

2015 saw a record increase in renewables generation in Europe, equal to 2.5% of European electricity demand. But despite this, power sector CO2 emissions are expected to fall by only about 0.5%.

The large falls in coal generation in the UK were offset by increased coal generation in the Netherlands, Spain, Portugal and Poland; European gas generation saw its first increase since 2010; and German lignite generation barely changed as Germany exported record amounts of electricity. In addition, renewables growth was concentrated in only 3 countries: Germany, UK, Italy.

This should not worry people too much: most of this is a “pause for breath” after a massive 7.5% fall in power sector emissions in 2014, and emissions are expected to resume the fast downward trend in 2016.

Our ETS emissions forecast to 2020 remains unchanged, which is for emissions to fall 21% from 2014 to 2020. This would equate to 30% economy-wide CO2 cuts by 2020, far surpassing the EU target of 20% cut by 2020.

However, large – mostly political – uncertainties still remain about how quickly future emissions will fall to 2020, and beyond.

Our methodology

From a combination of official data sources, it is possible to already pull together a fairly accurate picture for changes in the generation mix and emissions in the European power sector in 2015.

In the same exercise last year, we [estimated](#) emissions falls of 8%, where they were actually 7.5%; we know our methodology is quite robust, but not 100% perfect. *It still relies on some estimates, so will be subject to minor revisions.*

Our methodology is as follows:

- We base our historic dataset on Eurostat, which is still only reporting up to 2013. We then add on differences for 2014 and 2015 gleaned from ENTSO-E, which is available for most countries up to at least October 2015. We add our assessment of Nov & Dec variances for 2015, from TSO's and other sources.
- For Netherlands, we use CBS data for coal/gas generation, and our own estimates.
- For Germany, we use initial estimates from AG Energiebilanzen.

2015 brought a record increase in European renewable generation.

Renewables generation jumped a record 87TWh in 2015; this is significantly higher than the 49TWh average annual increase from 2010 to 2014 (see figure 1). Over three-quarters of the increase came from just 3 countries: Germany, the UK, and Italy – which all set new national records for the size of the increase in renewables generation.

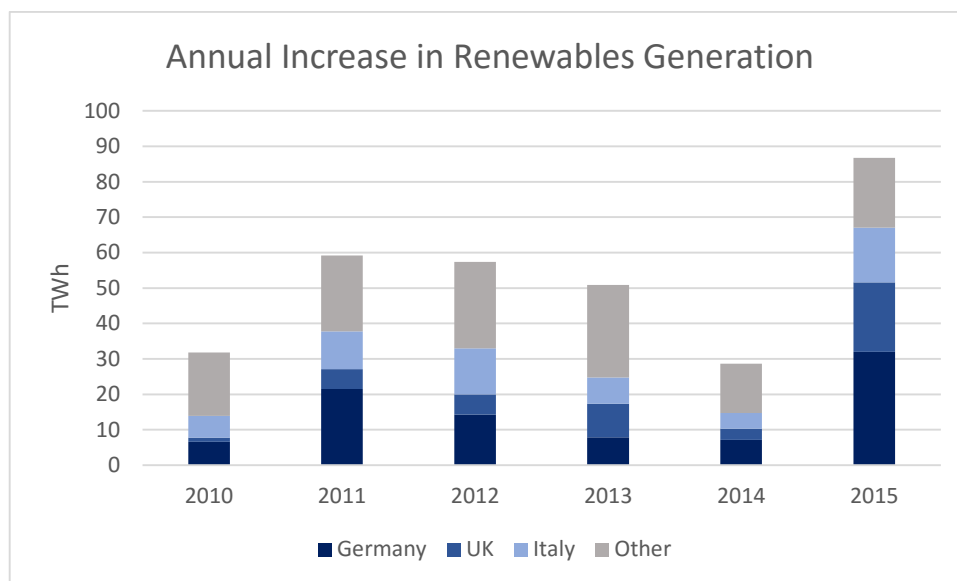


Figure 1

The renewables increase in each these 3 countries far outstrips any other European country (see figure2). Perhaps the EU is worryingly dependent on just these 3 countries for renewables growth - Sweden and France are the only countries that even seem to be readable on figure 2, and generation actually seemed to fall in Spain and the Netherlands.

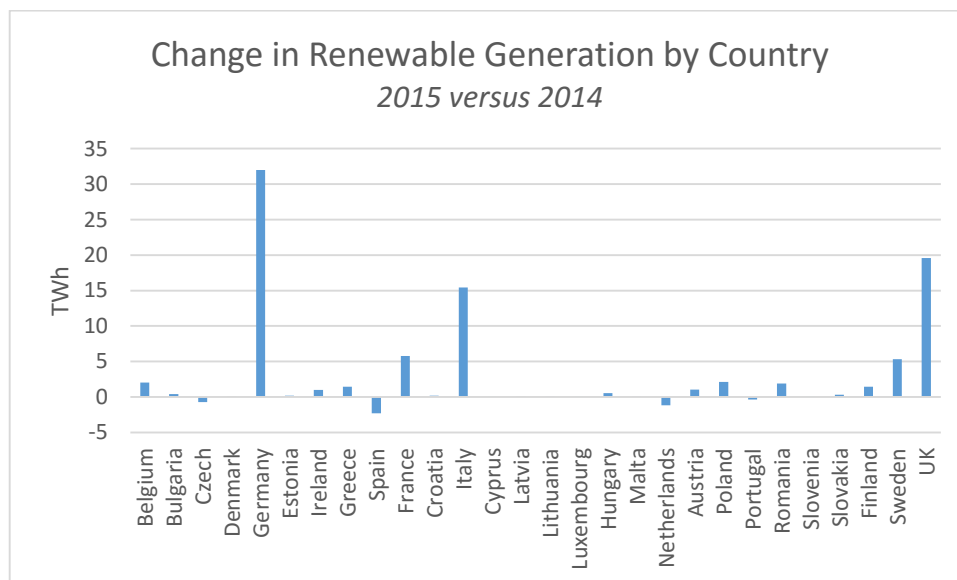


Figure 2

The renewables increase corresponds to 2.5% of European electricity demand. This means that 29% of Europe’s electricity demand is generated from renewables, up from 17% in 2008 (see figure 3)¹.

¹ Note, because hydro is included in the “official” renewables definition in figure 3, but not included in our analysis above, the increase in renewables including hydro in 2015 was only of 1.6% demand, not 2.5%, due to poor 2015 hydro conditions.

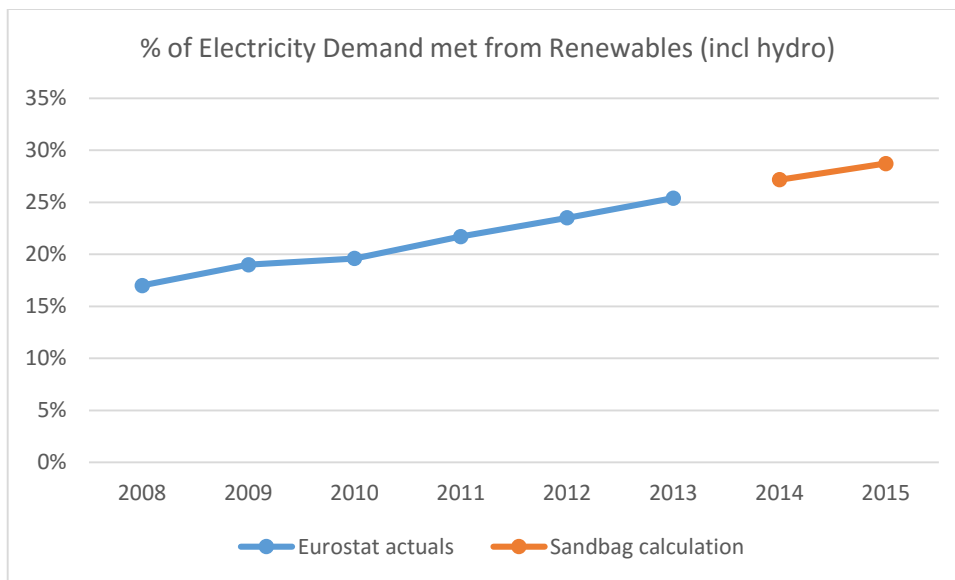


Figure 3

However, the massive increase in renewables generation did not lead to a fall in fossil generation.

A fall in nuclear and hydro levels, and an increase in total electricity demand, meant that fossil generation was roughly unchanged in 2015 (see figure 4). Lignite and hard coal only very marginally fell in total, and gas generation saw its first increase since 2010.

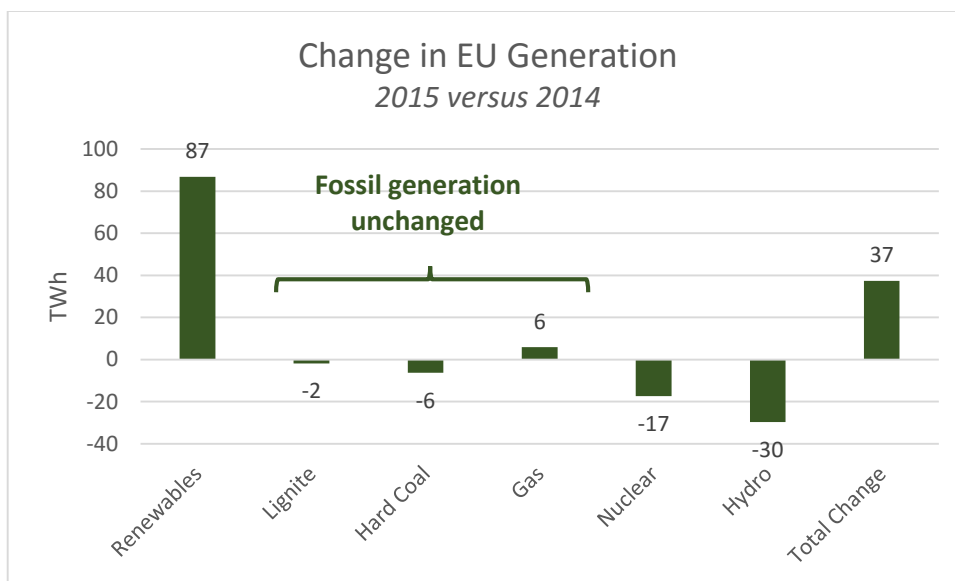


Figure 4

The changes in fossil generation were dominated by the collapse in UK coal generation, which was offset by increases in coal generation in the Netherlands and Spain (see figure 5). German and Italian fossil generation barely moved, despite record renewables growth.

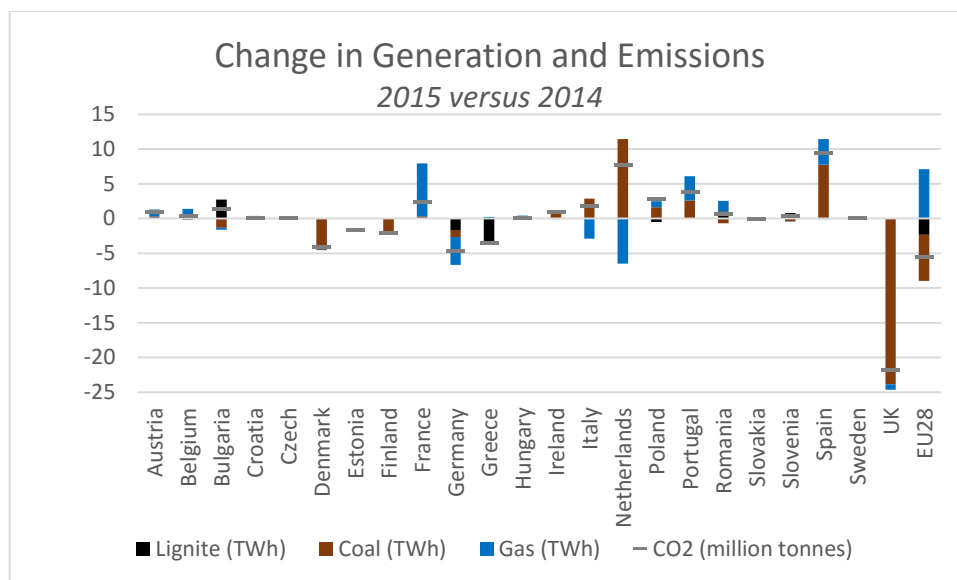


Figure 5

Key events in the European power sector in 2015 were:

- **UK:** Coal generation collapsed, mostly as a result of increased renewables generation. The UK carbon price support tax doubling to £18/tonne in April did not lead to an overall increase in gas generation; in fact gas generation also fell.
- **Germany:** Lignite and hard coal generation barely shifted, as the record jump in renewables was offset by increased electricity exports. The increase in exports was helped by factors such as less hydro generation across France and Austria, and less nuclear generation in Belgium, Switzerland and the Czech Republic. Figure 6 shows the changes in German exports. Also, gas generation continued its fall, with the running hours of flexible gas power stations at a record low. Agora Energiewende have published a [review of 2015](#) specifically for Germany.
- **Netherlands:** We estimate coal generation increased by 11TWh². This is as 3200MW of new coal plant came online - 1600MW of RWE plant in January, and 800MW of GDF's plant in July, and 800MW of EON's plant in November. The old coal plant are required to close by law by 2017; 3 small coal plants had closed already in November 2015³. This means there is an overlap before the old coal plants close, leading to a large but temporary increase in Dutch CO2 emissions. Around half of the coal increase led to lower gas generation, and half led to reduced electricity imports.
- **Poland:** A 2% increase in electricity demand necessitated more fossil generation, raising emissions, although there was a small increase in renewable generation.
- **Spain and Portugal:** Lower hydro levels led to big increases in coal generation. Hydro generation normalised after a wet 2014. Renewables generation in Spain actually fell.
- **Italy:** over the year, fossil generation the same year-on-year, as the large increase in renewables generation was offset by less Alpine hydro generation and higher air conditioning load during the summer heatwave.

² Derived on actual coal use data for Jan to August from CBS Statline, and Sandbag estimates from Sep to Dec. Contains quite a lot of uncertainty.

³ See <http://www.fluxenergie.nl/sluiting-van-drie-verouderde-kolencentrales-inmiddels-gerealiseerd/>

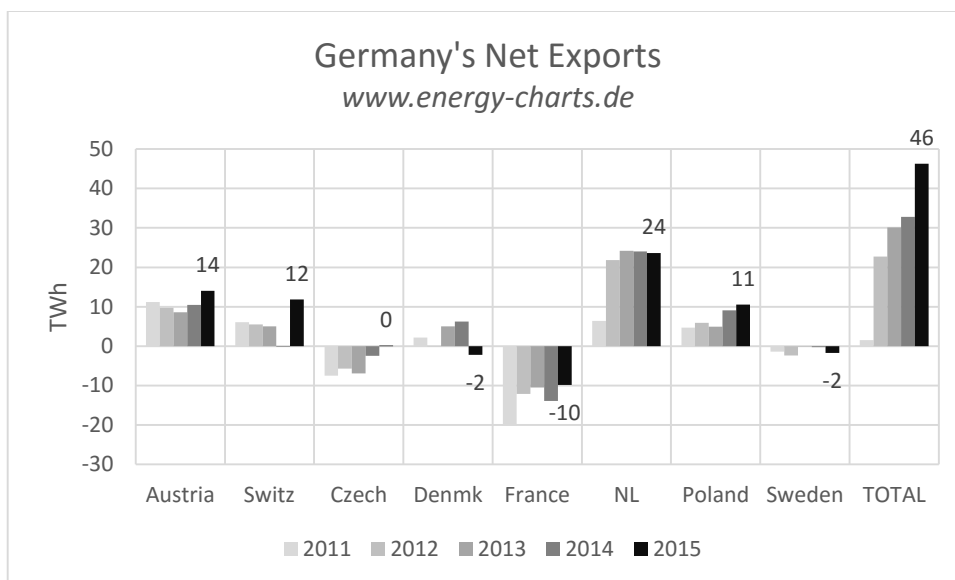


Figure 6

Electricity demand rose around 1.1% in 2015, rebounding from the huge fall of at least 2.3% in 2014.

2015 was largely dominated by a return to normal temperature after a record mild 2014 – especially in February and March (see figure 7). The only exceptions were higher-than-normal electricity demand in July due to an intense hot snap especially impacting demand in Italy and Spain, which was more than offset by very low electricity demand in December due to a record mild month⁴⁴.

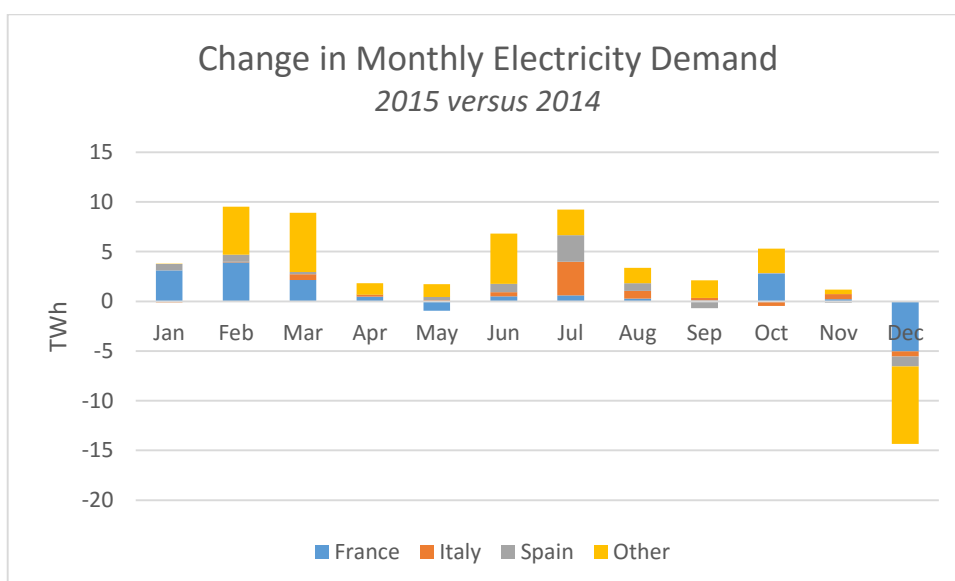


Figure 7

The overall trend is clearly still for falling electricity demand for Europe in total, especially in western European countries (see figure 8).

⁴⁴ In December: Netherlands was +5.9 degrees above normal, Belgium [was](#) +5.7 degrees, England [was](#) +5.0 degrees, Switzerland [was](#) +3.4 degrees, all setting new records.

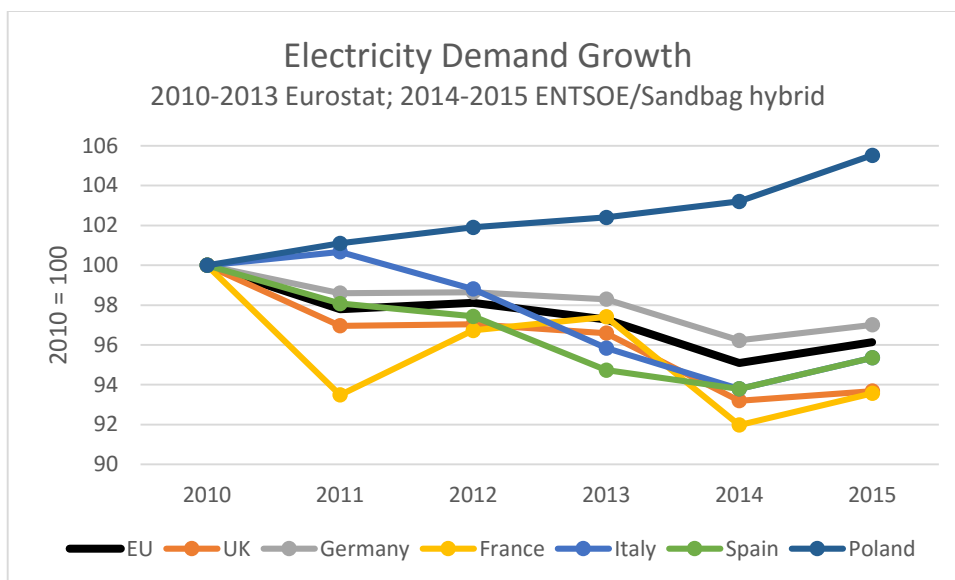


Figure 8

However, electricity demand may no longer be falling in eastern and southern European countries, as the economies pick up speed. It is harder to understand due to larger economic and weather changes in the last few years; it may be for electricity demand to be stable, or even to rise (see figure 9). It is unclear how quickly southern and eastern Europe will be able to delink future economic growth from electricity demand, in the way that western European countries have done.

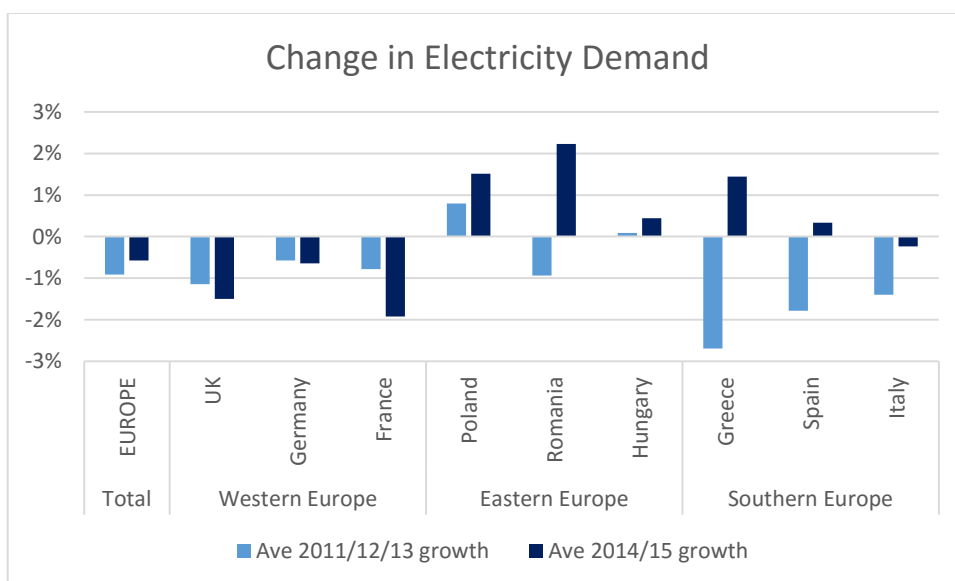


Figure 9

After a large fall in power sector emissions in 2014 of 7.5%, we estimate a 2015 fall of 0.5 % (5Mt).

Figure 10 shows Sandbag's split of EU ETS emissions attributable to the power sector, with our forecast for 2015.

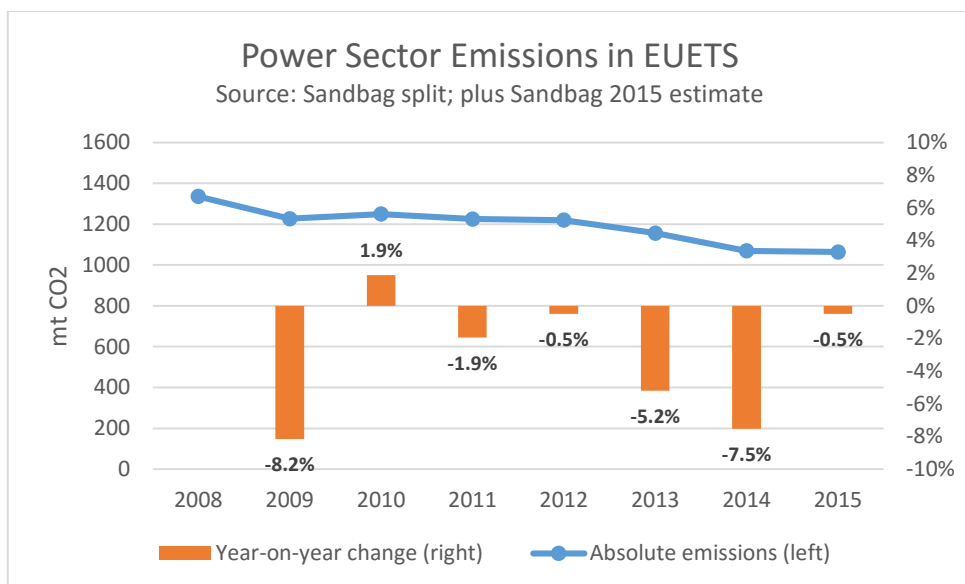


Figure 10

The two long term trends of increasing renewables and falling electricity demand mean that conventional generation is being crushed. However, CO2 emissions are not falling as fast as hoped. This is because the dirtiest generation of all – lignite generation – is the same level in 2015 as it was in 2010. In addition, only 9% of the fall in conventional generation since 2010 can be attributed to hard coal generation (see figure 11).

Instead, most of the fall was from gas generation: in fact gas generation from 2010 to 2015 fell by the same amount as renewables increased. This is because the marginal cost of gas is more currently expensive than coal, when using a low carbon price.

If the fall in gas generation since 2010 had instead happened on coal generation, EU power sector emissions in 2015 would be 15% below were they actually are now.

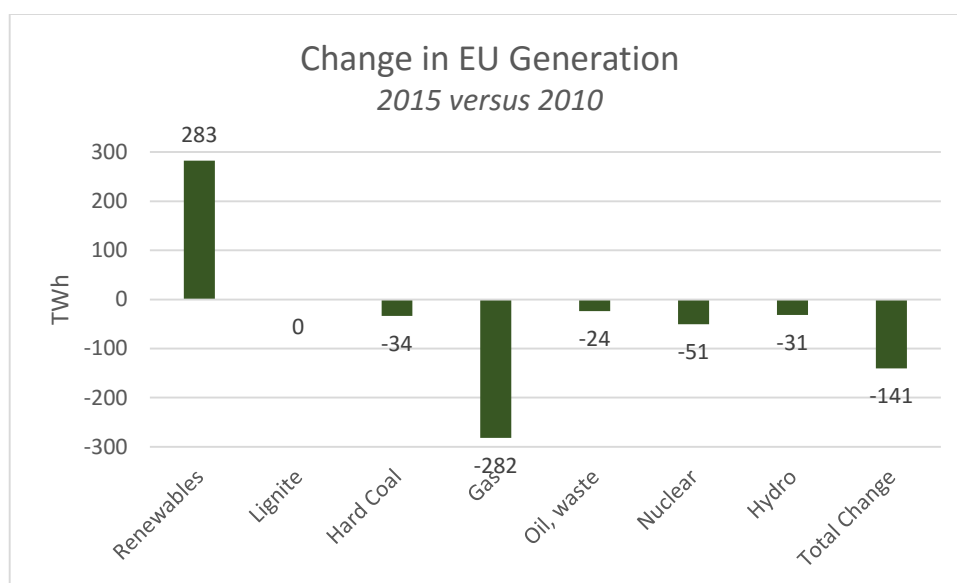


Figure 11.

Figure 12 shows how this trend has been slowly developing over the last years, and that the large falls expected in hard coal generation lignite are yet to come.

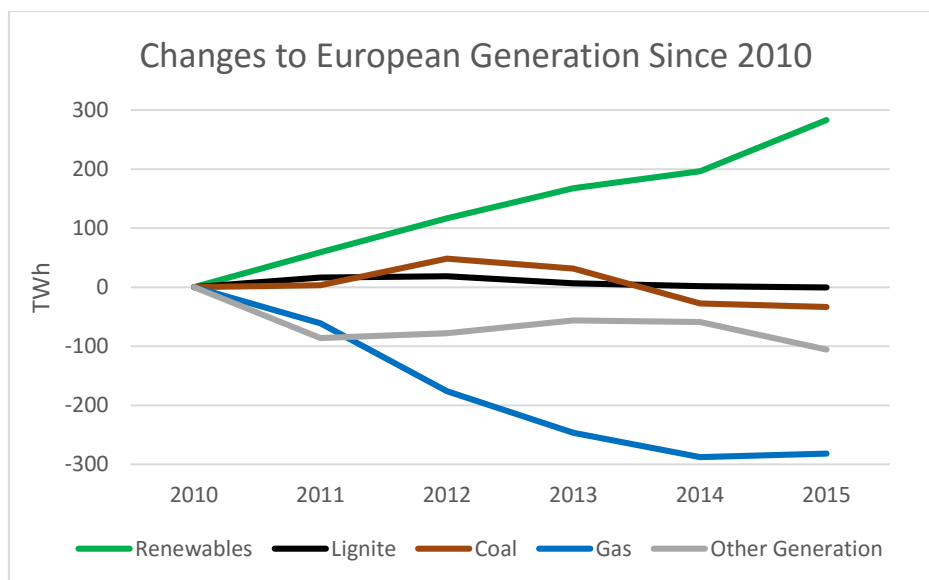


Figure 12

Sandbag Forecast for EU ETS emissions

We believe that total EU ETS stationary emissions for 2015 will fall by 0.7% to 1802Mt, from 1814Mt in 2014. As above, we forecast power sector emissions will fall by 5Mt from 1069Mt to 1064Mt. Industrial emission – which we have less certainty around – we forecast to fall by 1% from 745Mt to 738Mt.

The fall in industrial emissions could well exceed our 1% estimated fall, and is based on an anticipated fall in demand of energy-intensive materials production, as well as a small improvement in energy efficiency. Production in a few key ETS sectors most likely fell in 2015, according to industry associations. For example, EU steel production fell by 1.5% year-on-year to November⁵, 2015 cement production seems likely to show a minor fall⁶, and in the first 6 months of 2015 gas production was down 5%⁷.

Sandbag's forecast has hardly changed: our new 2015 forecast of 1802Mt is only 1.3% different from our previous emissions forecast of 1778Mt made way back in October-2014⁸, and reiterated as unchanged in March-2015⁹. What's more, our 2014 emissions forecast was spot on: in March 2014 we forecast 1814Mt¹⁰, which was the exact level of emissions emitted, and 0.4% different from the 1822Mt that forecast back in October-2014.

We leave our emissions forecast from 2016 to 2020 unchanged from our report published in October-2014. This forecast is for EUETS emissions to fall by a further 21% from 2014 to 2020. This would put the EU economy-wide on track for 30% emissions cuts by 2020, well above the 20% target¹¹.

We have updated the assumptions going into this analysis, and whilst there are some minor changes, we see no need to change our forecast, not least because many of these changes are offsetting each other.

⁵ See World Steel Association [November](#) release.

⁶ See Cembureau [Q3 release](#);

⁷ See European Commission Quarterly report on European Gas Markets for [Q3](#).

⁸ See [Sandbag report](#) "Forecasting the EUETS to 2020"

⁹ See [Sandbag report](#) "The Eternal Surplus of the Spineless Market"

¹⁰ See emissions forecasts submitted to Carbon Pulse [here](#).

¹¹ See [Sandbag report](#) "The EU is on track for 30% emissions cuts by 2030"

For example, whilst coal generation is falling faster in the UK than we anticipated, it is falling slower in Germany; electricity demand may not fall quite as quickly as we anticipated, but renewables generation may increase more; production of energy intensive materials may fall more than we thought, but energy efficiency efforts may be less.

The emissions forecast contains many uncertainties – the biggest of which is how fast coal generation is displaced; our assumptions are for a very large drop in coal emissions. It would probably need further direct intervention to reduce Germany’s lignite generation in order to achieve these falls we have forecast.

Our EUETS stationary emissions forecast, and the history of the Sandbag forecasts, is in figure 13.

	Date of Sandbag forecast			Actual ETS emissions
	Oct-14	Mar-15	Jan-16	
2014	1822	1814		1814
2015	1778	unchanged	1802	
2016	1703	unchanged	unchanged	
2017	1648	unchanged	unchanged	
2018	1573	unchanged	unchanged	
2019	1509	unchanged	unchanged	
2020	1432	unchanged	unchanged	

Figure 13 Sandbag ETS Emissions forecast, in Million Tonnes CO2

Looking Forward

There are a number of reasons to be confident power sector emissions will begin to fall rapidly again in 2016, besides the trends of increased renewables and falling electricity demand.

- There are many upcoming coal closures in 2016.
 - Closure of old Dutch coal plants – 3 old Dutch coal plants have closed in November 2015, and more are required to close in 2016 and 2017 – in total 2.7GW.
 - Closure of 3 UK coal power stations – around 5.8GW of coal plant will close in the UK in March 2016, which means UK coal generation is likely to continue its rapid descent.
 - Closure of a further 4.3GW of old coal plant across the remaining EU in 2016 alone; although virtually none of which is in Germany, the largest coal generator.
- Two Belgian nuclear reactors (2.4GW) returned in December 2015, reducing the need for fossil generation.
- Nuclear plants in Sweden, Switzerland and the Czech Republic also had problems in 2015, which are expected to be resolved for 2016.
- The new Spanish-French interconnector went live in November 2015, which will likely help reduce Spanish coal generation in 2016, as will a return-to-normal in Spanish hydro levels.

But the question of how fast emissions will fall even in the next few years is uncertain.

There are many factors that may lead to an unexpected slowdown in how quickly emissions will fall. And the root of much of this uncertainty comes from government policy.

- **How quickly will renewables generation be built?** The renewable build-rate in many European countries is falling, and it is unclear how much renewable capacity will be built in the future, especially post-2020 when there are no longer legally-binding renewables targets. Also, is it worrying it is concentrated in just 3 countries?
- **How quickly will lignite and hard coal be phased out?** The worsening economics of lignite and hard coal power stations and tightening air quality standards means they will be under pressure to close over the coming years,

but it is hard to know how fast – the fall in gas prices may accelerate closures. On the political side, there were substantial developments in 2015 on phasing out coal generation:

- The UK has committed to phase-out all coal by 2025, although it has yet to decide how to legislate this, and what that would mean for the path to 2025.
 - Germany committed to pay to put a small number of lignite units into a reserve for closure, but it is unclear how quickly the remaining old units will close.
 - The Netherlands has realised that, like Germany and the UK, emissions from coal power stations are undermining national CO₂ targets, and is considering whether a coal phase-out is desirable.
- **How quickly will nuclear generation fall?** Record-low wholesale electricity prices mean nuclear power plants may close sooner than thought, as they simply cease to be economic, meaning an increased reliance on fossil generation. A tax on Swedish nuclear output was the final straw for EON and Fortum, who in 2015 [announced](#) they will close 2 units of their Swedish nuclear plant, Oskarshamn – one unit has been offline since May-2013 so will never return, and the other unit needs a permit before a date is set, but is expected to be 2017-2019.
 - **Will interconnection keep lignite base-loading?** Lignite is the cheapest generation when carbon prices are low. Because of this, when interconnectors are expanded, it can flow into other countries, displacing lower-carbon generation. This is especially true of Germany, where new interconnection will keep increasing German exports even further than now (as [reported](#) by Agora Energiewende).
 - **When will eastern and southern European countries delink electricity demand from economic growth?** In October 2014, Sandbag [forecast](#) European electricity demand would fall by 10% this decade on the basis of efficiency improvements that are happening in western European countries being rapidly replicated across all European countries; this may have been optimistic.
 - **Coal / gas switching is not yet happening.** Even as gas price has collapsed, coal is still cheaper than gas. The exception is the UK, where an additional carbon tax means that UK power stations effectively schedule off a €30/tonne carbon price, which is more than enough to ensure gas comfortably runs ahead of coal. Will a higher carbon price lead to coal/gas switching?

Conclusion

In conclusion, people need not worry that emissions registered only a very small fall in 2015. 2015 was playing catch-up after the large 7.5% fall in 2014. It is clear emissions will resume their fast fall in the coming years – not least because of structurally falling electricity demand and the increase in new renewable capacity.

But because the power sector is seen as the “easy win” in helping reduce Europe’s greenhouse gas emissions, there are high expectations for large, consistent falls in power sector emissions. And policy-makers need to remember that renewables growth is only one of many factors that will determine how quick those emissions falls are.

A stronger carbon price cuts across all of the main uncertainty factors concerning power sector decarbonisation, by worsening the economics of coal and lignite, encouraging fuel-switching, improving the wholesale price for nuclear, and reducing or eliminating subsidies needed for renewable generation.

Structured phase-out programmes for coal and lignite – like that agreed in the UK, and what has begun in Germany – also offer an attractive way to reduce emissions and give investor confidence to invest in renewables and other zero carbon generation, in the move to a decarbonised power system.

About this briefing

Sandbag is a UK-based not-for-profit think tank conducting research and campaigning for environmentally effective climate policies.

Our research focus includes the phase-out of old coal in Europe; deep decarbonisation of industry through technologies including Carbon Capture Utilisation & Storage; reform of the EU Emissions Trading Scheme; and increasing ambition in the EU 2020 and 2030 climate & energy packages

Full information on Sandbag and our funding is available on our website (www.sandbag.org.uk).

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The logo for Sandbag, featuring the word "sandbag" in a bold, lowercase, blue sans-serif font.