European Commission

JRC SCIENCE FOR POLICY BRIEF

Supporting EU policies with independent evidence throughout the whole policy cycle **November 2017**

Mitigating climate change: are renewables working?[1]

Headlines

- **The change is here:** Evidence shows that the move towards renewable energies is helping long-term efforts on climate change mitigation.
- **There is a lot to gain:** (i) the EU is set to meet its 2020 decarbonisation goal; (ii) the shift in the energy fuel mix continues, with renewables spearheading the transformation in the electricity sector; (iii) the outlook for carbon emissions is changing significantly.

Policy context

With its 2008 Climate and Energy Package the EU took a significant step towards a low-carbon future. The package set mandatory 2020 targets for cuts in greenhouse gas (GHG) emissions and for the share of renewable energies in the energy mix. They are the benchmark we use to assess actual progress. In 2014 EU leaders endorsed a set of new, **more ambitious climate and energy goals for 2030**: (i) a cut in GHG emissions of at least 40 % compared to 1990 (including a 43 % cut in emissions under the Emissions Trading System compared to 2005); (ii) a binding renewable energy target of at least 27 % for the EU as a whole; and (iii) an indicative target to increase energy efficiency in the EU as a whole by at least 27 % against projections of future energy consumption With the ratification of the **COP 21 Paris climate agreement**, EU climate change policy entered a new phase. Its long-term aim of curbing GHG emissions by 80 % to 95 % by 2050 compared to 1990 received a fresh boost.

To implement these goals and commitments, in November 2016 the European Commission presented a **package of proposed measures**. They include a reform of the EU Emissions Trading System and a Clean Energy Package that will trigger an uptake in energy efficiency practices and renewable energy use. The European Parliament is currently debating these measures.

Key conclusions

The EU is on track to achieve its 2020 GHG emissions reduction target, thanks in part to changes in its energy mix. Fossil fuels in the EU are being displaced by renewable energy sources (RES). By 2015 renewables displaced 139 million tonnes oil equivalent (Mtoe), or 11.5 % of the gross inland consumption of fossil fuels in this year.

By 2015 the use of renewables in the EU resulted in estimated savings of 751 million tonnes of CO_2 equivalent (Mt CO_2-eq). Total EU emissions would otherwise have been almost 15 % higher. Emissions from public power and heating systems are estimated to have recorded the largest falls — 40 % in all — from the deployment of renewables in the electricity and heating/cooling sectors.

Looking further ahead, the trend towards decarbonising the energy system (which averaged 9 % per year from 2009 to 2015) must be maintained and supported. Meanwhile, the slowdown in the renewables deployment since 2015 is a concern that needs to be addressed.

Main findings

Looking at energy-related emissions, the EU is still in a vulnerable position, stemming

[1] This brief is based on the JRC Science for Policy report *Mitigating climate change: renewables in the EU — Cutting greenhouse gas emissions through renewables, Volume 2*, Banja M., Monforti-Ferrario F., Bódis K., Kona A., Jäger-Waldau A., Taylor N., Dallemand J.F. (EUR 28677 EN, https://ec.europa.eu/jrc/en/publication/eur-scientific-and-technical-research-reports/mitigating-climate-change-renewables-eu-cutting-greenhouse-gas-emissions-through-renewables

COP21 — helping stop global warming

2015 was a milestone year for climate action. In December of that year, the 21st Conference of the Parties (COP 21) concluded the **Paris climate agreement**. This is the first international climate agreement to impose mitigation obligations on all countries, developed and developing alike. It includes the collective aim to hold the increase in the global average temperature to 'well below 2°C above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5°C'. To achieve this, the Parties aim to ensure that global GHG emissions peak as soon as possible, and to undertake rapid reductions thereafter 'so as to achieve a balance between anthropogenic emissions by sources and removals by sinks of GHGs in the second half of this century'. So far **153 countries, together accounting for over two-thirds of global emissions**, have ratified or otherwise joined the Paris agreement.

from its high dependency on imported energy and the wide differences in domestic resources between Member States. Fossil fuels continue to make up the lion's share of the EU's gross domestic energy consumption. This tends to increase emissions and delay the necessary shift towards a sustainable low-carbon economy. Gas was the fastest-growing fossil fuel in the EU after the economic crisis. Coal, on the other hand, has seen its share decline over recent years, due to the environmental constraints in place. In 2014 and 2015 the EU's GHG emissions remained virtually static as renewables gradually start displacing more gas then coal.

Between 1990 and 2015, RES displaced 139 Mtoe, equivalent to 11.5 % of the gross inland consumption of fossil fuels.

Financial support for renewables peaked in around 2011 and by 2015 had almost fallen back to 2006 levels. Between 2005 and 2015 investments in renewables increased almost half whereas the use of renewables rose by nearly 70 % over that period. Currently these investments are mainly driven by an enabling legal and regulatory framework and specific support schemes to help renewables enter the energy market and compete with established technologies.

Differences in the methodology and quality of reporting applied by EU countries make it difficult to analyse the reported data on GHG emissions savings from the use of renewables. However, the benefits of an aggregated analysis level are evident.

The above-mentioned estimated emissions savings of 751 Mt CO_2-eq have brought the EU some EUR 5.5 billion or so in benefits, taking the 'average price' of European CO_2 emission allowances (EUR 7.3 per tonne of CO_2-eq from 1 January 2016).

The renewables deployment in three sectors (electricity, heating/cooling and transport) experienced different degrees of change between 2005 and 2015.

Electricity is the main sector where all fuels compete and so it plays a major role in changes to the fuel mix, with renewables gaining relative to gas and coal. The electricity sector is witnessing the greatest transformation because of the rapid deployment of renewables in the form of wind power and photovoltaics (PV), which have so far exceeded expectations (accounting for 18 % of renewables for electricity in 2015).

At present the electricity sector accounts for almost two-thirds of total GHG emission savings in the EU and for nearly 40% of total fossil fuel displacement thanks to its use of renewables. This makes it the largest single sector contributing to climate change mitigation.

These decarbonisation efforts are expected to gather pace as renewable energy sources in the electricity sector continue to gain market share. As the costs of technologies like wind and solar come down, they will become more competitive with others, including cheap coal and gas in the EU energy market. But coal and gas prices could act as a brake on the necessary low-carbon investments if they remain low in the coming years.

The deployment of renewables in the heating/cooling and transport sectors has lagged behind expectations. Their contribution to EU decarbonisation efforts decreased slightly between 2009 and 2015.

Related and future JRC work

This report is part of a series of studies compiled using the information that EU Member States must submit under the Renewable Energy Directive. The JRC's future work on this topic will incorporate critical analysis of deployment trends, policy drivers and socioeconomic aspects.