

Energy Efficiency Policies in Industry

Lessons Learned from the ODYSSEE-MURE Project



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Didier Bosseboeuf
Project leader

¹ Alphabetic order of countries

Key Messages

- In quite many countries the policy mix needs to be balanced better to address the multiple drivers of energy efficiency in industry. Quite many countries apply only a couple of measure types, often mainly those addressing financial drivers.
- Conscientious monitoring and evaluation schemes are most common in measures involving tax exemptions. Other well monitored measures are subsidy schemes, audit programmes, voluntary/negotiated agreements and legislative initiatives related to energy management. Systematic monitoring and evaluation of other measure types is less common.
- There is no clear correlation between the impact level of the measures and the measure types. Both high-impact and low-impact measures are of various types. The situation reflects the varying relative importance of energy efficiency drivers.
- The Draft Energy Efficiency Directive (June 2011) proposes a set of measures (e.g. energy efficiency obligations, mandatory audits and certification/qualification schemes) which represent an ambition level quite far from the current implementation status of these measures in Europe, requiring massive additional effort from the Member States.
- The focus on energy management in most countries is increasing among the measures but not in pace with the emphasis given to it by, e.g., the EU policy, IEA energy efficiency recommendations and the international standardization bodies.
- While several energy efficiency measures are already in place for SMEs, more tailored programmes are needed to address their special needs.
- There is an increasing need for energy advice in all sizes of industry and there is a need to step up activities in the area.
- The impact of the economic and financial turmoil since mid-2008 could not yet be seen on the types of measures implemented as of beginning of 2012. However, there are indications that financial measures are being cut as the recession has continued.

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1. Introduction

1.1. Objective of the brochure

The objective of this brochure is to analyse the policy instruments currently implemented to improve energy efficiency in industry. Measures included in the National Energy Efficiency Action Plans (NEEAPs) as well as those corresponding to the IEA recommendations for industry are studied. Emphasis is also put on innovative and high impact measures, as well as on the results of measure evaluations.

This publication relies on data contained in the **MURE** database on energy efficiency policies and measures. (**Box 1.1**).

Box 1.1: MURE database

MURE (Mesures d'Utilisation Rationnelle de l'Energie) provides information on energy efficiency policies and measures that have been carried out in the Member States of the European Union and enables the simulation and comparison at a national level of the potential impact of such measures. The MURE database is therefore an important tool to show "demonstrable progress" as requested by the Kyoto Protocol. It has been designed and developed within the framework of the SAVE and 'Intelligent Energy - Europe' Programmes by a team of European experts, led and co-ordinated by ISIS (Institute of Studies for the Integration of Systems, Rome) and the Fraunhofer Institute for Systems and Innovation Research ISI (Germany).

The development of the MURE database was also supported by national funding in each EU Member State. A permanent network of correspondents within energy efficiency agencies established in all EU Member States guarantees the continuous updating of the database. The database is structured by energy end-use sectors, and allows browsing the energy efficiency measures by sector. The database also contains information on general energy efficiency programmes and on general cross-cutting measures.

- Household
- Transport
- Industry
- Tertiary

The database can be accessed at www.muredatabase.org.

1.2. Contents of the brochure

Chapter 1 is the introduction.

Chapter 2 discusses the energy demand trends in industry and the current energy efficiency policy context for industry in Europe. It also gives an overview of the energy efficiency measures for industry in the MURE database.

Chapter 3 gives an overview of policies and measures for industry that have been adopted by the European Union. It covers both those included in the MURE database at present and those in the draft Energy Efficiency Directive (June 2011).

Chapter 4 analyses the characteristics of the NEEAP measures and those implemented in Norway using the information in the MURE database.

Chapter 5 discusses the IEA recommendations for energy efficiency policy and measures in industry.

1.3. Policy issues in industry

The report is looking for answers to the following policy issues in industry:

- How well the national policies and measures currently conform to the internationally recognised policy priorities and how much additional effort is needed?
 - The question concerns, e.g., the draft Energy Efficiency Directive and IEA recommendations for industry.
 - Particular focus is placed on the analysis of the different aspects of energy management and measures addressing small and medium sized enterprises (SMEs).
- How well the national policies and measures address energy efficiency drivers in industry?
 - Are there innovative measures which address the drivers well?
 - Is there adequate packaging of measures?
- Does the financial and economic crisis already have a visible impact on policy design and implementation?
- What is the level of monitoring and evaluation of measures?
- Given the significance and expectations placed on Emissions Trading, what is the role of other measures in industry?

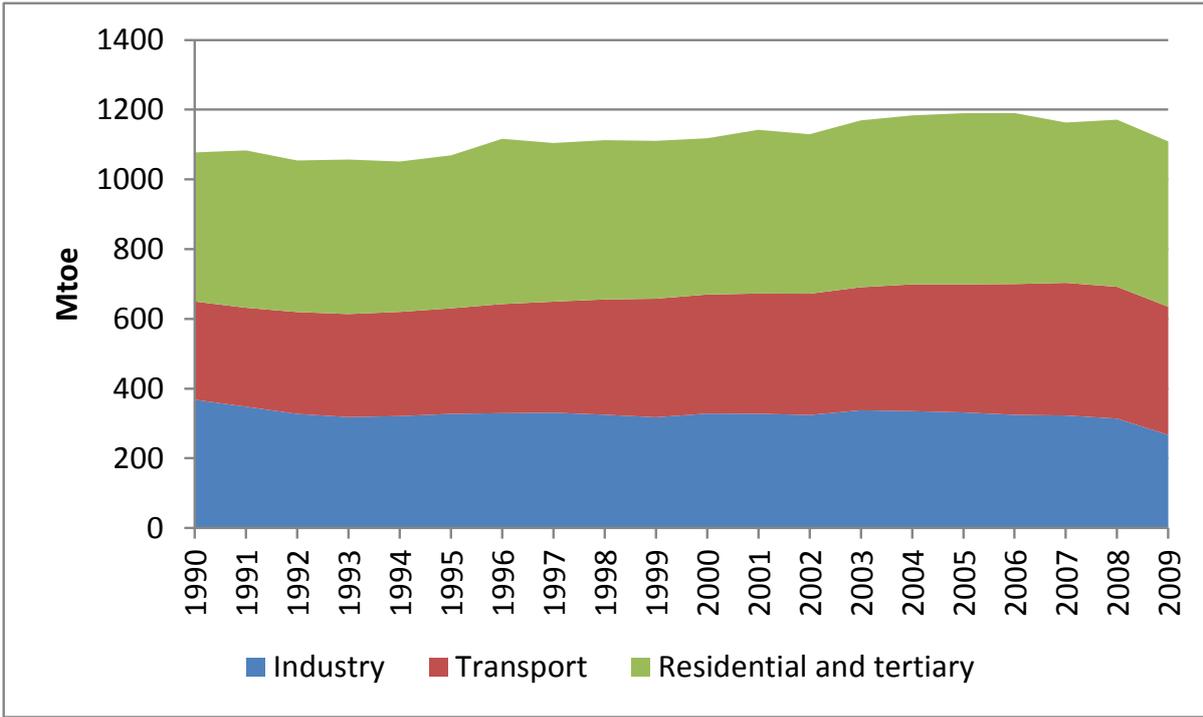
2. Overview of trends and policies

2.1. Energy demand in industry

Figure 1 shows the share of different sectors in total final consumption (TFC) in the European Union, Norway and Croatia. The share of industry in TFC in these countries was 24% on average in 2009 but there are large variations by country, from 12% in Malta to 45% in Finland (Figure 2).

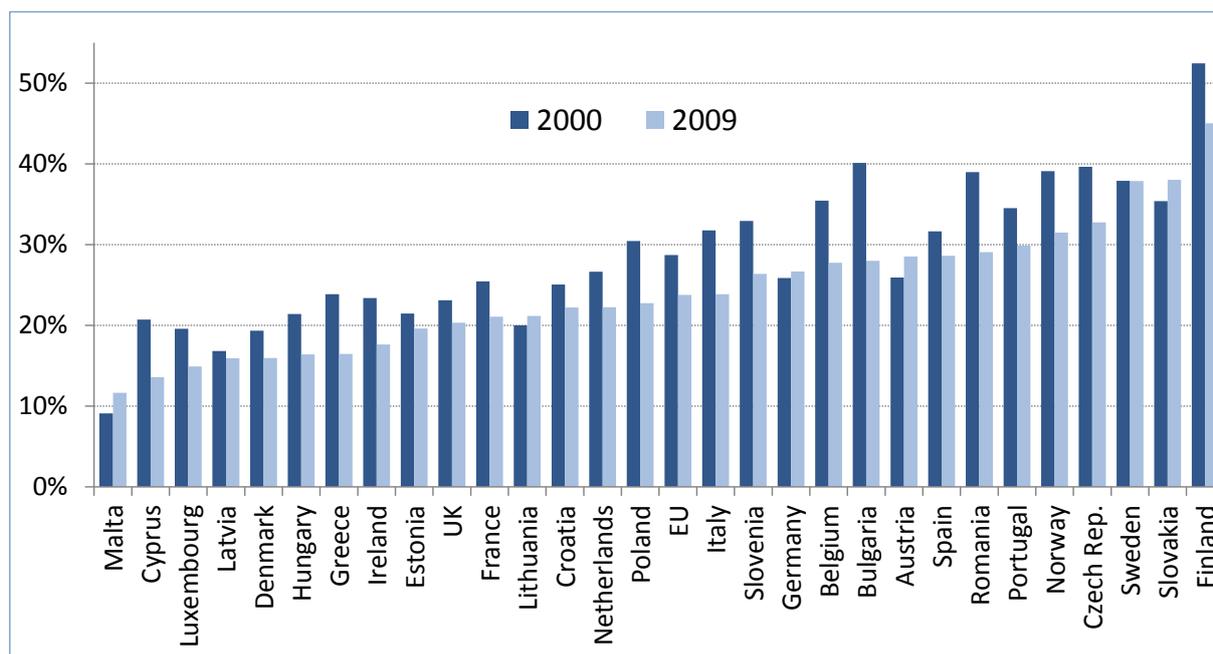
TFC increased by 9% between 1990 and 2008 driven by growth in other sectors. In 2009 it declined by 5% to 1 133 Mtoe due to reduction in industrial energy consumption as a result of the economic downturn. TFC in industry declined by 0.9% per year in the period from 1990 to 2008 and by further 15% in 2009 alone, reaching 274 Mtoe. As a result, the industrial sector is consuming a decreasing share of the energy used by final consumers in the EU.

Figure 1: Final Energy Consumption in the European Union, Norway and Croatia from 1990 to 2009 (without climatic corrections)



Source: ODYSSEE database

Figure 2: Share of industry in Total Final Consumption (TFC) in 2000 and 2009

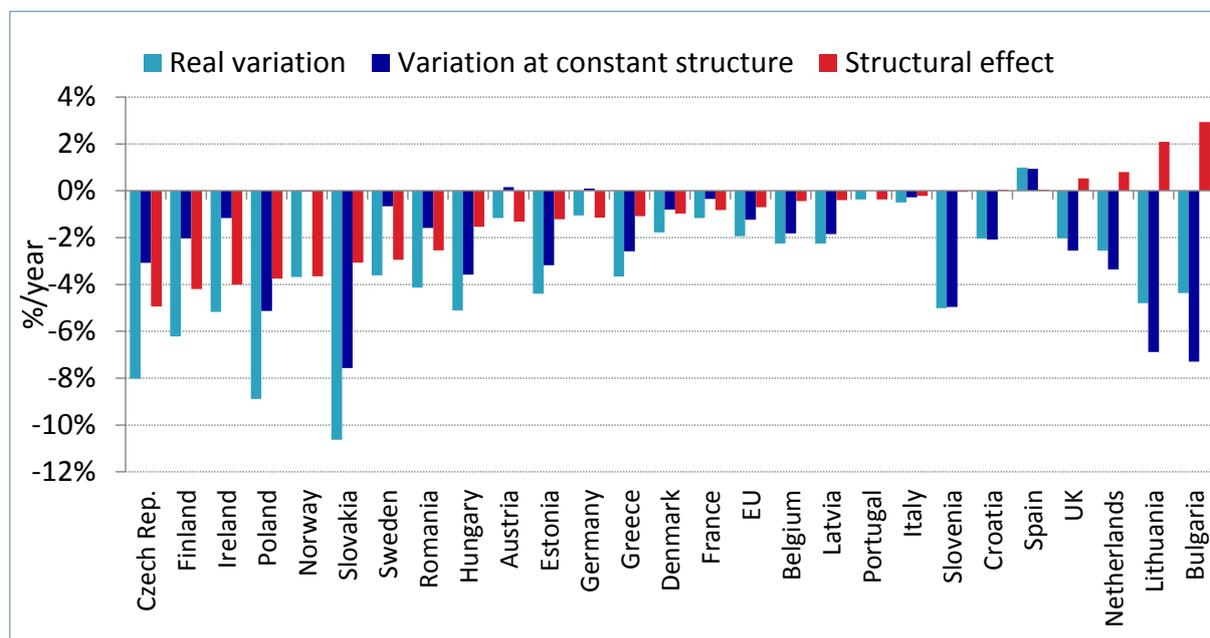


Source: ODYSSEE database

Figure 3 shows the development of energy intensities in industry. As an economic indicator, energy intensity is not a strong indicator of energy efficiency. It is quite possible that energy intensity drops significantly while specific consumption (e.g. energy consumption per tonne of steel) remains level. Calculation of specific energy consumption requires data on energy consumption by sector and volume of physical output. Such data is available from ODYSSEE quite well for steel production and for half of the countries for paper and cement. However, direct comparison of specific energy consumptions can be misleading if due consideration is not paid to analysing the factors behind the trends such as system boundaries, type of technical processes used, degree of materials recycling, quality of final products, production rates of factories etc.

Energy intensity has declined in most countries since 1990 - even quite dramatically in some of them. Structural change, i.e., the relative growth of less energy-intensive industrial branches, has contributed to the reduction of average energy intensity in industry in most countries. However, in a few countries, there was an increase in the contribution of energy-intensive branches (non-metallic minerals in Bulgaria and chemicals in the Netherlands and UK). ODYSSEE analysis with a constant industry structure shows that structural changes explain about 40% of the energy intensity decrease in the European manufacturing industry over the period 2000-2008. ODYSSEE data shows that specific consumptions of energy-intensive products, such as steel, pulp and paper and cement have decreased since 2000, implying that energy efficiency is likely to have improved. (ODYSSEE-MURE 2012)

Figure 3: Impact of Structural Change on Energy Intensities in Manufacturing Industries from 1990 to 2008



Note: Cyprus, Luxembourg and Malta are not shown.

Source: ODYSSEE database

2.2. Policy context for energy efficiency in industry in Europe

At the end of 2006, the EU pledged to cut its annual consumption of primary energy by 20% by 2020. Despite substantial steps taken towards this objective, recent Commission estimates suggest that the EU may only achieve half of the 20% objective. In June 2011, a new set of measures for increased energy efficiency, namely the Energy Efficiency Directive, was proposed by the European Commission to fill the gap. The proposed directive brings forward measures to step up Member States efforts to use energy more efficiently at all stages of the energy chain.

At the EU level energy efficiency in industry is seen as a matter of competitiveness as substantiated in EU's Energy Efficiency Plan 2011 which preceded the proposed Energy Efficiency Directive. The Plan states that the largest savings potential lies in buildings, followed by the transport sector. The Plan proposes the following measures for industry: energy efficiency requirements for industrial equipment, improved information provision for SMEs, energy audits and energy management systems. In energy for industry, the whole energy supply chain is addressed. Research and innovation are seen as catalysts for cost-effective energy efficient technologies in industry. (European Commission 2011a)

The 25 IEA recommendations (2011) for energy efficiency include actions also in industry (see Chapter 5). Recent IEA analysis concludes that substantial opportunities to improve industrial energy efficiency exist (OECD/IEA 2011). According to the IEA, much of this potential can be captured through policies for promoting use and

optimisation of energy-efficient industrial equipment and systems, and improving overall efficiency through energy management.

The European Commission has not yet published analyses of the second National Energy Efficiency Action Plans (NEEAPs), which each of the Member States is required to issue by the Energy Services Directive. The first NEEAPs were to be submitted to the Commission by June 2007 and the second NEEAPs by June 2011. The analysis of the first NEEAPs and information collected on their implementation status in 2010 shows that while most NEEAPs have focused on the building sector, also the number of measures implemented to trigger energy savings in industry and industrial buildings has been relatively high (European Commission 2011c). The European Commission (2009) points out that particularly three Member States, namely Hungary, Malta and the Slovak Republic, place a strong focus on energy efficiency in industry, and expect the highest share of savings to come from industry measures.

2.3. Overview of MURE measures for industry

As of January 2012, the MURE database contained a total of 289 industry measures², out of which 183 were in operation; the others (106) were either not active any more or were being planned. While the bulk of the measures (260) have been adopted in the EU Member States the database also contains 5 measures in Croatia and 14 in Norway. In addition, 10 measures introduced at the EU level have been put in the database.

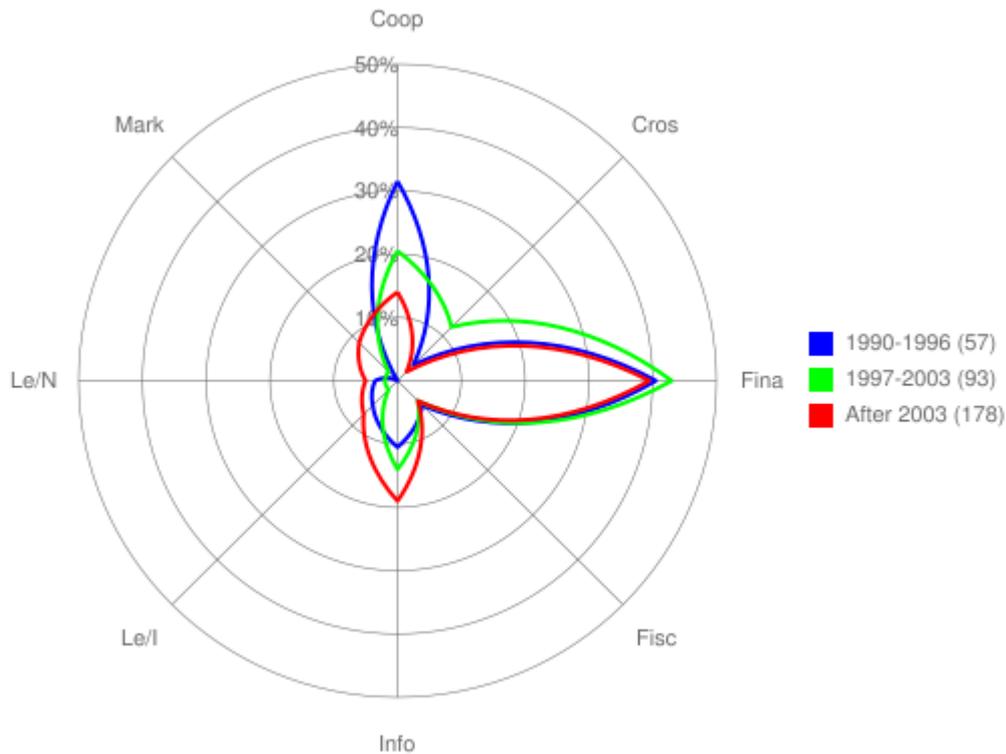
Figure 4 shows the changes in policy mix over time. Financial measures have been in the core of the policy mix for industry over the last two decades. While co-operative measures (principally voluntary agreements) were introduced frequently in the early 1990s and they have remained in the policy mix, new schemes have been introduced less frequently in the past decade. Information measures are diverse measures ranging from information campaigns to energy audits and training. Their role has grown. Legislative and fiscal measures are less often implemented in industry. However, when cross-sectoral measures in industry are analysed in more detail, energy and environmental taxes and pollution charges listed within this group of measures augment the relative importance of fiscal measures. EU Emissions Trading is an important market-based instrument applied in industry in all EU Member Countries.³

If we look only at measures introduced during the period of the on-going economic and financial turmoil, i.e., starting from 2009, there is not much change in the dispersion of measure types among the 41 measures launched thereafter. Financial measures still dominate and informative measures have a significant role. There is a slight increase in legislative measures, driven both by national implementation of EU measures and by new national measures. It is plausible that countries did not cut financial support immediately after the start of the recession in order to stimulate the economy. However, more recent signals indicate that reductions are starting to take place.

² It should be noted that any numeric information concerning the number of measures is not very accurate because the database is constantly evolving.

³ As it is an EU wide measure, it is not included at country level and is not correctly reflected in Figure 4.

Figure 4: Measures Introduced by Type and by Period of Time



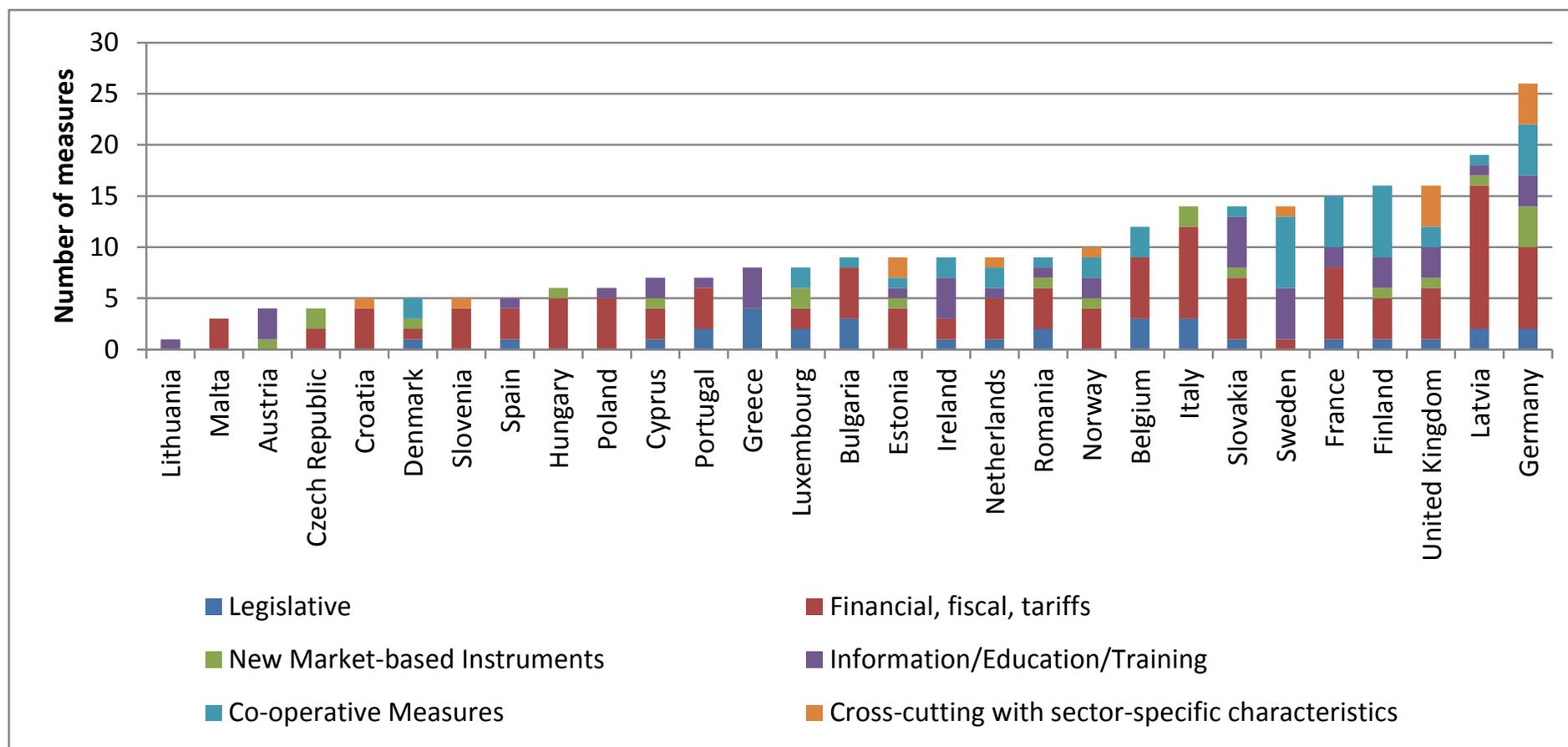
Coop = Co-operative measures, Cros = Cross-sectoral measures, Fina = Financial measures, Fisc = Fiscal measures, Info = Information/education/training, Le/I = Legislative/Informative, Le/N = Legislative/Normative, Mark = New market-based instruments
Source: MURE database, January 2012

Energy efficiency improvements are hindered by various barriers, each of which need to be addressed by different types of measures. This is done best by developing a balanced policy mix which includes several types of measures. The adopted policy mix varies significantly from country to country (Figure 5). However, some caution is needed while analysing Figure 5 because there is some variety in how countries package and report their measures. For instance, some countries have reported packages of measures as one measure, while others have split them into several independent measures.

Germany and United Kingdom apply all types of measure in their energy efficiency policy for industry. Seven more countries apply almost all measure types. While the majority of countries implements financial or fiscal measures, two countries (Greece and Lithuania) have opted not to implement them at all. About half of the countries implement co-operative measures. As many as ten countries have not reported any information, education or training activities in industry.⁴

⁴ The countries are asked to report in the database only innovative and comprehensive information measures to avoid too large many commonly applied information measures.

Figure 5: On-going Measures by Type and by Country



Source: MURE database, January 2012

Note: Some caution is needed while analysing Figure 5 because there is some variety in how countries package their measures. Some countries have reported larger packages of measures as one measure while others split them into several independent measures.

3. EU policies and measures for energy efficiency in industry

3.1. Summary of EU policies in the MURE database

In addition to national measures, the MURE database also includes common European measures for industry (Table 1). At present, there are eight measures. However, the voluntary labelling of electric motors has been replaced by the Eco-design Directive, and is thus considered as completed, although labelling is still in place.

Only the CHP Directive has been classified as a high-impact measure⁵ and emissions trading as a medium-impact measure. Other measures are expected to have low impact or their impact is unknown.

Table 1: EU Measures for Industry in the MURE Database

Code	Title	Status	Type	Starting Year	Semi-quantitative Impact
EU2	Voluntary labelling of electric motors (CEMEP/EU Agreement)	Completed	Co-operative Measures, Information/Education/ Training	2000	Low
EU1	Motor Challenge Programme	Ongoing	Information/Education/ Training	2002	Low
EU3	E2MAS	Unknown	Legislative/Informative	2003	Low
EU9	Combined Heat and Power (Cogeneration) Directive (2004/8/EC)	Ongoing	Legislative/Normative	2004	High
EU14	Community framework for the taxation of energy products and electricity (2003/96/EC)	Ongoing	Fiscal/Tariffs	2004	Low
EU4	EU Emissions Trading Scheme (2003/87/EC)	Ongoing	New Market-based Instruments	2005	
EU10	Efficiency reference values for electricity and heat production	Ongoing	Legislative/Normative	2007	
EU11	European Green Light Programme	Ongoing	Co-operative Measures	2007	Low
EU13	Integrated Pollution Prevention and Control Directive IPPC (2008/1/EC)	Ongoing	Legislative/Informative	2008	Low
EU12	Amended EU Emissions Trading Scheme (2009/29/EC)	Ongoing	New Market-based Instruments	2012	Medium

Source: MURE database, January 2012

Also some cross-sectoral measures have considerable industry relevance. Of particular interest is the Eco-design Directive for Energy-using Products (Directive 2005/32/EC) and its recast for energy-related products (Directive 2009/125/EC). The Eco-design

⁵ In MURE, each measure is classified with a qualitative impact label: 'high', 'medium', 'low' or 'unknown' (if no qualitative impact evaluation has been done). The impact of a measure is high if the corresponding savings are equal to or higher than 0.5% of the final energy consumption of the entire sector. The impact is medium if the savings are between 0.1% and 0.5%, and low if they are less than 0.1% of the final energy consumption of the entire sector. The classification is made by national teams for national measure and by the MURE management team for European measures.

Directive is discussed in more detail in Chapter 3.5. Furthermore, the cross-sectoral measures include those for renewable energy and taxation as well as the Energy Services Directive.

A forthcoming measure, which is not included in the MURE database yet, is the Energy Efficiency Directive under negotiation (see Chapter 3.6).

3.2. Emissions trading

The European Emission Trading Scheme (EU ETS) was launched in January 2005. The EU ETS covers around 11 000 large greenhouse gas emitting installations in the energy and industry sectors: combustion installations with a rated thermal input capacity of at least 20 MW, as well as refineries, coke ovens, steel plants, and installations producing cement clinker, lime, bricks, glass, pulp and paper provided that they exceed the threshold production levels given in Annex 1 of the ETS Directive. In total, the EU ETS covers about 50% of Europe's CO₂ emissions and 40% of its total greenhouse gas emissions. The ETS now operates in 30 countries (the 27 EU Member States plus Iceland, Liechtenstein and Norway).

The EU ETS was governed by the EU ETS Directive (2003/87/EC). It was substantially revised in 2009 (2009/29/EC) and the provisions of the Directive are required to be transposed into national law by 31 December 2012.

The new regulations describe the revised operation of the EU ETS from 2013 onwards, i.e., the third trading period. Specifically, the regulations mandate Environmental the Protection Agency to collect duly substantiated and verified emissions data from installations that will only be covered by the EU ETS starting from 2013. The Agency also publishes a list of national installations covered by the Directive and submits it to the European Commission. It may also consider the exclusion of certain small installations which are subject to measures that will achieve an equivalent contribution to emission reductions. Furthermore, the Agency has been appointed as an auctioneer, which is required under the Commission's regulation.

For phases 1 (2005-2007) and 2 (2008-2012) individual Member States developed country-specific National Allocation Plans (NAPs). NAPs will no longer be required in the third trading period.

3.3. Energy taxation

Environmental taxes can be divided into four broad categories: energy, transport, pollution and resource taxes. Energy taxes are by far the most significant, representing around three quarters of environmental tax receipts in Europe. (Eurostat 2011)

According to Eurostat (2011) environmental taxes have not been growing in recent years at the EU average level. A steady fall in the level of environmental taxes can be observed from 2003 onwards up to around 2008, after which there was an upturn

following excise duty increases in several countries namely Bulgaria, Czech Republic, Denmark, Estonia, Greece, Hungary, Latvia, Lithuania, Romania, Slovenia, Spain. Only Italy, Poland and Slovak Republic cut the excise duties on energy. There has been real value erosion in energy taxes while the level of other environmental taxes (on transport and resources/pollution) has remained relatively constant. This, however, concerns all energy using sectors together, not just that in industry. (Eurostat 2011)

Community framework for the taxation of energy products and electricity (Directive 2003/96/EC) sets minimum rates of taxation, including those for industry (Table 2). However, energy products and electricity are only taxed when they are used as motor or heating fuel, and not when they are used as raw materials or for the purposes of chemical reduction or in electrolytic and metallurgical processes.

Table 2: The Minimum Levels of Taxation Applicable to Fuels for Industrial Use

Fuel	Current minimum excise rates
Diesel (€/1000 litres)	21
Kerosene (€/1000 litres)	21
Liquefied petroleum gas LPG (€/1000 kg)	41
Natural gas (€/gigajoule)	0.3

Source: MURE database

3.4. IPPC Directive

The IPPC Directive (Integrated Pollution Prevention and Control Directive; latest amendment 2008/1/EC) requires industrial and agricultural activities with a high pollution potential to have an environmental permit. This permit can only be issued if certain environmental conditions are met, so that the companies themselves bear responsibility for preventing and reducing any pollution they may cause.

Integrated pollution prevention and control concerns new or existing industrial and agricultural activities with a high pollution potential, as defined in Annex I to the Directive (energy industries, production and processing of metals, mineral industry, chemical industry, waste management, livestock farming, etc.).

In order to receive a permit, the installation must use energy efficiently. Among other requirements, it also has to use the “best available techniques” (BAT) which reduce environmental impact as a whole, however, taking into account local considerations such as the technical characteristics of the installation and any special needs of the local environment.

The requirement for efficient use of energy is reinforced by Directive 2010/75/EC on industrial emissions, which the Member States shall transpose to national legislation by November 2012. The Industrial Emissions Directive makes the requirements for best available technologies described in so-called BREF documents binding.

3.5. Eco-Design Directive

The Eco-design directive for energy-related products (Directive 2009/125/EC) has direct impact on the efficiency through regulation on the efficiency of industrial process equipment such as electric motors, pumps, compressors and industrial ovens. Furthermore, it has significant indirect impact because the manufacturing industries must consider the energy efficiency and other environmental qualities of their energy-related products over their lifecycle.

Only a couple of countries have introduced national minimum energy performance standards for industrial equipment. German Large-Scale Combustion Plant Ordinance (1983, last revised in 2009) caps the major emissions components of combustion plants with at least 50 MW of heating capacity. By capping the carbon dioxide emissions, energy consumption is curbed. Latvia issued energy efficiency requirements in 2010 for district heating systems. The requirements concern heat production boilers and CHP units feeding district heating systems as well as heat losses in district heat network.

3.6. Draft Energy Efficiency Directive (June 2011)

3.6.1. Contents of the draft directive

The Energy Efficiency Plan 2011 is a strategic document issued by the EU in March 2011 (European Commission 2011a). In June 2011, it was translated into a proposal of a new directive, provisionally known as the Energy Efficiency Directive (EED). The directive is planned to repeal both the Energy Services Directive (2006/32/EC) and the CHP Directive (2004/8/EC). The new directive addresses industry in several different ways. It plans to introduce measures for energy efficiency in the manufacturing industry; for energy transformation including CHP; for energy transmission and distribution; and it mandates energy suppliers to help customers to save energy (**Box 3.1**). (European Commission 2011b, DECC 2012)

Box 3.1: Industry-relevant Provisions in the Draft Energy Efficiency Directive (June 2011)

Provisions for industry

- Member States must establish an energy efficiency obligation scheme requiring all energy suppliers (or distributors) to meet an annual energy-saving target equal to 1.5% of their energy sales by volume in the previous year. Alternatively, Member States may opt to take other measures to achieve energy savings amongst final customers as long as they deliver equivalent energy savings. Such alternative approaches must be approved by the Commission. (Article 6)
- Member States must promote the availability of energy audits and encourage SMEs to undergo an audit. (Article 7)
- Member States must ensure that large companies undertake an independent audit by 30 June 2014 and every three years thereafter. These audits may be conducted under existing energy management systems or voluntary agreements between stakeholder organisations and Government. (Article 7)

Energy transformation and CHP

- Member States shall produce a National Heating and Cooling Plan to develop the national potential for co-generation. The Plan must be submitted to the Commission by 1 January 2014 and then updated every five years. (Article 10)
- All new thermal electricity plant above 20 MW should be high efficiency co-generation units and is sited where waste heat can be used. When existing thermal electricity plant above 20 MW is significantly refurbished or its permit is updated, it must be converted to allow operation as a high-efficiency co-generation installation provided it is sited where waste heat can be used. (Article 10)
- Authorisation criteria must be adopted whereby other new or substantially refurbished industrial installations with a thermal input above 20 MW also capture and make use of their waste heat. (Article 10)
- Member States may lay down exemptions from these requirements on the basis of availability of heat load or a negative cost/benefit analysis, though these conditions for exemption must be approved by the Commission. (Article 10)
- Member States must draw up and update every 3 years an inventory detailing the energy performance for all combustion installations and refineries with a total rated thermal input of 50 MW. The Commission will use this information to assess the energy efficiency potential of these installations and, if necessary, may propose requirements to improve their efficiency when new installations are permitted or re-permitted after periodic review. (Article 11)

Energy transmission and distribution

- Member States must ensure that energy regulators pay due regard to energy efficiency in their decisions relating to the operation of gas and electricity transmission and distribution infrastructure. (Article 12)
- By June 2013, Member States must adopt plans which assess the energy efficiency of their gas, electricity and heating and cooling infrastructure and identify concrete measures and investments to deliver cost-effective improvements. (Article 12)
- Member States must guarantee transmission and distribution of electricity from high efficiency co-generation, as well as priority or guaranteed access to the grid and priority dispatch for CHP electricity. (Article 12)

Cross-cutting provisions with industry relevance

- Availability of Certification Schemes: Member States must ensure that by 1 January 2014 certification and qualification schemes are available for providers of energy services, energy audits and energy efficiency improvement measures. (Article 13)
- Energy Services: Member States must promote the energy service market through making available lists of providers, model contracts, and disseminating a range of information on incentives to support energy service projects. (Article 14)

Source: DECC (2012) ref. European Commission 2011b.

The proposed measures for industry have already been implemented in varying degree in the Member States. However, the current overall implementation status is quite long way off the level of ambition in the draft Directive requiring massive additional effort from the Member States.

3.6.2. Implementation status of energy obligation schemes

Five countries have already got an energy savings obligations scheme, also known as white certificates. These countries are Belgium (Flanders Region), Denmark, France, Italy and the UK (Table 3). In UK, only the household sector is targeted. In the other

countries, savings can be obtained in industry - although some countries exclude establishments under the ETS (e.g. France and Belgium-Flanders).

According to Poland's 2nd NEEAP, Poland is also planning to introduce a white certificates scheme. In addition, plans for a voluntary white certificates scheme are underway in Ireland. White certificates are also under discussion in Bulgaria, Romania and Slovenia.

Around 2 billion euros per year are being spent by energy companies in the EU to deliver energy efficiency under the obligation schemes. This figure represents between 1 and 5% of the energy bill to customers depending on the Member States. (ecee 2012)

According to an evaluation of the French obligation scheme in the 2nd NEEAP, savings of 65 TWh were achieved in the first obligations period from mid-2006 to mid-2009 exceeding the 54 TWh target. 7.4% of the savings were achieved in industry while the majority (86.7%) was gained in the residential sector.

Italy estimates in its 2nd NEAAP that the white certificates scheme has saved 15 TWh of final energy by September 2010. It should be noted that the target of the scheme, 24.7 TWh/a in 2009, was a primary energy target.

All countries but Cyprus report in the MURE Database that they run either voluntary or mandatory energy audit schemes or provide audit subsidies. Nineteen countries state that at least some of the measures advancing energy audits cover also the SMEs but as many as ten countries do not promote them for the SMEs. Furthermore, it is not clear how well the generic audit schemes reach the SME audience, particularly, when in-depth audits are the only option. Bulgaria, Finland, Germany, Ireland and Sweden have implemented tailored audit and energy advice programmes for the SMEs. In Finland, the SMEs benefit of 10 per cent points higher audit subsidies than other companies.

Table 3: Implementation of Energy Savings Obligations in Europe

Country	Obligated Company	Eligible Customers	Target set by	Administrator	Nature of saving target	Current size of target	Discount rate	Cost estimate (€/a)	Sanctions	Trading
Existing schemes										
Belgium-Flanders	Electricity distributors	Residential and non-energy intensive industry and service	Flemish Government	Flemish Government	Annual primary energy	2.6 TWh/a (2009)	no	25.8	10 €/MWh + fine	No
Denmark ¹	Heat, electricity, gas & oil distributors ²	All except transport	Government	Danish Energy Authority	Annual final energy	1.7 TWh/a (2009)		25		Between distributors
France	All suppliers of energy	All including transport except EU ETS	Government	Government	Lifetime final energy	54.7 TWh in 2006-2009; 345 TWh in 2010-2013	4%	180		Yes
Italy	Electricity & gas distributors	All including transport	Government	Regulator (AEEG)	Cumulative primary energy (over 5-8 years)	Annual target 23 TWh in 2010, 32 TWh in 2012	no	196	Related to non-compliance	Yes
UK	Electricity & gas suppliers	Residential only	Government	Regulator (Ofgem)	Lifetime final energy	62 TWh in 2008-2011; 293 Mt _{CO2} in 2005-2012	3.5%	900	Related to size of miss	Between suppliers
Planned schemes										
Ireland (planned for 2012)	Electricity, gas, oil and solid fuel distributors	All except transport			Annual primary energy	200 GWh in 2011, 375 GWh in 2012 & 2013	No			

Country	Obligated Company	Eligible Customers	Target set by	Administrator	Nature of saving target	Current size of target	Discount rate	Cost estimate (€M/a)	Sanctions	Trading
Poland (planned for 2013)	Electricity, gas and heat distributors	End-use consumers (80% of obligation), generators (10%), transmission & distribution (10%)			Final energy	24 TWh/a in 2016 (2-2.2 Mtoe/a)	No			

¹ Denmark was to expand the programme in 2010 by 83% from the current size of the obligation leading to annual energy savings equivalent to 1.2% of present Danish consumption. There are many more obliged players (over 200) than in UK, Italy and France (about 2 500 obliged companies but around 80% of the obligation falls on EDF and GDF-Suez).

² The legal obligation is only for heat distributors; for electricity, gas and oil distributors, it is a voluntary agreement with the sector as a whole.

Source: WEC 2010; updates from Lapillone 2011

Box 3.2: Energy Efficiency Certificates, France

The energy efficiency certificate (EEC) scheme was established by Law No 2005-781 (“Programme fixant les orientations de la politique énergétique”) adopted on 13 July 2005. EECs are given to obliged parties based on actions approved on an official list of 210 so-called ‘standardized actions’ with predetermined savings targets. These savings are estimated ex-ante following a standard methodology.

The mandatory target for the first period from 1 July 2006 to 30 June 2009 was 54 TWh in final energy cumulated (‘cumac’) and actualised with a 4% discount rate over the lifetime of the energy efficiency actions. The overall target was shared among the different energy sources covered and shared again between the obligated entities depending on their market share. The target for electricity was 31 TWh, natural gas 14 TWh, fuels 6.8 TWh, LPG 1.5 TWh and district heating and cooling heating 0.7 TWh. The number of obliged entities was 2 500. The first programme period was followed by a transition period from mid-2009 to the end 2010 when no energy-saving target was in force but activities continued in some obligated entities.

The second three-year period started at the beginning of 2011, stipulated by Article 78 of Law No 2010-788 of 12 July 2010. The Law also extends the energy-saving obligations to automobile fuel and domestic fuel oil distributors if their annual sales are above a given threshold. The obligation levels for the second period are 255 TWh_{cumac} for all sellers of electricity, gas, domestic fuel oil, LPG and district heating and cooling and 90 TWh_{cumac} for automobile fuel distributors.

In the second period EECs can be issued to programmes for reducing the energy consumption of the low-income households, in the context of combating energy insecurities, or to programmes offering information, training and innovation in support of demand-side management, in particular aimed at developing vehicles with low carbon dioxide emissions. Other new possibilities for acquiring EECs are training of construction sector professionals in energy saving and drawing up technical documents to support the construction sector in renovation, maintenance and construction of buildings in accordance with the Environment Round Table energy targets (low consumption and/or positive energy new buildings, major energy renovation of existing buildings).

All EECs are registered on a designated website (<https://www.emmy.fr/front/registre.jsf>). The website also enables trading.

The penalty for non-compliance with the apportioned targets is 2 cent/kWh whereas the average cost of the saving programmes is 1 cent/kWh. Payment of the penalty cancels the obligation.

Source: MURE database.

3.6.3. Implementation status of energy audits

A notable number of countries have introduced mandatory energy audits but the implementation of these schemes varies considerably. Also the certification and qualification schemes included in the draft Energy Efficiency Directive relate to the matter. More details on different approaches and case examples from Bulgaria (**Box 4.8**), Portugal (**Box 4.9**) and Romania (**Box 4.10**) can be found in Chapter 4.

Information on certification and qualification schemes for providers of energy services, energy audits and energy efficiency improvement measures in the MURE Database is somewhat fragmented making it difficult to form a comprehensive view of the situation. However, some information is available on the appointment of energy managers. In Hungary, Romania and in the Slovak Republic the appointment of energy

managers is mandatory among large energy users and training and formal certification schemes are in place. Some other countries, e.g., Greece and Italy, also require the appointment of energy managers but they do not need a specific certificate.

In Finland, undertaking an energy audit is voluntary but those making subsidized energy audits must pass a qualification scheme. Certification of auditors is also required in other countries, e.g., in Bulgaria, the Czech Republic and Romania.

Mandatory energy audit schemes may include various different elements beyond the site examination and reporting the results. WEC (2008) has analysed what different elements mandatory audit schemes may consist of. The list of possible elements is much wider than the provisions of the draft EED. However, some countries have already taken such integrated approaches. The elements identified by WEC (2010) were:

- Obligation to carry out audits at regular intervals (generally companies above certain threshold of energy consumption)
- Reporting obligations to governmental organisations and communication of audit results to the public (energy consumption reporting, reporting on saving measures, reporting on implemented measures)
- Obligation to propose action plans to implement the energy savings measures identified in audits
- Obligation to carry out certain types of measures
- Obligation to appoint an energy manager
- Mandatory certification of auditors
- Mandatory comparison to reference values (benchmarking)

3.6.4. Implementation status of other provisions

Some measures, particularly financial, have already been in place to advance the use of CHP. While financial support may be justified to open the market for CHP and speed up the adoption of new technologies, care should be taken to avoid excessive support to inefficient CHP and market distortions which have occurred in some cases. Another financial mechanism is third party financing, which has been used to a significant degree in Spain. However, the take-up of cogeneration was generally quite stagnated in the early 2000s when the CHP Directive (2004/8/EC) was issued. The Member States were to implement it by February 2006. The objective of the Directive was to overcome some barriers which the European Commission had identified, namely lack of coherent policies in some Member States, market uncertainties, higher fuel prices for small producers, relatively low prices for generated electricity, barriers to grid access to sell surplus electricity, and relatively high start-up costs. The proposed Energy Efficiency Directive, which will repeal the CHP directive, addresses the still existing barriers. According to the MURE Database, there is little evidence that measures in line with the new provisions would already have been implemented in the Member States.

There are few measures in place to promote the use of waste heat from industrial thermal generation units. However, the Dutch programme 'Heat at Full Steam' advances the use of industrial waste heat by subsidising regional heat maps which visualise availability of industrial waste heat and options for the use of geothermal heat.

Energy efficiency measures in transmission and distribution which are addressed by the draft Energy Efficiency Directive are not included in the MURE Database. Therefore these measures are not discussed here.

4. Industry measures in the NEEAPs and in Norway

The MURE database contains 132 so-called “NEEAP-measures” for industry in the EU Member States. Also Croatia’s two and Norway’s six on-going industrial measures are included in the analysis.

The NEEAP-measures are those described in the first (2007) or second (2011) National Energy Efficiency Action Plan issued by each Member State to conform to the requirements of the Energy Services Directive. The following analysis is based on the uploaded NEEAP measures but it should be noted that not all the NEEAP measures have been uploaded.

In Chapter 4.1, NEEAP measures are discussed according to the categorization used in the MURE database. An insight is given to the role of various measures in the overall policy mix, evaluation methods and evaluation results. Case studies are given on certain measures which are considered to have considerable impact, to be innovative or representative in their respective policy type.

In addition to individual instruments, attention should be paid to packaging of policies and measures (see Chapter 4.2). Quite often measures are implemented in isolation instead of combining them with other policy instruments. Given the variety of prevailing energy efficiency barriers and drivers, different types of policy instruments should be packaged.

Measures which the national teams have reported to have high impact on energy efficiency are given specific focus in Chapter 4.3.

Despite NEEAPs having been developed to implement the Energy Services Directive which excludes energy use in the emissions trading sector, 81 of the totality of 132 industry measures in the NEEAPs also address ‘large enterprises’ according to the MURE database. ‘Large enterprises’ do not equal the emissions trading sector but, given the significant share of such measures, it can be concluded that quite often the industry measures in the NEEAPs address the whole industry.

Measures classified as “New Market-Based Instruments” in the MURE database are all related to EU Emission Trading and its flexible mechanisms, i.e., Joint Implementation and Clean Development Mechanism, and therefore not NEEAP measures. Hence, they are not discussed here but in Chapter 3.2.

4.1. Measures by type

4.1.1. Co-operative measures appear to be effective but are preferred by a limited number of countries

Co-operative measures in the MURE database belong to the following three categories: voluntary/negotiated agreements to reduce energy consumption or CO₂

emissions of industrial processes, voluntary/negotiated agreements for cross-cutting technologies (e.g. industrial motors) and technology procurement for energy efficient equipment.

Co-operative measures are implemented by a somewhat limited number of countries. Thirteen countries have implemented 31 co-operative measures whereas the majority of countries have not introduced any co-operative measures. According to analyses by WEC (2011), the reason for country differences may lie in differences in administrative cultures and public-private relations. In some contexts, close relations between industry and government support voluntary and negotiated agreements. In other contexts, where leaner government and individual stakeholder integrity are highly prized, similar schemes may be problematic due to perceptions of regulatory intrusiveness.

The long-running voluntary agreements in Europe, namely those in Denmark, Finland, Luxembourg, the Netherlands, Sweden, the UK, have been introduced well before the Energy Services Directive entered into force reflecting national energy and climate policy goals. In Finland, the scheme was adjusted to the ESD as all its major provisions were incorporated into the new set of voluntary agreements introduced for the period 2008-2016. Some Member States (e.g. Sweden) have introduced agreements with implicit or explicit reference to the directive on minimum taxation of electricity. (JRC 2010)

Voluntary and negotiated agreements aimed at reducing energy consumption or CO₂ emissions are the most common type of co-operative measures. Various incentives are used to attract companies to enter the agreements, typically tax benefits (four countries) and subsidies but also easier access to environmental permits (the Netherlands, Finland).

Tax benefits are available, e.g., in Denmark, Norway, Sweden and UK. The financial incentives to participate in the agreements programme are two-fold: the tax exemption and financial gains from energy savings. In addition, long-term competitiveness is enhanced. In Norway, pulp and paper companies may apply for participation in a programme for energy efficiency and the approved companies will be given a full exemption from the electricity tax. In Sweden, all energy intensive companies have the opportunity to avoid the electricity tax by participating in the voluntary agreement (**Box 4.1**). In UK, joining the Climate Change Agreements gives a possibility to avoid part of the Climate Change Levy (**Box 4.2**). In Denmark, the Danish Energy Agency pledges payment of subsidies for partial coverage of a company's CO₂ tax liabilities when it signs a voluntary agreement. The agreement obligates a company to undertake a number of energy-saving measures and to implement a certified energy management system.

In some cases, subsidy schemes have been tailored to attract companies to join voluntary agreements. For example, in Finland subsidies for energy efficiency investments may be given for investment projects using conventional technologies if the company has joined the agreement scheme whereas in other cases only new technology is subsidised.

While most voluntary or negotiated agreements tend to address the whole energy use of a given sector, the German voluntary agreement for CHP is a rare example of a pure voluntary or negotiated agreement for cross-cutting technologies (**Box 4.3**). Another cross-cutting co-operative measure in Germany is contracting (i.e. third-party financing) of compressed air technology. The industrial facility which wishes to use compressed air concludes an agreement with a contractor, according to which the latter plans, finances, constructs, operates and maintains the compressed air installation. The compressed air user only pays for the compressed air which it has received. The standardisation of contracting models speeds up the development of markets for these energy services.

According to the MURE database, only the Swedish NEEAP includes a couple of measures for technology procurement for energy efficient equipment. Since the beginning of the 1990s, the Swedish Energy Agency has partly financed and initiated nearly 60 different technology procurements. In industry, the applications have covered factory doors, energy-efficient mine ventilation fans, large industrial fans, refrigeration compressors in the food industry, control systems for pumps, load and energy management systems for foundries, filters for harmonics and motors. The voluntary industry-related sector networks were established in Sweden in 2009 to save energy in various sectors over the next few years. The Network for Energy Efficiency, (ENIG), consists of a network of experts, industries, energy offices and energy and climate consultants to improve energy efficiency. The focus is on casting, surface treatment, heat treatment, sheet metal forming and plastics processing. The purpose of such networks is to increase know-how and provide tools to increase energy efficiency at every level of industrial firms through the exchange of information and knowledge.

Approximately two thirds of the co-operative measures (22 NEEAP measures + one in Norway) have been evaluated according to the MURE database. Fifteen of the measures are in the high-impact category and eight in the medium-impact category. The evaluation methods vary from enhanced engineering estimates using monitoring results to a mix of top-down and bottom-up methods. However, there are too few evaluations to draw any conclusions on typical methods, the level of results or the degree of achievement of the targets established in the agreements. The results should also be compared to the energy use of the branch/branches involved but this is not possible based on MURE data. More detailed data can be found e.g. from a recent report by the Joint Research Centre (JRC 2010).

The introduction of the EU Emissions Trading places new complexity to the evaluation of the voluntary agreements since there is sometimes a risk of double counting between these schemes. Countries have responded to this challenge by either revising their agreements so as to not interfere with the ETS, by adjusting the calculation methods or by gradually abandoning the agreements (e.g. France). (JRC 2010)

Box 4.1: Programme for Energy Efficiency in Energy Intensive Industry, Sweden

The Programme for Energy Efficiency was introduced in January 2005. By participating in the voluntary programme and meeting their efficiency goals, energy intensive companies can avoid the electricity tax (0.5 euro/MWh) applicable since 1 July 2004. The Swedish Energy Agency is the supervisory authority and the Swedish National Tax Board administers the tax reductions.

The programme period of a company lasts for five years, divided into two periods. During the first two years, the company shall implement measures which improve energy efficiency and improve its energy management. This involves implementing and certifying a standardized Energy Management System, performing Energy Mapping (an energy audit) and analyses of its energy consumption, planning the changes and renovations of its plants and taking energy efficiency into account in purchases of electricity consuming equipment.

At the end of the first period, the company shall present the Swedish Energy Agency an evaluation of the two first years including proposals for measures to improve the energy efficiency. If the Agency approves the evaluation, the company is to implement the measures during the coming three years. By the end of the second period, the company submits a final report and the Agency evaluates the results. Next, it is possible to start a second five-year period.

Results of 103 companies show electricity savings of 1.45 TWh/year equalling to 5% of consumption. Corresponding investments have been 75 million euros. 1 247 actions by the participants have been reported. Only very few enterprises outside the scheme have certified Energy Management Systems.

Source: MURE database.

Box 4.2: Climate Change Agreements, UK

The Climate Change Agreements were established in 2001. They allow a part exemption from the Climate Change Levy for businesses within energy intensive sectors that agreed to challenging targets for improving their energy efficiency or reducing carbon emissions. The Agreements reduced the rate of the Levy levied on energy consumed by these facilities by 80% (until 31 March 2011) and 65% (from 1 April 2011). From 1 April 2013, the rate will remain at 65% for all fuels except electricity, which will return to 80%. An individual company enters scheme by signing an agreement with the Department of Energy and Climate Change (DECC) which is administering the agreements.

The Agreements cover ten major energy intensive sectors and over thirty smaller sectors. There are Climate Change Agreements with over 50 industrial sectors; these current agreements will run until March 2013. In 2011, the Government announced that the scheme will be extended to 2023.

Every two years an assessment is made on progress over the previous target period. The energy savings from the Agreements are calculated according to supplementary Green Book policy appraisal guidelines available at http://www.hm-treasury.gov.uk/data_greenbook_index.htm

The key results of the fourth target period assessment (2008) show:

- 20.3 million tonnes of CO₂ per year emissions were saved in total compared to sector baselines
- 36 out of 52 sectors reporting met their targets outright
- In a further 12 sectors all the facilities had their Climate Change Levy discounts renewed
- 99% of facilities (8 973) have had Climate Change Levy discounts renewed
- Generally, there was continued improvement across the sectors.

Source: MURE database.

Box 4.3: Voluntary Agreement on CHP, Germany

In 2001, the Federal Government and the German businesses agreed on a voluntary agreement for the promotion of CHP, which is an addition to the voluntary agreement on climate protection of year 2000. According to the commitment, industrial CO₂ emissions should be decreased by 45 million tonnes until 2010, of which 20-23 million by CHP.

The measure works together with others, including the CHP Law, the Renewable Energy Sources Act and the ecological tax reform.

Out of the total savings due to CHP installations of 15.8 million tonnes of CO₂ a maximum of 1 million tonnes is estimated to be attributable to the voluntary agreement on CHP. The rest is attributable to “autonomous development” and other measures.

Source: MURE database.

4.1.2. Financial measures dominate in energy efficiency promotion in industry

The financial measures in the MURE database are grants/subsidies (for CHP investments; energy audits, training and benchmarking activities; energy efficiency investment or investment in renewables or clean fuels) and soft loans with preferential loan guarantee conditions or reduced interest rates (for investments in energy efficiency, renewables and CHP). 49 financial measures have been implemented in 21 countries. Fiscal/tariff measures are tax exemptions or possibility for accelerated depreciation. Eight fiscal/tariff measures have been implemented in four countries.

Eco-taxes have been reported in five NEEAPs (Estonia, Germany, the Netherlands, Sweden and UK), in Norway and in Croatia.

Financial feasibility is one of the key parameters a company weights when considering an energy efficiency investment or another investment entailing energy efficiency benefits. Pay-back periods are often used as criteria for smaller investments and internal-rate-of-return (IRR) for larger ones. CPI & Climate Strategies conducted a survey in 2011 amongst almost 800 manufacturing firms in six European countries which revealed an average four year pay-back time for energy savings measures. 10% of the firms only accept a maximum pay-back period of one and a half years while 10% accept pay-back times up to seven years. Pay-back times also vary systematically among sectors and countries. For larger investments, companies typically demand IRR values to be higher than 10% but sometimes up to 25%. When commitment to energy efficiency is lacking, firms will have a natural tendency to prioritise other, more financially appealing investments. (IEA 2011 ref. CPI & Climate Strategies 2011)

While the investment and operation costs are taken into consideration in the financial analyses, energy efficiency improvements are often hindered by various hidden costs. For example, because energy efficiency projects are typically small in the industry scale, they may result in disproportionately high transaction costs. (IEA 2011)

Subsidies directly influence the financial driver of investments in energy efficiency. The impact of the subsidy depends on the proportion of subsidy on the total project cost: by how much are costs for energy efficiency measures reduced, and their effect on pay-back periods and IRR. In case of technology specific subsidies, the more the list is targeted and updated, the higher the chance that these will create additional investments and lessen “free rider” behaviour (IEA 2011). The Dutch measure Green Investment and Finance (**Box 4.4**) employs an annually updated list of eligible technologies. The free rider issue is addressed in some subsidy schemes (e.g. Finland) by giving subsidies only to projects exceeding certain pay-back time. In a Latvian joint implementation project (**Box 4.5**) cost-effectiveness criteria are applied to the subsidy part of the CO₂ reductions. The Latvian measure is also innovative by requiring the application of green purchasing principles and public visibility of the results achieved.

The introduction of environmental tax reforms gained increasing support during the 1990s. The basic idea was to shift the tax burden from labour towards the use of natural resources and environmentally harmful goods and activities. In the Member States the ideas of green tax reforms have met varying success. Among others, Denmark, Finland, Germany, the Netherlands, Sweden and the United Kingdom have introduced the elements of green tax reforms over the last decade. Some new Member States, too, have followed suit. One example is Slovenia, where a CO₂ tax has been applied on all energy products since 1997. In Estonia the increases in excise duties have been used to finance substantial cuts of personal income taxes up to 2008. The Czech Republic introduced an environmental tax reform in 2008, which would increase the tax rates of most energy products over the period 2008–2012. Despite this interest, environmental tax revenues have not been growing in recent years at the EU average level. The share of environmental taxation out of total taxation has increased since 1995 in a number of the EU Member States (Austria, Bulgaria, Denmark, Estonia, Latvia, Lithuania, the Netherlands, Poland, Romania, Sweden and Slovakia), but remained stagnant or decreased in the others, including most of the big Member States. (Eurostat 2011)

The qualitative impact assessment of financial and fiscal NEEAP measures in the MURE database ranks them in quite equal proportions between high, medium and low impact categories.

Among the 26 measures which actually have been subject to quantitative evaluation, the results are equally mixed. It appears that a common factor for most low impact measures is that they are purely financial measures, whereas most high impact measures feature a combination of several different measure types in a package of measures.

It is not straightforward to summarise the evaluation methods used in quantitative evaluation. However, it appears that enhanced engineering estimates are oftentimes used to evaluate subsidies; input information is collected from subsidy applications or via monitoring systems. The evaluation of tax rebate schemes, when implemented as part of voluntary agreements, is based on the commitments and reporting. The impact of taxation is more difficult to evaluate and requires modelling. In Germany, the impact of the ecological tax reform has been evaluated by using a combination of three

different models: an econometric input-output-model, a macro-level simulation model and micro-level simulation model.

Box 4.4: Green Investment and Finance, the Netherlands

'Green Investment' covers both green saving and investment as well as green finance. To be eligible for green finance, projects must have a 'green statement' which shows that they meet certain criteria.

Green Investment is facilitated by two schemes: the Green Funds Scheme (MIA, Environmental Investment Deduction) and the Green Projects Scheme (VAMIL, accelerated depreciation of environmental investments). MIA offers businesses that invest in environmentally-friendly equipment the opportunity to deduct up to 36% of the investment costs from their taxable profits. The percentage of the deduction depends on the environmental effects and acceptability of the equipment. VAMIL offers a liquidity and interest benefit. Businesses using this scheme for equipment may depreciate it randomly or freely. Although MIA and VAMIL are two different schemes, they are often used in combination. Both schemes use a common eligibility list, called the Environment List, which lists all equipment eligible for the MIA and/or VAMIL. The List is revised every year.

VAMIL was first developed in September 1991, while MIA was introduced in 2000. Via VAMIL it is allowed to depreciate the investment costs on any given moment. Depreciation of the investment in the first year(s) will result in a benefit with respect to interest and liquidity. MIA allows the investor to additionally deduct up to 40% of the investment costs for a particular technology from the fiscal profit, resulting in lower taxes for the investor.

The accelerated depreciation schemes are managed by NL Agency (for the technical review) and the Tax Office (the level of tax reduction) on behalf of the Ministry of Infrastructure and the Environment and the Ministry of Finance.

The budgets have fluctuated year by year but in 2011 the budget for MIA was 101 million euros and for VAMIL 24 million. The latter was less than half the 2010 level.

Source: MURE database.

Box 4.5: Complex Solutions for GHG Emissions Reduction in Industry, Latvia

The objective of this measure is to reduce CO₂ emissions by improving energy efficiency in industrial buildings, technologies and equipment for industrial production. Latvia is a country participating in the Joint Implementation mechanism of the Kyoto Protocol through which the measure is financed. Part of these receipts is allocated to CO₂ emissions reduction by improving energy efficiency in industry. The Ministry of Environment (The Ministry of Environment and Regional Development from the beginning of 2011) is responsible for the implementation of the measure and Environmental Investment Fund (a company) supervises the implementation.

An open tender was announced in 2010 and 49 projects were chosen for implementation. The objective is to open a new tender each year. All sizes of industry were eligible to apply but those participating in EU Emissions Trading Scheme were excluded.

The applications have to meet multiple criteria. The cost-effectiveness criterion for the projects is that the CO₂ emissions reduction per year has to exceed 700 grams of CO₂ per LVL granted. Technically, an energy audit shall be performed by certified energy auditor and detailed information on the technical design, equipment and devices has to be provided. Lastly, cost comparisons have to be made between new fossil fuel and renewables based heating systems.

The projects can include renovation of buildings, process technologies, efficient lighting and fuel substitution to renewables but cogeneration was excluded. In addition to investment costs, also energy audits, consultation, technical design and cost estimates were supported but with some restrictions.

In the implementation of the project, the beneficiary shall apply the principles of green purchasing for the selection of technical designers and contractors of the construction works. After the completion of the project the beneficiary shall place publicly the energy certificate for the building and visual information demonstrating the achieved results.

Total financing provided by the Climate Change Financial Instrument (CCFI) was 8.1 million LVL (11.6 million euros) and the total contribution by the beneficiaries was 8.5 million LVL (12.1 million euros). CCFI applies the principle of additionality which means that the implemented projects cannot receive co-financing from elsewhere. The CCFI grant for one project can be in the range of 20 000-500 000 LVL (28 500-711 000 euros) and it can reach up to 55% of the total eligible costs for micro, small and medium-sized businesses and 45% for large businesses.

The ex-ante evaluation of the approved projects shows 37.4 GWh energy savings and 11 509 tonnes of CO₂ reductions annually. The estimates made in the second NEEAP for continued annual tenders envisage cumulative energy savings of 187 GWh/a by 2016 and 336.6 GWh/a by 2020.

Source: MURE database.

4.1.3. The role of information and training is increasing

In the MURE database this group combines quite heterogeneous instruments from information campaigns, informing top level management and training energy managers to establishment of information centres, voluntary labelling of cross-cutting technologies and voluntary energy audits. In this group of measures, energy audits are a bit different from other information measures because, unlike the other more generic measures, they provide detailed company specific information on cost-effective possibilities to improve energy efficiency. Yet, they are an instrument based on information.

Both the number and significance of this group of measures has been growing. At present, there are 22 NEEAP measures in this category in 13 countries and one in Norway in the MURE database. One of the countries which has visibly stepped up the information activities in the second NEEAP is Estonia which announced three new measures, namely organising training events to build energy management competence, increasing the number of energy auditors and developing and disseminating informational materials for company employees.

The whole span of activities can be found in terms of target groups, technologies and information instruments used. While some measures are highly focused on certain technology (motors, compressed air or lighting) others address all process and building technologies in industry. There are measures concentrating only on SMEs (e.g., in Germany, Ireland and Malta), solely on the large or energy-intensive industries (e.g., in Ireland, Romania and Sweden) as well as those which cover the whole industry (in most countries implementing information measures). Information instruments used range from written materials (brochures, manuals and web-info) and dissemination of energy management tools (web-based tools, audits and screening, benchmarking) to personalised advice (helplines and other advisory services) and events (training, seminars). In addition, energy awards (e.g. in Ireland) are used for motivation.

Some of the information measures aim at strengthening energy management capabilities. Energy audits, assessments and site surveys are energy management tools which are promoted in about half of the countries. One of the longest-running schemes is the Energy Audit Programme in Finland which was launched in 1992 (**Box 4.6**). Other voluntary audit schemes can be found, e.g., in Croatia, France, Ireland, Latvia, Luxembourg, Malta, Spain, Sweden and UK - and Estonia is planning to start one. Energy management training and tools are not usually provided in stand-alone measures but rather as part of others, typically voluntary agreements or other programmes for larger industries (example in **Box 4.7**) and SME programmes for smaller ones. An exception can be found in Estonia, which plans to start training events on energy conservation to increase energy management competences of enterprises as an independent measure. Benchmarking also enhances energy management. Norway runs a measure called “Energy Consumption – Industry” which is basically a subsidy scheme, but it uses reporting results from the recipients in an innovative way. The scheme operator Enova gathers energy consumption and production figures in a database via a web-based reporting scheme, calculates specific energy consumption for different industrial branches and presents the anonymous benchmarking data on the web.

Although not a NEEAP measure due to its focus on energy intensive industry, the long-running Irish networking programme (LIEN) (**Box 4.7**) is notable for its innovative approach of using networking for sharing information and experiences in the area of energy management. Networks were launched in Sweden in 2009 for the mining and steel industries, sawmills and energy efficiency in various industrial processes. Although not in the MURE database, also Denmark has set up a number of local dialogue networks across the country involving companies working with energy management and activities in this area also take place in Finland.

At the EU level there has been one initiative on voluntary labelling, namely that of electric motors (CEMEP/EU Agreement). The only national labelling example in the MURE database is the German Environmental Label Blue Angel, which covers numerous energy using consumer products. The labelling of consumer products triggers the knowledge of mainly “downstream” firms, i.e., ones operating close to the consumer market (IEA 2011).

Apart from energy auditing, information measures are rarely evaluated. A rare example are the enhanced engineering estimates made by Sustainable Energy Ireland in the SME programme based on reports and billing data received from the participating companies.

Box 4.6: The Energy Audit Programme, Finland

The Finnish Energy Audit Programme is a voluntary programme which has been in operation since 1992. The Ministry of Employment and the Economy provides subsidies for carrying out the energy audits. Subsidies can be granted only to energy audits which are performed by two qualified auditors, one with HVAC and another one with electric background.

The purpose of energy auditing is to analyse the energy use of the facility being audited, to work out the potential for energy savings and present a profitability calculation of proposed energy savings measures. In addition to working out possible uses of forms of renewable energy and the energy saving potentials, the energy audit reports on the impact of the proposed measures on CO₂ emissions.

An energy audit is based on data concerning output, energy consumption and energy use during the implementation period, though it also tries as far as possible to take account of existing information and planned alterations. The point is to link the energy audit closely with the facility's other operational processes so that it can be used for monitoring and maintaining the facility's energy efficiency in the future.

Motiva runs a monitoring system that compiles data on all energy audits and oversees the quality control of energy audit reporting. Monitoring results show that in 2010 the energy savings achieved were 1 435 GWh/a in the emissions trading sector and 1 348 GWh in the ESD area.

Source: MURE database.

Box 4.7: Large Industry Energy Network, Ireland

The Large Industry Energy Network (LIEN) is a voluntary network initiative operated by the Sustainable Energy Authority of Ireland (SEAI) for the largest industrial energy consumers, i.e., those with an annual energy spend over 1 million euros, with the average spend around 4 million euros.

The LIEN is developing a set of role-model companies who recognise the benefits of better energy management for their own competitiveness, for Ireland's economy and for the environment. This voluntary approach has been effective in removing barriers through its extensive informational and networking activities. In particular, the key technological and commercial barriers to energy efficiency in large industry have been explored extensively to enable members to choose profitable energy saving projects and actions. Membership involves engaging in a high level of networking between the members, with a view to sharing information and experiences in energy management.

In order to achieve significant energy savings, members of the Network employ a wide variety of technologies and management approaches. These include investments in technologies such as compressed air, refrigeration, energy efficient lighting, motive power, building management systems and combined heat & power (CHP). Other approaches include Monitoring & Targeting, staff awareness campaigns and energy management teams.

The LIEN started as a pilot project in 1993-1994 and currently 135 of Ireland's largest industrial companies are members accounting for almost two thirds of all industrial energy usage. The combined energy expenditure of the programme is around 300 million euros per annum.

SEAI publishes an annual report, which shows the performance of every company over recent years and at the same time highlights achievements, case studies and trends. Workshops and seminars are organised throughout the year providing LIEN members with a forum to learn from energy experts and other specialists, as well as from other energy managers.

Each of the 135 member companies submits an annual statement of energy accounts to SEAI. According to an analysis of the reports, energy savings of 1.6 TWh were achieved in 2010.

Source: MURE database.

4.1.4. Scarce use of regulation to address energy efficiency in industry

Legislative measures can be normative (mandatory demand side management or other mandatory standards) or informative (mandatory appointment of an energy manager or mandatory audits for industrial processes/buildings) in the MURE database. The database contains seven national legislative NEEAP measures working through informative instruments and nine national normative legislative measures.

National legislation has already been issued or has been announced in the NEEAPs to cover the following topics in industry. Examples of implementing countries are given in brackets for each target for legislation.

- Mandatory audits (e.g., Bulgaria, Czech Republic, Portugal, Romania)
- Mandatory energy efficiency plans (e.g., Hungary, Portugal)
- Mandatory energy managers (e.g., Hungary, Czech Republic, Italy, Romania)
- Mandatory energy management systems (e.g., Greece, Spain)
- Mandatory reporting of energy consumption data and energy efficiency measures (e.g., Hungary and Portugal)
- White certificates (Belgium/Flanders, Denmark, France, Italy, Poland, UK)

Bulgaria (**Box 4.8**), Czech Republic, Portugal and Romania have issued mandatory energy audits for large energy users. The Czech and Romanian measures also involve mandatory appointment of energy managers. In Portugal energy audits have been part of a long-running regulation for energy-intensive companies (**Box 4.9**). In Greece, mandatory audits are part of the Energy Management Systems obligation in industry. In Hungary, large energy users are obliged to deliver a report on their energy use and energy efficiency improvements, to prepare a work plan for energy efficiency improvements and to report the achievements. In practice, energy audits are necessary to implement this.

A few other countries, namely Belgium, Latvia and Luxembourg, refer to environmental permit procedures necessitating energy audits. In permit renewal in Belgium, companies have to submit a plan for performing all profitable investments to improve energy efficiency over the next three years.

In Romania, as an alternative to appointing an energy manager, large energy users can enter an energy services contract with authorized bodies (**Box 4.10**).

According to qualitative impact evaluations, legislative measures fall into different impact categories (low, medium, high) in equal amounts. About half of the legislative measures have been subject to quantitative evaluation. It appears to be most typical to use the enhanced engineering estimate method but also direct measurement, deemed savings, top-down calculations based on changes in specific consumption and integrated top-down and bottom-up methods have been used.

Box 4.8: Mandatory Industrial Energy Audits, Bulgaria

The Energy Efficiency Act of November 2008 and related ordinances mandate industrial facilities with annual energy consumption exceeding 3 000 MWh to undergo an energy audit every third year.

Sanctions apply for non-compliance. The audit results shall be recorded in a report which shall include an action plan for energy efficiency improvements and reference values for benchmarking with other companies. The energy agency (AEE) runs a database where the audits are recorded. Quality control is made by implementing control audits.

A public register is held of certified auditors. In 2011, the number of companies employing certified auditors was 47.

Evaluation results of 136 energy audits show that while the total annual energy consumption of audited companies is 3 153 GWh, their energy savings potential is 445 GWh. The corresponding financial savings are 62 million BGN (32 million euro) per year requiring investments of 204 million BGN (106 million euro).

Subsidies are available for implementing the identified measures. However, Bulgaria is also planning to mandate the implementation of the measures identified in the energy audits.

Source: MURE database.

Box 4.9: The Intensive Energy Consumption Management System, Portugal

The Intensive Energy Consumption Management System (SGCIE) was published on 15 April 2008, through Decree-Law 71/2008. The SGCIE imposes binding energy audits, with a 6-year periodicity, in energy-intensive facilities with consumption above 1000 toe/year. An 8-year periodicity for energy audits is applied to facilities with energy consumption between 500 and 1000 toe/year.

Intensive energy users are obliged to elaborate and execute Energy Consumption Rationalization Plans (PREn), establishing targets for energy and carbon intensity and specific energy consumption, which also outlines energy rationalization measures. The Plan must be submitted to the Directorate General for Energy and Geology (DGEG) through an online system and the company must submit biennial execution and progress reports. Upon DGEG's approval, the PREn becomes a Rationalization Agreement for Energy Consumption (ARCE). The ARCE provides facility operators with excise duty exemptions on oil and energy products as well as possibility to apply for incentives on energy audit costs and on investments in energy management and monitoring equipment.

Source: MURE database.

Box 4.10: Improvement of energy efficiency in industry through the management of demand for energy and the drawing up of energy balance sheets, Romania

The legislative framework for energy efficiency was established in Law 199/2001 and further strengthened by Government Ordinance 22/2008 that ensures the harmonization of the national legislation with the Energy Services Directive.

Article 3(1) of the Ordinance obliges companies that consume more than 1 000 toe energy annually to:

1. Have an energy audit made annually by a body authorized by National Regulatory Authority in the Energy Sector; (the corresponding audit reports are being referred to as “balance sheets”)
2. Establish energy efficiency programs with short, medium and long term measures;
3. Appoint an energy manager, attested by National Regulatory Authority in the Energy Sector or to conclude an energy management contract with an authorized body performing energy services.

According to Article 4 of the Ordinance, companies with annual energy consumption between 200 and 1 000 toe should undergo and audit by and authorized body every 2 years.

The authorization process for energy auditors and certification process for energy managers started in 2004. They have been subject to some updating over time. By the end of 2009, 318 companies had appointed their energy managers certified by the Authority. However, by May 2011 the number had declined to 262 due to declining energy consumption in companies because of the recession. The numbers of authorized energy auditors were 35 legal persons and 166 natural persons in May 2011.

Survey results of 132 companies with annual energy consumption exceeding 1000 toe, shows that the 500 energy efficiency measures have been implemented. An analysis of 50 files of the certified energy managers’ activity shows that the companies have saved about 32.8 toe/year by applying energy efficiency measures.

The energy savings potential from the energy efficiency programs of the companies totalled 1.2 Mtoe/year in the period 2008-2010 of which 0.7 Mtoe/year were estimated to be realized. 14 energy auditors have provided synthesis reports of 81 “energy balances” (audit reports). These include measures that lead to energy savings of 0.17 Mtoe/year.

Source: MURE database.

4.2. Packages of measures

There appears to be quite wide general consensus in the international energy efficiency *fora* on the importance of using multiple policy instruments in order to address the variable barriers for energy efficiency (e.g., WEC 2011, IEA 2011). Yet, it is not uncommon that countries rely on a rather limited mix of policies and measures.

The IEA (2011) recognises that the relationships between the characteristics and design of a policy (policy instrument characteristics), a country’s policy mix (policy package), and what drives a business to make the investments (driving forces) are critical in analysing the effectiveness of a policy package. It has recognised that the driving forces that decision makers within a large industrial company take into account when deciding to make new investments can be classified in five categories, namely:

- The financial imperatives of a company.
- The policy obligations placed on the company to achieve environmental compliance.
- The knowledge of energy-savings opportunities within the company.
- The commitment of the company to the environment and energy efficiency.
- The demands of the public and market to improve the company’s environmental or energy performance.

Table 4 illustrates the relationship between these driving forces and various types of policies and measures (IEA 2011). According to the matrix, various types of measures are applicable for most types of driving forces, but only negotiated and voluntary agreements enhance commitment. This raises a number of questions. Is commitment the lacking driving force slowing down energy efficiency improvements? Is the level of commitment so difficult to be increased that almost the entire palette of policies and measures is powerless? If commitment cannot be improved, are there other alternatives but to increase obligation?

While the importance of different drivers varies by country and by branch, one would expect to see measures addressing each type of drivers in place in each country. However, this does not seem to be the case according to the MURE database.

Table 4: Interaction between Driving Forces and Different Types of Policies

Type of policy	Policy (below) Driving force (to the right)	Financial	Policy obligation	Knowledge	Commitment	Public and market demands
Prescriptive	Norms/standards		High	Medium		
	Negotiated agreements			High	Medium	Medium
	Obligations/commitments e.g. mandatory energy audits		High	Medium		
Economic	Taxes	High				
	Incentives and subsidies	High		Medium		
	Tradable permits	High	Medium			Medium
Information	Labelling			High		High
	Other information measures			High		Medium

Source: IEA 2011

The summaries of policies and measures in Chapter 4.1 show that economic incentives are frequently used to address financial drivers. Negotiated and voluntary agreements have a significant policy status on some countries. Norms and standards as well as various obligations have not been used extensively. Use of information measures has grown but not as much as could be expected given the need to further energy management.

Two types of measure packages can be identified from the MURE database and the NEEAPs. Sometimes several independent measures also work together. In other cases

different types of instruments have been included in one overarching measure. Both approaches are common.

Examples of the first packaging method can be found, e.g., from Spain and Finland. Spain has a long history of comprehensive Action Plans which establish the policies and measures for energy efficiency. The Action Plan 2005-2007 advanced voluntary agreements and energy audits and subsidies were provided for energy efficiency investments. The Action Plan 2011-2020 continues to promote energy audits, but it also envisages the establishment of energy management systems and improvements in the technologies of equipment and processes by implementation of best available technologies (BAT). In Finland, the impact of coexisting Energy Audit Programme, voluntary agreements (Energy Efficiency Agreements) and investment subsidies has been measurable and considerable energy savings have been achieved.

Examples of the second packaging method can be found, e.g. from Norway. In Norway, the Energy Efficiency in Industry Programme is currently open mainly for the pulp and paper industry but may be extended to other branches in the future. The Programme uses a variety of instruments. The structure of the programme is that of a negotiated agreement with voluntary participation but requiring very high level of commitment (see **Box 4.11**).

Box 4.11: Energy Efficiency in Industry, Norway

The programme, administered by the Norwegian Water Resources and Energy Directorate (NVE), was launched in 2005 and will run until 2014. Companies within the pulp and paper industry may apply for participation in a programme for energy efficiency and the approved companies will be given a full exemption (i.e. a zero tax rate) from the electricity tax. The companies are offered the possibility to participate in a five-year programme, which requires that certain energy efficiency obligations be fulfilled, and stipulates penalty arrangements in case the obligations are not fulfilled.

The number of beneficiaries is expected to be 30 in the paper and pulp industry. 28 energy intensive undertakings in other branches are potentially expected to enter the programme in the future.

The participants agree to three obligations. Within two first years, they shall:

- Implement a standardised energy management system that is certified by an accredited certification body.
- Carry out an energy audit and identify measures reducing electricity consumption. A special financial requirement is established for the identification of measures: the company should show documented savings which correspond to the steering impact of an electricity tax of EUR 0.5 per MWh (equivalent to the minimum of the Energy Tax Directive). NVE assesses whether the report can be approved.

Within the five-year period they shall:

- Implement the identified electricity-efficient measures in the production process with a payback time of less than 3 years.

A report is also required by the end of the five-year period. If the final report is not submitted or is too incomplete, NVE will decide that the company has not fully implemented the energy efficiency measures in accordance with the programme and it will have to pay the exempted electricity taxes with interest.

The scheme is expected to bring electricity savings of 2%, or about 0.13 TWh. Early monitoring results showed that eight industries had identified 77 energy efficiency measures that were to be implemented by 2009 bringing electricity savings of 73 GWh.

Source: MURE database.

4.3. High-impact measures

In MURE, the semi-qualitative impact of each measure is classified as 'high', 'medium' or 'low'. The impact of a measure is high if the corresponding savings are equal to or higher than 0.5% of the final energy consumption of the entire sector. The impact is medium if the savings are between 0.1% and 0.5%, and low if they are less than 0.1% of the final energy consumption of the entire sector.

42 industry measures are reported to have a high impact⁶. Seven EU Member States and Croatia do not have high-impact measures in industry. Almost half of the measures claimed to have high impact, have not been subject to quantitative evaluation. The lower the expected impact, the rarer are evaluation activities; evaluation results are given only for four low-impact measures.

High-impact measures are a very mixed group. About one third of them are not NEEAP measures, because they address industries that participate in the emissions trading. There is no clear correlation between the impact of the measure and its type, indicating that both high-impact and low-impact measures belong to various measure types. This finding is in line with the discussion on energy efficiency drivers in Chapter 4.2. Because the needs to stimulate each driver vary by country and branch, the relative impact of different types of measures varies accordingly.

Given the relative importance of the EU emissions trading scheme among industrial measures, surprisingly few countries rank it high in impact. Five countries report EU Emissions Trading to have high-impact and six countries rank it in the medium-impact category. Seven countries have not been able to make the ranking but nobody ranked it as a low-impact measure. The rest of the countries have not reported the measure in the database.

⁶ This section only deals with measures that are presently active.

5. IEA recommendations for industry

5.1. Recommendations

The International Energy Agency (IEA) recommended the adoption of specific energy efficiency policy measures to the G8 summits in 2006, 2007 and 2008. The consolidated set of recommendations to these summits covers 25 fields of action across seven priority areas: cross-sectoral activities, buildings, appliances, lighting, transport, industry and electric utilities. (IEA/OECD 2011)

Out of the 25 recommendations, those applying to the industry were:

- Collection of high quality energy efficiency data for industry
- Energy performance of electric motors
- Assistance in developing energy management capability
- Policy packages to promote energy efficiency in small and medium-sized enterprises.

The IEA has conducted evaluation reports of member-country implementation of the recommendations. The most recent evaluation report was published in March 2011. According to the report, policies to improve energy management in the industry sector are underway, as are various schemes to encourage electricity providers to deliver cost-effective energy savings to end users. The report names the EU-level minimum efficiency requirements for motors (namely the EuP Directive) and energy management activities as well as SME activities in some countries. In energy industry, the report singles out the energy saving or energy services obligations in Denmark, Ireland, Spain and UK. (IEA/OECD 2011)

Later in 2011 the IEA published an updated list of the 25 recommendations (OECD/IEA 2011). The new list includes the following four recommendations for industry (**Box 5.1**):

- Energy management
- High-efficiency industrial equipment and systems
- Energy efficiency services for SMEs
- Complementary policies to support industrial energy efficiency

Box 5.1: IEA Recommendations for Industry (2011)

21 Energy management in industry

Governments should require large, energy-intensive industry, and encourage other industrial energy users, to conform to ISO 50001 or an equivalent energy management protocol. Actions to deliver cost-effective energy savings should be implemented, and industry should periodically report on their efforts.

Energy management measures should include:

- Identifying and assessing energy saving opportunities by benchmarking, measuring and documenting energy consumption.
- Implementing actions to capture identified energy-saving opportunities.
- Publicly reporting the energy-saving opportunities identified and the actions taken to capture them.

22 High-efficiency industrial equipment and systems

Governments should adopt MEPS [Minimum Energy Performance Standards] for electric motors and other categories of industrial equipment, and implement portfolios of measures to address barriers to the optimisation of energy efficiency in the design and operation of industrial systems and processes.

Policies should include:

- Mandatory MEPS for electric motors and other categories of industrial equipment such as distribution transformers, compressors, pumps and boilers.
- Comprehensive policy portfolios to address barriers to the optimisation of energy efficiency in the design and operation of industrial processes such as electric motor-driven, hot water and steam, and cogeneration systems. Measures could include providing information on equipment energy performance, training initiatives, audits, technical advice and documentation, and system-assessment protocols.

23 Energy efficiency services for small and medium-sized enterprises (SMEs)

Governments should develop and implement a package of specially designed policies and measures to promote energy efficiency in SMEs. Measures directed at improved energy efficiency in SMEs should include:

- A system for ensuring that energy audits, carried out by qualified engineers, are widely promoted and easily accessible for all SMEs.
- Provision of high-quality and relevant information on proven practice for energy efficiency that is appropriate to each industrial sector.
- Energy performance benchmarking information that can be easily used by SMEs and structured to allow international and within economy comparisons.

24 Complementary policies to support industrial energy efficiency

Governments should support improvements in industrial energy efficiency by removing energy subsidies, internalising environmental costs, providing targeted incentives and ensuring ready access to financing.

To promote economically efficient investment in energy efficiency improvements, governments should:

- Remove energy subsidies and internalise the external costs of energy through policies such as carbon pricing.
- Encourage investment in energy-efficient industrial equipment and processes by putting in place targeted financial incentives such as tax incentives for energy-efficient investments in industry (in particular in SMEs). Foster private finance of energy efficiency upgrades in industry through risk-sharing or loan guarantees with private financial institutions and enabling the market for energy performance contracting.

Source: OECD/IEA (2011)

5.2. Implementation status according to the MURE database

Recommendation 21: Energy management in industry

The European standard for energy management, EN 16001:2009, was issued by CEN and CENELEC in July 2009. It has been replaced by ISO 50001:2011 which is the new global standard, released in June 2011. Denmark, Ireland, Norway and Sweden use energy management standards to underpin their energy-savings agreements.

The MURE database does not include a measure identifier for energy management *per se*. Instead, energy management measures need to be investigated from MURE by some of its components, such as voluntary and mandatory energy audits or appointment and training of energy managers. The application of these measures is described in Chapters 3.6 and 4.1. Furthermore, improved energy management is the core of most voluntary agreements. One example is the Danish agreement scheme (**Box 5.1**).

Box 5.1: Energy Management in Voluntary Agreements, Denmark

Since 1996 Denmark has used voluntary agreements on energy efficiency as an important instrument to improve the energy efficiency in industry. The voluntary agreement scheme is closely integrated with the Green Tax Package as companies, who enter an agreement, receive a rebate on the green taxes. Agreements cover a period of maximum three years, after which a new agreement can be made.

The agreement system contains three essential elements:

- Implementation of a certified energy management system
- Special investigations focusing on improving energy efficiency of the primary production
- Processes investments in projects improving the energy efficiency

The impact of the agreements on energy efficiency has been evaluated for the period 1996-1999 based on a case study of 27 production companies. The evaluation results showed energy savings of 1 300 TJ CO₂ emission reductions of 122 000 tons for the 4-year period.

Source: MURE database and the Danish Energy Agency.

Recommendation 22: High-efficiency industrial equipment and systems

As discussed in Chapter 3.5, European countries do not establish minimum energy performance standards (MEPS). Instead, efficiency requirements are established for the EU as whole by the Eco-design Directive.

The IEA recommendation also calls for comprehensive policy portfolios to address barriers to the optimisation of energy efficiency in the design and operation of industrial processes. These could include measures providing information on equipment energy performance, training initiatives, audits, technical advice and documentation, and system-assessment protocols. As discussed in other parts of this report, energy auditing is already used extensively in Europe, however, with varying

details of implementation. Networks for information exchange within the industry have been established in, e.g., Denmark, Finland, Ireland and Sweden. Also some advice activities have been reported. In Denmark, efficient design of production facilities is considered to be one of the elements in energy management. Savings exceeding 15% and pay-back times of under four year are reported. Toolboxes for efficient design were provided by the Danish Energy Agency already in the 1990s.

Recommendation 23: Energy efficiency services for small and medium-sized enterprises (SMEs)

MURE data shows that quite many measures address energy efficiency in the SMEs. However, seemingly only few have been tailored to address the specific needs of SMEs. Bulgaria, Finland, Germany, Ireland, Malta and Spain run programmes aimed specifically at SMEs to help them to undergo energy audits or other energy assessments and to implement energy efficiency measures. Most other countries have programmes which target industries of all sizes.

Box 5.2: Special Fund for Energy Efficiency in SMEs, Germany

The Federal Ministry for Economics and Technology and KfW Förderbank (a government-owned development bank) established a fund in 2008 to promote energy efficiency in SMEs. The fund supports both energy advice and investments. Independent energy advice for SMEs is subsidised up to 80% of its cost and some investments are eligible to low-interest loans. To qualify for a low-interest loan, a replacement investment shall lead to an energy saving of at least 20% compared to the average consumption during the three years preceding the investment. In the case of a new investment, it must save at least 15% compared to the market average of similar equipment. So far, approximately 10 000 companies have benefited of the advice.

Source: MURE database.

Box 5.3: Support Scheme for Industry and SMEs, Malta

Malta Enterprise is the agency responsible for the promotion of foreign investment and industrial development in Malta. It runs a list of approved advisors in various areas related to industry and SMEs, including energy audits. Malta Enterprise pays fully for the first 10 hours of service and 65% of the next 40 hours. An advisor prepares an energy report and further financial assistance can be acquired from Malta Enterprise for the implementation of the proposed measures. The programme was launched in 2009 and it is planned to operate until 2013.

Source: MURE database.

Box 5.4: SME Energy Efficiency, Ireland

In Ireland, Sustainable Energy Ireland (SEI) has offered since 2008 free assessments to SMEs analysing their current energy use and their immediate opportunities for savings, and advises on appropriate monitoring and management. Indications are that the service is proving popular and effective in stimulating early action on energy efficiency. This service will be built upon to engage a larger number of businesses over time, delivering significant direct energy efficiency gains, as well as building the case for, and market for, energy advisory services.

Source: MURE database.

Recommendation 24: Complementary policies to support industrial energy efficiency

As discussed in Chapter 4.1, fiscal measures proposed by the IEA such as carbon taxes, eco-taxes and tax incentives are already used in considerable extent. Additional examples of the use of the taxation policy can be found, e.g., from the UK, where the Enhanced Capital Allowances scheme provides businesses with a first year 100% tax allowance on designated energy efficient equipment investments. In Estonia, corporate income tax exemption is given to profit that is re-invested within the company. The scheme has not been created only for energy efficiency but for all types of investments. However, energy efficiency is improved because new technologies usually are more energy efficient than old ones.

The MURE database contains only three examples of preferential loan guarantees proposed by the IEA. The Sofergie scheme has been running a long time in France but it is not considered to be among the key measures in the country. The Czech Republic mentions World Bank's energy savings programme (FINESA) in Central and Eastern Europe which provides bank loans with up to a 50% loan guarantees, repayment period of seven years and an interest rate of 3%. The energy priority line of the Operational Programme "Competitiveness and Economic Growth" in the Slovak Republic is mentioned to provide loan guarantees but the details are unclear.

Energy performance contracting (EPC) is implemented in different ways. The typical example is the classic Energy Service Company (ESCO) concept which is promoted in several countries in Europe, e.g., in Austria, Belgium, Finland, Germany, Hungary, Poland, Spain and UK. In UK, the Green Deal has been developed to expand the concept beyond the largest energy consumers (**Box 5.5**). In Romania, there is an obligation for industrial companies to appoint an energy manager or alternatively, large energy users can enter to an energy services contract with authorized bodies (**Box 4.10**).

Box 5.5: Green Deal, UK

Provisions for the Green Deal were introduced to parliament in the Energy Bill in December 2010. The first Green Deals are expected to appear in autumn 2012.

The government is establishing a framework, which will enable private firms to offer energy efficiency improvement to homes, community spaces and businesses at no upfront cost, with the payments recouped through instalments on the properties energy bills. In industry, the framework covers buildings but excludes industrial processes. Under the Green Deal, bill payers will be able to get energy efficiency improvements without upfront costs. Instead businesses will provide the capital, getting their money back through the energy bill. An innovative financing arrangement means that if they move out and cease to be the bill-payer at that property, the financial obligation does not move with them, but is passed on to the next bill payer.

The Government also plans to create a Green Investment Bank to deliver financial interventions to deal with market failures specific to green investment, stimulating growth while supporting environmental objectives. It is intended that the Green Investment Bank will be privately financed.

Source: MURE database and IEA Policies and Measures Database.

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