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Progress Report on energy efficiency in the European Union

Accompanying the document

REPORT FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT AND THE COUNCIL

Progress Report on the application of Directive 2006/32/EC on energy end-use efficiency and energy services and on the application of Directive 2004/8/EC on the promotion of cogeneration based on a useful heat demand in the internal energy market

{COM(2013) 938 final}

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1 INTRODUCTION

At the 17 June 2010 meeting of the European Council, Heads of State and Government of the EU Member States reaffirmed their will to achieve the objective of saving 20% of the EU's primary energy consumption compared to projections for 2020. Energy efficiency thus constitutes one of the cornerstones of the European Union's 2020 strategy.

In order to achieve the transition of the European Union towards a more energy-resource efficient economy, the Commission proposes to act at different levels. As set out in the Energy Efficiency Plan 2011[1], areas of action include low energy consumption in the construction, industry and transport sectors, while ensuring appropriate national and European financial support, and enhancing the scope of the monitoring.

In accordance with Article 14(2) of Directive 2006/32/EC on energy end-use efficiency and energy services (Energy Services Directive, ESD), Member States were required to prepare a second national Energy Efficiency Action Plan (EEAP) and to notify it to the Commission no later than 30 June 2011.

The importance of the EEAPs was highlighted as they set a solid and comprehensive framework for energy efficiency policies and measures. In fact, in line with the provisions of Article 14(2) of the ESD, the purpose of the EEAPs is to report on progress on energy end-use efficiency targets, energy efficiency improvement measures implemented to achieve the targets, as well as to report on complying with the provisions on the exemplary role of the public sector, and on the provision of information and advice to final customers.

Consequently, the EEAPs were designated to become a central tool for mainstreaming energy efficiency in all relevant policy areas. Therefore, since the entry into force (2006) and the first reporting period (2007) of the ESD, an expansion of the original scope of the EEAPs has taken place.

Before the 2011 submission of the second EEAPs, the Commission – taking into consideration the new strategic requirements – made available a non-compulsory guide and template to assist Member States in the preparation of the reports. In line with this, Member States adopted the guidelines to differing extents, resulting in different level of detail on both energy end-use and supply side measures. While most of the Member States generally opted to follow the structure of the template, some (for example those with comprehensive greenhouse gas reduction strategies) tended to report in a different structure.

This Progress Report concludes the Commission's assessment and reporting on the second EEAPs in response to its obligation under Article 14(5) of the ESD. It comes later than foreseen as in January 2012 the analysis would have been partial due to the fact that not all Member States had submitted their EEAPs in accordance with the deadline set out in Article 14(2) of the ESD. The comprehensive assessment of the second round of ESD reporting only

[1] Communication from the Commission to the European Parliament, the Council, the Economic and Social Committee and the Committee of the Regions of 8 March 2011 – Energy Efficiency Plan 2011 [COM (2011) 109 final – Not published in the Official Journal].

became possible once all Member States notified the Commission on the submission of their second EEAP.

The use of high-efficiency cogeneration offers considerable potential to achieve energy savings in the EU. This potential has not yet been realised. Directive 2004/8/EC on the promotion of cogeneration based on a useful heat demand in the internal energy market (the CHP Directive or the Cogeneration Directive) aims to facilitate the installation and operation of cogeneration facilities in order to save energy and combat climate change. The CHP Directive should, in the short term, make it possible to consolidate existing cogeneration installations and promote new plants, and in the longer term, create the necessary framework for high efficiency cogeneration to reduce emissions.

In accordance with Article 11 of the CHP Directive, the Commission is required to report periodically on progress towards the CHP Directive's goals. This CHP progress report is summarised in section 2.2 and it is presented in its entirety in Annex 4 of this report.It has to be noted that the ESD and the CHP Directive will be almost entirely repealed by the new Energy Efficiency Directive[2] with effect from 5 June 2014. However, the obligation to set a target under Article 4 of the ESD will not be repealed until 1 January 2017.

The Report is structured as follows: After providing an overview of progress in energy efficiency in the EU (Chapter 2), including in relation to cogeneration, developments in improving energy efficiency in energy supply are reviewed in Chapter 3. Chapter 4 provides an evaluation of efforts to improve energy efficiency in energy end-use consumption (including in the buildings, industry, transport and agriculture sectors, as well as horizontal, public sector and information and awareness raising measures). Final energy savings achieved up to 2010 and forecast until 2016 and 2020 are evaluated, and the overall impact of ESD related national policy measures addressing end-use consumption on the 2020 target are estimated. In Chapter 5 an overview is provided of financing instruments supporting the implementation of energy efficiency measures.

Annex 1 to this report includes assessments of the individual second EEAPs. Annex 2 provides an overview of various methodologies based on the ESD as applied by different Member States to calculate final energy savings in the second EEAP. Annex 3 sets out the 2020 targets for energy efficiency as stated by certain Member States in their second EEAPs in 2011-2012. Annex 4 provides a detailed overview of the Commission's analysis of the second progress reports on the implementation of the Cogeneration Directive.

In this report, all the overview analyses are based on the data provided in 2011 and 2012 by the EU-27 in their second national EEAPs and national CHP progress reports as required by Directives 2006/32/EC and 2004/8/EC. As Croatia submitted its first national EEAP in April 2013, despite not being required to do so by the Directives, Annex 1 of this report also includes an assessment of the Croatian national EEAP.

[2] Directive 2012/27/EU.

GENERAL OVERVIEW OF THE PROGRESS IN ENERGY EFFICIENCY

1.1 Overall analysis of the energy consumption in the EU

The EU's primary energy consumption (gross inland consumption[3] minus non-energy uses[4]) followed a slightly decreasing trend over the last years (-0.3% on average for the years 2005 to 2008) (see Figure 1). The downturn because of the economic and financial crisis had an impact on lowering overall energy consumption. However, the latest movements of energy consumption can mainly be attributed to structural effects on top of technology-driven increases in energy efficiency and policy induced energy savings. Latest primary energy consumption figures for 2011 suggest that primary energy consumption is again decreasing, following the sluggish recovery of major European economies.

With a 2011 energy consumption of 1583 Mtoe, the EU-27 was still far from its its overall 20% energy efficiency objective for 2020 which implies a primary energy consumption of 1474 Mtoe[5] (Article 3 of the Energy Efficiency Directive) (see

[3] The aggregate of gross inland consumption refers to the quantity of energy consumed within the borders of a country. It is calculated as primary production plus recovered products plus imports plus/minus stock changes minus exports minus bunkers (*i.e.* quantities supplied to international sea - going ships).

[4] Non-energy consumption of energy carriers in petrochemicals and other sectors, such as chemical feedstocks, lubricants and asphalt for road construction.

[5] Directive 2013/12/EU adapts Directive 2012/27/EU following the accession of Croatia to the Euroepan Union and provides that the Union's 2020 energy consumption should not be more than 1483 Mtoe of primary energy or no more than 1086 Mtoe of final energy.Progress towards the EU-28 target will be analysed during the assessment of the NEEAPs to be submitted by 30 April 2014 under the framework of the Energy Efficiency Directive (2012/27/EU).

Figure **2**).

Figure 2: EU 27 primary energy consumption (Mtoe)

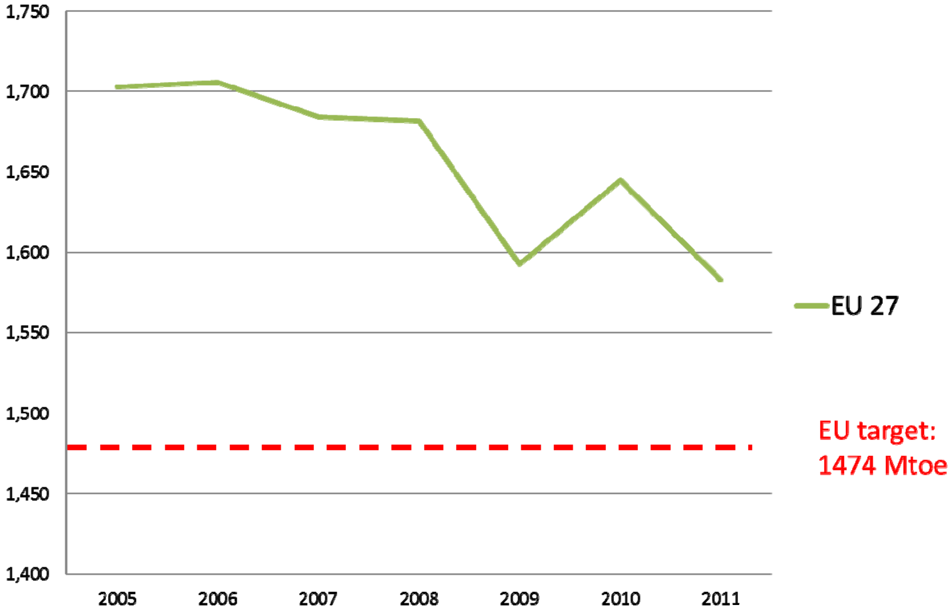
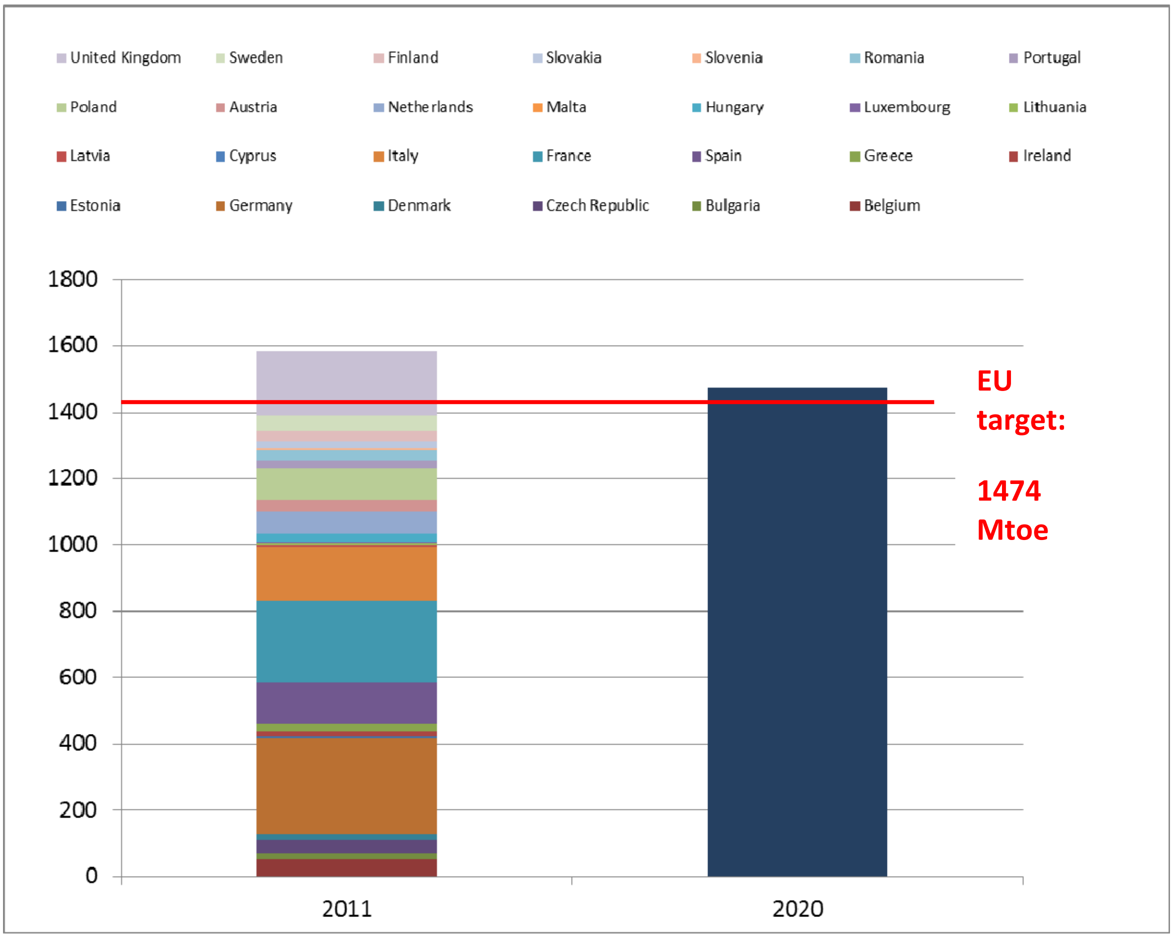


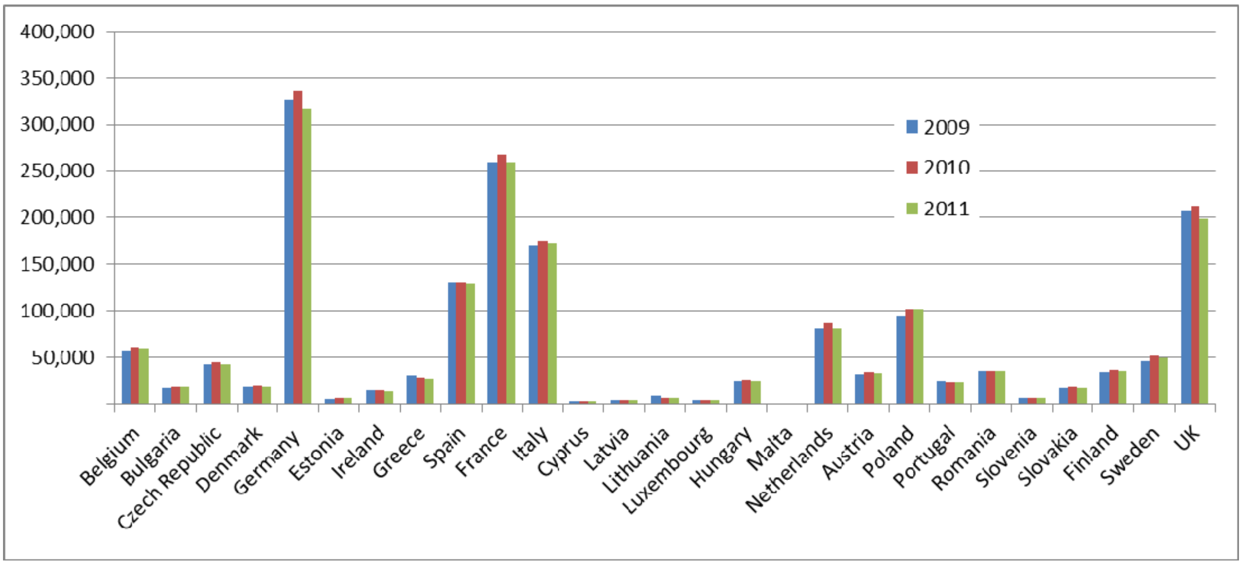
Figure 2: EU 27 primary energy consumption 2011 and 2020 energy efficiency target (Mtoe)



Gross inland consumption minus non-energy uses. Source 2010 figures: Eurostat

It should be noted that the energy consumption effects still differ considerably from Member State to Member State (see Figure) and that the overall statistics do not allow for separated structural and policy-induced energy saving effects.

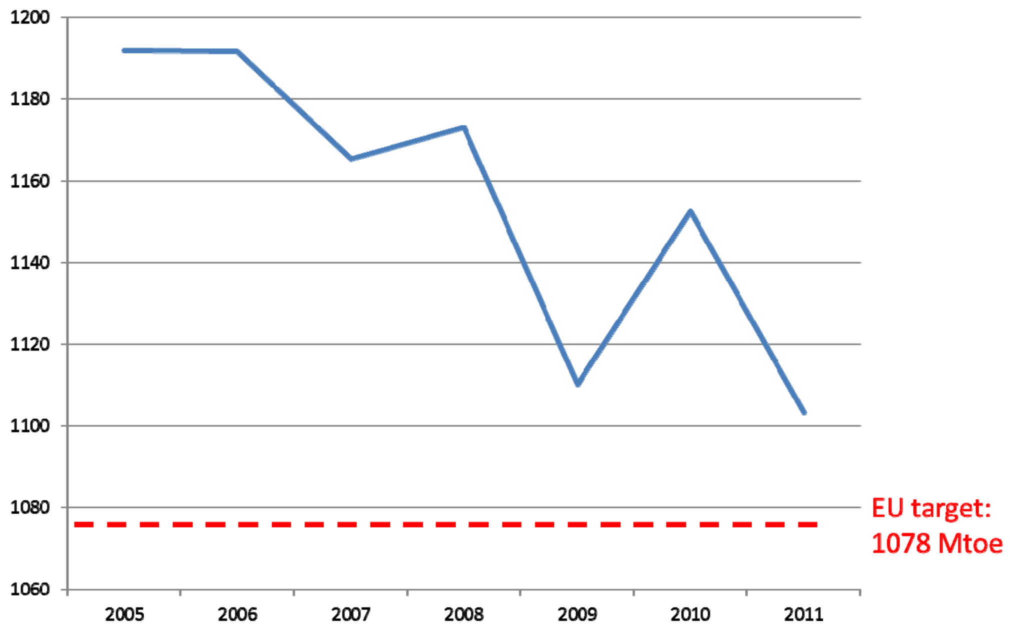
Figure 3 : Energy consumption 2008-2011 by country (Mtoe)



Source: Eurostat

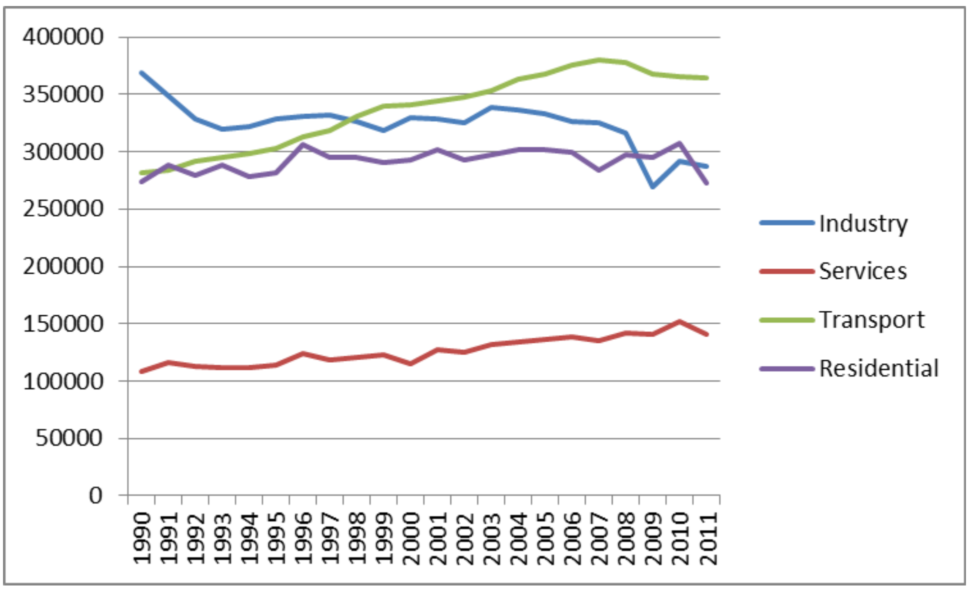
The trends in the overall final energy consumption mirror the pattern of the primary energy aggregate (see Figure), dropping from 1110 Mtoe in 2009 to 1103 Mtoe in 2011 (Figure 4). When looking at the sectoral display of final energy consumption, it emerges that the reduced overall primary and final energy consumption can be mainly attributed to the significantly decreased energy consumption in the industrial sector (see Figure 5), whereas the transport sector only followed a minimally decreasing trend (- 0.1 % over the years 2005 to 2011). Less impacted by the economic effects, energy consumption in the services and residential sectors continued to follow an increasing trend (2.1% and 0.4%, respectively, over the years 2005 to 2011).

Figure 4: EU 27 final energy consumption (Mtoe)



Source: Eurostat

Figure 5: EU 27 sectoral energy consumption (Mtoe)



Source: Eurostat

1.2 Developments in the national Energy Efficiency Action Plans

The second reporting period indicated an overall improvement in the quality of action plans submitted. More Member States (over half of the 27) presented coherent and comprehensive EEAPs qualifying as ambitious strategies. High quality strategies presented in the EEAPs were typically backed by institutional and financial provisions, demonstrating a holistic view with regard to the scope and to the actions of individual measures. Ambitious strategies would also identify priority end-use sectors and policy tools, adopt a portfolio approach combining a mix of instruments and delivery mechanisms to achieve targets, perform better than the 9% indicative target required under the ESD or set themselves higher national targets than the indicative 9% target.

In the first reporting period, the EEAPs of Finland, Germany, Ireland, Luxembourg, the Netherlands, Portugal, Slovenia and the UK were deemed as high quality strategies. In the second reporting period, the group of Member States presenting ambitious EEAPs included Belgium, Cyprus, Denmark, Finland, France, Germany, Ireland, Italy, Luxembourg, Poland, Slovenia, Sweden and the UK. However, the remainder of the second EEAPs still demonstrate either an unambitious or a business-as-usual scenario, often taking a piecemeal approach to energy savings measures with fragmented and stand-alone energy efficiency measures targeting a sector or end-use.

For most Member States, the second EEAPs represent a significant progression in energy savings efforts. Generally, reports provide greater detail on medium-term national energy savings strategies, on energy efficiency measures and on evaluation methodologies than were provided in the first set of EEAPs. While many Member States retain existing 2016 energy savings targets, some indicate higher levels of forecast savings than envisaged in the first reports, either due to increased policy activity or due to a re-evaluation of the effectiveness of existing policies.

1.3 Developments on energy efficiency according to the national Energy Efficiency Action Plans

The figures presented in the second EEAPs indicate a high level of energy savings achieved since 2008, with Member States generally exceeding intermediate targets. EEAP figures show that most expect savings in 2016 to be significantly in excess of the ESD indicative target. Various EEAPs state national energy efficiency or energy consumption targets for 2020. These are typically economy-wide targets incorporating savings from sectors outside the scope of the ESD. National targets are variously expressed in terms of savings, intensity and consumption limits, in either primary or final energy units. Some provide an estimate or forecast of ESD-related energy savings in 2020 as a result of implementing measures listed in their action plans.

Questions arise, however, with regard to the divergence of methodologies used to calculate savings and the extent to which published savings figures reflect the level of energy saving efforts. For some Member States declared and forecast savings include all savings due to increased energy efficiency in the economy, while for others an attempt is made to include only quantifiable policy-induced savings in their declared and forecast figures. This presents difficulties with regard to the assessment of overall energy savings in the EU that can be attributed to reported measures. These issues are addressed later in this document.

There is much variance among the EEAPs in terms of the types of measures presented and level of detail provided. For some, the measures described represent broad strategic objectives, while others provide more detail on specific actions addressing particular aspects of energy consumption in a sector or end-use.

The influence of the economic crisis on energy savings activities is referred to in some national plans. Some EEAPs mention that funds did not materialise for specific programmes, while one Member State highlights the possibility of significant policy changes in the near future arising from its participation in the European financial stability programme.

The impact of the recession on calculated intermediate savings is highlighted by a number of Member States, with negative savings recorded in parts of some industry sectors. One Member State offers an alternative calculation of total national savings in order to adjust for apparent distortions in savings figures due to recessionary effects. Although recession is identified as an impediment to the progression of certain energy efficiency measures and as a cause of reduced energy savings in several plans, most of these plans do not identify energy efficiency as a means of assisting economic recovery.

The focus of the ESD is on savings in energy end-use. It excludes most energy efficiency measures on the supply side and measures to improve the energy efficiency of participants in the EU Emission Trading Scheme (ETS). At the same time, many of the second EEAPs provide details of activities undertaken or planned to improve the energy efficiency of energy supply. As in the case of measures targeting energy end-use, the level of detail provided and topics covered varies between Member States. Communicated supply side interventions include the development of high efficiency, large and small-scale CHP, expansion and modernisation of district heating systems, use of renewable energy sources, retirement of old inefficient plants, and efforts to reduce transmission and distribution losses.

Buildings represent the largest single share of energy savings potential in the EU and achieving energy efficiency improvements in the sector is a priority target for the Member States. Almost all the Member States reported, in their second EEAPs, measures covering new and existing buildings on the one hand, and residential and tertiary buildings on the other hand. The savings achieved by building regulations make up a significant part of total national savings for some of those who provide bottom-up calculations, with some including early savings resulting from regulations implemented since 1995. As in the first reporting period, the residential sector is a key feature of the second EEAPs as well. Programmes for the refurbishment of residential panel buildings (characterised by overall low efficiency) featured in the first EEAP of almost all new Member States. A continuation of this positive trend is reflected in second EEAP, in which extensive building renovation programmes are reported by 17 of the Member States.

In the first reporting period a small subset of EEAPs did not include measures aimed at improving the energy performance of buildings. In connection to the link established between the ESD and the recast Energy Performance of Buildings Directive[6] (EPBD), all of the second EEAPs contain reference to measures on the energy performance of buildings. Most second EEAPs referred to the recast EPBD either as a general framework or as a key requirement to be met, with over half of the Member States opting to report on relevant articles of the EPBD in the second EEAP. However, there is space for improvement with respect to the presentation of results achieved with these measures.

[6] Directive 2010/30/EU.

In the industry sector overall savings are lower than expected in a number of Member States as the effects of the economic situation affect the energy productivity of some manufacturing plants during the period. Financial measures that offer loans or subsidies for energy efficiency investments are the most common type of measures to encourage energy efficiency in the sector. Continuing the trend observed in the first EEAPs, an increasing number of Member States are committing to putting in place voluntary agreements in manufacturing to encourage larger energy users to adopt energy management systems and pursue their own energy savings plans.

Similarly to the first reporting period, the second round of EEAPs reflects that the transport sector is still not an area of emphasis for energy savings in the EU Member States. As with the first EEAPs, the number of second EEAPs presents clear and consistent strategies to achieve more environmentally friendly and energy saving modes of transport remains modest. At the same time, it is a cause for concern that some Member States report high savings in transport without presenting clear and consistent transport strategies. This is a similar characteristic with the first EEAPs, where savings overestimates, primarily concerning transport measures, were also detected.

It is a positive development that more Member States present measures supporting the areas of public transport, mobility management and eco-driving than in the first reporting period. Fiscal incentives targeting passenger or freight vehicles also remain an important group of measures in the second EEAPs. More Member States include spatial planning provisions related to transport in their second EEAP than did in the first reporting period. At the same time, the fact that some Member States still report large-scale infrastructure projects where it is unclear how these projects themselves will deliver energy savings, and present ordinary technical inspection of vehicles as energy efficiency measures are remaining weaknesses in the second reporting period.

As in the first reporting period, agriculture has received relatively little attention in the second EEAPs. While in the review of the first EEAPs four Member States were highlighted as demonstrating interesting measures and packages in agriculture, in the second reporting period more than a third of the Member States included agricultural measures in their National Energy Efficiency Action Plans.

The second EEAP of most Member States includes dedicated sections describing activities aimed at improving the energy efficiency of the public sector. However, the level of implementation details presented varies between Member States. Only half of the Member States suggested the fulfilment of the requirement of choosing two of the six proposed public procurement measures set out in Annex VI of the ESD. Others followed a similar approach observed in the first EEAPs, often referring to public procurement action plans, energy efficiency criteria and guidelines, remaining unclear if these would introduce an obligation.

In the second reporting period about a third of the Member States were found to provide a strong set of diverse information measures. These action plans represent good practice in the coordination of a wide range of information efforts, providing consistent messages properly tailored to the end-users targeted, and in terms of using different channels of information distribution. Some remaining problems found in other second EEAPs include limited detail on implementation, as well as on possible effectiveness and impact, and in some cases failure to designate information measures.

On a positive note, the second reporting period seems to demonstrate an improvement in terms of reporting on the actions undertaken by market operators in the provision of more information and advice to final costumers on end-use energy efficiency.

The increase in the number of advanced metering and billing initiatives is a positive trend in the EU. Compared to the first reporting period more Member States address metering and billing in their second EEAP. In connection to metering and billing, regulatory instruments combined with financial incentives, as well as inclusion among the obligations of energy service companies have been reported in some second EEAPs. The number of smart metering schemes has been increasing, with the pilot phase of smart meters, large-scale rollout of smart meters or widespread use of intelligent meters reported by nearly a third of the Member States in their second National Energy Efficiency Action Plans.

Some Member States include in their savings calculations of the effects of EU legislation, such as implementing regulations relating to Ecodesign and the Energy labelling.

In terms of financing energy saving measures, the use of EU funds as well as revenues from the sale of Assigned Amount Units[7] (AAUs) under the Kyoto Protocol have been reported by a group of new Member States. At the same time efforts to increase the involvement of the private sector in the financing of energy efficiency improvements are also on the rise throughout the EU.

The number of promising horizontal measures has increased from the first to the second reporting period. In line with this, energy savings obligations now form a key part of efforts to encourage accelerated rates of energy savings. Established white certificate schemes were reported as being already operating in five Member States. Two other member States report in their second EEAP the upcoming introduction of such schemesEEAP. Energy Services Companies (ESCOs) remain a further key area of financing energy efficiency in the EU. In line with this, a number of Member States indicate the provision of model contracts, the introduction of legislation or the removal of legal barriers to open energy services in the public sector to ESCOs. At the same time, as it was observed in the first reporting period, many of the ESCO related measures reported contain little detail about concrete actions to be undertaken.

As the above overview of progress in energy efficiency in the EU indicates, various positive developments occurred between the first and second round of reporting under the ESD. The widespread use of the guide and template provided by the Commission has contributed to the overall improved quality of the EEAPs. However, a group of Member States could improve their reporting even further by providing more detail on measures and their concrete implementation, as well as by clarifying methodologies used to quantify energy savings. The second round of reporting indicates that there is still space for improving information provision in the EEAPs to demonstrate whether and how Member States can reach the energy savings target.

[7] Assigned Amount Units are emission allowances regulated by the Emission Trading Scheme under the Kyoto Protocol.

2 DEVELOPMENTS IN IMPROVING ENERGY EFFICIENCY IN ENERGY SUPPLY

The ESD provides a legal framework for improving the efficiency of energy end-use in the European Union. The Directive requires Member States to establish end-use energy savings targets, to put in place measures to achieve those targets and promote energy services, and to report on progress in a series of EEAPs. Including supply-side measures in a EEAP is beyond the reporting requirements of the Directive. However, in the guide and template issued by the Commission to the Member States to assist them in the compilation of their EEAPs, Member States were encouraged to report all energy savings activities, including activities improving the efficiency of the supply, transmission and distribution of energy. A dedicated section addressing measures to improve the energy efficiency of supply was envisaged.

This section therefore provides an overview of progress in improving the energy efficiency of energy supply in the European Union. The information is drawn from two sources: the second round of EEAPs from the 27 Member States submitted in accordance with the requirements of the ESD; and the national CHP Progress Reports submitted in accordance with the requirements of the Cogeneration Directive.

2.1 Measures in the EEAPs addressing energy efficiency of supply

2.1.1 Introduction

This section gives an overview of energy savings measures on the supply side as presented in the EEAPs of the 27 Member States. As including supply-side measures is beyond the reporting requirements of the Directive, the section does not reflect the full level of effort applied by the Member States to improve supply-side energy efficiency.

It has to be noted that a number of larger Member States, including France, Germany and the United Kingdom, do not address supply-side energy efficiency or address it only to the extent to which it leads to end-use savings. EEAPs that incorporate more comprehensive reports of energy efficiency activities in energy supply include those of Estonia, Ireland, Latvia, Slovenia and Spain. Cyprus describes planned energy savings measures in supply and quantifies expected savings. The Czech Republic outlines its primary energy savings strategy but does not detail supply-side savings. Poland includes some measures relevant to the supply of energy in its descriptions of end-use savings measures.

2.1.2 Measures to promote or extend the use of district heating

Eleven Member States mention or give detail about measures that promote the use of district heating or that provide investment in refurbishment or expansion of district heating equipment and networks. The Estonian EEAP states that local authorities can designate parts of their territories as district heating regions, in which consumers are provided with heat from the network and the use of other sources of energy is restricted. Additional measures in Estonia include a heat price regulation, which incorporates minimum efficiency coefficients for heat generation by fuel source and maximum heat loss values for pipelines, and financial support for the upgrade of district heating networks. In Austria, two statutory instruments allow for the provision of subsidies for new and upgraded district heating plants and distribution systems. The Länder implement national district heating targets using their own methods, which include compulsory connections. In Denmark, a subsidy available for replacing old boilers in households will only be paid for a connection to a district heating network if the house is located in a designated district heating area. Legal minimum requirements relating to the efficiency of the distribution of thermal energy have been established in the Czech Republic. The Greek EEAP mentions on-going and completed projects expanding installed district heating in the country, and building regulations accelerating the use of renewables in new buildings allow the use of district heating as an alternative to renewable sources.

The Latvian EEAP indicates that as a result of recent measures undertaken to improve the energy efficiency of district heating networks in Riga, losses have fallen by 13%. The commissioning of a new cogeneration plant in Riga ensures that over 90% of heat consumed in the city is generated by high-efficiency CHP. However, there are high levels of heat losses in district heating networks in other parts of the country. The report states that the high levels of necessary funding, the lack of financing options for local authorities and low capital turnover inhibit the implementation of measures to address the significant heat losses. However, a programme has been put in place using cohesion funds to finance the construction or modification of heat plants and heat distribution networks. Under the programme two projects have been completed to-date. Measures promoting district heating in Sweden include a district heating research programme partly funded by the state, and a grant for households with electric heating to assist conversion to district heating. In Slovenia distribution losses in 2008 were 14% of total gross heat generated. Local suppliers of district heat are required to show in their development plans how they will address losses without passing on costs to their customers. An on-going measure to reduce heat network and distribution losses is outlined in the Hungarian EEAP.

2.1.3 Measures or strategies to improve the efficiency of electricity generation

Increased energy efficiency in the generation of electricity may be achieved by upgrading existing power generation facilities, replacement of older, less efficient plants with new highly efficient power stations, or increasing the share of high-efficiency plant, including generation capacity in the form of non-combustible renewables such as wind, solar photovoltaic or hydroelectricity. These energy efficiency improvements may be achieved naturally or may be achieved through the effects of national or EU policy efforts to improve efficiency of electricity generation or increase the use of renewables in primary energy consumption. The EEAPs of a number of Member States, including Denmark, Ireland and Spain, foresee an improved efficiency in electricity generation sectors through an increased share of renewables in their installed generation capacity.

Spain records significant energy savings in electricity generation in the period from 2007 to 2010 which it attributes to a reduction in own-use consumption in power plants and changes in the shares of fuel types used in generation. The reduction in own-use consumption of power plants is explained by increased shares of wind and solar, which require less energy for auxiliary services. Future savings in electricity generation will be achieved principally by increases in the shares of renewables and gas in the generation mix. Greece lists a number of planned upgrades of existing power stations that should lead to an increase in the efficiency of electricity generation. In Malta, additional capacity is being added to a new combined cycle plant which will lead to a reduction in output from an older inefficient plant. New onshore and offshore wind farms will also increase the efficiency of electricity generation. In Ireland savings are also expected through the replacement of 1300 MW of existing plant with high-efficiency combined cycle gas turbines and additional wind capacity up to 2020, and the phasing out of all oil-fired plants. The Latvian EEAP details modifications undertaken and planned at a number of hydroelectric plants and combined cycle plants with cogeneration, which increase their capacity and improve overall efficiency. The draft Slovenian National Energy Programme prioritises the construction of cogeneration plants and plants that use less polluting fuels such as natural gas to replace old less efficient plant over the coming years and to meet expected increases in electricity demand. Refurbishment and expansion of hydroelectric infrastructure is planned. A 25% increase in national electricity generation between 2008 and 2020 is expected to bring about only a 5% increase in total primary fuel consumption at power plants.

2.1.4 Measures addressing electricity transmission and distribution losses

Electricity transmission and distribution losses include all losses occurring in delivering electric energy generated at points of supply to electricity consumers. Losses are, for the most part, attributable to technical characteristics of the electrical network, but may also include some non-technical losses. According to Eurostat, transmission and distribution losses in the EU in 2010, at 16.6 Mtoe, amounted to around 5.8% of gross electricity output[8].

An investment plan in Italy foresees an expansion of the transmission network to accommodate more renewables in the south of the country and to enable greater interconnection between the mainland and Sardinia and Sicily. The expansion will also facilitate higher import capacity through connections with neighbouring countries to the north. Italy lists among the planned actions to reduce losses in distribution networks the reduction in the length of distribution lines, the increased use of low-loss components, in particular transformers, the increasing of the power factor at the sites of large consumers, and the increasing of the voltage levels of distribution networks around the county to standard values of 15kV or 20kV. The report highlights, however, some of the financial and technical difficulties associated with changing the voltage of distribution networks, and describes the adverse effect on efficiency of the trend towards the installation of aluminium cables that have higher resistance and greater losses than traditional copper cabling. In Ireland a transmission loss factor applied to generators should encourage investors to locate new power plants in areas close to the existing transmission network. However, the Irish EEAP highlights the challenge of reducing transmission losses in an environment where promotion of wind power leads to the development of wind turbine installations in areas that have good wind resource but less developed networks. The EEAP states that Ireland will consider investing in reducing the 2% transmission losses only if a benefit to the consumer can be shown to outweigh investment costs. However, it does make a commitment to reduce the loss adjustment factor in its distribution networks from 7.3% in 2012 to 7.1% in 2014. Spain expects the total transmission and distribution losses in 2020 to decrease by 0.4% to 7.7% between 2010 and 2020 through upgrade of infrastructure and greater distribution of generation capacity. Estonia encourages greater efficiency in transmission and distribution networks through network charges applied to network operators and through the establishment of minimum quality requirements for network services. In Poland support is available only for network upgrade projects that will deliver at least a 30% reduction in energy losses. Listed actions include replacing low-efficiency transformers, shortening of very long distances and changing the cross-section of conducting wires. A Greek transmission system development study foresees the development of new transmission lines and improvement of existing ones as well as a greater level of interconnection with neighbouring countries leading to a reduction in the use of oil for domestically generated electricity. Additionally, a greater level of interconnection with the Greek islands is anticipated. In Malta a 200MW interconnector with mainland Europe, currently under construction, is expected to lead to a reduction in output from Malta's inefficient main power plant. Cyprus plans to achieve energy savings through improving the power factor at electricity sub-stations and construction of new lines between power plants and cities. In Latvia it is planned to reconstruct two or three 110kV sub-stations every year using lower maintenance equipment. It is envisaged that a number of measures including reconstruction of power lines and

[8] Eurostat database, Energy statistics – supply, transformation, consumption. http://epp.eurostat.ec.europa.eu

transformer sub-stations, and replacement of transformers will improve the efficiency of the network in the coming years.

2.1.5 Voluntary agreements for supply-side savings

Several Member States have in place voluntary agreements with energy suppliers or network operators, whereby organisations are committed to achieving agreed levels of energy savings. The extent to which supply-side savings may contribute to an organisation's savings figure is not always clear from the EEAPs. Finland has a dedicated energy agreements programme for energy producers covering 90% of electricity generation and 80% of heat production. Companies which sign up commit to integrating the improvement of energy efficiency into management processes, setting company-specific targets related to energy efficiency and submitting annual reports. In return, funding is provided for energy audits, and investment aid is considered on a case-by-case basis. Additionally, sellers and distributors of energy who are committed to achieving energy savings among their consumers through voluntary agreements may also count own-use savings towards their commitments. In Denmark, network and distribution companies are under obligation to deliver defined quantities of energy savings. While most of the savings are achieved in end-use, savings made in transmission and distribution networks may also count towards their obligations. In 2010 these savings amounted to around 5% of total savings obligations. Ireland now has a new voluntary agreements programme in place that requires energy suppliers to achieve a defined amount of energy savings. The EEAP does not indicate if supply-side side savings may count towards suppliers' targets. Austria also has voluntary agreements with energy suppliers in place, although the extent to which these have led to supply-side savings is unclear as only end-use savings arising from the agreements have been quantified in the EEAP. Italy's white certificate scheme incorporates savings achieved through the installation of micro-CHP systems. The obligations scheme in Slovenia requires energy suppliers to achieve a saving equivalent to 1% of the previous year's energy sales. Savings may be claimed for the refurbishment of district heating sub-stations.

2.1.6 Measures facilitating demand-side management

Demand side management can reduce peak loads by encouraging large electricity consumers to shift energy consumption to off-peak times. Demand side management can thereby reduce the need for relatively inefficient peaking power plants and improve the overall efficiency of power supply. Only one Member State provides a detailed description of a demand side management programme. Ireland has a winter peak demand reduction scheme in place for a number of years through which industrial and commercial consumers are rewarded for meeting their commitments to reduce their own peak demand.

2.1.7 Measures addressing energy efficiency in the supply of oil and gas

While the greatest opportunities for supply-side energy efficiency, and the emphasis of supply-side measures in the EEAPs, are related to the generation and supply of electricity, opportunities exist to improve the efficiency in the supply of other fuels through the improvements in the recovery and transmission of gas and increased efficiency in oil refineries.

The EEAP for Estonia mentions a national plan to increase the efficiency of the use and extraction of oil shale. The Danish EEAP refers to an action plan aimed at improving the efficiency of oil and gas recovery in the North Sea. Latvia is undertaking a modernisation of its underground gas storage facility and is planning to invest in upgrading some of its gas network to improve safety, but the extent to which these activities may produce energy savings is not specified in the report. Spain highlights the adverse influence of the increase in the share of diesel vehicles and the stricter specifications of transport fuels with regard to sulphur content on the energy consumption of oil refineries in recent years. Although no measures are detailed, the Spanish EEAP states that it is anticipated that any losses in efficiency arising from a continuation of these developments will be compensated for by improvements in production technologies for cleaner fuels.

2.1.8 Measures to promote greater competition among energy suppliers

As well as providing consumers with greater choice and reducing costs, measures promoting greater competition among energy suppliers can improve overall efficiency as suppliers undertake cost-effective energy efficiency actions to remain competitive. Very few EEAPs contain information about measures designed to increase competition in the supply of energy.

Ireland's EEAP identifies the establishment of an all-island electricity market incorporating Northern Ireland as a measure to promote competition. The report states that a number of measures were put in place to address issues arising from having two dominant players in the market, and that a fully deregulated retail electricity market has been achieved. In Estonia the electricity market is open only for consumers with annual consumption of more than 2GWh, but it is envisaged that a market open for all consumers will be achieved by 2013.

The German EEAP describes how the measuring and metering sector in Germany has been liberalised so that metering no longer has to be carried out by the network operator. The opening of the sector to competition allows consumers to get more precise information about their electricity and gas use and enables the proliferation of new metering technologies.

2.1.9 Measures to advance the development of smart metering infrastructure

A smart grid is an upgraded electricity network to which a digital communications layer enabling interaction and transfer of information between electricity suppliers and consumers has been added. Smart grids, in combination with smart meters, will provide the supplier with the opportunity to employ time-dependent tariffs and can give the consumer the incentive to use energy more efficiently.

A broad measure outlining support for smart grids planned for 2012 is presented in the Polish EEAP. It incorporates support for information actions, feasibility studies, development of standards and pilot programmes for smart lighting and energy storage. The Irish EEAP contains a commitment to develop smart grids to integrate more renewable energy and further develop demand side management. The importance of smart grids in enabling the integration of renewable electricity sources and facilitating demand-side management is also mentioned in the French EEAP. In France research funding has been dedicated to smart grid research as part of its digital economy development programme. Latvia has developed a smart network concept to establish a common understanding of the meaning of smart grids and to create a basis for examining the need to implement smart grids and assessing its technical possibilities. The benefits of smart networks are outlined in its report but an assessment of the levels of investment required has yet to be undertaken. The Italian EEAP recognises the importance of applying greater intelligence to its distribution network over the coming years, and with infrastructure already in place to read 32 million meters remotely, it sees Italy as a major player in the implementation of future smart grid technologies. Sweden has completed a preliminary study of a demonstration smart grid project applied to a district in Stockholm. The study examined technical aspects and market models, and aimed to identify the potential for commercial products and services that could arise from the project within the next five years. Slovenia has also undertaken a study of advanced metering infrastructure as a first step in the development of a smart grid infrastructure.

2.1.10 *Measures in the EEAPs to promote cogeneration*

As the EEAPs respond to the requirements of the ESD Directive and these reporting requirements differ from those of the CHP Directive, they do not contain the same level of detail with respect to aspects of the promotion of high-efficiency cogeneration as is contained in the Member States' latest national CHP progress reports summarised in Annex 5.

Spain describes a number of broad measures to promote high-efficiency CHP. These include financial aid for feasibility studies for new plants and for energy audits of existing plants, as well as support for new plants larger than 150kW_e in non-industrial applications. In the Czech Republic, organisations with a heat source above a defined thermal capacity are required by law to examine the viability of installing high-efficiency cogeneration facilities in the event of a significant change or a necessary replacement of the heat source. Additionally, cogeneration is supported by a favourable feed-in tariff for installations with a capacity of up to 5MW_e. In Austria, the CHP Act facilitates investment grants for CHP systems providing district heating. Support is offered for the construction of new CHP plants in Estonia that burn renewables, waste, peat and retort gases from oil shale processing. Support is also available for new plants burning other fuels if their electrical capacity does not exceed 10MW. Ireland sets a 2020 target for installed CHP, although its CHP investment support programme ended in 2010. In Cyprus, a new scheme to promote high-efficiency cogeneration is in place, where levels of capital subsidy are dependent on the economic sector in which the plant is employed and on the size of plant. However, the report comments that only around half of the identified CHP potential up to 2020 is likely to be realised due to a low level of interest, the climatic conditions on the island and the lack of availability of gas. The Greek EEAP mentions the transposition of the CHP Directive into national law, the availability of subsidies for high-efficiency CHP and the implementation of Guarantees of Origin certificates. Latvia has made public financing available from the cohesion fund for the development of cogeneration plants using renewable fuels. However, no projects financed by this measure have been completed. Legislation in Latvia also allows cogeneration plants using renewables to choose between receiving a guaranteed payment for electricity capacity and selling electricity generated with a mandatory buy-back of electricity capacity. In Malta loans at preferential rates are available to the hospitality sector for investing in energy efficiency including CHP. A CHP programme for larger energy users is also in place and has had a number of applicants, but none has yet been approved. In Slovenia it is envisaged in the national energy programme that CHP will have an 18% share of gross energy use in 2020, rising to 23% in 2030. Measures that support increased use of CHP include a guaranteed purchase price or a support premium for electricity generated and sold from high-efficiency CHP plants, financial incentives in the form of loans and grants for businesses investing in CHP, and a requirement for state-owned companies to reinvest 15% of annual profits in energy efficiency, renewables or CHP. Although structural funds have been available since 2007 in Slovakia for the development of high-efficiency CHP, it is stated in the EEAP that uptake among businesses has been slow due to the amount of administration required to receive funding. Businesses have been opting instead to apply for support from a new renewables and high-efficiency cogeneration programme that came into effect in 2010. The effectiveness of the new programme has not yet been assessed, however. Measures to promote increased use of CHP in Italy include investment loans at attractive rates, financed from a revolving fund for plants and the availability of tradable white certificates for savings brought about as a result of installing high-efficiency cogeneration plants.

In the Wallonia region of Belgium two separate investment subsidy programmes exist, for the public and private sectors respectively, for CHP investments that can demonstrate at least a 10% energy saving. Additionally, Wallonia uses its green certificate system to promote CHP.

The availability of grants for cogeneration for buildings and for industry is also mentioned in the plan for the Brussels region, and green certificates are issued for electricity generated from CHP. The Brussels region uses a multiplier coefficient when calculating green certificates allocated to gas-fired cogeneration facilities in collective housing blocks to provide an additional support to CHP. In the Flanders region of Belgium cogeneration certificates are issued to CHP facilities based on the amount of primary energy deemed to have been saved. A quantity of certificates must be acquired by electricity suppliers in the region that is in proportion to the amount of electricity they sell. The price of a cogeneration certificate has recently been raised by the Flemish government to provide further incentive, and the action plan indicates that the current support mechanism for cogeneration is undergoing a thorough review. Other relevant measures in Flanders include a 20% subsidy for micro-CHP plants installed by local authorities and tax incentives for investment in CHP in the agriculture sector.

Some Member States that provide no information about supply-side energy efficiency activities do describe in their EEAPs actions to promote CHP among end-users. Significant growth in installed CHP in the horticulture sector in the Netherlands over a number of years has been achieved as a result of a successful voluntary agreements programme in the sector supported by a number of financial measures. A feed-in tariff is used to promote small CHP in Luxembourg. Measures to promote CHP uptake in industry and in hospitals are mentioned in the first Portuguese EEAP, but no detail is given in the second report. The German EEAP describes a support programme for small CHP up to $50kW_e$ and support for CHP in industry as part of the industry voluntary agreements programme.

Table 1 Overview of supply-side measures contained in the second EEAP[9]

Member State	Measures addressing electrical transmission and distribution losses	Measures promoting high efficiency cogeneration	Measures prioritising other high efficiency generation plants, including wind, PV	Measures to encourage district heating or improve its efficiency	Measures to promote load management	Measures to promote or develop smart grids	Measures addressing the efficiency of the supply of oil and gas	Voluntary Agreements encouraging supply-side savings	Measures aimed at promoting greater competition among suppliers
AT		X		X					
BE		X[10]							
BG	X	X		X		X			
CY	X	X	X						
CZ		X	X	X					
DK	X			X[11]			X	X	
EE	X	X		X			X		X
FI								X	
FR						X			
DE		X[12]							X
GR	X	X	X	X					
HU				X					
IE	X		X		X	X		X	X
IT	X	X	X			X			
LT	X	X	X	X		X	X		
LV		X							
LU		X							
MT	X	X				X			
NL		X							
PL	X			X		X			
PT		X							
RO									
SK		X							
SI		X	X	X		X		X	
ES		X	X						
SE				X		X			
UK						X			

2.2 Report on the implementation of the CHP Directive

2.2.1 Introduction

This section summarises the most recent progress on the implementation of the CHP Directive and, therefore, on the use of high-efficiency cogeneration by Member States. The progress

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[9] The table is of a descriptive nature to only show that Member States have been taking different types of measures in their second EEAPs. The number of crosses is not directly linked to the comprehensiveness or quality of the measures included in the second EEAP

[10] Separate measures for Wallonia, Flanders and Brussels regions.

[11] Measure or strategy mentioned but no detail provided.

[12] CHP measures described in the EEAP focus mainly on end-use or micro-CHP installations.

report itself is presented in its entirety in Annex 5 of this report. A summary is given here to provide a more integrated view of overall progress in supply-side energy efficiency in the EU.

The report is compiled from reports received from the Member States updating progress since the first progress reports that were due in 2007[13]. A questionnaire was circulated among Member States to assist them to provide the information to meet the reporting requirements of the CHP Directive. Much of the progress report reflects the responses to this questionnaire. The progress report does not provide a complete view of developments as no reports were received from the Czech Republic, Germany, Luxembourg or Romania. For several other Member States the information provided was incomplete.

2.2.2 State of transposition of the CHP Directive

All Member States reported that the CHP Directive has been fully transposed into national law, either in their first or second progress reports or in the intervening period. The process of establishing fully operational systems of Guarantees of Origin (GO) as required under Article 5 has not been completed by all Member States. Ireland reported that it was working on the detailed framework relating to its GO system. In Malta, decision 2008/952/EC, establishing a harmonised methodology for the calculation of electricity from cogeneration, is yet to be implemented. In Cyprus, a GO system was to be adopted in 2011. Estonia plans to improve the legal basis of its GO system. For Luxembourg, the GO system was not fully implemented when its first progress report was submitted, and a second progress report has not been received. While Austria reports that the CHP Directive is fully transposed, an amendment to its Cogeneration Act is planned to enable its GO system to be administered.

2.2.3 Progress towards realising national potentials

Member States were required to assess progress made in promoting cogeneration, including the extent to which they had acheived their national economic potentials. The depth and level of detail of this assessment varied from Member State to Member State and depended, among other things, on whether Member States provided quantitative data on the evolution of cogeneration capacities, outputs, fuel inputs, and CO_2 and primary energy savings for the period 2000-2010 as requested by the Commission in its template spread sheet. Based on the data provided, progress was assessed in the period up to 2010 and furthermore against the national potentials when those were identified by Member States either in the first set of national reports that included national potential analyses and the first progress report, or in the second progress report. Since the identification of national potentials was not done consistently by all Member States, especially not always in the three time horizons of 2010, 2015 and 2020 required by the Directive, or some Member States did not identified a potential, for the sake of a comprehensive analysis, and comparison, national economic potentials have been identified in the TIMES energy system model developed by the Joint Research Centre on behalf of the Commission. Using data provided for the shares of cogeneration in the second progress reports, the Commission looked at to what extent Member States realised their 2010 potentials in 2009 and 2010. Where it had data available, the Commission also assessed whether the progress realised by 2010 represented a sufficient trajectory towards the longer term potential in 2020. The Commission also looked at the overall trend of development, in particular in the period since the first progress reports.

[13] Member States were required to submit their second national progress report by 11 October 2011 following a request by the Commission of 11 April 2011 as required by Article 6(3) and 10(2) of the CHP Directive.

The table 2 shows the national economic potentials for cogeneration, expressed in TWh of electricity produced from cogeneration. These potentials are provided for the 23 Member States that submitted the information of sheet 1 of the spread sheet[14]. Two sets of estimates are provided. The first set is derived from the national reports and spread sheet templates as analysed in the previous progress report. The second set of estimates is derived from a modelling exercise using the TIMES energy system model conducted by the Joint Research Centre.

It should be noted that the two approaches (national reports on the one hand and TIMES modelling on the other hand) are fundamentally different. The potentials recorded in the national reports (and consolidated in the previous progress report), on the one hand, are typically based on national models or bottom-up estimation of the potential. The potentials derived from the TIMES model, on the other hand, are based on an EU-wide optimisation model that simulates possible futures of the entire European energy system. The TIMES model may therefore overlook specific local circumstances that are taken into account in the national reports. In some cases, therefore, there may be a significant difference between the potentials from the national reports and the potentials from the TIMES model. In addition, in some cases, there may be different definitions of the baseline, as is the case, for example, for Slovakia. However, in that case, although the baseline of the estimates is different, the *increments* to 2015 and 2020 are more similar. For that reason, as mentioned before, the comparisons in the remainder of the chapter will focus mostly on the increments.

[14] This corresponds to all 24 Member States that submitted the spreadsheet, plus Romania, which submitted the same data in tables in a report, minus Denmark and Spain, because they submitted only sheet 3 of the spreadsheet.

Table 2: Economic potentials for cogeneration in 23 Member States, expressed in electricity generated from cogeneration [TWh/y], as taken from national reports and TIMES modelling

Member State	Base year (from WP1)	Economic potential National reports (from WP1)			Economic potential TIMES (from WP2)		
	2007/2008	2010	2015	2020	2010	2015	2020
Austria	4.554				18.2	20.5	21.6
Belgium	9.021			12.464	7.4	7.4	7.4
Bulgaria	3.014	3.074	5.030	22.249	5.3	5.1	5.7
Cyprus	0	0.094	0.554	1.054	0.0	0.0	0.0
Czech Republic	11.788	12.636	14.365	17.419	19.3	21.6	24.5
Estonia	0		2.100	2.100	1.8	2.0	2.2
Finland	26.7	26.200	25.600	23.800	37.1	39.4	38.1
France	21.645	21.255	17.764	19.135	24.8	29.0	41.5
Germany	84.6			176.803	125.0	170.4	205.0
Greece	0.121	3.037	5.837	6.318	4.3	4.7	4.7
Hungary	5.895	5.595	6.095	6.131	8.4	8.9	9.9
Italy	22.99	23.023	27.592	38.840	43.0	39.8	37.1
Latvia	0				6.7	7.6	7.9
Lithuania	0				1.5	2.2	2.7
Malta	0	0.062	0.119	0.125	0.1	0.1	0.1
Netherlands	61.47	70.320	78.069	84.827	31.1	31.1	31.1
Poland	25	58.800	55.800	55.350	45.7	51.2	58.6
Portugal	5.407	7.918	10.691	13.409	2.8	2.4	1.9
Romania					15.9	15.6	15.6
Slovakia	0.07	0.893	1.680	1.209	8.0	9.8	10.7
Slovenia	1.106	1.123	2.321	3.211	1.7	2.1	1.8
Sweden	13.353	16.289	14.986	14.448	16.9	19.5	20.1
United Kingdom	27.911	27.911	85.122	128.647	29.1	30.3	33.9

Note: The base year is based on the national reports, in which it was defined as “2007 or latest”. In most cases, 2007 was used by the Member States. For national reports in which the exact base year was not specified, 2007 was assumed for the remainder of the analysis.

The table 3 presents the amount of electricity actually generated from cogeneration in the years 2009 and 2010. The left half of the table shows the amounts stated in the spread sheets accompanying the questionnaires. The right half of the table contrasts these numbers with the data from Eurostat. The numbers are not fully comparable as the reporting under the Cogeneration Directive includes only high-efficiency cogeneration, while Eurostat includes all cogeneration.

In both sources, one can observe that electricity generation from cogeneration has remained more or less unchanged between the base year and 2009. On the other hand, there has been a moderate increase between 2009 and 2010. According to the spread-sheets accompanying the questionnaires, the increase was around 9 TWh. According to Eurostat, the increase was around 23 TWh. As mentioned before, the Eurostat data includes also low-efficiency cogeneration, and covers a larger set of Member States.

Table 3: Realisation of electricity produced from cogeneration in 2009 and 2010, from the current questionnaire and compared with Eurostat [TWh/y]

Member State	Realisation (from current questionnaire)			Increase since base year		Realisation (from Eurostat)			Increase since 2007	
	Base year	2009	2010	2009	2010	2007	2009	2010	2009	2010
Austria	7.510	8.466	9.813	0.956	2.303	10.102	9.120	10.954	-0.982	1.834
Belgium	6.056	11.891	11.352	5.835	5.295	11.103	13.228	15.219	2.125	1.992
Bulgaria	*3.014*	3.678	3.839	0.664	0.825	4.070	4.039	3.732	-0.031	-0.306
Cyprus	0.000	0.008	0.046	0.008	0.046	0.015	0.021	0.053	0.006	0.033
Czech Republic	11.431	11.045	12.240	-0.386	0.809	11.466	11.022	12.199	-0.444	1.178
Estonia	0.869	0.807	0.911	-0.062	0.042	0.878	0.808	1.335	-0.070	0.528
Finland	26.759	24.793	27.734	-1.966	0.975	27.949	25.798	29.201	-2.151	3.403
France	21.861	21.631		-0.230		18.233	23.191	15.932	4.959	-7.259
Germany	*84.600*		83.200		-1.400	77.726	77.020	82.885	-0.706	5.865
Greece	0.121	0.117	0.209	-0.004	0.088	1.016	1.841	2.468	0.825	0.627
Hungary	7.755	6.332	6.506	-1.423	-1.248	8.551	7.361	7.325	-1.190	-0.036
Italy	54.000	48.000	53.000	-6.000	-1.000	32.330	29.849	34.737	-2.481	4.888
Latvia	0.869	0.807	0.911	-0.062	0.042	1.951	1.097	2.982	-0.854	1.885
Lithuania	1.720	1.761	1.769	0.041	0.049	1.849	2.135	1.989	0.286	-0.146
Malta	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Netherlands	36.400	40.100		3.700		31.654	36.434	39.222	4.780	2.788
Poland	27.600	26.100	27.700	-1.500	0.100	27.567	26.096	27.748	-1.471	1.652
Portugal	4.269	4.015		-0.254		5.812	5.523	6.383	-0.289	0.860
Romania	4.400	3.500	3.300	-0.900	-1.100	6.599	6.266	6.547	-0.333	0.281
Slovakia	4.369	3.887	3.798	-0.482	-0.571	7.182	5.022	4.427	-2.161	-0.595
Slovenia	1.088	1.025		-0.063		1.083	1.017	1.134	-0.066	0.117
Sweden	13.336	15.942	18.930	2.606	5.594	12.212	14.355	18.576	2.143	4.221
United Kingdom	25.343	24.511	23.644	-0.832	-1.699	25.394	24.488	23.630	-0.906	-0.858
Total				**-0.355**	**9.149**				**0.988**	**22.949**

Note: the base year realisation for Bulgaria and Germany is in italics, because the number was taken from the national report, and not from the spread-sheet submitted in this round.

The table 4 compares these increments in electricity generation from cogeneration, with the potential increments shown earlier (potentials from national reports, TIMES, PRIMES Baseline 2009 and PRIMES Energy Efficiency).

Table 4: Comparison of economic potential with realisation in 2010, expressed in electricity produced from cogeneration [TWh/y]

Member State	Potential increment from base year to 2010				Increase from base year to 2010 (questionnaire)	Assessment of realisation of potential*
	National reports	TIMES	PRIMES Baseline 2009	PRIMES Energy Efficiency		
Austria		1.380	-0.554	-0.582	2.303	+
Belgium		0.000	1.872	1.890	5.295	+
Bulgaria	0.060	-0.120	1.732	1.740	0.825	0
Cyprus	0.094	0.000	0.007	0.007	0.046	+
Czech Republic	0.848	1.380	3.858	3.592	0.809	0
Estonia		0.120	0.379	0.373	0.042	0
Finland	-0.500	1.380	1.887	1.887	0.975	0
France	-0.390	2.520	-0.459	-0.991		
Germany		27.240	25.503	22.408	-1.400	-
Greece	2.916	0.240	1.188	1.173	0.088	0
Hungary	-0.300	0.300	2.374	2.368	-1.248	-
Italy	0.033	-1.920	6.755	4.224	-1.000	-
Latvia		0.540	0.346	0.346	0.042	0
Lithuania		0.420	0.874	0.874	0.049	0
Malta	0.062	0.000	0.000	0.000	0.000	0
Netherlands	8.850	0.000	8.262	8.258		
Poland	33.800	3.300	0.331	0.314	0.100	0
Portugal	2.511	-0.240	2.702	2.692		
Romania		-0.180	-1.086	-1.130	-1.100	+
Slovakia	0.823	1.080	1.428	1.414	-0.571	-
Slovenia	0.017	0.240	0.470	0.365		
Sweden	2.936	1.560	4.406	4.384	5.594	+
United Kingdom	0.000	0.720	5.826	5.826	-1.699	-
Total	**51.760**	**39.960**	**68.101**	**61.432**	**9.149**	**0**

* Legend: + potential was realised; – cogeneration output decreased; 0 potential was partially realised.

The lack of growth in 2009 and the relatively limited growth in 2010 may be partly or wholly due to the economic crisis, which led to a drop in electricity demand and a slow-down or standstill in new electricity generation investment. Six countries (Greece, Hungary, Italy, Portugal, Slovakia and Slovenia) explicitly mention the crisis as a factor in their national reports and/or questionnaires.

The 2010 figures for electricity produced from cogeneration in 19 Member States for which figures are available indicate that overall 23% of the 2010 potential identified in the TIMES model has been realised. In their first national reports 16 of these Member States quantified economic potential for cogeneration for 2010. In 2010 these Member States achieved 18% of the combined overall 2010 potential identified in their national reports.

As regards the breakdown by sectors of CHP electricity capacity, a comprehensive study of the evolution of CHP up to 2010 was not possible due to missing data and incomplete time series supplied by some Member States. Figure 6 shows the breakdown by sector of CHP electricity capacity in 2009 for 15 Member States for which data was available. Total electrical capacity of CHP in these Member States in 2009 was 56.6 GW.

Figure 6 Breakdown by sector of electricity capacity from CHP in 15 Member States in 2009

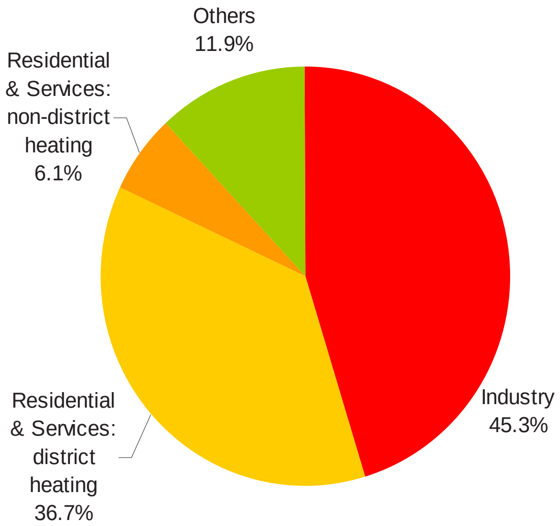


Figure 7 presents a breakdown of the shares of different CHP technologies installed in the Member States in 2009. From the data supplied by the Member States a slight increase in the share of combined cycle gas turbines in total CHP electricity capacity since 2000 is apparent.

Figure 7 Breakdown by technology of electricity capacity from CHP in 2009

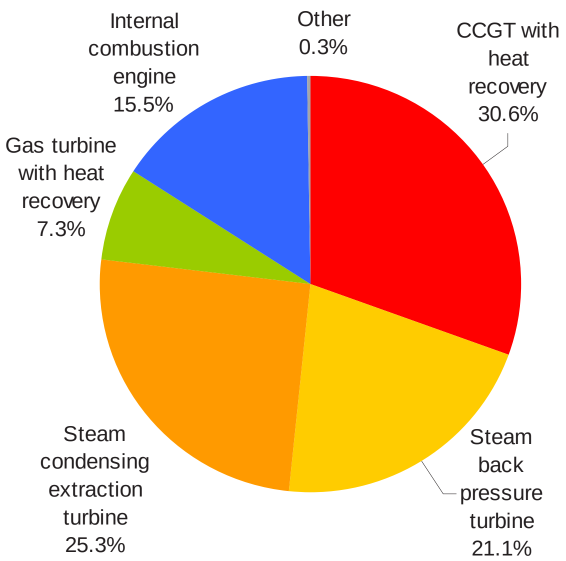
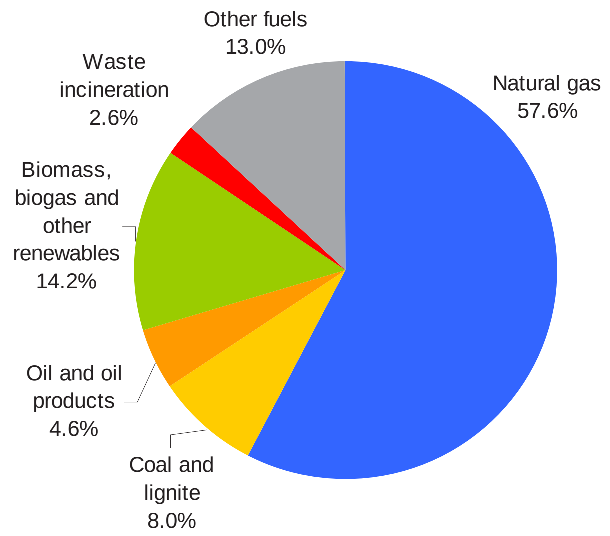


Figure 8 shows the shares in 2009 of each input fuel type used in CHP plants installed in Member States for which data was available. The time series data available shows an on-going increase in the share of natural gas as a fuel in the period since 2000.

Figure 8 Shares of CHP input fuel type in 2009



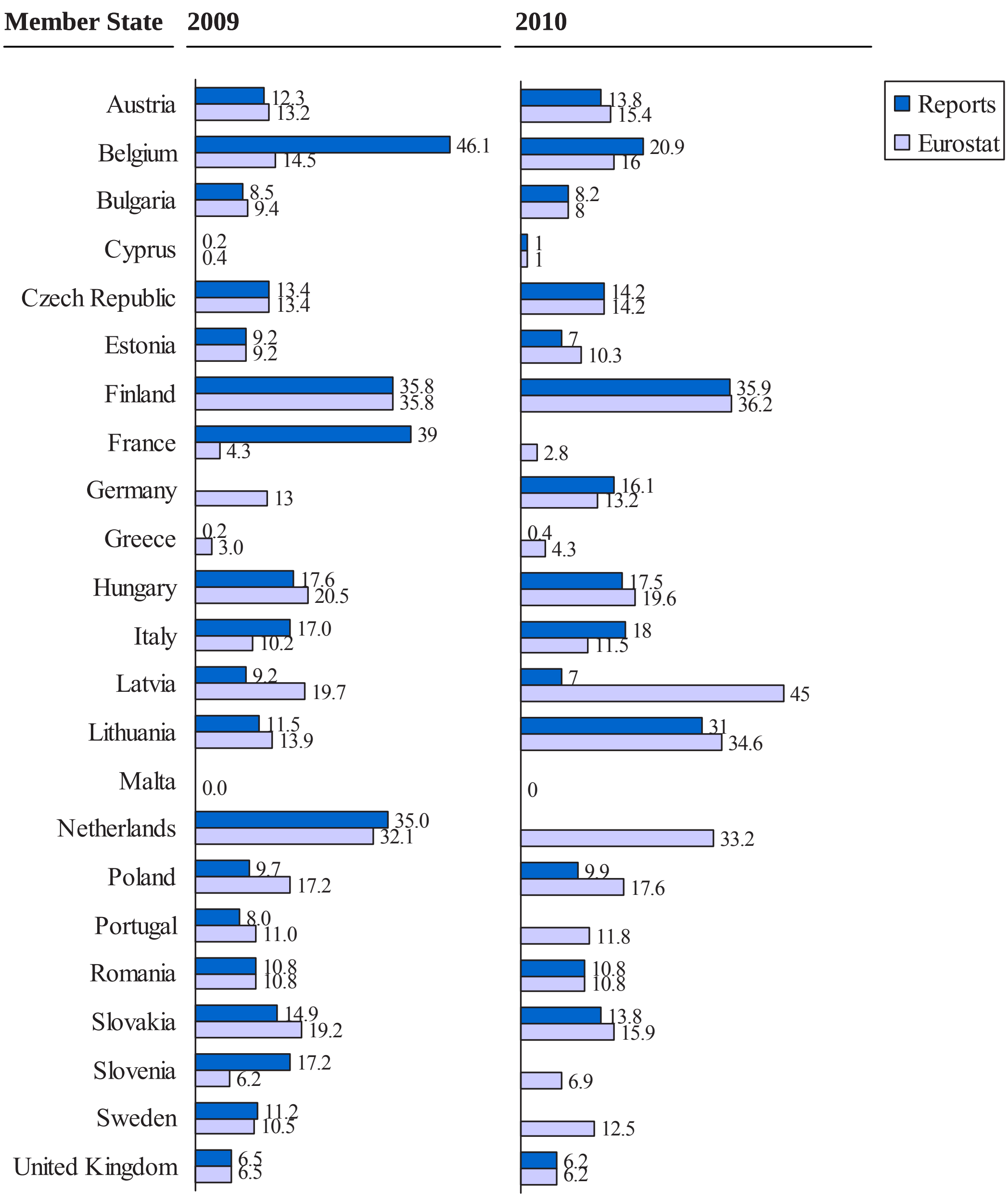
2.2.4 Quantity and share of CHP in 2010

The following table provides an overview of the quantity and share of electricity from CHP in absolute terms (both capacity and production) and as a share of the market, in both 2009 and 2010. These values are provided for the 23 countries for which the data of sheet 1 of the spread-sheet was available. For comparison, the share of cogeneration in gross electricity generation from Eurostat is also shown.

Table 5: Quantity and share of CHP in electricity production (based on spread-sheets submitted)

	2009				2010			
	Capacity GW	**Output** TWh	**Share in total** %	**Share in total** % Eurostat	**Capacity** GW	**Output** TWh	**Share in total** %	**Share in total** % Eurostat
Austria	2.419	8.466	12.3	13.2	2.760	9.813	13.8	15.4
Belgium	1.920	11.891	46.1	14.5	1.733	11.352	20.9	16.0
Bulgaria	1.306	3.678	8.5	9.4	1.566	3.839	8.2	8.0
Cyprus	0.003	0.008	0.2	0.4	0.015	0.046	1.0	1.0
Czech Republic	4.764	11.045	13.4	13.4	4.799	12.240	14.2	14.2
Estonia	0.415	0.807	9.2	9.2	0.439	0.911	7.0	10.3
Finland	7.344	24.793	35.8	35.8	7.494	27.734	35.9	36.2
France	6.345	21.631	39.0	4.3				2.8
Germany				13.0		83.200	16.1	13.2
Greece	0.097	0.117	0.2	3.0	0.099	0.209	0.4	4.3
Hungary	1.589	6.332	17.6	20.5	1.509	6.506	17.5	19.6
Italy	9.960	48.000	17.0	10.2	9.852	53.000	18.0	11.5
Latvia	0.415	0.807	9.2	19.7	0.439	0.911	7.0	45.0
Lithuania	0.765	1.761	11.5	13.9	0.777	1.769	31.0	34.6
Malta	0.000	0.000		0.0	0.000	0.000		0.0
Netherlands	8.000	40.100	35.0	32.1				33.2
Poland	8.600	26.100	9.7	17.2	8.700	27.700	9.9	17.6
Portugal	0.858	4.015	8.0	11.0				11.8
Romania		3.500	10.8	10.8		3.300	10.8	10.8
Slovakia	2.547	3.887	14.9	19.2	2.609	3.798	13.8	15.9
Slovenia	0.327	1.025	17.2	6.2				6.9
Sweden	5.131	15.942	11.2	10.5		18.930		12.5
United Kingdom	5.706	24.511	6.5	6.5	6.102	23.644	6.2	6.2

Figure 9: Quantity and share of CHP in electricity generation (based on spread-sheets submitted)



Overall, the percentage data reported by the Member States is relatively well aligned with the data collected by Eurostat.

CHP penetration in 2009/2010 ranges from around 0% in islands and Greece to more than 30% in Finland and the Netherlands. The share in France is high because France has only included fossil fuel power plants in the total (*i.e.* excluding nuclear, hydro, etc.).

Likewise for heat, the following table provides an overview of the quantity and share of electricity from CHP in absolute terms (both capacity and production) and as a share of the market, in both 2009 and 2010.

As regards primary energy savings (PES) and CO_2 emission reduction, for the subset of Member States which provided adequate data for 2010 (Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Estonia, Finland, Germany, Greece, Hungary, Italy, Latvia, Lithuania, Malta, Poland, Romania, Slovakia, Sweden and the United Kingdom), the increase in electricity production from CHP since the base year 2007 has been 9.149 TWh/y, as shown earlier in this chapter. This would result in additional 0.5 Mtoe/y of PES and 1.3 Mt/y of CO_2 emissions reductions[15]. These savings are relatively low since – as mentioned before – the bulk of the potential was expected to be realised after 2010.

As part of the spread-sheets, some Member States also submitted information on PES, as summarised in the following table. Note that roughly half of the savings are concentrated in Greece, which leads to the conclusion that different methodologies have been used by different Member States. The same holds for the incremental PES (difference between 2007 and 2010). Total incremental PES are 1.6 Mtoe/y, but most of this is concentrated in Sweden, which again points to methodological differences.

Table 6: Primary Energy Savings 2010 according to Member States' reports (spread sheets)

	Primary Energy Savings (from spreadsheets)		**Primary Energy Savings (from spreadsheets)**		**Increase in PES**
	2007		2010		2007-2010
	PJ	Mtoe	PJ	Mtoe	Mtoe/y
Austria	30.1	0.7	37.4	0.9	0.2
Bulgaria	0.0	0.0	4.6	0.1	0.1
Cyprus	0.0	0.0	0.1	0.0	0.0
Greece	511.7	12.2	513.6	12.2	0.0
Hungary	3.0	0.1	2.6	0.1	0.0
Italy	193.2	4.6	189.0	4.5	-0.1
Lithuania	4.6	0.1	5.0	0.1	0.0
Malta	0.0	0.0	0.0	0.0	0.0
Netherlands	83.0	2.0	*90.0*	2.1	0.2
Romania	10.5	0.3	8.0	0.2	-0.1
Slovakia	6.0	0.1	6.5	0.2	0.0
Sweden	89.2	2.1	146.4	3.5	1.4
UK	59.3	1.4	53.8	1.3	-0.1
Total	**990.7**	**23.6**	**1057.1**	**25.2**	**1.6**

Note: The 2010 number for the Netherlands is in italics because 2009 data was used.

A more complete way of estimating the PES of CHP is to consider the CHP production as recorded by Eurostat, since this includes all Member States. Electricity production from CHP in Eurostat increased from 365 TWh/y in 2007 to 393 TWh/y in 2010, *i.e.* an increase of 27 TWh/y. Using the same technical coefficients as before, this would represent an additional PES of 1.5 Mtoe/y, and CO_2 emissions reductions of 3.8 Mt/t. This would mean that roughly half of the 2010 potential is achieved.

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[15] Primary Energy Savings are based on reference PES values (calculated according to Annex III of the Directive) for the future CHP technology mix indicated in the templates. Since the resulting coefficient (in Mtoe/TWhe) has been applied at aggregate level, a large error margin applies. Avoided CO_2 emissions are based on the Primary Energy Savings* and reference CO_2 emissions for the future fuel mix indicated in the Templates. Since the resulting coefficient (in Mt CO_2/Mtoe) has been applied at aggregate level, a large error margin applies.

2.2.5 Barriers to high-efficiency cogeneration

Member States were asked by means of a questionnaire to identify current barriers to high-efficiency cogeneration in their jurisdictions. Member States were asked to describe barriers in the following categories:

- Barriers related to administrative procedures;
- Barriers related to the grid system and tariff issues;
- Other barriers.

Barriers were also identified in the first round national reports. The total number of barriers for the sub-sample of 19 Member States that have included barrier analysis in their reports has decrease slightly from 101 to 97. However, the plain mention of a barrier in a national report is treated as a barrier in this analysis. With this in mind, a decrease of around 4% of barriers does not seem very relevant. Although between the two reporting rounds there is a slight decrease in the number of barriers (from 101 to 97), there is an increase of relevance of the most cited barriers and a more remarkable loose of ground of the least cited barriers[16]. In this section, the conclusions as regards the most important barriers identified are presented.

The two most cited barriers in both the first and second round of National reports are “fuel prices” and “heating or cooling demand”.

A barrier that was not very relevant in the first round of reports “rest of infrastructures not prepared” is now mentioned by ten countries (a number of countries quite close to the most cited barriers, see row 30). Under this heading are clustered all the barriers mentioned by the Member States that somehow mention that the lack of an already deployed network of district heating, the lack of distribution network of natural gas or some related problems, are an hindrance to further expansion of cogeneration.

The barriers that seem to be losing ground are “lack of promotion”, “risk/economic justification”, “access to/availability of fuels”, “uncertainties due to the ETS” and “lack of expertise”. The barriers that gain weight are “fuel prices”, “heating or cooling demand”, “lack of financial resources”, “rest of infrastructure not prepared”, “lack of awareness (by potential end users)”, and “maturity of the technologies”. The high weight of the barriers “complexity of the law” and “heating and cooling demand” did not experience change in both rounds of reporting.

2.2.6 Systems of Guarantees of Origin

According to the CHP Directive, Member States must ensure that the guarantee of origin (GO) of the electricity enables producers to show that the electricity sold is produced from high-efficiency cogeneration. A GO should identify:

- The lower calorific value of the fuel from which the electricity was produced, the use of the heat generated, and the dates and places of production;
- The amount of electricity from high-efficiency cogeneration that the guarantee represents;
- The primary energy savings calculated using harmonised efficiency values established by the Commission.

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[16] The comparative inventory of barriers based on first and second progress report is presented in Annex 5 on the Commission Progress Report.

Of the Member States that have reported, all except Ireland indicated that they have fully operational GO systems in place. In other Member States GO systems appear to be robust and comprehensive. No need has been expressed by any Member State for a review of threshold values used to calculate electricity from cogeneration, cogeneration efficiency or primary energy savings.

2.2.7 Access to electricity grid and grid system rules

In the questionnaire circulated among Member States to assist them in compiling their latest progress reports, Member States were asked to indicate if there is priority access to the grid for high-efficiency CHP, and if so, to describe how it is facilitated. They were asked to indicate if priority access was linked with a GO scheme. They were requested to describe how high-efficiency CHP is distinguished for the purpose of priority dispatch. They were asked to describe the connection rules and identify if there were any specific rules for small-scale and micro-CHP.

Of the Member States that responded to the questions, twelve have priority grid access while six have some kind of assisted access. Italy, Malta and the United Kingdom do not appear to have priority access for cogeneration. Priority access is linked with the GO scheme in four Member States, while two more specifically state that priority access is not linked to GO. Sixteen Member States did not indicate if there is a link with their GO systems.

Ten Member States reported clear criteria for distinguishing high-efficiency CHP for the purpose of priority dispatch based on meeting the energy saving criteria specified in the CHP Directive, either by being registered in the GO system or by stating that they meet the CHP Directive requirements. Two Member States described criteria that may have had the same effect but the descriptions were not explicit. There is no priority despatch in the United Kingdom. For eight Member States the response was not clear.

Five Member States reported preferential access to the grid for cogeneration, but preferential access was not necessarily for all classes of generators. Austria reported that no preferential access is given but that all generators have easy access to a connection. The United Kingdom and the Flanders region of Belgium reported that no priority access is given to cogeneration plants. Eleven Member States provided no information.

2.2.8 Support schemes for cogeneration

In the questionnaire circulated to the Member States, they were asked to identify and describe support schemes in place to promote CHP so as to provide an overview of support schemes reported, sorted according to broad categories of measures.

Fourteen Member States provide support in the form of a feed-in tariff or a guaranteed purchase price for electricity generated. In Finland a feed-in tariff system supporting small-scale cogeneration from biogas or wood was introduced in 2011. Up to 2013 France will provide a purchase guarantee for 20 years for $800MW_e$ of new biomass cogeneration plants. In Ireland a renewable energy feed-in tariff guaranteed for 15 years will help achieve target by installed capacities of $100MW_e$ biomass CHP and $50MW_e$ of CHP from anaerobic digestion. Latvia provides guaranteed compulsory purchase of electricity generated from CHP at a fixed price and also provides for the right to receive guaranteed payment for installed electrical capacity. In Slovakia a fixed price is paid for electricity from CHP, usually for 15 years, but this can be supplemented by an additional payment if the plant produces electricity at a cost that is greater than the fixed tariff. In Slovenia, plants up to $1MW_e$ may choose to receive a guaranteed purchase price or to sell their electricity on the open market and receive operating support when their forecast reference costs exceed the forecast reference market price of electricity. Plants larger than $1MW_e$ cannot receive a fixed tariff but can qualify for operating support if their costs exceed market rates. Cyprus assures a minimum price for electricity generated or the first 20 years of operation of eligible CHP plants.

Thirteen Member States reported that assistance is available in the form of capital grants. Cyprus offers grants of up to 30% of investments for plants up to $1MW_e$ using renewable fuels. Austria has made EUR 50 million available in investment subsidies for cogeneration plants since 2007. In Denmark production-independent subsidies are financed through the electricity price charged to consumers. A scheme to provide grants to support the development of CHP in Ireland was discontinued in 2010.

A certificate scheme was reported by four Member States. Italy grants qualifying plants an exemption from an obligation to purchase green certificates, which must be purchased by all other electricity generating facilities that use non-renewable fuels. In Italy plants can also receive white certificates based on the amount of primary energy they are deemed to have saved. Sweden has an electricity certificate scheme, which enables producers of electricity from CHP to sell certificates to other electricity suppliers, who are obliged to buy a quantity of certificates determined by the amount of electricity they sell.

Four Member States reported favourable energy tax rates or energy tax exemptions for energy from cogeneration. In Finland heat production from cogeneration is subject to just half the CO_2 tax rate applicable to heat from other sources. In the Netherlands CHP plants generating electricity with an electrical yield greater than 30% are exempt from an environmental tax.

Six Member States reported measures that provide business taxes exemptions or reductions, or enhanced fiscal allowances for investment. Reduced federal taxes and tax deductions are applicable to investments in the Wallonia region in Belgium while tax deductions of 13.5% of total investment are also available from the federal state. A tax rebate is available in the Netherlands through its Energy Investment Allowance programme. Enhanced capital allowances for CHP investments are available in France, Ireland and the United Kingdom.

Table 7 Overview of support schemes for CHP according to assessment of most recent round of national reports

Member State	Feed-in tariff/ guaranteed purchase price	Certificate scheme	Capital grants	Energy tax exemption	Accelerated fiscal allowances for investment	Business tax exemption
AT			X			
BE		X	X		X	
BG	X					
CY	X		X			
CZ						
DK	X		X			X
EE	X		X			
FI	X		X	X		
FR	X			X	X	X
DE						
EL	X		X			

Member State	Feed-in tariff/ guaranteed purchase price	Certificate scheme	Capital grants	Energy tax exemption	Accelerated fiscal allowances for investment	Business tax exemption
HU						
IE	X				X	
IT		X				
LT						
LV	X		X			
LU						
MT						
NL			X	X	X	
PL		X	X			
PT	X					
RO						
SK	X		X			
SI	X					
ES	X		X			
SE		X				
UK	X		X	X	X	X

2.3 Evaluating savings achieved by supply-side measures

Energy savings achieved in the supply, transmission or distribution of energy cannot be counted towards the 2016 indicative target in the ESD. For many of the Member States that describe supply-side energy efficiency measures in their EEAPs, the savings achieved or expected to be achieved by the measures are not fully quantified. In some cases, for example Poland, savings associated with measures addressing energy efficiency in energy transmission and distribution, CHP and heating systems are incorporated into end-use savings figures. For some Member States savings are given for some measures related to energy supply, such as district heating measures, but measures addressing efficiency in electricity generation and transmission are not addressed, such that overall national primary energy savings cannot be assessed.

Some Member States provide primary energy consumption or savings forecasts or targets for 2016 or 2020. For instance Denmark, Ireland and Spain give primary energy consumption targets for 2020; Hungary provides a forecast of 2020 primary energy consumption, while Cyprus and Malta describe 2020 primary energy savings forecasts in their EEAPs. These forecasts and targets take into account primary savings expected to be achieved as a result of end-use energy efficiency improvements within and outside the scope of the Directive, as well as supply-side savings.

Generally, however, a breakdown of the proportion of total national savings attributable to energy supply and energy end-use is not given. Exceptions include Spain, where supply-side measures account for 32% of the 2020 forecast savings and Ireland, where they make up 13% of the 2020 primary energy savings. Cyprus expects that the use of gas in electricity generation from 2015 onwards will account for around 59% of its total primary energy savings. Some Member States, such as the Czech Republic and Poland, give savings figures for measures related to supply, but these figures do not necessarily represent the total supply-side savings as all measures related to supply may not be addressed in the reports. Romania quantifies savings for some supply-side measures, but the reference time-frame differs from that of the ESD savings. As the reports do not provide sufficient supply-side data, and as no supply-side figures are available for some of the larger Member States, it is not possible to assess from the second round of EEAPs the overall level of savings achieved or forecast for the EU energy supply sector or the likely contribution of supply-side savings to the EU 2020 primary energy savings target.

With regard to savings achieved as a result of measures to promote CHP specifically, the progress report on CHP contained in Annex 5 to this document estimates annual savings of between 1 Mtoe and 2 Mtoe *per annum* in primary energy consumption for Member States that provided reports. This estimate excludes the savings of those Member States that did not provide reports. The CHP update reports from Member States, however, do not provide any energy savings figures, nor indeed were they requested to provide them in the questionnaire from the Commission. The EEAPs from the Member States also generally provide few insights into the amount of energy saved specifically as a result of the deployment of CHP. In some cases measures described support several energy-saving technologies, not just CHP. In others, aggregate top-down savings figures are given according to sector, incorporating savings achieved by all measures addressed at that sector. Additionally, the methods used by Member States to quantify savings vary considerably. This aspect is dealt with in greater detail later in this report.

Overall, the existing reporting mechanisms for both the ESD and the CHP Directive do not provide sufficient information for evaluating energy savings arising from supply-side energy efficiency measures.

2.4 Conclusions

National plans that incorporate supply-side measures into national energy efficiency activities demonstrate a cohesive, strategic approach to achieving national savings goals. While the majority of Member States include measures in their EEAPs that improve the efficiency of energy supply, most do not provide a comprehensive analysis of the future of energy supply or of measures to improve its efficiency. Most EEAPs do not, therefore, give a complete overview of past and future energy efficiency developments. However, it is evident from the EEAPs that many Member States recognise that measures addressing energy supply will be an important part of their commitments to help the EU achieve its 2020 energy savings targets.

Despite the lack of a comprehensive section addressing energy efficiency of supply in many EEAPs, various of them provide details of measures to improve the energy efficiency of district heating systems and to extend their use to a greater number of consumers. Measures include capital investment programmes for refurbishments and extensions, designated district heating areas and compulsory use in buildings of district heating facilities in the locality. A number of EEAPs and several of the national CHP reports highlight the high levels of funding needed for investment in district heating networks and the current scarcity of financing options.

In many of the EEAPs details of measures addressing energy efficiency in the transmission and distribution of electricity are given. Measures related to transmission typically involve expansion of networks to enable greater inter-connection and to increase capacity, thereby indirectly providing opportunity for increased energy efficiency. Measures related to electricity distribution include activities to replace or upgrade inefficient network components, replace or reduce lengths of lines, and install power factor correction equipment.

Many Member States foresee primary energy savings arising as a result of the decommissioning of older inefficient electricity generation capacity and its replacement with modern high-efficiency installations. Furthermore, primary savings will be achieved through the increased share of renewables and the favourable calculation of primary energy equivalent for electricity generated from wind and solar photovoltaic installations. Some EEAPs also detail measures to upgrade existing power plants and thereby improve their efficiency. Although market liberalisation and unbundling of network energy services are not referred to in most of the EEAPs, greater competition will accelerate energy efficiency improvement of the electricity generation capacity of many Member States.

Commitments are made by a number of Member States to the development of smart grids. Measures undertaken to-date, however, tend to be small-scale research programmes or restricted roll-out of smart meters in pilot programmes to examine potential and to prepare for larger-scale implementation at a later stage. The savings potential of demand side management measures is not reflected in the EEAPs. It is to be hoped that the roll-out of smart networks will facilitate greater use of demand side management than is evident from the Member States' reports.

Many Member States have now, or will have in the near future, voluntary agreements or energy efficiency obligations schemes, whereby energy suppliers or network operators are required to deliver agreed levels of energy savings. Whether supply-side savings may count towards agreed savings targets, and the extent to which these savings contribute towards total expected savings from these schemes, is not clear from most EEAPs.

In this report two different sets of information are analysed to assess measures implemented by Member States to promote the use of high-efficiency CHP. Unfortunately, the two sources of information do not complement each other well, and putting the two together to form a better picture of CHP developments in the Member States is difficult. National CHP reports were received from all but one Member State and several that were received contained incomplete information. While a complete set of EEAPs has been received, the level of detail provided does not address the reporting requirements of the CHP Directive, and several Member States provide no information in their EEAPs about the promotion of CHP. The reporting timeframes for the two sets of national reports are also different. The most recent progress report provides an update on developments since 2009, while the EEAPs report on progress in the 3-year intermediate period to 2010.

Most of the EEAPs do list or describe measures that promote greater use of CHP. Many of these measures are aimed at increasing the installed base of small-scale or micro-CHP plants in the facilities of end-users.

The national CHP reports provide a more comprehensive list of measures. The most frequently used measure is the provision of feed-in tariffs or guaranteed purchase prices for electricity generated by CHP. In some Member States the availability of feed-in tariffs may be dependent on the capacity of the plant or on the type of fuel used. Some Member States provide additional payments for plants in the event that they cannot produce electricity at the guaranteed purchase prices due to developments in fuel costs.

Another measure common to most of the national CHP reports examined is the provision of capital grants and subsidies for investments in cogeneration. Grants may be financed from EU structural funds, national revolving funds or through additional charges to all energy consumers.

High fuel prices, uncertainties about future price developments and changes in the spread between electricity and gas prices are the most commonly identified barriers to CHP. The reports also highlight uncertainties about the demand for heat, in particular in countries with warm climates. Several Member States now identify the lack of infrastructure, in particular the lack of a natural gas network, as a significant barrier to the development of CHP.

Figures for electricity production from CHP for 20 Member States for 2009 show that electricity production was almost at the same level as in 2007. For a smaller sub-set of Member States production figures for 2010 indicate a small growth of around 5% since 2007. The figures suggest that measures have not yet been successful in achieving the goals of the CHP Directive.

The Energy Efficiency Directive should provide a more integrated framework for reporting measures related to the CHP Directive. The reporting framework should make the contribution of savings associated with CHP-related measures to total national energy savings in each Member State more transparent. The Directive should also facilitate a more comprehensive mechanism for monitoring and reporting on progress to improve the efficiency of energy supply.

3 IMPROVING ENERGY EFFICIENCY IN END-USE CONSUMPTION

3.1 Overall coverage of sectors

The buildings sector remains a priority in the second EEAPs. Actions on space heating, cooling and domestic hot water represent the highest share of energy savings reported with bottom-up methods in most of the EEAPs. Many Member States still focus their efforts on existing residential buildings (as it holds the largest potential), and almost all the EEAPs reported measures whose combination covers new and existing buildings on the one hand, and residential and tertiary buildings on the other hand. For new buildings, Member States focused mainly on standards and regulations together with incentives or demonstration projects for highly efficient buildings (low, passive or nearly zero-energy). The EPBD is a key driver, but its implementation varies according to the national context and background confirming that there is no "one size fits all" package of measures. In particular, while a majority of EEAPs includes packages of measures mainly focused on the building owners or occupants, some EEAPs presented promising comprehensive strategies to stimulate the offer of energy efficiency actions or services, and/or to raise the interest or involvement of the construction companies in energy efficiency practices and markets.

Less than half of the second EEAPs include specific objectives for energy efficiency in buildings (either for the whole stock or for existing buildings), mainly for 2016 or 2020. These objectives are expressed in terms of reduction in energy consumption (percentage, absolute figure or level of specific energy consumption in kWh/m²/a) or in terms of refurbishment target: number of buildings (Bulgaria, Czech Republic), building areas (Slovenia) or share of the stock. Some Member States have set a combination of objectives. As regards highly efficient new buildings, most of the Member States mentioned the objective set in the EPBD recast (nearly zero energy buildings by 2020), but few of them stated clear timelines or commitment.

According to governance structure, measures may be implemented at the national, regional or local level. For example, Austria presented measures reported by its federal states[17], while Spain mentioned the differences in implementing building regulations among the Autonomous Communities. Some countries have investigated the relevance of local approaches in order to encourage comprehensive renovations (e.g., Community Energy Savings Programme in the UK, Block by Block approach in the Netherlands or Arbed in Wales in the UK). These measures are recent, therefore the relevant second EEAPs do not report on results of these efforts.

Meanwhile, many Member States have highlighted the role of local authorities or bodies through different activities: local energy advice centres (e.g., Austria, Slovenia), regional or local energy planning or action plans (e.g. Estonia, Finland, France, Greece), promotion of the Covenant of Mayors (e.g., Italy, Malta) or the European Energy Awards (e.g., France, Luxembourg). While these activities have a wider scope, energy efficiency in buildings is often one of their priority fields of action. Initiatives at local level may favour integrated approaches, in which energy efficiency in buildings is only one of the criteria addressed, such as in the case of sustainable neighbourhoods or cities (Belgium, Italy, Sweden). This kind of integration can also be encouraged through planning requirements (e.g. France, Ireland and

[17] There is an agreement between the central government and the states regarding measures in the building sector.

Slovenia). At the same time related descriptions mostly include general principles and no results have been presented.

The effects of the on-going financial crisis have influenced energy trends in industry since 2008. Recorded energy savings are lower than expected in a number of Member States as some of the more energy-intensive sectors in particular experience a fall in output. Financial instruments that provide grants, subsidies or loans for investment in energy efficiency are the most common type of measure recorded in the second EEAPs. Voluntary agreements in manufacturing continue to be an important means of encouraging companies to undertake long-term energy management programmes. Voluntary agreement schemes often complement other measures, whereby participant companies can qualify for investment subsidies or energy tax exemptions. The second round of EEAPs indicates that new voluntary agreements are planned in a number of Member States, while in some others progress in developing previously planned schemes is not evident. An interesting development is the introduction in a number of newer Member States of mandatory energy audits for companies with energy consumption above defined threshold levels. Although many Member States have energy efficiency measures that target enterprises of all sizes, fewer than half of the second EEAPs provide details on programmes that are tailored specifically for SMEs. Despite the fact that most of the energy consumption in the sector is accounted for by EU ETS participant installations and thereby outside the scope of the ESD, it is anticipated that industry will make a significant contribution to overall savings in 2016.

A group of Member States report on measures targeting modal shift in transport in their second EEAP. However, the number of action plans with a clear and consistent strategy towards more environmentally friendly and energy saving modes of transport remains modest. This is in contrast with the fact that some Member States expect a large proportion of their energy savings by 2016 to stem from the transport sector. Individual measures reported include support for public transport, fuel efficiency standards, eco-driving, electric vehicles, tax incentives in freight transport and in passenger vehicles, and spatial planning regulations.

The agriculture sector was characterized by the least number of reported measures and achieved and expected savings. The majority of reported activities are of financial nature complemented by information and advice, voluntary type activities, and research and development programs. Investment support (e.g. grants, subsidies, loans) is mainly provided to accelerate the introduction of efficient energy systems in greenhouses, stock farms, grain silos. Innovation programs and demonstration schemes focus on energy-efficient processes and technologies.

Apart from sector specific action, Member States also reported on horizontal measures in their second EEAP. The number of energy supplier savings obligations (EEOs) and white certificate schemes increased compared to the first ESD reporting period. A group of Member States reported on regulatory provisions in place to support the expansion of the energy services market, while others highlighted barriers to the operation of ESCOs. These included legal barriers, low consumer awareness, lack of interest by energy supply companies and lack of positive examples. Most Member States reported on energy and energy efficiency related research and research funding in their second EEAP. Related activities included the establishment of technology centres, research laboratories and programmes to enhance competitiveness, as well as research activities in connection to determining objectives for nearly zero energy buildings.

While reporting on the exemplary role of the public sector was fulfilled to varying extents by the Member States, several good practices emerged. These included the setting of quantified energy saving targets in the public sector, as well as the implementation of energy management systems and voluntary agreements for energy savings at local authorities. However, these positive examples are rather the exception. The report of only half of the Member States suggested the fulfilment of the requirement of choosing two of the six proposed procurement measures in Annex VI of the ESD. While some Member States went beyond minimum requirements and reported on steps undertaken on implementing more than the requested two measures, problems with compliance were detected in the case of a relatively larger group of Member States.

The provision of information and advice was addressed by most of the Member States in their second EEAP. Some presented a strong set of diverse information measures, often designed to complement other types of actions. This practice reflects that information provision forms and integral part of energy efficiency policy. The provision of individualized advice through free energy hotlines, comprehensive advice prior to the implementation of specific measures, and information on related subsidies has also been reported by a group of Member States. The second EEAPs also reflected the importance of energy agencies and other designated organisations as key facilitators of information provision. As for measures to improve metering and billing of individual energy consumption, a third of the Member States reported on the operation of smart meters, the planned large-scale rollout of smart meters or the pilot phase of smart metering.

An overview of total intermediate energy savings by economic sector is presented in **Error! Reference source not found.**10 with the forecast for 2016 in **Error! Reference source not found.**11. Residential and services sectors combined account for most of the reported savings. As many Member States attribute these savings to the built environment in general, it is difficult to separate overall savings in residential from those in services. However, from the figures of Member States that do separate the sectors, it is apparent that savings in residential account for over 80% of these combined savings. Many Member States do not quantify the savings associated with measures in the public sector. Therefore, it is not possible to estimate their share of total savings. Some Member States did not include savings figures associated with horizontal measures in their declared savings due to the difficulties in quantifying them. For Member States that have provided sector-level savings projections for 2016, increases in the shares of savings accounted for by the industry and transport sectors are apparent. The increasing share of industry savings in 2016 is explained by the lower than anticipated savings recorded for 2010 arising from recessionary effects. An increasing share of transport savings in 2016 can be attributed in part to voluntary agreements among car manufacturers and the inclusion in some of the forecast figures of the effects of the EU regulation governing the CO_2 emissions performance standards for new passenger cars[18].

[18] Regulation (EC) No 443/2009 of the European Parliament and of the Council setting emission performance standards for new passenger cars as part of the Community's integrated approach to reduce CO_2 emissions from light-duty vehicles. Official Journal of the European Union.

Figure 10 Achieved intermediate savings by sector

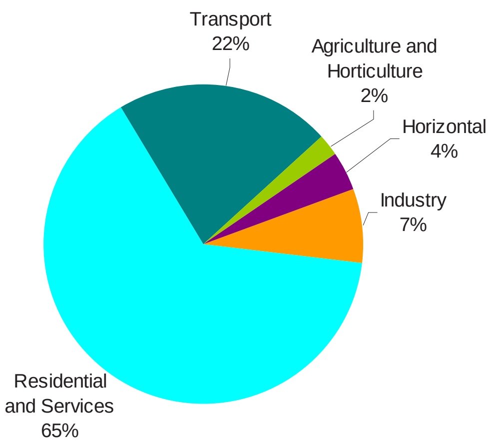
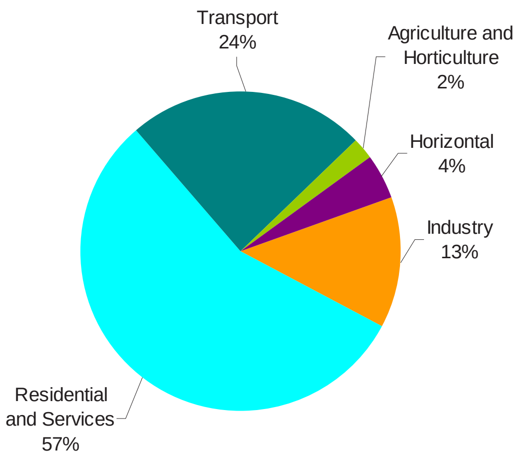


Figure 11 Forecast savings for 2016 by sector



3.2 Buildings

Buildings account for about 40% of the final energy consumption in the EU, mostly for space heating, cooling and domestic hot water. They are therefore a priority target for all the Member States, as they also hold the largest share of the energy savings potential in the European Union on the medium and long term (2020 and beyond)[19]. They represent a very high share of the energy savings reported with bottom-up methods (e.g., 58% for Italy, 63% for Ireland, 71% for Slovenia and 77% for Austria)[20].

Almost all Member States reported on energy savings related to buildings, using either bottom-up or top-down evaluation methods. However, it is sometimes difficult to know the coverage of these results (all buildings or only residential buildings, all end-uses or only heating and cooling). Moreover, due to the diversity of methods and assumptions used, these results cannot be compared nor summed up. Therefore, it is not possible to use directly the figures presented in the EEAPs to assess the energy savings achieved (in 2010) or expected (in 2016) at European level.

Energy savings calculated bottom-up are mostly based on estimates with different levels of reliability ranging from rough estimates to detailed modelling. Very few Member States mentioned results from ex-post evaluations or measurements. Likewise, almost none of the second EEAPs include any detailed experience feedback, cost-benefit analysis or cost-effectiveness indicators (only Spain presents a detailed cost/benefit analysis, which is mostly prospective). In particular, non-energy benefits are seldom mentioned, although they are often the key to involving decision-makers (e.g. through employment co-benefits[21]) and building occupants (e.g. through comfort and health related co-benefits).

A minority of the second EEAPs include details about concrete results in terms of number of buildings renovated and/or level of energy performance reached. Examples of good practice include the annual market surveys done with the covenants for buildings in the Netherlands (including number and types of measures implemented according to building type, based on a random sample of 70 000 residents) and the recent national energy efficiency data-framework in the UK.

Fourteen Member States presented packages of measures mainly consisting of incentives and information measures, focusing on building owners or occupants[22]. Some Member States have developed more comprehensive strategies[23], including measures to stimulate the offer of energy efficiency initiatives or services (e.g. Germany), and/or to raise the interest or involvement of construction companies in energy efficiency practices. Nevertheless, this is essential to meet two key challenges: Changing the pace of the energy efficient renovation rate (which requires making the integration of energy efficiency in refurbishment works

[19] Fraunhofer ISI et al., 2009. Study on the Energy Savings Potentials in EU Member-States, Candidate Countries and EEA Countries. Final report for the European Commission Directorate-General Energy and Transport. 15 March 2009 (see p.41).

[20] This high share can sometimes be partially due to the lack of data about the results in the other sectors.

[21] See e.g. the BoligJobplan, a measure setting tax deductions on wage costs incurred for help and renovation work (Denmark).

[22] In addition to regulations that by nature have an impact on both owners and the construction sector.

[23] Employment Environment Alliance (Belgium), Danish Knowledge Centre for Energy Savings in Buildings (Denmark), National Plan for Buildings (France), Building the Future (Greece), National Strategy for the Energy Performance of Buildings (Hungary), Better Energy (Ireland), Eco-Innovation Cluster (Luxembourg), More with Less (The Netherlands), Construction/Living Dialogue (Sweden).

common practice); and developing and disseminating innovations to meet the upcoming nearly zero-energy buildings standards.

Almost all Member States have put the priority on the housing stock (whether explicitly or *de facto*), except for Spain where the importance of cooling in tertiary buildings explains a larger share of savings in this sector. In eastern European Member States the focus has been mainly on multi-apartment or "block" buildings (in Bulgaria, the Czech Republic, Hungary, Latvia, Lithuania, Poland, and Romania).

3.2.1 Existing buildings

Regarding existing buildings, in most Member States there is still a significant gap between potentials (or expectations for 2016/2020) and current achievements. Many EEAPs include recent or upcoming measures to support more ambitious renovation programmes. Several EEAPs mention an increased effort towards energy efficient renovations within national recovery plans (e.g. Austria and France). The German KfW programme stands out as one of the most successful measures for building renovations[24], which will be accompanied by a long term renovation roadmap targeting nearly zero-energy building standards for renovation by 2050. A good example of using monitoring feedback is the standardisation of official guidance on renovations based on the analysis of about 150 cases combined with a Renovation Advice Network in Finland.

Several Member States are debating the relevance of strengthening incentives and other support measures with binding provisions. Some EEAPs include or consider the use of such obligatory measures, in particular for non-domestic buildings[25] and for heating systems[26]. Moreover, the UK states in its second EEAP that private landlords may be required from 2016 to implement reasonable energy efficiency improvements requested by tenants. From 2018 the least-efficient properties should be improved, provided there are no net negative costs to landlords. This appears to be the most ambitious measure in this direction. Representing an opposing view, in its second EEAP Germany explicitly rejects the possibility of compulsory renovations.

In addition to the energy dimension of renovating the existing building stock, the current economic crisis and increasing energy prices highlights the issue of fuel poverty. Nine EEAPs comprise measures for existing buildings including social considerations (Greece, Hungary, Latvia and Slovenia) or explicitly targeting low income households (Belgium, Finland, France, Ireland and Luxembourg). Moreover, most of the eastern European Member States present measures dedicated to the upgrade of their stock of multi-family or "block" buildings (Bulgaria, Czech Republic, Lithuania, Poland, Romania and Slovakia), which can be

[24] See e.g., Lorraine Murphy, Frits Meijer and Henk Visscher, 2012. Effective National Energy Performance Instruments for Existing Dwellings? Lessons from Front-Runners, Retrofit 2012 conference: http://www.energy.salford.ac.uk/cms/resources/uploads/File/Retrofit%20Papers/022%20Murphy.pdf

[25] Making energy audits mandatory in medium sized to large buildings and heating and cooling installations in the tertiary sector (Belgium –Brussels Capital Region), mandatory energy managers for tertiary buildings with high consumption (Italy), Environmental Management of Non-Residential Buildings Act with several mandatory provisions, as the obligation of implementing actions with a payback time of less than 5 years for business or public buildings above a given consumption threshold (The Netherlands), obligation of renovations for tertiary buildings between 2012 and 2020 (in France, furthermore energy audits should be performed in all co-owned residential buildings before 2017).

[26] Gradual phasing-out of oil-fired and gas-fired boilers in buildings (Denmark), minimum standards equivalent to condensing boilers (Ireland and UK), minimum solar contribution to sanitary hot water (Spain).

considered implicitly as measures with a social focus. Three EEAPs present a specific strategy to alleviate fuel poverty (France, Ireland and the UK).

3.2.2 New buildings

The main measure addressing new buildings is the building code, with the pace of strengthening the requirements differing per Member State. Most Member States refer to the objective of nearly zero-energy buildings by 2020. Germany, Denmark, Finland, Luxembourg, Malta, the Netherlands, Sweden and the UK report on recent or upcoming tightening of building requirements by 20% or more, often planning further additional upgrades. Some recent or upcoming building requirements are already equivalent to low energy buildings (France, Ireland and Italy).

However, setting building requirements does not necessarily deliver the expected energy savings. In this context, it has to be noted that the majority of the second EEAPs do not address the key issue of compliance. This is especially relevant in Member States where building codes are assumed to have brought a very large share of the energy savings achieved so far (e.g. 76% of the bottom-up savings for Lithuania). Two EEAPs (Cyprus and the Netherlands) have taken into account a time lag in the implementation of new requirements when calculating related savings, and Luxembourg applied a default 15% non-compliance rate. Measures aimed at improving compliance include providing specific information or training to architects or building engineers (Belgium, Ireland, Luxembourg and Malta), and to building companies and private households (Denmark); reinforcing the certification or control of the buildings (Estonia, Finland and France); or using the energy performance certificates (Portugal, Spain and Sweden). Slovakia conducted a review of compliance with the specific requirements for hydraulic balancing and insulation of hot water distribution systems, showing an increased compliance rate of 80% in 2010 (vs. 60% in 2004). The Dutch government signed an agreement with market participants (so-called 'Lente Akkoord 2008') to support the tightening of the building requirements, including a knowledge-transfer and promotion programme run by trade organisations.

3.2.3 Public buildings

The scope of measures for public buildings varies substantially between Member States, ranging from central government buildings only to all publicly-owned buildings and all buildings used for public purposes. Nine Member States have defined clear objectives for energy efficiency improvements in public buildings[27]. The building types most commonly covered include administration buildings and offices, school and education buildings, and hospitals and healthcare centres. Some Member States introduced measures specific to a given type of public building, for example the program for improving energy efficiency in buildings of cultural and historical importance in Sweden. Measures targeting specific public building

[27] Reducing energy consumption in national administration buildings by 10% in 2011 from 2006 levels (Denmark); Reconstruction of 480 buildings with an aggregate usable area of 1.27 million m² for a budget of €146.5 million (Estonia); Rate of 150,000 m² renovated/year for central government buildings reaching at least the C class (Finland); Renovation plan for central administration with the aim of a 40% consumption decrease in 8 years (France); Voluntary agreement to reduce CO_2 emissions of the federal buildings by on average 30% in the period 2008 to 2012 compared with 1990, with a further target of a reduction of 50% by 2020 compared with 1990 (Germany); Global objective of 33% consumption reduction by 2020 and assisting public agencies to improve the energy rating of their buildings to B3 (or better) by January 2012 and to A3 (or better) by January 2015 (Ireland); 1.3 million m² of rehabilitation for 2011-2016 *i.e.* about 15% of the public building stock (Slovenia); Central government reduction target for carbon emissions by 10% between 2010 and 2011 with an actual achievement of about 14% and CO_2 emissions from offices reduced by 17% in 2009/10 against the target of 12.5% by 2010/11, relative to a 1999/00 baseline (UK).

types could be a special topic for experience sharing at European level (e.g. in the Concerted Action[28]).

As regards building requirements, only six of the second EEAPs included clear stricter provisions for public buildings[29]. Many EEAPs announce demonstration projects for very efficient buildings, especially for public buildings to meet the 2018 deadline for nearly zero-energy buildings (Belgium/Flanders, Bulgaria, Italy, Lithuania, Luxembourg, Poland, Slovakia and Slovenia). It should be noted that the German EEAP mentions that the Federal Government will construct new buildings to the nearly zero-energy standard from 2012 onwards.

As regards energy audits and energy management, eight EEAPs include information about energy audits for public buildings in compliance with the provisions of ESD Annex VI (Bulgaria, Denmark, Finland, France, Italy, Latvia, Lithuania and Malta), four of which have given details about achievements in this field (Bulgaria, Finland, France and Malta). Eleven Member States presented measures to promote energy management (Austria, Belgium, Cyprus, Germany, Spain, Greece, Ireland, Luxembourg, Poland, Slovenia and the UK). Many of the second EEAPs emphasised measures targeting local authorities including mandatory preparation of energy efficiency improvement plans (Bulgaria and Romania), mandatory implementation of actions recommended by energy efficiency labelling with payback periods of up to five years (Denmark), promotion of the European Energy Award approach (France and Luxembourg), and training for energy managers in municipalities (Spain and Slovakia).

The diverse level of detail used to present measures and the lack of comparable results makes it difficult to identify good practices or promising measures in the public buildings sector. Nevertheless, the following measures should be highlighted. Austria runs an extensive nation-wide renovation program for public buildings, using energy performance contracting. Bulgaria assigned individual energy savings targets to the owners of public and municipal buildings with a total floor area of over 1,000 m². Italy presented budget commitments to fund energy efficiency improvements in many central and local public administrations/ buildings. Ireland has implemented basic energy audits and an intensive staff energy awareness campaign combined with a review of building operation, achieving on average about 12% reduction in CO_2 emissions[30]. Sweden proposed state aid for strategic work on improving energy efficiency in municipalities. Likewise, Malta provided local councils with grants of 80% up to 10,000 EUR for investment in energy savings. Denmark established voluntary agreements on energy saving activities with local authorities and regions. France obliges urban areas with over 50,000 inhabitants to prepare a local climate action plan. Furthermore, Austria mentioned several programmes to support local authorities[31].

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[28] See www.epbd-ca.eu for more information about the concerted action for the EPBD.

[29] Stricter technical requirements in some federal states for new buildings or for renovations (Austria), passive standard for new and 'low-energy' standard for major renovations together with 30% of their consumption to be provided with 'green energy' (Belgium – Brussels Capital Region), 'low-energy' requirement for all new public buildings in 2012 (Belgium – Wallonia), class A required for new buildings, and class C for basic repairs to existing buildings (Finland), compulsory installation of central solar thermal systems to meet domestic hot water requirements, and then 100% RES supply from 2015 (Greece), higher standards for social housing (Ireland), public buildings one phase ahead of the tightening for other buildings (The Netherlands).

[30] See the programs Optimising Power @ Work and Better Energy Workplaces.

[31] The e5 programme for energy efficient local authorities, the Climate Alliance, the energy saving local authorities programme, environmental local authorities, EKKO energy and climate model regions.

3.2.4 *Role of the EPBD*

Directive 2010/31/EU on the energy performance of buildings (EPBD and its predecessor (Directive 2002/91/EC) is the main driver for energy efficiency policies on buildings. Most Member States referred to the EPBD as providing either the general framework or key requirements to be met, while the implementation varies according to the national context. Key EPBD provisions include Article 9 on objectives for nearly zero energy buildings (nZEB), Articles 11, 12 and 13 on energy performance certificates, Articles 14 and 15 on the inspection of boilers and air conditioning systems and Article 10(2) on the requirement to draw up a list of proposed measures and instruments including those of financial nature.

Twelve of the second EEAPs mention explicitly the nZEB objectives. However, the details provided show that most Member States are at an early (or even very early) stage towards defining specifications, timelines and strategy. The most detailed strategy is presented by the Netherlands, which is also one of the only EEAPs to mention the importance of occupants' behaviour for very low-energy buildings. Moreover, Ireland plans to implement nZEB requirements in 2016. The most concrete measures or commitments concern the planning of demonstration projects (Czech Republic, Estonia) and/or providing incentives for low or passive energy buildings (Austria, Belgium, France, Germany, Italy, Lithuania, Sweden, Slovenia and Spain,). A few Member States mentioned objectives that may go beyond nZEB requirements: zero energy buildings (the Netherlands), positive energy buildings (Denmark and France), climate neutral new buildings (Germany) and the zero carbon standard (the UK). Many EEAPs highlight the importance of R&D programmes and innovation strategies to support the challenges of meeting the nZEB objectives (e.g. EUDP in Denmark, Energy Leap in the Netherlands and CERBOF in Sweden), or to support the dissemination of good practices for renovations (e.g. in Estonia).

Energy Performance Certificates (EPCs) have to be applied by all Member States. However, their implementation and use vary substantially from one Member State to another. In many EEAPs they are presented mostly as an information tool and it is not always clear to what extent they include recommendations. Eleven Member States have shown good practices through a more strategic use of EPCs, mainly as a reference for other measures (e.g. criteria for incentives in France, Greece, Malta, the Netherlands, Spain and the UK), for monitoring the building market (Germany) or energy savings (Ireland, Lithuania, Slovakia), or combined with a web-portal to support the implementation of the recommendations (Sweden).

The inspection of heating and air conditioning systems is reported in seventeen EEAPs. Most of the Member States have given explanations about implementation, especially when choosing alternative measures to the inspections of EPBD Articles 14 and 15 (e.g. Estonia and Sweden). However, few Member States presented results or achievements related to these measures[32]. Eighteen Member States have used their second EEAP for reporting on Article 10(2) of the recast EPBD (list of existing and proposed measures and instruments promoting the EPBD objectives), either by including notifications in the EEAP itself or by adding a separate document.

3.2.5 *Skills in the building sector*

The results expected for 2016 represent a significant change of scale compared to the achievements reported for 2010 in most of the second EEAPs. This implies, amongst others, a

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[32] For example, the phase out of oil-fired heating is mentioned by Austria and Denmark; Greece reports on a successful programme for replacing old air conditioners (including recycling), while Italy reports on significant savings from maintenance of residential heating generators.

significant increase in the workforce needed, and/or changes in the current practices of professionals, to implement energy efficient renovation and construction works. Key challenges in this context are the dissemination of specific good practices in different building trades (e.g. carpenters, bricklayer, plumbers, electricians, etc.) and the improvement of the coordination between these professions.

Thirteen EEAPs report on training activities for building professionals (including the Czech Republic, Estonia, Hungary, the Netherlands, Slovenia, Sweden), seven of whom give concrete outputs or implementation details (Austria, Belgium, Denmark, France, Germany, Ireland, Luxembourg) [33]. Training activities are more often mentioned for experts (as regards EPCs, inspections or energy audits) and to a lesser extent for architects and building engineers (as regards the enforcement of building codes), and for energy managers and energy services companies. These activities are sometimes included in a more global strategy to involve the construction industry in energy efficiency policies.

[33] Training activities included in the 'klima:aktiv' programme with 5000 craftsmen trained so far (AT), similar activities included in the Employment Environment Alliance with clear qualitative objectives (BE – Brussels and Wallonia), "Low-energy house in the housing stock" model projects aiming at accelerating the transfer of know-how and at developing and increasing the awareness of innovative technologies and introducing them onto the market (DE), among the objectives of the Danish Knowledge Centre for Energy Savings in Buildings is the wider dissemination of knowledge among the parties to the construction sector (DK), FEEBAT program with 29 000 trainees for 2008-2010, plus an online platform for training (e-nergieBat) and several networks and resource centres (FR), several training activities presented for design and construction professionals and a national qualification roadmap (IE), a dedicated training institute for buildings including applied training about specific energy efficiency actions/practices plus annual training sessions for the executives of relevant craft businesses related to energy in buildings (LU). See also the Intelligent Energy Europe project BUILD UP Skills initiative (mentioned by HU and IE): http://www.buildup.eu/news/18351

Table 8 Measures in existing buildings and public buildings reported in the second EEAP

	Existing buildings			Public buildings	
Member State	Comprehensive strategies for refurbishment markets 1	Extensive building renovation programmes 2	Fuel poverty criteria integrated 3	Measures for existing public buildings 4	Energy audits/management in public buildings 5
AT		x		x*	x
BE	x*		x	x	x
BG		x	x	x	x
CY					x
CZ		x			
DK	x*			x*	x*
EE	x	x		x*	
FI	x		x	x*	x*
FR	x*	x	x*	x*	x*
DE	x*	x*		x*	x*
EL	x	x	x	x	x
HU	x	x	x	x	
IE		x	x	x	x*
IT				x*	x*
LV			x	x*	x
LT		x	x	x	x
LU	x*		x	x	
MT				x	x
PL	x	x		x*	x
PT					
RO		x	x	x	x
SK		x	x	x*	
SI		x	x	x*	x
ES		x		x	x
SE	x*			x	
NL	x*	x	x		
UK		x	x*	x*	x*

1 – x: Comprehensive strategies (targeting on the one hand building owners, on the other hand construction companies and the providers of energy efficiency services), but not yet implemented.
x*: Comprehensive strategies implemented.
2 – x: Measures aiming at deep refurbishments. x*: First results or experience feedback reported.
3 – x: Mentioned. x*: Specific objectives / results are included.
4 – x: Mentioned. x*: Implementation details and / or quantitative objectives with clear commitment and / or results achieved are presented.
5 – x: Implementation details presented. x*: The measure covers central and local authority buildings and /or results presented and / or promising approach.

Table 9 Measures in new buildings and EPBD implementation reported in the second EEAP

Member State	Significant strengthening of building codes 1	Financial support for passive or low-energy houses 2	Use of EPC (Energy Performance Certificates) 3	nZEB target/strategy 4	Measures for the inspection of boilers and air conditioning systems 5	Separate listing for Article 10 EPBD 6
AT		x				
BE	x	x	x		x	x
BG				x	x	
CY			x	x	x	
CZ		x	x	x*	x	
DK	x*		x*	x*		x
EE	x	x	x	x	x	x
FI	x		x	x	x	x
FR	x*	x*	x*		x	x
DE	x*	x*	x			x
GR	x		x*		x	x
HU			x			x
IE	x*		x*	x		
IT	x	x	x	x	x*	x
LV			x	x	x	x
LT			x*		x	x
LU	x	x	x*			x
MT	x		x*	x		x
PL			x			x
PT			x			
RO					x	x
SK			x*		x	x
SI		x			x*	
ES		x	x*	x	x	
SE	x	x*	x*		x*	x
NL	x*		x*	x*	x	x
UK	x*		x*			

1 – x: Mentioned with a recent or upcoming strengthening with of at least 20%. x*: Low or passive energy or similar requirements.
2 – x: Mentioned. x*: Objectives / results are included.
3 - x: EPC mentioned and required (mainly used as an information tool). x*: Links between EPC and other measures and / or special provisions about the actions recommended in EPC.
4 – x: Mentioned with at least a few details about current situation. x*: Clear deadlines and implementation details.
5 – x: Mentioned. x*: Objectives / results are included.
6 – x: Integrated within the second EEAP or provided as a separate document.

3.3 Industry

The economic recession has had a significant impact on energy consumption in the sector since the publication of the first set of EEAPs. Energy savings have also been affected as many energy-intensive plants operate at lower capacity due to a fall-off in demand. The contribution of industry to ESD savings is lower than expected in many Member States with industry savings making up around 7% of total declared intermediate savings. A number of Member States using top-down methods to quantify declared savings have recorded negative savings, or energy losses, in some industry sub-sectors. These include Bulgaria Poland, Romania, Slovakia, and Spain. The losses can be explained by reduced manufacturing output and consequent reduced capacity and increases in specific energy consumption. While not directly related to energy efficiency improvement measures, the impact of structural changes on energy consumption patterns in the sector was highlighted by Poland and Spain. Much of the structural change may be accounted for by the recession as the share of total industry value-added and energy consumption attributed to some energy-intensive sectors reduces. Only some of the energy savings activities of the sector are within the scope of the ESD as the Directive does not apply to participants in the EU Emissions Trading System. Typically Member States have applied a factor, representing estimated non-EU ETS companies' share of total energy consumption of the sector, to total industry energy savings to determine ESD-relevant savings figures. Forecast figures for 2016 indicate that Member States expect an accelerated rate of energy savings in the sector in the next few years.

Financial measures in the form of subsidies, loans or tax benefits remain the most prevalent type of measure to encourage energy efficiency in industry. Most Member States provide grants or loans for investment in energy efficient equipment or for one-off retrofit projects. Beneficial taxation conditions for the purchase of energy efficient equipment are common to a number of EEAPs. In Italy a tax incentive equivalent to 20% of the cost of high-efficiency electric motors and inverters had been available up to 2010. In France, Ireland and the UK the tax benefit is in the form of an enhanced capital allowance, whereby purchasers of listed equipment can write off the full cost of their purchases in the first year of ownership rather than over several years. Similarly, in the Netherlands deductions from taxable profit are possible for equipment purchased from an approved list.

Several Member States recognise industry voluntary agreements on energy efficiency as a most effective means of encouraging greater energy efficiency in manufacturing. Companies signing up to voluntary agreements commit to accelerating energy savings actions within their manufacturing operations in order to reduce energy costs and increase competitiveness. Participants are encouraged to employ a structured approach to energy management. Often voluntary programmes are associated with state-aided support schemes or tax exemptions to incentivise active participation. In Sweden, participants receive an exemption from energy tax on electricity in return for implementing identified actions that have a return on investment of three years or less. In the UK, participant companies can get a rebate on their climate change levy in return for adopting agreed energy efficiency targets. The Swedish system promotes the establishment of networks of companies with similar manufacturing processes. Such networks can increase know-how with respect to energy efficiency actions that are tailored for processes relevant to each network. An important element of the Irish scheme is information exchange, where the experiences of some participants in pursuing exemplar projects are shared with the others. Typically, participants are required to report regularly on activities undertaken and savings achieved in the form of an annual report. Finland employs a web-based system for reporting purposes. In Luxembourg a self-regulation approach is used whereby the Luxembourg business federation monitors targets and publishes results.

In some of the newer Member States new voluntary agreement schemes have been introduced or are planned. A new voluntary agreement scheme in industry has been introduced in Latvia. A start date of 2011 is given for a voluntary agreements programme for industry in the Czech Republic. In Lithuania, a programme is planned for 2012. However, a voluntary agreements programme proposed for Poland in the first EEAP is not mentioned in the second plan. In Romania, a pilot voluntary agreements project has been initiated with support from the Netherlands, but a lack of resources has hampered a roll-out to the wider industry sector. Progress on a planned voluntary agreements measure in Hungary, introduced in the first action plan, is unclear from the latest report.

It can be difficult for manufacturing companies actively pursuing energy efficiency opportunities to assess their performance in relation to organisations undertaking similar activities. Benchmarking provides a means of comparing energy use to that of similar manufacturing sites and can motivate organisations to achieve greater energy efficiency improvement. In the Flanders region of Belgium, companies involved in a benchmark covenant must allow external consultants to assess the extent to which specific energy consumption values in their processes achieve world benchmark levels and must put in place a plan that enables them to reach these benchmarks. Benchmarking is also a key component of the long-term agreements programme in The Netherlands where participating companies with energy consumption greater than 0.5 PJ (12 ktoe) per annum must compare themselves with best international benchmarks that are redefined every four years.

An energy management system provides a structured approach to controlling and reducing energy use and improving energy efficiency in an organisation. Implementing an energy management system shows a serious long-term commitment to reducing energy use. In many Member States, energy management systems are promoted through their voluntary agreements programmes. For some programmes, implementing an energy management system is a prerequisite for participation in a voluntary agreement scheme. Germany cites examples of manufacturing companies that have made considerable energy savings as a result of implementing energy management systems and that received recognition with the national energy agency's Energy Efficiency Award. In Romania, each site consuming more than 1 ktoe of energy annually is legally required to implement energy management incorporating an annual energy audit, appointment of an energy manager and development of a programme of energy efficiency improvement. Since the first EEAPs were published, much has happened in the area of standardisation of energy management systems. EN16001, the European standard for energy management systems, was introduced in 2009. Since then, the International Organisation for Standardisation has published ISO50001, a new international standard for energy management systems. Consequently EN 16001 will be withdrawn in 2012. Ireland sets as one of its goals the intensification of participation of large industry in the new ISO standard. Italy also plans to promote the new standard through information measures and training of energy managers. A measure planned for 2012 in Slovenia promotes the adoption of the international standard and offers financial incentives to companies implementing energy management systems.

An energy audit is a study of energy consumption in an organisation. An audit, typically carried out by a qualified specialist, identifies the main consumers of energy in a company and determines the most significant and cost-effective opportunities for energy saving. In Austria energy audits are supported at national and federal state level. Also in Austria energy efficiency vouchers are provided to SMEs to cover up to 90% of the cost of energy audits.

Finland has an energy audit scheme in addition to its voluntary agreements programme but up to 90% of audits conducted as part of the scheme are related to energy agreements activities. In a number of cases, a precondition for support is that the specialist conducting the audit must hold relevant qualifications. In Finland experienced auditors must undergo training with the national energy agency. In some Member States new legal requirements to undertake energy audits have been imposed. In Romania, energy audits must be undertaken every 2 years by companies consuming between 0.2 ktoe and 1 ktoe annually. In Bulgaria, companies consuming more than 3,000 MWh (0.26 ktoe) per year must carry out energy audits at least every 3 years and implement measures identified in the audits. In the Czech Republic, energy audits have been mandatory since 2001 for all private organisations with annual energy consumption greater than 35,000 GJ (0.86 ktoe), while the Energy Efficiency Act in Slovakia establishes compulsory energy audits for industrial sites.

The ESD foresees that Member States provide energy audit schemes that are designed to identify potential energy efficiency improvements to smaller energy users including small and medium-sized enterprises (SMEs). Dedicated audit programmes and other schemes that are tailored to SMEs' needs can provide support that is more suited to the energy efficiency opportunities that exist in smaller companies. Such programmes provide assistance to smaller companies that don't have the resources to implement full energy management systems that are typically a precondition to participation in a voluntary agreements programme. Dedicated SME programmes may be in the form of information, support for energy audits, or grants or loans for energy efficiency investments. In The Netherlands a dedicated Energy Centre for SMEs that provides advice on energy efficiency measures has been in place for several years. Sweden provides support through the publication of an energy efficiency handbook for SMEs. A significant barrier to investment in energy efficiency among SMEs is the lack of access to finance. To overcome this barrier in the UK, a scheme, which is now finished, provided interest-free loans to SMEs for energy efficiency investments. Although several Member States do not provide details of programmes dedicated exclusively to SMEs, some broader industry programmes incorporate support for SMEs as well as for larger organisations. For instance, Finland declares that one third of the aid granted under its energy audits programme was made available to medium-sized enterprises. In Malta it is planned to adjust downwards the minimum spend threshold for qualification of an existing enterprise energy grant scheme in order to provide support to SMEs.

In some Member States where energy supplier obligation schemes exist, specific energy efficiency actions in industry are promoted through the schemes. In Italy the white certificates scheme is used to promote the replacement of old electric motors and the installation of high-efficiency co-generation plants in industrial facilities, while the French scheme encourages the development of energy performance contracting in industry.

Table 10 Measures in industry reported in the second EEAP

Member State	Voluntary agreements	Energy audit schemes	Promotion of energy management systems and standards	Programmes tailored for SMEs
AT		x		x
BE	x			
BG	x	x	x	
CY				
CZ	x	x		
DK				
EE				
FI	x	x		
FR				
DE	x		x	x
GR				
HU				
IE	x	x	x	x
IT		x	x	x
LT	x	x		
LV	x			x
LU	x			
MT		x		x
NL	x			x
PL		x		x
PT	x			
RO	x	x	x	
SK		x		
SI			x	
ES		x	x	
SE	x	x		x
UK	x			

3.4 Transport

Transport accounts today for over 30% of final energy consumption in the EU. In a context of growing demand for transport, final energy consumption by transport is projected to increase by 5% by 2030 rising further marginally by 2050. Transport growth is driven mainly by aviation and road freight transport. According to business as usual scenario of the Energy Roadmap 2050[34], the EU transport system would remain extremely dependent on the use of fossil fuels. Oil products would still represent 88% of EU transport sector needs in 2030 and 2050.

Even though, more Member States report on measures targeting modal shifts in their second EEAP, the number of action plans with a clear and consistent strategy towards more environmentally friendly and energy saving modes of transport remains modest.

Promising examples of inter-modal transport initiatives with clear targets and/ or funding commitments feature in the second EEAP of Austria, Belgium, France, Germany, Hungary, Slovakia, Slovenia, Spain, Sweden and the UK.

The annual programme of the Austrian Climate and Energy Fund includes measures to enhance the attractiveness and efficiency of the intermodal interface – bicycle traffic/ public passenger transport, investment subsidies for new construction, extension or upgrading of existing connection lines and multi-modal transport systems.

The French National transport infrastructure scheme sets State guidelines on network improvement and provides financial support to shift towards most environment-friendly modes of transport. The National rail freight commitment sets the objective to enable more than 500,000 lorries a year to be transferred to rail by 2020. Financial support for combined transport is provided to compensate for additional costs linked to trans-shipment.

Sweden aims to make optimal use of different modes of transport by means of logistical solutions and strategically located trans-shipment terminals with suitable support infrastructure. Good examples are showcased.

The Belgian Federal second EEAP foresees tax-related measures to promoting combined goods transport by rail by stimulating new international connections. Germany, Hungary and Slovenia introduced road toll systems for heavy commercial vehicles, whereby tolls are calculated according to emission classes. Slovakia provides subsidies to transfer freight from road to railways. The UK Government confirmed a budget of £20m for 2011/12 and £19m for 2012/13 to support the transfer of freight from road to rail and water, through the provision of mode shift grants. Spain aims to double the share of rail travel of passengers and goods by 2020.

Generally, a broad variety of different types of measures to promote environmentally friendly and sustainable transport development can be identified in the second EEAPs both in terms of numbers and types of applied activities. The quality and level of detail provided varies to a huge margin between Member States. Some measures appear aspirational and it is not always clear whether they will lead to concrete actions and energy savings.

As in the first reporting phase, technological measures in combination with minimum energy efficiency requirements and labelling schemes, subsidies and fiscal incentives to promote

[34] Energy Roadmap 2050 Impact Assessment – Commission Staff Working Paper, SEC(2011) 1565/2

vehicles with fuel-efficient consumption and low-emissions as well as to enhance the attractiveness of public transport are common types of activities in transport.

Comprehensive strategies and packages in transport including sets of complementing instruments (regulatory, financial and fiscal interventions, information and training, infrastructure) targeting vehicle efficiency, modal shift towards efficient forms of transportation, transport logistics, infrastructure and behaviour are reported by some Member States. Promising examples of good practices in Austria, Belgium (Flanders), Denmark, Germany, Ireland, Lithuania, Portugal, Spain and the UK are presented below.

A range of different measures were taken in regard to transport by the Austrian Government and the federal states. These include, *inter alia*: reduction of speed, 'park & ride', expansion of public passenger transport systems, bicycle infrastructure, shifting transport of goods, electro-mobility, 'bike & ride', car-sharing and bicycle parking stations.

The Flemish second Energy Efficiency Action Plan features the Flemish Mobility Plan to be revised by end of 2012. The programme contains various innovative and complementary measures to control mobility demand and promote modal shift: investment in dynamic transport management, improvement of traffic flow and speed optimisation by applying a "reduced disruption" approach, set up of e-Government Coordination Unit to implement Information and Communication Technology (ICT) projects for the supply of integrated public services, including call-up bus service in rural areas, implementation of company transport plans funded via Commuting Fund *(Pendelfonds)*, bicycle allowance granted by an employer to its employees, improvement of public passenger railway network, investment on main inland waterway network and application of telematics on navigable waterways.

As part of the Danish Government’s long-term objective for independence from fossil fuels, the strategy Sustainable transport from 2008 includes a number of CO_2 reduction measures in form of increased public transport, a green car tax and better fuel technologies. The strategy sets out the overall framework and principles for the development of a green transport policy and contains a number of specific initiatives. It is a broad agreement whose primary content is an investment plan.

The German Federal government’s fuel strategy of 2004 constitutes a strategic concept up to 2020 supporting market launch in Germany of alternative or renewable fuels as well as innovative drive technologies. It also comprises the Passenger Vehicle Energy Consumption Labelling Ordinance *(Pkw-EnVKV)*.

Ireland introduced the Smarter Travel Policy (Government's Sustainable Transport Policy 2009-2020). Its aim is to reduce overall travel demand, maximise efficiency of transport networks, reduce reliance on fossil fuels and transport emissions as well as to improve accessibility to transport. Promising measures under this strategy are the mobility management plans in schools, workplaces and at home. Examples are Taisce’s Green Schools Travel programme, an initiative to deliver workplace travel plans in Ireland’s biggest one hundred employers by the end of 2012 and pilot exercises in personalised travel planning.

The EEAP of Lithuania presents the National Strategy for transport and communications scheduled for 2011. The programme incorporates organisational, legal and economic measures. The following key activities are envisaged: upgrade vehicle fleets with 'eco-vehicles', support for public transport, including bike sharing programmes, guidelines for efficient car-sharing and system introduction, draft legislation for eco-taxes, along with information campaigns promoting eco-driving.

As reported in the second action plan of Portugal, a Strategic Transport Plan is currently being drawn up by the Government. Plans for urban mobility in office parks and industrial parks as well as a traffic management platform for major urban centres have already been introduced.

Sustainable Urban Mobility Plans have to be prepared by all Spanish cities with more than 50,000 inhabitants and the majority of those that fall within big city category. Measures included are the introduction of bicycle systems for public use and at least 20,000 electric bicycles for work, the intention to increase the share of rail travel of passengers and goods as well as of maritime transport. School travel programmes to promote walking, cycling or public transport and Company Transport Plans, including for centres of activity (e.g. airports, industrial zones, education or health centres, shopping centres) are further features of the second EEAP. In 2020, all companies with more than 100 employees should have transport plans in place for their employees (some 15,000 companies).

The second UK EEAP presents a well-balanced Strategy to reduce GHG emissions from transport integrated within its wider policy context, which focuses on the decarbonisation of the economy *(2008 UK Climate Change Act)*. The Government's Local Transport White Paper was published January 2011. It includes the Local Sustainable Transport Fund, which provides £560m to support local sustainable travel measures, e.g. walking, cycling or public transport. ICT solutions to provide fast and effective alternatives to travel are reported to enable people to work at home, attend meetings remotely through audio or video conferencing or to do their shopping online.

The second EEAPs of Austria, Belgium, Finland, France, Greece, Ireland, Malta, Portugal, Slovakia, Slovenia and the UK include good integrated packages aimed at increasing the use of public transport. The following common types of complementing support measures could be identified in the action plans: modernisation of the public passenger transport system, including infrastructure, vehicle fleet and services provided (e.g. by means of enhanced spatial planning and traffic concepts, extension of public transport routes and increased frequency of public service), 'park & ride', 'bike & ride', congestion and parking charges, information and awareness campaigns targeting behavioural change.

Greece commits to increase the percentage of public transport use from present 26.6% in 2008 to 35% in 2016, Malta targets a modal shift of 8% from use of private cars to use of public transport. The action plans of both Member States describe comprehensive packages of measures to implement the objectives, including infrastructure and service improvement, parking near to bus stops and metro stations, innovative information systems for travelling public (e.g. real time information at bus stops and online as well as to receive full timetables for each route by SMS).

The requirement to establish business travel plans, activity travel plans (for cultural, commercial or sports event) and school travel plans by businesses, institutions and public administrations to encourage the use of public transport or alternative means of transport are reported in the second EEAPs of Belgium Federal, Greece and Portugal as well as the second EEAP of Brussels-Capital Region. Promising instruments are free train travel for commuting civil servants, the extension of tax deductibility of travel-to-work costs involving travel on foot, by bicycle, by public transport, etc., subscription to shared vehicle systems and bicycle grants.

Similar measures are implemented in France and Slovenia: In France the employer is responsible for half of the cost of the public transport season ticket for its employees.

Slovenia provides for a relief on registration of private vehicles and/ or on annual road tax for vehicle users in the event of usage of a public transport ticket.

In the second EEAPs of Bulgaria, Cyprus, Czech Republic, Estonia, Hungary, Italy, Latvia, Luxembourg, Poland, Romania and the Netherlands fragmented (mostly investment programmes for modernisation of rolling stock, fleet replacement and infrastructure improvements), vaguely described, just planned or no measures at all could be identified.

Spatial planning provisions are included in the second EEAPs of Austria, Brussels-Capital Region, Estonia, Finland, France, Hungary, Ireland and Sweden. They range from comprehensive strategies, such as mandatory Urban Travel Schemes in France for urban transport areas of more than 100,000 inhabitants setting out principles for organising transport of persons and goods, traffic flow and parking, to single measures. Examples are the establishment of low traffic or low emission zones (e.g. Brussels-Capital Region, Hungary) and the creation of special lanes for public transport (e.g. Brussels-Capital Region).

Mobility management and traffic demand management initiatives to introducing intelligent transport systems and telematics form part of the action plans of Austria, Belgium, Bulgaria, Estonia, Finland, Germany, Greece, Ireland, Lithuania, Malta, the Netherlands, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden and the UK.

Eco-driving measures, in various forms, have been identified in the second EEAPs of Austria, Bulgaria, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Lithuania, the Netherlands Poland, Slovakia, Slovenia, Spain, Sweden, and the UK. They range from information campaigns to raise awareness, increase motivation and target behaviour change towards economical ways of driving, training and feedback for smart and fuel-efficient driving for private and professional drivers, to introducing eco-driving as mandatory part of driving tests (e.g. Finland, Greece, Lithuania, Slovakia, Spain, Sweden).

Tax incentives/disincentives for passenger and freight vehicles are included in the second EEAPs of Belgium, Finland, France, Germany, Greece, Ireland, Italy, Latvia, Luxembourg, Malta, the Netherlands, Portugal, Slovakia, Slovenia, Spain, Sweden and UK. Support schemes and funding provisions for electric vehicles and the necessary supporting infrastructure form part of the action plans of Belgium, Cyprus, Estonia, Germany, Ireland, Malta, the Netherlands, Slovenia, Spain, Sweden and the UK.

The following Member States report on Voluntary Agreements (VAs), e.g. on car manufacturers' commitment to reducing CO_2 emissions covering the transport sector: Czech Republic, Finland, France, Germany, the Netherlands and the UK.

Table 11 Measures in transport reported in the second EEAP

Member State	Comprehensive strategies / packages in transport	Fuel efficiency	Support for public transport	Spatial planning	Mobility management/ traffic demand management	Eco-driving	Modal shift (passenger and freight transport)	Tax incentives/ disincentives: passenger vehicles	Tax incentives/ disincentives: freight vehicles	Electric vehicles	Sector covered by VA(s)	Clear funding commitment
AT	x	x	x	x	x	x	x					x
BE	Fl		B, Fe, W	B	Fe		Fe	B, Fl, W	B, Fl, W	Fe		Fe, Fl
BG	x	x	x		x	x	x					
CY		x	x							x		x
CZ	x	x	x			x	x				x	
DK	x	x				x						
EE		x	x	x	x	x	x			x		
FI	x	x	x	x	x	x	x	x	x		x	x
FR	x	x	x	x		x	x	x	x		x	x
DE	x	x	x		x	x	x	x	x	x	x	x
GR	x	x	x		x	x	x	x	x	x		
HU			x	x			x					
IE	x	x	x	x	x	x	x	x	x	x		x
IT		x						x	x			x
LV			x					x				
LT	x	x	x		x	x	x					x
LU		x						x	x			
MT	x	x	x		x	x	x	x		x		x
PL		x	x		x	x	x					x
PT	x	x	x		x		x	x				
RO		x										
SK		x	x		x	x	x	x				x
SI		x	x		x	x	x	x	x	x		
ES	x	x	x		x	x	x	x	x	x		
SE		x	x	x	x	x	x	x	x	x		
NL		x			x	x		x	x	x	x	x
UK	x	x	x		x	x	x	x	x	x	x	x

Legend:
Fe – Belgium Federal
B – Brussels-Capital Region
Fl – Flanders
W – Wallonia

3.5 Agriculture

Based on the number of reported measures and the associated achieved and expected savings, the agricultural sector (including horticulture, forestry and fisheries) has been the least popular for the implementation of energy efficiency actions. The exceptions are the Dutch and Finish second EEAPs. From all the 27 Member States reviewed only 10 (Flanders/ Belgium, Bulgaria, Czech Republic, Estonia, Finland, France, Hungary, Malta, the Netherlands and Spain) present agriculture related activities with a maximum of only five measures reported.

Most commonly the reported activities are financial in nature, complemented by information and advice as well as voluntary type activities, research and development programmes. The majority of measures are targeted at energy-efficient heating systems (including co-generation and conversion to renewable energy sources), energy savings in buildings and facilities, improvement of agricultural processes and crop cultivation in general, as well as the purchase of energy-efficient equipment.

Investment support (e.g. grants, subsidies, loans) is mainly provided to accelerate the introduction of efficient energy systems in greenhouses, stock farms, grain silos, etc. (e.g. regulating systems, heat shields, boiler house improvement, and heat recovery). Exemplary is the state subsidy for boiler houses when switching from fossil fuels to renewable energy sources, which is reported to be the most effective measure in the Finish action plan in terms of generated savings.

Innovation programmes and demonstration project schemes focus on energy-efficient processes and technologies, including the application of renewable technologies and the development of new products and cultivation techniques.

Examples for voluntary agreements have been identified in the second EEAPs of Finland, France and the Netherlands, whereby the Finish "Farm Energy Program" provides support for energy plans and audits. The French report features long-term partnerships between energy suppliers and greenhouse owners. The apparent success of CHP in greenhouse cultivation is notable in the Dutch second action plan, with CHP savings accounting for two thirds of the savings in 2010 attributed to a long-term agreement (LTA), supported by a number of horizontal financial and fiscal measures.

The Dutch LTA for the greenhouse sector has recently been replaced by a CO_2 equalisation measure which imposes a ceiling on emissions and a market price for CO_2 based on the EU ETS price. It will not be linked to the EU ETS but around 80 horticulture companies will be offered the opportunity to opt out of the ETS system and join the CO_2 equalisation system.

Other activities in the agricultural sector reported in the second EEAPs include land management (for example parcelling of fragmented parcels in order to minimize transport), technical advice and diagnosis, as well as training and awareness rising (for example on equipment and technical improvement).

3.6 Horizontal measures

Information presented in the second round of EEAPs suggests an expansion compared to the first reporting period, where already a large number of promising horizontal measures were presented by the Member States. In this section an overview is provided on energy supplier savings obligations (EEOs) and white certificate schemes, the promotion of energy services (energy service companies and third party financing), sustainable product policy, as well as support for energy efficiency related research and development, as reported by Member States in their second EEAP. Table 12 contains information on action and reporting by Member States related to the specific issues. Some horizontal measures – e.g. subsidies, fiscal measures, voluntary agreements and energy audits – are discussed under the particular sector-specific sections.

Energy supplier savings obligations (EEOs) / white certificate schemes

An expansion in energy supplier obligation schemes (EEOs) took place compared to the first round of reporting under Directive 2006/32/EC on energy end-use efficiency and energy services. As part of this policy instrument energy saving obligations are placed on some categories of energy market operators (e.g. electricity and gas distributors or retail energy sales companies), and achieved savings are verified by an independent body. EEOs can be teamed with a system of tradable white certificates, representing certified, project-based savings. EEOs and white certificates schemes in the EU have delivered larger savings than expected, at lower than anticipated costs[35]. A key benefit of EEO schemes is their suitability to target smaller energy users (e.g. the residential sector). Certificates in some cases can also be awarded for the development of renewable energies. The cost-effectiveness of EEOs designates them as policy instrument representing good practice, probably worthy of expansion across EU Member States.

Established white certificate schemes are currently operating in Denmark, France, Italy, the UK and the region of Flanders in Belgium (without trading element in Denmark and Flanders).

As communicated in the second EEAP of the UK, the Energy Company Obligation (ECO) scheme is to replace the Carbon Emission Reduction Target (CERT) and the Community Energy Savings Programme (CESP). The third obligation phase of the CERT, which began in 2008, has been extended to December 2012 with a strengthened target and increased focus on supporting insulation[36]. The aim of CESP, the other programme to be replaces by ECO, is to deliver energy saving measures to domestic consumers in specific low income areas of Great Britain[37]. The new ECO scheme is to be implemented parallel to the Green Deal market framework. Both mechanisms rely on finance from the private sector. Improved targeting and assisting the fuel poor is a key element of both of the new initiatives reported in the second EEAP. In the UK participation in the energy efficiency obligation scheme is required based on the customer base of licensed domestic energy suppliers, as well as on amount of TWh generated per year by electricity generators. After the expiration of CERT and CESP in 2012,

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[35] Bertoldi, P., Rezessy, S., Lees, E., Baudry, P., Jeandel, A. and Labanca, N. 2009. Energy supplier obligations and white certificate schemes: Comparative analysis of experiences in the European Union. *Energy Policy*. 38. 1455-1469.

[36] Department of Energy and Climate Change, UK http://www.decc.gov.uk/en/content/cms/funding/funding_ops/cert/cert.aspx

[37] Office of the Gas and Electricity Markets, UK http://www.ofgem.gov.uk/Sustainability/Environment/EnergyEff/cesp/Pages/cesp.aspx

ECO will place one or more obligations on energy companies, requiring them to generate a specific amount of credit by facilitating the installation of energy efficiency measures in homes in Great Britain before a set deadline[38].

The white certificate scheme in Italy has been operating since 2005. As stated in the second EEAP, a large part of national policy to achieve energy efficiency targets is based on this policy instrument. In 2007 the mechanism has been extended for the time period 2010-2012. The electricity market operator issues white certificates based on verification of energy savings by the Italian National Agency for New Technologies, Energy and Sustainable Economic Development (ENEA), and certification by the electrical power and gas authority (AEEG). Certificates are bankable without expiry. In case an electricity or gas distributor does not reach its target, non-compliance may be corrected within one year if at least 60% of the target is met. Five types of certificate are available, all of which can be traded on the market. Type V certificates represent energy savings in the transport sector, different from electricity and natural gas and are the only type of certificate without a cost recovery mechanism for obliged actors. Limited availability of white certificates has arisen as a key issue limiting the functioning of the system in the last years. Taking into account the actual lifetime of the measures as well as including CHP and reduction in transmission losses among eligible measures are expected to contribute to improving the scheme through reducing scarcity of available white certificates. The second EEAP also highlights the risk of double counting, which may arise as a result of the overlap of white certificates and financial incentives, and recognizes the need to distinguish between the separate schemes.

In France the first period of the Energy Efficiency Certificate (EEC) mechanism ran between 2006 and 2009, followed by a transitional period (from mid-2009 to end-2010) when no energy-saving target was set. Participants in the EEC mechanism include all sellers of electricity, gas, domestic fuel oil, LPG, district heating and cooling, and transport fuel. France is the only Member State where transport fuel suppliers have been placed under obligation. As communicated in the second EEAP, Grenelle 2 renewed the EEC mechanism for a second three-year period, from 2011 onwards. Further commitment periods are to follow until 2020. The target of the first period was exceeded, with almost 65 TWh_{cumac}[39] of certified energy savings as at 1 July 2009, more than 86% of which were made in the residential sector. Over the target of the first period (54 TWh_{cumac}) EECs issued during the first and the transitional period are to be deducted from the total target of the second period (amounting to 345 TWh_{cumac}).

Legislation on energy saving obligations has been in place in Denmark since 2006. As communicated in the second EEAP, savings obligations placed on energy companies is a major contributing measure of the overall Danish energy savings programme. Distribution companies supplying electricity, natural gas, district heating and oil fall under the obligation to implement energy savings in end-use consumption, which otherwise would not be implemented. In 2008 the savings target of companies was increased from 2.95 PJ/year to 5.4 PJ/year, and in 2009 a further increase to 6.1 PJ/year took place. Targeted end-uses include heat and electricity consumption in households and businesses, electricity and fuel consumption in industrial processes. Energy consumption in distribution networks also falls

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[38] Department of Energy and Climate Change, UK
http://www.decc.gov.uk/en/content/cms/consultations/green_deal/green_deal.aspx

[39] The unit of measurement of EECs is a kWh of final energy cumulated and actualised over the life of the product. One EEC equals 1 kWh_{cumac}.

under the scheme. Part of the energy savings are foreseen to be realised through agreements with installers, craftsmen and engineers.

Energy efficiency obligations (without certificate trading) are also in place in the Flemish Region of Belgium. From 2003 onwards electricity distribution network operators in Flanders have been required to achieve a primary energy saving target on an annual basis, through stimulating energy-saving investments by end-users. The target is 3.5% of total electricity supplied for "normal" network operators and 2.5% of electricity supplied for network operators with fewer than 2,500 final costumers. In case of breaching of the target a fine is to be paid in the Energy Fund. Network operators are obliged to make an extra effort to promote the rational use of energy in low-income households. Furthermore, for the coming year they are obliged to submit an action plan to the Flemish Energy Agency. In order to avoid double counting the grant of subsidies for rational energy use in existing schools is no longer quantified separately (as it was in first regional Energy Efficiency Action Plan) because it can be assumed that savings are largely included in the savings calculated for grants offered by network operators.

A white certificate scheme, presented as a separate measure in the Polish second EEAP, will begin operation in Poland in 2013. Energy companies selling electricity, heat and natural gas to final costumers, as well as final consumers connected to the grid who are members of the commodity exchange market form the target group of the scheme. Supported investments include modernisation of local district heating grids and heat sources, buildings, lighting, household appliances, as well as energy recovery and modernisation of industrial devices and installations. Electricity produced in cogeneration falls under a separate red certificate scheme in Poland. The Energy Regulatory Office has been designated as the authority issuing and redeeming white certificates. Certificates will be tradable on the commodity exchange market or on a regulated market. The Ministry of Economy will be responsible for the provision of a detailed list of investments which may participate in the tender procedure, and system monitoring including calculation of the achieved energy savings and preparation and submission of reports to the European Commission.

As for further expansion of EEOs and white certificates in the EU, Bulgaria presents in the second EEAP research and evaluation of the possibilities for introducing a market for white certificates as separate horizontal measure. Impacts of the introduction of similar schemes in other EU countries, as well as the expediency of introduction in Bulgaria are assessed. In Ireland legislation has been put in place allowing energy savings obligations to be placed on energy suppliers. In line with this, as part of the Better Energy Programme an obligation is placed on energy suppliers (supplying over 75GWh per annum) to deliver energy savings. Reporting by some other Member States also reflects a move towards energy savings achieved by energy suppliers. Austria and Greece follow a voluntary agreements based approach, while Slovenia includes information in the second EEAP on obligations on large energy suppliers to provide their customers with energy services.

To summarise, the expansion of energy efficiency obligations and white certificate schemes, as reflected by intermediate reporting under the ESD, is a welcome development in the EU. EEOs and white certificates have not only increased in number, but the deepening of existing schemes (e.g. improving of targeting of low income households in the UK and in Flanders, improvement of evaluation methods in Italy, putting transport fuel suppliers under obligation in France and the tightening of targets in Denmark) has also occurred. These developments indicate that EEOs and white certificates promise the achievement of higher energy savings in the EU.

Promotion of energy services, ESCOs, TPF

Most Member States included information in their second EEAP on the status of and actions taken to promote the market for energy services.

Bulgaria, the Czech Republic, Germany, Greece, Italy and Spain reported on regulatory provisions in place to support the expansion of the energy services market. The Slovakian second EEAP communicated a measure consisting of drafting legislation on energy services. In Bulgaria a fund acting as co-financing institution and guarantor in the performance of services under energy performance contract has been established, while Greece provided details on the Register for ESCOs. In Poland regulation has been put in place allowing ESCOs to participate in the newly established market for white certificates. Spain reported on changes implemented in the regulatory framework to make energy service contracting more dynamic.

Some Member States communicated details on programmes involving energy service contracts in the public sector. In Austria the market for energy services is supported by a comprehensive programme to refurbish over 200 federal property objects. Spain has also reported on the implementation of energy service contracts in 330 buildings of the state administration, to be extended to 2,000 public energy consumers. Furthermore, Poland outlined plans to establish a national contact point facilitating the establishment of ESCO contracts, focusing on the public sector and local government units.

Well-established mechanisms for the promotion of the energy services market already operate in a group of Member States. Belgium demonstrated good practice in the stimulation of the ESCO market with the creation of Fedesco by the Federal Government in 2005 and other region specific initiatives in Flanders, Wallonia and the Brussels Capital Region. The Hungarian second EEAP reported on building refurbishment measures operating in the form of a state ESCO. An upcoming large-scale programme could contribute to the expansion of the energy services market in the UK: the proposed Green Deal market framework is to involve private firms offering energy efficiency improvements with no upfront costs to costumers and repayment of the investments though savings in energy bills.

The provision of model contracts has been reported by Austria, France, Lithuania the Netherlands, and Poland. Ireland also communicated plans to develop standard documentation for EPCs, as well as a roll-out of ESCO pilot projects in local authorities. The French second EEAP outlines several actions supporting the dissemination of energy performance contracts (EPCs). These include the amendment of the public procurement law allowing EPCs to be concluded, while other actions focus on the residential and services sectors. EPCs are also planned to be expanded in the industry sector.

A group of Member States communicated difficulties in connection to ESCOs. Estonia reported an existing but limited energy services market, mainly involving street lighting services. Latvia highlighted the barriers to the expansion of its ESCO market, including legal matters due to the conclusion of service contracts, lack of interest by energy supply companies, low consumer awareness and lack of positive examples. The prevalence of legal barriers was also reported in the second EEAP of Slovenia. Planned activities that have not yet been implemented by the Member State include the preparation of sample contracts and the provision of expert support for project design in the public sector.

Some Member States contained reference on the expansion of the energy services market. Finland reported on demand-driven growth in energy-efficient business highlighting the role of professional operators and principles of sustainable business. Strong growth in the energy services market has also taken place in Luxembourg in the past years, according to its second EEAP. The Member State has communicated plans to create of an office to further facilitate the expansion process.

Some additional Member States also referred to the promotion of the energy services in their second EEAPs. Cyprus reported on the establishing a legal framework for energy audits, while Sweden communicated the carrying out of an analysis of the energy services market. According to the Maltese second EEAP, in the Member State there are no significant barriers to the provision of energy services (such as energy audits and energy efficiency improvement measures) by installers, energy advisors and energy consultants.

Support for energy efficiency related R&D

Most second EEAPs included information on energy and energy efficiency related research and research funding. Sweden communicated in its second EEAP that research activities form a significant part of its energy efficiency policy efforts, while Austria reported that the increase in the expenditure of public authorities on energy efficiency related research was disproportionally high in recent years. A strong emphasis on research and development was demonstrated in the French second EEAP. Funding for research on smart grids, as well as for demonstration projects focusing on new energy technologies was reported. Furthermore, funding has also been designated for the establishment of technology innovation campuses for RES, new energy technologies and energy efficiency. The Finish second EEAP also outlines several research programmes including the establishment of clusters of strategic cutting-edge expertise (SHOK), green growth and sustainable communities. The UK reported on research as part of a support package for the introduction of Ultra Low Emissions Vehicles (ULEVs), while electric mobility pilot projects were also reported to be running in Germany.

The setting up of technology centres, research laboratories and programmes to enhance competitiveness have also been reported by other Member States. Poland indicated the operation of the Polish-Japan Energy Conservation Technology Centre (PJCEE) which among other tasks conducts research and development work in energy efficiency in industry. Research programmes on electricity systems and energy efficiency in industry in connection to restoring competitiveness were reported to be running in Italy. According to the Dutch second EEAP, in the Netherlands the Energy Research Subsidy covers energy efficiency and renewable energy related research from the idea to the market introduction phase. The Danish second EEAP refers to the establishment of a research centre on energy savings in buildings, while the Maltese action plan contains a measure involving the setting up of an electrical energy and efficiency laboratory within the University of Malta.

Spain reported on research activities in connection to sector specific measures (e.g. fisheries and agriculture), while the Greek, the Estonian and the Slovakian second EEAP addressed support for research on energy and energy saving in the form of separate measures. The Irish second EEAP informs about research activities on energy savings in the domestic sector and in school buildings, as well as in ICT.

In Bulgaria, the Czech Republic and Latvia research activities were mentioned in connection to the setting of objectives with reference to Net Zero Energy Buildings. Bulgaria reported on research activities with reference to the possible introduction of a white certificate scheme. Funding for energy efficiency related studies and research projects are indicated in the Belgian and the Lithuanian second EEAPs. The Hungarian second EEAP refers to plans to strengthen and harmonize research, development and innovation activities related to sustainable energy management, while the greater use of European programme funds for energy related research is encouraged in the Slovenian second EEAP.

Sustainable Product Policy

Since the first reporting period under the ESD, product policy in the EU has undergone key developments. In 2009 the European Parliament and the Council adopted the recast Ecodesign Directive (Directive 2009/125/EC on establishing a framework for the setting of ecodesign requirements for energy-related products) and in 2010 the recast Energy Labelling Directive (Directive 2010/30/EU on the indication by labelling and standard product information of the consumption of energy and other resources by energy-related products). The amendments made in the Community legislative framework represent an expansion of earlier product policy related regulations to include not only energy-using, but also all energy-related products in the domestic, commercial and industry sectors[40].

Most Member States included information on the implementation of Community sustainable product policies in their second EEAP; however the level of detail provided on status of implementation varied. Even less information was given on enforcement related issues. The second EEAP of about half of Member States presented supporting national legislation to transpose EU Directives on sustainable product policy, included the implementation of ecodesign or energy labelling requirements as a separate measure, or demonstrated progress in the implementation of the Directives. Clear legislative measures for the transposition of both recast directives for sustainable product policy were presented by Finland, Lithuania, Slovakia, and Sweden. A third of the Member States presented energy labelling as a separate measure, with nearly as many addressing ecodesign requirements in a similar manner. At the same time a small group of Member States did not include any information on sustainable product policy in the second EEAP.

Good practices in sustainable product policy include the provision of information on regulatory measures to transpose Community legislation, national measures going beyond Community requirements, and the provision of details on enforcement and implementation. The application of financial incentives, coordination with relevant stakeholders, and regulation for sustainable product policy applied as part of policy packages teamed with financial and awareness raising instruments form further areas of good practice.

The second EEAP of a number of Member States demonstrates some of these good practices in ecodesign and energy labelling. Italy presents several relevant measures in detail, focusing on solar heating panels for hot water, efficient air conditioning systems, energy-efficient lighting and control systems, as well as the replacement of refrigerators and freezers and washing machines for more energy-efficient models. As part of these measures connection is established between relevant EU legislation (on energy labelling and minimum efficiency requirements), financing through the white certificate scheme, information programmes, as well as agreements with industry. Other good practices appearing in the second EEAPs include the market surveillance programme of Ireland which is currently being designed to test products under both the Ecodesign and Energy Labelling directives. France reports on the

[40] Energy-using products (EUPs) use, generate, transfer or measure energy (electricity, gas, fossil fuel), such as boilers, computers, televisions, transformers, industrial fans, industrial furnaces etc**.** Other energy-related products (ERPs**)** do not use energy but have an impact on energy and can therefore contribute to saving energy, such as windows, insulation material, shower heads, taps etc. Means of transport for persons and goods are out of the scope of both the Ecodesign Directive and the Energy Labelling Directive.

ahead of timetable signing of a national agreement between the state and the Lighting Trade Union for withdrawing the least efficient lamps from the market. Furthermore, in France financial incentives are provided for businesses to support investment in equipment that consumes less energy, and for ecodesign aimed at promoting ecodesigned tools and generic products. The UK includes information in its second EEAP on progress made in the adoption of minimum energy performance requirements and labelling for priority products and quantifies annual net benefits that can be gained through these measures.

In the next reporting period more detail should be provided by Member States on the implementation and enforcement of sustainable product policy, demonstrating the exploration of synergies with other policy areas. The examples of good practice identified in the second reporting period can serve as a basis for improvement.

Table 12 Horizontal measures reported in the second EEAP

				Sustainable Product Policy	
Member State	Energy supplier savings obligations, white certificate schemes	Promotion of energy services, ESCOs, TPF	EE related R&D	Ecodesign	Energy Labelling
AT		x	x		x
BE	x	x	x	x	
BG	x[4]	x	x[3]	x	x
CY		x			
CZ	x[4]	x	x[3]	x	
DK	x		x		
EE		x[1]	x		
FI		x	x	x	x
FR	x	x	x	x	x
DE		x	x	x	x
GR		x	x		
HU		x	x[2]		
IE	x[4]	x	x		x
IT	x	x	x	x	x
LV		x[1]	x[3]		
LT		x	x	x	x
LU		x			x
MT		x	x		
PL	x*	x	x		
PT					
RO					x
SK		x	x	x	x
SI		x[1]	x	x	x
ES		x	x		
SE		x	x	x	x
NL		x	x		
UK	x	x[2]	x	x	x

Legend:
* In operation from 2013.
1 - Barriers / delays in implementation reported.
2 - Proposal stage / Communication of plans.
3 - Research in connection to preparation for nZEB.
4 - Investigating possibilities for introduction.
x - In Sustainable Product Policy - supporting national legislation presented / addressed as a separate measure / progress in implementation demonstrated.

3.7 The exemplary role of the public sector

The requirement to report on the exemplary role of the public sector was fulfilled to varying extents by all the Member States in their second EEAPs. Some Member States (e.g. Austria, Belgium, Cyprus, Finland, Germany and Ireland) clearly communicated relevant actions undertaken. However, reporting of most Member States often contained some gaps and, while addressing the exemplary role of the public sector, the information provided on actual actions undertaken was not comprehensive. Some Member States did not communicate clear actions on all relevant ESD provisions (e.g. Czech Republic, Hungary, Slovakia), communicated lack of success (e.g. Slovenia),In some EEAPs the exemplary role of the public sector was found not to be well highlighted (e.g. Luxembourg, Portugal and Spain).

The exemplary role of the public sector is one of the key provisions of ESD, as well as of the recast EPBD. At the same time only few Member States highlight in a concrete manner the specific role of public buildings (beyond the display of energy performance certificates). Good examples include the exemplary role for public buildings in the promotion of energy services for buildings (in Belgium, with Fedesco and Belesco); communication of good practices and achievements through websites and other medias (in Denmark and Estonia); organisation of an annual event to communicate savings achieved in the public buildings sector (Cyprus); a Government Buildings Agency in charge of sharing best practices with the market and encouraging innovation in technology, process and contract forms (the Netherlands).

In Annex VI of the ESD a six-item list of eligible measures for energy efficient public procurement is outlined. Member States must ensure that at least two requirements from the list are applied in the public sector. The second EEAP of half of the Member States suggested the fulfilment of the requirement of choosing two of the six proposed procurement measures. Austria, Belgium, Cyprus, Denmark, Finland, Germany and Sweden went beyond minimum requirements and reported on steps undertaken on implementing more than the requested two measures. Estonia, France, Greece, Latvia, Italy and Lithuania presented with sufficient detail two measures from those outlined in Annex VI of ESD.

However, a group of Member States did not communicate clearly the efforts taken to comply with Article 5 and Annex VI of the ESD. Slovenia reported on significant delays in implementation of relevant actions, while also in Portugal no progress was evident in the measure on sustainable public procurement. Slovakia and Hungary failed to present two measures from the list of eligible actions under Annex VI. Bulgaria, the Czech Republic, Luxembourg and Poland referred to two eligible measures, but due to the lack of detail provided on implementation it was not possible to assess the actual level of compliance. Both Malta and Spain reported on relevant action plans on public contracting but did not clearly specify eligible energy efficiency public procurement measures. In Romania, at the time of the submission of the second EEAP the government ordinance transposing Annex VI of the ESD was awaiting approval by the national Parliament. The second EEAP of the Netherlands and the UK reflected significant actions undertaken in the field of public procurement. At the same time, while these actions are likely to contribute to fulfilling ESD requirements, the reports did not provide clear information on the options selected in accordance with Annex VI of ESD. Ireland reported on legislation transposing the ESD, including standards for energy efficient procurement and the amendment of energy efficient public procurement provisions. However, the Member State did not fully clarify which of the requirements of Annex VI have been clear action to facilitate the exchange of good practices between public sector bodies has been reported by a group of Member States (e.g. Austria, Belgium, Cyprus, Denmark, Finland, France, Germany, Ireland, Malta and Sweden). Action constituting of programmes, projects or legal provisions facilitating the exchange of good practice between public sector bodies was demonstrated by Estonia, Greece, Lithuania, the Netherlands and Slovakia. Reporting on relevant action was less clear in Bulgaria, Luxembourg and the UK. Hungary elaborated on relevant actions in the second EEAP. However, these appeared to be in the planning stage. In the case of Greece, Italy and Latvia local authority participation in the Covenant of Mayors initiative of the European Commission was found to be a circumstance potentially contributing to the exchange of good practice within the public sector. The second EEAP of the Czech Republic, Portugal and Spain did not provide information on facilitating information exchange between public sector bodies.

Several measures and packages of measures demonstrating the exemplary role of the public sector and facilitating the exchange of good practice between public sector bodies were identified as good practice in the second EEAPs. These included regulation requiring the use the highest energy efficiency criteria in public tenders (e.g. in Germany) and the application of at least two measures from Annex VI affecting different levels of government (e.g. in Finland and Sweden), the facilitation of networking of experts (e.g. in Finland) and appointment of green leaders in the public sector (e.g. in Malta), the publishing of energy saving results of the public sector (e.g. in Denmark), and the implementation of energy management systems (e.g. in Luxembourg) and voluntary agreements (e.g. in Denmark) for energy savings at local authorities. The setting of quantified energy savings targets in the public sector (as it is done in Ireland) is a further area of good practice, worthy of replication by other Member States.

In Germany regulation requires only the highest energy efficiency criteria to be stipulated in public tenders and life-cycle costs to be considered in the award procedure. It facilitates this process by publishing guidelines for considering energy conservation in public procurement. The Member State applies a combination of measures referring to all items of Annex VI of the ESD.

In Finland several mechanisms were established to facilitate the sharing of best practice between public sector institutions. These include the support for the networking of experts from local councils taking part in the voluntary energy efficiency agreement scheme; a government resolution obliging central government to implement three of the six measures listed in Annex VI; local councils that are signed up to the agreement scheme committed to implementing five of the six measures listed in Annex VI; the Local Government Climate Campaign coordinated by the Association of Finnish Local and Regional Authorities.

In Denmark voluntary agreements on energy saving activities have been established with the participation of local authorities and regions. Once a year, the Danish Energy Agency assesses and publishes the government institutions' energy consumption and presents it to the energy committee of the Danish Parliament.

In Sweden a government ordinance stipulates that every national public authority shall implement at least two out of six recommended measures of Annex VI of the ESD. Many public bodies decide to implement more than the requested two measures.

In Malta Green Leaders scheme has been operating in the public sector since 2004. Green Leaders are appointed and have a duty to create environmental awareness within their Ministries. They act as catalysts for action to promote environmentally friendly practices including energy efficiency measures and renewable energy. Green focal points are also appointed in departments and sections to be closer to staff and to create a green network.

In Luxembourg energy management systems were implemented at the municipal level, offering significant energy saving potential and indicating a serious, long-term commitment to energy efficiency improvement.

The Irish second EEAP shows a strong commitment to improve energy efficiency in the public sector. An ambitious energy savings target has been set. Dedicated public sector measures have been put in place and targets quantified for each. The exemplary role of the public sector is clearly communicated.

The above examples of good practice in establishing and demonstrating the exemplary role of the public sector in energy saving should provide a basis for other Member States in developing similar schemes.

3.8 Provision of information and advice to end-users

Most of the Member States explicitly addressed in their second EEAP the ESD requirements regarding the provision of information and advice. However, differences were experienced in the detail of reporting and emphasis laid on information and advice related measures. A number of Member States (including Austria, Belgium, Denmark, Germany, Finland, Italy, Luxembourg, Malta, Sweden and the UK) demonstrated in the second EEAPs that the provision of information and advice forms an integral part of their energy efficiency policy. These Member States typically presented a strong set of diverse information measures, often designed to complement other types of actions. Good practice incorporated the establishment of a network of energy agencies, the provision of individualized advice targeted at different actors (residential, business and public sector), as well as information provision obligations for energy supply companies. The use of websites as well as the organisation of information campaigns was widespread among Member States.

Energy agencies and other designated organisations were key facilitators of information provision. Action of these organisations often involved different governance levels, ensuring the provision of energy saving advice from the national to the local level. Austria communicated on the work of regional energy agencies, energy saving associations and energy institutes with respect to the provision of information and advice on energy efficiency and renewable energies. Latvia reported on the work of four regional energy agencies, while energy and climate protection agencies were also reported to be present at the regional and local level in Germany. A network of local energy advice centres is available to provide advice to households in Slovenia. In the UK two institutions, the Energy Saving Trust (targeting households) and the Carbon Trust (focusing on businesses and organisations) were reported as the two main actors in information and advice provision. An Energy Saving Trust was also established in Denmark, promoting cost-effective energy savings in households, the public sector and businesses. The Czech Republic reported on energy information and advice centres as well as regional energy agencies. In Cyprus the Energy Service was communicated as the promoter of information and advice regarding application for RES and energy savings grants schemes. The Romanian second EEAP provides a list of non-governmental actors (e.g. chambers of commerce, professional associations, and the Energy Cities network) involved in information provision on energy efficiency.

Establishment of mechanisms for the provision of individualized advice was indicated by various Member States. Germany and Belgium reported on the operation of free energy hotlines, while individual advice is also provided in Austria from consultation by phone to comprehensive advice prior to the implementation of specific measures. In France the Energy Info Site network has been reported to provide individualized advice on energy saving measures. In the UK the Energy Saving Trust and Carbon Trust were reported as the providers of energy saving advice on a one-to-one basis. In the Netherlands the A *More with Less* programme was reported to give residential consumers customised advice on energy savings opportunities in their homes and information about related subsidies. In Sweden municipalities benefited from energy and climate advice services by the Sustainable Municipalities Programme. The second EEAP of Ireland contained new measures that provide tailored advice from experts to public sector organisations and SMEs, complementing the existing large industry programmes. The Italian second EEAP mentions the availability of an eco-sustainable training involving about 50-55 thousand people every year. A website and toll-free number have also been set up on energy efficiency and on benefiting from available incentives.

The role of energy supply companies in the provision of energy efficiency related information and advice was also addressed in the second EEAPs. Established energy supplier obligation schemes are currently operating in Denmark, France, Italy, the UK and the Belgian region of Flanders (see more on energy supplier savings obligations and white certificate schemes in the section on horizontal measures). The obligation scheme reported to operate in Slovenia requires large energy suppliers to provide their customers with energy services, including specific information. In Latvia a law allows distribution system operators and traders of energy to provide final customers with energy services (however the second EEAP notes that no such a contract has so far been concluded). The Lithuanian second EEAP report contains the requirement for energy companies to provide information to energy customers and municipal authorities. In Malta information on energy efficiency measures is available on the websites of the electricity supplier and the regulator, while Estonia communicates that energy supply companies distribute information on energy conservation to their customers along with utility bills. In Greece the use of voluntary agreements and the introduction of white certificates are envisioned in the future. Furthermore, energy companies are required to provide all available information annually on their final consumers to the ministry responsible for energy policy. The Romanian second EEAP gives a detailed account on a consultation conducted with energy companies on their information provision activities, as well as proposals to expand these. The cost implications of the development of more complex actions are also highlighted.

Provisions of Article 13 of the ESD on metering and informative billing of energy consumption (including the instalment of individual meters, billing on actual energy consumption and the provision of appropriate information on the energy bill) have been addressed by most Member States in their second EEAP. However, different Member States provided different level of detail in information regarding these measures.

Austria, Germany, Greece, Lithuania, and the Netherlands reported on the application of regulatory instruments to support the metering and billing of individual energy consumption. Austria communicated a concrete legislative measure on the metering and billing of individual energy consumption, which was preceded by pilot projects in order to check and adjust implementation. Germany communicated on regulation requiring the consumption dependent billing of heating and hot water use. This billing practice has been connected to incentives for the economical use of energy. Further regulatory instruments were mentioned in the German second EEAP regarding the opening up to competition of the metering and meter reading service market. Greece reported on the installation of electronic and intelligent metering of electricity as a combined regulatory, financial support and information measure. Lithuania provided a detailed account on a regulatory measure for the installation of advanced energy meters at end-user premises. In the Netherlands smart meters are among the obligations of energy companies to promote end-use energy saving through information to end-users, based on actual consumption and indicative costs.

The trial and rollout of smart meters has also been mentioned by various Member States. In the UK second EEAP the planned large-scale rollout of smart meters (providing near real-time information on energy consumption) was communicated. An overall strategy and timetable for the rollout has been set out, specifying the expected year of completion. Ireland has also communicated on a smart meter rollout (involving both electricity and gas meters), expected to take place from August 2011 onwards. Malta reported on the rollout of smart meters as a separate measure, with start and end expected end dates specified. Furthermore, it has been reported by the Netherlands that smart meters are installed in new buildings, during large-scale renovation, at times of regular replacement and at the request of the final customer. In Germany support was provided for pilot projects to investigate and test the benefits of using information technologies such as smart metering in the energy area. In connection to the development of smart grids, France reported on the trialling of new communicative meters. A pilot phase subject to technical and economic review before the rollout of meters has also been communicated by Greece and Luxembourg. Furthermore, Italy reported on the widespread use of intelligent meters in the context of improving the efficiency of the electricity distribution and transmission networks.

The rest of the Member States also reported on action relevant to Article 13. In Cyprus the sole distribution company provided detailed electricity bills including a message concerning efforts to save energy, while no legal obligation has been imposed on energy distributors for promoting end-use energy efficiency. In Belgium all regions communicate measures relevant to metering and informative billing. Denmark reported on remote metering in government institutions, while in Finland water meters for homes as well as office and business properties were applied in a mandatory manner. Metering-based billing and smart metering were presented as part of complex measures in Hungary. However, no detail on the stage of implementation was provided. Poland devoted a separate measure to smart grids, as part of which the implementation of smart metering was indicated in pilot areas. In Spain a loan programme included smart meters as one of its priority areas.

More detail in reporting would have enabled a deeper assessment of progress in the areas of metering, billing and smart meters. For example, Latvia addressed the issue of the smart network concept in its second EEAP; however, no details were provided on action on metering and informative billing. The importance of these measures was highlighted in the Swedish second EEAP. Relevant activities of a Commission for Enquiry for new efficiency actions were mentioned; however, no specific measure has been reported. Bulgaria also touched upon the topic of metering and billing of individual energy consumption in second EEAP; however, no details were communicated on results achieved since 2004. The Slovenian second EEAP envisioned the drawing up the necessary legal basis for accelerated introduction of active networks, introduction of smart meters and accounting devices at electricity consumers; however, the stage of implementation was unclear from the report.

Various aspects were identified as weaknesses in the information and advice provision related reporting and practice of a number of Member States (e.g. Bulgaria, Hungary, Poland, Portugal, Slovakia and Spain). These included limited detail on implementation, failure to designate information measures, as well as lack of clarity on continuation of previously reported measures. Bulgaria appeared to devote limited attention to information measures, while reporting was found to be limited on the size and extent of relevant efforts in Slovakia. In the case of Portugal the continuation or dropping of some previously reported information measures was unclear. While Spain presented a clear communication strategy, specifying strategic objective of communication actions, the information actions associated with the measures were not explained in detail. For each measure, the need for an information component has been recognised. Hungary addressed the provision of information and advice as part of integrated measures, while the Polish report contained a separate, strategic measure related to the provision of information and advice. Both the Hungarian and Polish second EEAP contained a separate section on information provisions; however, details on implementation and timeframe were missing.

3.9 Final energy savings achieved up to 2010 and forecast for 2016 and 2020

In the second EEAPs submitted by the Member States, savings achieved in the intermediate period up to 2010 and forecast savings for 2016 are given. The reports indicate that high levels of savings have been achieved up to 2010 and that the 9% indicative target for 2016 will be comfortably exceeded by most Member States. The savings figures are summarised in Table 13. Savings are expressed both in final energy units (Mtoe) and as a percentage of the Member States' reference energy consumption values[41].

Total declared final energy savings for 2010 are approximately 59 Mtoe. This figure is around 35% higher than the sum of the intermediate energy savings targets set by the 27 Member States in their first EEAPs submitted in 2008. Declared intermediate savings levels range from 1.8% of reference consumption in Lithuania to nearly 9% in Germany and Sweden where the ESD indicative target for 2016 has effectively been reached at the end of the intermediate period.

Total final energy savings of around 132 Mtoe are forecast for 2016, well in excess of the 9% indicative target of approximately 89 Mtoe. Spain and Germany forecast the highest levels of savings, while four Member States quantify 2016 savings that are lower than 9% of their reference energy consumption. When comparing the savings figures of Member States, however, it is important to consider the methods used to calculate savings and not just the declared and forecast savings levels. A number of different approaches were used to quantify the savings. Accordingly, the numbers presented below can only serve as a rough indicator of the actual EU saving impact. The national approaches are examined in more detail in Annex 3.

[41] The method for the calculation of the national final energy saving targets was established in the Annex 1 of Directive 2006/32/EC on energy end-use efficiency and energy services.

Table 13 EEAP final energy saving targets and forecasts for 2016 and declared savings for 2010

Member State	2010 target final energy savings *(primary equivalent in italics)*		2010 declared final energy savings *(primary equivalent in italics)*		2016 forecast final energy savings *(primary equivalent in italics)*	
	Mtoe	% of reference consumption	Mtoe	% of reference consumption	Mtoe	% of reference consumption
Austria	0.428	2.0%	1.180	5.5%	1.874	8.8%
Belgium	0.789	3.0%	1.301	4.9%	2.985	11.4%
Bulgaria[42]	0.209	3.0%	0.305	4.4%	1.066	15.3%
Cyprus[43]	*0.060*	3.3%	*0.066*	3.6%	*0.191*	10.4%
Czech Republic[44]	0.355	1.8%	0.532	2.7%	1.596	8.2%
Denmark	0.449	3.0%	0.664	4.4%	1.285	8.6%
Estonia	0.061	2.3%	0.079	3.0%	0.213	8.1%
Finland	0.507	3.0%	1.040	6.1%	2.123	12.5%
France	5.000	3.8%	5.159	3.9%	18.000	13.5%
Germany	12.181	6.1%	17.937	9.0%	33.868	17.1%
Greece[45]	0.439	2.8%	0.794	5.1%	1.415	9.0%
Hungary	0.152	1.0%	0.293	1.9%	1.371	9.0%
Ireland	*0.559*	4.5%	*0.523*	4.2%	*1.576*	12.6%
Italy	3.066	2.7%	4.102	3.6%	10.880	9.6%
Latvia	0.006	0.2%	0.294	8.8%	0.299	9.0%
Lithuania	0.054	1.5%	0.067	1.8%	0.341	9.4%
Luxembourg	0.045	2.7%	0.128	7.6%	0.238	14.1%
Malta	0.011	3.0%	0.014	3.8%	0.033	9.0%
The Netherlands	*0.978*	2.0%	*2.278*	4.7%	*6.416*	13.1%
Poland	1.021	2.0%	3.037	5.9%	5.779	11.3%
Portugal	0.344	1.9%	0.662	3.6%	2.240	12.2%
Romania[46]	0.940	3.0%	2.222	7.1%	2.800	9.0%
Slovakia	0.224	3.0%	0.668	9.0%	0.671	9.0%
Slovenia	0.102	2.5%	0.101	2.5%	0.591	14.5%
Spain[47]	2.179	3.0%	4.720	6.5%	13.126	18.1%
Sweden	2.003	6.3%	2.846	9.0%	4.626	14.6%
The United Kingdom	11.737	9.0%	8.547	6.6%	17.816	13.7%

[42] 2016 figures for Bulgaria represent the bottom-up savings totals given in the EEAP.
[43] Figures for Cyprus, Ireland and the Netherlands are shown in Primary Energy Equivalent.
[44] The Czech Republic does not clearly state intermediate savings achieved. The 2010 figure shown above is one third of the forecast figure for 2016.
[45] To account for recessionary influences, Greece adjusted a very high interim savings figure given by top-down methods to get a more realistic range of likely savings achieved. The 2010 figure shown here represents the low end of the range. No clear forecast of energy savings in 2016 exists. The value shown assumes that the 9% indicative target is achieved.
[46] No savings forecast given for 2016 for Romania. 2016 figure shown represents the 9% ESD indicative target.
[47] The calculation of the 9% ESD target for Spain is unclear from the EEAP.

The levels of overall achieved and forecast savings in the second EEAPs are higher than other indicators of energy efficiency improvement rates. According to the second EEAPs, Member States that use mostly top-down indicators declare an energy efficiency improvement of 6.6% for the 3-year intermediate period, or an average annual improvement of over 2.1% of reference consumption. This figure is in contrast with the average rate of final energy intensity reduction of around 1.2% recorded for the years 2000-2009 by Odyssee project[48]. The significant increase in the rate of annual improvement apparent from the EEAPs may not be fully accounted for by an increase in policy activity, but also by additional structural and statistical factors as well as data inconsistencies and overlaps when aggregating the impacts of various national measures[49].

The savings of Member States calculated using bottom-up or measure-specific methods can in many cases provide a more accurate indication of the effectiveness of energy efficiency measures. Member States using mostly bottom-up methods to determine their declared savings values show savings of 5.1% of reference energy consumption up to 2010. This figure also looks high considering that, unlike the top-down methods, bottom-up figures should exclude autonomous savings, although they do incorporate some early savings. A diverse set of approaches has been used to calculate bottom-up savings, with various combinations of modelled data, measured data and estimates. Bottom-up savings given in different EEAPs are difficult to compare to each other as the EEAPs generally do not provide the level of detail necessary for controlling if the methods, models and estimates used are similar across Member States.

3.10 Primary energy savings targets for 2020 given in the EEAPs

Various Member States declare national energy consumption or energy savings targets for 2020 in their EEAPs. In most cases, stated 2020 targets apply to the energy consumption of the whole economy and not just to that of the sectors that are within the scope of the ESD. A variety of approaches have been used to define 2020 targets. Some Member States have set primary energy consumption targets; some have set final energy consumption targets, while others have defined energy intensity targets. Additionally, some countries have set 2020 national energy savings targets or savings targets for specific sectors of their economies. A more detailed overview of all 2020 national energy savings and energy consumption targets mentioned in the EEAPs is given in Annex 4 of this document. Estimation of the overall impact of the ESD-related national policy measures addressing end-use consumption on the 2020 target.

Given the considerable difference between the ESD approach of target setting and the overall EU objective to save 20% of its primary energy consumption in 2020, only a tentative assessment of ESD-related policy measures' contribution to the overall EU target for 2020 can be put forward. This assessment necessarily needs to be based on a set of assumptions which might not hold true in reality.

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[48] Odyssee project on energy efficiency indicators (http://www.odyssee-indicators.org/) using top-down methodologies similar to the methodologies used in the second EEAPs by many Member States.

[49] In periods of economic turbulence, such as that experienced by some Member States since 2008, the potential inaccuracy of the top-down calculation methodology can be pronounced. In such cases, a top-down analysis might give an inaccurate view of overall energy efficiency trends over a short 3-year period, such as the period from 2008 to 2010 analysed in the EEAPs. Top-down methods can be prone to misrepresenting developments where there are anomalies in activity data or energy data used to calculate them.

Targets and savings for each Member State are converted to primary energy equivalent and are added together. A total savings figure for 2010 is determined and a savings projection for 2016 is calculated. An estimate is made of ESD-related energy savings impact in 2020. The estimate combines 2020 measure-specific energy savings estimates provided by some Member States and projections of energy savings based on the historical trends for Member States that have not provided 2020 savings estimates. Due to the nature and quality of the data available and the diversity of approaches used it has been necessary to make a number of significant assumptions. These are listed below.

A) Calculation of primary energy equivalent. For Member States that do not provide targets and savings in primary energy or do not convert electricity savings into primary equivalent, a coefficient of 2.5 is used to estimate primary energy savings associated with electricity savings. A factor of 1.0 is used to convert all other fuel types in end-use to primary equivalent.

B) Shares of electricity in total savings. Most Member States have not quantified savings by fuel type and it is not possible to determine the proportion of total savings that are electricity savings. Therefore, the electricity savings for each Member State that has not converted figures into primary equivalent have been estimated by assuming that the share of electricity savings in total savings is equal to the share of electricity consumption in total final consumption of the Member State. To calculate the electricity consumption shares over the period to 2020 for each Member State, electricity shares from the 2009 PRIMES baseline projections of energy trends are used (European Commission, 2009)[50].

C) Estimating the rate of savings up to 2020. Most of the EEAPs evaluated do not provide an estimate of energy savings in 2020 associated with ESD-relevant measures. To estimate the impact of ESD-related energy savings, it is assumed that for Member States that do not provide 2020 estimates of savings associated with ESD measures specifically, ESD-related savings from 2016 to 2020 will increase at the same rate as they are projected to do in the period between 2010 and 2016 in the EEAPs.

D) Allowing for Member States that do not provide a 2016 projection. For Member States that do not provide a clear forecast of 2016 energy savings, the 2016 forecast figure is set to the 9% indicative target figure.

E) Equivalence of energy savings figures across Member States. Despite the diversity of approaches used by Member States to calculate their declared savings figures, it is assumed that each declared unit of energy saved is equivalent, regardless of the methodology applied. The total energy saved in the EU27 is determined by adding together the savings declared by each Member State.

3.11 Estimated 2020 savings impact arising from the ESD

When the 9% indicative energy savings targets for all Member States are added together and converted to primary equivalent, they amount to 118 Mtoe. Extrapolating the 1% annual increase in energy efficiency implicit in the ESD target for 2016 gives a target value of 170 Mtoe in 2020 or 13% of reference energy consumption. Declared intermediate savings are 74 Mtoe. Forecast savings in 2016 amount to 173 Mtoe. Annual ESD-relevant savings are

[50] European Commission, 2009, EU energy trends to 2030 – Update 2009. Luxembourg.

estimated to grow to 241 Mtoe in primary energy equivalent in 2020 and therefore exceed the extrapolated ESD target by 71 Mtoe.

A sensitivity analysis of the savings forecast results has been undertaken to test the impact of some of the assumptions made. The following adjustments to the assumptions have been made and targets and estimated savings for each Member State have been recalculated where relevant:

- For Member States that provide figures in final energy only, the factor used to convert electricity end-use savings into primary energy equivalent has been varied between 2.0 and 3.0;

- The conversion factor for other fuels has been adjusted between 1.0 and 1.1;

- The share of electricity savings in total savings has been adjusted between 30% less than the electricity share of final energy use, and 30% more than the electricity share of final energy use;

- For Member States that do not provide ESD-related savings forecasts for 2020, the rate of savings from 2016 to 2020 has been varied between 30% lower than the rate between 2016 and 2020 and 30% higher than the rate between 2016 and 2020.

Considering worst- and best-case scenarios for all of the above adjustments, the excess of ESD-related savings over the extrapolated ESD target in 2020 in theoretical terms is between 56 Mtoe and 93 Mtoe in primary energy equivalent.

However, it should be emphasised that these calculations cannot be used for any direct comparison with the business-as-usual scenario used for establishing the consumption impact of the EU 2020 energy efficiency target[51]. This is because of various reasons including:

- The ESD methodology allowed for significant amount of early action often as old as 1991 to be counting towards the ESD target; the analysis of the second EEAPs revealed that up to 1/3 of savings could be coming from early actions;

- The top-down methodologies applied by the Member States show significant distortion cause by the impacts of the economic crisis; the calculation of same savings using top-down and bottom-up indicators showed in some cases 50% difference at least partly due to statistical effect of the economic crisis;

- The expected extrapolated 2020 second EEAP savings capture most of the impact of other EU energy efficiency legislation, in particular Energy Performance in Buildings Directive as well as Ecodesign and Ecolabelling regulations;

- In some EEAPs an overlapping impact of the EU Emissions Trading Scheme has most probably also been captured[52].

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[51] European Commission (2007): EU energy and transport trends to 2030 - update 2007.

[52] A total of 16 Member States explicitly state that EU ETS figures are excluded from targets and savings (AT, BG, CY, DK, FI, FR, EL, IE, LV, LT, LUX, MT, PL, SK, SL, SW); For 9 Member States the handling of EU ETS consumption or savings is not fully clear and in some cases EU ETS is excluded from calculations of the target, but exclusion from savings calculations is not explicit (BE, CZ, EE, HU, IT, PT, RO, ES, UK). Two

In general, from the analysis of the information provided by the Member States in the second EEAPs, it could be concluded that the calculations of the achieved and expected energy savings linked to the measures included in the EEAPs based on the methodologies established on the basis of the provisions of ESD are useful for getting better understanding of the developments with the implementation of energy efficiency measures. However, for the measurement of the progress towards the EU 2020 target for energy efficiency an additional set of aggregated indicators with more transparent calculation methods is needed.

Another conclusion from the analysis of the national calculations of the energy savings expected for 2016 (and extrapolated for 2020) is that at least part of these savings can be attributed to some existing and/or new planned energy efficiency measures that have been included in the Energy Efficiency Directive[53]. This means that this part of the measures-related impacts of the second EEAP are already or will be soon contributing to the achievement of energy savings assumed to be generated by the implementation of the Energy Efficiency Directive.

Member States declare that some of the energy savings of EU ETS participants are included in their industry figures (DE, NL).

[53] Examples of Member States who implemented or informed in the EEAPs about plans to introduce energy saving obligation schemes include Belgium, Bulgaria, Czech Republic, Denmark, France, Ireland, Italy, Poland and the UK.

4 OVERVIEW OF FINANCING INSTRUMENTS

Financial support instruments are a key driver for energy efficiency. This section presents various good examples of financial support measures and market mechanisms implemented by the Member States to finance energy efficiency projects, in particular in the building sector. This covers both traditional financing instruments and more innovative schemes reported in the EEAPs, explaining what are the main funding issues encountered by the Member States and how access to EU funds supported them with the implementation of energy efficiency measures. It will also illustrate the role played by the public and private sector in the funding process and finally draw conclusions on good practices that can be identified across the Member States to finance energy efficiency improvements.

4.1 Innovative and traditional schemes

The analysis of the second EEAPs shows that Member States have adopted a wide range of financing instruments to finance energy efficiency. These financing tools include, on the one hand, more 'traditional' schemes such as grants and loans used in combination with other fiscal incentives, rebates on the purchase of the most energy efficient products and the use of revolving funds, and, on the other hand, innovative market-based instruments such as Energy Performance Contracting (EPC), Energy Services Companies (ESCOs) and the monetisation of surplus of AAUs to finance energy efficiency improvements. The use of revenues derived from the sale of surplus AAUs to finance energy efficiency improvements was reported in Czech Republic, Hungary, Latvia and Lithuania, while Estonia, Poland, Slovakia and Bulgaria have also engaged in such transations (Point Carbon 2012)[54] .

While all known AAU deals were conducted through Green Investment Schemes (Point Carbon 2012) (whereby the seller government commits itself to using the revenue for investments that lead to verifyable GHG esmission reductions), these schemes are implemented in a variety of ways. Poland reported in the EEAP that the funds obtained from the sale of the AAUs were used for the Green Investment Scheme, resulting in helping the buyer countries (e.g. Spain) in meeting their Kyoto obligations, while providing financial resources for projects that reduce greenhouse gas emissions in Poland. Hungary reported the use the revenues from allowance trading in combination with other EU funds, while Latvia made a clear distinction between these financing sources when reporting on their use.

France reported the use of favourable interest rates for mortgages linked to energy efficiency criteria and the introduction of zero-rated eco-loan to finance energy retrofitting in low-income households, lower VAT rate for renovation work and exempting from property tax those buildings in which significant work eligible for the Sustainable Development Tax Credit had been carried out.

Regarding fiscal incentive mechanisms Finland reported on their "Energy Tax" system, which allows the government to re-distribute the revenue from the tax applied on excessive energy use to citizens according to their income.

[54] Point Carbon 2012. Carry-over of AAUs from CP1 to CP2 – Future implications fro the climate regime. http://carbonmarketwatch.org/wp-content/uploads/2012/11/AAU-banking-briefing-paper-Point-Carbon.pdf

4.2 Financing tools in the building sector

The information provided in the EEAPs shows that financial measures in the building sector represent the largest share of the budget allocated by the Member States to energy efficiency. Next to market-based mechanisms such as ESCOs and Third Party Financing (TPF) that enable the end user to carry out energy efficiency activities without having to provide upfront capital[55], many EEAPs reported on the subsidies and tax incentives granted from state funds for the energy efficient renovation of residential buildings. Some good examples are: the 55% tax allowances for the energy upgrading of existing buildings in Italy; the Austrian residential building subsidy scheme for thermal insulation and renewable energy and the Development Tax Credit in France, which allows individuals to claim a tax credit when purchasing the most energy efficient materials or equipment. Germany provides a large number of measures promoting the energy-related renovation of existing buildings, the use of renewable energies through long term low-interest loans and direct investment grants. The KfW programme described in the EEAP can be considered one of the most successful measures for renovations, which will be followed by a long term renovation roadmap targeting nearly zero-energy building standards for renovation by 2050.

In the Netherlands, the national grant scheme "More with Less" offers grants to home owners who implement energy-saving measures, while in Ireland "Better Energy Homes" provides grant aid for domestic energy efficiency retrofits and advice for residential energy users. Luxembourg and Finland have both established subsidies schemes whereby thermal envelope refurbishment is integrated with building equipment measures.

With reference to domestic energy efficiency retrofits, Denmark, Latvia, Luxembourg and the UK provide subsidies for scrapping oil-fired boilers whilst Bulgaria, Finland, Greece, Ireland, the Netherlands and Portugal offer incentives for the upgrade of heating systems in existing buildings. Poland and Romania also allocate substantial state funds for the thermo-modernisation of housing units.

Nevertheless, whereas many Member States mention the importance of creating a favourable environment and promoting energy services for buildings, the general performance level in this field remains low. The best examples presented in the second EEAPs are the detailed analysis of the energy contracting market in Germany and the definition of clear objectives for energy services in tertiary buildings in Spain (together with supporting measures such as aids for energy audits to prepare contracts and for energy efficiency investments within energy services contracts).

Most of the second EEAPs include estimates of public budgets or investments made in buildings in 2008-2010 and planned for 2011-2016. Fewer have estimated the investments from the private sector[56]. The most frequently mentioned difficulty encountered by the Member States towards achieving their objectives is related to the funding needed in a time of economic crisis. This applies both to public funding, which is affected by budgetary restrictions, and to private sector funding, which suffers from smaller revenues and worse financing conditions. In fact, various Member States highlighted their difficulties in funding

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[55] For further information on TPF and ESCOs, please refer to section 4.6 Horizontal measures promotion of energy services, ESCOs, TPF.

[56] An example is the estimates made in the Spanish second EEAP about investments needed for the 2011-2020 plan, distinguishing public aids and private investments, and where a significant leverage effect is expected (about 5€ of private investments for each euro of public investment).

planned measures or less investment from the private sector (Estonia, Greece, Hungary, Italy, the Netherlands and Romania).

While support for the construction sector has often been a way for revitalising the economy, only few Member States (Austria, France and Germany) explicitly mentioned measures for energy efficiency in buildings related to their recovery plan. Nevertheless, access to EU funds, market based mechanisms (obligation schemes, tax depreciation, developing energy services market) and public-private partnerships' investments have supported some of the Member States to overcome the funding problems regarding energy efficiency improvements.

4.3 The use of EU Funds to finance energy efficiency programmes

Considerable resources to finance energy efficiency measures as reported in the 27 EEAPs have been made available at EU level through various instruments aimed at assisting Member States in supporting the implementation of energy efficiency projects and facilitating the associated investments.

EU Cohesion policy funding has increasingly focused on investments in energy efficiency and renewables in line with the Europe 2020 Strategy for smart, sustainable and inclusive growth and the related 20-20-20 targets. In support of these objectives, an amendment to the European Regional Development Fund (ERDF) Regulation in 2009 allowed all Member States to allocate up to 4% of their national allocation to energy efficiency and renewables in the residential sector.[57]

In this context, EU Structural Funds available for eastern European Member States play a significant role in financing energy efficiency projects, as highlighted in the EEAPs of Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovenia and Slovakia, as well as in the EEAPs of France, Greece, Italy and Malta. Furthermore, the use of the ERDF for the improvement of energy efficiency in public buildings and utility facilities was highlighted in the EEAPs of Czech Republic, Italy, Lithuania, Poland, Romania, Slovakia and Slovenia.

Some Member States that meet the relevant criteria are also offered the possibility to invest some of their Structural Funds allocations in financial instruments in support of urban development and energy efficiency programmes, through the Joint European Support for Sustainable Investment in City Areas (JESSICA) initiative[58]. These financial instruments invest in public-private partnerships and other projects included in integrated plans for sustainable urban development. Although not all the EEAPs reported information related to energy efficiency projects financed by this initiative, Bulgaria, Czech Republic, Estonia, Germany, Greece, Italy, Lithuania, Poland, Portugal, Spain and the UK have made use of this financial mechanism either in the form of a Holding Fund (HF) or Urban Development Fund (UDF).[59]

To complement the JESSICA facility, the ELENA Technical Assistance Facility (launched in 2009) aims at providing co-financing to local and regional authorities for the development and launch of sustainable energy investments in their territories. About a third of these

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[57]Regulation (EC) No 397/2009 OJ L 126, 21.5.2009, p 3.
http://ec.europa.eu/energy/efficiency/consultations/doc/2012_05_18_eeb/2012_eeb_consultation_paper.pdf

[58] JESSICA provided technical assistance for Member States. Its objective was to assist Member States in the implementation of financial instruments for urban development and regeneration

[59] How does JESSICA work?: http://ec.europa.eu/regional_policy/thefunds/instruments/jessica_en.cfm#3

investments address the buildings sector and energy performance contracting. The use of the ELENA financial mechanism was highlighted in France, Greece, Italy, the Netherlands, Portugal, Spain, Sweden and in the UK and has also been used to co-finance the EU Covenant of Mayors activities within various cities across the Member States[60].

Support from the EU Funds is expected to increase in the upcoming years, as Member States will have to devote a substantial share of their European Regional Development Fund (ERDF) allocations to support investments in the fields of energy efficiency and renewable energy: at least 20% in more developed regions, 15% in transition regions, and 12% in less developed regions (this share will go up to 15%, if a Member State decides to use also the Cohesion Fund for the same purpose).

4.4 Public-private funding mechanism

The strong supporting role of the public sector in financing energy efficiency improvements was highlighted by most Member States. However, budget contribution from the private sector is still relatively small.

Many EEAPs mentioned the use of public-private partnerships (PPP) or energy performance contracting, which uses cost savings from reduced energy consumption to repay the cost of putting in place energy conservation measures, as an important instrument, although few EEAPs report a significant uptake of these tools (beyond demonstration projects).

With regards to PPP, Germany reported on successful examples being awarded the "Good Practice Energy Efficiency" label of the German Energy Agency. The agreement signed between the Energy Agency in Berlin and the Romanian Agency for Energy Conservation represents a mechanism for sharing relevant experience. Austria and Belgium have created a specific agency to develop performance contracting in public buildings (respectively the Federal Real Estate Contracting and Fedesco), while Estonia has established a centralised service (State Real Estate Ltd.) to supervise the energy efficiency actions for public buildings. Spain has set specific objectives regarding the number of public sites (central and local administrations) to be covered by energy services contracts with ESCOs. A third of the EEAPs mentioned measures in order to create more favourable conditions for performance contracting or other energy services especially through the drafting of model contracts (Finland, France, Hungary, Italy, Poland and Romania)[61] and/or to support pilot projects (Estonia, Greece, Ireland and Luxembourg).

To increase energy efficiency levels in across sectors (e.g. industry, public sector, SME's) some Member States (Germany, Ireland, Malta, the Netherlands Poland, Romania, Slovenia, and the UK), have also launched energy efficiency funds at national level. Moreover, the EEAPs of Bulgaria and Romania include measures that build on existing credit lines for energy efficiency projects from international financing institutions.

Other alternative funding mechanisms reported in the EEAPs are the Public Sector Energy Efficiency Loans managed by a private bank (UK) and a *bonus/malus* system where part of the regular funding assigned to certain administrations or institutions is frozen unless they meet specific carbon or energy efficiency targets (France and the UK).

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[60] Maximising investment in sustainable energy (ELENA): http://www.eib.org/products/elena/index.htm.
[61] Romania also reports on participation in the European Energy Service Initiative (EESI) project for experience sharing: http://www.european-energy-service-initiative.net.

A popular approach for public support is to provide financial incentives (e.g. soft loans and financial guarantees[62]) as opposed to direct aids (e.g. subsidies and tax credits). This is perceived as creating higher leverage effect or ensuring better sustainability of funding (e.g. through revolving funds).

Market-based approaches also include an increased role of energy companies through obligation schemes (e.g. the Region of Flanders in Belgium[63], Bulgaria, Denmark, France, Ireland, Italy, Poland, Slovenia and the UK), facilitating alternative financing solutions (e.g. Public-Households Partnership in the Brussels Capital Region in Belgium; cost recovery mechanisms for landlords in France and the Netherlands; Pays As You Save scheme in Ireland; accelerated tax depreciation for tenants in Luxembourg), or explicitly addressing market failures through enhanced information activities (Sweden) or voluntary agreements[64]. Another common option is to use dedicated funds possibly based on contributions on energy tariffs (the Walloon Region in Belgium, Bulgaria, Denmark, Estonia, Greece, Luxembourg, Malta and Slovenia)[65].

In the UK, the Green Deal, expected to be operational from late 2012, will enable energy efficiency retrofit in homes and businesses to be financed through energy bill savings and, if successfully implemented, would contribute to further support the development of the energy services market.

As for good practice in fiscal incentives, the Enhanced Capital Allowance (ECA) scheme reported in the UK EEAP enables businesses to claim 100% first year capital allowance on the purchase of energy saving equipment on the Energy Technologies List. A similar scheme is applied in the Netherlands, where an additional allowance on taxable profit is provided when designated energy efficient equipment for the generation of renewable energy is purchased. Furthermore, in the UK, as part of the Climate Change Agreements, a tax rebate is provided on the Climate Change Levy for steps taken to improve energy efficiency.

Finally, taxes on energy and transport are widely applied among Member States. Some examples reported in EEAPs include Germany's Ecological Tax Reform (increased petroleum tax rates on motor and heating fuels and a tax on electricity), Denmark's green tax reform and green car tax, Italy's transport tax (comprising of emission specific car tax paid when the vehicle is registered, vehicle tax to be paid annually and fuel tax on transport fuels) and Ireland's carbon tax on petrol and diesel.

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[62] E.g. risk covering fund to reduce the guarantees required from borrowers on the part of the financial entities and facilitation of access to credit for ESCOs.

[63] Obligations on energy distributors to offer grants for roof insulation have been in place since 2009 in Flanders, Belgium.

[64] In 2011Greece has started the ambitious “Building the Future” programme, a partnership between the public sector, construction industry and citizens, aimed at both residential buildings, and commercial buildings (for renovations). The main objective is to make possible investments through voluntary agreements with all parties involved, with a total funding expected of €41 billion. Another example is the ‘More with Less’ programme (2008), a joint initiative of the Dutch government, housing corporations, building companies, the installation sector and energy companies, with the objective for 2020 of making 3.2 million existing buildings 20 to 30% more energy-efficient.

[65] This option was also considered by Slovakia, but finally not implemented to avoid an increase in energy prices, resulting in a significant financing gap.

4.5 Conclusion

The analysis of the second EEAPs indicates that the majority of Member States apply a combination of grants, loans, fiscal incentives and market mechanisms to finance energy efficiency improvement measures, mainly in the building sector.

However, many of the second EEAPs did not include data on the effectiveness of most of the reported financial instruments, which made it difficult to assess the scale of actual investments carried out and the related actually achieved energy savings. This could be due to a lack of sufficient ex-ante and ex-post evaluations or monitoring during the implementation of these financial instruments.

While public-private partnerships for energy efficiency can provide effective means to realise energy efficiency investments, the involvement of the private sector in the funding process still seems to be limited.

Although ESCOs and energy performance contracting[66] are increasingly common in Member States, due to different legislative and regulatory frameworks in place, different maturity of the commercial financial market and the energy services market, their uptake varies significantly between the different countries[67].

It has also become clear that public finance continues to be needed to kick-start the private finance market for energy efficiency. In this context, the use of EU Structural and Cohesion Funds by member states remains crucial to finance energy efficiency improvements.

[66] EPC uses cost savings from reduced energy consumption to repay the cost of putting in place energy conservation measures and ESCOs deliver these energy efficiency improvement measures in a user's facility and pay part or all of the upfront costs, which are paid back with the money saved on the energy bills. In this type of performance based contract, the guarantees are provided for the energy savings achieved.

[67] IEA, Joint Public-Private Approaches for Energy Efficiency Finance, 2011. p. 48.

Table 14 Financing tools reported in the second EEAP

Member State	Grants	Soft loans	Tax incentives	Sale of AAUs to finance EE	Energy Performance Contracting	EU Structural and Cohesion Funds
AT	x	x	x		X	
BE	x	x	x		X	
BG	x	x		x	X	x
CY	x	x				
CZ	x	x	x	x	X	x
DK	x		x			
EE	x	x	x	x		x
FI	x	x	x			
FR	x	x	x		X	x
DE	x	x	x		X	
GR	x	x	x			x
HU	x	x		x		x
IE	x		x		X	
IT	x	x	x		X	x
LV	x	x	x	x	X	x
LT	x	x	x	x	X	x
LU	x	x	x			
MT	x	x	x		X	x
PL	x	x		x	X	x
PT	x		x		X	x
RO	x	x	x		X	x
SK	x	x	x	x		x
SI	x	x	x		X	x
ES	x	x	x		X	
SE	x		x		X	
NL	x	x	x		X	
UK	x	x	x		X	x

5 CONCLUSIONS

Measures to improve energy efficiency in energy supply

As indicated, the ESD does not oblige Member States to report measures addressed at improving the energy efficiency of energy supply. Moreover, savings achieved in the energy supply sector cannot be counted towards ESD end-use energy savings targets. However, the Commission has recommended that supply-side energy efficiency measures be incorporated into national plans. All Member States have listed some measures that are relevant to supply-side energy efficiency in their latest round of EEAPs. Many have dedicated sections in the EEAPs describing or outlining strategies or measures aimed at improving particular aspects of energy efficiency in supply. However, few provide a comprehensive national plan for energy savings covering the whole economy that fully incorporates a plan to improve supply-side energy efficiency. Most have focused only on supply-side measures that are most relevant to end-use efficiency.

Many EEAPs provide details of national efforts to improve the energy efficiency of district heating systems or to ensure more widespread use of existing network. Some EEAPs give details of plans to extend electricity transmission networks to facilitate greater interconnectivity, to provide for increased demand, and to accommodate more generation capacity from renewables. A number of Member States describe in their plans efforts to improve electricity distribution systems through technical modifications and replacement of network components. A significant improvement in the energy efficiency of electricity generation capacity is foreseen by some Member States through the replacement of old power stations with new efficient ones and the increase in the share of electricity produced from renewable sources. While some of the plans provide information about efforts to further the development of smart grids, listed activities are generally small-scale research projects or pilot roll-out programmes for smart meters. In some Member States achieving greater energy efficiency in supply is incentivised through voluntary agreements with energy suppliers whereby supply-side savings can count towards suppliers' energy savings commitments.

Most of the EEAPs contain details of measures to promote the increased use of high-efficiency CHP. Many of the measures listed are aimed at incentivising small-scale or micro-cogeneration in end-use. The national CHP reports provide a better overview of policies put in place and actions undertaken to promote cogeneration, although CHP reports from a number of Member States have not been received.

The CHP national reports indicate that the most common type of support for CHP is a fixed feed-in tariff or guaranteed purchase price for electricity produced by cogeneration. Measures that provide capital grants for investment in high-efficiency CHP are common to most of the Member States that provided reports. Tax exemptions or favourable conditions for writing off capital costs are used to provide additional incentives for investment in cogeneration. In some countries CHP is further supported through existing green certificate or white certificate schemes.

The CHP national reports indicate that the most significant barriers to the growth in cogeneration are high fuel prices and fluctuations in the difference between electricity and input fuel prices, uncertainty about the level of heat demand. In several countries the lack of suitable infrastructure, in particular the lack of a natural gas network, is seen as a significant barrier to CHP development.

Based on the limited figures available from the CHP national reports it is apparent that, despite all measures, there has been very little growth in the amount of electricity generated from CHP facilities in the Member States since 2007.

Measures to improve energy efficiency in end-use consumption

Most Member States do not include inputs from assessments of savings potentials in buildings, the key sector for achieving energy savings in the EU. Furthermore, none of them referred to any kind of potentials when presenting objectives or results. At the same time, Member States have assessed energy savings expected in 2016 (and sometimes in 2020) of the measures presented in this field. For many of them, the resulting estimates mean a large increase in savings between 2010 and 2016, which implies a significant change of scale (often a 5 to 10-fold in annual rate of actions or savings). This raises critical issues regarding the availability of funding and skilled staff.

No Member State has reported technical problems which would impede the realization of the energy savings potential, indicating the availability of technical solutions. Main difficulties reported are linked to funding and/or the involvement of building owners. The supply side of energy efficiency in buildings is seldom analysed, but some Member States have presented measures to support the involvement of building professionals and the development of new offers.

As regards existing buildings, three main challenges emerge:

1) Avoiding lost opportunities (ensuring that criteria for energy efficiency are taken into account when regular refurbishments take place): the use of requirements for existing buildings seems still to be insufficient in this respect in many Member States.

2) Increasing the rate of refurbishments (volume of actions): funding remains a key issue, as highlighted in the second EEAPs, especially with the crisis affecting both the public budgets and the private investment capacities. Innovative mechanisms aim at guarantying the investments and/or favouring cost recovery over the action lifetime. Their actual leverage effect could be one of the keys to support the needed change of scale.

3) Reaching a high level of energy performance and avoiding possible lock-in effects (quality of the actions): an increasing number of incentives are linked to global performance requirements. However incentives whose amount is based on the type of action still remain the main practice.

In addition to the energy dimension of the upgrade of the building stock, the context of economic crisis and increasing energy prices has raised the acuteness of the issue of fuel poverty. This has been addressed more or less explicitly in a growing number of EEAPs.

As regards new buildings, regulation remains the leading instrument. The new objective of nearly Zero Energy Buildings will likely represent a breakthrough for the construction industry. Forerunners have indeed emphasised measures supporting R&D and the dissemination of innovation. In the meantime, compliance is seldom discussed, while it is of upmost importance to ensure the effectiveness of regulations. Another issue rarely addressed in the second EEAPs is that the more efficient the buildings, the bigger the influence of behaviour.

Furthermore, there is sometimes a large discrepancy between the savings reported for 2010 and the ones for 2016 in buildings, while there are very few explanations about how the change of scale will be accomplished: this shows the necessity of defining detailed and comprehensive roadmaps for energy efficiency in buildings. Besides funding mechanisms, training activities are another key area not addressed enough in many second EEAPs. The Build Up Skills initiative could be a European supporting measure to change this trend.

Intermediate savings figures for various Member States show that economic growth has a significant influence on energy efficiency progress in the industry sector. A prolonged period of recession experienced by several Member States since submitting their first EEAPs has resulted in lower than expected rates of energy savings in the sector. The EEAPs anticipate that industry will account for a greater proportion of the total savings in the future. The ability of all Member States in the EU to return to positive growth will be an important factor in determining whether energy savings targets for the industry sector will be met.

Voluntary agreements in manufacturing, in which large industrial energy users commit to a programme of energy savings and to putting in place energy management systems, have proven to be a successful means of encouraging the sector to pursue its own energy savings opportunities. Member States that do not have such agreements in place are encouraged to establish programmes that assist industry energy users to adopt a more strategic approach to energy management. Voluntary agreements programmes can complement existing financial measures such as grants and loans for energy efficiency investments in industry, and can provide a platform for dissemination and exchange of information on rational energy use.

The ESD requires Member States to provide small energy users, including SMEs, with access to energy audit programmes that can help them to identify and address energy savings opportunities. Many EEAPs do not clarify whether national energy audit programmes exist or are accessible to SMEs. While some EEAPs mention energy audit programmes for industry, the extent to which these are suited to the specific requirements of SMEs is not clear. Member States should ensure that audit schemes are in place that are accessible to SMEs and these should be described in the EEAPs. In addition, it is recommended that information and supports for SMEs be tailored to suit the needs of small energy users.

As regards the transport sector, clear, consistent strategies towards more energy saving modes of transport remain limited. This is especially worrying because in some Member States the transport sector is highlighted as a major contributor of energy savings towards 2016. At the same time the review of the second EEAPs did reveal some positive practices in the transport sector. These include measures aimed at increasing the use of public transport, as well as inter-modal transport initiatives, with relevant actions reported by about a third of the Member States.

Based on information provided in the second EEAPs agriculture is the least favoured sector for implementing energy saving measures, with only ten Member States reporting relevant policy initiatives. Successful programmes communicated by the Member States include the state subsidy for fuel switch to renewables in boiler houses in Finland, and the use of CHP in greenhouse cultivation in the Netherlands.

With relevance to the exemplary role of the public sector, clearer reporting and better compliance with public procurement requirements (as set out in Annex VI of the ESD) is a key issue, as only half of the Member States demonstrated fulfilment of these requirements. Furthermore, while positive examples such as setting quantified energy saving targets in the public sector (in Ireland), implementation of energy management systems and voluntary agreements for energy savings at local authorities (in Luxembourg and Denmark respectively) have been reported, the expansion of these good practices among Member States would be necessary.

About third of the Member States demonstrated in their second EEAP that the provision of information and advice forms an integral part of their energy efficiency policy, presenting a strong set of diverse information measures complementing other types of action. However, limited detail on implementation and failure to designate information measures remain a problem in some cases. Measures related to informative metering and billing are becoming more widespread, with a third of the Member States reporting on the use, planned rollout or pilot phase of smart meters.

Financing instruments

Many promising financing tools to finance energy efficiency programmes have been identified across the second EEAPs. These instruments range from financing energy efficiency projects through the sale of AAUs as reported in the EEAPs of some new Member States, as well as the use of EPC and revolving funds. Energy tax systems are applied on excessive energy use parallel to more traditional financing mechanisms such as favourable loans, grants and tax incentives, especially in the residential sector.

Overall, among the second EEAPs, the use of EU Structural Funds to finance energy efficiency programmes is clearly visible. As a result of the recent increased EU Cohesion policy funding on energy efficiency and renewables, many Member States will be able to focus even more on financing energy efficiency programmes in the residential sector.

Financial measures in the building sector represent the largest share of the budget allocated by the Member States to energy efficiency. Energy certification of buildings plays a major role in this context and it has been clearly emphasised in many EEAPs.

Although the majority of the Member States have opted to report separately on the requirements of EPBD, many measures promoting the objective of the directive have been reported in the second EEAPs. These range from financial incentives to encourage the construction of nearly zero energy buildings and various instruments to promote energy efficiency measures in existing buildings. These include long term low-interest loans and grants for the installation of systems which utilise renewable energies for space heating, hot water production or electricity generation.

In the public sector, a large amount of funds have been allocated through Operational Programmes to improve energy efficiency in buildings and utility facilities. Significant national funding has also been provided by some Member States to co-finance energy efficiency investments in public infrastructure. However, overall, private investment contribution is still very low compared to national/EU funding.

Achieved and forecasted savings

Many different approaches have been applied in the EEAPs to calculate savings achieved in 2010 and savings forecast for 2016. Some Member States choose to show only savings that can be attributed to measures by providing bottom-up figures only, while others declare top-down figures incorporating all energy efficiency improvements whatever their origin. Some EEAPs present top-down figures for all sectors complemented by bottom-up figures for measures for which savings can be assessed. Some add top-down figures for some sectors to bottom-up calculations for others to determine total savings. In some EEAPs no information or inadequate detail is provided about how the savings figures were determined. Top-down methods are generally in line with those recommended by the Commission while bottom-up methods are typically national methods that are described with varying levels of detail in the EEAPs.

Given the different approaches used to calculate savings, the different interpretations of qualifying savings, the very high levels of savings declared by a number of Member States, and the lack of information about calculation methods in some cases, it is difficult to quantify overall savings and assess the extent to which these can be attributed to energy efficiency policy measures undertaken by the Member States. Nonetheless, summing up declared intermediate figures for the 27 Member States gives approximately 59 Mtoe of annual final energy savings up to 2010. In most cases intermediate figures exceed targets given in the first EEAPs. Total forecast final energy savings for 2016 amount to around 132 Mtoe, equivalent to 13.3% of reference energy consumption for all Member States.

The figures on their own indicate that savings are well ahead of ESD targets. However, a clear relationship between the quantities of savings stated in the reports and the quality of policy measures presented in them is not discernible. Also, given the differences in calculation methodologies, the performance of Member States relative to each other cannot be determined by comparing their percentage savings figures alone. Figures should provide a better indication of the level of energy savings activities in each Member State. A greater effort must be made by Member States, with the assistance of the Commission, to ensure a more harmonised approach to calculating energy savings is applied in the next round of EEAPs.

An approach to estimating the contribution of ESD-related savings to the EU 2020 primary energy savings target has been developed based on the energy savings patterns given in the EEAPs. By leaving aside differences in methodologies and by assuming that all savings figures given in the national plans are correct and that each unit of savings declared is the same regardless of calculation method, an ESD-related primary energy savings figure of between 211 Mtoe and 287 Mtoe in 2020 has been estimated. This estimate excludes savings that may be achieved by economic sectors outside the scope of the ESD. Just as forecast savings exceed the ESD indicative target for 2016, the estimated ESD-related primary energy savings are between 56 Mtoe and 93 Mtoe in excess of the ESD target extrapolated to 2020. The accuracy of the estimates is of course highly dependent on the reliability and comparability of savings figures from the EEAPs.

ANNEX 1 EEAP COUNTRY SUMMARIES

AUSTRIA

Summary

The Austrian EEAP provides a good overview of current energy efficiency efforts in the Member State. Figures for 2010 indicate that energy savings achieved by measures exceeded the intermediate target by a factor almost 3[68], indicating a strong performance since 2007. Most of the savings are accounted for by measures addressing energy use in residential buildings, with relatively small contributions from other sectors.

The descriptions of some of the measures are, however, insufficient. The report lists comprehensive sets of information measures and measures addressing energy efficiency in the public sector. However, quantified savings due to these measures in the public sector are low. The too brief descriptions of measures, coupled with relatively low savings calculated using bottom-up methods, make it difficult to assess energy efficiency achievements in the transport and industry/SME sectors.

Austria has chosen to measure progress towards its energy savings target using bottom-up methods and thereby endeavours to include only savings achieved by policy measures. Achievement of the 2016 savings forecast relies heavily on the contribution of energy efficiency measures implemented well before 2008[69]. While the bottom-up projection of savings in 2016 shows a small shortfall with respect to the 2016 target, Austria could demonstrate that the target can be achieved by measures with minimal additional effort.

General evaluation

Austria's second EEAP provides an update of energy efficiency progress in the Member State since 2007. It presents energy savings in 2010 attributable to measures and forecasts savings in 2016. It provides brief descriptions of measures, explains some of the energy savings calculation methodologies, and gives more detail on selected aspects of the ESD.

Austria uses bottom-up methods to quantify energy savings and validates some of its figures using top-down methods. A comprehensive set of top-down indicators, based on recommended methods, is presented in the document. The report estimates intermediate savings that are far ahead of target. However, most of the savings are accounted for by early actions undertaken already in the period 1991 to 2007. Bottom-up calculations are made using national methods that are broadly similar to Commission recommended methods.

For the sub-sector dominating the savings (heating and hot water in households) the bottom-up savings are a multiple of those quantified using top-down methods. The report suggests that high rebound effects in households account for the difference. Currently implemented measures are projected to achieve savings that are slightly lower than the 9% indicative target of 80,400 TJ. The projection does not take into account savings achieved by any future measures or autonomous savings.

Measures aimed at improving energy efficiency in buildings account for most of the bottom-up savings. Those measures include subsidies, building standards and energy advice for households. Financial support measures in forms of soft loans and/or grants to improve the thermal quality of residential buildings as well as heating systems account for most of the

[68] Two thirds of savings result from early actions taken in the period 1991 – 2007.
[69] Dating back until 1991.

savings. Three measures address the provision of such public support to private households for renovation of existing and for new buildings. The too brief descriptions provided for each do not make it clear how they differ from each other nor how they interact. Reporting requirements of the EPBD are not directly addressed. No specific target concerning buildings has been presented, despite some very good measures for this sector, including tightening of the building codes requirements for both renovation and new buildings.

The EEAP does not include a comprehensive overview of supply-side measures as such. However, some measures related to district heating and CHP systems are thereby described. The report indicates that subsidies are provided for district heating systems, pipelines and distribution networks. In addition, investment grants are available for new CHP plants and subsidies for existing CHP facilities that provide public district heating. Additionally, federal states use different instruments to promote and extend district heating systems, including compulsory connections in some cases.

For industry and SMEs (32% of final energy consumption) savings are attributed to one listed measure only, which consists in providing advice, information and subsidies to enterprises, The measure is not sufficiently described. Elsewhere in the document an 'energy efficiency voucher' for SMEs is briefly explained, the availability of energy audits is described, and savings attributed to energy audits in 2010 are quantified. It is unclear if these are part of recorded industry savings.

The EEAP gives a very brief description of a number of measures addressing energy efficiency in the transport sector (32% of final consumption). For the most part, savings cannot be quantified using bottom-up methods. Top-down calculations presented elsewhere in the report suggest small energy efficiency improvements in 2008.

A number of horizontal measures are listed, ranging from fiscal measures such as energy taxes and excise duty to information measures such as training and energy labelling. For two of those measures, energy savings are recorded but no descriptions are given.

Voluntary agreements with a number of energy distributors and energy sales companies have been put in place whereby companies are induced to achieve specific savings targets using measures that can be freely selected by them. The company targets are given and the achieved savings in 2010, adjusted for double-counting, are quantified in the report. The extent to which member companies have achieved their targets is not clarified, nor is it clear how the savings have been incorporated in overall bottom-up savings figures.

The exemplary role of the public sector is highlighted in the EEAP with most of the energy saving measures introduced already before ESD entered into force. These comprise extensive renovation of public buildings through contracting and procurement of products and services as part of the federal real estate contracting, the central federal procurement agency as well as actions undertaken by the regions ("Länder"). For the public sector measures presented, a total of only 0,278 PJ savings could be measured in 2010. The exchange of good practices between public sector bodies is facilitated and enabled by several listed information and advice actions. The obligations related to Annex VI of ESD on public procurement have been fulfilled.

The Federal Procurement Act governs public procurement in Austria[70] and since 2007 environmental aspects, including energy efficiency criteria have to be considered in the award procedure. It has not been specified in the EEAP if Austria facilitates this process by

[70] Market share of 17%.

publishing clear guidelines on energy efficiency and energy savings as possible criteria in competitive tendering. On a more general level, the action plan for sustainable public procurement of 2010 serves as a guideline for procurement of environmentally friendly products and services.

Provisions of information and advice form an integral part of implemented actions. Regional energy agencies, energy saving associations and energy institutes serve as focal points and competence centres for energy efficiency. Information is made available by a wide range of advertising and information campaigns, on federal and state level as well as by energy utilities. 'Klima:aktiv' is the most comprehensive climate protection initiative. Several "Länder" and energy utilities offer individual advice or internet services. The measures range from provision of information by phone to comprehensive advice prior to implementation of specific measures often linked to residential building subsidies offered by "Länder".

Strengths

- The EEAP presents a realistic strategy of implementing EE in all economic sectors, but relies almost exclusively on savings in residential buildings. Implementing measures are accompanied by several information and advice actions that help to address knowledge and awareness gaps.
- The calculations presented indicate that Austria has exceeded its 2010 intermediate energy savings target considerably, aiming to show the success of the national energy efficiency strategy, though early actions dating back to 1991 are included.
- Austria has successfully introduced an energy performance contracting programme for public buildings. Although with low savings reported so far, it can be expected to generate more savings in the future.
- Austria has chosen to assess the progress towards energy savings targets using bottom up methods and thereby has endeavoured to include only savings achieved by energy efficiency measures in declared savings data.

Weaknesses

- Not all measures have been described in clear way. Descriptions of many measures listed are inadequate (e.g. G.1, V.2, I.1) or are completely missing (e.g. H.6, H.7). Three measures are categorised as "subsidies" for the residential sector. None of these subsidies has been sufficiently explained and the differences, synergy and possible overlap between them are unclear.
- The achievement of the calculated ESD targets is heavily dependent on the building shell and heating savings in the residential sector, with approximately 80% of the 2010 declared savings being attributed to energy savings in these buildings. The proportion of savings achieved by transport and industry (with almost 2/3 of final consumption) and the number of measures addressing these sectors are relatively small (approximately 12%).
- Combined savings attributed to measures implemented in the public sector amount to less than 0.5% of the 2016 target. Considering the exemplary role of the public sector, and given the good practices in the sector, a higher level of savings would be anticipated.
- For the industry/SME sector, the top-down savings figure is very low when compared to the 2005 industry energy consumption figures given in EEAP1, excluding EU ETS

participants. Again, the figure is lower than the bottom-up figure for the sector. The top-down figure suggests that EE improvement in the industry sector has been slow.

Recommendations for improvement

- Austria could provide more comprehensive descriptions of some important measures that have been implemented. The differences between measures that provide subsidies to enhance the thermal quality and heating systems of buildings, for example, should be clearer.
- Where measures are grouped together to assess total savings, some indication could be given on which of the measure(s) has been the most critical in achieving the aggregate saving.
- Comprehensive assessment of achievable savings should be made in transport (providing grounds for essential assumptions e.g. "price-induced export of gasoline/diesel" due to "motor fuel tourism", mainly near the German border), but also in the supply sector as well as in industry.
- A comprehensive assessment of the savings achieved by measures in the public sector would be useful.
- Greater effort should be made to reconcile top-down results with bottom-up savings. In some cases, the savings results from the top-down analysis are lower than those given by bottom-up methods. It could suggest that figures may be inaccurate due to rebound effects, or measurement or calculation errors. In the case of heating in households, higher bottom-up savings are attributed to rebound, but the level of rebound effects necessary to account for the difference would be very high. As attainment of the 2016 target is heavily dependent on households achieving projections calculated using bottom-up methods, a significant error in the calculation could jeopardise the achievement of the ESD target, requiring stronger efforts in other sectors.
- With the methodology chosen to measure energy savings using bottom-up calculation (including early actions), the projection of savings attributable to existing measures in 2016 shows a shortfall with respect to the 9% target. Austria may need to put in place some new measures or adjust existing measures to achieve greater savings in order to reach its ESD target for final energy savings in 2016 and the future 2020 target for primary energy savings as required by the new Energy Efficiency Directive.

BELGIUM

Summary

An overall improvement in Belgian reporting compared to first EEAP is the provision of an umbrella country level action plan with the aim to summarize the Federal and the three regional Energy Efficiency Action Plans (EEAPs). The national energy saving targets is reported to be the sum of respective regional targets in order to meet Belgium's obligation as a Member State. All the regional/federal parts of the Plan have been are structured according to the template and method recommended by the Commission. However, they still differ in detail, consolidation of applied methods and described measures. This reflects the fact that the overall country strategy is a set of parallel strategies alongside each other. The fact the federal and regional documents comprising the overall second EEAP are still not sufficiently integrated creates some lack of clarity on the overall national targets and the savings achieved.

On the positive side, each of the EEAPs contains various good practices that capture the spirit of the ESD, especially in the public and transport sector. The federal part and all four regional parts well address the public sector and information provision obligations. Integrated packages of measures where the comprising elements (e.g. regulatory, financial, information measures) mutually support each other represent a further strong aspect of Belgian energy efficiency policy, as outlined in second EEAP.

General evaluation

Intermediate 2010 energy saving targets have been adopted by all regions within their second reports. Belgium declares with its second EEAP that the national targets for 2010 and 2016 amount to the sum of respective regional targets. The absolute saving figures for all second EEAP are henceforth reported in final energy and expressed in the same unit.

The methodology to quantify energy savings varies according to region and sector leading to figures being presented in final energy consumption and/ or primary energy equivalent. A top-down approach is used to quantify some savings and bottom-up for others. A combination of EC recommended and national methodology is applied. It is not possible to determine the contribution of early measures or autonomous effects. The methodology, underlying assumptions and data, is documented in various degree of detail in the annexed EEAPs.

Overall, the Belgian second EEAP, the four EEAPs for the Federal State and the regions of Brussels-Capital, Flanders and Wallonia are in line with and build upon their first action plans. The new reports refer back to the first and provide an evaluation. Compared to the first action plan, the Flemish second EEAP introduced five new measures. In the case of the Walloon Region a large improvement of the second EEAP compared to the first EEAP is that it quantifies savings for a wide range of measures and aggregates and compiles the 137 single actions of the first action plan within new measure packages.

All three Belgian regions have opted to fulfil EPBD-reporting requirements within their second EEAP and list those instruments and measures that directly contribute to improving energy efficiency in buildings in order to meet the commitment as set out in Article 10(2)(1) of the EPBD. Brussels-Capital, Flanders and Wallonia have already transposed Articles 14 and 15 on inspection for heating and air-conditioning into regional legislation, and there is therefore no reporting requirement on alternative equivalent measures (as set out in paragraphs 14.4 and 15.4).

As indicated by all four Belgian EEAPs, provision of information and advice forms an integral part of implemented measures with a clear focus on buildings and transport. The plans include numerous information provision actions, which are often part of integrated packages that include financial support (subsidies, tax incentives) to promote implementation of certain regulatory provisions. Measures target citizens, companies and market operators to inform final customers on energy end-use efficiency and on how to change consumer behaviour. Information and advice measures also include dissemination of knowledge regarding the energy services market, metering, green certificates, audits, as well as certification and accreditation of energy experts.

The exemplary role of the public sector is clearly highlighted in all four Belgian EEAPs for Federal and regional level. The Federal EEAP includes Fedesco, a government agency created in 2005 to promote TPF in Federal buildings, and Belesco, a non-profit organisation gathering main operators on the recently created energy services market to share experiences and disseminating information about ESCOs. Further measures are the application of EMAS and the promotion of public transport: 70,000 civil servants receive a free season ticket for rail commuting and can apply for a cycling allowance. Exchange of best-practices between public sector organisations is institutionalised between State and Federal regions through ENOVER/CONCERE consultative groups.

All four action plans refer to public procurement geared towards energy efficiency to fulfil the obligations under Article 5 of the ESD by introducing a combination of measures which refer to all items of Annex VI. This process is facilitated by publishing guidelines for considering energy conservation in public procurement. The Federal government introduced the Federal Action Plan for Sustainable Procurement (2009-2011). Furthermore, practical support for purchasers is provided by the unit 'Purchasing policy and Advice' and sustainable development units have been established within each Federal government department.

None of the EEAPs for the regions in Belgium describe strategies to address all aspects of the energy efficiency of supply. However, the plans for Flanders, Wallonia and Brussels-Capital do have significant measures promoting greater use of CHP. In Flanders, a cogeneration certificate system exists whereby certificates are issued to CHP facilities according to the amount of energy they are deemed to have saved. Energy suppliers are required to acquire a quantity of cogeneration certificates that is in proportion to the amount of energy they supply. Flanders also provides subsidies to local authorities installing micro-CHP plants and tax incentives to the agriculture sector for investment in CHP. In Wallonia, the region's green certificate scheme is used to support CHP. Additionally, investment subsidies are available in Wallonia for both private and public sectors for applications that can demonstrate energy savings of at least 10%. In Brussels-Capital, grants for cogeneration are available and its green certificate system is also applied to CHP. A multiplier coefficient is used to calculate green certificates to be allocated to gas-fired CHP installations in collective housing blocks in Brussels to provide further incentive.

Strengths

- A national EEAP is presented for Belgium summarizing the main points of the three regional and the Federal second EEAP in a unified way according to the template provided by the EU Commission. This contributed to delivering five well-structured and clear documents.
- The Belgian EEAP underlines the strong performance of Flanders and Wallonia with respect to 2010 intermediate target of the ESD. The EEAP contains a number of good practices, especially in the public and transport sector (TPF in Federal buildings through Fedesco; Belesco to promote the energy services market; extensive renovation of public buildings through promotional programmes, contracting and procurement; application of EMAS and promotion of public transport).

- Provision of information and advice with a clear focus on buildings and transport forms an integral part of implemented measures presented by all plans. The actions are often part of integrated packages that include financial support to promote implementation of certain regulatory provisions. Measures target citizens, companies and market operators and embrace dissemination of knowledge regarding the energy services market, metering, green certificates, audits, certificates and accreditation of energy experts.

Weaknesses

- While an "umbrella document" is presented and the information has been organised according to the template and methods recommended by the European Commission, the EEAP is not fully integrated to form a single national strategy and to allow an easier judgement on feasibility of achieving the national level energy saving targets.
- The summary document presents intermediate and final indicative targets, as well as related savings achieved and expected according to regions, with no national overall energy savings for 2010 and 2016 communicated. Calculation of the overall achieved and expected savings in Belgium is difficult, *inter alia* because of the lack of data for the Region of Brussels-Capital.
- The combined result of measures implemented in different parts of the country is not fully clear. The fact that the different regions use different saving calculation methodologies also reflects that the overall country strategy is a set of parallel strategies alongside each other, adding to the complexity of measuring and verifying impacts at the level of the country.

Recommendations for improvement

- Consistency and consolidation of the summarizing national EEAP and accompanying four EEAPs for the Federal State and the three regions (Brussels-Capital, Flanders and Wallonia) should be improved further, to collate the described measures in a coherent single national strategy and to allow judgement on feasibility and appropriateness of the group of proposed actions.
- The "umbrella document" should focus on the overall national targets and the improve reporting on the achieved national savings at the level of the the country.

BULGARIA

Summary

According to calculations supplied in the second EEAP, Bulgaria has exceeded its intermediate 2010 energy saving target by almost 50%. However, the trends reported for the transport sector make it difficult to understand this large amount of savings. While sufficient detail is provided for the top-down calculations, hardly any information is available on the bottom-up ones.

A comprehensive set of measures (regulatory, financing, information, etc.) are presented in all end-use sectors, including transport and agriculture, which can be highly effective if properly implemented. However, the second EEAP provides scarce elements on important operational details – including implementing provisions, monitoring and control – making it difficult to assess the potential effectiveness of the measures.

The second EEAP does not seem overly ambitious, but includes a wide variety of measures targeting all end-use sectors.

General evaluation

The second EEAP targets for 2010 and 2016 (final energy) amount to 2430 GWh and 7291 GWh respectively and have not been recalculated since the first EEAP. In 2010 the achieved savings reported amount to 3549 GWh[71], exceeding the intermediate target by almost 50%. The projected 2013 savings amount to 5892 GWh.

The largest amount of savings (top-down calculations) comes from the transport and industrial sectors that together account for almost two thirds of the expected savings in 2016. However, the second EEAP does not include any details about concrete results or achievements from the few measures in the transport and industrial sectors announced in the first EEAP.

There are no significant changes in the second EEAP with respect to the first EEAP. The major new measures in the second EEAP include individual energy savings targets assigned to energy traders and owners of large public buildings and industrial sites; using the Structural Funds for co-financing energy efficiency measures; measures in the transport sector (insufficient level of details) and the national strategy for nearly-zero energy buildings (nZEB). Various measures have been pursued in another form, which actually shows some progress in the respective field (e.g., loans in the agricultural sector). Various more specific measures have been added, most of them related to the transposition and implementation of European legislation (e.g. EcoDesign).

For public buildings and industrial sites, a combination of energy saving obligations, mandatory audits and energy management is envisaged in the second EEAP. The imposition of individual energy saving targets seems to be a key measure for Bulgaria in the coming years. At this stage, no sufficient details are provided about the design and/or actual implementation of the measure, neither about any possible interactions with other policies, such as voluntary agreements in place.

Bulgaria has reported some measures with relevance to the EPBD implementation without explicitly opting for fulfilling the EPBD reporting requirements within the second EEAP. No measures are reported in the private service sector. It remains uncertain whether any concrete output has been achieved since the start of the first preparatory period for the nZEB, while

[71] Using only the top-down approach, the savings achieved by 2009 were estimated at 5168 GWh.

there seems to be an intention to have national targets starting from 2011. The only clear objective of the second EEAP with respect to nZEB is the development of pilot projects for public buildings in the period 2011-2013.

The second EEAP clearly highlights the exemplary role of the public sector. Thirteen measures are described for the public sector (no reference to private service sector), mainly targeted on buildings (nine measures, out of which three target electricity consumption). The lack of details about implementation, funding and results makes it difficult to assess whether these expected results are realistic or overestimated.

While very few measures explicitly and directly aim at information and advice of final customers, it should be emphasised that the second EEAP relies strongly on measures encouraging or imposing energy audits in the residential, public and industrial sectors. A strong focus is placed on expert workgroups or networks of actors to assist the development of energy efficiency plans in different areas or sectors. Furthermore, measures are included that aim at stimulating energy services, encompassing legal definitions, measurement methods, conditions and procedure for energy performance contracts as well as financing instruments, and potentially the individual energy savings targets that are expected to induce the provision of energy services.

The EEAP briefly mentions several supply-side energy efficiency measures that are planned or are being implemented. Listed measures include feed-in tariffs for renewables and high-efficiency cogeneration, the creation of a 'power exchange', advanced regulatory approaches to stimulate energy efficiency in the energy supply sector, information and training measures, loans and grants for decentralised electricity production including cogeneration. Further general measures related to transmission and distribution of energy are mentioned, including strengthening the role of the energy regulator and promoting investments in new technological solutions such as smart grids, smart meters and demand side management. The plan also mentions extending the existing Energy Efficiency Act to apply to the energy sector, mandatory energy audits for installations, and the development of an energy efficiency programme for the sector. The report states that it is planned to actively support high efficiency cogeneration and to stabilise and develop the district heating sector but details or a timetable are not given. The EEAP includes a description of a grant scheme for commercial energy users that supports the implementation of energy savings technologies including renewable energy technologies and cogeneration.

Strengths

- Well-structured EEAP that attempts to provide a comprehensive set of measures in all end-use sectors, including transport and agriculture.
- The background of the Bulgarian situation is well presented, explaining the main trends observed in energy consumption and highlighting relevant specific factors that have an impact on energy consumption.
- The top-down monitoring is clearly described. Main data used are included for most of the calculations. Adding analysis to explain the top-down calculations and making link policies and measures implemented so far that could explain the observed results would greatly increase the quality of the EEAP.
- An effort has been made to estimate budgets or additional financing needs for most of the measures, but it remains unclear whether some of the reported figures are financial commitments or estimates of financing needs without clear commitment to secure them. The sources of the corresponding funding and the mechanisms to allocate and

provide the funding are often described in a qualitative manner. In case of grants or loans, no detail is given about the amount per action or beneficiary, the eligibility criteria, the exact financing mechanism (in case of loans), total lending activity to date, etc.

- Intentions to use various Operation Programmes under the Structural Funds to implement energy efficiency measures in different sectors.

Weaknesses

- The size of the main energy efficiency programmes included in the second EEAP and assumed to be financed with the EU Cohesion Policy Funds seems to be small compared to the needs.
- The second EEAP stays at a rather general level with a wide range of regulatory measures (mostly implementing EU legislation), plans and programmes, but no indication as to the concrete activities and tasks to enforce existing legislation and/or to implement the existing plans and programmes. It remains unclear whether measures that run since 2006 have so far delivered concrete outcomes.
- There is no clear presentation of the strategies defined for each end-use sector and often it is not obvious what measures could be considered as umbrella policies and what the implementation measures are. It remains to be seen how all these measures will deliver together.
- The objectives and principles of the measures are often well-described, but there is insufficient degree of detail about results to date, even for measures running for several years. For example, the second EEAP includes a lot of regulations, but gives no details about their implementation, especially about how they are monitored and how compliance is ensured. This raises some doubts about the implementation of the measures, and to what extent they will actually achieve the expected savings.
- The second EEAP appears to be postponing a lot of practical action for beyond 2012. It remains to be seen how the gap between the small numbers of demonstration projects and the ambitious objectives for the coming years will be filled up.
- Adding analysis to the top-down results is of particular importance for the transport sector holding the highest share of top-down savings, while at the same time the list of measures reported for this sector reveals that they are mostly expected to deliver savings from 2011 or 2012 onwards.
- The information on key measures (such as the new obligation scheme and the renovation programme) is insufficient, as is the outline of the role of the key bodies (MEET and EEA).
- No details about the bottom-up evaluations of the measures. The description of the measures often include an assessment of savings (mostly expected savings for 2016), however it is almost never explained how these figures have been calculated. Only a few measures include some information about this, such as energy audits for large buildings. Indeed, it seems that most of the savings (large residential buildings, public sector, and industry) have been or will be based on energy audits: this should be clarified.
- In the service sector all measures seem to be focused on public buildings and no measures appear to target private tertiary buildings.

Recommendations for improvement

- The EEAP should provide more details on the actual outcomes and results from measures already in place. The report should also be more explicit about the concrete activities and tasks envisaged to deploy existing measures, especially in the case of regulatory measures (incl. enforcing existing legislation) and/or planning and programming.
- It is recommended to consider significant increase of the scale of the programmes co-financed from the EU Cohesion Policy Funds addressing energy efficiency in buildings. In particular, the programmes addressing existing multi-apartment buildings should be significantly strengthened as this sector probably represents the biggest potential for energy saving in Bulgaria.
- The actions expected to encourage private sector financing contribution should be explained especially as regards planned actions ensure the actual availability of such private financing.
- A short presentation of sectoral strategies (e.g. energy efficiency in residential buildings, in industry, etc.) would improve the structure of the EEAP.

CYPRUS

Summary

The strategy presented in the Cypriot second EEAP is clear, coherent and feasible. With reported savings calculated by bottom-up national methodologies in final energy, and based solely on implemented measures, Cyprus achieves its targets of 3,3% by 2010 and 10% by 2016. The presented regulatory, financial, information and training type measures complement each other and cover all sectors of the economy. They are well-described following the EC's guide and template.

The actions focus on those sectors with the highest energy saving potential (buildings, transport and industry), but the proportion of quantified savings achieved by transport and industry are still comparatively small with the biggest contribution (about 85%) stemming from the residential sector.

General evaluation

The second EEAP confirms the final energy saving targets of the first EEAP. Already in the first action plan, Cyprus clearly committed to a 10% target for 2016, which represents 185.000 toe. For 2010, the first Cypriot EEAP indicated the intermediate target of approximately 3,3%, *i.e.* 60.000 toe. The reference consumption is the average of the yearly final energy consumption from 2001 till 2005 and represents 1.842.730 toe.

Cyprus set its national primary energy saving target for 2020 as a reduction by 463 ktoe compared to a business-as-usual scenario[72]. With the second EEAP Cyprus also submits an action plan for primary energy savings until 2020, presenting additional measures other than those implemented by 2010 with the key strategy to use natural gas in power generation (transformation) after 2015. Also, the potential for savings in road transport is deemed remarkable.

The Cypriot second EEAP is a follow-up of the first EEAP and presents energy saving information for all sectors referred to in the first action plan (residential, tertiary [public and commercial], industry [incl. agriculture], transport, horizontal). The second EEAP refers back to and reviews the first EEAP, lists all measures as presented in the first action plan, along with the estimated savings according to the first reporting phase, and compares them to the calculated savings for 2010 and 2016 of the second reporting period.

The evaluation of the first EEAP reveals that, although, the targets for 2010 and 2016 have been/ will be most probably achieved, most individual quantitative estimates for single measures were not confirmed. This is mainly due to the fact that a number of actions included in the first plan have not yet been implemented, or implementation thereof started later than foreseen, or quantification was impossible due to lack of data.

The savings declared for 2010 (65 ktoe) and forecast for 2016 (190 ktoe) in the overview section of the EEAP include only those achieved by existing measures. The impact of planned measures has not been included in these figures. This may imply that Cyprus has the potential to exceed savings forecasts if planned measures are properly implemented.

In calculating energy savings, national bottom-up methodologies were applied in the majority of cases, due to data limitations in applying the Commission's recommended methods. No

[72] The national business as usual scenario anticipates that in 2020 primary energy consumption in Cyprus would reach 3219 ktoe.

top-down approach was used to quantify eligible savings. The methodology, underlying assumptions and data are described and detailed per measure.

Even though enterprises and industries make a contribution towards the achievement of the targets, the investments made in these sectors appear to be short-lived (in the industrial sector in particular). Moreover, subsidies have been granted for fourteen energy saving investments implemented by enterprises which are subject to ETS and as such cannot be counted towards the ESD 2016 target for final energy savings. These savings can however be counted towards the primary energy target for 2020. The energy savings resulting from these investments reached 5.200 toe in 2010.

In the transport sector not all programmed measures have been implemented yet and the resulting savings are quite limited as compared to the savings' potential for the sector.

Cyprus opted to fulfil EPBD-reporting requirements as part of the second EEAP though no target or strategy to promote nearly-zero energy buildings (nZEB) has yet been established. At this stage, Cyprus has not indicated those instruments and measures to promote improved energy efficiency in buildings as required under Article 10(2) of the EPBD.

Cyprus appears to comply with the ESD special provisions regarding the exemplary role of the public sector and the provision of information and advice. Cyprus has prepared the initial Action Plan for Green Public Procurement to be implemented in 2007-2009. In 2010 the Environment Department proceeded to revise the Action Plan according to the EC GPP Toolkit by including the new categories and criteria proposed. The revised plan lays down more specific targets for RES, e.g. conditions for signing public procurement contracts for the use of RES, cogeneration, and energy savings measures. The plan has been completed and is about to be submitted to the Cabinet of Ministers for approval.

The Energy Service of the Ministry for Commerce, Industry and Tourism is overseeing the ESD target and is responsible for the ESD public sector integration control. It is also nominated for the implementation of the independent control systems according to EPBD and the supervision and calculation of energy savings relating to the primary energy savings target. The Energy Service promotes information and advice regarding application for grants schemes for RES and energy savings since 2004. The measures implemented include preparation and distribution of publications on different end-use energy savings technologies and guides for citizens concerning application for the grants schemes, organising events and exhibitions for providing information on energy savings to the public, businesses and other market actors, carrying out media campaigns, and annual energy savings awards.

The second EEAP of Cyprus contains a separate chapter on primary energy savings measures, which have been implemented or planned in energy production and supply, and distribution and transfer. The report highlights barriers to the penetration of high efficiency cogeneration of heat and power, including the lack of interest in investing in the technology, climatic conditions and the lack of natural gas in the energy mix. To reverse this trend, the need for additional grant schemes for small and very small high efficiency cogeneration systems is pointed out in the report. A grant scheme is operating in Cyprus to encourage the use of renewable energy, including independent photovoltaic systems, in the residential, tertiary and agriculture sectors.

Strengths

- The second EEAP of Cyprus presents a clear and coherent strategy, with well-coordinated, realistic measures implemented and accrued savings in all economic sectors. Policy continuity is demonstrated with actions revised in 2010, and continued with improved schemes based on experience.

- The plan appears to be realistic, with a 10% target set for 2016, which is transparently defined with all underlying data such as conversion factors for electricity put forward. A primary energy savings target is defined for 2020 with clear measures to achieve that especially as regards improving efficiency of power generation. Whenever possible, expected savings for 2020 are projected per measure.
- Despite the fact that savings were quantified for implemented measures only, from the description of measures it seems that achieving the 2016 target for final energy savings as defined by ESD sounds feasible. The second EEAP lists all measures as presented in the first EEAP and compares estimated savings with calculated savings for 2010 and 2016 of the second reporting period.
- The report acknowledges and identifies shortcomings with respect to data necessary to quantify savings.
- The role of the public sector is clearly demonstrated and, according to the second EEAP, the Action Plan for Green Public Procurement in Cyprus appears to be well applied.
- The EEAP includes a number of useful measures on information dissemination and training implemented in all sectors which help to address any knowledge and awareness gaps.

Weaknesses

- The proportion of measured savings achieved in the transport and industry sectors is comparatively small. For example, according to data provided on the second EEAP, the transport sector accounted for 54.6% of the final energy consumption in Cyprus in year 2010 but it only contributes with 2.12% to the expected 2020 savings.
- The potential for facilitating energy saving through the introduction of smart metering and related energy services is not addressed in the second EEAP. Furthermore, the system for energy audits and the provision of energy services, which could significantly help with the implementation of many other measures of the second EEAP, seem to be still at an early stage of development.

Recommendations for improvement

- It is recommended to consider measures to boost the market for energy audits and energy services including, where necessary, suitable training programmes for energy auditors as well transparent certification or accreditation schemes for energy service providers.
- It is recommended to have a more comprehensive look at the transport and industry sectors.

CZECH REPUBLIC

Summary

The EEAP presents an updated analysis of the energy efficiency progress in Czech Republic. While it is not possible to forecast whether the Member State will reach the 2010 ESD intermediate energy savings target, the action plan forecasts that the Czech Republic will achieve the new intermediate saving target sets for 2013. The second EEAP does not report on the progress of the specific measures defined in the previous report since no sufficient description of the measures and their savings was supplied in the first action plan.

In general, a description of the measure presented in the report is provided but, for some of them, the effectiveness in achieving energy savings is unclear since it is only based on expert estimates and not on a methodological calculation. A number of new measures across the Czech economy sectors that expected to contribute towards the 2016 target have been included in the plan. However, some of them appear aspirational and it is not clear whether they will lead to concrete actions contributing to the 2016 target.

Although a significant improvement can be noted with respect to the first EEAP, the report acknowledged shortcomings with regards to availability of data necessary to assess the effectiveness of measures, especially for 2009-2010. The EEAP forecasts a savings shortfall of 0.77% with respect to the 2016 target. The projected shortfall indicates that a greater level of ambition is needed and highlights the need for the Czech Republic to put in place additional energy savings measures especially because the success of the policy package, the strategy and many measures announced in the second EEAP remain uncertain.

General evaluation

The Czech Republic's second EEAP provides an overview of national policies and strategies related to energy use, it recalculates energy efficiency targets, it outlines measures needed to achieve these targets and it underlines the importance to implement further programmes in order to attain the 2016 energy savings objective. The plan also provides some information related to the EPBD reporting requirements. The report partially followed the template proposed by the European Commission and it is much more substantial than the first EEAP. However, some key information to allow a thorough evaluation is still missing.

The second EEAP report differs considerably from the first. In the first EEAP no measures were clearly described in detail, the report lacked an energy efficiency strategy and in many cases, no expected savings for individual measure were committed. Without doubt, the structure and the content of the second Czech Republic action plan have improved. The annex of the latest EEAP reported forty-one measures across the sectors of the Czech economy with the basis of the calculation, an explanation of the calculation method (though in many cases it is very rough) and the value of energy saving expected for 2008 and 2016. In the second EEAP both the 2010 and 2016 energy savings target have been recalculated and 2016 expected savings for individual measure can be identified (yet the reliability of the estimates in many cases is uncertain).

The EEAP outlines the primary energy savings strategy and describes some measures related to the supply side but does not provide information on primary energy savings associated with these measures. The efficiency in the generation of electricity and heat and the promotion of cogeneration supported by the implementation of legislative decrees can be identified as the most significant measures. The measure related to the distribution and transmission of thermal energy affect both primary (*i.e.* transmission and outdoor distribution system) and final energy consumption (*i.e.* internal distribution system) and it sets up the minimum efficiency of energy use for internal and outdoor distribution. Overall, the successful implementation of these measures is also depending on the legislative support and the established framework currently in place at national level.

Due to the 2006 final energy consumption data lacking from the first action plan, the 2010 and 2016 energy savings targets were recalculated in the second EEAP. As a result, the intermediate target for 2010 was set at 2.18% based on the average final energy consumption for the time frame 2002-2006. A new target for 2016 corresponding to 9% of final energy consumption was also established. Additionally, the Member State set up an intermediate target for 2013 as 7,009GWh and according to the calculation, the plan forecasts the achievement of 7,408GWh or 3.28% of final energy consumption for the period 2011-2013, overshooting the target by 0.28%. Due to a lack of global strategy targeted specifically at primary energy savings, the Czech Republic has not set a target for 2020. The EEAP declares that 2008 indicative target has been reached. However, this claim is based on an assessment of 2007-2008 trends because the relevant statistical data required by the ESD were not available.

Due to inadequate data, the Czech Republic could apply bottom-up methods only for some measures. In general, the method used to quantify the energy savings for the measures described in the EEAP is top-down approach. However, when the calculation of the savings could not be determined, an expert estimate by reference to certain literary works and energy audits was carried out.

The report forecasts the achievement of 18,565GWh energy savings in 2016, which is 0.77% below the ESD target. According to the second EEAP, the forecast has been made using a combination of expert opinions, estimates and top-down calculation methods recommended by the European Commission. It is not clear if the forecast includes only savings attributable to measures or if autonomous changes are included. Some measures contributing to primary energy savings – therefore outside the scope of the ESD – have been included in the total savings.

The expected results for most of the measures are based on rough estimates and, more importantly, some key information about their implementation is lacking. Although further explanation is required in order to assess the savings forecast based on estimations, the energy savings potential in each sector up to 2016 is assessed. Almost half of the 2016 energy savings reported in the EEAP are coming from twenty-two horizontal measures accounting for 43.6% of the 2016 expected energy savings, followed by the household sector 28.8%, services 10.9%, industry 10.8%, transport 4.3% and agriculture 1.6%.

In relation to EPBD reporting requirements, Czech Republic has not proposed an energy coefficient for nearly-zero energy buildings and the cost optimal energy performance levels have not been estimated.

The EEAP dedicates a specific section on the exemplary role of the public sector. In the Czech Republic, Directive 2006/32/EC was transposed by Act No. 406/2000 on energy management and Act No 458/2000, the Energy Act. The Czech legislation contains a number of initiatives with regards to energy saving which involve the public sector, though no specific programmes contributing to energy savings are described. The action plan declares that energy audits and energy performance certificates for buildings are used to achieve energy savings and it indicates that the Member State has implemented public procurement measures (e) and partially implemented measure (f) listed in Annex VI of the ESD.

Strengths

- The EEAP has defined final energy consumption for 2007 and 2008 according to fuel type for each sector. Additionally, the energy savings potential for each sector up to 2016 has been declared.

- The Member State has set up another intermediate target for 2013 and according to the method used to quantify the expected savings, the target should be met.

- The plan acknowledges and identifies shortcomings with respect to resources and statistical data necessary to quantify savings and to properly assess the effectiveness of some measures.

- The Czech Republic has reported the energy savings calculated for each sector separately, with and without overlaps indicating the conversion factor for any possible overlapping for each sector. However, the way the overlap effects have been assessed is not explained.

- The Member State acknowledged the necessity to implement additional programmes to reach the 2016 energy savings target and suggested some areas that could enhance the effectiveness of existing measures and proposed other actions that could contribute to energy savings.

Weaknesses

- The forecast of energy savings for 2016 indicates that existing measures will not be sufficient to meet the Czech Republic's ESD target. Moreover, the description of some key new measures (e.g., measure 2.1 for the public sector, measure 3.3 for the industry), lack of details. Their actual and effective implementation remains uncertain, which adds significant doubts about the overall achievement of the target.
- Due to a lack of data for 2009 and 2010, the evaluation is based on year-on-year trends in final energy consumption for the years 2006-2007-2008 only. As a result, it is not possible to assess the final energy savings contribution towards the 2010 target.
- The EEAP highlights several inconsistencies with regards to the figures declared. For example, there are problems in the figures including overlap effects for tertiary, transport and cross-cutting.
- Only twenty-five out of the forty-one measures described are showing savings for 2008. For many measures, the amount of energy savings cannot be determined by calculation, hence the reported savings are based on expert estimate, reference to literary works and energy audits. Significant measures such as the obligation to produce energy performance certificates for buildings reported 'symbolically' savings. Overall, the reliability of the savings estimates is very uncertain.
- The total savings related to transmission and distribution of thermal energy have been included in the savings though this measure is considered outside the scope of the ESD.
- In general, there is a lack of implementation details in the description of the measures, especially for the ones where a large increase in the impact is expected (see, for example, measure 3.2). In particular, the measure addressing the implementation and recommendation of mandatory energy audit has no statistical data on the number of

audits conducted. Therefore, 2016 savings are based on expert estimate. As a consequence, the feasibility of the achievements for these measures is uncertain.

- Although some significant financial measures for the renovation of existing buildings exist, the extent to which energy efficiency standards must be complied with in order to receive support is not clear from the description, nor it is explained how the quality of the renovations undertaken is controlled.
- Many measures rely on a significant leverage effect from the public financial aid. The uncertainties about the capacities of households and companies to invest in a time of economic crisis are not discussed.

Recommendations for improvement

- The overall comprehensiveness of the second EEAP has improved considerably compared to the first EEAP. More could be done for the next action plan. In the future reporting it is strongly recommended to provide a calculation for all the achieved and expected savings related to the energy efficiency measures and programmes implemented.
- Details such as budget commitments, implementation schedule and concrete achievements/outcomes should also be systematically monitored (at least for the major measures). More explanation on the scale of the measures would be vital for gaining better understanding of their actual potential to deliver savings.
- Improving the effectiveness of new requirement for the repair and construction of buildings to high energy standards, a greater application of energy audits and more investment in energy efficiency by the national government are among key measures to help Czech Republic achieve its 2016 target and any future national 2020 targets for energy efficiency. As such, it is recommended to consider further strengthening of these measures.
- Although the introduction of white certificates scheme has been mentioned in the second EEAP, it would be important to develop further planning on that to ensure optimal synergies and complementarity with any other national programmes (e.g. future operational programmes for EU Cohesion Policy Funds).
- More focus and detail of information on the EPBD reporting requirements and national energy efficiency policies implemented by the Member State should be included in the next EEAP.
- The involvement of the public sector and the main programmes undertaken to improve energy efficiency should be presented together with the achieved/expected savings.
- It is recommended to consider introduction of more measures addressing energy savings in the industry. The second EEAP reported only three measures addressing this sector. The implementation of measures in this sector should contribute to more energy savings. The support measures especially in the household sector mainly consist of national and operational programmes which provide some financial support for particular projects but to achieve more significant savings it may be necessary to be increase the scale of such programmes.
- Enhancing the effectiveness of existing measures, proposing new programmes and improving the estimates of the benefits, the evaluation of the measures already implemented and the monitoring and the analysis of the indicators of energy

consumption will be important for the strengthening of the future EEAPs of Czech Republic.

Denmark

Summary

The measures proposed in the second EEAP of Denmark are credible, consistent and supported by legislation, with targets even beyond 2016 suggesting an ambitious scenario being followed. This is in line with the overall government strategy documents on energy efficiency.

The second Danish EEAP clearly builds on the commitments of the first EEAP, having notably in addition a higher energy saving obligation. Moreover, a clear commitment of the public sector to reduce energy consumption by 10% in national administration buildings, a strategy for reducing the energy consumption in transport, a clear roadmap and targets for tightening building codes for new buildings and for building components in case of renovation, complement an ambitious set of measures.

Denmark uses top-down methods to quantify energy savings. Savings for some sectors and end-uses are verified using a national bottom-up approach. However, details on those national bottom-up methods are not provided. The relation between the bottom-up and top-down calculation of savings remains unclear.

General evaluation

The Danish second EEAP reports the achievement of the 2010 intermediate energy saving target under the ESD. The energy saving obligation scheme is by far the most important measure, delivering almost all the savings required by the ESD. According to the estimates from the EEAP, measures will lead to 53.8 PJ savings by 2016 remaining below 56.5 PJ savings, the equivalent of 9% of the baseline. However, the savings in the transport and public sector are not clearly accounted for.

The second EEAP report is considerably enhanced in comparison to the first EEAP. It sets short and long term targets and aims to improve sustainability of energy production and consumption by 2050. It includes the 2010 and 2016 target and energy savings excluding the energy consumption covered by ETS allowances as required by the ESD. It also reports projected savings for 2020. Overall, the measures listed in the second EEAP are described in more details. Measures related to the transport sector are now included in the action plan and the scope of the measures described in the second EEAP is clearer.

Additionally, the second report also shows a clear commitment of the public sector towards a reduction of energy use by 10% in national administration buildings, a strategy for reducing the energy consumption in transport, a clear roadmap and targets for tightening the building codes for new buildings and for building components in case of renovation and a new Energy Strategy 2050. These elements were not present in the first EEAP.

Denmark has opted not to annex the EPBD reporting requirements to the second EEAP. The EEAP mentions the measure on tightening building codes may lead new buildings towards nZEB by 2020. Moreover, building codes have requirements on cost-effectiveness of the building components in case of minor renovations, but it is not clear if the cost-effectiveness requirement will lead to cost-optimal levels.

As indicated by the second EEAP, provision of information and advice forms an integral part of action to increase efficiency of energy end-use in Denmark. There are two main measures targeted at dissemination of information and advice on energy savings to end-users of energy: the energy companies' obligations and the Energy Saving Trust.

The exemplary role of the public sector is demonstrated in the Danish second EEAP with a clear commitment to reduce the energy consumption in national administration buildings. Energy savings measures undertaken in the public sector are disseminated and publicised through websites. They comprise procurement of energy-efficient products, installation of remote reading meters for electricity, heat and water, energy efficiency labelling of buildings. The exchange of good practices is facilitated and enabled between public sector bodies. Voluntary agreements on energy saving activities have been established with local authorities and regions. The second EEAP indicates that the Member State has implemented public procurement measures (c), (e) and (f) listed in Annex VI of the ESD.

The EEAP foresees that extensive use of wind power both onshore and offshore will contribute to reduced gross energy consumption in the future. Denmark uses its supplier obligations scheme to promote greater efficiency in its energy distribution and transmission networks, whereby savings achieved through improvements in the networks may be counted towards company obligations. Energy consumed in the recovery of oil and gas in the North Sea accounts for 4% of national gross energy consumption. The report mentions an action plan that aims to improve the energy efficiency of the sector. While measures directly supporting district heating are not described, a demand-based boiler scrapping scheme provides indirect support, whereby a household in a designated district heating area can qualify for a subsidy only if a district heating connection is used to replace a boiler.

Strengths

- The Danish EEAP clearly aligns a set of ambitious measures to the long-term strategy on energy efficiency. Moreover, all measures proposed in the plan include a projection for 2020 savings, demonstrating commitment and giving confidence in the continuity of actions beyond the ESD timeframe.
- The measures entitled 'Tightening up building regulations in 2010' is deemed strong, leading to new buildings consuming only 25% compared to 2006 levels by 2020, most probably close to nZEB levels required according to the recast EPBD.
- The energy saving obligations – an on-going, well established and proved activity – will provide the ESD target almost by itself.
- Finally, the newly proposed Energy Strategy 2050 shows commitment of the country in obtaining long term and sustainable results, thus linking the EEAP to the longer term policy commitment.

Weaknesses

- The savings in the transport and public sector are not accounted for. The national bottom-up method, which covers the supplier obligation with quite an impressive target, is not put forward. The national bottom-up method is not described in detail for energy saving obligations and not at all for the other measures listed in the EEAP.

Recommendations for improvement

- The technical details of the national bottom-up method should be made transparent.
    - A top-down evaluation may catch the savings at macroeconomic level, counting not only the savings obtained by the measures but also autonomous effects at the level of the whole economy. Hence Denmark should provide more details on the combined

application of national bottom-up and ESD top-down methodologies to be able to check and confirm the declared savings.

ESTONIA

Summary

The EEAP presents an analysis of energy efficiency progress to-date in Estonia and states that Estonia's intermediate energy savings target has been reached. However, it is not clear from the EEAP how savings values were calculated or to what extent they have been achieved by the measures listed. In general, the measures presented in the report are not well described and their effectiveness in achieving energy savings is unclear. The report does not communicate progress in energy efficiency in Estonia since the publication of the first national plan. Overall, the plan does not present a cohesive national energy efficiency strategy. The report provides a frank acknowledgement of shortcomings with regard to availability of data necessary to assess the effectiveness of measures. The EEAP forecasts a savings shortfall of 10% with respect to the 2016 ESD target. The projected shortfall indicates that a greater level of ambition is needed and highlights the need for the Member State to put in place more effective energy savings measures.

General evaluation

Estonia's second EEAP provides an overview of national policies and strategies related to energy use, it recalculates energy efficiency targets in accordance with the requirements of the ESD, it outlines measures needed to achieve the targets, and it provides an indication of progress to-date. The plan also provides information with respect to EPBD reporting requirements.

The second EEAP differs considerably from the first, and the differences do not help to convey progress in the intermediate period. In the first EEAP, fourteen significant measures were described in detail. In the annexes of the second EEAP around a hundred measures are listed but many are not described. The second EEAP does not report on the progress of the specific measures defined in the first EEAP. It is clear that some measures mentioned in the first EEAP, such as the development of the provision of energy services and the training of specialists, have not progressed.

In the second EEAP, the 2016 energy savings target was recalculated to incorporate energy consumption in transport. The intermediate target for 2010 is set at one third of this figure, or 3.3 PJ, and the EEAP declares that the intermediate target has been reached. However, this assertion is based on an assessment of 2008 savings only, as insufficient data was available for subsequent years. The plan indicates that the 2008 savings figure was calculated using top-down methods. No breakdown of the contribution of individual sectors to the intermediate result is provided. The Member State could not apply bottom-up methods due to inadequate data.

The report forecasts energy savings of 8.9 PJ in 2016, 10% below the ESD target. According to the EEAP, the forecast has been made using a combination of expert opinions and calculation methods recommended by the European Commission. Alongside the savings forecast, the energy savings potential in each sector up to 2016 is assessed.

In the annexes of the EEAP many measures are listed for each economic sector. However, the measures are generally not well described and the level of detail supplied is inadequate. For many measures listed, the relevance to energy efficiency is unclear.

The EEAP identifies energy efficiency in buildings as the main area of focus for energy efficiency measures. A number of measures are outlined in the annex, including soft loans for renovations and financial support for reconstruction. The extent to which these measures have been effective in pursuing ESD goals, however, is unclear, as no estimates of savings achieved are given. From the information supplied, it is clear that a number of measures aimed at training and improving know-how among construction workers, architects and energy auditors have not yet been implemented. The plan identifies the considerable energy saving opportunities in small houses in Estonia. Yet no measures that are aimed specifically at improving the energy efficiency of small houses are apparent.

The EEAP acknowledges that resource constraints have limited Estonia's ability to address energy efficiency in the industry sector. Savings achieved by a small number of EU ETS participants are included in the top-down calculations of industry energy savings.

The EEAP identifies excise duty on fuels as it main energy conservation measure in the transport sector. Most of the transport measures listed are not well explained and have no implementation dates. As a result, many measures appear aspirational, and it is not clear that they will lead to concrete actions by 2016.

Some sections of the plan address the electricity generation sector, summarise development plans and outline measures aimed at primary energy conservation. Several measures addressing electricity supply issues are listed in the annex.

In the annexes, information measures are listed for each sector. Many of these are not well explained or have no implementation dates associated with them. Elsewhere it is explained that KredEx are involved in the administration of a campaign to raise awareness of the energy performance of buildings. Activities relating to an annual national energy week are publicised through websites. Energy supply companies and building management companies distribute information on energy conservation to their customers along with utility bills. A national information system for planning trips with any kind of public transport is also mentioned.

The exemplary role of the public sector is highlighted. Energy saving measures undertaken in the public sector are publicised through websites and other media. Some local authorities have drawn up their own sustainable energy plans or have conducted smaller energy analyses. Guidelines for considering energy conservation in public procurement have been published, and some examples are given of projects where information exchange between public sector institutions has been facilitated. The EEAP indicates that public procurement measures (b) and (e) in Annex VI of the ESD have been implemented. Measure (b) is addressed with the Public Procurement Act and measure (e) is covered by the States Assets Act. A centralised real estate services provider to the state has been established. Responsibility for state buildings is being transferred to it gradually. This centralised approach offers the potential to ensure that renovations are carried out in accordance with national requirements and may help facilitate information exchange between public sector organisations.

The plan addresses the EPBD reporting requirements. An energy coefficient of 50-140 kWh/m^{2}a for nZEB has been proposed. Cost optimal energy performance levels are estimated at 120-200 kWh/m^{2}a, while current minimum requirements are 150-300 kWh/m^{2}a, indicating the level of improvement necessary over the next number of years. The report points out that although initial research has been undertaken, greater public consultation is needed with respect to the definition of nZEB. Estonia plans to have at least 10 large publicly accessible nZEB buildings by 2015, and to gradually introduce stricter energy performance requirements from 2013 onwards. Elsewhere the report states that Estonia has not set any targets for low energy or nearly zero energy buildings. For the inspection of heating systems, the Member State chooses to implement Article 14(4) of the EPBD as an alternative to compulsory inspection. It is explained that a greater level of energy efficiency is unlikely to be achieved through inspection due the relatively low number of boilers installed, the lack of a reliable database of installed units, and the limited success of the obligatory registration system for new boilers. For air conditioning units above 12kW, the Member State chooses to provide advice rather than introduce a compulsory inspection system, as only small numbers of units are installed each year.

Estonia dedicates a large section of its report to energy supply. The EEAP details a number of programmes and plans relevant to energy supply that will be implemented up to 2020. A 'National Development Plan for the Energy Sector' aims to achieve a more efficient and sustainable energy system. It incorporates national plans for renewable energy and for development of the heat sector, among others. Support for the wider use of renewables and for greater energy efficiency in the energy sector is mentioned in the description of a 'National Strategic Reference Framework'. The relevance to energy efficiency of some of the supply-side information is unclear. A development plan for the use of oil shale is described, for instance, that aims to reduce the annual volume extracted. Specific measures to address energy efficiency in energy generation include completion of the liberalisation of the electricity market, modernisation of oil shale electricity generation facilities and unspecified environmental charges. Support is available for new high-efficiency CHP plants that use as feedstock either renewables, waste, peat or retort gases from oil shale processing. Support is also available for new plants burning other fuels if their electrical capacity does not exceed 10MW. Measures to support energy efficient district heating include the designation by local authorities of parts of their territories as district heating regions so that the use of other sources of energy for heat is restricted, a heat price regulation which incorporates minimum efficiency coefficients for heat generation by fuel source and maximum heat loss values for pipelines, and financial support for the upgrade of district heating networks. The EEAP indicates that greater efficiency in transmission and distribution networks is achieved by linking energy efficiency with network charges payable by the network operator and by the establishment of minimum quality requirements for network services.

Strengths

- The EEAP has defined energy consumption targets for 2016 and 2020 according to fuel type for each sector. Additionally, the energy savings potential for each sector up to 2016 is provided.
- The plan acknowledges and identifies shortcomings with respect to resources and data necessary to quantify savings and to properly assess the effectiveness of individual measures.
- The EEAP provides an initial assessment of the distance from current standards for energy performance of buildings to the Member State's own initial definition of nZEB performance.

Weaknesses

- The declared savings for 2010 are based on the analysis of one year’s data only and are presented as an aggregate number with no sector-level breakdown. It is not clear how the savings have been calculated or how they relate to measures. There is no indication given that any of the declared savings have been achieved through measures.
- Although significant financial measures for the renovation of existing buildings exist, the extent to which energy efficiency standards must be complied with in order to receive support is not clear, nor is it explained how the quality of the renovations undertaken is controlled.
- Of the measures listed under industry, only three are currently being implemented, and their relevance to the improvement of energy efficiency is not clear. Most of the other

industry measures listed have no planned implementation dates. A concerted effort to improve the energy efficiency of industry is not apparent.

- The second EEAP does not show any progress with respect to key measures defined in the first EEAP, such as growing a market for energy services in Estonia and enforcing the energy savings responsibilities of energy companies.

Recommendations for improvement

- The Member State should include only measures that offer real energy savings opportunities within the scope of the ESD. These measures should be explained in greater detail and implementation dates should be given. Measures with only a tenuous connection to energy efficiency and measures that have no concrete timeframe should be omitted.
- As the forecast of energy savings in 2016 shows a shortfall, Estonia will need to implement additional measures or more effective measures to ensure that the ESD target is achieved. These could focus on energy savings opportunities identified in the EEAP, such as small private dwellings, or on areas where measures have not yet been effective, such as the stimulation of a market for energy services.
- The Member State should develop more robust methods to evaluate overall energy efficiency progress and to assess the effectiveness of individual measures.

FINLAND

Summary

The Finnish second EEAP provides a comprehensive overview of the policy, strategy and measures to promote energy efficiency and energy savings. The plan is well presented, robust, coherent, credible and ambitious. It contains a complex set of measures including fiscal, financial, legislative, information, education and training activities as well as voluntary energy efficiency agreements. A detailed description is provided of a broad range of measures that have been implemented to improve energy efficiency in buildings (residential, public and commercial), industry, transport and agriculture.

Finland's second EEAP calculates the impact on energy savings of thirty-six measures, thirty-one of which have an impact on savings that target energy use within the scope of the ESD and three of which have an impact that targets both the scope of the ESD and the emissions trading sector. Two of the measures have an impact on energy savings that is calculated entirely outside the scope of the ESD. For fourteen sets of measures the direct impact in terms of energy savings is not evaluated (mainly horizontal and related to training, education, communication, advice, taxation and community planning). In the first EEAP the savings were estimated only for fourteen measures/ sets of measures. All measures are assessed on the basis of the national bottom-up methodology, which is explained for each assessed measure in the measures' description from Annex 2 of the second EEAP.

General evaluation

Despite the fact that not all measures have savings estimates, the reported savings are well in excess of both targets, *i.e.* 12,1 TWh (6,1%) in 2010 and 24,7 TWh (13%) in 2016. The energy efficiency agreements are a key instrument for the fulfilment of the obligations under the Energy Services Directive in Finland. The agreements will be in force until the end of 2016, and one of their key targets is the 9% energy saving under the ESD. As a whole, the energy efficiency agreement scheme, which includes several sectors, is very broad and covers approximately 70% of Finland's total energy use. They are in force in Finland since 1997. There are schemes in place relating to the business (industry, energy, and private services), the local government, the oil (distribution of heating and transport fuel, oil heating), the property and the transport sectors and the Farm Energy programme.

The second Finnish EEAP is in line with the first EEAP and the proposed policies, programmes and measures are in the process of being implemented. The measures correspond to the ones mentioned in the first EEAP, some with changes in title, structure, modifications and adaptations. The second EEAP reports on the progress of the specific measures defined in the first EEAP. The first EEAP estimated savings for fourteen measures/ sets of measures whereas the second calculates the impact on energy savings of thirty-six measures, thirty-one of which within the scope of ESD. For the second EEAP, Finnish authorities compiled comprehensively energy efficiency activities for which energy saving effects could be calculated (incorporating now also energy efficiency regulations and voluntary agreements). In order to obtain a better picture of the entire scope of energy efficiency activity in Finland, the second EEAP also includes key "non-assessable" energy efficiency activities.

Finland opted to fulfil the EPBD-reporting requirements within the second EEAP and sets out a list of the instruments and measures to promote improved energy efficiency in buildings as required under Article 10(2) of the EPBD, the inspection or alternative equivalent measures for heating and air-conditioning equipment (Article 14(4) and 15(4)), support measures and the status of the nZEB planning (Article 9).

Information and advice concerning energy efficiency is provided by nearly all energy companies, energy agencies, environmental information and service centres, the consumer agency, research institutes, many associations and organisations, building control departments of local councils, and building centres in Finland. One of the key players is Motiva, which was designated by the Ministry of Employment and the Economy in 2010 to act as the national coordination centre for consumer energy advice.

The exemplary role of the public sector is clearly demonstrated in the Finish second EEAP. Government resolution obliges central government to implement three of the six measures listed in Annex VI of the ESD. There are several important measures within the public sector, such as the 'energy efficiency agreement and energy program 2008-2016' and energy audits for local governments, that already produce by 2010 savings equivalent to 2,5% of all energy use of local government. Those are expected to double by 2016.

More than 101 municipalities and local councils representing around 67% of the Finnish population entered in the energy efficiency agreements scheme or in the energy program regarding their own energy use. Energy audits were performed for around 59% of the overall local government buildings area. Councils that sign up to the agreement scheme commit to an energy saving of at least 9% as well as including the promotion of energy efficiency as part of their management system and preparing an action plan on the implementation of energy-saving measures and other contractual obligations. The local councils that join agreement scheme are committed to implementing five of the six measures listed in Annex VI ESD.

The exchange of best practice is promoted as a continuous activity in local government by gathering and sharing information about measures that have been found to be good. However, the construction of networks of experts for active local councils, and joint events for experts, have been deemed to be the most important measures. The obligations under the local government energy efficiency agreement scheme include energy efficiency guidelines, energy audits, new financing procedures for investments (ESCO service), consumption monitoring, new operating models, education and information activities, the introduction of renewable energy sources, and annual reporting, through which the implementation of the contractual obligations is monitored.

The second EEAP of Finland does not provide a comprehensive overview of supply side energy efficiency measures. According to the report, electricity produced at CHP plants accounts for over a third of total electricity production in the Member State. As part of recent changes in the structure of energy taxes, the carbon dioxide tax on fuels used in combined production has been halved. Furthermore, energy producers may sign up for a dedicated energy agreements programme. Signatory companies commit to integrating the improvements of energy efficiency into management processes, setting company-specific targets related to energy efficiency and submitting annual reports. In return, they may benefit from energy audits and investment aid considered on a case-by-case basis. 90% of electricity generation and 80% of heat production are covered by the voluntary agreement scheme. Sellers and distributors of energy who commit to achieving energy savings among their consumers may also count own-savings towards their obligations.

Strengths

- The Finnish second EEAP has a strong strategic approach, is robust, coherent, in line with the first EEAP, ambitious, and provides a very good analysis of the energy consumption and end-use as well as the energy policy in Finland.
- The EEAP contains a comprehensive set of measures applied in all sectors of the economy, with each sector making a contribution to the 2016 target. The report

communicates a coherent and feasible national energy efficiency strategy, supplemented by funding and budget.

- The report contains a good mix of different types of measures including regulatory, financial instruments, voluntary agreements and co-operative instruments, energy services for energy savings, information to final customers and transport specific measures.
- The energy savings are properly monitored and measured by a 100% national bottom-up methodology, detailed per measure, listing starting points and assumptions of the calculation.
- Despite the fact that not all measures have savings estimates, the reported savings are well in excess of both targets.
- The 'early actions' are not included in the calculation and all the achieved and expected savings are the result of on-going or future measures.
- The role of the public sector is clearly demonstrated and there are varied measures at all national and local government levels. The EEAP is in-conformity related to the obligations on public procurement.
- There are varied information and advice measures addressing all the sectors and extensive exchange of best practice.

Weaknesses

- There are some small discrepancies related to the reported savings figures under Annex 2 as opposed to chapter 'energy saving measures' (measures VA-04-VM and MA-04-MMM).

Recommendations for improvement

- At the moment, Finland uses only a bottom-up methodology for assessing energy savings, which does not allow the evaluation of several types of measures. The actual bottom-up monitoring methodology may be complemented by a top-down methodology for measures such as of fiscal or horizontal nature. Despite the fact that this is not a requirement of the ESD, this approach may provide an even more accurate estimate of the energy efficiency activities impact and a useful indication of the effectiveness of the implementing measures.
- It would be useful to extend the description of the 'obligations of energy companies under the Energy Services Directive'. In the current form, the measures mentioned in the second EEAP could be mixed with 'energy savings obligations' as foreseen in the new Energy Efficiency Directive.
- Communication on smart metering could further enhance the quality of the second EEAP. The single measure mentioned related to meters are the building regulations concerning water and drainage systems that ask for mandatory installation of water meters in new homes as from the beginning of 2011.

FRANCE

Overall Summary

The second EEAP demonstrates a high level of commitment to improve energy efficiency and reduce the end use energy consumption in France. This commitment is reflected by the legislative framework currently in place, which strengthens France's energy policy, sets ambitious targets and establishes energy efficiency policies guidelines to be implemented in the years to come.

The French second EEAP provides a comprehensive overview of new and existing measures to promote energy savings in the residential and services, transport, agriculture, industry and public sectors of the French economy. Overall, the plan is well presented and ambitious. The quality of measures described in the report indicate the progress of the successful on-going actions already in place and the implementation of new and innovative energy efficiency programmes that will contribute to the achievement of the 2016 target and of the overall EU 2020 target.

General evaluation

The French second EEAP did not fully follow the template recommended by the Commission. However, it still presents a more solid and consistent structure than the first EEAP, which did not include the evaluation of the measures. The second EEAP provides a detailed description of each new proposed measure and on-going action indicating, wherever possible, an estimation of the expected savings. The progress of the most significant energy efficiency measures and programmes included in the first EEAP is well presented in the second EEAP. When compared to the first EEAP, the report communicates a clearer analysis of energy efficiency progress to-date in France.

According to the second EEAP, France already exceeded the 3.75% energy savings target for 2010 and it estimates to obtain around 13,5% in 2016 hence fulfilling the ESD requirements showing a solid, coherent and feasible strategy towards energy efficiency.

According to the 2016 estimations of the ‘Energy Climate Air’ prospective scenarios described in the second EEAP, most of the savings are delivered in the residential and services sector (around 88%) followed by transport (approximately 10%) and industry sector (approximately 1%), excluding the energy consumption covered by ETS allowances. The scenario indicates the achievement of 28.4 Mtoe energy savings by 2020. The estimation of 2016 and 2020 energy savings is based on the comparison between ‘pre-Grenelle’ (PG) scenario and the scenario ‘with additional measures’ (AMG).

The 2010 savings declared in the second EEAP are quantified using top-down methodology recommended by the European Commission for the period 2007-2009 since 2010 data were not yet available. The majority of monitored savings are in heating and fuel consumption. Negative savings associated to the electricity consumption related to the household and service sector amounting to a total 0.919 Mtoe, have been discarded.

In order to promote methodological consistency of evaluations over time, savings defined in the second EEAP as flagship measures[73] are estimated by SceGES, a national bottom-up

[73] Energy: regulation under the Ecodesign Directive on lamps (ban on incandescent light bulbs). Construction: 2012 Thermal Regulation, zero-rated eco-loan, sustainable development tax credit. Transport: measures concerning the performance of new vehicles (*bonus-malus*, scrapping premium, European regulations), HGV eco-tax. Agriculture: introduction of mobile test benches for tuning tractors.

methodology applied by France to assess the energy savings (detailed in Annex 2 of the EEAP).

The measures proposed in the French EEAP are based on a well-established legislation in the framework of "The Environment Round Table" also called "The Pope Law", which defines energy policies guidelines. Additionally, as a framework for the actions to be carried out in the context of the national energy strategy, the POPE Law sets performance targets and establishes a certain number of incentive programmes for reducing final energy intensity by 2% a year by 2015 and by 2.5% a year between 2015 and 2030. This seems to be an ambitious target to be achieved.

The building sector accounted for 44% of France's final energy consumption in 2009 and the second EEAP identifies it as the sector where most of the energy savings can potentially be achieved. A number of measures are outlined in the Action Plan, including Sustainable Development Tax Credit and the zero-rated eco-loan, two major fiscal measures that provide financial incentives to the owner, occupier or landlords of properties that require major renovation work.

In this context "The Environment Round Table" has set a very ambitious target for existing building stock, *i.e.* a 38% reduction in primary energy consumption by 2020. This target shows the motivation of France towards further reducing energy consumption in the building stock. Widespread development of low consumption buildings by 2012 and positive energy buildings to 2020 have been identified as good policies towards nearly-zero energy building as required by Article 9(2) of the EPBD.

With regards to procurement measures and the compliance with Annex VI of the ESD the stimulation by law of the energy performance contracting for public, residential and services sectors has been highlighted in the EEAP by the development of the Energy Performance Contracts. In the transport sector, the implementation of EU regulations with regards to the reduction of CO_2 emissions for new vehicles has set up more ambitious targets for the Member State towards 2020 further reducing carbon emissions. Thus, France has chosen to apply requirements (b) and (e) listed in Annex VI.

In the second EEAP France has opted to transpose Article 14 of the EPBD in line with paragraph 4. New regulations introduced at the end of 2009 established the compulsory annual maintenance of all boilers types with an output power between 4 and 400 kW.

With regards to improving the energy performance of existing buildings as required by Article 9(2) of the EPBD, the Member State has set up a 38% target in reduction of energy consumption by 2020 showing its solid commitment towards nZEB.

With regards to the public sector, the state and local/regional authorities play a very important role in realising the energy efficiency targets, not just through managing their assets and their direct activities, but also when exercising their responsibilities (for example, urban development, in the case of authorities). Regarding state services, an initial review of implementation of the 'Exemplary State' circular for 2009 shows initial concrete results, in particular in terms of energy audits and purchase of energy-efficient vehicles. In the case of local authorities, they are encouraged to develop local climate action plans providing a genuine local climate and energy policy within their specific areas of responsibility.

Grenelle laws also strengthened the provisions allowing urban development master-plans to manage space, resources and energy efficiency by developing levers for demand-side management, the fight against urban sprawl and promotion of sustainable cities.

A number of measures related to information and advice can be identified in the report with ADEME (Environment and Energy Management Agency), playing a fundamental role in this context. The ADEME eco-citizen web-site supports individuals to facilitate the provision of information. Also, the Establishment of the Energy Info Site network to advise private individuals on energy efficiency and renewable energies has been stabilised and professionalised since 2010 and resulted in an increase of the number of advisers. Amongst the horizontal measures, actions focusing on raising public awareness and measures providing information and advice on energy efficiency for individuals and businesses have also been reported.

The report does not provide a comprehensive analysis of supply side measures. Ways to promote smart grids and smart metering and suggestions on how to manage electricity peak demand have been described in the EEAP. As part of their research funding, France has introduced a trial for the installation of smart metering infrastructure, covering 300,000 units. The importance of smart grids in enabling the integration of renewable electricity sources and facilitating demand-side management is also mentioned in the report. The report states that a working group has made a number of proposals for managing electricity peak demand. A capacity obligation programme introduced by new legislation should help balance peak demand with supply.

Strengths

- The EEAP contains a very comprehensive set of measures applied in the residential and services, transport, industry and agriculture sectors. The report communicates a coherent and feasible national energy efficiency strategy.
- Overall, the French second EEAP declares the achievement of 5.16 Mtoe energy savings by 2010, more than the assumed target of 5 Mtoe. The 2016 estimated savings exceed by 50% the 2016 target (18 Mtoe energy savings compared to 12 Mtoe declared target in the first EEAP).
- The energy savings are calculated using a top-down methodology however flagship measures are also evaluated by a national bottom-up methodology. The savings attributed to these measures contribute to 38.8% of the 2010 savings and are expected to deliver between 60%-80% of the 2016 target.
- The second EEAP contains a good mix of different types of synergic measures including fiscal, financial, legislative, information and voluntary measures. The impact of the implementation of European energy efficiency legislation such as Ecodesign, Ecolabelling and EPBD, has been taken into account.
- The role of the public sector is clearly shown and there are various measures at national, regional, and local levels that demonstrate the commitment of the Republic of France towards improving energy efficiency. The success of the White Certificate programme, the energy performance contracting for public, residential and service sector and the commitment to fulfil the obligations regarding the reduction of CO_2 emission in the transport sector outlined by EU regulation, are some clear examples.

Weaknesses

- As much as 88% of the 2016 energy savings are expected to come from the residential and services sector, 10% from the transport sector while only 1% of total savings is expected to be achieved from the industry (non-ETS). Effective facilitation of energy saving in the industry and transport may require further consideration.

Recommendations for improvement

The French second EEAP well describes a number of measures addressing transport and industry sectors. These seem to be more oriented towards a reduction of CO_2 and other emissions, which is positive. However, incentivising energy efficiency is not clearly highlighted. It may be useful to consider some additional measures addressing industry and transport clearly addressing energy saving and/or strengthening of existing measures with clear energy efficiency objectives.

GERMANY

Summary

The German second EEAP presents an ambitious and coherent strategy, which contains a wide range of measures across all relevant sectors of the economy. A good mix of regulatory, financial promotion, fiscal, information, and voluntary type measures are reported and described in detail. It complies with the ESD special provisions.

In the second EEAP the reported savings for 2016 and 2010 (calculated both in final and primary energy) are well in excess of the targets. Germany applies top-down and bottom-up indicators, as well as national methods in a complementary fashion. The methodology, underlying assumptions and data are documented in detail and in a transparent manner in a separate accompanying report.

The German second EEAP is in line with the first EEAP. It clearly builds on it and adheres to its strategy. The new report refers back to the first and provides an evaluation. Many of the measures represent either a continuation or adjustment of already existing measures. They are supplemented by some newly proposed actions, especially in the buildings, appliances and lighting and industry and trade sector. The new measures consist of financial, promotion and regulatory instruments. Examples include KfW promotional programmes, the Act on the Promotion of Renewable Thermal Energy.

General evaluation

According to top-down calculations, the second EEAP projects final energy savings of 2,479 PJ by 2016, of which are 1,061 PJ accounted for early actions undertaken prior to 2008. The calculated savings are higher by a factor of 3.3 than the target (748 PJ), autonomous savings incorporated. The intermediate target is significantly exceeded with a saving of 1,812 PJ in total and also with reference solely to period 2008-2010 (751 PJ compared to 456 PJ). For top-down, Germany applies the EC recommended methodology, exclusively using preferred indicators. Mostly statistics from 2009 were used, with the exception of some cases when only 2008 data were available.

Bottom-up calculations are made using a combination of EC recommended and national methods in particular for instruments from transport and mobility sector as well as for horizontal measures. It is projected that currently implemented measures taking into account lifetimes will save 819 PJ in 2016 surpassing the target with buildings accounting for more than half of the savings. Of these, 460 PJ are attributable to early actions. Regulatory measures such as the Energy Saving Order *(EnEV)* and promotional measures such as the CO_2 building renovation programme of KfW, with 248 PJ, account for more than half of the early actions. The ecological tax reform, which acts as a horizontal instrument, is another important early measure.

The first German EEAP reported a total of sixty-five individual measures, of which thirty-two were quantified in respect of their energy savings. These activities were stepped up with the second EEAP reporting eighty-nine measures. Savings effects are provided for forty-three of them. Additional measures with potentially considerable savings implemented at *Länder* and municipal level as well as introduced by private actors are not discussed in the report. In some cases, bottom-up calculations deviate from *ex-ante* assessments of savings from actions presented in the first EEAP. This is explained by the fact that there were no specified methodological requirements during first evaluation phase. For the second EEAP Germany consistently applied the EC recommended methodology.

For systematic reasons, the second EEAP deviates from the strictly sectoral structure of the first EEAP and applies henceforth a combination of sectoral and application-oriented breakdown. Trends in total savings are recorded by top-down indicators whereas effects of individual/groups of measures are quantified by using bottom-up methods for all of the following areas of application: buildings and installations, appliances and lighting, industry and trade, transport and mobility, cross-sectoral and public sector (exemplary role).

To avoid double counting due to distorting errors such as rebound and multiplier effects, figures are corrected by a set of variables and on the basis of empirical evidence and experts' judgement. So-called 'implementation factors' shall reveal and take account of possible non-compliance with regulatory requirements. A financial proviso is contained in the EEAP (for all programmes, instruments and measures which presuppose financial expenditure by public authorities it is indicated whether financing has been made available).

The second EEAP reports on a number of good practices. These include extensive renovation of public buildings through promotional programmes, as well as contracting and procurement. Subsidised audits and information and advice measures with the participation of suppliers represent further good practices.

The exemplary role of the public sector is clearly highlighted in the EEAP with most of the energy saving measures introduced already before the ESD entered into force. With the data available, saving measures implemented for public properties and street lighting accrues the highest quantifiable effects. The amendment of the Order on the Award of Public Contracts requires only the highest energy efficiency criteria to be stipulated in public tenders and life-cycle costs to be considered in the award procedure. This process is facilitated by publishing guidelines for considering energy conservation in public procurement. Germany fulfils the obligations under Article 5 of the ESD by introducing a combination of measures referring to all items of Annex VI.

The exchange of good practices between public sector bodies is facilitated by several information and advice measures. Measures to communicate the exemplary role to citizens and/or companies are foreseen and described in the plan. Examples include the Green-IT Initiative of the Federal Government, the Mission E: campaign for changing user behaviour with respect to energy consumption among employees of the German Armed Forces and the Guideline for sustainable building.

Since April 2011 suppliers of energy services and consumers have access to a public list of suppliers of services. The German Government in its energy concept announced to further support the market for energy services, to strengthen the concept of energy contracting and to present a bill on supply contracting, in particular for residential building sector. There are no robust quantitative assessments of accrued savings.

The second EEAP of Germany does not report on energy saving measures on the supply side. A relevant end-use energy efficiency measure reported is the funding programme supporting mini CHP plants. In terms of promoting greater competition among suppliers, the measuring and metering sector in Germany has been liberalised so that metering must no longer be carried out by the network operator.

Strengths

- The German second EEAP presents a clear and feasible strategy with well-coordinated realistic measures implemented, reporting on accrued savings in all economic sectors (financial proviso included). It establishes a coherent set of priorities (encompassing buildings, the public sector, SMEs, and provision of information and advice).

- The German second EEAP demonstrates policy continuity and includes complementary measures in different sectors. It highlights synergies between the ESD and the EPBD and incorporates related actions from the EPBD into the EEAP/ ESD strategy.
- The German second EEAP already moves towards the reporting foreseen under the Energy Efficiency Directive and delivers complementary information in line with stepping up the second EEAP to a policy document. Especially the review of the *status quo* and development of the energy service markets is a high quality addition to the standard reporting.
- The second EEAP provides targets, trends and savings from measures in final energy consumption and primary energy equivalent (electricity only). The reported savings for 2010 and 2016 are well in excess of the objectives.
- The second EEAP quantifies savings achieved from early measures but attempts to exclude them from reported achievements by measuring improvements relative to 2007. The figures are corrected so as to avoid double counting.
- The second EEAP applies top-down and bottom-up methods in a complementary manner: top-down indicators are applied parallel to bottom-up methods that verify savings for some sectors/end-uses. The methodology, underlying assumptions and data are documented in detail in a separate accompanying document.
- The second EEAP reports on a good set of information and advice measures encompassing all sectors.
- The second EEAP foresees an improvement in data availability. The Federal Agency for Energy Efficiency has been established in 2009 to monitor the market, contributing to even more precise assessments in the future.

Weaknesses

- Ambiguous definition regarding the calculation of the intermediate target in Annex I.

Recommendations for improvement

- The specific provisions (role of the public sector according to ESD and EPBD, provision of information and advice) and related total savings could be made more explicit.

Greece

Summary

Overall, the plan is clear and there are various measures implemented under the Operational Programmes through EU Structural Funds, which are giving certain coherence. On the other hand, the second EEAP does appear to show a clear strategy for backing up the implementation of significant energy efficiency measures that should contribute to the achievement of the 2016 target.

The report stresses the importance of the economic crisis and how it has impacted the reduction in final energy consumption. It therefore suggests that most of the savings reported should not be attributed to the implementation of energy efficiency measures. However, according to the top-down methodology recommended by the European Commission and the adjusted methodology used by Greece to take into account the economic recessionary effect, the 2010 2.8% target has been significantly achieved, declaring the attainment of 5.1%[74]. Nevertheless, the figures resulting from these calculations should be treated with caution.

Due to the impact of the economic recession and the methodologies applied to quantify the savings, it is not possible to evaluate whether Greece will achieve the 2016 ESD 9% target.

General evaluation

Greece's second EEAP provides an overview of national policies and strategies related to energy use. It outlines the measures implemented to achieve the 2010 target. It recognizes the significant impact of the economic crisis on final energy consumption and it honestly acknowledges the uncertainty of attributing energy savings to the implemented measures. The slowdown of economic growth has significantly contributed to a substantial reduction in end-use energy. The report has partially followed the template proposed by the European Commission.

The 2010 and 2016 targets set in the first EEAP remain unchanged in the second EEAP. Based on the average of final energy consumption for the 2001-2005 time frame, the 2010 intermediate target stays at 5.1 TWh or 2.8% and the 2016 final energy savings target remains 16.46 TWh or 9% as previously declared. According to the top-down methodology applied by the Member State, the latest action plan declares the attainment of 21.37 TWh for 2010 or 11.7%, therefore significantly overshooting the intermediate target.

The expected savings towards 2016 have not been calculated as it is not possible to obtain a thorough evaluation of the progress of specific measures described in the plan without taking into account the impact of the economic recession, which may affect the implementation of the measures and the energy savings they should contribute to.

The second EEAP also informs on the 20% target in primary energy set by Greece to achieve savings in the production, supply, distribution and transportation of energy. The plan forecasts primary energy savings for 2020 equal to 33,1 TWh, claiming that major part of the savings will be due to the implementation of measures included in the first action plan.

The type of approach used to quantify energy savings is based on a top-down methodology. Using this method, Greece calculates a level of savings in 2010 that is 11.7% of reference consumption, well in excess of the 2.8% ESD target for 2010 and also exceeding the 9%

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[74] This figure is based on the adjusted top-down methodology applied by the Member State and it represents the low end of the range 5.1-10.9% in reference to the ESD target.

target for 2016. Since this calculation does not take into account the effects of the recession, Greece has adjusted the calculation in order to have a more realistic approach and it has applied an alternative national top-down method that takes into account the recessionary effects. With the alternative calculation, savings between 5.1 and 10.9% in 2010 are estimated.

The majority of the measures reported in the second EEAP were reported in the first EEAP. In addition to those, new measures have been added and some existing ones have been adjusted. The description of those measures is often not exhaustive and for many of them it is not clear whether they have already been implemented or not yet started.

The measures described cover the major sectors of the Greek economy and end-uses. According to the report, the transport and residential sectors contribute to most of the 2010 savings, followed by industry and services. The main policy measures in the residential, tertiary and industry sectors are expected to yield after 2010 (e.g. Regulation on the energy performance of buildings, NSRF projects) and should contribute to savings in the 2011-2016 time frame. Overall it is not possible to compare the first EEAP with the second EEAP as the majority of the measures of the first EEAP only started after 2010 or have not yet started.

The exemplary role of the public sector is clearly highlighted in the EEAP. Provisions requiring the implementation of energy saving measures in all end-use sectors of the public and the use of energy efficiency criteria in the public procurement tendering procedures and contracts, have been adapted to the national law. In compliance with Annex VI of the ESD, requirements concerning the use of financial instruments for energy savings, including energy performance contracting is mentioned in measure D4: Energy upgrading of existing buildings through Energy Services Companies under Energy Performance Contracts (EPC).

Regarding the use of ESCO services, the concept of energy services in Greece is not yet well established. However, its institutional framework is regulated by a national law that has introduced for the first time the concept of Energies Services Companies and that underlines the operational framework, the suppliers' obligations and tools for the promotion and development of the market.

The EEAP does not include comprehensive planning for the implementation and the recast of the EPBD and the strategy to increase nearly zero energy buildings. However, a number of measures related to Article 10 of the EPBD can be explained in the Plan.

Strong informational measures are illustrated as separate measures as well as supporting actions. In the residential sector, measures such as providing information to consumers on energy saving issues and tax incentives to promote energy efficient technologies/interventions, can be highlighted. Among the horizontal measures, "Targeted education campaigns, provision of information and rewarding of good practices", has been implemented since 2008, in order to spread the message to the general public about the benefits of energy efficiency measures.

The second EEAP of Greece contains a separate chapter on primary energy savings measures, which have been implemented or planned in energy production and supply, and distribution and transfer. Cost estimates are presented for planned projects to enhance the distribution and transmission system. Various interconnection projects are presented, in particular regarding Cyclades, Northern Aegean and Crete Islands, which are expected to be completed by 2020 and reduce generation and transmission losses by 2.3 TWh. The report contains a separate measure promoting high-efficiency cogeneration focusing on installations in public hospitals, as well as one for improving district heating systems. The separate measure concerning the installation of intelligent metering of electronic and natural gas consumers is expected to facilitate energy saving due expected development of smart grids. Some measures have been introduced to promote of solar thermal systems.

Strengths

- In order to estimate and quantify energy savings and to take into account the impact of the economic recession on final energy consumption, the Member State has considered appropriate to adjust the calculation.
- According to the top-down method suggested by the European Commission to quantify the expected savings and the adjusted methodology that assesses the impact of economic recession on final energy consumption, the 2010 target has been met.
- Due to the impact of the economic recession, the plan acknowledges and identifies uncertainty with respect to attributing energy savings to measures and it suggests that decrease in final energy consumption in Greece is mainly due to the economic crisis.
- The Member State acknowledged the delay in the implementation of new additional programmes. Although many of these measures have not yet started, they should significantly contribute to the attainment of the 2016 ESD target.
- The Action plan describes a very consistent set of measures in the transport sector which delivers most of the savings. Additionally, a good set of measures in the public sector, highlighting the role of the public authorities and municipalities have been illustrated.
- The wider use of the EU Structural Funds for improving energy efficiency and promoting renewable energy in end-use sectors has been highlighted in the EEAP as it plays an important role in the Greek national strategy towards the financing of energy efficiency programmes. In 2009, almost all allocation for energy efficiency were re-allocated to create a dedicated fund for energy efficiency improvement measures in housing (energy saving at home) with ERDF contribution of EUR 241 million. Co-financing level for structural and cohesion funds has been raised up to 95%. However, the disbursement of funds has been stalled due to the economic and political situation in Greece.

Weaknesses

- Due to the specificity of the methodology applied to quantify the 2010 savings, it is not possible to estimate the further progress of the measures towards the achievement of the 2016 target and to take into account the impact of the economic recession on the calculation of energy savings.
- From the action plan it is difficult to distinguish what is the proportion of savings attributable to energy efficiency measures and to autonomous savings.
- The EEAP recognises that the top-down methods recommended by the Commission yield unreliable savings figures due to the effects of a significant economic recession in Greece. Greece therefore adjusts these top-down calculations using its own factors to provide a more realistic view of interim energy savings. While these factors are documented, the EEAP does not explain how the adjusted savings values have been calculated. As the adjusted calculation gives a wide range of values rather than a

specific savings value, it is unclear how much of these savings are likely to have been achieved by measures. Furthermore, no estimate of expected savings in 2016 is given.

- Delay in implementing many of the measures from the first EEAP, postponing them for 2011-2012, did not allow an evaluation of the savings.
- The energy savings reported in the action plan have mainly been presented by sectors, hence lacking the evaluation and the monitoring for each measure described.
- Potential overlap between several cross-sectoral and sectoral measures or even within the same target sector can be identified (e.g.: M5 and M6 or D7 and OIK1).
- Some measures are not clearly described and it is difficult to deduct if the measures have already been implemented or they are still pending (e.g. "Changing my old air-conditioner" action; compulsory replacement of all light fittings with low energy efficiency in the public sector and the wider public sector; etc.).
- Greece reports no comprehensive plan for the implementation and the recast of the EPBD and the strategy to increase nearly zero energy buildings. This is also stated in page 125 of the EEAP. With regards to the compliance with Article 9 of the EPBD, Greece could have drawn up plans to for increasing the number of nearly-zero energy buildings including setting up targets according to the category of buildings; with regards to Article 11 of the EPBD, Greece could have laid down necessary measures to establish a system of certification of the energy performance of buildings.

Recommendations for improvement

- The third EEAP should present a forecast for 2016 energy savings and it should include details such as the implementation schedule for each measure. Concrete achievements/outcomes should also be systematically monitored and reported (at least for the most important measures or groups of measures).
- In order to avoid possible double counting of savings towards the indicative 2016 target, it is recommended that the next report takes more thoroughly into account the synergic effects and overlaps between different measures.
- As the second EEAP includes a number of fairly new measures, it would be useful if the next report described the actual progress with the implementation of these measures.
- The involvement of the public sector and the main programmes undertaken to improve energy efficiency should be presented together with the achieved/expected savings.
- More focus and detail of information on EPBD and nZEB reporting requirements implemented by Greece should be included in the next EEAP.

HUNGARY

Summary

The Hungarian second EEAP reports exceeding the 2010 intermediate energy saving target under the ESD. It presents an energy efficiency strategy until 2016 with twelve complex measures covering all key end-use sectors (residential, public, industrial, transport). The presented data indicate that the largest proportion of final energy savings came from the residential sector, followed by industry and the public sector. The selection includes mainly incentive-type, information and ESCO-based instruments. Transport and SME related measures are limited.

Links with core national strategies are established and references are made to relevant regulatory instruments, suggesting that the second EEAP is well integrated with the existing national policies.

In general, the second EEAP of Hungary demonstrates rather low level of ambition, focusing mainly on the compliance with the absolute minimum of the requirements of the ESD. Furthermore, the lack of some concrete details (timeframe, extent) on relevant information measures is a barrier to the assessment with regard to compliance with information provisions. While measure descriptions contain details of future plans, information on actions already undertaken by 2010 is limited

General evaluation

The overall energy saving target remained unchanged compared to the first EEAP, at 57,4 PJ/year (15 955 GWh/year) representing 9% of the reference consumption. According to the Plan, progress by 2010 has been sufficient: achieved savings amount to 12,25 PJ/year, as compared to the intermediate target of 9,4 PJ/year (as reported in the first EEAP).

Bottom-up calculation methods and data sources are described for a list of measures that have contributed to the achievement of savings by 2010. The combined use of top-down and bottom-up methods is indicated as recommended by the European Commission.

In the second EEAP the measures have been recreated and rearranged as compared to the first EEAP. The strategy now includes twelve complex measures. Planned measures are presented with enough detail in general, establishing connection to relevant legislation. However, the description of some sub-measures is too vague, and measures descriptions often contain elements of goals rather than information on actually implemented actions. There are certain goals or measures expressed in the second EEAP, which would need more information to allow assessment, such as actions for ESCOs, smart meters, voluntary agreements. In terms of commitments made, the second EEAP is not more ambitious than the first EEAP and represents compliance with minimum ambitions according to the ESD.

Hungary emphasises the role of public sector and dedicates a separate chapter for this topic in the second EEAP. This information has been described in a clearer way than in the first EEAP. However, the proposed measures are limited mainly to the compliance with energy certification deriving from transposition of the EPBD, and supporting this with training and a software. It is not explained whether the support measures are in place or are only planned.

The second EEAP of Hungary contains only some preliminary information about the basic principles of the spread of nearly zero energy buildings in Hungary. The Hungarian second EEAP contains an overview of the plans, the existing national legislation and the incentive programmes for moving towards the nearly zero-energy buildings target (see Article 9 of Directive 2010/31/EU). However, the report does not provide many details about concrete targets and individual measures. The actual reporting on issues required by the EPBD is expected to be done though another report.

The second EEAP of Hungary does not provide a comprehensive overview of supply side energy efficiency measures. However, one of the presented comprehensive measures is focused on the improvement of efficiency of the district heating distribution networks. As part of this financial support measure, the renovation of district heating supply systems is envisioned, including the modernisation of heat supply pipe systems, primary heat reception and heat distribution centres. The measure also involves the establishment of modern measurement as well as advanced data collection and processing.

Strengths

- The measures in the second EEAP are described in detail and are presented in clear format. Implementation details – especially for future actions – are provided, such as the expected budget and its source, as well as monitoring and implementing bodies. It is also a positive feature that possible overlaps and synergies are indicated for each measure.
- The second EEAP clearly builds on the largest final energy saving potentials in the country, particularly the refurbishment of existing (residential) buildings.
- Measures combine financial and informational actions reinforcing each other's impacts.
- The EEAP preparation offered the opportunity to identify limitations in data collection, monitoring and proper implementation of energy efficiency measures. The part of the second EEAP identifying the problems and description of possible solutions is fairly comprehensive and can be used as a basis for longer term planning for concrete actions. The Government Decision attached to the second EEAP includes the requirement to monitor the second EEAP implementation, as well as the establishment of a calculation methodology and data collection.
- The use of the second EEAP at national level is aided through establishment of coherence with other strategies which sometimes run on a longer term.
- The detailed indication of data, data sources and bottom-up calculation methods for measures that add up to savings achieved by 2010 is a further strength of the second EEAP.
- The role of bodies involved in implementation and monitoring is well described.

Weaknesses

- The second EEAP of Hungary is mainly focuses on fulfilling the absolute minimum of the requirements of the ESD. While there is a reference to a 2020 outlook, the mentioned 10% commitment can be considered as not ambitious both in the light of the EU level objective of achieving 20% energy savings, and compared to the final energy savings of 9% at the national level expected by 2016.
- The presented set of measures, if implemented in an appropriate way, is expected to contribute to the achieving of the 2016 target. However, there is a risk of being on the conservative side, and not acting early on growing energy users, such as transport.
- Measures to address exemplary role of the public sector are rather weak. The description of measures lacks some concrete details (timeframe, extent). The

voluntary character of the horizontal measure to promote energy efficiency criteria in public procurement may not be sufficient to ensure achieving major energy savings.

- The lack of some concrete details (timeframe, extent) on relevant information measures is a barrier to the assessment with regard to compliance with information provisions. While measure descriptions contain details of future plans, information on actions already undertaken by 2010 is limited.
- For measures in the transport sector no cost estimations or budget sources are indicated. This raises uncertainty regarding the implementation of these measures.
- In some cases (for example measure 1.3, sub-measure: "Spread of energy-efficient lighting equipment and light sources", and measure 3.2, sub-measure: "Employment of energy experts at large energy consumers") the measure identifies a task, or desirable outcome. However, it does not explain the practical steps and actions that should be taken to implement the measure to achieve this outcome.

Recommendations for improvement

- Start and end date, duration of the measure, energy savings from early action, energy savings in the current and the forecast period, and practical steps already undertaken should be indicated separately for each measure.
- It would be recommendable that of the most important measures, parallel to estimated costs, also the amount of financing that has already been committed or spent is indicated.
- It would be useful that in the case of public funds, the share of EU funds, the share of revenues from allowance trading and auction incomes, as well as the share of other possible public sources are indicated separately.
- It is recommended to strengthen the measures to ensure exemplary role of the public sector especially as regards ensuring practical application of energy efficiency criteria in public procurement or public purchases of products falling under the EU Energy Labelling regulations.
- In the view of some new instruments required by the new Energy Efficiency Directive, already implemented and planned measures as described in the second EEAP and the significant potential for improving energy efficiency in all sectors in Hungary, it is recommended to consider increasing the level of ambition of the Hungarian 2020 target.

IRELAND

Summary

The Irish EEAP details an ambitious but realistic medium-term strategy to improve the energy efficiency of the economy. The report shows how achieving the ESD target will be an important milestone in the roadmap to achieving national energy efficiency goals for 2020. A comprehensive set of measures addresses energy efficiency in each of the main sectors of the economy. The plan aims to exceed the ESD target for 2016. Declared savings for 2010, however, are below the projections in the first EEAP. Bottom-up savings are calculated using national methods, and thereby attempt to capture only those savings that can be attributed to measures. The exemplary role of the public sector is evident and an ambitious energy savings target for the sector indicates a strong national commitment to energy efficiency. The supplier obligations scheme currently being rolled out will be a key element in achieving aggressive energy savings targets in the residential sector and will provide a platform for encouraging a market for energy services in Ireland.

General evaluation

The EEAP records savings of 4815 GWh in primary energy equivalent in 2010, which is considerably lower than the 6500 GWh intermediate target given in the first EEAP. Forecast savings in 2016 of 17130 GWh are 11.75% of average energy consumption in the reference period from 2001 to 2005. 56% of savings in 2016 are attributed to measures in buildings, 18% to transport, 15% to the business sector, and 11% to the public sector. The first EEAP defined a national energy savings target of 31925 GWh for 2020 to be achieved by the whole economy including sectors outside the scope of the ESD. The measures listed in the second EEAP are forecast to save 34060 GWh in 2020.

All savings are calculated using measure-specific national methods. Some are derived from feedback from programmes, expert assessments and national stock models. Figures include savings achieved as a result of measures implemented prior to 2008, in particular building regulations. The potential for double counting has been identified for each measure and the report indicates that appropriate adjustments have been made. The report does not present a top-down assessment of savings.

Much of the savings in buildings are attributed to a number of measures implementing building regulations, including building regulations for nearly zero energy buildings planned for 2016. A number of schemes that provided grants to householders for energy efficiency improvements have been replaced in 2011 by a new Better Energy Homes programme. Forecast savings figures indicate that the new programme will have a far greater impact than the previous ones. The scheme is supported by the new supplier obligations scheme which commits large energy suppliers to deliver energy savings. Given that the older grant-based programmes were moderately successful, the report does not explain how the supplier obligation scheme will lead to the necessary large increase in consumers willing to undertake energy retrofits of their homes.

Significant measures in the business sector include an accelerated capital allowance programme for organisations investing in energy efficient equipment, and a voluntary agreements programme for large energy users in industry who make a strong commitment to improving energy efficiency. Total savings associated with the voluntary agreements programme are reduced by 80% to determine its contribution to ESD and exclude EU ETS participants' savings. The plan includes an existing programme dedicated to improving the energy efficiency of SMEs in which participants receive targeted supports including mentoring and on-site assessments from a dedicated energy efficiency expert. The supplier obligations scheme is also expected to deliver savings in the industry sector in addition to those attributed to existing programmes.

The action plan contains a strong commitment to improving energy efficiency in the public sector. An ambitious 33% energy savings target for 2020 defined in the first action plan is retained. A number of new measures are presented. The Public Sector Programme provides tailored advice, mentoring and training to public sector organisations committed to energy efficiency improvement. Better Energy Workplaces offers grants for qualifying energy efficient upgrades. The report makes commitments on sustainable procurement, on development of financial models for energy performance contracting and use of ESCOs, and on the promotion of energy management in the public sector. Efforts are underway to better quantify energy use and to provide a robust monitoring and reporting system for the sector.

Of the listed transport measures, the EU regulation governing maximum CO_2 average emissions levels of private cars accounts for the largest share of savings. Other measures include adjustments to a tax on new cars purchased and to an annual motor tax in order to discriminate in favour of vehicles with lower CO_2 emissions levels, and an information measure to influence driver behaviour and improve the overall on-road efficiency of vehicles. A public transport investment plan called "Transport 21" to encourage a modal shift was introduced in the first EEAP, but is not mentioned in the second report.

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The EEAP provides a comprehensive description of plans addressing the efficiency of energy supply in Ireland. To improve electricity generation efficiency up to 2020, the report describes plans to phase out all oil-fired power plants and to replace some existing plants with high-efficiency combined cycle gas turbines and additional wind capacity. Electricity market deregulation and the establishment of an all-island market, incorporating the Republic of Ireland and Northern Ireland, are presented as measures that encourage greater efficiency in electricity supply. Furthermore, a winter peak demand reduction scheme encourages participating industrial and commercial consumers to reduce their peak electricity demand. The report states that investment in reducing transmission losses will only be considered if it can be shown that the investment costs will be outweighed by the benefits to the electricity consumer. On the other hand, clear targets are given up to 2014 for the reduction of losses in distribution networks. The EEAP states that a target of 800 MW_e of installed CHP is set for 2020, compared to an existing capacity of 284 MW_e. However, the programme providing capital assistance for new CHP ended in 2010.

Strengths

- The EEAP presents a clear and cohesive medium strategy to improve energy efficiency in Ireland. The plan addresses energy use in each of the main energy consuming sectors of the economy with a mix of state-funded programmes and market-based instruments. Measures are well explained and targets clearly stated.
- Savings for 2016 are forecast to exceed the 9% ESD target. Savings have been assessed using measure-specific methods, thereby excluding autonomous progress.
- The report shows a strong commitment to improve energy efficiency in the public sector. An ambitious energy savings target has been set. Dedicated public sector measures have been put in place and targets quantified for each. The exemplary role of the public sector is clearly communicated.

- New measures that provide tailored advice from experts to public sector organisations and SMEs complement the existing large industry programmes. The SME programme responds directly to the requirements of Article 12(1) in the ESD.
- The second EEAP contains commitments to helping energy users in both public and private sectors to implement energy management systems to meet the ISO 50001 standard.
- Introducing an energy supplier obligations scheme will help drive energy efficiency in public and business sectors and in the residential sector, and will help grow a market for energy services.
- The EEAP proposes to replace state funding with an innovative Pay As You Save financial model whereby energy consumers can finance their energy efficiency investments with the energy savings that they generate. The approach provides a possible mechanism for encouraging retrofits in homes and small businesses when public funding is not available. The report provides little detail on the proposal, however.
- Much of the savings in future are attributed to a number of measures implementing building regulations. New regulations are e.g. planned for "nearly zero energy buildings" as of 2016. This target seems to be quite ambitious as the EPBD requires new buildings to be "nearly zero-energy" only by 2019/2021.
- The certification scheme on the energy performance of buildings in Ireland is a good example for communication of the buildings performance to the building's owners and tenants.
- Clear targets up to 2014 are given for the reduction of losses in distribution networks.

Weaknesses

- Recorded intermediate savings of 4815 GWh are considerably lower than the 6500 GWh intermediate target defined in the first EEAP. The shortfall is not adequately explained. Instead, the report compares achieved savings to a lower intermediate target of 5000 GWh defined in national legislation from 2009.
- The EEAP uses only bottom-up or measure-specific national methods to evaluate savings. The top-down methods recommended by the Commission are not employed.
- The report does not explain well how the large savings anticipated from the new Better Energy Homes programme will be achieved. Forecast savings for the programme appear ambitious when compared to the more modest savings achieved by the combination of programmes it replaces. Although it is expected that the new supplier obligation scheme will drive energy efficiency in the residential sector, it is not clear what significant new actions will be implemented to ensure that homeowners will undertake renovations at a much greater rate than they already have.
- Implementation dates are not given for several planned activities. These include the establishment of a cross-departmental implementation group to deliver the contents of the action plan, the development of an ESCO action plan and the creation of a green fund for energy performance contracting. Of note also is that, although pilot programmes for smart meters have been implemented since 2007, no timelines are defined yet for a wider-scale rollout.

- The EEAP states that a target of 800 MW_e of installed CHP is set for 2020, compared to an existing capacity of 284 MW_e. However, the programme providing capital assistance for new CHP ended in 2010. The EEAP seems to miss some additional measures to achieve the Irish national CHP target.

Recommendations for improvement

- A more detailed explanation of the Better Energy Homes scheme and of its interaction with the supplier obligation scheme could be provided. Ireland should outline how the scheme will achieve savings in the residential sector that are significantly greater than those achieved by successful schemes implemented in the past.
- Planned start dates should be given for all proposed actions that enable energy savings and that facilitate listed strategic measures.

ITALY

Summary

The plan is a continuation of the policies and strategies described in the first action plan with the inclusion of a number of additional measures that should contribute to the 2016 savings. Overall, the second EEAP provides a thorough analysis of the existing measures proposed by Italy to improve energy efficiency and to promote energy savings in the residential, services, industry and transport sectors. The legislative framework currently in place strengthens Italy's energy policy, it identifies clear targets and it establishes energy efficiency policies guidelines to be implemented in the future.

The policies packages and strategy described in the report are coherent, ambitious and the quality of the measures indicates the progress of the successful on-going actions already in place that will contribute to the attainment of the 2016 target.

General evaluation

The second EEAP reports the savings achieved up to 2010 and it updates the energy efficiency measures to be adopted for the achievement of the 2016 target in accordance with the ESD requirements. The plan also includes some measures related to the EPBD reporting requirements.

The purpose of the second EEAP is to follow up actions and initiatives already described in the first EEAP and to present medium- to long-term proposals supported by innovative scenarios. The 2010 and 2016 predefined targets reported in the second EEAP have not been recalculated. In the first EEAP Italy committed to an intermediate target of 3% to be achieved by 2010 and to a 9.6% target to be reached by 2016. The second EEAP declares the achievement of the intermediate target set for 2010 at 47,711GWh or approx. 4% against the expected 35,658GWh or 3%. Furthermore, the EEAP forecasts that Italy will reach the 9.6% or 126,327GWh savings in final energy consumption by 2016. While this does not surpass projections given in the first EEAP, it is 0.6% above the 9% target required by the ESD.

In the second EEAP the methodology used to calculate the target remains unchanged. The types of actions and measures have also remained substantially the same, although new measures that could contribute to the energy savings already defined for 2016 are listed in the latter action plan. The second EEAP also defines a 2020 target. The plan addresses the achievement of the 20% reduction in primary energy demand by 2020 highlighting the need for implementation of further measures in order to achieve such ambitious target.

According to the second EEAP, most of the achieved/projected savings for 2010 and 2016 are associated to the residential sector (66%[75]), followed by industry 17% services 10% and transport 6%.

In the residential sector, the transposition of Directive 2002/91/EC through the legislative decrees 192/05 has significantly contributed to the implementation of the measures related to the 55% tax allowances for energy saving works on the existing building stock. This can be seen as one of the most successful programmes that contributed to the majority of the savings in the building sector. On the other hand, energy efficiency improvements in the transport sector are still weak considering that the transport sector in Italy accounts for approximately 25% of the country's total consumption.

[75] This percentage is calculated based on 2010 overall total energy savings 47,711GWh declared in the second EEAP.

The choice of criteria for the quantification of the energy savings achieved outlined in the second EEAP appears to be quite conservative. Although the ESD allowed the inclusion of energy savings achieved as a result of "early actions", the second EEAP reports the values of the annual energy savings by the end of 2010, assessing the measures applied from when they started and effective up to 31 December 2010. Possible overlapping have been highlighted in the second EEAP for those measures contributing to energy savings that interrelate with other actions, especially as a result of tax incentives and measures related to the successful White Certificates Scheme.

Additional measures and energy efficiency policies in the building sector have been added in EEAP2 with reference to EPBD implementation. Also, to some extent, a more significant role of the public sector is highlighted in the second EEAP.

Concerning EPBD requirements, Italy has transposed 2002/91/EC concerning the energy performance of buildings by implementing the Legislative Decree No. 192/2005. The Decree introduced important changes to the existing legal framework, setting up minimum standards, initiating the inspection of heating systems installations and introducing the energy performance certification of buildings. The second EEAP describes a number of measures that contribute to fulfil the EPBD reporting requirements such as: new mandatory minimum requirements for primary energy needs for winter heating and summer air conditioning for all new buildings; higher levels of thermal insulation for the envelope and minimum requirements for buildings that are undergoing refurbishment, promotion of the use of more efficient plant and equipment (e.g. heat pumps, three- and four-star rated gas boilers, for new buildings and refurbishments) and rationalisation of the controls on thermal systems for heating and air conditioning.

Legislative Decree 115/2008 has implemented Directive 2006/32/EC and it has assigned a higher importance to the role of the public sector by adopting measures with the aim to harmonise and distribute State and Regional functions related to energy efficiency, requesting the public sector to make the best use of technical and financial instruments to implement energy efficiency activities and promote actions throughout the country and also by appointing an energy manager responsible for the rational use of energy for all companies in the industry, service and transport sector that have significant energy consumption.

With regard to procurement measures and the compliance with Annex VI of the ESD, the stimulation by law of energy performance contracting for public, residential and services sectors has been highlighted in the EEAP by the use of financial instruments for energy savings including third party financing and ESCOs, enabling the end user to carry out energy efficiency activities without having to provide capital in advance.

A number of measures related to information and advice have been reported in the plan, a portal called *Obiettivo Efficienza Energetica* has been set up to provide information on the regulatory framework, available incentive mechanisms, technological solutions, training and simplified methods for achieving energy efficiency improvement targets. Furthermore, an internet site open to the public has been set up to provide information on how to save energy and money through tax allowances.

The second EEAP includes a broad range of supply-side measures implemented by Italy to improve energy efficiency. The report foresees the implementation of measures addressing electricity transmission and the reduction of losses in the distribution networks, measures to promote high efficiency cogeneration, strategies to improve the efficiency of electricity generation and measures to advance the development of smart grids. Among the planned actions, Italy lists the expansion of the transmission network to accommodate more renewables in the south of the country and to enable greater interconnection between the mainland and the main islands; the reduction in the length of distribution lines; the increased use of low-loss components, in particular transformers; the increase of the power factor at the sites of large consumers, and the increase of the voltage levels of distribution networks around the country. The report outlines a strategy to incorporate greater use of renewables, specifically wind and solar, in the production of electricity. The EEAP recognises the importance of applying greater intelligence to its distribution network over the coming years, and with infrastructure already in place to exploit 32 million smart meters already installed, it is forecasted that Italy will become a major player in the implementation of future smart grid technologies. Cogeneration is supported by the Italy's White Certificate Scheme whereby savings associated with micro-CHP installations can be traded. Legislation transposing the Cogeneration Directive is in the process of being updated. Planned changes relate to definitions of cogeneration technologies, methods of quantifying energy produced from cogeneration, and calculation of related savings for the purpose of issuing white certificates.

Strengths

Although most of the programmes and activities to improve energy efficiency have not changed since the first EEAP, the report communicates a coherent and feasible national energy efficiency strategy. The main strengths of the action plan are:

- The 2016 target declared in the EEAP appears to be secured by the on-going measures on condition these are properly implemented.
- Possible overlapping between energy efficiency measures contributing to the savings are highlighted in the Action Plan by the Italian monitoring authorities.
- There is a considerable number of new proposed measures that can minimise the risk of falling short of the 2016 target as well as a significant number of new programmes for which savings have yet to be quantified (such as those in the public sector).
- The ESCOs support seems to be strong and there are several measures in the industry sector within the White Certificates scheme which involves the ESCOs.
- Many measures operate in a synergic way, in particular in combination with the White Certificates Scheme and 50% tax allowance for energy efficiency improvement works on buildings; both programmes seem to sustain well the implementation of the energy efficiency measures associated to them.

Weaknesses

- The presentation of the plan is slightly unbalanced, with often too much description of the EU framework and less clear presentation of the Italian activities (e.g. for the public sector and on dissemination and information activities).
- Although for some measures the description is relatively well detailed, the second EEAP provides no description on the methodology used for the White Certificate scheme. Moreover, while most of the assumptions for the 2016 target are fairly detailed, the information on the achieved savings in 2010 appears to be less detailed.
- As regards improving energy efficiency in buildings, the roadmap towards nearly nZEB does not contain any concrete targets or definitions but mainly outlines only certain steps.
- The plan lacks details on the implementation of the measures regarding provision of information to customers including measures to improve informative feedback from metering and billing of individual energy consumption.

- There is a certain risk related to the effectiveness and energy savings contribution of some major measures presented in the EEAP (e.g. the 55% tax allowances, incentives for more efficient cars) as it seems that some of these measures have been only applicable during a short period of time. Any sudden discontinuation might potentially endanger the achievement of the 2016 and 2020 target and weaken the effectiveness of some other measures (e.g. White Certificate Scheme).

Recommendations for improvement

- The details of information described regarding energy efficiency policies and initiatives implemented in various sectors of the Italian economy are comprehensive and well described. However, it seems that most of this information is based on existing policy initiatives already presented in the previous action plan. In the view of the new Energy Efficiency Directive, it would be recommendable to consider further strengthening of the plan by including a description of the implementation of new programmes and actions to promote energy efficiency in the various sectors of the Italian economy.
- Energy savings associated to the planned measures to address public sector should be quantified.
- The part of the EEAPs with measures addressing the buildings envelope as well as the roadmap towards nearly-zero energy buildings would benefit from further strengthening.

LATVIA

Summary

The Latvian second EEAP complies with the ESD requirements. It provides a clear overview of the overall national energy policy context, energy efficiency measures and their sources of financing, relevant national legislation and compliance with the ESD, following the structure of reporting recommended by the European Commission.

While on the positive side a well-developed legislative and regulatory framework for energy efficiency is demonstrated and financing sources and timeframe of the measures are specified, the strategy does not appear ambitious enough. The high contribution of the transport sector to savings in energy end use in the intermediate reporting period raises concerns, due to the mismatch between the presented measures and the amount of savings in the sector.

2010 savings may be overestimated as the methodology used is based only on the top-down approach and it is likely that some of the savings come from the statistical effect of the economic crisis rather than actual energy efficiency measures. A new monitoring methodology (comprising of both top-down and bottom-up) has been developed but is expected to be applied only in the preparation of the next EEAPs.

General evaluation

According to the data provided in the second EEAP, Latvia nearly achieved its 2016 energy savings target under the ESD already in 2010. The national indicative energy savings target for 2016 has been retained at 3,483GWh (equivalent to 9% of average final energy consumption in the period between 2000 and 2004). Reported savings in energy end-use amounted to 3,418GWh (8.8%) in 2010, well above the 67GWh (0.17%) intermediate target. Furthermore, by 2020 Latvia plans to achieve 7,779GWh savings in total and 6,050GWh (15.6%) savings in final energy consumption.

In the reporting period 11 measures were fully and 9 measures were partially implemented. The measures are presented with high level of detail, specifying timeframe and financings sources. The EU Structural Funds and the Cohesion Fund, as well as the Climate Change Financial Instrument (CCFI, which is connected to revenues from AAU sales) play an important role in financing already implemented, as well as planned measures.

Measures were proposed in the following five energy end-use sectors: residential, transport, industry, the tertiary sector and agriculture, as well as horizontal cross-sectoral measures. In the intermediate reporting period the transport sector contributed most to savings in energy end-use (amounting to 78% of the total), while savings in the services sector constituted 28%, and the residential sector 20% of the total. However, it must be noted that savings reported in the transport sector correspond to 24% of total sector specific energy end-use in 2004. Such a large amount of savings with the presented measures seems unlikely. The economic crisis had an impact on the transport sector through the increase in petrol prices. Other factors identified as contributors to savings in energy end-use in road transport included optimisation of freight transport and improvements in technology.

In terms of financial commitments no significant change was detected between the first EEAP and the second EEAP. At the same time information measures for energy efficiency in transport and a measure in the agriculture sector (targeted at farms, forestry and biofuel renewable energy supply) are not mentioned in the second EEAP. Furthermore, information campaigns on energy efficient lighting and computers and on energy labels of electrical equipment, targeted at the tertiary sector, were not implemented. In the second EEAP new measures were added in primary energy, in the industry sector (voluntary agreements) and in the buildings sector (tightening the building codes requirements). Overall the second EEAP represents improvement compared to the first EEAP.

Latvia opted to fulfil the EPBD reporting requirements within the second EEAP. With reference to nZEB, in 2011 a competition was organized on low-energy buildings (with financing from CCFI). Legislative provisions, including specific technical requirements for the use of RES will be developed by July 2012. With reference to Article 10 of the EPBD, the most important financial instruments for promoting the energy efficiency of buildings in Latvia are the EU Structural Funds (ERDF) and the CCFI. Regulations for inspecting boilers and air conditioning systems are in place. An inspection of boilers and air conditioning systems is mandatory when certifying the energy performance of a building, but in other cases the inspection is voluntary. Given Latvia's climatic conditions, there are no statutory requirements to provide cooling systems in buildings.

The exemplary role of the public sector is highlighted in the second EEAP. In Latvia state and local authority bodies are obliged by law (Article 9 of the Law on Energy End-Use Efficiency) to promote energy efficiency measures. Measures concerning the procurement of energy efficient equipment that has efficient energy consumption in all modes (including standby mode), and requirement to carry out energy audits for public buildings indicate compliance with Annex VI of the ESD.

Overall there are several positive elements in the provision of information and advice on energy saving measures in Latvia (for example the existence of relevant laws, and the work of regional energy agencies and the cities that are members of the Covenant of Mayors), but there is space for improvement (for example with regard to expansion of efforts, in the area of ESCOs, as well as in energy service provision by distribution system operators and energy traders). Consultation and information activities (including online information, individual consultations, lectures, seminars, publications, and TV and radio reports) are provided by the Ministry of Economics and the AS "Latvenergo" Energy Efficiency Centre. Expansion of these activities is planned in the future with respect to provision of information to individuals and legal entities.

Various measures are proposed for improving energy efficiency in primary energy. These include the development of a smart grid concept, improving energy efficiency in transmission and distribution of natural gas and electricity, improving the efficiency of centralized heating supply systems, development of a CHP plant using renewable energy sources, and improving efficiency in electricity generation at one hydro power and one CHP plant.

Measures to improve the energy efficiency of electricity generation include modifications of existing hydroelectric plants and on-going projects to upgrade combined cycle gas plants that can operate in cogeneration mode. The efficiency of the electricity network will be improved in the coming years by the planned reconstruction of power lines and transformer sub-stations, and replacement of transformers. Latvia is developing a smart network concept to establish a common understanding of the meaning of smart grids, to create a basis for examining the need to implement smart grids, and to assess its technical possibilities. The report mentions that an upgrade of the gas network is planned, including a modernisation of an underground gas storage facility. While a programme to finance the construction or modification of heat plants and district heating networks is in place, lack of funding and low capital turnover are identified as barriers to energy efficiency improvement in district heating systems. Finance from the cohesion fund has been allocated to the development of cogeneration plants using renewable fuels. However, no projects financed by the measure have yet been completed. CHP development is further supported by a guaranteed compulsory purchase of electricity from cogeneration at a fixed price and by the right of plant operators to receive guaranteed payment for installed electrical capacity. Additionally cogeneration plants using renewables can choose either to receive guaranteed payments for electricity capacity or to sell electricity generated.

Strengths

- The Latvian second EEAP is well structured. It provides a clear description of the current situation, including details on energy consumption, building stock characteristics and legislation. Information on financing sources and timeframes of the individual measures is also provided.
- The EU ERDF and the Cohesion Fund are put to the use of energy efficiency activities, providing a best practice example for other new member states.
- There is a good estimation of budgets for specific measures. Financing is on-going for the large majority of measures, secured through 2013 (via sources from the EU).
- The Latvian second EEAP provides a target and estimation of energy savings by 2020.
- The measures presented in the second EEAP provide a good coverage of all important end-use sectors, as well as savings in primary energy.
- The second EEAP demonstrates a well-developed legislative and regulatory framework for energy efficiency.
- The top-down calculation method used is the one recommended by the EU commission and is well explained.

Weaknesses

- Savings are calculated only by top-down methodology. As such, it is unclear to what extent reported intermediate savings are due to the implementation of specific energy efficiency measures and to what extent the economic crisis has influenced savings. There is a risk of an overestimation of energy savings achieved by 2010 (particularly in the transport sector). Energy savings presented in the second EEAP for the intermediate target have been calculated for 2009, due to lack of approved statistical data for 2010.
- While the Latvian second EEAP is a well-structured document, it contains repetitions in the measure descriptions: some residential and tertiary sector measures are declared again, later on, as building sector measures, some district heating measures are also declared as primary energy measures.
- Some measure descriptions could provide more detail. For example, the details on future requirements are missing in the case of tightening minimum energy performance requirements for renovation and for new buildings; the measure targeted at the transport sector on ‘systematic inspections of the technical condition of vehicles’ seems to be only an ordinary technical inspection.
- While smart metering infrastructure is mentioned in the second EEAP, the implementation of the concept seems to be at the very early planning stage, to be subjected to economic assessment.

Recommendations for improvement

- In the view of the new requirements of the Energy Efficiency Directive, monitoring of energy savings arising from future energy saving obligation schemes and alternative measures to such schemes should be improved in Latvia in order to ensure fair treatment of obligated parties and that there is no double counting of energy savings.
- The expansion of measures for providing information and advice to the public on energy efficiency would be desirable. Plans to fulfil this have already been mentioned in the second EEAP.

LITHUANIA

Summary

The second EEAP of Lithuania builds on the first action plan, showing improvement in terms of structure and readability. Lithuania applies the EC recommended guide and the template, presents measures per sector (household, public, industrial, energy, transport and horizontal), provides more detailed information for the measures and calculates energy savings using national bottom-up methods.

However, most of the measures are still focused on residential and public sector buildings and nearly all of Lithuania's declared energy savings in 2010 are attributed to pre-2008 building regulations and other early measures.

General evaluation

Lithuania did not revise its energy saving target. The national final energy savings target for the nine year period (2008–2016), calculated in line with the requirements of Annex I of the ESD, remains as set in EEAP1 at 9% (3 797 GWh) of the average reference energy consumption for base period 2001–2005. The intermediate energy savings figure for the three year period (2008–2010) is 1.5% (628 GWh).

Final energy savings for 2010 amount to 780 GWh, compared to the savings target of 628 GWh set in the first EEAP. The energy savings were calculated using national bottom-up methods. However, quantification was not possible with regard to each documented measure. Contributions per sector are reported as follows: horizontal - 590 GWh, public - 110 GWh, residential - 80 GWh. Nearly all of Lithuania's declared energy savings in 2010 are attributed to pre-2008 building regulations and other early measures which were not included in the first EEAP.

Generally, the top-down figures are at odds with the bottom-up ones. Using top-down methods, road transport accounts for most of the energy savings, while negative savings are shown for heat use in households and for some industrial sub-sectors.

With regard to the impact of individual energy savings measures that have already been implemented, are being implemented or are planned, final energy savings for the 2008–2016 period are estimated at 3 962 GWh, compared to the savings target of 3 797 GWh. It is estimated that horizontal measures will account for 1 240 GWh, the energy sector 740 GWh, industry around 565 GWh, the residential sector around 558 GWh, the transport sector 472 GWh, and the public sector 387 GWh to the 2016 savings target.

Interesting national policies presented in the second EEAP include the promotion of standard contracts for the diffusion of energy services in the public and private sector and voluntary agreements with the industry. The following quantitative energy efficiency improvement targets were set for Lithuanian electricity distribution enterprises, heat suppliers and natural gas suppliers: to reduce final energy consumption by end-users by 10% compared to average consumption in 2001–2005, which seem to be going in the direction of the energy saving obligation schemes included in the new Energy Efficiency Directive.

Compared to the first EEAP, the exemplary role of the public sector is more clearly highlighted in the second EEAP. In the first EEAP a lot of attention was devoted to public buildings, training and provision of information to public employees, and planning to use public procurement to promote efficiency. Measures in the second EEAP comprise renovation of scientific and higher education institutions, community centres, libraries, museums, prisons and other public buildings through promotional programmes and funds, partly using Structural Funds, information and advice, as well as procurement and mandatory audits. The exchange of good practices between public sector bodies is facilitated. Lithuania fulfils the obligations on public procurement by introducing a combination of relevant measures.

Order No 4-184 of the Minister for the Economy of the Republic of Lithuania of 29 April 2008 approved the methodology for performing audit on energy, energy resource and cold water consumption in public buildings (Official Gazette 2008, No 55-2097). The methodology defines the stages for audit performance as well as for preparation of the audit report.

As regards metering and billing, inter alia Order No 4-40 of the Minister for the Economy of the Republic of Lithuania of 31 January 2007 approved general rules for installation of advanced meters at the premises of electricity, heat and natural gas consumers which shall accurately reflect actual energy consumption by the end-users and record the exact time of consumption (Official Gazette 2007, No 24-936, 2008, No 58-2190). However, it is not clear if Lithuania introduced measures that would improve technical feasibility of using individual heat meters or accurate heat cost allocators to account for individual consumption and enable billing based on actual consumption of heating in multi-apartment buildings (e.g. programmes supporting installation of thermostatic valves for the radiators).

In terms of financing, Lithuania reports on standards contracts for the diffusion of energy services in the public and private sector. Furthermore, Lithuania indicates the use of EU funds and funding obtained through the sale of surplus Assigned Amount Units on international carbon markets for the financing of energy efficiency improvement measures.

There is a lot of attention to information and advice to final customers and SMEs in relevance of Article 7(2) of ESD. Furthermore, the Lithuanian second EEAP report contains the requirement for energy companies to provide information to energy customers and municipal authorities.

In a document accompanying the EEAP, Lithuanian authorities have listed measures that promote the objectives of the recast EPBD, as required by Article 10(2). The EEAP itself lists measures addressing the requirements of Articles 14 and 15 to inspect heating and air conditioning systems. However, the EEAP does not refer to a national plan for nZEB, it does not set any intermediate targets for nearly-zero energy buildings for 2015 (Article 9 of EPBD), and the leading role of public authorities in the field of energy performance in buildings is not sufficiently highlighted (Article 11(5) of the EPBD).

The second EEAP of Lithuania does not provide a full review of measures on the supply side as such. However, the use of Structural Funds for the upgrade of co-generation plants, construction of high-efficiency co-generation plants and their connection to heat supply systems are reported under the measures addressing energy savings in the industry sector.

Strengths

- The Lithuanian second EEAP is well structured, presenting measures by sectors. It provides more detailed information on measures compared to the first EEAP and provides calculations for the achieved and expected energy savings.
- The promotion of standard contracts for the diffusion of energy services in the public and private sector, and voluntary agreements with industry represent good practice in national policies.
- The exemplary role of the public sector is now clearly highlighted in the second EEAP. The measures mostly focus on publicly owned buildings. Lithuania fulfils the

obligations on public procurement by introducing a combination of measures referring to Annex VI of ESD.

- The EEAP includes useful measures to ensure the provision of information and advice to final customers and SMEs, which goes in the direction of new requirements of the Article 12 of the Energy Efficiency Directive.

Weaknesses

- Most of the measures are still focused on residential and public sector buildings but nearly all of Lithuania's declared energy savings in 2010 are attributed to pre-2008 building regulations and other early measures.
- Out of the documented 57 measures of the second EEAP, only 10 are declared new measures compared to EEAP1. Some measures just follow the mandatory transposition of EU regulations (e.g. under Ecodesign Directive)
- One of the important measures being the voluntary agreement with energy undertaking to reduce final energy consumption by 10% among final customers (compared to the average consumption of 2001-2005) was introduced. However, the results of the actions taken by these undertakings so far under this voluntary agreement have not been presented in the EEAP.
- A number of measures reported in the second EEAP are legal requirements with clauses (e.g. as regards obligations to install and report on the installation of individual meters when technically and economically feasible). However, the second EEAP does not provide information on the actual impact of such measures (e.g. how many meters were actually installed).

Recommendations for improvement

- The EEAP is mainly based on measures in the building sector, both in the residential and public sector. Lithuania's declared energy savings in 2010 are attributed to pre-2008 building regulations and other early measures. Bearing in mind significant potential for energy savings especially in existing buildings in Lithuania, it recommended considering some new strong measures that would improve energy performance of such buildings on a more massive scale.
- In order to enhance technical conditions for accurate metering and billing of individual consumption of heating and domestic hot water in multi-apartment and other multi-user buildings, it is recommended to consider new programmes to improve in-house central heating systems including installation of thermostatic valves for radiators in such buildings.
- Clarification of discrepancies between savings figures calculated by bottom-up and top-down methods would be useful to get a better understanding of the actual achieved and expected savings.
- In the view of the requirements of the new Energy Efficiency Directive, it is recommended to clarify the level of obligation (or self-obligation) by the energy undertakings to save energy among end-users. Implementation should be thoroughly monitored.

LUXEMBOURG

Summary

The second EEAP for Luxembourg is well written and presents a coherent national energy efficiency plan. Forecast savings for 2016 are realistic and are considerably greater than the level necessary to meet ESD requirements. The documented savings for 2010 indicate successful implementation of national energy efficiency policy. The plan is consistent with the first EEAP, with a clear view of progress in the intermediate period and with new, updated and adjusted measures where necessary. There remains, however, considerable untapped energy savings potential in Luxembourg. In existing building stock there is scope for increased energy efficiency. Luxembourg should develop new measures, or adapt existing ones where these are less effective, to convert this potential into real savings. The exemplary role of the public sector is not sufficiently addressed in the report. Although a number of measures are planned, the report doesn't commit the public sector to implementation dates for these and doesn't attempt to quantify the sector's contribution to overall savings. Luxembourg's own projections for final energy savings show that energy savings target of ESD for 2016 will be achieved if all the measures included in the second EEAP are implemented.

General evaluation

Measures presented in the Luxembourg EEAP are divided into three groups: early action measures that were implemented prior to 2007, new measures that have been put in place since 2008, and potential measures not yet implemented. The report declares intermediate savings of 7.6% of reference energy consumption and forecasts savings of over 14% in 2016 if all existing and planned measures are fully implemented and if early actions are included. Luxembourg used national bottom-up methods to calculate measure-specific savings and early actions account for over 40% of forecast savings.

The residential sector accounts for the largest proportion of listed measures and the largest share of savings. Most of the savings are attributed to building regulations that are applicable only to new buildings and buildings undergoing significant renovation. Although some measures address energy efficiency in existing households, these contribute only a small proportion of total savings.

Four measures listed for the tertiary sector, three of which are building regulations. The fourth measure, planned to exploit the electricity savings potential, is vague and contains little detail about implementation. As the first three measures apply only to new buildings and renovations, and the fourth has not yet been implemented, the listed measures do not appear to adequately encourage increased energy efficiency in the tertiary sector.

Of the four listed measures addressing energy efficiency in industry, three are associated with long-standing voluntary agreements. Most of the projected savings are accounted for by voluntary agreements in the period up to 2007. The fourth measure is a possible future measure which, like similar measures in the tertiary sector, aims to exploit some of the untapped electricity savings potential in the sector. While this potential is quantified, the planned actions associated with the measure are not sufficiently dealt with.

In the transport sector, forecast savings are given for three measures. Measures include an increase in the tax on transport fuel to encourage lower consumption, the introduction of a CO_2-dependant motor tax, and a subsidy for low emissions passenger vehicles. No measures that directly encourage greater use of public transport are mentioned.

A series of horizontal or cross-cutting financial measures are presented, including subsidies to promote the increased use of renewables among households and favourable electricity selling tariffs to encourage investment in CHP in commercial buildings.

A section explaining the exemplary role of the public sector is included. Since 2010, all new public buildings must comply with the lowest "domestic energy standard". The EEAP mentions that a budget of around EUR 30 million has been made available for upgrading existing building stock. As the same budget is referred to in the first EEAP, it is not clear how much has been done to improve the energy efficiency of public buildings since 2008. Some proposed public sector measures introduced in the first EEAP are not mentioned in the second report.

It is stated that a sample energy service contract is currently being drawn up to be used in one or more pilot projects in the public sector. The report also declares that Luxembourg will implement public procurement measures (a) and (b) in Annex VI of the ESD, but a timeline for their implementation is not given.

The European Energy Award system is being implemented in Luxembourg's municipalities. Municipalities undertake to implement the energy management system in return for financial and technical support from the state. Successful implementation will demonstrate a serious commitment to increased environmental sustainability and energy efficiency.

The EEAP has a good communications strategy with measures in the form of websites, exhibitions, advice centres and training programmes. The report presents a broad range of information measures that are designed to promote energy efficiency. Myenergy is a national institute that has responsibility for increasing awareness of energy efficiency and renewables among the public. As well as maintaining a comprehensive information website, the institute organises a series of trade shows to promote energy efficient retrofits.

The report presents a list of existing and planned measures for achieving the objectives of the recast EPBD. Existing financial measures include subsidies for building low-energy homes and for energy retrofitting of existing homes, subsidies for companies investing in energy efficiency, and investment aid for municipalities. Planned or possible future measures include tax credits for notary fees and subsidised mortgage interest rates for energy efficient homes, low-interest loans for retrofitting low-energy homes, accelerated capital depreciation for tenants, and reduced VAT rates for energy efficient renovation works. The report does not contain any information *vis-à-vis* inspection of heating and air-conditioning systems in buildings. While the report does not define any target nZEBs, it commits the Government to building "plus-energy" buildings for demonstration purposes. However, it does not quantify the number of buildings or give a timeline for their construction.

The first and second EEAP reports are very similar with a good deal of consistency between the measures presented in the two. Higher projected savings in the second EEAP can be attributed to recalculation of savings projected to be achieved by individual measures, and the inclusion of additional existing and potential measures. The second report shows that some planned measures in the first EEAP are now being implemented. On the other hand, other measures planned in the first EEAP, such as those addressing the energy savings potential in the industry and tertiary sectors still have not been implemented according to the second EEAP.

The EEAP contains no information about measures addressing supply-side energy efficiency. A measure promoting renewables and decentralised CHP using feed-in tariffs is described. As savings figures associated with the measure are given as early action savings, *i.e.* achieved before 2007 but still effective, it is not clear from the report if the feed-in tariffs are still available for new installations.

Strengths

- The report introduces a clear energy efficiency strategy, sets ambitious national targets, provides a good overview of progress in Luxembourg, and presents a coherent set of measures with effective actions in each main economic sector.
- The EEAP presents achieved and forecast savings that are well ahead of ESD targets. These figures indicate that significant progress has been made in improving the energy efficiency of the economy in Luxembourg.
- As total declared and projected savings are the sum of savings evaluated per measure, they provide an accurate reflection of energy savings achieved through policy.
- Energy management systems implemented at municipal level offer significant energy saving potential and indicate a long-term commitment to energy efficiency improvement.
- The report presents a good communications strategy with a variety of information measures including web sites, trade shows, local advice centres and training programmes.

Weaknesses

- The exemplary role of the public sector is not sufficiently highlighted and some important measures have not been implemented, yet. No public sector savings have been quantified. The extent to which planned upgrading of existing public buildings has progressed is unclear.
- Programmes addressing efficiency in existing buildings indicate low energy savings with most of the savings in buildings are achieved through building regulations. The significant energy savings potential in existing buildings is not adequately addressed.
- Proposed measures to address the energy savings potential in the industry and tertiary sectors are not sufficiently supported by concrete actions. For example, Luxembourg quantifies the total electricity savings potential of the industry sector up to 2016 for several technologies (e.g. motors, fans, pumps, compressed air, etc.). It then takes a percentage of this potential and presents it as the 2016 savings associated with a future measure called "C7 cross-cutting technologies savings potential". However, it does not list any concrete measures that will help realise this potential, e.g. enhanced capital allowances for EE equipment, grants for pumps, motor replacement programme, etc. All other industry savings are achieved by voluntary agreements in the sector.
- The electricity savings potential for the service sector is quantified in a similar manner and 50% of the potential is presented as the savings to be achieved by a proposed measure called "C6 Electricity Savings Potential". Again no planned actions to incentivise the replacement of electrical appliances in the sector are given. All other savings in the service sector are achieved by building regulations.
- While quantifying the energy savings potential is a positive aspect of the EEAP, the savings potential itself doesn't constitute a measure. Luxembourg needs a broader range of measures, in particular clear measures that address the quantified electricity savings potential in the industry and services sectors.
- The EEAP does not report on any measures that would actively encourage energy efficiency among SMEs.

Recommendations for improvement

- The report should provide greater detail about concrete measures implemented in the public sector. The exemplary role of the sector should be emphasised. Energy savings targets should be defined and time frames for the achievement of goals specified. It should be possible to assess the public sector's progress towards its goals. Public sector targets with respect to nZEB and implementation of the recast EPBD should be set.
- Luxembourg should analyse the effectiveness of measures that encourage greater efficiency in existing buildings. Improving insulation and increasing the efficiency of heating systems in existing homes and offices should offer considerable energy savings potential. This potential should be quantified and targeted by actions, and existing actions should be intensified or modified if shown to be ineffective.
- In the second EEAP, several potential actions are mentioned that could save energy in the tertiary and industrial sectors. These include addressing technologies such as lighting, IT systems, electric motors, compressors, etc. with information actions, energy audits and other actions. The listed actions offer significant energy savings opportunities. Luxembourg could further develop these potential actions into concrete measures and provide greater detail about these in the next EEAP.

MALTA

Summary

The Maltese second EEAP is a well-structured document, embedding the individual measures in the broader national energy policy concept. A clear link and display to the national indicative primary energy saving target for 2020 is put forward and supported by an additional interim target for 2014. The energy efficiency measures focus on enhancing energy efficiency in the domestic sector, tourism and industry.

The document is following the template suggested by the guidelines developed by the European Commission for ESD reporting. The Maltese second EEAP reports the overachievement of the 2010 intermediate energy saving target under the ESD and expects to reach the overall 2016 ESD target and presents a comprehensive and workable set of instruments.

The presented data indicates that the largest proportion of final energy savings came from the households sector. In methodological terms, the action plan could be improved by providing more detail on the measurement and verification and the underlying data used.

General evaluation

According to the second EEAP policies proposed in the first EEAP are in the process of being implemented. In the majority of cases measures correspond to the ones mentioned in the first EEAP, some with changes in title, structure, modifications and adaptations. Few additional measures have been initiated. A CFL scheme is mentioned as a new measure, as part of which all households were given free energy saving lamps, with the aim of promoting the future purchase of this product.

The EEAP for Malta lists 40 measures (Table 3-4 of the second Maltese EEAP). Thirteen of these were in place prior to 2008 but most of the early measures are still active into the first or second EEAP period, such as incentive programmes for PV and solar water heaters. The level of ambition of the first EEAP and of the second EEAP is similar.

An Energy Efficiency Fund has been created by the Ministry of Finance, the Economy and Investments to ensure the availability of funding for energy efficiency support schemes. Sources of funding included an excise duty on petrol and diesel, as well as EU structural funds.

As indicated by the second EEAP provision of information and advice forms an integral part of action to increase efficiency of energy end-use in Malta. Two education campaigns were carried out at the national level between 2007 and 2010. Information sessions and programmes targeted towards different audiences are delivered on radio and television, as well as through seminars and presentations. Furthermore, information on energy efficiency measures is available on the websites of the electricity supplier and the regulator.

The wide range of measures incorporating different sub-sectors indicates the importance of the public sector in Maltese energy efficiency policy. Public authorities in Malta have been implementing energy savings measures as part of their own operations. A Green Leaders Programme is running in government ministries in Malta. As part of the programme green focal points are appointed in different departments, creating a green network within government. As for public procurement the National Green Public Procurement Action Plan does not specify eligible energy efficiency public procurement measures, as set out in Annex VI of ESD.

The Maltese second EEAP devotes a separate section to the context and planned measures of EPBD implementation and to the promotion of nearly-zero energy buildings. According to the report the impact of applying energy performance requirements in new and renovated buildings is currently limited. Malta plans to utilize experience acquired through EPBD implementation to achieve the final goal of substantial energy savings through new nearly zero-energy buildings by 2020. A combination of significant incentives (financial instruments, including rebates, tax credits and advantageous bank loans) and better enforcement of the certification system is expected to be the key driver of this process.

Related to EPBD implementation the need for additional training for architects, engineers and qualified experts is identified in the second EEAP, in order to improve skills in energy audits. Furthermore, an EPC web portal including online audit reports and data entry validation was developed and is continuously improved.

As mentioned above, Malta has achieved and exceeded its interim final energy saving target of 3% (126GWh in absolute terms) under the ESD: as indicated by top-down analysis total savings by 2010 amounted to 3.8% (161GWh in absolute terms). According to the second EEAP energy efficiency is a key area of Maltese energy policy, with the 9% final energy saving target (378GWh in absolute terms) expected to be met by 2016.

Malta uses top-down methods to quantify energy savings, with savings for some sectors and end-uses verified using the bottom-up approach. Savings verified by bottom-up methods amount to approximately 108GWh. However, the applied bottom-up methods could have been explained in more detail. Top-down methods for calculating savings in transport (11GWh) and in households (108GWh) in 2010 are in line with those recommended by the European Commission. In the industry sector a national method involving early actions is used for calculating top-down savings, taking the year 2000 as reference. The top-down assessment in industry focuses on the water sector, as potable water production (involving extensive use of seawater desalination) accounts for about 30% of electricity consumed by industry.

Most of the declared top-down savings are measured with 2007 as base year and therefore exclude early savings. However, declared industry savings of 42GWh, or 26% of total declared savings for 2010, are measured relative to 2000 and therefore include early savings. Even assuming all industry savings were achieved prior to 2008, early savings as a proportion of total declared savings cannot be more than 26%.

The second EEAP of Malta contains a separate section on strategies addressing primary energy savings. Reported supply side measures focus on reducing electrical transmission and distribution losses (through the planned submarine electrical interconnection to the European network), installation of new efficient generating capacity and promoting smart grids through the rollout of smart meters.

Strengths

- The Maltese second EEAP document clearly links the measures put forward to the overall energy efficiency policy concept and the national 2020 energy efficiency objective. A clear and comprehensive link to the EPBD reporting is established.
- The measures are clearly and comprehensively described.
- The Maltese second EEAP generally follows the reporting guidelines proposed by the European Commission. Energy savings achieved and possible overlaps and synergies are also addressed, although this information is not available in the case of every measure.

Weaknesses

- In the Maltese second EEAP the timely attainment of the 9% energy saving target by 2016 is foreseen. It would have been helpful to support this expectation by detailed description of the individual measures; energy savings expected from each measure by 2016 is missing in the majority of cases.

Recommendations for improvement

- In the Maltese second EEAP information on achieved savings in 2010 and expected savings by 2016 from individual measures do not in all cases correspond with the presented overview table.
- It would be helpful to provide details of bottom-up methods. The relation between the bottom-up and top-down calculation of savings in the case of some measures remains unclear. In all cases it should be clearly indicated whether bottom-up or top-down methods are used.

POLAND

Summary

The second EEAP for Poland presents a comprehensive set of measures that address energy efficiency in key sectors of the economy. The figures presented for 2010 suggest significant energy efficiency improvement since 2007 and indicate that the national intermediate target has been surpassed. Forecasts for 2016 show that the 9% ESD energy savings target can be exceeded by the measures listed in the report. The report does not provide sufficient detail about methods used to calculate forecast saving. The report does not give sufficiently clear explanation of the extent to which intermediate savings have been achieved by the policy measures. While the leading role of the public sector has been stated in the second EEAP, the extent to which it complies with the public procurement requirements of the ESD is not clear. Also and the means to facilitate exchanges of good practices among public institutions on energy savings and to promote the leading role of the public sector to the wider public would benefit from are not sufficiently explained. The second EEAP contains a more concrete set of measures, but the lack of detail with respect to listed actions in the first EEAP is still evident in many of the measures presented in the second EEAP. The introduction of a white certificate scheme in Poland provides the biggest opportunity for energy savings in the coming years and goes in line with the key instruments endorsed by the new Energy Efficiency Directive. The scheme should accelerate national energy savings efforts and enhance the market for energy services.

General Evaluation

The EEAP declares final energy savings of 5.9% of reference energy consumption for the 2-year intermediate period to 2009. The intermediate savings are calculated using top-down methods recommended by the Commission. Forecast savings for 2016 are 11.3% of reference energy consumption. The 2016 forecast figure appears to be the sum of projected savings calculated using bottom-up methods for each of the measures detailed in the document. Listed are 15 'priority measures' measures that include financial support schemes and dedicated state funding as well as market-based mechanisms, and are designed to address energy efficiency in housing, industry and SMEs, the public sector, and energy distribution.

The 'Thermomodernisation and Repairs Fund' is the only listed measure that addresses energy efficiency in the residential sector. As the report shows high levels of investments and savings per application, it's apparent that the programme encourages mainly renovations of larger multi-dwelling apartment buildings. There is no indication of the extent to which this or any other measure encourages energy efficient retrofits of owner-occupied dwellings.

Listed measures to encourage energy efficiency in industry include a fund to finance energy audits of large energy users and a fund for energy efficiency actions subsequent to execution of energy audits. A separate financing programme is dedicated to providing loans to SMEs who wish to make investments in energy efficiency. Further measures listed under industry include a measure addressing the efficiency of CHP plants, a planned measure to support the introduction of smart grids, incorporating pilot smart metering actions, and a measure to reduce losses in electricity and heat distribution networks. A planned industry voluntary agreements programme which was mentioned in the first EEAP is not listed in the current report.

Transport savings for the intermediate period are calculated for freight only. Two transport measures are listed. The first addresses the optimisation of goods transport. Listed actions include increased use of rail, reduction of excessive transport demand and establishment of limited access zones for transport vehicles. The actions are not well explained and the extent to which they have been implemented is not described. Their contribution to the high level of declared intermediate savings is not clear. The second transport measure with a start date of 2012 proposes replacing public transport vehicles and promoting eco-friendly driving. The proposed actions are not sufficiently detailed and it is not explained how expected savings have been quantified. The report does not mention many of the transport actions planned in EEAP1, such as facilitating car-pooling and providing park and ride facilities.

The planned Polish white certificate scheme will impose energy savings obligations on energy companies selling electricity, heat and natural gas to final consumers. A start date of 2013 is given for the scheme. A planned start date of 2009 was given in the first EEAP. The scheme is expected to contribute 25.5 TWh to the ESD target by 2016 according to a regulatory impact assessment. The EEAP does not refer to any potential synergies with other measures.

Four measures addressing energy efficiency in the public sector are detailed. Three of these already provide funding for insulation and upgrading of public buildings. The report does not provide information about the extent to which they have been implemented or about the savings achieved. The fourth measure planned for 2012 aims to modernise district heating systems, and promote renewables as well as address energy efficiency in public buildings. A 2011 Energy Efficiency Act obliges public sector units to implement at least two measures from a list included in the Act. Although a 'National Plan for Sustainable Public Procurements' is mentioned, and it is stated that public procurement should take environmental aspects into account, the extent to which this is actually done is not indicated. The EEAP indicates that changes will be made to financial aspects of public contracts to facilitate the use of energy services companies.

It is acknowledged that public administration must play an exemplary role by implementing and promoting nearly-zero energy buildings (nZEB). It is mentioned that support to pilot public sector nZEBs is planned but no timeline is given for their construction and no national targets are mentioned. In accordance with Article 102) of the EPBD, the EEAP describes existing and planned financial measures addressing energy efficiency in buildings. The report does not address EPBD Articles 14 or 15.

The EEAP does not sufficiently explain how information on energy efficiency is disseminated to consumers. It does not mention any specific advertising campaigns, road-shows, consumer websites or provision of information by energy suppliers, for instance. It does state which information campaigns planned in the first EEAP have been undertaken to-date. The information measure detailed in the list of measures is a strategic measure that encompasses all future information campaigns and has a start date of 2012.

The EEAP does not contain a section addressing supply-side energy efficiency. However, some broad energy efficiency measures are detailed that are relevant to energy supply. A measure to reduce losses in transmission and distribution of heat and electricity provides support for actions such as construction of heating and electricity grids, replacement of transformers, and shortening of long-distance lines. Electricity grid projects must demonstrate a reduction in losses of at least 30% to qualify for support. A broad measure to promote distributed generation incorporates support for CHP systems, including support for construction of new installations and for the replacement of existing heat generation units with new cogeneration plants. A smart grids programme that starts in 2012 is also outlined that incorporates actions such as feasibility studies, promotional and educational actions, pilot programmes for implementation of grid measurement systems and smart metering.

Strengths

- The EEAP includes many new energy efficiency measures clearly indicating responsibilities of different bodies for the implementation and the monitoring of results together with budgets where public support is foreseen and timing for the implementation. This is may be demonstrating an increased commitment of the Polish authorities to assign a higher priority to energy efficiency.
- The EEAP presents intermediate savings that are ahead of target and forecast savings that exceed the ESD target. Intermediate savings calculated using top down methods suggest continued significant energy efficiency progress in the economy. Bottom-up forecasts show that Poland aims to exceed the ESD target with savings achieved by measures alone.
- The report presents a good mix of measures that address energy efficiency in the main sectors of the economy, with a combination of state and private funding, state support and market-based mechanisms.
- The introduction of a white certificate scheme in Poland will provide a cost-effective, market-based approach to unlock significant energy savings potential in several economic sectors, and will stimulate the market for energy services.
- The report presents details of top-down calculations quantifying intermediate savings and includes some key information on historical energy efficiency trends in the Polish economy.

Weaknesses

- Many measures included in the first EEAP have never been implemented. There is a risk that if this time some of the important new measures included now in the second EEAP are not properly implemented too, the actual energy savings will be lower than currently foreseen and Poland may have difficulties with reaching its energy efficiency targets.
- The report does not explain if the expected savings attributed to the white certificate scheme have been adjusted to account for potential overlaps with other programmes listed in the EEAP.
- The information measures do not describe active and planned information actions well, and the section describing the availability of advice and information does not give a clear view of how information promoting rational energy use is disseminated to the Polish consumers.
- Although the report contains a number of measures addressing energy efficiency in the public sector, some of these measures are not sufficiently explained. The report does not sufficiently quantify savings achieved to-date for on-going measures, such that their effectiveness cannot be fully ascertained. The public sector commitment to promoting nZEB, while expressed, is not backed up by any targets or timelines.
- The EEAP does not sufficiently address energy use in private passenger transport. The application of top-down methods to calculate future savings in the transport sector is not fully clear.
- For several measures, the listed actions are not explained (e.g. 'reduction of excessive transport demand', 'promotion of cogeneration'). For measures already being implemented, the extent to which the actions have been completed is not fully clear.

Recommendations for improvement

- In the view of the new requirements established by the new Energy Efficiency Directive, cost-efficient implementation of the EEAP and the appropriate monitoring of energy savings especially in relation to the new white certificate scheme and any public-funded programmes will require better understanding of the synergies and overlaps between the impacts of different measures. It is strongly recommended that Poland establishes a proper system to avoid double-counting of savings. Any future reporting on achieved savings should explain in more detail how the double-counting have been avoided.
- The actions associated with several measures, such as the measures on information campaigns and optimisation of goods' transport, should be explained in greater detail.
- Figures given for the thermo-modernisation fund in the housing sector indicate that the fund is used primarily for renovations of multi-dwelling units. The report should provide more detail on actions to improve energy efficiency in owner-occupied dwellings.
- The report should explain more clearly the measures addressing energy efficiency in public sector buildings. To assess the effectiveness of these important measures, an indication of achieved energy savings should be given. The methods by which the public sector facilitates exchange of best practices should be better explained. Targets with respect to nZEB for new and existing public buildings should be set and communicated in the EEAP.

PORTUGAL

Summary

Portugal's second EEAP report provides an update of savings achieved since 2008. The report indicates that Portugal will exceed the ESD energy savings target for 2016, with contributions from each economic sector.

The EEAP is short and lacks detail, and does not communicate a national strategy effectively. It does not provide an adequate update of several promising measures contained in the first EEAP or a satisfactory description of energy efficiency improvement efforts in Portugal to-date. Unlike the first EEAP, the second EEAP does not represent a clear and coherent national action plan for energy efficiency. It does not provide sufficient information with respect to specific provisions of the ESD, such as the exemplary role of the public sector and the provision of information to consumers.

. The second EEAP does not explain how the savings achieved by measures have been quantified but the basic data provided in the Plan on savings indicate that an important progress has been made since 2007. Nevertheless, it is recommendable that the Portuguese second EEAP is significantly strengthened to include more information on implemented and planned measures.

General evaluation

Portugal's second EEAP report gives a very brief update on energy efficiency progress in the Member State since the first EEAP, presents intermediate energy savings figures and updates savings forecasts for 2016. The report does not provide much analysis of the success of measures in place nor does it provide much detail on achievements up to 2010. Instead, it presents savings figures for individual measures defined in the first EEAP. As such, it does not give a good overview of the current national strategy with respect to energy efficiency. It is explained that only aggregate results are presented because of the recent change in government and the drafting of a Memorandum of Understanding (MoU) on economic policy. While the MoU requires certain aspects of government policy related to energy use to be reviewed, its relevance to the lack of detail in the report is unclear.

Neither this report nor the first EEAP presents a calculation of the 2016 energy savings target of 9%, in accordance with the requirements of ESD. Instead, the first EEAP gives the average annual final consumption in the period 2001 to 2005, including final consumption of EU ETS participants, and sets a national target of 9.8% to be achieved in 2015. The second EEAP declares savings of 662 ktoe in 2010, which is 36.7% of the 2015 target. From these figures a 9% target for 2016 of 1,651 ktoe can be derived. Based on measured performance up to 2010, the second EEAP sets a new national target, or savings forecast, of 2,240 ktoe for 2016, equivalent to 12.2% of the reference energy consumption value. Although the EEAP shows total savings in 2010 to be ahead of intermediate targets, it provides no information about how the savings attributed to different measures were determined.

In the transport sector, where 231 ktoe of savings have been reported, a measure to encourage a modal shift in large cities and a reintroduced car scrapping scheme account for most of the savings. The report attributes much of the success of modal shift to the influence of the economic crisis and increasing fuel prices. Various listed transport-related measures have not been implemented to-date or have not achieved savings.

In the combined residential and services sectors 215 ktoe of savings have been achieved. The replacement of appliances and lamps accounts for a large share of the savings. Significant savings are also recorded in both residential and services sectors as a result of the implementation of the Energy Certificate System. The report mentions that almost 400,000 certificates have been issued but does not explain how the certificate system has led to energy savings.

The EEAP records energy savings of 178 ktoe in industry. Most of these savings are attributed to 'Retroactive Measures'. The report provides no indication of what these measures are or in which sub-sectors they have been implemented. Although sub-sector specific measures are listed in the first EEAP, the most recent EEAP records no savings for these in most of the manufacturing sub-sectors. The uncertainty about the handling of savings achieved by EU ETS participants further confuses the picture of energy efficiency progress in the sector.

Fiscal and supporting measures such as the use of taxation to drive energy efficiency and the establishment of financial incentive schemes aimed at encouraging users to save energy, which were addressed in detail on the first EEAP report, are not mentioned in the second EEAP. A promising financial measure proposed in the first EEAP, the Efficiency Cheque awarded to domestic consumers who demonstrate energy savings in two consecutive years, does not appear to have been implemented.

The second EEAP does not contain sufficient information about the exemplary role of the public sector. Although some measures aimed at improving the energy efficiency of the public sector show savings, it is not evident that any of the sector's exemplary achievements are communicated to the wider public. A number of public sector measures listed show no savings, and the EEAP provides no commentary on these. It is noteworthy that no progress in a sustainable public procurement measure is evident. On the other hand, measure E8M1, energy certification of public authorities' buildings, account for much of the public sector savings. The report does not explain, however, how the certification system works or how it leads to savings. There is no update given of requirements to have environmental criteria in public tenders as outlined in the first EEAP. Total savings in the public sector of 10 ktoe in 2010 are behind the intermediate target for the sector set in the first EEAP.

The report mentions a new Public Administration Energy Efficiency Programme that has come into effect in 2011 and that aims to improve the energy efficiency of the public service by up to 30% by 2020 relative to the current situation. It is explained that the programme consists of a series of measures, including the entering into contracts with energy service companies and the appointment of an energy manager for each public department. The report provides too little detail on the programme, considering its potential importance in helping meet ESD targets and fulfilling public sector obligations under the Directive.

In the first EEAP a series of information measures aimed at bringing about behavioural change was incorporated into an 'Operation E' campaign. The second EEAP records savings for some of these measures, but the status of others is not mentioned and it is not clear if the measures have been implemented or dropped. The EEAP does not provide any detail about websites or ad campaigns designed to increase awareness among consumers. The 'More' ('Mais') information initiative described in detail in the first EEAP is not referred to in the second EEAP. Actions that appear to be information campaigns are mentioned but no description is given, e.g. '2009 Solar Energy Campaign', '2010 Portugal energy efficiency barometer'.

The second EEAP of Portugal does not include any measures addressing energy efficiency improvements in supply-side or transmission/distribution.

The baseline for the Portuguese ESD target for final energy savings includes undertakings involved in Emissions Trading Scheme, which would increase the absolute savings that Portugal is committed to achieve.

Strengths

- The savings figures presented in the EEAP suggest that Portugal has made progress towards the ESD energy efficiency target since 2007.
- The EEAP declares that, based on its own assessment of the energy savings achieved to-date, Portugal has adapted policy measures to ensure that defined targets are met. Measures that have not delivered savings up to 2010 have been dropped and additional measures have been added.

Weaknesses

- Description of measures in the EEAP is insufficient and does not give an adequate update on the success of measures or on overall energy efficiency progress in Portugal since the first EEAP.
- Some potentially very important new measures referred to in the report, such as the Public Administration Energy Efficiency Programme, have not been sufficiently explained.
- Several planned measures that were detailed in the first EEAP are not mentioned in the second EEAP. For a number of measures no savings are shown, suggesting that they either have not been effective or have not been implemented.
- While the numbers in the report indicate that Portugal will meet its ESD energy saving target, methodologies for calculating savings are not explained or even mentioned, and it is unclear how the figures have been derived.
- The exemplary role of the public sector in Portugal is not evident from the information presented in the EEAP.
- The handling of energy consumed and savings achieved by manufacturing facilities participating in the EU ETS has not been sufficiently explained.

Recommendations for improvement

- It is recommended that the Portuguese second EEAP is significantly strengthened with more details on the implemented and planned measures. It should describe how the figures for achieved and forecast savings are calculated.
- The report should provide a more detailed update on progress with respect to the key areas for energy efficiency improvements, such as ensuring availability of information to final customers, the exemplary role of the public sector, financial instruments and funding, etc.
- It would be useful that the strengthened EEAP provides a more comprehensive explanation of successful actions and a more detailed description of new measures implemented or planned during the next three-year period.
- With a view to the oncoming new Energy Efficiency Directive, the strengthening of the Portuguese Plan should also cover energy saving measures addressing supply-side and well as transmission and distribution of energy.

ROMANIA

Summary

The Romanian second EEAP report builds on the first action plan but is improved in terms of actions, structure and readability. Much higher energy savings are reported by 2010 than estimated in the first EEAP, delivering already up to 80% of the 2016 target which remained unchanged and still ambitious (*i.e.* 13,5% energy savings in 2016).

The second EEAP's strategic approach and vision take into account the EU 2020 objectives and combines the continuation of the first EEAP by 2016 with Romania's longer term Energy Strategy for the period 2007-2020. This approach integrates and ensures the continued implementation of all the various programs encompassed under the first EEAP and complement them targets and policies until 2020, in line with the EU objectives. Since the achievement of the 2010 intermediary and 2016 target is on track and forecasted, the continuation of existing policies and the 2020 national energy strategy also encompassing energy efficiency provides a realistic approach to the realisation of the identified saving potentials in the main sectors of the Romanian economy. The monitoring methodology is mainly top-down complemented with a certain share of bottom-up evaluation in the end-use sectors, e.g. dishwashers, refrigerators and freezers.

General evaluation

The Romanian second EEAP report provides a range of measures that have been implemented to improve energy efficiency in buildings (residential and services), industry and transport, measures addressing the public sector as well as measures providing energy savings at energy generation and distribution.

The ESD targets declared in the first EEAP remained unchanged: 940ktoe by 2010 and 2800ktoe by 2016, representing an average of 1,5% energy savings per year. According to the second EEAP evaluation and monitoring, the reported savings for 2010 are well in excess, *i.e.* 2223ktoe (79,4% of the 2016 target). While energy savings are re-evaluated under the longer term Energy Strategy, the formal energy savings commitment from the first EEAP remains unchanged, *i.e.* 13,5% or 2800ktoe, despite the significant additional saving potential. This potential has been taken into account in setting the 2020 energy saving target under the EU 2020 strategy. Almost half of 2010 target is achieved in industry (47,7%), around 35% in tertiary sector,12,6% in residential and 4,5% in transport.

Several key differences have been identified between the first EEAP and the second EEAP. These include more measures and a more detailed description of the activities showing the exemplary role of public sector; the measure for promoting biofuels in transport which have been estimated in the first EEAP as providing the large majority of plan's savings has been replaced by a broader based renewable energy promotion policy taking into account the RES Directive, but with calculated primary energy saving impacts of 1883 thousand toe in 2020.); consideration of measures using the EU structural funds; and the EPBD reporting.

Measures to highlight in the second EEAP include the comprehensive national thermo-renovation programme targeting loss reduction and the increase in the efficiency of the heating systems through district heating network refurbishment, the use of more high-efficiency cogeneration and renewable energy and the renovation of blocks of flats, which delivers more savings than anticipated. The effect of a broad ranged program to modernise the fleet for electricity and heat production and the introducing of energy management and audits in companies with energy consumption higher than 200toe have been chief contributors to reaching the intermediary target.

Romania opted to fulfil EPBD-reporting requirements providing separately the list of instruments and measures to promote improved energy efficiency in buildings, as required under Article 10(2) of EPBD. At the same time some additional support measures for implementing the EPBD, the alternative equivalent measures for heating and air-conditioning equipment (Article 14(4) and 15(4)), and the status of the nZEB planning (Article 9) are reported within the second EEAP.

At the time of the submission of the second EEAP the government ordinance transposing Annex VI of the ESD was awaiting approval by the national Parliament.

The EEAP provides an ambitious program for efficiency in energy supply. It focusses on the efficiency of thermal generation in industry and district heating systems. Around 80 % of the thermal power units were installed in the period 1970-1980 with technologies used being those available in the '60s and '70s. These units exceeded their operating life-time and have a high level of wear and tear. Consequently, their technical-economic outputs are low and electric efficiencies are of 31-32% as opposed to an EU average of 41%, the state-of-the-art being some 48% and 60% for coal and gas fired plant, respectively. Most cogeneration units are 61-67% efficient, below the minimum high-efficiency range of 75-80% established under the Cogeneration Directive 2004/8/EC. The retirement of 5544 MW installed power capacity by 2020 is foreseen, out of which 2340 MW cogeneration. The aim of the EEAP is to retrofit and replace the obsolete generation fleet. The focus is on the upgrading of units built before 1990. However, new high power and high output units are also planned. The promotion of high-efficiency cogeneration represents a key measure in reducing primary energy consumption.

The program on the heating supply of localities through district heating foresees the modernization of district heating systems in cities. Priority measures include heating metering and control; heating cost allocators; thermostatic adjustment valves, thermal insulation of buildings and retrofitting several thousands of grids (3369 km in Bucharest and 2049 km in other cities). Heat losses are planned to be reduced by 67-70% on average and the total final energy saving at a national level would amount to 261 thousand toe per year.

Significant planned saving, e.g. of 1406 thousand toe in 2015 and 1883 thousand toe in 2020, would come from switching to renewable energy.

The plan also covers the national transmission and distribution networks targeting a significant saving potential by 2020: e.g. approximately 69% of the total length of the National Natural Gas Transmission System has exceeded the operating life-time. Priority measures include the replacement of inefficient equipment, and upgrading of switching stations and power lines. The EEAP highlights the difficulties of finding the investment needed, but indicates the successful use of EU cohesion policy funds.

These supply side measures start to bring results. Disconnection from the district heating system stopped and reversed. A growing portion of cogeneration now meets the minimum 10% primary energy saving (PES) required under the Cogeneration Directive. The PES from high-efficiency cogeneration was 10.5 PJ with a saving rate of 13.4% in 2007. The saving rate increased to 14.5% in 2010, while absolute savings slightly decreased to 8 PJ, due to lower production levels during the economic downturn. The share of high-efficiency cogeneration was 10.8% in overall electricity production in 2010. The share of all cogeneration (low and high-efficiency) is higher (was 26.2% in 2005 and 18% in 2006 when reported together). An upward trend in the use of the cogeneration saving potential has however started**.** The report states that cogeneration is supported through a bonus paid for electricity from high-efficiency

CHP plants. Plants that burn biomass may alternatively opt for support through a green certificate scheme. Successful examples of supported CHP projects are given.

Strengths

- The energy savings achieved by 2010 are by far bigger than the intermediate target assumed in the EEAP1, *i.e.* 2223ktoe achieved (79,4% of the 2016 target) as comparing to 940ktoe assumed. However, the influence of the economic crisis is recognised.
- The 2016 target remained unchanged and still ambitious, *i.e.* 13,5%.
- The proposed measures are described much clearer than in the first EEAP.
- The replacement of measure for biofuels in transport proposed in the first EEAP which was supposed to deliver most of the first EEAP's savings but was clearly a renewable measure.
- Co-financing energy efficiency measures by the EU Structural Funds.
- A much higher impact than estimated in the first EEAP of the thermo-renovation measures for multi-family blocks of flats.
- Most of 2010 final energy savings seems to be accountable also in 2016, which if implemented well, will help Romania achieve its 2016 ESD target.
- The Romanian second EEAP includes a significant portfolio of energy efficiency measures implemented or planned on supply-side as well as transmission and distribution of energy, which may result in major primary energy savings important for reaching the Romanian 2020 target.
- The monitoring methodology and the basic assumptions are clearly described.
- Energy management and audits recommendations generated important energy savings.
- While slowly implemented and still at an incipient phase, promoting LTAs in industry and the ESCO/EPCs actions are very good initiatives for stimulating the energy efficiency market.

Weaknesses

- The plan is rather an umbrella framework for implementing various programs and strategies with different timeframes and objectives. A more integrated vision would be needed to link the planning towards 2016 target with the 2020 objectives and ensure consistent mainstreaming in the different sectors (including risk assessment, vigorous new measures, and clear continuation of the present measures).
- There is a risk that the intermediate final energy savings reported by Romania for 2010 using 100% top-down approach could have been strongly influenced by the economic crisis and may be showing more savings than the actual impact arising from the implemented energy efficiency measures.
- While important energy savings are reported, the measures addressing the services/tertiary sector are not clearly described or addressed.
- The measures showing the exemplary role of public sector are modest; the effectiveness of implement is not clear.

- While the second EEAP proposes more information and awareness raising measures, they are still modest and most of them rather implemented by NGOs and not by the authorities.
- Smart metering is mentioned only as a potential permission that can be given to the building owners, if they will request having it.
- While planned for the near future, none of the listed measures from Annex VI of the ESD seem to be implemented at the moment.

Recommendations for improvement

- Develop a stronger strategic, integrated vision towards 2016, including risk assessment, vigorous new measures, and clear continuation of the present measures.
- It is recommended to consider further st6rengthening of the portfolio of energy efficiency measures especially as regards addressing improvements of energy efficiency in residential buildings as well as awareness raising campaigns addressed addressing small final customers (households and SMEs).
- Improve clarity and consistency of the description of measures in the services/tertiary sector.
- Strengthen information provision efforts of the public authorities.
- For the sake of the implementation of the new Energy Efficiency Directive, it would be recommendable to consider improving monitoring and verification capacities to measure actual savings resulting from real actions implemented on the basis of any future energy saving obligation scheme and/or alternative measures (e.g. voluntary agreements).

SLOVAKIA

Summary

The Slovakian second EEAP provides an overview of national policies and strategies related to energy's use however, the plan still appears to be lacking of clarity and consistency. Nevertheless, a clear improvement can be noted when comparing the first EEAP to the second EEAP and the basic structure of the second EEAP can form a basis for a successful, clear and coherent plan that will be easy to monitor in the future.

A significant barrier to the evaluation of individual measures described in the first EEAP and still prevailing in the second EEAP is the lack of relevant data, awareness and reliable monitoring. It has to be noted that energy savings of single measures in most cases are still not quantified for the second EEAP and those figures provided in the report have to be interpreted carefully as they essentially rely on experts' estimates and do not appear to be reliable.

The implementation of the "monitoring system" will be the key for quantifying energy savings primarily by bottom-up method in future. It will be operated by the Slovak Innovation and Energy Agency (SIEA). As a result of the above, there are many points that require further clarification and substantial improvement.

General evaluation

The Slovakian second EEAP builds on the first EEAP. It provides an evaluation of measures proposed in the first EEAP as well as a continuation or adjustment of the measures which were not completed in the first EEAP. Additionally, these measures are supplemented by a few newly proposed actions being implemented by the national authorities to improve energy efficiency in the Slovakian economy.

Despite some improvements compared to the first EEAP, its good initial structure, the broad list of measures and actions provided, the second EEAP does not present a coherent strategy. The second action plan presents a strategy complemented by a list of measures only until 2013, establishing a "second intermediate final energy savings target" for the three year period 2011-2013. Consequently, the expected savings for 2016 are not declared and it is not possible to assess whether the defined target for 2016 can realistically be achieved.

There are many points that require clarification, especially regarding the applied methodology for monitoring/measuring savings as well as some of the presented figures on achieved or expected savings which do not appear to be reliable. Although positive steps are undertaken across the relevant line Ministries to track energy consumption data, a robust monitoring and verification methodology and system is missing.

With regards to the targets, Slovakia recalculated the reference average final energy consumption 2001-2005 for the second EEAP. The calculation method is based on an expert's estimate of the share of ETS companies in overall final energy consumption (first EEAP: 413506 TJ; second EEAP: 312220 TJ). Therefore, Slovakia revised the absolute figures for its targets for 2010 (3%) and 2016 (9%), based on the recalculated reference consumption, excluding ETS. The Plan therefore follows the requirements set by Directive 2006/32/EC and does not aim for a more ambitious target.

A particularity of the Slovakian second EEAP is the establishment of a "second intermediate final energy savings target" of 6% for the three year period 2011-2013 corresponding to 18 722 TJ by 2013. In its "Energy Security Strategy" for the years 2017-2022, Slovakia defines a long-term final energy savings target for 2020 with savings of 0.5% per year. The total value of energy savings over the 2008-2020 period is therefore set at 11%, corresponding to

45 486 TJ of the gross average final energy consumption 2001-2005 (ETS sectors included). Though Slovakia justifies the smaller anticipated pace for energy savings in the years 2017 to 2020 with the reduced potential for cost-effective savings, this target is not ambitious taking into account the high energy savings potential, particularly in buildings, industry and urban transport sectors. Also, this target falls well below the overall EU aspirations.

Although the 2020 target was also adopted in the 2010 National Reform Programme, the second EEAP does not clearly describe particular measures that should contribute to the 2020 energy savings. Taking into account the lifecycle of energy saving investments in particular in the buildings sector, missing outline for measures up to 2016 and 2020 brings the risk of suboptimal implementation, and missed opportunity for savings generated by systemic measures.

In order to assess the measures reported in the first EEAP, in the second EEAP Slovakia applies both, top-down and bottom-up method. For TD, the Member State uses the recommended methodology of the Commission, based on indicators (M1-8), relative to 2007, but for timeframe 2008-2009, as official statistics for 2010 will only be available at the end of 2011. Total savings are presented per sector.

Regarding its 2010 target, Slovakia declares achieved total final energy savings, calculated by top-down of 27 957 TJ, which is about three times the intermediate 2010 savings target (9 366 TJ) and close to the final 2016 savings target (28 098 JT). This figure appears too high, possibly due to the very high savings attributed to the transport sector that require further clarifications.

According to the Member State, the bottom-up method reveals achieved final energy savings of 3 689 TJ, representing approximately 39% of the net final energy savings target for 2010. For the intermediate period until 2013 Slovakia reports expected savings of 8 362 TJ and no savings are declared for 2016.

However, the energy savings reported for 2010 and 2013 do not appear to be fully reliable. Most of these figures have to be interpreted carefully as they essentially rely on experts' estimates, therefore further clarification is needed.

The EEAP proposes measures as well as financial and legal instruments for the three year period 2011-2013, covering buildings, public sector, industry, transport, appliances and horizontal measures. Many of the measures under the second EEAP had already been planned in the first EEAP. Also the system for monitoring efficiency in energy use still has to be put into operation in Slovakia.

Overall, individual measures do not link well together, and most of them are lack sufficient explanation.

Even though in the second EEAP further importance has been given to the leading role played by the public sector and the need for exemplifying the work in that sector is repeated several times in the plan, few tangible measures are associated to it and its role remains rather limited.

Slovakia states that it has opted to fulfil EPBD-reporting obligations within second EEAP, however, the lack of detailed descriptions of these measures make it difficult to judge whether the Member State will be able to comply with the EPBD provisions.

Further, the Slovakian second EEAP is still in non-conformity related to the obligations on public procurement. The requirements to include a minimum of two options from the "list of eligible energy efficient public procurement measures" in Annex VI of the ESD have not been met.

Extensive information and campaigning measures, including measures on training and advice for the public, residential sector and SMEs have been included in the plan. However, the Plan does not include sufficient details to explain the size and extent of these efforts.

The EEAP does not report an exhaustive list of measures on the supply side and it only describes high efficiency cogeneration and the introduction of advanced technology in the energy supply sector. There was little uptake on financial support made available through structural funds to finance cogeneration projects due to the level of administrative effort involved in receiving funding. Businesses have been opting instead to apply for support for CHP projects from a new renewables and high-efficiency cogeneration programme funded by national resources.

Strengths

- As for the first EEAP, the main strength of the plan is its realistic description of the state of energy efficiency activities in Slovakia. (According to Slovakian Authorities, the main barriers are the lack of crucial instruments, e.g. legislative tools or monitoring systems, relevant data and information, combined with the insufficient experience, knowledge and awareness of the persons responsible for implementing energy efficiency measures at all levels.)
- The Slovak second EEAP improved compared to the first EEAP. It is evident that Slovak Authorities made an effort to consider the "Guide and template for the preparation of the second EEAP" and to implement the recommendations brought forward by the European Commission during the first assessment phase.
- The plan is fairly structured and measures are divided by sectors, covering buildings, public sector, industry, transport, appliances and horizontal measures. The descriptions are supported with informative tables including the envisaged or attributed budgetary allocations. Complex solutions are planned, considering institutional, organizational, financial need.
- The institutional background planned for the measures is described and gives a solid potential to implement the measures. Positive point is the declared aim to include the ´energy saved´ among obligatory indicators for all projects supported by public funds.
- Another positive element is the declared support for the development of sustainable energy action plans of local and regional authorities. Setting of a harmonised methodology, connected with the national monitoring system will be one of the key success factors of the measure.

Weaknesses

- Most of the savings assumed in the first EEAP were based too much on the establishment of Energy Efficiency Fund. As this was not implemented, many measures outlined in the first EEAP have been cancelled, especially in the buildings and industrial sectors. No alternative solutions were proposed.
- Even though the Slovakian second EEAP has improved compared to the first EEAP, the plan is still relatively weak as regards the leading role of the public sector. The second EEAP is still in not fully in line with the public sector's obligations on energy efficiency criteria in public procurement.

- Another weakness of the second EEAP is related to the insufficient explanation of the methodology applied for monitoring/measuring energy savings in Slovakia. Some of the presented figures on achieved or expected savings especially in the transport sector seem to have been overestimated and may require further clarification.
- Slovakia does not present a strategy or measures for 2016 (and an outline up to 2020) but only until 2013. Consequently, the expected savings for 2016 are not declared, making it very difficult to assess whether the defined target for 2016 can realistically be achieved. In general, there is a risk that the lack of longer-term systemic vision may bring suboptimal solutions.
- Details on the budget indicate a clear, but somehow relatively low-ambition commitment to improve energy efficiency in most of the sectors of the Slovak economy.
- Slovakia states that it has opted to fulfil EPBD-reporting obligations within second EEAP. However, some of the EPBD related actions have not been sufficiently explained and require further details and clarification to meet the EPBD requirement, in particular as regards the National Plan for nearly-zero energy buildings and the lack of inclusion of any related targets as required by EPBD (Article 9). The EEAP declares only the intention to develop "conceptual solutions" and plans to promote the construction of low-energy and passive buildings with future legislative and technical activities.
- As the first EEAP measures 4.6.7, 4.6.11 and 4.6.12 are energy efficiency-relevant only in limited scope and their application seems to be stemming from other than energy efficiency priorities, their application for accounting of achieved energy savings should perhaps be reconsidered. If maintained, achieved savings need to be explained in more details. The same applies for measures 4.4 and 4.5 in the second EEAP.
- As regards the measure 5.3 on energy audits in industry, savings planned for 2011-2013 seem to be very high and need some further explanation.

Recommendations for improvement

- The EEAP often refers to the failure to establish the Energy Efficiency Fund but does not provide any information on what are the actions to overcome this problem. New alternative measures and/or significant stepping up of existing measures are needed.
- The implementation of an appropriate "monitoring system" would enhance not only the reporting on achieved savings but also directly help the implementation and functioning of the future new instruments required in the new Energy Efficiency Directive (e.g. energy saving obligation schemes or any alternative measures to such schemes).
- The strategy should be extended to cover both 2016 and 2020 time horizon.
- Slovakia has improved with regards to complying with the special provisions on public sector and information and advice but the related measures are still not sufficiently clearly described. As a result, it is difficult to judge to which extent they indeed comply with the requirements of the EU legislation. The same applies if Slovakia aims to fulfil EPBD-reporting obligations within its EEAP.
- As properly functioning market for energy services is a key driver for higher energy efficiency, inclusion of measure 7.6.7 to the second EEAP can be a move in the right direction. However, in order for the measure to be credible, better description might be necessary.

- Although the declared aim to include the “energy saved” indicator among obligatory performance indicators for all projects supported by public funds is a positive and necessary step for proper monitoring of results, concrete steps and measures for this aim to become reality should be included to the second EEAP.

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SLOVENIA

Summary

The Slovenian second EEAP presents a detailed and relevant energy efficiency strategy, with good coverage of the main energy end-uses, a clear explanation of the overall management, targeting and other key features of the measures. A further positive aspect is the appropriate analysis of problems encountered.

The 2010 target is reported to be reached, but this has been achieved by the inclusion of energy savings from "earlier activities" (amounting to 29% of the result). This represents a certain lowering of the level of ambition as compared to what was planned in the first EEAP. The main reasons seem to be a budget gap and difficulties in the implementation of the first EEAP measures.

The 9% target in 2016 is planned to be exceeded, but the experience from the analysis of the first EEAP results highlights how uncertain this achievement remains. The risk of budget shortage is analysed and solutions are proposed. But some other key issues related to measure implementation (e.g. involvement of intermediate actors) are not really addressed. Overall, the ambition of the second EEAP is rather high, but relies on key points of vigilance.

General evaluation

The second EEAP targets for 2010 and 2016 amount to 1184 GWh and 4261 GWh (final energy) respectively and have not been recalculated since the first EEAP. In 2010 the achieved savings reported amount to 1174 GWh, very close to the intermediate target. This includes 343 GWh (*i.e.* 29%) from "earlier activities". The projected 2016 savings amount to 6873 GWh, exceeding the 9% target but significant uncertainties remain.

The new National Energy Programme under discussion includes several targets for 2020: a 20% improvement in energy consumption efficiency (but not transcribed in an absolute figure while expected savings in 2020 are estimated to 10281 GWh), reduced end-use energy consumption of 7% relative to 2008 (excluding transport) and holding total end-use energy consumption growth at no more than 7% relative to 2008. Besides, the objective of an annual 3-percent share of renovation for buildings in the public sector from 2014 is also mentioned.

The calculation methods used are detailed in a specific annex, and the main assumptions are explained in the core report (for 2016) or in Annex I (for 2010). However, the measures are described several times along the core report and the annexes, creating inconsistencies that are not explained. Moreover, it should be clarified why the factor 2.5 has been applied to electricity when calculating energy savings, while it was not applied on electricity consumption when calculating the target.

While most of the second EEAP measures are continuation and enhancement of the first EEAP measures, their presentation has changed. In the first EEAP, the measures were mainly reported according to their funding source. In the second EEAP, the measures are divided according to their main objectives or targets. This appears to be more relevant to present the results. However, this change creates some difficulties in comparing results estimated for 2010 and the ones expected for 2016. Annex I of the second EEAP provides a review of the implementation of the measures planned in the first EEAP, showing the achievements as well as the gaps between planned and realized activities, budgets or savings.

The exemplary role of the public sector is clearly highlighted and explained although the EEAP mentions that activities in this field have not been successful so far. Efforts have been focused on renovation of buildings and public lighting thanks to Structural Funds. In the short term the priority should be to overcome the significant delays observed as regards ESD provisions in the public sector. The other ESD special requirements are mostly fulfilled.

The second EEAP does not include the complete reporting for the EPBD 2010. The EEAP mentions that the strategy for nZEB will be reported separately. The new Energy Act under discussion should include provisions about nZEB, especially transposing the targets for 2018 (new public buildings) and 2020 (all new buildings). Incentives are already in place to support demonstration projects of low energy or passive buildings.

The activities of information for households can rely on a network of local energy advice centres. Moreover the EEAP highlights the importance of labelling for equipment and vehicles. Meanwhile it recognises that the other awareness-raising activities were not enough coordinated so far, neither being specific enough according to the different target groups. The EEAP addresses this through the new horizontal measure H3, covering three target groups (households, public sector, SME). Large energy suppliers are supposed to provide their customers with energy services, including specific information (due to the obligation scheme), but the details of the requirements set by law have not been explained. Energy audits are mentioned several times within the measures for the industry and service sector. However, there is no quantitative information to assess the level of success in this field.

The second EEAP of Slovenia provides a comprehensive overview of supply side energy efficiency measures. A group of supply side measures encourages the improvement of the efficiency of district heating. It is required from local district heating companies to communicate in their development plans how distribution losses will be addressed without passing on the costs to consumers. Furthermore, the obligations scheme operating in the Member State requires energy suppliers to achieve savings equivalent of 1% of the energy sales of the previous year. Savings achieved may be used for the refurbishment of district-heating substations. The refurbishment and expansion of hydroelectric infrastructure is also foreseen in the second EEAP. In terms of the promotion of smart grids, a study has been undertaken to support the development of a smart grid infrastructure in Slovenia. A group of measures support the increased use of high efficiency CHP, including a guaranteed purchase price or a support premium for electricity generated and sold from high-efficiency CHP plants, financial incentives in the form of loans and grants for businesses investing in CHP, and a requirement for state-owned companies to reinvest 15% of annual profits in energy efficiency, renewables or CHP.

Strengths

- Clear organization of the general management of the measures.
- Analyses of encountered barriers and difficulties.
- The combinations of measures in force or planned appear to form a relevant strategy.
- Main funding sources are presented and budgets (overall and per measure) are assessed.
- All the key aspects to report are covered.
- Most of the measures are well described, including the possible problems.
- Bottom-up methods and top-down indicators used, as well as main assumptions made are clearly explained.
- Use of the recommended template.

Weaknesses

- Reported gaps in the actual funding compared to budgets planned pose a risk of not achieving the expected savings. In particular, a number of the first EEAP actions to address public sector were not fully implemented.
- For several key measures, the expectations in the second EEAP seem to be very high compared to what was achieved in 2008-2010, the reported budgetary problems and the identified deficits in terms of qualified staff.
- The objectives in the transport sector are relevant, but the estimations for the budget needs (especially for infrastructures) seem underestimated.
- The need to involve industrial and business actors (e.g., building companies, retailers, etc.) is mentioned in the second EEAP but not explained in terms of planned actions to ensure that.
- The core report and Annex I describe several times the same set of measures, which makes the reading fairly difficult and might provoke inconsistencies in the figures (reported savings, budget estimates, etc.).
- The top-down results are not analysed, while savings were calculated by comparison between 2009 versus 2007. Therefore, these results are likely including the impacts of the economic crisis, making the impact of the actual energy efficiency measures less clear.

Recommendations for improvements

- Make a clear distinction between the measures for the private tertiary sector and the industry, or clarify the reasons why there are no specific measures for private tertiary.
- Expected results from key measures for buildings imply a major change of scale compared to the situation before. It is recommended that in the continuation of these efforts, a particular attention is paid to the needs for the qualified staff and financing of actual investments (esp. from private actors, including individual consumers). It would be useful to include information on required staff and investments in the future EEAPs.
- The budget planned for transport infrastructure seems underestimated. It should be clarified whether other funding sources will be used (e.g., budget for transport outside the scope of energy efficiency policies).
- The second EEAP reports 343 GWh of savings in 2010 from "earlier activities" while only 239 GWh were reported for these activities in the first EEAP: the difference should be explained (it makes about 10% of the 2010 achievements).
- Electricity savings have been reported using the 2.5 factor, while it seems that this factor has not been applied to electricity consumption when calculating the target. This should be clarified (e.g., it could increase artificially the 2008 savings by about 100 GWh, *i.e.* about 10% of the 2010 achievements).

SPAIN

Summary

The Spanish EEAP outlines an ambitious national energy efficiency strategy, presents significant measures, quantifies energy savings achieved, and projects future savings to 2020. The second EEAP reports that significant energy efficiency progress has been made since 2007. The savings recorded up to 2010 indicate successful implementation of energy efficiency measures.

The report serves well as a strategy document that lays out the Member State's plans to improve energy efficiency in the economy up to 2020. The report does not provide sufficient information on how some of the more ambitious goals, such as those in the transport sector for instance, are going to be achieved. The exemplary role of the public sector needs to be highlighted better. Forecast savings calculated using top-down methods show that Spain will easily achieve the ESD target for 2016 and suggest that existing measures, if successful, will make a significant contribution to the EU energy saving goals in 2020.

General evaluation

The figures presented in the Spanish EEAP suggest that the ESD energy efficiency target for 2016 will be achieved and exceeded by a large margin. It is indicated that average final energy consumption over the period from 2003 to 2007 is used to calculate the 9% ESD energy savings target. However, the calculation of the target is not presented and the target itself is not very clearly expressed. In a footnote in the summary document the 2016 target is given as 6682 ktoe in final energy consumption. According to the document, the declared and estimated savings figures are calculated using top-down energy efficiency indicators in accordance with European Commission recommended methods. Bottom-up savings for specific measures are also presented in the annex. Projected savings in primary and final energy consumption are given for 2016 and 2020. In 2016, final energy savings of 13176 ktoe are expected, equivalent to 17.7% of average 2003-2007 energy consumption. Savings are anticipated to grow to 17842 ktoe in 2020, or 24%.

The report details 41 measures to be implemented between 2011 and 2020 to address energy efficiency in the main sectors of the economy. All measures have the same 10-year timeframe and generally represent broader strategic policy objectives rather than specific actions. Each is typically a combination of a number of implementation mechanisms such as financial incentives, legislation, information programmes, etc. As such, some measures lack the detail that would elucidate how the measures' objectives can be met. It is anticipated that around EUR 46 billion will be invested in measures to improve the energy efficiency of the Spanish economy and that EUR 6 billion of this will be managed by the state and the autonomous communities. Investments in buildings and equipment account for more than 59% of the total budget. Investment figures are given for each measure presented in the document and appear to be estimates of what it would cost to achieve goals, as opposed to secured and allocated funds.

For each sector the historical trends in energy consumption are presented and influencing factors are identified. An overview of industry shows increases in energy intensity in several sub-sectors, such that the sector's contribution to intermediate national savings is negative. This is attributed to falls in production levels arising from the recession. It is not clear how savings have been adjusted to account for contributions of EU ETS participants. A bottom-up analysis of savings to-date indicates that a programme of "improved equipment in the industry sector" implemented by the autonomous communities has been successful up to 2010. Specific actions associated with this measure are not detailed, however. Three strategic measures for the period from 2011 to 2020 are presented. Some of these measures are not well described. For instance, it is stated that legislative actions will be needed to implement a measure to encourage the adoption of energy management systems, but no description of any legislation is given and it is not well explained why such legislative actions would be required. A voluntary agreements measure introduced in the first EEAP is not mentioned in the second EEAP.

According to the figures presented, significant transport savings have been achieved in the sector up to 2010. The annex attributes most of these to improvements in freight transport efficiency. Little detail is provided on specific actions undertaken in the period. Large transport savings are anticipated in 2016, accounting for more than half of the total expected national energy savings. Several transport measures are presented. While the budgets and expected savings are quantified, the actions listed for each are presented in a rather vague way. Although an ambitious goal of doubling rail passenger traffic by 2020 is mentioned, the relevant measure does not list any specific actions that would be necessary to achieve this goal. The overall transport strategy is well explained but the specific actions that will achieve forecast savings are not sufficiently detailed.

Most of the forecast savings in buildings and equipment are achieved in the services sector. Measures to improve efficiency of heating in residential buildings are projected to achieve just 85 ktoe of energy savings in 2016. It is expected that much of the savings brought about by improving the efficiency of heating will be cancelled by increased use of domestic air conditioning units. The report sets out how the original EPBD has been transposed into law in recent years and explains how it is reflected in the national building standards. With regard to the recast EPBD, the report states that Spain has begun to set out the roadmap to achieving the recast EPBD objectives. Although a definition of nZEB has not been formulated the report presents a method of assessing the savings achieved through the construction of nZEB, estimating that new buildings from 2021 will consume 70% less primary energy than those that adhere to current building standards. A financial incentive to encourage the construction of nZEBs is planned for the future. Total aid from the public sector up to 2020 for the construction or renewal of buildings with near zero consumption will be just EUR 5 million.

The exemplary role of the public sector is not sufficiently highlighted. Although the report quantifies energy consumption and forecasts savings for the sector, the measures are not well explained. While the EEAP refers to a plan to improve the energy efficiency of 2000 public buildings in the state, it provides too little detail on specific measures that will bring about the improvement. Although the public sector obligations as defined in the recast EPBD are restated, there is little information with respect to the leading role of the public sector in achieving the goals of the directive. The report states that a legal framework has been established to facilitate the use of energy services companies in the public sector.

The EEAP presents a clear communications strategy and details the strategic objectives of all communications actions. It lists a number of information campaigns that have been executed since 2004. Studies are typically conducted among the public to assess the effectiveness of information campaigns. Most of the measures presented in the report incorporate an information component. Generally, however, the information action associated with the measure is not explained in detail.

Supply-side measures form a significant part of the Spanish action plan and account for nearly one third of forecast 2020 savings. Savings in electricity generation will be achieved mainly by a greater share of renewables and gas in the generation mix. The report shows significant savings in the three years up to 2010 which are attributed to changes in shares of fuel types used and reduced own-use consumption of power plants. A 2020 target figure of 7.7% is given for losses in electricity transmission and distribution. The reduction in losses is to be achieved by upgrading infrastructure and by a greater distribution of electricity generation capacity. The EEAP describes a number of broad measures to promote high-efficiency CHP. These include financial aid for feasibility studies for new plants and for energy audits of existing plants, as well as support for new plants larger than 150kW$_e$ in non-industrial applications.

Strengths

- The report provides a good overview of energy trends in each economic sector and identifies the factors influencing energy consumption in each.
- The EEAP presents a clear and coherent medium-term strategy with ambitious targets and strategic measures addressing energy efficiency in each sector up to 2020.
- For each measure, an estimate is made of savings likely to be achieved and budget figures are given for the level of investment needed.
- The savings figures presented in the report suggest that Spain has already made significant progress towards its 2016 energy savings goals. Savings estimates indicate that the 9% ESD target are likely to be exceeded by a considerable margin.
- The report presents details of energy savings calculations, and achieved and projected savings are presented in terms of both primary and final energy consumption.

Weaknesses

- The second EEAP does not provide an adequate explanation of how the significant savings up to 2010 have been achieved. Actions associated with individual measures undertaken by the state or the autonomous communities are not sufficiently explained.
- The description of many of the planned measures is too general with little indication of the actions necessary to achieve the projected savings associated with them.
- In the transport sector in particular, the large savings achieved are not sufficiently supported by documented actions, and the planned measures to achieve ambitious future targets are not well explained.
- The EEAP is short on the information with regard to the exemplary role of the public sector and communicating its successes to the wider public. The public sector's leading role in achieving the goals of the recast EPBD is also not sufficiently explained.
- In the EEAP the calculation of 2016 target is not fully clear. Moreover, the percentage figures that declared and forecast savings need to be better explained as it is not clear what they represent. According to the EEAP, the annual average consumption for the 5 years up to 2007 was 72621 ktoe and that 9% of this is 6536 ktoe. However, the summary document states that declared savings of 4720 ktoe for 2010 are equivalent to 9.2% of reference consumption. The presentation of savings using two different base years of 2004 and 2007 is unclear.

Recommendations for improvement

- It would be important to clarify the Spanish energy efficiency targets and present the calculations in a consistent manner. The report should more clearly explain how installations participating in the EU ETS have been excluded.

- Rather than generally stating that financial, legislative, communication and training mechanisms are needed for each measure, the report should give details about specific actions that will be, or have been, undertaken to achieve the savings associated with the measure.
- The report should more clearly highlight the role of the public sector. Successful actions should be described, and the means of disseminating information gained and communicating successes to the public should be explained. It would be useful to highlight the leading role of the public sector with respect to the implementation of EPBD.
- In the future EEAPs it would be useful to better explain the extent to which measures included in the previous Plan were implemented, so that the most successful measures from the last three years could be more easily identified.
- It is recommended to consider some additional measures to address energy efficiency in SMEs.

Sweden

Summary

The second EEAP of Sweden contains a comprehensive set of measures applied in all sectors of the economy, with each sector making a contribution to the 2016 target. The report communicates a feasible national energy efficiency strategy, according to which Sweden already delivered 9% energy savings in 2010 and estimates to achieve 14.6% by 2016, overshooting the targets (6.5% and 9% respectively). However, the Member State does not attribute savings to individual measures making it difficult determine the relative effectiveness of measures or to identify the contribution of each measure to overall savings.

Policy integration is demonstrated both at the national (for example in the case of the Environmental Code) as well as on the EU level: connections are established between the second EEAP and European directives and strategies, including the EPBD, EU ETS - ECCP, RES directive, energy taxation directive, eco-design directive, as well as the EU 2020 energy, and EU 2020 growth strategy.

General evaluation

Savings reported under the Swedish second EEAP are based on calculation methods recommended by the EU Commission. The energy savings in buildings (residential properties and service business premises) are calculated using bottom-up methods, while the energy savings in the transport sector are calculated using top-down methods. Energy savings in the industrial sector are calculated using a combination of bottom-up and top-down methods. Calculation methodologies are presented in detail in a distinct chapter. The bottom-up methodology is the same as the one recommended by the Commission with some adaptations due to statistical data availability. The top-down method is slightly modified compared to the one recommended by the Commission. Justification given for this is that top-down methods recommended by the Commission are designed in a way that activity in the closing year of 2016 will have a major impact on the final saving.

The second EEAP contains a comparison section to the first EEAP. According to the analysis provided, 2010 savings are notably higher than in the first EEAP in the residential and services sectors (23.2TWh vs. 15.1TWh) and in the industry sector (5TWh vs. 0.7TWh). Savings are lower in the transport sector (4.9TWh vs. 5.7TWh). For 2016 the projected savings are considerably higher in all sectors (24.5TWh vs. 20.4TWh in residential and services, 17.4TWh vs. 0.7TWh in industry and 11.9TWh vs. 5.9TWh in transport). Results in the second national energy efficiency action plan differ from those of the first action plan due to the fact that more actions have been included, different calculation methods were used and the calculations cover different time periods and lifetimes.

Sweden opted to fulfil EPBD-reporting requirements within the second EEAP. The action plan sets out a list of instruments and measures to promote improved energy efficiency in buildings as required under Article 10(2) of EPBD. Measures include financial support such as grants and tax deductions, and information about energy use for domestic households and businesses. The plan also clarifies that Swedish actions to provide advice about heating systems and air conditioning systems are equivalent to the inspection of such systems, in accordance with Article 14(4) and 15(4) of Directive 2010/31/EU.

The Swedish Energy Agency is responsible for the overall monitoring and supervision of the five-year national energy efficiency programme, along with other actions (including ESD and eco-design directives) aimed at achieving national cross-sectoral energy efficiency targets.

Responsibility for the Energy Performance of Buildings Directive (2010/31/EU) is shared between the Swedish National Board of Housing, Building and Planning and the Swedish Energy Agency.

The action plan sets out a list of cross-sectoral instruments and measures to promote improved energy efficiency as well instruments and measures for buildings, industry and in the transport sector. The Swedish second EEAP demonstrated as well that the provision of information and advice forms an integral part of energy efficiency policy of the Member State, presenting a strong set of diverse information measures.

The role of the public sector is clearly shown in the second EEAP with various measures at the national, regional, county and municipal level. Some measures aim for tangible results (e.g. procurement rules or in buildings), whereas others to increase cooperation or disseminate information. Swedish Energy Agency has been designated with the task of providing advice and follow-up on other public bodies' energy efficiency work. Government Ordinance (2009:893) stipulates that every national public authority shall implement at least 2 out of 6 recommended measures of Annex VI of the ESD. Most public authorities chose to implement the measures on purchasing energy efficient equipment and renting energy efficient buildings. Furthermore, many public bodies decide to implement more than the requested two measures.

The second EEAP of Sweden does not provide a comprehensive overview of supply side energy efficiency measures. At the same time a cross-sectoral national energy intensity target is mentioned, which incorporates efficiency improvements at every stage of the energy system, from energy conversion to transmission and distribution to final consumption. In terms of concrete measures, the EEAP contains information about a programme supporting the competitive commercial and technological development of district heating companies to realise sustainable energy systems. Furthermore, a preliminary study on smart networks has been carried out focusing on a demonstration project in a district of Stockholm, as part of research and development efforts.

Strengths

- A key strength of the second EEAP is that it contains a good mix of different types of measures including fiscal, financial, legislative, information and voluntary instruments.
- The second EEAP demonstrates that energy efficiency policy is present and supported in various governance levels.
- Policy integration is demonstrated both at the national (for example in the case of the Environmental Code) as well as on the EU level: connections are established between the second EEAP and other European directives and strategies, including the EPBD, EU ETS - ECCP, RES directive, Energy taxation directive, eco-design directive, as well as the EU 2020 energy, and EU 2020 growth strategy.
- EEAP2 introduces some new measures in addition to EEAP1. These include good practices e.g. the establishment of the Energy Efficiency Board, the introduction of energy mapping checks for businesses and agricultural producers, and the requirement and support for the development of regional climate and energy strategies.
- The role of the public sector is clearly demonstrated in the second EEAP with various measures at the national, regional, county and municipal level.
- The second EEAP contains a detailed explanation of the energy savings associated to early and new measures.

- The methodology section discusses the uncertainty associated with the calculation of different measures.

Weaknesses

- According to the calculations included in the second EEAP, the Swedish intermediate ESD target for final energy savings in 2010 has been achieved. However. From these calculations it is not clear how much of the identified savings are due to policy measures as some autonomous savings and economic recession are included.
- Description of measures is often general, making it difficult to establish the connection to actual savings.
- As both top-down and bottom-up methods are used for estimating savings in the three individual sectors, adding their results together may not provide an accurate view of overall energy efficiency improvements in the economy.
- While attention is drawn to the issue in the document, when calculating savings from the industry sector a pre-recession baseline is applied, posing difficulty to assess the result of technical measures as opposed to economic circumstances.
- The industry sector savings are calculated by combining bottom-up savings for specific actions with top-down savings for the whole sector. It is unclear whether the Member State adjusted the top-down calculations to avoid double-counting the savings quantified using bottom-up methods.

Recommendations for improvement

- While in terms of policy integration the mentioning of measures (such as EU ETS and the national Environmental Code) not primarily targeting, but having an effect on energy end-use is a positive element, their impact should be clarified.
- It is advised to use a methodology that allows comparisons between the assessed sectors, and to provide assurance that double counting did not take place in the case of the industry sector. A further clarification of the rather significant difference between savings in industry in the first EEAP and the second EEAP would be important
- An area for possible improvement of the next EEAP is to include more information about the scale, the achieved/expected savings resulting from the measures focused on awareness raising, networking, knowledge acquisition, advice services, energy labelling, etc. Information about any synergic effects with other policy measures would be useful

THE NETHERLANDS

Summary

The Dutch second EEAP report provides a comprehensive overview of measures to promote energy saving in the Netherlands. Overall the report presents a realistic medium term plan for energy efficiency improvement. A good mix of measures addresses energy efficiency in each significant energy-consuming sector. The introduction of some new measures that address barriers identified in the first EEAP shows commitment to national energy efficiency goals and an ability to adapt policy when needed. The top-down assessment of savings achieved to-date suggests successful implementation of energy efficiency measures.

As the Netherlands has incorporated all savings including autonomous savings in its assessment of progress, it will easily achieve the defined 2016 ESD target. The extent to which measures will have contributed to the target, however, is difficult to assess because the total projected savings due to measures have not been evaluated. Bottom-up savings are also given for some sectors but the figures presented incorporate the effects of several measures such that it cannot be ascertained which measures have been most successful in achieving energy savings since the first EEAP report. While the public sector obligations with respect to the Directive are fulfilled, the sector's contribution to overall savings has not been quantified.

General evaluation

The Dutch second EEAP report provides a detailed description of a broad range of measures that have been implemented to improve energy efficiency in every sector of the economy in the Netherlands. The reported savings for 2010 are well in excess of the intermediate target and are close to or surpass the high savings projections given in the first EEAP for all sectors. However, while the first EEAP attempted to project savings due to measures alone, the second EEAP figures incorporate autonomous savings as well, following a changed interpretation of the definition of eligible savings. Savings per sector are calculated using national top-down methods rather than those recommended by the European Commission to evaluate energy savings. The report provides a justification for this approach. The bottom-up figures used generally do not represent the effect of individual measures, but instead represent the savings achieved by a combination of measures in each sector. The report does not give estimates of savings attributable to individual measures.

In the built environment, the "Meer met Minder" programme, identified in the report as a key measure, combines customised advice for residential energy users with subsidies for undertaking energy saving measures. Voluntary agreements with housing corporations have clearly defined energy savings targets up to 2020. An assessment of savings due to these voluntary agreements up to 2010, however, is not undertaken in the report. Other measures of note in the sector include improved building codes for new buildings, temporarily reduced VAT rates on labour costs associated with insulation and renovation, and discounted loans to encourage home owners to undertake energy saving investments.

The second EEAP report contains the Dutch National Plan for nearly zero-energy buildings. The plan defines zero-energy and sets targets for new buildings in accordance with the EPBD. For existing buildings, a study is to be undertaken to help develop measures that would encourage nearly zero-energy retrofits of existing buildings. The second EEAP savings projections incorporate those brought about by implementation of EPBD. Requirements regarding inspection of heating systems the conditioning units are also addressed.

The savings figures given in the EEAP indicate that the existing long-term agreements account for the largest share of savings in the industry sector. Participating companies are required to draw up an energy plan and implement energy saving actions, and must further commit to putting in place an energy management system within three years of joining. An energy information centre for SMEs, described in the first EEAP report, is not mentioned in the second plan.

Listed among measures addressing energy efficiency in the transport sector are European legislative measures, such as energy labelling and European vehicle standards, and national fiscal measures that encourage the purchase of more efficient vehicles. The bottom-up savings presented for transport are small compared to those projected using top-down methods. It is therefore difficult to assess how realistic is the savings projection for the sector for 2016 and the extent to which these savings may be brought about by measures is unclear.

In the agriculture and horticulture sector, the apparent success of CHP in greenhouse cultivation is notable, with CHP savings accounting for two thirds of the savings in the agriculture and horticulture sector in 2010. This has been attributed to long-term agreements with greenhouse growers and has been supported by a number of horizontal financial and fiscal measures. The long-term agreements measure has recently been replaced by a CO_2 equalisation measure the greenhouse sector which imposes a ceiling on emissions and a market price for CO_2, based on the EU ETS price. The agriculture and horticulture sector shows a loss in energy efficiency in 2009, when evaluated using a bottom up approach. This is related to the global economic slowdown. However, the report also presents for this and other sectors the positive underlying energy efficiency trend over a longer period, such that fluctuations in the short period can better be assessed.

The exemplary role of the public sector is referred to in a general sense. A planned gradual phasing in of energy labelling of public buildings is described. A target of nZEB for new buildings from the end of 2018 is given. The report shows that the Netherlands fulfils the obligations under Annex VI of the Directive on public procurement. However, the second EEAP does not provide information with respect to savings already achieved in the public sector up to 2010 or its contribution to the 2016 target.

A number of horizontal measures designed to address energy efficiency in multiple sectors are presented, including an energy tax, tax incentives for investments in projects that have a positive effect on the environment, and voluntary agreements that address energy efficiency in all economic sectors. The role of energy service companies is briefly described but their contribution to total savings is unclear. The report contains a strong set of information measures. Milieu Centraal provides advice on environmental issues, energy labelling, energy efficiency, and sustainable mobility, while "Meer met Minder" gives residential consumers customised advice on energy savings opportunities in their homes and information about related subsidies available to them.

The EEAP does not provide a full overview of supply side measures. However, it presents measures that support the deployment of CHP, with particular success in the agriculture and horticulture sector. Reduced energy production for CHP in that sector for 2009 is noted, however. While a temporary subsidy was available to CHP installations up to 2007 to compensate for unfavourable developments in energy prices, the report mentions that few companies are currently investing in CHP due to market conditions. A subsidy of EUR 4000 is available for micro-CHP for use in the residential sector.

Strengths

- The EEAP contains a comprehensive set of measures applied in all sectors of the economy, with each sector making a contribution to the 2016 target. The report communicates a coherent and feasible national energy efficiency strategy.

- The report contains a good blend of different types of measures including fiscal, financial, legislative, information and voluntary measures, and the impact of European directives, such as Ecodesign and EPBD, has been taken into account.
- The second EEAP includes some new and innovative measures, such as the coupling of maximum rents to the energy performance of a dwelling in the Home Evaluation System. Financial barriers in the households sector are addressed with low interest loans for energy saving investments and with subsidies for domestic renewable energy systems.
- Energy savings up to 2010 calculated using top-down methods exceed the intermediate target, indicating a strong improvement in energy efficiency in recent years and suggesting a successful implementation of related policy measures. Top-down projections show that over half of the 2016 ESD target has been achieved by 2010.
- The success of CHP in the horticulture sector can be attributed to a number of policy measures that are within the scope of the ESD. The calculated energy savings have made a significant contribution towards the ESD target, and the measures outlined in the report could provide a template for how cogeneration may be encouraged in other Member States.

Weaknesses

- As savings are calculated using top-down methods, it is unclear how much of these savings are achieved through the implementation of measures aimed at improving energy efficiency and how much are due to autonomous effects. The report does not quantify total savings due to measures.
- The second EEAP report does not present any forecast or achieved savings figures to verify success of energy efficiency measures in the public sector. The report mentions a 'number of innovative projects' in the public sector without describing them. On the other hand, it attributes an energy savings potential to them that is many times larger than all of the savings for the whole services sector for 2016 projected using top-down methods (section 3.1.2)
- The report does not provide sufficient information on measures addressing SMEs.

Recommendations for improvement

- The plan could incorporate a more comprehensive assessment of savings due to energy efficiency measures, highlighting those measures that have had the most success.
- The report could provide an update of the public sector's progress in achieving defined energy efficiency targets. The sector's contribution to national savings could be quantified.

UNITED KINGDOM

Overall summary

The second EEAP of the UK demonstrates a clear commitment for energy efficiency and carbon abatement action. The plan reflects the already existing legislative framework for climate action. A significant number of energy efficiency and carbon abatement measures and programmes are put forward. The UK expects a significant overshooting of the 2016 energy saving target.

The fact that energy efficiency policy in the UK is integrated within the wider climate change policy framework is also reflected by the second EEAP. However, energy efficiency and carbon abatement measures are sometimes presented in an overlapping manner. No explanation is given on the methodologies used to calculate achieved energy savings.

General evaluation

The second EEAP of the UK contains a comprehensive set of energy efficiency and carbon abatement measures, with overall expected energy savings amounting to 207.2TWh by 2016. This corresponds to exceeding the 2016 ESD target by 70%.

Measures are focusing on three sectors: households, the private and public sectors, as well as transport. Each sector contributes to the 2016 energy savings target, with the household sector to be the largest contributor to expected savings. Existing, new and adjusted measures are applied parallel to each other. The second EEAP provides sector specific estimates of the results of main policies for energy and carbon savings by 2010, 2016 and 2020.

The second EEAP of the UK retains the 2010 intermediate energy savings target and the 2016 target of EEAP1: 9%, corresponding to 136.5TWh final energy savings. However, reported savings for 2010 are less than expected in the previous EEAP (99.4 TWh in the second EEAP against 136.5TWh in the first EEAP). According to the second EEAP the decrease in projected savings for 2010 is largely due to improvements in the calculation methodology. Furthermore, the national appraisal and evaluation framework adopted by the UK government is reported to have led to more accurate attribution of savings to specific policies and measures.

Overall energy savings by 2016 are expected to amount to 207.2TWh. While this does not surpass projections given in the first EEAP, it is considerably higher than the 9% (136.5TW) required by ESD, corresponding to 14% savings against the baseline. The second EEAP also includes the 2020 projections of the UK EEAP's measures, with expected final energy savings amounting to 272.5TWh.

The second UK EEAP applies existing, new and adjusted measures parallel to each other. The majority of these additional measures not already listed in the first EEAP mainly focus on the transport sector. They address some of the latest legislation being implemented by the UK government to improve the efficiency of new vehicles. Nevertheless, the main emphasis in the second EEAP is the household sector, where applications of building codes and the introduction of new national schemes (e.g. the Green Deal starting in 2012) will enable energy efficiency improvements in new and existing buildings.

The EEAP integrates the energy efficiency policy measures taken into the overall national energy policy context, such as the 2008 UK Climate Change Act. The structure of the second EEAP reflects the emphasis on linking energy efficiency to CO_2 emission reduction action: measures relevant to carbon abatement and energy savings are reported parallel to each other. Furthermore, some measures that are relevant for decarbonisation of the economy but not directly contributing to improving energy efficiency (e.g. the use of biofuels in transport) are included in the second EEAP.

In terms of methodology, the calculation methods used to measure achieved/expected savings remains largely unclear. Although the HMT Green Book and supplementary policy appraisal guidelines are given as reference, the information provided in the action plan itself is not sufficiently detailed to assess methodological issues.

The second EEAP includes specific measures promoting the energy performance of existing buildings and the transition to nearly-zero energy buildings as required by EPBD (however the second EEAP does not formally report on EPBD requirements). Financial and reputational incentives targeting (both public and private) organizations and emphasis on information provision and awareness raising (smart meters, and organizations dedicated to the provision of advice on saving energy) represent further good practice in UK energy efficiency policy.

Additional strengths include the wide range of sector-specific actions. In the public sector these include differentiated actions targeting local governments, the central government, education, as well as health institutions. However, more detail would be necessary on public sector measures to assess their contribution to ESD implementation.

The second EEAP of the United Kingdom does not report on measures on the supply side. The large-scale rollout of smart energy meters is the only measure which can be seen as supporting supply side energy efficiency, through its connection to the development of the smart grid.

Strengths

- The UK second EEAP contains a comprehensive set of measures applied in three key sectors of the economy (households, private and public sectors, transport) with each sector making a contribution to the 2016 energy saving target. The second EEAP also reports expected savings for 2020 reflecting the longevity of the measures described in the action plan and clearly embeds the energy efficiency measures into the broader policy context.
- Changes compared to the first EEAP are clearly and understandably highlighted, listing a number of measures described in the previous EEAP that have been revised since the initial projections.

Weaknesses

- In the UK second EEAP, methodologies used to calculate achieved and expected energy savings from different measures remain largely unclear. Although the HMT Green Book and supplementary policy appraisal guidelines are given as reference, the information provided in these documents and the plan itself are not sufficient to conduct any detailed assessment of the achieved/expected savings (e.g. to detect any major risk of double counting). In order to assess the impact of the implemented/planned measures reported in the second EEAP it would have been necessary to attach an Annex to the Plan explaining the methods used for the calculation energy of final energy savings.
- Information about expected/achieved savings is missing in relation to a number of important measures (e.g. EPC Energy Performance contracting as part of the Green Deal programme to be launched late 2012; NHS plan to introduce the EU Green

Public Procurement standards for Medical Devices; Boiler scrapping scheme established in 2010, etc.).

- The UK second EEAP covers energy efficiency policy within the wider legislative context of carbon abatement. In the action plan, CO_2 emission reductions and energy savings are reported in parallel to each other but in some cases only information on the achieved carbon is provided while information on energy savings is missing. In the view of the EU objectives to monitor the progress toward energy efficiency in the Member States, the reporting on expected and achieved energy savings is important.

Recommendations for improvement

- In the UK second EEAP the connected areas of carbon abatement and energy efficiency policy are reported in an overlapping manner. Some of the mentioned policies, such as biofuels for transport and the promotion of the inclusion of aviation in the ETS are strongly connected to carbon abatement, while not necessarily having direct relevance for achievement of the ESD target. In order to avoid unnecessary reporting effort and for the better clarity of the describing of the national energy efficiency framework, it would strongly be recommendable to always describe the impact of any measures or group of measures on the ESD and any other national energy efficiency targets. Measures, which are to contribute to CO_2 and/or renewable energy targets while not having clear impact on energy savings do not need to be included in the future EEAPs.
- In addition to the description of and expected energy savings from measures contributing to the achievement of the energy saving targets, information on possible overlaps between measures and calculation methodology for separate measures could be provided in a more consistent manner.
- It would be useful to quantify energy savings arising from measures implemented by the Devolved Administrations (Wales, Scotland and Northern Ireland) and that their relation to UK-wide energy saving commitments is clarified.

CROATIA

Summary

The Croatian EEAP provides a comprehensive analysis of energy efficiency progress and presents a coherent strategy to improve energy efficiency in the whole economy. Building regulations account for most of the interim bottom-up savings, while achieving 2016 targets is reliant on estimates of savings arising from planned ambitious building renovation measures. These proposed measures will need to be further developed because the level of detail given does not adequately explain how the savings will be achieved. Significant progress has been reported in parts of the public sector though the promotion of energy management. On the other hand, there is little evidence of a concerted effort to improve energy efficiency in industry, commercial services or transport up to 2010. Many of the measures for these sectors planned in the first EEAP have not been implemented but new measures are proposed to replace them. Measures that support a voluntary network in industry and encourage and implementation of energy management practices should instil a culture of energy efficient practices in these sectors. The plan also assumes a measure to examine the possibility of the establishment of a white certificate system. As an effective energy efficiency obligation scheme is one of the key measures of the new Energy Efficiency Directive (EED), it will be important for Croatia to identify soon optimal solutions for such a scheme and/or alternative measures that would ensure the minimum impact as required in EED Article 7.

General Evaluation

The second EEAP retains the 9% ESD energy savings target of 19.77 PJ for 2016 calculated in the first EEAP. Achieved and forecast savings are calculated using both top-down and bottom-up methods. Top-down calculations are made using P- and M- indicators recommended by the Commission and bottom up assessments are made using both recommended methods and national methods. Top-down savings of 6.43 PJ in 2010 are close to the interim target of 6.59 PJ, while savings attributed to measures using bottom-up methods amounted to 3.53 PJ in 2010. Projected top-down savings for 2016 are 38.66 PJ, well ahead of 2016 ESD, while forecast bottom-up savings are 18.64 PJ. Although ESD-related final energy savings of 57 PJ are projected for 2020, no formal 2020 target has yet been defined.

The EEAP recognises the importance of achieving energy savings in **buildings**. The plan has ambitious targets with respect to renovation of existing buildings and identifies the development of the national renovation plan as key to achieving 2016 savings targets. Planned sector-specific financial measures related to the renovation plan account for a large share of total forecast bottom-up savings. Most of the bottom-up savings achieved up to 2010 are attributed to implementation of building codes in new buildings. The report explains how legal and administrative difficulties relating to the funding of ESCO projects, the performing of energy audits and the issuing of building certificates have hampered energy efficiency progress in buildings and states how these issues have been addressed through amended legislation. No nearly Zero Energy Building targets have been defined and no definition of nZEB has been formulated in Croatia, yet. A planned measure to incentivise the construction of buildings with significantly higher energy performance standards than required by building codes is described. The nature of the incentive and the budget for the measure are not detailed, however. In response to the requirements of the EPBD, mandatory 5-year control checks have been introduced for boilers larger than 20kW and air conditioning systems larger than 12kW, but these checks are conducted in conjunction with energy audits and in non-residential buildings only.

Achieved and projected savings are largest in the **residential** sector. The report indicates that activities in the sector focused mainly on awareness raising in the first EEAP period, and successful awareness campaigns are described. A financial support scheme introduced in the first EEAP to encourage homeowners to invest in energy efficiency improvements and renewable technologies appears to have achieved only a very small amount of savings up to 2010. By contrast, significant future savings are anticipated from a new financial measure to stimulate the renovation of residential buildings in accordance with the aims of the renovation plan that has yet to be prepared. The measure aims to improve the energy efficiency of buildings constructed before 1987, and a budget has been quantified. The report does not explain well, however, how the measure will be implemented, what activities will be undertaken to undertaken to incentivise homeowners to undertake renovations, or how these will lead to the savings anticipated.

In the first EEAP significant savings in the non-ETS part of the **industry** sector were envisaged. Most of the savings were to be achieved by a revived Industry Energy Efficiency Network, a voluntary scheme whereby participating companies would receive support for energy management, energy audits and other measures. The second EEAP explains that the network has not been implemented to-date as planned, but that it remains a key measure for achieving 2016 targets for the sector. It does not adequately explain how the difficulties in implementing the measure are to be overcome in the next period. Although a feed-in tariff mechanism to promote cogeneration was implemented as planned the sector did not show a sufficient level of interest in the programme. It is reported that there has been little other activity to promote greater energy efficiency in industry up to 2010. Consequently, interim savings attributable to measures in the sector are low.

The report contains little evidence of energy efficiency progress in the **commercial services** sector. It is not well explained why a measure to promote energy management has been unsuccessful or why 2016 targets for savings through energy management have been significantly reduced. Most of the anticipated future savings in the sector are attributed to a new measure to encourage the energy renovation of commercial buildings. As is the case in the residential sector, the measure is based on the renovation action plan. As the plan does not exist and proposed actions are not outlined it is not clear how the measure will achieve the anticipated savings. Savings projections are based on the optimistic assumptions that 3% of all pre-1987 commercial buildings will be renovated annually and that, as a result, their average annual specific consumption will be reduced by over 80%. Significant savings are also anticipated from efforts to promote greater use of solar energy in the hospitality sector.

Significant progress has been made in implementing energy efficiency measures in the **public sector** at local and regional levels. A ‘Systematic Energy Management’ programme establishes and provides technical support for energy management projects in cities and regions and communicates their exemplary role and their successes to the public. Notable is an advanced energy network, a web-based tool for recording and monitoring public sector energy use at building, city and regional levels. A ‘House in Order’ programme introduces systematic energy management in government facilities. Public sector organisations are legally obliged to undertake energy efficiency activities such as implementation of energy management systems and execution of energy audits. The report acknowledges that to-date public procurement has been driven by price and that energy efficiency criteria have not been sufficiently considered. Croatia intends to address ESD public procurement requirements by changing regulations to facilitate energy performance contracting in the public sector and by integrating energy efficiency requirements into existing procurement procedures.

Although **transport** accounts for the largest share of final energy use, 2010 savings attributed to transport measures introduced in the first EEAP are small. The report indicates that those measures were too general in nature and proposes to replace them with a new set of more focused measures. Significant measures include an eco-driving training campaign, a 'bonus-malus' scheme to promote the purchase of low emissions vehicles, and subsidies for energy efficient vehicles or energy efficient retrofits. Some of the measures, such as the promotion of e-mobility and of modal shift in freight transport, appear to be in a conceptual phase and still require studies to examine how they can be implemented.

The EEAP incorporates a comprehensive analysis of primary energy consumption in Croatia. It outlines a series of ongoing and planned measures addressing losses in **energy supply and distribution** including measures to reduce losses in electricity distribution and in the transportation of oil and gas, improvement of the energy efficiency of domestic oil and gas fields, and modernising of district heating systems. Savings are anticipated in power generation facilities through refurbishments of oil fired plants and the construction of a new gas cogeneration plant.

The EEAP documents Croatia's systematic approach providing **advice and information**. Croatia raises awareness, disseminates energy efficiency information through media campaigns and dedicated information offices.

Strengths

- The Croatian EEAP is a comprehensive report, with planned measures addressing all sectors. It incorporates supply-side measures to provide economy-wide plan. It is well-structured and addresses the key reporting requirements of the ESD.
- The plan is fairly ambitious, with total projected savings in excess of 2016 target, and projected savings attributable to planned measures accounting for nearly 95% of the target. Ambitious targeted levels of energy savings due to renovations of buildings have been quantified.
- The exemplary role of the public sector is evident in the cities and counties. Strong measures exist to promote and encourage energy management at a local authority level.
- The report presents top-down savings figures for each sector to give a view of overall progress, and complementary bottom-up calculations to show how much of the savings are attributable to measures. The assumptions underpinning projected savings are well documented for each measure.

Weaknesses

- The report shows little progress in promoting energy efficiency in industry, commercial services or transport. Many of the measures planned in the first EEAP have had little success or have not been implemented. Outside of the public sector there is little evidence of a concerted effort to improve energy efficiency up to 2010.
- Savings through renovations up to 2010 have been low while, in contrast, anticipated savings in 2016 are very high. Although the EEAP describes planned renovation measures that are contingent on a future national renovation plan, it does not explain well how Croatia will encourage a significantly higher rate of renovations.
- In the commercial services sector the plan relies heavily on a measure to renovate existing buildings, while ambitions to promote energy management in the sector have been significantly reduced.
- The plan does not contain any measures tailored for small to medium-sized enterprises and it is not clear how energy audits are promoted among SMEs.

Recommendations for improvement

- It is recommended that improving energy efficiency in the private sector is given some closer attention in the next EEAP. Greater effort may be needed to encourage energy management in the service sector. Improving energy efficiency of manufacturing through voluntary agreements will require further monitoring and verification of actually achieved energy savings.
- Achieving energy savings targets for Croatia (both 2016 ESD target and the future 2020 target as required by EED) may require significant increase of the rate of renovations of existing buildings. However, little savings have been achieved to-date through such renovations. While renovation measures are broadly outlined in the EEAP, a clearer set of incentives will need to be put in place to encourage building owners and to ensure that the ambitious renovation targets in the EEAP can be met.
- The report indicates that Croatia will examine the possibility of setting up of a white certificate scheme. The choice of how to introduce white certificates and/or alternative measures may determine how savings attributed to many listed measures will be delivered and may have a major impact on Croatia's ability to achieve its savings targets. Examining the options for such schemes is anyway already required in the EED. As many key measures listed are dependent on state financing, Croatia should consider streamlining instruments such as energy efficiency obligations or other market-based instruments to complement financial incentives based on the state budget and the EU funding.

	2010 (PJ)	2016 (PJ)	2020 (PJ)[76]
Interim and ESD 9% final energy savings target according to EEAP1 and EEAP2	6.59	19.77	-
Declared / projected final energy savings according to EEAP2	6.43	38.66	57.17
Amount of declared / projected savings attributable to measures	3.53	18.64	34.78

[76] 2020 savings figures relate to ESD-relevant sectors only and do not constitute 2020 national savings targets. Separately, a projected final energy savings figure of 22.76 PJ is given for 2020 compared to a baseline forecast.

Annex 2 - Overview of different methodologies used by Member States to calculate final energy savings in the Second EEAPs

The ESD requires that energy savings figures reported in the EEAPs be determined using a harmonised calculation model. The envisaged harmonised model is a combination of top-down calculation methods that use aggregated national statistics and bottom-up methods that assess measure-specific savings. Top-down and bottom-up evaluation methods provide two complementary approaches to assess energy efficiency progress. A top-down indicator gives a view of energy efficiency trends in an economic sector or sub-sector. It does not quantify savings achieved as a result of measures. Instead, it aggregates efficiency changes brought about by a combination of autonomous effects, such as changes in global energy prices, hidden structural effects and the effects of old and new energy efficiency policies. A bottom-up method, on the other hand, calculates measure-specific savings by assessing the influence of the measure on the energy use of one or more consumers and by scaling up by the number of effected consumers. A combination of top-down methods and bottom-up methods gives a view of the success of individual measures and of their combined influence on overall energy trends.

In July 2010, the Commission circulated among Member States a set of recommended top-down energy efficiency indicators and bottom-up calculation models (European Commission, 2010)[77]. A total of 22 top-down indicators are presented in the Commission's recommendations. These consist of 14 preferred (P) and 8 minimum (M) indicators. A P indicator typically uses an activity variable that is closely related to energy service demand, such as the number of tonne-kilometres or the value of a physical industrial production index, whereas the relationship between energy use and the activity variable of an M indicator, such as number of vehicles or industrial gross value added, is less strong. Three categories of recommended bottom-up calculation formulae contained in the Commission's recommendations provide a means of quantifying the savings achieved by measures addressing energy efficiency in residential and tertiary buildings, including equipment and appliances used in buildings.

Table 15 indicates which broad approach was used by each Member State to quantify declared intermediate savings for 2010. Twelve Member States use mostly the top-down methods recommended by the Commission or national top-down methods to determine the declared savings achieved up to 2010. These twelve Member States claim around 63% of total declared savings for 2010. Fifteen other Member States use mostly bottom-up or measure-specific methods to determine the declared intermediate savings in their EEAPs, accounting for the remaining 37% of total savings. Several Member States that determined total intermediate savings using top-down methods also include bottom-up calculations for some measures in their reports. Some that declared their bottom-up savings also presented top-down figures. Some Member States used bottom-up methods for some sectors and top-down for other sectors for which no bottom-up information was available. The bottom-up methods presented in the EEAPs are typically national methods based on either measured savings from

[77] European Commission, 2010, Preliminary draft excerpt – Recommendations on Measurement and Verification Methods in the Framework of Directive 2006/32/EC on Energy End-use Efficiency and Energy Services. Unpublished.

specific actions, or modelled savings using building and vehicle stock models, or expert estimates.

Table 15: General approaches used to quantify declared intermediate final energy savings

Approach used to quantify declared intermediate savings	Member States
Mostly or all top-down	Denmark, Estonia, France, Germany, Greece, Latvia, Malta, The Netherlands, Poland, Slovakia, Spain
Mostly or all bottom-up / measure-specific	Bulgaria, Austria, Belgium, Cyprus, Czech Republic, Finland, Hungary, Ireland, Italy, Lithuania, Luxembourg, Portugal, Slovenia, Sweden, United Kingdom

The evaluation approaches used by some of Member States to quantify savings in their EEAPs are briefly described here. The section provides some insight into the extent to which Member States applied evaluation methodologies recommended by the Commission, and serves to highlight the diversity of approaches used and the differences in interpretation of qualifying savings. Cases are identified where figures are inconsistent with policy efforts, and where insufficient information is presented.

Austria. Austria uses bottom-up methods to quantify declared and forecast energy savings in its EEAP. It validates some of the bottom-up figures using top-down methods. Bottom-up calculations are made using national methods that are documented in a separate publication. The bottom-up indicators are similar to Commission recommended methods. Bottom-up savings due to early actions are clearly identified. A comprehensive set of top-down indicators, based on methods recommended by the Commission, is presented in the document. For one sub-sector, heating and hot water in households, the intermediate bottom-up savings are a multiple of those quantified using top-down methods. The report suggests that a combination of rebound and higher quality bottom-up data may explain this.

Belgium. The EEAP for Belgium consists of four separate EEAPs presented in annexes to the main document, representing federal or state-wide measures and measures implemented in the regions Wallonia, Flanders and Brussels, with differences in the calculation methods applied in each.

<u>Federal:</u> While the federal EEAP describes measures implemented throughout the whole country, no savings are quantified due to overlaps with measures implemented in the regions.

<u>Wallonia:</u> The EEAP gives targets and declared savings in both final energy and primary energy equivalent units. Savings are assessed using bottom-up methods with much of the intermediate savings attributed to early actions. Although 2016 forecast savings are below target the report points out the figures exclude savings associated with a number of measures that have yet to be evaluated. The plan does not apply top-down methods to assess savings but points out that top-down results can be inaccurate due to short-term fluctuations in the data used to calculate them.

Flanders: The EEAP for Flanders quantifies transport-related savings using top-down methods recommended by the Commission, while savings achieved by other sectors are calculated using bottom up methodologies that are explained in the plan. Again, figures are presented in final and primary energy equivalent.

Brussels: For most measures presented, expected savings per measure are presented in the EEAP. The figures are given in final energy and primary energy equivalent. The figures are calculated using modelling methods and bottom-up methods recommended by the Commission. No intermediate savings figures are presented in the plan.

Bulgaria. Bottom-up final energy savings figures are given for 2010. Total bottom up savings for 2016 are not declared; instead an intermediate savings forecast for 2013 is reported. For most measures, however, expected savings for 2016 and 2020 are given. The plan does not provide detail on how the figures were calculated or how double-counting was avoided. Bulgaria also provides top-down intermediate savings figures for 2009 and savings forecasts for 2016. The top-down analysis shows that savings in 2009 were already double the intermediate target set for 2010. Two-thirds of all top-down savings are attributed to the transport sector although all of the 8 listed transport measures are listed have start dates of 2011 or later.

Cyprus. Declared and forecast savings are calculated using bottom-up methods. Measure-specific savings are typically modelled using deemed savings or performance values. Detailed data used for the calculations are presented in the report. Electricity savings are calculated in primary equivalent using a national conversion factor. No top-down calculations are carried out.

Czech Republic. Measure-specific savings are evaluated in EEAP for the Czech Republic using bottom-up methods. The report points out that total intermediate savings are only partially evaluated. Savings values are given for each measure for years 2008 and 2016. Total expected savings in 2016 calculated using bottom-up methods are adjusted to account for overlaps by applying a factor to each of the sector totals. Application of top-down methods to assess overall energy savings trends is not apparent in the plan.

Denmark. Denmark presents both top-down and bottom-up calculations in its EEAP. Top-down savings are calculated with a mix of P and M indicators from Commission guidelines. Declared intermediate energy savings are determined using the top-down approach. The report mentions uncertainties associated with activity data used to calculate intermediate savings. Due to lack of data for 2010, the 2010 savings have been estimated based on historical patterns in 2008 and 2009. The savings forecast for 2016 represents a business as usual scenario, and excludes the effects of future policies and planned measures about which no decision has been reached. It also excludes some anticipated additional transport savings. The report explains that most of the energy end-use savings are achieved through the energy savings obligations of energy companies. It presents the energy companies' declared savings, adjusted for savings lifetimes and with savings from EU ETS participants removed, as the national bottom-up savings figures. Although formulae and calculations are presented for top-down savings, the report does not detail how energy companies determined the figures presented in the EEAP as bottom-up savings. It explains that energy companies' savings are subject to external audit and are spot checked by the national energy agency.

Estonia. For Estonia, savings declared for 2010 are based on savings achieved in 2008 only, as more recent data was not available. The Estonia plan indicates that 2008 savings were assessed using top down methods. No breakdown of the contribution of individual sectors to the intermediate result is given. According to the EEAP, the savings forecast for 2016 has been made using a combination of expert opinions and calculation methods recommended by the European Commission although the methods are not specified. It is not clear if the forecast incorporates only savings attributable to measures or if autonomous changes are included. No detail about the calculation of achieved or forecast savings is provided.

Finland. In the Finnish EEAP national bottom-up or measure-specific methods are used to quantify savings for 2010, 2016 and 2020 for 36 measures. For each measure a description is given of the data and assumptions used to calculate the savings value. The savings associated with some measures incorporate the combined effects of early and new actions such that the proportion of total savings associated with actions implemented since 2008 cannot be ascertained. The report also provides details for a range of horizontal measures such as information, education and taxation measures for which no savings are calculated. No top-down calculation methods are applied.

France. France documents top-down and bottom-up savings in its EEAP. Commission-recommended top-down methods are used to determine the declared intermediate savings, while national bottom-up methods are used to evaluate the savings achieved by certain programmes and to forecast savings in 2016 and 2020. The top-down methods give negative savings, or efficiency losses, for electricity use in the tertiary sector. To determine total declared intermediate savings, France discards these losses by setting them to zero.

Germany. Germany uses a combination of top-down and bottom-up methods to quantify savings in primary and final energy consumption. Total declared savings are measured using the top-down indicators recommended by the Commission. The more detailed and potentially more accurate P indicators are used exclusively. In its declared savings figures Germany includes electricity savings made at EU ETS industrial installations, and all savings at some sites that will participate in EU ETS from 2013 onwards. Germany conducts a bottom-up analysis of a sub-set of its measures using national methods. An "instrument factor" accounting for double-counting of savings achieved by different measures, and an "implementation factor" adjusting for statistically recorded cases that may not lead to any savings, are applied to bottom-up calculated savings for each measure. These adjustments are detailed for each measure in the report. Savings lifetimes are applied to bottom-up calculations in accordance with the Commission's recommendations.

Greece. Using the top-down methods recommended by the Commission, Greece calculates a level of savings in 2010 that is 11.7% of reference consumption, well in excess of the ESD target for 2016. The EEAP acknowledges that the figure does not provide a true representation of energy efficiency developments in the country since 2008. It attributes the result to the effects of the economic recession and its influence on the variables used to calculate the savings. It then offers an alternative national top-down evaluation approach that takes into account the recessionary effects. With the alternative calculation, savings of between 5.1% and 10.9% in 2010 are estimated.

Hungary. Hungary gives expected savings in 2016 for each measure listed in the EEAP. The plan indicates that the measure-specific savings have been quantified using sampling surveys and annual reports. For intermediate savings, one aggregate value for each sector is given. It is not clear how the intermediate values have been determined. It is stated that the calculation methodologies used in the EEAP are based on the approach recommended by the European Commission. No top-down indicators appear to have been applied.

Ireland. In the Irish EEAP, declared and forecast primary energy savings are provided for each measure listed. Savings are calculated using a variety of national methods. For a number of building and transport measures stock models with specific energy consumption values are used to assess savings. The savings achieved by some programmes are quantified on the basis of specific actions undertaken by programme participants. Top-down approaches are used to estimate the impact of building standards in the tertiary sector and of smart meters in the residential sector. The savings forecasts for some programmes are made on the basis that they will fulfil Government commitments to quantified energy savings in individual sectors. Sector-level top-down calculations recommended by the Commission were applied.

Italy. Achieved and forecast savings given in the EEAP for Italy are the sum of savings for the listed measures, where these are calculated individually using national bottom-up methods. The report does not provide detail on the calculation methods used but indicates for several measures that savings are based on figures reported through the national white certificates scheme. For measures in the industrial section the report does not explain how the figures were adjusted to include only those achieved in installations that are not participating in the EU ETS.

Latvia. Latvia uses a mix of top-down P and M indicators recommended by the Commission to calculate intermediate savings. Top-down calculations are made for the year 2009 as the 2010 data wasn't available at the time that the report was compiled. The report points out that due to fluctuating economic indicators a reliable top-down estimate of 2010 savings cannot be given. The very high levels savings reported for 2009 are already close to 2016 targets, even though negative savings in industry have been recorded. Transport accounts for over 78% of the intermediate net savings and the report indicates that the economic crisis has had a significant impact on these figures. The reported savings in transport do not provide a reliable indication of the level of savings achieved by the three transport measures listed in the EEAP. Measure-specific savings are also given for some measures. The report does not provide any details about how these were calculated.

Lithuania. Lithuania uses national bottom-up methods to determine the savings achieved and forecast for each documented measure. Nearly all of Lithuania's declared energy savings in 2010 are attributed to pre-2008 building regulations and other early measures. Top-down figures for 2010, calculated using the M indicators from the Commission's recommendations, are also presented. Generally, the top-down figures are at odds with the bottom-up ones. Using top-down methods, road transport accounts for most of the energy savings, while negative savings are shown for heat use in households and for some industrial sub-sectors.

Luxembourg. In the EEAP for Luxembourg, final energy savings are calculated exclusively using bottom-up or other measure-specific evaluation methods. The report thereby endeavours to include only those savings that can be attributed to measures. Luxembourg uses its own evaluation methods to quantify measure-specific savings. For example, national building stock models are used to assess savings due to building measures, while price elasticities are employed to evaluate the effects of taxes on fuel. The report clearly differentiates between early savings, mostly achieved through building regulations, and savings that have been achieved through measures implemented from 2008 onwards. The top-down evaluation approach recommended by the European Commission is not applied.

Malta. Malta calculates declared intermediate savings using top-down methods. For the transport and residential sectors, M indicators are used. No industry savings are recorded due to lack of data. Instead intermediate savings achieved for supply of water are presented. These are calculated using a national top-down method that takes into account efficiency improvements since 2000. No overall forecast of 2016 savings is given. The EEAP states that it is expected that the 9% target will be achieved. Additionally, unspecified bottom-up methods were applied to calculate achieved and forecast savings for several measures.

The Netherlands. In the EEAP for The Netherlands, total primary energy savings for each sector are calculated using a top-down approach. The report does not use the top-down methods recommended by the Commission to evaluate energy savings. Instead, projected top-down savings are calculated by applying national top-down methods that have been in use since 2000 and that are based on national statistics and evaluation models. The report provides a justification for this approach. The bottom-up savings are calculated relative to 2007 using national methods, but bottom-up figures that include the savings due to early measures are also shown for illustrative purposes. The bottom-up figures used in the report generally do not reflect the effect of individual measures, but instead represent the savings achieved by a combination of measures in each sector. The report does not give estimates of savings attributable to individual measures. A substantial proportion of the savings in industry is achieved through electricity savings among EU ETS participant companies.

Poland. Poland calculates intermediate savings using top-down P and M indicators recommended by the Commission. Some industry sub-sectors show negative savings which are included in the net savings calculations for the sector. Savings in private transport are not calculated. The savings forecast for 2016 is based on bottom-up assessments of listed measures. Bottom-up calculations are national methods about which no detail is provided in the EEAP.

Portugal. The second EEAP for Portugal documents measure-specific savings up to 2010. Target savings figures for sectors are given for 2016. The report provides no information at all about how the savings were determined.

Romania. In the Romanian EEAP, intermediate savings are calculated using top-down indicators recommended by the Commission. A mix of P and M indicators are applied. Bottom-up or measure-specific savings are not given. No forecast of energy savings in 2016 is presented. The report states that as the 2010 savings figure is already close to the 2016 ESD target and that these savings were achieved in a period of recession. It concludes that for these reasons the 2016 target will be met.

Slovakia. Top-down and bottom-up calculations are presented in the Slovakian EEAP. Top-down M indicators are used to determine that intermediate savings are equivalent to 9% of reference energy consumption with very high savings for car transport in particular. Bottom-up calculations show savings of 1.2% of reference energy consumption. The report deems the intermediate target to have been met because top-down savings exceed the intermediate target and because 39% of intermediate savings target has been shown to have been achieved with bottom-up methods. The report refers to anomalies relating to energy statistics for 2007, the base year from which savings are measured, and proposes alternative calculations using average annual consumption for the years 2001 to 2005 as base year values. The 9% target for 2016 is presented but the report does not give any 2016 savings forecast figures.

Slovenia. Slovenia uses a mix of bottom-up and top-down methods to determine total savings. Measure-specific savings values are given for 2010 and 2016 for most measures and these include savings from actions prior to 2008. All methods are documented in a separate annex. It is unclear from the report whether targets and savings are calculated in final energy units or in primary energy equivalent. Both the first and second EEAP reports appear to suggest that the target has been calculated using final energy consumption values, but that the savings have been calculated using primary energy equivalent by applying a conversion factor of 2.5 to electricity savings.

Spain. The EEAP for Spain states that declared and estimated savings figures are calculated using top-down energy efficiency indicators in accordance with Commission recommended methods. In the annex of the report, however, a decomposition analysis approach is used to quantify the industry savings and the effects of structural change in the sector appear to have been included in the total savings calculation. Bottom-up savings for specific measures are also presented in the annex. Some of these are calculated using changes in unit consumption values and as such are more akin to top-down calculations. For some measures, it appears that top-down savings and savings attributable to specific actions have been added together to give total savings. In these cases it is not clear how the Member State has avoided double counting savings.

Sweden. Sweden combines bottom-up methods for some sectors and top-down for others to calculate total savings. The share of savings attributable to early actions is clearly identified. Savings achieved in buildings in the residential and services sectors, calculated using bottom-up methods, make up most of the intermediate savings. Bottom-up calculations for buildings are typically not measure-specific but cover multiple actions. Industry savings since 2007 are calculated using the top-down M indicators. The early savings associated with a voluntary programme for industry prior to 2008 are assessed separately and added to the top-down result for the sector. Top-down savings for transport are calculated using a combination of P and M indicators. The formulae used for most of the calculations are documented, with deviations from the Commission's recommended methods identified and justified.

The United Kingdom. The EEAP report for the United Kingdom does not provide any details of calculations used to quantify achieved and forecast final energy savings. Instead, it refers to a 'Green Book', which is a government guidance document used for the appraisal and evaluation of all policies. As savings published in the EEAP are given according to measures or groups of measures, it is assumed that the national methods used to determine them are measure-specific. It is indicated that the effects of measures are modelled in a national energy and emissions model and that adjustments are made for overlaps and double-counting. The report explains that energy savings associated with some policies have been adjusted with respect to those published in the first EEAP due to methodological improvements and reappraisal of savings projections.

ANNEX 3 - OVERVIEW OF 2020 ENERGY SAVINGS AND ENERGY CONSUMPTION TARGETS GIVEN IN THE SECOND EEAPS

The ESD establishes an indicative, non-binding 9% energy savings target for 2016 for each Member State. In 2007, the EU set itself a further savings target of 20% of primary energy consumption in 2020 to be achieved by improved energy efficiency. The 20% target is measured from a 2020 baseline primary energy requirement projection for the whole EU, while the ESD target for each Member State is determined from its reference energy end-use in a five-year historical period. However, the actions undertaken at national level in response to the ESD will make a significant contribution to overall 2020 savings targets. In most of the EEAPs reference is made to the EU 2020 target. This section provides an overview of 2020 national energy efficiency and energy consumption targets mentioned in the latest round of EEAPs.

Austria. The Austrian energy strategy, published in 2010, sets a 2020 final energy consumption target of 1,100 PJ. This is equivalent to the level of national final energy consumption in 2005.

Belgium. The EEAP does not detail any 2020 savings targets for Belgium. The Federal EEAP and the EEAPs for Flanders and for Brussels also have no information about 2020 targets. Although the EEAP for Wallonia does not define an energy savings target for 2020 for the region, for each measure for which savings have been quantified, the plan presents expected 2020 savings values in primary energy equivalent.

Bulgaria. The Bulgarian EEAP refers to the national document 'Bulgaria's Energy Strategy up to 2020'. The strategy aims to reduce primary consumption to 15.8 Mtoe in 2020 (compared to 20 Mtoe in 2005). A 2020 target final energy consumption value of 9.16 Mtoe is given. A target value for national energy intensity is also mentioned in the report. Bottom-up savings values for 2020 are given for many of the measures specified in the EEAP amounting to 15,632 GWh (1.34 Mtoe) in final energy savings.

Cyprus. A 2020 primary energy savings target of 463 ktoe is set in the National Reform Plan for Cyprus. The target is calculated by comparing a reference scenario that includes no additional energy efficiency measures after 2010 with an energy efficiency scenario that assumes continued development of national programmes and EU legislation as well as fuel switching in power generation. A 2020 indicative primary energy consumption figure, excluding non-energy uses, of around 2.76 Mtoe is given for the energy efficiency scenario. Additionally, measure-specific savings in 2020 are presented for each measure in the EEAP for which savings have been quantified.

The Czech Republic. The EEAP for Czech Republic does not specify any energy consumption or energy savings targets for 2020. An indicative target annual rate of decline in energy intensity is stated and long-term goals of stabilised primary energy consumption and growth through energy efficiency are mentioned.

Denmark. The national primary energy consumption target for 2020 of 829 PJ, equivalent to 96% of 2006 consumption, is stated in the Danish EEAP. The plan states that the Danish Energy Outlook 2011 gives an expected primary energy consumption value of 818 PJ in 2020. The longer term strategic objective of making Denmark independent of fossil fuels by 2050 is also mentioned. If the measures proposed in the national 'Energy Strategy 2050' are adopted, primary energy consumption is expected to drop to 781 PJ in 2020.

Estonia. The EEAP explains that in its National Reform Programme, Estonia has set a 2020 final energy consumption target. Final energy consumption in 2020 should not exceed 2010 levels. 2020 energy consumption targets for each sector are listed as follows: Industry 850 ktoe, Agriculture 110 ktoe, Transport 626 ktoe, Services 392 ktoe, Households 1149 ktoe. In the EEAP total final energy savings needed to reach the energy consumption target are quantified as 375 ktoe.

Finland. Finland's targets are defined in its long-term climate and energy strategy. The strategy sets a final energy consumption target of 310 TWh in 2020 and 220 TWh in 2050. A target level of electricity use in 2020 is also quantified. The target values relate to final consumption of the whole economy incorporating the emissions trading sector. The 2020 target figure corresponds to final energy savings 37 TWh, or 11% of final energy consumption, when compared to a basic scenario forecast that assumes that no further action is taken. No primary energy consumption targets are given but the target scenario gives a primary energy consumption forecast of 430 TWh in 2020 which is 49 TWh lower than the basic scenario value. The EEAP gives 2020 savings figures for all ESD-related measures for which savings are quantified.

France. To assess the impact of listed measures on energy consumption in 2020, the French EEAP compares a '*pre-Grenelle*' scenario with an '*additional measures*' scenario. It is thus calculated that additional energy efficiency measures listed will achieve 28.4 Mtoe of final energy savings, around 8 Mtoe of which us attributed to the national energy efficiency obligations scheme. Calculated savings exclude the savings achieved by the French private car '*bonus malus*' measure as these savings are already incorporated in the pre-Grenelle scenario projection. The report also mentions that the 2007 Grenelle environment round table set a 2020 target reduction of energy consumption in existing buildings of 38%.

Germany. The German EEAP outlines a 2020 national target, defined in the national energy concept, to reduce primary energy consumption by 20% compared to 2008 levels. Sector level targets for 2020 mentioned in the document include a 20% reduction in the heating requirement of buildings, a 10% reduction in the final energy consumption of transport, and a 10% reduction in electricity use. Longer-term targets for 2050 are also mentioned, including a 50% reduction in primary energy consumption and a 2.1% average annual improvement in energy productivity.

Greece. While the EEAP for Greece does not define a 2020 energy savings target, it does refer to a primary energy savings projection made as part of the National Renewable Energy Action Plan. Using a model of energy demand, a 2020 projection of 33.1 TWh in primary savings was made in a scenario where expected energy efficiency improvements are taken into account and renewable energy targets are achieved.

Hungary. A business-as-usual projection of primary energy consumption of 1,255 PJ in 2020, assuming an annual growth rate of 3%, is mentioned in the Hungarian EEAP. It is estimated that if the rate of savings anticipated for sectors within ESD scope is matched by the whole economy, primary energy savings in 2020 of between 135 and 145 PJ relative to the business-as-usual scenario could be expected by 2020. The contribution of sectors within the scope of ESD to final energy savings is expected to be between 70 and 90 PJ annually in 2020. Elsewhere, a national commitment to 10% total energy savings in 2020 is mentioned although the method of quantifying this target is not specified.

Ireland. Ireland has two main energy savings targets for 2020. A 20% target applies to the whole economy. The target is equivalent to 31,925 GWh of Primary Energy Equivalent and is calculated in a similar manner to the ESD target as 20% of average annual national consumption in the period from 2001 to 2005. The calculation is presented in the first EEAP report. A 33% energy savings target for 2020 is set for the public sector. In the second EEAP this is quantified as 3240 GWh. All measures presented in the EEAP have estimated or target savings figures up to 2020.

Italy. Italy provides an estimate of final energy saved in 2020 by the measures listed in its EEAP. It shows that savings will grow from 9.6% of ESD reference energy consumption in 2016 to 14% of reference consumption, or 15.9 Mtoe, in 2020. This is equivalent to 18 Mtoe of primary consumption. A 2009 PRIMES forecast for the economy projects gross final consumption to be 133 Mtoe in 2020 if energy efficiency measures are implemented and national renewable energy targets are met.

Latvia. The Latvian EEAP gives planned energy savings values for energy end-use and primary energy consumption for 2020 (6,050 GWh and 7,779 GWh respectively). Separately, a forecast final energy consumption value of 55,233 GWh for 2020 is presented, and a forecast of primary energy consumption is shown in graphical form only. It is not clear from the report if these energy consumption forecasts take into account the projected energy savings values. Latvia does not expect supply-side measures to contribute much to 2020 energy savings due to a high level of efficiency in the transformation sector and the high level of electricity imports. For 2020 an efficiency target for heat generation plants of up to 90% and a heat loss level of 12% for heat distribution networks are described. Although top-down methods are used to quantify total savings, for some measures bottom-up forecasts of expected savings in 2020 are given.

Lithuania. No 2020 targets for energy efficiency or energy consumption are given in the Lithuanian EEAP. The plan mentions an envisaged 8% reduction in final energy consumption in the transport sector in 2020.

Luxembourg. The EEAP for Luxembourg does not provide any detail on national 2020 targets. The plan refers to the several energy-related EU targets, including the EU 20% energy savings target for 2020, and mentions that a thorough quantitative analysis and a discussion process is needed to understand their implications for Luxembourg.

Malta. A provisional national primary energy savings target for 2020 of 235 ktoe is given in the EEAP. The target assumes that planned electricity supply infrastructure will be in place and that renewables targets will be met. A Primary energy consumption forecast for 2020 of 835 ktoe is also given.

The Netherlands. The EEAP for the Netherlands does not refer to any national energy savings targets for 2020. A plan to make existing buildings 20-30% more efficient by 2020 is mentioned and 2020 savings targets for specific programmes related to the energy efficiency of buildings are given.

Poland. The Polish EEAP does not quantify any energy consumption or energy savings targets for 2020. It refers to an official document called 'Energy Policy of Poland until 2030' which declares some medium-term objectives for the economy, including economic growth without growth in primary energy consumption, improved efficiency of electricity generation, increased use of high-efficiency co-generation, reduced network losses and improved end-use efficiency.

Portugal. The Portuguese EEAP briefly mentions that a 2020 national energy savings target of 20% has recently been increased to 25%. The baseline from which the target is measured is not mentioned. A new 30% energy efficiency target for the public sector for 2020 is also mentioned, measured relative to current levels.

Romania. In 2010 a forecast of primary energy consumption was conducted by the National Commission of Prognosis. The forecast of 41.0 Mtoe is lower than the 2007 PRIMES forecast of 53.0 Mtoe and the 2009 PRIMES forecast of 42.8 Mtoe. The EEAP mentions the high level of uncertainty in the forecasts but states that Romania shall achieve 10 Mtoe in primary energy savings compared to the 2007 PRIMES scenario. Elsewhere in the report it is indicated that the electricity generation sector is anticipated to save 3.4 Mtoe in 2020 through increased use of renewables, promotion of high efficiency cogeneration, and replacement and refurbishment of power plants.

Slovakia. Slovakia sets an energy savings target for 2020 of 11% of average annual final energy consumption for the years from 2001 to 2005. The target amounts to savings of 45486 TJ and applies to the whole economy, with EU ETS participants expected to achieve 24.5% of the target. The EEAP indicates that a slowdown in the rate of savings is expected from 2017 onwards due to the reduced potential of less costly measures. The 2020 target was determined in the Energy Security Strategy for the Slovak Republic.

Slovenia. The EEAP contains a projection of primary energy supply, showing a value of 302 PJ in 2020 which is 5.6% less than the 2008 value. The EEAP refers to a draft National Energy Programme currently in preparation, which defines targets of a 20% improvement in energy efficiency by 2020, a 27% improvement by 2030, and sets out sets out plans that will achieve them. The report points out that Slovenia is not setting a primary energy consumption target because it could limit its choice of energy mix.

Spain. The Spanish EEAP details national primary and final energy consumption targets for 2020. The measures listed in the plan are expected to save 17,843 ktoe of final energy consumption in 2020 while total primary energy savings in the whole economy are anticipated to be 35,585 ktoe in the same year. Primary savings equate to 20% of forecast total energy consumption in 2020 in the absence of energy efficiency and renewable energy measures. Annual changes in energy efficiency indicators for each sector needed to achieve the 2020 targets are given. Other 2020 targets mentioned include the addition of 2.5 million EVs, the doubling of rail passenger traffic, and the installation of 3.75 GW of new cogeneration capacity. The plan also assumes the construction or complete renovation of 8.2 million m^2 of buildings per year and the replacement of 0.5 million domestic appliances per year up to 2020.

Sweden. Sweden sets a 2020 primary energy intensity target equivalent to 80% of the primary energy intensity of the economy in 2008. Additionally, a 2020 final energy consumption target for buildings is set at 20% below 1995 levels, measured as average energy consumption per unit of heated area. A longer-term 5050 target of 50% below 1995 levels is also set. In the report it is estimated that achieving the 2020 targets will save between 11.6 Mtoe and 14.7 Mtoe.

The United Kingdom. The UK EEAP gives expected final energy savings in 2020 for each ESD-related measure listed for which savings have been quantified. These savings amount to 272.5 TWh in 2020. Excluded from the calculation are a number of measures for which savings have not been assessed, such as savings from specified fiscal measures. Although an overall national target is not given, the plan mentions a Scottish target to reduce final energy consumption by 12% in 2020 measured using a 2005 to 2007 baseline.

ANNEX 4 - SECOND PROGRESS REPORT ON THE IMPLEMENTATION OF THE COGENERATION DIRECTIVE

Context

The report is an update on a previous report delivered in May 2011, covering progress in implementing the Cogeneration Directive and its effects in terms of promotion of high This report is prepared in support of the implementation of Article 11 of the Cogeneration Directive (2004/8/EC), which states that the Commission should periodically report on progress in implementing the Directive and its effects in terms of promotion of high efficiency cogeneration. It follows from a previous preliminary report prepared in 2011. It analyses the progress towards realizing the potential for high-efficiency cogeneration in the EU. The analysis is based on Member States' national progress reports submitted in late 2011 - early 2012, the spread sheets with quantification of progress towards increasing the share of high-efficiency cogeneration (as submitted by Member States in response to the Commission's request) external scenario data and technology parameters, and internal Commission analyses. It reviews the progress achieved since early 2011 in term of: realizing the potentials for high-efficiency cogeneration which has in general been slow; barrier removal which has shown good progress; status of the implementation of Guarantees of Origin which is nearly achieved; grid system access rules which have been in general made transparent and fair; and support schemes which vary considerably among Member States. As noted in the previous reports, Member State reporting has generally been slow, inconsistent and in many cases non-existent or inadequate.

State of transposition

Directive 2004/8/EC, and the guidelines from Decisions 2007/74/EC (now 2011/9523/EC) and 2008/952/EC oblige transposition into national laws, regulations and decrees. This chapter presents the state of transposition in Members States as of 18th of June 2012.

Updates on the state of transposition for the second progress report were received in the time of drafting from 21 Member States (Austria, Belgium, Bulgaria, Cyprus, Denmark, Estonia, Finland, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Malta, Netherlands, Poland, Slovak Republic, Slovenia, Spain, Sweden, and the UK).

Table 16 presents the state of transposition based on the first and second progress reports of the Member States. From the 21 countries reporting, 7 had already reported full transposition in 2009 (Belgium, Hungary, Poland, Portugal, Slovenia and Spain). Four additional countries reported on full implementation in the transposition of the Directive and the Decisions since the first progress report (Denmark, Finland, France, Greece, Italy, Latvia, Lithuania, Netherlands and the Slovak Republic, Sweden).

Table 16: State of transposition based on input from national reports.

Member State	State of transposition on 1 December 2009	State of transposition on 9 March 2012
Austria	Yes, but responsibilities for the GO* system on regional level have yet to be clarified	Directive fully transposed. But, still GOs for high-efficiency CHP cannot be administered, issued and traded.

		Amendment to Cogeneration Act is being prepared and will be implemented in Spring 2012.
Belgium	Directive fully transposed.	Directive fully transposed.
Bulgaria	Yes, but formal requirements for GOs are incomplete, grid access priority is only up to 10 MW	Directive mostly transposed. Still grid access priority only for plants up to 10 MW.
Cyprus	Directive fully transposed.	Directive mostly transposed. GO system established by TSO and regulations were to be adopted in 2011.
Czech Rep.	Directive fully transposed.	-
Denmark	Yes, but no priority connection, priority access only for decentralised plants	Directive fully transposed.
Estonia	Yes, but formal requirements for GOs incomplete, no priority grid access & connection	Directive transposed. But legal basis for GO is planned to be improved.
Finland	Incomplete	Directive fully transposed.
France	Yes, but no priority grid access & connection	Directive fully transposed.
Germany	Directive fully transposed.	-
Greece	Yes, but GO system not operational, priority access only for production facilities up to 35 MW	Directive fully transposed.
Hungary	Directive fully transposed.	Directive fully transposed.
Ireland	Directive fully transposed.	Directive transposed, but for Article 5 (Guarantees of Origin) a fully functional system is still under development.
Italy	Yes, but GO only above 50 MWh/a	Directive fully transposed.
Latvia	Yes, but formal requirements for GOs unclear, no priority grid access/connection	Directive fully transposed.
Lithuania	Yes, but no priority grid access/ connection	Directive fully transposed.
Luxemburg	Yes, but GO system not precise	No information received
Malta	Directive fully transposed.	Directive transposed.

		Decision 2008/952/EC to be implemented.
Netherlands	Yes, but no priority grid access/transmission	Directive fully transposed.
Poland	Directive fully transposed.	Directive fully transposed.
Portugal	Directive fully transposed.	Directive fully transposed.
Romania	Directive fully transposed.	-
Slovak Rep.	Incomplete, grid access to be clarified	Directive fully transposed.
Slovenia	Directive fully transposed.	Directive fully transposed.
Spain	Directive fully transposed.	Directive fully transposed.
Sweden	Yes, but no priority access/connection	Directive fully transposed.
UK	Incomplete	Directive fully transposed.

* = Guarantee of Origin

One Member States has not submitted a second progress report. In most countries the transposition seems to be complete and a GO is in place. However, in several cases the actual implementation of GO still remains to be completed.

1. PROGRESS TOWARDS REALIZING NATIONAL POTENTIALS FOR HIGH-EFFICIENCY COGENERATION (ARTICLE 11(1)(A)

1.1. Introduction

Article 11(1)(a) of the Directive states that "[the progress report submitted by the Commission] shall consider progress towards realising national potentials for high-efficiency cogeneration referred to in Article 6". This chapter addresses Article 11(1)(a), thereby answering the following main question: have Member States made progress in realising the potential for high-efficiency cogeneration in the past few years?

In order to answer this question, the corresponding chapter in the previous report provides an overview and critical assessment of the EU potential for high-efficiency cogeneration. That overview was based on the national potentials identified by the Member States in the national reports that have been submitted to the Commission in accordance with Article 6(1) of the Directive. The chapter in the previous Commission Background report on progress in implementing the Cogeneration Directive provided an assessment of the progress made by Member States in realizing these potentials, based on data from Eurostat and on the information provided by the Member States in accordance with Articles 6(1) and 6(3) of the Directive.

The current chapter provides an update regarding the realising of the national potentials. The update is based on questionnaire responses provided by Member States in accordance with reporting requirements of Articles 6(3) and 10(2) of the Directive, as well as on information gathered at the informal meeting of the cogeneration committee on 7 October 2011 in Brussels.

1.2. Scope: Member State information included

As mentioned above, the analysis of the realisation of national potentials in this chapter is based on the reports submitted by the Member States in accordance with Articles 6(3) and 10(2) of the Directive. As requested by the Commission, Member States' reporting was based on a questionnaire template and a spread sheet. As with the previous exercise, the spread sheet was used to ensure maximum comparability of the quantitative information submitted by different Member States.

Not all Member States used the questionnaire or the spread sheet template consistently. Eighteen Member States provided both the questionnaire and the complete spread sheet. Six Member States provided the questionnaire and a partially completed spread sheet. One Member State returned the questionnaire without any spread sheet and one provided information without using the templates. The remaining Member State did not provide any information at all. An overview of documentation included in the analysis is given in the following table.

Table 17: Overview of questionnaires and spread sheets on realisation of national potentials used in the analysis of this chapter

Member State	*Questionnaire input*	*Spread-sheet*	*Questionnaire responses obtained from*
Austria	Yes	Yes	
Belgium	Yes	Yes	
Bulgaria	Yes	Yes	
Czech	Yes	Yes[a]	
Cyprus	Yes	Yes	
Denmark	Yes	Yes[b]	
Estonia	Yes	Yes	
Finland	Yes	Yes	
France	Yes	Yes	
Germany	Yes	Yes[a,c]	
Greece	Yes	Yes	
Hungary	Yes	Yes	
Ireland	Yes		
Italy		Yes	Yes
Latvia		Yes	Yes
Lithuania	Yes	Yes	
Luxemburg	Yes[f]	Yes[f]	
Malta	Yes	Yes	
Netherlands	Yes	Yes	
Poland		Yes[a]	Yes
Portugal	Yes	Yes	
Romania			Yes[e]
Slovakia	Yes	Yes	
Slovenia	Yes	Yes	
Spain	Yes	Yes[b]	
Sweden	Yes	Yes	
UK	Yes	Yes[d]	

[a] Provided only sheets 1 and 3 of the spread sheet
[b] Provided only sheet 3 of the spread sheet.
[c] Provided limited information
[d] Provided only sheet 1 of the spread sheet
[e] Provided statistics and general statements but did not follow questionnaire and spread sheet template. A spread sheet with limited information was extracted from the statistics tables.
[f] Did not follow the questionnaire, but provided limited spread sheet data.

In the remaining part of the chapter, the results from these documents will be analysed and compared with the national potentials as they were described in the corresponding chapter of the previous Commission Progress Report on Cogeneration. The analysis of national potentials was based on input from 25 Member States (*i.e.* EU-27 minus Luxembourg and Romania), which represented 347 TWh out of a total of 353 TWh of electricity generated from CHP in the EU-27 at the time of the estimation in 2007, *i.e.* 98%.

1.3. Methodological assumptions

The same methodological approach is used as in the previous Commission Progress Report on Cogeneration. Since the national reports and templates deal with *high-efficiency* cogeneration only, the baseline numbers used in the national reports and templates are different from the statistics recorded by Eurostat, which include *all* cogeneration, *i.e.* both high- and low-efficiency[78]. As in the previous report, in order to make the most productive use of the information available in the reports and the templates, the focus is on the increments in cogeneration observed in each of the sources, while trying to limit direct comparisons of absolute numbers from different sources.

In the event of discrepancies between the questionnaires and the spread sheets, priority is given to the spread sheets.

Some specific issues were encountered for individual countries:

- Cyprus supplied numbers both for high-efficiency and low-efficiency CHP. In the context of the present Directive, only the former are considered in the analysis.
- Spain combined the numbers for 'steam back pressure turbine' and 'steam condensing extraction turbine' into one number. For the purpose of this analysis, this entire number was allocated to 'steam back pressure turbine'.

1.4. Progress compared to the potential

The next table shows the national economic potentials for cogeneration, expressed in TWh of electricity produced from cogeneration. These potentials are provided for the 23 countries that submitted the information of sheet 1 of the spread sheet[79]. Two sets of estimates are provided. The first set is derived from the national reports and spread sheet templates as analysed in the previous progress report. The second set of estimates is derived from a modelling exercise using the TIMES energy system model, conducted by the JRC in the context of WP2 of the Administrative Arrangement on cogeneration with DG ENER[80] for the sake of comparison.

It should be noted that the two approaches (national reports on the one hand and TIMES modelling on the other hand) are fundamentally different. The potentials recorded in the national reports (and consolidated in the previous progress report) are typically based on national models or bottom-up estimation of the potential. The potentials derived from the TIMES model, on the other hand, are based on an EU-wide optimisation model that simulates possible futures of the entire European energy system. The TIMES model may therefore overlook specific local circumstances that are taken into account in the national reports. In some cases, therefore, there may be a significant difference between the potentials from the national reports and the potentials from the TIMES model. In addition, in some cases, there may be different definitions of the baseline. This is the case for Slovakia. However, in that case, although the baseline of the estimates in different, the *increments* to 2015 and 2020 are more similar. For that reason, as mentioned before, the comparisons in the remainder of the chapter will focus mostly on the increments.

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[78] See the Eurostat annual questionnaire "Electricity and Heat" (*http://epp.eurostat.ec.europa.eu/cache/ITY_SDDS/Annexes/nrg_indic_esms_an10.pdf*) which defines CHP based on the "Statistical Terminology Employed in the Electricity Supply Industry" (1991 edition) prepared by the International Union of Producers and Distributors of Electrical Energy (UNIPEDE). This definition was established long before the Directive on Cogeneration, and hence does not take into account the concept of high-efficiency cogeneration.

[79] This corresponds to all 24 countries that submitted the spreadsheet, plus Romania, who submitted the same data in tables in a report, minus Denmark and Spain, because they submitted only sheet 3 of the spreadsheet.

[80] "Economic analysis of CHP potentials", JRC Scientific and Technical Reports, 2011.

Table 18: Economic potentials for cogeneration in 23 Member States, expressed in electricity generated from cogeneration [TWh/y], as taken from national reports and TIMES modelling

Member State	Base year (from WP1)	Economic potential National reports (from WP1)			Economic potential TIMES (from WP2)		
	2007/2008	2010	2015	2020	2010	2015	2020
Austria	4.554				18.2	20.5	21.6
Belgium	9.021			12.464	7.4	7.4	7.4
Bulgaria	3.014	3.074	5.030	22.249	5.3	5.1	5.7
Cyprus	0	0.094	0.554	1.054	0.0	0.0	0.0
Czech Republic	11.788	12.636	14.365	17.419	19.3	21.6	24.5
Estonia	0		2.100	2.100	1.8	2.0	2.2
Finland	26.7	26.200	25.600	23.800	37.1	39.4	38.1
France	21.645	21.255	17.764	19.135	24.8	29.0	41.5
Germany	84.6			176.803	125.0	170.4	205.0
Greece	0.121	3.037	5.837	6.318	4.3	4.7	4.7
Hungary	5.895	5.595	6.095	6.131	8.4	8.9	9.9
Italy	22.99	23.023	27.592	38.840	43.0	39.8	37.1
Latvia	0				6.7	7.6	7.9
Lithuania	0				1.5	2.2	2.7
Malta	0	0.062	0.119	0.125	0.1	0.1	0.1
Netherlands	61.47	70.320	78.069	84.827	31.1	31.1	31.1
Poland	25	58.800	55.800	55.350	45.7	51.2	58.6
Portugal	5.407	7.918	10.691	13.409	2.8	2.4	1.9
Romania					15.9	15.6	15.6
Slovakia	0.07	0.893	1.680	1.209	8.0	9.8	10.7
Slovenia	1.106	1.123	2.321	3.211	1.7	2.1	1.8
Sweden	13.353	16.289	14.986	14.448	16.9	19.5	20.1
United Kingdom	27.911	27.911	85.122	128.647	29.1	30.3	33.9

Note: The base year is based on the national reports, in which it was defined as "2007 or latest". In most cases, 2007 was used by the Member States. For national reports in which the exact base year was not specified, 2007 was assumed for the remainder of the analysis.

An alternative source of estimates of cogeneration potential, is provided by the PRIMES model. The table below shows the PRIMES simulations for electricity generated from CHP. Two scenarios are considered: the *PRIMES Reference (Baseline 2009)*, and *PRIMES - Energy Efficiency*. The same comment as for the TIMES model is applicable here: the PRIMES model is a complete simulation model of the entire European energy system, hence its results may be significantly different from the bottom-up analyses done by Member States in their national reports.

Table 19: Economic potential for cogeneration in 23 Member States, expressed in electricity generated from cogeneration [TWh/y], as taken from two PRIMES scenarios

Member State	Economic potential PRIMES Reference (Baseline 2009)				Economic potential PRIMES - Energy Efficiency			
	2005	2010	2015	2020	2005	2010	2015	2020
Austria	10.717	9.794	14.380	18.337	10.717	9.747	15.455	18.999
Belgium	7.550	10.670	14.455	16.948	7.550	10.699	16.343	20.062
Bulgaria	2.998	5.885	7.604	7.516	2.998	5.898	8.988	10.089
Cyprus	0.000	0.012	0.030	0.039	0.000	0.012	0.030	0.041
Czech Republic	14.853	21.282	35.463	37.258	14.853	20.839	34.184	38.186
Estonia	1.123	1.754	2.009	2.831	1.123	1.746	2.028	2.848
Finland	28.909	32.055	32.011	31.817	28.909	32.055	34.689	34.878
France	19.538	18.774	27.257	27.545	19.538	17.887	28.735	30.980
Germany	85.001	127.506	149.282	153.860	85.001	122.348	149.927	161.721
Greece	1.104	3.084	3.964	4.802	1.104	3.058	3.954	4.800
Hungary	7.151	11.108	13.451	16.323	7.151	11.097	13.452	17.952
Italy	28.801	40.060	48.303	53.905	28.801	35.841	52.089	55.107
Latvia	1.624	2.200	2.294	2.482	1.624	2.200	2.689	2.953
Lithuania	2.558	4.015	4.167	4.373	2.558	4.016	4.156	4.432
Malta	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Netherlands	30.848	44.617	45.841	46.407	30.848	44.612	45.048	45.362
Poland	28.410	28.961	31.532	34.873	28.410	28.933	43.945	52.247
Portugal	5.632	10.134	12.967	14.835	5.632	10.119	14.702	16.679
Romania	16.996	15.187	17.734	19.063	16.996	15.113	19.064	20.869
Slovakia	5.316	7.696	7.759	10.371	5.316	7.672	8.353	11.135
Slovenia	1.239	2.022	3.443	3.827	1.239	1.846	3.920	3.972
Sweden	11.221	18.565	22.571	25.408	11.221	18.528	22.734	25.699
United Kingdom	26.036	35.747	54.929	56.151	26.036	35.746	61.330	68.496

The next table presents the amount of electricity actually generated from cogeneration in the years 2009 and 2010. The left half of the table shows the amounts stated in the spread sheets accompanying the questionnaires. The right half of the table contrasts these numbers with the data from Eurostat. As mentioned before, these numbers are not fully comparable, since the reporting under the cogeneration Directive includes only high-efficiency cogeneration, while Eurostat includes all cogeneration.

In both sources, one can observe that electricity generation from cogeneration has remained more or less unchanged between the base year and 2009. On the other hand, there has been a moderate increase between 2009 and 2010. According to the spread sheets accompanying the questionnaires, the increase was around 9 TWh. According to Eurostat, the increase was around 23 TWh. As mentioned before, the Eurostat data includes also low-efficiency cogeneration, and covers a larger set of Member States.

Table 20: Realisation of electricity produced from cogeneration in 2009 and 2010, from the current questionnaire and compared with Eurostat [TWh/y]

Member State	**Realisation (from current questionnaire)**			**Increase since base year**		**Realisation (from Eurostat)**			**Increase since 2007**	
	Base year	2009	2010	2009	2010	2007	2009	2010	2009	2010
Austria	7.510	8.466	9.813	0.956	2.303	10.102	9.120	10.954	-0.982	1.834
Belgium	6.056	11.891	11.352	5.835	5.295	11.103	13.228	15.219	2.125	1.992
Bulgaria	*3.014*	3.678	3.839	0.664	0.825	4.070	4.039	3.732	-0.031	-0.306
Cyprus	0.000	0.008	0.046	0.008	0.046	0.015	0.021	0.053	0.006	0.033
Czech Republic	11.431	11.045	12.240	-0.386	0.809	11.466	11.022	12.199	-0.444	1.178
Estonia	0.869	0.807	0.911	-0.062	0.042	0.878	0.808	1.335	-0.070	0.528
Finland	26.759	24.793	27.734	-1.966	0.975	27.949	25.798	29.201	-2.151	3.403
France	21.861	21.631		-0.230		18.233	23.191	15.932	4.959	-7.259
Germany	*84.600*		83.200		-1.400	77.726	77.020	82.885	-0.706	5.865
Greece	0.121	0.117	0.209	-0.004	0.088	1.016	1.841	2.468	0.825	0.627
Hungary	7.755	6.332	6.506	-1.423	-1.248	8.551	7.361	7.325	-1.190	-0.036
Italy	54.000	48.000	53.000	-6.000	-1.000	32.330	29.849	34.737	-2.481	4.888
Latvia	0.869	0.807	0.911	-0.062	0.042	1.951	1.097	2.982	-0.854	1.885
Lithuania	1.720	1.761	1.769	0.041	0.049	1.849	2.135	1.989	0.286	-0.146
Malta	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Netherlands	36.400	40.100		3.700		31.654	36.434	39.222	4.780	2.788
Poland	27.600	26.100	27.700	-1.500	0.100	27.567	26.096	27.748	-1.471	1.652
Portugal	4.269	4.015		-0.254		5.812	5.523	6.383	-0.289	0.860
Romania	4.400	3.500	3.300	-0.900	-1.100	6.599	6.266	6.547	-0.333	0.281
Slovakia	4.369	3.887	3.798	-0.482	-0.571	7.182	5.022	4.427	-2.161	-0.595
Slovenia	1.088	1.025		-0.063		1.083	1.017	1.134	-0.066	0.117
Sweden	13.336	15.942	18.930	2.606	5.594	12.212	14.355	18.576	2.143	4.221
United Kingdom	25.343	24.511	23.644	-0.832	-1.699	25.394	24.488	23.630	-0.906	-0.858
Total				**-0.355**	**9.149**				**0.988**	**22.949**

Note: the base year realisation for Bulgaria and Germany is in italics, because the number was taken from the national report, and not from the spread sheet submitted in this round.

The next table compares these increments in electricity generation from cogeneration, with the potential increments shown earlier (potentials from national reports, TIMES, PRIMES Baseline 2009 and PRIMES Energy Efficiency).

Table 21: Comparison of economic potential with realisation in 2009 and 2010, expressed in electricity produced from cogeneration [TWh/y]

Member State	Potential increment from base year to 2010				Increase from base year to 2010 (questionnaire)	Assessment of realisation of potential*
	National reports	TIMES	PRIMES Baseline 2009	PRIMES Energy Efficiency		
Austria		1.380	-0.554	-0.582	2.303	+
Belgium		0.000	1.872	1.890	5.295	+
Bulgaria	0.060	-0.120	1.732	1.740	0.825	0
Cyprus	0.094	0.000	0.007	0.007	0.046	+
Czech Republic	0.848	1.380	3.858	3.592	0.809	0
Estonia		0.120	0.379	0.373	0.042	0
Finland	-0.500	1.380	1.887	1.887	0.975	0
France	-0.390	2.520	-0.459	-0.991		
Germany		27.240	25.503	22.408	-1.400	-
Greece	2.916	0.240	1.188	1.173	0.088	0
Hungary	-0.300	0.300	2.374	2.368	-1.248	-
Italy	0.033	-1.920	6.755	4.224	-1.000	-
Latvia		0.540	0.346	0.346	0.042	0
Lithuania		0.420	0.874	0.874	0.049	0
Malta	0.062	0.000	0.000	0.000	0.000	0
Netherlands	8.850	0.000	8.262	8.258		
Poland	33.800	3.300	0.331	0.314	0.100	0
Portugal	2.511	-0.240	2.702	2.692		
Romania		-0.180	-1.086	-1.130	-1.100	+
Slovakia	0.823	1.080	1.428	1.414	-0.571	-
Slovenia	0.017	0.240	0.470	0.365		
Sweden	2.936	1.560	4.406	4.384	5.594	+
United Kingdom	0.000	0.720	5.826	5.826	-1.699	-
Total	**51.760**	**39.960**	**68.101**	**61.432**	**9.149**	**0**

* Legend: + potential was realised; – cogeneration output decreased; 0 potential was partially realised

The lack of growth in 2009, and the relatively limited growth in 2010 may be partly or wholly due to the economic crisis, which has led to a drop in electricity demand and a slow-down or standstill in new electricity generation investment. The following countries explicitly mention the crisis as a factor in their national reports and/or questionnaires:

- **Greece:** reduction in electricity demand;
- **Hungary:** reduction in cogeneration growth potential; reduction in non-district heating; negative impact on investment and production;
- **Italy:** reduction in demand;
- **Portugal:** reduction in demand for useful heat from industry; reduction in support schemes;
- **Slovakia:** reduction in proportion of high-efficiency cogeneration investments;
- **Slovenia:** delay in investments.

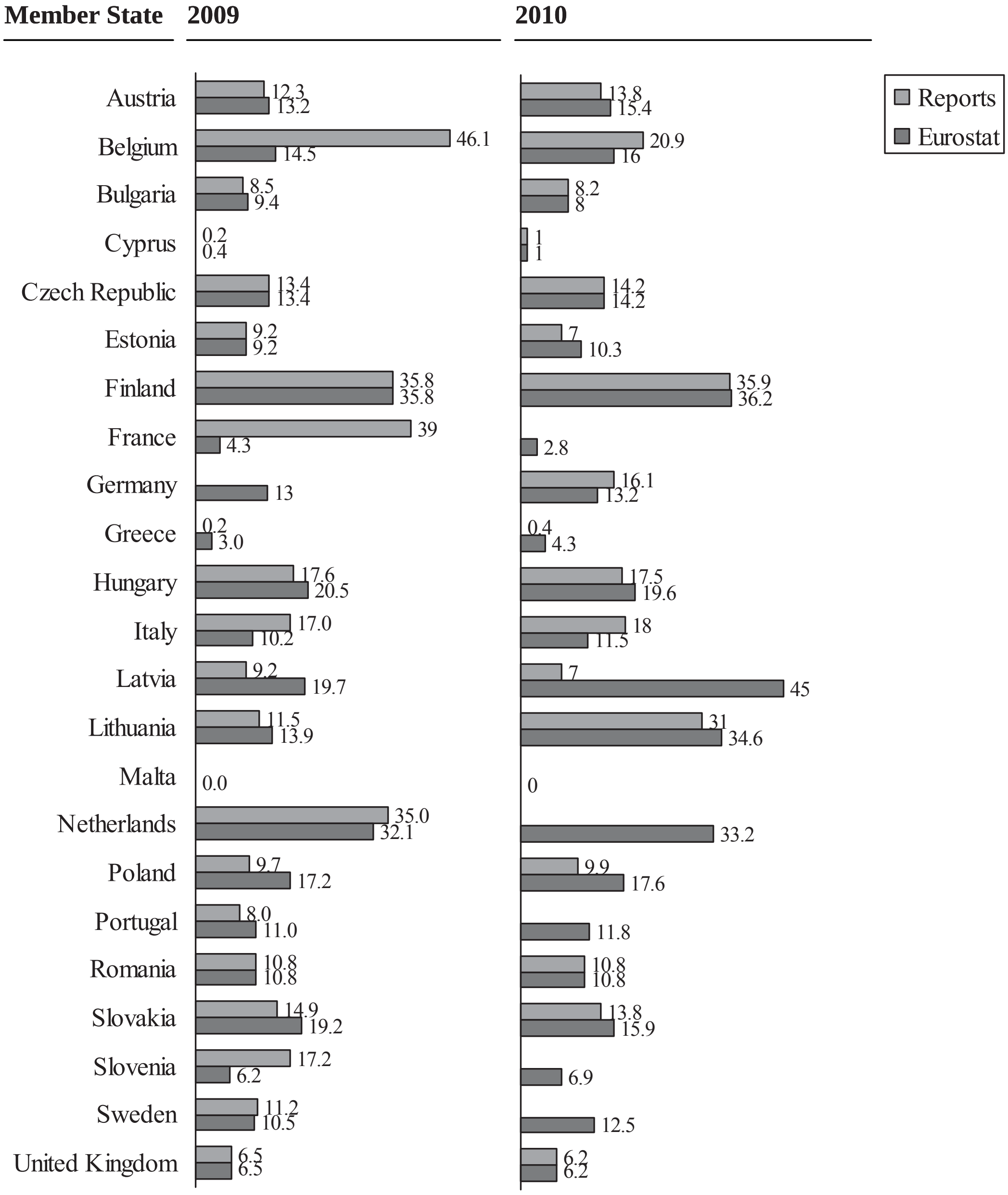
1.5. Quantity and share of CHP in 2010

The following table and figure provide an overview of the quantity and share of electricity from CHP in absolute terms (both capacity and production) and as a share of the market, in both 2009 and 2010. These values are provided for the 23 countries for which the data of sheet 1 of the spread sheet was available. For comparison, the share of cogeneration in gross electricity generation from Eurostat is also shown.

Table 22: Quantity and share of CHP in electricity generation (based on spread sheets submitted)

	2009				2010			
	Capacity	**Output**	**Share in total**	**Share in total**	**Capacity**	**Output**	**Share in total**	**Share in total**
	GW	TWh	%	% Eurostat	GW	TWh	%	% Eurostat
Austria	2.419	8.466	12.3	13.2	2.760	9.813	13.8	15.4
Belgium	1.920	11.891	46.1	14.5	1.733	11.352	20.9	16.0
Bulgaria	1.306	3.678	8.5	9.4	1.566	3.839	8.2	8.0
Cyprus	0.003	0.008	0.2	0.4	0.015	0.046	1.0	1.0
Czech Republic	4.764	11.045	13.4	13.4	4.799	12.240	14.2	14.2
Estonia	0.415	0.807	9.2	9.2	0.439	0.911	7.0	10.3
Finland	7.344	24.793	35.8	35.8	7.494	27.734	35.9	36.2
France	6.345	21.631	39.0	4.3				2.8
Germany				13.0		83.200	16.1	13.2
Greece	0.097	0.117	0.2	3.0	0.099	0.209	0.4	4.3
Hungary	1.589	6.332	17.6	20.5	1.509	6.506	17.5	19.6
Italy	9.960	48.000	17.0	10.2	9.852	53.000	18.0	11.5
Latvia	0.415	0.807	9.2	19.7	0.439	0.911	7.0	45.0
Lithuania	0.765	1.761	11.5	13.9	0.777	1.769	31.0	34.6
Malta	0.000	0.000		0.0	0.000	0.000		0.0
Netherlands	8.000	40.100	35.0	32.1				33.2
Poland	8.600	26.100	9.7	17.2	8.700	27.700	9.9	17.6
Portugal	0.858	4.015	8.0	11.0				11.8
Romania		3.500	10.8	10.8		3.300	10.8	10.8
Slovakia	2.547	3.887	14.9	19.2	2.609	3.798	13.8	15.9
Slovenia	0.327	1.025	17.2	6.2				6.9
Sweden	5.131	15.942	11.2	10.5		18.930		12.5
United Kingdom	5.706	24.511	6.5	6.5	6.102	23.644	6.2	6.2

Figure 12: Quantity and share of CHP in electricity generation (based on spread-sheets submitted)



Overall, the percentage data is relatively well aligned with Eurostat.

CHP penetration in 2009/2010 ranges from around 0% in islands and Greece to more than 30% in Finland and the Netherlands. The share in France is high because France has only included fossil fuel power plants in the total (*i.e.* excluding nuclear, hydro etc.).

Likewise for heat, the following table provides an overview of the quantity and share of electricity from CHP in absolute terms (both capacity and production) and as a share of the market, in both 2009 and 2010.

Table 23: Quantity and share of CHP in heat generation (based on spread sheets submitted)

	2009			2010		
	Capacity	**Output**	**Share in total**	**Capacity**	**Output**	**Share in total**
	GW	TWh	%	GW	TWh	%
Austria	8.809	27.624	69.2	8.603	30.652	70.7
Belgium	3.641	22.934	71.7	2.548	16.697	76.8
Bulgaria	5.396	10.696	70.7	4.617	11.832	
Cyprus	0.004	0.011	0.7	0.030	0.030	6.2
Czech Republic	19.011	33.306		20.548	37.687	
Estonia	1.461	3.198	35.3	1.506	3.443	37.1
Finland	11.721	66.723	77.5			
France	14.901	54.842				
Germany					187.729	79.2
Greece	0.163	0.396	13.3	0.337	0.299	8.5
Hungary	2.207	8.315	52.2	2.262	8.957	53.5
Italy						
Latvia	1.461	3.198	35.3	1.506	3.443	37.1
Lithuania	1.780	4.050	38.6	1.809	4.288	39.0
Malta	0.000	0.000		0.000	0.000	
Netherlands	18.300	61.900	100.0			
Poland	24.800	71.800	25.2	24.800	77.000	24.8
Portugal	4.224	14.815				
Romania		18.417			19.167	
Slovakia	7.041	11.803	22.2	7.099	10.998	
Slovenia	0.832	3.119	55.3		2.128	44.5
Sweden		47.038	37.8		51.740	
United Kingdom	7.355	43.301		7.811	43.201	

The numbers are more divergent than for electricity, presumably because Member States have used different baseline definitions for the total heat market. For example, the figure of 100% for the Netherlands suggests that the Netherlands only considered the market for *traded* heat, *i.e.* excluding auto-producers.

To consider numbers on the same basis, the next table compares CHP heat production with the total market, as estimated by JRC. The share of CHP in heat production ranges from around 0 in islands and Greece, to around 30% and more in Austria, Bulgaria, Estonia, Finland and Sweden. The share of cogeneration in total heat demand in the Netherlands is now 23.3%, rather than the 100% suggested above.

Table 24: CHP output compared to independent total heat market estimate

	Database WP4	2009		2010	
	Total heat market	**CHP output**	**Share in total**	**CHP output**	**Share in total**
	TWh/y (2009)	TWh	%	TWh	%
Austria	107.8	27.624	25.6	30.652	28.4
Belgium	158.3	22.934	14.5	16.697	10.5
Bulgaria	35.8	10.696	29.9	11.832	33.1
Cyprus	5.1	0.011	0.2	0.030	0.6
Czech Republic	115.4	33.306	28.9	37.687	32.7
Estonia	11.0	3.198	29.2	3.443	31.4
Finland	108.8	66.723	61.3		
France	680.7	54.842	8.1		
Germany	1059.8			187.729	17.7
Greece	73.3	0.396	0.5	0.299	0.4
Hungary	84.8	8.315	9.8	8.957	10.6
Italy	545.2				
Latvia	15.7	3.198	20.4	3.443	22.0
Lithuania	24.5	4.050	16.5	4.288	17.5
Malta	0.9	0.000	0.0	0.000	0.0
Netherlands	265.2	61.900	23.3		
Poland	285.8	71.800	25.1	77.000	26.9
Portugal	67.0	14.815	22.1		
Romania	125.2	18.417	14.7	19.167	15.3
Slovakia	63.0	11.803	18.7	10.998	17.5
Slovenia	14.6	3.119	21.3	2.128	14.6
Sweden	127.6	47.038	36.9	51.740	40.5
United Kingdom	615.9	43.301	7.0	43.201	7.0

1.6. Evolution from 2000 to 2010

This section shows the evolution over time (2000-2010) of electricity production from CHP, heat production from CHP, electricity capacity from CHP, and heat capacity from CHP. The results are broken down in the 3 main sectors and 4 subsectors. Many Member States did not provide data for all years in the time series. In order to obtain sensible year-on-year results, only those Member States that provided a full data set are included in the analysis.

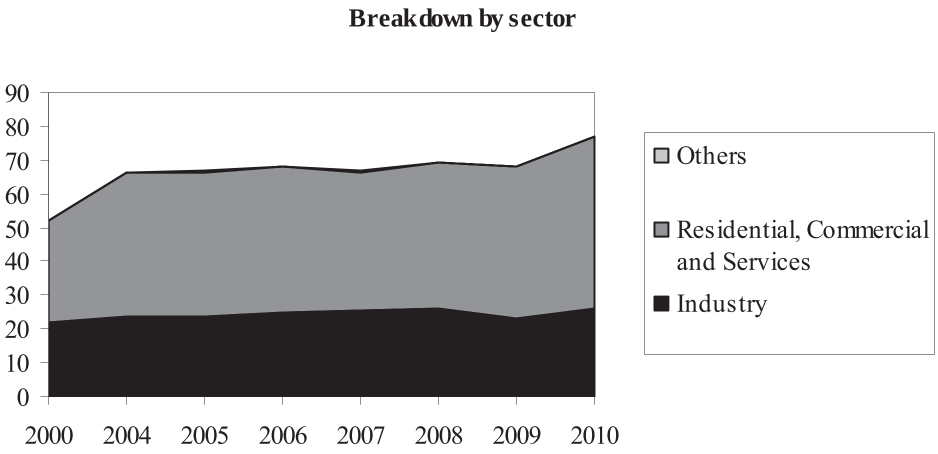
1.6.1. Electricity production

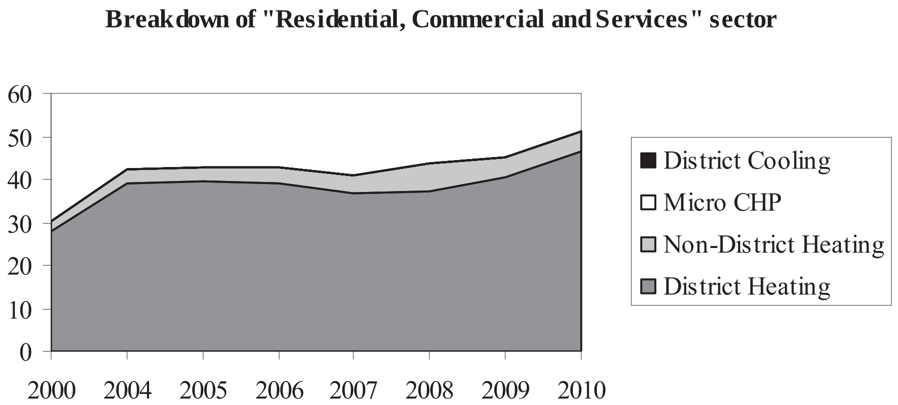
Table 25: Evolution of electricity production from CHP over time [TWh]

	2000	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**
Industry	22.204	23.797	23.561	25.016	25.503	25.806	22.908	25.906
Residential, Commercial and Services	30.011	42.479	42.994	42.844	41.108	43.504	44.898	51.032
District Heating	27.874	39.012	39.612	39.172	36.634	37.359	40.654	46.615
Non-District Heating	2.136	3.467	3.382	3.672	4.474	6.145	4.244	4.417
Micro CHP	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
District Cooling	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Others	0.048	0.048	0.078	0.078	0.078	0.078	0.078	0.078
Total	**52.262**	**66.325**	**66.633**	**67.938**	**66.689**	**69.389**	**67.884**	**77.016**
Annual growth		6.1%	0.5%	2.0%	-1.8%	4.0%	-2.2%	13.5%
Number of Member States	6	6	6	6	6	6	6	6

Note: Member States included: Austria, Estonia, Finland, Hungary, Latvia and Sweden

Figure 13: Graphical representation of the previous table [TWh]





The graphs show a steady increase in electricity from cogeneration since 2000. The increase is mostly due to the increase in District Heating in the Residential, Commercial and Services sector, which has especially taken off since 2008. There was a slight decline in total generation from CHP 2009, especially in industry – probably due to the economic downturn – followed by a rebound in 2010.

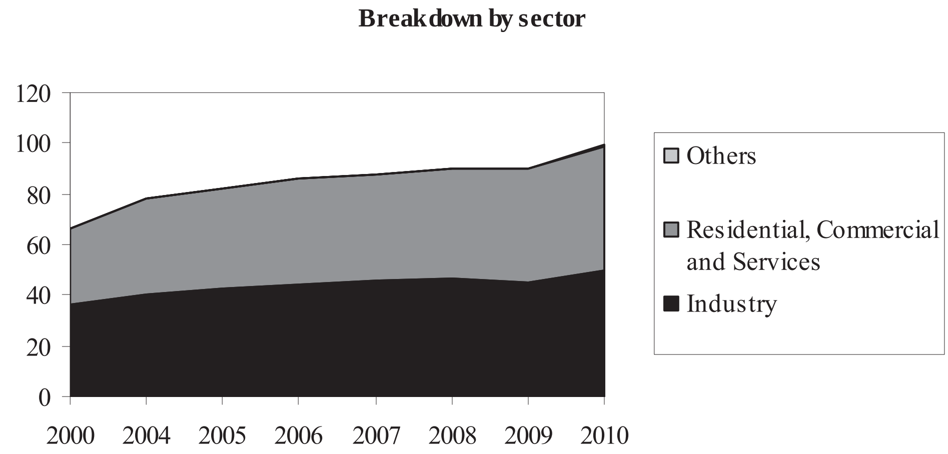
1.6.2. Heat production

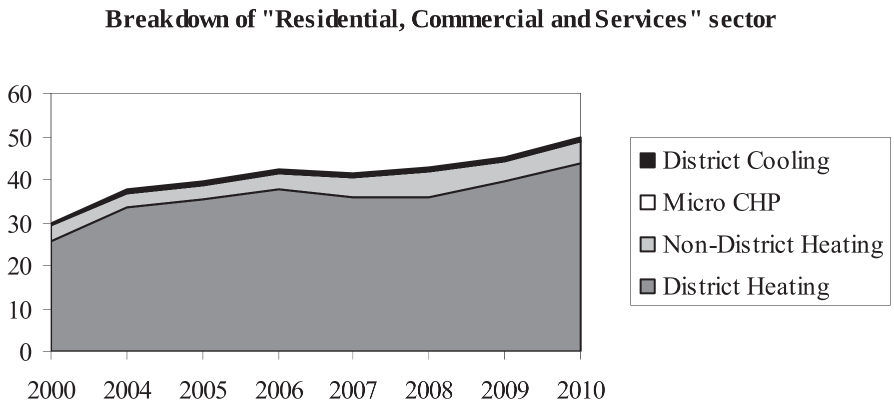
Table 26: Evolution of heat production from CHP over time [TWh]

	2000	2004	2005	2006	2007	2008	2009	2010
Industry	36.556	40.585	42.828	43.996	46.082	46.958	45.142	49.396
Residential, Commercial and Services	29.561	37.543	39.374	42.269	41.245	42.798	44.966	49.616
District Heating	25.644	33.264	35.170	37.544	35.674	35.678	39.623	43.526
Non-District Heating	3.581	3.659	3.541	3.948	4.853	6.347	4.514	5.219
Micro CHP	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
District Cooling	0.336	0.620	0.662	0.777	0.718	0.773	0.829	0.871
Others	0.060	0.060	0.096	0.096	0.096	0.096	0.096	0.096
Total	**66.177**	**78.188**	**82.298**	**86.361**	**87.423**	**89.852**	**90.204**	**99.108**
Annual growth		4.3%	5.3%	4.9%	1.2%	2.8%	0.4%	9.9%
Number of Member States	5	5	5	5	5	5	5	5

Note: Member States included: Austria, Estonia, Hungary, Latvia and Sweden.

Figure 14: Graphical representation of the previous table [TWh]





Unlike the production of electricity, the production of heat from cogeneration did not decline in 2009, but rather stabilised. Overall, there has been steady growth since 2000.

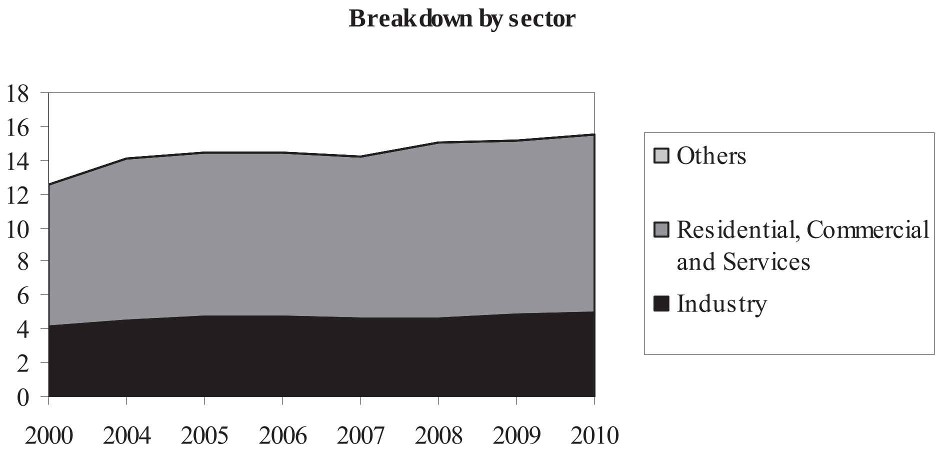
1.6.3. Electricity capacity

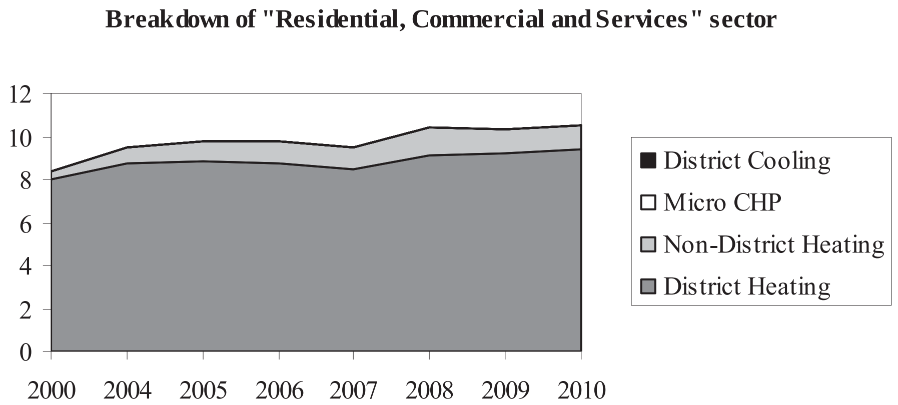
Table 27: Evolution of electricity capacity from CHP over time [GW]

	2000	2004	2005	2006	2007	2008	2009	2010
Industry	4.152	4.549	4.741	4.725	4.628	4.646	4.841	5.005
Residential, Commercial and Services	8.346	9.520	9.735	9.728	9.527	10.432	10.356	10.507
District Heating	7.958	8.725	8.882	8.772	8.436	9.099	9.193	9.411
Non-District Heating	0.389	0.795	0.853	0.956	1.091	1.333	1.163	1.096
Micro CHP	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
District Cooling	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Others	0.006	0.006	0.010	0.010	0.010	0.010	0.010	0.010
Total	**12.505**	**14.075**	**14.486**	**14.463**	**14.165**	**15.088**	**15.207**	**15.522**
Annual growth		3.0%	2.9%	-0.2%	-2.1%	6.5%	0.8%	2.1%
Number of Member States	5	5	5	5	5	5	5	5

Note: Member States included: Austria, Estonia, Finland, Hungary and Latvia.

Figure 15: Graphical representation of the previous table [GW]





In terms of capacity, the decline from 2008 to 2009 is not present, rather there is a small increase. Hence, the decline of CHP electricity production may be largely due to the macroeconomic environment, which caused an underutilisation of capacity. This can be observed especially in industry.

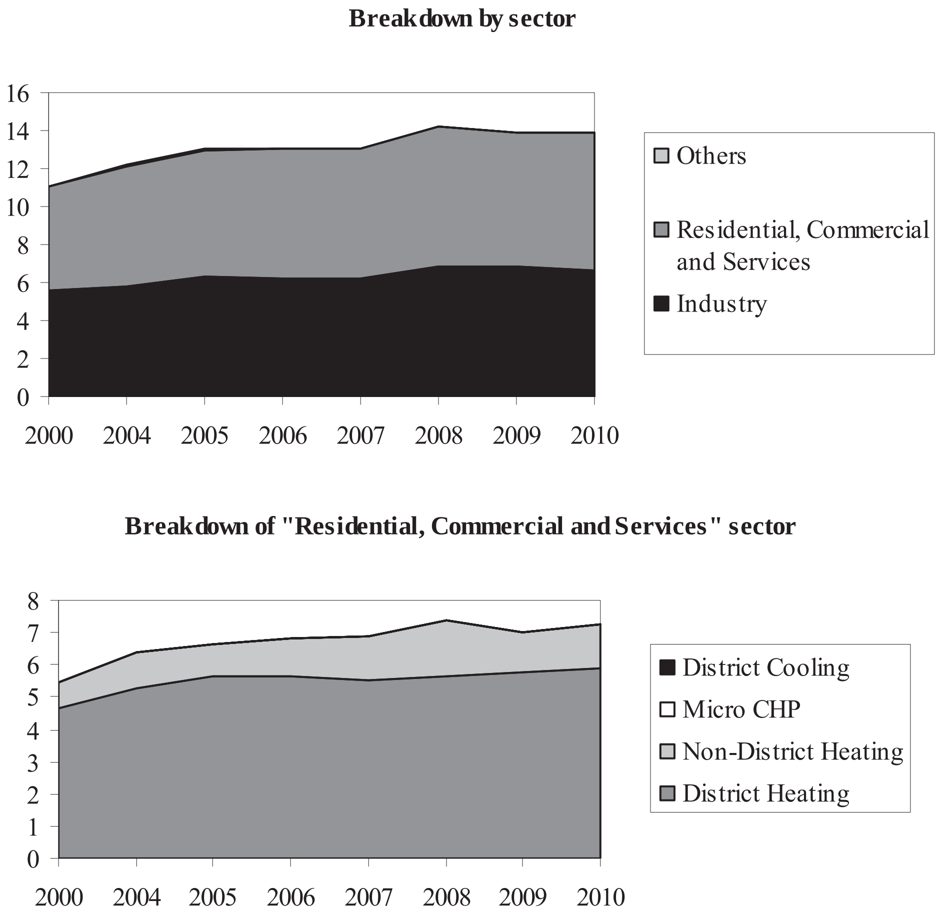
1.6.4. Heat capacity

Table 28: Evolution of heat capacity from CHP over time [GW]

	2000	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**
Industry	5.627	5.792	6.341	6.239	6.180	6.866	6.889	6.608
Residential, Commercial and Services	5.442	6.364	6.650	6.822	6.885	7.351	7.035	7.255
District Heating	4.671	5.250	5.621	5.653	5.529	5.670	5.739	5.872
Non-District Heating	0.771	1.114	1.028	1.169	1.356	1.681	1.295	1.383
Micro CHP	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
District Cooling	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Others	0.008	0.008	0.014	0.014	0.014	0.014	0.014	0.014
Total	**11.077**	**12.163**	**13.005**	**13.075**	**13.079**	**14.231**	**13.938**	**13.877**
Annual growth		2.4%	6.9%	0.5%	0.0%	8.8%	-2.1%	-0.4%
Number of Member States	4	4	4	4	4	4	4	4

Note: Member States included: Austria, Estonia, Hungary and Latvia.

Figure 16: Graphical representation of the previous table [GW]



It is worth noting that there is a decline in heat capacity from 2008 to 2009, contrary to the increase in electricity capacity.

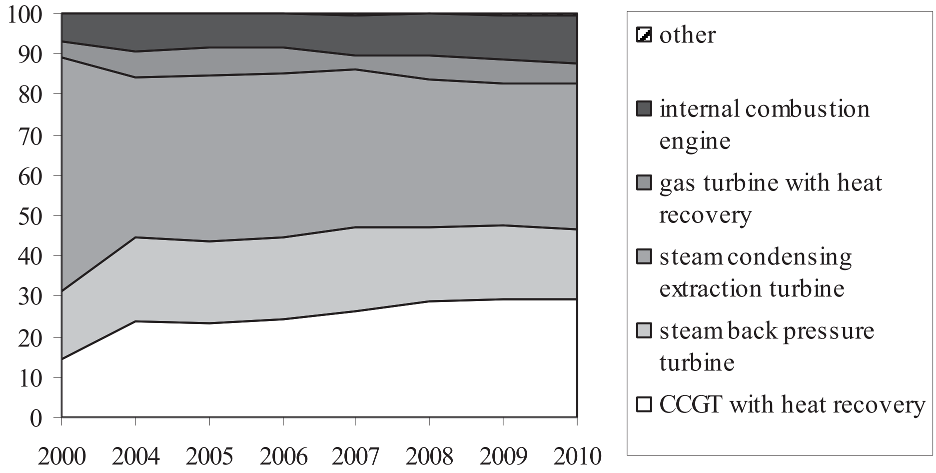
1.7. Analysis by technology and fuel

The following table and figure show the break-down of electricity capacity from CHP, into different technologies. The analysis is based on all Member States that provided a data series that included 2010: Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Greece, Hungary, Italy, Latvia, Lithuania, Malta, Poland, Slovakia and Spain.

Table 29: Break-down of CHP electricity capacity by technology [as % of total]

Technology	2000	2004	2005	2006	2007	2008	2009	2010
CCGT with heat recovery	14.2	23.9	23.3	24.1	26.0	28.6	29.1	29.2
steam back pressure turbine	16.8	20.8	20.3	20.2	21.3	18.3	18.3	17.5
steam condensing extraction turbine	58.3	39.6	41.2	40.8	38.9	36.9	35.2	35.8
gas turbine with heat recovery	3.5	6.5	6.6	6.2	3.7	5.9	6.1	5.4
internal combustion engine	7.2	9.2	8.4	8.5	9.9	10.1	11.1	11.9
micro-turbines	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1
Stirling engine	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
fuel cells	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
steam engine	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
organic Rankine cycle	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
any other	0.0	0.1	0.1	0.1	0.3	0.1	0.2	0.1

Figure 17: Graphical representation of the previous table



Overall, one can observe a gradual increase in CCGT and internal combustion engines.

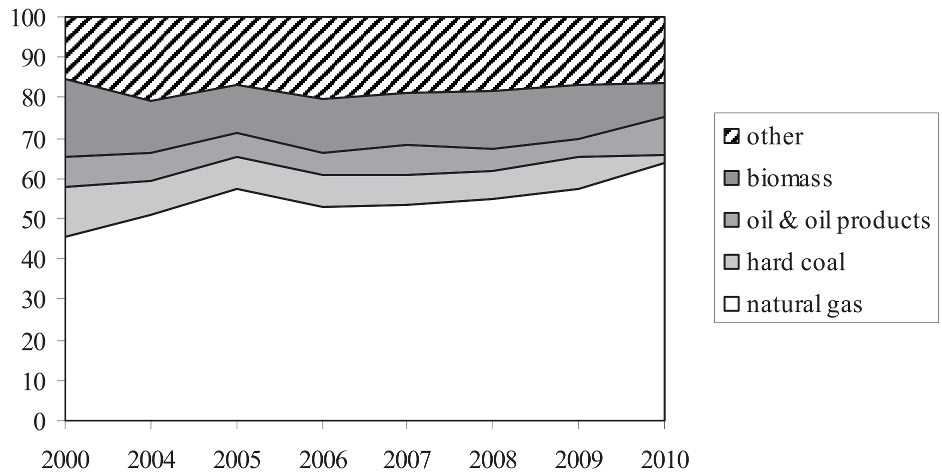
The following table and figure show the break-down by fuel input. The analysis is based on all Member States that provided a data series that included 2010: Austria, Czech Republic, Estonia, Greece, Hungary, Italy, Latvia, Lithuania, Romania, Slovakia, Sweden and the United Kingdom.

Table 30: Break-down of CHP fuel input by fuel [as % of total]

Fuel	2000	2004	2005	2006	2007	2008	2009	2010
natural gas	31.5	54.0	50.8	46.4	47.6	47.0	52.4	52.8
hard coal	8.0	3.0	9.3	8.7	8.0	7.8	7.3	7.1
lignite	0.9	0.1	16.0	14.8	16.3	17.2	10.5	10.3
renewables	0.2	0.0	0.1	0.4	0.4	0.5	0.8	0.7
oil & oil products	18.2	10.5	6.2	5.9	8.3	6.9	6.4	7.8
biomass	14.3	4.9	4.5	5.2	5.4	6.6	8.0	7.5
biogas	0.2	0.5	0.6	0.6	0.4	0.4	0.5	1.0
waste incineration	0.4	0.6	0.7	0.6	0.7	1.0	0.8	1.0
landfill gas	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
other fuels	26.1	26.4	11.7	17.4	12.9	12.6	13.2	11.8

Note: 'other fuels' include all fuels labelled as such in Member States' spread sheets. However, since some Member States used different fuel categorisations, the 'other fuels' category in some Member States may also include fuels that are explicitly listed elsewhere in the table.

Figure 18: Graphical representation of the previous table



The most remarkable effect is the consistent increase in the use of natural gas as a fuel for CHP.

1.8. Primary Energy Savings and CO_2 emissions reductions

For 2010, the previous report had identified a potential of an additional 0-5 Mtoe/y of primary energy savings (PES), calculated according to the methodology of the Directive, and correspondingly an additional 0-10 Mt/y of CO_2 emissions reductions. For the subset of Member States analysed in the present report, this means 2-3 Mtoe/y of PES and 5-6 Mt/y of CO_2 emissions reductions. These potentials are relatively low since the bulk of the potential was expected to be realised after 2010.

For the subset of Member States who provided adequate data for 2010 (Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Estonia, Finland, Germany, Greece, Hungary, Italy, Latvia, Lithuania, Malta, Poland, Romania, Slovakia, Sweden and the United Kingdom), the increase in electricity production from CHP since the base year 2007 has been 9.149 TWh/y, as shown earlier in this chapter. Using the same reference coefficients as in the previous exercise, this would result in 0.5 Mtoe/y of PES and 1.3 Mt/y of CO_2 emissions reductions. These savings are relatively low since – as mentioned before – the bulk of the potential was expected to be realised after 2010.

As part of the spread sheets, some Member States have also submitted information on PES, as summarised in the following table. Note that roughly half of the savings are concentrated in Greece, which leads to the conclusion that different methodologies have been used by different Member States. The same holds for the incremental PES (difference between 2007 and 2010). Total incremental PES are 1.6 Mtoe/y, but most of this is concentrated in Sweden, which again points to methodological differences.

Table 31: Primary Energy Savings 2010 according to Member States' reports (spread sheets)

	Primary Energy Savings (from spreadsheets)		**Primary Energy Savings (from spreadsheets)**		**Increase in PES**
	2007		2010		2007-2010
	PJ	Mtoe	PJ	Mtoe	Mtoe/y
Austria	30.1	0.7	37.4	0.9	0.2
Bulgaria	0.0	0.0	4.6	0.1	0.1
Cyprus	0.0	0.0	0.1	0.0	0.0
Greece	511.7	12.2	513.6	12.2	0.0
Hungary	3.0	0.1	2.6	0.1	0.0
Italy	193.2	4.6	189.0	4.5	-0.1
Lithuania	4.6	0.1	5.0	0.1	0.0
Malta	0.0	0.0	0.0	0.0	0.0
Netherlands	83.0	2.0	*90.0*	2.1	0.2
Romania	10.5	0.3	8.0	0.2	-0.1
Slovakia	6.0	0.1	6.5	0.2	0.0
Sweden	89.2	2.1	146.4	3.5	1.4
UK	59.3	1.4	53.8	1.3	-0.1
Total	**990.7**	**23.6**	**1057.1**	**25.2**	**1.6**

Note: The 2010 number for the Netherlands is in italics because 2009 data was used.

A more complete way of estimating the PES of CHP is to consider the CHP production as recorded by Eurostat, since this includes all Member States. Electricity production from CHP in Eurostat increased from 365 TWh/y in 2007 to 393 TWh/y in 2010, *i.e.* an increase of 27 TWh/y. Using the same technical coefficients as before, this would represent an additional PES of 1.5 Mtoe/y, and CO_2 emissions reductions of 3.8 Mt/t. This would mean that roughly half of the 2010 potential is realised.

1.9. Conclusions

The data shown in this chapter have demonstrated that CHP penetration has started to increase again between 2009 and 2010, after a stagnation in 2009 due to the economic downturn. The increase in CHP penetration has been limited however. National potentials are not being fully achieved.

2. BARRIERS

2.1. Introduction

Under the Cogeneration Directive the Member States are asked to assess their national potential for cogeneration and to carry out various enabling assessments (of barriers, support mechanisms, verification through guarantees of origin) and then update the Commission on progress towards achieving the potential. Member States were required to produce the following reports:

- Analysis of the national potential for cogeneration. Article 10(1) and Article 6(1).
- Review of barriers to the wider use of cogeneration. Article 10(1) and Article 6(2)(c).
- Administrative and procedural situation. Article 10(1).
- Guarantees of origin. Article 10(1) and Article 5(3).
- Progress Report on Cogeneration Directive. Article 10(2), Article 6(3).

By 2010, all the Member states had provided that information to the Commission (many countries with considerable delay, the due date was 2006 for the analysis of national potential and 2007 for the other reports). The information provided was already discussed by the European Commission and in the previous edition of the progress report[81]. To assist the member states to prepare their new progress report according to Articles 6(3) and 10(2), the Commission prepared a questionnaire (Annex A) with a total of 11 questions. In this report, we will refer to this new set of national reports like new or second round of national reports. The eighth question was:

Q8 Please give your views on the current barriers to high-efficiency cogeneration in your country:

-barriers in relation to administrative procedures (authorization, coordination among competent authorities, streamlined simplified procedures, etc.);

-barriers in relation to the electricity grid system and tariff issues (including specific measures for small scale and micro cogeneration units);

-other barriers (internalisation of external costs, energy prices, financial &/EC. technical barriers, etc.) in accordance with Articles 9 and 6 of the cogeneration Directive 2004/

At the time of writing this report October 2012, the Commission counts on 26 reports from Member States, (all Member States except from Luxembourg). This chapter gives, in points 3.4, 3.5 and 3.6, the answers (or a summary) provided by the Member states to each point of the eighth question. The next point (3.2) compares the evolution of the barriers from the previous round of National reports to this one, and point 3.3 extracts some overall conclusions of the analysis carried out.

[81] Commission Progress Report on Implementing the Cogeneration Directive.

2.2. Evolution of the barriers compared with barriers reported in the 1st set of Member States reports.

The table 32 collects the different clusters of barriers analysed in the previous round of reporting by the Member states. This table has been updated according the descriptions about barriers in the new round of National reports. The barriers considered in both rounds of National reports have their own wording and the barriers have been treated to a different extent. In order to extract some conclusions about these barriers, it is necessary to cluster them according to their similarities.

In the initial round of National reports, there were no questions about the barriers, whereas for this round there were three questions related to 1) administrative procedures, 2) the electricity grid system and tariff issues and 3) other barriers.

In the original round of National reports, the only country that did not include an analysis of the barriers in their report was France. For this new edition of the National reports, France continues without producing any analysis of barriers. Also, Lithuania did not include any barriers in their first national report; in this case, it was because in their analysis Lithuania considered that there are no legal, technical or financial barriers preventing further implementation of CHP. In this new round of National reports, Lithuania has delivered its report. Also, the Italian report does not contain any analyses of barriers.

In both rounds of reporting, the rest of the countries discussed, to a greater or lesser extent, the barriers that they have found. In the first round, for Denmark, and Sweden, the only barrier identified is related to the economic justification of the CHP, whereas, for Hungary, also in the first round, the only barrier identified is related to the heat demand. For this Background report, the Swedish report mentions some barriers for micro generation and other exogenous barriers for the rest of high efficiency cogeneration, and in the Danish report, it is said that is hard to go further in the high penetration that CHP already has. Hungary, in its second National report, when discussing about administrative barriers, discuss their administrative system, but without considering it a factual barrier, and do not discuss anything at all about issues related to the electricity grid, tariffs or any other barrier. Also, in the Portuguese report there is a discussion of the new laws enacted to remove barriers, but which do not acknowledge any barriers, only the change in the remuneration regime of the cogeneration is perceived as possible barrier. A similar case to the Portuguese report is the Finland report, Finland gives the context in which the CHP project are developed, without mentioning any concrete barriers, only the new energy taxes that came into effect in the beginning of 2010 can be seen as a barrier, since it is said “weakened the competitiveness of district heating”. Also, the Romanian report does not contain any analysis of barriers at all; there is only a mention about a decrease of heat demand.

In short, out of the 26-progress report delivered in the second round of National reports, there is no way to include in a comparison of the evolution of barriers to France and Italy. And, we can hardly include to Hungary, Denmark, Portugal, Finland and Romania. Therefore, these seven countries will not be considered when discussing about the evolution of barriers (these countries are crossed in table 32), in the remaining 19 counties for further analysis. The 19 countries reporting barriers in the second round of National reports are indicated in table 32 with a yellow background. The barriers already reported in the first round of national reports are marked with a dark blue cell. The barriers identified in the second round of national reports are signalled with a “NR”. The barriers (excluded from further discussions) from Demark, Portugal, Finland and Romania are a “NR” with red font.

For the first round of National reports, the 28th row of the table 32 contains the number of Member States that report each barrier. The 29th row contains the same information about the first round of National reports but only for the 19 countries that have a sufficient description of barriers in the second round of National reports. For the second round of reporting, row 30 contains the number of Member states reporting each barrier.

The first precaution when extracting conclusions is that there have been different interpretations of the questions asked. For example, the second point of question eighth asked about:

- barriers in relation to the electricity grid system and tariff issues (including specific measures for small scale and micro cogeneration units);

To answer this question some Member states have considered enough to describe how different participants in the system are remunerated (through electricity tariffs for electricity from cogeneration plants or by other means). Few Member states describe about who bears the cost of the connection to the grid (or connection tariffs). Some countries that have given this last interpretation acknowledge that the cost of connection (associated permits or administrative steps) may be an effective deterrent. The different interpretations may lead to misleading results when comparing the answers.

In the table 32, the barriers in the columns are according a decreasing order of number of Member states reporting them. The two most cited barriers in the first round of National reports ("fuel prices" and "heating or cooling demand") are also the most cited in the second round.

Another remarkable fact is that a barrier that apparently was not very relevant in the first round of reports "rest of infrastructures not prepared" is now mentioned by ten countries (a number of countries quite close to the most cited barriers, see row 30). Under this heading are clustered all the barriers mentioned by the Member states that somehow mention that the lack of an already deployed network of district heating, the lack of distribution network of natural gas or some related problems, are an hindrance to further expansion of cogeneration.

The barriers that lose ground are "lack of promotion", "risk/economic justification", "access to/availability of fuels", "uncertainties due to the ETS" and "lack of expertise". The barriers that gain weight are "fuel prices", "heating or cooling demand", "lack of financial resources", "rest of infrastructure not prepared", "lack of awareness (by potential end users)", and "maturity of the technologies". The high weight of the barriers "complexity of the law" and "heating and cooling demand" do not experience change in both rounds of reporting.

The total number of barriers for the sub-sample of 19 countries has decreased slightly from 101 to 97. However, the plain mention of a barrier in a National report has made us treat it as a barrier in this analysis. With this in mind, a decrease of around 4% of barriers does not look very relevant.

The seven most cited barriers accounts for 66 and 69 of the barriers in the first and second round of reports, respectively, and 35 and 28 times for the least cited barriers, again, in the first and second round, respectively. Although between the two reporting rounds there are a slight decrease in the number of barriers (from 101 to 97), there is an increase of relevance of the most cited barriers and a more remarkable loose of ground of the least cited barriers.

Table 32: Barriers identified in the first round of national reports (dark blue cells) and in the second round of national reports ("NR")

		Fuel Prices	Heating or cooling demand	Complexity of the law	Lack of promotion	Access to the electrical grid	Risk/ Economic Justification	Access to/availability of fuels	Lack of financial resources	Uncertainties due to the ETS	Rest of infrastructure not prepared	Lack of expertise	Lack of awareness (by potential end-users)	Maturity of the technologies	Other	# barriers (1st round)	# barriers (2nd round)
1	**Austria**	NR		NR	■					■		■	■	■		5	2
2	**Belgium**	■ NR	■ NR	NR	■ NR	NR	■			NR	■ NR	■	■	NR	NR	7	9
3	**Bulgaria**	■ NR	■ NR	■ NR	■ NR				■ NR			■			■ NR	7	6
4	**Cyprus**	NR	■ NR	■	NR	■	■ NR	■ NR	NR		NR		NR			5	8
5	**Czech Republic**	■		NR		NR		■	■	■ NR				■	■	6	3
6	**Denmark**						■ NR									1	0
7	**Estonia**	■ NR	■ NR					■ NR		■ NR	NR					4	5
8	**Finland**	■		■	NR			■		■						4	0
9	**France**															0	0
10	**Germany**	NR	■ NR				■ NR	■		■ NR						4	4
11	**Greece**	■	■ NR	■ NR	■ NR	■ NR			NR		NR	■				6	6
12	**Hungary**		■													1	0
13	**Ireland**	■ NR	■ NR		■	■	NR	■	NR			■		■		7	4
14	**Italy**	■	■	■	■	■	■							■		7	0
15	**Latvia**			■ NR					■ NR		NR			NR	NR	2	5
16	**Lithuania**	NR						NR			NR					0	3
17	**Luxembourg**	■	■		■		■	■	■							6	
18	**Malta**	■ NR	■ NR		■ NR						■ NR		■ NR			5	5
19	**Netherlands**	■ NR	NR		■	■ NR					NR		NR	NR	■	4	6
20	**Poland**	■ NR	NR	■	■ NR			NR	NR	■ NR	■ NR		NR		■	6	8
21	**Portugal**	■	■	■	■ NR	■			■	■	■		■			9	0
22	**Romania**	■	■	■ NR		■	■				■					6	0
23	**Slovakia**	■	■ NR	■ NR	■ NR	■	■	■	■		■	■	■	■	■	13	3
24	**Slovenia**	NR		■ NR		NR	■ NR		■				NR			3	5
25	**Spain**	■	NR	■ NR	■ NR	■ NR		■	■ NR			NR				6	6
26	**Sweden**	NR	NR				■							NR		1	3
27	**United Kingdom**	■ NR	■	■		■ NR			NR	■	■ NR		NR		NR	6	6
28	# barriers 1st round	17	15	13	13	10	10	9	8	8	7	6	5	5	5	131	97
29	1st round (out of 19 countries)	13	11	9	11	7	7	8	7	6	5	6	4	3	4	101	
30	# barriers 2nd round (19 countries)	14	13	9	8	7	4	4	8	5	10	1	6	4	4	97	

2.3. Assessment of the barriers

One of the main conclusions reached by the European Commission in earlier reports is that the discretion given to the Member States to choose the approach followed to prepare the reports requested in Article 10 of the Directive made it difficult to make a consistent comparison of many of the points asked for in Article 10 and as a consequence in Article 11 of the CHP Directive. The gaps in the reports about the matters treated (or in some cases not treated) meant that most of the conclusions already extracted were in fact about these gaps. Some of these gaps were due to differences in interpretation about the reporting requirements. In the second round of National reports, the European Commission received all but one of the due reports. For this round of national reports, there was a questionnaire with some questions about the barriers. However, the lack of common understanding of the questions asked still prevails.

The first fact that stands out is that, even with three clear points on the eighth question, only few Member states address all the points separately (Austria, Belgium, Bulgaria, Greece, Ireland, Malta, Lithuania, The Netherlands, Poland, Portugal, Slovakia, Slovenia, Spain and United Kingdom). Most of the remaining countries have prepared a description of the administrative system. Also, whereas some of the Member states assess that the changes done to their administrative system address some of the barriers (Denmark, Greece, Hungary, Ireland, Malta, The Netherlands, Poland, Portugal, Slovenia, Slovakia and Spain), the rest do not assess whether or not their administrative system ease the administrative burden. Some of the countries state that all generators are treated in an open and transparent way, or that there is no way to improve the administrative barriers. There are two countries that have not carried out an analysis of barriers, France and Italy. The French report refers to the previous report sent to the Commission in October 2010 and 2008 (however, none of those reports include any analysis of barriers. In the Italian report, there is no discussion about barriers (although some of the laws described could overcome some administrative burden).

There are few remarkable changes in the evolution of the barriers, standing out that problems associated with the heat and cooling demand and with the fuel prices are the most relevant barriers in both rounds of National reports. However, the sometimes less than robust methodology followed by most of the countries when reporting about barriers, and the different interpretation of some of the questions of the questionnaire, do not allow the Commission to go further in the analysis of the barriers.

2.4. Barriers in relation to administrative procedures (authorization, coordination among competent authorities, streamlined simplified procedures, etc.);

Austria

In its report, Austria states: “The problematic aspect of the procedures for obtaining authority approval is not the administrative processes themselves but rather, as in all projects in the energy industry, the lack of public acceptance and the resulting lengthy procedures. Authorisation procedures for comparatively large projects are conducted as part of a comprehensive environmental impact assessment procedure. However, objections to the planned plants raised by local residents almost inevitably lead to high-level proceedings usually lasting several years. A solution to this problem has yet to be found.”

Cyprus

In its report, Cyprus states: “In Cyprus there are no noteworthy barriers relating to administrative procedures or barriers relating to the electricity grid and pricing issues”

Bulgaria

Bulgarian authorities explicitly mention as administrative barriers:

“Insufficient administrative capacity at municipal level for preparing zoning plans based on energy master-plans showing which form of energy provision is most economically and environmentally beneficial.”

“Renewable energy producers have no incentive to use cogeneration technologies as the pricing of renewable energy provides an adequate financial guarantee of a return on their investment.”

Belgium

Belgium’s report has different answers to the eight questions according to their region.

Walloon region
Walloon region states that: “There are often a number of administrative difficulties, especially for small structures, for example, the fact that there are several subsidy systems with different and sometimes time-consuming procedures (prior application etc.) without, in some cases, the guarantee that the subsidy will actually be granted”.

As with measures to overcome these barriers the green certificate quotas, the compensation mechanism for machines <10 kW, the third party investor mechanism, the increase in prices for energy resources, the cogeneration facilitator service set up in the region, the implementation of Energy performance of buildings and industry wide agreements are mentioned.

Flemish region
The Flemish region states that authorisation procedures may be causing unnecessary long delays between an investment decision and the commissioning of the installation. The Flemish government is currently discussing ways to simplify procedures for obtaining authorisation with other regional authorities (provinces and municipalities) and the Federal Government. Also the process for applying for aid through cogeneration certificates may be a heavy administrative burden for micro-generation, the regulator is working on a simplified procedure for micro-generation.

The main support measure to overcome the barriers, the cogeneration certificate system, has been very successful promoting cogeneration. The excess of certificates has created some uncertainties in the certificated market. Part of these uncertainties has been alleviated by a minimum guarantee provided for CHP plants.

Brussels Capital Region
As barrier related to the administrative procedure in Brussels capital region the unauthorised private networks and direct electricity lines is mentioned. The “Brussels Housing Code” imposes every single household to be connected to the electricity grid through a proper EAN-meter and on the other hand, selling electricity requires a special licence that is very difficult

to obtain. Yet, the green certificated to gas generation in housing buildings alleviates the situation by improving the profitability of the project.

Czech Republic

As barrier related to the administrative procedure the Czech report states “Drawn-out permit process for the construction of energy related facilities are a general problem. This problem should be eased by an amendment to the Building Act that is currently under consideration at the Parliament of the Czech Republic”. There is a general acknowledgment of: a complex legal framework, unclear long-term prospects in the area of state aid, complex and time-consuming administrative procedures, and the influences of other legislation.

Denmark

Denmark states that the support provided by their legislation (administrative procedures) has paved the way for the major expansion of cogeneration in Denmark since 1980. “The overall regulatory framework presents no barriers to the expansion of cogeneration. On the contrary, the active promotion of cogeneration has been a matter of policy”.

Estonia

Estonia states in its report: “There are no significant barriers in relation to administrative procedures in Estonia. The administrative procedures in place ensure the various parties have the opportunity to participate in decision-making processes.”

Finland

Finland states that: “No actual barriers to cogeneration can be identified in Finland”. The barriers to electricity market access have been removed and the authorisation systems work well. Naturally there are a number of variables in the operating environment of cogeneration that also affect the competitiveness and operating conditions of cogeneration”.

France

The literal response to the three points of question 8th is “The French authorities have sent the reports required by the Directive. The 2008 report pursuant to Article 9 and the report on national potential sent in October 2010 set out the administrative procedures applicable to cogeneration installations. These procedures have not changed since the reports were drafted.” The French authorities have not carried out an analysis of the barriers. Neither in this report nor in the reports referred in their answer.

Germany

The German report states “Over the past few years the pace of investment in large CHP plants has been sluggish. This is linked, in particular, to the current political framework, …“ the paragraph continues adding other general barriers not related to the administrative procedures.

German report also states “The German Government has set itself the objective of increasing the share of electricity generated by CHP plants to 25% of total electricity generation by 2020. To help achieve this objective the Cogeneration Act is currently being reviewed. The resulting amendment is due to be adopted, through parliamentary procedure, by summer 2012”

Greece

Greece states that "The authorisation framework has always been a key barrier to HECHP and RES facilities", and says that "Law 3468/2006 laid the foundation for streamlining the authorisation procedure with a view to speeding up the issue of the required generation, installation and operating authorisations for the implementation of RES and HECHP projects". And, "through Law 3851/2010, an effort was made to lift all authorization barriers and further simplify the different authorisation procedure stages by reducing authorisation issuance deadlines substantially. As far as HECHP systems were concerned, it relieved plants of an installed capacity of less than 1 MW_e of the obligation to obtain a generation, installation and operating authorisation, thus making things easier for interested investors". The report also sets out the milestones of the authorisation procedure, as currently in force under the provisions of Law 3851/2010.

Hungary

The Hungarian report indicated when electricity or district heating producers have to apply for a construction license (the firsts only where nominal capacity exceeds 50 MW and the seconds when their thermal capacity is 5 MW or more). The procedure for small cogeneration plants (*i.e.* power plants with a nominal electrical capacity greater than 0.5 MW and lower than 50 MW) is much simpler, with the Hungarian Energy Office issuing licenses for the construction of small power plants and electricity generation in a single procedure (simplified licensing procedure), in combined form.

The Hungarian Energy Office has harmonised procedures with its partner offices to ensure they are completed quickly and smoothly.

The government introduced considerable simplifications to small cogeneration plants in 2011 by having the Hungarian Energy Office issue a simplified, single license for small power plants and an operating license for district heat producers in a single procedure and a single license. The single license for small power plants referred to above is not required for power plants with a capacity of less than 50 kVa (known as 'micro power plants'), which can therefore be built quite simply and quickly.

The fact that the Office refuses to issue licenses only in the cases provided for in the legislation guarantees the non-discriminatory and objective operation of the licensing procedure.

Ireland

Ireland "analyse" the barriers relative to their administrative procedures addressing the thresholds below which the generator does not need to apply for authorisation. In this last case, a single authority assesses a single application form. According to Ireland's Authorities, there are nine broad criteria that the rest of produces have to satisfy.

Italy

Italy has sent a complete report describing rules and regulations related to the Directive, describing the historical evolution of cogeneration. However, there is no discussion about barriers.

Latvia

In its report, Latvia describes permits, time required to receive and review permit applications at various administrative bodies and the administrative bodies involved. Eventually it concludes, “Latvia has no administrative barriers to the development of cogeneration, but shortening the time taken for some administrative procedures would be advisable”. However, “The longest periods of time are for permits for polluting activity, but these decisions involve public consultation and coordination between different bodies.” It is also stated that “shortening the time periods would not currently be useful to promote valid implementation and increasing of cogeneration capacity".

Lithuania

In its report, the analysis about the barriers in relation to administrative procedures boils down to the statement: there are no fundamental barriers.

Malta

In its report, Malta states the measures adopted to reduce administrative barriers to the minimum. Small or micro producer are exempt of some requirements. There is also a description of these requirements for the rest of producers.

Netherlands

The report says, “As regards administrative procedures the Dutch Government does not see any specific barriers to cogeneration, other than those which apply to (energy) projects in the wider sense. An important simplification is the 'environmental permit', which was introduced as from 1 October 2010 with the Environmental Law (General Provisions) Act. The environmental permit is a single integrated permit for building, residence, monuments, space, nature and environment. Integrating these permits, which previously had to be applied for separately, is conducive to better service provision and less red tape for undertakings and citizens, as well as shorter administrative procedures and consistent rules”.

Poland

Regarding administrative procedures the Polish report says: “Amendments to the Energy Law have abolished the licensing requirement for energy cogeneration from low- and medium capacity sources, with the exception of biogas sources. In this way, one of the administrative barriers has been eliminated. The decision seems to be right given the situation in which owners of buildings with a heat demand of 50 kW or more will be obliged to use their own cogeneration sources.

The current legal framework shifts the responsibility for energy security in respect of heat supply from central administration to communes. The activities of the commune in this respect are based on the so-called “Objectives for the heat, electrical energy and gaseous fuel supply plan”. Communes have a legal obligation to develop the “Objectives...”, but no legal sanctions are envisaged if they do not comply. As a result, most of the Polish communes have not developed the “Objectives...”. Moreover, in the communes where the “Objectives...” have been developed, no one actually checks whether the measures envisaged by the objectives are being implemented. This is a consequence of not only the aforementioned absence of formal discipline, but also of the incompetence of the communes in the field of energy. Commune offices lack staff specialising in energy. The Polish Energy Policy until 2030 promises that this situation will change."

The Polish report mention substantial changes of the energy Law to eliminate two significant barriers (related to the obligation to have heating tariffs approved and provide for the possibility of combining property laws relating to high efficiency cogeneration using renewable energy sources, and new provisions aimed at the obligatory connection of new buildings to district heating networks. Also, as supporting measure, the information published on the URE website concerning the procedures involved is mentioned".

Portugal

According to the Portuguese report, "the new law mitigates the majority of the barriers identified. This law has simplified and streamlined procedures. To this end, the following measures have been adopted:

- Providing cogeneration producers with access to networks in a non-discriminatory and transparent way;
- The manager of the National Electricity Transmission Network (RNT) giving priority to dispatching electricity from cogeneration facilities which do not participate in organised markets, in order to ensure the transmission and distribution of electricity with regard to access to networks;
- Providing dedicated websites in order to streamline the licensing procedures as well as to simplify the interface between cogeneration producers and both the body responsible for issuing guarantees of origin (EEGO) and the Directorate-General for Energy and Geology.

These measures mean a substantial simplification of the whole procedure relating to cogeneration, from awarding the production licence to starting operations and selling electricity to the network or to third parties".

Romania

Romania does not provide any description about barriers in relation to administrative barriers.

Sweden

The Swedish report, regarding the administrative barriers, states "There are no barriers in Sweden to high efficiency cogeneration production in terms of administrative procedures or other barriers".

Slovakia

The Slovak Republic has submitted a report based on Article 6(3) of the Directive 2005/8/EC that describes the potential obstacles of their administrative procedures. The report includes the requirements to build cogeneration plants. The requirements vary depending on the size of the plant. The only indirect acknowledgement that the administrative procedures could constitute a burden is this reference "One of the measures for reducing the administrative burden on combined production plants with a total installed output of less than 1 MW_e is the establishment of exemptions in the Act on heat energy in relation to business permits and the requirement to have a professionally competent person".

Slovenia

Slovenian report enumerate the legislation defining spatial planning and procedures for granting building permits for generating equipment for cogeneration of heat and electricity. There is also a description of some phases of spatial planning for installing generating equipment for cogeneration of heat and power (CHP); Depending on the type of fuel and capacities the cogeneration plant, the number of administrative steps vary.

To smooth the administrative barriers it is mentioned that: "In order to shorten procedures for obtaining permits for micro cogeneration equipment, the Decree on Energy Infrastructure (OJ RS 75/10) was amended to include equipment generating electricity through cogeneration of heat and power with a nominal electric power up to and including 50 kW as simple equipment not requiring a building permit for installation in existing buildings. Investors only require consent for the connection from the electricity distribution network systems operator, which checks whether the prescribed requirements have been met."

Spain

The main barriers to the development of high-efficiency cogeneration related to the administrative procedures in Spain are: "administrative and technical complexity of the procedures for obtaining authorisation for small-capacity cogeneration installations and for connecting them to the grid."

The measures mentioned to overcome all barriers (even the ones referring in the barriers related to the electricity grid and other barriers are:

"The introduction of simplified administrative procedures and simplified technical requirements for connecting small-capacity cogeneration installations (less than 1 MW_e)"

"The creation of special sources of funding for high-efficiency cogeneration with preferential conditions and reduced guarantees".

"An intensive programme of district heating projects in public installations".

United Kingdom

Regarding barriers related to administrative procedures states "CHP schemes need to be relatively close to where there is a demand for the heat they produce. It is not always easy to arrange this. The newly established Infrastructure Planning Commission, will take decisions on planning applications for nationally significant energy infrastructure. The requirement for developers to demonstrate that they have fully considered CHP will continue. As part of existing pollution control regulation, European energy efficiency guidance encourages the uptake of CHP and better use of surplus heat. The UK Government will continue to work with the regulators who provide the permits under Integrated Pollution Prevention and Control to encourage energy efficiency in an industrial and large commercial context".

2.5. Barriers in relation to the electricity grid system and tariff issues (including specific measures for small scale and micro cogeneration units);

Austria

In its report, Austria states: "All production technologies are always connected to the electricity grid system in the same, non-discriminatory manner. In other words the same grid access conditions apply to cogeneration plants as to all other production technologies. The Austrian regulator is not aware of any specific existing barriers to the connection of cogeneration installations to the electricity grid system."

Cyprus

In its report, Cyprus do not mention any barriers related with the electricity grid or tariff issues, although they summary many other aspects that are summarised in point 3.4.

Bulgaria

Regarding the relation to the electricity grid and problems with tariffs, Bulgarian authorities state: "The conditions for connecting new units to the grid are a barrier that can be overcome and are not an obstacle to building new cogeneration units".

Belgium

Walloon region
According to the report the contacts with the distribution network operator are sometimes difficult, since it lacks transparency and may have many administrative procedures. The few exceptions to the direct electrical connexion between different legal entities is seen as a barrier related to the electricity grid. The main measures set in place to overcome this barriers are the ones already given in point 3.4 for the Walloon region of this report

Flemish region
Regarding the connexion to the grid the Flanders has already introduced a measure to alleviate the high cost of connecting to the grid (first kilometre free for CHP plants). Some parts of the grid need some reinforcement (foreseen for 2014-2015) to allow new connexions. Also to avoid grid congestion the operation of some CHP plants is remotely controlled by the grid operator. If this operation is not compensated it can affect project profitability. The complexity to set this systems and some lacks of communication regarding meter and power char requirements, and associated services are an additional burden to the cogeneration projects.

Regarding the tariffs, decentralised production injection tariffs since 2009 stalled in practice new CHP, to remove this barrier the Flemish government adopted a Decree which prevents the injection tariffs from having to be paid for decentralised production from renewable energy sources and qualitative cogeneration. However, the federal regulator responsible for the tariffs, has appealed against this Decree to the Constitutional Court. The Court has yet to deliver its judgment. Also, the main measures set in place to overcome these barriers are the ones already given in point 3.4 for the Flemish region of this report.

Brussels Capital region
According to the report “In Brussels, there is no real barrier linked to electricity grid system and this can be partly explained by the fact that the electricity network is really dense and developed (urban character of the Brussels Capital Region) and that there is only one Distribution Network Manager (Sibelga), which is sensitive to cogeneration issues as it operates itself several production units in the Brussels Capital Region.

There are no tariff barriers as the Distribution Network Manager does not impose injection tariffs for the electricity sent on the grid and as the production support mechanism consists of Tradable Green Certificates and no Feed-in Tariffs. The electricity production is sold separately to an electricity supplier.”

Czech Republic

The Czech report acknowledge as a barrier “the reservation of connection capacity by projects that are not implemented in the sphere of renewable energy sources, in particular photovoltaic power plants, which block grid capacity for other electricity generators, including those that cogenerate electricity and heat. This problem should be solved by a new act on promoted energy sources, which, under certain conditions, cancels the reservation of energy input for photovoltaic power plants obtained before 1 April 2010 on the date of promulgation of the act in the Collection of Laws”.

The Czech report also mention as general barriers related to the grid connection: the availability of connection to the grid (financial, time-related), the updating of the grid in order that electricity generated by way of cogeneration may be supplied, and unfavourable conditions for reserve supplies of electricity from the grid.

Denmark

In answer to the 10th question it is said that “In Denmark electricity produced together with heat is given priority grid access.” There is no other mention to any issues with the electricity grid system or tariffs.

Estonia

Estonia states “There have to date not been any barriers in relation to the electricity grid system and tariffs which have hindered investment decisions regarding cogeneration plants. However, the authorities have had to intervene to resolve some disputes between market participants. An open exchange of information is enough to overcome the problems that arise. So far Estonia has not used the network service tariffs applicable to producers but their introduction is being looked into. However, a fundamental change of this kind must be flexible and take account of events on neighbouring markets in order not to have an unnecessarily negative impact on the competitiveness of Estonian electricity producers.”.

Finland

Regarding access to the grid and tariff issues, Finland says, “The barriers to electricity market access have been removed and the authorization system basically work well”.

France

The literal response to the three points of question 8th is “The French authorities have sent the reports required by the Directive. The 2008 report pursuant to Article 9 and the report on national potential sent in October 2010 set out the administrative procedures applicable to cogeneration installations. These procedures have not changed since the reports were drafted.”

Germany

The is no discussion about the barriers when accessing the grid, however the report says ”Like plants supported on the basis of the Renewable Energies Act, CHP plants are also entitled to priority access to the network and, for as long as they receive subsidies, to distribution of its electricity by the network operator. Moreover, since 2009 the construction of new and extension of existing heating networks have also been promoted through the scheme financed by levies under the Cogeneration Act.

The costs of the scheme are borne by electricity consumers. Since 2009 the total amount has been capped at EUR 750 million per year, of which EUR 150 million per year for network development. This limit has not been reached since, however, as the 'evolution' of older, large plants led to a constant decrease in the scheme's costs in the past couple of years. Meanwhile the construction of new plants followed a downward trend” .

Greece

In its report, Greece states that the same procedure used for RES plants applies to matters relating to the connection of HECHP plants to the System or Grid. Certain opinions from RAE have laid down the terms and conditions for connecting users (RAE opinion 1/2007 “Approval of the terms and conditions for connecting users to the Transmission System”) and determined the fees to be charged for connecting them to the transmission system (RAE opinion 2/2007 “Approval of the tariffs charged for connecting users to the Transmission System”). Moreover, certain matters relating to connecting RES/HECHP power plants to the System or Grid had been regulated initially by Law 3468/2006 (Article 11), before being replaced by Law 3851/2010 (Article 4).

Hungary

Hungary does not provide any description about barriers in relation to the electricity grid system or tariff issues

Ireland

Ireland “analyse” the barriers relative to barriers in relation to the electricity grid system and tariff issues addressing saying that: “The Single Electricity Market (the SEM) on the island of Ireland was established in November 2007 and is a mandatory gross pool market. Here, generators do not have to find a supplier to contract with bilaterally, rather they bid in to the pool. Also, although participation in the SEM pool is mandatory, smaller generators below a defined minimum level (currently $10MW_e$) do not have to do so affording them the option to trade outside of the pool and avoid administrative costs associated with participation.

The rules of the SEM are published on the web site of the SEM market operator (SEMO http://www.sem-o.com/Pages/default.aspx) as are half hourly prices set in the SEM”.

The only reference about access to the grid is given in the answer to question 1 related to the status of the implementation of the directive. In their answer, Ireland says: "Certification as HE CHP qualifies the unit for priority dispatch, for access to the relevant national support scheme (REFIT) as appropriate and relatively early connection to the grid in defined circumstances."

Italy

Despite Italy report enumerate rules and regulations related to the Directive, there are no potential barriers related to the access to the grid and tariff issues.

Latvia

There is no mention about any barriers accessing the grid or related tariffs. In the Latvian report, it is stated that the public trader, under the procedure and price stipulated by the cabinet, will purchase the excess of electricity. The procurement costs shall be covered by all end users by buying a specific share of electricity generated by cogeneration.

Lithuania

In its report, the analysis about the barriers in relation to electricity grid and tariff issues boils down to the statement: there are no fundamental barriers

Malta

Malta explains the steps that the cogeneration applicant has to follow to access the grid: The distribution system operator (DSO) has to assess the suitability of the connection and the applicant has to make a Power Purchase Agreement with Enemalta. Malta has recently set up a 'feed in tariff' system for photo-voltaic unit and a similar incentive for cogeneration units is under consideration.

Netherlands

The Dutch report states, "In the Netherlands there are no appreciable barriers resulting from the existing electricity grid system and system of tariffs. Where in the past network capacity was not sufficient to cope with all cogeneration, congestion is prevented by expanding the network infrastructure.". There are additional details in the answer given to question 6. "Nonetheless, there is a bill in preparation which will improve the position of cogeneration when there is network congestion on connecting up to the grid". There are extra details about this bill in preparation in the answer to question 10. Notwithstanding previous statements, it is also stated that: "grid managers and cogeneration plant operators do not always interpret the legislation affecting the distribution of the grid connection costs in the same way".

Poland

In the Polish report, the discussion about the barriers related to electricity grid and tariff issues boils down to state: "The development of cogeneration is further hindered by problems relating to the connection of cogeneration plants to the power grid. In many instances, the cost of connections, which must be borne by the investor, makes up a substantial part of the entire investment cost

Portugal

Regarding tariff issues, the Portuguese report states that "With the publication of Law No 19/2010, some issues were changed relating to the methods of the remuneration regime for cogeneration production, which could cause barriers to the implementation of high-efficiency cogeneration. In particular, the reference tariff will now comply with the following requirements:

- It must not favour some fuels over others;
- It must be indexed to the international development of fuel prices, to the development of the consumer price index and to exchange rate developments;
- It must reflect the environmental benefits, the losses avoided on the transmission and distribution networks."

Romania

Romania does not provide any description about barriers in relation to the electricity grid system or tariff issues

Sweden

Regarding the access to the grid of tariff issues the Swedish report states: "The electricity market has been deregulated and made competitive with electricity offered (mainly) on Nordpool. There are no large vertically-integrated operators that 'squeeze out' cogenerated electricity by selling to their own companies in instalments."

Slovakia

Regarding the access to the grid it is said:

"Under Act No 309/2009, the preferential connection of electricity production plants to the distribution system, preferential access to the system, and preferential transmission, distribution and supply of electricity are obligations applying equally to all combined production plants and to plants for the production of electricity from renewable sources. In practice, this is handled on the basis of the order of submission of applications for connection to the system. In the case of a large number of applications being submitted (e.g. in relation to the frequent construction of photovoltaic power plants in 2010) the deadline for preferential connection to the system is extended."

"Since the EU supports not only high-efficiency combined production, but also the production of electricity from renewable sources, and a binding target has been set for the use of renewable sources (14% of gross final consumption in 2020) it would be unrealistic at the national level to give priority to combined production plants with small and very small outputs in terms of system connection ahead of plants for the production of electricity from renewable sources."

There is also the following discussion about tariffs: "On the basis of Act No 309/2009 and Act No 267/2001 on regulation in network industries, the Regulatory Office for Network Industries sets a fixed price for electricity produced by high-efficiency combined production for a given period through a generally binding law and along with this issues authorised entities with individual price decisions for each calendar year. Combined production plant operators are obliged to submit applications every year for the issuance of a price decision prior to the issuance of the price decision."

"Under Act No 267/2001, the price of heat is also regulated. Heat prices applied by operators of heat production plants and therefore also combined production plants are assessed individually by the Regulatory Office for Network Industries. The benefits arising from the sale of electricity produced by high-efficiency combined production must, under the procedures set out in the implementing regulations for Act No 267/2001, be taken into account by the operator in a heat price proposal, which is approved by the Office through the issuance of a decision."

"Measures to eliminate obstacles in the area of tariff-setting and price-setting for electricity and heat produced by combined production may be implemented through a change in the approach of the Regulatory Office for Network Industries at least for combined production plants with small and very small outputs."

Slovenia

With regard to the electricity network, in Slovenia "the main barrier for investors is the network connection cost. Pursuant to Article 64(k) of the Energy Act, CHP generating equipment investors bear the costs of making the connecting line from the generating equipment to the connection to the network of the system operator. Meanwhile, generating equipment investors with a valid declaration do not bear the cost of any upgrade of the existing transmission or distribution network required due to the connection of the generating equipment."

"The next important barrier is that investors must themselves obtain land use rights for their connecting line from the owners of land crossed by the connecting line. This sometimes constitutes a major problem."

As with measure to ease the barriers it is said: "To ensure greater transparency in procedures for connecting generating equipment to the network, the distribution network systems operator, pursuant to Article 64(m) of the Energy Act, adopted and published the System operating instructions, incorporating Instructions for connecting and operating power plants with installed electric power up to 10 MW, which include principles for determining connection points and requirements for technical equipment, on the basis of which permits are issued for connections to the network. In the System operating instructions, the systems operator set out standard rules for determining the cost of technical implementation of the connection from generating equipment transmitting electricity generated from renewable sources or from high-efficiency cogeneration in the network to the network connection. These rules are objective, transparent and non-discriminatory and, for generating equipment up to 10 MW, based on the same starting points as are used for connecting electricity consumers."

Spain

The barriers related to the electricity grid system and tariff issues identified in the Spanish report are:
"Availability of the grid for absorbing the electricity generated. There is a great deal of ignorance and uncertainty regarding the possibility of connection to the grid, the technical conditions and, not least, the cost. This is a very important barrier in view of its strong impact on the financial viability of new projects".

"Strong competition among energy sources in electricity generation. There is excess generation capacity in Spain that could, in the future, cause competition between difference technologies, including cogeneration".

United Kingdom

Concerning barriers related to the electricity grid system and tariff issues the British report states: "A barrier to the installation of distributed generation including CHP is the cost associated with upgrading the distribution network. This upgrade is required to move from a situation where electricity is taken from centralised power plants and delivered to consumers to one where small-scale generators, such as CHP installations, can sell surplus power all the time whilst maintaining the integrity and reliability of the network. A significant increase in the supply of low carbon and renewable energy sources will be required to meet international obligations to reduce carbon emissions. Transmission and distribution networks will need to be upgraded to support a new generating mix".

"As part of the electricity distribution price control arrangements that run from 1 April 2010 to 31 March 2015, Ofgem, responsible for the economic regulation of the electricity and gas industries in Great Britain (GB), operates the Low Carbon Networks (LCN) Fund. The Fund allows up to £500m support to projects sponsored by the distribution network operators (DNOs) to try out new technology, operating and commercial arrangements. The objective of the projects is to help all DNOs understand what they need to do to provide security of supply at value for money as GB moves to a low carbon economy".

2.6. Other barriers (internalisation of external costs, energy prices, financial & technical barriers, etc.) in accordance with Articles 9 and 6 of the Cogeneration Directive 2004/8/EC)

Austria

In its report, Austria states: "There are no such explicit barriers. However, the fact that almost all large installations constructed are based on natural gas is problematic, as the profitability of investment is always determined by the difference between gas and electricity prices."

Cyprus

In its report, Cyprus says that the lack of natural gas "results in high CHP fuel prices. High fuel prices result in micro cogeneration systems not being financially viable and especially so in the tertiary sector. In addition, uncertainty about future fuel prices is a deterrent to investing in CHP". Also, the weather conditions affect to the need for heat and cooling. The low demand makes the investment not economically viable. Their report also mentions as a barrier the existence of other more competitive technologies, the investment risk (when compared to other more competitive technologies), the lack of information, training or technical knowledge, lack of national financial sources to promote chop (especially micro units).

Bulgaria

The Bulgarian authorities mention the barriers when discussing measures dealing with barriers:

"The downward trend in the consumption of thermal energy in some sectors of industry and in the domestic sector has resulted in deterioration in the high-efficiency indicators. The construction of new installations proportionate to this trend with the added fall in consumption because of active energy efficiency measures is a suitable measure for overcoming this barrier".

"Some energy consumers fail to pay their bills in time on various social and other grounds. All heat distribution enterprises are owed money by consumers and operate at a loss, which makes it difficult to implement investment projects to improve efficiency".

"A technical barrier to installing cogeneration systems for heating enterprises is the restricted operating hours of the schemes, because of great seasonal load fluctuations".

"The rising trend in gas prices is a serious barrier to building combined systems".

Belgium

Walloon region
There are other barriers mentioned such as: Uncertainty about prices, demand from the industrial sector, and about the ETS. Also, the fact that cogeneration is not the core business of the potential promoters and the sustainability of the biofuels is seen as a barrier for the cogeneration.

Flemish region
The Flemish report includes some of the specific obstacles of micro-generation: lack of product awareness high cost, greater support for alternative generation technologies and impossibility of selling electricity within apartment buildings`.

Brussels Capital region
Micro-cogeneration faces the bottleneck of having just only one supplier in the region, and lack of consensus about the environmental performances of these machines.

District heating has as barrier the important investment cost, the complexity of its daily management and general people aversion to this type of installation. Moreover, a recent study to build four district heating networks including biomass showed that these kinds of projects are less attractive than other investment options about the rational use of energy.

Czech Republic

With regard to the barriers no yet treated in points 3.4.5 and 3.5.5 "The emissions trading system is economically unfavourable for cogeneration facilities with heat input of over 20 MW, which from 1.1.2013 will be forced to buy a progressively rising percentage of permits for carbon dioxide emissions in auctions. These costs are projected in the prices of heat from cogeneration and disadvantage it in competition with local or individual heat production, which is not encumbered by this external factor. In respect of the fact that the use of cogeneration in local and individual heat production is minimal, the disadvantage to larger facilities is a significant barrier to the development of cogeneration of electricity and heat in the Czech Republic. The Government of the Czech Republic has approved a so-called carbon tax as of 1.1.2014; this should remove this disadvantage".

Denmark

Denmark states that "the socioeconomic potential of cogeneration over and above the existing capacity to be limited, no further measures were taken to increase the share of high-efficiency cogeneration in Denmark beyond the existing support schemes described in the answer to Question 10”. There is no other mention of any other barriers.

Estonia

The fact of having only one gas provider and the potential fuel price changes is reckoned as a mayor barrier. Therefore, also the lack of investments in the gas network of the provider affects the availability of the gas natural. Also, the lack of a gas network with the Baltic gas pipeline and the Finnish gas network is a barrier to using gas for cogeneration in central and western Estonia and on the islands of Hiiumaa and Saaremaa. Apparently, potential alternative fuels such as peat and renewable biofuel have high risks due to “the confusion surrounding the greenhouse gas emission allocation plan and the trading system”. The report includes a discussion about the variability of the price of alternative biofuels, but without stating clearly that this variability of alternative fuels us a barrier. However, the fact that a considerable proportion of the heating market is made up of relatively low-consumption networks is considered as another barrier to the development of cogeneration.

Finland

In its report, Finland presents a discussion about the increase of competition of district heating with other energy sources such as geothermal heat, and other systems. Describes the objectives of Finnish energy policy, describes the energy taxation reform, and the challenges that the industry face due to the Industrial emissions directive. The flexibility offer to district heating plants does not lessen their need for investments. The investments needed will favour district heating. There is also the mention that “Building regulations do not in themselves present an obstacle to cogeneration, but in some cases they may affect the competitiveness of district heating compared to other heating methods and thus create a financial barrier to district heating and thereby also to cogeneration”.

France

The literal response to the three points of question 8th is “The French authorities have sent the reports required by the Directive. The 2008 report pursuant to Article 9 and the report on national potential sent in October 2010 set out the administrative procedures applicable to cogeneration installations. These procedures have not changed since the reports were drafted”.

Germany

In the point of their report devoted to obstacles to high-efficiency cogeneration that says “Over the past few years the pace of investment in large CHP plants has been sluggish” also give similar reasons: “the future arrangements for emissions trading and the particularly volatile economic and energy situation (above all as regards price trends for fuel and plants). After all, operators of CHP plants must, as with all conventional energy producers, also take account of the prospect of falling utilisation rates in the light of increased expansion of renewable energies and the consequences of this for the plants' economic viability (in this regard, see the debate on a future electricity market”.

Greece

Greece describes four barriers 1) an undeveloped heat market due to the low and irregular demand for heat and cooling. 2) Difficulty in investment financing, this difficulty is enhanced by the lack of attractiveness of these technologies compared to RES investments. 3) Limited district heating network.

Hungary

Hungary does not provide any discussion or description about any other barriers (apart of the already discussed in point 3.4.12).

Ireland

What follows is the analysis about the rest of barriers from Ireland "There are a number of significant barriers to CHP development in Ireland ranging from market structure through economic factors to appropriate heat loads to ensure compliance with the requirements of Directive 2004/8/EC".

The structure of Ireland's industrial base and its housing pattern is not conducive to significant penetration of CHP. Ireland's industry is primarily based on high value, low energy intensity sectors such as pharmaceuticals, ICT and services industries. One energy intense industrial site (an alumina refinery) has a 160 MW_e cogeneration plant which accounts for more than 50% of the total national installed capacity. A recently opened waste-to-energy plant with a generating capacity of 22 MW_e is located in an area with no immediate local heat load. District heating which is often associated with CHP plants in other European countries has no tradition in Ireland due to the distribution of a relatively small population, a mild climate and low density and low rise housing. Indeed it is possible that improvements in the energy efficiency of Irish housing stock that is currently being driven by government legislation and capital supports will militate further against district heating by making its economic viability more challenging.

The current economic climate is not conducive to investment generally, let alone to investment in CHP. In addition, the spark gap (ratio between electricity and gas price) remains at a level (typically between 3.5 and 4.5 for industrial applications) which is insufficient to provide an acceptable payback for most CHP operations. There are instances where units have been mothballed as a result.

Heat loads that are necessary for CHP to be economically viable and to enable compliance with Directive 2004/8/EC are not readily available in Ireland. While some of the largest industries (cement & periclase manufacture and mining) consume a significant proportion of industrial fossil fuels and electricity, they are not suited to CHP due to the mismatch between the heat output from CHP plants and the thermal demand of those industries. Other large scale industries, such as the dairy sector, operate on a seasonal basis which does not favour economic operation of CHP".

Italy

In spite of the fact that Italian report enumerates rules and regulations related to the Directive, and the historical evolution of many aspects of cogeneration, there is not any analysis of barriers.

Latvia

The Non-regulatory barriers mentioned by Latvia are: technical barriers financial (investment), operational problems, access to raw material sources and the necessary infrastructure, public attitudes, internalisation of external costs (for example, new taxes). Nevertheless, “overall, it can be concluded that Latvia has no significant non-regulatory barriers to the uptake of high-efficiency cogeneration potential”. There are not any additional details about these barriers that their mention.

Lithuania

With regard to other barriers, Lithuanian authorities only mention some issues related to Natural gas, more concretely it is said: ”Natural gas, which is the main type of fuel used in cogeneration plants, is supplied from a single source – Russia. This makes it difficult to forecast natural gas price variations and poses the risk of disruptions in supplies. It is a factor impeding the development of natural gas-fired cogeneration plants. There are several alternatives for ensuring reliable gas supplies, of which the construction of a liquefied natural gas terminal in Klaipėda constitutes the most economically advantageous alternative. Another weighty alternative, which has a strategic importance in regional terms, includes a gas link to Poland enabling the connection of Baltic States’ gas grids to Poland and Western Europe.

One more barrier to cogeneration is that a natural gas transmission system is underdeveloped in the western part of the country and this has negative implication for cogeneration developments in the region. To overcome this barrier, a new gas pipeline from Jurbarkas to Klaipėda is planned to be built by 2014 to connect the future liquefied natural gas terminal to the Lithuanian natural gas transmission system and thus form a natural gas transmission circle system. This would create more favourable conditions for the development of cogeneration in the western region of Lithuania”.

Malta

With regard to other barriers Malta states that “other barriers to the installation of CHP units could be: (i) the lack of informed knowledge on the technology, (ii) the limited ‘heat’ requirements of Malta due to its geographical location: (iii) the lack of interest and promotion from the companies producing such units due to the limited market on the Islands, (iv) the lack of a natural gas grid which could provide micro co-generation units a further prospect, (v) the appreciable installation of PV units on the premises of the industrial and commercial sector coupled with the use of LPG boilers which could present a more attractive alternative for their energy use to interested parties, (vi) limited awareness of the possible benefits, (vii) lack of internalisation of external cost in electricity and fuel prices”.

Netherlands

Another example of a barrier is the lack of commercial availability of small-scale cogeneration plants on the market. The Subsidy Scheme on Sustainable Heat for Existing Houses is intended inter alia to overcome this barrier. Where a lack of knowledge forms a barrier, objective knowledge is disseminated via the National Centre for Expertise on Heat. Internalisation of external costs takes place through the energy tax and the Emissions Trading System. In addition there are permit conditions for emissions other than CO_2 (e.g. NO_x, SO_x and volatile organic compounds), while large-scale installations also come under the NO_x trading system.

The report also includes the barriers already mentioned in the previous progress report prepared in 2010 by the Netherlands. For which no solutions are being sought or are in the offing. These are as follows:

- Much of the technical potential has already been realised;
- Increasing flexibility in the demand for heat reduces the number of operating hours of cogeneration plants;
- Industrial and domestic (*i.e.* household) heat demand is declining due to increasing energy efficiency;
- Providing the infrastructure for heat distribution in an urban environment is expensive;
- in some cases it is uncertain whether an industrial heat demand exists;
- Innovative energy concepts in greenhouse horticulture limit the potential for cogeneration;
- Gas price volatility creates a risk for parties considering whether to invest in cogeneration;
- Grid managers and cogeneration plant operators do not always interpret the legislation affecting the distribution of the grid connection costs in the same way.

Poland

According to the Polish report there are no technical barriers, the barriers are economic (financial), environmental, infrastructural, legal administrative and social. The economic barriers are offset by the certificates of origin, however this system will be in use until 31 March 2012, the lack of a clear definition of future support can mean a barrier in the decision-making process of new investments. The high cost of the construction of new district heating networks is mentioned as an additional barrier. Also the ETS and IPPC directives are perceived as barriers related to the emissions from cogeneration. District heating can suffer from the fact that they will have to participate in the ETS, whereas local heat producers not. The decrease of the heat demand due to improvements in energy efficiency will reduce the potential for high-efficiency cogeneration. A social barrier is the reluctance of the building owner to be connected to district heating network because the procedures and costs involved in the connection. Another social barrier is related to the lack of awareness by the public of micro-cogeneration. The limited amount of biomass and the competition for it is perceived as an additional barrier.

Portugal

Regarding the rest of the barriers the Portuguese report states that the new Law “fixes a transitional remuneration regime for facilities which are already operating, and allows producers to choose the previous remuneration regime, or to transfer to the new regime within a period laid down by law and keep the validity of the operating licences which they have been given”.

Romania

Romania does not provide any discussion or description about barriers. However, it includes the following statement “there continues to be a slight downward trend in useful heat demand for heating”.

Sweden

“With regard to small-scale cogeneration installations, the main barrier is high investment costs, particularly for incinerating solid fuels. The market for district heat is another decisive factor. Small-scale cogeneration installations also have fairly low electric efficiency and alpha values, which poses challenges for the development of the technology.

Potential barriers to the expansion of (high efficiency) cogeneration in Sweden are mainly exogenous by nature and it is not possible to influence them directly. Examples of potential barriers to the expansion of cogeneration include rising steel and biofuel prices. The price of electricity is particularly significant with regard to continued development. A decreasing demand for heat as the result of energy efficiency improving measures for energy consumption can have a negative impact on the development of cogeneration. A barrier of this kind must be overcome by the district heating companies themselves with the development of technology and compensation in the form of a widened customer base".

Slovakia

The Slovak report mentions like barrier the gathering of statistical information on plants and on combined production. Also, "the introduction of the calculation of the amount of electricity produced by combined production within the meaning of Commission Decision 2008/952/EC, since the operators of combined production plants have yet to master these calculations sufficiently". As technical obstacles it is mentioned that:

"The technical potential of high-efficiency combined production is reduced particularly by the:

– reduced heat consumption resulting from application of the energy efficiency policy,
– increased use of renewable energy sources in the heating and the preparation of hot water (heat pumps, solar collectors),
– increased use of renewable energy sources for the production of electricity (growth of demand for regulated electricity, which is provided mainly by combined production plants, as a result of which, however, overall efficiency declines, and the proportion of electricity produced by high-efficiency combined production falls)".

Slovenia

The Slovenian report mentions the following barriers:

- Lack of awareness of cogeneration technology and the advantages of its use;
- Uncertainty regarding forecast future prices for natural gas and wood biomass;
- Protracted administrative procedures;
- Insufficiently active local communities in preparing local energy plans and introducing district heating systems;
- Uncertain general economic conditions and the impact on the cost of financing new projects and current company operations.

Spain

Under the heading of other barriers the Spanish report mentions the following barriers:

"The volatile nature of thermal-energy consumer-undertakings, which prevents investment in new cogeneration projects".

“Access to funding for promoters of cogeneration projects. Cogeneration projects bear a higher risk than those involving electricity generation from renewable sources because of the stability [sic] of demand for useful heat. This means that financial institutions require more guarantees”.

“The lack of experience in using cogeneration in public projects, such as district heating.

Uncertainty regarding the impact of financial factors on the need to hand over CO_2 emission rights. This means that projects with only a small profit margin are not undertaken”.

United Kingdom

The British report mentions as barrier the effect of the spark spread - – the difference between the price received for the electricity and the cost of generation – not being large enough to provide an adequate return on investment, and the adverse economic situation. Also the access to main gas networks is seen as a significant barrier for some parts of the UK. The exempt from Hydrocarbon Oil Duty Rates for facilities using diesel in CHP is aimed at offsetting this barrier. The rest of the barriers mentioned are informational barriers and the absence of an established market for heat. To compensate the lack of awareness, “In October 2008, DECC launched CHP Focus, a website and free helpline service for assisting the development of new and existing CHP schemes” The UK Government under their Energy Market Reform are also considering additional measures for incentivising low carbon generation including:

- “Structuring an Emissions Performance Standard (EPS) – which sets as an annual limit the amount of carbon new fossil-fuel power stations can emit- to avoid acting as a disincentive to investment in CHP, as far as is practicable.”
- “Varying a new system of long-term contracts in the form of Feed-in Tariffs with Contracts for Difference (FiT CfD) that provides clear, stable and predictable revenue streams for investors in low-carbon electricity generation- in order to develop an approach that is best suited to each of the low-carbon generation types. CHP is being considered as part of this mechanism”.

3. System of Guarantees of Origin (GO)

3.1. Existence of GO schemes

Article 5 of the Directive requires Member States to ensure that accurate and reliable guarantees of origin are issued according to objective, transparent and non-discriminatory criteria. Member States were asked (Question 5) to indicate what the situation is concerning the implementation of this measure in their country (information on primary energy savings, type of registration system).

The table below gives an overview of the state of implementation of GO systems in the Member States as given by their reports.

Member States were also asked (Question 4) if their country used the alternative calculation method according to Article 12(2) of Directive 2004/8/EC. The answers to this are summarized in Table 4-1 below.

Table 33: Overview table of the state of implementation/existence of the GO systems by Member States

MS	Is the Alt Calc used? Art 12(2)	Description	GO system in place?
BE	yes	**Brussels Capital Region:** Decision of 19th July 2007 of the Brussels government concerning the guarantees of origin. **Wallonia** - GOLs (guarantee of origin labels) since 2007. **Flanders** - Statistics are compiled annually and there is an operational system of guarantees of origin. With regard to the application of Annex II to the issuing of guarantees of origin for electricity from cogeneration, the principles of the Decision are applied. A forthcoming revision of the Belgian legislation concerned will include more consistent application of the Decision.	yes
BG	no	Bulgaria has appointed the State Energy and Water Regulation Commission (DKEVR) as the independent competent authority for issuing certificates of origin for electricity and guaranteeing that the criteria and rules for issuing certificates of origin are kept. Under Article 21(1)(14) of the Energy Act (ZE), the DKEVR issues power generators with certificates of origin for cogenerated electricity. The procedures and definitions needed to apply the methods for determining the amounts of cogenerated electricity issued by the Commission on 19 November 2008 are reflected in Regulation No RD-16-267 of 19 March 2008.	yes
CZ		The Ministry of Industry and Trade issues certificates of origin relating to cogeneration based on Act No. 165/2012 Sb. on promoted energy sources (according to Section 47), whereby the application forms are published on the Ministry of Industry and Trade website. Records of the certificates issued are kept by the Ministry of Industry and Trade separately.	yes
DK	no	In the Order of 16 February 2007 on guarantees of origin for electricity from high-efficiency cogeneration, the Agency put in place a mechanism to issue and verify guarantees of origin in respect of high-efficiency cogeneration. The registration system is administered by energinet.dk.	yes
DE		The EU provisions on the guarantee of origin for CHP electricity are transposed in Section 9a of the Cogeneration Act	yes
EE	no	Although Estonia has implemented a certificate of origin scheme and it is possible to obtain certificates of origin from the system operator, the legal basis of the Estonian scheme is being improved. At the same time Estonia does not intend to link the support schemes arising from the Electricity Market Act with the certificates of origin.	yes
IE	no	The Directive 2004/8/EC is fully transposed, with the exception of Article 5 – Guarantee of Origin (GOO). Consideration was given to including Guarantee	no

		of Origin in recent regulations (S.I. 147 of 2011), but it was decided to await the new Directive on energy efficiency. Essentially the Commission for Energy Regulation (CER www.cer.ie) have the power to do the certification of HE CHP under S.I. 298 and 299 of 2009, but not to give guarantees of origin. To date, no formal requests for GO have been received.	
EL	no	Ministerial Decision Δ6/Φ1/off.8786/14-05-2010 provided a more detailed framework for the implementation of the system of guarantees of origin generated by HECHP plants and the mechanism used for securing the system. Moreover, the system of guarantees of origin and the mechanism used for securing the system applies only to the amount of energy generated by HECHP plants and is calculated in accordance with the provisions of Law 3734/2009 (Article 1 of Ministerial Decision Δ6/Φ1/off.8786/14-05-2010). Concerning the control mechanism used to verify that the requirements for the issue of guarantees of origin are met and the information used as a basis for issue thereof is accurate, the issuing organisation and its authorised agents have free access to the plant, as well as to all necessary details or information. The producer shall have to facilitate the work of the issuing organisation or its authorised agents. Inspections may be performed periodically, at any time, even without warning, and the time between two successive inspections may not be longer than 5 years.	yes
ES	no	In Spain, the Comisión Nacional de la Energía administers the system for issuing guarantees of origin for electricity generated using renewable fuels and high-efficiency cogeneration. The system has operated since 1 December 2007 with the aim of informing final consumers about the origin of the electricity they consumer and its environmental impact. The system for the issue of guarantees of origin in Spain is governed by Order No ITC/1522/2007 of 24 May 2007 laying down rules on guarantees of origin for electricity generated using renewable fuels and high-efficiency cogeneration.	yes
FR	no	The French system of guarantees of origin was the same for electricity produced by cogeneration and electricity produced from renewable sources, and it was necessary to amend the legislative basis of the system in order to transpose the guarantee of origin provisions in Directive 2009/28/EC of 23 April 2009 on the promotion of the use of energy from renewable sources. This amendment was introduced by order no 2011-1105 of 14 September 2011 published in the Official Journal of the French Republic of 16 September 2011, which consolidated in Articles L.314-44 and following of the Energy Code the new legislative provisions applied to guarantees of origin.	yes
IT	no	The Directive was first implemented in Italy with Legislative Decree No 20 of 8 February 2007 [2] which among other things brought in the guarantee of origin for HEC. Pursuant to this Decree, the conditions for defining HEC laid down in the Directive only apply from 31 December 2010; electricity produced prior to that date shall, however, be assessed on the basis of the previous rules (Decision No 42/2002 by the Regulatory Authority for Electricity and Gas (AEEG) [3]). The Directive was implemented with the Ministry for Economic Development's Decree of 4 August 2011, issued in consultation with the Ministry for the Environment, Protection of Natural Resources and the Sea.	yes

		The issuing of this Decree was necessary to take account of two Commission Decisions [12, 13] adopted after this Directive.	
CY	yes	The 2011 Regulations on Cogeneration of Electricity and Heat (Publication process, Management and Safeguarding Mechanism of Guarantees of Origin of Electricity Supply) (Annex II) establish the implementing rules for the system for issuing guarantees of origin and the system for safeguarding the reliability of the system. In order to comply with Article 5 of Directive 2004/08/EC and Directive 2001/77/EC on renewable energy sources, and based on Act No 174(I)/2006 and Act No 162(I)/2006 on the promotion of CHP facilities and renewable energy sources, an electronic register has been created and is up and running, through which Guarantees of Production Origin from CHP and REN will be issued, transferred and cancelled. This sector has regulations, laws, technical manuals and other information regarding the electronic register. The electronic registration system for guarantees of origin is handled by the Transmission System Operator (TSO).	yes
LV	no	Latvia's certificate of origin system for electricity generated by cogeneration is laid down in the Electricity Market Law and Chapter V of Cabinet Regulation No 221. Economic operators can obtain a certificate of origin that the electricity generated by a cogeneration power station owned by them complies with stipulated efficiency requirements and therefore is acknowledged to be electricity generated by high-efficiency cogeneration. Such certificates of origin are issued by the Ministry of the Economy. If economic operators wish to receive a certificate of origin for electricity generated in one year, when submitting a report to the Ministry of the Economy on the operation of every cogeneration power station they own, they make a note in their submission that they wish to receive a certificate of origin.	yes
LT	no	that an undertaking transacting the functions of an electricity transmission system operator (TSO) is a body responsible for the issue and withdrawal of guarantees of origin certificates for electricity produced from high efficiency cogeneration (hereinafter referred to as 'guarantees of origin certificates'). The TSO keeps a register of entities managing cogeneration plants. Information on the registered guarantees of origin certificates, the quantities of electricity produced from high-efficiency cogeneration and the amounts of primary energy savings are available on TSO's website http://www.litgrid.eu/go.php/Efektyv_kogener.	Yes
LU		No information received	
HU	no	The introduction of guarantees of origin in Hungary is laid down in Section 12(1) of Electricity Act LXXXVI of 2007. Under Government Decree 389/2007 of 23 December 2007 the guarantee of origin is a document certifying the amount (in MWh) in a given calendar year of electricity generated by energy from renewable sources or waste and by cogeneration and, in the case of cogenerated electricity, complying with the conditions of Decree 110/2007 of the Minister for Economic Affairs and Transport of 23 December 2007 on the calculation method for determining the amount of high-efficiency cogenerated electricity and useful heat.	yes
MT	no	The regulation establishing "guarantees of origin" came into force by means of the Guarantees of Origin of electricity from high Efficiency Cogeneration and Electricity, Heating, and / or Cooling from Renewable Energy Sources Regulations (LN 92/10 as amended by LN 126/11 and was amended to include references to " guarantees of origin" for the Renewables Directive	yes

		(Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable source s and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC	
NL	no	Since 14 December 2005, the 1998 Electricity Act has provided a framework for the nature, operation and application of guarantees of origin for high-efficiency cogeneration (Article 77(ca) to 77(ce)). Detailed provisions for the guarantees of origin are contained in the 'Regulation on guarantees of origin for electricity generated in a high-efficiency cogeneration plant' (WJZ7105952/BWBR0022539). The implementing provisions for establishing the detailed guidelines are laid down in that Regulation with an amendment that entered into force on 1 December 2009.	yes
AT	no	Since 2003 the Austrian regulator has maintained a central electricity guarantee database in which both guarantees of origin of electricity produced from renewable energy and other national and international electricity guarantees can be electronically issued, administered and traded.	yes
PL		The new Article 9(e) (1(a)) of the Energy Law, from 11 March 2010, introduces new changes to the existing scheme.	yes
PT	yes	Pursuant to Decree-Law No 23/2010, the Portuguese State entrusted the procedure for issuing Guarantees of Origin to the National Electricity Network (REN), the concession holder of the National Transmission Network (RNT). The REN is a member of the Association of Issuing Bodies (AIB), an international organisation which promotes the use of a standard certification system based on a harmonisation of structural concepts and procedures, the aim of which is to ensure the correct operation of the international system of energy certificates. With the support of the European Commission, the scope of the certificate systems was extended to include the requirements resulting from Directive 2004/08/EC, developing an approach which includes the Guarantees of Origin (GO) indicated in Article 5 of the Directive.	yes
RO		No information received	
SI	no	The provisions of the Directive on the promotion of high-efficiency cogeneration (2004/8/EC).were transposed into Slovenian law by amendments to the Energy Act in 2004. Article 64(f) of the Energy Act stipulates that a guarantee of origin of electricity is a document that enables generators to show that the electricity they produced was generated in high-efficiency cogeneration or from renewable sources. Guarantees of origin may be transferred to another party, or may serve as proof that electricity was generated in high-efficiency cogeneration or from renewable sources when obtaining operational support or for guaranteed purchases of electricity.	yes
SK	no	Guarantees of the origin (confirmations of the origin) of electricity produced by high-efficiency combined production are issued on the basis of Act No 309/2009 by the Regulatory Office for Network Industries on the basis of applications submitted together with the required attachments. The confirmations are issued in the form of a decision of the Office on a printed form. The Office keeps a record of the confirmations issued. At present no control mechanism is established for checking confirmations issued in respect of the origin of electricity produced by high-efficiency combined production.	yes

FI	no	Provisions on the granting of guarantees of origin are laid down in an Act and in a Government Decree adopted on the basis thereof. The guarantee of origin is granted by the national grid company Fingrid (TSO) once the applicant has submitted the information necessary to obtain the guarantee in accordance with the Directive. This activity is supervised by the Energy Market Authority. The certificate issued under the European Energy Certificate System EECS is considered equivalent to the certificate referred to in the Act on Verification and Notification of Origin of Electricity	yes
SE	yes	A new Act also means increased safety and reliability, since under it guarantees of origin must be issued, transferred and annulled electronically. Seems highly robust.	yes
UK	yes		yes

5 Member States used the alternative calculation, 11 did not, and 1 country provided no information on this question.
All countries have implemented a GO system except EI.

3.2. Individual assessment of National GO schemes

In general, from the information received, all Member States apart from Ireland state that they have fully operational GO systems. Based on the information provided the Member States are confident that their GO schemes comply with the requirements of the relevant Directives. This statement is therefore assumed to apply to all Member States apart from Ireland, which says it will be implementing the necessary regulations pending the implementing of the Energy Saving Directive. In the table below comments specific to Member States regarding robustness are added where appropriate.

All Member States were asked if there is any need for their country to review in accordance with Article 13 the (Question 5) threshold values used for calculation of electricity from cogeneration and/or the threshold values used for calculation of efficiency of cogeneration production and primary energy savings. The responses are included in the table below:

Table 34: Individual comments on robustness, and the need for review of reference values (Art 13)

MS	Q5 – Need to review reference values?	Individual comments on robustness of GO schemes
BE	No	Comprehensive system for all 3 regions
BG	No	No information received
CZ		Comprehensive system
DK	No	No information received

DE		Comprehensive system
EE	No	Does not intend to link the support scheme arising from the electricity Market Act with the certificates of origin.
IE	No	No information received
EL	No	No information received
ES	No	No information received
FR	No	No information received
IT	*	No information received
CY	No	No information received
LV	No	No information received
LT	*	Not indicated
LU		No information received
HU	No	No information received
MT	No	No information received
NL	No	No information received
AT	No	System permits GOs to be internationally traded. Very comprehensive description of system operation given
PL		The new Energy Law, from 11 March 2010 and this seems to be a robust system.
PT	No	The REN is a member of the Association of Issuing Bodies (AIB), an international organisation which promotes the use of a standard certification system based on a harmonisation of structural concepts and procedures, the aim of which is to ensure the correct operation of the international system of energy certificates.
RO		No specific information
SI	No	No specific information
SK	**	SK states that at present no control mechanism is established for checking confirmations issued in respect of the origin of electricity produced by high-efficiency combined production.
FI	No	No information received
SE	No	A new Act also means increased safety and reliability, since under it guarantees of origin must be issued, transferred and annulled electronically, it seems highly robust.
UK	No	No information received
* = no specific response. ** = some concerns were expressed, but not specifically calling for a review.		

19 countries did not perceive a need to review the reference values, 2 made no specific response, and Slovakia made some comments on difficulties experienced but did not call for a review.

3.3. Assessment for the EU as a whole

Taking the statements from the Member States as a whole, it seems that the GO system is well entrenched in all countries, except Ireland where there has been little demand and a system will soon be in place. All GO systems appear to be robust and comprehensive.

There is no clear need expressed for a review in accordance with Article 13 of the threshold values used for calculation of electricity from cogeneration and/or the threshold values used for calculation of efficiency of cogeneration production and primary energy savings.

4. GRID SYSTEM RULES, ACCESS TO ELECTRICITY GRID

This chapter examines the Member States responses to the questionnaire regarding grid system access rules for High Efficiency CHP.

In order to provide clarity the responses have been divided into three groups, A, B, and C answering the questions posed below:

Part A: Is there priority access? If so, how it is organized? Is it ensured via operational support, such as feed-in tariffs, price premium, purchase obligation or other support mechanism? Is there a link with the GO system or other certification scheme?

How is access to the grid guaranteed?

Part B: How the distinction of high-efficiency CHP is organized for the purpose of priority dispatch?

Part C: What are the connection rules?

Are there specific connection and grid access rules for micro-CHP and small scale CHP?

4.1. The responses to on priority access

The responses to questions under Part A can be found in table 35.

Table 35: Responses from Member States to the issues in part A of the questionnaire

Is there priority access? **If so, how it is organized?** **Is it ensured via operational support, such as feed-in tariffs, price premium, purchase obligation or other support mechanism.** **Is there a link with the GO system or other certification scheme?** **How is access to the grid guaranteed?**
A “y” indicates that support is given which will assist access. It cannot be determined if this means guaranteed access results.

“yy” indicates that guaranteed access results or is applied.			
MS	**Is there priority access / despatch?**	**Mechanism**	**Link with GO ?**
BE	y	A range of support schemes	
BG	yy	The mandatory purchase of all energy produced through high efficiency cogeneration at preferential rates; New installations with an output exceeding 5 MW powered with natural gas must be designed as cogeneration plants.	y
CZ		No specific information	
DK	yy	Cogeneration is given the financial support required to cover the necessary investment costs without unduly increasing the district heating costs borne by consumers. Operating aid is also provided for high-efficiency cogeneration. Cogeneration has clear priority from government policies.	
DE		No information received	
EE	yy	under the Electricity Market Act under which support is paid for electricity produced in efficient cogeneration plants, investment aid is granted in Estonia for low-capacity cogeneration plants fuelled on sustainable fuels.	n
IE		Ireland has an existing application to DG Competition for State Aids clearance for a REFIT which has preferred rates for biomass CHP and anaerobic digestion CHP.	
EL	yy	The key tool for supporting investments in HECHP plants is guaranteed tariffs for the generated electricity fed into the System or Grid, including the Grid of the Non-Interconnected Islands, on the basis of a defined price expressed in Euro per MWh of electricity for a definite period of time. Application of this mechanism provides stable long-term investment conditions. Law 2773/1999, as amended by Law 3426/2005, Law 3175/2003 and Law 2837/2000, stipulated that the System or Grid Operator should give priority access to the electricity generated from RES and cogeneration systems. Law 3468/2006 stipulated that the competent System or Grid Operator should, in allocating the load, give priority to HECHP plants using RES or a combination of RES and gaseous fuels, irrespective of installed capacity, as well as to HECHP plants of an installed capacity of up to 35 MWe.	y
ES	y	There is a system of financial support for cogeneration provided for by Royal Decree No 661/2007, which is based on the Directive. The following support is provided for cogeneration: - Priority access to the grid. - The transfer of net electricity production to the grid via the transmission or distribution network provided that absorption by the grid is technically possible.	

		- Receipt for the sale of net electricity production of a financial return based on the financial scheme chosen, either sale at regulated tariffs or sale on the market. Where electricity is sold on the market, a premium on top of the market price is paid. In addition, the tariff and the premium are indexed to the price of the raw material (fuel) used for cogeneration.	
FR	yy	French support scheme for CHP contains an obligation to purchase electricity produced by cogeneration (in particular as regards biomass installations). This support scheme comprises various guaranteed electricity purchase tariffs to support HEC	
IT	y	A range of incentives are offered to support HEC	
CY	yy	Grants and feed in schemes. Obligation to purchase.	
LV	yy	Three support instruments for HEC 1. Compulsory purchase of electricity; 2. Guaranteed payment for installed electrical capacity; 3. To promote the development of cogeneration power stations using renewable energy sources, targeted grants for investment in the construction of such power stations are provided for, utilising European Union Structural Fund financing for this purpose.	
LT	yy	There are specific quotas laid down requiring a certain amount of cogenerated power from district heating plant to be bought at pre specified prices. A powerful support.	
LU		No information received	
HU		The situation for support is not clear	
MT	n	Very limited support, CHP seen as unnecessary due to climate	
NL	y	Priority connection to the grid and priority access to transport capacity in the event of congestion in the grid for high-efficiency cogeneration will shortly come into effect. These support measures are intended as a means of structurally reducing risks in the development and operation of high-efficiency cogeneration	
AT	y	3 schemes – operational aid, and investment aid	
PL	y	The support mechanism for undertakings producing electricity from high-efficiency cogeneration consists in the obligatory reception, transmission or distribution of the generated energy by the distribution system operator	
PT	yy	Support for cogeneration is given by means of a reference tariff, efficiency premiums and renewable energy premiums. The manager of the National Electricity Transmission Network (RNT) giving priority to dispatching electricity from cogeneration facilities which do not participate in organised markets, in order to ensure the transmission and distribution of the electricity with regard to access to networks.	
RO		No specific information	
SI	yy	irrespective of the price of electricity in the market, the support centre buys all the acquired net electricity produced, for which the CHP generating equipment has received guarantees of origin,	y

SK	yy	The preferential connection of electricity production plants to the distribution system, preferential access to the system, and preferential transmission, distribution and supply of electricity are obligations applying equally to all combined production plants and to plants for the production of electricity from renewable sources	y
FI	yy	Feed in tariffs and reduced carbon taxes are used to support hi efficiency cogeneration.	
SE		No information received	
UK	n	No guaranteed access	n

Overall assessment of the responses to Part A of the questionnaire

12 countries have priority grid access. 6 have some kind of assisted access. Italy, Malta and the UK do not appear to have priority access for cogeneration. Four Member States link priority access with the GO scheme, two Member States countries specifically state that priority access is not linked to the GO. Sixteen Member States do not state if it is so linked.

4.2. The guarantees of origin and priority dispatch

The Table below describes the responses to the issues in part B of the questionnaire: "How the distinction of high-efficiency CHP is organized for the purpose of priority dispatch"

Table 36: Responses to the issues on priority dispatch

MS	How is the distinction of high-efficiency CHP organised for the purpose of priority dispatch?
BE	Not stated / Not clear – but does not seem to be an inhibitory factor
BG	the following criteria are considered: Predominant nature of the main thermal load; Type of fuel used; Cogeneration technology; Unit/station capacity
CZ	No specific information
DK	All CHP in Denmark is HE and it is government policy to allow priority access.
DE	No information received
EE	Not stated / Not clear
IE	All projects supported had to demonstrate compliance with the threshold values in Annex III(a) when applying the methodology in Annex III(b) of Directive 2004/8/EC.
EL	Registered in GO system
ES	Not stated / Not clear
FR	Not stated / Not clear

IT	Not stated / Not clear
CY	The EAC is obliged to buy electricity produced by combined electricity and high-efficiency useful heat, or through cogeneration from renewable energy sources at the current emission prevention price, as set by CERA at that time.
LV	To receive guaranteed payments for installed electrical capacity, the Ministry of the Economy must issue a decision on qualification for compulsory procurement or allocation of the right to receive guaranteed payments for installed electrical capacity, with heat and electricity tariffs approved by the Public Utilities Commission. Stipulated efficiency criteria (the saving of primary energy sources is greater than 1% for low capacity cogeneration stations and not less than 10% for other cogeneration stations) must be met.
LT	Specified quotas of electricity must be cogenerated.
LU	No information received
HU	Not stated / Not clear
MT	Effectively no CHP
NL	Conditions are attached to the current regulations such that in practice only high-efficiency cogeneration comes into consideration.
AT	Not stated / Not clear – but does not seem to be an inhibitory factor
PL	The support mechanism for undertakings producing electricity from high-efficiency cogeneration consists in the obligatory reception, transmission or distribution of the generated energy by the distribution system operator
PT	Not stated / Not clear
RO	No specific information
SI	Registered in GO system
SK	Registered in GO system
FI	Not stated / Not clear
SE	Priority access is implied by market structure
UK	Priority dispatch is not organized

Overall assessment of responses to Part B of the questionnaire

Ten Member States reported clear criteria for the distinction of high-efficiency CHP organized for the purpose of priority dispatch based on meeting the energy saving criteria specified in the Directive, either by being registered in the GO system or stating that they meet the Directive requirements. Two Member States stated criteria that may have had the same effect but were not explicit. There is no priority despatch in the UK. In eight Member States it was not clear.

4.3. Connection rules

The Table below describes the responses to the issues in outlined in Part C of the questionnaire.

Table 37: Responses to questions on connection rules (part C of the questionnaire)

What are the connection rules? Are there specific connection and grid access rules for micro-CHP and small scale CHP?			
MS	**Is there priority connection ?**	**Mechanism**.	**Specific connection rules for micro-CHP?**
BE		**The Brussels Capital Region:** Relatively easy to connect	
		Wallonia: Contacts with the DNO (distribution network operator) are sometimes difficult (lack of transparency). And there may also be many administrative procedures with the DNO (request for connection, meter, disconnection protection etc.) A detailed feasibility study is required, which also involves certain costs.	
	no	**Flanders:** CHP grid connection problems are currently a significant obstacle to the implementation of CHP projects. The existing electricity network imposes a number of barriers both to physical connection to the grid itself and to exploitation of CHP plants through this connection. But, Flanders has introduced a measure exempting CHP plants from some of connection costs (*i.e.* first kilometre of connection free).	no
BG	yes	All power stations producing electricity through high efficiency cogeneration with an installed capacity of up to 10 MW are given priority in being connected to the grid.	yes
CZ		No information received	
DK		No information received	
DE		No information received	
EE		No information received	
IE		Generators with a capacity not exceeding 1 MWe, which covers all small scale and micro CHP, are not required to apply to the CER for authorization and stand duly authorized, so removing an administrative procedure. Generators with a capacity not exceeding 1 MWe, which covers all small scale and micro CHP, are also considered to automatically stand duly licensed, so removing an administrative	yes

		procedure.	
EL		The same procedure as that used for RES plants apply to matters relating to the connection of HECHP plants to the System or Grid but these are not stated.	
ES		No information received	
FR		No information received	
IT		The right to use the 'on-site exchange service' (for plants with a nominal output of no more than 200 kW). This service enables producers to feed excess electricity into the public grid and then to withdraw it whenever their requirements exceed their production.	yes
CY		No information received	
LV		No information received	
LT		No information received	
LU		No information received	
HU		No information received	
MT	yes	Micro CHP is exempt from certain licensing requirements if less than 15 kWe peak output.	yes
NL		No information received	
AT	no	All production technologies are always connected to the electricity grid system in the same, non-discriminatory manner. In other words the same grid access conditions apply to cogeneration plants as to all other production technologies.	no
PL	yes	There are preferential terms for the connection of cogeneration sources, which enjoy a reduced connection fee. In accordance with Article 7 (8) of the Energy Law. Cogeneration units with an installed electricity capacity below 1 MW are an exception – half of the connection fee calculated in the basis of the actual expenditure is charged. Moreover, in accordance the fee charged for the connection of cogeneration units with an installed capacity not exceeding 5 MW shall be half of the calculated fee until 31 December 2011.	no
PT		No information received	
RO		No specific information	
SI	yes	Investors only bear costs of direct connection, not any downstream reinforcement	yes
SK	yes	Under Act No 309/2009, the preferential connection of electricity production plants to the distribution system, preferential access to the system, and preferential transmission, distribution and supply of electricity are obligations applying equally to all combined production plants.	
FI		No information received	

SE		No information received	
UK	no		no

Overall assessment of replies to the questions in Part C of the questionnaire

Five Member States reported preferential access to the grid for co-generators, but this was not for all classes of generator. Austria reported no preferential access but that all generators have easy access to connection. One other Member State, the UK, and the Belgian region of Flanders reported no priority access. Eleven Member States provided no information.

From the workshop held in Brussels in 2011 all the delegates agreed that there was not a real problem anymore with accessing the grid. However, it is known that in at least one Member State connections are deterred from connecting due to the potential downstream costs being attributed to them, so called "deep charging" whereas only one specifically stated that deep.

(**Deep charging** is where a developer is charged for reinforcement costs deep in and remote from the actual specific connection works)

5. SUPPORT SCHEMES

Under the Cogeneration Directive the Member States are asked to assess their national potential for cogeneration and to carry out various enabling assessments (of barriers, support mechanisms, verification through Guarantees of Origin) and then update the Commission on progress towards achieving the potential. Member States were required to produce the following reports:

– Analysis of the national potential for cogeneration. Article 10(1) and Article 6(1);
– Review of barriers to the wider use of cogeneration. Article 10(1) and Article 6(2)(c);
– Administrative and procedural situation. Article 10(1);
– Guarantees of origin. Article 10(1) and Article 5(3);
– Progress Report on Cogeneration Directive. Article 10(2), Article 6(3).

By 2010, all the Member states had provided that information to the Commission (many countries with considerable delay, the due date was 2007). The information provided was already discussed by the European Commission in the previous edition of the progress report. To assist the member states to prepare their new progress report according to Articles 6(3) and 10(2), the Commission prepared a questionnaire (Annex A) with a total of 11 questions. In this chapter, following the same approach that in chapter 3, we will refer to this new delivery of national reports like "new" or "second" round of national reports. The tenth and eleventh questions, related to the support schemes, were:

Q10 Does your country have support schemes for cogeneration/CHP based on Directive 2004/8/EC (operational and/or investment aid)? What kind of support is provided (feed-in tariffs, certificates and quota, priority access to the grid, etc.)? Are they designed to provide stable long-term investment conditions? Which sectors will be targeted (agricultural and/or industrial and/or heating cogeneration)?

Q11 How much money on a yearly basis has been provided in this way in the past years to the promotion of high-efficiency cogeneration in particular? And how much money is expected to be made available on a yearly basis to the promotion of high-efficiency cogeneration in the coming years?

This chapter summarizes the information, about the kind of support schemes, gathered by the Commission, from the national reports presents a summary of the answers to the tenth and eleventh question.

Table 38: Overview of support schemes for CHP used in all EU Member States, according the Impact assessment and the new round of National reports

	Feed-in Tariff/ guaranteed purchase price		Certificate scheme		Capital grants		Energy tax exemption		Accelerated fiscal allowance for investment		Business tax exemption	
	Impact Assessment 2011	New Report	Impact Assessment 2011	New Report	Impact Assessment 2011	New Report	Impact Assessment 2011	New Report	Impact Assessment 2011	New Report	Impact Assessment 2011	New Report
Austria					■	■						
Belgium			■	■	■	■			■	■		
Bulgaria	■	■										
Cyprus	■	■			■	■						
Czech Republic	■	■			■	■						
Denmark	■	■			■	■					■	■
Estonia	■	■				■						
Finland		■			■	■	■	■				
France	■	■					■	■	■	■	■	■
Germany	■	■			■		■					
Greece	■	■			■	■						
Hungary	■											
Ireland		■			■				■	■		
Italy				■	■		■					
Latvia	■	■			■	■						
Lithuania	■	■			■	■						
Luxembourg	■	▒			■	▒						
Malta												
Netherlands					■	■	■	■	■	■		
Poland			■	■	■	■						
Portugal	■	■			■							
Romania												
Slovakia	■	■			■	■						
Slovenia	■	■			■		■					
Spain	■	■			■	■						
Sweden				■			■					
United Kingdom	■	■			■	■	■	■	■	■	■	■

In table 38, the columns corresponding to “impact assessment 2011” has the kind of support scheme identified by the Commission in the Impact Assessment[82], The column with the heading “new Report” contains the support scheme identified from the new round of national reports. The countries with a yellow background are the ones that have delivered a new edition of their national report. For countries that have not delivered a new edition of their progress report at the time of drafting, the column “new report’ reflects the kind of support scheme already identified in the “Impact Assessment 2011”.

Among the changes in support schemes observed in the next table, what stands out that is that two additional countries have established feed-in tariff recently (Finland and Ireland). On the other hand, Hungary has discontinued their feed-in tariff in 2011 (there is no reference to any other alternative support measures in the Hungarian national report).

Countries that have discontinued their support schemes on capital grants are Ireland (in 2010), from others, there is no mention in their national reports to any kind of capital grants.

[82] Commission Staff working paper annexes to the impact assessment accompanying the document Directive of the European Parliament and of the Council on energy efficiency and amending and subsequently repealing Directives 2004/8/EC and 2006/32. SEC (2011)779 final.

Table 39: Summary of the support measures of the second round of National reports

	Q10	Q10	Q10	Q10	Q11	Q11
	Does your country have support schemes for cogeneration/CHP based on Directive 2004/8/EC (operational and/or investment aid)?	**What kind of support is provided (feed-in tariffs, certificates and quota, priority access to the grid, etc.)?**	**Are they designed to provide stable long-term investment conditions?**	**Which sectors will be targeted (agricultural and/or industrial and/or heating cogeneration)?**	**How much money on a yearly basis has been provided in this way in the past years to the promotion of high-efficiency cogeneration in particular?**	**And how much money is expected to be made available on a yearly basis to the promotion of high-efficiency cogeneration in the coming years?**
Austria	Yes	There are several different support schemes under the Cogeneration Act: - Operational aid for existing cogeneration plants which received money between 2003 and 2010 in order to maintain operation - Investment aid for new cogeneration plants from 2007 to 2012 - Investment aid for Waste lye-based cogeneration from 2009-2012		No discrimination, but 30% of the available funds are reserved for industrial cogeneration plants, and the investment aid for waste lye-based cogeneration are provided for the pulp and paper industry	Some EUR 350 million in operational aid under the Cogeneration Act was provided between 2003 and 2010. Roughly EUR 50 million of the total available investment subsidies under the Cogeneration Act (EUR 55 million) has so far been provided. None of the EUR 10 million available under the Green Electricity Act to waste lye-based cogeneration plants has so far been provided.	

Belgium		The Federal state set up a scheme of tax reductions for individuals to support certain energy-saving investments including cogeneration. For 2011 incomes, this tax reduction amounts to 40% of the costs up to a maximum amount of EUR 2 830 per year per resident. Companies also benefit from a tax deduction for certain investments like cogeneration. The tax deduction rate amounts 13.5% of the total investment.				

Belgium	Walloon region Most of these mechanisms were already in existence before the Directive.	Walloon region Green certificate mechanism which constitutes support for production: Every quarter, the producer sends the meter readings to the WEC. The WEC issues the GC for the production site on this basis. These GC can be negotiated on the GC market. These GCs are valid for a 5-year period. Every quarter, the supplies of electricity in Wallonia declared by suppliers, part of which is measured by the network operators, are sent to the WEC. On the basis of this information, suppliers and network operators are obliged to return a quota of GCs to the WEC that is proportional to the quantity of electricity supplied in the quarter. As an alternative solution to the sale of GCs, a system for the compulsory purchase of GCs by the local transmission system operator (LTSO Elia) at a minimum guaranteed price of EUR 65 was provided for in the Decree (6). These GCs are then cancelled and cannot be resold on the GC market." · GOLs (Guarantee of origin labels); · Different types of support for investment: Energy Fund premiums (for all sectors including individuals), UREBA premiums (public sector) from the Walloon Region and investment support (UDE support – economic growth law	Walloon region	Walloon region Some of the support (investment support) is aimed at one sector more than another, but ultimately almost all sectors are covered, including individuals	Walloon region Green certificate mechanism, which constitutes support for production (last WEC report) Year MEUR Biomass 2008 58.22 2009 74.58 Offer of subsidies for studies on the relevance of cogeneration in the private sector Year EUR 2009 76 081.25 2010 30 910.00 2011 126 071.00 (at end of September) Regional investment support (private and public sectors) Year MEUR 2009 5.422 2010 1.004 2011 0.235 (at end of August) Investment support for residential micro-cogeneration (around 1 kWe) Year EUR 2009 88 541.00 2010 44 917.00	Walloon region

<table>
<tr>
<td>Belgium</td>
<td></td>
<td>Flemish region

Cogeneration is supported mainly through a system of certificates with an annual quota.

The present support system for quality CHP in Flanders has achieved a great deal: it has created a stable and sufficiently attractive investment climate, stimulating sufficient investment to meet the Flemish Government's targets for the production of electricity by means of quality CHP.

Nevertheless, there are various reasons why the present cogeneration certificate systems should be evaluated and adapted where necessary.

· A number of policy-relevant lessons may be learned from the eight years of experience gained of the way these systems work.

· A number of recent – critical – analyses, recognising that the functioning of the certificate systems has a number of undesirable side-effects (windfall profits) and that the overall cost of the systems is increasing, have called for a discussion of the future development of the systems.

· Thoroughgoing revision is therefore essential in order to make the support policy for renewable energy and qualitative regeneration sufficiently future-focused and also future-'proof'.</td>
<td>Flemish region

The cogeneration certificate (CC) system has supported high quality cogeneration in Flanders since 2005. Only CHP plants commissioned or significantly modified after 1 January 2002 are eligible for certificate support. This support is linked to the energy saved as a result of the CHP.

The Decree of 6 May 2011 also paved the way for the long-term rise in the cogeneration certificate quota: from 4.90 % in 2010 to 10.5 % in 2020

In 2011 the Flemish Government announced an in-depth evaluation of support policy.</td>
<td>Flemish region</td>
<td>Flemish region

Estimation of the support provided by the quota obligation

Year MEUR
2004 1.297
2005 8.451
2006 18.920
2007 47.045
2008 88.426
2009 131.648
2010 165.574</td>
<td>Flemish region

Support necessary to make the as-yet unrealized potential of CHP sufficiently profitable.
Year Margin of Unprofitability
2011 14
2012 27
2013 42
2014 56
2015 66
2016 77
2017 95
2018 113
2019 150
2020 184</td>
</tr>
</table>

Belgium		Brussels Capital region The Brussels Capital Region supports cogeneration since 2005. Within that time, the Region elaborated a fairly complete set of support including: • Expertise point of contact: An expert in cogeneration is available for free in order to advice professionals willing to study or install a properly-dimensioned CHP-unit. • Investment support scheme: The 'energy premiums' encourage project promoters when acquiring cogenerations. This investment support scheme is available for both the private and public sectors as well as for companies and households. In 2011, the premium formula for combined heat and power installation is: EUR 3500 *√ (electric power of the CHP-unit in kW). • Specific grants for the so-called ‘economic expansion’ are available for local privately-owned SMEs. These grants also cover the acquisition of CHP-units and vary depending on the size of the company. • Operational support scheme: green certificates By general principle, green certificates (GC) may be granted for CHP energy after certification of the	Brussels Capital region The granting of GCs is spread over a period of 10 years, and the GCs remain valid for 5 years.	Brussels Capital region As from 2011, the Brussels Capital Region shall raise the GC level of support for gas fired CHP units installed in apartment blocks. The standard calculations of GC is enhanced with multiplying coefficients as follows: - GC * 2 for CHP units with an electric power of up to 50 kW; - GC * 1.5 for CHP units with an electric power exceeding 50 kW.	Brussels Capital region	Brussels Capital region The green certificate scheme will remain until 2020 and possibly beyond that point in time. Considering (a) the continuous efforts to promote CHP, (b) the sectoral focus detailed in the answer to question 10 and (c) the current review of the quota of green certificates electricity providers have to hand in, the number of green certificates allocated to CHP plants in the coming years is expected to increase substantially

Bulgaria		Under the Energy Act (ZE), the State Energy and Water Regulation Commission (DKEVR) sets preferential prices, exclusive of VAT, for the sale of 1 MWh of electricity produced by electrical and heat energy cogeneration facilities based on individual production costs and supplements per producer group according to the following criteria: 1) Predominant nature of the main thermal load; 2) Type of fuel used; 3) Cogeneration technology; 4) Unit/station capacity. The Energy Act (ZE) promotes cogeneration, mainly by: - The mandatory purchase of all energy produced through high efficiency cogeneration, registered with a certificate of origin, with the exception of energy generated for internal use, or energy used on the free energy market; - Energy produced through high-efficiency cogeneration must be purchased at preferential rates; - Where there is a declared need for thermal energy, new installations with an output exceeding 5 MW powered with natural gas must be designed as cogeneration plants. - All power stations producing electricity through high efficiency cogeneration with an installed capacity of up to 10 MW are given priority in being connected to the grid.		Sale prices based on individual production costs and supplements for three main groups of producers (heat, industrial and agricultural producers)	From 01 July 2010 to 30 June 2011 the funding of the preferential prices amounted to BGN 80 million	For the pricing period from 1 July 2011 to 30 June 2012 an increase of around 21% is expected

Czech Republic		The Czech Republic supports cogeneration of electricity and heat in the form of a bonus for electricity from high-efficiency cogeneration of electricity and heat. Cogeneration investment support projects, however, appear in grant programmes at the Czech Invest agency and the State Environmental Fund (SEF) only to a limited extent. There is also the right of preferential connection to the electrical network as long as the meet certain conditions of connection. Electricity generators that put into operation a new facility for the high-efficiency cogeneration of electricity and heat are entitled to a contribution to the price of electricity from high-efficiency cogeneration of electricity and heat for a period of at least 6 years from the date of putting the facility into operation.	No long-term guarantee of the level of support is laid down and in this sense the support scheme does not therefore provide stable long-term investment conditions Support is to be newly regulated from 1 January 2013 by new Act No. 165/2012 Sb. on promoted energy sources. The principles, however, shall remain. Entitlement to preferential connection shall also remain	The support scheme is universal and is not targeted to a specific sector.	Additional costs of support for cogeneration of electricity and heat (thousands of CZK per annum) 2007 502 992 2008 416 342 2009 521 595 2010 696 091 2011 701 240	

Cyprus		There are two different support schemes: one for the high-efficiency cogeneration investments and one for promotion of cogeneration using biomass (biogas). One scheme is for 'Legal persons and bodies in the public sector engaged in an economic activity'. This scheme covers only the funding of the electricity produced by the EAC at the price set by CERA. The other scheme is for 'Natural persons and organisations that are not engaged in an economic activity (non-profit making)'. This last scheme is for CHP units and high-efficiency and cogeneration units from renewable energy sources of up to 1MW. It offers grant of 30% of the eligible initial cost (with an upper limit of EUR 160 000 per investment) and a feed-in tariff for the electricity produced and supplied to the EAC network. Also, the support scheme for RES provides a minimum sale price of electricity produced from biomass and supplied to the distribution/transfer electricity grid will be EUR 0.1179/KWh for the first 20 years that the system exists. The subsidy issued by the Special Fund for RES will come from the difference between the total sale price and the market price of the electricity produced from renewable energy sources by the EAC, as set by CERA. The minimum sale price given above will be increased with a premium of 1.71 cents per KWh of electricity in cases where the electricity is produced by electricity cogeneration units for heat and/or cooling.	Yes (assures a minimum price to electricity generated or the first 20 years of the facility)	There is one scheme for profit making organisations (for high efficiency and cogeneration from renewables) and other scheme for non-profit making organisations	In 2008 EUR 103 609 In 2009 EUR 436 906 No sum available in 2010	Provision of EUR 50000 for 2011

Denmark	Yes	Electricity produced together with heat is given priority grid access Operating aid provided for High-efficiency cogeneration. The aid may be classified as: - Production-independent subsidies financed through the electricity price charged to consumers -Production-dependent subsidies financed by the budget There are additional operating subsidies on the basis of renewable fuels (biomass and biogas) financed by electricity consumers Until 2010, operating subsidies were also awarded for cogeneration using domestic waste as a fuel. In the case of biomass-based cogeneration, heat production is also exempt from taxation.	Yes, designed to provide stable long-term investment conditions for electricity producers and will run for a period of 20 years from the date of establishment of the plant, and in any case for no less than 15 years from 2004.	Subsidies are granted both for cogeneration geared towards the heat market and for industrial cogeneration.	The Public Service Obligation cost of high efficient decentralised cogeneration were: In 2005 DKK 906 m, In 2006 DKK 401 m In 2007 DKK 1 179 m In 2008 DKK 170 m In 2009 DKK 1 267 m In 2010 DKK 573 m The decentralised cogeneration costs, financed under the Finance Act (DKK million were: In 2005 DKK 245 m, In 2006 DKK 277 m In 2007 DKK 179 m In 2008 DKK 246 m In 2009 DKK 203 m In 2010 DKK 92 m	The plan is to adjust the payments made under the Finance Act to basic amounts financed as PSO contributions. Overall support for high-efficiency cogeneration (excluding special subsidies granted for biomass or biogas-based cogeneration) is expected to be at a similar level to 2010, *i.e.* approx. DKK 700 million per annum.

Estonia		Support scheme provided under the Electricity Market Act – Feed in tariff for electricity produced in efficient cogeneration plants There is an investment aid granted for low-capacity cogeneration plants using sustainable fuels.		No distinction is drawn between sectors as regards the support schemes		EUR 420–470 million has probably been spent solely on establishing cogeneration plants, to which must be added the cost of improving the electricity grid and modernising the district heating network.
Finland		Funding of decentralised energy production through the Agency for Technology and Innovation (TEKES) Supporting of small-scale cogeneration based on biogas and wood through the feed-in tariff system for renewable energy introduced recently. Small biogas plants receive the extra support in the form of a heat premium Similar support is granted to small-scale, wood-fired cogeneration if it meets the minimum efficiency requirement. The State budget includes funding for energy support. These funds can be granted to energy projects that are eligible. Heat production based on cogeneration receives preferential treatment in taxation. It is subject to half of the CO_2 tax rate, which is calculated by multiplying by 0.9 the heat produced by taxable fuels.		The government is supporting small-scale cogeneration based on biogas and wood through the feed-in tariff system for renewable energy. Small biogas plants receive the extra support in the form of a heat premium, similar support is grated to small scale, wood-fired cogeneration	Feed-in tariff system introduced in 2011 and no support has yet been paid under that system In 2008-2010 energy support was granted to different sectors. Cogeneration is not in itself grounds for granting energy support. As support is granted on the basis of renewable energy use or new technology, there are no separate statistics on the support received by cogeneration plants. Most of the energy-production projects based on wood, biogas or recycled fuels are carried out at cogenerations plants. The energy support 2008-2010 was of EUR 171.9 m (the report breaks down this amount by energy source)	

France		The purchase tariff for natural-gas cogeneration installations applied since 2001 (duration of contracts 12 years, powers below 12 MWe). For biomass cogeneration installations exceeding 12 MWe, a multi-annual invitation to tender composed of four stages to be launched annually between 2010 and 2013 for a cumulative power of 800 MWe. Electricity purchase obligation is guaranteed for 20 years. For medium-size biomass cogeneration installations, regulated purchase tariffs (duration of contracts: 20 years). The purchase tariff was adjusted upwards at the beginning of 2011 for installations between 5 and 12 MWe; if the threshold of 5 MWe is exceeded, this leads to the application of the ICPE authorisation system However, it was decided at the beginning of 2011 that sawmills with cogeneration of at least 1 MWe for drying their products may be exempted from the 5 MWe threshold. In order to maintain a constant load, it was necessary to decrease slightly the purchase tariff for all installations (-3.6% compared to the adjusted purchase tariff).	The purchase tariff for natural-gas cogeneration installations applied since 2001 has not been revised since the report from 2008 (duration of contracts of 12 years powers below 12MWe)	Support measures based on the source of the energy source (for natural gas or biomass)	The compensation for the feed-in of electricity produced by cogeneration installations is estimated in 2011 at EUR 705.3 million as regards natural-gas-based units and at EUR 53.2 million for biomass-based units.	The end of the 12-year purchase contracts for natural-gas-based cogeneration will gradually lower the amounts granted to this sector, which will be partly compensated by the development of biomass cogeneration.

Germany		The Cogeneration Act (KraftWärme-Kopplungsgesetz, KWKG) promotes electricity generation in combined heat and power (CHP) plants through temporary subsidies topping up the market price for electricity, financed through levies. In the subsidy scheme the market price for electricity is topped up in the case of modernisation and building of new plants (subsidies amounting to between 5.11 and 1.5 ct/kWh, depending on the size of the plant). Like plants supported on the basis of the Renewable Energies Act, CHP plants are also entitled to priority access to the network and, for as long as they receive subsidies, to distribution of its electricity by the network operator. Moreover, since 2009 the construction of new and extension of existing heating networks have also been promoted through the scheme financed by levies under the Cogeneration Act.	The subsidy scheme is limited in time (ranging from a fixed period of 10 years to a maximum of 30 000 operating hours, depending on the category of plant).		The costs of the scheme are borne by electricity consumers. Since 2009 the total amount has been capped at EUR 750 million per year, of which EUR 150 million per year for network development. This limit has not been reached since, however, as the 'evolution' of older, large plants led to a constant decrease in the scheme's costs in the past couple of years. Meanwhile the construction of new plants followed a downward trend.	Subsidy payments under the Cogeneration Act will drop from currently EUR 384 million (2010) to EUR 159 million (2011). In 2011 subsidy payments for CHP electricity will decrease from currently around EUR 342 million to EUR 109 million. On the other hand, subsidy payments to heating networks will increase from EUR 42 million to EUR 50 million in the same period. It is expected that subsidy payments will increase to a level of about EUR 630 million by 2017 and thereafter decrease to about EUR 560 million by 2020. The changes introduced by the current amendment to the Cogeneration Act could lead to additional subsidy costs of EUR 20-100 million per year.

Greece		The previous Development Law 3299/2004 provided for the following types of aid for HECHP plant construction investment plans: (a) financial lease subsidy and/or aid; (b) tax exemption; (c) subsidy for the cost of the jobs created. The new Development Law 3908/2011 has provided for supporting investment plans, including construction of HECHP plants, by offering the following individual or combined types of aid:(a) income tax exemption; (b) subsidy consisting in payment by the State of an amount of money, free of charge, for covering part of the subsidized expenditures; (c) financial lease subsidy consisting in coverage by the State of part of the instalments paid for the acquisition of mechanical and other equipment. Opportunities for financing the construction of HECHP plants were also granted by the Operational Programme on Competitiveness (2000-2006), Currently, the Operational Programmes "Environment and Sustainable Development" and "Competitiveness and Entrepreneurship", as included in the National Strategic Reference Framework (NSRF) 2007-2013, are financing several investment aid programmes including the installation of cogeneration systems as eligible expenditures. Furthermore, a call for proposals for operations has been published with a view to including and financing district heating actions either through new projects or by expanding existing networks as part of the Operational Programme "Environment and Sustainable Development", of a total budget of EUR 50 million.		The investment aid of the National Strategic Reference Framework (NSRF) from 2007-2013 are financing several investment aid programs focus on: a) High efficiency cogeneration on heat and power in hospitals b) Green tourism c) alternative tourism The tariff for the electricity from HECHP using biogas is calculated in different way that for rest of HECHP plants	The financial support for the construction of new HECHP plants from 2000 to 2006 granted a total amount of EUR 357.3 m The amount of money spent on purchasing electricity from HECHP plants was: In 2006 EUR 0.665 m In 2007 EUR 2.482 m In 2008 EUR 2.540 m In 2009-2010 EUR 21.857 m The amount of money spent on purchasing electricity from HECHP plants using biogas was In 2006 EUR 2.071 m In 2007 EUR 1.711 m In 2008 EUR 1.481 m In 2009-2010 EUR 6.714 m	The investment aid of the National Strategic Reference Framework (NSRF) from 2007-2013 are financing several investment aid programs. With a total amount of EUR 65 m

Hungary		The statutory rules on the mandatory off-take system are contained in Electricity Act LXXXVI of 2007 (‘the Electricity Act’). These provisions of the Electricity Act are governed by Act XXIX of 2011 amending energy-related Acts, which provides that producers of CHP using fossil fuels are not authorised to sell in the mandatory off-take system in accordance with Section 171(5a), (5f) and (5h) of the Electricity Act.			According to the figures and calculations of the Hungarian Energy Office, the amount we spent promoting high-efficiency cogeneration (primarily to make district heating more affordable for households) rose steadily each year from HUF 8 billion in 2003 to around HUF 57 billion in 2010. Under current legislation, however, as mentioned in the previous point, co-generators are excluded from the mandatory off-take system by Section 171(5a), (5f) and (5h) of the Electricity Act, which Section entered into force on 30 March 2011.	

Ireland		Projects which receive REFIT preferred rates will have to demonstrate compliance with the threshold values in Annex III(a) when applying the methodology in Annex III(b) of Directive 2004/8/EC. The REFIT is a feed in tariff system, which acts as a floor price guarantee for generators from biomass. The support for cogeneration that will be provided by the REFIT is intrinsically linked to the achievement of the goals of the National Renewable Energy Action Plan (NREAP) prepared by Ireland under the Renewable Energy Directive 2009/28/EC. The anticipated 100 MWe of biomass CHP and 50 MWe of AD CHP are important contributions to the national renewable energy target of 16% by 2020. Financial tax incentives are available through the Accelerated Capital Allowance (ACA) scheme to encourage the purchase of plants that are highly efficient	Support by way of REFIT will be provided for a 15 year period, with tariffs index linked to the consumer price index (CPI). It is anticipated that 100 MWe of biomass CHP and 50 MWe of AD CHP will be supported under this support programme.	REFIT which has preferred rates for biomass CHP and anaerobic digestion CHP in the agricultural, commercial and industrial sectors.	Ireland has operated two capital grant support programmes through the Sustainable Energy Authority of Ireland (SEAI) from 2006 to the end of 2010. The SEAI CHP Deployment Programme provided funding of up to 30% of defined eligible costs for small scale, fossil fired CHP. Under the programme 68 projects were supported resulting in a total installed capacity of 15.7 MWe. This programme was closed at the end of 2010. The SEAI Biomass CHP / AD CHP Call for Proposals was targeted at biomass CHP and AD CHP. The grant level was also up to 30% of defined eligible costs with no specified size limits. This programme supported one biomass CHP project (installed capacity of 3 MWe) and one AD CHP project (installed capacity of 250 kWe). This programme was closed at the end of 2010. In the period 2006 to 2010, through these two programmes, EUR 6.5 million in capital support was provided to small scale fossil CHP and biomass / AD CHP projects.	The REFIT is a feed in tariff system, which acts as a floor price guarantee for generators from biomass. As such, there is no defined 'budget' for the measure, as the amount of support required will vary from year to year due to varying electricity prices. The measure is funded through the 'Public Service Obligation', a measure that has been in place for a number of years.

Italy		Exemption from the obligation to purchase Green Certificates (an obligation imposed, in general, on electricity from non-renewable sources) The right to priority use, after electricity solely from renewable sources. The right to use the 'on-site exchange service' (for plants with a nominal output of no more than 200 kW) This service enables producers to feed excess electricity into the public grid and then to withdraw it whenever their requirements exceed their production. Ability to obtain energy efficiency certificates (White Certificates) equivalent to the annual primary energy savings. Ability to obtain Green Certificates (only for HEC plants which are part of district heating networks and provided they fulfil requirements regarding the date of commissioning , or which are part of farming communities. Simplified electricity grid connection procedure; reduced connection costs .Simplified authorisation procedure (only for plants with an output of less than 1 MWe, provided they are certified). Special treatment regarding the transmission and distribution costs of the electricity produced, and regarding the purchase of back-up or additional electricity. On 5 September 2011, a decree set up a support scheme based on the issue of White Certificates equivalent to the plant's primary energy savings in a given year There is decree about to be adopted to simplify the installation and introduction of fiscal provisions for high-efficiency micro-cogeneration plants (with an output of up to 50kW). There are some provisions to support fiscally high-efficiency micro-cogeneration plants (with an output of up to 50kW). This decree will also simplify the payment of duties and other taxes and fiscal charges.	The White certificate system provides incentives for a minimum of ten years	Under certain conditions, green certificates are granted to cogeneration plants which form part of district heating networks		

Latvia		Aid for the generation of electricity by cogeneration is provided for in Cabinet Regulation No 221, which provides for the compulsory procurement of electricity generated by a cogeneration process for a set price, and provides for the right to receive guaranteed payment for the electrical capacity installed in a cogeneration station. Electricity generation by cogeneration is also facilitated by the European Union Cohesion Fund-financed activity “Development of cogeneration power stations using renewable energy sources”. Cabinet Regulation No 165, “Regulation on Operational Programme ‘Infrastructure and Services’ supplementary activity 3.5.2.2 ‘Development of cogeneration power stations using renewable energy sources” (hereinafter referred to as the “Activity”) entered into force on 17 February 2009 to implement the Operational Programme “Infrastructure and Services” supplementary activity 3.5.2.2 “Development of cogeneration power stations using renewable energy sources”,. The Activity provides for aid for the construction of cogeneration stations utilising renewable energy sources.		There is no discrimination, however the objective of Cabinet Regulation No 165, “Regulation on Operational Programme ‘Infrastructure and Services’ supplementary activity 3.5.2.2 ‘Development of cogeneration power stations using renewable energy sources” is to significantly increase the amount of electricity and heat energy generated from renewable energy sources..	Up to 1 July 2011, contracts have been concluded for ten projects within the framework of Activity 3.5.2.2, with Cohesion Fund funding of LVL 21 365 499.55.	

Lithuania		The support mechanism is based on public service obligations (PSO). The support is granted to the power plants supplying heat to heating systems (district heat supply systems). The support is targeted towards heat cogeneration based on a useful demand of heat. The scopes of production of electricity from cogeneration and electricity feed-in tariffs are approved on an annual basis. The Rules for purchasing power from combined heat and power generators regulate the establishment of annual purchase quotas for electricity generated in cogeneration plants using non-renewable energy sources and the ways of purchasing such electricity. For cogeneration plants, the ratio of rated electric and thermal input shall be at least 0.45 and total efficiency in electricity and heat generation shall be at least 75 %. The National Control Commission for Prices and Energy (VKEK Commission), sets the price for the electricity that must be purchased on a mandatory basis. The Rules do not specify the feed-in price in respect of each power plant separately. The feed-in (purchase) price is a product of basic electricity price, which is the same for all power plant groups, and a ratio categorising a capacity value. On the basis of installed electrical capacity, power plants are attributed to one of the following 3 groups: group I – electrical capacity of more than 50 MW, group II – electrical capacity of 5 to 50 MW, and group III – electrical capacity of up to 5 MW. The basic electricity price is subject to recalculation on an annual basis, taking into account changes in natural gas prices.	The Ministry for Energy sets the annual scope for purchasing electricity from cogeneration and the three-year purchase forecast based on, among other factors, the objective for the share of the electricity generated in cogeneration plants by 2025. That year, the share should be at least 35 % of the generated electricity. In the future, it is planned to follow the principle of gradual reduction of support for heat cogeneration using fossil fuels by establishing a gradual reduction in the annual quantities of supported electricity from this type of cogeneration: 900 GWh in 2012, 800 GWh in 2013, 700 GWh in 2014 600 GWh in 2015	Electricity from biomass, same as in case of electricity from any other renewable sources, is promoted under the Procedure for the fulfilment of public service obligations established by the Government. The procedure provides for promoted quotas and fixed tariffs. The fixed tariff shall be applied to electricity generated from renewable sources in respect of which a guarantee of origin has been issued in the statutory procedure. The fixed tariffs shall be set and promotion quotas shall be established by auctions.	Support funds for cogeneration plants using fossil fuel, from which electricity output was purchased at premium prices are In 2004 LTL 85.3 m In 2005 LTL 91.5 m In 2006 LTL 98 m In 2007 LTL 162.4 m In 2008 LTL 160.4 m In 2009 LTL 301.3 m In 2010 LTL 35.7 m In 2011 LTL 85.7 m In 2012 LTL 117.6 m	

Malta					In 2009 and 2010, the Government of Malta made available EUR 15 million through the European Regional Development Fund (ERDF) for the industrial sector to take steps to become more efficient in the use of energy. Although there was a lot of interest in these funds, only one proposal was related to cogeneration but unfortunately, it never came to a fruition.	
Netherlands	Other than the Regulation on guarantees of origin for high-efficiency cogeneration the Netherlands does not have any systems for cogeneration that are based directly on Directive 2004/8/EC	Also, an amendment to the 1998 Electricity Act is well under way. This amendment will regulate two things for high-efficiency cogeneration: (a) priority connection to the grid and (b) priority access to transport capacity in the event of congestion in the grid. These support measures are intended as a means of structurally reducing risks in the development and operation of high-efficiency cogeneration Other relevant policy measures are, for example, exemption from environmental tax for installations generating electricity with an electrical yield of 30% or higher (Article 64 of the Environmental Taxes Act), and the tax rebate for energy investments through the Energy Investment Allowance (EIA).	The measures are not specifically aimed at a limited number of sectors, but are generally applicable.		In 2009 about EUR 9 million in fiscal support was promised to cogeneration in the Energy Investment Allowance (EIA), some EUR.2 million of it for bio-CHP. With this support total investment reached EUR.78 million. In addition to that, in the Subsidy Scheme on Sustainable Heat (part of the Energy and Innovation Subsidy Scheme) EUR 4 million was made available in 2010 for investments in micro-CHP in existing houses. A good EUR 3 million of this had been allocated by mid-2011, in particular to households and housing corporations. Likewise in 2010 in the Sustainable Energy Production Incentive Scheme (SDE) a budget of EUR 168 million was made available for high-efficiency cogeneration above 250 MWe, but no applications were received for this	The expectation is that the EIA will continue. In addition with a part of the SDE scheme a number of biomass projects will be honoured. A substantial amount of the EUR 1.8 billion expenditure expected in the period 2011-2026 will relate to bio-CHP, for example in manure fermentation. Finally, from 2012 onwards SDE+, which will replace the SDE scheme as of 2011, will offer more possibilities of support for sustainable heat. Spending on sustainable heat, including that from bio-CHP, is expected to increase.

Portugal		According to Decree Law No 23/2010, as amended by Law No 19/2010 of 23 August 2010, support for cogeneration is given by means of a reference tariff, efficiency premiums and renewable energy premiums. With regard to access to networks by cogeneration producers, this depends on the method of remuneration regime chosen. In the case of cogeneration produced under the special method, access is given under the terms of Decree Law No 312/2001 of 10 December 2001, as amended by Decree Law No 33-A/2005 of 16 February 2005, whilst under the general method, access is given on similar terms to those laid down for the ordinary regime for electricity production. The actual licensing of cogeneration producers complies with rules which are common to both remuneration methods, and is based on the system which applies to the production of electricity under the ordinary regime, mutatis mutandis, in particular those resulting from simplifying and streamlining procedures.	With regard to the sectors covered by the support schemes, there are no plans to make any distinctions in terms of its allocation.			

Poland		Whereas cogeneration units with an installed electricity capacity below 1 MW pay only half of the connection fee to the distribution or transmission system almost all remaining producers pay 100% of the connections costs. However, in accordance with Article 5 of the Act of 2007, the fee charged for the connection of cogeneration units with an installed capacity not exceeding 5 MW shall be half of the calculated fee until 31 December 2011. Investors may apply for financial assistance to the National Fund for Environmental Protection and Water Management, hereinafter referred to as "NFOŚiGW", under the programme for renewable energy sources and high-efficiency cogeneration facility initiatives. Investments in the conversion and construction of electricity and heat cogeneration units meeting the requirements for high-efficiency cogeneration are supported under the Operational Programme Infrastructure and Environment, measure 9.2 High-efficiency generation. The support mechanism for undertakings producing electricity from high-efficiency cogeneration consists in the obligatory reception, transmission or distribution of the generated energy by the distribution system operator, and in the issuing of certificates of origin which are tradable on the Polish Power Exchange (Towarowa Giełda Energii S.A.).	The implementation period of the programme NFOŚiGW is from 2009 to 2015.	There are three types of certificates of origin: 1) Certificates of origin from gas-fired units or units of installed capacity below 1 MW; 2) Certificates of origin from other cogeneration sources; 3) Certificates of origin from cogeneration units burning methane released and captured during deep mining operations in coal mines (open, under liquidation or closed), or gas obtained by processing biomass. The cogeneration support system is complemented by the provisions of the Energy Law which make it possible to impose a fine on those undertakings that fail to comply with the obligation to cancel a sufficient number of certificates of origin from cogeneration or to pay the substitution fee.	The total budget of the programme NFOŚiGW is PLN 1 400 million. Financial assistance to initiatives is provided in the form of loans, from PLN 4 million to PLN 50 million. Beneficiaries are selected in a competitive procedure, and are obliged to prove, inter alia, that the minimum total cost of the project is PLN 10 million. Levels of substitution fees from 2007 to 2011 2007 - 117.0 PLN/MWh 2008 - 117.0 PLN/MWh 2009 - 128.8 PLN/MWh 2010 - 128.8 PLN/MWh 2011 - 127.15 PLN/MWh	

Slovakia		Operational assistance: - Preferential connection or access to the distribution and transmission system. - Collection of electricity at a "loss-making electricity price" by the operator of the regional distribution system to which a plant is connected, directly or via a local distribution system - Supplement, *i.e.* the difference between the fixed set price (tariff) and the loss-making price of electricity; - Assumption of responsibility for deviations by operators of regional distribution systems; The price of electricity produced by high-efficiency combined production is set by an Order (e.g. Order No 7/2009, No 02/2010, ...) of the Regulatory Office for Network Industries (hereinafter the "Office") for specific kinds of combined production technology and different types of fuel. The price is made up of the loss-making price of electricity and the supplement Investment assistance: In order to support high-efficiency combined production, investment assistance was also provided through the use of money from the Structural Funds for the 2004-2006 programming period, in particular for industry through the Sectoral Operational Programme Industry and Services. In the 2007-2013 programming period, it was possible to draw on funds for high-efficiency combined production through four operational programmes:	During the period of support (usually 15 years) the fixed price of electricity produced by high-efficiency combined production remains at least at the level set for the year in which the plant was brought into operation or the year of reconstruction or modernisation of the plant. The loss-making price of electricity may change, however, and the supplement will change with it automatically. The price is made up of the loss-making price of electricity and the supplement It is set in such a way as to ensure a return on investment within about 12 years.		Funds provided in the form of operational assistance for electricity produced by combined production prior to 1 January 2010 are not monitored separately. The corresponding after January 2010 has not yet been calculated. It can be expected that operational assistance amounting to about EUR 20 million was provided on the basis of Act No 309/2009 in 2010. Investment assistance from the Structural Funds that is provided for high-efficiency combined production plants through individual operational programmes cannot be established clearly, since these are projects involving other activities as well as the construction or reconstruction of combined production plants. Clearly identifiable assistance for high-efficiency combined production plants was provided in 2007-2010 from the Operational Programme Competitiveness and Economic Growth, amounting to EUR 10.67 million.	The provision of investment assistance for high-efficiency combined production plants is not envisaged until the end of 2013. The future level of operational assistance depends on developments in the prices of primary energy sources as well as on the amount of electricity produced by high-efficiency combined production. It is provisionally expected to be EUR 20 million annually.

Slovenia	Amendments to the Energy Act EZ-C (OJ RS 70/08) created the statutory basis for the introduction of a new support scheme providing the right to support for electricity from high-efficiency cogeneration, as stipulated by Directive 2004/8/EC. The scheme has been implemented since November 2009	Support for electricity produced in CHP equipment through guaranteed purchase of electricity Financial aid for current operations is allocated for net electricity generated for which a guarantee of origin has been received and which CHP electricity generators sell themselves on the market or use for their own consumption, provided that the costs of producing this energy are greater than the price that can be obtained for it on the electricity market. CHP generating equipment with nominal power up to 1 MW is eligible for guaranteed purchase of electricity. For such generating equipment, during the validity of the contract on guaranteed purchase the support centre regulates the registration of the operating forecast and balances the difference between the forecast and actual production, including the balance sheet affiliation. Operators of CHP generating equipment with nominal power of up to 1 MW may decide, instead of guaranteed purchase, to sell electricity independently in the market, and to receive operating support, where they must themselves arrange the registration of their operating forecast and balancing the difference between forecast and actual production, including balance sheet affiliation. Generating equipment using CHP with nominal power of 1 MW and more may receive only operating support. Operating support is the difference between the reference costs of producing electricity in individual types of generating equipment and the reference market price of electricity, which is forecast for each year with regard to market conditions.	The duration of support is defined in the decision allocating support, and is 10 years for new CHP generating equipment. Support is paid out for net electricity production for which the support centre receives guarantees of origin.	Eligibility for support is held by new and mainly new CHP generating equipment that have a valid declaration for the generating equipment and that fulfil the prescribed conditions observed by the Energy Agency in the process of deciding on eligibility for support. CHP generating plants that attain specific CO_2 emissions of over 600 kg CO_2/MWh in the generation of electricity, may not receive support.	The amount of aid for high-efficiency cogeneration was In 2004 EUR 7.0 m In 2005 EUR 6.0 m In 2006 EUR 5.9 m In 2007 EUR 7.9 m In 2008 EUR 7.0 m In 2009 EUR 5.7 m In 2008 EUR 13.0 m	The Government prescribed in detail the method for determining the required quantity of funding for support, such that, before the start of each year being evaluated, the Support Centre at Borzen d.o.o. (market organiser) and the Energy Agency must prepare an estimate of the funding required. This is done on the basis of data on anticipated new investment in CHP generating equipment, and assessment of the likelihood that the equipment will be built and will receive a decision granting support within the envisaged interval, and on the basis of data from previous years for existing equipment.

Spain	In Spain there is a system of financial support for cogeneration provided for by Royal Decree No 661/2007, which is based on the Directive	The following support is provided for cogeneration: Priority access to the grid. The transfer of net electricity production to the grid via the transmission or distribution network provided that absorption by the grid is technically possible. Receipt for the sale of net electricity production of a financial return based on the financial scheme chosen, either sale at regulated tariffs or sale on the market. Where electricity is sold on the market, a premium on top of the market price is paid. In addition, the tariff and the premium are indexed to the price of the raw material (fuel) used for cogeneration. Receipt of an additional payment based on the extent to which the energy efficiency of cogeneration exceeds the minimum laid down.		As for the sectors covered, the support plan covers all activities that might require heat or cooling, including a considerable part of the industrial and tertiary sectors	The incentives provided over recent years were In 2007 EUR 571.4 million In 2008 EUR 714.6 million In 2009 EUR 1 035 million In 2010 EUR 1 302 million	The incentives planned to promote cogeneration until 2020 are: In 2012 EUR 1235 million In 2013 EUR 1366 million In 2014 EUR 1496 million In 2015 EUR 1622 million In 2020 EUR 2080 million

Sweden		Sweden support is based on an electricity certificate scheme. Other support schemes have also had a certain impact on the development of cogeneration, albeit only indirectly. The electricity certificate scheme is a market-based support scheme in which trading takes place between the producers of renewable electricity and those subject to the quota requirement. The aim of the scheme is to create competition between renewable sources of energy. The revenue gained by electricity producers when they sell electricity certificates replaces the investment aid and operational aid granted previously. Electricity suppliers are obliged to have electricity certificates corresponding to a certain share of the electricity they sell, *i.e.* the quota requirement. To meet the quota requirement, the electricity suppliers declare annually to the Swedish Energy Agency how much electricity they invoiced their customers for during the previous year and submit electricity certificates corresponding to a specific share (quota) of electricity sales. The declaration must be submitted by 1 March each year. Electricity-intensive industry and electricity users who have used electricity they have produced themselves, imported or bought on the Nordic power exchange are subject to quotas. Quotas have been set until 2035. Government proposal 2010/11:155 proposes a new Electricity Certificates Act which preserves the objectives and working methods of the current electricity certificate system unchanged but has simpler rules and has been extended to also cover other countries.	The electricity certificate scheme was introduced in Sweden on 1 May 2003, and the quotas – electricity certificates that electricity suppliers are obliged to, have been set until 2035	The Local Investment Programme (Lokala investeringsprogram, LIP) was another aid form that had a positive impact on the development of district heat between 1998-2002 when it existed, as does its successor, the Climate Investment Programme (Klimatinvesteringsprogrammet, KLIMP). These have enabled **municipalities and other operators** to apply for aid to take measures increasing ecological sustainability (LIP) and reduce greenhouse gas emissions (KLIMP). During the years in which LIP and KLIMP funding was paid out, approximately 260 district heating projects were granted funds83.		

- [83] ‘Incentives for increased cogenerated production’ [*Incitament för ökad kraftvärmeproduktion*] Report 2009:9.

United Kingdom		The support measures include: Exemption from the Climate Change Levy, introduced in 2001 worth 0.48p/kWh on electricity and 0.15pkWh on Gas , from all fuel inputs and electricity outputs from Good Quality CHP, Eligibility for Enhanced Capital Allowances for Good Quality CHP, introduced in 2001. Business Rates exemption for CHP power generation plant and machinery Reduction in VAT on certain grant-funded domestic micro-CHP installations . Extending the eligibility for Renewable Obligation Certificates to include mixed waste plants which use Good Quality CHP. This adds CHP to the list of eligible advanced conversion technologies Favourable treatment in Phases II of the EU Emissions Trading Scheme. CHP, as a low carbon technology, has benefited from the EU ETS as it does not have to buy as many allowances to emit CO_2 as conventional power stations. CHP also benefits from the operation of the Carbon Reduction Commitment, which introduced carbon trading for large non-energy intensive industries. In particular, CHP heat used on site or exported to other consumers will be treated as if it were zero carbon, even if it comes from fossil fuels. Established feed-in tariffs (FIT) for distributed generation, including gas fired micro-CHP with capacity less than 2 KWe.	From April 2009, CHP plants fuelled by biomass received two Renewable Obligation Certificates (ROCs) for each MWh of electricity, compared to 1.5 ROCs for biomass power-only plants. The Government has also confirmed that the Renewables Obligation will continue up to 2037, providing long-term certainty about this source of revenue for renewable generators	Developers of new power stations have to show that they have explored fully any opportunities for existing and likely local business or community uses of heat. To facilitate this, the Guidance contains new heat maps which were developed by the Department of Energy and Climate Change (DECC), indicating potential local heat customers. Whilst the UK Following a major upgrade, the Guidance can also be used by both small and large organisations to help identify the locations where the supply of CHP heat would have the greatest potential, and therefore the largest positive environmental impact. The map includes heat loads across all UK sectors including industrial, commercial, public and domestic.	The value of the Climate Change Levy exemption for Good Quality CHP is in the order of EUR 60-80 million per year (total value to CHP operators of about EUR 600-800 million since 2001). The total Enhanced Capital Allowance tax reduction benefit for investment in Good Quality CHP, since 2001, is estimated to be in the order of EUR 60 million for a total investment in the order of EUR 1.2 billion. The Renewables Obligation Order which came into force on 1st April 2009, provides Good Quality CHP Schemes fuelled wholly by biomass with an uplift in Renewable Obligation Certificated (ROCs) benefit from 1.5 to 2 ROCs/MWh and schemes fuelled by waste with 1 ROC/MWh. In the first 2 years since the Order came into force, the value of the additional ROCs issued has been estimated to be in the order of EUR 15-20 million per year to CHP operators.	

6. CHP COUNTRY SUMMARIES

6.1. Austria

Progress

The share of cogeneration in the overall electricity production was 15.4% in 2010, reflecting a stable level over the previous five-year period since 2005, when this share was also 15.4%. The energy regulatory authority's (E-Control)'s monitoring reports on security of supply describe plans to build new thermal power stations[84]. Most of the proposed projects use cogeneration plants and will be located close to towns with district heating requirements. Some of these plants have received support in the form of investment subsidies under the Cogeneration Act.

Support schemes

There are three support schemes :

- Operational aid for existing cogeneration plants which received money between 2003 and 2010 in order to maintain operation;
- Investment aid for new cogeneration plants for the 2007-2012 period (2014);
- Investment aid for waste lye-based cogeneration plants (pulp/paper production) for the 2009-2012 period.

30 % of the available funds are reserved for industrial cogeneration plants

Funding

Some EUR 350 million in operational aid under the Cogeneration Act was provided between 2003 and 2010. Roughly EUR 50 million of the total available investment subsidies under the Cogeneration Act (EUR 55 million) has so far been provided.

None of the EUR 10 million available under the Green Electricity Act to waste lye-based cogeneration plants has so far been provided.

6.2. Belgium

Progress

The share of electricity from cogeneration has reached 16% in 2010, doubling the 8.5% share in 2005, according to Eurostat. This can be seen as a result of ambitious policies, including targets, supported by certificate schemes in the various regions.

Region Wallonia

The share of cogeneration in relation to the total consumption of electricity and heat in the Walloon Region is progressing steadily. At the present time, the strongest growth is in micro-cogeneration (<50 kWe), which means that the overall quantities of heat and electricity produced by cogeneration are progressing relatively slowly.

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[84] http://www.e-control.at/de/publikationen/publikationen-strom/berichte/monitoringreport-versorgungssicherheit

However, the share of high-efficiency cogeneration is also progressing strongly in relation to cogeneration overall. This is due mainly to the green certificate mechanism and other types of support promoting high-quality cogeneration.

Flemish Region

Due to an effective support scheme for CHP is based on a system of certificates with an annual quota, progress towards reaching a targeted level of CHP has been quicker than expected

The Brussels Capital Region

The current electrical capacity installed equals 23.4 MW in the Region. The data suggest cogeneration is increasing in the Brussels Capital Region. The number of CHP has moved from 25 in 2006 to 40 in 2009 where 9 new installations were put in service and certified. The latter should influence the production of electricity and heat as from 2010.

In 2020, the electrical capacity installed in the Brussels Capital Region could go beyond 75 MW.

6.3. Bulgaria

Progress

According to the national progress report the share of cogenerated electricity in 2009 fell by 38 % compared to 2008. Bringing units and their operation in line with European requirements for high efficiency cogeneration resulted in a 4 % increase in 2010 in the production of cogenerated energy compared with 2009.

The same trend has also been observed with the cogeneration of thermal energy. There was a decline of 28 % in 2009 compared with 2008, and after the technological operation regime was brought in line with high efficiency combined production, there was an increase in cogenerated thermal energy of 10 % in 2010 over 2009. The share of cogenerated thermal energy in total thermal energy generated grew from 70.70 % in 2009 to 78.17 % in 2010. Because of the increase in the share of energy generated from renewable sources, despite the upward trend in the production of electricity through cogeneration, the share of cogenerated energy in total electricity output in Bulgaria in 2010 fell from 8.53 % in 2009 to 8.21 % in 2010 (or to 8% according to Eurostat). This however is still an increase from the 6% reported in 2005.

Following a drop in output in 2009 at heating power stations and industrial thermal power plants, in 2010 there was a stabilisation of the thermal energy produced at such plants with slight upward trend of 3.3 % observed on 2009. At industrial thermal power plants thermal energy produced increased by 16 % on 2009.

The amounts of fuel used in cogeneration followed the output of electricity and heat: a decrease in 2009 compared with 2008, and an increase in 2010.

Support schemes

There are preferential prices for the sale of electricity produced by electrical and heat energy cogeneration facilities based on individual production costs and supplements per producer group according to the following criteria:

Predominant nature of the main thermal load;

- Type of fuel used;
- Cogeneration technology;
- Unit/station capacity.

There are three main groups of producers:

1. Heat producers, where the main heat load is for heating and domestic hot water;

2. Industrial producers which supply industry with the required thermal energy, mainly steam and hot water required by the food industry;

3. Agriculture, where thermal energy is required for greenhouses, mainly for growing vegetables.

Funding

During the pricing period from 01 July 2010 to 30 June 2011 for which the DKEVR set preferential prices, funding only from the high efficiency power generation supplement stood at BGN 80 million, while for the next pricing period from 01 July 2011 to 30 June 2012 an increase of around 21 % is expected.

6.4. Cyprus

Progress

There has not been a significant increase in high-efficiency cogeneration since the last report on national potential submitted in 2009. There was however a slight increase from the level of 0.3% in 2005 to 1% in 2010, as reported by Eurostat. The biggest high-efficiency cogeneration sector is industry (75%) and the rest is from biomass units (biofuel) for electricity production. The principal low-efficiency cogeneration sector is industry (50%) and the rest is from biomass units for electricity production

Support schemes

In 2008 EUR 103 609 was made available and in 2009 EUR 436 906 via the grant scheme Development of Biomass/Combined heat and power. No sum was made available in 2010.

Funding

In 2011 provisions were made for EUR 50 000 out of the budget of the Special Fund for Energy Conservation and Utilisation of Renewable Energy Sources.

6.5. Czech Republic

Progress

The fraction of high-efficiency CHP has remained at around 13% in the last three years as can be seen from the Table 40 below on the total generation of electricity and heat 2008-2012[85].

According to Eurostat, the share of cogeneration stood at 13.2% in 2010, a decrease compared to the 16.8% share in 2005.

The initial situation in the Czech Republic in terms of the use and development of cogeneration is perceived as good overall. Sources of cogeneration and the centralised supply of heat have long traditions in the Czech Republic. The application of condensation extraction and back-pressure steam turbines in particular was supported and developed even during the era of central planning. Modern technology is available, the network of financial supports works well and there is enough operating experience and know-how for the preparation and implementation of new cogeneration projects.

The Czech Republic applies support for cogeneration in the form of a bonus for electricity from high-efficiency cogeneration of electricity and heat.

There is no direct state aid for cogeneration, but the legislation in force assumes support within the system of price regulation conducted by the Energy Regulatory Authority in the form of a price decision, which invariably lays down the level of support for the following calendar year. No long-term guarantee of the level of support is laid down and in this sense the support scheme does not therefore provide stable long-term investment conditions. The support scheme is universal and is not targeted to a specific sector.

It ensues from the specified legislative development that the legislation in the Czech Republic relating to cogeneration is currently in full compliance with the aims of Directive 2004/8/EC

[85] Explanatory notes for table:

Number of companies: the number of companies that use the relevant fuel for cogeneration of electricity and heat. If the company has more than one type of fuel, it is counted for each one separately in the table.

Number of facilities: the number of facilities for cogeneration (CEH), among which are steam gas facilities with heat supply, back pressure steam turbines, condensation extraction turbines with heat recuperation, combustion piston engines, micro-turbines, Stirling engines, fuel cells, steam turbines, organic Rankin cycle or a combination of the facilities and technologies stated. In the case of the combustion of more than one type of fuel, the facility is only counted for the fuel which has the main energy share.

Electrical and heat power (MW): the output of a cogeneration facility according to the technical data of the producer.

Electricity (GWh) and heat (TJ) generation: the values of cogeneration specified according to decree for the relevant fuel. The generation of heat is defined as the "supply of useful heat", meaning heat generated in cogeneration for use by another natural or legal person or for own technological use at the parent company (not for the own use of the electricity and heat generating plant). The electricity generated is therefore determined using the amount of useful heat.

Charge: the consumption of the relevant fuel in cogeneration. The relevant unit is specified for each group of fuels.

and contributes significantly towards the possibility of making savings on primary fuel and reducing the load on the environment.

Table 40: Total generation of electricity and heat 2008-2012 in Czech Republic

				2008			2009			2010			
Companies	Number of facilities	Electrical power (MW)	Thermal power (MW)	Electricity generation (GWh)	Heat generation (TJ)	Charge	Electricity generation (GWh)	Heat generation (TJ)	Charge	Electricity generation (GWh)	Heat generation (TJ)	Charge	Unit
39	109	7,133	21,197	6,159	69,072	9,114	5,828	68,905	8,928	6,239	77,075	9,718	103t
14	31	1,998	5,613	2,639	25,410	2,122	2,312	24,231	2,123	2,394	25,420	2,147	103t
15	16	193	924	168	4,012	127	143	3,388	113	115	2,834	93	103t
16	-	-	-	192	3,888	726	382	4,937	1,006	367	4,826	1,061	103t
3	3	3	32	19	746	94	18	699	98	41	941	145	103t
2	2	9	79	5	188	6	14	150	7	4	100	4	103t
152	429	614	2,439	952	10,348	4,713	887	9,473	4,454	986	11,359	5,246	GWh
81	183	49	63	138	789	84	200	872	132	275	1,299	191	106m3
11	27	175	314	1,098	8,646	3,969	750	6,822	3,005	852	8,006	3,679	106m3
3	3	9	24	36	356	900	28	307	835	25	378	910	TJ
-	803	10,182	30,684	11,406	123 455	228 419	10,562	119 784	223 199	11,298	132 238	241 370	TJ
generation (ERO)				83,518			82,250			85,910			
tricity from CEH				13.7 %			12.8 %			13.2 %			

Table 41: Share of fuels in cogeneration in 2010 in Czech Republic

Brown coal	54 %
Renewable sources	2 %
Oil and oil products	2 %
Biomass	5 %
Biogas and stored gas	2 %
Waste	1 %
Other fuels	5 %
Natural gas	7%
Black coal	22 %

Support schemes

• A system of support for the purchase of electricity from cogeneration through price regulation is in place, implemented by the Energy Regulatory Office based on the energy-related legislation in force.

• Cogeneration investment support projects, however, appear in grant programmes at the CzechInvest agency and the State Environmental Fund (SEF) only to a limited extent.

Funding

The total costs of operational support for high-efficiency cogeneration of electricity and heat are presented in the table below:

Table 42: Total costs of operational support for high-efficiency cogeneration of electricity and heat

Year	2007	2008	2009	2010	2011
Additional costs of support for cogeneration of electricity and heat (thousands of CZK per annum)	502 992	416 342	521 595	696 091	701 240

6.6. Denmark

Progress

Although there has been widespread expansion of cogeneration in Denmark, there is still a certain technical potential for further expansion. According to Eurostat, the share of cogeneration in electricity production was 49.2% in 2010.

The first progress report, submitted to the Commission in February 2007, estimated the technical potentials over and above the existing cogeneration. The potentials were divided into three categories:

(1) 800 MW (electricity) in the form of decentralised cogeneration. The potential assessment is based on the scope to increase the *Cm* value (the power to heat ratio, *i.e.* electrical output/thermal output) by establishing new cogeneration plants covering the same heat markets as the current decentralised cogeneration plants;

(2) 1 200 MW industrial cogeneration;

(3) 2 200 MW in the form of micro-cogeneration with an electrical output of less than 50 kW. This potential is likely to be reduced since a large portion of the heat market associated with the potential is expected to convert to heat pumps, district heating, etc.

As the potential assessment submitted by the Agency to the Commission in 2010 found the socioeconomic potential of cogeneration to be limited, measures were not taken to increase the share of high-efficiency cogeneration in Denmark.

Cogeneration plays an absolutely crucial role in Danish energy supply, and Denmark is one of the countries with the highest cogeneration cover in the European Union.

District heating, which supplies around 60% of Danish households with heating energy, is the most important basis for cogeneration, and nowadays the majority of district heating is produced at cogeneration plants together with electricity. In addition, there is some industrial cogeneration.

The widespread cover through cogeneration is the result of a targeted policy of promoting this form of production – a policy that has laid the foundations for cogeneration to continue to make an important contribution to Danish energy supplies in the future.

Proportion of electricity and district heating produced by cogeneration:

In 2010 60 % of thermal electricity production (*i.e.* total production excluding wind power and hydropower) was produced together with heat. The proportion of electricity produced by cogeneration has generally risen: in 1990 cogeneration accounted for 37 %, compared to a mere 18 % in 1980. There will be annual variations resulting from cold or warm winters, just as levels of rainfall in the Nordic countries affect the price of electricity and consequently the commercial profitability of cogeneration under market conditions. In other words rainfall affects hydropower generation in the Nordic countries and therefore the amount of electricity that Denmark exports, as electricity for export is mainly produced at separate electricity production plants.

In 2010 a total of approx. 78 % of district heating was produced by cogeneration, compared to 59 % in 1990 and 39 % in 1980. On account of the market conditions, electricity is not produced together with district heating if electricity prices are low. The proportion of district heating produced by cogeneration has decreased slightly as a consequence of the liberalisation of the gas and electricity market, so electricity and heat are coproduced only where there is a financial benefit to the cogeneration plants.

High shares of wind power in the electricity system will – all other things being equal – reduce the proportion of district heating produced by cogeneration on account of the resulting reduction in electricity prices.

Table 43: Cogeneration production broken down by type of production

Sheet No 3 Technologies				TOTAL	CCGT with heat recovery	Steam back-pressure turbine	Steam condensing extraction turbine	Gas turbine with heat recovery	Internal combustion engine
2000	electricity	capacity	[GW]	6.5	0.51	0.68	4.10	0.27	0.91
		output	[TWh]	23.0	2.15	2.72	13.15	1.28	3.65
	heat	capacity	[GW]	9.1	0.55	2.34	4.47	0.50	1.21
		output	[TWh]	30.8	2.75	9.14	11.51	2.40	4.98
	fuel	input	[PJ]	245.4	20.24	50.56	123.16	15.86	35.55
2004	electricity	capacity	[GW]	5.9	1.08	0.70	2.84	0.28	1.00
		output	[TWh]	25.4	4.66	2.52	12.77	1.38	4.05
	heat	capacity	[GW]	9.0	1.17	2.29	3.63	0.58	1.33
		output	[TWh]	30.9	4.93	9.09	9.01	2.48	5.41
	fuel	input	[PJ]	261.2	42.82	47.81	116.01	16.27	38.26
2005	electricity	capacity	[GW]	6.8	1.08	0.61	3.85	0.28	1.02
		output	[TWh]	25.7	4.14	2.75	13.79	1.28	3.72
	heat	capacity	[GW]	9.2	1.14	1.94	4.21	0.56	1.35
		output	[TWh]	31.4	4.75	9.26	9.97	2.43	4.97
	fuel	input	[PJ]	265.2	38.64	49.07	127.02	15.41	35.06
2006	electricity	capacity	[GW]	6.4	1.08	0.61	3.46	0.29	1.00
		output	[TWh]	29.8	4.89	2.60	17.69	1.35	3.23
	heat	capacity	[GW]	8.7	1.14	1.94	3.76	0.57	1.31
		output	[TWh]	29.5	5.06	8.79	8.88	2.45	4.35
	fuel	input	[PJ]	294.5	44.55	46.60	157.02	15.73	30.61
2007	electricity	capacity	[GW]	6.3	1.08	0.84	3.14	0.20	1.02
		output	[TWh]	23.8	3.85	2.76	13.79	0.74	2.64
	heat	capacity	[GW]	9.6	1.16	2.78	3.94	0.40	1.33
		output	[TWh]	28.5	4.53	9.83	9.22	1.36	3.53
	fuel	input	[PJ]	249.0	36.84	51.75	126.71	8.93	24.74

2008	electricity	capacity	[GW]	6.2	1.07	0.77	3.14	0.19	1.03
		output	[TWh]	22.9	3.88	2.78	12.54	0.87	2.70
	heat	capacity	[GW]	9.3	1.14	2.50	3.94	0.39	1.33
		output	[TWh]	28.6	4.39	9.81	9.20	1.62	3.57
	fuel	input	[PJ]	240.6	36.08	51.93	116.76	10.57	25.22
2009	electricity	capacity	[GW]	5.6	1.05	0.59	2.74	0.24	1.02
		output	[TWh]	22.2	3.51	2.66	12.95	0.68	2.41
	heat	capacity	[GW]	8.2	1.07	1.83	3.51	0.41	1.33
		output	[TWh]	27.0	4.01	9.95	8.62	1.23	3.20
	fuel	input	[PJ]	231.6	32.32	50.86	117.78	8.14	22.50
2010	electricity	capacity	[GW]	6.2	1.06	0.58	3.31	0.24	1.04
		output	[TWh]	25.3	4.35	2.79	14.52	0.74	2.91
	heat	capacity	[GW]	8.9	1.12	1.79	4.18	0.48	1.34
		output	[TWh]	32.6	5.09	9.98	12.19	1.45	3.88
	fuel	input	[PJ]	265.7	40.67	52.38	136.55	9.01	27.05

2010 was a cold year, which meant that more heat was produced at both central and decentralised cogeneration plants and more electricity was therefore also produced at Danish cogeneration plants than in the previous two years.

Regarding the production of electricity, broken down by fuel, the general trend is a fall in electricity production based on coal and natural gas and a slight rise in electricity production based on wind power and biomass. However, the picture is blurred by significant variation in annual production.

Regarding the production of district heating, broken down by production plant, cogeneration in Denmark is mainly district heating-based. In 2010 gross production was approx. 150 PJ, nearly half of which was produced at central cogeneration plants, approx. 20% at decentralised cogeneration plants and just over 10% at private cogeneration plants, while approx. 20% came from plants producing only heat.

2010 was a cold year, which meant that more heat was produced at both central and decentralised cogeneration plants.

Support schemes

In Denmark electricity produced together with heat is given priority grid access.

The production and expansion of cogeneration are given the financial support required to cover the necessary investment costs without unduly increasing the district heating costs borne by consumers. Operating aid is also provided for high-efficiency cogeneration. This aid may be classified as follows:

- Production-independent subsidies granted to electricity producers, financed as a PSO (Public Service Obligations) contribution through the electricity price charged to consumers;
- Production-dependent subsidies (price supplements) granted to electricity producers, financed by the budget.

Additional operating subsidies for cogeneration are also granted on the basis of renewable energy (biomass and biogas) and financed by electricity consumers as PSO contributions. These subsidies are awarded as price supplements for biomass or as a fixed total price (market price + operating subsidy) for biogas.

Until 2010 operating subsidies were also awarded for cogeneration using domestic waste as a fuel. In the case of biomass-based cogeneration, heat production is also exempt from taxation. Subsidies are granted both for cogeneration geared towards the heat market and for industrial cogeneration.

The high-efficiency cogeneration support schemes are designed to provide stable long-term investment conditions for electricity producers and will run for a period of 20 years from the date of establishment of the plant, and in any case for no less than 15 years from 2004.

Funding

The PSO (Public Service Obligations) contribution costs of environmentally friendly electricity production in previous years are divided in Table 44 below into wind, biomass, etc., and decentralised cogeneration. In 2010 the PSO costs of high-efficiency decentralised cogeneration were, as may be seen, DKK 573 million.

Table 44: PSO costs of environmentally friendly electricity production (DKK million)

PSO costs of environmentally friendly electricity production (DKK million)						
	2005	2006	2007	2008	2009	2010
Wind	1 668	1 076	1 631	667	1 242	1 069
Biomass, etc.	368	245	419	228	424	461
Decentralised cogeneration	906	401	1 179	170	1 267	573
Total	2 942	1 722	3 229	1 065	2 932	2 103

In previous years the costs of high-efficiency cogeneration, financed under the Finance Act, were as follows:

Table 45: Decentralised cogeneration costs, financed under the Finance Act (DKK million)

Decentralised cogeneration costs, financed under the Finance Act (DKK million)						
	2005	2006	2007	2008	2009	2010
Natural gas-based cogeneration	127	129	100	129	104	92
Waste-based cogeneration	118	148	79	117	99	0
Total	245	277	179	246	203	92

It has been highlighted that the plan is to adjust the payments made under the Finance Act to basic amounts financed as PSO contributions.

Overall support for high-efficiency cogeneration (excluding special subsidies granted for biomass or biogas-based cogeneration) is expected to be at a similar level to 2010, *i.e.* approx. DKK 700 million *per annum*.

6.7. Estonia

According to the date provided in the Excel template as part of the national progress report, the share of cogeneration varied in the range of 7-10.8% between 2000 and 2010. It was 7% in 2010 (10.3% according to Eurostat, which includes all cogeneration), 9.2% in 2009, 8.6% in 2008, 7.1% in 2007, 10.7 in 2006, 10.2% in 2005, 9.9% in 2004 and 10.8 in 2000.

Measures which foster the development of cogeneration are based on European Union legislation, national legislation and support schemes. However, it is also necessary to recognise the achievements of local authorities. Where district heating is used in densely populated areas with a view to safeguarding district heating systems, they have analysed the development of the local energy economy and in many cases established district heating areas (areas in which district heating is the only available source of heating). Local authorities and their utility companies have searched actively for funding, e.g. from EU Funds, to improve the condition of district heating systems and, as regards support, have provided the co-financing required for projects.

The development of cogeneration in Estonia can be considered satisfactory. The contribution of cogeneration plants on the electricity market has been preserved in spite of significant changes in the energy sector, such as the closure of old oil-shale fuelled cogeneration plants in Estonia, the increase in natural gas prices to a level comparable to that of other EU countries and the dwindling market in heat. The use of local fuels in cogeneration is increasing. Peat and renewable biofuel are local fuels with considerable energy potential which can be used sustainably in small-scale cogeneration plants.

The fact that a considerable proportion of the heating market is made up of relatively low-consumption networks is a barrier to the development of cogeneration.

In addition to the support scheme provided for under the Electricity Market Act under which support is paid for electricity produced in efficient cogeneration plants, investment aid is granted in Estonia for low-capacity cogeneration plants fuelled on sustainable fuels. The aim of the support scheme provided for under the Electricity Market Act is to stimulate investments in cogeneration. No distinction is drawn between sectors as regards the support schemes.

Some EUR 420–470 million has been spent solely on establishing cogeneration plants, to which must be added the cost of improving the electricity grid and modernising the district heating network.

6.8. Finland

Progress

Progress has been made in high-efficiency cogeneration. This progress has been supported by investments in the development of technology and its promotion, legally guaranteed equal access to markets and good cooperation between private operators and public organisations. It is difficult to identify the impact of individual measures on the use and role of high-efficiency cogeneration. National legislation does not set out to promote cogeneration in any particular way but nor does it put any obstacles in the way of its use.

In Finland 70-76% of district heat is produced by cogeneration, depending on the average winter temperature There is no longer much potential to increase this share in Finland, because the market share of district heating is nearly half of the total heating demand of all residential and service buildings and can exceed 90% in the biggest cities.

In recent years cogeneration electricity has accounted for about 35% of all Finnish electricity production. According to Eurostat data, the share of electricity from cogeneration was 36.2% in 2010, one of the highest in Europe and covering the majority of thermal power generation, including biomass. This is, however, a slight decrease from previous years, e.g. the share stood at 38.9% in 2005.

In turn, cogeneration heat makes up nearly 80% of the heating energy used in industry and district heating. The volume of district heating has continued to climb somewhat in recent years, but in order to increase its share markedly it would often be necessary to introduce district heating in areas where, due to low demand, it would not be able to compete with other heating solutions on market terms. Whether the energy-intensive industry can further increase cogeneration volumes depends directly on its capacity utilisation rate and the possibility of raising it, which in turn are dependent on the international competitiveness of these sectors and on trends in global demand.

Figure 19: CHP heat production percentage in Finland

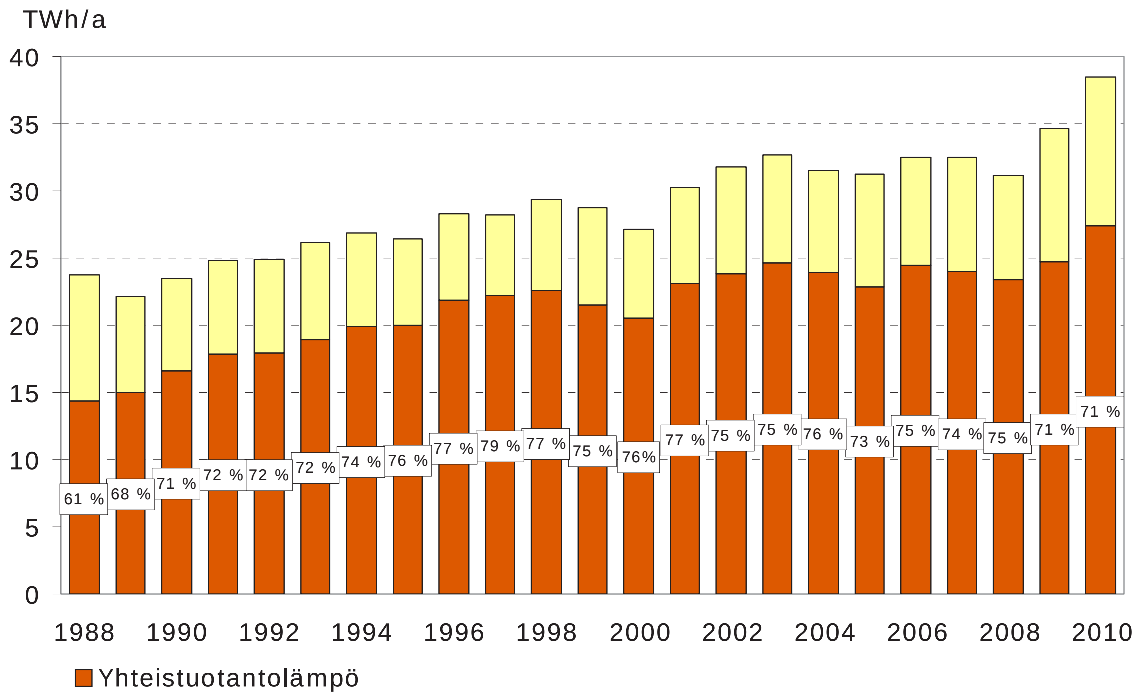

Table 46: Market Shares of Heating:

district heat	49%
electricity	18%
heat pump	5%
domestic fuel oil	12%
wood	14%
heavy fuel oil	1%
natural gas	1%

In recent years, district heating has had to face ever-tighter competition on the heating market. A few individual consumers have left existing district-heating networks and switched, for example, to geothermal heat. The growing competition can be seen especially in new residential areas, where there are discussions on which heating system(s) can best meet the areas' energy needs. Criteria include not just competitiveness but also other factors such as suitability for the area, reliability of the service, the company's image and effects on emissions.

In recent years, geothermal heat has emerged as the biggest challenger of district heat on the heating market. Geothermal heating systems work by transferring heat stored in the soil, rock or water by a heat pump to the buildings to be heated. The system is characterised by a rather high level of investment and relatively low operating expenses based on electricity. The competitiveness of geothermal heat is closely linked to the level of investment and trends in electricity prices.

In addition to geothermal heat, various hybrid systems that combine solar thermal/photovoltaic solar energy, heat pumps or e.g. pellet heating, have become more popular and they are considered modern heating systems such as geothermal heat.

Support schemes

Cogeneration is not in itself grounds for granting energy support. As support is granted on the basis of renewable energy use or new technology, there are no separate statistics on the support received by cogeneration plants. Most of the energy-production projects based on wood, biogas or recycled fuels are carried out at cogenerations plants.

Funding

Total Support in 2008-2010 was EUR 171,9 million .

6.9. France

Progress

In the beginning of the 2000s cogeneration using fossil energy grew, then stabilised and started decreasing in 2008, in accordance with energy policy objectives, which aim to develop cogeneration based on biomass so that it would gradually replace existing natural-gas-based installations.

According to Eurostat data, the share of electricity from cogeneration was 2.8% in 2010. This share was 4% in 2005.

Support schemes

There is a tendered guaranteed purchase scheme at favourable rates.

Funding

The compensation for the feed-in of electricity produced by cogeneration installations is estimated in 2011 at EUR 705.3 million as regards natural-gas-based units and at EUR 53.2 million for biomass-based units.

6.10. Germany

Progress

Net CHP electricity generation increased by 14 TWh, from around 76 TWh to approximately 90 TWh between 2002 and 2010. The CHP share of total net electricity generation thus increased by 1.5 % to currently 15.4 % (reported in the national progress report of May 2012). In 2010, it stood at 13.2% as reported by Eurostat.

Of the total generated, *i.e.* approx. 90 TWh, around 53 TWh was generated by general supply plants. In industry, net CHP electricity generation increased from 23 TWh to around 27 TWh. The CHP share of electricity generation by plants supplying industry thus increased by 9 % to 62 %. CHP plants of less than 1 MW and biogenic CHP plants had the most dynamic growth. Electricity generation in small conventional CHP plants increased by 1.6 TWh to 3.5 TWh between 2002 and 2010.

Support schemes

The contribution of biogenic CHP plants receiving aid under the Renewable Energies Act (Erneubare-Energien-Gesetz, EEG) increased from virtually nil in 2004 to 5.9 TWh.

Among plants receiving subsidies since 2002, small CHP plants of up to 2 MW_e predominate in terms of numbers, but contribute only around 4 % to total net CHP electricity generation.

Electricity generation in high-efficiency CHP plants is currently promoted in the framework of the Cogeneration Act through a subsidy scheme financed by levies where the market price for electricity is topped up in the case of modernisation and building of new plants . Since 2009 the construction of new and extension of existing heating networks have also been promoted through the scheme financed by levies under the Cogeneration Act.

Since 2009 the total amount has been capped at EUR 750 million per year, of which EUR 150 million per year for network development. This limit has not been reached since, however, as the 'evolution' of older, large plants led to a constant decrease in the scheme's costs in the past couple of years. Meanwhile the construction of new plants followed a downward trend.

According to the study carried out for the interim review, subsidy payments under the Cogeneration Act will drop from currently EUR 384 million (2010) to EUR 159 million (2011). The reason for this is the expiry of subsidies for modernised CHP plants as well as for plants with a capacity of 50 KW to 2 MW that came into operation between 2002 and 2008. As a result, in 2011 subsidy payments for CHP electricity will decrease from currently around EUR 342 million to EUR 109 million. On the other hand, subsidy payments to heating networks will increase from EUR 42 million to EUR 50 million in the same period.

Based on the assumption that subsidy payments to heating networks will remain stable at EUR 50 million per year, the experts estimate that, due to the expected expansion of CHP generation, total subsidy payments will nevertheless increase to a level of about EUR 630 million by 2017 and thereafter decrease to about EUR 560 million by 2020.

6.11. Greece

Progress

Overall as reported by Eurostat, the share of cogeneration was 4.3% in 2010, a significant increase compared to the 1.7% share in 2005. As regards progress made in the last four years (in the period since the last progress report), this is depicted in Figure 8 below and described in the section below.

Figure 20: Development of the electricity and heat generated by HECHP plants in Greece

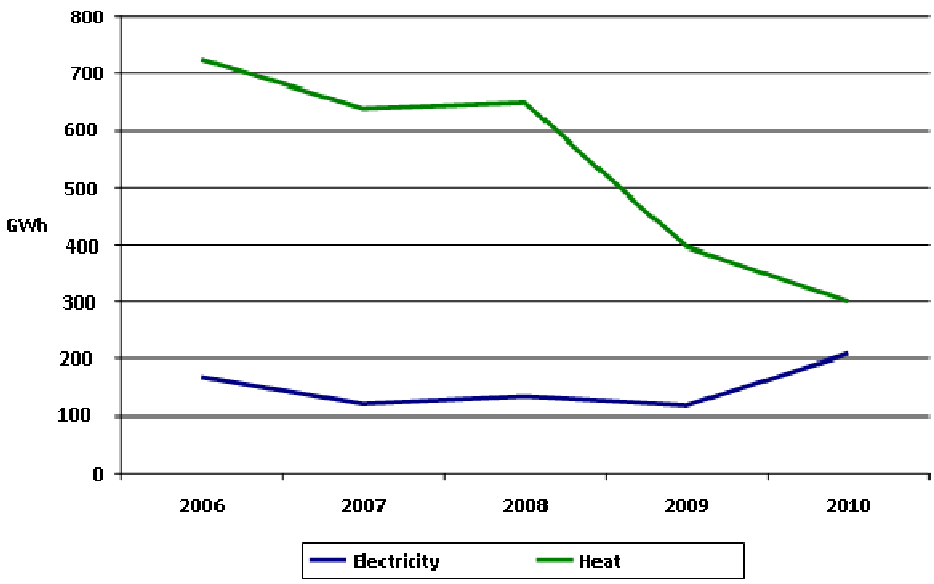

Figure 2020 clearly presents a relatively steady increasing trend in electricity production in 2010, in contrast with heat production, which is marked with more intense fluctuations. In particular, following a small drop in heat production in 2007 and steady production levels in 2008, there was a significant drop in 2009, which went on in 2010. The drop was mainly due to fluctuations in the production activity of units and was influenced by a number of factors, the most important one being an increase in fuel prices which made the operation of some units inexpedient. The effect of fuel prices can also be seen in the change of the fuel mix used by HECHP units. Natural gas was the basic fuel used by HECHP units in 2006; however, there was a significant reduction in its use in 2007, followed by an increase. Increased penetration of diesel was observed in 2007 and 2008, but its use dropped significantly in the following years.

Finally, the penetration of HECHP units using biogas seems of particular importance since 7 units of a total installed electric and thermal capacity of 8.9 MW_e and 27.0 MW_{th}, respectively, operated in 2010.

Important findings are derived from the above graph for the period after 2009, during which, despite continued and increased consequences from the economic recession, the institutional changes and adjustments made from 2009 onwards within the context of transposing the Directive appear to be boosting and reinforcing the share of HECHP units.

Taking into account the above behaviours, the recent changes made in support of natural gas-fuelled CECHP and the development of new financing instruments and reinforcement/activation of existing ones are expected to contribute towards the growth of HECHP units, in particular in sectors (“other sectors” category in the above graphs) including applications mainly in the tertiary sector. Moreover, the expansion of the natural gas network may support the prospect of developing district heating applications, which has resulted in the appearance of relevant units since 2009.

Support schemes

There are a range of support schemes including FITs and investment subsidies.

Funding

3 CHP investment plans were financed, of a total budget of EUR 12.5 million, with State expenditure amounting to EUR 4.4 million. In addition, as part of Measure 2.1.3 “Economic incentives for supporting individual private energy investments”, 12 CHP investment plans were financed, of a total capacity of 278.6 MW and a total budget of EUR 1071.9 million, with State expenditure amounting to EUR 352.9 million.

Figure 21:1 presents a breakdown of the electricity and heat generated by HECHP units per operating sector for the years 2007 to 2010 in Greece. The largest percentage of the electricity generated was observed in the industrial sector by 2008, whereas district heating gradually occupied a significant share from 2009 onwards, finally reaching 23% of the heat generated by HECHP units. This, however, is caused to a large extent by the drop in the heat generated by HECHP units in industry, which was reduced by 81% in absolute figures. The contribution to the generation of electricity from other sectors, despite being steady by 2009, doubled in 2010, but their contribution to the generation of heat rose more rapidly as far as the relevant share was concerned, reaching almost 60% of the heat generated by HECHP units in 2010. Graph 8 presents a breakdown of the electricity and heat generated by HECHP units per technology. Steam turbine units were used in electricity generation mainly in 2007, while at the same time the share of internal combustion engines was rising thus making them the key technology in 2009 and 2010. The share of gas turbine units remained steady in the period under examination and tended to drop in 2009 and 2010. The same trend was observed in connection with heat generation, where the operation of steam turbine units was gradually replaced by internal combustion engines, whereas the share of gas turbine units was particularly high in 2010 as compared to previous years.

Taking into account the above behaviours, the recent changes made in support of natural gas-fuelled CECHP and the development of new financing instruments and reinforcement/activation of existing ones are expected to contribute towards the growth of HECHP units, in particular in sectors ("other sectors" category in the above graphs) including applications mainly in the tertiary sector. Moreover, the expansion of the natural gas network may support the prospect of developing district heating applications, which has resulted in the appearance of relevant units since 2009.

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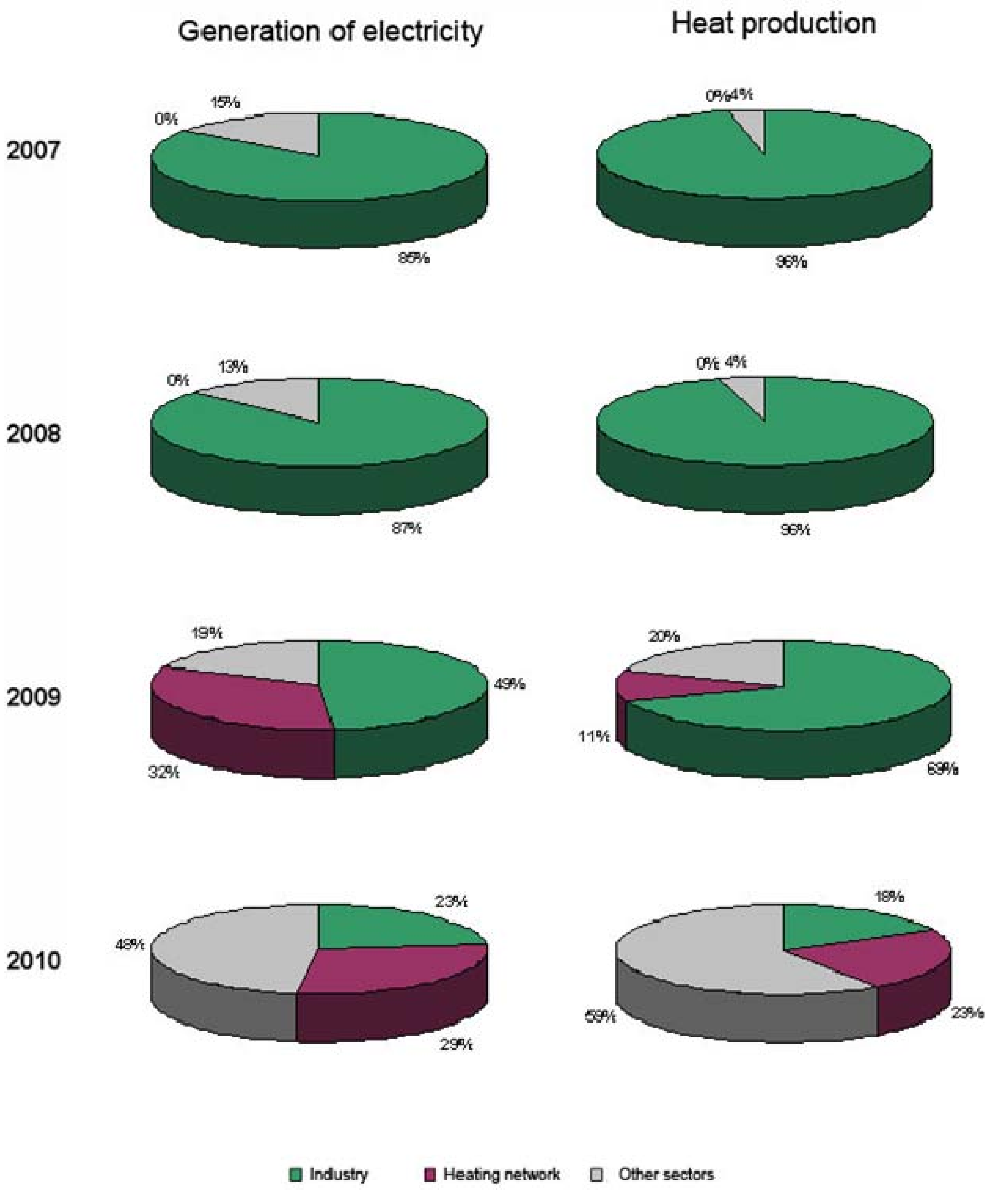
Figure 21:1 Development of the electricity and heat generated by HECHP plants in Greece



6.12. Hungary

Progress

2000 high-efficiency cogenerated electricity accounted for 9% of total electricity generation. In 2004 the rate stood at 16%, in 2005 at 19% and in 2006 at 21%. After that, it hovered around the 20% mark. In 2009 the rate fell slightly, to 18%. In 2000 high-efficiency cogenerated heat accounted for 29% of total heat production. In 2004 the rate stood at 44%, in 2005 at 55%, rising steadily to 66% in 2008. In 2009 it was down to 56%. The sharp growth witnessed since 2000 was the result of the introduction of a support system. The reasons for the slowdown and eventual stalling of this growth may be the possible withdrawal of the support system in the future and the limited nature of the heat market. Of total cogenerated heat production, both high efficiency and non-high efficiency, more than 80% of total heat demand is met from cogeneration. The economic crisis that began in 2008 has also had a negative impact on both investment and production.

As regards fuels, natural gas accounted for a significant share of the total fuels used throughout the period under review. Natural gas represents more than 90% of electricity generation and since 2006 more than 80% of heat production. Since the middle of the decade there has been an increase first in biogas then in biomass use, although they still account for only a small share of the total.

In terms of sectors, by 2005 there had been a sharp increase in 'district heating', while 'non-district heating' saw a bigger increase in 2006 and 2007. The lowest increase was in the industrial sector. 2009 saw a slump in industrial and non-district heating, presumably due to the economic crisis.

As regards the technology, CCGT with heat recovery saw the biggest increase, though there was also a sharp rise in internal combustion engine use during the period under review. Both technologies had peaked by 2004/2005. There was a stagnation followed by a decline in the use of gas turbines with heat recovery.

Support schemes

The sharp growth witnessed during the period under review was the result of the introduction of a support system. The reasons for the slowdown and eventual stalling of this growth may be the possible withdrawal of the support system in the future and the limited nature of the heat market. If we consider total cogenerated heat production, both high efficiency and non-high efficiency, we can see that more than 80% of total heat demand is met from cogeneration. The economic crisis that began in 2008 has also had a negative impact on both investment and production.

Funding

The amount spent promoting high-efficiency cogeneration (primarily to make district heating more affordable for households) rose steadily each year from HUF 8 billion in 2003 to around HUF 57 billion in 2010.

6.13. Ireland

Progress

The operational CHP capacity at the end of 2010 was 280 MW_e, which was the same as that which was operational at the end of 2009. This was 32 MW_e below the most optimistic projection of the Combined Heat and Power (CHP) Potential in Ireland report published in 2009. However the output from these operational units increased from 2009 to 2010 as follows:

- For electricity from 1.8 TWh to 1.92 TWh (+7%), and
- For heat from 3.05 TWh to 3.32 TWh (+9%).

The barriers to CHP development are still considerable. The general economic climate is particularly difficult and militates against investment in CHP, such that there has been little or no activity in terms of new plant development.

There are a number of significant barriers to CHP development in Ireland ranging from market structure through economic factors to appropriate heat loads to ensure compliance with the requirements of Directive 2004/8/EC.

The structure of Ireland's industrial base and its housing pattern are not conducive to significant penetration of CHP. Ireland's industry is primarily based on high value, low energy intensity sectors such as pharmaceuticals, ICT and services industries. One energy intense industrial site (an alumina refinery) has a 160 MW_e cogeneration plant which accounts for more than 50% of the total national installed capacity. A recently opened waste-to-energy plant with a generating capacity of 22 MW_e is located in an area with no immediate local heat load. District heating which is often associated with CHP plants in other European countries has no tradition in Ireland due to the distribution of a relatively small population, a mild climate and low density and low rise housing. Indeed it is possible that improvements in the energy efficiency of Irish housing stock that is currently being driven by government legislation and capital supports will militate further against district heating by making its economic viability more challenging.

The current economic climate is not conducive to investment generally or to investment in CHP. In addition, the spark gap (ratio between electricity and gas price) remains at a level (typically between 3.5 and 4.5 for industrial applications) which is insufficient to provide an acceptable payback for most CHP operations. There are instances where units have been mothballed as a result.

Heat loads that are necessary for CHP to be economically viable and to enable compliance with Directive 2004/8/EC are not readily available in Ireland. While some of the largest industries (cement & periclase manufacture and mining) consume a significant proportion of industrial fossil fuels and electricity, they are not suited to CHP due to the mismatch between the heat output from CHP plants and the thermal demand of those industries. Other large scale industries, such as the dairy sector, operate on a seasonal basis which does not favour economic operation of CHP.

Support schemes

Feed in tariffs.

6.14. Italy

Progress

The marked increase (around 3 000 MW or 40%) in total cogeneration output is highly significant. This figure shows that the policy of providing incentives for cogeneration was effective, even though the process was still continuing during the period in question. Thanks to this policy more than half of Italy's potential HEC output, estimates to be at least 17 000 MW, has been effectively realised.

The increase in electricity production, by 47%, was also significant, in spite of a slight drop in 2008 and 2009 (perhaps due among other things to the difficult economic conditions at that time).

As was to be expected, fuel consumption increased (25%) less than electricity production. This is proof that plants' average efficiency has improved.

The most used fuel remains natural gas, which still represents 70% and more of total consumption. Renewable sources are almost completely missing. However, this is only an apparent absence, as there are plants for which the incentives for renewable sources have been requested rather than those for cogeneration, because the two categories cannot be combined. Therefore these plants, which in fact are cogenerative, could not be included in the table.

Finally, and most comfortingly, the fact is that cogeneration enables Italy, each year, to save 27-28% of fuel compared to the corresponding separate production, which equals around 4.5 million tonnes of oil equivalent.

Figure 22: HEC electricity production (TWh)

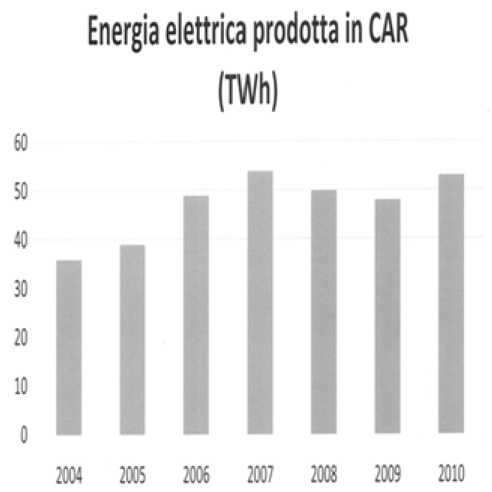


Figure 23: HEC electricity share of national total (%)

Figure 24:Energy saving from CHP compared to separate production of electricity and heat (%)

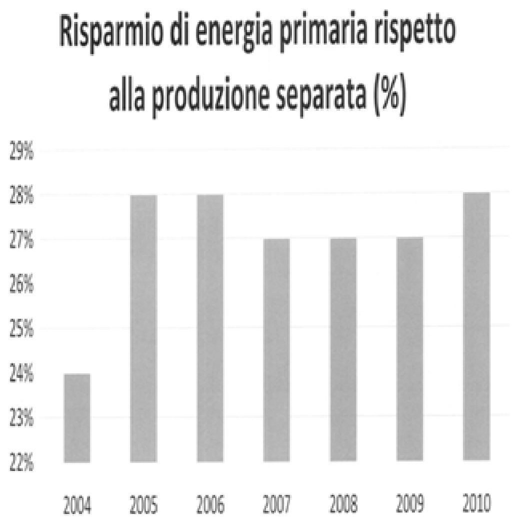
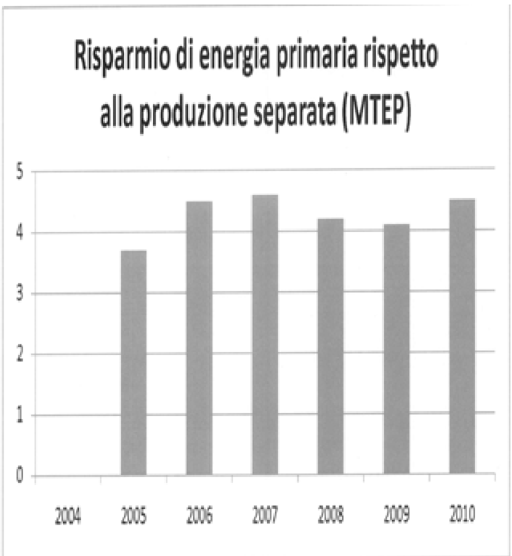


Figure 25: Energy savings from CHP as compared to separate production of electricity and heat (Mtoe)



District Heating

The share of the civil sector (which practically coincides with the sector of district heating or to be more exact of urban heating) has increased during the period in question, from 8% in 2004 to 16% in 2010. The increase, particularly evident in 2009, is mainly due to the legislation which, under certain conditions, grants Green Certificates to cogeneration plants which form part of district heating networks.

Technology

The most rapid development has been with regard to internal combustion engines, where the total output has more than doubled from 2004 to 2010.

Also very obvious was the growth (around 60% in output) of combined cycle gas-steam plants thanks to major recent investment.

The number of gas turbines has decreased following growth from 2005 to 2006. This can be explained by the common practice of adding a steam turbine to an existing gas turbine so as to increase total output. In this way a new combined cycle gas-steam turbine has apparently taken over from the present gas turbine which seems to have 'disappeared'. Finally, there is a clear decrease in steam turbines, output from which has approximately halved during the period in question. This is another sign of the renewal process going on in Italy's cogeneration.

6.15. Latvia

Progress

Latvia has identified the necessity to satisfy existing energy demand through the use of the maximum possible amount of local energy sources and environmentally friendly and sustainable technologies. Consequently, it remains essential to gradually replace existing heat-production installations with cogeneration installations using local energy sources. Their considered replacement, together with the efficient utilisation of energy sources, would make a considerable contribution to reducing greenhouse gas emissions.

The relationship between district heating energy produced in boiler houses and district heating energy produced by cogeneration has changed since 2000, with the amount of heat energy produced by cogeneration district heating systems in 2010 increasing by 20.9 percentage points compared with 2000.

In 2010, Latvia’s high-efficiency cogeneration power stations (with total installed electrical capacity of 898.3 MW and heat capacity of 997.8 MW) generated 2981 GWh of electricity and 2790 GWh of heat energy, mainly utilising natural gas as fuel (24.6 PJ). Only 0.01% (0.26 PJ) of all the fuel used in cogeneration derived from renewable energy sources. The share of high-efficiency cogeneration in total electricity generation in 2010, compared with 2004, increased by 16%, and the cogeneration share of district heating supply rose significantly.

Around 22% of the necessary heat energy used is produced by district heating systems, whereas 78% of heat energy is produced by decentralised (local and individual) heating systems (2009, Eurostat). In 2010, around 70% of the final consumption of district heating systems’ heat energy was consumed by households. In recent years, the amount of energy produced by district heating system boiler houses has gradually reduced, as shown below.

Table 47: Structure of energy produced in Latvia from 2000 to 2010 (%)

	2000	2005	2006	2007	2008	2009	2010
Electricity generated	12.92	15.05	20.46	19.94	22.31	22.01	27.75
Power stations		0.01		0.01	0.02	0.03	0.07
Cogeneration stations	12.92	15.04	20.46	19.93	22.29	21.97	27.68
Heat produced by district heating	87.08	84.95	79.54	80.06	77.69	77.99	72.25
Cogeneration stations	32.89	40.03	44.08	44.87	40.85	42.86	42.40

Boiler houses	54.20	44.91	35.46	35.18	36.84	35.13	29.85

Source: Central Statistical Bureau, Latvia

Looking at the structure of electricity supply, gross national electricity consumption was 7500 GWh in 2010, of which 2402 GWh was generated by large cogeneration stations (Riga TEC-1 and Riga TEC-2), while other cogeneration stations generated 648 GWh. The cogeneration station share of gross national electricity consumption comprised 40.7% in 2010. The contribution of the said large cogeneration stations increased from 19.6% in 2000 to 32.0% in 2010. In the same period, the share of other cogeneration stations grew from 2.5% in 2000 to 8.6% in 2010.

Looking at the structure of district heating supply, 28.66 PJ was produced in 2010, of which cogeneration stations produced 16.82 PJ and boiler houses produced 11.84 PJ of heat energy. Consequently, of all the heat supplied by district heating systems, cogeneration stations produced 58.7% and boiler houses 41.3%.

A rapid increase in the share of high-efficiency cogeneration can be seen in Latvia's energy sector since 2000. In 2010, the share of electricity generated by a cogeneration process in Latvia was 45% of the electricity generated in the country. Cogeneration is efficient in terms of utilising primary energy, but the useful utilisation of the heat energy produced is restricted by the seasonality of heating, and the lack of an appropriate industrial heat load.

The share of electricity generated by cogeneration has risen considerably, having increased by 132.3% from 2010 to 2000. In 2010, Latvia's gross electricity consumption was 7.5 TWh while 2.98 TWh was generated by high-efficiency cogeneration, as shown in Table 48.

Table 48: Number of high-efficiency cogeneration stations, installed capacity and energy generated

	2007	2008	2009	2010
Number of high-efficiency cogeneration stations	30	35	46	55
Installed electrical capacity (MW)	555.1	876	891.4	898.3
Installed heat energy capacity (MW)	880.3	971	990.4	997.8
Electricity generated (GWh).	1911	1634	2000	2981
Heat energy produced (GWh)	2568	2059	2029	2790

Source: Ministry of Economy, Latvia

In 2010, cogeneration stations produced 4673 GWh (16.82 PJ) or 58.7%, while boiler houses produced 3289 GWh (11.84 PJ) or 41.3% of district heating system heat energy. Efficient cogeneration, as seen in Table 3, generated 2981 GWh (10.73 PJ) of electricity in 2010, 63% of the total amount of electricity generated by cogeneration (Table 3).

Table 49: Number of cogeneration stations, installed capacity and energy generated

	2007	2008	2009	2010
Number of cogeneration stations	43	48	56	71
Installed electrical capacity (MW)	593.3	587.7	933.6	947.5
Installed heat energy capacity* (MW)	3024.1	2737.3	2737.2	2856.6
Electricity generated (GWh)	1983.9	2103.6	2057.2	3049.9
Heat energy produced** (GWh)	4606.9	3990.2	4076.1	4730.8

* Installed heat energy capacity shown including installed capacity of water-heating boilers for producing heat energy
** Heat energy produced shown including heat energy produced by water-heating boilers
Source: Central Statistical Bureau, Latvia

Given that implemented energy policy has nominated increasing energy generating efficiency as one of the priorities, the relationship between district heating energy produced in boiler houses and district heating energy produced by cogeneration has changed since 2000: the amount of heat energy produced by cogeneration district heating systems increased from 12.03 PJ (37.8%) in 2000 to 16.82 PJ (58.7%) in 2010 and the amount of heat energy produced by boiler houses fell from 19.83 PJ (62.2%) in 2000 to 11.84 PJ (41.3%) in 2010.

Latvia's consumption of primary energy sources has fallen considerably, from 333.2 PJ in 1990 to 200.5 PJ in 2010, with energy production by high-efficiency cogeneration utilising 24.9 PJ of energy sources in 2010, of which 0.26 PJ were renewable energy sources.

Currently, oil products (33.9% in 2010) and wood fuel (24.6% in 2010) are the fuels most consumed in final energy consumption. Natural gas is the main fuel utilised in Latvia's cogeneration stations. Small amounts of heating oil, peat, coal and biofuel (wood-chip fuel, fuel residues, biogas and biodiesel) are used. The diagram in this report displays the breakdown of fuel types used in all cogeneration stations, which has remained fundamentally unchanged since 2000.

Given the development level of cogeneration technology and the cost of investment, the implementation in practice of widely-used technologies – steam turbines, gas turbines, combined-cycle and internal combustion engines – can be expected in Latvia over the next ten years in populated areas with a sufficiently large, appropriate heat load. However, in the next few years more extensive implementation of innovative technologies is not expected in Latvia. Some utilisation of Stirling engine and Organic Rankin Cycle technologies for cogeneration can be expected.

In 2010, 86.3% of the electricity generated in high-efficiency cogeneration power stations was generated utilising combined cycle gas turbines (CCGT) with heat utilisation, with 12.8% utilising internal combustion engines, 0.7% utilising back pressure steam turbines, and 0.2% utilising gas turbines with heat utilisation.

Numerous cogeneration stations with installed capacity of up to 1 MW operate in Latvia. Operating these stations does not require a licence, and the electricity generated is sold pursuant to agreements with the transmission system operator, with the heat energy sold pursuant to agreements with local heating supply companies.

District Heating

The rate of increasing the use of high-efficiency efficient cogeneration installations for district heating systems is being held back by the large amount of investment required, the restricted capacity of local governments to obtain loans, and the low rate of capital turnover. For these reasons, local governments continue to operate inefficient installations resulting in increased over-consumption of fuel and the inability to supply heat at the required quality level. The energy generating process can be optimised and heat losses in transmission systems reduced through the complete overhaul of systems. Nevertheless, the overall average efficiency level of heat production installations in Latvia can be rated as high.

Efforts must also be made to maintain and develop existing district heating systems in the future as they provide the constant heat load and, to achieve the maximum impact, choose cogeneration capacity appropriate to the existing heat load. A considerable increase is not expected in the coming years.

Latvia is currently already paying particular attention to the application of those cogeneration technologies which use renewable energy sources to produce energy. Given the circumstances in Latvia, that is mostly wood fuel. One of the current priorities is the implementation of measures to promote energy produced from renewable energy sources, increasing the share in total gross final energy consumption,[86] which means support for the efficient utilisation of biomass not only for heat energy but also to generate electricity.

Considerable cogeneration potential also exists in local and individual heating supply, the uptake of which does not significantly affect existing district heating system cogeneration heat loads.

In promoting the development of cogeneration stations and energy generation from renewable energy sources, the potential electricity capacity in both transmission and distribution systems must be increased

6.16. Lithuania

Progress

In 2004, energy in combined heat and power (high-efficiency cogeneration) systems was produced by nine cogeneration units (CU) with a total installed electrical capacity of 556 MW and heat capacity of 1117 MW. In 2010, the number of high-efficiency CUs grew up to 32 with an increase in the total electrical capacity up to 777 MW and heat capacity up to 1809 MW, *i.e.*, the number of high-efficiency CUs more than tripled from 2004 to 2010, demonstrating an increase in electrical capacity of up to 221 MW and in heat capacity of up to 692 MW. Changes in the installed electrical and heat capacities in high-efficiency cogeneration plants in Lithuania in 2004–2010 are displayed in Figure 1.

In Lithuania, steam condensing extraction turbine-based cogeneration (combined-cycle) units account for the greatest share of high-efficiency CUs by installed capacities. This technology has been used in the biggest CUs in Vilnius, Kaunas and Mažeikiai. In 2004, installed electrical and heat capacities of high-efficiency CUs using this technology in Vilnius and Kaunas power plants amounted to 530 MW and 997 MW, respectively. In 2007, generation of electricity from high-efficiency cogeneration was started in two more, previously

[86] The share of energy generated using renewable energy sources must reach 40% of total final gross energy consumption by 2020.

insufficiently efficient, cogeneration units in Mažeikiai with a total installed electrical capacity of 160 MW and heat capacity of 560 MW. In 2007-2010, installed electrical and heat capacities of high-efficiency CUs using the aforementioned technology amounted to 690 MW and 1555 MW, respectively.

There were minor changes in the number of electricity production capacities and installed capacities of high-efficiency cogeneration units using the steam back pressure turbine technology: from two CUs of this type with a total installed electrical capacity of 24.75 MW and heat capacity of up to 118 MW in 2004 up to five CUs of the aforementioned type with a total installed electrical capacity of 36 MW and heat capacity of up to 202 MW in 2010.

In Lithuania, the first cogeneration unit with 35 MW electrical capacity and 34 MW heat capacity, based on combined cycle gas turbine with heat recovery, was constructed in Panevėžys in 2008.

Internal combustion engine appears to be the most developed cogeneration technology by electricity production capacities and installed capacities in 2004–2010. This technology has been mostly used by small electricity and heat producers. In 2004, there were 3 high-efficiency internal combustion engine-based cogeneration units with a total installed electrical capacity of 0.52 MW and heat capacity of 0.86 MW. In 2010, this technology was used by 20 CUs with installed electrical and heat capacities of 15.53 MW and 18.27 MW respectively, *i.e.*, electrical capacity increased by more than 30 times and heat capacity – by more than 20 times, as compared to 2004. The dynamics of the development of high-efficiency cogeneration plants with different technologies is shown in Figure 2.

A comparison of the number of, and capacities installed in, CUs of high-efficiency cogeneration plants operating in the industrial sector and in the district heat supply (DHS) sector in 2004–2010 demonstrates a considerable increase in the capacities of power plants of industrial undertakings in the total balance and as relatively compared to the heat supply sector.

The share of electricity produced from high-efficiency cogeneration has increased in the overall electricity generation balance of the country from 9.91 % in 2004, when electricity generated by way of high-efficiency cogeneration was 1.91 TWh and country's total electricity generation from all sources was 19.27 TWh, up to 31.04 % in 2010, when electricity generated by way of high-efficiency cogeneration was 1.77 TWh and country's total electricity generation from all sources was 5.7 TWh.

The share of thermal energy produced from high-efficiency cogeneration has increased in the overall heat generation balance of the country from 34.16 % in 2004, when heat generated by way of high-efficiency cogeneration was 4.01 TWh and country's total heat generation from all sources was 11.73 TWh, up to 38.98 % in 2010, when thermal energy generated by way of high-efficiency cogeneration was 4.29 TWh and country's total heat generation from all sources was 11.0 TWh.

There was a big increase in the percentage share of electricity produced by way of high-efficiency cogeneration (from 11.5 % in 2009 up to 31 % in 2010) a result of the shutdown of the then largest electricity producer, Ignalina Nuclear Power Plant, at the end of 2009.

In 2004, generation of electricity and heat energy in CHP plants led to primary energy savings of 1.219 TWh, as compared to non-CHP energy generation (*i.e.*, generation of electricity in a condensing cycle of a power plant, and generation of heat in separate water boilers). This savings indicator kept regularly growing from 2004 to 2010 and reached 1.41 TWh primary energy savings of CHP electricity and heat in 2010.

Funding

Feed-in tariff.

Table 50: funds appropriated for cogeneration plants

Year	2004	2005	2006	2007	2008	2009	2010	2011	2012
Funds, mio. LTL	85.3	91.5	98	162.4	160.4	301.3	35.7	85.7	117.6

6.17. Luxemburg

No Information

6.18. Malta

Progress

There is limited scope for CHP however the government has made EUR 15 million available. Some installations are in progress but are in the testing phase and not details are available

6.19. Netherlands

Progress

In spite of the increase in installed capacity the share of high-efficiency cogeneration in electricity production in 2009 is the same (35%) as in 2006. This finding is largely due to the fact that the capacity of non-high-efficiency cogeneration and separate generation also increase in the period in question.

After 2006 the saving increased from 81 PJ to 90 PJ in 2009. It can be seen from the spread sheet that this increase is the result of an increase in installed capacity in the farming sector, especially in greenhouse horticulture. This applies above all to gas-fired combustion engines. The installed capacity of other techniques and in other sectors remained largely stable between 2006 and 2009.

The above-mentioned increase can be ascribed to the possibility of using the gas engines profitably in greenhouse horticulture (see e.g. the report ‘Uneconomic top calculations for new cogeneration capacity for 2009’, ECN-E--08-082). The best farm savings through cogeneration in greenhouse horticulture are partly due to management policy. Relevant policy measures are, for example, exemption from environmental tax for installations generating electricity with an electrical yield of 30% or higher (Article 64 of the Environmental Taxes Act), and the tax rebate for energy investments through the Energy Investment Allowance (EIA).

Also, problems of congestion in the electricity network have largely been put right. These problems appeared in areas where the growth of cogeneration capacity was concentrated. With the construction of a total of six new high-voltage substations – in Horst aan de Maas, Westland, Luttelgeest, Klazienaveen and IJmuiden – cogeneration operators will once again have full marketplace access. The last of the new substations will be handed over in January 2012.

Support schemes

Energy Investment Allowance (EIA),

Funding

In 2009 about EUR 9 million in fiscal support was promised to cogeneration in the Energy Investment Allowance (EIA), some EUR 2 million of it for bio-CHP. With this support total investment reached EUR 78 million.

In addition to that, in the Subsidy Scheme on Sustainable Heat (part of the Energy and Innovation Subsidy Scheme) EUR 4 million was made available in 2010 for investments in micro-CHP in existing houses. A good €3 million of this had been allocated by mid-2011, in particular to households and housing corporations.

Likewise in 2010 in the Sustainable Energy Production Incentive Scheme (SDE) a budget of EUR 168 million was made available for high-efficiency cogeneration above 250 MW_e, but no applications were received for this.

6.20. Poland

Progress

Poland made progress in increasing the production of electricity from high-efficiency cogeneration, going from a level of ca. 15.6% in 2007 to ca. 17% in 2010.

The total installed capacity in the national power system, was 35 949 MW as at the end of 2010. The vast majority of the power (91%) is installed in the main activity producer electricity plants and main activity producer combined heat and power plants ” (32 757 MW in 2010). Both the installed capacities and the shares of individual plant types have not changed significantly within the last 15 years. Since 1995, the total installed capacity has changed by 2 789 MW (*i.e.* just under plus 8%). Slight increases in installed capacities due to the start-up of new generation units have been offset by the decommissioning of obsolete units. The installed capacity in main activity producer CHP plants was 5 810 MW as at the end of 2006 and 6 163 MW as at the end of 2010.

The total annual electricity output in Poland in 2010 was 15 7658 GWh, marking a reversal in the downward trend initiated in 2008, which resulted from the global economic downturn. The shares of individual power plant types are similar to those for the installed capacity. The dominance of thermal power stations in the main activity producer electricity plant category is even more remarkable. It results from the lower utilisation time of installed capacity in other main activity producer electricity plants, mostly hydroelectric plants.

In 2005, the production of cogenerated electricity in main activity producer and auto-producer power plants and CHPs was 21 702 GWh (13.8% of the total gross electricity production). In 2010, the production increased to 26 377 GWh (16.7% of the total gross electricity production), which means a 21.5% increase when compared with 2005. On the other hand, considering the period from 2007 to 2010, the increase in the production of cogeneration electricity in the categories of thermal power stations, main activity producer CHP plants and auto-producer CHP plants was not noticeable until the year 2010.

Electricity is cogenerated in Poland with a substantial share of main activity producer combined heat and power plants (18 832 GWh in 2010, 71.4% of the total cogeneration output). In 2010, auto-producer CHP plants (with a capacity above 0.5 MW) generated 5 753

GWh of electricity in the cogeneration mode (21.8% of the total cogeneration electricity). Main activity producer electricity plants have a minor share (6.8% in 2010) in the cogeneration output.

The data on electricity production from high-efficiency cogeneration covers not only main activity producer and auto-producer generators, but also independent entities whose production is considered to be high-efficiency cogeneration. In 2010, the total output of cogeneration electricity was 26 892 GWh. It means that the annual output increased by 1 961 GWh (7.9%) when compared with 2007. At the same time, the share of electricity produced from high-efficiency cogeneration in the gross total production of electricity in Poland increased from 15.6% in 2007 to 17.1% in 2010.

In 2006, the total heat generation capacity of the heat plants of distribution and production companies, as well as main activity producer electricity plants and CHP plants was 50 712 MW, of which 25 656 MW was installed in heat plants, and 25 056 MW – in electricity plants and CHP plants. In 2009, the heat generation capacity was 43 673 MW (15 205 MW – heat plants; 28 467 MW – electricity plants and CHP plants). This structure shows that the share of heat generation capacities of electricity plants and CHP plants are strongly increasing, with relatively visible reductions in the capacities of heat plants in distribution and production companies.

There has been a certain growth in generation from biomass, mainly biogas.

Support schemes

A system of tradable certificates of origin offers financial support

6.21. Portugal

Progress

The economic and financial crisis which has been affecting Portugal, together with the recent establishment of the current Government, has been reflected – in the specific case of cogeneration – in the need to review the existing proposals relating to Orders and support schemes, in particular the reference tariff and premiums and other procedures contained in Decree Law No 23/2010 of 25 March 2010. This crisis has also been reflected in industry, particular in the demand for useful heat, which has contributed to decreasing the potential of high-efficiency cogeneration initially identified.

Support schemes

Support for cogeneration is given by means of a reference tariff, efficiency premiums and renewable energy premiums.

6.22. Romania

Progress

The national installed cogeneration potential continues to be underused, as it is largely intended only for seasonal useful heat demand (for heating), as the production technologies/units installed before 2000 are not adapted to the new conditions on the market for thermal energy (reduction by approximately 90% of the market for thermal energy in the form of steam - industrial consumption).

There continues to be a slight downward trend in useful heat demand for heating.

Romania is seeing the beginnings of an upward trend (growth) in the production of electricity and useful heat by auto producers (for industrial consumption).

Actions of note include:

- The commissioning of a new cogeneration unit using renewable energy sources (biomass) in Sebeş;
- The decommissioning of cogeneration units installed before 2000 in Piteşti and Giurgiu;
- The start of the process of replacing cogeneration units installed before 2000 in Braşov;
- The installation of new cogeneration units (using internal combustion engines) in Bucharest.

From an operational point of view, the focus continues to be on the efficient functioning of existing cogeneration plants.

Table 51: Production of electricity and heat in cogeneration in Romania

Year	Total electricity produced in cogeneration units	Electricity produced in cogeneration (Annex II to Directive 2004/8/EC)	of which:		Share of electricity produced in cogeneration out of total national production	Useful heat produced in cogeneration units (Annex II to Directive 2004/8/EC)	of which:	
			Power plants	Auto-producers			Power plants	Auto-producers
	TWh	TWh	TWh	TWh	%	PJ	PJ	PJ
2007	14.23	6.62	5.65	0.97	10.7	73.2	61.7	11.6
2008	14.06	6.21	5.24	0.97	9.6	71.5	58.6	12.9
2009	12.33	6.26	5.40	0.86	10.8	66.3	54.7	11.6
2010	11.93	6.54	5.38	1.16	10.8	69.0	53.5	15.5

Table 52: Electricity and heat cogeneration capacities in Romania in 2010

Cogeneration technology	Maximum capacity	
	Electricity (Gross)	Heat (Net)
	MW	MW
Combined cycle	185.60	187.83
Gas turbines with heat recovery	116.14	181.69
Internal combustion engines	59.73	60.85
Steam backpressure turbines	809.58	3308.06
Steam condensing turbines with heat recovery	3411.00	7032.88
Total	4582.05	10771.31

Table 53: Quantities of fuel used to produce electricity and heat in cogeneration

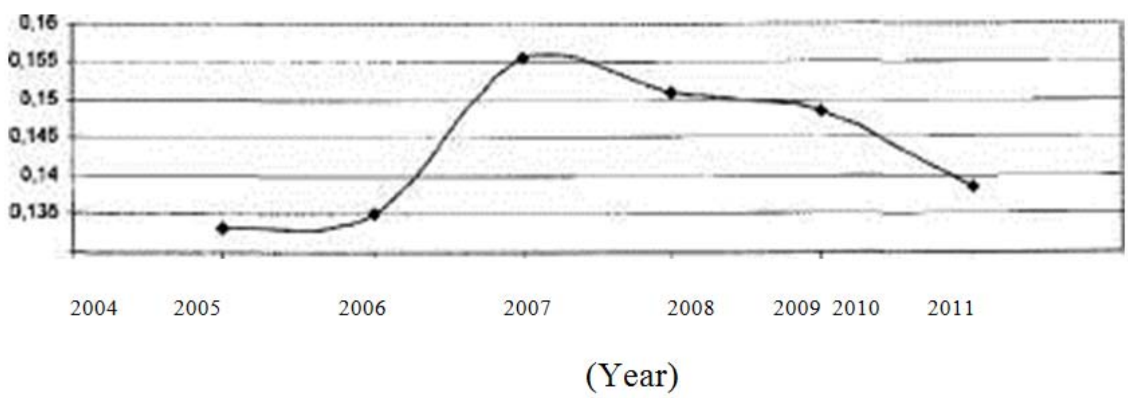
Year	Total fuel used by cogeneration units	Fuel used for cogeneration (Annex II to Directive 2004/8/EC)	of which:				
			Solid fossil fuel	Fuel oil	Natural gas	Renewables and waste	Other fuels
	PJ	PJ	%	%	%	%	%
2007	221.4	122.8	38.2	8.3	52.8	0.0	0.7
2008	216.8	118.1	39.5	6.3	52.8	0.0	1.4
2009	188.6	112.4	39.8	6.9	49.7	0.5	3.1
2010	186.1	117.3	38.6	3.8	50.8	1.9	4.9

6.23. Slovakia

Progress

The proportion of electricity produced by high-efficiency combined production determined by individual combined production plants recorded in the database on total electricity produced is shown in Figure 26 below:

Figure 26: The proportion of electricity produced by high-efficiency combined production determined by individual combined production plants



The proportion of individual types of fuel used for combined production remains almost unchanged. Since 2007, there has been a gradual increase in the proportion of wood chips, which is mainly due to the environmental policy of reducing emissions of sulphur oxides, but also due to the national requirement to support the production of electricity from biomass only in combined production plants.

Despite the progress in the area of high-efficiency combined production up to 2007, the proportion of electricity produced by high-efficiency combined production fell after 2007, mainly for the following reasons:

- The consumption of usable heat is falling through application of the energy efficiency policy, particularly in the municipal housing sector and in industry, and the need for cooling is increasing only minimally;
- The heat distribution systems for centralised supplies of heat are physically and technically decrepit;

in view of the extensive network of gas pipelines in the Slovak Republic, the favourable prices for natural gas and the availability of high-efficiency boilers, a trend towards disconnection from centralised heat supply systems is beginning to set in, thereby reducing the potential of usable heat from high-efficiency combined production;

Increased use of renewable energy sources in heating and in the preparation of hot water (heat pumps, solar collectors) reduces the potential of usable heat from high-efficiency combined production;

increased use of renewable energy sources for the production of electricity increases demand for regulated electricity, which is provided mainly by combined production plants, as a result of which, however, overall efficiency declines, and the proportion of electricity produced by high-efficiency combined production falls;

the economic crisis and the subsequent gas crisis have also negatively affected the proportion of electricity produced by high-efficiency combined production (during the economic crisis 4 KVET power sources were decommissioned, representing a total installed output of 87 MW_e and 271 MW_{th}).

<u>Construction of combined production plants</u>

Under Act No 656/2004 on energy, it is possible to build electrical energy plants, including combined production plants, only on the basis of a certificate confirming that the investment plan conforms to the long-term energy policy concept issued by the Ministry of Economy of the Slovak Republic. Such certificates do not apply to the construction of facilities with a total installed output of less than 1 MW_e. This procedure gives an advantage to plants with a low output. No special advantages have been put in place for combined production plants.

Since combined production plants also produce heat, the construction of such plants is also subject to Act No 657/2004 on heat energy. Heat plant systems or parts thereof with a total installed heat output of 10 MWth or more can be constructed only on the basis of a certificate confirming that the planned construction of the heat plant systems or parts thereof conforms to the long-term energy policy concept of the Slovak Republic. The certificates are issued by Ministry of Economy of the Slovak Republic. Certificates for the construction of heat production plants with a heat output of up to 10 MWth are issued by local authorities. No special advantages have been put in place for combined production plants.

The construction of combined production plants with an output of up to 1 MW_e is subject to an approval process only at the level of the local authority, which issues a certificate on the basis of an approved Municipal Development Plan for the area of heat energy.

<u>Support schemes</u>

On the basis of Act No 309/2009 and Act No 267/2001 on regulation in network industries, the Regulatory Office for Network Industries sets a fixed price for electricity produced by high-efficiency combined production for a given period through a generally binding law and along with this issues authorised entities with individual price decisions for each calendar year. Combined production plant operators are obliged to submit applications every year for the issuance of a price decision prior to the issuance of the price decision.

Under Act No 267/2001, the price of heat is also regulated. Heat prices applied by operators of heat production plants and therefore also combined production plants are assessed individually by the Regulatory Office for Network Industries. The benefits arising from the sale of electricity produced by high-efficiency combined production must, under the procedures set out in the implementing regulations for Act No 267/2001, be taken into account by the operator in a heat price proposal, which is approved by the Office through the issuance of a decision.

Collection of electricity at a loss-making electricity price by the operator of the regional distribution system to which a plant is connected, directly or via a local distribution system; applies to all of the electricity produced by high-efficiency combined production in plants with a total installed output of up to 125 MW or up to 200 MW where the energy share for renewable energy sources in the fuel is higher than 20%. The support can be applied to plants with a total installed output of up to 1 MW throughout the lifetime and to other plants for 15 years from the year in which the plant is brought into operation or from the year of reconstruction or modernisation of the mechanical part of the plant.

Supplement, *i.e.* the difference between the fixed set price (tariff) and the loss-making price of electricity applies to all of the electricity produced by high-efficiency combined production in plants with a total installed output of up to 10 MW and up to 125 MW or 200 MW, where the proportion of usable heat supplied to the industrial sector is no more than 40%. In the case of a higher proportion of usable heat supplied to the industrial sector it is possible to apply the supplement only to the amount of electricity which corresponds to a plant with a total installed output of up to 10 MW. The support may be applied for 15 years from the year in which the plant is brought into operation or from the year of reconstruction or modernisation of the mechanical parts of the plant. The supplement may also be applied to plants in respect of which the electricity produced is consumed directly at the place of production, therefore without being supplied to the distribution network

Assumption of responsibility for deviations by operators of regional distribution systems applies to plants with a total installed output of up to 4 MW with effect from 1 April 2011 and, where appropriate, only to plants with a total installed output of up to 1 MW. The support may be applied to plants with a total installed output of up to 1 MW throughout their lifetime and to other plants for 15 years from the year in which the plants were brought into operation or from the year of reconstruction or modernisation of the mechanical parts of the plants.

Electricity produced by high-efficiency combined production is exempt from the excise duty on electricity (Act No 609/2007 on excise duty on coal, electricity and natural gas as amended) where it is supplied directly to the end consumer of electricity or is consumed by the producer.

Investment assistance

In order to support high-efficiency combined production, investment assistance was also provided through the use of money from the Structural Funds for the 2004-2006 programming period, in particular for industry through the Sectoral Operational Programme Industry and Services. In the 2007-2013 programming period, it was possible to draw on funds for high-efficiency combined production through the following operational programmes:

Operational Programme Competitiveness and Economic Growth (particularly industry),

Operational Programme Environment (particularly for plants supplying heat for local authority housing, only together with a change to the fuel base in existing heat production plants),

Operational Programme Bratislava Region (small projects in the Bratislava region),

Rural Development Programme (particularly in agriculture in relation to the use of biogas).

Funding

Funds provided in the form of operational assistance for electricity produced by combined production prior to 1 January 2010 are not monitored separately. They form part of the assistance provided for supporting the production of electricity from renewable sources and from domestic brown coal.

The funds provided in the form of operational assistance after 1 January 2010 have not yet been calculated. It can be expected that operational assistance amounting to about EUR 20 million was provided on the basis of Act No 309/2009 in 2010.

The future level of operational assistance depends on developments in the prices of primary energy sources as well as on the amount of electricity produced by high-efficiency combined production. It is provisionally expected to be EUR 20 million annually.

Clearly identifiable assistance for high-efficiency combined production plants was provided in 2007-2010 from the Operational Programme Competitiveness and Economic Growth, amounting to EUR 10.67 million.

The provision of investment assistance for high-efficiency combined production plants is not envisaged until the end of 2013.

In order to maintain the proportion of electricity produced by high-efficiency combined production it is essential to include in future programming periods sufficient funding for the reconstruction of heat distribution pipes. If this does not happen, it can be expected that the proportion of electricity produced by high-efficiency combined production will fall.