Are the Energy Savings Sufficient? Impact of Energy Efficiency Policies Included in the 2011 NEEAPs

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ABSTRACT

An important framework condition for energy efficiency policies at EU level is the primary energy-saving objective of 20 % by 2020 compared to a reference development. In the EU Energy Efficiency Plan 2011, it is stated that this target is currently far from achieving. The proposed Energy Efficiency Directive from June 2011 includes several proposals for additional policies. At the same time, the EU Member States submitted their 2011 National Energy Efficiency Action Plan (NEEAP) in accordance with the actual Directive on Energy Efficiency and Energy Services. These shall include impact evaluations of past and planned energy efficiency policies and measures. Here we systematically collect and analyze the impact of the energy efficiency policies included in the 2011 NEEAPs with support of the MURE database. The focus is on the building sector, where the largest saving potential is seen. The qualitative analysis shows that policies for new buildings are mostly based on the national transposition of the relevant EU regulations, whereas energy efficiency in existing buildings are especially the focus of financial measures which are based mainly on public funding which has now come under pressure due to the financial crisis. The quantitative analysis shows that there is still a gap between the measures reported in the NEEAPs and the savings which are necessary in order to reach the 20% saving objective, especially when taking into account that the NEEAPs also comprise "Early Action" measures, as well as autonomous savings for the measures which have been evaluated with top-down methods.

Introduction

The European Union has a set of three combined energy and climate targets for 2020: a reduction of greenhouse gas emissions (GHG) by 20% compared to 1990 (30% under the specific conditions of an ambitious international post-2012 climate policy agreement), an increase of the share renewable energies in total EU energy consumption to 20%, and the reduction of primary energy consumption by 20% compared to a trend (European Commission 2010). Whereas both the GHG and the renewable targets are legally binding, the energy saving target is not a mandatory, but only an indicative target. The energy saving target requires savings of 394 Mtoe (16,496 PJ) primary energy by 2020 compared to a projected consumption in the PRIMES 2007 scenario of 1842 Mtoe (European Commission 2008). Whereas the EU is on track to achieve the GHG and renewable targets, the EU is only halfway towards the energy saving target (European Commission 2011a), despite the fact that decreased activities following the financial and economic crisis have narrowed the gap to target achievement. This means a gap of almost 200 Mtoe (8,370 PJ). A similar calculation was made in a study on energy savings in 2020 by Ecofys & Fraunhofer ISI (2010). According to this study, existing energy efficiency policies (95 Mtoe), renewable energy policies (20 Mtoe) as well as the economic recession (70 Mtoe) are expected to reduce energy use in the EU-27 in 2020 by 185 Mtoe compared to 2020 baseline projection, which means a remaining gap of around 208 Mtoe (8,700 PJ) towards the EU target.

In order to still achieve the 2020 energy saving target, both the Energy Efficiency Plan and the proposed Energy Efficiency Directive (EED) from 22 June 2011 (European Commission 2011b) include several proposals for additional policies in order to achieve the 20 % energy saving target nevertheless. On the other hand, recent calculations have shown that the existing energy saving potentials in the EU and its Member States are sufficient to achieve the 20 % target (Eichhammer et al. 2009; Ecofys & Fraunhofer ISI 2010). The largest saving potential is thereby seen in the building sector, but there are also cost-effective potentials in the other end-use sectors (industry, transport). In summer 2011, the EU Member States also submitted their 2nd National Energy Efficiency Action Plan (NEEAP) in accordance with the Directive on Energy Efficiency and Energy Services ESD; (European Commission 2006). The ESD prescribes an overall national indicative final energy saving target of 9 % to be reached in 2016. Compared to the EU primary energy saving of 20 %, however, this target requires considerably less energy savings.[1] Nevertheless, according to Article 14 of the ESD, the 2nd NEEAPs shall include results with regard to the fulfillment of this target, thereby using harmonized efficiency indicators for the evaluation of past measures and estimated effects of planned future measures.

In this paper, we systematically collect and analyze energy efficiency policies included in the 2011 NEEAPs of the Member States. The analysis includes both the quantitative impact of the policies, and a qualitative analysis of measure characteristics as e.g. measure type, actor and target audience. The main focus is on policies addressing the building sector (residential and non-residential buildings). Apart from energy consumption for space heating, cooling and hot water, polices addressing electrical appliances are also taken into account. The reported savings are also compared with the existing saving potentials in the building sector. The main focus of this paper is on analyzing the remaining gap between expected results and initial objectives for 2020 and the limitations arising to such a gap analysis from the heterogeneity in quantitative evaluation methodologies used in the NEEAPs. The qualitative characterization of the NEEAP measures completes previous work on the first NEEAPs by the European Commission (2009) and within the Energy Efficiency Watch project[2] (Geiss et al. 2010) and the still ongoing work at that level on the second NEEAPs by making use for the first time of a detailed database established on the NEEAPs in the frame of the MURE database. This database allows to describe where the main efforts have been directed by EU Member States for the building sector in the second NEEAPs and to deduce recommendations with respect to policy fields which are still insufficiently covered.

Methodological approach

In the following, the main tools, which are used for the analysis, are described. The analysis of the energy efficiency policies is mainly based on the MURE Measure Database[3], which was developed and regularly updated within the EU-IEE project "ODYSSEE-MURE"[4]. The energy saving potentials are mainly taken from a study on behalf of the European Commission which took a detailed bottom-up approach to assess energy savings potentials in the European Union and all Member States for all end-use sectors (Eichhammer et al. 2009). The calculation of the energy saving potentials in this study was mainly based on the MURE simulation tool, which is provided in addition to the MURE database.

The MURE Measure Database

MURE (Mesures d'Utilisation Rationnelle de l'Energie) provides a free online database which contains information on energy efficiency policies and measures that have been implemented or are

[1] In Boonekamp (2011) it was shown that the EU 20 % saving target requires energy savings of about 2.4 %/a compared to the 1 %/a which are required by the ESD.
[2] http://www.energy-efficiency-watch.org/
[3] http://www.isisrome.com/mure/index.htm
[4] ODYSSEE-MURE is a project coordinated by ADEME and supported under the Intelligent Energy Europe (IEE) Programme of the European Commission. This project gathers representatives such as energy Agencies from the 27 EU Member States plus Norway and Croatia and it aims at monitoring energy efficiency trends and policy measures in Europe (see http://www.odyssee-indicators.org/ and http://www.muredatabase.org/).

planned in the EU and its Member States. The MURE Measure Database is structured by final energy consumption sectors (household, tertiary, industry, transport) and also includes a general cross-cutting section. At the level of sectors, the focus is on single policy measures in order to allow a specific analysis of each measure based on criteria as e.g. the measure type, the targeted audience, the main actors, the end-uses involved or the quantitative energy saving impact. 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 for these descriptions (Schlomann & Eichhammer 2011). At the moment, the database includes around 1500 policy measures for the period from 1995 only for the 27 EU Member States[5], about half of them in the household and tertiary sector (see Figure 1). If a measure is included in the National Energy Efficiency Action Plan under the EU Energy Efficiency and Service Directive ESD, it is classified as "NEEAP measure" in the MURE database. This allows an easy identification of NEEAP measures and will be used for the following analysis. 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 1).

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.[6]. At the moment, about half of the NEEAP measures have a quantitative impact evaluation which is already included in the MURE database (Figure 1). The following analysis makes use of these features implemented in the MURE database with regard to policies included in the 2nd NEEAPs. The main focus is on the NEEAP measures in the household and tertiary sector.

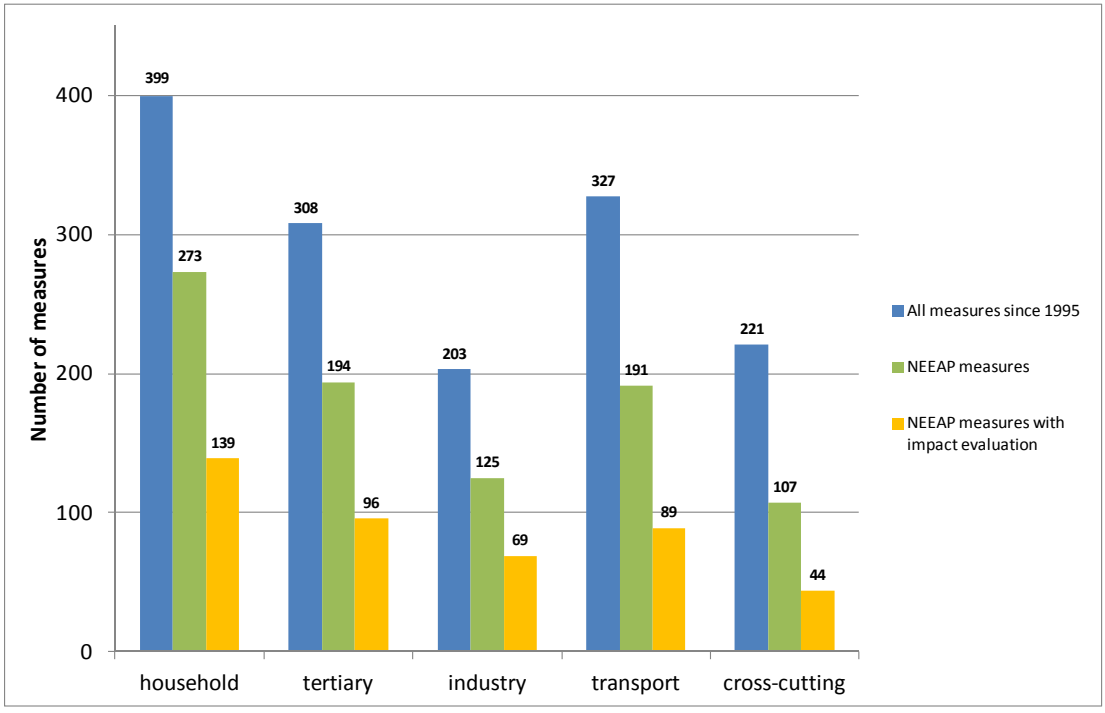

Figure 1. Number of measures in the MURE Measure Database (all EU Member States, status as of end of March 2012)

[5] In addition, policies implemented at the level of the European Union and in Norway and Croatia are included, too.
[6] If a National Energy Efficiency Plan only provides the quantitative measure impact for a package of measures, the measures should still be described separately following the single measure approach which is central to the definition of energy efficiency measures as used in MURE.

The MURE simulation tool

MURE also provides a simulation tool 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 2). 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.[7]. 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).

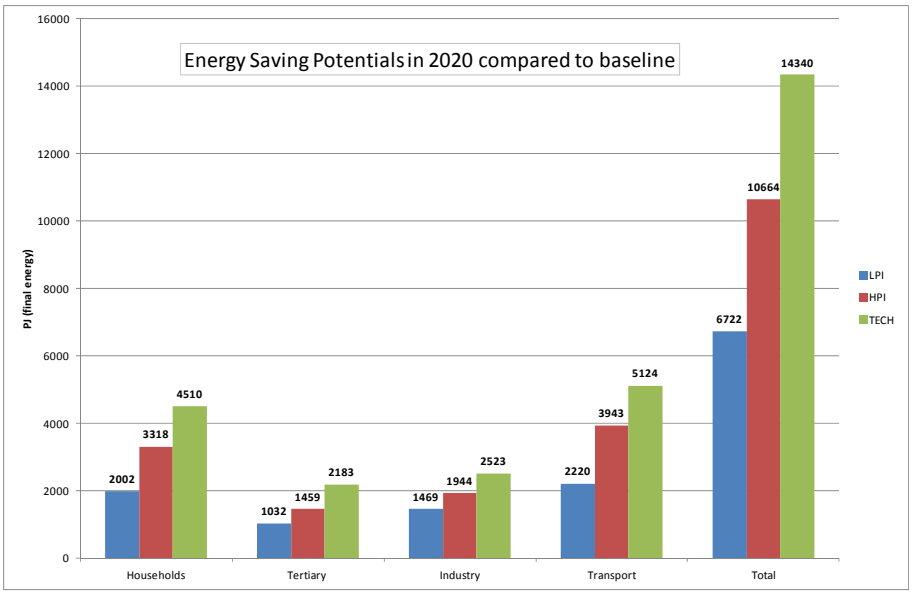

Figure 2. (Final) Energy Saving Potentials in 2020 by sector (Source: Calculations Fraunhofer ISI based on Eichhammer et al. 2009, Ecofys & Fraunhofer ISI 2010, Boßmann et al. 2011)

[7] 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.

Analysis of policy 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 on the building sector, both including space heating consumption (incl. sanitary hot water) and energy consumption of electrical appliances (incl. large household appliances, lighting, IT appliances, electric cooking and air-conditioning). The measures included in the MURE database constitute the main analytical basis.[8] In addition, the savings reported in the 2nd NEEAPs[9] 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.[10] 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 3):

- 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 PJ and kt CO_2eq., 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).

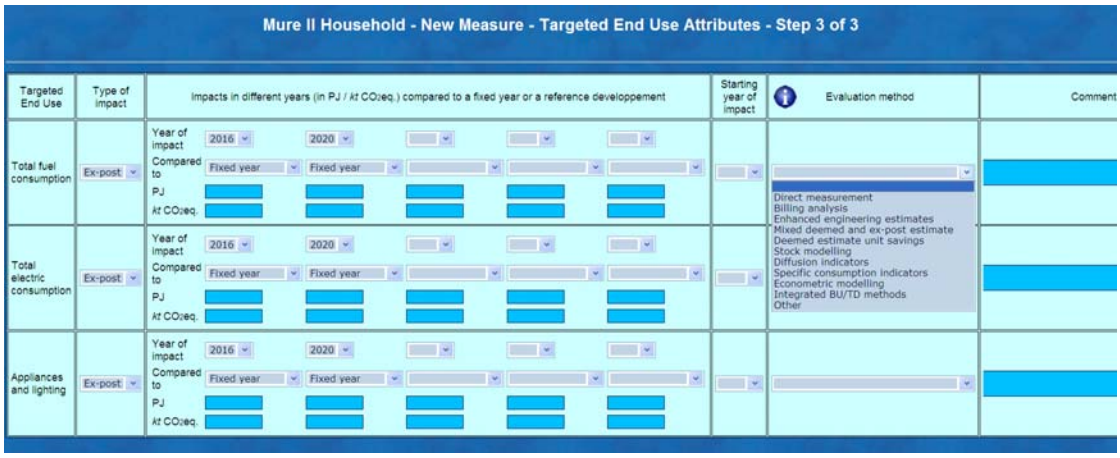

Figure 3. Impact quantification table for policy measures in the MURE database (Source: http://www.muredatabase.org/)

[8] 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 1).

[9] 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.

[10] 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.

Though this structure, which was also described in detail in the MURE Guidelines mentioned above (Schlomann & 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 theses 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.[11]

Measures addressing heating consumption in residential and tertiary buildings

At the moment, the MURE Measure Database includes around 100 policy measures from the NEEAPs addressing energy consumption for space heating and hot water in the residential sector and more than 40 measures in the tertiary sector. All NEEAP measures included in the MURE database for these end-uses are listed in the Annex, also showing the semi-quantitative impact mentioned above.

The dominating measure **types** addressing heating consumption in residential buildings are legislative-normative measures (mainly building codes) with a share of around 37% and financial measures with an only slightly lower share of 36% (Figure 4). When also taking into account legislative-informative measures (as e.g. building certificates) with a share of 11%, the total share of legislative and financial measures adds up to 85%. Nevertheless, the role of information and education programs at a voluntary basis must not be underestimated. Almost 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 one quarter of the policy measures addressing heating consumption in tertiary buildings are assigned to this type (Figure 4). In 14 Member States, financial incentives for energy-efficient heating and hot water systems and the building shell are reported in the NEEAPs. In some countries (e.g. Estonia, Germany), energy audits are subsidized, too. Whereas in most of the countries, the financial programs are financed by the public budget, in some countries (e.g. France, Italy, UK), they are also based on national energy efficiency obligation schemes. The latter at least permits a budget-independent funding of energy-efficiency measures, though the actual financing and the share of private and public funding within these systems depends on the actual design and differs by country (see e.g. Bertoldi et al. 2010 or Lees 2012). The legislative measures in MURE are distinguished between normative and informative measures. Legislative-normative measures mainly include the building regulations, i.e.

[11] low impact: <0.1%; medium impact: 0.1-<0.5%; high impact: ≥0.5%(Schlomann &Eichhammer 2011)

national implementation of the European Directive on the Energy Performance of Buildings (EPBD) from 2002 (2002/91/EC) and the planned implementation of the EPBD recast from 2010 (2010/31/EC). These measures are reported in most of the NEEAPs. In addition, legislative-informative measures include mandatory information (esp. building certificates as required by the EPBD) whereas the category "information/education" includes voluntary information programs on energy-efficient heating and hot water systems. To sum up, the qualitative analysis on the type of measure introduced shows that energy efficiency policies for heating consumption in new buildings are mostly based on the national transposition of the EPBD as regards legislative-normative and legislative-informative measures, while more differences between the countries can be observed for financial measures and voluntary information education and training measures. Energy efficiency in existing buildings, which should be a major focus in order to achieve the required savings, are mainly the focus of financial measures which – to a large degree - are based on public funding which has now come under pressure as state budgets are more limited due to the economic crisis, or on fluctuating funding such as the support programs for buildings in Germany which draw on income from the EU Emission Trading scheme. The prices for the CO_2 certificates are currently at half and less of the expected level, when the programs where set up. This underlines the importance of providing stable funding systems for energy efficiency in existing buildings, similar to the stable funding sources which have been set up for renewables with the feed-in tariffs introduced in many EU countries. Based on the information given in the MURE database, policies addressing heating consumption in residential and tertiary buildings are still mainly initiated by central governments (around three quarters of the described policy measures) which a strong role of the European Commission through the Energy Performance Directive for Buildings. This mainly applies to legislative measures such as building codes, but also to a lot of financial programs. In some countries, however, local governments historically play an important role, too.

Important **target audiences** of the measures addressing residential buildings are the owners of the houses, building professionals, housing associations, and landlords. One possible target group for energy efficiency measures which is increasingly discussed with regard to building renovations are low-income households. 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. Nevertheless, there are only a few NEEAP measures described in MURE which directly address low-income households.

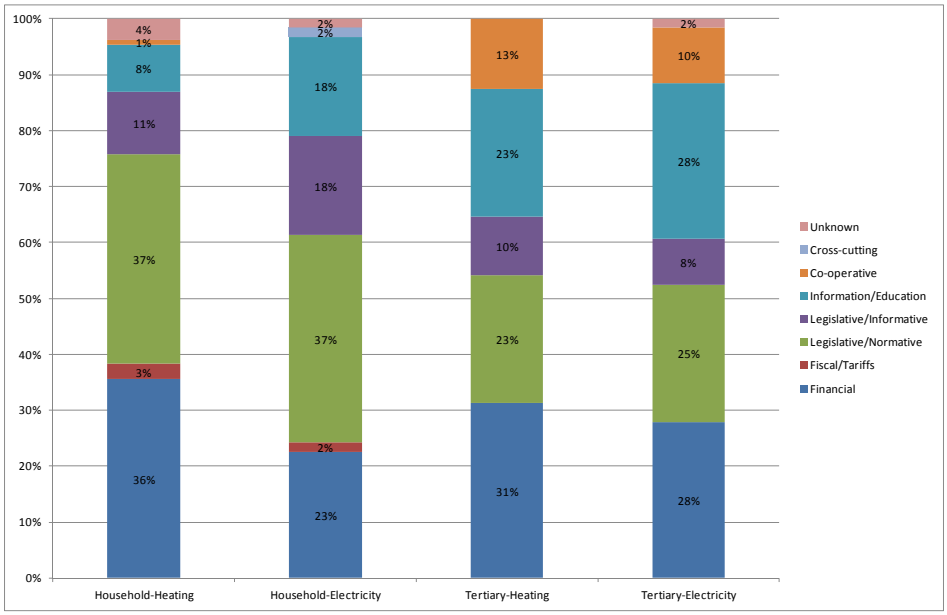

Figure 4. NEEAP measures in residential and tertiary buildings by type (Source: MURE Measure Database; partly double-counting since some measures address more than one type)

One important feature in the MURE Measure Database is the **quantitative measure impact** which is associated to a measure if a quantitative impact is available from the NEEAPs or from other data sources (as e.g. impact evaluation studies for a single measure). For about 60% of the around 140 policy measures addressing heating consumption in the building sector and classified as NEEAP measures, a quantitative impact is indicated in MURE. This quantitative impact is based on the results from bottom-up analyses. The total final energy savings of these measures amounts to around 1230 PJ in 2016 (Table 1). This figure is not without caveats as the number of countries that could be included, is limited[12] and the evaluation methods, even though based on bottom-up methods, vary between the countries, as the evaluations methods where recommended by the EU Commission but not used uniformly by the different EU Member States. Most of these savings (around three quarters as a rough estimate) are reported for residential buildings, though a clear separation of the impact for residential and tertiary buildings is not possible, since in some NEEAPs these savings are only quantified all together.

Measures addressing electricity consumption in residential and tertiary buildings

With regard to electricity consumption in the household and tertiary sector (with the exemption of electricity for heating and hot water), the MURE Measure Database includes around 50 measures from the NEEAPs in the residential sector and around 45 measures in the tertiary sector (for a detailed list see Annex). As in the case of heating, the dominating measure **types** in the household sector are legislative-normative measures (mainly mandatory energy efficiency standards) with a share of around 37%. Financial measures are less widespread than for heating, but also important (Figure 4). The same applies to informative policies; mandatory and voluntary measures both have a share of 18%. 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.

As in the case of policies addressing heating consumption, policies addressing electricity consumption in residential and tertiary buildings are mainly initiated by central governments with the EU level influencing heavily the developments via the energy efficiency standards set by the Eco-design Directive and its implementing directives. But the local governments also play an important role, especially in the tertiary sector. In total, more than half of the policies are initiated by them. However, other actors, especially energy agencies, associations and energy suppliers are more active in the field of electricity than with regard to heating consumption. Around one third of the measures to promote energy-efficient electrical appliances in the household and tertiary sector are initiated by such actors. A **quantitative measure impact** is indicated in MURE for about 70% of the around 130 NEEAP measures addressing electricity consumption in residential buildings and 50% in the case of tertiary buildings. The total final electricity savings of these measures amount to around 240 PJ in 2016, of which around 150 PJ in residential and 90 PJ in tertiary buildings (Table 1).[13] Also here, similar notes on caveats hold than for the building-related energy efficiency measures.

Analysis of the quantitative impact of policy measures addressing the building sector

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 are represented with quantitative impact evaluation up to now for several reasons (see above). Therefore, the energy savings reported in the 2nd NEEAPs are also taken

[12] This includes quantified measure impacts in 15 EU Member States. For the remaining EU Member States, no quantified measure impact is reported in the MURE database due to different reasons (as e.g. no quantified measure impact available since the NEEAPs only include top-down savings for the building sector or no measure update until beginning of March 2012).

[13] Including quantified measure impacts in 15 EU Member States; a clear separation of residential and tertiary buildings was not possible for all Member States.

into account directly from the NEEAPs[14] 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.

	Residential sector			**Tertiary (incl. Public) sector**			**Total Building Sector**		
	Heating	**Electricity**	**Total**	**Heating**	**Electricity**	**Total**	**Heating**	**Electricity**	**Total**
Unit	**PJ**								
MURE: NEEAP measures	Based on information from 15 EU Member States			Based on information from 12 EU Member States					
2016	1031	149	1180	202	89	290	1232	238	1470
2020 (projection)	1443	209	1652	282	124	407	1725	333	2059
NEEAPs: only BU	Based on information from 19 EU Member States			Based on information from 18 EU Member States					
2016			1427			313			1740
2020 (projection)			1997			438			2435
NEEAPs: incl. TD	Based on information from 23 EU Member States			Based on information from 21 EU Member States					
2016			2341			362			2703
2020 (projection)			2977			507			3484
Saving Potentials (HPI)	All EU Member States (EU-27)			All EU Member States (EU-27)					
2016	2138	219	2357	740	283	1023	2878	502	3380
2020	3030	288	3318	991	468	1459	4021	756	4777

Table 1. Overview of final energy saving in the building sector reported in the 2nd NEEAPs (Sources: MURE Measure Database; NEEAPs 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 1700 PJ are calculated from the NEEAPs for the year 2016, the target year of the ESD. Most of these savings (around 80%) 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)[15], the total savings for the building sector in the year 2016 amount to around 2700 PJ. An overview of the final energy savings calculated under these assumptions gives Table 1. Nevertheless, the limitations of the quantitative analysis due to the very diverse use of top-down and bottom-up evaluation

[14] http://ec.europa.eu/energy/efficiency/end-use_en.htm

[15] 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.

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 1 only show a rough order of magnitude of possible measure impacts and not a full impact analysis due to methodological limitations.

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.[16] 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 2435 PJ are projected for 2020 from the NEEAPs (based on 19 countries), which is not far from the savings of 2059 PJ (based on 15 countries) projected from the information in the MURE database (see Table 1). 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 3500 PJ (Figure 1). This would be, only in the building sector, around 40 % of the total (primary) savings of 8370 PJ which are still missing in order to achieve the EU 20% 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 3500 PJ 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 2 and Table 1), around 70 % of the estimated savings in the building sector are already exploited if both including bottom-up and top-down reported savings (Table 1). 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 (which is the case for example for most thermal building regulations from that period, the buildings built during that period according to this building regulation and 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. 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), 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 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 1)), but less extensively in the tertiary sector.

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

Summary and Conclusions

The MURE Measure Database allows a detailed analysis of energy efficiency measures by sector and end-use reported in the 2nd National Energy Efficiency Action Plans (NEEAPs) of the EU Member States, both including qualitative and quantitative features of the policies.

The qualitative analysis of policy measures by type especially showed that energy efficiency policies for new buildings and appliances are mostly based on the national transposition of the relevant EU regulations (EPBD, Ecodesign and Labelling Directives) as regards legislative-normative and legislative-informative measures while more differences between the countries can be observed for financial measures and voluntary information education and training measures. Energy efficiency in existing buildings, which should be a major focus in order to achieve the required savings, are mainly the focus of financial measures which – to a large degree - are based on public funding which has now come under pressure as state budgets are more limited due to the economic crisis, or on fluctuating funding such as income from the EU Emission Trading scheme. The prices for the CO_2 certificates are currently at half and less of the expected level, when the programs where set up. As a major recommendation for the further improvements of the NEEAPs, this observation underlines the importance of providing stable funding systems for energy efficiency in existing buildings, similar to the stable funding sources which have been set up for renewables with the feed-in tariffs introduced in many EU countries.

The total impact of these measures on final energy savings amount to almost 1500 PJ in 2016, the target year of the ESD, and to (projected) around 2000 PJ in 2020. The quantitative analysis of measure impacts is, however, limited by methodological restrictions due to the actual variety of the use of impact evaluation methods by the Member States in their NEEAPs, mixing both top-down and bottom-up evaluation methodologies. When taking into account all bottom-up and top-down calculated savings reported in the 2nd NEEAPs for the building sector, the savings amount to around 2700 PJ in 2016 and (projected) 3500 PJ in 2020. This means that around 40 % of the (primary) energy savings, which are still missing in order to achieve the 20 % energy saving target of the European Union until 2020, could be reached by the measures reported in the 2nd NEEAPs only for the building sector. The remaining savings have to be achieved by savings in other final consumption sectors (transport, industry) and in the conversion sector, which were not analyzed in this paper. However, it has to be taken into account that this share comprises "Early Action" measures which are part of the NEEAPs (measures initiated between 1995-2007 which still have an impact in 2016), as well as autonomous savings for the measures which have been evaluated with a top-down method. With the fragmented information from the NEEAPs it is not possibly to correct for these two factors. However, the estimates show that roughly one third of NEEAP measures may be based on Early Action. So in fact, the net contribution of the energy efficiency measures investigated here in the residential sector may be rather in the range below 30% rather than 40% of the required savings.

Also in the building sector there is a remaining energy saving potential, which is not tapped by the measures already reported in the NEEAPs. This potential amounts at least to 30% and only includes energy saving measures that are cost-effective from an 'end-user' perspective.

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Annex: Overview of policy measures in the MURE database classified as “NEEAP” measures

Measures addressing energy consumption for heating in the building sector

Household Sector

Code	Title	Status	Type	Starting Year	Semi-quantitative Impact
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
AU26	National recovery plan / renovation voucher	Ongoing	Financial	2009	Unknown
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) - Minimum efficiency standards for boilers	Ongoing	Legislative/Normative	2005	Medium
BG16	Mandatory heating pipe insulation in Buildings	Ongoing	Legislative/Normative	2007	Medium
BG25	National Program for increase of the energy efficiency at the solid fuel usage	Proposed (advanced)	Legislative/Normative	2012	Unknown
CY9	EU-related: Energy Performance of Buildings EPBD Recast (Directive 2010/31/EU) - Information, awareness policies for energy savings	Ongoing	Legislative/Normative	2004	Medium
CZ20	Support to housing fund modernization using the building saving	Ongoing	Legislative/Normative	1995	Medium
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
CZ19	Green to Savings Programme	Ongoing	Financial	2009	High
DK4	Heat Consulting	Completed	Legislative/Normative	1986	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
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
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 efficent 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
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
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
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
FIN33	Building code D1: Water and Drainage Systems for Properties	Ongoing	Legislative/Normative	2011	Medium
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 (Marktanreizprogramm 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(advanced)	Legislative/Informative	2011	Medium

Code	Title	Status	Type	Starting Year	Semi-quantitative Impact
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
GRE16	“Energy Savings in households” Program	Ongoing	Financial, Legislative/Normative	2010	High
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(advanced)	Legislative/Normative		Medium
HUN23	Development of the operation of an energy efficiency consultant network	Proposed(advanced)	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
HUN16	Non-Governmental Organisations for Energy Efficiency	Ongoing	Information/Education	1992	Low
HUN28	Individual measurements, application of mini heat centres in district heating	Ongoing	Legislative/Normative	2005	Low
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
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	2006	High
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
LV33	Increasing Heat Energy Efficiency in Social Apartment Buildings	Ongoing	Financial	2008	Medium
LV28	Increasing Energy Efficiency in Multi Apartment Buildings	Ongoing	Financial	2009	High
LV29	Information Campaign "Live Warmer"	Ongoing	Information/Education	2009	Medium
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
MAL3	Grants on purchase of micro-RES generation equipment	Ongoing	Financial	2006	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
SPA27	Action Plan 2005-2007: Improvement of the energy efficiency of thermal installations in existing buildings	Completed	Financial, Legislative/Normative	2005	High
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
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
UK20	UK20_Carbon Emissions Reduction Target & Suppliers obligation	Ongoing	Co-operative Measures, Financial	2008	High

Tertiary Sector

Code	Title	Status	Type	Starting Year	Semi-quantitative Impact
AU12	Bundesgebäude Contracting - Energy saving programme for federal buildings	Ongoing	Co-operative Measures	1999	Unknown
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 prostøednictvím 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
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
EST16	Counselling of local governments upon planning the development of the energy sector and the related sectors	Proposed (advanced)	Information/Education/Training		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 he future, and 250 m2 since 2015)	Ongoing	Legislative/Informative, Legislative/Normative	2009	Medium
FIN34	Farm land reparcelling projects	Ongoing			Medium
FIN27	Investments in heating plants (agricultural sector)	Ongoing	Financial	1996	High
FIN32	Fresh grain silos	Ongoing	Financial	2008	Low
GER22	Environmental Label "Blue Angel" (Umweltzeichen "Blauer Engel")	Ongoing	Information/Education/Training	1977	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,	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
HUN3	UNDP/GEF municipal energy efficiency project	Completed	Financial, Information/Education/Training	2001	Low
HUN5	Encouragement of reduction of energy use in the Regional Operative Programmes	Ongoing	Financial	2007	Low
ITA14	White Certificates	Ongoing	Financial	2005	Medium
ITA13	EU-related: Energy Performance of Buildings (Directive 2002/91/EC) - Energy Performace 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
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
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
SLO10	Schemes for efficient electricity consumption and reduction of GHG emissions	Proposed (advanced)	Fiscal/Tariffs	2013	Low
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
SPA29	Action Plan 2008-2012:Energy Saving and Efficiency Plans in Public Administrations	Ongoing	Information/Education/Training, Legislative/Informative	2008	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
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 energy consumption for electrical appliances in the building sector

Household Sector

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
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
BG26	Preferential credits for electrical energy savings in residential buildings	Proposed (advanced)	Financial	2012	Medium
CZ17	EU-related: Energy Labelling of Household Appliances (Directive 92/75/EC) - (Energetické štítkování domácích elektrospotøebièù)	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
DK27	Club1000 - 1000 kWh campaign	Ongoing	Information/Education	2007	Medium
EST15	Minimum energy performance requirements (for buildings)	Ongoing	Legislative/Normative	2008	High
GER48	Top Runner Strategy	Proposed(medium/long-term)	Legislative/Informative, Legislative/Normative		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
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
GRE17	"Changing Air-Condition" Program	Completed	Financial	2009	Unknown
GRE16	"Energy Savings in households" Program	Ongoing	Financial, Legislative/Normative	2010	High
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
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
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	2006	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
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
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 flourescent Lamps	Completed	Financial	2009	High
MAL8	Energy Audits for households	Proposed (medium/long-term)	Financial, Information/Education	2012	Unknown
RO9	EU-related: Revised Directive for Labelling of Energy-related Products (Directive 2010/30/EU) - Using promotion of performing householder appliaces	Ongoing	Legislative/Informative	2001	Medium
SLO15	EU-related: Energy Labelling of Household Appliances (Directive 92/75/EC) - Rules on energy labelling of household appliance	Ongoing	Legislative/Informative	2004	Low
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
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

Tertiary Sector

Code	Title	Status	Type	Starting Year	Semi-quantitative Impact
AU30	Public procurement of energy efficient products	Ongoing		2001	Unknown
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
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 veøejného osvìtlení)	Ongoing	Legislative/Normative	2010	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
EST11	Development of legislative acts on environmentally friendly public procurements and the related instruction materials	Proposed (advanced)	Co-operative Measures		Low
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)	Unknown		Low
EST16	Counselling of local governments upon planning the development of the energy sector and the related sectors	Proposed (advanced)	Information/Education/Training		Medium
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
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
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
HUN3	UNDP/GEF municipal energy efficiency project	Completed	Financial, Information/Education/Training	2001	Low
HUN5	Encouragement of reduction of energy use in the Regional Operative Programmes	Ongoing	Financial	2007	Low
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
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	Unknown
LUX4	Realising electricity savings potential in the TCS sector	Proposed(advanced)	Financial, Information/Education/Training	2012	Medium
MAL12	Eco-Gozo	Ongoing	Co-operative Measures	2010	Unknown
MAL2	Grant scheme for tourism enterprises	Completed	Financial	2011	Low
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
SLO10	Schemes for efficient electricity consumption and reduction of GHG emissions	Proposed (advanced)	Fiscal/Tariffs	2013	Low
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 - 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
SPA29	Action Plan 2008-2012:Energy Saving and Efficiency Plans in Public Administrations	Ongoing	Information/Education/Training, Legislative/Informative	2008	High
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