

9. Policy measures in the household sector

On the one hand residential energy use in different EU-countries (EU-15, excluding Luxemburg, including Norway) has many characteristics in common, such as the need to heat the dwelling in winter, the need for hot water and the use of a number of standard appliances. The saving measures available in the countries are more or less the same as well. On the other hand policy on residential energy savings is for a large part national policy, which takes account of country specific factors, such as building practices, the role of government in providing (rented) housing and the role of other parties. So, it is interesting to look at common trends as well as differences between countries in stimulating energy savings. These could reveal lessons to be learned from optimal policy deployment or provide information on innovative policy measures.

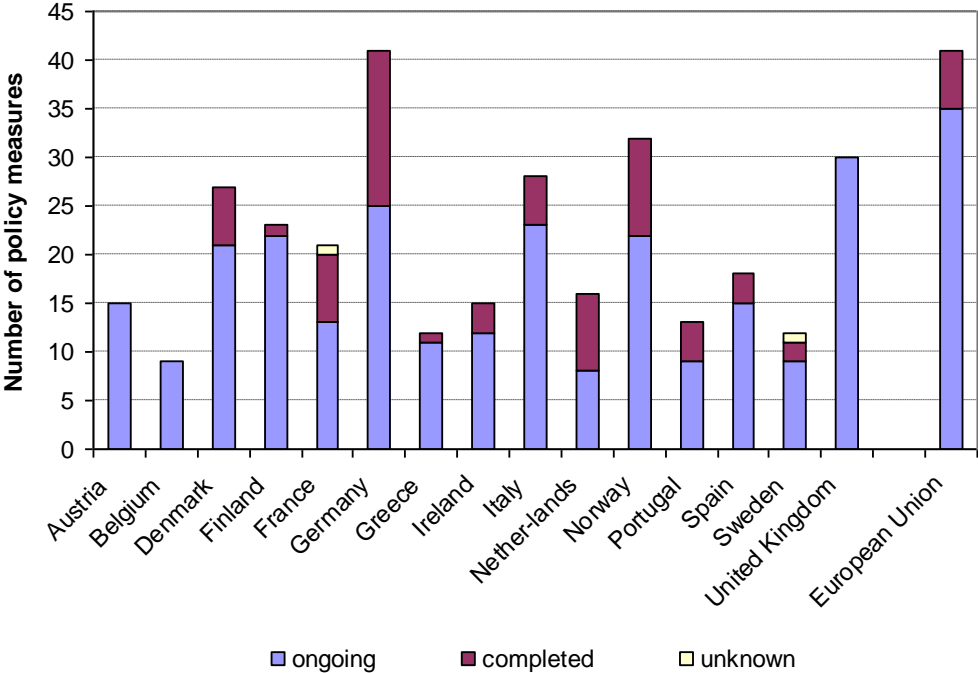
According to the Odyssee results for the household sector the increase in energy efficiency has slowed down since the middle of the nineties. Where appropriate the analysis on policy measures and impact will pay attention to this phenomenon.

9.1. Patterns and dynamics of energy efficiency measures

Large differences in number of policy measures between EU-countries

About 310 policy measures have been implemented for the residential sector in EU Member States plus Norway, or on average almost 21 policy measures per country. However, the number varies considerably, from 9 for Belgium to 41 for Germany (Figure 9-1). The large number of EU policy measures on household energy use overlaps with country measures because EU-legislation is transferred into national policy measures. About three-quarters of all policy measures are still active, reflecting the present policy efforts of countries. Again the number varies considerably, between 9 (Belgium) and 30 (UK).

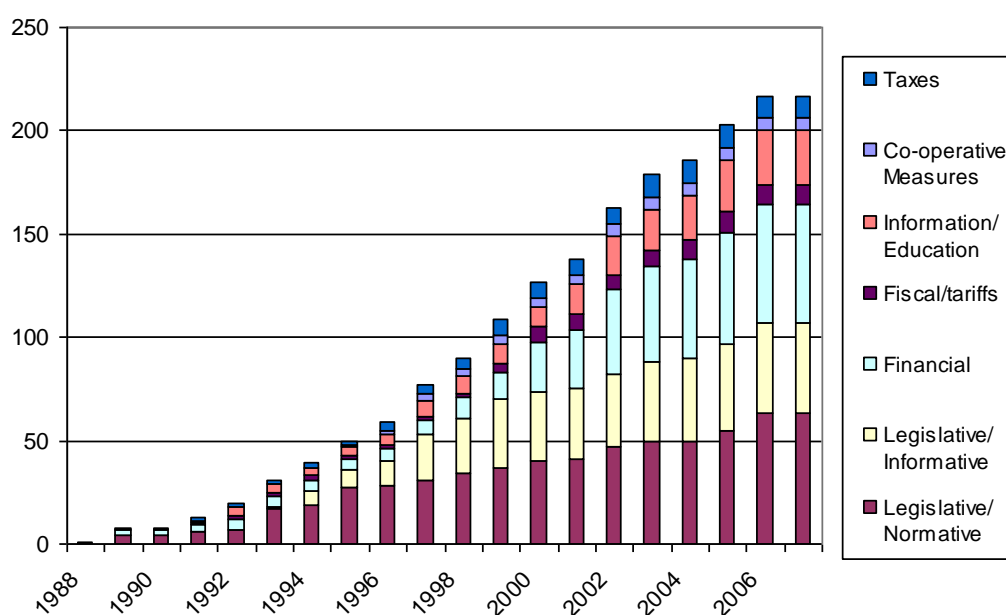
Figure 9-1: Number and status of policy measures for each EU-country and the EU



Substantial increase in number of policy measures

The total number of active policy measures has increased substantially over the years (**Figure 9-2**). Standards (legislative/normative) were introduced often in the early nineties and mandatory labels in the later nineties. From 2000 on, financial measures have been much more popular. However, very recently standards have gained weight again. The number has increased most for financial (e.g. subsidies for efficient systems) and for information/education measures, both at the cost of the legislative/normative measures (e.g. standards on insulation). The number of measures for taxes (based on energy use as well as on CO2 emission) seems small but one tax measure per county can have a significant effect, as it influences all energy use. Fiscal measures (e.g. tax deductions for investment in energy savings) and co-operative measures (voluntary agreements) did not play an important role.

Figure 9-2: Development of active policy measures by type in all EU-countries



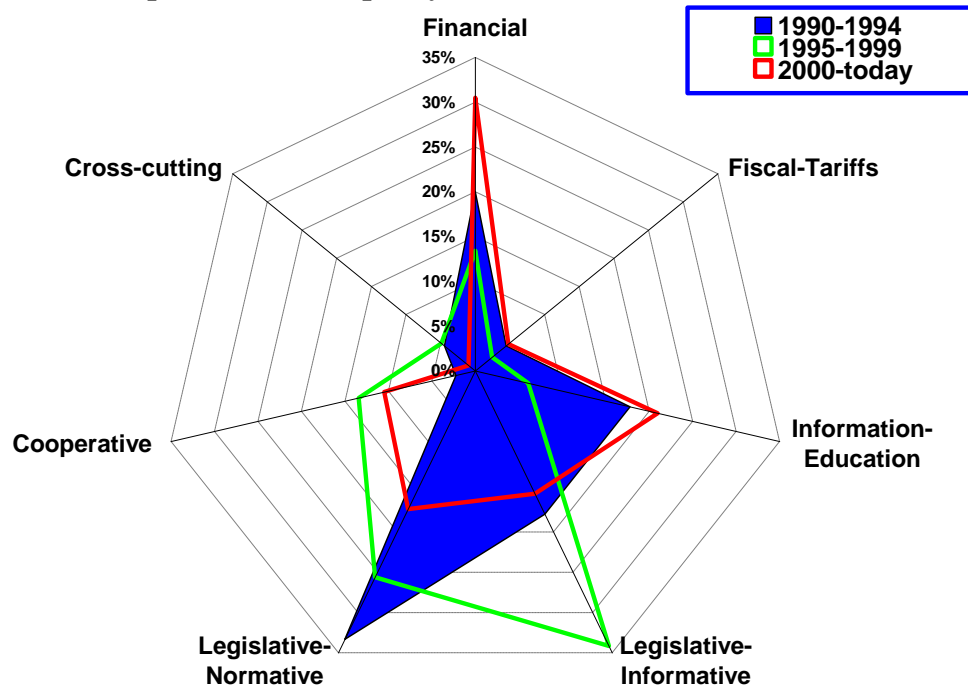
Life time of policy measures shorter for subsidies and information

The development of the number of active policy measures is the result of additions of new measures and subtractions due to measures that are no longer applied. The number of new measures from 1990 on is five to six times higher than that of completed measures. For completed policy measures financial measures take the lead, followed by information measures. It can be concluded that introduced taxes and labels have been maintained all over the period observed. Actually, the same holds for standards, as completed measures generally are replaced by a similar measure with stricter demands. Subsidies and tax deductions (financial or fiscal measures) have a rather short lifetime. The same holds for information/education measures.

More subsidies and fewer standards

The spider-graph (**Figure 9-3**) shows the distribution of policy measures over seven main categories and for three periods. It proves that standards (legislative/normative) have lost weight, while subsidies (financial) have gained weight. Labels (legislative/informative) and agreements (cooperative) have been introduced mainly in the second half of the nineties. Information/education measures were mainly introduced in the early nineties, but again in recent years.

Figure 9-3: Composition of new policy measures for EU-countries since 1990



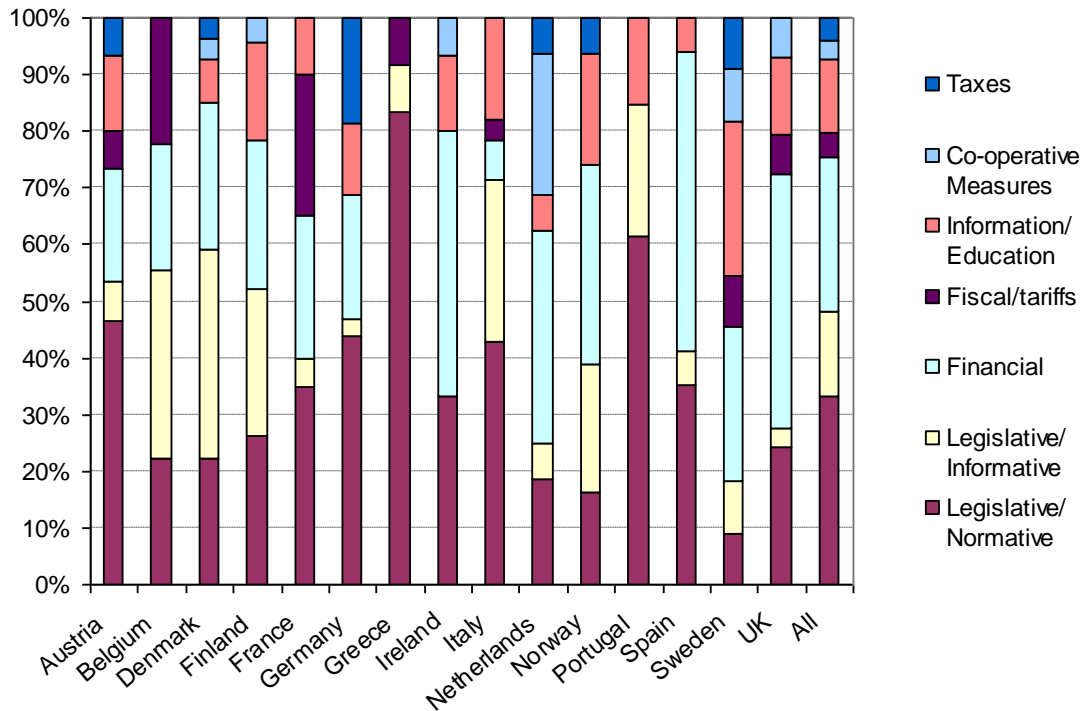
Countries make extreme choices as to type of policy measures

Countries make very different choices as to the type of policy measures (**Figure 9-4**). The most extreme choices per type of policy measure are:

- Legislative/normative: Greece (80%) versus Sweden (9%)
- Legislative/informative: Denmark (40%) versus Ireland (0%)
- Financial: Spain, UK and Ireland (53-47%) versus Greece/Portugal (0%)
- Fiscal/tariffs: France and Belgium (28 and 25%) versus many without any
- Information/education: Finland (20%) versus Belgium/Greece (0%)
- Co-operative measures: Netherlands (25%) versus many without any
- Taxes: Germany (17%) versus many countries with no special tax at all

Greece and Spain are the countries with policy measures that focus the most on only few types, such as standards (Greece) or subsidies (Spain, mainly renewables). Sweden is the country with the most evenly distributed set of policy measures.

Figure 9-4: Policy measures per type for EU-countries (fraction of total number)



Policy measures cover all targeted energy uses

Policy measures on energy savings often regard a specific part of household energy consumption. The coverage is shown (**Table 9-1**) for the following targets of policy measures:

- New dwellings
- Boilers for space heating and hot water
- Envelopes of existing dwellings
- Electric appliances

In almost all countries the set of policy measures covers all parts of household energy use. However, the distribution of policy measures over all energy use targets is often uneven. For each country the divergence from an even distribution (i.e. 25% of all policy measures devoted to each of the four energy uses) was calculated. The mean divergence is large for Greece and Portugal and lowest for Spain and UK. Generally countries with a larger number of policy measures tend to have a more even distribution over different energy use targets.

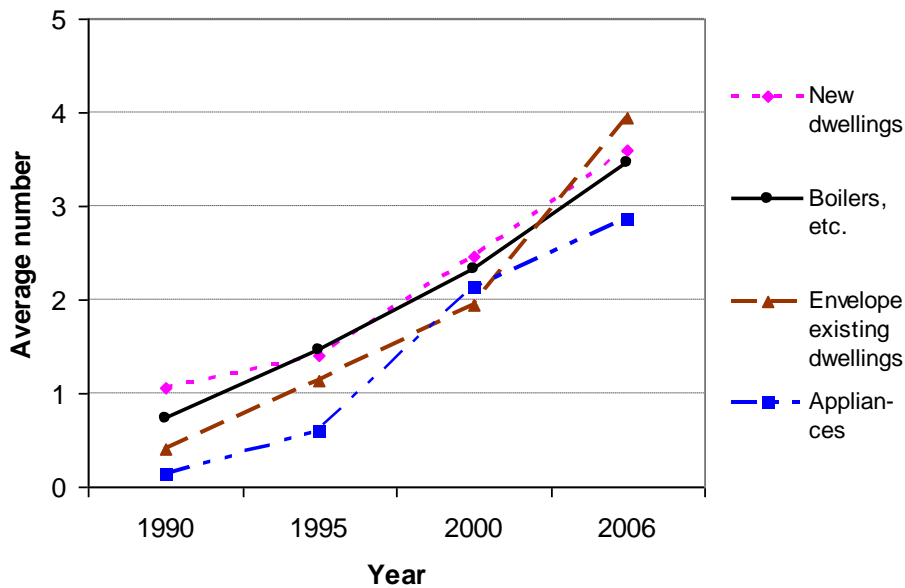
Table 9-1: Policy measures per targeted energy use and divergence for EU-countries

	Austria	Belgium	Denmark	Finland	France	Germany	Greece	Ireland	Italy	Netherlands	Norway	Portugal	Spain	Sweden	United Kingdom
New dwellings	2	1	7	3	6	5	1	4	2	3	6	5	4	1	4
Boilers, etc.	4	2	3	5	2	7	5	1	7	1	2	3	3	0	7
Envelope existing dwellings	2	4	7	2	5	10	1	3	3	2	8	0	3	1	8
Appliances	1	1	3	2	2	2	1	1	7	6	7	1	2	2	5
Divergence	10%	13%	10%	8%	12%	10%	19%	14%	12%	13%	8%	19%	4%	13%	6%

Policy coverage increases for all targeted energy uses

The average number of policy measures per country increases more or less the same for the four targeted energy uses (**Figure 9-5**). Note that the average number can be less than unity (see appliances in 1990) when many countries do not target (yet) some parts.

Figure 9-5: Average number of policy measures per EU-country, targeted at different energy uses in the period 1990-2006



Broad policy measures not always applied

Broad policy measures, such as taxes or tariffs and information campaigns, aim by nature at all energy uses. General information and awareness campaigns are present in most countries but only half of the countries applies energy taxes, and special tariff structures are completely absent. Therefore most countries cannot provide a general financial incentive for investing in energy savings, in case specific policy measures, such as subsidy schemes, are lacking.

Not much policy influence on daily energy use

Most policy measures try to influence the purchase of more efficient devices. However, if these devices are not used in a proper manner as to daily energy use, part of the potential savings are lost. E.g. the savings of high efficiency boilers decrease if the temperature of the circulating water is higher than necessary. Policy measures on inspection and/or maintenance, that stimulate the proper use of the systems, are applied by about half of the countries only. One country (Germany) can influence daily energy use via maintenance as well as taxes and information.

EPBD not yet fully transposed in national policy

The Energy Performance of Buildings directive (EPBD, see **Box 9-1**) of the EU must be transposed into national legislation and policy measures. All Member States already implemented either insulation or performance standards for new dwellings before (**Table 9-2**). So, the demand for standards in the EPBD more or less follows already existing practice. However, as to the demanded certificates not all countries have a policy measure in place. As regards inspection, half of the countries already did implement national policy measures; however, these national measures have to be adapted in line with the EPBD.

Box 9-1: Energy Performance of Buildings Directive (EPBD)

The EPBD-directive has three main components:

- standards for new and renovated buildings,
- energy certificates for large (existing) buildings;
- regular testing of boilers and air conditioning systems.

Member States are demanded to apply standards for new dwellings and buildings and for large existing buildings that are renovated for a substantial part. However, the directive does not quantify the standard. As most MS already have standards this part of the directive will not have much influence on energy efficiency.

MS are also demanded to implement a system of certificates that describe the actual energy efficiency level of the dwelling or building and possible measures to increase the efficiency. Buildings or dwellings that are built, sold or rented should have a certificate. It is expected that the information about yearly energy use and possible saving measures will stimulate saving measures by the new owners or renters. However, the certificate system will not force saving measures; realized savings will depend on other policy measures of MS, e.g. subsidies.

The regular testing of boilers regards an obligatory test of the efficiency of boilers > 20 kW, which form the bulk of boilers for space heating. For AC systems it regards systems with a capacity > 12 kW.

Table 9-2: Number of policy measure per country related to EU policy

	Austria	Belgium	Denmark	Finland	France	Germany	Greece	Ireland	Italy	Nether-lands	Norway	Portugal	Spain	Sweden	United Kingdom
EPBD:															
- standards new dwellings	1	1	3	2	4	4	1	3	2	3	4	3	4	1	4
- certificates dwellings	0	1	6	2	0	0	0	0	1	0	0	2	0	0	0
- inspection heating device	1	0	2	0	0	1	2	0	3	0	0	2	0	0	0
Eff.standard boilers	0	1	0	1	1	3	2	1	2	0	0	1	1	0	2
Labels appliances	1	1	1	1	1	1	1	1	6	1	6	1	1	1	1

EU policy on boiler standards and labels fully transposed

Policy measures on minimum efficiency standards for boilers lack for some countries, notably the ones with a long history on energy efficiency policy (**Table 9-2**). However, due to the market transformation realized, the not very strict EU standard is probably regarded as irrelevant and therefore not inserted in the database. National policy measures on labels for appliances are present in all EU countries, so full compliance with EU-legislation exists.

9.2. Impact of policy measures

About 70% of the policy measures in the MURE data base have been evaluated as to their effect on energy use. The impact of these measures has been qualitatively rated as low, medium or high¹²³. The total impact of groups of measures has been calculated with weighting factors of 1, 3 and 5 for low, medium and high.

Impact of policy measures differs greatly per country

The overall impact of all measures for each EU-country shows large differences (**Figure 9-6**). Because this could be due to differences in the number of measures, these are shown as well. From the overall impact and total number an average impact has been calculated. Germany has the largest number of policy measures, France and Greece the largest average impact per measure and the UK the highest overall impact. Both the number of measures and the average impact are important to reach a high overall impact for the set of policy measures.

Average impact per policy measure does not increase

The total impact of policy measures for EU-countries in the period 1990-2006 has been rising sharply (**Figure 9-7**). As the total number of policy measures increases at the same pace it must be concluded that the average impact of policy measures has not increased. If the total impact is calculated with weighting factors representing the final energy use of countries in 2000, a slight increase in the average impact per policy measure is visible.

¹²³ Low impact is given for 0-0.1% of total use, medium for 0.1-0.5% and high for >0.5%. For instance, “medium” impact for a subsidy scheme means that the savings are estimated at about 0.3% of total fuel use

Figure 9-6: Rated policy measures and average/total impact for EU-countries (% of EU-average)¹²⁴

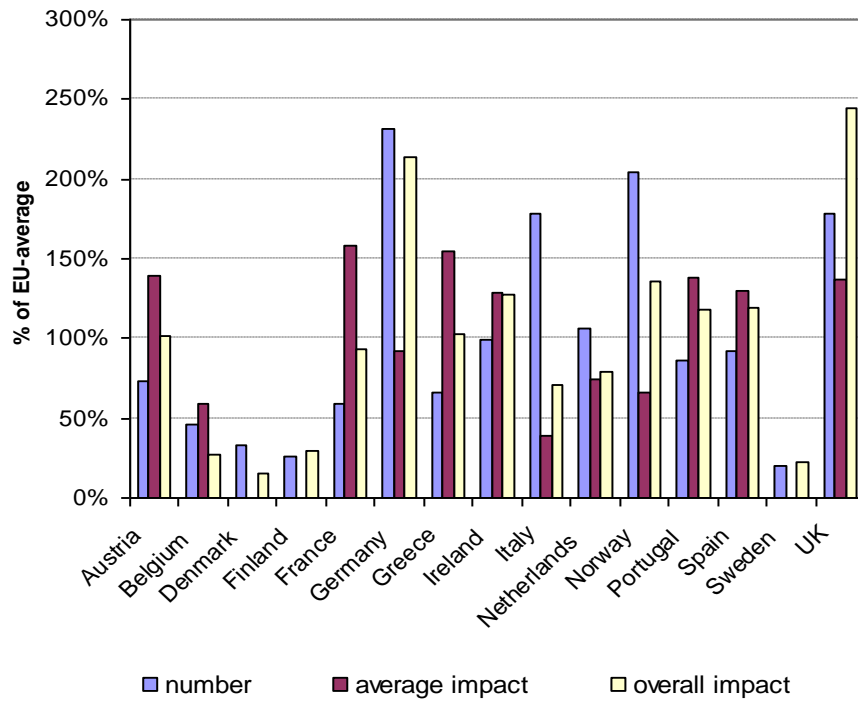
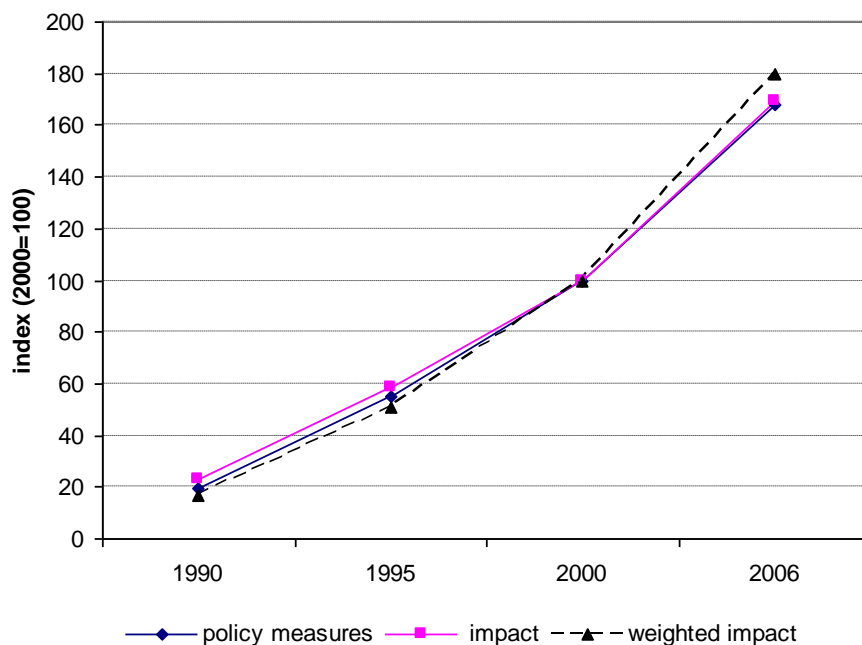


Figure 9-7: Development of the number and the (weighted) total impact of policy measures for all EU-countries (2000=100)

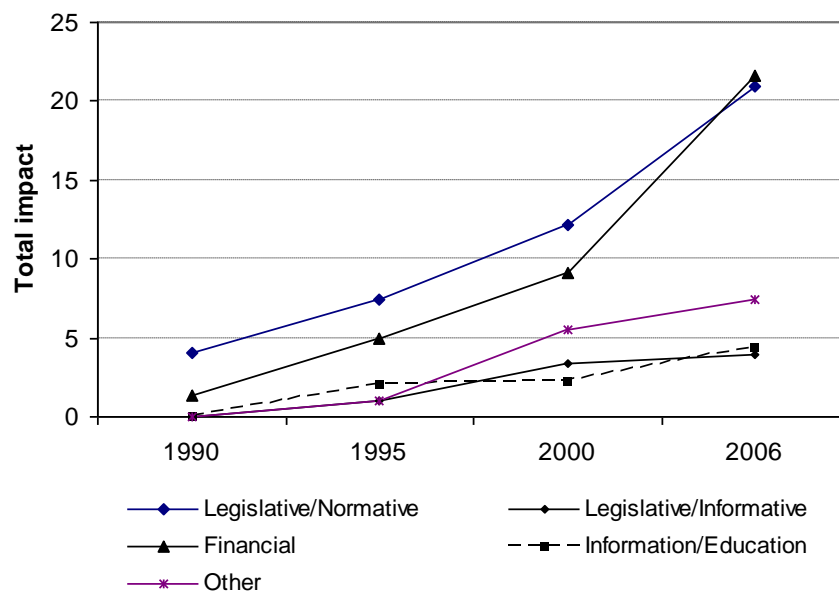


¹²⁴ The measures are weighted according to their relative energy savings. Given the previously mentioned ranges weighting factors of 5 (high), 3 (medium) or 1 (low) are used.

Low impact of information/education

The total impact per type of policy measure shows that standards (legislative/normative) have the highest impact. Recently financial measures have become more important (**Figure 9-8**). The impact of “other policy measures “(voluntary agreements and taxes) increases the most. Labels (legislative/informative) do not have much impact, probably because they focus on part of electricity use only. Measures on information/education, which is often a focus in savings policy, have never been of great importance for realizing energy savings in households.

Figure 9-8: Development of total impact per policy measure type, for all EU-countries



Trend for total policy impact and total realized energy savings do not match

The combined set of energy indicators, called ODEX-Households, provides an estimate of the realized total energy savings. ODEX- shows a strong increase in energy efficiency until the mid-nineties, followed by stagnation and a small further increase after 2000. This development is not in line with the ever increasing impact of all policy measures in EU-countries (**Figure 9-7**). A possible explanation could be found in the developments of energy prices which decreased in real terms in the latter half of the nineties.

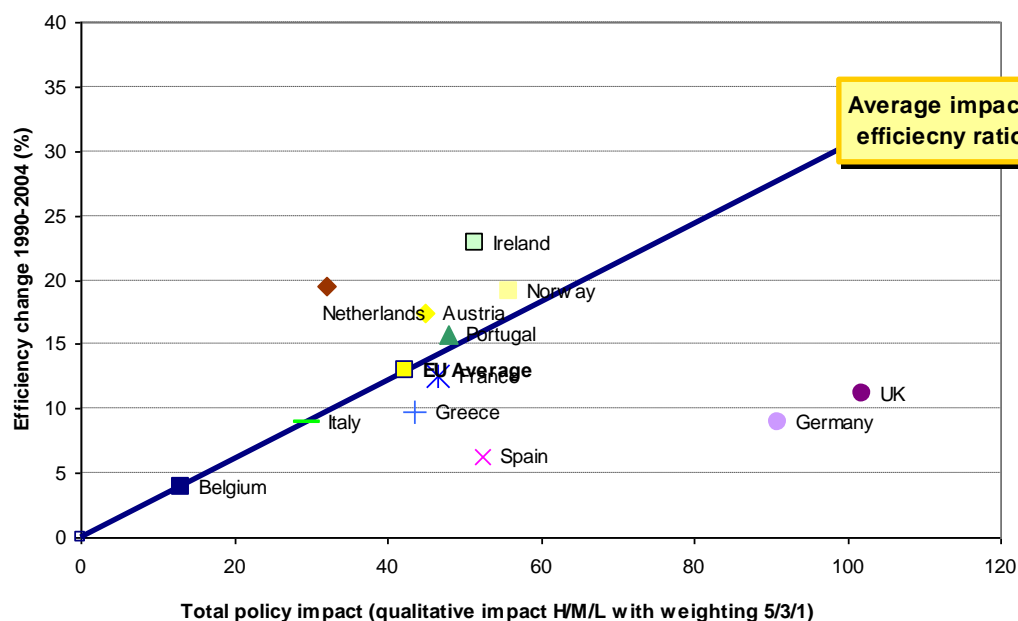
Relationship between policy impact and realized energy savings per EU-country

The realized energy savings per country for the period 1990-2004 are traded against the total impact per country (**Figure 9-9**). Due to lacking impact figures for Denmark, Finland and Sweden these countries have been left out from the analysis.

Overall a relationship between policy effort (impact) and realized energy savings emerges from the figure. However, Germany and the UK show modest energy savings despite their large policy effort. For Germany the large impact is mainly due to the large number of measures; for the UK both the number of measures and the average impact are on the high side. Ireland and the Netherlands on the other hand show high savings with half the policy

effort of UK or Germany. Belgium has both low savings and few impact, but the ratio is according to the EU-average.

Figure 9-9: Efficiency increase 1990-2004 and estimated policy measure impact for EU-countries



However, conclusions should be drawn with caution, because:

- the efficiency indicator shows not only the effect of policy measures, represented by the impact, but also the autonomous savings, due to technological development and energy prices. Especially at the end of the period rising prices can have contributed to increased energy efficiency, thereby distorting the relationship with total impact.
- the calculated ODEX-indicator may contain non-saving effects, e.g. changing occupation rates of dwellings due to higher or lower employment levels;
- the registered impact of policy measures does not always fit with their actual effect in the period 1990-2004. Some measures, active in the eighties, have contributed to total savings after 1990, but their impact has not been registered. For measures, active after 2000, the impact has been registered but the full saving effect comes after 2004.
- the qualitative impact ratings high, medium and low have often been estimated without backing by quantitative analysis;
- policy measures without a rating have been rated as “low”, possibly leading to an underestimation of the total impact for some countries. Mandatory CO₂ standards for cars are currently being debated since voluntary agreements will not be able to deliver the desired results by 2008 even though some progress has been made in the right direction.

Another uncertainty is created by the choice of the impact factors attached to the impact ratings high, medium and low. However, from further analysis with different weighting factors the same overall picture emerges.

9.3. Innovative energy efficiency measures

Criteria used

For households the criteria used for selecting innovative policy measures are:

- Successful ways to stimulate energy efficiency
- Contribution to energy-poverty alleviation
- Structurally influencing energy consumption itself
- A healthier indoor climate
- Limiting acidification
- Increasing security of supply
- Link with R&D-policy.

Innovative measures do not necessarily have the highest impact, nor does not necessarily imply that the measure is completely novel.

List of innovative measures

The following policy measures have been selected from the MURE-database, based on the specified criteria (Table 9-3).

Table 9-3: Innovative policy measures for households

Country	MURE code	Energy use type	Description
Austria	AU14	Heating	Chimney sweepers as energy advisors
Denmark	DK2	Heating	Grants for savings pensioner's dwellings
Denmark	DK4	Collective	Heat consulting (maintenance, control)
Denmark	DK9	Heating	Agreement on efficient windows
Finland	FIN4	Heating	Orders for indoor climate and ventilation
Finland	FIN8	Heating	Promotion of wood pellet heating
France	FRA1	All use	White certificate scheme
Germany	GER28	All use	Ecological tax reform
Italy	ITA6	All use	White certificate scheme
Netherlands	NLD1	All use	Regulatory energy tax (REB)
Netherlands	NLD5	All use	Environmental action plan (MAP)
Norway	NOR11	All end use	Mandatory activities information centres
Norway	NOR17	All end use	Energy act on informative billing
Sweden	SWE1	Heating	Grants for substitution of electricity
Sweden	SWE4	Heating	CO2 and energy taxation
UK	UK5	Heating	Fuel poverty schemes
UK	UK17	All end use	Energy efficiency commitment (EEC)
EU	EU28	Heating	Energy Performance of Buildings directive

The Austrian policy measure “**Chimney sweepers as climate ambassadors**” creates a new and cost effective way to address energy users at regular time intervals about their energy use, their saving options and their energy use in general.

Most policy measures focus on installing new, more efficient, energy systems. The Danish policy measure “**Heat Consulting**” assures that these new systems remain efficient during their lifetime. The “Agreement with manufacturers on efficient windows” is one of the few policy measures that assures a continuous availability of ever more efficient systems, thus preventing exhaustion of the saving potential. The specific support for pensioners combines energy and social goals, such as comfortable living conditions with affordable fuel use.

The Finnish “**Orders for indoor climate and ventilation in new buildings**” addresses both the increasing interest in a healthy indoor climate and the need to save energy. The approach prevents a possible conflict between both goals and creates new ways to put saving options in place. The “Promotion of wood pellet heating” increases security of supply. The special thing is that it reverses an earlier trend from wood to fuel oil or electricity, but in a way that suits modern lifestyles.

The “**White Certificate scheme**” of both France and Italy oblige energy distribution companies to realize energy savings at their customer’s place. Certificates are given for proven energy savings. The distributors either realize the savings themselves or they buy certificates from so-called ESCO’s (Energy Service Companies). It is expected that this scheme will lead to a structural commitment of parties to the subject of energy savings. Moreover, the commercial approach will lead to a more effective way of realizing energy efficiency in households.

The German “**Ecological tax reform**”, the Swedish “**CO₂ and energy tax**” and especially the Dutch “**Regulatory energy tax (REB)**” represent a greening of the tax system. The tax burden is shifted from labor to energy. Contrary to most other policy measures the tax also influences the proper use of energy system in place. It even changes the socio-economic structure in a more energy saving direction. Energy taxes in other countries that are due to minimum levels set by the EU are not rated as innovative as the level is too low to reach substantial savings and the energy tax is not meant to replace other taxes.

The “**Environmental action plan (MAP)**” of the energy distribution sector in the Netherlands can be seen as a front runner of the proposals in the recent EU-directive on offering energy services. As with present white certificate schemes, it combined different means to overcome the hurdles for energy efficiency. However, this voluntary plan did not survive liberalization of the energy sector.

The “**Energy act on informative billing**” in Norway forces suppliers to inform their customers at regular intervals on their energy use in a clear manner. From earlier studies it is known that this approach is far more effective than a yearly, hardly comprehensible, bill. The “mandatory information activities of regional centres” have evolved into a “market” based system, which resembles the ESCO approach (see White Certificate scheme).

The Swedish “**Grants for reduced use of electricity for heating**” combines (primary) energy savings with substituting electricity by gas or wood. This substitution in order to enable the closure of nuclear plants does not contribute to increased security of supply because it replaces electricity from nuclear of hydropower. However, in countries with much coal-based electricity this policy measure can decrease acidification. In countries with much electricity production on natural gas the use of wood or biomass can increase security of supply.

The UK “**Fuel poverty scheme**” has a special focus on low-income households. Next to energy savings the lack of comfort due to too high energy bills is addressed too. The focus increases the effectiveness of support, as higher income households can invest into savings without support. The UK “Energy efficiency commitment” provides a successful example of offering energy services to clients of energy distribution companies.

The recent **Energy Performance of Buildings directive** (EPBD) is chosen as the innovative measure for the EU because of the obligatory certificates that provide information on saving possibilities in dwellings at the right time and place. The obligatory certificate informs the new owner at the moment when he/she already wants to upgrade the new dwelling. The EPBD provides information on actual energy use as well. A new tenant or buyer can use this information when deciding to rent or purchase the dwelling, thereby indirectly pressing the landlord or seller to take energy saving actions.

Overall contributions

From the motivation for the selected policy measures it can be concluded that most measures enhance **effectiveness**. As to energy-poverty these are the **fuel poverty** scheme in the UK and a comparable scheme for pensioners in Denmark. As to **security of supply** the Finnish policy measure to promote wood pellet heating (instead of oil) is an example. For **acidification** there are no clear examples of policy measures that have a substantial effect on this kind of emissions as well. Regarding the additional goal **influencing energy use** there are various ecotax measures that support this goal. Regarding **health** the Finnish measure on indoor climate can be mentioned and for integration with **R&D policy** the agreement on efficient windows is an example measure.

Finally it must be remarked that all innovative and regular policy measures contribute more or less to reduction of CO₂-emissions, enhancing security of supply and preventing acidification.

9.4. Conclusions

The following conclusions can be drawn from the analysis:

- The highest number of policy measures for EU-countries is four to five times the lowest number observed, for which no obvious explanation can be found.
- The total number of policy measures in EU-countries has increased seven to eight fold since 1990 as a result of new measures that surpassed removed measures by far.
- Policy measures on subsidies, tax-deductions and information have a short lifetime; standards, taxes and labels have a much longer lifetime
- Some shifts in measure types have occurred, among which more financial stimulation. The share of standards has decreased.
- EU-countries make sometimes extreme choices as to measure types; the highest fraction for each of the seven main types runs from 25 to 80%. These maximum fractions are found in

seven different countries. The lowest fraction is often 0% as measure types are often missing in one or more countries.

- The coverage by policy measures of targeted energy uses (new dwellings, shell of existing dwellings, boilers and appliances) is generally good. For each targeted use the number of related policy measures increases substantially in the period from 1990.
- Relatively few policy measure focus on daily energy use; most measures aim at the investments in efficient systems or appliances.
- The compliance of national policy measures with EU-directives, such EPBD, boiler standards and Labels, is generally good, taking into account the lag in transposing EU-policy into national measures.
- The impact of saving policy in EU-countries increased substantially. However, this was almost entirely due to extra policy measures and not to a higher impact per new policy measure.
- Standards and financial support have the highest impact; policy measures on information/education have on average the lowest impact.
- Combination of the Odyssee-results on realized energy efficiency and the MURE-results on total impact of policy measures show a “soft” relationship between both. Countries with a rather large number of policy measures and impact show relatively lower realized energy savings. Probably large sets of policy measures are less optimal.
- The results should be used cautiously as the analysis is hampered by absence of qualitative ex-post policy evaluation studies (except for the Netherlands and Germany). Governments have taken an increasing number of measures in the transport sector over the past 15 years, which may partially explain the fact that transport energy consumption has remained steady or even decreased in several EU-15 Member States in recent years. It should not be overlooked, however, that the recent increase in transport fuel prices has certainly also had an important impact.
- A number of innovative policy measures have been selected, based on criteria such as effectiveness, energy-poverty alleviation, influencing energy consumption itself, healthier indoor climate, limiting acidification, increasing security of supply and link with R&D-policy.
- Innovative measures are found in the majority of EU-countries.
- Some measures are innovative due to addressing specific criteria or specific energy users. Other measures, such as white certificates are rated innovative because of their broad scope and integrated approach in realising implementation of saving measures.