98,585	90,385	97,769	109,089
Non energy uses	7,842	6,785	6,765	6,765
Petroleum products	7,362	6,415	6,415	6,415
Natural Gas	480	370	350	350
Total Final Uses	106,426	97,170	104,534	115,854

Very little change is expected among the different sectors of the demand structure. The largest consumers are transport, accounting for 40% of demand, followed by industry and "other uses" (residential, services and agriculture), both accounting for 30% of consumption.

Table 2.2-3 Final energy consumption by sector
(Reference scenario)

Ktoe	2005	2010	2010	2020
Industry	30,675	25,733	26,997	28,628
Transportation	37,956	36,394	40,915	47,149
Residential, services and other	29,954	28,258	29,857	33,312
Total Energy Uses	98,585	90,385	97,769	109,089
Non energy uses:	7,842	6,785	6,765	6,765
Total Final Uses	106,426	97,170	104,534	115,854

The immediate effect of the crisis on the evolution of demand in terms of primary and final energy is appreciable in both cases. As from 2011, a progressive rise in demand is expected, moderated to some extent by the effect of the efficiency measures implemented up to 2009 within the framework of the 2008-2012 Savings and Efficiency Action Plan. After the period covered by this Plan, no new additional efficiency measures are envisaged within this Reference Scenario.

Figure 2.2-4 Development of primary energy consumption in the Reference Scenario

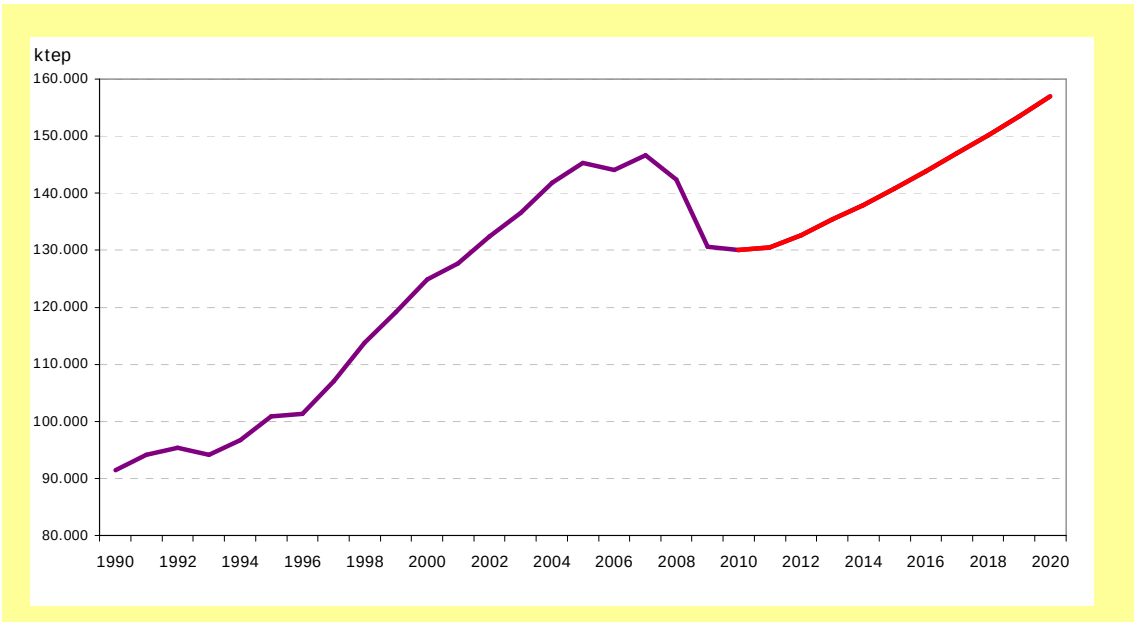
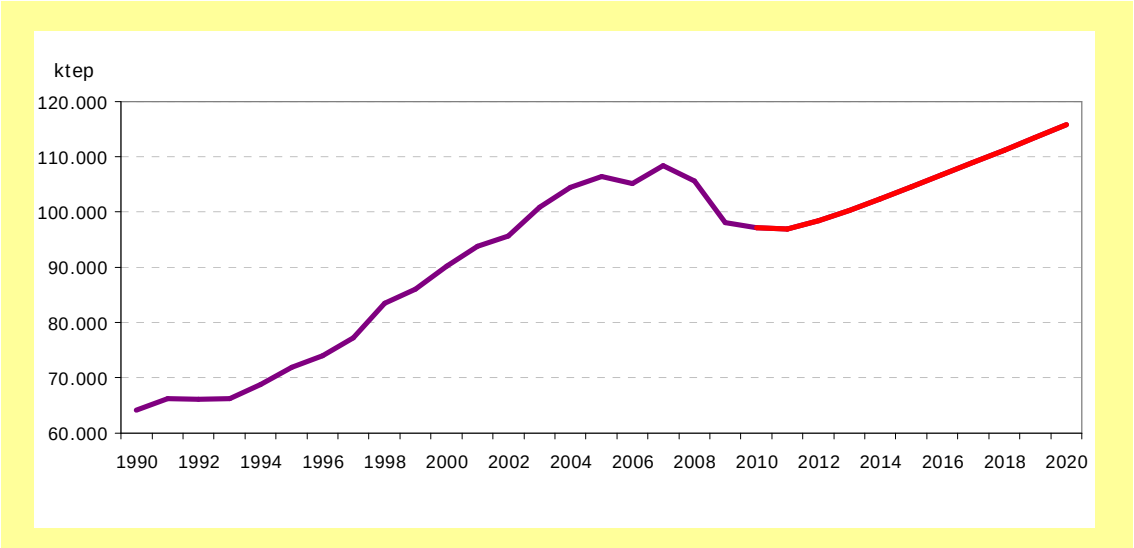


Figure 2.2-5 Development of final energy consumption in the Reference Scenario



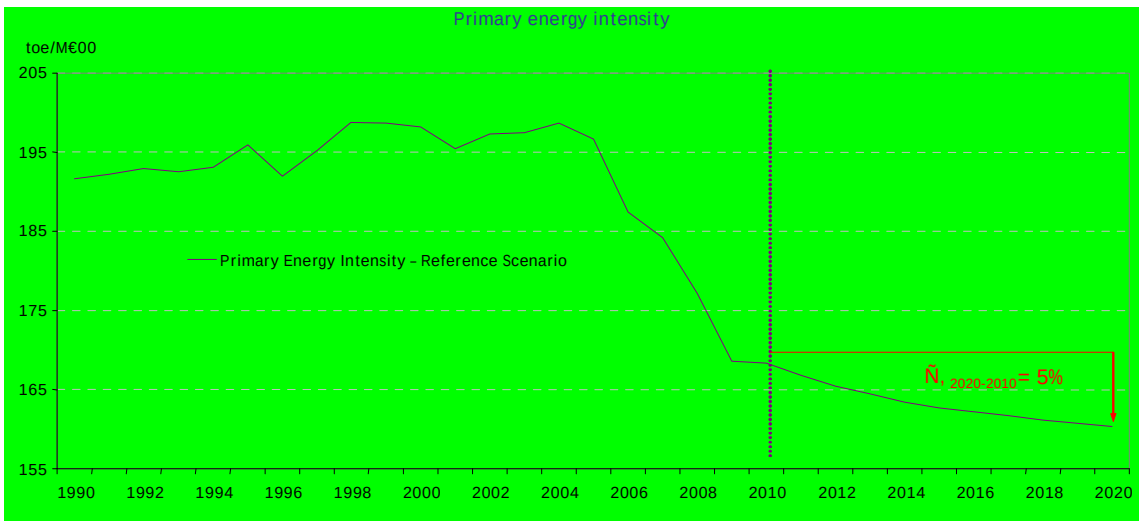
Development of energy intensity 2010-2020

In this scenario, the lack of additional efficiency measures as from 2010 causes a progressive increase in demand both in terms of primary and final energy at an approximate average annual rate of 2% in both cases.

Combined with the expected development of gross domestic product, this would produce an accumulated reduction in primary energy intensity of 5% by 2020, approximately three times lower than the expected improvement within the framework of the efficiency scenario.

The following figures show the historical and expected development of primary and final energy intensities for the period 1990-2020.

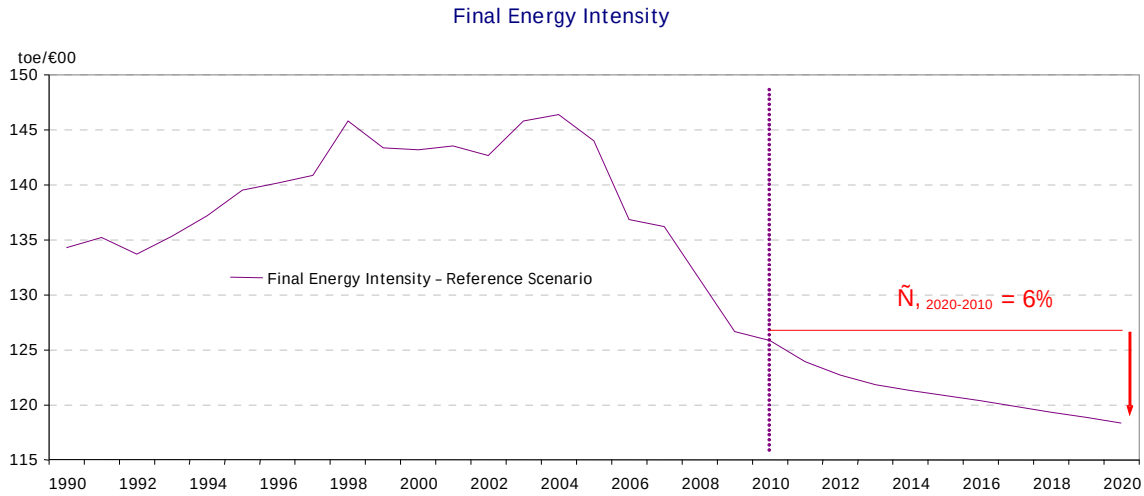
Figure 2.2-6 Development of primary energy intensity in the Reference Scenario



A slightly higher cumulative improvement (6%) can be expected in final energy intensity, undoubtedly due in part to the savings and efficiency actions undertaken

under the preceding E4 2008-2012, which will continue to generate annual savings throughout the useful life of the aforementioned actions.

Figure 2.2-7 Development of final energy intensity in the Reference Scenario



Development of the electricity generation mix 2010-2020.

An analysis of the electricity balance pinpoints two energy sources which may be expected to play an important role in the electricity generation structure by 2020: renewable energies and natural gas, which together will cover nearly three quarters of total domestic demand for electricity.

The case of renewable energies is particularly important given their greater average annual growth during the period of analysis (approximately 6.34%), meaning that by 2020 these autochthonous resources will meet 36% of electricity demand, on a par with natural gas (39%).

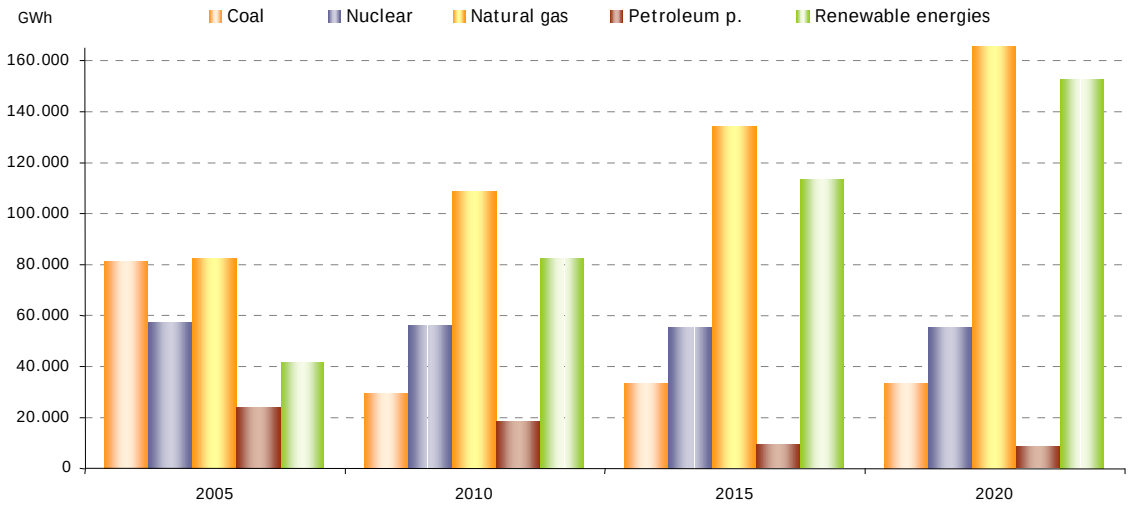
Table 2.2-3 National Electricity Balance
(Reference scenario)

GWh	2005	2010	2015	2020
Coal	81,458	29,710	33,630	33,500
Nuclear	57,539	56,000	55,600	55,600
Natural Gas	82,819	108,829	134,220	165,791
Petroleum products	24,261	18,535	9,381	8,721
Renewable Energies	41,741	82,631	113,325	152,835
Pumped hydroelectric	5,153	3,640	6,577	8,023
Gross generation	292,971	299,345	352,733	424,470
Consumption during generation	11,948	9,300	8,610	8,878
Net generation	281,783	290,045	344,122	415,592
Energy consumed by pumping	6,360	5,200	9,396	11,462
Exchange balance	-1,344	-8,000	-8,000	-8,000
Demand (bc)	274,080	276,845	326,727	396,130
Consumption processing sectors	5,804	5,314	5,800	5,800
Losses transport, distribution	25,965	25,520	28,065	31,138
FINAL ELECTRICITY DEMAND	242,310	246,011	292,862	359,192
Increase over preceding year	4.58%	0.80%	4.18%	4.16%
% renewables/gross production	14.7%	27.6%	32.1%	36.0%

We would add an additional observation regarding other energy sources. Throughout the period (2010-2020), the contribution of coal-fired and nuclear energy to coverage of the demand for electricity will remain practically stable with a slight upward trend in the first case and the opposite in the second. The contribution of petroleum products will decrease at an average annual rate of 7%.

As for renewable energy technologies, wind and hydroelectric energy will remain in the forefront, accounting for over 70% of total renewable electricity generation with the former clearly predominant.

Figure 2.2-8 Development of gross electricity generation by energy source (Reference scenario)



Within this scenario, there are emerging energy areas which hitherto were non-existent or only marginally present. One such is solar thermoelectric energy which is expected to play a much more important role from 2010 onwards.

There is also solar photovoltaic technology, whose contribution to electricity generation will continue to grow significantly over the next several years.

Also noteworthy is the effort planned over the next several years in technologies with great energy potential such as biogas, biomass and MSW which have not been fully exploited to date.

We would finally draw attention to the entry of new technologies such as offshore wind, geothermics and sea energy. Of these, we would highlight the contribution of offshore wind, which is predicted to reach a production level of close to 8,000 GWh in 2020.

2.3 Additional energy efficiency scenario

2.3.1 Description of the additional energy efficiency scenario

The additional energy efficiency scenario includes new energy efficiency measures implemented as from 2010 to allow a reduction in primary energy demand from approximately 157 million toe of the reference scenario in 2020 to nearly 140 million

toe, i.e. an 11% reduction in relative terms. The aim of this section is to explain the measures under study from now to 2020 with a view to bringing demand down to the levels set out in the Additional Energy Efficiency Scenario.

The **Sustainable Economy Act** (a bill already sent by the Government to Parliament) will foreseeably be approved during the Plan's interim horizon. This Act incorporates a large proportion of the regulatory measures listed in the 2008-2012 Action Plan approved by the Spanish Government in July 2007 within the framework of the 2004-2012 Energy Efficiency Savings Strategy, mostly within the industrial sector, for specific ex-ante evaluation of energy impacts required of all industrial projects. Within the transport sector, the provisions of the Sustainable Economy Act provide for the implementation of basic legislation on urban mobility which will be further developed in the future **Energy Efficiency and Renewable Energies Act** to which the Sustainable Economy Act now before Parliament refers. The provisions of these two legal texts, together with the ones already passed prior to 2009 (*Royal Decree 1890/2008 of 14 December 2008 establishing the Energy Efficiency Regulation for outside lighting and its Supplementary Technical Instructions EA-01 to EA-07*), will meet the requirements of the 2008-2012 Energy Savings and Efficiency Action Plan.

The Sustainable Economy Act and the Energy Efficiency and Renewable Energies Act will serve as fundamental regulatory measures to achieve the efficiency gains alluded to in the Additional Energy Efficiency Scenario. In these laws (the former currently before Parliament) we would draw attention to the creation of conditions allowing for the efficient operation of an **energy services market**, stimulating demand for such services and enhancing supply by providing these companies with a stable legal framework over the medium term.

Of the new measures incorporated in the Additional Energy Efficiency Scenario since 2009, some constitute new approaches or newly approved budgets to achieve the targets already set out in the 2008-2012 Energy Savings and Efficiency Action Plan for the measures included in the latter.

Whatever the relative importance of the role played by taxation in each of the sectors, we believe that environmental taxation and positive tax discrimination in favour of improved energy efficiency and greater penetration of renewable energies in general are fundamental elements in the effort to achieve the reduction in energy consumption envisaged in the additional energy efficiency scenario and the renewable energy targets laid down in this Plan. Therefore, this is one of the major issues under study for purposes of design and implementation in a manner consistent with the development of the European tax harmonisation framework.

The efficiency scenario may in some cases incorporate additional mechanisms to ensure the efficient operation of the energy services market.

The specific measures proposed for sectors are additional to those included in the 2008-2012 Energy Savings and Efficiency Action Plan. Their implementation will continue after 2010 and must be allocated the resources necessary to achieve their targets while respecting budgetary stability.

In the **INDUSTRIAL** sector it is important to ensure the economic viability of energy saving and efficiency projects by devising **direct public aid programmes** providing the maximum aid permitted under Community competition law, to be managed by the competent bodies of the Autonomous Communities or by the IDAE (Institute for Energy Diversification and Saving) itself. As an additional measure to achieve the improvements envisaged in the additional energy efficiency scenario, it is important to

continue with the *IDAE aid programme for strategic investment projects in energy savings and efficiency* authorised by the European Commission (in accordance with Community Guidelines regarding aid in favour of the environment) for purposes of multi-regional and multi-annual energy savings and efficiency projects and unique and innovative projects in the industrial sector which entail conversion or change of production processes in large energy-intensive areas of industry.

In the **TRANSPORT** sector, both scenarios a certain degree of saturation in energy consumption is assumed as a result of the impact of air quality measures in cities and social pressure, which translates into the relatively active participation of consumption in the sector (of total final demand, not counting non-energy uses), around 40% (40.8% in the Reference Scenario and 39.7% in the Additional Energy Efficiency Scenario, as a result of the active savings and energy efficiency measures adopted).

One fundamental element in the supplementary measures envisaged in addition to those already alluded to in the 2004-2012 Energy Savings and Efficiency Strategy Action Plans is a reorientation of taxation in this sector with greater stress on the environment.

In addition to tax measures, **comparative energy efficiency labelling of passenger vehicles** should be encouraged and priority awarded to vehicles with the highest energy efficiency ratings in public tenders for the purchase of vehicles. Vehicle labelling should be encouraged at the same time as the introduction of labelling for basic automobile accessories (tyres, A/C, lighting, etc.).

Rail transport should be obliged to incorporate **Brake energy recovery systems** in metropolitan and commuter train transport.

The following additional measures for the transport sector up to 2020 are proposed in line with the classification of energy savings and efficiency measures already laid down in the 2008-2012 Action Plan:

Modal change measures

There will be general checks on energy savings arising from increased investment in rail transport (both passenger and freight) in both scenarios in urban settings during the 2010-2020 period.

Specifically in the Additional Energy Efficiency Scenario, **implementation of the measures proposed in the *Sustainable Urban Mobility Plans*** which have been devised (and which will have to be implemented following approval of the Sustainable Economy Act or of the Energy Efficiency and Renewable Energies Act in this scenario), should give rise to a clear shift towards collective modes of transport (urban) and non-motorised modes. Similarly, the need to meet air quality standards in cities laid down in Directive 2008/50/EC will give rise to increased demand for more environmentally-friendly vehicles to access some urban areas (where certain vehicles may be banned) with particular stress on consumption linked to last-mile freight transport in cities.

Measures for rational use of means of transport

The **across-the-board application of new information technologies to passenger and freight transport fleets** for proper management of routes and loads will receive the backing of the public administrations through specifically-designed public support programmes, which may be managed by the Autonomous Communities or by the General State Administration itself through IDAE. Information and communication

technologies will also translate into potential important savings linked to the management of road traffic to prevent congestion.

Energy saving and efficiency plans designed to guarantee effective achievement of the targets laid down in the 2008-2012 Energy Savings and Efficiency Action Plan or which extend the latter to ensure compliance with the energy saving and efficiency targets included under the Additional Energy Efficiency Scenario, will include continuing training in efficient driving techniques. Additionally, approval of these plans (currently before Parliament) ensures that knowledge of these techniques will be required as a basic skill for new drivers to pass their driving test.

Fleet renewal measures

The main difference between the two scenarios is the accent put on the **electrification of road transport**, which will make it possible to lower the 95 gCO_2/km target envisaged under Regulation 443/2009.

The incorporation during the 2010-2020 period of **new electric and plug-in hybrid** vehicles, which are projected to account for **10% of the total fleet** by 2020, translates into **2.5 million of these vehicles** by that date. Assuming that vehicles today travel 15,000 kilometres annually and that city-driving consumption is 8 litres/100 km, estimated annual energy consumption is in the neighbourhood of 1.2 toe/year/vehicle. Based on this figure, energy savings should be as follows: conventional hybrids could lower this figure by 20-25% and plug-in hybrids would achieve a 35-40% saving while savings from purely electrical vehicles would be in the vicinity of 50-55%.

Additionally, for vehicles currently exempt from Regulation 443/2009 (vans and the like), similar regulatory provisions are envisaged to achieve energy savings on a par with those laid down for light vehicles by 2020.

The additional measures proposed starting in 2009 in the **BUILDING** sector are grouped as in the 2008-2012 Action Plan itself, i.e. those addressing existing buildings and those addressing new buildings, the term "building" referring not only to the thermal sheathing but also to energy-consuming installations (heating, cooling, lighting, etc.) and energy-consuming equipment (appliances, for example).

Measures proposed for existing buildings

While a great deal of energy can potentially be saved in existing buildings, this is not easily accomplished. The 2008-2012 Action Plan itself noted the difficulties encountered in addressing energy rehabilitation measures affecting a significant number of buildings. Up to 2009, annual rehabilitation was carried out on 0.2% of existing buildings, where the target was 3.3%. The crisis in the real estate sector makes it more difficult to achieve these objectives although the slowdown in the construction of new buildings could serve as an opportunity to concentrate efforts on the energy rehabilitation of existing buildings, which would have an indisputably positive effect on employment.

Energy rehabilitation of buildings revolves around 4 core measures where the greatest potential savings are to be made:

- Energy rehabilitation of the thermal sheathing of existing buildings;
- Enhancement of the energy efficiency of existing thermal installations (heating, cooling and hot water);
- Enhancement of the energy efficiency of inside lighting in existing buildings;

§ Renewal of appliances.

These measures are implemented through the so-called ***Planes Renove*** (renewal plans) which up to 2009 have been successful in replacing inefficient home appliances. This was considered the best way to channel public aid to domestic consumers and allows traders and distributors of equipment to take an active part in the management of public programmes supporting the acquisition of efficient appliances. Therefore, the already existing *Planes Renove* will continue past 2009 (with a new budget) and other new ones will be implemented: *Planes Renove* for roofs, *Planes Renove* for building façades, *Planes Renove* for windows, *Planes Renove* for boilers, *Planes Renove* for air conditioning systems, *Planes Renove* for home appliances, etc.

Additionally, achievement of the savings targets established in the Additional Energy Efficiency Scenario requires **boosting public or private rehabilitation plans in urban centres**. Given that a number of buildings are subject annually to some type of reform (cleaning of façades, roof repair, replacement of woodwork, etc.) for reasons of safety, comfort or simply appearance, energy rehabilitation should be part and parcel of this refurbishment so as to ensure its economic viability.

Approval of the aforementioned statutes (the Sustainable Economy Act and the Energy Efficiency and Renewable Energies Act) assumed in the Additional Energy Efficiency Scenario will raise the requirement level of the building energy certification procedure so that buildings which do not receive an energy score above a certain threshold value will have to perform repairs in order to comply with minimum energy efficiency requirements. In this scenario, applicable laws will include the minimum energy efficiency requirements for existing buildings, which are more stringent than the current ones.

Investment in energy savings and efficiency in the building sector – especially non-residential – will receive a boost from the energy services market and from the support framework envisaged to encourage savings arising from energy saving and efficiency investment projects. However, **the public sector must set an example by stimulating the demand for energy services** and thus contribute – through the engagement of energy services in its own buildings – to a change in the model whereby energy savings and efficiency investments are made.

Measures proposed for new buildings

Despite recovery in economic activity in both scenarios, actions implemented in new buildings are expected to have less of an effect than the proposals for existing ones: the new Directive on Energy Efficiency in Buildings provides that by 2020 new buildings must be energy efficient (class A, for example), this being applicable to public buildings in 2018; more demanding interim targets for 2015 are also set within the framework of this Directive although the impact of the transposition of this Directive into Spain's legal system will not translate into significant quantified savings due to the decline expected in new construction projects during the time horizon of the National Renewable Energy Action Plan.

In the Additional Energy Efficiency Scenario, mandatory extension of the minimum energy efficiency requirements laid down for new installations in the *Regulation on the energy efficiency of outdoor lighting* approved in December 2009 to already existing installations is expected in the **PUBLIC SERVICES** sector.

While application of the aforementioned regulation to new installations forms part of the reference scenario, its mandatory application to already existing outdoor lighting

installations will only be possible if the Energy Efficiency and Renewable Energies Act is passed, so that Act will provide that already existing installations must adapt within five years to the minimum energy efficiency requirements applicable to new installations.

In the **AGRICULTURE AND FISHERIES SECTOR** we may expect to see continued implementation of the measures announced in the 2008-2012 Action Plan, further enhanced by the approval of the annual public budgets making the execution of the Plan and its projection beyond 2012 possible. Even though the 2008-2012 Action plan was approved in 2007, approval of sufficient budgetary allocations is necessary each fiscal period. and hence starting in 2009, to make the savings envisaged in the Additional Energy Efficiency Scenario possible. These measures include communication campaigns on the efficient use of energy in agriculture, the incorporation of energy efficiency criteria in agricultural tractor modernisation plans, the replacement of spray irrigation systems with localised ones, the introduction of minimum tilling techniques and improvement in energy efficiency among irrigation communities and the fisheries sector.

In the **ENERGY TRANSFORMATION** sector, the measures envisaged within the horizon of the National Renewable Energy Action Plan include the continuation and intensification of the measures already included in the 2008-2012 Energy Savings and Efficiency Action Plan devised to develop the potential of high-efficiency cogeneration and to improve the energy efficiency of existing cogeneration which has been around for over 16 years.

2.3.2 Development of consumption and energy intensity 2010-2020 in the additional energy efficiency scenario

Development of primary and final consumption 2010-2020

Primary energy consumption forecasts indicate that while oil will remain the primary source to meet domestic demand, its relative importance will diminish significantly. No changes are in the offing for nuclear energy which will continue to be present through the nuclear generators whose close-down date has not been established, meaning that they will continue to cover approximately 10% of the energy demand throughout the period under consideration.

However, requirements arising from the energy and environmental imperatives that shape our energy policy, together with the need to address the high dependence issue and the foreseeable investment in energy infrastructures to connect with European markets through France, all contribute to the increasing importance of natural gas, and especially renewable energies, in the energy mix. The share of energy needs covered by these two sources will progressively increase, mostly to the detriment of oil, jointly covering nearly 50% of primary energy demand by 2020 and surpassing oil's contribution, which will stand at an estimated 36% by 2020.

Table 2.3-1 Primary energy consumption
(Additional energy efficiency scenario)

Ktoe	2005	2010	2015	2020
Coal	21,183	9,198	10,641	10,533
Oil	71,765	60,441	54,100	49,680
Natural Gas	29,116	32,314	35,486	39,118
Nuclear	14,995	14,594	14,490	14,490
Renewable Energies	8,371	13,966	19,798	28,095

Elec. Balance (imp-exp)	-116	-688	-971	-2,167
Total Primary Energy	145,314	129,825	133,544	139,749

This situation will lead to considerable development of these two sources, particularly in the case of renewable energies. This can be summed up in annual average growth rates of 1.9% and 7.2% respectively in the consumption of natural gas and renewable energies from 2010 onward. In the case of renewable energies, this also implies doubling the coverage of total demand to approximately 20.1%. This trend will be further stimulated by the implementation of strict energy savings and efficiency measures and policies which will moderate domestic energy demand so that renewable resources, mostly autochthonous, can cover a greater proportion of that demand.

Briefly then, primary energy supply is generally evolving towards greater diversification in 2020 with a more balanced mix of nearly all sources.

The development pattern is similar for final energy. Oil, currently in a dominant position, will diminish in relative importance in favour of renewable energies and electricity, demand for which will grow significantly. This is especially true of renewable energies, whose share of the energy mix will grow at an average annual rate of 5.3% with 2010 as the base year. The demand for coal will remain stable at 2%.

Table 2.3-2 Final energy consumption
(Additional energy efficiency scenario)

Ktoe	2005	2010	2015	2020
Coal	2,424	1,650	2,173	2,162
Petroleum products	54,376	46,426	41,391	36,972
Natural Gas	17,145	15,532	17,197	17,964
Electricity	20,836	21,157	23,803	27,343
Renewable Energies	3,804	5,467	6,875	9,158
Total Energy Uses	98,585	90,232	91,439	93,600
Non energy uses	7,842	6,785	6,765	6,765
Petroleum products	7,362	6,415	6,415	6,415
Natural Gas	480	370	350	350
Total Final Uses	106,426	97,017	98,204	100,365

Very little change is expected in the sectoral structure of final energy demand during the course of the period under scrutiny. In other words, the transport sector will continue to dominate and account for 40% of that demand. The relative importance of the industrial, residential and services sectors will remain stable in terms of their energy demand throughout the period.

Table 2.3-3 Final energy consumption by sector
(Additional energy efficiency scenario)

Ktoe	2005	2010	2015	2020
Industry	30,675	25,721	26,083	26,365
Transportation	37,956	36,241	36,883	37,470
Residential, services and others	29,954	28,270	28,473	29,764
Total Energy Uses	98,585	90,232	91,439	93,600
Non energy uses:	7,842	6,785	6,765	6,765

Total Final Uses	106,426	97,017	98.20	100,365

The following Figures show historical development since 1990 and the forecasts for primary energy consumption and final energy consumption, respectively, for each of the two scenarios described. They show a sharp reduction in consumption associated with the additional energy efficiency scenario, and that is in comparison with values which have already fallen sharply over the last several years.

Figure 2.3-1 Primary Energy Consumption in the Additional Energy Efficiency Scenario

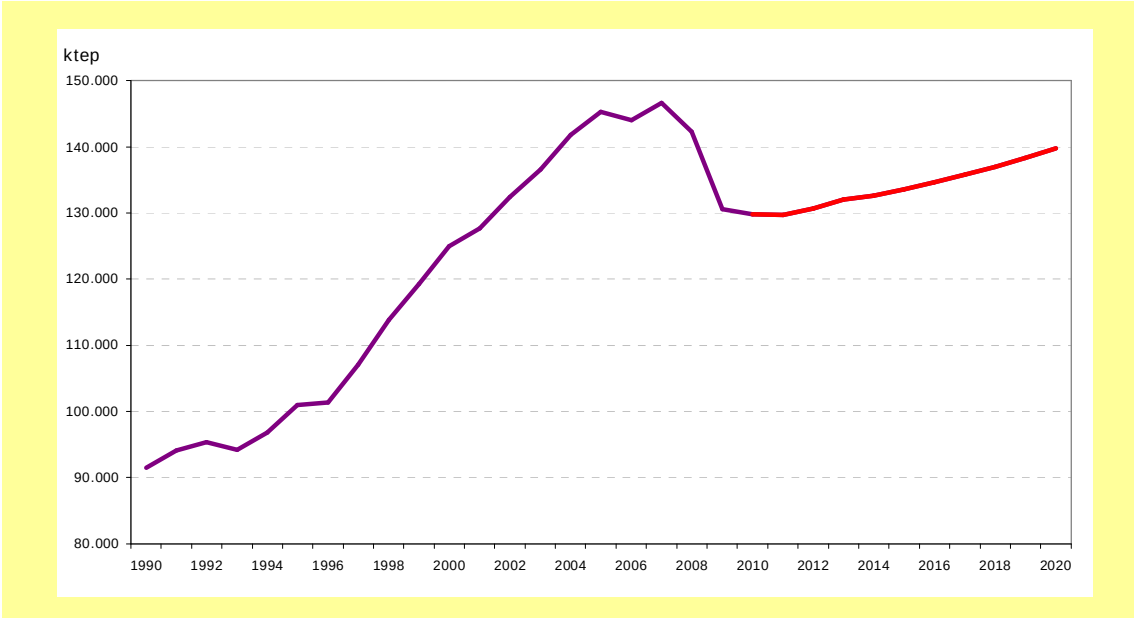
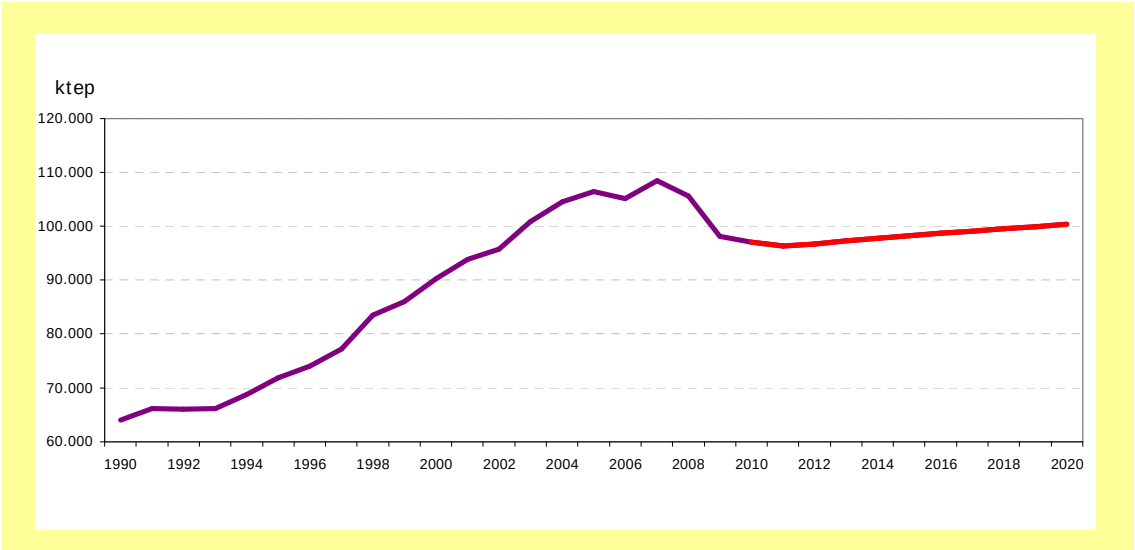


Figure 2.3-2 Final Energy Consumption in the Additional Energy Efficiency Scenario



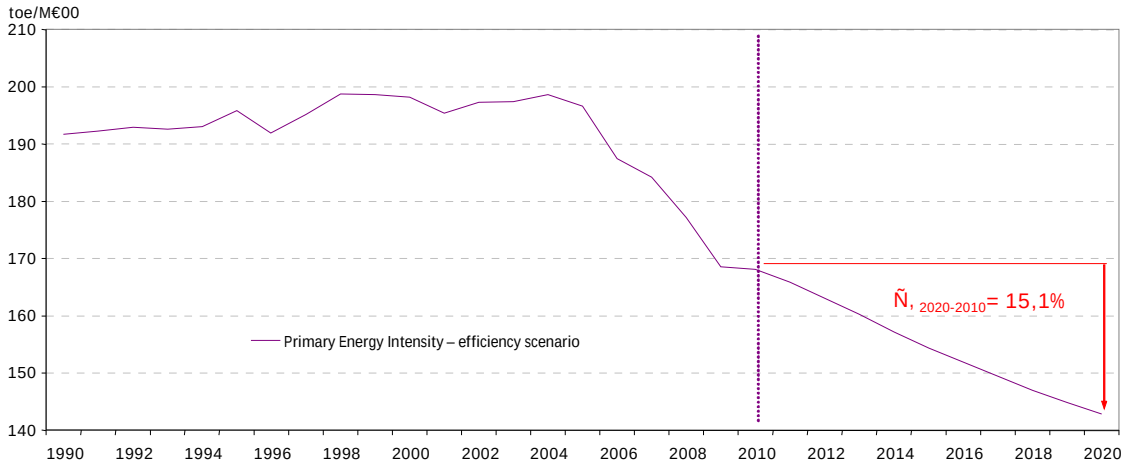
Development of energy intensity 2010-2020

As a result of intensified energy efficiency measures, primary and final energy demand is expected to level off, with annual average growth rates of under 1% in both cases. This assertion is also borne out by per capita energy consumption trends, an indicator which will remain practically flat in terms of both primary and final energy.

This situation, taken together with the expected development of gross domestic product, will lead to an accumulated reduction in primary energy intensity of 15.1% by

2020, equivalent to an average annual improvement of 1.62%. This is a continuation of the efficiency improvement already initiated in 2004.

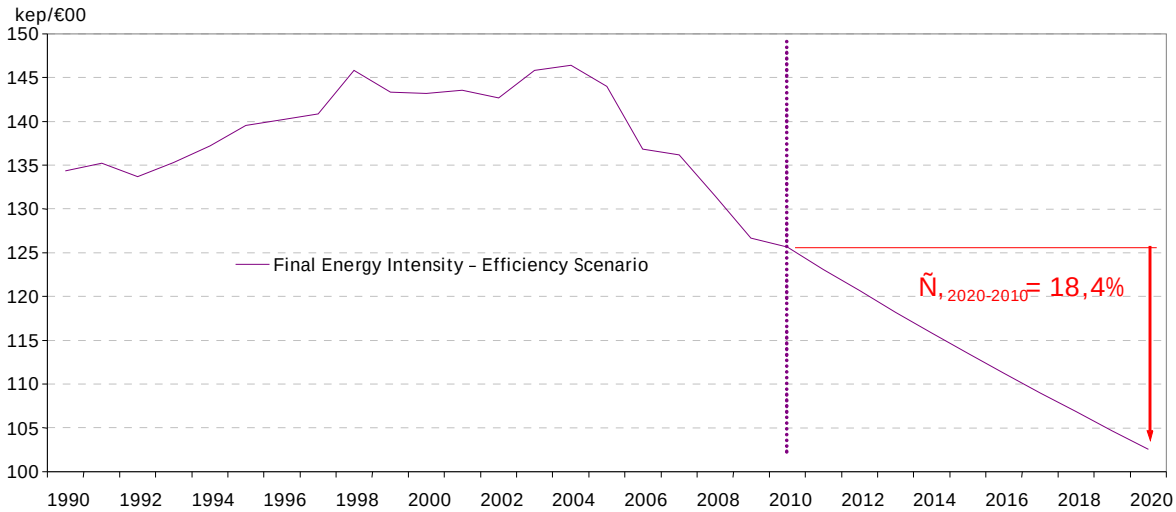
Figure 2.3-3 Development of Primary Energy Intensity in the Additional Energy Efficiency Scenario



The above final energy prediction represents an even greater improvement (approximately 18.4%) in the final energy intensity indicator in cumulative terms between 2010 and 2020, showing an annual average improvement of 2%.

In the new situation, the improvement in final energy intensity, outpacing improvements in primary energy intensity, highlights the effort made through energy policies to improve the efficiency of all final use sectors where the greatest margin for efficiency improvement can be found within the 2010-2020 horizon.

Figure 2.3-4 Development of Final Energy Intensity in the Additional Energy Efficiency Scenario



Development of the electricity generation mix 2010-2020

Judging from the structure of electricity generation, an increase is expected in the relative importance of natural gas and renewable energies, areas which will grow by 2.7% and 6.34% in terms of electricity generation. Electricity production from nuclear energy will remain stable with a downward trend, registering a slight erosion in its coverage ratio of global electricity demand. Coal will remain practically stable while the relative importance of petroleum products in electricity generation will take a downward turn.

In any event, renewable energies are destined to play a more central role in our electricity generation mix and are the only source whose electricity generation will grow not only in absolute terms but also in relative terms, as evidenced by the expected rise in the vicinity of 3.3% in the annual average electricity demand coverage, to give a coverage rate close to 40%. Having regard to natural gas, new production will mostly be attributable to cogeneration plants; these will evolve at a faster rate than combined cycle plants, which today account for 71% of electricity production based on that fuel as compared to 25% from cogeneration with natural gas. In the case of natural gas, we expect greater convergence between these two technologies in favour of cogeneration. Furthermore, this fuel's total coverage of electricity demand will develop within relatively stable margins in the area of 35%.

A breakdown by renewable energy technologies shows that wind energy will continue to play a dominant role, accounting for 52% of renewable electricity production in 2020 (on- and offshore considered jointly), which is close to 20% of total electricity production and exceeds nuclear production. It is followed at a considerable distance by hydraulic, solar thermoelectric and solar photovoltaic, accounting respectively for 8.3%, 3.8% and 3.6% of total gross electricity generation.

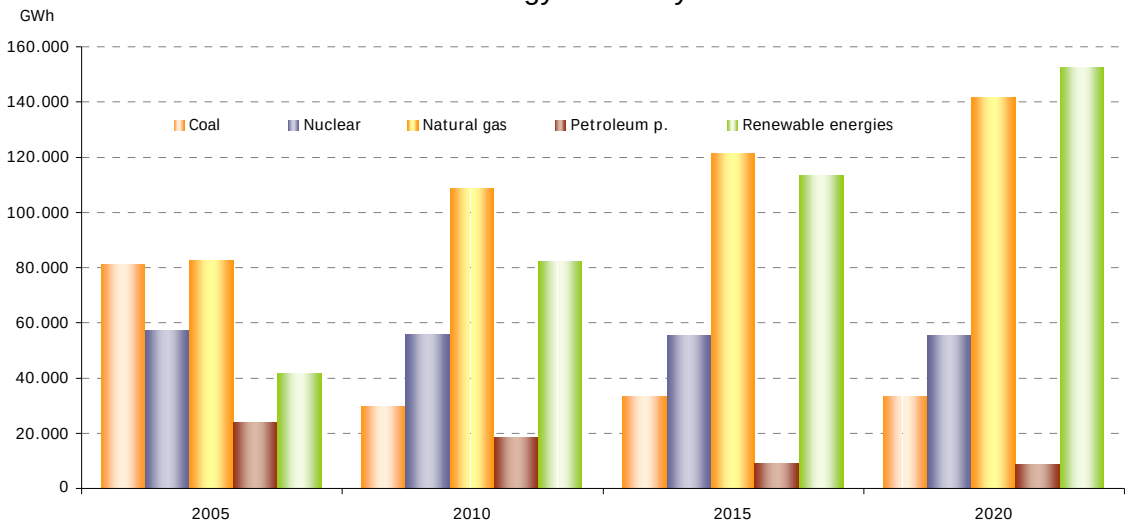
Table 2.3-4 National Electricity Balance

GWh	2005	2010	2015	2020
Coal	81,458	29,710	33,630	33,500
Nuclear	57,539	56,000	55,600	55,600
Natural Gas	82,819	108,829	121,419	141,741
Petroleum products	24,261	18,535	9,381	8,721
Renewable Energies	41,741	82,631	113,325	152,835
Pumped hydroelectric	5,153	3,640	6,577	8,023
Gross generation	292,971	299,345	339,931	400,420
Consumption during generation	11,948	9,300	8,610	8,878
Net generation	281,783	290,045	331,321	391,542
Energy consumed by pumping	6,360	5,200	9,396	11,462
Exchange balance	-1,344	-8,000	-11,285	-25,199
Demand (bc)	274,080	276,845	310,640	354,882
Consumption processing sectors	5,804	5,314	5,800	5,800
Losses transport, distribution	25,965	25,520	28,065	31,138
FINAL ELECTRICITY DEMAND	242,310	246,011	276,775	317,944
Increase over preceding year	4.58%	0.80%	2.69%	2.95%
% renewables/gross production	14.7%	27.6%	33.3%	38.2%

As the foregoing table suggests, international trade in electricity in 2020 shows annual exports in the range of 25,000 GWh. The efficiency improvement envisaged in this scenario puts Spain's renewable energy generation capacity ahead of its domestic consumption needs; this contributes to a large degree to our country's renewable energy surplus, which can be transferred to other Member States, thus contributing to compliance with the joint objectives of the European Union.

However, if we are to attain 40% electricity generation with renewables, largely from non-manageable installations, it is indispensable to extend electricity interconnection towards Central Europe through France at a significantly faster rate than is currently planned, as explained in ~~sub~~section 4.2.6.

Figure 2.3-5 Development of Gross Electricity Production by energy source in the Additional Energy Efficiency Scenario



Particularly noteworthy in relative terms is solar thermoelectric energy, which shows sharp growth in electricity production by a factor of 13.42 vis-à-vis 2010. It is accompanied by biomass and biogas, production of which is expected to rise sharply at an average annual rate of between 7% and 12.6% in the period 2009-2020. We would also draw attention to the incorporation of new technologies which are still relatively unknown such as offshore wind, geothermal and marine energies which will play an increasingly greater role. This is especially the case of offshore wind. By 2020, these emerging technologies considered jointly will contribute an amount of electricity on a par with that from petroleum products.

2.4 Gross final energy consumption forecasts for Spain 2010-2020

Following are the forecasts for gross final energy consumption in Spain for 2010-2020 for the reference hypothesis (or reference scenario) and for the additional energy efficiency hypothesis (additional energy efficiency scenario) in accordance with the methodology defined in Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources, and the Decision of the European Commission of 30 June 2009 establishing a template for National Renewable Energy Action Plans under the aforementioned Directive.

The figures appearing under the headings "heating and cooling", "electricity", "transport as in Article 3(4) a)" and "final gross consumption of energy" were calculated in accordance with the said directive and template. In this connection, we should note that in any given year the sum of the figures from lines 1, 2 and 3 of TABLE 1 do not necessarily coincide with the corresponding figure from line 4.

Table 1: **Expected gross final energy consumption of Spain in heating and cooling, electricity and transport up to 2020 taking into account the effects of energy efficiency and energy saving measures** (6) **2010-2020 (ktoe)** *(A)*

	2005	2010		2011		2012		2013		2014	
	Base year	Reference scenario	Additional energy efficiency	Reference scenario	Additional energy efficiency	Reference scenario	Additional energy efficiency	Reference scenario	Additional energy efficiency	Reference scenario	Additional energy efficiency
1. Heating and cooling (1)	40,254	33,340	33,340	32,649	32,465	32,559	32,349	32,393	31,984	32,318	31,671
2. Electricity (2)	25,080	25,056	25,056	25,616	25,513	26,428	26,105	27,571	26,951	28,589	27,593
3. Transport as in Article 3(4) a) (3)	32,407	30,891	30,875	30,816	30,795	31,433	30,746	32,402	31,068	33,460	31,180
4. Gross final energy consumption (4)	101,845	93,379	93,226	93,169	92,503	94,635	92,974	96,613	93,634	98,743	94,116

The following calculation is needed only if final energy consumption for aviation is expected to be higher than 6.18 % (4.12 % for Malta and Cyprus):

Final consumption in aviation											
Reduction for aviation limit (5) Article 5(6)											
Total consumption after reduction for aviation limit											

(A) CLARIFICATION: The values under each year of line 4 "gross final energy consumption" do NOT necessarily have to coincide with the sum of the preceding three lines ("heating and cooling", "electricity" and "transport as in Article 3(4) a)" of that same year.

(1) This is the final energy consumption of all energy commodities except electricity for purposes other than transport, plus the consumption of heat for own use at electricity and heat plants and heat losses in networks (items 2. Own use by plant' and 11. Transmission and distribution losses' as per Regulation (EC) No 1099/2008 on energy statistics (p. 23-24).
(2) The gross electricity consumption is national gross electricity production, including self-production, plus imports, minus exports.
(3) Transport consumption as defined in Article 3(4)(a) of Directive 2009/28/EC. For this figure, renewable electricity in road transport should be multiplied by a factor of 2.5, as indicated by Article 3(4)(c) of Directive 2009/28/EC.
(4) As defined in Article (2)(f) of Directive 2009/28/EC. This comprises final energy consumption plus network losses and own use of heat and electricity at electricity and heating plants. (NB: this does not include consumption of electricity for pumped hydro storage or for transformation in electrical boilers or heat pumps at district heating plants).
(5) According to Article 5(6) consumption for aviation has to be considered only up to 6.18 % (Community average), for Cyprus and Malta up to 4.12 % of gross final energy consumption .
(6) These energy efficiency and energy saving estimates should be consistent with other estimates of this type which Member States report to the Commission, mainly in their action plans in accordance with the Directive on energy services and the Directive on the energy efficiency of buildings. If different units are used in those action plans, the conversion factors applied must be indicated.

Table 1: Gross final consumption forecasts for Spain for heating and cooling, electricity and transport up to 2020, taking account of the effects of energy efficiency and energy savings measures (6) 2010-2020 (ktoe) (A)

	2015		2016		2017		2018		2019		2020	
	Reference scenario	Additional energy efficiency	Reference scenario	Additional energy efficiency	Reference scenario	Additional energy efficiency	Reference scenario	Additional energy efficiency	Reference scenario	Additional energy efficiency	Reference scenario	Additional energy efficiency
1. Heating and cooling (1)	32,315	31,452	32,259	31,181	32,180	30,894	32,067	30,546	31,932	30,189	31,837	29,849
2. Electricity (2)	29,647	28,264	30,926	29,140	32,072	29,863	33,271	30,625	34,517	31,421	35,816	32,269
3. Transport as per Article 3(4) a) (3)	34,391	31,222	35,382	31,292	36,367	31,410	37,380	31,502	38,408	31,609	39,410	31,681
4. Gross final consumption of energy (4)	100,923	94,593	103,150	95,078	105,417	95,562	107,739	96,055	110,108	96,544	112,530	97,041

The following calculation is only necessary if final energy consumption for aviation is expected to exceed 6.18 % (4.12 % for Malta and Cyprus):

Final consumption in aviation	6,294		6,526		6,784		7,054		7,334		7,603	
Reduction for aviation limit (5) Article 5(6)	57		152		270		396		529		649	
Total consumption after reduction for aviation limit	100,866		102,998		105,147		107,343		109,579		111,882	

(A) CLARIFICATION: The values under each year of line 4 "gross final energy consumption" do NOT necessarily have to coincide with the sum of the preceding three lines ("heating and cooling", "electricity" and "transport as in Article 3(4) a)" of that same year.

(1) This is the final energy consumption of all energy commodities except electricity for purposes other than transport, plus the consumption of heat for own use at electricity and heat plants and heat losses in networks (items 2. Own use by plant' and 11. Transmission and distribution losses' as per Regulation (EC) No 1099/2008 on energy statistics (p. 23-24).
(2) The gross electricity consumption is national gross electricity production, including self-production, plus imports, minus exports.
(3) Transport consumption as defined in Article 3(4)(a) of Directive 2009/28/EC. For this figure, renewable electricity in road transport should be multiplied by a factor of 2.5, as indicated by Article 3(4)(c) of Directive 2009/28/EC.
(4) As defined in Article (2)(f) of Directive 2009/28/EC. This comprises final energy consumption plus network losses and own use of heat and electricity at electricity and heating plants. (NB: this does not include consumption of electricity for pumped hydro storage or for transformation in electrical boilers or heat pumps at district heating plants).
(5) According to Article 5(6) consumption for aviation has to be considered only up to 6.18 % (Community average), for Cyprus and Malta up to 4.12 % of gross final energy consumption .
(6) These energy efficiency and energy savings estimates should be consistent with other estimates of this type which Member States report to the Commission, mainly in their action plans in accordance with the Directive on energy services and the Directive on the energy efficiency of buildings. If different units are used in those action plans, the conversion factors applied must be indicated.

RENEWABLE ENERGY TARGETS AND TRAJECTORIES

CHAPTER 3

3. RENEWABLE ENERGY TARGETS AND TRAJECTORIES

3.1 National overall target

Table 2: National overall target for the share of energy from renewable sources in gross final consumption of energy in 2005 and 2020 (figures to be transcribed from Annex I, Part A to Directive 2009/28/EC)

A) Share of energy from renewable sources in gross final consumption of energy in 2005 (S_{2005}) (%)	8.7%
B) Target of energy from renewable sources in gross final consumption of energy in 2020 (S_{2020}) (%)	20%
C) Expected total adjusted energy consumption in 2020 (from Table 1, last cell) (ktoe)	97,041
D) Expected amount of energy from renewable sources corresponding to the 2020 target (calculated as B x C) (ktoe)	19,408

3.2 Sectoral targets and trajectories

Table 3: Spain's 2020 target and estimated trajectory of energy from renewable sources (RES) in heating and cooling, electricity and transport (calculation Tables 4a and 4b may serve as guides for preparation of Table 3)

	2005	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Renewable Energy Sources - Heating & Cooling (15) (%)	8.8%	11.3%	11.7%	12.0%	12.5%	13.2%	14.0%	14.9%	15.9%	17.0%	18.1%	18.9%
Renewable Energy Sources - Electricity (16) (%)	18.4%	28.8%	29.8%	31.2%	31.9%	32.9%	33.8%	34.3%	35.7%	36.9%	38.2%	40.0%
Renewable Energy Sources - Transport (17) (%)	1.1%	6.0%	6.1%	6.5%	6.5%	8.2%	9.3%	10.4%	11.1%	12.0%	12.7%	13.6%
Overall Renewable Energy Source share (18) (%)	8.3%	13.6%	14.2%	14.8%	15.4%	16.5%	17.4%	18.3%	19.4%	20.4%	21.5%	22.7%
Of which from cooperation mechanism (19) (%)			0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%		0.0%
Surplus for cooperation mechanism (20) (%)			3.2%	3.9%	3.3%	4.4%	3.6%	4.5%	3.3%	4.3%		2.7%
As Part B of Annex I to the Directive			2011-2012		2013-2014		2015-2016		2017-2018			2020
			S_{2005} + 0.20 (S_{2020} - S_{2005})		S_{2005} + 0.30 (S_{2020} - S_{2005})		S_{2005} + 0.45 (S_{2020} - S_{2005})		S_{2005} + 0.65 (S_{2020} - S_{2005})			S_{2020}
RES minimum trajectory (21) (%)			10.96%		12.09%		13.79%		16.05%			20.00%
RES minimum trajectory (ktoe) [2-year arithmetical average, except in 2020]			10,164		11,350		13,073		15,372			19,408

(15) Share of renewable energy in heating and cooling: gross final consumption of energy from renewable sources for heating and cooling (as defined in Articles 5(1)b) and 5(4) of Directive 2009/28/EC) divided by gross final consumption of energy for heating and cooling. Line (A) from Table 4a divided by line (1) of Table 1.
(16) Share of renewable energy in electricity: gross final consumption of electricity from renewable sources for electricity (as defined in Articles 5(1)(a) and 5(3) of Directive 2009/28/EC) divided by total gross final consumption of electricity. Row (B) from Table 4a divided by row (2) of Table 1.
(17) Share of renewable energy in transport: final energy from renewable sources consumed in transport (cf. Article 5(1)(c) and 5(5) of Directive 2009/28/EC) divided by the consumption in transport of 1) petrol; 2) diesel; 3) biofuels used in road and rail transport and 4) electricity in land transport (as reflected in row 3 of Table 1). Line (J) from Table 4b divided by row (3) of Table 1.
(18) Share of renewable energy in gross final energy consumption. Row (G) from Table 4a divided by row (4) of Table 1.
(19) In percentage point of overall RES share.
(20) In percentage point of overall RES share.
(21) As per the definition in Annex I.B of Directive 2009/28/EC.

Table 4a: Calculation table for the renewable energy (RES) contribution of each sector to final energy consumption (ktoe) (B)

	2005	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
A) Expected gross final consumption of RES for heating and cooling	3,550	3,764	3,811	3,879	4,009	4,181	4,404	4,651	4,926	5,189	5,477	5,645
B) Expected gross final consumption of electricity from RES	4,624	7,227	7,610	8,133	8,593	9,080	9,545	10,002	10,662	11,288	12,007	12,903
C) Expected final consumption of energy from RES in transport	366	1,802	1,833	1,927	1,950	2,477	2,695	3,004	3,209	3,416	3,624	3,885
D) Expected total RES consumption (22)	8,433	12,693	13,125	13,786	14,376	15,542	16,419	17,403	18,513	19,578	20,760	22,057
E) Expected transfer of RES to other Member States												
F) Expected transfer of RES from other Member States and 3rd countries												
G) Expected RES consumption adjusted for target (D) - (E) + (F)	8,433	12,693	13,125	13,786	14,376	15,542	16,419	17,403	18,513	19,578	20,760	22,057

(B) CLARIFICATION: Row D figures "Expected total RES consumption" will NOT necessarily coincide each year with the sum of the three preceding rows because, as explained in note 22 below, gas, electricity and hydrogen are to be counted only once in the total. For example, part of the electricity produced from RES could be listed in row "B" or in row "C" because it is also consumed for transport. Therefore, in order to avoid double accounting, it should be subtracted once only from the total (row "D")

(22) According to Article 5(1) of Directive 2009/28/EC gas, electricity and hydrogen from renewable energy sources shall only be considered once. No double accounting is allowed.

Table 4b: Calculation table for the renewable energy in transport share (ktoe)

	2005	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
(C) Expected RES consumption in transport (23)	366	1,802	1,833	1,927	1,950	2,477	2,695	3,004	3,209	3,416	3,624	3,885
(H) Expected RES electricity in road transport (24)	0.0	0.1	0.9	3.1	6.8	12.3	30.6	48.3	66.5	84.6	103.6	122.9
(I) Expected consumption of biofuels from wastes, residues, non-food cellulosic and lignocellulosic material in transport (25)	0	50	55	55	60	65	161	170	175	232	242	252
(J) Expected RES contribution to transport for the RES-T target: (C) + (2,5 - 1) x (H) + (2 - 1) x (I)	366	1,852	1,890	1,987	2,020	2,560	2,902	3,247	3,484	3,774	4,022	4,322

(23) Containing all RES used in transport including electricity, hydrogen and gas from renewable energy sources, and excluding biofuels that do no comply with the sustainability criteria (cf. Article 5(1) last subparagraph). Specify here actual values without using the multiplication factors.

(24) Specify here actual values without using the multiplication factors.

(25) Specify here actual values without using the multiplication factors.

MEASURES FOR ACHIEVING THE TARGETS

CHAPTER 4

4. MEASURES FOR ACHIEVING THE TARGETS

4.1 Overview of all policies and measures to promote the use of energy from renewable resources

Table 5
Overview of all policies and measures

General measures

Name and reference of the measure	Type of measure (*)	Expected result (**)	Targeted group and/or activity (***)	Existing or planned	Start and end dates of the measure
1. Develop a suitable framework whereby to simplify, standardise and unify administrative procedures for the authorisation of renewable energy installations, including simple notification.	Regulatory	Ease administrative burden, reduce red tape for administrative authorisation	Public administrations	Existing and planned	2010-2020
2. Develop a simplified regulated procedure whereby to secure administrative authorisation for renewable energy projects for thermal applications.	Regulatory	Expedite the issue of administrative authorisation	Public administrations	Planned	Not defined
3. Support R&D-Innovation in energy storage systems.	Financial	Enhanced capacity for the integration of renewable energies in the electricity system.	Public administrations Technological centres	Planned	2012-2020
4. Maintain active public participation in R&D-Innovation in the renewable energies sector by setting up annual support programmes for priority industrial technological development initiatives designed to reduce generation costs, mainly in the wind and solar sectors.	Financial	Enhance the competitiveness of the more mature renewable energies. Full competitiveness in the case of wind energy.	Public administrations	Existing and planned	2011-2020
5. Develop lines of scientific research and innovation which promote the technological development of prototypes to harness marine renewable energies	Regulatory	Achieve commercial implementation of the technology	Technologists, development of national prototypes	Planned	Not defined
6. Develop specific marine technologies especially targeting deployment of projects to harness renewable energies on the high sea (wind, wave energy, etc.).	Financial	Increase the potential of marine renewable energies	Technologists, technological centres	Planned	2011-2020

7. Financial support for the implementation of high-level and very specialised experimental platforms at national level with international recognition.	Financial	Provide incentive for R&D-Innovation and enhance technological competitiveness	Public administrations	Planned	2011-2020

(*) Indicate if the measure is (predominantly) regulatory, financial or soft (i.e. information campaign).
(**) Is the expected result behavioural change, installed capacity (MW; t/year), energy generated (ktoe)?
(***) Who are the targeted persons: investors, end users, public administration, planners, architects, installers, etc.? or what is the targeted activity/sector: biofuel production, energetic use of animal manure, etc.)?

Measures in the field of electricity generation using renewable energies

Name and reference of the measure	Type of measure (*)	Expected result (**)	Targeted group and/or activity (***)	Existing or planned	Start and end dates of the measure
1. Change to a smart grid system of transmission and distribution.	Regulatory	Better adaptation to supply and demand for electrical energy	Electricity system operators.	Planned	2012-2020
2. Promote facilities generating electricity for own use from renewable sources by setting up better systems based on net balance and compensation for energy balances.	Regulatory	Limit energy demand on the system and evolve towards better management of demand	The General State Administration Electricity system operators Electricity traders	Planned	2011-2020
3. Establish a remuneration framework which is stable, predictable, flexible, controllable and secure for developers and the electricity system.	Regulatory - Financial	Foster investment in the sector. Move the economy	The General State Administration	Existing	2010-2011
4. Review current planning for the gas and electricity sectors (approved in May 2008 for the 2008-2016 period) and properly develop electricity transmission infrastructure.	Regulatory Financial	Guarantee the transmission of electricity generated from renewable sources	The General State Administration	Existing and planned	2010-2012
5. Specific planning of electricity transmission infrastructures linked to marine projects (wind, wave energy, etc.) taking account of progress in administrative procedure. Possibility of establishing offshore electricity transmission corridors to offshore project site.	Regulatory	Removal of barriers hindering the development of marine renewable energy projects	The General State Administration	Planned	2011-2020

6. Establish new international interconnections (especially with France).	Financial	Enhanced capacity for the integration of renewable energies in the electricity system.	European Commission	Planned	2010-2020
7. Increase in energy storage capacity through the start-up of new pumping plants.	Regulatory	Enhanced capacity for the integration of renewable energies in the electricity system.	The General State Administration Developers	Existing	2010-2020
8. Better management of demand in real time, facilitating participation of the end electricity user through measures aimed at flattening the demand curve (charging of electrical vehicle batteries and other initiatives).	Regulatory	Enhanced capacity for the integration of renewable energies in the electricity system.	The General State Administration	Planned	2011-2020
9. Establishment of a specific quota for experimental projects.	Regulatory	Facilitate the launching of emerging technologies	The General State Administration	Planned	2010-2011
10. New regulations to facilitate the connection of electricity generation facilities with low-power renewable energies associated with consumption centres interconnected with the electricity grid (especially low-voltage).	Regulatory	Lessen administrative red-tape	The General State Administration	Planned	2010-2011

(*) Indicate if the measure is (predominantly) regulatory, financial or soft (i.e. information campaign).
(**) Is the expected result behavioural change, installed capacity (MW; t/year), energy generated (ktoe)?
(***) Who are the targeted persons: investors, end users, public administration, planners, architects, installers, etc.? or what is the targeted activity/sector: biofuel production, energetic use of animal manure, etc.)?

Measures in the field of thermal renewable energies

Name and reference of the measure	Type of measure (*)	Expected result (**)	Targeted group and/or activity (***)	Existing or planned	Start and end dates of the measure
1. Measures for involvement of the financial system in the funding of projects and energy service undertakings within the scope of thermal renewable energies.	Financial	55 ktoe	Investors, financial institutions ESEs. Activity: production of renewable thermal energy	Existing and planned	2009-2020
2. Development of a renewable heat incentive system (ICAREN) for thermal renewable energies.	Financial	709 ktoe	Public administration and ESEs Activity: Sale of thermal energy	Planned	2012-2020
3. Renewable thermal energy investment aid system.	Financial	494 ktoe	Public administration and end users Activity: thermal energy consumption	Existing	New phase: 2011-2020.
4. Inclusion of renewable thermal energies and heating networks in building energy certification systems.	Regulatory	Behavioural change among architects and housing developers	Public Administration, urban planners, architects, developers Activity: construction	Existing	2007-2020
5. Amendment and improvement of the clauses regarding renewable thermal energies in technical codes and regulations governing thermal installations in buildings.	Regulatory	Behavioural change among architects and housing developers	Public Administration, urban planners, architects, developers Activity: construction	Existing	2010-2012
6. Introduction of renewable thermal energies and central heating systems through municipal ordinances.	Regulatory	80 ktoe	Public administrations	Existing and planned	2002-2020
7. Creation of a registry called "Renewable Thermal Installations and other Renewable Energies not subject to the special Renewable Energy Regime".	Regulatory	Certify and verify the participation of renewable thermal energies in the gross final consumption of	Public administrations	Planned	2011-2012

		energy and ensure the reliability of statistical transfers			

(*) Indicate if the measure is (predominantly) regulatory, financial or soft (i.e. information campaign).
(**) Is the expected result behavioural change, installed capacity (MW; t/year), energy generated (ktoe)?
(***) Who are the targeted persons: investors, end users, public administration, planners, architects, installers, etc.? or what is the targeted activity/sector: biofuel production, energetic use of animal manure, etc.)?

Specific measures in the hydroelectric sector

Name and reference of the measure	Type of measure (*)	Expected result (**)	Targeted group and/or activity (***)	Existing or planned	Start and end dates of the measure
1. Promote hydroelectric energy from existing water resources and infrastructures in an environmentally-friendly way and in accordance with hydrological and energy planning.	Regulatory	Increase installed hydroelectric capacity	Public administrations	Existing	2010-2020
2. Provide incentive for the rehabilitation, modernisation and/or replacement of installations and equipment at hydroelectric plants producing 10 MW or less with a view to increasing production capacity at installations nearing the end of their useful life.	Regulatory - Financial	Maintain / Increase installed hydroelectric capacity	Public administrations	Planned	Not defined

(*) Indicate if the measure is (predominantly) regulatory, financial or soft (i.e. information campaign).
(**) Is the expected result behavioural change, installed capacity (MW; t/year), energy generated (ktoe)?
(***) Who are the targeted persons: investors, end users, public administration, planners, architects, installers, etc.? or what is the targeted activity/sector: biofuel production, energetic use of animal manure, etc.)?

Specific measures in the geothermal sector

Name and reference of the measure	Type of measure (*)	Expected result (**)	Targeted group and/or activity (***)	Existing or planned	Start and end dates of the measure
1. Develop aid and risk reduction programmes for activities at the exploration and research stage which are needed to assess geothermal project resources.	Financial	Foster the development of projects	Investors	Planned	2011-2020
2. Develop and implement a training and certification model in the different fields of geothermics.	Regulatory	Enhance quality	Industrial sector	Planned	2011-2020
3. Promote greater knowledge of the subsoil to assess geothermal potential and to identify favourable areas.	Regulatory	Learn more about the resource	Research centres, developers	Planned	2012-2020

(*) Indicate if the measure is (predominantly) regulatory, financial or soft (i.e. information campaign).
(**) Is the expected result behavioural change, installed capacity (MW; t/year), energy generated (ktoe)?
(***) Who are the targeted persons: investors, end users, public administration, planners, architects, installers, etc.? or what is the targeted activity/sector: biofuel production, energetic use of animal manure, etc.)?

Specific measures in the solar sector

Name and reference of the measure	Type of measure (*)	Expected result (**)	Targeted group and/or activity (***)	Existing or planned	Start and end dates of the measure

1. Implement measures for dissemination, development and regulatory adaptation of solar facilities (photovoltaic, thermal and thermoelectric) in order to foster their cross-cutting inclusion in all sectors (construction, agriculture, industry and services).	Financial Regulatory Information campaign	Change of attitudes to solar energy	Public administration Installers Developers and end users	Existing	2010-2020
2. Develop the mechanisms needed to foster desalination facilities based on solar technologies (low temperature thermal, photovoltaic and thermoelectric).	Financial	Facilitate the launching of new uses for solar technology	Public administrations Developers Technological and research centres	Planned	2011-2020
3. Boost projects for optimisation of thermal solar facilities which include integrated solutions (hot water, heating and cooling).	Financial Information campaign	Optimisation of solar systems Improve profitability	ESE, Technological centres, manufacturers, installers and users	Existing and planned	2010-2020
4. Measures aimed at professionalising the sector and changing user perceptions by disseminating the advantages of solar energy and users' rights and duties.	Dissemination campaign	Change of attitudes to solar energy	Installers Developers and end users	Planned	2011-2020

(*) Indicate if the measure is (predominantly) regulatory, financial or soft (i.e. information campaign).
(**) Is the expected result behavioural change, installed capacity (MW; t/year), energy generated (ktoe)?
(***) Who are the targeted persons: investors, end users, public administration, planners, architects, installers, etc.? or what is the targeted activity/sector: biofuel production, energetic use of animal manure, etc.)?

Specific measures in the marine energy sector

Name and reference of the measure	Type of measure (*)	Expected result (**)	Targeted group and/or activity (***)	Existing or planned	Start and end dates of the measure
1. Development of a specific regulatory framework for the development of marine projects	Regulatory - Financial	Projects up to 100 MW	Investors	Planned	2011-2020

(*) Indicate if the measure is (predominantly) regulatory, financial or soft (i.e. information campaign).
(**) Is the expected result behavioural change, installed capacity (MW; t/year), energy generated (ktoe)?
(***) Who are the targeted persons: investors, end users, public administration, planners, architects, installers, etc.? or what is the targeted activity/sector: biofuel production, energetic use of animal manure, etc.)?

Specific measures in the wind sector

Name and reference of the measure	Type of measure (*)	Expected result (**)	Targeted group and/or activity (***)	Existing or planned	Start and end dates of the measure
1. Review technical operating procedures to adapt technical requirements as regards the way aerogenerators interact with the grid.	Regulatory	Allow greater wind integration in the electricity system	The General State Administration	Existing and planned	2010-2013
2. Differentiated administrative handling of the repowering of wind farms by replacement of some or all of their aerogenerators so as to facilitate the necessary administrative procedure.	Regulatory	Technological renovation of obsolete equipment optimising their interaction with the system	The General State Administration Regional governments	Planned	2010-2012

3. Encourage and facilitate the implementation of small sample offshore wind farms (under 50 MW) to which a simplified administrative processing procedure would be applied.	Regulatory Financial	Rationalisation of the launch of offshore wind energy, minimising potential impact	The General State Administration	Planned	2010-2011
4. Specific regulatory processing and the establishment of a suitable remunerative framework so as to provide incentives for small wind facilities in urban, semi-urban, industrial and agricultural settings, differentiating in terms of technological maturity and development with respect to medium and high-power wind facilities.	Regulatory Financial	Deployment of the low-power wind sector	The General State Administration	Planned	2010-2011
5. Standardisation of technical instructions and procedures affecting low power wind equipment.	Regulatory	Standardise the homologation and certification of equipment	The General State Administration	Planned	2010-2011
6. Harmonise existing regulations to encourage the integration of low power wind installations in urban, semi-urban, industrial and agricultural settings.	Regulatory	Lessen administrative red-tape	The General State Administration Regional governments Municipalities	Planned	2010-2012
7. Set up accreditation systems for "low power wind energy installers".	Regulatory	Guarantee the quality of service in this segment	The General State Administration	Planned	2010-2011

(*) Indicate if the measure is (predominantly) regulatory, financial or soft (i.e. information campaign).
(**) Is the expected result behavioural change, installed capacity (MW; t/year), energy generated (ktoe)?
(***) Who are the targeted persons: investors, end users, public administration, planners, architects, installers, etc.? or what is the targeted activity/sector: biofuel production, energetic use of animal manure, etc.)?

Specific measures in the biomass, biogas and waste sectors

Name and reference of the measure	Type of measure (*)	Expected result (**)	Targeted group and/or activity (***)	Existing or planned	Start and end dates of the measure
1. Regulatory amendment for the transport of biomass-related products.	Regulatory	Reduce transport costs	Logistics companies, purchasing companies	Planned	2013-2020
2. Draft implementing legislation for multi-annual plans to harness energy from products, by-products or waste from forestry and agriculture and foster forest restocking for energy purposes.	Regulatory	5,500,000 t/year	Public administration, forest land owners and farmers Production of agri-forest biomass	Planned	2014-2020
3. Foster the separation of combustible materials from dump sites.	Regulatory	Reduce the currently high volume of waste and increase energy recovery	Public Administration, waste management undertakings, potential purchasing companies	Planned	2016-2020
4. Create a register of Solid Recovered Fuels (SRF) and implement an AENOR quality assurance system for SRF production processes.	Regulatory	Create a market for fuel produced from waste	Public Administration, waste management undertakings, potential purchasing companies	Planned	2012-2020
5. Foster the agricultural application of digestates from anaerobic digestion processes.	Regulatory	Standardise the use of digestates as fertilizers or organic amendments	Public administration, livestock and agro-industrial sectors	Planned	2012- 2020
6. Foster the regulation and standardisation of biomass fuels	Regulatory	Standardisation of different types of biomass for domestic use including specific regulations and standards for pellets,	Public administration, AENOR	Under way	2000 - 2020

		etc.			

(*) Indicate if the measure is (predominantly) regulatory, financial or soft (i.e. information campaign).
(**) Is the expected result behavioural change, installed capacity (MW; t/year), energy generated (ktoe)?
(***) Who are the targeted persons: investors, end users, public administration, planners, architects, installers, etc.? or what is the targeted activity/sector: biofuel production, energetic use of animal manure, etc.)?

Specific measures in the biofuel sector

Name and reference of the measure	Type of measure (*)	Expected result (**)	Targeted group and/or activity (***)	Existing or planned	Start and end dates of the measure
1. Draft technical specifications for B30 and E85 and incorporate these into the Spanish fuel quality regulation.	Regulatory	Improve biofuel quality control and enhance trust in the sector	Industrial, oil and logistics sector	Planned	2010-2012
2. Design and implement an AENOR quality assurance system for biofuel production processes.	Regulatory	Improve biofuel quality control and enhance trust in the sector	Industrial, oil and logistics sector	Planned	2010-2012
3. Design and implement a sustainability control system throughout the entire value chain of biofuels marketed in Spain in accordance to the requirements laid down in Directive 2003/28/EC of 23 April 2003.	Regulatory	Enhance sustainability analysis	Agricultural, industrial, oil and logistics sector	Planned	2010-2012
4. Maintain and adapt the scheme for compulsory use of biofuels in transport beyond 2010. It is currently in force until 2010 by virtue of ORDER ITC/2877/2008.	Regulatory	Raise demand for biofuels	Agricultural, industrial, oil and logistics sector	Existing Planned	From 2008 2010-2020
5. Amend special duty legislation which permits the use of biogas as a fuel for transport vehicles under the same conditions as bioethanol and biodiesel.	Regulatory	Diversify the supply of biofuels	Industrial, oil and logistics sector	Planned	2010-2011
6. National Technological Development Support Programme in the biofuel sector: 2G and biorefineries.	Regulatory-financial	Boost technological development	Industrial, oil and logistics sector	Planned	2011-2020
7. Government administrations set an example by encouraging the purchase of vehicles designed to use labelled mixtures of biofuels in their fleets and in the awarding of transport concessions.	Regulatory-financial	Raise demand for biofuels	Government administrations and the automotive sector	Planned	2011-2020

(*) Indicate if the measure is (predominantly) regulatory, financial or soft (i.e. information campaign).
(**) Is the expected result behavioural change, installed capacity (MW; t/year), energy generated (ktoe)?
(***) Who are the targeted persons: investors, end users, public administration, planners, architects, installers, etc.? or what is the targeted activity/sector: biofuel production, energetic use of animal manure, etc.)?

The application of measures which entail the allocation of economic resources will have to adapt to Spanish economic austerity measures and budget balancing.

4.2 Specific measures to fulfil the requirements under Articles 13, 14, and 16 and Articles 17-21 of Directive 2009/28/EC

4.2.1 Administrative procedures and spatial planning (Article 13(1) of Directive 2009/28/EC)

List of existing national and, if applicable, regional legislation concerning authorisation, certification, licensing procedures and spatial planning applied to plants and associated transmission and distribution network infrastructure.

In the industrial sector there is a national regulation which basically governs the electricity sector with the exception, inter alia, of authorisations and procedures, whose regulation falls within the purview of those Autonomous Communities with competence in this area.

This means that, in principle, national regulations providing for industrial authorisation and procedures for the set-up of these plants are only applicable to plants for whose authorisation the State is competent. In other words, in the case of electrical energy plants generating over 50 MW or which are located offshore and electrical energy plants generating under 50 MW when the Autonomous Community (region) where they are located does not have competence in this area or when the plants are located in more than one Autonomous Community.

In all other cases, the applicable regulations are the industrial provisions in force in the Autonomous Communities where plants are located.

As shown in the individual sheets included in the annex, not all the Autonomous Communities have regulated the industrial authorisations needed to set up electrical energy production plants powered by renewable energy sources or their concession procedures, thus giving rise to the subsidiary application of national provisions in parts of Spain. The Autonomous Communities in this situation include La Rioja, Madrid and others.

We also have a national regulation having regard to thermal energy production plants powered by renewable energy sources, (Thermal Plant Regulation) that is generally applicable in all the Autonomous Communities given that the majority of the latter have not enacted implementing regulations (one exception being the Community of Madrid, which provides specific regulations for the operation of these plants.

As for urban planning regulations, we would note that this is a specific competence of the Autonomous Communities and as such, all have a specific regulation providing for the different authorisations needed to set up these plants and the applicable concession procedure.

Moreover, as seen in the corresponding page in the Annex, a look at the authorisations which are the competence of the Spanish State shows that urban planning authorisations needed in each case depend upon the location of the plant. so that the applicable regulations are the ones in force in each Autonomous Community. In this connection, all the Autonomous Communities have exercised this competence, with the exception of the Balearic Islands.

Lastly, under the Spanish Constitution it is incumbent upon the National Government to enact the basic legislation regarding the environment and upon the Autonomous Communities to enact the basic implementing legislation in this area.

As can be seen in the individualised sheets annexed hereto, in the discharge of this duty all the Autonomous Communities have enacted specific regulations governing the environmental authorisations that must be obtained to set up the plants referred to in this study, and the basic legislation in this area laid down by the National Government is equally applicable.

Administration responsible for the regulation of these procedures

As mentioned in the previous section, the Spanish Constitution provides an administrative responsibility scheme whereby a number of different administrations are responsible for the regulation of these procedures.

Hence, in the ***area of industry*** the National Government has competence, pursuant to Article 149(1) 13) and 25) of the Spanish Constitution, to enact basic legislation in connection with energy. However, in the discharge of this function the National Government is not allowed to regulate the authorisation procedure for plants where authority for the latter's concession has been devolved to the Autonomous Communities. The Electricity Sector Act, Law 54/1997, therefore provides that in regulating the authorisation and procedure needed to set up electricity generation plants, the said provisions are not considered minimum requirements.

As can be observed in the individual sheets of each Autonomous Community annexed to this document, through their Statutes of Autonomy the Autonomous Communities have assumed responsibility for energy production, distribution and transmission plants and the power to enact and enforce implementing legislation in the field of energy.

With regard to ***urban planning***, Article 148(1) 3) of the Spanish Constitution provides that the self-governing Autonomous Communities "may assume competences over town and country planning and housing". As can be observed in the individual sheets annexed to this document, the Statutes of Autonomy of all of the Autonomous Communities vouchsafe this exclusive competence to the Autonomous Communities.

Therefore, regulation in this connection is performed by the respective Autonomous Communities.

Lastly, with regard to the ***environment***, we would note that in compliance with Article 149(1) 23) of the Spanish Constitution, it is the duty of the National Government to enact basic legislation on the environment.

Moreover, as can be observed in the individualised sheets of the annex, the Statutes of Autonomy of the Autonomous Communities specifically endow the latter with the power to enact implementing legislation and enforce it in this area. We therefore find regional legislation regulating the awarding of authorisations required under national law for the implementation of these authorisations, or new requirements or circumstances under which such authorisations are required, or requirements necessitating new authorisations (the case of Valencia, Catalonia and others, where the so-called "environmental licence" and "environmental communication" are regulated and which have no equivalent in national basic legislation.

Determining whether revision of applicable rules is planned

Improvement and update of applicable rules is a constant in the work of all government administrations. Also, both at national level and in some Autonomous Communities there is a relatively recent regulation governing these aspects, especially in connection with industry.

For example, at national level Royal Decree 198/2010 of 26 February 2010 was recently passed (published in the Official State Gazette on 13 March 2010) adapting certain electricity sector provisions to the terms of Law 25/2009 amending different laws to adapt them to the law on free access to service activities and their exercise.

At regional level we would highlight the Autonomous Community of Galicia, where an industrial regulation governing certain plants was recently enacted.

Specifically we are referring to the approval of Law 8/2009 of 22 December 2009 regulating wind use in Galicia and creating the wind tariff and Environmental Compensation Fund, and the Order of 24 February 2010 regulating enforcement of the Regulation on Thermal Installations in Buildings in the Autonomous Community of Galicia.

Regarding the environment, we would also highlight the case of Catalonia, which passed Law 20/2009 of 4 December 2009 on the Environmental prevention and control of activities, published in the Official Gazette of the *Generalitat* of Catalonia on 11 December 2009 and due to enter into force on 11 August 2010 (D.F.3ª).

Lastly, we would mention the case of Castile-La Mancha, where Law 1/2007 of 15 February 2007 Fostering renewable energies and providing incentives for energy savings and efficiency in Castile-La Mancha, is intended to rationalise the administrative authorisation procedures for these plants.

Determining the authorisations, permits and licences required for the implementation of energy plants powered by renewable energy sources.

As described in the different individual sheets attached in the Annex, each Autonomous Community has individually regulated the industrial, urban planning and environmental authorisations and permits required to set up a plant of this nature. However, we can generally describe the authorisation scheme which is followed in all of the Autonomous Communities.

From an ***industrial*** perspective, national law requires the following authorisations to set up electrical energy generation installations under its jurisdiction:

- Administrative authorisation of the installation's draft project.
- Project approval.
- Operation permit.

This scheme, based on the national regulations, is generally followed in the regulations of the Autonomous Communities which have regulated the authorisation procedure for these installations, with the exception of implementation procedures for wind installations.

In most of the regulatory procedures governing the implementation of this electrical energy generation technology, a Wind Plan is required to regulate the implementation of these actions, and the project to be implemented must have been selected through a public call for proposals.

This is the case of the Autonomous Communities of Valencia, Galicia, Castile-La Mancha, Extremadura and others.

Moreover, national law requires that installations which must be inscribed in the Energy Generation Installation Registry under the Special Regime (inter alia, installations whose primary energy source is a non-renewable energy, biomass or any type of biofuel, with a capacity under 50 MW) must obtain the following authorisations:

- Status as an installation under the special regime.
- Inscription in the said Register.

As regards industrial authorisations, neither national nor regional law requires thermal energy generation installations powered by renewable energy sources to obtain an authorisation for their construction, only for operation.

As for ***urban planning***, despite the non-existence of a basic procedure at national level, the vast majority of Autonomous Communities require practically the same sort of authorisation but attach different names to them.

Hence, as can be observed from the individualised sheets attached in the Annex, for the implementation of these installations all the Autonomous Communities require a works licence verifying that the installation to be built meets the planning standards in the municipality where it is to be located.

Also, in the event that these installations are built on land not designated for development, the vast majority of Autonomous Communities require a specific authorisation granting extraordinary permission for the use of the said land for this sort of activity.

In some cases, a planning instrument may also be required, mostly in the case of wind installations (the case of the Autonomous Communities of Valencia, Castile-La Mancha, Galicia and others).

And in terms of the ***environment***, in application of national basic legislation, there are a series of environmental authorisations which are typically required throughout Spain for the implementation of these installations depending on their characteristics. This specifically refers to the need to subject the authorisation of these installations to an environmental assessment procedure requiring the prior issue of an Environmental Impact Statement and the requisite Integrated Environmental Authorisation.

As the Autonomous Communities are competent to enact implementing legislation for national environmental protection regulation, some Communities have established more stringent requirements than those envisaged in national regulations and require these additional authorisations (especially the Environmental Impact Statement) for a number of installations which would be free of such requirements under national law.

Implementation of these installations also requires the requisite operating licence. However, this licence was eliminated in some Autonomous Communities and replaced with the "Environmental Licence" and "Environmental Communication" (Catalonia and Valencia) or the "Environmental Rating" (in Andalusia).

The administrations competent to issue the authorisations, permits and licences needed for these installations

As can be observed from the individualised sheets attached in the Annex, there are a number of specific administrations responsible for awarding the different authorisations, given that the specific body in charge of their issue differs from one region to another. Nonetheless, in the vast majority the same scheme is followed to determine the territorial administration competent to issue them (i.e. whether this authority lies with the regional or local authorities) with the exception of installations whose authorisation is the responsibility of the Central Government.

In general terms, without prejudice to the specific cases indicated in the individualised sheets, regional legislation enacted in this connection (i.e. industrial, urban planning and environmental) identifies the following administrations as competent to issue these authorisations:

- In the case of industry, in general terms the body responsible for energy matters of the Autonomous Community.
- For urban development, the municipal administration holds the authority to issue works licences.

However, in general terms, the Autonomous Community is the competent administration for the issue of extraordinary authorisations on land not designated for development. Exceptionally, authority in this case is held by the municipalities (Cantabria and others).

- As for environmental authorisations, in general terms and without prejudice to the specificities of each Autonomous Community, the regional Department of the Autonomous Community responsible for environmental issues is competent to grant the Environmental Impact Statement and the Integrated Environmental Authorisation.

  The municipalities, however, hold the authority to issue operating licences or permits of equal rank.

As a general exception to this rule, when installations have to be authorised by the National Government, the industrial authorisation required is issued by the Directorate-General for Energy Policy and Mines at the Ministry of Industry, Tourism and Trade, except for the operating permit, which is the competence of the industry and energy office of the Government Delegations or Deputy-delegations in the provinces where the installation is located.

Also, the fact that the industrial authorisation is issued by the National Government means that the competent body for the issue of the Environmental Impact Statement is the Ministry of the Environment. However, the rest of the environmental and urban development authorisations and permits required are issued by the administration designated under the law of the region where the installation is located.

Information measures envisaged in the procedures for awarding these authorisations, permits and licences

Generally speaking, as can be observed in the individualised sheets, in all procedures for authorisation of these installations at both national and regional level, information measures have been established with a view to ensuring that information regarding the establishment of these installations is available to citizens.

Hence, at ***industrial level*** we would note that as part of the procedure to procure prior building authorisation, the application must be subject to a public information period and the decision must be published in the corresponding Official Gazette.

Furthermore, in some cases (particularly wind installations) a public call for proposals must be made whereby power capacity is allocated under the umbrella of a sectoral plan or requested by the stakeholders, and this obviously must be subject to public information by means of the requisite announcements in Official Bulletins and Gazettes.

From an ***urban development*** perspective, public information measures are only envisaged for extraordinary authorisation to build on land not designated for development, in which case regional rules require that the application be subject to public information.

However, no information measure is envisaged as part of the regulated procedure to obtain a works licence.

As regards ***environmental authorisations***, we would note that national and regional rules provide for different information measures in the procedure for issue of these authorisations.

In general terms, the Environmental Impact Assessment should be subject to a public information requirement, either together with the substantive project which is the object of the Environmental Impact Assessment or individually when sectoral regulations do not provide for public information on the project as a whole. For its part, the Environmental Impact Statement must be published upon issue.

The same applies to the Integrated Environmental Authorisation, the procedure for which specifically provides that the application must be subject to public information.

Likewise, in the case of the rest of the environmental authorisations directly established and regulated under regional law (i.e. licences to operate, environmental licences, environmental rating, etc.), information measures are likewise envisaged and applications submitted are likewise subject to public information, as shown in the individualised sheets attached in the Annex.

As a last point on information measures, we would note that the Public Administrations and Common Administrative Procedure (Legal Regime) Act, Law 30/1992 of 26 November 1992 recognises the right of citizens to receive information concerning any stage of procedures in which they are interested parties and to obtain copies of documents contained therein.

Regarding the environment, Law 27/2006 of 18 July 2006 regulating rights concerning information access, public participation and access to justice in the area of the environment, recognises the following citizens' rights regarding access to information:

- To have access to the environmental information held by public authorities or by others on the latter's behalf without having to state any particular reason, regardless of nationality, legal domicile or headquarters.
- To be informed of the rights granted by virtue of Law 27/2006 and to be advised as to their proper exercise.
- To be assisted in the search for information.

- To receive information requested.
- To receive the environmental information requested in the chosen form or format.
- To be informed of the reasons for which information is totally or partially denied and also the reasons that information is not furnished in the requested form or format.
- To be shown the list of any fees and prices that may be payable in order to receive the requested information, and the circumstances in which payment may be required or excused.

Furthermore, as regards environmental information, these regulations oblige public administrations:

- To properly inform the public of the rights to which they are entitled under Law 27/2006 and the channels through which they can exercise such rights.
- To furnish information on the proper exercise of such rights and counsel and advise to the extent possible.
- To draw up lists of public authorities and the environmental information that they possess, which must be accessible to the public.
- To guarantee that their personnel assist the public in gaining access to environmental information.
- To foster the use of information and communications technologies to facilitate access to information.
- To guarantee the agility principle in processing and resolving requests for environmental information.

Measures for coordination between the different competent government administrations envisaged in the procedural steps to be followed for these authorisations, permits and licences

As can be observed in the individual sheets in the Annex, which provides an analysis of the procedures envisaged at national and regional level for the issue of authorisations, permits and licences needed to build energy generation plants powered by renewable sources of energy, in most cases a wide variety of coordination mechanisms between the different administrations affected are envisaged.

Of the different coordination mechanisms established for the different procedures in each of the regulations and which are analysed in detail in the individual sheets, special mention should be made of the following:

- In the ***area of industry***, the regulation has provided for coordination mechanisms in installation authorisation procedures which require authorisation prior to construction. These mechanisms consist mainly of the need to obtain the requisite Environmental Impact Statement as a prerequisite to approval.

  Other coordination mechanisms are established In general terms, such as the transfer of applications to the different administrations affected by the action so that they can issue a reasoned opinion on the draft project of the installation and on the Project itself.

- Concerning ***urban development*** authorisations, coordination mechanisms are provided for in Regional urban planning regulations in the case of extraordinary authorisation for land not designated for development. Hence, when this type of authorisation is required, such coordination must take place prior to the issue of the municipal works licence.

  Also in these cases the regulation provides for mechanisms of coordination with environmental authorities to prevent the issue of this extraordinary authorisation without the prior issue of the Environmental Impact Statement or the environmental instrument required in the corresponding Autonomous Community regulation.

  Traditionally, issue of the works licence has been made contingent upon the prior issue of the licence to operate when the latter is a requirement. However, these two licences may be issued simultaneously, or the interested party may waive compensation for not having been issued the licence to operate and have the works licence issued directly.

- Lastly, in the case of ***environmental authorisations***, both national and regional laws provide for the issue of certain environmental authorisations prior to the issue of substantive authorisations (in this case the specified industrial authorisations) and urban planning authorisations. This specifically refers to the Environmental Impact Statement and the Integrated Environmental Authorisation.

  Also, the issue of reports by the affected administrations is envisaged in the processing of these authorisations, including the Local Corporation itself (specifically for activities requiring the Integrated Environmental Authorisation).

  All other environmental authorisations at municipal level also provide for the application of different coordination mechanisms such as the need to obtain a prior report from other administrations (typically the regional administration when issued by local corporations) or the need to process the environmental authorisation together with the urban planning authorisation (in the case of licences to operate and works licences).

These are, in principle, the main coordination mechanisms described in general terms since they are practically the same in all the Autonomous Communities. However, the sheets in the Annex individually describe the mechanisms applied to each of the procedures envisaged for each area in each of the Autonomous Communities and in the national regulations.

Concerning the existence of specific procedures depending on the technology or capacity of the installation

The sheets in the Annex analyse the specific and general procedures regulated for the issue of the industrial, urban development and environmental authorisations, permits and licences required for the construction and operation of these installations.

In particular, both the central and regional governments have regulated certain procedures at industrial level depending on the capacity of the plant or the technology.

Specifically, ***having regard to installed capacity***, in the vast majority of cases a simplified procedure has been provided for the authorisation of low voltage electricity generation installations. Moreover, in many cases this authorisation entails no more than a simple communication allowing activity to commence once the requisite documentation is submitted.

Then again, ***with respect to specific technologies****,* we would note the existence of a special procedure for the implementation of wind installations in all Autonomous Communities with the exception of Madrid, Murcia and Andalusia. Authorisation of offshore wind installations and their implementation procedure are regulated at national level by Royal Decree 1028/2007.

A simplified procedure is available for many of the procedures indicated depending on the capacity of the wind installation or its end use (mainly for experimental use and research). This is the case of the Canary Islands, Castile-Leon and others.

Over and above the specificities involved in the processing of wind installations, another of the technologies for which specific procedures have been set up in many Autonomous Communities is solar photovoltaic, especially where installations are connected to the grid (e.g. Andalusia, Cantabria, Catalonia and others).

A separate matter, and an exception to the rule, is the regulation of implementation procedures for electricity generation installations powered by forest biomass in Galicia, given that that is the only region where the implementation of this technology has been specifically regulated.

Lastly, the procedure envisaged in national law for the implementation of thermal energy generation installations in buildings does not require an authorisation procedure prior to execution; only operational authorisation is required as described in the individual sheets attached in the Annex.

But unlike the situation at industrial, urban development and environmental level, there are no procedural differences relating to the technology to be installed or the installed capacity except in the case of wind installations, where certain Autonomous Communities have established the obligation to file a territorial planning document to regulate their implementation. An exception to this rule is the Community of Valencia, where special procedures are in place to obtain the requisite urban planning and environmental authorisations depending on the capacity and the technology of the energy generation installation, as can be observed in the corresponding sheet attached to the final document.

Regarding deadlines for the issue of authorisations, permits and licences needed for the implementation of these installations

The individualised sheets in the Annex provide a concrete description of the deadlines laid down in the regulation for the issue of the different authorisations, permits and licences required for the implementation and operation of these installations and the meaning of administrative silence once the deadline has expired.

Where the deadline for the issue of the aforementioned authorisations is not specifically stipulated or when the meaning of administrative silence is not stipulated, the provisions of the Public Administrations and Common Administrative Procedure (Legal Regime) Act, Law 30/1992 of 26 November 1992 shall apply. According to

Article 42 of this Act, when the rules governing these procedures do not provide a maximum period of time within which the administration must take its decision, such period shall be three months as from the day on which the application was officially registered as received by the competent body responsible for its processing in procedures initiated at the request of the interested party.

Moreover, according to the provisions of Article 43 of Law 30/1992, when the rules governing the procedures fail to define the meaning of administrative silence once the deadline date has expired, it will be generally assumed that silence indicates a favourable decision and therefore the interested parties may conclude that their application will go forward unless such decision bestows powers or rights to which the awardee is not entitled where he lacks the essential requirements for their granting.

Regarding any fees to be paid when applying for the authorisations, permits and licences needed to execute and operate these installations.

Regarding fees established by the different competent administrations for the issue of authorisations, permits and licences required for the execution and operation of these installations, we would note that the individualised sheets attached in the Annex specifically indicate when a fee is required for the processing of these authorisations, and we therefore remit to them for the sake of clarity on this point.

Notwithstanding the foregoing, it is generally safe to say that there is no standard regulation of these fees and not all Autonomous Communities charge a fee for the processing of authorisations.

What is more, different amounts are charged; in some cases a fixed amount is set for the processing of an authorisation while in others a variable rate applies depending on the value of the equipment to be installed or the building project itself.

Typically, payment becomes due once the licence is granted and no payment is required if authorisation is denied.

However, over and above the amount established, we should point out that pursuant to the Law regarding local public finance departments, the amount of the fee to be paid for the rendering of a service or for the performance of an activity may not exceed, all sums considered, the real or foreseeable cost of the service or activity in question or, failing that, the value of the service rendered.

Therefore, direct and indirect costs are generally taken into consideration in the determination of the amount of the fee, including financial costs, depreciation of fixed assets and, where applicable, costs required to guarantee the reasonably efficient performance of the service or activity for which the fee is exacted, regardless of the budget or body providing such service. The reasonably efficient performance of the service or activity shall be calculated in accordance with the budget and project passed by the competent body.

Therefore, regardless of the amount established in each case, what is certain is that all such amounts must be proportionate to the real or foreseeable cost entailed in the rendering of the service being requested and for which the fee is being charged.

Over and above all this and regardless of the fees, implementation of these installations can require the payment of a tax or royalty.

In this regard, according to the Law regarding local public finance departments, the performance within the municipality of any construction, installation or work requiring a works or urban planning licence, regardless of whether said licence was actually obtained or not provided that its issue is within the competence of the local corporation levying the tax, constitutes a taxable transaction for purposes of the Construction, Installation and Works Tax.

As a result, regardless of the fees indicated on the individual sheets attached in the Annex, we would note that in all cases the implementation of these installations is subject to payment of the aforementioned tax given that their construction requires a works licence.

Lastly, we would note that some Autonomous Communities require payment of a royalty for issue of the extraordinary authorisation for the use of land not designated for development. This is the case in Extremadura, Castile-La Mancha and Valencia.

Regarding specific training for the administrative bodies responsible for the processing of licence authorisation, certification and award procedures for renewable energy installations

In general terms, such training has only been imposed in connection with industrial authorisations and only for certain installations. Specifically, this requirement applies to authorisation to operate thermal installations and low-voltage energy generation plants, which generally require that the documentation needed for the issue of the said authorisation be drawn up and submitted by an installation firm.

4.2.2 Technical specifications (Article 13(2) of Directive 2009/28/EC)

Article 13(2) of Directive 2009/28/EC provides that renewable energy equipment and systems must meet the technical specifications established by the European standardisation bodies in order to benefit from support schemes.

Industrial quality and safety infrastructure in Spain

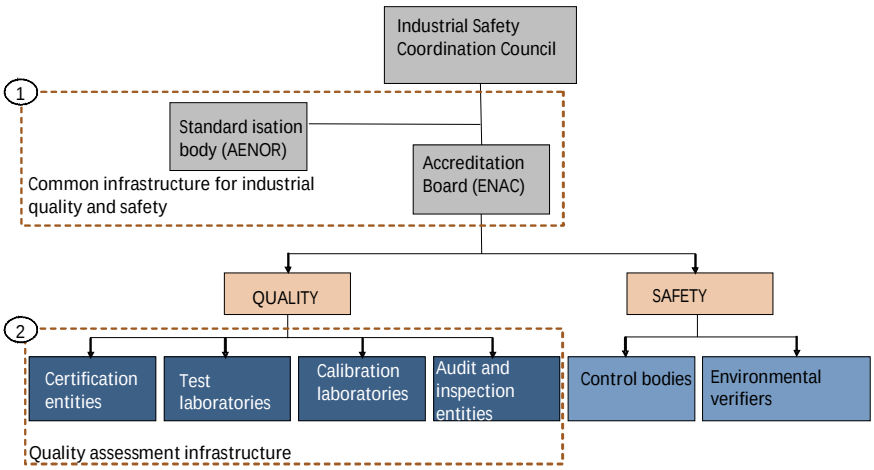
Today, these technical specifications for equipment and renewable energy systems are defined by quality standards.

In Spain, the Ministry of Industry, Tourism and Trade is responsible for reviewing and adapting the *Industrial quality and safety infrastructure* in order to set up the agents and mechanisms needed for across-the-board application and certification of these quality standards, not only for equipment and renewable energy systems but also for other economic activities.

Technical specifications
Identification of bodies. Common infrastructure

The agents comprising the common infrastructure which are qualified to assess quality in Spain are broken down into standardisation bodies, accreditation bodies and conformity assessment bodies.

Quality infrastructure organisational chart



Source: Ministry of Industry, Tourism and Trade

At present, industrial quality and safety infrastructure in Spain is directed by the Industrial Safety Coordination Council, the body in charge of devising and coordinating the criteria and actions of the public administrations in matters of industrial safety. This body is regulated by Royal Decree 251/1997 of 21 February 1997 approving the Regulation of the Industrial Safety Coordination Council.

Royal Decree 2200/1995 classifies the agents who take part in the industrial quality and safety infrastructure into three groups:

- Common infrastructure for industrial quality and safety.
- Quality assessment infrastructure.
- Industrial safety assessment infrastructure.

The *common industrial quality and safety infrastructure* is comprised of entities and bodies broken down into the following categories:

- *Standardisation bodies:* private non-profit organisations whose purpose is to undertake activities related with the drafting of standards to unify criteria in certain fields at national level and to allow for the use of common terminology in specific fields of activity. Royal Decree 2200/1995 recognises and appoints the *Spanish Standardisation and Certification Association* (Sp. acronym AENOR) for that purpose.

- *Accreditation entities*: responsible for formally recognising the technical capacity of an entity or test or calibration laboratory to certify, inspect or audit quality and to verify, at national level, compliance with the technical conditions and requirements demanded for the operation of control bodies and environmental verifiers. Royal Decree 2200/1995 recognises and appoints the *National Accreditation Board* (Sp. acronym ENAC) for that purpose.

Moreover, Royal Decree 2200/1995 provides that the entities and bodies broken down into the following categories constitute *quality assessment infrastructures:*

- *Certification entities* are responsible for establishing that a given company, product, process, service or person meets the requirements laid down in technical standards or specifications.
- *Test laboratories* are responsible for verifying that industrial goods meet applicable technical standards or specifications.
- *Audit and inspection entities* are responsible for determining whether quality activities and results satisfy previously established requirements and whether the said requirements were properly established and are sufficient to meet objectives.
- *Industrial calibration laboratories* are responsible for facilitating the traceability and uniformity of measurement results.

Classification of renewable energy systems and equipment

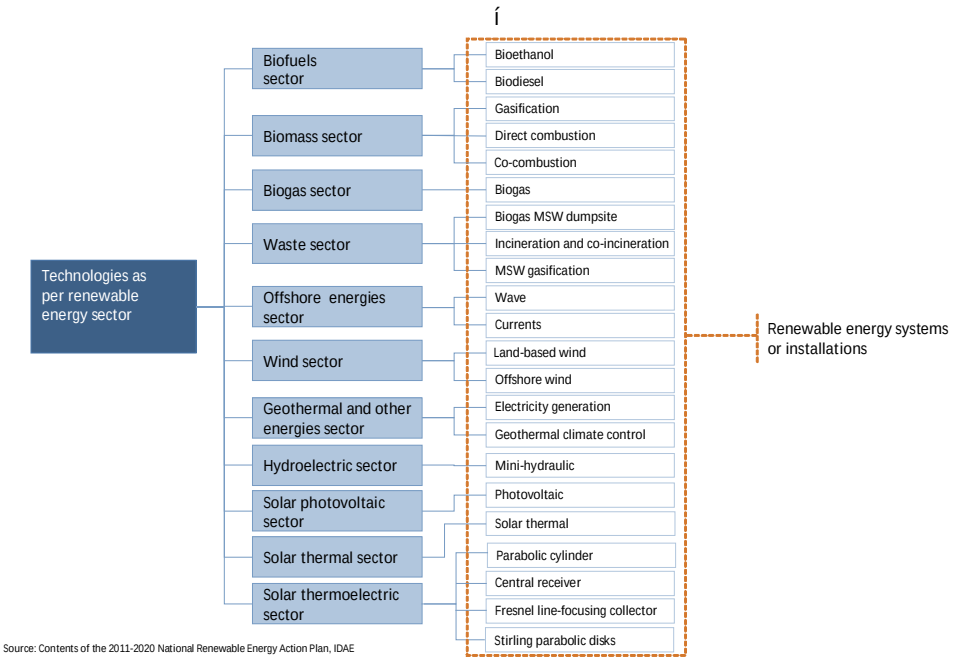
With a view to defining *technical specifications* within the renewable energies sector, a classification has been drawn up of installations or renewable energy systems at the commercial stage and of the items of equipment comprising these systems.

Classification of *renewable energy systems* was performed on the basis of the sectors defined in the 2011-2020 National Renewable Energy Action Plan.

In this connection, a total of 22 renewable energy systems at the commercial stage have been defined.

Technical specifications
Identification of systems and equipment

Renewable technologies have been classified into 11 different sectors and 22 renewable energy systems depending on the type of renewable energy



Source: Contents of the 2011-2020 National Renewable Energy Action Plan, IDAE

In determining the *equipment* to be analysed and which technical specifications are to be applied, we identified the main components of each renewable energy system or installation within the sectors defined under the 2011-2020 NREAP.

A total of 150 main components were thus identified:

Technical specifications
Identification of systems of equipment. Equipment list

A total of 150 main components of energy systems which are at the commercial stage and included in the 2011-2020 NREAP have been identified. Existing technical specifications will be determined based on these (1/5).

Components list I

Biofuels Sector		Biomass Sector		
Bioethanol	**Biodiesel**	**Gasification**	**Direct combustion**	**Co-combustion**
• Raw material storage silos • Mills • Tanks – Liquefaction – Fermentation – Distillation • Decantation • End product storage tanks	• Raw material storage silos (oil / methanol) • Transesterification reactors • Decanters • Glycerine recovery equipment • Biodiesel purification tanks • End product storage tanks	• Raw material grinders • Transfer system • Mills • Raw material storage silos • Cooling/aerocondenser towers • Gasifiers • Engine-alternator unit • Electrical sub-station	• Raw material grinders • Transfer systems • Mills • Raw material storage silos • Steam boiler (ORC) • Turbine • Cooling/aerocondenser towers • Alternator • Electrical sub-station	• Raw material grinders • Transfer systems • Mills • Raw material storage silos (The rest of the equipment needed is already part of the pre-existing coal-fired plant.)

Technical specifications
Identification of systems of equipment. Equipment list

A total of 150 main components of energy systems which are at the commercial stage and included in the 2011-2020 NREAP have been identified. Existing technical specifications will be determined based on these (2/5).

Components list II

Biogas Sector	Waste Sector		
Biogas	**Biogas MSW from dump sites**	**MSW Incineration and Co-incineration**	**MSW Gasification**
• Raw material storage silos • Anaerobic digestates • Gas cleaning equipment • Gas cooling units • Engine-alternator units • Electrical sub-station	• Gas cleaning equipment • Storage – Gasometer – Dials • Engine-alternator units • Electrical sub-station • Torch (combustion unit)	• Gas cleaning equipment • Waste hopper-tank • Raw material grinders • Transfer system • Combustion furnace • Ash container ELECTRICAL GENERATION OPTION • Steam boiler / ORC • Turbine • Cooling / aerocondenser towers • Alternator • Electrical sub-station	• Gas cleaning equipment • Waste hopper-tank • Raw material grinders • Transfer system • Gasifiers • Cooling / aerocondenser towers • Engine-alternator units • Electrical sub-station

Technical specifications
Identification of systems of equipment. Equipment list

A total of 150 main components of energy systems which are at the commercial stage and included in the 2011-2020 NREAP have been identified. Existing technical specifications will be determined based on these (3/5).

Components list III

Marine Energy Sector		Wind Sector	
Wave[1]	**Current**	**Onshore wind**	**Offshore wind**
• Energy converter – Surface attenuator (Pelamis) – Point absorber (buoy) – Oscillating water column (OWC) • Anchoring systems • Underwater cables • Signalling and beacon equipment • Electrical sub-station	• Energy converter – Horizontal axial turbine – Vertical axial turbine – Venturi – Oscilante • Fastening systems – aerial – floating system • Underwater cables • Signalling and beacon equipment • Electrical sub-station	• Aerogenerators • Towers • Alternator • Electrical sub-station	• Aerogenerators • Towers • Alternator • Underwater cables • Electrical sub-station • Signalling and beacon equipment

Note: 1) All technologies are at R&D-Innovation stage or even pre-commercial. The only technology at the commercial stage is tide energy.

Technical specifications
Identification of systems of equipment. Equipment list

A total of 150 main components of energy systems which are at the commercial stage and included in the 2011-2020 NREAP have been identified. Existing technical specifications will be determined based on these (4/5).

Components list IV

Geothermal and Other Energy Sector		Hydroelectric Sector
Electricity Generation[1]	**Geothermal Climate-control**	**Mini-hydraulic**
• Geothermal drilling • Impulse pumps • Aerators • Steam turbines • Condensers • Cooling towers • Centrifugal compressors • Electricity generators • Electrical sub-station	• Geothermal drilling • Heat pumps • Heat exchangers • Circulation pump	• Gates • Penstocks • Hydraulic turbines • Electrical generators • Electrical sub-station

Note: 1) Electricity generation is listed for information purposes in the list of technologies. However, standards are not analysed since this technology is not used in Spain.

Technical specifications
Identification of systems of equipment. Equipment list

A total of 150 main components of energy systems which are at the commercial stage and included in the 2011-2020 NREAP have been identified. Existing technical specifications will be determined based on these (5/5).

Components list V

Solar Photovoltaic Sector	Solar Thermal Sector	Solar Thermoelectric Sector			
Photovoltaic	**Solar Thermal**	**Parabolic cylinder**	**Central receiver**	**Stirling parabolic disks**	**Fresnel line-focusing collectors**
• Photovoltaic modules • Inverters • Trackers • Electricity accumulator (batteries) • Electrical sub-station	• Solar collectors • Accumulators • Heat exchangers • Circulation pumps	• Parabolic cylinder mirrors • Trackers • Absorption tube • Thermal storage tanks • Steam turbines • Cooling towers • Alternator • Electrical sub-station	• Heliostats • Central receiver • Tower • Thermal storage tanks • Steam turbines • Cooling towers • Alternator • Electrical sub-station	• Parabolic disk mirrors • Mirror support structure • Arm structure, focus system and Stirling motor • Stirling motor, alternator and radiator • Receiver and concentrator • Control and orientation system • Hydrogen system • Electrical storage system • Electrical sub-station	• Mirrors • Trackers • Absorber tube • Thermal storage tanks • Steam turbines • Cooling towers • Alternator • Electrical sub-station

Description of technical specifications

Description of the technical specifications has been divided into technical specifications of renewable energy systems and technical specifications of the components of the renewable energy systems.

The *technical specifications of renewable energy systems* are the quality standards which must be met by plants as a whole. Compliance with these technical specifications is compulsory given that their quality standards have been transposed into applicable laws via Royal Decrees.

For purposes of analysis, these technical specifications applicable to renewable energy systems have been classified in four different groups:

1. *Technical specifications applicable to civil works*
   - § Royal Decree 314/2006 of 17 March 2006, Technical Building Code
   - § Royal Decree 1027/2007 of 20 July 2007, Regulation on Thermal Installations in Buildings
2. *Technical specifications applicable to electrical and control installations*
   - § Royal Decree 842/2002 of 2 August 2002, Electro-technical Regulation for Low Voltage and Supplementary STIs
   - § Royal Decree 223/2008 of 15 February 2008 establishing the Regulation laying down technical conditions and safety guarantees for high-voltage electrical lines and supplementary technical instruction ITC-LAT 01 to 09
   - § Royal Decree 3275/1982 of 12 November 1982 of the Ministry of Industry and Energy. Official State Gazette of 1 December 1982. Error correction. Official State Gazette of 18 January 1983. Regulation laying down technical conditions and safety guarantees for electrical power plants and processing facilities
3. *Technical specifications applicable to mechanical installations*

- § Royal Decree 2060/2008 of 12 December 2008 establishing the Regulation on pressure equipment and supplementary technical instructions
- § Royal Decree 379/2001 of 6 April 2001 establishing the Regulation on storage of chemical products and supplementary technical instructions MIE-APQ-1, MIE-APQ-2, MIE-APQ-3, MIE-APQ-4, MIE-APQ-5, MIE-APQ-6 and MIE-APQ-7
- § Royal Decree 2267/2004 of 3 December 2004 establishing the Regulation on fire safety at industrial premises

4. *Technical specifications applicable to ATEX standards*
   - § Royal Decree 400/1996 (94/9/EC) - ATEX 100: on protection devices and systems for use in explosive atmospheres
   - § Royal Decree 681/2003 (1999/92/EC) - ATEX 137: on the safety and health protection of workers at risk from explosive atmospheres in the workplace.

Regarding the technical specifications of renewable energy equipment ***UNE quality standards*** have been defined for the components identified in the foregoing.

In the case of the following technologies, ***no specific standard has been defined***:

- § *Biodiesel technology:* Transesterification reactors, glycerine recovery equipment.
- § *Bioethanol technology:* Dehydration tower.
- § *Biomass technology*: co-combustion: coal or biomass mills, raw material grinders (biomass, wood).
- § *Biogas technology:* gas washing equipment, gas cooling units.
- § *Offshore and wind technologies:* signalling and beacon equipment.
- § *Thermosolar technology:* mirrors, central tower.

4.2.3 Buildings (Article 13(3) of Directive 2009/28/EC)

The building sector is key in Directive 2009/28/EC and it is therefore essential to establish a series of measures to foster energy efficiency and the use of renewable energies in light of the considerable amount of energy consumed by the sector.

In this connection, Article 13(3)(4)(5)(6) of Directive 2009/28/EC provide a series of guidelines to encourage the building sector to play an important role in fostering renewable energies. To that end, Member States should see to it that:

- § Local and regional administrative bodies ensure equipment and systems are installed for the use of electricity, heating and cooling from renewable energy sources and for district heating and cooling when planning, designing, building and renovating industrial or residential areas.
- § Construction regulations and codes provide appropriate measures in order to increase the share of all kinds of energy from renewable sources in the building sector.
- § Existing public buildings that are subject to major renovation, at national, regional and local level fulfil an exemplary role from 1 January 2012 onwards.
- § Building regulations and codes promote the use of renewable energy heating and cooling systems and equipment that achieve a significant reduction of energy consumption.

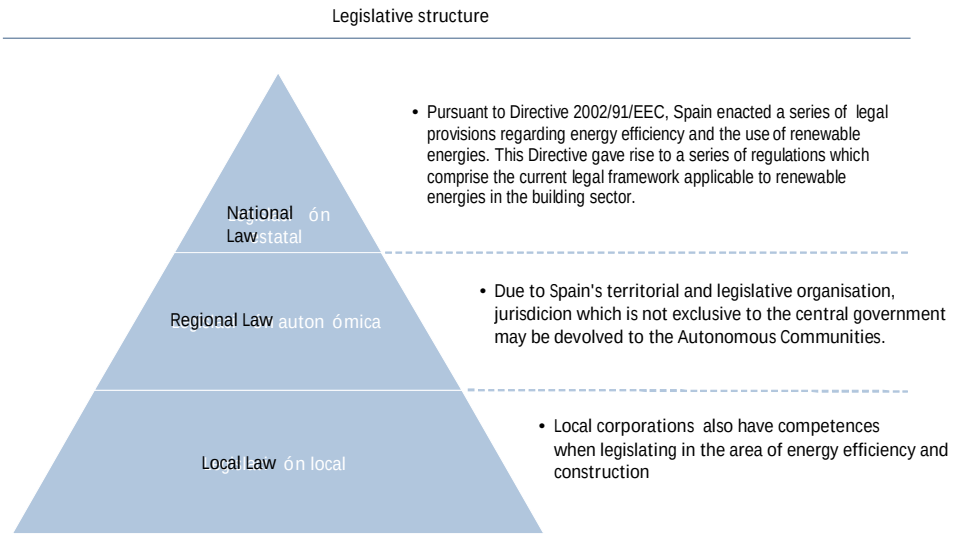
Bodies and legislation relating to renewable energies in the building sector

Spain has been working for years at national, regional and local levels to meet these guidelines through the implementation of legislation and the creation of bodies responsible for overseeing compliance and raising awareness of already established energy policies.

According to Spain's legislative structure, not only the central government but also regional and local administrations may enact laws in the field of energy efficiency and renewable energies in the building sector in cases where these competences have been devolved.

Construction
Legislative structure

Current legislation regarding renewable energy in the building sector is structured at different levels and in different classes within the legislative structure



At national level, the Ministry of Industry, Tourism and Trade and the Ministry of Housing have legislative competence in the field of renewable energies and the building sector.

Building sector
Identification of bodies and regulations. National entities

At national level, the Ministry of Industry, Tourism and Trade and the Ministry of Housing have legislative competence in the building sector and the field of energy

	Scope	Dependent body	Activities and competencies	Significant projects
Ministry of Industry, Tourism and Trade	National	Government of Spain	• Jurisdiction in the area of energy is delegated to the Secretariat of State for Energy – Draft standards in the area of energy and mining in accordance with legislation in force. – Draft proposals on the regulation of tariff structures, energy commodity prices and tolls in accordance with legislation in force. – Formulate energy conservation and savings proposals, foster renewable energies and develop new energy and mining technologies. – Draft and, where applicable, apply measures aimed at ensuring energy supply	Laws in force • Royal Decree 661/2007 of 25 May 2007 regulating electrical energy production activity under the special regime. • Royal Decree 1578/2008 of 26 September 2008 on remuneration of electrical energy production activity using solar photovoltaic technology for installations after the deadline date for remuneration under Royal Decree 661/2007 of 25 May 2007 for that technology.
Ministry of Housing	National	Government of Spain	The Ministry pursues the following lines of action in the field of construction: • Monitor the Construction Planning Act, Law 38/1999, by proposing mechanisms, amendments and any necessary actions to achieve greater efficiency in application and implementation, especially concerning regulatory actions relating to the drafting of the Technical Building Code, the implementation of support mechanisms envisaged in the latter and permanent updating thereof. • Develop programmes, in collaboration with building agents, which foster and regulate sustainable development in the building sector. • Perform voluntary regulatory quality certification activities on buildings and homes and study and propose the awarding of usage authorisations for protective materials for flooring and roofing in accordance with current laws, without prejudice to duties corresponding to collegiate bodies. • Participate in and monitor conformity and suitability certification activities regarding the use of materials, equipment and innovative systems used in buildings and homes.	Laws in force • Royal Decree 314/2006 of 17 March 2006 approving the Technical Building Code. • Royal Decree 1027/2007 of 20 July 2007 approving the Regulation on Thermal Installations in Buildings.(1) • Royal Decree 47/2007 of 19 January 2007 approving the Basic Procedure for the certification of energy efficiency in newly constructed buildings.(1)

Notes: 1) RD 1027/2007 and RD 47/2007 were proposed jointly by the Ministry of Industry, Tourism and Trade and the Ministry of Housing.
Source: Ministry of Industry, Tourism and Trade and the Ministry of Housing, Idom analysis.

Spanish legislation currently in force at national level regarding energy efficiency and renewable energies in the building sector was the result of the transposition of Directive 2002/91/EC of the European Parliament and of the Council of 16 December 2002 on the energy performance of buildings.

A series of ***standards and codes*** resulted from this process in Spain in an attempt to cover the requirements laid down in Directive 2002/91/EC:

- § Royal Decree 314/2006 of 17 March 2006 establishing the Technical Building Code.
- § Royal Decree 47/2007 of 19 January 2007 establishing the basic procedure for the energy efficiency certification of new buildings.
- § Royal Decree 1027/2007 of 20 July establishing the Regulation governing thermal installations in buildings.

The Technical Building Code (Sp. acronym CTE) was established by Royal Decree 314/2006 (Official State Gazette 28/03/06). The CTE is the regulatory framework laying down the requirements which buildings must meet in terms of basic safety and habitability established under the CET's Building Planning Law, whose Basic

Documents (Sp. acronym DB) provide a structured list of the requirements set out in the objects of the Law and its basic requirements. These Basic Documents define the technical rules contained in the calculation methodology of the acceptable solutions for each type of installation provided for in the Code. However, in certain cases, it envisages the possibility of proposing different alternative means of compliance.

The so-called DB-HE "Energy Saving" is among the seven Basic Documents. Its basic requirement is the rational use of energy in buildings, reducing consumption to sustainable levels and seeing to it that part of this consumption comes from renewable energy sources.

The DB HE “Energy Saving” is broken down into five sections, each with a basic requirement; HE4 deals with on solar thermal energy and HE5 with solar photovoltaic energy. Under the CTE, new and refurbished buildings must, in addition to other energy requirements, be equipped with solar thermal and photovoltaic energy. In the case of solar thermal technology, it establishes a minimum share of energy depending on the climate zone and demand for hot water, while in the case of solar photovoltaic energy, it establishes a minimum share of electrical energy depending on the type of building and climate zone.

The ***Regulation on Thermal Installations in Buildings***, jointly sponsored by the Ministry of Industry, Tourism and Trade and the Ministry of Housing, was enacted by Royal Decree 1027/2007 of 20 July 2007. It was drafted in response to the need to transpose European Directive 2002/91/EC on the Energy Performance of Buildings and to Spain's approval of the 2006 Technical Building Code. The new Regulation, which came into force on 29 February 2008, revokes and replaces the previous Regulation on Thermal Installations in Buildings, hereafter RITE, passed by Royal Decree 1751/1998 and subsequent amendments thereof in Royal Decree 1218/2002.

The Regulation on Thermal Installations in Buildings lays down the energy efficiency and safety requirements which must be met by thermal installations in buildings designed to meet personal well-being and hygiene standards. It applies to their design, size, operation, maintenance and use and lays down procedures whereby compliance can be accredited.

As for the scope of the Regulation, it covers fixed climate-control installations (heating, cooling and ventilation) and hot water, designed to meet personal well-being and hygiene standards.

The regulation includes four Technical Instructions that define pertinent technical aspects for the proper implementation of each phase of a thermal installation project.

- IT1 Design and size
- IT2 Assembly
- IT3 Maintenance and use
- IT4 Inspections

Regarding renewable energies, the technical requirement laid down in Article 12 – Energy Efficiency – provides that thermal installations must be designed and devised, operated, maintained and used in such a way as to reduce the consumption of conventional energy, and consequently greenhouse gas emissions and other air-polluting substances, through the use of energy efficient systems which permit energy recovery and the use of renewable energies and waste energy. In this connection, the

RITE requires the use of renewable energies, meaning that thermal installations must use available renewable energies in order to cover a part of the building's needs.

At regional level, competence in the area of renewable energies is divided among different *Consejerías (*regional ministries) and Departments of the Autonomous Communities. In this connection, the following ***regional bodies*** have competences in the area of renewable energies:

- *Andalusia:* Directorate-General for Industry, Energy and Mines.
- *Aragon:* Directorate-General for Energy and Mines.
- *Asturias:* Directorate-General for Mining and Energy.
- *Cantabria:* Directorate-General for Industry.
- *Catalonia:* Directorate-General for Energy and Mines, Catalonian Energy Institute.
- *Castile-La Mancha* Directorate-General for Industry, Energy and Mines.
- *Castile-Leon:* Regional Energy Body of Castile-Leon.
- *Extremadura:* Directorate-General for Industrial Planning and Energy Policy.
- *Galicia:* Directorate-General for Industry, Energy and Mines.
- *Balearic Islands:* Directorate-General for Energy.
- *Canary Islands:* Directorate-General for Energy.
- *La Rioja:* Directorate-General for Labour, Industry and Trade and the Directorate-General for Innovation.
- *Madrid:* Directorate-General for Industry, Energy and Mines.
- *Murcia:* Directorate-General for Industry, Energy and Mines.
- *Navarre:* Directorate-General for Business.
- *Basque Country:* Deputy-department of Industry and Energy.
- *Valencia:* Directorate-General for Energy.

Regarding ***Regional legislation***, only a few Autonomous Communities have enacted legislation in the field of renewable energies in the building sector, establishing minimum levels and climate zones within their geographical area. In this regard, only Catalonia has implemented a regulation establishing criteria of this sort within the building sector.

Other Autonomous Communities have actually enacted renewable energy legislation in the building sector at regional level but for the purpose of regulating aspects such as administrative procedure, connection points to the low-voltage grid, etc.

Regarding legislative measures affecting the share of energy from renewable sources in the building sector, Catalonia has implemented ***Decree 21/2006 of 14 February 2006 regulating the adoption of environmental and eco-efficiency criteria in buildings***, defining the minimum levels of renewable technology to be applied and climate zones within the Autonomous Community.

Article 4 of this regional regulation stresses the need to install solar thermal energy systems to supply hot water and provides for minimum coverage of hot water needs on the basis of building demand and climate zone.

Regarding the current status of renewable energies in the building sector, given the number of municipalities in Spain, the scope of the study was limited to a series of ***local bodies*** with regulations which can serve as a benchmark for the object and purpose of the National Renewable Energy Action Plan. The scope of the study was limited to the following local corporations:

- Barcelona City Council

- Bilbao City Council
- Las Palmas de Gran Canaria City Council
- Madrid City Council
- Murcia City Council
- Seville City Council
- Valencia City Council
- Zaragoza City Council

Some local corporations in Spain have enacted city ordinances requiring the incorporation, in most cases, of solar installations in all types of newly constructed or refurbished buildings, i.e. flats, offices, sports facilities or hospitals, with a view to promoting renewable energies in the building sector.

The following municipal regulations were identified for the municipalities within the scope of this study.

Building sector
Identification of bodies and regulations. National entities

The vast majority of the Local Corporations studied have enacted ordinances concerning solar thermal energy in buildings
The Local Corporations of Madrid and Bilbao do not currently have their own regulation

Local Corporation	Solar Thermal	Solar Photovoltaic	Biomass	Geothermal	Mini-wind	Bio-fuel
Barcelona	General environmental ordinance of Barcelona	The Local Corporation's energy and environmental quality service is currently drafting an ordinance.	None	None	None	None
Bilbao	None CTE H4 applies	None CTE H5 applies	None	None	None	None
Las Palmas de Gran Canaria	Municipal Ordinance for the incorporation of solar energy collection and use systems for thermal uses.	Municipal ordinance for the incorporation of solar photovoltaic energy collection and use systems.	None	None	The Local Energy Agency is currently drafting an ordinance	None
Madrid	Madrid's solar ordinance was repealed in Jul 2009. CTE H5 now applies.	None CTE H5 applies	None	None	None	None
Murcia	Municipal solar collection ordinance	None CTE H5 applies	None	None	None	None
Seville	Ordinance for the local management of energy in Seville	None CTE H5 applies	None	None	None	None
Valencia	Municipal ordinance on solar collection for thermal uses	None CTE H5 applies	None	None	None	None
Zaragoza	Municipal ordinance on eco-efficiency and the use of renewable energies in buildings and their installations.	None CTE H5 applies	None	None	None	None

Energy saving and efficiency plans for public sector buildings

The aim of ***energy saving and efficiency plans for public sector buildings*** is to establish a specific action programme for buildings belonging to the public administration in order to reduce their energy consumption.

Directive 2006/32/EC of the European Parliament of 5 April 2006 sets up a new regulatory framework for end-use efficiency and energy services. This Directive requires the public sector to play an exemplary role in the application of energy savings and efficiency measures and in the promotion and procurement of energy services.

The role of the public sector is further stressed in Directive 2009/28/EC on the promotion of the use of energy from renewable sources, Article 13(5) of which provides that "Member States shall ensure that new public buildings, and existing public

buildings that are subject to major renovation, at national, regional and local level fulfil an exemplary role in the context of this Directive from 1 January 2012 onwards".

In this connection, Spain has been integrating Community energy saving and efficiency objectives into national energy policy. Spain's 2004-2012 Energy Saving and Efficiency Strategy (E4), passed by the Government on 28 November 2003, defines potential savings and the measures needed to realise such potential with a view to improving the Spanish economy's performance in the area of energy.

These measures were then implemented through the 2005-2007 and the current 2008-2012 Action Plans, where some measures stress the exemplary role that the Public Administrations should play in some energy saving and efficiency measures. In this connection, as one of the measures of the Action Plan of the Energy Savings and Efficiency Strategy, Spain passed the Action Plan for Energy Efficiency in Buildings of the General State Administration (Sp. acronym PAEE-AGE) and dependent bodies and corporations, at the proposal of the Ministry of Industry, Tourism and Trade.

Generally speaking, to date the vast majority of Autonomous Communities in Spain have not drawn up specific energy efficiency plans for public buildings belonging to their administrations. They have, however, focused on the administration of energy consumption in their public buildings through the measures and initiatives laid down in their regional Energy Plans or other strategic documents.

The following table summarises the main actions taken at national and regional level:

Building sector
Public buildings. Measures

There are no specific plans for public buildings at regional level but most Autonomous Communities do refer to this in their energy plan and propose measures.

			Planned measures/ programmes						
Geographical scope	**Specific plan/ legislation**	**Reference in regional energy plan**	**Energy control centre [1]**	**Energy administrator [2]**	**Energy studies / audits**	**Renewable energies in public buildings**	**Training, information, consulting**	**Economic incentives**	**Observations**
National	√ PAEE-AGE Energy saving and efficiency plan – General State Administration	N.A.		√	√	√	√		
Andalusia		√	√		√	√	√	√	In addition to the plan there is a law fostering renewable energies or energy savings and efficiency.
Aragon									Aragon's energy plan makes no reference to public buildings.
Asturias					√		√	√	Municipal energy advisory plan
Cantabria		√			√	√			
Catalonia	√ Agreement 24 April 2007			√	√	√	√		
Castile-La Mancha		√			√	√			In addition to the plan there is a law fostering renewable energies and providing incentives for energy savings and efficiency..
Castile-Leon		√					√		
Extremadura		√			√		√		
Galicia								√	E-SOL Programme
Balearic Islands	√ Agreement 1 Nov 2003		√		√			√	
Canary Islands		√			√				
La Rioja									There is no plan or reference to energy saving and efficiency in public buildings in other documents.
Madrid									Public buildings are not addressed in the Plan but there is the Madrid Centre for Energy Saving and Efficiency (CAEEM)
Murcia						√			Law 10/2006 of 21 December of the Region of Murcia on Renewable Energies and Energy Saving and Efficiency
Navarre		√				√			
Basque Country									The 2010 Euskadi Energy Strategy mentions it should serve as an example.
Valencia		√			√	√	√	√	

Notes: 1) An energy control centre is an instrument to foster action in the field of renewable energies and energy saving and efficiency in regional and local public buildings.
2) An energy administrator is a person assigned to a consumption centre with a minimum level of consumption for the latter's energy administration.

Measures fostering renewable energies in the building sector

The fostering of renewable energies in the building sector is a clear sign of the will to enhance energy efficiency in this sector. Measures ***supporting and encouraging*** these technologies in the building sector are necessary if the implementation of renewable energies is to become a reality by supplying a significant proportion of the energy consumed in the building sector.

Most of the measures fostering renewable energies in the building sector in Spain have been through energy plans at national and regional level.

At national level the main support measures for renewable energies in the building sector are laid down in two Plans: the 2005-2010 Spanish Renewable Energies Plan and the 2008-2012 Action Plan (PAE4+).

The support measures targeting renewable energies in the building sector in Spain's 2005-2010 Renewable Energies Plan focus on public aid for investment and premiums for electricity generated from renewable energies.

The 2008-2012 Action Plan (PAE4+) provides for support in the form of measures to enhance the energy efficiency of existing thermal installations and the revamping of energy requirements applicable in building codes.

A large majority of the Autonomous Communities are supporting renewable energies through their Energy Plans. These provide guidelines as to what policies should be

followed by the Communities to attain their objectives in terms of fostering not only renewable technologies and energy savings and efficiency but also the energy sector as a whole.

One of the most commonly used measures among the different Communities to foster renewable energies in the building sector is public aid or investment incentives. In this connection, the respective Autonomous Communities are responsible for drawing up, public aid programmes, preparing and drawing up the ground rules for public calls for proposals, administration, processing and technical assessment of applications, awarding of aid and payment certification including control and, where applicable, refunds and sanctions.

To procure the funds needed to carry out these incentive policies the Autonomous Communities have signed agreements with the Institute for Energy Diversification and Saving (Sp. acronym IDAE) for the implementation of National Action Plans and of the budget allocations specified by the regional governments.

Some Autonomous Communities take part in European programmes to foster renewable energies in their territories. One such is the "Islands Pact" signed by the Canary and Balearic Islands.

Building sector
Incentive measures

A series of renewable energy support measures in the building sector has been established at national and regional level (1/2)

Geographical scope	Economic incentives	Regulatory implementation	Implementation of administrative procedures	Solar thermal	Photovoltaic	Energy savings and efficiency	Biomass	Cogeneration
Andalusia	√	√	√	√	√	√	√	√
Aragon	√	√		√	√	√		
Balearic Islands	√			√		√		
Canary Islands	√			√				
Cantabria	√		√	√	√	√		√
Castile-La Mancha	√		√	√	√	√	√	
Castile-Leon	√	√				√		

Building sector
Incentive measures

A series of renewable energy support measures in the building sector has been established at national and regional level (2/2)

Geographical scope	Economic incentives	Regulatory implementation	Implementation of administrative procedures	Solar thermal	Photovoltaic	Energy savings and efficiency	Biomass	Cogeneration
Catalonia	√	√	√	√	√	√	√	
Valencia	√	√			√	√		
Extremadura	√	√	√	√	√	√	√	√
Galicia	√							
La Rioja	√							
Madrid	√			√	√	√	√	
Murcia	√			√	√	√	√	
Navarre	√							
Basque Country	√	√				√		
Principality of Asturias	√	√		√	√	√	√	√

4.2.4 Information provisions (Articles 14(1), 14(2) and 14(4) of Directive 2009/28/EC)

Directive 2009/28/EC also stresses the mechanisms which Member States must have in place to provide agents and/or stakeholders of the renewable energies sector with access to information on support measures and benefits related with these technologies.

Article 14(1) and (2) of Directive 2009/28/EC contains a number of guidelines encouraging information and training mechanisms in the renewable energies sector so that:

- Information on support measures is made available to all relevant actors, such as consumers, builders, installers, architects, and suppliers of heating, cooling and electricity equipment and systems and of vehicles compatible with the use of energy from renewable sources.

- Information on the net benefits, cost and energy efficiency of equipment and systems for the use of heating, cooling and electricity from renewable energy sources is made available either by the supplier of the equipment or system or by the competent national authorities.

Legislative measures concerning information requirements

In this regard in Spain only ***public dissemination of the rules and laws*** enacted by national, regional and local bodies competent in legislative matters is compulsory.

Article 9(3) of the 1978 Spanish Constitution guarantees the publicity of legal statutes. Therefore, the publication of regulations and laws is a legal imperative which is met through publication in official journals.

At national level we have the *Boletín Oficial del Estado* (Official State Gazette, Sp. acronym BOE) which is regulated under Royal Decree 181/2008 of 8 February 2008 on the regulation of the "Official State Gazette", which is the organ responsible for publishing laws, provisions and acts whose publication is compulsory. Therefore, measures supporting renewable energies established by legislative means must be published in the Official State Gazette.

Then when ***subsidies*** are granted from ***European Union funds***, the specific Community rules and national regulations concerning the latter's implementation and transposition apply, and therefore such subsidies must be considered on a case by case basis.

In this connection we would note that when subsidies are granted from ERDF funds, Regulation (EC) No 1828/2006 requires the managing authority of the aid to draw up a Communication Plan.

Bodies responsible for the dissemination of information

In Spain, the ***bodies responsible for the dissemination of information*** include national, regional and local authorities. At national level, this duty is discharged by public bodies such as the Institute for Energy Diversification and Savings (IDAE), the Association of Spanish Energy Administration Agencies (EnerAgen) and sectoral associations linked to the different energies.

At regional level, the responsibility for disseminating information regarding renewable energy support measures and benefits is mostly shouldered by the Energy Agencies.

Information dissemination measures

In Spain, the main provisions regarding information at national level are found in the ***2005-2010 Renewable Energy Plan*** and in the ***2008-2012 Energy Savings and Efficiency Action Plan*** which furnish information on a whole series of public assistance and communication, information and awareness measures for citizens relating to energy savings plans and the fostering of renewable energies.

A series of measures to disseminate information to publicise support measures and the benefits of renewable energy systems and equipment have been designed to achieve the objectives set out in these Plans. Particularly important at national level is the activity carried on by the Institute for Energy Diversification and Savings (IDAE), which is the body responsible, together with the Autonomous Communities, for managing measures and funds earmarked for both Plans and for running training and awareness-raising campaigns to help promote the construction of a new energy model.

Moreover, we have recently been seeing growth and enhancement of the role of sectoral associations and energy agencies, among whose many responsibilities we would highlight their activities in disseminating knowledge and raising awareness of renewable energies.

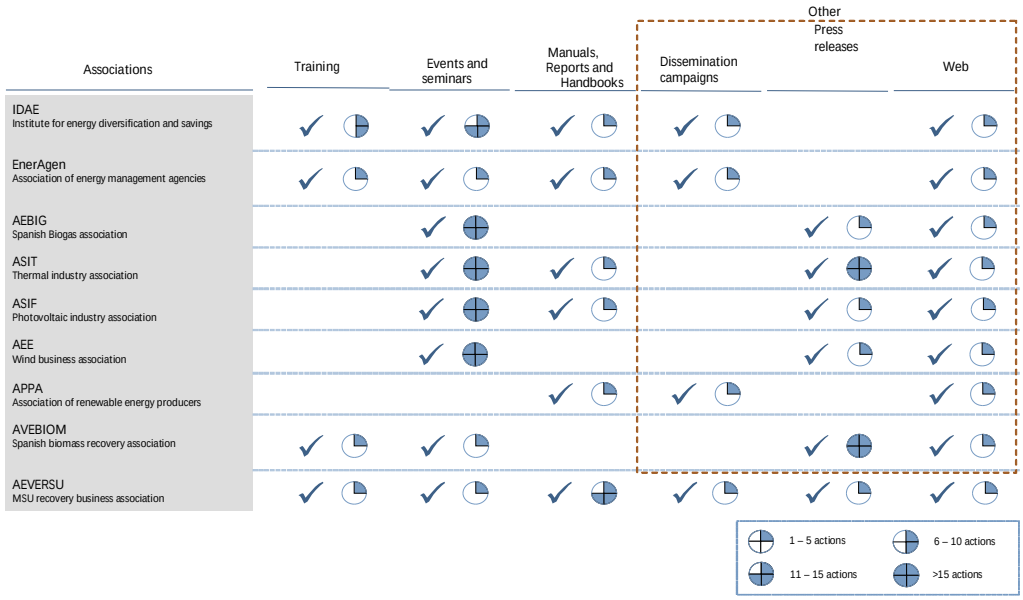
The main information dissemination measures carried out by national, regional and local bodies in 2009 and 2010 can thus be broken down into five groups:

- *Official publications*: all regulations and laws published in the Official State Gazette and Official Regional Journals.
- *Training*: all training activities designed to enhance and adapt the knowledge and skills of professionals in the renewable energies sector.

- *Events and seminars*: all activities having to do with presentations or talks on a particular subject designed to raise stakeholder awareness as to experience gained in the sector and/or present and future projects.
- *Manuals, reports and sectoral guides:* These documents serve as practical consultation tools for the application of best practices in the area of renewable energies in the different sectors of the economy on the basis of real experience gained through projects implemented in the business sector.
- *Other:* This group includes all activities related to the dissemination of information, written articles, press releases, publicity campaigns, web pages, etc.

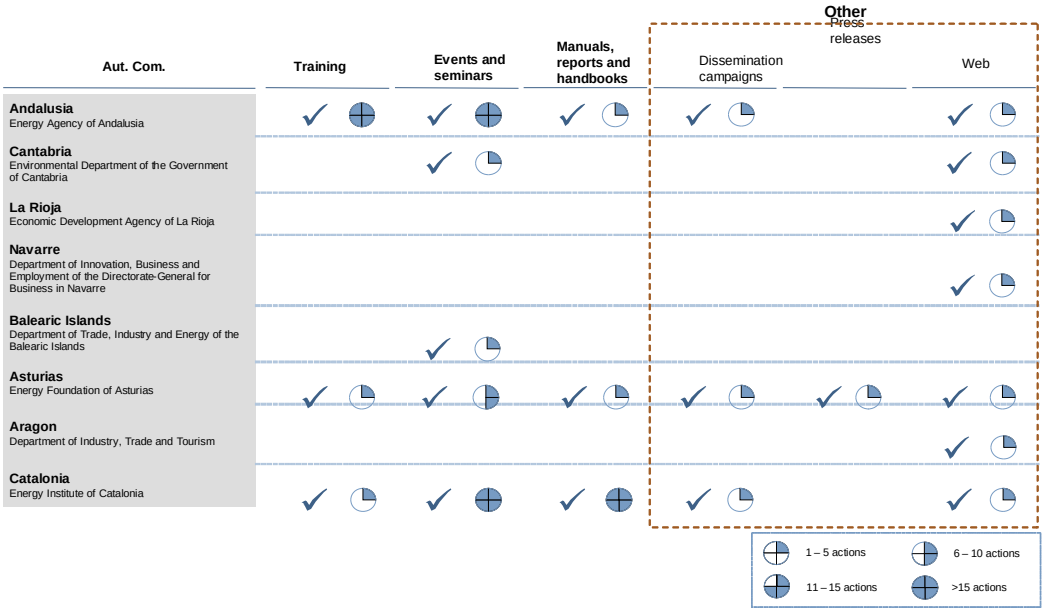
Information availability
Information dissemination measures

Agencies and associations in all the Autonomous communities promote energy efficiency and renewable energies within their sphere of action(1/3)



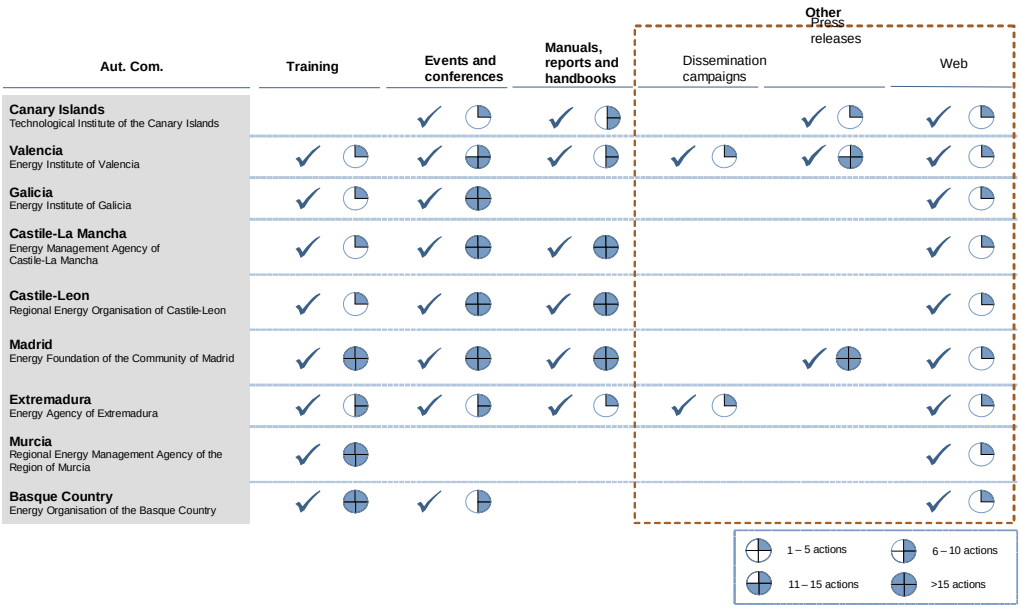
Information availability
Information dissemination measures

Agencies and associations in all the Autonomous communities promote energy efficiency and renewable energies within their sphere of action(2/3)



Information availability
Information dissemination measures

Agencies and associations in all the Autonomous communities promote energy efficiency and renewable energies within their sphere of action(3/3)



4.2.5 Certification of installers (Article 14(3) of Directive 2009/28/EC)

Another of the objectives pursued by Directive 2009/28/EC is the implementation the Member States of certification systems or standardised 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 **authorised installers**.

Professionally qualified installers

Professionally qualified installers are those who have accredited professional installation skills acquired through vocational and continuing training, training and employment programmes 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 specialised 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.

Installer certification
Identification of bodies and regulations. National entities

National bodies with competences in matters of installer certification through the National Qualification and Vocational Training System (Sp. acronym SNCFP)

	Scope	Dependent body	Functions
General Vocational Training Council CSFP	National	Government of Spain Ministry of Labour and Social Affairs	• Draw up and propose the National Vocational Training Programme for Government approval. Within that framework Autonomous Communities with competences in this area can regulate specific characteristics for their respective territories. • Evaluate and control implementation of the Programme and propose updates as necessary, without prejudice to the competences of the Autonomous Communities in this sphere. • Inform proposals for curricula and qualifications corresponding to the various degrees and to specialist areas in vocation training; also certificates of professional competence in the area of occupational vocational training, and where appropriate academic or professional homologation with the corresponding regulated vocational training degrees, without prejudice to the competences of the State Schools Council in these matters. • Report on any matters that may be submitted to it by the Public Administrations in connection with vocational training. • Submit proposals and recommendations to the public Administrations competent in matters of vocational training, especially those relating to implementation of the National Vocational Training Programme. • Propose actions to improve vocational guidance, particularly actions within the ambit of the Ministry of Education and Science and the Ministry of Labour and Social Affairs. • Evaluate and follow up actions undertaken in matters of vocational training..
National Institute for Qualifications	National	Government of Spain Ministry of Education and Science	• Propose the establishment and administration of a National System of Professional Qualifications. • Establish criteria for the requirements and characteristics that qualifications must satisfy. • Establish a basic methodology to identify professional skills and define the model that a professional qualification must adopt in order to be included in the National System of Professional Qualifications. • Propose a system of professional accreditation and recognition. • Establish a procedure whereby regional Qualification Agencies or Institutes and social agents can share responsibility. • Lay down criteria for the basic methods that must be followed in assessing competence and for the procedure to be followed for granting of accreditation by the competent authorities. • Propose procedures for establishing modes of competence accreditation. • Carry on essentially technical Vocational Training activities with both a national and a Community-wide scope. • Facilitate functional inter-relationships between training activities of the different Vocational Training subsystems, and of the qualifications and certificates that they generate on the one hand, and vocational classification systems created through collective bargaining on the other. • Perform the necessary tasks for the establishment of a frame of reference for the general programming of all subsystems; and at the same time provide support for normative and regulatory tasks in the field of Vocational Training. • Propose whatever measures are necessary for regulation of the system of correspondences, recognition and equivalences among the three Vocational Training subsystems (regulated, occupational and continuous), including in-work experience. • Provide support for start-up and expansion of the new training contract. • Improve the design and content of certificates of professional competence; this will facilitate recognition and correspondences. • Propose, through the General Vocational Training Council, a definition of the scope of the Occupational Vocational Training modules for purposes of capitalisation, via the appropriate certificate of professional competence, for workers pursuing them. • Submit proposals on certification of continuous training actions in connection with the National System of Qualifications, through integration in the National System of Professional Qualifications, in both legal and functional terms.

Source: Law 19/1997 of 9 June 1997; Royal Decree 375/1999

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:

Installer Certification
Professional certification. Professional qualifications

Skill-based professional qualifications recognised for working as an installer within the framework laid down by Directive 2009/28/EC (1/2)

	References	Professional qualification	General competence	Units of competence
Professional qualifications within the CNCP	• Vocational family: Energy and Water • Level: 2 • Code: ENA190	Assembly and maintenance of thermal solar installations	Perform the assembly, commissioning, operation and maintenance of thermal solar installations, to required quality and safety standards and in accordance with current regulations	UC0601_2: Laying-out of thermal solar installations UC0602_2: Assembly of collectors, equipment and hydraulic circuits of thermal solar installations UC0603_2: Assembly of electrical circuits and equipment of thermal solar installations UC0604_2: Start-up and operation of thermal solar installations UC0605_2: Maintenance of thermal solar installations
	• Vocational family: Energy and Water • Level: 2 • Code: ENA261	Assembly and maintenance of photovoltaic solar installations	Perform the assembly, commissioning, operation and maintenance of photovoltaic solar installations, to required quality and safety standards and in accordance with current regulations	UC0835_2: Laying-out of photovoltaic solar installations UC0836_2: Assembly of photovoltaic solar installations UC0837_2: Maintenance of photovoltaic solar installations
	• Vocational family: Energy and Water • Level: 3 • Code: ENA264	Organisation and projects for thermal solar installations	Promote installations, implement projects and administer the assembly and maintenance of thermal solar installations, monitoring the results, applying the requisite techniques and procedures in each case, and optimising the available human and material resources, to the requisite quality standards, in compliance with current regulations and in conditions of safety	UC0842_3: Determine the viability of solar installation projects UC0846_3: Implement thermal solar installation projects UC0847_3: Organise and control the assembly of thermal solar installations UC0848_3: Organise and control the maintenance of thermal solar installations
	• Vocational family: Energy and Water • Level: 3 • Code: ENA263	Organisation and projects for photovoltaic solar installations	Promote installations, implement projects and administer the assembly and maintenance of isolated and grid-connected photovoltaic solar installations, applying the requisite techniques and procedures in each case, and optimising the available human and material resources, to the requisite quality standards, in compliance with current regulations and in conditions of safety	UC0842_3: Determine the viability of solar installation projects UC0843_3: Implement photovoltaic solar installation projects UC0844_3: Organise and control the assembly of photovoltaic solar installations UC0845_3: Organise and control the maintenance of photovoltaic solar installations

Source: Royal Decree 1114/2007 of 24 August 2007, and Royal Decree 1228/2006 of 27 October 2006 supplementing the National Catalogue of Professional Qualifications.

Skill-based professional qualifications recognised for working as an installer within the framework laid down by Directive 2009/28/EC (2/2)

	References	Professional qualification	General competence	Units of competence
Professional qualifications within the CNCP	• Vocational family: Installation and Maintenance • Vocational Area: Refrigeration and Air Conditioning • Level: 2 • Code: IMAR0108	Assembly and maintenance of cooling installations	Perform the assembly, maintenance and repair of cooling installations, to required quality standards, in compliance with current regulations and in conditions of safety and respect for the environment	UC0114_2: Assembly of commercial and industrial cooling installations UC0115_2: Maintenance of commercial and industrial cooling installations
	• Vocational family: Installation and Maintenance • Level: 3 • Code: IMAR0308	Implementation of projects for fluid distribution networks and systems	Implement projects for fluid distribution networks and systems, determining their characteristics, drawing up the plans, planning and specifying the assembly and the intermediate or final test protocols required for reception, on the basis of a preliminary project and in accordance with established specifications, techniques, standards and procedures, assuring the viability of the project, its quality, safety and respect for the environment in such installations	UC1278_3: Determination of the characteristics of fluid distribution networks and systems UC1279_3: Determination of the characteristics of auxiliary electrical installations for fluid distribution networks and systems. UC1280_3: Implementation of plans for fluid distribution networks and systems
	• Vocational family: Installation and Maintenance • Vocational Area: Cooling and Heating • Level: 2 • Code: IMAR0208	Assembly and maintenance of air conditioning and ventilation / extraction installations	Carry out assembly, maintenance and repair operations on air conditioning, ventilation/extraction and air filtering installations, in accordance with the assembly and maintenance processes and plans, to the requisite quality standard, in compliance with current rules and regulations, in conditions of personal and environmental safety	UC1158_2: Assembly of air conditioning and ventilation/extraction installations UC1159_2: Maintenance of air conditioning and ventilation/extraction installations
	• Vocational family: Installation and Maintenance • Level: 1 • Code: IMAR0108	Domestic plumbing and heating / air conditioning work	Carry out installation of piping, preparing, cutting and joining pipes made of different kinds of materials according to the type of installation, and assemble and/or disassemble domestic sanitary apparatuses, radiators and air conditioning apparatuses, to requisite standards of quality and safety, in compliance with the established norms	UC1154_1: Carry out installation of piping, preparing, cutting and joining pipes for water and drain conduits UC1155_1: Carry out basic installation and maintenance work on domestic sanitary apparatuses, radiators and air conditioning apparatuses

Source: Royal Decree 182/2008 of 8 February 2008, and Royal Decree 1375/2009 of 28 August 2009 supplementing the National Catalogue of Professional Qualifications by introducing professional qualifications of the installation and maintenance vocational family.

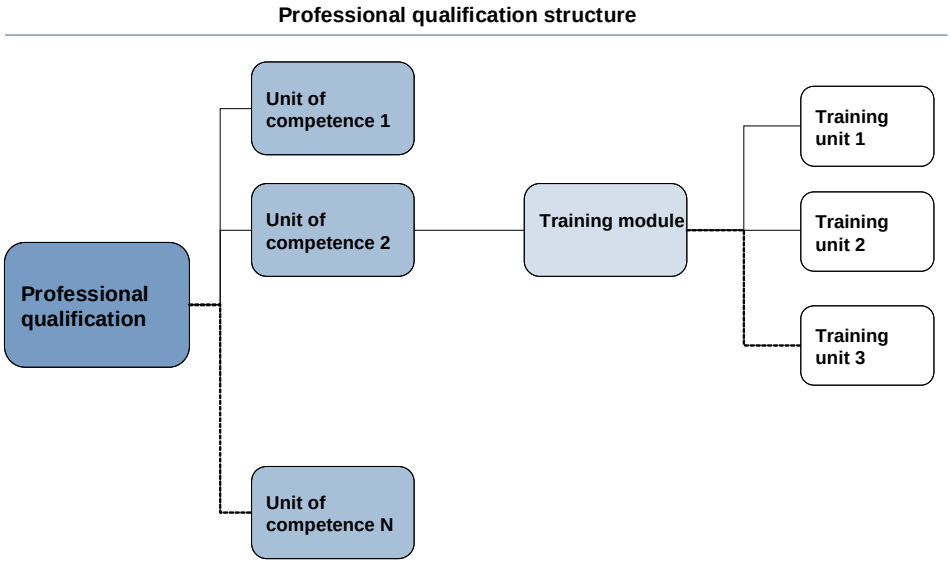
Each qualification is assigned a general skill where the professional's essential duties and function are briefly defined.

Each professional qualification also includes a description of the professional environment in which the qualification can be achieved, the appropriate productive sectors and the relevant occupations or job posts to which the qualification gives access.

Each of these skill units is associated with training modules, each composed of a number of training units.

Installer Certification
Certification systems. Professional qualification structure

Certificates of professional competence carry associated units of competence; these contain a training module, each with associated training units



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[2]

An ***installation company*** is any natural or legal person who, on the basis of theoretical-practical knowledge and in accordance with applicable law, is authorised 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 authorised installer's license is an administrative authorisation that is required for anyone to install, and in some cases design, certain industrial installations.

[2] Installation company within the meaning of R.D. 249/2010 for thermal installations and R.D. 560/2010 for photovoltaic installations.

Within the groups of installers referred to in the 2011-2020 NREAP and pursuant to regulations currently in force, authorised 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 authorised 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 authorised 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 authorisation 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 authorised installer or competent technician who will then have to draft a technical report for official authorisation, 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 authorised installers, but these require a preliminary project and must be supervised by a competent technician (engineer or technical engineer).

The same applies to **photovoltaic installations**. According to ITC-BT-04 of the low-voltage electro-technical Regulation, the size of the installation will determine whether an authorised installer is needed (pursuant to Royal Decree 560/2010 of 7 May 2010) at the different stages of a project for a new generator or converter installation. In this connection, for purposes of official processing of a photovoltaic installation, two different cases are possible depending on the size:

1) When the electrical rating is 10 kW or less, the installation must be designed, calculated, installed and tested by an installation company or competent certified technician, who will then have to draft a technical design report (Sp. acronym MTD) for official authorisation, which must be drawn up in accordance with the procedure specified by the Autonomous Community in question and filed once the installation is complete.

2) Installations whose electrical rating exceeds 10 kW must also be performed by installation companies, but these require a preliminary project and must be supervised by a competent technician(s).

Installer Certification
Authorised installers

Principal agents involved in the various stages of implementation of projects for thermal installations and photovoltaic installations

	Type of installation	1. Calculation and design	2. Execution	3. Construction supervision	4. Final tests	5. Compulsory maintenance
Thermal installations (1)	1. Installation with thermal capacity of 0 to 5 kW	Approved installer or holder of appropriate qualification	Approved installer	Not required	Approved installer	Approved company
	2. Installation with thermal capacity of 5 to 70 kW	Approved installer or holder of appropriate qualification	Approved installer	Not required	Approved installer	Approved company
	3. Installation with thermal capacity of more than 70 kW	Holder of appropriate qualification (engineer or technical engineer)	Approved installer	Holder of appropriate qualification (engineer or technical engineer)	Approved installer supervised by project supervisor	Approved company
Photovoltaic installations	4. Installation with electrical capacity of less than 10 kW	Installation company	Installation company	Not required	Installation company	Installation company
	5. Installation with electrical capacity greater than 10 kW	Holder of appropriate qualification (engineer or technical engineer)	Installation company	Holder of appropriate qualification (engineer or technical engineer)	Installation company supervised by project supervisor	Installation company

Note 1) Installations of biomass boilers and burners, thermal solar systems, surface geothermal systems and small-scale heat pumps
Source: Royal Decree 1027/2007 of 20 July 2007 approving the Regulation on Thermal Installations in Buildings
Royal Decree 842/2002 of 2 August 2002 approving the Electro-technical Regulation for Low Voltage

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.

Installer certification
Identification of bodies and regulations. National entities

RITE Advisory Committee

	Scope	Dependent bodies	Functions	Organisation of the Committee
RITE Advisory Committee CA RITE	National	Secretariat General for Energy Ministry of Industry, Tourism and Trade	• Analyse the results of practical application of the Regulation on thermal installations and propose criteria for proper interpretation and application. • Receive proposals and comments submitted by the various Public Administrations, sector agents and users for examination and consideration. • Examine and propose updates to the regulations to keep track of technical progress. • Examine international actions in the sphere, particularly those of the European Union, and propose appropriate actions. • Lay down the requirements that must be met by the documents recognised by the Regulation on Thermal Installations in Buildings, the conditions for validation and the procedure to be followed for joint recognition by the Ministry of Industry, Tourism and Trade and the Ministry of Housing, and submit a proposal to the Secretariat General for Energy for their inclusion in the General Registry.	• The Advisory Committee shall function as a Full Committee, and through a Standing Committee and Work Groups. • The Full Committee shall be required to deal with any matters that the Chairman considers important enough after consideration by the Standing Committee and the specific Work Groups. The internal regulations shall require the approval of the Full Committee. The Full Committee shall be convened at least once a year, either by the Chairman or at the request of at least a quarter of its members. • The Standing Committee, which shall meet once every six months, shall exercise any competences delegated to it by the Full Committee, implement its resolutions and coordinate the specific work groups. It shall be composed of a Chairman, two Deputy Chairmen and a Secretary. In addition to these, at the Chairman's request meetings shall be attended by the members representing the Ministry of Industry, Tourism and Trade, the Ministry of Housing , the Institute for Energy Diversification Saving (Sp. acronym IDAE), four representatives of the Autonomous Communities chosen in the full committee and representatives directly affected by the business at hand. Work Groups shall be set up to analyse any specific matters relating to the functions of the Advisory Committee that the Full Committee may delegate to them. In addition to the members of the Advisory Committee, meetings may be attended by representatives of the Administration, the sectors concerned and experts on the subject. These shall be designated by resolution of the Standing Committee and coordinated by a member of that Committee. • The Advisory Committee shall function with the human and material resources of the Secretariat General of Energy. • In order to function properly, the Committee shall approve internal regulations

Source: ROYAL DECREE 1027/2007 of 20 July 2007 approving the Regulation on Thermal Installations in Buildings

The professional license certification alone does not authorise 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 authorised 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 authorised 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 authorised 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 authorised 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.

Installer certification
Register of authorised companies

In nine Autonomous Communities, lists of authorised installation companies are published on their web page. In all other cases, the list or information regarding authorised companies may be requested from regional authorities (1/2)

Aut. Com	Regional authority	Register	List published	Means of publication	Comments
Andalusia	Directorate-General for Industry, Energy and Mines	✓	not published	-	List of electricity installers is published in the web page. For other categories, the list must be requested in writing at the appropriate Provincial Delegation.
Aragon	Directorate-General for Energy and Mines	✓	✓	Web page	
Asturias	Department of Industry and Employment	✓	✓	Web page	
Cantabria	Directorate-General for Industry	✓	not published		Lists may be requested in writing at the Industry directorate (there are no specific lists for categories such as solar thermal and photovoltaic systems but rather for categories such as heating.
Castile-La Mancha	Directorate-General for Industry Energy and Mines	✓	not published		Specific information may be requested about a company at the Provincial Delegations but a general list is not published.
Castile-Leon	Directorate-General for Industry	✓	not published		A list of installer companies can be requested in writing.
Catalonia	Secretariat of Industry and Corporate Affairs	✓	not published		Specific information on a company may be requested.
Extremadura	Department of Industry, Energy and the Environment	✓	not published		A list may be requested upon explaining why it is needed.

Source: web pages of regional bodies, telephone interviews

Installer certification
Register of authorised companies

In nine Autonomous Communities, lists of authorised installation companies are published on their web page. In all other cases, the list or information regarding authorised companies may be requested from regional authorities (2/2)

Aut. Com.	Regional authority	Register	List published	Means of publication	Comments
Galicia	Directorate-General for Industry, Energy and Mines	✓	✓	Web page	
Balearic Islands	Directorate-General for Industry	✓	✓	Web page	
Canary Islands	Department of Employment, Industry and Trade	✓	not published		A list may be requested in writing addressing a letter to the Department of Employment, Industry and Trade
La Rioja	Directorate-General for Industry	✓	not published		A list may be requested in writing addressing a letter to the Directorate-General for Industry (justifying need)
Madrid	Directorate-General for Industry, Energy and Mines	✓	✓	Web page	
Murcia	Department of Universities, Business and Research	✓	✓	Web page	
Navarre	Department of Innovation, Business and Employment	✓	✓	Web page	
Basque Country	Directorate for Industry and Mine Administration	✓	✓	Web page	Published in the web page which is currently not updated. An updated list may be requested.
Valencia	Department of Industry, Trade and Innovation	✓	✓	Web page	

Source: web pages of regional bodies, telephone interviews

4.2.6 Electricity infrastructure development (Article 16(1) and Article 16(3) to (6) of Directive 2009/28/EC)

The 2008-2016 Electricity and gas sector plan approved in May 2008 under the *Electricity Sector Act, Law 54/1997* and the *Hydrocarbon Sector Act, Law 34/1998,* as well as the provisions of *Royal Decree 1955/2000 of 1 December 2000 regulating transmission, distribution, commercialisation and supply activities and authorisation procedures for electrical energy installations*, are currently in force. A new Planning document covering up to 2020 is being prepared and will be approved at the end of 2011.

Among the rights granted under Law 54/1997 to producers registered with the special regime, which includes electrical plants powered by renewable sources, is priority access to transmission and distribution grids for their energy provided that grid reliability and security is upheld, and the right to feed their energy production into the system and to receive the appropriate remuneration. This last right may be temporarily limited by the Government for a specified period, subject to a report the Autonomous Communities, which will be responsible for determining the amount of energy that can be fed into the system.

Royal Decree 661/2007 of 25 May 2007 regulating electrical energy production under the special regime implements the rights described in the foregoing and acknowledges the right of producers under the special regime to transfer to the system, through the electricity distribution or transmission company as appropriate, their net energy production or sales, provided that it is technically possible for the grid to absorb it.

Annex XI to Royal Decree 661/2007 implements the right of priority access and connection to the grid and provides that as long as electricity system security and quality conditions are safeguarded without prejudice to the limitations established by the system operator in accordance with applicable laws, or if applicable, the distribution grid manager, generators under the special regime will be given priority over generators operating under the ordinary regime for the transmission of energy produced, with special preference for non-manageable special regime generation from renewable sources. It further provides that, in order to contribute to safe, maximum integration of non-manageable special regime generation, the system operator will give preference to those generators whose technological adaptation more fully contributes to the guarantee of supply security and quality conditions for the electrical system.

In this connection, Royal Decree 661/2007 defines as non-manageable generation that whose primary source cannot be controlled or stored and whose associated production plants are unable to control production following the instructions of the system operator without dumping primary energy, or where the accuracy of production forecasts is insufficient for it to be considered a programme. In principle, electricity production plants using the following primary energy sources will be considered to be non-manageable: solar, wind, geothermal, tidal, wave, hot dry rock, ocean thermal and marine current energy, and integrated river power plants with a 50 MW or lower rating, unless a plant is specifically assessed as manageable by the system manager, which would then necessitate application of the requirements or conditioning factors associated with that status.

In the case of limitation at the point of connection arising from physical or technical feasibility issues or the application of grid development criteria, Royal Decree 661/2007 gives connection priority to special regime generators from renewable energy sources

vis-à-vis other generators. The applicable laws make no provision for reservation of connection capacities in respect of this right of priority access.

Article 31 of Royal Decree 2019/1997 obliges system operators to submit the technical and instrumental operational procedures necessary for the proper technical management of the system to the Ministry of Industry, Tourism and Trade (Sp. acronym (MITyC) for approval, and the Ministry will issue its decision following a report by the National Energy Commission (Sp. acronym CNE). In compliance with the foregoing, there is a series of Operational Procedures related to special regime generation connected to the transmission grids:

- § O.P. 12.1 Access applications for the connection of new installations to the transmission grid.
- § O.P. 12.2 Installations connected to the transmission grid: minimum design, equipment, operation, security and start-up requirements.
- § O.P. 12.3 Response requirements in dealing with wind installation voltage dips.
- § O.P. 14.8 Recipient of payment for special regime installations.

Regarding the development of grids, pursuant to the terms of Law 54/1997, Planning is composed of an indicative part and a binding part. The indicative part makes forecasts regarding the evolution of electrical energy demand over the medium term and the generation mix available to meet that demand. In making these forecasts the Plan uses, inter alia, access applications from the different system agents (producers, distributors, etc.), so that in this respect existing needs are taken into account. Given that planning is done over a 10-year time horizon and is reviewed every 4 years, it is important to have instruments which provide flexibility so that necessary changes can be made to guarantee the adaptation of the transmission infrastructures to generation needs and demand at any given moment. In this connection, Royal Decree 1955/2000 provides for the approval of Annual Programmes whose purpose is to include one-off variations and exceptional actions which may have arisen during the year in the Plan. These mechanisms guarantee that the access needs of generation plants are met.

The current "Sustainable Economy" bill calls for, inter alia, maximum participation of renewable energies in the energy generation basket, especially electrical energy. In order to achieve this objective, the Law requires that binding plans be drawn up in compliance with the aforementioned obligation and that the latter be taken into consideration in the rest of the planning instruments.

Smart grids, with the support of information technology, define the future of electricity infrastructure and are very important in actively managing demand. This management will help flatten the demand curve, thus reducing structural spending to cover peak demand and the risk of having to dump renewable energies at off-peak hours, mostly wind. This is especially important in Spain, which has over 19,000 MW of wind capacity connected to the grid but very low capacity for exchange with Europe (approximately 3% of domestic consumption – the lowest in Europe).

In this regard, it is very important for Spain to establish international connections with France because, in addition to increasing security of supply, this would allow for the integration of a greater volume of renewables and increase electricity trade with the rest of Europe, thus ending Spain's status as an energy island. Current planning envisages two new connections with France, one through the Eastern Pyrenees and another through the Central Pyrenees. The first of the two is the Santa Llogaia-Baixas line, whose definitive technical solution involves a double direct-current circuit with 2,000 MW of capacity which is expected to come into operation in 2014. The exact definition of the Central Pyrenees line and its time horizon need to be studied jointly by

the operators of the Spanish and French systems and passed by mutual agreement between the Governments of the two countries. However, these two actions fall short of reaching the objective of interconnection capacity equivalent to 10% of installed capacity by 2020, which would mean approximately 10,000 MW. Therefore, solutions need to be sought as soon as possible to overcome this deficit. One option would be to start developing a European super-grid, which was conceived as a solution to the large-scale integration of renewables.

The authorisation procedure for transmission and distribution gird infrastructures is regulated by Law 54/1997 and by Royal Decree 1955/2000 implementing the former. This provides deadline dates for each of the infrastructures with a view to coordinating the administrative processes for infrastructure authorisation with the Plan.

Applicable legislation provides that connection costs be charged to the developer while the carrier or distributor will have to shoulder the cost of reinforcing or extending the transmission or distribution grid. This is in application of what Decision 2009/548/EC calls the "shallow connection cost approach". This guarantees recovery of investment through a remuneration system regulated by Royal Decree *325/2008 of 29 February 2008 establishing remuneration for electrical energy transmission activity for installations put into service as from 1 January 2008* and by *Royal Decree 222/2008 of 15 February 2008 establishing the remuneration system for electrical energy distribution.*

Rules regulating the access and connection of new producers to transmission and distribution grids are contained in Title IV of Royal Decree 1955/2000, and their technical aspects are implemented by operational procedures O.P. 12.1 and O.P. 12.2 referred to earlier.

4.2.7 Electricity network operation (Article 16(2) and Article 16(7) and (8) of Directive 2009/28/EC)

In order to achieve the planned 2020 objectives, support must be provided for the integration of energies from renewable sources into the transmission and distribution grid and that will entail energy storage systems if we are to integrate non-manageable energy from renewable sources.

In this connection, hydroelectric energy produced by plants located at existing regulation reservoirs and pumping plants could be an important pillar in bringing this Plan to fruition, as that is the ideal way to compensate for irregularities in renewable source generation and for storage of surplus from the latter. This is high-quality energy which contributes to the security and reliability of the electricity system as a readily available regulated energy to offset supply and demand fluctuations while also offering flexibility to control grid frequency and voltage, service replenishment, etc.

Promotion of new reversible or pumping plants will become necessary, mainly using existing reservoirs, as a way to allow for the full integration of electricity from renewable sources, especially wind.

Forecasts up to 2020 envisage 3000 additional MW of pumping power to be installed using the same reservoirs, including the repowering of existing pumps.

Royal Decree 1663/2000 of 29 September 2000 on the connection of photovoltaic installations to the low-voltage grid is currently in force in the field of solar photovoltaic energy and is applicable to photovoltaic installations whose nominal rating does not exceed 100 kVA and whose connection to the distribution grid is at low-voltage (i.e. connections not exceeding 1 kV).

A draft Royal Decree is currently being drawn up to regulate the grid connection of low power electrical energy installations under 1 MW.

Its aim is to allow low-power installations, which would connect in parallel to the low-voltage distribution grid where a similar or higher supply of electricity has been contracted, to connect at the same point of supply by means of a simplified procedure envisaging simple notification guaranteeing access to the distribution grid.

4.2.8 Biogas integration into the natural gas network (Article 16(7) and Article 16(9) and (10) of Directive 2009/28/EC)

Access to gas transmission networks for natural gas is guaranteed in Spain and there are Government regulations and access tariffs (Royal Decree 949/2001 regulating the access of third parties to gas installations and establishing an integrated economic system in the natural gas sector).

Work is currently under way to define the quality standards that gas from renewable sources must meet in order to gain access to the gas network. Specifically, Detailed Protocol PD-01 defines the quality of natural gas that can be injected into the network and is now under review to include in the near future the quality requirements for gas from renewable sources. This review of PD-01 will shortly be published by the Ministry of Industry, Tourism and Trade in the Official State Gazette.

A working group of the sector's main stakeholders (ENAGAS, CNE) has been formed to develop this Plan and study the different distribution options for biogas (injection into the transmission network, injection into the distribution network, isolated consumption, road transport, etc.). The initial conclusion is that, in light of the volume of gas that will potentially be produced in Spain, both at joint and individual project level, the most appropriate option appears to be injection into existing natural gas infrastructures or new ones, which could be achieved through thermal use of biomethane.

Therefore, to date no consideration has been given to the effect that the possible injection of biogas would have on the planning of gas infrastructures in Spain. The important existing natural gas transmission infrastructures in Spain and those at the planning stage need to be supported by distribution networks or the building of small local networks, including the possibility of small local biogas distribution networks. However, it would seem that the first priority should be to increase biogas generation to significant levels so as to justify the additional effort entailed in building such infrastructures.

At the initial stage, this biogas production would focus on electricity generation for incorporation into the grid with the support of an appropriate incentive system. Once the sector has acquired a certain volume, given the potential strategic interest in its thermal use through the gas infrastructure, the aim would be to devise a support framework suited to further developing this application.

4.2.9 District heating and cooling infrastructure development (Article 16(11) of Directive 2009/28/EC)

Heating networks in Spain using any fuel are scant and their role in supplying buildings and industry is negligible. There are no major or medium-sized installations supplying heat to a significant number of buildings. There are some examples of relatively large networks established several decades ago, but these are no longer in use for a number of different reasons.

Thirty or forty years ago, it was common practice for blocks of flats to have a boiler room to supply the community with hot water and heat. Since then, the most frequently-used and virtually the only system in blocks of flats or developments with single-family homes is for each consumer to have his own boiler. Fossil fuel companies encourage this situation by means of commercial strategies and messages encouraging controlled consumption.

More recently, some 5 MW networks were installed on a pilot basis to encourage the use of biomass. Notable examples include the Geolit project (Jaen, Andalusia), Europe's first biomass installation supplying heating and cooling to a number of users, the Cuellar heating network, the Molins de Rei heating network and the Mataró-Tub Verd project, or the Cantoblanco project featuring a cooling network powered by geothermal energy. In any event, these remain isolated projects, and the ones which have the backing of energy service companies come up against a major barrier of ignorance and ensuing mistrust, starting with the administration itself.

All of these circumstances represent a serious handicap for the development of renewables for heating and cooling in Spain. It is not only a matter of lacking infrastructure but also one of barriers to implementation.

In addition to all this, the housing construction sector in Spain is also a factor to be reckoned with. After years of expansion, there is now a significant housing surplus which is going to have an effect on urban development in the near future.

The General State Administration and a number of regional energy agencies have been in touch with municipal officials to disseminate information and familiarise them with the rationale behind this solution, including a standard municipal ordinance that defines the legal procedure and relations between the local administration, system developers and building developers.

The General State Administration has also been implementing funding programmes for small-scale heating and cooling networks set up by energy service companies. Maximum funding per project is €3.5 million and can be applied to biomass, solar and geothermal projects.

Other actions fostering heating and cooling networks are described in section 4.4. Applications combining both heating and cooling adapt well to Spain's climate since the systems generating heat in winter can provide cooling in summer. Therefore, there is a lot of potential for the development of small and medium-sized projects in this field. These applications could spur a 250 MW rise in thermal power by 2020.

In the light of the power ranges envisaged, it is safe to say that the contribution made by major biomass, solar and geothermal energy installations to district heating and cooling systems will not be as significant as in other countries with a longer-standing

tradition in this area. In contrast, the number of small networks in the vicinity of 5 MW, mostly new, could be more significant.

4.2.10 Biofuels and other bioliquids – sustainability criteria and verification of compliance (Articles 17-21 of Directive 2009/28/EC)

Order ITC/2877/2008 of 9 October 2008 establishing a mechanism to foster the use of biofuels and other renewable fuels for transport purposes, provides for a certification system intended as a mandatory control instrument, in addition to regulating the minimum compulsory objectives and counting mechanisms to determine amounts sold or consumed.

Article 7 of this Order describes the essential accreditation requirements applicable to biofuels sold or consumed, and sub-paragraph e) in particular provides as follows:

“The sustainability of the biofuel must be accredited in the terms provided taking account of the quality, origin of raw materials and environmental evaluation of the crops. This requirement will only apply once the legal provisions regulating it have been approved in accordance with Community regulations implemented for that purpose."

Article 7 of the National Energy Commission's Circular 2/2009 of 26 February 2009 regulating the implementation and management of the mechanism for fostering the use of biofuels and other renewable fuels for transport, provides a system for the submission of certification applications for biofuels sold or consumed and lists documentation required. Sub-paragraph m) of that Article provides:

"Accreditation of the biofuel sustainability criterion will be required once the legal provisions regulating it have been approved in accordance with Community regulations implemented for that purpose."

This provides the basis for completion of the regulatory framework of the current system for certifying compliance with the obligation to use biofuels, with special care to lay down clear rules and minimise the administrative red tape involved in such verification.

Regarding chain of custody, the aim is for complete traceability of sustainability conditions from the growing of the raw material to the commercialisation of the biofuel. To this end, the length of the chain will be defined (taking special account of the peculiarities of Spain's hydrocarbon distribution system) with special attention paid to controlling incoming and outgoing flows and inventory. Furthermore, an administrative management system will be set up which will include:

a) Internal registers of incoming and outgoing flows for each link in the chain.
b) The issue of supporting documentation throughout the chain.
c) A minimum period during which registers must be kept.

Article 6 of the aforementioned Order ITC/2877/2008 designates the National Energy Commission as the body responsible for the issue of biofuel certificates, management of the certification and supervision mechanism and control of the mandatory commercialisation of biofuels. In sub-paragraph 2 of its second final provision it also authorises the Commission to issue the Circulars deemed necessary for the discharge of its functions as the Certification Body.

The Natural Heritage and Biodiversity Act, Law 42/2007 of 13 December 2007, establishes the basic legal system for the conservation, sustainable use, improvement and restoration of Spanish natural heritage and biodiversity as part of the duty to conserve and the objective of guaranteeing people's right to a proper environment for their well-being, health and development. It also lists international standards and recommendations which international organisations and environmental instruments such as the Council of Europe or the Convention on Biological Diversity have been establishing over the last several years, especially with regard to the worldwide "Programme of Work for protected areas".

The Act includes regulation of the specific instruments for knowledge and planning of natural heritage and biodiversity. These include the Natural Heritage and Biodiversity Inventory and the National Natural Heritage and Biodiversity Strategic Plan. It also addresses natural resource planning and in so doing provides the following basic instruments: the Natural Resource Organisation Plans and the Guidelines for Natural Resources Planning, created pursuant to Law 4/1989 of 27 March 1989 on the Conservation of Natural Areas and Wild Flora and Fauna, the former conceived as a specific instrument at the disposal of the Autonomous Communities for the zoning, description and network integration of the systems forming part of the heritage and natural resources of a particular spatial area and definition of the latter's relationship with the rest of the territory. The Government-issued Guidelines for Natural Resources Planning lay down the basic criteria and regulations that should be included in Autonomous Communities schemes for the management and use of natural resources.

In Spain, the Autonomous Communities have exclusive competence for territorial planning by virtue of the Statutes of Autonomy provided for in Article 148(1) 3) of the Constitution. However, the Ministry of the Environment is responsible for monitoring international initiatives in this area in addition to having competence in environmental policies (particularly regarding waters, coasts and biodiversity) affecting large territorial areas in Spain. It also conducts studies and gathers information on general interest territorial matters in support of the Autonomous Communities while developing specific territorial programmes.

Ever since territorial planning powers were devolved to the Autonomous Communities in 1978, the latter have taken responsibility for legislating and implementing their own territorial planning regulations, so that all have their own territorial planning laws.

Territorial planning laws determine the planning instruments that must be implemented in each Autonomous Community (regional, sub-regional and sectoral instruments). The degree of implementation of these instruments is very heterogeneous and there is an enormous variety and difference among instruments.

That difficulty is being met by the Secretariat-General for Territories and Biodiversity at the Ministry of the Environment, which has a Database of Territorial Planning Instruments (Sp. acronym BIOT) for the purpose of establishing a standard, systematic and comparable vision of territorial planning in Spain.

The main aim of the Database is to identify and become familiar with the main documentary and cartographic contents of the different territorial planning instruments of the Autonomous Communities. This information is organised around 3 elements:

- Territorial Planning Regulations of each Autonomous Community
- Territorial Planning Instruments of each Autonomous Community: regional and sub-regional

§ Regulations concerning the Protected Natural Areas of each Autonomous Community.

4.3 Support schemes to promote the use of energy from renewable resources in electricity applied by the Member State or a group of Member States

4.3.1. Regulatory framework for electricity generation using renewable energies

National scope

According to the 1978 **Spanish Constitution**, the central government has jurisdiction over "Basic legislation on environmental protection, without prejudice to powers of the Self-governing Communities to take additional protective measures" (Article 149(1) 23). Similarly, Article 148(1) provides that "the Self-governing Communities may assume competences over country planning, woodlands and forestry, environmental protection and economic development", inter alia. Subsequently, the devolution of competences to the Autonomous Communities in matters of territorial planning, authorisation of electricity installations under certain circumstances and environmental protection (and others) is stipulated in the provisions of each of the Statutes of Autonomy.

In fact, Article 147 of the Constitution recognises the **Statutes of Autonomy** as "the basic institutional rule of each Self-governing Community and the State shall recognize and protect them as an integral part of its legal system."

The Electricity Sector Act, Law 54/1997 of 27 November 1997, whose main aim is to regulate activities relating to the supply of electrical energy, integrated electricity generation under 50 MW using renewable energies into the Special Regime (formerly regulated by RD 2366/94) on a voluntary basis and awarded competences to the Autonomous Communities to grant authorisation in that connection. That Law also guaranteed grid access to special regime installations and provided the basis for the economic regime and generation guidelines, which were subsequently implemented through successive Royal Decrees (Royal Decrees 2818/1998 of 23 December 1998, 436/2004 of 12 March 2004 and 661/2007 of 26 March 2007). The Law also granted competences to each Autonomous Community to enact implementing legislation and regulations and to enforce the Central Government's basic regulations concerning electricity matters. Summing up, under this legislation producers of electricity from renewable energies have guaranteed access to the grid and the technical and economic conditions between producers and distributors are clearly defined.

Royal Decree 661/2007 of 26 May 2007 regulating electrical energy production under the special regime, implements the Electricity Sector Act Law 54/1997 and defines the legal and economic regime for electrical energy and cogeneration plants and plants that use renewable energies and waste as raw material, with the overarching objective of establishing a stable and predictable system that guarantees a reasonable return on electrical energy production under the special regime.

Royal Decree 1955/2000 of 1 December 2000 governs the authorisation of generation facilities and electricity transmission and distribution grids when their use affects more than one Autonomous Community or when installed capacity exceeds 50 MW or when transmission or distribution leaves the territory of either one of these. Under these circumstances, the competent authority is the Directorate-General for Energy Policy and Mines at the Ministry of Industry, Tourism and Trade.

Royal Decree 1028/2007 of 20 July 2007 defines the "administrative procedure for the processing of authorisation applications for electrical power plants located in territorial waters". Once again, the competent authority is the Directorate-General for Energy Policy and Mines.

As regards waters, **Legislative Royal Decree 1/2001** of 20 July 2001 establishing the consolidated text of the Water Act and Royal Decree 849/1986 of 11 January 1986 (partially amended in 2003 and in 2008) defines the administrative procedure for the processing of water concessions and administrative authorisations. In this case, the basin water authorities are competent in respect of hydroelectric power below 5000 kW, while the Directorate-General for Water of the Ministry of the Environment and Rural and Marine Affairs is competent in respect of hydroelectric plants above 5000 kW or which affect more than one Autonomous Community.

Royal Decree 842/2002 of 2 August establishing the low-voltage Electro-technical Regulation and its supplementary technical instructions (ITC) BT 01 to BT 51, applicable to all renewable energy generation installations with low-voltage connections.

Royal Decree 314/2006 establishing the Technical Building Code provides, among other details, basic requirements concerning the contribution of solar photovoltaic energy in the building sector.

Use of geothermal resources, as mined energy resources, is regulated under mining legislation, specifically in the Mines Act, **Law 22/1973** of 21 July 1973 (amended by Law 54/1980 of 5 November). Authorisation for the use of high-enthalpy geothermal energy (generation of electricity or direct use) is governed by Section D of the resource concession regime provided in the mining legislation. The Autonomous Communities are competent to implement legislation and enforce basic national law concerning mines.

Regarding the regulatory framework governing environmental matters, **Law 9/2006** of 28 April 2006 "on evaluation of the effects of certain plans and programmes on the environment" introduces the Strategic Environmental Assessment into law as a prevention tool allowing for the integration of environmental aspects in decisions concerning public plans and programmes at the level of the General State Administration and at regional level. This Law incorporates Directive 2001/42/EC of the European Parliament and of the Council of 27 June 2001 on the assessment of the effects of certain plans and programmes on the environment into domestic Spanish law.

Legislative Royal Decree 1/2008 of 11 January 2008 "establishing the consolidated text of the Law on assessment of the environmental impact of projects" sets up the legal system applicable nationwide for the assessment of projects for the purpose of carrying out works or installations and other activities related to renewable energies. For projects requiring authorisation or approval from the General State Administration, the competent body is the Ministry of the Environment and Rural and Marine Affairs.

Royal Decree 1578/2008 of 26 September 2008 on remuneration for electrical energy generation using solar photovoltaic technology.

Royal Decree-Law 6/2009 of 30 April 2009 creating the pre-assignment remuneration Register for installations under the special regime.

Regarding the instruments provided for under the regulation for the planning of renewable energies in Spain, we would first point out that this is done on two different levels:

- § Planning at national level, binding on the Central Government, only for the global objectives linked to commitments acquired as a member of the European Union but indicative for the purpose of implementation in each Autonomous Community.
- § Planning at regional level, which includes the detail necessary for the development of renewable energies in line with the specific energy and environmental criteria of each Autonomous Community.

This Plan, with a time horizon up to 2020, is based on the two global objectives for renewable energy sources taken from Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources:

- § Global objective one: 20% share of energy from renewable sources in the gross final consumption of energy.
- § Global objective two: The share of energy from renewable sources in all forms of transport in 2020 to be at least 10% of the final consumption of energy in transport.
- § Breakdown by technological areas and time frames must cover the interim targets laid down in the Directive.
- § It establishes affirmative action measures and the elimination of technical, administrative and market barriers standing in the way of development of renewable energies.
- § It advocates improvement and adaptation of the framework for the development of electricity generation installations powered by renewable sources.
- § It seeks to boost R&D-Innovation.
- § It takes account of the available information and documentation concerning basic aspects in the development of each renewable area: investment and cost forecasts, cost-benefit analysis, land use and competition between different technologies and with other activities, resource maps, technological barriers and R&D-Innovation trends, integration of renewable electricity into the electricity grid, hydroelectric pumping capacity available in Spain, evaluation of the potential for the use of different types of biomass, environmental sustainability, etc.

Transposition of the Directive into the Spanish legal system is compulsory for the Spanish Government, which embraces this commitment as a priority strategic objective.

As already mentioned, the ultimate aim of renewable energy planning at national level is rational and coordinated development of renewable energies throughout the national territory.

This planning is based upon a set of data whose purpose is to serve as a guide for administrations and individuals, especially economic operators, on the future development of the different factors affecting the renewable energies sector and particularly to define certain principal needs:

- § Renewable implementation needs in each of the associated technological areas in order to meet the global objectives within the stipulated time frame.

- § Promotion measures needed at regulatory and technological level in each renewable sector.
- § The economic resources needed to meet the objectives.

This "2011-2020 National Renewable Energy Action Plan" sets specific objectives in each renewable sector for the whole of Spain, thus **serving as the basis for coordination with other state-wide planning affecting the development of renewable energies**, especially with "Electricity and gas sector planning" to ensure that it factors in the most recent forecasts in the development of transport infrastructure. The Plan can likewise lend **support to regional governments in drawing up their renewable energy plans**.

Regional scope

As noted, the Governments of the Autonomous Communities have competences in respect of territorial planning, energy and mining schemes and environmental issues within their territorial scope.

In the case of electricity generation, regional governments are responsible for granting administrative authorisation for new renewable energy installations when installed capacity is below 50 MW and does not affect more than one Autonomous Community.

Within the scope of their competences, regional governments generally set up different legislative frameworks to regulate the procedures, including environmental requirements, needed for the approval of renewable energy projects. These governments likewise have regional plans with specific targets regarding the use of these resources.

In accordance with our constitutional and legislative system and the Statutes of Autonomy, exclusive competence in matters of energy has been devolved to the Autonomous Communities when transmission does not cross regional borders, use does not affect another territory and when the installed capacity of the electricity generation plants is under 50 MW.

Regional Renewable Energy Plans are the strategic instrument for coordination of sectoral policies concerning energy infrastructures and for supporting renewable energies in each Autonomous Community. These regional plans include the necessary details regarding the areas considered acceptable for the development of renewable energies in adherence to the specific environmental criteria applicable in each Autonomous Community.

As a reference, following are the strategic plans and energy forecasts in force in the Autonomous Communities:

- § 2007-2013 Energy sustainability plan of Andalusia.
- § 2005-2012 Energy Plan of Aragon.
- § Horizon 2010 Energy Strategy of the Principality of Asturias.
- § 2015 Energy Sector Management Plan of the Balearic Islands (under review).
- § 2015 Energy Plan of the Canary Islands.
- § 2006-2011 Energy Plan of Aragon.
- § Horizon 2012 Energy development framework strategy of Castile-La Mancha.
- § 2009-2014 Regional sustainable development strategy of Castile-Leon.
- § 2009 Review of the 2006-2015 Energy Plan of Catalonia.

- § 2010-2020 Strategic infrastructure plan of Valencia.
- § Agreement for sustainable energy development in Extremadura.
- § 2010-2015 Strategic energy plan of Galicia (in the process of strategic environmental assessment).
- § 2004-2012 Energy Plan of the Community of Madrid.
- § 2003-2012 Energy plan of the Region of Murcia (pending approval).
- § 2005-2010 Energy Plan of Navarre.
- § 2010 Energy Strategy of Euskadi (Basque Country).
- § General energy strategy of the Government of la Rioja (at the drafting stage).

We would note that the different regional energy schemes are likewise subject to the procedure envisaged under Law 9/2006 of 28 April 2006 on evaluation of the effects of certain plans and programmes on the environment. This is where a sufficiently detailed assessment is made of environmental acceptability and of other environmental considerations concerning the locations of the renewable energies envisaged in these plans.

Details concerning the administrative authorisation procedure for offshore wind farms: Royal Decree 1028/2007 of 20 July

This Royal Decree standardises the procedure for the set-up of offshore generation installations, for which competence lies with the State, safeguarding locations where installation is proposed from possible environmental impact, considering the lack of any offshore experimentation. It also includes applicable national regulations and includes these in a single administrative procedure as a guide to private initiative.

Specifically, offshore wind installations – whose minimum installed capacity will exceed 50 MW – require preliminary studies, tests and analyses which, in the light of the size of the projects and the lack of any prior experimentation, inevitably take a long time to implement. In this case, the applicable procedure lists the following steps:

a) "Site reservation" application. The purpose of the reservation is to be able to conduct the preliminary studies before applying for authorisation for an offshore wind farm.

b) "Description of the offshore wind site". The Directorate-General for Energy Policy and Mines – as the body competent in the matter – draws up the description of the area(s) affected by the requested reserve site.

   This document must include all the reports issued by the institutions affected – including *Red Eléctrica de España* (Spanish electricity grid) – estimate the maximum energy that can be delivered from the site and the effect that an offshore wind farm could have on the surrounding area: effects on fishing, marine flora and fauna, birds, sea and air navigation, tourism, heritage, landscape, sea bed, littoral and coastal dynamics, use of mineral resources, defence and security, etc.

   This description is indicative (except for the limiting maximum capacity) and remains current for five years; it serves to justify the desirability of a wind project in the area and what locations would be most suited.

c) **Site reservation tendering procedure within the entire offshore wind energy area(s)**. Commencement of the tender procedure coincides with the publication of the area description. Any other developer – not the one who

applied for the site reservation – has three months in which to offer an offshore wind energy project within the wind area.

All interested parties must submit a tariff request (c€/kWh) **to be applied during the useful life of the installation**, and proof of having deposited a guarantee equivalent to 1% of the estimated cost of the offshore wind installation.

d) Decision concerning the tender procedure and awarding of the reservation. An Assessment Committee is convened and entrusted with evaluating the applications submitted and drawing up a motion for resolution. Assessment criteria include: legal, technical and economic capacity of the developer, maximum installable capacity, tariff bid submitted, equivalent hour forecast, technology proposed and its repercussion on system stability, associated economic and social impact, etc.

   The decision is published in the Official State Gazette, identifying the projects selected, summarising their characteristics and justifying the selection made. Site reservation gives the developer the exclusive right to study the wind resource for a period of two years (extendible to three) and the right to access the transmission grid for the wind capacity assigned.

   A copy of the decision is sent to the Directorate-General of Environmental Quality and Assessment – to initiate the environmental impact assessment of the project – and to the Directorate-General of Coasts – to process the concession procedure for occupation of public marine-terrestrial domain, which are both indispensable requirements before construction related to the research work may commence.

   There is a special public registry housed at the Ministry of Industry, Tourism and Trade for site reservations awarded.

e) Offshore wind installation authorisation. Having completed the research studies, the developer may submit an authorisation request for the specific project. Modification of up to 10% in the surface area and tariff initially requested is admitted, in both cases with prior approval of the Cabinet, and installed capacity may be modified by up to $\pm$15% but must always be above 50 MW.

   The application is subject to a single public information process covering authorisation, the environmental impact study and the concession of the public marine-terrestrial domain. The concession decision is taken by the Directorate-General of Coasts – always subsequent to the environmental impact statement and the authorisation – and may require consent by the Merchant Marine when maritime security, navigation or human life at sea could be affected.

f) Approval of the implementation proposal. Lastly, the installation must pass the approval formalities for the implementation proposal and for authorisation to operate.

4.3.2 Financial aid for electricity generation using renewable energies

The support framework for electricity generation using renewable energies for installations connected to the electricity system is based on a legal framework which allows for prioritisation of electrical energy from renewable energies on a stable and predictable economic framework that provides incentives for generation using these resources.

Electricity generation using renewable energies is considered **Special Regime** production in the terms laid down in the Electricity Sector Act, Law 54/1997. This Special Regime is based on **system of direct support for production** and provides for higher remuneration than under the Ordinary Regime through a regulated tariff scheme and specific premiums which are justified on the basis of **environmental and supply diversification and security benefits**. This scheme has proven to be highly effective in the development of electricity using renewables both in Spain and the rest of the world.

The costs arising from the support network are included in the tariff structure together with system-related costs.

Law 54/1997 also liberated electricity generation and distribution businesses, creating the figures of Market Operator (for the economic management of the system), System Operator (for the technical management of the system) and electricity distribution managers. The Hydrocarbon Sector Act created the National Energy Commission (Sp. acronym CNE) based on the former National Electrical System Commission, as an independent regulatory body. Its duties include the drafting of non-binding reports on any new national energy regulation and payment of the premiums on electricity generation from renewable sources.

The support mechanism takes account of the evolution of electricity market prices so as to strike a balance between the need to guarantee minimum remuneration levels and the desirability that electricity generation from renewable sources be able to compete on an equal footing with conventional generation, including external factors, while at the same time contributing as far as possible to lower system costs.

The Special Regime applies to renewable electricity generation installations (with certain exceptions, basically large-scale hydroelectric) throughout Spain regardless of their location.

The remuneration paid for electricity generation using renewable energies – specific amounts for each renewable area – is established by royal decree. With a view to ensuring the sustainability and efficiency of the support framework, the remuneration paid for each technology will tend to converge over time with that paid under the Ordinary Regime, i.e. for all other conventional generation technologies, thus encouraging technological advance and , in any case assessing the investment and real costs incurred by owners in their operation and maintenance.

The economic framework, currently implemented by **Royal Decree 661/2007** of 25 May 2007 regulating electrical energy production under the Special Regime, and Order ITC/3519/2009 of 28 December 2009 reviewing access fees as from 01 January 2010 along with the tariffs and premiums corresponding to special regime installations, provide for electricity generation remuneration levels that afford a reasonable return on investment. In determining those levels, account is taken of the specific technical and economic aspects of each technology, installed capacity and the date operation commenced, in all cases using criteria of system economic sustainability and efficiency.

Owners of renewable installations may choose, for periods of at least one year, between two remuneration alternatives for energy delivered to the grid:

§ Regulated tariff sale, different for each technology;
§ Sale on the open electrical energy market. In this case, remuneration is the price on the organised market (or freely negotiated price), supplemented by a specific premium for each renewable technology area.

Under this latter alternative, premiums vary on the basis of per-hour market prices:

- In the event of low market prices, the remuneration scheme guarantees a floor price meaning that the owner of a renewable installation can be assured a minimum return.
- The scheme also provides for a ceiling premium payment, which means that no premiums are paid when market prices are high, thus helping keep system costs at bay.

For special regime installations, the framework does not envisage limitations on the total volume of electricity generated for the purpose of premium payments.

The following tables show remuneration levels for electricity generation from renewable sources in force during 2010, broken down by renewable technology and the remuneration alternative chosen by the owner:

2010	Two options for electricity sales			Option a)	Option b) Sale on the organised electricity market		
Group	Subgroup	Rating	Timing	Regulated tariff c€/kWh	Reference premium c€/kWh	Ceiling c€/kWh	Floor c€/kWh
b.1 (solar)	b.1.1 (photovoltaic)	P• 100 kW	first 25 yrs	46.5897			
			thereafter	37.2718			
		100 kW<P• 10 MW	first 25 yrs	44.169			
			thereafter	35.3352			
		10<P• 50 MW	first 25 yrs	24.3077			
			thereafter	19.4462			
	b.1.2 (solar thermal processes for elec. prod,)		first 25 yrs	28.4983	26.8717	36.3906	26.8757
			thereafter	22.7984	21.4973		
b.2 (wind)	b.2.1 (land)		first 25 yrs	7.7471	3.0988	8.9866	7.5405
			thereafter	6.4746			
	b.2.2 (marine)				8.9184	17.3502	
b.3 (geothermal, wave, tide, hot dry rocks, oceanothermal and marine currents)			first 25 yrs	7.2892	4.0672		
			thereafter	6.8872	3.2373		

* Maximum reference premium for the purpose of the competition procedure provided in RD 1028/2007 of 20 July 2007 and the ceiling for offshore wind installations.
** b.1.1 (solar photovoltaic) applies only to installations registered in the Special Regime prior to 29 September 2008. b.1.2 (solar thermoelectric) applies only to installations registered in the pre-assignment Register set up under Royal Decree-Law 6/2009.

2010	Two options for electricity sales			Option a)	Option b) Sale on the organised electricity market		
Group	Subgroup	Rating	Timing	Regulated tariff c€/kWh	Reference premium c€/kWh	Ceiling c€/kWh	Floor c€/kWh
b.4 (hydroelectric P• 10 MW)			first 25 yrs	8.2519	2.6459	9.0137	6.8978
			thereafter	7.4268	1.4223		
b.5 (hydroelectric 10 MW< P• 50 MW)			first 25 yrs	**	2.2263	8.4635	6.4676
			thereafter	***	1.4223		
b.6 (biomass)	b.6.1 (energy crops)	P• 2MW	first 25 yrs	16.8096	12.6732	17.5936	16.3029
			thereafter	12.4764			
		2MW< P	first 25 yrs	15.5084	11.1562	15.9643	15.0968
			thereafter	13.0624			
	b.6.2 (agricultural or garden waste)	P• 2MW	first 25 yrs	13.2994	9.162	14.0812	12.7905
			thereafter	8.9663			
		2MW< P	first 25 yrs	11.3771	7.0249	11.8384	10.9804
			thereafter	8.5334			
	b.6.3 (forestry	P• 2MW	first 25 yrs	13.2994	9.162	14.0812	12.7905

	waste)		thereafter	8.9663			
		2MW< P	first 25 yrs	12.5148	8.1633	12.9704	12.1028
			thereafter	8.5334			

**The amount of the regulated tariff for group b.5 installations for the first 25 years from the start-up date will be: (6.6+1.2x((50-P)/40))x1.0605 where P is the installed capacity.
***The amount of the regulated tariff for group b.5 installations for year 26 and thereafter from the start-up date will be: (5.94+1.080x((50-P)/40))x1.0605 where P is the installed capacity.

2010	Two options for electricity sales			Option a)	Option b) Sale on the organised electricity market		
Group	Subgroup	Rating	Timing	Regulated tariff c€/kWh	Reference premium c€/kWh	Ceiling c€/kWh	Floor c€/kWh
b.7 (manures, biofuels or biogas)	b.7.1 (biogas from rubbish dumps)		first 25 yrs	8.4551	4.4721	9.4792	7.8711
			thereafter	6.8872			
	b.7.2 (biogas generated in digesters)	P• 500kW	first 25 yrs	13.8262	10.8104	16.2182	13.0656
			thereafter	6.8872			
		500kW< P	first 25 yrs	10.2409	6.587	11.6691	10.1033
			thereafter	6.8872			
	b.7.3 (manures)		first 25 yrs	5.6706	3.738	8.8126	5.3955
			thereafter	5.6706			
b.8 (biomass from industrial installations)	b.8.1 (biomass from agricultural installations)	P• 2MW	first 25 yrs	13.2994	9.162	14.0812	12.7905
			thereafter	8.9663			
		2MW< P	first 25 yrs	11.3771	7.0249	11.8394	10.9804
			thereafter	8.5334			
	b.8.2 (biomass from forestry installations)	P• 2MW	first 25 yrs	9.8177	5.6814	10.6006	9.2993
			thereafter	6.8872			
		2MW< P	first 25 yrs	6.8851	2.5329	7.3421	6.4746
			thereafter	6.8851			
	b.8.3 (biomass from black liquor installations)	P• 2MW	first 25 yrs	9.8177	5.9439	10.6006	9.2993
			thereafter	6.8872			
		2MW< P	first 25 yrs	8.4635	3.8813	9.5215	7.9346
			thereafter	6.8851			

For both remuneration schemes (tariff and premium-based), further supplementary payments are provided for installations that contribute to the technical stability of the system by means of technological innovation, especially supplements for reactive energy.

Special regime generation installations are given priority access to the grid provided there are no technical restrictions.

All special regime installations whose capacity exceeds 10 MW must be registered at a generation control centre which acts as an interlocutor with the system operator, sending real-time information on the installations and ensuring that instructions are followed with a view to guaranteeing the reliability of the electricity system at all times.

Renewable development control mechanisms

The support framework for electricity generation from renewable sources also has mechanisms for planning and delimiting the development of these installations in accordance with the targets laid down in this Law and national renewable energy schemes. Particularly, Royal Decree-Law 6/2009 of 30 April 2009 providing for the adoption of certain measures in the energy sector and the approval of the social bonus, created an administrative remuneration pre-assignment Register for electrical energy production installations and provided for the registration of projects and installations in that Register as a pre-requisite for payment of the economic stipend associated with their status as special regime facilities.

The aim of the remuneration pre-assignment Register is to monitor installed capacity more closely and ensure compliance with the requirement of furnishing consumers with reasonably-priced energy and to ensure that technological developments of these generation sources translate into a gradual reduction in their cost making them more competitive with conventional electricity generation technologies. All this is intended to

help **achieve the renewable energy targets** established in this 2020 Renewable Energy Plan **in an orderly fashion**.

Following are the main requirements which must be met by projects for registration in the Pre-assignment Register: awarding of an access point and firm connection for the capacity proposed, administrative authorisation and a works license, guarantee of own economic resources or sufficient financing for 50% of the investment, and submission of a purchase commitment for 50% of the equipment.

Review of remuneration

Royal Decree 661/2007 provides for reviews of remuneration amounts every four years, which may be modified on the basis of technological developments within the sectors, market behaviour, degree of compliance with renewable energy targets, percentage of demand covered by special regime facilities and their effect on the technical and economic management of the system, while always guaranteeing reasonable rates of return. In any event, these reviews take account of cost trends associated with each technology with three objectives in mind: to see that renewable technologies become as competitive as possible with Ordinary Regime generation, to foster a technological development balance and to see that the remunerative scheme moves in the direction of minimising socio-economic and environmental costs.

Particularities of the solar photovoltaic support system

Over 85% of the 363 MW increase envisaged for 2005-2010 under the 2005-2010 Renewable Energy Plan (Sp. acronym PER) was achieved in August 2007. A period of 12 months was therefore established during which installations registered in the Administrative Registry for Special Regime generation facilities (Sp. acronym RIPRE) would be entitled to the regulated tariff established under R.D. 661/2007 of 25 May 2007.

At the end of those 12 months, Royal Decree 1578/2008 defined a new economic scheme while also creating a Pre-assignment Remuneration Register for photovoltaic technology (Sp. acronym PREFO) pertaining to installations permanently registered at RIPRE as from September 2008. This new framework is based on a rising quota / diminishing tariff system, prioritising installations in buildings.

A capacity quota of approximately 500 MW/year is envisaged and two types of installations are established: one for installations in buildings and another for installations on outdoor generation sites, each with their corresponding quotas and tariffs.

There are two types of installations in buildings: those under 20 kW and those between 20 kW and 2 MW. The second type groups together all other installations not situated in urban buildings and allows installations with a maximum capacity of 10 MW. Tariffs fall at an approximate annual rate of 10% depending on the way assigned quotas are covered.

Table 4.3-1 Groups defined under R.D. 1578/2008

		RATING	TYPE OF INSTALLATIONS
TYPE I	I.1	P • 20 kW	Roofs or facades with uses: Residential, services, commercial, industrial, crop & livestock.
	I.2	20 kW • P • 2 MW	Car Parks with those uses. (Lot with urban cadastre reference)
TYPE II	II	P • 10 MW	OTHERS, not included in type I

For the purpose of assigning quota capacity, R.D. 1578/2008 creates a pre-assignment register in which all photovoltaic projects must be registered in order to receive the attendant tariffs. Divided into four quarterly calls, the pre-assignment register guarantees full adherence to the energy plan.

Projects for which registration is sought must be submitted with the administrative authorisation, works license, the point of connection awarded by the electric company and the counterfoil of a bank guarantee deposited at the *Caja General de Depósitos* (General Deposit Fund), for the sum of €50/kW in the case of installations in buildings under 20 kW capacity or of €500/kW in all other cases. The award process in each call considers the most recent date of those documents so as to put applications in chronological order and give preference to the oldest.

The tariff and quota framework for 2009 is shown in the following table:

Table 4.3-2 Tariffs and quotas for the 4 calls in 2009

		2009			
	Type	1C	2C	3C	4C
TARIFF (c€/kWh)	I.1	34.0000	34.0000	34.0000	34.0000
	1.2	32.0000	32.0000	32.0000	32.0000
	II	32.0000	30.7189	29.9113	29.0857

		ALLOCATED	REGISTERED	ALLOCATED	REGISTERED	ALLOCATED	REGISTERED	ALLOCATED	REGISTERED
ALLOCATION (c€/kWh)	I.1	6.675	1.668	6.675	3.631	6.675	2.786	6.675	4.670
	1.2	60.075	20.916	60.075	31.691	60.075	35.601	60.075	60.104
	II	58.250	66.113	94.552	94.718	89.512	90.411	85.620	89.955

At the time of this report, a preliminary decision was taken regarding the third call for 2010, for which we have the tariffs and quotas.

Table 4.3-3 Tariffs and quotas for the calls in 2010

		2010		
	TYPE	1C	2C	3C
TARIFF (c€/kWh)	I.1	34.000	33.4652	33.0597
	1.2	31.1665	30.3099	29.5200
	II	28.1045	27.3307	26.5509

		ALLOCATED	REGISTERED	ALLOCATED	REGISTERED	ALLOCATED	REGISTERED
ALLOCATION (c€/kWh)	I.1	6.675	6.016	6.653	5.760	6.675	
	1.2	61.640	62,522	61.439	61.480	61.640	
	II	50,033	50.894	51.339	52.380	52.105	

If, for any given type, registrations account for less than 75% of the quota, the corresponding tariff remains fixed for the following call. This was the case with types I.1 and I.2. If over 75% of the quota is covered, the tariff is reduced proportionately to the capacity registered; the reduction is 0 if registration covers exactly 75% of the quota and 2.6% if 100% of the quota is registered. This was the case with type II. A mechanism has been set up allowing for the transfer of capacity from a group where there is excess capacity to another where the quota has not been covered.

Specific characteristics of the support system for electricity generation using biomass

In addition to the breakdown of remuneration categories by biomass or biogas defined in the foregoing (groups b6, b7 and b8 under category "b" with their corresponding sub-groups), a specific group is also included within the chapter devoted to cogeneration in

Royal Decree 661/2007. In this case, when an electricity and thermal generation installation using biomass meets the requirements laid down in this Royal Decree, it then becomes part of sub-group a.1.3. In turn, this sub-group is sub-divided into the categories envisaged for groups b.6, b.7 and b.8 and is allotted higher remuneration for being a cogeneration system.

Minimum levels of compulsory energy efficiency are established for electricity generation with biomass and for cogeneration with biomass.

In the case of generation with biomass, Annex II point C of the Royal Decree provides that the energy efficiency of the condensation systems using biomass/biogas must reach the following levels for gross electrical energy generation.

1. At least 18% for capacity up to 5 MW.
2. At least 20% for capacity between 5 and 10 MW.
3. At least 22% for capacity between 10 and 20 MW.
4. At least 24% for capacity between 20 and 50 MW.

In the case of cogeneration with biomass/biogas, Annex I of the Royal Decree provides that in order to receive the attendant remuneration, group b.6 and b.8 installations must achieve a minimum equivalent electrical efficiency (EEEminimum) of 30% and group b.7 installations a minimum of 50%.

Also, in the case of cogeneration, an additional efficiency supplement can be earned as follows:
Efficiency supplement = 1.1 x (1/EEEminimum – 1/EEEi) x Rmc

where:

EEEi = equivalent electrical efficiency accredited by the installation in the year considered.

Rmc: Unit raw material cost of the natural gas (in c€/kWh$_{PCS}$) published periodically by the MITYC.

Financial assistance for investment

As a supplement to the support scheme described in the foregoing, we should note the following:

- Exceptionally, some new renewable technologies may receive investment assistance in the form of low-interest subsidies or loans.
- Some renewable technologies receive additional support in the form of tax benefits (exemptions, deductions, rebates). The consolidated text of the Company Tax Act was approved by Legislative Royal Decree 4/2004 of 5 March. Article 39 specifies the objects that investment in new installations and equipment for the use of renewable sources of energy must have to qualify for deduction of 2% of their cost from the total tax bill for tax periods as from 01 January 2010. This deduction will be revoked for tax periods commencing on 01 January 2011:

  – All types of solar installations (photovoltaic, thermoelectric and thermal).
  – Use of MSW or biomass from waste or energy crops as fuel.
  – Waste treatment.

– Processing of products to transform them into biofuels.

Future developments in support schemes for electricity generation from renewable energies

Electrical energy production under the special procedure is founded on three basic principles, namely legal certainty, feasibility and regulatory stability.

Any present or future economic remuneration system to support the generation of electricity from renewable sources will be based on the aforementioned principles, and the necessary mechanisms will be devised to dovetail technological improvements and market developments with incentives for electricity generation from renewable sources in order to meet the targets and objectives by the established deadlines.

Technical parameters and investment costs incurred will be considered in determining remuneration with a view to providing a reasonable rate of return referenced to the cost of money on the capital market in accordance with the provisions of the Electricity Sector Act.

Also, effective administrative supervision is required to assure that gains from the development of these technologies in terms of relative cost competitiveness are passed on to society, thus minimising the speculative risks posed in the past by excessive rates of return, which not only hurts consumers but is also damaging to the industry in general in terms of the perception people have of it. Therefore, it will be necessary to devise sufficiently flexible and transparent systems that permit the issue and reception of economic and market signals so as to minimise the risks associated with investment and its remuneration and those caused by fluctuations in the energy markets.

Efforts to enhance technology and reduce costs must go hand-in-hand with improved integrability and manageability of installations to allow more efficient management of the electricity system as a whole by taking advantage of the specific characteristics of the different renewable source generation technologies and any mutually complementary features.

This scheme will provide the renewable energies sector with the long-term stability needed to make reasonable and sustainable investments while also establishing sufficient flexibility mechanisms for the Administration to adopt the control and stimulus measures necessary to correct possible deviations from the indicative trajectory leading to achievement of national targets.

4.4. Support schemes to promote the use of energy from renewable resources in heating and cooling applied by the Member State or a group of Member States

The support scheme to promote electricity generation through a system of premiums (described in point 4.3 under the Special Electricity Generation Regime with specific sub-groups for biomass and biogas depending on their origin and the technology used) specifically supports cogeneration from renewable sources. Once the minimum equivalent electrical efficiency required under the Directive is achieved, the next category is cogeneration, for which remuneration is higher for all of the sub-groups.

From there on, to further enhance equivalent electrical efficiency, remuneration must be improved by increasing the efficiency premium.

All the support systems, both regulatory and financial, promoting renewable energies and their thermal applications are being implemented or evaluated together with certain specific variations according to the type of energy source (biomass, geothermal or solar thermal) and type of application (individual, centralised or climate-control networks). Although Spain has not traditionally employed district heating systems, support schemes to promote the use of such district heating and cooling systems using renewable energies has been included alongside other applications so that it can be propagated, if only to a limited extent as will be explained presently.

Following are the measures for all technologies.

Regulation

Directive 2002/91/EC of the European Parliament and of the Council of 16 December 2002 on the energy performance of buildings lays down the obligation to make an energy performance certificate available to buyers or users of buildings. This certificate must include objective information on the energy characteristics of buildings so that their energy efficiency can be assessed and compared with a view to promoting energy efficient buildings and investment in energy savings.

This Directive has been transposed through three Royal Decrees: RD 47/2007 on the energy rating of buildings, RD 1027/2007 on the regulation of thermal installations in buildings and RD 314/2006 on the Technical Building Code.

§ *Energy rating of buildings*

Royal Decree 47/2007 of 19 January 2007 partially transposed Directive 2002/91/EC through the approval of a basic procedure for the energy efficiency certification of new buildings.

A building may be given an energy rating by means of the Reference IT programme (CALENER) or an Alternative IT programme constituting the so-called general energy rating option for buildings in accordance with Article 4 of RD 47/2007. Also, the energy certification procedures for existing buildings are nearly complete. These not only calculate buildings' energy rating but also propose measures to improve that rating in both technical and economic terms.

The possibility of evaluating and calculating the rating when buildings are supplied with heating, hot water or cooling by means of renewable energy systems (including biomass, geothermal and solar thermal) either individually, centralised or through centralised heating networks, is currently being incorporated into the calculation procedures for energy certification in buildings.

The necessary legal steps are now being taken to transpose the obligation envisaged in Article 7(1) of Directive 2002/91/EC to make an energy performance certificate available to prospective buyers or tenants.

Although there are no specific quantitative targets for this measure, its aim is to bring about change in the behaviour of local administrations, planners, architects and housing developers to get them to consider renewable energy options in the sphere of urban development and housing. This measure, added to all the other ones described in this section, will produce a series of synergies with which to motivate the sector.

§ *Regulation on Thermal Installations in Buildings*

Directive 2002/91/EC has been transposed through Royal Decree 1027/2007 laying down the Regulation on Thermal Installations in Buildings (Sp. acronym RITE). This document, along with the documents recognised by the RITE Advisory Committee, sets out the minimum requirements which must be met by thermal installations in the building sector. A number of modifications have been made over the last several years to regulate and eliminate barriers hindering the implementation of thermal installations in buildings using renewable energies (biomass, geothermal and solar thermal).

These minimum requirements must be met in order to obtain an operating permit for the installations and are verified by means of inspections performed by the competent departments in each of the Autonomous Communities.

Modification of the RITE is currently being considered in order to comply with Article 13 of Directive 2009/28 and offer an adequately structured prescriptive framework to develop regulatory aspects that can help both to improve the energy efficiency of thermal installations by introducing new, more efficient technologies and to introduce renewable energies which are not yet sufficiently developed.

§ *Technical Building Code*

Directive 2002/91/EC was also taken into account in the drafting of Royal Decree 314/2006 approving the Technical Building Code, section HE 4 of which makes the use of renewable energies compulsory. This section provides for a minimum solar contribution for hot water depending on the specific climate conditions of the Spanish region in question, and volume of use. Section HE 5 also establishes a minimum solar photovoltaic contribution for buildings intended for certain purposes from a given size upwards.

Compliance with the provisions of the Technical Building Code is a basic requirement which must be met for a new building to obtain the certificate of habitability, and it is therefore compulsory to satisfy these in the building sector..

Continuing along the lines of the current Technical Code, the intention is to promote the use of renewable energies through a revision of the Code and include a wider obligation by adding a minimum contribution of renewable energies for the heating and cooling of newly constructed buildings. A minimum contribution of renewables to electricity generation, not necessarily photovoltaic, is likewise under study and will be quantified on the basis of the technology employed.

Studies are proceeding to identify possibilities and cases where similar measures could be introduced for existing buildings.

§ *Municipal Ordinances*

A model solar municipal ordinance was drafted six years ago laying down the minimum conditions of use and the minimum compulsory contribution of solar energy in buildings within municipalities. Local authorities are free to adopt this model and a large number of municipalities have opted to implement it.

In light of the success of this model ordinance, the intention is to put together a similar model which would include other renewable energies such as biomass and centralised

district heating networks. This would mark an important step in boosting thermal applications, especially in small or medium-sized rural municipalities.

Financial support

Currently there are two ways of promoting renewable thermal energies through financial support: direct investment assistance and specific deferred payment programmes. These two systems could be supplemented with a new incentive system for thermal generation which is under study.

§ *Investment aid*

There is a thermal renewable energy investment aid system whose budgets are established by the General State Administration and which is applied by means of agreements with the Autonomous Communities, which manage those funds and channel them to applicants. Agreements are reviewed and signed annually and then monitored for compliance and possible adaptation. These budgets are supplemented, sometimes notably so, with Autonomous Communities funds.

Applicants must meet the requirements laid down in the assistance publications of each Autonomous Community, which are based on the agreements signed between the Central government and its regional counterparts.

Investment aid is awarded according to technology type, renewable area and the specific characteristics and performance of the equipment used.

These budgets only cover a portion of the installations actually implemented since there are not enough funds to distribute to all renewable thermal energy installations.

§ *Deferred payment programmes*

A number of different modes of thermal renewable energy project finance programmes have been developed over the last several years: financing coupled with subsidy, financing through ICO (Official Credit Institute) or specific per-installation financing through the IDAE using schemes such as third party financing (TPF) or financing accompanied by technical consulting.

Over the last year, a new line of financing was launched as a pilot to finance heat production installations for hot water, heating, cooling and other uses in buildings through Energy Service Companies (ESCOs) This experiment commenced in 2009 with the BIOMCASA Programme targeting the biomass area, and in 2010 it is being extended to geothermal (GEOCASA Programme) and solar thermal (SOLCASA Programme). These programmes have some limitations in terms of the amount of funding per project and are supplemented through the Large Thermal Installation Programme (Sp. acronym GIT) for the three sources of renewable energy mentioned above; this programme is applicable to projects requiring a higher volume of investment but has a system with different technical and financial guarantees.

These programmes are not limited to financial activities but also provide technical guarantees when carrying out installations, ensure a supply commitment in terms of the amount of energy and economic savings passed on to the end user, and include information promotion campaigns targeting both the sectors involved in the development of projects and users.

These programmes make total or partial financing available to ESCOs that have previously been authorised by IDAE to receive the said financing. There are a number of requirements regarding supply and technical-economic capacity and technical-financial solvency that must be met to obtain this authorisation, and these can be accomplished through agreements with other sector undertakings which specialise in specific aspects of the energy management process. Authorisation gives a company is access to the line of finance, but it also allows it to use the logos of the programme for which is has been authorised and to take part in the promotional activities carried out within that programme.

The user is given a long-term supply contract with an energy price lower than what he would have had to pay had he opted for a conventional fuel installation, and the price assures amortisation of the installation and operation and maintenance. Also, interest rates are the lowest on the market; this financing is therefore attractive to ESCOs, which then pass these costs on to users.

If the expected positive results are achieved during the lifetime of these programmes, we will explore the possibility of implementing them through private financial institutions or continue to operate them with funds from public bodies or institutions.

§ *Renewable Heat Incentive System (Sp. acronym ICAREN)*

The data on accomplishment of renewable thermal objectives show that these have yet to achieve the necessary momentum, despite the removal of a large number of regulatory barriers.

Studies are currently being conducted into the possibility of developing a new incentive mechanism (incompatible with the award of other forms of assistance) to promote the development of Renewable Energy Service Companies (ESCOs) with a view to eliminating financial or aid access barriers, which still persist when projects of this kind are mooted.

This new specific remuneration framework for renewable energies could be based on the establishment of a reference ceiling price for thermal energy sold by the ESCO, together with an incentive which would depend on the renewable energy employed – i.e. an additional payment contingent upon the supply of energy through an ESCO invoiced to the user on the basis of consumption. ESCOs would be entitled to receive the incentive for the supply of energy in accordance with applicable regulations.

These incentives would vary depending on the renewable energy source (biomass, geothermal, solar thermal, biogas, etc.).

4.5 Support schemes to promote the use of energy from renewable resources in transport applied by the Member State or a group of Member States

Regulation

§ *Compulsory use of biofuels*

Additional Provision 16 of the Hydrocarbon Sector Act, Law 34/1998 of 7 October 1998, sets annual targets for biofuels and other renewable fuels for transport which are compulsory as from 2009, reaching 5.83% in 2010. It also authorises the Ministry of

Industry, Tourism and Trade to enact the provisions needed for regulation of a mechanism to promote the incorporation of biofuels and other renewable fuels used in transport.

To achieve these targets as efficiently as possible, Order ITC/2877/2008 of 9 October 2008 providing for a mechanism to promote the use of biofuels and other renewable fuels for transport sets minimum per-product targets which are below the global target set out in Law 34/1998 of 7 October 1998, temporary flexibility mechanisms to measure the amount of biofuel sold or consumed and a certification and compensatory payment system to be managed by the National Energy Commission which will allow those bound by it to transfer certificates while also serving as a control mechanism for this obligation. This mechanism for promoting the use of renewable fuels and other renewable fuels for transport will make it possible by 2011 to achieve a global target of 7% energy content in petrol and diesel sold for that purpose.

The following compulsory global targets have been set:

Table 4.5-1 Biofuel targets

2009	2010
3.4%	5.83%

The following per-product targets have also been set:

Table 4.5-2 Biofuel targets for diesel

2009	2010
2.5%	3.9%

Table 4.5-3 Biofuel targets for petrol

2009	2010
2.5%	3.9%

As these tables show, at present no distinction is made regarding type of fuel or technology within the compulsory framework and no specific support is given to the biofuels meeting the criteria laid down in Article 21(2) of the Directive.

The following are bound by Spain's compulsory scheme on the use of biofuels:

- Annual domestic market sales by operators authorised for wholesale distribution of petroleum products, excluding wholesale sales to other operators.
- Annual domestic market sales by retail distributors of petroleum products which were not supplied by wholesale operators.
- Annual consumption by consumers of petroleum products which were not supplied by wholesale operators or by retail distributors of petroleum products.

Persons subject to this scheme who lack the certificates needed to comply with their obligations shall be required to make compensatory payments.

Obligations shall be presumed to have been met upon payment of the required compensatory amounts provided that the degree of infraction is minor (below the threshold set using the formula provided in Order ITC/2877/2008). Otherwise, this shall be considered a breach of the obligations laid down for achievement of the annual targets set for minimum biofuel and other renewable fuel content and shall constitute a

very serious breach according to Law 34/1998. Any imposition of administrative sanctions which may arise from the aforementioned breach is without prejudice to compensatory payments to be paid in any case.

Order ITC/2877/2008 designates the National Energy Commission as the body responsible for the issue of biofuel certificates, management of the certification and supervision mechanism and control of the mandatory commercialisation of biofuels.

Circular 2/2009 of 26 February 2009 issued by the National Energy Commission regulating the implementation and management of the mechanism promoting the use of biofuels and other renewable fuels used for transport, lays down the organisational and operational rules governing that mechanism. Specifically, it define procedures, standards and rules pertaining to applications to open Certification Accounts, applications for the issue of biofuel certificates and the transfer and handover of certificates and lays down the management procedures for the Book-Entry System applicable to the National Energy Commission (Sp acronym CNE).

The CNE is authorised to perform whatever checks and inspections it deems necessary to supervise and control the obligations that are defined, which could affect entities bound by those obligations as well as those not so bound.

Entities accrediting sale or consumption of biofuels must furnish the evidence required by the CNE and grant access to their premises, registries and accounting ledgers under suitable conditions to facilitate the verification and, as the case may be, inspection of compliance with the obligations laid down by Order ITC/2877/2008, Circular 2/2009 and any others regarding these matters.

The obligations laid down in Order ITC/2877/2008 may be eliminated or amended for as long as necessary by order of the Ministry of Industry, Tourism and Trade.

Here we would stress that this *obligation* is the basic mechanism that will be used to achieve the energy target of introducing renewable energies in transport through the contribution of biofuels.

§ *Use of biofuels by the Administration's fleet of vehicles*

One of the novelties emerging from the review of the 2006 European Union Strategy for Sustainable Development is the incorporation of concrete targets in government procurement. The section devoted to Consumption and Sustainable Production sets the promotion of trends in this direction as a global target and sets out an operational aim and objective of "aspiring to reach an average level of green public procurement by 2010 in all of the European Union equal to that achieved to date by the most advanced Member States in this connection".

In this context, and as part of environmental policy strategy, the Cabinet created the Interministerial Commission for the Incorporation of Environmental Criteria in Public Procurement through the Decision of 22 May 2006. This Commission is responsible for drawing up a Green Public Procurement Scheme with a view to establishing a link between public procurement and the implementation of environmentally-friendly practices.

This objective is set out in Order PRE/116/2008 of 21 January 2008 publishing the Cabinet Decision approving the Green Public Procurement Scheme pertaining to the General State Administration and its public bodies and the managing entities of the Social Security System.

This scheme establishes the link between public procurement and the implementation of environmentally-friendly practices so as to achieve the target established by the European Community in the revised Sustainable Development Strategy by 31 December 2010. Specific objectives of that Strategy include the establishment of quantifiable targets for groups of products, services and works considered a priority by the European Commission for the incorporation of environmental criteria and to draft guidelines for the incorporation of environmental criteria at the different stages of procurement.

Following are some of the measures adopted in the sphere of transport:

"Analyse and adapt the existing fleet of vehicles, before 31 December 2010, so that they can run on biofuels. This does not apply to hybrid vehicles. Include biofuel compatibility as a compulsory criterion in all purchases of new vehicles in those segments of the sector where there is an adequate supply of automobiles already equipped with this technology so that by 31 December 2012, 50% of the fleet will consume mixtures with a high biofuel content (30% diesel and 85% bioethanol). As from 01 January 2008, hybrid automobiles will be purchased for use as utility vehicles mainly for city driving provided that there is sufficient market supply to allow for competition. Inclusion of a biofuel availability clause in all fuel supply contracts by 31 December 2010.

Through this measure we intend to attain consumption levels of 38% biofuels out of the total fuel consumed by Spain's fleet of government vehicles by 31 December 2012.

The 2008-2011 Energy Saving and Efficiency Scheme approved the by Cabinet on 1 August 2008 features 31 urgent measures to intensify energy saving and efficiency in Spain. Many of these are additional to others already in force. For instance, in the area of mobility the General State Administration’s example-setting action is enhanced by the Green Public Procurement Scheme which set a 2009 target of at least 20% biofuel consumption by fleets of public vehicles.

Financial support

Following is a list of applicable domestic statutes in this connection:

- Law 38/1992 of 28 December 1992 on Excise Duties.
- Royal Decree 1165/1995 7 July 1995 establishing the Special Duty Regulation.
- Law 53/2002 of 30 December 2002 on fiscal, administrative and social order measures.
- Royal Decree 1739/2003 of 19 December 2003 amending the Special duty Regulation approved by Royal Decree 1165/1995 of 7 July 1995 and Royal Decree 3485/2000 of 29 December 2000.
- Law 22/2005 of 18 November 2005 incorporating several Community Directives regarding the taxing of energy and electricity commodities and the common system of taxation applicable to the parent and affiliate companies of Member States and regulation of the tax system applicable to cross-border contributions to pension funds within the ambit of the European Union, into the Spanish legal system.
- Royal Decree 191/2010 of 26 February 2010 amending the Special duty Regulation, approved by Royal Decree 1165/1995 of 7 July 1995.

§ *Special tax rate levied on biofuels*

The Special duty Act provides that, under the hydrocarbon tax, a special tax rate of 0 euro per 1000 litres will be levied on biofuels until 31 December 2012. This special rate will apply solely to the volume of actual biofuel, even when it is mixed with other products.

If deemed appropriate on the basis of the relative production cost of petroleum products and biofuels, General State Budget Laws may replace the zero rate with a positive levy which shall not exceed the tax rate applicable to equivalent conventional fuels.

This is a compulsory scheme administered by the *Agencia Tributaria* (tax administration)'s Department of Customs and Excise Duties.

Eligibility within this support scheme is not contingent upon the size of the agency commercialising the biofuel.

§ *Tax exemption for biofuel pilot projects*

The Special duty Act provides that the manufacture or import of biofuels intended as automobile fuel, full-strength or mixed with conventional fuels, are exempt from the special duty on hydrocarbons for purposes of pilot projects for the technological development of less-polluting products.

"Pilot projects for the technological development of less-polluting products" shall mean experimental and time-limited projects addressing the production or use of such products whose aim is to demonstrate the technical or technological feasibility of their production or use, excluding the subsequent industrial exploitation of the results of such projects.

This is a voluntary scheme managed by the Tax Administration's Department of Customs and Excise Duties.

The Special duty Regulation provides that, once the exemption application is approved, the management centre will issue the requisite decision recognising the exemption for the period requested by the interested parties, which may not exceed five years.

For purposes of accrediting the experimental nature of a project, i.e. that it is limited to demonstrating the technical or technological feasibility of production or use, the Special duty Regulation establishes a maximum annual production limit of 5000 litres of biofuel.

4.6 Specific measures for promotion of the use of energy from biomass

4.6.1 Biomass supply: both domestic and trade

Table 7

Sector of origin		Amount of national resource (1) (t)	Imported		Exported	Net amount	Primary energy production (ktoe)
			EU	Non-EU	EU/Non-EU		
A) Biomass from silviculture (2)	Of which:						

	1) Direct supply of wood biomass from woodlands and other forested areas for power generation	4,800,000				4,800,000	1,200
	Optional — if information is available you can further detail the amount of feedstock belonging to this category:						
	a) fellings						
	b) residues from fellings (tops, branches, bark, stumps)						
	c) landscape management residues (woody biomass from parks, gardens, tree rows, bushes)						
	(d) other (please define)						
	2) indirect supply of wood biomass for energy generation	5,218,750	1,000	0	1,000	5,218,750	1,600
	Optional — if information is available you can further detail:						
	a) residues from sawmilling, woodworking, furniture industry (bark, sawdust)	3,218,750	1,000		1,000	3,218,750	1,000
	b) by-products of the pulp and paper industry (black liquor, tall oil)	2,000,000				2,000,000	600
	c) processed wood-fuel	0					
	d) post consumer recycled wood (recycled wood for energy generation, household waste wood)	0					
	e) other (please define)	0					
B) Biomass from agriculture and fisheries	Of which:	457,852	546,083	379,839	0	1,383,774	277
	1) agricultural crops and fishery products directly provided for energy generation	457,852	546,083	379,839	0	1,383,774	277
	Optional — if information is available further detail:						
	a) arable crops (cereals, oilseeds, sugar beet, silage maize)	457,852	546,083	334,672	0	1,338,607	270
	b) plantations						
	c) short rotation trees						
	d) other energy crops (grasses)						
	e) algae						
	f) other (palm)	0	0	45,167	0	45,167	7
	2) Agricultural by-products/processed residues and fishery by-products for energy generation	4,773,001			141,330	4,631,671	1,435
	Optional — if information is available you can further detail:						
	a) straw	333,333				333,333	100
	b) manure	234,250	0	0	0	234,250	1.6

	c) animal fat	112	0	0	0	112	0.04
	d) meat and bone meal	88,976	0	0	0	88,976	33.8
	e) cake by-products (incl. oil seed and olive oil cake for energy)	1,885,669	0	0	135,669	1,750,000	700
	f) fruit biomass (including shell, kernel)	630,661	0	0	5,661	625,000	200
	g) fishery by product	0					
	h) clippings form vines, olives, fruit trees	1,600,000				1,600,000	400
	i) other (please define)	0					
C) Biomass from waste	Of which:						
	1) Biodegradable fraction of municipal solid waste including biowaste (biodegradable garden and park waste, food and kitchen waste from households, restaurants, caterers and retail premises, and comparable waste from food processing plants) and landfill gas	4,653,471	0	0	0	4,653,471	366.9
	2) Biodegradable fraction of industrial waste (including paper, cardboard, pallets)	16,436				16,436	5.8
	3) Sewage sludge	254,400				254,400	4.9

(1) Amount of the resource in m3 (if possible, otherwise in appropriate alternative units) for category A and its subcategories and in tonnes for categories B and C and their subcategories
(2) Biomass from forestry should also include biomass from forest-based industries. The category of biomass from forestry processed solid fuels, such as chips, pellets and briquettes should include the corresponding subcategories of origin.

In the case of biodiesel, the following calculation methodology was used:

$$\Pr imary\,energy\,(ktoe) = \frac{Amountofoil\ (t)}{conversionfactor} \times \frac{Energy\ content\ (toe/m^3)}{Density\ (t/m^3)} \times \frac{1}{1000}$$

where

Amount of oil (t): that used for the production of biodiesel expressed in tonnes; the ratio between oilseeds or nuts and the oil obtained was calculated using the following extraction factors (tonnes of seeds/nuts needed to obtain 1 tonne of oil):

- Sunflower = 2.386
- Rape = 2.560
- Soy = 5.435
- Palm = 5.755

Conversion factor: tonnes of oil needed to produce 1 tonne of biodiesel; the following values were used:

- Vegetable oil = 1.05
- Used oil = 1.10

Energy content: energy per unit of volume obtained from biodiesel; the value used is the one indicated in the Annex of Order ITC/2877/2008, i.e. 0.7894 toe/m^3.

Density: R.D. 61/2006 laying down the specifications for petrol, diesel, fuel-oil and liquefied petroleum gas and the use of biofuels, requires compliance with standard EN 14214 in the case of biodiesel; this standard indicates that density must be between 0.860 and 0.900 t/m^3; for the calculations in this document the standard value used was 0.880 t/m^3.

In the case of bioethanol, the following calculation methodology was used:

$$\mathrm{Pr}imary\,energy\,(ktoe) = \frac{Feedstock\ (t)}{Conversion\quad factor} \times \frac{Energy\ content\ (toe/m^3)}{Density\ (t/m^3)} \times \frac{1}{1000}$$

where

Feedstock (t): the amount of grain used to produce bioethanol expressed in tonnes.

Conversion factor: tonnes of feedstock needed to produce 1 tonne of bioethanol; the following values were used:

- Wheat = 2.8
- Barley = 3.3

Energy content: energy per unit of volume obtained from bioethanol; the value used is the one indicated in the Annex of Order ITC/2877/2008, i.e. 0.5074 toe/m^3.

Density: for the calculations in this document the standard value used was 0.794 t/m^3.

Table 7a: Estimated biomass domestic supply in 2015 and 2020

Sector of origin		2015		2020	
		Expected amount of domestic resource	Primary energy production (ktoe)	Expected amount of domestic resource	Primary energy production (ktoe)
A) Biomass from forestry	1) direct supply of wood biomass from forests and other wooded land for energy generation	6 327 647	1 582	8.322 328	2 081
	2) Indirect supply of wood biomass for energy generation.	5 595 619	1 679	5 674 765	1 702
B) Biomass from agriculture and fisheries	1) Agricultural crops and fishery products directly provided for energy generation.	2 442 108	733	4 355 772	1 307
	2) Agricultural by-products/processed residues and fishery by-products for energy generation.	14 876 096	1 529	30 852 890	1 933
C) Biomass from waste	1) Biodegradable fraction of municipal solid waste including biowaste (biodegradable garden and park waste, food and kitchen waste from households, restaurants, caterers and retail premises, and comparable waste from food processing plants) and landfill gas.	6 310 422	532.3	6 693 515	726
	2) Biodegradable fraction of industrial waste (including paper, cardboard, pallets)	547 763	158	626 963	194
	3) Sewage sludge.	2 840 000	52.6	4 760 000	86

Calculation methods for biomass from agriculture, forestry, energy crops and black liquor

Having regard to table 7 (2006), the following amounts and LHV were considered:

				APPLICATION	
	toe	LHVh (toe/t)	tonnes	electricity (ktoe)	thermal (ktoe)
Felled wood	950 000	0.2500	3 800 000	0	950
Pruning wood	250 000	0.2500	1 000 000	0	250
Olive and agricultural wood	400 000	0.2500	1 600 000	0	400
Cereal straw	100 000	0.3000	333 333	80	20
Black liquor	600 000	0.3000	2 000 000	600	0
Sawdust and wood chips	450 000	0.3000	1 500 000	0	450
Bark	550 000	0.3200	1 718 750	170	380
Pomace	700 000	0.4000	1 750 000	250	450
Other food waste	200 000	0.3200	625 000	0	200
Total	4 200 000		14 327 083	1 100	3 100

For the purposes of Table 7a (2015 and 2020), the following distribution was considered for electricity applications from this type of biomass:

	Distribution 2015 (ktoe)	Distribution 2020 (ktoe)
Energy crops	105	335
Farm biomass	137	284

Forestry biomass	172	338
Agricultural industry biomass	381	435
Forestry industry biomass	214	251
Black liquor	417	416

Regarding thermal applications, for Table 7a the following amounts of this type of biomass were considered:

	Distribution 2015 (ktoe)	Distribution 2020 (ktoe)
Forestry biomass	1357.3	1575
Indirect wood biomass	1047.06	1035
Farm crops	542.92	855
Farm by-products/processed waste	930.72	1035

Calculation methodology for biomass from urban and industrial solid waste

All the amounts of waste featured in tables 7 and 7a refer exclusively to the biodegradable fraction of the waste.

Regarding Table 7 (2006), the following considerations were made:

- Manure from section B.2 is used exclusively for biogas production.
- Animal fat and meat and bone meal from section B.2 are used exclusively for the cement sector.
- In section C.1., the biodegradable fraction of municipal solid waste (MSW) includes incinerated biodegradable MSW (1,000,000 t), biodegradable MSW used for anaerobic digestion for the production of biogas (8,189 t) and biodegradable MSW in waste dumps where biogas is collected and used for energy (3,589,098 t).
- The biodegradable fraction of industrial waste from section C.2 is comprised of end-of-life tyres (ELT) (12,350 t) reclaimed wood (11,097 t) and paper, cardboard and cellulose (16,436 t) in the cement sector.
- Sewage sludge from section C.3 is the sum total of that used for biogas generation (244,730 t) and the cement sector (9,670 t).
- Primary energy and the amounts expressed in tonnes corresponding to waste used for biogas generation were calculated (using the appropriate generation factors) from the 2006 electricity generation data using biogas. These data were 6.6 GWh of electricity generation from manure, 2 GWh of generation from MSW, 490 GWh from landfills and 7.5 GWh from WWTP sludge.
- We used the following LHV and generation ratios of methane per tonne of waste used to produce biogas:

						APPLICATION	
	LHVh (toe/t)	m3 CH4/t	% renewable	tonnes	toe	electric (ktoe)	thermal (ktoe)
Manures	----	8	100%	234 250	1 621	1.6	----
Animal fats	0.4	----	100%	112	45	----	0.04
Meat and bone meals	0.38	----	100%	88 796	33 742	----	33.7
MSW (incineration)	0.2	----	50%	1 000 000	200 000	200	----
MSW (waste dump biogas)	----	39	100%	3 589 099	120 378	120	----
MSW (biogas)	----	70	100%	8 189	491	0.5	----
ELT (end-of-life tyres)	0.75	----	29%	42 006	9 139	----	9.1
Reclaimed wood	0.35	----	100%	11 097	3 884	----	3.9
Paper, cardboard or cellulose	0.35	----	100%	16 436	5 753	----	5.8
WWTP sludge	0.32	----	100%	9 670	3 094	----	3.1
WWTP sludge (biogas)	----	9	100%	244 730	1 843	1.8	----
Total				5 244 386	379 991	324	56

Regarding Table 7a (2015 and 2020), note that the huge amount and variety of available waste means that targets can be reached using a wide array of combinations. Following are a number of considerations regarding the data in Table 7a:

- Section B.2. reflects the amounts of manure and other co-substrates (mostly agro-industrial waste) used to produce biogas (10,962,000 t in 2015 and 25,920,000 t in 2020) and an estimate of the amounts of animal fat and meat meal that the cement sector is expected to consume (90,500 t in 2015 and 101,000 t in 2020).
- Section C.1 includes the amounts of biodegradable MSW intended for incineration (1,165,000 t in 2015 and 1,790,000 t in 2020) and the amounts of biodegradable solid recovered fuels (SRF) produced from MSW intended for incineration (62,000 t in 2015 and 100,000 t in 2020), the amounts of biodegradable MSW intended for biogas production in anaerobic digesters (708,349 t in 2015 and 1,187,405 t in 2020) and waste dumps (4,175,073 t in 2015 and 3,296,110 t in 2020) and SRF produced from biodegradable MSW intended for industrial ovens (200,000 t in 2015 and 320,000 t in 2020).
- Section C.2. shows the incineration of industrial waste at a paper sector facility (310,000 t in 2015 and in 2020) and the use of solid recovered fuels or fuels derived from waste produced from reclaimed wood in industrial ovens (50,000 t in 2015 and 2020), paper, cardboard or cellulose (30,000 t in 2015 and 2020), waste from the paper sector (66,000 t in 2015 and 132,000 t in 2020), construction and demolition waste (55,000 t in 2015 and 2020), end-of-life vehicles (22,000 t in 2015 and 35,200 t in 2020) and end-of-life tyres (14,763 t in 2015 and 2020).
- Section C.3. is divided between sludge intended for biogas generation (2,740,000 t in 2015 and 4,600,000 t in 2020) and sludge for use in industrial ovens (100,000 t in 2015 and 160,000 t in 2020).
- Following are the LHV and generation ratios of methane for waste intended for energy recovery in 2015 and 2020:

				2015	2015	APPLICATION 2015		2020	2020	APPLICATION 2020	
	% renewable	LHVh (toe/t)	m3 CH4/t	tonnes	toe	electricity (ktoe)	thermal (ktoe)	tonnes	toe	electricity (ktoe)	thermal (ktoe)
Manures	100%	----	8	8,729,000	61,856	62	----	20,640,000	142,865	143	----
Other co-substrates	100%	----	62	2,233,000	121,871	122		5,280,000	281,479	281	----
Animal fats	100%	0.4	----	500	200	----	0	1,000	400	----	0
Meat and bone meals	100%	0.38	----	90,000	34,200	----	34	100,000	30,000	----	38
MSW (incineration)	50%	0.21	----	1,165,000	244,650	245	----	1,790,000	375,900	376	----
MSW (waste dump biogas)	100%	----	39	4,175,073	140,007	140	----	3,296,110	110,532	111	----
MSW (biogas)	100%	----	70	708,349	42,501	42.5	----	1,187,405	71,244	71	----
SRF (from MSW)	50%	0.4	----	62,000	24,800	24.8	----	100,000	40,000	40	----
SRF (from MSW)	50%	0.4	----	200,000	80,000	----	80	320,000	128,000	----	128
Industrial waste (incineration)	59%	0.2	----	310,000	62,000	62	----	310,000	62,000	62	----
End-of-life tyres	29%	0.75	----	14,763	11,076	----	11	14,763	11,076	----	11
Reclaimed wood	100%	0.35	----	50,000	17,500	----	18	50,000	17,500	----	18
Paper, cardboard or cellulose	100%	0.35	----	30,000	10,500	----	11	30,000	10,500	----	11
Paper industry waste	59%	0.44	----	60,000	29,040		29	132,000	58,080	----	58
CDW	50%	0.3	----	55,000	16,500	----	17	55,000	16,500	----	17
End-of-life vehicles	16%	0.52	----	22,000	11,440	----	11	35,200	18,304	----	18
WWTP sludge	100%	0.32	----	100,000	32,000	----	32	169,000	51,200	----	51
WWTP sludge (biogas)	100%	----		2,740,000	20,629	21	----	4,600,000	34,633	35	----
Total				20,750,685	960,770	718	242	38,101,478	1,468,212	1 119	350

4.6.2 Measures to increase biomass availability, taking into account other biomass users (agriculture and forest-based sectors)

Mobilisation of new biomass sources

In Spain, over 50% of agricultural land is classified as having a medium-high risk of erosion and this figure rises as high as 70% in some regions like Andalusia. A study conducted by the Nature Conservation Institute (Sp. acronym ICONA) in the 1990s estimated that the direct annual cost arising from erosion in Spain totalled €280 million due to the reduction in agricultural production, deterioration of reservoirs and flood damage, resulting in an estimated cumulative cost of €3 billion to combat erosion and recover land over a 15 to 20 year period. Since that time, quite a bit of work has been done on Conservation Agriculture techniques such as not burning stubble, using harvest remains as ground cover and employing minimum tilling techniques, to name just a few.

The Ministry of the Environment and Rural and Marine Affairs (MARM) is now in the process of drafting the 2002–2012 National Soil Erosion Inventory based on the provisions of the Spanish Forestry Plan, the Woodlands Act, Law 43/2003 and the Natural Heritage and Biodiversity Act, Law 42/2007. The aims of this Inventory are as follows:

- Detect, quantify and map, using digital media and graphically, the main erosion processes affecting national territory.
- Study its evolution over time by means of ongoing inventory.
- Establish priority areas of action to control erosion.
- Serve as a coordination tool for policies, plans and programmes designed to conserve and protect soils.

This inventory is studying sheet and rill erosion, gully and ravine erosion, deep erosion, stream bank erosion and wind erosion. It is now partially available, i.e. completed for certain provinces only.

The areas at the greatest risk of deterioration are non-productive areas in a state of abandonment. According to the agricultural yearbook (2004) approximately 5.4 million hectares, accounting for over 10% of Spanish territory, are in disuse and therefore non-

productive. In many cases, these areas not being used for agriculture or livestock could support wood species.

In the case of agricultural areas, CAP data from 2006 indicate that there were 1,093,420 hectares set aside in addition to the 928,267 hectares of fallow land in Spain.

Regarding fallow land, we would first point out that as from 2010 this practice is only compulsory for farmers applying for Crop Rotation aid in areas where the level of regionalisation is 2 t/ha or less. We would further note that it is not easy to promote other uses for these traditional fallow lands because they are necessary due to climate conditions, poor soil or livestock demands.

The following areas were set aside in Spain during the 2008 and 2009 harvest seasons:

Table 4.6-1 Areas set aside in Spain in the 2008 and 2009 harvest seasons

Harvest year	Non-irrigated	Irrigated	TOTAL
2008	1,066,852	97,776	1,164,628
2009	1,629,675	129,790	1,759,465
2010	It is believed to have increased due to depressed grain prices		

In other words, there is a growing trend towards setting aside land and it is likely that this will continue because, even though set-aside will no longer be recognised from 2010 onwards, rights are paid whether crops are grown or not. According to experts, between 1 and 2 million hectares of land will remain unfarmed in Spain depending on grain prices over the next few years, or on the profitability of other new crops or new land uses. Due to cross-compliance rules, farmers must care for and rotate these areas and this could serve as a stimulus to their mobilisation.

One of the measures being analysed to promote energy crops is the reforestation of farmland in areas of low productive capacity or forest areas which have been cut and are no longer productive. Forest species with energy-generating capacity such as Quercus, Eucalyptus and Acacia could be planted in these areas.

The introduction of new energy crops both in forest and farmland entails a set of measures which it is proposed to implement through programmes for restocking of currently non-productive forest land with energy species, and programmes for restocking of farmland which has been abandoned or is being set aside due to low production indices (below 1.2 t/ha per year).

The MARM and the Ministry of Industry, Tourism and Trade (MITYC) are working closely on wooded forest land with a view to mobilising biomass that is produced on Spanish woodlands, is currently not being collected and is a fire hazard and breeding ground for pests. In this connection the "Spanish Strategy for the Development of Forestry Residue Biomass", drafted by MARM with the consultative support of IDAE, has been instrumental in identifying and quantifying the minimum amounts of forestry biomass from the remains of tree felling and other forestry operations that need to be mobilised both to improve forestry areas and to contribute to the development of renewable energies. This strategy will also help lay the groundwork for improvement of many currently non-productive woodlands where the use of forestry residue for energy purposes will subsequently prepare those areas for non-energy production.

Moreover, the different regional departments with competence in forestry matters, in consultation with IDAE, are defining and implementing the background work for the productive use of certain forest land for energy production.

Plans are thus under way to use currently available products and by-products such as the residues described in Table 7a to achieve these objective.

Regarding specific policy for the production and use of biogas, aside from remuneration for electricity production and cogeneration with biogas, on 26 December 2008 the Ministry of the Environment and Rural and Marine Affairs published the Slurry Biodigestion Plan whose purpose is to reduce greenhouse gas emissions from the handling of slurry by using anaerobic digestion techniques. The quantifiable target of this Plan is to process 9,470,000 t slurry/year by means of this technique. In addition to providing for the covering of slurry tanks, the Plan provides aid for the construction of individual and centralised facilities for the anaerobic digestion of pig slurry (covering up to 40% of eligible investment costs).

In order to maximise slurry processing, in the case of individual and centralised facilities where the volume of substrates other than pig manure accounts for over 20% of the mixture, the subsidy will be reduced by 5% for each 10% volume increase of co-digestate over the 20%. The volume of manures other than pig slurry in the mixture intended for co-digestion must not exceed 30%.

This plan has a four-year horizon (2009-2012). The ground rules applicable to subsidies to promote the application of technical processes under the Slurry Biodigestion Plan were published in Royal Decree 949/2009.

Impact on other sectors

In Spain there are 27 million hectares of forest land (over 50% of the total surface area) of which 18 million are wooded (including open formations). The total extension was estimated in 2006 at 893 million m3 of which approximately 45 million m3 could actually be exploited yearly. The 13 million m3 that were cut that same year puts Spain's extraction rate at 29%. In the case of the five Autonomous Communities in the Mediterranean basin the figure is 17%. These rates are well below productive capacity and are a far cry from the European Union average of 69%.

This situation, characterised by a growing downward trend over the last several years is due, among other reasons, to a sharp drop in their use as an energy source. The traditional use of firewood, mostly from woodlands populated with species of the Quercus genus, has fallen off sharply over the last several decades due to the expansion of fossil fuel applications. This consumption decline is also due to the rural exodus which took place at the end of the 20th century.

Furthermore, the restocked stands, mainly with trees of the Pinus genus planted in the 1950s and 60s as a result of the water policy at the time, are in need of treatment and there is no market for their products.

This marked decline in woodland resource extraction, removal of undergrowth and the abandonment of residues left from treatments applied to tree groves, all contribute to the accumulation of dry combustible matter in the woodlands to fuel forest fires, which thus tend to be increasingly virulent.

Today, aside from energy and other non-wood-related uses (cork, resins, etc.), woodlands supply raw materials to three major sectors: paper, lumber and sawn timber, but as already noted, supply outpaces demand for these forestry products.

At the same time, however, wood imports have grown sharply (having more than doubled in the last fifteen years). This is due either to the fact that industry is demanding products which the domestic market is unable to supply, or to the strong downward pressure on prices from imported products from with which the Spanish forestry structure cannot compete.

Implementation of the aforementioned "Spanish Strategy for the Development of Forestry Residue Biomass" will make it possible to monitor the mobilisation of energy resources from forestry residues. MARM is also developing a series of specific measures linked to Law 45/2007 of 13 December 2007 on the sustainable development of rural areas through the 2010-2014 Sustainable Rural Development Programme (Sp. acronym PDRS), devised to promote the development of rural areas. Noteworthy measures of this Programme include those designed to promote renewable energies, with special emphasis on biomass.

These programmes, as applied to both forest and farmland, not only seek to develop biomass but also promote concurrent development of traditional agro-forestry activities with new ones such as biomass production. This will entail the monitoring of objectives, which will require close collaboration between MARM, MITYC and the Departments of the Environment, Agriculture and Energy of the Autonomous Communities.

There are a number of industrial sectors directly linked to biomass production, notably the pulp and paper, wood, olive oil and wine and alcohol production sectors.

Following the growth of the lumber industry in Spain in the 1980s and 90s, the crisis affecting the building sector has had a dramatic effect on this industry, as a result of which large quantities of biomass from other forestry product industries are now available for the energy market. Given that the building sector is not expected to recover the levels reached at the end of the 1990s, the lumber sector, and the forestry sector in general, has set its sights on developing an energy market to offset the production losses sustained in its original activity.

The oil production sector enjoys a stable margin of development limited only by the production capacity of Spain's olive groves. This sector has discovered a new source of income not only in the sale of industrially-generated waste but also through the development of ways to use the residue from pruning and other olive grove maintenance operations. Traditionally, this type of biomass has been burned in the field; however, the prohibition of these practices together with the possibility of deriving income from their sale are driving pilot projects to examine the technical-economic feasibility of these new uses.

Lastly, we would note that over the last several decades agricultural policy has led to the loss of a significant amount of farmland devoted to the production of wine grapes and this, together with the need to earn extra income, has prompted the sector to begin promoting the use of vineyard waste to produce energy.

4.7 Planned use of statistical transfers between Member States and planned participation in joint projects with other Member States and third countries.

4.7.1 Procedural aspects

Of the cooperation mechanisms offered under Directive 2009/28/EC, the most attractive for Spain are statistical transfers and joint projects with third countries. Following is a brief outline of some of the main procedural aspects linked to the implementation of these two types of mechanisms in Spain. However, it should be noted that at this time there is no procedure in place for implementing these types of projects:

Statistical transfer

The following steps must be followed for statistical transfer between Spain and another European Union Member State:

- Signing of a Memorandum of Understanding (MOU) between the Government of Spain and that of the other Member State involved confirming their intention to establish a statistical transfer mechanism.
- Signing of an agreement between the Government of Spain and that of the other Member State laying down amounts of energy, calendars and prices. The Ministry of Industry, Tourism and Trade would represent the Government of Spain.
- The certification body in Spain for statistical transfer beyond national borders is the National Energy Commission (Sp. acronym CNE).
- If required under the laws of the other Member State, the process could conclude with the signing of a treaty between the two countries.

Joint projects with third countries

The essential elements to be taken into account when implementing the mechanism based on projects with third countries are as follows:

- Signing of a Memorandum of Understanding (MOU) between the governments of the states involved stating their intention to develop a project within the framework of the scheme for joint projects with third countries as set out in Directive 2009/28/EC.
- Signing of an agreement between the governments of the states involved stipulating the amounts of energy to be shared, delivery dates, and prices of energy and transmission tariffs. The Ministry of Industry, Tourism and Trade would represent the Government of Spain.
- The CNE will act as the certifying body for the electricity transferred for purposes of transmission through Spanish territory. All the States taking part in the project must recognise the capacity of one another's corresponding certification bodies.
- Project implementation is subject to a prior report by REE (Spanish Electrical Network) on the feasibility of the project with respect to the capacity and maintenance of the Spanish electrical network. This report must also analyse the effects of the project on the interconnection capacity of Spain with its neighbouring countries.
- Projects require prior administrative authorisation from the Ministry of Industry, Tourism and Trade following a technical-economic analysis of the project, study of the information furnished by the CNE and REE and any necessary enquires concerning environmental procedures, to be pursued by the Ministry of the Environment and Rural and Marine Affairs.

The administrative authorisation will include, if applicable, a description of the economic support mechanism envisaged for the project. This should at least take account of: payment of tolls, the mechanism whereby electricity is fed into the Spanish electricity system within the system of the existing market, and the possibility of applying a feed-in tariff to the electricity in the event that a portion is consumed within Spanish territory.

Renewable electricity generated in a country outside the EU may be consumed in another Member State rather than in Spain. In that case Spain would be the transit country for this electricity and the Member State will also have to sign the inter-government agreement.

§ In the case of conflict of interests, the applicable laws shall be those of the country where the project is located for tax purposes.

Private bodies may always apply to participate in joint projects. This application must be addressed to the Secretariat of State for Energy, who ultimately decides to authorise such participation or not and in the event of authorisation is responsible for laying down the specific rules governing its implementation.

Given that the forecasts included in this Plan indicate that Spain will have a surplus in terms of its compliance with the compulsory energy targets laid down in Directive 2009/28/EC, statistical transfers may be used provided an agreement is reached with another Member State interested in receiving part of that surplus. If no agreement is reached in this connection, Spain may readjust the said surplus accordingly.

In the case of joint projects, Spain favours projects with other Member States and third-countries within the framework laid down in Articles 9 and 10 of the Directive. In this context, Spain awards priority to actions that help meet the energy targets of the Mediterranean Solar Plan while also helping to solve the regulatory and administrative problems and lack of electricity interconnections which are currently hindering its development. In the case of Spain, electricity generated through potential joint projects with third-countries will increase the surplus according to the forecasts of this plan given that these projects are not yet factored in. Therefore, this electricity could serve to make use of statistical transfers with another Member State or could be designated for consumption in another Member State when Spain is the country of transit.

Be it noted in this connection that unless electricity interconnections with the rest of the European Union through France are reinforced, it would be senseless for Spain to take part in joint projects.

With the reservations expressed in the preceding paragraph, Spain's position is that it is open to partnering with any other Member State with no prerequisite other than an expression of interest in participating in a project of this nature between the Secretariat of State for Energy and its counterpart in the interested country.

Given the forecast surplus vis-à-vis the target, Spain does not foresee the purchase of renewable energy from any third country within the framework of Article 9 of Directive 2009/28/EC. Similarly, EU countries that plan to use this mechanism to import renewable energy through the interconnection between Spain and Morocco should be aware of the existing technical, market and/or regulatory restrictions, especially the lack of electrical interconnections with the rest of the European Union through France.

In principle, Spain has no plans to participate in joint projects with other Member States.

4.7.2 Estimated excess production of renewable energy compared to the indicative trajectory which could be transferred to other Member States

As shown in Table 9 in the following section, surplus production is expected throughout the entire 2011-2020 period. The surplus over the past year was just over 2,600 ktoe.

Spain intends to hold on to its surplus for possible future transfer to other Member States.

4.7.3 Estimated potential for joint projects

In principle, no sector or technology is barred from implementing these projects and nor has a capacity ceiling been established in this sense. The assessment made by the regulator and authorities regarding the desirability of taking part in these projects considering, inter alia, their effect on energy transmission infrastructures and depletion of national renewable resources, is another issue. At the end of the day, this will be what determines whether or not these projects can be carried out.

The implementation of a project of this nature should be subject to no limitations other than those laid down in the current legislation and the considerations set out in the foregoing paragraph.

The information available on these topics is fragmented and does not provide a clear idea of the real potential of developing these projects by countries.

Moreover, we should again note how important interconnections between Spain and other countries and between Spain and the EU are for these projects. Today, the only interconnection between the EU and Africa is the Spain-Morocco connection. According to REE data, today's maximum trade potential in the direction of Spain to France varies between 400 and 500 MW in winter and summer and between peak and off-peak hours. Also the maximum interchange potential in the direction Morocco to Spain is 600 MW in any situation (applying a security margin of 100 MW on the basis of historical regulatory fluctuation observed in this interconnection).

The possibility of raising the Morocco-Spain exchange capacity to 2000 MW has been mooted on the basis of infrastructural reinforcements that have yet to be defined. In this case, the limiting factor to the Morocco-EU transfer capacity (through Spain and France) is the exchange capacity in the direction Spain-France, which can be increased with new interconnections. According to existing plans, between 2011 and 2014 the interconnection capacity between Spain and France will rise to 1700 MW at peak times (in summer and winter) and to 2700 MW at non-peak times. However, these values still seem insufficient to ensure the maximum possible integration of renewable electricity in the EU.

We have no preference as to the type of technology that should be developed in a project of this kind.

4.7.4 Estimated demand for renewable energy to be satisfied by means other than domestic production

TABLE 9. **Forecast of surplus and/or shortfall of energy production from renewable sources with respect to the indicative trajectory susceptible of transfer to/from other Member States from/to Spain (ktoe)**

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Surplus predicted in the forecast document		3,690	4,277	3,886	4,755	3,990	4,774	3,616	4,532		2,647
Surplus predicted in the NREAP		2,986	3,596	3,056	4,163	3,379	4,296	3,180	4,166		2,649
Shortfall predicted in the forecast document		0	0	0	0	0	0	0	0		0
Shortfall predicted in the NREAP		0	0	0	0	0	0	0	0		0

ASSESSMENTS

CHAPTER 5

5. ASSESSMENTS

5.1 Total contribution expected of each renewable energy technology to meet the binding 2020 targets and the indicative interim trajectory for the shares of energy from renewable resources in electricity, heating / cooling and transport

Development of hydroelectric energy

Despite the fact that hydroelectric energy is a consolidated and efficient technology, it still has untapped sustainable potential which is compatible with environmental protection and the quality of water resources. It is also valuable in terms of energy supply security and diversification and of economic and social cohesion.

The 2020 forecast takes into account projects still at the administrative stage, the potential calculated in the studies conducted to install hydroelectric devices in state-owned infrastructures not presently being used for hydroelectric power generation, and the capacity that has been installed over the past 10 years in the form of lower-capacity hydroelectric plants (under 50 MW) at an average annual rate of between 40 and 60 MW.

Annual growth is expected to continue at the current rate barring any change in applicable laws, with growth in annual capacity of 40 MW in the initial years of the period and reaching annual growth rates of 70 MW towards the end. By the end of 2020, cumulative installed capacity in hydroelectric energy will have reached 16 662 MW not including installed capacity in pure pumping.

Development of geothermal power for electricity generation

The forecast for operation of geothermal electricity production plants takes account of the resources available in Spain for these applications estimated from the geothermal potential study conducted within the framework of the Renewable Energy Plan, the areas designated for geothermal exploration and research and the administrative complexity entailed in putting a renewable mining resource into operation.

The processing of permits and the different stages of research prior to development and execution of the project (survey, preliminary feasibility and feasibility studies of the terrain) that are needed to even approach a project of these characteristics takes an estimated five years before it can commence and then a further 2 or 3 years for actual execution.

An initiative is currently under way to develop a high-temperature geothermal electricity production project in Tenerife which has completed the survey stage and has just commenced the research stage.

Spain's prospects for the future are largely based on the development of two types of geothermal projects depending on the geothermal resource available: enhanced geothermal systems (EGS) and projects linked to aquifers in deep sedimentary basins. There is also potential in Spain for the development of geothermal projects in the active volcanic systems of the Canary Islands.

Enhanced geothermal systems (EGS) are currently at the demonstration stage, with several world level pilot projects under way. It is expected that technological progress in Spain during the latter years of this NREAP will permit the operation of demonstration plants in areas where exploration activities are now being conducted.

Apart from enhanced geothermal systems, the greatest geothermal potential in the Iberian Peninsula is associated with hot aquifers in deep sedimentary basins and fractured basement areas with anomalous geothermal gradients. There are several different examples of this type of plant in Europe both in operation and at the development stage, and if the feasibility of the projects currently at the exploration stage in Spain is confirmed, demonstration plants may be expected to come into operation starting in 2018.

Development of geothermal power for thermal use

Two types of applications are considered in our analysis of geothermal power for thermal use.

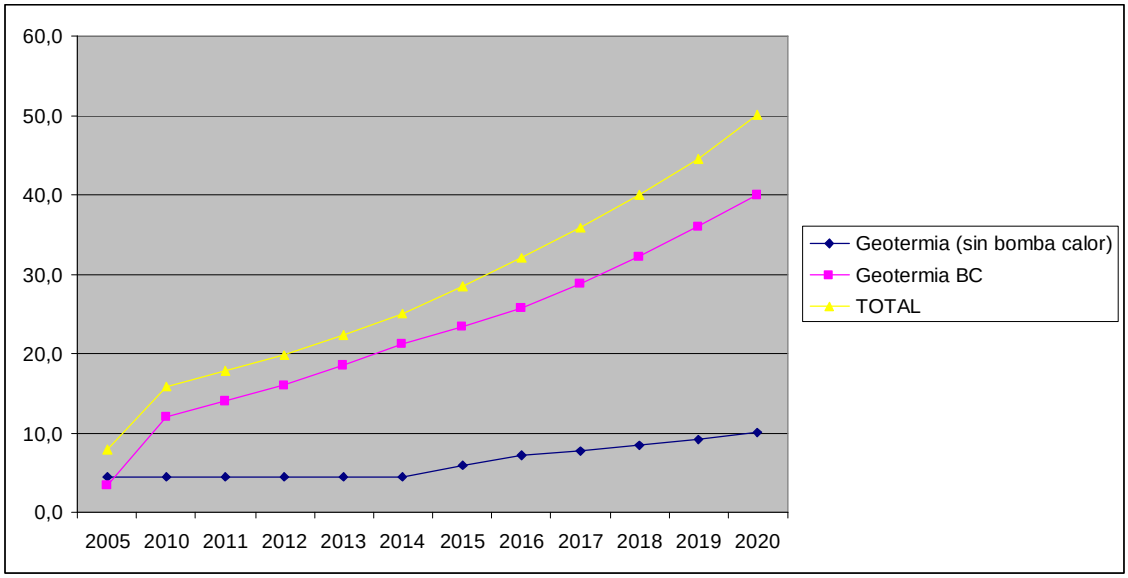
§ *Geothermal energy, excluding low-temperature geothermal heat used for heat pump applications*

In this case, current installed geothermal capacity is in the form of direct use applications at spas and greenhouses built in the 1980s. Future estimates indicate that this type of application will not grow over the lifetime of the study period but will rather remain stable. However, several geothermal district heating projects are expected to start coming into operation from 2015 onwards. These are currently at the exploratory/research stage and administrative authorisations are in process.

§ *Renewable energy from geothermal heat pumps*

There is an emerging market for shallow geothermal or very low temperature applications for climate control and hot water using heat pumps. Over the last several years there has been a sharp rise in the number of heat pump driven geothermal installations, with growth rates of over 30%. Forecasts indicate that this demand will level off; during the first 5 years growth it is expected to be in the vicinity of 15%, and from 2015 onwards, once the market has consolidated, growth levels of between 10 and 12% should be the norm.

In general, the average constant annual installed capacity of all geothermal applications for thermal energy production is expected to grow by 12%.



Geothermal (no heat pump)
Geothermal (heat pump)
TOTAL

§ *Renewable energy from aerothermal heat pumps*

According to Directive 2009/28/EC aerothermal, hydrothermal and geothermal energy captured by heat pumps is considered renewable energy although given that these need electricity or some other auxiliary energy to operate, only heat pumps whose production significantly exceeds the primary energy needed to operate them will be considered.

At this time, although the Directive does define the formula to determine how much energy captured by heat pumps should be considered renewable energy, the Commission has yet to establish guidelines so that Member States can estimate the total useful heat values furnished by heat pumps and the average seasonal performance factor for the different heat pump technologies and applications, taking account of differences in climate conditions, especially in very cold climates.

Bearing this in mind, the current capacity of aerothermal heat pumps which meet Directive requirements is estimated to account for approximately half of the total number of pumps installed, and the forecast for 2020 predicts an annual growth rate of 6% up to 2013 and a higher annual rate thereafter due to a combination of promotion of climate control systems from renewable energy sources and energy efficiency measures in buildings. These forecasts include possible contributions from hydrothermal projects, although the figures are not expected to be very significant.

Development of solar photovoltaic energy

The foreseeable contribution of solar photovoltaic energy to meeting the binding 2020 targets is estimated at 14,316 GWh generated by cumulative installed capacity in 2020 of 8,367 MW. Capacity growth in the 2011-2020 period is estimated at 4,346 MW.

Consideration has been given to continuing the current framework, which provides a system of quotas and associated tariffs for two types of installations, in buildings and on outdoor sites.

The estimate for energy generated during this period is based on the assumption that 67% of these installations are in buildings and 33% on monitored sites. Gradual movement of installations to areas with greater sun radiation intensity was factored in.

As from 2015, the penetration of solar photovoltaic energy is expected to grow in self-supply systems interconnected with the distribution grid and associated with existing supplies as generation prices approach parity with energy prices charged to consumers through systems such as net balance, energy balance compensation, etc.

Development of solar thermoelectric energy

The foreseeable contribution of solar thermoelectric energy to meeting the binding 2020 targets is estimated at 15,353 GWh generated by cumulative installed capacity in 2020 of 5,079 MW. Capacity growth in the 2011-2020 period is estimated at 4,447 MW.

The current framework was considered up until 2013, identifying 2,471,MW which will enter into operation over the next few years.

The estimate of energy generated during this period up to 2013 is based on the distribution of plants with a pre-assigned tariff, 40% of which are plants with energy storage capacity while the remaining 60% do not have this feature. As from 2014, all installations are expected to be equipped with energy storage systems; they can thus be integrated into adjustment systems, making them more manageable.

Development of solar thermal energy

Solar thermal energy's contribution to meeting the binding 2020 targets is estimated at 644 ktoe produced by the 10,000,000 m^2 envisaged by 2020. This implies an increase of approximately 7,600,000 m^2 over the period.

The application of solar thermal energy today is mainly associated with the building sector as a result of the requirements laid down in section HE4 of the Technical Building Code.

In order to reach this installed surface area by 2020, the number of square metres installed each year must rise from 376,000 m^2 estimated for 2011 to over 1,300,000 m^2 calculated for 2020. In order to achieve such a considerable increase in installed area each year, it is vital to add applications over and above the production of hot water required by the Technical Building Code. These could include industrial uses, climate control processes, etc. in those sectors where there is a demand for heat, and especially in the agricultural, industrial and service sectors.

Development of marine energy

At this time the first pilot projects to harness wave power in Spain are starting up with different prototypes.

With the development of national technology for different kinds of prototypes and the implementation of projects at several test centres, there is promise of major industrial development in the area of marine energies. Projects are currently at the demonstration stage and by 2016 we expect to have identified the best technology to harness marine energy, which will provide a basis for commercial development of the sector with the start-up of the first commercial marine electricity generating plants.

Annual growth in installed capacity was calculated on the basis of our knowledge of the different prototypes and their role in the different projects that have now been defined and planned in detail, with due consideration of the administrative complexity involved in carrying out these projects.

Development of wind energy

There are a number of factors that militate in the direction of enhanced development of wind energy between now and 2020. These include untapped on- and off-shore wind potential (factored into the ambitious targets in regional energy plans) and efforts on the part of Spain's electricity system operator and the wind industry (incorporation of new management tools, operational requirements and ongoing technological enhancement) to maximise growth of the share of wind in the system.

Chapter 4.1 addressed the general measures contemplated in this Plan to tackle the new challenges facing the development of wind energy (and other renewables) in Spain, mostly aimed at enhancing the capacity for integration of wind in the electricity system. In this connection, we would draw attention to the need to increase the interconnection capacity with Central European electricity systems through France. Although planned interconnection is expected to double the current capacity of approximately 1,400 MW by 2013, the degree of interconnection will still be less than 3.5% of total electricity generation capacity in Spain, a far cry from the reference threshold of 10% set as a target for all Member States in the conclusions of the March 2002 Barcelona European Council.

In addition to these measures, plans are under way to boost deployment of offshore wind energy and mini-wind energy in Spain. As from the middle of the next decade, the planned repowering of wind farms will make a very significant contribution to the annual installed wind capacity in Spain. Following is a summary of developments expected in each field:

§ *Repowering of obsolete wind installations*

Spanish wind power is relatively young; 99% of installed wind capacity came into operation in the last 15 years (at the end of 1996 only 200 MW were in service compared to approximately 19,200 MW by the end of 2009). Average useful life is approximately 20 years. To date, only isolated wind installations in the Canary Islands and Cadiz have been repowered.

At the end of 2009, only about 400 MW of wind energy in Spain was produced by aerogenerators with a per-unit capacity below 500 kW (considered low-performance),

all in wind farms which came into operation before or during 1998. All these models are approaching technological obsolescence (asynchronous, fixed speed generators with no power regulation capacity), their performance well below current requirements. In general, these farms are expected to be repowered between 2009 and 2015 due to technical problems (reduced production, difficulty finding spare parts, higher operating and maintenance costs, etc.) and therefore electricity generation is expected to increase at these farms thanks to the new installations. However, repowered farms are unlikely to account for a significant share of total wind (over 5% of installed capacity) until 2015.

On the other hand, between 2016-2020, repowered wind farms which commenced operation from 1998 onwards will gradually account for a greater share in terms of annual installed capacity, even outpacing wind farms at new on-shore sites from 2019.

§ *Offshore Wind*

While approximately 30 offshore wind projects are under way off the Spanish coast (Cadiz, Huelva, Castellon, Tarragona, La Coruña, Canary Islands, etc.), Spain does not yet have any offshore wind farms in operation.

Offshore wind farms present particular technological challenges vis-à-vis their on-shore counterparts, mostly arising from the immaturity and complexity of this segment: higher investment costs, more complex construction logistics and the need for detailed studies of surrounding socially and environmentally sensitive areas and adverse climactic conditions. This is in addition to the lack of adequate sites off the Spanish coast with suitable ocean depths to accommodate the technology of farms currently in service (ocean depths of less than 50 m) which is a very serious limiting factor along the Spanish coast despite what would appear to be vast areas of available public marine-terrestrial domain.

There are several initiatives now under way for the implementation of experimental wind farms (Cantabria, Catalonia, Andalusia, Canary Islands and Asturias), including in deep waters. The first of these initiatives and small demonstration wind farms are expected to come into operation in 2014 setting in motion a planned and orderly development of offshore wind in Spain.

As from 2015, high-capacity offshore wind farms along the Spanish coast are expected to begin operation and all sites through 2020 will most likely be at ocean depths of less than 50 m. Installed offshore wind capacity is expected to increase gradually up to 750 MW in 2020, bringing the total installed offshore wind capacity to 3,000 MW by that year.

§ *Mini wind energy*

It is a fact that high-power wind farms play an essential role in increasing the share of renewable energy in the national electricity system. However, Spain has yet to take advantage of the capacity of wind technology to supply distributed renewable energy through integration in urban, semi-urban, industrial and agricultural environments, especially associated with points of consumption along the distribution grid.

Mini wind installations offer a number of advantages over major wind farms, such as potentially greater overall efficiency because no energy is lost in transmission and distribution grids and they permit the integration of renewable generation without the need for new electricity infrastructures. An added advantage is citizen involvement in improving energy efficiency and combating climate change.

If these applications are to prosper, they must be differentiated from large-scale wind farm electricity generation by facilitating administrative procedures and connection to distribution grids. Also, a suitable remunerative framework must be provided which takes account of differences in terms of the state of the technology, costs and specific advantages. With the measures devised for the deployment of mini wind installations, installed capacity is expected to increase gradually from 5 MW in 2011 to approximately 50 MW/year between 2015 and 2020. This would mean cumulative growth of 370 MW from 2011 to 2020.

Briefly, the wind targets for 2020 are as follows:

Land-based wind: 35,000 MW broken down as follows:
Medium and high capacity: 34,630 MW, including the repowering of obsolete wind farms.
Mini wind 370 MW.
Offshore Wind: 3,000 MW.

Development of biomass for electricity generation

Growth in electricity generation using biomass over the lifetime of the plan will be pursued through pure and co-generation installations. It is too early yet to predict the eventual breakdown between these two applications.

The same analyses conducted for thermal biomass in the industrial sector were used to determine possible trends in this increase. The underlying hypothesis is that a portion of this consumption will employ co-generation systems.

The co-generation systems used will depend on the type of industrial establishment and its thermal consumption. Rankine cycles with extraction (in large installations of 5 MWe and over), gasification (in installations of less than 5 MWe with moderate consumption of thermal energy) and organic Rankine cycles (in installations with stable thermal demand throughout the year and less than 2 MWe capacity) are being considered.

The greatest use of cogeneration with biomass is expected in the following sub-sectors:

- pulp, paper and printing–
- wood, cork and furniture, including pellet plants
- food, beverages and tobacco.

Therefore, the rise in thermal demand from these sectors will affect the development of cogeneration systems. Capacity levels of 383 MW of cogeneration could be reached by 2020, which would mean an increase in cogeneration capacity of 215 MW over 2005.

Pure biomass generation plants will generally be medium or high-capacity installations of between 7 and 15 MW. Moreover, part of the electricity generation will be covered by biomass co-combustion projects at coal-fired plants.

In general, a total of close to 617 MW generated at biomass installations for electricity generation without cogeneration is expected over the whole planning period.

By 2020, the total installed biomass capacity, considering both pure and cogeneration plants, is expected to reach 1,000 MW, with an approximate annual production of 6,000 GWh. However, the support system for this technology set up by RD 661/2007 will remain in force until installed capacity reaches 1,317 MW.

Development of the area of biogas

The forecast for development of electricity generation installations using biogas is based on the expectation that agro-industrial biogas will play a predominant role, and that its share of the total will substantially increase during the lifetime of the Plan from the present low level to over 50% by 2020. Growth forecasts are lower during the initial years, but the rate of further growth will rise as installed capacity rises. However, it has also been suggested that assistance earmarked for the 2009-2012 Slurry Biodigestion Plan could make contribute positively to the development of agro-industrial biogas plants during those initial years. As for other types of biogas, landfill biogas is expected to grow initially but then suffer a setback (due to the policy of re-channelling biodegradable waste from landfills), and biogas from MSU and WWTP sludge will also grow but substantially less than agro-industrial biogas (due to the technical difficulties typically encountered in the case of MSU biogas plants and to the low biogas productivity of treatment plant sludge in the case of WWTP sludge).

Growth in the areas of MSW and industrial waste

The forecasts for development of electricity generation plants using municipal and industrial solid waste factor in the lengthy administrative processing times needed before these plants can be built. Because of these long lead times, although planning and studies indicate that more incineration plants will be needed than were initially calculated, it is estimated that only a part of the planned projects will be executed during the 2011-2020 period. From the 95 MW of installed renewable electricity generation capacity in 2009, we expect to reach installed capacity of 187 MW by 2020, equivalent to production of 1,400 renewable GWh.

The complexity of administrative procedure also explains why installed capacity growth is expected to be much greater in 2015-2020 than in 2011-2014. During this initial period, only the enlargement of certain MSW incinerators is envisaged (some have already been completed) and a specific incinerator in the paper sector, which already has administrative authorisation for execution. In other words, most of the capacity is expected to be installed during 2015-2020.

As for the thermal use of waste, a significant increase is expected in the consumption of waste as fuel in the cement sector. Moreover, it is estimated that implementation of the legislation on solid recovered fuels will promote consumption in the cement sector and will give rise to new waste recovery agents. All this will lead to 350 ktoe of thermal consumption of renewable waste by 2020.

Development of the area of thermal biomass

The assessment of the current state and foreseeable evolution of consumption of thermal biomass was based on an examination of the share of final energy furnished by biomass from 1973 to the present.

The results are presented separately for domestic and industrial use.

In the case of domestic consumption, 2003 to 2008 saw the takeoff of the modern thermal biomass market for domestic use, agricultural applications and developments in the public administration and services sectors.

For purposes of biomass used in domestic appliances (including pellet-fired stoves), specific lines of support will be set up, provided that such equipment passes the minimum quality standards required to assure the performance and emission levels offered by the best existing technologies on the market.

This period saw the beginning of growth in the sector, which in order to meet the objectives set needs the stimulus of the mechanisms set out in section 4.3, i.e. assistance and financing under preferred conditions, changes in the regulatory framework governing thermal installations (RITE, CITE and energy rating), incentives for renewable heat production and the adaptation of pellet production for use in buildings and apartment blocks.

Forecasts for biomass consumption by the domestic sector and for diverse uses taking this support into account predict 2,430 ktoe by 2020 with a relative increase in consumption of 12% with respect to 2008.

In the industrial sector, the following sub-sectors will consume the greatest amounts of biomass:

- pulp, paper and printing
- other industrial sectors, largely wood, cork and furniture
- food, beverages and tobacco.
- non-metallic minerals.

Other sub-sectors are less important consumers of biomass but, considered, jointly, should not be underestimated.

Fluctuations in the consumption of thermal biomass for industry have mostly been caused by fluctuations in the production of the sub-sectors mentioned and in some cases have been influenced by co-generation with gas in industry.

The growth trend in the consumption of biomass from the year 2000 to 2008 has levelled off in the main sub-sectors, but the changes that have taken place since 2005 in some pulp and paper sector companies, new cogeneration projects in pellet plants and in the agri-food sector, and measures promoting renewable thermal energy (such as incentives and credits) have prompted considerable growth in biomass consumption in the industrial sector.

This stimulus should drive major growth in the second half of the 2011-2020 period with a consumption forecast of 2,070 ktoe for 2020 and a 40% relative increase in consumption vis-à-vis 2008 in the industrial sector.

Development of the area of biofuels

The following hypotheses account for the development expected in the production and use of biofuels in Spain in the 2011-2020 period:

§ Bioethanol and Bio-ETBE.

Consumption is expected to nearly double, from 232 ktoe in 2011 to 400 ktoe in 2020. There will probably be a major leap in consumption in 2013 given the probable disappearance of the so-called "protective petrol" and the generalised E10 petrol specification.

The considerable share of ETBE imports in national consumption of ethanol observed in 2010 is expected to diminish over the following years and eventually disappear with generalised addition of a bioethanol / ETBE mix to petrol.

Regarding the consumption of bioethanol and bio-ETBE in the context of Article 21(2), the figures suggest that by the end of the 2011-2020 period one or more of Spain's bioethanol production projects using ligno-cellulosic or waste material will be at the commercial stage.

§ Biodiesel.

Consumption of biodiesel is also expected to double during the lifetime of the NREAP, from 1,471 ktoe in 2011 to 3,100 ktoe in 2020. However, the rate of growth is not expected to be uniform: from now until 2013 growth will be very slow and then will pick up thanks to the development of specifications for labelled mixtures and the foreseeable success of B10 standardisation.

As for imports, which in 2010 will likely account for over 60% of national consumption, a slow downward trend is expected in relative terms during the next several years, eventually stabilising at around 10% of total consumption during the second half of the 2011-2020 period.

Lastly, regarding diesel consumption in the context of Article 21(2), the figures support the expectation that used vegetable oil consumption will reach two-thirds of the potential by the end of the 2011-2020 period.

§ *Others*

According to the estimates made in drawing up this Plan, consumption of biofuels between 2011 and 2020 also includes a small contribution from biofuels other than bioethanol and biodiesel which will be incorporated during the second half of the period. Of these, the most likely to develop independently in the future are biogas for transport (see Table 12), HVO and Bio-SPK for the aviation market, all now at very early stages of development.

Estimate of the foreseeable share of renewable technologies in Spain in meeting targets

Adhering to the methodology set out in Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources, and the European Commission Decision of 30 June 2009 establishing a template for National Renewable Energy Action plans, the following tables reflect estimates of the total share of each renewable energy technology in Spain up to 2020 for the electricity, heating/cooling and transport sectors. We should

note that, as required by Article 5(3) of Directive 2009/28/EC, the electricity generated by hydro and wind power is accounted for in accordance with the normalisation rules set out in Annex II of that Directive.

Table 10a: Estimation of total contribution (installed capacity, gross electricity generation) 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 2010-2014 (C)

•	2005		2010		2011		2012		2013		2014	
	MW	GWh	MW	GWh	MW	GWh	MW	GWh	MW	GWh	MW	GWh
Hydro	18,220	35,503	18,687	34,617	19,869	35 353	19 909	34 960	19 949	36 023	19 999	36 559
<1MW	239	893	242	831	244	739	247	677	249	716	251	718
1MW-10MW	1,534	5,719	1,603	4,973	1,640	4 568	1 665	5 607	1 703	4 592	1 731	4 613
>10MW	16,447	28,891	16,842	28,813	17,985	30 045	17 997	28 676	17 997	30 716	18 017	31 228
of which pumping:	2,727	5,153	2,546	3,640	3,700	5 130	3 700	5 130	3 700	6 577	3 700	6 577
Geothermal	0	0	0	0	0	0	0	0	0	0	0	0
Solar	60	41	4,653	7,561	5,877	9 945	6 949	12 553	7 693	14 570	8 300	16 123
photovoltaic	60	41	4,021	6,417	4 498	7 324	4 921	8 090	5 222	8 709	5 553	9 256
concentrated solar	0	0	632	1,144	1 379	2 621	2 028	4 463	2 471	5 861	2 746	6 867
Tide, wave, ocean	0	0	0	0	0	0	0	0	0	0	0	0
Wind	9,918	20,729	20,155	40,978	21 855	43 668	23 555	47 312	24 986	50 753	26 466	53 981
onshore	9,918	20,729	20,155	40,978	21 855	43 668	23 555	47 312	24 986	50 753	26 416	53 906
offshore	0	0	0	0	0	0	0	0	0	0	50	75
Biomass	601	2,653	752	4,517	771	4 655	803	4 876	844	5 151	897	5 499
solid	449	2,029	596	3,719	604	3 769	624	3 898	653	4 078	692	4 319
biogas	152	623	156	799	167	885	179	978	191	1 073	205	1 180
Bioliquids (29)	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL (w/o pumping)	26,072	53,773	41,701	84,034	44 672	88 490	47 516	94 571	49 722	99 921	51 962	105 586
of which co-generated	177	747	246	1,462	250	1 501	254	1 532	266	1 604	287	1 724

(C) CLARIFICATION: According to Article 5(3) of Directive 2009/28/EC, the electricity generated by hydropower and wind power are to be accounted for in accordance with the normalisation rules set out in Annex II of the Directive.

(29) Taking into account only those that satisfy sustainability criteria. See Article 5(1) last paragraph of Directive 2009/28/EC.

Table 10b: Estimation of total contribution (installed capacity, gross electricity generation) 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 2015-2020 (C)

•	2015		2016		2017		2018		2019		2020	
	MW	GWh	MW	GWh	MW	GWh	MW	GWh	MW	GWh	MW	GWh
Hydro	20,049	36,732	22,109	37,566	22,169	38,537	22,229	38,443	22,289	38,505	22,362	39,593
<1MW	253	715	256	760	259	765	262	743	265	819	268	803
1MW-10MW	1,764	4,617	1,796	4,398	1,828	4,712	1,855	4,856	1,882	5,024	1,917	5,477
>10MW	18,032	31,399	20,057	32,408	20,082	33,060	20,112	32,844	20,142	32,662	20,177	33,314
of which pumping:	3,700	6,577	5,700	8,023	5,700	8,023	5,700	8,023	5,700	8,023	5,700	8,023
Geothermal	0	0	0	0	0	0	10	60	30	180	50	300
Solar	8,966	17,785	9,700	19,649	10,508	21,741	11,394	24,088	12,371	26,719	13,445	29,669
photovoltaic	5,918	9,872	6,319	10,565	6,760	11,345	7,246	12,222	7,780	13,208	8,367	14,316
concentrated solar	3,048	7,913	3,381	9,084	3,747	10,397	4,149	11,866	4,592	13,511	5,079	15,353
Tide, wave, ocean	0	0	10	22	30	66	50	110	75	165	100	220
Wind	27,997	57,086	29,778	60,573	31,708	64,483	33,639	68,652	35,819	73,197	38,000	78,254
onshore	27,847	56,786	29,278	59,598	30,708	62,238	32,139	64,925	33,569	67,619	35,000	70,502
offshore	150	300	500	975	1,000	2,245	1,500	3,727	2,250	5,577	3,000	7,753
Biomass	965	5,962	1,048	6,510	1,149	7,171	1,265	7,931	1,410	8,876	1,587	10,017
solid	745	4,660	810	5,066	887	5,545	972	6,074	1,073	6,699	1,187	7,400
biogas	220	1,302	238	1,444	262	1,626	293	1,858	337	2,177	400	2,617
Bioliquids (29)	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL (w/o pumping)	54,277	110,988	56,945	116,297	59,863	123,975	62,687	131,261	68,294	139,619	69,844	150,030
of which co-generated	310	1,866	335	2,014	359	2,160	385	2,317	403	2,428	423	2,551

(D) CLARIFICATION: According to Article 5(3) of Directive 2009/28/EC, the electricity generated by hydropower and wind power are to be accounted for in accordance with the normalisation rules set out in Annex II of the Directive.

(29) Taking into account only those that satisfy sustainability criteria. See Article 5(1) last paragraph of Directive 2009/28/EC.

(D) The support system for this technology established in RD 661/2007 will be valid until 1,317 MW is attained.

Table 11: Estimation of total contribution (final energy consumption (31)) 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 heating and cooling 2010-2020 (ktoe)

•	2005	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Geothermal (excluding low temperature geothermal heat in heat pump applications)	3.8	3.8	3.8	3.8	3.8	3.8	5.2	6.4	7.1	7.9	8.6	9.5
Solar	61	1559	171	198	229	266	308	356	413	479	555	644
Biomass	3,477	3,583	3,617	3,655	3,751	3,884	4,060	4,255	4,469	4,661	4,868	4,950
solid	*3,441*	*3,550*	*3,578*	*3,610*	*3,700*	*3,827*	*3,997*	*4,185*	*4,392*	*4,576*	*4,776*	*4,850*
biogas	*36*	*33*	*39*	*45*	*51*	*57*	*63*	*70*	*77*	*85*	*92*	*100*
bioliquids (32)	0	0	0	0	0	0	0	0	0	0	0	0
Renewable energy from heat pumps	7.6	17.4	19.7	22.2	24.9	28.1	30.8	33.6	37.2	41.2	45.8	50.8
- of which aerothermal	*4.1*	*5.4*	*5.7*	*6.1*	*6.4*	*6.9*	*7.4*	*7.9*	*8.4*	*9.0*	*9.7*	*10.3*
- of which geothermal	*3.5*	*12.0*	*14.0*	*16.1*	*18.5*	*21.2*	*23.4*	*25.7*	*28.8*	*32.2*	*36.1*	*40.5*
- of which hydrothermal	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
TOTAL	3,550	3,764	3,811	3,879	4,009	4,181	4,404	4,651	4,926	5,189	5,477	5,654
of which district heating (33)	*1.4*	*3.4*	*4.4*	*5.8*	*8.5*	*11.3*	*15.4*	*20*	*.24.0*	*29.0*	*33.7*	*38.6*
of which biogas in households (34)	*2,029*	*2,055*	*2,060*	*2,061*	*2,064*	*2,064*	*2,068*	*2,073*	*2,088*	*2,100*	*2,116*	*2,117*

(31) Direct use and district heating as defined in Article 5(4) of Directive 2009/28/EC.
(32 Only those satisfying sustainability criteria to be taken into account. See Article 5(1) last paragraph of Directive 2009/28/EC.
(33) District heating and/or cooling within total heating and cooling consumption from renewable sources (RES-CU).
(34) Of total heating and cooling consumption from renewable sources.

Table 12: Estimation of total contribution expected from each renewable energy technology Spain to meet the binding 2020 targets and the indicative interim trajectory for the shares of energy from renewable resources in the transport sector 2010-2020 (ktoe) (35)

•	**2005**	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Bioethanol / bio-ETBE	113	232	232	281	281	290	301	300	325	350	375	400
of which biofuels (36) as per Article 21(2)	0	0	0	0	0	0	0	0	0	0	0	0
of which imported (37)	0	25	15	5	0	0	0	0	0	0	0	0
Biodiesel	145	1,471	1,471	1,493,	1,493	1,990	2,169	2,450	2,600	2,750	2,900	3,100
of which biofuels (36) as per Article 21(2)	0	50	55	55	60	65	161	170	175	180	190	200
of which imported (37)	0	910	515	373	299	299	325	245	260	275	290	310
Hydrogen from renewable sources	0	0	0	0	0	0	0	0	0	0	0	0
Renewable electricity	107.9	99.1	130.5	152.9	175.8	195.5	223.6	252.4	282.3	312.6	346.3	351.2
of which road transport	0.0	0.1	0.9	3.1	6.8	12.3	30.6	48.3	66.5	84.6	103.6	122.9
of which non-road transport (E)	108	99	130	150	169	183	193	204	216	228	243	258
Others (e.g. biogas, vegetable oils, etc.) - specify	0	0	0	0	0	1	1	2	2	3	3	4
of which biofuels (40 as per Article 21(2)	0	0	0	0	0	0	0	0	0	0	0	0
(E) **TOTAL**	**366**	**1,802**	**1,833**	**1,927**	**1,950**	**2,477**	**2,695**	**3,004**	**3,209**	**3,416**	**3,624**	**3,885**

(E) *CLARIFICATION: The 2005 value is greater than the 2010 value because the share of electricity from renewable energy sources was greater in the years used for the calculation, i.e. 2003 and 208 respectively (see Article 4(c) of Directive 2009/29/EC).*

(35) In the case of biofuels, only those satisfying sustainability criteria to be taken into account. See Article 5(1) last paragraph of Directive 2009/28/EC.
(36) The biofuels that are included in Article 21(2) of Directive 2009/28/EC.
(37) Of the total amount of bioethanol / bio-ETBE.
(38) The biofuels that are included in Article 21(2) of Directive 2009/28/EC.
(39) Of the total amount of biodiesel.
(40) The biofuels that are included in Article 21(2) of Directive 2009/28/EC.

5.2. Total contribution expected from energy efficiency and energy saving measures to meet the binding 2020 targets and the indicative interim trajectory for the shares of energy from renewable resources in electricity, heating and cooling and transport.

According to the estimates set out in Table 1 (Chapter 2), the additional energy efficiency scenario with which NREAP targets are associated represents a savings of approximately 15.5 million tonnes oil equivalent in the gross final consumption of energy in Spain in 2020, which means that renewable energies will account for approximately 3 percentage points of gross final consumption that year.

5.3. Assessment of the impacts

5.3.1 Employment and renewable energies

The study, now nearing completion, on employment associated with the promotion of renewable energies in Spain shows the direct and indirect employment generated in Spain, broken down by the renewable energy production technologies envisaged in the Community Directive and by related areas of activity (manufacturing of equipment, R&D, trade, exports, training, finance, etc.). It also provides an analysis of the characteristics of the employment generated in terms of professional qualification, gender, age, type of contract and activity.

On the basis of the preliminary data from this study, it is estimated that renewable energies in Spain in 2010 will be responsible for the creation of 70,152 direct jobs and a further 45,570 indirect jobs, bringing the total employment figure in the renewable energies sector to 115,722 job posts in 2010.

The breakdown of direct employment by renewable area shows that 43.7% correspond to the wind sector, 27.9% to solar photovoltaic and 9.6% to solar thermal. The rest of the areas considered jointly account for 18.8% of the remaining direct employment. The activities creating the most jobs are equipment manufacturing (35%), implementation of service projects (17%) and plant construction (16%). R&D-Innovation activities contribute to employment at a rate of 4.5%, indicating that as far as employment is concerned renewable energy companies contribute more to GDP than the rest of the economy.

Table 5.3-1. Direct and indirect employment generated by renewable technologies in 2010

	Direct employment	***Indirect employment***	***Total employment***
Wind	*30,651*	*24,521*	*55,172*
Solar photovoltaic	*19,552*	*8,798*	*28,350*
Solar thermal	*6,757*	*3,041*	*9,798*
Activities common to all areas	*4,263*	*2,718*	*6,981*
Biomass	*3,191*	*2,808*	*5,999*
Waste incineration	*1,415*	*637*	*2,052*
Hydropower and mini-hydro	*1,078*	*485*	*1,563*
Biofuels	*964*	*988*	*1,952*
Biogas	*664*	*681*	*1,345*
Solar thermoelectric	*511*	*307*	*818*
Geothermal	*415*	*162*	*577*
Other	*268*	*171*	*439*
Aerothermal (heat pump)	*184*	*83*	*267*
Mini-wind	*165*	*132*	*297*
Tidal power	*74*	*38*	*112*
TOTAL	*70,152*	*45,570*	*115,722*

Source: ISTAS

The areas accounting for the greatest volume of employment (both direct and indirect) are likewise wind (55,172 jobs), solar photovoltaic (28,350) and solar thermal (9,798). According to the analysis of employment characteristics, contracts are mostly open-ended (not time limited) with women accounting for just over 26% and most workers holding professional technical or higher education degrees.

On the basis of the evolution forecast by the 2011-2020 Renewable Energy Plan and the socio-economic forecasts, direct employment associated with renewable energy sources in 2015 and 2020 is expected to reach 82,589 and 128,373 jobs respectively.

Table 5.3-2 Direct employment forecasts for renewable technologies – 2015

Source: ISTAS

	Employment Manufacturing and installation	Employment operation and maintenance:	Total direct employment
Wind	18,048	3,386	21,435
Hydropower	4,016	118	4,134
Solar thermal	12,259	1,727	13,986
Solar thermoelectric	913	370	1,284
Solar photovoltaic	30,255	3,362	33,617
Biomass	732	1,574	2,306
Biofuels	294	822	1,116
Biogas	909	59	969
Geothermal	616	25	641
Waste incineration	1,214	1,890	3,104
TOTAL	69,257	13,333	82,589

Table 5.3-3 Direct employment forecasts for renewable technologies – 2020

	Employment Manufacturing and installation	Employment operation and maintenance:	Direct total employment
Wind	25,713	4,596	30,309
Hydropower	5,863	120	5,983
Solar thermal	24,657	3,523	28,180
Solar thermoelectric	1,476	617	2,093
Solar photovoltaic	40,873	6,654	47,527
Biomass	1,767	2,537	4,304
Biofuels	348	1,164	1,513
Biogas	3,819	108	3,927
Geothermal	385	45	430
Waste incineration	1,285	2,823	4,108
TOTAL	106,186	22,188	128,373

Source: ISTAS

5.3.2 Emissions prevented

Another important element associated with the development of renewable energies is the considerable contribution they make to reducing the impact of transport and energy consumption on the environment. The commitments acquired under the Kyoto Protocol and subsequent agreements and discussions to intensify the fight against global warming, especially at EU level, bear witness to the political and social concern caused by climate change. Energy generation is responsible for 80% of greenhouse gas emissions, meaning that the introduction of renewable energies in this sector will substantially reduce the problem.

The use of renewable energies has many environmental benefits when compared to fossil fuels and these affect a large number of polluting emissions. In this section, however, we limit our scope to the Plan's contribution to limiting CO_2 emissions, the principal greenhouse gas.

On the basis of the growth targets of the different renewable technologies defined in this Plan, we made a dual assessment of CO_2 emissions prevented by the Plan. The first refers to emissions prevented in the year 2020 thanks to the expected growth in renewables from 2011 to 2020. The second refers to the sum total of emissions prevented between 2011 and 2020 thanks to the enhanced role played by renewable energies in the energy system during that period.

The calculation method used to assess prevented CO_2 emissions varies depending on the activity considered, the nature of the energy and the type of technology used for the transformation of primary energy into consumable energy.

In the case of electrical energy, the assumption is that if it had not been produced using renewable energies, it would have been generated using fossil fuels. Taking the most conservative approach we have assumed that, for the period analysed, in the absence of renewable energies the same amount of electricity would have been produced by combined cycle plants using natural gas and an efficiency rate of 54% was calculated for that combined cycle.

For thermal renewable energies, a distinction is drawn between the industrial and transport sectors and sundry uses, the latter including the residential, services and agricultural sub-sectors. It was calculated what fuel would substitute for the renewable energy in each sector and that substitute was multiplied by the emission coefficient associated with that particular energy source.

ESTIMATE OF CO_2 EMISSIONS PREVENTED BY THE PLAN IN 2020

Emissions prevented in 2020 thanks to growth in renewable sources between 2011 and 2020

	CO_2 emissions prevented as compared to CC using NG for electricity generation) (tCO_2/year)
Renewable energies - ELECTRICITY GENERATION	
REE hydropower system (without pumping)	933,501
Other hydropower	544,717
Wind	11,292,827
Offshore Wind	2,940,529
Solar thermoelectric	5,305,686
Solar photovoltaic	2,949,307
Biomass	1,117,961
Biogas	678,872
Renewable MSW	256,806
Marine energy	82,148
Geothermal	112,020
TOTAL ELECTRICITY AREAS	**26,214,375**
Renewable energies - HEATING/COOLING	,
Biomass (h/c)	3,632,240
Biogas (h/c)	199,591
Geothermal (h/c)	19,321
Solar panels and other (h/c)	1,643,645
Heat pump (aerothermal + geothermal)	113,609
TOTAL THERMAL AREAS	**5,608,405**
Biofuels - TRANSPORT	,
Biodiesel	4,978,817
Bioethanol	486,741
TOTAL TRANSPORT AREA	**5,465,558**

TOTAL CO_2 prevented in 2020 (tonnes/year)	**37,288,337**

According to these hypotheses, the expected increase in renewable energies between 2010 and 2020 would reduce CO_2 emissions in Spain by 37.3 million tonnes in 2020. In order to evaluate the total impact of renewable energies on the reduction of CO_2 emissions, the emissions prevented by the development of renewable energies up to 2010 must be added to this figure. The increases predicted during the NREAP must then be added to those amounts.

The following table presents an assessment of the total CO_2 emissions prevented thanks to the Plan up to 2020, i.e. the accumulated emissions from 2011 to 2020 which will not be released into the atmosphere thanks to the expected growth in renewable energies during the lifetime of the NREAP.

TOTAL CO_2 EMISSIONS PREVENTED BY THE PLAN UP TO 2020

Cumulative 2011-2020 total thanks to the growth in renewable sources envisaged in the Plan

	CO_2 emissions prevented as compared to CC using NG for electricity generation) (tCO_2/year)
Renewable energies - ELECTRICITY GENERATION	
REE hydropower system (without pumping)	10,456,738
Other hydropower	2,992,283
Wind	62,188,338
Offshore Wind	7,785,401
Solar thermoelectric	28,564,085
Solar photovoltaic	15,209,234
Biomass	4,222,194
Biogas	2,670,611
Renewable MSW	1,126,643
Marine energy	217,693
Geothermal	201,636
TOTAL ELECTRICITY AREAS	**135,634,856**
Renewable energies - HEATING/COOLING	**,**
Biomass (h/c)	16,785,842
Biogas (h/c)	1,026,746
Geothermal (h/c)	74,358
Solar panels and other (h/c)	6,871,088
Heat pump (aerothermal + geothermal)	544,160
TOTAL THERMAL AREAS	**25,302,193**
Biofuels - TRANSPORT	**,**
Biodiesel	23,551,914
Bioethanol	2,361,710
TOTAL TRANSPORT AREA	**25,913,624**

TOTAL CO_2 prevented in 2020 (tonnes/year)	**186,850,674**

As the table shows, over 186 million tonnes of emissions will be prevented by the plan up to 2020 under the conservative hypotheses described at the beginning of this section.

5.4. Preparation of the national Renewable Energy Action Plan and follow-up of its implementation

The Plan provides for a suitable supervision system based in the first instance on the guidelines provided in the Directive. In this connection, Spain will submit a report to the Commission on progress in the promotion and use of energy from renewable sources by 31 December 2011, and every two years thereafter up to December 2021. Regarding electricity generation, these reports will indicate:

- Ø Sectoral and global share in the two preceding calendar years and measures adopted or envisaged at national level to promote their growth, taking account of the indicative trajectory laid down in Chapter 3.

- Ø The introduction and functioning of support schemes and other promotional measures and any developments in the measures used with respect to those

set out in this National Action Plan, and information on how supported electricity is allocated to final customers.

- Ø How Spain has structured its support schemes to take additional benefits into account in relation to other comparable applications but which may also have higher costs.

- Ø The functioning of the system of guarantees of origin for electricity and the measures taken to ensure the reliability and protection of the system against fraud.

- Ø Progress made in evaluating and improving administrative procedures to remove regulatory and non-regulatory barriers to development.

- Ø Measures taken to ensure the transmission and distribution of electricity produced from renewable energy sources, and to improve the framework or rules for bearing and sharing of costs.

- Ø Developments in the availability and use of biomass resources for energy purposes.

- Ø Changes in commodity prices and land use within Spain associated with its increased use of biomass and other sources

- Ø The estimated net greenhouse gas emission saving.

- Ø The estimated excess production of electricity compared to the indicative trajectory which could be transferred to other Member States.

- Ø Estimated demand for electrical energy that Spain must satisfy by means other than domestic production until 2020.

- Ø Information on how the share of biodegradable waste in waste used for producing energy has been estimated, and what steps have been taken to improve and verify such estimates.

The main purpose of monitoring the Plan is to systematically and regularly assess the development of the different areas of renewable energies, in accordance with the targets laid down, to analyse persisting barriers and to formulate proposals to overcome these. There will be a quantitative assessment of the headway made in complying with targets and a qualitative assessment of each of the areas, considering energy, environmental, technological, industrial and socio-economic aspects, as well as any others that could help or hinder compliance with the Plan's specific or global targets over the medium or long term.