

Financing the Energy Efficient Transformation of the Building Sector in the EU

November 2012

Report prepared by
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Fraunhofer Institute for Systems and Innovation Research ISI (Germany)



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Financing the Energy Efficient Transformation of the Building Sector in the EU

Lessons from the ODYSSEE-MURE project

Report prepared by
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Didier Bosseboeuf
Project leader

¹ Alphabetic order of countries

Key Messages

This publication presents and analyses the policies implemented in the building sector in the European Union, its Member States and Croatia and Norway. It mainly relies on the **MURE database** with policy measures on energy efficiency, covering all EU countries plus Croatia and Norway and also includes the quantitative impact of the measures (www.muredatabase.com). The tool can be used to support energy policy formulation by the European Commission, e.g. as part of the monitoring and evaluation of the National Energy Efficiency Actions Plans submitted under the Directives on End-use Energy Efficiency and Energy Services (ESD) and under the new Energy Efficiency Directive (EED).

This brochure, while providing a general view on energy efficiency policies in the buildings sector, **focuses on important issues and questions of energy policies directed towards financing the energy efficient transformation of the built environment**. From the study presented in this brochure, the following key messages emerge.

How large are the energy efficiency potentials in the building sector (including both the building energy uses and the electric appliances/equipment)?

- Previous studies have shown that up to 2020 economic potentials exist of the order of 255 Mtoe in terms of final energy that could contribute largely to the 20% primary energy target of the EU Commission. In fact, considering that the primary energy target has been formulated before the economic crisis, realizing this economic potential would be sufficient alone to reach the target.
- Buildings (including appliances) contribute with 80 Mtoe (residential sector) and 35 Mtoe (tertiary sector) roughly 45% of the target but due to the long investment cycles the contribution of building beyond 2020 and in particular up to 2050, is far greater.

How large are the upfront-investment required to mobilize these potentials?

- In order to realize those economic potentials substantial upfront investments are necessary despite the fact that the investments will pay largely off in the future.
- The required investments for the built environment differ according to the assumptions, especially with respect to the question whether differential investment compared to a less energy efficient solution of full costs have to be considered which is a matter of debate when it comes to an increase of the present refurbishment rates beyond the autonomous rates.
- In case that full costs are considered for all investments outside the present investment cycle, upfront investments up to 2020 are of the order of 800 billion Euro, or roughly 80 billion Euro annually.

Which individual policies already address financing needs for the energy efficient transformation of the built environment and what is their role in the context of other instruments? What role for private sources of financing?

The report discussed the pros and cons of the main present financing tools to provide the required upfront investments:

- **State budgets:** this is for example the case of a number of subsidy programmes described in the MURE database such as the KfW programme in Germany. The large drawback of this type of financing is that in times of tight budgets it will be difficult to find the additional investments as the costs cannot be easily passed on to the tax payers although the energy savings will at the end relieve the pressure on the economy from reduced energy costs. It seems unlikely that through this path all the investment needs identified in the building sector could be covered. The advantage of this type of financing is that the means can be directed towards deep renovations.
- **Financing from state-like budgets,** e.g. the use of income from the emission trading scheme to finance energy efficiency investment. The drawback of this financing source is that it is heavily dependent on the CO₂ price, the advantage that is independent from the direct state budget. However, the temptation is large for governments to use such income not in a dedicated manner for energy efficiency options. In order to finance the large investment volumes required for building rehabilitation, the CO₂ price should be considerably higher than present levels in order to contribute substantially to the annual investment needs identified above.
- **Leveraging of private investments from companies in the energy sector** through energy saving obligations/White Certificates: This has the advantage in opening new, more stable, financing sources. At the end the cost will be passed on to the consumer. The advantage is that private investments are leveraged and that energy companies may possibly develop into energy service companies. The disadvantage is that, if no special provisions are taken, mainly shallow refurbishments are undertaken.
- **Leveraging of private investments from through energy service companies:** Here the charge is totally on the private sector. The investor gets his money from the reduced energy cost of the client. This has the advantage that markets are developed for energy services and that the energy consumer is (in principle) not charged additionally and may even get a (small) reduction in energy cost during the phase when the investment is paid off. At present, mainly energy conversion options or options that pay off rapidly are financed in such a way (boilers, HVAC systems, building control systems etc.) while deep renovations including the building envelope are rather rare due to the long payback time. An option may be to subsidise the payback to a rate interesting for the energy service companies. The report cites examples such as the EPC Plus approach proposed by the Berlin Energy Agency, how deep renovation can be achieved through contracting in combination of other sources. Also risk mitigation is an important aspect where the state generally plays a role.
- **Financing through a levy on energy consumption (“Feed-in tariff for energy efficiency”):** this innovative policy design is in principle similar to the promotion of renewable through feed-in tariffs – while energy saving obligations are the equivalent to quote systems for renewable - and has the substantial advantage of financing stability and risk-lowering. On the other hand, given the fact that renewable already charge heavily especially electricity prices in some countries, it may be difficult to levy in the same way the large investments for refurbishing existing buildings. However, in difference to renewable, where first the costs are positive and serve to pay their cost down along the cost degression

curve, energy efficiency options provide after some time, benefits to the consumers due to lower energy bills. Also the energy consumption on which the costs for energy efficiency investments are charged should cover a much larger range than just electricity consumption but also fossil fuel use.

- **Combining different sources in an Energy Efficiency Fund:** one last important possibility of generating the funds necessary for the large investments is combining different sources discussed in the previous point in a general energy efficiency funds, such as the EU Energy Efficiency fund but at a much larger level of volumes. Combining the sources would have the advantage of taking the largest basis possible, though, in most cases, the final consumer would carry the charges in some way. Energy efficiency funds offer more flexibility in promoting innovative technologies and solutions than other financing sources.

How can the state fulfill its exemplary role with respect to energy efficiency improvement as requested by the Energy Efficiency Directive?

The discussion in the report on the exemplary role of the public sector for buildings brings three major aspects to the focus:

- The **scope for low-cost measures in the public buildings and their large potential** which is well-illustrated in the report with the case of Ireland and the activities of the Office for Public Works in Ireland.
- The **limits of the approach when it comes to investments**, and in particular investments into the building envelope with comparatively large sums and longer periods of return, also illustrated with the example of Ireland.
- The **emerging role of Energy Service Companies (ESCOs)** to build the bridge beyond the public budgets but which is not without difficulties, especially when it comes to finance deep renovations including the building envelope with its long payback periods.

Are there social impacts linked to the introduction of such policies? How to tackle such social impacts?

- There is no doubt that increasing energy prices do and will have strong social impacts (fuel poverty).
- It is also without doubt that policies that mobilizing the large investments could also have impacts on some part of the population.
- The distributional impacts largely depend on the policy instruments and its design: while tax relief/credits mitigates to a certain degree the distributional impacts as taxes are paid according to the income, most other instruments, in particular those that charge the investment costs finally to the consumer of energy lead to distributional effects among consumers.
- Especially low income consumers may require particular measures to support their transition to a more efficient energy use.

Which policy combinations may mobilize the required large upfront investments?

The report identifies some coherent combinations of policy instruments which describe an increasing perimeter covered by the instruments and could be able to provide in principle – with more or less barriers - the large upfront-investments specified earlier:

- Policy Path 1: a combination of regulation and financial incentives based on state budgets
- Policy Path 2: a combination of regulation, financial and fiscal incentives
- Policy Path 3: a combination of regulation, financial and fiscal incentives and saving obligation schemes
- Policy Path 4: a combination of regulation, fiscal incentives and an energy saving trust
- Policy Path 5: a combination of regulation, fiscal incentives, energy saving trust and saving obligation schemes
- Policy Path 6: a combination of regulation, financial and fiscal incentives, energy saving trust and saving obligation schemes

In summary this discussion shows that solutions exist to cover the large investment needs for the built environment. However, Member States and the EU need to design stable mixtures of policy instruments, depending only partially on state budgets in order to provide the required long-term stability to investors in efficient buildings, including deep renovations.

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1. Introduction

1.1. Objective of the brochure and analytical basis

The aim of this brochure is to provide insight into energy policy measures in the building sector in the European Union and its Member States, as well as Norway and Croatia. This analysis should support policymakers and other parties involved in energy efficiency and CO₂ emission reduction in adapting present policy and formulating new effective policy measures. **The focus of this brochure is on financing the energy efficient transformation of the built environment.**

The main basis for the analysis is the **MURE database** including policy measures on energy efficiency, covering all EU countries plus Croatia and Norway (see the following box).

Description of the MURE database

The MURE database (www.muredatabase.com) provides an overview of the most important energy efficiency policy measures in the EU Member States, Norway, Croatia and the EU itself. The database is structured by final energy consumption sectors (household, tertiary, industry, transport) and also includes a general cross-cutting section. The policy measures addressing the building sector which is discussed in this brochure can either be found in the household (residential buildings) and tertiary (non-residential buildings) sector, or in some cases in the cross-cutting part if a policy addresses both buildings and other areas of energy consumption (as e.g. energy efficiency obligations schemes).

At the level of sectors, the focus is on single policy measures in order to allow a specific analysis of each measure. More general programs comprising several measures are mainly described in the cross-cutting section of MURE. The homogeneity of the measure descriptions over sectors and countries is ensured by detailed guidelines (Schlomann & Eichhammer 2011). All measures are classified according to specific keywords, thus allowing queries based on criteria as e.g.:

- their status (completed, on-going or planned);
- their year of introduction and completion;
- their type: legislative/normative (e.g. standards for new dwellings), legislative/informative (e.g. obligatory labels for appliances), financial (e.g. subsidies), fiscal (e.g. tax deductions), information/education, cooperative (e.g. voluntary agreements) and taxes (on energy or CO₂-emissions);
- the targeted end-uses and the main actors involved by the policy measures;
- their semi-quantitative impact: low, medium or high impact, based on quantitative evaluations or expert estimates;
- the end-uses involved and the quantitative impact of the policy measure related to a specific end-use (if this information is available)

In order to allow a separate analysis of policy measures from specific sources, two additional categories have been added to the MURE database:

- If a measure is included in the National Energy Efficiency Action Plan under the EU Energy Efficiency and Service Directive ESD (2006/32/EC), it is classified as “**NEEAP measure**” in the MURE database. This allows an easy identification of policy measures reported in the NEEAPs and a specific analysis of these policies.
- In order to separate of EU-wide measures which are common to all countries (mainly EU Directives) from pure national measures, a set of “**EU measures**” was defined in the MURE database

In addition, for each policy measure a detailed description is available in MURE.

The MURE database provides the following services to European and international policy monitoring and evaluation:

- Integration of measures submitted by the EU member states in the frame of the National Energy Efficiency Action Plans to the Commission in a database format which allows easily retrieving information.
- Input for the IEA database on Energy Efficiency Policies and Measures, with regard to Europe (<http://www.iea.org/textbase/effi/index.asp>).
- The MURE simulation tool, attached to the database, has been used by the EU Commission as an aid to assess saving potentials when evaluating the National Energy Efficiency Action Plans submitted in 2007 (Eichhammer et al. 2009).

The introductory information on energy efficiency trends relies on data contained in the ODYSSEE database on energy efficiency indicators (www.odyssee-indicators.org), including data on energy trends, drivers for energy use, explanatory variables and energy-related CO₂ emissions.

1.2. Scope and structure of the brochure

The building sector, as it is subject of this brochure, refers to two main categories of buildings: residential buildings and non-residential buildings. Whereas residential buildings are relatively homogenous and can further be divided into single/two-family houses and apartments blocks, non residential buildings are more heterogeneous. They refer to buildings in the service or tertiary sector and include several building categories (esp. office buildings, hospitals, schools and universities, hotels and restaurants, buildings in wholesale and retail trade). With regard to the sectoral structure of MURE, the building sector can be more or less equated with the residential and tertiary sector in the MURE database (including electric appliances in both sectors).

The energy use in buildings shows different consumption patterns with regard to space and water heating on the one hand and electricity (without electricity consumption for space and water heating) on the other hand (see Enerdata 2012). This is also reflected by the – often different – policy measures addressing these final end-uses. Therefore, a further subdivision of the building sector by end-uses is useful. In the following, the building sector is subdivided by the following end-uses:

- Space and water heating, both including residential and tertiary buildings; in tertiary buildings, other process heat (apart from water heating) is also added to this category.
- Electricity consumption in buildings (without electricity for space and water heating), which shows more differences between the residential and the tertiary sector. In residential buildings, the predominant electricity uses are electric household appliances, information and communication technologies (ICTs), lighting, cooking, and space cooling. In tertiary buildings, the relevant electric end-uses taken into account here are ICTs, lighting, ventilation and air-conditioning, electric motors and commercial appliances.

This brochure, while providing a general view on energy efficiency policies in the buildings sector, **focuses on important issues and questions of energy policies**

directed towards financing the energy efficient transformation of the built environment:

- How large are the energy efficiency potentials in the building sector (including both the building energy uses and the electric appliances/equipment)?
- How large are the upfront-investment required to mobilise these potentials?
- Which individual policies already address financing needs for the energy efficient transformation of the built environment and what is their role in the context of other instruments? What role for private sources of financing?
- How can the state fulfill its exemplary role with respect to energy efficiency improvement as requested by the Energy Efficiency Directive?
- Are there social impacts linked to the introduction of such policies? How to tackle such social impacts?
- Which policy combinations may mobilize the required large upfront investments?

The structure of this brochure follows this sectoral and end-use approach:

- First, a general overview is given on energy efficiency policies included in the MURE database by different criteria of classification (Chapter 2). The report then discussed the role of financing measures in the portfolio of energy efficiency policies in the building sector
- In the following two chapters, the energy efficiency policies addressing the building sector are analyzed separately with regard to space and water heating (Chapter 3) and electricity (Chapter 4). The different financial instruments are exemplified with country-specific information from the MURE database.
- Chapter 5 provides a view of the impact of energy efficiency measures as extracted from the measures presented in the second National Energy Efficiency Action Plans NEEAPs and gathered in the MURE database.
- Finally, Chapter 6 discussed different aspects of energy efficiency policies for the financing of the upfront investments identified up to 2020:
 - the size of the required upfront investments
 - the role of different financing mechanisms and of private actors
 - the exemplary role of the public sector and how the measures there can be financed,
 - social impacts and distributional effects of energy efficiency policies in the building sector
 - innovative financing policies.

2. Financing measures in the portfolio of energy efficiency policies in the building sector

2.1. Energy efficiency policies in the building sector

Residential and non-residential buildings consume about 40% of total final energy requirements in Europe in 2010 (Enerdata 2012, based on Eurostat). It is the largest end-use sector, followed by transport (32%), industry (24%) and agriculture (2%). Final energy consumption of buildings has increased at EU level by around 1%/year since 1990 and by 2.4%/year for electricity (Enerdata 2012).

Several studies have shown that there exist large energy saving potentials especially in the building sector in all EU Member States, Norway and Croatia (Eichhammer et al. 2009; Ecofys/Fraunhofer ISI 2010; Boßmann/Eichhammer et al. 2012). In the Energy Efficiency Plan from 8 March 2011, the European Commission (2011) also states that the greatest energy saving potential lies in buildings. In addition, both the Energy Efficiency Plan and the new Energy Efficiency Directive (EED), which will come into force before the end of 2012 (European Commission 2012) include several proposals for additional policies in order to better exploit the saving potential in the building sector, above all:

- the increase of the renovation rate of buildings (private and public)
- the improvement of components and appliances used in buildings
- the emphasis on the outstanding (exemplary) role of public buildings, and not least
- Article 7 of the forthcoming EED to introduce Energy Efficiency Obligations (EEO) obliging final energy suppliers or the distribution network operators to a certain amount of annual energy savings which would certainly also affect the building sector.

Already in the past, many energy efficiency policies addressing the building sector have been implemented all over Europe, both at the national level and for the EU as a whole. In April 2012, the MURE database included around 2000 energy efficiency policy measures for the 27 EU Member States, Norway and Croatia, and the EU itself (Figure 1). About half of them are assigned to the household and tertiary sector, i.e. are mainly related to residential and non-residential buildings.

A certain share of the policy measures addressing energy efficiency are based on EU legislation. With regard to the building sector, the most important regulations are

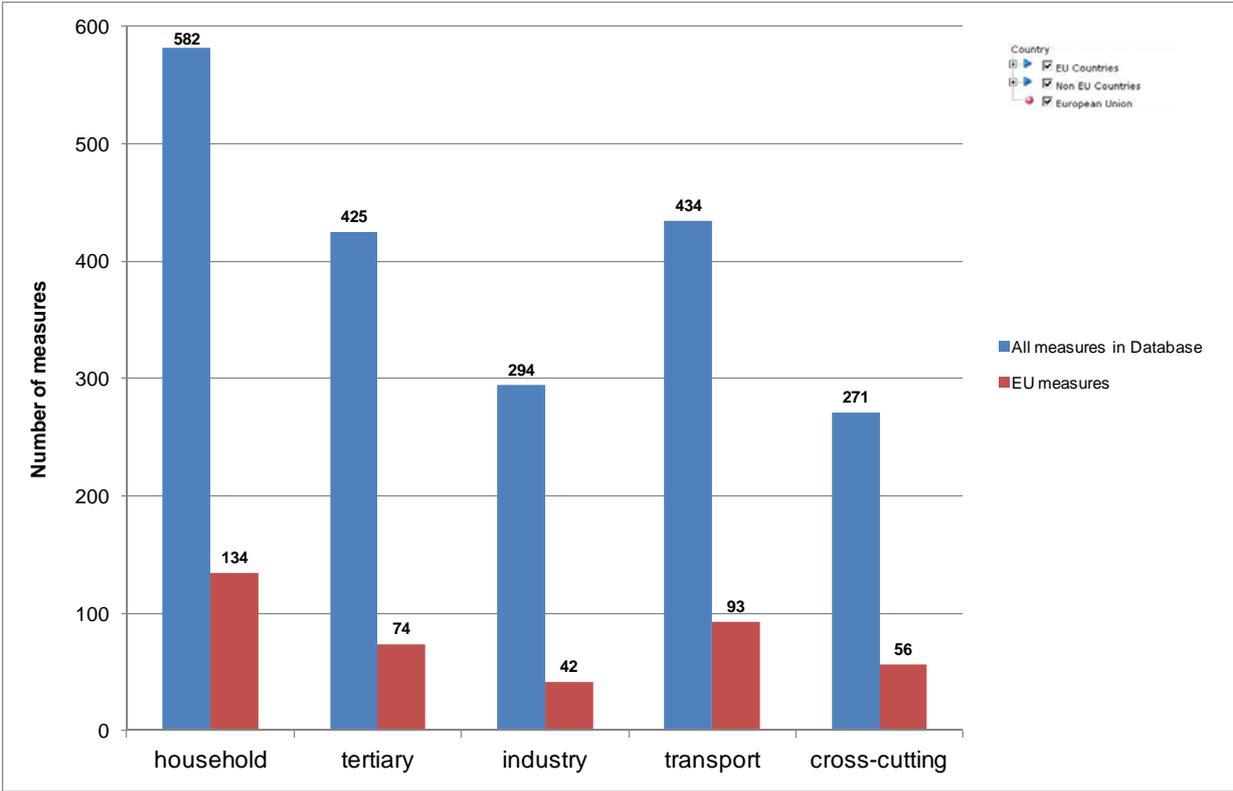
- the Energy Performance of Buildings Directive (EPBD) of 2002 (2002/91/EC) and the EPBD recast of 2010 (2010/31/EC),
- the Ecodesign Directive of 2005 (2005/32/EC) and its recast of October 2009 (2009/125/EC), and
- the Energy Labelling Directive from 1992 and its recast from May 2010 (2010/30/EU).

Another important piece of energy policy for the building sector is the Renewable Energy Directive of 2009 (RED, 2009/28/EC). The RED fosters the use of renewable

for heat purposes (RES-H) in buildings by the regulatory introduction of a use obligation. Though renewable and energy efficiency imply different strategies, these two strategies are increasingly interlinked in the building sector as for example building regulation integrate the use of renewable in buildings as a trade-off for energy efficiency.

In order to ensure a more homogeneous representation of EU-wide measures across the countries, a set of EU measures common to all countries (mainly EU Directives) was defined in the MURE database and separated from pure national measures. Around 130 policy measures in the residential sector and 70 measures in the tertiary sector in MURE are classified as EU measures (Figure 1). With a share of almost 25%, the importance of these policies is most important in the residential sector. In the other sectors (tertiary, industry, transport, cross-cutting), the share of EU measures in total measures compiled in MURE varies between 15 and 20% (Figure 1).

Figure 1: Total number of energy efficiency policy measures in the MURE database and EU measures



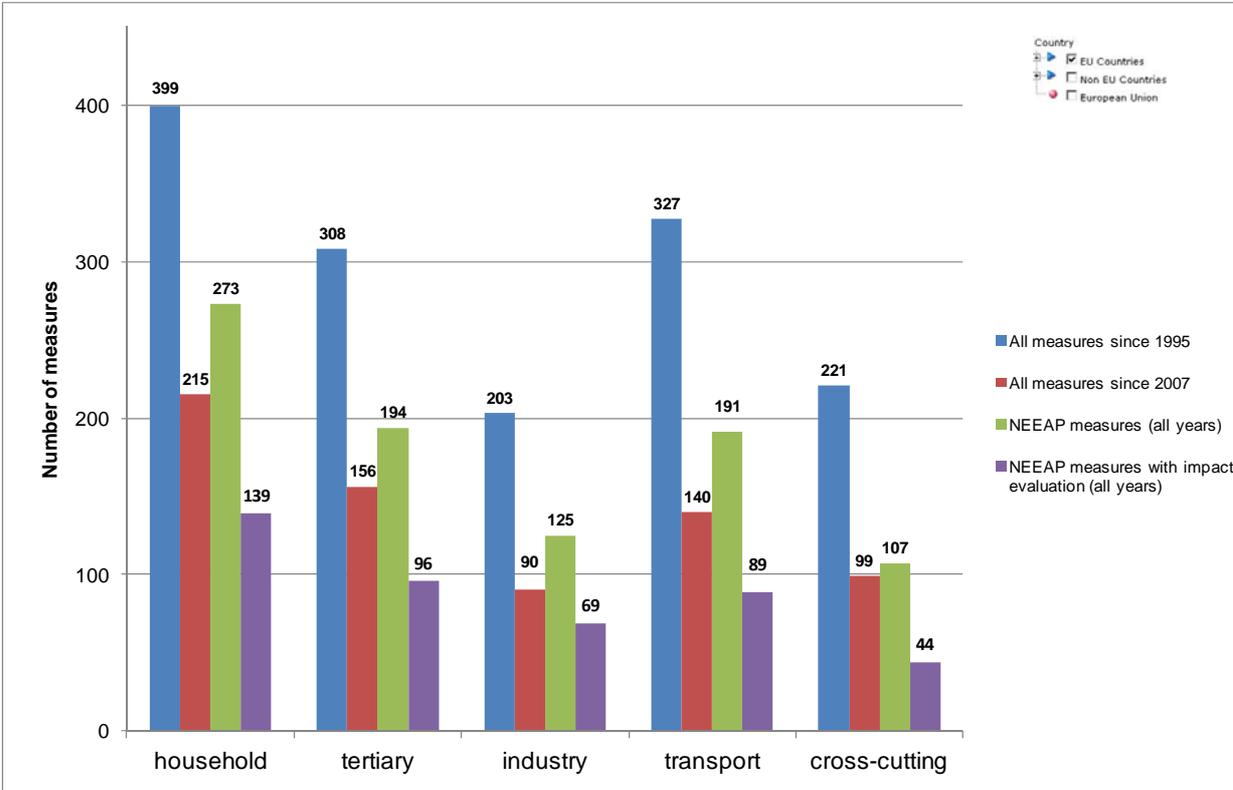
Source : MURE Database (as of April 2012)

If a measure is included in the National Energy Efficiency Action Plan under the EU Energy Efficiency and Service Directive ESD (2006/32/EC), it is classified as “NEEAP measure” in the MURE database, which allows an easy identification of these policies. The analysis of NEEAP measures in this brochure will be restricted to the 27 EU Member States (MS), which are obliged to submit a NEEAP under the ESD. In the household sector, almost 70% of the policy measures in MURE valid from 1995, which is the first year from which energy saving measures may be counted under the ESD, are measures from the NEEAPs. In the tertiary, industrial and transport sectors the share is

around 60 % (Figure 2). When only looking at measures starting from 2007, the base year for the actual savings in the ESD, i.e. savings without accounting for early actions, the majority of the policy measures compiled in MURE for the EU MS are measures from the NEEAPs (Figure 2).

One objective of MURE is the analysis of the quantitative impact of energy efficiency policies. For this purpose, the quantitative measure impact is systematically compiled in the database if this information is available from impact evaluation studies or from the National Energy Efficiency Action Plans, which are in many Member States the most comprehensive data source for this kind of quantitative information. At the moment, about half of the NEEAP measures have a quantitative impact evaluation which is already included in the MURE database (Figure 2).

Figure 2: Number of policies classified as “NEEAP measures” the MURE database in the EU Member States



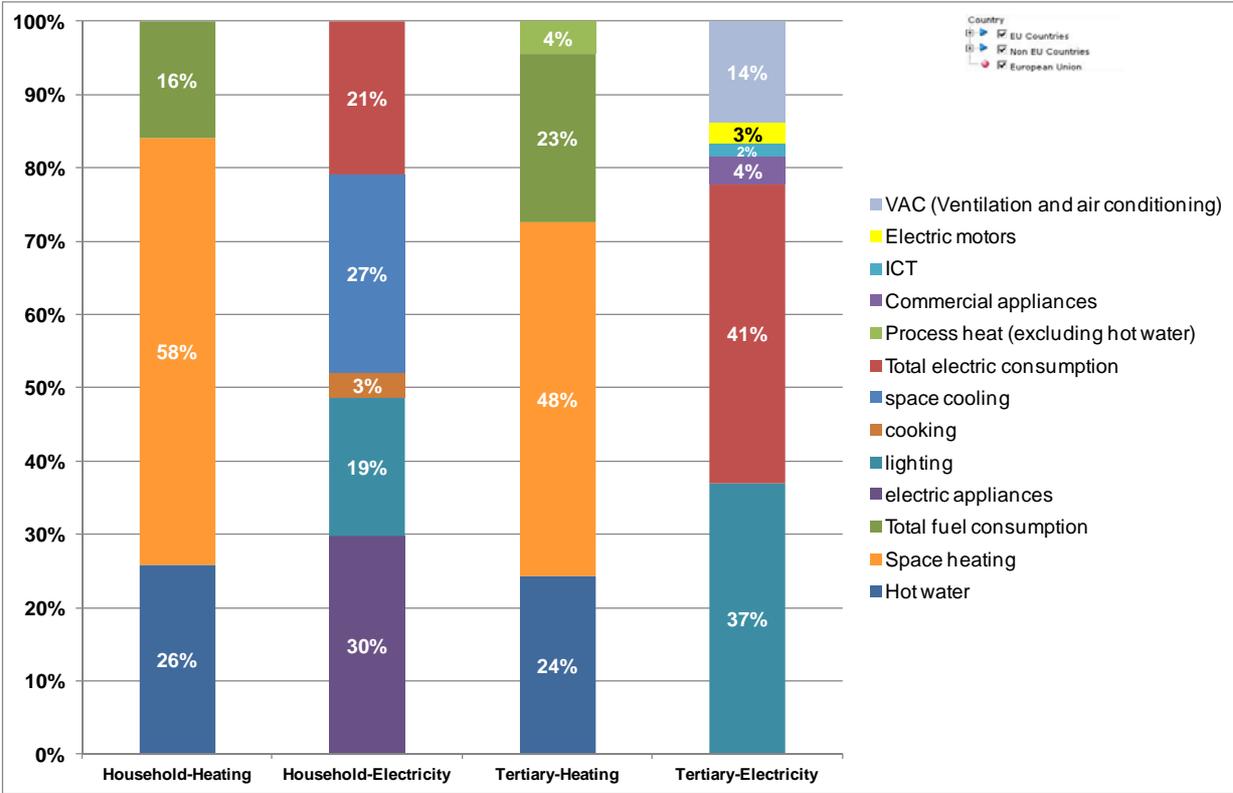
Source : MURE (as of April 2012)

One important classifier in MURE is the **end-use** which is targeted by a policy measure. With regard to buildings, policies addressing space heating and hot water (both in the household and tertiary sector) should be separated from policies addressing electricity, where the diversity of targeted end-uses is considerably more pronounced (Figure 3)². Electricity consumption in private households is dominated by the large household

² There is, however, a considerable part of policy measures which cannot be clearly assigned to one or more end-uses. For these cases, MURE offers the possibility to use total electricity consumption (or total fuel consumption in the case of heating) as a proxy.

appliances, lighting, and space cooling), whereas in the tertiary sector, lighting and ventilation and air-conditioning are most important.

Figure 3: Energy efficiency policy measures in MURE in the residential and tertiary sector by targeted end-uses

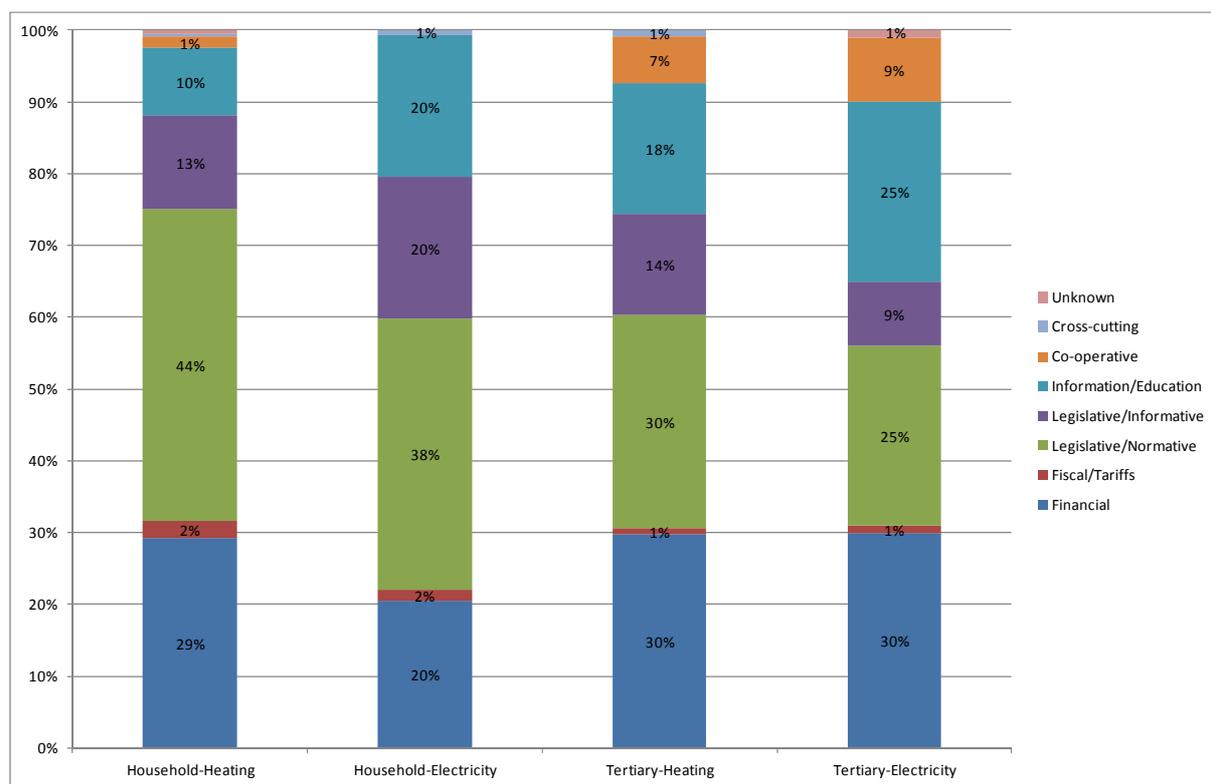


Source : MURE (as of April 2012)

2.2. The relevance of financing measures in the portfolio of measures to improve energy efficiency in buildings

The dominating measure **types** addressing heating consumption in residential buildings are legislative-normative measures (mainly building codes) with a share of around 44%. Financial measures with a share of 29% come second (Figure 4). When also taking into account legislative-informative measures (as e.g. building certificates) with a share of 13%, the total share of legislative and financial measures adds up to 86%. Nevertheless, the role of information and education programs at a voluntary basis must not be underestimated. Around 10% of the policy measures described in MURE and addressing residential heating belong to this type (e.g. training for professionals in the building sector). Their role is even more important with regard to tertiary buildings. According to the MURE database, almost 20% of the policy measures addressing heating consumption in tertiary buildings are assigned to this type (Figure 4).

Figure 4: Policy measures addressing residential and tertiary buildings by type (all measures, all countries)

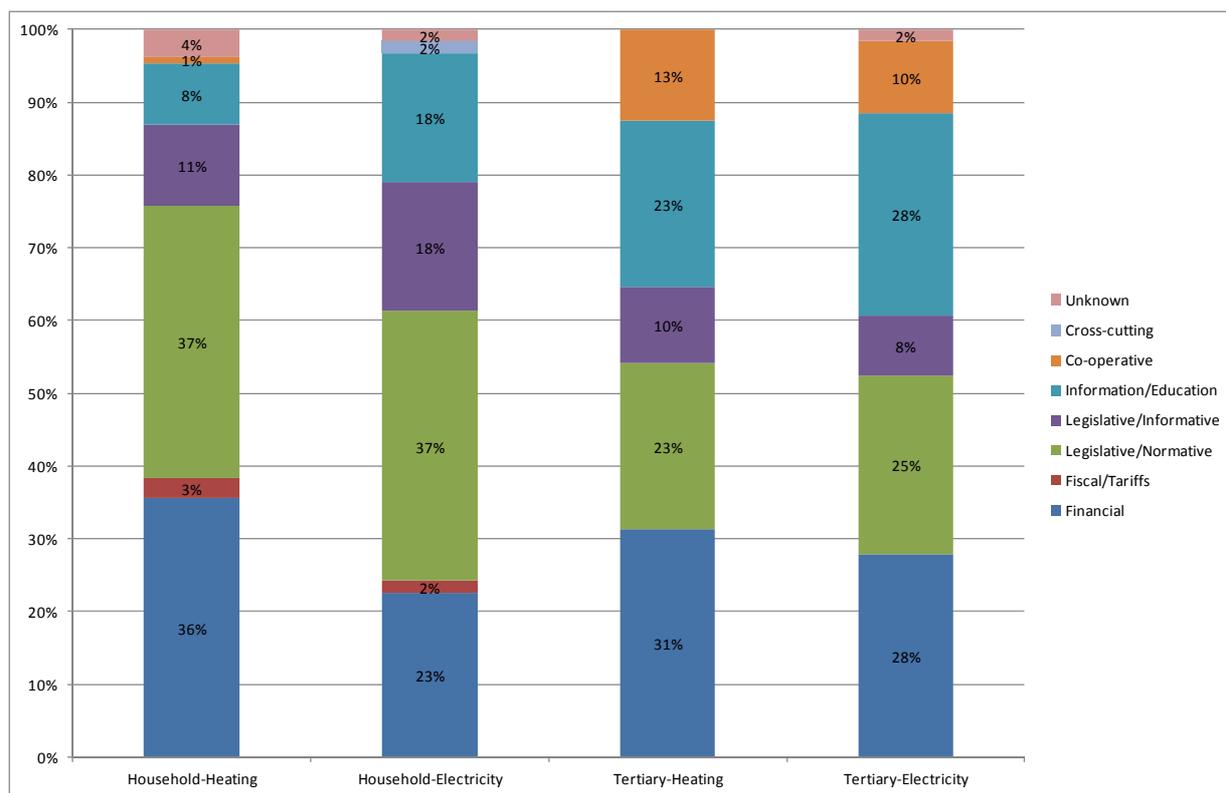


Source : MURE (as of April 2012; partly double-counting since some measures address more than one type)

With regard to electricity, the dominating measure types in the household sector are legislative-normative measures (mainly mandatory energy efficiency standards) with a share of around 38%. Financial measures are less widespread than for heating, but also important (Figure 4). The same applies to informative policies; mandatory and voluntary informative measures both have a share of 20%. I.e. informative policies at a legislative (e.g. EU Energy Labelling) or voluntary basis are the most important measure type addressing residential electricity consumption. In the tertiary sector, the structure of measures by type is similar. But legislative measures are less important, whereas both voluntary information and co-operative measures are more relevant than in the household sector.

It is interesting to see that the structure of policy measures by type shows some differences when only taking into account the measures which are included in the National Energy Efficiency Action Plans submitted by the EU Member States, the so-called “NEEAP measures” in MURE (Figure 5). With regard to heating consumption in buildings, the dominance of legislative-normative measures is less pronounced whereas financial measures become even more important, especially with regard to residential buildings (share of 36% compared to 29%).

Figure 5: Policy measures addressing residential and tertiary buildings by type (only NEEAP measures in EU Member States)



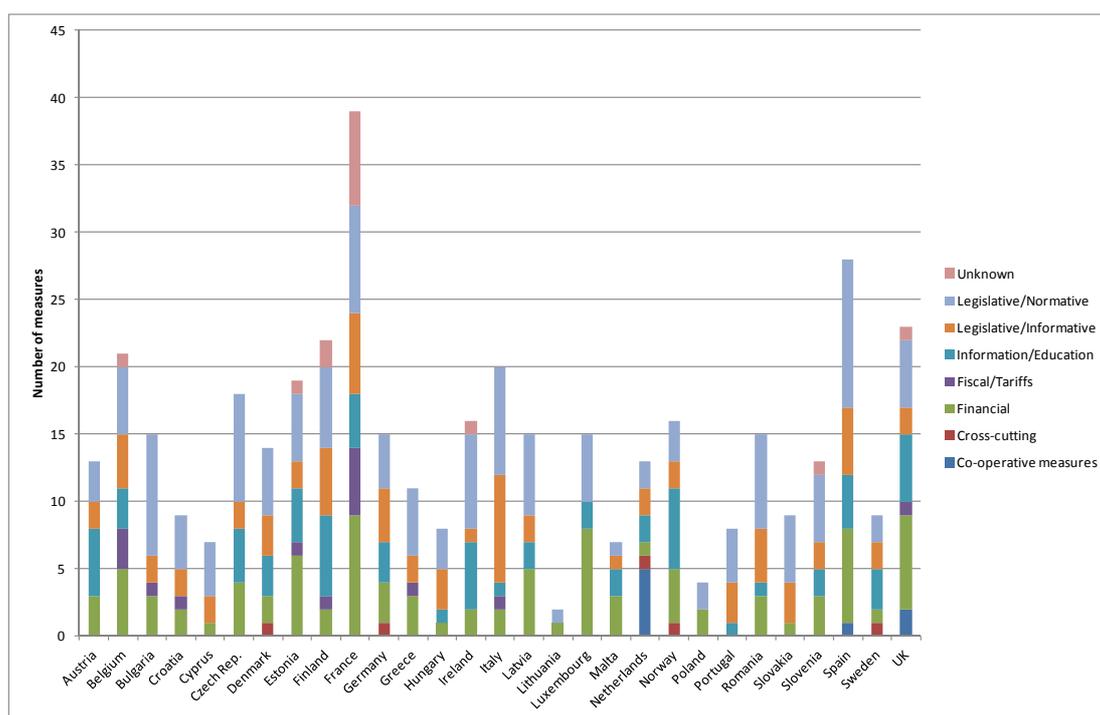
Source : MURE (as of April 2012; partly double-counting since some measures address more than one type)

Figure 6 and Figure 7 show the number of ongoing policy measures in MURE by type and country. Though there is partly a double-counting since some measures address more than one measure type, there are considerable differences both with regard to the number of (here only ongoing) measures stored in MURE and the structure by type.

In the residential sector, the by far highest number of (ongoing) measures addressing residential buildings can be stated for France and Spain. For Belgium, Norway, and UK, the number also exceeds 20 measures (Figure 6). Though in most countries, the most important measure types are again legislative-normative, financial and legislative and voluntary informative measures, there are differences in the importance of these types and in the role of additional types as e.g. co-operative measures. In some countries, e.g. financial measures only play a minor role in the instrument mix (e.g. Cyprus, Denmark, Hungary, Italy, Portugal, Slovakia, Sweden), there are other countries where around of the measures are assigned to this type (Luxembourg, Poland).

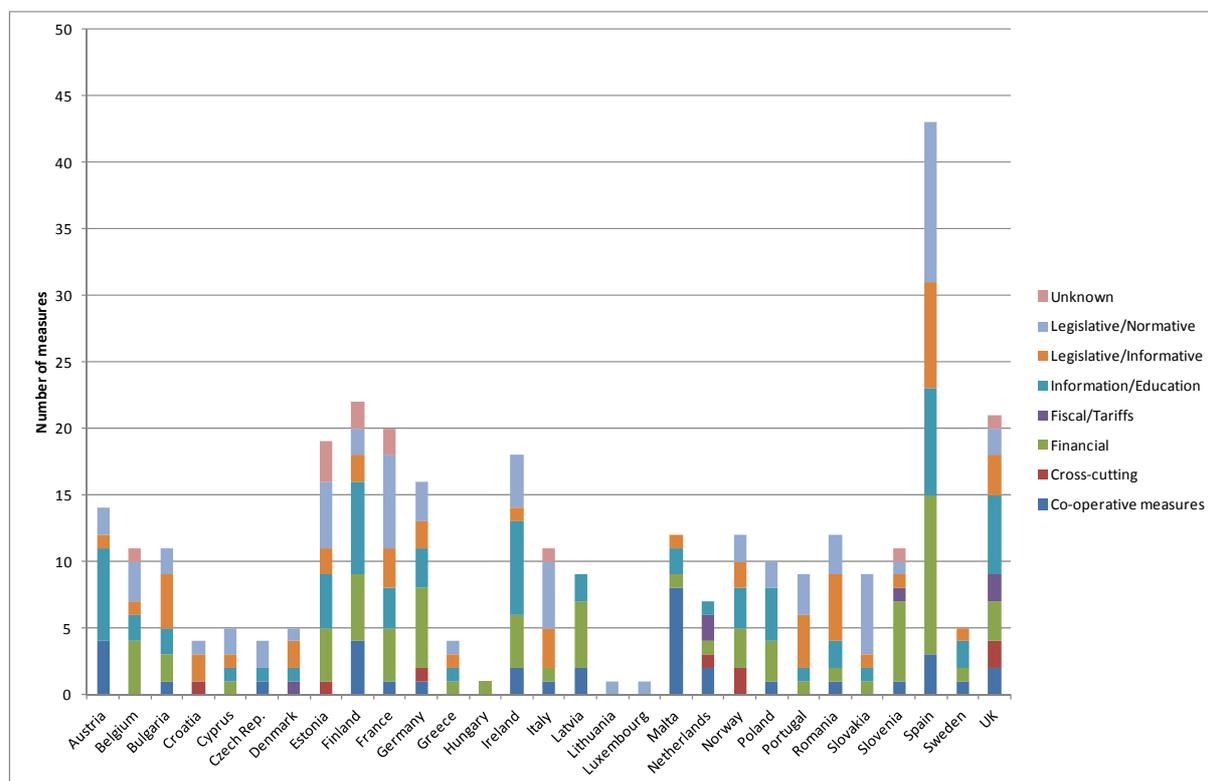
In the tertiary sector, the total number of measures addressing tertiary buildings in most of the countries is smaller than for residential buildings. Only Spain reports a rather high number of measures also for tertiary buildings (Figure 7). The mix of policies by type is in general more diversified than in the residential sector. Especially voluntary information plays an important role in many countries.

Figure 6: Policy measures in the residential sector by type and country (only ongoing measures)



Source : MURE (as of April 2012; partly double-counting since some measures address more than one type)

Figure 7: Policy measures in the tertiary sector by type and country (only ongoing measures)



Source : MURE (as of April 2012; partly double-counting)

3. Energy efficiency policies addressing space and water heating in buildings

In this section we will focus on individual policies addressing energy efficiency in the space and water heating uses. The main focus will be on financial instruments (section 3.2), but other relevant instruments are also presented, in particular legislative-normative and legislative-informative instruments.

3.1. Energy Performance Directive for Buildings EPBD and national building codes

3.1.1. EPBD

The European Directive on Energy Performance of Buildings was enacted in its first instance on 2002/91/EC and came into force in January 2003. It was amended in 2010 and is in force in its current version since 8th June 2010.

Methodological framework for calculating energy performance

The directive requires the application of a methodological framework for calculating energy performance of buildings (Art. 3) in accordance with the guidance given in its annex 1. This calculation method shall consider building characteristics as well as technological equipment. Building characteristics are i.e. thermal capacity, insulation, passive heating, cooling elements and thermal bridges as well as the design, positioning and orientation of the building and solar protection. Technological systems for heating, hot water supply, air-conditioning, ventilation and lighting also need to be included in the calculation. A specified building categorization is to be adopted.

National plans for increasing the number of nearly zero- energy buildings (Art. 9)

The Directive requires that all new buildings to be nearly zero-energy buildings by the end of 2020, and all new buildings occupied and owned by public authorities are nearly zero-energy buildings by 31 December 2018.

National plans to reach that target are required and need to include the definition of nearly zero-energy buildings according to local conditions and by giving a numerical value that indicates the primary energy use as well as intermediate targets for the energy use of new buildings to be set for 2015; and information on political and financial measures to achieve the target.

Regular inspection of heating and air-conditioning systems in buildings

Member states shall ensure that all accessible parts of the heating and air-conditioning systems are regularly inspected and that heating installations older than 15 years are assessed with respect to their energy performance.

In addition, independent control systems for energy performance certificates and for inspection reports of heating and air-conditioning systems shall be established.

3.1.2. National Building Codes

Minimum requirements

Member States need to set minimum requirements for the energy performance of buildings and building elements. New buildings, existing buildings and building elements that are subject to major renovation as well as technical building systems that are installed, replaced or upgraded shall meet minimum energy performance requirements.

These requirements are to be set at the cost optimal level or stricter. The cost optimal level is to be determined considering the investments and the energy costs saved throughout the lifetime of the building. The calculation of the cost optimal level shall be in accordance with the comparative methodology framework that was to be established by the Commission by June 30th 2011 as referred to in Article 5 of the directive.

3.1.3. Building Certificates

Energy certification of buildings or building units

Member States need to implement systems for certification of the energy use of new and existing buildings. Certificates shall be no older than five years and those of public buildings shall be prominently displayed. Since the amendment in 2010 the EBPD requires the extension of the certificate system with indicators that enable the comparison of buildings and with recommendation for a cost optimal improvement of the energy performance of the building.

The building certificates that have been implemented are different within the boundaries set by the EBPD. Most countries have chosen to include a energy efficiency class system in their certificates, which makes the figures more transparent to end users. These rankings can for example be used in real estate advertisements as it is done for example in France.

Figure 8: Example for French real estate advertisement including the energy efficiency class (D)

The image shows a real estate advertisement for a property in Meylan, France. The advertisement includes the following information:

- ImmoChartreuse** logo and name.
- A VENDRE** (For Sale) banner.
- MEYLAN** location.
- 3P+C - 79 m²** (3 bedrooms + common areas - 79 square meters).
- Belle résidence dans parc verdoyant** (Beautiful residence in a lush park).
- Description: **Appartement de 79m² env comprenant une belle pièce de vie exposée Sud petit terrasse avec une vue magnifique sur Belledonne, cuisine équipée, 2 chambres, nombreux rangements, cave et place de parking privée.**
- Possibilité garage.** (Possibility of garage).
- Prix : 298 000 €** (Price: 298,000 €).
- Frais d'agence inclus** (Agency fees included).
- Energy Efficiency Class (D)** label with a scale from A to G.
- Optimiser son énergie** (Optimize energy) logo.

The advertisement also features a photograph of the property and a small inset photo of the interior.

Nevertheless the impact of the energy certification on investment decisions is still limited according to the latest barometer ADEME - TNS/Sofres³: In 2011, 16% of the households of the survey realized an energy certification compared to 12% in the year before. Only about one third took note of the recommendations of the certificate and only half of those realized the recommended improvements, frequently only partially. The certificate is considered as an informative document for the performance of the building but does not yet seem to have an impact on the decisions to improve the building. The certificate is even considered as a barrier to building transactions by three quarters of the households.

Germany has chosen not to include those energy efficiency classes, forcing customers to deal with the real energy demand values from the certificates.

3.2. Financial and fiscal measures

Financial instruments

Countries that have introduced financial incentive systems mostly offer loans at low interest rates (named credit lines or soft loans) often combined with a grant system (also housing allowances and funding). Apart from the different subsidy volumes available for the instruments the systems differ in the conditions that need to be fulfilled to receive support.

The grants usually cover a percentage of the total investments for the energy saving measure. The percentages vary among 15 to 40 % among different countries. There are programs that require implementation of certain technical measures in order to qualify for a grant of a certain percentage.

The Estonian and the German Program for example scale their support according to the energy savings or energy certification class met. In Estonia incentive are risen if efficiency systems like heat recovery systems and devices to measure heat cost individually are installed.

In Austria the conditions for the incentives scheme for residential buildings differ across states. The overall budget was on average 2.85 billion per year between 2005 and 2009 of which about 550 million EUR were used for renovations. These investments leading to estimated energy savings of around 4 TWh in 2010 through measures for the building envelope and additional 3 TWh are saved annually through efficient heating systems.

The Bulgarian incentive system supports the residential system through a credit line and a grand of 20% and up to 850 Euro. The program has a volume of 50 million EUR for the credit line and 10 million EUR for grants and has achieved 48 GWh until 2011.

In Italy the investor can receive a 55% tax credit, to be spread over a maximum of ten fiscal years, for works improving existing buildings performances. For those measures i.e. on heating systems and building envelope the tax credit will be reduced by 5% for

³ http://ademe.typepad.fr/files/synth%C3%A8se-barom%C3%A8tre_aout2012.pdf

the year 2012 and by 20% for the year 2013. The access to the incentives is limited to those buildings provided with energy certification.

Table 1: Comparison of typical financial incentive systems in selected countries

	Scope	Conditions	Volume	Impact
Austria	residential buildings, new buildings (75%) and renovations (25%)	differ by state	2.85 billion 2005-2009; of which about 0,5 billion for renovations	334.3 ktoe through building envelope; 243.6 ktoe through efficient heating systems (1996 – 2010).
Bulgaria	residential buildings	credit line; 20% grant max 850€	50 million for credit line + 10 million for grants	from 2000 until March 2011 4.1 ktoe per year
Estonia	residential buildings, renovation of envelope	grant 15-35% of renovation cost depending on energy savings (20-50%) and size, renovation loan	October 2010 – Nov 2011 6,28 Mio Euro	not assessed (33%)
Czech Republic	residential; thermal insulation; new construction in passive standard; use of RES heating; Bonus for combination of measures	not described	1000 million EUR from 2009 - 2010	25.8 ktoe in 2010; 103.9 ktoe in 2013
Germany	refurbishment of residential buildings	energy performance of 55% to 115% of the requirement for new buildings; support depending on performance	loans comprising 4.2 billion Euro; grants of 75 million Euro	396.4 ktoe in 2007 and additional 561.2 ktoe in 2016
Ireland	residential buildings, wall insulation, heating controls, efficient boilers	Building energy rating	not described	257.9 ktoe in 2016 and 515.8 ktoe in 2020
Italy	heating systems, building envelope, Existing buildings	meeting required u-values, renewable heating, more support for exceeding u-values by 20%	tax credit	not described
Latvia	privately owned flats in multi-apartment building	20% energy savings monitored ex-post to implementation; financial efficiency of at least 2 MWh/year per EURO of financing	30 million EUR up to 2011	expected 20.64 Mtoe in 2016
Poland	residential and tertiary buildings	energy audit specifying alternative options with economic and technical details; review of audit report by designated authorities	23 – 70 million EUR annually since 2007, decreasing	696.44 ktoe in 2016
Slovenia	residential renovation and new buildings, renewables and efficiency in heating	new buildings need to meet a defined standard	2011 to 2016 estimated volume of 161 million EUR	envelope: 37.83 ktoe in 2016 and 55.03 ktoe in 2020; heating: 54.17 ktoe in 2016 and 76.52 ktoe in 2020

The renewal or the improvement of the efficiency of the heating system is supported in Italy by a fiscal deduction of up to € 30.000 and includes installation of electric, absorption cycle, geothermal heat pumps and condensing boilers. Furthermore, it is established a fiscal deduction up to € 60.000 to support the installation of solar thermal applications.

A fiscal deduction up to € 60.000 is also granted for retrofitting of building envelope elements. The works have to satisfied stricter values, which were updated specifically by the Decree of the Ministry of Economic Development in 2010. The law specifies u-values for roof, wall, basement and windows are specified for 6 climatic zones and those are obligatory to receive the incentives.

To induce measures with higher efficiency the fiscal deduction is increased to up to € 100.000 for building renovations works, able to grant an improvement of building energy performance 20% more efficient than the values set by law.

In Poland Projects eligible for support under the “Thermo-Modernisation Programme” include end-use improvements in residential and tertiary buildings, reduction of energy losses in heat distribution networks and the substitution of conventional energy sources by renewable energies. The scheme is available to all investors, such as owners or administrators of buildings, local heat sources and local heat distribution networks. Only upon completion of the project investors receive a premium of up to 20% of the loan, but not more than 16% of the costs incurred for the implementation of projects and no more than twice of the projected annual energy cost savings.

To be eligible, submission of an energy audit is obligatory which includes specific technical and economical criteria precisely described in legislation. The energy audit report is reviewed by designated authorities. In particular it contains an appraisal of technical condition of a building, local heat source and local heat distribution network; a description of all possible options of thermal-modernisation project completion; economic analysis of possible measures, identification of an optimum option and scope of thermal-modernisation project; detailed description of optimum option.

Within this instrument 70-23 million EUR (300 – 100 PLN) have been invested since 2007, with a decreasing tendency. The expected amount of saved energy due to the measure is e 8.1 TWh in 2016.

In Slovenia financial incentives exist for building envelope as well as heating systems. Renovation of old buildings and new buildings construction exceeding a defined energy standard are supported. For building envelope measures the incentives reached an estimated volume of 161 million EUR from 2011 to 2016. The energy savings achieved in 2010 are 138 GWh. The expected energy savings are 0.44 TWh in 2016 and 0.64 TWh in 2020.

The financial incentives for heating systems include i.e. the replacement of unsuitable boiler capacities with high energy efficient device: use of condensing and modular boilers, installation of special biomass boilers with very high efficiency, optimization of heating system operation through investments in thermostatic valves, regulation and hydraulic balance of heating system, the installation of ventilation system with high-efficiency heat recovery, use of thermal solar system and heat pump for space heating and preparing of hot water. From 2011 to 2016 the instrument has an estimated volume of 164 million EUR. The energy savings achieved in 2010 are 117 GWh. The expected energy savings are 0.63 TWh in 2016 and 0.89 TWh in 2020.

Sample Case: Latvia

The “Latvian Investments and Development Agency” supervises the financial support of projects investments in energy efficient multi-apartment building renovation since 2009. The investments in energy efficient multi-apartment building renovation are co-financed from the EU Regional Development Fund under the Latvia national operational programme „Infrastructure and services” [3, activity No 3441 „Energy Efficiency in MultiApartment Housing”]. The submission of the tenders of renovations’ applications was opened 14 April 2009 and will continue up to 31 December 2013.

The maximum standard rate of financial support is stated 50%, this rate is increased by 10% if at least 10% of apartment owners have status of low income persons. The maximal financial support per m² of total area of building is defined not higher than 35 LVL (50 EUR).

Applicants : Projects’ applicants are apartment owners, which may be represented by authorised legal persons, e.g. apartment buildings management companies. The property of one owner shall not exceed 20% of the total number of flats in a multi-apartment building (the given criterion does not apply for state and municipalities owned flats).

Supported measures: The financing is provided for activities promoting energy efficiency, as energy audit, technical documentation preparation for renovation, supervision of construction works, insulation of building envelope and change of particular building elements, insulation of cellars’ and upper storey/roof covering, reconstruction of entrances and staircases premises, renovation of heat supply system, renovation/reconstruction of ventilation system.

Conditions: Projects need to realize energy savings of at least 20%. In addition, since 2011 heat energy consumption for heating shall not increase 120 kWh/m² (for 1 and 2 storeys multi-apartment houses) and 100 kWh/m² (for 3 and more storeys).

There is a threshold criterion characterising efficiency of financial investments, namely, after reconstruction the ratio of heat energy saving (MWh/year) to ERDF financing (in thousand LVL) shall be at least 2 and higher (if at least 10% of apartment owners have status of low income persons, than the threshold value is stated 1.6).

The activities provided for in the projects approved within the framework of the tenders shall be implemented during 2 years after signing the contract. The functions of multi-apartment residential building, in which project activities are implemented, shall not be changed at least 5 years after project completion as well as the building shall not be demolished.

Monitoring: Monitoring is required to ensure the defined conditions have been met. Therefore, a report on heat consumption shall be submitted for each of 3 years after project completion.

Volume: Up to 1st September 2011 it was submitted more than 600 projects. Number of signed contracts – 356 contracts with about 20.6 million LVL (30 million EUR) total co-financing from European Regional Development Fund (ERDF)

Impact: Energy savings of 240 TWh (0.864 PJ) shall be realized by this measure in 2016.

Outlook: United Kingdom’s “Green Deal”

The Green Deal is a proposed UK Government policy set to commence in January 2013. The basic idea is to tackle the financing problems for efficiency measures in UK caused by the high fluctuation in the real estate market. The instrument design was therefore chosen to unbundle the loan for efficiency measures from the individual person. Instead, it proposes tying low interest loans, issued by Green Deal Providers for energy efficiency improvements to the energy bills of the properties the upgrades are performed on. These debts will then be passed onto new occupiers when they take over the payment of the bills. A general concept of Green Deal loans is that the energy savings must outweigh the loan repayments, the so-called “Golden Rule”⁴.

The measure will be initiated by a Green Deal Advisor, who will perform an inspection of the property to provide a report on advised energy improvement measures. The funding for these measures is then issued by the Green Deal Provider and a Green Deal Installer will then install the measures. The overall aim of the Green Deal is to initiate widespread renovation of the UK's housing stock with measures like Double Glazing, Cavity Wall, Loft Insulation and Heat Pumps.

⁴ For more information on the Green Deal see http://www.decc.gov.uk/en/content/cms/tackling/green_deal/green_deal.aspx and Oxley 2011; DECC 2012).

Approaches to ensure the efficiency of the financial measure

Different countries have applied different approaches to ensure the efficiency of the financial measure. Since financial measures are financed through the fiscal budget the governments want to make sure that the investment, as necessary as it is, returns as much fossil energy savings as possible.

In Poland the eligibility to financial support is based on energy audits covering technical and economical components. The audit reports need to be reviewed by designated authorities. Preparing the audits and reviewing them could be an additional effort but also a structured approach towards an optimal economic use of financing and effective technical implementation.

To target very cost-effective energy saving potentials the Latvian government has designed a financial instrument addressing only one most representative type of building, the multi-apartment homes. In a collectively owned building this approach could help to overcome the barrier of need for consensus among multiple parties. In structures with community associations the renovation of homes for people with lower income would directly be addressed by it.

Furthermore in Latvia the efficiency of financial investments is not only measured but condition for the subsidy. After reconstruction the ratio of heat energy saving (MWh/year) to ERDF financing (in thousand LVL) shall be at least 2 and higher. This way the cost efficient renovations are induced first, while renovations that are more costly are postponed.

The Latvian approach to monitor energy savings through a required report on heat consumption for each of 3 years after project completion ensures the precise measurement of the actual savings. Furthermore it encourages the investor to take measures to achieve the energy savings. This could be a careful review of the renovation planning and implementation or a contractual agreement with the construction company. However, rebound effects could impede the savings and measures on the user side may also be necessary.

3.3. Informational and educational measures

There are lots of different concepts of information and educational measures ranging from the pure publication of informational material over consulting offers via telephone or in person and mass media advertising campaigns through monitoring and advice services of independent experts. These measures are primarily intended to induce a change in the users' behaviour by creating awareness of energy use and interest in its reduction. The effect of these measures is comparably low and hard to assess due to several reasons.

First it is essentially difficult to measure the change of a single users' behaviour. A reduction in energy use could for example result from an investment in energy efficient technology or in a change of user behaviour. Thus, it is not possible to identify the change in user behaviour from a reduction in energy use. The investments as a whole, however, can be traced more easily i.e. through market data.

When a change in user behaviour is identified and quantified it is hard to determine its origin. Lots of informational measures are combined with other types of measures, like financial incentives. This combination leaves the question of the allocation of the energy savings open.

There are many national and European programs that affect the behaviour of users concerning their heating and hot water demand, although few of them directly focus on heat supply within buildings.

Guidelines and data to inform the user about the areas where energy can be saved and how are made available through numerous European and national projects and websites. Such website is for example “Energyoffice” and ‘Build up’ at European level.

A further step is to consult the user in person or via phone. This provides the opportunity to answer specific questions according to the users’ situation. Such programs are for example ‘The Power of One’ in Ireland, the ‘Tailored Energy Advice’ in the Netherlands, the ‘energy information helpline’ in Norway and the ‘Energy advice for private consumers’ in Germany.

Other programs encourage single users and groups of users to compete in saving energy through behavioural changes examples for such European programs are the ‘European Citizens Climate Cup’ and the ‘Energy neighbourhoods’.

Outstanding are programs that go further than just offering information and advice. The British government has fixed its plan to roll out ‘Smart Metering and Billing’ throughout the complete country and has supported early installations and ensured all necessary technology and systems are being build and tested until the mass roll out in 2014. Connected to this is the establishment of a Data and Communications Company that enables the data collection and transfer needed.

In Finland experts were monitoring energy use and water consumption in buildings and promptly advising in the course of the ‘Energy conservation education for inhabitants of buildings’ project.

In the Netherlands ‘Ecoteams’ were established between 1991 and 2001. These groups of 8 people from different households met six times within a period of 8 months. Discussion topics were the monitored consumption of electricity, gas and water as well as the amount of garbage produced, transport and other consuming behaviour. Part of the project was not only the peer review of the results and the consumption behaviour but also a review by a regional Eco team center.

3.4. Energy efficiency obligations

Energy efficiency obligations are another important tool for financing energy saving measures as they broaden the basis by including energy companies as private investors into the scheme.

Energy efficiency obligations (EEOs) have been introduced in several European countries within the last couple of years. Among them are the United Kingdom, France, Italy, Denmark and Flanders as part of Belgium. Other countries, like Poland, have concrete plans to introduce such a system. The design of the energy efficiency obligation systems differs heavily between the different countries. These differences are caused by the different energy-economic conditions in these countries as well as by the varying target and scope of these systems.

Nevertheless the general idea of an energy efficiency obligation is the same in all countries: An obliged party has to deliver proof of a defined amount of realized energy savings to a supervising authority. So the instrument is – differing from the fiscal and financial instruments – in a certain way an instrument of direct quantity control. In MURE, the Energy Efficiency Obligation Schemes which already have been introduced, are described either in the sectors or partly also in the cross-cutting section. In the following, the most important characteristics are summarized.⁵

In the **United Kingdom**, the instrument was first introduced with the energy efficiency commitment (EEC) in 2002. In 2008 the EEC was succeeded by the Carbon Emission Reduction Target (CERT), which kept the general characteristics of the EEC, like the obligation of the biggest energy suppliers, but changed the saving target from lifetime cumulated energy to lifetime cumulated carbon in order to reflect climate change issues better. The CERT is limited to measures in private households with a strong focus on thermal retrofit. In the starting phase, CFLs were also an eligible measure, but by now, the savings are delivered via cavity wall insulations and roof insulations mainly. A speciality of the British system is the priority of fuel poor and low-income households, in which more than 40 % percent of the saving measures have to be implemented, and thus extending the scheme by a social dimension. Under the extension of the CERT in 2012, an additional target has been introduced, to require that 15% of the savings be achieved in a subset of low income households (a Super Priority Group) considered to be at high risk of fuel poverty. Savings can be traded bilaterally between the six obliged actors, but no formalized market exists.

In **France**, the saving obligation scheme comprises such a formalized market, making it a white certificate scheme. In contrast to the UK, the scheme in France covers all sectors (including transport) and uses lifetime cumulated final energy as saving target. Therefore the range of measures could be expected to be much broader than within the British system. Nevertheless, the sectoral focus is also on private households. The type of measure is different though, as mainly boiler retrofits are induced by the French scheme. This effect is triggered by an (intended) double instrumentation of saving obligation and tax credits. Although the formal conditions for a trade of savings are given within the French scheme, there is barely any trade of certificates. For only obliged parties can create white certificates, trade is limited to the obliged parties. No third party is allowed to create certificates, which could stimulate a market heavily, as the Italian scheme clearly shows.

⁵ Comprehensive overviews on energy efficiency obligation schemes in Europe can e.g. be found in Bertoldi et al. 2010, Lees 2012, Staniaszek & Lees 2012, Bertoldi 2012. In the MURE database (www.muredatabase.org), these schemes are mainly described in the cross-cutting section. For the international perspective see e.g. RAP 2012.

Within the **Italian scheme** the majority of saving measures is not implemented by the obliged parties – the net operators – but by third parties from the energy efficiency services sector. The certificates are then bought by the obliged parties to fulfil their obligation. The scope of the scheme is comparably wide as in the French scheme, but the mix of measures is not as narrowly focussed but still, the majority of measures are carried out within the building sector.

Within the **Danish system** the focus is quite different, as the majority of measures is implemented in industry. Nevertheless there is still a significant share of measures carried out in the building sector, so the instrument is also relevant within the building policy mix.

Table 2 summarizes the most important design features of the described systems.

Table 2: Most important design features of existing energy efficiency obligations schemes

	UK	France	Italy	Denmark
Nature of saving target	Cumulative CO ₂ emissions during the lifetime	Cumulated discounted final energy during the lifetime	Cumulative primary energy over 5 year period (buildings: 8 yr, CHP: 10 yr)	Final energy accounted only in the 1 st year
Standardized saving target final energy ("Danish mode")	679.2 ktoe/a	971.6 ktoe/a	593.3 ktoe/a	146.2 ktoe/a
Standardized saving target final energy ("British mode")	20.4 Mtoe/a	9.9 Mtoe/a	6.3 Mtoe/a	1.5 Mtoe/a
Obligated companies	Energy suppliers	Energy suppliers	Energy distributors	Energy distributors
Actors authorized to realize saving measures	Participation of the obligated companies necessary	Participation of the obligated companies necessary	No restriction	Participation of the obligated companies necessary
Targeted sectors	Residential	Residential, tertiary, industry, transport	Residential, tertiary, industry,	Residential, tertiary, industry
Certificates trading	No, bilateral trading is possible	Yes (but limited trading activity)	Yes	No
Targeted end-uses of the energy-saving measures	62 % building refurbishment 25 % CFL	72 % heating systems 14 % building refurbishment 6 % transport 8 % industry	50 % electricity uses (also: energy-saving lamps) 25 % heating and hot water (also: shower heads) 20 % Industry	47 % industry 44 % residential
Quality of the induced saving measures	43 % of building measures are cavity wall insulation; 57 % loft insulation. Distribution of 300 million energy-saving lamps (about 5 per inhabitant)	Heating system measures: mainly exchange by condensing boilers (state of the art)	Distribution of 60 million energy-saving lamps (about 1 per inhabitant)	

Source: Schlomann et al. 2012

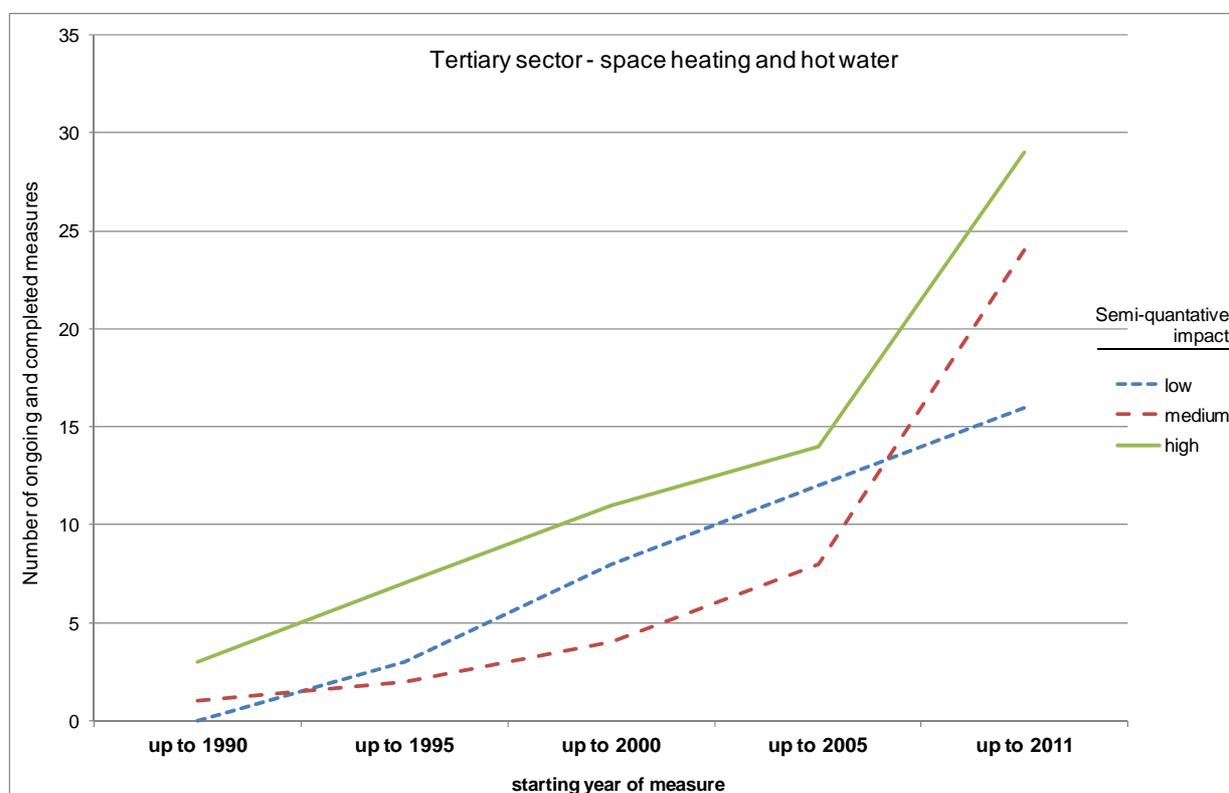
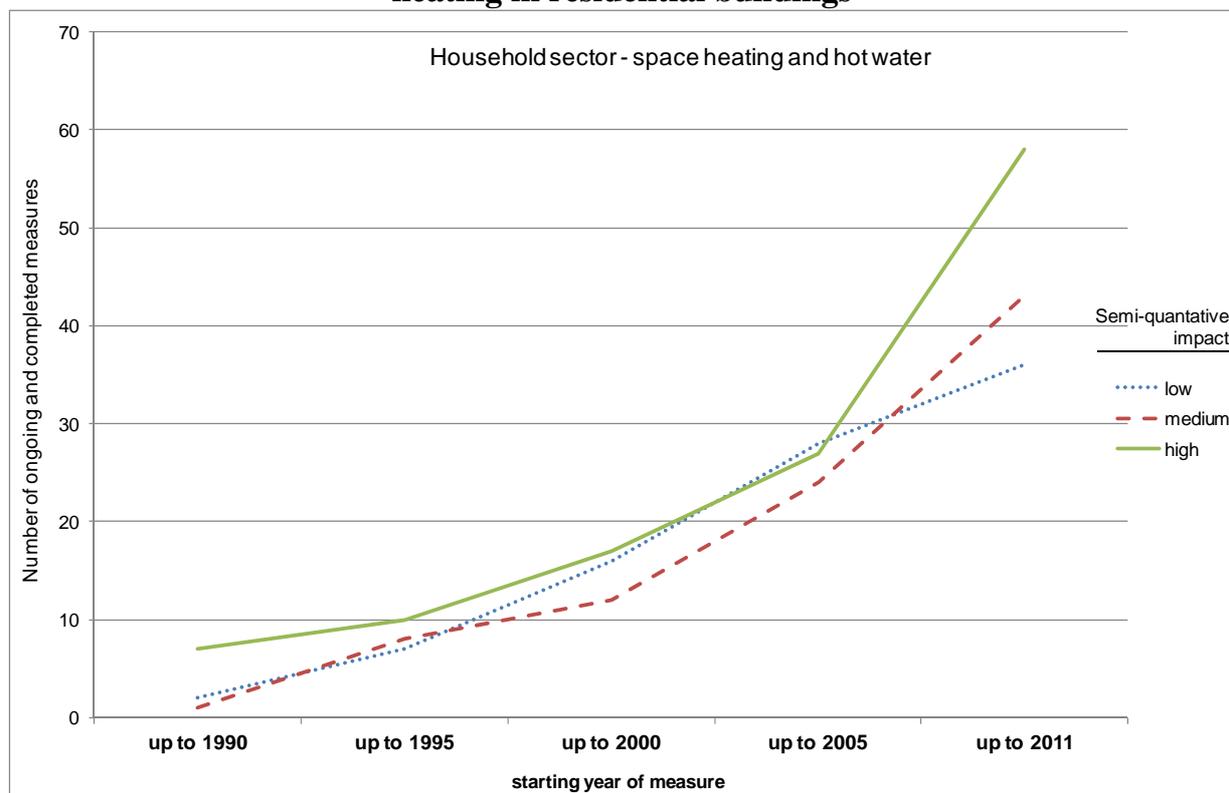
3.5. Impact of policy measures in the field of space heating and hot water

Though no full quantitative overview of impacts can be provided in this section, semi-quantitative impact categories are available in the MURE database show increasing impacts of the policy measures. These semi-quantitative impact categories “low, medium or high” are linked to the energy or electricity consumption of the sector through a percentage range.⁶ This type of semi-quantitative evaluation does provide useful information for screening the policy measures and establishing a first order estimate of the impact of policy measures.

Figure 9 shows all measures addressing energy consumption for space heating and hot water in residential and non-residential buildings ordered by the semi-quantitative impact assessment since 1990. The share of high impact measures considerably increases for measures starting from 2005 or later, both in the household and tertiary sector.

⁶ The following limits are defined for the three impact levels: low impact: <0.1 %; medium impact: $0.1 - <0.5$ %; high impact: ≥ 0.5 %. If a quantitative evaluation is available, the qualitative impact can easily be calculated by applying this definition to the quantitative figures. For measures with no quantitative evaluation, the qualitative evaluation is a relatively rough expert judgement.

Figure 9: Semi-quantitative impact of policy measures addressing space and water heating in residential buildings



Source : MURE (as of April 2012)

4. Policies addressing electricity consumption in buildings

In this section we will focus on individual policies addressing energy efficiency in the field of electric uses in the residential and tertiary sector, focussing again mainly on financial instruments in section 4.2, but presenting also the full spectrum of other relevant instruments, in particular legislative-normative and legislative-informative instruments.

4.1. Ecodesign and Energy Labelling

Mandatory minimum energy efficiency requirement and mandatory energy labelling are the most important legislative measures addressing electricity consumption in residential and tertiary buildings. Most of these policies are EU policies which have to be transposed into national law by the Member States and therefore also play an important role in the national mix of energy efficiency policies (see Chapter 2). Therefore, in the following these EU policies are described more detailed.

4.1.1. Ecodesign Directive

The European Directive 2009/125/EC of 21 October 2009 establishes a framework for the setting of **ecodesign requirements** for **energy-related products** (“ErP”). The “ErP” creates a framework for the constitution of requirements to an ecologic design of products that are related to energy. It replaces the European Directive 2005/32/EC from 6 July 2005, better known as “Energy-using Products” (“EuP”) Directive. The “EuP” which had to be transformed into national law by the member states until 11 August 2007 was related to energy efficiency and environmental compatibility of electronic devices only. The subsequent directive, “ErP”, includes besides products that actively need electricity those which are relevant for energy consumption and influence energy efficiency such as insulating materials. It had to be translated into national law until 20 November 2010.

The “EuP” respectively the “ErP” builds the regulatory framework for a variety of implementing regulations. The following **implementing regulations**⁷ have been issued since then which are relevant for the building sector:

- (1) [Commission Regulation \(EC\) No 1275/2008](#) of 17 December 2008 implementing Directive 2005/32/EC of the European Parliament and of the Council with regard to **ecodesign requirements for standby and off mode electric power consumption** of electrical and electronic household and office equipment.
- (2) [Commission Regulation \(EC\) No 107/2009](#) of 4 February 2009 implementing Directive 2005/32/EC of the European Parliament and of the Council with regard to **ecodesign requirements for simple set-top boxes**.
- (3) [Commission Regulation \(EC\) No 245/2009](#) of 18 March 2009 and its amendment (Commission Regulation (EU) No 347/2010 of 21 April 2010) implementing Directive 2005/32/EC of the European Parliament and of the Council with regard to **ecodesign requirements for fluorescent lamps without**

⁷ http://ec.europa.eu/energy/efficiency/ecodesign/eco_design_en.htm;
http://ec.europa.eu/enterprise/policies/sustainable-business/ecodesign/index_en.htm

integrated ballast, for high intensity discharge lamps, and for ballasts and luminaires able to operate such lamps, and repealing Directive 2000/55/EC of the European Parliament and of the Council.

- (4) [Commission Regulation \(EC\) No 244/2009](#) of 18 March 2009 and its amendment (Commission Regulation (EC) No 859/2009 of 18 September 2009) implementing Directive 2005/32/EC of the European Parliament and of the Council with regard to ecodesign requirements for **non-directional household lamps**.
- (5) [Commission Regulation \(EC\) No 278/2009](#) of 6 April 2009 implementing Directive 2005/32/EC of the European Parliament and of the Council with regard to ecodesign requirements for no-load condition electric power consumption and average active efficiency of **external power supplies**.
- (6) [Commission Regulation \(EC\) No 642/2009](#) of 22 July 2009 implementing Directive 2005/32/EC of the European Parliament and of the Council with regard to ecodesign requirements for **televisions**.
- (7) [Commission Regulation \(EC\) No 643/2009](#) of 22 July 2009 implementing Directive 2005/32/EC of the European Parliament and of the Council with regard to ecodesign requirements for **household refrigerating appliances**.
- (8) [Commission Regulation \(EC\) No 640/2009](#) of 22 July 2009 implementing Directive 2005/32/EC of the European Parliament and of the Council with regard to ecodesign requirements for **electric motors**.
- (9) [Commission Regulation \(EC\) No 641/2009](#) of 22 July 2009 implementing Directive 2005/32/EC of the European Parliament and of the Council with regard to ecodesign requirements for glandless standalone **circulators** and glandless circulators integrated in products.
- (10) [Commission Regulation \(EU\) No 1015/2010](#) of 10 November 2010 implementing Directive 2009/125/EC of the European Parliament and of the Council with regard to ecodesign requirements for **household washing machines**.
- (11) [Commission Regulation \(EU\) No 1016/2010](#) of 10 November 2010 implementing Directive 2009/125/EC of the European Parliament and of the Council with regard to ecodesign requirements for **household dishwashers**.
- (12) [Commission Regulation \(EU\) No 206/2012](#) of 6 March 2012 implementing Directive 2009/125/EC of the European Parliament and of the Council with regard to ecodesign requirements for **air conditioners and comfort fans**.

Those implementing regulations are binding in its entirety and directly applicable in all Member States. In addition to the implementing regulations already in place, almost 40 energy-using product groups are in preparation as well as some energy-related product groups such as windows, insulation material or shower heads. Voluntary agreement instead of regulation is discussed in some cases, too (as e.g. for complex set-top boxes or imaging equipment).⁸ According to the impact assessment of the Directive, the first 12 implementing measures are estimated to allow yearly savings by 2020 equivalent to almost 14% of the EU final electricity consumption in 2009. This is equivalent to around 376 TWh, of which 135 TWh from electric motors, 43 TWh from televisions, 39 TWh from domestic lighting, 38 TWh from tertiary sector lighting, 35

⁸ A comprehensive overview of the legislation process is also given on the eceee website (http://www.eceee.org/Eco_design).

TWh from standby and off-losses, 34 TWh from industrial fans (Bertoldi & Atanasiu 2009; figures partly incl. impact of energy labelling). The new evaluation study of the Ecodesign Directive, which was published in April 2012 (CSES & Oxford Research 2012) does not include quantitative saving impacts, but an assessment of the relevance, effectiveness, efficiency and European added-value of the current Ecodesign Directive.

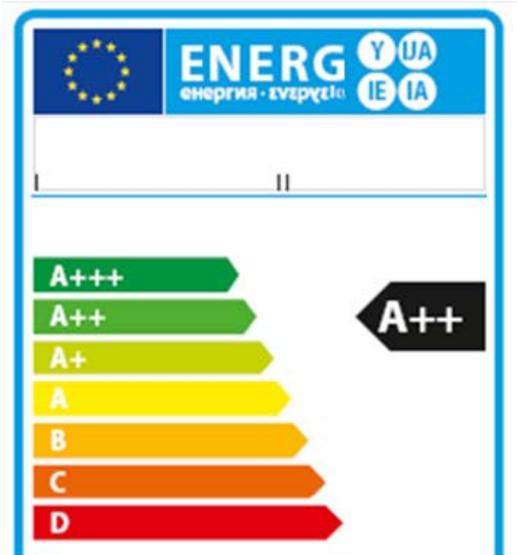
4.1.2. Energy Labelling Directive

Energy labels are thought as a complementary instrument for minimum energy efficiency requirements. Whereas efficiency standards shall remove the less energy-efficient products from the market, energy labels shall help consumers choosing the most energy-efficient products and also to provide incentives for the industry to develop and invest in these products.

Directive 92/75/EEC of 22 September 1992 on the Indication by labelling and standard product information of the consumption of energy and other resources of **household appliances** has been substantially amended by Directive 2010/10/30 of 19 May 2010 on the indication by labelling and standard product information of the consumption of energy and other resources by energy-related products. Where the scope of Directive 92/75/EEC is restricted to household appliances, an extension to energy-related products which have a significant direct or indirect impact on energy consumption during use is covered by the **Revised Directive for Labelling of Energy-related Products (Directive 2010/30/EU)**, which entered into force on 19 June 2010.⁹

Energy labelling requirements are already in force for a number of products and the Commission plans to adopt **delegated regulations** for energy labelling **in parallel** with the adoption of the **Ecodesign regulations**. The layout of the energy label is new but has kept its uniform and simple design characteristics across the different product categories (Figure 10).

Figure 10: Layout of the new Energy Label for energy-related products under Directive 2010/30/EU



⁹ For detailed information on the EU legislation on energy labelling see : http://ec.europa.eu/energy/efficiency/labelling/labelling_en.htm

The new layout of the energy efficiency label gives room to up to three new energy classes to reflect technological progress. The principle of the energy labelling system is that the energy label starts with the classes A to G. The new Energy Labelling Directive introduces new efficiency classes A+, A++ and A+++ on top of the existing A grade for the most energy-efficient household products. The most efficient class is represented by A+++. However, the total number of classes will still be limited to seven. The "A" to "G" scale may thus appear as follows:

- If the highest class is classified as A+, the lowest class will be F.
- If the highest class is classified as A++, the lowest class will be E.
- If the highest class is classified as A+++, the lowest class will be D.

The labelling colour scheme will be adjusted accordingly, so that the highest energy efficiency class will remain dark green and the lowest energy efficient class will be red. In 2014, the energy classes will be reviewed again.

The main characteristics of the new energy label for energy-related products are:

- The new label will be uniform in all EU27 Member States.
- The new label will be language-neutral as texts will be replaced by pictograms which inform consumers about the characteristics and performance of a given product.
- Each single product will be supplied with the full new label. The current practice in many countries, to provide the basic label and the data strip separately, will be abandoned.
- Noise declaration will be mandatory for products where noise is a relevant criterion.
- New obligations appear in terms of advertisement and promotional material.

These provisions apply only to product categories for which a related delegated Regulation has already entered into force. As described above, the Energy Labelling Directive builds the basis of a variety of **delegated regulations**. The following regulations have been issued up to now addressing the building sector:

- (1) [Commission Delegated Regulation \(EU\) No 392/2012](#) of 1 March 2012 supplementing Directive 2010/30/EU of the European Parliament and of the Council with regard to energy labelling of **household tumble driers**.
- (2) [Commission Delegated Regulation \(EU\) No 626/2011](#) of 4 May 2011 supplementing Directive 2010/30/EU of the European Parliament and of the Council with regard to energy labelling of **air conditioners**.
- (3) [Commission Delegated Regulation \(EU\) No 1059/2010](#) of 28 September 2010 supplementing Directive 2010/30/EU of the European Parliament and of the Council with regard to energy labelling of **household dishwashers**.
- (4) [Commission Delegated Regulation \(EU\) No 1060/2010](#) of 28 September 2010 supplementing Directive 2010/30/EU of the European Parliament and of the Council with regard to energy labelling of household **refrigerating appliances**.
- (5) [Commission Delegated Regulation \(EU\) No 1061/2010](#) of 28 September 2010 supplementing Directive 2010/30/EU of the European Parliament and of the Council with regard to energy labelling of household **washing machines**.
- (6) [Commission Delegated Regulation \(EU\) No 1062/2010](#) of 28 September 2010 supplementing Directive 2010/30/EU of the European Parliament and of the Council with regard to energy labelling of **televisions**.

The label will be allowed on a voluntary basis after the entry into force of the regulations. One year after the entry into force they become mandatory for appliances placed on the market.

It is estimated that energy labelling has contributed to annual energy savings in the order of 2.7 Mtoe in the period 1996-2004 (Europe Economics & Fraunhofer ISI 2007). According to the impact assessment, the recast Directive, when fully implemented as planned, is estimated to save 22 Mtoe by 2020 and some 5 Mtoe additional savings from the broadening on the scope, based on considerations on three priority product groups (windows, commercial refrigeration and heating appliances). More than half of these savings would come from the heating and water heating appliances alone. The remaining part of the savings would come from the upgrading of the existing eight already existing regulations and from a new measure on televisions.

Though the new energy label was welcomed e.g. by the European Committee of Domestic Equipment Manufacturers (CECED), there were many reservations by environmental and consumer NGOs. They feared that the new labels are too confusing, which was demonstrated by surveys in six European countries by the British, Dutch and Swedish governments (EUBusiness 2010). Another survey conducted by the University of St. Gallen and GfK (Heinzle/Wüstenhagen 2010) also showed that the well-known A-G closed scheme has a greater impact on consumer decisions than an A+++ style label. The survey, which was based on 2,244 choice observations in Germany, clearly showed that introducing the new label with its additional categories weakens the effect of the label, resulting in lower awareness of consumers about energy efficiency as an important attribute. Taking this into account, the introduction of the new label should be accompanied by well-designed information campaigns in order to ensure that the understanding of the new label is improved. At the moment, however, based on the information in the MURE database (as of April 2012), it seems that there are no specific information activities with regard to the new energy label in the Member States ongoing.

There are, however, other European projects within the “Intelligent Energy Europe” programme looking more specifically at the implementation of the EU Labelling Directive at the national level. The “Come On Labels” project¹⁰ both gives information on promoting activities and on compliance control at the level of the EU Member States. It also includes some additional information on the Eco-design Directive.

¹⁰ <http://www.come-on-labels.eu/about-the-project/welcome-eu>

4.2. Financial and fiscal measures

Compared to the financial support given for energy efficiency investment in the field of space heating and hot water (see Chapter 3.2), there are relatively few financial and fiscal policy measures promoting the spread of energy-efficient electrical appliances in the residential and tertiary sector. Many countries providing extended financial support programmes with regard to space heating do not have this kind of measures for electrical appliances (e.g. Germany or Austria). In contrast to investments in the field of refurbishment of buildings, which often have very long payback times, the risk of free-riders is bigger when subsidizing consumer goods like electrical appliances, since the price differences in between the most efficient and non-efficient good is not always very large. This may be one major reason for this difference in the structure of policy measures. In addition, some of the few existing programmes are included in a broader instrument, as e.g. energy efficiency obligation schemes (see Chapter 4.4).

Another broad financial instrument supporting energy efficiency investment is an energy efficiency fund. Such funds have been established in a considerable number of Member States. In the MURE database, these funds are mainly described in the cross-cutting section, since they usually address more than one sector. Nevertheless, many of them also include specific programs addressing electricity consumption in residential and tertiary buildings. Such funds are established e.g. in Bulgaria, Czech Republic, Denmark, Germany, Greece, Malta, Norway (at local level), Slovakia, Slovenia or UK. In some countries, however, funds cannot be established due to constitutional issues (e.g. in Finland).

Some countries have introduced subsidies or tax incentives to promote energy-efficient household appliances or lighting (Table 3):

- In Hungary, a program for the replacement of electrical household appliances was in place in 2009, as a sub-program of the Green Invest System. The budget of the sub-program was 1 billion HUF (\approx 3.7 Million €).
- In 2009, the Government of Malta announced a scheme whereby a number of energy saving lamps (CFLs) would be made available free of charge to every household. This scheme was administered during 2009 and was terminated by mid 2010.
- In Bulgaria, a new measure is planned from 2012 providing credits for purchasing energy efficient electrical appliances. The approximate budget for the measure implementation until 2020 amounts to € 276 million.
- In Italy, fiscal incentives for energy savings in the household sector were also given for energy-efficient refrigerators and freezers and efficient lighting in non-residential buildings. The same law had created a ‘Fund for energy and efficiency savings’ with a budget of around one million Euro supporting an awareness raising campaign on appliance labelling, a standby campaign, a campaign for the replacement of incandescent light bulbs and measures to improve the energy efficiency of public lighting.

Table 3: Examples for financial and fiscal measures addressing electricity consumption in buildings

Country	Scope	Conditions	Budget	Impact
Bulgaria	Household appliances	Credits for purchasing energy-efficient electrical appliances.	276 million €	2016: 66 ktoe
Hungary	Household appliances	Max 225€ for Class A appliances, max 260€ for class A+ and A++ refrigerators (the last 10 percent of the subsidy was only paid after the successful termination)	3.7 million €	n.a.
Malta	Lighting in households	A number of energy saving lamps (CFLs) free of charge for every household	Not described	2010: 3.5 ktoe
Spain	Appliances	Mix of labelling, financial, training and informational measures to promote-efficient lighting in existing buildings. Target: substitution of 300000 appliances/yr	Public support 2011-2020: 500 million €	In 2020: 92 ktoe
Spain	Lighting in buildings	Mix of minimum efficiency standards, financial, training and informational measures to promote-efficient lighting in existing buildings. Target: replacement of 34 million incandescent light bulbs in households and acting on 200 million m2 of floor space area in buildings.	Public support 2011-2020: 192 million €	In 2020: 842 ktoe
Italy	Refrigerators and freezers, lighting in non-residential buildings	Incentive of up to 200 € for any A+ refrigerator and freezer purchased by 31.12.2007 and tax incentive of 36% for efficient lighting in non-residential buildings in 2009.		n.a.
Italy	Household appliances, standby, lighting	Campaigns addressing appliance labelling, reduction of standby consumption, and energy-efficient lighting.	Fund: 1 million €	n.a.
Luxembourg	Promotion of efficient refrigerators (A++)	Subsidies for the purchase of highly efficient electrical appliances	n.a.	2010: 0.25 ktoe

In Spain, the Action Plan 2011-2020, which makes up the 2nd National Energy Efficiency Action Plan (NEEAP), also includes two measures addressing electricity in buildings: a program for the substitution of electrical appliances and the promotion of efficient lighting. Both programs do not only include financial incentives, but a mix of regulative, financial, educational and informative measures. The measure is described in detail in the box below. It can also serve as a good example for a measure package addressing one targeted end-use (see Chapter 6.4).

Sample Case Spain - Action Plan 2011-2020: Improvement of the energy efficiency of the electric appliances stock and Improvement of energy efficiency of the indoor lighting installations in existing buildings

The Action Plan 2011-2020 presents a set of measures and actions coherent with the end-use and primary energy consumption scenarios included in other planning instruments, in terms of renewable energies and planning in the gas and electric power sector. In this way, the planning in the field of energy makes up a coherent set, leading to the end-use intensity improvement objective set at inter-annual 2% of period 2010-2020. The measures included in this Action Plan 2011-2020 will involve savings of final energy for 2020 worth 17,842 ktoe and of primary energy worth 35,585 ktoe, calculated with reference to year 2007 and in accordance with the methodology proposed by the European Commission. The Plan establishes a final energy saving objective of 2.867 Mtoe for the year 2020 in the Building and Equipment sector corresponding to the Services and Household sectors. This objective involves avoided emissions of around 12.120 MtCO₂. For these purposes, investments worth 27,322 M€ and public aids worth 2,883 M€ will be necessary.

Improvement of the energy efficiency of the electric appliances stock

The aim of this measure is to reduce the energy consumption through the improvement of the energy efficiency of the stock of household electrical appliances. The Renove Plans will focus on the electrical appliances (fridges, freezers, washing machines, dishwashers, ovens and induction and gas worktops) with both high energy consumption and low penetration of the best energy labelling available on the market. As a whole, it's expected to

substitute 300,000 electrical appliances/year which amounts to 3 million of units during the period covered by the Action Plan 2011-2020. In detail, this measure includes the following actions:

- Regulatory: The energy efficiency measurement of electric appliances and the information to be supplied to the buyer is regulated by the various Royal Decrees on energy labelling that European Directives and the EU Regulations transpose in this field. In this sense, the emergence of new European Directives or regulations to raise energy efficiency levels will be the base to guide the minimum requirements in the Renove plans to be implemented.
- Economic incentives, such as direct aids available through Renove Plans Calls, etc. The economic incentive is expected to encourage the buyer to decide to acquire more energy-efficient equipment.
- Training courses addressed to both sellers and buyers/users of household appliances, concerning the energy efficiency and labelling in household appliances, organised with the collaboration of associations of manufacturers, traders and consumers.
- Information on the most efficient equipment through Data Bases available on IDAE's Website. Other mechanisms, such as a system to guarantee the recycle and management of residues in accordance with the normative in force, once the equipment is removed.

Impact assessment: The ex-ante assessment of the impact of this measure on energy savings, the avoided CO₂ emissions, as well as the necessary investments and public aids during the period 2011-2020 brought the following results: the annual final energy savings in 2020 amount to 92 ktoe, the respective avoided CO₂ emissions (direct and indirect) to 493 kt; the total investments related to this measures are 800 million Euro between 2011 and 2020, the public support amounts to 500 million Euro.

Improvement of energy efficiency of the indoor lighting installations in existing buildings

The aim of this measure, considered as a priority one, is to reduce the energy consumption of the existing indoor lighting installations to be renovated in a way the minimum energy requirements established by the Technical Building Code (TBC) can be met, leading to a reduction of the energy consumption. The energy actions included in this measure shall be those achieving a reduction in the conventional energy consumption of the indoor lighting in existing buildings. This is to be done by means of actions on the technical installations (i.e. lighting fixtures, bulbs and equipments, switch start control gear and lighting level adjustment, change in the lighting system). A monitoring systems to evaluate the comfort conditions and the adequacy of the actions carried out is foreseen, too. The energy efficiency improvement of indoor lighting will involve acting on 200 million m² of floor space area in buildings of the tertiary sector all along the term of the Plan. Apart from this action, it will be necessary to replace 34 million incandescent light bulbs with efficient technology ones in the household sector.

The following actions will be carried out with a view to promoting the renewal measure of indoor lighting installations in buildings:

- Regulatory: the establishment of energy efficiency minimum requirements to be met by new lighting installations and the existing ones to be refurbished alike are the ones set forth by the Technical Building Code.
- An economic support line will be created on an annual basis, to be managed by each Autonomous Community, which shall contribute to the economic feasibility of the said measure. Preferential actions will be considered those affecting a high number of buildings, and also those to be implemented through "Renove Plans", aimed at specific actions to install high energy-efficiency devices and systems (as for example, to light up office buildings, condominiums, etc.). The aim is to link economic incentives with energy rating levels, especially when dealing with comprehensive rehabilitations.
- Training activities will be devised and implemented as a supplement to relation to this measure, which may consist in, only for indicative and non-restrictive purposes, in-depth courses aimed at designers, project management and the agents in charge of the external control of the energy policy in this issue, adapted to the functions each of them has to carry out in this process, and particularly relating to the handling of energy certification software for existing buildings.
- Information on the most efficient equipment and systems through databases on IDAE's Website.

Impact assessment: The ex-ante assessment of the impact of this measure on energy savings, the avoided CO₂ emissions, as well as the necessary investments and public aids during the period 2011-2020 brought the following results: the annual final energy savings in 2020 amount to 842 ktoe, the respective avoided CO₂ emissions (direct and indirect) to 4251 kt; the total investments related to this measures are 8763 million Euro between 2011 and 2020, the public support amounts to 192 million Euro.

4.3. Informational and educational measures

There are many different national and programs in the Member States which aim to change the consumer's behavior regarding his energy consumption and to be more concerned of energy efficiency in his purchasing decisions.

These programs follow many different concepts ranging from pure publication of information in brochures or booklets to mass media campaigns via internet and TV to monitoring and consulting of consumers by experts or smart metering and billing. In the following, some of these activities are described and show the variety of these programs.

The most common way for informational and educational measures is promoting more energy efficient usage through campaigns via print, internet and TV. Such campaigns were realized in almost all countries. Many examples can be found in the MURE database.

Another way to inform the consumer of energy efficient products is the introduction of voluntary labels like the "Blauer Engel" (Blue Angel) in Germany, which exists since 1977, or the Danish "Go'Energimærket" label, which is used on the market's 20% most efficient products of a category.

A step further goes the "EFEKT" program in the Czech Republic. The purpose of this program is to assist in the organizing of exhibits, professional courses, seminars and conferences regarding energy saving and renewable energy sources and subsidies such events with up to 60% of the total cost.

Smart metering programs are used to reduce the energy consumption in many countries within the EU. The meters will record the actual consumption of the consumer and send the data to a central system of energy providers which will be collected and processed. Such programs exist in smaller or larger scale in Ireland, Greece, Spain and Austria. In Austria, where 24000 smart meters were installed in 2010, these programs also go along with an informative billing program like in Norway. The Norwegian informative billing program aims to make the household aware of its electricity consumption by prescribing detailed demands for invoicing of grid services. The programme is estimated to save up to 3% of electricity consumption of participating households which results in 1.8 TWh/year.

The Austrian ongoing project "Wohnmodern" implements the direct consulting approach for modernization of large residential buildings. Advisers develop an analysis of the respective building, which involves important parameters in terms of efficiency as well as an inspection of the property. According to this information individual proposals for the refurbishment are offered. An assessment of the costs and the sponsorships helps the customer to make an objective decision.

Well-developed (permanent) consumer energy advice infrastructures are important measures, too. The Energy Saving Trust (EST) in UK has a very advanced advice programme and so have e.g. France and Sweden. Finland is building up such a system at the moment.

4.4. Energy efficiency obligations

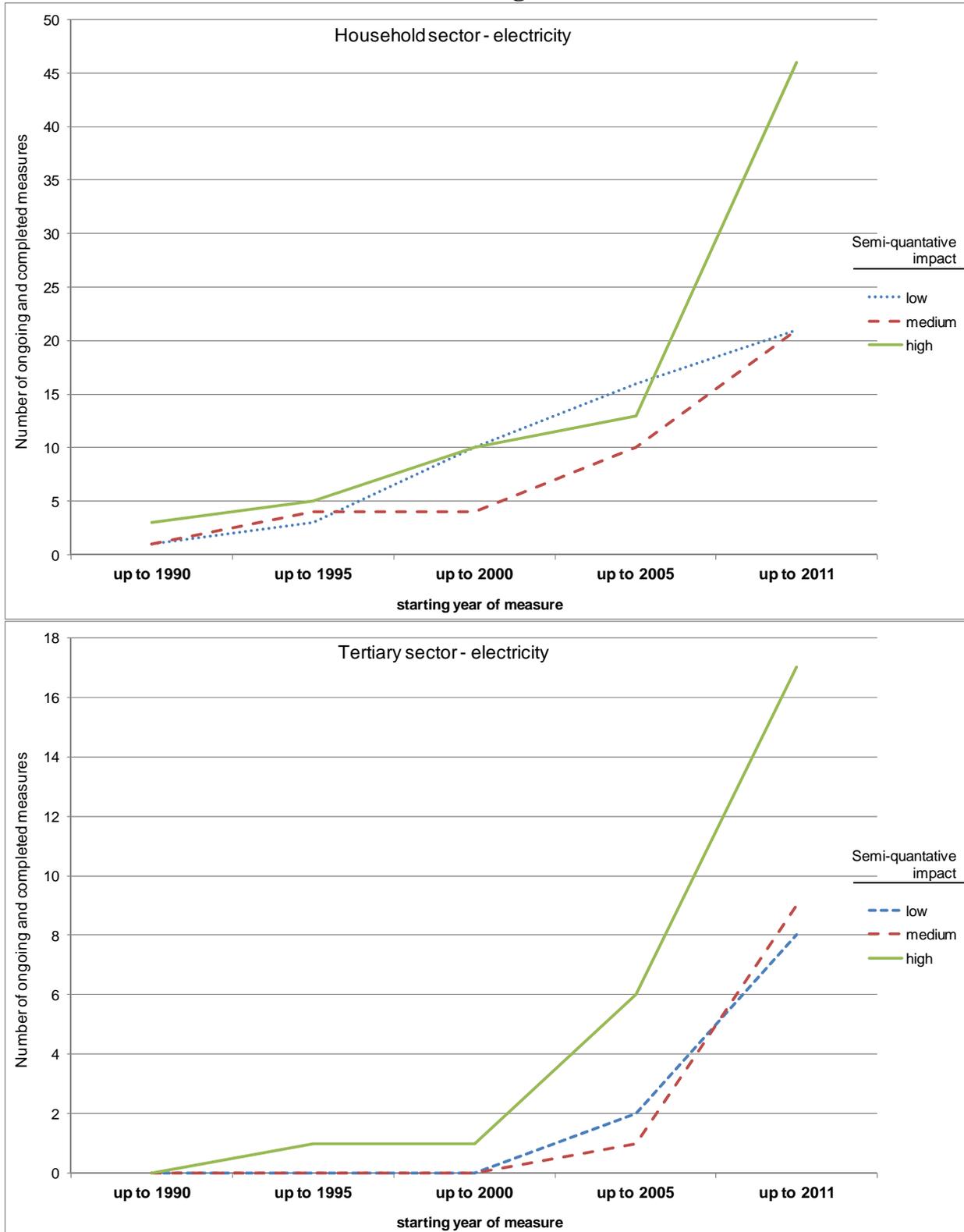
There is no energy saving obligation scheme with a special focus on appliances, likewise the British CERT scheme for buildings. Within this scheme, the eligibility of CFLs has ended, since every household in the UK has been delivered an average of 12 CFLs. Nevertheless except from this scheme, all the other saving obligation schemes also cover electricity use, nevertheless there are differences in the schemes' design, which hinder the implementation of electricity targeted measures. In France, the accounting of the cumulated lifetime savings of final energy favours long-lasting measures in the fuel sector. In contrast the focus on primary energy in Italy and the accounting of first year savings in Denmark favour electricity savings. In Denmark a lot of appliances have been excluded from the obligation scheme, for these measures are covered well by other policies, so the accounting of these measures resulted in deadweight effects.

4.5. Impact of policy measures addressing electricity consumption

In Figure 11 all measures addressing electricity consumption in residential and non-residential buildings are shown ordered by the semi-quantitative impact assessment since 1990. The share of high impact measures considerably increases for measures starting from 2005 or later, especially in the household sector. In the tertiary sector, this trend already started earlier.

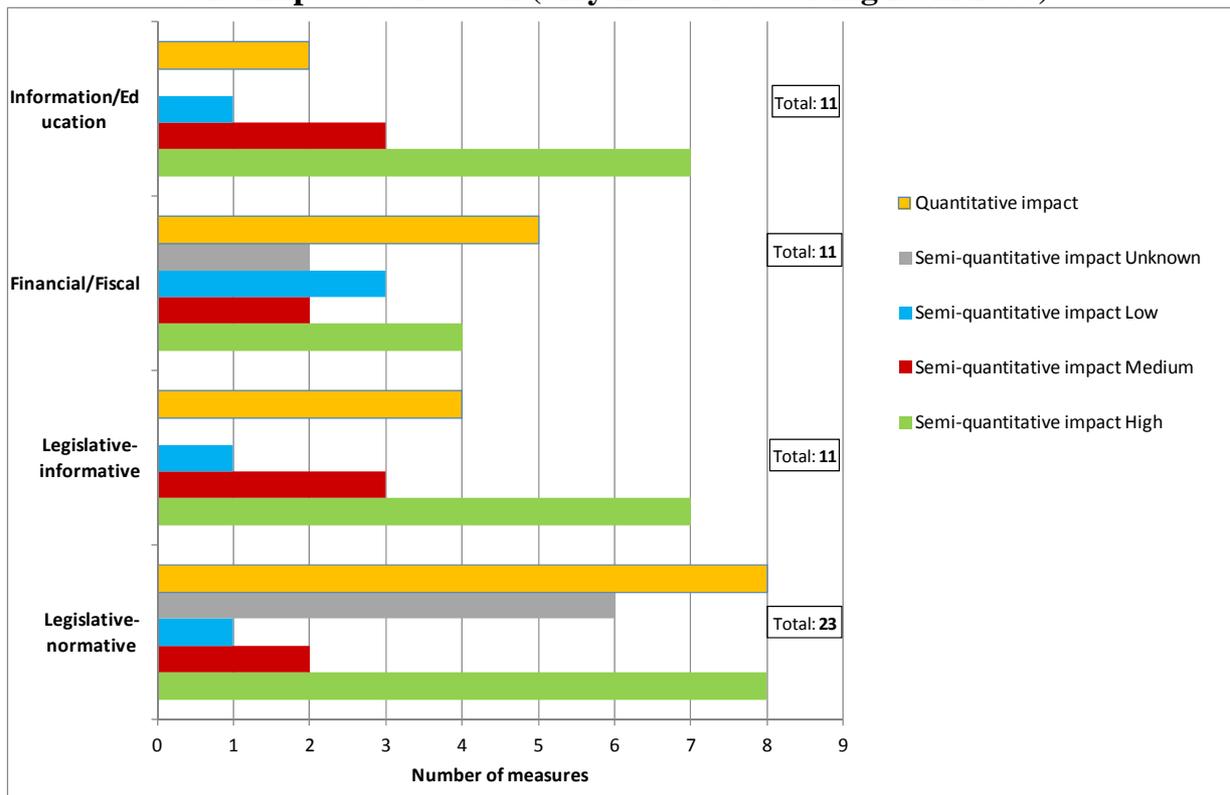
When looking at these measures by type, only taking into account measures starting from 2007, the starting year of the NEEAP, the high share of high impact measures in the field of information is astonishing at first sight (Figure 12). Around 60 % of these measures are ranked as high impact measures, whereas their share in the other categories (financial/fiscal and legislative normative) only amount to one third. This shows that information and education plays an important role for the improvement of energy efficiency of electrical appliances and lighting. On the other hand, the effective and especially the long-term impacts of these measures are very difficult to assess and multiplier effects must be taken into account, too. This becomes apparent when looking at the number of quantitative impact assessments available for these policy measures (Figure 12). Here, the share is the lowest for informative measures, whereas considerably more quantitative impact evaluations are available for financial and legislative-normative measures (mainly from the 2nd NEEAPs). Some results have already been described in the previous chapters.

Figure 11: Semi-quantitative impact of policy measures addressing electricity in buildings



Source : MURE (as of April 2012)

Figure 12: Policy measures addressing electricity in residential buildings by type and impact evaluation (only measures starting from 2007)



Source : MURE (as of October 2012)

5. Analysis of the quantitative impact of NEEAP measures in the building sector

In the following, the energy efficiency policies and measures of the NEEAPs of the EU Member States are analyzed at the aggregated level of EU-27. The focus of the analysis is again only on the building sector, including both space heating consumption (incl. sanitary hot water) and electricity consumption (excl. space heating and hot water). The measures included in the MURE database constitute the main analytical basis.¹¹ In addition, the savings reported in the 2nd NEEAPs¹² are also taken into account in order to get a more comprehensive picture of the reported savings and also to include the impact of top-down calculated savings.¹³

5.1. Methodological approach

The MURE impact quantification tool

In order to ensure a homogenous description of the quantitative impact of a policy measure in the MURE database, a table was developed including the following information, which should be given separately for each policy measure following the single measure approach of MURE (Figure 13):

- The specific end-use is targeted by the policy measure; if no specific end-use can be identified, the information can also be given for the aggregate electricity, fuel or final energy consumption.
- The categorization if the impact results from an ex-post or an ex-ante evaluation.
- The values from the impact evaluation: here, the year(s) of impact and if the value is compared to a fixed year or to a reference development can be chosen. The units are limited to Mtoe and kt CO₂eq., If a measure is classified as a NEEAP measure, it is recommended to take the quantitative impact figure from the NEEAP, if available.
- The starting year of impact, i.e. when the policy measure started to have an impact on final energy consumption.
- The evaluation method which was used to quantify the impact; here, MURE refers to the classification of possible evaluation methods which was developed within the IEE project “EMEEES” (Eichhammer et al. 2008).

¹¹ The status of the MURE database on which the analysis is based is as of March 2012. Since the database is continuously updated by the national MURE partners, the measures from the 2nd NEEAPs may not have been fully included for a few Member States, though the present number of NEEAP measures implemented in MURE is rather comprehensive, especially in the household sector (see Figure 2).

¹² All National Energy Efficiency Action Plans (NEEAPs) submitted by the Member States under the ESD can be found under http://ec.europa.eu/energy/efficiency/end-use_en.htm.

¹³ For the measurement of the overall improvement in energy efficiency and the impact of individual measures, a harmonized calculation model which uses a combination of top-down and bottom-up calculation methods shall be used (see Annex IV ESD). The focus of the MURE Measure Database is on policies, i.e. the impact quantification reported in MURE is restricted to bottom-up calculated savings for a single policy measure or a bundle of measures referring to a specific end-use. Energy savings, which are calculated top-down using energy efficiency indicators based on statistical data are not considered in MURE.

Figure 13: Impact quantification table for policy measures in the MURE database

Mure II Household - New Measure - Targeted End Use Attributes - Step 3 of 3								
Targeted End Use	Type of Impact	Impacts in different years (in PJ / kt CO ₂ eq.) compared to a fixed year or a reference development				Starting year of impact	Evaluation method	Comment
Total fuel consumption	Ex-post	Year of impact	2016	2020				
		Compared to	Fixed year	Fixed year				
		PJ						
		kt CO ₂ eq.						
Total electric consumption	Ex-post	Year of impact	2016	2020				
		Compared to	Fixed year	Fixed year				
		PJ						
		kt CO ₂ eq.						
Appliances and lighting	Ex-post	Year of impact	2016	2020				
		Compared to	Fixed year	Fixed year				
		PJ						
		kt CO ₂ eq.						

Though this structure, which was also described in detail in the MURE Guidelines (Schlommann & Eichhammer 2011), helps to ensure a homogenous description of the quantitative measure impact in the MURE database, the actual variety of the use of impact evaluation methods by the Member States in their National Energy Efficiency Action Plans (a first overview is given by Bukarica & Suomi 2012) limits a fully harmonized analysis of the quantitative measure impact based on the information included in the MURE database:

- A strong limitation is the complete missing of bottom-up evaluated policy measures if a Member State only uses top-down methods for the reporting, as it was the case for 4 Member States (Bukarica & Suomi 2012). If a combination of top-down and bottom-up methods was used, this information may at least be missing for some sectors or end-uses.
- If bottom-up methods were used for the reporting, this does not ensure that the quantitative impact information is available at the level of single policy measures, as they are described in MURE. A considerable number of NEEAPs only reports on measure packages including a certain number of policy measures. The main tool how to handle these cases in the MURE database is the comment field in the last column of the impact quantification table (Figure 3). Here, it is described if a given quantitative impact only refers to a single policy measure or to a bundle of two or more policies. In order to avoid double-counting of measure impacts, an analysis based on MURE always has to take into account the given quantitative impact and the scope of this impact described in the comment field.
- In order to have at least semi-quantitative impact evaluation criteria, which is, however, homogenous between the policy measures and has a broader coverage of measures, a semi-quantitative expert judgment was introduced in MURE, distinguishing between three impact levels: low – medium – high. These levels are defined as percentage of overall final energy or electricity consumption of a final energy consumption sector.

The MURE simulation tool

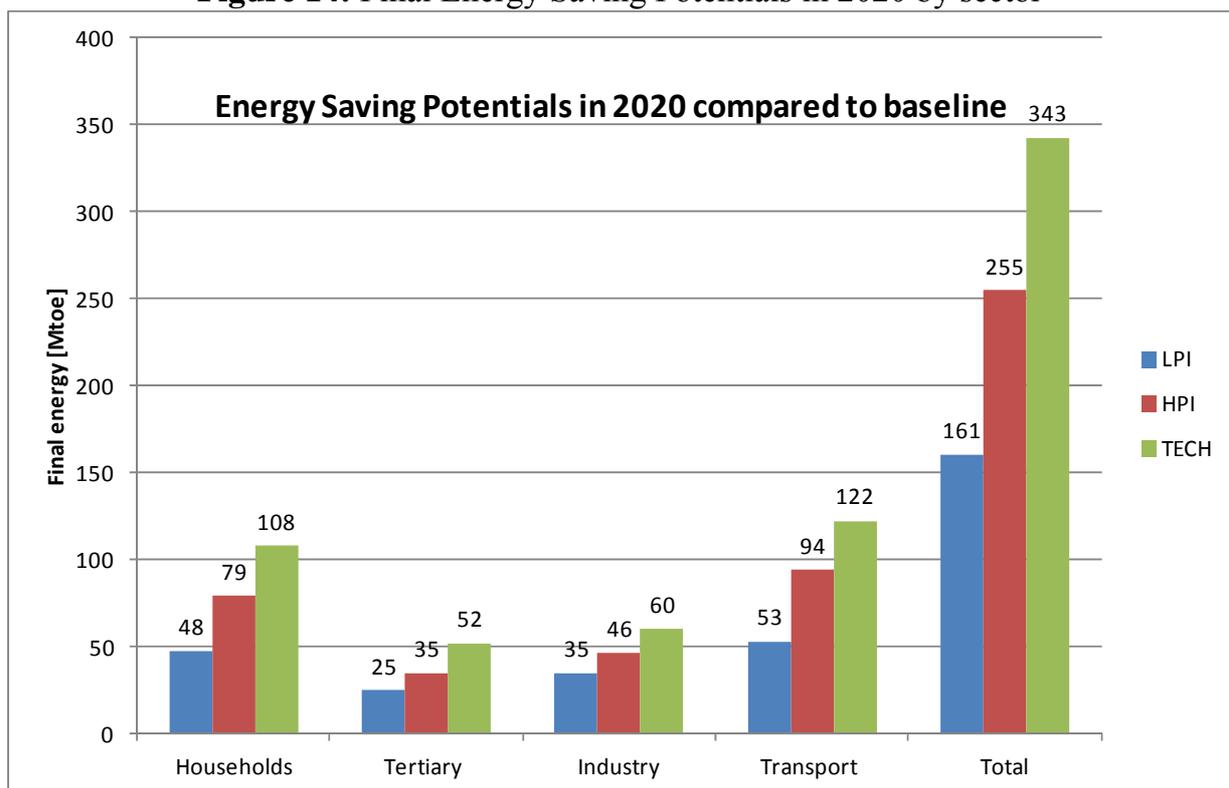
Within MURE, a simulation tool was developed, too, to carry out calculations of final energy saving potentials covering all EU Member States. This tool was the methodological basis for the calculation of energy saving potentials in a study on behalf of the European Commission (Eichhammer et al. 2009). MURE comprises modules for the following end-uses: residential and tertiary buildings, electrical appliances in the household and tertiary sector, IT appliances, process and cross-cutting technologies in industry, and transport sector (Eichhammer et al. 2009). The energy saving potential study considered four scenarios:

- A baseline scenario which extrapolates autonomous technical progress and also includes the impact of past energy policies; the economic drivers for the baseline scenario were taken from the PRIMES model (European Commission 2008).
- A low policy intensity scenario (LPI) which implies continued high barriers to energy efficiency, a low policy effort to overcome the barriers and high discount rates for investments in energy efficiency.
- A high policy intensity scenario (HPI) which implies removing barriers to energy efficiency, a high policy effort to overcome the barriers and low discount rates for investments, options are economic on a life cycle basis.
- A technical scenario (TECH) which includes also more expensive but still fairly realistic energy saving technologies.

As a result, three final energy saving potentials were calculated, compared to the energy consumption in the baseline scenario (see Figure 14). These potentials will be compared to the savings reported in the MURE database and in the 2nd NEEAPs at the level of end-uses, thereby mainly focusing on the building sector. The comparison will be made in relation to the HPI potential, since this scenario best reflects the idea behind the EU regulations on energy efficiency, which also implies a relatively high policy effort to remove barriers to energy efficiency.¹⁴ A direct comparison of the EU 20% target with these potentials is, however, not possible since the 20% target is a primary energy target also including the conversion sector and renewable energies, whereas the potentials here are pure demand side potentials. Nevertheless, the comparison of the potentials with the baseline shows that the HPI reaches 22% energy savings in 2020 and therefore is relatively near to the 20 % target (Eichhammer et al. 2009).

¹⁴ In Ecofys & Fraunhofer ISI (2010) it was also shown that the HPI scenario is robust in regard to a change in the baseline due to the economic recession which was not taken into account in the PRIMES 2007 baseline against which the potentials in Eichhammer et al. (2009) were calculated.

Figure 14: Final Energy Saving Potentials in 2020 by sector



Sources : Calculations Fraunhofer ISI based on Eichhammer et al. 2009, Ecofys & Fraunhofer ISI 2010, Boßmann et al. 2011

5.2. Impact analysis

Since the MURE Measure Database is structured by single energy efficiency policies, only the impact of bottom-up (BU) evaluated measures from the NEEAPs can be drawn from the MURE database. In order to avoid double-counting, the impact of measure packages is only accounted for once. In addition, not all Member States were represented with quantitative impact evaluation when these calculations were carried out (as of March 2012). Therefore, the energy savings reported in the 2nd NEEAPs were also taken into account directly from the NEEAPs¹⁵ in order to get a more comprehensive picture of the reported savings and also to include the impact of top-down (TD) calculated savings. Top-down savings, however, were only taken into account for those Member States where no bottom-up calculations were available for the building sector (regardless whether Member States officially reported bottom-up or top-down savings). The top-down saving generally include the impact of autonomous progress and of energy efficiency policies previous to the period under consideration. A separation between the heating sector and electrical appliances at this level was not possible since not all NEEAPs allowed a clear differentiation by end-uses. In some NEEAPs, even a distinction between residential and tertiary buildings was not possible since only the impact on the total building sector was quantified. In that case, all savings are already included in the residential sector.

¹⁵ http://ec.europa.eu/energy/efficiency/end-use_en.htm

Table 4: Overview of final energy saving in the building sector reported in the 2nd NEEAPs

Unit	Residential sector			Tertiary (incl. Public) sector			Total Building Sector		
	Heating	Electricity	Total	Heating	Electricity	Total	Heating	Electricity	Total
	Mtoe								
MURE-NEEAP measures	Based on information from 15 EU Member States			Based on information from 12 EU Member States					
2016	25	4	28	5	2	7	29	6	35
2020 (projection)	34	5	39	7	3	10	41	8	49
NEEAPs: only BU	Based on information from 19 EU Member States			Based on information from 18 EU Member States					
2016							7		
2020 (projection)	46			10			56		
NEEAPs: incl. TD	Based on information from 23 EU Member States			Based on information from 21 EU Member States					
2016	50			9			58		
2020 (projection)	69			12			81		
Saving Potentials (HPD)	All EU Member States (EU-27)			All EU Member States (EU-27)					
2016	51	5	56	18	7	24	69	12	81
2020	72	7	79	24	11	35	96	18	114

Sources: MURE Measure Database; National Energy Efficiency Action Plans of the EU Member States; Eichhammer et al. 2009; Ecofys & Fraunhofer ISI 2010; Boßmann et al. 2011; own calculations Fraunhofer ISI

In total, bottom-up calculated final energy savings in the residential and tertiary sector (including public sector, excl. agriculture) of around 40.6 Mtoe are calculated from NEEAP measures in MURE for the year 2016, the target year of the ESD. Most of these savings (around 80%) in the MURE database are assigned to residential buildings though this implies a certain amount of inaccuracy since in some NEEAPs the savings for residential and tertiary buildings are not or not fully separated so that all savings were assigned to the residential sector. This result is based on bottom-up calculated energy savings in 19 NEEAPs, which provide bottom-up calculated energy savings at the level of end-use sectors. If also adding the top-down calculated savings for the residential and tertiary sector from 4 additional NEEAPs (Bulgaria, France, Greece, Netherlands)¹⁶, the total savings for the building sector in the year 2016 amount to around 64.5 Mtoe. An overview of the final energy savings calculated under these assumptions gives Table 4. Nevertheless, the limitations of the quantitative analysis due to the very diverse use of top-down and bottom-up evaluation methods in the actual NEEAPs described above have to be taken into account. This both limits the number of Member States which could be included in the analysis and the division of the building sector in residential and tertiary buildings, which could not be fully separated due to a partial lack of quantitative information. This means that the values given in Table 4 only show a rough order of magnitude of possible measure impacts and not a full impact analysis due to methodological limitations.

¹⁶ In 2 NEEAPs (Germany and Latvia), both bottom-up and top-down calculated are shown in the NEEAP; in that case, the BU-value was taken. For 4 EU Member States (Poland, Portugal, Romania, Slovakia), no impact evaluation could be taken into account since savings at the sectoral level were only quantified for interim years of the ESD (2010 and/or 2013) or the NEEAP was not available in English.

In order to compare these savings with the EU 20% saving target for 2020, a rough projection of the 2016 figures was also made for 2020, using a projection factor of 1.4.¹⁷ This factor is based on a linear projection of the savings from the active period of the ESD up to 2020. This rough approach for projection may be justified in a first order, as the larger part of the measures address the buildings, where the build-up of the savings is rather linear over time well beyond the end of the ESD period in 2016. Based on bottom-up quantifications, total savings in the building sector of 58.15 Mtoe are projected for 2020 from the NEEAPs (based on 19 countries), which is not far from the savings of 49.17 Mtoe (based on 15 countries) projected from the information in the MURE database (see Table 4). When also taking into account top-down calculated savings from 4 additional Member States, the total final energy savings amount to in the building sector in 2020 amount to almost 83.6 Mtoe (Figure 14). This would be, only in the building sector, around 40 % of the total (primary) savings of 200 Mtoe which are still missing in order to achieve the EU 20% target for 2020. However, it must be taken into account that all the calculations shown here are based on final energy, thus not taking into account the impact of renewable energies and the conversion sector, whereas the EU 20% saving target is based on primary energy. Furthermore, the missing energy savings for the EU 20% 2020 are by nature savings from 2006 additional to baseline projections, whereas the 83.6 Mtoe from the NEEAPs include a part of the baseline savings and some early energy savings before 2006 as explained below.

When comparing the reported savings with the saving potentials calculated in the High Policy Scenario (see Figure 14 and Table 4), around 70 % of the estimated savings in the building sector are already exploited if both bottom-up and top-down savings are included. When only taking into account BU measures, the exploitation rate is around 50%. However, an important point to note is that the NEEAPs also include so-called “Early Action”, that is policy measures but also often individual action initiated in the period 1995-2007 which still have an impact in 2016. This is the case, for example, for most thermal building regulations from that period which have a long-term impact. Only few NEEAPs provide enough information to separate clearly “Early Action” from new measures taken in the period since 2008. In addition, the top-down savings included do in general include also autonomous progress as the top-down indicators used are not corrected for such savings. This is evidenced by the comparatively large savings added by the four additional countries applying the top-down method. They increase the savings from the 19 countries with BU approaches by around 64%. The bottom-up savings reported contain generally only policy measures; hence autonomous development is largely excluded (though it may in some measures be included to some degree in the form of free-rider effects, i.e. part of the impacts included are not a direct consequence of the measure but may have occurred anyhow). Previous estimates of the authors based on the first NEEAPs showed that on average up to one third of the measure impacts included in the NEEAPs may be due to Early Action. For example the German NEEAP comprises 45% energy savings from Early Action in the Residential/Tertiary sector (electricity conversion factor 1), the NEEAP of Luxembourg 41%, the NEEAP of the UK an estimated third of the savings, the NEEAP of Austria 42% (residential sector only) and the NEEAP of Sweden 66%. The savings from the High Policy Scenario on the contrary do not include Early Action and are additional to a

¹⁷ Only in a few NEEAPs (Denmark, Finland, France, UK) energy savings are also reported for 2020.

Business-As-Usual-Scenario which comprises autonomous progress. With regard to electrical appliances, the saving potential especially in the residential sector is more extensively tapped by the NEEAP measures than for measures addressing energy consumption for heating purposes (Table 4), but less extensively in the tertiary sector.

6. Designing efficient policy packages in the building sector addressing the financing needs and policy interactions

6.1. Financing energy efficiency policy measures in the building sector

6.1.1. Financing needs

The study “The upfront investments required to double energy savings in the European Union in 2020” (Ecofys & Fraunhofer ISI 2011) identified the additional investment costs to improving energy efficiency in the European Union with 200 Mtoe in 2020. Such an improvement would bridge the gap between current expectations of energy use in the European Union in 2020 and the targeted energy use, as derived from the EU’s 20% energy savings target. Moreover, realising 200 Mtoe of energy savings in 2020 would save 540 Mt of CO₂.

Additional investment costs as determined in that study, for instance in the case of an energy efficient car, relate to the difference in purchasing costs between the efficient car and a car without such energy efficiency features. The study looked at the total amount of cash required to do the investment. No amortization was applied. As a best estimate for the **total additional investment** to realize 200 Mtoe of additional energy savings in 2020 across all sectors, the study finds a number of €900 billion over the period 2010 – 2020. Though an uncertainty range from €800 – 1200 billion was estimated in the study by combining data from several studies on this topic, both bottom-up and top-down. The breakdown of the €900 billion is as follows:

- buildings: €400 billion (uncertainty range €350 – 650 billion);
- transportation: €400 billion (uncertainty range €300 – 500 billion);
- industry: €100 billion.

The sectors contribute respectively some 50% (buildings), 30% (transportation) and 20% (industry¹⁸) to the overall savings of 200 Mtoe in 2020 (Table 5).

Table 5: Distribution of required upfront-investments and cost-effective energy savings over sectors

	Energy savings (in 2020)	Total upfront investments
	200 Mtoe	€900 billion
Built environment	50%	44%
Transport	30%	44%
Industry	20%	11%

Source: Ecofys & Fraunhofer ISI 2011

The uncertainty in the investments numbers is highest in the buildings sector because it has a big impact on costs whether retrofit is carried out in conjunction to regular refurbishment or not. **The study assumed that most of the energy efficient retrofitting can be done in connection to refurbishment that will occur anyhow. If**

¹⁸ This includes savings in refineries and the power sector

this is not the case, costs will become higher as evidenced by the studies cited below. Note, that the €900 billion of additional investments generate 200 Mtoe of energy savings in 2020. But the majority of the savings measures will also generate energy savings (and financial revenues) beyond 2020. As a result, all measures considered in that study are cost-efficient. This means that over the lifetime of measures, annual revenues from energy savings measures exceed the annualized investment (and operation and maintenance) costs (Ecofys & Fraunhofer ISI 2010). Indeed, when amortizing the overall required investments over a period of 20 years, reflecting the average lifetime of the mix of measures, against a 4% discount rate, annual investment costs amount to €66 billion a year (nearly half of this is required in the building sector). The study estimates that this is compensated by an average €135 billion lowering of annual energy bills. As a result, the net annual energy bill for European end-users is lowered with almost €70 billion per year.

More in detail the following two studies show the important up-front investments required in the building sector as compared to the other sectors and the dependency of the required investments on the assumptions.

2050 Climate Roadmap

The 2050 Climate Roadmap of the European Commission provides investment data per sector for the baseline scenario and for a set of low-carbon scenarios (European Commission 2011b; section 7.11). Average yearly investments per sector are provided for the baseline as well as for the low carbon scenarios. The differential investments (low carbon scenario versus baseline) provide a value for the additional investment needs in the low-carbon scenario. The average annual (differential) costs over the full 2010-2050 period were applied to the 2010-2020 period. Results are provided in Table 6 (the transport sector is excluding electric cars which require much higher investment cost). For the building sector aggregate investments of 765 billion Euro are required for the period 2010-2020.

Table 6: Upfront investments (2010-2020) estimated from EU 2050 Climate Roadmap (excluding electric cars), in billion Euro

	Average investment/yr (2010-2050)*	Average over period: (2010-2020)	%
built environment	77	765	60
transport	47	473	37
industry	3	30	2
Total	127	1268	100

* for transport average from 2010-2030 period

Note: the built environment measures may include some non-energy savings related measures such as the use of biomass. Built environment investments needs seem to refer (at least partially) to additional energy related investments in that study.

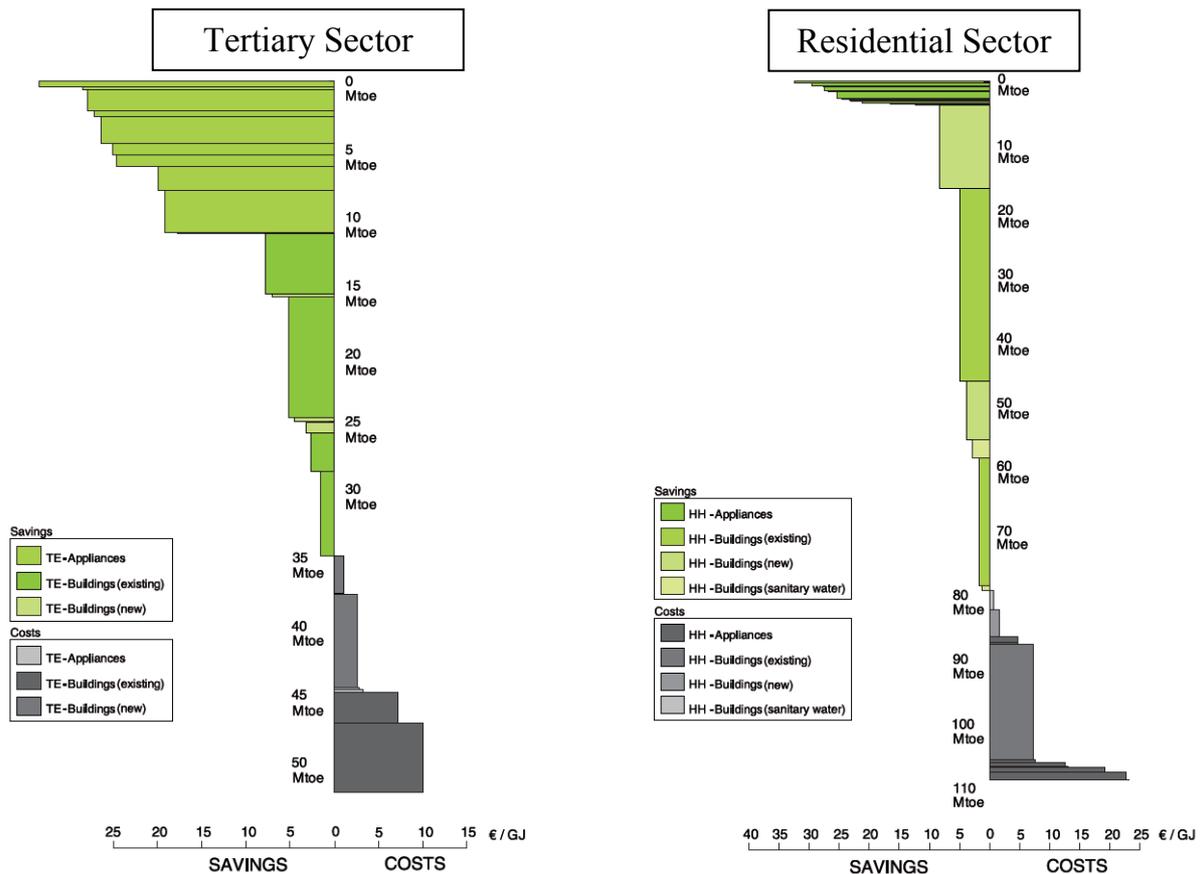
Source: Ecofys & Fraunhofer ISI 2011

Energy Savings 2020 study

Another study looking in more detail at the economics of energy efficiency investments in the different sectors was the Energy Savings 2020 study. The EU economy wide marginal abatement cost-curves (MACC) established by Fraunhofer ISI et al. (2009) and published in the Energy Savings 2020 report (Ecofys & Fraunhofer 2010) provide a cross-sectoral source of information for upfront investments needs.

Figure 15: Overall MACC for energy efficiency options in the EU 27 in 2020

EU 2020 Marginal Abatement Cost Curve for the Built Environment



Note: Energy savings are expressed in final energy units. Energy savings (Y-axis) are relative to the baseline. Cost savings are to the left and net positive costs to the right.

Source: Ecofys & Fraunhofer ISI 2011

The MACC shown above for the built environment were calculated as follows. Differential investment costs of individual technologies and measures were annualised with discount factors and investment lifetimes varying according to the application. To the annualised investments differential maintenance and operational costs (O&M) were added (however, this is a very small amount, as energy efficient technology require usually the same amount of O&M or less than the standard technology). Finally the annually saved energy flow was converted to a financial flow considering energy prices for each energy carrier and each application. All prices were specified in the same price unit (€2005). The difference between the annual investment and O&M costs and annual financial revenues from energy savings in 2020 results in net € costs or savings per unit of saved energy for each technology or measure. When all the technologies and

measures are sorted by increasing net costs per unit of saved energy, this results in the MACC shown in above. From this work upfront-investments can be extracted (Table 7). The cumulative overall investment required for the period 2011-2020 to save 200 Mtoe of energy in 2020 (in primary energy terms) is around €1600 billion. The residential sector carries almost 50% of the investments, followed by the transport sector with 27%, the tertiary sector with 17% and the industry sector with 7%. In the building sector the lion share comes from the existing buildings. The estimates for the upfront investment are higher than for the Roadmap, as well as for a variety of other studies, which – among other reasons - is due to the fact that some of the investments in the building sector are charged with full costs instead of differential costs, especially in the case of an enhancement of the thermal building renovation rate.

Table 7: Cumulative energy efficiency investments (2011-2020, billion €₂₀₀₅) and energy savings

	Investments 2010-2020	HPI potential (final)	HPI potential (primary)
	€ billion	Mtoe	Mtoe
All sectors	1633*	166	216
Households	797	52.8	70.2
Appliances	20	2.4	6.1
New Buildings	264	14.9	19.4
Existing buildings	481	33.2	40.7
Hot water	31	2.3	4
Tertiary sector	284	23.2	34.4
Appliances	59	7.5	18.6
New Buildings	17	0.8	0.8
Existing buildings	208	14.9	14.9

Note that the potentials mentioned are the remaining potentials for the period 2011-2020

Source: Ecofys & Fraunhofer ISI 2011

6.1.2. Is there a need for private sector financing in the building sector?

The differential financing requirements established in the previous section may be financed by different sources¹⁹:

- **State budgets:** this is for example the case of a number of subsidy programmes described in the MURE database such as the KfW programme in Germany. The large drawback of this type of financing is that in times of tight state budgets it will be difficult to find the additional investments as the costs cannot be easily passed on to the tax payers although the energy savings will at the end relieve the pressure on the economy from reduced energy costs. It seems unlikely that through this path all the investment needs identified in the building sector could be covered. The advantage of this type of financing is that the means can be directed towards deep renovations.

The following examples from some EU Member States show, however, that there is clear evidence on a drawback of this kind of financing from public sources in times of an economic crisis and the resulting budget cuts in many countries.

¹⁹ For much more complete overviews on this issue see in particular BPIE (2012) and Rezessy/Bertoldi (2010)

Example Austria: National recovery plan / renovation voucher Austria (“Sanierungsscheck”)

Subsidies are provided for measures to improve thermal insulation (building shell as well as windows and doors) and to improve the weather generation systems of residential buildings and commercially used buildings that were erected before 1 January 1999 or which are at least 20 years old. Household action 2009: The maximum subsidy level amounts to 20% of the (thermal) renovation costs and/or a maximum amount of EUR 5 000. Household action 2011: The maximum subsidy level amounts to 20% of the (thermal) renovation costs and/or a maximum amount of EUR 5 000 plus EUR 1 500 in the case of conversion from heat generation systems to systems based on renewable energy sources. Companies: Subsidy of 30% at most for small and medium-sized enterprises, for at most 40 % of the investment costs.

Budget and financial resources:

- 2009: households and businesses 50 million euros each
- 2010/11/12: households 70 million euros, businesses 30 million euros

Financed by the Federal Ministry of Economy, Family and Youth, the Federal Ministry of Agriculture, Forestry, Environment and Water Management. The Austrian government has foreseen financial means up to 2016²⁰ but the budget decision is taken every year. The action was reconducted in 2012 with the explicit argument that building rehabilitation triggers economic growth in addition to reducing the energy bill²¹. During the action 2011 around 17.500 houses and apartments were rehabilitated in the residential sector (0.5% of the total stock of around 3.6 million dwellings, leveraging investments of about 690 million Euro. Despite the fact that the subsidy was reconducted, this example shows that the visibility of such type of financing has a time horizon limited to one year, or at best a few years which also hampers the development or energy service businesses.

Example France: The impact of the economic crisis on building policies and measures:

In the wake of the economic crisis, some financial measures addressing energy efficiency were adapted as e.g. the sustainable development tax credit or the zero rated eco-loan. Nevertheless the commitments by the environment round table in 2007 have been respected and the crisis did not cause an important decrease in the financial means for energy efficiency measures in the building sector. In addition, in order to mitigate the impact of the crisis on low-income households, France strengthened actions to hinder energy poverty.

Sustainable development tax credit: Following the environment round table, the draft Finance Law for 2009 renewed this mechanism until the end of 2012 and extended it to social landlords. Since its introduction, the list of equipment eligible for a sustainable development tax credit and the rates applied were regularly revised in order to speed up the pace of 'minor' thermal renovations and encourage the use of the most efficient technologies. For example, the level of a tax credit for condensing boilers decreased from 25% to 15% between 2006 and 2010. The tax level for thermal insulation products also decreased and in parallel the admissible performance's products increased.

Zero rated eco-loan: This loan is available since 1 April 2009. It was designed for owner-occupiers or landlords to finance major renovation work in existing buildings. Until 31 December 2010 it was possible to combine zero-rated eco-loans and sustainable development tax credit.

Energy efficiency obligations (white certificates): The impact of the economic crisis on energy efficiency certificates is difficult to estimate. Up to now, there were two periods and the target has been multiplied by about six for the second period (54TWh CUMAC vs 345 TWh CUMAC). This target in the 2nd period resulted from a huge consultation process and it was not only only deduced from the present economic context.

The ‘Live Better’ programme, managed by ANAH, was given €500 million from Future Investments, which will be supplemented by ANAH financing estimated at €850 million. It allocates aid additional to that provided by ANAH to low-income owner-occupiers (aid of between €1,100 and €1,600) carrying out work that enables an energy efficiency gain of at least 25%. It also provides for specific support, with a subsidy of between €300 and €430. The ‘Live Better’ programme should allow for around 300,000 building refurbishments between 2010 and 2017.

Example Belgium:

The *federal tax reductions and tax credits* for energy efficiency investments in private households, which is the most important support for that kind of investment in Belgium, have been stopped from 1st January 2012 for budgetary reasons. The only exception is roof insulation, for which it remains, but only to a reduced extent. The decision was presented as a transfer of competence to the Regions, but the related budgetary means have not been transferred and private households have not been able to benefit from the measure since then.

²⁰ http://www.publicconsulting.at/kpc/de/home/aktuelles/sanierungsoffensive_2012/

²¹ <http://www.bmwfj.gv.at/energieundbergbau/energieeffizienz/seiten/NeuerSanierungsscheck.aspx>

Example Portugal:

In the wake of the economic crisis, some fiscal benefits were removed or even eliminated in Portugal: In 2010, the VAT for the acquisition of renewable energy equipment for residential sector (solar thermal, photovoltaic, biomass and biogas boilers for DHW and space heating, wind turbines up to 5kW) was reduced to 13%. Since 2011, the VAT rate has been raised to the standard rate of 23%.

Concerning the *Personal Income Tax*, in 2010 the Portuguese State's Budget has established a fiscal deduction for the purchase of renewable energy equipment as well as for the equipment to improve thermal behavior of buildings, such as application of thermal insulation (outside or the inside) including roofs (roofs or slabs), walls and floors adjacent the ground or to no conditioned spaces and replacing single glazing for double glazing with frames of thermal break, up to 30% the purchase price and up to a maximum of 803€.

In 2011, however, the same tax benefits was only applied to taxpayers with lower incomes. For the other taxpayers, the tax benefits have fallen from 803€ to 100 €, and to zero for classes with highest incomes. Since 2012, there is no tax benefit either for expenses with renewable energy equipment either for the equipment of thermal improvement of buildings as concerns the Personal Income Tax. The fiscal deduction was completely eliminated.

- **Financing from state-like budgets**, e.g. the use of income from the emission trading scheme to finance energy efficiency investment. The drawback of this financing source is that it is heavily dependent on the CO₂ price, the advantage that is independent from the direct state budget. However, the temptation is large for governments to use such income not in a dedicated manner for energy efficiency options. In order to finance the large investment volumes required for building rehabilitation, the CO₂ price should be considerably higher than present levels in order to contribute substantially to the annual investment needs identified above. The impact of decreasing CO₂ prices on this type of financing is show below at the example of a subsidy programme for thermal building rehabilitation in Germany.

Example: KfW Thermal building rehabilitation programme in Germany (“KfW Programm Energieeffizient Sanierung”)

In Germany it was the intention to use the whole of the expected 3 billion Euro of annual income from the ETS (at around 15 Euro per t CO₂) to finance energy efficiency investment, especially in the building sector. The income should serve a newly established fund, i.e. the Energy and Climate Fund („Sondervermögen Energie und Klima“). For 2012, according to the German Ministry of Finance (BMF 2012) only 50% (expenditure) respectively 60% (commitment authorizations) of the originally foreseen budget could be committed. In order to maintain the level of expenditures for the building rehabilitation programme of 1.5 billion Euro annually between 2012-2014, special loans had to be given from the federal budget which have to be reimbursed later on. At a moment in early 2012 a cut of expenditure from 1.5 to 0.9 billion Euro was under debate. Other parts of the energy efficiency subsidies and other programmes were cut on average by around 30%. The following table shows that the Ministry of Finance expects an income from the emission trading scheme for 2013 to 2016 of 9.7 billion Euro (based on CO₂ prices ranging from 10-12.4 Euro/t CO₂), while the original expectation of 15 Euro/t CO₂ would have led to 12.8 billion Euro available and the present price of around 7 Euro/t CO₂ would lead to only around 6 billion Euro available. In total such type of developments and other factors of impact lead to a rather variable financing of the building rehabilitation varying from a rate of around 1% of the annual building stock in 2010 to only half of that in 2011 which is hardly compatible with the steady development of a market.

Expected development of the income of the Special Fund Energy and Climate Fund in Germany 2013-2016 (million Euro)

	2013	2014	2015	2016	Total 2013-2016
Number of Certificates	218	214	212	210	854
Income at CO ₂ price assumed by the Finance Ministry	2180	2400	2500	2600	9680
Assumed price of certificate	10	11.2	11.8	12.4	
Income at 15 Euro/t (originally expected)	3270	3214	3178	3145	12807
Income at 7 Euro/t (present price level)	1526	1500	1483	1468	5977

Source: Monthly report July 2012 of the German Federal Ministry of Finance BMF (p.19)
http://www.bundesfinanzministerium.de/Content/DE/Monatsberichte/2012/07/Downloads/monatsbericht_2012_07_d_eutsch.pdf?__blob=publicationFile&v=4; own calculations

Development of the renovation rate and resulting energy and CO₂ savings from the KfW Thermal building rehabilitation programme 2005-2011

	2005	2006	2007	2008	2009	2010	2011
Building units (thousands)	70.1	155.4	88.6	134.3	363.0	342.8	181.0
Share in building stock	0.19%	0.41%	0.23%	0.35%	0.95%	0.92%	0.49%
CO ₂ -reduction (kt/a)	340	700	330	546	955	847	457
Final energy savings (ktoe)	58	131	81	132	230	211	107

Source : KfW Monitoring Report 2012
http://www.kfw.de/kfw/de/I/II/Download_Center/Fachthemen/Research/PDF-Dokumente/Evaluationen/Monitoring_EBS_2011.pdf

- **Leveraging of private investments from companies in the energy sector** through energy saving obligations/White Certificates: From a financial point of view, one main advantage of these systems is the opening new, more stable, financing sources. Private investments are leveraged and energy companies may possibly develop into energy service companies. At the end, however, the costs will be passed on to the consumer if no special provisions are taken or additional state funds are pumped into the system. Another possible disadvantage is that mainly shallow refurbishments could be undertaken if the design of the system does not prevent this effect.

Example: Energy Saving Obligation/White Certificates in several European countries

Examples are the schemes in Denmark, France, Italy, UK or the region of Flanders (see section 3.4). In most of these countries, the schemes expanded over time with rising targets for the obligations.

- **Leveraging of private investments from through energy service companies:** Here the charge is totally on the private sector. The investor gets his money from the reduced energy cost of the client. This has the advantage that markets are developed for energy services and that the energy consumer is (in principle) not charged additionally and may even get a (small) reduction in energy cost during the phase when the investment is paid off. At present, mainly energy conversion options or options that pay off rapidly are financed in such a way (boilers, HVAC systems, building control systems etc.) while deep renovations including the building envelope are rather rare due to the long payback time. An option may be to subsidise the payback to a rate interesting for the energy service companies. Also risk mitigation is an important aspect where the state generally plays a role.

Example: various ESCO programmes

ESCO programmes exist in many countries to differing degrees (see the overview on the websites of the European Energy Services Initiative EESI²² and the discussion in section 6.2 for the case of financing investments in the public sector).

- **Financing through a levy on energy consumption (“Feed-in tariff for energy efficiency”):** this is in principle similar to the promotion of renewable through feed-in tariffs – while energy saving obligations are the equivalent to quote systems for renewable - and has the substantial advantage of financing stability and risk-lowering. On the other hand, given the fact that renewable already charge heavily especially electricity prices in some countries, it may be difficult to levy in the same way the large investments for refurbishing existing buildings. However, in difference to renewable, where first the costs are positive and serve to pay their cost down along the cost degression curve, energy efficiency options provide after some time, benefits to the consumers due to lower energy bills. Also the energy consumption on which the costs for energy efficiency investments are charged should cover a much larger range than just electricity consumption but also fossil fuel use.

²² <http://www.european-energy-service-initiative.net/>

Example: “Feed-in tariff for energy efficiency”

Such feed-in tariffs (Fits) for energy efficiency have not been introduced to a large degree in different countries (see the in-depth discussion in section 6.5 on innovative measure for the financing of building measures).

An innovative variant to be introduced in the UK is the “Green Deal” financial mechanism (see the description of this sample case in section 3.2) which eliminates for the consumer the need to pay upfront for energy efficiency measures and instead provides reassurances that the cost of the measures should be covered by savings on the electricity bill.

- **Combining different sources in an Energy Efficiency Fund:** one last important possibility of generating the funds necessary for the large investments is combining different sources discussed in the previous point in a general energy efficiency funds, such as the EU Energy Efficiency fund but at a much larger level of volumes. Combining the sources would have the advantage of taking the largest basis possible, though, in most cases, the final consumer would carry the charges in some way. Energy efficiency funds offer more flexibility in promoting innovative technologies and solutions than other financing sources.

Examples for the design of an Energy Efficiency Fund:

Further up we already discussed the example of the German Energy and Climate fund which combines money from the state budget and the emission trading scheme.

More complex financial engineering combinations exist at the European level, especially in connection with structural funds. For example, JESSICA - Joint European Support for Sustainable Investment in City Areas²³, is an initiative of the European Commission developed in co-operation with the European Investment Bank (EIB) and the Council of Europe Development Bank (CEB). It supports sustainable urban development and regeneration through financial engineering mechanisms. EU countries can choose to invest some of their EU structural fund allocations in revolving funds to help recycle financial resources to accelerate investment in Europe's urban areas. Contributions from the European Regional Development Fund (ERDF) are allocated to Urban Development Funds (UDFs) which invest them in public-private partnerships or other projects included in an integrated plan for sustainable urban development. These investments can take the form of equity, loans and/or guarantees.

Alternatively, managing authorities can decide to channel funds to UDFs using Holding Funds (HFs) which are set up to invest in several UDFs. Owing to the revolving nature of the instruments, returns from investments are reinvested in new urban development projects, thereby recycling public funds and promoting the sustainability and impact of EU and national public money.

These examples show that also quite complex solutions could be financed through such type of mechanisms.

This brief discussion of the pros and cons of the different options shows that in order to deal with the challenge of a large reduction in energy consumption of buildings a combination of several financing instruments using different financing sources is necessary; otherwise the large investment needs could not be levied. In addition, to tackle the barriers hindering energy efficiency improvements in building, this may not be enough, but a combination of several political instruments may be necessary in order to achieve a sufficient amount of energy savings in the building sector in order to achieve the overall energy efficiency targets set at the European level (see the discussion on policy packages in section 6.4).

²³ http://ec.europa.eu/regional_policy/the_funds/instruments/jessica_en.cfm

6.2. Financing energy efficiency in the public sector

In this section we will focus on the question on how energy efficiency could be improved in the public sector and what role financing plays in that context, in particular in view of tight public budgets to finance such work, especially on the refurbishment of public buildings. On the other hand, there could be at present an enormous push to building refurbishment exactly as a consequence of the economic crisis: first of all, as public money gets rare, public buildings could save large amounts on the budget. Second, through investments in buildings, based on public or private sources, the presently low running European economies could get a push that helps to emerge from the crisis.

Article 5 of the new Energy Efficiency Directive EED advocates an *exemplary role of public bodies' buildings*. The main provisions are as follows:

- By 1 January 2014, 3% of the total floor area of heated and/or cooled buildings owned and occupied by central governments is to be renovated each year to meet at least the minimum energy performance requirements that are set up in application of Article 4 of the EPBD (Directive 2010/31/EU).
- The 3% rate shall be calculated on the total floor area of buildings with a total useful floor area over 500 m² owned and occupied by the central government of the Member State concerned. That threshold shall be lowered to 250 m² as of 9 July 2015.
- Member States may also extend these requirements to floor area owned and occupied by administrative departments at a level below central government and could thus relieve the requirement to reach the 3% rate with central government buildings only.
- If a Member State exceeds the rate in a given year it may bank to compensate gaps in any of the three previous or following years.
- Member States may count towards the annual renovation rate of central government buildings new buildings occupied and owned as replacements for specific central government buildings demolished in any of the two previous years, or buildings that have been sold, demolished or taken out of use in any of the two previous years due to more intensive use of other buildings.
- Member States may opt for an alternative approach, taking other cost effective measures, including deep renovations and measures for behavioural change of occupants, to achieve, by 2020, an amount of energy savings in eligible buildings owned and occupied by their central government that is at least equivalent to that required, reported on an annual basis.
- For the purpose of the alternative approach, Member States may estimate the energy savings that the standard approach would generate by using appropriate standard values for the energy consumption of reference central government buildings before and after renovation and according to estimates of the surface of their stock. The categories of reference central government buildings shall be representative of the stock of such buildings.
- Member States opting for the alternative approach shall notify to the Commission, by 31 December 2013, the alternative measures that they plan to adopt, showing how they would achieve an equivalent improvement in the energy performance of the buildings within the central government estate.

- Member States shall encourage public bodies, including at regional and local level, and social housing bodies governed by public law, with due regard for their respective competences and administrative set-up, to:
 - adopt an energy efficiency plan, freestanding or as part of a broader climate or environmental plan, containing specific energy saving and efficiency objectives and actions, with a view to following the exemplary role of central government buildings;
 - put in place an energy management system, including energy audits, as part of the implementation of their plan;
 - use, where appropriate, energy service companies, and energy performance contracting to finance renovations and implement plans to maintain or improve energy efficiency in the long term.

This exemplary role of the public sector requested by the EED needs to be fulfilled by a combination of instruments. An overview of financial and fiscal measures addressing the public sector under the NEEAP is given in the Annex in section 8.3 based on the MURE database. Many of these examples imply public budgets to provide grants for investments. With the following examples from several Member States we would like to discuss three aspects:

- The **scope for low-cost measures in the public buildings and their large potential** which is well-illustrated with the case of Ireland and the activities of the Office for Public Works in Ireland.
- The **limits of the approach when it comes to investments**, and in particular investments into the building envelope with comparatively large sums and longer periods of return, also illustrated with the example of Ireland.
- The **emerging role of Energy Service Companies (ESCOs)** to build the bridge beyond the public budgets but which is not without difficulties, especially when it comes to finance deep renovations including the building envelope with its long payback periods.

Example 1: Public sector programme (Ireland)

The public sector has been set a target of 33 % energy efficiency savings of by 2020, equal to 3,240 GWh. This represents 10 % of the energy saving required by 2020 for the entire economy (a national target of 20 % saving has been set for the economy as a whole). Reaching this ambitious target will require radical action by the public sector. The National Energy Efficiency Action Plan (NEEAP) and the ESD mandate the following obligations and targets:

- All public sector bodies from 1 January 2011 shall include in annual reports, a statement describing the actions it is taking to improve its energy efficiency and an assessment of its progress towards the 33% target.
- Put energy efficiency programmes in place for Government Departments, State Agencies, Local Authorities, the Health Service and all other areas of the public sector.
- Implement energy-efficient procurement practices.
- All public sector buildings over 1,000m² must have a Display Energy Certificate on show to demonstrate actual energy use and the Building Energy Rating.

In fulfilment of this programme the example of the **campaign of the Office of Public Works (OPW) in Ireland** (OPW, 2011) is instructive, especially the conclusions with respect to financing the building rehabilitation:

- Property Management is one of the main activities of OPW. OPW owns/leases the properties on behalf of the State, individual occupying Departments pay for maintenance and energy.
- OPW launched in 2008 a staff energy awareness campaign entitled *Optimising Power @ Work* . Savings of approximately 14% have been achieved to date; targeted buildings with floor areas >1000 m² (250 in total).

Results from Phase 1, in particular in the right hand graph the influence of the level of engagement on average savings:



Note:

- Excellent: Full support from management, appropriate and proactive Energy Officer and team, good response to the programme, taking their own initiative in energy savings.
- Good: Good support from management, energy manager and team, medium/good response to the programme.
- Fair: Reasonable support from energy manager and team, medium/fair response to the programme.

Source: OPW (2011)

Phase 2 was launched in late 2010. The main aims of this phase were: 20 % average saving in CO₂-emissions across the 250 buildings in the campaign, minimum saving of 15% in each building, in buildings, which have already achieved >20 %, target a 5 % further reduction in CO₂-emissions. The main measure was the procurement of energy by framework agreements for the different energy carriers (agreements for electricity and gas in place, others are planned).

Estimated results:

- Energy savings up to 25% are possible with current initiative plus low cost energy projects with good payback periods.
- Investment will be needed to achieve the remainder of the Public Service target (33% -25% = 8%).
- Limited opportunity for realistic returns on any investment for the remaining 8% of the public service target (investment in energy efficient heating, a/c systems, lighting systems, computer systems, efficient data centres).
- Only limited opportunity for investment in reducing the heat loss.

Conclusions for refurbishment:

Work carried out on existing buildings to improve energy efficiency -payback over a long period of time. Any refurbishment requirement of this type will have to be funded from sources other than the central exchequer. Challenge to devise a business case for ESCO models.

Example 2: Public sector financing through Salix (UK)

Salix Finance Ltd is a not for profit company limited by guarantee, which was set up in 2005. It is funded by Government to establish energy efficiency revolving loan schemes in the public sector. The company, a spin-off from the Carbon Trust, is developing innovative approaches to overcome financial barriers in the public sector that currently prevent highly cost-effective measures being adopted. It provides loans to organisations, which are required to provide match funding and establish an on-going 'ring-fenced' energy efficiency fund. The loans once established continue to deliver energy and emission savings over time, with recycled energy savings split between the revolving fund and released for front-line services. The value of the recycling approach is that the energy costs saved by the projects are fed back into the fund which then supports further projects, which in turn deliver more energy savings and so on. This allows each pound to be used several times over time to generate carbon savings. Financial mechanisms of this type drive change by encouraging procurement managers and decision makers to look again at the way they plan, invest and save within their portfolio giving them real reasons to 'invest to save' for the long term. Not only does this improve environmental and efficiency standards within estates, but it can also stimulate more widespread adoption of energy saving and carbon reduction measures.

Salix loans are provided for energy efficiency projects that pay for themselves within five years through lower energy bills. Salix projects include insulation, lighting and heating upgrades, IT improvements, swimming pool covers, voltage reduction or better boilers. Through a mixture of loans and grants Salix Finance have engaged with around 725 public sector bodies and to date have funded 8,400 projects, valued at £178m, which will save the public sector £53m annually and £700m over the projects' lifetime. In December 2011, DECC made available a further £20 million in Salix loans for public sector energy efficiency projects in England before the end of March 2012. The new money is estimated to deliver savings of around £46 million on bills and 210,000 tonnes of carbon. This assumes that the money is recycled twice.

Examples of successful projects include:

- Staffordshire University has carried out 17 projects - including insulation projects, network power management, low loss transformer including voltage management and lighting projects, valued at - £722,592 in total. The annual energy bill savings from these are £236,611 per year with expected lifetime savings of £3,928,288. These projects will save 1600 tonnes of CO₂ annually.
- Durham County Council has implemented a number of street lighting projects to the value of £1.12m across the council area. These will realise lifetime savings of £6.8m and reduce CO₂ emissions by 42,400 tonnes over their lifetime.
- The installation of a condensing flue gas economiser, which improves boiler heat recovery, at a cost of £300,000 will save King's College Hospital over £2million and reduce CO₂ emissions by 18,000 tonnes over its lifetime. This technology pays back its costs within 18 months.

Example 3: EPC Plus (Germany)²⁴

The Berlin Energy Agency BEA developed a new product called EPC Plus which combines the classical Energy Performance Contracting with subsidies to achieve large savings of 40% including changes in the building envelope. Payback periods exceed 12 years in those cases and up to 15 years (at present energy price levels). The EPC contract is completed with special provisions concerning financing. Financing may be a mixture of funds from credits with low interest rates (KfW), contractor funds and subsidies from the budget lines for building maintenance.

Challenges are:

- Considerably higher investments compared to the classical EPC.
- High transaction cost during project development (detailed pre-planning including quantification of savings required before tendering).
- Difficulty to find adequate bidders that can provide the full range of complex measures (at present most bidders are specialized on building equipment rather than the envelope).
- Frequently more dimensions have to be considered such as inside air climate which requires additional organizational measures during the construction phase.

As an example BEA describes an EPC-Plus project in Berlin (hospital):

- Measures:
 - Large scale roof insulation
 - CHP unit and new gas boiler
 - Reduced temperature level in the main distribution system for heat
 - Meter systems for measuring the consumption
 - Reduction of losses from the air conditioning systems
 - Other measures: optimized lighting, hot water preparation
- Results:
 - Baseline energy consumption 2010: 0,8 million €
 - Guaranteed savings: 39,6 % = 0,32 million €/a
 - Investment of the contractor: 2,44 million €
 - CO₂-Reduction : 1,789 t/a
 - Duration of contract: 12 years



In an example scenario BEA also discusses a mixed investment:

	EPC classic	EPC plus
Energy cost baseline	1,000,000 €	1,000,000 €
Guaranteed savings	25%	40%
Guaranteed savings in Euro	250,000 €/a	400,000 €/a
Saving participation of client	50,000 €/a	-
Investment contractor	1,200,000 €	10,000,000 €
of which investment subsidy from client (or other sources)	-	6,600,000 €
Contracting period	10 years	15 years

²⁴ Source: http://www.european-energy-service-initiative.net/uploads/media/WP2_D25_advanced_EPC_plus_BEA_German_03.pdf

6.3. Social impact of policy measures in the building sector

Rising energy prices threaten the poorest households, and subsidizing the price increase, as done in some EU Member States in the past²⁵, is not a long-term option as public budgets will not allow for such subsidies at a large scale.

Energy efficiency improvement is an important long-term means to combat fuel poverty. Energy efficiency measures, as shown by Figure 15, will finally pay off for the individual consumer, as well as for the whole economy. However, mobilising the upfront-investments has strong distributional aspects and may impact on the poorest part of the population. Energy efficiency policies have therefore to be designed to allow the poorest households to undertake the necessary investments or put the burden on stronger investors. This is the rationale for policies like energy saving obligations with a special target for fuel poor households or the Green Deal in the UK.

In this section we will discuss both the impacts of rising fuel prices and the distributional effects of energy efficiency policies.

6.3.1. Definitions and extent of fuel/energy poverty

For poor households the terms “fuel poverty” or “energy poverty” have become common. *The term “energy poverty” and the term “fuel poverty” are often used interchangeably. The energy sources covered by the term fuel poverty (electricity, natural gas, liquefied petroleum gas, oil, coal, district heating and other solid fuels) are broader than those considered in the energy poverty references in the internal energy market legislation (electricity and gas). It could therefore be argued that considering energy poverty in isolation would exclude those consumers using fuels other than electricity and gas to heat their homes.*²⁶

In the definition used by the UK, a household is said to be fuel poor if it needs to spend more than 10 per cent of its income on fuel to maintain an adequate level of warmth. The Fuel Poverty Ratio is defined as:

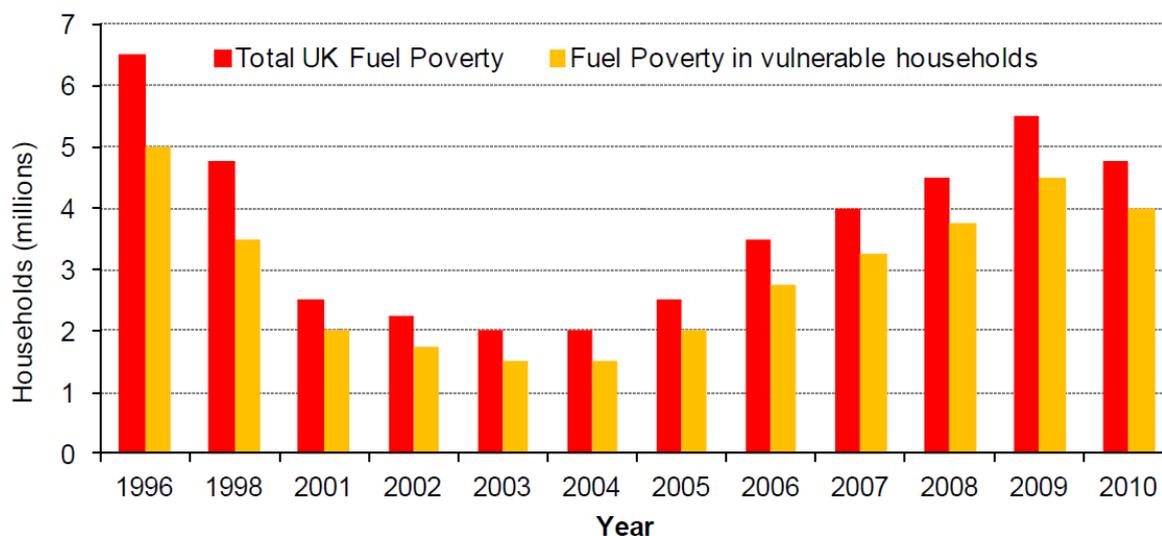
$$\text{Fuel poverty ratio} = \frac{\text{Modelled fuel costs (i. e. Modelled consumption} \times \text{price)}}{\text{Income}}$$

Fuel poverty is therefore based on modelled spending on energy, rather than actual spending. Although the emphasis in the definition is on heating the home, modelled fuel costs in the definition of fuel poverty also include spending on heating water, lights and appliance usage and cooking costs. Figure 16 shows the development of fuel poverty in the UK from 1996 to 2010. While fuel poverty was strongly reduced by rising income and low fuel prices around 2000, it has risen once again after 2005 following the rise in energy prices.

²⁵ For example, France had introduced a subsidy for the poorest households during 2007-2009 (“prime à la cuve”) which reached up to 200 Euros for households that do not pay taxes. The subsidy was not prolonged in 2010 with the effects of the financial and economic crises on state budgets.

²⁶ Cited from: European Commission (2010a).

Figure 16: Fuel poverty in the UK (1996 to 2010)



Note: A vulnerable household is one that contains the elderly, children or someone who is disabled or has a long term illness

Source: UK Department of Energy & Climate Change (2012)

The 10% threshold was criticized as not reflecting adequately all the populations which suffer from high energy prices, and a twice-median threshold was therefore proposed more recently²⁷. This was taken up by the European Commission (2010a). Proposed thresholds for fuel poverty from that Commission working paper can be found in the table below.

²⁷ See the discussion of this threshold by Liddell et al. (2011). The paper emphasizes that a national fuel poverty prevalence rate, based on a national twice-median, remains vital for ensuring parity across the regions, especially in the achievement of the long-term goal of eradicating fuel poverty wherever practical.

Table 8: Estimation of the number of households and persons living in households that face significant energy expense burden compared to the national averages

Country	Data reference year	Average households' expenditure on energy (%)	Proposed threshold for considering significant burden	Estimated share of households spending considerable share of their expenditure on energy (%)	Estimated number of concerned households	Estimated number of residents living in such households
AT	2005	4,6	10,0%	11,9	431.000	991.000
BE	2008	5,9	11,8%	8,9	562.977	1.295.000
BG	2008	9,5	19,0%	6,4	168.000	487.000
CY	2005	3,8	8,0%	6,4	18.000	52.000
CZ	2005	11,2	22,0%	14,5	605.000	1.513.000
DE	2005	5,1	10,0%	12,6	4.927.000	10.347.000
DK	2005	7,4	15,0%	12,4	341.000	682.000
EE	2007	7,3	14,6%	19,7	115.529	266.000
ES	2008	7,4	14,8%	11,2	1.880.341	5.077.000
FI	2005	3,4	7,0%	13,0	329.000	691.000
FR	2005	5,2	10,0%	16,2	4.516.000	10.387.000
GR	2005	3,8	8,0%	7,6	316.000	853.000
HU	2008	13,9	27,8%	8,2	311.844	811.000
IE	2005	3,8	8,0%	13,5	214.000	599.000
IT	2008	6,2	12,4%	8,6	2.086.293	5.007.000
LT	2008	8,6	17,6%	16,0	205.000	533.000
LU	2007	3,8	7,6%	13,6	23.500	59.000
LV	2008	6,9	13,8%	6,1	53.700	140.000
MT	2005	1,8	*	6,4	9.000	26.000
NL	2005	4,4	9,0%	8,1	579.000	1.332.000
PL	2008	11,4	22,8%	14,1	1.919.000	5.373.000
PT	2007	4,2	10,0%	10,0	393.000	1.061.000
RO	2005	11,6	20,0%	16,6	1.231.000	3.570.000
SE	2005	3,9	8,0%	11,2	494.000	1.037.000
SI	2005	6,6	13,0%	12,0	87.000	244.000
SK	2005	14,5	25,0%	19,0	354.000	1.027.000
UK	2008	6,9	13,8%	19,2	4.932.000	11.837.000
EU27	-	7-8% (est.)	-	13,1	27.102.184	65.297.000

* For MT CY data value was used as proxy

Source: European Commission (2010a)

The overview shows that 27 million households or 65 million persons were concerned by fuel poverty. Note that a variety of data in the table concern 2005, i.e. before the strong rise in energy prices. This number is therefore to increase in the future.

The key elements in determining whether a household is fuel poor or not are:

- Income
- Fuel prices
- Fuel consumption (which is dependent on the dwelling characteristics and the lifestyle of the household)

The fuel poverty data may be used to help develop and target policies towards those most likely to be fuel poor, or those most at risk of falling into fuel poverty. For these households, the financial burden from rising energy costs is above-average, whereas they often do not profit from financial investment programs in energy efficiency.

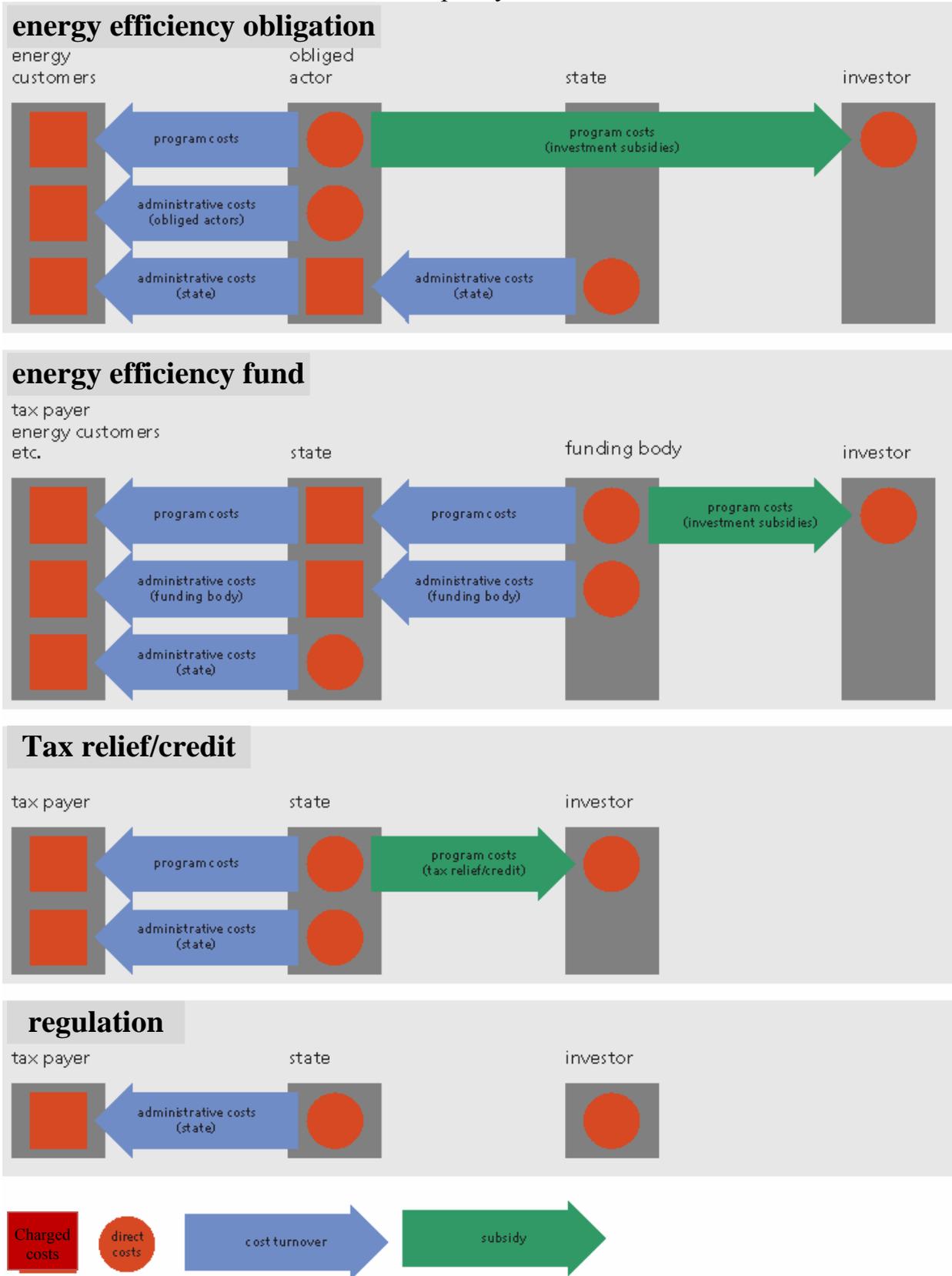
6.3.2. Distributional effects of energy efficiency policies

Energy efficiency policies are thought to alleviate fuel poverty at the longer term but may also generate considerable distributional impacts due to the high upfront-investments, i.e. the effect of the policy instruments on different actors. Such distributional effects need to be considered in the design of policy instruments in the building sector.

Figure 17 shows the general distribution effects of different instruments in the field of energy efficiency policy. The graphics concentrates on four major instruments. A distinction needs first to be made between the costs incurred directly by the various actors and the costs passed on:

- **Energy efficiency obligations:** the obliged party provides investment subsidies to investors and charges these programme costs, together with his own and possible state administrative costs on the energy customer, who is charged independently from his income and only linked to his energy consumption.
- **Energy efficiency subsidies / Energy efficiency funds:** In the case of energy efficiency funds it is the funding body who provides investment subsidies to investors. Via the state budget (if the state is the only contributor to the fund) these programme costs, together with the fund's own and possible state administrative costs are charged on the tax payer (or the energy customer depending on the charging mechanism). The tax payer is charged according to his income while the energy consumer would be charged independently from his income and only linked to his energy consumption. In case that there are other contributions to the fund, e.g. from an obligation on energy company or from auctioning emission rights, the distributional effects are similar as for the energy efficiency obligations. However, there are differences among the energy companies as intermediates which may, for the obligation to contribute to the fund, be charged according to the energy consumption of their customers, while in the case of emission rights they will be charged according to the carbon contents of the fuels used. Hence the shift towards low-carbon fuels could reduce the charge on the companies in the second case.
- **Tax reliefs/credits:** in the case of tax reliefs/credits the state directly carries the programme cost by providing the tax relief/credit to investors and charges thos, together with its own administrative cost to the tax payer. The tax payer is charged according to his income.
- **Regulation:** In the case of regulation, there are no programme costs as the investor carries the full investment costs. The administrative costs are charged by the state to the tax payer. (according to his income).

Figure 17: Distributional effects of major instruments in the field of energy efficiency policy



Source: Schlomann et al. 2012

6.3.3. Measures to mitigate distributional effects of energy efficiency policies

As discussed on section 6.3.2 there are wide ranges of distributional effects depending on the design of the policy. Those distributional effects may require actions to mitigate the strongest effects. One target group for energy efficiency measures which is increasingly discussed with regard to building renovations are low-income households. There are some NEEAP measures in the MURE database which directly address low-income households. In the following, they are shortly described.

Slovenia has a special scheme of energy efficiency for low-income households. Also, in the other funding schemes of Slovenia the issue of fuel poverty is explicitly addressed.

In **France**, a target has been set to renovate the 800 000 most energy hungry social dwellings by 2020. Achievement of this target relies on the following measures: Introduced after the Environment Round Table, social housing eco-loans are fixed-interest loans, discounted by 1.9% over 15 years or 2.35% over 20 years. By encouraging heat networks to make use of renewable and recovered energies, the Heat Fund also has a significant positive impact in social terms (reducing and stabilising the cost of heating predominantly social housing) and in terms of diversification of energy supplies.

In the **UK**, besides the special focus of the CERT-scheme, there are other funding schemes directly connected to fuel poverty, such as the Warm Front scheme. The Warm Front scheme is one of the key tools for tackling fuel poverty through energy efficiency measures among private households in England. Eligibility for assistance is based on a combination of income related benefits and the thermal efficiency of the applicant's property. Households who are entitled to assistance under the scheme can benefit from energy efficiency measures including efficient heating systems, insulation, and draught proofing. Besides this programme which targets the fuel-poor households directly, the community energy savings programme is targeting low income communities. It is a statutory carbon based obligation on energy suppliers and generators and is designed to deliver whole house retrofits on a street by street basis, particularly tackling hard to treat homes and providing a range of energy saving measures such as solid wall insulation, new boilers, solar heating and micro-generation.

In **Germany** an energy check for low-income households has been established. It is a project founded by the national climate initiative to support the target group with a cost-free energy audit and direct support with instant technical measures. The project has four major objectives:

- Reduction of CO₂-emissions
- Cost relief for low income households as well as authorities
- Qualification of long-term unemployed people
- Information and education on energy topics to provide help for self-help

The auditing process consists of four steps. The first step is the audit application of the households, followed by a first visit of the auditor to make a status report. Within the third step the auditor will evaluate the results of the initial visit. Finally, in the fourth step, the auditor will visit the household again, present them the results of the evaluation

report and will implement instant saving measures like CFLs, switching plugs or water saving showerheads. The project currently operates with 600 trained auditors in 100 cities and communities. Up to now, over 70000 audits have been carried out. On state-level (Bundesland) accompanying programs to promote more expensive investments exist. By now the Program has achieved cumulative lifetime savings by the instant measures of 137 Mt CO₂.

6.4. Barriers to energy efficiency and packages of policy measures

In section 6.1.2 we discussed the issue that the large financing needs identified in section 6.1.1 may require combining different financing instruments. However, to tackle the barriers hindering energy efficiency improvements in buildings, a combination of several political instruments will be necessary as none of the described financial instruments alone delivers the desired savings with regard to the energy efficiency targets set at the EU level. In addition, all new instruments have to be integrated into the already existing framework of energy efficiency measures which is both set by EU and national policies.

The main reason why one instrument alone may not be able to fully exploit the existing energy saving potentials in buildings is the existence of different barriers to energy efficiency deployment and the different suitability of the instruments for removing them. Though the discussion on barriers is ongoing for many years (e.g. Barr et al. 2005), there is still a gap between the realized and the economic or nearly-economic energy saving potential in the building sector. The persistent existence of barriers to energy efficiency deployment was only recently pointed out in the World Energy Outlook 2012 by IEA (2012).

With regard to energy efficiency measures in buildings, the **major barriers**, which are partly different with regard to building owners, landlords and tenants, are:

- Information and knowledge deficits both with regard to the existing saving potentials in the respective building and to existing financial support programmes for investments in energy efficiency (and maybe also to the concrete demands on building owners from building regulations).
- Low awareness for energy efficiency issues and therefore low priority for energy efficiency investment.
- Lack of own capital to undertake the necessary investments and no willingness to use borrowed capital.
- Difficulties to cope with a long refurbishment process and lack of trust in the relevant actors (architects, craftsmen, energy advisors etc.).
- The costs and benefits of energy efficiency investment decisions can also fall on different actors, which is referred to as “split incentives” (see e.g. IEA 2012). Especially in the building sector, this happens quite often due to the opposite interests of landlords (who have to undertake the investment) and tenants (who profit from lower energy bills) or the long payback periods which may be longer than the owner intends to keep a building or the tenant to stay.

On the other hand, there are also **driving forces** which facilitate the implementation of energy efficiency measures in buildings. On the one hand, these are more social and psychological factors as e.g. a high environmental awareness, the wish for more comfort, some social “pressure” or a better image. On the other hand, the general economic conditions in the housing market also play an important role and can be influenced by policy actors in order to create a general frame which is beneficial for energy efficiency investment.

A suitable **policy package** should therefore both try to remedy the barriers and to make use of the driving forces:

- **Regulatory instruments** generally define the technological baseline for the technical energy improvement measures in buildings. That way they also implicitly raise the priority for energy efficiency issues and lower the hampering impact of the split incentives.
- **Financial and fiscal instruments** play a crucial role for the reduction of the economic barriers, especially the lack of own capital and the long payback periods of many investments in building refurbishment. They can also improve the economic framework conditions on the housing market (e.g. by tax allowances or the possibility for rent increases in case of substantial building refurbishment). With a suitable design, these instruments can also tackle the split incentive issue. One example is the new Green Deal in UK (see Chapter 3.2) which tries to unbundle the loan for efficiency measures and the benefit from lower energy bills from individual person and directly link it to the object.
- However, there still remain non-economic barriers which cannot be successfully tackled by regulatory and financial instruments alone. Therefore, **informational and advisory instruments** are an important completion of such a package since they can address barriers and driving forces which do not lie in economic reasons (as e.g. information and knowledge deficits, lack of trust and social and psychological factors). In order to tackle these barriers, there is a wide range of additional policy measures ranging from a more detailed measurement of energy consumption, labelling and benchmarks, energy audits in buildings to awareness raising and information campaigns on the importance and economic benefits of energy efficiency improvements and the existing financial and fiscal support for energy efficiency investments in buildings. Many good examples for this kind of policy measures have been described in the Chapters before and can be looked at in the MURE database.

Every policy package should therefore comprise regulatory as well as the other incentivising instruments (“stick and carrot”), where the regulatory instruments define the technological baseline. The other instruments may then either encourage the investor to undertake measures complying with this baseline or they may set incentives to even exceed the standards significantly and make use of more advanced technologies.

Especially for the building itself a regulatory instrument alone will not be able to target the most important energy use in the building sector, which is the existing building stock. Ambitious regulatory approaches are hampered by ownership rights and deep renovations may not be possible under such an approach. In contrast, regarding the replacement-driven market of household appliances, a regulatory approach may be

highly successful. Nevertheless a combination with financial incentives to invest in even more energy efficient solutions still may enhance the impact of the instrument. But there may be a considerable free-rider risk.

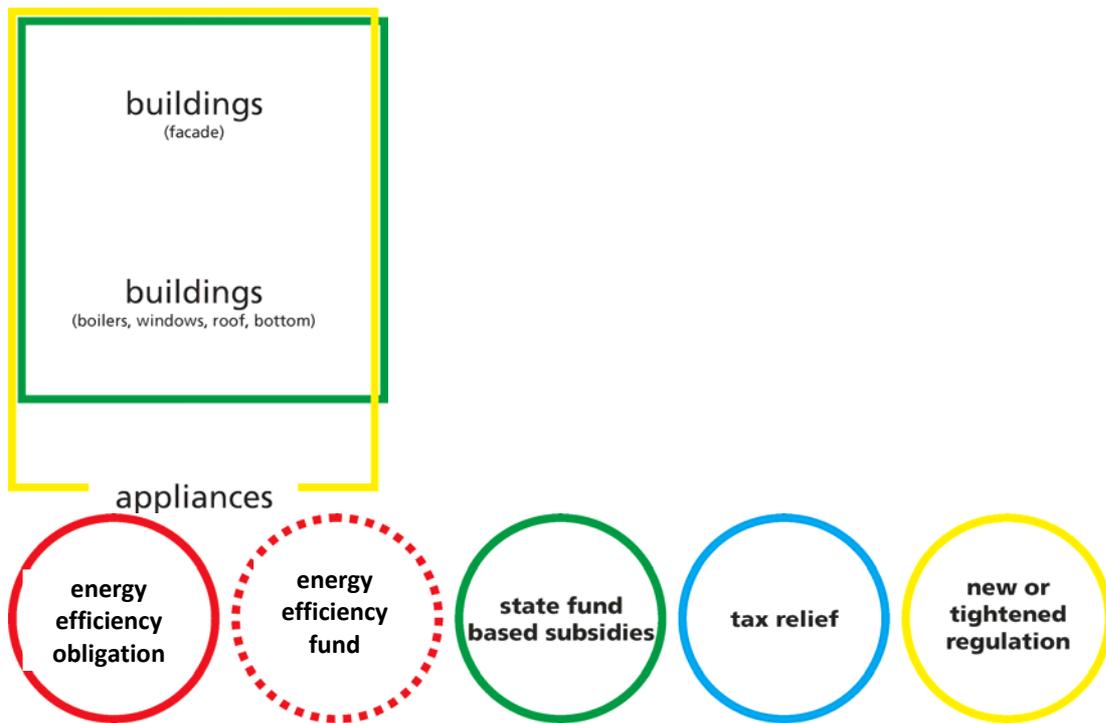
Within the following paragraphs some coherent combinations of policy instruments are described which cover an increasing perimeter covered by the instruments and could be able to provide in principle – with more or less barriers - the large upfront-investments specified earlier:

- Policy Path 1: a combination of regulation and financial incentives based on state budgets
- Policy Path 2: a combination of regulation, financial and fiscal incentives
- Policy Path 3: a combination of regulation, financial and fiscal incentives and saving obligation schemes
- Policy Path 4: a combination of regulation, fiscal incentives and an energy saving trust
- Policy Path 5: a combination of regulation, fiscal incentives, energy saving trust and saving obligation schemes
- Policy Path 6: a combination of regulation, financial and fiscal incentives, energy saving trust and saving obligation schemes

Policy Path 1: Regulation and financial incentives

This policy path is a combination of financial incentives based on state budgets combined with regulation. The status of regulation reflects the actual situation in Europe, where buildings are subject to a broad regulation in accordance with the EPBD. The regulation of appliances does not (yet) includes all product groups and is therefore incomplete.

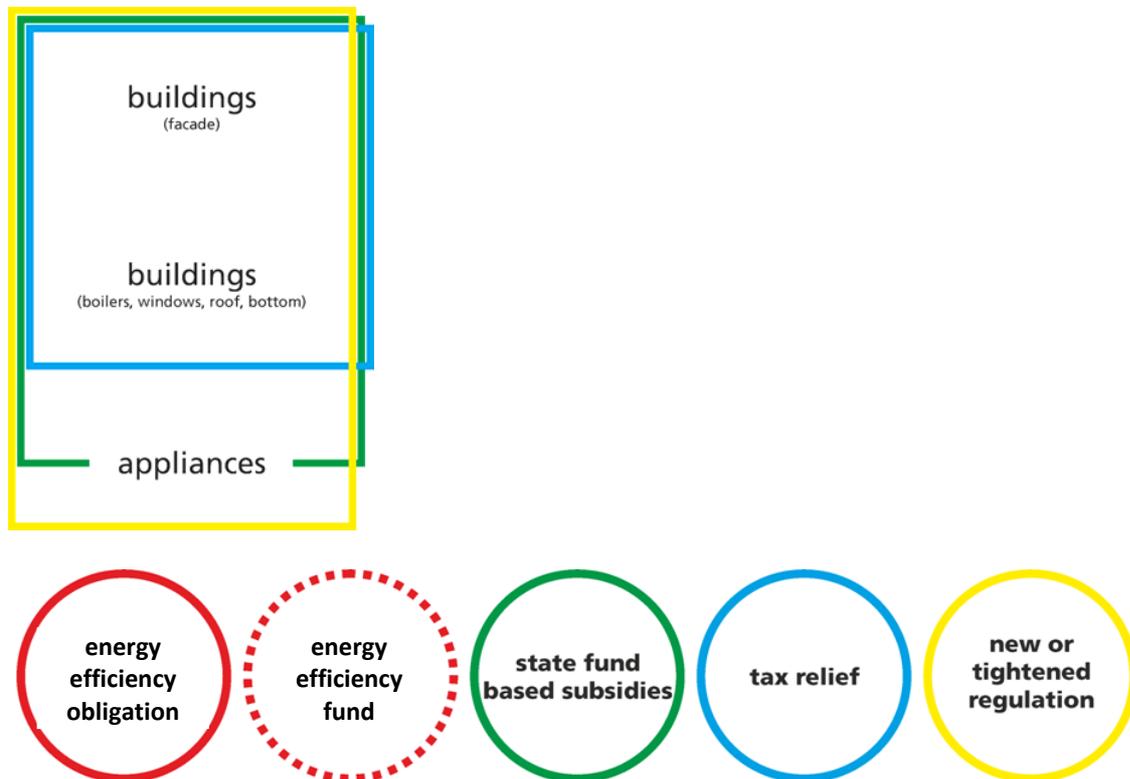
The scope of the financial support schemes may be exemplified with the situation in Germany, where the KfW programmes (which in the past was mainly based on state budgets) cover the whole building sector, whereas the domestic appliances are not subject to incentive instruments. The major limitations of this combination of instruments stem from the limitations on state budgets.



Note: the different colours in this and the following graphs indicate the different combinations of instruments. Not all instruments are already integrated in this graph but will occur in the following graphs

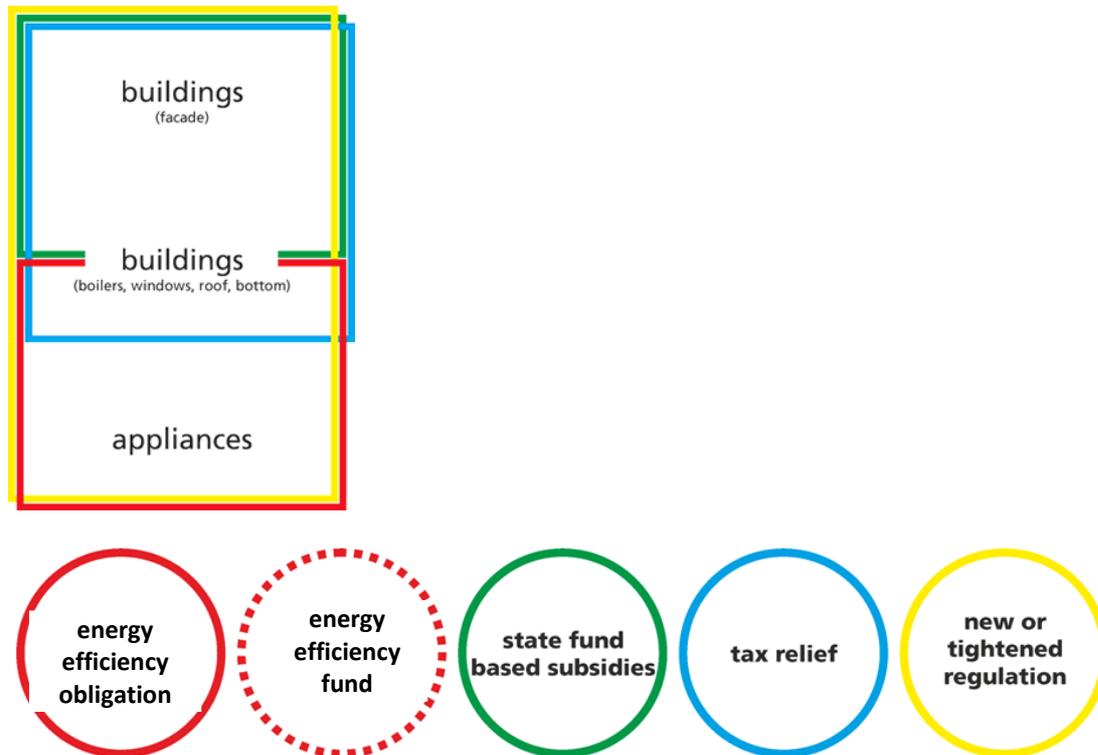
Policy Path 2: Regulation, financial and fiscal incentives

Policy Path 2 extends the instrument mix of path 1 by adding tax relief schemes to the instrument mix and assumes a broad extension of product regulation. Additionally the financial incentives may be extended to some appliance categories.



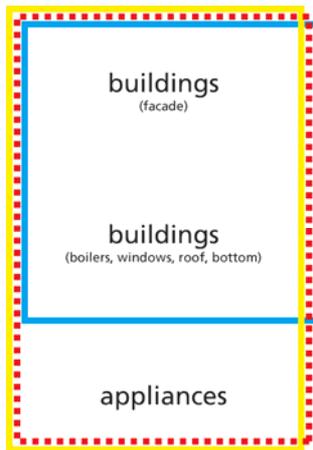
Policy Path 3: Regulation, financial and fiscal incentives and energy efficiency obligation schemes

Including the experiences with saving obligation schemes, the policy path 3 represents an even wider mix of instruments. The saving obligation schemes introduced in this path include appliances as well as some parts of measures related to the building itself but does not cover deep renovation due to the difficulties that such an instrument, whose main feature are standardised energy savings, may encounter for such applications.



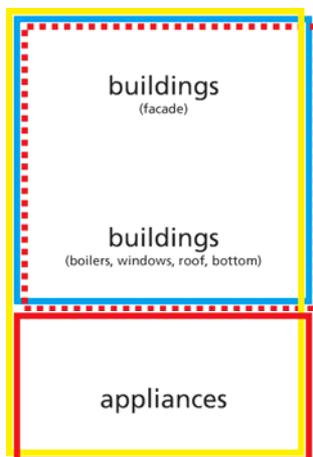
Policy Path 4: Regulation, fiscal incentives and an energy saving trust

Policy path 4 is a reduction of the instrument set, preserving a broad range of application. The role of state funded support schemes is taken by an energy saving trust (which may of course be also funded by some tax money). Such a trust, possibly including a tender system, could cover all sectors. Still some tax relief schemes covering the buildings themselves seem reasonable due to the rather high upfront costs.



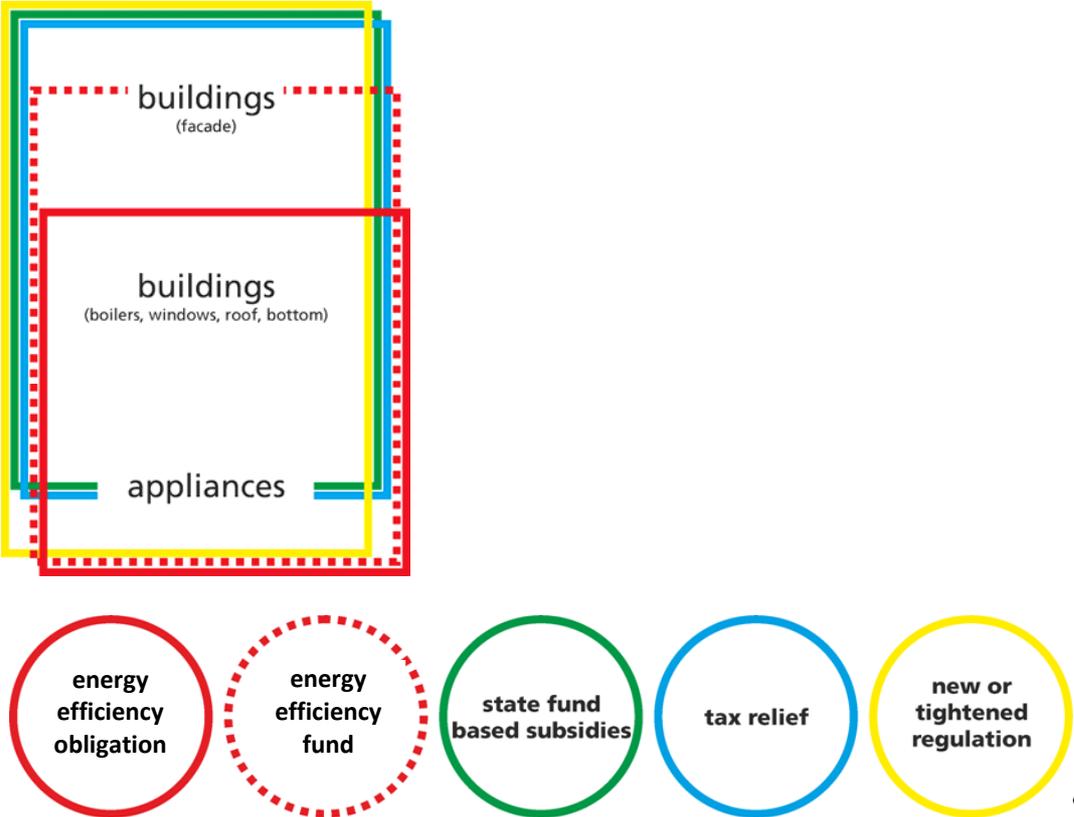
Policy Path 5: Regulation, fiscal incentives, energy saving trust and saving obligation schemes

The advantages of an energy saving trust and a saving obligation scheme are combined in policy path 5. The saving obligations cover the measures suitable for deemed savings, the appliances. The saving trust thus covers the more complex measures with longer payback times covering the building structure.



Policy Path 6: Regulation, financial and fiscal incentives, energy saving fund and energy efficiency obligations

Finally path 6 is a combination of all the approaches mentioned before, including a saving trust, saving obligation schemes, financial and fiscal incentives and tightened regulation. In such a case the interaction between the instruments could be complex and a careful design of the individual instrument is necessary taking into account the overall objectives.



The concrete choice of one of these general paths to combine the different policy instruments in the building sector depends on the concrete situation in a country and needs a detailed discussion of the pros and cons of these options both within the main categories, i.e. regulative, financing and informative instruments, and with regard to a suitable combination. Some of the aspects which have to be considered at the analytical level, especially with regard to financing energy efficiency, have been discussed in the previous Chapters of this brochure. From a political point of view, Article 7 of the new EU Energy Efficiency Directive (EED) provides some flexibility for the Member States to choose a path which is both in line with the already existing landscape of energy efficiency measures addressing the building sector in a country and these analytical considerations. Nevertheless, in order to exploit the energy saving potential in the building sector to an extent which is sufficient to reach the 20% EU energy saving target and the yearly 1.5% energy savings prescribed in Article 7 of the new EED, additional efforts will be necessary in probably all Member States.

In the closing section 6.5 of this brochure, a forward look at some new and innovative instruments which may be part of such a future policy mix in order to reach the EU and maybe also additional national energy saving targets is given.

6.5. Innovative financing measures in the building sector

In the previous sections, we extensively discussed the financial needs in order to achieve a high amount of energy savings in the building sector. Some examples from different EU countries for innovative measures and measure packages were described which already make an important contribution to these demands (as for example energy efficiency obligation schemes which have already been established in several Member States, the new instrument of the Green Deal in the UK or some successful measures specifically addressing public buildings).

In this section we will focus on some further innovative measures to finance building rehabilitation which have not been introduced yet but which may be an additional option in order to cope with the financial limitations for energy efficiency investments in the building sector. This brief discussion based on some recent literature can, however, not compensate for a detailed impact analysis of such new instruments and a critical comparison with the instruments already established in several EU countries.

In particular we will debate the idea of an energy efficiency levy or Energy Efficiency “Feed-in tariffs” (FiTs). This is in principle similar to the promotion of renewable through feed-in tariffs – while energy saving obligations are the equivalent to quote systems for renewable - and has the substantial advantage of financing stability and risk-lowering. On the other hand, given the fact that renewable already charge heavily especially electricity prices in some countries, it may be difficult to levy in the same way the large investments for refurbishing existing buildings. However, in difference to renewable, where first the costs are positive and serve to pay their cost down along the cost degression curve, energy efficiency options provide after some time, benefits to the consumers due to lower energy bills. Also the energy consumption on which the costs for energy efficiency investments are charged should cover a much larger range than just electricity consumption but also fossil fuel use.

A simple calculation, taking into account the financing needs of around 80 billion Euro annually for the built environment up to 2020, shows by much energy prices may need to be increased to cover those financing needs. The Primes projections from 2009 (European Commission 2010b) estimate the energy costs for the EU27 with 1220 billion Euro2005 in 2010 and 1729 billion Euro2005 in 2020. **Levying 6% annually would raise between 70 and 100 billion Euro annually, hence enough to cover the financing needs for the building investments.** However, in difference to the feed-in tariffs for renewables, this is not an extra cost to buy the cost of renewable down along the cost degression curve but would come back to the economy over time in the form of reduced energy costs and imports. Hence on average there would be net benefits to the consumers. For comparison: electricity is charged at present in Germany since 2012 with 5.3c/kWh under the feed-in tariffs, hence roughly at a level 20%. Naturally the more fuels and groups are exempted from such a levy, they higher gets the charge on the other consumers, as is the case for the feed-in tariff in Germany, which levies only on electricity and exempts industries mostly from the levy.

It is important to underline that energy levies are not new. Many EU countries have put eco-taxes on different types of energy carriers, which can be gathered in the MURE

database under the category of fiscal measures. However, none of these levies have been used to a large degree and in a dedicated manner to cover investment needs for energy efficiency. Some recent literature debates advantages and disadvantages of such a system, which will shortly be described in the following.

A recent report published by **Neme & Cowart (2012)** comes to the following conclusions (*cited from the original source*):

- *Until an efficiency FiT is tested on a large scale, it is difficult to make definitive determinations as to how it compares to energy savings obligations and/or other policy mechanisms for generating energy savings. Indeed, whether it is the best approach in any jurisdiction may well depend in large part on local conditions, including whether it is politically possible to establish a system-benefits charge funding mechanism; the degree to which there are obvious parties to “obligate” to meet savings targets; the degree to which those parties are trusted; the degree to which there are prospects for a well-functioning, competitive, and high-quality ESCO industry; evidence as to the ability and willingness of incumbent utilities, distribution companies, and energy service providers to promote deep, sustained savings; and the political and practical history of energy-savings programmes in that jurisdiction.*
- *Experience with similar or related mechanisms leads [...] to a number of conclusions regarding design:*
 - *It should be structured to allow both mass market programmes and individual retrofit projects to participate;*
 - *It must establish “ownership” rules to encourage efficiency investments and ensure no double counting of savings results;*
 - *It will be most effective if simultaneously established for both electric and gas savings;*
 - *It must be supported by a viable, long-term source of revenues to support private investments by customers, ESCOs, and other potential market participants;*
 - *The price paid for energy savings should vary by both (1) expected costs of different kinds of measures/projects and (2) the depth of savings achieved, and may vary to reflect other important values, such as addressing energy poverty, addressing peak load costs, improving reliability in congested load pockets, and so forth;*
 - *Payment should be made for the full estimated quantity of lifetime savings of measures/projects (although not necessarily the full value of the savings to the power system as a whole);*
 - *Payments should be made up-front for any measures with deemed savings (or that use deemed savings algorithms), but can be made across appropriate time periods for larger, individualised projects as needed to accurately “true up” estimated savings for those measures and/or programmes requiring EM&V investments;*
 - *Savings claims by market participants should be validated by independent third parties and periodically audited by the FiT administrator; and*
 - *Administrative systems that will need to be put in place should be developed through a process that engages a range of potential stakeholders, with the final products being as clear and transparent as possible.*
- *Finally, because efficiency FiTs have not yet been widely tested, they will almost certainly require fine-tuning as experience with their implementation is gained. Perhaps most importantly, pricing structures will need to be refined once the market response sheds light on which prices may be too high or too low to optimise investment in different types of efficiency measures and programmes.*

Green Alliance (2011) debates a demand reduction feed-in tariff for electricity for the UK. They find the following key messages in which in particular they underline the benefits for investors from the long-term stability of financing as well as the needs for an adequate monitoring and verification of electricity savings (*cited from the original source*):

- **How would an electricity efficiency FiT work in practice?** Energy saving in the UK has thus far been delivered through a supplier obligation, which has been limited to existing energy suppliers, has relied on set measures with deemed energy saving, and has not been incentivised by market forces. In contrast, a feed-in tariff could provide a stable, predictable incentive to foster competition to deliver measurable energy savings. The benefit of this approach is that it doesn't prejudge the means by which energy aggregators find ways of saving energy: it doesn't rely on a central bureaucracy to decide how energy will be saved. Instead, by providing income certainty to businesses which actually reduce energy demand, this mechanism means that potential energy aggregators don't need to be existing utilities, have a deep understanding of electricity trading, or have large capital reserves. An aggregator can very simply forecast income and expenditure on energy saving measures, and use this certainty to focus their business model on delivering better consumer engagement to encourage energy saving, securing financing for longer term energy saving, and increase the market for energy saving measures. This approach harnesses the power of the market to drive innovation in energy saving.
- **How to make FiTs to save electricity operational?** Green Alliance (2011) suggest to make FiTs to save electricity operational based on the present electricity market reform (EMR) and the suggested Feed in Tariffs (FIT) based on a Contract for Difference (CfD) which are aimed at low-carbon technology, possibly including nuclear and carbon capture and storage.
- **Ensuring additionality and verifying savings:** Additionality and verification are essentially the flip side of the same coin: both can be addressed by a clearly defined mechanism based on actual, metered savings. This is in contrast to the measurement mechanism used in the carbon emissions reduction target (CERT), which relies on deemed savings based on expected performance of efficiency measures. The benefit of this approach is that it is not open to problems such as occurred under the CERT with energy saving light bulb distribution, where energy companies sent out thousands that ended up in people's drawers, unused. To use measured savings, meter readings are needed from both before and during the period of the efficiency programme.

New financing instruments for renewable heat are discussed at present in Germany in the wake of the challenge to completely transform the energy system – the so-called “Energiewende” - due to the phase-out of nuclear energy which was decided on after the nuclear disaster in Fukushima in March 2011 (BMU 2012). Though the focus is not on renewable in this report, a brief presentation of the discussion in that field could also provide insight into similar instruments for energy efficiency. At present renewable heat in Germany is promoted with a subsidy programme (“Marktanreizprogramm MAP”). Since 2011 part of the programme means are provided by the Energy and Climate Fund described earlier. The German “Energiewende” provides for an explicit mandate to investigate such budget independent promotion schemes for renewable heat.

- **Premium model** (Seefeldt, 2011; Nast et al., 2006): The Premium model aims at the price. Investors in renewable heat receive premium fixed by law. In difference to the bonus approach developed by Nast et al. (2006) also large renewable heat generators (e.g. biomass-CHP which feed a local heat network) receive the support in form of a one-off payment (hence an investment subsidy). The differentiation of the premium by technology influences the technology mix. The subsidies are charged on the price of fossil fuels that go into the heat market. This influences the economy of fossil fuels and provides an incentive for energy efficiency in addition. Target groups are private, commercial and public building owners of residential and non-residential buildings as well as housing societies. Other involved actors are energy suppliers or traders which are obliged to charge the premium on the price for fossil fuels.

- **Portfolio model** (Seefeldt et al., 2012): This model corresponds to a quota model, hence is comparable to energy efficiency obligations. The obliged group are the suppliers of fossil fuels which have to pay energy taxes in Germany. They can fulfill the obligation by bringing more renewable energy carriers into the market, by investing into renewable heat plants or by purchasing rights from third parties. Also in this approach the costs are charged on the prices of fossil fuels. Target groups and actors would also be similar to the premium model.

An adaptation of the premium model was proposed by the Federal Ministry of Finance for the total heat sector (BMF 2011). As for the ministry it became evident that the state budgets may soon have limits for financing the necessary upfront investments for the thermal building rehabilitation. The proposal contained the following elements:

- According to the „polluter pays“ principle, the energy companies in the heat sector - similar to the obligation on electricity suppliers under the emission trading scheme and the obligation on the suppliers of motor fuels to integrate biofuels - should be obliged to take up a certain amount of CO₂-reduction based on the CO₂-contents of the fuels.
- The reduction may occur through the substitution of CO₂ containing fuels CO₂-free or neutral heating fuels, through energy efficiency improvements during supply of heat (e.g. through the avoidance of losses in the heat pipes), through CO₂ savings in the heat sector with third parties (for example through the thermal building rehabilitation, technical improvements of heating systems) or through the integration of renewable energy sources into buildings.
- Savings are certified through independent verifiers (which could develop out of the present certifiers for building certificates)
- If the savings cannot be proven, penalties have to be paid by the energy companies in the heat sector which should be high enough to provide an incentive for the realization of energy savings

The **premium model** is further discussed in detail in **Küchler & Nestle (2012)** for both renewables for heat and energy efficiency measures in the building sector. The importers/whole salers of oil and gas (in Germany around 1000 entities) have to pay a premium for each energy unit that is directly invested in renewable energy systems or efficiency measures in the building sector. The premium covers the additional investment costs in comparison to a fossil heating system or the use of the building without the thermal rehabilitation measure. The costs are charged on the price of oil and gas. The premium model can be differentiated according to the supported technology, the building (age, single or multi-family building, office building etc.). The support can also be degressive similar as for the renewables in the electricity sector. The support can be differentiated into one-time subsidies for smaller renewable energy systems (like in the present MAP) or smaller energy efficiency measures (window replacement), as well as subsidies paid over a longer time period (e.g. ten years) for larger renewable heat systems or larger investments into energy efficiency. In the latter case the knowledge from the present KfW-Programmes can be used to fix the amount of subsidies. One could also fix the subsidy to reach a preset payback time. All actors that invest into such type of measures should be able to access the premium: building owners, landlords, building societies but also energy service providers such as contractors, architects or craftsmen.

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8. Annexes

Note: The following lists of policy measures addressing energy efficiency in the building sector (residential and non-residential buildings) are all taken from the MURE database (as of beginning of November 2012): <http://www.muredatabase.org/>

8.1. List of measures in the residential sector

Measures addressing space and water heating consumption

Code	Title	Status	Type	Starting Year	Semi-quantitative Impact
AU6	Heating system design standards, maximum exhaust gas losses	Ongoing	Legislative/ Normative	1989	High
AU13	Residential building subsidy	Ongoing	Financial	1989	High
AU27	Energy advice for households	Ongoing	Information/ Education	1990	Unknown
AU5	Minimum thermal standards for buildings	Ongoing	Legislative/ Normative	1991	High
AU8	Heating cost settlement for common thermal facilities	Ongoing	Legislative/ Normative	1992	Medium
AU10	Grants for renewable energy (thermal solar, heat pumps, biomass heating, ...)	Ongoing	Financial	1992	High
AU17	topprodukte.at - Platform for energy efficient appliances	Ongoing	Information/ Education	2005	Low
AU18	klima:aktiv building - new standards for efficient buildings	Ongoing	Information/ Education	2005	High
AU19	„Wohnmodern“ – support for building developers in the extensive renovation of large apartment buildings	Ongoing	Information/ Education	2006	Medium
AU21	EU-related: Energy Performance of Buildings (Directive 2002/91/EC) - Energy Certificates for Buildings (Energieausweis für Gebäude)	Ongoing	Legislative/ Informative	2008	High
AU26	National recovery plan / renovation voucher	Ongoing	Financial	2009	Unknown
BEL19	Federal Government - K insulation level buildings regulations	Ongoing	Legislative/ Normative	1985	High
BEL1	Federal government: Tax deduction for energy saving measures in residential buildings	Ongoing	Fiscal/Tariffs	2003	Unknown
BEL10	Brussels - Grant energy subsidies	Ongoing	Financial	2003	Medium
BEL29	EU-related: Energy Performance of Buildings (Directive 2002/91/EC) - (Flanders) Insulation and energy performance regulation for buildings	Ongoing	Legislative/ Informative, Legislative/ Normative	2006	High
BEL8	EU-related: Energy Performance of Buildings (Directive 2002/91/EC) - (Wallonia) Thermal regulation for buildings	Ongoing	Legislative/ Normative	2008	High
BEL25	EU-related: Energy Performance of Buildings (Directive 2002/91/EC) - (Brussels) Act structurally on the demand through progressive reinforcement of the requirements of the EPB (building energy performance) regulations - Inspection of technical fac...	Ongoing	Legislative/ Informative, Legislative/ Normative	2008	High
BG9	EU-related: Performance of Heat Generators for Space Heating/Hot Water (Directive 92/42/EEC) - Update of the legislative requirements for the efficiency coefficient at nominal power and partial power of boilers, working with liquid and/or gas fuel	Ongoing	Legislative/ Normative	2005	Medium
BG8	Control Systems for heating regulation	Ongoing	Legislative/ Normative	2007	Medium
BG13	Individual billing (multi-family houses)	Ongoing	Legislative/ Normative	2007	High

Code	Title	Status	Type	Starting Year	Semi-quantitative Impact
BG16	Update for the legislation requirements and methods for design of the heating, ventilation and air-conditioning installations in buildings with counting the advance of the technical progress in the area	Ongoing	Legislative/ Normative	2007	Medium
BG17	EU-related: Performance of Heat Generators for Space Heating/Hot Water (Directive 92/42/EEC) - Mandatory energy efficiency control for boilers and air-conditioning systems - Households	Ongoing	Legislative/ Normative	2008	High
BG25	National Program for increase of the energy efficiency at the solid fuel usage	Proposed (advanced)	Legislative/ Normative	2012	Unknown
CR13	Program of LPG and solar energy use in the islands	Ongoing	Legislative/ Normative	2008	Low
CY9	EU-related: Energy Performance of Buildings EPBD Recast (Directive 2010/31/EU) - Information, awareness campaigns, workshops, seminars for energy savings	Ongoing	Information/ Education, Legislative/ Normative	2004	Medium
CZ20	Support to housing fund modernization using the building saving	Ongoing	Legislative/ Normative	1995	Medium
CZ10	The EFEKT programme (Previous name Government Programme part A)	Ongoing	Financial, Information/ Education	1999	Low
CZ14	Renewal of panel houses – PANEL programme/New Panel	Ongoing	Legislative/ Normative	2001	Low
CZ15	Loans granted to cities, towns and villages for modernization of housing units	Ongoing	Financial	2001	Low
CZ16	Edification – state support to activities leading to reduction in heat energy consumption in the residential sector	Ongoing	Information/ Education	2001	Low
CZ1	Specifying the details of the efficiency of the utilization of energy in consumption of heat inside of structures	Ongoing	Legislative/Informati ve, Legislative/Normativ e	2002	Unknown
CZ5	EU-related: Energy Performance of Buildings (Directive 2002/91/EC) - Periodic mandatory inspection of boilers (Povinná pravidelná kontrola kotlů)	Ongoing	Legislative/ Informative, Legislative/ Normative	2006	Unknown
CZ19	Green to Savings Programme	Ongoing	Financial	2009	High
DK4	Heat Consulting	Completed	Legislative/ Normative	1986	Low
DK2	Grant for energy saving measures for pensioners' dwellings	Completed	Financial	1993	High
DK12	Grants for connection of houses built before 1950 to district CHP systems	Completed	Financial	1993	Low
DK14	1995 Regulations for New Building	Completed	Legislative/ Normative	1995	Medium
DK18	Statutory inspection of boilers and heating installations	Ongoing	Legislative/ Normative	1995	Low
DK3	Energy management for larger buildings	Ongoing	Legislative/ Informative	1997	Low
DK11	Energy Certificate	Ongoing	Legislative/ Informative	1997	Low
DK15	Energy labelling of smaller buildings	Completed	Legislative/ Informative	1997	Medium
DK22	Carbon Dioxid tax	Ongoing	Cross-cutting with sector-specific characteristics	1998	Low
DK10	Grid Supplied Heat Planning	Ongoing	Legislative/ Normative	2000	Medium
DK9	Agreement on efficient windows	Completed	Financial	2004	Medium
DK32	EU-related: Energy Performance of Buildings EPBD Recast (Directive 2010/31/EU) - Energy Labeling Buildings	Ongoing	Legislative/ Normative	2005	High

Code	Title	Status	Type	Starting Year	Semi-quantitative Impact
DK8	EU-related: Energy Performance of Buildings (Directive 2002/91/EC) - Revision of thermal building code (2005/2006)	Ongoing	Legislative/ Normative	2006	Low
DK21	Energy requirements for new and existing buildings (substitute by DK8)	Completed	Legislative/ Normative	2006	Low
DK33	Scrapping scheme for oil-fired boilers	Ongoing	Financial	2010	Medium
DK31	EU-related: Performance of Heat Generators for Space Heating/Hot Water (Directive 92/42/EEC) - Statutory inspection of boilers and heating installations	Ongoing	Legislative/ Normative	2011	Unknown
EST13	Information campaigns for energy efficient renovation of residential buildings	Ongoing	Information/ Education	1993	Medium
EST11	Support for energy efficient renovation of residential buildings (multi-apartment houses)	Ongoing	Financial	2003	Medium
EST12	Grants for energy audits in residential buildings	Ongoing	Financial	2003	Medium
EST1	EU-related: Performance of Heat Generators for Space Heating/Hot Water (Directive 92/42/EEC) - Efficiency requirements for boilers	Ongoing	Legislative/ Normative	2004	Medium
EST2	Requirements for periodic mandatory inspection of boilers	Ongoing	Legislative/ Normative	2005	Low
EST15	Minimum energy performance requirements (for buildings)	Ongoing	Legislative/ Normative	2008	High
EST16	EU-related: Energy Performance of Buildings (Directive 2002/91/EC) - Energy performance of buildings	Ongoing	Legislative/ Informative, Legislative/ Normative	2008	High
EST18	Building design and construction supervision support for apartment associations for making preparations for major renovation	Ongoing	Financial	2010	Medium
EU59	empty	Unknown			Unknown
EU10	Performance of Heat Generators for Space Heating/Hot Water (Directive 92/42/EEC)	Ongoing	Legislative/ Normative	1998	High
EU63	Recast Ecodesign Directive for Energy-related Products (Directive 2009/125/EC)	Ongoing	Legislative/ Normative	2010	High
EU78	Energy labelling of air conditioners ("New EU Energy Label")	Ongoing	Legislative/ Informative	2013	High
FIN6	EU-related: Performance of Heat Generators for Space Heating/Hot Water (Directive 92/42/EEC) - Building code D7: Orders for boiler efficiency	Ongoing	Legislative/ Informative, Legislative/ Normative	1998	Unknown
FIN8	Promotion of wood pellet heating in buildings	Ongoing	Financial	1999	Unknown
FIN2	Procurement competition for energy efficient detached-houses	Completed	Co-operative Measures	2000	Low
FIN30	Promotion of heat pumps	Ongoing	Information/ Education	2000	High
FIN5	Programme for energy conservation in oil-heated buildings, the "Höylä II" programme	Completed	Information/ Education	2002	High
FIN20	Energy Efficient Home Campaign	Completed	Information/ Education	2005	Low
FIN1	Window Energy Rating System	Ongoing	Information/ Education	2006	High
FIN21	Programme for energy conservation in oil-heated buildings, the Höylä III Programme	Ongoing	Information/ Education	2007	High
FIN24	EU-related: Energy Performance of Buildings (Directive 2002/91/EC) - Periodic voluntary inspections of household boilers	Ongoing	Information/ Education	2007	Low
FIN31	Building code D5: guidelines on the calculation of power and energy needs for heating of buildings	Ongoing	Unknown	2008	Unknown
FIN7	Building codes C3 and C4: Thermal insulation	Ongoing	Legislative/ Normative	2010	High

Code	Title	Status	Type	Starting Year	Semi-quantitative Impact
FIN33	Building code D1: Water and Drainage Systems for Properties	Ongoing	Legislative/ Normative	2011	Medium
GER78	EU-related: Recast Ecodesign Directive for Energy-related Products (Directive 2009/125/EC) - Energiebetriebene-Produkte-Gesetz – EBPG (revised version)	Proposed(a dvanced)			High
GER11	Ordinance on Heat Consumption Metering (Verordnung über Heizkostenabrechnung)	Ongoing	Legislative/ Normative	1981	High
GER9	On-site energy advice (Vor-Ort-Beratung)	Ongoing	Financial	1991	Medium
GER32	Market Incentive Programme for Renewable Energies (Marktanzreizprogramm für erneuerbare Energien – MAP)	Ongoing	Financial	1999	High
GER33	KfW Programme "Energy-efficient refurbishment" (former CO2 Building Rehabilitation Programme)	Ongoing	Financial	2001	High
GER6	EU-related: Energy Performance of Buildings (Directive 2002/91/EC) - Energy Savings Ordinance (Energieeinsparverordnung - EnEV)	Completed	Legislative/ Informative, Legislative/ Normative	2002	High
GER68	EU-related: Energy Performance of Buildings (Directive 2002/91/EC) - Länder activities in the building sector	Ongoing	Legislative/ Informative, Legislative/ Normative	2002	High
GER42	KfW Programme Housing Modernisation (KfW-Programm Wohnraum Modernisieren)	Completed	Financial	2005	Medium
GER43	KfW Programme Ecological Construction (KfW Programm Ökologisch Bauen)	Completed	Financial	2005	Low
GER72	EU-related: Revised Directive for Labelling of Energy-related Products (Directive 2010/30/EU) - Energy Consumption Labelling Ordinance – revised version (EnVKV - revised)	Proposed(a dvanced)	Legislative/ Informative	2011	Medium
GER67	EU-related: Energy Performance of Buildings EPBD Recast (Directive 2010/31/EU) - Energy Savings Ordinance - revision 2012	Unknown	Legislative/ Normative	2013	High
GRE15	Energy Performance of residential Buildings	Ongoing	Legislative/ Informative, Legislative/ Normative	2009	High
GRE22	Promotion of Combined heat and power (CHP) and district heating systems- Residential Sector	Unknown	Financial, Unknown	2009	Medium
GRE16	"Energy Savings in households" Program	Ongoing	Financial, Legislative/ Normative	2010	High
GRE20	Installation of electronic and intelligent metering of electricity and natural gas residential consumers	Ongoing	Co-operative Measures, Financial, Information/ Education	2010	Medium
GRE23	"Xtizodas to Mellon" Project- Residential sector	Ongoing	Co-operative Measures, Financial, Legislative/ Normative	2011	Unknown
GRE12	Obligatory installation of central thermal solar systems in residential buildings.	Ongoing	Financial, Fiscal/Tariffs, Legislative/ Informative, Legislative/ Normative	2012	Medium
HUN21	Application of individual measurements with miniature heat centres in district heating supply	Proposed(a dvanced)	Legislative/ Normative		Medium
HUN23	Development of the operation of an energy efficiency consultant network	Proposed(a dvanced)	Information/ Education		Low
HUN31	Sub-programme Our Home: Reduction of the heat demand of residential buildings with individual and central heating	Proposed (advanced)	Financial		Low

Code	Title	Status	Type	Starting Year	Semi-quantitative Impact
HUN16	Non-Governmental Organisations for Energy Efficiency	Ongoing	Information/Education	1992	Low
HUN13	Introduction of bill settlement based on metering in district heating	Completed	Legislative/Normative	1998	Low
HUN11	Financial assistance for domestic energy savings for 2006	Completed	Financial	2001	Low
HUN28	Individual measurements, application of mini heat centres in district heating	Ongoing	Legislative/Normative	2005	Low
HUN20	Residential energy saving programme for 2008	Completed	Financial	2008	Low
HUN27	EU-related: Energy Performance of Buildings (Directive 2002/91/EC) - Energy review of heat producing sets and air conditioning systems	Ongoing	Legislative/Informative, Legislative/Normative	2008	Medium
HUN25	Residential energy saving programme for 2009	Completed	Financial	2009	Low
HUN26	Green Investment Climate-friendly Home Sub-programme (ZBR-Panel) / Green Investment System Climate friendly Home Energy Efficiency Sub-programme (ZBR-EH) for 2009	Completed	Financial	2009	Low
IRL14	Energy Conservation Standards for New Dwellings (Revised Building Regulations) 2002	Completed	Legislative/Normative	2003	High
IRL25	Building Regulations 2008	Ongoing	Legislative/Normative	2008	Medium
IRL40	Building regulations 2011	Ongoing	Legislative/Normative	2011	High
IRL41	Building Regulations - Nearly Zero Energy Homes	Proposed (medium/long-term)	Legislative/Normative	2016	High
ITA14	Fiscal Incentives for Energy Saving in the Household Sector	Completed	Fiscal/Tariffs	1992	Low
ITA5	Energy Performance of buildings: design norms for building shell and thermal equipments	Ongoing	Legislative/Normative	1993	Medium
ITA12	Limit to the Heating Period of Buildings	Ongoing	Legislative/Normative	1993	Low
ITA15	EU-related: Performance of Heat Generators for Space Heating/Hot Water (Directive 92/42/EEC) - Standards and Labelling for New Boilers	Ongoing	Legislative/Normative	1997	Low
ITA16	Energy Performance of Buildings: modifications of the design norms for buildings shell and thermal systems	Ongoing	Legislative/Normative	2000	Low
ITA33	White Certificates	Ongoing	Financial	2004	Medium
ITA24	EU-related: Energy Performance of Buildings (Directive 2002/91/EC) - Energy Performance of Buildings	Ongoing	Legislative/Informative, Legislative/Normative	2006	High
ITA31	Energy Performance of Building: updated of the norms on thermal systems efficiency	Ongoing	Legislative/Normative	2006	Medium
ITA30	New Fiscal incentives for energy savings in the household sector	Ongoing	Financial, Fiscal/Tariffs	2007	High
ITA28	Mandatory use of solar thermal energy in buildings	Ongoing	Legislative/Normative	2009	Medium
ITA32	EU-related: Revised Directive for Labelling of Energy-related Products (Directive 2010/30/EU) - Eco Design Directive. Framework Law	Ongoing	Legislative/Informative	2011	Medium
LV20	EU-related: Energy Performance of Buildings (Directive 2002/91/EC) - Minimum Thermal Insulation Standards	Ongoing	Legislative/Normative	2003	Medium
LV18	Regulation on Heat Supply and Ventilation of Public Buildings and Dwelling Houses	Ongoing	Legislative/Normative	2004	Low
LV21	EU-related Performance of Heat Generators for Space Heating/Hot Water (Directive 92/42/EEC)	Ongoing	Legislative/Normative	2004	Medium
LV33	Increasing Heat Energy Efficiency in Social Apartment Buildings	Ongoing	Financial	2008	Medium

Code	Title	Status	Type	Starting Year	Semi-quantitative Impact
LV27	EU-related Energy Performance of Buildings (Directive 2002/91/EC)	Ongoing	Legislative/ Informative, Legislative/ Normative	2009	Medium
LV28	Increasing Energy Efficiency in Multi Apartment Buildings	Ongoing	Financial	2009	High
LV29	Information Campaign "Live Warmer"	Ongoing	Information/ Education	2009	Medium
LV31	Grants for Renewable Energy Technologies in Households	Ongoing	Financial	2011	Low
LV36	EU-related: Recast Ecodesign Directive for Energy-related Products (Directive 2009/125/EC) - EU-related Recast Ecodesign Directive for Energy-related Products (Directive 2009/125/EC)	Ongoing	Legislative/ Normative	2011	Medium
LT2	Thermal Techniques of Building Enclosures from 1992	Completed	Legislative/ Normative	1992	Unknown
LT7	Demonstration project in the field of energy saving (housing)	Completed	Financial	1998	Medium
LT3	Thermal Technique of Envelopes of the Buildings 1999-2005	Completed	Legislative/ Normative	1999	High
LT4	Thermal Technique of Envelopes of the Buildings from 2005	Ongoing	Legislative/ Normative	2005	High
LT8	Programme for the renovation/upgrading of multi-apartment buildings	Ongoing	Financial	2005	High
LT9	Preferential VAT rate of 9%	Completed	Fiscal/Tariffs	2005	Unknown
LT15	EU-related: Recast Ecodesign Directive for Energy-related Products (Directive 2009/125/EC) - Ecodesign	Unknown	Legislative/ Normative	2005	Unknown
LT10	European Union Structural Funds 2007–2013	Ongoing	Financial	2007	Medium
LT12	Energy efficiency improvement in the household sector	Ongoing	Financial	2010	High
LT11	'Visagino Energizija', Visaginas town Programme for energy efficiency improvement in multiapartment buildings	Ongoing	Financial	2011	Unknown
LUX21	Improvement in the overall energy efficiency of private dwellings (WD 2012) (new/old buildings)	Unknown	Legislative/ Normative		High
LUX22	Renewal of oldest heating systems	Proposed (advanced)	Financial		Medium
LUX11	EU-related: Energy Performance of Buildings (Directive 2002/91/EC) - Ordinance of the Grand Duchy of 22 November 1995 on the thermal insulation of buildings (dwellings)	Completed	Legislative/ Normative	1996	High
LUX12	Promotion of efficient new building/more efficient heating systems (2001-2007)	Completed	Financial	2001	High
LUX13	EU-related: Energy Performance of Buildings (Directive 2002/91/EC) - Improvement in the overall energy efficiency of private dwellings (WD 2008) (new/old buildings)	Ongoing	Legislative/ Normative	2008	High
LUX14	Old building upgrade programme	Ongoing	Financial	2008	Medium
LUX15	Promotion of energy-efficient new homes (new building compared with WD2008: low-energy housing, passive housing)	Ongoing	Financial	2008	Medium
LUX17	Renewal of oldest heating systems	Ongoing	Financial, Legislative/ Normative	2008	Medium
LUX16	Expansion of the upgrading programme for old buildings	Unknown	Financial	2010	Medium
LUX18	Increase in promotion of efficient new building (new buildings, as against WD2008)	Unknown	Financial	2010	Medium

Code	Title	Status	Type	Starting Year	Semi-quantitative Impact
LUX20	EU-related: Recast Ecodesign Directive for Energy-related Products (Directive 2009/125/EC) - Law establishing a framework for setting ecodesign requirements for energy related products	Unknown	Legislative/ Normative	2010	Unknown
MAL3	Grants on purchase of micro-RES generation equipment	Ongoing	Financial	2006	High
MAL2	Provision of advisory services for domestic customers	Completed	Information/ Education	2007	Medium
NOR2	Local energy efficiency fund in Oslo (Enøkfondet i Oslo)	Ongoing	Financial	1981	Low
NOR4	Building regulations 1987 (Byggeforeskrift 1987)	Completed	Legislative/ Normative	1987	Medium
NOR12	Energy saving loans (Husbanken)	Ongoing	Financial	1996	Low
NOR16	Building Regulations 1997 (Byggeforskrift 1997)	Completed	Legislative/ Normative	1997	Medium
NOR26	EU-related: Performance of Heat Generators for Space Heating/Hot Water (Directive 92/42/EEC) - Performance of Heat Generators for Space Heating and the Production of Hot Water (92/42/EEC) - Minimum energy efficiency standards for boilers	Ongoing	Legislative/ Normative	1998	Low
NOR5	Energy efficient low energy houses (Energibruk i boliger)	Completed	Financial	2003	Low
NOR14	Grants to electricity savings in households (Elsparetiltak i husholdningene)	Completed	Financial	2003	Low
NOR22	Grants for electricity savings in households (Tilskuddsordningen i husholdningene)	Ongoing	Financial	2006	Low
NOR27	Building regulations 2007 (Byggeforeskrift 2007)	Completed	Legislative/ Normative	2007	High
NOR19	EU-related: Energy Performance of Buildings (Directive 2002/91/EC) - Bygningsenergidirektivet	Ongoing	Legislative/ Informative	2010	High
NOR28	Building regulations 2010 (Byggeforskrift 2010)	Ongoing	Legislative/ Normative	2011	High
PL9	Promotion of solar collectors in households sector	Ongoing	Financial	2010	Low
RO24	Regulation of heat supply and use	Ongoing	Legislative/ Normative	1994	Medium
RO21	EU-related: Performance of Heat Generators for Space Heating/Hot Water (Directive 92/42/EEC) - 2/42/EEC) - Minimum efficiency requirements of new hot-water boilers fired with liquid or gaseous fuels	Ongoing	Legislative/ Normative	2003	Medium
RO31	EU-related: Performance of Heat Generators for Space Heating/Hot Water (Directive 92/42/EEC) - Energy labelling of new hot water boilers fired with liquid or gaseous fuels	Ongoing	Legislative/ Informative, Legislative/ Normative	2003	High
RO25	EU-related: Energy Performance of Buildings (Directive 2002/91/EC) - formance of New Buildings-building code	Ongoing	Legislative/ Informative, Legislative/ Normative	2007	Medium
RO30	EU-related: Energy Performance of Buildings (Directive 2002/91/EC) - Energy Performance of existing Buildings-obligatory energy efficiency certificates	Ongoing	Financial, Information/ Education, Legislative/ Normative	2007	High
RO22	Individual billing of the consumers supplied by public distric heating systems	Ongoing	Legislative/ Normative	2009	High
SK3	EU-related: Energy Performance of Buildings (Directive 2002/91/EC) - Energy Performance Certificates for Buildings	Ongoing	Legislative/ Informative, Legislative/ Normative	2006	High

Code	Title	Status	Type	Starting Year	Semi-quantitative Impact
SLO2	EU-related: Recast Ecodesign Directive for Energy-related Products (Directive 2009/125/EC) - Rules on efficiency requirements for new hot-water boilers fired with liquid or gaseous fuels	Ongoing	Legislative/ Informative, Legislative/ Normative	2002	Low
SLO14	Regulation on thermal insulation and efficient energy use in buildings	Completed	Legislative/ Normative	2002	High
SLO21	Financial incentives for the energy efficient heating systems	Ongoing	Financial	2008	High
SLO24	Compulsory division and calculation of heating costs in multi-dwelling and other buildings according to actual consumption	Ongoing	Legislative/ Normative	2008	Low
SLO25	Rules on efficient use of energy in buildings	Ongoing	Legislative/ Normative	2010	High
SPA16	Norms and technical complementary instructions for homologation of solar panels	Completed	Co-operative Measures	1980	High
SPA4	Heating, Air Conditioning and Sanitary Water Equipment Regulations	Completed	Legislative/ Normative	1981	High
SPA5	Financial help for Energy Efficiency (Law 82/1980) (Ley de Conservación de la Energía 82/1980)	Completed	Financial	1982	Medium
SPA17	Norm on building thermal insulation in Catalonia region	Ongoing	Legislative/ Normative	1987	High
SPA2	Energy Conservation and Efficiency Plan, EECF 1991-2000 (Plan de Ahorro y Eficiencia Energética, PAEE 1991-2000)	Completed	Financial, Information/ Education	1991	Medium
SPA13	EU-related: Performance of Heat Generators for Space Heating/Hot Water (Directive 92/42/EEC) - 2/42/EEC) - Regulation of Thermal Installations in Buildings	Completed	Legislative/ Normative	1998	High
SPA10	Aid Programme for the support of solar thermal energy	Completed	Financial	2000	High
SPA15	Plan for the Promotion of Renewable Energies in Spain 2000-2010 (Plan de Fomento de las Energías Renovables 2000-2010)	Completed	Financial	2000	High
SPA7	Proposal of a Municipal Ordinance for thermal uses of solar absorption	Ongoing	Legislative/ Normative	2001	High
SPA27	Action Plan 2005-2007: Improvement of the energy efficiency of thermal installations in existing buildings	Completed	Financial, Legislative/ Normative	2005	High
SPA35	EU-related: Energy Performance of Buildings (Directive 2002/91/EC) - Energy Certificate for new and refurbished buildings	Ongoing	Legislative/ Informative	2007	High
SPA36	EU-related: Energy Performance of Buildings (Directive 2002/91/EC) - Technical Building Code (CTE)	Ongoing	Legislative/ Normative	2007	High
SPA38	IDAE's Financing Lines for Thermal Renewable Energies in Buildings: BIOMCASA-SOLCASA-GEOTCASA	Ongoing	Financial, Information/ Education	2009	Medium
SPA31	Action Plan 2011-2020: Improvement of energy efficiency of the thermal installations in existing buildings.	Ongoing	Financial, Legislative/ Normative	2011	High
SPA33	Action Plan 2011-2020: Construction of new buildings and rehabilitation of the existing ones with high energy qualification	Ongoing	Financial, Legislative/ Informative, Legislative/ Normative	2011	High
SPA39	EU-related: Energy Performance of Buildings EPBD Recast (Directive 2010/31/EU) - Action Plan 2011-2020: Construction or rehabilitation of nearly-zero energy buildings	Ongoing	Financial, Legislative/ Informative, Legislative/ Normative	2011	Low
SWE23	Technology procurement (teknikupphandling)	Ongoing		1989	Unknown
SWE5	Investment grants for solar heating	Completed	Financial	2000	Medium

Code	Title	Status	Type	Starting Year	Semi-quantitative Impact
SWE10	Investments grants for small scale biofuel-fired heating systems and more energy efficient windows (Stöd för installation av energieffektiva fönster eller biobränsleanordningar)	Completed	Fiscal/Tariffs	2006	Low
SWE14	Support for conversion of heating system in household	Completed	Financial	2006	Medium
SWE21	Support for installation of Solar heat (Stöd till installation av solceller)	Ongoing	Financial	2009	Medium
UK11	UK11_National Grid Affordable Warmth Solutions	Ongoing	Financial, Information/Education	2001	Low
UK20	UK20_Carbon Emissions Reduction Target & Suppliers obligation	Ongoing	Co-operative Measures, Financial	2008	High

Measures addressing electricity consumption

Code	Title	Status	Type	Starting Year	Semi-quantitative Impact
AU27	Energy advice for households	Ongoing	Information/Education	1990	Unknown
AU5	Minimum thermal standards for buildings	Ongoing	Legislative/Normative	1991	High
AU1	EU-related: Energy Labelling of Household Appliances (Directive 92/75/EC) - EU-related Energy Labelling of Household Appliances (Directive 92/75/EC)	Ongoing	Legislative/Informative	1994	Medium
AU17	topprodukte.at - Platform for energy efficient appliances	Ongoing	Information/Education	2005	Low
AU18	klima:aktiv building - new standards for efficient buildings	Ongoing	Information/Education	2005	High
AU19	„Wohnmodern“ – support for building developers in the extensive renovation of large apartment buildings	Ongoing	Information/Education	2006	Medium
AU28	Smart Metering and Informative Billing	Ongoing	Information/Education	2008	Unknown
BEL8	EU-related: Energy Performance of Buildings (Directive 2002/91/EC) - (Wallonia) Thermal regulation for buildings	Ongoing	Legislative/Normative	2008	High
BEL25	EU-related: Energy Performance of Buildings (Directive 2002/91/EC) - (Brussels) Act structurally on the demand through progressive reinforcement of the requirements of the EPB (building energy performance) regulations - Inspection of technical fac...	Ongoing	Legislative/Informative, Legislative/Normative	2008	High
BG10	EU-related: Ecodesign Directive for Energy-using Products (Directive 2005/32/EC) - Mandatory measures for efficient lighting	Ongoing	Legislative/Normative	2005	Medium
BG12	EU-related: Energy Labelling of Household Appliances (Directive 92/75/EC) - Minimum efficiency standards for electrical appliances	Ongoing	Legislative/Normative	2006	Medium
BG17	EU-related: Performance of Heat Generators for Space Heating/Hot Water (Directive 92/42/EEC) - Mandatory energy efficiency control for boilers and air-conditioning systems - Households	Ongoing	Legislative/Normative	2008	High
BG26	Preferential credits for electrical energy savings in residential buildings	Proposed (advanced)	Financial	2012	Medium
CR9	Building regulations and enforcement	Ongoing	Legislative/Normative	2006	High

Code	Title	Status	Type	Starting Year	Semi-quantitative Impact
CR14	Plan for Energy renovation of residential buildings	Ongoing	Financial	2011	High
CZ10	The EFEKT programme (Previous name Government Programme part A)	Ongoing	Financial, Information/ Education	1999	Low
CZ17	EU-related: Energy Labelling of Household Appliances (Directive 92/75/EC) - (Energetické štítkování domácích elektrospotřebičů)	Ongoing	Legislative/ Normative	2004	Low
CZ18	Electric energy savings in the area of household lighting	Ongoing	Legislative/ Normative	2010	Low
DK22	Carbon Dioxid tax	Ongoing	Cross-cutting with sector-specific characteristics	1998	Low
DK28	The electricity savings label (Elsparemærket)	Ongoing	Information/ Education	2006	High
DK23	A-pumps	Completed	Information/ Education	2007	Medium
DK24	Guide for lower electricity consumption	Completed	Information/ Education	2007	High
DK25	Cheapest-most expensive campaign focusing on electricity savings	Completed	Information/ Education	2007	High
DK26	My house – the intelligent home	Ongoing	Information/ Education	2007	High
DK27	Club1000 - 1000 kWh campaign	Ongoing	Information/ Education	2007	Medium
EST3	EU-related: Recast Ecodesign Directive for Energy-related Products (Directive 2009/125/EC) - Energy efficiency requirements for electrical appliances	Ongoing	Legislative/ Normative	2004	Medium
EST4	EU-related: Revised Directive for Labelling of Energy-related Products (Directive 2010/30/EU) - Energy labelling of household electric appliances	Ongoing	Legislative/ Informative	2004	Medium
EST15	Minimum energy performance requirements (for buildings)	Ongoing	Legislative/ Normative	2008	High
EU12	Energy Labelling of Household Appliances (Directive 92/75/EC)	Ongoing	Legislative/ Informative	1994	High
EU62	Ecodesign Directive for Energy-using Products (Directive 2005/32/EC)	Ongoing	Legislative/ Normative	2007	High
EU63	Recast Ecodesign Directive for Energy-related Products (Directive 2009/125/EC)	Ongoing	Legislative/ Normative	2010	High
EU67	Ecodesign for TVs	Ongoing	Legislative/ Normative	2010	Unknown
EU69	Ecodesign for external power supplies	Ongoing	Legislative/ Normative	2010	Unknown
EU61	Revised Directive for Labelling of Energy-related Products (Directive 2010/30/EU)	Ongoing	Legislative/ Informative	2011	High
EU73	Ecodesign for washing machines	Unknown	Legislative/ Normative	2011	Unknown
EU74	Energy labelling of household dishwashers ("New EU Energy Label")	Ongoing	Legislative/ Informative	2011	High
EU75	Energy labelling of household refrigerating appliances ("New EU Energy Label")	Ongoing	Legislative/ Informative	2011	High
EU76	Energy labelling of household washing machines ("New EU Energy Label")	Ongoing	Legislative/ Informative	2011	High
EU77	Energy labelling of televisions ("New EU Energy Label")	Ongoing	Legislative/ Informative	2011	High
EU79	Ecodesign for dishwashers	Ongoing	Legislative/ Normative	2011	High
EU68	Ecodesign for Circulators	Proposed (advanced)	Legislative/ Normative	2013	Unknown
EU78	Energy labelling of air conditioners ("New EU Energy Label")	Ongoing	Legislative/ Informative	2013	High

Code	Title	Status	Type	Starting Year	Semi-quantitative Impact
GER48	Top Runner Strategy	Proposed (medium/long-term)	Legislative/ Informative, Legislative/ Normative		High
GER78	EU-related: Recast Ecodesign Directive for Energy-related Products (Directive 2009/125/EC) - Energiebetriebene-Produkte-Gesetz – EBPG (revised version)	Proposed (advanced)			High
GER14	Environmental Label "Blue Angel" (Umweltzeichen "Blauer Engel")	Ongoing	Information/ Education	1977	Low
GER8	EU-related: Ecodesign Directive for Energy-using Products (Directive 2005/32/EC) - Energiebetriebene-Produkte-Gesetz - EBPG	Ongoing	Legislative/ Normative	2009	High
GER64	Smart Metering	Ongoing	Legislative/ Informative	2010	Medium
GER72	EU-related: Revised Directive for Labelling of Energy-related Products (Directive 2010/30/EU) - Energy Consumption Labelling Ordinance – revised version (EnVKV - revised)	Proposed (advanced)	Legislative/ Informative	2011	Medium
GER67	EU-related: Energy Performance of Buildings EPBD Recast (Directive 2010/31/EU) - Energy Savings Ordinance - revision 2012	Unknown	Legislative/ Normative	2013	High
GER90	Test	Unknown	Legislative/ Normative	2013	Unknown
GRE19	Energy Labelling of appliances and minimum energy efficiency requirements-Residential Sector	Ongoing	Information/ Education, Legislative/ Normative	2006	Medium
GRE17	"Changing Air-Condition" Program	Completed	Financial	2009	Unknown
GRE16	"Energy Savings in households" Program	Ongoing	Financial, Legislative/ Normative	2010	High
GRE20	Installation of electronic and intelligent metering of electricity and natural gas residential consumers	Ongoing	Co-operative Measures, Financial, Information/ Education	2010	Medium
GRE23	"Xtizodas to Mellon" Project- Residential sector	Ongoing	Co-operative Measures, Financial, Legislative/ Normative	2011	Unknown
HUN23	Development of the operation of an energy efficiency consultant network	Proposed (advanced)	Information/ Education		Low
HUN32	Programme of Electricity Saving Households: reduction of household electricity demands	Proposed (advanced)	Information/ Education, Legislative/ Informative		Low
HUN16	Non-Governmental Organisations for Energy Efficiency	Ongoing	Information/ Education	1992	Low
HUN30	Spinning Grumbler (Forgó-Morgó) for change of electrical appliances of households	Completed	Information/ Education	2006	Low
HUN29	Replacement of household appliances subprogramme of the Green Investment System	Completed	Financial	2009	Low
IRL34	Condensing Boilers - Minimum Boiler Efficiency	Ongoing	Legislative/ Normative	2008	High
IRL27	EU-related: Recast Ecodesign Directive for Energy-related Products (Directive 2009/125/EC) - Energy Efficient Lighting	Ongoing	Legislative/ Normative	2009	High
IRL29	Smart Metering	Ongoing	Information/ Education	2016	High
ITA14	Fiscal Incentives for Energy Saving in the Household Sector	Completed	Fiscal/Tariffs	1992	Low
ITA5	Energy Performance of buildings: design norms for	Ongoing	Legislative/	1993	Medium

Code	Title	Status	Type	Starting Year	Semi-quantitative Impact
	building shell and thermal equipments		Normative		
ITA23	EU-related: Energy Labelling of Household Appliances (Directive 92/75/EC) - Standards and Labelling of refrigerators and freezers	Ongoing	Legislative/ Informative	1998	Low
ITA13	EU-related: Energy Labelling of Household Appliances (Directive 92/75/EC) - Standards and Labelling for Dishwashers	Ongoing	Legislative/ Informative	1999	Low
ITA16	Energy Performance of Buildings: modifications of the design norms for buildings shell and thermal systems	Ongoing	Legislative/ Normative	2000	Low
ITA19	EU-related: Energy Labelling of Household Appliances (Directive 92/75/EC) - Standards and Labelling for Air Conditioners and Electric-Fired Ovens	Ongoing	Legislative/ Informative	2003	Low
ITA33	White Certificates	Ongoing	Financial	2004	Medium
ITA24	EU-related: Energy Performance of Buildings (Directive 2002/91/EC) - Energy Performance of Buildings	Ongoing	Legislative/ Informative, Legislative/ Normative	2006	High
ITA30	New Fiscal incentives for energy savings in the household sector	Ongoing	Financial, Fiscal/Tariffs	2007	High
ITA29	EU-related: Ecodesign Directive for Energy-using Products (Directive 2005/32/EC) - Standard for efficient lighting and electrical appliances	Ongoing	Legislative/ Normative	2011	Medium
ITA32	EU-related: Revised Directive for Labelling of Energy-related Products (Directive 2010/30/EU) - Eco Design Directive. Framework Law	Ongoing	Legislative/ Informative	2011	Medium
LV31	Grants for Renewable Energy Technologies in Households	Ongoing	Financial	2011	Low
LV36	EU-related: Recast Ecodesign Directive for Energy-related Products (Directive 2009/125/EC) - EU-related Recast Ecodesign Directive for Energy-related Products (Directive 2009/125/EC)	Ongoing	Legislative/ Normative	2011	Medium
LT14	EU-related: Revised Directive for Labelling of Energy-related Products (Directive 2010/30/EU) - Labelling of energy consumption-related products	Ongoing	Legislative/ Informative	2004	Unknown
LT15	EU-related: Recast Ecodesign Directive for Energy-related Products (Directive 2009/125/EC) - Ecodesign	Unknown	Legislative/ Normative	2005	Unknown
LUX23	Promotion of efficient refrigerators (A++)	Ongoing	Financial		Unknown
LUX19	EU-related: Ecodesign Directive for Energy-using Products (Directive 2005/32/EC) - Law establishing a framework for setting ecodesign requirements applicable to the EuP	Ongoing	Legislative/ Normative	2009	Low
LUX20	EU-related: Recast Ecodesign Directive for Energy-related Products (Directive 2009/125/EC) - Law establishing a framework for setting ecodesign requirements for energy related products	Unknown	Legislative/ Normative	2010	Unknown
MAL1	Rebates on investments in energy efficiency by domestic consumers	Completed	Financial	2006	High
MAL3	Grants on purchase of micro-RES generation equipment	Ongoing	Financial	2006	High
MAL7	Information Campaigns	Ongoing	Information/ Education	2008	Medium
MAL6	Promotion of Compact fluorescent Lamps	Completed	Financial	2009	High
MAL8	Energy Audits for households	Proposed (medium/ long-term)	Financial, Information/ Education	2013	Unknown
NOR1	EU-related: Energy Labelling of Household Appliances (Directive 92/75/EC) - (Energimerking av hvitevarer)	Ongoing	Legislative/ Informative	1996	Low
NOR17	Energy Act on informative billing (Energiloven)	Completed	Information/ Education	1999	High

Code	Title	Status	Type	Starting Year	Semi-quantitative Impact
RO9	EU-related: Revised Directive for Labelling of Energy-related Products (Directive 2010/30/EU) - Using promotion of performing household appliances	Ongoing	Legislative/ Informative	2001	Medium
RO7	EU-related: Recast Ecodesign Directive for Energy-related Products (Directive 2009/125/EC) - Efficiency standards for household appliances	Ongoing	Legislative/ Normative	2004	Medium
SK3	EU-related: Energy Performance of Buildings (Directive 2002/91/EC) - Energy Performance Certificates for Buildings	Ongoing	Legislative/ Informative, Legislative/ Normative	2006	High
SLO1	EU-related: Ecodesign Directive for Energy-using Products (Directive 2005/32/EC) - Energy Efficiency Requirements for Domestic Refrigeration Appliances and their combinations	Ongoing	Legislative/ Normative	2002	Low
SLO14	Regulation on thermal insulation and efficient energy use in buildings	Completed	Legislative/ Normative	2002	High
SLO3	EU-related: Recast Ecodesign Directive for Energy-related Products (Directive 2009/125/EC) - Rules on minimum energy efficiency requirements for ballasts for fluorescent lighting	Ongoing	Legislative/ Normative	2003	Low
SLO15	EU-related: Energy Labelling of Household Appliances (Directive 92/75/EC) - Rules on energy labelling of household appliance	Ongoing	Legislative/ Informative	2004	Low
SLO25	Rules on efficient use of energy in buildings	Ongoing	Legislative/ Normative	2010	High
SPA3	Basic Building Standards for Thermal Insulation (Norma Básica de la Edificación sobre condiciones térmicas en los edificios, NBE-79)	Completed	Legislative/ Normative	1979	High
SPA4	Heating, Air Conditioning and Sanitary Water Equipment Regulations	Completed	Legislative/ Normative	1981	High
SPA5	Financial help for Energy Efficiency (Law 82/1980) (Ley de Conservación de la Energía 82/1980)	Completed	Financial	1982	Medium
SPA17	Norm on building thermal insulation in Catalonia region	Ongoing	Legislative/ Normative	1987	High
SPA2	Energy Conservation and Efficiency Plan, EECF 1991-2000 (Plan de Ahorro y Eficiencia Energética, PAEE 1991-2000)	Completed	Financial, Information/ Education	1991	Medium
SPA12	Energy Qualification of Buildings (Calificación Energética de Edificios, CALENER)	Ongoing	Information/ Education	1999	Low
SPA6	Aid Programme for the support of solar photovoltaic Energy	Completed	Financial	2000	High
SPA10	Aid Programme for the support of solar thermal energy	Completed	Financial	2000	High
SPA11	ICO-IDAE Financing Line for Renewable Energies and Energy Efficiency Projects	Completed	Financial	2000	High
SPA15	Plan for the Promotion of Renewable Energies in Spain 2000-2010 (Plan de Fomento de las Energías Renovables 2000-2010)	Completed	Financial	2000	High
SPA27	Action Plan 2005-2007: Improvement of the energy efficiency of thermal installations in existing buildings	Completed	Financial, Legislative/ Normative	2005	High
SPA28	Action Plan 2005-2007: Improvement of the energy efficiency of indoor lighting installations in existing buildings	Completed	Financial, Legislative/ Normative	2005	High
SPA24	EU-related: Recast Ecodesign Directive for Energy-related Products (Directive 2009/125/EC) - Ecodesign requirements for energy-related products (recast)	Ongoing	Legislative/ Normative	2007	Medium
SPA35	EU-related: Energy Performance of Buildings (Directive 2002/91/EC) - Energy Certificate for new and refurbished buildings	Ongoing	Legislative / Informative	2007	High
SPA36	EU-related: Energy Performance of Buildings (Directive 2002/91/EC) - Technical Building Code	Ongoing	Legislative/ Normative	2007	High

Code	Title	Status	Type	Starting Year	Semi-quantitative Impact
	(CTE)				
SPA25	Plan for Replacement of Electricity Meters	Ongoing	Information/ Education	2008	Medium
SPA37	EU-related: Energy Performance of Buildings (Directive 2002/91/EC) - Regulation of Thermal Installations in Buildings (RITE)	Ongoing	Legislative/ Normative	2008	High
SPA38	IDAE's Financing Lines for Thermal Renewable Energies in Buildings: BIOMCASA-SOLCASA-GEOTCASA	Ongoing	Financial, Information/ Education	2009	Medium
SPA31	Action Plan 2011-2020: Improvement of energy efficiency of the thermal installations in existing buildings.	Ongoing	Financial, Legislative/ Normative	2011	High
SPA32	Action Plan 2011-2020: Improvement of energy efficiency of the indoor lighting installations in existing buildings	Ongoing	Financial, Legislative/ Normative	2011	High
SPA33	Action Plan 2011-2020: Construction of new buildings and rehabilitation of the existing ones with high energy qualification	Ongoing	Financial, Legislative/ Informative, Legislative/ Normative	2011	High
SPA39	EU-related: Energy Performance of Buildings EPBD Recast (Directive 2010/31/EU) - Action Plan 2011-2020: Construction or rehabilitation of nearly-zero energy buildings	Ongoing	Financial, Legislative/ Informative, Legislative/ Normative	2011	Low
SWE23	Technology procurement (teknikupphandling)	Ongoing		1989	Unknown
UK11	UK11_National Grid Affordable Warmth Solutions	Ongoing	Financial, Information/ Education	2001	Low

8.2. List of measures in the tertiary sector

Measures addressing space and water heating consumption

Code	Title	Status	Type	Starting Year	Semi-quantitative Impact
AU12	Bundesgebäude Contracting - Energy saving programme for federal buildings	Ongoing	Co-operative Measures	1999	Unknown
BEL13	Flanders: Subsidies for energy saving measures in horticulture (cultivation under glass)	Ongoing	Financial	2001	High
BEL20	EU-related: Energy Performance of Buildings (Directive 2002/91/EC) - EU-related: Energy Performance of Buildings (Directive 2002/91/EC) - Flanders - Insulation and energy performance regulations for buildings	Ongoing	Legislative/ Informative, Legislative/ Normative	2006	High
BEL20	EU-related: Energy Performance of Buildings (Directive 2002/91/EC) - EU-related: Energy Performance of Buildings (Directive 2002/91/EC) - Wallonia - Thermal regulation for buildings	Ongoing	Legislative/ Informative, Legislative/ Normative	2008	High
BG8	Mandatory energy efficiency control for boilers and air-conditioning systems - Services	Ongoing	Legislative/ Normative	2008	High
BG13	Instructions (rules) criteria related to green public procurement and select priority categories of products and services	Ongoing	Co-operative Measures	2010	Medium
CR10	Program aimed at stimulating the use of solar energy in the camps	Ongoing	Financial	2011	High
CR12	Program aimed at stimulating investment in solar thermal systems and other measures to improve EE in hotels	Ongoing	Financial	2011	High
CR13	Increasing the efficiency of the cooling systems in hotels and other tourist facilities	Ongoing	Financial	2011	High
CZ7	EU-related: Energy Performance of Buildings (Directive 2002/91/EC) - Provision of energy services via the EPC method in the tertiary sector and its support (Poskytování a podpora energetických služeb prostřednictvím metody EPC v terciárním sektoru)	Ongoing	Co-operative Measures	1995	Low
DK3	Heat inspection of small oil heat furnaces	Ongoing	Legislative/ Normative	1995	High
DK4	1995 Regulations for new Building	Completed	Legislative/ Normative	1995	Medium
DK5	Monitoring and Labelling of Larger Buildings	Completed	Information/ Education/Training	1997	Low
DK6	Monitoring and Labelling of Smaller Buildings	Completed	Information/ Education/Training	1997	Low
DK8	Tax on energy expenses in government financed institutions	Ongoing	Fiscal/Tariffs	1997	Low
DK7	Grid Supplied Heating Planning	Ongoing	Legislative/ Informative	2000	Low
DK9	Promoting energy conservation in the public sector	Ongoing	Legislative/ Informative	2005	Low
EST10	A programme for reconstruction of public sector buildings	Ongoing	Financial		High
EST12	Appointment of central contracting authorities for public procurements (appointment of centres of excellence)	Proposed (advanced)	Co-operative Measures		Low
EST6	Regional information centre on energy efficiency	Ongoing	Information/ Education/Training	1993	Medium
EST1	Efficiency requirements for new hot-water boilers	Ongoing	Legislative/ Normative	2004	Medium
EST4	Grants/subsidies for energy efficient investments	Ongoing	Financial	2004	Medium
EST5	Grants/subsidies for investments in renewables	Ongoing	Financial	2004	Medium
EST2	Periodic mandatory inspection of boilers	Ongoing	Legislative/ Normative	2005	Low

Code	Title	Status	Type	Starting Year	Semi-quantitative Impact
EST16	Counselling of local governments upon planning the development of the energy sector and the related sectors	Ongoing	Information/ Education/Training	2005	Medium
EST17	EU-related: Energy Performance of Buildings EPBD Recast (Directive 2010/31/EU) - A requirement to have an energy performance certificate for each building of more than 1000 m2 (500 m2 in the future, and 250 m2 since 2015)	Ongoing	Legislative/ Informative, Legislative/ Normative	2009	Medium
EU11	Energy Performance of Buildings (Directive 2002/91/EC)	Completed	Legislative/ Normative	2006	High
EU14	Energy Performance of Buildings EPBD Recast (Directive 2010/31/EU)	Ongoing	Legislative/ Normative	2012	High
FIN34	Farm land reparation projects	Ongoing		1917	Medium
FIN27	Investments in heating plants (agricultural sector)	Ongoing	Financial	1996	High
FIN18	EU-related: Energy Performance of Buildings (Directive 2002/91/EC) - Periodic voluntary inspections of boilers in the services sector	Ongoing	Information/ Education/Training	2007	Low
GER23	Market Incentive Programme for Renewable Energies (Marktanreizprogramm für erneuerbare Energien – MAP)	Ongoing	Financial	1999	High
GER31	EU-related: Ecodesign Directive for Energy-using Products (Directive 2005/32/EC) - Eco-Design of Energy-using Products (Energiebetriebene-Produkte-Gesetz - EBPg)	Completed	Legislative/ Informative	2009	High
GER40	EU-related: Energy Performance of Buildings EPBD Recast (Directive 2010/31/EU) - Energy Savings Ordinance (Energieeinsparverordnung - EnEV) 2012	Unknown		2012	High
GRE9	Energy savings in Local Self-Governments. - "Economize" program	Ongoing	Financial, Information/ Education/Training	2010	High
GRE10	EU-related: Energy Performance of Buildings (Directive 2002/91/EC) - Energy Performance of Buildings of Tertiary sector	Ongoing	Legislative/ Normative	2010	High
HUN8	Municipal training, awareness-raising, consultation on the basis of the experiences of UNDP/GEF municipal energy efficiency project	Proposed (advanced)	Information/ Education/Training		Unknown
HUN11	Renewable Public Institution Sub-Programme: Reduction of the heat demand of public buildings with complex investment of energy efficiency	Proposed (advanced)	Financial, Information/ Education/Training		Low
HUN9	SAPARD agricultural and rural development programme	Completed	Financial, Information/ Education/Training	2000	Low
HUN3	UNDP/GEF municipal energy efficiency project	Completed	Financial, Information/ Education/Training	2001	Low
HUN10	AVOP: Agricultural and Rural Development Programme	Completed	Financial, Information/ Education/Training	2004	Low
HUN4	'Apple of our eyes' modernisation programme for public schools	Completed	Financial, Information/ Education/Training	2005	Low
HUN5	Encouragement of reduction of energy use in the Regional Operative Programmes	Ongoing	Financial	2007	Low
IRL11	Building Regulations 1991	Completed	Legislative/ Normative	1992	High
ITA3	Norms for Installation, Management and Maintenance of Thermal Equipment in Offices.	Completed	Legislative/ Normative	1991	High
ITA4	Design Norms for Thermal Plant Regulation and Metering	Completed	Cross-cutting with sector-specific characteristics	1993	Low
ITA8	Limit to the Internal Temperature of Buildings	Ongoing	Legislative/ Normative	1993	Low

Code	Title	Status	Type	Starting Year	Semi-quantitative Impact
ITA10	Energy Efficiency of buildings: design norms of buildings shell	Ongoing	Legislative/ Normative	1993	High
ITA14	White Certificates	Ongoing	Financial	2005	Medium
ITA12	Energy efficiency of buildings: project, installation, working and maintenance of thermal plants	Ongoing	Legislative/ Normative	2006	Medium
ITA13	EU-related: Energy Performance of Buildings (Directive 2002/91/EC) - Energy Performance of Buildings	Ongoing	Legislative/ Informative, Legislative/ Normative	2006	High
LV6	Implementation of the Exemplary Role of the Public Sector	Ongoing	Co-operative Measures, Information/ Education/Training	2008	Medium
LT9	School improvement programme	Completed	Financial	2002	Low
LT10	Energy saving investment programme for the buildings of public authorities	Completed	Financial	2003	Unknown
LT8	EU Structural Funds 2004–2006	Completed	Financial	2005	Medium
LT12	Programme 2006–2008 for the reconstruction of general education and vocational schools and for providing them with teaching aids	Completed	Financial	2006	Unknown
LT11	EU Structural Funds 2007–2013	Ongoing	Financial	2007	High
LT13	Programme for the upgrading of educational institutions	Ongoing	Financial	2009	Medium
LT15	Energy efficiency improvement in the service sector	Ongoing	Financial	2010	High
LUX1	Thermal insulation of buildings (tertiary sector)	Completed	Legislative/ Normative	1996	High
LUX2	Improvement in the U-values of the non-domestic buildings (WD2008)	Ongoing	Legislative/ Normative	2008	Medium
LUX3	EU-related: Energy Performance of Buildings (Directive 2002/91/EC) - Expansion of the Ordinance of the Grand Duchy for 2008 on improving the overall energy efficiency of buildings to nondomestic buildings in 2010	Unknown	Legislative/ Normative	2010	Medium
MAL2	Grant scheme for tourism enterprises	Completed	Financial	2011	Low
MAL10	Promotion of groundwater heating and cooling	Proposed (advanced)	Unknown	2012	Unknown
NOR3	Building regulations 1987 (Byggeforskrift 1987)	Completed	Legislative/ Normative	1987	Medium
NOR5	Building Regulations 1997 (Byggeforskrift 1997)	Completed	Legislative/ Normative	1997	Medium
NOR12	Grants to heating plants	Completed	Financial	1997	Medium
NOR20	Minimum energy efficiency standards for boilers	Ongoing	Legislative/ Normative	1999	Low
NOR14	Grants for energy savings in the built environment (Bygg, bolig og anlegg)	Ongoing	Financial	2005	Medium
NOR21	Building regulations 2007 (Byggeforskrift 2007)	Completed	Legislative/ Normative	2007	High
NOR17	Grants to renewable heat production and distribution - district heating and local heating plants (Program for fjernvarme og lokale energisentraler)	Ongoing	Financial	2008	Medium
NOR19	Conversion of direct electric heating to central heating (Program for konvertering av varmeanlegg i bygg - fra elektrisk oppvarming til vannbåren varme)	Completed	Financial	2009	Low
NOR6	EU-related: Energy Performance of Buildings (Directive 2002/91/EC) - Energy Performance of Buildings (2002/91/EC) - Bygningsenergidirektivet	Ongoing	Legislative/ Informative	2010	High
NOR23	Building regulations 2010 (Byggeforskrift 2010)	Ongoing	Legislative/ Normative	2011	High

Code	Title	Status	Type	Starting Year	Semi-quantitative Impact
RO2	EU-related: Energy Performance of Buildings (Directive 2002/91/EC) - Energy Performance of existing Buildings-obligatory energy efficiency certificates	Ongoing	Legislative/ Informative	2007	Medium
RO3	EU-related: Energy Performance of Buildings (Directive 2002/91/EC) - Energy Performance of New Buildings	Ongoing	Legislative/ Informative	2007	Medium
RO4	EU-related: Energy Performance of Buildings (Directive 2002/91/EC) - Energy Performance of Buildings-energy efficiency certificates	Ongoing	Legislative/ Informative	2007	Medium
RO5	EU-related: Energy Performance of Buildings (Directive 2002/91/EC) - Energy Performance of Buildings-inspection of boilers,air conditioners and heating systems	Ongoing	Legislative/ Normative	2007	Medium
SLO3	Financial incentives for energy efficient heating systems	Ongoing	Financial	2008	High
SLO9	Financial incentives to raise energy efficiency in industry and the services sector and significantly increase the scope of environmentally friendly electricity generation from RES and CHP systems	Ongoing	Financial	2008	High
SPA15	Basic Building Standards for Thermal Insulation (Norma Básica de la Edificación sobre condiciones térmicas en los edificios, NBE-79)	Completed	Legislative/ Normative	1979	High
SPA13	Heating, Air Conditioning and Sanitary Water Equipment Regulations	Completed	Legislative/ Normative	1981	High
SPA1	Financial help for Energy Efficiency (Law 82/1980) (Ley de Conservación de la Energía 82/1980)	Completed	Financial	1982	Medium
SPA4	Programme for the Energy Optimisation in the Central Administration Building	Completed	Information/ Education/Training	1987	Medium
SPA12	Norm on building thermal insulation in Catalonia region	Ongoing	Legislative/ Normative	1987	High
SPA2	Energy Conservation and Efficiency Plan, EEEP 1991-2000 (Plan de Ahorro y Eficiencia Energética, PAEE 1991-2000)	Completed	Financial	1991	High
SPA14	EU-related: Energy Performance of Buildings (Directive 2002/91/EC) - Regulation of Thermal Installations in Buildings	Completed	Legislative/ Normative	1998	High
SPA3	Energy Qualification of Buildings (Calificación Energética de Edificios, CALENER)	Ongoing	Information/Education/Training	1999	Medium
SPA7	ICO-IDAE Financing Line for Renewable Energies and Energy Efficiency Projects	Completed	Financial	2000	High
SPA9	Aid Programme for the Support of Solar Thermal Energy	Completed	Financial	2000	High
SPA17	Plan for the Promotion of Renewable Energies in Spain 2000-2010 (Plan de Fomento de las Energías Renovables 2000-2010)	Completed	Financial	2000	Medium
SPA16	Proposal of a Municipal Ordinance for thermal uses of solar absorption	Ongoing	Legislative/ Informative	2001	High
SPA31	Action Plan 2005-2007: Improvement of the energy efficiency of thermal installations in existing buildings	Completed	Financial, Legislative/ Normative	2005	High
SPA33	EU-related: Energy Performance of Buildings - Action Plan 2005-2007: Regulatory measures for the implementation in Spanish law of Directive 2002/91/EC	Ongoing	Financial, Legislative/ Informative, Legislative/ Normative	2005	High
SPA40	EU-related: Energy Performance of Buildings (Directive 2002/91/EC) - Technical Building Code	Ongoing	Legislative/ Normative	2007	High
SPA47	EU-related: Recast Ecodesign Directive for Energy-related Products (Directive 2009/125/EC) - Ecodesign requirements for energy-using products (EuPs).	Ongoing	Legislative/ Informative, Legislative/ Normative	2007	Medium
SPA29	Action Plan 2008-2012:Energy Saving and Efficiency Plans in Public Administrations	Ongoing	Information/Education/Training,	2008	High

Code	Title	Status	Type	Starting Year	Semi-quantitative Impact
			Legislative/ Informative		
SPA39	EU-related: Energy Performance of Buildings (Directive 2002/91/EC) - Energy Performance Certificate for new and refurbished buildings	Ongoing	Legislative/ Informative	2008	High
SPA41	EU-related: Energy Performance of Buildings (Directive 2002/91/EC) - Revised "Regulation of Thermal Installations in Buildings"	Ongoing	Legislative/ Normative	2008	High
SPA44	Green Public Procurement Plan	Ongoing	Co-operative Measures, Information/ Education/Training, Legislative/ Informative	2008	Medium
SPA42	IDAE's Financing Lines for Thermal Renewable Energies in Buildings: BIOMCASA-SOLCASA-GEOTCASA	Ongoing	Financial, Information/Education/Training	2009	Medium
SPA45	Activation Plan in the State's General Administration Buildings through ESCOS (Plan 330 ESE)	Ongoing	Co-operative Measures, Financial, Information/Education/Training	2009	Medium
SPA46	Plan to Boost Energy Services Contracts (Plan 2000 ESE)	Ongoing	Co-operative Measures, Financial, Information/ Education/Training	2010	Medium
SPA35	Action Plan 2011-2020: Improvement of energy efficiency of the thermal installations in existing buildings	Ongoing	Financial, Legislative/ Normative	2011	High
SPA36	Action Plan 2011-2020: Construction of new buildings and rehabilitation of the existing ones with high energy qualification	Ongoing	Financial, Legislative/ Informative, Legislative/ Normative	2011	High
SPA48	Action Plan 2011-2020: Improvement of energy efficiency in commercial refrigeration installations	Ongoing	Financial, Information/ Education/Training	2011	Low
SPA49	EU-related: Energy Performance of Buildings EPBD Recast (Directive 2010/31/EU) - Action Plan 2011-2020: Construction or rehabilitation of nearly-zero energy buildings	Ongoing	Financial, Legislative/ Informative, Legislative/ Normative	2011	Low
SWE12	Support for energy efficiency, conversion and solar cells in public buildings	Completed	Financial	2006	Medium

Measures addressing electricity consumption

Code	Title	Status	Type	Starting Year	Semi-quantitative Impact
AU35	prova	Unknown	Legislative/ Normative		Unknown
AU30	Public procurement of energy efficient products	Ongoing		2001	Unknown
BEL13	Flanders: Subsidies for energy saving measures in horticulture (cultivation under glass)	Ongoing	Financial	2001	High
BEL18	Wallonia: Public lighting (including EPURE) + trafficlights	Ongoing	Financial	2005	Medium
BEL20	EU-related: Energy Performance of Buildings (Directive 2002/91/EC) - EU-related: Energy Performance of Buildings (Directive 2002/91/EC) - Flanders - Insulation and energy performance regulations for buildings	Ongoing	Legislative/ Informative, Legislative/ Normative	2006	High
BEL20	EU-related: Energy Performance of Buildings (Directive 2002/91/EC) - EU-related: Energy Performance of Buildings (Directive 2002/91/EC) - Wallonia - Thermal regulation for buildings	Ongoing	Legislative/ Informative, Legislative/ Normative	2008	High
BG13	Instructions (rules) criteria related to green public procurement and select priority categories of products and services	Ongoing	Co-operative Measures	2010	Medium
BG20	EU-related: Recast Ecodesign Directive for Energy-related Products (Directive 2009/125/EC) - Mandatory measures for office lightning	Unknown	Legislative/Normative	2011	Medium
BG18	EU-related: Recast Ecodesign Directive for Energy-related Products (Directive 2009/125/EC) - Program for street lightning modernization	Unknown	Legislative/Normative	2012	Unknown
CR11	"Green" public procurement	Ongoing	Co-operative Measures	2008	Unknown
CR14	The project "Energy Efficient Public Lighting"	Ongoing		2011	High
CR15	Plan of energy refurbishment of the public sector	Ongoing	Financial	2016	High
CZ9	EU-related: Energy Performance of Buildings (Directive 2002/91/EC) - Electric energy savings in the area of lighting in the tertiary sector and public lighting (Úspory elektrické energie v oblasti veřejného osvětlení)	Ongoing	Legislative/Normative	2010	Low
DK8	Tax on energy expenses in government financed institutions	Ongoing	Fiscal/Tariffs	1997	Low
DK9	Promoting energy conservation in the public sector	Ongoing	Legislative/Informative	2005	Low
DK10	Reverse-the-trend agreements	Ongoing	Information/Education/Training	2007	High
EST10	A programme for reconstruction of public sector buildings	Ongoing	Financial		High
EST12	Appointment of central contracting authorities for public procurements (appointment of centres of excellence)	Proposed (advanced)	Co-operative Measures		Low
EST13	Preliminary surveys regarding modernisation of street lighting and analysis of respective financing options	Proposed(advanced)	Financial		Low
EST4	Grants/subsidies for energy efficient investments	Ongoing	Financial	2004	Medium
EST16	Counselling of local governments upon planning the development of the energy sector and the related sectors	Ongoing	Information/Education/Training	2005	Medium
EST11	Development of legislative acts on environmentally friendly public procurements and the related instruction materials	Proposed(advanced)	Co-operative Measures	2008	Low
EU11	Energy Performance of Buildings (Directive 2002/91/EC)	Completed	Legislative/Normative	2006	High
EU14	Energy Performance of Buildings EPBD Recast (Directive 2010/31/EU)	Ongoing	Legislative/Normative	2012	High
FIN19	EU-related: Energy Performance of Buildings (Directive 2002/91/EC) - Periodic inspections of air	Ongoing	Legislative/Normative	2008	Low

Code	Title	Status	Type	Starting Year	Semi-quantitative Impact
	conditioning systems				
FIN23	Energy efficiency in server halls	Proposed(advanced)	Information/Education/Training	2010	Medium
GER31	EU-related: Ecodesign Directive for Energy-using Products (Directive 2005/32/EC) - Eco-Design of Energy-using Products (Energiebetriebene-Produkte-Gesetz - EBPBG)	Completed	Legislative/Informative	2009	High
GRE9	Energy savings in Local Self-Governments. - "Economize" program	Ongoing	Financial, Information/Education/Training	2010	High
GRE10	EU-related: Energy Performance of Buildings (Directive 2002/91/EC) - Energy Performance of Buildings of Tertiary sector	Ongoing	Legislative/Normative	2010	High
HUN6	Elaboration and implementation of energy efficiency Directives related to public procurements	Proposed (advanced)	Legislative/Normative		Low
HUN7	EU-related: Ecodesign Directive for Energy-using Products (Directive 2005/32/EC) - Elaboration of minimum energy efficiency requirements for office equipment	Proposed (advanced)	Legislative/Normative		Low
HUN8	Municipal training, awareness-raising, consultation on the basis of the experiences of UNDP/GEF municipal energy efficiency project	Proposed(advanced)	Information/Education/Training		Unknown
HUN12	Reduction of the electricity demand of public institutions	Proposed (advanced)	Financial, Information/Education/Training		Low
HUN9	SAPARD agricultural and rural development programme	Completed	Financial, Information/Education/Training	2000	Low
HUN3	UNDP/GEF municipal energy efficiency project	Completed	Financial, Information/Education/Training	2001	Low
HUN10	AVOP: Agricultural and Rural Development Programme	Completed	Financial, Information/Education/Training	2004	Low
HUN4	'Apple of our eyes' modernisation programme for public schools	Completed	Financial, Information/Education/Training	2005	Low
HUN5	Encouragement of reduction of energy use in the Regional Operative Programmes	Ongoing	Financial	2007	Low
IRL11	Building Regulations 1991	Completed	Legislative/Normative	1992	High
ITA14	White Certificates	Ongoing	Financial	2005	Medium
ITA15	EU-related: Ecodesign Directive for Energy-using Products (Directive 2005/32/EC) - Eco-Design Directive implementation	Ongoing	Legislative/Informative	2007	Medium
ITA17	Measure for efficient lighting and control systems	Ongoing	Legislative/Normative	2008	Medium
LV3	Information campaigns on applying energy efficient electrical equipment	Ongoing	Information/Education/Training	2008	Low
LV6	Implementation of the Exemplary Role of the Public Sector	Ongoing	Co-operative Measures, Information/Education/Training	2008	Medium
LV13	Green Public Procurement	Ongoing	Co-operative Measures	2009	Medium
LV11	Investments in Public Territories' Lighting Infrastructure to Reduce GHG Emissions	Ongoing	Financial	2011	Medium
LUX4	Realising electricity savings potential in the TCS sector	Proposed(advanced)	Financial, Information/Education/Training	2012	Medium
MAL6	Energy Efficiency in government owned industry	Ongoing	Co-operative Measures	2000	High
MAL7	Improvement in Buildings Efficiency	Unknown	Legislative/	2006	Medium

Code	Title	Status	Type	Starting Year	Semi-quantitative Impact
			Informative		
MAL3	Energy efficiency action in the public sector	Ongoing	Co-operative Measures	2008	Medium
MAL8	EU-related: Ecodesign Directive for Energy-using Products (Directive 2005/32/EC) - Promotion of CHP for large industries and tourist complexes	Ongoing	Information/Education/Training	2009	Low
MAL4	Improvements in street lighting	Proposed (medium/long-term)	Co-operative Measures, Legislative/Normative	2010	Medium
MAL12	Eco-Gozo	Ongoing	Co-operative Measures	2010	Unknown
MAL2	Grant scheme for tourism enterprises	Completed	Financial	2011	Low
MAL17	Energy Performance Contracting	Proposed (advanced)	Co-operative Measures	2012	Unknown
RO7	Improvement of public lighting system	Ongoing	Legislative/Normative	2008	Medium
RO11	EU-related: Energy Labelling Office Equipment (Energy Star) - Promote the use of energy efficient household appliances and lamps in the public sector	Ongoing	Information/Education/Training	2009	Low
SLO5	Financial incentives for efficient use of electricity	Ongoing	Financial	2008	Medium
SLO9	Financial incentives to raise energy efficiency in industry and the services sector and significantly increase the scope of environmentally friendly electricity generation from RES and CHP systems	Ongoing	Financial	2008	High
SLO15	Financial incentives for efficient electricity consumption in the public sector	Ongoing	Financial	2008	Low
SPA15	Basic Building Standards for Thermal Insulation (Norma Básica de la Edificación sobre condiciones térmicas en los edificios, NBE-79)	Completed	Legislative/Normative	1979	High
SPA1	Financial help for Energy Efficiency (Law 82/1980) (Ley de Conservación de la Energía 82/1980)	Completed	Financial	1982	Medium
SPA4	Programme for the Energy Optimisation in the Central Administration Building	Completed	Information/Education/Training	1987	Medium
SPA12	Norm on building thermal insulation in Catalonia region	Ongoing	Legislative/Normative	1987	High
SPA2	Energy Conservation and Efficiency Plan, EECF 1991-2000 (Plan de Ahorro y Eficiencia Energética, PAEE 1991-2000)	Completed	Financial	1991	High
SPA3	Energy Qualification of Buildings (Calificación Energética de Edificios, CALENER)	Ongoing	Information/Education/Training	1999	Medium
SPA7	ICO-IDAE Financing Line for Renewable Energies and Energy Efficiency Projects	Completed	Financial	2000	High
SPA17	Plan for the Promotion of Renewable Energies in Spain 2000-2010 (Plan de Fomento de las Energías Renovables 2000-2010)	Completed	Financial	2000	Medium
SPA18	Aid Programme for the Support of Solar Photovoltaic Energy	Completed	Financial	2000	High
SPA19	Action Plan 2005-2007: Plan for energy efficient equipment and efficient energy use in government buildings	Completed	Information/Education/Training	2005	High
SPA20	Action Plan 2005-2007: Improvement of the energy efficiency of existing street lighting installations	Completed	Information/Education/Training, Legislative/Normative	2005	High
SPA21	Action Plan 2005-2007: Improvement of the energy efficiency of new street lighting installations	Completed	Legislative/Normative	2005	High
SPA32	Action Plan 2005-2007: Improvement of the energy efficiency of indoor lighting installations in existing buildings	Completed	Financial, Legislative/Normative	2005	High
SPA33	EU-related: Energy Performance of Buildings -	Ongoing	Financial,	2005	High

Code	Title	Status	Type	Starting Year	Semi-quantitative Impact
	Action Plan 2005-2007: Regulatory measures for the implementation in Spanish law of Directive 2002/91/EC		Legislative/ Informative, Legislative/ Normative		
SPA40	EU-related: Energy Performance of Buildings (Directive 2002/91/EC) - Technical Building Code	Ongoing	Legislative/ Normative	2007	High
SPA47	EU-related: Recast Ecodesign Directive for Energy-related Products (Directive 2009/125/EC) - Ecodesign requirements for energy-using products (EuPs).	Ongoing	Legislative/ Informative, Legislative/ Normative	2007	Medium
SPA29	Action Plan 2008-2012: Energy Saving and Efficiency Plans in Public Administrations	Ongoing	Information/ Education/Training, Legislative/ Informative	2008	High
SPA39	EU-related: Energy Performance of Buildings (Directive 2002/91/EC) - Energy Performance Certificate for new and refurbished buildings	Ongoing	Legislative/ Informative	2008	High
SPA44	Green Public Procurement Plan	Ongoing	Co-operative Measures, Information/ Education/Training, Legislative/ Informative	2008	Medium
SPA43	Energy Efficiency Regulation in Street Lighting Installations	Ongoing	Legislative/ Normative	2009	High
SPA45	Activation Plan in the State's General Administration Buildings through ESCOS (Plan 330 ESE)	Ongoing	Co-operative Measures, Financial, Information/ Education/Training	2009	Medium
SPA46	Plan to Boost Energy Services Contracts (Plan 2000 ESE)	Ongoing	Co-operative Measures, Financial, Information/ Education/Training	2010	Medium
SPA25	Action Plan 2011-2020: Renewal of the existing outdoor lighting installations	Ongoing	Legislative/ Normative	2011	High
SPA27	Action Plan 2011-2020: Studies, feasibility analyses and audits to improve the energy efficiency in exiting lighting installations	Ongoing	Financial	2011	High
SPA28	Action Plan 2011-2020: Training of the local council energy managers	Ongoing	Information/ Education/Training	2011	High
SPA37	Action Plan 2011-2020: Improvement of energy efficiency of the indoor lighting installations in existing buildings	Ongoing	Financial, Legislative/ Normative	2011	High
SPA48	Action Plan 2011-2020: Improvement of energy efficiency in commercial refrigeration installations	Ongoing	Financial, Information/ Education/Training	2011	Low
SPA49	EU-related: Energy Performance of Buildings EPBD Recast (Directive 2010/31/EU) - Action Plan 2011-2020: Construction or rehabilitation of nearly-zero energy buildings	Ongoing	Financial, Legislative/ Informative, Legislative/ Normative	2011	Low

8.3. List of financial/fiscal measures mentioned in the 2nd NEEAPs addressing the public sector

Code	Title	Status	Type	Starting Year	Semi-quantitative Impact
BG7	National Strategy for financing the building insulation for energy efficiency 2006-2020 - services	Ongoing	Financial, Legislative/Informative, Legislative/Normative	2006	High
BG15	Financing of energy efficiency projects in municipal buildings by Operational Program Regional Development	Ongoing	Financial	2010	High
CY1	Governmental financial support schemes for investments in RES/RUE/EE	Ongoing	Financial	2004	High
EST10	A programme for reconstruction of public sector buildings	Ongoing	Financial		High
EST13	Preliminary surveys regarding modernisation of street lighting and analysis of respective financing options	Proposed(advanced)	Financial		Low
EST19	A programme for regional investment support from the gambling tax	Ongoing	Financial	2007	Low
FIN3	Energy Auditing Programme in the Service Sector	Ongoing	Financial, Information/Education/Training	1994	High
FIN25	Subsidies for energy audits and energy investments (the services sector)	Ongoing	Financial	2002	Unknown
FRA16	Energy Efficiency certificates	Ongoing	Financial	2006	High
FRA15	"Modernizing building and cities" programme	Ongoing	Financial, Legislative/Informative	2008	High
GER23	Market Incentive Programme for Renewable Energies (Marktanreizprogramm für erneuerbare Energien – MAP)	Ongoing	Financial	1999	High
GRE8	Obligatory installation of central thermal solar systems in buildings of tertiary sector	Proposed(medium/long-term)	Financial, Fiscal/Tariffs, Information/Education/Training, Legislative/Informative, Legislative/Normative	2008	Medium
GRE9	Energy savings in Local Self-Governments. - "Economize" program	Ongoing	Financial, Information/Education/Training	2010	High
HUN11	Renewable Public Institution Sub-Programme: Reduction of the heat demand of public buildings with complex investment of energy efficiency	Proposed (advanced)	Financial, Information/Education/Training		Low
HUN12	Reduction of the electricity demand of public institutions	Proposed (advanced)	Financial, Information/Education/Training		Low
HUN5	Encouragement of reduction of energy use in the Regional Operative Programmes	Ongoing	Financial	2007	Low
IRL31	CHP grants programme - Private Sector	Ongoing	Financial	2006	High
ITA14	White Certificates	Ongoing	Financial	2005	Medium
LV7	Investments in Municipal Public Buildings' Energy Efficiency to Reduce CO2 emissions	Ongoing	Financial	2009	High
LV8	Investments in Complex Solutions for GHG Emissions Reduction in Professional Education Institutions Buildings & Investments in Higher Education Institutions Buildings' Energy Efficiency to Reduce GHG emissions	Ongoing	Financial	2010	High
LV10	Grants for Low Energy Consumption Building	Ongoing	Financial	2011	Low
LT9	School improvement programme	Completed	Financial	2002	Low
LT10	Energy saving investment programme for the buildings of public authorities	Completed	Financial	2003	Unknown
LT8	EU Structural Funds 2004–2006	Completed	Financial	2005	Medium
PL1	Thermal Modernisation Fund	Ongoing	Financial	1998	High
PL9	Infrastructure and Environment Operations Programme and the Regional Operations Programme	Ongoing	Financial	2008	Unknown
PL13	Green Investment Scheme. Part 5 – Energy Management in Buildings of Selected Public Sector Entities	Ongoing	Financial	2010	Unknown
PL14	Programme "Energy Savings and Renewable Energy Sources Promotion" (under the EEA Financial Mechanism and Norwegian Financial Mechanism)	Proposed (medium/long-term)	Financial	2013	Unknown
RO12	Increase efficiency and reduce consumption of water supply facilities	Unknown	Financial	2011	Medium
SLO4	Financial incentives for energy-efficient renovation and sustainable construction of buildings in the public sector	Ongoing	Financial	2008	Medium
SLO5	Financial incentives for efficient use of electricity	Ongoing	Financial	2008	Medium
SLO9	Financial incentives to raise energy efficiency in industry and the services sector and significantly increase the scope of environmentally friendly electricity generation from RES and CHP systems	Ongoing	Financial	2008	High
SLO15	Financial incentives for efficient electricity consumption in the public sector	Ongoing	Financial	2008	Low
SPA22	Action Plan 2005-2007: Improvement of the energy efficiency of existing installations of water potabilization, supply and treatment	Completed	Financial, Information/Education/Training	2005	High
SPA31	Action Plan 2005-2007: Improvement of the energy efficiency of thermal installations in existing buildings	Completed	Financial, Legislative/Normative	2005	High
SPA33	EU-related: Energy Performance of Buildings - Action Plan 2005-2007: Regulatory measures for the implementation in Spanish law of Directive 2002/91/EC	Ongoing	Financial, Legislative/Informative, Legislative/Normative	2005	High
SPA26	Action Plan 2011-2020: Improvement of energy efficiency of the current water purification plants, supply, treatment of sewage waters and desalination	Ongoing	Financial	2011	High
SPA27	Action Plan 2011-2020: Studies, feasibility analyses and audits to improve the energy efficiency in existing lighting installations	Ongoing	Financial	2011	High
SPA35	Action Plan 2011-2020: Improvement of energy efficiency of the thermal installations in existing buildings	Ongoing	Financial, Legislative/Normative	2011	High
SWE12	Support for energy efficiency, conversion and solar cells in public buildings	Completed	Financial	2006	Medium
UK7	UK7_The Energy Saving Trust	Ongoing	Financial, Information/Education/Training	1992	Medium
UK2	UK2_Carbon Trust programmes	Ongoing	Financial, Information/Education/Training	2001	Medium
UK18	Public Sector financing through Salix	Ongoing	Financial	2006	Low