

Consumers and energy efficiency

(Workpackage 5)

Country Report for Spain

**An inventory of policies, business and civil society initiatives
focusing on heating & hot water and the use of electricity**

December, 2015



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Methodological notes:

This report has been compiled as a result of desktop search into:

- i) data on energy consumption in the household sector in Spain, and
- ii) policies, business and civil society initiatives mainly at the national level to promote energy efficiency in the household sector in Spain.

The report focuses on the use of energy in the household sector for the purposes of heating and the use of hot water, as well as on the use of electricity. Transport-related use of energy is excluded.

The data analysis on energy consumption is based on the ODYSSEE database on energy efficiency indicators and data (<http://www.odyssee-mure.eu>), using the most recent data available.

The scope of information presented in the report in the case of policies at the national level is mainly on governmental measures in effect. In the case of business and civil society initiatives the main objective of the report is to illustrate diversity and not to provide a complete overview or an exhaustive list of all existing initiatives. An attempt was made to introduce the better-known campaigns and programmes as well as to indicate the variety of the actions.

The collection of information was concluded by end of November 2015.

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Abbreviations

BAR	Building Assessment Report
CCI	Chambers of Commerce and Industry
EESTI	Estrategia Española de Ciencia y Tecnología y de Innovación
EIB	European Investment Bank
EOI	Escuela de Organización Industrial
ERDF	European Regional Development Fund
ETAP	Environmental Technologies Action Plan
FIDAE	Fondo de Inversión en Diversificación y Ahorro de Energía
FNEE	Fondo Nacional de Eficiencia Energética
IDAE	Instituto para la Diversificación y Ahorro de la Energía
ILO	International Labour Organisation
INE	Instituto Nacional de Estadística
Ktoe	Kilotonne of Oil Equivalent
Kwh	Kilowatt hour
Mtoe	Million tons of oil equivalent
NEEAP	National Energy Efficiency Action Plan
MARIE	Mediterranean Building Rethinking for Energy Efficiency Improvement
PAEE-AGE	Plan de ahorro y eficiencia energética en los edificios de la Administración General del Estado
PPP	Purchasing Power Parity
OECD	Organisation for Economic Co-operation and Development
OSE	Observatorio de la Sostenibilidad en España
PAREER-CRECE Programme	Programa de Ayudas para la Rehabilitación Energética de Edificios existentes
PLANETA	Environmental Technology Platform
RITE	Reglamento de Instalaciones Térmicas en los Edificios
RDI	Research, Development and Innovation
STEEEP	Support and Training for an Excellent Energy Efficiency Performance
TBC	Technical Building Code

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1. Introduction

1.1 General socio-economic and energy data

Spain is the world's fourteenth biggest economy (IMF, 2015). Spain economy growth by 48.92% in the period 1995-2012; GDP and private consumption at 2005 PPP increased with annual average rate of 2.71% and 2.46%, respectively (Table 1).

The economic structure is principally dominated by its tertiary sector, which accounted for about 66% of its GDP in 2012. Spain's tourism industry is the one of the largest in the world, next only to France and the US. The industry contributed nearly 21% to the nation's GDP, and has been responsible for employment of over 2 million individuals in the Spanish economy. After the tertiary sector, Spain's industry sectors have been the second largest contributor to the economy, employing about a quarter of the nation's total labor force. The industry sector, which comprises of textiles, chemicals, shipbuilding, automobiles, metals and machine tools, was also responsible for a majority of the exports. The contribution of the agricultural sector to the total GDP was only 2.5%; despite this, Spain continued to be Europe's biggest cultivator of oranges, strawberries and lemon and the world's largest producer of olive oil.

The population of Spain was estimated at 47.265,32 as of 2012 (47.129,78 million in 2013, Odyssee database LE), equivalent to 9.3% of the total European Union population. The population from 1995 to 2012 increased of the 20%.

Table 1. General socio-economic data

SOCIO-ECONOMIC				
Item	Unit	1995	2005	2012
GDP at exchange rate	M€2005	644.714,92	930.566,00	960.112,98
GDP at 2005 PPP	M€2005p	705.555,70	1.018.382,11	1.050.717,39
Population	k	39.383,05	44.108,53	47.265,32
Number of households	k	11.892,28	15.327,10	18.054,31
Private consumption of household at exchange rate	M€2005	369.896,10	528.157,00	534.276,62
Private consumption of household at 2005 PPP	M€2005p	404.802,64	577.998,38	584.695,50
Value added of agriculture at exchange rate	M€2005	20117,91	25238	24933,23
Value added of agriculture at 2005 PPP	M€2005p	22016,41	27619,67	27286,14
Value added of industry at exchange rate	M€2005	184655,91	254196,64	207262,18
Value added of industry at 2005 PPP	M€2005p	202081,61	278184,8	226821,2
Value added of tertiary at exchange rate	M€2005	390093,1	554640,37	637881,08
Value added of tertiary at 2005 PPP	M€2005p	426905,6	606980,94	698076,96

Source: Odyssee database

In 2012, Spain's final residential energy consumption amounted to 15.34 Mtoe – a 53.36% increase compared to 1995 – reaching its peak in 2010, with 16.77 Mtoe.

The household sector accounted for 18.4% of Spain's total energy end-use in 2012, and the residential final energy consumption per capita was 0.32 Toe per inhabitant, one of the lowest of the EU countries.

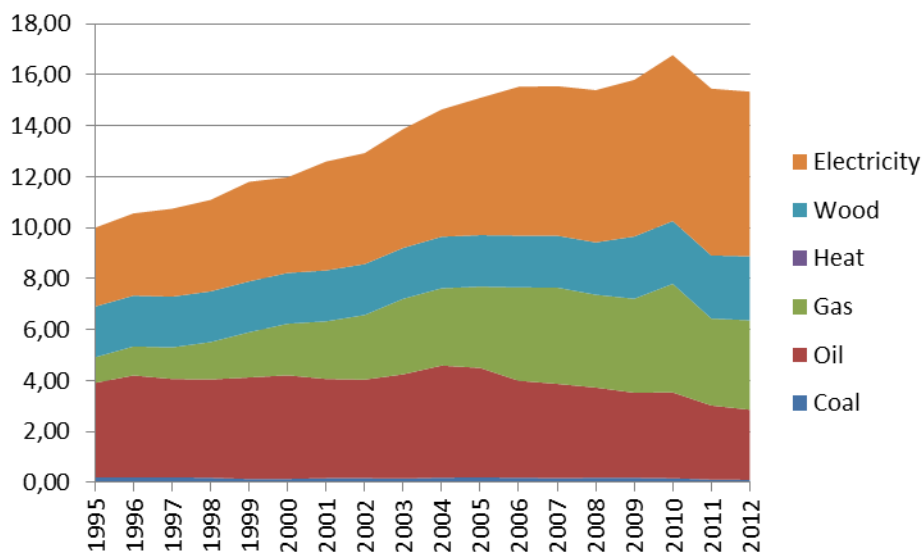
Table 2. Data related residential energy consumption

ENERGY				
Item	Unit	1995	2005	2012
Final consumption of residential (with climate correction)	Mtoe	10,88	14,86	15,40
Final consumption of residential	Mtoe	10,00	15,09	15,34
➤ Coal	Mtoe	0,22	0,21	0,11
➤ Oil	Mtoe	3,70	4,29	2,75
➤ Gas	Mtoe	1,00	3,19	3,51
➤ Heat	Mtoe	0,00	0,00	0,00
➤ Wood	Mtoe	1,99	2,02	2,51
➤ Electricity	Mtoe	3,10	5,38	6,46
Space heating	Mtoe	4,31	7,79	7,28
Water heating	Mtoe	2,78	3,22	3,40
Cooking	Mtoe	0,92	1,16	1,08
Air cooling	Mtoe	0,02	0,11	0,16
Electrical appliances and lighting	Mtoe	1,98	2,86	3,61
Electricity consumption of captive electricity	TWh	23,18	34,47	43,89
Total stock of dwellings	k	18.533,99	23.126,85	26.052,39
Stock of dwellings permanently occupied	k	11.892,28	15.327,10	18.054,31
Total construction of dwellings	k	221,30	590,70	133,42
Floor area of dwellings (average)	m ²	87,15	90,10	91,28
Stock of refrigerators	k	11.677,24	n.a.	n.a.
➤ Unit consumption	kWh/year	n.a.	n.a.	n.a.
➤ Rate of equipment ownership	%	98,69	99,80	n.a.
Stock of freezers	k	2.281,29	n.a.	n.a.
➤ Unit consumption	kWh/year	n.a.	n.a.	n.a.
➤ Rate of equipment ownership	%	15,42	33,86	n.a.
Stock of washing machines	k	11.294,67	n.a.	n.a.
➤ Unit consumption	kWh/year	n.a.	263,74	n.a.
➤ Rate of equipment ownership	%	95,62	98,87	n.a.
Stock of dishwashers	k	1.961,85	n.a.	n.a.
➤ Unit consumption	kWh/year	n.a.	218,23	n.a.
➤ Rate of equipment ownership	%	15,38	36,77	n.a.
Stock of TV	k	16.303,84	n.a.	n.a.
➤ Unit consumption	kWh/year	n.a.	72,67	n.a.
➤ Rate of equipment ownership	%	99,84	99,88	100,00

Source: Odyssee database

Electricity and gas have been the main energy sources in 2012 representing the 42.1% and the 22.8%, respectively, of the total residential energy consumption. They had a steady growth over the period 1995 -2012: 6.05%/y for electricity and 13.9%/y for gas. While the use of coal and heat has been insignificant, oil accounted for 17.9% and wood for 16.3% of the total residential energy consumption in 2012.

Figure 1. Spain’s final residential energy consumption by source 1995 – 2012 (Mtoe)

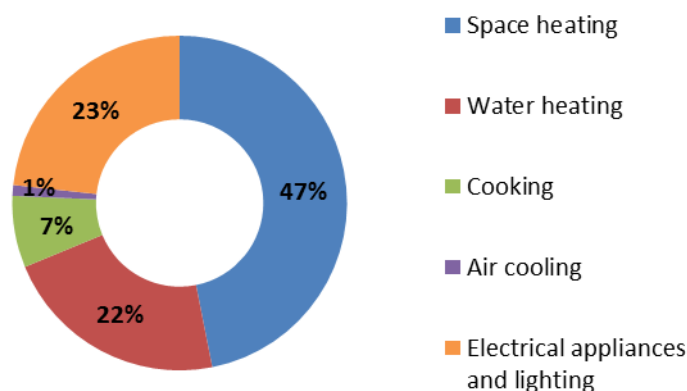


Source: Author’s elaboration based on Odyssee database

Approximately 47% of energy in the residential sector was used for space heating, roughly 23% for electricity for appliances and lighting, about 22% for water heating, and a small part for cooking (7%) and air cooling (1%).

Figure 2 illustrates the composition of the energy end-use in the residential sector in 2012.

Figure 2. Spain’s final residential energy consumption by end-use 2012 (%)



Source: Author’s elaboration based on Odyssee database

Total use of energy for space heating amounted to 7.28 Mtoe in 2012. Of this, wood was 1.98 Mtoe (27.1%), oil 1.80 Mtoe, gas 1.76 Mtoe, electricity 1.60 Mtoe, coal 0.14 Mtoe. In the period 1995-2012, the strongest rate of growth was for electricity (196.3%).

As many European countries, gas was the main source of energy used for water heating in 2012; it represented 42.6% of the total energy share of water heating in 2012, followed by oil (30.8%), electricity (24.4%), wood (1.1%), and coal (1.1%).

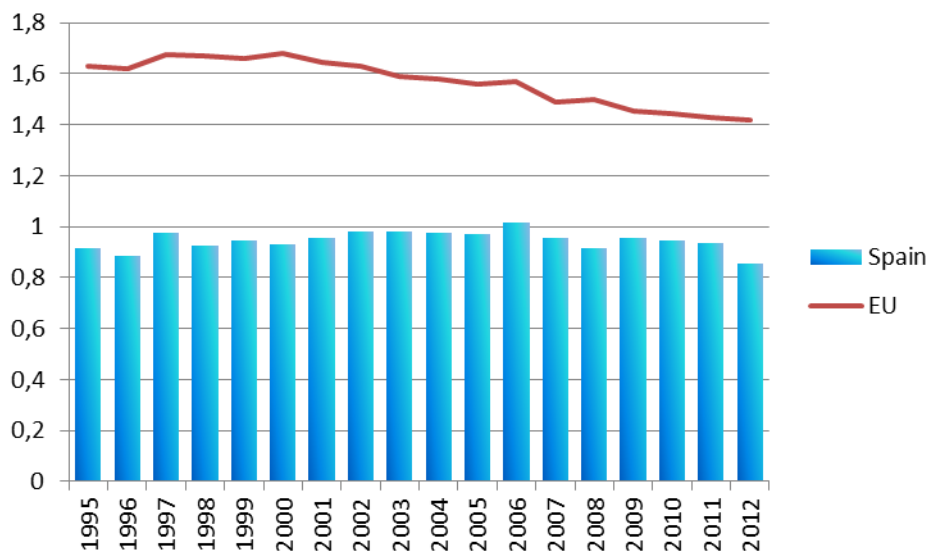
Electrical appliances were responsible for 79.5% of the total electricity consumption in 2012; the remaining 20.5% was used for lighting.

45.3% of energy consumed for cooking in 2012 came from oil, 34.2% from gas and 19.4% from electricity.

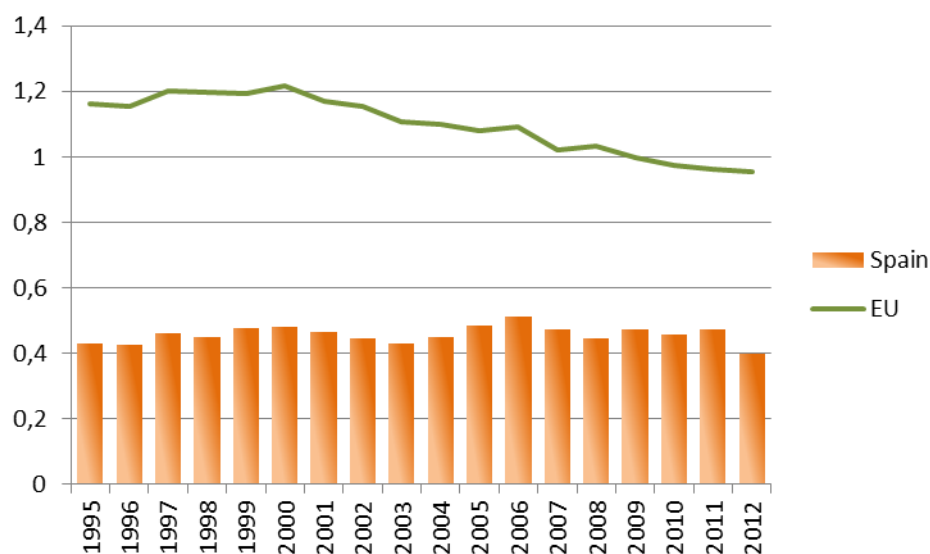
In 2012, the average floor area of dwellings was about 91.2 m² similar to the average of the European Member States (87.81m²). Energy consumption of households per permanently occupied dwellings (calculated at normal climate), was only 0.85 toe/dw (the average of the European Member States was 1.41 toe/dw).

Figure 3 shows the household energy consumption per dwelling of Spain compared to the average of the European Member States over the period 1995-2012, while Figure 4 shows the household space heating consumption at normal climate per dwelling compared to the average of the European Member States.

Figure 3. Spain’s final energy consumption per dwelling 1995-2012 (toe/dwelling)



Source: Author’s elaboration based on Odyssee database

Figure 4. Spain's space heating consumption per dwelling 1995-2012 (toe/dwellings)


Source: Author's elaboration based on Odyssee database

With regard to CO₂ emissions the residential sector's share of total emissions (44.21 Mt CO₂, Table 3) increased of 32.95% from 1995 to 2012 and it was bigger than the average of the European Union (27.9 Mt CO₂), decreased of 11.89% in the same period.

In contrast to the general trend of the EU of decreasing CO₂ emissions in the residential sector, Spain is one of the few countries that increased their emissions in this sector; even worse did only Cyprus. However, Spain is ranked in the twenty-first position for the CO₂ emissions of the residential sector per capita among the European Member States in 2012 (where Estonia is in the first position being the less efficient).

Table 3. Environmental aspects of residential energy consumption

ENVIRONMENT				
Item	Unit	1995	2005	2012
CO ₂ emissions of households (excluded electricity)	MtCO ₂	14,02	20,84	16,66
Total CO ₂ emissions of households (included electricity)	MtCO ₂	33,25	49,50	44,21
CO ₂ emissions per dwelling	tCO ₂ /dw	1,18	1,36	0,92
CO ₂ emissions per dwelling (with climatic corrections)	tCO ₂ /dw	1,28	1,33	0,92
CO ₂ emissions per dwelling with climatic corrections (included electricity)	tCO ₂ /dw	2,9	3,2	2,44
CO ₂ emissions of space heating per dwelling	tCO ₂ /dw	0,44	0,73	0,55
CO ₂ emissions of space heating (with climatic corrections)	tCO ₂ /dw	0,5	0,69	0,54
CO ₂ emissions of space heating with climatic corrections (included electricity)	tCO ₂ /dw	0,83	1,25	0,91
Degree-days	degree	1.522,17	1.937,21	1.871,27

Source: Odyssee database

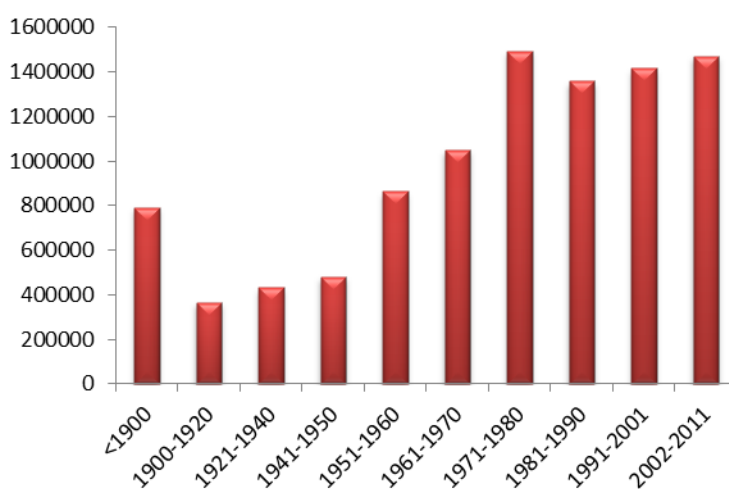
In 2012, CO₂ emissions per dwelling with climatic corrections (included electricity) were 2,44 (tCO₂/dw), far below the European average (3,74). Also, CO₂ emissions of space heating with climatic corrections (included electricity) were the 54% below the European average.

1.2 Specific data on residential building stock and related energy use

Based on information gathered from the latest INE census in 2011 and on area to be constructed according to the main intended use of new buildings from Ministry of Development statistics, it was estimated that the national stock in 2011 comprise 9.730.99 million buildings, occupying around 2.500 million m² of usable space, 2.100 million m² thereof for domestic use and 400 million m² for tertiary or service use.

The breakdown of the building stock by year of construction (Figure 4), indicates that 16.3% of the buildings have been built before 1940 (tradition buildings), 13.8% between 1940 and 1960 (first cycle of urban expansion with block types), 26.1% between 1960 and 1980 (second cycle of urban expansion with changes in construction systems), and 43.6% between 1980 and 2011 (new technical changes and period of application of NBE-CT/79 that required a minimum of thermal insulation in envelopes; from 2008 onwards, implementation of the Technical Building Code, CTE, which requires energy efficiency conditions for the buildings).

Figure 5. Building stock by construction period



Source: INE (2011)

There are a total of 25.2 million existing dwellings in Spain, distributed as follows, according to the 2011 census: 71.5% main dwellings (17.528.518 dwellings), 14.8% secondary dwellings (3.616.695) and 13.8% empty and other dwellings (3.374.291).

From the more than 18 million Spanish stock of dwellings permanently occupied, nearly half have a size between 61 m² and 90 m²; to be more precise 29.6% (5.354.920 dwellings) are between 76 and 90 m² and 18.6% (3.360.925) are between 61 and 75 m².

In detail, exploiting the land register information from 2013 makes it possible to differentiate the following dwelling types based on the use of the dwelling: shared (multi-family) in a block or open building, account for 24.1% of the total national dwellings, shared (multi-family) in perimeter blocks,

account for 46.3%. Within single-family dwellings, detached and semi-detached homes, account for 10% of the total stock, and terraced single-family dwellings or dwellings in a perimeter block (in a traditional urban area or a recent low-density development), amount for 19.6% of the total.

2. Politics affecting energy consumption in households

2.1 General policy framework

The main policy instruments to improve the energy efficiency in the residential sector with the aim of achieving the European energy savings target and as part of the “Spanish Strategy for Energy Renovation in the Building Sector” are:

- Regulatory: Royal Decree 314/2006 (updated by Order FOM/1635/2013), Royal Decree 1027/2007 (updated by Royal Decree 238/2013), Royal Decree 1390/2011 (amending the Royal Decree 124/1994), Law 4/2013, Law 8/2013, Royal Decree 235/2013, Royal Decree 238/2013, draft Royal Decree transposing partially Directive 2012/27/UE.
- Economic - Financial: BIOMCASA, SOLCASA, GEOTCASA, GIT; State Plan for promotion of rental housing, building rehabilitation and urban regeneration and renewal, 2013-2016 (Royal Decree 233/2013); Aid Programme for the Energy Renovation of Existing Buildings (PAREER).
- Informational: Order ITC/3860/2007, Order IET/290/2012.
- Cross-cutting: Law 15/2012, Royal Decree-Law 29/2012.

2.2 Energy efficiency targets

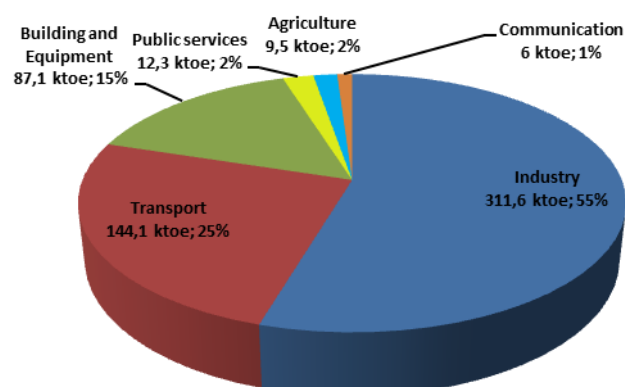
In the new 2014–2020 NEEAP, Spain notified to the European Commission an energy consumption target expressed in terms of an absolute level of primary energy consumption (119.893 ktoe) and final energy consumption (80.1 Mtoe) in 2020 in accordance with Article 3(1) of the Directive.

According to the latest Spanish NEEAP 2014, 15.3% (87.1 ktoe/year) of the final energy savings target (571 ktoe/year)¹ will be achieved through measures in the building and equipment sector (54.6% industry, 25.3% transport, 2.2% public service, 1.7% agriculture and fishing). In this scenario, savings would derive from the energy renovation of the thermal envelope of existing buildings, improvement in the energy efficiency of heating, cooling and domestic hot water systems, lighting, lifts and other transport systems and electrical installations. It would also derive from the restoration of existing buildings to a high rating (this also includes measures for improving the efficiency of commercial and industrial cooling systems and data processing centres). And, finally, the implementation of smart systems (home and building automation) and renovation of the stock of electrical appliances.

Figure 5 shows the distribution of the final energy savings target by sector (571 ktoe/year). The shares are resulting from the application of bottom-up approach employed in the previous NEEAP and must be achieved using the energy efficiency obligation scheme (Article 7).

¹ The cumulative savings target is 15.979 ktoe for the inclusive period between 1 January 2014 and 31 December 2020, which is equivalent to 571 ktoe/year assuming it follows a linear distribution during the entire obligation period. Spanish NEEAP 2014.

Figure 6. Distribution of the final energy savings target (571 ktoe/year).



Source: IDAE

In greater detail, the building and equipment sector target of 87.1 ktoe/year² is broken down into energy saving and efficiency measures, each has assigned an own indicative target which it is expected to contribute (Table 4).

Table 4. Contribution of the building and equipment sector to the final energy savings target under the energy efficiency obligation scheme (Article 7 of Directive 2012/27/EU)

	Residential buildings	Public Buildings	Large enterprise buildings	SME buildings
Energy renovation of the thermal envelope of existing buildings	7.39	2.38	4.76	1.75
Improvement of the energy efficiency of heating installations in existing buildings	12.68	1.48	2.17	0.99
Improvement of energy efficiency of interior lighting installations in existing buildings	1.17	2.66	5.32	1.95
Renovation of existing buildings with a high energy rating	1.60	0.48	0.97	0.35
Improvement of the energy efficiency of existing commercial cooling installations			1.14	1.08
Renovation of industrial and tertiary cooling generators			0.31	2.50
Improvement in the energy efficiency of lifts and other existing transport systems.	7.05	0.14	0.06	0.12
Implementation of smart systems in existing construction (home and building automation, smart grids)	3.16	1.65	3.29	1.21
Improvement in the energy efficiency of existing data processing centres		0.59	1.18	0.59
Energy efficiency measures in electrical installations			10.64	
Renovation of electrical appliances			4.29	
Communication and information measures			0.93	
TOTAL FINAL ENERGY SAVING (ktoe/y)			88.03	

Source: IDAE

² 88.03 ktoe/year considering also 0.93 ktoe/year deriving from communication and information measures.

Building energy efficiency measures are sorted into 12 groups: those considered of most importance are measures for the energy renovation of the thermal envelope of existing buildings with a saving of 16.28 ktoe/year and improvement in energy efficiency of heating installations with 17.31 ktoe/year, followed by interior lighting measures, which have a savings target of 11.09 ktoe/year. These last three measures have a very impact on energy rating improvement. They have been set up as independent measures which will allow for an improvement in the efficiency level at any letter in the rating scale. According to the NEEAP (2014), it is difficult to obtain a high energy rating in existing buildings, since this requires a comprehensive renovation. Such buildings shall be subject to measures which concern the thermal envelope, cooling and lighting, in addition to a specific measure for buildings opting for a high energy rating which applies integrally to the envelope and installations. In this case, the assigned saving target is lower, due to the challenges in implementing integral renovation measures for existing building stock in comparison to partial renovations.

Another of the targets is to reduce energy consumption in lifts and another transportation systems, such as escalators and moving walkways, a sector in which there is still a significant potential for saving and where few energy efficiency measures (on lighting systems, energy recovery, etc.) have been introduced. The savings target for the residential sector is 7.05 ktoe/year.

One measure showing great future potential is the use of ICTs to manage energy and to improve energy efficiency, related to the implementation of smart systems through home and building automation in existing constructions. In this case, the savings target is 3.16 ktoe/year for the residential sector. Finally, measures have been designed to improve the renovation of electrical installations (10.64 ktoe/year) and appliances (4.29 ktoe/year).

2.3 Specific policies

2.3.1 Regulatory

The Technical Building Code (TBC), promulgated by Royal Decree 314/2006, 17 March 2006, is the regulatory framework governing the basic quality requirements of health, sustainability, energy saving and comfort that must be met by buildings, in order to comply with the basic safety and habitability regulations defined by Law 38/1999 on the organization of building construction.

The Technical Building Code applies to new construction, except for technically simple structures of negligible constructional consequence not designated for residential or public use. It also applies to the extension, modification, alteration or renovation works that are carried out on existing buildings.

The TBC is divided into two parts, both of regulatory nature. Part I contains general provisions (scope, structure, classification of uses, etc.) and the basic requirements of the buildings; Part II consists of Basic Documents, the appropriate use of which guarantees compliance with the basic requirements. These documents contain procedures, technical rules and examples of solutions for determining whether a building complies with the stipulated performance levels.

Among the mentioned Basic Documents, it must be highlighted the Basic Energy Saving Document in which the principal objectives are: to obtain a rational use of the energy required for buildings, to reduce their consumption to sustainable limits, and thereby ensuring that a portion of this consumption comes from renewable sources of energy. The IDAE took part in the documents drafting and editing, acting as an advisor to the Ministry of Housing. This Basic Document comprises the following sections:

- HE.1: Limiting energy demand (heating and air conditioning).
- HE.2: Efficiency of heating/air-conditioning systems.
- HE.3: Energy efficiency of lighting systems.
- HE.4: Minimum solar contribution to the hot water supply.
- HE.5: Minimum photovoltaic contribution to the electrical power supply.

In addition to TBC, Spain has adopted the Regulation of Thermal Installations in Buildings (Reglamento de Instalaciones Térmicas en los Edificios, RITE, Royal Decree 1027/2007). The objective of RITE, is to lay down the energy efficiency and safety requirements to be met by heating and cooling systems in buildings which are intended to meet the thermal comfort and hygiene demands of people, during their design and sizing, construction, maintenance and use, and also to specify the procedures allowing it to be proven that these requirements have been met. RITE has also been revised in 2013 by the Royal Decree 238/2013.

The Technical Building Code, and in particular, the Basic Document DB-I “Energy saving” of the Spanish Technical Building Code, has been updated by the Order FOM/1635/2013. It concerns energy savings and partially transposes the European Directives 2010/31/EU (articles 3, 4, 5, 6, 7 - regarding the energy efficiency requirements of buildings) and 2009/28/EC (art. 13 - regarding the requirement of minimum levels of energy from renewable sources in buildings) to the Spanish legal order. This involves an increase in energy efficiency and in renewable energies different from the ones mentioned in the above Basic Document, and it also introduces a new section: “HE.0: limitation of energy consumption”. The update of the Basic Document on Energy Saving and the requirements set out there in form the first phase of moving towards the objective of getting buildings with nearly zero energy consumption before 31 December 2020 (2018 in public authority buildings). Also, it represents a considerable step forward in terms of the requirements regarding energy efficiency of buildings that were in force up to that point.

The Directive 2010/30/EU regarding the labelling and standard product information of the consumption of energy products, has been transposed to the Spanish legal system by the Royal Decree 1390/2011 of 14 October 2011 (amending the Royal Decree 124/1994). This decree provides a coherent and simplified framework on labelling, aimed at improving product energy and environmental features and promoting its use by consumers.

The Council of Ministers of 5 April 2013 approved a “Comprehensive Housing and Land Plan”, with regulatory and development measures, aimed at facilitating access to housing for more disadvantaged people and improving the energy efficiency of buildings. The Royal Decree 233/2013 aims to promote the energy renovation of residential buildings regulating the State Plan to promote rental housing, building renovation and urban regeneration and renewal, 2013–2016. (Official State Gazette of 10 April 2013). In particular, measures eligible for subsidy include improving the thermal envelope of buildings to reduce energy demand for heating and cooling; installing heating, cooling, domestic hot water and ventilation systems; and common building facilities such as lifts and lighting. To qualify for subsidies, the building's total annual energy demand in terms of heating and cooling must be reduced by at least 30% compared to the levels taken before implementation of the measures, as demonstrated by the energy certificate. For more details about this decree, please see “2.1.2 Economic”.

The Law 8/2013 on Urban Renovation, Regeneration and Renewal, together with Law 4/2013 of 4 June on measures to develop and make the house rental market more flexible, forms the cornerstone of the abovementioned “Comprehensive Housing and Land Plan”. In fact, according to the legislator, Law 8/2013 has come up because of the verification that *“there is not any (legislative) development (...) which allows sustaining the operations of urban rehabilitation, regeneration and renewal, in which there are still legal obstacles preventing their implementation or even their own*

technical and economic viability". The purpose of the law is to regulate the basic conditions that will ensure a sustainable, competitive and efficient development of the urban environment, and a suitable quality of life for citizens and an adequate housing. In particular:

- Regulation to improve the state of conservation of buildings.
- Regulation to ensure universal accessibility and non-discrimination against persons with disabilities.
- Regulation to make it possible, on a voluntary basis, to improve the energy efficiency of existing buildings.
- Legislative amendments to remove obstacles and make the current arrangements more flexible.
- New mechanisms for funding and public-private partnership.

The law also establishes the basic provisions of a Building Assessment Report (BAR). In addition to assessing the conservation status of the buildings, the BAR provides information about the degree of compliance with current regulations on accessibility, and includes the Certification of Energy Efficiency.

The European Directive 2010/31/EU with regard to energy efficiency certification in buildings, both new and existing, has been transposed by the Royal Decree 235/2013. This Decree establishes the technical and administrative conditions for certification of energy efficiency of buildings and the methodology for calculating its energy efficiency rating. The purpose of the basic procedure is to promote energy efficiency, using information on the energy characteristics of buildings, in the form of an energy performance certificate that must be provided to buyers and users. This basic procedure applies to new buildings; buildings or parts of buildings which are sold or leased to a new tenant, provided they do not hold a current certificate; and buildings or parts of buildings in which a public authority occupies a total useful floor area of 250 m² and are frequently visited by the public. It also implements the basic procedure to be followed in calculating energy efficiency ratings, considering factors which have the most influence in terms of energy consumption, as well as technical and administrative conditions for building energy efficiency certifications. The competent bodies of the autonomous communities must create a statistical inventory of measures related to certificates registered by them, which will serve as a crucial mechanism for planning measures to improve the energy efficiency of the existing stock of buildings and for monitoring compliance with the rule. The Decree also establishes an Advisory Commission to certify the energy efficiency of buildings, responsible for advising the competent ministries in matters relating to the energy performance of buildings.

On the same date, April 5th 2013, the Royal Decree 238/2013 was approved. It amends certain articles and technical instructions of the Thermal Installations in Buildings Regulation (RITE) of 2007 and transposes to Spanish legislation the EU Directive 2010/31/EU (articles 8, 14, 15) concerning the periodic inspections of heating systems. This Decree establishes higher requirements regarding energy performance of equipment generating heat and cold as well as the requirements aimed at moving and transporting fluid. It sets out requirements related to general energy efficiency, correct installation and sizing, appropriate control and adjustment of the installations that are present in existing buildings. Moreover, it establishes the inspections that must be carried out periodically on the accessible parts of climate control installations throughout their useful lives, in order to verify compliance with the energy efficiency requirement.

Currently, a draft Royal Decree transposing partially Directive 2012/27/EU has been elaborated and passed to public information. This Royal Decree partially transposes the Directive regarding energy audits, hot water meters and accreditation schemes for energy services providers. The Royal Decree

consists of fourteen articles, grouped into six chapters, one additional provision, six transitional provisions, six final provisions and four annexes.

- Chapter I "General Provisions": it sets the object and purpose of this Royal Decree, and the necessary definitions for the proper interpretation of the text.
- Chapter II "Energy Audits": it contains the regulation of the energy audits. This Royal Decree establishes the obligation for companies not SMEs, which must do an energy audit before December 5th, 2015 and thereafter at least every four years from the date of the previous energy audit. Requirements to be met by the audit are also established. An Administrative Registry Energy Audits is created in the Ministry of Industry, Energy and Tourism and an inspection system is established.
- Chapter III "Accreditation system for providers of energy services and energy auditors": it regulates the conditions and requirements to be applied in the accreditation of these suppliers and auditors.
- Chapter IV "Promotion of energy efficiency in the production and use of heat and cold": it regulates the assessment of high-efficiency cogeneration potential and district heating and cooling to be performed in order to provide information to investors regarding the national development plans and contribute to a stable and supportive environment for investment.
- Chapter V "Accounting for consumption of heat, cold and hot water in buildings": it regulates the conditions and requirements to be met for individual accounting of thermal facilities consumption in existing buildings.
- Chapter VI "Penalties": it relates to the penalties for the provisions defaults of this Royal Decree. The provisions included in the Royal Decree impact on the assessment of energy efficiency potential in the gas infrastructure, establish deadlines and dates for the mandatory implementation of the articles contained in the Royal Decree and modify existing legislation to incorporate aspects of energy auditing, the system of accreditation of providers of energy services and energy auditors and accounting for consumption of hot water and heating, provided by Directive 2012/27/UE.

On the 22nd of October 2015, in its monthly package of infringement decisions, the European Commission requested Spain and other ten Member States to fully transpose the EU Energy Efficiency Directive. Spain should comply with its obligations before the end of December 2015, following that the Commission may decide to refer these Member States to the Court of Justice of the EU and ask for financial penalties.

Case study: The Catalan Strategy for Energy Renovation of Buildings

The Regional Government of Catalonia approved, on February 25th 2014, the Strategy on Energy Renovation of Buildings, which aims to encourage the owners of 1,2 million of buildings in Catalonia, for services and residential uses, to improve their energy efficiency driving cost savings and living conditions and comfort.

The Catalan Strategy for Energy Renovation of Buildings has been drawn up as part of the MARIE European Project. This is due to the commitment of the Regions forming part of this project to achieve by December 2014 a long-term strategy to mobilise the renovation of public and residential buildings in accordance with Sections 4 and 5 of the Directive 2012/27/EU of the European Parliament and of the Council of 25 October 2012 on energy efficiency.

The Catalan Government approved an Action Plan 2014-2020 which lists five areas of action that will guide the implementation of the Strategy:

- Information System;
- Involvement and Training;
- Innovation in products and services;
- Organisational Model;
- Investment Program and Financial Mechanisms.

Thus, the Action Plan sets the creation of an Information System with data of Catalan buildings, the launch of Information Campaigns to stimulate demand for energy rehabilitation emphasizing the potential energy savings. Also, it focuses on the entry into the market of new products and services applicable to the renovation energy processes. Another key part in the implementation of this strategy is the preparation of the financial structure and the search for resources and public - private agreements to carry out an Investment Program from 2014 to 2020.

In particular, the main objectives of the Action Plan 2014-2020 are:

- Energy: 14.4% reduction on estimated final energy consumptions on Catalan tertiary and residential buildings' park (558 ktoe);
- CO₂ emissions: 22% reduction on CO₂ emissions on Catalan tertiary and residential buildings' park (2.6 Mt CO₂);
- Buildings: intervention through a renovated energy management and/or integral energy renovation on 61% of Catalan tertiary and residential buildings' park (790.673 buildings);
- Economic savings: 21% saving of Catalan tertiary and residential buildings' park economic expenses (M€800);
- Investments: M€1.400 investment mobilisation of public and private funds for 120 Energy Renovation Macro projects;
- Employment: Job creation and/or recycling of more than 14.000 jobs.

2.3.2 Economic

Within the Spanish Renewable Energy Plan 2005–2010 framework, the Programmes “IDAE's Financing Lines for Thermal Renewable Energies in Buildings: BIOMCASA-SOLCASA-GEOTCASA” have been published (2010). These Programmes aim to improve energy efficiency and the penetration of

renewable energies in the building sector through Energy Service Companies (ESCOs) and to set up a financing system to boost a quality offer adapted to users' needs for hot water, heating and cooling in buildings. Installations are to be made in buildings running on biomass, solar thermal energy or geothermal energy for thermal use and/or air conditioning for any kind of non-industrial use. IDEA is responsible for the promotion and financial support of the projects in the households and building sector. To finance the submitted projects on the part of authorised companies, IDAE has devised a specific budget for each programme: BIOMCASA (M€5), SOLCASA (M€5), GEOTCASA (M€3). On the 14th of January 2013 an updated version of the Programme BIOMCASA has been published in the Official Gazette. The BIOMCASA II establishes the call and the regulatory basis of the authorization for the companies participating in the Programme.

Soon afterwards, the launching of the financing programme GIT responded to the need to boost the implementation of large installations to produce thermal energy in building from the exploitation of renewable energies such as biomass, solar thermal and geothermal energy. This new boost line was addressed to all the projects which, due to their size and complexity, were so far left out of the limits established in the calls of programmes BIOMCASA, SOLCASA and GEOTCASA. IDAE has contributed with a 17 million € budget to finance the projects submitted by the ESCOs (Energy Service Companies) approved for the implementation of large projects meeting the requirements of the Programme. The maximum financing limit per project amount to 80% of the value of the eligible investment (the one devoted to thermal generation), with a maximum absolute financing limit per individual project of €3.000.000 – from €250,000 for SOLCASA GIT projects and from €350.000 for projects under BIOMCASA and GEOTCASA GIT.

The Council of Ministers of 5 April 2013 approved a “State Plan for promotion of rental housing, building rehabilitation and urban regeneration and renewal, 2013-2016” (Royal Decree 233/2013), with regulatory and development measures, whose fundamental objectives focused on facilitating access to housing for more disadvantaged people, assisting with rent, promoting renovation and improving the energy efficiency of buildings.

The main functions of the State Plan 2013-2016 were underlined in its preamble: *“to adapt the aid system to the current social needs and to the scarcity of resources available, concentrating them on two issues: the promotion of tenancy and the promotion of rehabilitation and urban regeneration and renewal.”* Other objectives of the State plan are: to strengthen inter-administrative cooperation and coordination, as well as to encourage the co-responsibility in both financing and management; to improve the quality of building construction and, in particular, its energy efficiency, universal accessibility and proper conservation; to contribute to real estate sector reactivation from the two key issues stated above: the promotion of tenancy and the promotion of rehabilitation and urban regeneration and renewal.

To do so, the Plan envisages a total budget of 2.421 million €. Measures eligible for subsidy include improving the thermal envelope of buildings to reduce energy demand for heating and cooling; installing heating, cooling, domestic hot water and ventilation systems; and common building facilities such as lifts and lighting.

The State Housing Plan 2013-2016 adopts a system of subsidies which may be supplemented by the Autonomous Communities and Local Corporations, since they are competent to agree on subsidies and aids according to their budgets.

The Plan is organized round the following programmes:

- Subsidized loans program
- Housing rental aid program
- Rented public housing stock program

- Building rehabilitation program
- Urban regeneration and renovation program
- Support program to introduce the building assessment report
- Sustainable and competitive cities program
- Support program to introduce and administer the National Plan

The programmes of promotion of building rehabilitation and urban regeneration and renovation are one of the most relevant issues in the field of energy efficiency improvement.

The promotion programme of building rehabilitation is meant to finance the implementation of programmes of alterations and maintenance & intervention in fixed installations and equipment, as well as in common private areas and elements in buildings of a residential kind (building complexes) built before 1981 with at least a built-up surface area of 70% for residential use. To qualify for subsidies, the building's total annual energy demand in terms of heating and cooling must be reduced by at least 30% compared to the levels taken before implementation of the measures, as demonstrated by the energy certificate.

The maximum amount of the subsidies to be granted per building is not to exceed the amount resulting from multiplying €11.000 by each house and by every 100 m² of the premises useful surface. The expected beneficiaries of the aids from this programme are property owners, associations of property owners or sole owners of blocks of houses.

The promotion programme of urban regeneration and renovation means to finance the joint implementation of rehabilitation works in buildings and houses, of urban development and redevelopment of public spaces, and eventually, of building replacing pulled-down buildings. To this end, efficiency criteria in terms of water, energy, use of materials, waste management and protection of biodiversity – among others - will be taken into account.

The maximum amount of these aids shall not exceed 35% of the eligible cost, with a unit aid per dwelling of: €11.000 in the case of rehabilitation; €30.000 in the case of rebuilding after demolition; and €2.000 in the case of quality improvement and sustainability of the urban environment.

The beneficiaries of these aids may be the house owners, sole owners of blocks of houses, property owners, associations of property owners, consortiums, management partnership bodies and Public Administrations.

The Ministry of Industry, Energy and Tourism through the Institute for Energy Diversification and Saving (IDAE) has recently launched the PAREER-CRECE Programme “Aid programme for integral energy efficiency and saving projects in residential buildings” (Programa de Ayudas para la Rehabilitación Energética de Edificios existentes). It is a specific aid and financing programme amounting to 207 million euros to encourage and promote the implementation of integral energy efficiency saving and improvement actions, as well as the use of renewable energy sources, such as the renovation of windows, roofs, boilers, air conditioning equipment, the incorporation of equipment to individually measure heating and domestic hot water consumption, replacing conventional energy with biomass or geothermal energy, etc. Also, it helps to achieve the objectives set out in Directive 2012/27/EU on energy efficiency, and in the Action Plan 2014-2020. The actions are to fit one or more of the following typologies:

1. Improving a building's thermal insulation.
2. Improvement of energy efficiency in thermal and lighting installations (including solar thermal).
3. Replacement of conventional energy for biomass in thermal installations.
4. Replacement of conventional energy with geothermal energy in thermal installations.

Eligible beneficiaries of the aids from this Programme are:

- Natural and legal persons, owners of residential and hotel buildings.
- Associations of property owners or Associations of residential-building property owners.
- Owners of single-family houses or sole owners of residential buildings.
- Energy service companies.

All types and beneficiaries are entitled to receive a money allowance without consideration, supplemented with a refundable loan. The amount of the direct aid to be allocated shall be the sum of the Base Aid and the Extra Aid. The additional aid up to the top amount to be received will depend on the following criteria (Table 5):

- a) Social criteria: actions to carried out by the relevant body in the Regional Government in buildings classified as public housing and subsidized housing under the Special Scheme; or actions taken in residential buildings located in areas of buildings Urban regeneration and renewal, in compliance with the State Plan for Development of Rental Housing, the Rehabilitation in Buildings and Urban Renewal and Regeneration 2013-2016.
- b) Energy efficiency: actions to upgrade the energy rating of the building to achieve "A" or "B" energy rating in the CO2 emission scale, or else, actions to upgrade the initial energy rating by two letters.
- c) Comprehensive Performance: simultaneous actions combining two or more action types.

Table 5. PAREER-CRECE Programme

Type of action	Building use	Money allowance without consideration					
		Base aid	% Additional Aid				
			Social criteria	Compreh. performance	Energy efficiency		
					"A" Final Rating	"B" Final Rating	Two-letter upgrade or higher
Upgrade of the energy efficiency in the thermal envelope	Households	30% (limit 6 000 €/ household)	15%	20%	15%	10%	5%
	Other uses		0%	20%	15%	10%	5%
Upgrade of energy efficiency in thermal & lighting installations	Households	20%	0%	0%	10%	5%	0%
	Other uses		0%	0%	10%	5%	0%
Replacement of conventional energy by thermal biomass in building thermal installations	Households	25%	5%	10%	0%	0%	0%
	Other uses		0%	10%	10%	5%	0%
Replacement of conventional energy by geothermal energy in building thermal installations	Households	30%	10%	15%	0%	0%	0%
	Other uses		0%	15%	10%	5%	0%

Source: ODYSEE-MURE

Aid can be requested from the 5th of May 2015 to the 31st of December 2016.

The calculation methodology to establish the savings from this measure will be based on the difference of specific final energy consumptions, stated in the corresponding official reports, on energy certification all along the surface of the affected building before and after undertaking the energy efficiency project. According to this, the measure is deemed to produce a total amount of 14.1 ktoe of accumulated saving during the 2014 – 2020 period.

2.3.3 Informational

The draft Royal Decree transposing Articles 9, 10 and 11 of the Directive 2012/27/EU, states that in existing buildings which have a central heating, cooling or domestic hot water system serving more than one user or in buildings supplied by a district heating network serving multiple buildings, individual consumption meters shall also be installed to measure the consumption of heat or cooling or hot water for each unit or final customer. In the case of the heating systems, where the use of individual consumption meters is not technically feasible, alternative systems shall be used to measure consumption. The law also regulates billing content and the obligation for all sellers to offer their customers free online billing and complementary information on historical consumption, within the terms of Article 10(2) of Directive 2012/27/EU (NEEAP, 2014).

In addition, there is a plan for the replacement of electricity supply metering equipment. According to the Order ITC/3860/2007 of 28 December 2007 that all electricity supply meters with a contracted power of up to 15 kW shall be replaced by new devices which offer time and remote management settings (known as “smart meters”) before 31 December 2018, two years before the target set by Directive 2009/72/EC of 13 July 2009 concerning common rules for the internal market in electricity.

This change was to take place following a set of milestones which were subsequently amended by Order IET/290/2012 of 16 February 2012, with the schedule now as follows:

- By 31 December 2014, 35% of each distributor's total stock of meters with a contracted power of up to 15 kW must be replaced.
- Between 1 January 2015 and 31 December 2016, 35% of each distributor's total stock of meters with a contracted power of up to 15 kW must be replaced.
- Between 1 January 2017 and 31 December 2018, 30% of each distributor's total stock of meters with a contracted power of up to 15 kW must be replaced.

The technical equipment requirements in Order ITC/3860/2007 on metering and remote management systems are set out in the unified regulation on electricity system metering points, approved by Royal Decree 1110/2007 of 24 August 2007 and Order ITC/3022/2007 of 10 October 2007.

2.3.4 Cross-cutting

Spain has the highest electricity tariff deficit among Member States. The amount of the outstanding tariff debt is estimated at some EUR 30 billion (3% of GDP) at the end of 2013. Tariff deficit has also become an issue of economic policy concern in Spain. In order to reduce the deviation between costs and revenue within the Electricity Sector, the Spanish government applied in the recent years a package of measures to split the burden of the corrective action between energy consumers, renewable energy producers and the other actors in the energy sector. In particular, the Law 15/2012 of 27th December on tax measures for energy sustainability and Royal Decree-Law 29/2012, established permanent tax mechanisms on energy prices in order to promote a rational and efficient use of energy by the end user.

Law 15/2012 includes the following tax measures that came into force on January 1, 2013. All revenues obtained with these new tax measures will be used to finance certain costs within the Electricity Sector, and thus should help to reduce the current deviation between costs and revenue within the Electricity Sector (the “tariff deficit”):

- Tax on Production Value: the taxable basis will amount to all revenues derived from the production/injection of energy into the electrical system. Tax rate of 7%.
- Levy on the Use of Fresh Water Resources: the taxable basis is the value of the hydroelectric energy produced, measured at the power plant busbar. Tax rate of 22%.

- Green Cent: the law creates 3 new special taxes applicable to the use of gas (general use: 1,15 €/gigajoule; energy production: 0,65 €/gigajoule; other professional uses: 0,15 €/gigajoule), coal (0,65 €/gigajoule) and fuel-oil (29.15 €/1,000 liters diesel; 12.00 €/ton fuel-oil).
- Tax on the production of radioactive waste as a consequence of the energy generating activity, and the tax on radioactive waste storage.

In addition, Law 15/2012 has introduced important restrictions to the premium-based regimes for the generation of energy based on the utilization of fuels. In particular, according to the Law, the electrical energy attributable to the use of fuels in facilities that use any of the non-consumable renewable energies as primary energy shall not be subject to a premium-based economic regulation (this affects particularly solar-thermal facilities).

2.4 Side effects of politics

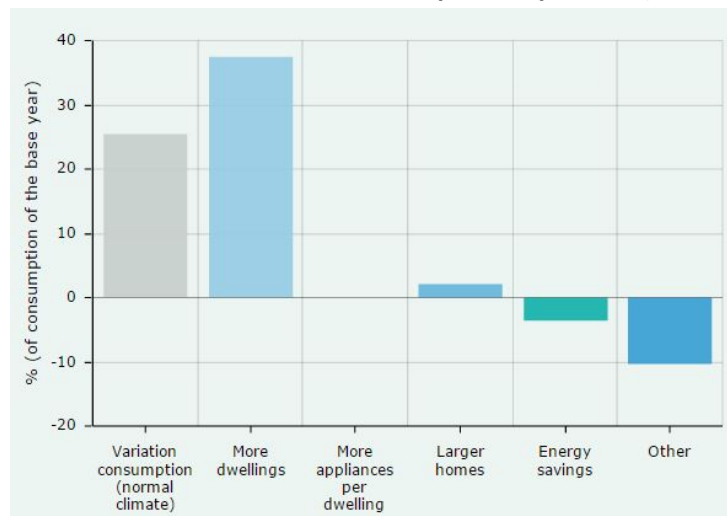
One of the strongest assumption behind improvements of energy efficiency indicates that increasing energy efficiency naturally and automatically leads to reductions in energy consumption or that efficiency is by far the dominant determinant. However, empirical studies consistently indicate that increases in energy efficiency do not regularly lead to one-to-one reductions in energy consumption (Galvin, 2014). In fact, policies designed to reduce energy consumption through energy efficiency measures in the residential sector are typically based upon engineering calculations, which differ significantly from outcomes observed in practice. A widely acknowledged explanation for this gap between expected and realized energy savings is household behavior, as energy efficiency gains alter the perceived cost of comfort and may thereby generate shifts in consumption patterns – a “rebound effect”.

Over the period 2000-2012, even though energy efficiency in the residential sector increased by 3.6%, the final energy consumption of households at normal climate increased by 25.5% in Spain. According to Odyssee, the variation of the final energy consumption of households at normal climate is influenced by:

- Change in number of occupied dwelling (“more dwellings”);
- “More appliances per dwelling” (electrical appliances, central heating);
- Change in floor area of dwelling for space heating (“larger homes”);
- Energy savings, as measured from ODEX;
- Other effects (mainly change in heating behaviors).

Figure 7 shows the contribution of each variable to the overall variation of household energy consumption.

Figure 7. Variation households consumption - Spain - % (2000-2012)



Source: Odyssee

In particular, “more dwellings” means the demographic effect due to the increasing number of dwellings is calculated as the variation in the number of dwellings multiplied by the energy consumption per dwelling (with climatic corrections). From 2000 to 2012 it increased by 37.4%.

The demographic effect is: $DEH_{t/t-1} = \Delta nbrlpr_{t/t-1} * CU_{t-1}$

Where, *nbrlpr* is the number of permanently occupied dwellings, and *CU* is the energy consumption per dwelling with climatic corrections.

Two lifestyle effects may also influence the energy consumption of households: the increase in the household equipment ownership (electrical appliances and central heating) and in the increasing size of dwellings (i.e. larger homes).

The increasing number of equipment per households is due on one hand to the increasing number of electrical appliances (ICT, small electrical appliances, air conditioning in Southern countries), larger homes which requires more energy and central heating which requires around 25% more energy compared to single room heating.

With regard to “more appliances per dwelling” that indicates the increasing number of electrical appliances approximated with their unit consumption per dwelling in relation with the overall index for electrical appliances, no data are available.

The indicator “larger homes” that shows a change in floor area of dwelling for space heating, increased of 2.1% from 2000-2012 (in the EU it increased of 5%), while “energy savings” increased of only 3.6% (in the EU it increased of 19.5%).

Energy savings are based on ODEX, expressed in Mtoe.

$$ESI = Ct * \left(\frac{ODEX_t}{ODEX_{t-1}} - 1 \right)$$

For ODEX, the following indicators are considered to measure efficiency progress:

- Heating: unit consumption per m^2 at normal climate (koe/m^2)
- Water heating: unit consumption per dwelling with water heating
- Cooking: unit consumption per dwelling
- Large electrical appliances: specific electricity consumption, in kWh/year/appliance

In conclusion, the 3.6% of energy efficiency progress in the residential sector between 2000 and 2012, corresponding to 0.47 Mtoe, have been mainly offset and overwhelmed by “more dwelling” (demographic effect).

3. Private sector support complementing public policies

3.1 Energy Service Companies (ESCOs)

The role of the energy service company (ESCO) has been incorporated into Spanish legislation by Royal Decree-Law 6/2010 of 9 April 2010 on measures for stimulating economic recovery and employment. More recently, Law 8/2013 of 26 June 2013 on urban renovation, regeneration and renovation proposes the participation of energy service companies in building energy renovation incentive programmes, taking on financing commitments from the operations through savings that are amortised over time, for the implementation of energy saving and efficiency measures.

In 2014, 968 companies were registered as energy service providers, a number which has grown continuously since it started in 2010. The profile of these companies is essentially that of engineering and installation and assembly companies, some of which are associated with building heating system maintenance companies (this latter activity being regulated in Spain through the Regulation on Building Heating Installations, RITE), as well as with subsidiaries of building companies and electricity suppliers, primarily. About 80% of the registered companies provide services in industrial activities and service buildings, 70% in residential sector, 65% in outdoor lighting and just 50% in cogeneration. 93% of these companies are SMEs, that is, they have fewer than 250 employees and an annual revenue of less than €50 million, while 7% are large enterprises.

3.2 Energy management and audit systems

With regard to the energy audits and management systems, article 8 of Directive 2012/27/EU shall be transposed to the Spanish legislation through the approval of a Royal Decree. In accordance with the draft Royal Decree, large enterprises must be subject to an energy audit no later than 5 December 2015 and then at least once every four years after the date of the last energy audit. Fulfilment of this obligation can be accredited by companies if: they carry out an audit which adheres to the minimum guidelines established in the Royal Decree, which reproduces the minimum content of Annex VI to the Directive, and they apply an energy or environmental management system, certified by an independent body in conformity with the pertinent European or international standards, provided that the management system in question includes an energy audit carried out in accordance with the criteria in Annex VI to the Directive.

The draft Royal Decree creates an Energy Audit Register in which to record all audits carried out by obligated large enterprises and those which undertake audits voluntarily. This register shall be used to record audits carried out in large companies with more than 250 employees and with an annual trading volume in excess of €50 million or whose annual balance sheet exceeds €43 million.

The legal framework of energy audits is currently regulated under articles 80 to 86 of the Law 18/2014 (“Ley 18/2014, de 15 de octubre, de aprobación de medidas urgentes para el crecimiento, la competitividad y la eficiencia”). These articles only contain provisions that deal with the penalties imposed if energy audits are not properly conducted; the energy audits which are not carried out in accordance with legal criteria shall be considered as a serious penalty and are fined with a minimum amount of 600.000 €.

3.3 Energy Efficiency Funds

The European Investment Bank (EIB) and the Spanish Energy Saving and Diversification Institute (IDAE) on the 1st of July 2011 concluded a finance agreement to launch a JESSICA holding fund (FIDAE) designed to finance energy efficiency and renewable energy projects. EIB underlined *“the multiplier effect of the JESSICA initiative, which will make it possible to increase the volume of financing for projects contributing to greater energy efficiency and more sustainable growth, in line with the objectives of the EIB and the European Union”*. The Secretary of State for Energy, Fabrizio Hernández Pampaloni, emphasised *“the innovative nature of this financing formula aimed at promoting energy efficiency and renewables”*.

The Fund for Investment in Efficiency and Energy Savings (FIDAE) was initially endowed with 127.6 million € (87.8 million € are financed by the ERDF). The fund will be managed by the European Investment Bank (EIB) and available for 10 Spanish regions: Andalusia, the Canaries, Castilla y León, Castilla-La Mancha, Ceuta, the Valencia Region, Extremadura, Galicia, Melilla and the Murcia Region. Also, it is compatible with other public or private funding sources, as well as with subsidies.

The conditions that a project must meet to be fundable, are:

- Being located in one of the Spanish Regions included in FIDAE - Andalusia, the Canaries, Castilla y León, Castilla-La Mancha, Ceuta, the Valencia Region, Extremadura, Galicia, Melilla and the Murcia Region.
- Being included in one of the following sectors: 1. Building: public and private buildings; 2. Industry: firms of any size; 3. Transport: infrastructures, equipment and both public and private transport fleet (for public use); 4. Public services infrastructures related to energy.
- Taking part in one of the priority issues: 1. Energy Efficiency Projects and energy management – such as Renovation of existing buildings, new buildings with energy rating A or B, Renovation or enlargement of the heat/cool existing networks; 2. Renewable Energy Projects – such as solar thermal, solar PV if integrated in an energy efficiency project, biomass; 3. Projects related to clean transport, contributing to improvement of energy efficiency and the use of renewable energies.
- Ensuring an acceptable return of the investment.
- Being included in an integrated plan for sustainable urban development.
- Not being finished on receiving the funding.

On the 11th of June 2014, the Spanish government has adopted a National Energy Efficiency Fund (Fondo Nacional de Eficiencia Energética, FNEE). The new fund will be managed by the Institute for Diversification and Saving of Energy (Instituto para la Diversificación y el Ahorro de Energía, IDAE) and will be partly financed (35%) by the central government from EU structural funds. The FNEE will allocate most of the funds to co-finance energy-efficiency actions in residential and commercial buildings (hotels, National Health System centres, retail trade, etc.). It will focus on building renovation, heating systems, and boiler efficiency, among others, and will co-finance energy efficiency investments in buildings, industry, transportation, and agriculture. In the building sector, the FNEE will participate to energy-efficiency investments worth about €892m/year. It will be completed by the “Plan de Vivienda 2013-2016” (200 million €) for building renovation.

3.3 Support and Training for an Excellent Energy Efficiency Performance (STEEEP)

Spain is also one of the ten European countries participating in the project STEEEP “Support and Training for an Excellent Energy Efficiency Performance”. This 3-year European project is helping 600 European cross-sector small and medium sized enterprises (SMEs) to reduce their energy consumption and become more energy-efficient through an effective energy management tools and practices provided by an established network of intelligent energy advisors of Chambers of Commerce and Industry (CCIs).

The STEEEP project aims also to shift from an individual to a collective approach towards energy efficiency in order to demonstrate the energy savings potential of collective action. Eight Local Energy Communities of 5-10 SMEs will be created to pursue common goals in the field of energy efficiency and with the involvement of local authorities, energy providers and industrial park managers. The communities’ objectives are to boost, where possible, energy exchanges, to encourage the establishment of intercompany smart-grids and to increase energy efficiency in participating companies.

4. Initiatives targeting households behavior

Through communication campaigns and information and training programmes for consumers and all other actors on the energy efficiency market the Energy Diversification and Saving (IDEA) aims at promoting and facilitating an efficient use of energy by SMEs and households. As a result, many developments have been posted on the institute's website specialising in energy efficiency (www.idae.es), including publications, online classes and an array of audiovisual content. The awareness-raising campaigns carried out over more than ten years have helped to track the evolution of the Spanish consumer profile and to better direct actions aimed at achieving quantifiable energy saving results (NEEAP, 2014). A recent study (Labanderia et al., 2015) suggests that energy efficiency-driven public campaigns may increase their effectiveness if they focus on the adoption of pro-environmental behaviors rather than on trying to raise environmental attitudes.

The communication and information and training in energy saving and efficiency programmes designed for the transposition of Articles 12 and 17 are grouped into seven parts:

- 1. *Institutional advertising and communication campaigns.* The first institutional advertising and communication campaign on energy saving and energy efficiency under the latest NEEAP with a national coverage, has been implemented in June, 2014. The campaign has a budget of 4 million €, a savings target of 6 ktoe/year and is aimed at the 26 million holders of domestic energy agreements. The campaign is structured into three stages: permanent online presence through the creation of a citizen information site (search engine placement and social networks), mass media campaign (television, radio, press, etc.) accompanied by measures such as the distribution of 26 million leaflets with electricity bills, and the production and broadcasting of informative content on Spanish public television.

In regard to conventional public advertising and communication, public bodies act in accordance with Law 29/2005 of 29 December on institutional advertising and communication, which lays down the regulatory framework within which such campaigns are to be implemented. Since 2004, IDAE has been running radio (“consume” campaign), radio and television (“energía para todos, energía para siempre” campaign), press, outdoors and online (“ahorro de energía” campaign) campaigns, as well as periodic campaigns focusing on the efficient use of energy for heating (in winter) and air conditioning (in summer), aimed at the southern half of the peninsula and the Mediterranean basin as the areas which use the most energy for air conditioning. On occasions, players from the Spanish national football team have been used to endorse energy saving (2009 and 2010 campaigns) and the wide distribution of the Vuelta Ciclista a España cycling race has been used to maximise the impact of communication.

Recently, The Ministry of Industry, Energy and Tourism and IDAE carried out an institutional communication and publicity campaign about the new electricity billing and energy saving system during the second half of 2014. This campaign was primarily aimed at informing the public in a clear and simple manner about the changes that have taken place in the electricity price calculation system and the rights of consumers with regard to power supplied to homes. To this end, a comprehensive campaign has been developed using the creative concept of “Now, you control your energy”.

- 2. *Internet.* IDAE website. Dedicated to the promotion of energy efficiency and renewable energies, www.idae.es has been online since 1999 and provides information of public interest aimed at companies or citizens: The site content include: the IDAE catalogue of publications, informative documentation (statistical bulletins and reports), and databases of

energy service and renewable energy companies, high energy efficiency devices, appliance, air conditioning and heating, passenger vehicle energy labelling.

The citizen information service is to be expanded through the creation of an online national citizen information platform on energy saving and energy efficiency, which contains the practical energy guide and will be integrated into the existing citizen information service (SICER), offering online and telephone support.

- 3. *Periodic communications*: IDAE online newsletter. In 2004, IDAE began distributing a newsletter entitled “Boletín Electrónico del IDAE”, providing specialist information on IDAE activities in regard to energy saving and efficiency and renewable energies, which regularly reached more than 20.000 subscribers.
- 4. *Internal audiovisual productions*. Since 2005, IDAE has operated a dedicated line of communication on energy saving and efficiency and renewable energies based on the internal or third party creation of audiovisual productions targeting the general public. These productions are designed to be broadcast through different channels including television, internet and even cinemas.
- 5. *Citizen information service on energy efficiency and renewable energies (SICER)*. IDAE maintains a citizen information service on energy efficiency and renewable energies (SICER) set up in late 2008.
- 6. *E-learning*. The website www.aprendecomoahorrarenergia.es offers free e-learning courses and provides tips on how to save energy at home and at work, as well as how to make a home energy certified. These courses last around two hours and have been taught to more than 12.000 students already.
- 7. *Attendance-based training*. Each year, IDAE participates in some 200 activities organised by third parties and itself organizes around 12 workshops offering specific training on energy saving and efficiency. IDAE collaborates in the Master of Renewable Energies and Energy Markets programme offered by the School of Industrial Organisation (EOI), in which the energy efficiency module has become one of the most important in recent years. One of the most prominent features is the Energy Certification Training Plan, developed during the second half of 2012 and in 2013, having educated more than 8.000 professionals and organised over a hundred courses and workshops in different formats, both in-person and online (NEEAP, 2014).

References

2014–2020 National Efficiency Action Plan (2014).

Aydin, E., Kok, N., Brounen, D. (2015). Energy Efficiency and Household Behavior: The Rebound Effect in the Residential Sector.

Conchado, A., Anadón, L., Linares, P. (2012). Innovación en energía en España. Análisis y recomendaciones. Informe 2012. Economics for Energy, Vigo.

Galvin, R. (2014). Estimating broad-brush rebound effects for household energy consumption in the EU 28 countries and Norway: some policy implications of Odyssee data. *Energy Policy*, 73, 323-332.

Law 4/2013 (4 June 2013), on the easing and promotion measures on the rental housing market.

Law 15/2012 (20 December 2012), on tax policy aimed at energy sustainability.

Law 8/2013 (26 June 2013), on urban renewal and regeneration.

OECD Environmental Performance Reviews: Spain 2015.

Order FOM/1635/2013 (10 September 2013), updating the DB-HE Basic Document "Energy Saving", of the Technical Building Code, approved by Royal Decree 314/2006 of 17 March.

Order IET/290/2012 (16 February 2012), amending the Order ITC / 3860/2007 of 28 December 2007. The electricity tariffs are reviewed as of 1 January 2008, with regard to the meter replacement. BOE NO. 44, 21 February 2012.

Order ITC/3860/2007 (28 December 2007). The electricity tariffs are reviewed as of 1 January 2008. BOE NO. 312, 29 December 2007.

Proyecto de Real Decreto por el que se transpone la Directiva 2012/27/EU del Parlamento Europeo y del Consejo de 25 Octubre de 2012, relativa a la eficiencia energética, en lo referente a auditorías energéticas, acreditación de proveedores de servicios y auditores energéticos, promoción de la eficiencia energética y contabilización de consumos energéticos.

www.minetur.gob.es/energia/es-ES/Participacion/Documents/proyecto-rd-directiva-201227UE/proyecto-RD-directiva-eficiencia-energetica.pdf

Ramos, A., Labandeira, X., Lösche, A. (2015). Pro-Environmental Households and Energy Efficiency in Spain. *Economics for Energy*, WP 01/2015.

Resolution of 12th December 2012, by the Secretary of State of Energy, publishing the Resolution dated November 13, 2012, by the Management Board of the Institute for Energy Diversification and Saving, establishing the regulatory bases and call for the authorization of collaborating companies in the programme for the implementation of projects on the use of biomass for heating in buildings. BOE No.12, of 14th January 2013 (BIOMCASA II).

Resolution of 7th April 2011, by the Secretary of State of Energy to enable partner companies in the GIT Programme for the implementation of the major thermal installation in buildings.

Resolution of 13th May 2010, of the Institute for the Diversification and Saving of Energy, establishing the call and the corresponding bases for authorising collaborative firms into Programme SOLCASA, with the firms in the solar thermal energy sector operating in buildings. BOE No. 122, of 19th May 2010.

Resolution of 13th May 2010, of the Institute for the Diversification and Saving of Energy, establishing the call and the corresponding bases for authorising collaborative firms into Programme GEOCASA,

with the firms in the geothermal energy sector operating in buildings. BOE No. 122, of 19th May 2010.

Resolution of 13th March 2009, of the Presidency of the Institute for the Diversification and Saving of Energy, establishing the call and the corresponding bases for authorizing collaborative firms, within the Voluntary Agreement Programme with the firms in the thermal biomass sector operating in buildings. BOE No. 68, of 20th March 2009 (BIOMCASA).

Scarpellini, S., Aranda, A., Aranda, J., Llera, E. & Marco, M. (2012). R&D and eco-innovation: opportunities for closer collaboration between universities and companies through technology centers, *Clean Technologies and Environmental Policy*, 14:1047–1058.

Spanish plan for Scientific and Technical Research and Innovation (2013-2016)
www.idi.mineco.gob.es/stfls/MICINN/Investigacion/FICHEROS/Spanish_RDTI_Plan_2013-2016.pdf

Royal Decree 238/2013 (5 April 2013), modifying certain articles and technical instructions of the Regulations on Building Heating Installations, approved by Royal Decree 1027/2007 of 20 July.

Royal Decree 235/2013 (5 April 2013). Basic Procedure for the Energy Efficiency Certification Buildings.

Royal Decree 233/2013 (5 April 2013). State Plan for promotion of rental housing, building rehabilitation and urban regeneration and renewal, 2013-2016.

Royal Decree Law 29/2012 (28 December 2012), amending certain parts of the Spanish Electricity Sector Law, particularly those related to how the tariff deficit will be financed.

Royal Decree 1390/2011 (14 October 2011), regulating the indication of energy consumption and other resources by energy-related products through labelling and standardized information. BOE, No. 249.

Royal Decree 1027/2007 (20 July 2007). Regulations on Building Heating Installations. Ministry of Industry, Tourism and Trade.

Royal Decree 314/2006 (17 March 2006). Technical Building Code.

The Catalan Strategy for Energy Renovation of Buildings (2014).

www.aprendecomoahorrarenergia.es

www.idae.es (Instituto para la Diversificación y Ahorro de la Energía).

www.marie-medstrategic.eu/en.html