SAVING AND ENERGY EFFICIENCY ACTIONPLAN

2011-2020

(SPAIN'S 2nd NATIONAL ENERGY EFFICIENCYACTION PLAN)

CONTENTS

GENERAL FRAMEWORK

1.

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1. GENERAL CONTEXT OF THE 2011-2020 ACTION PLAN

1.1 Main content of the 2011-2020 Action Plan

This 2011-2020 Action Plan constitutes the second National Saving and Energy Efficiency Action Plan(NEEAP[1]) which, in accordance with article 14 ofDirective 2006/32/EC[2], from the European Parliament and Council of 5 April 2006,on the efficiency of the final use of energy and energy services, the Spanish statewill submit to the European Commission by 30 June 2011. This Action Planwas approved by the Council of Ministers on 29 July 2011,and further develops the saving and energy efficiency plans previously approved by theSpanish government within the context of the Saving and Energy Efficiency Strategyin Spain 2004-2012 (E4), approved in November2003.

The previous action plans, approved within the framework of the E4, have been the subject of analysis and assessment, according to the recommendations on methods for checking and measuring savings, developed by the European Commission. Therefore, this new Action Plan includes quantification of the energy savingsderived from the 2005-2007 and 2008-2012 Action Plans, approved, respectively, under agreement of the Council of Ministers on 8 July 2005 and 20 July 2007[3].

The second of these plans, the 2008-2012 Action Plan, was that submitted to the European Commission by the Spanish state as a first *National Saving and Energy Efficiency Action Plan(NEEAP)*. In so far as the 2008-2012 Action Plan was the continuation of the 2005-2007 Plan, both within the framework of the 2004-2012 E4,in this new Plan an evaluation has been made together with the results in terms of saving from both plans (this evaluation is included in the document in the section under the heading "Calculation methodologyfor the savings derived from the 2005-2007 and 2008-2012 Energy Efficiency Action Plans: Analysis of results").This document, however, includes the main results from the calculation of final energy savings with base year 2007, as set out by the European Commission in its methodological recommendations, in such a way that the savings derived from measures and actions implementedbefore this date do not appear in this calculation,although they are included in the previous separate document,which includes details of the savings calculated with base year 2004 (base yearfrom E4 2004-2012) and base year 2007 (base year proposed by the European Commission to determine the savings derived from the first national action plans).The previous results, together with the objectives proposed in this Plan for2016 and 2020, are detailed in Chapter 2 of this Plan (Chap.2:Final and primary energy savings: 2016 and 2020 objectives and 2010 results), whichfollow this first introductory chapter of the general context of the 2011-2020 Action Plan.

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[1]***National Energy Efficiency Action Plan***, in the terminology of Directive 2006/32/EC, of the European Parliament and Council, of 5 April 2006, concerning the efficiency of the final use of energy and energy services.

[2]Official Journal of the European Union, 27.4.2006.

[3]This Council of Ministers also approved the ***Saving and Energy Efficiency Plan for the State General Administration's buildings***.

Both the calculation of savings achieved up to 2010, and the objectives proposed for2016 and 2020 has been performed in terms of final and primary energy: despite the fact that Directive 2006/32/EC only requires reporting in terms of final energy for the sectors expressly included in its scope of application, this Planhas been designed with a comprehensive approach, including final and primary energy savings, to the extent thatit seeks to create a central tool for the Spanish state's energy policy.
The final and primary energy savings proposed in this document arein line with the final and primary energy consumption scenarios included inother planning instruments concerning renewable materials (in accordance with the obligations set out in Directive2009/28/EC, of 23 April 2009, relative to the promotion of energy usefrom renewable sources) and planning of transport infrastructure and distribution of electricity and gas. Therefore, the savings reported in this document —calculated in accordance with the methodological recommendations from the European Commissionfor the purposes of Directive2006/32/EC— are in line with the objectives relative to reducing greenhouse gases set by Spainin the context of the European Union's 20-20-20 strategy, although there are differences in the approach and calculation methods with theemission projections for 2020 reported to the European Commission. Likewise, the calculation of CO_2 emissions avoided as a result of the saving and energy efficiency measures included in this plan are *ad hoc*calculations for the same and assume a translation of the savingscalculated using different base years (2004 and 2007), in terms of final and primary energy, to emissions of CO_2 avoided - this calculation does not necessarily coincide, therefore, with that achieved with different approaches or accounting bases aspart of the periodic reports produced in relation to the evolution of greenhouse gas emissions.Likewise, this Plan assumes other strategies and plans in terms ofR+D+i, industrial policy or infrastructures already approved, as conditions required for the achievement of the final and primary energy saving objectives proposed for 2020.In this sense, this Plan integrates —although, strictly, does not form part of the same— other plans and programmes required for theglobal improvement of energy efficiency set as an objective. The improvement in energy efficiency —by its horizontal character— has been the backbone of all the public policiesto the extent that it can assure the achievement of the objectives concerningsafety of the supply, improved competitiveness and respect of the environment and, in particular, the aforementioned reduction in emissions of greenhouse gases.

Chapter 3 of this Plan goes deeper into the mechanisms and strategies that make the achievement of the saving objectives proposed by the different measures possible (Chap.3:*Strategies and action mechanisms for improving energy efficiency*). This chapter presents, synthetically and integrally,and for all the energy consumption sectors, the cooperation mechanisms between administrations implemented for the execution of the different saving measures. Basically, the policy-related and regulatory mechanisms —approved on the initiative of different ministerial departments—; themechanisms developed by the Ministry of Industry, Trade and Tourism (MITYC),through the Institute for Diversification and Energy Saving (IDAE), asresponsible for the implementation and monitoring of the saving and energy efficiency action plans; and, finally, the cooperation mechanisms set out with the Autonomous Communities for theexecution, mainly, of the measures directed at the diffuse sectors, where the greater proximity of the Administration to the citizen and final energy consumer is key to guaranteeing the effectiveness of the measure itself.

Chapter 4 (Chap. 4: *Cost-benefit analysis*) includes an analysis of global benefits associated with the 2011-2020 Plan, as a result, firstly, of the primary energy saving and the reduction in oil imports and, secondly, of emissions ofCO_2avoided with the implementation of the saving and energy efficiency mechanisms contained in the same.

Chapter 5 (Chap. 5: *Financing of the Plan: Source of Funds*) identifies the budget sections or mechanismswhich are derived from the economic resources required to encourage the adoption of saving and energy saving measures by the private sector.

Finally, in Chapter 6 (Chap. 6: *Determination of socioeconomic impacts relative to saving and energy efficiencyfor 2020*), carries out an analysis of the socioeconomic impacts of the Plan in terms of Gross Domestic Product(GDP) andemployment. This chapter is the last in the first part of the 2011-2020 Action Plan, that relating to the General Framework, in contrast to the second part of the same,in which the analysis of the situation and measures proposed for each of the sectors (*Sectoral Framework*) is discussed in detail.

The second part of the Plan focuses on sectoral analysis for each of the following sectors: Industry (Chap. 7),*Transport* (Chap. 8),*Buildings andEquipment* (Chap. 9),*Public Services* (Chap. 10),*Agriculture and Fisheries* (Chap. 11) and*Energy Transformation* (Chap. 12). For each of these sectors, there is a description of the current situation and the measures implemented as well as those planned tomake the achievement of the intermediate (up to2016) and general objectives (up to 2020) possible in each of the sectors; finalising each sector withquantification of the private investments and aids managed by the public sector required for the achievement of the objectives proposed.

The structure of this 2011-2020 Action Plan is adapted, as far as possible, to the templatedeveloped by the European Commission[4] and covers all the aspects set out in the same,including an individual analysis of the saving and energy efficiency measures. That whichrelates to the achievement of the provisions included in Directive 2006/32/EC,particularly, that which refers to the key exemplary role of the public sector, to theinformation from final consumers and to the promotion of energy services on the market, includes in section 1.3, within the presentation of the general outline of the Action Plan, although it is developed in depth -when required— in the corresponding sectoral chapter.

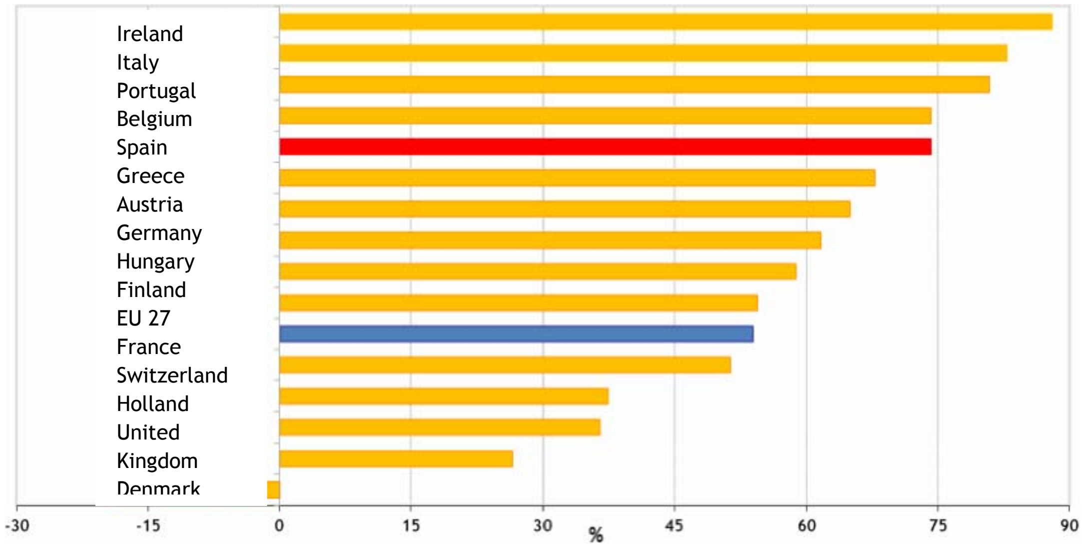
[4]***Guide and template for the preparation of the second national energy efficiency actionplans***. Final version. Prepared by European Commission, Joint Research Centre. Ispra, Italy,19/11/2010.

1.2 National context of the Action Plan: energy policy, consumption andintensities

.-Evolution of energy production and degree of self-sufficiency

Spain is characterised by having a consumption structure dominated by petroleum products, almost all of which are imported, which, together with the reduction in the supply of native resources, has contributed to increased energy dependency,close to 80%,higher than the European average (54%).

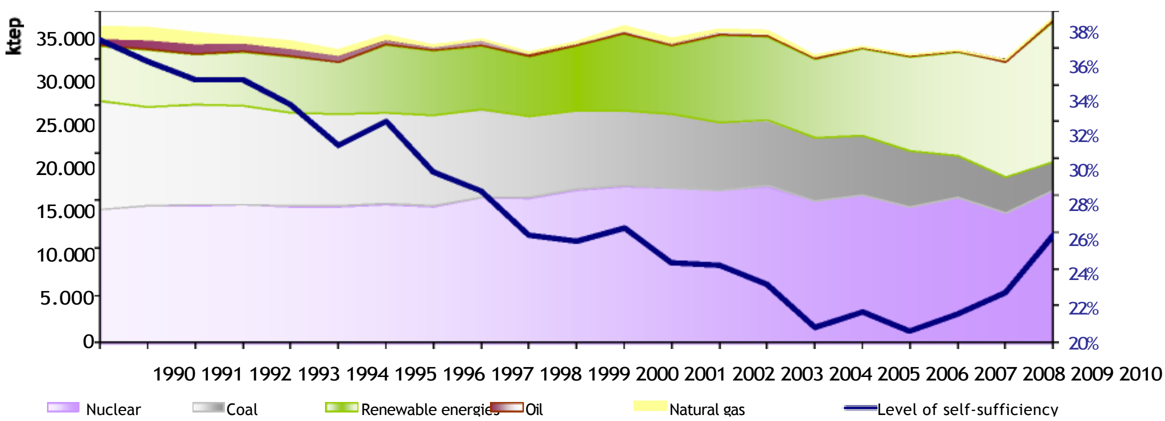
Graph 1.1. Energy dependency in Spain and EU27



Source: EUROSTAT (2009)/MITYC (2010)

This situation presents a certain change in its trend from 2005, in the context of the current policies concerning renewable energies and energy efficiency,showing a gradual improvement in our level of self-sufficiencyreaching 26% in 2010.

Graph 1.2. Evolution of interior energy production and the degree of self-sufficiency

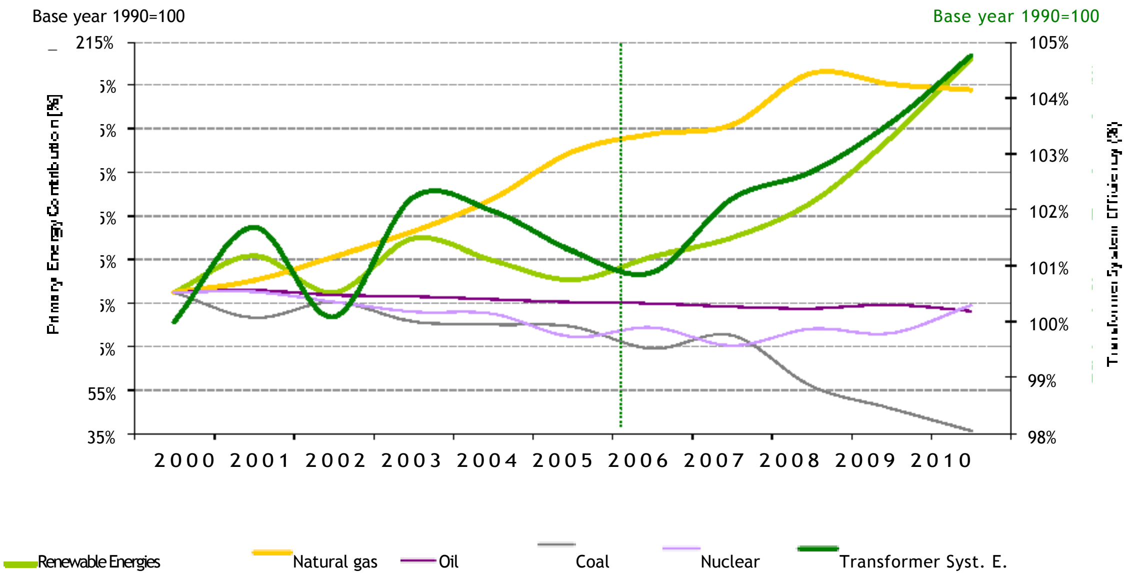


Source: MITYC/IDAE

If it is a fact that national energy dependency continues to be considerable, the positive effect that the intensification and synergy of the policies mentioned in the energy efficiency and renewable energy sectorshas had on improving our level of self-sufficiency is indisputable, making better coverage,with native resources, of the national energy demand possible.An additional consequence has been the improved energy efficiency of our transformer system, this being expressed as the relationship between total final and primary energy demands.

Likewise, the greater output associated with electricity generation technologiesbased on renewable energies and natural gasin cogeneration and combined cyclesand the gradual involvement of these technologies in the energy mix, has achieved a reduction in primary energy needs,enhanced, also, by moderation of the final demand derived from energy efficiency actions. Proof of this is the correlation that appears to exist in the evolution of the rise of the contribution of the aforementioned energy sources with the primary energyand the improved efficiency of the transformer system.

Graph 1.3. Effect of renewable energies on the transformer system



Source: MITYC/IDAE

.-Evolution of energy consumption and intensity in Spain

The energy demand has experienced an upward trend in the last three decades,during which there have been four economic energy crisesglobally (1973, 1979, 1993 and 2008), with a negative impact oneconomic activity and the energy demand of the majority of developed countries. However, at the start of the 70s, this situation served as acatalyst for tackling policies based on reducing energy dependency and improving efficiency. In Spain, this reaction manifested with almost a decade ofdecline (until the end of the 70s), which affected the industrial restructuringof the measures in the 80s.

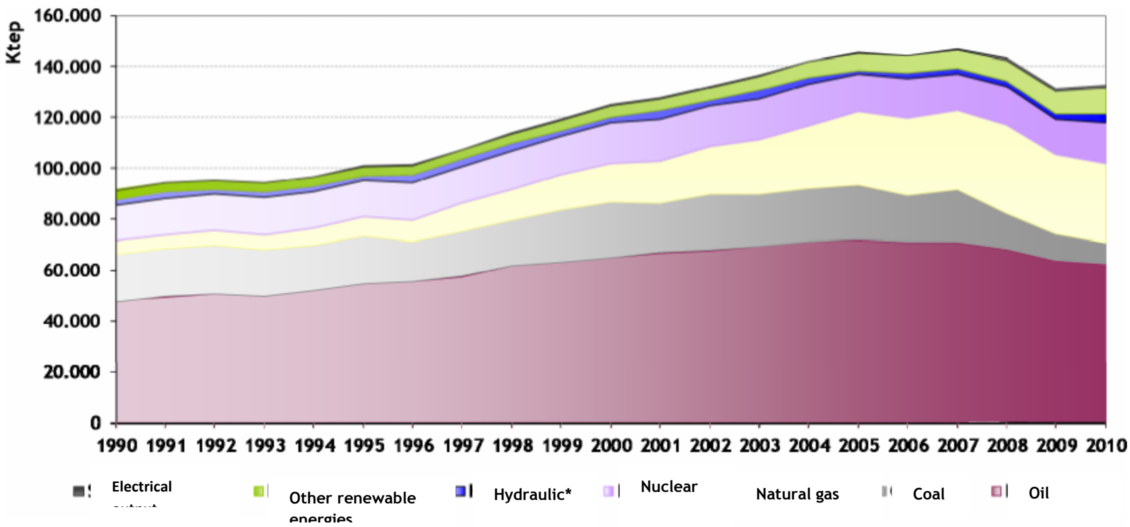
The subsequent economic expansion of our country,since its incorporation in the EU, resulted in an increase in purchasing power, which is reflectedin more cars and domestic equipment, as well asa source developed from the housing sector, factors, among others, which have been decisive in upward trends in energy consumption. At the start of the 90s, anew crisis was echoed by a slight attenuation of the energy demand. The subsequentevolution maintained an upward trend in 2004, beginning, thereafter, a new stage in the evolution of the energy demand, fostered,among others, through the implementation of actions under the Saving and Energy Efficiency Strategyin Spain 2004-2012 (E4), approved in November2003. This turning point marks a divergence in the evolution of the Gross Domestic Product (GDP) of energy consumption.

These characteristics are still true even today strengthened by the effect of the international financial crisis which began in the second half of 2008. In Spain, the effect of this crisis was shown through the decline experienced in the construction sector which, traditionally, was one of the driving forces behind the national economy. The fall in this sector's productivity and,in general, the Spanish economy as a whole,this has been accompanied by a sharp decrease in energy demand,which confirms the existence of factors linked to greater energy efficiency,others and prior to this crisis, which impacts on the improvement in the intensity indicators.

Trends in primary consumption and intensity:

Therefore current trends show synergy of the effectsderived from the change recorded since 2004 in the improvement inenergy efficiency and the crisis which, together, have resulted in a sharp decline in energy demand.

Graph 1.4. Evolution of primary energy consumption



Note: includes Mini Hydraulic

Source: MITYC/IDAE

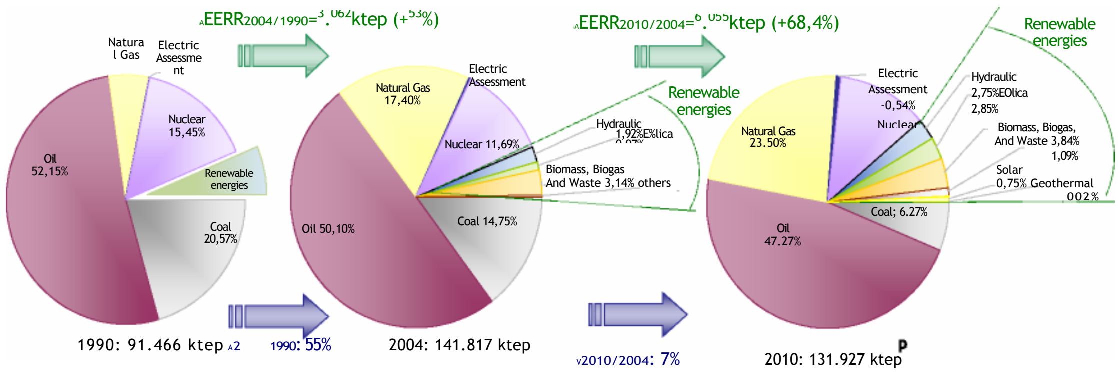
The structure of the national primary energy demand has changed in recent decades. Of course, this change is more evident from the second half of the 90s,when energy sources, such as renewable energies and natural gas,burst onto the scene, gaining ground on coal and oil, which are, traditionally, more dominant in our energy basket;this caused the significant diversification of energy self-sufficiency.

This was possible, in large part, due to the actions in the different plans relative to the gas and electricity sectors, which meant greater developmentof the energy infrastructures required for the integration of the new renewable energy.

In 2010, primary energy consumption in Spain was 131.927 Ktep,which was a slight increase in consumption with respect to 2009, the year in which Spain recordeda record fall in demand of 8.3% with respect to 2008. The2009-2010 period represents an abnormal situation due to the crisis, which explains the sharp decrease in energy demand in 2009 and the slow recover in 2010.However, essentially, the global trendfor moderation of the demand started earlier in 2004.

Graph 1.5. Evolution of the structure of primary energy consumption by energy source

Source: MITYC/IDAE



In this situation marked by the crisis, which meant a change in the rate of evolution of the demand and its structure by source, the renewable energy trajectory is an exceptional constant; renewable energy is the only energy source whose demand didn't fall, maintaining annual increases greater than 9% from 2006,exceeding this threshold in 2009 and, even, doubled in 2010, which assumed a 23% increase in 2010 in the demand for these resources.

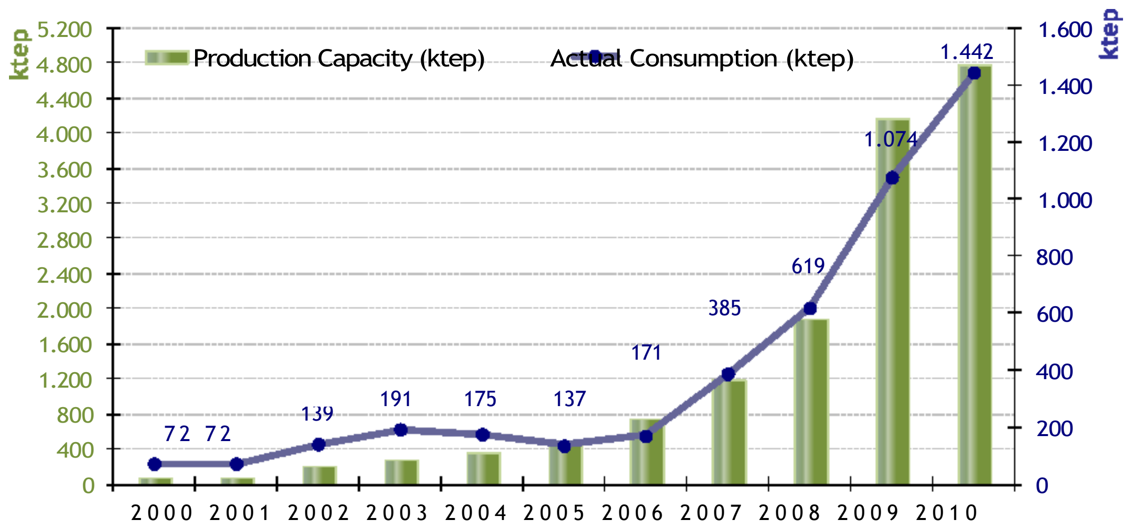
This situation led to an 11.3% coverage in the final energy demand. Contributors to this were, mainly, wind energy, bio fuels and solar energy, which showed high activity in 2010 with increases in their consumption of 15%, 34% and 41% respectively,of course, in absolute terms,biomass is the most relevant renewable energy resource, with more than 30% of all renewable productionof primary energy.

The dynamism shown after 2005 in the areas linked to bio fuels and solar energy brought about, among others,by the Renewable Energies Plan(REP) 2005-2010, which led to a radical change — from marginal participation to growing visibility—, especially insectors such as transport and buildings, in both the tertiary and residential sectors. This latter was strengthened by advanced in legislation linked to buildings as well as by other parallel incentives appearing in the successive 2004-2012 Saving and Energy Efficiency Action Planin Spain (E4).

The production capacity of bio fuels has shown a gradual increase, exceeding, at the end of 2010,4,7 Mtep. Consumption of this type of fuel, although it recorded a significant increase in the last five years, continues to present a significant differential in relation to production capacity.

In this respect, both the approval of Order ITC/2877/2008, of 9 October, which establishes amechanism for promoting the use of bio fuels and other renewable fuels for transport, and Royal Decree459/2011 of 1 April, which sets out the obligatory bio fuel objectives for 2011, 2012 and 2013 relative to the consumption of transport,;this is expected to provide greater dynamism to the market for these products, with the consequent advantagesin terms of environmental benefits and the reduction in energy dependency.

Graph 1.6. Evolution of bio fuels: consumption and production capacity



Source: MITYC/IDAE

A similar analysis of the evolution of the primary intensity enables reporting of the effect of thedifferent crises and reaction policies with respect to this indicator.

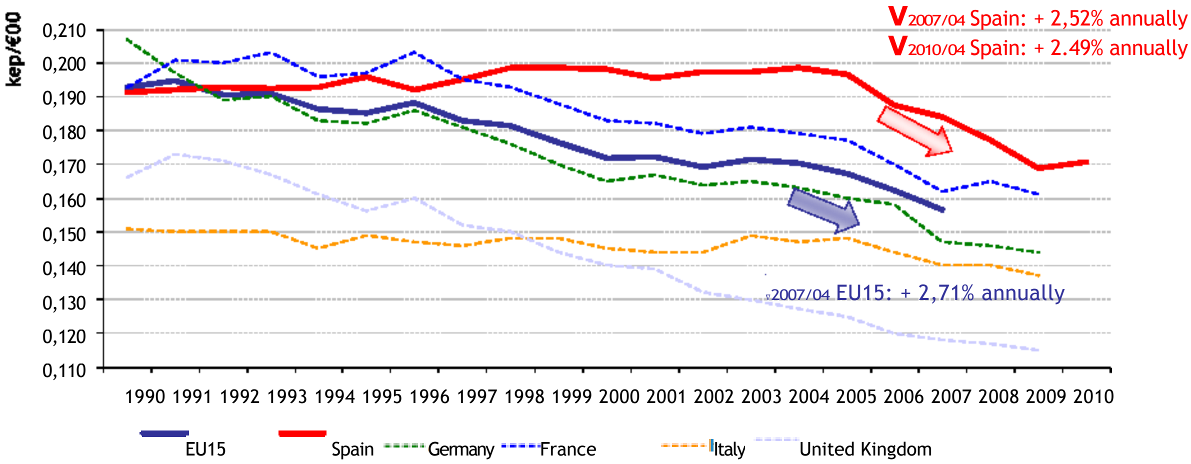
A clear example is the actions implemented at the end of the 70s, as a reaction to the energy crisis in 79; the result was improved energy intensity. However, this improvement did not last long with theindicator worsening after the subsequent recovery and economic expansion. This situation continued in the 90s and until the start of the new century,showing a growing divergence with respect to the average trend observed in the whole EU. 2004 presented a new milestone,breaking the previous trend due to the confluence of structural effects and others relative to technological nature, which led to improved primary intensity.

Since then, the improvement continued, and continues today,strengthened by the crisis, which achieved a reduction in2009 of 4.8% in the indicator mentioned, a result, among others, of the sharp decrease in primary energy, in terms of the Product

Gross Domestic Product (GDP), which, in turn, in 2009, recorded a fall of 3.7% as a result of the fall in economic activity caused by the crisis.

In 2010, a slight increase in demand and a slowdown in the fall of GDP was recorded, a circumstance which caused the intensity indicator to worsen slightly, by 1.2%, which, in principle,appears to be temporary, without affecting, essentially, the general trend which started five years ago.

Graph 1.7. Evolution of primary intensity in Spain and in the EU



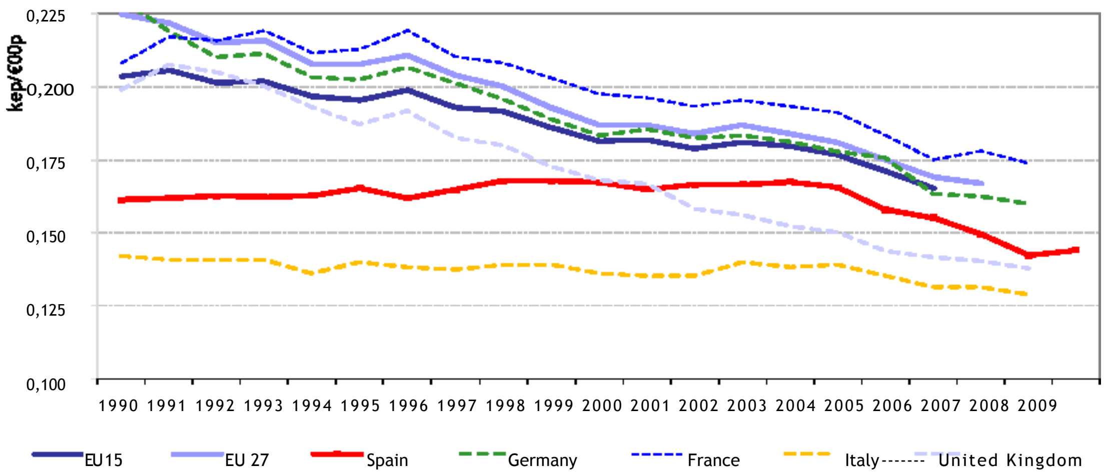
Source: EnR/IDAE

As a global assessment of the 2009-2010 period, the most pronounced fall in primary energy demand appears to indicate the existence of factors which, independently from the crisis, from 2004, had a positive influence on improved energy intensity.

Among these factors, the incorporation of more efficient generation technologies into the energy mix is highlighted —renewable energies, cogeneration and combined cycles—. Thissituation has led to, since them, a cumulative 15% reduction in energy consumption required to obtain one unit of GDP. However, parte, it was the aforementioned moment when a gradual convergence in the evolution of the national primary intensity indicator began to be noticed with respect to thecorresponding European average, which indicates an approximation of the trends recorded in recent years in terms of improved energy efficiency.

The analysis of the indicator in terms of purchasing power parity allows for a comparison of the trends in energy intensity between the most accurate countries. This type of analysis highlights the differences relative to the different pricing levels existing in EU countries,giving rise to a GDP adjustment for different countries.

Graph 1.8. Evolution of the primary intensity relative to purchasing power parity in Spain and the EU



EU27 = Reference; Source: EnR/IDAE

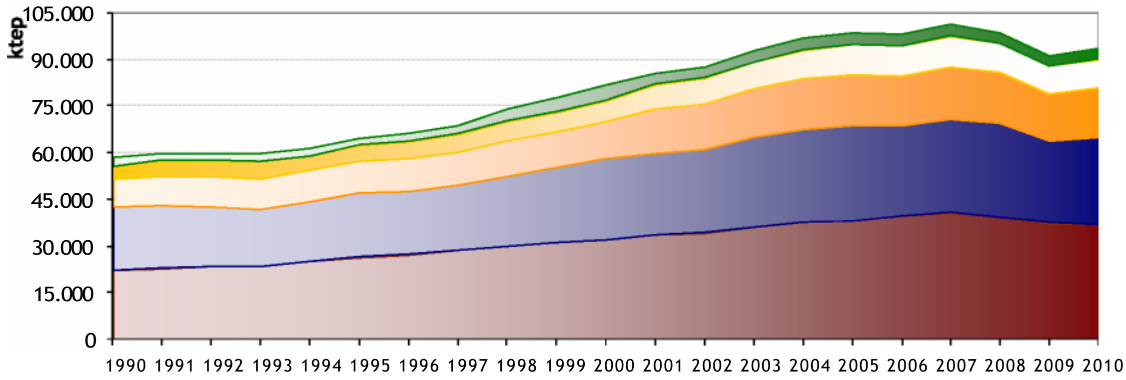
The result is a decrease in intensity in countries like Spain, with a lower cost of living, and an increase in those countries where the opposite is true. Inany case, the use of purchasing power parities does not affect intensity trends, resulting in a more realistic indicator for international comparisons. As a result of the application of this indicator, Spain presents primary intensity at purchasing power parity which is slightly lower than the European average.

In the current context marked by uncertainty, it is hoped that the crisis will act as a catalyst to stimulate the necessary changes relative to potential improvements in efficiency and energy savings, which, in the long term, will assume an economic saving and the improved competitiveness of our economy.

Trends in final consumption and intensity:

With respect to final energy consumption, the evolution followed a trend similar to that seen for primary energy, showing, equally, a trend towards stabilisation and contraction of the demand from 2004, as well as the effect of the current crisis in the 2009-2010 period.

Graph 1.9. Evolution of final energy consumption by sector

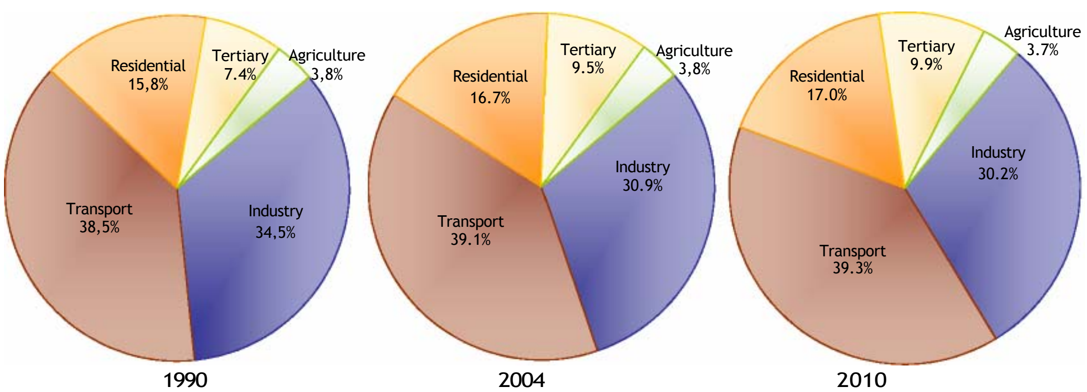


Note: Provisional 2010 sectorisation.

Source: MITYC/IDAE

Based on the sectoral distribution of demand, the transport sector is the biggest consumer with 39.3% of total final consumption,mainly, based on oil products, which, in large part, determine the increased national energy dependency. Industry is next in order of size, with 30.2% of consumption,which the various use sectors follow,highlighting, with increasing prominence, the residential and tertiary sectors.

Graph 1.10. Evolution of the sectoral structure of final energy demand

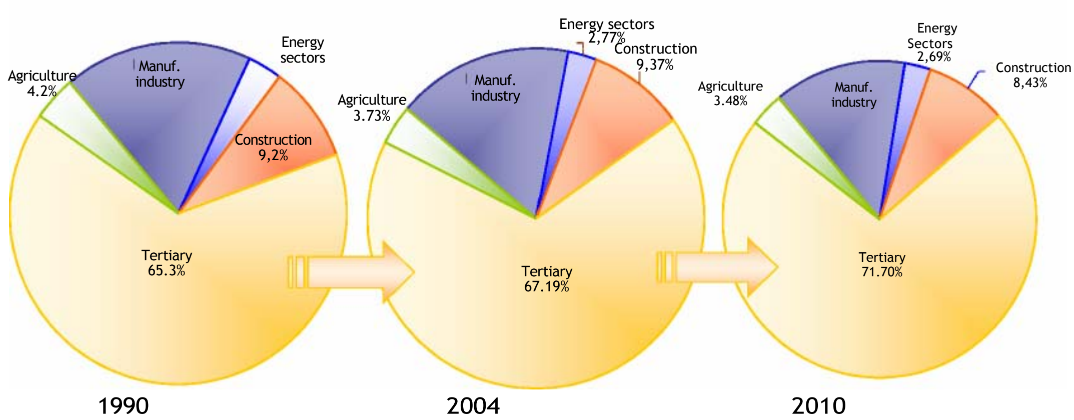


Note: Provisional 2010 sectorisation.

Source: MITYC/IDAE

In particular, the expansion of the tertiary sector, especially that related to tourism,with its impact on energy demand and national productivity, contributes to strengthening the phenomenon which started in 70s relative to the tertiarisation of the Spanish economy, which acts as adamping factor for the energy intensity at a global level. This is due to its high contribution to GDP, six times greater than the corresponding contribution to the total energy demand.

Graph 1.11. Evolution of the GDP's sectoral structure



Note: Calculation of GDP without taxesSource: IDAE/INE

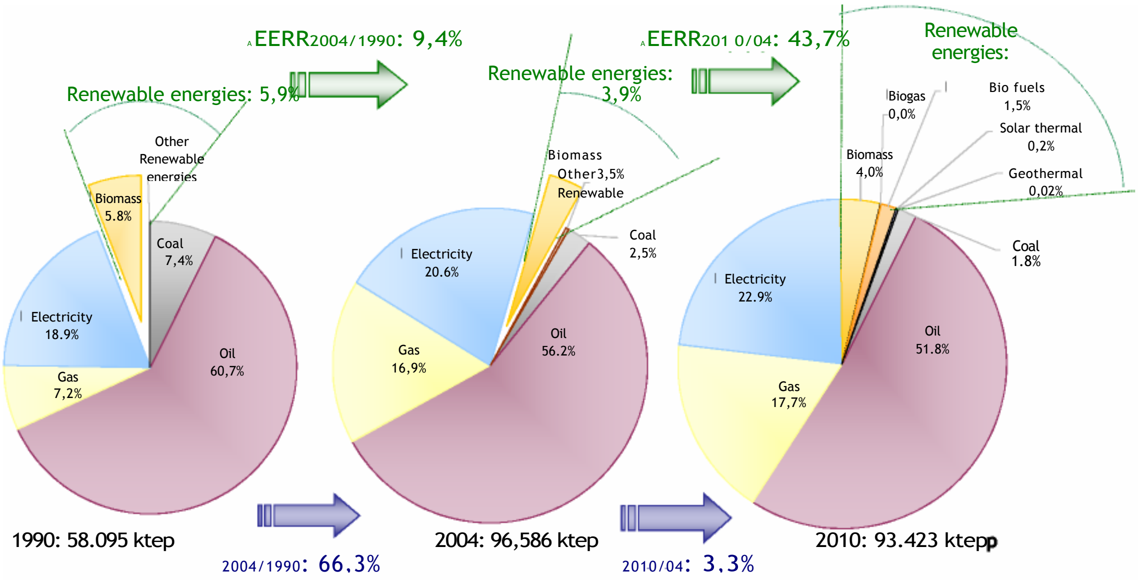
Source: INE/IDAE

Currently, essentially, the sectoral trends remain the same, of course industry—especially the construction and self-propulsion sectors—, was particularly affectedby the crisis, experiencing a sharp slowdown in 2009,demonstrated by the 16.2% fall in the *Industrial Production Index (IPI)* and 10.4% fall in *Gross Value Added* in said year,up from the fall in GDP.

Notwithstanding the foregoing, the sectoral structure of final energy consumption has hardly changed, given that in the context of the current crisis, all the final use sectorshave moderated their energy demand, which, in relative terms,translates into some stability in terms of participation of the different sectors in the energy demand.

An assessment of the evolution of energy consumption broken down according to sources shows,again, an acceleration in the contribution to the demand from renewable resources in recent years. Therefore, the increase in consumption from these sources in the 2004-2010 periodquintuplicates that from the start of the 90s. This reflects a firm commitment in favour of greater incorporation of these resources into our energy basket, particularly, from 2005,as well as greater moderation in the demand from consumer sectors, a result of actions such as those set out in the *2004-2012 Saving and Energy Efficiency Strategy for Spain(E4)*. This circumstancemakes 2004 a turning point in the analysis of energy efficiency.

Graph 1.12. Evolution of the structure of final energy consumption by energy source



Source: MITYC/IDAE

In 2010, final energy consumption experienced a 2.8% increase with respect to the previous year, in which demand fell by 7.7%. This recovery can be seen for practically all of the energy sources, with the exception of oil products, the demand for which continues to decrease. Similarly to the previous analysisin terms of primary energy, it should be pointed out that the favourablecontribution of renewable energies, the only sector to maintain an upward trend at all times,represents the thermal demand from these sources at around 6% of the total demand;this is triple the coal's contribution to final demand.

A detailed analysis of the sectoral energy demand highlights industry as the sector that has shown the most sensitivityto the effects of the crisis. Insaid year, in a generalised context of moderation of the energy demand,this is the one that experienced the most contraction, decreasing its demand by 12.5% in 2009,well above that observed for all the end-use sectors.

Table 1.1. Structure of final energy consumption by sector and source in 2009

	Structure (%)of Consumption by Source and Sector					TOTAL (ktep)	2009/08 (%)					
	Coal Oil	Gases		Renewable Energies	Electrical		TOTAL	for Coal	Oil Gases		Renewable Energies	Electrical
Industry	5,5%	15,2%	40,2%	6,0%	33,0%	26.468	-12,5%	-30,5%	-11,5%	-14,5%	-4,5%	-9,3%
Transport	--	95,9%	--	2,8%	1,3%	37.464	-4,7%	--	-6,0%	--	73,1%	-0,8%
Various Uses	0,1%	32,2%	15,7%	8,6%	43,4%	26.975	-6,6%	5,0%	-10,3%	-6,2%	2,3%	-2,9%
Residential/	0,1%	29,5%	22,1%	14,2%	34,0%	15.754	-4,2%	2,7%	-10,9%	-6,1%	2,0%	-2,9%
Services	0,04%	21,7%	7,3%	1,4%	69,6%	9.150	-2,9%	17,1%	-7,8%	6,2%	1,9%	-2,9%
Agriculture	--	76,1%	8,5%	1,4%	14,0%	3.155	-8,2%	--	-11,3%	-6,1%	19,3%	-3,0%
TOTAL (ktep)	1.427	49.032	14.639	4.828	20.980	90.906	-7,7%	-31,4%	-7,3%	-13,2%	10,4%	-5,7%

Source: MITYC/IDAE.

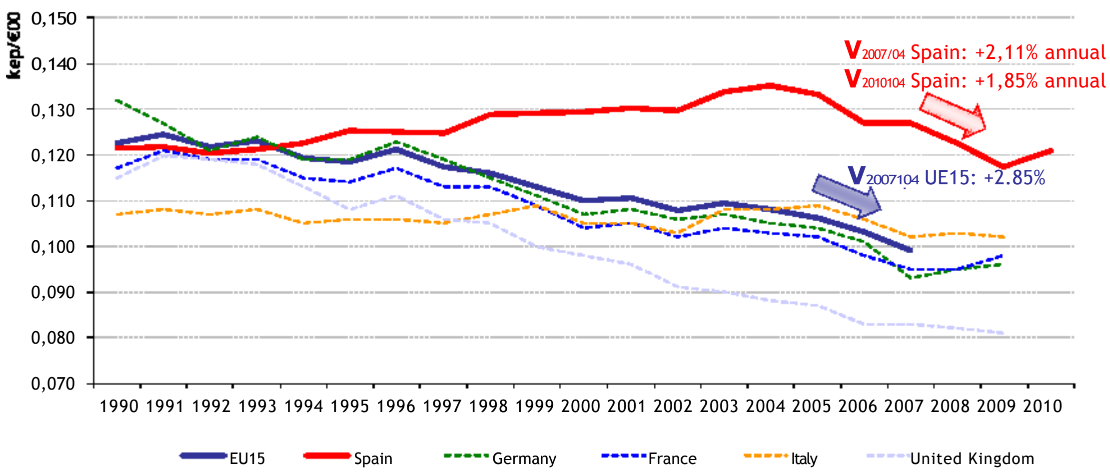
This is due, in part, to the structure of national industry, which includes sectors dependent on construction. In general, the crisis caused a halt in production linked toall types of activity in this sector and, more specifically,in relation to non-metallic minerals and the iron and steel industry, in addition to that in others such as chemical, which, together, represent over 50% of all energy demand in this sector.

However, these subsectors are characterised by a increased demand for oil products and natural gas, equivalent to two thirds of the global demand from these energy sources on the part of industry. The impact of the crisistranslated into a significant decrease in consumption of oil and gas, which explains, if not all, a large part of the decrease recorded in 2009 relative to the global demand from these energy products.

Another critical sector, with repercussions for the national energy demand, is the transport sector,given its high dependency on fossil fuels, as well as the complexity associated with its fragmentednature and its links to other economic activity sectors, such asindustry, trade and tourism, without forgetting its high environmental impact. This sector, similar to industry,was very affected by the crisis, recording less mobility associated with the carriage of goods by road, a mode of transport that is responsible for the bulk of oil product consumption. This explains the 6% reduction in oil demand in this sector in 2009, reinforcing the negative effect of the industrial crisis on these fuels.

Similar to that which occurs in the 2010 assessment of primary intensity, this contexthas led to some abnormal and erratic behaviour in final intensity, with a 3.9%decrease in 2009, followed by a subsequent 2.4% increase in 2010. Going back to the last two decades, the trend seen forfinal intensity has been parallel to that of the equivalent primary intensity indicator,showing greater convergence with the European average after 2004.

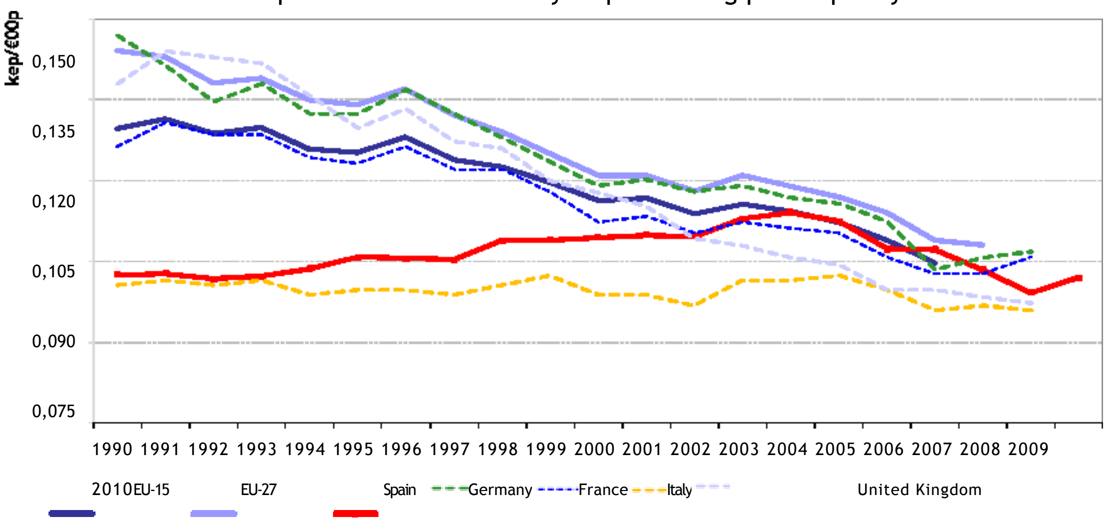
Graph 1.13. Evolution of final intensity in Spain and in the EU



Source: EnR/IDAE

Similarly, the analysis of the previous indicator at purchasing power enables similar conclusions to be drawn,improving the national position with respect to the European average, due to the correction introduced through said adjustment.

Graph 1.14. Final intensity of purchasing power parity

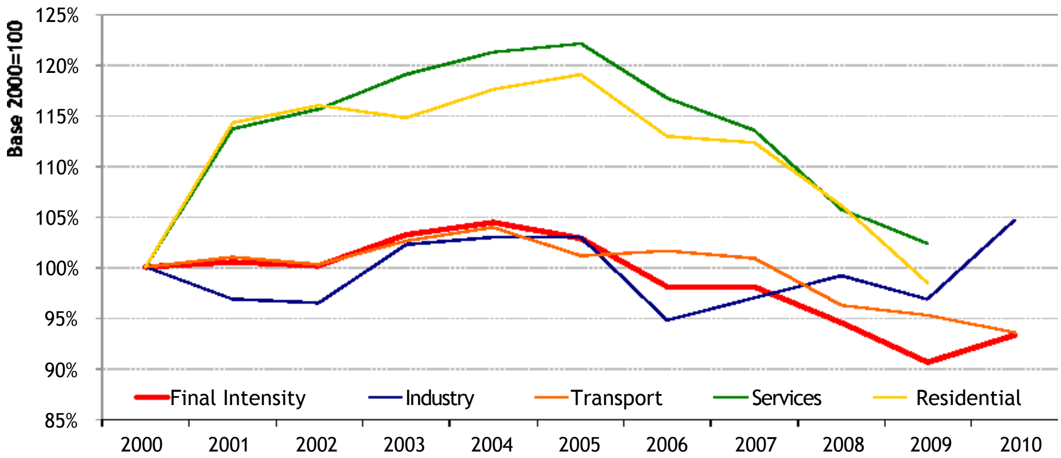


Reference: EU27; Source: EnR/IDAE

Source: EnR/IDAE

The improvement is not only due the crisis, since prior to the start of said crisis,improvements in intensity were identified relative toefficiency policies concerning the final use of energy, technological improvements and structural changes. These phenomena continue having a positive impact on improved energy efficiencyin the context of the current crisis. The latter shows,from the analysis of the final intensity indicator at constant structure,the favourable effect of the aforementioned factors,highlighting the importance that technology and energy efficiency appear to have gained in recent years.
Finally, a comparison, in relative terms, of the evolution of the sectoral and final intensities forthe whole economy, highlights two sectors with greater weight in terms of global intensity: transport and industry. Thus, theglobal intensity trend evolves in parallel to that of the two intensity indicators for this sector.

Graph 1.16. Evolution of the final and sector intensities in Spain



Source: IDAE/MITYC

Likewise, despite the lesser relevance of energy intensity in the sectors integrated into Various Uses—Residential, Services and Agriculture and Fisheries—,the largest growth in relative terms can be seen throughout the last decade. However, practically all the sectors share a common denominator: the upward trend of associated intensities.

1.3 General diagram of the Action Plan: measures and strategies or action mechanisms

This section presents the general structure of the 2011-2020 Action Plan, that is, the complete relationship of the measures and mechanisms contained in the Plan to make the achievement of the objectives possible. The following table (Table 1:*Measures and action mechanisms from the 2011-2020 Action Plan*) shows a comprehensive matrix of themeasures contained in the Plan and instruments or mechanisms that will make this achievement possible: the action mechanisms correspond—although not accurately— to the categories proposed by the European Commissionin Annex 1 of the template developed for the preparation of the second national saving and energy efficiency action plans.

This diagram will be developed in more detail in Chapter 3 of the Plan: a)direct action programmes from the MITYC, through the IDAE; b) jointIDAE and Autonomous Communities action programmes; and c) policy-related mechanisms or provisions.The saving and energy efficiency measures included in the Plan will be executed making use of different action mechanisms: basically, withgenerally all of them, policies and aids. That is to say, the achievement of thesaving objectives proposed for a good number of measures requires (or required) a policy-related effort complemented by the availability of sufficient support for final energy consumers,in the form of direct subsidies,which made the change in consumption patterns possible or the adoption of new technologies which made the savings calculated possible.

The matrix shown in Table 1 enables the checking, quickly, of those that have been theexecution mechanisms of each of the measures contained in the 2005-2007 and 2008-2012 Action Plans—which were the subject of evaluation[5]— andthose will be the execution mechanisms for the new measures contained in this 2011-2020 Action Plan. A good part of the measures contained in this new 2011-2020 Action Planhave already been incorporated into previous plans,although, for all of them, they propose new objectives and new mechanisms which will make the achievement of the objectives set out possible. Logically. the intersectionof the measure and the mechanism indicates whether or not it is expectedto achieve the objectives of the measure making use or not of the related mechanism.

Within each category of mechanisms, subcategories have been established in accordance with those set out in Annex 1 of the template prepared by the European Commission.

[5]See annexed document "*Calculation methodology for the savings derived from the 2005-2007 and 2008-2012 Saving and Energy Efficiency Action Plans. Results analysis*".

Within the cooperation mechanism or joint action from IDAE and the Autonomous Communities, we can distinguish between aid mechanisms (“*financialinstruments*") and training, communication and information mechanisms("*information and mandatory measures*"). Practically all the measures containedin the 2005-2007 and 2008-2012 Action Plans were executed in the context of thecollaboration agreements signed with the Autonomous Communities described in Chapter 3(Chap. 3:*Strategies and action mechanisms for the improvedenergy efficiency of this Plan*, with the exception of those that affected modes of transportoutside the autonomous competencies (maritime and air)and others requiring more complex action mechanisms. Logically, the execution of these measures in the context of saidcollaboration agreements does not exclude the use of otheraction mechanism for the achievement of the objectives proposed for each of the measures, in a complementary manner.

In accordance with the foregoing, within the direct action programmes from the Ministry of Industry, Trade and Tourism, through the IDEA,we can distinguish, again,between aid mechanisms ("financial instruments"), training, communication and information mechanisms("information and mandatory measures")and promotion and dynamisation measures relative to the energy services market("energy services for energy savings"). The mechanisms approved for the promotion of the electric vehicle constitute aid mechanisms,but they have been highlighted in Table 1in the same way as the rest of the specific measures directed at the Transport Sector, as proposed in Annex 1 of the template prepared by the European Commission. The direct action programmed from the IDAE listed in this table will be described in more detail in Chapter 3(Chap. 3: Action strategies and mechanisms for improved energy efficiency in this Plan.

Within the policy-related mechanisms or provisions, the most relevant for 2020 will be Law 2/2011, of 4 March, concerning Sustainable Economy and those provisions from it. In addition to Law2/2011, of 4 March concerning Sustainable Economy, within the category of policy-related mechanisms or provisions, 5 subcategories have been established: 1)training, communication and information; 2) establishment of energy efficiency standards; 3) exemplary role of the public sector[6]; 4)promotion of cogeneration; and 5) other mechanisms, under which we have tried to group all the policy-related provisions approved within the 2005-2007 and 2008-2012 Action Plans.

[6] In Annex 1 of the template prepared by the European Commission, the exemplary role of thepublic sector is a subcategory in the information measures category. However,in this 2011-2020 Action Plan, that relating to the exemplary role of the public sector appears in the policy-related provisions category, since3 there are a good number of provisions guaranteeing the exemplary role of the public sector,, as well as also appearing in the"direct action programmes from MITYC/IDAE" category,not only for the exemplary actions realised by IDAE for the replacement of traffic light opticswith new LED technology, but also within the specific plans relative to the promotion and dynamisation of the energy services market(which has been focused on the different Public Administrations' energy consumer sectors.

Diagram 1.1. Measures and action mechanisms from the 2011-2020 Action Plan

MEASURE CODE	SECTOR	MEASURE NUMBER	ACTION MECHANISMS																		
			A. IDAE-AUTONOMOUS COMMUNITIES COOPERATION PROGRAMME		B. DIRECT ACTION PROGRAMMES FROM THE MITYC/IDAE												C. POLICY-RELATED PROVIDIONS		
					B.1 PUBLIC AID MECHANISMS						B.2 YTRAINING, COMMUNICATION AND INFORMATION		B.3 PROMOTION AND DYNAMISATION ACTIONS RELATIVE TO THE ENERGY SERVICES MARKET			C.1 TRAINING, COMMUNICATION AND' INFORMATION		
									PROMOTION OF THE ELECTRIC VEHICLE									
			PUBLIC AID MECHANISMS	TRAINING, COMMUNICATION AND INFORMATION	IDAE Strategic Grants Programme	2009 and 2010 campaign to distribute Low –Consumption Lamps	2-for-1 low consumption lamps campaign	Programme to replace traffic lights with new LED technology	Pilot project for the promotion of the electric vehicle (MOVELE)	Strategy to promote the electric vehicle in Spain 2010-2014	Communication and dissemination (campaigns)	Programmes for the efficiency driving of commercial vehicles	Saving and energy efficiency plan for the State General Administration's buildings	Energy efficiency action plan for the State General Administration's buildings	Plan to promote the contracting of energy services (A.C.M. of 16/07/10)	Initial qualification and continuous training of drivers of specific road transport vehicles (RD 1032/2007 OF 20/07/2007)	Motor vehicle driving licence in terms of control points and speed limits	Introduction of efficient driving in driving tuition
1.1	INDUSTRY	Energy audits																
1.2		Improved technology of equipment and processes (MTD)																
1.3		Implementation of energy management systems																
2.1	TRANSPORT	Urban Mobility Plans																
2.2		Transport plans for companies																
2.3		Greater participation of collective means in road transport																
2.4		Greater participation of rail transport																
2.5		Greater participation of maritime transport																
2.6		Transport infrastructure management																
2.7		Road transport fleet management																
2.8		Aircraft fleet management																
2.9		Efficient driving of private vehicles																
2.10		Efficient driving of lorries and buses																
2.11		Efficient flying of planes																
2.12		Renovation of the road transport fleet																
2.13		Renovation of the aircraft fleet																
2.14		Renovation of the maritime fleet																
2.15		Renovation of private vehicles																
3.1	BUILDINSG AND EQUIPMENT	Energy renewal of the thermal envelope of existing buildings																
3.2		Improvement in the energy efficiency of thermal installationsin existing buildings																
3.3		Improvement in the energy efficiency of interior lighting installationsin existing buildings																
3.4		Construction of new buildings and renovation of existing buildings withhigh energy ratings																
3.5		Improved energy efficiency of cold commercial plants																
3.6		Construction or renewal of buildings with nearly zero energy consumption																
3.7		Improvement of the energy efficiency of electrical appliances																
4.1	PUBLIC SERVICES	Renovation of existing exterior public lighting installations																
4.2		Studies, feasibility analysis and audits of existing externallighting installations																
4.3		Training of municipal energy managers																
4.4		Improved energy efficiency of current drinking water, supply, waste water purification and desalination plants.																
5.1	AGRICULTURE AND FISHERIES	Promotion and training of technicians in the efficient use of energy in theagriculture and fisheries sector.																
5.2		Incentives for migration from spraying or gravityirrigation systems to localised irrigation systems.																
5.3		Improvement in saving and efficiency in the fisheries sector																
5.4		Energy audits and action plans to improve arable farms																
5.5		Aid for migration to conservation agriculture																
5.6		Tractor RENOVE plan																
6.1	ENERGY TRANSFORMATION	Feasibility studies for cogenerations																
6.2		Energy audits for cogeneration																
6.3		Promotion of cogeneration plants in non-industrial activities																
6.4		Promotion of small capacity cogeneration plants																
6.5		Promotion of cogeneration plants in industrial activities																
6.6		Substantial modification of existing cogenerations																

Exemplary role of the public sector.

Actions in the transport sector.

The coloured cells indicate the measure's planned objectives making use of the mechanism involved.

Diagram 1.1. (cont.): Measures and action mechanisms from the 2011-2020 Action Plan

MEASURE CODE	SECTOR	MEASURE NUMBER	ACTION MECHANISMS																
			C. POLICY-RELATED PROVIDIONS																
			C.2 ESTABLISHMENT OF ENERGY EFFICIENCY STANDARDS									C.3 EXEMPLARY ROLE OF THE PUBLIC SECTOR			C.4 PROMOTION OF COGENERATION		C.5 OTHER MECHANISMS		
			Regulation 443/2009 concerning CO_2 emissions for new vehicles	Pneumatic labelling (EC REGULATION No. 1222/2009 of 25/11/2009)	Energy labelling for new vehicles	Energy labelling for tractors	Ecolabelling. Ecological design requirements applicable to energy-related products (DIRECTIVE 2009/125/EC of 21/10/2009) and Ecolabelling directives for specific	Technical Building Code (R.D. 314/2006 of 17/03/2006)	New RITE (R.D. 1027/2007 of 20/07/2007)	Energy rating for buildings (R.D. 47/2007 of 19/01/2007)	Energy efficiency regulation for external lighting installations and their TBCs (RD 1890/2008 of 14/11/2008)	Framework agreement for the supply of vehicles to the State General Administration (BOE nº 126 of 25/05/2009)	Plan for the public contracting from the State General Administration and its Public bodies and the Social Security management entities (Order PRE/116/2008 of 21/01/2008)	Directive 2009/33/EC relative to the promotion of energy clean and efficient road vehicles (Sustainable economy law Art. 106, 107)	Promotion of cogeneration (RD 616/2007 of 11/05/2007)	Activity of producing electricity in special operating mode (RD 661/2007 of 25/05/2007)	2005-2020 Strategic infrastructure and transport plan (PEIT)	Plan for the renewal of private vehicle, plan PREVER, plan VIVE and others)	2010-2014 Sustainable rural development programmes (RD 752/2010 of 04/06/2010) National irrigation plan
1.1	INDUSTRY	Energy audits																	
1.2		Improved technology of equipment and processes (MID)																	
1.3		Implementation of energy management systems																	
2.1	TRANSPORT	Urban Mobility Plans																	
2.2		Transport plans for companies																	
2.3		Greater participation of collective means in road transport																	
2.4		Greater involvement from rail transport																	
2.5		Greater involvement of maritime transport																	
2.6		Transport infrastructure management																	
2.7		Road transport fleet management																	
2.8		Aircraft fleet management																	
2.9		Efficient driving of private vehicles																	
2.10		Efficient driving of lorries and buses																	
2.11		Efficient flying of planes																	
2.12		Renovation of the road transport fleet																	
2.13		Renovation of aircraft fleets																	
2.14		Maritime fleet renovation																	
2.15		Renovation of the private vehicle fleet																	
3.1	BUILDINGS AND EQUIPMENT	Energy renewal of the thermal envelope of existing buildings																	
3.2		Improvement in the energy efficiency of thermal installationsin existing buildings																	
3.3		Improvement in the energy efficiency of interior lighting installationsin existing buildings																	
3.4		Construction of new buildings and renovation of existing buildings withhigh energy ratings																	
3.5		Improved energy efficiency of cold commercial plants																	
3.6		Construction or renewal of buildings with nearly zero energy consumption																	
3.7		Improvement of the energy efficiency of electrical appliances																	
4.1	PUBLIC SERVICES	Renovation of existing exterior public lighting installations																	
4.2		Studies, feasibility analysis and audits of existing externallighting installations																	
4.3		Training of municipal energy managers																	
4.4		Improved energy efficiency of drinking water, supply, waste water purification and desalination plants																	
5.1	AGRICULTURE AND FISHERIES	Promotion and training of technicians in the efficient use of energy in theagriculture and fisheries sectors.																	
5.2		Promotion of migration from spraying or gravity irrigation systems to localised irrigation systems.																	
5.3		Improvement in saving and efficiency in the fisheries sector																	
5.4		Energy audits and action plans to improve arable farms																	
5.5		Aid for migration to conservation agriculture																	
5.6		Tractor RENOVE plan																	
6.1	ENERGY TRANSFORMATION	Feasibility studies for cogenerations																	
6.2		Energy audits for cogeneration																	
6.3		Promotion of cogeneration plants in non-industrial activities																	
6.4		Promotion of small capacity cogeneration plants																	
6.5		Promotion of cogeneration plants in industrial activities																	
6.6		Substantial modification of existing cogenerations																	

Exemplary role of the public sector.

Actions in the transport sector.

The coloured cells indicate the measure's planned objectives making use of the mechanism involved.

2. 2. FINAL AND PRIMARY ENERGY SAVINGS: 2016 AND 2020 OBJECTIVES AND2010 RESULTS

2.1 Objectives relative to consumption and final and primary energy saving in 2016 and 2020:summary of the 2011-2020 Action Plan.

The 2011-2020 Action Plan presents all the measures and actionsin line with the final and primary energy consumption scenarios included inother planning instruments concerning renewable energies (in accordance with the obligations set out in Directive2009/28/EC, of 23 April 2009, relative to the promotion of energy use from renewable sources) and planning of the electricity and gas sectors. Therefore, the planning in terms of energy constitutesa coherent whole, conducive to the objective of improvingfinal intensity by 2% year-on-year in the 2010-2020 period.

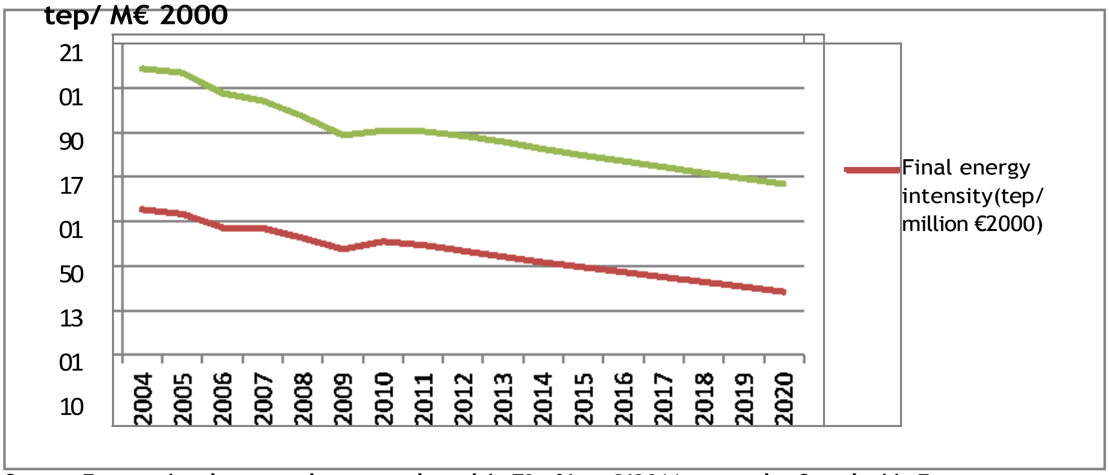
Therefore, the scenario considered as an objective of this Plan and scenario, efficiency, presents a primary energy consumption-objective of142.213 Ktep in2020, which assumes a year-on-year increase of 0.8% from 2010 and a primary intensity improvement of 1.5% annually between both years.

Table 2.1. Primary energy savings by source (ktep)

Sources	2004	2007	2008	2009	2010	2016	2020	2010-2020 (Year-on-year rate of variation)
Coal	20.921	20.354	13.983	10.509	8.271	10.468	10.058	1,98%
Oil	71.054	70.848	68.182	63.684	62.358	55.746	51.980	-1,80%
Natural Gas	24.671	31.601	34.782	31.096	31.003	37.147	38.839	2,28%
Nuclear	16.576	14.360	15.368	13.750	16.102	14.490	14.490	-1,05%
Renewable Energies	8.854	9.976	10.942	12.165	14.910	21.802	27.878	6,46%
Elec. assessment (Imp.-	-260	-494	-949	-697	-717	-1.020	-1.032	3,71%
TOTAL	141.817	146.645	142.308	130.507	131.927	138.633	142.213	0,75%

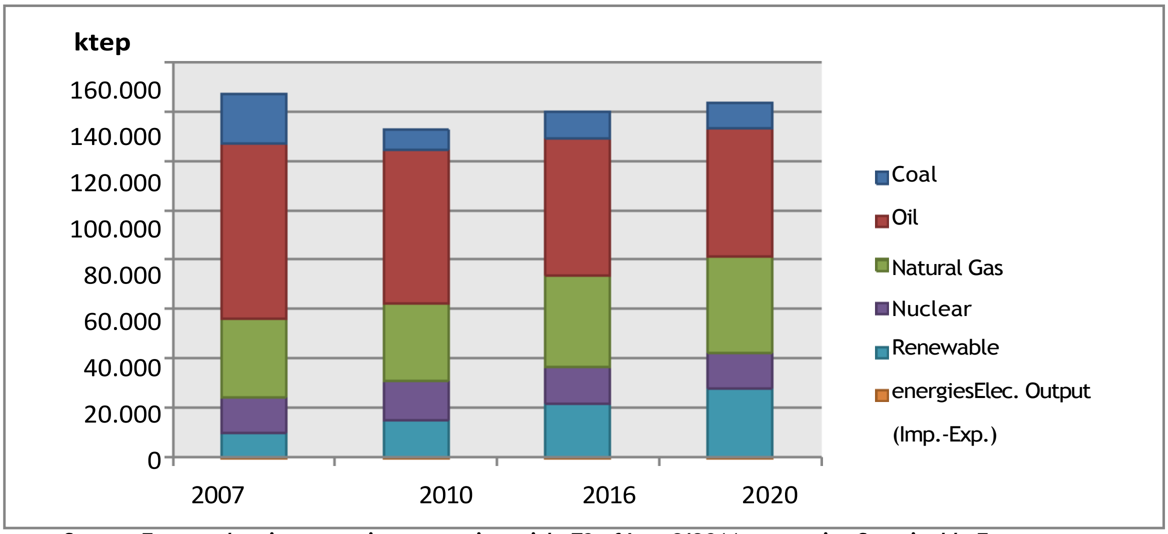
Source: Energy planning scenarios set out in article 79 of Law 2/2011 concerning Sustainable Economy

Graph 2.1. Final and primary energy intensities (tep/M€2000)



Source: Energy planning scenarios set out in article 79 of Law 2/2011 concerning Sustainable Economy

Graph 2.2. Primary energy savings by source (ktep)



Source: Energy planning scenarios set out in article 79 of Law 2/2011 concerning Sustainable Economy

In terms of final energy, this Plan's scenario-objective is that summarised in the following table,with a consumption objective for 2020 of 102.220 Ktep, from which,subtracting final energy consumption with non-energy purposes, aconsumption total of 95.355 Ktep is obtained. This scenario guarantees theachievement relative to the improvement of final intensity by 2% year-on-year set out in theplans approved prior to this 2011-2020 Action Plan,and to enable the improved efficiencyproposed which identified the saving and energy efficiency measures contained in the same.

Table 2.2. Final energy consumption by sector (ktep)
.excluding non-energy uses-

Sectors	2004	2007	2008	2009	2010	2016	2020	2010-2020 (Year-on-year rate of variation)
Industry	29.855	29.878	30.241	26.468	28.209	26.034	25.777	-0,90%
Transport	37.736	40.804	39.313	37.464	36.744	38.670	38.752	0,53%
Residential,services and others	29.030	30.448	28.886	26.975	28.470	30.016	30.827	0,80%
TOTAL	96.621	101.130	98.440	90.906	93.423	94.720	95.355	0,20%

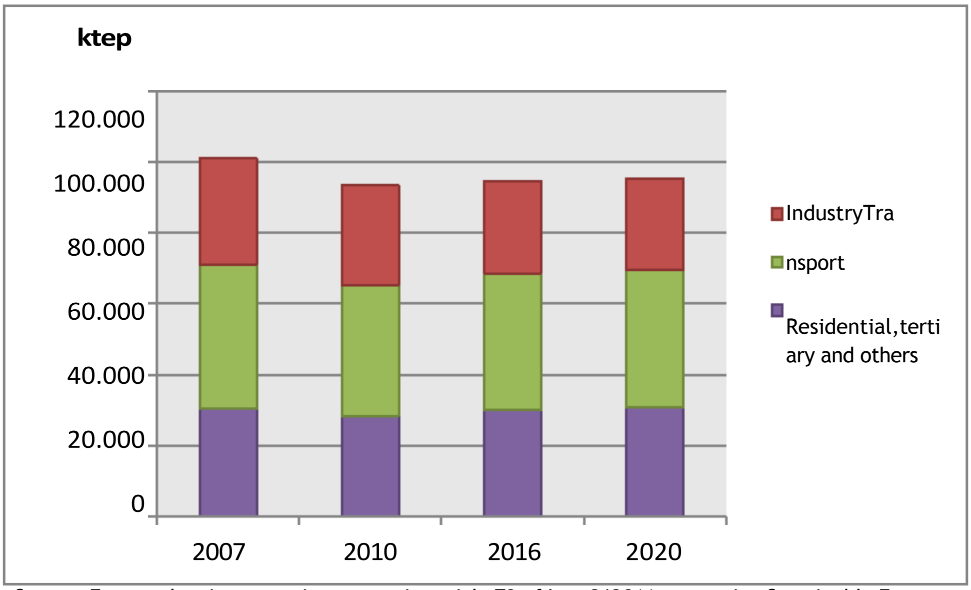
Source: Energy planning scenarios set out in article 79 of Law 2/2011 concerning Sustainable Economy

Table 2.3. Final energy consumption by source (ktep)
-excluding non-energy uses

Sources	2004	2007	2008	2009	2010	2016	2020	2010-2020 (Year-on-year rate of variation)
Coal	2.405	2.317	2.080	1.427	1.693	2.168	2.146	2,40%
Oil Products	54.244	55.277	52.867	49.032	48.371	43.026	39.253	-2,07%
Natural Gas	16.283	17.277	16.866	14.639	16.573	18.211	18.800	1,27%
Electricity	19.914	22.159	22.253	20.980	21.410	24.343	27.085	2,38%
Renewable energies	3.774	4.101	4.374	4.828	5.375	6.971	8.070	4,15%
TOTAL	96.621	101.130	98.440	90.906	93.423	94.720	95.355	0,20%

Source: Energy planning scenarios set out in article 79 of Law 2/2011 concerning Sustainable Economy

Graph 2.3. Final energy consumption by sector (ktep)

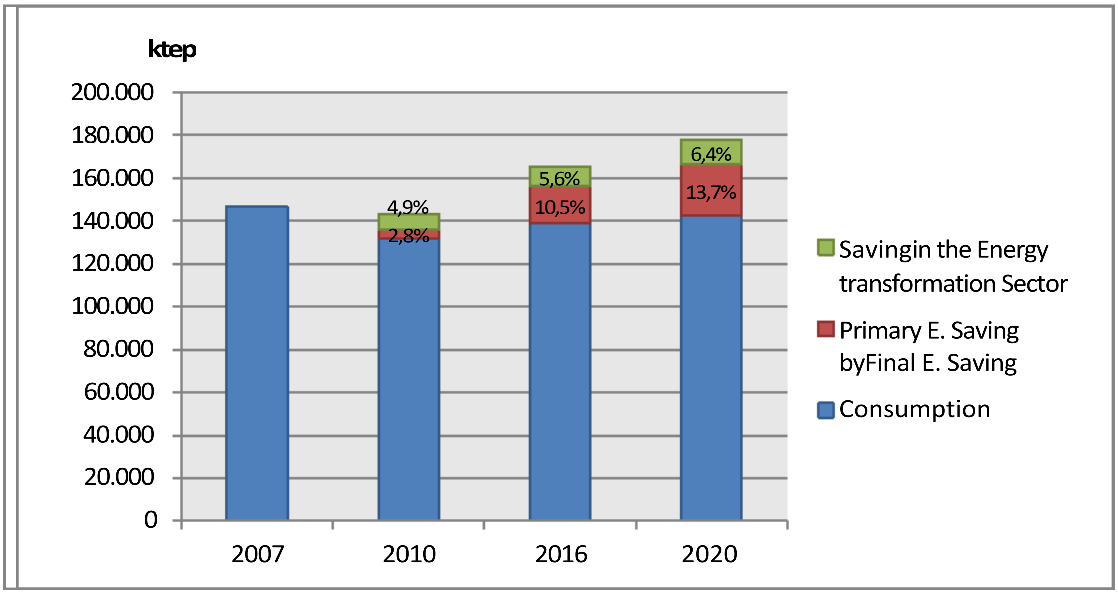


Source: Energy planning scenarios set out in article 79 of Law 2/2011 concerning Sustainable Economy

The measures included in this 2011-2020 Action Plan will provide a finalenergy saving of 17,843ktep in 2020 and a primary energy saving of 35,585ktep,calculated with reference to 2007 and using the methodology proposed by the European Commission. The saving, in terms of primary energy, includes savingsderived from the measures proposed for the Energy Transformation Sector in thisPlan —mainly, from the promotion of cogeneration— and those derived from thechange in the mix of electricity generation stimulated by other planning in terms ofenergy policy beyond the same and that which meets the obligations set out byDirective 2009/28/EC, of 23 April 2009, relative to thepromotion of energy use from renewable sources.

The previous savings, in terms of primary energy, equate to 20% of primary energy consumptionwhich will occur in 2020 in the absence of diversification andpromotion programmes relative to renewable energies by the Spanishgovernment and the present 2011-2020 Action Plan.

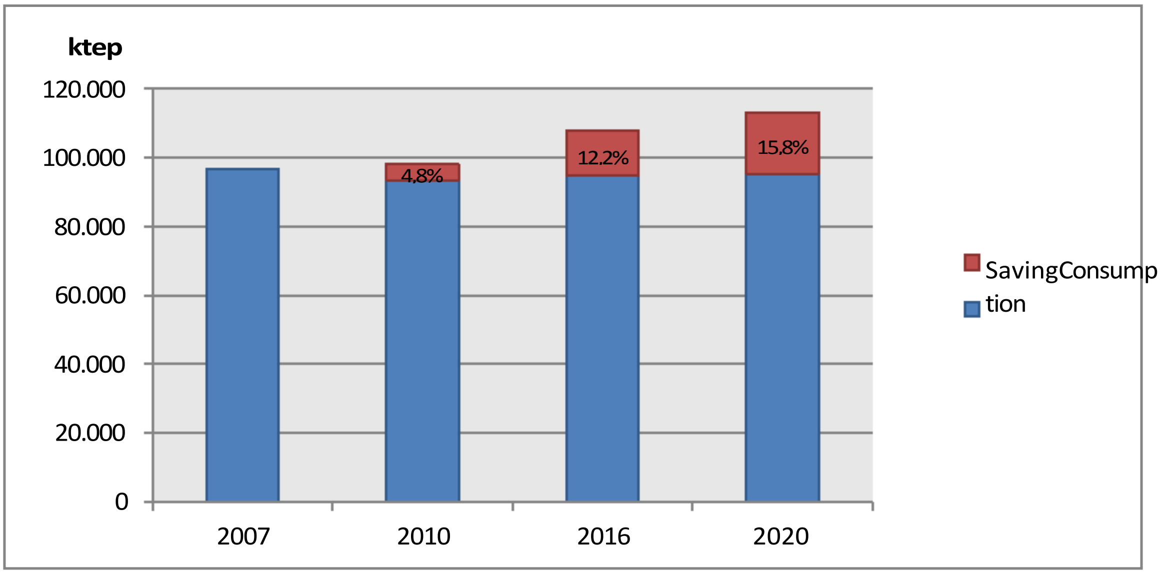
Graph 2.4. Primary energy consumption and savings (ktep)



Source: IDAE

In terms of final energy, the savings in 2016 are 13.176 ktep, which equatesto 12.2% of final energy consumption for this year in the absence of thePlan.

Graph 2.5. Final energy consumption and savings (ktep)



Source: IDAE

The saving in terms of final energy, once the sectors not included in the scope of application ofDirective 2006/32/EC are subtracted (basically, the ETS sectors—Emission Trading System—, included in the scope of Directive 2003/87/EC, from theEuropean Parliament and Council, of 13 October 2003, is reduced to 11.532Ktep/year in 2016[7]. This saving, calculated on the average consumption corresponding to these same sectorsover the five years prior to the Directive entering into force, that is to say, the average consumption for the 2003-2007 period,assumes 15.9% of the total[8].

Therefore, the 2011-2020 Action Plan complies with the saving targets set out by Directive 2006/32/EC and is in line with the global targets agreed bythe European Council on 17 June 2010, in relation to improving primary energy efficiencyby 20% in 2020.
The achievement of said objectives in the sectors included in this Plan(all end-user sectors plus the Energy Transformation Sector)will be possible with the application of aids to be managed by the public sector in the order of 4.995M€ during the 2011-2020 period with which it aims to mobilise a total investment of45.985 M€. The cumulative final and primary energy savings achievedduring the 2011-2020 period reach 120.967 ktep and 247.791 ktep,respectively.

[7]The calculation of the savings affected by Directive 2006/32/EC are performed by subtracting66.8% from the total savings in the industry sector —those within the ETS Directive— and those corresponding to aviation.

[8] The hypothesis considered is the maintenance, in 2016, of the weight of the ETS sectors on the total emissions corresponding to the industry sector.

Table 2.4. Cumulative savings and investments and aids managed by the public sector 2010-2020

	2020
Final Energy Saving (cumulative 2011-2020) (ktep)	120.967
Final Energy Saving (annual 2020) (ktep)	17.842
Primary Energy Saving (cumulative 2011-2020) (ktep)	247.791
Primary Energy Saving (annual 2020) (ktep)	35.585
Associated Investment (cumulative 2011-2020) (M€)	45.985
Aid managed by the Public Sector (cumulative 2011-2020) (M€)	4.995

Source: IDAE

2.2 Details of the final and primary energy saving objectives by sector in 2016 and 2020

The final energy savings from the 2011-2020 Action Plan were determined, for 2016 and 2020,in line with the same methodological criteria and indicators as for 2010, all of them being fully coherent with the methodology proposed by the European Commission for the measurement and verification ofthe energy savings derived from the first action plans, which were completed, in this Plan, by the counting of those effects not set out in the indicators selected by the Commission.

Generally, and for summary purposes, the savings proposed as objectives for eachsector are the result of adding the savings expected at a moredetailed level, the five following areas being the final sectors included in the Plan: 1)Industry; 2) Transport; 3) Building and Equipment; 4) Public Services; y 5)Agriculture and Fisheries.

Likewise, for the Industry Sector, the savings set as objectives are the result of the aggregation of the savings calculated by activity group or subsector. For the Transport Sector, the total savings were determined as a sum of the results expected for each mode of transport(road, rail,maritime and air). For the Buildings and Equipment Sector, as a result of the sum of the savings in residential buildings, on the one hand, and in tertiary buildings on the other, in addition to the savings achievedthrough improvements tothe energy efficiency of electrical appliances and office equipment (in turn, the savings associated with buildings, either residential or tertiary, are the result of addingsavings achieved in heating, climate control and sanitary hot waterand the savings achieved through improved energy efficiency relative to lighting). Finally, the savings associated with the Public Services Sector are also the result ofaggregating savings in public lighting and water treatment plants (purification and desalination).

Table 2.5. Final energy savings by sector (ktep) and percentage distribution of savings

	2010		2016		2020	
	(ktep)	Percentage distribution	(ktep)	Percentage distribution	(ktep)	Percentage distribution
INDUSTRY	-2.866	-60,7%	2.489	18,9%	4.489	25,2%
TRANSPORT	4.561	96,6%	6.921	52,5%	9.023	50,6%
Road	4.916	104,2%	5.830	44,2%	6.926	38,8%
Rail	-207	-4,4%	1.121	8,5%	1.996	11,2%
Maritime	-100	-2,1%	-11	-0,1%	56	0,3%
Air	-48	-1,0%	-19	-0,1%	45	0,3%
BUILDINGS AND EQUIPMENT	2.529	53,6%	2.674	20,3%	2.867	16,1%
RESIDENTIAL	752	15,9%	119	0,9%	211	1,2%
Thermal envelope and equipment	699	14,8%	85	0,6%	161	0,9%
Lighting	53	1,1%	34	0,3%	50	0,3%
TERTIARY	1.570	33,3%	2.497	19,0%	2.736	15,3%
Thermal envelope and equipment	1.322	28,0%	1.858	14,1%	1.944	10,9%
Lighting	248	5,3%	639	4,9%	792	4,4%
EQUIPMENT	207	4,4%	57	0,4%	-80	-0,4%
PUBLIC SERVICES	29	0,6%	56	0,4%	125	0,7%
Public lighting	11	0,2%	19	0,1%	58	0,3%
Water	17	0,4%	36	0,3%	67	0,4%
AGRICULTURE AND FISHERIES	467	9,9%	1.036	7,9%	1.338	7,5%
TOTAL FINAL ENERGY SAVINGS	4.720	100,0%	13.176	100,0%	17.842	100,0%

Source: IDAE

Note: Generally speaking, the savings for each sector have been calculated as the difference between thevalue of the energy efficiency indicatorschosen for each sector, mode of transport or energy use, between 2007 (base year)and 2010. Therefore, this difference determines whether the savings are positive or negative. Ifthe indicator (normally unit consumption) decreases up to 2010, savings are made and,alternatively, if the indicator increases, "negative savings" occur, which appear in the results tables as "negative savings". In the Industry Sector, the low use of production capacities, as a result of the economic crisis,and the fall inproduction together with the required maintenance of fixed costs has caused anincrease in consumption by unit of added value in the Industry Sector, which translates intonegative savings attributable to this sector in 2010. Logically, however,direct savings were achieved (positive savings) derived from the investments stimulated by the previous action plans, whichhowever, were compensated for by the indirect effect (negative savings)attributable to the low use of production capacities.

The savings —at the most itemised level possible- were determined, in all cases, as a result of the product between the unit savings for 2016 or 2020(taking 2007 as a reference), and the activity variableconcerned in any case. This is, as a result of the product of the savings per unit of added value, in the Industry Sector or in the Agriculture and Fisheries Sector,by the added value of said sectors in 2016 and 2020.Or, in the case of the Transport Sector, as a result of the product between the energy savings per passenger or per ton-kilometre carried(between 2016 and 2020 and base year 2007) and the traffic or volume of passengers or goods carried in the calculation years. In the case of the Residential Sector, the unit savings were determined perm^2built, inhabitant or home —according to the use— and, in the tertiary sector,by employee, according to the methodological recommendations from the European Commission and the section of energy efficiency indicators proposed by them[9].

The above assumes the need to establish hypotheses, mainly on theactivity variables which appear in the following table and mean, logically, that theabsolute value of the savings shown in this 2011-2020 Action Plan are conditioned by the assumed evolution of the variable looking ahead to 2020.

Table 2.6. Hypothesis assumed for 2020 concerning the activity variables

SECTOR		ACTIVITY VARIABLE	UNIT	2010-2020 (Year-on-year rate of variation)	2020
INDUSTRY		$GVA_{industry}$	10^6 €2000	1,66%	203.344
TRANSPORT	Road	Private vehicle traffic	10^6 passengers-km	1,98%	427.007
		Moving lorries and l. vehicles	n°	0,20%	3.723.661
	Rail	Passenger traffic	10^6 passengers-km	10,50%	64.653
		Goods traffic	10^6 tons-km	18,03%	41.976
BUILDING, EQUIPMENT AND SERVICES		Population	10^3	0,27%	48.295
		Total n° of households	10^3	0,74%	27.755
		Total n° of main homes	10^3	0,85%	18.838
		Total surface area of main homes	10^3 m^2	0,37%	1.559.191
		N° of tertiary employees	10^3	1,83%	16.068
AGRICULTURE		$GVA_{agriculture\ and\ fisheries}$	10^6 €2000	2,43%	30.854

Source: IDAE

In addition, the objectives for improving energy efficiency set byeach sector —and established on the energy efficiency indicators whichwill serve to monitor objectives this Action Plan— can be seen in Table 2.7.

[9] Section 2.3 of this Plan details the results, in terms of final energy savings, achieved in 2010 as a result of the 2005-2007 and 2008-2012 Action Plans prior to this; they are presented with details of the top-downordescending indicators used to calculate the savings, with the maximum level of disaggregation achieved. These descending indicators, used for the evaluation of the savings achieved in 2010, were the same as those used for 2016 and 2020,coherence of the evaluation method is guaranteed in 2010, 2016 and 2020. However, for 2010, in so far asdetailed information was used on the results of saving and energy efficiency actions, plans and programmes,the calculations obtained through descending indicators are complemented bythose derived from bottom-up or ascending indicators.

Table 2.7. Objectives relative to improved efficiency by sector

SECTOR		ENERGY INDICATOR	UNIT	2007-2010 (Year-on-year rate of variation)	2010-2020 (Year-on-year rate of variation)	2007	2020
INDUSTRY		M8 Energy intensity (final e. consumption/GVA)	Ktep/10^6 €	2,74%	-2,52%	0,15	0,13
TRANSPORT	Road	P8 Unit consumption passenger-km	gep/pkm	-2,57%	-0,87%	38,20	32,37
		A2lorries Unit consumption of lorries-light vehicles	tep/veq	-8,05%	0,30%	1,19	0,95
	Rail	P10 Unit consumption passenger-km	gep/pkm	-3,85%	-3,03%	11,24	7,34
		P1 Unit consumption for ton of freight-km	gep/tkm	10,44%	-9,22%	85,18	43,62
BUILDING, EQUIPMENT AND SERVICES	P1	P1 Domestic heating consumption per surface area unit of main home (corrected for climatic conditions)	tep/m^2	-1,43%	0,11%	0,0050	0,0048
	P2	P2 Domestic consumption of refrigeration per surface area unit of main home (corrected for climatic conditions)	tep/m^2	-3,10%	6,64%	0,00012	0,00022
		P5 Domestic consumption of lighting per unit of main home	tep/household	-2,63%	0,11%	0,0401	0,0374
		P4Unitary domestic consumption of a domestic appliance	tep/appliance	-7,87%	-2,92%	0,0174	0,0101
		M3 Non-electrical unitary consumption of services per employee (corrected for climatic conditions)	tep/employee	-9,47%	-0,87%	0,25	0,17
		M4 Electrical unitary consumption of services per employee (corrected for climatic conditions)	tep/employee	-3,90%	-0,68%	0,45	0,37
	MAP	Unitary consumption of public lighting per household	tep/household	-1,13%	-1,39%	0,013	0,011
AGRICULTURE AND FISHERIES		M8 Energy intensity (final e. consumption/GVA)	Ktep/10^6 €	-4,30%	-1,93%	0,16	0,11

Source: IDAE

As a result of the previous hypotheses on the main activity variables and the set unit saving objectives,the savings achieved are shown in Tables 2.5. (in detail, by mode or energy use) and 2.8. (as a summary). The savings counted in the Plan for each sector are the result, therefore, of aggregating the direct savings derived frominvestments to promote saving and energy efficiency in each sector,plus the indirect or induced savings (positive or negative) derived fromother factors (price for example), that will be reflected in the hypotheses established on the general evolution of the indicators proposed. As an example of the saving calculationassociated with the energy consumption in lighting in the domestic sector, from indicator P5[10], to indicate that this saving is net of the two aforementioned effects: the directeffect on the investments made to improve the efficiencyof lighting systems in residential buildings (positively) and the indirect effect (positive or negative) derived from other factors(energy prices, better or worse lighting equipment, that is to say,an increase or decrease in the number of light points per household etc).

Likewise, the final energy savings from the 2011-2020 Action Plan areconcentrated in the Transport Sector, accounting for 51% of the total savingsin 2020. Next is the Industrial Sector, with savings equivalent to 25% of the total. These savings are a result of a decrease in final energy consumption, between 2007 and 2020, in the order of 13% in the Industrial Sector and 5% in the Transport Sector.

Table 2.8. Final energy savings by sector (in ktep and percentage terms with respect to the sector's total consumption)

	2010		2016		2020	
	(Ktep)	(%)	(Ktep)	(%)	(Ktep)	(%)
INDUSTRY	-2.866	-11,3%	2.489	8,7%	4.489	14,8%
TRANSPORT	4.561	11,0%	6.921	15,2%	9.023	18,9%
BUILDINGS AND EQUIPMENT	2.529	9,4%	2.674	9,3%	2.867	9,7%
PUBLIC SERVICES	29	3,6%	56	6,7%	125	14,7%
AGRICULTURE AND FISHERIES	467	12,3%	1.036	23,3%	1.338	27,9%
TOTAL FINAL ENERGY SAVINGS	4.720	4,8%	13.176	12,2%	17.842	15.8%

Source: IDAE

In the Transport Sector, the savings are attributed to road transport, 77%, and to rail transport, 22%, mainly, associated with freight, where the 2011-2020 Action Plan assumes the objectives relative to change of mode andincrease in rail traffic included in the 2005-2020 Strategic Infrastructure and Transport Plan(PEIT).

[10] Savings achieved by $P5_{(net)} = \left[\left(\frac{E^{Hel}_{2004}}{D_{2004}}\right).FC_{2010} - \left(\frac{E^{Hel}_{2010}}{D_{2010}}\right).FC_{2010}\right].D_{2010}$

E^{Hel}: Electricity consumption in homes

D: Number of permanently occupied homes

FC: % of the domestic electric consumption intended for interior lighting

P5 $Savings_{(net)} = \sum \text{Direct savings (BU)} \pm \frac{\text{Effects}}{\text{Savings}} \text{(indirect and induced)}$

Likewise, the achievement of the savings proposed in the Transport Sector are based on the improved technology of vehicles, particularly, on the introduction of the electric vehicle in the terms set out in the Electric Vehicle Action Plan which sets as an objective, for 2014, 250,000 vehicles and, for 2020, 2.5 million electric vehicles, equivalent to 10% of the fleet.

The improved final intensity set as an objective for the whole Industry Sector is 2.5% year-on-year in the 2010-2020 period, attributing, from the sector's total savings,a percentage of 93% to technological improvement (compared with 7% of thetotal savings attributable to structural change).

In the Buildings Sector, the savings are concentrated in the tertiary sector, since,in terms of household use, final energy savings relative to heating, derived from themeasures proposed in terms of the building skin and for the improved energy efficiency of equipment (renewal of boilers, basically), will, practically, be compensated for by the increase in energy consumption per m^2 ofsurface area built for air-conditioning. The expected increased penetration of air-conditioning unitsin homes will have a negative effect onfinal energy consumption, therefore measures are proposed, within the framework of this Plan, relative to the renewal of appliances by otherwith high energy ratings which will having a bearing, at least partially, onthe effects of better appliances on consumption. Likewise,there has been a significant improvement in the performance of installations due to theintroduction of cold and heat networks in Spain, thanks to the Energy Service Companies. Said installations will facilitate the introduction of renewable thermal energies andcogeneration, enabling the distributed generation of electrical energy through this technology, avoidinglosses due to transport and distribution.

On the other hand, and generally speaking for all sectors, the development of intelligent networks ("Smart Grids") which enable the integration of the electrical energy generated in small installations will be required, together withthe use of accumulation mechanisms, such as the electric vehicle, which may serve as consumers or generators at different times according tothe convenience of the system. For all these applications, as well as for optimising management systems, significant developments inmeasurement and control elements will be required, together with the development and application of ICT.

Within the Building and Equipment Sector, consideringbuildings used as homes and those with tertiary uses together, the savings are attributed, 73%, toimprovements in the thermal envelope and installations and, 29%, to improvements in energy efficiency relative to lighting —again, in this use, the savings are focused,principally, in buildings for tertiary use.The savings in equipment are, practically, zero, since the savings in use in homes are compensated for, in this case, by the negative effect derived from the increased electricity consumption associated with more equipment for tertiary uses.

Finally, the final energy savings for the Public Services Sector represent0.7% of the total, due to a reduction in the energy consumption of plants fordesalination, drinking water and purification of waste water and due to a reduction in the energy consumptionof public lighting. In the Agriculture and Fisheries Sector, the final energy savings reach, in 2020, 7.5% of the total savings, through a reduction in the sector's energy consumption per unit of added value.

These final energy saving objectives in 2016 and 2020 will be achieved through the introduction and execution of the saving and energy efficiency measurescontained in this 2011-2020 Action Plan. The achievement of these objectives, through measures, requiresthe introduction of different mechanisms (policy-related or regulatory,from aid or collaboration between administrations) which are detailed, specifically,in the second section of this 2011-2020 Action Plan, focused on the Sectoral Framework

Table 2.9. Distribution of final energy savings by measure (ktep)

	2016	2020
INDUSTRY	2.489	4.489
Energy Audits		
Improved technology of equipment and processes	2.332	4.154
(MTD)Installation of energy management systems	156	335
TRANSPORT		
Urban Mobility Plans	6.92180	9.0239
Transport plans for companies	24088	9650
Greater involvement in collective means of roadtransport	41.121	8921.9
Greater involvement from rail transport	-9	96421.
Greater involvement of maritime transport	4401	95044
Transport infrastructure management	-9	5214
Road transport fleet management	497	9360
Aircraft fleet management	607	2148
Efficient driving of private vehicles	-7	2210
Efficient driving of lorries and buses	570	141.01
Efficient flying of aircraft	-3	7
Renovation of land transport fleets	-2	
Renovation of air fleets	705	
Maritime fleet renovation		
Renovation of the private vehicle fleet		

BUILDINGS AND EQUIPMENT	2.67477	2.8677
Energy renewal of the thermal envelope inexisting buildings	59086	7590
Improvement of the energy efficiency of thermal installationsin existing buildings	74224	8842
Improvement of the energy efficiency of interior lightingin existing buildings	0,80,	2471
Construction of new buildings and renewal of existing buildings withhigh energy ratings	492	,60,
Improved energy efficiency in cold commercial plants		892
Construction or renewal of buildings with practically nearly zeroenergy consumption		
Improved energy efficiency of electrical appliances		

	2016	2020
PUBLIC SERVICES	**56**	**125**
Renovation of existing external public lighting installations	19	58
Studies, feasibility analysis and audits of existing exteriorlighting plants		
Training of municipal energy managers		
Improvement of the energy efficiency ofcurrent drinking water, supply, purification of waste water and desalination plants	36	67
AGRICULTURE AND FISHERIES	1.0369	1.3381
Promotion and training of technicians for the efficient use of energy in theagriculture and fisheries sector.	3262	2233
Incentives for migration from spraying or gravityirrigation systems to localised irrigation systems.	14	518
Improvement in saving and energy efficiency in the fisheries sector.	110	142
Energy audits and action plans to improve farms.	557	721
Support for conservation agricultureTractor RENOVE plan		
TOTAL OF END-USE SECTORS	13.176	17.842

Source: IDAE

In terms of primary energy, the savings forecast for 2016 and 2020 are the result of final energy savings in the previous sectorsand subsequent savings, proposed for the Energy Transformation Sector.

Forming part of this 2011-2020 Action Plan are all measures associated with the promotion of cogeneration,those relating to the improved efficiency in the refining sector—through reduced losses or self-consumption— and those relating to the improved efficiency inelectricity generation through reduced losses in the transport and distribution of electricity, less self-consumption andimproved efficiency in energy transformation. That which relates to energy efficiency attributable to the change in the mix of electricity generationthrough greater penetration of renewable energies not forming part of this Plan, but, alternatively, other plans that assume the obligations derived from Directive2009/28/EC of 23 April 2009, relative to the promotion of energy use from renewable sources, in linewith the long-term objectives of this 2011-2020 Action Planand with the plan relative to the electricity and gas sectors, which sets out scenarios up to 2020 relative to the installed capacity of electricity generation with conventional sources and renewable energies.

Table 2.10. Primary energy savings by sector (ktep)

	2010	2016	2020
INDUSTRY	-5.717	2.151	4.996
TRANSPORT	4.909	8.680	11.752
BUILDINGS AND EQUIPMENT	4.189	5.096	5.567
PUBLIC SERVICES	67	131	295
AGRICULTURE AND FISHERIES	580	1.289	1.665
PRIMARY ENERGY SAVINGS final sectors	4.029	17.347	24.274
ENERGY TRANSFORMATION	7.019	9.172	11.312
Oil Refining	39	-137	-88
Electricity generation (non-CHP)	6.909	8.169	9.701
Cogeneration	71	1.141	1.699
TOTAL PRIMARY ENERGY SAVINGS	11.047	26.519	35.585

Source: IDAE

Table 2.11 below shows the Plan's objectives in term of final and primary energy saving and emissions ofCO_2 avoided and details of investments and aids managed by the public sector linked to the same. Chapter 4 of this Plan provides a cost-benefit analysisof the same, detailing the concepts included, sector by sector,in the "investment" category;however, generally speaking, it should be noted here that,in the *Transport*Sector, not included in this concept are investments in infrastructure and those relative to the promotion of the electric vehicle[11]which, however, will include a good part of the energy savings counted in this sector, a result of the greater recourse to rail transport compared with road transport for the carriage of goods and passengers.

The differences that can be seen in the apparent cost per equivalent ton of oil saved between each of the measuresare due to the different nature of the investments and savings considered in this measure. Logically, not all of the measuresincur the same associated public or private cost, but it is understood thatall the measures included in this Plan are required for theachievement of the objectives proposed for 2020, sincecoherent and complete actions are required directed at all consumer sectors without exception. On the other hand, the monitoring of the Plan will enable adjustment of the time planning of the different measures so that they will, eventually, be able to be replaced by others in the case ofexhausting the saving potential of any of those proposed including adjusting the aids managed by the public sectorto adapt them to technological evolution and prices or policy-related measures which may be adopted at state, autonomous or local level.

[11]Only includes investments relating to the charging infrastructure of the electric vehicle, the subject of public aid.

Table 2.11 Summary of measures in the 2011-2020 Action Plan

	Final energy savings (ktep)		Primary energy savings (ktep)		Emissions of CO_2 avoided ($ktCO_2$)		Aids managed by the Public Sector (10^6 €)			Investments (Aids managed by the public sector + private investment)(10^6 €)		
	2016	**2020**	**2016**	**2020**	**2016**	**2020**	**2011-2016**	**2017-2020**	**2011-2020**	**2011-2016**	**2017-2020**	**2011-2020**
INDUSTRY	**2.489**	**4.489**	**2.151**	**4.996**	**5.233**	**11.641**	**450**	**300**	**750**	**4.836**	**3.224**	**8.060**
Energy Audits							4,7	3,1	7,8	9,4	6,2	15,6
Improved technology of equipment and processes (MTD)	2.332	4.154	2.016	4.623	4.905	10.772	444,2	296,1	740,3	4.441,7	2.961,1	7.402,8
Implementation of energy management systems	156	335	135	373	328	869	1,2	0,8	2,0	384,9	256,6	641,6
TRANSPORT	**6.921**	**9.023**	**8.680**	**11.752**	**22.922**	**31.177**	**598**	**399**	**996**	**1.862**	**1.242**	**3.104**
Urban Mobility Plans	802	996	1.006	1.298	2.655	3.443	231,1	154,1	385,2	462,2	308,2	770,4
Transport plans for companies	408	508	512	661	1.353	1.754	53,2	35,5	88,7	106,4	70,9	177,4
Greater involvement in collective means of roadtransport	84	92	106	120	280	319	12,8	8,5	21,3	25,6	17,0	42,6
Greater involvement from rail transport	1.121	1.996	1.406	2.600	3.712	6.898	26,5	17,7	44,2	53,0	35,3	88,3
Greater involvement of maritime transport	-9	42	-11	55	-29	145	6,8	4,5	11,2	13,5	9,0	22,5
Transport infrastructure management	1.756	1.950	2.202	2.540	5.815	6.738	8,4	5,6	14,0	33,7	22,5	56,2
Road transport fleet management	401	445	503	580	1.327	1.538	32,2	21,5	53,6	128,7	85,8	214,6
Aircraft fleet management	-9	21	-11	28	-30	73	8,0	5,3	13,4	32,1	21,4	53,4
Efficient driving of private vehicles	497	493	623	642	1.646	1.703	12,0	8,0	19,9	23,9	15,9	39,8
Efficient driving of lorries and buses	607	602	761	784	2.010	2.080	9,5	6,3	15,8	19,0	12,6	31,6
Efficient flying of planes	-7	14	-8	18	-22	47	7,6	5,1	12,6	15,2	10,1	25,3
Renewal of road transport fleets	570	822	715	1.071	1.887	2.842	49,8	33,2	83,0	249,0	166,0	415,1
Air fleet renovation	-3	10	-4	13	-11	35	6,4	4,3	10,7	32,0	21,3	53,3
Maritime fleet renovation	-2	14	-3	18	-7	48	12,2	8,1	20,4	61,1	40,7	101,8
Renovation of the private vehicle fleet	705	1.017	884	1.325	2.335	3.515	121,4	80,9	202,3	606,9	404,6	1.011,5

Note regarding the Industry Sector: Generally, the substitution of fossil fuels for electricity in the industrial sector yields lower primary energy savings -absolute value- than final energy savings.

	Final energy savings (ktep)		Primary energy savings (ktep)		Emissions of CO_2 avoided ($ktCO_2$)		Aids managed by the Public Sector (10^6 €)			Investments (Aids managed by the public sector + private investment)(10^6 €)		
	2016	2020	2016	2020	2016	2020	2011-2016	2017-2020	2011-2020	2011-2016	2017-2020	2011-2020
BUILDINGS AND EQUIPMENT	2.674	2.867	5.096	5.567	11.116	12.120	1.730	1.153	2.883	16.393	10.929	27.322
Energy renewal of the thermal envelope inexisting buildings	775	775	1.319	1.329	2.921	2.943	665,7	443,8	1.109,5	3.356,4	2.237,6	5.594,0
Improvement of the energy efficiency of thermal installationsin existing buildings	908	908	1.546	1.558	3.424	3.449	169,8	113,2	283,0	4.354,8	2.903,2	7.258,0
Improvement of the energy efficiency of interior lightingin existing buildings	674	842	1.588	1.986	3.400	4.251	115,2	76,8	192,0	5.257,8	3.505,2	8.763,0
Construction of new buildings and renewal of existing buildings withhigh energy ratings	224	247	425	473	901	1.002	472,8	315,2	788,0	2.920,8	1.947,2	4.868,0
Improved energy efficiency in cold commercial plants	0,8	1,6	1,9	3,8	4,0	8,1	3,0	2,0	5,0	12,0	8,0	20,0
Construction or renewal of buildings with practically nearly zeroenergy consumption	0,4	0,8	0,8	1,5	1,6	3,2	3,0	2,0	5,0	11,4	7,6	19,0
Improved energy efficiency of electrical appliances	92	92	216	216	463	463	300,0	200,0	500,0	480,0	320,0	800,0
PUBLIC SERVICES	56	125	131	295	281	631	86	57	143	485	324	809
Renovation of existing public lighting plants	19	58	46	136	97	292	62,7	41,8	104,5	416,3	277,5	693,8
Studies, feasibility analysis and audits of existing exteriorlighting plants							10,0	6,7	16,7	20,0	13,3	33,3
Training of municipal energy managers							4,3	2,8	7,1	4,3	2,8	7,1
Improvement of the energy efficiency ofcurrent drinking water, supply, purification of waste water and desalination plants	36	67	86	158	184	339	9,0	6,0	15,0	45,0	30,0	75,0

	Final energy savings (ktep)		Primary energy savings (ktep)		Emissions of CO2 avoided (ktCO2)		Aids managed by the Public Sector(10^6 €)			Investments (Aids managed by the public sector + private		
	2016	2020	2016	2020	2016	2020	2011-2016	2017-2020	2011-2020	2011-2016	2017-2020	2011-2020
AGRICULTURE AND FISHERIES Promotion and training of technicians in the efficient use of energy in theagricultural and fisheries sector. Incentives for migration from spraying or gravityirrigation systems to localised irrigation systems. Improved saving and energy efficiency in the fisheries sector. Energy audits and action plans to improve farms. Support for conservation agricultureTractor RENOVE plan	1.036 932 621 4 110 557	1.3381 223 351 8 142 721	1.2892 252 932 3 123 624	1.6652 943 752 9 159 808	3.716 477 897 58 377 1.908	4.799 622 1.147 74 486 2.470	46 5,81 8,02 ,95, 4 10,6 3,4	31 3,91 2,01 ,93, 6 7,0 2,3	77 9,7 30,0 4,8 9,0 17,6 5,7	358 5,8 90,0 14,5 27,1 156,0 64,1	23 83, 960 ,09, 718 ,1 104,0 42,7	596 9,71 50,0 24,2 45,2 260,0 106,8
TOTAL OF END-USE SECTORS	13.176	17.842	17.347	24.274	43.268	60.368	2.909	1.940	4.849	23.935	15.956	39.891
ENERGY TRANSFORMATION OIL REFINING ELECTRICITY GENERATION (without cogeneration) COGENERATION Feasibility studies for cogenerationsEnergy audits for cogenerations Promotion of cogeneration plants in non-industrial activities Promotion of cogeneration plants in non-industrial activitiesPromotion of cogeneration plants in industrial			9.172 - 1378. 1691.1 41 265 3 7031 70	11.312 - 889.70 11.699 388 61 .0362 69	63.365 -375 61.744 1.995 445 61 .1803 64	79.230 - 24276.4 942.97 8 653 111 .7395 75	17 17 2,4 1,1 13,1 0,8	5 5 1,2 0,7 2,6 0,3	22 22 3,6 1,8 15,7 1,1	3.885 3.885 5,0 2,2 912,0 17,0 1.723,2 1.225,7	2.085 2.085 2,3 1,3 444,0 15,5 884,8 736,7	5.970 5.970 7,2 3,5 1.356,0 32,5 2.608,0 1.962,4
TOTAL END-USE SECTORS + ENERGY TRANSFORMATION	13.176	17.842	26.519	35.585	106.633	139.599	2.927	1.944	4.871	27.820	18.041	45.861
COMMUNICATION							74	50	124	74	50	124
PLAN TOTAL	13.176	17.842	26.519	35.585	106.633	139.599	3.001	1.994	4.995	27.894	18.091	45.985

Source: IDAE

Note 1: There is no aid or investment indicated for the refining and electricity generation sectors. The savings attributed to these sectors are the result of improved energy efficiency in the refining sector(due to reduced losses or self-consumption) and improved efficiency in electricity generation due to reduced losses in the transport and distribution of less self-consumed electricity distributionand improved efficiency in energy transformation, as well as changing the mix of electricity generation through better penetration of renewable energy. On the other hand, the energy savings, in theEnergy Transformation Sector, were considered, solely, in terms of primary energy which, obviously, doesn't mean that it should produce final energy savings.

Note 2: The calculation of emissions of CO_2 avoided as a result of the saving and energy efficiency measuresincluded in this Plan are ad hoc calculations for the same and assume a translation of the savingscalculated using different base years (2004 and 2007), in terms of final and primary energy, to emissions of CO_2 avoided - this calculation does not necessarily coincide,therefore, with those achieved with approaches or different accounting bases aspart of the periodic reports produced in relation to the evolution of greenhouse gas emissions.

2.3 Final and primary energy savings in 2010: methodology and results.

The final energy savings in 2010 have been calculated - in the same way as the savings proposed asobjectives for 2016 and 2020 - in accordance with the methodological recommendations from the European Commission.

The base year for the calculation of the savings is 2007 to guarantee the possibility of being able to add the savings calculated for Spain within this 2011-2020 Action Plan, to those calculatedfor the rest of the Member States, within their respective action plans;therefore, a European assessment can be established and the coherence of thenational action plans can be evaluated with the community objective of improving energy efficiency by 20% in 2020.

Therefore, the savings calculated for 2010 take 2007 as the reference year, which also enables them to be compared with the saving objectives proposed for 2016 and 2020. Notwithstanding the foregoing, the savings —in 2010— were also calculatedusing 2004 as a base year, to be included in the assessment of savings achieved, those derived from the 2005-2007 Action Plan, approved within the*2004-2012 Saving and Energy Efficiency Strategy in Spain (E4)* as thefirst action plan, even when, in terms of the effects of Directive 2006/32/EC, thefirst national saving and energy efficiency Action Plan is the 2008-2012 Action Plan.

The assessment of the savings achieved in 2010, calculated with both 2004 and 2007 as base years, is the result of the coherent combination of top-down or descendingand bottom-up or ascending approaches.

Generally speaking, descending or *top-down* indicators define the total savings achieved,either as a direct result of saving and energy efficiency measuresimplemented, or as an indirect result of the same or a result of othervariables. Among these, we notethe general evolution of prices or the effect that policies —with distinct saving and energy efficiency objectives— may have had on final energy consumption. The results achieved bydescending or*top-down* indicators (M or P) include, therefore, different effects which aren't always linked,closely, to improved energy efficiency—this is more pronounced when M indicators are used instead of P indicators;logically, the consumption reductions observed in 2010,derived from the economic crisis, were determined by calculating the top- down indicators in all the sectors, for this reason the results of these indicatorsmay not always be improved energy efficiency, since, at times,that which presents itself is the reduction of consumption recordedas a result of less economic activity.

The ascending or*bottom-up* indicators enable, on the contrary, the identification of direct savings attributable toeach of the measures individually considered within the action plans.

The following table shows the relationship between the descending indicators used foreach sector, mode of transport or energy use in residential and tertiarysectors (heating, refrigeration, SHW, lighting and appliances). Basically, it deals with P indicators (P: preferred by the European Commission),with an exception made for the tertiary sector, where M indicators are used (M:minimum) proposed by the European Commission due a lack of qualitystatistical information on the activity variables which formed part of those initially proposed as P indicators. In addition,in this 2011-2020 Action Plan, new indicators have been included —calculated based on the statistics submitted by IDAE to the European Commission in the context oftheODYSSEE-MURE project— to identify or clarify the effects on the saving from determined measures.

The calculation details of each of the descending indicators used is included in the annex document"*Calculation methodology for the savings derived from the 2005-2007 and 2008-2012 Energy Efficiency Action Plans: Analysis of results*", whilst, in the table that follows, the definitions and units of measurement for each of them are related.

Table 2.12. Top-down (descending) indicators used to calculate savings

SECTOR			ENERGY INDICATOR	UNIT
INDUSTRY	Division 1 Parametric method (LAS-PDM1)		$T_{technology}$ PDM1 indicator of technological effect by economic sector	Ktep/10^6 €
			$L_{Estructura}$ PDM2 indicator of the structural effect by economic sector	Ktep/10^6 €
TRANSPORT	ROAD	PASSENGERS	P8 Energy consumption of private vehicles by number of passengers (passengers-km)	gep/pkm
			M53/PB Energy consumption of buses per fleet	tep/veq
		GOODS	M52/A2 Energy consumption of lorries and light vehicles per fleet of equivalent vehicles	tep/veq
	RAIL	PASSENGERS	P10 Energy consumption of passenger rail transport by number of passengers (passengers-km)	gep/pkm
		GOODS	P11 Energy consumption of freight rail transport by amount of goods (tons-km)	gep/tkm
	MARITIME (GOODS)		M7 Energy consumption of the maritime carriage of goods (coastal and river shipping) by amount of goods (tons-km)	gep/tkm
	AIR (DOMESTIC PASSENGERS)		Mav Energy consumption of aerial passenger transport by means of domestic flights by operations (n° of flights)	gep/pkm
	CHANGE OF MODE	PASSENGERS from private to collective modes	P12 Transfer of passenger traffic from the private vehicle to collective means (bus, train and metro)	%
		FREIGHT from road torail and maritime	P13 Transfer of freight traffic from road to rail and maritime	%
BUILDINGS	RESIDENTIAL	THERMAL ENVELOPE AND EQUIPMENT	P1 Domestic energy consumption of heating by surface area of main homes (corrected by climatic conditions)	tep/m_2
			P2 Domestic energy consumption of refrigeration units by surface area of main homes (corrected by climatic conditions)	tep/m_2
			P3 Domestic energy consumption of SHW per inhabitant	tep/inhabitant
		LIGHTING	P5 Domestic energy consumption of lighting per main home	tep/household
	TERTIARY	THERMAL ENVELOPE AND EQUIPMENT	M311 Domestic non-electrical energy consumption for heating in the tertiary sector per employee (corrected by climatic conditions)	tep/employee
			M411 Electrical energy consumption for heating in the tertiary sector per employee (corrected by climatic conditions)	tep/employee
			M412 Electric energy consumption for refrigeration in the tertiary sector per employee (corrected by climatic conditions)	tep/employee
			M312 Non-electrical energy consumption of SHW in the tertiary sector per employee	tep/employee
			M413 Electrical energy consumption of SHW in the tertiary sector per employee	tep/employee
		LIGHTING	M42 Energy consumption of lighting in the tertiary sector per employee	tep/employee
EQUIPMENT	RESIDENTIAL	ELECTRICAL APPLIANCES	P4 Domestic energy consumption of electrical appliances per appliance	tep/appliance
			P41 Domestic energy consumption of cookers per appliance	tep/cooker
	TERTIARY	ELECTRICAL APPLIANCES	M44 Electric energy consumption of electrical appliances and office equipment in the tertiary sector per employee	tep/employee
		COOKERS	M43 Electrical energy consumption of cookers in the tertiary sector per employee	tep/employee
			M32 Non-electrical energy consumption of cookers in the tertiary sector per employee	tep/employee
PUBLIC SERVICES	PUBLIC LIGHTING		MAP Energy consumption of public lighting per household	tep/household
	WATER DESALINATION		$MAG_{desalination}$ Energy consumption of desalination by volume of desalinated water	Ktep/hm^3 year
	WATER PURIFICATION		$MAG_{purification}$ Energy consumption of water purification per inhabitant	tep/inhabitant
AGRICULTURE AND FISHERIES			M8' Energy consumption of agriculture and fisheries per unit of GVA	Ktep/10^6 €

The difference between the value of the indicators selected for each sector, mode or transport or energy use, between2004 and 2010 and between 2007 and 2010, dependingon its use, respectively, using 2004 or 2007 as reference years for the calculation,determines whether the savings are positive or negative. Ifthe indicator (normally unit consumption) decreases up to 2010, savings are made and,alternatively, if the indicator increases, "negative savings" occur, which appear in the results tables as "negative savings". The difference between the 2004 and 2010 or 2007 and 2010 indicators(either one or the other according to the reference year) provides the final energy unit savings. The order of the size of the savingsis determined by the product of the difference between the final energy unit consumptionby the activity variable relative to each sector,mode of transport or energy use (GVA —Gross Value Added—,carriage of passengers, carriage of goods, vehicle fleet, population, homes and total surface area of main homes etc.

The results, in terms of final energy, obtained with both base years (2004 and2007) are those recorded in the following table; we can see that the total savingsis equivalent to 4,720 Ktep/year in base year 2007, and 8.342 Ktep/year in base year2004. It should be noted that industry presents negative saving values, both in base year 2004 and base year 2007, as a result of the increase in energy intensity in the sector due, in turn, to the reduction in use factors relative to the production capacities installed due to the current economic crisis.The savings calculated, with base year 2004, for 2010 (8.342 Ktep/year) is equivalent to49,4% of the energy savings set as an objective for 2012 in the 2008-2012 Action Plan(16.883 Ktep/year), even though these first objectives were established differently, by the difference between two scenarios (base or trend scenarioand efficiency scenario or E4+). However, in so far as thebase scenario relative to the 2004-2012 Saving and Energy Efficiency Strategy in Spain (E4) is defined as a trend scenario (business as usual), assuming the absence of saving measures and, therefore, the absence ofimproved energy efficiency with respect to the Strategy's base year, that is to say, 2004, the savings calculations realised in accordance with these two methodological estimations—even divergent— may be considered to be comparable.

The savings set as an objective for 2010 in the 2008-2012 Action Planare 11.677 Ktep/year, calculated by aggregating the savings calculated for each of the end-use sectors, which assume a71.4% degree of achievement relative to the objectives —it should be noted that the savings identified in the 2008-2012 Action Planinclude both the savings derived directly from the execution of the measures proposed and the indirect or induced savingsthat may be obtained as a result of the same, which constitutes a method of calculating savings similar to that followed,in this new 2011-2020 Action Plan, on the basis of descending or top-down indicators.

The savings achieved in 2010, calculated as a percentage of final energy consumptionover the five years immediately prior to the application ofDirective 2006/32/EC, —as defined in Annex I of the same—, that is to say, theaverage final energy consumption for the 2003-2007 period[12] —inclusive—,

[12]The average final energy consumption (for energy uses) for the 2003-2007 period
is 72.621 ktpe/year —excluding sectors not included in Directive 2006/32/EC—,therefore 9% is equivalent to 6.536

is 9,2%, a percentage greater than 9% of the saving proposed by the Directive itself for 2016. This assumes, in practice, that Spain expected to achieve the saving objective from the Directive, proposed for 2016, in 2010.

Table 2.13. Final energy savings by sector (ktep)

	SAVINGS IN 2010	
	Base year 2004	Base year 2007
INDUSTRY	-799	-2.866
TRANSPORT	6.451	4.561
Road	6.784	4.916
Rail	-317	-207
Maritime	52	-100
Air	-68	-48
BUILDINGS AND EQUIPMENT	2.232	2.529
RESIDENTIAL	355	752
Thermal envelope and equipment	274	699
Lighting	81	53
TERTIARY	2.077	1.570
Thermal envelope and equipment	1.364	1.322
Lighting	713	248
EQUIPMENT	-199	207
PUBLIC SERVICES	32	29
Public lighting	5	11
Water	27	17
AGRICULTURE AND FISHERIES	426	467
TOTAL FINAL ENERGY SAVINGS	8.342	4.720

Source: IDAE

Table 2.14. Primary energy savings and emissions of CO_2 by sector in 2010

	PRIMARY E. SAVINGS (ktep)		ENISSIONS OF CO_2 AVOIDED ($ktCO_2$)	
	Base year 2004	Base year 2007	Base year 2004	Base year 2007
INDUSTRY	-2.695,7	-5.717,4	-5.281,8	-12.416,8
TRANSPORT	6.874,1	4.909,2	21.471,2	13.330,1
BUILDINGS AND EQUIPMENT	3.165,0	4.189,1	6.982,8	9.269,0
PUBLIC SERVICES	79,6	67,4	161,0	144,3
AGRICULTURE AND FISHERIES	535,5	580,4	1.526,3	1.673,2
TOTAL OF END-USE SECTORS	**7.958,5**	**4.028,7**	**24.859,4**	**11.999,8**
ENERGY TRANSFORMATION	9.766,9	7.018,5	51.796,9	53.252,8
TOTAL FOR END-USE SECTORS +ENERGY TRANSFORMATION	**17.725,4**	**11.047,2**	**76.656,4**	**65.252,6**

Source: IDAE

Note: The calculation of emissions of CO_2 avoided as a result of the saving and energy efficiency measuresincluded in this Plan are ad hoc calculations for the same and assume a translation of the savingscalculated using different base years (2004 and 2007), in terms of final and primary energy, to emission of CO_2 avoided - this calculation does not necessarily coincide, therefore, with those achieved with approaches or different accounting bases apart of the periodic reports produced in relation to the evolution of greenhouse gas emissions.

ktep/year (the saving—base year 2007— excluded, basically,the industry sectors within Directive ETS and those reporting negative savings in 2010— equivalent to 6.682 Ktep).

For each of the end-use sectors that form part of the 2011-2020 Action Plan, a detailed analysis of the savings has been performed, not just with descending indicators, but with ascending indicators enabling the identification ofthe individual impact on the energy consumption of each of the saving and energy efficiency measures proposed in the 2005-2007 and 2008-2012 Action Plans —to the extent that it has tried to determine the total saving associated with both plans, in what follows, the analysis will focus on the savings calculated with base year2004.

Industry

The descending indicators used (Laspeyres indicators) distinguishthe effect on the final energy savings due to the changes in the industry sector's production structure(weight gains or losses relative toone subsector compared with others) from the effect due to technological improvement in each of said subsectors(possible reductions in unit or specific consumption —consumption by production unit— in each subsector). The sum of both effectsprovides the total saving attributable to the sector (in this case, negative saving).

The following diagram, diagram 2.1., shows the first of the effects (LE) produces positive savings(1.655,5 Ktep), which corresponds to the saving derived from structural changes within the industry sector —greater weight relative to the less energy intensive sectorson the sector's total added value—, whilst the second of the effects(LT), that attributable to technological improvement, strictly speaking, presents negative savings(-2.454,1 Ktep) due to greater consumption per unit of added value recorded in the industry sector in 2010 with respect to 2004.

The current economic crisis distorts and makes the analysis of the results derived from energy efficiency measures in this sector difficult. On the one hand, unit consumptionhas increased in recent years as a result of the low use of production capacities, derived fromproduction reductions and themaintenance of fixed consumption, which produces negatives savings for technological improvement. On the other hand, the loss in the relative weight of the sectors associatedwith manufacturing produced positive results in terms of savings through structural change.
The sum of the previous two effects defines the total final energy savings in the sector: -798,6 Ktep. These total savings (negative savings)differ from direct savings —resulting from measures to renew appliances and processes— which are determined using bottom-up indicators ($BUin_1$ +$Buin_2$). The difference between the direct savings calculated using ascending indicators and those calculated using descending indicators allows for the estimation of indirect effects which are either derived from measures directly executed within the context of the action plans or derived from other factors.

In this case, the difference between the savings calculated by both means (top-down vs.bottom-up) is also negative, which assumes that, even thoughdirect savings were achieved relating to measures to improve energy efficiency effectively introduced,the indirect effects —derived from the economiccrisis and the loss of added value in the industry sector— counteract the savings achieved.

Definitively, this result occurs as a result of the lower industry production levels between 2004 and 2010, from the loss of added value and from the impossibility of reducing, in parallel to the, reduction in production levels, energy consumption. The maintenance of determined fixed production costs and the low use of production capacitiesproduces a less pronounced reduction in energy consumption compared with the industry sector's added values and, as a result,an increase in energy intensities,calculated either by unit of added value or by unit of production. Therefore, this may confirm that the negative value of the savings calculated through descending or*top-down* indicators (with the opposite sign to the savings calculated using bottom-up indicators) responds, basically,to the adverse effects associated with the current economic crisis.

Diagram 2.1. Diagram for the calculation of savings in the industry sector: integrated *top-down/bottom-up* approach

<table>
<tr><td colspan="4">Industry [L] = -798,6 ktep 2010(Base year 2004)</td></tr>
<tr><td rowspan="2">Improved consumption structure[LE] = 1.655,5 ktep 2010(Base year 2004)</td><td colspan="3">Technological improvement
[LT] = -2.454,1 ktep
2010(Base year 2004)</td></tr>
<tr><td>Collaboration agreements
[BUin$_1$] =
1,068.6 ktep 2010(Base year 2004)</td><td>Strategic projects
[BUin$_2$] =
131.5 ktep 2010(Base year 2004)</td><td></td></tr>
</table>

The direct savings calculated using bottom-up indicators may be associatedwith the measure included in the 2005-2007 Action Plan and in the 2008-2012 Action Plan:"public aid programme". The public aids for investment in the renewal of appliances and processes,either in the context of the cooperation mechanisms with theAutonomous Communities ($BUin_1$), or in the context of direct actions from the Ministry of Industry, Trade and Tourism,through IDAE, ($Buin_2$) have enabled the achievement ofsignificant savings which however, were absorbed by the crisis.These direct savings have been calculated by aggregating the individual savingsexpected for each of the subsidised projects, project by project, to the extent that IDAE relies ondetailed information from the public aid programmes managed by the Autonomous Communities and from thosemanaged directly.

Transport

The analysis of the transport sector deals with modes of transport (road, rail, maritime—sea and river— and air), distinguishing, within rail and road modes of transport,the carriage of goods from the carriage of passengers.

A large part of the savings are concentrated on road transport(6.782 Ktep) and, basically, on the carriage of goods, which makes up for the negative savings made, basically, relative to rail transport. These negative savings focused on rail transportoccur as a result of less goods traffic—derived from the economic crisis— and the subsequentreduction in loading factors (energy consumption is maintained —since the regular transport lines are maintained—, but the occupation levels have fallen, which increases consumption per ton-Kilometre carried).

Diagram 2.2 summarises the main results in terms of savings in the sector and the calculation method for each mode of transport. The*top- down* indicators respond to the description included in the previous Table 2.9., whilst,as can be seen, for the evaluation of the savings associated with the carriage of passengers by road,which used bottom-up indicators.

TRANSPORT TOTAL			[BU $_{rp+BUcet+A2+PB]+}$ [P10+P11] +[M7] + [Mav]+[P12 +P13] =**6.451, 1 ktep**2010 (Base year 2004)
Road transport:			[BU_{rp}+BU_{cet}]+[A2]+[PB]=**6.701,4 ktep2010** (Base year 2004)
Road transport relative to private vehicles			[BU_{rp}+BU_{cet}]= **788,4ktep**2010 (Base year 2004)
Road transport for the carriage of goods(lorries and light vehicles)			[A^2] =**5.880,4** **ktep**2010 (Base year 2004)
Collective modes of transport relative to road transport(buses)			[PB] = **32,6 ktep**2010 (Base year 2004)
Rail transport:			[P10+P11] =¯**317,4 ktep**2010 (Base year 2004)
Carriage of passengers [P10] = 24,3 Ktep2010 (base year 2004)	[P12]= 84,7 Ktep 2010(base year 2004)	Carriage of goods	[P11] =**-341,7 Ktep**2010 (base year 2004)
Maritime transport:		[P13]= -2,0 Ktep 2010(base year 2004)	[M7] **52 3 ktep**2010 (Base year 2004)
Air transport:			[Mav] =**-68,0 ktep**2010 (Base year 2004)

Note: The indicators P12 and P13 correspond to change of mode and provide an estimate of energy savings in transport achieved as a result of the replacement of individual modes of transport (by road) with collective modes of transport(whether road or rail modes of transport) in the case of indicator P12, and as a result ofthe replacement of road transport with rail and maritime transport in the carriage of goods in the case of indicator P13. The tables summarises the savings achieved through theP12 and P13 indicators have been added road transport, which shows a saving of 6.927,2 Ktep instead of 6.844,4 Ktep.

The savings associated with road transport have been calculated as shown in Diagram 2.3.: through the aggregation of bottom-up savings for the carriage of passengers and through indicatorA2 (unit consumption of lorries and light vehicles) for the carriage of goods.The ascending indicators calculated for the carriage of goods include the savings due to renewal of the automobile fleet (BUrp) and due to efficient diving courses—BUcet— (the latter are undertaken, basically, within the context of the IDAE cooperation programmes with the Autonomous Communities, the savings being determined on the basis of the actual number of drivers trained[13]).

The indicator calculated to measure the impact of the saving due to the renewal of private vehicles(BUrp) includes savings from natural renewal (with or without replacement) those derived from vehicle replacement plans (Plan PREVER1997-2007, Plan VIVE 2008-2010 and Plan 2000E 2010) and the replacement of vehicles with electric or hybrid vehicles —the latter realised within the subsidy programmes from the Autonomies Communitiesor from IDAE itself,basically, through the MOVELE electric vehicle project.These savings equate to 733,1 Ktep/year of final energy, from which we can differentiate that from plans and programmesthat have promoted greaterscrapping of older and high-consumption vehicles —and their replacement with new vehicles with better consumption and emissions—, from those derived from the natural renewal ofthe automobile fleet.

The final energy savings derived from the natural renewal of the automobile fleet—by other more efficient vehicles— has been evaluated at 425,3Ktep/year, which assumes 58% of the savings attributable to private vehicles. These savings are considered to be attributable, either directly or indirectly, to the saving and energy efficiency action plans. The fiscal discrimination introducedfor Vehicle Registration Tax according to energy efficiency and emissions ofCO_2 per kilometre covered[14] and has directedpotential buyers of new vehicles towards those with less consumption and has stimulated gains in the market share relative to vehicles with lower consumption and emissions. Likewise, in table 2.15. that follows, these savings (425,3Ktep/year) are attributed, jointly, to these fiscal measure and to the application of regulation443/2009 concerning emissions of CO_2 from new vehicles.

The global assessment of the savings from road transport in 2010 (base year2004) was performed on the basis of the bottom-up savings calculated (BUrp +BUcet) for the carriage of passengers and on the basis of the top-downsavings calculated for the carriage of goods (A2). The savings calculated for the carriage of goods by road(5.880,4 Ktep/year) are due to a reduction in consumption per vehicle(lorries and light vehicles).

[13]The calculation details relative to the bottom-up indicators can be found in the annex document"Methodology for the calculation of savings derived from the 2005-2007 and 2008-2012 Energy Efficiency Action Plans.Analysis of results".

[14] This modification of the tax structure was introduced by Law 34/2007 concerning Air Quality and Atmospheric Protectionfrom 1 January 2008. The new structure includes type 0 for vehicles with less than120 gCO_2/Km.

Likewise, the global assessment of savings in the transport sector in 2010 is obtained as a result of adding, to the previous ones, the savings attributable to the other modes of transport (rail, maritime and air) for those that used top-down indicators. Therefore, in this global assessment, 12.2% of the total savings attributable to the Transport Sector in 2010 were determined through a bottom-up approximation (788,4 Ktep/year on a total of 6.451,1Ktep/year).

The savings in rail transport are negative as a result of the behaviour of the carriage of goods. Whilst, in terms of the carriage of passengers,savings are recorded as a result of less consumption per passenger-kilometre—largely attributable to high-speed—, in the carriage of goods, the evolution was the opposite: greater consumption per ton-kilometre carried was recorded in 2010 compared with 2004,which may be attributable, in large part, to the reduction in loading factors as a result of the current economic crisis.Negative savings were also achieved in air transport due to greater energy consumption per flight.

Definitively, the global assessment of savings in the Transport Sector was realised by adding the top-down indicators—with the exception of the savings attributable to the carriage of passengers by road— for each of the modes of transport, and always distinguishing betweenthe carriage of passengers and that of goods. However, bottom-up indicators were calculated for the determination of the impact, in terms of saving, of the different measures included in the action plans prior to this one (2005-2007 Action Plan and 2008-2012 Action Plan). These results are shown in table2.15., which distributes the bottom-up savings calculated by measures and mechanisms referred to in these plans. Likewise, within the measure relative to the renewal of private vehicles, in addition to the savings attributable to the fiscal discrimination concerningthe aforementioned vehicle registration tax,the savings are attributed to the Plan PREVER (275,3 Ktep/year), Plan VIVE (10,0Ktep/year), Plan 2000E (15,4 Ktep/year) and the initiatives relative to the promotion of the electric and hybrid vehicle(9,0 Ktep/year)[15].

In total, through a bottom-up approximation, savings equivalent to1.711,8 Ktep/year were determined which assumes that more than 26% of the total savings in the Transport Sector are due, directly, tosaving and energy efficiency measuresfrom those included in the action plans. 860Ktep/year is attributable to the introduction of Sustainable Urban Mobility Plansand Workers' Transport Plans—plans

[15] These savings include those derived from hybrid vehicles subsidised under theaid orders from the Autonomous Communities in the context of IDAE cooperation with these territorial administrations, and from the IDAE itself(IDAE's Grants for Strategic Projects Programme), and those from electric vehicles subsidised within the MOVELE electric vehicle project.

developed withinthe aid programmes from the Autonomous Communities—, whilst114,1 Ktep/year is the result of subsidised efficient driving courses or continuous training introduced forprofessional drivers as a result of the approval of Royal Decree1032/2007.

Diagram 2.3. Calculation diagram for savings in the *Transport* Sector (road transport): integrated *top-down/bottom-up* approach.

ROAD TRANSPORT: BU_{rp} +BU_{cet}+A2+PB = 6.701,4 Ktep 2010(base year 2004)

PRIVATE VEHICLES: BU_{rp} +BU_{cet} = 788,4 Ktep2010(base year 2004)

Renovation of the privatevehicle fleet (BU_{rp}) 734,9 Ktep 2010(base year 2004)	Efficient Driving ofPrivate Vehicles (BU_{cet}) 53.5 Ktep 2010(base year 2004)

GOODS: A2 = 5.880,4 Ktep2010(base year 2004)

Renovation of Road Transport Fleets(BU_{rf}) 1,0Ktep 2010(base year 2004)	Management of Road Transport Fleets (BU_{gf}) 1.3 Ktep 2010(base year 2004)	Efficient Driving ofLorries (BU_{cec}) 60,6Ktep2010(base year 2004)

COLLECTIVE:PB = 32,6 Ktep2010(base year 2004)

Table 2.15. Final energy savings through measures (bottom-up) in the Transport Sector (road transport) in 2010 (ktep)

	Mechanisms / Measures	IDEA- Autonomous Communities cooperation programme	IDEA Strategic Grants Programmes	Strategy to promote the electric vehicle in Spain 2010-2015	Plan Prever	Fiscal discrimination in terms of Vehicle registration tax	Regulation 443/2009	Initial qualification and continuing training of road transport drivers (RD 1032/2007)	Plan Vive	Plan 2000E	Total
2010 Base year 04[Ktep]	PMUS and PTT (1)	860,0									860,0
	Road transport fleet management	1,3									1,3
	Efficient driving ofroad transport	30,0						30,6			60,6
	Efficient driving of private vehicles	53,5									53,5
	Renovation of road transport fleets	1,5									1,5
	Renovation of privatevehicles	6,9		2,1	275,3	425,3			10,0	15,4	734,9
	Total	953,2		2,1	275,3	425,3		30,6	10,0	15,4	1.711,8

1) Sustainable Urban Mobility Plans and Workers' Transport Plans

Buildings and Equipment

The final energy savings attributable to the Buildings and Equipment Sector (2.232Ktep/year) are due, basically, to the improved energy efficiency of the thermal envelope and appliances and, basically, focuses on the tertiary sector(approximately 61% of savings in 2010 correspond to savings in heating, cooling and sanitary hot water in the tertiary sector).

In all cases, the savings were calculated using the aforementioned P and M indicators, the savings having been calculated using bottom-up indicators to isolate the effect of the measures introduced and to identifythe possible indirect effects or, even, the possible rebound effect that may occur, as the difference between the total savings calculated using top-down indicators and the direct savings determined usingbottom-up indicators, which constitutes a methodological approximation common to all the sectors in this 2011-2020 Action Plan[16]. In the residential sector, P indicators were used(preferred), instead of M indicators (minimum), which are those used for the determination of savings in the tertiary sector,to lack, for the latter,consistent statistical information which will enable the calculation of equivalent P indicators.

Indicators P1 and P2—expressed as energy consumption for heating and cooling, respectively, per square metre built in buildings for residential use– which shows savings (or negative savings) due to the decrease (or increase) in consumption per m^2 between 2004 and 2010. Indicator P3—defined as energy consumption per inhabitantfor sanitary hot water— resulting in savings of196,9 Ktep/year. In aggregated terms, the previous indicators result in a saving of273,9 Ktep/year which is shown in Diagram 2.4. below: in large part, the savings derived from lower consumption in heating(153,7 Ktep/year) are absorbed by the negative savingsderived from greater consumption in cooling per square metre, a result of the increase in the number of homes fitted with domestic air-conditioning units (-76,6Ktep/year).

In the tertiary sector, the determination of the savings was performed, equally, by use(heating, cooling and sanitary hot water), but using consumption by employee as the indicator—in both cases, both for residential buildings and for buildings used for tertiary purposes, consumption for heating and coolinghave been corrected for the climate, using average degrees-dayin winter and summer respectively. The number of employees was also an activity variableconsidered as a reference for consumption relative to lighting in the tertiary sector, where savings equivalent to713 Ktep/year were achieved.

Again, and similarly to the Transport Sector, the bottom-upindicators summarise the direct effect, in terms of saving, of the programmes relative to the renewal of appliances

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[16]This would prove the existence of a rebound effect in the domestic sector, if, through application of descending or top-down indicators, negative savings are achieved or, in any case,less savings than when ascending or bottom-up indicators are used. In this case, this rebound effect would absorb, partially or completely, the savings due to application ofmeasures calculated using a*bottom-up*approach.

and even,from the policy-related actions realised as a result ofthe approval of the 2005-2007 and 2008-2012 Action Plans.Likewise, the savings derived from programmes to renew thermal equipment(boiler and air-conditioning units etc) in the context of theaid programmes approved and managed by the Autonomous Communities were calculated (BUit= 61,1 Ktep/year); the savings derived from the grant programmesfor the improved energy efficiency of roofs or facades (which includes results from window renewal programmes closures andglazing), equivalent to 22,3 Ktep/year (BUet), and the approval of the Technical Building Code(231,7 Ktep/year). In terms of lighting, equally, the savings derived fromgrant programmes within public aid programmes from the Autonomous Communities have been calculated (29,7Ktep/year) as well as those derived from the programme for the free distribution of low-consumption lamps realised by IDAE(84,9 Ktep) and the 2-for-1 programme (13,0 Ktep).

The savings attributed to the Buildings and Equipment Sector are the result, however, of adding to the previous savings those derived from the renewal of electrical appliances (and cookers) in homes and tertiary sector establishments (hotels and restaurants) by other more efficient ones, as a result of the autonomous technological progress and theand the incentivisation programmes from grants to replace appliances with other with a higher energy rating.

Bottom-up indicators were used to determine the direct saving derived from the Electrical Appliances RENOVE plan(80,0 Ktep/year in 2010), whilst, as a result of the calculation of P indicators—energy consumption per appliance— a total savingcan be attributed to the RENOVE plan, not onlythrough the direct replacement of 3.907.745 appliances, but through positive indirect effects from the same: better knowledge of energy efficiency labelling and greater presence ofclasses A and A+ at points of sale—this has meant the practical disappearance of electrical appliances with low energy efficiency from commercial establishments. This total saving calculated using P indicatorsis 286,1 Ktep/year.

The domestic saving in the equipment sector is, notwithstanding the foregoing, compensated for through greater consumption per employee in terms of appliances (office equipment and others) in the tertiary sector(the indicator calculated produces negative results in the order of -660,4 Ktep).

Table 2.16. shows the savings calculated using bottom-up indicators,using the matrix that shows the measure/mechanism intersections, showing the mechanisms (public aids, policy-related mechanisms and others)used to achieve savings through the improved energy efficiency of the thermal envelope and equipment, in terms of lighting and equipment. Thedirect savings attributable to the measures included in the 2005-2007 and 2008-2012 Action Plan are1.251,3 Ktep, which represents 56% of the total savings calculated for the sector[17].

[17]The 666,3 Ktep/year saving through improvement of interior lighting installations attributed to thenew buildings policy was calculated by the difference between savings in lighting achieved by the application of descending indicatorsand the bottom- up savings are derived from the subsidised saving projects in the context of theaid programmes from the Autonomous Communities or from the IDAE itself, in addition to those derived fromprogrammes to encourage the replacement of incandescent lamps with low-consumption lamps.

Diagram 2.4. Diagram for calculation of the savings in the Buildings and Equipment Sector: *integrated top-down/bottom-up* approach

Buildings Sector $[P1+P2+P3+M3_1+M4_1]+[M2_2+M4_2]+[P4]+[P4_1+M4_3+M3_2]+[M4_4]$ = 2.232,5 kteP2010 (base year 2004)

- **Thermal envelope and installations** $[P1+P2+P3+M3_1+M4_1]$ = 1.637,7 kteP2010 (base year 2004)
  - **Homes**
    - $[P1+P2+P3]$ = 273,9 kteP2010 (base year 2004)
      - Thermal envelope RENOVE plan BUet = 22,3 kteP2010(base year 2004)
      - PR thermal installations BUit = 61,1 kteP2010 (base year 2004)
      - CTE new homes BUcte = 231,7 kteP2010 (base year 2004)
      - Strategic projects BUpe = 60,9 ktep2010 (base year
  - $[M3_1+M4_1]$ = 1.363,7 kteP2010 (base year 2004)
- **Interior lighting** $[M2_2+M4_2]$ = 793,9 ktep2010 (Base year 2004)
  - **Homes** $[M2_2] = [P5]$ = 81,0 ktep2010 (base year 2004)
    - Improved installations BU$_{i3}$ = 29,7 kteP2010 (base year
    - Free distribution programme BU$_{i1}$ = 84,9 kteP2010 (base year
    - 2-for-1 programme BU $_{i2}$= 13,0 kteP2010 (base year
  - **Building services** $[M^4_2]$ =713,0 kteP2010 (base year 2004)
- **Equipment** $[P4]+[P^4_1+M^4_3+M^3_2]+[M^4_4]$=-199,1 kteP2010 (Base year 2004)
  - **White goods**
    - Renovation of white goods. [P4] = 286,1 kteP2010 (base year 2004)
      - White collar RENOVE plan BUe= 80,0 kteP2010 (base year 2004)
  - **Cookers in homes and the tertiary sector** $[P4_1+M4_3+M3_2]$ = 175,2 kteP2010 (base year 2004)
    - Renovation of cookers in homes $[P4_1]$ = 103,0 kteP2010 (base year 2004)
      - Cooker RENOVE plan BUc= 1,4 kteP2010 (base year 2004)
  - **Equipment in the tertiary sector** $[M4_4]$= -660,4kteP2010(base year 2004)

Table 2.16. Final energy savings through measures (bottom-up) in the Transport Sector (road transport) in 2010 (ktep)

<table>
<tr><th colspan="2">Mechanisms / Measures</th><th>IDEA-Autonomous Communities cooperation</th><th>IDEA Strategic Grants Programme</th><th>2-for-1 low-consumption lamp campaign</th><th>Campaign for the distribution of low-consumption lamps in 2009 and 2010</th><th>New RITE (RD 1027/2007)</th><th>TBC (RD 314/2006)</th><th>Energy rating for buildings (RD 47/2007)</th><th>TOTAL</th></tr>
<tr><td rowspan="5">2010 Base year 04[Ktep</td><td>Thermal envelope renewal</td><td>22,3</td><td rowspan="2">60,9</td><td></td><td></td><td colspan="3" rowspan="2">231,7</td><td rowspan="2">376,0</td></tr>
<tr><td>Improved thermal installations</td><td>61,1</td><td></td><td></td></tr>
<tr><td>Improved int. lighting installations</td><td>29,7</td><td></td><td>13,0</td><td>84,9</td><td colspan="3">666,3</td><td>793,9</td></tr>
<tr><td>Renewal of electrical appliances</td><td>81,4</td><td></td><td></td><td></td><td colspan="3"></td><td>81,4</td></tr>
<tr><td>TOTAL</td><td>194,5</td><td>60,9</td><td>13,0</td><td>84,9</td><td colspan="3">898,0</td><td>1.251,3</td></tr>
</table>

Note: The 666,3 Ktep saving in lighting, attributable to the new building policy, was not calculated using a strictly bottom-up procedure.

Public Services

The final energy savings attributable to Public Services equate to31,8Ktep. Of these savings, 4,6 Ktep corresponds to improved energy efficiency in public lighting and27,2 Ktep to improved energy efficiency in water treatment and desalination plants or installations.

The first amount—corresponding to public lighting— is significantly reduced, if we take the countable effects frombottom-up indicators into account, a result of the programmes to renew existing public lighting installations, and programmes to replacetraffic lights with new LED technology, achieves 86,3 Ktep. The grant programmes (withaid intensities that reached 40% on projects to renew municipal public lighting) report savings equivalent to 77,7 Ktep, the result of the sumof the annual savings reported by the Autonomous Communities toIDAE since 2004 (actually from 2006—the first year when projects of this typewere undertaken within the cooperation programmes from the IDAE and the Autonomous Communities). From the programme to replace traffic lights with new LED technology, savings of8,7 Ktep were achieved,through the replacement of 461.791 traffic light optics in 600 Spanish municipalities.

In the case of public lighting, the increase in electricity consumption per home—due to new urban development's and the installation of new light points– has absorbed the savings through improved energy efficiency and technological renewal calculated using a bottom-up approach, which may constitute, partially, a rebound effect.

The opposite result is achieved in the energy consumption associated with the water cycle is analysed (drinking water, supply, waste water purification and desalination plants), to the extent that the descending indicators show a reduction in energy consumption per inhabitant(or per m^3 of desalinated water in the case of desalination plants) for this use.

Diagram 2.5. Diagram for calculation of the savings in the Public Services sector: *integrated top-down/bottom-up* approach

Public Services

[MAP] + [MAG] = 31,8 $kteP_{2010}$ (Base year 2004)

External lighting

[MAP] = 4,6 $kteP_{2010}$ (Base year 2004)

Improved energy efficiency of existing external lighting installations

Renewal of existing public lighting installations

BU_{ai} = 77,7 $ktep_{2010}$ (base year 2004)

Programme to replace traffic lights with new LED technology

BU_{a2} = 8,7 $ktep_{2010}$ (base year 2004)

Water cycle

[MAG] = 27,2 $ktep_{2010}$ (Base year 2004)

Desalination [MDS] = 26,6 $ktep_{2010}$ (base year 2004)

Purification [MDP] = 0,7 $ktep_{2010}$ (base year 2004)

Improved energy efficiency of current drinking water, supply, waste water purification and desalination plants

Strategic projects

BU_{pe} = 0,2 ktep 2010 (base year 2004)

Drinking water and supply

Indirect effects:
Natural renewal of the fleetCommunication and dissemination programmes
–Technological efficiency
- Economies of scale

Agriculture and Fisheries

The final energy savings attributable to the Agriculture and Fisheries Sector reached, in 2010, 425,5 Ktep, calculated from the reduction in energy consumption per unit of added value in the sector. The improved energy intensity for the agriculture and fisheries sector jointly has been, on average,in the order of 2% annuallybetween 2004 and 2010: from 0,154 Ktep/M€2000 in 2004, to 0,137Ktep/M€2000 in 2010.

The previous savings may be differentiated according to those corresponding to the agriculture, livestock, hunting and forestry subsector and those attributed to the fisheries and aquaculture subsector,the savings being determined, in both cases, by the difference in the energy consumption per unit of added value in each of the individually analysed subsectors—the difference between the sum of the savings calculatedfor the subsectors and the saving achieved at a global level for the agriculture and fisheries sector as a whole due to the weight gains relative to less energy intensive subsector,that is to say, the arable and livestock farming sector, compared with the fisheries sector, representing the first 95% of the added value and 85% of the energy consumption for the whole Agriculture and Fisheries Sector. Therefore, in the agriculture, livestock, hunting and forestry sector, savings of240,1 Ktepwere counted, compared with 146,4 Ktep for the fisheries sector.

In addition, and with a bottom-up approach, we have tried to identify the savings due to technological improvements in terms of farming machinery and improved irrigation practices. In the first case, the assessment is negative as a result of the increased use of technology and machinery on farms and in greenhouses. In the second, savings were recorded through less energy consumption per hectare irrigated(up to 73,5 Ktep). In the case of the fisheries and agriculture sector, the decrease in consumption per fishing boat also produces positive savings of 38,7 Ktep.

Diagram 2.6. Diagram for calculation of the savings in the Agriculture and Fisheries Sector: integratedtop-down/bottom-up approach

<table>
<tr><td colspan="6">Agriculture and Fisheries [M8’] = 425,5 ktep 2010(Base year 2004)</td></tr>
<tr><td colspan="3">Agriculture, livestock farming, hunting and forestry[$M8_1$] = 240,1 ktep</td><td colspan="2">Fishing and agriculture $M8_2$ = 146,4 ktep</td><td rowspan="2">Weight change in the consumption structure 39,1 ktep</td></tr>
<tr><td>Farms
[PMa + PCl] = -65,6 ktep2010(B 2004)</td><td>Irrigation
[PRe] = 73.5 ktep 2010(Base year 2004)</td><td>Climate control Technological improvement Production 339,8ktep2010(Base year 2004)</td><td>Fishing[PP_e] = 38,7 kteN010(B 2004)</td><td>Technological improvement Production 107.6 ktep 2010(Base year 2004)</td></tr>
</table>

2.4 Monitoring of the Plan: periodic evaluation of results and revision of the2011-2020 Action Plan.

The determination of the results in terms of final and primary energy saving and emissions ofCO_2 avoided in 2010 required the development of a coherent and complete evaluation platform relative to the energy savings and emissions ofCO_2 avoided forall the consumer sector identified in the E4 and, as a result, in the Action Plans which will be derived from this strategy(2005-2007 Action Planand 2008-2012 Action Plan). This platform consistently includes top-down or descending indicators and bottom-up or ascending evaluations, the latest results of the individual monitoring of the results derived from the saving and energy efficiency measures introduced.

The design of the aforementioned platform responded to the need to adapt the analysis of results to be contained in this Plan as required and included in the methodological recommendations prepared by the European Commission, as well as the IDAE's own desire to carry out monitoring and evaluation on the saving and energy efficiency action plans prior to this one in the terms derived from that set out in said plans. Therefore, IDAE has complete the evaluation required by the European Commissionrelative to the measures introduced from—therefore, with base year 2007— with the evaluation of the saving and energy efficiency measures adopted since—therefore, with base year2004.

The IDAE is configured, in the 2008-2012 Action Plan, as the Plan's only monitoring centre, with the aim of carrying out correct analysis on the degree of execution of the different measures and the barrier that make their introduction difficult and incorporating and implementing the necessary corrective measures. In the same way asfor the previous plans, the IDAE will be the only body responsible for monitoring this 2011-2020 Action Plan,for whichcollaboration from the different ministerial departments involved in the implementation of the different measures contained in the same and the Autonomous Communities, through the Sectoral Energy Conference, should be counted on.

The periodic monitoring of the Plan will include an analysis similar to that performed for 2010 and summarised in this document.This periodic evaluation will make use of the top-down indicators chosen for the evaluation performed in 2010 or others which, alternatively,may be proposed, ion the initiative of the European Commission or the Member States, if they will allow for the counting of the savings derived from these plans and the quality of the analyses.In any case, IDAE is tailored to theEuropean Commission's requirements in terms of information required relative to the degree of progress in the achievement of the objectives for 2016 and, specifically, in terms of the degree of progress in terms of the achievement of the 20% primary saving objective in definitively, IDAE will respondto the European Commission's information requirements in terms of the results of the plans and programmes, in accordance with that set out in the final section of the Directiveapproved on the basis of the proposal proposed by the Commission in June [COM(2011) 370 final].

It should be noted that, as a result of this periodic evaluation and as the entity responsible for monitoring this 2011-2020 Action Plan,IDAE may incorporatechanges into the sectoral distribution or through measures relative to aids managed by the public sectorrecognised in the Plan to guarantee the achievementof the saving objectives proposed. In the same way, on theinitiative of the Autonomous Communities -through the Sectoral Energy Conference- new measures may be included in this Plan, if the cost-benefit analysis of said measures is suitable for their introduction to guarantee or facilitatethe achievement of the final and primary energy saving objectives proposed.

3. STRATEGIES AND ACTION MECHANISMS FOR IMPROVING ENERGY EFFICIENCY

3.1 Introduction

This chapter further develops the presentation of the diagram for the 2011-2020 Action Plan introduced in section 1.3, providing more detail on the direct action programmes by the Ministry of Industry, Trade and Tourism, through the IDAE, and on the programmes managed jointly by IDAE and the Autonomous Communities, as basic execution mechanisms for the measures proposed in the Planalong with policy-related mechanisms. Notwithstanding the aforementioned,this Plan proposes—as an addition or alternative to the direct public aid programmes that have come to be one of the main action mechanisms– the establishment of a new recognition oreconomic value attribution diagram for theverified, certified and non-market based energy savings.

Before describing in greater detail the mechanism designed by the State General Administration and the Autonomous Communities for the execution of the 2005-2007 and 2008-2012 Action Plans,we should mention the two saving and energy efficiency plans that, at the initiative of the Ministry of Industry, Trade and Tourism—through the office of the Secretary of State for Energy—have been added to thealready approved action plans, proposing urgent measures or intensifying efforts–with new mechanisms— to make the achievement of the global objectives set out in the first possible:the 2008-2011 Saving and Energy Efficiency Action Plan, approved by the Council of Ministers on 1 August 2008, and the Saving and Energy Saving Intensification Plan,approved by the Council of Ministers on 4 March 2011. Both plans, of special relevancebecause of the time in which they were approved (marked by the significant political instability in the main countries that are the source ofpetroleum imports and the increased prices of crude oil), do not constitute new saving and energy efficiency action plans per se, but consistently fit in with the 2008-2012 Action Plan.

2008-2011 SAVING AND ENERGY EFFICIENCY ACTION PLAN(ACM, 1 August 2008)

This Plan contains 31 measures, practically all of them being executed (it is estimated thatthe degree of achievement for the saving objectives is 92%), which are grouped under four main headings:1) Transversal measures; 2) Mobility; 3) Energy saving in buildings; 4) Electrical saving measures. The objective of the Plan was the reduction ofenergy consumption by 44 million barrels of oil, equivalent to10% of annual crude oil imports.

Of the 31 measures, the following measures should be highlighted: measure n° 1 within the transversal measures section, which makes reference to the promotion of the energy services market;measure n° 2 (duplication of the budgetary allocation from the *IDAE Grants for Strategic Projects Programme*); measure n° 5 (MOVELE project)—within the measures that affect mobility and measures n° 25 and n° 26, within theelectrical saving measures relative, respectively for the free distribution oflow-consumption lamps through discount vouchers distributed withelectricity bills (one low-consumption lamp per household in 2009 and 2010) and the distribution of 6 million low-consumption lamps within the framework of the 2-for-1 programme.

The previous measures specifically, and generally all the measures contained in the Plan will be mentioned and described in thecorresponding sectoral sections, since they have contributed to the achievement of a large part of theobjectives allocated to each of the related measures for this Plan until 2010.To the extent that almost all of them were executed by the Ministry of Industry, Tourism and Tradethrough the IDAE, they will also be described in section 3.2 of this same chapter.

MEASURE 1: Promotion of the energy services market.

MEASURE 2: Duplication of the grant from the IDAE's Assistance Programme to strategic projectsin energy saving and efficiency.

MEASURE 3: Requirement of energy efficiency accreditation in public contracting for the General Administration of State.

MEASURE 4: Campaign for consumer information and training.

MEASURE 5: Electric Vehicle Pilot Project.

MEASURE 6: Acquisition of Class A tourism vehicles in the General Administration of State (AGE).

MEASURE 7: Minimum 20% consumption of bio fuels by the State's vehicle fleet.

MEASURE 8: Regulatory development to guarantee the 2010 bio fuels objective of5,83%.

MEASURE 9: Plan VIVE for vehiclesubstitution.

MEASURE 10: Obligatory comparative energy labelling for tourism vehicles.

MEASURE 11: Reduction of speed limits on roads.

MEASURE 12: Promotion of efficient driving.

MEASURE 13: New funding for Sustainable Urban Mobility Plans (PMUS).

MEASURE 14: Inclusion of energy efficiency criteria for the funding of public transport.

MEASURE 15: Guaranteed mobile phone access on collective modes of public transport.

MEASURE 16: Extended opening hours for metro networks at weekends.

MEASURE 17: Promotion of urban transport by bicycle:

MEASURE 18: Incentivisation of the HOV lane in big cities.

MEASURE 19: Introduction of workers' transport plans by from the State General Administration.

MEASURE 20: Optimisation of air routes reducing them by up to 10%.

MEASURE 21: Temperature limitation inside climate-controlled spaces.

MEASURE 22:RENOVE plan for private vehicle infrastructure.

MEASURE 23: High energy rating in new State General Administration buildings.

MEASURE 24: Elimination of low-efficiency bulbs in 2012.

MEASURE 25: Distribution of 49 million low-consumption bulbs through gift vouchers sent out with electricity bills.

MEASURE 26: Distribution of 6 million low-consumption bulbs through the 2-for-1 programme.

MEASURE 27: 10% reduction the State General Administration's energy consumption.

MEASURE 28: Improved energy efficiency of external lighting.

MEASURE 29: 50% reduction in the luminous flux on motorways.

MEASURE 30: Recovery of electricity from the braking of trains.

MEASURE 31: Reduction in losses through transport and distribution of electrical energy.

SAVING AND ENERGY EFFICIENCY INTENSIFICATION PLAN(ACM, 4 March 2011)
This Plan contains 20 measures with the objective of reducing crude oil imports by 6%.These measures are grouped into four action blocks:1) Transport and mobility; 2) Building; 3) Lighting and electricity consumption, 4) Dissemination and training. Of these measures, the following measures should be highlighted: measure n° 2 (energy efficiency plan in transport, focusing on the carriage of goods by rail in particular),measure n° 3 (Tyre Renewal Plan for tyres), measure n° 6 (reducing speed limits from120 to 110 kph on motorways for private vehicles and motorbikes), measure n° 16 (upgrade of municipal public lighting systems with other more efficient ones) and measure n° 19 (2-for-1 Plan to replace halogens with LEDs). Again and as happened with the 2008-2011 Saving and Energy Efficiency Action Plan, the related measures in this Plan will be dealt with in the corresponding sectoral analysis and,if applicable—dealt with as direct actions from the IDAE— in section 3.2 of this chapter. **MEASURE 1:** Funding for the execution of Sustainable Urban Mobility Plans(PMUS). **MEASURE 2:**Energy efficiency plan for transport, focusing on the carriage of goods by rail in particular. **MEASURE 3:**Tyre Renewal Plan. **MEASURE 4:**Optimisation of the use of green corridors and approach routes.**MEASURE 5:**Promotion of car pooling through ICT. **MEASURE 6:** Reduction of speed limits from 120 to 110kph. **MEASURE 7:**Increase of the bio diesel objective to 7% year-on-year. **MEASURE 8:**up to 5% fare reduction for "cercanias" trains and medium-distance RENFE trains. **MEASURE 9:**Promotion of public transport in the State General Administration: prioritisation of social aids for transport. **MEASURE 10:**Promotion of cities with the MOVELE seal. **MEASURE 11:** ICO-ESE line for the promotion of the Plan 2000ESE for saving and energy efficiency works in public buildings. **MEASURE 12:** Introduction of biomass boilers in Administration buildings. **MEASURE 13:**Rationalisation of energy consumption in Public Administration. **MEASURE 14:** Intensification of the*Renove* Plan for boilers with high energy yield. **MEASURE 15:**Compulsory energy certification of non-residential buildings with more than 400KW of installed power. **MEASURE 16:**Upgrade of municipal public lighting systems with other more efficient ones. **MEASURE 17:** Energy efficiency plan for the State's Road Network. **MEASURE 18:**Culmination of the replacement of traffic light optics with LED technology. **MEASURE 19:** 2-for-1 plan to replace halogens with LEDs.

MEASURE 20: Energy saving awareness campaign aimed at end-users.

The action mechanisms described in this chapter are those executed up to 2010, that have been continued in 2011 to the extent that the 2008-2012 Action Plan is still in force and that will continue for 2016 and 2020.

The 2005-2007 and 2008-2012 Action Plans were executed through a co-management and co-funding mechanism from the State General Administration and the Autonomous Communitiesbased on the signing of collaboration agreements by the IDAE and the Autonomous Communities, with an annual characterfor 2005, 2006 and 2007 and with a multiyear character from 2008, covering the 2008-2012 Action Plan's period of validity.

These collaboration (or cooperation) agreements between Administrations defined the way in which the Autonomous Communities executed the measures containedin the 2005-2007 and 2008-2012 Action Plans. These measures were, basically, of two types:1) aid measures or 2) training, information and communication measures.In either of the twocases, IDAE has set out, with a general character for the wholenational territory, the characteristics and the way in which each of the Autonomous Communitiesshould execute said measures in their own territory, setting themaximum support intensities for the subsidised saving and energy efficiency projects, or the characteristics and content of the training courses that the Autonomous Communities should organise and run.

These agreements also set out the way in which the IDAE has transferred,to the Autonomous Communities, the resources that have beenfacilitated by the successive Action Plans, from theGeneral State Budgets, and electricity and gas prices by the amount indicated in the plans themselves[18]. Therefore the amounts transferred by IDAE were applied to the Autonomous Communities in the exercise of its powers and within the framework of these collaboration agreements, in which IDAE have a supervisory and coordination role terms of the actions realised by the different Autonomous Communities with the aim of guaranteeing coherence in the whole national territory in terms of saving and energy efficiency carried out. In addition to the amounts transferredby IDAE, the Autonomous Communities have negotiatedinvestments which, for the finalisation of the 2005-2007 and 2008-2012 Action Plans, have made their own autonomous budget.

[18] The distribution of the funds by Autonomous Communities was performed in accordance with the criteria and objective indicators that take into account the sectoral activity, the potential of the different areas and the effort that went into achieving the objectives set out in the plans; namely:***Gross Value Added*** for the industry sector; vehicle fleet;buildings built for the tertiary sector in Spain and number of heated and cooled homes;total number of homes; population; agricultural machinery census; number of cogeneration plants and installed power.

As a result of the foregoing, the Autonomous Communities manage 75% of the total budget for the 2005-2007 and 2008-2012 Action Plans,with the Ministry of Industry, Trade and Tourism, through IDAE,assuming the direct management of the remaining 25%, which has seen the introduction of the plans and programmes described in the following section.

This co-management and co-funding model achieved positive results derived fromthe creation of new regional energy agencies, better dissemination of knowledge relative toenergy efficiency actions plans as a result of the decentralisation of the management of funds,active involvement in the application of measures for small and medium enterprises at local or regional levelrand the promotion of investment in improving energy efficiency in small and medium enterprises uniformly distributed across the whole national territory. The creation of a new business network—of services— to meet new demands(performance of energy audits, feasibility studies,urban mobility plans and efficient driving courses etc) was also distributed uniformly across the whole national territory.

3.2 Direct action programmes from the Ministry of Industry, Trade and Tourism through IDAE

The resources managed by IDAE directly within the context of the2005-2007 and 2008-2012 action plans were applied tonational programmes and are aimed at final energy usersnot covered by public support programmes or training and information undertaken byAutonomous Administrations. The results, in terms of saving and to the extent that they can be determined using abottom-up approximation, are shown in the following table, and the programmes which are referred to in detail below:

Table 3.1. Summary of the bottom-up savings achieved in 2010 (base year 2004) through direct action programmes from the Ministry of Industry, Trade and tourism, through the IDAE

	Final E. Savings (ktep)	Primary E. Savings (ktep)	Emissions of CO_2avoided ($ktCO_2$)
STRATEGIC PROJECTS PROGRAMME	199,9	337,0	722,5
OTHER PROGRAMMES DIRECTLY EXECUTED BY IDAE	140,5	302,2	653,8
Efficient driving of private vehicles	1,1	1,2	3,7
Efficient driving of lorries and buses	30,7	34,4	105,0
MOVELE project	2,1	0,9	4,6
Programme for the distribution of low-consumption bulbs	84,9	212,5	429,5
Programme for the 2-for-1 on low-consumption bulbs	13,0	32,5	65,8
Programme to replace traffic lights	8,7	20,4	43,7
TOTAL	340,4	639,1	1.376,3

Source: IDAE

Note: The calculation of emissions of CO_2 avoided as a result of the saving and energy efficiency measuresincluded in this Plan are ad hoc calculations for the same and assume a translation of the savingscalculated using different base years (2004 and 2007), in terms of final and primary energy, to emission of CO_2 avoided - this calculation does not necessarily coincide, therefore, with those achieved with approaches or different accounting bases aspart of the periodic reports produced in relation to the evolution of greenhouse gas emissions.

IDAE's Strategic Grants Programme.

IDAE has been calling, since 2008, for aid corresponding to this Programme, blessed, in the first call, with a budget of 60 million Euros which was double in the following and successive calls corresponding to 2009, 2010 and 2011, to120 M€. The doubling of the programme's budgetis down to the approval, on 1 August 2008, of the 2008-2011 Saving and Energy Efficiency Action Plan which includes this provision as measuren° 2.

This aid programme (direct subsidies) has the aim of incentivising the introduction of innovative strategic, sectoral and singular projects thatpromote saving and improved energy efficiency.Basically, said programme is aimed at companies with sites or activity centres in more than three Autonomous Communities, or at companiesexecuting saving and energy efficiencyprojects with a minimum eligible investment of 0.5 million Euros or more.

This IDAE Strategic Grants Programme is in line with the community policy concerningState aids, the amount of the aids being determined in accordance with that set out in the Community Directives on state aids in favour of the environment2008/C 82/01.

The Programme's results, in terms of saving, are those shown in the following table:

Table 3.2. *Results of the 2008-2010 Strategic Projects Programme*

SECTOR	Public aid (10^6 €)	Final E. Savings (ktep)	Primary E. Savings	Emissions of CO_2 avoided [ktCO_2]
INDUSTRY	149,6	131,5	195,1	426,7
TRANSPORT	25,7	4,2	4,6	13,2
BUILDINGS	96,5	63,5	136,2	280,8
ENERGY TRANSFORMATION	0,1	0,6	0,6	0,7
PUBLIC SERVICES	0,4	0,2	0,5	1,0
TOTAL	272,2	199,9	337,0	722,5

Source: IDAE

Note: The calculation of emissions of CO_2 avoided as a result of the saving and energy efficiency measuresincluded in this Plan are ad hoc calculations for the same and assume a translation of the savingscalculated using different base years (2004 and 2007), in terms of final and primary energy, to emission of CO_2 avoided - this calculation does not necessarily coincide, therefore, with those achieved with approaches or different accounting bases aspart of the periodic reports produced in relation to the evolution of greenhouse gas emissions.

The subsidised projects correspond to big projects in the Industry sector,belonging to the chemical, pulp, paper and printing sectors, the non-metallic minerals sector or the food, drink and tobacco sector.Attimes, the projects subject of aid have changed their production processes and, generally speaking, have replaced equipment and installations withBest Available Technologies (BAT).

In the Building and Equipment Sector, investments have been made in the renewal of the thermal envelope in existing buildings, renovation of thermal or interior lighting installations, and in the construction of new buildings with high energy ratings,as well as some investments, generally-speaking, in energy-consumingequipment, installations and systems (cooling equipment,uninterruptible power systems or lifts).

In the Transport Sector, the projects subject to aid are projects to renew fleets for the carriage of people and goods,. for electric, hydrogen and hybrid private and industrial vehiclesand investments in chargers and the logistical network for supplying electric vehicles.

Finally, in the Energy Transformation Sector, the investments subject to grants are those for micro cogeneration or large cogeneration plantsin non-industrial sectors.

The intensity of the aid can be up to 80% of the project's eligible cost, depending on the company size,considering, within the Programme and as potential recipients of the aid, Energy Service Companies, in addition to the actions developed within the framework ofthe 2005-2007 and 2008-2012 Action Plans (especially the second one) to promote the energy services market.

Free distribution of low-consumption lamps and 2-for-1 Programme.

The*2008-2011 Saving and Energy Efficiency Action Plan* includes, as measuresn° 25 and n° 26, the distribution of 49 million low consumption lamps through vouchers sent out withelectricity bills and the distribution of 6 million low-consumption bulbs through a 2-for-1 programme,respectively, as action mechanisms enabling objectives relative to theimprovement of energy efficiency in lighting from the 2008-2012 Action Plan to be achieved.

The free distribution of low-consumption lamps took place as part of two separate annual campaigns in 2009 and 2010:in 2009, 7.254.250 bulbs were exchanged out of a total of20.276.976 gift vouchers distributed, which is an exchange rate of 35.78%; in 2010, theexchange rate was in the order of 29.96% (6.576.625 bulbs out of a total of 21.954.008 gift vouchers sent out with electricity bills to domestic customers).

Together with the previous programmes, the promotion campaign associated with the 2-for-1 programme, which consisted of making 1.200.000packets of 2 lamps available to consumers for the price of one, enabled the introduction of2.400.000 additional low-consumption lamps on the market compared with previously.

These programmes, based on the replacement of incandescent lamps with low-consumption lamps in the domestic sector, achieved the direct results shown intable 3.2. in terms of final and primary energy saving and emissions ofCO_2 avoided, although additional indirect effects were achieved—if possible, greater than previously— through the reduction in the market prices of low-consumption lamps and the generalisation of knowledge of these types of products.

Programme to replace traffic lights with new LED technology.

IDAE introduced a programme to replace traffic light optics with others with LED technology; this enabled the replacement of461.791 optics in 600 Spanish municipalities, through thepurchase of traffic light optics by IDAE by means of public tenders,a requirement for the municipalities to join the programme the municipalities bear the full cost of the installation and maintenance of the traffic lights.

This action mechanism from IDEA has promoted the rapid introduction of new technology guaranteeing the product's energy characteristics, sinceall the optics were acquired with the same quality specifications. The programme also had a significant impact on citizen awareness and information, since the population lining in the municipalities involved in the programme amounts to 27 million inhabitants.

The programme will be replicated by IDAE to affect 100% of traffic light optics and the measure has already been recorded as measuren° 18 in the Saving and Energy Efficiency Intensification Plan, approved under Agreement ofthe Council of Ministers on 4 March 2011, in which it is estimated that 500,000 optics fitted with incandescent or halogen bulbswill be replaced with LED optics so that all traffic lights using modern technology within 2 years.

Promotion of the electric vehicle:

Pilot project to promote the electric vehicle (MOVELE project) andS*trategy to Promote the Electric Vehicle in Spain 2010-2014*.

Within the framework of the 2008-2011 Saving and Energy Efficiency Action Plan in Spain,approved by the Council of Ministers on 1 August 2008, a pilot project to promote the electric vehicle is included, thedevelopment of which, in September 2008, was granted a budget of 10 M€, with the main objective being topromote the incorporation of 2,000 electric vehicles into the Spanish vehicle fleet and tofacilitate the development of the first electric vehicle charging points in Spanish cities.

Within the project, a MOVELE catalogue has been developed, which shows all the plug-in electric and hybrid vehicles in Spain, in different categories, and 1,110 electric vehicles have been subsidised, which amounts to a total budget of3.313.891 €, with an average grant of2.985 Euros per vehicle—out of all the vehicles subsidised, 30% are commercial vehicles(N1).

In addition, within the framework of the MOVELE project, collaboration agreements have been signed with the cities of Madrid, Barcelona and Seville with the aim of installing 546 public charging points for electric vehicles in these three cities.Of these 546 charging points—with economic aid within the MOVELE Project, 149 have already been installed. However, other Spanish cities, other than those previously mentioned and outside of the MOVELE Project have installed charging points on top of theaforementioned number (409 additional charging points in 59 Spanish cities) as an indirect result of the policy to promote the electric vehicle undertaken by the Ministry of Industry, Trade and Tourism, through the IDAE.

To this policy dedicated to the promotion of electric mobility, we can add the approval, in April 2010, of the 2010-2014 SpanishElectric Vehicle Promotion Strategy, with the aim of there being 250,000 electric vehicles by the end of 2014.Within the Strategy, the two 2010-2012 and 2012-2014 Action Plans are defined.

The 2010-2012 Action Plan includes the objective of incorporating 70,000 electric vehicles into the fleet by the end of 2012,for which 590 M€ has been set aside, in addition to the 10 M€as part of the aforementioned MOVELE Project, which will be applied,partially, to the promotion of the demand for this type of vehicle through grant programmes.

This Strategy's objectives (250,000 electric vehicles in 2014) will beincorporated into this 2011-2020 Saving and Energy Efficiency Action Plan with an expected energy reduction of162,5 Ktep.

Actions to promote and dynamise the energy services market.

The actions to promote the energy services market set out by Directive2006/32/EC from the European Parliament and Council, of 5 April, were aimed,specifically, at the public sector, which also has, within the framework of this Directive,an exemplary role in the application of saving and energy efficiency measures and in the promotion of the contraction of energy services.

Together with the 2008-2012 Action Plan, the Council of Ministers of 20July 2007 approved the Saving and Energy Efficiency Action Plan for the State General Administration's buildings, which sets the minimum energy saving objectivefor all of the State General Administration's buildings in 2016.

In addition and as a result of the approval, under agreement of the Council of Ministers on 1 August 2008,of the 2008-2011 Saving and Energy Efficiency Action Plan— which includes, as measure n° 1, the promotion of the energy services market—, theEnergy Efficiency Action Plan for the State General Administration's buildings was approved on 1 December 2009,with the aim of achieving the previous savings (20% in 2016) in 330of the State General Administration's energy consumer centres,all through the realisation of saving and energy efficiency measures executed by Energy Services Companies.
The Energy Services Companies (ESCOs) figure has been incorporated into Spanish Law by means of Royal Decree Law 6/2010, of 9 April,concerning measures for the promotion of economic recovery and employment, with the following definition:"any physical, or legal person providing energy services[19]to a user's

[19] The energy service provided by the energy services company will consist of a package of services, including the realisation of intangible investments, works or supplies required to optimise quality and to reduce energy costs. This action may include,in addition to the construction, installation or transformation of works, equipment and systems, their maintenance, updating or renewal, their use or their management derived from the incorporation of efficient energies.

plants or premises and accepts a certain amount of financial risk in doing so. All this, provided that payment for services provided is based, either fully or partially, on the achievement of energy savings through the introduction of energy efficiency improvements and compliance with the agreed performance criteria".The definition included is adjusted, reliably, to that proposed by Directive2006/32/EC.

The Public Private Collaboration Contract (PPCC)[20], within the scope of the Public Sector ContractsLaw, constitutes the most suitable contractual figure forcoordinating the management of energy services for public buildings affected by this Plan in addition, article 20 of the aforementioned Royal Decree Law 6/2010 has modified some aspects of the regulatory framework of public sector contracts to make contracting processes more dynamic. The length of the contract is agreed for a period determined according to the time required for the depreciation of the investments made by the ESCOs or funding formulas that provide this, and the payment for services provided will be based, either partly or fully, on the energy saving achieved through the improved energy efficiency of buildings.

The Plan approved and implemented by the State General Administration's 330 buildings has been extended to the otherterritorial Public Administrations with the approval of the Plan for Promoting the Contracting of Energy Services, under agreement of the Council of Ministers on 16 July 2010,known as Plan 2000 ESE[21] concerning 2,000 energy consumer centres:1,000 belonging to Autonomous and Local Administrations and another 1,000belonging to the State General Administration. The expansion of theState General Administration's 330 centres set out in the previous Plan to 1,000 will identify the State General Administration's buildings with maintenance contracts ending in the next two years so as to negotiate new contracts, as a priority, within the modality of energy services.

Investments by ESCOs within this Plan will be funded by the"ICO - Sustainable Economy line", amounting to 20,000 million Euros for 2010-2011(10,000 from the ICO and 10,000 from financial entities involved in the fund).This fund is the result of adapting the Official Credit Institute's action lineswith the aim of improving

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The energy service definedwill be provided based on a contract which should include a verifiable, measurable or considerable energy saving.

[20] In accordance with the definition contained in article 11 of the Contracts Law for the Public Sector, the PPCCassumes that a Public Administration is entrusted with a private legal entity, for a determined period, according to the time relative to the depreciation of the investments orthe funding formulas providing this, the realisation of a global and complete action which, in addition tofunding from intangible investments, works or supplies required for the achievement of specific public service objectives or related to general intersectoral actions, includes some of the services covered in the Public Sector Contracts Law.

[21] Royal Decree-law 6/2010 concerns the adoption of a Voluntary Agreements Programmewith ESCOs and entrusts the government with the adoption, within 6 months, of a specific plan relative to promoting ESCOs,including, specifically, a specific programme for the Public Administrations.The Plan 2000 ESE responds to this requirement.

access to credit to suit the activities and sectors that contribute the most to the economic growth:(www.economiasostenible.gob.es). In terms of this line in particular,the Saving and Energy Efficiency Intensification Plan of4 March 2011approves the ICO-ESCO Line for the promotion of the Plan 2000 ESE, funded by600 M€ from the previous fund and for which IDAE has made a risk covering fund of30 M€ available, which will reduce the guarantees required from borrowers on the part of the financial entities and will facilitate access to credit.

In addition to the foregoing, in terms of the improved access to private funding for ESCOs awarded contracts, the Plan 2000 ESE providesthree lines of economic aid: 1) An economic aid line aimed at energy consumer sectors for the contracting of technical assistance for the realisation of diagnostics, energy audits and for the preparation of energy contracts;2) An economic aid line in the form of a bonus or compensation aimed at the finalist ESCOsinvolved in competitive dialogue, best valuein final rating and which are not awarded contracts, inaccordance with article 163 from the LCSP; and 3) An economic aid line aimed at the ESCOs awarded contracts, for the realisation of investments in saving and energy efficiency measures(for this last line of economic aid,the Plan itself amounts to a maximum of 80 M€from the 2008-2012 Action Plan[22]).

Training, communication and information.

Since IDAE, IDAE has performed numerous actions aimed at the citizen interms of training, communication, dissemination and information in terms of saving and energy efficiency and the measures contained in the Plan.To said actions, we can also addthose performed by the Autonomous Communities themselves for each of the measures contained in the same.

The training actions cover, at times, training courses for trainers, toextend the scope of the training to a greater number of students(drivers/citizens) trained—in particular, these training coursesfocus on efficient driving techniques[23] andthe new building policy.

In terms of communication, dissemination and information campaigns, on the IDAE's website(www.idae.es), you can find the audiovisual material developed for said campaigns, aimed at the end-user, with a greater scope and a greater impact:

[22] Applied to 1,000 Energy Consumer Centresby the Autonomous and Local Administration.

[23]The efficient driving courses were organised, generally speaking, by the Autonomous Communities, within the framework of thecollaboration agreements signed with IDAEfor the execution of the 2008-2012 Action Plan. However, IDAE has signed collaboration agreements withthe Directorate General of Land Transportation from the Ministry of Public Works and thePassenger and Goods Departments from the National Road Transport Committee(NRTC)—5,000 professional drivers trained— and the National Associations ofVehicle Manufacturers and Importers (ANFAC and ANIACAM)—8,800 drivers trained— for the development of efficient driving programmes—the savings derived from these efficient driving courses are reported under the bottom-up approach in this Plan.

http://audiovisuales.idae.es/index.php/mod.videos/mem.listado/relcategoria.3690.

The following list—which isn't exhaustive— shows the most relevantcommunication campaigns, both relative to their budgetary impact and relative to the results in terms of changing energy consumption habits.Thesecampaigns were present in the main communication measures in Spain(television, radio, press, foreign, Internet and special actions etc.):

- "Energy Saving" communication campaigns in 2004, 2005, 2007 and 2008. These campaignspromoted energy saving through messages on the use of energy labelling,turning lights off, the use of low-consumption bulbs,stand-by, setting the heating temperature to a suitable level, the optimaltemperature of air conditioning and the use of public transport.

- "Energy Saving" communication campaigns in collaboration with the Spanish Football Association in2009, 2010 and 2011 -the latter is in the production phase-). Thesecampaigns promote energy saving with messages similar to those previously mentioned, using the prescription ability of the players in the National Football Selection.

- "Energy Saving" communication campaigns within the framework of the Cycle Tour of Spain2009, 2010 and 2011 -the latter in the production phase which also includes a special action to promote the electric car-, with the aim of promoting energy efficiency.

- Production and dissemination of audiovisual productions for broadcast on television:"Turn off the lights" series (2006-2007); "Enermanos" series of cartoons(2009-2012); series of cartoons with Disney Channel Spain (2006, 2007 and 2008).

In addition to the foregoing, the IDAE developed periodic communication campaigns for the promotion of bio mass, geothermal and thermal solar energy as renewableenergies for use in the domestic sector (2009, 2010 and2011 -this latter is in the production phase-).

The communication campaigns developed have been analysed, one by one, in terms of the impact through post-campaign studies(telephone surveys of 1,000 people).

In addition, given the long period since the IDAE realised the communication campaigns(started in 2004), an evaluation study was performed on the success of changing the consumption habits ofSpanish citizens between 2004 and2010 which enabled, likewise, new communication actions to be developed.Relevant conclusions were derived from this study[24]:

- Around 70% of those interviewed recall having received information relative to

[24]2010 FutureBrand report.

moderating their energy consumption.

- Energy consumption is an increasing criterion in the decision to purchase electrical appliances(has influenced or influences the decision of 48% of the population compared with 16% previously). 85% of the population take energy labelling into accountwhen making a purchase.
- The "Heating to 21" messages have had a significant impact on the population with the vast majority of the population maintaining this comfortable temperature (56%).
- A positive, stable and continuous increase in stand-by being turned off (79.5%, in2010).

It is important to note that, in 2010, the IDAE came to an agreement with RadioTelevision Espanola (RIVE), Spain's public radio and television service, through which they made the "television window" available for freefor the broadcast of audiovisual productions made by the IDAE for the promotion of energy saving and renewable energies.

In addition to all of the above, IDAE also introduced a Citizen Information Service forEnergy Efficiency and Renewable Energies,through its website, which achieves an average of 3,000 hits monthly,with an assessment of the quality of response at 8.7/10:ciudadano@idae.es. Likewise, on the IDAE website: (http: / /www. idae. es/index. php/ mod. pags/ mem. detalle/idpag. 50 / relcategoria.1025 /relmenu.45), includes a link to consumption guides, information on RENOVE plans andenergy efficiency labelling, tools for optimising your electricity bills and, generally, practical advicefor energy saving.

Generally speaking, the information made available to end-consumers by Public Administrations in relation to energy savingsatisfies that set outby Directive 2006/32/EC in article 7 relative to the "availability of information".

3.3 Joint action programmes from IDAE and the Autonomous Communities

The Autonomous Communities, within the context of their competencies, have been carrying the measures contained in the2005-2007 and 2008-2012 Action Plans out since 2005. As a result of the signing of collaboration agreementswith IDAE, sets out the way in which said measures should execute, basically, the conditions of the recipients of public aid included in said Plans and maximum aid intensities.

The agreements signed with IDAE distinguish between priority measures and additional measures.The first were developed by all Autonomous Communities guaranteeing uniform application of the Action Plans across the whole national territory and the second were conditioned by the decision of the Autonomous Communities themselves; they decidedthe budget to be applied to each of them and if they could be executed or not, depending on the characteristics of each territory.

The collaboration agreements signed for the execution of the measures containedin the 2008-2012 Action Plan have a multi-year character, therefore the agreements signed remain in force until 2012 to theextent that the analysis of the savings achieved as a result of these co management and co funding mechanisms enhance the convenience of its maintenance,so it will be an execution mechanism in the new 2011-2020 Action Plan.

Within the framework of these collaboration agreements, around200 M€ is distributed to the Autonomous Communities annually, up to a total of 1.165 M€ thatappears in the following table for the whole national territory and the analysis period:2005-2010. Within the framework agreement signed for the 2008-2012 period,an average of 258 millionEuros/year was distributed between 2008 and up to 2010, the territorial distribution responding to objective criteria and indicators;namely: Gross Value Added for the industry sector in each of the Autonomous Communities; vehicle fleet; buildings constructed for the tertiary sector by Autonomous Communities and number of heated and cooled homes;total number of homes; population; agricultural machinery census; number of cogeneration plants and capacity installed in each territorial area.

Table 3.3. Budgets for the joint IDAE-Autonomous Communities action programmes (2005-2010)

Autonomous Communities	2005-2010
ANDALUCIA	145.760.909
ARAGON	44.734.787
ASTURIAS	30.872.144
BALEARES	21.486.232
CANARIAS	32.098.231
CANTABRIA	15.221.477
CASTILLA LA MANCHA	57.935.121
CASTILLA Y LEON	77.702.071
CATALUNA	215.361.431
MADRID	178.503.885
VALENCIA	116.195.927
EXTREMADURA	21.037.447
GALICIA	73.953.114
LA RIOJA	11.342.773
MURCIA	30.463.924
NAVARRA	21.782.197
PAIS VASCO	68.532.354
CEUTA	1.191.529
MELILLA	1.106.216
TOTAL IDAE-MITYC BUDGET	1.165.281.769
Additional autonomous BUDGET	348.071.178
TOTAL BUDGET	1.513.352.947

Source: IDAE

The results, in terms of savings, of this cooperation mechanism are shown in thetable below, reaching 2.305 Ktep/year, in terms of final energy, and 3.221 Ktep/year in terms of primary energy. These savings werecalculated using a bottom-up approximation for each of the public aid programmes developed by the Autonomous Communities in each territory, to the extent that the IDAE has individualised information on the savings and the characteristics of the subsidised projects. For each of the measures containedin the agreements, information is provided, in table 3., on the results achieved: generally speaking, the volume of the public aidsapplied and particularly for some me4asures, the number of appliances replaced—in the case of the Electric Appliances RENOVE plan[25]—, thenumber of subsidised electric or hybrid vehicles, the number of public bicycle systems—and bicycles— subsidised within the scope of the 2005-2007 and 2008-2012 Action Plansin the whole national territory, and the number of drivers trained in efficient driving, both in terms of private vehicles and industrial vehicles.

Specifically, in terms of the application of the funds, six measures from those listed in the following table absorb more than three quarters of the funds applied annually: the Electric AppliancesRENOVE plan—in some years,this plan absorbed 40% of the total IDAE-MITYC finds applied at national level–, the public aids programme in the industry sector, the aid programmes for therenewal of existing external public lighting installations, the public aid programmes for the renewal of the thermal envelope in existing buildings, those dedicated to the improved energy efficiency ofthermal installations and aid programmes—aimed at Local Entities– for the reduction of Sustainable Urban Mobility Plans(PMUS).

[25]The indirect effects of some of the measures proposed in the saving and energy efficiency action planswere greater, if possible, than the direct effects of the same, as can clearly be seen by the difference between the savings calculatedusing a top-down approximation (quantifying all the direct and indirect effectsof the measures introduced including the savings - positive or negative— that may be recorded by changes in activity variables linked to thesaving measures themselves) and the savings calculated using a bottom-up approximation.In the case of the Electric Appliances RENOVE plan, the generalisation of the appliances with high energy ratings (A+ and A++) on shop floors and the generalised awareness of the energy efficiency labelare indirect effects of the programme itself introduced by the IDAE and the autonomous governments:between 2004 and 2010, there was an increase in the percentageof the population taking notice of the energy efficiency labelwhen making a purchase, from 42.8% in 2004 to 83.8% in 2010.

Table 3.4. Summary of the bottom-up savings achieved in 2010 (base year 2004) through joint performance programmes from IDAE and the Autonomous Communities (2005-2010)

	Activity variable (2005/2006 - 2010)		Final E. Savings (ktep)	Primary E. Savings (ktep)	Emissions of CO_2 avoided ($ktCO_2$)
INDUSTRY			**1.069**	**1.586**	**3.469**
Energy Audits	Number of audits:	1.415			
Public aid programmes	Associated investment (10^6 €)	1.645,7	1.069	1.586	3.469
TRANSPORT			**948**	**944**	**2.978**
Urban mobility plans and Worker' transport plans	Number of public bicycle systems/nº of bicycles /31,220	254	860	846	2.684
	Public aid (10^6 €)	57,3			
Greater participation of collective means in road transport	Public aid (10^6 €)	9.3			
Road transport fleet management	Public aid (10^6 €)	6.6	1,3	1,5	5,0
Efficient driving of private vehicles	Equivalent number of students trained	235.360	52	58	173
Efficient driving of lorries and buses	Equivalent number of students trained	63.594	30	34	103
Renovation of the private vehicle fleet	Number of vehicles replaced	8,064	2,7	3,0	8,6
Renovation of the road transport fleet	Number of vehicles replaced	806	1,5	1,6	5,0
BUILDINGS AND EQUIPMENT			**195**	**439**	**899**
Energy renewal of the thermal envelope of existing buildings	Public aid (10^6 €)	111.5	22	42	89
Improvement in the energy efficiency of thermal installationsin existing buildings	Public aid (10^6 €)	145,5	61	116	244
Improvement of the energy efficiency of interior lightingplants in existing buildings	Public aid (10^6 €)	22,5	30	74	150
Construction of new buildings and renovation of existing buildings withhigh energy ratings	Public aid (10^6 €)	6.2	0,9	1,5	3,3
Improvement of the energy efficiency of electrical appliances	*Number of domestic appliances* *Indirect and induced effects:*	3,907,745	81 389	204 882	412 1805

Table 3.4. Summary of the bottom-up savings achieved in 2010 (base year 2004) through joint performance programmes from IDAE and the Autonomous Communities (2005-2010)

	Activity variable (2005/2006 - 2010)		Final E. Savings (ktep)	Primary E. Savings (ktep)	Emissions of CO_2 avoided (ktCO2)
PUBLIC SERVICES			**85**	**212**	**428**
Renovation of existing exterior public lighting installations	Public aid (10^6 €)	116	78	194	393
Studies, viability analysis and audits of existing exteriorlighting installations	Public aid (10^6 €)	9.4			
Training of municipal energy managers	Public aid (10^6 €)	0.9			
Improvement of the energy efficiency ofcurrent drinking water, supply, purification of waste water and desalination plants	Public aid (10^6 €)	10.8	7	18	36
AGRICULTURE AND FISHERIES			**8**	**12**	**30**
Promotion and training of technicians in the efficient use of energy in theagriculture and fisheries sector.	Public aid (10^6 €)	5.0			
Incentives for migration from spraying or gravityirrigation systems to localised irrigation systems.	Public aid (10^6 €)	6.9	2	5	10
Improvement in saving and energy efficiency in the fisheries sector.	Public aid (10^6 €)	2.1	4	5	14
Energy audits and action plans to improve farms.	Public aid (10^6 €)	3.7	2	2	6
Support for conservation agriculture	Public aid (10^6 €)	0.4	0,2	0,2	0,6
TOTAL OF END-USE SECTORS			**2.305**	**3.192**	**7.804**
ENERGY TRANSFORMATION				**29**	**40**
Feasibility studies for cogenerations	Public aid (10^6 €)	1.8			
Energy audits for cogenerations	Public aid (10^6 €)	0.9			
Promotion of cogeneration plants in non-industrial activities	Public aid (10^6 €)	3.4		10	12
Promotion of small capacity cogeneration plants	Public aid (10^6 €)	0.5		0,8	1,4
Promotion of cogeneration plants in industrial activities	Public aid (10^6 €)	6.7		19	26
TOTAL END-USE SECTORS + ENERGY TRANSFORMATION			**2.305**	**3.221**	**7.844**

Source: IDAE

Note: The calculation of emissions of CO_2 avoided as a result of the saving and energy efficiency measures included in this plan are ad hoc calculations for the same and assume a translation of the savingscalculated using different base years (2004 and 2007), in terms of final and primary energy, to emissions of CO_2 avoided - this calculation does not necessarily coincide, therefore, with that achieved with different approaches or accounting bases aspart of the periodic reports produced in relation to the evolution of greenhouse gas emissions.

PRIORITY MEASURES (IDAE/AUTONOMOUS COMMUNITIES COLLABORATION AGREEMENTS) **INDUSTRY:**
1:Public aid programme **TRANSPORT:** **1:** *Sustainable Urban Mobility Plans (PMUS)* and*Workers' Transport Plans (PTT)* **2:** Road transport fleet management **3a:** Efficient driving of private vehicles **3b:** Efficient driving of industrial vehicles **4a:** Renovation of private vehicles **4b:** Renewal of transport fleets **BUILDINGS AND EQUIPMENT:** **1:** Energy renewal of the thermal envelope of existing buildings1 a: WindowRENOVE plan **1b:**RENOVE planfor Facades of Residential Buildings **1c:**RENOVE planfor Roofs of Residential Buildings **2:** Improved energy efficiency of thermal installations in existing buildings **2a:** RENOVE plan for Boilers **2b:** RENOVE plan for Air-conditioning equipment **3:**Improved energy efficiency of interior lighting installations in existing buildings **4:** Electrical AppliancesRENOVE plan **ENERGY TRANSFORMATION:** **1:** Cogeneration development potential. Public aids for non-industrial cogenerations.

Note: In terms of the measures included in the collaboration agreements signed between IDAE and each of the Autonomous Communities and Cities for the execution of the measures contained in the 2008-2012 Action Plan(2011). The relationship of measures is updated, annually,by accommodating new programmes (RENOVE plans for example) or to adapt the aid intensities so as to make the achievement of the saving objectives set out in the Plan possible.

ADDITIONAL MEASURES (IDEA/AUTONOMOUS COMMUNITIES COLLABORATION AGREEMENTS)
INDUSTRY: **1:** Energy audits **TRANSPORT:** **1:** Greater participation of public and/or collective modes of transport **2:** Development of infrastructure for recharging electric vehicles **BUILDINGS AND EQUIPMENT:** **1:** Construction of new buildings with high energy ratings **2:** Training courses on the new energy policy for buildings **3:** Improved energy efficiency of existing lifts inbuildings **PUBLIC SERVICES:** **1:** Renovation of existing external public lighting installations **2:** Studies, feasibility analysis and audits of existing externallighting installations **3:** Running of energy training courses for municipal technicianswhich enables the improved energy efficiency of municipal installations **4:** Improved energy efficiency of current drinking water,supply, waste water purification and desalination plants **AGRICULTURE AND FISHERIES:** **1:** Promotion and training campaigns and improved techniques for the efficient use of energy in the agriculture and fisheries sector. **2:** Promotion for the migration from irrigation by spraying or gravity irrigation systems to localised irrigation systems. **3:** Improved saving and energy efficiency in the fisheries sector. **4:** Performance of energy audits and action plans for improvements to arable farms. **5:** Improved efficiency of tractors by average use of TIV. **6:** Aid for migration to conservation agriculture **ENERGY TRANSFORMATION:** **1:** Feasibility studies for cogenerations. **2:** Energy audits for cogeneration. **3:** Promotion of small capacity cogeneration plants.

Note: In terms of the measures included in the collaboration agreements signed between IDAE and each of the Autonomous Communities and Cities for the execution of the measures contained in the 2008-2012 Action Plan(2011). The relationship of measures is updated, annually,by accommodating new programmes (RENOVE plans for example)or to adapt the aid intensities so as to make the achievement of the saving objectives set out in the Plan possible.

3.4 Policy-related mechanisms or provisions

Law 2/2011, of 4 March, concerning Sustainable Economy includes, under Heading IIIrelative to environmental sustainability, the provisions most directly related to this plan.

Chapter I (sustainable energy model) sets out, in article 20, that the necessary measures and strategies will be adopted toachieve a general objective in terms of reducing the demand for primary energy,on the trend scenario in the absence ofactive saving and energy efficiency policies, in line with the objective set outfor the European Union which is 20% in 2020 and with the objectives relative to reducing greenhouse gas emissions for Spain, which assumes the setting ofsaving and energy efficiency objectives for 2020.More specifically and for the State General Administration and dependent organisations, the saving objective of 20% is expected to be achievedwith respect to the "measure-free" scenario in 2016.

Chapter III (sustainable transport and mobility), sets out the priorities for the state planning oftransport infrastructure with the aim of promoting the carriage of goods by rail, the development of Sustainable Urban Mobility Plans (PMUS) and transpose Directive 2009/33/ECrelative to the promotion of clean and energy efficient road transport vehicles-articles 105 and 106—.

Chapter IV (renewal and homes) also includes provisions concerning improved water and energy managementfor a sustainable urban environment.

The Sustainable Economy Law includes policy-related and regulatory provisionsthat go into more detail about the establishment of energy efficiency standards for the different end-consumer sectors.

The classification of the different policy-related provisions that may be made for the 2010-2020 periodis no different from that for those approved and in force during the period of validity for the previous 2005-2007 and 2008-2012 Action Plans:

1: Training, communication and information.

This category, which covers all the policy-related provisions that regulate the minimum training required to obtain a licence to drivecertain road vehicles, introducedthe minimum knowledge requirement for efficient driving(R.D. 1032/2007, of 20 July).In addition, it includes provisions regulating speed limits on motorwaysor those guaranteeing the effective achievement of these speed limits on roads, although they were approved with a main objective different to the energy saving objectiveexpected by this plan (driving licence points).

2: Establishment of energy efficiency standards.

This category contains all the provisions relative to the labelling of energy-consuming appliances, fromdomestic appliances to private vehicles[26], tyres or tractors[27]. These provisions have, in large part, resulted in thetransposition of Community directives: the TechnicalBuilding Code (R.D. 314/2006 of 17 March 2006), the newRegulations on Thermal Installations in Buildings (R.D. 1027/2007 of 20 July2007) and the process relative to the energy rating of buildings (R.D. 47/2007,of 19 January 2007) constitute examples of the foregoing, to be transposed intoDirective 2002/91/EC concerning Energy Efficiency in Buildings according to Spanish law.

This category also includes R.D. 1890/2008 of 14 November2008 by adopting energy efficiency regulations for external lighting installations.

3: Exemplary role of the public sector.

This category includes the Green Public Contracting Plan from the State General Administration and dependent organisations(Law PRE/116/2008 of 21 January) in addition to some other provisions regulating the contracting from Public Administrations with energy efficiency criteria.

4: Promotion of cogeneration.

The two policy-related provisions that fall within this category will be the subject of an analysis described in detail in Chapter II of this Plan, based on the Energy Transformation Sector:Royal Decree 616/2007 of 11 May concerning the promotion of cogeneration and Royal Decree661/2007 of 25 May; they regulate the activity of electrical energy production in special mode.

5: Other mechanisms.

This category includes other plans, programmes or provisions with an impact on final and primary energy consumption objectives, approvedon the initiative of Ministerial Departments other than those responsible for the execution and follow-up of the objectives contained in this Plan and, therefore,different from the Secretary of State for Energy from the Ministry of Industry, Trade and Tourism:this basically refers to actions in the Transport Sector and in the Agriculture and Fisheries Sector.

The change of mode initiative in the carriage of goods contained in the 2005-2020 Strategic Infrastructure and Transport Plan(PEIT) is considered in the final and primary energy saving objectives in this 2011-2020 Saving and Energy Efficiency Action Plan,and the private vehicle RENOVE plans already finalised(among others, Plans PREVER, VIVE) has achieved a large part of the savings through the renewal of the vehicle fleet reported up to 2010 for some of the measures included in this Plan.

[26]On 2 August 2002 R.D. 837/2002 was published regulating the information relative to fuel consumption andCO_2 emissions from new private vehicles put on sale oroffered through financial leasing on Spanish territory.

[27]R.D. 1539/2006 and R.D. 228/2009, concerning modernisation of the fleet of agricultural tractors(RENOVE plan for Tractors).

In addition, the Ministry of Public Works has aid lines aimed at the renewal of buildings and homes and to encourage the promotion ofnew works with high energy ratings in the promotion of protected housing.These grants fall within the State Housing and RENOVE plan 2009- 2012 (PEVR), which has dedicated resources totalling 1.082 M€. Within this Plan, there isa programme for "RENERWAL aids relative to renovation and energy efficiency"which is divided into two separate parts: the "programme of RENEWAL aids for the renovation of housing and existing residential buildings"—grants andwe agree loans with or without funding aimed at financing the renovation of insulated buildings or housing, with aid of between1.100 Euros and 6.500 Euros perhousehold— and the "programme of aids for the promotion of energy efficiency in homes"—with aids of between 2.000 and 3.500 Euros per home, provided that the projects achieve an energy rating of A, B or C.

Within the framework of the PEVR, there is another programme of aids aimed at renovation;it concerns Integral Rehabilitation Areas (IRAs) and Urban Renovation Areas (URAs). This programme of aids constitutes grants and loans agreed without finding to finance rehabilitation/renovationin wholeneighbourhoods, including, as financeable aspects, both rehabilitation/demolitionactivities and newly built homes, and works to reurbanise neighbourhoods,the technical team that manages the aids and informs the neighbours and the rehousing of families in the case of demolitions.= As there are rehabilitation actions,many of the projects include works aimed at improving the energyefficiency of buildings, and in the case of demolitions and new builds, the efficiency will be improved with respect to the demolished housing.

3.5 Communication and training

The achievement of the saving and energy efficiency objectives proposed in this 2011-2020 Plan will also be the result of efforts in terms of communication and trainingcarried out relative to awareness of the energy saving required.The actions identified are based on a long-term effort strategy, materialised through a continued and constant presencein the communication media that consistently reaches the greatest number of citizens.This strategy of persistence is absolutely necessaryif we want, in the medium and long-term, to change the habits of citizens with respect to energy saving and energy efficiency.

The communication actions are divided into three sections:

- "Conventional" communication and publicity campaigns through production and dissemination through the purchase of advertising space— of key messages using TV adverts, radio spots, inserts in newspapers, outdoor and Internet etc. during one of various periods of the year.
- "Unconventional" communication and publicity actions that generate eco media coverage, without the need to buy advertising space, such as additionaldirect marketing and/orpublic relations actions,the organisation of public acts, exhibitions, presence in the street, road shows and consumer centres etc.

- Enhancing participation and involvement in media coverage by means of interviews, reports or programmes specially producedformedia coverage, such as informative programmes and documentaries etc., expressly developed to contain institutional messageson saving and energy efficiency.

On this point we should point out the collaboration agreement established between theIDAE and RTVE, the public radio television service, which will serve as a "window" for broadcasting productions that the IDAE develops itself or with third parties.

The total cost of the three measures proposed for the entire period 2011-2020 rises to 124,000,000 euro, with annual periodification of 12,400,000 euro.

The training actions will continue the effort made since 2004 in terms of training of drivers(professional and non-professional) in efficient driving techniques and training on the new building policy.However,courses aimed at professionals will be strengthened in terms of energy services, electricity mobility and generation distributed, all aspects that may be considered as priorities in this 2011-2020 Plan. More specifically,training relative to measurement systems and the verification of savings and introduction of energy generation systems will be promoted. The training of newprofessionals able to meet the working demands of energy services companies_the activity of which is expected to be promoted generally in all energy consumption sectors but, specifically, in public buildings_ is considered as a priority within the framework of this Plan.

The unregulated training—aimed at the citizen— shares the objectives of thecommunication strategy to focus and modify consumption habits, not only directly, refers to the reduction in energy consumption but also contributes, indirectly, to this objective: reduction of unnecessary consumption, reuse and recycling.

Contents of the communication

All the communication actions relate to promoting "citizen awareness, mobilisation and action for responsible energy consumption",throughthe following (not exhaustive):

Objectives:

Generally:

- Topromote the value of energy to the citizen-consumer, as a scarce resource that should be looked after.

- To save energy through consciousness-raising with the problem and the creation ofcitizen schools of thought, mobilisation and action in the daily context of their activity:home, work and modes of transport.

- To give citizens information on practices so they know how to save from their particular actions.

- To introduce saving and efficiency policies as tools in a new national energy model based on sustainability, energy efficiency and that contribute to slowing down climate change.

Specifically:

- To mobilise the action of citizens in the challenge of consuming energy intelligently and responsibly, since citizens are responsible for 30% of all energy consumption.

- To promote the purchase of appliances with highest energy rating (homes,cars, electrical appliances, air-conditioning and lamps etc).

- To promote public transport, in general as well as the alternative ways of travelling by private car in urban centres in particular.

- To promote the responsible use of the private vehicle. In the city, 50% of car journeys areto travel distances of less than 3km and 75% of journeys using this mode of transport are made with only one occupant.

- To promote energy saving through the responsible use ofheating equipment during the winter.

- To promote energy saving through the responsible use of air-conditioning during the summer. These campaigns are, basically, aimed at reducing consumption in the tertiary sector (hotels, shopping centres andleisure centres etc). The cooling of buildings in Spain(not including industry) assumes a large part of national energy consumption, the cooling of buildings in the tertiary sectorbeing the greatest consumer in terms of air-conditioning.

As previously mentioned, the periodicity of theinstitutional communication and publicity actions should be annual to maintain contain pressure on citizens.

The campaigns and all the actions included in them will comprise measurement studies and results and willbe supported by conclusions and advice throughanalysis and research studies (discussion groups. working groups and qualitative and/or quantitative surveys etc.).

3.6 R+D+i

The participation of the R+D+i results, basically, in the achievement of the saving objectives in this 2011-2020 Action Plan.

The objectives proposed by the same assume the objectives from other plans and strategies in force, specifically, from the National Science and Technology Strategy and theState Innovation Strategy (E2I), which constitutes theaction framework in terms of innovation to make it possible to change the production model in Spain these two instruments are seen as complementary within the Science, Technology and Innovation Law(LCTI)[28], approved in June2011.

Although this 2011-2020 Action Plan is based on policies promoting or incentivising saving and energy efficiency actions in the different energy-consuming sectors, the change of production mode is assumed as the scenarioand the gradual transition to more efficient modes of transport or sustainable habits or uses of energy in all the consumption sectors, onlypossible as a result of intensified efforts in research, development and innovation in terms of energy technologies.

The energy technologies form part of the priorities for the Spanish Science, Technology and Innovation System(SECTI) and specific programmes aimed at promoting this national system, basically, the National Scientific Research, Development and Technological Innovation Plan(National R+D+i Plan 2008-2011) andthe INGENIO 2010 initiative.

[28]Law 14/2011, of 1 June, concerning Science, Technology and Innovation.

NATIONAL R+D+i 2008-2011 PLAN

The National Scientific Research, Development and Technological Innovation Plan(National R+D+i Plan) is the planning instrument concerning theSpanish science and technology system for the achievement of the objectives and priorities relative to our country'sresearch, development and technological innovation policy in the medium-term.Currently, the 2008-2001 NationalR+D+i Plan is in force, which takes the National Science and Technology(ENCYT) for 2015 and the Ingenio 2010 initiative as a referencewhich aims to converge with the EU in terms of R+D+i through the allocation of more resources and the introduction of strategic actions.

The current R+D+i plan is based on four different areas associated with instrumental programmes:

- *Generation of Knowledge and Capacities.- Promotion of Cooperation in R+D.*
- *Sectoral Development and Technological Innovation.- Strategic Actions.*

The Area of Sectoral Development and Technological Innovation aims tomake the instruments and programmes required to realise its technological development and innovation activities available, addressingR+D+i actions focused of business competitiveness. The programmes related to this areawill be applied in ten key sectors, the energy sector being one of them.Within the latter sector,R+D+i actions are promoted aimed at encouraging energy saving and efficiency, as well asenergy generation with autonomous resources.

As specified in the Plan itself, it is necessary to guarantee the electricity supply with the R+D, increasing the contribution of renewable energies and the emerging energy technologies, as well as their integration into the national energy sector, so as to improve our degree of energy self-sufficiencyalong with the energy diversification in the supply and, definitively, economic and social sustainability.

The Area of Strategic Actions makes reference to a group of five sectors ortechnologies with a horizontal character to which it is intended to cover throughfull management of all the instruments available in the remaining areas:Health; Biotechnology; Energy and Climate Change; Telecommunications and the Information Society; Nanoscience and Nanotechnology, New Equipment and New Industrial Processes.

For its relation to the scope of action of this 2011-2020 Action Plan, the specificlines relative to the area of Energy and Climate Change are detailed below:

- Line 1: Energy and mitigation of climate change for the production of clean final energy and energy efficiency,with a special impact on the transport and buildings sector.
- Line 2: Sustainable mobility-transport.
- Line 3: Other areas of climate change.

As an instrument for the transfer of knowledge, Spain has establishedtwo Technological Platforms directly involved in improving energy efficiency: the Spanish Energy Efficiency Technological Platform andtheIntersectoral Platform for Energy Efficiency.

- The Spanish Energy Efficiency Technological Platform aims toinnovate energy efficiency, through new solutions and the development of new techniques and products.Among its priorities, it encourages collaboration between the tertiary, industry and scientific sectors to promoteR+D+i in energy efficiency, recommendsactions in various sectors in the field of R+D+i, developsrecommendations for the strategy of training professionals in R+D+i andincreases opportunities for Spanish companies and R+D institutions tin international projects.

- TheIntersectoral Platform for Energy Efficiency, on its part, isa group formed in 2011 for large companies from different sectors to promote joint activities aimed at of energy efficiency.

From different ministerial departments and, additionally, projects or directly developed actionsare promoted associated with research and development for improved energy efficiency, both from the Ministry of Science and Innovation,and from the Ministry of Industry, Trade and Tourism.

The following fall within the initiatives from the Ministry of Science and Innovation for the development of research in energy efficiency:

- The creation of the DETEA R+D+i Energy Efficiency centre[29] in theCartuja 93 Science and Technology Park.
- The funding of Singular Strategic Projects (PSE) related to energy efficiencynotes the following among them:

    - The Singular Strategic Project onBioclimatic Architecture and Solar Cold(PSE-ARFRISOL), which includes the construction and development of five office buildings with a significant energy saving through recourse to bioclimatic architecture and the application ofsolar energy.

    - The PSE CICLOPE project[30], the objective of which is the analysis of the environmental impact of the buildings throughout their life cycle, in quantifiable terms of energy consumption and associated greenhouse gas emissions.

    - The PSE CYTELEC project[31], the objective of which is to define a

[29]http://www.detea.es.

[30]http://circe.cps.unizar.es/ciclope/index.html

[31]http://www.cityelec.es

system able tomeet the needs of urban transport current and future, enabling the mobility of people with a minimum carbon footprint; and

  - o The TECMUSA project with the aim of developing large electric and hybrid vehicles of people and goods.

- The founding charter from the Alliance for Energy Research and Innovation(ALINNE), which constitutes a large national public-private agreement to define a national strategy for energy R+D.Itsactivities will be coordinated by the Centre of Energy, Environmental and Technological Research(CIEMAT).

However, the Centre for Industrial Technological Development (CDTI), an organisationbelonging to the Ministry of Science and Innovation, has tools for the funding of R+D+i projects and the creation and consolidation of technology-based companies. Among its initiatives, we should point out the research and development projects, the technological background, the internationalisation of the R+D+i (theEuropean Union programme) and the Cenit resolutions.

Within the CDTI's technological funds, we should highlight the following projects:

- The Smart City Malaga[32] project aims to apply the new technologies to reduce electricity consumption and achieve optimal integration of the renewable energy sources in the electricity network[33].

- The REDUCA project, aimed at the energy renewal of educational buildingsin Andalucia[34]to increase the energy efficiency of the buildings.

- The Active Demand Management Project[35] (GAD), thatinvestigates the optimisation of electricity consumption in homes, developing solutions thatenable active demand management; and

- Within the CENIT Programme, the MEDIODIA project[36]is focused on the energy efficiency of crop greenhouses(agriculture under plastic); the Denise project,focused mainly on the efficient management of the electrical energy offer and demand, and theVERDE project[37], dedicated to researching the manufacturing and marketing future of plug-in electric and hybrid vehicles in Spain.

[32]http://www.smartcitymalaga.es/

[33]The CDTI funds this project with 21 million Euros.

[34]www.pitalmeria.es

[35]www.proyectogad.com

[36] http://www.cenitmediodia.com/

[37]http://cenitverde.es

The CDTI works with the Japanese agency NEDO to introduce projects related to smartcities and smart networks.

With regard to the Ministry of Industry, Tourism and Trade, in March2011, this Ministry opened the call for the granting of the aids from theAvanza 2 Plan for the introduction of projects and actions from the Strategic Action fromTelecommunications and Information Society. The main aim of theAvanza 2 Plan's 2011-2015 Strategy is to contribute to the change in our country's economic modelthrough the TICs, since these technologies generate an increase in competitiveness and productivity, help to cut costs and constitutes the best tool forintroducing and realising new business ideas.

The Avanza 2 Plan includes theAvanza TIC Verdes sub programme. Thisinitiative benefits companies, groups or business associations and private research organisations.The budget is 270million Euros in loans and the thematic priorities are:

- Systems and tools based on ICT that contributes to reducing the environmental impact.
- Systems and tools based on ICT that leads to improved energy efficiency and intelligent energy management: newdevelopment in lighting, creation of intelligent energy networks(smart meters), new interoperable automated solutions integrated into the electricity network, improvement and optimisation of the integration of new renewable energies into the electricity network etc.
- Systems and tools based on ICT that enable the integration of urban electricity mobility.

In previous calls from the Avanza Plan, R+D projectsrelated to the development of the electric vehicle were funded, such as the DOMOCELL project which isbased on the study of recharging networks in residential buildingsin large and medium cities; or theSurtidor project which aims to develop ultra-rapid recharging stations for electric vehicles.

The IDAE has also promoted innovative energy efficiency measuressuch as the MOVELE pilot project—described in section 3.2. of this2011-2020 Action Plan—, the objective of which is to demonstrate the technical, energy-related and financial feasibility of the electric vehicle.

Definitively, the achievement of this 2011-2020 Action Plan's energy saving and objectivesrequires the maintenance and consolidation of the R+D+i actions, plans and programmesbased on the development of new systems and tools based on TICs making improved energy efficiency in all the sectors,the optimisation and improvement in energy management, the active management of demand and electrical mobility possible.

4. COST-BENEFIT ANALYSIS

The final and primary energy savings which derive from the 2011-2020 Action Plantranslate into direct economic benefits due to the reduction incrude imports and less greenhouse gas emissions. Other direct or indirect impactsderived from the saving and energy efficiency measuresconsidered and associated with improved energy efficiencyfor 2020, linked to the creation of jobs or the increase in Gross Domestic Product, will be the subject of analysisdetailed in Chapter 6 of this document and,particularly, will be discussed separately under the heading of "Socioeconomic impact of saving and energy efficiency in Spain for 2020".

Therefore, in this chapter, the economic savings derived directly fromenergy savings and lower CO_2emissions will be subject to assessment.Being the easiest to quantify in economic terms—through the adoption ofdifferent hypotheses relating to the evolution of oil prices and tons of CO_2,respectively—, they are not the Plan's only positive impacts, in addition to thesocioeconomic ones referred to in the previous paragraph. From the Plan, otherpositive environmental effects are derived associated with fewer emissions of other contaminating gases different fromCO_2 or, directly, associated with improved air quality in citiesderived from less traffic or consumption and, therefore, emissions per kilometre travelled by new vehicles.

The positive environmental impacts, different from the reduction in emissions ofCO_2—the economic value of which can easily be determined by the existence of a market which gives an economic value toCO_2 which is not emitted or avoided,may be more difficult to quantify in economic terms due to theabsence of obligations to reduce emissions of other contaminant gases or due to the non-existence of a market similar to that ofCO_2. In this case, the quantification of these positive environmental impactsshould take place through methods which allow for the determination,in economic terms, of the negative impacts on health or on the economic activity avoided as a result of lower consumption of energy from fossil fuels,and that would have occurred in a scenario of more energy consumptiondue to an increase in the concentrations of contaminants in the natural environment.

Therefore, we will focus on the economic analysis of the benefits derived fromlower energy consumption and fewer CO_2 emissions, the total cumulative savingsduring the period, equivalent to 133,4 million equivalent tons ofoil—in terms of primary energy— an economic benefit of70.357 million Euros as down in the following table, which disaggregates the economic benefit per sector.

Table 4.1. Economic benefits derived from primary energy savings by sector

	CUMULATIVE PRIMARY ENERGY SAVING (ktep)	ECONOMIC BENEFITS THROUGH PRIMARY ENERGY SAVING (10^6 €)	
		Cumulative	Annual average
INDUSTRY	72.794	38.436	3.844
TRANSPORT	25.492	13.345	1.334
BUILDINGS AND EQUIPMENT	3.869	2.024	202
PUBLIC SERVICES	798	430	43
AGRICULTURE AND FISHERIES	3.681	1.925	193
ENERGY TRANSFORMATION	26.774	14.197	1.420
TOTAL	**133.408**	**70.357**	**7.036**

Source: IDAE

Note 1: The sum of the primary energy savings that appear in this table (under theheading of cumulative primary energy saving) corresponds to the sum of the annual pr9imary energy savings recorded in each year this Plan is in force, from 2011 up to 2020, the savings being calculated taking 2010 as a base year—and not2007, which was the base year for the savings calculated and presented in this document,in line with the methodological recommendations developed by the European Commission for the determination of the savings.Therefore base year 2010corresponds to 2010, normalising, however, the electricity production values from hydraulic and wind sourcesthrough the uniqueness of electricity generation from renewable energies corresponding to said year.
Note 2: The evolution of the prices per barrel of Brent oil assumed by this Plan set theprice per barrel at 109,6 $ 2010 in 2020.

The primary energy savings included in this analysis were calculated using 2010 as a base yearto calculate, uniquely and as far as possible, the savings associated, directly or indirectly,with theinvestments and aids provided during the Plan's validity period,that is to say, the 2011-2020 period. Therefore, the sum of the primary energy savings that appear in the previous tabledo not correspond to the sum of the primary energy savings set out in this document, withbase year 2007 in linewith the methodological recommendations developed by the European Commission for the determination of the savings.Logically, the savings calculated with base year 2001 are the result of the saving and energy efficiency actions and measuresintroduced by the Public Administrations from this date—with or without aid-, as well as the autonomous technological progress; in this chapter, whereas,to the extent that we will try to analyse the profitability of the investments proposed in this Plan, the savings—and the financial benefits derived from the same- are bounded and limited to those that can be associated with said investmentsin the 2011-2020 period and, therefore, were calculated with base year 2010.

The savings calculated equate to 977,9 million barrels of oil,254% of oil imports in 2010, therefore, annually,the primary energy saving is 25% of total crude imports, with the consequent expected reduction in the trade deficit andimproved assessment of payments.

Previous economic benefits (over 70,000 million Euros) werecalculated assuming a hypothesis relative to the evolution of the price of Brent oil barrelswhich was 109,6 $2010 in 2020.

These economic benefits from energy saving are focused, basically, on the Industry Sector, which accounted for 55% of the total benefit for this item, followed by the Energy Transformation and Transport sectors.

The cumulative economic benefits of emissions of CO_2 avoided equate to8.330 million Euros, through the reduction of CO_2emissions by 394,7 milliontons. The price of a ton of CO_2 assumed as a hypothesis will increase to25 Euros in 2020.

Table 4.2. Economic benefits from emissions of CO_2 avoided by sector

	Cumulative EMISSIONS OF CO_2 AVOIDED (ktCO_2)	ECONOMIC BENEFITS FROM EMMISSIONS OF CO_2 AVOIDED (10^6€)	
		Cumulative	Annual average
INDUSTRY	163.158	3.447	345
TRANSPORT	65.953	1.370	137
BUILDING AND EQUIPMENT	7.186	164	16
PUBLIC SERVICES	1.708	38	4
AGRICULTURE AND FISHERIES	10.611	216	22
ENERGY TRANSFORMATION	146.051	3.094	309
TOTAL	**394.667**	**8.330**	**833**

Source: IDAE

Note 1: In the same way as for the previous table, the sum of the primary energy savings that appear in this table (under theheading of cumulative primary energy saving) corresponds to the sum of the annual pr9imary energy savings recorded in each year this Plan is in force, from 2011 up to 2020, the savings being calculated taking 2010 as a base year—and not2007, which was the base year for the savings calculated and presented in this document,in line with the methodological recommendations developed by the European Commission for the determination of the savings.Therefore base year 2010corresponds to 2010, normalising, however, the electricity production values from hydraulic and wind sourcesthrough the uniqueness of electricity generation from renewable energies corresponding to said year.
Note 2: The evolution of the prices per ton of CO2 assumed by this Plan set the price per ton ofCO2 at 25 €2010 in 2020.

Table 4.3. Total economic benefits

	ECONOMIC BENEFITS (10^6 €)					
	BY PRIMARY ENERGY SAVINGS		BY EMISSIONS OF CO2 AVOIDED		TOTAL	
	Cumulative	Annual average	Cumulative	Annual average	Cumulative	Annual average
INDUSTRY	38.436	3.84	3.447	3	41.88414	4.1
TRANSPORT	13.345	41.3	1.370	4	.7152.1	8
BUILDING AND	2.024	342	164	5	88	8
EQUIPMENTPUBLIC SERVICES	430	02	38	1	468	1.
AGRICULTURE AND FISHERIES	1.925	43	216	3	2.141	47
ENERGY TRANSFORMATION	14.197	1.420	3.094	309	17.292	1.729
TOTAL	**70.357**	**7.036**	**8.330**	**833**	**78.687**	**7.869**

Source: IDAE

The quantification of the benefits derived from the primary energy saving and the emissions ofCO_2 avoided (globally around 80.000 million Euros)should allow a cost-benefit analysis of the global profitability of the measures in the 2011-2020 Action Plan.However, the results of said cost-benefit analysisdoes not allow for the comparison—in terms of profitability— of themeasures included in one sector with the measures in another, given the different nature of theinvestments included in each sector. In summary,the items included or not in the "investment" categoryare detailed below for all of the Plan's sectors.

The investments (aid managed by the public sector + private investment) for this2011-2020 Action Plan do not include investments in transport infrastructure already incorporated and quantified in other plans (PEIT), or investments inrenewable energies or other electricity generation technologiesthat contribute to the change in the mix and, consequently, the primary energy saving in the Energy Transformation Sector.The investments in the Transport Sector also don't includeinvestments associated with the natural renewal of the transport fleetor those associated with the electric vehicle with the exception of investments in the charging infrastructure for the electric vehicle which is the subject of public aid.

Generally speaking, in terms of all the end-use sectors, the investments refer to the total investments (or the total cost) required for the achievement of the savings forecast;therefore, they include the total investments associated with the natural renewal of the equipment or the fleet, although these latter items are not the subject of aid (Industry Sector).

In the Building and Equipment Sector, on the other hand, the investments considered in this Plando not include the total cost associated with new equipment (climate control and air-conditioning systems, lighting systems and electrical appliances etc), but the surplus with respect to conventional investment; therefore,the investments associated with the measures relative to the energy renewal of thethermal envelope or the construction of new buildings with high energy ratingsmaking reference to the total surplus of all the actionson the building stock for the Plan (renewal of an area greater than700 million m^2 between 2011 and 2020). Investments in this sector include, therefore, the investments associated with the natural renewal as a result ofthe autonomous technological progress or policy-related changes that require the accelerated replacement of appliances with other more energy efficiency ones,even though in these suppositions, these investments are not the subject of aid.

The criteria for reflecting the surplus associated with investments in efficient equipment is that also adoptedin the measures relating to the renewal of transport fleets, where the surplus associated with efficient vehicles the subject of public aid are is quantified as investment. In the TransportSector, investments associated with the natural renewal of the fleet are not included; therefore, they will not be counted either in the investment chapter or, logically, in the aid managed by the public sector. In this sector, the investments—in some measures that include studies, feasibility analysis of Sustainable Urban Mobility Plans,pilot projects and development of fleet management software etc— makereference to the total cost of the measures, only counting those actions that will be the subject of aid within the framework of this 2011-2020 Action Plan.

In the Public Services and Agriculture and Fisheries sectors, the investments reflect the total cost of the studies, feasibility analysis, orequipment proposed which is the subject of aid, not the surplus.

To summarise, and regardless of whether we were able to make an assessment of the total private investments required to achieve the savings forecast, the aidsincluded in this Plan will not be applied to thesuppositions relative to the natural renewal of equipment and processes as a result of autonomous technological progress or to the appliances replaced by other more efficient ones derived from policy-related changes planned or included in this Plan.

In some of the end-use sectors considered in the Plan, an estimate can be made relative to the total investments requiredto achieve the savings forecast (this is the case for the Industry Sector or the Building and Equipment Sector–in this latter case, in terms of surplus), whilst, inothers, this global estimate could not be made relative to the investments and those that are provided make reference to the total investments that will be the subject ofaid (this is the casefor the Transport Sector—in terms of surplus relative to the fleet renewal measures– or to the Public Services and Agriculture and Fisheries Sector.

Finally, in the Energy Transformation Sector, the investments attributable to the Planrefer to the total cost of the new electricity generation capacity in cogeneration plantsforecast for 2020 and the cost associated with the renewal of existing plants, with or without aid managed by the public sector. The Plan's aidsare limited to small-capacity cogeneration plants and non-industrial cogenerations.The investments associated with the electricity generation and refining sectors are consideredoutside of this Plan.

The foregoing shows the difficulty of performing a private profitability analysis of the investments associated with the Plan or, even, the global profitability of the same. On the other hand, in addition to the problem associated with the "investment" item used for each sector as a result of the nature of the measures considered in each of them, there is the added difficulty ofperforming this analysis derived from the nature of the savings considered.

The savings considered in this Plan are calculated in line with the methodological recommendations proposed by the European Commission, taking 2007 as the reference base year. However, to perform the cost-benefit analysis, 2010 should be considered as the base year, to the extent thatonly the savings associated with investments and financial aidsstarted in 2011 are included. This new reference base year is that taken into account in the tablesthat summarise the financial benefits from the previous Plans,therefore through primary energy saving and emission of CO_2 avoided. Oncethis difficulty is overcome and the inability to perform the cost-benefit analysis considering the savings shown in the Plan has been noted when the difficulty associated with the saving itemoccurs.

The savings from the Plan, whatever base year is used for the calculation, include the savings that may occur through structural changes, through changes in consumption habits—savings not directly linked to the investments proposed in the Plan- and through investments not considered in the Plan—investments in transport infrastructures, for example.

Likewise, the savings shown in the Plan should be considered as net savings due to the fact that, in the opposite way, they could lead to other variables, such as the expected increase in equipment in the tertiary sector, which may lead to increased consumption perm^2 which compensates—at least partially— from the improvements in efficiencyderived from directly quantifiable actions, in terms of investment, in the Plan.That is to say that the savings shown in the Plan are not the direct result ofthe investments quantified,given that the savings are net from different effects—both positively and negatively- and, generally speaking, include autonomous technological progress, whilst the investments associated with the natural renewal of the fleet making it possible for autonomous savings to be achieved throughimproved technology not considered, inlarge part, in the sectors included in the Plan. The asymmetry in the considerationof the investments in the different sectors included in the Plan and the use of a saving item that includes direct and indirect effects and, in addition, autonomous savings expected from technological changesoccurring naturally in thedifferent sectors or derived from policy-related changesmaking it impossible to perform an analysis of the cost-benefit or private profitability and, not even, the global analysis of the investments proposed.

Notwithstanding the foregoing, the measures in the Industry and Energy Transformation sectorsare considered to have a useful life of 10 years, 5 for the Transport and Agriculture and Fisheries sectors,15 for the Public Services sector and 30 for the Building Sector,obtaining sufficient investment return rates (€ per € invested)(more than 5€ per Euro invested in the Industry and Transport sectorat the end of the Plan's period of validity).

In the Building and Equipment Sector,the investments quantified in the Planrefer to the surplus associated with all the investments expected for buildings for energy renewal and that associated with all the renovations expected in terms ofthermal installations and lighting systems, andthey have to be profitablein the terms set out in Directive 2010/31 /EC, from the European Parliament and Council, of19 May 2010,, relative to the energy efficiency of buildings.In this sector, the savings quantified in the Plan were less than those forecast, strictly speaking, as a resultof the investments quantified by the contrary negative effect derived from the increase in electrical equipment, especially, in tertiary use but also associated with use in the residential sector.

The results, with all the limitations that have been shown, allow us to insist on the opportunity and necessity of this 2011-2020 Action Plan, especially whena full cost-benefit analysis should have included the financial value of the new jobs createdas a result of the application of the Plan and the financial value of other environmental benefits derived from the reduced amount of emissions of other contaminantsdifferent from CO_2, as well as other positive externalities associated with the same (reduction in costs associated with traffic congestionin city centres etc.).

5. FUNDING OF THE PLAN: SOURCE OF FUNDS

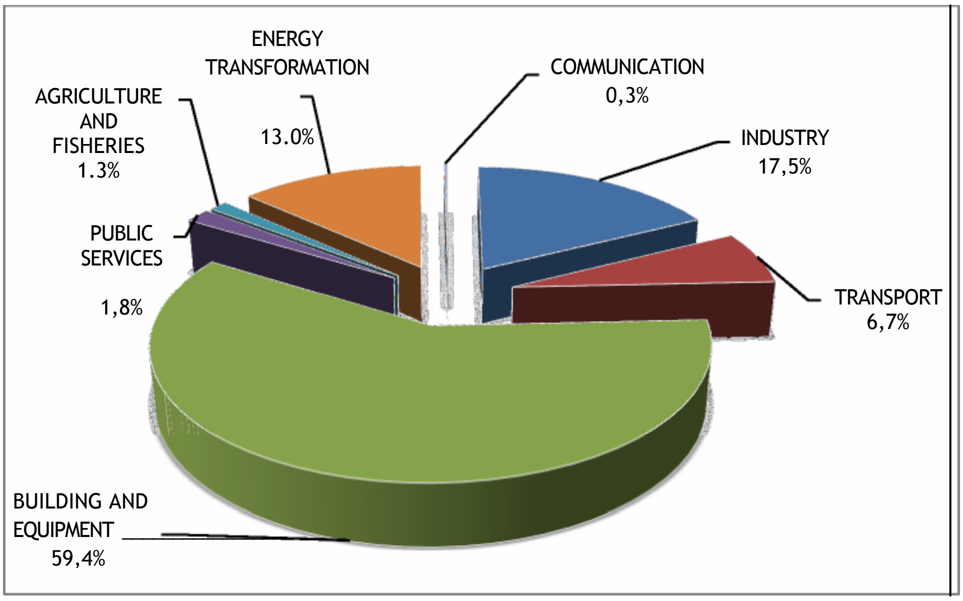
The final and primary energy saving objectives in this Plan will be possible as a result ofinvestment equivalent to 45.985 million Euros during thewhole of the Plan's period of validity and application, from 2011 until 2020, whichrepresents, as an annual average, an investment of 4.598 million Euros.These investments will correspond to autonomous investments made byprivate agents to adapt to the new regulatory framework which may be derived from the Plan andto investments which will be made as a result of the incentive effects which will have thesupports managed by the public sector expected in the same for the whole period:in the order of 500 million Euros as an annual average.

The total investments are distributed, by sector, unequally: the Building and Equipment Sectorabsorbs 59.4% of the total investments, whilst the Transport Sectorrepresents 6.7% of the total. This asymmetry responds to the items, included or not,in the total investments set out in the Plan.In this 2011-2020 Action Plan, investments in infrastructures linked to change of mode or any other links to the development ofrailway transport networks have not been evaluated, which may be necessary to enable an increase inthe carriage of passengers and goods by rail. Therefore, the investments quantified in the Transport Sector in this Planreflect the total cost(aids managed by the public sector andprivate investment) of the measures directly promoted by this Plan and, therefore, the subject of aid;in large part, these measures arefocused on the design of Sustainable Urban Mobility Plans and Workers' Transport Plans, the development of pilot projects, the development of studies to improve the management of road transport fleets orthe introduction of efficient driving courses, both for private vehicles and industrial vehicles.The investments—and, therefore, the support—associated with the Strategy to Boost Electric Vehicles, required torealise the target of 2.5 million electric vehicles in 2020, haven't been includedin the same[38].

The investments corresponding to the Industry Sector and the Energy Transformation Sector represent, respectively, 17.5% and 13.0% of the total investments set out in thePlan.

[38] See Chapter 4 (cost-benefit analysis) for more detail on that included under the "investment" item in this Plan in each of the sectors.

Graph 5.1. Total investments by sector



Source: IDAE

Note: The aids managed by the public sector don't include support for investment in infrastructures—for this samereason, investments in infrastructures are not included.

The supports managed by the public sector made available in this Plan reflect theasymmetry that, by sector, is observed in the distribution of the total investment, in addition to the priority of the diffuse sectors and, by extension,of the non-ETS sectors (notincluded in the scope of application of Directive 2003/87/EC on the trading ofgreenhouse gas emission rights) as beneficiaries of saidresources. The Building and Equipment Sector represents 57.7% of the total aids managed by the public sector.A large part of the investments required, associated with improving energy efficiency, must be made without supports, as a result of the policy changesalready introduced and those scheduled for 2020 as a resultof this Plan; another significant portion of the investments will be the result of autonomoustechnological progress and the renewal of buildings whichoccurs outside of the support programmes established with this purpose, and,of course, a portion of the investments identified as necessary to achieve thesavings estimated in the Plan will not be possible without counting the incentive effect of thesupports to be negotiated by the public sector within this Plan and which,globally, reach 2.883 million Euros—the Electrical Appliances RENOVE planmaintains, as an annual average, a volume of aid equivalent to that applied tothis programme since 2006 within the framework of the cooperation agreements between IDAE andthe Autonomous Communities, to the execution of the saving and energy efficiency measures contained in the 2005-2007 and 2008-2012 Action Plans

The Transport Sector, with a reduced weight relative to the total investment quantified in the Planthrough the non-valuation of the investments in infrastructure,absorbs 20% of the Plan's supports, in so far as a large part of the cost of the studies,feasibility analysis or pilot projects encouragingchange of mode or performed in order to improve fleet management will be supported, up to 50%, by thisPlan.

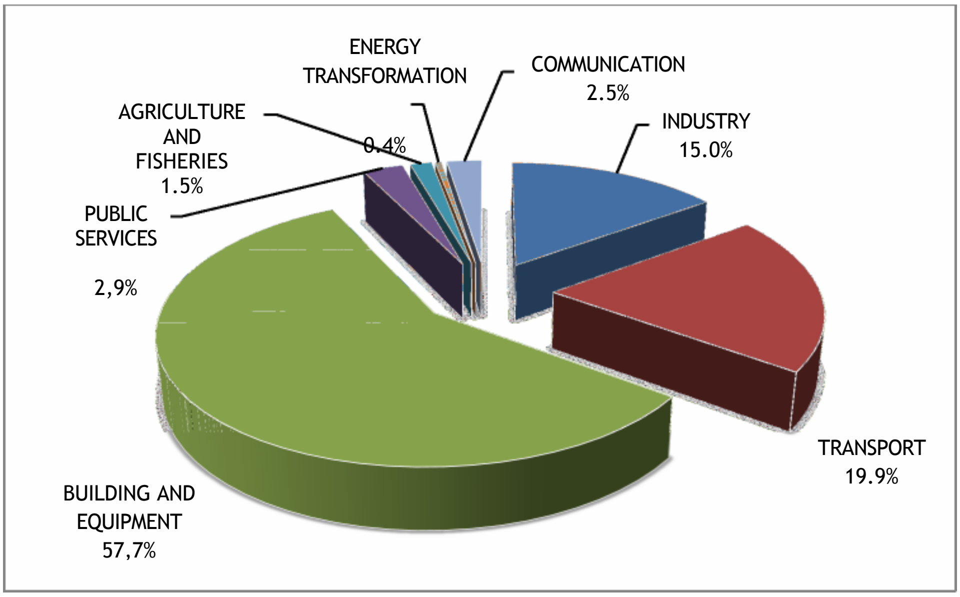
The Industry Sector is next in importance absorbing 15% of the funds managed by the public sector with a total of 750 million Euros in the period as a whole.The greater or lesser weight of the actions with a policy or regulatory characterincluded in the Plan justifies the greater or lesser applicationof funds to meet the savings objectives expected.In the Public Services Sector, for example, the application or extension of the energy efficiency regulation relative to exterior lighting will allow a good part of theexpected savings to be achieved, which, in connection with the competition from the Energy Service Companies, will allow for a reduction in the intensity of the supports which will be appliedto the renewal projects and improvements to public lighting in Spain.A large part of the boost that this Plan seems to give to the energy services market is concentrated, at least initially, on renewal projects and improving municipal public lighting.

IDAE, as the entity responsible for monitoring the results from this 2011-2020 Action Plan,may modify the sectoral distribution or by means of thefunds available to the Plan to try to correct deviations and guarantee that the expected savings targets are met.These changes to thesectoral assignment of the Plan's resources allocated will continue to respect, in so far as possible, the priorities defined in said Plan.

It should be noted that all the supports to be negotiated by the public sector considered in this Planwill be applied guaranteeing the necessary incentive effect that should guide theapplication of funds to investment projects and in accordance with Community rules concerningState supports, in particular, through the application ofthe community Directives concerning State supports in favour of the environment, 2008/C82/01.

Definitively, the 2011-2020 Action Plan evaluates the total supports requiredto achieve the savings set out of 4.995 million Euros, which isalmost 11% of the total investments reported, which is 45.985M€.

Graph 5.2. Sectoral destination of the funds managed by the public sector applied to the Plan



Source: IDAE

Note: The aids managed by the public sector don't include support for investment in infrastructures—for this samereason, investments in infrastructure is not included.

Table 5.2. Resources to be managed by the public sector and investments and their sectoral application
(10^6 €)

	Aids (10^6 €)		Investments (Aid + private investment) (10^6 €)	
	2011-2020	**Annual average**	**2011-2020**	**Annual average**
INDUSTRY	750	75	8.060	806
TRANSPORT	996	100	3.104	310
BUILDINGS AND EQUIPMENT	2.883	288	27.322	2.732
PUBLIC SERVICES	143	14	809	81
AGRICULTURE AND FISHERIES	77	8	596	60
ENERGY TRANSFORMATION	22	2	5.970	597
COMMUNICATION	124	12	124	12
TOTAL	**4.995**	**500**	**45.985**	**4.598**

Source: IDAE

Note: The aids managed by the public sector don't include support for investment in infrastructures—for this samereason, investments in infrastructures are not included.

The funds to be managed by the public sector quantified by the Plan (4.995 M) will come from various sources, copying the financing outline from the 2005-2007 Action Plan and the 2008-2012 Action Plan over to this Plan.

Almost a quarter of the funds to be applied to be Plan come from thepublic budgets, either from the General State Budgets (7%) or the autonomous budgets(16%), the latter with an annual average of80 million Euros, equivalent to that which has been applied, annually, within the framework ofthe cooperation programme set out between the IDAE and the Autonomous Communities for the execution of the saving and energy efficiency measures contained in the previous plans.Both the investment fromGeneral State Budgets and that from autonomous budgets areconditioned by budgetary availabilities and must be approved, annually, within the corresponding budgetary laws, by the State or theAutonomous Communities. The remaining 77%, equivalent to 3.845 million Euros (or an average of 385 million Eurosannually), will come from investment in the energy sector through the formula that, appropriately, is set out—in application of2013-[39].

Royal Decree-law 14/2010, of 23 December, which includes urgent measures for the correction of thetariff deficit, sets out, in its thirdadditional provision, that the amounts charged to the electrical system designed for the 2008-2012 Action Planwill be funded through investment from each of the producing companies, in the percentages that were, explicitly, included in this decree-law. The Royal Decree-law makes reference to theamounts projected for 2011 (270 million Euros) and 2012 (250 million Euros), and those relative to2013, whilst, the latter refers to approval of thenecessary approval under Agreement of the Council of Ministers from this Action Plan.For this reason, and until the end of the period of validity of the previous 2008-2012 Action Plan, the funding of the Plan with loading of the electricity system(the electricity tariff, according to that set out, literally, in the drafting of the Plan approved in June 2007),is covered, annually, by the investments from each of the electricity producing companies in the quantities and percentages set out in the Decree-law.

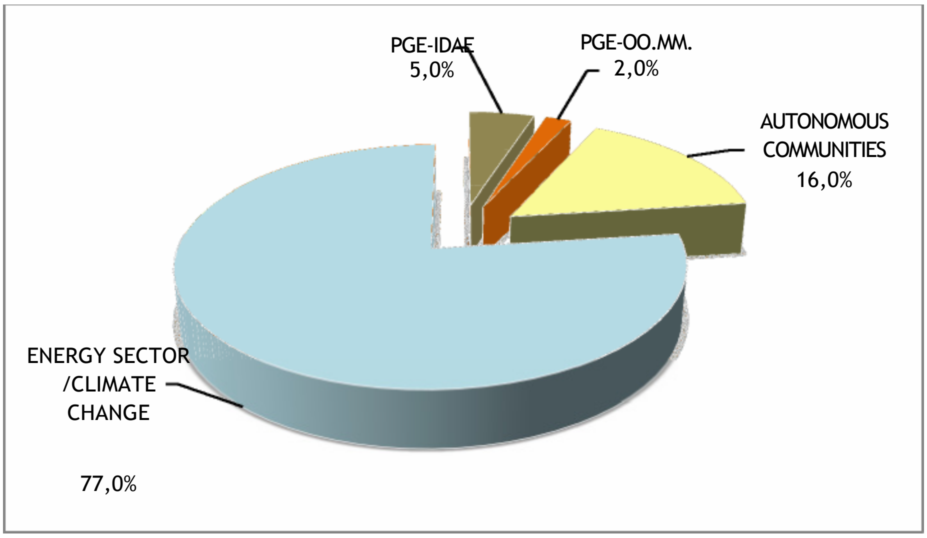
Once the period of validity covered by the previous 2008-2012 Action Plan ends, the government shall approve the most suitable formula for funding the plan.The Plan may be financed with investments from the energy sector.

The preamble of Law 13/2010, of 5 July, modified byLaw 1/2005, of 9 March, which regulates the regime governing greenhouse gas emission rights,reflects the commitment, without prejudice to the non-assignment ofincome to expenses, to allocatean equivalent amount of the financing to climate change policies through invitations to tender relative to emission rights. In this sense, we should point out that, among others,the International Energy Agency has recognised, that saving and energy efficiency policiesconstitute the most economic instrument to reduceemissions of CO2. Therefore, and without expecting previous resources from the tendering of emission rights to affect this Plan, andsubject to budgetary approval taking the limitations of the General Budgetary Law itself into account,recourse to the recourses for financing this Planwithin the general framework of the policy against climate change may be required.

[39]The FEDER funds that might become available in the period of validity covered by this Plan,either applied directly by the Spanish Public Administrations for the funding of investment projects insaving and energy efficiency or, indirectly, through funds from Cartera JESSICA supervised and managed by the European Investment Bank, are not included in this global calculation.

The formula adopted should take into account that set out in the 2011 Energy Efficiency Plan presented by the European Commission[40], in relation to the intensification requiredin terms of price signals through the taxation of energy (understood as conventional non-renewable energy) or carbon emissions. Theneed for the energy sector to make, within the framework of this 2011-2020 Action Plan, the resources required for the sufficient promotion of the private investments in saving and energy efficiency assumes a indirect and alternative mechanism for setting energy efficiencyobligations in terms of said sector, given that greater energy savingsresulting in less funding required by future saving and energy efficiency programmes.The resources relative to this Plan will be managed by theMinistry of Industry, Trade and Tourism through the IDAE—except for when said resources relate to contributions from General State Budgetsallocated to other ministerial Departments different from the previous one forthe execution of specific measures[41]— and by the Autonomous Communities. The co management and cofounding mechanism between IDAE and the Autonomous Communitiesstarted for the execution of the measures contained in the 2005-2007 Action Plan, and continued in the 2008-2012 Action Plan,will continue being the main mechanism of application for the funds to be managed by the public sectorto be entered in favour of this Plan during its whole period of validity.

Graph 5.3. Source of funds



Source: IDAE

Note: PGE-OO.MM. corresponds to budgetary contributions to other ministerial Departments differing from theMinistry of Industry, Trade and Tourism for actions considered in this 2011-2020 Action Plan.

[40]COM (2011) 109 final. Brussels, 8.3.2011.

[41]This was the case for the budget dedicated to the Agricultural Tractor RENOVE plan, forexample.

Table 5.1. Source of funds (10^6 €)

	2011-2020	Annual average
PGE-IDAE	250	25
PGE-OO.MM.	100	10
Autonomous Communities.	800	80
ENERGY SECTOR/CLIMATE	3.845	385
TOTAL	**4.995**	**500**

Source: IDAE

Note: PGE-OO.MM. corresponds to budgetary contributions to other ministerial Departments differing from theMinistry of Industry, Trade and Tourism for actions considered in this 2011-2020 Action Plan.

6. DETERMINATION OF THE SOCIOECONOMIC IMPACTS OF SAVING AND ENERGY EFFICIENCY IN2020[42]

6.1 Introduction

Energy efficiency is key for the current and future development of the Spanish economy.In addition to the energy savings (and as a result the financial ones)achieved, positive socioeconomic impacts occurred relative to the generation ofnew economic activities resulting in increases in GDP and employment at national level.

Despite its importance as a 2020 objective, in Spain, there is no financial quantification of the different energy efficiency products and services ort the energy efficient sector and market as a whole. The transversal presence of the sector in other sectors of the economymeans thatthere is not sufficient or specific enough information available on its size, number of employees and increase potential.

Therefore this chapter aims to measure and quantify the energy efficiency sector in Spain,based, in large part, on the current model of economic growth, in terms of production, GVA and employment, as well other variables such as exports, imports andR+D+i. Another of the chapter's objectives is toestimate the projection of these variables for 2020, which will give more visibility to the contribution that energy efficiency makes and will make to our economy.

This chapter includes a description of the current situation in the economy's energy efficiency sector, a short description of the history of studies relative to the valuation of the energy efficiency market at national and international level, themethodology used and theresults of the qualitative and quantitative valuation of the sector.

6.2 Economic and energy context

.-Situation of the Spanish economy

The presentation of the 2011-2020 Saving and Energy Efficiency Action Planfalls within the framework of a global financial crisis from2007. In 2009, global production experiences the largest contraction since the end of the Second World War.As an annual average, global growth isaround -0,6% as a result of the contraction of GDP in developed economies(-3,1%) and the significant slowdown in the growth of emerging economies.From the second quarter of 2009, a slight improvement was experienced,although said recovery was unequal, as it was stronger in emerging

[42]The complete document evaluating the socioeconomic impacts associated with energy efficiency will be published separately by IDAE under the title of:"Socioeconomic impactof saving and energy efficiency in Spain for 2020".

countries and weaker in developed countries. In the European Union (EU27), theeconomy contracted by 4.2% in 2009.

The Spanish economy, which has been growing at an average of 3.5% annually over the last five years, contracted by 3.7% in 2009,influenced by theexplosion of the international financial crisis and the collapse of the national housing market, which was one of the main driving for5ces behind GDPand employment in recent years.

The financial crisis in Spain was also marked by the contraction of national spending.In 2009, national demand fell by 6.1% annually (household consumption fell by 4,9%), residential investment fell by 24,5% and productive investment in businesses (the formation of gross capital)fell by 15%.

However, the foreign sector contributed positively to the growth in GDP (by2,8 percentage points) due, mainly, to the fall in imports motivated by the decrease in national demand.On the other hand, this correction of the trade deficitreduced the need for funding of the Spanish economy, which went from9,2% of GDP in 2008 to 4,7% in 2009.

In 2010, the Spanish economy began to return to its positive growth path. The provisional GDP data for the last quarter of 2010points to a year-on-year increase of 0,6%, which limited the fall in GDP for the year as a wholeat only 0.1% annually.

In the coming years, the Spanish economy faces a major challenge:changing and diversifying the growth pattern as well asincentivising some more efficient and profitable activities, so that the growth in demand can be met without levels of comfort being reduced.In this context, theeconomic activity associated with energy efficiency is an opportunity tosignificantly contribute to the improvement in the current economic situation and overcoming the crisis.

.- Energy context

The energy sector is a sector that transverses the whole economy. Energy consumption is presentin all economic activities and represents an operating cost in many relevant cases, in terms of results from economic agents.Therefore, especially in a context of crisis, like at the present time, it is necessary toreduce costs to relaunch the economy, resulting, essentially, frompromoting energy efficiency, both in production and in consumption of goods and services.

The 2020 Europe Strategy estimates that the objective of 20% of energy coming from renewable energy sources,has the potential to create more than 600,000 jobs in the EU, whilst if the 20% energy efficiency objective is achieved, an impact greater than a million jobs is estimated.

All of the actions set out in this Plan will reduce energy consumption and costs in all the economic sectors and the foreign energy dependency of the EU and Spain, improving our economy's productivity and competitiveness.Likewise, all the measures for promoting energy efficiencywill trigger the growth of this sector in our country's economy,creating new business activities and opportunities and creating jobs in the market relative to the manufacturing of equipment and the provision of energy efficiency services.

6.3 Methodology for the socioeconomic valuation of the energy efficiency sector inSpain

The main purpose of the study of the Plan's socioeconomic impact for 2020 is to quantifyin terms of Gross Value Added (GVA) and employment in theenergy efficiency sector in Spain, both for now and its growth potential.There is a significant lack of information on the size of each sector in the Spanish economy due, in part, to the fact that the sector's producing sectorsare not dedicated, in general, to the manufacture, exclusively, of energy efficiency equipment,therefore it is not possible to perform a quantification analysis through the direct aggregation of subsectors.

For this reason, thorough and extensive fieldwork was carried out with production companies and business associations.This fieldwork included a total of59 associations representing the sector; 41 of them facilitated data and/or distributed the questionnaire to their associated to obtain information. In addition, 198 companies were contacted directly; 76 of them provided information and 3 public bodies also helped. In addition, 28 expert bodies and entities were consulted in the sector with the aim of checking the information analysed and the results obtained from the study and to get their opinion on growth perspectives.

Therefore this study constitutes the first valuation study for the energy efficiency sector in Spain withbottom-up methodology (from bottom to top) based oninformation on products, and as a reference for subsequent studieson this subject, given the non-existence, to date, ofinformation from the sector in Spain as well asreference socioeconomic valuations of the same.

In fact, the methodology also aims to serve as a tool to periodically replicate, in subsequent years, the socioeconomic valuation of the energy efficiency sector.

Firstly, in order to estimate the importance of energy efficiency products in the economy, that is to say, to measure their size,we should define what is meant by energy efficiency and highlight the sectors, products and services that compose the energy efficiency sector as a whole.

After this necessary theoretical conceptualisation, we will proceed to quantify the direct, indirect and induced socioeconomic impact from the energy efficiency products and services and, from the same, from the energy efficiency sector as a whole for 2009, as the reference year.Said quantification covers the 2004-2008 period(historical) and into the future, for the 2010-2020 period(prospective).

The difficulty of putting this plan into practice comes from the fact that the energy efficiency sector is a transversal and horizontal sector relative to other sectors, which means it not well limited or defined. The improvements in energy efficiencyare often embedded within other existing sectors, technologies or practices,therefore the measurement of the sector tends to be complex and sufficient or specific information relative to its size and growth potential etc is not available.

Therefore, a quantification of the energy efficiency sector was performed from the perspective of production or supply, with abottom-up approach,obtaining the information from the companies and business associations that manufacture or produce the different products and services and not from consumer demand for energy efficient products.This approximationis not without its difficulties either, given that practically all the companies that produce these energy efficient products and services also produce conventional or less energy efficient alternatives,besides not usually being itemised or differentiated fromthe products or services which are the subject of this study, meaning that the producers estimate the data attributable to said products or services.

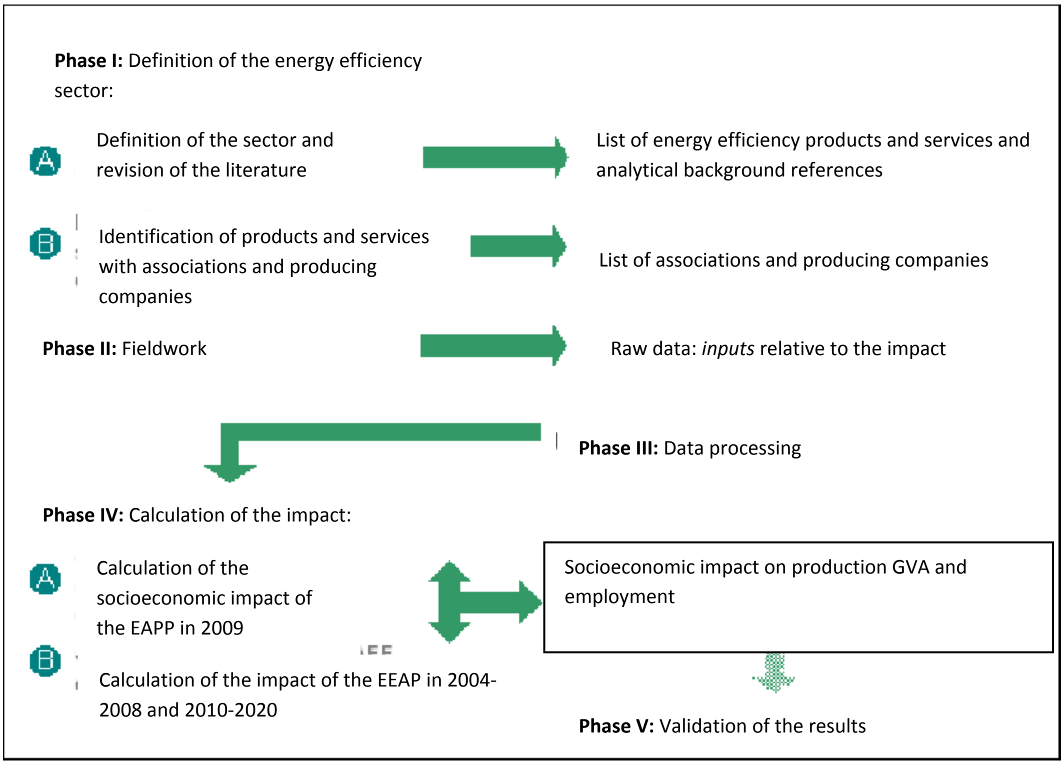
With this objective, 8 activity sectors related to energy efficiency have been differentiated and more than 90 possible efficient products have been analysedfrom an energy point of view, with 79 products constituting thecalculation basis. The products selected were validated and analysed with the aid and information provided by the different associations, bodies and companies. In total, 260 entities were contacted for the collection of data including associations, companies and organisations.

The main source of data was the surveys completed by different associations and companies making use, in some cases, of annual calculationsfrom some companies to complete and/or compare information, as well as from othersources. Additionally, this data complements and contrasts with the informationobtained through meetings and interviews with key players in the sector and with public socioeconomic data from official sources.

The choice of the associations, companies and organisations that composed the sample or universe to question was performed using direct selection with the intention ofcovering all production of each of the goods and services selected in a representative manner.Therefore, we sought to define and quantify, in a global and representive manner,the energy efficiency sector with the participation of agents from this market.

All this planning was structured around the planning of five interrelated working phases, as shown in Diagram 6.1.

Diagram 6.1. Methodological phases for the socioeconomic valuation of the energy efficiency sector in Spain



.- Phase I: Definition of the energy efficiency sector

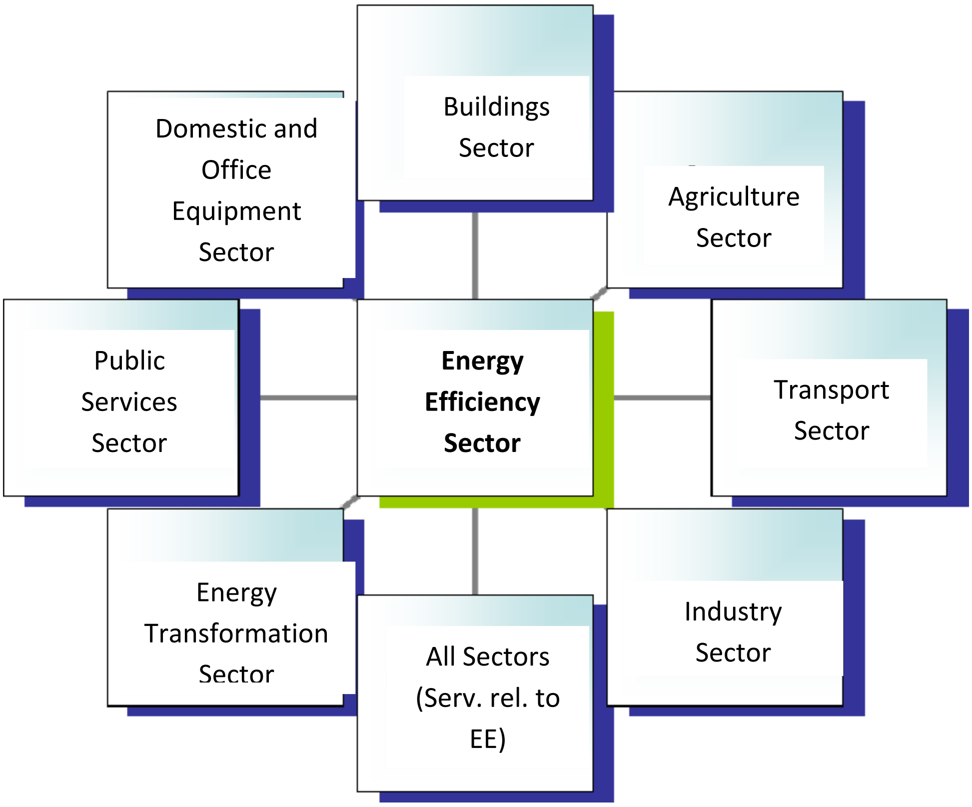
As previously mentioned, the energy efficiency sector is a sector that transverses various activity sectors in the Spanish economy.

Therefore, this sector would generally be formed by a ratio of the different production sectors that develop energy efficient products and services.

However, it is a continuously evolving and rapidly developing sector due to technological innovation.This means that a product considered as being energy efficientmay cease to be so in the coming years for different reasons(for example, the development of new technologies that give rise to an alternative more energy efficient product.In order to determine the energy efficient products, we have optedfor a conservative approach, considering the more energy efficient products or alternatives in line with current best practice in terms oftechnologies and higher energy classifications that currently exist, complying with policies, plans and programmes.

As set out in this Plan, the energy efficiency sector will be integrated into 8 economic activity sectors.The products considered within each sector(and therefore within the energy efficiency market) are themain products of the same and/or some with greater energy saving in the sector.

Diagram 6.2. Integration of energy efficiency sectors



Below, you will find activity sectors defined by the Plan thatconforms to the energy efficiency sector, as well as, generally, theproducts and services included in said sectors[43]:

[43]The set of products identified are divided into the 8 sectors defined in the Saving and Energy Efficiency Action Plan, which considers the saving and energy efficiency measures from the different energy consumption or energy demand sectors.The products related to energy efficiency considered in the Industry and Energy Transformation Sectors are those relating to the sector'shorizontal or transversalmeasures, more specifically, measures relative to electrical and thermal equipment,without going into process technology or production system, more specifically in each subsector. However,in relation to the product defined as District Heating in the Building Sector,only the income from operating activities is considered (sale of electricity, heating and cooling)but the manufacture of equipment associated with the same is not taken into account (such as motors and boilers etc.), so as to avoid double counting, given that it is already considered in cogeneration(part of the Energy Transformation Sector). Therefore, it should be noted that the services provided by the Public Administration concerning energy efficiencyare set out in the All Sectors section, assuming that the revenue generated by this item in 2009 was 8% of the sector's total.

Building sector	Transport Sector
- Thermal insulation and windows that improve energy efficiency - Low-consumption and LED lighting in buildings - Air-conditioning and water cooling equipment with high energy efficiency - Boilers with high energy efficiency - Low-temperature water radiators and radiantfloors/ceilings - District heating systems - LIfts with high energy efficiency - Systems for the management, control and regulation of lighting and heating in buildings	- Electric and hybrid vehicles and those using hydrogen and gaseous fuels. - Electric and hybrid motorbikes and bicycles- Low-emission vehicles - Electric and hybrid buses and those using hydrogen and gaseous fuels. - Public bicycle hire systems- High-speed trains (complete machine) - Recharging points and stations for vehicles running on electricity and gaseous fuels - Information and communication technologies (ICT) applied to public and private transport - Tyres with high energy efficiency

Domestic Equipment Sector and Office equipment	Agriculture Sector
- Fridges and freezers with high energy efficiency - Ovens with high energy efficiency - Washing machines and dishwashers with high energy efficiency - Domestic air-conditioners (with power of up to 12Kw) with high energy efficiency - IT, multifunctional/printing equipment with high energy efficiency - Telemanagement systems - Other electrical appliances with high energy efficiency	- Combine harvesters, seeders and tractors with high energy efficiency - Localised irrigation equipment - Electronic speed variators in electric motors for the pumping of irrigated water - Systems for the management, control and regulation of climate control in crop greenhouses - Thermal insulation in crop greenhouses

Public Services Sector	Industry Sector
- Low-consumption and LED lighting in public lighting systems - Traffic lights using LED technology - Systems for the control and regulation of public lighting - Electronic speed variators in electric motors for the pumping of water in terms of supply, drinking water and purification	- Insulation for equipment and pipes in industry - Water coolers with high energy efficiency - Industrial boilers with high energy efficiency - Electrical motors with high energy efficiency - Electronic speed variators forelectric engines - Absorption machines

Energy Transformation Sector	**All Sectors**
- Cogeneration systems - Electrical motors with high energy efficiency - Electronic speed variators forelectric engines - Absorption machines- Energy services provided by Energy Services Companies(ESCOs)	- Services provided by the Public Administration concerningenergy efficiency - Advertising services concerningenergy efficiency - Other services related to energy efficiency (engineering, consulting, auditing, certification, installers and maintainers).

Before performing this first phase of the study, a documentary revision of similar studies on the socioeconomic valuation of the energy efficiency sectordeveloped at national and international level was carried out,with the aim of identifying and analysing the methodological references, hypotheses and results, which may be useful for developing the study[44].

[44]The studies analysed were mainly:

- Karen Ehrhardt-Martinez and John A. "SKip" Laitner. American Council for an Energy EfficientEconomy (ACEEE). Report Number E083 (mayo 2008). The Size of the U.S Energy Efficiency MarKet:Generating a More Complete Picture.
- "SKip" Laitner, John A. American Council for an Energy-Efficient Economy (ACEEE). Report NumberE112. (2011). Energy Efficiency Invesments as an Economic Productivity strategy for Texas.
- German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (2011). ANew Growth Path for Europe: Generating Prosperity and Jobs in the Low-Carbon Economy.
- Deloitte. (2009). Study of the Macroeconomic Impact of Renewable Enerhies in Spain.
- Fundación Conde del Valle de Salazar de la Universidad Politecnica de Madrid en colaboración conComisiones Obreras (CC.00) y el Instituto Sindical de Trabajo, Ambiente y Salud (ISTAS) (December2010). THe generation of employment in the energy renewal and modernisation of buildings and homes.
- German Federal Ministry of Economy and Technology. (March 2010). Energy Efficiency Made in Germany: Energy Efficiency in Industry, buildings, transport and infrastructure.
- Gari, Manuel; Arregui, Guillermo; Candela, Jose; Estrada, Bruno; Medialdea, Bibiana and Perez, Sara.InstitutoSindical de Trabajo, Ambiente y Salud (ISTAS) (November 2010). Study on employment associated withrenewable energies in Spain 2010.
- ECOFYS (October 2009). Sectoral Emission Reduction Potentials and Economic Costs for ClimateChange (SERPEC-CC).
- United Nations Environment Programme (UNEP), and International Labour Organization (ILO),Institute of Education (I0E), International Trade Unión Confederation (ITUC). Green Jobs Initiative.Worldwatch Institute. (September 2008). Green Jobs: Towards decent work in a sustainable, low- carbon world.
- IDAE (2000) within the framework of a community project for measuring the impact on employment fromenergy efficiency programmes funded by the SAVE programme (DG XVII). Impacts onthe Use of the Energy Efficiency Actions in Spain and the European Union.
-

.- *Phase II: Fieldwork*

The bottom-up approach is based on the use of raw data collected directly from the production companies and business associations.In this sense, the aim of this second phase, of fieldwork, was tocollect all the data requiredto quantify the energy efficiency products in 2009[45] andthe data required to extrapolate said quantification to the previous five years(2004-2008) and make a production for the coming years (2010-2020). In addition, the fieldwork tried to collect additional data on the energy efficiency products.

To address this phase, firstly, a exhaustive identification was performed on the associations that group together the different Spanishproduct manufacturing companies that are the subject of this study.These associations represent a large section of the marketfor the products considered. In the event that a single association does not representa large percentage of the product/service in question, more thanone association has been used for the collection of information. Therefore, in the event that the associations do not havethe information available and cannot provide it,said information was requested from the companies belonging to the associations.This process was essential for identifying the entities suitable for the study's requirements and with the data available.The peculiarity of the energy efficiency sector,often composed of energy efficient "versions" of products, which means that there is not an a clearly defined a priorisample for the sector.

The study's information collection method included a combination of telephone calls,face-to-face meetings, email communications andthe submission of specifically developed questionnaires, with the aim ofobtaining as much raw information as possible.

The raw data obtained from the fieldwork for the base year (2009)is as follows:

- Identification and contact data for the manufacturing associations or companies.
- Market share of the product.
- Turnover (in Euros or as a percentage of total turnover forall the associated companies) for each product.
- Spending on suppliers (in Euros).
- Number of full-time employees (and percentage of females employed).
- Wage bill (in Euros).
- Total cost of depreciation (in Euros).
- Exports (in Euros).
- Imports (in Euros).
- Investment in R+D+i (in Euros).
- Profit (in Euros).
- Allocation of the data to the Plan's energy efficiency sectors.
- Average annual growth rate of the production of energy efficient products in the

[45] Last year that the companies have data for closed and audited years for.

last five years.

- Average annual growth rate expected in the production of energy efficient products in the next five years.

In the event that sufficient information could not be obtained from the companies,other secondary sources were consulted, such as the annual accounts from the companies registered in the Trade Registry or data fromNational Accounting

This fieldwork phase was complemented with the collection of information from public and private organisations through meetings with two aims: to collect information on forecasts relative to evolution of the energy efficiency sector in the 2010-2020 periodand to validate the results obtained from the current and past periods.The forecasts madeare one of the bases used to create the future scenarios in terms of the impact of the energy efficiency sector.

.- Phase III: Data processing

Once the fieldwork was complete, we moved onto the third phase corresponding to data processing.The objective of this phase consisted of checking the quality of the data availableand processing all the information collected so as to calculate the economic impact with theInput-Output Table (IOT hereinafter) for Spain.

This phase included the following steps:

- Quality control of the information collected.
- Classification and organisation of the information.
- Resolution of inconsistencies in the aggregated data and estimation of the incomplete data from secondary sources.
- Estimation of incomplete data from secondary sources, such as:
    - The annual accounts from companies registered in the Trade Registry,
    - Through information from other companies that produce the product or service themselves,
    - Data from the National Accounting sector or from the statistics published(IOT; Survey of the Active Population; Salary Survey; orR+D statistics).
    - Other reliable public or private sources.

In addition to processing the data collected, this phase set out thecorrelations of the energy efficiency products and services with theexisting sectors in the National Accounting or Slain and in the IOT, with the purpose ofcalculating the indirect and induced impacts from the energy efficiency sector.The correspondence of the products with the IOT is relevant for comparing the data and/or for making up for gaps in the fieldwork.

.- *Phase IV: Impact calculation*

The fourth phase is the quantification of the socioeconomic impact of the energy efficiency sector through different macroeconomic magnitudes,once the data collected during the fieldwork phase and refined during the information processing phase has been obtained.

The theoretical framework used to calculate the impact is based on the central idea that the relevance of an economic sector, both in terms of production and use,is, in reality, greater than the production and use in the sector itself. Thisis due to the fact that each sector of the economy, in this case of energy efficiency sector,demands goods and services from other sectors, generating new production and use.The workers and owners of companies in the sector in questionreceive income, used to compare all types of goods and servicesas private consumers, generating additional production and use. The concepts ofdirect, indirect and induced data emerge from this idea which is explained below.

- The magnitude of the sector or direct impact consists of the production and use required to transform the supplies from other sectors into final products in the sector.

- The production of energy efficient products requires the purchase of other goods and services from other economic sectors.The production of these goods and servicesconstitutes the indirect effect. This effect also includes the impacts generated by the supply sectors which,through their intermediate consumption, generates successive rounds of chain reactions.

- In the latter case, an additional effect should be considered: the induced effect. The economic activity generated by the aforementioned impacts generate an increase in employment. Said increase in employment results from an increase inprofits from the work that, depending on the propensity in terms of household consumption, is translated into consumption.Therefore, the increase in consumption generatesa new chain of effects like those described previously and which comprise the induced effect.The sum of the indirect and induced impactis known as the intersectoral impact and the sum of the three impacts (direct, indirect and induced)is known as the total impact or productive impact.

The quantification method developed for the energy efficiency sector covers two very distinct periods:one in the past (from 2004 to 2008 taking 2009 as the base year)and the other in the future (from 2010 to 2020,taking 2009 as the base year).

The quantification methodology for the energy efficiency is different for each of the two periods.For the first period, the methodology is used on the primary data collected from the associations and company during the fieldwork phasewhilst, for the second period, it is based, in addition to the forecasts from producing companies and associations, on forecasts from experts.

These projections enable an estimation to be made of the turnover in the energy efficiency sector in 2004 and for the future periods of 2016 and 2020.The calculation of the economic impact for the base year (2009) enables a link to be made between the sector's total turnover and the impacts, known as a multiplier. This multiplier is used for past and estimated future turnover,estimating the impacts of the energy efficiency sector in the past and the future.

.- Phase V: Validation of the results

Once the impact study was complete, we proceeded to validate the results through quantitative and qualitative methods.Specifically, this validation is performed in three ways.

- Contrast with the data from National Accounting.
- Interviews with the experts and associations and companies consulted.
- Contrast with secondary sources.
- Subsequent evaluation in intermediate years in the future period.

6.4 Results and conclusions

The quantification of the socioeconomic impact of the EEAP for 2020 is performed on the economic production variables gross value added (GVA) and employment. The difference between the value of the end product and the value of the intermediate consumption is that understood as GVA, thevalue that the company or sector adds to intermediate consumption bought.

Below you can see the presentation of the results of the energy efficiency's sector socioeconomic impact in the reference base year (2009)as well as the historical evolution and the future forecasts for the same.

.- Magnitude of the energy efficiency sector

The magnitude or direct effect from the energy efficiency sectoris given by the volume of its production, by that of its gross value added and by the number of jobs that it directly generates.

The production in the energy efficiency sector, that is to say, the aggregated turnover of all theenergy efficient products, achieved in 2009 was 21.462million Euros, which accounts for 1% of the total production at basic prices in Spain.The gross value added in the energy efficiency sector was7.431 million Euros, equivalent to 0,8% of Spain's total GVA. In terms ofemployment, the energy efficiency sector directly employed106.393 people, being directly responsible for 0,5% of employment in Spainin 2009, 77,7% corresponded to men and 22,3% to women.

Table 6.1. Direct impact of the energy efficiency sector in terms of production, gross value added and employment in relation to the Spanish economy in 2009

	Direct impact	% on Spain
Production (Millions of Euros)	21.462	1,0%
Gross Value Added (Millions of Euros)	7.431	0,8%
Employment (Number of employees)	106.393	0,5%

Source: Own work; INE: Symmetrical Input-Output Table

It is useful to compare the energy efficiency sector with the energy sector as a whole(INE classification; energy efficiency is not included in this sector), so as to determine its size. Therefore, in 2009, the energy sector recorded a GVA of28.208 million Euros, whilst the magnitude of the energy efficiency sectorachieved 7.431 million Euros in terms of GVA.

Table 6.2. Comparison of the energy sector and the energy efficiency sector in terms of GVA, 2009.

Activity sector	Millions of Euros
Energy sector (CNAE)	28.208
Energy subsectors	
Extraction of anthracite, coal, lignite and peat	316
Extraction of crude oil, natural gas, uranium and thorium	97
Extraction on metallic minerals	43
Extraction of non-metallic minerals	1.337
Coke refining and nuclear fuels	2.208
Production and distribution of electricity and gas	20.790
Collection, purification and distribution of water	3.417
Energy Efficiency Sector	7.431

Source: Own work, INE and National Accounting.

In terms of employment, in 2009, the energy sector directly employed141.900 people and for the energy efficiency sector it was 106.393.

Table 6.3. *Comparison of the energy sector and the energy efficiency sector in terms of employment, 2009.*

Activity sector	Number of employees
Energy sector (CNAE)	141.900
Energy subsectors	
Extraction of anthracite, coal, lignite and peat	7.304
Extraction of crude oil, natural gas, uranium and thorium	696
Extraction on metallic minerals	463
Extraction of non-metallic minerals	27.137
Coke refining and nuclear fuels	9.900
Production and distribution of electricity and gas	43.318
Collection, purification and distribution of water	53.082
Energy Efficiency Sector	106.393

Source: Own work, INE and National Accounting.

Likewise, the importance of the energy efficiency sector is also highlightedif a comparison is made with the rest of the producing sectors in the Spanish economy.Therefore, in the case of the energy efficiency sector andthat shown in the Input-Output Table for Spain, this is in terms of gross value addedahead of sectors such as metallurgy and the textile industry.

Table 6.4. *Comparison of the energy sector with other sectors of the Spanish economy in terms of GVA, 2009.*

Sector	Gross Value Added (millions of €)
Building	102.104
Agriculture, livestock farming and hunting	21.232
Land transport and pipeline transport	21.040
Production and distribution of electrical energy	16.447
Sale and repair of motor vehicles;fuel for driving	14.322
Chemical industry	11.799
Manufacturing of metal products	11.664
Machinery and mechanical Equipment	9.049
Manufacturing of motor vehicles and trailers	7.922
Metallurgy	7.334
Publishing and graphic arts	6.892
Textile industry	1.847
Energy Efficiency Sector	7.431

Source: Own work and INE, Symmetrical Input-Output Table[46].

Table 6.5. *Comparison of the energy sector with other sectors of the Spanish economy in terms of employment, 2009*

Sector	Number of employees
Building	1.875.251
Agriculture, livestock farming and hunting	769.000
Land transport and pipeline transport	602.368
Sale and repair of motor vehicles; Fuel for driving	378.684
Manufacturing of metal products	277.611
Machinery and mechanical equipment	207.504
Manufacturing of motor vehicles and trailers	190.661
Publishing and graphic arts	155.685
Chemical industry	138.883
Metallurgy	91.585
Textile industry	56.858
Production and distribution of electrical energy	35.300
Energy Efficiency Sector	106.393

Source: Own work and INE, Symmetrical Input-Output Table[47].

[46]The table shows a comparison between some of the more significant sectors in the Input- Output Table in terms of GVA and the energy efficiency sector. The figures for GVA in the energy efficiency sectorcomes from the fieldwork.

[47]The table shows a comparison between some of the more significant sectors in the Input- Output Table in terms of employment and the energy efficiency sector. The figures for employment in the energy efficiency sectorcomes from the fieldwork.

Performing the same comparison in terms of employment, the energy efficiency sectoris behind the sectors relating to chemical industry and the manufacture of motor vehicles and trailers, and ahead of the sectors relating to the textile industry, metallurgy and the production and distribution of electrical energy.

.- Productive impact

In addition to the direct magnitude of the energy efficiency sector, it is important to consider the productive impact or total impact that this sector has on the whole economy in terms of production, gross value added and employment.

Grouping the different effects together (direct, indirect and induced), we can see that the productive impact or total impact of the energy efficiency sectorin terms of employment is 281.473 jobs or, that is to say, 1.4% of total employment in the Spanish economy in 2009.This employment generatedgross value added of 17.771 million Euros, that is to say, 1,81% of the total GVA.

Table 6.8. *Total socioeconomic impact of the energy efficiency sector in terms of production, Gross Value Added and employment as % in Spain, 2009*

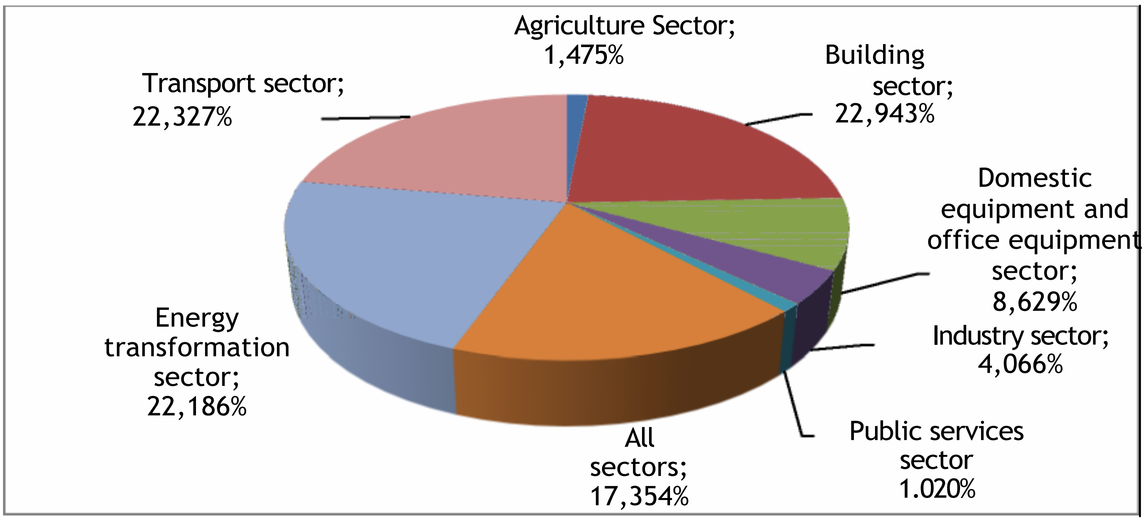
	2009	
PRODUCTION	**Millions of Euros**	**% for Spain**
Magnitude of the sector (Direct	**21.462**	**1,05%**
Intersectoral impact	**28.786**	**1,40%**
Indirect effect	17.292	0,84%
Induced effect	11.494	0,56%
TOTAL PRODUCTION IMPACT	**50.247**	**2,45%**
GROSS VALUE ADDED	**Millions of Euros**	**% for Spain**
Magnitude of the sector (Direct effect)	**7.431**	**0,76%**
Intersectoral impact	**10.34**	**1,06%**
Indirect effect	6.574	0,67%
Induced effect	3.767	0,38%
TOTAL GVA IMPACT	**17.771**	**1,81%**
EMPLOYMENT	**Number of employees**	**% for Spain**
Magnitude of the sector (Direct effect)	106.393	0,53%
Intersectoral impact	175.080	0,87%
Indirect effect	96.233	0,48%
Induced effect	78.847	0,39%
TOTAL EMPLOYMENT IMPACT	**281.473**	**1,40%**

Source: Own work; INE: Symmetrical Input-Output Table

.- *Analysis by sectors in the Plan*

Delving into the field of energy efficiency,we can see that both the magnitude and the total socioeconomic impact differ according to the different sectors. In terms of magnitude or direct effect, the Building, Transport and Energy Transformation sectorsare those that are the best represented within the energy efficiency sector, both in terms of production and added value.However, the Public Services sector is that which contributes least to the sector, followed by the Agriculture sector.

Graph 6.1. *Distribution by EAPP sector of the magnitude (direct effect) of the energy efficiency sector in terms of GVA,2009*



Source: Own work

Table 6.9. *Productive impact on GVA in the EAPP sectors, 2009.*

Millions of Euros	Magnitude of the sector	Indirect effect	Induced effect	Total Productive Impact	% on EES	% on Spain
Agriculture Sector	110	**95**	55	260	1,5%	0,03%
Building Sector	1.705	**1.411**	808	3.924	22,1%	0,40%
Domestic equipment and office equipment sector	641	**422**	242	1.305	7,3%	0,13%
Industry Sector	302	**372**	213	887	5,0%	0,09%
Public services sector	76	**106**	61	242	1,4%	0,02%
All sectors	1.290	**456**	261	2.007	11,3%	0,20%
Energy Transformation Sector	1.649	**1.420**	814	3.883	21,8%	0,40%
Transport Sector	1.659	**2.292**	1.313	5.264	29,6%	0,54%
Energy Efficiency Sector	7.431	**6.574**	3.767	17.771	100%	1,81%

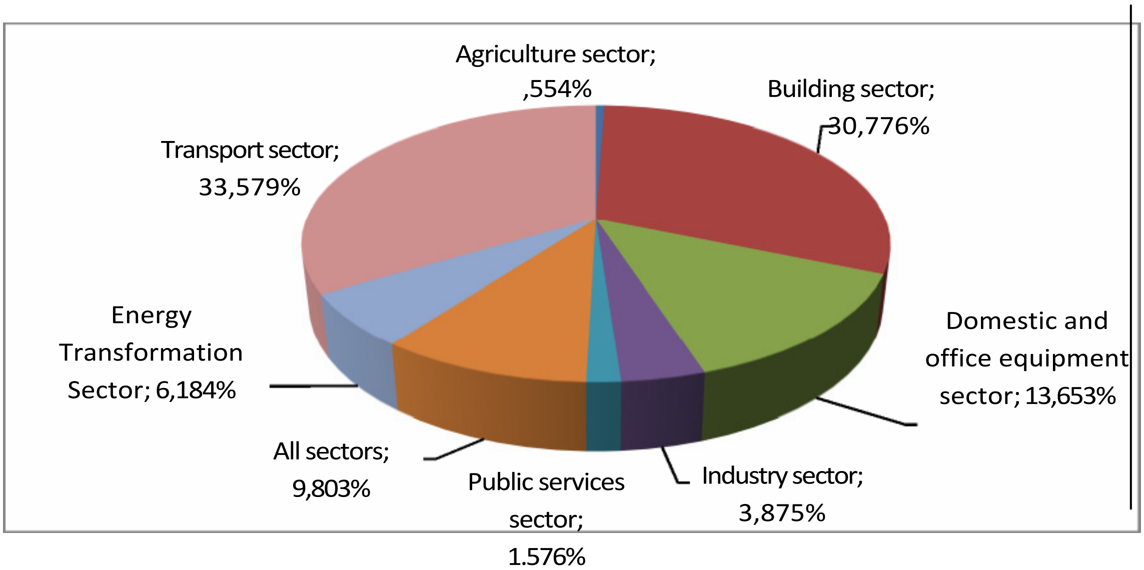
Source: Own work and INE, Symmetrical Input-Output Table

Note: The total productive impact corresponds to the sum of the sector's magnitude, the indirect effect and the induced effect.

In terms of the total productive impact, it is again the sectors of Building, Transport and Energy Transformation that have the greatest total impact on the economy as a whole, accounting for 74% of the sector's GVA and with a productive impact on the Spanish economy at 1.3% of the GVA.This fact has added relevance taking into account the important role thatbuilding and the automobile industry have within the Spanish economy, two sectors that are also suffering from the current economic crisis more intenselyand where the development of the energy efficiency sector may constitute a way for recovery.

In addition to the differences in terms of the value of the magnitude or the impact, there are also qualitative differences between the EAPP sectors.Some sectors have a more relevant weight in terms of gross value addedwhilst their weight is less in terms of employment.That is to say, there is no clear correspondence between production, gross value added and employment,which highlights the different production structures in the sectors.This will be the case for the Energy Transformation Sector,with only 6% of direct employment in the energy efficiency sector.Likewise, the EEAP sectors that have the greatest impact on employment are, once again, the Transport Sector and the Building Sector, as shown in Graph 6.2 and Table 6.6.

Graph 6.2. *Distribution by EAPP sector of the magnitude (direct effect) of the energy efficiency sector in terms of employment, 2009*



Source: Own work.

***Table 6.10**. Productive impact on Employment in the EAPP*

Number of employees	Magnitude of the sector	Indirect effect	Induced effect	Total employment	% on EES	% on Spain
Agriculture Sector	589	1.623	1.335	3.547	1,3%	0,02%
Building Sector	32.744	24.014	19.757	76.514	27,2%	0,38%
Domestic equipment and office equipment sector	14.526	7.185	5.911	27.622	9,8%	0,14%
Industry Sector	4.1231.	6.326	5.205	15.654	5,6%	0,08%
Public services sectorAll	67710.42	1.800	1.481	4.958	1,8%	0,02%
sectors	9	7.770	6.392	24.591	8,7%	0,12%
Energy transformation sector	6.579	8.498	6.666	21.743	7,7%	0,11%
Transport Sector	35.725	39.018	32.100	106.844	38,0%	0,53%
Energy Efficiency Sector	106.393	96.233	78.847	281.473	100%	1,40%

Source: Own work and INE, Symmetrical Input-Output Table.

.- Foreign dimension of the energy efficiency sector

The energy efficiency sector has an important role in the foreign economy.It imports account for 24.9% of its turnover, whilst its exports account for34,4% of the same. Both figures give rise to a coverage rate of138,3%, that is to say, its exports are 1,38 times itsimports with a positive assessment of 2.047 million Euros.More specifically, its imports account for 2% of the total Spanish imports, whilst its exports account for3% of total exports.

In terms of sectors, the Transport sector is the one that plays the biggest role in terms of foreign trade.This sector accounts for 1,1% of all Spanish imports and2,2% of exports, while representing more than half, both in terms of imports and exports for the whole energy efficiency sector, and achieving a positive assessment of2.407 million Euros. Likewise, the Transport sector is key to the trade surplusexisting in the energy efficiency sector.

Table 6.11. Imports and exports by sector, 2009

	Imports (mill. €)	% on Spain	Exports (mill. €)	% on Spain
Agriculture Sector	101	0,04%	93	0,04%
Building Sector	983	0,37%	1.022	0,41%
Domestic equipment and office equipment sector	530	0,20%	447	0,18%
Industry	169	0,06%	150	0,06%
sectorPublic	95	0,04%	131	0,05%
servicesAll sectors	60	0,02%	144	0,06%
Energy transformation sector	458	0,17%	52	0,02%
Transport Sector	2.944	1,09%	5.351	2,17%
Energy Efficiency Sector	5.341	1,99%	7.388	3,00%

Source: Own work, INE and National Accounting.

The energy efficiency sector also has a double positive effect on theinsertion of the Spanish economy abroad: on the one hand, energy saving, which reduces the load of the imports of fossil fuels and, on the other hand, hasa positive trade assessment in terms of energy efficient products.

.- R+D+i in the energy efficiency sector

In 2009, the energy efficiency sector spent 253 million Euroson R+D+i which equates to 3.4% of its gross value added. With this figure, the energy efficiency sector has positioned itself as an innovative sector of the economy,by finding the ratio of expenditure in terms of R+D+i on GVA around the average ratio for the Spanish economy, at1,38%.

.- Forecasts

The energy efficiency sector finds itself characterised bysignificant expansion at a key moment. For this reason, although thequantification and calculation of the impact of the energy efficiency sector in the Spanish economy focuses on 2009, the reference year, this section looks at forecastsboth to the past and to the future, specifically at2004, 2016 and 2020.

The energy efficiency sector experienced growth of 18.7% in terms of gross value added in the 2004-2009 period, which representsa3.5% rate of increase year-on-year. This rate is around the rate of growth for the Spanish economy as a whole,which experienced an average year-on-year growth rate of 1.6% during the same period.Therefore, the energy efficiency sectoraccounted for 0.7% of Spanish economy's GVA in 2004 and 0.8% in 2009.

The magnitude or direct effect of the energy efficiency sector in terms of employment grew from 2004 to 2009 by16.788 employees.

Table 6.12. *Magnitude and impact of the energy efficiency sector in 2004 and 2009.*

	2004		2009	
PRODUCTION	Millions of Euros	% on Spain	Millions of Euros	% on Spain
Magnitude of the sector (Direct effect)	18.075	1,0%	21.462	1,0%
Total Impact	42.319	2,2%	50.247	2,6%
GROSS VALUE ADDED	Millions of Euros	% on Spain	Millions of Euros	% on Spain
Magnitude of the sector (Direct effect)	6.258	0,7%	7.431	0,8%
Total impact	14.967	1,7%	17.771	1,8%
EMPLOYMENT	Number of employees	% on Spain	Millions of Euros	% on Spain
Magnitude of the sector (Direct effect)	89.605	0,5%	106.393	0,5%
Total impact	237.059	1,2%	281.473	1,4%

Source: Own work, INE, Symmetrical Input-Output Table, Ministry of Economy and Treasury

The energy efficiency sector has the potential to grow both in terms of the generation of activity and employment.Its importance increases if we consider its role as the sector driving the new sustainable economy model,from the increase in productivity and the competiveness of companies.

A forecast scenario for 2016 and 2020 is shown below which takes into account the expectations of the sector's companies, business associations and expert organisations, as well as some factors that may have a significant bearing onsome of the products in question in the coming years.

Table 6.13. Forecasts of the energy efficiency sector's magnitude and impact for 2016 and 2020.

	2009		2016		2020	
PRODUCTION	Millions of Euros	% on Spain	Millions of Euros	% on Spain	Millions of Euros	% on Spain
Magnitude of the sector (Direct effect)	21.462	1,0%	40.472	1,7%	58.154	2,3%
Total impact	50.247	2,6%	94.756	4,0%	136.153	5,3%
GROSS VALUE ADDED	Millions of Euros	% on Spain	Millions of Euros	% on Spain	Millions of	% on Spain
Magnitude of the sector (Direct effect)	7.431	0,8%	14.013	1,3%	20.136	1,6%
Total impact	17.771	1,8%	33.513	3,0%	48.155	3,9%
EMPLOY	Number of employees	% on Spain	Number of employees	% on Spain	Number of employees	% on Spain
Magnitude of the sector (Direct effect)	106.393	0,5%	200.634	0,9%	288.290	1,1%
Total impact	281.473	1,4%	530.798	2,3%	762.698	3,0%

Source: Own work, INE, Symmetrical Input-Output Table, financial forecasts from the Ministry of Economy and Treasury, expectations from companies associations and expert organisations.

The forecasts according to this scenario assume accelerated growth with respect to the 2004-2009 period.This forecast means that the magnitude of the energy efficiency sector's GVAon Spain's total GVA accounts for 0,8% in2009, 1,3% in 2016 and 1,6% in 2020. In terms of employment, the magnitude of the energy efficiency sector on total employment in Spainaccounts for 0,5% in 2009, 0,9% in 2016 and 1,1% in 2020, achieving 288.290direct employees in this year. Therefore, added to its magnitude,the energy efficiency sector has a total impact on the economy with similar characteristics.The expected size of the energy efficiency sectorgives rise to an impact, in terms of GVA, of 3% in 2016 and 3,9% in 2020. In terms of employment,the total impact will reach 2,3% of employment in 2016 an 3% in 2020.

With respect to the evolution forecasts for the future of the energy efficiency sector,the sector will grow in size throughout the next decade, due to the improved energy intensity set out in this Plan.In thecoming years, various products and services associated with energy efficiency will play an important role in the market.Therefore, we should point out that:

- The introduction of public energy efficiency policies through the approval ofpolicies, strategies, plans and programmes and other development measures, both at European (such as the green package with the energy saving objective of 20%,the 2020 European Strategy or the 2011 Energy Efficiency Action Plan, to give a few examples) and national level(for example, Law 2/2011, of 4 March, concerning Sustainable Economy, the current2008-2012 Saving and Energy Efficiency Strategy and thesaving and energy efficiency plans that fall within this 2011-2020 Action Plan), which show an increase in the energy efficiency sector.

- The energy renewal of buildings, which has an enormous potential for growth,as set out in the Housing Plans and Renewal of the State General Administration and from the different Autonomous Communities encouraged by the Technical Building Code andthe new provisions set out in the RITE.

- The cogeneration capacity installed, which increased by more than 50% for 2020 in line withthe growth objectives set out bythe Public Administrations in this Plan.

- The new Information Communication Technologies (ICTs), that will continue growing according to the trends forecast,facilitating the development of production processes and enabling significant energy savings.

- Various actions developed by the Public Administrations, which willpromote energy efficiency in the transport sector. Thus, for example,the high-speed network will grow according to forecasts from the State General Administration, incorporating new lines such asMadrid- Galicia and along the Mediterranean Coast. Likewise, the Integral Strategy for promoting the Electric Vehicle in Spainaims to reach250,000 electric vehicles in 2014, as well as a minimum infrastructurein the same year for normal charging ;located in public car parks andon public streets and rapid charging, therefore meaning a strong impetusfor the Spanish automobile industry.

- The development of the Energy Services Companies (ESCOs), especially,through the existence of various initiatives and actions of the part of the Public Administrationsaimed at promoting the ESCOs in Spain,in addition to the related policy both at European and national level(Law 2/2011, of 4 March, concerning Sustainable Economy, Royal Decree law 6/2010, of 9 April, for the promotion of the economic recovery and employment.).

All these energy efficient products and others with high growthexpectations will, in addition, be promoted by a series of factors encouraging demand for this type of product, factors such asthe upward trend in energy prices, the increase in the price ofCO_2 and the expansion of the European trade regime concerning emission rights for new sectors(chemical sector andaviation etc), greater environmental awareness, or technological innovation,which increases the energy efficiency of products and, therefore, their profitability in terms of energy saving product cost.Taking the increase in GDP expected in our country into account,as well as the energy savings estimated by this Plan, we canconclude that the energy efficiency marketgrew in size compared to data for 2009.

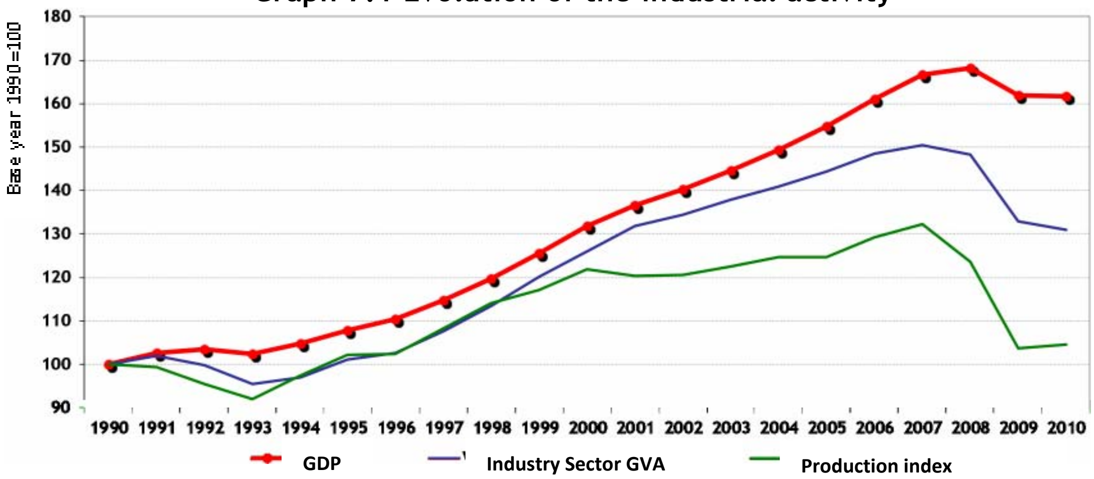
SECTORAL FRAMEWORK

3. 7.- INDUSTRY

7.1 Current situation

Final energy consumption in the Industry Sector decreased in the 2007-2010 period, with an annual year-on-year average of -2,1%, whilst energy intensity increased by2,7%, also as an annual average. In 2007,the energy intensity was 151 tep/M€2000 and, in 2010 it was164 tep/M€2000. The fall in added value in the industry sector between both yearscaused the sector to lose weight in terms of GDP (or total added value) in the order of 3 percentage points: from 27,6% in 2007, to 24,6% in 2010(excluding the energy industries, from 25,2% to 22,1%).

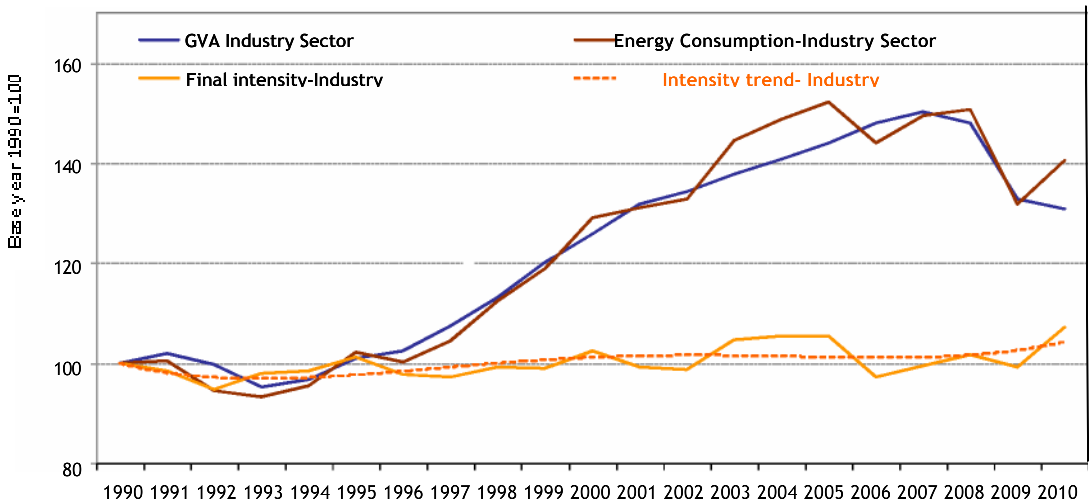
Graph 7.1 Evolution of the industrial activity



Source: INE/IDAE

The previous decrease in final energy consumptioncaused, at the same time, a reduction—more pronounced— in the*Industrial Production Index(IPI)*, which had an average annual rate of 8% between 2007 and 2010.

Graph 7.2 Main indicators in the *Industry* Sector



Source: IDAE/MITYC/INE

Table 7.1 Evolution of final energy consumption and IPI: *Industry* sector

	2007	2008	2009	2010
Final Energy Consumption (Ktep)	30.056	29.971	26.040	28.209
Actual growth according to period	---	-0,3%	-6,9%	-2,1%
IPI Base year 2005	106,15	98,61	82,63	83,35
Actual growth according to period	---	-7,1%	-11,8%	-7,7%

Source: IDAE/MITYC/INE

Considering energy intensity, defined as the quotient between final energy consumption and *Gross Value Added (GVA)*, base year 2000, the following results are obtained:

Table 7.2 Energy Intensity (tep/M€2000)

	2007	2008	2009	2010
Energy intensity (Ktep/M€2000)	151	153	148	164
Year-on-year growth		1,3%	-3,0%	10,4%
Growth according to period		1,3%	-0,9%	2,7%

Source: IDAE/MITYC/INE

As the previous table shows, energy intensity decreased up to2009, increasing in the subsequent year, which produced a negative result, in terms of increasedenergy consumption per unit of added value, as the average for the whole period.More specifically, although energy consumption fell as a result of the fall in production levels, thereduction in energy consumption did not have the same intensity.

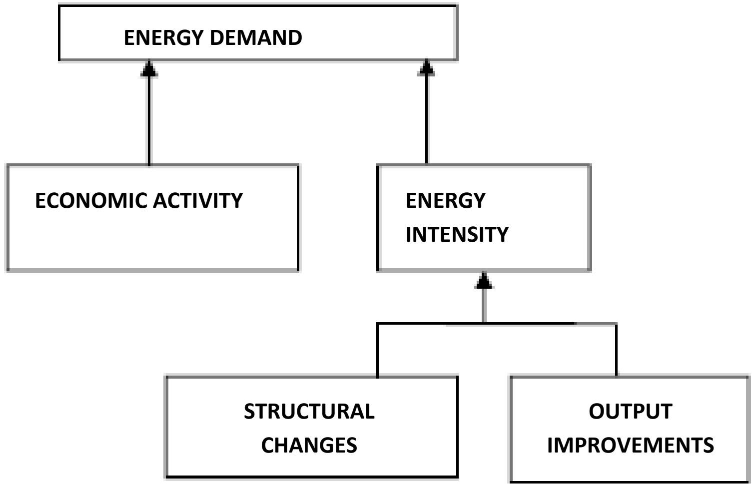
The evolution of the Industry Sector's final intensity indicatorsis due tothe following:

- Technical changes and changes in production supply, towards more or less energy-consuming structures.
- The effect of prices on unit consumption and energy saving.
- Changes by replacing one energy source with another.

For this reason, a quantification of these effects was performed through an estimate of the structural effect, the technological effects and efficiency.

Definitively, the behaviour of the energy demand from the Industry Sector was analysed as a product, mainly, of economic growth and energy intensity,discussing the latter indicator in more detail, since its value and evolution depends,above all,on the structural changes and advances recorded in energy output (equivalent to the technological and efficiency effect).This output reflects the energy saving effort made by a specific economy or sector,as a product of the elimination of superfluous consumption and/or through the optimisation of energy use (changes in production processes).

Diagram 7.1 Energy demand and energy intensity



Taking technological effects, efficiency and mix-structure into account, as well as energy intensity, final energy savings are shown in the following table:

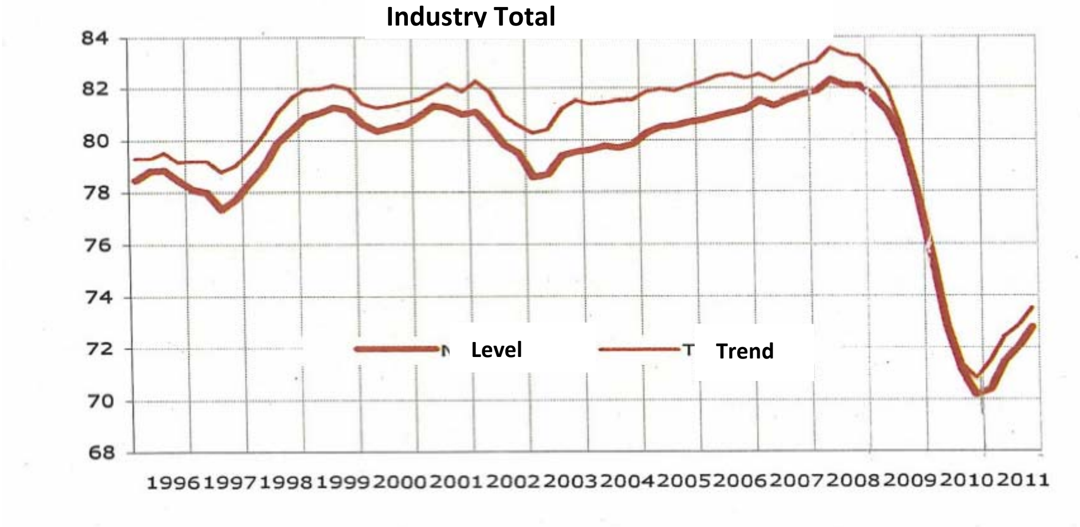
Table 7.3 Evolution of energy variables 2007-2010

	2007	2008	2009	2010
Final Energy Consumption (Ktep)	30.056	29.971	26.040	28.209
Saving by technological effect and efficiency (Ktep)	0	-952	-1.206	-3.988
Saving by structure-mix (Ktep)	0	364	1.342	1.122
Total saving (Ktep)	0	-588	137	-2.866
Energy intensity (tep/M€2000)	**151**	**153**	**148**	**164**

Source: IDAE

The technological effect and efficiency show negative savingsfor the whole Industry Sector, although positive savings were achieved as a result of the measures introducedwithin the framework of the2008-2012 and previous Action Plans, as well asin the activity groupings of *Chemical Industry and Food, Drinks and Tobacco*. These negative savingscan be explained by the removal of the energy consumption and production from the industry sector:the fall in production levels caused an increase in energy consumption per unitproduced and a decrease in the degree of use for production capacities.The low use of theproduction capacities and the maintenance of fixed consumption explains, in large part, the increase in consumption per production unit.However,the fall in production causes a decrease in industrial added value not correlated with the sector's energy consumption.

Graph 7.3 Degree of use of the production capacityAverage profile of the 4 quarters (percentages)

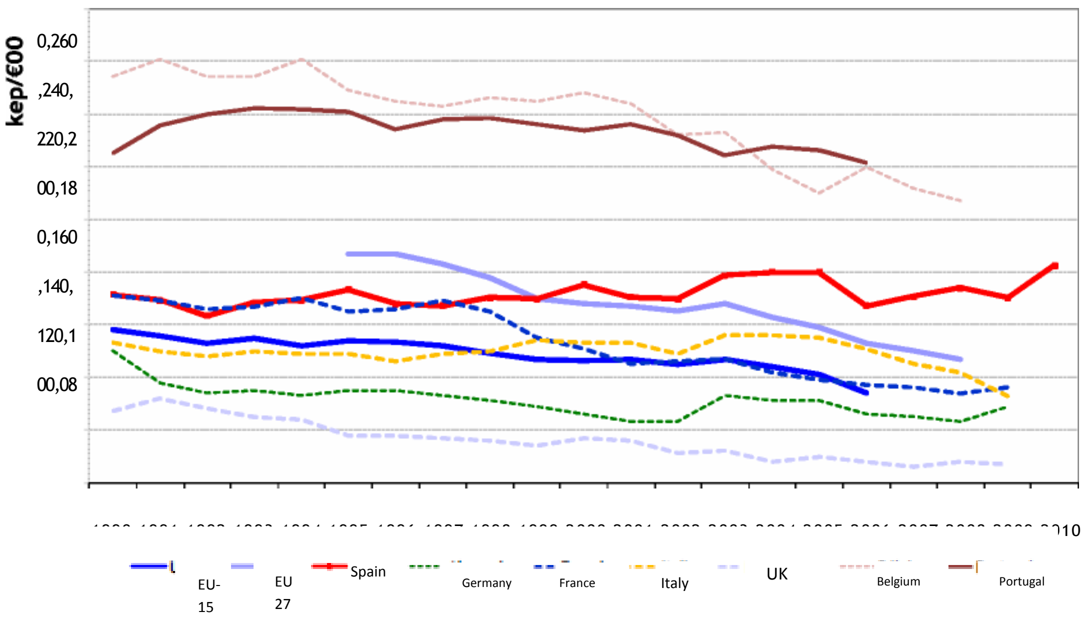


Source: MITYC

However, the structural effect shows positive savings,basically, as a result of the loss in weight relative to the Non-Metallic Minerals and Metallurgy and Metal Products sectors, associated with the construction sector which cannot compensate, however, for the negative savings achieved as a result of the technological effect and efficiency.

The comparative analysis with the European Union of industrial energy intensity reveals above-average values,the structure of which tends towards the integration ofless intensive branches such as those associated with equipment. This explainsa trend towards improved global intensity in European industry, encouraged by structural changes in the manufacturing industry, a circumstance thatencounters much resistance in national industry.

Graph 7.4 Energy intensity in Spain and the EU: Industry sector



Activity groupings:

The behaviour, in the 2007-2010 period, of energy consumption in the different activity groupingsintegrated into the Industry Sector was the reflection,both in terms of the variable evolution of production levels, and demand,on the part of the market, for products that consume less energy, from the environmental action plans andthe different degrees of use of production capacities.

The data available for these activity groupings are as follows:

Table 7.4 Evolution of final energy consumption, by activity groupings

Final Energy Consumption Ktep	2007	2010	Growth Rate Annualaverage 2007-2010
Food, Drinks and Tobacco	2.556	2.352	-2,7%
Textiles, Leather and Footwear	747	597	-7,2%
Wood, Cork and Furniture	698	705	0,3%
Cardboard, paper and printing	2.516	2.535	0,2%
Chemical	5.770	4.944	-5,0%
Non-metallic minerals	7.519	6.093	-6,8%
Transport Equipment	788	852	2,6%
Metallurgy and metal Products	6.687	5.944	-3,9%
Machinery and Mechanical Equipment	354	321	-3,3%
Electrical, Electronic and Optical equipment	362	345	-1,6%
Rest of the Industry sector	2.058	3.522	19,6%
Industry Sector Total	30.056	28.209	-2,1%

Source: MITYC/IDAE

Taking the evolution in final energy consumption into account, each activity grouping allows some conclusions to be drawn:

- The activity groupings that reduced their energy consumption the most were*Textiles, Leather and Footwear*(7,2%), *Non-Metallic Minerals* (6,8%) and*Chemical Industry*,with an average annual reduction in the 2007-2010 period of - 5,0%—a rather marked fall, in this case, shown in the IPI for this same period, in the order of-0,6%—.

- The Non-Metallic Minerals Sectorshows an average annual growth rate relative to final energy consumption in the order of-6,8% in the 2007-2010 period. This fallin energy consumption in the period is due, basically, to the fall in the construction of housing.

- The Metallurgy and Metallic Products Sector experienced a fall in final energy consumption,in the 2007-2010 period, by -3,9%, as a result of the fall in industrial production in theorder of -11,6% for the same period (see table6.5.).

Table 7.5 Variation in IPI with Base year 2005 for the 2007-2010 period

IPI base year 2005	2007	2010	Annual average growth rate 2007-2010
Food, Drinks and Tobacco	102,4	101,3	-0,4%
Textiles, Leather and Footwear	90,9	65,4	-10,4%
Wood, Cork and Furniture	98,8	54,4	-18,1%
Cardboard, Paper and Printing	104,4	90,1	-4,8%
printing	103,7	101,9	-0,6%
Non-metallic minerals	102,7	55,7	-18,5%
Transport Equipment	108,2	79,1	-9,9%
Metallurgy and metal Products	108,4	75,0	-11,6%
Machinery and Mechanical Equipment	125,5	79,3	-14,2%
Electrical, Electronic and Optical equipment	112,9	80,6	-10,6%
Rest of the Industry sector	104,1	83,7	-7,0%

Source: INE

With regard to the behaviour maintained, in relation to the energy saving in each of the activity groupingsthat comprise the Industry Sector,we obtain the following table, a result of the evolution in the intensity indicators; this is shown in table6.7:

Table 7.6 Global energy savings, by activity grouping 2007-2010

	2007-2010
Food, Drinks and Tobacco	-194
Textiles, Leather and Footwear	41
Wood, Cork and Furniture	-121
Cardboard, Paper and Printing	-428
Chemical	-42
Non-metallic minerals	325
Transport Equipment	-196
Metallurgy and Metal Products	-281
Machinery and Mechanical Equipment	-21
Electrical, Electronic and Optical equipment	-41
Rest of the Industry sector	-1.906
Industry Sector Total	-2.866

Source: IDAE

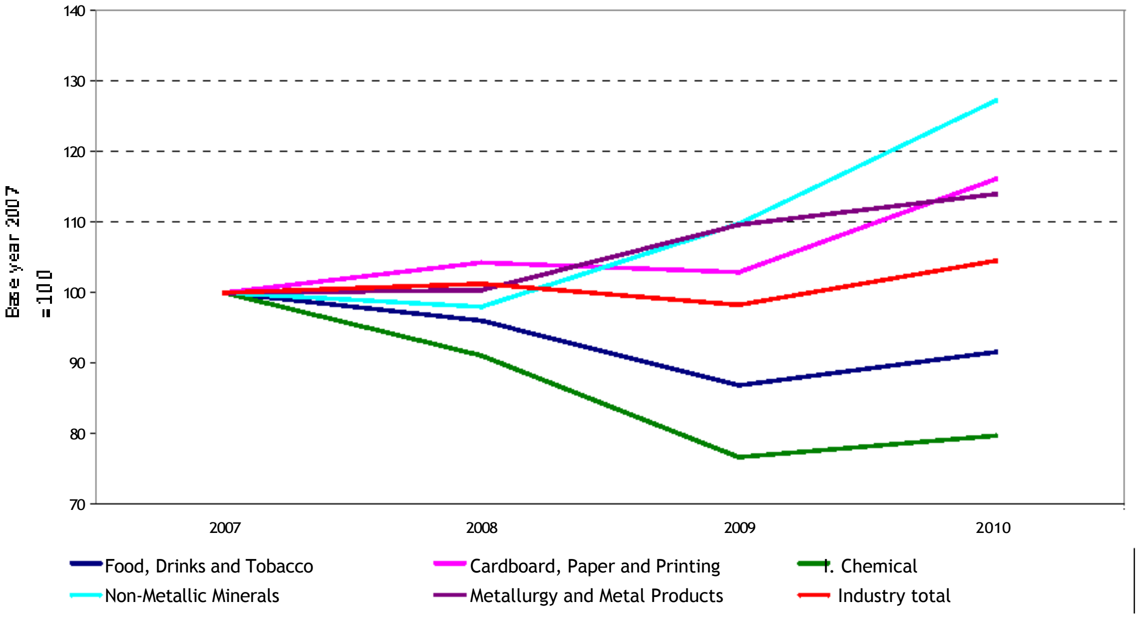
Table 7.7 Evolution of final intensity, by activity grouping 2007-2010

	Energy Intensity with base year 2007				Average annual increase for the period
	2007	2008	2009	2010	2007-2010
Food, Drinks and Tobacco	100,0	96,0	86,9	91,6	-2,9%
Textiles, Leather and Footwear	100,0	81,3	88,7	106,4	2,1%
Wood, Cork and Furniture	100,0	115,9	144,5	157,1	16,2%
Cardboard, Paper and Printing	100,0	104,3	102,9	116,1	5,1%
Chemical industry	100,0	91,1	76,7	79,7	-7,3%
Non-metallic minerals	100,0	98,0	109,8	127,2	8,4%
Transport Equipment	100,0	117,1	130,3	148,8	14,2%
Metallurgy and metal Products	100,0	100,3	109,6	113,9	4,4%
Machinery and Mechanical Equipment	100,0	101,0	103,8	100,2	0,1%
Electrical, Electronic and Optical equipment	100,0	103,7	112,9	116,2	5,1%
Rest of the Industry sector	100,0	171,7	160,0	196,7	25,3%
Industry Sector Total	100,0	101,3	98,2	108,4	2,7%

Source: IDAE/MITYC/INE

As we can see, the activity grouping that saw the biggest decrease in its energy intensity was that of Chemical Industry,followed by Food, Drinks and Tobacco. However,the increase in energy intensity in the Industry Sector is justified by the increase in energy intensity for the rest of the activity groupings.

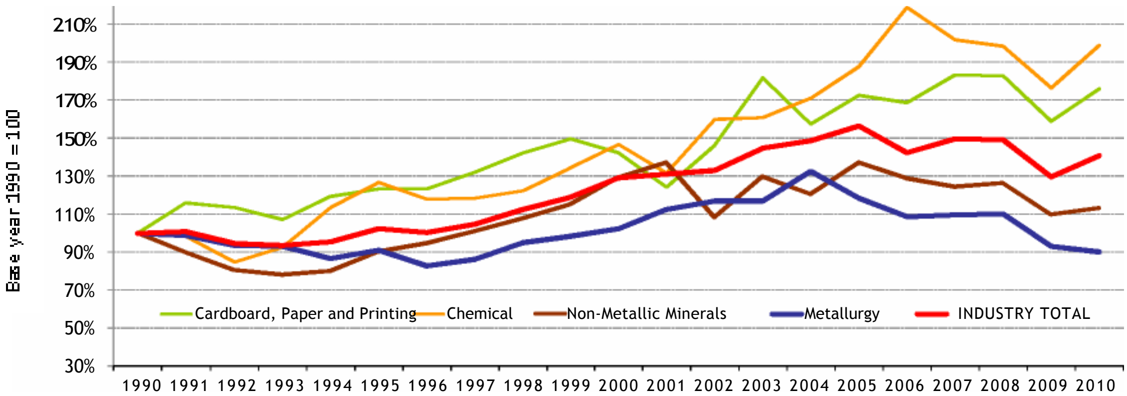
Graph 7.5 Evolution of energy intensity with Base year 2007



Source: IDAE/MITYC/INE

The most recent evolution of the intensity indicators, that relative to 2010,shows an upturn in demand, possibly associated with the reactivation of the economic activity.This has meant an increase in energy intensity although erratic behaviour was observed which appears to be due to the increased demand experienced in some activity groupings such asChemical Industry,Metallurgy and Metal Products, Cardboard, Paper and Printing,Food, Drinks and Tobacco and Non-Metallic Minerals. This latter activity grouping, in particular, is the one mainly responsible for the increased intensity in the energy for the Industry Sector, given its increased energy consumption, approximately, a quarter of the energy consumption for industry as a whole, and, in contrast,its decreased participation in the industrial added value. This field of industryis closely linked to the construction sector which,unlike other countries in our environment, is very significant in the Spanish production structure, achieving 8% of national GDP, double the EU's average.

Graph 7.6 Energy Consumption in Relevant Industrial Fields

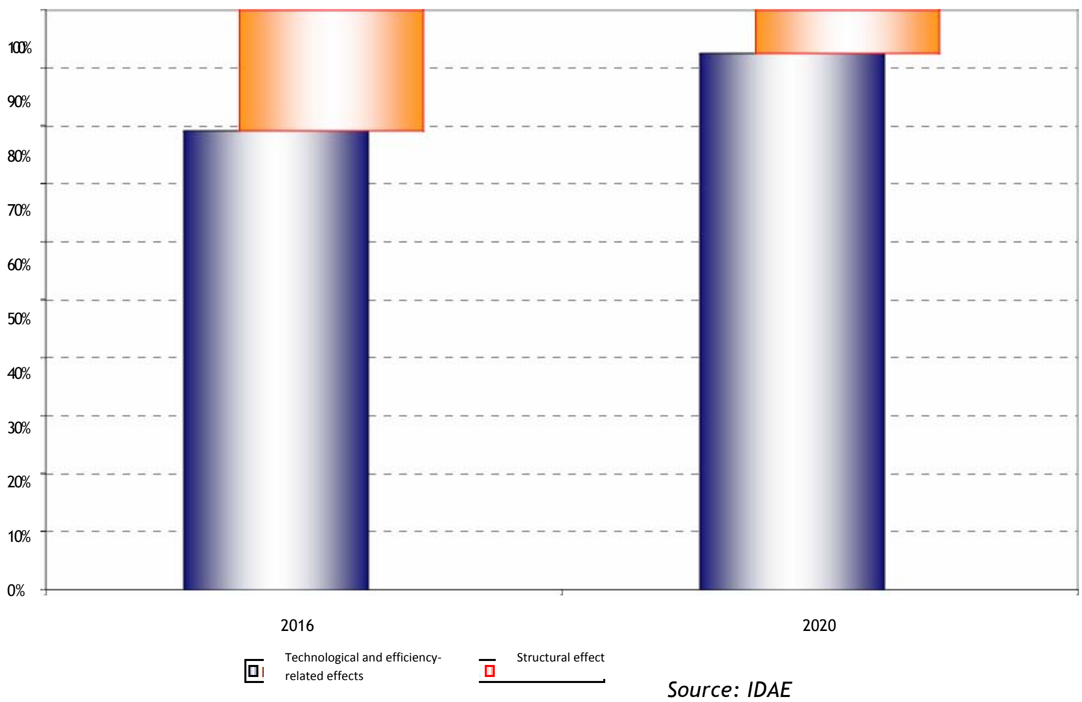


Source: IDAE/MITYC

7.2 Assessment of the 2011-2020 period

The objective of the 2011-2020 Action Plan is to achieve a global final energy saving in the Industry Sector of4.489 Ktep in 2020 which, predictably, will be due to the technological effect and efficiency and the structural effectin the percentagesshown in the following graph:

Graph 7.7 Evolution of the global energy savings



Source: IDAE

The expected evolution in the Industry Sector is shown in the following table, which highlightsan average year-on-year reduction in energy intensity in the industry sector, set as an objective,of 2,5% in the 2010-2020 period:

Table 7.8 Objectives from the 2011-2020 Action Plan: Industry sector

	2016	2020
Final Energy Consumption (Ktep)	26.034	25.777
Saving by technological effect and efficiency (Ktep)	1.969	4.194
Saving by structure-mix (Ktep)	519	295
Total saving (Ktep)	2.489	4.489
Energy intensity (tep/M€2000)	136	127

Source: IDAE

The expected evolution in the final energy consumption of the different activity groupings fir the 2010-2020 period is expected to follow the trend started in 2007, basically, for the Non-Metallic Minerals grouping, even though, in the activity groupings of Chemical Industry andMetallurgy and Metallic Products, the marked trend in the 2007-2009 trendchanges, in the 2010-2020 period, due to the recovery of production.

For the activity groupings considered, the average annual growth rate of energy intensity(tep/M€2000) in the 2010-2020 period, varies,expectedly, between 2% and -4%, as an annual average.

7.3 Measures in the *Industry* Sector

Measure 1: Energy audits

Objective:

> To determine energy-saving potential in the businesses in which it is carried out.

> To encourage the making of the decision to invest in Energy Saving.

> To determine the benchmarking for the production processes audited.

Description:

The performance of energy audits is an instrument that makes it possible to carry out a detailed and exhaustive study on production processes and, more specifically,on the main energy-consuming equipment.

With this, it is possible to find out the energy consumption of the installations, to determine the basic energy boundaries of the process and its equipment, as well as to find out the deviations with respect to the sector's energy standard.

Moreover, the investments required for the implementation of themeasures highlighted are determined, as well as the profitability of these investments and the feasibility of the same.

Action mechanisms included in the measure:

The action mechanisms that will make the achievement of the saving objectives set out will be the following:

- Financial incentives: awarding of incentives for the performance of energy audits,associated with the material realisation of the project, an analysisthat has proved viable.

Timeframe:2011-2020.

Group the measure is aimed at:

This measure is aimed at all owners of industrial energy-consuming installations, including all the activity groupings within the Industry Sector.

Responsibility and collaborators:

The organisations responsible for the execution and follow-up of the measure are the Ministry of Industry, Trade and Tourism/IDAE, in collaboration with the Autonomous Communities.

Aidmanaged by the public sector:

The total estimated aid managed by the public sector in the 2011 - 2020 period will be7,8 M€.

Measure 2: Improved technology of equipment and processes

Objective:

This measure includes the measures for implementing energy-environmental BATs (Best Available Technologies)and the introduction of new technologies and the use of waste, with the following aims:

1) To minimise the impact on energy consumption, which will be considered in the environmental impact studiesfor the projects undertaken.
2) To incorporate new technologies, both in terms of energy saving and the use of new raw materials and production processes.The use of waste is included,both from the appreciation viewpoint and in terms of raw materials in the differentproduction and reuse systems, guaranteeing coherence with the policy on waste.
3) To facilitate the economic feasibility of investments in the Industry Sector in terms of energy saving, with the aim of achieving the energy saving potential highlighted.

Description:

This measure sets out the mechanisms required for the introduction of the energy-environmental BATs to achieve the energy objectives set out in this 2011-2020 Action Plan.These mechanisms assume the channelling of the aids required for projects concerning the introduction of new technologies and the use of waste.

Action mechanisms included in the measure:

The action mechanisms that will make the achievement of the saving objectives set out will be the following:

> Financial incentives: awarding of incentives for the realisation of investments for energy saving in projects concerningnew technologies and the use of waste(understood as investments motivated by energy saving, some of which generate at 50% of the installation's useful life— an economic saving through reduced energy costs and fewer emissions ofCO_2, greater than the project's total investment).

> Legislative information: policy-related and regulatory developments for the establishment of a framework favourable to the consolidation and introduction of new technologies planned.

Timeframe: 2011-2020.

Group the measures is aimed:

This measure is aimed at all owners of energy-consuming industrial installations, including all the activity groupings included in the Industry Sector.

Responsibility and collaborators:

The organisations responsible for the execution and follow-up of the measure are the Ministry of Industry, Trade and Tourism/IDAE, in collaboration with the Autonomous Communities.

Aidmanaged by the public sector:

The estimated aid managed by the public sector for the development of this measure in the 2011-2020 period is740,3 M€.

Measure 3: Implementation of energy management systems

Objective:

To incorporate, generally speaking, measurement and control elements, as well as systems for analysingthe production process variables.

Description:

The measures aims to establish the mechanisms required for the introduction ofenergy management systems.

Action mechanisms included in the measure:

The action mechanisms that will make the achievement of the saving objectives set out will be the following:

> Legislative information: policy-related and regulatory developments for the establishment of a framework favourable to the consolidation and introduction of new technologies planned.

Timeframe: 2011-2020.

Group objective for the measure:

This measure is aimed at all owners of energy-consuming industrial installations, including all the activity groupings included in the Industry Sector.

Responsibility and collaborators:

The organisations responsible for the execution and follow-up of the measure are the Ministry of Industry, Trade and Tourism/IDAE, in collaboration with the Autonomous Communities.

Aidmanaged by the public sector:

The estimated aid managed by the public sector for the development of this measure in the 2011-2020 period is2 M€.

7.4 Table-Summary by measure: Industry sector

	Final energy savings (ktep)		Primary energy savings (ktep)		Emissions of CO_2 avoided ($ktCO_2$)		Publicly-managed aids (10^6 €)			Investments (Aid + private investment) (10^6 €)		
	2016	2020	2016	2020	2016	2020	2011-2016	2017-2020	2011-2020	2011-2016	2017-2020	2011-2020
INDUSTRY	2.489	4.489	2.151	4.996	5.233	11.641	450	300	750	4.836	3.224	8.060
Energy Audits							4,7	3,1	7,8	9,4	6,2	15,6
Improved technology of equipment and processes (MTD)	2.332	4.154	2.016	4.623	4.905	10.772	444,2	296,1	740,3	4.441,7	2.961,1	7.402,8
Implementation of energy management systems	156	335	135	373	328	869	1,2	0,8	2,0	384,9	256,6	641,6

Source: IDAE

Note: The calculation of emissions of CO_2 avoided as a result of the saving and energy efficiency measures included in this plan are ad hoc calculations for the same and assume a translation of the savingscalculated using different base years (2004 and 2007), in terms of final and primary energy, to emissions of CO_2 avoided - this calculation does not necessarily coincide, therefore, with that achieved with different approaches or accounting bases aspart of the periodic reports produced in relation to the evolution of greenhouse gas emissions.

8. TRANSPORT

Introduction

The Transport Sector includes some measures, equipment and actions aimedat tangibly moving people or goods. A first classification can be performed for the TransportSector by taking the mode of transport used for travel into account.Thus, we distinguish between:

- Land transport
- Air transport
- Sea-river transport

Land transport can be divided into:

- Road transport
- Rail transport

The modes of transport are combinations of networks, vehicles and operations.They include walking, the bicycle, the car, the road network, trains,river and sea transport (boats, canals and bridges) and air transport (aeroplanes, airports and air traffic control), or even the union of several or all of the three modes of transport.

According to the modes of transport used, the transport referred to in this document is classified and categorised as:

- Road transport: cars and other vehicles without rails.
- Rail transport: rolling stock on railway lines (includes trains, metros and trams).
- Waterway transport: Maritime transport and river transport.
- Air transport: aeroplanes and airports.

The combination of several modes of transport gives rise to intermodal or multimodal transport.

Vertical transport (lifts and goods lifts) andpipeline transport is not included in this sector: pipelines and gas pipelines; this means that fluidsare pushed through pipelines by means of pumping or compression stations.

Likewise, we can distinguish between public and private transport depending on theowner of the modes of transport used.

The distinction between the carriage of goods and the carriage of passengers is also interesting.

The Spanish population is markedly urban, with more than half of the population living in municipalities with more than 50,000 inhabitants.In line with Spanish legislation,municipalities with over 50,000 inhabitants are obliged to provide urban transport services(Law 7/1985 Regulating Local Regimes).

Energy factors relating to transport

Since 1996, the transport sector has been the biggest consumer of Energy in Spainaccounting for 39% of final energy consumption.Within the different modes of transport, road transport accounts for 80% of the sector's consumption, ahead of air transport with 14%, rail transport with 3% and maritime transport with 3%.

Derived from the fact that consumption in the road and air sectors is related, practically completely,to products derived from oil, which confirms that the main risks facing the sector is the enormous dependence ona single sourceof fuel with the subsequent negative effects, more than likely involvingincreased oil costs and the effects of this on the economy in general, to be the mode of transport with an input of cost on all the products and services.The union of this risk to another consequence of this dependenceare the impacts on the environment, making a significant improvement in energy efficiency in the sector mentioned essential.

In terms of the absolute variation in energy consumption, we should point out that until halfway through the first decade of the centurya significant increase in energy consumption in the transport sector was seen, especially in road and air transport. Since 2005, the figures for the evolution of energy consumption were moderated to values close to the evolution of GDP,until the falls experienced in2008, 2009 and 2010 due to the impact of high energy prices (2008) andthe reduction in the economic activity in 2009 and 2010.

Per type of fuel, the continuous reduction in the consumption of petrol should be highlighted,as a result of the gradual re-introduction of diesel, whilst the increase experienced for keroseneevolved in parallel with the growth in air mobility.

With respect to the source of primary energy, consumption in the transport sectoraccounts for 65% of total national consumption of oil. As previously indicated, practically100% of fuel for road transport maritime transport and air transport is originally derived from oil, which makes the energy diversification with primary sources such as natural gas or bio fuels as well as the use of electrical energy, an important element to be taken into account by thepositive effect that assumes decreased volatility in the prices of these sources and, therefore, less risk of competitiveness effectsconcerning the economy in terms of transport.

Finally, in Spain, the transport sector is responsible for the emission of 24% of the greenhouse gases(CO_2in particular), faces a significant challengein the coming years so that the country complies with international commitments.This element assumes a critical factor in the definition of the new scenarios facing the sector.

An analysis of the energy situation in the transport sector up to 2010 shows a clear change in thetrend of the evolution of consumption, with a special mention to the evolution inde2008-2010.Until this year, the introduction of a set of saving and energy efficiency measuresin transport, with legislative and policy-related mechanisms being particularly important, enabled the consumption values to be maintainedwithin the most relevant forecast scenarios in terms of efficiency.

In 2008, the incidence of the sharp increase in international oil prices, with a maximum of145 $/barrel in June, resulted in two notableevents:

> The reduction in consumption due to fuel shortages (on the 2007 valuesreduced consumption for transport by 3,7%).

> The enhancement of energy saving measures in the sector.

In 2009 the economic crisis was in full swing, with a direct effect on the fall in mobility due to the reduction in the economic activity given that the oil pricesfell to their lowest value (35 $/ barrel at the end of 2008). Thefall in energy consumption for transport in 2009 was 4,7%, with an impact on allconsumer subsectors, putting total energy consumptionat values similar to those in 2003.

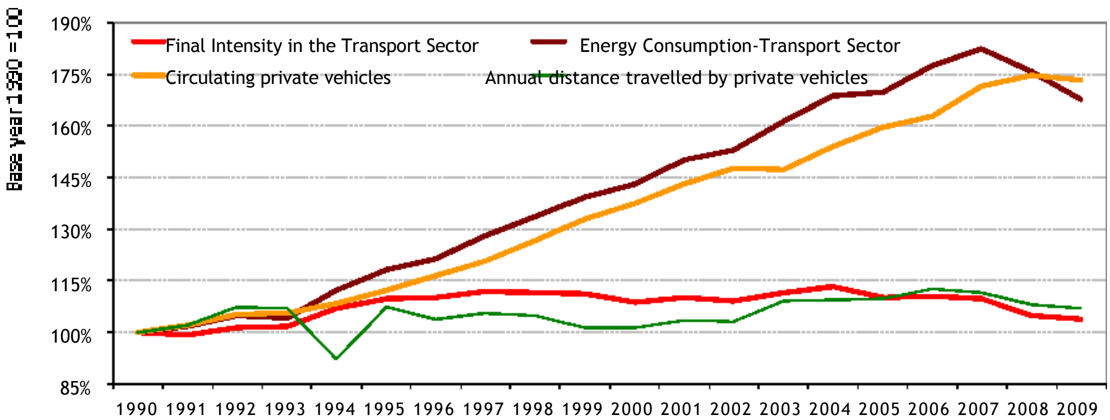
Table 8.1 Evolution of final energy consumption in the Transport Sector (2004-2010)

(Ktep)	2004	2005	2006	2007	2008	2009	2010
Total Final Transport	38.317	37.956	39.669	40.804	39.313	37.464	36.744
Annual growth		-0,9%	+4,5%	+2,9%	-3,7%	-4,7%	-1,9%
Variation on 2004		-0,9%	+3,5%	+6,5%	+2,6%	-2 2%	-4,1%

Source: MITYC

On the other hand, this sector's energy intensity continues the downward trend started in 2004m in large part as a result of less activity invarious sectors of the economy, which meant less mobility associated with the carriage of goods(in large part) and passengers(less significantly), in all the modes of transport.

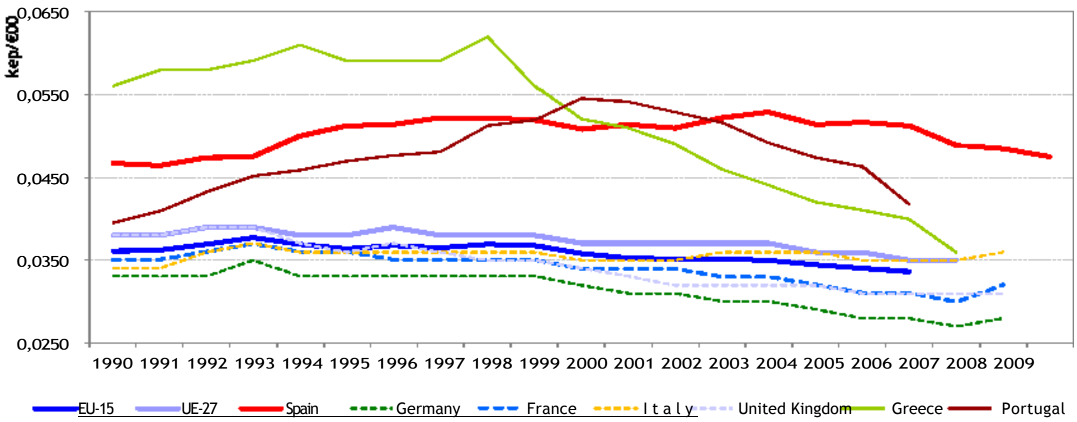
Graph 8.1. Key indicators in the Transport Sector (1990-2009)



Source: DGT/MForn/ /MITYC/IDAE

This decrease was more pronounced than in the European Union's average,therefore we can talk about a converging trend in terms of energy intensity in 2020.

Graph 8.2. Energy intensity in Spain and the EU (1990-2010)

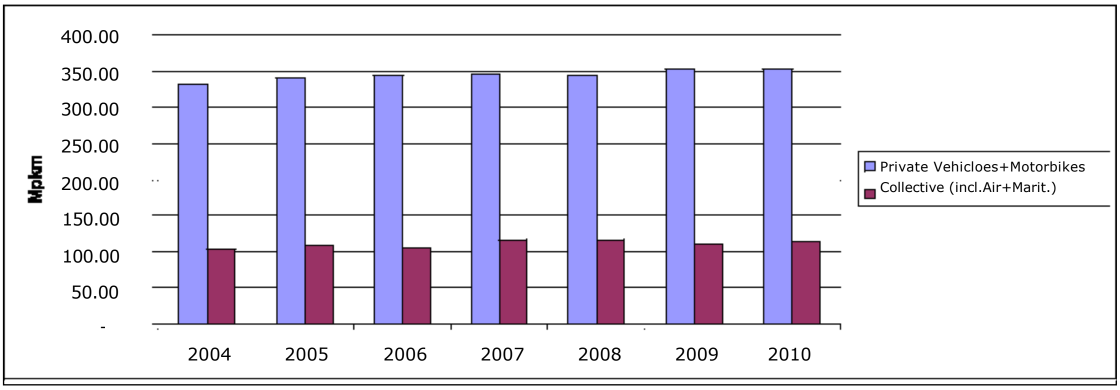


Source: EnR/IDAE

Evolution of sectoral indicators up to 2010

Mobility by motorised transport, with the sole exception of 2008,followed an upward trend, since a stabilisation was shown from 2009.

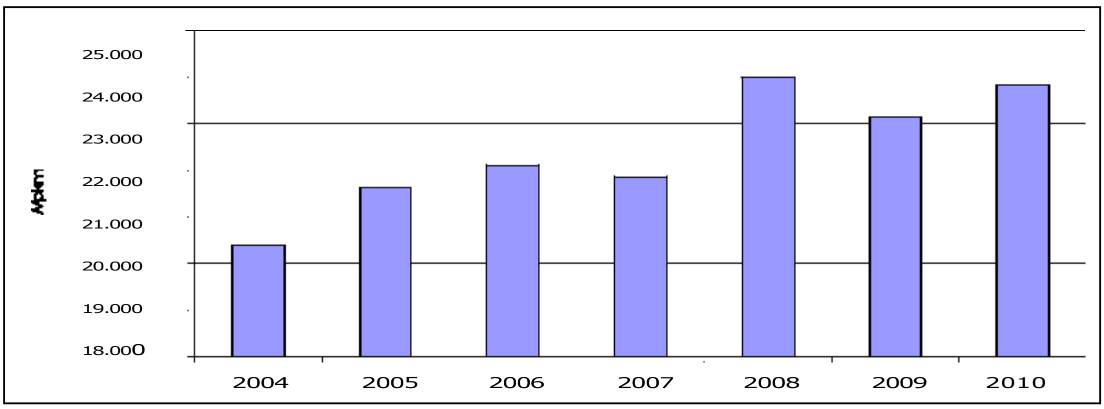
Graph 8.3. Evolution of the mobility of people (2004-2010)



Source: Own work, IDAE

With respect to the carriage of passengers by rail, a qualitative leap can be seen from 2007,due to the new high-speed lines entering into service.

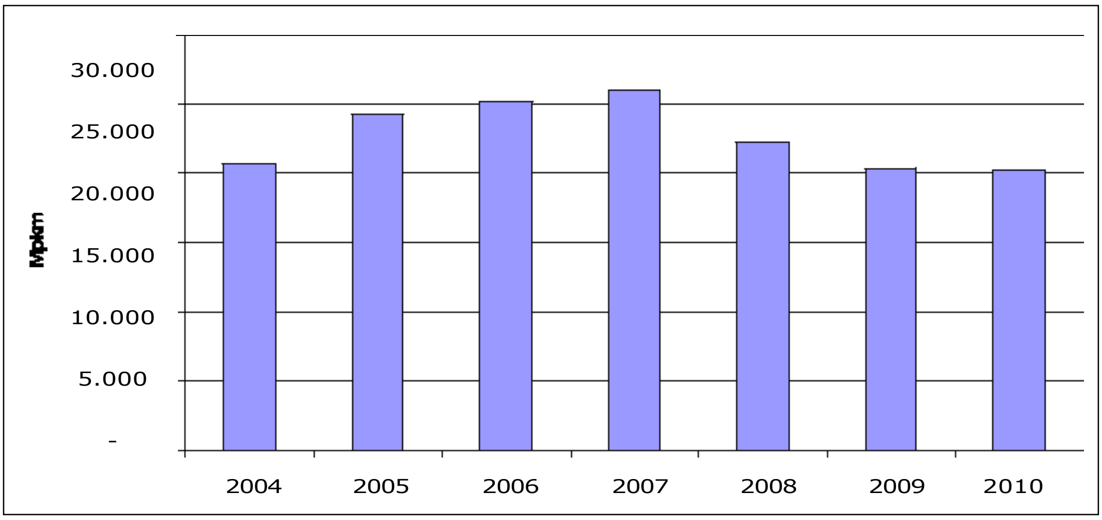
Graph 8.4. Evolution of the carriage of passengers by rail (2004-2010)



Source: Own work, IDAE

By contrast, the air sector inverted its trend: from 2008, we can see a marked decrease in the number of travellers due to theeconomic crisis and the growth of rail transport, above all with the new high-speed lines entering into service.

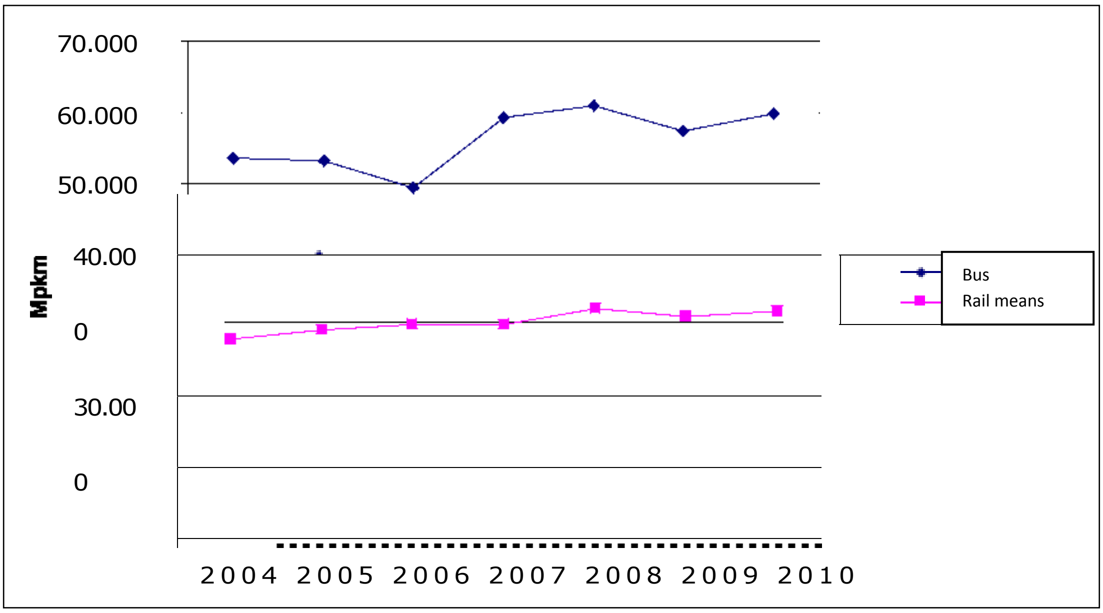
Graph 8.5. Evolution of the number of passengers taking domestic flights (2004-2010)



Source: Own work, IDAE

We can also see a stagnation of growth in recent years both in the case of passenger transport by car and rail transport (railway and metro mainly).

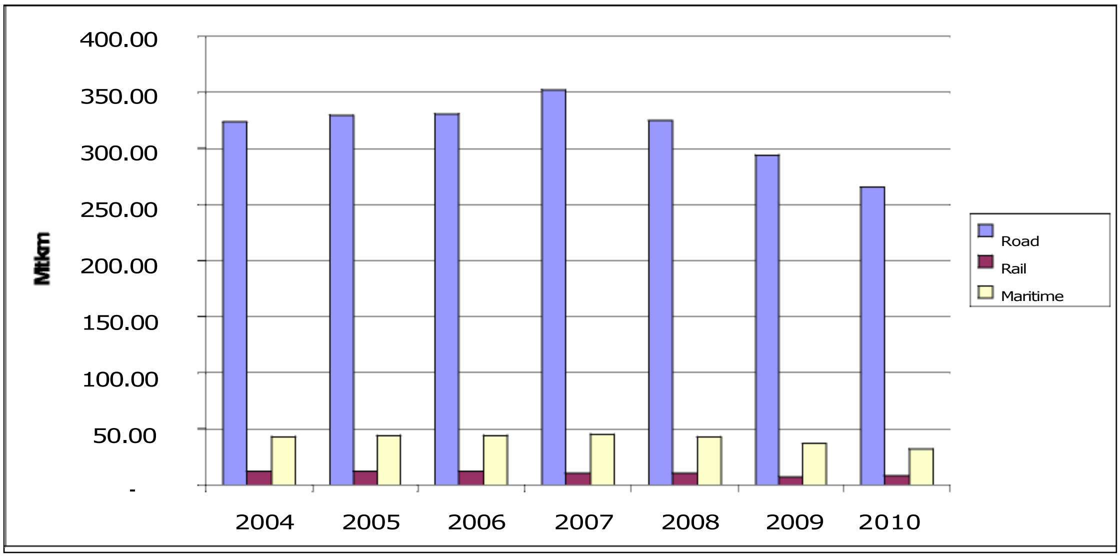
Graph 8.6. Evolution of collective land transport (2004-2010)



Source: Own work, IDAE

In terms of goods, we can see a significant fall in activity from 2008 onwards.This fall relates to road, rail and maritime transport.

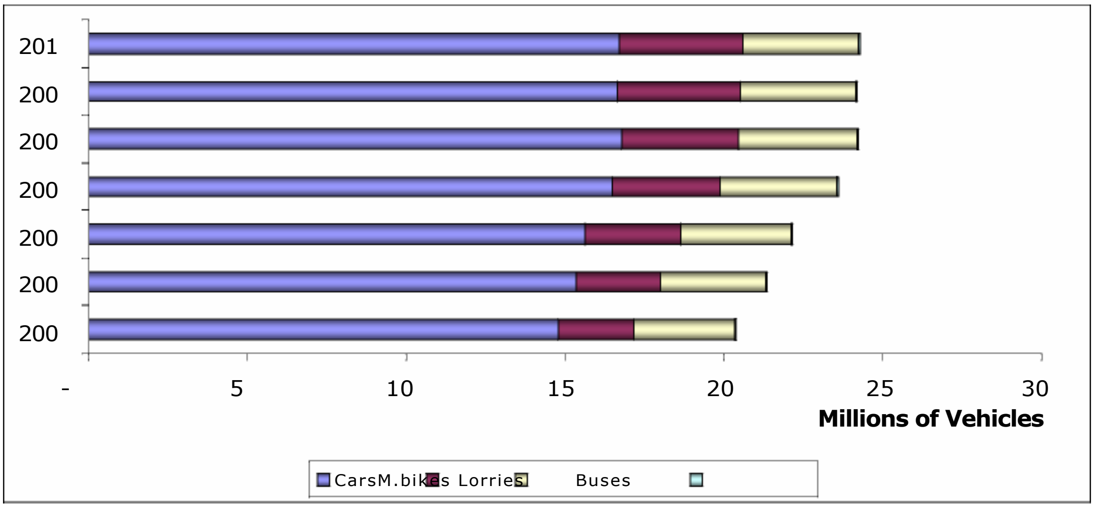
Graph 8.7. Evolution of the carriage of goods (2004-2010)



Source: Own work, IDAE

In terms of the road vehicle fleet, we can see an increase in the number of units up to 2007 and stabilisation from this year onwards. Motorbikes are the vehicle type that experienced the most percentage growth throughout the whole period.

Graph 8.8. Evolution of the road transport fleet (2004-2010)



Source: Own work, IDAE

As we can see from the information collected by the Freight Activity Observatory[48] (Directorate General of Land Transport, from the Ministry of Public Works), ion the period analysed, the fleet of freight vehicles-the offer - did not decrease by the same proportion as the fall in demand.

Therefore, the fall in the consumption of fuel during this period or "energy saving", in general terms, is not achieved, exclusively, throughimproved

[48] www.fomento.gob.es/NR/rdonlyres/39333E6D-84D4-44AB-B0F1-AB37B9ADBE9/103264/ObservatorioActividad

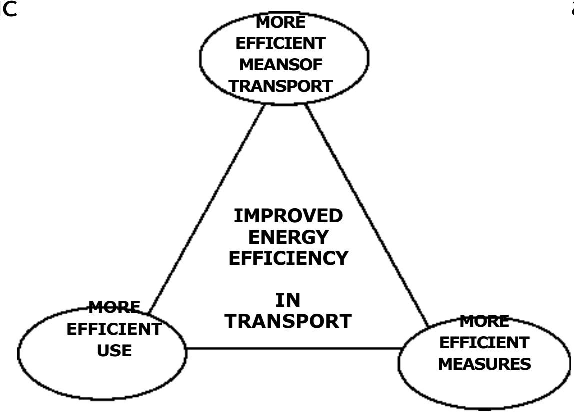
efficiency in the activity; but many more factors are affected,among others, and, possible, in large part, the decrease in the activity derived from the economic crisis,which directly affected industrial activity and, as a result,the carriage of goods. Therefore, the macro character of the indicator chosen for the calculation of the savings associated with the carriage of goods by road, in the terms set out in Chapter 2 of this 2011-2020 Action Plan(A2), defined as energy consumedin relation to the total number of vehicles in the fleet, covers, as otherwise it could not be amacro indicator, all the phenomena and variables they represent the carriage of goods by road,in large part not related, directly, to theoptimisation of the use of the vehicle fleet.

A more specific analysis of energy consumption per ton transported will represent, more reliably, from a strictly technical point of view, the evolutionof the efficiency of the carriage of goods by road, to only collect the variation inenergy consumption per unit transported, regardless of the evolution of the fleet of vehicles and mobility, which reflects, basically, technological, logistical and training improvements.] The use of consumption indicators per ton transportedprovides results significantly lower than those from indicator A2, as a result of the distortion introduced into the savings calculation year(2010) due to the current economic crisis. The use of this indicatorwill achieve, for this specific subsector, savings in the order oftwenty-five times less than those for indicator A2.

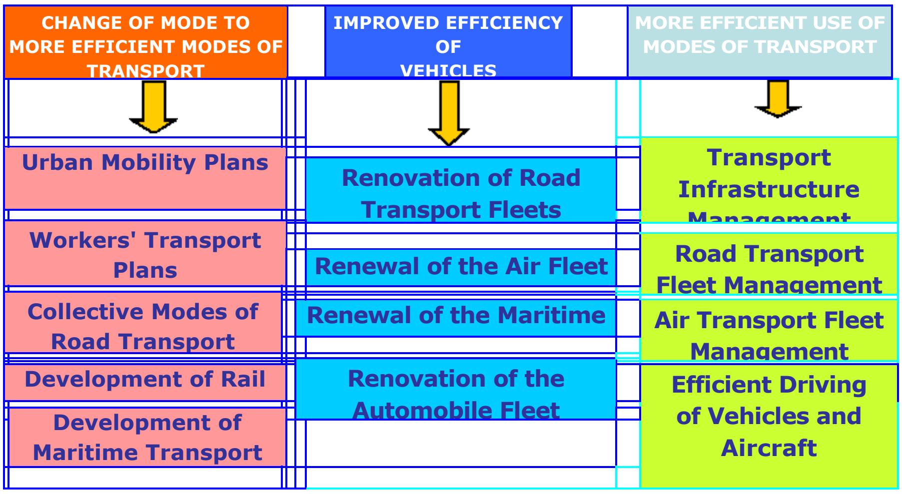
Basic approach of the Saving and Energy Efficiency Plans for Transport

The improved energy efficiency in transport is based a set of actions,encompassed in three broad types of measures: actions aimed atencouraging change of mode in the carriage of people and goods to more energy efficiency modes; actionsaimed at renewing the transport fleets so as to incorporate technological advances orimproved energy efficiency;and actions aimed at the more efficient use of modes of transport.

These sections, particularised for the different transport subsectors, give rise toa set of more specific actions that are



shown in the following diagram and enable the measures aimed at promoting energy efficiency in transport to be defined:



The application of these measures, for all the transport subsectors,has been channelled, preferably, through the collaboration agreements from the IDAE with the Autonomous Communities, which are ultimately responsible for their execution.

The actions set out are consistent with the general provisions in the Spanish Sustainable Mobility Strategy:

- To integrate sustainable mobility into the town planning and management.
- To integrate global sustainability criteria.
- To promote local town planning.
- To develop public transport and unmotorised transport, to promote the intermodality of modes of transport.
- To promote technological innovation.
- To reduce emissions and promote environmental improvement.
- To improve the safety of modes of transport.
- To promote actions with the aim of promoting public health.
- To incentivise the most sustainable modes of transport.
- To promote new technologies to rationalise the amount of motorised travel.

The promotion of technologies associated with the electrical mobility of people and goods, especially relative to urban and periurban transport,is emerging as one of the main areas of activity in the coming years.The Spanish Strategy for Promoting the Electric Vehicle in Spain2010-2014 shall mean the consolidation of this sustainable mobility alternative, with large-scale energy and environmental impacts.

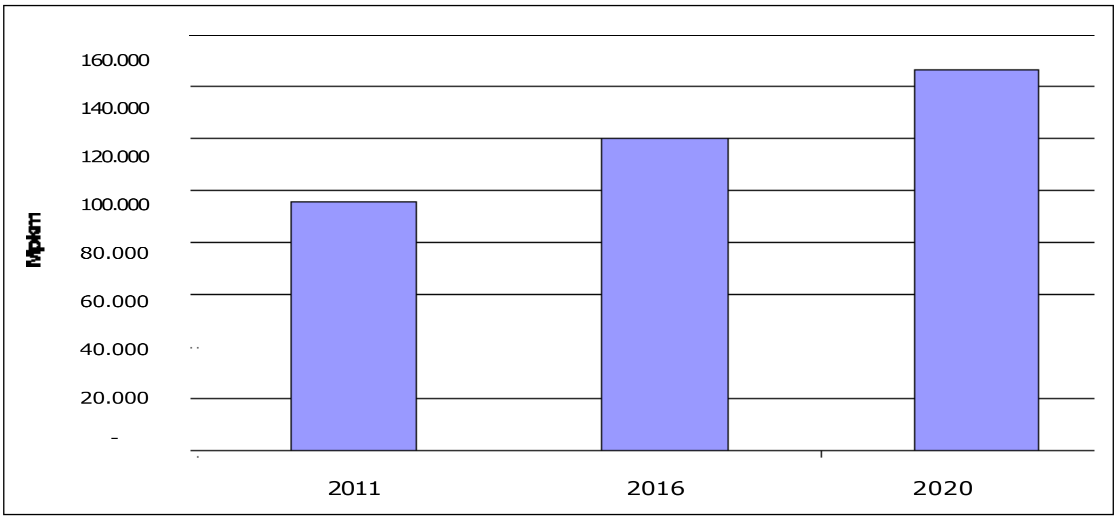
Finally, the introduction of legislative or policy-related measures such as the calculation of registration tax for private vehicles depending on theCO_2emissions, awareness of the recovery of the braking energy ofrailways through the netting of energy, the inclusion of efficient driving training in theCertificate of Professional Competence (CPC) forprofessional drivers, the requirement to make Urban Mobility Plans available to access public aid for public transport, or the recent inclusion of energy and environmental criteria intenders for the purchase of public vehicle fleets,have had an impact taking into account that this must be strengthened in the coming years.

8.1 Assessment for the 2011-2020 period

Scenarios forecast for the 2011-2020 period

The prospective studies up to 2020 show a gradual and progressive increase in the collective carriage of passengers, both in urban and intercity terms.

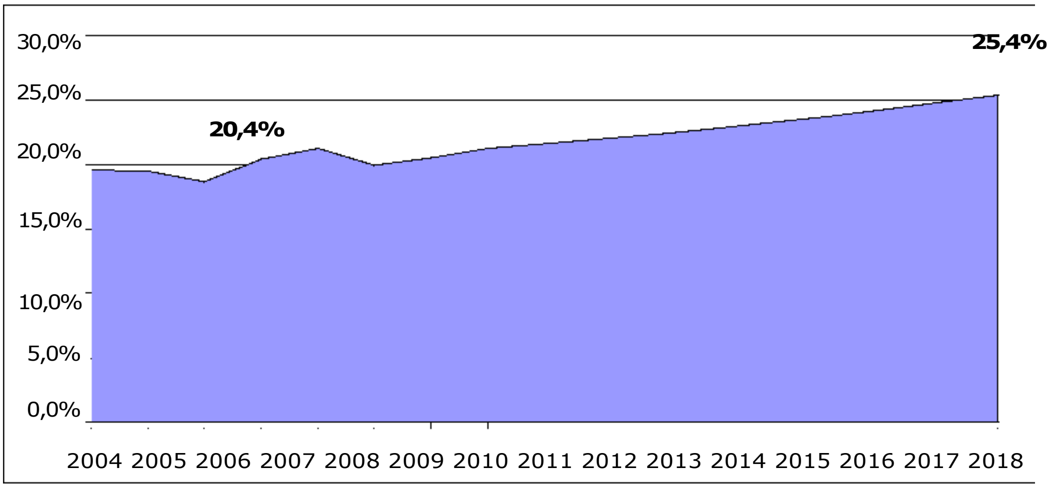
Graph 8.9 - Expected evolution of Collective Land Transport (2011-2020)



Source: IDAE

It is estimated that, in 2020, collective land transport will account for 25,4% ofthe total land carriage of passengers; that is to say, an increase of 5 percentage points with respect to reference year 2007.

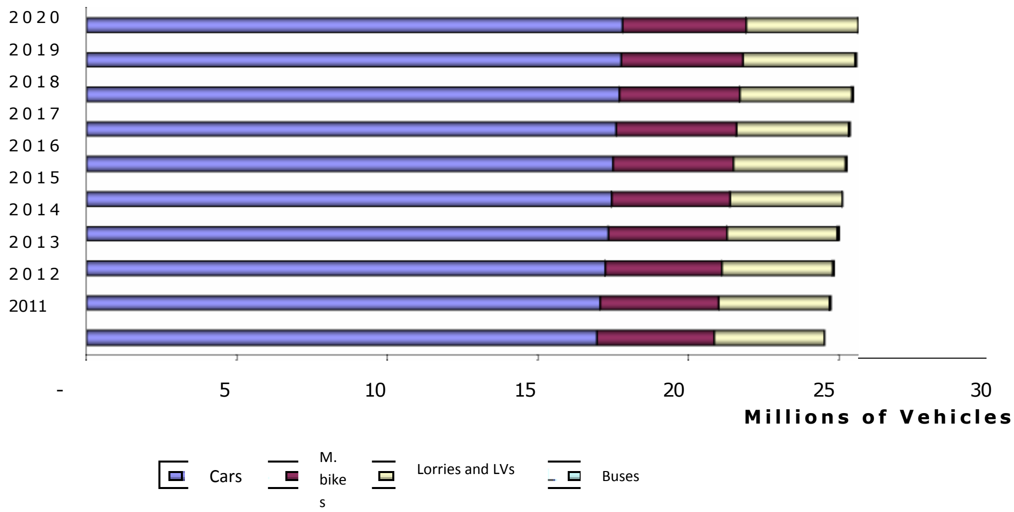
Graph 8.10 - Expected evolution of Collective Land Transport (2004-2020)



Source: IDAE

In this period, stagnation in the road vehicle fleet is expected,in all its versions, it being estimated that the increase in mobility will be focused on rail transport,falling on a good part of the investments in present and future infrastructure and that the road transport sector willsuffer the effects of saturationand mobility limitations in urban environments.

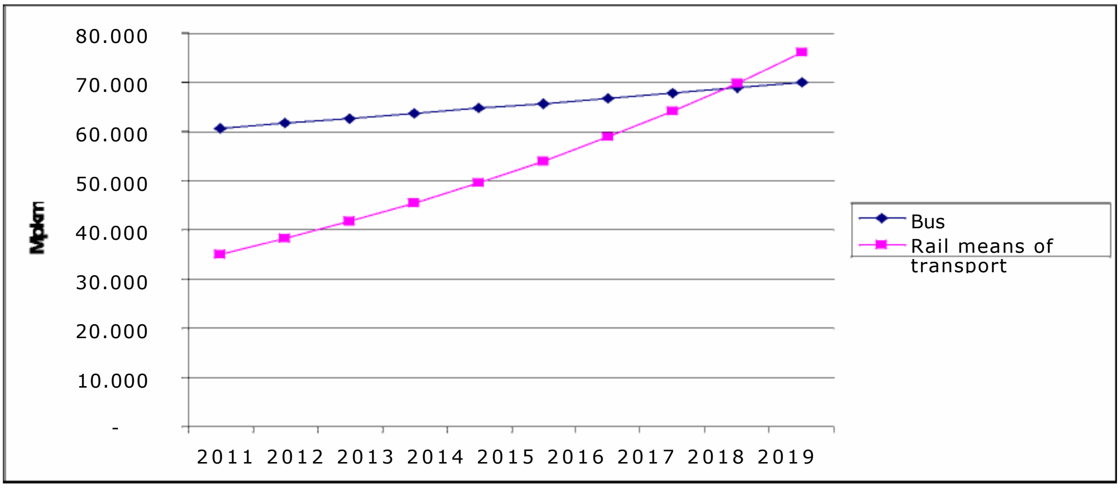
Graph 8.11 - Expected evolution of Road Transport Fleet (2011-2020)



Source: IDEA

In addition, as we can see in the graph, an increase in collective modes of land transport is expectedas well as an increase in rail means of transport(mainly railway) is greater than for buses,with, from 2019, the carriage of passengers by rail surpassing carriage by bus.

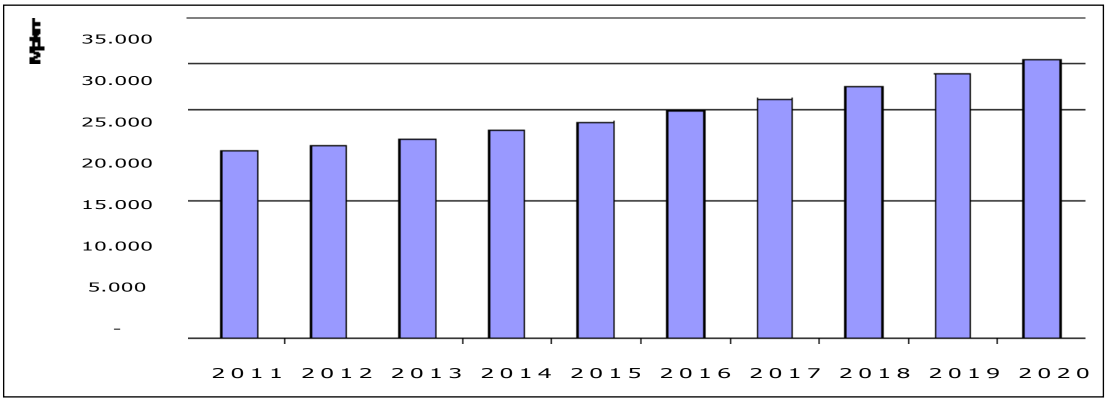
Graph 8.12 - Expected evolution of Collective Land Transport (2011-2020)



Source: IDAE

In the case of the air sector, a gradual increase in passengers using this mode is expected, but with growth rates well below that for previous periods:

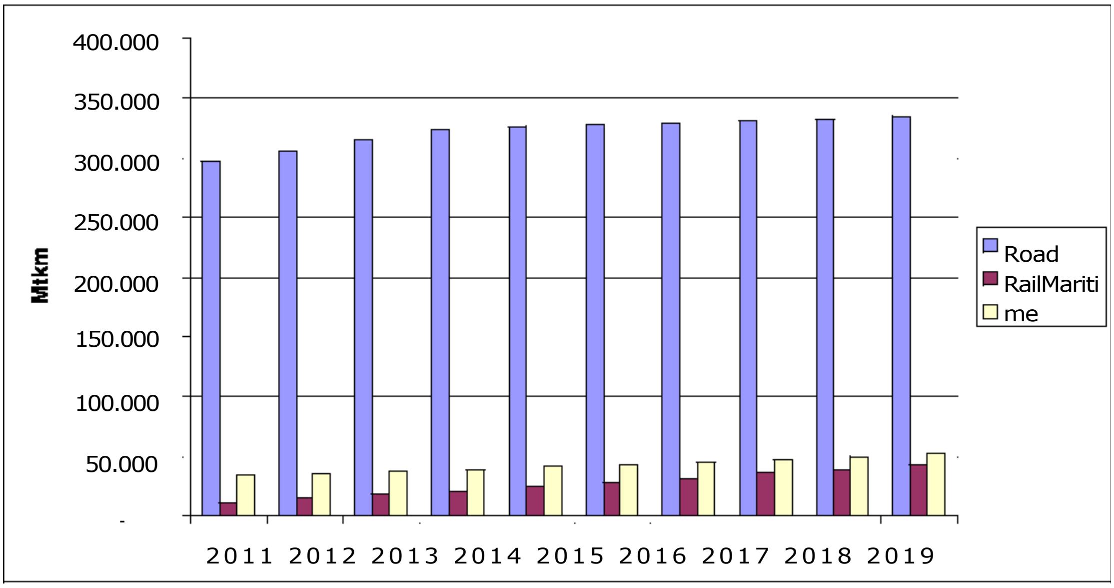
Graph 8.13 - Expected evolution of the Carriage of Passengers by Air (2011-2020)



Source: IDAE

With respect to the carriage of goods in the coming years,road transport will remain the predominant mode, but we should stress the growth attenuation of road transport(particularly as of 2014) in favour of the gradual growth of the rail sector and, to a lesser extent, the maritime sector.

Graph 8.14 - Expected evolution of the Carriage of Goods (2011-2020)



Source: IDAE

It is expected that the total freight carried by rail will multiply by a factor of3,75 (which represents a growth greater than for the carriage of passengers).

The table shows the estimated increase in the quota of rail transport relative to the carriage of passengers and goods.

Table 8.2. Evolution of the Modal Quota for the Rail Transport Sector (2011-2020)

	Year 2011	Year 2020
Modal quota for rail passengers/Transport Total	5,7%	10,6%
Modal quota for rail freight/Transport Total	3,3%	9,8%

Source: IDAE

Achieving these results for the rail transport sector will require a strategy for improving railway infrastructures, especially in relation to goods, which must be accompanied by improvements in the management of the railway system and improvements in the quality of the service with special attention on the increase in intermodality both in terms of rail with road, andrail with ports which would require substantial improvements to rail connections and access as well as the implementation of suitable logistics to facilitate accessibility and operations relative to the collection and distribution of goods.

Therefore, in addition, it will require a significant coordination effort relative to the policies concerning transport between the State General Administration and the Autonomous Communities to create a global coherent and integrated network as well as for the introduction of aid mechanisms relative to the carriage of goods by rail, all this within the process ofliberating the sector,which should be enhanced.

The energy efficiency plan promotes the electrification of the vehicle fleetsince replacing diesel traction with electrical traction reduces the specific consumption(in 2009 Renfe had an electricity/diesel mix of73%/27%). This will contribute to the gradual introduction of criteria relative to efficiency andenvironmental improvement in the purchase of rolling stock (in a similar way as to that expected for road transport based onarticle 106 of Law 2/2011, of 4 March, concerning Sustainable Economy) and the gradual electrification of theroad network.

Energy consumption forecast for the 2010-2020 period

Throughout the period considered, no big changes are expected in the sectoral structure of final energy demand,which will continue to be dominated by the transport sector.

Table 8.3. Sectorisation of final energy consumption (2004-2020)

(Ktep)	2004	2007	2010	2016	2020
Total Final Uses		108.258	99.838	101.585	102.220
Transport	38.317	40.804	36.744	38.500	38.752
Transport/Final Uses		37,69%	36,80%	37,89%	37,91%

Source: MITYC/IDAE

This energy consumption evolution scenario up to 2020 assumes the following estimate of growth in terms of transport:

Table 8.4. Relative variation in final energy consumption for the Transport Sector (2004-2020)

(Ktep)	2004	2007	2010	2016	2020
Variation/2004 (%)	--	+6,5%	-4,1%	+0,5%	+1,1%
Variation/2007 (%)		--	-10,0%	-5,6%	-5,0%
Variation/2010 (%)			--	+4,8%	+5,5%

Source: MITYC/IDAE

In the 2004-2020 period, the growth in energy consumption in transport is close to1% (an absolute value) and with respect to 2007, assumes an absolutereduction of 5%.

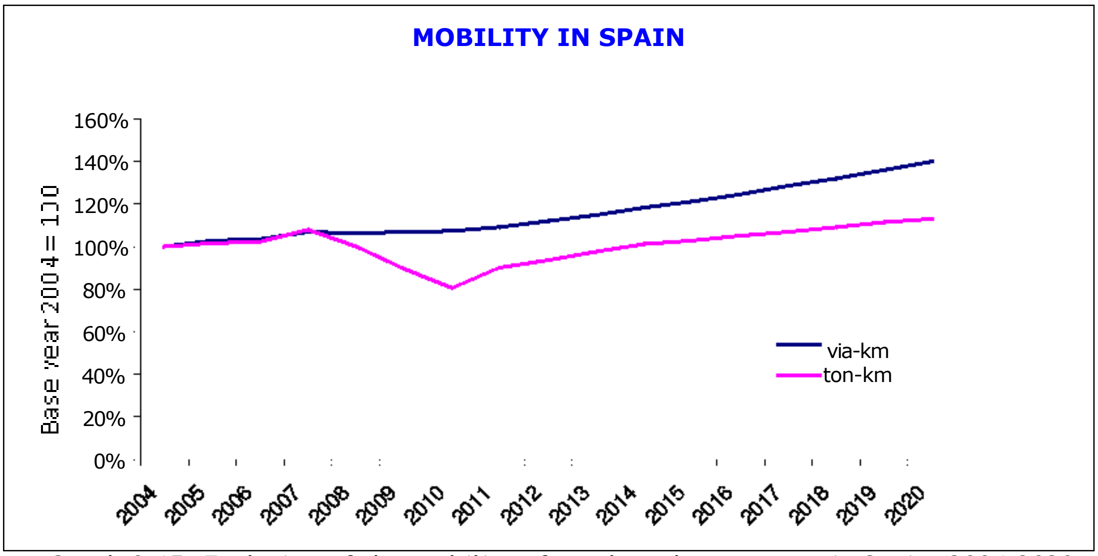
However, as we can see in the previous point, the different scenarios discussedprovide an evolution of the mobility of people and goods, for the same period, based onestimates of socioeconomic and development indicators(GDP; fleets per capita; population; standard of living, etc.), where they come to show that significant growth will occur.

Table 8.5. Evolution of indicators relative to the mobility of people and goods (2007-2020)

	2007	2010	2016	2020
Mob. of People (Gpkm)	462,4	466,3	541,0	608,1
Variation on 2007 (%)	--	0,84%	17,00%	31,50%
Variation on 2010 (%)		--	16,02%	30,40%
Mob. of Goods(Gtkm)	409,3	305	398	428,2
Variation on 2007 (%)	--	-25,48%	-2,76%	4,62%
Variation on 2010 (%)		--	30,49%	40,39%
Personal Mob. (km-priv. vehicles and year)	12.824	12.665	13.668	14.710
Variation on 2007 (%)	--	-1,24%	6,58%	14,70%
Variation on 2010 (%)		--	7,92%	16,14%

Source: IDAE

These estimates of the evolution of mobility in the 2010-2020 period emphasize theneed for the introduction of measures relative to the promotion ofsaving and energy efficiency in transport contained in this 2011-2020 Action Plan, to compensate for thisgrowth and with anintegral approach that, on its part, "softens" the forecasts of increased mobilityand effects the change of mode to more efficient modes and, also, promotes the incorporation of equipment withtransport fleets with much greater energy output,all promoting the rational use of the modes of transport.
The graph shows the evolution expected in the 2004-2020 period withdata on activities inherent to the mobility of passengers and goods.



Graph 8.15. Evolution of the mobility of goods and passengers in Spain (2004-2020)

Source: IDAE

A basic factor for achieving the energy scenarios in question is to substantially alterthe modes of transport used for this mobility in the 2010-2020 period.The table shows that the sector with the most growth in terms ofenergy consumption with respect to the total for the transport sector is the rail sector, which practically doubles its percentage weight in 2020 with respect to2007.

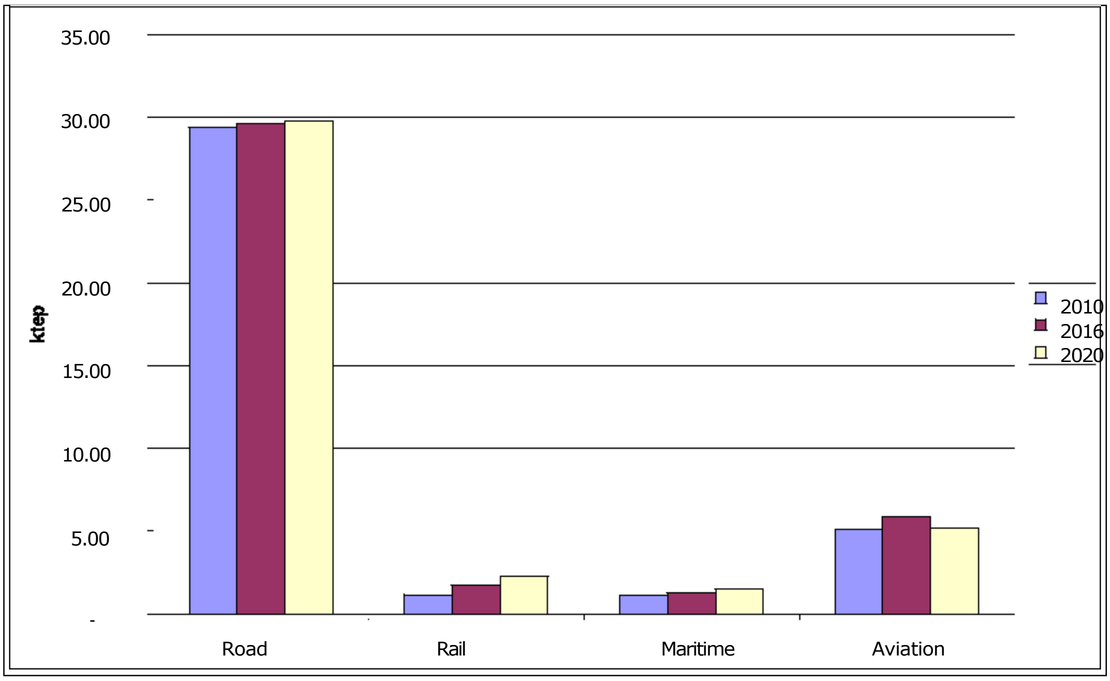
Table 8.6. Evolution of the percentage of energy consumption by mode of transport (2004-2020)

	2004	2007	2010	2016	2020
Road	79%	80%	80%	78%	77%
Rail	3%	3%	3%	5%	6%
Maritime	4%	3%	3%	3%	4%
Aviation	15%	14%	14%	14%	13%

Source: MITYC/IDAE

The consolidation of these forecast scenarios for transport will assume a significant change in the sector's energy consumption.

Graph 8.16. Evolution of energy consumption by mode of transport (2010-2020)



Source: MITYC/IDAE

Introduction of the energy saving measures in the Transport Sector

To achieve these objectives, the diagram proposed for the application of saving and energy efficiency measures in transport is based on the following elements:

- To establish measures that reduce the expected growth in demand for mobility(Urban Mobility and Business Plans, promotion of teleworking and remote assistance systems and systems for the promotion of shared motorised mobilityetc.).

- To establish measures that assessment the modal distribution of the carriage of people and goods to more efficient technologies(promotion of public transport, non-motorised modes, promotion of the rail and maritime carriage of goods and the development of intermodalityetc).

> To establish measures aimed at promoting the renewal of transport fleets so as to incorporate the technological advances into vehicles in terms of energy efficiency.

> To establish measures that encourage the rational use of modes of transport,promoting efficient driving techniques and management systems for the optimisation of fleets and routes.

In the Transport Sector, for the 2010-2020 period,we can expect a certain saturation in terms of energy consumption,particularly in the road transport sector, as a result of the saturation costs(a consequence of the fact that demand from mobility is growing at a faster rate than the infrastructure), from the impact of the air quality measures in cities and social pressure.Therefore, it would be reasonable to assume that this sectorwill reduce its participation relative to total energy consumption(40% of the final energy demand not counting non-energy uses),as long as a set of active measuresfor promoting saving and energy efficiency is applied.

As a starting point for the 2010-2020 period, it will be essential for municipalities and companies to introduce elements for the energy efficiency analysis ofpublic and private transport systems in the public funding and aid mechanism.

In addition, the competitive energy labelling of private vehicles should be enhancedand the presence of vehicles in the highest energy efficiency classes should be promoted during public tenders for the acquisition of vehicles, with special attention being paid to the increasing incorporation of electric vehicles. Similarly,the labelling of vehicles must be accompanied by the introduction of energy labelling into other basic elements of the automobile(tyres, A/C and lightsetc.).

Obligatorily, and in relation to rail transport, braking energy recovery systems should be incorporated, in stages, intometropolitan transport and local rail, making use of the figure from the Energy Services Companies with this objective.

As a result, maintaining the classification of the saving and energy efficiency measures already introduced by the previous saving plans, the measures proposed for thetransport sector, for 2020, are as follows:

Measures promoting modal change

Generally speaking, in terms of intercity transport and during the 2010-2020 period,it will be necessary to verify the energy savings derived from the significant increase in investments in infrastructure for rail transport, both in terms of the carriage of passengers and goods.

The execution of the measures and proposals contained in the Sustainable Urban Mobility Plansthat have been developed and should lead to a modal transfer to collective modes (urban transport) and non-motorised modes.Likewise, theneed to achieve the air quality objectives set fir cities by Directive2008/50/EC will translate as increased demand for clean vehicles to access specific urban areas which may restrict access to certain vehicles—, with special emphasis onconsumption associated with the capillary carriage of goods in cities.

Table 8.7. Modal change measures (2010-2016-2020)

	2010	2016	2020	TOTAL
Investments in projects (M)	73	110	139	1.078
Publicly managed aids (M)	36	55	70	539
Energy savings (ktep)	1.549	2.407	3.635	24.991
Relative weight in the sector's total saving	34%	35%	40%	
Emissions of CO_2 avoided ($ktCO_2$)	3.721	5.774	8.724	59.981

Source: IDAE

Measures for the rational use of modes of transport

The generalised inclusion of new fleet information technologiesrelative to the carriage of people and goods, for the proper management of routes and loads,will continue to be developed by public administrations within the aid programmesdefined. The information and communication technologies also assumea significant saving potential in traffic management to avoid congestion.

The saving and energy efficiency plans defined will include continuous training in efficient driving techniques as a basic competence for newdrivers to obtain their driving licence.

Table 8.8. Measures for the rational use of modes of transport (2010-2016-2020)

	2010	2016	2020	TOTAL
Investments in projects (M)	27	43	56	420
Publicly managed aids (M)	9	13	17	129
Energy savings (ktep)	2.204	3.245	3.525	30.547
Relative weight in the saving	48%	47%	39%	
Emissions of CO_2 avoided ($ktCO_2$)	5.132	7.888	8.490	73.498

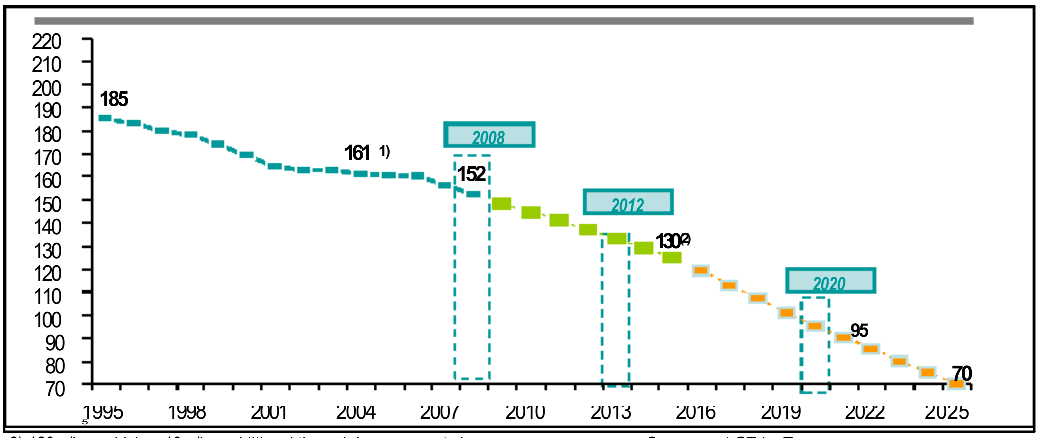
Source: IDAE

Fleet renewal measures

Within the policy-related actions from the EU, the application of Regulation443/2009 is without doubt the item most responsible for the obligation to reduce levels of emissions ofCO_2 from all private vehicles sold in Europe,up to average levels of 95 gCO_2/Km in 2020. This regulation is a key tool for achieving the saving and energy efficiency objectives in transport with special emphasis on the increased introduction of electrical mobility.

Based on average emission levels in 2010 for the fleet as a whole totalling 143 gCO_2/Km,equivalent to 5,9 l/100 Km, the 2020 objective aims to reduce the fleet's average consumption to3,92 l/100 Km, that is to say a decrease of 33,55%.

Graph 8.17. CO_2 objectives for EU Vehicles (g/km)



2) 120 g/km vehicles; 10 g/km additional through improvements in tyres and AC

Source: ACEA; European Parliament;Roland Berger Strategy

The introduction of a similar mechanism for industrial light vehicles,as indicated in COM (2009) 593, will enable the incorporation of a key subsector for road transport(urban carriage of goods) in the path of technological advances in energy efficiencythat will support the saving scenarios for transport.

Likewise, the application of Directive 33/2009, transposed into Law 2/2011,of 4 March, concerning Sustainable Economy, to the mechanisms relative to the acquisition of vehicle fleets by the Administration and the public services,will promote the introduction of more energy efficiency vehiclesthrough the internalisation of energy and environmental costs in terms of tenders.

Table 8.9. Fleet renewal measures (2010-2016-2020)

	2010	2016	2020	TOTAL
Investments in projects (M€)	110	151	221	1.582
Publicly managed aids (M€)	22	30	44	316
Energy savings (ktep)	809	1.270	1.863	13.028
Relative weight in the saving	18%	18%	21%	
Emissions of CO_2 avoided (ktCO_2)	1.931	3.097	4.526	31.628

Source: IDAE

The incorporation, in the 2010-2020 period, of new electric and hybrid vehiclesso that they make up 10% of the fleet in 2020 assumes the availability of 2.5 million of these vehicles by this date.Considering that, currently, a vehicle travels 15,000 kilometres annually,with an urban consumption cycle being8 litres/100 Km, annual energy consumption can be estimated at1,2 tep/year/vehicle. In line with the foregoing, the energy savings should follow the following patterns:conventional hybrids may save 20-25%of this figure, whilst for plug-in hybrids it may be 35-40%,with the saving associated with purely electric vehicles being estimated at 50- 55%.

The aids for the acquisition of vehicles set out in the Spanish Strategy for the Promotion of the Electric Vehicle, the objective of which is to make available, by the end of 2014, 250.000 electric vehicles in Spain, which may be estimated ataround 575 MC, in response to the following evolution:

	2011	2012	2013	2014	Total
Plug-in hybrids (PHEV)		10.000	30.000	60.000	100.000
Unitary aid (Civet')		2.400	2.000	1.500	
Purely Electric Cars (BEV)	20.000	40.000	40.000	50.000	150.000
Unitary aid (Civet')	3.600	3.000	2.500	2.200	
Total Units	20.000	50.000	70.000	110.000	250.000
Total aids (M€)	72	144	160	200	575

These aids are not included in the total aids for the renewal of transport fleets set out in the 2011-2020 Action Plan, given thattheir destination corresponds to a very specific project that includes elements of the industrial and environmental policy,which follows the general criteria marked by ratios of aid by energy saving in transport.

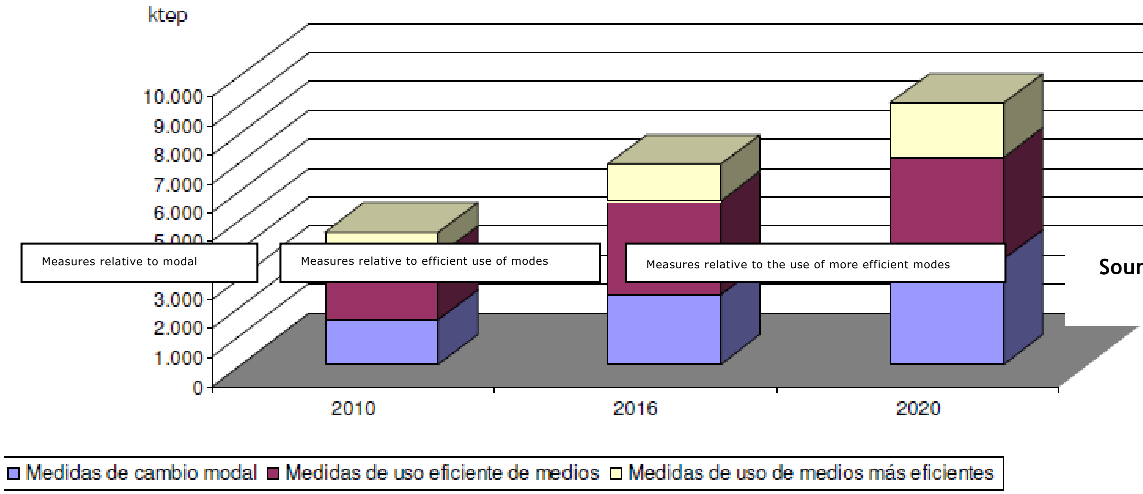
The evolution of the aids for the electric vehicle beyond 2014, seeking to achievethe marked objective, in 2020, of a total fleet of plug-in vehicles of 2,500,000 units,will depend on the technological evolution of this mobility alternative, particularly in terms of thereduction in costs through the effect of volume andthe articulation of the total measures set out in the "Electric Vehicle Strategy" in Spain itselfwith the emphasis on the presence of municipal policies to promote these technolo0gies.

Summary of the results derived from the transport measures

The application of the measures set out in the box (Summary of savings, by measure), considering a determined degree of saturation of the same in the 2010-2020 period and the results achieved by the plans in force, as well as the application of a set of legislative measures (see table of legislative instruments), allows for an estimate of the degrees of participation of the different blocks of measures in the achievement of energy savings.

Even though in the early stages of the measures relative to change of mode and efficient use of the modes of transport, they will assume the greater impact, in the final stages of the participation of the measures related to the renewal of fleets,shall assume the greatest percentage of the saving achieved.

Graph 8.18. Summary of results of energy savings by block of measures



Source: IDAE

Legislative/policy-related instruments

Within these measures specific to transport, a set of legislative or policy-related actions is proposed which requires the participation of various Administration establishments.

The following table shows these actions listing the entity responsible for its promotion and the collaborators and the impact of the instrument by type of measures proposed.

Table 8.10. Legislative/policy-related instruments in the *Transport* Sector

2010-2020 ACTION PLAN. LEGISLATIVE/POLICY-RELATED MEASURES IN THE TRANSPORT SECTOR

ACTION NO	DESCRIPTION OF THE MEASURE	MINISTRIES						IMPACT BY BLOCK OF MEASURES		
		INDUSTRY, TRADE AND TOURISM, IDAE	ENVIRONMENT	PUBIC WORKS	INTERIOR/ DGT	ECONOMY AND TREASUURE	HEALTH & CONSUMER AFFAIRS	Measures to promote modal change	Measures for rational use of means of transport	Measures to renovate fleets
1	To improve the effective application of the transposition of Directive 33/2009 for public calls relative to fleet renovation	X				X				
2	To propose the modification of the Law of Air Quality to include a reduction in the level of dissemination of the Vehicle registration tax according to technological advances and the objectives relative to reducing emissions of CO_2 according to Regulation 443/2009.		X			X				
3	To promote the obligation to incorporate, in public transport companies, the recovery of braking energy in the carriage of passengers by rail	X		X		X				
4	To introduce efficient driving techniques into assessment relative to obtaining a driving license for private and industrial vehicles				X					
5	Modification of the Law of Local Schemes to develop a system for calculating Congestion Charges according to energy efficiency and CO_2 emissions					X				
6	To proceed with the transposition of the Regulation resulting from COM(2009) 593 to reduce the average emission limits for light goods vehicles			X						
7	To implement a system for distributing grants from the State General Administration to urban public transport according to energy efficiency criteria					X				
8	To improve fiscal benefits relative to corporation tax for companies that implement transport plans and renovate their vehicle fleets with high-efficiency vehicles (e.g. vehicles with consumption inferior to 70% of the average annual limit marked by Regulation 443/2009)	X				X				
9	Immediate modification of Royal Decree 837/2002, of 2 August, including the replacement of current labelling with comparative labelling for private vehicles	X	X				X			
10	To promote the development of an energy labelling system for industrial vehicles	X								
11	To promote municipal ordinance models on mobility and fiscality relative to private vehicles with energy efficiency criteria	X								
12	To promote the obligation to include, in public calls relative to the acquisition of rolling design criteria relative to energy efficiency			X						
13	To promote a study on the establishment of a general pay-per-use system for transport infrastructure			X						
14	To promote an accreditation system for companies having incorporated a road transport fleet management system into their companies			X						
15	To promote a minimum criteria system for road transport fleet management for the for the awarding of licenses to companies			X						
16	Improved legislation for alternative airports			X						
17	Development of a regulation on the electrification of rail networks with energy efficiency criteria			X						

8.2 Measures in the Transport Sector

Measures for Modal Change

Measure 1: Sustainable Urban Mobility Plans (PMUS)

Objective:

The objective of this measure is to act on urban mobility to achieve important changes in modal distribution, with greater participation of the most efficiency modes of transport, at the expense ofthe use of the private vehicle with low occupation, and to promotethe use of modes of transport that do not use coal such as walking and cycling.

Description:

The Sustainable Urban Mobility Plans will adjust their content to that set out in the policyas applicable, as well as the principles contained in the Sustainable Economy Act and that set out in the planning instruments that affect them and, particularly, that relating to infrastructure, transport and energy efficiency saving, as well as the Spanish Sustainable Mobility Strategy.

The measure will follow the lines already marked in 2011 from the 2008-2012 Action Plan:

1. *Sustainable Urban Mobility Plans (PMUS).*
   Comprehensive sustainable mobility studies, aimed at promoting actions inurban mobility that make modal change to the use of modes of transport that consume less energypossible. It is understood that all cities with more than 50,000 inhabitants and the majority of those that fall within the big city category, carry out a PMUS study.
   In terms of the Sustainable Urban Mobility Plans, they will be applied in accordance with that set out in articles101 and 102 of the Sustainable Economy Law.

2. *Promotion of urban transport by bicycle.*
   This consist of the design and introduction of a service providing bicycle systems for public use in municipalities and intercity areas, preferably, from 50,000 inhabitants Each public bicycle availablehas an induced domino effect of 5-7 private bicycles, since it gives visibility to the bicycle andgives security to potential users of the same. It is understood that, in 2020,the number of public bicycles will have increased from its current figure of 30,000 to 150,000.

3. *Feasibility studies for actions related to the PMUS.*
   Studies prior to the introduction of measures specific to sustainable mobility, which have a significant impact on energy saving.

4. *Follow-up studies on the results of the implementation of sustainable urban mobility measures.*
   This relates to studies performed to evaluate the result achieved through the introduction of a measure or a set or measures relating to sustainable mobility.

5. *Training courses for mobility managers.*
   This relates to training, according to the sustainability of urban mobility,of mobility managers, municipal technicians responsible for developing the PMUS or in charge of mobility in municipalities or urban agglomerations.It is understood that courses are for all Autonomous Communities and that, at least 80% of the municipal technicians dedicated to mobility management, are trained in sustainability criteria applied to mobility.

6. *Pilot projects relative to sustainability measures.*
   Pilot experience of measures relating to sustainable mobility. The following types ofprojects will be included: introduction of a shared car scheme andshuttle bus services etc.

7. *Promotion of the introduction of school travel programmes.*
   This relates to promoting and adopting measures to promote "soft" modes of transport(walking, cycling or public transport) for travelling to and from school and, therefore, to encourage the use of alternative transport to the car, both for students and parents. This relates toinvolving, by 2020, at least 20% of schools in school transport programmes(approx. 180.000 in 2020).

Action mechanisms included in the measure:

The action mechanisms that will make the achievement of the saving objectives set out will be the following:

> *Legislative:* the measure should be accompanied by sufficient policy-related and regulatory developments in order to guarantee its feasibility and establish a favourable framework for consolidating andimplementing the actions to be promoted. Namely:

- Sustainable Mobility Law and regulatory developments derived from it.
- Public Transport Funding Law with efficiency criteria.
- Development and application of bylaws in line with the PMUS.

> *Financial incentives:*awarding of incentives that, in no case, willexceed 60% of the eligible cost.

> *Training:*this will strengthen training in sustainable mobility, above all, between municipal technicians and managers.

> *Information:* guides and manuals will be developed on aspects linked to sustainable urban planning and mobility. They will also boost observatories, forums and round tables on sustainable mobility.

> *Communication:* they will realise specific social awareness campaignsto encourage modal change and the rational use of private vehicles in urban environments. Development and promotion of institutional campaigns supporting a new urban mobility, including giving rewards and awards to exemplary projects.

Timeframe:

The different actions included in this measures have distinct timeframes and, therefore, very different penetration, since some of them have nearly achieved the objective for which they were developed and others are new.

1. *PMUS:*this action falls within the 2005-2007 Action Plan, having started in 2006. Nowadays, the majority of cities with more than50,000 inhabitants (original objective)have performed PMUS studies. Therefore, the timeframe set for maintaining this action is 2012.

2. *Promotion of urban transport by bicycle*: began in2005. Many cities with more than 50,000 inhabitants have introduced public bicycle-hire systems. Therefore, the timeframe set for maintaining this action is 2012.

3. *Feasibility studies for actions related to the PMUS:* the PMUSinclude a series of measures implemented in the short, medium or long-term and which require a specific study prior to their execution. Therefore, this action will be in force until 2020.

4. *Follow-up studies on the results of the implementation of sustainable urban mobility measures:* the PMUS include a series of measuresimplemented in either the short, medium or long-term. Therefore, this action will be in force until 2020.

5. *Training courses for mobility managers:* this action was introduced in 2008, but to date its implementation has been limited. In addition, there is a needfor training of municipal technicians and managers,which justifies this action being maintained until 2020.

6. *Pilot projects relative to sustainability measures:* the maintenance of this actionuntil 2020 is justified due to innovative themes, both for urban mobility and home-work travel.

7. *Promotion of the introduction of school travel programmes:* this is a new actionintroduced in 2011. Therefore, and given theinterest in this action in terms of reducing the use of the car in urban environments, its validity until 2020 is justified.

Group the measure is aimed at:

Town councils, public transport authorities and councils or otherterritorial representation entities, that may cover one or more municipalities.

Responsibility and collaborators:

<u>Responsible:</u> Ministry of Industry, Tourism and Trade/IDAE.

<u>Collaborators:</u> Autonomous Communities, Ministry of the Environment and Rural and Marine Environment, Ministry of Economy and Treasure, Ministry of Public Works and Local Entities.

Aid managed by the public sector:

The estimated aid managed by the public sector for the development of this measure in the 2011-2020 period is385.2 M€.

Measure 2: Workers' Transport Plans (PTT)

Objective:

The main objective of this measure is to act on home-work mobility to achieve important changes in modal distribution, with greater participation of the most efficiency modes of transport, at the expense of the use of the private vehicle with low occupation, and to promotethe use of modes of transport that do not use coal, such as walking and cycling.

Plans for areas of special consideration will be particularly important, such asairport systems and train stations etc. where the need to act on mobility does notjust relate to passengers, companions, goods and airport workers, but also all mobility associated with service areas and thereforeall companies based in them, in addition to also considering the influence of these systems on the whole urban area of influence.

Description:

In terms of the development of Company Transport Plans, they will be applied in accordance with that set out in articles103 and 102 of the Sustainable Economy Law. In addition,the realisation of the same will take place within a framework of social dialogue which workers' representatives will contribute to.

The measure will follow the lines already marked in 2011 from the 2008-2012 Action Plan:

1. *Company Transport Plans (PTTS).*
   Performance of studies for the execution of transport plans for a company or centre of activity(airports, industrial zones, education or health centres and shopping centres etc), aimed at largely changingthe way people travel to work/studies in private vehicles, with low occupation. These Company Transport Plans were approved within the framework ofcollective negotiation or social dialogue. In 2020, all companies with more than 100 employeesshould put transport plans in place for their employees(some 15.000 companies).

2. *Feasibility studies for actions related to the PTTS.*
   Studies prior to the introduction of measures specific to sustainable mobility, which have a significant impact on energy saving.

3. *Follow-up studies on the results of the implementation of sustainable urban mobility measures.*
   This relates to studies performed to evaluate the result achieved through the introduction of a measure or a set or measures relating to sustainable mobility.

4. *Training courses for mobility coordinators.*
   This relates to training, with sustainability criteria, mobility coordinatorsfor companies, industrial zones or leisure parks and services. These coursesare intended for all Autonomous Communities so that at least 80% of coordinators and managers working within mobility management arte trained insustainability criteria applicable to mobility.

5. *Pilot projects relative to sustainability measures.*
   Pilot experience of measures relating to sustainable mobility. The following types ofprojects will be included: introduction of a shared car/bus system, shuttle bus services and the promotion of travel by bicycle etc.
6. *Promotion of the electric bicycle for work.*
   The objective of this action is the promotion of the electric bicycle to replace motorized transport for travel to and from work and for introduction intodelivery fleets. The aim is to introduce at least 20,000 electric bicycles.

Action mechanisms included in the measure:

The action mechanisms that will make the achievement of the saving objectives set out will be the following:

> *Legislative*: the measure should be accompanied by sufficient policy-related and regulatory developments in order to guarantee its feasibility and establish a favourable framework for consolidating andimplementing the actions to be promoted. Namely:

- Sustainable Mobility Law and regulatory developments derived from it.
- Development and application of bylaws in line with the PMUS.

> *Financial incentives:* awarding of incentives that, in no case, willexceed 60% of the eligible cost.

> *Training:* the line of training and collaboration with energy agencies and operational managers will be maintained for the execution of the Plan in the different Autonomous Communities.

> *Information:*guides and manuals will be developed and updated on aspects linked to sustainable travel to work. They will also boost observatories, forums and round tables on sustainable mobility.

> *Communication:* they will realise specific awareness and information campaignsto encourage modal change and the rational use of private vehicles for work-related travel. Development and promotion of institutional campaigns supporting a new urban mobility, including giving rewards and awards to exemplary projects. Development of mobility offices in some of the special consideration areasand particularly in the big airport systems, train stations and transport interchanges etc.

Timeframe:

The different actions included in this measure have a distinct timeframe, since some were introduced in 2011. However, they have all justified their validity for the 2011-2020 period.

1. *PTTS*: the majority of daily travel is derived from so-called forced mobility (travel to work or studies). The vast majority of Spanish companiessee the mobility of their employees as something unrelated to their

business activity and do not consider transport plans with sustainability criteria for the mobility of their employees. Therefore,this action will be valid until 2020.

2. *Feasibility studies for actions related to the PTTS.:* they include a series ofmeasures, the implementation of which requires specific studies. Therefore,this action will be valid until 2020.

3. *Follow-up studies on the results of the implementation of sustainable urban mobility measures:* the PTTS include a series of measures that require follow-up to check their effectiveness and to identify improvements. Therefore,this action will be valid until 2020.

4. *Training courses for mobility coordinators:* this action was introduced in 2008, but to date its implementation has been limited. In addition, there is a needfor training of company managers,which justifies this action being maintained until 2020.

5. *Pilot projects relative to sustainability measures:* the maintenance of this action until 2020 is justified in innovative projects between home-worktravel or relative to work-related mobility.

6. *Promotion of the electric bicycle in work-related travel:* this is a new actionintroduced in 2011. Therefore, and given theinterest in this technology, above all, for urban mobility, its validity until 2020 is justified.

Group the measure is aimed at:

Entities, companies, activity centres, industrial and shopping areas, airports, train stations and transport interchanges etc, public and private organisations (preferably with more than 100 employees or workers).

Responsibility and collaborators:

<u>Responsible:</u> Ministry of Industry, Tourism and Trade/IDAE.

<u>Collaborators:</u> Autonomous Communities, Ministry of the Environment and Rural and Marine Environment, Ministry of Economy and Treasure, Ministry of Public Works and Local Entities.

Aid managed by the public sector:

The estimated aid managed by the public sector for the development of this measure in the 2011-2020 period is88.7 M€.

Measure 3: Greater participation of collective modes of road transport

Objective:

To achieve greater modal participation of the collective means of road transport, compared with the participation of the private vehicle.

Description:

The measure will follow the lines already marked in 2011 from the 2008-2012 Action Plan,although others will be included:

1. Basic feasibility studies to tackle infrastructure for intermodal transport interchanges, lanes reserved for public transport—on the road network owned by the Autonomous Communities and improved intermodality between the different modes of transport.
2. Design and introduction of a network information tool, continually being updated, to informintercity public transport services, in terms of the Autonomous Communities, including both public transport by road and rail.
3. Application studies relative to the new information or ticketing technologies for public transport systems.
4. Feasibility studies for pricing schemes and congestion charging.
5. Aids for the introduction ofsecure bicycle parks at transport interchanges.

Action mechanisms included in the measure:

The action mechanisms that will make the achievement of the saving objectives set out will be the following:

- *Legislative*: the measure should be accompanied by sufficient policy-related and regulatory developments in order to guarantee its feasibility and establish a favourable framework for consolidating andimplementing the actions to be promoted,complementing programmes for investment in infrastructure at national and regional level.
- *Financial incentives*: awarding of incentives that, in no case, willexceed 60% of the eligible cost.
- *Training*: the line of training and collaboration with energy agencies and operational managers will be maintained for the execution of the Plan in the different Autonomous Communities.
- *Information*: the publication of manuals, guides and brochures will be developed.
- *Communication*: specific awareness campaigns will be carried out to encourage the use of alternative technologies and fuels.

> Other accompanying mechanisms: the promotion, gradually, of positive discrimination measureslocally for vehicles that include alternative measures or technologies.

Timeframe: 2011-2020.

Group the measure is aimed at:

Transport consortiums and companies, public or private companies.

Responsibility and collaborators:

Responsible: Ministry of Industry, Tourism and Trade/IDAE.

Collaborators: energy agencies, concessionaries and vehicle manufacturers.

Aid managed by the public sector:

The estimated aid managed by the public sector for the development of this measure in the 2011-2020 period is21.3 M€.

Measure 4: Greater participation of rail in the carriage of passengers and goods

Objective:

To achieve greater modal participation of the railway in the carriage of passengers and goods. It is intended that, by 2020, rail travel will have doubled its current modal quota.

Description:

The railway has a very low participation in terms of the carriage of passengers and goods, when it is more efficiency that road transport. The forecast for rail transportshould be shown in the objectives relative to investments from the administrations.

In order to increase this mode of transport's participation quota, it is necessary to internalise the actual road costs and improve the quality of the service and the infrastructure, especially, to improvethe combined carriage of goods. The liberalisation of the sector has helped to achieve these objectives.Therefore, it is important to facilitate the car-rail intermodality, improving and providing parking near to stations or connected through shuttles with the same.

Apart from promoting the corresponding legislative developments, this measure will help with the realisation of feasibility studies for the introduction of the aforementioned actions.

Action mechanisms included in the measure:

> *Legislative*: the measure should be accompanied by sufficient policy-related and regulatory developments in order to guarantee its feasibility and establish a favourable framework for consolidating andimplementing the actions to be promoted,complementing programmes for investment in infrastructure at national and regional level. Equally, legislative developments will be promoted to internalise the actual road costs (the railway's competitor mode of transport).

> *Financial incentives*: awarding of incentives for feasibility studies that, in no case, willexceed 60% of the eligible cost.

> *Training*: the line of training and collaboration with energy agencies and operational managers will be maintained for the execution of the Plan in the different Autonomous Communities.

> *Information*: within the framework of this measures, information platforms on the consortium of Transport, Metropolitan Transport Companies and Autonomous Entities have been introduced—and will be introduced aimed at informing users about the combined use of the different collective andalternative modes of transport instead of the use of the private vehicle (including rail).

> *Communication*:social awareness campaigns will be carried outto encourage modal change and the rational use of private vehicles in urban environments.

> Other accompanying mechanisms: they will promote, gradually, restrictions in terms of access for private vehicles in city centres or in terms of long-stay parking in city centres.

Timeframe: 2011-2020.

Group the measure is aimed at:

Consortiums and Transport Companies, Railway Infrastructure Management, Town Councils, Directorate General of Transport, Ministry of Public Works.

Responsibility and

collaborators: Responsible: Ministry of

Public Works.

Collaborators: Ministry of Industry, Trade and Tourism/IDAE, ADIF,Autonomous Communities and Local Entities, Ministry of Economy and Treasury.

Aid managed by the public sector:

The estimated aid managed by the public sector for the development of this measure in the 2011-2020 period is44.2 M€.

Measure 5: Greater participation of the maritime transport sector in the carriage of goods

Objective:

To achieve greater modal participation of the maritime sector in the carriage of passengers and goods.

Description:

Maritime transport contributes to improving the global energy efficiency of the carriage of goods if it is combined, suitably, with land transport, especially, rail and, particularly, for certain loads.

In order to make it more attractive and competitive with other means of transport, it is necessary to improve the design of its infrastructures and services, mainly by way of agreements with businesses of the sector, individual studies, audits and projects, and aid instruments.

Action mechanisms included in the measure:

> *Legislative*: the measure should be accompanied by sufficient policy-related and regulatory developments in order to guarantee its feasibility and establish a favourable framework for consolidating andimplementing the actions to be promoted.

> *Financial incentives*: awarding of financial incentives aimed at overcoming the market barrierwhich is the extra cost associated with these technologies.

> *Training*: the line of training and collaboration with energy agencies and operational managers will be maintained for the execution of the Plan in the different Autonomous Communities.

> *Information*: to improve the dissemination, in different formats, of the advantages that represent the new technologies and alternative fuels from the point of view of energy efficiency and emissions.

> *Communication*: specific channelled campaigns will be carried out, mainly, through the network of energy agencies.

Timeframe: 2011-2020.

Group the measure is aimed at:

Maritime Transport Companies.**Responsibility and collaborators:**Responsible: Ministry of Public Works.

Collaborators: Ministry of Industry, Trade and Tourism/IDAE, SpanishShip-owners Association (ANAVE).

Aid managed by the public sector:

The estimated aid managed by the public sector for the development of this measure in the 2011-2020 period is11.2 M€.

Measures for More Efficient Use of Means of Transport

Measure 6: Transport infrastructure management

Objective:

To improve the management of existing transport infrastructure with the aim of achieving better energy efficiency in the use of the modes, both in the carriage of passengers and goods.

Description:

Optimisation of transport infrastructure management through the performance of full studies on interchange networks and logistical centres, as well as on the infrastructure for pay-for-use systems which enable the development and future introduction of new management proposals.

Action mechanisms included in the measure:

- *Legislative*:consideration of the introduction of a general pay-for-use infrastructure system, both for private vehicles andvehicles for the collective carriage of people and goods. Consideration of the increasein the load permitted in the carriage of certain goods in road transport(from 40 to 44 tons).
- *Financial incentives*: if it is considered necessary, financial aids required for theintroduction of the different saving and energy efficiency promotion measures in the sector will be made available.
- *Information*: preparation of improvement proposals to optimise the management of interchange networks for passengers and logistical centres for goods, based on studies and comprehensive analysis of existing infrastructures.
- *Communication*: development of communication actions and campaigns to provide informationon plans and measures set out for the improved energy efficiency ofthe management of transport infrastructures.
- *Other accompanying mechanisms*: realisation of studies for the introduction of a general pay-for-use system for the use of infrastructure.

Timeframe:2011-2020.

Group the measure is aimed at:

Transport infrastructure managers and operators, authorities, consortiums andtechnical personnel associated with mobility management.

Responsibility and

collaborators: Responsible: Ministry of

Public Works.

Collaborators: Ministry of Industry, Trade and Tourism/IDAE, Ministry of the Interior/General Directorate for Traffic and Autonomous Communities.

The estimated aid managed by the public sector for the development of this measure in the 2011-2020 period is14.0 M€.

Measure 7: Road transport fleet management

Objective:

To improve the management of road transport fleets in order to reduce consumption per kilometre or ton or passengers carried.

Description:

Within the framework of this measure, it is intended to promote improvements in the efficient management of road transport fleets through the performance ofaudits,provision of information systems and applications to improve the efficiency of the operational management of fleets,performance of training campaigns in fleet management coursesfor transport fleet professionals, provision of licenses and accreditations for fleets according to their efficient management.

Action mechanisms included in the measure:

- *Legislative*: consideration of the introduction of minimum criteria concerning efficient management of fleets for the awarding of licences to companies associated with the collectivecarriage ofpassengers and goods.

- *Financial incentives*: Continuation of the aid lines introduced within the framework of the E4 action plansfor the performance of audits concerning the efficient management oftransport fleets and the provision of information systems and applicationsto improve efficiency in the operational management of fleets and the realisation of campaigns relating to training courses in fleet management for transport fleet professionals.

- *Training*: to improve training concerning the efficient management of transport fleets through training of transport managers.

- *Information*: definition and awarding of a suitable accreditation for all companies thathave implemented an efficient fleet management system in their organisation. This accreditation may be combined with the accreditation corresponding to the renewal of fleets.

- *Communication*: development of actions to demonstrate and promote efficient driving in the sector and to the general public.

- *Other accompanying mechanisms:* promotion of integrated logistical

  centres.**Timeframe**: 2011-2020.

Group the measure is aimed at:

Fleet managers and technical personnel associated with road transport fleets andthe Administrations and entities associated with logistics and road transport fleets.

Responsibility and collaborators:

Responsible: Ministry of Public Works, Ministry of Education and Ministry of Industry, Trade and Tourism/IDAE.

Collaborators: Autonomous Communities.

Aid managed by the public sector:

The estimated aid managed by the public sector for the development of this measure in the 2011-2020 period is53.6 M€.

Measure 8: Aircraft fleet management (this measure includesoperational measures integrated into the air transport cycle and energy audits)

Objective:

Evaluation and reduction of the inefficiencies in the air transport chain and its processes and interactions with air traffic, airports, handling and air lines withthe aim of achieving improved energy efficiency in the whole air transport sector.

Description:

Within the framework of this measure, the intention is to promote operational improvements in theinteroperability between air companies, airports and auxiliary services through analysis techniques and the optimisation of the air transport process, and to perform energy/operational audits on the whole air transport cycle.

Every day, air transport becomes more interrelated with different processes where the errors or problems relative to each of the phases have a bearing on the efficiency of the rest of the players. This Measure is a change that proposes the use of the analysis mechanism and process improvements (Life cycle analysis) applied to the air transport chainfocused on energy efficiency.

These improvements will include the analysis for the application of operational improvements to aircraft and ground procedures:

- Decrease in the use of the auxiliary power units loaded on aircraft
- Introduction of taxiing with N-1 engines loaded on aircraft.
- Optimisation of taxiing movements
- Renewal of buses/shuttles
- Renewal of handling vehicles
- Promotion of ecotaxis (low-consumption or hybrid taxis)
- Courses for then efficient driving of land vehicles
- Promotion of free parking/reduced-cost parking for efficient vehicles

Respect of energy/operational audits will be established for each of the players/sub processes(airports, handling, operations and dispatch etc)involved in the complete air transport cycle, analysing the interaction of the system's total efficiency andproposing energy efficiency improvementsconverting the processes involved

Action mechanisms included in the measure:

>*Legislative*: development of legislative improvements for the operational management of airports and operational measures.

> *Financial incentives:* if it is considered necessary, financial aids required for theintroduction of the different saving and energy efficiency promotion measures in the sector will be made available.

> *Training:* development of training campaigns on the optimisation of air traffic and operational improvements.

> *Development of energy audits for each of the processes forming part of the air transport cycle.*

> *Information:*promotion of improvements in airline company procedures so that they take energy efficiency criteria into account.

- Creation of specialised groups to work with airline companies and airport operators to identify and introduce improvements in fleet management and operational measures.

- Development of agreements in the sector to reduce delays and waiting times through improved traffic management, the coordination between control areas and more specific information enabling optimal planning.

> *Communication:* development of communication actions and campaigns, both public and specific to the sector, to provide informationon plans and measures set out for improved energy efficiency.

> *Other accompanying mechanisms:* decrease intankering, through agreements with the companies on the tankering limit.

- Development of framework agreements with the sector for the effective introduction of all the improvements proposed,including the promotion of improvements to air traffic systems, including the optimisation of the use or aircorridors and green approach routes.

- Development of operational improvements, through the reduction in speed and cost-benefit study of the optimal speeds, optimisation offlying levels and centres of gravity, fuel analysis and management, increase in the occupation factor, reduction in the weight of aircraft and the introduction of flight optimisation software.

- Promotion of improvements to ground equipment: buses/shuttles, handling vehicles and taxis etc.

Timeframe:2011-2020.

Group the measure is aimed at:

Technical personnel from organisations and entities associated with air traffic management, airports fleet managers and technical personnel working for aircraft operators.

Responsibility and

collaborators: Responsible: Ministry

of Public Works.

Collaborators: Ministry of Industry, Trade and Tourism/IDAE, Ministry of the Environment, the Rural and Marine Environment and the Ministry of Defence.

Aid managed by the public sector:

The estimated aid managed by the public sector for the development of this measure in the 2011-2020 period is13.4 M€.

Measure 9: Efficient driving of private vehicles

Objective:

To introduce efficient driving techniques both for new drivers and for expert drivers of private and commercial vehicles(maximum weight 3,500kg).

Description:

Efficient driving training for driving instructors, drivers andthose applying for a licence for private and commercial vehicles weighing less than 3,5000kg through practical training courses.

Action mechanisms included in the measure:

> *Legislative*:

- Formal introduction of efficient driving techniques into theDGT's Teaching System for the obtainment of the driving licence for private vehicles and light commercial vehicles (less than 3,500kg), in collaboration between IDAE and the DGT from the Ministry of the Interior and in line with the administrative policy duly approvedin the 2008-2011 Saving and Energy Efficiency Action Plan.
- Consideration of policy-related measures, whether they are transitory or permanent, concerning reducing vehicle speed limits on certain roads.

> *Financial incentives*:aids defined at between 80% and 100% of the training cost,depending on the nature of the student (driver or instructor) and the nature of the fleet service (private or public).

> *Training*:

- Continuation of the campaigns concerning practical training courses for the efficient driving of private and commercial vehicles weighing less than 3,500kg drivers with valid driving licences and driving instructors, within the context of the collaborationcampaigns from the IDAE and the Autonomous Communities.
- Introduction of efficient driving training programmes for new driving instructors, as a result ofthe formal introduction of efficient drivingtechniques in the DGT's Teaching System for the obtainment of a driving license for private vehicles and light goods vehicles.

> *Information*: preparation of publication and dissemination material on the efficient driving of private and commercial vehicles weighing less than 3,500kg.

> *Communication*: development of actions to demonstrate and promote efficient driving in the sector and to the general public.

> *Other accompanying mechanisms:*

- They will promote professional benefits for fleets of private and commercial vehicles with accredited training of their drivers in efficient driving.

- Performance of control campaigns for the strict application of the speed limits specified for urban and intercity environments,and, generally-speaking, the traffic policy.

Timeframe:

- Continuation of the campaigns for efficient driving courses for drivers and driving instructors: 2011 to 2020.
- Introduction in the teaching system for the obtainment of a driving licence: 2011 to 2020. It is expected that in this case, the introduction in the teaching systemis completed by 2015[49].

Group the measure is aimed at:

- Drivers of private and industrial vehicles weighing less than 3,500Kg with a valid driving licence and active driving instructors:
  - On 31 December 2009, the existing number of valid licences for the driving ofprivate and commercial vehicles (weighing less than 3,500Kg) was21.958.075.
  - In April 2011, the estimated number of active driving instructors was in the order of17.000.
- New drivers and driving instructors:
  - The latest data available shows that, in 2009, 653.607class B driving licences were awarded (private and commercial vehicles weighing a maximum of3.500 Kg).
  - In terms of new driving instructors, each year around1.500-2.000 new driving instructors join the profession.

Responsibility and collaborators:

Responsible: Ministry of the Interior/DGT, Ministry of Industry, Trade and Tourism/ IDAE.

Collaborators: Autonomous Communities.

Aid managed by the public sector:

The estimated aid managed by the public sector for the development of this measure in the 2011-2020 period is19.9 M€.

[49] Royal Decree 1032/2007, of 20 July, which regulates the minimum training required to obtain a licence to drive specific vehicles designed for the roadhas introduced the requirement to have a minimum amount of knowledge of efficient driving.

Measure 10: Efficient driving of lorries and buses

Objective:

To introduce efficient driving techniques both for new drivers and for expert drivers of industrial vehicles.

Description:

Efficient driving training for driving instructors, drivers andthose applying for a driving licence for lorries and buses through practical training courses.

Action mechanisms included in the measure:

- *Legislative*: formal introduction of the policy on efficient driving techniques in the DGT teaching system for the obtainment of a driving licence for lorries and buses, in collaboration with the IDAE and the DGT from the Ministry of the Interior.
- *Financial incentives*: aids defined at between 50% and 100% of the training cost,depending on the nature of the student (driver or instructor) and the nature of the fleet service (private or public).
- *Training*:
  - Continuation of the efficient driving course campaigns for drivers with a valid driving licenceand all driving instructors for lorries and buses within the framework of the collaboration agreements between the IDAE and the Autonomous Communities and with the Ministry of Public Works,manufacturers and importers and associations in the sector.
  - Introduction of efficient driving training programmes for new drivers andnew driving instructors, as a result of the formal introduction of a policy on efficient driving techniques in the DGT's teaching systemfor the obtainment of a licence to drivelorries.
  - Continuation of the training programmes within the framework of the initial and continuous Certificate of Professional Competence (CPC) in which efficient driving is considered as one of the key parts of training.
- *Information*: preparation of publication and dissemination material on the efficient driving of industrial vehicles.
- *Communication*: development of actions to demonstrate and promote efficient driving in the sector.

Timeframe:

- Continuation of the campaigns for efficient driving courses for drivers and driving instructors: 2011 to 2020.

- Introduction in the teaching system for the obtainment of a driving licence: 2011 to 2020. It is expected that in this case, the introduction in the teaching systemis completed by 2015[50].

Group objective:

- Drivers of lorries and buses with a valid driving licence and active driving instructors:
  - On 31 December 2009, the existing number of valid licences for the driving ofdifferent categories of lorries and buses was1,749,551.
  - In April 2011, the estimated number of active driving instructors was in the order of17.000.

- New drivers and driving instructors:
  - The latest data available shows that, in 2009, 104.241 licences for the driving ofdifferent categories of lorries and buses were awarded.
  - In terms of new driving instructors, each year around1.500-2.000 new driving instructors join the profession. Theseinstructors are suitably trained in efficient driving, among other things,at centres contracted by the DGT for this purpose.
- Training expected to obtain the CPC:
  - Group in the order of 22,000 drivers/year for initial training and in the order of84.000 for continuous training.

Responsibility and collaborators:

Responsible: Ministry of the Interior/DGT. Ministry of Industry, Trade and Tourism/ IDAE and Ministry of Public Works.

Collaborators: Autonomous Communities.

Aid managed by the public sector:

The estimated aid managed by the public sector for the development of this measure in the 2011-2020 period is15.8 M€.

[50] Royal Decree 1032/2007, of 20 July, which regulates the minimum training required to obtain a licence to drive specific vehicles designed for the roadhas introduced the requirement to have a minimum amount of knowledge of efficient driving.

Measure 11: Efficient flying of aircraft (this measure includesactions to improve the energy efficiency related to the air traffic system)

Objective:

To introduce measures to flexible and optimise the air space helping to achieve substantial energy savings in the air sector.

Description:

Analysis and introduction of improvements intended to achieve improved efficiency relative to air trafficand reducing inefficiencies associated with the not flying in optimal speed, height and trajectory conditions due to limitations or congestion relative to air traffic control.

Introduction of measures to improve the air traffic system such as:

- Continuous descent/Green routes
- Improves Transatlantic routes (South Atlantic and North Atlantic)
- Optimisation of routes (Limitations in air space in military zones).

Action mechanisms included in the measure:

> *Legislative*: the measure should be accompanied by sufficient policy-related and regulatory developments in order to guarantee its feasibility and establish a favourable framework for consolidating andimplementing the actions to be promoted.

> *Financial incentives*: if it is considered necessary, incentives will be made available for this purpose to introduce the efficiency flying of aircraft and the rest of the me4asures to improve the air traffic system.

> *Training*: aid for the realisation of training course campaigns for personnel from air companies, authorities and navigation in the concepts of efficiency related to air traffic.

> *Information*: development of aid tools for the efficient flying of aircraft and the rest of the measures to improve the air traffic system.

> *Communication*: development of actions to aid and promote efficient driving within air transport companies.

> *Other accompanying mechanisms*: agreements will be developed in line with the air companies for the introduction oftraining protocols for pilots in their procedures and agreements with the organisations responsible for the air navigation system for the testing and introduction of measures to improve the air traffic system.

Group the measure is aimed at:

Those responsible for the Spanish air navigation system, airlines, airports and Civil Aviation authorities.

Timeframe: 2011-2020.

Responsibility and collaborators:

Responsible: Ministry of Public Works.

Collaborators: Ministry of Industry, Tourism and Trade/IDAE.

Aid managed by the public sector:

The estimated aid managed by the public sector for the development of this measure in the 2011-2020 period is12.6 M€.

Measures to Improve the Energy Efficiency of Vehicles

Measure 12: Renewal of land transport fleets

Objective:

The objective of this measures is to modernise and replace the fleet of industrial road transport vehicles tomake the most of the advantages of the improved energy efficiency of new vehicles and the advantages associated with the introduction of fuel and alternative technologies.

In the rail sector, the aim is to achieve, at the time of decisions relating to the purchase of rolling stock(trains, metros and trams), taking into account certain energy efficiency criteria, such that the rail transport operators or the public authoritiesthat bid for public services can select the most energy efficient trains; it is intended, in addition, that manufacturers and designers ofrolling stock have an incentive to reduce consumption. More specifically, it will boost the replacement of diesel traction rolling stock with electrical traction.

Therefore, replacement refers to the following:

- buses and lorries relating to road transport and rolling stockrelating to transport tasks at airports, ports,mining, industrial and service activities (although registered vehicles are not included): for example, baggage trucks or trucks for towing aircraft andvehicles for moving containers and dumpersetc.

- diesel traction rolling stock with electrical and efficient traction stock

Description:

As regards the road, as well as rolling stock for transport tasks at airports, ports, mining, industrial and service activities(although registered vehicles are not included), the measure aims to promote the acquisition of vehicles, with a fuel battery, hybrid or electric propulsion[51], supplied by natural gas, liquid hydrogen or oil gasesthrough the awarding of financial aids that make up for the extra cost of alternative vehiclesrelative to the same vehicles with traditional design and motorisation. Equally, the development of recharging infrastructure for alternative fuels.

However, rail transport contributes to improving the global energy efficiency of the carriage of people and goods. To make it more attractive and efficient,the rail fleet needs to be electrified. This is intended to promote the gradualreplacement of diesel traction in rail rolling stock (which, in 2009, was in the order of 27%) so that this is below10% in2020. Therefore, financial aids and the gradual

[51] From electric propulsion which might not be covered by specific plans to promote the electric vehicle.

use of energy efficiency criteria will be considered relative to the purchase of trains,which has already been introduced in the road sector.

Action mechanisms included in the measure:

> *Legislative:* the measure should be accompanied by sufficient policy-related and regulatory developments in order to guarantee its feasibility and establish a favourable framework for consolidating andimplementing the actions to be promoted.

> *Financial incentives:* awarding of financial incentives according to the type of alternative technology and fuel in question. These incentives will beaimed at breaking down the market barrier that assumes the extra cost associated with these technologiesand will bearticulated by aid programmes for the acquisition of vehicles running on alternative energies instead of conventional ones (petrol and diesel).

> *Training:* the line of training and collaboration with the energy agencies and operational managers associated with the execution of the Plan in the different Autonomous Communitieswill be maintained. Equally, a methodological development and a calculation toolwill be introduced and published; they facilitate the application of efficiency criteria depending on the type of rail stock and the type of service to be provided.

> *Information*: the dissemination, in different formats, of the advantages that represent the new technologies and alternative fuels from the point of view of energy efficiency and emissions will continue.

> *Communication:* specific channelled campaigns will be carried out, mainly, through the network of energy agencies.

> *Other accompanying mechanisms:* the municipal strategies for the improvement of the quality of urban air, following provisions in European Directive2008/50/EC, will establish increasing limitations in the incorporation of conventional rolling stock. Equally, referring to article 106 of Law2/2011, of 4 March, concerning Sustainable Economy on acquisition, by the contracting authorities, on clean and energy efficient road vehicles,which transposed Directive 2009/33/EC.

Timeframe: 2011-2020.

Group the measure is aimed at:

Transport companies and companies with vehicle fleets (buses, lorries and industrial vehicles), public authorities, rolling stock manufacturers, rail transport operators and companies.

Responsibility and collaborators:

Responsible: Ministry of Industry, Tourism and Trade/IDAE.

Collaborators: Autonomous Communities and Local Entities, Spanish Association of Automobile Fleet Manager (AEGFA), Rail Infrastructure Administrator (ADIF), transport operators and authorities.

Aid managed by the public sector:

The estimated aid managed by the public sector for the development of this measure in the 2011-2020 period is83.0 M€.

Measure 13: Renewal of the air fleet (this measure includes transition actionsto the use of alternative fuels in the whole sector including airport vehicles).

Objective:

To introduce more efficient aircraft into air transport companies' fleets and able to use new alternative fuels.

To promote and incentivise the renewal of buses/shuttles and handling vehiclesthat travel around Spanish airport platforms including the use of new alternative fuels.

Description:

To promote the renewal of the current air fleet through the use of legislative measures that promotethe withdrawal of the most obsolete and less efficient aircraft and to improve the transition to the use of new alternative fuels, in line with the European Commission's policy on the use of 10% of alternative fuels in the transport sector in 2020.

For these new alternative fuels, the potential to reduce energy consumption in thewhole production cycle and use (life cycle) will also be studied.

To promote the renewal of handling vehicles and the introduction of alternative fuels in these vehicles.

Action mechanisms included in the measure:

> *Legislative*: the measure should be accompanied by sufficient policy-related and regulatory developments in order to guarantee its feasibility and establish a favourable framework for consolidating andimplementing the actions to be promoted. The legislative measures will be in line with the European Union's policieswith the aim of promoting the renewal of fleets to more efficient aircraft. To promote, through legislative measures, less efficient handling equipment.

> *Training*: an information line will be established between the authorities andcompanies associated with the air sector to provide information aimed at promotingenergy efficiency in the sector.

> *Information*: periodically, energy efficiency in the air sector and the use of new alternative fuelswill be promoted on a specific day.

> *Communication*: Communication campaigns will be performed concerning the efficiency of the differentalternative fuels and the efficiency of new handling vehicles.

Timeframe:2011-2020.

Group the measure is aimed at:

Representation of the air sector, the Directorate General of Civil Aviation, the Aviation Safety Agency, Senasa - Observatory for Sustainability in Aviation, IDAE/Ministry of Industry, Trade and Tourism,Airline companies.

Responsibility and

collaborators: Responsible: Ministry

of Public Works.

Collaborators: Ministry of Industry, Trade and Tourism/ IDAE, SENASA,Airline companies.

Aid managed by the public sector:

The estimated aid managed by the public sector for the development of this measure in the 2011-2020 period is10.7 M€.

Measure 14: Renovation of the maritime fleet

Objective:

To introduce more efficient boats and fuels other than diesel into the maritime transport companies.

Description:

This relates to setting up a working group, with representation of the naval sector,Spanish Ship-owners Association (ANAVE), Ministry of Public Works,IDAE/Ministry of Industry, Trade and Tourism, to study the best way to promote the introduction of efficient technologies and fuels into boats.

Action mechanisms included in the measure:

> *Legislative*: the measure should be accompanied by sufficient policy-related and regulatory developments in order to guarantee its feasibility and establish a favourable framework for consolidating andimplementing the actions to be promoted.

> *Training*: a collaboration line will be established with the authorities andcompanies associated with the naval sector to provide information aimed at promotingenergy efficiency in the sector.

> *Information*: periodically, energy efficiency in the sectorwill be promoted on a specific day.

> *Communication*: communication campaigns will be carried out aimed at the public concerningthe efficiency of the different modes of transport.

Timeframe:2011-2020.

Group the measure is aimed at:

Maritime transport and shipping companies.

Responsibility and collaborators:

Responsible: Ministry of Public Works.

Collaborators: Ministry of Industry, Trade and Tourism/ IDAE, ANAVE,maritime transport companies.

Aid managed by the public sector:

The estimated aid managed by the public sector for the development of this measure in the 2011-2020 period is20.4 M€.

Measure 15: Renewal of the automobile fleet

Objective:

The objective of this measure is to modernise the fleet of private and industrial vehicleswith up to 3,500kg of Maximum Authorised Weight (MAW) and motorbikes to take advantage of the greater energy efficiency of new vehicles and the advantages associated with the introduction of fuel and alternative technologies.In parallel, the necessary infrastructure will be promoted in terms of filling (alternative fuels) and electrical recharging (electric and hybrid vehicles that can be plugged into the electricity network)both for private (companies with fleets and individuals) and public use (private or public promotion).

Description:

The measure aims to promote the acquisition of new vehicles, private and commercial, with MAW up to 3,500Kg(type M1 or N1) and motorbikes, electric propulsion, hybrid or supplied by natural gas, liquid oil gases, orhydrogen through the awarding of financial aids that compensate for the extra cost of alternative vehiclesrelative tovehicles with equivalent design and traditional motorisation, as well as the installation of filling stations or electrical recharging points. They may be accessible to public or private physical or legal people.

Action mechanisms included in the measure:

> *Legislative*: the measure should be accompanied by sufficient policy-related and regulatory developments in order to guarantee its feasibility and establish a favourable framework for consolidating andimplementing the actions to be promoted.

> *Financial incentives*: awarding of financial incentives according to the type of alternative technology and fuel in question. These incentives will beaimed at breaking down the market barrier that assumes the extra cost associated with these technologiesand will bearticulated by aid programmes for the acquisition of vehicles running on alternative energies instead of conventional ones (petrol and diesel), for example, hybrid and elect6ric vehicles[52].

> *Training*: the line of training and collaboration with energy agencies and operational managers will be maintained for the execution of the Plan in the different Autonomous Communities.

> *Information*: the dissemination, in different formats, of the advantages that represent the new technologies and alternative fuels from the point of view of energy efficiency and emissions will continue.

> *Communication*: specific channelled campaigns will be carried out, mainly, through the network of energy agencies.

[52] From electric propulsion which might not be covered by specific plans to promote the electric vehicle.

> Other accompanying mechanisms: the municipal strategies for the improvement of the quality of urban air, following provisions in European Directive2008/50/EC, will establish increasing limitations in the incorporation of conventional rolling stock. Equally, referring to article 106 of Law2/2011, of 4 March, concerning Sustainable Economy on acquisition, by the contracting authorities, on clean and energy efficient road vehicles,which transposed Directive 2009/33/EC.These aid lines will be in line with the planning set out in the 2010-2012 Electric Vehicle Action Plan and the 2010-2012 Spanish Strategy for the Promotion of the Electric Vehicle (2010-2014).

Timeframe: 2011-2020.

Group the measure is aimed at:

Citizens and public or private companies and entities.

Responsibility and collaborators:

Responsible: Ministry of Industry, Tourism and

Trade/IDAE.Collaborators: Autonomous Communities.

Aid managed by the public sector:

The estimated aid managed by the public sector for the development of this measure in the 2011-2020 period is202.3 M€.

8.3 Table-Summary be measure in the Transport Sector

	Final energy savings (ktep)		Primary energy savings (ktep)		Emissions of CO_2 avoided (ktCO2)		Publicly managed aids (10^6 €)			Investments (Aid + private investment) (10^6 €)		
	2016	2020	2016	2020	2016	2020	2011-2016	2017-2020	2011-2020	2011-2016	2017-2020	2011-2020
TRANSPORT	6.921	9.023	8.680	11.752	22.922	31.177	515	481	996	1.595	1.509	3.104
Urban Mobility Plans	802	996	1.006	1.298	2.655	3.443	201,3	183,9	385,2	402,6	367,8	770,4
Transport plans for companies	408	508	512	661	1.353	1.754	46,4	42,3	88,7	92,7	84,7	177,4
Greater involvement in collective means of roadtransport	84	92	106	120	280	319	11,6	9,7	21,3	23,2	19,4	42,6
Greater involvement from rail transport	1.121	1.996	1.406	2.600	3.712	6.898	20,0	24,2	44,2	39,9	48,4	88,3
Greater involvement of maritime transport	-9	42	-11	55	-29	145	7,4	3,8	11,2	14,9	7,6	22,5
Transport infrastructure management	1.756	1.950	2.202	2.540	5.815	6.738	7,6	6,4	14,0	30,5	25,6	56,2
Road transport fleet management	401	445	503	580	1.327	1.538	29,2	24,5	53,6	116,7	97,9	214,6
Aircraft fleet management	-9	21	-11	28	-30	73	4,4	9,0	13,4	17,4	36,0	53,4
Efficient driving of private vehicles	497	493	623	642	1.646	1.703	11,4	8,5	19,9	22,8	17,0	39,8
Efficient driving of lorries and buses	607	602	761	784	2.010	2.080	9,1	6,8	15,8	18,1	13,5	31,6
Efficient flying of planes	-7	14	-8	18	-22	47	6,1	6,5	12,6	12,3	13,0	25,3
Renewal of road transport fleets	570	822	715	1.071	1.887	2.842	41,1	42,0	83,0	205,3	209,8	415,1
Air fleet renovation	-3	10	-4	13	-11	35	7,6	3,0	10,7	38,2	15,1	53,3
Maritime fleet renovation	-2	14	-3	18	-7	48	12,0	8,4	20,4	59,8	42,0	101,8
Renovation of the private vehicle fleet	705	1.017	884	1.325	2.335	3.515	100,1	102,2	202,3	500,3	511,2	1.011,5

Source: IDAE

Note 1: The aids managed by the public sector do not include aid for investment in infrastructure.

Note 2:The calculation of emissions of CO_2 avoided as a result of the saving and energy efficiency measures included in this plan are ad hoc calculations for the same and assume a translation of the savingscalculated using different base years (2004 and 2007), in terms of final and primary energy, to emissions of CO_2 avoided - this calculation does not necessarily coincide, therefore, with that achieved with different approaches or accounting bases aspart of the periodic reports produced in relation to the evolution of greenhouse gas emissions.

5. BUILDINGS AND EQUIPMENT

9.1 Current situation

Introduction

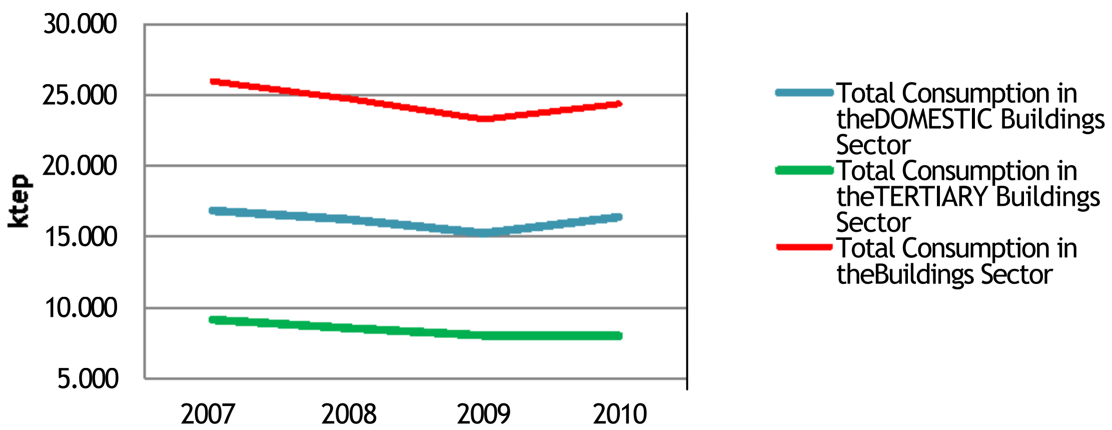
The*Buildings and Equipment* Sector includes, for the purposes of the 2011-2020 Saving and Energy Efficiency Action Plan,the services that have the greatest weight on the energy consumption of buildings, such as thermal installations like heating, air-conditioning, ventilation and sanitary hot water production, interiorlighting installations, as well as other typical equipment according to the activity sectors (electrical appliances, cold commercial and industrial and office equipment etc).

Evolution and distribution of energy consumption in the Buildings and Equipment Sector.

In 2010, final energy consumption in the Buildings and Equipment Sector was24.391 Ktep, with total national consumption for energy uses being93.423 Ktep, which represents 26,1% of final national energy consumption for energy uses.

Of this consumption, 16.377 Ktep corresponds to thedomestic buildings sector, that is to say 17,5% of national energy consumption and 8.014 Ktep in the tertiary buildings sector, which represents 8,6% of total national energy consumption. The evolution of previous energy consumption, in the2007-2010 period, is shown in the following graph:

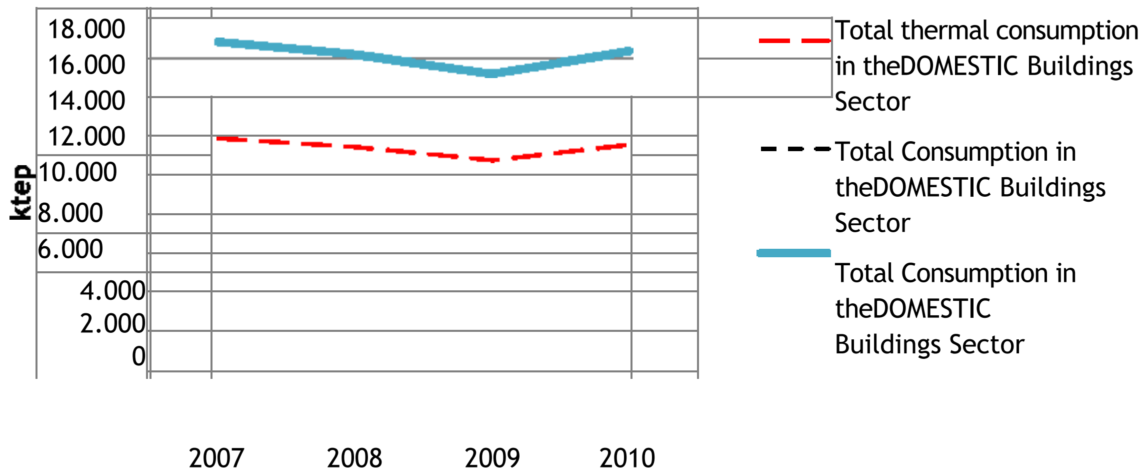
Graph 9.1. Evolution of consumption in the *Buildings* sector in the 2007-2010 period



Source: MITYC/IDAE

If consumption in the domestic sector is divided into thermal and electrical, we can see that thermal consumption is in the order of11.223 Ktep in 2010, but is double that of electricity consumption,5.154 Ktep, for the same year.

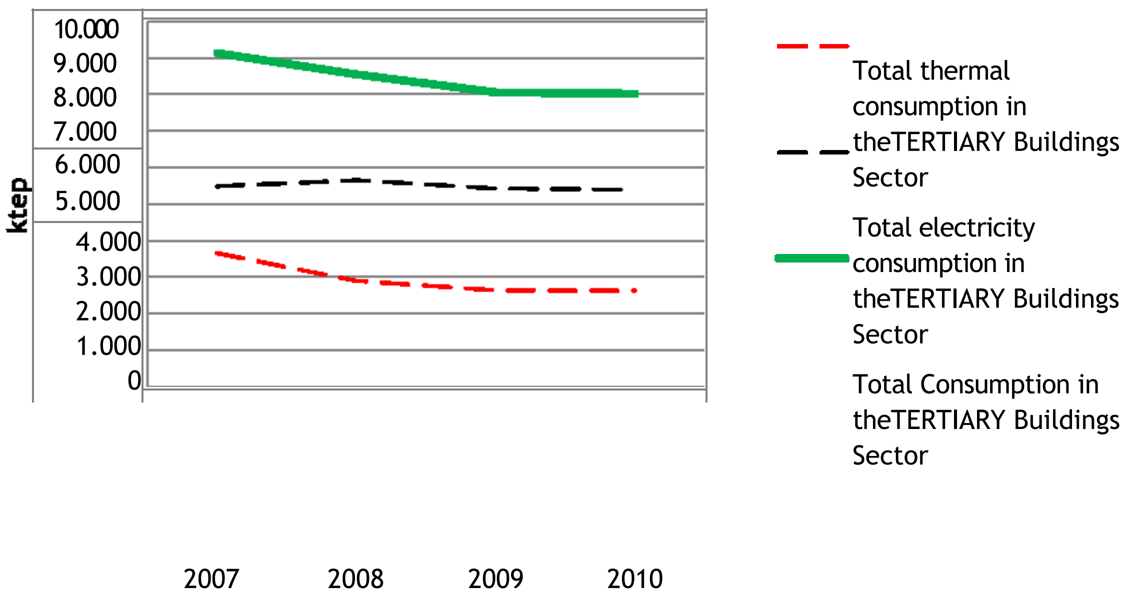
Graph 9.2. Evolution of consumption in the DOMESTIC *Buildings* sector in the 2007-2010 period



Source: MITYC/IDAE

In the case of consumption in the tertiary sector, we can see significant variation through the years,with an increase in electricity consumption (5.387 Ktep in 2010), compared with a fall in thermal consumption(2.627 Ktep in 2010).

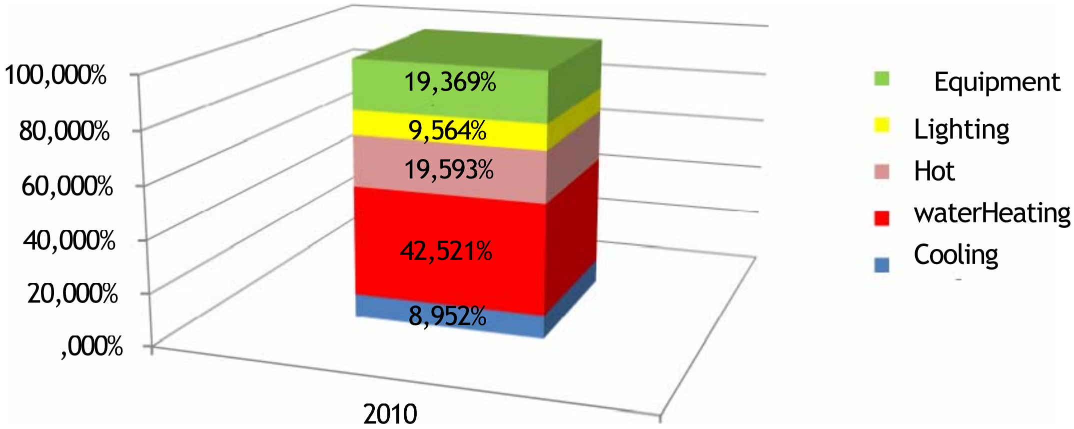
Graph 9.3. Evolution of consumption in the TERTIARY Buildings sector in the 2007-2010 period



Source: MITYC/IDAE

The assessment of final energy consumed in 2010 in the Building and Equipment Sectorindicates that more than 42,5% is destined for heating, followed by19,6% for SHW, 19,4% is used by equipment, 9,6% by lighting and8,9% for cooling.

Graph 9.4. Distribution of consumption in the *Buildings* Sector (2010)



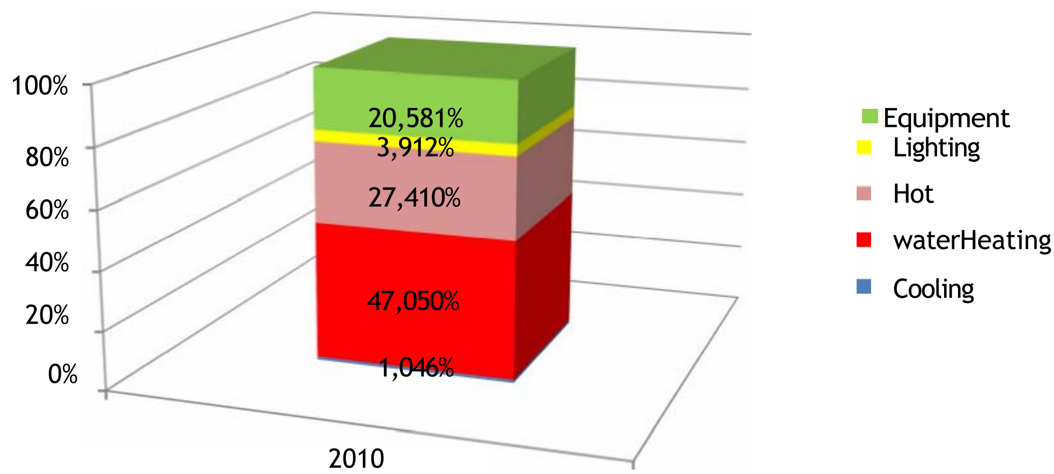
Source: IDAE

Distribution of consumption in the domestic sector

Final energy consumption in domestic sector buildings is distributed, by use, as follows: heating (47%), sanitary hot water (27,4%),equipment (20,6%), lighting (3,9%) and air-conditioning (1,1%). Airconditioning, given its seasonality, does not, nowadays, represent a significant percentage,although it contributes to generating peaks in electricity demand which contributes to causing local problems in terms of thecontinuity of the electrical supply in summer when outdoor temperatures are higher.

It should be noted thatthermal household installations (heating and sanitary hot water)represent almost three quarters of the sector's energy consumption.

Graph 9.5. Distribution of final energy consumption in the DOMESTIC *Buildings* Sector



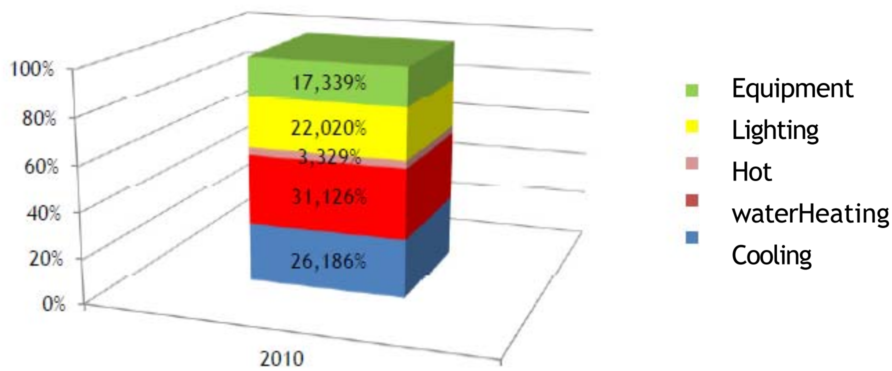
(2010)

Source: IDAE

Distribution of consumption in the tertiary sector

Thus with regard to the tertiary buildings sector, the distribution is different:heating (31,1%), air-conditioning (26,2%), lighting (22%), equipment(17,3%) and sanitary hot water (3,3%). We can see higher values for lighting and cooling,whilst they are significantly lower for sanitary hot water in the domestic sector.

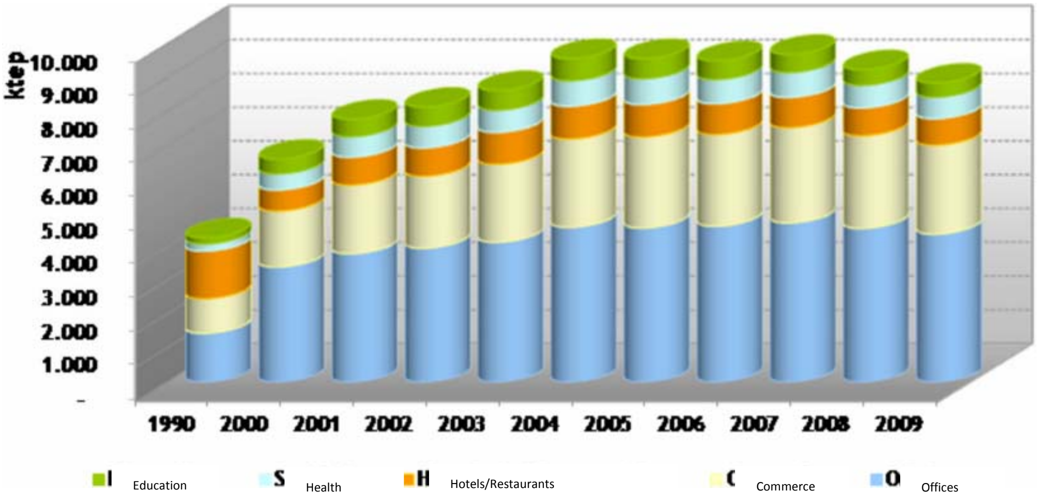
Graph 9.6. Distribution of final energy consumption in the YTERTIARY Buildings Sector (2010)



Source: IDAE

Within the distribution of consumption in buildings in the tertiary sector and uses other than household uses,buildings for administrative use are those that have a greater weight in total energy consumption in the tertiary sector (50%), followed bybuildings designed for commercial use (30%), restaurants and accommodation (8%), health(7%) and educational buildings (5%).

Graph 9.7. Consumption in the TERTIARY Sector (ktep)



Source: IDAE/MITYC

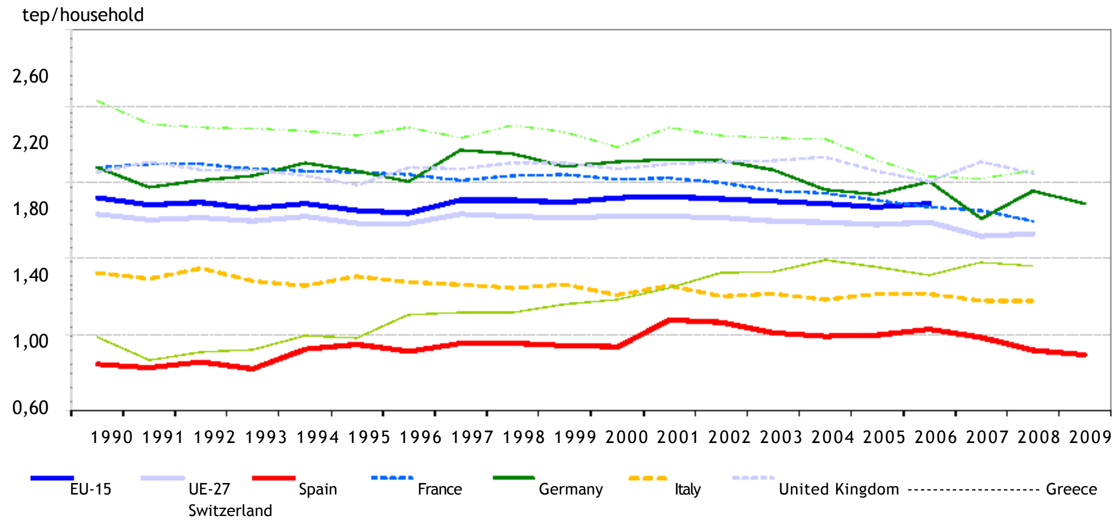
Energy evolution in the domestic sector

If the energy intensity in the Spanish domestic sector is compared to that in other European Union countries,we can see that energy intensity in Spain (0,92tep/household) is 40% below the European average (1,53tep/household), taking data from 2008 as a reference.

This situation is due, among other things, to our country'sgood weather, which means there is less need for heating, 48% according to data from 2008 compared with the European average of almost 70%.

The significant downward trend in recent yearsin terms of consumption per household in Spain fell from 1.03 tep/home in 2006 to 0,89 tep/home in 2009, a significantdecrease of13,5% as a result, at least partially, of the saving andenergy efficiency programmes realised in this country in recent years.

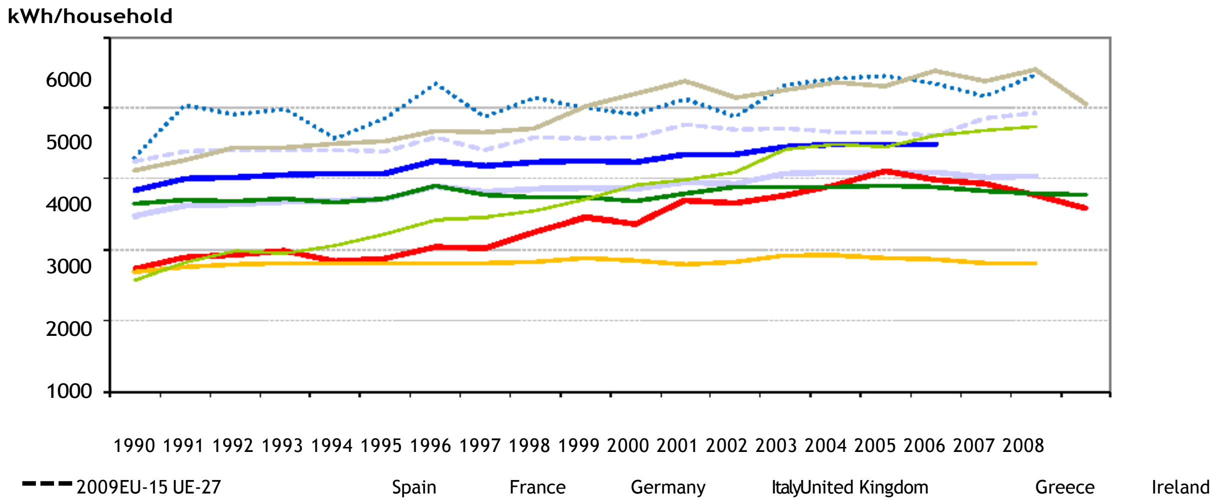
Graph 9.8. Energy intensity in the DOMESTIC sector with Climate Corrections in Spain and the EU



Source: EnR/IDAE/INE

However, comparing electrical intensity, we can see that in Spain in recent years, it is around the European average, whilst still being below it and with a downward trend. In 2008, electricity consumption per household in Spain was3.760 KWh, whilst, in the EU-27, it was 4.100 KWh. The start of the downward trend,which haws the steepest gradient for the countries represented in graph 8.9.,coincides with 2005, the year when the Saving and Energy Efficiency Action Plans approved within the framework of the E4 were introduced. Thedecline led, up to 2009, to a 12,6% reduction, increasing its decreasing slopefrom 2007.

Graph 9.9. Electrical intensity in the DOMESTIC Sector



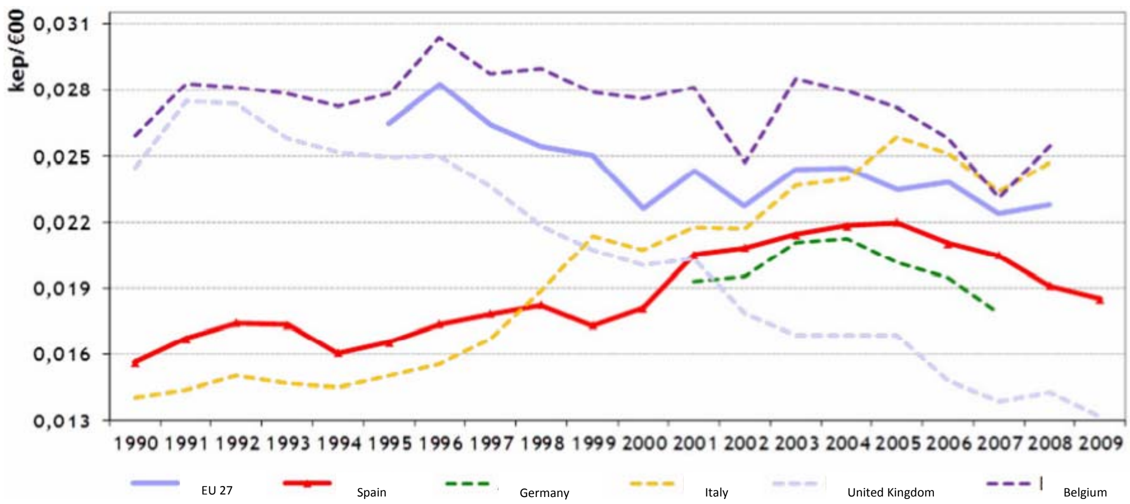
Source: EnR/IDAE

One of the reasons for the electrical intensity in the domestic sector is Spain's climate. In cold climates the demand for heating is covered by centralized boiler installations which use fuel, such as natural gas and diesel. However, in warm climates like Spain, a large percentage of existing homes do not have fixed individual or collective heating systems, and useequipment, electrical radiators in many cases.In recent years, both new and existing homes have been equipped withindividual or centralised installations, mainly using natural gas, as well as including sanitary hot water systemswith solar energy supportsince the approval of the Technical Building Code, which makes them obligatory, hence the downward trend in electricity use.

Energy evolution in the tertiary sector

The evolution followed by this indicator shows an upward trend, although below the European average,to achieve convergence with the European average at the start of the last decade. Since then, both indicators, national and European, have evolved in parallel, with both stabilising with a downward trend that, nationally, can be clearly seenfrom 2005, evolving below the European averagein the order of 20%, which is, currently, strengthened by theeffect of the crisis that Spain is going through, which leads to less economic activity in all areas in this sector, as well as a fall in productivity associated with the same.

Graph 9.10. Energy intensity in the TERTIARY Sector

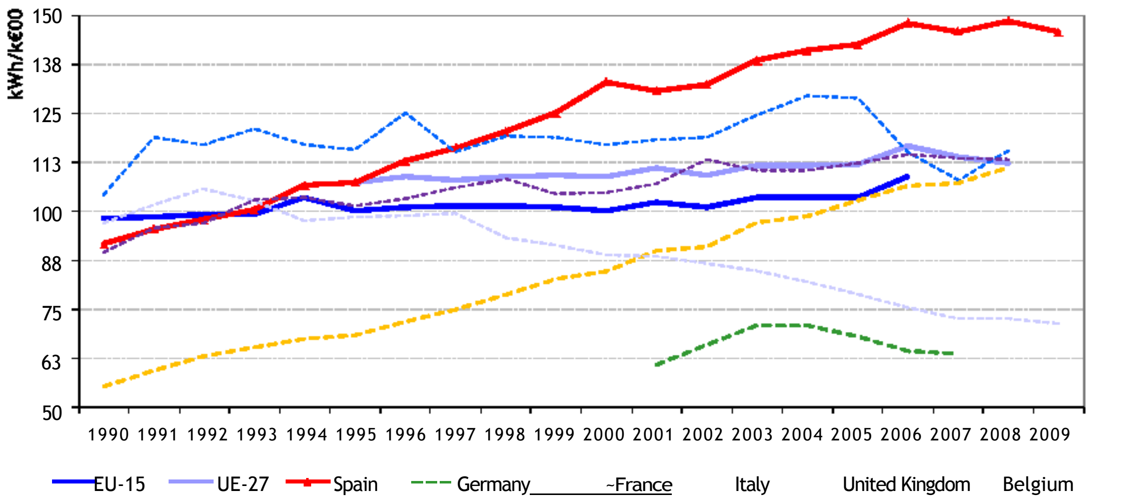


Source: EnR/IDAE

An assessment of the electrical intensity in this sector leads to different conclusions from thosedrawn for the residential sector, with an inversion of the previous situation being observed. In this case, the national indicator is around the European average and that for neighbouring countries.

Thus, according to the data available for 2008, the national indicator (148,5 KWh/€00) is higher than theEuropean average by 32%.

Graph 9.11. Energy intensity in the TERTIARY Sector



Source: EnR/IDAE

In the tertiary sector, electrical intensity is much higher than in the residential sector. Climate also plays an important role here. This circumstance is explained,among other reasons, by the increased weight that electricity consumption has in this sector, in the order of65%, well above that corresponding to the whole European Union, especially, the countries in the North,which have a higher demand for heating, covered mainly by fossil fuels.However, the increased national electricity demand,the majority being concentrated on office and commercial buildings, with over 80% of electricity consumption,associated with cooling requirements that are significantly higher than the European average as well as others associated with office equipment and lighting etc.

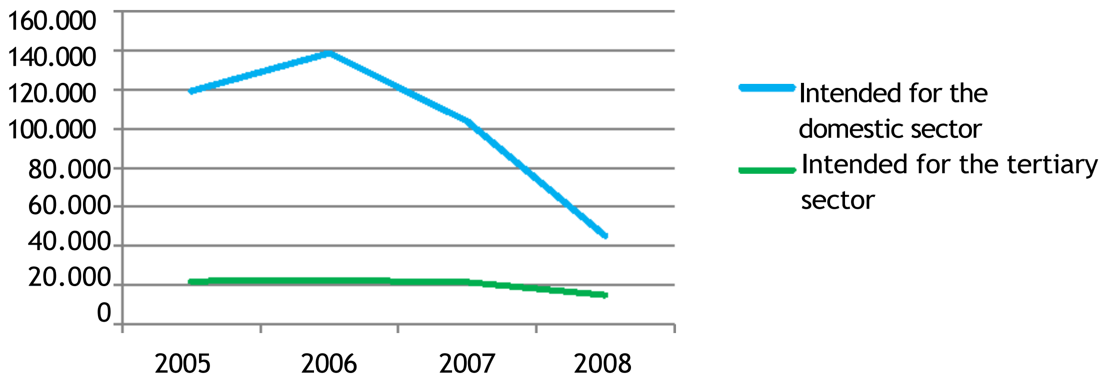
Evolution of sectoral

indicators*.Evolution of buildings*

One of the most significantindicators at the time of evaluating energy consumption in thebuildings sector is the evolution of its stock, due to the direct relationship it has withenergy consumption, also associated with the use of buildings and the climatic zone in which it is found.

The evolution of the surface area constructed in the 2005-2008 period remained almost constant in the tertiary sector, whilst it fell considerably from 2006 in the case of residential buildings. This evolution is analysed in more detail, in the following graph,from the data from the Ministry of Housing, for the 2005-2008 period,which shows thesurface area constructed annually, expressed in m^2constructed/year both for buildings for domestic use and those for other uses.

Graph 9.12. Evolution of the surface areas constructed in buildings

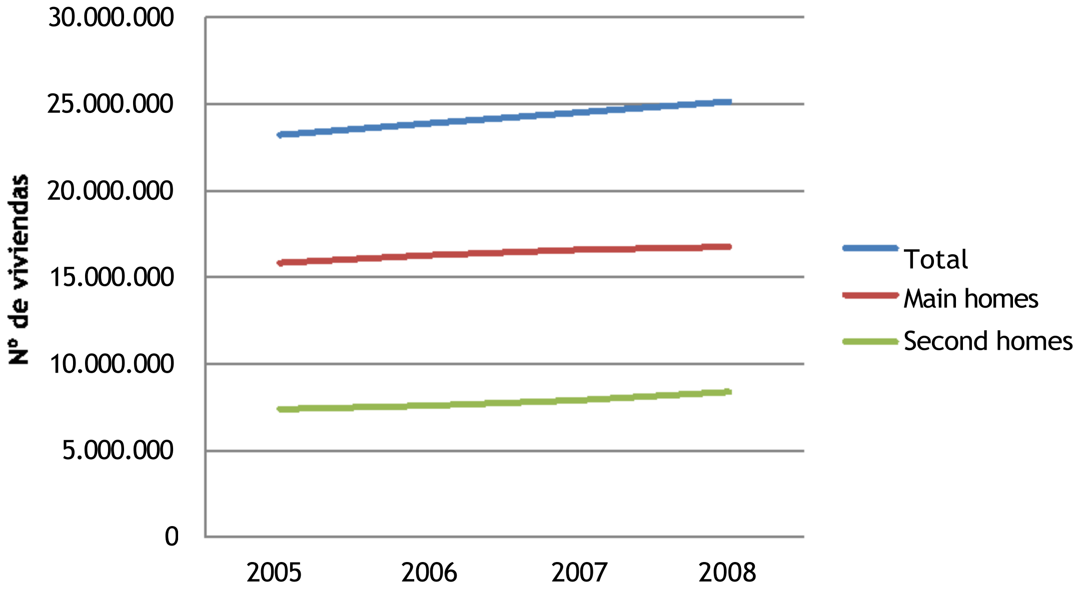


Source: Ministry of Housing

This marks the decrease in m^2 of surface area constructed intended for housing between 2006(around 140 mill. m^2) and 2008 (43 mill. m^2). Even though thesurface area constructed for homes continues being, in any case, above the values for the tertiary buildings sector(15 mill. m^2 in 2008).

The number of main homes was 25.129.207 in 2008, of which66,6%, that is to say, 16.747.294 are main homes and 8.381.913,33,3%, are second homes. The following graph shows the evolution in the number ofhomes constructed in recent years.

Graph 9.13. Evolution of homes in Spain



Source: Ministry of Housing

Evolution of the indicators

The measures carried out to improve energy efficiency in the sector in the periodforecast a 7% reduction in the domestic sector's energy ratio(tep/m^2), due to the simultaneous effect of a 3% energy saving and an increase in thesurface area constructed for homes of 5%.

For the tertiary sector, a 12% reduction in the energy ratio(tep/employee), due, solely, to the 12% energy saving achieved, since the number of employees in the sector has hardly changed.

Year	Ratio	2007	2010
Domestic sector	tep/m^2 per home	0,012	0,011
Tertiary sector	tep/employee	0,678	0,597

Assessment of the buildings sector

The activity related to saving and energy efficiency in the buildings sector is framed by theaction lines that propose two Directives:

- Directive 2010/31 /EC, of 19 March 2010, relative to energy efficiency in buildings,as a reworking of Directive 2002/91 /EC

- Directive2006/32/EC, of 5 April 2006, on the efficiency of the end-use of energy and energy services.

In terms of the Directive on the Energy Efficiency of Buildings, it sets out the minimum energy efficiency requirements that must be complied with, both new and existing,for its energy certification, as well as the regular energy efficiency inspections that are to be performed.

The transposition of this Directive is performed in legislative terms, incorporating Spanish law,through the specific administrative provisions, these mandates;in terms of financial aid, through the development of lines of funding and aid through Saving and Energy Efficiency Action Plans, co managedwith theAutonomous Communities, based on thereform and renewal of buildings, installations and buildings to improve their energy efficiency and, lastly,in the training, information and consciousness-raising plan, throughinformation programmes and campaigns aimed at players involved.

In terms of the Directive on the end-use of energy and energy services, the activity is also realised in these three respects. In the legislation,modifying the Public Sector Contracts Law, making thecontracting of energy services possible. In economic terms, lines of funding and specific aids have also been developed to support the execution of energy saving measures relative to ESCOs. And, finally, through training, information and consciousness-raising campaigns aimed both at ESCOs and potential clients. The exemplary role of the public sector should be highlighted through the preparation of two plans concerning thecontracting of energy services in a significant number of buildings.

The following sections provide a more detailed assessment of this situation.

<u>Assessment of the transposition and application of Directive 2002/91/EC in Spain concerning theenergy efficiency of buildings.</u>

- *Introduction*

The transposition of Directive 2002/91/EC from the European Parliament and Council of 16 December 2002 relative to the energy efficiency ofbuildings into Spanish Law has been realised, which sets out minimum energy efficiency requirements, regular energy efficiency inspections of thermal installations and energy certification of buildings through the following Royal Decrees:

- Royal Decree 314/2006, of 17 March, by approving the Technical Building Code (TBC)
- Royal Decree 47/2007, of 19 January, by approving the basic procedurefor the energy certification of newly built buildings.
- Royal Decree 1027/2007, of 20 July, by approving the Regulation on Thermal Installations in Buildings (RITE)

To these three provisions we can add a fourth, the Royal Decree concerning the energy certification of existing buildingsthat complements the transposition of Directive2002/91 into Spanish Law.

- *Minimum energy efficiency requirements for buildings and regular energy efficiency inspections of thermal installations.*

The minimum energy efficiency requirements covered by the Directive are transposed as follows:

Reduction in the energy demand from heating and cooling: The Technical Building Codeincludes a Basic Energy Saving Document. The first section of this documentbears the name HE1 - Decrease in energy demand whichreplaces the Basic Building Standard NBE-CT-79 concerning thermal conditions in buildings. Compliance with this requirement can be verified through a prescriptive option,using tables and other performance-based information, based on an information programme that comparesenergy demand from heating and coolingin the building in question with that of a hypothetical building reference that strictly meets current legislation.

*Output from thermal installations and regular energy efficiency inspections:*The energy efficiency of thermal installations relative to heating, cooling, ventilation and sanitary hot water production as well as the regular energy efficiency inspections areregulated by document HE2- Output from thermal installations, the context of which is developed by the Regulation on Thermal Installations in Buildings (RITE). This regulation regulatesthe design and sizing, assembly, maintenance and inspection of thermal installations.

The regular energy efficiency inspection of heat and cold generators (articles 14 and 15 of Directive 2002/91/EC) is obligatory for all heat generators with nominal thermal power greater than 20 KW and for allcold generators with nominal power greater than 12 KW and for the whole installationif it is more than 15 years old. This nationally-applied Regulationsets the minimum frequency of inspections depending on the type of fuel usedand the installation's nominal power which may be increased if the Autonomous Community, responsible for the same, considers it necessary. It is the responsibility of the Autonomous Communities to provide detailedregulations of the content of these inspections, including aspects such as documentary records, compliance with energy efficiency requirements, evaluation of the output from generators,the safety conditions for the equipment anda report on the installation and the proposal of measures to improve the same.

In addition to the foregoing, the Technical Building Code sets out the use ofthermal solar energy for the production of sanitary hot water and the heating of swimming pools in the HE4 section -Minimum solar contribution to sanitary hot water.

*Energy efficiency of lighting installations:*The energy efficiency of interior lighting installations isregulated in section HE3 of the TBC.It obliges compliance with an energy efficiency value for the installation, VEEI(W/m^2 x 100 lux), different according to the buildings' area of activity. It also includesobligations relative to the regulation and control of lighting and especiallywith the use of natural light.

Energy certification of buildings

*Energy certification of new buildings:*the Energy Certification of New Buildingsis regulated by Royal Decree 47/2007, of 19 January,by approving the basic procedure for the energy efficiency certification of new buildings, applicable tonew builds andmodifications, reforms or renewals of existing buildings, with auseful surface area of 1.000 m^2 where more than 25% of all their closures are renewed.

The recording, external control and inspection of the energy efficiency certificates is the responsibility of the Autonomous Communities. To realise the external control, the Autonomous Communities can delegate this task to organisations or entitiesaccredited in the regulatory field in terms of buildings and their thermal installations or qualified independent technicians. External control effectsthe certificates both for the project and the finished building. In addition to this control,the Administration has the option to inspectany certificate if it deems it necessary. In terms of violations and sanctions,these are those set out in Law 26/1984, of 19 June, generally for the protection of consumers and users,the reformed text of which is published in Legislative Royal Decree1/2007. To date the following Autonomous Communitieshave adopted legislation implementing the Royal Decree:Andalucia, Galicia, Canarias, Extremadura, Valencia, Navarra and CastillaLa Mancha. Cataluña has an unofficial record of energy certificates.We should point out the importance of introducing records, control and inspection in energy certification. A situationthat reinforces the new obligations set out by the energy efficiency Directive for buildingswhich among other things, obliges the performance ofstatistically significant random control and which should be performed by the Autonomous Communities.

Energy efficiency certification of existing buildings: this aspect of theDirective is to transposed into national Spanish law. The Sustainable Economy Lawhas been given a period of 6 months for its publication, which expires in early September 2011.

Application of energy certification in public buildings: Royal Decree47/2007 sets out that all buildings occupied by the Public Administration or by institutions providing public services to a significant number of people and that, consequently,are often frequented by them, with a useful surface area greater than1.000 m^2, will be required to display, somewhere clearly visible to the public, its energy efficiency label.

Lines of aid to improve energy efficiency in buildings

The 2008-2012 Action Plan includes a series of incentivesto improve energy efficiency in existing buildings enabling their voluntary adaptation tothe new minimum energy efficiency requirements set out by the new policy derived from the Directive andto be energy certified.The measures included are the following:Renewal of the thermal envelope, improved energy efficiency of thermal installations and interior lighting installations in existing buildings.

These measures are introduced by all the Autonomous Communities and are considered as priorities. They aim to reduce energy consumption by at least 20%, subsidised, generally, by 22% of the investment required. However, this amount may rise to 27% of the investment if the actionaims for the building to have an energy rating of B or up to 35% in it is an A rating.

A measure called "Construction of new buildings with high energy ratings"has been developed which subsidises the construction ofbuildings with A or B energy ratings. The amount of the grant varies according to the tripe of building (single family, multi-family or tertiary) and the rating obtained(A or B) from 50 €/m^2 for a single-family house with an A energy rating up to15 €/m^2 for tertiary buildings with a B energy rating.

The Ministry of Public Works has grants designed for the renewal of buildings and homes and thepromotion of new works with high energy rating insubsidised housing developments covered by the StateHousing and RENOVE plan 2009-2012 (PEVR). Within this Plan, there isa programme for "RENEWAL aids relative to renovation and energy efficiency" which is divided into two separate parts: the "programme of RENEWAL aids for the renovation of housing and existing residential buildings"— grants and loansagreed with or without funding aimed at financing the renovation of insulated buildings or housing, with aid of between1.100 Euros and 6.500 Euros perhousehold— and the "programme of aids for the promotion of energy efficiency in homes"—with aids of between 2.000 and 3.500 Euros per home, provided that the projects achieve an energy rating of A, B or C.

Within the framework of the PEVR, there is another programme of aids aimed at renewal in Integral Rehabilitation Areas (IRAs) and Urban Renovation Areas (URAs). This programme of aids constitutes grants and loans agreed without funding to finance rehabilitation/renovationin wholeneighbourhoods, including, as financeable aspects, both rehabilitation/demolitionactivities and newly built homes, and works to reurbanise neighbourhoods, the technical team that manages the aids and informs the neighbours and the rehousing of families in the case of demolitions.= In terms of rehabilitation actions, many of the projects will include works aimed at improving the energyefficiency of buildings, and in the case of demolitions and new builds, the efficiency will be improved with respect to the demolished housing.

Perspectives relative to the application of new Directive 2010/31/EC relative to energy efficiency in buildings.

- *Introduction*

The new Directive 2010/31/EU, of 19 May 2010, concerning the energy efficiency of buildings, as an adaptation of the previous Directive 2002/91/EC,sets out new objectives for the 2010-2020 period concerning minimum energy efficiency requirements,energy efficiency and regular inspection of thermal installations in buildings.

Spain has begun to define the road map that will guide us towards the objectives set out by the adaptation ofDirective 2010/31/EC and, in this sense, has started the transposition processboth for the minimum energy efficiency requirements in the Technical Building Code, RITE, as the energy certification the first revisions of which is scheduled for 2011 and 2012.

Generally-speaking, the Directive sets out and completes some aspects already dealt with in Directive2002/91 /EC however, in other case, it concerns significant modifications or new items such as the methodology for calculatingminimum energy efficiency requirementsand the promotion of buildings with practically zero energy consumption, as explained below.

- *Minimum energy efficiency requirements in buildings*

The Directive maintains the current obligation to set out some minimum energy efficiency requirements for buildings, The new item is that these minimum requirementsshould be set in accordance with a common "comparative methodological framework", developed by the Commission before30 June 2011 but the basic criteria of which is already defined in Annex III of the same. The requirements should be set out based on a"Optimal level of profitability" which will take into account the costs relative to investment, maintenance, operation and energy etc. calculated for the buildings' useful life. Therefore, an optimal profitability assessment is achievedbetween the investments made and financial savings achieved throughout the building's life cycle.

In the first revision of the forecasts up to 2020, the TBC's Basic Energy Saving Documentwill perform the necessary and convenient confluence of the TBC with the energy rating, setting out new and stricter basic energy efficiency requirementsbased on this rating. This convergence will allow the following revisions to be made in a rational and scalable manner so as to achieve the ambitiousobjectives set out in the Directive for 2020. In addition, special attention should be given to reducing energy consumption in services, such as lifts or other transport elements, office equipment and data processing centres,where current technology allows significant energy savings to be achieved. Therefore, some minimum energy efficiency requirements may be developedcomplemented by financial aids through specific RENOVE plans.

As a consequence of the foregoing, energy certification and energy rating,as complementary policy-related processes, one linked to transparency objectives in the market, with its ownR.D., and the other to the basic energy efficiency requirements that will form part of the revised TBC,will be key elements in theregulatory energy policy for buildings,providing unity and consistency to the same. Also, in the non-regulatory sense, they will remain the basison which the incentive and aid policies are established. Overall,this energy efficiency energy certification process for buildings is considered as essential to the effective and committed participation of the Autonomous Communities.

In addition, in accordance with that set out in the new Directive,a disciplinary regimen is expected to be approved in terms of energy certification to guarantee its effective realisation.

In terms of existing buildings, outside of that already general specified,there is the intention, through the future Law on the Quality and Sustainability of Urban Environments, to encourage the introduction of energy certification for said buildings,planned as a compulsory part of Technical Building Inspections.

Buildings with practically zero energy consumption

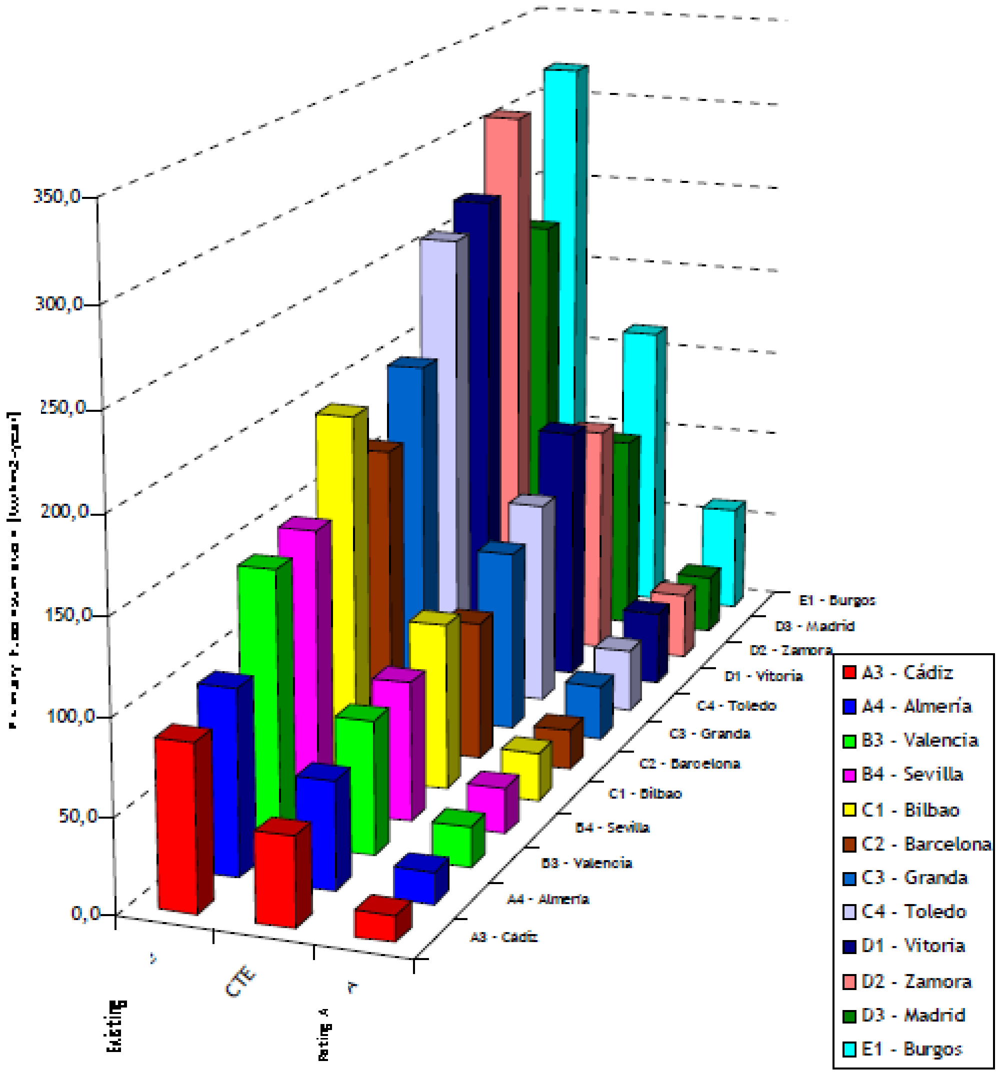
Article 9 of the Directive indicates that all buildings built in the different Member States from 31 December 2020,should be buildings with practically zero energy consumption, ahead of this requirement on 31 December 2018 for new buildings that are occupied by and are the property of public authorities.

Buildings with almost zero energy consumption are those, with a very high energy efficiency level, in which the almost zero or very low amount of energy requiredshould becovered, in large part, by energy from renewable sources, includingenergy from renewable energies produced insitu or nearby.

This definition of buildings with almost zero energy consumption, in each Member State,should reflect their national, regional or local conditions and include anumerical indicator of primary energy use expressed in KWh/m^2 for the year.In addition, some intermediate objectives should be defined for 2015 so as to improve the energy efficiency of new buildings.

Despite not having defined, for the moment, the conditions that a building with almost zero energy consumptionshould comply with in Spain, we can make an estimate of the energy demand that these types of buildings should have based on the current energy efficiency rating scale for buildings.

The current energy rating procedures for new buildings calculate the final and primary demand and the emissions of carbon dioxide for each distinct use of the building, comparing this with a scale defined for the case ofsingle-family housing and project housing and with a reference building that strictly complies with the policy for tertiary buildings. Based on theenergy efficiency rating scale for buildings, already defined for Spain,both for new and existing buildings, approximate savings may be inferredthat involves the construction of new buildings according to the currentpolicy and those that involve the application of Directive 2010/31. In the case ofthe final energy demand in heating and cooling for households we have, for each of the climatezones that the Spanish territory is divided into, the following.



We can see that the primary energy saving, in heating and cooling,between an existing multi-family house in 2006 anda building that complies strictly with the Technical Building Code is approximately50%, this percentage being 70% for a multi-family homethat complies strictly with the Technical Building Code and a class A building in terms of primary energy consumption in heating in cooling.

Therefore, if we take as a basis the fact that the definition of a building with almost zero energy consumptionwill be based on the work already developed relative to the energy efficiency rating of buildings and supposingthat something very different is not implied to that currently considered as class A, from 2021 all buildings constructed in Spainshould have primary energy consumption that is 70% less that under the current policyand 85%less than buildings representative of the stock for 2006.

For tertiary buildings, the scale is self-referential however, given the same,the saving percentages for a building representative of the stock in 2006, one which strictly complies with the current policy and a building with almost zero energy consumption arte, approximately, the same as for houses.

Dynamisation of the energy services market in the buildings sector.

Directive 2006/32/EC from the European Parliament and Council, of 5 April, on the final use ofenergy and energy services, sets out a regulatory framework for efficiency in the final use of energy and energy services.

In the public buildings sector, there is significant energy saving potential that, to a certain extent, is difficultrealise in practice due to the presence of a series of administrative, legal, financial and technological barriers that make it difficult. Thus, for example, in the public sector's budget, the part intended for investment in energy-consuming technologies is different to that intended for the maintenance and energy supply of this same equipment. Thisdivision in unrelated areas causes difficulties when renewing equipment with energy efficient criteria. The energy services try to solve thisproblem with a single energy purchase contract, its energy maintenance, the maintenance of the energy-consuming installations and the realisation of saving and energy efficiency measuresand the use of renewable energies.

The promotion of this business model requires a legal framework that offers adequate security and stability,improved access to funding for energy servicescompanies and the improvement of public contracting in this area.As proposed in the Directive, the public sector should begin energy efficiency projects and stimulate efficient behaviour in terms of energy.Therefore, it is necessary for the public sector to promote, worth actions in its own patrimony,the realisation of investments aimed at improving the energy efficiency of its buildings in a global and comprehensive manner,which affects the contracting ofthe energy supply, energy management, the maintenance and execution of savingand energy efficiency measures and the use of renewable energies.

For this reason, the development of the contracting of energy services in our countrythrough companies in the private sector will help to achieve the energy saving objectives and will assume the necessary stimulus of the private initiative for the creation of a competitive and dynamic energy services market.As a result it is expected thatthe increase in contracting of energy services in the public sector contributes to the creation of new companies and the refocusing of the business model and the business strategy from others to the energy efficiency sector.

The promotion and dynamisation of the energy services in Spain was realised through the publication of the Directive mainly throughactions directed by the public sector, or modified by Law30/2007, of 30 October, concerning Public Sector Contracts to accommodate contracts such as the Public Private Collaboration Contract (PPCC) which will allow the contracting of energy services and the realisation of two plans that will promote the contracting of energy services companies in the General State, Autonomous and Local Administrations.And in particular with the publication of Royal Decree Law 6/2010, of 9 April, concerning measures for the promotion of energy recovery and the use that in its Chapter V, relative to measures in the energy sector,incorporates the concept of energy services companies into Spanish law.In addition, through article 20, some aspects are modifiedfrom the regulatory framework concerning contracts from the public sector, to make the contracting processesrelative to energy services companies with public administrations more dynamic,as a formula particularly effective for the dynamisation of the sector and energy saving.

Within the Public Administration, two plans were approved concerning the promotion of energy services in this sector:

- Energy efficiency action plan relative to the State General Administration's buildings: published on 14 January 2010 known asPlan 330 ESEs, approved by the Council of Ministers on 11 December 2009.Its objective is for there to be 330 energy consumer sectors belonging to the State General Administration, reducing their energy consumption by 20% in 2016, through the realisation of saving and energy efficiency measures,in the form of energy services contracts,realised by energy services companies (ESCOs).

- Plan to promote the contracting of energy services (Plan 2000 ESEs):approved by the Council of Ministers on 16 July 2010. The objective of this new plan was to achieve an energy saving in 2,000 publicly-owned energy consumer centres. The Plan is divided into three action sub programmesaccording to the owner of the energy consumer centres:Local Administration, Autonomous Administration and General State Administration sub programme.

Both plans have a financial aid line formed of:

o A funding line called "ICO line - Sustainable Economy" which mayinclude the Energy Services Companies awarded tendersderived from the execution of this Plan to realise investments in saving and energy efficiency measures.

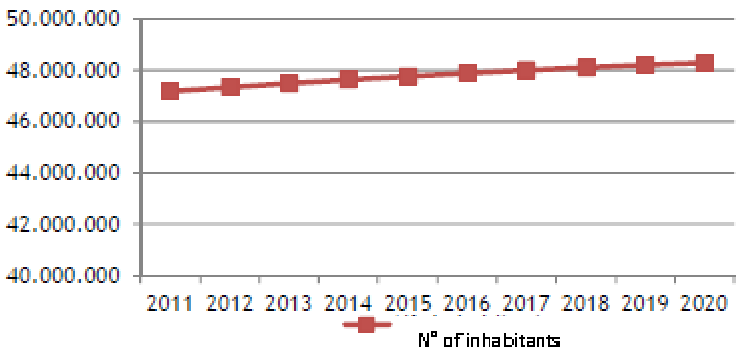
o A financial and incentivisation aid line is aimed at the ESCOs to realise the investments in saving and energy efficiency measures within the EEP.

9.2 Assessment for the 2011-2020 period

The evolution of energy consumption in the Building and Equipment Sector and, especially, in homes,will be affected by two indicators in the 2011-2020 period: the evolution of the population and the number of homes.

Therefore the evolution of the population, as shown in the following graph,shows that average growth is expected in the 2011-2020 period, according to data from the INE, at 120.000 inhabitants/year, which will lead to atotal growth in said period of 2.5% of the population in Spain, going from47.183.010 million inhabitants in 2011 to 48.294.898 million in 2020. That is to say,an increase of 1.1 million in this period.

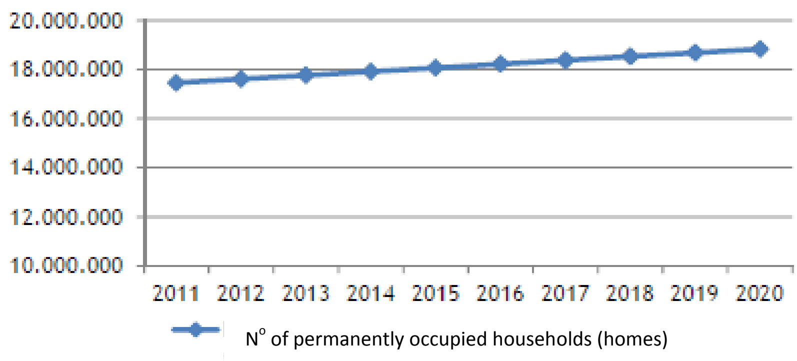
Graph 9.15. Forecast of the evolution of the population considered in the Plan



Source: IDAE

In terms of the evolution in the number of homes, the following graph showsthat, according to data from the INE, the average growth in the number of homes in the 2011-2020 period is expected to be 138,000 homes annually, which will meana total growth of 7.9% in said period.Therefore, the average home will change from2.7 people in 2011 to 2.56 people in 2020. Thus,the number of homes will increase by 1.3 million, changing from17.456.956 million in 2011 to 18.837.769 million in 2020.

Graph 9.16. Forecast of the evolution of homes considered in the Plan



Source: IDAE

A way of measuring the energy efficiency evolution in the building sector is through the energy rating of buildings.Newly built buildings or existing oneswith a useful surface area greater than 1.000m^2 that have undergone a modification, reform or renewal, where more than 25 percent of all their closures have been renewed, should have anenergy efficiency certificate.

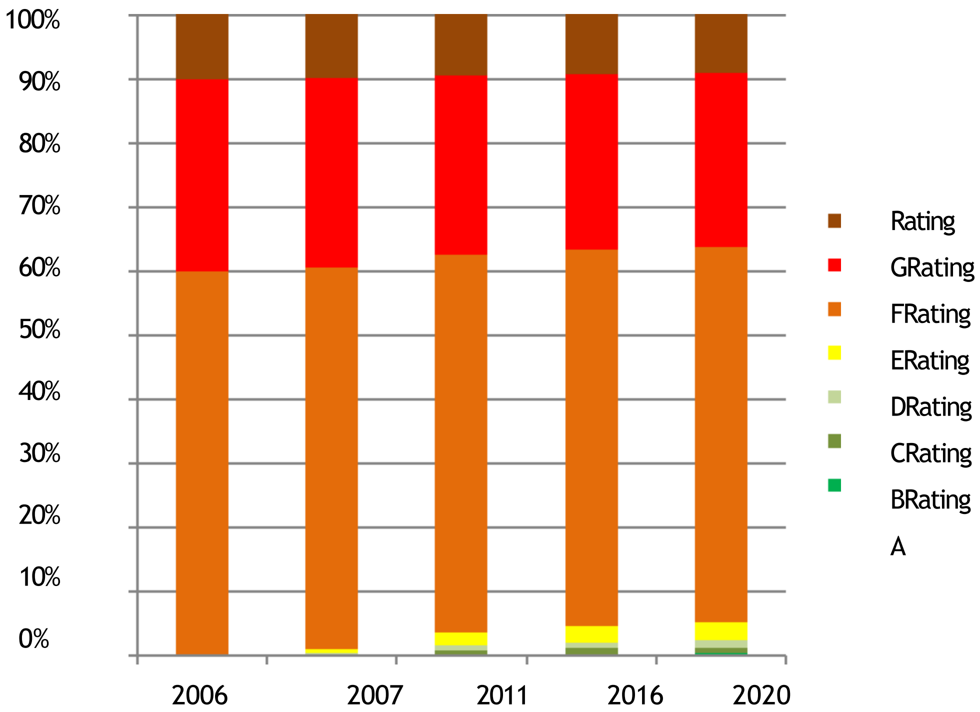
Based on the data available on energy certificates that have been registered by the Autonomous Communities' competent bodies as of 2007 and studies performed on the level of the energy efficiency of the existing stock, the following graph has beencreated. The information available only refers to the Autonomous Communities ofCataluña, Extremadura, Galicia and Navarra, therefore is not very representative of the national situation. We should remember that the number ofAutonomous Communities having introduced an energy certificate registry is very low, despite four years having passed since the basic procedure entered into force in 2007.Attention is drawn to the lack of this datameaning that Spain is not able to meet its obligations as a Member State with the European Commission,so effective autonomous collaborationshould be encouraged and in good time in the development process relative to the autonomous legislation that sets out registration, control and inspection mechanisms.

We can see that buildings in the current building stock, constructed prior to the TBC,are mainly in efficiency classes E and Fand only from 2007, with the entry into force of the Royal Decree concerning certification and the TBC,and have started to slowly evolve to better classes, mainly D.The new buildings constructed or renewed in recent years have contributed to this.

It should be noted that the data shown in the graph only refers to buildings that have received an official certificate(new buildings and those having undergone significant renewal) and not to existing buildings that, in this period,have undergone some type of energy reform, but are not obliged to obtain a certificate. For example, changes to boilers, improved glasswork and woodwork or to the lighting system. In these there has been an improvement in their performance class,but it is not shown with an official certificate. From the entry into force of the new Royal Decree concerning energy certification of existing buildings, we have more specific knowledge of the situation of the stock to the extent that this stockof buildings will be energy rated.

From 2007, when the *Energy Certification of Newly Built Buildings* came into force,gradual growth has been seen in the percentage of surface area of buildings with high energy rating, A and B.During the 2011-2020 period,the figure is expected to be 1% of the surface area of the building stock in 2011 and 1.4% in 2020.

Graph 9.17. Forecast of the evolution of the energy class of buildings considered in the Plan.



Source: IDAE

This low level of penetration of buildings with high energy ratings relative to the stock of existing buildings is due, mainly, totheexpected decrease in the construction of new buildings in the 2011-2020 period(3,7% increase in the 2011-2020 period). For example, in the case of homes, the forecast for the evolution of homes in this period is almost flat. Although considering thatthese new buildingswill have a minimum energy rating of C, once the Technical Building Code is modified, and will promote— thanks to this 2011-2020 Action Plan and the aid from otherpublic policies from the State Administration, as is the case for the currentState Plan for Housing and Renewal, and in their case with the plans that continue until2020— the construction of buildings in classes A and B andbuildings with almost zero energy consumption, their weight in relation to the stock constructed will be low.

Secondly, the renewal of buildings, which may be another way to improve their energy ratingbut is also not expected to achieve a high number of actions either. To realise the previous energy rating forecasts,13% of existing homes should be renewed by 2020.In addition, in the case of renewals, they are known to be very technically difficultdue to actions that improve energy efficiency, which makes it more difficult to achieve an A energy rating that in a new building.Thus, during the 2011-2020 period, actions are only expected to improve the energy rating of 1.4% of the stock by 2020.

Here the induced effects from the future Royal Decree concerningenergy certification in existing buildings are considered.

The previous graph only refers to improved energy efficiency achieved through theofficial expedition of the energy certificate both for new and existing buildings. However, the Plan foresees actions to improve the energy efficiency inexisting buildings that are not obliged tohave energy certification and that nevertheless will improve their rating. Logically,this is not taken into account in the previous graph, which only refers to buildings that have obtained a formal certificate.

Another aspect affecting energy consumption, both for the domestic and tertiary sector, is thedegree of penetration of energy-consuming equipment,which has suffered significant changes in recent years,with changes also being expected in the coming years.

Firstly, the evolution in the use of electrical appliancesin the home must be taken into account. In 2011, fridges and washing machines already havea degree of penetration of 98,9% and 96 % respectively, these being the highest penetration values for white goods. The evolution is increasing for electric cookers compared withnon-electric dual cookers, which may account for74% of homes in 2020, compared with gas cookers which reduced their penetration from 37 % to 22 %.The use of dishwashers also increased from 44 % to 53 % and ovens from65 % to 80%.

In terms of the expected evolution in the energy consumption of electrical appliances in the 2011-2020 period,an increase is expected due to the increased penetration of these appliances in Spanish homes, going from4.864 Ktep in 2011 to 5.514 Ktepin 2020. It is important to note the decrease in the consumption of fridges from 263Ktep to 203 Ktep in 2020, despite maintaining their penetration, and the same effect for washing machines from168 Ktep to 131 Ktep in 2020, due to the improvements in the energy classes of these appliances.

For the 2011-2020 period, this Action Plan sets out actions to reduce, both the energy demand for heating and cooling(improvements to the thermal envelope of buildings), and to improve the energy output from theclimate control, and lighting installations that consume the most energy. In the case ofnew buildings, the strategy is focused on the promotion of buildings with high energy ratings (classes A and B)and on the development of a specific plan for buildings with almost zero energy consumption. In terms of domestic or commercial equipment, it will be focused on the improved energy efficiency ofthe stock of electrical appliances and cold commercial installations.

The forecasts for national consumption in 2020 in terms of final energy point toan increase in the weight of consumption in the buildings sector on final energy consumption for energy uses, going from 26% in 2010 to 28% in 2020.

Likewise, a 3% reduction in the domestic sector's energy ratio is forecast(tep/m^2) because it simultaneously reduces consumption by 2% and increases the surface area constructed in homes by1%.

On the other hand, an 8.5% reduction in the tertiary sector's energy ratio is expected(tep/employee), due to the expected 6% increase in consumptionand the number of employees in the sector increasing by 20%.

		Year 2010	Year 2020
Domestic sector	tep/m^2 home	0,0114	0,0110
Tertiary sector	tep/employee	0,655	0,599

To avoid this percentage going above these forecasts, it is necessary to introducemeasures that include the Saving and Energy Efficiency Plan for this sector,described in the following section, and which enables savings of2.674 and 2.867 Ktep to be achieved in 2016 and 2020 respectively.

Year	2016	2020
Savings by efficiency (Ktep)*	2.673,78	2.866,96

Savings in 2007

9.3 Measures in the Building and Equipment Sector

Measure 1: Energy renewal of the thermal envelope in existing buildings

Objective:

To reduce the energy demand in heating and cooling of existing buildings, through the energy renewal of the thermal envelope as a whole or the renewal of some of the elements comprising it.

Description:

This measure aims to promote the energy renewal of the thermal envelope in existing buildingsso that they comply with and improve the minimum requirements set outby the Technical Building Code reducing energy consumption in heating and cooling.

The energy actions considered within this measure will be those that achieve areduction in the energy demand for heating and cooling in buildings,through actions on their thermal envelope and justified in documentary terms. The thermal envelope is understood as that composed of the building's closures that separatethe habitable premises fromthe outside environment (air, ground or another building) and the internal partitions that separatethe habitable premises from non-habitable premises, which are in contact with the outside environment.

The energy actions concerning the thermal envelope may involveconventional or unconventional construction solutions. Conventional construction solutions are understood as those usually used in buildings toreduce their energy demandsuch as, for example, those that affect facades, roofs,external carpentry, glassworks and solar protections. Unconventionalconstruction solutions are understood to be those usually known as"bioclimatic architecture" measures such as, for example:trombe walls, parietodynamic walls, attached greenhouses, shading systems and natural ventilation etc.

Action mechanisms included in the measure:

> *Regulatory*: The setting of the minimum energy efficiency requirementsthat the thermal envelope of both new and existing renewed buildings must comply with are those set out by the Technical Building Code. During the Plan's period of validity, these requirements from the Technical Building Code will be gradually modified in line with Directive2010/31 /EU relative to energy efficiency of buildings and their methodological framework that links the energy efficiency aspects with the savings through calculation of the optimal level of profitability during the building's useful life.

On the other hand, the approval of the energy certification procedure for existing buildingswill enable an objective valuation to be performed on the improved energy efficiency of the building linked to the energy class achieved after the reform proposed. In the case of the existing buildings for which the application ofthe certification is obligatory, a list is provided of the measures that improve the energy rating startingat one or two levels.

> *Financial incentives*: the aid mechanisms may be based on direct capital grants or bonus interest rates on loansrequired tomake the investment or any others that are suitable for the measure.

The actions that affect a large number of buildings, such as the renewal of neighbourhoods, will be considered as preferred actions.This also applies to those thatare realised through "RENOVE plans “aimed at specific citizen actions particularised by the renewal of hollow closures (windows and woodwork), roofs and facades independently.Thiswill be linked, as far as possible, to the financial incentives for the obtainment of energy rating levels, especially relative to comprehensive renewals.

Given that in terms of the viability of these measures, the weight of the civil work andauxiliaryinstallations such as scaffolding is very important to the financial incentives thattake this particularity into consideration.

> *Training*: as an accompaniment to this measure, training activities will be designed and realisedwhich may include, for guidance and with a non-limitative character,more in-depth courses aimed at designers, facultative management and agents responsible for the external control of the energy policy in this area,appropriate to the functions performed by each of them in this process. This includes courses forthe management of energy certification software for existing buildings.

> *Information*: with the aim of promoting the information betweenthe recipients of the more energy efficient equipment and systems, databases will be made available on the IDAE's website, in collaboration with the sector's associations.To guarantee the veracity of the information contained in the database, the databases will be subject to suitable veracity checks.

Timeframe: 2011-2020

Group the measure is aimed at:

Public or private physical or legal people (building owners,public or private promoters, communities or neighbouring commonwealths,municipal housing companies and energy services companiesetc.).

Responsibility and collaborators:

The organisations responsible for the execution and follow-up of the measure are the Ministry of Industry, Trade and Tourism/IDAE and the Ministry of Public Works in collaboration with the Autonomous Communities.

Actions and planning:

Therefore, actions relative to the reform or renewal of the thermal envelope in existing buildingswill affect 58.1 million m^2/year of surface area constructed.

In total, for the renewal of the envelope for 581 mill. de m^2 of surface area constructed will requirean investment relative to the overrun for efficient technology of5.594 M€.

Aid managed by the public sector:

The estimated aid managed by the public sector for the development and promotion of this measurewas obtained as a percentage contribution to the total investment required, since the rest of the investment will be realised without aid as an induced effect of the promotion of this measure in the sector. The total aid managed by the public sector in the 2011-2020 period will be 1.109,5 M€.

Measure 2: Improved energy efficiency of the thermalinstallations in existing buildings

Objective:

To reduce the energy consumption of thermal installations for heating, climate control and the production of sanitary hot water in existing buildings.

Description:

This measure aims to improve the energy efficiency of thermal installations in existing buildingsthat are renewed, so that they comply, at least, with and improve the minimum requirements set outby the current regulations, reducing their energy consumption.Thermal installations relative to heating, climate control and sanitary hot water are those designed to achieve the demand in terms of the thermal and hygiene well-beingof people in existing buildings.

The energy actions considered within this measure will be thosethat achieve an annual reduction in conventional energy consumption throughactions in their heating, climate control and sanitary hot water production installations and justified in documentary terms. In addition, they should comply with the requirements set out in theRegulation on Thermal Installations in Buildings(RITE) and other regulations in force in the field.

The energy actions may be, with a guidance and unlimited character, the following:

> Replacement of heat and cold producing equipment with others with high energy ratings,selected based on greater energy output,both for individual and centralised installations.

> Replacement of equipment for moving heat transfer fluids by others with high energy ratings. This includes improving the thermal insulation ofpiping networks and equipment that reduce the losses in the carriage of thermal fluids.

> Free cooling systems for outdoor air and heat recovery from air extraction.

> Systems that combine conventional equipment with evaporative techniques that reducethe installation's energy consumption: evaporative cooling,evaporative condensation, evaporative pre-cooling of the condensation air,direct and indirect evaporative cooling prior to therecovery of heat from air extraction etc.

> Control systems and regulation equipment and/or installations that save energy, for example,depending on the variation in the outdoor temperature, the presenceor the needs of the user. Telematic management systems for thesupply of sanitary hot water for buildings that enable the control ofsanitary hot water and energy consumption, to limit the maximum instantaneous flow, the maximum volume used including thecut in supply per home/station. Taps for the control and management of sanitary hot waterat consumption points, which enable optimal and rapid regulation of temperature and flow,controlled directly

by the user and through telematic systems, to manage and controlthe instantaneous consumption, the outflow volume and the maximum consumption volume of this. Measures required to introduce accounting and telemanagement of energy consumption.

> Integration of the thermal subsystems in a domestic system that enables communication between the different systems,so that these interact with each other and can be controlled locally or remotely.

> The new installations relative to centralised urban and district heating and cooling systems or that serve various buildings, as well as the reform andamplification of existing ones. They will includegeneration equipment, the laying of pipes for heat transfer fluids,their regulation and control systems, and the civil work directly attributable to the installation of the same.

Timeframe: 2011-2020.

Action mechanisms included in the measure:

> *Regulatory*: the setting of the minimum energy efficiency requirementsthat both new and existing thermal installations must comply with are those set out by the Regulation on Thermal Installations in Buildings. During the Plan's period of validity, these requirements will be gradually modified in line with Directive2010/31 /EU relative to energy efficiency of buildings and their methodological framework that links the energy efficiency aspects with the savings through calculation of the optimal level of profitability during the building's useful life.

On the other hand, the approval of the energy certification procedure for existing buildings will enable an objective valuation to be performed on the improved energy efficiency of the building linked to the energy class achieved after the reform proposed. In the case of the existing buildings for which the application ofthe certification is obligatory, a list is provided of measures that improve the energy rating on one or two levels. And also through the recommendations proposed for theenergy efficiency inspection of thermal installationsset out by the RITE for all complete installations older than 15 years and periodically for heat and cold generation systems. In the revision of the RITE, the prohibition of the use of solid fossil fuelsin thermal installations in buildings is regulated.

To the extent that energy labelling systems are developedfor specific equipment or modifications to existing ones will be link the Plan's objectivesto the improved energy efficiency classes available on the market.

> *Financial incentives*: the aid mechanisms may be based on direct capital grants or bonus interest rates on loansrequired tomake the investment or any others that are suitable for the measure.

The actions that affect a large number of buildings, such as the renewal of neighbourhoods, will be considered as preferred actions. In addition, those that are realised through "RENOVE plans" aimed at specific actions for citizens particularised for the renewal of equipment and systems. Thiswill be linked, as far as possible, to the financial incentives for the obtainment of energy rating levels, especially relative to comprehensive renewals.

The measures supported by the opinion held by the agent authorised to perform the periodic energy efficiency inspectionset out by the RITE will be prioritised.

> Training: as a complement to this measure, training activities will be designed and realisedthat may include,for guidance and with an unlimited character, more in-depth courses aimed at designers,facultative management and agents responsible for the external control ofthe energy policy in this area, appropriate to the functions performed by each of them in this process and, in particular, to the periodic energy efficiency inspection procedure andthe management of software programmes relative to the energy certification of existing buildings.

> *Information:* with the aim of promoting the information betweenthe recipients of the more energy efficient equipment and systems, databases will be made available on the IDAE's website, or recognised certification programmes, in collaboration with the sector's associations.To guarantee the veracity of the information contained in the database, the databases will be subject to suitable veracity checks.

> *Market inspection*: The Regulation on Thermal Installations in Buildings(RITE) makes the periodic energy efficiency inspection obligatory, both for heat and cold generators and complete thermal installations when they are over 15 years old. As aresult of this inspection, the preparation of a report by the inspector is obligatory, with the aim of advising the owner of the installation,that will contain a series of improvements or modifications relative the installation so as to improve their energy efficiency. Likewise, the competent authoritiesshould perform a selection at random of a significantpercentage of all inspection reports submitted annually andsubject to verification.

> *Other accompanying mechanisms:* when appliances removed are subject to subsequent use, particular as part of RENOVE plans, it will be necessary to implement a system thatguarantees the removal of the appliance for recycling and waste management purposes in line with the current regulations.

Timeframe:2011-2020.

Group the measure is aimed at:

Public or private physical or legal people (building owners,public or private promoters, communities or neighbouring commonwealths,municipal housing companies and energy services companiesetc.).

Responsibility and collaborators:

The organisations responsible for the execution and follow-up of the measure are the Ministry of Industry, Trade and Tourism/IDAE, in collaboration with the Autonomous Communities.

Actions and planning:

The development of this measure to improve the energy efficiency of thermal installations in buildings will require actions on8.200 MW thermal/yearrelative to heat-cold production, distribution, regulation and control and air-conditioning equipment. The entire Plan will act on 82.000 MWthermal,which will require an overrun investment for efficient technology in the order of7.258 M€.

Aid managed by the public sector:

The estimated aid managed by the public sector for the development and promotion of this measurewas obtained as a percentage contribution to the total investment required, since the rest of the investment will be realised without aid as an induced effect of the promotion of this measure in the sector. The total aid managed by the public sector in the 2011-2020 period will be 283 M€.

Measure 3: Improved energy efficiency of interior lighting installations in existing buildings

Objective:

To reduce the energy consumption of existing interior lighting installations.

Description:

This measure aims to improve the energy efficiency of existing interior lighting installations in existing buildingsthat are renewed, so that they comply, at least, with and improve the minimum requirements set outin the Technical Building Code, reducing their energy consumption.

The energy actions included within this measure will be those that achieve a reduction in conventional energy consumption relative to interior lighting in existing buildings and its installations, as may be the case for lifts, guaranteeing suitable light comfort for the task being performed and justified in documentary terms.The energy actions may be, with a guidance and unlimited character, the following:

- *Lights, lamps and equipment:* replacement of the whole set by another with lights with higher output, more efficient lamps and adjustable electronic reactance which allows for reduction of the installed capacity in lighting, meeting the regulatory quality and visual-comfort requirements.

- *Local or remote lighting control systems and regulation of the lighting level:* these will include motion-sensor control systems and regulation of lighting levelaccording to the contribution of natural light, adjusted to the needs of the userachieving an electricity saving with respect toinstallations with no control or regulation.

- *Changing lighting systems:* relocation of the light points using the above technologies so as to reduce electricity consumption as compared with the current lighting system.

- Installation of monitoring systems to find out the comfort conditions and suitability, at any time, of the actions performed to improve energy efficiency.

Action mechanisms included in the measure:

- *Regulatory:* The setting of the minimum energy efficiency requirementsthat the both new and existing lighting installations must comply with are those set out by the Technical Building Code. During the Plan's period of validity, these requirements will be gradually modified in line with Directive2010/31 /EU relative to energy efficiency of buildings and their methodological framework that links the energy efficiency aspects with the savings through calculation of the optimal level of profitability during the building's useful life.

On the other hand, the approval of the energy certification procedure for existing buildingswill enable an objective valuation to be performed on the improved energy efficiency of the building linked to the energy class achieved after the reform proposed. In the case of the existing buildings for which the application ofthe certification is obligatory, a list is provided of measures that improve the energy rating on one or two levels.

To the extent that energy labelling systems are developedfor specific equipment or modifications to existing ones will be link the Plan's objectivesto the improved energy efficiency classes available on the market.

> *Financial incentives:* the aid mechanisms may be based on direct capital grants or bonus interest rates on loans required tomake the investment or any others that are suitable for the measure.

The actions that affect a large number of buildings, such as the renewal of neighbourhoods, will be considered as preferred actions. This also applies to those thatare realised through "RENOVE plans” aimed at specific actionsto install appliances and systems with high energy efficiency (like for example, for lighting in office buildings and neighbouring communities etc. Thiswill be linked, as far as possible, to the financial incentives for the obtainment of energy rating levels, in the case of buildings in the tertiary sector, especially relative to comprehensive renewals.

Regardless of the actions aimed at the professional lighting sector, campaigns are also considered for the domestic sector which are similar to thoserealised for the promotion of low-consumption lamps for LED technology for homes, such as 2-for-1 scheme, Renewal or similar.

> *Training:* as a complement to this measure, training activities will be designed and realisedthat may include,for guidance and with an unlimited character, more in-depth courses aimed at designers,facultative management and agents responsible for the external control ofthe energy policy in this area, appropriate to the functions performed by each of them in this process and, in particular, the management of software programmes relative to the energy certification of existing buildings.

> *Information:*with the aim of promoting the information betweenthe recipients of the more energy efficient equipment and systems, databases will be made available on the IDAE's website, in collaboration with the sector's associations.To guarantee the veracity of the information contained in the database, the databases will be subject to suitable veracity checks.

Timeframe:2011-2020.

Group the measure is aimed at:

Public or private physical or legal people (building owners,public or private promoters, communities or neighbouring commonwealths,municipal housing companies and energy services companiesetc.).

Responsibility and collaborators:

The organisations responsible for the execution and follow-up of the measure are the Ministry of Industry, Trade and Tourism/IDAE, in collaboration with the Autonomous Communities.

Actions and planning:

The improved energy efficiency of interior lighting installations aims to act on200 million m^2 of surface area constructed in buildings in the tertiary sector during the Plan's period, which requires an overrun investment in efficienttechnology in the order of8.763 M€. In addition, within this action it will be necessary toreplace 34 million incandescent lamps with efficient technologies in the domestic sector, a process that should take place naturally, due tomarketing restrictions imposed by the EU.

Aid managed by the public sector:

The estimated aid managed by the public sector for the development and promotion of this measurewas obtained as a percentage contribution to the total investment required, since the rest of the investment will be realised without aid as an induced effect of the promotion of this measure in the sector. The total aid managed by the public sector in the 2011-2020 period will be 192 M€.

Measure 4: Construction of new buildings and comprehensive renewal of existing buildingswith high energy ratings

Objective:

To reduce energy consumption through the promotion of newly built buildings and renewal of existing ones, with high energy ratings.

Description:

Royal Decree 47/2007, of 19 January, whichapproves the Basic Procedurefor the energy efficiency certification of buildings, sets out the obligation to make an energy-efficiency certificate available to buyers or users of buildings. This certificate will have to includeobjective information on the building's energy characteristics, such that its energy efficiency can be assessed and compared,with the aim of encouraging the promotion of buildingswith high energy efficiency and investments in energy saving. The energy-efficiency rating assigned to the building is expressed by a scale of seven letters, from A (most efficient building) to G (least efficient building).

The letter-based energy rating promoted by this measure will be linked to the evolution ofregulatory requirements.

The energy actions included within this measure will be those thatallow the building's energy rating to achieve class A or B,through a reduction in its energy consumption, complying with that set out in Royal Decree47/2007 and the regional regulations applicable in this field. Theenergy rating will be calculated using the CALENER programme oranother programme officially recognised as an alternative. In the case of using solutions not includedin the CALENER programme, the assessment of its repercussions on the energy rating will becarried out using another simulation or calculation method relative to the use,owing to justifying the methodology used and the result.

This relates to incentivising the construction of new buildings and the renewal of existing ones with high energy ratings through a series of action mechanism.

Action mechanisms included in the measure:

- *Regulatory*: The setting of the requirements new and existing buildingsthat have been renewed must comply with in order to achieve high energy ratings are contained in the current policy on the energy certification of buildings. During the Plan's period of validity, theserequirements will be gradually modified in line with Directive2010/31/EU relative to the energy efficiency of buildings that sets out both the general calculation framework for energy efficiency and the control system regardless of certifications.

  This system allows the energy efficiency in news buildings to be objectively assessed as well as in the case ofexisting buildings linked to the energy class obtained after the reform proposed.

> *Financial incentives:* the aid mechanisms may be based on direct capital grants or bonus interest rates on loans required tomake the investment or any others that are suitable for the measure.

The following will be considered as an eligible cost: the overrun in equipment, installations and systems requiredto move towardscompliance with the minimum energy efficiency requirements contained in the current regulations, both in the Technical Building Code and the RITE to achieve an A or B energy rating.

The eligible cost will only include energy efficiency measures for the thermal envelope, thermal installations (heating, climate control and sanitary hot water production) and interior lighting.Excluded completely or partially from the eligible cost will bethose measure applicable to renewable energies that use financial aid covered by planning in terms of the promotion of renewable energies.

> *Training:* Training activities associated with this measure will be designed and realisedwhich may include, for guidance and with a non-limitative character,more in-depth courses aimed at designers, facultative management and agents responsible for the external control of the energy policy in this area,appropriate to the functions performed by each of them in this process.

> *Information*: The Autonomous Communities' Competent Organisations in this areamay develop a technical assistance and advice service for the user, with the aim of resolving doubts on energy certification, both in administrative and technical terms andthe application of software programmes.

> *Market inspection:*the Autonomous Communities' Competent Authoritiesshould perform a random selection of a significant percentage of all inspection reports submitted annually and subject to verification.

Timeframe: 2011-2020.

Group the measure is aimed at:

Public or private physical or legal people (public or private promoters,municipal communities or neighbouring commonwealths etc).

Responsibility and collaborators:

The organisations responsible for the execution and follow-up of the measure are the Ministry of Industry, Trade and Tourism/IDAE and the Ministry of Public Works in collaboration with the Autonomous Communities.

Actions and planning:

The construction and energy renewal of buildings will be promoted with a value of 8,2 million m^2/year, that is to say, 82 million m^2 during the Plan's period, with an overrun investment for efficient technology in the order of 4.868 M€, to execute thetechnological measures required to move towards energy rating that complies with the minimum energy efficiency requirements.

Aid managed by the public sector:

The estimated aid managed by the public sector for the development and promotion of this measurewas obtained as a percentage contribution to the total investment required, since the rest of the investment will be realised without aid as an induced effect of the promotion of this measure in the sector. The total aid managed by the public sector in the 2011-2020 period will be 788 M€.

Measure 5: Construction or renewal of buildings with almost zero energy consumption

Objective:

To promote the construction of new buildings or the renewal of existing ones so that they have almost zero energy consumption.

Description:

Directive 2010/31/EU of 19 May 2010 concerning the energy efficiency of buildings considers that measures are required that increase the number of buildings, that do not just comply with the minimum energy efficiency requirements currently in force, but are also more energy efficientso as toreduce both energy consumption and emissions of carbon dioxide. Therefore,Member States should develop national plans to increase the number of homes with almost zero energy consumption, and should send these plans to the Commission periodically. These national plans may include different objectives in line with the building's category.

A "building with almost zero energy consumption" is defined, according to article 2° from the Directive, as abuilding with a very high energy rating determined in accordance with a "common calculation framework for the energy efficiency of buildings" contained in annex I of the Directive. The almost zero or very lowamount of energy required should be covered, as far as possible, by energy from renewable sources producedin situ or nearby.

Article 9°sets out the deadlines set for the Member States for its implementation:

a) no later than 31/12/ 2020, all new buildings will be buildings with almost zero energy consumption, and

b) after 31/12/ 2018, new buildings occupied and owned by public authorities will be buildings with almost zero energy consumption.

In addition, the Member States, following the example set by the public sector, will develop and adopt measuressuch as the establishment of objectives. tostimulate the transformation of buildings into buildings with almost zero energy consumption.

a) The national plans will include, among others, the following elements:

   the detailed practical application, by the Member State, of the definition of buildings with almost zero energy consumption, which reflects its national, regional or local conditions and includes an numerical indicator of the use of primary energy expressed inKWh/m^2 for the year;

b) some intermediate objectives to improve the energy efficiency of new buildingsin 2015 at the latest;

c) information on the financial measures and policies or other adopted to promote buildings with almost zero energy consumption.

Article 10°, concerning financial incentives, indicates that taking the importance ofproviding financial instruments and other types into account, able to encourage the transition to buildings with almost zero energy consumption, the Member States will adopt the measures required toconsider which of these instruments are best in light of national circumstances.

With the aim of promoting buildings with almost zero energy consumption, within the framework ofDirective 2010/31/EU, an annual national call will be made by the IDAE within the EEAPrelative to an aid line for projects in terms ofnewly built or existing buildings renewed nationally, both privately and publicly owned, for use as homes or other uses and with almost zero energy consumption.

These buildings, in addition to complying with the current regulations in this area, should have an energy demand, primary energy consumption and emissions ofCO_2 lower than that set out for each climate zone.

The buildings with almost zero energy consumption will be classified according to the energy efficiency classes that are determined according to the use, type of intervention and climate zone where they are built. The proponentswill justify these aspects through documentation and will include the evaluation performed with the LIDER and CALENER programmes,so that the building project will be sufficiently defined in this aspect. In addition to complying with the current regulations in this area, the buildings should comply with the additionalrequirements set out in terms offunctionality, security and habitability.

The projects selected will acquire the commitment to start the official steps for the construction of buildings in a time period less than 1 year from the communication of the financial aid.

Action mechanisms included in the measure:

> Financial incentives: the mechanism may be based on an aid line for anannual national call aimed at supporting actions in terms of buildings with almost zero energy consumption, intended for both homes and other uses, new and renewed.

> Communication: the buildings selected will benefit from a communication campaign together with a recognition for the design team.

Timeframe:

As a first step and with the aim of promoting the achievement of the intermediate objectives referred to in the Directive,a first phase will be developed for 2011-2015 through the realisation of an annual call and a second phase for the 2016-2020 period.

Measure 5: Construction or renewal of buildings with nearly zero energy consumption

Objective:

To promote the construction of new buildings or the renewal of existing ones for those with almost zero energy consumption.

Description:

Directive 2010/31/EU of 19 May 2010, relative to the energy efficiency of buildings considers that measures are required to increase the number of buildings that, not only comply with the current minimum energy efficiency requirements, but are also more energy efficient top reduce both energy consumption and emissions of carbon dioxide.Therefore, Member States should develop national plans to increase the number of homes with almost zero energy consumption, and should send these plans to the Commission periodically.These national plans may include different objectives in line with the building's category.

A "building with almost zero energy consumption" is defined, according to article 2° from the Directive, as abuilding with a very high energy rating determined in accordance with a "common calculation framework for the energy efficiency of buildings" contained in annex I of the Directive.The almost zero or very lowamount of energy required should be covered, as far as possible, by energy from renewable sources producedin situ or nearby.

Article 9°sets out the deadlines set for the Member States for its implementation:

c) no later than 31/12/ 2020, all new buildings will be buildings with almost zero energy consumption, and

d) after 31/12/ 2018, new buildings occupied and owned by public authorities will be buildings with almost zero energy consumption.

In addition, the Member States, following the example set by the public sector, will develop and adopt measuressuch as the establishment of objectives tostimulate the transformation of buildings into buildings with almost zero energy consumption.

c) The national plans will include, among others, the following elements:

the detailed practical application, by the Member State, of the definition of buildings with almost zero energy consumption, which reflects its national, regional or local conditions and includes an numerical indicator of the use of primary energy expressed inKWh/m2 for the year;

d) some intermediate objectives to improve the energy efficiency of new buildingsin 2015 at the latest;

c) information on the financial measures and policies or other adopted to promote buildings with almost zero energy consumption.

Article 10°, concerning financial incentives, indicates that taking the importance ofproviding financial instruments and other types into account,able to encourage the transition to buildings with almost zero energy consumption, the Member States will adopt the measures required toconsider which of these instruments are best in light of national circumstances.

With the aim of promoting buildings with almost zero energy consumption, within the framework ofDirective 2010/31/EU, an annual national call will be made by the IDAE within the EEAPrelative to an aid line for projects in terms ofnewly built or existing buildings renewed nationally, both privately and publicly owned,for use as homes or other uses and with almost zero energy consumption.

These buildings, in addition to complying with the current regulations in this area, should have an energy demand, primary energy consumption and emissions ofCO_2lower than that set out for each climate zone.

The buildings with almost zero energy consumption will be classified according to the energy efficiency classes that are determined according to the use, type of intervention and climate zone where they are built.The proponentswill justify these aspects through documentation and will include the evaluation performed with the LIDER and CALENER programmes,so that the building project will be sufficiently defined in this aspect.In addition to complying with the current regulations in this area, the buildings should comply with the additionalrequirements set out in terms offunctionality, security and habitability.

The projects selected will acquire the commitment to start the official steps for the construction of buildings in a time period less than 1 year from the communication of the financial aid.

Action mechanisms included in the measure:

- *Financial incentives:*the mechanism may be based on an aid line for an<annual national call aimed at supporting actions in terms of buildings with almost zero energy consumption, intended for both homes and other uses, new and renewed.

- *Communication*:the buildings selected will benefit from a communication campaign together with a recognition for the design team.

Timeframe:

As a first step and with the aim of promoting the achievement of the intermediate objectives referred to in the Directive,a first phase will be developed for 2011-2015 through the realisation of an annual call and a second phase for the 2016-2020 period.

Group the measure is aimed at:

Public and private building developers and owners of buildings designed for domestic use and other uses, both new ones and renewed ones, both private and public owners.

Responsibility and collaborators:

The organisations responsible for the execution and follow-up of the measure are the Ministry of Industry, Trade and Tourism/IDAE and the Ministry of Public Works in collaboration with the Autonomous Communities.**Actions and planning:**

Therefore, the construction or energy renewal of buildings with a surface area of 10.000 m^2/year should be promoted, that is to say, 100.000 m^2 during the Plan's period, with a 19 M€ investment due to the overrun from efficient technology.

Aid managed by the public sector:

The estimated aid managed by the public sector for the development and promotion of this measurewas obtained as a percentage contribution to the total investment required, since the rest of the investment will be realised without aid as an induced effect of the promotion of this measure in the sector.The total aid managed by thepublic sector in the 2011-2020 period will be 5 M€.

Measure 6: Improved energy efficiency of cold commercial plants

Objective:

To reduce the energy consumption of existing cold commercial plants. Description:

This measure aims to promote improved energy efficiency of existing cold commercial plants that have been renewed.

Cold commercial plants are considered as those designed to maintain, within the temperature limits set out, different refrigerated or frozen foods, stored inside.

The energy actions considered within this measure will be those which allow for a reduction of conventional energy consumption.The energy actions may be, with a guidance and unlimited character, the following:

> Actions on the cold production plan (replacement of condensors and replanning of cooling circuits etc.).

> Installation of compressor frequency converters.

> Installation of floating condensation and evaporation technologies.

> Installation of programmable control systems.

> Recovery of heat from condensation to cover the building’s other thermal needs.

> In the case of refrigeration equipment, installation of covers on the horizontal and vertical doors of existing equipment that does not have the same and replacement of lighting systems for with others will less energy consumption and less heat dissipation.

Action mechanisms included in the measure:

> *Financial incentives*:the aid mechanisms may be based on direct capital grants or bonus interest rates on loansrequired tomake the investment or any others that are suitable for the measure.

> *Information*: With the aim of promoting the information betweenthe recipients of the more energy efficient equipment and systems, databases will be made available on the IDAE's website, or recognised certification programmes, in collaboration with the sector's associations. To guarantee the veracity of the information contained in the database, the databases will be subject to suitable veracity checks.

> *Other accompanying mechanisms*: when the aid is intended to change one product for another with high energy efficiency, particularly in terms of

RENOVE plans, the financial incentive only applies when the removal of equipment is removed is justified by its recycling according to current legislation or certificate relative to scrapping the product.

Timeframe: 2011-2020.

Group the measure is aimed at:

Public or private physical or legal people (public or private promoters, municipal communities or neighbouring commonwealths etc).

Responsibility and collaborators:

The organisations responsible for the execution and follow-up of the measure are the Ministry of Industry, Trade and Tourism/IDAE, in collaboration with the Autonomous Communities.

Actions and planning:

Therefore, actions will be promoted to improve the energy efficiency of a fleet with installed capacity of 1 $MW_{electrical}$/year in industrial refrigeration. That is to say, 10 $MW_{electrical}$ during the Plan's entire period, which will require a investment of 20 M€ due to the overrun in efficient technology.

Aid managed by the public sector:

The estimated aid managed by the public sector for the development and promotion of this measurewas obtained as a percentage contribution to the total investment required, since the rest of the investment will be realised without aid as an induced effect of the promotion of this measure in the sector.The total aid managed by thepublic sector in the 2011-2020 period will be 5 M€.

Measure 7: Improved energy efficiency of the stock of electrical appliances

Objective:

To reduce energy consumption through the improved energy efficiency of electrical appliances or, more generally, energy-consuming electrical appliances.

Description:

Given that a significant proportion of all electrical appliances is renewed annually, due to the end of their useful life, this is the perfect time to encourage buyers to replace them with others with a better energy rating among those sold on the market, through a financial incentive that helps the buyer with their purchase decision.

The electrical appliances likely to form part of the RENOVE plans will be those with energy consumption that has greater weight in household consumption and the penetration of better energy classes into the market is still low. The following are a guideline and are non-exhaustive: Refrigerators, fridge-freezers, washing machines, dishwashers (both conventional and thermo efficient dishwashers and washing machines complying with Technical Specification AENOR AE 0035 and AE0040), ovens and total induction hobs and gas hobs.

Action mechanisms included in the measure:

> *Regulatory*: The measurement of the energy efficiency of electrical appliances and the information to be given to the buyer is regulated in the different Royal Decrees concerning energy labelling which transpose the European Directives on this matter and the EU's Regulations. In this sense, the appearance of new European Directives or regulations that increase energy efficiency levels will be based on the minimum requirements from the RENOVE plans implemented.

> *Financial incentives*: The aid mechanisms may be based on direct capital grants by means of calls from Electrical Appliance RENOVE plans or any others. The aid will lead to a financial incentive that will encourage the buyer to choose a more energy efficient appliance.

> *Training*: Training activities related to this measure will be designed and carried out which may include, as a guideline and in a non-exhaustive manner, training courses on the energy efficiency of electrical appliances, aimed at both sellers of electrical appliances and citizens, organised in collaboration with the manufacturing, trading and consumer associations, both as face-to-face learning and e- learning.

> *Information*:With the aim of promoting the information betweenthe recipients of the more energy efficient equipment and systems, databases will be made available on the IDAE's website, in collaboration with the sector's associations.To guarantee the veracity of the information contained in the database, the databases will be subject to suitable veracity checks.

> *Other accompanying mechanisms:* when appliances removed are subject to subsequent use, it will be necessary to implement a system thatguarantees the removal of the appliance for recycling and waste management purposes in line with the current regulations.

Timeframe:2011-2020.

Group the measure is aimed at:

Public or private physical or legal people replacing an electrical appliance.

Responsibility and collaborators:

The organisations responsible for the execution and follow-up of the measure are the Ministry of Industry, Trade and Tourism/IDAE, in collaboration with the Autonomous Communities.

Actions and planning:

There 300.000 electrical appliances/year should be replaced, that is to say, 3 million electrical appliances during the Plan's period, with an investment of 800 M€ for the overrun due to efficient technology.

Aid managed by the public sector:

The estimated aid managed by the public sector for the development and promotion of this measurewas obtained as a percentage contribution to the total investment required, since the rest of the investment will be realised without aid as an induced effect of the promotion of this measure in the sector.The total aid managed by thepublic sector in the 2011-2020 period will be 500 M€.

Method of measuring and evaluating the savings:

Calculation of the energy saving from the follow-up statistics relative to the RENOVE plans, provided by each Autonomous Community, which will include the number of electrical appliances replaced by type of equipment and the number and energy efficiency class of the new electrical appliances. To evaluate the induced effect, the statistics relative to sales made from manufacturing and trading associations will be used.

9.4 Table-Summary by measure in the Building and Equipment Sector

<table>
<tr><th rowspan="2"></th><th colspan="2">Final energysavings(ktep)</th><th colspan="2">Primary energysavings(ktep)</th><th colspan="2">Emissions of CO_2 avoided ($ktCO_2$)</th><th colspan="3">Publicly managed aids(10^6 €)</th><th colspan="3">Investments (Aid +private investment)(10^6€)</th></tr>
<tr><th>2016</th><th>2020</th><th>2016</th><th>2020</th><th>2016</th><th>2020</th><th>2011-2016</th><th>2017-2020</th><th>2011-2020</th><th>2011-2016</th><th>2017-2020</th><th>2011-2020</th></tr>
<tr><td>BUILDINGS AND EQUIPMENT</td><td>2.674</td><td>2.867</td><td>5.096</td><td>5.567</td><td>11.116</td><td>12.120</td><td>1.730</td><td>1.153</td><td>2.883</td><td>16.393</td><td>10.929</td><td>27.322</td></tr>
<tr><td>Energy renewal of the thermal envelope of existing buildings</td><td>775</td><td>77</td><td>1.319</td><td>1.329</td><td>2.921</td><td>2.943</td><td>665,7</td><td>443,8</td><td>1.109,5</td><td>3.356,4</td><td>2.237,6</td><td>5.594,0</td></tr>
<tr><td>Improved energy efficiency of thermal installationsin existing buildings</td><td>908</td><td>590</td><td>1.546</td><td>1.558</td><td>3.424</td><td>3.449</td><td>169,8</td><td>113,2</td><td>283,0</td><td>4.354,8</td><td>2.903,2</td><td>7.258,0</td></tr>
<tr><td>Improved energy efficiency of interior lighting installationsin existing buildings</td><td>674</td><td>884</td><td>1.588</td><td>1.986</td><td>3.400</td><td>4.251</td><td>115,2</td><td>76,8</td><td>192,0</td><td>5.257,8</td><td>3.505,2</td><td>8.763,0</td></tr>
<tr><td>Construction of new buildings and renewal of existing buildings withhigh energy ratings</td><td>224</td><td>224</td><td>425</td><td>473</td><td>901</td><td>1.002</td><td>472,8</td><td>315,2</td><td>788,0</td><td>2.920,8</td><td>1.947,2</td><td>4.868,0</td></tr>
<tr><td>Construction or renewal of buildings with nearly zero energy consumption</td><td>0,4</td><td>70,</td><td>0,8</td><td>1,5</td><td>1,6</td><td>3,2</td><td>3,0</td><td>2,0</td><td>5,0</td><td>11,4</td><td>7,6</td><td>19,0</td></tr>
<tr><td>Improved energy efficiency of cold commercial plants</td><td>0,8</td><td>81,</td><td>1,9</td><td>3,8</td><td>4,0</td><td>8,1</td><td>3,0</td><td>2,0</td><td>5,0</td><td>12,0</td><td>8,0</td><td>20,0</td></tr>
<tr><td>Improved energy efficiency of electrical appliances</td><td>92</td><td>69
2</td><td>216</td><td>216</td><td>463</td><td>463</td><td>300,0</td><td>200,0</td><td>500,0</td><td>480,0</td><td>320,0</td><td>800,0</td></tr>
</table>

Source: IDAE

Note: The calculation of emissions of CO2avoided as a result of the saving and energy efficiency measuresincluded in this Plan are ad hoc calculations for the same and assume a translation of the savingscalculated using different base years (2004 and 2007), in terms of final and primary energy, to emissions of CO2 avoided - this calculation does not necessarily coincide, therefore, with those achieved with approaches or different accounting bases aspart of the periodic reports produced in relation to the evolution of greenhouse gas emissions.

6. 10. PUBLIC SERVICES

10.1 Current situation

The Public Services Sector includes, in this 2011-2020 Action Plan, external lighting installations on streets and in public areas and plants relative to the water supply to the population, external lighting being understood as functional, environmental and ornamental lighting installations on streets and in open spaces; and by the supply of water, we understand municipal drinking water, supply and purification plants as well as seawater desalination plants.

By subsectors, 95% of external lighting corresponds to installations owned by town councils and, to the same extent, the majority of installations in the water subsector are also publicly owned.

The sector has experienced significant growth in the last 15 years, associated with the great urban development that has occurred in the different Spanish towns and the subsequent equipment associated with new streets and other related spaces and infrastructure.

In 2010, all these installations represented 0,8% of final energy consumption in Spain (764 Ktep), all in the form of electrical energy, its distribution by type of activity being as follows:

Table 10.1. Energy consumption in the Public Services Sector (ktep)

	2010	%
External lighting	326	43%
Supply and water purification	230	30%
Water desalination	209	27%
TOTAL CONSUMPTION	764	100%

Source: IDAE

External lighting

In 2010, it is estimated that there were 4.800.000 light points in Spain which, with average power of 180 W and 4.200hours of annual use, represented electricity consumption of 3.629GWh/year.

This data has been established based on the results of energy audits in recent years, through the 2008-2012 Action Plan and previous, and enabled the obtainment of the following results according to the size (population) of the municipalities.

Table 10.2 Evaluation of external lighting in 2010

Town size	kWh/inhab./ year	W/PL	PL/1000 inhab.	GWh/y	PL
> 75.000 inhabitants	62	202	73	1.265	1.493.782
40.001 to 75.000 inhabs.	83	181	109	351	460.993
10.000 to 40.000 inhabs.	91	200	108	969	1.151.938
< 10.000 inhabs.	106	147	172	1.043	1.693.287
Total	80	180	106	3.629	4.800.000

Source: IDAE

To this figure relative to the electricity consumption of external lighting, we should add that corresponding to existing traffic lights, around 300.000 units, the unitary consumption of which is in the order of 1250 KWh/year for units fitted with incandescent or halogen lamps, and only 250 KWh/year for the same units equipped with LED technology.

This transformation to LD technology in traffic lights has already taken place in many Spanish towns, especially after the introduction of the IDEA direct aid programme in 2008 and which supplied, together with 600 town councils, a total of 461.791 LED Optics to replace existing traffic lights.The application of this programme, and its effect on the renewal of this type of installation by town councils, means we are able to estimate that, currently, only 30% of traffic lights still need to be transformed to LED.

In line with the foregoing, in 2010, the electricity consumption of existing traffic lights was evaluated at 165GWh/year, which totalled, for all external lighting, consumption of 3.790 GWh/year, equivalent to 325,94 Ktep/year.To this figure, we should add the testimonial electricity consumption of neon signs and other external signage equipment.

Supply and water purification

The flow of water required for the water supply for human use and the subsequent purification of this waste water is estimated in the range of between 160 and 180 litres per person per day.In the same way as external lighting, this subsector has experienced an increase in energy consumption not just due to the population increase but also through that derived from requirements relative to quality and purification of waste water contained in Directive 91/271 and the subsequent National Sewerage and Purification Plan, which has resulted in the entry into service of many WWTSs (Waste Water Treatment Stations) throughout Spain.

Specifically, in 2010, in Spain, there were 2.950 WWTSs in service for the treatment of urban water, 600 more than existed in 2004,, which means we can estimate that at least 95% of the Spanish population is connected to a purification system.

The energy consumption of the systems to supply water to the populations and, above all, waste water treatment systems depends on the technology used, the size of the population served and the applicable discharge and purification limits.

In Spain, it is estimated that there is a urban water supply flow of 3.730 hm^3annually, and a volume of waste water treated in the order of 4.450 hm^3, this difference being justified by the fact that not all water supplied ends up in piped drainage and that the sewage treatment plant receives, in addition, rainwater and water from other possible effluents.

Based on data from studies performed by IDAE, average energy consumption for water purification is estimated at 0,5 KWh/m^3 which represents, for all plants in 2010, electricity consumption of 2.225 GWh/a.

On the other hand, in terms of the collection, supply and distribution of urban water, the electricity consumption for pumping is estimated at 447 GWh/y, which gives a total, for this subsector, of 2.672 GWh/y, equivalent to 230 Ktep/y.

Water desalination

Obviously different desalination technologies have different energy consumption, Spain predominantly uses reverse osmosis between existing plants and even more in future ones, therefore the energy consumption of the plants using inverse osmosis are taken as a reference.

The latest data on the production of desalinated water in Spain establishes a range between 1,5 hm^3/day and 2 hm^3/day (influences the variation in the annual rainfall demand) for almost 1.000 existing desalination plants.

In 2006, and for a production of 0,8 hm^3/day, the existing plants consumed between 4 and 10 KWh/m^3, with average weighted consumption being estimated at 5 KWh/m^3.Between 2006 and 2010, production increased by0,7 hm^3/day up to 1,5-2 hm^3/day through improved output and the entry into service of new planst with average consumption of 3,5 KWh/m^3.

Assuming the minimum production of 1,5 hm^3/day, by means of weighting, results in average consumption of 4,3 KWh/m^3, a figure which should be added to another 0,6 KWh/m^3 for the collection and pre/post treatment of water which totals 4,9 KWh/m^3

Therefore, this led to, in 2010, total energy consumption of 7,25 GWh/day and power demand of 302 MW.Estimating production 24 hours/day for 335 days/year, the electricity consumption of desalination in 2010 reached 2.428 GWh/year, equivalent to 209 Ktep/y.

10.2 Assessment for the 2011-2020 period

Analysing the sector, in this decade, we estimate continued growth in consumption motivated by improved urban equipment both at municipal level (lighting and signage) and through consolidation of the process relative to the entry into service of new water supply and purification infrastructure and the introduction of new desalination plants.

Table 10.3.Evaluation of the energy consumption trend (ktep)

	2010	2020
External lighting	326	363
Supply and water purification	230	238
Water desalination	209	251
TOTAL CONSUMPTION	764	852

Source: IDAE

However, this trend will not be achieved by the savings that will occur in the sector as a result of both all the direct measures promoted by the public administrations through this Action Plan and other strategic actions, and through the indirect action executed in the sector through technological changes and the current economic situation, as occurred in 2010.

This savings forecast are expected to achieve the following results:

Table 10.4 Final energy savings (ktep)

	2010	2016	2020
External lighting	11	19	58
Supply and water purification	2	11	35
Water desalination	15	26	32
TOTAL SAVING	29	56	125

Source: IDAE

And based on the same, the expected energy consumption in the Public Services sector for this decade is as follows:

Table 10.3.Evaluation of the energy consumption objective (ktep)

	2010	2016	2020	2020/2010
External lighting	326	333	305	94%
Supply and water purification	230	225	203	88%
Water desalination	209	215	219	105%
TOTAL CONSUMPTION	764	773	727	95%

Fuente:IDAE

This shows that throughout the decade energy consumption in the sector as a whole experienced a 5% reduction whilst in the analysis of the subsectors, the evolution varies between a 12% fall in the consumption of water supply and purification and a 5% increase in enerfgy consumption for desalination.

The criteria and actions to achieve these savings are as follows:

External lighting

External lighting has experienced technological and legislative advances that marked a point of inflexion in the consumption trend.

Thus, the publication of the Regulation on energy efficiency in external lighting installations (RD 1890/2008), the introduction of LED technology as a new source of lighting and the introduction of contracting to energy services companies by public administrations are milestones encountered in the last two years which will change the plants that, today, we know as lighting in our towns and on our streets.

The pilot experiment that the IDAE carried out with the town councils of Alcorcon,Soto del Real and Teruel to adapt their external lighting installations to that set out in the REEIAE and the audits carried out in collaboration with the Spanish Lighting Committee on these installations, proved the significant saving potential relative to electricity consumption that this type of installation has, in the order of 45%, through actions on increased levels of existing lighting, especially late at night; on the quality of light and their emission of light to other areas not the subject of the lighting (light contamination) and control of turning these lights on and off.

In addition, this saving potential in financial terms allows, in the majority of cases, investments with a simple return period of less than 6 years, which is suitable for energy services companies.

This has had to a compliance programme being designed for lighting in Spanish towns consistent with prioritizing transformation in cities with more than 25.000 inhabitants (295 cities and 2.300 GWh/y) through ESCOs that will make a specific line of funding available for this activity, and this strategy being fully validated by other town councils that will adopt this procedure.

Therefore, the scenario forecasts that, by 2020, the programme will have been executed in 70% of cities with more than 25.000 inhabitants, with an average saving of 30% of its energy consumption in lighting and 10% from other Spanish towns also with an average saving of 30% in their electricity consumption.

In parallel, the transformation to LED from lights for traffic lights is not expected to be complete.

Therefore, for 2020, a saving in the external lighting subsector of 675 GWh/y is expected, equivalent to 58 Ktep/y.

Supply and water purification

In terms of water supply, the reduction in energy consumption will be motivated by the reduction in water losses from the supply networks, not just through improvements to existing networks, but also through the introduction of remote systems for the systematic detection of hidden leaks; through the reuse of treated water in municipal consumption (irrigation of gardens and street cleaning) and through the optimisation of pumping systems according to variations in pressure and water supply demands.

The water treatment and purification plants for water for urban use (WWTSs) will experience an improvement in their efficiency through technological innovation and by grouping flows into jointly-owned plants. Thus, small sewage treatment plants, that usually lack aeration control systems and the design of which is based on mechanical robustness, involve a certain over sizing of electromechanical equipment, therefore unit consumption in these sewage treatment plants is relatively high, in the order of 50 KWh/inhab year. Large sewage treatment plants benefit from the optimisation of their design, size and control to achieve energy consumption at around 20 -30 KWh/inhab year.

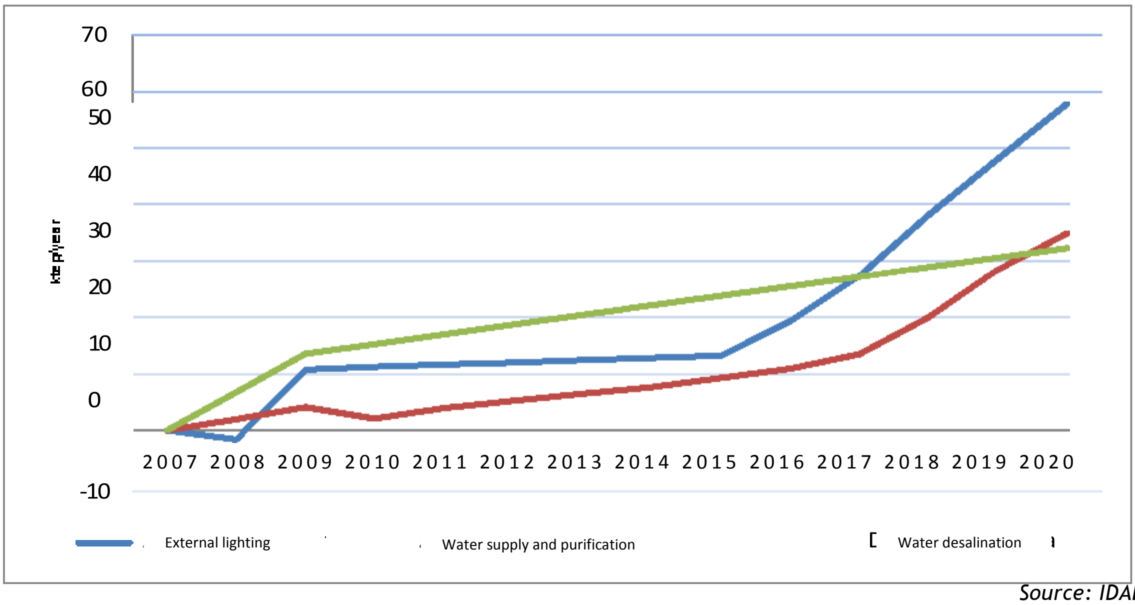
The 2007-2015 National Water Quality Plan forecasts the construction of 1.000 new WWTSs, in part due to the expansion and modernisation of operational sewage treatment plants, which predicts a 15% improvement in the energy consumption of these plants in this decade, which will lead to a reduction in the electrical energy demand in the order of 400 GWh/y, equivalent to 35 Ktep/a.

Water desalination

With regard to desalination, modern inverse osmosis plants consume in the order of 3,5 KWh/m^3, whilst the oldest plants usually have consumption greater than 5KWh/m^3. Recent studies suggest that the optimisation of current technology may achieve energy consumption values in the order of 2,5 KWh/m^3 of desalinated seawater. Measures such as the replacement of current osmosis membranes with other more efficient models or the replacement of current equipment for the recovery of energy from water rejected from turbines for isobaric brine pressure chambers are examples of reforms that will reduce electrical energy consumption relative to the process in current plants.

This shall not preclude energy consumption in this sector from increasing based on the growth of infrastructure itself in Spanish towns and their drinking water needs, basically, through locations on the Mediterranean coats and on the islands.Also, for this subsector, in the present decade, a 15% improvement is expected in the energy consumption of the desalination plants, which will mean a reduction in electrical energy demand in the order of 369 GWh/y equivalent to 32 Ktep/y.

Graph 10.1. Evolution of energy savings in the Public Services Sector



Source: IDAE

The evolution of the energy savings for these subsectors is shown in the graph, where external lighting is that which, from the middle of the decade, will experience the greatest acceleration through the maturity and introduction of the reforms set out by the REEIAE and the contracting of services from the ESCOs. With regard to supply and purification, it is expected that, together with the technological innovation for controlling pressure and water leaks, throughout the decade, the reuse of treated water for non-sanitary uses will be introduced; this will achieve an added saving. Finally, and differing from the above, the evolution of the saving for the water desalination subsector is expected to be uniform throughout the decade in the sense of gradually introducing the improvement in its energy efficiency through the gradual improvement of consumption specific to the sector with the entry into service of new more efficient plants.

10.3 Measures in the Public Services Sector

Measure 1: Renovation of existing exterior public lighting installations

Objective:

To reduce the electrical energy consumption of external public lighting installations through the renewal of its equipment based on obsolete technologies, with other current and more efficient technologies.

Description:

Royal Decree 1890/2008, of 14 November, approved the Regulation concerning energy efficiency in external lighting installations as a legal framework for improved energy efficiency in lighting installations, through regulation of the maximum lighting levels in areas depending on the activity that will be performed in them, from the incidence of lighting to other areas and through the requirement for a minimum level of energy efficiency for light points.

The energy, light and financial consequences of the application of this Regulation could have an effect on the current external lighting systems in Spanish towns, making the introduction of a programme for the adaptation of town lighting to this new Regulation concerning the energy efficiency of external lighting installations necessary.

Action mechanisms included in the measure:

- >*Regulatory*: Royal Decree 1890/2008, of 14 November, which approved the Regulation on energy efficiency of external lighting installations.
- >*Financial incentives:* grants for the eligible cost of equipment, provided that the reform complies with that set out in the Regulation on energy efficiency of external lighting installations and regardless of whether the reform actions in external lighting are undertaken by Energy Services Companies or, directly, by the owner of the plants.

Timeframe: 2011-2020.

Group the measure is aimed at:

Town councils, public institutions or public or private concessionary companies in the external lighting sector, owners' communities and any association or public or private entity owning external lighting installations which have their luminous flux over public streets.

Responsibility and collaborators:

<u>Responsible:</u> Ministry of Industry, Tourism and Trade/IDAE.

Collaborators: Autonomous Communities, Local Administrations, FEMP and sectoral agents.

Aid managed by the public sector:

The estimated aid managed by the public sector for the development and promotion of this measurewas obtained as a percentage of the total investment required for the modernisation of existing external lighting installations applying saving and energy efficiency criteria, with a percentage of the economic means required for the realisation of the actions being made available by Town Councils and public institutions. The total aid managed by thepublic sector in the 2011-2020 period will be 104.5 M€.

Measure 2: Feasibility analysis studies and audits of existing external lighting installations

Objective:

The performance of studies, feasibility analysis and audits of existing external lighting installations.

Description:

Introduction of the realisation, as part of cost-sharing measures, of studies and feasibility analysis relative to saving and energy efficiency projects, applying energy efficient technologies.

Action mechanisms included in the measure:

- Financial incentives: grants for the cost of the project. The energy audits will be based on the energy auditing protocol of external public lighting installations developed by the IDAE.

Timeframe: 2011-2020.

Group the measure is aimed at:

Town councils, public institutions or public or private concessionary companies in the external lighting sector, owners' communities and any association or public or private entity owning external lighting installations which have their luminous flux over public streets.

Responsibility and collaborators:

Responsible: Ministry of Industry, Tourism and Trade/IDAE.

Collaborators:Autonomous Communities, Local Administrations, FEMP and sectoral agents.

Aid managed by the public sector:

The estimated total aid managed by thepublic sector in the 2011-2020 period will be 16.7 M€.

Measure 3: Training of municipal energy managers

Objective:

Realisation of energy training courses for municipal technicians and those responsible for maintaining municipal installations, which enables dependencies on its load, the introduction of new technologies and the application of saving and energy efficiency measures.

Description:

Implementation of Information and Training Days on Municipal Energy Management in each Autonomous Community, with direct invitations to each Municipal Council with more than 5,000 inhabitants, and by way of inducement to the remaining municipalities.

Action mechanisms included in the measure:

- Financial incentives: grants for training courses, with the aim ofcovering the costs associated with the tender, the course and logistics.

Timeframe: 2011-2020.

Group the measure is aimed at:

Municipal technicians and those responsible for maintaining municipal

installations. **Responsibility and collaborators:**

Responsible: Ministry of Industry, Tourism and Trade/IDAE.

Collaborators: Autonomous Communities, Local Administrations, FEMP and sectoral agents.

Aid managed by the public sector:

The aid to be managed by the public sector estimated by this measure provide the financial means to cover the expenses inherent to the call, delivery of courses and logistics inherent to the same. The total aid managed by thepublic sector in the 2011-2020 period will be 7.1 M€.

Measure 4: Improved energy efficiency of current drinking water, supply, waste water purification and desalination plants

Objective:

To promote replacement of existing technologies in plants for drinking-water, supply, purification and desalination of water by other more efficient technologies.

Description:

Introduction of energy efficiency criteria and low energy consumption in the terms of calls for tenders to reform existing plants with regard to drinking water, supply, waste water purification and desalination projects, in publicly-owned plants.

Action mechanisms included in the measure:

- *Regulatory:* development of technical specifications to improve energy efficiency to be incorporated into the terms of public calls for tenders relative to the execution of new drinking water, purification or water desalination plants.
- *Financial incentives:* grants for the eligible costs relative to the execution of projects for introducing new equipment with more modern technology making improved saving and energy efficiency in existing plants possible.

Timeframe: 2011-2020.

Group the measure is aimed at:

Public owners of drinking water, supply, purification and water desalination plants or public or private companies for the concessionning of services.

Responsibility and collaborators:

Responsible: Ministry of Industry, Tourism and Trade/IDAE.

Collaborators:Autonomous Communities, Ministry of Environment, Rural and Marine Environment, Local Administrations and FEMP.

Aid managed by the public sector:

The estimated aid managed by the public sector for the development and promotion of this measurewas obtained as a percentage of the total investment required for the modernisation of drinking water, supply, purification and desalination plants, applying saving and energy efficiency criteria, with a percentage of the economic means required for the realisation of the actions being made available by Town Councils and public institutions. The total aid managed by thepublic sector in the 2011-2020 period will be 15.0 M€

10.4 Table-Summary be measure in the Public Services Sector

	Final energy savings (ktep)		Primary energy savings (ktep)		Emissions of CO_2 avoided (ktCO_2)		Publicly managed aids (10^6 €)			Investments (Aid + private investment) (10^6 €)		
	2016	2020	2016	2020	2016	2020	2011-2016	2017-2020	2011-2020	2011-2016	2017-2020	2011-2020
PUBLIC SERVICES	56	125	131	295	281	631	86	5	143	485	324	809
Renovation of existing public lighting plants	19	58	46	136	97	292	62,7	741	104,5	416,3	277,5	693,8
Studies, feasibility analysis and audits of existing externallighting installations							10,0	,86	16,7	20,0	13,3	33,3
Training of municipal energy managers							4,3	,72	7,1	4,3	2,8	7,1
Improvement of the energy efficiency ofcurrent drinking water, supply, purification of waste water and desalination plants	36	67	86	158	184	339	9,0	,8	15,0	45,0	30,0	75,0

Source: IDAE

Note: The calculation of emissions of CO_2 avoided as a result of the saving and energy efficiency measures included in this plan are ad hoc calculations for the same and assume a translation of the savingscalculated using different base years (2004 and 2007), in terms of final and primary energy, to emissions of CO_2 avoided - this calculation does not necessarily coincide, therefore, with that achieved with different approaches or accounting bases aspart of the periodic reports produced in relation to the evolution of greenhouse gas emissions.

7. 11. AGRICULTURE AND FISHERIES

11.1 Current situation

The energy consumption associated with Agriculture and Fisheries activities reached the figure of3.270 Ktep in 2010 (without counting the contribution of renewable energies to the consumption, valued at44 Ktep), which represented 3,5% of final energy consumption in Spain in this year.

To facilitate the view and energy analysis of this sector, it is divided intothe following subsectors which are used to define and organise the different aid lines to improve energy efficiency:

- Machinery, which covers the energy consumed by tractors, harvesters andcultivators for arable farms, forests and livestock farms.
- Irrigation, which refers to the energy used for the extraction and/or distribution ofpumped water for irrigation.
- Farms; this covers the consumption of agricultural and livestock farms, and others such as crop greenhouses.
- Fishing, which includes consumption of different types of fishing boats and equipment in the Spanish fleet: Deep-sea, coastal and artisanal fishing. With regards to aquaculture,up t0 2010 no calculations were made since marina aquaculture is considered to be part of the fleet and inland aquaculture, is considered as a minimum energy weight.

The amount and structure of the energy consumption in these subsectors was determined based on the following criteria:

Machinery:

We make a distinction between agriculture, livestock and forestry

The consumption of agricultural machinery relates, mainly, to the use of tractors and is correlated with hectares cultivated, 17.203.324 ha (Survey on surface areas - ESYRCE - from the MARM), and the different working practices carried out,where the average consumption of diesel is estimated at 62,5 l/ha which, for 2010, equates to consumption of925 Ktep. The rest of the machinery, harvesters and cultivators and others consumed154 Ktep.

The consumption of machinery for livestock farming is determined based on the report called "Method of estimating fuel consumption in Spanish rural farming", where the consumption in litres of diesel is correlated with the number of livestock farms, distinguishing between ovine, bovine and pigs, resulting in a value of334 Ktep. This consumption is also largely caused by the use oftractor-powered equipment able to performagricultural functions; the consumption of this is calculated in the previous section.

In terms of forestry machinery, the consumption is estimated based on the variation in the repopulated area, the amount of wood extracted and the results from IDAE on this subject linked to the obtainment of bio mass, this value being308 Ktep for 2010.

Irrigation:

The IDAE carried out, through the Action Plan, a programme of energy audits onirrigation installations in Irrigation Communities, and from its data on the area irrigated and irrigation technology (gravity, spraying, pivot, localised and others), has assigned consumption that, applied to the data on the area irrigated from theMARM (ESYRCE), 3.407.953 ha in 2010, providers a total energy consumption figure of 425 Ktep. The structure of this energy consumption is basically in the form of electricity, more than 80%, compared with diesel pumps that do not represent 20% of consumption.

Agricultural farms:

In 2010, in Spain, there were around 1.000.000 agricultural farms,685.000 of which were livestock farms and the rest comprisedvarious activities including crop greenhouses.

Even though, to date, the IDAE has not performed any precise calculations on this subsector,a subject that will be tackled in this new Action Plan, generally-speaking,the consumption may include the use of heat and cold generators for pasteurisation and conservation processes,climate control in cattle sheds and greenhouses,the lighting in sheds, the use of engine benchesfor mechanical drives and other services inherent to these activities,not including consumption relative to rural living or to self-propelled machinery, the latter having already been counted in the previous section.

Based on this and in terms of ratios and consumption counted in the sector, consumption of640 Ktep was estimated for this subsector in 2010, the structure of which includes the different types of energy.

Fishing:

We analysed the Spanish fishing fleet in its different typologies, and to determine the energy consumption of each of them, the results obtained from the energy audits performed in fishing boats in the 2008-2012 Action Plan were used. These results,together with data on the number of registered boats byMARM by fishing ground and type of fish and the number of catches,determines energy consumption.

In 2010, the fleet comprised 10.893 boats (767 deep-sea fishing boatsbetweenlong liners and trawlers and with average power per boat of 1.000 CV,1.130 coastal fishing boats with average power of 240 CV and 8.996 artisanal fishing boatswith average power of 33 CV) which, together,consumer 484 Ktep of diesel and fuel.

Using this criteria, energy consumption in the sector by type of activity in 2010 was:

Table 11.1. The sector's energy consumption (ktep/year)

TYPE OF ACTIVITY	2010	%
Machinery	1.721	53%
Irrigation	425	13%
Agricultural farms	640	20%
Fisheries	484	15%
TOTAL CONSUMPTION	3.270	100%

Source: IDAE

The structure of the different types of energy is as follows:

Table11.2 Sector consumption by type of energy (ktep/year)

TYPE OF ENERGY	2010	%
Diesel and fuel	2.461	75%
Natural Gas and LPG	192	6%
Electricity	617	19%
TOTAL CONSUMPTION	3.270	100%

Source: IDAE

11.2 2011-2020 assessment

By analysing the sector's scenario, we estimate continued growth in the agricultural activity in this decade through consolidations of its production advances and its improved equipment, which allows us to estimate the annual growth rate for energy consumption at 3,0%.

To the same extent, the trend in energy consumption in the fishing subsectoryields a positive estimated value with an average growth rate of3,85% due, mainly, toa natural trend to replace low-power and independent boats withvessels with a greater radius of action that broaden the horizon of catches.

Both scenarios would put energy consumption in the sector at that set out in the following forecast:

Table 11.3.Energy consumption trend (ktep)

	2010	2020
Consumption in Agriculture	2.786	4.039
Consumption in fishing	484	706
TOTAL CONSUMPTION	3.270	4.745

Source: IDAE

However, this trend will not be achieved based on the anticipated savings that will occur in the sector and that will bethe result of both the set of direct measures introduced by the Public Administrations through this Action Plan and other strategic actions, such as through the indirect action exerted on the sector through technological changes and the current economic situation.

This savings forecast is expected to achieve the following results:

Table 11.4 Final energy savings (ktep)

	2016	2020
Agriculture	774	1.004
Machinery	667	864
Irrigation	93	122
Agricultural farms	14	18
Fisheries	262	335
TOTAL SAVING	1.036	1.339

Source: IDAE

The evolution expected in terms of energy consumption in the Agriculture and Fisheries Sector for this decade is as follows:

Table 11.5.Expected evolution in energy consumption (ktep)

	2010	2016	2020	2020/2010
Agriculture	2.786	2.939	3.035	109%
Fisheries	484	411	371	77%
TOTAL CONSUMPTION	3.270	3.350	3.406	104%

Source: IDAE

This shows that, during this decade, energy consumption in the sector as a wholewill experience growth of 4% even though in the analysis of the subsectors, the evolution varies between growth of 9% for Agriculture activities and a decreaseof 23% for Fishing activities.

The criteria and actions to achieve these savings in the different subsectors are as follows:

Agricultural machinery:

This sector's energy consumption is due, basically, to the of the tractor in its use to cultivateland, therefore the variation in energy consumption will be determined by the variation in the surface area to be cultivated in Spain and the nature of this cultivation, such as the number of tractors in use and the energy efficiency of the same.

The expected scenario maintains the same working surface area throughout the decade, estimatedat 17.200.000 ha, as well as the same nature of the cultivation carried out,although a slight decrease in the number of tractors in use is expected due to the concentration of arable land(renting or grouping of interests)under a single farmer or miller.

Faced with this scenario, the energy saving is achieved through promotingminimum tillage techniques for direct seeding, as well as the improved energy efficiency of tractors renewed both naturally and through an incentive from the administration.

Direct seeding is based on a drastic fall in the different tasks inherent to conventional tillage (uprising of stubble, tilling of fallow land, fertilising and seeding) to be executed in one pass with a machine able to sowon the remains of previous crops, and that places the seed on the agricultural landwithout any type of previous tilling, performing the following operations in the same pass: opening-up of the groove, placement of the seed andburying and settling of the soil.

From an energy perspective, numerous studies report on the profitability and feasibility of the direct seeding systems compared with conventional agriculture,highlighting the energy savings achieved, that in terms of the majority of crops and groundin different Spanish regions enables the establishment, as an average, of the following results:

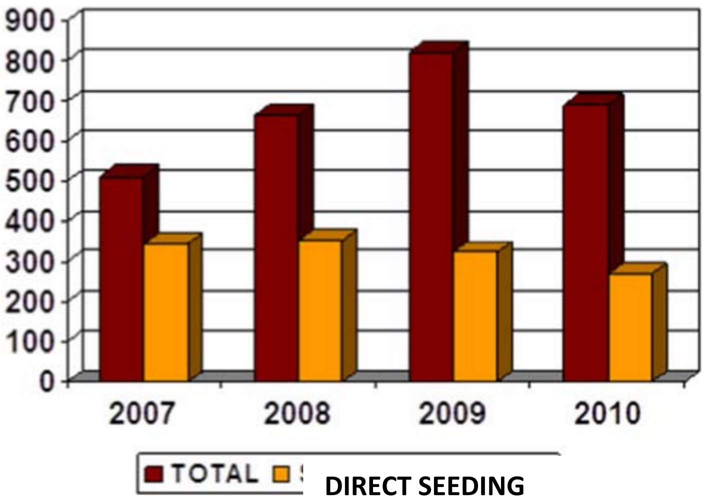
Table 11.6 Average fuel consumption by type of farming techniques (litres of diesel/ha)

	Unirrigated crops	Irrigated crop
Conventional farming techniques	62 ha	88 ha
Direct seeding	31 ha	55 ha
Energy saving	50%	37,5%

Source: Technological Sustainable Agriculture Plan, Ministry of the Environment and Rural and Marina Environment andIDAE

In recent years, the direct seeding technique has been introduced into Spanish agricultureto the extent that almost 30% of sales of seeders are for direct seeding,as shown in the following figure based on the machinery listed in theofficial agricultural machinery register (ROMA), which, in 2009,enables the achievement of a working area with direct seeding of 274.000ha of rain fed and irrigated crops.

Figure 11.7. New seeders listed in the Official Agricultural Machinery Register



Source: Ministry of Environment, Rural and Marine Environment

The scenario for this decade includes penetration of direct seeding in the order of 30% looking ahead to 2020 relative to both14.092.047 ha of rain fed land and3.407.953 ha of irrigated land, which will facilitate a saving of 142 Ktep/year.

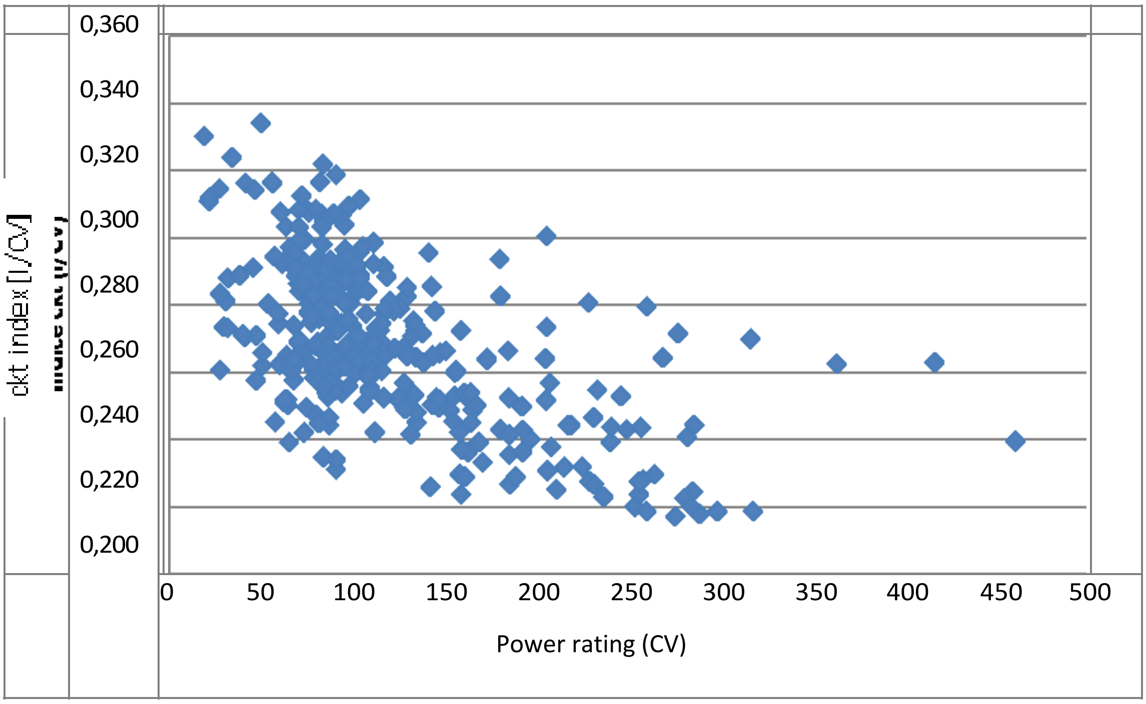
With respect to the fleet of tractors, the number in use is expected to experience a 25% decrease throughout the decade due to the concentration of smallareas of arable landunder one farmer or miller, which will favour the fact that 75% of the remaining tractorsare more directly improving energy efficiency that, naturally occurs with the renewal ofthe machinery fleet throughout this decade,and this based on the results achieved in the sector through theenergy labelling of tractors developed by the IDAE and the MARM.

This energy labelling and its corresponding rating is based on the results of the assay performed according to the OCDE's codes.The methodology developed bya team of professors from the UPM's Technical School of Agricultural and Industrial Engineeringon the initiative of the IDAE has enabled the MARM's Agricultural Mechanics Station to rate agricultural tractors soldin Spain according to their energy efficiency and the measurementof data relative to capacity and fuel consumption.

This rating, published on both organisations' web pages, has helped, since 2007, the MARMto apply an additional premium to farmers that benefitfrom the tractor RENOVE plan (delivery of a tractor over 15 years old to buy a new one) if the tractor bought belongs to categories A(30€/CV) or B (10€/CV).

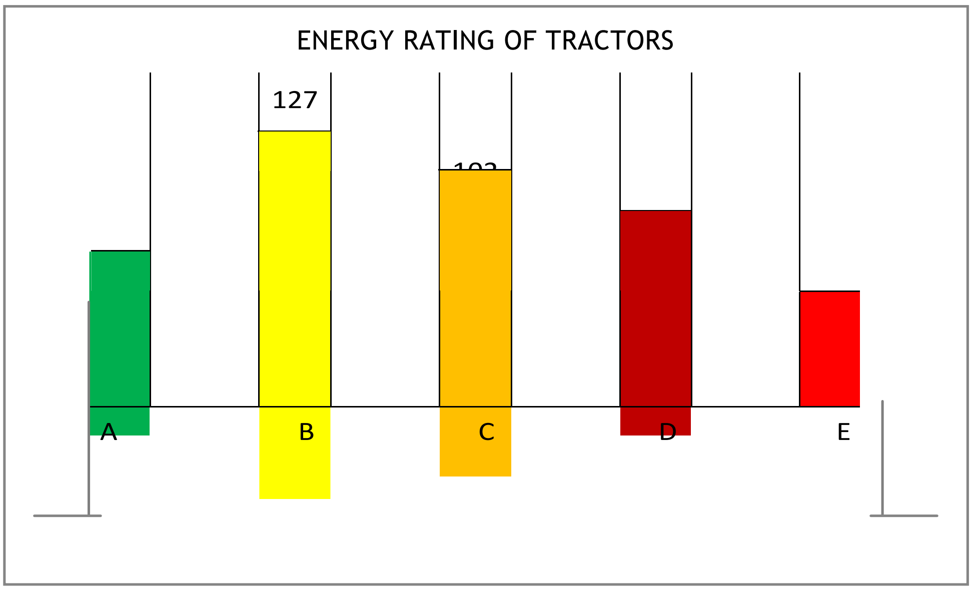
In 2010, the EMA analysed 413 tractors, the following being the result of their performance and energy rating:

Figure 11.8. Power and consumption of the tractors evaluated in 2009



Source: IDAE

Figure 11.9. Energy rating of the tractors tested



Source: IDAE

The action of these two estimates, a reduction in the number of tractors in use and improved energy efficiency of the remaining ones, with a 45% renewal rate in the period,providing a fuel saving of 722 Ktep/year, which together with the 142 Ktep/ through the extension of the practice of direct seeding achieving a saving in the machinery subsector of864 Ktep/year by 2020.

Irrigation:

The 2020 scenario relative to energy consumption in irrigation maintains the irrigated area at the current value of3.407.000 hectares, and forecasts a 30% reduction in energy consumption in the decadethrough the reform and modernisation of pumping installationsconsistent with the improved output from pumps and theadaptation of their capacities to varying loads, as well as through migration from spraying systems to localised irrigation systems.This increased saving percentagewill be induced naturally through the current prices introduced in the subsector with the current electricity rates.

Therefore, the energy saving expected in 2020 relative to irrigation is 122

Ktep/year.**Agricultural farms:**

The scenario forecast for 2020 in relation to the number and improved energy-consuming equipment on agricultural farms expects a 22% increase.However, the renewal of existing installations is also expected(heat and cold generators, lighting systems and pumping etc) which, together,will reduce the subsector's energy consumption by 20% in 2020, which will equate to a saving of18,1 Ktep/year.

Fishing:

This forecast expects a 19% reduction, throughout the decade, relative to all boats motivated mainly by the reconversion of thecoastal fleet set out in the National Strategic Fishing Plan.

To this we should add a decrease, in this period, of energy consumption relative to the remaining fleet through improved energy efficiency in the navigation of our boats motivated by the renewal of engines, replacement of the geo9metry of the propellers, improved fishing practices and other measures currently being researched and developed.

This Fishing reconversion, which naturally results in improvements to boats, together with the previous improvements expected to reduce energy co9nsumption in 2020 for Fishing by335Ktep/year.

11.3 Measures in the Agriculture and Fisheries Sector

Measure 1: Promotion and training of technicians for the efficient use of energy in the agriculture and fisheries sector

Objective:

To introduce to the agents in the agriculture and fisheries sector, and to make them aware of, the importance of energy efficiency in the use of energy-consuming equipment.

Description:

Execution of a programme for the implementation of specific training actions in techniques for the efficient use of energy in the agriculture and fisheries sector, aimed at farmers, stockbreeders or fishermen.

Action mechanisms included in the measure:

- *Financial incentives*: grants for the implementation of training courses, with the aim ofcovering the costs associated with the tender, the course and logistics.
- *Training*: through the IDAE'[s editorial series of documents[53] concerningsaving and energy efficiency in agriculture, stockbreeding and fishing.

Timeframe: 2011-2020.

Group the measure is aimed at:

Framers, stockbreeders, fishermen and, in general, professionals that work directly or indirectly in these sectors.

Responsibility and collaborators:

Responsible: Ministry of Industry, Tourism and Trade/IDAE.

Collaborators: Autonomous Communities, Ministry of Environment, Rural and Marine Environment and sectoral agents.

Aid managed by the public sector:

The total estimated aid managed by the public sector in the 2011 - 2020 period will be9.7 M€.

[53] See IDEA documents on:http://www.idae.es/index.php/mod.publicaciones/mem.listadoDestacadas/relmenu.73.

Measure 2: Improved energy efficiency of irrigation installations andpromotion of migration from irrigation by spraying systems to localised irrigation systems

Objective:

To reduce energy consumption through modernisation of pumping installations andreduction in water consumption for irrigation through the new projects to be included within the National Strategy for the Sustainable Modernisation of Irrigation,related to actions to optimise the supply and transport and with newtechnologies applied to plot water.

Description:

Aid to be managed by the public sector for the execution of energy audits andtheir further reform bill relative to the modernisation of pumping installations in Watering Communities for the energy optimisation of the current collection, supply, distribution networks relative to irrigation water.

Action mechanisms included in the measure:

- *Financial incentives:*
    - Grants for the cost of performing energy audits inWatering Communities and the cost eligible for the subsequent introduction of the measures to improve energy efficiency.
    - Grants for studies to optimise the energy assessment of distribution networks in Watering Communities, through new proposals and more efficient technologies from an energy viewpoint in terms of supply, transport and application of irrigation water.

Timeframe:2011-2020.

Group the measure is aimed at:

Owners of agricultural farms with irrigation and Managers of the Watering Communities.

Responsibility and collaborators:

<u>Responsible:</u> Ministry of Industry, Tourism and Trade/IDAE.

<u>Collaborators:</u> Autonomous Communities, Ministry of Environment, Rural and Marine Environment and Sectoral agents.

Aid managed by the public sector:

The total estimated aid managed by the public sector in the 2011 - 2020 period will be30.0 M€.

Measure 3: Improved saving and energy efficiency in the fisheries sector

Objective:

To promote saving and energy efficiency in the fisheries sector through the introduction of efficient technologies.

Description:

Performance of studies, pilot experiments, energy audits, and the introduction of improvements to fishing vessels which might lead to substantial energy saving and improve their efficiency.

The poor energy efficiency of the fisheries sector and the increase in the price of oil give rise to a serious problem for the sector. With a registered fleet of more than 10,000 vessels and direct employment of some 45,000 people, fuel accounts for a high percentage of total costs.

The best option to confront these problems must be by putting faith in technologies which reduce consumption, achieving both a competitive improvement in the national fishing sector and technological development on the part of Spanish companies which would be able to market new products and services for the national sector and for export.

Action mechanisms included in the measure:

> *Financial incentives:*

- o Grants for the performance and execution of research projectsconsidered of interest in relation to the energy saving and improved efficiency in the fisheries sector.
- o Grants for the performance of energy audits on fishing vessels. The energy audits will be based on the protocol set out by the IDAE and thepayment of the funded amount will besubject to the execution of the measures proposed.
- o Grants for the eligible cost for the introduction of the measures that propose energy audits to improve energy efficiency.

Timeframe:2011-2020.

Group the measure is aimed at:

Owners of fishing vessels.

Responsibility and collaborators:

Responsible: Ministry of Industry, Trade and Tourism/IDAE, in collaboration with theSecretary General of the Sea, the Ministry of Environment,Rural and Marine Environment.

Collaborators: Autonomous Communities, Ministry of Environment, Rural and Marine Environment and sectoral agents.

Aid managed by the public sector:

The total estimated aid managed by the public sector in the 2011 - 2020 period will be4.8 M€.

Measure 4: Energy audits and plans to improve the energy efficiency of agricultural farms

Objective:

To promote saving and energy efficiency measures to reduce the energy co0nsumption ofagricultural and livestock farms.

Description:

Aid to be managed by the public sector for the performance of energy audits and their subsequent reform project to any agricultural or livestock farm, including irrigated farms.

The energy audit must justify, in advance, the nature and extent of the reform to be carried out and thepayment of the funded amount will besubject to the execution of the measures proposed.

The use of the protocols developed by IDAE is recommended. However, theAutonomous Community may authorise the performance of audits using other models.

Action mechanisms included in the measure:

- *Financial incentives:*
  - Grants for the cost of performing energy audits on agricultural farms.
  - Grants for the eligible cost for the introduction of the measures that propose audits to improve their energy efficiency relative tothermal insulation, pumps, heat and cold generators and artificial lighting etc). Investments in protection and self-propelled machinery will not be included.

Timeframe: 2011-2020.

Group the measure is aimed at:

Owners of agricultural farms.

Responsibility and collaborators:

Responsible: Ministry of Industry, Tourism and Trade/IDAE.

Collaborators: Autonomous Communities, Ministry of Environment, Rural and Marine Environment and sectoral agents.

Aid managed by the public sector:

The total estimated aid managed by the public sector in the 2011 - 2020 period will be9.0 M€.

Measure 5: Support for conservation agriculture

Objective:

The objective of this measure is encourage migration from conventional agriculture toconservation agriculture to reduce the sector's energy consumption.

Description:

To technically and financially support migration from conventional agriculture farming techniques to the directseeding techniques part of conservation agriculture (a 35% saving in relation to the consumption of traditional farming).

With conservation agriculture techniques, direct seeding and the use of vegetal covers,markedly reduces tillage and, therefore, that of the same tractor, which represents a significant reduction in its fuel consumption. In addition, in this type of agriculture the soil is left covered by the remains of old crops which feed and contribute carbon to the soil. This encourages the carbon sink effect of soils by fixing atmospheric carbon in same.

Action mechanisms included in the measure:

- *Financial incentives:*
  - o Grants for the performance and execution of research projectsconsidered of interest in conservation agriculture in relation to saving and energy efficiency.
  - o Grants for the acquisition of direct seeders forarable crops. A direct seeder is defined as a machine used to seed on the remains of the previous crop,whichplants the seed without the need for any tillage beforehand,performing the following operations in one pass. opening-up of the groove, placement of the seed, ripening,burying and settling of the soil.

Timeframe: 2011-2020.

Group the measure is aimed at:

Owners of agricultural farms.

Responsibility and collaborators:

Responsible: Ministry of Industry, Tourism and Trade/IDAE.

Collaborators: Autonomous Communities, Ministry of Environment, Rural and Marine Environment and sectoral agents.

Aid managed by the public sector:

The total estimated aid managed by the public sector in the 2011 - 2020 period will be17.6 M€.

Measure 6: Tractor RENOVE plan

Objective:

The objective of this measure is to promote the renewal of the national fleet of tractors, throughscrapping the units of these older machines and their replacement with new tractors which, being equipped with modern technologies, improve working conditions, improve energy efficiency and have a smaller impact on the environment.

Description:

This measure includes energy rating criteria, through the energy labelling of tractors,in the call for aid for the renewal of thenational fleet of tractors (RENOVE plan)promoted by the Ministry of Environment, Rural and Marine Environment. Therefore, the aids will begreater in the renewal of the new tractors that have a better energy rating.

Action mechanisms included in the measure:

Continuation of the system of cataloguing the new tractors available on the national marketaccording to their energy efficiency, which serves to provide users with information before making a purchase or replacement decision.

- *Financial incentives:*
  - Maintenance of the aid system to improve the purchasing conditions for tractors on behalf of farmers, encouraging renewal of the fleet, giving priority to tractors with the best energy ratings.
  - The support system will be based on investment aids for the renewal of tractors. The amount of this support will be defined by agrant per CV replaced and scrapped.

Timeframe: 2011-2020.

Group the measure is aimed at:

Owners of agricultural farms and millers.

Responsibility and collaborators:

Responsible: Ministry of Environment, Rural and Marine Environment.

Collaborators: Ministry of Industry, Trade and Tourism/IDAE, the Autonomous Communities' Agriculture Advisors and manufacturers of agricultural machinery.

Aid managed by the public sector:

The total estimated aid managed by the public sector in the 2011 - 2020 period will be5.7 M€.

This aid only includes aid linked to the renewal of tractors by others with higher energy ratings (Classes A and B).
Assuming that thetotal budget for these RENOVE plans is around 5 M€/year, it is considered thatthe tractors in Classes A and B absorbs around 0,57 M€/year.

11.4 Table-Summary of measure in the Agriculture Sector

	Final energy savings (ktep)		Primary energy savings (ktep)		Emissions of CO_2 avoided (ktCO2)		Publicly managed aids (10^6 €)			Investments (Aid + private investment) (10^6 €)		
	2016	2020	2016	2020	2016	2020	2011-2016	2017-2020	2011-2020	2011-2016	2017-2020	2011-2020
AGRICULTURE AND FISHERIES	1.036	1.338	1.289	1.665	3.716	4.799	46	31	7	4365,8	1603	5969
Promotion and training of technicians in the efficient use of energy in theagricultural and fisheries sector.	93	122	225	294	477	622	5,8	3,9	7	90,014	,960,	,7150
							18,0	12,0	9,	,527,1	09,7	,024,
Incentives for migration from spraying or gravityirrigation systems to localised irrigation systems.	262	335	293	375	897	1.147	2,9	1,9	73	156,0	18,1	245,
										64,1		
Improved saving and energy efficiency in the fisheries sector.	14	18	23	29	58	74	5,4	3,6	0,		104,0	2
Energy audits and action plans to improve farms.											42,7	
Support for conservation	110	142	123	159	377	486	10,6	7,0	04			260,0
agricultureTractor RENOVE plan	557	721	624	808	1.908	2.470	3,4	2,3				106,8
									,8			

Source: IDAE**Note 1:** The aid managed by the public sector relative to the Tractor RENOVE plan only includes aid linked to the renewal of tractors by others with higher energy ratings (Classes A and B). Assuming that the total budget for these RENOVE plans is around 5 Me/year, it is considered that the tractors in Classes A and B absorb around 0,57 Me/year.

Note 2: The calculation of emissions of CO_2 avoided as a result of the saving and energy efficiency measures included in this plan are ad hoc calculations for the same and assume a translation of the savingscalculated using different base years (2004 and 2007), in terms of final and primary energy, to emissions of CO_2 avoided - this calculation does not necessarily coincide, therefore, with that achieved with different approaches or accounting bases aspart of the periodic reports produced in relation to the evolution of greenhouse gas emissions.

12. ENERGY TRANSFORMATION

12.1 Current situation and 2011-2020assessment

Oil Refining

Current situation

The data published by CORES (Corporation of Strategic Resources of Oil-Based Products (CORES) for the 2007-2010 period shows a downward trend in the consumption of oil-based products, with an annual variation rate of3,6percentage points. The significant fall in the consumption of oil-based productsin 2009 with respect to 2008, should be highlighted; this fall was 5,6%.

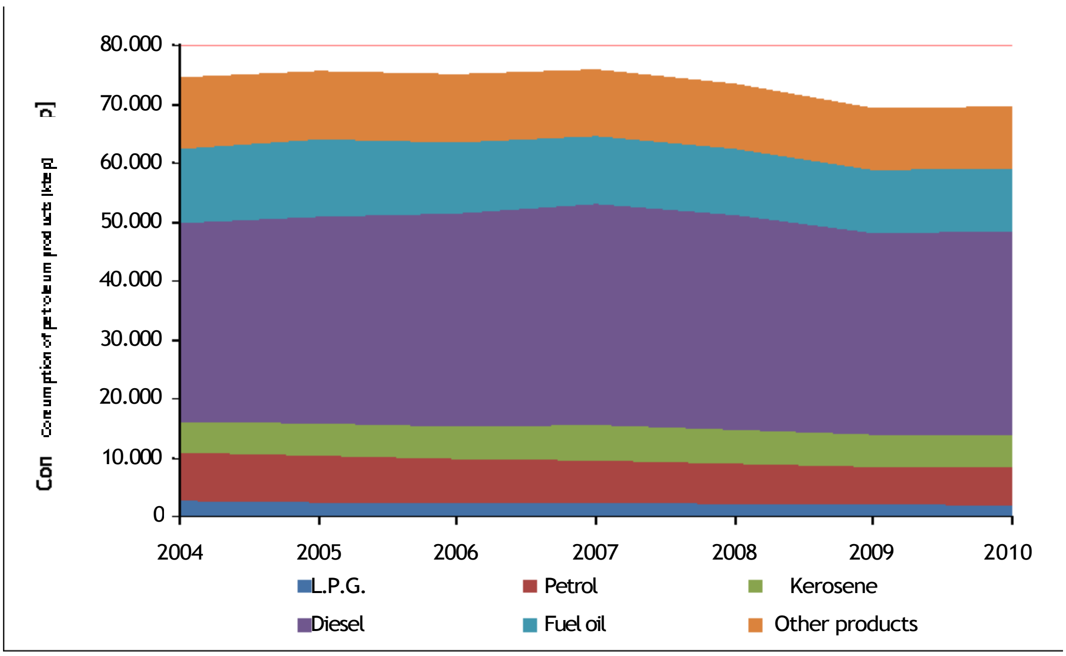
Table 12.1. Consumption of oil-based products in Spain for 2007 - 2010 (kt)

	Consumption	Year-on-year variation
2007	74.910	+1,4%
2008	72.534	-3,2%
2009	68.442	-5,6%
2010	67.094	-2,0%

Source: CORES

The distribution of the consumption of the different oil-based products in the 2004-2010 periodis shown in the following diagram, showing not only a fall in total annual consumption but also a change in the mix of oil-based products due to the change in the consumption trend experienced in the period.

Graph 12.1. Consumption of oil-based products in Spain for 2004 - 2010



Source: CORES

In terms of raw material processed at refineries and net production ofoil-based products in the 2007-2009 period, production suffered an annual fall of2,3%. The fall in productionin 2009 with respect to 2008, should be highlighted; this fall was 5.7%.

Table 12.2. Crude processed and net production of oil-based products 2007 - 2010 (kt)

	Crude processed	Year-on-year variation	Net production	Year-on-year variation
2007	60.392	-2,5%	55.869	-2,3%
2008	61.091	+1,2%	56.485	+1,1%
2009	57.738	-5,5%	53.282	-5,7%
2010	57.687	-0,1%	53.432	+0,3%

Estimated data

Source: CORES

In the 2007-2010 period, there were two notable events that affected the energy efficiency of Spanish refineries: the new specifications relative to hydrocarbons and the dieselisation of the automobile fleet in Spain.

With the entry into force of Royal Decree 1700/2003 on 15 December, which sets out the specifications forpetrol, diesel, fuel oils and liquid petroleum gasesand the use of bio fuels, transposing Directives 2003/17/EC and2003/30/EC from the European Parliament and Council, a period of decrease in terms of the concentration of sulphur in hydrocarbonsstarted which, in the case of petrol and diesel,has taken the following path:

Table 12.3. Maximum concentration of sulphur in petrol and diesel (ppm)

	Up to 2005	2005 - 2008	From 2009
Petrol	150	50	10
Diesel A	350	50	10

These conditions reducing the content of sulphur in diesel and petrol caused an increase in the energy intensity relative to the production of oil-based products, which is clearly reflected in the increase in consumption inherent to refineries. This has been due, mainly to the reduction in the concentration of sulphur achieved through hydrogenconsuming processes. The hydrogen production plantshave an energy consumption that, having an impact on the final product, reduces the efficiency of the entire cycle or increases the energy intensity of oil-based products.

Equally, the strong dieselisation of the fleet of private vehicles in Spainhas meant that the refineries have had to adapt to the new demand-related conditions and have increased in complexity(hydrocracker or cocker), which means an increase in the obtainment of light and medium distilled productsto the detriment of heavy distilled products. This type of complex reference means an increase in energy intensity,since more primary energy is required per unit of refined product.

On the other hand, the entry into force of TBC Law 2877/2008 which sets out a mechanismfor the promotion of bio fuels, sets a minimum annual percentage of bio fuels in hydrocarbons, which meant a greater excess of petrol, but, on the contrary,has avoided imports of petrol.

Table 12.4. Own consumption, losses and efficiency ratio in oil refining 2007 - 2010 (kt)

	Own consumption in refineries	Refinery losses	Production ratio - primary energy consumed
2007	3.986	537	92,5%
2008	4.058	548	92,4%
2009	3.954	502	92,3%
2010	3.752	518	92,6%

Estimated data

Source: CORES

The production-primary energy consumed ratio, shown in the previous table, was the indicator usedto analyse energy efficiency in the refining sector, obtained from the quotient between production and raw material processed.
Based on the foregoing, the results obtained in the 2007 - 2010 period,with respect to 2007 in terms of energy savings by efficiency, is shown in thefollowing table.

Table 12.5. Primary energy saving in oil refining for 2007 - 2010 (ktep)

	2007	2008	2009	2010
Savings by efficiency	0	-94	-179	39

Source: IDAE

The data shows a trend towards greater energy intensity in the production of oil-based products(speaking in terms of energy efficiency, a fall with respect to2007), due, mainly, to changes in the specifications relative to hydrocarbons and the adaptation of production due to changes in the patternof the demand for oil-based products.

Assessment for the 2011-2020 period

The forecasts for national consumption in 2020 in terms of primary energy point to petrol remaining as the primary source relative to the primary energy demand, although its participation experiences, in terms of structure,a significant decrease, going from 47,3% in 2010 to 36,6% in 2020.

In terms of final energy, the evolution pattern is similar. Oil-based products, with a dominant position of 54,8% in 2010, will lose ground torenewable energies and natural gas to arrive at44,7% in 2020.

This decrease in consumption will be accompanied by a variation in the weight of medium distillates compared with light and heavy distillates which will mean the industry will need to significantly adapt to the new situation.

It will be necessary to incorporate new units ofcoking with the consequent increase in energy consumption per unit produced.

With regard to the energy efficiency in the refineries, we are not expecting any notable variations in the 2010-2020 period,since the modifications made relative to hydrocarbonshas caused an increase in the energy intensity of refining plants andan increase in emission of CO_2 per unit produced. It ishoped that the new more restrictive specifications will be compensated for with the maturityacquired from production technologies relative to cleaner hydrocarbons.

The results of the modifications made in the sector's energy efficiency, with respect to the efficiency of own consumption, in losses and refining,are summarised in the following table, where we can see the estimated efficiency for the sector and from this, the savings expected with respect to 2007:

Table 12.6. Expected ratio of production-primary energy consumed for 2016 and 2020

	2016	2020
Production ratio - primary energy consumed	92,3%	92,4%

Source: IDAE

Table 12.7. Expected primary energy saving in oil refining for 2016 - 2020 (ktep)

	2016	2020
Savings by efficiency with respect to2007	-137	-88

Source: IDAE

Looking at the previous data, it appears that the adaptation of the modifications in the pattern of national demand and the environmental restrictions applied to hydrocarbons, will play an important role in energy intensity relative to the production of oil-based products, which is reflected in the sector's reduced efficiency with respect to 2007.

Something else indirectly related to the energy efficiency of refineries is the gradual increase in the incorporation of bio fuels in hydrocarbons. In the short-term, we expect a percentage increase in bio fuels on the hydrocarbon market,which will translate into the increase in the content of bio fuels in petrol and diesel. This may mean, in the case of biodiesel,a product that is heavier than diesel, the obligation to produce alighter cut so it can be mixed, which will lead to greater production of fuel oils.

In addition to the foregoing, it is possible that in the period,heavier crude will be produced compared to that which is currently used, a situation which would increase energy consumption per unit of output.

Electricity

generationCurrent

situation

The Electricity Generation Sector includes electrical energy production activitiesfrom raw energy resources and oil-based products. Therefore, this sector may be divided as follows,by type of energy source:

- Generation from non-renewable sources:
  - From coal
  - From oil-based products
  - From natural gas
  - Nuclear

- Generation from renewable sources:
  - Hydroelectric
  - From biomass and waste
  - Solar: Photovoltaic and thermoelectric
  - Wind

This sector bases its planning on the current document entitled "Planning for the electricity and gas sector2008-2016', approved in May 2008 within the framework of Law54/1997 concerning the Electricity Sector and Law 34/1998 concerning the Hydrocarbon Sector, as well as that set out in Royal Decree 1955/2000, of 1 December,which regulates activities relative to transport, distribution,marketing, supply and authorisation procedures in terms of electrical energy. However, Law 2/2011, of 4 March, concerning Sustainable Economy, sets outthat, three months after its entry into force, a planning document will be approved, which will set out the model for the generation and distribution of energy under different demand scenariosfor 2020.

The contribution of electrical energy to the national system produced in the 2007-2010 period by type of generation is as follows:

Table 12.8. Electricity production in Spain 2007 - 2010 (GWh)

	2007	2008	2009	2010
Hydraulic	30.519	26.117	29.184	45.321
Nuclear	55.102	58.971	52.761	61.788
Coal in Ordinary Service conditions	74.203	49.018	36.106	24.730
Fuel and natural gas in Ordinary Service conditions(except for combined cycles)	11.731	11.309	11.227	10.544
Combined natural gas cycles in Ordinary Service conditions	72.219	95.529	82.253	68.303
Coal, oil-based products and natural gas in Special Service conditions*	35.639	37.240	36.012	33.986
Biomass and waste	3.635	4.625	4.781	4.891
Thermoelectric solar	8	16	103	691
Other renewables	28.069	35.037	44.030	49.987
National total	311.125	317.862	296.457	300.241

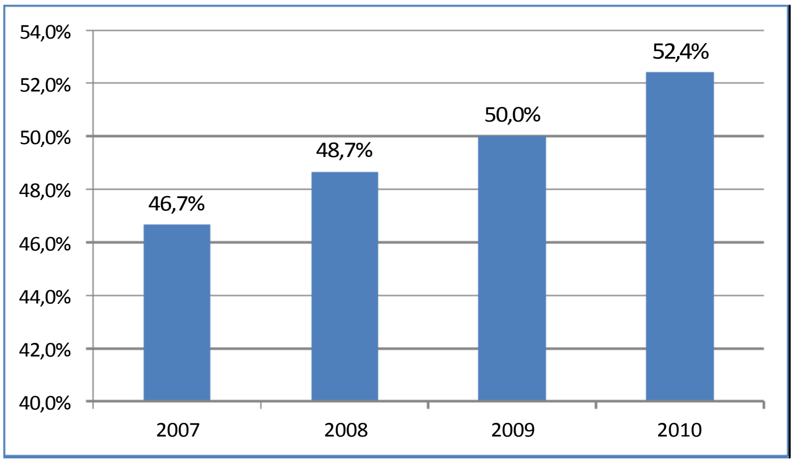
(*)Includes the production of electrical energy with cogeneration in special service conditions.

Source: MITYC

It should be noted that there was an increase in weight in this period in terms of electricity generationfrom renewable resources (basically, wind energy and, to a lesser extent, photovoltaic solar),representing 34% of the total generated in 2010, whilst in 2007, it represented 20%. Hydroelectric generationis completely dependent on annual rainfall,whilst the generation from fuel gradually decreased.

The indicator used to analyse the energy efficiency in Electricity Generation is the output from electrical production, obtained from the quotient between said electrical production and the primary energy used. The following graph showssaid indicator for the whole generation fleet in the 2007-2010 period.

Graph 12.2. Electrical output from the generation fleet in the 2007 - 2010 period



The return from the electrical generation fleet increased by 5.7 percentage points in the 2007-2010 period, basically, due to the increased participation of hydroelectric, wind and solar renewable energies, which account for 100% of the output.

The energy savings associated with Electricity Generation are shown in the following table. Said savings were obtained in comparison with the electrical output from the national system in2007 (46,7%).

Table 12.9. Primary energy saving in electricity generation for 2007 - 2010 (ktep)

Source: IDAE

	2007	2008	2009	2010
Electricity generation saving	0	2.422	3.653	6.097

This energy saving data is due to the contribution of two factors:

- Greater efficiency in each technological area, due to the improved outputfrom each type of plant by energy source.
- Modification of the participation in total electrical production in each of the technological areas.

The greater contribution of savings is focused on renewable energy areas,by their greater participation with respect to 2007, as well as in electrical production from coal due to its decreased participation with respect to said reference year. In2010, an energy saving of 6.097 Ktep was achieved with respect to 2007.

With regard to theown consumption of electricity generation plants, the following box shows said consumption, its percentage of gross consumption and the energy saving with respect to 2007. Theconsumption for their own use decreased by 0.5 percentage points in 2010 with respect to 2007,meaning an energy saving of310 Ktep in 2010.

Table 12.10. Primary energy saving for consumption for their own use 2007 - 2010

	2007	**2008**	**2009**	**2010**
Consumption for their own use [GWh]	11.995	11.679	10.462	9.956
Savings by lower consumption for their own use(ktep)	0	110	185	310

Source: IDAE

The gradual reduction in the consumption for their own use was due to the greater participation of technologies such as wind and solar,which results in less need forelectricity consumptionfrom auxiliary services with respect to thermal power plants.

Finally, in terms of the energy situation of the transport and distribution networks, the table below shows the quantification of losses in said networks,its percentage of the electrical production in the middle bars and the associated savings with respect to 2007.We should point out the decrease in losses in the 2007-2010 period by 0.7 percentage points, which corresponds to the modernisation of the transport and distribution infrastructurerelative to electricity carried out in recent years. The saving achieved with respect to 2007 is 502 Ktep.

Table 12.11. Primary energy saving in transport and distribution networks 2007 - 2010

	2007	2008	2009	2010
Losses (GWh)	27.649	27.438	25.830	24.456
Savings through fewer losses (ktep)	0	182	128	502

Source: IDAE

Assessment for the 2011-2020 period

From the point of view of future planning in the electricity sector, there was a development phase for anew document looking ahead to 2020 which is expected to be approvedin 2011. This document is provided in Law2/2011, of 4 March, concerning Sustainable Economy. On the other hand, Directive2009/28/EC concerning promotion of the use of energy from renewable sourcesis considered as a basic document containing measures for the extensive development of the participation of renewable energies in total electricity production.

The following table shows the expected electrical energy production by source up to 2020.With regard to 2010-2020, we are expecting an increase in the participation of natural gas and renewable energies,with a stabilised downward trendin electricity from nuclear sources being maintained. Coal will remain practically stable, whilst the contribution ofoil-based products to electricity production will fall.

In any case, it is renewable energies that will play a more relevant role in the weight of electricity generation as they are the only sourcesthat will see a growth in their electricity production in bother absolute and relative terms,making 41% coverage in 2020 possible.

In terms of natural gas, the new production will be due, mainly, to the cogeneration plants, which will evolve at a pace greater than combined cycle plants. They represent, currently, 23% of electricity production, compared with11% for cogeneration with natural gas.

Table 12.12. Electricity production forecast for 2016 and 2020 (GWh)

	2016	2020
Hydraulic	41.084	41.597
Nuclear	55.600	55.600
Coal in Ordinary Service conditions	32.500	31.279
Fuel and natural gas in Ordinary Service conditions(except for combined cycles)	4.332	4.224
Combined natural gas cycles in Ordinary Service conditions	78.028	81.428
Coal, oil-based products and natural gas in Special Service conditions*	51.015	55.065
Biomass and waste	8.821	13.700
Thermoelectric solar	9.276	14.379
Other renewables	68.456	86.361
National total	349.111	383.634

(*)Includes the production of electrical energy with cogeneration in special service conditions.

The output and the energy saving expected with respect to 2007 from Electricity Generationup to 2020 is shown in the following graph and table. Weexpect electricity output to stabilise at around 52%, whilst we expectan energy saving of 7.572 Ktep for 2020 with respect to the situation in 2007.It should be pointed out that, due to the gradual increase in the weight of renewable generation in the 2011-2020 period,results in an increase in energy saving despitethe stabilisation of the electrical output in this period.

Graph 12.3. Electrical output expected from the generation fleet 2016 - 2020

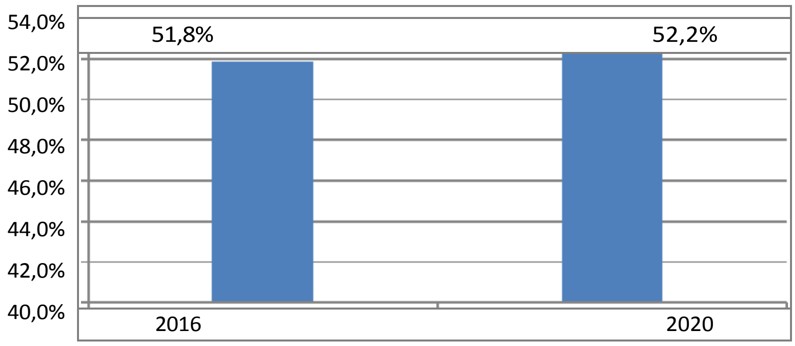


Table 12.13. Expected primary energy saving in electricity generation 2016 - 2020 (ktep)

	2016	2020
Primary energy saving	6.441	7.572

Source: IDAE

With regard to electricity consumption for the plant's' own uses, 2.3% of losses are expected in 2020 with respect to gross electricity generation, with decrease of one percentage point in the 2010-2020 period.This means a saving of 1.116Ktep in 2020 with respect to 2007.

Table 12.14. Primary energy saving expected for consumption for their own use 2016 - 2020

	2016	2020
Consumption for their own use [GWh]	8.848	8.968
Savings by lower consumption for their own use(ktep)	884	1.116

Source: IDAE

With regard to the transport and distribution networks, we expect energy losses of 7.7%of the electrical energy that these networks receive from generation plants in2020. This means a decrease by 0,4 percentage points in the 2010-2020 period,a result of the gradual modernisation of this type of infrastructure and the effect of generation distributed that, both in terms of cogeneration and renewable energies, is provided. This improved energy efficiencyaccounts for a saving of 1.012 Ktep in 2020 with respect to the situation in 2007.

Table 12.15. Primary energy saving expected in transport and distribution networks 2016 - 2020

	2016	2020
Losses (GWh)	27.459	29.839
Savings through fewer losses (ktep)	843	1012

Source: IDAE

Cogeneration

Current situation

In line with the statistics from the National Energy Commission (NEC) on sales of electrical energyproduced under special service conditions, the operational cogeneration capacity at the end of 2010 in Spain was6.704 MW, including, in this figure, 6.046 MW fromplants belonging to class a) in the current RD 661/2007 and 658 MW fromwaste treatment and reduction plants. Notwithstanding the foregoing, thestatistics on the electrical energy industry from the MITYC indicate the existence of397 MW of additional capacity in cogeneration plants that, or may not even be operational for current reasons,or have ceased their activity and have notcomplied with the requirement to be discharged in the register of plants under special service conditions.

In terms of the production of electrical energy generated by cogeneration in the 2008-2010 period, it stabilised at around32.000 GWh annually.

From the publication of Directive 2004/8/EC, the legislative development affecting cogeneration in Spain is focused, on the one hand,on guaranteeing that the source of the electricity produced from high-efficiency cogenerationmay be identified according totransparent and non-discriminatory criteria objectives and, on the other hand,to guarantee that the aid for cogeneration, both in terms of existing andfuture units, is based on the demand for useful heat and primary energy saving, in line withthat set out by articles 5 and 7 in the Directive itself.

The transposition of Directive 2004/8/EC into Spanish law relative to guaranteeingsource materialised through the following regulation:

- Royal Decree 616/2007, of 11 May, on the promotion of cogeneration.
- Act ITC/1522/2007, of 24 May, which sets out the regulation relative to guaranteeing the origin or electricity from renewable energy sources andhigh-efficiency cogeneration.

The NEC is the organisation responsible, for the whole Spanish territory,for issuing the guarantee of electricity origin, as well as through its management using abook-entry system, with the aim being that electricity producers that use renewable energy sources orhigh-efficiency cogeneration can show that the electricity they sellwas generated in accordance with such principles.

On the other hand, the aid plans for cogeneration, as set out in article 7 of Directive2004/8/EC, are set out in Law 54/1997 concerning the Electricity Sector, the basic aspects of which are the following:

- Law 54/1997 recognises producers working in special service conditions, which includes producers using cogeneration, priority access rights totransport and distribution networks relative to energy generated by the same,subject to compliance withthe maintenance of the feasibility and safety of the networks and the right to incorporate their net energy production into the systemthereby receiving the corresponding payment.

– The electrical energy production activity from cogeneration is considered to beproduction in special service conditions, based on a direct aid for the production, through the establishment of asystem of regulated tariffs andspecific premiums that take the internalisation of environmental benefits, diversification andsupply safety intoaccount.

– The Special Scheme is applicable to both cogeneration and renewable electricity production plants(with some exceptions, basically, hydraulic) in the whole Spanish state, regardless of their location and provided that thecapacity of the plants is less than or equal to 50 MW.

the determination of the remuneration for the generation of electricity from cogeneration is set out using royal decrees. The Royal Decree that currently regulates the production of electrical energy activity using a special scheme isRD 661/2007, of 25 May.

The owners of cogeneration plants can choose, for periods of a year or more, between two remuneration alternatives for the energy transferred to the system:

– Sale at a regulated tariff, only for planning periods.
– Direct sale to the electrical energy market. Their remuneration is theresulting price in a regulated market (or the freely negotiated price),complemented by a bonus.

For both remuneration methods, the tariff system and the bonus system, othersupplementary payments exist depending on the capacity factor and the efficiency of the generation.

For electricity generation with cogeneration plants, there are minimum levels of energy efficiency that must be met; these are set out in AnnexI of Royal Decree 661/2007.

The evolution of the capacity installed in recent years has been closely linked to thegeneral economic situation and the situation of electrical energy prices themselves relative to the network and fuel prices,especially with regard to natural gas. Taking 2007 as a reference, the latest data available showsquite limited growth in cogeneration, as shown in the following table.

Table 12.16. Capacity installed in cogeneration in Spain 2008 - 2010 (MW)

	New capacity installed in a special scheme	New capacity installed with respect to 2007
2008	41,5	41,5
2009	136,3	177,8
2010	3	180,8

Source: MITYC

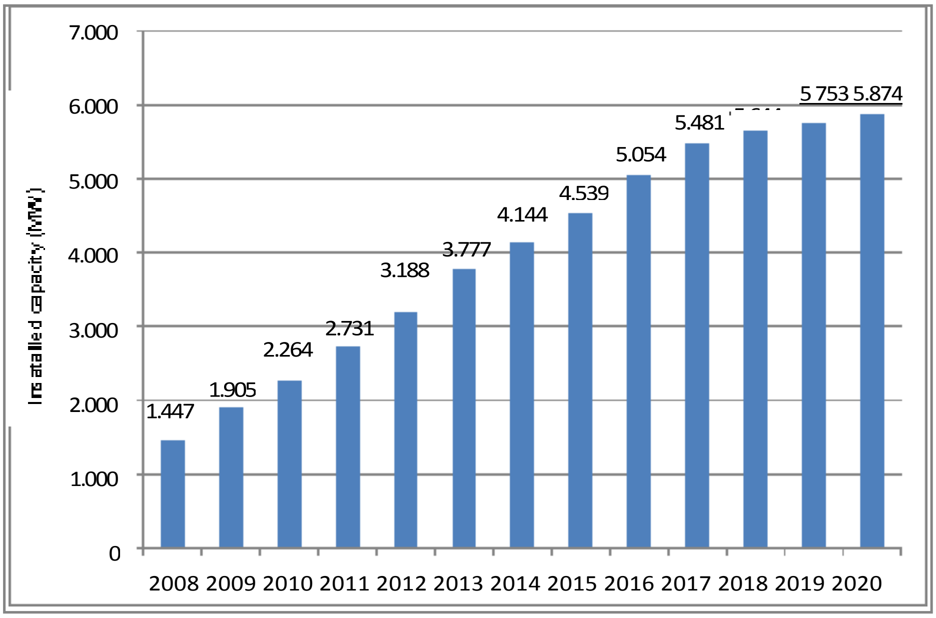
The limited growth is attributable to the existence of a series of administrative and regulatory barriers thataffect the perception of risk for the investor and/or developer of this technology considered when evaluating a new investment project. The main barriers that currently restrict the development of cogeneration are the following:

– Access and interconnection conditions relative to new network projects.
– Client risk added to the risk implicit to the project, especially in terms of the sectors most affected to economic cycles.
– Administrative complexity associated with the processing of projects and, especially, low-capacity projects.
– A lack of incentives relative to the current special scheme for the development of projects with capacity greater than50 MW.

It is expected that regulation, both administrative and financial, of the special cogeneration scheme derived from the transposition of Directive8/2004/ECproduces a strong impetus in the future development of cogeneration's potential.

Another aspect that should be highlighted is the number of cogenerations over 15 years old. This represents a challenge and an opportunity to improve the energy efficiency of the existing cogeneration stock through the modernisation and/or replacement of the main equipment depending on its useful life.The graph shows the age of the existing stock of cogenerations,with 2.264 MW being 15 years old or older in 2010.

Graph 12.4. Cogeneration capacity installed 15 years old or older 2008 - 2020



Taking 2007 as a reference, the following box reflects the capacity that has been renewed in plants that are 15 years old or older.

Table 12.17. Capacity renewed in cogeneration 2008 - 2010 (MW)

	2008	2009	2010
Power renewed	2	26	60

The 60 MW of capacity renewed in 2010 only represents capacity that is over 15 years old.
This low percentage is justified because of the legislative development of the technicalconditionsof substantial change,

which is the basis for the renewal of equipment, was not completed at the end of 2010, with the publication ofRD 1565/2010 relative to modification of the special scheme, and this delay has affected the decision to renew on the part of developers.

The indicator used to analyse cogeneration efficiency is the primary energy saving achieved comparing separate electricity and heat generation with the fuel consumed by cogeneration to produces said electricity and heat. The reference value for the separate production of electricity is the generation mix correctedby the level of voltage delivered and the reference value for the separate production of heat is that corresponding to the use of natural gas.

The following table shows the value of the primary energy saving in the 2007-2010 periodboth for the new capacity installed and for the capacity renewed in the period.

Table 12.18. Primary energy saving in the 2007- 2010 period (ktep)

	2007	2008	2009	2010
Primary energy savingper new cogeneration plant	0	11,5	56,1	65,3
Saving of primary energy through themodernisation of existing cogenerations	0	0,1	1,8	5,5
TOTAL	0	11,6	58,0	70,8

Source: IDAE

Assessment for the 2011-2020 period

The primary energy saving objective in the cogeneration sector for 2011-2020pursues, both the increase in new capacity relative to this type of plant in the generation mix, and the improved energy efficiency of the existing cogeneration stock through the renewal of the plants thatare over a determined age. This objective is in keeping with that set out in Directive2004/8/EC concerning the promotion of cogeneration based on the demand for useful heat.

The development of potential cogeneration energy in 2011-2020, both in theindustry sector and the tertiary and residential sector, will be closely linked to thelegal framework derived from RD 661/2007 of 25 May, this being the mainlegislative mechanism for the introduction of new capacity.

With regard to small-scale cogeneration, the regulatory policyrelative to the network connection, in terms of both low and medium voltage that is expected in the second half of 2011 will enable, through the simplification of administrative procedures, the development of acapacity niche that is currently unexploited.

The following table shows the expected introduction of new capacity in cogeneration plants up to 2020. In total, we expect the installation of3.751 MWin the 2011 - 2020 period.

Table 12.19. Cumulative new capacity expected to be installed for 2016 and 2020 (MW)

	2016	2020
New installed capacity	2.490	3.751

However, the renewal of the capacity stock that is over 15 years old is a priority objective for2011 - 2020. Therefore, RD1565/2010, which develops the concept of substantial modification, is considered to be thelegislative instrument that will allow modernisation of the existing stock to be achieved. The modernisation of 3.925 MW is expected in the 2011 - 2020 period,with the following chronological distribution:

Table 12.20. Cumulative modernised capacity expected for 2016 and 2020 (MW)

	2016	2020
Modernized capacity	2.452	3.925

The expected production of electrical energy by cogeneration in 2020 is in the order of55.000 GWh.

The primary energy saving associated with cogeneration in Spain, expected in 2020 with respect to the situation in 2007, iswith the following detail:

Table 12.21. Expected primary energy saving in cogeneration 2016 and 2020 (ktep)

	2016	2020
Primary energy savingper new cogeneration plant	971,2	1.430,2
Primary energy saving through themodernisation of existing cogenerations	169,9	268,6
TOTAL	1.141,1	1.698,8

Source: IDAE

12.2 Measures in the Energy Transformation Sector

Measure 1: Feasibility studies for cogenerations

Objective:

To analyse the technical and financial feasibility of high-efficiency cogenerations plants, thuspromoting the development of the cogeneration capacity in Spain and improving the knowledge of said capacity.

Description:

Performance of studies that determine the technical, financial and administrative feasibility of the applicability of a cogeneration plant. They will be carried out by engineeringcompanies specialised in cogeneration technologies and familiar with their regulations.

The studies will be performed taking into account the criteria set out in Directive8/2004/EC concerning high-efficiency cogeneration, with the aim of selecting an alternative which might mean greaterprimary energy saving and prioritising actions in sectorswith high replicability capacities. These studies will be performed according to a minimum content specified by thismeasure's responsible entities and collaborators.

Action mechanisms included in the measure:

This measure will be carried out using the following action mechanisms:

> *Financial incentives*: awarding of a budget aimed at incentivising the performance of feasibility studies,linked to the material realisation of the project, the analysis of which has proved viable.

> *Communication:* preparation of a communication plan to inform consumers in each Autonomous Communityabout the advantages of cogeneration.

Timeframe: 2011-2020.

Group the measure is aimed at:

This measure is aimed at owners of energy-consuming plants able to usea cogeneration plant.

Below is an expository and non-exhaustive list of the activity sectors in which cogeneration has been significantly introducedand those that this measure is aimed at:

A. Industry, with special emphasis on the following branches in which technically there are the best conditions for the siting of cogenerations:

- Food, Drinks and Tobacco
- printing
- Paper and Cardboard

- Non-metallic minerals
- Textiles, Leather and Footwear

B: Tertiary Sector: residential and commercial activities, in which the following stand out:

- Hospitals
- Hotels
- Commercial superstores
- Prisons
- Institutional buildings

Responsibility and collaborators:

Responsible: Ministry of Industry, Tourism and

Trade/IDAE.Collaborators: Autonomous Communities.

Aid managed by the public sector:

The aid managed by the public sector required for the development of this measure in the 2011-2020 period is3.6 million Euros, with the following chronological breakdown:

Table 12.22. Expected cumulative aid to be managed by the public sector for feasibility studies 2016 and 2020 (thousands of Euros)

	2016	2020
Publicly managed aid	2.475	3.600

Measure 2: Energy audits for cogenerations

Objective:

To analyse and evaluate the potential for improving the energy efficiency of operational cogenerations,considering aspects of technological availability, sizing and improvements applicable to their operation and adaptation to the legal framework in force.

Description:

Individualized audit-type studies to obtain information relating to the potential for improvement from both the energy-efficiency point of view and the operation viewpoint in the face of the electrical system in operating cogeneration plants. Anenergy audit of cogeneration will assess the technical, financial and administrative feasibility of modernising cogeneration. The audits will be carried out by engineeringcompanies specialised in cogeneration technologies and familiar with their regulations.

The audits will be performed taking into account the criteria set out in Directive8/2004/EC concerning high-efficiency cogeneration, with the aim of selecting an alternative which might mean greaterprimary energy saving and prioritising actions in sectorswith high replicability capacities. Likewise, they will be carried out according to a minimum content specified by this measure's responsible entities and collaborators.

Action mechanisms included in the measure:

This measure will be carried out using the following action mechanisms:

>*Financial incentives*: awarding of a budget aimed at incentivising the performance of energy audits on cogeneration,linked to the material realisation of the project, the analysis of which has proved viable.

> *Communication*: preparation of a communication plan to inform consumers in each Autonomous Communityabout the advantages of cogeneration.

Timeframe: 2011-2020.

Group the measure is aimed at:

This measure is aimed at all owners of energy-consuming plants that have installed cogeneration plants in all sectors; however,it is particularly applicable tocases whereexisting cogenerations are of a certain age, as is the case in the industry sector.

Responsibility and collaborators:

Responsible: Ministry of Industry, Tourism and

Trade/IDAE.Collaborators: Autonomous Communities.

Aid managed by the public sector:

The aid managed by the public sector required for the development of this measure in the 2011-2020 period is1.77 million Euros, with the following chronological breakdown:

Table 12.23. Expected cumulative aid to be managed by the public sector for energy audits 2016 and 2020 (thousands of Euros)

	2016	2020
Publicly managed aid	1.103	1.766

Measure 3: Promotion of cogeneration plants in non-industrial activities

Objective:

To contribute to developing high-efficiency cogeneration potential in non-industrial activities. This measure is based on the fact that cogeneration plants in this type of activity have a low presence.

Description:

Promotion of the introduction of new cogeneration plants by way of various institutional actions that allow for a significant increase in the participation of these plants in non-industrial sectors.

This measure focuses on high-efficiency cogeneration plants with electrical capacity greater than150 KW. Regardless of the fuel used.

Action mechanisms included in the measure:

This measure will be carried out using the following action mechanisms:

> *Regulatory*: the policy regulating cogenerations in Spain is set out in Royal Decree616/2007 concerning the promotion of cogeneration, which transposes the European Directive in this area as well as in Royal Decree661/2007 which regulates the activity of special scheme electrical energy production.
> *Financial incentives*: awarding of a budget aimed at incentivising therealisation of cogeneration projects in non-industrial activities.
> *Communication:* given the existence, in receiving sectors, of market niches not familiar with cogeneration plants, there is provision for the production of publications and dissemination workshops which provide technical, economic, environmental and administrative knowledge of cogeneration plants.

Timeframe: 2011-2020

Group the measure is aimed at:

This measure is aimed at owners of energy-consuming plants in non-industrial sectors able to accommodatecogeneration plants.

The most typical receiving sectors are the tertiary, residential and commercial sectors in which the degree of penetration is currently low.

Responsibility and collaborators:

<u>Responsible:</u> Ministry of Industry, Tourism and

Trade/IDAE.<u>Collaborators:</u> Autonomous Communities.

Actions and planning:

The forecast for the realisation of installations during the 2011-2020 period is shown below.In total, the installation of 1.130 MW is expected.

Table 12.24. Cumulative new power expected to be installed in cogenerations in non-industrial activities for 2016 and 2020 (MW)

	2016	2020
New capacity installed	760	1.130

Aid managed by the public sector:

The estimated aid managed by the public sector for the development of this measure is 15.74 million Euros with the following annual investment:

Table 12.25. Aid expected to be managed by the public sector for cogenerations in non-industrial activities 2016 and 2020 (thousands of Euros)

	2016	2020
Publicly managed aid	13.128	15.744

Final energy savings achieved (2010):

The following table shows the cumulative primary energy savings achieved bycogenerations in non-industrial activities with respect to 2007.

Table 12.26. Primary energy saving in cogeneration in non-industrial activities 2008 -2010 (ktep)

	2008	2009	2010
Primary energy saving (base year 2007)	0,0	11,5	10,0

The energy savings are due to a slight increase in installed capacity, and, to the improvedelectrical and thermaloutput from the new cogenerations.

Final energy savings expected (2016 and 2020):

The primary energy savings expected in 2016 and 2020 with respect to 2007are as follows:

Table 12.27. Primary energy saving expected in cogenerations in non-industrial activities in 2016 and 2010 (ktep)

	2016	2020
Primary energy saving (base year 2007)	264,8	388,2

This data responds to an expected increase from cogenerations in non-industrial activities in the order of1.164 MW in the 2008 - 2020 period.

Measure 4: Promotion of small-capacity cogeneration plants

Objective:

To promote the installation of cogeneration plants with electrical capacity equal to or lower than150 KW to achieve the installation of a strategically significant amount of this type of plant.

Description:

The technical characteristics and size of the equipment for low capacity cogeneration allow for its introduction in activities with limited energy demands, typical of non-industrial sectors. This measure assumes institutional support to build up a significant presence of these plants by way of various instruments.

The measure assumes the realisation of demonstration projects on the part of IDAE and execution of reduced-size cogeneration plants, understood as having capacity below150 KW. Regardless of the fuel used.

Action mechanisms included in the measure:

This measure will be executed using the following action mechanisms:

> *Regulatory:* the policy regulating cogenerations in Spain is set out in Royal Decree616/2007 concerning the promotion of cogeneration, which transposes the European Directive in this area as well as in Royal Decree661/2007 which regulates the activity of special scheme electrical energy production. In addition, a specific policy will need to be developed for network connections regardingsmall-scale cogenerations.

> *Financial incentives:* awarding of a budget aimed at incentivising therealisation of small-capacity cogeneration projects.

> *Communication:* dissemination activities are deemed to be of special importance given the sparse knowledge in the residential area of this type of plant. There is provision for publications and dissemination workshops which provide technical, economic, environmental and administrative knowledge of the same.

Timeframe: 2011-2020.

Group the measure is aimed at:

This measure is aimed at owners of energy-consuming plants in all sectors able to accommodatecogeneration plants. Those receiving sectors understood to be more closely related, on the one hand, are those which have buildings likely to supply energy, and on the other hand, activities likely to take advantage of small quantities of fuel generated as a by-product or waste. These sectors are the following:

- Tertiary, residential, commercial and institutional sector.
- SMEs in the Industry Sector.

Responsibility and collaborators:

Responsible: Ministry of Industry, Tourism and

Trade/IDAE.Collaborators: Autonomous Communities.

Actions and planning:

The forecast for the realisation of installations during the 2011-2020 period is shown below.In total, the installation of 13 MW is expected.

Table 12.28. Cumulative new power expected to be installed in small-capacity cogenerations 2016 and 2020 (kW)

	2016	2020
New power installed	6,8	13,0

Aid managed by the public sector:

The estimated aid managed by the public sector for the development of this measure is 1.07 million Euros with the following annual investment:

Table 12.29. Cumulative aid expected to be managed by the public sector for small-capacity cogenerations 2016 and 2020 (thousands of Euros)

	2016	2020
Publicly managed aid	780	1.073

Final energy savings achieved (2010):

The following table shows the cumulative primary energy savings achieved bysmall-capacity cogenerations with respect to 2007.

Table 12.30. Primary energy saving in small-capacity cogenerations 2008 -2010 (ktep)

	2008	2009	2010
Primary energy saving (base year 2007)	0	0,03	0,03

This data corresponds to a slight increase in installed capacity in the order of 70KW.

Final energy savings expected (2016 and 2020):

The cumulative primary energy savings expected in 2016 and 2020 with respect to 2007are as follows:

Table 12.31. Expected primary energy saving in small-capacity cogeneration 2016 and 2020 (ktep)

	2016	2020
Primary energy saving (base year 2007)	3,11	5,91

An increase of 13,07 MW of installed capacity is expected, maintaining the currentdata relative to the electrical and thermal output of cogenerations.

Measure 5: Promotion of cogeneration plants in industrial activities

Objective:

To promote the installation of new cogeneration plants in industrial establishments contributing to the developmentof cogeneration capacity in Spain.

Description:

The presence of cogeneration in Spanish industry is, currently, significant;however, nowadays, there are still industrial sites without cogeneration plants that are able to use this type of system.

The measure consists of promoting the installation of new cogeneration plants with any capacity through various institutional actionsthat enable the participation of these plants in industrial sectors to continue increasing.

Action mechanisms included in the measure:

This measure will be carried out using the following action mechanisms:

- *Regulatory:* the policy regulating cogenerations in Spain is set out in Royal Decree616/2007 concerning the promotion of cogeneration, which transposes the European Directive in this area, as well as in Royal Decree661/2007 which regulates the activity of special scheme electrical energy production.
- *Communication:* this provides for the inclusion of the industry sector in the groupsat which technical, financial and regulatory information workshops and campaigns concerning cogenerations are aimed.

Timeframe:2011-2020.

Group the measure is aimed at:

This measure is aimed at owners of all energy-consuming industrial plants able to usea cogeneration plantthat still do not use this type of system. The following areas should be pointed out, in which, or technicallythe best conditions are given for the location of cogenerations,or relating to sectors with low penetration of cogeneration:

- Food, Drinks and Tobacco
- printing
- Oil Refining
- Paper and Cardboard
- Non-Metallic Minerals
- Textiles, Leather and Footwear
- Pharmaceutical industry

Responsibility and collaborators:

Responsible: Ministry of Industry, Tourism and Trade/IDAE.

Actions and planning:

The forecast for the realisation of installations during the 2011-2020 period is shown below.In total, the installation of 2.608 MW is expected.

Table 12.32. Cumulative new power expected to be installed in cogenerations in industrial activities for 2016 and 2020 (MW)

	2016	2020
New power installed	1.723	2.608

Energy savings achieved (2010):

The following table shows the primary energy saving achieved bycogenerations in industrial activities with respect to 2007.

Table 12.33. Primary energy saving in cogenerations in industrial activities 2008 - 2010 (ktep)

	2008	2009	2010
Primary energy saving (base year 2007)	17,4	44,6	55,2

During these years, there was an increase of 147 MW in cogenerations in industry, which induced the savings indicated.

Energy savings expected (2016 and 2020):

The cumulative primary energy savings expected in 2016 and 2020 with respect to 2007are as follows:

Table 12.34. Primary energy saving expected in cogenerations in industrial activities in 2016 and 2010 (ktep)

	2016	2020
Primary energy saving (base year 2007)	703,3	1.036,1

However, this data relates to an increase in cogenerations in industrial activities in the order of2.755 MW.

Measure 6: Substantial modification of existing cogenerations

Objective:

Increased energy efficiency through the renewal of major equipmentachieving increased output and, consequently, reducing primary energy consumption.

Description:

Replacement of major equipment in existing cogeneration plants, complying with the definition of substantial modificationaccording to that set out in Royal Decree1565/2010 which regulates and modifies determined aspects relative to the activity of special scheme production of electrical energy.

Action mechanisms included in the measure:

This measure will be carried out using the following action mechanisms:

> *Regulatory*: the substantial modification regulated byRoyal Decree1565/2010 which regulates and modifies determined aspects relative to the activity of special scheme production of electrical energy.
> *Communication*: this provides for the realisation of dissemination workshops thatfacilitate knowledge of substantial modification.
> *Other accompanying mechanisms*: this relates to the renewal ofcogenerations within the strategies and plans implemented for the promotion and dynamisation of the energy services marketset out in Chapter 3 of this 2011-2020 Action Plan.

Timeframe:2011-2020.

Group the measure is aimed at:

This measure is applicable to all activities likely to use cogeneration plants, despite the fact that almost all the renovation potential is concentrated in the industry sector. In this way, activity sectors with greater probability of introducing this measure are the following:

- Food, Drinks and Tobacco
- printing
- Oil Refining
- Paper and Cardboard
- Non-Metallic Minerals
- Textiles, Leather and Footwear

Responsibility and collaborators:

Responsible: Ministry of Industry, Tourism and Trade/IDAE.

Actions and planning:

The forecast for the modernisation of cogenerations during the 2011-2020 period is shown below.In total, the substantial modification of 3.925 MW is expected.

Table 12.35. Cumulative modernised capacity expected for in cogenerations 2016 and 2020 (MW)

	2016	2020
Modernised capacity	2.452	3.925

Final energy savings achieved (2010):

During the 2008 - 2010 period, the substantial modification of 88 MW was achieved,which led to significant energy savings due to the improved electrical output of cogenerations:

	2008	2009	2010
Primary energy saving (base year 2007)	0,1	1,8	5,5

Table 12.36. Primary energy saving in modernisation of cogenerations 2008 -2010 (ktep)

Final energy savings expected (2016 and 2020):

The following primary energy saving is associated with the substantial modifications made in the 2008-2020 period:

Table 12.37. Expected primary energy saving in the modernisation of cogenerations 2016 and 2020 (ktep)

	2016	2020
Primary energy saving (base year 2007)	169,9	268,6

12.3 Table-Summary by measure in the Energy Transformation Sector

	Final energy savings (ktep)		Primary energy savings (ktep)		Emissions of CO_2 avoided ($ktCO_2$)		Publicly managed aids (10^6 €)			Investments (Aid + private investment) (10^6 €)		
	2016	2020	2016	2020	2016	2020	2011-2016	2017-2020	2011-2020	2011-2016	2017-2020	2011-2020
ENERGY TRANSFORMATION			1.141	1.699	1.995	2.978	17	5	22	3.885	2.085	5.970
Feasibility studies for cogenerations							2,4	1,2	3,6	5,0	2,3	7,2
Energy audits for cogenerations							1,1	0,7	1,8	2,2	1,3	3,5
Promotion of cogeneration plants in non-industrial activities			265	388	445	653	13,1	2,6	15,7	912,0	444,0	1.356,0
Promotion of small-capacity cogeneration plants			3	6	6	11	0,8	0,3	1,1	17,0	15,5	32,5
Promotion of cogeneration plants in industrial activities			703	1.036	1.180	1.739				1.723,2	884,8	2.608,0
Substantial modification of existing cogenerations			170	269	364	575				1.225,7	736,7	1.962,4

Source: IDAE

Note: The calculation of emissions of CO_2 avoided as a result of the saving and energy efficiency measures included in this plan are ad hoc calculations for the same and assume a translation of the savingscalculated using different base years (2004 and 2007), in terms of final and primary energy, to emissions of CO_2 avoided - this calculation does not necessarily coincide, therefore, with that achieved with different approaches or accounting bases aspart of the periodic reports produced in relation to the evolution of greenhouse gas emissions.