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Trends and projections in Europe 2015

Tracking progress towards Europe's climate and energy targets

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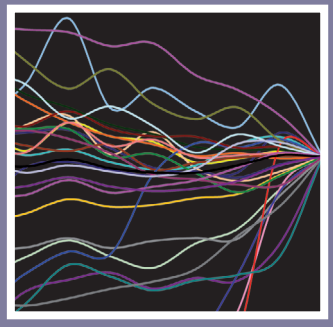

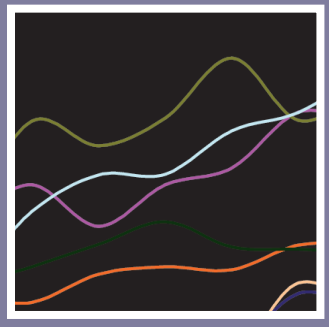

European Environment Agency

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European Environment Agency
Kongens Nytorv 6
1050 Copenhagen K
Denmark

Tel.: +45 33 36 71 00
Web: eea.europa.eu
Enquiries: eea.europa.eu/enquiries

Contents

List of figures and tables

Figures

Tables

Acknowledgements

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The overall coordination of the report was carried out by François Dejean (EEA) and the ETC/ACM task manager, Sabine Gores (Öko-Institut).

The authors were, in alphabetical order, Anca-Diana Barbu, François Dejean and Mihai Tomescu from the EEA; Hannes Böttcher, Johanna Cludius, Hannah Förster, Benjamin Greiner, Sabine Gores, Sean Healy, Katja Schumacher and Anne Siemons from Öko-Institut (ETC/ACM partner, Germany), and Nele Renders from Vito (ETC/ACM partner, Belgium).

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Executive summary

EU and Member States progress towards 2020 climate and energy targets

The 2015 edition of the annual European Environment Agency (EEA) 'Trends and projections' report confirms that the EU is well on track to meet its climate and energy targets set for 2020 (Figure ES.1).

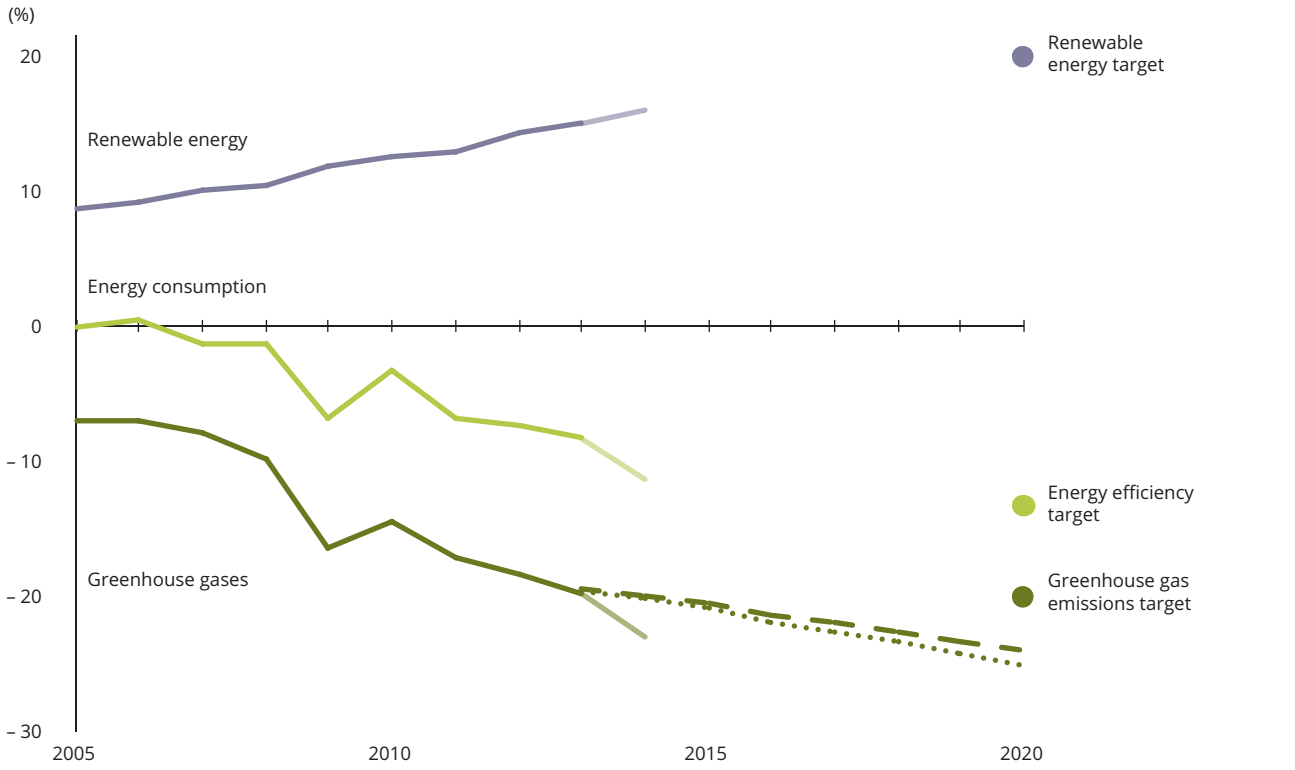
The report highlights the positive impact of key 'drivers', in particular:

- Steady roll-out of renewable energy;
- Decrease in the energy consumption in most EU Member States over the last decade.

The positive effects of these drivers on emission trends outweighed factors generally responsible for emission increases, such as:

- Demographic and economic growth;
- Return to (more CO_2-intensive) coal in some countries.

Figure ES.1 EU progress towards 2020 climate and energy targets



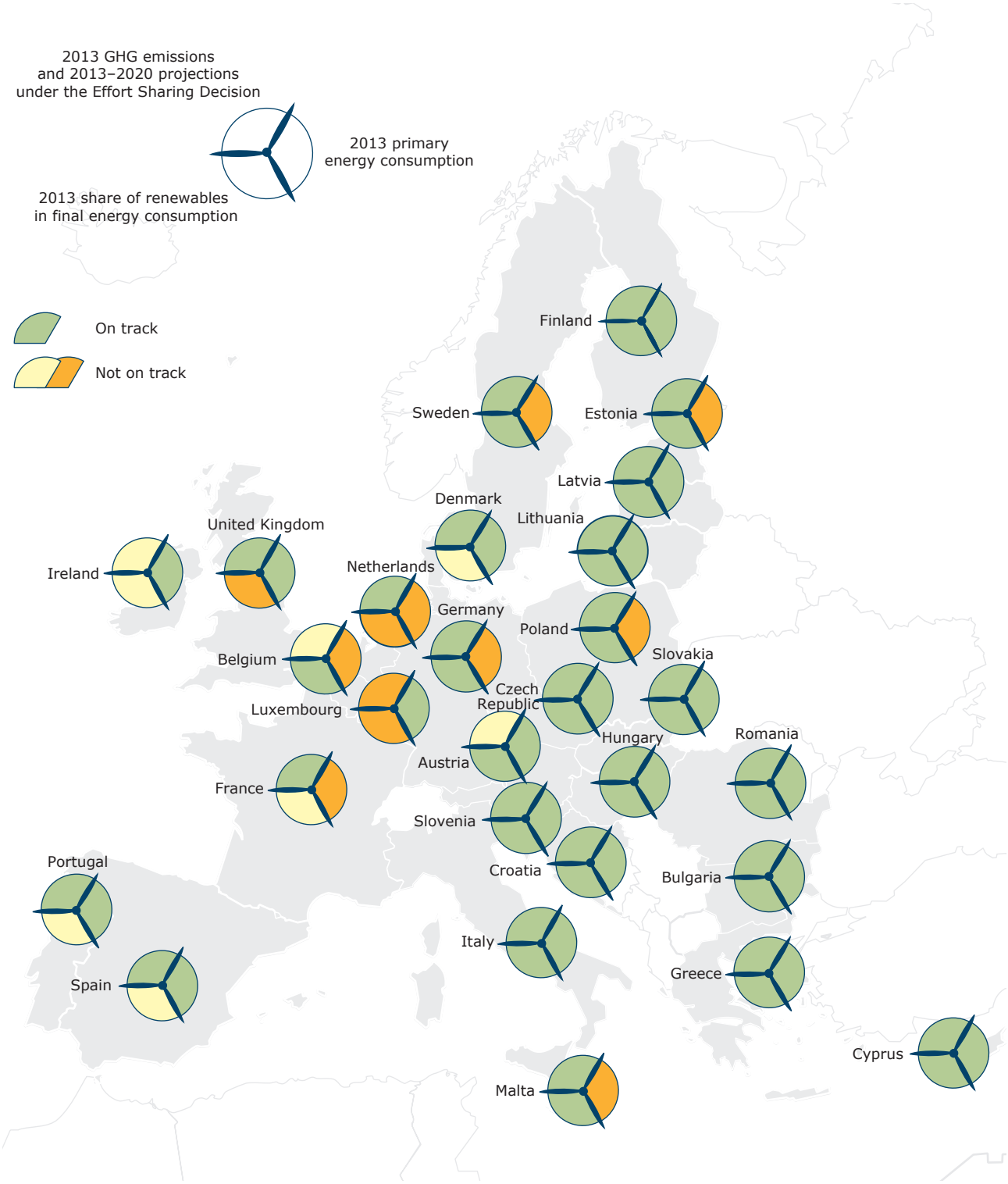
Note: The renewable energy target corresponds to a 20% share of renewable energy sources in EU's final energy consumption (in comparison with a 9% level in 2005).

The energy efficiency target corresponds to an absolute energy consumption 20% below a 'business-as-usual' scenario, which is equivalent to a 13% reduction from 2005 levels.

The greenhouse gas emission target corresponds to a 20% reduction compared to 1990 levels (the reduction achieved in 2005 was — 7%). The dashed and dotted lines represent emission projections, based on Member States' data submitted in 2015.

Source: EEA, 2015.

Figure ES.2 Progress of Member States towards 2020 climate and energy targets



Note: The Effort Sharing Decision sets individual binding annual targets for GHG emissions not covered by the EU ETS for all Member States for the period from 2013 to 2020. The Renewable Energy Directive sets individual binding targets for the 2020 share of renewable energy sources in gross final energy consumption, as well as indicative trajectories up until 2020. Under the Energy Efficiency Directive, Member States set their own target on energy consumption for 2020.

See further methodological details in Table 2.1.

Source: EEA, 2015.

The report goes beyond these headline numbers and also looks at the progress of Member States towards their individual climate and energy objectives for 2020. Here the picture is nuanced: while the EU is on track, the situation differs significantly between Member States.

- 24 are on track to meet their GHG targets (all except Austria, Belgium, Ireland and Luxembourg);
- 20 are on track to achieve their renewable energy targets (all except Denmark, France, Ireland, Luxembourg, the Netherlands, Portugal, Spain and the United Kingdom);
- 20 are on track to achieve their energy efficiency targets (all except Belgium, Estonia, France, Germany, Malta, the Netherlands, Poland and Sweden);
- 13 Member States are on track to deliver on their national targets in all three areas.

This is an improvement on 2014, where 9 Member States were on track to deliver on their national targets in all three areas. Most Member States that were on track to their national target in 2014 remain on track in 2015 (Figure ES.2).

EU progress towards 2030 climate and energy targets

In 2014, the European Council agreed on the 2030 climate and energy policy framework for the EU and endorsed new targets on greenhouse gas emissions, renewable energy and energy efficiency for 2030. In 2015, the EU adopted an Energy Union Strategy to ensure that Europe has secure, affordable and climate-friendly energy and achieve its climate and energy goals for 2030.

The report shows that while projections show further decreases in EU GHG emissions beyond 2020, Member States project that the pace of these reductions will slow down. Planned reductions will only bring EU emissions between 27% and 30% below 1990 levels by 2030, which falls short of the 40% reduction target for 2030 (Figure ES.2).

However, the recently agreed reform of the EU ETS and new policy proposals still being discussed in the EU (such as a post-2020 Effort Sharing Decision, measures to enhance energy efficiency and measures in the transport sector) have not yet been taken into account in projections. Discussions are also ongoing concerning the inclusion of land use and forestry into the 2030 greenhouse gas mitigation framework.

Sustaining the current pace of growth in renewable energy sources could enable the EU to achieve its target of a minimum 27% share by 2030. However, this will be challenging because market barriers persist, while support measures for renewable energy have been scaled back in various countries.

Furthermore, as economies pick up across Europe, further efforts will be necessary to ensure that energy consumption continues to decrease in order to reach the objective of reducing Europe's energy use by at least 27% by 2030 compared to a baseline scenario.

Outlook on greenhouse gas emission trends for 2050

The EU recently adopted new objectives for 2030, both domestically (through its 2030 climate and energy policy framework) and internationally (through its intended contribution to the UNFCCC), as part of a global effort to limit an average temperature increase below 2 °C compared to pre-industrial levels. These objectives are also consistent with a cost-effective pathway towards long term domestic emission reductions of 80% by 2050.

Although the EU and its Member States are making good progress towards their short-term goals on climate and energy, they will have to increase considerably their efforts to meet longer-term energy and decarbonisation objectives for 2050.

For example, the reduction in GHG emissions needed between the 2030 target level (– 40% below 1990) and the 2050 EU objective (at least 80% below 1990) will have to be two to three times steeper than the necessary reduction between current levels and the 2030 target, which is itself steeper than the reductions achieved so far since 1990 (Figure ES.3).

Meeting the long-term challenge

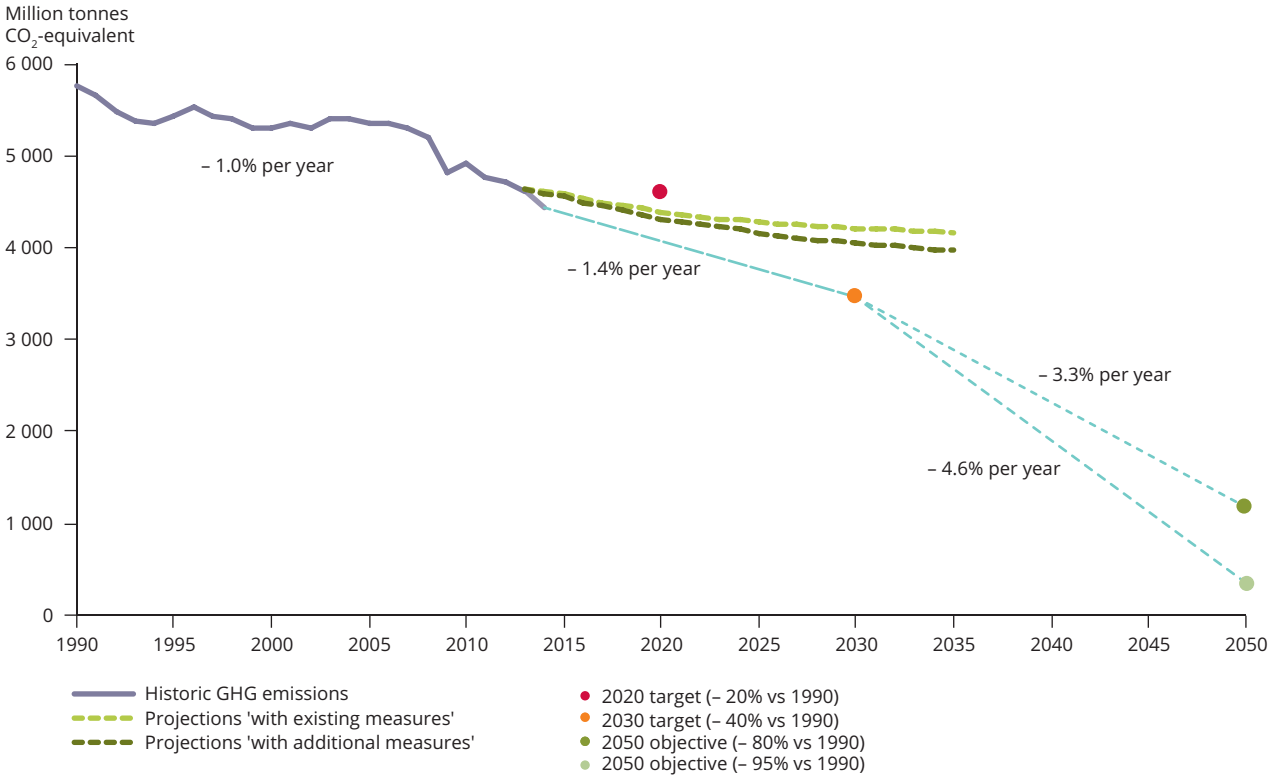
To meet this challenge, the European Commission proposed in 2011 a roadmap for moving to a competitive low carbon economy by 2050. EU Member States are now developing low carbon development strategies outlining concrete steps to turn EU-wide, long-term ambitions into national and local action. These national strategies were submitted for the first time in 2015 to the European Commission and will be further assessed by the EEA in 2016.

Towards a more transparent governance system

Performing a consistent and integrated assessment of progress across the three climate and energy policy objectives remains challenging, because the parameters used by Member States for projections and progress reporting are not sufficiently consistent and comparable.

To help ensure that the EU meets its energy and climate policy goals, a more reliable and transparent governance system will be developed. This represents a timely opportunity to streamline the planning and reporting obligations of Member States and to anchor measurement of progress in comparable, coherent and reliable data and information.

Figure ES.3 EU greenhouse gas emission trends, projections and reduction targets



Source: EEA, 2015.

About the Trends and projections report

The 2015 edition of the annual European Environment Agency (EEA) 'Trends and projections' report provides an updated assessment of the progress of the European Union (EU) and European countries towards their climate mitigation and energy targets.

The assessment of Member States' progress towards their climate and energy targets is based on:

- National data on GHG emissions, renewable energy and energy consumption for 2013.
- Projections reported by Member States concerning expected trends in greenhouse gas emissions until 2035.

The report also presents preliminary ('approximated' or 'proxy') data for the year 2014. It is the first time that the report includes such proxy data for renewable energy and energy consumption (estimated by the EEA). Because the EEA has not yet been able to assess fully the level of uncertainty associated with these estimates, these data have not been used to assess countries' performances towards their targets.

The report supports and complements the annual assessment, by the European Commission, of the progress of the EU and its Member States towards meeting the Kyoto and EU 2020 objectives, as required by EU regulation (the Monitoring Mechanism Regulation). This assessment is included in the 2015 European Union State of the Energy Union Report (forthcoming in November 2015).

EEA reports

This report is part of an annual package of EEA reports on climate change and energy. In particular this report is linked to:

- The EEA Technical report No 14/2015 *Trends and projections in the EU ETS in 2015*
- The EEA Technical report No 15/2015 *Approximated EU GHG inventory: proxy GHG emission estimates for 2014*

You can access all of our reports here: eea.europa.eu

About the EEA

The European Environment Agency (EEA) is an agency of the European Union. It aims to support sustainable development and to help achieve significant and measurable improvement in Europe's environment by providing timely, targeted, relevant and reliable information to policymaking agents and the public. It is supported in its work by the European environment information and observation network (Eionet), a network of 39 European countries.

1 Introduction

1.1 Background

What is the 'Trends and projections' report?

The annual EEA 'Trends and projections' report provides an updated assessment of progress made by the European Union (EU) and European countries towards their climate mitigation and energy targets.

These objectives include:

- international commitments under the United Nations Framework Convention on Climate Change (UNFCCC) and its Kyoto Protocol;
- EU domestic policy targets consistent with the '20-20-20' objectives, which aim to achieve the following by 2020:
  - 20% reduction of greenhouse gas (GHG) emissions (compared to 1990 levels),
  - 20% share of renewables in energy consumption,
  - 20% saving of the EU's primary energy consumption (compared to baseline projections).

Scope of the report

The report also presents some analysis of the progress made at EU level in meeting longer-term policy objectives, where relevant data are available.

The geographical scope of this assessment is limited to the 33 EEA member countries ([1]) in the following contexts: the EU as a whole, its 28 individual Member States and the other EEA member countries.

Related reports

The report supports and complements the annual report of the European Commission to the European Parliament and the Council on the progress of the EU and its Member States in meeting the Kyoto and EU 2020 objectives, as required by Article 21 of the Monitoring Mechanism Regulation (MMR) (Regulation (EU) No 525/2013 on a mechanism for monitoring and reporting greenhouse gas emissions and for reporting other information at national and Union level relevant to climate change and repealing Decision No 280/2004/EC) (EU, 2013a). It also complements the analysis on information included in the EU 'State of the Energy Union' report (forthcoming, in November 2015).

1.2 Data

The report is based on several data sets for GHG emissions and energy, as described below.

- Unofficial GHG inventory data for the period from 1990 to 2013, reported by Member States to the EEA by 31 August 2015: these data will be finalised autumn 2015 and will be available in the EEA GHG data viewer (EEA, 2015a).
- Data related to the EU Emissions Trading System (EU ETS) until 2014, available from the EEA's EU ETS data viewer (EEA, 2015b). Most of these data are sourced from the European Commission through the EU Transaction Log (EUTL).
- Energy statistics on energy production and energy consumption, as well as the share of energy from renewable sources, for the period from 2005 to 2013, available from the European Commission's

([1]) The 33 member countries of the EEA are Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom. The European Environment Agency is not to be confused with the European Economic Area, which comprises 31 member countries.

statistical services (Eurostat) and Eurostat's Short Assessment of Renewable Energy Sources (SHARES) tool (Eurostat, 2015a).

- Projections of GHG emissions until 2035, reported by Member States until 31 August 2015 to the European Commission (EEA, 2015c). These projections are reported in two scenarios: a 'with existing measures' (WEM) scenario, similar to the 'Baseline Scenario' developed by the Commission; and a 'with additional measures' (WAM) scenario, which also takes into account measures planned but not yet adopted. Reported projections are disaggregated by the main emitting sector, including a division between emissions covered by the ETS and emissions covered by the Effort Sharing Decision (ESD) (Decision No 406/2009/EC on the effort of Member States to reduce their greenhouse gas emissions to meet the Community's greenhouse gas emission reduction commitments up to 2020) (EU, 2009a).

- Approximated ('proxy') GHG emission data for 2014, reported by 23 Member States and Norway until 3 August 2015. For those Member States which did not report proxy emissions, the EEA used its own proxy estimates (based on a methodology in use since 2010) (EEA, 2015d).

- Approximated data on the 2014 share of energy consumption from renewable sources in EU Member States, as estimated by the ETC/ACM (EEA, 2015e).

- Approximated data on 2014 levels for primary energy consumption in EU Member States, as estimated by the ETC/ACM (EEA, 2015f).

Detailed data and assessment results are provided in the annexes to this report.

1.3 Approach to assessing progress

The report employs a twofold approach for assessing progress towards 2020 climate and energy targets, as explained below.

- For energy and GHG emission targets, an assessment of **current** progress is presented. Such assessment is based on a comparison between the latest historic trends until 2013 and the relevant levels for comparison, such as interim targets, indicative trajectories or relevant target paths (e.g. annual GHG emission targets for 2013 to 2020 under the ESD, interim targets and indicative trajectories for the development of renewable energy, or linear trajectories for the reduction or limitation of energy consumption). The assessment is complemented by the outlook for the 2014 situation based on approximated estimates from Member States (GHG emissions) and the EEA (energy).

- The assessment of progress towards GHG emission targets is complemented by an assessment of **projected** progress. This assessment is based on a comparison between projected emissions reported by Member States in 2015 and the relevant targets. In the case of renewable energy and energy efficiency, similar projections are not available from Member States in a scenario suitable for comparison with targets or trajectories (in particular, a WEM scenario which only takes existing measures into account). Therefore, the assessment of progress towards energy targets only relies on historic data ([2]).

The 2014 ('approximated' or 'proxy') data on GHG emissions, renewable energy and energy consumption were used to assess countries' performances towards their targets, because the EEA has not yet been able to assess the level of uncertainty associated with the proxy estimates for renewable energy and energy consumption, which are included for the time in this report.

1.4 Report structure

Following an integrated overview of the latest progress towards the '20-20-20' climate and energy targets for 2020 (Chapter 2), the report separately addresses progress towards each of the three policy objectives: GHG emissions, renewable energy and energy efficiency. Each of these chapters also includes the outlook for 2030 and 2050 policy objectives.

- Chapter 3 provides detailed information on current and projected progress towards GHG emission targets. This multilevel analysis covers overall EU progress towards its 20% reduction objective by 2020, progress within the EU ETS towards EU-wide

([2]) The projections, as reported by Member States, naturally imply a certain degree of uncertainty: they make predictions about developments in future which are likely to have different outcomes. According to the EEA (2015g), differences of over 10% can be found between projected values and existing developments, even over a limited time horizon. Projections in this report should thus be read and understood in this context.

emission caps, and Member States' progress towards their national annual targets set under the ESD. Such targets concern only those GHG emissions not covered by the EU ETS.

- Chapter 4 tracks progress towards renewable energy targets under the Renewable Energy Directive (RED) (Directive 2009/28/EC on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC) (EU, 2009b).
- Chapter 5 analyses progress made in the EU towards reducing energy consumption and achieving energy efficiency objectives for 2020 and national indicative targets set by Member States under the Energy Efficiency Directive (EED) (Directive 2012/27/EU on energy efficiency, amending Directives 2009/125/EC and 2010/30/EU and repealing Directives 2004/8/EC and 2006/32/EC) (EU, 2012).

The annexes provide detailed methodological and technical information.

2 Overall progress towards the EU's '20-20-20' climate and energy targets

EU and Member State progress

- The EU is on track to meet its 2020 climate and energy targets: a 20% reduction in GHG emissions compared to 1990, a 20% share of renewable energy sources (RES) in energy consumption and a 20% reduction in primary energy consumption compared to baseline projections.
- This assessment is based on national data on GHGs, renewable energy and energy consumption for 2013, and projections reported by Member States on expected trends in GHG emissions until 2035. It is also confirmed by preliminary data for the year 2014.
- While the EU as a whole is on target, the situation differs across individual Member States: 24 are expected to meet their GHG emission targets, 20 to achieve their renewable energy targets and 20 to achieve their energy efficiency targets.
- A total of 13 Member States are on track to deliver on their national targets in all three areas, an improvement on the 2014 assessment, where this was the case for only nine Member States. Most Member States that were on course to meet their national target in 2014 hold similar status in 2015.
- To ensure that the EU remains on a cost-effective track towards meeting its long-term climate objective, climate and energy targets for 2030 were endorsed in 2014. These include a 40% domestic reduction of EU GHG emissions compared to 1990 levels, a minimum 27% share of renewable energy consumption in the EU and a minimum 27% reduction in the EU's primary energy consumption, compared to baseline projections. Although the EU is expected to achieve its 2020 targets, current efforts need to be stepped up if it is to meet these more ambitious longer-term objectives. Policy proposals are under discussion at EU level. Once adopted, these will require swift and effective actions at national level.

Behind the numbers

- Between 2005 and 2013, the EU reduced its energy intensity (the use of energy to generate economic output). It also sped up the deployment of RES (resulting in a shift away from CO_2-intensive fuels in electricity and heat production). These two factors contributed significantly to the decrease in GHG emissions — their effects on emission trends outweighed factors responsible for emission increases, such as demographic and economic growths and a switch back from gas to the more CO_2-intensive coal.
- Weather conditions play a key role in annual changes in energy consumption and GHG emissions. For example, a particularly cold winter in 2010 was a key factor in the increase in GHG emissions observed that year (the only increase between 2005 and 2013). In contrast, warmer years such as 2013 and 2014 had the opposite effect.
- The significant variance in the parameters used by Member States for projections and progress reporting towards their 2020 climate and energy objectives represents an obstacle to carrying out a consistent, integrated assessment of progress based on information reported by countries. Amongst the three streams of reporting obligations (for GHG emissions, RES and energy efficiency), the most complete and transparent provisions are on the climate side (GHG emissions).
- The setting up of a reliable and transparent governance of the Energy Union, including the monitoring of progress towards the 2030 climate and energy targets, represents a timely opportunity to establish a consistent reporting structure for these targets.

2.1 EU progress towards its '20-20-20' climate and energy targets

Based on the analysis of data and information reported by Member States in 2014 and 2015, the EU is on course to meet each of its 2020 targets for GHG emissions, renewable energy and energy efficiency. Progress towards the GHG target is substantial and more pronounced than for the renewable energy and energy efficiency targets (Figure 2.1).

- **GHG emissions.** These were already 19.8% below 1990 levels in 2013, very close to the 20% reduction target set for 2020. The EU may achieve a GHG reduction of 24% below 1990 levels by 2020 with the current measures in place, according to the latest projections from Member States. Additional measures (currently planned by Member States) could further reduce emissions to 25% below 1990 levels. Most of the savings in GHG emissions are expected to take place under the EU ETS, which today represents about 45% of total EU emissions. Approximated estimates of 2014 GHG emissions reported by Member States indicate that GHG emissions decreased significantly in 2014. Compared to 1990 levels, the reduction reached 23% (24% if international aviation is excluded). The year 2014 was exceptionally warm in almost all parts of Europe, resulting in a markedly low heating energy demand compared to 2013. This 2014 level is significantly lower than that anticipated by Member States in their projections.

- **Renewable energy.** The steady deployment of RES in the EU's energy mix continues. The consumption of renewable energy continued to increase in 2013, standing at 15% of gross final energy consumption and getting closer to the 20% target for 2020. The 2013 share is higher than indicative levels set for that year in both the RED ([3]) and Member States' national renewable energy action plans (NREAPs). The 2020 target could be attained if Member States can sustain the speed at which they have been developing RES, so far. However, as we approach 2020, the trajectories for meeting the national targets become steeper, and more costly projects will have to be developed, while market barriers persist in several Member States. According to approximated estimates from the EEA, the EU RES share further increased in 2014 and remained above the indicative share set in the RED for the two-year period from 2013 to 2014.

- **Energy efficiency.** The EU is reducing its energy consumption. Since 2005, the EU's primary and final energy consumption has been decreasing at a pace which, if sustained until 2020, would be sufficient for the EU to meet its 20% energy efficiency target. Again, the pace might be difficult to sustain because European legislation implementation remains weak in several Member States. Considering EEA preliminary estimates, primary energy consumption further decreased in 2014 in most Member States. This decrease can be partly explained by the warmer temperatures in 2014, compared to 2013.

These results seem particularly consistent with the European Commission's 2011 communication *A Roadmap for moving to a competitive low-carbon economy in 2050* (EC, 2011a): delivering on its commitment to reach 20% renewables and achieve 20% energy efficiency by 2020 would enable the EU to outperform the 20% emission reduction target, and achieve a 25% reduction by 2020.

This also underlines the interconnected and reciprocal nature of progress made towards each policy objective:

- lower energy consumption levels (encouraged in part by the energy efficiency target) and a less carbon-intensive fuel mix (encouraged in part by the renewables target) are two key drivers for reducing GHG emissions;

- an increasing share of RES helps meet the energy efficiency target, as a 100% transformation efficiency is assumed for renewables, which reduces levels of primary energy consumption (EEA, 2014f);

- measures primarily designed to deliver GHG emission reductions (i.e. establishing a carbon price signal through the EU ETS) may encourage investments in low-carbon energy sources and energy efficiency.

These interactions between the 2020 climate and energy targets are at the core of the EU's climate and energy package adopted in 2009. They underline the importance of using consistent assumptions to design policies and of reporting consistent information under different obligations, in order to improve the quality of future progress assessments (ETC/ACM, 2013).

The progress made to date by the EU towards its 2020 climate and energy targets reflects a collective

([3]) The indicative RED targets are set as an average for two consecutive years. For the EU, the average of its real-life RES shares in 2013 and 2014 must be above 12.1%.

achievement by the EU and its Member States. They adopted a range of policies and measures to reduce GHG emissions, deployed renewable energy across Europe (through support measures such as premium or feed-in tariffs, quota systems, tax incentives and tender schemes) and improved energy efficiency through building regulations, product labelling and vehicle emissions standards, for example.

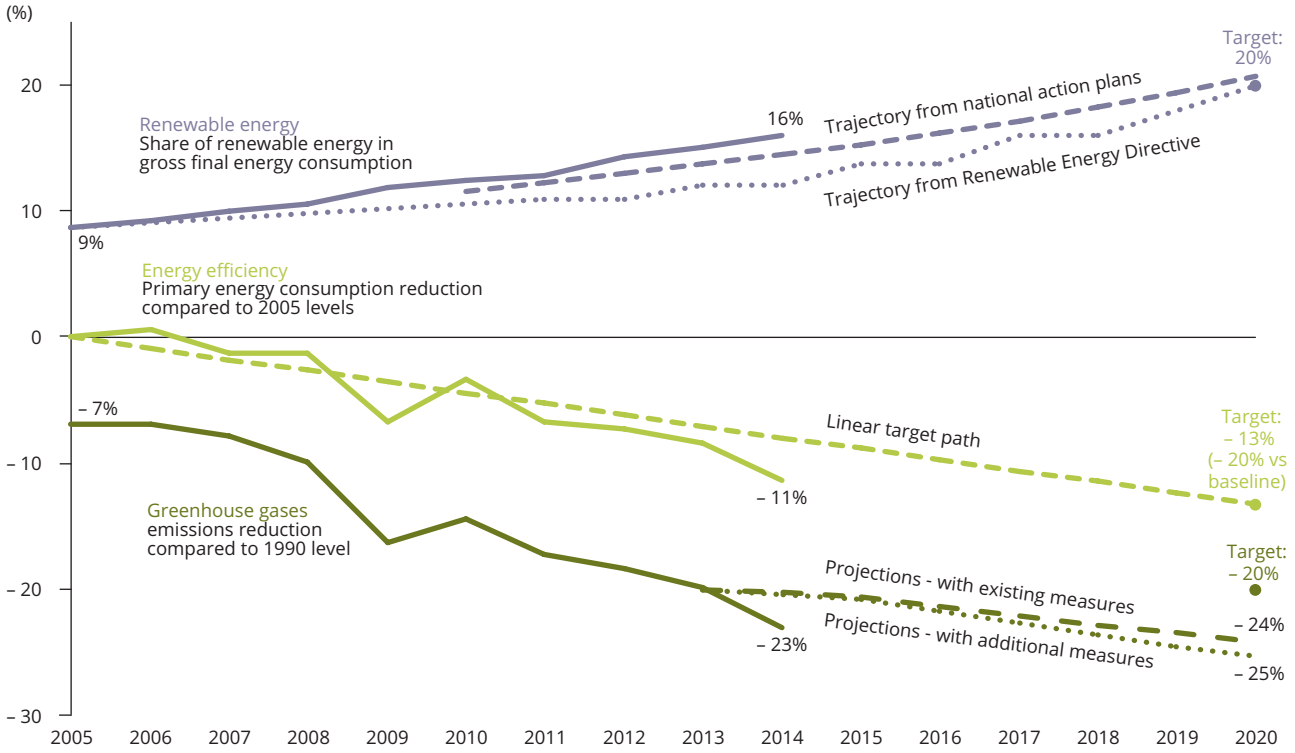
This progress was reinforced by the impacts of the economic crisis, during which lower levels of economic activity severely affected the EU's energy demand and related GHG emissions, in particular in 2009 (Figure 2.1). In turn, the lower demand for final energy (combined with an increase in renewable energy capacity) bolstered the increase in the share of renewable energy in energy consumption. As the effects of the economic recession slowly dissipate, it is important for the EU and its Member States to maintain or increase their efforts in implementing an adequate mix of policies, in order to further decouple economic growth from environmental impacts and achieve all the '20-20-20' targets.

2.2 Progress towards EU mid- and long-term climate and energy objectives

The EU has articulated a long-term goal for 2050 of reducing Europe's GHG emissions by 80% to 95%, compared to 1990 levels. To ensure that the EU is on a cost-effective track towards meeting this long-term objective, EU heads of state or government agreed, in October 2014, on a climate and energy policy framework for the EU, and endorsed new climate and energy targets for 2030 (European Council, 2014).

The framework includes a binding target of a 40% (at least) domestic reduction in GHG emissions, compared to 1990. This target will be delivered through a 43% reduction in the ETS sectors and a 30% reduction in the non-ETS sectors by 2030, compared to 2005. According to current Member State projections, a reduction of EU GHG emissions by 27% (on the basis of existing mitigation measures) up to 30% (accounting for planned national measures) could be achieved by 2030, compared to 1990 levels. The EU Reference

Figure 2.1 EU progress towards 2020 climate and energy targets



Note: The energy efficiency target for 2020 is defined as an absolute target, set 20% below the level in primary energy consumption projected for 2020 in the 2007 Energy Baseline Scenario of the European Commission. In this figure, this target is expressed as a relative change compared to 2005 levels of EU primary energy consumption, in order to show the required reduction in primary energy consumption over time. The year 2005 was chosen because it is used as a base year for GHG (in the EU ETS and under the ESD) and for renewable energy targets. It also corresponds to a peak in energy consumption in the EU.

Source: EEA, 2015a, 2015b, 2015c, 2015e and EEA, 2015f; Eurostat, 2015a and 2015b.

Scenario 2013 (EC, 2013a) reached similar conclusions (32% GHG reduction in 2030, if no further policies are adopted). These projected levels are not sufficient to meet the 40% target by 2030, however the projections do not take into account new policy proposals, still being discussed in the EU to enable the achievement of this 2030 target.

The European Council also adopted a target of at least 27% for the share of renewable energy consumption for 2030. This target is binding at EU level, but with no fixed targets for the individual Member States. The target is intended to provide flexibility for Member States to set their own more ambitious national objectives for increased renewable energy, and to support them, in line with the state aid guidelines, while taking into account their degree of integration into the internal energy market. Maintaining the current pace of RES deployment across Europe would enable the EU to achieve RES shares above the 20% target in 2020 and the 27% target in 2030. However, it cannot be assumed that this will transpire, as the least costly options will become scarcer and current support mechanisms are being phased out. Moreover, even if the 2030 target is achieved, renewable energy would need to grow even faster until 2050 in order to attain the minimum levels consistent with the EU's long-term decarbonisation objectives. Growth between 2030 and 2050 will have to be two to three times faster than in the period from 2005 until 2013.

Finally, EU heads of state or government also adopted an indicative target at EU level of at least 27% for improving energy efficiency in 2030 compared to projections of future energy consumption (based on the European Commission's 2007 Energy Baseline Scenario (EC, 2008)). The target will be reviewed by 2020, with an EU level of 30% in mind. A 27% reduction target in 2030 compared to the 2007 Energy Baseline Scenario is equivalent to a reduction of primary energy consumption by about 20% below 2005 levels. For final energy consumption, the 2030 target would mean a 12% decrease from 2005 levels. With these targets, the average reduction in energy consumption between 2020 and 2030 would be slightly lower than that needed between 2005 and 2020 to achieve the 2020 energy efficiency targets. In any case, achieving the 2030 targets requires not only a strong implementation of energy efficiency measures, but also a rapid change in consumer behaviour.

Although the EU and its Member States are making good progress towards their short-term goals on climate and energy, they will have to increase considerably their efforts to meet longer-term energy and decarbonisation objectives for 2050. To meet this challenge, the European Commission proposed in 2011 a *Roadmap for moving to a competitive low carbon economy by 2050*. EU Member States are now developing low carbon development strategies outlining concrete steps to turn EU-wide, long-term ambitions into national and local action. These national strategies were submitted for the first time in 2015 to the European Commission and will be further assessed by the EEA in 2016.

2.3 Progress towards national 2020 climate and energy objectives

Overall, the EU is currently on track to meet its three climate and energy targets for 2020; however, Member States are not all individually performing well with respect to their national targets (Table 2.1). The projected overachievements of the majority of Member States offset the slower progress projected in a few Member States.

- A total of 24 Member States are on schedule to meet their national GHG targets. These differentiated targets were set under the ESD ([4]) and cover about 55% of total GHG emissions at EU level.

- A total of 20 Member States are on course concerning renewable energy targets. These differentiated targets were set under the RED, taking into account the large variety of national circumstances in relation to the potential for renewable energy growth.

- A total of 20 Member States are considered to be on target regarding energy efficiency. These indicative national targets, relative to primary or final energy consumption in 2020, were set by Member States under the EED.

As in the 2014 assessment (EEA, 2014a), several Member States are considered to be on track to meet their three climate and energy targets, while no Member State underperforms in all three domains. The number of Member States that are currently expected to achieve their national 2020 GHG emission targets increased from 14 to 24 compared to last year, while progress towards the renewables and energy efficiency target have remained relatively stable over the past 2 years.

([4]) The targets set under the ESD relate to GHG emissions not covered by the EU ETS, e.g. emissions from sectors such as transport, buildings or agriculture. The remaining GHG emissions are covered by the EU ETS and are therefore governed by a single cap set at EU level. Emissions and removals from land use, land-use change and forestry (LULUCF) are neither covered by the EU ETS, nor included in the ESD.

Table 2.1 Progress of Member States towards 2020 climate and energy targets

Member State	GHG emissions (Effort Sharing Decision)						Renewable energy sources			Energy efficiency	
	On track (green)/not on track (yellow or orange)	Distance between 2013 ESD emissions and 2013 ESD target	Distance between projected 2020 ESD emissions and 2020 ESD target (WEM)	Distance between projected 2020 ESD emissions and 2020 ESD target (WAM)	Distance between sum of projected 2013 to 2020 ESD emissions and sum of 2013 to 2020 ESD targets (WEM)	Distance between sum of projected 2013 to 2020 ESD emissions and sum of 2013 to 2020 ESD targets (WAM)	On track (green)/not on track (yellow or orange)	Distance between 2013 RES share and NREAP trajectory	Distance between 2013 RES share and RED trajectory	On track (green)/not on track (orange)	Distance between 2013 PEC and 2005 to 2020 linear target path
		Mt CO_2-eq.	Mt CO_2-eq.	Mt CO_2-eq.	Mt CO_2-eq.	Mt CO_2-eq.		Percentage points	Percentage points		ktoe
Austria		2.9	– 2	3	0	18		0.8	6.1		177
Belgium		4.3	– 4	NE	1	NE		2.1	2.5		– 42
Bulgaria		3.8	6	NE	37	NE		7.6	7.6		1 536
Croatia		2.6	4	5	27	31		2.2	3.2		2 679
Cyprus		1.6	3	3	22	18		0.3	2.2		162
Czech Republic		0.7	10	15	42	58		1.4	4.2		1 208
Denmark		3.4	0		16	NE		– 0.1	6.3		662
Estonia		0.5	1	1	6	7		2.3	5.5		– 553
Finland		0.4	0	0	3	3		5.2	5.5		1 926
France		22.4	14	NE	178	NE		– 0.8	0.1		– 7 158
Germany		5.0	4	NE	80	NE		0.4	2.9		– 6 970
Greece		12.9	18	NE	116	NE		5.1	4.8		3 769
Hungary		12.7	21	23	128	115		2.3	2.9		5 091
Ireland		3.8	– 5	– 2	– 1	9		– 0.8	0.8		847
Italy		37.4	18	31	232	286		6.8	8.0		14 069
Latvia		0.9	1	2	7	8		2.4	2.3		619
Lithuania		0.7	2	3	12	14		4.0	5.6		1 476
Luxembourg		0.0	– 2	NE	– 8	NE		– 0.3	– 0.3		326
Malta		0.1	0	0	2	2		0.0	0.8		– 12
Netherlands		13.9	6	6	85	87		– 2.1	– 1.4		– 1 621
Poland		4.6	13	NE	73	NE		0.3	1.8		– 886
Portugal		9.6	13	13	88	89		– 1.4	2.1		2 361
Romania		8.7	11	14	80	93		4.5	4.2		9 190
Slovakia		2.2	4	5	24	28		0.9	0.9		837
Slovenia		1.5	1	NE	11	NE		2.0	2.8		411
Spain		31.0	6	14	149	178		– 0.2	3.3		13 542
Sweden		6.6	5	NE	48	NE		6.5	9.5		– 1 195
United Kingdom		10.3	11	15	85	95		0.1	– 0.3		4 147
EU			160	205	1 543	1 724		1.3	2.9		21 796

Note: Values represent the difference between the target and the parameter considered. A positive value indicates that a target is met.

For GHGs, Member States are considered to be:

- **on track** (green) if GHG emissions in 2013 were below their respective annual ESD target and if emissions are expected to remain below the annual ESD targets, any year between 2014 and 2020 (based on approximated estimates for 2014 and projections for 2015 to 2020);
- **not on track,** if:
  - (yellow) historic emissions in 2013 were below their 2013 ESD target, but projections in the WEM scenario show that 2020 emissions will be higher than the 2020 ESD target,
  - (orange) historic emissions in 2013 were above their 2013 ESD target, or projections (WEM and WAM) show that the emissions for the whole period from 2013 to 2020 will be above the overall 2013–2020 emission budget under the ESD (this is equivalent to saying that the 2020 target will be missed, despite the carry-over of any surplus from previous years). These Member States can still achieve their 2020 target WAM or by using flexibility provisions under the ESD.

For RES, Member States are considered to be:

- **on track** (green) if both interim targets (NREAP and RED) were exceeded in 2013;
- **not on track,** if:
  - (yellow) the NREAP target was not met but the RED was met in 2013,
  - (orange) the RED target was not met in 2013.

For energy efficiency: Member States are considered to be:

- **on track** (green) if the primary energy consumption in 2013 remained below the linear 2005–2020 target path,
- **not on track** (orange) if the primary energy consumption in 2013 was above the linear target path.

NE: not estimated

For energy efficiency, the distance between the 2013 primary energy consumption and the linear target path between 2005 and the 2020 target at EU level differs from the sum of the distances calculated for each Member State, because the sum of the Member States' targets on primary energy consumption is higher than the EU's overall target.

Source: Based on analyses in individual chapters.

In total, 13 Member States (Bulgaria, Croatia, Cyprus, the Czech Republic, Finland, Greece, Hungary, Italy, Latvia, Lithuania, Romania, Slovakia and Slovenia) are considered to be on course for meeting all three of their national climate and energy targets for 2020, based on their situations as observed in 2013 (Table 2.1). This outcome may reflect, to some extent, the fact that some of the national targets to be achieved by 2020 do not actually require absolute reductions in GHG emissions or energy consumption, but only relative 'limitation' efforts, i.e. for some Member States, emissions or consumption are allowed to increase until 2020. In 10 of the countries mentioned above (i.e. all except Cyprus, Greece and Italy), at least one of the two 2020 targets on GHG emissions and on primary energy consumption for 2020 is higher than the respective 2005 level ([5]).

The share of energy-related GHG emissions covered by the ESD is lower than under the ETS. Therefore, the progress made by Member States towards their renewable targets, and to a lesser extent towards their energy efficiency targets, has a comparatively smaller effect on their ESD emissions (for which they have a national target to achieve) than on their ETS emissions. The link between the three targets is therefore somewhat weaker at national level than at EU level (where all emissions are considered in the 20% reduction target). Renewable and energy efficiency policies nevertheless contribute to reduce emissions in the sectors covered by the ESD, in particular the transport and building sectors. Energy efficiency improvements and the development of RES have been playing different roles across Member States in helping them to make progress towards their national ESD targets. Two different examples of pathways followed in attaining ESD targets are presented in Box 2.1.

In the four Member States projected to have their ESD GHG emissions above their targets for the year 2020 (i.e. Austria, Belgium, Ireland and Luxembourg), current policies appear to be insufficiently effective at overcoming obstacles to generate sufficient emission reductions. Such obstacles might be technical, for example, a relatively low potential for RES, or economic, such as the low taxes on fuel sales compared to neighbouring countries (as is the case for Luxembourg).

Box 2.1 Examples of contributions of energy efficiency and renewable energy towards ESD targets in Sweden and the United Kingdom

Sweden and the United Kingdom have similar GHG emission targets for 2020 under the ESD (− 17% and − 16%, respectively), and are both making good progress towards these targets.

However, these countries' followed different pathways in energy consumption and renewable energy.

- Between 2005 and 2013, primary energy consumption declined by approximately 13% in the United Kingdom, while decreasing by only 3% in Sweden during that period. The introduction of policies and measures in the United Kingdom's transport sector (i.e. fuel efficiency standards, investments in public transport) may have contributed to a 9% reduction in final energy consumption between 2005 and 2013. The implementation of policies and measures in the residential sector (i.e. low-carbon building regulations) also contributed to a reduction in the final energy consumption of that sector during this period (Eurostat, 2015a). By contrast, despite government efforts, Sweden achieved a smaller reduction in final energy consumption in both the transport sector (− 3%) and the residential sector (− 4%) during this period (Eurostat, 2015a).

- In 2013, the share of renewables used in the generation of residential heating and cooling was much higher in Sweden (67%) than in the United Kingdom (3%), reflecting the country's effective use of district heating networks (Eurostat, 2015f). Furthermore, the promotion of biofuels in Sweden contributed to this country overachieving on its renewable energy target for transport (10%), with well over 16% renewable energy use in the transport sector. This compares to only 4% in the United Kingdom. To achieve its ESD target, Sweden has therefore been relying more than the United Kingdom on reducing the carbon intensity of its energy consumption.

([5]) Under the ESD, the national GHG emission targets for 2020 were set on the basis of Member States' relative wealth (measured by GDP per capita per capita). Less wealthy countries are allowed emission increases in these sectors because their relatively higher economic growth is likely to be accompanied by higher emissions. This is particularly the case for Bulgaria, the Czech Republic, Hungary, Latvia, Lithuania, Slovakia, Slovenia and Romania. Furthermore, five Member States of the same group of countries performing well in all three policy objectives (Finland, Hungary, Latvia, Romania and Slovenia) have also voluntarily adopted positive limits (i.e. increase within a specified constraint) on primary energy consumption for 2020.

The different national circumstances of each Member State, with regard to their emission profile, may also play a role in making targets more or less difficult to attain. As a consequence of the economic recession, many Member States are also operating under stricter financial constraints that can limit the capacity of national governments to finance future investments in new technologies.

2.4 Main drivers of GHG emission trends

The drop in EU GHG emissions between 2005 and 2013 resulted from the combination of several driving forces (energy efficiency improvements, increase in the use of renewables, etc.). The relative effects of various drivers on emission trends during this period were quantified through a decomposition analysis ([6]). As this method does not allow for capturing all relevant factors at once, its results were complemented by an analysis of the effects of annual variations in weather conditions on GHG emission trends over this time period.

The EU is becoming decreasingly energy intensive over time: its economy is growing while it requires decreasing amounts of energy ([7]). This trend is primarily responsible for the reductions in GHG emissions observed in the EU between 2005 and 2013 (Figure 2.2). Reductions in energy intensity occurred in all years during this period, except in 2010, following the recovery from the economic crisis and a particularly cold winter (Figure 2.2), which was reflected by a sharp increase in the number of heating degree days in 2010 compared to the previous year (Figure 2.3). The 14% reduction in the EU's energy intensity between 2005 and 2013 was driven by a number of factors including structural change and improvements in energy efficiency resulting from a range of policies and measures, such as stricter building regulations and energy product labelling.

Reductions in GHG emissions are also attributable to a change in the fossil fuel mix, and the increasing use of carbon-free energy sources, including renewables ([8]). The EU-wide use of fossil fuels such as hard coal and gas in gross electricity production declined by 12% and 23%, respectively, between 2005 and 2013, whereas the EU-wide use of renewables in gross electricity production increased by 73% over the same time period (Eurostat, 2015h). The increasing contribution of this driver to GHG reductions over time reflects the effects of policies and measures supporting the deployment of renewables (i.e. feed-in tariffs), the establishment of a carbon price through the EU ETS, and more external factors such as fluctuations in fossil fuel prices.

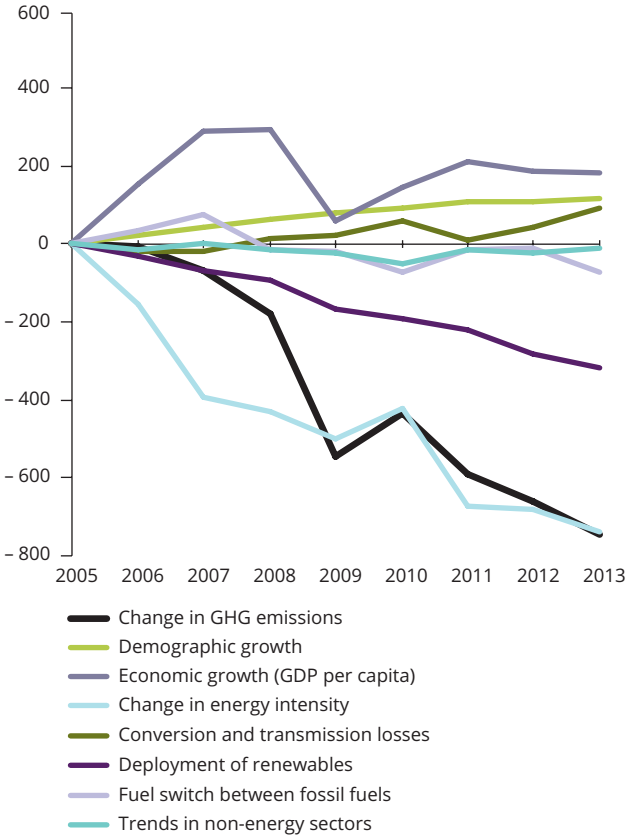
The contributions of upward drivers on GHG emissions (such as economic and demographic growth) over the whole period from 2005 to 2013 were mainly offset by the GHG reductions associated with lower levels of energy intensity, and to a lesser extent, a shift to renewable energy (Figure 2.2). However, lower levels of activity following the economic recession also contributed to an overall reduction in GHG emissions over the time period, as represented by the lower contribution of GDP to emissions increases after 2010, compared to the pre-recession period.

Fossil fuel-switching ([9]) contributed to increases in GHG emissions for several years during the 2005 to 2013 time period. It is likely that cheaper coal prices following the economic recession, combined with exogenous developments such as the shale gas revolution in the United States ([10]) (amongst other factors), contributed to fuel-switching towards more CO_2 intensive fuels. At the same time, when the EU ETS delivered a strong EUA price signal above EUR 20 per tonne CO_2 in the first half of 2008, this encouraged fuel-switching to lower CO_2-intensive fuels (i.e. from coal to natural gas) and contributed to GHG emission reductions (Figure 2.2). While the price signal from the EU ETS weakened in subsequent years, GHG emission reductions were still influenced by fuel-switching in both 2010 and 2013 in response to other exogenous factors (i.e. differentials in fossil fuel prices).

([6]) The decomposition methodology followed the Logarithmic Mean Divisia Index (LMDI) approach (Ang, 2005). The drivers assessed are explained throughout the footnotes.
([7]) Energy intensity is calculated by dividing gross inland energy consumption by gross domestic product.
([8]) The effect of this driver is reflected through the share of non-renewable fuels in gross final energy consumption, which is itself calculated by dividing gross final energy consumption of energy from non-renewables by the total gross final energy consumption of energy.
([9]) Fuel-switching is calculated by dividing CO_2 emissions from fossil fuel use by gross final energy consumption of energy from non-renewable sources.
([10]) The shale gas revolution in the United States refers to the extraction of non-conventional sources of shale gas. The exploitation of cheaper shale gas reserves reduced the demand for alternatives such as coal that impacted world energy prices and resulted in increased global exports of coal from the United States.

Figure 2.2 Contributions of drivers to GHG emission trends, 2005–2013

Effect of individual driver on GHG since 2005 (Mt CO_2-eq.)

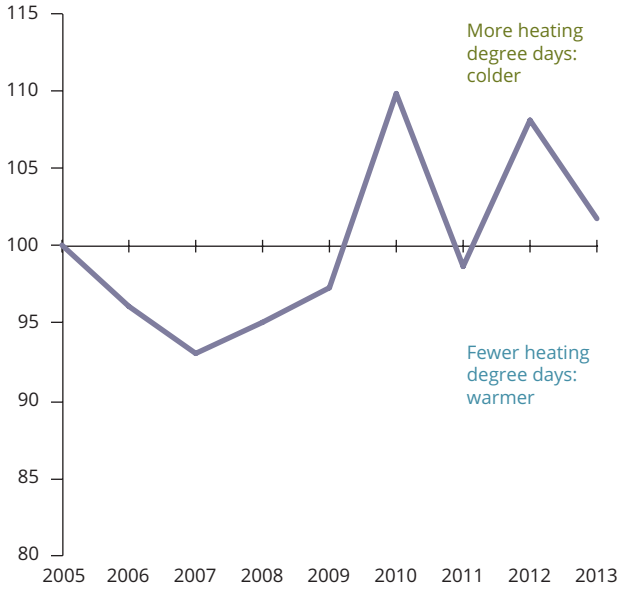


Note: Each line represents the contribution of a driver to the total GHG emission trend since 2005. For any given year, the sum of the contributions of each individual driver is equal to the overall change in GHG emissions.

Source: EEA, 2015a; Eurostat, 2015a, 2015c, 2015d and 2015e.

Figure 2.3 Heating degree days in Europe, 2005–2013

Index 100 = 2005



Note: Heating degree days express the severity of the cold in a specific time period, taking into consideration outdoor temperature and room temperature.

Source: Eurostat, 2011, 2012, 2013, 2014a and 2015f.

3 Progress towards GHG emission targets

Progress in figures

- The EU is on track to meet its target to reduce GHG emissions by 20% by 2020 under the UNFCCC; this corresponds to a 20% reduction compared to base-year levels for the second commitment period under the Kyoto Protocol (from 2013 until 2020).
- EU GHG emissions were 19.8% below 1990 levels in 2013. They are expected to decrease to levels between 24% and 25% below 1990 levels, by 2020 (national projections reported by Member States in 2015). EU GHG emissions may have decreased by 4% in 2014 and reached a level of 23% below 1990 (recent and preliminary estimates of 2014 levels). This level is lower than the levels anticipated by Member States in their projections for 2014.
- EU-15 ([11]) emissions were on average 11.8% below base-year emissions for the first commitment period of the Kyoto Protocol (from 2008 until 2012), well below the 8% reduction target (compared to base-year levels).

EU ETS sectors

- Between 2005 and 2014, emissions covered by the EU ETS (which represents about 45% of total EU emissions) decreased by 24%.
- 2014 ETS emissions were already below the 2020 cap. Between 2015 and 2020, ETS emissions are expected to decrease by a further 8%. Between 2005 and 2020, the overall emission reduction could reach at least 26%.
- The ETS has undergone a reform so as to address the current surplus of allowances and enhance the ability of the EU ETS to meet medium and long-term emission reduction targets cost-effectively.

Non-EU ETS sectors

- In sectors not covered by the ETS, GHG emissions decreased by 9.6% between 2005 and 2013. They are expected to further decrease between 2013 and 2020, and to remain lower than the target levels set under the ESD. Preliminary data for 2014 already indicate a 12.7% decrease compared to 2005.
- In 2013, national 'ESD emissions' (the difference between total emissions and ETS emissions) were below national ESD targets in all Member States. Preliminary data for 2014 seem to confirm this trend across the EU.
- National projections show that in most Member States, ESD emissions will remain below annual ESD targets until 2020. However, in four Member States (Austria, Belgium, Ireland and Luxembourg), emissions in 2020 could exceed the targets by 2020 if no additional measures are implemented. These countries could nevertheless achieve their ESD targets by using flexibility provisions under the ESD (using surplus compliance units (AEAs) accumulated in the early years of the 2013-to-2020 period to compensate for shortfalls in the later years of this period (Austria (WAM) and Belgium)). They could also buy compliance units from other countries. Altogether, based on the latest data available, a surplus of more than 1 500 million AEAs could accumulate in the EU by 2020. This is significantly more than previously estimated.

([11]) 15 EU Member States before 2004.

Beyond 2020

- Projections beyond 2020 show further decreases in EU GHG emissions. However, Member States expect that the pace of these reductions will slow down, particularly in the ESD sectors. Planned reductions will only bring EU emissions between 27% and 30% below 1990 levels by 2030, which is insufficient to achieve the 40% reduction target set for 2030.
- However, new policy proposals, still being discussed in the EU to enable the achievement of this 2030 target, have not yet been taken into account in projections. Such proposals include a revision of the ETS, a post-2020 ESD, and measures to enhance energy efficiency as well as in the transport and land use sectors.
- Looking further ahead, the long-term decarbonisation objectives of the EU (in particular a reduction of EU GHG emissions by 80% to 95% by 2050, compared to 1990) will require even sharper emission cuts after 2030.

3.1 EU progress towards GHG emission targets

The EU is making good progress in meeting its target of reducing GHG emissions by 20% by 2020, compared to 1990. In 2013, its total GHG emissions were 19.8% below 1990 levels. According to the most recent approximated emission data, emissions in 2014 were already 23.0% below 1990 levels. This includes all emissions from aviation (including international flights), covered under the EU target.

According to national projections reported by Member States to the European Commission in 2015 and aggregated at EU level, GHG emissions are expected to further decrease between 2013 and 2020 (Figure 3.1).

By 2020, projected levels are expected to be:

- 24% below 1990 levels in the WEM scenario, which reflects the effects of all adopted and implemented measures at the time projections were prepared;
- 25% below 1990 levels in the WAM scenario, which takes also into account the measures at planning stage at the time projections were prepared ([12]).

However, these projections do not reflect the latest EU-level policy developments aiming to meet the recently endorsed 2030 target of a 40% domestic reduction of EU emissions. This concerns, for example, the recent proposals on reforming the EU ETS, which include a more stringent cap reduction after 2020.

In fact, preliminary estimates of 2014 GHG emissions, reported by Member States after having submitted their GHG projections, indicate that GHG emissions decreased significantly in 2014, with the reduction being much higher than projected levels. The reduction compared to 1990 levels reached 23% (24% when international aviation is excluded). The year 2014 was exceptionally warm in almost all parts of Europe, resulting in a considerably low heating energy demand compared to 2013. This 2014 proxy level is significantly lower than the 2014 levels consistent with Member States' projections.

The latest projections from Member States also indicate that the EU seems on track to reach its target for the second commitment period of the Kyoto Protocol. This target corresponds to emissions reductions of 20% below base-year level (i.e. similar to 1990) averaged over the period between 2013 and 2020 ([13]). Accordingly, total emissions for this period have to remain below the corresponding emissions budget. The scope of the EU's target under the Kyoto Protocol excludes emissions from international aviation, and includes emissions and removals from land use, land use change and forestry (LULUCF). Total GHG emissions (excluding LULUCF) were 21% below 1990 levels ([14]) in 2013. They are expected to decrease to levels between 23% and 24% below 1990 levels on average, during the second commitment period. The range of values corresponds to the two scenarios considered, i.e. the implementation of additional measures planned by Member States (WAM) or not (WEM).

For the first commitment period running from 2008 until 2012, the EU-15 (comprising the 15 pre-2004 EU Member States) had a common reduction target of − 8% for the period, compared to base-year levels. This target was reached, as total GHG emissions in

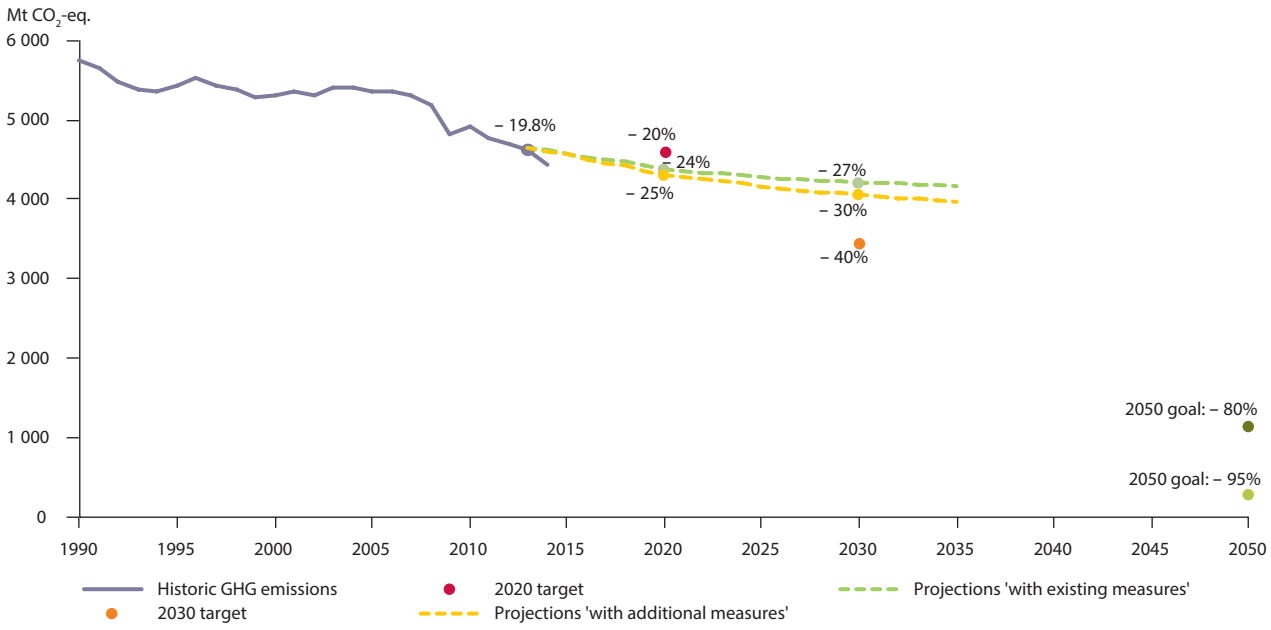
([12]) Not all Member States reported a WAM scenario, so the reduction might not take all planned measures into account and therefore be underestimated. For further information on reporting of projections, see Section A2.3 in Annex 2.
([13]) This target is similar in ambition but not equivalent in scope to the EU domestic target of − 20% for the year 2020, because these two targets have different scopes and are governed by different accounting rules (for details, see Section A1.3 in Annex 1).
([14]) Under the Kyoto Protocol, emission targets and changes in emissions are normally expressed compared to base-year levels, which might differ from 1990 levels. The base-year values to be used for the second commitment period of the Kyoto Protocol will only be available in 2016.

the EU-15 were on average 11.8% below base-year emissions during that period (EEA, 2014b). While nine EU-15 Member States intend to make use of flexible mechanisms under the Kyoto Protocol to achieve their burden-sharing targets for the first commitment period, nine non-EU-15 Member States have reported on their intention to sell a net amount of Kyoto units to other parties (EEA, 2014b).

Looking towards 2030, projections from Member States show that both current measures in place and additional national measures at planning stage will not be sufficient to deliver enough savings for the EU to achieve the reduction target endorsed by the European Council (EU heads of state or government) in October 2014 of − 40%, compared to 1990 levels (Figure 3.1). The pace of GHG emission reductions is actually projected to slow down after 2020, while mid and long-term targets will in fact require faster reductions. Existing policies and measures are expected to result in an emission reduction of 27% by 2030, compared to 1990 levels, and the implementation of additional measures could push this reduction down to 30% below 1990 levels. Because of this projected shortfall, new policies and measures are currently being developed at EU level to further reduce GHG emissions. These policy options include measures in the transport and land use sector as well as the reform of the ETS. A post-2020 ESD and measures to enhance energy efficiency are based on the 2030 framework for climate and energy policies proposed by the European Commission in early 2014 (EC, 2014a), the subsequent conclusions of the European Council of October 2014, as well as the EU's Energy Union Strategy (EC, 2015a).

Assuming that the 2030 target will be achieved, even steeper emission reductions will be required for the EU to reach its long-term decarbonisation objective — a reduction of EU GHG emissions by 80% to 95% compared to 1990, to be achieved by 2050. Such a reduction can only take place in the context of a major transformation of the EU's energy system. As the effects of policies and measures often take time to materialise (e.g. increases of energy efficiency in buildings), long-term action should not be delayed but is required now. While Member States tend to prioritise low-cost mitigation measures, they should also take into consideration the long-term mitigation potential of other measures, which are generally postponed due to high current costs or other types of difficulties related to their implementation. However, investments in these measures often make economic sense, even in the short term, as they significantly contribute to generate learning effects and thereby bring about future cost reductions.

Figure 3.1 GHG emission trends, projections and targets in the EU, 1990–2050



Note: The scope of the GHG emission targets presented in this figure includes emissions from international aviation, and excludes emissions and removals from the LULUCF sector (carbon sinks) and nitrogen trifluoride (NF_3) emissions. The WEM scenario takes currently adopted policies into account. The WAM scenario takes into account the additional effects of planned measures reported by 18 Member States (no WAM scenario was available from Belgium, Bulgaria, Denmark, France, Germany, Greece, Luxembourg, Poland, Slovenia and Sweden) (see Section A2.3 in Annex 2). However, the projections do not take into account recent policy proposals such as the reform of the EU ETS and other measures in non-ETS sectors post 2020.

Source: EEA, 2015a, 2015c and 2015d.

3.2 Trends and projections in GHG emissions, by sector

Between 1990 and 2013, GHG emissions were reduced in all the main emitting sectors except transport. In this sector, emissions increased by 19.4% over the whole period (13.0% excluding emissions from international aviation), although they have been steadily decreasing since 2007. In 2013, the transport sector represented 22.1% of total GHG emissions in the EU (18.8% excluding international aviation). Activities related to LULUCF represent a net carbon sink, removing every year the equivalent of 6% of the EU's total GHG emissions (the scope of EU target under the Kyoto Protocol). These removals are not taken into account in the EU's 2020 target under the climate and energy package, though.

The decrease in emissions which took place in the 1990s was mostly driven by the restructuring of eastern European economies across the energy, industry and agriculture sectors. The recent economic crisis also contributed to further emission reductions across the EU. Besides the predominant influence of economic factors shaping GHG emission trends, policies at national and EU levels have been playing an increasing role. After the early implementation of energy efficiency and air pollution mitigation policies in the 1990s and the gradual shift to less carbon-intensive fossil fuels (e.g. the fuel switch from coal to gas), more directly targeted climate and energy policies were implemented in the EU (EEA, 2011a). These policies, supporting the development of renewable energy and improvements in energy efficiency, have led to sustained emission cuts across the EU (EEA, 2014c and 2014d). According to previous EEA analysis, the economic downturn in the EU between 2008 and 2012 contributed to less than half of the emission reductions observed during that period. In fact, EU emissions have been decreasing every single year since 2003, except in 2010 when they slightly recovered from the 7% 'crisis drop' in 2009.

Since the introduction of the EU ETS in 2005, GHG emissions in the EU can be separated into two main categories: 'ETS emissions' and 'non-ETS emissions'.

- About 40% to 45% of EU GHG emissions are covered by the EU ETS. These emissions essentially come from industrial installations (point sources), a large part of which fall under the power generation sector. Other activities covered by the ETS include cement production, iron and steel production, and oil refining. Since 2012, the EU ETS has also covered emissions from aviation. The mitigation of all ETS emissions is being addressed at EU level through an ETS-wide emission cap ([15]).

- All other emissions, not covered by the EU ETS, come from a more diverse range of sectors or activities including road transport, energy consumption in buildings, agriculture (cattle and soils) and waste management. These emissions, except for emissions and removals from LULUCF, are now covered under the ESD, which sets annual targets for each Member State from 2013 until 2020. Mitigation actions therefore take place at national level, through a mix of EU-driven policies and measures and national initiatives (see Table 3.1 for an indicative list of key EU policies and measures supporting GHG emission reductions under the ESD).

GHG emissions in ETS sectors and in ESD sectors have been following markedly different trends since 1990 ([16]) (Figure 3.2) and projections reported by Member States also show significant differences between these two categories.

In the sectors now covered by the EU ETS, emissions have been decreasing significantly since 1990. Total ETS emissions decreased by 24% between 2005 and 2014, with most emission reductions being related to fossil fuel combustion for heat and electricity production (the power sector). Most future emission reductions in the EU are projected to take place under the EU ETS. While emissions covered by the EU ETS represented about 42% of total EU emissions in 2013, the emission reductions in these sectors are expected to account for 63% of total emission reductions projected by Member States between 2013 and 2020, and Member States project further emission reductions until 2030. However, emissions from international aviation which already increased by 93% between 1990 and 2013 are expected to increase further by 2030.

In the sectors covered by the ESD, the only significant projected emission reductions are expected to take place in the building sector: an annual saving of 8 Mt CO_2-eq. could be reached by 2020 (− 9% compared to 2013 levels, corresponding to a total saving of 62 Mt CO_2-eq.) on the basis of existing mitigation measures, including deep retrofits and energy-efficient new buildings. In the transport sector (excluding aviation), which is the largest contributor to GHG emissions under the ESD, emissions are projected to

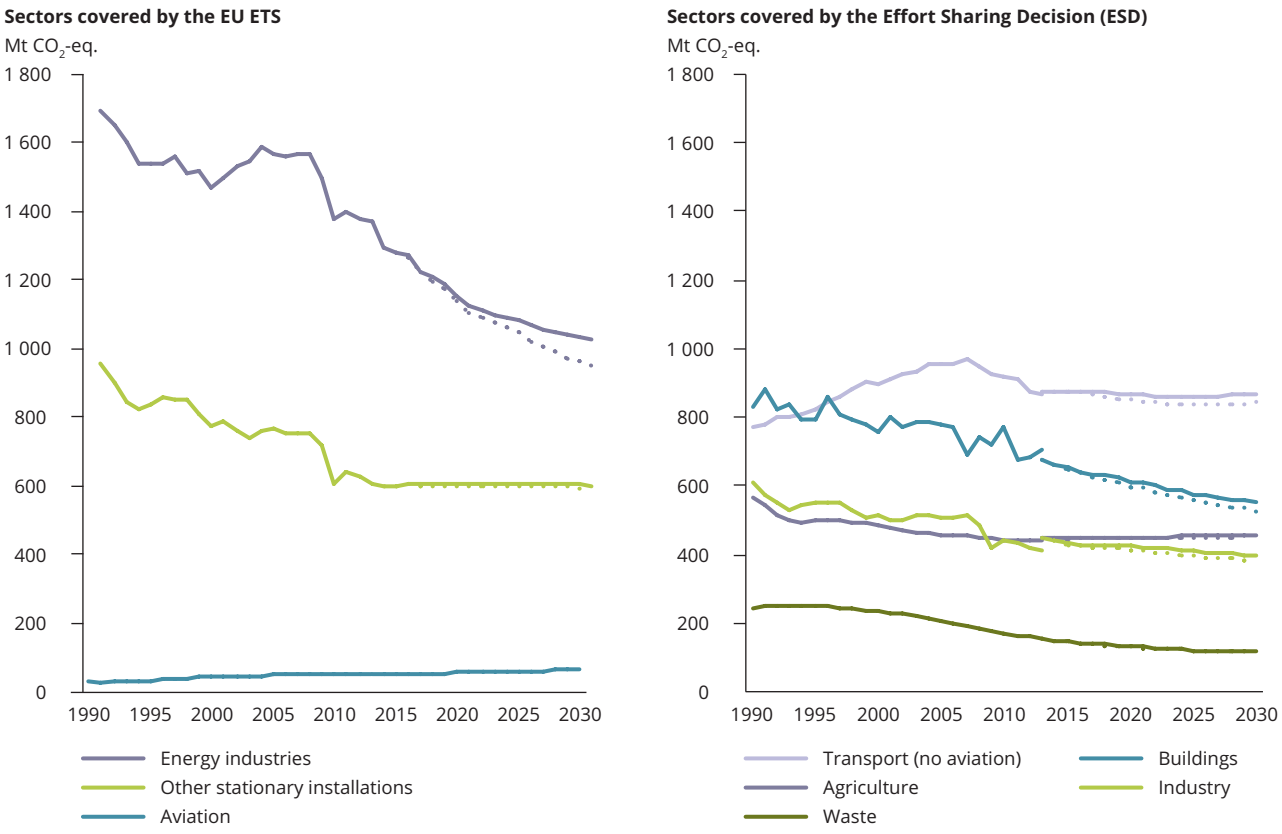
([15]) The cap has been set for all participants in the ETS, including the EU as well as Iceland, Liechtenstein and Norway.
([16]) Although the ETS was introduced in 2005 and the ESD in 2013 (i.e. no ETS or ESD emissions existed before 2005), it is possible to reconstruct a time series dating back to 1990 by drawing up a correspondence between ETS/ESD emissions and the source categories used to officially report national GHG inventories under the UNFCCC.

decrease by only 0.7% between 2013 and 2020 with the existing measures in place. Implementing the additional measures currently at planning stage would lead to further emission decreases in the transport and buildings sectors by 2020. After 2020, further decreases are expected, especially in the buildings sector, whereas WEM emissions in the transport sector are projected to stay at the level of the year 2020.

Member States actually anticipate a slight increase in agriculture emissions in future. The implementation of additional measures considered by 18 Member States in their projections is not expected to result in meaningful further reductions at EU level in this sector.

Limited reductions are projected in the industry and waste sector, although in relative terms, the projected decrease in emissions by 2020 in the industry sectors covered by the ESD would be the largest (− 16% compared to 2013 levels, corresponding to − 26 Mt CO_2-eq.). In the waste sector, emissions are projected to decrease by 23 Mt CO_2-eq. between 2013 and 2020 (− 15% compared to 2013 levels).

Figure 3.2 GHG emission trends and projections by sector, 1990–2030



Note: Solid lines represent historic GHG emissions up to 2013. Dashed lines represent WEM projections. Dotted lines represent projections under the WAM scenario.

The sectors presented here are consistent with the categories defined by the Intergovernmental Panel on Climate Change (IPCC) for the reporting of national GHG inventories. For this figure, emissions are further spit between those covered by the EU ETS and those covered by the ESD, based on the application of a fixed percentage for each source category, as described below:

- Energy industries (IPCC sectors 1.A.1, 1.B and 1.C): 91% ETS/9% ESD;
- Manufacturing and construction sector (IPCC sector 1.A.2): 74% ETS/26% ESD;
- Residential and commercial sector (IPCC sectors 1.A.4 & 1.A.5): 1% ETS/99% ESD;
- Industrial processes sector (IPCC sector 2): 60% ETS/40% ESD;
- Transport (without aviation), agriculture and waste (IPCC sectors 1.A.3.a, 3 and 5): 100% ESD;
- Aviation (IPCC sector 1.A.3.a and memo item international bunkers): 34% ETS.

Data were gap-filled for Greece. For Greece and (partly) Poland, the separation of ETS emissions into source categories was carried out by applying average sectoral percentages to total ETS emissions.

Source: EEA, 2015a, 2015b, 2015c and 2015e.

Table 3.1 Key EU policies supporting national achievements under the ESD

Main sector(s) targeted	EU legislation	Issue
Non-ETS; cross-cutting	Directive 2006/32/EC	End-use efficiency and energy services
Transport	Directive 2003/30/EC	Biofuels
Transport	Directive 2006/28/EC	Infrastructure charging for heavy goods
Transport	Directive 2006/40/EC	Mobile air conditioning
Transport	Regulation (EC) No 443/2009 and Regulation (EU) No 333/2014	CO_2 from cars
Transport	Directive 2009/33/EC	Clean and energy-efficient road transport
Transport	Regulation (EU) No 510/2011 and Regulation (EU) No 253/2014	CO_2 from vans
Residential, transport	Directive 2009/28/EC	Promotion of use of renewable energies in heating and transport
Residential, cross-cutting	Directive 2012/27/EU	Energy efficiency
Residential	Directive 2010/31/EC	Energy performance of buildings
Residential	Regulation (EU) No 813/2013	Ecodesign legislation for space heaters and combination heaters
Residential	Regulation (EU) No 814/2013	Ecodesign legislation for water heaters and storage tanks
Agriculture	Directive 2000/60/EC	Water Framework Directive
Agriculture	Regulations related to Common Agricultural Policy (CAP)	Agricultural measures
Industrial processes	Regulation (EC) No 842/2006 and Regulation (EU) No 517/2014	F-gas regulation
Waste	Directive 1999/31/EC	Landfill
Waste	Directive 2000/76/EC	Waste incineration
Waste	Directive 2008/98/EC	Waste

Source: EEA, 2015.

3.3 Emission trends (2013–2020) under the EU ETS

In 2014, GHG emissions from Member States' stationary installations covered by the EU ETS reached their lowest level since the start of the scheme in 2005, at 1 786 Mt CO_2-eq. This corresponds to a 24% decrease between 2005 and 2014 ([17]). It also means that 2014 emissions were below the 2020 target set for the EU ETS.

In the two first trading periods (2005 to 2007 and 2008 to 2012), ETS emissions were lower than the ETS cap in every single year, with the exception of 2008 (Figure 3.3). This was also the case in 2013, the first year of the third trading period (2013 to 2020). By the end of 2013, a surplus of more than 2 billion emission credits (allowances) had accumulated in the ETS. In 2014, ETS emissions exceeded the quantity of ETS allowances (EUAs) which had been auctioned or freely allocated to operators in that year. It was the first time since 2008 that the demand for emission allowances was higher than the supply. This was a direct consequence of the decision to postpone the auctioning of 400 million EUAs for the year 2014 ('backloading'). Taking into account the net demand of allowances from the aviation sector observed in 2014 and the additional supply of allowances stemming from the use of international emission credits from the Kyoto Protocol, overall supply and demand of allowances appear to have been relatively balanced in 2014. The overall surplus of allowances (accumulated over recent years) therefore remained at a level of about 2.1 billion EUAs ([18]).

According to the projections submitted by Member States in 2015, with the existing measures in place, emissions from their stationary installations under

([17]) These values were derived using scope-corrected emissions to account for the change in scope of the EU ETS since its inception.

([18]) When considering all ETS participating countries (including Iceland, Liechtenstein and Norway), supply and demand of allowances were relatively balanced in 2014. When considering EU Member States only, the amount of available allowance including international credits was higher than ETS emissions. The aviation sector was short of allowances in 2012, 2013 and 2014. This is expected to represent a net demand for EUAs of 37 million credits for those 3 years.

the EU ETS will decrease by 8.2% between 2015 and 2020, and by 6% between 2020 and 2030. Most of the projected reductions by 2020 and 2030 are expected to occur in the sector of energy industries, while emissions from other activities are envisaged to remain relatively stable during this period.

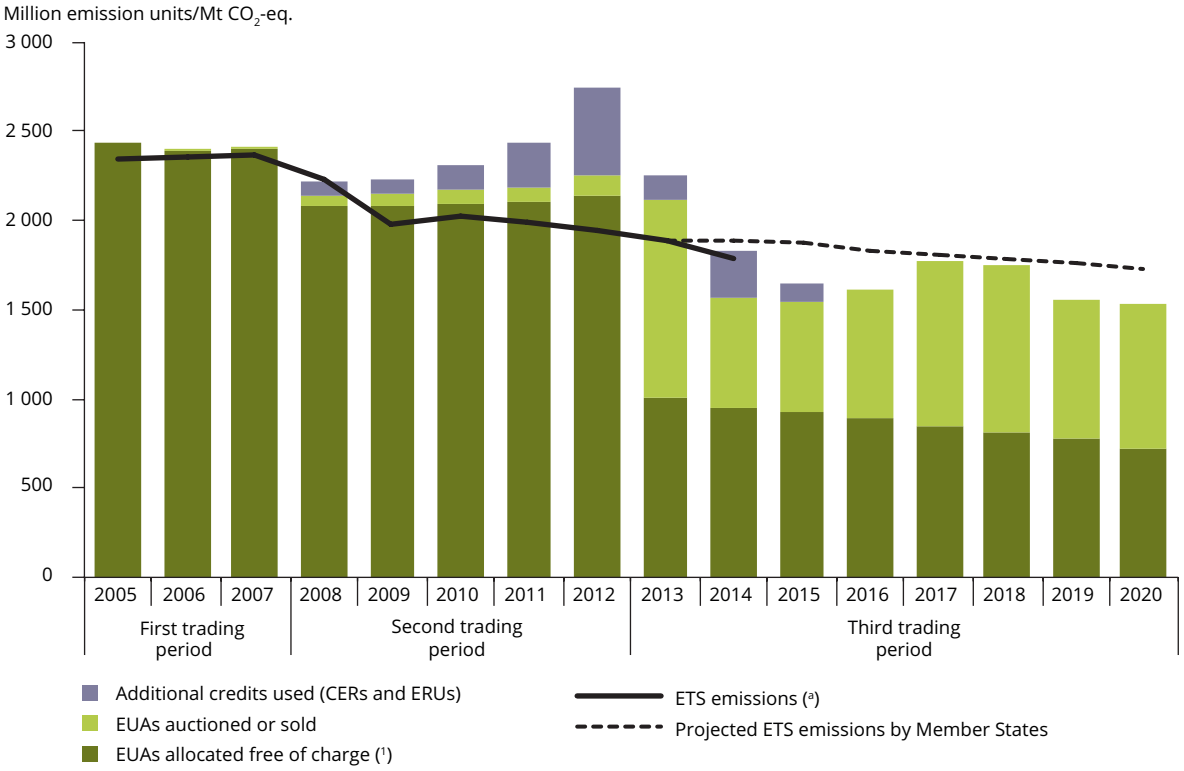
Calculating an overall reduction between 2005 and 2020 or 2030 is subject to a large uncertainty, because projected trends are not fully aligned with historic trends. With the current data available, 2020 ETS emissions could be at least 26% below 2005 levels, and 2030 ETS emissions could be at least 31% below 2005 levels. This reduction is not as large as the contribution of the ETS sectors (a 43% reduction) needed to achieve the EU's domestic GHG emissions by 40 % in 2030. However the latest ETS revision proposal, agreed but not yet adopted, is not completely reflected in national projections.

The surplus of allowances is expected to start declining in 2015 (Figure 3.3), since Member States' projections show that emissions are expected to exceed available allowances from that year onwards. This can be explained by the reduced supply of allowances and emission credits compared to previous years, itself due to several reasons, explained below.

- Most of international certificates which could be used in the years from 2008 to 2020 have been used by 2014, because the eligibility of many of these emission credits expired. Certified emission reduction (CER) were traded at less than EUR 1/CER by the end of the second trading period.

- The auctioning of 300 and 200 million allowances in 2015 and 2016, respectively, will be postponed ('backloading').

Figure 3.3 Trends and projections of EU ETS emissions (stationary installations), ETS cap and available credits, 2005–2020



Note: (a) Between 2005 and 2013, the scope of the EU ETS increased in terms of both countries and activities. To make the time series comparable across the whole period being considered, a scope correction has been estimated and added to both ETS emission trends and allocated allowances for the period 2005 to 2012.

Projected ETS emissions are from the scenario 'with existing measures', which takes currently adopted policies into account but not recent policy proposals such as the reform of the EU ETS.

Projected ETS emissions are the sum of ETS projections for stationary installations reported by Member States. Greece did not report ETS projections, therefore these emissions were gap filled on the basis of the 2013 Reference Scenario of the European Commission. These gap-filled projections represent 3 % of the total projected ETS emissions at EU level.

The MSR is assumed to start in January 2019. The MSR parameters used are consistent with EU, 2015.

Source: EEA, 2015b, 2015c and 2015f; EU, 2015; ETC/ACM, 2015.

- The introduction of the Market Stability Reserve (MSR), which is set to become operational in 2019, is to serve as a long-term solution. The MSR, recently endorsed by the European Parliament and by the Council, adjusts the supply of allowances to be auctioned depending on the overall surplus, and is therefore expected to reduce the surplus of allowances and support carbon prices. As part of the agreement reached on the MSR, the 900 million backloaded allowances as well as remaining unallocated allowances will be placed into the reserve.

Aviation has been included in the EU ETS since 2012 (EU, 2008b), but the scope of aviation emissions covered by the ETS has been changing. In 2012, ETS emissions from aviation amounted to 84 Mt CO_2-eq., while they were equal to 53 Mt CO_2-eq. and 55 Mt CO_2-eq. in 2013 and 2014, respectively (EEA, 2015b).

3.4 Progress towards targets (2013–2020) under the ESD

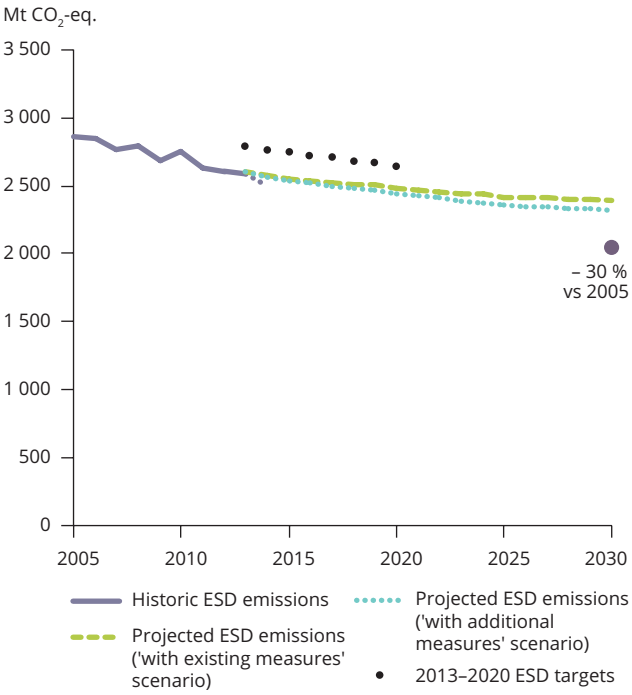
Total emissions covered by the ESD at EU level amounted to 2 586 Mt CO_2-eq. in 2013. This level was 7.3% below the sum of the 28 national ESD targets for 2013. It was also 9.6% lower than the 2005 emissions in the sectors covered by the ESD. Preliminary estimates indicate that in 2014, ESD emissions further decreased to a level 12.7% below 2005 levels, which would be 9.9% below the sum of the 28 national ESD targets for 2014.

According to Member State projections, ESD emissions are expected to keep on decreasing until 2020 (Figure 3.4). At EU level, ESD emissions will remain below the sum of national ESD targets in every year between 2013 and 2020. In the WEM scenario, the annual gap between EU ESD emissions and aggregated targets is anticipated to slightly decrease every year, from 7% of total ESD targets (204 Mt CO_2-eq.) in 2013, to 6% of total AEAs in 2020 (160 Mt CO_2-eq.).

Since emissions are expected to remain below ESD targets throughout the whole period from 2013 to 2020, a surplus of ESD emission allowances (called annual emission allocations (AEAs)) is expected to build up between 2013 and 2020. This surplus, calculated as the sum of annual surplus AEAs, could reach a level between 1 543 Mt CO_2-eq. and 1 724 Mt CO_2-eq. by 2020, depending on the scenario considered (WEM only or WAM).

The comparison between ESD emissions and targets at EU level does not reflect the diversity of situations encountered by each individual Member State: while the vast majority of Member States project that their ESD emissions will remain below their annual ESD targets during the whole compliance period from 2013 to 2020, emissions could exceed the quantity of annual emission allowances (i.e. annual ESD targets) in four Member States and for certain years.

Figure 3.4 EU GHG emission trends and projections in sectors covered by the ESD



Note: Emission projections for ESD sectors until 2030 take currently existing measures (WEM scenario) as well as currently planned measures (WAM scenario) into account. However, for the post-2020 period, final decisions on policies to reduce GHG emissions remain to be adopted.

Source: EC, 2013c and 2013d; EEA, 2015a, 2015b, 2015c, 2015d and 2015g; EU, 2009a.

Historic ESD emission levels

In 2013, all Member States exhibited ESD emissions which were below their 2013 targets. Member States with the largest overachievement in absolute terms in 2013 were Italy (37.4 Mt CO_2-eq.), Spain (31.0 Mt CO_2-eq.) and France (22.4 Mt CO_2-eq.). In relative terms 12 Member States achieved emission reductions of more than 10% above their targets (Bulgaria, Croatia, Cyprus, Greece, Hungary, Italy, the Netherlands, Portugal, Romania, Slovenia, Spain and Sweden).

When approximated 2014 ESD emissions ([19]) are considered, ESD emissions remained below the respective ESD targets in 2014 in all EU Member States (Table 3.2). The gap between annual ESD emissions and targets actually increased for 22 of them.

However, this widely positive picture could change for a number of Member States during the remaining period from 2015 until 2020. Based on the latest available data (i.e. 2013 inventory data, 2014 proxy data and 2015 to 2020 projections submitted in 2015), while 23 Member States expect that their ESD emissions will stay below their annual target under the ESD in every year from 2015 until 2020 ([20]), emissions in four Member States (Austria, Belgium, Ireland and Luxembourg) could exceed ESD targets for one or more years of the 2013 to 2020 period — in particular 2020 — with the current measures in place (Table 3.2).

Table 3.2 Historic (2013–2014) and projected (2015–2020) annual absolute gaps to annual ESD targets

		Absolute annual gap (Mt CO_2-eq.)							
Member State	**Scenario**	**Inventory**	**Proxy**	**Projections**					
		2013	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
Austria	WEM	2.9	4.0	0	– 1	– 1	– 1	– 2	– 2
	WAM			0	2	1	1	3	3
Belgium	WEM	4.3	5.2	2	1	– 1	– 2	– 3	– 4
	WAM								
Bulgaria ([a])	WEM	3.8	2.9	4	4	5	5	6	6
	WAM								
Croatia	WEM	2.6	3.6	3	3	3	4	4	4
	WAM			3	4	4	4	5	5
Cyprus ([a])	WEM	1.6	1.9	3.0	3.0	3.0	3.0	3.1	3.1
	WAM			3	3	3	3	3	3
Czech Republic	WEM	0.7	1.2	3	4	6	7	9	10
	WAM			4	6	8	10	12	15
Denmark	WEM	3.4	3.6	3	3	2	1	0	0
	WAM			3	3	2	1	0	0
Estonia	WEM	0.5	0.8	1	1	1	1	1	1
	WAM			1	1	1	1	1	1
Finland	WEM	0.4	0.2	1	1	0	0	0	0
	WAM			1	1	1	0	0	0
France	WEM	22.4	39.6	25	23	21	18	16	14
	WAM								
Germany	WEM	5.0	19.1	15	12	10	8	6	4
	WAM								
Greece ([b])	WEM	12.9	13.4	13	14	15	16	17	18
	WAM								
Hungary	WEM	12.7	14.2	13	14	16	18	19	21
	WAM			15	17	18	20	21	23
Ireland	WEM	3.8	3.4	2	1	0	– 2	– 4	– 5
	WAM			3	2	1	0	– 1	– 2
Italy	WEM	37.4	43.5	32	29	27	24	21	18
	WAM			37	36	35	34	32	31
Latvia	WEM	0.9	0.6	1	1	1	1	1	1
	WAM			1	1	1	1	1	2
Lithuania ([a])	WEM	0.7	0.8	1	1	2	2	2	2
	WAM			1	1	2	2	3	3

([19]) All Member States reported approximated 2014 GHG emissions by 4 August 2015, except Bulgaria, Cyprus, Lithuania, Portugal and Romania.
([20]) The data presented here take into account projections submitted by Member States until 31 August 2015. For Greece, projections were gap-filled by the EEA, based on European Commission projection data (2013 Reference Scenario).

Table 3.2 Historic (2013–2014) and projected (2015–2020) annual absolute gaps to annual ESD targets (cont.)

		Absolute annual gap (Mt CO_2-eq.)							
Member State	**Scenario**	**Inventory**	**Proxy**	**Projections**					
		2013	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
Luxembourg	WEM	0.0	0.2	– 1	– 1	– 1	– 1	– 2	– 2
	WAM								
Malta	WEM	0.1	0.1	0	0	0	0	0	0
	WAM			0	0	0	0	0	0
Netherlands	WEM	13.9	22.7	10	9	9	8	7	6
	WAM			10	10	9	8	7	6
Poland	WEM	4.6	4.0	8	9	10	11	12	13
	WAM								
Portugal [a]	WEM	9.6	10.4	10	10	11	12	12	13
	WAM			10	10	11	12	13	13
Romania [a]	WEM	8.7	10.2	9	10	10	10	11	11
	WAM			11	11	12	13	13	14
Slovakia	WEM	2.2	2.9	2	3	3	3	4	4
	WAM			3	3	4	4	4	5
Slovenia	WEM	1.5	1.7	1	1	1	1	1	1
	WAM								
Spain	WEM	31.0	27.6	25	21	17	13	9	6
	WAM			26	24	21	19	16	14
Sweden	WEM	6.6	7.0	6	6	6	6	5	5
	WAM								
United Kingdom	WEM	10.3	28.2	4	7	8	8	8	11
	WAM			4	8	8	10	11	15
EU	**WEM**	**204.5**	**273.0**	**196**	**190**	**182**	**173**	**164**	**160**
	WAM			**211**	**211**	**208**	**206**	**204**	**205**

Note: This table takes into account national inventory data for 2013, approximated inventory data for 2014 and projections for the 2015-to-2020 period. While 2013 data and 2014 proxy data are consistent, there may be some discrepancy in the time series between 2014 and 2015 data, because Member States calibrated their projections with historic emissions earlier than 2013. For a WAM scenario aggregated at EU level, Member States not reporting a WAM scenario were gap-filled with the WEM scenario.

An annual gap corresponds to the difference between an annual target under the ESD and ESD emissions. Negative numbers show a shortfall in AEAs (emissions higher than the target), while positive numbers reflect a surplus in emission credits (emissions lower than the target).

Green shading means that more allocations are available than emissions produced by a country. The darker the colour, the higher the gap (red) or the surplus (green). The shading indicates the development of the gap or surplus of one Member State by showing the absolute distance to the national target, and thus allows for comparison for that Member State over time.

[a] No national approximated 2014 ESD emissions were available for Bulgaria, Cyprus, Lithuania, Portugal and Romania. Gap-filled proxy data (calculated by the EEA) were used instead.

[b] For Greece, projections were submitted too late for consideration in the assessment. Therefore, the WEM scenario was gap-filled with the European Commission's Reference Scenario 2013 (based on PRIMES/Gains models). The reported ESD projections are slightly higher than the gap filled projections, resulting in a smaller AEA surplus by 2020.

Source: EC, 2013c and 2013d; EEA, 2015a, 2015b, 2015c and 2015g.

Austria, Belgium, Ireland and Luxembourg particularly would have to enhance national efforts to bring their domestic emissions below ESD target levels by 2020, or to use flexibility provisions provided under the ESD. In particular, the possibility to carry over unused AEAs to subsequent years within the compliance period from 2013 to 2020 will allow a large net surplus of AEAs to build up across the EU. This provides opportunities to those Member States with a deficit to fill their gaps to reach their targets by purchasing AEAs from other Member States with a surplus (within certain limitations).

For these four Member States, a different picture emerges when looking at the gaps between ESD emissions and ESD targets over the whole period from 2013 until 2020, based on the latest available data.

- For Austria, deficits are projected for the years from 2016 until 2020, with an annual gap reaching 2.2 Mt CO_2-eq. in 2020. Austria could close these annual gaps by implementing the additional measures currently at planning stage, in particular in the transport sector (e.g. efficiency improvements of vehicles, modal shift to public or non-motorised transport, charging for external effects on noise or air pollution, and tolls). If the planned additional measures are not sufficiently implemented, to achieve its annual ESD targets, Austria will have to use the flexibility provision allowed by the ESD; for compliance in the years 2016 to 2019 Austria could achieve its ESD targets by using the emission permits (AEAs) accumulated between 2013 and 2015 ([21]). This will not be sufficient to close the gap to ESD targets in 2020 (Table 3.4). Austria would have to buy additional certificates to comply in 2020, as explained below.

- For Belgium, the projected WEM emission levels would lead to deficits for the years between 2017 and 2020, with an estimated gap of 4.5 Mt CO_2-eq. in 2020. No WAM scenario is available. Belgium could achieve its ESD targets in the whole period by using surplus AEAs accumulated between 2013 and 2016.

- For Ireland, deficits are projected in every year between 2017 and 2020, with a gap of 4.9 Mt CO_2-eq. in 2020. Despite the implementation of additional measures, emissions would still remain higher than ESD targets in 2018, 2019 and 2020 ([22])

- For Luxembourg, deficits are projected for the years in every year between 2015 and 2020, with a gap of 2.1 Mt CO_2-eq. in 2020. No WAM scenario is available.

For these countries, using surplus AEAs from earlier years would not be sufficient to reach all their annual ESD targets until 2020. They will therefore need to step up their mitigation measures to achieve further emission reductions through the impact of additional policies, or use other flexibility mechanisms, as described below.

- Member States may transfer up to 5% of their AEAs of the following year to other Member States, which may use this emission allocation until 2020 (*ex ante*). Any overachievement in a year of the period from 2013 to 2019 may also be transferred to other Member States, which may use this emission allocation until 2020 (*ex post*).

- Member States may also make limited use of international project-based emission credits, according to specific provisions.

According to WEM projections, Austria and Ireland would need to use these mechanisms only in 2020, while Luxembourg would need to do so between 2016 and 2020. In these years, the gap to its annual ESD targets exceeds 5% of AEAs of the next year ([23]).

Table 3.3 Minimum conditions expected for achieving the ESD budget for the period 2013 to 2020

Use of flexibility mechanisms	'With existing measures' scenario	'With additional measures' scenario
No use of flexibility mechanisms	24 Member States ([a])	24 Member States and Austria
Transfer of AEAs between years (only)	Belgium	Ireland ([b])
Other flexibility mechanisms needed	Austria, Ireland, Luxembourg ([b])	

Note: ([a]) 24 Member States: Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Italy, Latvia, Lithuania, Malta, the Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden and the United Kingdom.

([b]) No WAM projection scenario is available for Belgium and Luxembourg.

([21]) Under the ESD, within the Member State itself, any overachievement in a year of the period from 2013 to 2019 can be carried over ('banked') to subsequent years, up to 2020. It is also possible for a Member State to carry forward (i.e. 'borrow') an emission allocation of up to 5% from the following year, during the period from 2013 to 2019.

([22]) The results published in Ireland's national report on GHG projections (Ireland Environmental Protection Agency, 2015) differ from the figures presented here, because the Irish report estimates revised ESD targets as a result of the use of the 2006 IPCC guidelines and UNFCCC methodologies for compiling the national GHG emissions inventory (1990–2013) and for preparing the latest projections. Under the MMR, by December 2016 the Commission shall examine if the impact of the use of the 2006 IPCC guidelines for national GHG inventories and may revise Member States' annual emission allocations as provided in the ESD (see Section A1.4 in Annex 1).

([23]) The ESD allows each Member State to carry forward from the following year a quantity of up to 5% of its AEA, in order to guarantee compliance (Article 3, EU, 2009b) At the same time, a Member State can carry over from a past year any surplus emission allocations. If it is not possible for a Member State to combine these two approaches to comply within a single year, it must make use of other flexible options under the ESD.

Table 3.4 Historic (2013–2014) and projected (2015–2020) cumulated absolute gaps to annual ESD targets

				Cumulative gap (Mt CO_2– eq)					
Member State	**Scenario**	**Inventory**	**Proxy**	**Projections**					
		2013	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
Austria	WEM	2.9	6.9	7	6	5	4	2	0
	WAM			7	9	10	12	15	18
Belgium	WEM	4.3	9.5	11	12	11	9	6	1
	WAM								
Bulgaria [a]	WEM	3.8	6.7	11	15	20	25	31	37
	WAM								
Croatia	WEM	2.6	6.1	9	13	16	20	23	27
	WAM			9	13	17	21	26	31
Cyprus [a]	WEM	1.6	3.6	7	10	13	16	19	22
	WAM			3	6	9	12	15	18
Czech Republic	WEM	0.7	1.9	5	9	15	22	31	42
	WAM			6	12	20	31	43	58
Denmark	WEM	3.4	7.0	10	13	14	16	16	16
	WAM			10	13	14	16	16	16
Estonia	WEM	0.5	1.3	2	3	3	4	5	6
	WAM			2	3	4	5	6	7
Finland	WEM	0.4	0.6	1	2	2	3	3	3
	WAM			2	2	3	3	3	3
France	WEM	22.4	62.1	87	110	131	149	165	178
	WAM								
Germany	WEM	5.0	24.1	39	51	61	70	76	80
	WAM								
Greece [b]	WEM	12.9	26.4	39	52	67	82	99	116
	WAM								
Hungary	WEM	12.7	26.9	40	54	70	88	107	128
	WAM			15	32	51	70	92	115
Ireland	WEM	3.8	7.2	9	10	10	8	4	–1
	WAM			10	12	13	13	11	9
Italy	WEM	37.4	80.9	113	143	169	193	214	232
	WAM			118	154	189	223	255	286
Latvia	WEM	0.9	1.5	2	3	4	5	6	7
	WAM			1	2	4	5	6	8
Lithuania [a]	WEM	0.7	1.5	2	4	5	7	9	12
	WAM			3	4	6	8	11	14
Luxembourg	WEM	0.0	0.2	0	–1	–2	–4	–6	–8
	WAM								
Malta	WEM	0.1	0.2	0	1	1	1	1	2
	WAM								
Netherlands	WEM	13.9	36.6	47	56	65	72	79	85
	WAM			47	57	66	74	81	87
Poland	WEM	4.6	8.6	17	26	36	47	59	73
	WAM								

Table 3.4 Historic (2013–2014) and projected (2015–2020) cumulated absolute gaps to annual ESD targets (cont.)

		Cumulative gap (Mt CO_2– eq)							
Member State	**Scenario**	**Inventory**	**Proxy**	**Projections**					
		2013	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
Portugal (a)	WEM	9.6	20.0	30	40	51	63	75	88
	WAM			30	40	51	63	76	89
Romania (a)	WEM	8.7	18.8	28	37	47	58	69	80
	WAM			30	41	53	66	79	93
Slovakia	WEM	2.2	5.1	7	10	13	16	20	24
	WAM			8	11	15	19	23	28
Slovenia	WEM	1.5	3.3	4	6	7	8	10	11
	WAM								
Spain	WEM	31.0	58.6	83	104	121	134	143	149
	WAM			85	109	130	148	164	178
Sweden	WEM	6.6	13.6	20	26	32	37	43	48
	WAM								
United Kingdom	WEM	10.3	38.5	42	50	57	66	74	85
	WAM			42	50	59	69	80	95
EU	**WEM**	**204.5**	**477.5**	**674**	**864**	**1 046**	**1 219**	**1 383**	**1 543**
	WAM			**688**	**900**	**1 108**	**1 314**	**1 519**	**1 724**

Note: This table takes into account national inventory data for 2013, approximated inventory data for 2014 and projections for the 2015-to-2020 period. While 2013 data and 2014 proxy data are consistent, there may be some discrepancy in the time series between 2014 and 2015 data, because Member States calibrated their projections with historic emissions earlier than 2013. For a WAM scenario aggregated at EU level, Member States not reporting a WAM scenario have been gap-filled with the WEM scenario.

The calculation of the cumulative gap takes previous years gaps into account. No other flexible options (such as trading ESD emission allocations or buying international certificates) are taken into account here. Negative numbers show a shortfall in AEAs (with emissions higher than the target), while positive numbers reflect a surplus in emission credits (with emissions lower than the target).

Green shading means that more allocations are available than emissions produced by a country. The darker the colour, the higher the gap (red) or the surplus (green). The shading indicates the development of the gap or surplus of one Member State by showing the absolute distance to the national target, and thus allows for comparison for that Member State over time.

(a) No national approximated 2014 ESD emissions were available from Bulgaria, Cyprus, Lithuania, Portugal and Romania. Gap-filled proxy data (calculated by the EEA) were used instead.

(b) The WEM scenario was gap-filled with the European Commission's Reference Scenario 2013 (based on PRIMES/Gains models) for Greece.

Sources: EC, 2013c and 2013d; EEA, 2015a, 2015b, 2015c and 2015g.

The cumulative shortfall of AEAs for those four countries could reach about 9 million AEAs by 2020. This is insignificant (0.6%) compared to the overall surplus of more than 1 500 million AEAs which could accumulate in the 24 other Member States.

Table 3.3 summarises the minimum conditions for staying within the 2013 to 2020 ESD budget. Table 3.4 provides insights into the build-up of the cumulative surplus of emission allocations in the sectors governed by the ESD. Member States projections result in a cumulated ESD surplus of about 1 500 to 1 700 million AEAs, depending on the scenario considered. This surplus is considerably higher than the one calculated in last year's report (700–1 200 Mt) and is due to the updated projections.

3.5 Emission and removals from LULUCF

Land use activities can result in emissions, but so can removals of CO_2. In 2012, the LULUCF sector represented a net carbon sink of about 303 Mt CO_2-eq. in the whole EU. This sink was dominated by CO_2 absorbed from existing and new forests. Over the past decade, the relatively large shares of young forests

and moderate harvest rates led to a net carbon accumulation in European forests. Despite being a net sink, the sector was also responsible for limited CO_2 emissions. The largest sources were land conversions, especially from forests to other land uses, and emissions from cropland.

According to the EU Reference Scenario (EC, 2013a), the EU LULUCF net sink is expected to decrease by about 7% between 2010 and 2020, despite decreased emissions from cropland and grassland (due to reduced rates of land conversion to cropland, and expected lower emissions from agricultural soils). The current sink of EU forests could potentially be affected by an increased use of bioenergy. Without further policies addressing LULUCF, this projected trend is likely to continue after 2020, up to 2050 (EC, 2013a). A diminishing sink in the LULUCF sector would affect future net emissions.

CO_2 emissions and removals from the LULUCF sector are currently covered under the Kyoto Protocol, but not by the EU 20% reduction target by 2020. Discussions are ongoing concerning the inclusion of the LULUCF sector into the 2030 greenhouse gas mitigation framework.

3.6 GHG emission trends and projections in other EEA member countries

Historic emissions followed different trends in the EEA member countries which are not Member States of the EU (Iceland, Liechtenstein, Norway, Switzerland and Turkey). Updated information on emission projections was only available for Norway (Figure 3.5).

Iceland plans to reduce its GHG emissions by 20% by the year 2020, compared to 1990 levels. It aims to reach this target together with the EU and its Member States. In 2013, emissions had been reduced by 8.5% compared to 1990 levels; therefore, Iceland does not currently seem to be on track to reach its target for 2020. Iceland also set a long-term GHG mitigation target of between 50% and 75% by the year 2050 compared to GHG emissions in 1990. As an Intended Nationally Determined Contribution (INDC) for the post-2020 agreement under the UNFCCC, Iceland has submitted its commitment to reduce GHG emissions by 40% by 2030 compared to 1990 levels. It intends to fulfil this commitment jointly with the EU; the details of collective delivery are yet to be determined.

Liechtenstein also aims to emit at least 20% less GHG emissions in 2020 compared to 1990. To attain this target, Liechtenstein has also set itself a sectoral goal: GHG emissions from the energy sector will decrease by 20% between 1990 and 2020. But in 2013, Liechtenstein's emissions were only 1.3% lower than in 1990 though, which means that considerable additional efforts are necessary if it is to reach its target. For 2030, Liechtenstein has committed to reduce its GHG emissions by 40% compared to 1990 under the UNFCCC ([24]).

Norway aims to reduce its GHG emissions by at least 30% in 2020, compared to 1990 ([24]). If there is an ambitious global climate agreement, it aims to reduce its GHG emissions by 40%. Norway also has a long-term mitigation target: by 2050, the country wants to have reached climate neutrality. In 2013, Norway's emissions were 3.3% above 1990 levels. For 2030, Norway has committed to reducing its GHG emissions by at least 40% compared to 1990 levels ([25]). Submitted as an INDC to the UNFCCC, Norway has stated its intention to fulfil this commitment through a collective delivery with the EU and its Member States.

Switzerland's target is to reduce its GHG emissions by 20% in 2020 compared to 1990. Like Norway, it also sets a more ambitious GHG reduction target of 30% reduction in 2020 compared to 1990, provided that the international community agrees on a stricter climate policy. In 2013, emissions in Switzerland were reduced by 1.4% compared to 1990 levels. For 2030, Switzerland has submitted an INDC to the UNFCCC which states its intention to reduce its GHG emissions by 50% compared to 1990 levels ([24]). This target will partly be reached through the use of carbon credits from international mechanisms.

Turkey has submitted an INDC to the UNFCCC with a 21% economy-wide cut in GHG emissions by 2030, compared to a business-as-usual scenario (Turkey, 2015). This implies an increase in GHG emissions limited to a level of 929 Mt CO_2-eq. in 2030, which is nearly 5 times the emissions of 1990. To reach its national target, Turkey aims to use carbon credits from international market mechanisms.

([24]) Including emissions and removals from LULUCF.
([25]) How emissions and removals from LULUCF will be accounted for will be determined later. Norway's position is that the choice of accounting approach should not change the ambition level compared to when LULUCF is not included.

Figure 3.5 Total GHG emission trends and projections in other EEA member countries, 1990–2030

Note: Projections display total GHG emissions excluding LULUCF and international aviation. Solid lines represent historic values, while dashed lines represent projections WEM.

Values shown for Iceland include inventory data, taking into account total CO_2 emissions from industrial processes. Iceland may exclude these emissions for compliance in the first commitment period of the Kyoto Protocol.

Norway's INDC includes emissions and removals from LULUCF, which are not shown in this figure.

Source: EEA, 2015a and 2015d; Iceland, 2014; Liechtenstein, 2014; Switzerland, 2015; Turkey, 2014.

4 Progress towards renewable energy targets

Progress in numbers

- With a 15.0% share of renewable energy in the EU's gross final energy consumption in 2013, the EU is currently on track to meet its 20% RES target for 2020.
- Preliminary estimates indicate a 2014 share of 16.0% at EU level, which confirms the EU's good progress towards its 2020 target.
- In 2013, 25 Member States (i.e. all except Luxembourg, the Netherlands and the United Kingdom) met or exceeded their indicative targets for 2013 to 2014 set under the RED, while 21 Member States (i.e. all except Denmark, France, Ireland, Luxembourg, the Netherlands, Portugal and Spain) exceeded the indicative trajectories set in their national action plans.
- Three Member States (Bulgaria, Estonia and Sweden) exhibited 2013 renewable energy shares that are already higher than their 2020 RED targets. Recent and preliminary data for 2014 indicate that this number could rise to nine Member States to include Austria, the Czech Republic, Finland, Italy, Lithuania and Romania.
- According to approximated RES shares for 2014, 27 Member States (i.e. all except the Netherlands) met or exceeded their indicative targets for 2013 to 2014 set under the RED, while 20 Member States (i.e. all except Cyprus, France, Ireland, Malta, the Netherlands, Portugal, Spain and the United Kingdom) exceeded their expected 2014 NREAP targets.
- Excessive RES capacity may be used for transfers to support those Member States having difficulty reaching their targets. The trading options provided for under the RED could provide benefits to involved countries and help the EU to achieve its 2020 RES target more cost-effectively.

Beyond 2020

- If the current pace of growth in RES is sustained until 2030, the EU will achieve a share higher than its target of a minimum 27% RES share in gross final energy consumption by 2030. However, this may not happen without additional efforts, because a number of regulatory changes have already affected investors' confidence in renewables, and market barriers and fragmentation still represent challenges for new entrants.
- In view of its longer-term energy and decarbonisation objectives for 2050, the EU will need to increase its efforts to support renewables.

4.1 EU progress towards its RES targets

The EU is well on track to meet its target of reaching, by 2020, a 20% share of RES in its gross final energy consumption (i.e. all final energy uses). In 2013, the EU's consumption of renewable energy continued its steady growth, standing at 15% of gross final energy consumption. This is an increase of 0.7 percentage points compared to 2012. According to preliminary estimates from the EEA, the share of renewables further increased in 2014, reaching a level of 16.0% in gross final energy consumption.

Both 2013 and 2014 levels are thus higher than the interim target set for the years 2013 and 2014 under the RED (12.1%). The 2013 and 2014 EU RES shares are also higher than the levels that Member States were expecting to achieve, according to their NREAPs reported in 2010. Aggregated, these amount to an expected EU-wide RES share of 13.7% in 2013 and 14.5% in 2014.

The EU 2020 target for renewable energy includes a 'sub-target', which is to reach a 10% share of renewable sources in the transport sector. Progress is here much slower. In 2013, RES represented only 5.4% of the

energy consumption from this sector. According to preliminary estimates from the EEA, this share slightly increased to 5.6% in 2014 (EEA, 2015e).

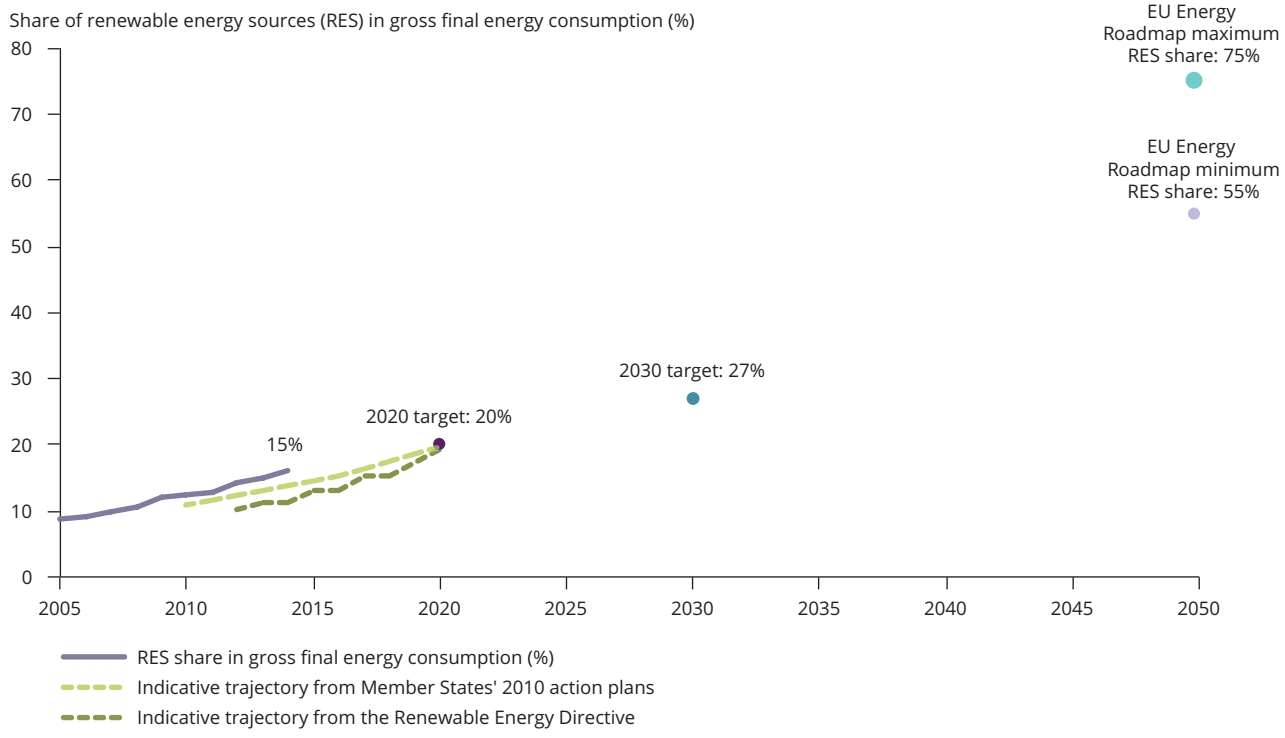
Between 2005 and 2013, the share of renewable energy in gross final energy consumption increased by an average 0.8 percentage point every year. If this average annual increase is maintained until 2020, the EU will achieve its 2020 target (Figure 4.1). This, however, may prove more challenging, due to recent changes in national RES supporting polices, and persisting market barriers for new projects. Other complex factors are also at play, with uncertain outcomes. In particular, cheap RES development options are becoming scarcer as low hanging fruits are gradually being harvested, while at the same time, costs for new RES capacity are being reduced through economies of scale, better knowledge integration and growing experience.

Member States must regularly report on projected excess or deficit production of renewable energy in their biennial Progress Reports under the RED ([26]). However, they do not all report such RES projections or specify whether these RES projections are based on currently existing measures. This hampers the use of such RES projections for assessing progress towards RES targets for all Member States in a consistent manner as is being done for GHG emissions.

In October 2014, EU heads of state or government agreed to a target of raising the EU-wide RES share to at least 27% by 2030. Unlike the 2020 target, the 2030 target will not be translated into mandatory targets for each Member State. No specific RES target for the transport sector is set for 2030 either. Instead, Member States will devise and agree upon national targets with the overall EU target in mind and coordinate their actions in a governance process, which will be designed at Union level (EC, 2014a and 2015a). Assuming that the current pace of renewable energy deployment in the EU (+ 0.8 percentage points per year on average) is sustained until 2030, which is not a given, the 2030 RES share in the EU would be above the 2030 target (Figure 4.1).

Beyond 2030, the EU has no longer-term quantified objective on renewable energy. However, to achieve its goal of reducing its GHG emissions by 80% to 95% below 1990 levels and moving to a competitive low-carbon economy by 2050, the EU will have to raise significantly

Figure 4.1 Trends and targets in the share of renewable energy sources in EU energy consumption, 2005–2050



Source: EC, 2011b; EEA, 2011b; EU, 2009b; European Council, 2014; Eurostat, 2015f.

([26]) For the years up to 2020, Member States have to report in their RED Progress Reports the estimated excess/deficit production of energy from renewable sources compared to their national indicative RED trajectory.

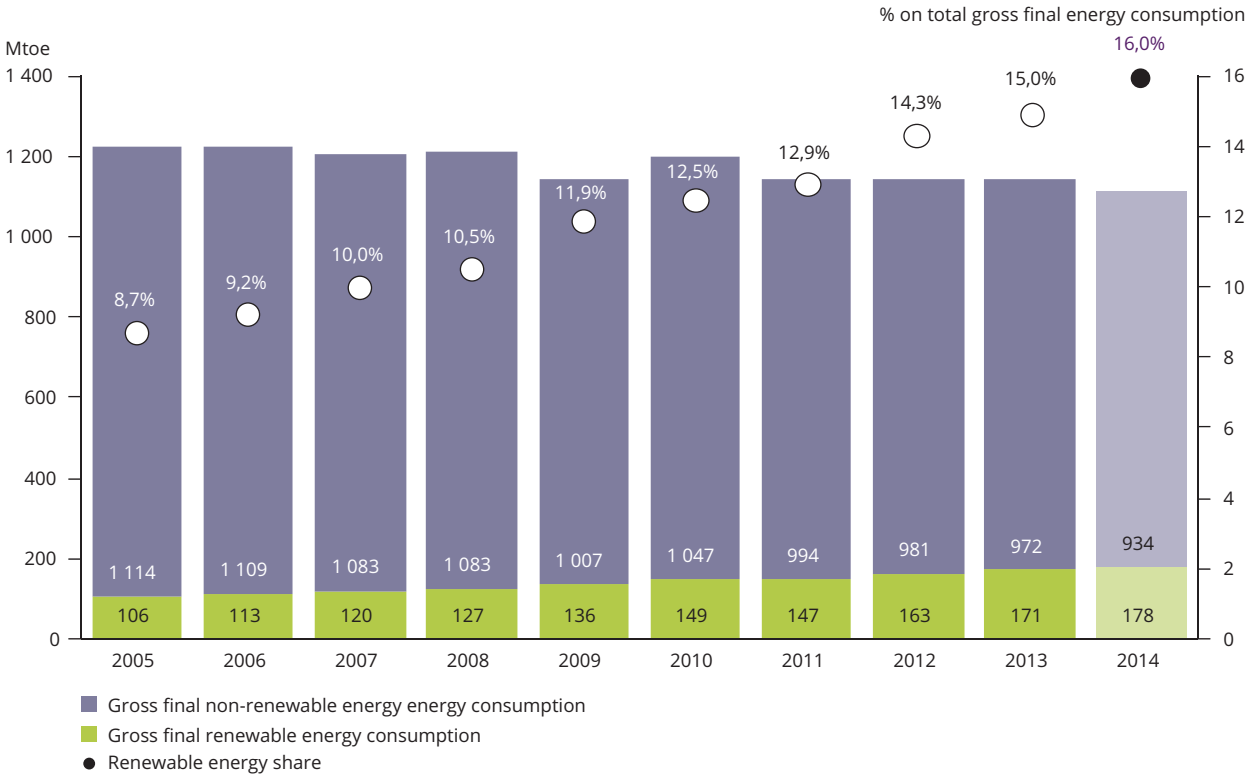
the contribution of renewable sources in its energy mix. According to the decarbonisation scenarios presented in the European Commission's communication *Energy Roadmap 2050* (EC, 2011b, 2011c and 2011d), RES shares should reach levels between 55% and 75% of the EU's gross final energy consumption in 2050 in order to reduce GHG emissions by 85% in 2050 ([27]) (EC, 2011d). Achieving such levels calls for significantly increased efforts, as the required growth in the RES share between 2030 and 2050 would have to be two to three times faster than that between 2005 and 2013.

In order to follow such a path, further policy efforts and investments are necessary. As RES shares increase, and the least costly options of decarbonisation become scarcer, the EU should start decarbonising sectors in which abatement costs are higher and structural change poses a greater challenge. One particular challenge is the transport sector, because of its decentralised structure and the significant infrastructural change required to move it away from fossil fuels to renewables. Progress in reducing GHG emissions from this sector has been relatively slow in the EU to date (see Section 3.2).

4.2 Relative trends in final energy consumption and renewable energy use

The steady increase in the share of renewable energy observed since 2005 reflects two combining trends: a dynamic development in the use of renewable energy (in absolute terms), together with a decrease in final energy consumption. While the consumption of renewable energy grew by more than 60% between 2005 and 2013, total final energy consumption decreased by 6% during the same period (Figure 4.2).

Figure 4.2 Gross final energy consumption of renewable and non-renewable energy sources (2005–2013), and approximated RES share, 2014



Note: Eurostat (2015a) calculates RES shares and in this process normalises wind and hydro electricity generation, which is part of the RES share numerator. However, the total consumption of electricity included in the denominator is not normalised. In the figure above, non-normalised gross final energy consumption is displayed together with RES shares in which the numerator has been normalised.

2014 data are approximated estimates from the EEA.

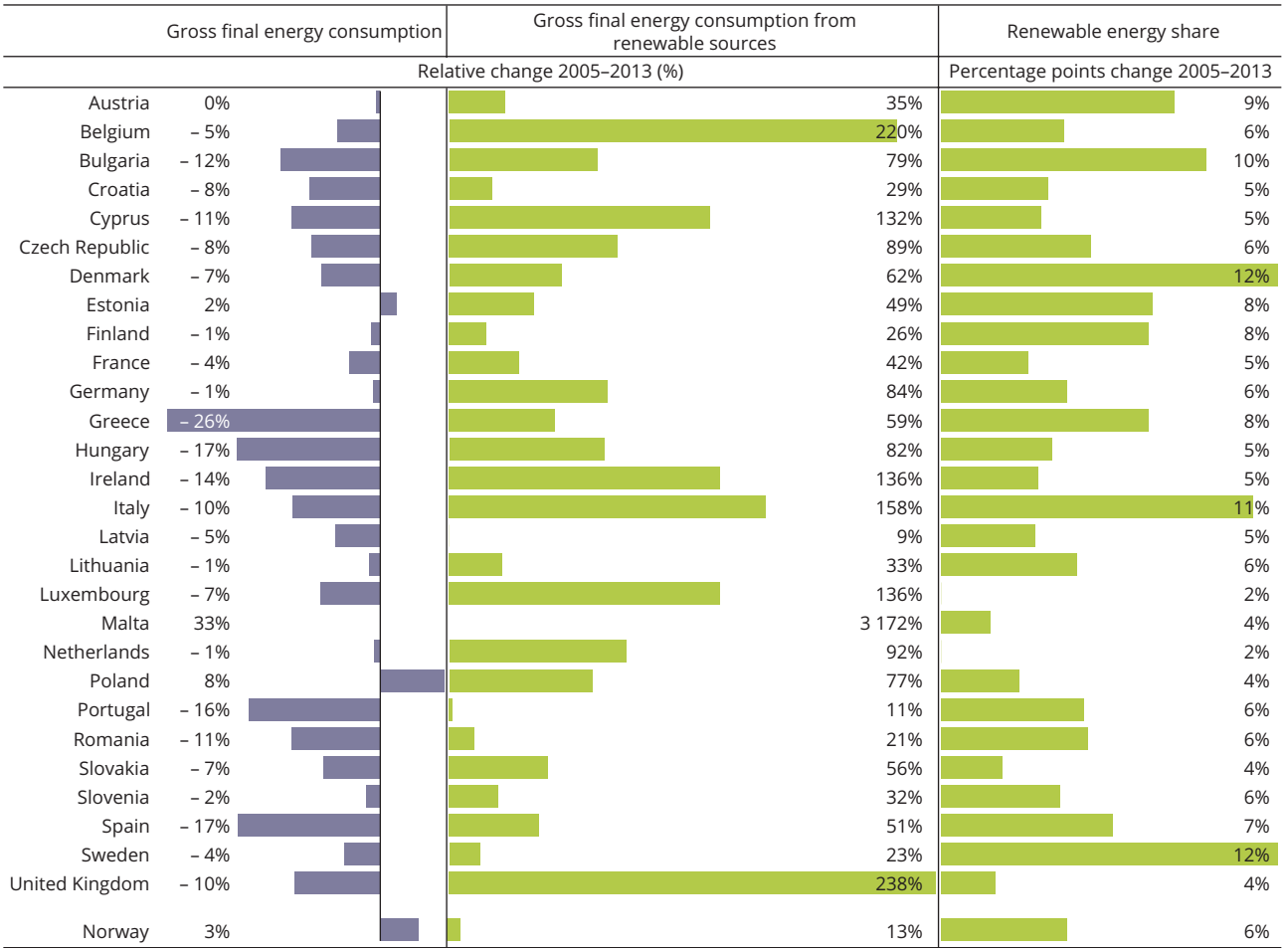
Source: EEA, 2015e; Eurostat, 2015a.

([27]) All of the five decarbonisation scenarios are in line with the EU's long-term emissions reduction goals (between 80% and 95% by 2050, compared to 1990 levels).

The year 2010 alone saw the consumption of energy of all sources increase, including non-renewables — this was a combined result of a relatively cold winter and a rebound following the large drop observed in 2009 due to the economic crisis. In absolute terms, the continued development of renewables only marked a pause in 2011. Total energy consumption remained roughly constant in 2013 compared to 2012, while consumption of renewable energy increased by 8 Mtoe (from 163 Mtoe to 171 Mtoe), and consumption of non-renewable sources fell from 981 Mtoe to 972 Mtoe. The 13% decrease in gross final energy consumption of non-renewable sources between 2005 and 2013 clearly indicates a progressive substitution of fossil fuels by renewables. This trend persists when proxy estimates for RES shares in the year 2014 are taken into account.

In the period from 2005 until 2013, 25 Member States experienced a decline of gross final energy consumption. Combined with a growth in renewable energy use, this amplified the increase in their RES shares (Figure 4.3). Conversely, the increase in total gross final energy consumption observed in Estonia, Malta and Poland during this period somewhat mitigated the effect of the increase in RES use on the RES share ([28]).

Figure 4.3 Gross final energy consumption (total and from RES) and RES shares in Member States, 2005–2013



Note: Malta exhibits striking growth in renewable gross final energy consumption (+ 3 172%). Due to its absolute small size, however, data may not be fully representative and are thus omitted above.

Source: Calculated from Eurostat (2015a).

([28]) RES shares may vary without any additional RES deployment due to changes in gross final energy consumption, *ceteris paribus.* If total gross final energy consumption between 2005 and 2013 declines, then RES shares may amplify the actual growth of renewable energy consumption. The opposite holds true should gross final energy consumption grow. Overall, by taking into account the change in growth of gross final energy consumption by RES, a positive change is visible, despite the potential amplification mentioned above.

4.3 Trends in RES shares by sector

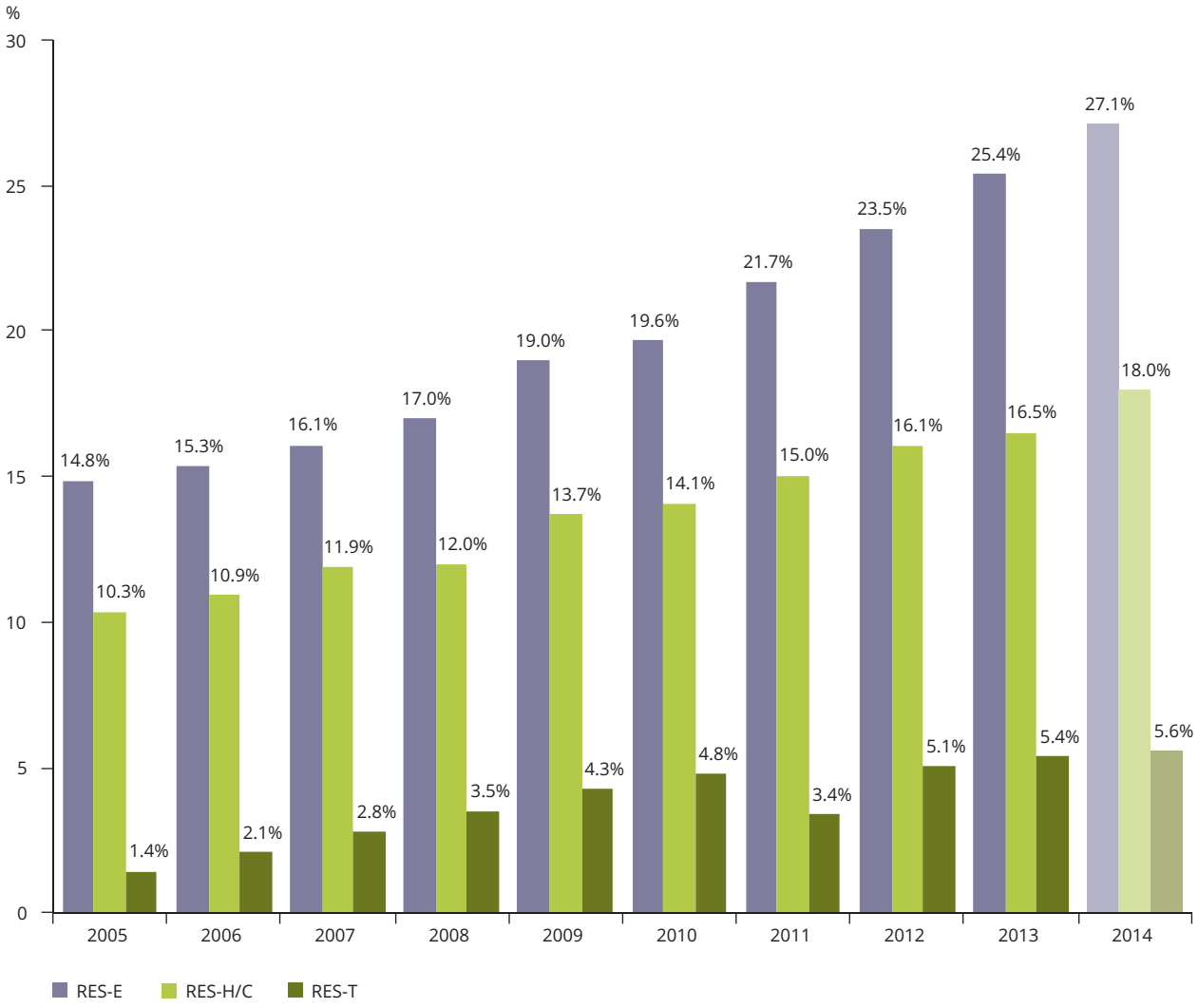
RES are used in power generation, in the heating and cooling sector and in the transport sector. The development of RES shares throughout the period from 2005 to 2013 in these individual sectors at EU level, supplemented by approximated RES shares for the year 2014, is depicted in Figure 4.4.

Between 2005 and 2013, the RES share in electricity consumed in the EU grew at an average of 1.3 percentage points per year. In 2013, 25.4% of the electricity consumed in the EU was generated from renewables, with about 38% of that share from variable renewable electricity (wind and solar power). For 2014, preliminary EEA estimates show that a total of 27.1% of electricity consumed stemmed from RES, with 40% taken from fluctuating sources (EEA, 2015e).

The EU RES share in the heating and cooling grew on average by 0.8 percentage points per year between 2005 and 2013. The share of renewables in this sector amounted to 16.5% in 2013, and is estimated at 18.0% in 2014 (EEA, 2015e). Renewable heating is increasingly being used as a cost-efficient and secure alternative to fossil fuels (mainly natural gas) in Member States for district heating and at local level.

Progress in the transport sector between 2005 and 2013 has been slowest: the RES share in this sector

Figure 4.4 Renewable energy shares by sector in the EU



Note: Percentages indicate the share on total gross final energy consumption of the corresponding sector.
Year 2014 data are approximated estimates from the EEA.

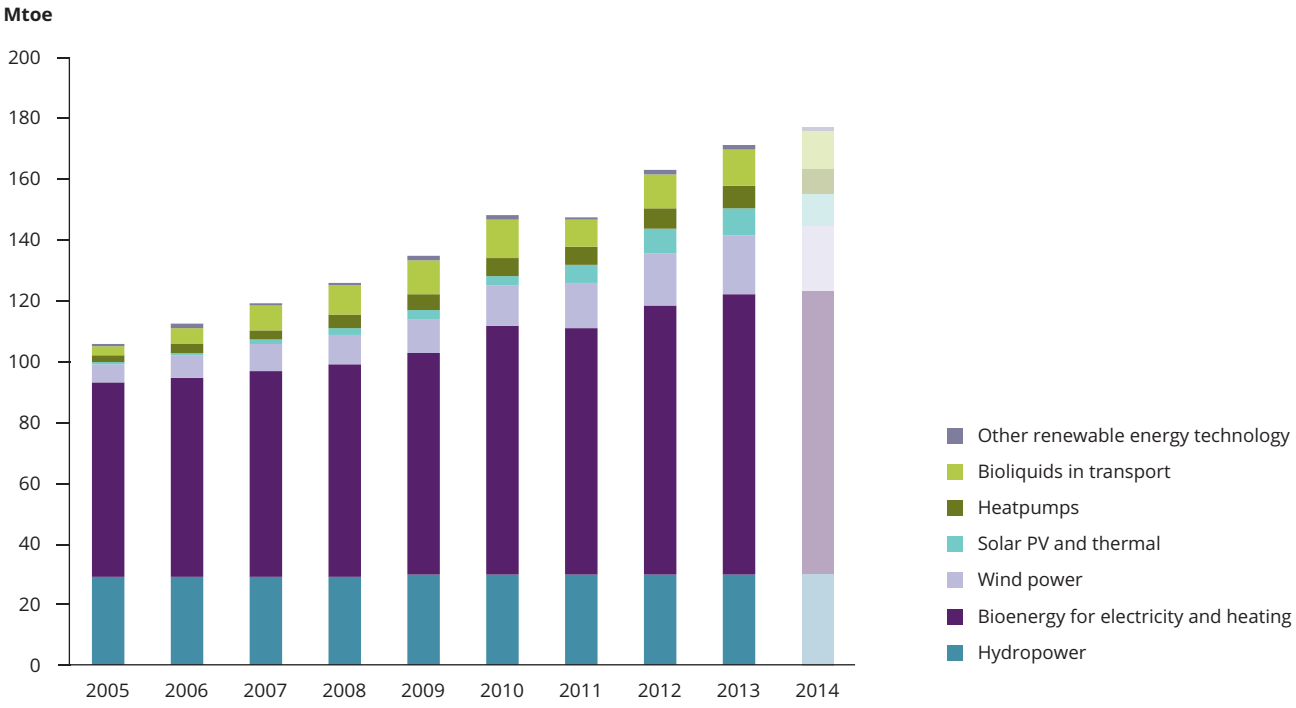
Source: EC, 2013b; EEA, 2015e; EurObserv'ER, 2015; Eurostat, 2014b and 2015a.

grew on average by 0.5 percentage points per year. In view of this sector being the only one which exhibits a specific RES share target for 2020 (10% share of renewable energy in all energy consumed in transport), speeding up progress seems crucial considering the distance to that target: the RES share in the transport sector was only 5.4% in 2013, and 5.6% in 2014 according to preliminary EEA estimates (EEA, 2015e).

Several reasons may explain the slow progress in the **transport** sector. Among others, these include uncertainty caused by delays in finalising the legislation limiting the risks of GHG emissions due to indirect land-use change (ILUC) ([29]), and relatively high abatement costs related to biofuels ([30]), not least because progress in the deployment of second-generation biofuels remains rather slow.

Solid biomass for heating is by far the single largest contributing technology throughout the time series, at an equivalent of 78 Mtoe (46% of all RES ([31])). With 30 Mtoe, hydropower provided the second largest contribution in 2013 (18% of all RES) (Figure 4.5). Proxy estimates for the year 2014 show further steady increases. All sources are expected to continue to increase considerably until 2020, especially wind energy.

Figure 4.5 Historic contributions from renewable energy technologies



Note: The group 'Other renewable energy technology' comprises heat and electricity from geothermal energy as well as electricity from tidal sources.

2014 data are approximated estimates from the EEA.

Source: EC, 2013b; EEA, 2015e; EurObserv'ER, 2015; Eurostat, 2014b and 2015a.

([29]) A political agreement reached in 2012, was adopted in 2015 (EU, 2015b, EU, 2015c). This agreement sets a maximum limit of 7% of final energy consumption in transport in 2020 to the share of energy from biofuels produced from crops grown on agricultural land primarily for energy purposes (and which could be used for other purposes too). Some 18 months after the entry into force of the directive, each Member State is to set a national target for advanced biofuels (for example, made from waste or algae).

([30]) For example, it is estimated (not considering ILUC emissions) that the mitigation costs of biodiesel would be in the range of EUR 100 to EUR 330 per avoided tonne of CO_2; for bioethanol fuels from sugars and straw, costs would range between EUR 100 and EUR 200 per tonne of avoided CO_2 (JRC, 2015).

([31]) For this analysis, only compliant biomass and normalised wind and hydro energy consumption have been considered.

4.4 Member State progress towards national RES targets

In 2013, a large majority of Member States were on track to achieve their national RES targets for 2020 ([32]). These binding targets were set in the 2009 RED and are differentiated by Member State to reflect differing national circumstances and starting points (national targets range from 10% for Malta to 49% for Sweden).

Under the RED, Member States must ensure that the share of renewable energy sources equals or exceeds their indicative RED targets during the period between 2011 and 2020. They may reach their indicative RED targets domestically, by establishing adequate RES support measures, or through cooperation (between local, regional and national authorities; planned statistical transfers; or joint projects) with other Member States and with third countries.

In 25 Member States, the national RES shares in 2013 were higher than the indicative shares set in the RED for the two-year period from 2013 to 2014. These indicative targets are part of the 'minimum indicative RES trajectories' determined by the RED for the period from 2005 to 2020, in order to ensure the continued development of renewable energy in each Member State.

Some Member States exhibit 2013 RES shares significantly above their indicative RED target (Figure 4 6). In Bulgaria, Estonia and Sweden, the RES shares recorded in 2013 were even higher than the national RED targets set for 2020; in Lithuania, the RES share matches the RED target exactly. However, in Luxembourg, the Netherlands and the United Kingdom, the 2013 RES shares were below their respective 2013 to 2014 indicative RED targets ([33]).

In 21 Member States, the national RES shares in 2013 were also higher than the 2013 level outlined in the NREAPs they submitted in 2010 ([34]).These action plans concern the development of renewable energy at national level, and include indicative trajectories as well as estimated future RES shares in transport (RES-T), heating and cooling (RES-H/C), and electricity (RES-E).

However, for seven Member States (Denmark, France, Ireland, Luxembourg, the Netherlands, Portugal and Spain), the 2013 RES shares were below the RES trajectories laid out by these Member States in their NREAPs. The RES trajectories in the NREAPs are generally more ambitious than the indicative RES trajectories set out in the RED (Figure 4.6) ([35]). For example, in the case of Denmark, the indicative RES level for the 2013 to 2014 period set out in the RED is 20.9%, while the expected level from the NREAP is 27.3%. By contrast, the trajectories set out in the national action plans of Greece, Latvia, Romania and the United Kingdom are actually lower than those set out in the RED.

In 2013, all Member States had achieved about a third or more of their 2020 RED targets:

- in four Member States (Luxembourg, Malta, the Netherlands and the United Kingdom), the 2013 RES shares were still below 40% of their 2020 RED target;
- six Member States (Belgium, Cyprus, France, Germany, Ireland and Slovakia) had a RES share of between 40% and 70% of their 2020 RED target;
- seven Member States (Croatia, Greece, Hungary, Poland, Portugal, Slovenia and Spain) had a share between 70% and 90% of their 2020 RED target;
- the other Member States exhibited a RES share either very close to their 2020 RED target (Austria 96%, the Czech Republic 95%, Denmark 91%, Finland 97%, Italy 98%, Latvia 93% and Romania 99%) or already on or above it (Bulgaria, Estonia, Lithuania and Sweden).

Approximated 2014 RES shares are higher than the indicative shares set in the RED for the two-year period from 2013 to 2014 for 27 Member States (i.e. all except the Netherlands ([36])). With the approximated shares for

([32]) In its 2015 'Renewable energy progress report' (EC, 2015b), the European Commission assessed the progress of the Member States towards their RES targets using historical RES developments for 2013 (data from Eurostat) and modelled data for 2014 and 2020 (Green-X modelling). By contrast, this report tracks progress using Eurostat data for 2013 and approximated estimates from the EEA for 2014 (EEA, 2015e). These different methods explain certain differences between the two reports.

([33]) Nevertheless, these countries could still meet their respective 2013 to 2014 indicative RED targets if their RES share growth in 2014 proves strong enough to offset the lower RES share in 2013.

([34]) Since 2011, Member States have had to submit biennial progress reports in pursuit of their NREAPs.

([35]) In its progress reports on the promotion and use of renewable energy from renewable sources submitted under Article 22 of the RED, Italy presented an updated RES trajectory, due to the unexpected quick development of the use of the RES share compared to that expected in the NREAP submitted in 2010. This was a consequence of the reduction in total final energy consumption and of the increase in energy generation from renewable sources, which was greater than anticipated. Such development is expected to continue until 2020. For the present assessment, the original NREAP trajectory was taken into account.

([36]) Under the RED, Member States must officially amended and re-submit their NREAPs, should their RES share fall below the indicative RED trajectory in the immediately preceding two-year period (RED Art.4.4). As shown in the 2014 'Trends and projections' report (EEA, 2014a), the Netherlands and other Member States recorded national RES shares in 2011 and 2012 below their respective indicative RED targets for this period.

2014, six additional Member States now show higher shares than their indicative RED target for 2020 (Austria, the Czech Republic, Finland, Italy, Lithuania and Romania).

In 20 Member States, the approximated RES shares in 2014 were also higher than their 2014 level outlined in their NREAPs. In particular, the 2014 RES shares of Denmark and Luxembourg were higher than their NREAP indicative targets, not the case in 2013. Conversely, the 2014 RES shares of Cyprus and Malta are estimated to be lower than their respective indicative NREAP targets, while the United Kingdom stood exactly at the level of its 2014 NREAP target.

According to the currently available progress reports on renewable energy submitted by Member States in 2013, 16 Member States expect more production from RES than in their indicative trajectory ([37]) for at least 1 year until 2020. These Member States could, in principle, transfer excess amounts to other Member States experiencing deficits. Such transfers would help more Member States attain their interim targets. The progress reports suggest that no statistical transfers had yet been made by 2013, but that Member States with excess production are willing and prepared to carry out such transfers in the future.

Norway and Sweden created a joint electricity certificate market in 2012, in which an electricity certificate issued in one country can be used to meet the quota obligation in the other country, and vice versa. Apart from this case, no other Member State reported having implemented such a joint project.

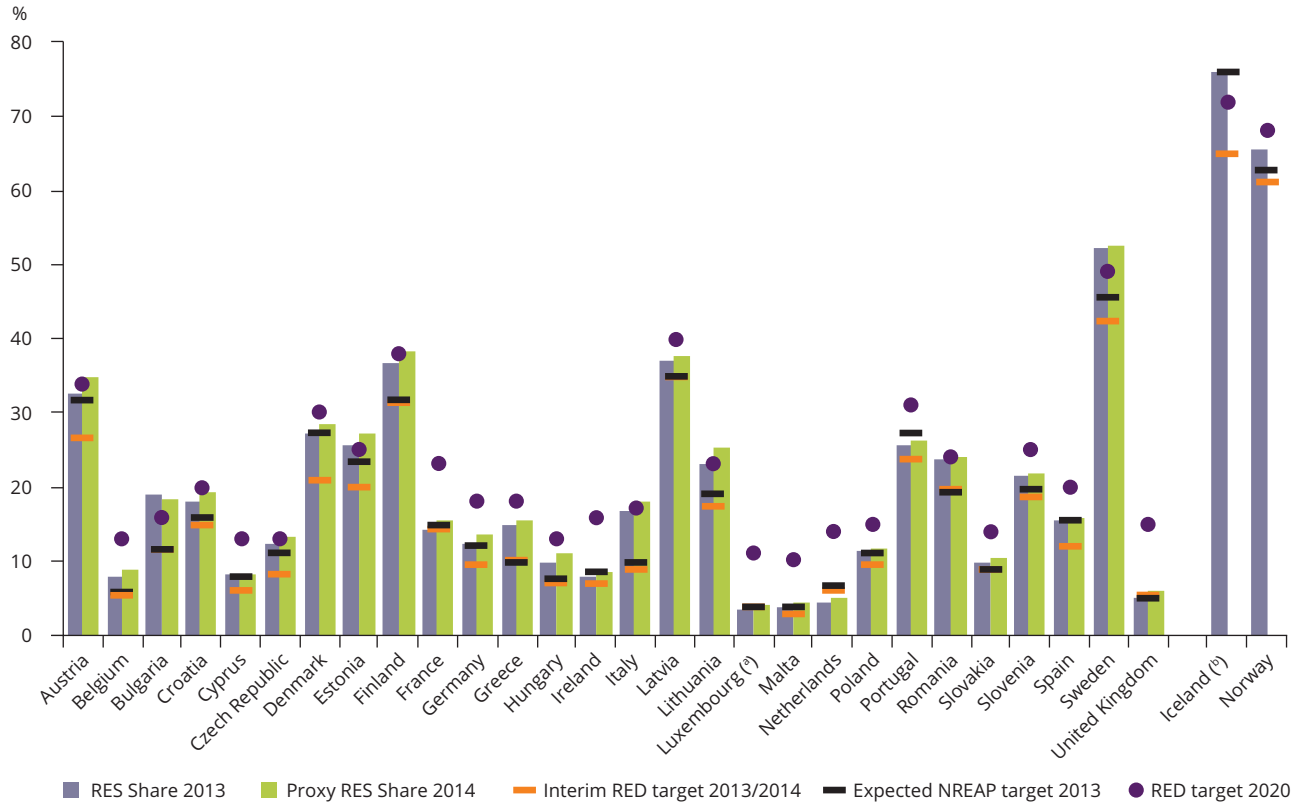
The specific target for renewable energy use in the transport sector is the same for all Member States ([38]). In 2013, only Sweden exhibited a RES shares in transport higher than 10% ([39]). The remaining Member States exhibited shares between 0.2% (Estonia) and 9.9% (Finland) (see also Table A4.2 in Annex 4).

([37]) Excess and deficits are reported in Table 7 in the 'progress reports on the promotion and use of renewable energy from renewable sources' under Article 22 of the RED.

([38]) At least 10% of energy consumption in the transport sector should stem from RES in 2020.

([39]) Sweden is currently a positive outlier with its high RES-T share of 16.7%: it stimulates fuel efficiency and renewable energy use in transport through a number of tax incentives and blending. It has a very high share of flexi-fuel vehicles, with numerous public busses running on ethanol and biogas. Many municipalities produce biogas from separately collected food waste and sewage. In addition, Sweden has also a high share of non-road renewable electricity consumption in transport thanks to a well-developed and extensive rail system.

Figure 4.6 **Member States' RES shares (2013–2014), in relation to the indicative RED target (2013–2014) and 2013 NREAP target**



Note: Under the accounting rules in the RED, electricity generated by hydro and wind were normalised for annual variations (hydro for 15 years and wind for 5 years). For details on the normalisation rule, see the SHARES manual provided by Eurostat at http://ec.europa.eu/eurostat/documents/38154/4956088/SHARES-2013-manual.pdf/6545be46-cacc-4e6d-baee-eceb99192d2f.

The targets for Iceland and Norway are part of Annex IV to the EEA Agreement. No approximated 2014 data are available for these two countries.

(a) For Luxembourg, missing data were estimated by Eurostat.

(b) For Iceland, the RES share and targets refer to the year 2012 as no data for 2013 are available.

Due to their insular and peripheral character, Cyprus and Malta's gross inland consumption is disproportionally high for aviation, and they are thus affected strongly by current technological and regulatory constraints. They therefore obtain an exemption covering the amount by which they exceed the Community average gross final consumption of energy in aviation in 2005 as assessed by Eurostat, i.e. 4.12%.

The 2013 RES shares are estimated by Eurostat, based on the national data transmission under Regulation (EC) No 1099/2008 on energy statistics (EU, 2008a).

Source: EEA, 2011b; EU, 2009b; Eurostat, 2015a.

5 Progress towards energy efficiency targets

Progress in numbers

- The EU is currently on track to meet its 20% energy efficiency target for 2020. In 2013, its primary energy consumption was 8.3% below 2005 levels. Continuing this downward trend at the same pace until 2020 would be sufficient for the EU to achieve its absolute target on primary energy consumption, which is equivalent to a reduction by 13.2%, compared to 2005 levels.
- The overall ambition of Member States to reduce or limit their energy consumption by 2020 remains insufficient. Member States have set their own indicative national absolute targets on primary energy consumption for 2020, which are not binding. The sum of these 28 national targets is 3% higher than the absolute target for 2020 set at EU level. Therefore, Member States overall are not aiming at sufficient reductions in energy use.
- In 2013, energy consumption in 20 Member States had sufficiently decreased or been limited since 2005 for these countries to be considered on track to meet their 2020 target. Eight Member States had not achieved sufficient savings: Belgium, Estonia, France, Germany, Malta, the Netherlands, Poland and Sweden. For these countries, 2013 levels in energy consumption stood above the linear trajectories between 2005 levels and 2020 targets.
- To support the fulfilment of national energy efficiency targets, the EED requires Member States to save energy in end-use sectors, by at least 1.5% per year between 2014 and 2020. This should be done through energy efficiency obligation (EEO) schemes or other alternative policy measures. However, the overall impact of this requirement could be smaller than originally envisaged, because Member States make extensive use of exemptions to limit their commitments to achieve new energy savings, do not sufficiently account for possible overlap between measures, and do not sufficiently demonstrate how they will achieve new savings compared to savings from already existing measures.
- The reductions in EU's energy consumption between 2005 and 2013 were a result of energy efficiency policies implemented across the EU, as well as reflecting the effects of the economic recession on energy demand. As economies pick up again across Europe, further efforts will be necessary to ensure that energy consumption continues to decrease.

Box 5.1 Primary and final energy consumption

Primary energy consumption measures the total energy demand of a country. It covers consumption of the energy sector itself, losses during the transformation (for example, from oil or gas into electricity) and distribution of energy, and final consumption by end users. It excludes energy carriers used for non-energy purposes (such as petroleum used not for combustion but for producing plastics).

Final energy consumption means all energy supplied to industry, transport, households, services and agriculture. It excludes deliveries to the energy transformation sector and the energy industries themselves.

5.1 EU progress towards its energy efficiency targets

The EU is currently on course to achieve its target of improving energy efficiency by 20% by 2020. Under the EED, this target was translated into two absolute targets on the EU's primary and final energy consumption in 2020:

- an absolute level of 1 483 Mtoe in primary energy consumption ([40]), which represents a 13.2% reduction compared to the EU's primary energy consumption in 2005 ([41]);

- an absolute level of 1 086 Mtoe in final energy consumption ([42]), which is 8.5% lower than in 2005.

In 2013, the EU's primary energy consumption was 1 567 Mtoe. This was 8.3% lower than in 2005 and corresponds to an annual decrease of 1.0% per year on average, between 2005 and 2013. This decrease was steeper than the average decrease in primary energy consumption between 2005 and 2020 (0.9% per year) necessary to achieve the 2020 target. In other words, the EU's primary consumption in 2013 was below the linear trajectory between 2005 and the 2020 target (Figure 5.1). Between 2012 and 2013, primary energy consumption decreased by 1.1%.

According to preliminary estimates, in 2014 the EU's primary energy consumption further decreased to 1.515 Mtoe, and remained below the linear trajectory between 2005 and the 2020 target (EEA, 2015f).

The EU's final energy consumption in 2013 was equal to 1 104 Mtoe. This was 7.0% lower than in 2005 and corresponds to an annual decrease of 0.9% per year on average, between 2005 and 2013. As for primary energy consumption, the EU's final consumption in 2013 was below the linear trajectory between 2005 and the 2020 target: the 0.9% average annual decrease observed between 2005 and 2013 was steeper than the 0.6% decrease determined by the linear trajectory. Final energy consumption increased slightly, by 0.1%, between 2012 and 2013. This may be related to a 3% increase in natural gas consumption by all end-use sectors at EU level ([43]).

The EU has been reducing its energy consumption since 2005. The 7.0% decrease in final energy consumption between 2005 and 2013 was influenced by economic performance, structural changes in various end-use sectors (in particular industry), improvements in end-use efficiency, lower energy consumption in the transport sector (peaking in 2007, and subsequently decreasing by 9% between 2007 and 2013), as well as lower heat consumption due to favourable climatic conditions (e.g. warmer winters) (EEA, 2015h).

The 8.3% decrease in primary energy consumption between 2005 and 2013 was largely driven by the reduction in final energy consumption observed during that period. Other factors contributed to this decrease:

- improved efficiency in the conversion of primary sources (e.g. coal and gas) into final energy (e.g. electricity and heat);

- changes in the fuel mix to produce electricity and heat:

  - a decreasing share of thermal generation (excluding combined heat and power (CHP)),

  - a decreasing share of nuclear energy: the conversion efficiency of nuclear technology is considered lower than the average efficiency of thermal generation, so a decreasing share statistically improves the overall conversion efficiency of the energy system,

  - an increasing share of RES for electricity production (such as hydro, solar photovoltaic, wave and tidal, and wind): renewables are considered to have 100% transformation efficiency, so an increasing share statistically improves the overall conversion efficiency of the system. The increase in consumption of renewables from 2005 levels — and the subsequent substitution of fossil fuels — is estimated to have contributed to a 1.6% reduction in primary energy consumption in 2013 (EEA, 2015i).

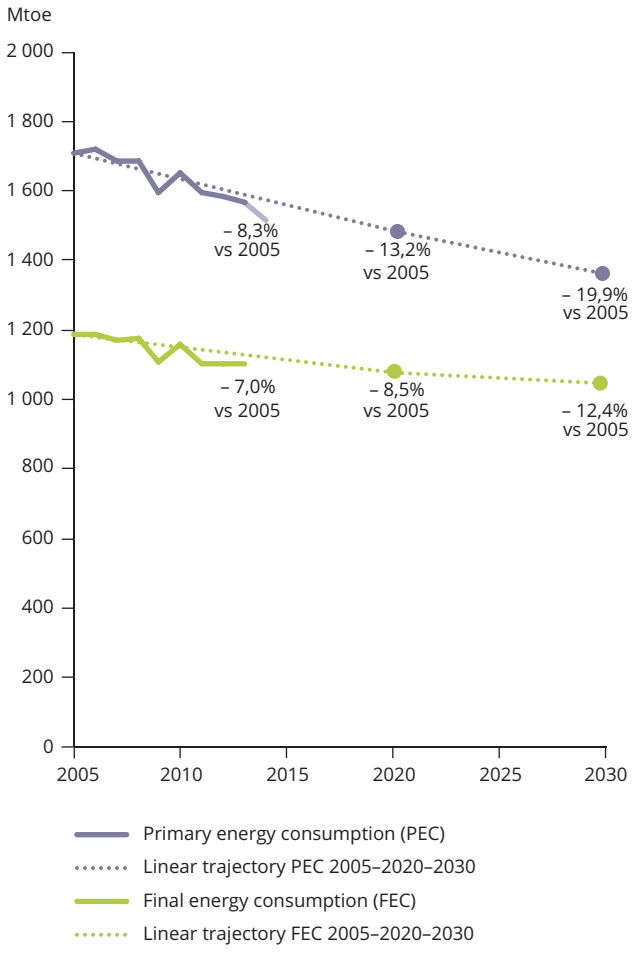
In its July 2014 communication *Energy efficiency and its contribution to energy security and the 2030 framework for climate and energy policy energy efficiency* (EC, 2014b), the European Commission estimated that if current policies and measures in place in Member States were not better implemented or enforced, the EU would only achieve energy savings of between 18% and 19% in 2020 (calculated with the so-called

([40]) Primary energy in the context of the EED means gross inland energy consumption minus nonenergy use.
([41]) This level is 20% lower than the projection for 2020 set out in the European Commission's Energy Baseline Scenario from 2007, based on the PRIMES model.
([42]) Final energy consumption includes all energy delivered to the final consumer's door (in industry, transport, households and other sectors) for all energy uses. It excludes deliveries for transformation and/or own use of the energy-producing industries, as well as network losses. See Box 5.1
([43]) Source: Eurostat — ten00095: final energy consumption by product.

Reference + Scenario, which is an update of the EU Reference Scenario 2013). Another study carried out for the European Commission (Fraunhofer ISI, 2014) also found projected gaps to targets of between 0% and 3%, for both primary and final energy consumption in 2020. This is because a number of measures reported by Member States in their second national energy efficiency action plans (NEEAPs) are expected to generate fewer energy savings than anticipated.

These results may appear to contradict the assessment of current progress according to which the EU is currently on track towards its 20% energy efficiency target (because its energy consumption in 2013 was below the 2005-to-2020 linear target trajectory). This is because this assessment does not factor in the potential effects of an economic recovery on future energy consumption trends; if energy demand across the EU is reinvigorated, the 2020 target will be harder to reach than anticipated based on current levels (EC, 2014b).

Figure 5.1 Trends in EU's primary and final energy consumption (2005–2014) and targets, 2020 and 2030



Source: EC 2014a and 2014b; EEA, 2015f and 2015h; EU, 2012; Eurostat, 2015b, 2015g and 2015h.

In October 2014, the European Council endorsed an indicative energy efficiency target of at least 27% for 2030, in comparison to the 2007 Energy Baseline Scenario of the European Commission ([44]). This target should be reviewed by 2020, having in mind the 30% target proposed by the European Commission following a review of the EED. It will not be translated into national binding targets. The European Commission will also propose priority sectors in which significant gains in energy efficiency can be achieved, and ways to address them at EU level, with the EU and the Member States focusing their regulatory and financial efforts on these sectors. Individual Member States are free to set their own higher national targets.

A 27% improvement of energy efficiency by 2030 corresponds to:

- a primary energy consumption of 1 369 Mtoe in the EU, which is 20% lower than 2005 — this level corresponds to an average annual decrease of 0.8% per year between 2020 target and 2030 (compared to a 0.9% average annual decrease between the 2005 level and the 2020 target);
- a final energy consumption of 1 039 Mtoe, which is 12% lower than 2005 — this translates into a 0.4% average annual decrease between 2020 and 2030 (compared to the 0.6% average reduction between 2005 and the 2020 target).

A 27% energy efficiency target by 2030 can be reached by continuing, beyond 2020, the efforts to reduce EU's primary energy consumption between 2005 and 2020, while the average reduction in final energy consumption between 2020 and 2030 would be lower than the average reduction needed between 2005 and 2020.

5.2 EU policies for 2020 energy efficiency targets

A number of policies and measures have been adopted at EU level to support the EU and its Member States in meeting the 2020 energy efficiency targets:

- the EED, including the End-Use Efficiency and Energy Services Directive (Directive 2006/32/EC on energy

([44]) This 2007 Energy Baseline Scenario is the same that was used to set the 20% target for 2020 (EC, 2014a). It is based on the Price-driven and Agent-based Simulation of Markets Energy System Models (PRIMES) (EC, 2011e).

end-use efficiency and energy services repealing Council Directive 93/76/EEC);

- the Energy Performance of Buildings Directive (EPBD) (Directive 2010/31/EU of the European Parliament and of the Council of 19 May 2010 on the energy performance of buildings);

- product regulations laying down minimum energy performance standards and putting energy performance information on labels (the Ecodesign Directive (Directive 2009/125/EC of the European Parliament and of the Council of 21 October 2009 establishing a framework for the setting of ecodesign requirements for energy-related products)) and the Energy Labelling Directive (Directive 2010/30/EU of the European Parliament and of the Council of 19 May 2010 on the indication by labelling and standard product information of the consumption of energy and other resources by energy-related products)

- CO_2 performance standards for cars and vans;

- increased financing through EU Structural and Investments (ESI) Funds, Horizon 2020, and dedicated facilities such as European Local ENergy Assistance (ELENA) and the European Energy Efficiency Fund;

- the roll-out of smart meters, following the Internal Electricity Market Directive (Directive 2009/72/EC of the European Parliament and of the Council of 13 July 2009 concerning common rules for the internal market in electricity and repealing Directive 2003/54/EC).

- the ESD, reducing emissions from non-ETS sectors;

- the EU ETS.

The 2012 EED (EU, 2012) contained a set of binding measures to help the EU reach its 20% energy efficiency target by 2020. Under the directive, Member States are required to use energy more efficiently at all stages of the energy chain: from its production to its final consumption. It is also under this directive that Member States are required to set their own indicative 2020 target in order to contribute to the achievement of the EU's 2020 energy efficiency target.

More than half of the required energy savings are expected to be delivered by Article 7 of the EED, under which Member States must attain 1.5% of new energy savings from sales to final consumers for every year between 2014 and 2020. This is to be achieved by setting up EEO schemes or adopting other alternative policy measures. In the few countries or regions where they have been implemented (Denmark, France, Italy, Poland and the United Kingdom, as well as the Flanders region in Belgium), EEO schemes delivered significant savings in an efficient manner. Nevertheless, many countries seem to prefer alternative measures which build on existing measures to setting up EEOs. This may be happening because EEOs are a completely new type of instrument for most Member States. There is therefore little experience in designing, administering and adapting this type of policy. Furthermore, large differences exist across schemes in terms of number and types of obliged parties, eligible sectors, eligible projects, monitoring mechanisms, fund raising mechanisms and metrics used to set the targets. These differences may hamper experience sharing between Member States. Alternative measures are expected to contribute towards approximately 60% of the total energy saving target under Article 7 of the EED, while EEOs could contribute to the remaining 40% of target savings (ENSPOL, 2014).

The overall impact of Article 7 might be less important than initially expected. A recent evaluation for the European Commission of the national policies and measures reported under Article 7 indicates that total annual savings in primary energy will be smaller than initially estimated by the European Commission in 2011 (Ricardo AEA et al., 2015). This is mainly due to two reasons, as explained below.

- Almost all countries plan to use the maximum exemptions possible, which means that the 1.5% annual end-use savings target set under Article 7 could be reduced by up to 25%.

- Three quarters of all energy savings under Article 7 will be delivered by policy measures already in place before the directive came into force (Ricardo AEA et al., 2015). Most of these savings come from cross-cutting measures such as taxes or financial incentives. The residential sector is responsible for the largest share of the savings coming from measures targeting a single sector. Member States adopt different approaches to both additionality ([45]) and double counting of policy measures, suggesting a general insufficient accounting for additionality for most Member States.

([45]) The EED requires that energy savings be additional to the required minimum EU levels. Only savings above levels that are 'mandatory and applicable in Member States under the Union Law' may be counted towards the target.

Overall, calculation and reporting approaches for Article 7 measures are extremely diverse across Member States. Information on methodological aspects remains incomplete, and it is difficult to determine the most appropriate calculation method for energy savings, owing in large part to the variety of policy measures with broad technology and sectoral scopes (ENSPOL, 2014; Ricardo AEA et al., 2015).

5.3 National 2020 energy efficiency targets vs the EU target

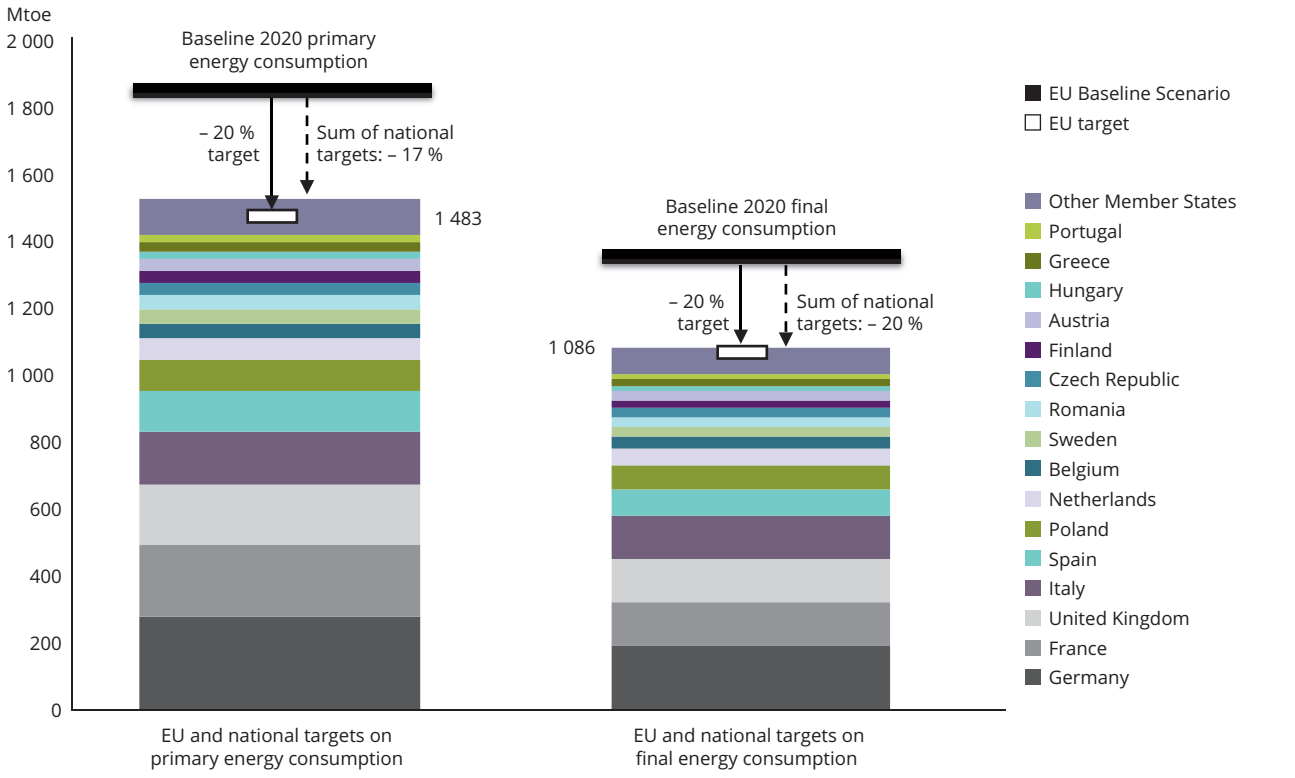
There is an apparent overall lack of ambition in the primary energy targets which Member States have taken on under the EED. The sum of the latest Member States' 2020 absolute targets for primary energy consumption remains 3% higher than the EU targets adopted under the EED, in contrast to the final energy targets.

- The sum of all 2020 targets for primary energy consumption from 28 Member States is equal to 1 530 Mtoe. This is higher, by 47 Mtoe (3%), than the EU target of 1 483 Mtoe. Between 2014 and 2015, the gap remained constant, although Croatia also formulated a primary energy target for 2020 in its NEEAP 2014. The constant gap is explained by the lower targets as reported by different Member States in their national energy efficiency action plans (NEEAPs) of 2014, counterbalancing the Croatian target.

- For final energy consumption, the sum of all 2020 targets from 28 Member States is 5 Mtoe (0.5%) below the EU target of 1 086 Mtoe.

Therefore, if all Member States strictly achieve their national targets under the EED, the EU's primary and final energy consumption would decrease to levels

Figure 5.2 Overall ambition level of national targets for primary and final energy consumption by 2020



Note: The Member States grouped as 'Other Member States' are those which have a 2020 target on primary energy consumption lower than 20 Mtoe and a 2020 target on final energy consumption lower than 15 Mtoe. In order of decreasing magnitude of 2020 target, these countries are Denmark, Bulgaria, Slovakia, Ireland, Slovenia, Estonia, Lithuania, Latvia, Luxembourg, Cyprus, Malta and Croatia.

Source: Reported targets under Article 3 of the EED in 2013, including updates of Austria, Bulgaria, Croatia, Cyprus, France, Greece, Italy, Poland, Slovakia, Spain, Sweden and the United Kingdom based on their third NEEAPs submitted in 2014 (or based on separate notifications to the Commission).

close to overall EU 2020 targets, but not enough to achieve the primary energy target (Figure 5.2). This is essentially because Member States have the possibility to determine their own indicative (non binding) targets and to revise them.

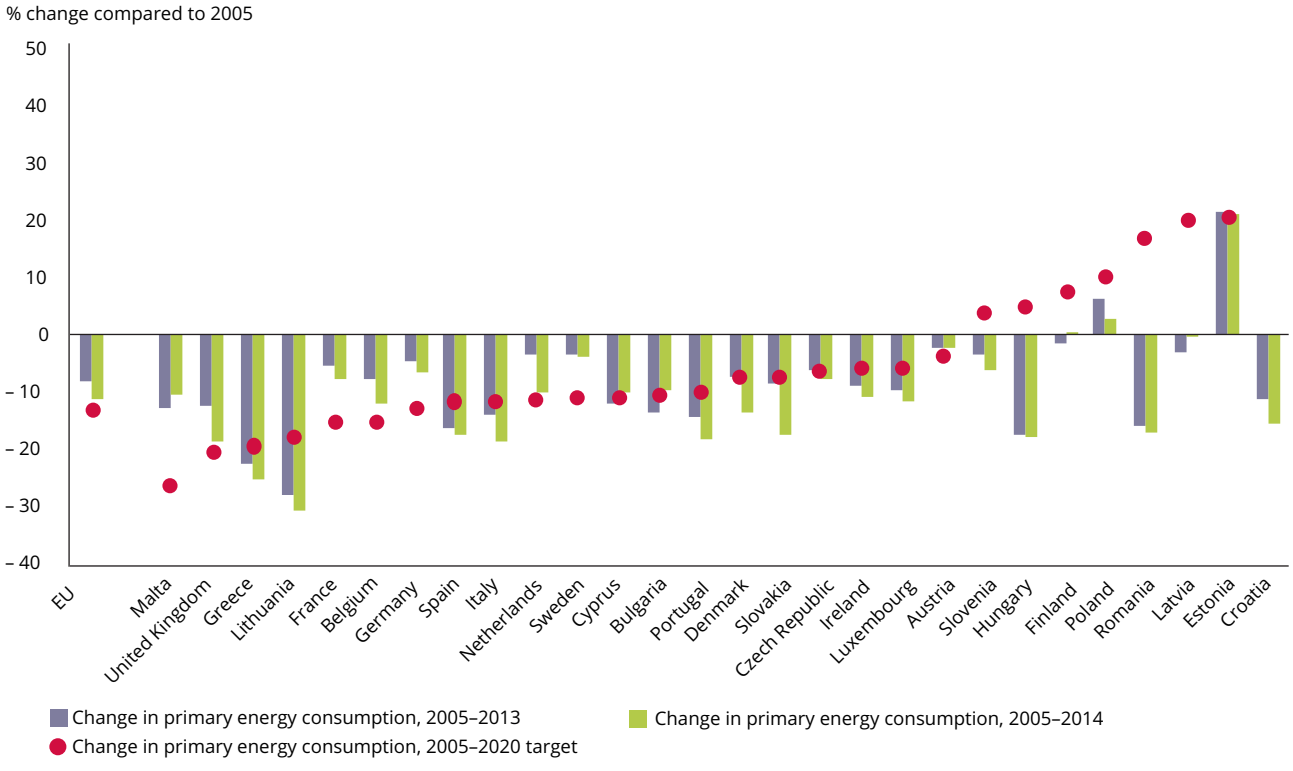
For some Member States, the 2020 targets provide much potential for increasing either primary or final energy consumption from 2005 levels (Figure 5.3). Although not explicitly stated in the EED, Member States are allowed to revise their targets when submitting annual progress reports or NEEAPs. In their 2014 NEEAPs ([46]), 12 Member States (Austria, Bulgaria, Croatia, Cyprus, France, Greece, Italy, Poland, Slovakia, Spain, Sweden and the United Kingdom) changed their 2020 targets. Most of these countries moved towards more ambitious targets (lower energy consumption) in light of the most recent analysis on the impact of the economic crisis on their economies. However, both Bulgaria and Slovakia weakened their targets on primary energy consumption, allowing themselves higher energy consumption levels by 2020 compared to the targets announced in 2013. The same holds true for Poland and its final energy consumption target.

5.4 Progress towards national 2020 energy efficiency targets

Twenty Member States are on track to reach their 2020 energy efficiency targets, while eight (Belgium, Estonia, France, Germany, Malta, the Netherlands, Poland and Sweden) are not (Figure 5.4).

Eight Member States (Croatia, Estonia, Finland, Hungary, Latvia, Poland, Romania and Slovenia) have taken 2020 targets for primary energy consumption higher than 2005 levels ([47]).

Figure 5.3 Primary energy consumption (2013–2014) and 2020 national targets, relative to 2005 levels



Note: Member States are ordered according to their 2020 target on primary energy consumption (relative to 2005 levels).

Source: EEA, 2015d; Eurostat, 2015b, 2015g and 2015h; Reported targets under Article 3 of the EED in 2013, including updates of Austria, Bulgaria, Croatia, Cyprus, France, Greece, Italy, Poland, Slovakia, Spain, Sweden and the United Kingdom, based on their third NEEAPs submitted in 2014 (or based on separate notifications to the Commission).

([46]) Or in separate notifications to the European Commission
([47]) The year 2005 was an exceptional year for Finland: because of long strikes, energy consumption dropped temporarily.

- Croatia, Finland, Hungary, Latvia, Romania and Slovenia managed to reduce their primary energy consumption between 2005 and 2013, thereby staying well below their linear trajectory between 2005 and the 2020 targets.

- Estonia and Poland are the only two Member States whose primary energy consumption increased between 2005 and 2013. Furthermore, these increases were too large for primary energy consumption to remain below the linear trajectories between 2005 levels and the 2020 targets (+ 0.8% increase per year in primary energy consumption for Poland and + 2.7% annual increase for Estonia between 2005 and 2013). Energy consumption in the residential sector as well as the services sector grew in both countries. Moreover, energy demand in the transport sector in Poland grew significantly (+ 30% between 2005 and 2013), which can be linked to economic growth and higher living standards. For example, the number of passenger cars per inhabitant increased by 50% between 2005 and 2012 (EEA, 2014e; Eurostat, 2015g).

Twenty Member States have taken a reduction target for 2020 for primary energy consumption.

- In 14 Member States, the pace of reductions in primary energy consumption between 2005 and 2013 was sufficient, and if maintained until 2020, should allow them to reach their 2020 target. In 11 of these Member States (Bulgaria, Cyprus, the Czech Republic, Greece, Ireland, Italy, Lithuania, Luxembourg, Portugal, Slovakia and Spain), the 2013 levels were actually already below the 2020 primary energy targets. These Member States are therefore in a situation where stabilising their energy consumption is crucial, especially as their economies recover from the crisis.

- The remaining six Member States (Belgium, France, Germany, Malta, the Netherlands and Sweden) have not been reducing their primary energy consumption fast enough between 2005 and 2013 to stay below their linear 2005 to 2020 trajectory. These countries have adopted targets for 2020 exceeding a 10% reduction of primary energy compared to 2005 (see Figure A1.3 in Annex 1). Malta, the Netherlands and Sweden made a good progress in 2013 compared to 2012: both countries reduced their primary energy consumption in 2013 compared to 2012, and reduced the gap with their linear trajectory. By contrast, energy consumption increased in Belgium, France and Germany, therefore the distance to the linear trajectory and to the 2020 target increased. In Belgium, the deviation between the 2013 primary energy consumption and the 2005-to-2020 linear trajectory is very small (– 0.01%). In Germany, as a response to the insufficient progress observed so far, in December 2014 the government launched a new national action plan on energy efficiency (NAPE), which sets out the strategy on energy efficiency Strategy of the federal government for the 18th legislative term by laying down short-term measures and longer-term work processes (BMUB, 2014).

Preliminary estimates show that in 2014, primary energy consumption decreased in most Member States compared to 2013, except for Bulgaria, Cyprus, Finland, Malta and Latvia. This decrease can be partly explained by an exceptionally warm winter, which reduced energy demand for heating across Europe.

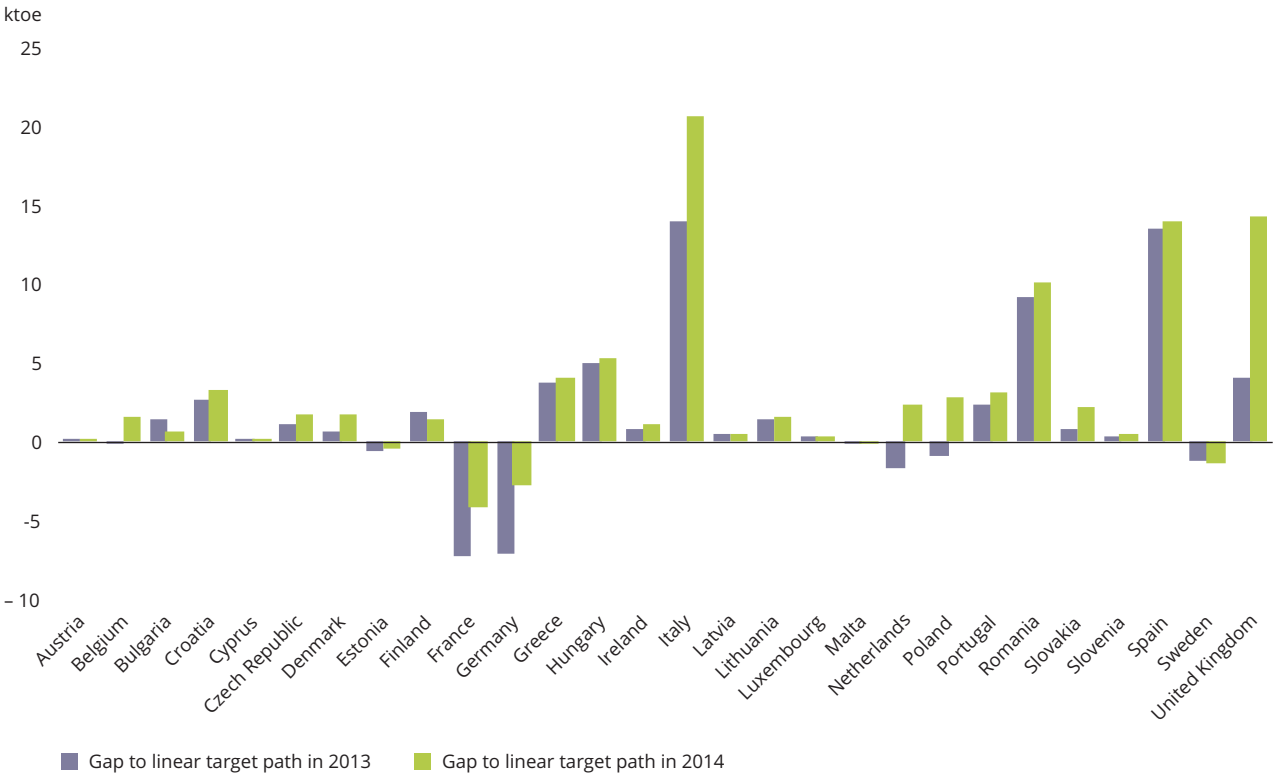
Member States have already put in place a wide range of energy efficiency measures that should go a long way towards meeting the 2020 energy efficiency objective, but the challenge remains to fully implement and enforce these measures at national level. Furthermore, Member States will need to achieve reductions beyond their targets in order to have the EU meet its overall 2020 energy efficiency target related to primary energy.

There is a risk that the economic crisis, which contributed to recent reductions in energy consumption levels across the EU, has sent a misleading signal: that energy efficiency targets might be achieved with limited efforts. In fact, Member States will need to continue to fully implement and enforce the agreed legislation, and to overcome common barriers associated with energy efficiency improvements. Such obstacles include lack of transparency, inadequate pricing of externalities and insufficient financing. Focus should be placed on the multiple benefits of energy efficiency, such as enhancing the sustainability of the energy system, supporting strategic objectives for economic and social development (e.g. job creation), increasing prosperity (e.g. retrofitting buildings for health and well-being) and promoting environmental goals (EEA, 2014b).

Box 5.2 Progress towards 2016 targets under the Energy Services Directive

In 2006, the EU adopted a framework for energy end-use efficiency and energy services, the End-Use Efficiency and Energy Services Directive (EU, 2006). According to this directive, Member States must adopt and attain an indicative energy saving target of 9% of final energy consumption by 2016. Based on the 2014 NEEAPs from 20 countries ([48]), most countries expect that they will meet or even exceed the 2016 target. However, progress made by Estonia, Italy, Lithuania and Slovakia is slower, and according to these Member States' estimates, a significant gap remains till the 2016 target is met. These Member States may therefore need to step up efforts in order to stay on track towards these targets.

Figure 5.4 Distance between 2013 and 2014 primary energy consumption and linear target path



Note: The assessment is based on a comparison between the 2013 levels in primary energy consumption and the 2013 levels of the linear target path between 2005 and the 2020 target on primary energy consumption, for each Member State. Because this is only the first year that the EEA is able to estimate approximated primary energy consumption level for the year 'Y-1', the comparison between 2014 levels is provided as additional information only but is not used for the assessment (see Section 1.3).

Source: EEA, 2015f; Eurostat 2015b, 2015g and 2015h; Reported targets under Article 3 of the EED in 2013, including updates of Austria, Bulgaria, Croatia, Cyprus, France, Greece, Italy, Poland, Slovakia, Spain, Sweden and the United Kingdom, based on their third NEEAPs submitted in 2014 (or based on separate notifications to the Commission).

([48]) The NEEAPs from seven Member States (Austria, the Czech Republic, Hungary, Ireland, Latvia, Romania and Slovenia) were either not available at all, unavailable in English on the European Commission website (see https://ec.europa.eu/energy/en/topics/energy-efficiency/energy-efficiency-directive/national-energy-efficiency-action-plans) at the time of writing, or did not include information on the national target under the End-Use Efficiency and Energy Services Directive.

Acronyms, units and terms

AAU	Assigned amount unit. A Kyoto unit representing an allowance to emit 1 metric tonne of carbon dioxide equivalent (CO_2-eq.) AAUs are created (issued) up to a level of a Party's initial assigned amount
AEA	Annual emission allocation (allowances issued under the ESD)
Annex I	The annex to the UNFCCC specifying which developed country Parties and other Parties to the UNFCCC have committed to limiting anthropogenic emissions and enhancing their GHG sinks and reservoirs
AR	IPCC Assessment Report
ARD	Afforestation, reforestation and deforestation
Assigned amount	The total quantity of valid emission allowances (Kyoto units) held by a Party within its national registry. The initial assigned amount for a Party is determined by its base-year emissions, and its emission limitation and reduction objective contained in Annex B to the Kyoto Protocol. Any Kyoto units that the Party acquires through the Kyoto mechanisms, or issues for removals from LULUCF activities under Article 3, paragraphs 3 and 4, are added to the Party's assigned amount; any units that the Party transfers, or cancels for emissions from LULUCF activities under Article 3, paragraphs 3 and 4, are subtracted from the Party's assigned amount. At the end of the commitment period, each Party must ensure that its total emissions over the commitment period are less than or equal to its total assigned amount
Cancellation	The transfer of a unit to a cancellation account. Such units may not be further transferred, and may not be used towards meeting a Party's Kyoto target
Carry-over	The authorisation for a unit that was issued in one commitment period to be used in a subsequent commitment period. Individual unit types are subject to different rules for carry-over
CDM	Clean Development Mechanism. A Kyoto Protocol mechanism that allows Annex I Parties to purchase emission allowances from projects in non-Annex I Parties that reduce or remove emissions. The emission allowances from CDM projects are CERs
CER	Certified emission reduction. A Kyoto unit representing an allowance to emit 1 metric tonne of CO_2-eq. CERs are issued for emission reductions from CDM project activities
CH_4	Methane
CM	Cropland management
CO_2	Carbon dioxide
CO_2-eq.	Carbon dioxide equivalent

COP	Conference of the Parties to the UNFCCC
CRF	Common reporting format
Domestic	Pertaining to a country's or group of countries' own emissions or internal action to reduce emissions
EEA	European Environment Agency
EED	Energy Efficiency Directive (Directive 2012/27/EU of the European Parliament and of the Council of 25 October 2012 on energy efficiency, amending Directives 2009/125/EC and 2010/30/EU and repealing Directives 2004/8/EC and 2006/32/EC)
EEO	Energy efficiency obligation
EFTA countries	European Free Trade Association countries: Iceland, Norway, Liechtenstein and Switzerland
ELENA	European Local Energy Assistance
EPBD	Energy Performance of Buildings Directive (Directive 2010/31/EU of the European Parliament and of the Council of 19 May 2010 on the energy performance of buildings)
ERU	Emission reduction unit. A Kyoto unit representing an allowance to emit 1 metric tonne of CO_2-eq. ERUs are issued for emission reductions or emission removals from JI project activities by converting an equivalent quantity of the Party's existing AAUs or RMUs
ESD	Effort Sharing Decision (Decision No 406/2009/EC of the European Parliament and of the Council of 23 April 2009 on the effort of Member States to reduce their greenhouse gas emissions to meet the Community's greenhouse gas emission reduction commitments up to 2020)
ESI	EU Structural and Investments
ETC/ACM	European Topic Centre on Air Pollution and Climate Change Mitigation. The ETC/ACM is a consortium of European institutes contracted by the EEA to carry out specific tasks in the field of air pollution and climate change
EU ETS	European Union Emissions Trading System
EU	European Union (Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Poland, Portugal, Romania, Slovenia, Slovakia, Spain, Sweden and the United Kingdom)
EU-15	Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden and the United Kingdom
EUA	European Union allowance
EUAA	European Union aviation allowance
EUTL	European Union Transaction Log
F-gas	Fluorinated gas
FEC	Final energy consumption

FM	Forest management
GAINS	Greenhouse Gas and Air Pollution Interactions and Synergies. Model providing a consistent framework for the analysis of co-benefits reduction strategies from air pollution and greenhouse gas sources
GDP	Gross domestic product
GHG	Greenhouse gas
GM	Grazing-land management
GWP	Global warming potential
HFCs	Hydrofluorocarbons
ICAO	International Civil Aviation Organization
IED	Industrial Emissions Directive (Directive 2010/75/EU of the European Parliament and of the Council of 24 November 2010 on industrial emissions (integrated pollution prevention and control))
IET	International emissions trading. One of the three Kyoto Protocol emissions trading mechanisms by which an Annex I Party may transfer Kyoto units to or acquire units from another Annex I Party. A Party must meet specific eligibility requirements to participate in emissions trading
IIEP	Institute for European Environmental Policy
ILUC	Indirect land-use change
INDC	Intended Nationally Determined Contribution
IPCC	Intergovernmental Panel on Climate Change
IPPU	Industrial processes and product use
ITL	International Transaction Log. An electronic data system, administered by the UNFCCC Secretariat, which monitors and tracks Parties' transactions of Kyoto units.
JI	Joint implementation. A Kyoto Protocol mechanism that allows Annex I Parties to purchase emission allowances from projects of other Annex I Parties that reduce or remove emissions. The emission allowances from JI projects are ERUs
JRC	Joint Research Centre
KP	Kyoto Protocol
ktoe	Kilotonne of oil equivalent
LDC	Least developed country
LMDI	Logarithmic Mean Divisia Index
LULUCF	Land Use, Land Use Change and Forestry. A GHG inventory sector subject to specific accounting rules

MBM	Market-based mechanism
MMD	Monitoring Mechanism Decision (Decision 28/2004/EC of 11 February 2004 concerning a mechanism for monitoring Community greenhouse gas emissions and for implementing the Kyoto Protocol)
MMR	Monitoring Mechanism Regulation (Regulation (EU) No 525/2013 of the European Parliament and of the Council of 21 May 2013 on a mechanism for monitoring and reporting greenhouse gas emissions and for reporting other information at national and Union level relevant to climate change and repealing Decision No 280/2004/EC)
MSR	Market Stability Reserve
Mt	Mega (million) tonne
Mtoe	Million tonne of oil equivalent
N_2O	Nitrous oxide
NAPE	National action plan on energy efficiency
NAT	National allocation table
National registry	An electronic database maintained by a Party, or group of Parties, for the transfer and tracking of units in line with Kyoto Protocol rules
NEEAP	National energy efficiency action plan
NER 300	Funding programme, funded from the sale of 300 million allowances from the NER set up for the third phase of the EU ETS, for demonstration projects of environmentally-safe carbon capture and storage, and innovative RES technologies on a commercial scale within the EU
NER	New entrants reserve
NF_3	Nitrogen trifluoride
NIM	National implementation measure
Non-Annex I Parties	Parties not included in Annex I to the UNFCCC
NREAP	National renewable energy action plan
PAM	Policies and measures
Party	A state (or regional economic integration organisation such as the EU) that agrees to be bound by a treaty and for which the treaty has entered into force.
PEC	Primary energy consumption
PFCs	Perfluorocarbons
Pledge	Emission reduction expressed as a percentage reduction, relative to the base year, which has to be achieved by a given year in the future

PPSR	Previous Period Surplus Reserve. Account in a Party's national registry where the Party's AAU surplus under a commitment period of the Kyoto Protocol, is transferred to be carried over to the subsequent commitment period.
PRIMES	Price-driven and Agent-based Simulation of Markets Energy System Models
PV	Photovoltaics
QELRC	Quantified Emission Limitation or Reduction Commitment, average level of anthropogenic carbon dioxide equivalent emissions of GHG expressed as a percentage in relation to the base year
RED	Renewable Energy Directive (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 sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC)
RES	Renewable energy sources
Retirement	The transfer of a unit to a retirement account to be used towards meeting a Party's Kyoto commitment
RICE	Regulation on International Credit Entitlements (European Commission Regulation (EU) No 1123/2013 of 8 November 2013 on determining international credit entitlements pursuant to Directive 2003/87/EC of the European Parliament and of the Council)
RMU	Removal unit. A Kyoto unit representing an allowance to emit 1 metric tonne of CO_2-eq. RMUs are issued for emission removals from LULUCF activities under Article 3, paragraphs 3 and 4
RV	Revegetation
SEF	Standard electronic format for reporting Kyoto Protocol units
SF_6	Sulphur hexafluoride
SHARES	Short Assessment of Renewable Energy Sources. Tool developed by Eurostat and aimed at facilitating the calculation of the share of energy from renewable sources according to the RED
SIDS	Small island developing state
TFEU	Treaty on the Functioning of the European Union
True-up period	A 100-day period after final emissions have been reported for the commitment period during which Parties have the opportunity to undertake final transactions necessary to achieve compliance with their Kyoto commitment
UNFCCC	United Nations Framework Convention on Climate Change
WAM	With additional measures
WEM	With existing measures

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Annex 1 Climate and energy targets in the EU

Key points

- The European Council has endorsed the objective of reducing Europe's GHG emissions by between 80% and 95% by 2050, compared to 1990 levels, in the context of necessary reductions to be collectively achieved by developed countries, according to the IPCC.
- The EU, its Member States and EEA member countries are committed to limiting or reducing their GHG emissions under international commitments, in particular the UNFCCC and its Kyoto Protocol. For the first commitment period (2008 to 2012), the EU-15 had a common reduction target of − 8% compared to base-year levels (close to 1990 levels). For the second commitment period (2013 to 2020), the EU and Iceland committed to cutting their emissions by 2020 by 20%, compared to base-year levels.
- The EU also adopted, unilaterally, a set of three climate and energy targets for 2020: a 20% reduction of its GHG emissions compared to 1990, a 20% share of renewable energy in its gross final energy consumption (with a minimum 10% share in the transport sector), and a 20% saving of its energy consumption, compared to a hypothetical 2020 level in a business-as-usual scenario.
- To meet the 2020 GHG target, in 2009 the EU adopted a climate and energy package, a legislative set of binding targets. This package set one single target for all EU emissions covered by the EU ETS, and one set of national targets for all other emissions not covered by the EU ETS. The ETS target corresponds to a reduction of about 21% of ETS emissions by 2020 compared to 2005, while for the other emissions, an overall reduction of about 9% is to be achieved under the ESD, compared to 2005. The ESD sets annual national targets for each year of the period between 2013 and 2020.
- To meet the 2020 target on renewable energy, the RED sets differentiated binding targets for each Member State for 2020, and provides indicative trajectories for the period from 2011 to 2020.
- Concerning energy efficiency, Member States have set their own non-binding targets for energy consumption for 2020 under the EED. These targets take various forms, and some of them may be subject to later revision.
- In October 2014, the European Council agreed endorsed a binding EU target of an at least 40% domestic reduction in GHG emissions by 2030 compared to 1990. They also set a target, binding at EU level, of at least 27% for the share of renewable energy consumed in the EU in 2030, as well as an indicative target at EU level of at least 27% for improving energy efficiency in 2030 compared to projections of future energy consumption, based on the current criteria.

A1.1 International commitments of EU and EEA countries under the UNFCCC and the Kyoto Protocol

In 1992, countries across the globe adopted the UNFCCC to cooperatively consider options for limiting average global temperature increases and the resulting climate change. Under the UNFCCC, developed country parties (Annex I parties) ([49]) are specifically obliged to commit to adopting national policies and to take corresponding measures for mitigation of climate change.

A1.2 First commitment period of the Kyoto Protocol, 2008–2012

The Kyoto Protocol is the first international legally binding agreement signed under the UNFCCC that specifies mitigation obligations of Annex I Parties which

([49]) A party is a state (or regional economic integration organisation such as the EU) that agrees to be bound by a treaty and for which the treaty has entered into force. Annex I parties are those listed in Annex I to the UNFCCC; they comprise industrialised countries that were members of the OECD in 1992 as well as countries with economies in transition (UNFCCC, 2014).

have signed the agreement. It was signed in 1997 and entered into force in 2005.

The first commitment period of the Kyoto Protocol ran from 2008 until 2012. In this first period, 37 industrialised countries committed to reduce GHG emissions by an average of 5% against 1990 levels. Under this commitment period, the 15 countries which were EU Member States at the time pledged to jointly reduce their GHG emissions by 8% compared to base-year levels (base year levels are roughly equivalent to 1990 levels) ([50]). To determine the contribution of each Member State in meeting this overall target, differentiated emission limitation or reduction targets were agreed for each of the 15 pre-2004 Member States under an EU accord known as the Burden-Sharing Agreement (Commission Decision determining the respective emission levels allocated to the Community and each of its Member States under the Kyoto Protocol pursuant to Council Decision 2002/358/EC) (EC, 2006b).

While the EU-15 (15 pre-2004 Member States) has a target under the Kyoto Protocol's first commitment period, the EU (28 Member States) does not, because the protocol was ratified before 13 countries became EU Member States in 2004, 2007 and 2013. Of these 13 Member States, 11 have individual targets under the Kyoto Protocol's first commitment period, while Cyprus and Malta do not have targets. These two latter countries became Annex I parties to the convention in 2013 and 2010, respectively (UNFCCC, 2009 and 2011).

Of the other country members of the EEA, Iceland, Liechtenstein, Norway and Switzerland have individual targets under the Kyoto Protocol's first commitment period. Turkey, which acceded to the Kyoto Protocol in February 2009, has no quantified emission reduction commitment. Despite being an Annex I party to the UNFCCC, Turkey is not included in the Kyoto Protocol's Annex B where individual targets for Annex I parties are listed, because it was not a party to the UNFCCC when the Kyoto Protocol was adopted ([51]).

The target under the Kyoto Protocol for the first commitment period was based on the following methodological assumptions and conditions:

- emissions or removals from LULUCF are included;
- the target refers to 1990 as a single base year, but is subject to the flexibility rules on fluorinated gases (F-gases) and economies in transition contained in Article 3(5) of the Kyoto Protocol;
- emissions from international aviation are excluded from the target; the sectors included are energy, industrial processes and product use (IPPU), agriculture and waste;
- the use of CERs, emission reduction units (ERUs) and possible recognition of units from new market-based mechanisms is possible to achieve the target (yet the EU ETS is capped for the use of units under EU domestic legislation);
- the target is based on the global warming potential (GWP) included in the IPCC *Second Assessment Report;*
- the target covers the gases carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF_6), consistent with the GHGs covered under the reporting requirements under the UNFCCC.

A1.3 Second commitment period of the Kyoto Protocol, 2013–2020

In 2010, the EU submitted a pledge to reduce its GHG emissions by 2020 by 20% compared to 1990 levels, under the UNFCCC. The EU is also committed to raising this target to 30% emission reductions by 2020, compared with 1990 levels, provided that other countries step up their mitigation ambition as well. Overall, the targets currently submitted by parties to the UNFCCC would not be sufficient to make up the collective emission reductions needed to achieve the 2 °C goal (UNEP, 2014).

In Doha in 2012 (COP 18/CMP 8), the second commitment period (2013–2020) was delineated; the Doha Amendment includes new quantified emission limitation and reduction commitments (QELRCs) for

([50]) The target refers to 1990 as a single base year, but is subject to the flexibility rules regarding F-gases and economies in transition of Article 3(5) of the Kyoto Protocol. This paragraph stipulates that parties included in Annex I undergoing the process of transition to a market economy whose base year or period was established by Decision 9/CP.2 of the COP are to use that base year or period for the implementation of their commitments. Furthermore, 1995 may be used as a base year for HFCs, PFCs and SF_6. Accordingly, 1990 is used as a base year for emissions of CO_2, CH_4 and N_2O for all countries except Bulgaria (1988), Hungary (average of 1985 through 1987), Slovenia (1986), Poland (1988) and Romania (1989); and 1995 is used as a base year for F-gases (HFCs, PFCs and SF_6) for all countries except Austria, Croatia, France, Italy and Slovakia (all 1990) and Romania (1989).

([51]) See also UNFCCC's Kyoto Protocol target information online (UNFCCC, 2013a).

Table A1.1 Emission reduction commitments by EU and EEA countries for the Kyoto Protocol's second commitment period, 2013–2020

Party	QELRCs submitted by parties, 2013–2020
	% reduction compared to base-year emissions
EU	– 20.0
Iceland	– 20.0
Liechtenstein	– 16.0
Norway	– 16.0
Switzerland	– 15.8

Source: UNFCCC, 2013b.

Annex I parties intending to take part in the second commitment period. The EU, its 28 Member States and Iceland agreed to a joint QELRC, corresponding to a 20% reduction compared to the base year; they declared that they intended to fulfil this commitment jointly, under Article 4 of the Kyoto Protocol. Liechtenstein, Norway and Switzerland are the three other EEA member countries which also agreed on QELRCs for the second commitment period. The Doha Amendments' entry into force is subject to acceptance by at least three fourths of the parties to the Kyoto Protocol ([52]).

Overall, the Doha Amendment sets an emission reduction objective of 18% below 1990 levels for all parties to the Kyoto Protocol for the second commitment period (Table A1.1). Despite having targets under the first commitment period, Canada, Japan, New Zealand and Russia did not submit targets for the second commitment period. Overall, emissions by countries with targets for the second commitment period only make up 14% to 15% of global emissions (EC, 2013e).

Main changes between the first and second commitment period of the Kyoto Protocol

The main amendments to Kyoto Protocol rules for the second commitment period (from 2013 to 2020) compared to the rules that were applicable in the first commitment period (from 2008 to 2012) are as follows.

- The introduction of an ambition mechanism through Article 3(1quarter), which allows a party to adjust its commitment by increasing its ambition during a commitment period.
- The introduction of Article 3(7ter), which allows for the adjustment of assigned amounts for the second commitment period in order to prevent an increase in its emissions for the period 2013 to 2020, beyond its average emissions for the years 2008 to 2010. According to this rule, the assigned amount units (AAUs) of a party will be cancelled if and to the extent that its assigned amount for the second commitment period exceeds its average emissions in the first three years of the preceding commitment period multiplied by eight (the number of years in the second commitment period).
- New accounting rules for emissions removals from LULUCF according to the relevant decisions made at COP 17 in Durban (UNFCCC, 2012a).
- The carry-over of surplus AAUs from the first commitment period of the Kyoto Protocol is possible according to specific accounting rules (for further details, see EEA (2014b)).
- Use of the GWP included in the *Fourth Assessment Report* of the IPCC (instead of the GWP from the *Second Assessment Report*).
- In addition to the gases covered in the first commitment period, the target for the second commitment period also covers nitrogen trifluoride (NF_3).

A number of other rules have not changed for the second commitment period. As in the first commitment period, the target for the second commitment period refers to 1990 as a single base year, but allows for different base years according to the flexibility rules for F-gases and economies in transition (as described above). For the newly added GHG NF_3, either 1995 or 2000 may be used as a base year. Base years for individual Member States have not yet been set for the second commitment period. Also, the use of CERs, ERUs and the possible recognition of units from new market-based mechanisms are all possible in order to achieve the target (yet capped under EU domestic legislation), and sector coverage remains the same.

([52]) As of 28 May 2015, 32 countries have ratified the Doha Amendment. Decisions on the implementation of Article 3.7 ter of the Doha amendment, on the carry-over, from one commitment period to the next, and rules on reporting for parties without commitments for the second commitment period are still pending under the UNFCCC.

LULUCF activities under the Kyoto Protocol

In addition to policies and measures targeting sources of GHG emissions, countries can use policies and measures to protect their existing terrestrial carbon stocks (e.g. by reducing deforestation) and to further enhance terrestrial carbon stocks (e.g. by increasing the area or carbon density of forests).

The following LULUCF activities are included under the Kyoto Protocol.

- Afforestation, reforestation and deforestation (ARD) since 1990 (mandatory activities covered by Article 3.3 of the Kyoto Protocol), for land that has been subject to direct, human-induced conversion from a non-forest to a forest state, or vice versa.

- Forest management (FM), cropland management (CM), grazing-land management (GM) and revegetation (RV). Although CM, GM and RV are voluntary, since the second commitment period, FM has been a mandatory activity under Article 3.4 of the Kyoto Protocol). These activities pertain to land that has not undergone conversion since 1990, but is otherwise subject to a specific land activity. Parties account for net emissions or removals for each activity during the commitment period, by issuing removal units (RMUs) in the case of net GHG removals from LULUCF activities, or cancelling Kyoto units in the case of LULUCF activities being a net source of GHG emissions. LULUCF activities can therefore be used to offset emissions from other sources if removals are higher than emissions from this sector. In the first commitment period, the number of RMUs that could be issued by each party under FM was capped (UNFCCC, 2006). For the second commitment period, FM activities will be accounted against a 'FM reference level', i.e. a country-specific level of business-as-usual emissions or removals. RMUs will be issued only if FM removals are higher or emissions are lower than the agreed FM reference level. Otherwise, Kyoto units will be cancelled.

RMUs can be accounted for at the end of a commitment period or annually. According to Decision 13/CMP.1, parties must indicate the frequency of accounting with their initial reports. For each activity under Article 3.3 and Article 3.4, parties have elected to account for emissions or removals either annually during the commitment period, or only once at the end of this period. The decision on frequency determines when parties may issue RMUs or cancel other units in the case of emissions from Article 3.3 and Article 3.4 activities.

For the second commitment period, new accounting rules apply for the accounting of emissions and removals in the LULUCF sector. In particular, additional activities for wetland management can be chosen to be accounted for on a voluntary basis. Guidelines for these new rules were developed by the IPCC and adopted by the UNFCCC. Subsequently, the rules were almost entirely transferred into EU law in form of the EU LULUCF Decision 529/2013/EU on accounting rules on greenhouse gas emissions and removals resulting from activities relating to land use, land-use change and forestry and on information concerning actions relating to those activities (EU, 2013b).

LULUCF emissions and removals are not included in the EU domestic 2020 target under the climate and energy package. The EU has adopted LULUCF Decision No 529/2013/EU (EU, 2013b), legislation which harmonises EU LULUCF reporting with Kyoto Protocol requirements, but also goes beyond these requirements. Under EU rules, Member States have to also report on agricultural activities (CM and GM), irrespective of whether these activities are elected or not under the KP.

Emissions from aviation

While GHG emissions from domestic and international aviation have been partly included in the EU's target under the UNFCCC since 2012 as part of the EU ETS, only emissions from domestic aviation are included in its targets under the Kyoto Protocol. Domestic aviation from the EU Member States amounts to less than 0.5% of total GHG emissions without LULUCF, whereas international aviation of EU Member States totals about 3%.

In principle, the EU ETS covers all flights arriving at, and departing from, airports in all EU Member States, Norway, Iceland and Liechtenstein and closely related territories. However, since 2012, flights to and from aerodromes from other countries have not been included in the EU ETS. This exclusion, first resulting from the 'stop the clock' decision (EU, 2013c) was made in order to facilitate negotiation of a global agreement on aviation emissions in autumn 2013 by the General Assembly of the International Civil Aviation Organization (ICAO). At its 38th meeting in autumn 2013, the ICAO decided on a roadmap for the development of a global market-based mechanism to tackle aviation emissions. By 2016, the body will decide on a mechanism to be implemented by 2020.

The EU decided to continue with a reduced scope in the period from 2013 to 2016 (EU, 2014b). Only flights between aerodromes located in countries in the European Economic Area are included. Flights to and

from outermost regions, as per Article 349 of the Treaty on the Functioning of the European Union (TFEU), are covered only if they occur in the same outermost region.

More than 1 200 aviation operators are currently included in the EU ETS. The cap for aviation in the EU ETS is based on average historic emissions in this sector between 2004 and 2006 (221.4 million t CO_2 for all participating countries) ([53]). The cap for the 2013-to-2020 period equals 95% of baseline emissions (EU, 2008b). Whereas aircraft operators may use EU aviation allowances (EUAAs) as well as EU allowances (EUAs) from the stationary sectors, stationary installations are not permitted to use aviation allowances for compliance. In addition, some international credits can be used by aircraft operators: up to 14% of their verified emissions in 2012, and, from 2013 onwards, each aircraft operator is entitled to use international credits up to a maximum of 1.5% of its verified emissions during the period from 2013 to 2020, without prejudice to any residual entitlement from 2012 (EU, 2014b).

Comparison of accounting rules under the Convention target and under the Kyoto Protocol

The EU clarified that the accounting rules for its target under the UNFCCC are more ambitious than the current rules under the Kyoto Protocol, for example, including international aviation and adding an annual compliance cycle for emissions under the ESD or higher Clean Development Mechanism (CDM) quality standards under the ETS (UNFCCC, 2013b).

Accordingly, the following assumptions and conditions apply to the EU's 20% target under the UNFCCC.

- Emissions or removals from LULUCF are not included (but moving to the higher target of 30% would require some contribution from LULUCF).
- The target refers to 1990 as a single base year, not allowing for different base years for F-gases or economies in transition, as under the Kyoto Protocol.
- Emissions from international and domestic aviation are partly included in the target; furthermore, the target covers the IPCC sectors of energy, industrial processes and product use (IPPU), agriculture and waste.
- A limited number of CERs, ERUs and units from new market-based mechanisms may be used to achieve the target: in the EU ETS, the use of international credits is capped (up to 50% of the reduction required from EU ETS sectors by 2020 can be achieved through the use of carbon credits). Quality standards also apply to the use of international credits in the EU ETS, including a ban on credits from LULUCF projects and certain industrial gas projects. In the ESD sectors, the annual use of international credits is limited to up to 3% of each Member State's ESD emissions in 2005, with a limited number of Member States being permitted to use an additional 1% from projects in least developed countries (LDCs) and small island developing states (SIDS), subject to conditions. These caps thus define the concept of supplementary use of market-based mechanisms for the fulfilment of targets, and indicate that the EU applies more ambitious rules with regard to the use of market-based mechanisms to its target under the UNFCCC than in the context of the Kyoto Protocol.
- The carry-over of surplus AAUs from the first commitment period of the Kyoto Protocol is not possible (but surplus EU emissions allowances allocated under the EU ETS can be banked from the 2008-to-2012 period into subsequent periods).
- The target covers the gases CO_2, CH_4, N_2O, HFCs, PFCs and SF_6, consistent with the GHGs covered under the reporting requirements under the convention (UNFCCC, 2013b).

A1.4 EU domestic climate and energy targets for 2020

The '20-20-20' targets

In the context of its commitments and the negotiations at international level, the European Council in March 2007 committed the EU to becoming a highly energy-efficient, low-carbon economy, by achieving three domestic climate and energy objectives by 2020:

- reducing its GHG emissions by 20% from 1990 levels;
- raising to 20% the share of RES in the EU's gross final energy consumption;
- improving the EU's energy efficiency by 20%.

([53]) The annual average of CO_2 emissions in the years 2004, 2005 and 2006 forms the baseline for historical aviation emissions, based on data from the European Organisation for the Safety of Air Navigation (EUROCONTROL) and fuel consumption information provided by aircraft operators.

To achieve these domestic commitments, in 2009 the EU adopted the climate and energy package, which is a set of various pieces of legislation ([54]). The package introduced a clear approach to achieving the 20% reduction of total GHG emissions from 1990 levels, which is equivalent to a 14% reduction compared to 2005 levels. This 14% reduction objective is to be achieved through a 21% reduction target compared to 2005 for emissions covered by the ETS, and a 10% reduction target for ESD sectors.

A revision of the ETS Directive (EU, 2009c) introduced a single 2020 target for all EU emissions covered by the EU ETS (as well as ETS emissions from the three participating non-Member States Norway, Iceland and Liechtenstein). The ETS essentially covers emissions from large industrial installations, as well as emissions from aviation. ETS emissions represent about 40% to 45% of EU total GHG emissions. The 2020 cap corresponds to a reduction of about 21% of ETS emissions by 2020, compared to 2005. The sectors covered under the EU ETS are therefore expected to contribute the largest share of emission reductions for meeting the EU's 2020 GHG target. For allowances allocated to the EU ETS sectors, annual caps have been set for the period from 2013 to 2020, which decrease by 1.74% annually. For further details on the EU ETS in the 2013-to-2020 period, see EEA (2015j).

For all other emissions not covered by the EU ETS, the ESD set binding annual targets for each year of the period between 2013 and 2020, for each Member State.

These EU-internal rules under the '2020 climate and energy package' underpin the EU implementation of the 2020 target under the Convention (see Section A1.3 in Annex 1).

National 2020 targets and compliance under the ESD

The ESD covers emissions from all sources outside the EU ETS, except for emissions from international maritime, domestic and international aviation (which were included in the EU ETS from 1 January 2012) and emissions and removals from LULUCF. It includes a range of diffuse sources in a wide range of sectors such as transport (cars, trucks), buildings (in particular heating), services, small industrial installations, agriculture and waste. Such sources currently account for about 55% to 60% of total GHG emissions in the EU.

The ESD sets individual binding annual targets for GHG emissions not covered by the EU ETS for all Member States for the period from 2013 to 2020 (AEAs) (EU, 2009a). In 2013, the European Commission determined the AEAs of Member States for the period from 2013 to 2020, using reviewed and verified emission data for the years 2005, 2008, 2009 and 2010 (EC, 2013c). The AEAs were later adjusted to reflect the change in ETS scope from 2013 onwards (EC, 2013d) ([55]).

Each Member State will contribute to this effort, according to its relative wealth in terms of GDP per capita. The national emission targets range from a 20% reduction for the richest Member States to a 20% increase for poorer ones in 2020, compared with 2005 levels. At EU level, this will deliver an approximate 9% to 10% reduction of emissions in 2020 compared with 2005 levels, from those sectors covered by the decision. Less wealthy countries are allowed to increase emissions in these sectors because their relatively higher economic growth is likely to be accompanied by higher emissions. Nevertheless, their targets still represent a limit on emissions, and a reduction effort will be required in all Member States; they will need to introduce policies and measures to limit or lower their emissions in the various ESD sectors.

The ESD allows Member States to make use of flexibility provisions for meeting their annual targets, with certain limitations.

- Within the Member State itself, any overachievement in a year of the period from 2013 to 2019 can be carried over to subsequent years, up to 2020. An emission allocation of up to 5% during the period from 2013 to 2019 may be carried forward from the following year.

- Between Member States, Member States may transfer up to 5% of their AEAs to other Member States, which may use this emission allocation until 2020 (*ex ante*). Any overachievement in a year of the period from 2013 to 2019 may also be transferred to other Member States, which may use this emission allocation until 2020 (*ex post*).

Member States may use JI/CDM credits according to the following provisions.

- The use of project-based emission credits is capped on a yearly basis up to 3% of 2005 ESD emissions in Member State.

([54]) See http://ec.europa.eu/clima/policies/package/index_en.htm for more details. The climate and energy package also included directives on fuel quality (EU, 2009d), carbon capture and storage technologies (EU, 2009e) and a regulation on CO_2 emissions from cars (EU, 2009f).

([55]) According to Article 27 (2) of Regulation (EU) 525/2013 the European Commission is to examine the impact of the use of the 2006 IPCC guidelines for national GHG inventories and significant changes brought about by the UNFCCC methodologies where by December 2016 and may revise Member States' AEAs as provided in the ESD accordingly.

- Member States that do not use their 3% limit for the use of project-based credits in any specific year can transfer their unused part for that year to other Member States, or bank it for their own use until 2020.

- Member States fulfilling additional criteria (Austria, Belgium, Cyprus, Denmark, Finland, Ireland, Italy, Luxembourg, Portugal, Slovenia, Spain and Sweden) may use credits from projects in LDCs and SIDS up to an additional 1% of their verified emissions in 2005. These credits are not bankable nor are they transferable.

Overall, a maximum of JI/CDM credits representing 750 Mt CO_2 at EU level can be used during the period from 2013 to 2020. As most Member States are expected to meet their ESD targets (see Section 3.4) without the flexibility provisions, while other Member States can meet their ESD targets through intra-EU transfers of AEAs, the use of project credits is expected to be significantly smaller.

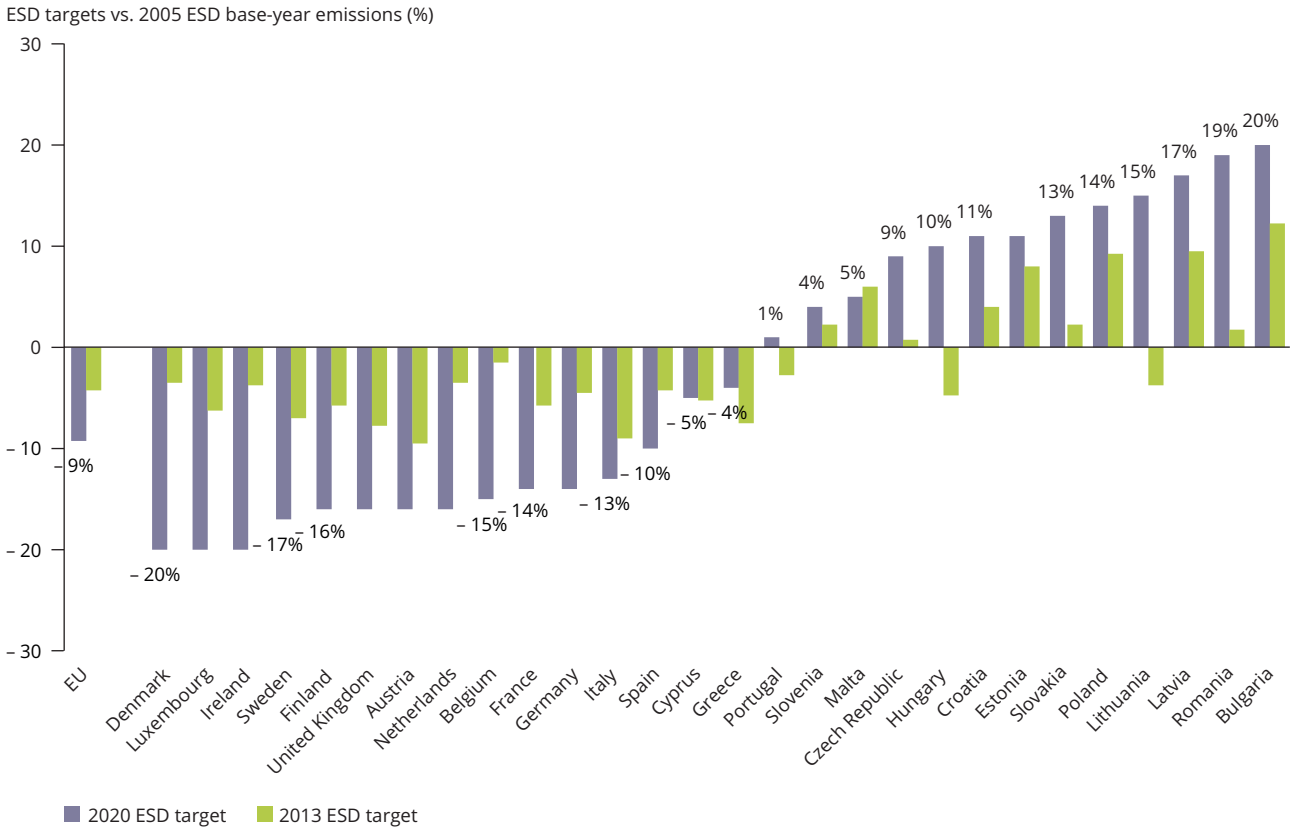
Any Member State exceeding its annual AEA, even after taking into account the flexibility provisions and the use of JI/CDM credits, will have to take corrective measures as laid down in the ESD and will be subject to the following consequences:

- deduction from the AEA for the next year of the excess non-ETS emissions multiplied by 1.08 (8% interest rate);

- development of a corrective action plan — the European Commission may issue an opinion, possibly taking into account comments from the Climate Change Committee;

- transfer of emission allocations and project-based credits from the account of that Member State will be temporarily suspended while the Member State is in a state of non-compliance with its ESD obligations.

Figure A1.1 National 2013 and 2020 GHG emission limits under the ESD, relative to 2005 emissions levels



Note: The 2013 targets are expressed against 2005 ESD base-year emissions. These base-year emissions calculated on the basis of relative and absolute 2020 targets (for details on ESD base-year emissions, see Section A3.4 in Annex 3).

The absolute 2020 and 2013 targets used for the calculations are consistent with the IPCC's *Fourth Assessment Report (AR4)* global warming values, and take into account the change in the scope of the ETS from the second to the third period (2013 to 2020).

Source: EC, 2013c and 2013d; EU, 2009a.

2020 targets on renewable energy

In order to meet its target of raising the share of RES to 20% in its gross final energy consumption by 2020, the EU adopted the RED (EU, 2009b), as part of the climate and energy package.

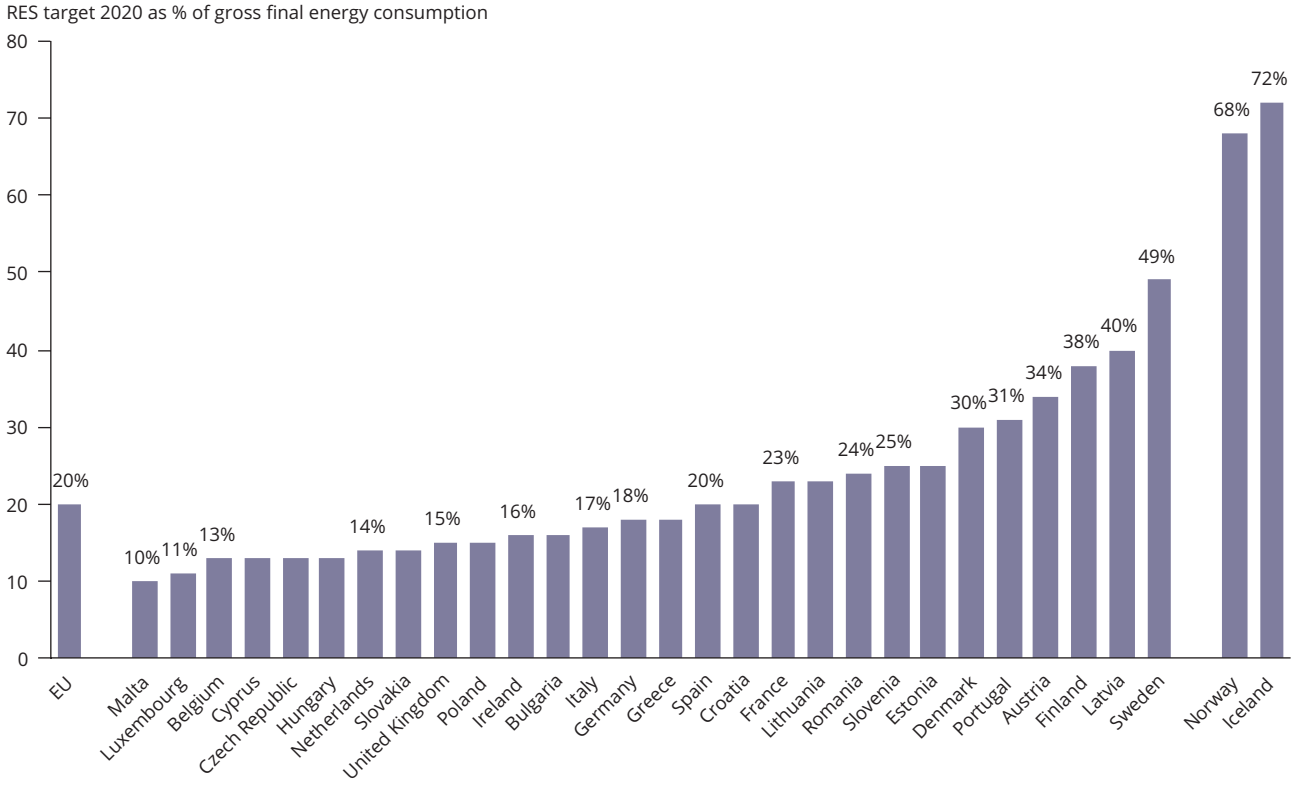
The RED includes legally binding national renewable energy targets for 2020 consistent with a 20% EU-wide RES share in gross final energy consumption by 2020, and a 10% RES share in transport by the same year (EU, 2009b). The RED also sets an indicative trajectory for each Member State for the period from 2011 until 2018, intended to ensure that each Member State achieves its 2020 target. An interim indicative RED target for the EU can be derived from the minimum indicative trajectories of the Member States in the run-up to 2020 (RED, Annex I, Part B).

Under the RED, Member States had to submit NREAPs in 2010 (EEA, 2011b). These plans outline the pathways (i.e. the expected trajectories) which Member States anticipate using to reach their legally binding national renewable energy targets in 2020. In 2011 (and every 2 years thereafter), Member States had to report on national progress towards the interim RED and expected NREAP targets. The NREAPs adopted by Member States in 2010 outline expected trajectories for the share of RES in gross final energy consumption towards the legally binding national 2020 RES targets.

2020 targets on energy efficiency

In 2007, the European Council (European heads of state or government) stressed the need to increase energy efficiency so as to achieve a 20% energy savings target for 2020 in primary energy consumption, and agreed on binding targets for GHG emission reductions and renewable energy (European Council, 2007). The reduction of primary energy consumption by 20% by 2020 is a non-binding objective in the EU.

Figure A1.2 National targets for renewable energies for 2020



Note: The targets for Iceland and Norway, which are not EU Member States, were agreed and included in the Annex of the European Economic Area agreement. For the sake of simplicity, the report refers to these as RED targets.

Source: EU, 2009b.

The climate and energy package does not address the energy efficiency target directly, although the CO_2 performance standards for cars and vans (Regulation (EU) No 333/2014 and Regulation (EC) No 443/2009), the revised EU ETS Directive and the ESD all contribute to fostering energy efficiency. Since the adoption of the package, the EU energy efficiency policy framework has advanced in line with the priorities identified in the Action Plan for Energy Efficiency 2006 (EC, 2006a). The energy efficiency action plan was reviewed in 2011, following revisions of several pieces of legislation:

- the Ecodesign Directive (EU, 2009g);
- the Energy Labelling Directive (EU, 2010a);
- the EPBD (EU, 2010b).

One of the key developments in the energy efficiency policy framework was the adoption of the EED in 2012 (EU, 2012). The EED establishes a common framework of measures for the promotion of energy efficiency within the Union and aims to help remove barriers and overcome market failures that impede efficiency in the supply and use of energy. The EED stipulates that primary energy consumption in the EU should not exceed 1 483 Mtoe in 2020, and that final energy consumption in EU should not exceed 1 086 Mtoe by the same year. These absolute targets were set using the European Commission's 2007 Energy Baseline Scenario, based on the Price-driven and Agent-based Simulation of Markets Energy System Models (PRIMES) (EC, 2011e). Implementing the EED was expected to lead to a 15% reduction in primary energy consumption compared to the 2007 Energy Baseline Scenario, with an additional 2% reduction expected from the transport sector (Groenenberg, 2012).

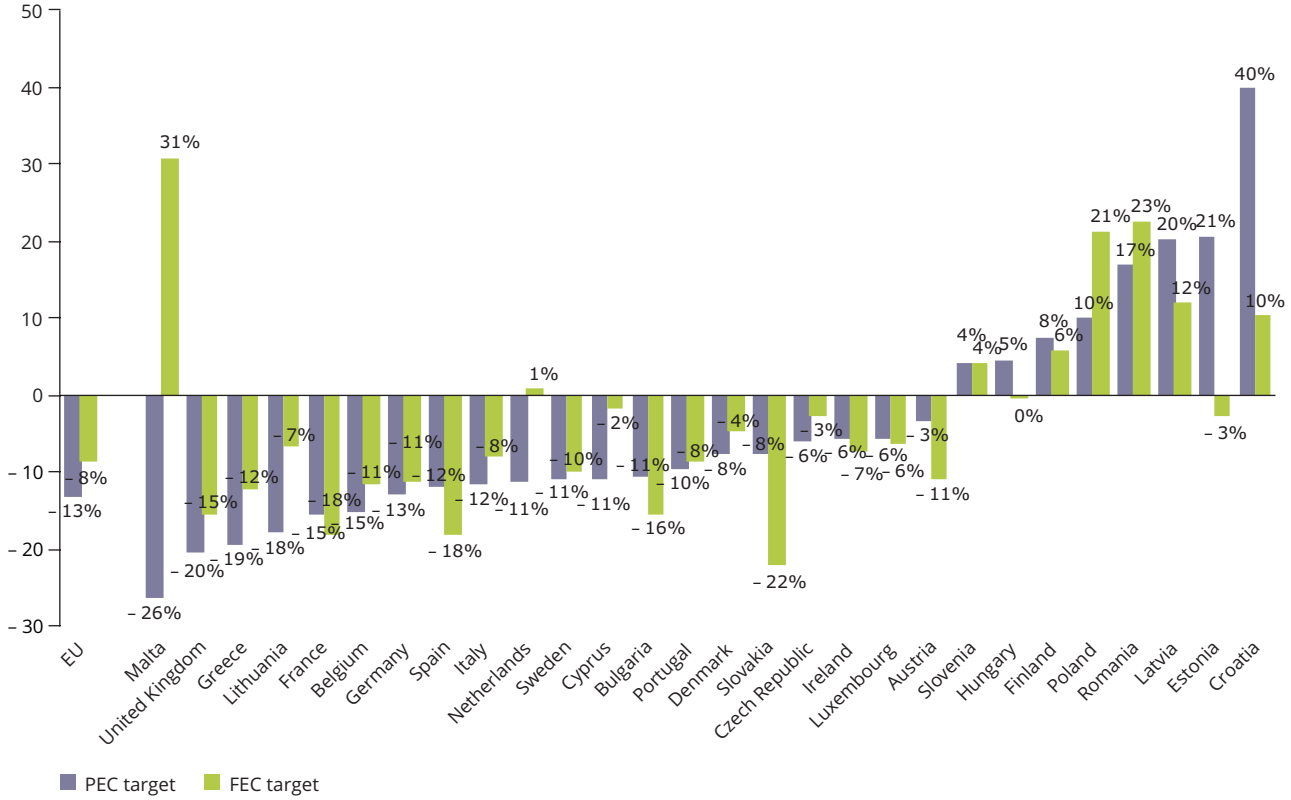
Under the EED, Member States had to set indicative national targets and implement a set of mandatory requirements, one of the most significant being the establishment of an EEO scheme, or the implementation of alternative measures.

Member States adopted different base years against which the progress towards national energy efficiency targets will be measured. Member States also chose different approaches when setting the national target. Ten Member States (Austria, Belgium, Cyprus, Denmark, Hungary, Ireland, Italy, Latvia, Malta and Poland) chose to focus the target on primary energy consumption, while 12 others (Croatia, Estonia, Finland, France, Greece, Lithuania, Luxembourg, the Netherlands, Spain, Slovakia, Slovenia and the United Kingdom) chose to focus their national target on gross final energy consumption; another two (Bulgaria and Sweden) focused on primary energy intensity. Each national target reflects the specific situation of the Member State which adopted it. As a consequence, ambition levels vary greatly. When comparing all targets to 2005 levels, 16 Member States have aimed for reduction of final as well as primary energy consumption; for 6 Member States, targets show an increase in final as well as primary energy consumption (including Malta, which has a 24% reduction target in primary energy consumption, alongside a + 40% target for final energy consumption, compared to 2005). Five other Member States have placed a cap on the potential increase of either primary or final energy consumption over the period.

In some Member States, the targets may still be subject to change in the upcoming years. This is due to the fact that some countries are currently holding nationwide debates on the future of their energy systems. Depending on the outcome of these debates, energy efficiency targets might be modified. Twelve Member States (Austria, Bulgaria, Croatia, Cyprus, France, Greece, Italy, Poland, Slovakia, Spain, Sweden and the United Kingdom) revised their energy efficiency targets in their triennial NEEAPs, submitted under the EED.

Figure A1.3 National indicative primary and final energy consumption targets

PEC and FEC targets as change in percentage to PEC and FEC 2005 (%)



Note: The national targets for 2020 reported by Member States under the EED were first calculated in absolute terms, and then compared with 2005 levels.

Source: Reported targets under Article 3 of EED in 2013, including updates of Austria, Bulgaria, Croatia, Cyprus, France, Greece, Italy, Poland, Slovakia, Spain, Sweden and United Kingdom based on their third NEEAPs submitted in 2014 (or based on separate notifications to the Commission) ([56]); Eurostat, 2015a and 2015c.

Figure A1.3 represents the national targets set by each Member State under the EED, compared to 2005 levels for primary and final energy consumption. The year 2005 is used here to serve as a common reference, although the EED does not explicitly use it as a common base year.

A1.5 Overview of 2020 national climate and energy targets

The main targets applicable to Member States under international and EU commitments are presented in Table A1.2. The scope of existing EU legislation implementing its domestic 20% commitment is different from that of its Kyoto target for the second commitment period. For this reason, the total allowed emissions or the 'emissions budget' under the climate and energy package cannot be directly compared to the corresponding QELRC. Several main differences in terms of emissions included and methodologies to determine emissions between the climate and energy package and the second commitment period include the treatment of emissions from international aviation, emissions and removals from LULUCF, the use of units from flexible mechanisms, coverage of NF_3, flexibilities regarding base years and the use of GWP. The differences are summarised in Table A1.3. For details, see EEA (2014a) and European Union (2012), as well as Sections A3.2, A3.3 and A3.4 in Annex 3.

([56]) See http://ec.europa.eu/energy/efficiency/eed/neep_en.htm.

Table A1.2 Main national climate and energy targets

	Annex I Party to the Convention	Partici-pating in EU ETS	ETS target (2020)	Effort Sharing Decision target (2020)	2020 ESD emission allocation	2005 ESD base-year emissions	Renewable target 2020 (RED)	Primary energy target 2020	Final energy target 2020
			% vs. 2005 ESD base-year emissions		Mt		% gross final energy consumption	Mtoe	
EU			– 21	– 9	2 644.2	2 914.0	20	1 483	1 086.0
Austria	x	x		– 16	48.8	58.1	34	31.5	25.1
Belgium	x	x		– 15	67.7	79.6	13	43.7	32.5
Bulgaria	x	since 2007		20	28.8	24.0	16	16.9	8.6
Croatia	x	since 2013		11	21.0	18.9	20	11.5	7.0
Cyprus [b]	x	x		– 5	5.9	6.3	13	2.2	1.8
Czech Republic	x	x		9	67.7	62.1	13	39.6	25.3
Denmark [a]	x	x		– 20	30.5	38.1	30	17.8	14.8
Estonia	x	x		11	6.5	5.8	25	6.5	2.8
Finland	x	x		– 16	28.4	33.8	38	35.9	26.7
France	x	x		– 14	359.3	417.8	23	219.9	131.4
Germany	x	x		– 14	425.6	494.9	18	276.6	194.3
Greece	x	x		– 4	61.2	63.8	18	24.7	18.4
Hungary	x	x		10	58.2	52.9	13	26.6	18.2
Ireland	x	x		– 20	39.0	48.7	16	13.9	11.7
Italy	x	x		– 13	294.4	338.4	17	158.0	124.0
Latvia	x	x		17	9.9	8.5	40	5.4	4.5
Lithuania	x	x		15	15.5	13.4	23	6.5	4.3
Luxembourg	x	x		– 20	8.1	10.2	11	4.5	4.2
Malta [c]	x	x		5	1.2	1.1	10	0.7	0.5
Netherlands	x	x		– 16	107.0	127.4	14	60.7	52.2
Poland	x	x		14	202.3	177.5	15	96.4	71.6
Portugal	x	x		1	51.2	50.7	31	22.5	17.4
Romania	x	since 2007		19	88.4	74.3	24	43.0	30.3
Slovakia	x	x		13	26.5	23.5	14	16.4	9.0
Slovenia	x	x		4	12.5	12.1	25	7.3	5.1
Spain	x	x		– 10	214.2	238.0	20	119.8	80.1
Sweden	x	x		– 17	37.2	44.8	49	43.4	30.3
United Kingdom [a]	x	x		– 16	327.1	389.4	15	177.6	129.2
Iceland	x	since 2008					72		
Liechtenstein	x	since 2008							
Norway	x	since 2008					68		
Switzerland	x								
Turkey [d]	x								

Note: [a] The Faeroes and Greenland (Denmark), and the United Kingdom's overseas territories are not part of the EU and therefore are not covered by the targets presented here.

[b] Cyprus ratified the UNFCCC in 1997 and the Kyoto Protocol in 1999.

[c] Malta ratified the UNFCCC in 1994 and became an Annex I party to the convention at the end of 2010. It ratified the Kyoto Protocol in 2001.

[d] Turkey was not party to the UNFCCC when the Kyoto Protocol was adopted. It ratified the Kyoto Protocol in 2009.

Source: EC, 2013c and 2013d; EU, 2009b, 2009c and 2012. Reported targets under Article 3 of the EED in 2013, including updates of Austria, Bulgaria, Croatia, Cyprus, France, Greece, Italy, Poland, Slovakia, Spain, Sweden and the United Kingdom based on their third NEEAPs submitted in 2014 (or based on separate notifications to the Commission).

Table A1.3 Technical details concerning EU climate-related targets

	International commitments			Unilateral EU commitments		
	Kyoto Protocol	UNFCCC	Kyoto Protocol	Climate and energy package		2030 framework on climate and energy policies
				EU ETS	ESD	
Target year or period	First commitment period (2008–2012)	2020	Second commitment period (2013–2020)	2013–2020	2013–2020	2030
Emission reduction target	− 8%	− 20%	− 20%	− 21% compared to 2005 for ETS emissions	Annual targets for Member States. In 2020, − 9% compared to 2005 for ESD emissions	At least − 40%
Other targets		Conditional target of − 30% if other parties take on adequate commitments		RED: 20% share of renewable energy of gross final energy consumption; EED: increase energy efficiency by 20%		At least 27% share of renewable energy consumption; at least 27% increase in energy efficiency
Base year	1990 Kyoto Protocol flexibility rules for F-gases and economies in transition	1990	1990, but subject to flexibility rules. 1995 or 2000 may be used as base year for F-gases or NF_3	1990 for overall emission reduction target; 2005 targets broken down into ETS and non-ETS emissions		1990 for emission reduction target.
LULUCF	Included ARD and other activities if elected	Excluded	Included ARD and FM, other activities if elected (new accounting rules)	Excluded		Included. Details to be finalised prior to 2020
Aviation	Domestic aviation included. International aviation excluded	Domestic aviation included. International aviation partly included	Domestic aviation included. International aviation excluded	Domestic and international aviation (partly) included in EU ETS	Aviation generally excluded, some domestic aviation included (operators below ETS de minimis thresholds)	Not specified yet; expectation of market mechanisms for aviation under ICAO
Use of market mechanisms	Use of KP flexible mechanisms subject to KP rules	Subject to quantitative and qualitative limits	Use of KP flexible mechanisms subject to KP rules	Subject to quantitative and qualitative limits	Subject to quantitative and qualitative limits	None
Carry-over of units from preceding periods	Not applicable	Not applicable	Subject to KP rules including those agreed in Doha Amendment	EU ETS allowances can be banked into subsequent ETS trading periods since the second trading period	No restriction of carry-over within the period from 2013 to 2020	Banking in the EU ETS is confirmed. The legislative proposal(s) for non-ETS emissions still pending
Gases covered	CO_2, CH_4, N_2O, HFCs, PFCs, SF_6,	CO_2, CH_4, N_2O, HFCs, PFCs, SF_6	CO_2, CH_4, N_2O, HFCs, PFCs, SF_6, NF_3	CO_2, CH_4, N_2O, HFCs, PFCs, SF_6, NF_3 not included		CO_2, CH_4, N_2O, HFCs, PFCs, SF_6, NF_3
Sectors included	Energy, IPPU, agriculture, waste, LULUCF	Energy, IPPU, agriculture, waste, aviation	Energy, IPPU, agriculture, waste, LULUCF	Power and heat generation, energy-intensive industry sectors, aviation	Transport (except aviation), buildings, non-ETS industry, agriculture (except forestry) and waste	100%

Table A1.3 Technical details concerning EU climate-related targets (cont.)

	International commitments			Unilateral EU commitments		
	Kyoto Protocol	UNFCCC	Kyoto Protocol	Climate and energy package		2030 framework on climate and energy policies
				EU ETS	ESD	
GWP used	IPCC's Second Assessment Report (SAR)	IPCC SAR; inventory data (including historical data) based on IPCC's Fourth Assessment Report (AR4) from 2015 onwards	IPCC AR4	IPCC AR4		IPCC AR4
EU Member States included	15 (additional KP targets for single Member States)	28	28 + Iceland	28 (Iceland, Liechtenstein and Norway also covered under EU ETS)		28 (Norway and Iceland intend to deliver their international commitment collectively with the EU)

Source: EC, 2007 and 2014a; EU, 2009a and 2009c; UNFCCC, 1998, 2012b, 2013a and 2013b.

A1.6 2030 climate and energy targets

The EU has a long-term goal of reducing Europe's GHG emissions by 80% to 95% by 2050, compared to 1990 levels. To ensure that the EU is cost-effectively attaining this long-term objective, EU leaders agreed, in October 2014, on a 2030 climate and energy policy framework for the EU, and endorsed the following targets (European Council, 2014).

- A binding target of an at least **40% domestic reduction in GHG emissions**, compared to 1990. The 40% domestic reduction target for GHG emissions will ensure that the EU is on track to cost-effectively meet its objective of cutting emissions by at least 80%, by 2050. This target will be delivered collectively, with a 43% reduction in the ETS sectors and a 30% reduction in the non-ETS sectors by 2030 compared to 2005, respectively. In the EU ETS, the annual factor to reduce the cap on the maximum permitted emissions will be changed from 1.74% to 2.2% from 2021 onwards. In non-ETS sectors, the methodology for setting the national reduction targets, with all the elements as applied in the ESD for 2020, will be slightly amended for 2030. Efforts will be distributed on the basis of relative GDP per capita, but targets for Member States with a GDP per capita above the EU average will be relatively adjusted to reflect cost-effectiveness in a fair and balanced manner (European Council, 2014). All Member States will contribute to the overall EU reduction in 2030, with the targets ranging from 0% to − 40%, compared to 2005.
- A target of at least **27% for the share of renewable energy consumption**. This target is binding at EU level, but with no fixed targets for individual Member States. This target is intended to provide flexibility for Member States to set their own more ambitious national objectives for increased renewable energy, and to support them, in line with the state aid guidelines, as well as take into account their degree of integration in the internal energy market.
- An indicative target at EU level of at least **27% for improving energy efficiency** compared to projections of future energy consumption, based on the current criteria (i.e. projections of energy consumption in 2030 according to the 2007 Energy Baseline Scenario from the European Commission). The target will be reviewed by 2020, having in mind an EU level of 30%.

Neither the renewable energy target nor the energy efficiency target will be translated into nationally binding targets. Individual Member States are free to set their own higher national targets.

These targets for 2030 were submitted to the UNFCCC on 6 March 2015 as an INDC for the post-2020 climate agreement that is to be negotiated until December 2015. If a legally binding agreement can be adopted by then, this target will become a commitment at international level as well.

No decision has been taken yet on how the LULUCF sector will be included in the target. The accounting rules for this sector will have a large impact on the effect of the LULUCF sector on the EU's progress towards the 2030 target.

Annex 2 Data sources for GHG emissions, energy consumption and targets

A2.1 Legal reporting requirements for GHG data

The assessments of progress towards GHG emission targets presented in this report are for the most part based on information submitted by Member States themselves under the MMR, which is the successor to the Monitoring Mechanism Decision (MMD) (Decision 28/2004/EC concerning a mechanism for monitoring Community greenhouse gas emissions and for implementing the Kyoto Protocol (EU, 2004)).

The initial purpose of the reporting requirements stipulated in the MMD was to enable the EU to complete its reporting commitments under the UNFCCC and to evaluate the projected progress of the EU and its Member States towards fulfilling their GHG mitigation commitments under the Kyoto Protocol in annual reports prepared by the European Commission and the EEA.

In 2015, Member States reported, for the first time, new information under the MMR adopted in 2013 (EU, 2013a). The MMR sets up a Union inventory system (Article 6) and lays down the obligation for the Union and the Member States to yearly determine and report GHG inventories in line with reporting requirements of the UNFCCC (Article 7).

A delegated act (Commission delegated Regulation (EU) No 666/2014 establishing substantive requirements for a Union inventory system and taking into account changes in the global warming potentials and internationally agreed inventory guidelines pursuant to Regulation (EU) No 525/2013 of the European Parliament and of the Council) (EC, 2014c) has defined the substantive requirements for a Union inventory system in order to fulfil the obligations pursuant to Decision 19/CMP.1.

Implementing provisions (Commission implementing Regulation (EU) No 749/2014 on structure, format, submission processes and review of information reported by Member States pursuant to Regulation (EU) No 525/2013 of the European Parliament and of the Council) (EC, 2014d), adopted in June 2014, provide structure and format for the reporting of GHG inventories, approximated GHG inventories, information on policies and measures, GHG projections, and the use of auctioning revenue and project credits and for the purposes of the LULUCF Decision (EU, 2013b).

A2.2 Historic GHG emission data

The analysis presented in this report is based on the following.

- GHG emission data for the period from 1990 to 2013, as included in GHG inventory reports reported under the UNFCCC. From 2015 onwards, national inventories by Annex I countries are prepared according to 2006 IPCC guidelines. Due to the change in reporting obligations, the submission of emission inventories has been considerably delayed in 2015. A review of submitted inventories did not take place in 2015 before this report was produced. For this reason, emission numbers used for the analysis in this report are only preliminary.
- Early estimates of 2014 GHG emissions reported by Member States to the European Commission under the MMR.
- Data relative to the EU ETS, publicly available from the EUTL ([57]) as well as the EEA ETS data viewer (EEA, 2015b).

([57]) The EUTL automatically checks, records and authorises all transactions in the EU ETS.

A2.3 Projected GHG emissions

The report uses GHG projection data to 2030, as reported by Member States in 2015 under the MMR. All Member States reported updated GHG emission projections but Greece. Greek projections have been gap-filled, based on the results of the European Commission's 2013 Reference Scenario. In 2015, projections were reported in two separate scenarios: the mandatory WEM scenario, which considers the implementation of existing (already implemented) measures only; and WAM, which additionally considers the implementation of additional (at planning stage) measures and is not a mandatory reporting requirement. WAM scenarios have been reported by 18 Member States (Austria, Croatia, Cyprus, the Czech Republic, Estonia, Finland, Hungary, Ireland, Italy, Latvia, Lithuania, Malta, the Netherlands, Portugal, Romania, Slovakia, Spain and the United Kingdom). Denmark reported a WAM scenario which is the same as the WEM scenario. For a WAM scenario aggregated at EU level, Member States not reporting a WAM scenario have been gap-filled with the WEM scenario. An overview of projected emissions for both scenarios is presented in Table A2.1 and Table A2.2.

Table A2.1 Projected emissions from Member States and Norway, WEM and WAM

GHG emission projections (Mt CO_2-eq.)	WEM scenario					WAM scenario				
European Union	**2015**	**2020**	**2025**	**2030**	**2035**	**2015**	**2020**	**2025**	**2030**	**2035**
Total GHG emissions	**4 445**	**4 228**	**4 108**	**4 034**	**3 979**	**4 424**	**4 159**	**3 995**	**3 875**	**3 781**
Energy supply	1 423	1 271	1 211	1 165	1 130	1 416	1 251	1 164	1 089	1 028
Manufacturing and construction industries	513	510	509	502	496	508	500	495	485	481
Transport	895	885	878	889	895	892	868	855	862	860
Residential and commercial	660	620	580	558	540	656	605	561	530	509
Industrial processes and process use	364	363	356	348	348	363	360	352	343	342
Agriculture	445	449	453	458	461	444	446	450	453	455
Waste	146	132	121	115	108	145	130	120	113	106
Emissions Trading System (stationary installations)	1 876	1 728	1 674	1 626	1 587	1 871	1 704	1 622	1 544	1 479
Effort Sharing Decision	2 553	2 484	2 416	2 391	2 375	2 538	2 439	2 356	2 313	2 284
Land use, land-use change and forestry	– 247	– 243	– 248	– 250	– 258	– 248	– 245	– 247	– 249	– 258
Austria	**2015**	**2020**	**2025**	**2030**	**2035**	**2015**	**2020**	**2025**	**2030**	**2035**
Total GHG emissions	**79.7**	**79.1**	**76.8**	**76.0**	**75.7**	**79.1**	**73.3**	**69.0**	**66.6**	**65.8**
Energy supply	10.9	10.5	9.2	9.0	10.0	11.0	10.2	8.8	9.0	10.0
Manufacturing and construction industries	10.5	10.9	11.4	12.0	11.9	10.4	10.5	10.9	11.2	11.1
Transport	23.2	23.3	23.3	23.0	22.6	22.8	18.8	17.9	16.6	15.7
Residential and commercial	10.3	9.3	8.0	7.1	6.4	10.2	8.9	7.2	6.2	5.6
Industrial processes and process use	16.4	16.9	16.9	17.0	16.8	16.3	16.7	16.3	15.9	15.7
Agriculture	6.9	7.0	7.1	7.1	7.2	6.9	7.0	6.9	6.9	7.0
Waste	1.5	1.2	1.0	0.9	0.8	1.5	1.2	1.0	0.8	0.7
Emissions Trading System (stationary installations)	28.2	28.0	27.4	27.9	28.7	27.9	27.5	26.4	27.0	27.9
Effort Sharing Decision	51.5	51.0	49.3	48.0	46.9	51.1	45.7	42.5	39.6	37.8
Land use, land– use change and forestry	3.5	5.0	5.0	5.0	5.0	3.5	5.0	5.0	5.0	5.0
Belgium	**2015**	**2020**	**2025**	**2030**	**2035**	**2015**	**2020**	**2025**	**2030**	**2035**
Total GHG emissions	**124.1**	**121.8**	**125.2**	**129.8**	**129.9**	**NE**	**NE**	**NE**	**NE**	**NE**
Energy supply	26.9	24.8	29.5	34.7	34.5	NE	NE	NE	NE	NE
Manufacturing and construction industries	14.9	15.5	15.6	15.9	16.4	NE	NE	NE	NE	NE
Transport	24.7	25.6	26.2	27.1	27.9	NE	NE	NE	NE	NE
Residential and commercial	24.3	23.2	22.3	21.4	20.9	NE	NE	NE	NE	NE
Industrial processes and process use	20.2	20.2	19.3	18.8	18.4	NE	NE	NE	NE	NE
Agriculture	10.7	10.7	10.7	10.7	10.6	NE	NE	NE	NE	NE
Waste	1.9	1.4	1.1	0.9	0.8	NE	NE	NE	NE	NE
Emissions Trading System (stationary installations)	50.6	49.6	54.4	59.7	59.7	NE	NE	NE	NE	NE
Effort Sharing Decision	73.5	72.2	70.8	70.1	70.2	NE	NE	NE	NE	NE
Land use, land-use change and forestry	– 0.7	– 0.8	– 0.5	0.9	0.9	NE	NE	NE	NE	NE

Note: Reported projections calibrated by EEA to align them with historic emissions.

Table A2.1 Projected emissions from Member States and Norway, WEM and WAM (cont.)

GHG emission projections (Mt CO_2-eq.)	WEM scenario					WAM scenario				
Bulgaria	**2015**	**2020**	**2025**	**2030**	**2035**	**2015**	**2020**	**2025**	**2030**	**2035**
Total GHG emissions	**59.9**	**60.2**	**56.8**	**56.9**	**56.3**	**NE**	**NE**	**NE**	**NE**	**NE**
Energy supply	31.8	32.7	29.0	28.1	27.2	NE	NE	NE	NE	NE
Manufacturing and construction industries	3.2	3.3	3.3	3.4	3.4	NE	NE	NE	NE	NE
Transport	8.0	7.1	6.6	6.2	6.3	NE	NE	NE	NE	NE
Residential and commercial	2.2	2.5	3.4	4.5	4.8	NE	NE	NE	NE	NE
Industrial processes and process use	4.4	4.3	4.3	4.3	4.0	NE	NE	NE	NE	NE
Agriculture	6.0	6.5	6.7	7.0	7.3	NE	NE	NE	NE	NE
Waste	4.4	3.8	3.5	3.4	3.3	NE	NE	NE	NE	NE
Emissions Trading System (stationary installations)	36.4	37.4	34.0	33.5	32.7	NE	NE	NE	NE	NE
Effort Sharing Decision	23.5	22.7	22.7	23.4	23.6	NE	NE	NE	NE	NE
Land use, land-use change and forestry	−8.2	−9.3	−5.4	−5.5	−5.5	NE	NE	NE	NE	NE
Note: Reported projections calibrated by EEA to align them with historic emissions.										
Croatia	**2015**	**2020**	**2025**	**2030**	**2035**	**2015**	**2020**	**2025**	**2030**	**2035**
Total GHG emissions	**24.9**	**26.6**	**28.4**	**30.2**	**31.4**	**24.9**	**24.1**	**24.5**	**25.0**	**25.7**
Energy supply	6.6	7.9	8.9	9.6	10.1	6.6	6.2	6.0	5.8	6.0
Manufacturing and construction industries	2.4	2.4	2.4	2.5	2.5	2.4	2.4	2.4	2.5	2.5
Transport	5.4	5.4	5.9	6.3	6.8	5.4	5.1	5.5	5.8	6.2
Residential and commercial	3.0	2.9	3.0	3.1	3.2	3.0	2.4	2.4	2.3	2.3
Industrial processes and process use	2.4	2.6	2.8	2.9	3.1	2.4	2.6	2.8	2.9	3.1
Agriculture	3.9	4.3	4.5	4.7	4.9	3.9	4.3	4.5	4.7	4.9
Waste	1.2	1.1	1.0	0.9	0.8	1.2	1.1	1.0	0.9	0.8
Emissions Trading System (stationary installations)	8.2	9.4	10.4	11.2	11.7	8.2	8.1	8.0	8.0	8.3
Effort Sharing Decision	16.8	17.2	18.1	18.9	19.7	16.8	16.0	16.5	16.9	17.4
Land use, land-use change and forestry	−8.3	−8.3	−8.4	−8.4	−8.4	−8.3	−8.3	−8.4	−8.4	−8.4
Note: Reported projections calibrated by EEA to align them with historic emissions.										
Cyprus	**2015**	**2020**	**2025**	**2030**	**2035**	**2015**	**2020**	**2025**	**2030**	**2035**
Total GHG emissions	**5.8**	**4.5**	**5.6**	**6.6**	**7.6**	**5.6**	**4.0**	**5.0**	**6.1**	**7.1**
Energy supply	2.0	0.6	1.1	1.5	1.9	1.8	0.1	0.6	1.0	1.4
Manufacturing and construction industries	0.3	0.4	0.4	0.5	0.5	0.3	0.4	0.4	0.5	0.5
Transport	1.4	1.5	1.7	1.9	2.1	1.4	1.4	1.6	1.8	2.0
Residential and commercial	0.4	0.3	0.4	0.5	0.6	0.4	0.5	0.6	0.6	0.7
Industrial processes and process use	0.8	0.9	1.0	1.2	1.3	0.8	0.9	1.0	1.2	1.3
Agriculture	0.5	0.6	0.7	0.8	0.9	0.5	0.6	0.7	0.8	0.9
Waste	0.3	0.2	0.2	0.3	0.3	0.3	0.1	0.2	0.2	0.3
Emissions Trading System (stationary installations)	2.9	1.6	2.2	2.7	3.2	2.7	1.1	1.6	2.1	2.7
Effort Sharing Decision	2.9	2.9	3.4	3.9	4.5	2.9	2.9	3.4	3.9	4.5
Land use, land-use change and forestry	−0.1	−0.1	−0.1	−0.1	−0.1	−0.1	−0.1	−0.1	−0.1	−0.1
Note: Reported projections calibrated by EEA to align them with historic emissions.										

Table A2.1 Projected emissions from Member States and Norway, WEM and WAM (cont.)

GHG emission projections (Mt CO_2-eq.)	WEM scenario					WAM scenario				
Czech Republic	**2015**	**2020**	**2025**	**2030**	**2035**	**2015**	**2020**	**2025**	**2030**	**2035**
Total GHG emissions	**129.1**	**116.4**	**105.2**	**101.9**	**96.1**	**127.4**	**111.2**	**100.0**	**96.6**	**91.3**
Energy supply	61.8	51.6	44.8	42.2	36.2	61.6	50.9	44.2	41.7	35.7
Manufacturing and construction industries	11.2	11.4	10.0	9.5	10.5	10.9	10.3	8.9	8.5	9.6
Transport	16.5	14.9	13.8	13.8	14.0	16.5	14.8	13.7	13.7	13.9
Residential and commercial	12.7	11.8	10.3	10.2	9.9	12.2	9.4	8.0	8.0	8.0
Industrial processes and process use	13.6	13.1	12.5	12.1	11.7	13.6	13.1	12.5	12.1	11.7
Agriculture	7.6	7.8	7.9	8.2	8.2	7.6	7.5	7.4	7.3	7.3
Waste	5.7	5.8	5.9	5.9	5.7	5.0	5.2	5.2	5.2	5.0
Emissions Trading System (stationary installations)	67.9	59.2	53.0	51.6	46.1	67.6	58.1	52.0	50.6	45.2
Effort Sharing Decision	61.2	57.2	52.1	50.3	50.0	59.8	53.1	47.9	45.9	46.0
Land use, land-use change and forestry	−0.9	−1.9	−2.9	−2.9	−2.9	−1.0	−2.4	−3.5	−3.3	−3.3
Note: Reported projections calibrated by EEA to align them with historic emissions.										
Denmark	**2015**	**2020**	**2025**	**2030**	**2035**	**2015**	**2020**	**2025**	**2030**	**2035**
Total GHG emissions	**51.0**	**43.0**	**41.3**	**39.8**	**39.8**	**NE**	**NE**	**NE**	**NE**	**NE**
Energy supply	16.7	10.5	9.7	8.4	8.8	NE	NE	NE	NE	NE
Manufacturing and construction industries	3.7	3.3	3.1	3.0	2.9	NE	NE	NE	NE	NE
Transport	12.1	11.3	10.8	10.6	10.6	NE	NE	NE	NE	NE
Residential and commercial	5.3	4.9	4.6	4.4	4.2	NE	NE	NE	NE	NE
Industrial processes and process use	1.8	1.4	1.5	1.5	1.6	NE	NE	NE	NE	NE
Agriculture	10.2	10.4	10.6	10.8	10.8	NE	NE	NE	NE	NE
Waste	1.2	1.1	1.0	1.0	0.9	NE	NE	NE	NE	NE
Emissions Trading System (stationary installations)	19.0	12.5	12.0	10.9	11.3	NE	NE	NE	NE	NE
Effort Sharing Decision	31.9	30.3	29.1	28.7	28.4	NE	NE	NE	NE	NE
Land use, land-use change and forestry	4.4	4.2	4.1	4.1	4.0	NE	NE	NE	NE	NE
Estonia	**2015**	**2020**	**2025**	**2030**	**2035**	**2015**	**2020**	**2025**	**2030**	**2035**
Total GHG emissions	**21.2**	**21.9**	**19.0**	**17.7**	**17.2**	**21.0**	**21.2**	**17.9**	**16.1**	**15.1**
Energy supply	14.9	15.2	12.3	11.0	10.6	14.9	14.8	12.0	10.4	9.7
Manufacturing and construction industries	0.7	0.8	0.8	0.8	0.8	0.7	0.8	0.8	0.8	0.8
Transport	2.3	2.4	2.4	2.4	2.3	2.1	2.0	1.7	1.4	1.2
Residential and commercial	0.7	0.7	0.7	0.7	0.7	0.7	0.6	0.6	0.6	0.6
Industrial processes and process use	1.1	1.3	1.3	1.2	1.2	1.1	1.3	1.3	1.2	1.2
Agriculture	1.3	1.3	1.4	1.4	1.4	1.3	1.3	1.4	1.4	1.4
Waste	0.3	0.3	0.2	0.2	0.2	0.3	0.3	0.2	0.2	0.2
Emissions Trading System (stationary installations)	15.6	16.2	13.5	12.3	11.8	15.6	15.9	13.1	11.7	11.1
Effort Sharing Decision	5.6	5.7	5.5	5.5	5.3	5.4	5.3	4.8	4.4	4.1
Land use, land-use change and forestry	−2.2	−2.2	−2.0	−1.7	−1.3	−2.2	−2.2	−2.0	−1.7	−1.3

Table A2.1 Projected emissions from Member States and Norway, WEM and WAM (cont.)

GHG emission projections (Mt CO_2-eq.)	WEM scenario					WAM scenario				
Finland	**2015**	**2020**	**2025**	**2030**	**2035**	**2015**	**2020**	**2025**	**2030**	**2035**
Total GHG emissions	**66.6**	**63.8**	**56.8**	**49.8**	**53.7**	**66.5**	**63.6**	**56.5**	**49.3**	**53.0**
Energy supply	27.6	26.0	20.4	14.7	19.6	27.6	26.0	20.4	14.7	19.6
Manufacturing and construction industries	8.2	8.1	7.8	7.6	7.3	8.2	8.1	7.8	7.6	7.3
Transport	12.4	11.7	11.1	10.5	9.8	12.4	11.7	11.1	10.5	9.8
Residential and commercial	4.9	4.3	3.9	3.6	3.5	4.9	4.3	3.9	3.6	3.5
Industrial processes and process use	5.5	5.9	6.0	6.1	6.3	5.5	5.8	5.8	5.8	5.7
Agriculture	6.1	6.3	6.4	6.4	6.4	6.1	6.2	6.2	6.2	6.3
Waste	2.0	1.5	1.2	1.0	0.8	2.0	1.5	1.2	1.0	0.8
Emissions Trading System (stationary installations)	36.5	35.1	29.5	23.6	28.3	36.5	35.1	29.5	23.6	28.3
Effort Sharing Decision	29.9	28.4	27.0	25.9	25.1	29.8	28.2	26.7	25.3	24.5
Land-use, land-use change and forestry	−10.0	−9.5	−3.8	−3.4	−3.4	−10.1	−9.9	−4.2	−3.8	−3.9
France	**2015**	**2020**	**2025**	**2030**	**2035**	**2015**	**2020**	**2025**	**2030**	**2035**
Total GHG emissions	**477.6**	**467.5**	**465.1**	**466.8**	**470.3**	**NE**	**NE**	**NE**	**NE**	**NE**
Energy supply	61.7	65.9	73.6	82.9	88.4	NE	NE	NE	NE	NE
Manufacturing and construction industries	58.7	57.4	56.1	54.9	54.9	NE	NE	NE	NE	NE
Transport	132.2	129.7	129.5	129.3	131.3	NE	NE	NE	NE	NE
Residential and commercial	85.1	76.9	72.3	67.8	64.1	NE	NE	NE	NE	NE
Industrial processes and process use	41.6	41.1	38.3	37.2	37.6	NE	NE	NE	NE	NE
Agriculture	78.8	78.4	78.6	78.5	78.2	NE	NE	NE	NE	NE
Waste	19.5	18.1	16.8	16.2	15.6	NE	NE	NE	NE	NE
Emissions Trading System (stationary installations)	113.2	116.4	122.1	129.7	134.6	NE	NE	NE	NE	NE
Effort Sharing Decision	359.2	345.8	337.4	331.3	329.6	NE	NE	NE	NE	NE
Land use, land-use change and forestry	−53.8	−61.6	−68.1	−74.4	−78.7	NE	NE	NE	NE	NE
Germany	**2015**	**2020**	**2025**	**2030**	**2035**	**2015**	**2020**	**2025**	**2030**	**2035**
Total GHG emissions	**900.8**	**833.2**	**782.6**	**707.3**	**642.9**	**NE**	**NE**	**NE**	**NE**	**NE**
Energy supply	350.7	313.1	297.8	254.5	212.6	NE	NE	NE	NE	NE
Manufacturing and construction industries	119.2	114.8	108.8	104.1	100.3	NE	NE	NE	NE	NE
Transport	154.8	148.1	140.0	132.7	126.5	NE	NE	NE	NE	NE
Residential and commercial	134.1	119.3	105.3	93.7	83.2	NE	NE	NE	NE	NE
Industrial processes and process use	70.8	67.5	61.1	53.3	51.6	NE	NE	NE	NE	NE
Agriculture	60.3	61.3	61.7	62.1	62.5	NE	NE	NE	NE	NE
Waste	11.0	9.1	7.8	6.9	6.1	NE	NE	NE	NE	NE
Emissions Trading System (stationary installations)	454.4	409.8	386.5	336.4	290.1	NE	NE	NE	NE	NE
Effort Sharing Decision	444.6	421.7	394.3	369.3	351.2	NE	NE	NE	NE	NE
Land use, land-use change and forestry	−15.7	−15.7	−15.7	−15.7	−15.7	NE	NE	NE	NE	NE
Greece	**2015**	**2020**	**2025**	**2030**	**2035**	**2015**	**2020**	**2025**	**2030**	**2035**
Total GHG emissions	**98.0**	**87.9**	**75.0**	**64.3**	**57.4**	**NE**	**NE**	**NE**	**NE**	**NE**
Energy supply	47.6	40.7	29.9	20.3	13.3	NE	NE	NE	NE	NE

Table A2.1 Projected emissions from Member States and Norway, WEM and WAM (cont.)

GHG emission projections (Mt CO_2-eq.)	WEM scenario					WAM scenario				
Manufacturing and construction industries	6.6	6.6	5.7	5.1	4.5	NE	NE	NE	NE	NE
Transport	17.6	15.9	14.8	14.3	14.0	NE	NE	NE	NE	NE
Residential and commercial	5.0	4.6	4.4	4.2	4.1	NE	NE	NE	NE	NE
Industrial processes and process use	10.2	8.9	8.9	8.9	9.0	NE	NE	NE	NE	NE
Agriculture	8.9	8.7	8.7	8.8	9.2	NE	NE	NE	NE	NE
Waste	3.6	3.6	3.3	3.2	3.2	NE	NE	NE	NE	NE
Emissions Trading System (stationary installations)	50.9	44.2	33.4	23.9	16.8	NE	NE	NE	NE	NE
Effort Sharing Decision	47.1	43.7	41.6	40.4	40.6	NE	NE	NE	NE	NE
Land use, land-use change and forestry	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
Note: Greece reported projections were reported too late for inclusion in this report. Instead. projections were gap filled with the results of the European Commission's Reference Scenario 2013. based on Primes/Gains models.										
Hungary	**2015**	**2020**	**2025**	**2030**	**2035**	**2015**	**2020**	**2025**	**2030**	**2035**
Total GHG emissions	**62.9**	**57.2**	**55.9**	**54.7**	**53.5**	**59.5**	**54.5**	**53.1**	**51.6**	**50.2**
Energy supply	18.0	13.9	13.2	12.5	11.8	16.1	13.5	12.9	12.3	11.7
Manufacturing and construction industries	3.0	2.6	2.6	2.6	2.7	2.9	2.5	2.6	2.7	2.8
Transport	12.7	12.8	13.5	14.2	14.8	12.5	12.6	13.2	13.8	14.4
Residential and commercial	13.0	12.1	11.1	10.1	9.1	12.5	11.2	10.0	8.7	7.5
Industrial processes and process use	6.9	6.5	6.3	6.1	5.9	6.5	6.0	5.9	5.7	5.6
Agriculture	6.4	6.9	6.9	6.9	6.9	6.2	6.4	6.4	6.4	6.4
Waste	2.9	2.4	2.4	2.4	2.4	2.8	2.2	2.1	1.9	1.8
Emissions Trading System (stationary installations)	22.9	20.0	19.0	18.1	17.1	22.2	19.0	18.3	17.6	16.8
Effort Sharing Decision	40.0	37.2	36.9	36.7	36.4	37.2	35.5	34.8	34.1	33.4
Land use, land-use change and forestry	−2.8	−1.8	−2.2	−2.6	−3.0	−2.8	−1.8	−2.2	−2.6	−3.0
Note: Reported projections calibrated by EEA to align them with historic emissions.										
Ireland	**2015**	**2020**	**2025**	**2030**	**2035**	**2015**	**2020**	**2025**	**2030**	**2035**
Total GHG emissions	**60.0**	**60.8**	**63.2**	**64.1**	**65.5**	**57.7**	**54.9**	**53.0**	**54.3**	**55.2**
Energy supply	13.7	12.9	13.8	14.5	15.8	12.4	10.1	7.1	8.6	9.9
Manufacturing and construction industries	3.6	3.5	3.6	3.6	3.6	3.3	2.8	2.8	2.7	2.7
Transport	11.9	13.2	14.2	15.0	15.8	11.8	12.5	13.5	14.3	15.0
Residential and commercial	8.9	8.7	8.6	8.4	8.3	8.3	7.2	6.7	6.2	5.7
Industrial processes and process use	2.6	2.9	3.0	3.1	3.2	2.6	2.9	3.0	3.1	3.2
Agriculture	18.1	18.8	19.2	18.9	18.2	18.1	18.6	19.1	18.7	18.1
Waste	1.2	0.8	0.7	0.7	0.6	1.2	0.8	0.7	0.7	0.6
Emissions Trading System (stationary installations)	17.6	16.9	18.1	18.8	20.2	16.1	13.5	10.8	12.3	13.7
Effort Sharing Decision	42.3	43.9	45.1	45.3	45.3	41.6	41.4	42.3	42.0	41.6
Land use, land-use change and forestry	1.9	2.5	4.0	5.7	4.2	1.9	2.5	4.0	5.7	4.2
Italy	**2015**	**2020**	**2025**	**2030**	**2035**	**2015**	**2020**	**2025**	**2030**	**2035**
Total GHG emissions	**441.2**	**440.4**	**438.2**	**449.5**	**436.8**	**435.2**	**424.3**	**408.1**	**404.5**	**386.8**
Energy supply	119.6	112.3	118.7	127.5	125.7	119.1	110.0	112.5	118.5	117.2

Table A2.1 Projected emissions from Member States and Norway, WEM and WAM (cont.)

GHG emission projections (Mt CO_2-eq.)	WEM scenario					WAM scenario				
Manufacturing and construction industries	53.0	57.5	58.5	60.4	59.3	49.8	52.8	50.6	49.9	50.2
Transport	104.4	106.4	108.0	115.6	114.2	104.2	101.3	99.3	104.2	95.9
Residential and commercial	84.8	86.4	76.9	71.1	65.7	82.8	82.4	69.6	56.9	51.5
Industrial processes and process use	31.3	32.2	32.4	32.1	31.7	31.3	32.2	32.4	32.1	31.7
Agriculture	30.9	31.0	31.1	31.2	31.0	30.9	31.0	31.1	31.2	31.0
Waste	17.1	14.7	12.6	11.7	9.3	17.1	14.7	12.6	11.7	9.3
Emissions Trading System (stationary installations)	167.0	162.0	169.3	179.1	176.4	166.2	158.8	160.4	165.7	164.0
Effort Sharing Decision	272.0	276.2	266.5	267.8	257.6	266.8	263.3	245.3	236.3	220.1
Land use, land-use change and forestry	−24.5	−25.5	−38.1	−40.3	−42.4	−24.5	−25.5	−38.1	−40.3	−42.4
Latvia	**2015**	**2020**	**2025**	**2030**	**2035**	**2015**	**2020**	**2025**	**2030**	**2035**
Total GHG emissions	**11.4**	**12.6**	**13.1**	**14.1**	**14.6**	**11.2**	**11.2**	**11.3**	**11.8**	**12.4**
Energy supply	2.1	2.5	2.3	2.5	2.6	2.1	2.0	1.8	2.0	1.9
Manufacturing and construction industries	1.2	1.5	2.1	2.5	2.7	1.0	1.0	1.3	1.5	1.9
Transport	2.8	2.9	2.9	3.0	3.0	2.7	2.7	2.7	2.8	2.8
Residential and commercial	1.5	1.5	1.2	1.0	0.8	1.5	1.4	1.2	1.0	0.9
Industrial processes and process use	0.8	1.0	1.1	1.2	1.3	0.8	1.0	1.1	1.2	1.3
Agriculture	2.4	2.8	3.0	3.3	3.6	2.3	2.5	2.7	2.9	3.1
Waste	0.6	0.6	0.5	0.5	0.5	0.6	0.6	0.5	0.5	0.4
Emissions Trading System (stationary installations)	2.9	3.5	3.7	4.2	4.4	2.8	2.8	2.8	3.1	3.4
Effort Sharing Decision	8.6	9.1	9.5	9.9	10.2	8.3	8.4	8.5	8.7	9.0
Land use, land-use change and forestry	2.0	4.9	5.9	7.1	8.2	2.0	4.9	5.9	7.1	8.2
Lithuania	**2015**	**2020**	**2025**	**2030**	**2035**	**2015**	**2020**	**2025**	**2030**	**2035**
Total GHG emissions	**21.3**	**22.4**	**23.3**	**24.4**	**25.2**	**21.0**	**21.5**	**21.7**	**20.9**	**22.0**
Energy supply	5.0	5.6	6.2	6.8	7.2	4.9	5.1	5.3	4.4	5.2
Manufacturing and construction industries	1.3	1.4	1.4	1.5	1.6	1.3	1.3	1.2	1.2	1.3
Transport	4.8	5.3	5.6	5.9	6.3	4.7	5.0	5.2	5.4	5.6
Residential and commercial	1.4	1.4	1.4	1.4	1.4	1.4	1.3	1.2	1.1	1.2
Industrial processes and process use	3.3	3.5	3.5	3.5	3.5	3.3	3.5	3.5	3.5	3.5
Agriculture	4.4	4.5	4.6	4.6	4.7	4.4	4.5	4.6	4.6	4.7
Waste	1.1	0.8	0.6	0.5	0.5	1.1	0.8	0.6	0.5	0.5
Emissions Trading System (stationary installations)	8.6	9.4	10.0	10.8	11.2	8.4	8.9	9.2	8.3	9.2
Effort Sharing Decision	12.7	13.0	13.3	13.6	14.0	12.6	12.5	12.5	12.5	12.8
Land use, land-use change and forestry	−10.0	−9.9	−9.9	−9.9	−9.9	−10.6	−11.0	−12.2	−13.3	−14.5
Luxembourg	**2015**	**2020**	**2025**	**2030**	**2035**	**2015**	**2020**	**2025**	**2030**	**2035**
Total GHG emissions	**11.5**	**12.0**	**12.4**	**12.9**	**13.3**	**NE**	**NE**	**NE**	**NE**	**NE**
Energy supply	0.9	0.9	0.9	1.0	1.0	NE	NE	NE	NE	NE
Manufacturing and construction industries	1.2	1.1	1.1	1.1	1.0	NE	NE	NE	NE	NE
Transport	6.4	7.0	7.6	8.1	8.7	NE	NE	NE	NE	NE

Table A2.1 Projected emissions from Member States and Norway, WEM and WAM (cont.)

GHG emission projections (Mt CO_2-eq.)	WEM scenario					WAM scenario				
Residential and commercial	1.5	1.5	1.4	1.2	1.2	NE	NE	NE	NE	NE
Industrial processes and process use	0.6	0.6	0.6	0.6	0.6	NE	NE	NE	NE	NE
Agriculture	0.9	0.9	0.8	0.8	0.8	NE	NE	NE	NE	NE
Waste	0.1	0.1	0.1	0.1	0.1	NE	NE	NE	NE	NE
Emissions Trading System (stationary installations)	1.8	1.7	1.7	1.7	1.7	NE	NE	NE	NE	NE
Effort Sharing Decision	9.7	10.3	10.7	11.2	11.7	NE	NE	NE	NE	NE
Land use, land-use change and forestry	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
Malta	**2015**	**2020**	**2025**	**2030**	**2035**	**2015**	**2020**	**2025**	**2030**	**2035**
Total GHG emissions	**2.7**	**1.7**	**1.7**	**1.6**	**1.7**	**2.6**	**1.7**	**1.7**	**1.6**	**1.7**
Energy supply	1.7	0.8	0.7	0.7	0.7	1.7	0.8	0.7	0.7	0.6
Manufacturing and construction industries	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Transport	0.4	0.3	0.4	0.4	0.4	0.4	0.3	0.4	0.4	0.4
Residential and commercial	0.1	0.2	0.2	0.2	0.2	0.1	0.2	0.2	0.2	0.2
Industrial processes and process use	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Agriculture	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Waste	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Emissions Trading System (stationary installations)	1.7	0.8	0.7	0.7	0.7	1.7	0.8	0.7	0.7	0.6
Effort Sharing Decision	0.9	0.9	1.0	1.0	1.0	0.9	0.9	1.0	1.0	1.0
Land use, land-use change and forestry	−0.1	−0.1	−0.1	−0.1	−0.1	−0.1	−0.1	−0.1	−0.1	−0.1
Note: Reported projections calibrated by EEA to align them with historic emissions.										
Netherlands	**2015**	**2020**	**2025**	**2030**	**2035**	**2015**	**2020**	**2025**	**2030**	**2035**
Total GHG emissions	**198.6**	**190.1**	**181.4**	**166.9**	**154.7**	**198.0**	**183.5**	**174.1**	**163.8**	**153.6**
Energy supply	67.0	64.9	59.1	49.1	40.3	66.6	59.1	51.4	45.9	40.3
Manufacturing and construction industries	26.8	26.3	26.1	24.8	24.2	26.8	26.1	26.4	25.3	24.2
Transport	32.5	30.8	30.4	30.3	30.1	32.3	30.8	30.4	30.3	30.1
Residential and commercial	38.3	35.3	33.5	31.3	29.3	38.4	34.8	33.5	30.9	28.2
Industrial processes and process use	12.1	12.4	13.0	12.9	13.0	12.1	12.4	13.0	12.9	13.0
Agriculture	18.6	17.9	17.6	17.3	17.0	18.6	17.9	17.6	17.3	17.0
Waste	3.3	2.3	1.7	1.2	0.7	3.3	2.3	1.7	1.2	0.7
Emissions Trading System (stationary installations)	90.5	88.8	84.2	74.2	66.0	90.1	82.9	76.9	71.4	65.9
Effort Sharing Decision	108.1	101.2	97.2	92.7	88.8	107.9	100.6	97.2	92.4	87.7
Land use, land-use change and forestry	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
Note: Reported projections calibrated by EEA to align them with historic emissions.										
Norway	**2015**	**2020**	**2025**	**2030**	**2035**	**2015**	**2020**	**2025**	**2030**	**2035**
Total GHG emissions	**54.0**	**54.6**	**53.4**	**52.3**	**NE**	**NE**	**NE**	**NE**	**NE**	**NE**
Energy supply	9.3	18.9	18.0	17.1	NE	NE	NE	NE	NE	NE
Manufacturing and construction industries	0.0	3.1	3.1	3.1	NE	NE	NE	NE	NE	NE
Transport	0.0	13.2	13.3	13.4	NE	NE	NE	NE	NE	NE
Residential and commercial	0.0	4.1	4.1	4.0	NE	NE	NE	NE	NE	NE

Table A2.1 Projected emissions from Member States and Norway, WEM and WAM (cont.)

GHG emission projections (Mt CO_2-eq.)	WEM scenario					WAM scenario				
Industrial processes and process use	8.6	9.5	9.4	9.3	NE	NE	NE	NE	NE	NE
Agriculture	4.8	4.7	4.7	4.7	NE	NE	NE	NE	NE	NE
Waste	1.2	1.0	0.8	0.7	NE	NE	NE	NE	NE	NE
Emissions Trading System (stationary installations)	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
Land use, land-use change and forestry	– 24.5	– 23.5	– 22.6	– 21.3	NE	NE	NE	NE	NE	NE
Note: Reported projections not quality check by EEA.										
Poland	**2015**	**2020**	**2025**	**2030**	**2035**	**2015**	**2020**	**2025**	**2030**	**2035**
Total GHG emissions	**394.7**	**385.7**	**372.8**	**358.3**	**358.3**	**NE**	**NE**	**NE**	**NE**	**NE**
Energy supply	185.4	177.1	164.1	147.8	147.8	NE	NE	NE	NE	NE
Manufacturing and construction industries	30.4	27.6	29.9	30.1	30.1	NE	NE	NE	NE	NE
Transport	48.1	51.2	51.9	56.0	56.0	NE	NE	NE	NE	NE
Residential and commercial	56.6	53.2	49.0	45.3	45.3	NE	NE	NE	NE	NE
Industrial processes and process use	31.5	31.0	31.3	31.4	31.4	NE	NE	NE	NE	NE
Agriculture	30.6	33.3	34.3	34.8	34.8	NE	NE	NE	NE	NE
Waste	12.1	12.2	12.5	12.8	12.8	NE	NE	NE	NE	NE
Emissions Trading System (stationary installations)	206.5	196.7	188.0	174.4	174.4	NE	NE	NE	NE	NE
Effort Sharing Decision	188.2	189.0	184.8	183.9	183.9	NE	NE	NE	NE	NE
Land use, land-use change and forestry	– 20.7	– 14.8	– 11.0	– 7.5	– 7.5	NE	NE	NE	NE	NE
Portugal	**2015**	**2020**	**2025**	**2030**	**2035**	**2015**	**2020**	**2025**	**2030**	**2035**
Total GHG emissions	**67.3**	**60.2**	**56.1**	**53.4**	**50.7**	**67.3**	**60.1**	**53.3**	**49.7**	**46.0**
Energy supply	19.0	13.3	10.9	9.2	7.5	19.0	13.3	10.2	7.5	4.7
Manufacturing and construction industries	6.7	6.6	6.6	6.5	6.4	6.7	6.6	5.8	5.8	5.8
Transport	15.4	14.7	14.6	14.4	14.3	15.4	14.7	14.0	14.4	14.8
Residential and commercial	4.6	4.5	4.6	4.7	4.8	4.6	4.5	4.5	4.5	4.6
Industrial processes and process use	6.4	6.9	6.0	6.3	6.5	6.4	6.8	5.4	5.2	5.0
Agriculture	7.6	7.3	7.1	6.5	5.8	7.6	7.3	7.1	6.5	5.8
Waste	7.7	6.9	6.4	5.9	5.4	7.7	6.9	6.2	5.7	5.2
Emissions Trading System (stationary installations)	26.7	21.6	19.6	18.2	16.9	26.7	21.6	18.0	15.8	13.7
Effort Sharing Decision	40.2	38.1	36.0	34.6	33.2	40.2	38.0	34.8	33.3	31.8
Land use, land-use change and forestry	– 10.0	– 7.6	– 7.9	– 8.3	– 8.7	– 10.0	– 7.6	– 7.9	– 8.3	– 8.7
Romania	**2015**	**2020**	**2025**	**2030**	**2035**	**2015**	**2020**	**2025**	**2030**	**2035**
Total GHG emissions	**116.7**	**126.9**	**136.3**	**146.8**	**157.6**	**115.0**	**124.0**	**132.4**	**141.5**	**150.6**
Energy supply	40.8	41.2	42.0	43.2	45.4	40.4	40.7	41.2	42.3	44.2
Manufacturing and construction industries	12.5	13.0	14.4	15.2	16.2	12.4	12.7	14.1	14.9	15.8
Transport	16.0	18.3	19.4	20.3	21.0	15.8	18.0	19.0	20.0	20.7
Residential and commercial	12.1	12.6	13.3	14.0	14.5	11.6	12.0	12.5	13.1	13.7
Industrial processes and process use	12.0	16.4	18.8	21.1	23.3	12.0	16.4	18.8	21.1	23.3
Agriculture	17.9	19.8	22.9	27.4	31.4	17.6	19.0	21.7	24.9	27.6
Waste	5.4	5.5	5.6	5.6	5.8	5.2	5.2	5.2	5.2	5.3

Table A2.1 Projected emissions from Member States and Norway, WEM and WAM (cont.)

GHG emission projections (Mt CO_2-eq.)	WEM scenario					WAM scenario				
Emissions Trading System (stationary installations)	46.5	49.8	51.6	52.9	55.0	46.4	49.6	51.5	52.7	54.7
Effort Sharing Decision	70.2	77.0	84.7	93.9	102.7	68.5	74.4	81.0	88.8	95.9
Land use, land-use change and forestry	−17.7	−18.0	−19.0	−17.4	−17.7	−17.5	−17.4	−14.2	−10.9	−11.7
Slovakia	**2015**	**2020**	**2025**	**2030**	**2035**	**2015**	**2020**	**2025**	**2030**	**2035**
Total GHG emissions	**44.0**	**44.1**	**45.2**	**46.2**	**46.9**	**43.7**	**43.4**	**42.1**	**42.4**	**42.6**
Energy supply	9.6	9.3	9.4	9.7	10.0	9.6	9.1	7.4	7.6	7.8
Manufacturing and construction industries	7.2	7.4	7.5	7.7	7.8	7.2	7.4	7.5	7.6	7.7
Transport	7.5	7.8	8.4	8.9	9.2	7.3	7.3	7.5	7.7	7.8
Residential and commercial	5.9	6.0	6.2	6.3	6.4	5.9	5.8	5.7	5.6	5.5
Industrial processes and process use	9.0	9.1	9.4	9.6	9.7	9.2	9.5	9.8	10.0	10.0
Agriculture	3.0	2.9	2.8	2.7	2.7	2.9	2.7	2.6	2.6	2.6
Waste	1.6	1.6	1.5	1.3	1.2	1.6	1.6	1.5	1.3	1.2
Emissions Trading System (stationary installations)	21.6	21.5	22.0	22.6	23.1	21.8	21.7	20.5	20.9	21.3
Effort Sharing Decision	22.4	22.6	23.2	23.6	23.9	22.0	21.6	21.6	21.5	21.3
Land use, land-use change and forestry	−8.4	−9.0	−9.6	−10.2	−10.2	−8.6	−9.5	−10.0	−10.6	−10.6
Slovenia	**2015**	**2020**	**2025**	**2030**	**2035**	**2015**	**2020**	**2025**	**2030**	**2035**
Total GHG emissions	**17.3**	**18.2**	**17.7**	**17.0**	**16.6**	**NE**	**NE**	**NE**	**NE**	**NE**
Energy supply	4.9	5.8	5.1	4.3	3.9	NE	NE	NE	NE	NE
Manufacturing and construction industries	1.7	1.8	2.0	2.2	2.4	NE	NE	NE	NE	NE
Transport	5.9	6.0	6.0	6.0	5.9	NE	NE	NE	NE	NE
Residential and commercial	1.5	1.2	1.1	1.0	0.9	NE	NE	NE	NE	NE
Industrial processes and process use	1.0	1.1	1.2	1.3	1.3	NE	NE	NE	NE	NE
Agriculture	1.8	1.9	1.9	1.9	1.9	NE	NE	NE	NE	NE
Waste	0.5	0.4	0.4	0.3	0.3	NE	NE	NE	NE	NE
Emissions Trading System (stationary installations)	6.1	7.2	6.8	6.3	6.0	NE	NE	NE	NE	NE
Effort Sharing Decision	11.2	11.0	10.9	10.7	10.6	NE	NE	NE	NE	NE
Land use, land-use change and forestry	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
Spain	**2015**	**2020**	**2025**	**2030**	**2035**	**2015**	**2020**	**2025**	**2030**	**2035**
Total GHG emissions	**331.7**	**352.7**	**374.1**	**389.4**	**404.8**	**330.2**	**344.6**	**366.0**	**381.3**	**396.6**
Energy supply	76.1	86.0	92.8	97.7	102.5	76.1	86.0	92.8	97.7	102.5
Manufacturing and construction industries	49.6	51.6	56.9	57.5	58.0	49.6	51.6	56.9	57.5	58.0
Transport	82.2	87.7	91.2	98.1	105.0	81.3	83.4	86.8	93.7	100.6
Residential and commercial	41.9	43.3	46.6	49.8	53.0	41.7	42.7	46.0	49.2	52.3
Industrial processes and process use	27.1	29.5	32.8	33.5	34.2	26.6	26.5	29.8	30.4	31.1
Agriculture	39.4	39.6	39.3	39.0	38.6	39.4	39.6	39.3	38.9	38.6
Waste	15.3	14.9	14.4	14.0	13.5	15.3	14.8	14.4	13.9	13.5
Emissions Trading System (stationary installations)	129.7	141.0	154.1	159.2	164.6	129.7	141.0	154.1	159.2	164.6
Effort Sharing Decision	199.0	208.4	216.5	226.4	236.3	197.5	200.2	208.4	218.3	228.2
Land use, land-use change and forestry	−33.9	−33.6	−33.1	−32.7	−32.3	−33.9	−33.6	−33.1	−32.7	−32.3

Table A2.1 Projected emissions from Member States and Norway, WEM and WAM (cont.)

GHG emission projections (Mt CO_2-eq.)	WEM scenario					WAM scenario				
Sweden	**2015**	**2020**	**2025**	**2030**	**2035**	**2015**	**2020**	**2025**	**2030**	**2035**
Total GHG emissions	**55.6**	**55.3**	**53.1**	**51.7**	**49.3**	**NE**	**NE**	**NE**	**NE**	**NE**
Energy supply	11.6	12.8	12.8	12.6	11.2	NE	NE	NE	NE	NE
Manufacturing and construction industries	8.2	8.5	8.2	7.9	7.6	NE	NE	NE	NE	NE
Transport	18.0	16.8	15.6	15.2	14.9	NE	NE	NE	NE	NE
Residential and commercial	3.2	3.1	2.8	2.7	2.6	NE	NE	NE	NE	NE
Industrial processes and process use	6.6	6.8	6.7	6.6	6.6	NE	NE	NE	NE	NE
Agriculture	6.6	6.3	6.1	5.9	5.7	NE	NE	NE	NE	NE
Waste	1.4	1.1	0.9	0.7	0.7	NE	NE	NE	NE	NE
Emissions Trading System (stationary installations)	21.0	22.8	22.6	22.2	20.7	NE	NE	NE	NE	NE
Effort Sharing Decision	34.1	32.1	30.1	29.1	28.2	NE	NE	NE	NE	NE
Land use, land-use change and forestry	– 28.1	– 25.6	– 23.4	– 25.0	– 25.6	NE	NE	NE	NE	NE
United Kingdom	**2015**	**2020**	**2025**	**2030**	**2035**	**2015**	**2020**	**2025**	**2030**	**2035**
Total GHG emissions	**569.3**	**462.0**	**425.3**	**436.5**	**451.4**	**567.6**	**453.2**	**403.6**	**387.1**	**371.2**
Energy supply	188.2	112.7	93.0	108.6	123.6	186.6	108.6	76.2	64.4	50.7
Manufacturing and construction industries	66.6	64.2	62.1	58.9	56.6	66.6	62.6	60.4	57.3	54.9
Transport	115.5	106.6	101.8	99.8	101.2	115.5	106.6	101.8	99.8	101.2
Residential and commercial	97.0	88.2	84.2	88.1	91.1	97.0	85.0	81.0	84.6	85.6
Industrial processes and process use	23.6	19.0	15.7	14.0	13.2	23.6	18.9	15.7	14.0	13.1
Agriculture	55.4	51.4	50.4	50.4	50.4	55.4	51.4	50.4	50.4	50.4
Waste	23.1	20.0	18.0	16.6	15.3	23.1	20.0	18.0	16.6	15.3
Emissions Trading System (stationary installations)	221.9	144.5	124.6	139.6	153.5	220.2	139.4	106.6	94.3	79.5
Effort Sharing Decision	345.7	315.6	298.7	294.8	295.7	345.7	311.9	294.9	290.7	289.5
Land use, land-use change and forestry	– 8.0	– 10.0	– 11.2	– 12.4	– 12.7	– 8.0	– 10.0	– 11.2	– 12.4	– 12.7

Note: Total GHG emissions exclude LULUCF and include indirect CO_2 emissions.

WEM: with existing measures, WAM: with additional measures, NE: not estimated.

Energy supply aggregates emissions from CRF categories 1. A.1, 1.B, 1.C, Manufacturing Industries and construction from CRF 1.A.2, Transport from CRF 1.A.3, Residential & Commercial from 1.A.4 and 1.A.5, Industrial processes and process use from CRF 2, Agriculture from CRF 3, LULUCF from CRF 4 and Waste from CRF 5.

No data reported in 2015 by Iceland, Liechtenstein, Switzerland and Turkey.

Source: EEA, 2015c.

QA/QC activities

In order to ensure timeliness, completeness, consistency, comparability, accuracy and transparency of the reporting of projections by the EU and its Member States, the projections reported by Member States and used in the report underwent QA/QC procedures by the EEA.

The QA/QC procedure is described in 'Elements of the Union System for Policies and Measures and Projections and the Quality Assurance and Control (QA/QC) Programme as Required under Regulation (EU) No 525/2013' (EC, 2015c). The activities include the recalibration of projected trends on the basis of GHG inventory data, where discrepancies between historic trends and projected trends are observed. When such calibration took place in 2015, national GHG inventory data as of 30 June 2015 were used. Calibrations performed in 2015 were performed against national GHG inventory data from 15 January 2014.

Projected ESD emissions

While projections of total emissions are relevant to the assessment of the EU's progress towards its 20% reduction target by 2020, the assessment of the projected progress of Member States towards their national 2020 targets, set under the ESD as part of the climate and energy package, is based on projection data on emissions not covered by the EU ETS, submitted by Member States on a voluntary basis.

All Member States who submitted projections presented separate projections for total GHG emissions, ETS emissions and ESD emissions. All Member States but Poland submitted a split between ETS and ESD emissions at the main source category level.

A2.4 Energy consumption data

The assessment of progress towards RES objectives and targets was for the most part based on information reported by Member States to Eurostat under the Energy Statistics Regulation and under the RED, and published by Eurostat via its energy statistics database (Eurostat, 2014b) and Eurostat's SHARES tool (Eurostat, 2015a). Targets regarding the RES share in each Member State in 2020 were taken from Part A of Annex I of the RED; indicative trajectories for the 2011-to-2018 period were taken from Part B of Annex I of the RED. Expected national RES trajectories for the 2011-to-2012 period and until 2020 were derived from information submitted by Member States to the European Commission in 2010, in the context of their NREAPs. Additional data published by EurObserv'ER (EurObserv'ER, 2015) were used for the breakdown of the RES share by energy technologies to supplement, where necessary, the data sourced from Eurostat.

The assessment of progress towards energy efficiency objectives was based on the following:

- reported targets under Article 3 of the EED in 2013, including updates of Austria, Bulgaria, Croatia, Cyprus, France, Greece, Italy, Poland, Slovakia, Spain, Sweden and the United Kingdom based on the NEEAP3 submitted in 2014 (or based on separate notifications to the Commission);
- historic numbers are based on Eurostat (2015b, 2015g and 2015h) and EEA (2015f);
- national progress reports submitted by Member States in 2014 in compliance with requirements laid out in Article 24 of the EED;
- national reports prepared under the EU project 'Energy Efficiency Watch' and the final report assessing the quality of the second NEEAPs;
- national reports prepared under the ODYSSEE-MURE project by national experts;
- preliminary primary energy consumption data for the year 2014.

Annex 3 Detailed assessment results (progress under the ESD)

A3.1 Tracking progress towards targets under the ESD

Member States with historic emissions (2013 and 2014) below their annual ESD target and with projections (2015 to 2020) remaining below ESD targets until 2020 are considered to be on track towards their targets under the ESD.

By contrast, Member States with historic emissions (2013 and 2014) higher than their 2013 ESD target or with WEM projections higher than their 2020 target are considered to be not on track towards their targets.

A3.2 Current progress towards targets under the ESD

The assessment of current progress towards 2013 ESD targets is based on a comparison between domestic ESD emissions in 2013 and ESD targets (AEAs) for 2013. This assessment does not take into account the possible use of flexibility options as permitted under the ESD. All the data used for this assessment are consistent with the scope of the EU ETS for the period from 2013 to 2020.

The AEA values for the period from 2013 until 2020 were set out in Commission Decision No 2013/162/EU (EC, 2013c) and adjusted according to Commission Implementing Decision No 2013/634/EU (EC, 2013d).

Table A3.1 Current progress towards 2013 and 2014 ESD targets

Member State	2013				2014 (approximated ESD emissions)			
	2013 ESD emissions	2013 ESD target	2013 absolute gap	2013 relative gap	2014 ESD emissions	2014 ESD target	2014 absolute gap	2014 relative gap
	Mt CO_2-eq.	Mt CO_2-eq.	Mt CO_2-eq.	%	**Mt CO_2-eq**	**Mt CO_2-eq**	**Mt CO_2-eq**	**%**
Austria	49.69	52.63	2.94	5.6	48.1	52.1	4.0	7.7
Belgium	74.10	78.38	4.28	5.5	71.7	76.9	5.2	6.7
Bulgaria	23.17	26.93	3.76	14.0	24.3	27.2	2.9	10.8
Croatia	17.03	19.61	2.58	13.2	16.2	19.8	3.6	18.0
Cyprus	4.27	5.92	1.65	27.9	4.0	5.9	1.9	32.8
Czech Republic	61.80	62.47	0.67	1.1	62.0	63.2	1.2	1.9
Denmark	33.43	36.83	3.40	9.2	32.4	35.9	3.6	9.9
Estonia	5.83	6.30	0.46	7.3	5.5	6.3	0.8	12.5
Finland	31.39	31.78	0.39	1.2	31.1	31.3	0.2	0.5
France	371.65	394.08	22.42	5.7	349.8	389.5	39.6	10.2
Germany	467.50	472.53	5.02	1.1	446.7	465.8	19.1	4.1
Greece	46.03	58.96	12.92	21.9	45.8	59.3	13.4	22.7
Hungary	37.70	50.40	12.70	25.2	37.3	51.5	14.2	27.6
Ireland	43.12	46.89	3.77	8.0	42.3	45.8	3.4	7.5
Italy	270.79	308.16	37.37	12.1	262.7	306.2	43.5	14.2
Latvia	8.37	9.26	0.89	9.6	8.7	9.4	0.6	6.8
Lithuania	12.23	12.94	0.71	5.5	12.5	13.3	0.8	6.2
Luxembourg	9.53	9.54	0.01	0.1	9.2	9.3	0.2	1.9
Malta	1.09	1.17	0.08	7.0	1.1	1.2	0.1	7.8
Netherlands	109.04	122.95	13.91	11.3	98.0	120.7	22.7	18.8
Poland	189.01	193.64	4.64	2.4	190.9	194.9	4.0	2.0
Portugal	39.70	49.31	9.61	19.5	39.2	49.6	10.4	20.9
Romania	66.98	75.63	8.65	11.4	67.3	77.5	10.2	13.1
Slovakia	21.84	24.02	2.18	9.1	21.5	24.4	2.9	11.9
Slovenia	10.77	12.32	1.55	12.6	10.6	12.4	1.7	13.9
Spain	196.54	227.56	31.02	13.6	198.1	225.6	27.6	12.2
Sweden	35.10	41.69	6.58	15.8	34.0	41.0	7.0	17.1
United Kingdom	348.45	358.74	10.29	2.9	326.0	354.2	28.2	8.0
EU	**2 586.18**	**2 790.63**	**204.46**	**7.3**	**2 497.1**	**2 770.1**	**273.0**	**9.9**

Note: Gaps to targets (i.e. surpluses of emission allocations compared to existing emissions) are calculated as ESD target − ESD emissions.

No national approximated 2014 ESD emissions were available for Bulgaria, Cyprus, Lithuania, Portugal and Romania. Gap-filled proxy data (calculated by the EEA) were used instead.

Source: EC, 2013c and 2013d; EEA, 2015a, 2015b and 2015d.

A3.3 Projected progress towards ESD targets

The assessment of projected progress towards 2020 ESD targets is based on a comparison between projections of domestic ESD emissions under WEM and WAM scenarios and ESD targets (AEAs) for 2020. It does not take into account the possible use of flexibility options as permitted under the ESD. All the data used for this assessment are consistent with the scope of the EU ETS for the period from 2013 to 2020.

The absolute annual ESD targets (AEAs) considered for the assessment of projected progress are consistent with the scope of the EU ETS during the third trading period (i.e. from 2013 to 2020).

Table A3.2 Projected progress towards 2020 ESD targets

Member State	2020 ESD target	2020 WEM ESD emissions	2020 WAM ESD emissions	2020 gap (WEM)	2020 gap (WAM)
	Mt CO_2-eq	Mt CO_2-eq	Mt CO_2-eq	Mt CO_2-eq	Mt CO_2-eq
Austria	48.8	51.0	45.7	– 2.2	3.1
Belgium	67.7	72.2	NE	– 4.5	NA
Bulgaria	28.8	22.7	NE	6.1	NA
Croatia	21.0	17.2	16.0	3.7	4.9
Cyprus	5.9	2.9	2.9	3.1	3.1
Czech Republic	67.7	57.2	53.1	10.5	14.5
Denmark	30.5	30.3	NE	0.2	NA
Estonia	6.5	5.7	5.3	0.8	1.2
Finland	28.4	28.4	28.2	0.0	0.2
France	359.3	345.8	NE	13.5	NA
Germany	425.6	421.7	NE	4.0	NA
Greece	61.2	43.7	NE	17.5	NA
Hungary	58.2	37.2	35.5	21.1	22.8
Ireland	39.0	43.9	41.4	– 4.9	– 2.4
Italy	294.4	276.2	263.3	18.2	31.1
Latvia	9.9	9.1	8.4	0.8	1.5
Lithuania	15.5	13.0	12.5	2.5	2.9
Luxembourg	8.1	10.3	NE	– 2.1	NA
Malta	1.2	0.9	0.9	0.2	0.2
Netherlands	107.0	101.2	100.6	5.8	6.4
Poland	202.3	189.0	NE	13.4	NA
Portugal	51.2	38.1	38.0	13.1	13.3
Romania	88.4	77.0	74.4	11.3	14.0
Slovakia	26.5	22.6	21.6	3.9	4.9
Slovenia	12.5	11.0	NE	1.5	NA
Spain	214.2	208.4	200.2	5.8	13.9
Sweden	37.2	32.1	NE	5.1	NA
United Kingdom	327.1	315.6	311.9	11.5	15.2
EU	**2 644.2**	**2 484.4**	**2 438.7**	**159.8**	**205.4**

Note: Gaps to targets are calculated as ESD target − ESD emissions. Thus, negative values are assigned to Member States who do not meet their annual target, i.e. who exhibit a deficit.

NE: not estimated; NA: not applicable.

Source: EC, 2013c and 2013d; EEA, 2015c.

A3.4 2005 ESD base-year emissions

For the year 2005, several emission data can be considered, depending on their use.

For the purpose of analysing emission trends in the ESD, **historic 2005 ESD emissions** are calculated using the latest GHG inventory data, from which ETS emissions (including scope corrections) and CO2 emissions from domestic aviation are subtracted.

It may also be relevant to use 'ESD base-year emissions' (Table A3.3), consistent with the relative 2020 ESD target (in % of 2005 emissions) and the absolute 2020 target as published in the European Commission decisions mentioned above.

The EEA calculates '**ESD base-year emissions**' as follows:

ESD base-year emissions = 2020 absolute target/ (1 + % 2020 ESD target)

These ESD base-year emissions can be used to express, in percentage, changes in ESD emissions since 2005 or annual ESD targets (for any year between 2013 and 2020). Such percentage changes or ESD targets are then comparable with the 2020 targets expressed in percentage in the ESD (see for example on Figure A1.1 in Annex A1.4). These emissions are different and not to be mistaken for actual 2005 emissions under the ESD, which are based on the latest GHG inventories, ETS verified emissions and ETS scope correction.

Table A3.3 ESD base-year emissions

Country	(2005) ESD base-year emissions
	Mt CO_2-eq.
Austria	58.1
Belgium	79.6
Bulgaria	24.0
Croatia	18.9
Cyprus	6.3
Czech Republic	62.1
Denmark	38.1
Estonia	5.8
Finland	33.8
France	417.8
Germany	494.9
Greece	63.8
Hungary	52.9
Ireland	48.7
Italy	338.4
Latvia	8.5
Lithuania	13.4
Luxembourg	10.2
Malta	1.1
Netherlands	127.4
Poland	177.5
Portugal	50.7
Romania	74.3
Slovakia	23.5
Slovenia	12.1
Spain	238.0
Sweden	44.8
United Kingdom	389.4
EU	**2 914.0**

Note: The 2005 base-year emissions were estimated by the EEA based on the 2020 ESD targets published in the decision, determining Member States' AEAs, the adjustment to account for the EU ETS scope of 2013 through 2020 and the percentage reduction targets for 2020 set out in the ESD.

Source: EC, 2013c and 2013d; EU, 2009a

Annex 4 Detailed assessment results (progress towards renewable energy targets)

Current progress is assessed by comparing the renewable energy shares in 2013 with the indicative 2013 to 2014 targets set under the RED (EU, 2009b) and with the expected NREAP target (EEA, 2011b). Member States are considered to be on track if both interim targets (NREAP and RED) are exceeded. They are considered not on track if either the RED or the NREAP interim target has not been met.

Table A4.1 Current progress towards renewable energy targets

Member State	RES share		RES targets			Gap to target in 2013		
	2013	2014 proxy	Interim RED target 2013–2014	Expected NREAP target 2013	RED target 2020	Gap to interim RED target	Gap to expected NREAP target	Gap to 2020 RED target
	%	%	%	%	%	percentage points	percentage points	percentage points
Austria	32.6	34.7	26.5	31.8	34.0	6.1	0.8	–1.4
Belgium	7.9	8.8	5.4	5.8	13.0	2.5	2.1	–5.1
Bulgaria	19.0	18.3	11.4	11.4	16.0	7.6	7.6	3.0
Croatia	18.0	19.4	14.8	15.8	20.0	3.2	2.2	–2.0
Cyprus	8.1	8.3	5.9	7.8	13.0	2.2	0.3	–4.9
Czech Republic	12.4	13.3	8.2	11.0	13.0	4.2	1.4	–0.6
Denmark	27.2	28.5	20.9	27.3	30.0	6.3	–0.1	–2.8
Estonia	25.6	27.3	20.1	23.3	25.0	5.5	2.3	0.6
Finland	36.8	38.3	31.4	31.6	38.0	5.5	5.2	–1.2
France	14.2	15.6	14.1	15.0	23.0	0.1	–0.8	–8.8
Germany	12.4	13.7	9.5	12.0	18.0	2.9	0.4	–5.6
Greece	15.0	15.5	10.2	9.9	18.0	4.8	5.1	–3.0
Hungary	9.8	11.1	6.9	7.5	13.0	2.9	2.3	–3.2
Ireland	7.8	8.5	7.0	8.6	16.0	0.8	–0.8	–8.2
Italy	16.7	17.9	8.7	9.9	17.0	8.0	6.8	–0.3
Latvia	37.1	37.8	34.8	34.7	40.0	2.3	2.4	–2.9
Lithuania	23.0	25.4	17.4	19.0	23.0	5.6	4.0	0.0
Luxembourg	3.6	4.2	3.9	3.9	11.0	–0.3	–0.3	–7.4
Malta	3.8	4.6	3.0	3.8	10.0	0.8	0.0	–6.2
Netherlands	4.5	5.1	5.9	6.6	14.0	–1.4	–2.1	–9.5
Poland	11.3	11.7	9.5	11.1	15.0	1.8	0.3	–3.7
Portugal	25.7	26.4	23.7	27.1	31.0	2.1	–1.4	–5.3
Romania	23.9	24.2	19.7	19.4	24.0	4.2	4.5	–0.1
Slovakia	9.8	10.5	8.9	8.9	14.0	0.9	0.9	–4.2
Slovenia	21.5	22.0	18.7	19.5	25.0	2.8	2.0	–3.5
Spain	15.4	15.9	12.1	15.6	20.0	3.3	–0.2	–4.6
Sweden	52.1	52.5	42.6	45.6	49.0	9.5	6.5	3.1
United Kingdom	5.1	6.0	5.4	5.0	15.0	–0.3	0.1	–9.9
EU	**15.0**	**16.0**	**12.1**	**13.7**	**20.0**	**2.9**	**1.3**	**–5.0**
Iceland	76.0	NE	65.0	76.0	72.0	11.0	0.0	4.0
Norway	65.5	NE	61.0	62.8	68.0	4.5	2.7	–2.5

Note: Gaps are calculated as RES target — RES Share; thus negative values indicate that Member States' RES shares were below interim targets.

Source: EU, 2009b; EEA, 2011b; Eurostat, 2015a.

Table A4.2 RES shares per sector, 2013 and 2014

Member State	RES-Electricity		RES-Heating and cooling		RES-Transport	
	2013	Proxy 2014	2013	Proxy 2014	2013	Proxy 2014
Austria	68.1	69.5	33.5	36.2	7.5	7.7
Belgium	12.3	13.8	8.1	9.2	4.3	4.9
Bulgaria	18.9	19.4	29.2	28.1	5.6	3.0
Cyprus	6.6	8.0	21.7	20.5	1.1	1.0
Czech Republic	12.8	13.1	15.3	16.5	5.7	6.7
Germany	25.6	28.8	10.6	11.8	6.3	7.1
Denmark	43.1	45.0	34.8	36.2	5.7	6.7
Estonia	13.0	13.2	43.1	45.4	0.2	0.1
Greece	21.2	22.2	26.5	27.4	1.1	1.1
Spain	36.4	37.5	14.9	15.4	0.4	0.5
Finland	31.1	31.7	50.9	52.6	9.9	9.9
France	16.9	18.3	18.3	21.2	7.2	7.7
Croatia	38.7	42.1	18.1	20.3	2.1	2.2
Hungary	6.6	6.6	13.5	15.7	5.3	5.4
Ireland	20.9	22.1	5.7	6.2	5.0	5.3
Italy	31.3	33.0	18.0	20.2	5.0	4.6
Lithuania	13.1	13.4	37.7	42.5	4.6	5.0
Luxembourg	5.3	5.9	5.6	6.2	3.9	4.5
Latvia	48.8	47.9	49.7	50.7	3.1	3.1
Malta	1.6	2.8	23.7	23.8	3.3	3.9
Netherlands	10.1	10.6	3.6	4.1	5.0	5.4
Poland	10.7	11.5	13.9	14.4	6.0	5.9
Portugal	49.2	51.7	34.5	35.0	0.7	0.7
Romania	37.5	42.2	26.2	24.8	4.6	4.8
Sweden	61.8	64.6	67.2	65.1	16.7	18.5
Slovenia	32.8	32.4	31.7	34.4	3.4	2.0
Slovakia	20.8	21.2	7.5	8.5	5.3	5.3
United Kingdom	13.9	15.5	2.6	3.0	4.4	4.7
EU	**25.4**	**27.1**	**16.5**	**18.0**	**5.4**	**5.6**

Note: 2014 values are approximated estimates from the EEA.

Source: Eurostat, 2015a; EEA, 2015e.

Annex 5 Detailed assessment results (progress towards energy efficiency targets)

A5.1 Progress achieved between 2005 and 2013: additional information

The assessment of progress made towards achieving energy efficiency targets at national level is based on the following question: Are the historic efforts (average, annual change 2005 to 2013) to reduce or limit primary energy consumption progressing at least according to the linear trajectory for 2005 to 2020? If energy consumption is reduced/limited/less compared to the linear trajectory for 2005 to 2020, then Member States are considered to not be on track.

This linear assessment is applied when tracking energy efficiency progress, for the following reasons:

- unlike RES and GHG emissions, reliable projections and/or targets for interim years until 2020 on energy consumption are not available at Member State level;
- no other indicators/parameters/methodologies with a transparent, well-established and statistically known relation to primary energy consumption are available either.

Therefore, this assessment is based on the comparison between historic, linear evolutions with preferred evolutions. For the reason of maintaining consistency with the chapters on RES and GHG emissions, the year 2005 was chosen as a single base year, to allow for comparable assessment of trends across Member States. This methodology does not take into account the level of ambition of the national target (which varies significantly across the EU), nor does it capture the complexity of the national context (economic development, ability to attract financing for energy efficiency projects, etc.). Several Member States defined their 2020 targets in terms of final energy consumption (instead of primary energy consumption): Austria, Croatia, the Czech Republic, Estonia, Finland, France, Greece, Lithuania, Latvia, Slovakia and the United Kingdom. For the purpose of cross-country comparison, the officially reported target in primary energy consumption was taken into account in this assessment.

The numeric results of this assessment per Member State are shown in greater detail in Table A5.1 below.

Table A5.1 Member States' progress towards their 2020 energy efficiency targets

Country	Primary energy consumption					
	2005	2013	2014 (proxy)	Linear target path (2013)	Linear target path (2014)	2020 target
Austria	32.6	31.9	31.9	32.0	32.0	31.5
Belgium	51.5	47.4	45.2	47.3	46.8	43.7
Bulgaria	18.9	16.3	17.0	17.8	17.7	16.9
Croatia	8.2	7.3	6.9	10.0	10.2	11.5
Cyprus	2.5	2.2	2.2	2.3	2.3	2.2
Czech Republic	42.2	39.6	38.9	40.8	40.6	39.6
Denmark	19.3	17.8	16.6	18.5	18.4	17.8
Estonia	5.4	6.5	6.5	6.0	6.1	6.5
Finland	33.4	32.8	33.5	34.7	34.9	35.9
France	260.0	245.8	240.0	238.6	235.9	219.9
Germany	317.2	302.5	295.5	295.6	292.9	276.6
Greece	30.6	23.7	22.9	27.5	27.1	24.7
Hungary	25.4	21.0	20.9	26.1	26.1	26.6
Ireland	14.7	13.4	13.1	14.3	14.2	13.9
Italy	178.9	153.7	145.6	167.7	166.3	158.0
Latvia	4.5	4.4	4.5	5.0	5.0	5.4
Lithuania	7.9	5.7	5.5	7.2	7.1	6.5
Luxembourg	4.8	4.3	4.2	4.6	4.6	4.5
Malta	1.0	0.8	0.9	0.8	0.8	0.7
Netherlands	68.5	65.9	61.4	64.3	63.8	60.7
Poland	87.7	93.2	90.0	92.3	92.9	96.4
Portugal	24.9	21.3	20.3	23.6	23.5	22.5
Romania	36.7	30.9	30.4	40.1	40.5	43.0
Slovakia	17.8	16.2	14.7	17.0	16.9	16.4
Slovenia	7.0	6.8	6.6	7.2	7.2	7.3
Spain	135.9	113.8	112.2	127.3	126.2	119.8
Sweden	48.7	47.1	46.8	45.9	45.5	43.4
United Kingdom	222.8	194.5	181.3	198.7	195.7	177.6
EU	**1 708.8**	**1 566.6**	**1 515.2**	**1 588.4**	**1 573.3**	**1 483.0**
Norway	24.9	31.3	NE	NA	NA	NA

Source: EEA, 2015f; Eurostat, 2015b; Reported targets under Article 3 of the EED in 2013, including updates of Austria, Bulgaria, Croatia, Cyprus, France, Greece, Italy, Poland, Slovakia, Spain, Sweden and the United Kingdom, based on their third NEEAPs submitted in 2014 (or based on separate notifications to the Commission).

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European Environment Agency
Kongens Nytorv 6
1050 Copenhagen K
Denmark

Tel.: +45 33 36 71 00
Web: eea.europa.eu
Enquiries: eea.europa.eu/enquiries

Publications Office

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