

ENERGY SAVING AND EFFICIENCY ACTION PLAN 2011-2020

2nd SPANISH ENERGY EFFICIENCY
ACTION PLAN 2011-2020
EXECUTIVE SUMMARY

**ENERGYSAVINGAND
EFFICIENCYACTION
PLAN2011-2020**

This Energy Saving and Efficiency Action Plan 2011-2020 was approved by Cabinet Meeting Agreement of the Spanish Government as of 29th July 2011 and complies with Directive 2006/32/EC of the European Parliament and of the Council, of 5th April 2006, on energy end-use efficiency and energy services.

Madrid, 2011

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1 Context & motivation of Action Plan 2011-2020

This Action Plan 2011-2020 makes up the second National Energy Efficiency Action Plan (NEEAP¹) which, pursuant to article 14 of Directive 2006/32/EC² of the European Parliament and of the Council, of 5th April 2006, on energy end-use efficiency and energy services, Spain must submit to the European Commission in 2011. This Action Plan was approved by Cabinet Meeting Agreement as of 29th July 2011, and lends continuity to the energy saving and efficiency plans formerly approved by the Spanish Government within the *Energy Saving and Efficiency Strategy for Spain 2004-2012* (E4), approved in November 2003.

The former action plans, approved within the E4 framework, have been the object of analysis and evaluation, in compliance with the recommendations on verification and measurement methods drafted by the European Commission. These methods were also used to determine the new objectives within this Action Plan 2011-2020 and have been described in Chapter 2 in this document. Chapter 3 presents a balance of the savings achieved as a result of saving plans prior to this, during period 2004-2010, and of the tools and measures developed for its achievement. Finally, Chapter 4 in this document presents the objectives put forward in this new Plan –estimated with the same methodological criteria as the savings devised for the former period– and the measures and instruments proposed for the 2020 horizon.

The savings achieved during period 2004-2010 are the result of Action Plans 2005-2007 & 2008-2012, approved, respectively, through Cabinet Meeting Agreement dated 8th July 2005 and 20th July 2007³. **The second of these plans, Action Plan 2008-2012, was the one sent by Spain to the European Commission as the first National Energy Efficiency Action Plan (NEEAP).**

In this new Action Plan 2011-2020, both the calculation of the savings achieved up to 2010 and the

objective proposal for 2016 and 2020 has been done in terms of final and primary energy⁴: despite the fact that Directive 2006/32/EC only obliges State Members to report in terms of final energy and for the sectors specifically stated within its scope of application, this Plan includes final and primary energy savings as long as it is part of an **integrated offer-and-demand energy strategy**, which also considers some promotion objectives for renewable energies and for more efficient transformation technologies.

The final and primary energy savings estimated in this document are, therefore, coherent with the scenarios of final and primary consumption included in the indicative energy planning, set forth in section 79 of Law 2/2011 of Sustainable Economy, and in other planning instruments in the field of renewable energies (in compliance with the obligations derived from Directive 2009/28/EC, of 23rd April 2009, on the promotion of the use of energy from renewable sources). In this way, the energy planning makes up a coherent whole, leading to the **objective to improve the final energy intensity by 2% year-on-year for period 2010-2020.**

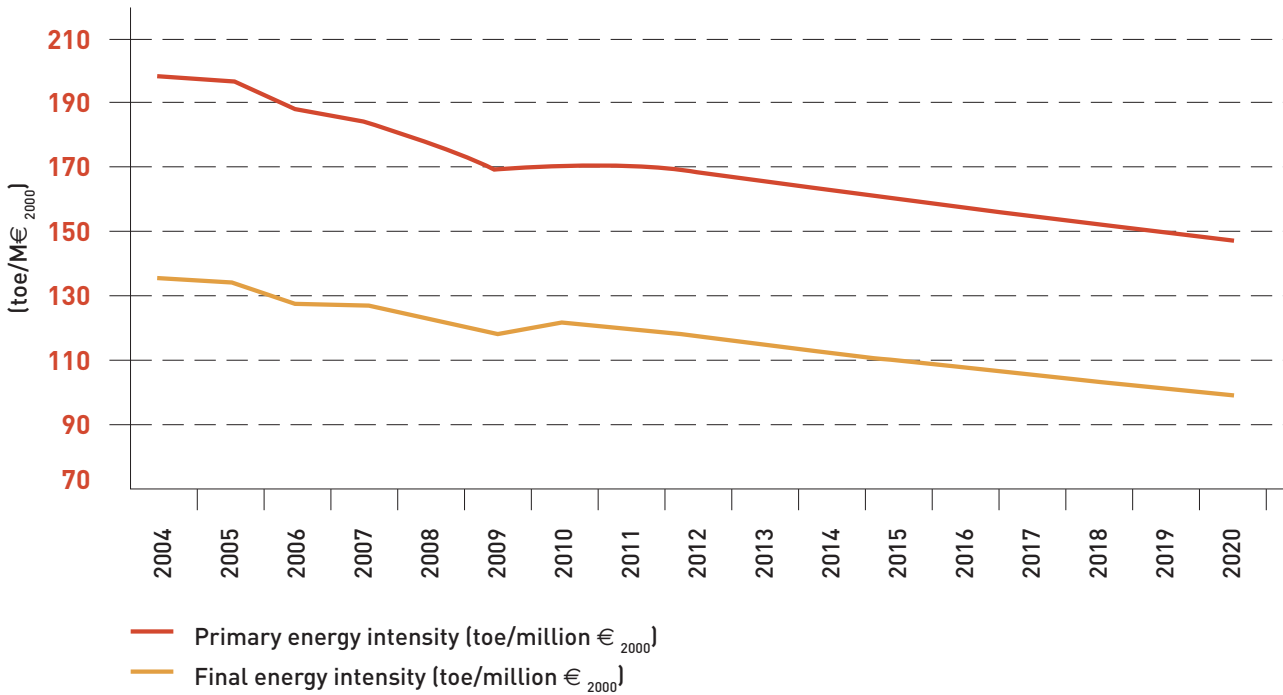
¹*National Energy Efficiency Action Plan*, in terms of Directive 2006/32/EC, of the European Parliament and of the Council, of 5th April 2006, on energy end-use efficiency and energy services

²Official Journal of the European Union, 27.4.2006

³This Cabinet Meeting also approved the *Saving and Energy Efficiency Plan in the State's General Administration Buildings*

⁴"Final energy" is defined as the energy supplied to the consumer for its use to produce goods or services, and "primary energy", the energy available for its use (which can be calculated as the result of adding up the consumption in the energy sector to the non-electric final energy –own consumption and transformation consumption– and the losses

Chart 1. Final and primary energy intensities (toe/M€2000)



The savings stated in this document are also coherent with the objectives on greenhouse effect gas reduction established for Spain within the framework of the European Union’s⁵ 20-20-20 Strategy, even if there are differences in the approach and the calculation methods with the emission projections over the 2020 horizon, as reported to the European Commission.

Likewise, this plan is coherent with other strategies in the field of the R+D+I, industrial policy or infrastructures (precisely, the Strategic Infrastructures and Transport Plan 2005-2020 —PEIT—) already approved, as necessary conditions to achieve the saving objectives of final and primary energy for year 2020. This Plan also assumes the objectives of the *Strategy to Promote the Electric Vehicle in Spain* and the objectives shown on the PANER to meet the renewable fuel incorporation scenarios for transport, as set forth in Directive 2009/28/EC, of 23rd April 2009, on the promotion of the use of energy from renewable sources (2.5 million electric vehicles in 2020).

The scenario considered as the objective of this Plan and therefore, efficiency scenario, is stated

on Table 1, and shows the primary energy consumptions by sources and its evolution by 2020, with a primary energy objective of 142,213 ktoe in that year; this involves a year-on-year increase of 0.8% since 2010, and an improvement in primary energy intensity of 1.5% a year between both years –considering a GDP increase of 2.3% a year, between 2010 and 2020.

⁵Ruling of the European Council of 17th June 2010, regarding the primary energy efficiency improvement by 20% in 2020

Table 1. Primary energy consumptions by sources (ktoe)

Sources	2004	2007	2008	2009	2010	2016	2020	2010-2020 (Annual growth rate) (%)
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	6,358	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
Elect. Balance (Imp.-Exp.)	-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

In terms of final energy, the objective-scenario of this Plan is the one summarised on Table 2, which list the final energy consumptions by sectors, and on Table 3, which gathers the final energy consumptions by sources, with target consumption for

the year 2020 of 102,220 ktoe. The final energy consumption with non-energy purposes are deduced from this figure (energy consumed as raw material in specific production processes); the achieved total consumption amounts to 95,355 ktoe.

Table 2. Final energy consumptions by sectors (ktoe) —non-energy uses excluded

Sectors	2004	2007	2008	2009	2010	2016	2020	2010-2020 (Annual growth rate) (%)
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 & 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

Table 3. Final energy consumptions by sources (ktoe) —non-energy uses excluded

Sources	2004	2007	2008	2009	2010	2016	2020	2010-2020 (Annual growth rate) (%)
Coal	2,405	2,317	2,080	1,427	1,693	2,168	2,146	2.40
Derived 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
Electric power	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

2 Savings measurement methodology

The energy savings up to 2010 were calculated –as it happens with the proposed target savings for 2016 and 2020– in compliance with the methodological recommendations of the European Commission.

The base year for the savings calculation is 2007, so as to add the savings calculated for Spain within the framework of this Action Plan 2011-2020, which will enable to calculate the ones of the remaining Member States within their respective action plans. In this way, a European balance can be drafted and to assess the coherence of the national action plans with the EC view to improving energy efficiency by 20% in 2020.

Therefore, the calculated savings have year 2007 as a reference up to 2010, which makes it possible to have them compared to saving objectives put forward for 2016 and 2020. Nonetheless, savings –in year 2010– were also calculated on the basis of 2004, so as to include the ones derived from Action Plan 2005-2007 in the balance of the achieved savings, as approved in the *Energy Saving and Efficiency Strategy for Spain 2004-2012 (E4)* framework.

The balance of the achieved savings in 2010, calculated both on the base years 2004 and 2007, is the result of the coherent combination of the top-down and bottom-up approaches.

Top-down indicators specify the whole of the achieved savings, either as a direct result of the energy saving and efficiency implemented or the indirect result derived from other variables. The derived savings from these indicators are, on a general basis, the result of the product of the activity variable by the difference between the unit consumptions of the base year (2007 or 2004) and of year 2010.

Some of the most relevant savings not directly calculated as a result of the energy saving and efficiency measures, apart from the ones resulting from the very technological breakthrough, are the ones derived from the price effect, or even, the ones derived from regulations with different objectives from saving and energy efficiency –that may have had and effect on final energy consumptions. Additionally, the economic and financial crisis has also affected these indicators, either positively or negatively.

The results achieved from *top-down* indicators (M: minimal or P: preferred⁶) therefore include the various effects, not always strictly bound to energy efficiency –this is more marked when M indicators are used instead of P indicators.

Table 4 shows the relation of the *top-down* indicators used in each sector, transport mode or energy use in the residential and tertiary sectors. Basically, they are P indicators, with the odd exception for road goods transportation and the tertiary sector. Additionally, new indicators have been included, not directly put forward by the European Commission to identify or clarify the effects on the saving from specific measures in public services and agriculture.

On the other hand, *bottom-up* indicators enable to identify the direct savings ascribable to each of the measures individually taken into account within the action plans, which often have been determined by adding the savings achieved, project by project, to each one which received support, ignoring the indirect or induced effects.

Here is the calculation of the saving associated with energy consumption in lighting in the household sector, from indicator P5, as an example to illustrate this *top-down/bottom-up* approach.

The indicator is determined in the way stated with the following formula, where C^{lighting} is the unit consumption (per household) in lighting:

$$\text{Savings } P5_{(net)} = \left[C_{2004}^{\text{lighting}} - C_{2010}^{\text{lighting}} \right] \cdot \text{Households}_{2010}$$

The saving calculated this way also results from two effects: the direct effect on the saving on the investments carried out to improve energy efficiency in lighting, and which can be approached with bottom-up methods, and the indirect effects (with a plus or minus sign) derived from other factors (energy prices, larger or smaller lighting equipment, i.e. increase or decrease of the number of the light fittings per dwelling, etc.).

$$\begin{aligned} \text{Savings } P5_{(net)} = & \sum \text{Direct savings (BU)} \pm \\ & \pm \text{Effects / Savings (indirect \& induced)} \end{aligned}$$

⁶Pursuant to the indicator rating set forth by the European Commission in the document on methodological recommendations used as a calculation basis for the savings in this Action Plan 2011-2020

Table 4. Top-down indicators used for the saving calculation

Sector			Energy indicator		Unit	
Industry	Parametric method Divisia 1 (LAS-PDM1)		L _{Technological}	PDM1 indicator of technological effect of industrial sub-sector	ktoe/M€	
			L _{Structure}	PDM2 indicator of structural effect of industrial sub-sector	ktoe/M€	
Transport	Road	Passengers	P8	Energy consumption of cars per passenger-km	goe/pkm	
			M53/PB	Energy consumption per buses fleet	toe/veq	
	Road	Freight	M52/A2	Energy consumption of trucks and light vehicles per vehicle fleet equivalent	toe/veq	
			Railway	Passengers	P10	Energy consumption of passengers rail transport per passenger traffic (passenger-km)
	Railway	Freight			P11	Energy consumption of freight rail transport per freight traffic (tonne-km)
			Maritime (freight)		M7	Energy consumption of freight sea transport (coastal and river) per freight traffic (tonne-km)
	Air (domestic passengers)		Mav	Energy consumption of passengers air transport in domestic flights per operations (number of flights)	goe/pkm	
	Modal shift	Passengers car to collective		P12	Transfer of passenger vehicle traffic to collective modes (bus, train and underground)	%
		Freight road to railway/maritime		P13	Transfer of freight road traffic to rail and maritime modes	%

(Continuation)

Sector			Energy indicator		Unit
Building	Residential	Envelope and thermal equipment	P1	Energy consumption of households for space heating per floor area (adjusted for climatic conditions)	toe/m ²
			P2	Energy consumption of households for space cooling per floor area (adjusted for climatic conditions)	toe/m ²
			P3	Energy consumption of households for water heating per inhabitant	toe/inhabitant
			Lighting	P5	Electricity consumption of households for lighting per dwelling
	Service	Envelope and thermal equipment	M311	Non-electric energy consumption in service sector for space heating per employee in full time equivalent (adjusted for climatic conditions)	toe/employee
			M411	Electric energy consumption in service sector for space heating per employee in full time equivalent (adjusted for climatic conditions)	toe/employee
			M412	Electric energy consumption in service sector for space cooling per employee in full time equivalent (adjusted for climatic conditions)	toe/employee
			M312	Non-electric energy consumption in service sector for water heating per employee in full time equivalent	toe/employee
			M413	Electric energy consumption in service sector for water heating per employee in full time equivalent	toe/employee
				Lighting	M42
	Equipment	Residential	Appliances	P4	Domestic Energy consumption of electrical appliances per equipment unit
P41				Domestic energy consumption of cookers per equipment unit	toe/kitchen
Service		Appliances	M44	Electric energy consumption in service sector of appliances and office equipment per employee in full time equivalent	toe/employee
			M43	Electric energy consumption in service sector of cookers per employee in full time equivalent	toe/employee
			Cookers	M32	Non-electric energy consumption in service sector of cookers per employee in full time equivalent

(Continuation)

Sector		Energy indicator		Unit
Public services	Street lighting	MAP	Electric energy consumption of street lighting per dwelling	toe/dwelling
	Water desalination	MAG _{desalination}	Energy consumption for desalination per volume of desalinated water	ktoe/hm ³ year
	Water treatment	MAG _{treatment}	Energy consumption for water treatment per inhabitant	toe/inhabitant
Agriculture and fisheries		M8'	Energy consumption in agriculture and fisheries per GVA unit	ktoe/M€

3 Balance

2004-2010

3.1 FINAL & PRIMARY ENERGY SAVINGS: RESULTS AS OF 2010

The saving results, in terms of final energy, obtained with both bases (2004 and 2007) are stated on Table 5, where it can be noticed that the total number of savings amount to 4,720 ktoe/year, on the year 2007 basis, and to 8,342 ktoe/year, on the year 2004 basis. Please note that the industry shows negative values for saving, both for the 2004 & 2007 bases, as a result of the energy intensity increase in the sector, the result in turn of the reduction of the use factors for the production capacities installed and the fall of the production values resulting from the current economic crisis.

On a general basis, sector savings were calculated as the difference between the value of the energy efficiency indicators that were chosen for each sector, transportation mode or energy use, between the base year and 2010. This difference

determines the plus or minus sign of the savings. If the indicator (usually unit consumptions) decreases until 2010, there are savings and alternatively, if the indicator increases, "unsavings" take place, which are shown as "negative savings" on the result tables. In the industry sector, the low use of the production capacities has triggered an increase of consumptions per value added unit which has been translated into negative values for the 2010 savings. Nevertheless, it is obvious that direct savings have taken place (plus sign) derived from the investments in efficient equipment, stimulated by the action plans that have been outnumbered by the indirect effect (minus sign), ascribed to the fall in production.

The saving achieved in 2010, calculated as the percentage of final energy consumption in the last five years just prior to the application of Directive 2006/32/EC, i.e. the consumption average of final energy in period 2003-2007, both inclusive⁷, amounts to 9.2%. This involves that Spain is ahead of meeting the saving objective of the Directive stated for 2016 (9%), six years in advance (2010).

Table 5. Final and primary energy savings and CO₂ emissions avoided by sectors, year 2010

	2004 Base			2007 Base		
	Final E. savings (ktoe)	Primary E. savings (ktoe)	CO ₂ avoided emissions (ktCO ₂)	Final E. savings (ktoe)	Primary E. savings (ktoe)	CO ₂ avoided emissions (ktCO ₂)
Industry	-799	-2,696	-5,282	-2,866	-5,717	-12,417
Transport	6,451	6,874	21,471	4,561	4,909	13,330
Building and equipment	2,232	3,165	6,983	2,529	4,189	9,269
Public services	32	80	161	29	67	144

⁷The average final energy consumption (for energy uses) in period 2003-2007 amounts to 72,621 ktoe/year — with the exclusion of the sectors not considered in Directive 2006/32/EC—, and therefore 9% amounts to a 6,536 ktoe/year. On the other hand, saving (on the 2007 basis) with the exclusion of the industrial sectors within ETS Directive and which involve negative savings in 2010, amounts to 6,682 ktoe

(Continuation)

	2004 Base			2007 Base		
	Final E. savings (ktoe)	Primary E. savings (ktoe)	CO ₂ avoided emissions (ktCO ₂)	Final E. savings (ktoe)	Primary E. savings (ktoe)	CO ₂ avoided emissions (ktCO ₂)
Agriculture and fisheries	426	535	1,526	467	580	1,673
Final sectors total	8,342	7,958	24,859	4,720	4,029	12,000
Energy transformation		9,767	51,797		7,019	53,253
Total of the final sectors + Energy transformation	8,342	17,725	76,656	4,720	11,047	65,253

Note: The CO₂ calculations avoided as a result of the saving and energy efficiency measures included in this Plan are ad hoc calculations for it, and involve a translation of the calculated savings on different bases (2004 & 2007), in terms of final and primary energy, into CO₂ emissions avoided –this calculation does not have to coincide, therefore, with the ones carried out with different approaches or account bases as part of the periodical reports done in relation to the evolution of the greenhouse effect gas emissions.

In terms of primary energy, the saving achieved in 2010 involve reaching 71.5% of the saving objective put forward by the former Action Plan for year 2012, two years before achieving the deadline. Nevertheless, the extent of achievement of the former Plan is subject to the results achieved in the industrial sector: the saving forecasts in the sector for 2012 were of 6,207 ktoe, whereas the *top-down* indicator accounts for a result of -2,696 ktoe derived from the increase in the unit consumptions in the industrial sector (in case of using bottom-up indicators, these could have accounted for savings in the industrial sector or around 1,781 ktoe).

In terms of final and primary intensity, both indicators have recorded more marked falls in period 2004-2010 than the ones stated as objectives for the E4 –and its successive action plans– for the period 2004-2012.

Table 6. Achievement of AP 2008-2012 objectives (primary energy, ktoe)

Objective 2012 (ktoe)	Result 2010 (ktoe)	%
24,776	17,725	71.5

Table 7. Achievement of AP 2008-2012 objectives (energy intensity, average % of annual growth)

	Objective 2004-2012 (%)	Result 2004-2010 (%)
Final intensity	-1,0	-1,9
Primary intensity	-1,8	-2,5

The following section shows the measures and strategies that have contributed to these results.

3.2 MEASURES AND ACTION MECHANISMS TO IMPROVE ENERGY EFFICIENCY

Action Plans 2005-2007 & 2008-2012 have been executed, essentially, through a co-management and co-financing mechanism of the State's General Administration (SGA) and the Autonomous Communities. Nevertheless, before describing the adopted measures in greater detail –as well as the results of the said measures– it is advisable to mention two energy saving and efficiency action plans which, upon initiative of the Ministry of Industry, Tourism and Commerce –through the State's Secretariat for Energy– have proposed urgent measures or have doubled the efforts –with new mechanisms– to make possible the achievement of the global objectives stated in Action Plan 2008-2012: *Energy Saving & Efficiency Activation Plan 2008-2011*⁸ and *Energy Saving & Efficiency Intensification Plan*⁹.

Estos dos planes, de relevancia especial por el momento en el que fueron aprobados (marcado por la fuerte inestabilidad política en los principales países de origen de las importaciones de petróleo y los elevados precios del crudo) han encajado de manera coherente con el Plan de Acción 2008-2012.

These two plans, of special relevance at the time they were approved (marked by the strong political instability in the main oil import countries of origin and the high crude oil prices) have coherently accepted Action Plan 2008-2012.

One of the most outstanding measures stemming from these plans is the market boost to the ESCOs (Energy Service Companies) and the proposal

of actions to guarantee the necessary exemplary role of the public sector: *Energy Saving & Efficiency Activation Plan in the buildings of the State's General Administration*¹⁰ and the *Plan to Promote Energy Service Contracts*¹¹, known as Plan 2000 ESCO, which involves the extension to the rest of the Regional Public Administrations of the former plan, affecting 1,000 energy –consuming centres belonging to the Regional and Local Administration and other 1,000 ones belonging to the SGA.

Plan 2000 ESCO¹² is perfectly integrated within the collaboration framework already started in 2005 between IDAE and the Autonomous Communities (regions). As stated formerly, Action Plans 2005-2007 & 2008-2012 have been jointly carried out and in a coordinated way between IDAE and the Autonomous Communities. This collaboration was made possible between the signature of agreements between the IDAE and each of them, on an ad hoc basis for each of the years 2005, 2006 & 2007, and on a pluriannual basis from 2008 onwards, covering all the enforcement period of Action Plan 2008-2012.

These collaboration (or cooperation) agreements between Administrations have defined the way the Autonomous Communities have implemented the measures stated in the plans. These measures have essentially been of two kinds: 1) support measures or 2) training, information and communication measures. In whatever scenario, IDAE has established, on a general basis for the entire national territory, the features and the way in which each of the Autonomous Communities should implement the said measures in their own territory, establishing the maximum amount of aid for the subsidized energy saving and efficiency projects or the features and contents of the training courses the Autonomous Communities have to organise and give.

⁸Approved in Cabinet Meeting as of 1st August 2008, as a result of the oil crisis in spring 2008

⁹Approved in Cabinet Meeting as of 4th March 2011, coinciding with the geo-political situation in North Africa

¹⁰Approved in Cabinet Meeting as of 1st December 2009 with the objective of achieve energy savings of 20% in 2016 in 330 of energy consumers centres of the State's General Administration, by carrying out saving and energy efficiency measures implemented by ESCOs

¹¹Approved in Cabinet Meeting as of 16th July 2010

¹²The results of this Plan 2000 ESCO –currently under way– will be noticed in the mid and long term, given the difficulty associated to its implementation for the high number of agents taking part in it, from the various Public Administrations to the private sector

These agreements have also established the way in which IDAE has been transferring the resources that have been authorised for the consecutive Action Plans to the Autonomous Communities, coming from the National Budget and from the energy sector thanks to electric power fees and from gas, for the amount stated in the very same plans. Additionally to the amounts transferred by IDAE, the Autonomous Communities have managed the contributions made at the expense of their own regional budget to finance Action Plans 2005-2007 & 2008-2012.

The Autonomous Communities have managed, within the framework of these collaboration agreements during the period 2005-2010, a budget amounting to M€1,500, out of which M€1,165 have been transferred from IDAE - from the National Budget or from the fees –and M€348 have corresponded to regional contribution.

The results of this co-operation mechanism, in terms of saving, are shown on the following table. They amount to 2,305 ktoe/year, in terms of final

energy, and to 3,221 ktoe/year, in terms of primary energy¹³, which involves 68% of the *bottom-up* savings estimated in 2010.

These savings have been calculated through a bottom-up approach for each of the public aid programmes coordinated by the Autonomous Communities in every territory, so far IDAE has itemised information on the savings and features of the subsidised projects.

For each of the measures set forth in the agreements, Table 8 provides relevant information on the achieved results: on a general basis, the amount of public aids applied and particularly for some measures, the number of equipment units –such is the case of *Renove* Plan for electric appliances¹⁴–, the number of subsidised electric or hybrid vehicles, the number of public bicycle systems –and bicycles– set into motion under Action Plans 2005-2007 & 2008-2012 in the whole of the national territory, and the number of drivers trained in Eco-driving, either for private cars or heavy duty vehicles.

Table 8. Summary of the *bottom-up* savings achieved in 2010 (2004 basis) in terms of joint action between IDAE and the Autonomous Communities (2005-2010)

		Activity variable (2005-2010)	Final E. savings (ktoe)	Primary E. savings (ktoe)	Avoided emissions CO ₂ (ktCO ₂)
Industry			1,069	1,586	3,469
Energy Audits	Number of audits	1,415			
Public aid programme to investment in industrial assets	Associated investment (M€)	1,645.7	1,069	1,586	3,469

¹³Note the differences between the saving calculation in 2010 through a *top-down* approach (table 5) and the *bottom-up* one (calculations done per measurement/mechanism and shown on tables 8, 9 & 10). The differences are due, as explained in the methodological section, to the indirect and induced effects (as a result of price evolution, to the autonomous technological progress and in general, to other factors not always linked to energy efficiency improvements) that count for in *top-down* indicators but not in the *bottom-up* ones

¹⁴The indirect effects of some of the proposed measures in the action plans of energy saving and efficiency have even been more important than their direct effects. In the case of *Renove* Plan for electric appliances, the generalisation of the high energy qualification of the equipment units (A+ & A++) in the sales areas and the widespread knowledge of the energy efficiency label are indirect effects of the very programme implemented by the IDAE and the regional governments: between 2004 and 2010, the percentage of the population that takes into account the energy efficiency labels has increased at the time of making a purchase, ranging from 43.8% in 2004 to 83.8% in 2010

(Continuation)

		Activity variable (2005-2010)	Final E. savings (ktoe)	Primary E. savings (ktoe)	Avoided emissions CO ₂ (ktCO ₂)
Transport			948	944	2,978
Urban mobility plans and mobility plans for companies and activity centres	Number of bicycle public systems/No. of bicycles	254/31,220	860	846	2,684
	Public aid (M€)	57.3			
Larger participation of collective means in road transport	Public aid (M€)	9.3			
Road transport fleet management	Public aid (M€)	6.6	1.3	1.5	5.0
Eco-driving for cars and vans	Number of students equivalent trained	235,360	52	58	173
Eco-driving for trucks and buses	Number of students equivalent trained	63,594	30	34	103
Renewal of the private car fleet	Number of replaced vehicles	8,064	2.7	3.0	8.6
Renewal of the road transport fleets	Number of replaced vehicles	806	1.5	1.6	5.0
Building & equipment			195	439	899
Energy rehabilitation of the thermal envelope in existing buildings	Public aid (M€)	111.5	22	42	89
Improvement of energy efficiency of the thermal installations in existing buildings	Public aid (M€)	145.5	61	116	244
Improvement of energy efficiency of the indoor lighting installations in existing buildings	Public aid (M€)	22.5	30	74	150
New buildings and rehabilitation of the existing ones with high energy qualification	Public aid (M€)	6.2	0.9	1.5	3.3

(Continuation)

		Activity variable (2005-2010)	Final E. savings (ktoe)	Primary E. savings (ktoe)	Avoided emissions CO ₂ (ktCO ₂)
Improvement of energy efficiency of the electric appliances stock	Public aid (M€)	282.3			
	Number of electric appliances	3,907,745	81	204	412
	Indirect and spill- over effects		389	882	1,805
Public services			85	212	428
Renewal of the existing outdoor lighting installations	Public aid (M€)	116	78	194	393
Surveys, feasibility analyses, and audits in the existing outdoor lighting installations	Public aid (M€)	9.4			
Training of the local council energy managers	Public aid (M€)	0.9			
Improvement of energy efficiency of the current water purification plants, supply, treatment of sewage waters and desalination	Public aid (M€)	10.8	7	18	36
Agriculture and fisheries			8	12	30
Promotion and training in energy efficiency techniques within the agriculture and Fisheries sectors	Public aid (M€)	5.0			
Promotion of spray or gravity irrigation systems to localised irrigation systems	Public aid (M€)	6.9	2	5	10
Improvement in energy saving and efficiency in the Fisheries sector	Public aid (M€)	2.1	4	5	14

(Continuation)

	Activity variable (2005-2010)		Final E. savings (ktoe)	Primary E. savings (ktoe)	Avoided emissions CO ₂ (ktCO ₂)
Energy audits and action plans to improve agriculture holdings	Public aid (M€)	3.7	2	2	6
Support to conservation agriculture	Public aid (M€)	0.4	0.2	0.2	0.6
Total No. of end-use sectors			2,305	3,192	7,804
Energy transformation				29	40
Feasibility studies for co-generations	Public aid (M€)	1.8			
Energy audits for co- generations	Public aid (M€)	0.9			
Promotion of co- generation in non- industrial activities	Public aid (M€)	3.4		10	12
Promotion of small capacity co- generation plants	Public aid (M€)	0.5		0.8	1.4
Promotion of de co- generation plants in industrial activities	Public aid (M€)	6.7		19	26
Total No. of end-use sectors + energy transformation			2,305	3,221	7,844

Note: The calculations of the CO₂ emissions avoided as a result of the energy saving and efficiency measures included in this Plan are the calculations done ad hoc for it, and involve a rendering of the calculated saving in the various bases (2004 & 2007) in terms of final and primary energy, into CO₂ emissions avoided –this calculation does not have to coincide, therefore, with the calculations done with different calculations or account bases as part of the periodical reports submitted in relation to the evolution of the greenhouse effect gas emissions.

Apart from the measures applied within the framework of the collaboration agreements between IDAE and the Autonomous Communities, IDAE has managed the funds directly within the framework of Action Plans 2005-2007 & 2008-2012, and have been applied to plans and programmes of a national scope, addressed to final consumers not under the

public aid or training and information programmes undertaken by the regional administrations.

The annual calls stems out from these plans and programmes –since 2008– of IDAE's Aid Programmes for Strategic Projects, allocated with M€120/year¹⁵.

¹⁵The programme budget allocation in 2008 amounted to M€60. As a result of the approval of the *Saving and Energy Efficiency Activation Plan 2008-2011* of 1st August 2008, the budget allocation of this programme was doubled in further editions (2009, 2010 & 2011)

This aid programmes (direct subsidies) are meant to encourage the execution of strategic, sectorial, singular, and innovative projects and actions that may favour the saving and improvement of energy efficiency. It is essentially addressed to firms located or with activity centres in over three Autonomous Communities, or to firms intending to implement projects with a minimum eligible investment over 0.5 million euros.

Apart from the above, there is the additional distribution of 49 million low energy bulbs through gift voucher with the electricity bill¹⁶ and the distribution of 6 million low energy bulbs with a 2x1 programme under the extraordinary programme

heading included in the *Saving and Energy Efficiency Activation Plan 2008-2011*, approved on 1st August 2008.

The replacement programme of traffic lights by others with LED technology - which enabled the replacement of 461,792 optics units in 600 Spanish municipalities –and the pilot project with a demonstrative character of the electric vehicle (MOVELE Project)¹⁸ make up good examples of the direct actions undertaken by IDAE.

The results of these programmes, in terms of saving –determined through a *bottom-up* approach, are shown on the following table:

Table 9. Bottom-up savings summary achieved in 2010 (on the basis of 2004) through direct action programmes of the Ministry of Industry, Tourism and Commerce, through IDAE

	Final E. savings (ktoe)	Primary E. savings (ktoe)	Avoided emissions CO ₂ (ktCO ₂)
Programme for strategic projects on energy efficiency	199.9	337.0	722.5
Other idae's direct execution programmes	140.5	301.9	652.4
Eco-driving for cars and vans	1.1	1.2	3.7
Eco-driving for trucks and buses	30.7	34.4	105.0
MOVELE Project	2.1	0.9	4.6
Low energy bulb distribution programme	84.9	212.5	429.5
2x1 low energy bulb programme	13.0	32.5	65.8

¹⁶The free distribution of low energy bulbs was done in two non-linked annual campaigns, in 2009 and 2010: in 2009 7,254,250 bulbs were exchanged out of a total number of 20,276,976 gift-voucher distributed, what involved an exchange rate of 35.78%; in 2010, the exchange rate was around 29.96% (6,576,625 bulbs, out of a total of 21,954,008 gift-vouchers distributed along with the electricity bill to domestic customers). This programme has entailed saving worth 84.9 ktoe of final energy in 2010, the equivalent to the annual electric power consumption of 246,000 households. Additionally, and along with communication campaigns, the programme has remarkably contributed to a change of habits and has led to the purchase of more efficient bulbs

¹⁷The 2x1 programme made available 1,200,000 two-bulb packages to consumers at the price of one; this has enabled to introduce 2,400,000 low-energy bulbs onto the market apart from the former ones

¹⁸MOVELE Project accounts for the subsidy of 1,110 electric vehicles, with a total budget allocation of €3,313,891 with an average aid of 2,985 euros per vehicle

(Continuation)

	Final E. savings (ktoe)	Primary E. savings (ktoe)	Avoided emissions CO ₂ (ktCO ₂)
Traffic light replacement programme	8.7	20.4	43.7
Total	340.4	638.9	1,374.9

Note: The CO₂ avoided emission calculations as a result of the saving and energy efficiency measures included in this Plan are calculations done ad hoc for it and involve a translation of the savings calculated with various bases (2004 and 2007), in terms of final and primary energy, of CO₂ emissions avoided –this calculation does not have thus to coincide with the different approaches or account bases as part of the periodical reports drafted in relation to the evolution of the greenhouse effect gas emissions. The CO₂ emissions avoided involve an economic benefit of 20.6 million euros/year (calculated on the basis of €15 euros per CO₂ ton).

Additionally to the above, the savings stemming from the renewal of the car fleet have been estimated through a *bottom-up* approach –in a natural or induced manner by way of fiscal discrimination in favour of the lower CO₂ emission vehicles and

as a result of the programmes aimed at the very renewal of the fleet (*Prever Plan, VIVE Plan, 2000E Plan, ...*). Globally, **the savings determined through *bottom-up* methods account for 40.5% of the whole savings established for 2010¹⁹.**

Table 10. Bottom-up savings summary achieved in 2010 (on the basis of 2004)

	Final E. savings (ktoe)	Primary E. savings (ktoe)	Avoided emissions CO ₂ (ktCO ₂)
IDAE-Regions (autonomous communities) programme	2.305	3.221	7.844
Strategic projects programme	200	337	723
Other idae's direct implementation programmes	140	302	652
Others/car fleet renewal (Prever plan, vive plan, 2000e plan,... It includes the effect of the positive tax discrimination in favour of low CO ₂ emission vehicles)	730	813	2.328
Total	3.375	4.673	11.547

¹⁹Notice again, the differences between the calculation of savings in 2010 through a *top-down* approach (table 5) and a *bottom-up* approach (calculations done through measurement/mechanism and displayed on tables 8, 9 & 10). These differences are due, as explained in the methodological approach, to the indirect and induced effects (as a result of the evolution of prices, to the autonomous technological progress and in general, to other factors not always linked to improvements of energy efficiency) that count towards in *top-down* indicators and not in the *bottom-up* ones

4 Action Plan 2011-2020

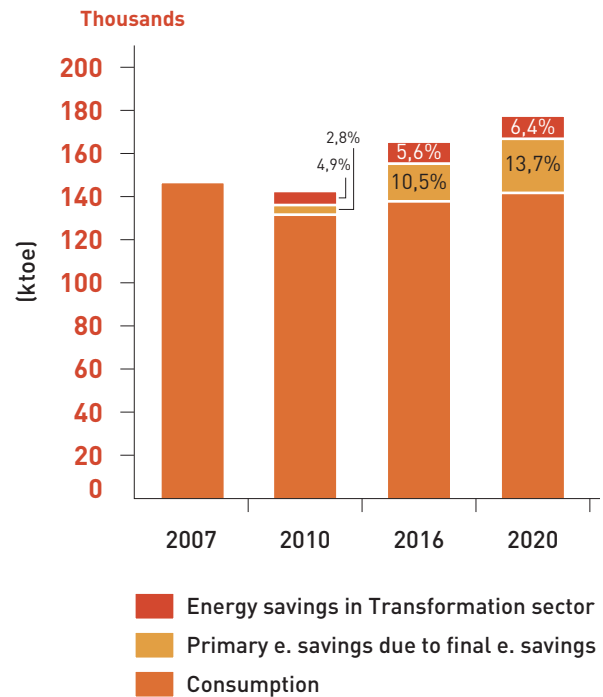
4.1 FINAL & PRIMARY ENERGY SAVINGS: OBJECTIVES FOR 2016 & 2020

The final & primary energy savings of Action Plan 2011-2020 have been established for years 2016 & 2020, in accordance with the same methodological criteria and the indicators for year 2010.

The measures included in this Action Plan 2011-2020 will involve savings of final energy for 2020 worth 17,842 ktoe and of primary energy worth 35,585 ktoe, calculated with reference to year 2007 and in accordance with the methodology proposed by the European Commission. Savings, in terms of primary energy, includes the savings derived from the measures proposed for the *Energy Transformation Sector* in this Plan –mainly on promotion of co-generation– and the ones derived from the change in the generation mix stimulated by other planning actions in terms of energy policy not involved with it, and which respond to the obligations derived from Directive 2009/28/EC, of 23rd April 2009, on the promotion of the use of energy coming from renewable sources.

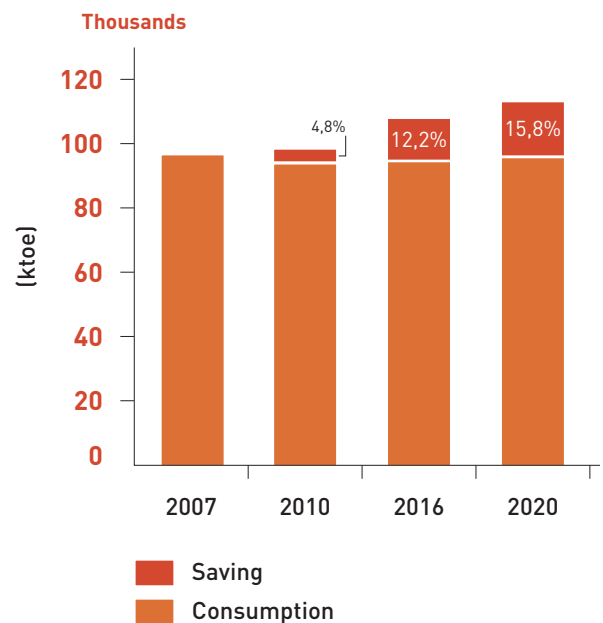
The former savings, in terms of primary energy, equals 20% of the primary energy consumption that would have taken place in 2020 for lack of the renewable energy diversification and promotion policies approved by the Spanish government and this Action Plan 2011-2020 (this primary energy consumption, without the adopted measures, would have reached 177,798 ktoe).

Chart 2. Consumption and saving in primary energy (ktoe)



In terms of final energy, saving in 2016 amounts to 13,176 ktoe, which equals 12.2% of final energy in that year, for lack of the Plan (consumption of final energy without these measures would have reached 107,896 ktoe in 2016).

Chart 3. Consumption and saving of final energy (ktoe)



(Continuation)

This saving, once discounted the non-included sectors in the field of application of Directive 2006/32/EC, amounts to 11,532 ktoe/year in 2016. In terms relating to the average consumption in the five last years prior to the enforcement of the Directive, it involves 15.9% of the whole. Let us remind on this point that the non-binding objective stated for the above Directive for all the Member States in year 2016 is put at 9%²⁰.

Action Plan 2011-2020 therefore meets the saving objectives demanded by Directive 2006/32/EC, and is coherent with the global objectives agreed on by the European Council of 17th June 2010, in relation to the improvement of primary energy efficiency by 20% in 2020.

The achievement of the said objectives in the sectors covered by this Plan (all the consuming sectors plus the *Energy Transformation Sector*) will be possible with the application of the aids to be managed by the public sector, amounting to M€4,995 during period 2011-2020 which, along with the regulatory measures, will mobilise an investment turnover of M€45,985. The accumulated final & primary energy savings during period 2011-2020 will reach 120,967 ktoe and 247,791 ktoe, respectively.

Table 11. Accumulated savings & investments and aids managed by the public sector 2010-2020

	Year 2020
Final energy saving (accumulated 2011-2020) (ktoe)	120,967
Final energy saving (annual 2020) (ktoe)	17,842
Primary energy saving (accumulated 2011-2020) (ktoe)	247,791

	Year 2020
Primary energy saving (accumulated 2020) (ktoe)	35,585
Associated investment (accumulated 2011-2020) (M€)	45,985
Public aid (accumulated 2011-2020) (M€)	4,995

On a general basis and as a summary, the proposed savings as the objective for each sector are the result of aggregating the envisaged savings at a more detailed level, and the final sectors included in the Plan are the following five: 1) Industry; 2) Transport; 3) Building & Equipment; 4) Public Services; & 5) Agriculture & Fisheries.

The savings –at the most disaggregated possible– have been determined in all the cases, as the result of the product between the unit savings in year 2016 or 2020 (with respect to year 2007, taken as a reference) and the activity variable in question for each case, using the same indicators that have been used as a base for the calculation of savings in 2010.

All the above has involved a need to set up scenarios, essentially in the activity variables that are shown on the following table and which logically, involve that the absolute value of the savings shown for this Action Plan 2011-2020 is conditioned to the assumed evolution for the following variables in the 2020 year horizon.

²⁰This objective for 2016 is to be calculated on the average consumption of the last five years prior to the enforcement of the Directive, that is, the average consumption of period 2003-2007, once discounted the consumption corresponding to the sectors outside the scope of the Directive (basically, ETS sectors –*Emission Trading System*– and aviation). The calculation that is stated in this Plan has been done discounting 66.8% of the whole of the savings calculated for the industrial sector, as it is understood that this percentage corresponds to ETS sectors

Table 12. Assumed hypotheses for 2020 on activity variables

Sector		Activity variable	Unit	2010-2020 (Year-on-year variation rate) (%)	2020
Industry		GVA _{industry}	M€ ₂₀₀₀	1.66	203,344
Transport	Road	Private cars traffic	M passengers- km	1.98	427,007
		Circulating fleet of lorries and light vehicles	No	0.20	3,723,661
	Railway	Passenger traffic	M passengers- km	10.50	64,653
		Goods traffic	M passengers- km	18.03	41,976
Building, equipment & services		Population	Thousands	0.27	48,295
		Total No. of dwellings	Thousands	0.74	27,755
		Total No. of main dwellings	Thousands	0.85	18,838
		Total surface of main dwellings	Thousands m ²	0.37	1,559,191
		No employees in tertiary sector	Thousands	1.83	16,068
Agriculture		VAB _{agriculture and fisheries}	M€ ₂₀₀₀	2.43	30,854

Additionally, the improvement objectives of energy efficiency established for each sector — and established with the energy efficiency indicators which will further be used for the extent of achievement of the objectives of this Plan — are shown in Table 13.

Table 13. Efficiency improvement objectives by sectors

Sector		Energy indicator	Unit	2007-2010 (Year-on-year variation rate) (%)	2010-2020 (Year-on-year variation rate) (%)	2007	2020	
Industry		M8	Energy intensity (Final e. consumption/GVA)	ktoe/M€	2.74	-2,52	0,15	0,13
Transport	Road	P8	Energy consumption of cars per passenger-km	goe/pkm	-2.57	-0,87	38,20	32,37
		A2 _{lorries}	Energy consumption of trucks and light vehicles per vehicle fleet equivalent	toe/veq	-8.05	0,30	1,19	0,95
	Railway	P10	Energy consumption of passengers rail transport per passenger traffic (passenger-km)	goe/pkm	-3.85	-3.03	11.24	7.34
		P11	Energy consumption of freight rail transport per freight traffic (tonne-km)	goe/tkm	10.44	-9.22	85.18	43.62
Building, equipment & services	P1	Energy consumption of households for space heating per floor area (adjusted for climatic conditions)	toe/m ²	-1.43	0.11	0.0050	0.0048	
	P2	Energy consumption of households for space cooling per floor area (adjusted for climatic conditions)	toe/m ²	-3.10	6.64	0.00012	0.00022	
	P5	Electricity consumption of households for lighting per dwelling	toe/ household	-2.63	0.11	0.0401	0.0374	
	P4	Domestic Energy consumption of electrical appliances per equipment unit	toe/ equipment	-7.87	-2.92	0.0174	0.0101	
	M3	Non-electric energy consumption in service sector per employee in full time equivalent (adjusted for climatic conditions)	toe/ employee	-9.47	-0.87	0.25	0.17	
	M4	Electric energy consumption in service sector per employee in full time equivalent (adjusted for climatic conditions)	toe/ employee	-3.90	-0.68	0.45	0.37	
	MAP	Electric energy consumption of street lighting per dwelling	tep/ dwelling	-1.13	-1.39	0.013	0.011	
Agriculture and fisheries		MB	Energy consumption in agriculture and fisheries per GVA unit	ktoe/M€	-4.30	-1.93	0.16	0.11

As a result of the former hypotheses on the main activity variables and of the established saving objective units for each sector, here are the savings stated on Table 14. The saving accounted for in the Plan for each sector are therefore the result of aggregating the direct savings derived from the investments promoted with energy saving and efficiency in each sector, plus the indirect or induced savings (of a plus or minus sign) stemming from other factors (price, for example), which will be recorded in the hypotheses established on the general evolution of the proposed indicators.

In this way, the final & primary energy savings in Action Plan 2011-2020 focus on the *Transport* Sector, which is ascribed 51% of the entire saving in 2020. It is followed in importance by the *Industry* Sector, with savings equivalent to 25% of the total. These savings yield a decrease in the final energy consumption of 13% in the *Industry* Sector, between years 2007 & 2020, and of 5% in the *Transport* Sector.

Table 14. Final & primary energy savings by sectors

	Final E. savings (ktoe)			Primary E. savings (ktoe)		
	2010	2016	2020	2010	2016	2020
Industry	-2,866	2,489	4,489	-5,717	2,151	4,996
Transport	4,561	6,921	9,023	4,909	8,680	11,752
Building and equipment	2,529	2,674	2,867	4,189	5,096	5,567
Public services	29	56	125	67	131	295
Agriculture and fisheries	467	1,036	1,338	580	1,289	1,665
Total end-use sectors	4,720	13,176	17,842	4,029	17,347	24,274
Energy transformation				7,019	9,172	11,311
Oil refining				39	-137	-88
Electric generation (non CHP)				6,909	8,169	9,701
Co-generation				71	1,141	1,699
Total end-use sectors + energy transformation	4,720	13,176	17,842	11,047	26,519	35,585

The improvement of the final energy intensity established as an objective for the whole of the *Industry* Sector is 2.5% year-on-year, over period 2010-2020.

In the *Transport* Sector, the savings are ascribed to the road mode by 77%, and to the railway mode by 22%, essentially associated with goods traffic, where Action Plan 2011-2020 assumes the objectives of modal shift and the increase of traffic by railway, integrated in the Strategic Infrastructures

and Transport Plan 2005-2020 (PEIT). More precisely, the Plan assumes that the railway passenger traffic quota will double in 2020 (from 6% in 2011 to 11% in 2020) and the goods traffic one will be threefold, which will remarkably reduce the unit consumptions per passenger or ton-kilometre transported.

Also, the achievement of the savings proposed in the *Transport* Sector is based on the technological improvement of vehicles and particularly, in the

introduction of the electric vehicle in the terms established in the *Strategy to Promote the Electric Vehicle* in Spain, which fixes as a goal 250,000 vehicles for 2014. This Plan 2011-2020 also assumes

the objectives stated in the PANER: 2.5 million electric vehicles in 2020, the equivalent of 10% of the fleet in 2020.

Table 15. Final energy savings in the *Transport Sector* (ktoe) & percentage distribution of savings

	2010		2016		2020	
	(ktoe)	Percentage distribution (%)	(ktoe)	Percentage distribution (%)	(ktoe)	Percentage distribution (%)
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
Railway	-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

In the *Building Sector*, savings concentrate on the tertiary sector, since in the dwelling use, the savings in final energy for heating, derived from the proposed measures on the building envelope and for the improvement of energy efficiency (essentially, renewal of boilers and air conditioning equipment) will be practically compensated with the increase of penetration of household air conditioning units. In like manner, a remarkable improvement of the installation performance will take place as a result of introducing cold and heat pump networks, provided by the ESCOs. The said installations will enable the introduction of thermal renewable energies and co-generation, preventing losses in transport and distribution.

On the other hand, and on a general basis for all the sectors, it will be necessary to develop smart grids enabling the integration of electric power generated in small installations, along with the use of accumulation mechanisms such as the electric vehicle, which may be of use at different stages like consumers or generators, depending on the convenience of the system. For all these applications, as well as for the optimisation of the management systems, it will be necessary to develop control and measurement units, along with the development and application of IT.

In the *Building and Equipment Sector*, and jointly taking into account the buildings used as dwellings and the ones for tertiary use, savings are ascribed to the improvements on the envelope at 73%, and to the improvements in lighting energy efficiency at 29% - again, savings largely focus in this use on the tertiary-use buildings.

Table 16. Final energy savings in the Building and Equipment Sector (ktoe) & saving percentage distribution

	2010		2016		2020	
	(ktoe)	Percentage distribution (%)	(ktoe)	Percentage distribution (%)	(ktoe)	Percentage distribution (%)
Building and equipment	2,529	53.6	2,674	20.3	2,867	16.1
Residential	752	15.9	119	0.9	211	1.2
Envelope & thermal equipment units	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
Envelope & thermal equipment units	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

Last, final energy savings in the *Public Services Sector* account for 0.7% of the whole, by reducing energy consumption in desalination plants, purification and treatment of sewage waters and by reducing the electric power consumption in street lighting. In the *Agriculture and Fisheries Sector*, final energy savings will reach 7.5% of the whole of the savings in year 2020 by reduction of energy consumptions in the sector by added value unit.

Table 17. Final energy savings in the Public Service Sector (ktoe) y saving percentage distribution

	2010		2016		2020	
	(ktoe)	Percentage distribution (%)	(ktoe)	Percentage distribution (%)	(ktoe)	Percentage distribution (%)
Public services	29	0.6	56	0.4	125	0.7
Street lighting	11	0.2	19	0.1	58	0.3
Water	17	0.4	36	0.3	67	0.4

In the *Energy Transformation Sector*, and in terms of primary energy, the savings derived from co-generation amount to 15% of the whole of the savings accounted in the sector, where the savings stemming from the largest renewable energy penetration in the electric power generation park are taken into account.

4.2 ACTION MEASURES AND MECHANISMS FOR THE IMPROVEMENT OF ENERGY EFFICIENCY

The complete account of the measures stated in this Action Plan 2011-2020 are included in Annex I, as for each of the measures the final and primary energy savings and the CO₂ emissions avoided as a result of their implementation have been determined. Annex II states those deemed as a priority.

The application mechanisms of the Plan will be analogue to the ones in Action Plan 2005-2007 and 2008-2012. Firstly, IDAE's collaboration framework with the Autonomous Communities to implement a large part of the support, training and communication measures in the Plan. Secondly, IDAE's direct action programmes will be kept, thus consolidating the co-financing and co-management model of the Plan between the State's General Administration and the regional administrations. Last, the regulatory and standard-setting mechanisms that may enable the achievement of the saving objectives proposed through the establishment of more demanding energy efficiency standards, mainly in the *Building & Equipment* Sector, in accordance with the contents of Directive 2010/31/EU, in relation to energy efficiency in buildings, and Directive 2010/30/EU, on the indication of energy consumption by labelling.

The maintenance of the co-management and co-financing of the Plan between IDAE and the Autonomous Communities involves the maintenance of direct support mechanisms and incentives to renovate equipment units, systems and processes. Nevertheless the above, this Plan also proposes –as a supplement or alternative to the former statement – the establishment of a new payment mechanism for the measured energy savings, verified and certified.

In a nutshell, the measures stated in the Plan make reference to the promotion of the technological improvement in the *Industry* Sector, which favour the adoption of the Best Available Technologies (BAT), the introduction of energy management systems and support to energy auctions.

In the *Transport* Sector, the measures focus on the modal shift boost –leading to a greater use of the

railway mode– of a rational use of transport media and of the renewal of the fleet.

In the *Building & Equipment* Sector, the improvement of energy efficiency of the building envelope, thermal installations and the lighting of the existing building stock, and the improvement of the energy efficiency in commercial refrigeration equipment; the building –and comprehensive renovation– of 8.2 million m²/year with high energy rating and the construction of nearly-zero energy buildings. As regards equipment, it has been proposed to keep on with Plan *Renove* for electric appliances with a view to replacing 500,000 units/year (out of a stock estimated at 90 million units).

The proposal for the *Public Services* Sector lies with the improvement of the energy efficiency in the existing street lighting installations and of the current installations for water treatment, supply, purification of sewage water and desalination, apart from others in relation to the municipal energy manager training and the implementation of surveys, feasibility analysis and audits in street lighting.

As regard the *Agriculture and Fisheries* Sector, the Plan includes measures to improve energy efficiency in irrigation installations, support to the migration towards conservation agriculture, and of local spray irrigation systems, apart from promotion and training measures on energy efficient use techniques in the *Agriculture and Fisheries* Sector, as well as the renovation of machinery.

Last, in the *Energy Transformation* Sector, the proposed aim is the installation of 3,751 MW of new co-generation capacity till 2020, and the renewal of up to 3,925 MW of co-generation capacity over 15 years' old. With these objectives, specific support is envisaged to boost small non-industrial capacity co-generation and regulatory developments for the grid connection of small-scale cogeneration.

In addition to direct support mechanisms and incentives for the replacement of equipment for more efficient one or for training –of drivers in Eco-driving techniques, for example– and mechanisms of a regulatory kind, awareness, mobilisation and citizen action mechanisms are envisaged for responsible energy consumption. Action Plan 2011-2020 includes a **Communication Plan** whose total cost amounts to M€124 (M€12.4/year), structured into three large blocks: communication campaigns and conventional publicity (TV commercials, radio slots...), communication actions and non-conventional publicity that should generate media

coverage (road shows...) and the enhancement of participation and presence in the media.

4.3 FINANCING OF ACTION PLAN 2011-2020: FUNDS SOURCE AND ALLOCATION

The final & primary energy savings of this Plan will be feasible as a result of the investments, amounting to 45,985 million euros during the whole of the enforcement and implementation period of the Plan –from 2011 until 2020. This represents an annual average volume of investment worth 4,598 million euros.

These investments will correspond to autonomous investments carried out by private agents to get adapted to the **new regulatory framework** that may be derived from the Plan, and to the investments to be made as a result of the incentive effect that will undergo the aids managed by the public sector, as envisaged in the Plan for the whole of the period: around 500 million euros on an annual average.

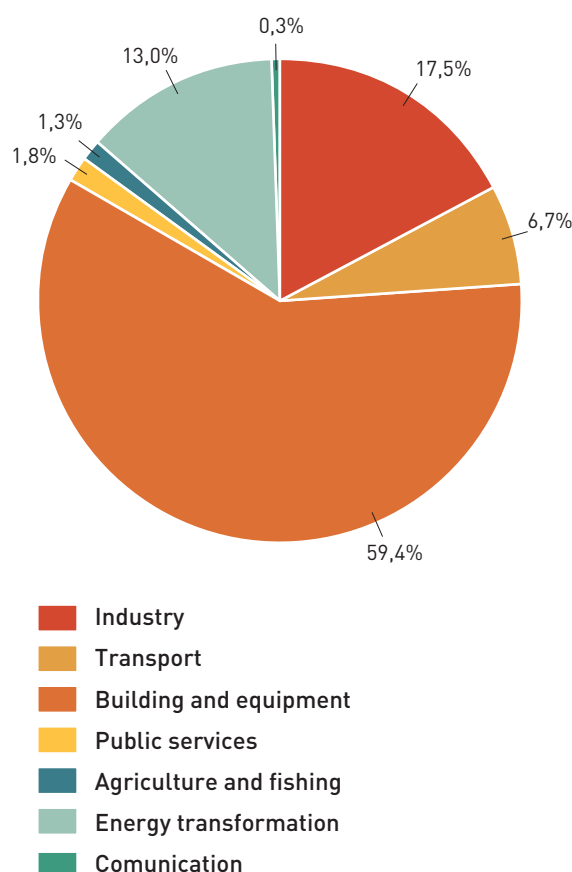
The whole of the investments are unequally allocated by sectors: the *Building & Equipment* Sector absorbs 59.4% of the total investments, whereas the *Transport* Sector accounts for 6.7% of the whole. This asymmetry responds to the concepts, either included or not, in the whole of the investments stated in the Plan.

This Action Plan 2011-2020 has not assessed the investments in infrastructures linked to the modal shift or whatsoever others, bound to the development of railway transport networks, which may be necessary to enable the increase of the passenger and goods traffic by railway. It is deemed that these investments are accounted for in the *Strategic Infrastructures and Transport Plan 2020* (PEIT). This way, the investments stated in the Transport Sector in the Plan show the total cost (both public and private) of the measures directly promoted by it, and therefore, subject to receiving the aids. These measures focus, to a great extent, on the design of the *Sustainable Urban Mobility Plans and the Mobility Plans for Companies and Activity Centres*, the development of pilot projects, the drafting of surveys to improve road transport fleet management, courses on Eco-driving, both for cars and for industrial vehicles.

Investments –and therefore, aids– associated with the *Strategy to Promote the Electric Vehicle*, necessary to materialise the goal of 2.5 million plug-in vehicles in 2020, have not been included in it.

The investments corresponding to the *Industry* Sector and to the *Energy Transformation* Sector account for 17.5% and 13.0%, respectively, of the whole number of investments envisaged in Plan.

Chart 4. Total investments by sectors



Note: The aids to be managed by the public sector do not include support to investment in infrastructures – and precisely for that reason, investments are not included in infrastructures.

The aids managed by the *Public Sector* at the disposal of this Plan show the asymmetry noticed in the allocation of the total investment by sectors, as well as the priority given to diffused sectors, and by extension, to non-ETS sectors (not included in the application scope of Directive 2003/87/EC on the rights of greenhouse gas emissions trading) as beneficiary of the said resources.

The *Building & Equipment Sector* represents 57.7% of the aid total amount. A large part of the necessary investments, linked to energy efficiency, will have to be made without aids as a result of the regulatory changes already set forth, and which will take place on the year 2020 horizon, in compliance with this Plan. Another large part of the investments will stem from the autonomous technological progress and the renewal of the building stock, which has been taking place in parallel to the aid programmes devised for this purpose and, obviously, a part of the investments identified as necessary to achieve the savings envisaged in the plan would not be possible without the boosting effect of the aids to be managed by the public sector within this Plan, and which will globally amount to 2,883 million euros.

The *Transport Sector*, with a somehow reduced weight in the total amount of the accounted investment in the Plan, as the investments in infrastructures have not been taken into account, will absorb 20% of the Plan's aids. The reason is that a large part of the cost of the surveys, feasibility analyses or pilot projects favouring the modal shift or carried out to improve the fleet management will be backed, up to 50%, by this Plan.

The *Industry Sector* follows the previous ones in relevance, trying to absorb 15% of the applied funds, with a total amount of 750 million euros for the whole of the period –note that, as regards ETS sectors, savings and improvements in energy efficiency will have to be basically achieved as a result of the CO₂ emissions trading system.

In the *Public Services Sector*, for example, the application or extension of the energy efficiency regulation on street lighting will enable to achieve a large part of the envisaged savings, which, along with the concurrence of the Energy Service Companies, will allow reducing the amount of the aids that have been applied to renewal projects and street lighting improvement in Spain. A large part of the boost this Plan means to endow the energy services market will concentrate, at least at the beginning, on the renewal and improvement projects for municipal street lighting.

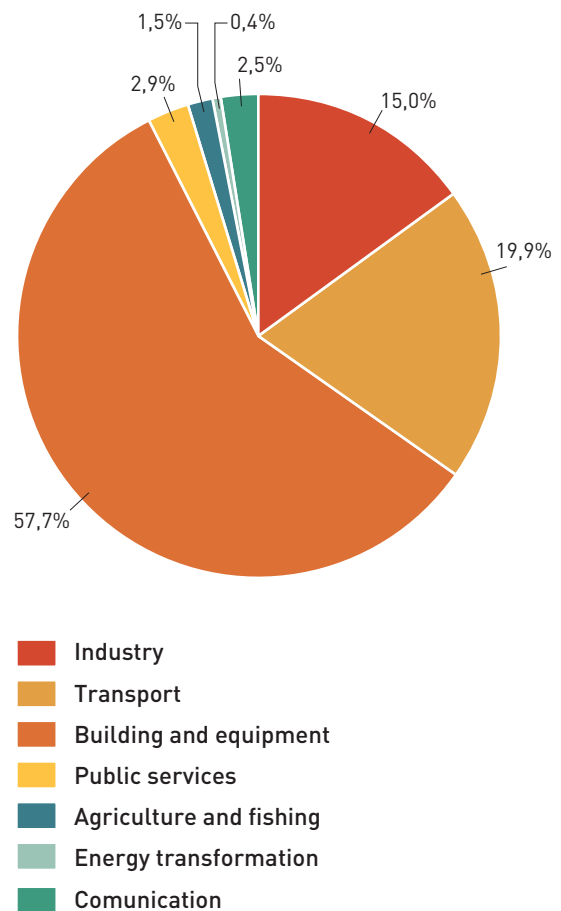
IDAE, as the responsible body of the follow-up of the Action Plan 2011-2020 results, will be enabled to modify the sector allocation with the measures of the funds acknowledged in the Plan with a view to amending deviations and guarantee the performance of the saving objectives proposed. These changes in the sector allocation of the Plan's

resources will keep respecting the priorities defined in it as much as possible.

It is important to state that all the aids to be managed by the public sector envisaged in this Plan will be applied, guaranteeing the necessary encouraging effect that should encourage the application of funds to investment projects, and in compliance with the EC regulation in the field of State aids - particularly through the application of EC Guidelines on state aids in favour of the environment, 2008/C 82/01.

All in all, Action Plan 2011-2020 appraises the total number of the aids necessary to achieve the envisaged saving of 4,995 million euros; this involves nearly 11% of the whole of the quantified investments, which amount to M€45,985.

Chart 5. Sector distribution of the funds managed by the public sector applied to the Plan



Note: The aids to be managed by the public sector do not include support to investment in infrastructures – and precisely for that reason, investments are not included in infrastructures.

Table 18. Resources managed by the public sector and investments and their sector application (M€)

	Aid managed by the public sector (M€)		Investments (Aid managed by the public sector + private contribution) (M€)	
	2011-2020	Annual average	2011-2020	Annual average
Industry	750	75	8,060	806
Transport	996	100	3,104	310
Building 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

Note: The aids to be managed by the public sector do not include support to investment in infrastructures –and precisely for that reason, investments are not included in infrastructures.

The funds to be managed by the public sector quantified in the Plan (M€4,995) come from various sources, as the Plan reproduces the financing scheme of Action Plan 2005-2007 and of Action Plan 2008-2012.

The funds to be managed by the public sector to be applied to the Plan will come, almost by one forth, from public budgets, either the State Budget (7%)²¹ or the Regional budgets (16%); the latter are annually applied with an average of 80 million euros, the equivalent to what has been lately applied every year within the framework of the cooperation programme set forth between IDAE

and the Autonomous Communities (Regions) so as to implement the energy saving and efficiency measures stated in former plans. Both the contribution coming from the State Budget and the regional budgets are subject to budget availabilities and are to be approved every year, within the relevant budget laws of the State or the Autonomous Communities.

For the remaining 77%, the equivalent of 3,845 million euros (or 385 million euros on an annual average), once the temporary period covered by the former Plan 2008-2012 is over, the Government should approve the most appropriate formula to

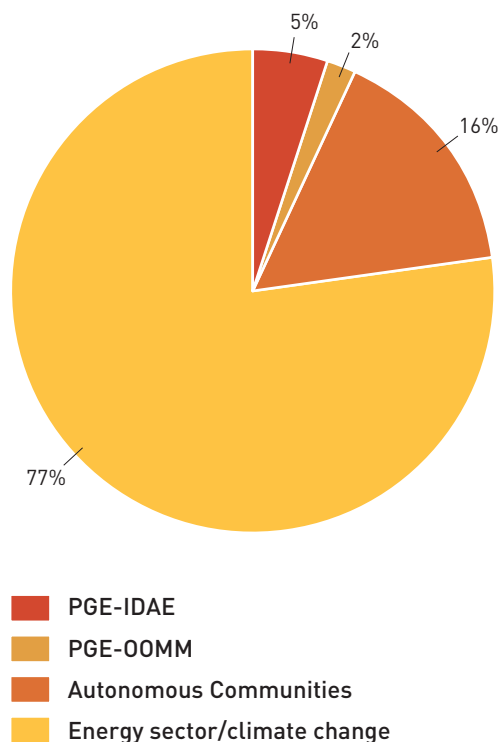
²¹This 7% is the result of all the contributions coming from the State Budget: 5% of the whole of the funds managed by the public sector at the disposal of the Plan corresponds to the allocation by the Ministry of Industry, Tourism and Commerce/ IDAE, coming from the State Budget, whereas 2% of the whole of the funds at the disposal of the Plan will come from budget allocations and allocated to other ministerial Departments other than the Ministry of Industry, Tourism and Commerce for the actions envisaged in this Action Plan 2011-2020

permit the Plan’s financing. The Plan could be financed at the expense of the contributions from the energy sector²².

On the other hand, the explanation of the reasons in Law 13/2010, of 5th July, modifying Law 1/2005, of 9th March, regulating the greenhouse emissions trading system, states the engagement, without prejudice to the principle of non-assigning revenues to expenses, of allocating to climate change policies a sum equivalent to the one paid through auctioning of emission permits. In this sense, it should be stated that, as it has been acknowledge by the International Energy Agency and others, the policies on energy saving and efficiency make up the most economical instrument to reduce CO₂ emissions. Therefore, and without any intention of assigning the resources coming from the auctioning of emission permits to this Plan, and once approved the budget –bearing in mind the limitations of the General Budgetary Law– resources could be allocated to finance this Plan within the general framework of the policy against climate change.

The resources to be managed on the part of the public sector, put at the disposal of this Plan, will be managed by the Ministry of Industry, Tourism and Commerce through IDAE –unless it comes to contributions from the State Budgets assigned in favour of other ministerial Departments other than the previous one for the execution of specific measures²³ –and by the Autonomous Communities (regions). The co-management and co-financing mechanism between IDAE and the Autonomous Communities started for the execution of the measures stated in Action Plan 2005-2007, and to be continued with Action Plan 2008-2012, will remain the main application mechanism of the funds to be assigned in favour of this Plan through its enforcement.

Chart 6. Source of the public management funds.



Note: PGE corresponds to the State Budget. PGE-00.MM. corresponds to the budgetary allocations to other ministerial Departments other than the Ministry of Industry, Tourism and Commerce for the actions envisaged in this Action Plan 2011-2020.

²²Royal Decree-Law 14/2010, of 23rd December, set forth that the amounts at the expense of the electric sector allocated to Action Plan 2008-2012 shall be financed through the contribution of each of the production companies. This Royal Decree-Law made reference to the amounts envisaged for years 2011 (M€270) & 2012 (M€250), and the ones relating to year 2013, even if for this latter, reference is made to the approval of this current Plan. Therefore and up to 2013, the financing of the Plan at the expense of the electric sector will be covered in the way envisaged in this Decree-Law

²³This has been so for the budget allocated to Renove Plan for agriculture tractors, for example

Table 19. Source of the public management funds (M€)

	2011-2020	Annual average
PGE-IDAE	250	25
PGE-OOMM	100	10
Autonomous Communities	800	80
Energy sector/ climate change	3,845	385
Total	4,995	500

Note: PGE corresponds to the State Budget. PGE-OOMM corresponds to the budgetary allocations to other ministerial Departments other than the Ministry of Industry, Tourism and Commerce for the actions envisaged in this Action Plan 2011-2020.

4.4 COST-BENEFIT ANALYSIS

The savings in final and primary energy derived from Action Plan 2011-2020 translate in direct economic benefits by a reduction of crude imports and by fewer greenhouse effect gas emissions. Other impacts, either direct or indirect, derived from energy saving and efficiency measures, linked to the creation of jobs or to the increase of the *Gross Domestic Product*, have also been closely analysed in section 4.5.

This section will therefore appraise the economic savings directly derived from energy savings and the lower CO₂ emissions. Even if they are the easiest to quantify in economic terms –through the assumption of various hypotheses on the evolution of oil prices and CO₂ ton, respectively, they are not the sole positive impacts in the Plan, apart from the social-economical ones that the above paragraph makes reference to. Other positive environmental effects linked to the fewer emissions of polluting gases other than CO₂ are derived from the plan, and are linked to the improvement of air quality in cities, as derived from the reduction of traffic or consumptions, and consequently, of emissions per kilometre travelled in new vehicles.

Positive environmental impacts, other than the reduction of CO₂ emissions –whose economic value

can be determined in a simple way because of the existence of a market that attaches economic value to the CO₂ non-emitted or avoided emissions, can happen to be more difficult to quantify in economic terms, in absence of obligations of emission reductions for other polluting gases, or as a result of a non-existing analogue CO₂ market.

In this case, the quantification of these positive environmental impacts should be done with methods enabling to determine, in economic terms, the negative impacts on health or on the economic activity, prevented as a result of the lower consumption of fossil-origin energy, and that would have taken place in a greater energy consumption scenario due to the increase of the concentrations of pollutants in the natural environment, associated with the combustion of fossil sources.

Focussing then on the economic analysis of the benefits derived from lower energy consumptions and the lower CO₂ emissions, the total savings accumulated during the period equivalent to 133.4 million tons equivalent of oil –in terms of primary energy– and to 394.7 million CO₂ tons avoided, translate into an economic benefit of 78,687 million euros, as shown on the following table, which disaggregates economic benefit by sectors.

The savings on primary energy and CO₂ emissions avoided taken into account in this analysis have been calculated not by taking year 2007 as a reference base of the European Commission to determine the savings, but rather using 2010 as base year to count, only and when possible, and in a direct or indirect way, the associated savings with the investments and public aids established during the time enforcement horizon of the Plan, that is, period 2011-2020.

The primary energy savings calculated equal 977.9 million barrels of oil, 254% corresponding to oil imports in year 2010, and that is why every year the primary energy saving amounts to 25% of the total oil imports, with the ensuing expected reduction in the trade deficit and the improvement in the balance of payments.

The above economic benefits (somehow over 70,000 million euros) have been calculated assuming the hypotheses of the evolution of Brent barrel oil prices, which place it at 109.6 \$₂₀₁₀ in 2020.

The accumulated economic benefits for CO₂ emissions avoided equal 8,330 million euros as a result of the CO₂ reduced emissions by 394.7 million tons.

The price of the CO₂ ton assumed as hypothesis is rising to 25 euros in year 2020.

Table 20. Total economic benefits

	Economic benefits (M€)					
	Per primary energy saving		Per CO ₂ emissions avoided		Total	
	Accumulated	Annual average	Accumulated	Annual average	Accumulated	Annual average
Industry	38,436	3,844	3,447	345	41,884	4,188
Transport	13,345	1,334	1,370	137	14,715	1,471
Building and equipment	2,024	202	164	16	2,188	219
Public services	430	43	38	4	468	47
Agriculture and fisheries	1,925	193	216	22	2,141	214
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

4.5 SOCIAL-ECONOMICAL IMPACTS OF THE IMPROVEMENT IN ENERGY EFFICIENCY IN 2020

As a supplement to the analysis of the final and primary energy savings derived from Action Plans 2005-2007 and 2008-2012, and to the proposal of measures and action mechanisms for the improvement of energy efficiency in the 2020 horizon in this Plan, an *ad hoc* study has been made to determine the social-economical impact of the saving and energy efficiency in Spain.

This study has identified a series of products (insulations, lighting, high-efficiency boilers, variable-speed drivers...) and services (consultancy services, engineering and certification firms, services provided by ESCOs...) that feature what could be called the

sector of energy efficiency. The methodology of the study has been based on the compilation –through an opinion poll– of primary data straight from manufacturers of suppliers of the analysed services; and later on, the use of input-output tables has led to analyse indirect and associated induced impacts, both in terms of production and added value and in terms of employment.

As a conclusion, it can be stated that the sector of energy efficiency represents 1.8% of the GDP in Spain and 1.4% of the total employment figures (inclusive of the total impacts, that is, direct, indirect and induced effects). The weight of the energy efficiency sector will be rising till 2020, so that it is estimated that the size of the sector will increase from current 0.8% –direct impact– up to 1.6% in 2020 (from 1.8% of GDP up to 3.9% in 2020, considering both indirect and induced effects). In terms of direct employment, the sector will provide jobs to nearly 300,000 in 2020 (more than 750,000 in terms of total employment).

Tabla 21. Total economic benefits

	2009		2016		2020	
	(M€) - (employees)	(% Spain)	(M€) - (employees)	(% Spain)	(M€) - (employees)	(% Spain)
Production (M€)						
Sector's size (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 (M€)						
Sector's size (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
Employment (n° employees)						
Sector's size (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

Annex I. Summary by measures of Action Plan 2011-2020

	Final energy savings (ktoe)		Primary energy savings (ktoe)		CO ₂ emissions avoided (ktCO ₂)		Aids managed by the public sector (M€)			Investments (aids managed by the public sector + private contribution) (M€)		
	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
Improvement in the technologies of equipment and processes (BAT)	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
Establishment 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
Company transport plans	408	508	512	661	1,353	1,754	53.2	35.5	88.7	106.4	70.9	177.4
Larger participation of collective means in road transport	84	92	106	120	280	319	12.8	8.5	21.3	25.6	17.0	42.6
Larger participation in train 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
Larger participation in sea transport	-9	42	-11	55	-29	145	6.8	4.5	11.2	13.5	9.0	22.5
Transport infrastructures 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 transport fleet management	-9	21	-11	28	-30	73	8.0	5.3	13.4	32.1	21.4	53.4
Eco-driving for cars and vans	497	493	623	642	1,646	1,703	12.0	8.0	19.9	23.9	15.9	39.8
Eco-driving for trucks and buses	607	602	761	784	2,010	2,080	9.5	6.3	15.8	19.0	12.6	31.6
Eco-driving for Aircrafts	-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
Renewal of air fleets	-3	10	-4	13	-11	35	6.4	4.3	10.7	32.0	21.3	53.3

(Continuation)

	Final energy savings (ktoe)		Primary energy savings (ktoe)		CO ₂ emissions avoided (ktCO ₂)		Aids managed by the public sector (M€)			Investments (aids managed by the public sector + private contribution) (M€)		
	2016	2020	2016	2020	2016	2020	2011-2016	2017-2020	2011-2020	2011-2016	2017-2020	2011-2020
Renewal of Sea transport fleets	-2	14	-3	18	-7	48	12.2	8.1	20.4	61.1	40.7	101.8
Renewal of cars fleets	705	1,017	884	1,325	2,335	3,515	121.4	80.9	202.3	606.9	404.6	1,011.5
Building & 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 rehabilitation of the thermal envelope in existing 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 energy efficiency of the thermal installations in 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 energy efficiency of the indoor lighting installations in 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
New buildings and rehabilitation of the existing ones with high energy qualification	224	247	425	473	901	1,002	472.8	315.2	788.0	2,920.8	1,947.2	4,868.0
Improvement of energy efficiency in refrigeration commercial installations	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 rehabilitation of nearly-zero energy buildings	0.4	0.8	0.8	1.5	1.6	3.2	3.0	2.0	5.0	11.4	7.6	19.0
Improvement of the energy efficiency of the electric appliances stock	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
Renewal of the existing outdoor lighting installations	19	58	46	136	97	292	62.7	41.8	104.5	416.3	277.5	693.8
Surveys, feasibility analyses and audits in the existing street lighting installations							10.0	6.7	16.7	20.0	13.3	33.3

(Continuation)

	Final energy savings (ktoe)		Primary energy savings (ktoe)		CO ₂ emissions avoided (ktCO ₂)		Aids managed by the public sector (M€)			Investments (aids managed by the public sector + private contribution) (M€)		
	2016	2020	2016	2020	2016	2020	2011-2016	2017-2020	2011-2020	2011-2016	2017-2020	2011-2020
Training of the local council energy managers							4.3	2.8	7.1	4.3	2.8	7.1
Improvement of energy efficiency of the current water purification plants, supply, treatment of sewage waters and desalination	36	67	86	158	184	339	9.0	6.0	15.0	45.0	30.0	75.0
Agriculture and fisheries	1,036	1,338	1,289	1,665	3,716	4,799	46	31	77	358	238	596
Promotion and training in energy efficiency techniques within the agriculture and Fisheries sectors							5.8	3.9	9.7	5.8	3.9	9.7
Promotion of spray or gravity irrigation systems in localised irrigation systems.	93	122	225	294	477	622	18.0	12.0	30.0	90.0	60.0	150.0
Improvement in energy saving and efficiency in the Fisheries sector	262	335	293	375	897	1,147	2.9	1.9	4.8	14.5	9.7	24.2
Energy audits and action plans to improve agriculture holdings	14	18	23	29	58	74	5.4	3.6	9.0	27.1	18.1	45.2
Support to conservation agriculture	110	142	123	159	377	486	10.6	7.0	17.6	156.0	104.0	260.0
Remove Plan for tractors	557	721	624	808	1,908	2,470	3.4	2.3	5.7	64.1	42.7	106.8
Total No. 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			9,172	11,312	63,365	79,230	17	5	22	3,885	2,085	5,970
Oil refining			-137	-88	-375	-242						
Electric generation (without co-generation)			8,169	9,701	61,744	76,494						

(Continuation)

	Final energy savings (ktoe)		Primary energy savings (ktoe)		CO ₂ emissions avoided (ktCO ₂)		Aids managed by the public sector (M€)			Investments (aids managed by the public sector + private contribution) (M€)		
	2016	2020	2016	2020	2016	2020	2011-2016	2017-2020	2011-2020	2011-2016	2017-2020	2011-2020
Co-generation			1,141	1,699	1,995	2,978	17	5	22	3,885	2,085	5,970
Feasibility studies for co-generations							2.4	1.2	3.6	5.0	2.3	7.2
Energy audits for co-generations							1.1	0.7	1.8	2.2	1.3	3.5
Promotion of co-generation 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 co-generation plants			3	6	6	11	0.8	0.3	1.1	17.0	15.5	32.5
Promotion of co-generation plants in industrial activities			703	1,036	1,180	1,739				1,723.2	884.8	2,608.0
Substantial modification existing co-generations			170	269	364	575				1,225.7	736.7	1,962.4
Total No. final 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
Total Plan	13,176	17,842	26,519	35,585	106,633	139,599	3,001	1,994	4,995	27,894	18,091	45,985

Note of the Sector *Industry*: On a general basis, the replacement of fossil fuels with electric power in the industrial sector provides lower primary energy savings –in absolute terms– than the final energy ones.

Note 1: No aids or investments for the refining and electric power generation have been stated. The savings assigned to these sector are the result of energy efficiency in the refining sector (as a result of losses or self-consumption) and of the improvement in efficiency in electric power generation as a result of reducing losses in the transport and distribution of electricity, lower self-consumption and improvement of efficiency in energy transformation. Apart from the above, it should be considered the change in the electric power generation mix due to a greater penetration of renewable energies. On the other hand, there are the energy savings in the *Energy Transformation* Sector, solely in terms of primary energy which, obviously, does not mean that final energy savings should take place.

Note 2: CO₂ avoided emission calculations as a result of the energy saving and efficiency measures included in this Plan are the calculations carried out *ad hoc* for it, and involve a translation of the calculated results into different bases (2004 y 2007), in terms of final and primary energy into CO₂ emissions avoided –this calculation does not have to coincide, therefore, with the calculations done with different account approaches or bases as a part of the periodical reports carried out in relation to the evolution of the greenhouse effect gas emissions.

Annex II. Measure prioritisation criteria

Action Plan 2011-2020 is a strategic, comprehensive plan that affects all the consuming end-use sectors as well as the *Energy Transformation Sector*. In this sense, the global energy-saving objective of the plan is the result of aggregating the individual savings of each of the measures plus a saving component derived from the expected synergy of the joint development of the various plan measures. Nevertheless, these measures can be prioritised in accordance with the following criteria, with a view to maximising energy global saving:

1. None of the 6 sectors in the Plan is to be excluded, that is, each of the measures should be measured at least once.
2. Priority should be given to the objectives depending on the regulatory developments stated in the Plan, as in all cases these actions will contribute to achieving remarkable energy savings with less resource contribution. In this sense, it is important to bear in mind that the term and demanding standards of the regulatory provisions that are approved will condition the permanence or maintenance of public aid to energy-consuming sectors affected by the said regulations, even enhancing their reduction or disappearance.
3. The sectors with more difficulty to undergo energy efficiency measures, as the diffused sectors, should be prioritised. In this sense, the priority sector is the *Building & Equipment* one, followed by the *Transport Sector*.
4. On a general basis, the first step to take should be undertaking the measures that involve a greater energy ratio versus the ones with greater support, but with the exception of those that may be of interest to boost the exemplary role demanded to the public sector or because they affect sensitive groups.

Bearing in mind the prioritisation criteria above, the list of measures in the plan, organised in decreasing order of relevance, is as follows:

1. More participation in the railway mode (*Transport*).
2. Energy renovation of the thermal envelope in existing buildings (*Building & Equipment*).
3. Improvement of energy efficiency in the thermal installations in existing buildings (*Building & Equipment*).
4. Mobility plans for companies and activity centres (PTT) (*Transport*).
5. Sustainable Urban Mobility Plans (SUMP) (*Transport*).
6. Improvement of energy efficiency in indoor lighting installations in existing buildings (*Building & Equipment*).
7. Improvement of equipment and processes technology (BAT) (*Industry*).
8. Renovation of existing street lighting installations (*Public Services*).
9. Promotion of co-generation plants for non-industrial activities (*Energy Transformation*).
10. Energy audits and action plans to improve agriculture estates (*Agriculture & Fisheries*).

Priority measures of the Action Plan 2011-2020

	Final energy savings (ktoe)		Primary energy savings (ktoe)		CO ₂ emissions avoided (ktCO ₂)		Aid managed by public sector (M€)			Investments (aid managed by public sector +private s. contribution) (M€)		
	2016	2020	2016	2020	2016	2020	2011-2016	2017-2020	2011-2020	2011-2016	2017-2020	2011-2020
Industry	2,332	4,154	2,016	4,623	4,905	10,772	444	296	740	4,442	2,961	7,403
Improvement of equipment and processes technology (BAT)	2,332	4,154	2,016	4,623	4,905	10,772	444	296	740	4,442	2,961	7,403
Transport	2,331	3,500	2,923	4,559	7,720	12,095	311	207	518	622	414	1,036
Urban mobility plans	802	996	1,006	1,298	2,655	3,443	231	154	385	462	308	770
Mobility plans for companies and activity centres	408	508	512	661	1,353	1,754	53	35	89	106	71	177
Larger participation of train in transport means	1,121	1,996	1,406	2,600	3,712	6,898	26	18	44	53	35	88
Building and equipment	2,357	2,525	4,453	4,872	9,746	10,643	951	634	1,585	12,969	8,646	21,615
Energy rehabilitation of the thermal envelope in existing buildings	775	775	1,319	1,329	2,921	2,943	666	444	1,110	3,356	2,238	5,594
Improvement of energy efficiency of the thermal installations in existing buildings	908	908	1,546	1,558	3,424	3,449	170	113	283	4,355	2,903	7,258
Improvement of energy efficiency of the indoor lighting installations in existing buildings	674	842	1,588	1,986	3,400	4,251	115	77	192	5,258	3,505	8,763
Public services	19	58	46	136	97	292	63	42	105	416	278	694
Renewal of the existing outdoor lighting installations	19	58	46	136	97	292	63	42	105	416	278	694

(Continuation)

	Final energy savings (ktoe)		Primary energy savings (ktoe)		CO ₂ emissions avoided (ktCO ₂)		Aid managed by public sector (M€)			Investments (aid managed by public sector + private s. contribution) (M€)		
	2016	2020	2016	2020	2016	2020	2011-2016	2017-2020	2011-2020	2011-2016	2017-2020	2011-2020
Agriculture and fisheries	14	18	23	29	58	74	5	4	9	27	18	45
Energy audits and action plans to improve agriculture holdings	14	18	23	29	58	74	5	4	9	27	18	45
Total No. of end-use sectors (priority measures)	7,053	10,255	9,460	14,220	22,525	33,877	1,774	1,183	2,956	18,476	12,317	30,793
Energy transformation			265	388	445	653	13	3	16	912	444	1,356
Promotion of co-generation in non-industrial activities			265	388	445	653	13	3	16	912	444	1,356
Total No. final sectors + energy transformation (priority measures)	7,053	10,255	9,724	14,608	22,971	34,529	1,787	1,185	2,972	19,388	12,761	32,149
Communication							74	50	124	74	50	124
Total No. of priority measures	7,053	10,255	9,724	14,608	22,971	34,529	1,861	1,235	3,096	19,462	12,811	32,273

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