



European Energy Network

ENERGY EFFICIENCY IN EUROPE



Overview of policies
and good practices



FOREWORD

The World Energy Council confirmed in 2013 that the European Union is the world champion of energy efficiency, even if some Member States are among the world's largest consumers. European Commission analyses are similar and show that European energy performance has improved by 12% between 2000 and 2010. Thus, without these energy savings, the European Union's final consumption would today be 130 million tons of oil equivalents higher.

However, this positive finding should not obscure the overall slow performance of recent years. This decrease is largely due to the impact of the economic crisis, which also impacts investments that are essential to the implementation of major energy policies. As a consequence, achieving the 20% target of energy savings to be reached by 2020 is a challenge.

In this difficult context, Europe provides a roadmap for moving to a low-carbon economy in 2050 which targets to reduce greenhouse gas emissions by 80% to 95% compared to 1990 levels. Moreover, the ongoing international negotiation on climate change aims to find an agreement by 2015 to limit the rising global temperature, which could increase by 5°C in 2100 if current trends continue.

Therefore, strengthening energy efficiency efforts must, more than ever, be revived and remain a priority of energy policies implemented by Member States. The new Energy Efficiency Directive (October 2012), the Ecodesign and Labelling Directives updates in 2013 and 2014, or the development of the "2030 framework for climate and energy policies" are examples of important steps in this direction.

Whatever the actions taken in the short or medium term, it is clear that the pooling of good practices is necessary for a wider dissemination of policies that have proven to be efficient or promising.

EⁿR publishes this document with the aim of effectively sharing this knowledge and making it available to the largest number of people possible. It is organised by major consuming sectors, and presents the energy efficiency measures implemented in Europe, with significant examples highlighted in each area. This document results from the unique contribution of a European network made up of 24 national energy management agencies, benefiting from 20 years of experience and to which ADEME is particularly pleased to be its president at this time. It is based largely on information available in the MURE database coordinated by ADEME, which collects energy efficiency measures from 29 countries.

Finally, beyond the exchanges between European countries, this policy overview also addresses the strengthening cooperation of the EU with its neighbours, who are increasingly involved in the international effort of energy conservation.

On behalf of EⁿR, ADEME intends to regularly distribute and update this kind of study, so that everyone can benefit from the achievements of its partners and be as well prepared as possible to meet the 21st century's energy challenges

Virginie Schwarz
EⁿR President
ADEME Deputy Director General



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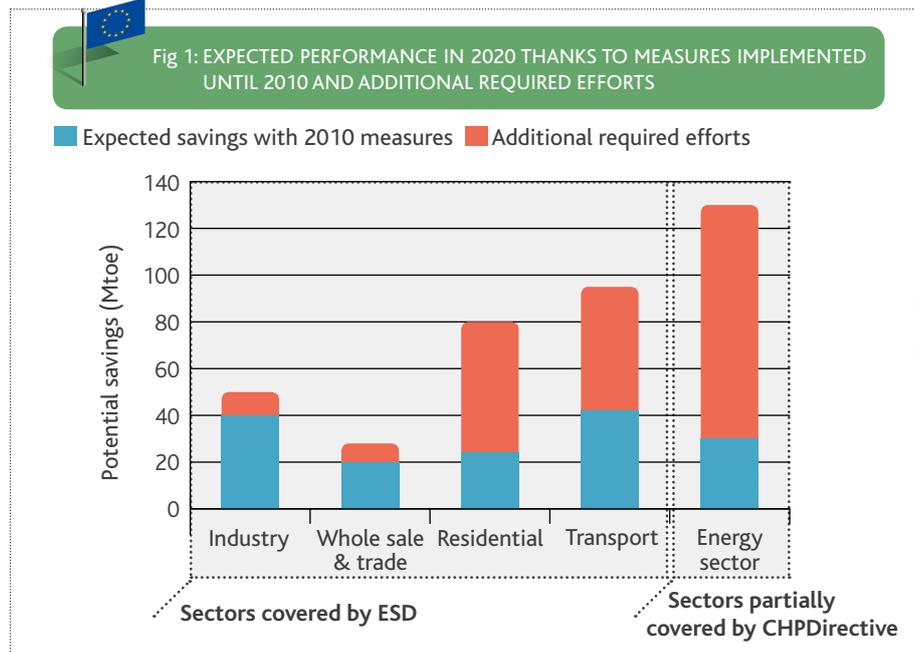
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..... INTRODUCTION



Various analyses published by the European Commission (EC) show that the 20% target of energy savings, as compared to projections estimated in the 2005 EC Green Book, will not be reached by 2020 in the current state of policy sets. As a result, the economic, environmental and social benefits may not be achieved either. In the same way, the advantages linked to an improved security of supply and to a least energy dependence may not be reached. **Figure 1** illustrates the remaining efforts to be done in each sector to achieve this 2020 target. According to analyses carried out to explain this delay, the implementation of regulation and energy efficiency measures have not been ambitious enough.



In this context and aware of the efforts that need to be made, the EC has launched several initiatives, including the new Directive on Energy Efficiency (DEE), adopted in October 2012. Member States (MS) have also implemented various measures, especially in the frame of their National Energy Efficiency Action Plans (NEEAP) enforced by the previous directive on "Energy end-use efficiency and energy services" (ESD, 2006).

The objective of this brochure is to present an overview of European actions undertaken in the field of energy efficiency. The introduction presents the main EC policies implemented and the past energy efficiency trends. Then, the document details an outline of the most illustrative measures implemented by end-use sector. Findings are described in 11 thematic chapters, each divided into three sections. For each chapter, the first section presents the past trends of final energy consumption and energy efficiency, and describes the context and challenges of the sector. This analysis is complemented by a review of the main types of existing measures to highlight the actions

the most implemented in Europe. Then, in the following two sections, two types of measures, selected among the most common and/or innovative ones, are described.

An additional chapter proposes an overview of energy management policies implemented by EU neighbors – Eastern (Russia, Ukraine...) and Southern Countries (Mediterranean) - particularly in the frame of the EC and MS cooperation actions.

This review of energy efficiency measures does not include all actions taken. In order to illustrate each chapter, specific thoughts are made on around thirty particularly interesting measures that have been chosen according to various criteria, such as their impact, the consistency of their implementation or their evaluation (see summary table at the end of the document). The analysis of measures relies mainly on the MURE database (see box below) and NEEAP. Trends in energy efficiency are illustrated thanks to indicators presented in the ODYSSEE database (see box below).

ODYSSEE - MURE: EVALUATION OF ENERGY EFFICIENCY POLICIES IN EUROPE

The European ODYSSEE – MURE project, coordinated by ADEME and supported by the IEE (Intelligent Energy for Europe) Programme, sets up a reference tool for the development and the evaluation of energy efficiency policies implemented in EU (European Union) MS and in Norway.

► <http://www.odyssee-mure.eu>

ODYSSEE: database on energy efficiency indicators and CO₂ emissions by end-use sectors. ODYSSEE encompasses various types of indicators, which can be classified into the following categories:

- Economic indicators linking energy consumption to macro-economic variables (energy intensity indicators);
- Technico-economic indicators unit consumption/emissions linking energy consumption/CO₂ emissions to physical indicators (for instance: litres/100 km of cars, toe/t of steel industry, kWh/refrigerator);
- Indicators of diffusion to monitor the market penetration of energy efficient technologies (condensing boilers, A+ class refrigerators, share of passenger transport by public modes);
- Benchmark/target indicators by sector to show the potential improvement

based on countries with the best performance in EU;

• Adjusted indicators to allow the comparison of indicators across countries.

MURE: database on rational use energy measures.

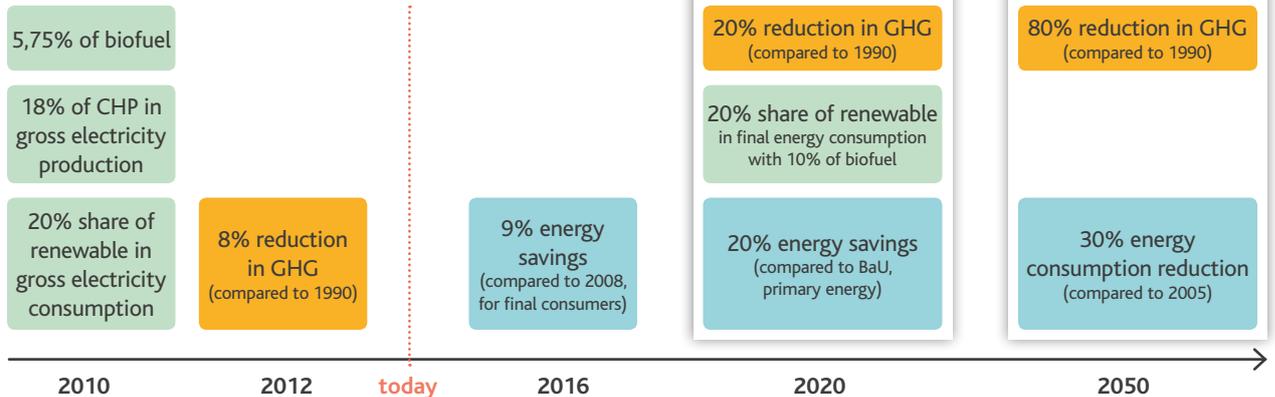
MURE database inventories all measures related to the rational use of energy implemented at the national EU level (and Norway).

The measures can be queried according to various criteria (types of measures, stakeholders, target of the measure, and type of impact).

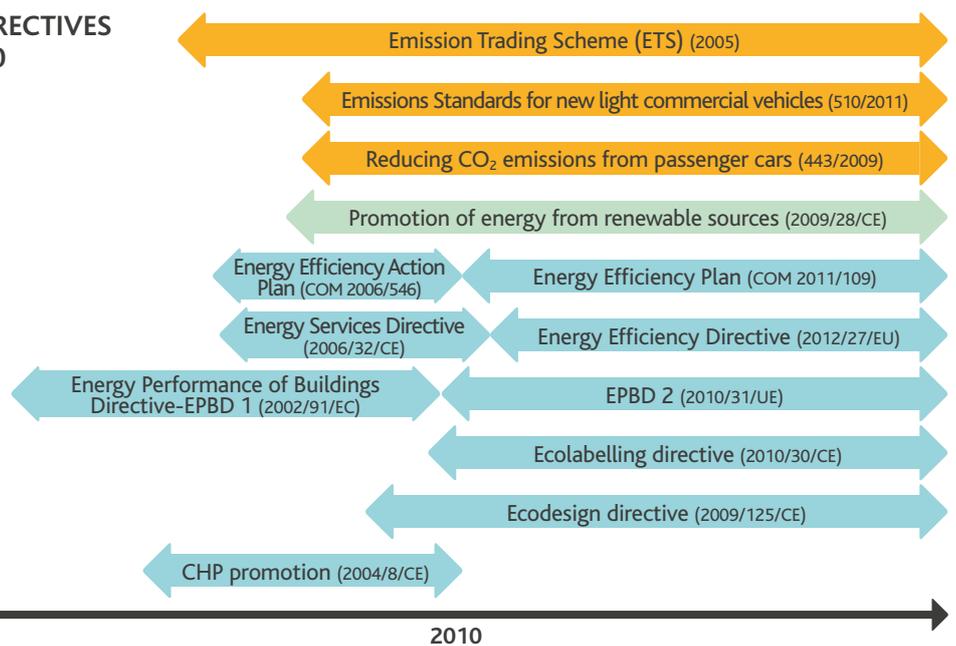
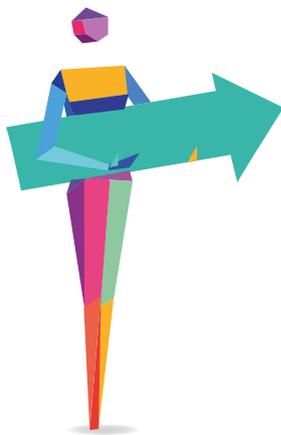
MURE also gives, whenever possible, ex-post evaluations of the existing actions. It lists about 1,000 measures currently implemented in Europe. This is the only tool that provides such a comprehensive overview of national energy efficiency and European policies.

European energy efficiency policies and targets

THE MAIN OBJECTIVES OF THE EU IN TERMS OF ENERGY EFFICIENCY, RENEWABLE ENERGY AND GREENHOUSE GAS EMISSIONS REDUCTION (GHG)...



...AND THE MAIN EU DIRECTIVES IMPLEMENTED SINCE 2000



SINCE THE 90'S, THE EU HAS BEEN CONCERNED ABOUT REDUCING ENERGY CONSUMPTION

Energy is at the heart of EU concerns. The first energy efficiency texts emerged in 1992, with the adoption of a series of sectoral measures. The Directive, implemented September 22, 1992, established the creation of energy consumption labels for some appliances, therefore energy labels started to be implemented (A label concerning to the more sober appliances and G for the least ones).

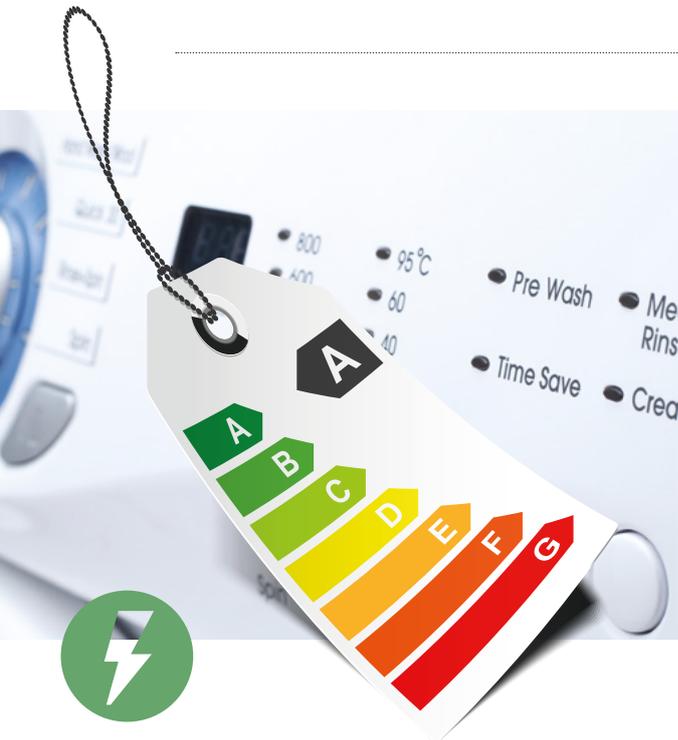
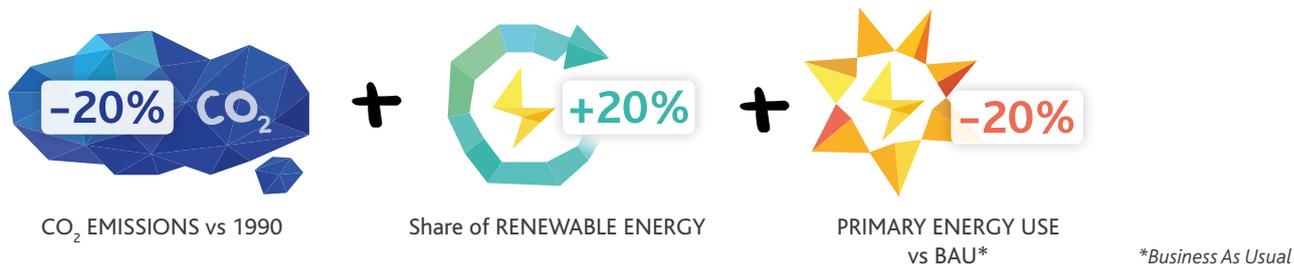
THREE DIRECTIVES HAVE BEEN SUCCESSIVELY ADOPTED IN THE 2000'S

Three directives on the **energy performance of buildings** (see [Chapter 1](#)), the Energy Performance of Buildings Directive-EPBD), **energy efficiency of end-uses and energy services** (ESD Energy Service Directive) and **eco-design** (see [Chapter 3](#)) were successively adopted between 2002 and 2008. The ESD enforced members to prepare every 3 years a NEEAP (see below), and the last NEEAP was published in June 2011. The analysis of national information available in the NEEAP shows it is quite obvious that initial targets will be difficult to achieve.



///THE EU CLIMATE AND ENERGY PACKAGE AND THE 3 *20 TARGET

The EU climate and energy package and the 3*20 target have strengthened and globalised the EC vision on energy efficiency, with a **target of 20% primary energy savings by 2020**, compared to projected consumption estimated in the 2005 Green Paper. Hence energy efficiency becomes a key target, as well as the 20% reduction of GHG emissions and the objective of 20% renewables in the energy mix in 2020.



///THE LAST ENERGY EFFICIENCY DIRECTIVE (EED)

The new EED submitted on October 25, 2012 provides a legal framework to the last "climate and energy package" target. Indeed, until now, only two targets, i.e. both targets on GHG and renewable energy in the energy mix, had a regulatory implementation. This new directive substitutes both ESD and the February 11, 2004 (2004/8/EC) Directive on cogeneration. In this context, MS should in particular:

- Retrofit at least 3% per year of public buildings;
- Reach 1.5% per year of energy savings by 2020 (based on energy sales) thanks to the implementation of energy saving obligation to utilities, or must enforce equivalent measures;
- Enforce energy audits in big companies;
- Allow end-consumer to get information on their energy bill;
- Ensure the qualification, accreditation and certification systems existence;
- Encourage the creation of an energy service market and that small and medium enterprises (SMEs) have access to this market;
- Implement a long-term roadmap to make the entire buildings sector more energy efficient by 2050 (commercial, public and private households included).

///"ROAD MAP 2050": FRAMEWORK DOCUMENT TO SET THE EU MAIN OUTLINES TO GO TOWARDS LOW CARBON ECONOMY

To limit to 2°C global warming due to climate change, the EC confirmed in February 2011 the reduction target on GHG emissions of 80% to 95% by 2050 compared to 1990 levels. As a result, the EU could use 30% less energy by 2050 compared to 2005 consumption levels. In addition, EC establishes an intermediary frame for climate and energy for 2030.



► <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2011:0112:FIN:FR:HTML>

Members State programmes: National Energy Efficiency Action Plans

Policies' monitoring provided by the Directive requires each MS to prepare three NEEAPs presenting measures and the institutional and legal framework in place to ensure energy efficiency, and to respect the commitments.

The first plan, submitted by MS in 2007, set an interim target for the third year of implementation (2010) and defined the corresponding measures implemented. In 2009, the EC has carried out a detailed evaluation of the NEEAPs, showing large discrepancies in their qualities and reliabilities.



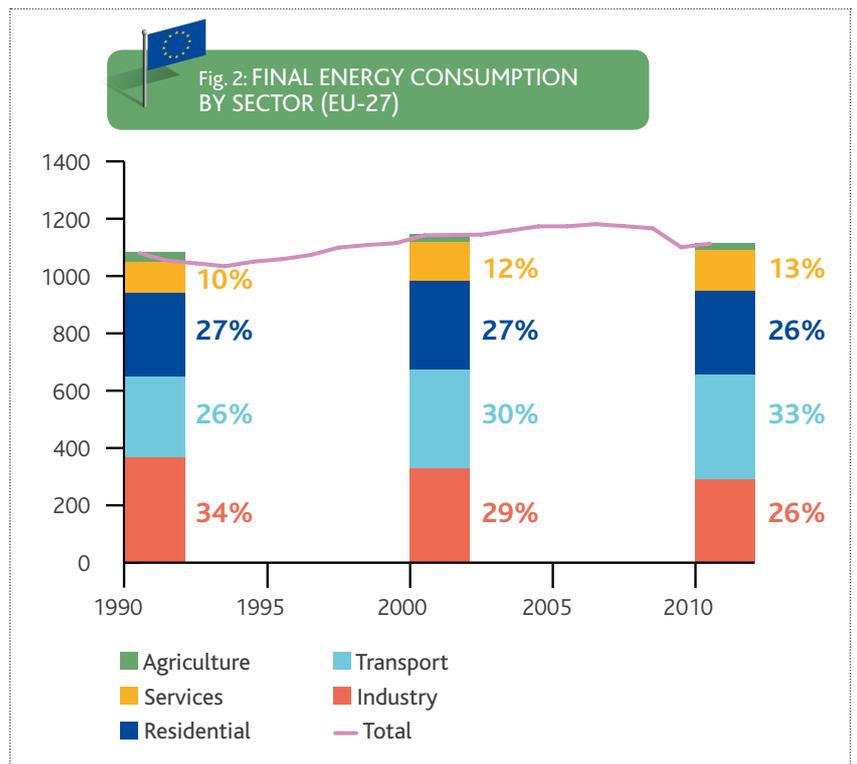
The second plans were submitted in 2011 by the MS. They presented a thorough evaluation of the first NEEAP, and at the same time listed the additional measures needed to achieve 9% energy savings in 2016 compared to the average consumption from 2001 to 2005.

On April 20, 2013, each MS has submitted to the EC their indicative targets by 2020, to be in line with the new EED. If they are considered insufficient to achieve the overall objective, MS should reassess them. Then each MS will present the next NEEAPs (2014, 2017 and 2020). The EC will assess progress by mid-2014.

Energy efficiency key figures

FINAL ENERGY CONSUMPTION

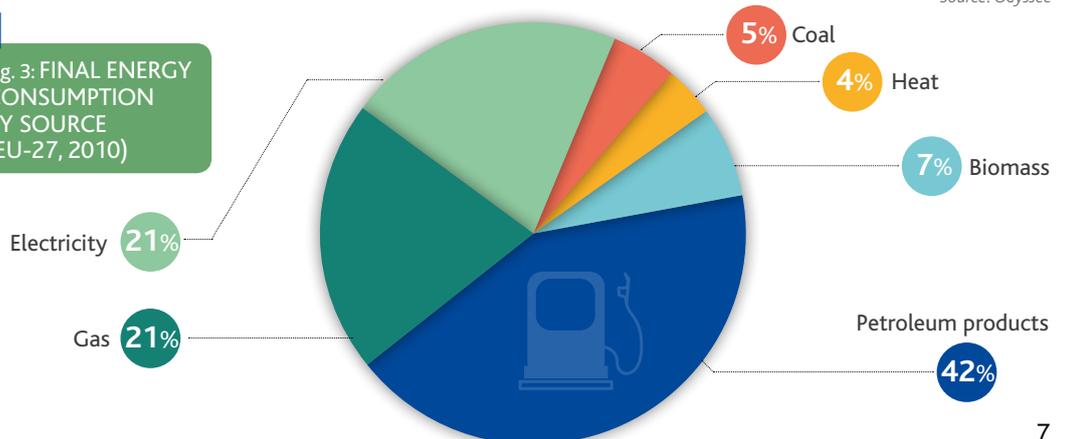
EU final energy consumption has reached 1,150 Mtoe. It has increased on average by 0.4% per year over the last 20 years (period 1990-2008). However, since 2008 there has been a significant impact of the global crisis (decrease of consumption by 2.2% per year). The three main final energy sectors are: the transport sector, that recorded a 7 points increase of its share (from 26% of final consumption in 1990 to 33% in 2010), industry with 34% in 2010, that in contrast saw its share decrease by 7 points, and the residential sector which has had a steady share of 26% of final consumption. The building sector, adding residential and tertiary sectors, accounted for 39% in 2010. Agriculture represents a marginal share (2%). Petroleum products are dominant in the final energy consumption (42%). They are followed by gas and electricity (21% each), biomass (7%), coal and heat (4% each). Taking into account all renewables consumed directly or indirectly, via electricity or heat, renewable share in final energy consumption accounted for 11% in 2011 (against 4.5% in 1990).



Source: Odyssee

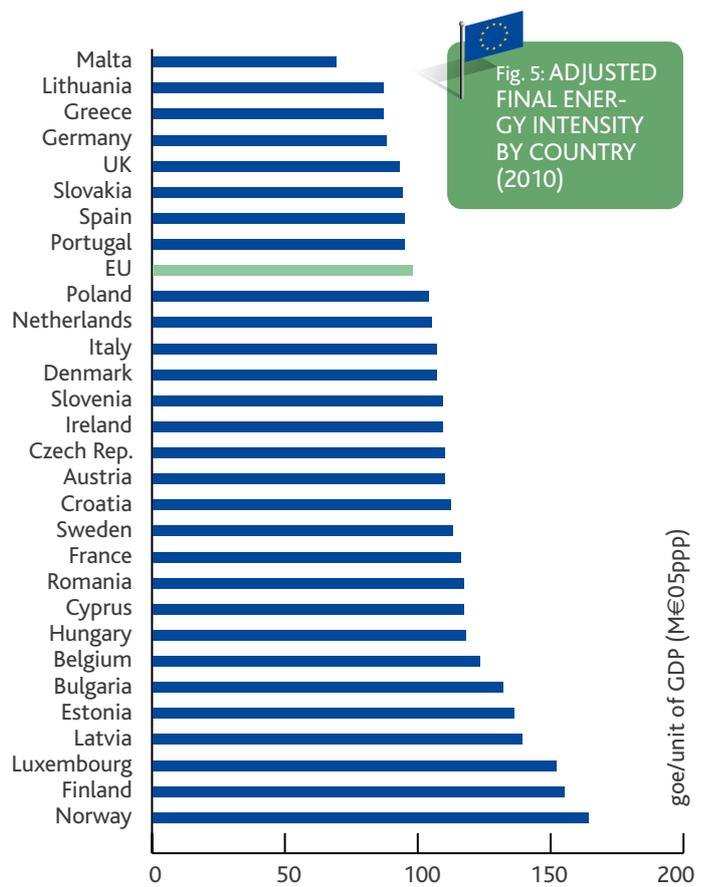
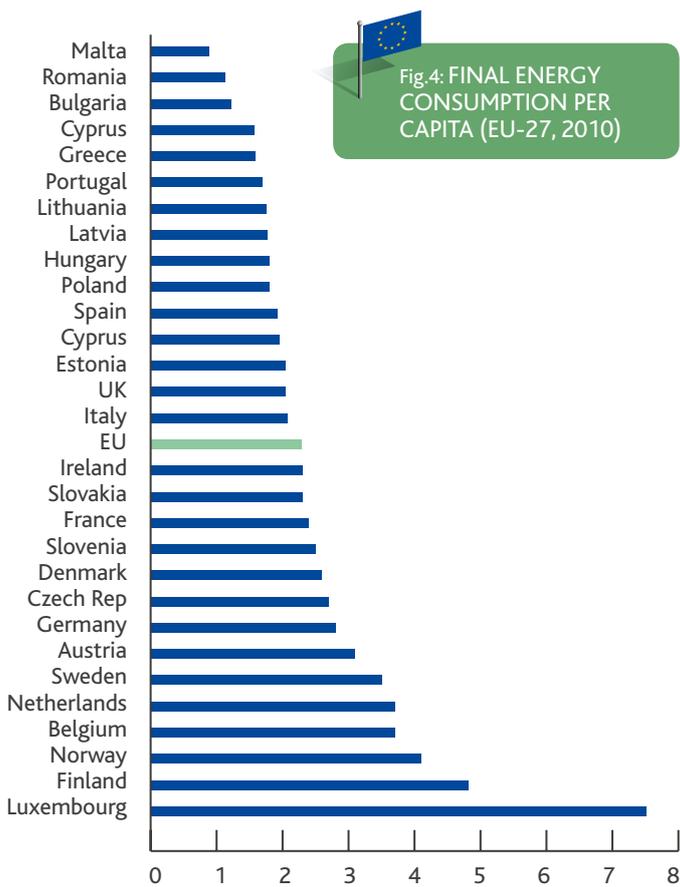


Fig. 3: FINAL ENERGY CONSUMPTION BY SOURCE (EU-27, 2010)



Final energy consumption per capita varies significantly among EU countries (by a multiplying factor of 4 without considering the extremes). Two countries are significantly above the European average corresponding to 2.3 toe per capita in 2010. The first country, Finland, combines a cold climate and an energy-intensive industrial structure (paper industries). The second, Luxembourg, hosts a significant number of non-resident workers that increase its population by a quarter during working days. Besides there is also a "fuel tourism" effect affecting country's consumption due to lower fuel taxes compared to neighbouring countries.

The indicator of adjusted final energy intensity is more relevant for comparison than the usual final intensity as it shows the amount of final energy per unit of GDP adjusted at purchasing power parity (ppp). This indicator can also be adjusted to the same climate and to the same economic and industrial structures. Again, there are discrepancies in adjusted intensity from one country to another, ranging from single to double digits. There is still great potential for energy savings in some countries, such as Latvia, Estonia, Bulgaria, but unfortunately these countries represent only a small part of the EU final consumption.



Source: Odyssee; Final energy intensity adjusted to the same industry & economic structure & climate (ppp, 2005)

ENERGY EFFICIENCY GAINS

Between 1990 and 2010 energy efficiency improved by 25% at EU level, or 0.8% per year on average (see Box on ODEX). In 2010, resulting energy savings corresponded to 277 Mtoe, of which 42% came from industry, 36% from the residential sector and 22% from transport. There is a slowdown of energy efficiency gains since 2008 because of the economic crisis. The best performances occurred during years 2000 thanks to new MS.

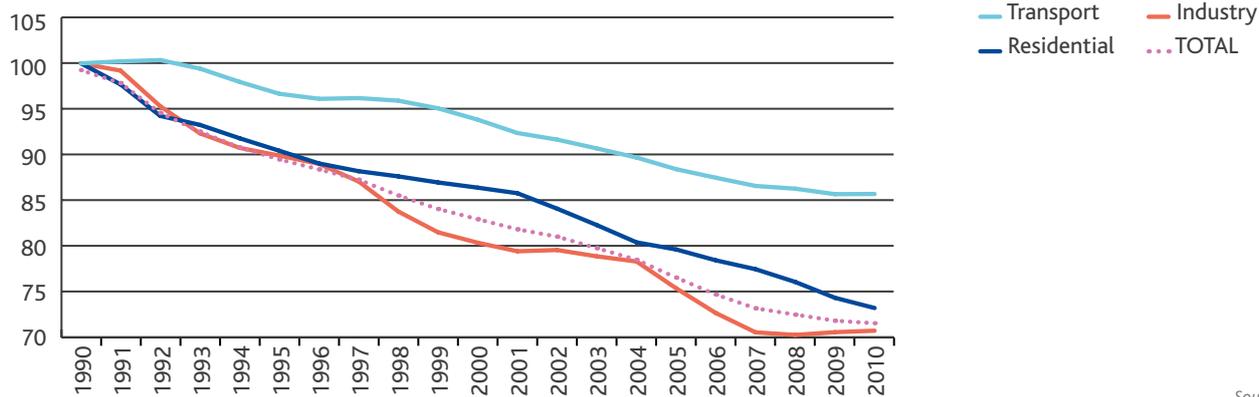
ODEX

The ODEX indicator or energy efficiency index is calculated for each end-use sector (industry, transport and residential) and for the whole economy (all end-use sectors).

For each sector, the index is calculated as a weighted average of sub-sectoral indices of energy efficiency progress; sub-sectors being industrial or service sector branches or end-uses for households or transport modes. The sub-sectoral indices are calculated from variations of unit energy consumption indicators, measured in physical units (for instance tons of steel, tonne-km for transport of goods, m² for offices, etc.). They provide the best "proxy" of energy efficiency progress, from a policy evaluation viewpoint. All these sub-sectoral indices are then aggregated and weighted by their respective share in the final energy consumption of the sector to a single energy efficiency index or ODEX that measures energy efficiency progress.

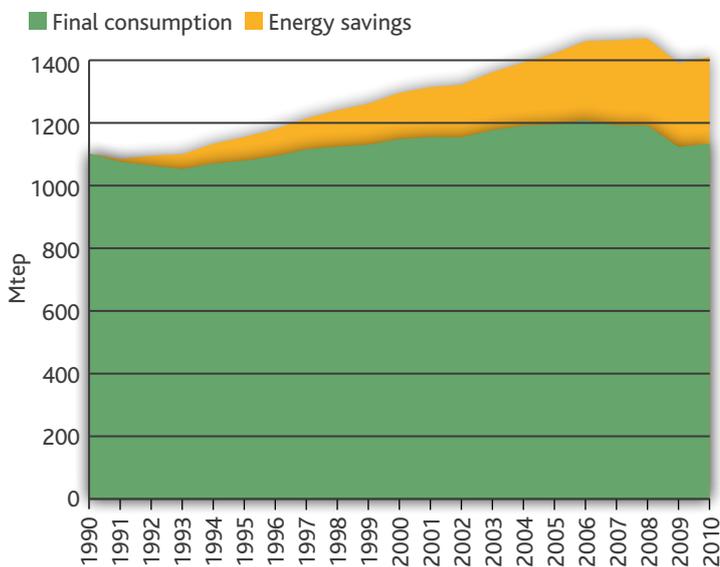


 Fig. 6: ODYSSEE ENERGY EFFICIENCY INDICATOR (EU-27, 2010)



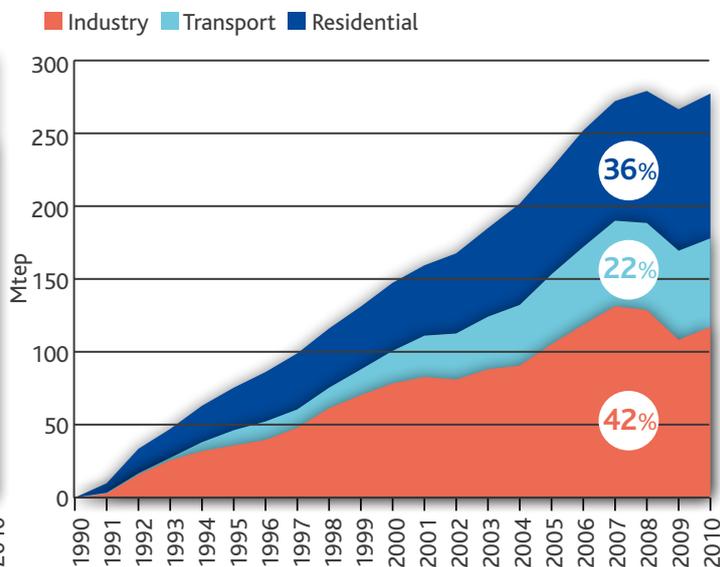
Source: Odyssee

 Fig. 7: FINAL ENERGY SAVINGS (EU-27)



Source: Odyssee

 Fig. 8: BREAKDOWN BY ENERGY SECTOR (EU-27)



Source: Odyssee

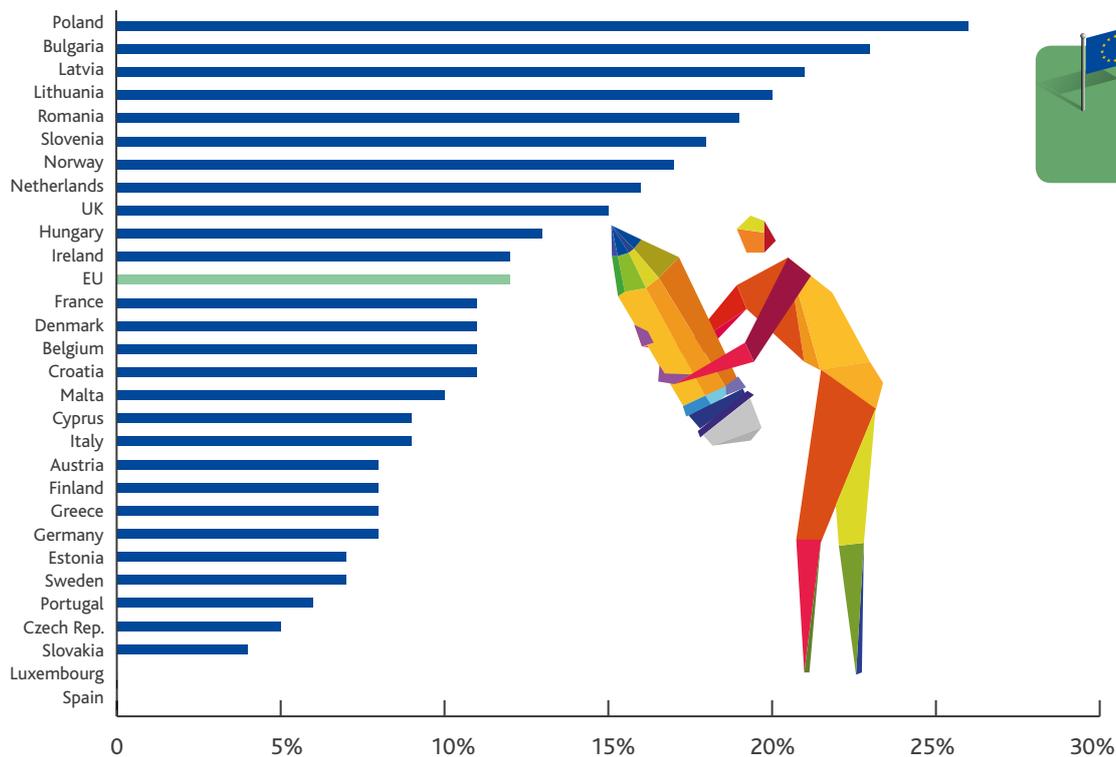


 Fig. 9: ENERGY EFFICIENCY GAINS BETWEEN 2000 AND 2010

Source: Odyssee



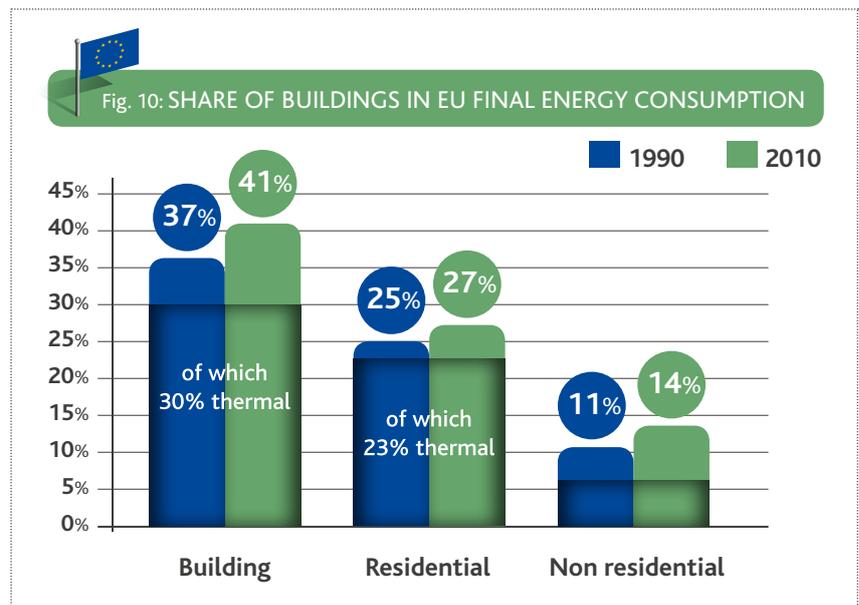
NEW BUILDINGS: TOWARDS NEARLY ZERO ENERGY BUILDINGS

Towards common European policies and targets on construction

/// BUILDINGS: FIRST ENERGY CONSUMER IN EUROPE

Buildings represent the largest energy use in Europe, with 41% of total final energy consumption in 2010, of which 27% for residential buildings. Thermal energy uses (space heating, water heating and cooking) correspond to 85% of total residential consumption in 2010, or 23% of total final energy consumption in Europe.

Unit consumption per dwelling for thermal uses has been decreasing since 1990 by 1.3% per year (-1.4% per year for space heating only). However several reports, such as the National Energy Efficiency Action Plans (2011) or the Impact Analysis of the EED (October 2012), point out that there is still a large energy saving potential in the building sector, mainly thanks to the rehabilitations of existing buildings (~70% of the building stock has been built before 1980; see next chapter).

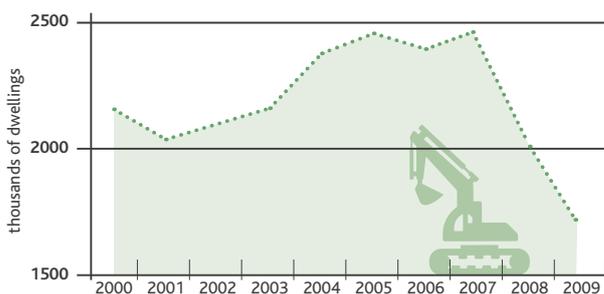


Source: Odysee, at normal climate

/// DYNAMICS OF CONSTRUCTION

The penetration of new efficient residential buildings is an important issue, and represents the benchmark to be followed for the existing stock. Recent dwellings, built after 2000, represent on average 9% of the total European stock: this means that on average, only 1.1% of the dwelling stock is new each year. The construction activity is very sensitive to the economic situation and has been deeply affected by the ongoing economic crisis: annual construction decreased by 30% between 2007 and 2009.

Fig. 11: DYNAMICS OF DWELLING CONSTRUCTIONS SINCE 2000 (EU)

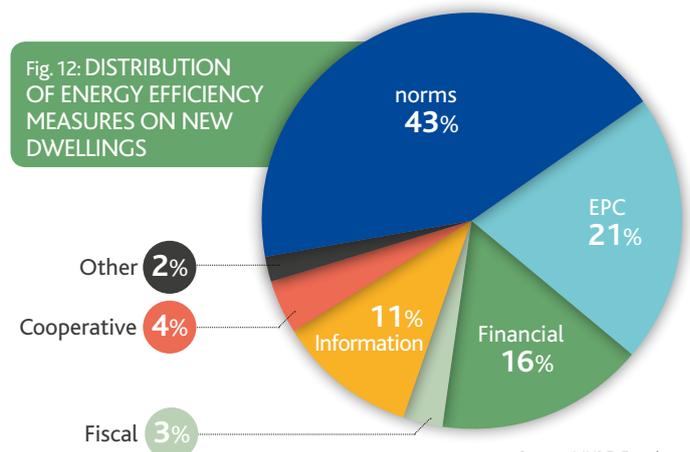


Source: Entranze, Enerdata calculation

/// REGULATIONS ARE THE DOMINANT MEASURES FOR NEW RESIDENTIAL BUILDINGS

Around 2/3 of European measures targeting new residential buildings are regulations and most of them relate to the EPBD Directive (see box on next page). More precisely, 43% are minimum efficiency standards and 21% are mandatory information requirements as required by Energy Performance Certificates (EPC, see [chapter 2](#)). Financial and fiscal measures represent only 19% of the energy efficiency measures for new dwellings.

Fig. 12: DISTRIBUTION OF ENERGY EFFICIENCY MEASURES ON NEW DWELLINGS



Source: MURE, Enerdata

More and more stringent measures on new buildings

The EPBD Directive n° 2002/91/CE (recast in 2010 n°2010/31/EU) aims at improving the energy efficiency performance of both new and existing buildings. Resulting savings are estimated to be equivalent to 60-70 Mtoe/year in 2020.

EPBD 1 (2002): (i) Implementation of an harmonised calculation methodology to push-up MS minimum energy performance requirements towards a cost-optimal level; (ii) Norms and minimum standards with mandatory strengthening every 5 years for both existing and new buildings; (iii) New thermal regulation for major renovation (in buildings >1000 m²) (iv) Mandatory EPC in case of sale or renting of a building/dwelling ; (v) Mandatory inspection of boilers and air conditioning systems.

EPBD 2 (2010) or "recast EPBD": (i) All new buildings shall be nZEB ("Nearly Zero Energy Buildings" by 2020, 2018 for public buildings) ; (ii) Nation plans to promote nZEB dissemination ; (iii) Minimum standard performance of new building calculated according to cost optimality basis; (iv) Removal of the 1000 m² thresholds for minimum standard in case of major renovation ; (v) Control and compliance of EPC; (vi) Mandatory annual report during boiler and air conditioning system inspections.



/// MINIMUM PERFORMANCE STANDARDS ARE SET AT DIFFERENT LEVEL ACROSS EU COUNTRIES

Minimum energy efficiency standards on new building's energy consumption have a positive impact on the average energy performance of the total stock. Indeed they enforce a maximum specific energy consumption, for space heating and often other uses, for new buildings. However, the magnitude of this impact depends on the rhythm of building code's updates, their severity, and on the annual volume of construction. For instance, the Netherlands has the highest number of building codes' updates (in total 8 updates over the last thirty years). As a consequence, the specific energy consumption of new dwellings has been significantly improved by 70% between 1983 and 2008 building codes (of which 27% of improvement between 1983 and 1985, and 20% between 1998 and 2000). Denmark implemented a total of 4 updates between 1985 and 2010, and each new building code enforced, on average, an additional 20% reduction in the specific energy consumption. Therefore, in Denmark, there has been a significant decrease of this specific energy consumption between 1985 and 2010 (by 55%): in other words, according to the standards, a dwelling built in 2010 consumed on average 55% less energy than a dwelling built in 1985.

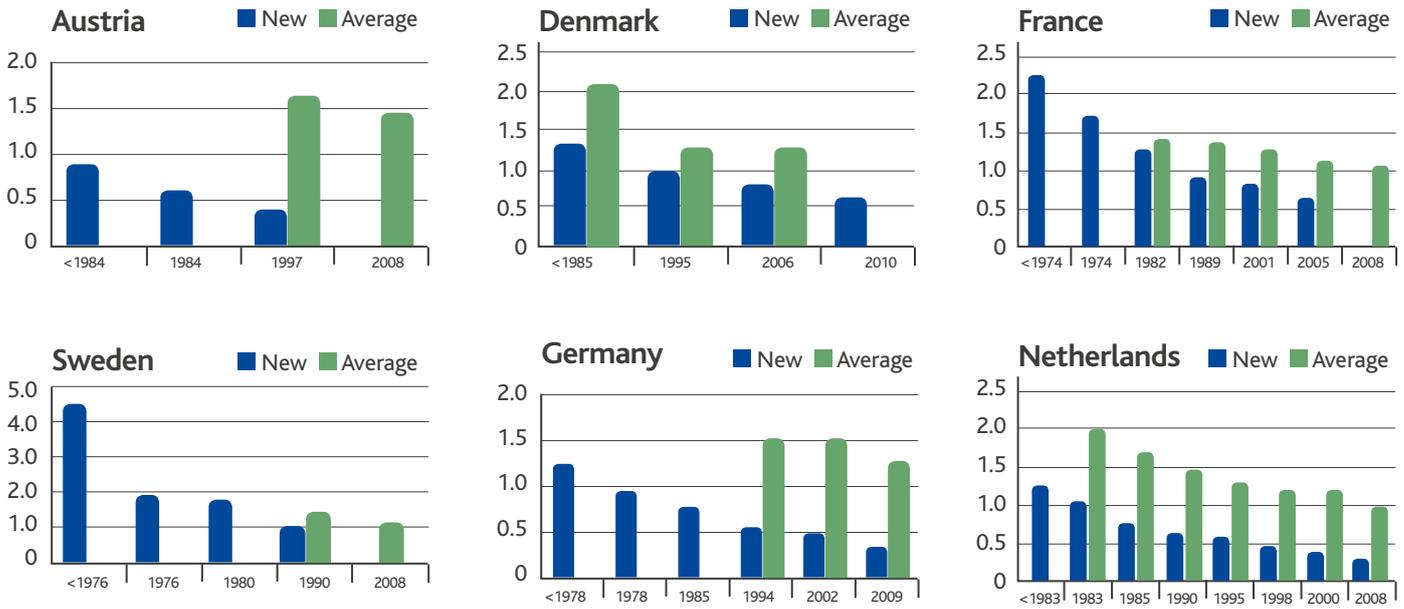
EPBD 2 (2010) enforces that all new buildings occupied and owned by public authorities shall be nearly zero-energy buildings by 2018 (nZEB), and by 2020 for all buildings. To reach this target, Member States shall furthermore draw up national plans. According to the report published by Buildings Performance Institute Europe (BPIE) ("Principles for nZEB", 2012), some EU Member States, such as Denmark, the UK, France, Germany and Belgium (Brussels Region), have already established general strategies or aims on nZEB definitions. In the EPBD Concerted Action, several national approaches for nZEB implementation have been presented, which differ a lot from country to country.



NZEB POLICY IN DENMARK

Denmark is one of the first EU countries that has already set-up its national nZEB definition and roadmap to 2020. The minimum energy performance requirements of buildings regulations will gradually become stricter, starting from the present standard (2010), with an interim milestone in 2015 and a final target in 2020 (20 kWh/m²/year for residential and 25 kWh/m²/year for non-residential buildings). The improvement of the energy performance is essentially done by increasing the requirements for buildings insulation. In addition, the energy efficiency of electricity and district heating generation should be improved by 2020 and the renewable energy supply, from nearby and onsite, will have to grow.

Fig. 13: SPECIFIC CONSUMPTION OF NEW DWELLINGS AND STOCK AVERAGE (TOE/DWELLING)



Source: ODYSSEE, Enerdata



The Dutch Green Building Council (DGBC) was founded in 2008 in The Netherlands as a market initiative. It is one of the first countries to adopt proactive policies and to implement measures to promote low energy buildings. These initiatives started in the 80's, and have been significantly developed in the 90's. In 1987, the policy on "sustainable" building became more institutionalized. In 1995, the Dutch government published an action plan on "sustainable" construction. It described the overall objectives and measures on green buildings i.e. standards on energy use, water consumption, and air quality. Sustainable building policies included

different types of instruments and strategies, such as demonstration projects, mandatory policies, and alliances with industrial groups. The original five founding partners of DGBC have already been joined by almost 370 other participants representing almost all industry sectors.

► http://www.dgbc.nl/wat_is_dgbc/dgbc_english

MANDATORY INSTALLATION OF EFFICIENT EQUIPMENT IN NEW BUILDINGS

Cyprus is the world leader in terms of solar thermal installation per capita. In the frame of Cyprus Presidential Decree 446/2009 on minimum energy performance requirements for buildings, installation of solar sSystems is mandatory to satisfy domestic hot water requirements on every new residential building.

► http://www.ewea.org/fileadmin/files/members-area/information-services/stable-regulatory-framework/nreap/CY_NREAP_en.pdf

Grants to promote the development of more efficient buildings

FINANCIAL TOOLS TO GO BEYOND MANDATORY REQUIREMENTS

Governments implement incentives to encourage investors to consider more and more efficient constructions, with performances higher than what is required by building codes. New buildings receiving such incentives are the benchmarks for the future minimum energy building requirements (towards higher levels), and will become the future standard. Financial incentives aimed at encouraging investment in energy efficient equipment and processes by reducing the investment cost, either directly (economic incentives) or indirectly (fiscal incentives); the most common one being direct subsidies and fiscal incentives.



In Luxembourg, the 2001 Ordinance (renewed in 2005, 2008 and 2013) on the promotion programme for energy efficient new buildings paves the way for financial support to promote the construction of efficient new buildings (low-energy housing, passive housing) and more efficient heating systems (condensing boilers). Between 2001 and 2007, 500 dwellings have benefited from the programme (200 single-family houses/terraced single-family houses, 300 apartments), corresponding to 6 GWh of annual savings.

► <http://www.legilux.public.lu/leg/a/archives/2001/0852307/index.html>



There are many examples of financial policies to promote energy efficiency in buildings, but few have targeted the most efficient ones (i.e. beyond the standards set by building codes).

In some Austrian Landers, more than 50% of new buildings are low-energy buildings thanks to the implementation of the Wohnbauförderung programme offering grants for constructions with higher efficiency than building code requirements.

► http://www.exclusive-bauen-wohnen.at/de/bau_news/foerderungen/bundeslaender_vergleich.html



// STRENGTHENING INFORMATION AND ADVICES TO HOUSEHOLDS, IN PARTICULAR ON THE AVAILABILITY OF FINANCIAL INCENTIVES

Several MS launched information campaigns targeting end-consumers to promote very-low energy buildings.

The "Energielotsen" (Energy Advisors informing end-users in particular on existing and available grants) in the Hannover region (around 672,000 inhabitants in municipalities participating to proKlima, regional projects on climate protection) in Germany are advising clients on energy efficiency measures for buildings during the entire construction or refurbishment process.

Regarding new buildings, the programme has provided financial support to around 300 very energy-efficient new homes (with space heating energy consumption below 15 kWh/m²/year and primary energy consumption below 120 kWh/m²/year) from 2005 to 2010. In the proKlima area, 3,255 new homes have been built between 2005 and 2010 and proKlima has provided financial and technical support for 11% of them. In 2010 alone, almost 70 new buildings received financial support for Energy Guides.



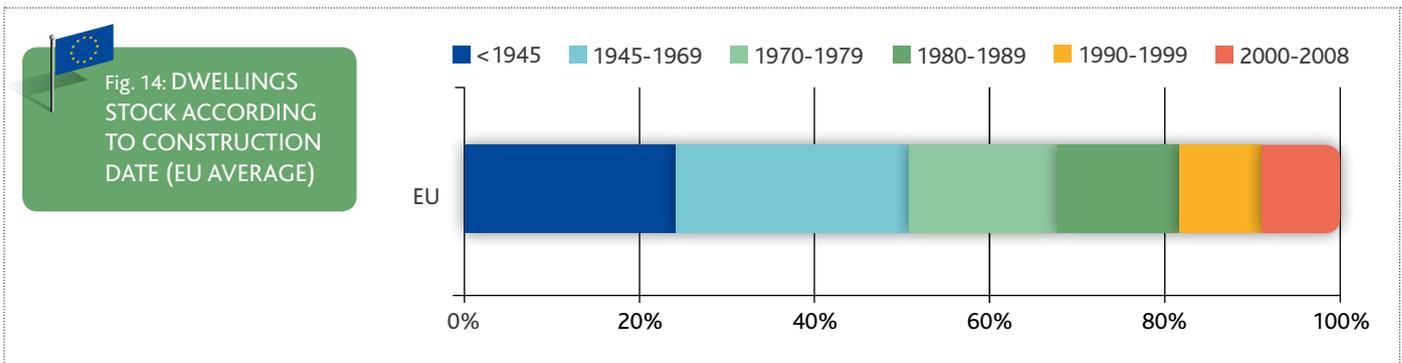


RETROFITTING AND THERMAL USES IN RESIDENTIAL SECTOR

Thermal retrofitting: key target for energy efficiency policies in buildings

/// DWELLINGS WITH POOR INSULATION ARE PREDOMINANT: 70% OF THE EXISTING STOCK WAS BUILT BEFORE 1980

On average in the EU, almost 25% of the building stock was built before 1945, and 70% of dwellings were built before 1980. There are some discrepancies across countries: for instance in Cyprus the stock is more recent (73% of dwellings built after 1980) whereas in Sweden 78% of the stock has been built before 1980; see next chapter).

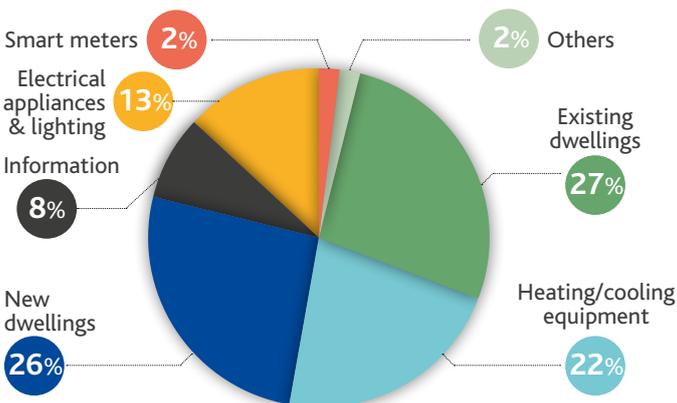


Source: Entranze, Enerdata calculation

/// HALF OF MEASURES IN THE RESIDENTIAL SECTOR TARGET THERMAL RETROFITTING OR THERMAL END-USES

Almost half of residential energy efficiency measures target thermal uses on existing buildings: either to retrofit the buildings envelopes (27%), or thermal equipment (22%). As a result, retrofitting becomes the key target for energy efficiency policies in the residential sector in the EU.

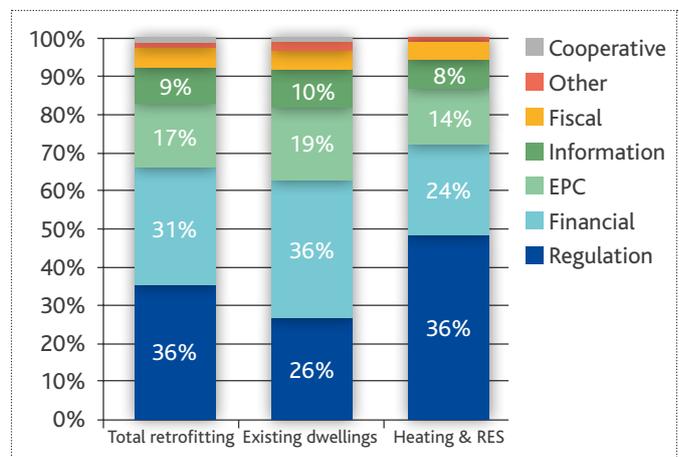
Fig. 15: RESIDENTIAL ENERGY EFFICIENCY MEASURES BY END-USE



Source: Mure 2013, Enerdata calculation

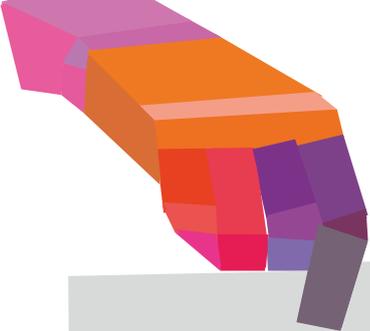
/// REGULATIONS AND FINANCIAL INCENTIVES ARE IMPORTANT FOR THERMAL RENOVATION

Fig. 16: MEASURES TARGETING RETROFITTING



Source: Mure 2013, Enerdata calculation, RES: Renewable energy

Regulations, namely building codes and mandatory inspections of boilers or air conditioners, as enforced by the Energy Performance Building Directive (EPBD, see [chapter 1](#)), are dominant. Other types of measures include financial incentives (31%), and mandatory information (17%) corresponding to mandatory EPC.



All these measures, or packages of measures, are implemented to accelerate the retrofitting of existing buildings. In France, for instance, the Housing Renovation Plan, that was launched in 2013, has set an ambitious target of 500,000 units renovated per year by 2017, and of 38% energy savings for buildings by 2020: it offers grants for retrofitting (the level of which depends on income levels) and set up 450 information points on retrofitting services.

/// STRENGTHENING INFORMATION AND ADVICE TO HOUSEHOLDS

Beyond regulatory information, almost all Member States are developing information and campaigns targeting consumers. Sweden is making great efforts to provide advice on energy, climate and transport to their citizens: in each municipality, an energy and climate advisor is available to inform consumers (households, SMEs or industries). In total 250 advisors are present all over the country. In Austria, in the framework of the "Klima: aktiv leben" program, the concept of "climate ambassador" has been developed in order to improve household awareness on possible energy efficiency measures to be implemented in their dwelling. This program proposes the acquisition of new efficient equipment (e.g. boilers) as well as more complete renovations. In Hungary, since 1992 NGOs educate and advise consumers on energy efficiency and facilitate access to loans all-over the country thanks to the dedicated network Energy Efficiency Advisory Network (gathering more than 40 scientific associations in the country).



In France Energy Information Centres launched in 2001 by ADEME inform on energy efficiency solutions (particularly on efficient space heating solutions, retrofitting options and renewable energies). These information centres gather 500 consultants throughout 259 centres all over France. More than 8 million people have consulted these centres since 2003. In 2011, out of the 650 000 people advised, 45% have implemented an action.

Regulation remains the main instrument in buildings

/// SPECIFIC LEGISLATIONS ON HEATING, VENTILATION AND AIR CONDITIONING SYSTEMS:

Since the first EPBD implementation (in 2003), inspections of heating boiler and air conditioning systems are mandatory for all Member States. Furthermore, since the EPBD recast in 2010, mandatory reports have to be provided (see [chapter 1](#)).

MANDATORY INSTALLATION OF SOLAR THERMAL SYSTEMS

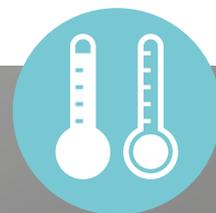
In order to speed up the penetration of renewable heat production systems, some countries have implemented legislations to enforce mandatory installation of solar thermal uses. In 2006, Spain was the first country mandate solar thermal use for renovated and new buildings in its building code (CTE, Código Técnico de la Edificación). Portugal, Italy, and some German or Austrian regions have adopted a similar regulation.

INCREASING CERTIFICATION OF THERMAL EQUIPMENT

The quality of thermal equipment is ensured thanks to certification procedures that are more widespread. In most cases the distribution of new equipment is done thanks to public incentives (subsidies) subject to quality control (examples of certification in France include QualiSol, QualiPV, QualiPac, Qualiboil). Some of them are European like Keymark.

► <http://www.key-mark.org/>

In some countries, certification is mandatory. One example is Slovakia, where efficiency has to be verified and standardized. Similarly in Italy, heating and solar water heating systems are required to meet UNI or CEN standards.



BOILER INSPECTIONS

In the 80's, Denmark was the first European country to implement mandatory annual inspections of large heating systems (> 120 kW) and large district heating systems (> 1500m²). Besides, these inspections were supervised by consultants to raise households' awareness: this resulted in an average reduction of 16% in heating consumption.

This measure was later extended to smaller heating systems and was performed by chimney sweeps.



// STRENGTHENING OF STANDARDS ALSO CONCERNS EXISTING BUILDINGS

BUILDING CODES

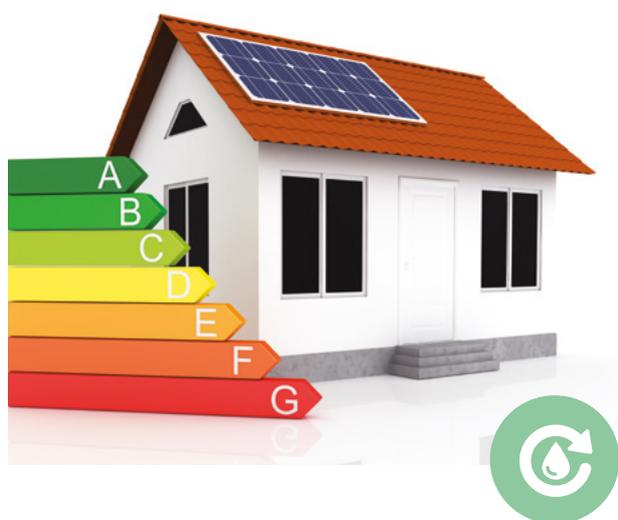
The EPBD does not enforce standards or specific objectives on existing buildings. However at national levels there are some initiatives. For example, Austria, since 2007, energy performance standards have been implemented, and they are different according to the type of building, i.e. existing or new ones. This Austrian regulation is accompanied by incentives implemented at the regional level; each "Lander" has introduced investment supports for construction, or building retrofitting (Wohnbauförderung). Recently, Finland has also defined several minimum efficiency standards on existing dwellings (2013): energy consumption of retrofitted dwellings should be reduced by 50%.

AUDITS AND ENERGY PERFORMANCE CERTIFICATES

Although audits are often linked to financial incentives, mandatory energy audits are also conducted in existing dwellings (e.g. Greece). They inform end-use consumers on building energy performance and propose solutions to improve energy efficiency. EPC function in the same way, although they correspond to a lighter diagnosis. EPC's are now mandatory in all Member States (EPBD requirement) whenever a dwelling is sold or rented. In most EU countries, EPC's are only communicated during transactions. In France, however, they must be displayed in any advertisement by real estate agencies since January 2011.



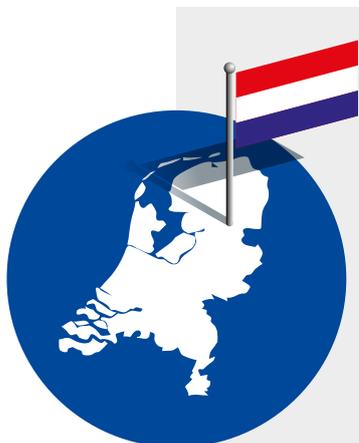
In Portugal, the law n° 79/2006 has been introduced for existing dwellings with a floor area exceeding 1 000 m². For each type of building (supermarkets, restaurants, school, hospitals, etc.), a maximum energy consumption limit is set. Existing buildings exceeding this limit have to propose and submit an energy efficiency plan to the General Directorate for Energy and Geology. All measures implemented must have a payback time shorter than 8 years.



New incentives to reduce the financing constraints for retrofitting investments

In order to reach energy efficiency targets and to be in line with ambitious objectives of energy consumption reduction, Members States usually implement a range of economic incentives for building retrofitting: fiscal incentives (tax credit, VAT exemption, etc.), financial incentives (such as investment subsidies or soft loans) and market instruments (e.g. white certificates).

In Greece, like in other countries such as Spain or Portugal, a package of financial incentive measures has been set (subsidy, reduced VAT and soft loans) to increase the stock of dwellings equipped with solar thermal systems: the target is to equip 50% (to 100% according to Greek climate zone) of dwellings for 2016 (against 27% in 2013).



NATIONAL INSULATION PROGRAM (NATIONAAL ISOLATIE PROGRAMMA, 1978-1987)

In the Netherlands, the national insulation program, launched in 1978, aimed to improve insulation of 800 000 owner-occupied dwellings and 1.7 million rented dwellings. This objective was almost reached after ten years of implementation, corresponding

to 60% of the existing dwelling stock at that time. In total, 1.8 million dwellings have received grants, and the total cost of the measure was estimated at 821 M€, representing 91% of the programme's total cost (the reminding budget was allocated to communication, technical research and staff). The average amount of subsidy corresponded to one third of the total investment cost, with a ceiling of 1 400€/dwelling. These grants permitted to reduce the specific energy consumption of dwellings by an average of 10%. The target on energy consumption reduction has been reached at 91% (Entrop, A.G. and H.J.J. Brouwers (2007)).



NATIONAL MULTI ANNUAL PROGRAMME

FOR THE THERMAL REHABILITATION OF BLOCK FLATS IN ROMANIA

In Romania, The National Multiannual Programme for the Thermal Rehabilitation of Multi-level residential buildings started in 2005 and targets landlord associations. The goals are to improve the energy performance of buildings built between 1950 and 1990, the quality of life of the inhabitants and contributing to a better townscape. According to the Romanian National Energy Efficiency Action Plan estimations, this programme would achieve up to 25% of energy savings. Measures on thermal insulation have to be appraised thanks to an energy audit. In terms of investments, landlord associations have to pay 20% of total rehabilitation cost, the remaining 80% is provided by government and local authorities. Around 80 000 flats have been retrofitted between 2008 and 2012 thanks to this programme. Since November 2012, a new European fund feeds the grants distributed by public authorities (Environmental Fund).

However, in case of major renovations, like the rehabilitation of building envelopes, financial and fiscal incentives, which are limited by the public budget (especially during economic crisis), are not sufficient. As a result, Member States have developed or facilitated the implementation of several innovative measures. These include third party financing, support to investments based on the level of insulation, or very long term financing schemes.

Third party financing involves a third party, usually an Energy Service Company (ESCO) that conducts an energy audit and invests in the place of the consumer. The ESCO is also in charge of the financing. The ESCO is paid from the energy savings. Increasingly, ESCOs offer Energy Performance Contracts, i.e. contracts that guarantee the energy savings.

Fundings linked to the level of insulation/renovation exist for instance in Germany with the KfW programme (see below) or in France with the zero interest loan (PTZ).

To put credit reimbursements for deep retrofitting investments in line with the monetary energy savings, some measures propose very **long-term** loans (20/25 years). The Green Deal and Jessica (Lithuania) are based on this concept.



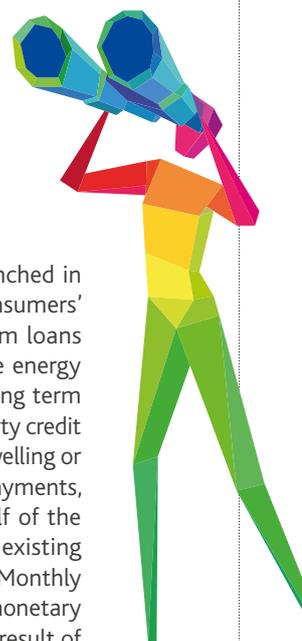
/// KfW FUND FOR ECO EFFICIENT RENOVATION SINCE TEN YEARS

KfW programme is one of three pillars of energy efficiency actions in Germany whose cornerstone legislation is the Energy Conservation Act of 2002 (known as EnEv in German). This measure proposes financial incentives via subsidies and loans to reduce buildings' energy consumption at all administrative levels – federal, regional and municipal. These incentives are offered by the public investment bank, KfW, with a strong financial backing from the German government. The Federal government injects funds through KfW. Dedicated credit lines are open with commercial banks to offer either grants or soft loans to consumers. Loans and subsidies depend on the level of energy efficiency performance of the retrofitted building. Building efficiency must be improved by at least 15%. Between 2006 and 2009, 1 million dwellings have been renovated or 1% of the total stock per year. The average energy saving rate is estimated at 48%.



/// THE INNOVATIVE FINANCING GREEN DEAL SYSTEM

In January 2013, the Green Deal was launched in the UK. It is an attractive solution to consumers' financing constraints and offers long term loans allowing investment repayments from the energy savings. Its operation is as follows. First, long term loans (20/25 years) are offered by a third party credit company. Then, professionals retrofit the dwelling or install new efficient equipment. Loan repayments, including interests, are collected on behalf of the financing company thanks to an already existing payment system such as the energy bill. Monthly loan repayments will be covered by the monetary savings that the consumers will make as a result of having the measures installed. Finally, the loan is attached to the property and not to the home owners.



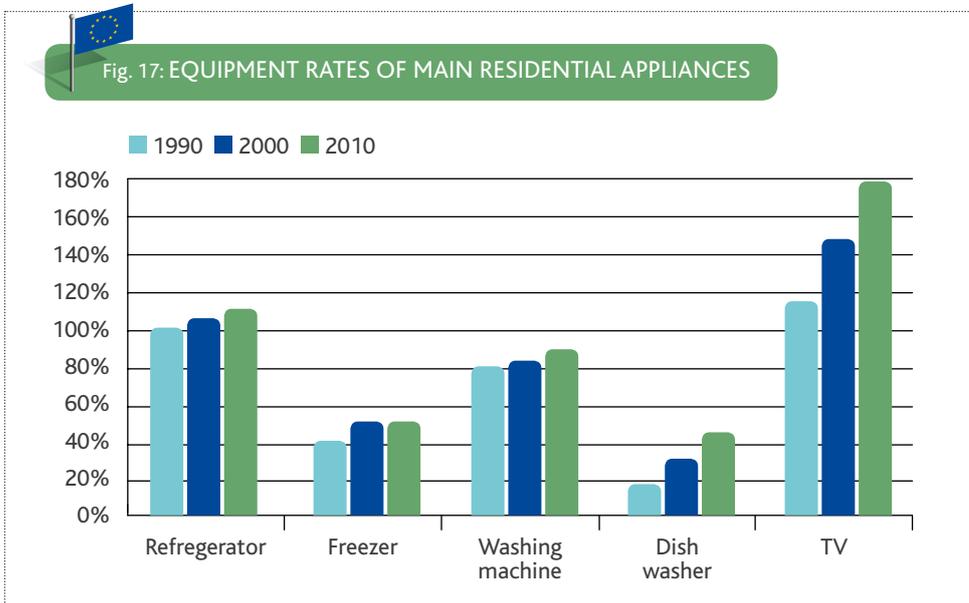


EFFICIENT ELECTRICAL APPLIANCES

Expanded information channels to guide purchasing behaviours

/// INCREASING POWER CONSUMPTION DUE TO LIGHTING AND APPLIANCES

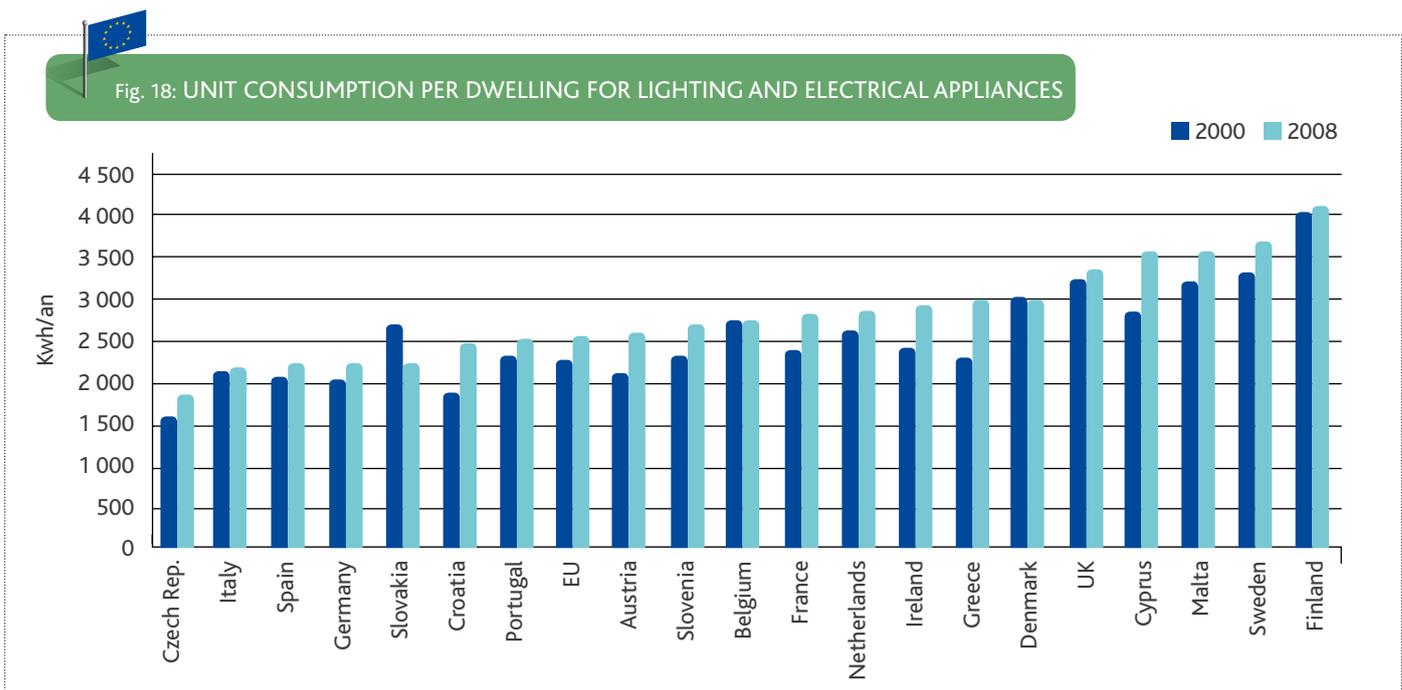
Ownership of large household appliances and multiple ownership, of televisions especially (1.8 TV per dwelling in 2010 versus 1.1 in 1990), increased drastically in recent years and have contributed to raising electricity consumption.



Few measures relate to specific electricity uses in buildings (12% of the residential measures, see [Figure 2](#) of Chapter thermal renovation), although household consumption for appliances and lighting continues to grow rapidly (+1.4%/year on average in the EU).

Hence, the share of electricity used for appliances and lighting has increased significantly and represents now 60% of the total electricity consumption in the EU (of which 10% for lighting). But there are some discrepancies among countries depending on the share of electric space heating.

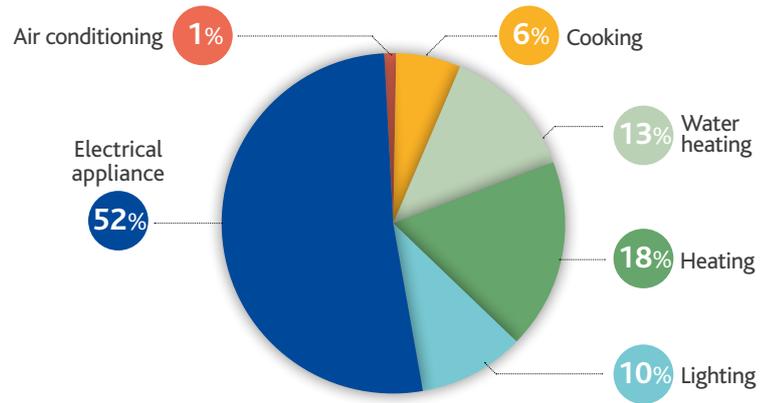
Source: ODYSSEE



Source: ODYSSEE



Fig. 19: UNIT CONSUMPTION PER HOUSEHOLD AND BY END-USE



Source: ODYSSEE

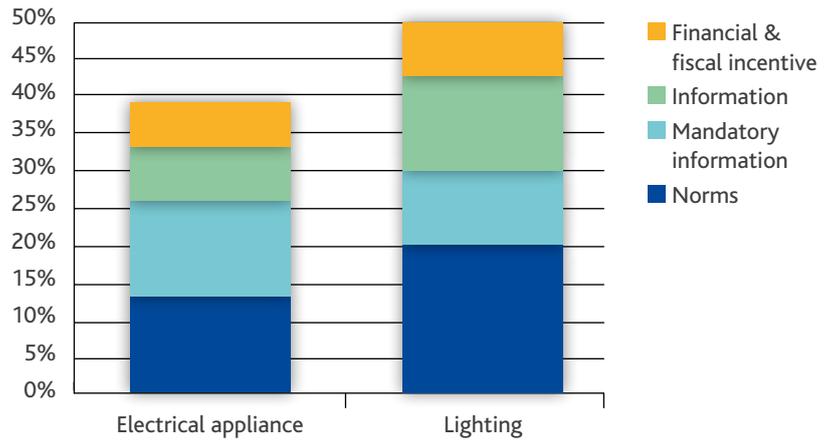


PROMOTION OF EFFICIENT ELECTRICAL APPLIANCES AND BANISHMENT OF INCANDESCENT LAMPS

More than half of the energy efficiency measures on electrical appliances concern lighting, which is an important target for energy efficiency programmes because of its significant impact on building energy consumption.



Fig. 20: ENERGY EFFICIENCY MEASURES BY TYPE OF EQUIPMENT AND MEASURE



Source: Mure

PERFORMANCE CHANGES GUIDED BY STANDARDS AND INNOVATIVE INFORMATION SYSTEMS



On average in Europe, standards and labelling systems are dominant both for electrical appliances and lighting. Information campaigns are also significant measures being taken to advise consumers. To accompany labelling systems (established under the European Directive on energy labelling), the website "Come On Labels" highlights the best European labelling systems. Its objective is to improve the visibility and credibility of the European label and promote the distribution of the best label. Along the same line, the Top Ten guide identifies the most efficient products to encourage manufacturers to develop, distributors to choose and finally consumers to buy, to realize the highest potential of energy savings.



Design and conception of efficient products thanks to mandatory standards and labels

Among already existing instruments available for policy makers to restrict the use of certain appliances and ultimately to orientate market towards the most efficient ones, standards and regulations are widely used. During the 90s, several European Directives have been adopted to enforce minimum energy efficiency standards for cold appliances, such as refrigerators and freezers. Implemented in all Member States, they aim to limit the consumption of cold appliances. Actual European Directives on electrical appliances include the Ecodesign and Energy Labelling Directive (see Boxes), as well as the incandescent light bulbs banishment enforced by the European Council in 2007 and confirmed by the European Parliament in 2008 (EC No 244/2009 Regulations).

The **Ecodesign Directive** (2005/32/EC and 2009/125/EC re) enforces clear European regulations to improve the environmental performance of energy-related equipment (a dozen of electrical appliances). This Directive sets the legal framework and the requirements for the energy-related appliances. Minimum requirements have to be fulfilled by appliances to get the EC label and to be introduced in the European market. The first Directive was adopted in 2005. Its scope was expanded in 2009 to all energy-related products. It is accompanied by regulations that adapt these requirements to different product groups. Thus, it avoids disparate national legislation representing obstacles to intra-Community trade. This benefits both consumers and retailers and induces an increasing quality of products and a better environmental protection, while facilitating the free movement of goods in Europe. The review of the Directive in 2014 plans to expand the scope of action: the Commission decided to add nine categories of products including windows, boilers, power cables, and smart meters based on a study on potential energy savings.

The **Energy Labelling Directive** (2010/30/EU recasting 92/75/EEC revision in 2014) provides homogeneous information related to energy consumption thanks to standards and labels. The energy label is designed to provide consumers identifiable and comparable information on the specific energy consumption and other appliances' features, such as water consumption, decibel measurement, size, volume, etc... It allows consumers to be aware of the product energy efficiency. All available information on the label is based on standards required by the European legislation. Initially, the product classification was ranked from A to G, A being the most efficient and G the least efficient. To adapt the labelling according to technological developments, and to strengthen product differentiation in terms of energy efficiency, the 2010 recast added new classes (up to label A+++).



/// VERIFICATION AND MEASUREMENT OF NORMS

In order to strengthen the European Directives, Member States have to control and measure the impact of standards and labels (S&L) implementation. These compliance verifications are rarely enforced, although they could reward respectful manufacturers and give them incentives to continue to invest in energy efficiency. The European project ATLETE (<http://www.atlete.eu/2/>), tested several models of refrigerators and highlighted that 57% of appliances do not comply with S&L.



In 1995, the Swedish Energy Agency (STEM) created the laboratory Testlab. This laboratory performs tests and trials on appliances (refrigerators, freezers, stoves, dishwashers, washing machines, vacuum cleaners, etc.) and also tests to ensure that products are labelled in accordance with the European energy system. In addition, a large part of TestLab research focuses on the development of new methods, and the design of new laws and regulations related to labelling, particularly useful for the European Directives.



The UK has also created a new authority for market compliances and ecodesign.

Consumer guidance thanks to financial incentives

Financial incentives, such as scrap premiums, are usually expensive measures for public budgets, and therefore, often temporary. These measures are difficult to calibrate in the sense that market evolution is rapid. In order to be effective, some initiatives, like in Switzerland, try to implement premiums for the most efficient appliances. There is a biannual revision of the top efficient appliances which are to be in line with the rapid development of the market (this list may also be a basis for public procurements). It gives the opportunity to increase the potential of energy savings by avoiding subsidizing less efficient products.

Finally, the impact of this type of programme is easily assessable (market share evolution) and is quite immediate. As for cars (see transport sections), several European countries have implemented incentive programmes to promote the most efficient vehicles.



SUSTAINABLE MARKET TRANSFORMATION



In Italy, from 2007 to 2009, a 200€ bonus was granted for the purchase of domestic cold appliances rated A+ or A++ (with a ceiling fixed at 20% of the purchase price). As a consequence, the market has changed rapidly. For example, the market share of the best classes A+ and A++ increased from 28% to 67% during the first seven months. Between 2005 and 2010, the average annual specific consumption of all new appliances decreased by 11% (or 255 kWh). But the program was expensive with a cost of 50 million€ in 2007.

In Greece, a program was launched in 2009 aimed at encouraging households to remove their old air conditioners thanks to a premium (up to 500€ or 35% discount on the final price). Thanks to the programme, 140 000 air conditioners have been replaced by more efficient units. Unfortunately, the program originally planned for a period of six months was cut short (less than 3 months), as the budget was quickly exceeded.



INITIATIVES TO LAUNCH NEW TECHNOLOGIES

Denmark implemented several campaigns during a period of 4 to 7 weeks to facilitate and speed up the introduction of new efficient products (A++ refrigerators, tumble dryer with heat pumps, circulators). However, the challenge was to identify an adequate time period to launch the campaign, and to coordinate efforts with manufacturers.

In order to comply with energy saving obligations (e.g. France or the United Kingdom, see the section on white certificates in [Chapter 11](#) on transversal measures,) or for other reasons (see example below for Switzerland), electric utilities can contribute to the purchase of high-performance equipment. In Switzerland, customers stemming from multiple retailers receive bonuses for buying the most efficient appliances listed by www.topten.ch website (for refrigerators, clothes dryers, televisions). The share of class A tumble-dryers has increased from 2 to 16% of the market between 2000 and 2008, before becoming in 2012 the only appliance approved for sale. Consumers wishing to benefit from the premium must go to the EWZ- Swiss electricity utility- showroom to receive cash, and can visit an exhibition dedicated to the best products.



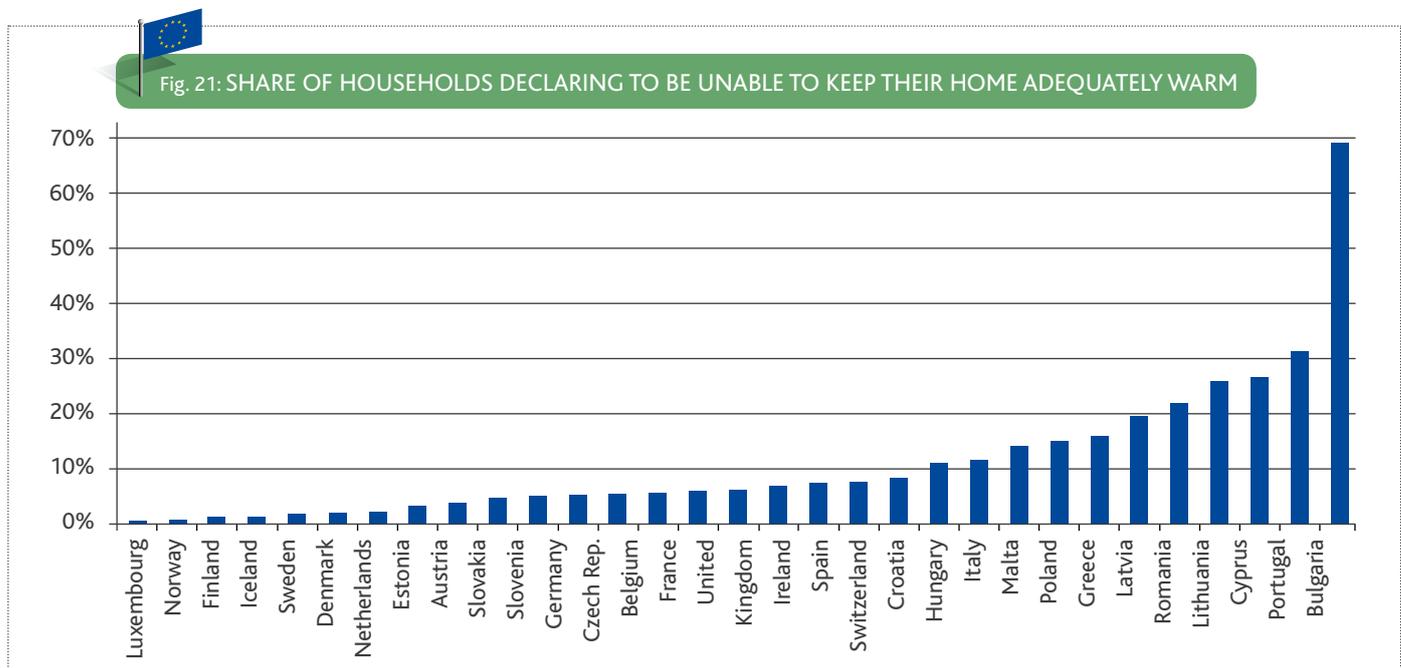


FUEL POVERTY

Emergence of the fuel poverty concept

Usually, a household is said to be in fuel poverty when it is struggling to meet its basic energy needs (especially space heating) at a reasonable price. The United Kingdom is considered as a pioneer in this field as it set up its fuel poverty strategy in 2001. Likewise, it was the first EU Member State to officially define fuel poverty and to propose an indicator to measure fuel poverty. Thus, a fuel poor household is defined in the UK as one which needs to spend more than 10% of its income on all fuel use for their home.

There is no definition of fuel poverty at the European level. However, some indicators, such as the share of households unable to keep their home adequately warm, allow the measure of certain aspects of fuel poverty. According to an estimate made in the context of the European project EPEE (European Fuel Poverty and Energy Efficiency), between 50 and 125 million people in the EU are estimated to be fuel poor.



Source: Eurostat (SILC)

/// A COMBINATION OF THREE MAIN FACTORS

Fuel poverty is a complex phenomenon that covers different situations. Three main factors attributed to fuel poverty have been identified thanks to case studies carried out in the five countries that participated to the EPEE project (France, United Kingdom, Spain, Italy and Belgium):

- The low thermal performance of dwellings, which implies high energy consumption for keeping homes adequately warm;
- High energy prices;
- Low incomes, which make the payment of energy bills difficult and prevent any investment to improve the thermal quality of dwellings.

/// MULTIPLE CONSEQUENCES

There are multiple consequences to fuel poverty. Some examples are financial (debt, deprivation, limitation of budget dedicated to other needs, etc.), technical (moisture in turn leading to deterioration, mould, unhealthy conditions, etc.), health (diseases related to cold and moisture, poisoning) or social (feeling or the real situation of exclusion). In addition, these factors and their consequences tend to reinforce themselves in a vicious cycle that increases fuel poverty.

/// THE GRADUAL RECOGNITION OF FUEL POVERTY

Following the measures taken in the United Kingdom, tackling fuel poverty becomes an important issue for Member States. In 2007, Ireland introduced fighting fuel poverty in its Energy White Paper. In France, this concept was introduced into the housing law through the Grenelle 2 Act of 2010. This issue has become a subject of growing attention since the law passed, as evidenced by the creation of the national observatory of fuel poverty in 2011.

At EU level, the fuel poverty concept is mentioned in several documents:

- The directives concerning common rules for the internal gas and electricity market (2009),
- The Energy Efficiency Plan of the EC (2011),
- The new EED (2012).

/// SOLUTIONS

Different approaches have been developed to alleviate fuel poverty. The first one is to help households cope with the financial burden of their energy bill. Thus, in Bulgaria, the Winter Supplement Program provides financial assistance to vulnerable households

to address heating costs during winter. In France, the Housing Solidarity Fund can be used to pay unpaid energy bills. These measures, with social objectives, have positive effects in the short term, but have no impact on the structural causes of fuel poverty. Other measures which aim at a sustainable improvement of the energy performance of dwellings are needed and are gradually being introduced.

/// MOBILIZATION AND NETWORKING OF STAKEHOLDERS

The fuel poverty issue covers several areas: energy, environment, social welfare, housing and public health, which implies the intervention of many stakeholders. To improve energy efficiency in dwellings, networking of these stakeholders is therefore essential. This observation has led to the creation of the RAPPEL network in France (network of

stakeholders acting on poverty and fuel poverty in housing), which allows sharing experiences and coordinating actions.

In the Rhône-Alpes region of France, the energy efficiency information centres (Espaces Info Energie - EIE) work with participants of social housing (called PACT) to support vulnerable households. The work of PACT is particularly useful for identifying target groups and supporting them. With the help of energy advisors, they do energy audits of dwellings and arrange the necessary financing to carry out the energy efficiency improvements that are recommended in the audits.

In Ireland, energy stakeholders have joined forces with associations that provide assistance to elderly, poor households or persons in debt and with public health services to develop the "Keeping Warm and Well" program. This program provides guidance on health, nutrition, home safety but also energy advice to reduce energy bills, information on financial supports available to improve insulation, etc.

Ensuring high levels of energy performance of dwellings

To ensure the thermal quality of dwellings, two types of actions are implemented: setting up financial mechanisms for dwelling refurbishment and defining specific energy efficiency standards for low-income dwellings.

/// FINANCING THE ENERGY EFFICIENT REFURBISHMENT OF DWELLINGS

In some countries there are financial supports for thermal renovation of dwellings that specifically target households likely to be in fuel poverty: low-income households, the unemployed, the elderly, etc.

These types of measures are available to low-income households in Slovenia and France ("Habiter mieux" (Live Better) program of the National Housing Agency ANAH). Meanwhile, Latvia finance energy efficiency improvements in social housing. In Hungary, the replacement of equipment is subsidized for low-income households, the unemployed, and the elderly. The UK probably provides the most comprehensive support for low-income households through the "Fuel Poverty Strategy" (see Box). In particular, in the context of energy efficiency obligations placed on energy suppliers since 2002, half of the energy savings should be achieved with low-income households.

TACKLING FUEL POVERTY IN THE UNITED KINGDOM



In 2001, the UK implemented its Fuel Poverty Strategy, specifically targeting "vulnerable" households. Four programs to improve the performance of heating systems and thermal insulation of dwellings have been set up for low-income households in the private sector:

In addition, since 2002, energy suppliers have a legal obligation to deliver energy efficiency measures to domestic energy users (Energy Efficiency Commitment which became Carbon Emissions Reduction Target in 2008 and Energy Company Obligation since 2013). Between 2008 and 2012, 40% of energy savings had to be achieved in the most vulnerable households, a goal that has been reached. Previously, this proportion was 50%. The new Energy Company Obligation continues to impose a significant share of the target to be achieved with the most vulnerable households.

The Warm Front program in England, which has helped nearly 2.3 million households from 2000 to 2011, with an average saving per household of £610/year (€850) on their energy bill;



The Energy Assistance Package program (which replaces the Warm Deal program) in Scotland;



The Nest program in Wales (previously called the Home Energy Efficiency Scheme program), which has helped 50,000 households between 2007 and 2010;



The Warm Homes program in Northern Ireland that helps about 9,000 households per year.



/// SPECIFIC STANDARDS

In the Brussels Capital Region of Belgium, the Government plans to introduce a threshold for unhealthy energy conditions in its housing code. Currently, this code defines basic requirements for rented homes in terms of safety, unhealthy conditions and equipment. It will be amended in 2015 to introduce a threshold for unhealthy energy conditions which will protect tenants whose energy consumption

would be excessive. Below a certain level of performance (to be defined), a dwelling would be classified as "unhealthy" in the Brussels Housing Code and would therefore not be rented.

In the UK, specific standards for social housing have also been introduced to ensure a minimum level of comfort. The requirements include a reasonable degree of thermal comfort. The standards cover both heating systems and insulation of buildings.

THE LEADING ROLE OF THE PUBLIC SECTOR



Energy efficiency promotion in the public sector to show its exemplary role

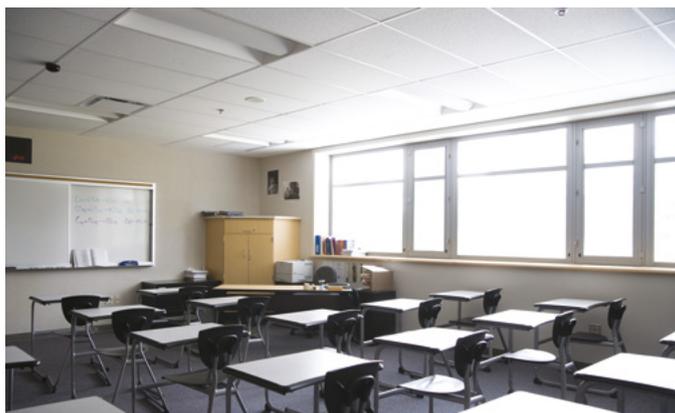
The composition of the public sector varies considerably from one country to another. If we combine national and local government's offices, schools, universities, hospitals, public housing, etc., the public sector covers many types of buildings, with heterogeneous characteristics. In total, this sector accounts for about 12% of the building stock in the EU, according to the EED.

► http://ec.europa.eu/energy/efficiency/eed/doc/2011_directive/sec_2011_0779_ia_annexes.pdf

In addition, the energy consumption of the public sector includes the electricity consumption for public lighting. Finally, the public sector is also responsible for part of the energy consumption of transport, whether it is for its own fleet of vehicles or for public transport.

Although there are no accurate statistics, the EC estimates that about 10% of the final energy consumption in the EU is due to the public sector. Even if this share may seem modest, the promotion of energy efficiency in the public sector remains an important issue, especially since public spending accounts for 19% of the EU GDP. The public sector is therefore a powerful tool to drive the market towards energy efficient products and services.

/// THE EXEMPLARY ROLE OF THE PUBLIC SECTOR ENCOURAGED BY EUROPEAN POLICIES



Because of the importance of this sector, a special attention is given to the public sector in European policies to promote energy efficiency. Thus, the ESD encourages Member States to have an exemplary role in energy efficiency. In their NEEAP, Member States shall ensure that at least two energy efficiency improvement measures are taken by the public sector from a suggested list.

These measures include requirements that concern the use of financial instruments for energy savings, such as energy performance contracting (EPC), requirements to purchase energy efficient equipment and requirements to use energy audits and implement the cost effective recommendations.

The new Directive on Energy Efficiency (EED) reinforces the exemplary role of the public sector. It requires that 3% of the total floor area of buildings owned and occupied by the central government is renovated each year to meet the minimum energy performance requirements as laid down in the Directive on the EPBD 2 for renovations. EED also encourages the adoption of energy efficiency plans containing targets and the development of energy management system as ESCO or energy performance contracting (EPC). The directive also requires the central administration to set up a procurement policy of energy efficient products.

Finally, EPBD 2 requires that all new buildings occupied and owned by public authorities are nZEB by the end of 2018, instead of the end of 2020 for the private sector.

/// LOCAL AUTHORITIES PLAYING AN EXEMPLARY ROLE ON A VOLUNTARY BASIS

Some local authorities go beyond what is required by the regulations. This is particularly true of local authorities joining the Display® campaign. Initiated in 2003 by the Energy-Cities Association, it was intended to encourage local authorities to publicly display the energy and environmental performances of their buildings using the domestic appliances labelling model. With regulatory changes, the Display® campaign now focuses on local communication campaigns and offers a wide variety of communication tools beyond the requirements of the EPBD. Currently, more than 500 local authorities from 32 countries participate to this project making it an extensive European network.

/// PROMOTING ENERGY EFFICIENCY THROUGH PURCHASING POLICY

Encouraged by the European Directives, in particular Article 5 of the ESD, many Member States have implemented responsible public procurement programs including energy efficiency criteria. These programs may involve equipment (computers, printers, lighting, etc.), vehicles and even buildings.

In 2009, the Croatian Parliament adopted the Biofuels Act which introduces requirements on ecological vehicles for public transportation. According to this act, 70% of new vehicles must use alternative fuels (i.e. use biofuels, biogas, hybrid engine, electric engine or hydrogen).

► <http://www.muredatabase.org/>



Energy planning in the public sector

Many measures cited in the chapter devoted to retrofitting of buildings apply to the public sector. However, other measures are aimed specifically for this sector.

/// SETTING UP OF AN INTEGRATED APPROACH

To improve the energy performance of their buildings, some local authorities implement action plans for energy efficiency. These plans typically include: energy audits, setting up energy savings targets, a description of measures to be implemented and how to monitor progress. These plans can be complemented by training the staff of local authorities, as is the case in Bulgaria, Croatia and Estonia, and by the establishment of an energy management system.

/// ACTION PLANS REQUIRED BY THE REGULATIONS

Encouraged by the ESD, several Member States have imposed in their national regulations the implementation of action plan for public buildings. This is the case in Bulgaria since 2009, as well as in Finland and Norway since 2010. In other countries, these plans are implemented on a voluntary basis. For example: some Austrian cities (Municipal Energy Concept KEK), some Danish local authorities (Reverse-the-trend agreements) or Finnish local authorities (Energy Efficiency Agreements KETS).

Tailor-made financial tools

The public sector can also play its exemplary role in terms of financing in demonstrating the effectiveness of certain financial arrangements for energy efficiency investments. For example, energy performance contracting has been used by some local authorities for the renovation of their building stock. These contracts, signed between local authorities and ESCOs, contractually require the latter to achieve a certain amount of energy savings which allow the repayment of the investment costs. The city of Stuttgart has established an interesting variant of this approach, called PICO, with a department of the municipality acting as an ESCO towards other services.



/// PICO ("PUBLIC INTERNAL PERFORMANCE CONTRACTING") IN STUTTART

The financing system called PICO ("Public Internal Performance Contracting") overcomes the budgetary constraints of local authorities. PICO takes up the central idea of third party financing but operates exclusively with municipal funds. It is a system of investment in energy efficiency based on a contract between different services or departments of the same public entity. Within the administration, a budget is released and serves as revolving funds for energy efficiency investments. This system was introduced in 1995 by the Department of Environment of the City of Stuttgart, in cooperation with the Department of Finance. In 2011, more than 270 projects have benefited from this scheme. The annual savings of all these projects are evaluated at €1.4 million/year, i.e. a 4% reduction compared to the original bill before the establishment of the PICO (€35 million in 2000).

► http://www.reneuer.com/upload/STUT_EN_M.PDF



The city of Berlin is one of the most interesting examples of energy performance contracting. More recently, in France, several regions have mobilized to implement innovative financing schemes. One example is the Rhône-Alpes region that has created a local public company for third-party investment entitled "OSER" which is dedicated to the energy retrofitting of public buildings of local authorities in the region. Apart from the financial aspects, OSER also provides technical and legal assistance to local authorities. The Ile-de-France region has also set up a third-party investment system, "SEM Energies POSIT'IF", for energy retrofitting of collective housing buildings (condominiums and housing managed by small donors); this system will also later target public buildings.



ENERGY SAVING PARTNERSHIP IN BERLIN AND IN PORTUGAL

The Energy Saving Partnership (ESP) in Berlin often serves as a model of energy performance contracting. ESP was developed by the Land of Berlin in 1996. It is based on the expertise of the Berliner Energy Agency (BEA), which is in charge of establishing EPC between the Land of Berlin and ESCOs for energy retrofitting of public buildings. Another key element of the success of this scheme is to create "pools" of buildings in which the contractor is obliged to make consolidated profitability calculations between buildings with different performance properties, which prevent less interesting buildings from being pushed aside. In early 2012, about 1,500 buildings divided into 25 pools had benefited from this scheme, which corresponds to annual savings of 70 ktCO₂ (500 kt accumulated since the beginning of the project). Savings on energy bills are estimated at €11.7 million/year (net savings of €2.7 million / year after reimbursement to the ESCO) for an initial bill exceeding €40 million /year.

► <http://berliner-e-agentur.de/en/topics/energy-saving-contracting>

In January 2011, as part of the National Energy Strategy (ENE2020) and the NEEAP, the Portuguese Government launched the Energy Efficiency in Public Administration Programme (ECO.AP). This programme aims to achieve a 30% increase in energy efficiency by 2020 in all public services and public administration bodies, particularly through the procurement of ESCOs. ECO.AP covers a set of measures from the appointment of energy managers by all public bodies to the implementation of energy efficiency management contracts between those bodies and ESCOs, as well as the establishment of a public administration energy efficiency barometer.

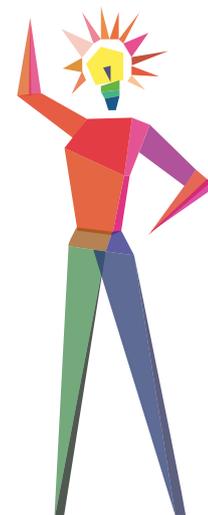
► <http://ecoap.adene.pt/>



FINANCIAL INCENTIVES FOR THE RENOVATION AND CONSTRUCTION OF ENERGY EFFICIENT BUILDINGS IN THE PUBLIC SECTOR IN SLOVENIA

Since 2008, Slovenia has introduced financial incentives for the renovation and construction of energy efficient buildings in the public sector. These measures are aimed specifically at buildings owned by municipalities: schools, childcare facilities, homes for the elderly, administrative buildings. Financial incentives concern not only energy efficiency measures, but also the establishment of energy management systems, the use of EPC or demonstration projects. Investments for the renovation of public buildings can benefit from soft loans offered by a public fund for the environment (Eco Fund) which is the main tool for financing energy efficiency in Slovenia. Eco Fund also provides grants. In 2011 and 2012, two public calls for the construction and renovation of educational buildings in low-energy or passive standard were launched for a total of €5.5 million.

► <http://www.muredatabase.org/>





INDUSTRY

An historical priority of energy efficiency policies

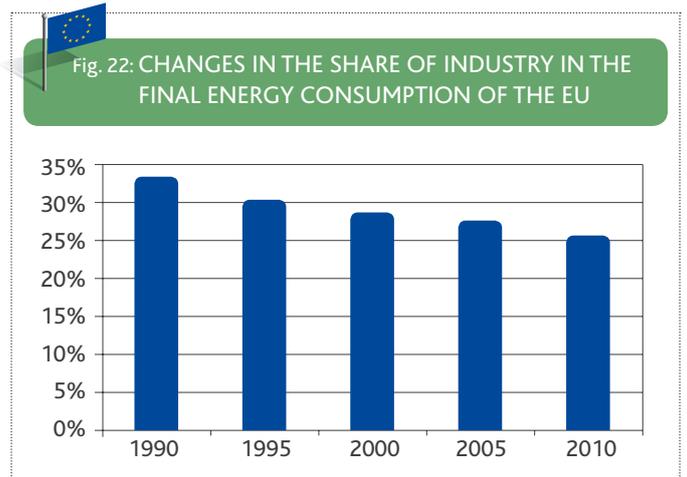
Following the oil shocks of the seventies, many energy savings measures have been implemented, with a special focus on the industrial sector which used to be the largest final energy consuming sector.

/// SHARE OF INDUSTRY IN ENERGY CONSUMPTION IS DECREASING...

For two decades, the share of industry in the EU final energy consumption has steadily declined from 33% in 1990 to 25% in 2010.

///...BUT STILL ACCOUNTS FOR A LARGE SHARE IN SOME COUNTRIES

However, industry remains a large sector in some countries. For instance, it represents nearly half of the final energy consumption in Finland and more than a third in Slovakia, Sweden and the Czech Republic.



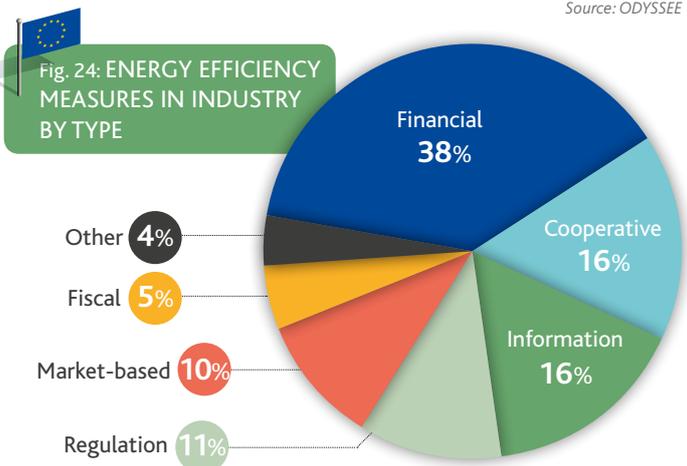
Source: ODYSSEE



Source: ODYSSEE

/// FLEXIBLE TOOLS TO PRESERVE COMPETITIVENESS

Industrial companies usually face international competition. Therefore, the establishment of an energy efficiency policy in this sector must take into account global competitiveness and avoid the application of stringent and costly measures which major international competitors are not subject to. This is why there are few regulatory or fiscal measures in industry. On the other hand, financial measures are widely used to support investments in energy efficiency. They help finance innovative or demonstration projects and accelerate the penetration of the most advanced technologies. Policies also give priority to flexible tools such as voluntary agreements (cooperative measures), information, market-based instruments (emissions trading), leaving considerable autonomy to industrial companies.



Source: Mure 2013, Enerdata processing

THE EU EMISSION TRADING SCHEME "EU-ETS"

The EU ETS was established in 2005 as one of the cornerstones of the EU's policy to combat climate change.

Under this scheme, limits to greenhouse gas emissions are imposed to large industrial facilities (with thresholds of size depending on the branch). To meet these requirements, companies may choose to reduce their emissions through energy efficiency improvements, fuel substitutions, or purchase allowances for emissions exceeding ceilings. After the initial trial period (2005-2007) and the second period which corresponded to the commitment period of the Kyoto Protocol (2008-2012), the European system is now in its third phase (2013-

2020). From now on, a single EU-wide cap on emissions applies in place of the previous system of national caps. In addition this cap is expected to decrease by 1.74% per year until 2020. Finally, auctioning is now the default method for allocating allowances and is gradually replacing their free allocation.

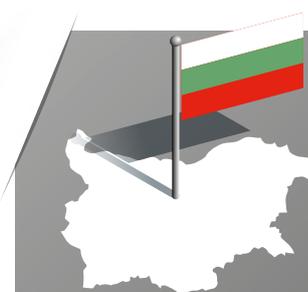
The ETS covers more than 11,000 power plants and manufacturing plants in the 28 EU member states as well as Iceland, Liechtenstein and Norway. CO₂ emissions from civil aviation are also covered. In total, 45% of EU greenhouse gas emissions are currently covered by the EU ETS.

Regulation is seldom used in industry

There are few regulations on energy efficiency in the industry sector. However, some Member States have set up mandatory energy audits for large energy consumers (e.g. Bulgaria, Slovakia, and Romania). Others require large consumers to designate an energy manager (Italy, Romania). In the future, these measures will become more widespread with the new EED, which makes it mandatory for large companies to conduct an energy audit every four years. Only companies that are implementing an energy management system certified by an independent body will be exempted.



At the Community level, in the framework of the implementation of the Eco-design Directive, electric motors in a power range from 0.75 to 375 kW must achieve a minimum level of energy performance since 2011.



MANDATORY AUDITS IN BULGARIA WITH IMPLEMENTATION OF RECOMMENDATIONS

In 2008, Bulgaria adopted an energy efficiency law which set up mandatory energy audits for companies consuming more than 3,000 MWh/year to be done every three years. Once audits are completed, companies have two years to start the implementation of the measures identified in the first phase. At the end of 2011, more than 200 companies have completed their audit. According to SEDA, the Bulgarian Energy Agency, that monitors the audit reports, if all recommended measures were implemented, the expected energy savings would reach 540 GWh / year.

Voluntary agreements: an alternative approach to regulation

Voluntary agreements between industry and the administration are an alternative to regulation which is sometimes considered too restrictive. By signing such agreements, industrial companies agree to define objectives of energy savings and/or reduction in greenhouse gas emissions and are committed to implement an action plan to achieve these goals. To encourage companies to enter into voluntary agreements, governments may implement specific incentive schemes and/or have tax exemptions. For example, in Denmark, Norway, Sweden, the United Kingdom and Switzerland, tax exemptions are granted to companies in return for their commitment.





PROGRAMME FOR ENERGY EFFICIENCY IN ENERGY INTENSIVE INDUSTRY (PFE) IN SWEDEN

The PFE programme was launched in 2005 by the Swedish Energy Agency (STEM). It is intended for energy-intensive industries with energy costs exceeding 3% of their production value or with energy and CO₂ taxes amounting to at least 0.5% of their value. These industries mostly correspond to the wood, paper, food, steel and mining sectors. The implementation of this programme was linked to the introduction of a tax on electricity (0.5€/MWh) in 2004. By participating to this programme, companies are exempt from this tax.

Each company programme lasts five years. During the first two years, the company must implement an energy management system, carry out an energy audit and propose an action plan to reduce its energy consumption. It should then implement measures to improve energy efficiency over the next three years. More than one hundred companies have already submitted their final evaluation to STEM at the end of their first five-year commitment period. The reported electricity savings amount to 1.45 TWh/year corresponding to about 1,200 identified measures.



VOLUNTARY AGREEMENTS IN PULP AND PAPER INDUSTRY IN NORWAY

In Norway, pulp and paper companies may participate in a voluntary programme to improve energy efficiency, which is administered by the NVE (Norwegian Water Resources and Energy Directorate). In return, participating companies are exempt from the electricity tax.

As for the PFE in Sweden, participating companies initially have to implement an energy management system, conduct an energy audit and propose actions to improve energy efficiency. Then they have to implement the identified measures whose payback time is less than three years. In non-compliant cases, the NVE can ask the company to repay, with interest, the electricity tax exemption. Nine companies participate in this program. Between 2005 and 2009, energy savings averaged 6 GWh/year per company.

The networking of companies is another voluntary approach: by participating in a network to improve energy efficiency, companies benefit from shared expertise and resources which are made available to companies. Several networks have thus emerged. In Switzerland, sectoral business groups have been set up by the Energy Agency for the Economy (AEnEC) in 2001. An approach inspired by the Swiss example was launched in Germany in 2009 (LEEN Learning Energy Efficiency Networks). In Ireland, the LIEN network (Large Industry Energy Network) has existed since 1995.

LARGE INDUSTRY ENERGY NETWORK (LIEN) IN IRELAND

LIEN is a voluntary network of energy-intensive companies concerned by energy efficiency and environmental protection. It was established by SEAI (Sustainable Energy Authority of Ireland) in 1995. Around 150 companies, representing approximately 15% of the country's energy consumption, are members of LIEN.

Regular workshops, seminars and site visits allow network members to share their experiences and knowledge with other energy managers. Since 2006, some companies participate in the EAP (Energy Agreements Programme), which is a subset of LIEN. The EAP helps companies to implement an energy management system complying with the EN 16001 standard (replaced by ISO 50001 standard since 2011). The purpose of this standard is to help companies develop a systematic energy management to improve their energy efficiency implementing actions to reduce and monitor energy use, verifying energy savings and planning improvements. Requirements include establishing a strategy with concrete objectives. Since the creation of LIEN, participating companies have achieved energy savings of about 2% per year on average.



SMALL AND MEDIUM-SIZED ENTERPRISES

A hard-to-reach target

The energy consumption of SMEs is not well known. However, according to the annual survey conducted in the French industry sector, it is estimated that companies with less than 250 employees accounted for about 43% of the total energy consumption of industry in 2011. This share, which was less than 30% 15 years ago, is growing rapidly. For policy makers, mobilizing the energy savings potential in SMEs is a real challenge. This sector is made up of many stakeholders with heterogeneous characteristics in regards to the type of activity and their energy uses. In addition, because of their size, these companies

usually have limited resources to implement energy savings actions. Finally, for most of them, the energy share in their expenditures is not high enough to encourage them to invest in energy efficiency.

/// FINANCIAL MEASURES ARE WIDELY PREFERRED

While some measures are aimed specifically at them, SMEs can also benefit from incentives implemented in other sectors such as industry and buildings. In general, many financial measures are available to SMEs that wish to invest in energy efficiency. Information and cooperative measures (i.e. voluntary agreements) are also widely used.

Networks to support and inform SMEs

SMEs usually do not have enough resources, whether it is human resources or technical skills, to invest in energy efficiency. Given this situation, various tools have been developed to help SMEs implement energy saving actions, mainly the provision of information and financial support.

In Ireland, the energy agency SEAI (Sustainable Energy Authority of Ireland) helps companies analyze their energy consumption and provides advice to improve energy efficiency. SEAI also provides training in energy management. In Sweden, the Jönköping Region has established a regional programme for audits and benchmarking in SMEs. Many activities of networking, training and the provision of information and tools have been carried out to encourage and help companies better manage their energy uses. In Finland, as part of the voluntary agreement on improving energy efficiency in industry and services, an energy efficiency advice project for SMEs was launched by Motiva. Switzerland also has a program focused on SMEs through the AEnEC agency.

SUPPORT TO SMES PROPOSED BY AENEC IN SWITZERLAND

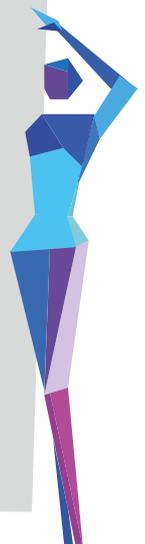
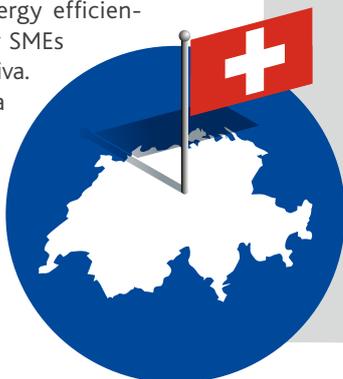
The "SME model" of AEnEC (Energy Agency for the Economy) is a comprehensive support for SMEs to save energy. First, an AEnEC consultant analyses the energy consumption of the company and then provides a list of cost-effective measures to improve energy efficiency. On this basis, the company and AEnEC establish an agreement over a period of ten years that details the energy performance targets to be achieved. Then the company implements the measures with the support of AEnEC. In addition, a monitoring system is set up between the company and AEnEC. Information is filled in on a website which allows the company to follow its progress.

▶ www.modele-pme.ch

More than 400 companies are monitored by the SME model. Most sectors are represented. To go further, AEnEC helped to launch a resource platform dedicated to energy savings in hotels and restaurants

▶ www.hotelpower.ch

Hotelpower offers companies simple tools to benchmark their energy consumption and estimate their energy saving potential. Companies enter their energy consumption data on the website and can immediately compare their situation with the average performance of the sector. The website also provides many case studies, fact sheets or testimony of energy efficiency improvement actions. Technical and financial supports that can be mobilized by hotels are listed on the website.





Financial and fiscal measures

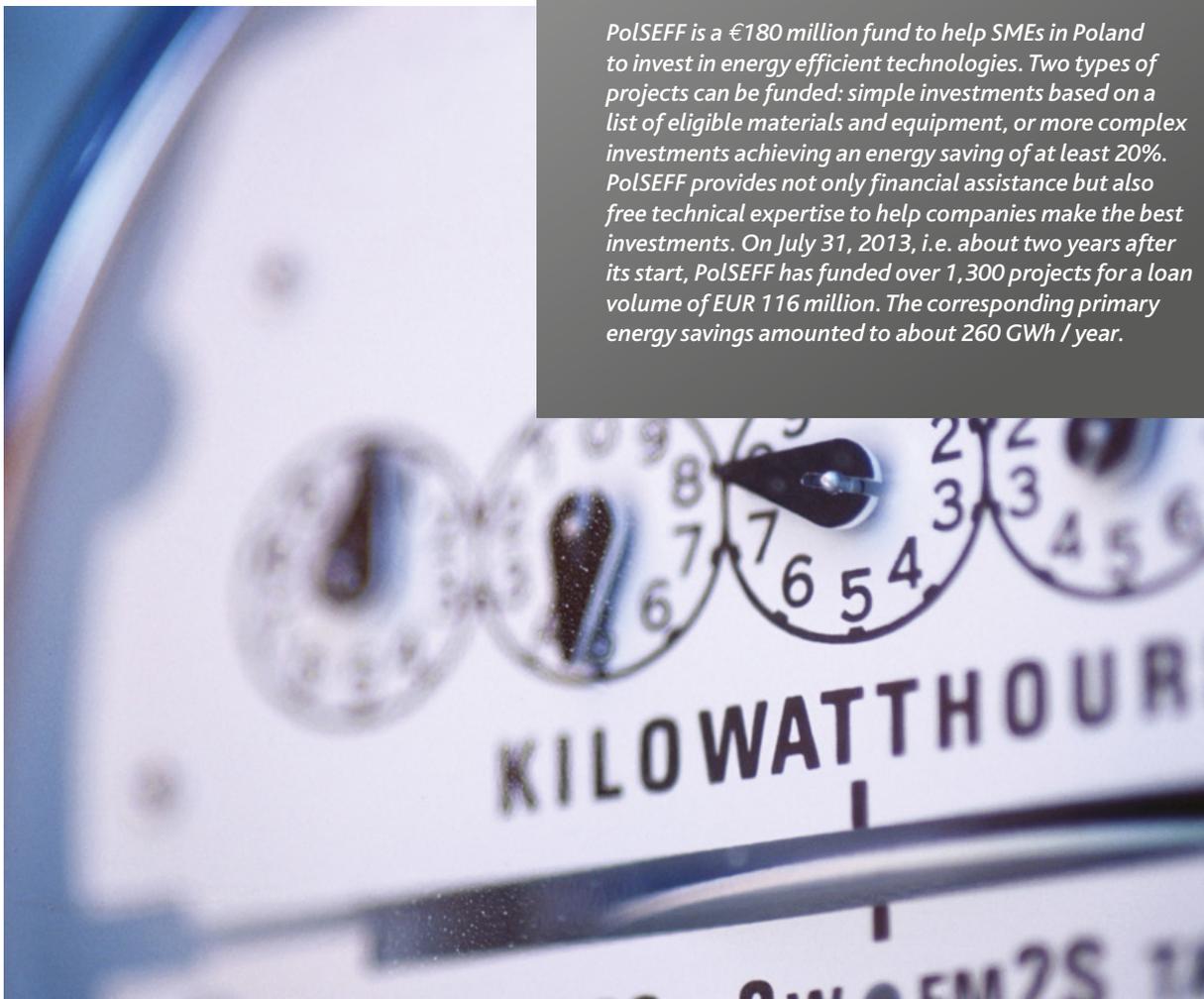
SMEs lack not only human or technical resources but also financial resources. Thus financial and tax incentives have been developed to help them invest in energy efficiency.

In Germany for example, the Federal Ministry of Economics and KfW established a Special Fund for Energy Efficiency in SMEs in 2008. This fund provides subsidies for independent energy advice and low-interest loans for energy savings investments. With regards to fiscal incentives, the Netherlands offer accelerated depreciation for energy efficiency investments. In Poland there is a support fund dedicated to SMEs.



POLSEFF (POLISH SUSTAINABLE ENERGY FINANCING FACILITY) IN POLAND

PolSEFF is a €180 million fund to help SMEs in Poland to invest in energy efficient technologies. Two types of projects can be funded: simple investments based on a list of eligible materials and equipment, or more complex investments achieving an energy saving of at least 20%. PolSEFF provides not only financial assistance but also free technical expertise to help companies make the best investments. On July 31, 2013, i.e. about two years after its start, PolSEFF has funded over 1,300 projects for a loan volume of EUR 116 million. The corresponding primary energy savings amounted to about 260 GWh / year.



TRANSPORT OF PASSENGERS



Cars are the main policy targets for passenger transport

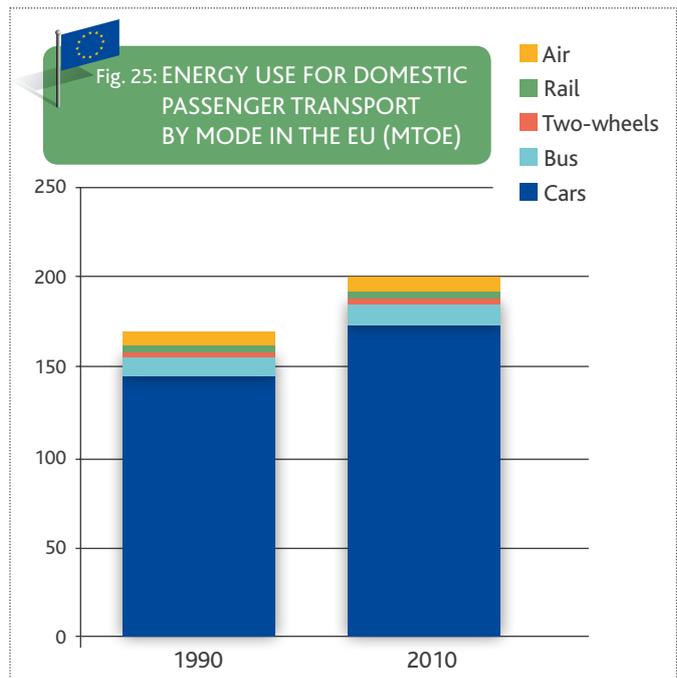
/// PASSENGER TRANSPORT REPRESENTS OVER 60% OF TRANSPORT CONSUMPTION IN EUROPE

The energy consumption of passengers (cars, two-wheelers, buses, trains, trams, metro and domestic air) reached 202 Mtoe in 2010 or an increase of 19% since 1990 (0.9% per year).

Cars represent the largest share of consumption with 86%, followed by buses with 5.4%, air with 4.2% and two-wheelers and rail (trains, trams, metro) with 2% each.

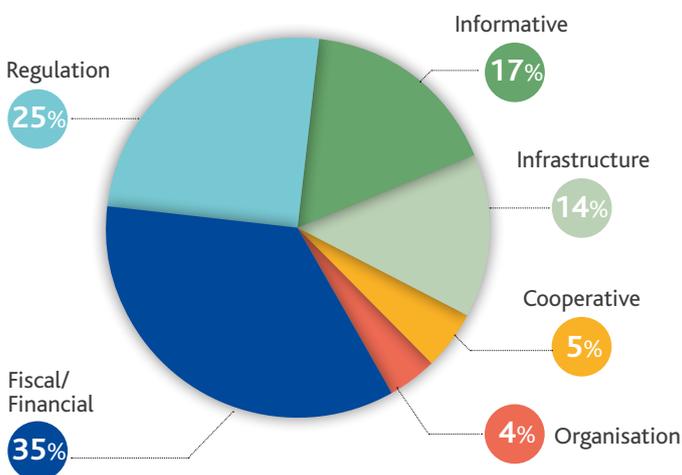
/// TAXES ON MOTOR FUELS ARE SIGNIFICANT ALTHOUGH NOT USUALLY EARMARKED FOR ENERGY EFFICIENCY

Taxes on motor fuels have an impact on consumption; however, these taxes are often raised for reasons that are not directly linked to energy efficiency. Only five countries (Germany, Finland, Sweden, Norway and Denmark) have implemented a tax that can be called "environmental" (green tax or CO₂), with part of their revenue used to support energy efficient transport modes. It should be noted, however, that these five countries do not have the highest taxes on motor fuels compared to other member states, such as Italy, the UK, Greece and the Netherlands.



Source: ODYSSEE

Fig. 26: DISTRIBUTION OF MEASURES FOR PASSENGER TRANSPORT



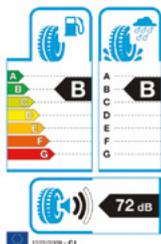
Source: Mure 2013, Enerdata calculations

/// PREDOMINANCE OF FINANCIAL AND FISCAL MEASURES

Fiscal and financial measures represent almost one third of the energy efficiency measures or passenger transport in the EU. Regulations, which represent 25% of the measures, are mainly Directives on energy labelling for cars and tyres, CO₂ emissions standards for cars, or at the national level, technical inspections of vehicles and enforcement of speed limits. The measures related to information represent a significant proportion (17%) to promote a better use of cars (eco driving, promotion of alternative modes, cycling, walking).

A new regulation has been adopted in April 2009 on mandatory emission standards for new cars, following the failure of the voluntary agreements signed in 1998 between the EC and associations of car manufacturers, such as ACEA (European Automobile Manufacturer's Association). The standard has been set at 130 g CO₂/km in 2015 for each car manufacturer, with a target of 95 g CO₂/km in 2020 (against 136 g CO₂/km in 2011). Financial penalties for car manufacturers are foreseen in case of non-compliance with these emission levels. Most European countries have also implemented speed limits (initially established for security reasons) and mandatory periodic inspections for vehicles to ensure a minimum level of performance and safety. Although these regulations have not been set up for the promotion of energy efficiency, they have a certain impact on consumption.

Car labelling was introduced in the EU in order to provide specific information on fuel consumption and CO₂ emissions of new passenger cars offered for sale or lease (Directive No. 1999/94/EC). This label must be affixed to each new passenger car model or displayed near it. The Directive also requires countries to publish a guide on fuel consumption and CO₂ emissions for all new passenger car models available for purchase in the member states.



The Directive (n° 1222/2009) requires labelling for new tyres with respect to fuel efficiency and other essential parameters such as wet grip and external rolling noise. This measure came into force in Europe on November 1, 2012.



Financial and fiscal incentives for the purchase of more efficient vehicles

Most energy efficiency measures for passengers are financial and fiscal incentives to purchase efficient vehicles.

/// VEHICLE TAXATION ACCORDING TO THEIR ENERGY AND/OR CO₂ PERFORMANCE

Initially, taxes on the purchase of vehicles or annual circulation taxes were based on the fuel type, the engine size or the weight of the vehicle. In many countries, these taxes now include an energy efficiency or CO₂ emissions criterion. Car purchase taxes, based on the energy and/or CO₂ performance, have been introduced in 15 EU countries during the 2000s (and even since 1992 in Austria). These purchase taxes can also be combined with a subsidy for the least polluting vehicles, such as with the "bonus malus" system in France and Austria since 2008.



BONUS MALUS IN FRANCE

The bonus malus system is one of the most important measures decided in France following the "Grenelle of Environment" (2008). Cars with relative low specific CO₂-emissions get a subsidy (called "bonus") and cars with high CO₂-emissions have to pay a tax. The subsidy is deducted from the purchase price of the new car: it ranges from 7000€ to 200€ for vehicles emitting from 20 g to less than 105 gCO₂/km (2013). Beyond 135g, a tax (called malus) is applied from 100 to 6000€ (vehicles emitting between 140 and more than 231gCO₂/km). In France the average emission of new vehicles was 127gCO₂/km in 2011, 22g less than before the introduction of the system. On average, the overall CO₂savings for new cars sold in 2011 are estimated at around 90kt. These savings are equivalent to the annual emissions of 45,000 vehicles.

In 2011, only 5% of the new vehicles sold belonged to class A (vehicles emitting less than 100gCO₂/km), 41% to class B (less than 120 gCO₂/km) and 35% to Class C (less than 140 gCO₂/km); these results are encouraging, because the share of the less efficient cars (label D to G, above 141 gCO₂/km) dropped from 35% in 2008 to 18% in 2011; in 2011, 32% of new vehicles sold have received a bonus (50% in 2010) and 11% a tax (9% in 2010), the change of scale in 2011 explaining these differences.

Some countries (7) have also set up a system of annual registration tax related to energy or environmental performance. This is the case in Denmark in 1997, the United Kingdom in 1998, France (for company cars only) and Sweden in 2006, the Netherlands and Ireland in 2008 and Finland in 2010.

/// GRANTS FOR ELECTRIC VEHICLES

Some countries intend to accelerate the diffusion of electric vehicles through subsidies for the purchase of new vehicles. Spain has a very ambitious target of 2.5 million electric vehicles by 2020, or 10% of the car stock. France, the UK and Germany also have ambitious targets with 2 million electric cars for France, 1.55 million for the UK and 1 million for Germany. However, the development of electric vehicles will have to be accompanied by quantitative targets for the implementation of charging stations across the countries as well as a standardization of plugs.

/// SCRAPPAGE SCHEMES: A TEMPORARY MEASURE TO RENEW THE VEHICLE STOCK

Scrappage schemes are financial and temporary measures to further drive the replacement of old inefficient vehicles with new more fuel efficient vehicles. In most countries, car scrappage schemes for old inefficient cars have been combined with incentives for purchasing new, efficient or low CO₂ emitting cars. About half of EU countries have implemented one or more scrapping schemes over different periods. The Italian experience, set up from 2007 to 2009, is particularly interesting because it did not require the owner of the car scrapped to buy a new car. In fact, the choice was left to the owner of the vehicle to replace his car or to get a grant of € 150 and an annual subscription to public transport or 800 € for car-pooling. Even if scrappage measures have been implemented in several countries, these schemes are often criticized because they primarily aim to temporarily boost sales of new vehicles and are costly for the public budget.



/// REDUCE CAR USE

The implementation of urban road pricing (London since 2003, Stockholm since 2006 or Milan since 2008) has decreased significantly the number of vehicles in city centres and reduced emissions and pollutants. Coupled with an offer of car park and public transport, these tolls are intended to encourage the use of public transport and decongest the city centre. After 10 years of experience, it is estimated that the traffic in London has fallen by about 20% and the traffic congestion has been reduced by 1/3. The number of vehicles traveling to London every day decreased by 60,000, which corresponds to a decrease of CO₂ emissions of around 150 kt per year. However, these tolls are criticized because they mainly benefit drivers who can pay the toll, and on the opposite would prejudice other users with no alternative transit through the city centre for their travel (e.g. inter-suburban trips). In addition, the high costs of operating for such tolls are also highlighted.

Limit the use of cars and promote public transport

Beyond regulations, financial and fiscal measures, several countries have launched information and awareness campaigns for a better use of cars and the promotion of public transport.

Eco-driving often refers to driving techniques that reduce fuel consumption (by up to 15%) and limit greenhouse gas emissions. Several countries such as Austria (Klima Aktiv program Mobil), the Netherlands (Het Nieuwe rijden), Germany, Spain, Denmark, Finland, Sweden and most recently Estonia and Lithuania consider eco-driving as an interesting measure that could generate substantial fuel savings. For decades, training in eco-driving has been mandatory in Switzerland for professional drivers (bus drivers, trucks ...) and more recently, in 2007, a similar device is mandatory for car drivers.

Car pooling consists in maximizing the number of passengers by car journey to the same destination. Several countries, including Austria, Belgium, Germany or the Netherlands have developed car pooling systems with dedicated parking spaces or traffic lanes to make car pooling more attractive. In the Netherlands, there are "lifters plaats" which consist of a 1 kilometre sidewalk to access highways. These sidewalks secure commuter travellers and are useful both for drivers and hitch hikers.

Car sharing is a system in which rather than having a personal car, users can have access to a car when they need it. The rest of the time, the car is used by other members. Several countries have already developed successful car sharing systems. In Belgium, Taxistop has created a system of car sharing in 2002, with cars available in more than fifteen cities in Flanders, Wallonia and Brussels. In the UK, there is also a very rapid development of car sharing, especially in London. Streetcar, established in 2004, now has more than 80,000 users. Car sharing is also very developed in Switzerland, where the operator Mobility CarSharing Switzerland has nearly 100,000 users, with more than 2,200 vehicles available in more than 1,150 stations.

According to studies, each car sharing vehicle replaces at least 4 to 8 private vehicles. At the

same time, between 20 and 30% of customers would also be willing to give up their cars or delay its acquisition.

Some countries have invested to focus on **improving and promoting public transport**, such as bus companies in Cyprus or the modernization of trams in the Czech Republic. Major investments in the supply of public transport with a strong improvement of rail infrastructure were initiated in various countries, such as Finland or Romania. Other countries promote urban mobility planning resulting in the development of alternative modes of transport to cars: public transport, motorcycles, walking etc. Public policies can also encourage mobility plans for employees (or students) to easily reach their place of work (or studies) without using cars (business travel plans, travel plans for administrations or schools in France).

Some countries also restrict the access to the city centre to promote public transport, the use of the bicycle or walking (Austria, Finland, and Germany).



THE AUSTRIAN EXPERIENCE FOR MOBILITY MANAGEMENT: AKTIV MOBIL

The Austrian initiative, klima aktiv mobil, also known as the National Programme to promote Mobility Management, has been undertaken by the Austrian Federal Ministry of Agriculture and Forestry, Environment and Water Management and supported by the Austrian Chamber of Commerce, the Austrian Association of Cities and Towns and the Austrian Association of Municipalities, as part of the implementation of the Austrian Climate Strategy and the EU Climate and Energy Package. This programme targets companies, public administrations, schools, local communities, tourism, leisure and real estate. The programme provides various kinds of support: advice for the development and implementation of action plans, campaigns on eco-driving or soft modes (bike2business), financial support, awards etc. Since 2007, the program has brought a financial contribution of around €42.5 million, induced investments of up to €271 million and created more than 3,000 "green" jobs. The programme has supported more than 1,800 companies, communities, cities and regions which led to a decrease in CO₂ emissions of 450 tons per year.

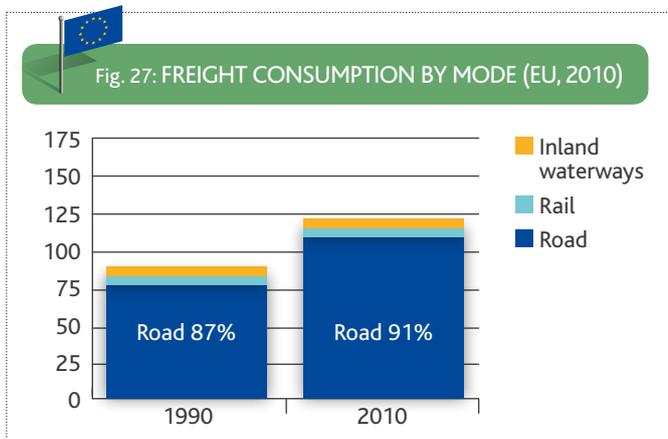


TRANSPORT OF GOODS

Few energy efficiency measures for freight transport despite the rapid growth of the sector

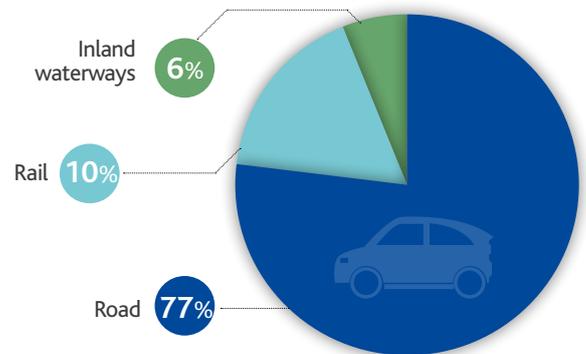
/// INCREASING SHARE OF ROAD FOR FREIGHT TRANSPORT

The energy consumption of freight rose sharply until 2007 (2.1% /year from 1990 to 2007), driven mainly by the increase in road transport (2.4% / year). Since 2007, this consumption is decreasing (-1.8% / year) due to a sharp drop in traffic because of the economic crisis (- 2.4% / year). Trucks and light trucks account for over 90% of the freight consumption and this share keeps growing: +4 points from 1990 to 2010. The share of road traffic increased by 11 points since 1990 and represented 77% of total freight traffic in 2010. However, in some countries, a reverse trend can be observed with an increase in rail and water transport: this is the case of the Netherlands, Belgium and Austria, with a share above 30% for these two modes.



Source: ODYSSEE

Fig. 28: DISTRIBUTION OF FREIGHT TRAFFIC IN THE EU (2010)



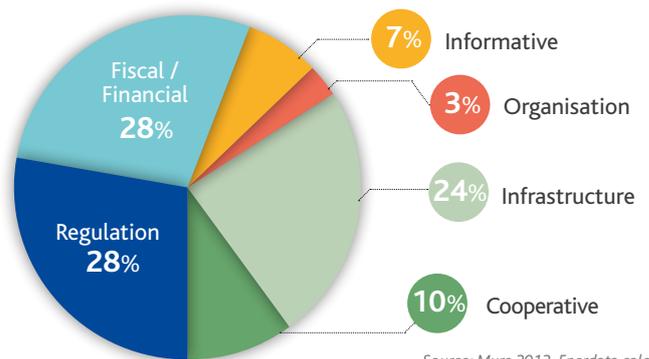
Source: ODYSSEE

/// 30% OF MEASURES IN TRANSPORT RELATES TO FREIGHT

Among all the energy efficiency measures implemented in the transport sector in the EU, 30% relate to freight transport. One-third of these measures are financial or fiscal measures, including the introduction of road tolls or taxes based on the amount of kilometres driven.

Regulations, which also account for about 30% of the measures, mainly concern the European CO₂ emission standards for light commercial vehicles, speed limits and vehicle technical inspections. Measures related to infrastructures (about ¼ of the measures) concern the promotion of combined transport. Finally, 10% of the measures correspond to voluntary agreements ("cooperatives" measures).

Fig. 29: DISTRIBUTION OF MEASURES BY TYPE



Source: Mure 2013, Enerdata calculations

Promotion of efficient vehicles and modal transfers



/// PROMOTION OF MORE EFFICIENT VEHICLES

The European regulation n° 510/2011 requires a reduction of CO₂ emissions of new light commercial vehicles with a maximum threshold of 175 gCO₂/km in 2017 and 147 gCO₂/km in 2020. Manufacturers who fail to achieve the targets will have to pay a penalty of €95/gCO₂ per vehicle sold in excess.



// PROMOTION OF COMBINED TRANSPORT

Many countries seek to promote combined transport, in order to reduce the share of road transport, through taxes or road tolls and financial support to infrastructures.

Austria, Germany, the Netherlands and Poland have introduced a tax for goods transport depending on the kilometres driven. France is implementing a comparable measure on main roads.

Austria was the first country to implement this system in 2004 for trucks over 3.5 tons. This measure led to a 3% decrease of the average distance travelled per ton carried and encouraged modal shift to rail.

Several countries such as the Czech Republic, Hungary and Slovakia have introduced road tolls depending on categories of vehicles and size.

TOLLS IN GERMANY

In January 2005, the German government has introduced a tax for trucks over 12 tons, based on the mileage, the level of emissions and the type of axle (LKW Maut). This tax applies to one third of the road network (12,000 kilometres of highways and 1,135 km of national roads, out of a total network of 40,000 km).

Since January 2009, the amount of the tax has reached 16.3€cents/km. A system control by GPS was introduced to monitor truck traffic. The potential of emission reduction is estimated between 3 and 5 MtCO₂/year. Revenues collected each year from the tax (€3 billion collected in 2011) are assigned to road maintenance and a small percentage goes to the development of railways and waterways.

► www.bmu.de



In 1991, The EC launched a support for rail freight which has resulted in the establishment of Directives gathered in the "railway packages" to create and promote unified European rail freight. Countries such as Poland, Spain, the United Kingdom and Germany are planning to invest in the renovation of existing lines and the purchase of new carriages.

In the framework of the Grenelle Environment, the French Government is committed to increase the share of non-road transport (rail and waterway) from 14% to 25% by 2022. In this context, ADEME provides financial support to carriers and shippers to carry out feasibility studies for the development of combined road-rail or road-water transport (maximum 50-70% of eligible costs and within a limit of 100 000€).

Some countries, such as Belgium, also provide subsidies for the transport of goods by rail.

Mobilisation of stakeholders through voluntary agreements; optimization of the supply chain

To mobilize the stakeholders, several countries, including Finland and France, have introduced voluntary agreements with transport companies based on advice, training and financial subsidies. Another approach pursued by some countries is to better organize the supply chain, optimizing travel and the vehicle load, including the increase of the maximum load capacity of trucks.

// VOLUNTARY AGREEMENT IN FRANCE

The Ministry of Ecology, Sustainable Development, Transport and Housing and ADEME, in cooperation with professional organizations, introduced in 2008 a charter of voluntary commitments to reduce CO₂ emissions for the transport of goods entitled "Target CO₂ Carriers undertake". As of January 1, 2013, 794 companies have signed the charter. The potential of CO₂ reduction at the end of the three years of action is estimated by ADEME at 633 kt/year.

// CARRY MORE

A solution to reduce the cost of transport is the use of large trucks called "mega-trucks" or "eco-combi" that are more than 25 meters and are able to carry more than 60 tons. These trucks are already common in large countries such as Canada, the United States and Australia. In Europe, the first eco-combi appeared in Sweden and the Netherlands in 2000. However, these trucks are controversial for security reasons, due to their size which is often an obstacle in manoeuvres and road damages.



THE VOLUNTARY APPROACH IN FINLAND

The signature of voluntary agreements for freight and logistics was signed in 2008 by the Ministry of the Environment, Transport and Telecommunications, the Ministry of Employment and Economy, the

representatives of the Association "Finnish Transport and Logistics - SKAL" Association logistics companies "LL" and the railway VR. The overall objective of the program is to reach at least 9% improvement in energy efficiency for freight and public transport over the period of 2008-2016, involving 60% of the companies of the sector. A set of energy performance criteria has been defined, both in the procurement of transportation services and the extension of eco-driving and technical measures, such as tire pressure, controls or vehicle maintenance. The transport companies that adhere to this programme are committed to improve their consumption and establish a system of energy management (annual report on consumption). According to the National Energy Efficiency Action Plan, one third of the energy savings target in transport in 2016, i.e. 4.25 TWh (0.37 Mtoe), should be achieved through the implementation of voluntary agreements of transport companies.

► www.motiv.fi



AGRICULTURE

Few energy efficiency measures in agriculture

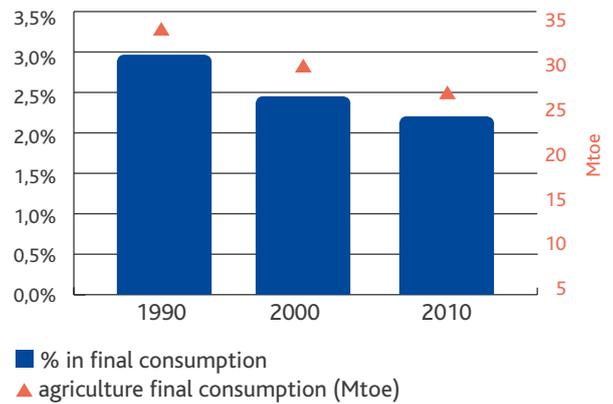
Only a few measures target the agriculture sector, and there is no specific European policy or directive dedicated to agriculture. Today, the only objective at the European level is to promote energy production from agriculture (sustainable plan for biofuels with grants and audits). Towards 2020, "The future Common Agricultural Policy will promote energy efficiency, carbon sequestration, biomass production and renewable energy and more generally innovation" (source: CAP towards 2020, Europa). At MS level, half of the NEEAP do not mention agriculture. Overall, only a dozen measures target agriculture specifically: very little regulation, and predominance of financial measures (via voluntary agreements). This limited number of measures is explained by the fact that agriculture represents a very low part of total final energy consumption.



/// AROUND 2% OF FINAL CONSUMPTION IN 2010

Agriculture is the least important sector in terms of final energy consumption in Europe, with 2.2% in 2010. Since 1990, its share and consumption have steadily decreased (annual decrease of 1.3% of agriculture consumption). However, some countries like the Netherlands, Denmark, Norway, Poland and Greece still have a significant share of agricultural consumption which is over 5%.

Fig. 30: SHARE OF FINAL AGRICULTURE ENERGY CONSUMPTION IN EU



Source: ODYSSEE



In Spain, to promote energy efficiency and to highlight potential energy savings, a training programme has been launched over the period 2011-2020 to implement specific actions to teach farmers, fishermen and cattle breeders how to use energy efficiently in their equipment. This measure proposes grants (total available budget for 2011-2020: 9.7 M€). There are also other specific measures implemented in the frame of the NEEAP to improve energy efficiency of some agriculture branches. For instance, energy audits and action plans to increase efficiency in farms, energy efficiency plans for fishing, energy efficiency plans of irrigation systems and the promotion of pulverization systems. For tractors a specific plan has been set (Tractor RENOVE Plan). In this frame, IDAE and the Ministry of Agriculture have developed a methodology to classify farming tractors according to their energy efficiency.

Source: NEEAP Spain <http://www.idae.es/index.php/id.82/reلمenu.340/lang.uk/mod.pags/mem.detalle>

Voluntary agreements and financial incentives to support energy efficiency in agriculture

In Finland, voluntary agreements between the government and public/private stakeholders are very common. Today, they cover 60% of final energy consumption, and include the agriculture sector. Farms benefit from subsidised energy audits and subsidies, and the amount of grants are calculated according to the potential energy savings stemming from these audits. Controls and compliances are implemented in the frame of these voluntary agreements in order to get feedbacks and evaluations of the real energy savings.

VOLUNTARY AGREEMENTS IN THE NETHERLANDS

Horticulture and greenhouses are highly developed in the Netherlands, and are very energy intensive activities (e.g. heating and lighting in greenhouses). Energy consumption represents about 20% of the final cost of products. In order to improve its energy efficiency, in 1997, this sector signed long-term agreements (Greenhouse Horticulture and the Environment Agreement-GLAMI). In 2011, it was followed by the CO₂ equalisation system. This system is supported by the innovative programme Greenhouse as Energy Source. The core of this programme is a set of long-term agreements for energy-efficiency improvement, CO₂ reduction and innovation. They set energy efficiency objectives for intensive cultures, greenhouse farming, and in return, receive grants (up to 70% of investment cost) or a deduction in energy taxes. Between 2007 and 2011, horticulture and mushroom growing have signed agreements implying a complete exoneration of the energy tax: this resulted in a 2% decrease of sector energy consumption in 2010.

► http://ec.europa.eu/agriculture/stateaid/decisions/n39607_en.pdf

The Netherlands implement voluntary agreements to increase energy efficiency in industry, services and agriculture. The majority of energy intensive sectors have already renewed this type of agreement entitled "long-term agreements". Firms implementing long-term agreements are not subject to new specific national actions on climate change.



FINANCIAL INCENTIVES IN FINLAND FARM LAND REPARCELLING PROJECTS IN FINLAND

The size of farms has increased, but the extra land is often situated far away from the economic centre of the farm and is small in size. Reparcelling is a way of updating the structure of farms and of optimising rural land use. There are currently hundred reparcelling projects in progress. The government proposes grants that are dedicated to the reparcelling project in order to decrease investment costs. These grants are financed thanks to a specific budget line, and their amount is fixed case-by-case. Between 1995 and 2010, 141,555 ha (or 6.2% of total agriculture area) have been reparcelled. Distance travelled by tractors has been decreasing by 30%, or 140,000 km per year, leading to a decrease of 0.1% of agriculture energy consumption (8 GWh/year, or 688 toe).
► Source: NEEAP Finland



SUBSIDIES FOR BIOMASS BOILERS IN FINLAND

As many farms are self-sufficient in the production of wood chips, switching to biofuels is generally a cost effective investment. The Ministry has granted investment subsidies for switching boiler fuels from fossil fuels to biofuels (wood chips or energy crops). Applications for support have to be made through the local office of the Rural Affairs Divisions. The investment support is either a soft loan (subsidized interest rate for 50–80% of the investment) or a grant (maximum amount 15–30% of eligible costs). Between 1996 and 1999, 330 projects, representing a capacity of 5.5 MW/year, have been submitted per year, and 250 projects per year between 2001 and 2005 (28 MW/year). In 2007, there were an exceptionally large number of applications; since the aid was opened up to piggeries and poultry establishments, and the total capacity of the applications reached approximately 165 MW. In 2008–2009, total capacity fell by approximately 40–50% because of budget reductions, and even more in 2010.

► Source: NEEAP Finland



CROSS-CUTTING MEASURES

Beyond sectoral approach, cross-sectoral measures aim at triggering additional energy savings in several sectors

The main obstacle to energy efficiency is financing investments. In the 2000s, new policy instruments have been developed to address this problem. They target several sectors at once (transport, buildings, industry, agriculture ...) and may involve several types of stakeholders (firms, households, government). Examples of cross-sectoral measures include energy taxes, white certificates (or energy saving certificates-ESC), or energy efficiency funds. ESCOs can be likened to cross-cutting measures, since they target all sectors, in the same way as information campaigns and communication.



/// FACILITATION OF ENERGY SERVICES AND ESCO MARKET IN EUROPE

A development of ESCO's market is one of cross-sectoral measures supported by EU to mobilize energy savings, especially since the adoption of the ESD. The EED (2012) reaffirms the necessity for each Member State to have a well-organized and efficient market of energy services to reach 2020 energy efficiency objectives. In addition, the next NEEAPs include an obligation to provide a qualitative review of current and future development of the energy services market.

An ESCO invests instead of the consumer and is compensated from the resulting savings under different types of contracts, and in particular the energy performance contracts (EPC). These latter are contracts on guaranteed savings (i.e. results) between the consumer and the ESCO. Germany is one of the first European countries to have implemented EPCs with ESCOs.

Eco taxes and energy efficiency funds

Energy taxes can encourage consumers to a more rational use by increasing the end-user cost of energy. They also improve the profitability of energy saving investments by reducing pay-back times. Although energy has always been heavily taxed in European countries, apart from any intention of energy efficiency (especially for motor fuels), some countries have integrated energy taxation as an energy efficiency policy tool. This is the case of Germany and the UK, with respectively a set-up of an energy tax and a fuel escalator that led to a steady increase in taxes. This is also the case of countries that have introduced a CO₂ tax in the early 90s (Finland, Sweden, Norway, and Denmark). Other countries have introduced special taxes on energy, such as Denmark in the "Danish Saving Trust", or in the UK as part of the Carbon Trust. For businesses, these taxes are generally designed to ensure tax neutrality since their application is usually accompanied by a reduction in other taxes (mainly on labour) so as not to affect their competitiveness.

Energy efficiency funds allow for greater stability and better management of financial aids to support energy efficiency investments. Sustainability of resources can even be achieved by funding supplied, for example, from dedicated taxes. Their scope of action is often national, but it can be international (JESSICA revolving fund established in Eastern Europe), regional or local (e.g. Proklima Fund in Hannover, Germany).

/// ECOTAX CAN GENERATE REVENUES TO FINANCE ENERGY EFFICIENCY

Energy efficiency funds supplied by dedicated taxes allow steady financing. This is, for instance, the case of the Danish Saving Trust, or in Poland with the implementation of the "Priority Program of the National Fund for Environmental Protection and Water Management et Energy loan for energy saved". This latter is funded from the revenues of various penalties and taxes enforced by Polish laws and regulations. These funds have also the advantage to be less dependent on the annual budget allocations from conventional government programmes. Funds can be also supplied from emission quota sales.



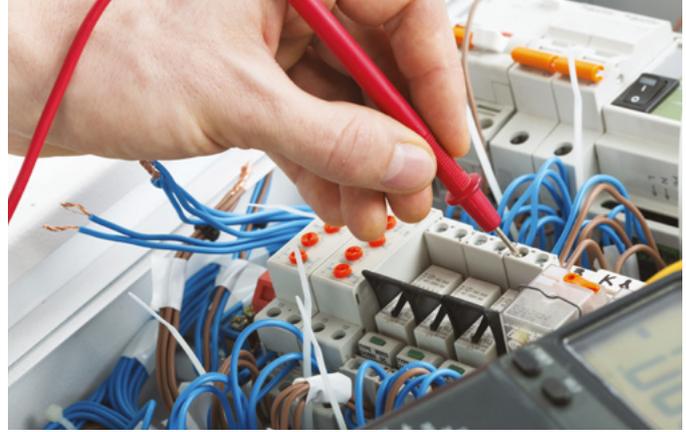
The Danish Energy Saving Trust (DST) is an independent authority under the Ministry of Climate and Energy. Its objective is to promote and to invest in energy efficiency projects in the residential, industrial and service sectors. Each sector is treated separately and has dedicated targets in order to maximize the overall impact.

DST is financed by a fund coming from a special energy tax payable by households and public sector.

This tax corresponds to a charge of DKK 6/MWh (or 0.80€/MWh). In 2009, the programme initiated 150 GWh (or 12,9 ktoe/year) of energy savings in all sectors.

► <http://www.savingtrust.dk/>

Fiscal revenues can be also reinvested, as in Switzerland, for climate protection projects in order to meet the commitments signed at international level, such as the Kyoto Protocol.



Stiftung Klimarappen
Fondation Centime Climatque
Fondazione Centesimo per il Clima
Climate Cent Foundation



In Switzerland, The Climate Cent programme was created in the framework of the Kyoto Protocol to help the country reduce its greenhouse gas emissions, including CO₂. The Federal Council decided in 2005 to levy a climate tax on motor fuels. The Climate Cent Foundation is thus funded by a charge levied on all petrol and diesel imports at a rate of 1.5 cent per litre. Climate Cent revenues have to be invested in projects aiming at reducing emissions, as well as in climate protection measures in Switzerland. Mobility, building and heat recovery projects are in the foreground. Between 2008 and 2012, this measure has permitted 0,237 MtCO₂ of emissions reduction thanks to the implementation of 8600 projects.

► <http://klimarappen.ch/fr/home.html>



/// ENERGY EFFICIENCY FUNDS IN PUBLIC/PRIVATE PARTNERSHIP

The creation of public/private entity dedicated to finance energy efficiency projects such as building energy rehabilitation, is becoming common. Indeed, rehabilitation requires long-term capital, and loans with low interest rates. One of the European flagship programme includes KfW in Germany (see chapter on renovation), a powerful measure for channelling capital to the energy renovation. This program permits renovations, with long-term financing and at a low-cost, without burdening the public debt.

Also, funds supplied by taxes can represent innovative financing sources for energy efficiency projects, especially in the public sector. The UK, through its Carbon Trust, has established several financial mechanisms or revolving funds. The Carbon Trust is funded from a national tax on electricity, gas and coal, titled the Climate Change Levy. In this programme, the trust provides loans to organizations providing necessary funds and creates a "protected" energy efficiency fund. SMEs and industries are the main targets of these funds. For the public sector, there is also a specific revolving fund called Salix.



In the UK, Salix is a non-profit organization that provides revolving soft loans to public bodies willing to increase energy efficiency. In order to do this, Salix has a fund of €100 million (2011) derived from the Carbon Trust. Salix puts this fund at the disposal of its promoters. To date, the fund has supported about 4,000 projects with more than 600 different public actors. In 2010, approximately 700 GWh and 124 ktCO₂ were saved thanks to Salix.

► <http://www.salixfinance.co.uk/>



/// ENERGY EFFICIENCY FUNDS SUPPORTED BY PUBLIC SECTOR INCOMES

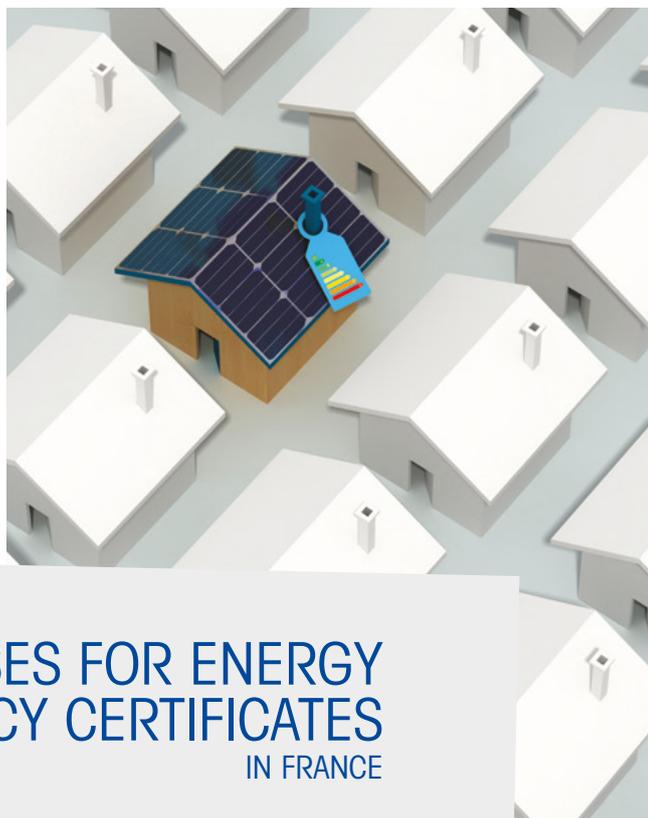
There are also public funds based on strong financial supports involving various financing from EU structural funds, public and private investors, banks and international financial institutions. This is the case of the JESSICA fund (Joint European Support for Sustainable Investment in City Areas), an initiative of the EC in cooperation with the European Investment Bank (EIB) and the Development Bank of the Council of Europe. JESSICA allows managing authorities of structural funds to use a portion of the grants received from the EU structural funds, to make refundable investments in projects forming part of a sustainable integrated urban development plan.



Energy savings obligations and energy saving certificates

Financial and fiscal incentives, as presented in previous chapters, are powerful to encourage consumers to make investments to purchase efficient equipment. However, their impact can be increased by setting energy savings obligations for energy utilities. The aim of this measure is to get energy suppliers ("obliged bodies") to achieve a certain amount of energy savings with their consumers, and receive, in exchange, ESC.

The obliged bodies can either achieve their required energy savings, buy certificates from other obliged bodies or possibly from other non-obliged bodies, or pay a fee. In Europe, the UK, Italy, France, Denmark, Ireland and more recently Poland such a measure has already been implemented. The EED requires each MS to create an energy saving obligation system with an ambitious target of 1.5% per year of energy savings based on the sales of obliged utilities (excluding the transport sector) (average of the last three years) .



THREE PHASES FOR ENERGY EFFICIENCY CERTIFICATES IN FRANCE

Since 2006 in France, ESC (also known as white certificates), require electricity, gas, oil, heat and cooling utilities, as well as motor fuel suppliers (since 2011), to achieve energy savings by giving incentives to their customers to purchase new efficient equipment. Each obliged body has, over a three year period, an amount of savings to gather which is set according to the company market share. In France, the volume of energy savings are measured in kWh cumac (contraction of "cumulated" and "discounted"), which correspond to the discounted lifetime energy saving. To be effective, energy savings actions have to be certified. If case targets are not achieved, there is a penalty of 0.02€ for each missing white certificate.

During the second phase of white certificates (2011-2013), the obliged bodies had to save a total of 345 TWh cumac. This measure was also opened to other bodies, so-called "eligible" (such as local authorities or social landlords), who can certify their own energy saving actions, get certificates and exchange them on the market.

The first two phases yielded excellent results. Indeed, from 2006 to 2009, the target of 54 TWh cumac was exceeded by 120%, and the target of 345 TWh, to be reached at the end of 2013, was completed in late February 2013. More than 2/3 of the white certificates have been awarded for the installation of efficient heating equipment (condensing boiler essentially).

The third phase (2014-2016), following the Energy Efficiency Roundtable (end of 2011), should be twice as ambitious to be in line with the objectives set by the EED.

► <http://www.certificat-economies-energie.com/>





ENERGY EFFICIENCY, VECTOR OF EU NEIGHBOURHOOD POLICY

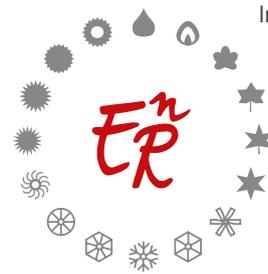
EU promotes the implementation of energy efficiency policy and encourages neighbouring countries to integrate European standards and regulations

Energy is a key issue of the EU "neighbourhood policy". Indeed, most of its energy depending from outside its borders (60% gas and 80% oil) comes from countries that have been defined as "strategic" by the EU energy security. These regions include Central Asia, the Caspian region, North Africa and sub-Saharan Africa. Some of these countries are also suppliers of raw materials, which strengthens their strategic nature. During the last decade, the tensions on energy transit with Russia, and the rapid change of the political landscape in the Mediterranean region have prompted the EC to take actions and create partnerships to ensure the security of its energy supply.

In 2007, a proposal presented a variety of measures to establish an energy policy that would tackle climate change while boosting energy security and competitiveness. An action plan followed, emphasizing the need for an external energy policy that brings together consumer, producer and transit countries. Under the heading 'International partnerships', action points included the strengthening of energy efficiency in energy and trade treaties, agreements, dialogues and other cooperation arrangements. The EU's key energy partners are Russia, Norway, the US, India, China and OPEC. Energy dialogues are underway with each partner. Memoranda of Understanding has also been signed with key energy partners, while regional cooperation initiatives such as the Black Sea Synergy, the Eastern Partnership, the Union for the Mediterranean and the Central Asia Strategy also contain energy components.

▶ http://eeas.europa.eu/energy/index_en.htm

The Eastern Partnership (EP) launched in 2009 further reinforced the EU involvement in six Eastern countries: Armenia, Azerbaijan, Byelorussia, Georgia, Moldavia and Ukraine. The EP introduced a cooperative framework articulated on four multilateral themes. One of them is energy security and covers questions on energy interconnection, energy market integration, energy efficiency and renewable energies. Finally in 2006, still in the same geographical area, the treaty established an Energy Community of South-East Europe and implemented the legal framework for an integrated market of electricity and natural gas networks that came into force. This community extends the EU internal energy market to new EU countries of Central and South-East Europe, thanks to an international treaty. Its main objective is to create legal and business frameworks that are steady and favourable to investments, and to enable a steady and continuous energy supply. In addition, participating countries undertake to implement the European achievements concerning electricity, gas, renewable energy, energy efficiency, competition, environment and security of supply.



In the field of energy efficiency, examples of cooperation and of sharing experience include the welcoming of neighbouring countries in political coordination structures, such as the European Energy Network (EⁿR) that brings together European energy efficiency and renewable energy agencies. Russia (since 2013) and Turkey (since 2011) are both EⁿR members. Ukraine intends to create

an energy centre, and the EU insists on launching an agreement as soon as possible, in particular to diversify European gas supply. The Mediterranean Association of National Agencies of Energy Conversation association – MEDENER - was created in 1997 and is made up of 12 organizations from both sides of Mediterranean basin, in charge of energy efficiency implementation and development of renewable energies.



Neighbouring EU countries strengthen their energy management: Russia, Turkey and Ukraine



Even though **Russia** has total energy independence and substantial funding, it is however facing problems inherent of abundance. In order to be less exposed to raw material price volatility, to end-consumers' waste, and the loss of industry competitiveness linked to exchange rate valuation, Russia has to make adjustments in its energy strategy.

The Russian Energy Agency was created in 2009 and joined EⁿR in 2013. It aims at facilitating the implementation of strategic policies in energy, and in particular in energy efficiency and diffusion of renewable energies. The federal law n°261 on energy efficiency was adopted in 2009, and the decree n°1 fixes a target of 2.5% of renewable energies in electricity production by 2015 and a share of 4.5% by 2020, corresponding to an increase of total renewable electricity capacity of 25 GW by 2020 (i.e. an increase of 10% compared to 2012 level). The objective set in energy efficiency in Russia is to decrease energy intensity by 40% by 2020 (compared to 2010 level). With that goal in mind, the government developed several initiatives, among which the co-financing of the best energy efficiency programmes promoting, in particular, the participation of the private sector, the implementation of incentive loans for firms willing to invest in long energy efficiency projects, or even the creation of an information platform on energy efficiency and renewable energies.

► <http://www.russiagogreen.ru/>

The energy is important in neighbouring relationships between the EU and Russia (more than 50% of Russian oil export and about 80% of natural gas exports were directed to the EU). An EU-Russia energy partnership was established in 2000 to discuss all common interest issues concerning the energy sector, including the implementation of cooperation in energy and infrastructure rationalization of production and transport, the possibility of European investments, and relationships between producer and consumer countries. There is a very active bilateral collaboration on these issues as evidenced by the creation of the Russo-German energy agency (RUDEA) in 2009, of the Franco-Russian Centre for Energy Efficiency (RFEEC) launched in December 2012, of the Finish-Russian energy club in 2010 or the Russian-Danish energy efficiency Centre (RDEEC) agency in 2011.

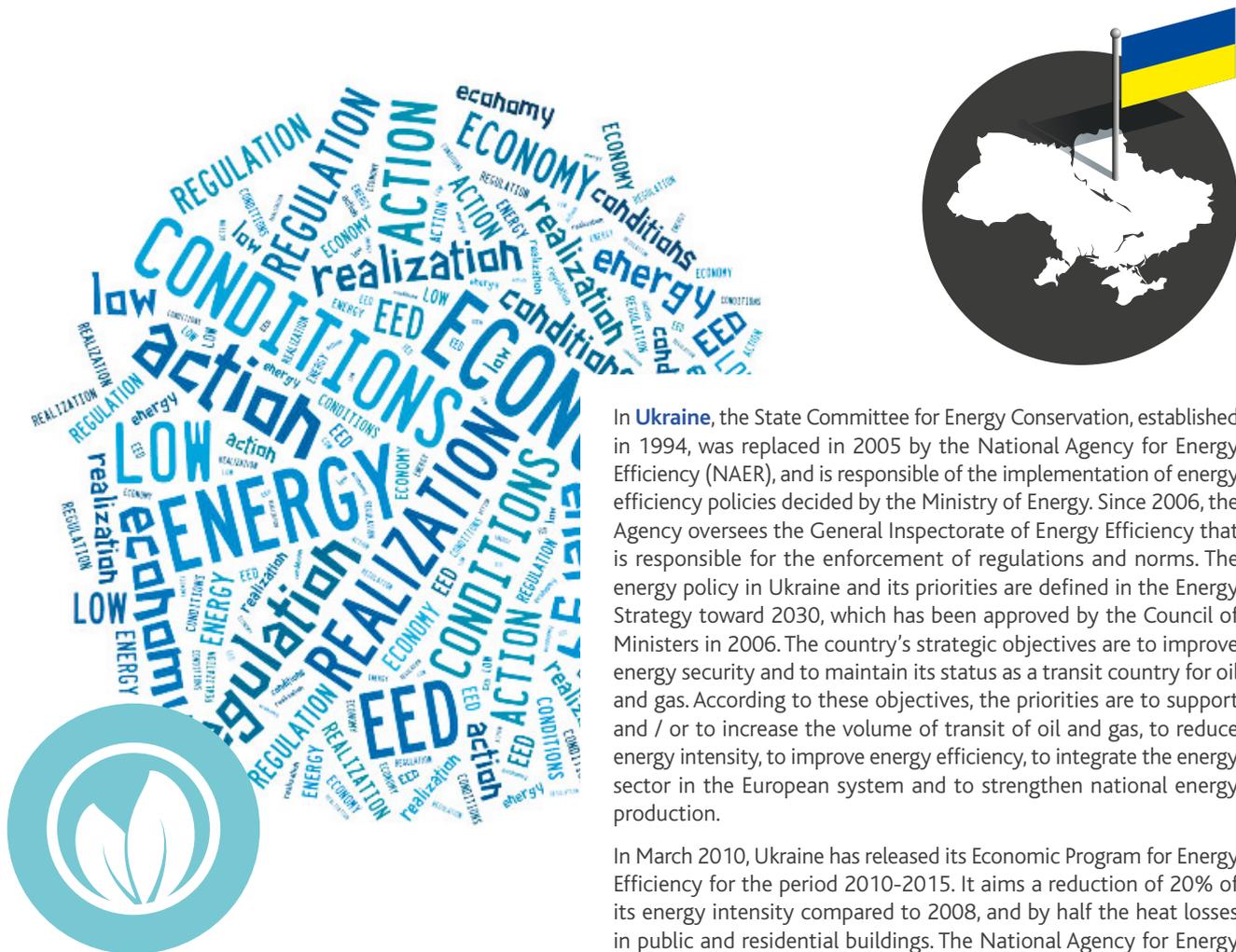




In **Turkey**, the energy sector legal framework is broadly in line with that of the EU and provides funding for the national energy efficiency program covering the areas of industry, production, transmission and distribution of electricity, buildings and transport. The set of energy efficiency improvements principles and procedures are gathered in a law on energy efficiency that was adopted in 2007.

Turkey targets to reduce its primary energy intensity by 10% by 2015 and 20% by 2023 compared to 2008 levels. The energy saving potential identified in national report represents 30% in the residential sector, 20% in industry and 15% in transport (source MEDENER, Energy Efficiency in the South and the Eastern Mediterranean). Total potential energy savings is estimated at 14 Mtoe per year, or about \$3 billion. The General Directorate of Renewable Energy of the Ministry of Energy and Natural Resources contribute to the development and the promotion of energy efficiency in Turkey and is part of the E²R club.





In **Ukraine**, the State Committee for Energy Conservation, established in 1994, was replaced in 2005 by the National Agency for Energy Efficiency (NAER), and is responsible of the implementation of energy efficiency policies decided by the Ministry of Energy. Since 2006, the Agency oversees the General Inspectorate of Energy Efficiency that is responsible for the enforcement of regulations and norms. The energy policy in Ukraine and its priorities are defined in the Energy Strategy toward 2030, which has been approved by the Council of Ministers in 2006. The country's strategic objectives are to improve energy security and to maintain its status as a transit country for oil and gas. According to these objectives, the priorities are to support and / or to increase the volume of transit of oil and gas, to reduce energy intensity, to improve energy efficiency, to integrate the energy sector in the European system and to strengthen national energy production.

In March 2010, Ukraine has released its Economic Program for Energy Efficiency for the period 2010-2015. It aims a reduction of 20% of its energy intensity compared to 2008, and by half the heat losses in public and residential buildings. The National Agency for Energy Efficiency prepares a National Energy Efficiency Action Plan to identify the necessary investments, the barriers to energy efficiency and the agencies that will be in charge of the deployment of national policy. In February 2011, the National Electricity Regulation Commission (NERC) has established a progressive electricity pricing (3 levels), as well as for gas (4 levels) for residential customers

Southern and Eastern Mediterranean countries

South and East Mediterranean Countries (SEMCs) are of strategic importance for the EU's energy security and cooperation. Indeed, the EU depends on the South and East for 35% of its gas and 22% of its oil, which represents respectively around 85% and 50% of their exporting volumes. SEMCs have a rapid population growth (2% per year), that may imply, if no energy efficiency policy is implemented, that there will be an increase in energy demand of about 150% in 2025 (source MEDENER, energy Efficiency in the South and East Mediterranean).

That is why energy efficiency policies have been gradually developed in the SEMCs, in particular in collaboration with European countries, to become one of the priorities of energy development plans in countries around the Mediterranean. Regulatory frameworks for the majority of SEMCs have evolved considerably over the last 5 years and now allow for the deployment of energy efficiency policies. The lack of common policies, however, shows that the commitment of the SEMCs in energy efficiency is very different from one country to another. Tunisia or Turkey, for example, are much more advanced, while energy-producing countries such as Libya and Egypt are much less. In general, the institutional and legal frameworks needed to develop a real market for energy conservation are in progress, although some can still be completed to be at once more visible, more sustainable and more efficient. The table below provides an overview of the scope of the legal frameworks of each country in terms of energy efficiency.

TABLE: LEGISLATIVE FRAMEWORKS FOR ENERGY EFFICIENCY IN SEMCs (SOURCE OME)

Algeria

The legal framework is consistent and covers all aspects of regulation, financing and implementation of energy efficiency policy. Framework Law No. 1999-09 of 29/07/1999 on the energy conservation was completed in 2000 and 2004 by two decrees on thermal regulation in new buildings (No. 2000-90) and on the procedures of elaboration of the national programme of energy conservation PNME (No. 2004-149).

Two other decrees followed in 2005, laying down specific energy efficiency requirements for equipment powered by electricity, gas and petroleum products (No. 05-16) as well as on the energy audit of major energy consuming institutions-EGCE (No. 05-495).

Since 2008, three ministerial orders determine the types of domestic appliances and define their energy classifications and the general provisions relating to the methods of organization and exercise of their energy efficiency control. Since 2009, three ministerial orders define the labelling of household refrigerators, freezers and their combinations, lamps and air-conditioners.



Egypt

The country has no real legislation specific to energy efficiency. The electricity draft law contains a chapter on improving the efficiency of energy use with items that relate to cogeneration, standards and labelling. The Egyptian Housing and Building Research Centre has nonetheless developed a building code on energy efficiency for residential and commercial buildings, as well as for administrative buildings. The Ministry of Housing and Urban Development has issued in 2005 a decree (482/2005) concerning the implementation of energy efficiency code for residential buildings.



Israel

Ambitious targets have been defined in a national energy efficiency programme, but the operational measures deployed cover very few areas. The only measures introduced to reduce electricity consumption relate to public institutions, ministries and local authorities. It lacks references to other economic sectors such as industry and buildings. The main laws in this area are:

- Law No. 5750-1989 on energy regulation
- Law No. 5753-1993 on energy labelling and monitoring of consumption
- Law No. 5744-2004 on energy efficiency of air conditioning, heating and electrical appliances systems



Jordan

A new law on renewable energy and energy efficiency was adopted in 2010 to improve energy efficiency in various sectors. Several energy efficiency codes have been developed in the building and solar energy as well as a system of tax exemptions to promote the use of energy efficient products. However, the legal framework is still to be completed.



Lebanon

There is still no specific law on energy efficiency. A legislative framework on efficiency is planned in the national energy efficiency plan recently presented to Cabinet. However, the time needed for review, approval and adoption by the parliament is uncertain.



Libya



There is no specific law on energy efficiency.

Morocco



A law on energy efficiency is being developed and it is expected to contain provisions for mandatory energy standards for buildings, mandatory audits and energy impact analysis for all new major projects. The final draft was delayed because of resistance from the industry against the mandatory audits.

Palestinian Territories



There is no specific law on energy efficiency. The Palestinian Centre for Energy and Environmental Research is working on a bill on energy efficiency.

Syria



Law No. 3 on the energy conservation that came out in February 2009 provides a statutory basis to adjust the energy efficiency and renewable energy to national economic sectors. Since 2008 Law No. 18 makes energy labelling of household appliances mandatory. It is also to mention the regulation of the thermal performance of buildings that came into force in 2007 and Law No. 32 on electricity adopted in 2011.

Tunisia



There is a strong regulatory framework consisting of laws and decrees promoting energy conservation. It includes among others, provisions relating to fiscal incentives for RE and EE projects (Decree 95-744); cogeneration (Decree No. 2002-3232); financing of EE (Law No. 2005-82, Law No. 2006-106, Decree 2005-2234 modified by Decree 2009-362), mandatory audits (Decree No. 2004-2144 , decree no. 2009-2269); energy services companies in the labelling of materials, electrical appliances and equipment, regulation of the thermal performance of buildings, to examination of engines and transportation planning (Law No. 2004-72 of 2 August 2004 and as modified by Law No. 7 of 9 February 2009).

Turkey



The legal framework for energy sector is generally aligned with that of the European Union and allows for funding for a national energy efficiency program covering the sectors of industry, power plants, transmission and distribution systems, building, tertiary and transportation.

All of the principles and procedures on improving energy efficiency are combined in the 2008 official newspapers no. 27035, no. 27075, no. 27028, no. 26901 (elaborated from Article 2 of Law No. 2819, articles 2 and 28 of Law No. 3154, Law No. 4628, Law No. 5627).



Trans-Mediterranean cooperation is illustrated by the creation, at the initiative of France, Spain and Tunisia, of the MEDENER network that is made up of 12 organizations, from both sides of the Mediterranean, in charge of energy efficiency and renewable energy development policies (ADEME-France, ADENE-Portugal, Spain-IDAE, CRES- Greece, ENEA-Italy, ADEREE- Morocco, ANME-Tunisia, APRUE-Algeria, ALMEE-Lebanon, NERC-Syria-, NERC-Jordan and PEC-Palestinian Authority). The exchanges within the MEDENER region has indeed contributed to significant progress in energy efficiency, the development of renewable energy sources and climate change issues (see some examples of the measures that have been implemented in MEDENER countries in the table below). MEDENER has also invested in several common projects, especially in the field of solar and energy efficiency. The implemented actions concerned regulatory, technical, development of the knowledge, training and communication. They facilitated market networking by promoting public/private partnerships and through the implementations of financial schemes.

MEDENER is becoming an important actor of the energy component of the Union for the Mediterranean, the main partnership between the EU and the Mediterranean Countries.



TABLE: EXAMPLES OF ENERGY EFFICIENCY MEASURES IMPLEMENTED IN MEDENER

Country	Title	Summary
Tunisia 	PROSOL	This program aims at promoting the development of the solar water heaters industry in Tunisia thanks to sustainable financing mechanisms allowing the removal of two major barriers to final consumers: high initial fix cost and high payback time in comparison to other conventional technologies. (http://www.steg.com.tn/fr/prosol_elec/presentation.html)
Algeria 	ECO-LUMIERE	This program promotes the diffusion of 1 million of CFL thanks to a subsidy scheme, accompanied by an information and awareness campaign. (http://www.riaed.net/?Algerie-l-APRUE-lance-le-programme)
Lebanon 	Information campaign LCEC	LCEC information channels are diversified and target different types of audiences : advertising campaigns on TV, on radio, and billboard campaigns that have alerted a large Lebanese audience on energy saving issues, etc. (www.lcepe.org.lb)



MAIN FINDINGS AND RECOMMENDATIONS

In 20 years, 25% of energy efficiency improvement in the EU

Between 1990 and 2012, energy efficiency increased on average by 0.8% per year. Over 40% of these energy savings resulted from efforts stemming from the industrial sector, 36% from the building sector (residential / commercial) and the rest from the transport sector (source ODYSSEE). This performance was achieved thanks to the implementation of EU policies that were more and more restrictive and dedicated to specific end-use sectors and thanks to the Member States commitment in the implementation of national energy efficiency policies. However, despite these efforts seen so far, the impact assessment analysis from the European Energy Efficiency Action Plan (in 2011) pinpoints that the "2020 objective" of 20% of energy savings will not be reached in the current state of policies. It is in this context that the EC took into consideration the remaining efforts, and has launched several programs, including the new directive on energy efficiency adopted in October 2012.



/// MAIN FINDINGS BY END-USE SECTORS

This brochure showcased the most illustrative measures of national energy efficiency policies implemented in 11 end-use sectors or themes. Each of them has been introduced by a description of the general energy efficiency trends and by the European policies context related to the sector. This overview is far from being exhaustive, the main objective was indeed to provide the reader inputs of thoughts and solid references, the main conclusions set by end-use sectors are the following:



1. NEW CONSTRUCTIONS:

Buildings represent the largest energy use in Europe. A major improvement has been in new buildings where new heating systems are more energy efficient thanks to regulations that require continuous strengthening (EPBD and dissemination of nZEB).



2. THERMAL RETROFITTING:

But the priority in the building sectors remains retrofitting of existing buildings (70% of the actual stock was built before 1980, and as a consequence is not well insulated on average) where energy savings potential are huge, but still complicated to catch up. In front of heavy investments and high costs, the challenge for consumers or other stockholders is to find innovative financial mechanisms (e.g. third-party payer). Information and advice to final consumers play a key role in guiding households.



3. ELECTRICAL APPLIANCES:

Large household appliances and televisions especially, increased drastically in recent years, and have contributed to raising electricity consumption. The implementation of mandatory energy labels, following the EU Directive in the 90's and updated several times since then, yielded to inform and orientate consumers towards the most efficient equipment. Some countries implement purchase premiums, usually on temporary period, that have measurable and prompt results.



4. FUEL POVERTY:

Low-income households are often disadvantaged by steadily growing energy prices and by low thermal efficient dwellings, as a result more and more initiatives are being settled to fight against fuel poverty. Some are dedicated to help households cope with the financial burden caused by the energy bill. Others establish financial means to help dwellings' retrofits.



5. THE LEADING ROLE OF PUBLIC SECTOR:

Promoting efficiency in the public sector is an important issue and a way to steer the market towards efficient products and services: it represents about 12% of the EU building stock. Among the most innovative measures, energy performance contracts, signed between the community and ESCO, enforce (contractually) the latter to reach a certain amount of energy savings.



6. INDUSTRY:

Even if the industrial sector recorded the best performance in terms of energy efficiency in the past 20 years, it still represents in some countries a significant share in the final energy consumption (nearly 50% in Finland for instance). The energy efficiency measures called "flexible" are promoted in order to preserve firms' competitiveness, it includes market based instruments or voluntary agreements. For instance, the emissions trading scheme system is central in European policy to improve energy efficiency in industry, and of course is useful for the fight against climate change. The financial measures are still implemented in some countries.



7. SME:

SMEs are increasingly important in industry activity and do not have all the time incentive energy costs; this sector needs a targeted approach to mobilise stakeholders. If some measures target specifically SMEs, they are also implementable in other sectors such as industry or building sectors. Overall, many financial measures are available for SMEs willing to invest in energy efficiency. Information measures and voluntary agreement are also represented.



8. TRANSPORT OF PASSENGERS:

Passenger transport energy consumption increased by 19% since 1990, and cars account for almost 90% of the consumption in this sector. European Directives on energy labelling for new vehicles and emissions standards for new cars, as well as incentives to increase the purchase of efficient vehicles are central to improve energy efficiency in the transport of passengers. Many countries have also launched information and awareness campaigns for a better use of cars and the promotion of public transport.



9. TRANSPORT OF GOODS:

Road transport is predominant in freight and its share is increasing. Commercial vehicles have a strong dynamic, even if their business is broader than freight. Most measures aim at improving the performance of commercial vehicles, thanks to the European regulations that enforces new commercial vehicles to have a specific emission threshold, to promote of modal shift; it includes financial incentives for combined transport and the introduction of incentive taxes or tolls.



10. AGRICULTURE:

Only a few measures target the agricultural sector, certainly because of its low share in total energy consumption expect some countries (The Netherlands in particular). And there are no specific European policies or directives dedicated to agriculture. The objectives at the European level are to promote energy production in agriculture.





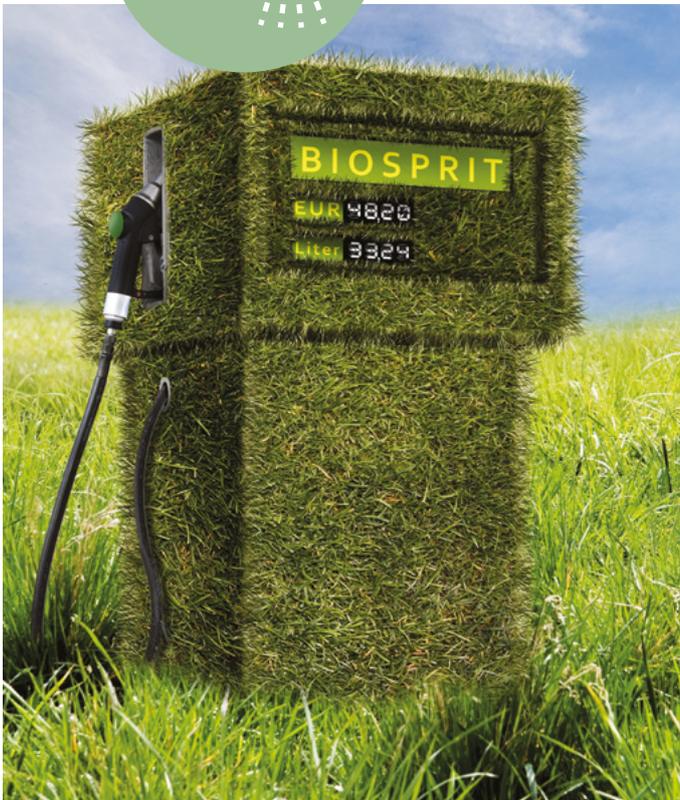
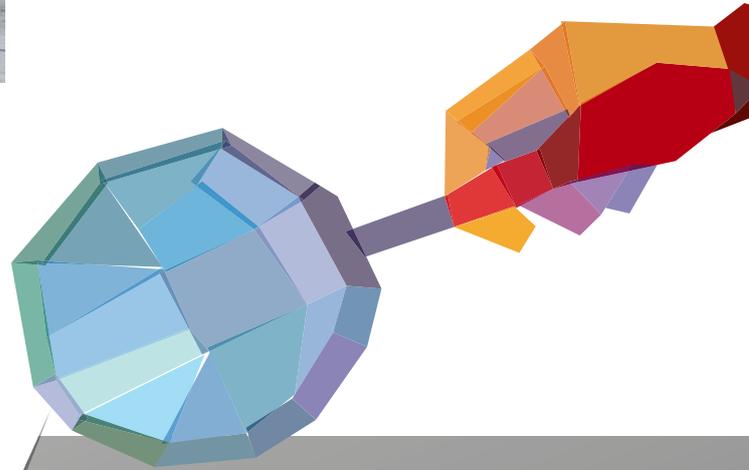
11. CROSS-SECTORAL MEASURES:

To increase incentives dedicated to energy efficiency in cross-sectoral sectors, i.e. covering several sectors (businesses, households, commercial, public actors), new instruments called transversal measures have been developed. Energy or CO₂ taxes, white certificates or energy efficiency fund are good examples of cross-sectoral measures.

This document presents a large range of selected examples (see table below as a summary of quoted measures), showing the diversity in implementation from one country to another, and the originality of some measures that are often precursors of EU policies. Beyond this inventory of energy efficiency measures, there are some important features, and particularly the following points:

- To improve energy efficiency, policy makers rely on a large scope of tools. Even if market base instruments and economic incentives are dominant, norms and regulation are often used, in particular in case of market failure in some sectors (buildings, electrical appliances, etc.).
- However in a context of economic crisis, hence of budget constraints, public policies rely more and more on the private sector, through implication of ESCO and white certificates.
- More and more often measures target end-user consuming behaviours, especially households. Local or regional initiatives are playing an increasing role (in particular in decentralized political contexts) and favour energy management initiatives. This phenomenon raises the need for training, in particular of local teams to support local authorities. The EED also mentions the necessity to install smart metering systems in buildings. This measure is crucial to increase awareness to consumers on their own energy consumption (EED smart-meter roll-out objective is 80% of buildings equipped). The diffusion of smart meters is a major component of electrical grids, also known as smart grids.
- The main important sector of energy efficiency is the building sector. The requirements set by the EPBD are ambitious: all new buildings must be nZEB by 2020. However, the main challenge remains in the thermal retrofitting of existing buildings. Thermal regulations should also be enforced on existing buildings (during transaction or a renovation), and renovations should be encouraged and accompanied by local platforms dedicated to energy renovation.
- Quantitative and specific evaluation of measures is crucial, and should be normalized at a maximum across countries in order to do international benchmarking.
- It is also very important that regulations are properly implemented and enforced. For instance, building thermal requirements become more demanding (nearly Zero Energy Buildings) leading to an increasing evidence of a performance gap between design intent (i.e. theoretical performance) and the actual energy performance in-use. Labelling programmes and performance standards are not always in line with this reality. Therefore, EU directives have reinforced regulation control and compliance (including energy labelling of equipment and buildings, known for the latter EPC).





ABBREVIATIONS

<i>CFL</i>	<i>Compact Fluorescent Lamp</i>
<i>Cumac</i>	<i>Cumulated and discounted</i>
<i>EC</i>	<i>European Commission</i>
<i>EED</i>	<i>Energy Efficiency Directive</i>
<i>EPBD</i>	<i>Energy Performance of Buildings Directive</i>
<i>EPC</i>	<i>Energy Performance Certificate</i>
<i>ESC</i>	<i>Energy Saving Certificates</i>
<i>ESCO</i>	<i>Energy Service Company</i>
<i>ESD</i>	<i>Energy Service Directive</i>
<i>ETS</i>	<i>Emission Trading Scheme</i>
<i>EU</i>	<i>European Union</i>
<i>GHG</i>	<i>GreenHouse Gas</i>
<i>MS</i>	<i>Member State</i>
<i>NEEAP</i>	<i>National Energy Efficiency Action Plan</i>
<i>Nzeb</i>	<i>Nearly Zero Energy Buildings</i>
<i>PPP</i>	<i>Purchasing Power Parity</i>
<i>RDEEC</i>	<i>Russian-Danish energy efficiency centre</i>
<i>RFEEC</i>	<i>Franco-Russian Centre for Energy Efficiency</i>
<i>RUDEA</i>	<i>Russo-German energy agency</i>
<i>S&L</i>	<i>Standards and Labels</i>
<i>SME</i>	<i>Small and Medium-sized Enterprise</i>
<i>VAT</i>	<i>Value Added Tax</i>

LIST OF MEASURES QUOTED IN THE BROCHURE

	Country	Title	Type	Page	Short description.
New buildings	DK	Nearly Zero Energy Buildings	R	11	Denmark is one of the first EU countries that has already set-up its national nZEB definition and roadmap to 2020.
	NL	Green Building	R	12	Netherlands is one of the first countries to adopt proactive policies and to implement measures to promote low energy building.
	CY	Mandatory installation of solar systems in all new buildings	R	12	Cyprus is the world leader in terms of solar thermal installation per capita, installation of solar systems is mandatory to satisfy domestic hot water requirements on every new residential building
	LU	Promotion program for energy efficient new buildings	F	13	It paves the way for financial support to promote the construction of efficient new buildings (low-energy housing, passive housing) and more efficient heating systems (condensing boilers).
	AU	Wohnbauförderung	F	13	The program offers in particular grants for constructions with higher efficiency than building code requirements
	DE	Energielotsen	I	13	In the Hannover region, in Germany, Energy Advisors are advising clients on energy efficiency measures for buildings during the entire construction or refurbishment process.
Thermal retrofitting	FR	Housing Renovation Plan	R+I	15	This plan has set an ambitious target of 500,000 units per year renovated by 2017, and 38% energy reduction of the building sector in 2020.
	DK	Mandatory annual inspection of boilers	R	15	Denmark was the first European country to implement mandatory annual inspections of large heating systems.
	ES	CTE, Codigo Tecnico de la Edificacion	R	15	Spain was the first country mandate solar thermal use for renovated and new buildings in its building code
	PT	law n° 79/2006	R	16	This law has been introduced for existing dwellings with a floor area exceeding 1 000 m ² ; their consumption must be under an established limit.
	GR	Mandatory installation of solar systems	R	16	In order to reach an ambitious target of 50%-100% of dwellings (% fixed according to climate zone) equipped with thermal solar systems for 2016, a package of financial incentive measures has been set.
	NL	National Insulation Program	F	16	The objective to improve insulation of 800 000 owner-occupied dwellings and 1.7 million of rented dwellings was almost reached after ten years of implementation, corresponding to 60% of the existing dwelling stock at that time
	RO	The National Multiannual Programme for the Thermal	F	16	The program targets landlord associations, and its goals are to improve the energy performance of buildings built between 1950 and 1990, the quality of life of the inhabitants and to contribute to a better townscape.
	DE	KfW (Investment bank dedicated to retrofitting)	F	17	This measure proposes financial incentives via subsidies and loans to reduce buildings' energy consumption at all administrative levels – federal, regional and municipal.
	UK	Green Deal	F	17	This program is an attractive solution to consumer financing constraints and offers long term loans allowing investment repayments from the energy savings
Electrical appliances	EU	Come On labels/TopTen	I	19	"Come On Labels" highlights the best European labelling systems. Its objective is to improve the visibility and credibility of the European label and to promote the distribution of the best label.
	EU	ATLETE	I	20	ATLETE test several models of electrical appliances.
	SE	Testlab	R	20	Testlab laboratory performs tests and trials on appliances.
	IT/GR	Premium for cold appliances	F	21	Premium according to energy label, e.g. a 200€ bonus in Italy, 500€ in Greece, was granted for the purchase of domestic cold appliances rated A+ or A++ (with a ceiling fixed at 20% of the purchase price).
	DK	Grants for new technology launching	F	21	Denmark implemented several campaigns during a period of 4 to 7 weeks to facilitate and speed up the introduction of new efficient products (A++ refrigerators, tumble dryer with heat pumps, circulators.
Fuel poverty	UK	Fuel poverty strategy	F	23	Programs to improve the performance of heating systems and thermal insulation of dwellings for low income households.
	UK	Energy saving obligation	F	23	In the framework of energy saving obligation, energy suppliers have to achieve a significant share of their target with the most vulnerable households.

Public sector	HR (Croatia)	Biofuels Act	R	24	This law introduces requirements on ecological vehicles for public transportation: 70% of new vehicles must use alternative fuels.
	DE	Public Internal Performance Contracting, PICO, in Stuttgart	F	25	System of investment in energy efficiency based on a contract between different services of the same public entity. It takes up the central idea of third party financing but operates exclusively with municipal funds.
	DE	Energy Saving Partnership in Berlin	F	25	Energy performance contracts (EPC) between the Land of Berlin and ESCOs for energy retrofitting of public buildings. Contracts have to be concluded for "pools" of buildings.
	PT	ECO.AP	F	26	It covers a set of measures appointment of energy managers by all public bodies, implementation of energy efficiency management contracts, and administration energy efficiency barometer.
	SI (Slovenia)	Incentives for renovation and sustainable construction in the public sector	F	26	Investments for the renovation of public buildings can benefit from soft loans offered by a public fund for the environment (Eco Fund).
Industry	EU	The EU Emission Trading Scheme ("EU-ETS")	R	28	Limits to greenhouse gas emissions for large industrial facilities and system for trading greenhouse gas emission allowances.
	BG	Mandatory audits	R	28	Mandatory energy audits for companies consuming more than 3,000 MWh / year to be done every three years and mandatory investments (companies have two years to start the implementation of the measures identified in audits).
	SE, NO	Programme for energy efficiency in energy intensive industry (PFE)	VA	29	Voluntary agreements administered by STEM or NVE. Participating companies are exempt from electricity tax. These five-year programs include energy management system, energy audit, and action plan and measures implementation.
	IE (Ireland)	Large Industry Energy Network (LIEN)	VA	29	Voluntary network of 150 energy-intensive companies established by SEAI. Regular workshops, seminars and site visits allow network members to share their experiences and knowledge with other energy managers.
SME	CH	Supports to SMEs proposed by AEnEC	VA	30	Supports to SMEs include an energy consumption analysis, a list of cost-effective measures to improve energy efficiency, the set-up of targets, help in implementing measures and results monitoring.
	PL	PolSEFF (Polish Sustainable Energy Financing Facility)	F	31	A €180 million fund to help SMEs to invest in energy efficient technologies. PolSEFF also provides free technical expertise to help companies make the best investments.
Transport of passengers	FR	Bonus Malus	F	33	New cars with relative low CO ₂ -emissions get a subsidy (called "bonus") and cars with high CO ₂ -emissions have to pay a tax. The revenues of penalties should in principle equilibrate expenditures of the bonus.
	AT	Klima : Aktiv Mobil	T	34	This programme targets companies, public administrations, schools, local communities, tourism, leisure, real estate and provides various kinds of support: advice for the development and implementation of action plans, campaigns on eco-driving or soft modes (bike2business), financial support, awards etc.
Goods Transport	DE	Road toll	F	36	Introduction of a tax for trucks over 12 tons, based on the mileage, the level of emissions and the type of axle (LKW Maut).
	FI/FR	Voluntary Agreement	VA	36	A set of energy performance criteria has been defined, both in the procurement of transportation services and the extension of eco-driving and technical measures, such as tire pressure, controls or vehicle maintenance.
Agriculture	ES	Training programme to agriculture	I	37	To promote energy efficiency and to highlight potential energy savings, a training programme has been launched to implement specific actions to teach farmers, fishermen and cattle breeders how to use energy efficiently in their equipment.
	NL	Voluntary agreements	VA	38	Long-term energy efficiency target were fixed for intensive cultures, greenhouse farming, and in return, farms receive grants (up to 70% of investment cost) or a deduction in energy taxes
	FI	Farm land reparcellisation	F	38	Reparcelling is a way of updating the structure of farms and developing rural land use.
	FI	Subsidies for biomass boilers in Finland	F	38	The Ministry has granted investment subsidies for switching boiler fuels from fossil fuels to biofuels (wood chips or energy crops).
Cross sectoral	DK	Danish Saving Trust	Fo	39	DST is an independent authority promoting and investing in energy efficiency projects in the residential, industrial and service sectors. It is financed by a fund coming from special energy tax payable by households and public sector.
	CH	Climate Cent	Fo	40	Climate Cent revenues (funded by a charge levied on all petrol and diesel imports at a rate of 1.5 cent per litre) have to be invested in projects aiming at reducing emissions, as well as in climate protection measures in Switzerland.
	UK	SALIX	Fo	40	Salix is a non-profit organization that provides revolving soft loans to public bodies willing to increase energy efficiency.
	FR	Energy Saving Certificates	R	41	ESC (or white certificates), require electricity, gas, oil, heat and cooling utilities, as well as motor fuel suppliers (since 2011), to achieve energy savings by giving incentives to their customers to purchase new efficient equipment.



European Energy Network



EⁿR is a voluntary network composed of 24 national European energy agencies. They mainly have responsibility for the planning, management or review of national research, development, demonstration or dissemination programmes in the field of energy efficiency, renewable energy and climate change abatement. EⁿR organizations are the main implementers of policies in their respective countries and, as a result, have a direct contact with stakeholders on a regular basis. In this sense, the network gathers information and experience from all backgrounds and acts as a two-way channel of communication between central policy makers and the citizens of Europe.

EⁿR members are:

- ▶ **ADEME**, Agency for Environment and Energy Management • FRANCE
- ▶ **ADENE**, Energy Agency • PORTUGAL
- ▶ **AEA**, Austrian Energy Agency • AUSTRIA
- ▶ **ANRE**, Energy Regulatory Authority • ROMANIA
- ▶ **BFE**, Swiss Federal Office of Energy • SWITZERLAND
- ▶ **CRES**, Centre for Renewable Energy Sources and Saving • GREECE
- ▶ **DEA**, Danish Energy Agency • DENMARK
- ▶ **DENA**, German Energy Agency • GERMANY
- ▶ **EIE**, General Directorate of Renewable Energy • TURKEY
- ▶ **EIHP**, Energy Institute Hrvoje Požar • CROATIA
- ▶ **ENEA**, National Agency for New Technologies, Energy and Sustainable Economic Development • ITALY
- ▶ **ENOVA** • NORWAY
- ▶ **EST**, Energy Saving Trust • UNITED KINGDOM
- ▶ **IDAE**, Institute for Energy Diversification and Saving • SPAIN
- ▶ **KAPE**, Polish National Energy Conservation Agency • POLAND
- ▶ **MOTIVA** • FINLAND
- ▶ **Myenergy** • LUXEMBOURG
- ▶ **NEL**, Netherlands Enterprise Agency • THE NETHERLANDS
- ▶ **PTJ**, Project Management Jülich • GERMANY
- ▶ **REA**, Russian Energy Agency • RUSSIA
- ▶ **SEDA**, Sustainable Energy Development Agency • BULGARIA
- ▶ **SIEA**, Slovak Innovation and Energy Agency • SLOVAKIA
- ▶ **SEAI**, Sustainable Energy Authority of Ireland • IRELAND
- ▶ **STEM**, Swedish Energy Agency • SWEDEN

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