



GOBIERNO
DE ESPAÑA

MINISTERIO
DE INDUSTRIA, ENERGÍA
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IDAE
Instituto para la Diversificación
y Ahorro de la Energía

SPANISH ENERGY EFFICIENCY ACTION PLAN 2011-2020

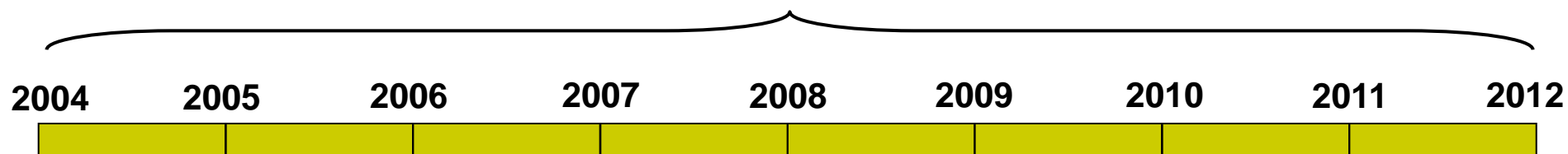
(2nd NEEAP, in accordance with Directive 2006/32/EC)

—energy saving measurement methodology—

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Saving and Energy Efficiency Strategy in Spain 2004-2012 (approved on 28.11.2003) Total savings: 69,950 ktoe



Action Plan 2005-2007
(8.07.2005)

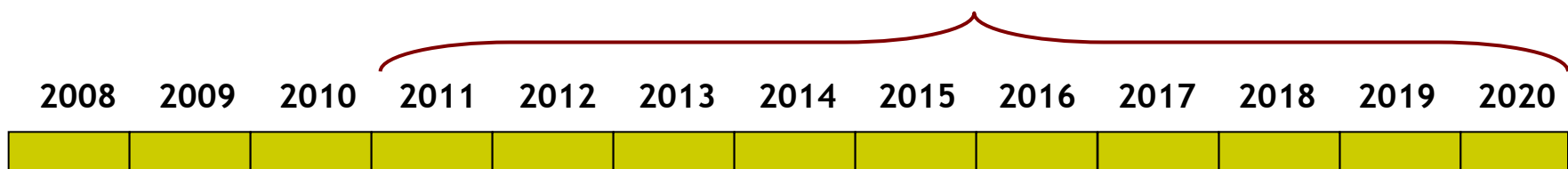
Total savings 2005-2007: 12,006 ktoe

Action Plan 2008-2012
(20.07.2007)

Total savings 2008-2012: 87,933 ktoe

1st NEEAP (ESD Directive)

NATIONAL ENERGY EFFICIENCY ACTION PLAN 2011-2020 = = 2nd NEEAP (ESD Directive)



Action Plan 2008-2012
(20.07.2007)

Total savings 2008-2012: 87,933 ktoe

2016:

Total Savings Target (in terms of
final energy consumption): 9%

(Directive 2006/32/EC)

2020:

Energy efficiency
improvement, in terms of
primary energy consumption:
20%

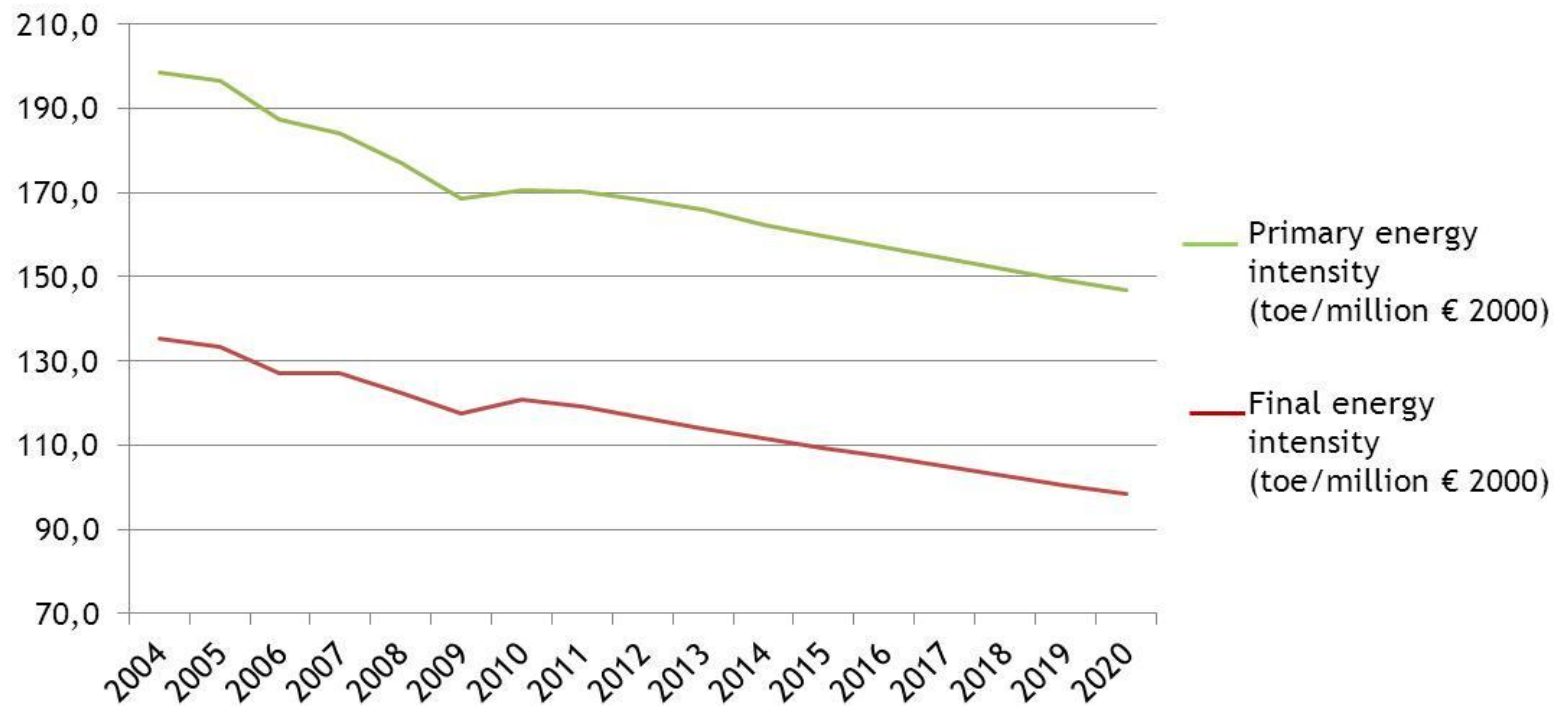
(Europe 2020: European
Council of June 17th 2010)

NATIONAL ENERGY EFFICIENCY ACTION PLAN 2011-2020 (I)

- Objective:

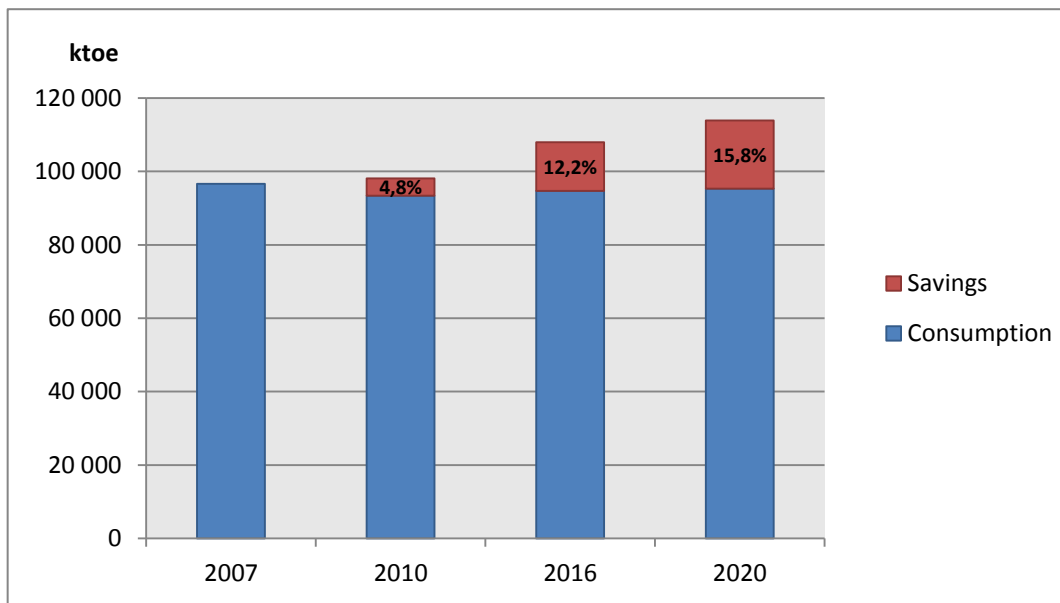
To improve final energy intensity by 2% per year in the period 2010-2020

toe/ M€ 2000



NATIONAL ENERGY EFFICIENCY ACTION PLAN 2011-2020 (II)

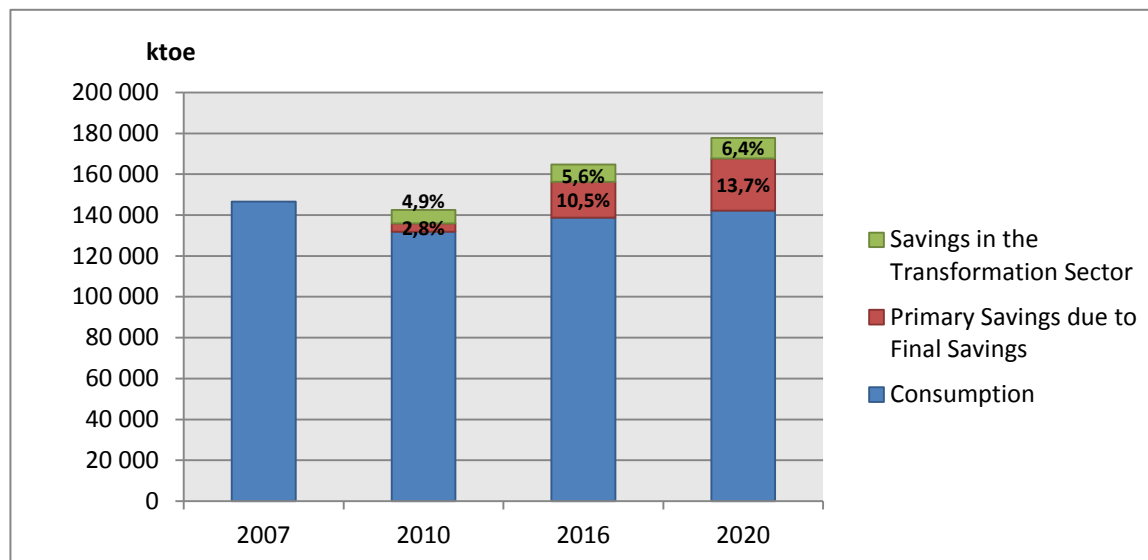
Measures included in the NEEAP 2011-2020 will report final energy savings in 2020 of **17,842 ktoe**, calculated with reference to 2007 and in accordance with the methodology proposed by the European Commission.



The NEEAP 2011-2020 fulfills the saving targets required by the Directive 2006/32/EC (9% in 2016): final energy savings in 2016 are equivalent to 11,532 ktoe (15.9% of average energy consumption of the five years previous to the application of the related Directive).

NATIONAL ENERGY EFFICIENCY ACTION PLAN 2011-2020 (III)

- Measures included in the NEEAP 2011-2020 will report primary energy savings in 2020 of **35,585 ktoe**, calculated with reference to 2007 and in accordance with the methodology proposed by the European Commission.



- The NEEAP 2011-2020 is in accordance with the global objectives agreed by the European Council on June 17, 2010, regarding the improvement of EU energy efficiency by 20% in 2020.



Sectors, measures and mechanisms (1/3)

- Energy savings up to 2010 have been evaluated as a result of a coherent approach based on **top-down** and **bottom-up** methods, and calculated in terms of **final** and **primary** energy (including savings due to energy efficiency improvements in electricity and refining sectors, and also savings due to more renewables for electricity generation).
- NEEAP 2011-2020 establishes objectives in terms of final energy savings for 5 sectors
 - 1) **Industry**
 - 2) **Transport**
 - 3) **Buildings and Equipment**
 - 4) **Public Services**
 - 5) **Agriculture**

and, in terms of primary energy, for the **Energy Transformation** sector (electricity sector and refineries).

- The list of measures is (more or less) the same than in the Action Plan 2008-2012 (1st NEEAP). Nevertheless, the objectives and mechanisms proposed to achieve them –measure by measure– are sometimes different.

Sectors, measures and mechanisms (2/3)

The mechanisms (*categories*, under the definition of the European Commission –see Annex V of the template–) are the following:

- Public aids for energy efficiency investment projects, under the framework of the cooperation programme established between IDAE and the regional governments for the Action Plan 2008-2012 (up to 40% of public support –over the eligible cost–, depending on the type of project and fully in accordance with 2008/C 82/01 –rules on State aids).
- Public aids directly managed by IDAE (IDAE's programme for energy efficiency strategic projects, with an annual budget of 120 M€ since 2008).
- Legal and regulatory instruments.
- Programmes and plans for boosting energy services market (Plan 2000 ESE, in public and administrative buildings of the central, regional and local governments, including public street lighting, and others).
- Programmes to promote electric mobility.
- Communication.

Sectors, measures and mechanisms (3/3)

MEASURES		INSTRUMENTS, MECHANISMS OR CATEGORIES OF MEASURES							
		COOPERATION PROGRAMME IDAE-CC.AA. (AUTONOMOUS REGIONS)	DIRECT ACTIONS UNDER THE RESPONSIBILITY OF THE MINISTRY OF INDUSTRY (IDAE)				REGULATION (BUILDING CODES, ENERGY PERFORMANCE STANDARDS,...)	ENERGY SERVICES PLANS (MAINLY, IN PUBLIC BUILDINGS)	...
			IDAE PROGRAMME FOR STRATEGIC PROJECTS ON ENERGY EFFICIENCY (PUBLIC AIDS)	ELECTRIC VEHICLE STRATEGY		COMMUNICATION			
		MOVELE PROJECT (PILOT PROJECT)		...					
INDUSTRY	Energy audits								
	Best Available Technologies (by means of public aids)								
TRANSPORT	Urban Mobility Plans (PMUS)								
	...								
BUILDINGS	Rehabilitation of the Thermal Envelope in Existing Buildings					CTE (Technical Building Code); Revision on Regulations on Building Heating Installations			
	...								
PUBLIC SERVICES	Renovation of Existing Public Street Lighting Installations								
	...								
EQUIPMENT	Renove Plan for Electrical Appliances								
AGRICULTURE & FISHING	Training (courses) on efficient use of energy								
	...								
ENERGY TRANSFORMATION SECTOR	CHP: Promotion of Low-Capacity Cogeneration Plants					RD 616; RD 661			
	...								

Diagram of the energy saving measurement methodology

A. Top-down method (INDICATORS M)

$$\left(\frac{\text{Consumption base year}}{\text{Activity variable base year}} - \frac{\text{Consumption calculation year}}{\text{Activity variable calculation year}} \right) * \text{Activity variable calculation year} = \left(\text{Unit.consumption base year} - \text{Unit.consumption calculation year} \right) * \text{Activity variable calculation year}$$

- Economic situation
- Commodities market
- Behavior modification
- etc.

- M1
- M2
- M3
- M4
- M5
- M6
- M7
- M8

B. Top-down method (INDICATORS P)

$$\left(\frac{\text{Consumption base year}}{\text{Activity variable base year}} - \frac{\text{Consumption calculation year}}{\text{Activity variable calculation year}} \right) * \text{Activity variable calculation year} = \left(\text{Unit.consumption base year} - \text{Unit.consumption calculation year} \right) * \text{Activity variable calculation year}$$

- Savings not related to direct programmes
- Tech improvements
- etc

- P1
- P2
- P3
- P4
- P5
- P6
- P7
- P8
- P9
- P10
- P11
- P12
- P13
- P14

C. Bottom-Up method (INDICATORS BU)

$$\sum_{i = \text{año}} \left(\text{Cons. item replaced } i - \text{Cons. item replacement } i \right) * \text{Nº item replaced} * \frac{\text{Activity variable calculation year}}{\text{Activity variable year } i}$$



EVALUATION OF ENERGY SAVINGS 2010

Top-down indicators

SECTOR		INDICATOR		UNIT
INDUSTRY		Laspeyres Parametric Divisia Method 1 (LAS-PDM1)	L-Tecnológico PDM1 indicator of technological effect of industrial sub-sector	ktoe/10 ⁶ €
			L-Estructura PDM2 indicator of structural effect of industrial sub-sector	ktoe/10 ⁶ €
TRANSPORT	ROAD	PASSENGER	P8 Energy consumption of cars per passenger traffic (passenger-km)	goe/pkm
		GOODS	M53/PB Energy consumption per buses fleet	toe/veq
		GOODS	M52/A2 Energy consumption of trucks and light vehicles per vehicle fleet equivalent	toe/veq
		PASSENGER	P10 Energy consumption of passengers rail transport per passenger traffic (passenger-km)	goe/pkm
	RAILWAY	GOODS	P11 Energy consumption of freight rail transport per freight traffic (tonne-km)	goe/tkm
		INLAND WATERWAYS (GOODS)	M7 Energy consumption of freight sea transport (coastal and river) per freight traffic (tonne-km)	goe/tkm
	AVIATION (PASSANGER-DOMESTIC FLIGHTS)	Mav Energy consumption of passengers air transport in domestic flights per operations (number of flights)	goe/pkm	
	MODAL SHIFT	PASSENGER	P12 Transfer of passenger vehicle traffic to collective modes (bus, train and underground)	%
GOODS		P13 Transfer of freight road traffic to rail and maritime modes	%	
BUILDINGS	HOUSEHOLD	THERMAL ENVELOPE AND THERMAL FACILITIES	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
		INDOOR LIGHTING SYSTEMS	P5 Electricity consumption of households for lighting per dwelling	toe/dwelling
	TERTIARY	THERMAL ENVELOPE AND THERMAL FACILITIES	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
			INDOOR LIGHTING SYSTEMS	M42 Energy consumption in service sector for lighting per employee in full time equivalent
EQUIPMENT	HOUSEHOLD	ELECTRICAL APPLIANCES	P4 Domestic Energy consumption of electrical appliances per equipment unit	toe/appliance
			P41 Domestic energy consumption of cookers per equipment unit	toe/cooler
	TERTIARY	ELECTRICAL 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
			M32 Non-electric energy consumption in service sector of cookers per employee in full time equivalent	toe/employee
PUBLIC SECTOR	STREET LIGHTING	MAP Electric energy consumption of street lighting per dwelling	toe/dwelling	
	WATER DESALINATION	MAG ^{desalación} Energy consumption for desalination per volume of desalinated water	ktoe/hm ³ año	
	WATER TREATMENT	MAG ^{depuración} Energy consumption for water treatment per inhabitant	toe/inhabitant	
AGRICULTURE AND FISHING		M8' Energy consumption in agriculture and fisheries per GVA unit	ktoe/10 ⁶ €	

	Recommended EU indicator
	Variation of a recommended EU indicator
	New indicator

INDUSTRY

Breakdown of energy saving in the industrial sector in 2010 with respect to 2004

Industry		[L] = -798.6 ktoe <small>2010(Base 2004)</small>	
Structural effect [LE] = -1,655.1 ktoe <small>2010(Base 2004)</small>	Technology effect [LT] = -2,454.1 ktoe <small>2010(Base 2004)</small>		
	Cooperation agreements [BUin₁] = 1,068.6 ktoe <small>2010(B 2004)</small>	Strategic Projects [BUin₂] = 131,5 ktoe <small>2010(B 2004)</small>	→

Divisia measurement method 1 (DMM1)

Technology effect per branch of activity

$$LT_{R2010} = C_{R2004} + R \cdot (C_{R2010} - C_{R2004}) \cdot Ln \left(\frac{C_{R2010}/GVA_{R2010}}{C_{R2004}/GVA_{R2004}} \right)$$

Structural effect per branch of activity

$$LE_{R2010} = [C_{R2004} + R \cdot (C_{R2010} - C_{R2004})] \cdot Ln \left(\frac{GVA_{R2010}/GVA_{I2010}}{GVA_{R2004}/GVA_{I2004}} \right)$$

- C_{Ri} : Consumption of final energy by the branch of activity in the year i
- GVA_{Ri} : Gross Value Added of the branch of activity in year i
- GVA_{Ii} : Gross Value Added of the industrial sector in year i

$$\bullet R : \frac{1}{Ln \left(\frac{C_{R2010}}{C_{R2004}} \right)} - \left(\frac{C_{R2004}}{C_{R2010} - C_{R2004}} \right)$$

TRANSPORT

Breakdown of energy saving in the transport sector in 2010 with respect to 2004

TRANSPORT	$[BU_{rp}+BU_{cet}+A2+PB]+ [P10+P11] +[M7]+ [Mav]+[P12+P13] = 6,451.1 \text{ ktoe}_{2010} \text{ (Base 2004)}$	
Road transport:	$[B_{urp}+ BU_{cet}]+[A2]+[PB]= 6,701.4 \text{ ktoe}_{2010} \text{ (Base 2004)}$	
Cars	$[BU_{rp}]= 788,4 \text{ ktoe}_{2010} \text{ (Base 2004)}$	
Freight vehicles (trucks and light vehicles)	$[A2]= 5,880.4 \text{ ktoe}_{2010} \text{ (Base 2004)}$	
Passengers (buses)		$[PB] = 32.6 \text{ ktoe}_{2010} \text{ (Base 2004)}$
Rail transport		$[P10+P11] = -317.4 \text{ ktoe}_{2010} \text{ (Base 2004)}$
Passengers $[P10] = 24.3 \text{ ktoe}_{2010} \text{ (base 2004)}$	$[P12] = 84.7 \text{ ktoe}_{2010} \text{ (base 2004)}$	Freight $[P11] = -341.7 \text{ ktoe}_{2010} \text{ (base 2004)}$
Maritime transport:	$[P13] = -2.0 \text{ ktoe}_{2010} \text{ (base 2004)}$	$[M7] = 52.3 \text{ ktoe}_{2010} \text{ (Base 2004)}$
Air transport:	$[Mav] = -68.0 \text{ ktoe}_{2010} \text{ (Base 2004)}$	



BUILDINGS AND EQUIPMENT

Breakdown of energy saving in the building sector in 2010 with respect to 2004

Buildings		$[P1+P2+P3+M3_1+M4_1] + [P5+M4_2] + [P4+P4_1]+ [M3_2+M4_3+M4_4] = 2,232.5 \text{ ktoe}_{2010} \text{ (base 2004)}$									
Thermal envelope and installations		$[P1+P2+P3+M3_1+M4_1] = 1,637.7 \text{ ktoe}_{2010} \text{ (base 2004)}$									
Residential buildings	$[P1+P2+P3] = 273.9 \text{ ktoe}_{2010} \text{ (base 2004)}$	Service buildings	$[M3_1+M4_1] = 1,363.7 \text{ ktoe}_{2010} \text{ (base 2004)}$								
<table border="1" style="margin: auto; border-collapse: collapse;"> <tr> <td style="padding: 2px;">Remove scheme envelopes</td> <td style="padding: 2px;">$BU_{et} = 22.3 \text{ ktoe}_{2010} \text{ (base 2004)}$</td> </tr> <tr> <td style="padding: 2px;">Remove scheme installations</td> <td style="padding: 2px;">$BU_{it} = 61.1 \text{ ktoe}_{2010} \text{ (base 2004)}$</td> </tr> <tr> <td style="padding: 2px;">CTE new households</td> <td style="padding: 2px;">$BU_{cte} = 231,7 \text{ ktoe}_{2010} \text{ (base 2004)}$</td> </tr> <tr> <td style="padding: 2px;">Strategic Projects</td> <td style="padding: 2px;">$BU_{pe} = 60.9 \text{ ktoe}_{2010} \text{ (base 2004)}$</td> </tr> </table>		Remove scheme envelopes	$BU_{et} = 22.3 \text{ ktoe}_{2010} \text{ (base 2004)}$	Remove scheme installations	$BU_{it} = 61.1 \text{ ktoe}_{2010} \text{ (base 2004)}$	CTE new households	$BU_{cte} = 231,7 \text{ ktoe}_{2010} \text{ (base 2004)}$	Strategic Projects	$BU_{pe} = 60.9 \text{ ktoe}_{2010} \text{ (base 2004)}$		
Remove scheme envelopes	$BU_{et} = 22.3 \text{ ktoe}_{2010} \text{ (base 2004)}$										
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CTE new households	$BU_{cte} = 231,7 \text{ ktoe}_{2010} \text{ (base 2004)}$										
Strategic Projects	$BU_{pe} = 60.9 \text{ ktoe}_{2010} \text{ (base 2004)}$										
Interior lighting		$[P5+M4_2] = 793.9 \text{ ktoe}_{2010} \text{ (Base 2004)}$									
Residential buildings	$[P5] = [M2_2] = 81.0 \text{ ktoe}_{2010} \text{ (base 2004)}$	Service buildings	$[M4_2] = 713.0 \text{ ktoe}_{2010} \text{ (base 2004)}$								
<table border="1" style="margin: auto; border-collapse: collapse;"> <tr> <td style="padding: 2px;">Improving Installations</td> <td style="padding: 2px;">$BU_{i3} = 29.7 \text{ ktoe}_{2010} \text{ (base 2004)}$</td> </tr> <tr> <td style="padding: 2px;">Free distribution light bulbs</td> <td style="padding: 2px;">$BU_{i1} = 84.9 \text{ ktoe}_{2010} \text{ (base 2004)}$</td> </tr> <tr> <td style="padding: 2px;">Programme 2x1</td> <td style="padding: 2px;">$BU_{i2} = 13.0 \text{ ktoe}_{2010} \text{ (base 2004)}$</td> </tr> </table>		Improving Installations	$BU_{i3} = 29.7 \text{ ktoe}_{2010} \text{ (base 2004)}$	Free distribution light bulbs	$BU_{i1} = 84.9 \text{ ktoe}_{2010} \text{ (base 2004)}$	Programme 2x1	$BU_{i2} = 13.0 \text{ ktoe}_{2010} \text{ (base 2004)}$				
Improving Installations	$BU_{i3} = 29.7 \text{ ktoe}_{2010} \text{ (base 2004)}$										
Free distribution light bulbs	$BU_{i1} = 84.9 \text{ ktoe}_{2010} \text{ (base 2004)}$										
Programme 2x1	$BU_{i2} = 13.0 \text{ ktoe}_{2010} \text{ (base 2004)}$										
Equipment		$[P4+P4_1]+ [M3_2+M4_3+M4_4] = -199.1 \text{ ktoe}_{2010} \text{ (Base 2004)}$									

PUBLIC SERVICES

Breakdown of energy saving in public services sector in 2010 with respect to 2004

Public Services		[MAP] + [MAG] = 31.8 ktoe ₂₀₁₀ (Base 2004)
Street lighting		[MAP] = 4.6 ktoe ₂₀₁₀ (Base 2004)
Improvements in the efficiency of existing street lighting installations		
Renewal of existings public street lighting installations $BU_{a1} = 77.7 \text{ ktoe}_{2010} \text{ (base 2004)}$	Programme to replace existing traffic lights with LED $BU_{a2} = 8.7 \text{ ktoe}_{2010} \text{ (base 2004)}$	
Water supply		[MAG] = 27.2 ktoe ₂₀₁₀ (Base 2004)

STREET LIGHTING

$$MAP = \left(\frac{E^{EA}}{V} \right)$$

E^{EA} : Power consumption of street lighting
 V : Number of houses

WATER SUPPLY $MAG = MDS + MDP$

Desalination

$$MDS = \left(\frac{E^{DS}}{A} \right)$$

E^{DS} : Power consumption in desalination
 A : Volume of water desalinated

Purification

$$MDP = \left(\frac{E^{DP}}{H} \right)$$

E^{DP} : Power consumed in treatment
 H : Number of inhabitants

EVALUATION OF ENERGY SAVINGS 2010 (I)

Bottom-up results

COOPERATION PROGRAMME IDAE-CC.AA.

	FINAL E. SAVINGS (2010, ktoe)	PRIMARY E. SAVINGS (2010, ktoe)
INDUSTRY	1.069	1.586
TRANSPORT	948	944
BUILDING & EQUIPMENT	195	439
<i>among others:</i>		
<i>Renove Plan for Electrical Appliances</i>	81	204
PUBLIC SERVICES	85	212
<i>among others:</i>		
<i>Renewal of the Existing Public Lighting Installations*</i>	78	194
AGRICULTURE & FISHING	8	12
TOTAL FINAL ENERGY SECTORS	2.305	3.192
ENERGY TRANSFORMATION		29
TOTAL FINAL ENERGY SECTORS + ENERGY TRANSFORMATION	2.305	3.221

EVALUATION OF ENERGY SAVINGS 2010 (II)

Bottom-up results

	Final E. Savings (2010, ktoe)	Primary E. Savings (2010, ktoe)
COOPERATION PROGRAMME IDAE-CC.AA.	2.305	3.221
IDAE PROGRAMME FOR STRATEGIC PROJECTS ON ENERGY EFFICIENCY	200	337
OTHER IDAE'S DIRECT ACTIONS	140	302
Cars ECOdriving	1,1	1,2
Trucks ECOdriving	31	34
MOVELE (Pilot Project)	2,1	0,9
Free distribution of FCL	85	212
2x1 FCL programme	13	33
Traffic light replacement programme with LED	9	20
OTHER PROGRAMMES (PREVER; VIVE; 2000E)	730	813
TOTAL	3.375	4.673

- Energy savings calculated as a result of *bottom-up* methods are equivalent to 40,5% of total final energy savings reported by 2010.

RESULTS ACCORDING TO DIRECTIVE 32/2006/EC:

2016 Objective	2010 Results	%
6.536 ktoe (9%)	6.682 ktoe (9,2%)	102,2%

RESULTS ACCORDING TO PRIMARY ENERGY OBJECTIVES SET IN ACTION PLAN 2008-2012:

2012 Objective	2010 Results	%
24.776 ktoe	17.725 ktoe	71,5%

RESULTS IN TERMS OF ENERGY INTENSITY (TARGETS SET IN ACTION PLAN 2008-2012):

	2004-2012 Objective	2004-2010 Results
Final Intensity	-1,0%	-1,9%
Primary Intensity	-1,8%	-2,5%



To sum up:

- Final energy savings in 2016 are equivalent to 11,532 ktoe (15,9% of average energy consumption of the five years previous to the application of the Directive).
- Final energy savings in 2016 represents 12,2% of the total final energy consumption in a scenario *without measures or business as usual* scenario –considering that this scenario is based on year 2007.
- Primary energy savings in 2020 (35,6 Mtoe*) represents 20% of the total primary energy consumption in a scenario *without measures or business as usual* scenario –considering that this scenario is based on year 2007.
- Final energy savings calculated up to 2010 covers 102,2% of the target set by the Directive 2006/32/EC for 2016 (energy savings calculated using 2007 as the base year).
- Primary energy savings calculated up to 2010 represents 71,5% of the objective set by the 1st NEEAP for 2012 –Action Plan 2008-2012– (energy savings calculated using 2004 as the base year).
- Spain contributes with a 9.7% to the global objective of the European Union of 368 Mtoe of primary energy savings in 2020, established by the Council of June 17th 2010.



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