

RENEWABLES BEAT FOSSIL FUELS

A half-yearly analysis of Europe's
electricity transition



EMBER

COAL TO CLEAN ENERGY POLICY

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The information in this report is complete and accurate to the best of our knowledge, but if you spot an error, please email dave@ember-climate.org.

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For the last seven years, Ember has published an [annual report into the European power sector](#). This mid-year analysis aggregates electricity grid data from ENTSO-E. We then curate the data to make a robust analysis of Europe's electricity system. The data and further details on the methodology is available [here](#).

Main findings

- 1. Renewable electricity generation exceeded fossil fuel generation, for the first time ever.** In the first half of 2020, renewables - wind, solar, hydro and bioenergy - generated 40% of the EU-27's electricity, whereas fossil fuels generated 34%.
- 2. Renewables rose by 11%.** This was driven by new wind and solar installations and favourable conditions during a mild and windy start to the year. Wind and solar alone reached a record of 21% of Europe's total electricity generation, and reached even higher penetration in Denmark (64%), Ireland (49%) and Germany (42%). Although electricity grids have coped well with record wind and solar penetrations, negative prices are highlighting inflexibilities in supply and demand that need to be addressed.
- 3. Fossil fuels fell by 18%.** Fossil was squeezed on two fronts: by rising renewable generation and a 7% fall in electricity demand due to COVID-19. Coal took the brunt, falling by 32%. Of that, hard coal generation fell 34% and lignite fell 29%. Even gas generation registered a fall of 6%, falling in eleven countries. As a result, EU-27 power sector CO2 emissions fell by about 23%.
- 4. Germany's coal generation collapses below Poland's for the first time.** Poland now generates more coal-fired electricity than Germany, and also as much as the remaining 25 EU countries combined. Whilst most other countries, including Germany, have a plan to phase out coal, Poland doesn't yet have a plan.

"This marks a symbolic moment in the transition of Europe's electricity sector. For countries like Poland and Czechia grappling with how to get off coal, there is now a clear way out. The new European Green Deal will provide both new investment into wind and solar and also a route away from coal through the expanded Just Transition fund. This would help complete Europe's transition from coal to clean electricity."

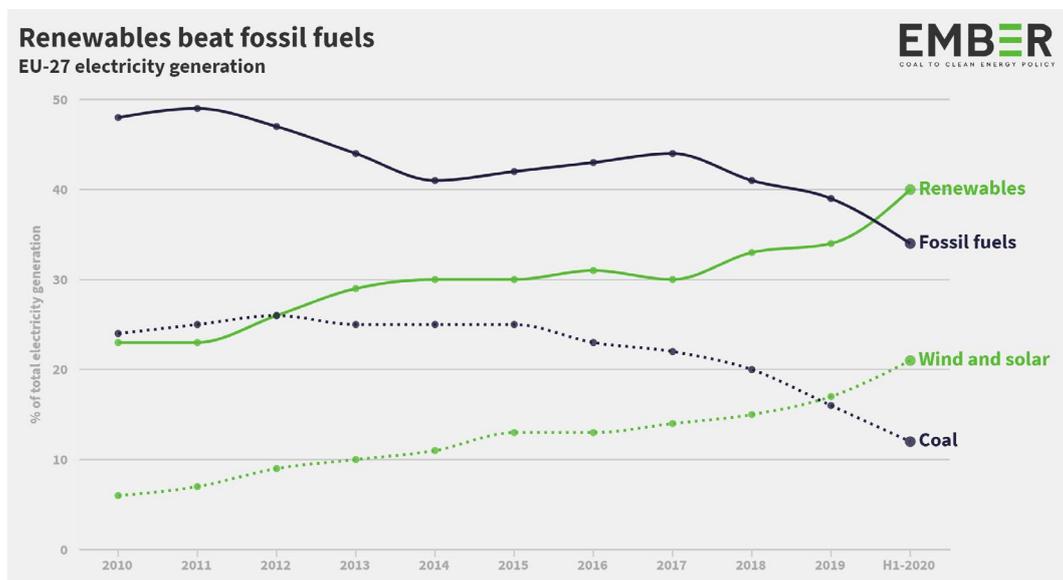
Dave Jones, senior analyst at Ember

Renewables beat fossil fuels

Europe's electricity transition faced a dramatic first half to the year, which culminated in renewable generation overtaking fossil generation for the first time ever.

This continues the trend of the last decade, as renewable generation replaces fossil generation. In the first half of 2020, renewables generated 40% of the EU-27's electricity, whereas fossil fuels generated 34%. Most of this is as coal has been replaced by wind and solar. Coal's market share has halved since 2016 to just 12% of the EU-27's electricity generation. Meanwhile, wind and solar has increased its market share from 13% in 2016 to 21% in the first half of 2020. Hydro generated 13% of Europe's electricity in H1-2020. Bioenergy generated 6% of Europe's electricity in H1-2020, although a small fraction of this (<15%) is generated by burning forest biomass (wood) to replace coal in power stations which should not be assumed to deliver the same climate benefits as renewables such as wind and solar.

FIGURE 1

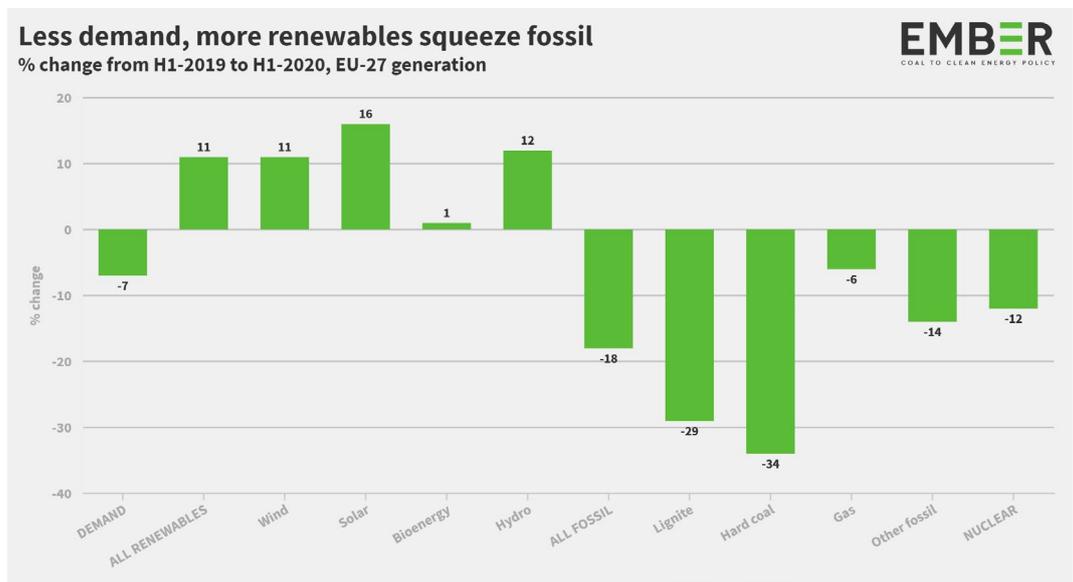


Renewables generation rose by 11% in the first half of 2020. This was mostly due to more wind and solar being installed, although renewables conditions were also quite favourable, with a sunny Q2, a very windy February, and wetter Iberian and Nordic regions giving more hydro generation. Wind rose by 11%, solar by 16%, and hydro by 12%. Bioenergy generation rose by only 1% (the data quality is not great for bioenergy, so we have lower confidence in this number).

Fossil fuel generation fell 18% in the first half of this year, squeezed by falling demand and rising renewables. Electricity demand fell 7% because of COVID-19 and a very mild January and February.

Coal took the brunt, falling by 32% across the EU-27. Of that, hard coal fell by 34% and lignite fell by 29%, in the first half of 2020, year-on-year. But the fall in fossil fuel was so severe that even gas generation registered a fall of 6%. This led to a CO2 reduction of about 23% (76 million tonnes) in the EU power sector.

FIGURE 2



Every country saw a fall in coal generation, if they had any coal to start with. Germany saw the largest absolute fall in coal of 31TWh (a 39% fall). Although German electricity demand fell by less than other countries, coal was impacted more. That's not only because of a rise in renewable generation, but also Germany exported much less electricity because many countries did not need to import as much.

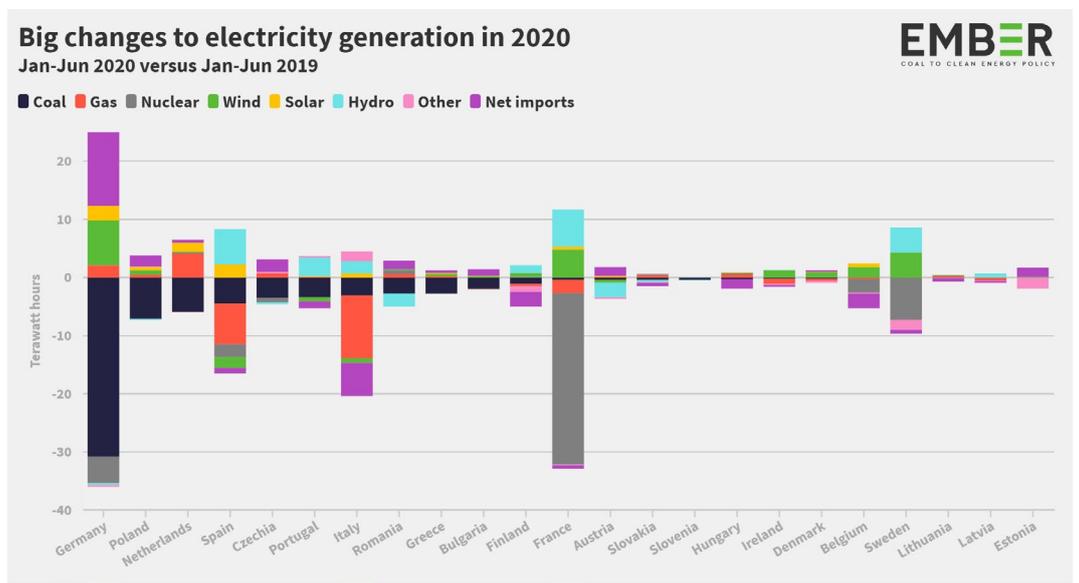
In Poland, Czechia, Bulgaria and Romania coal fell by a sizable proportion - 12%, 20%, 20% and 40% respectively. However, much of that was driven more by increased cheaper imports from neighbouring countries, rather than rising renewables or falling demand. In Poland, coal generation fell by 7.1 TWh against a 1.9 TWh rise in imports. Czechia saw coal down 3.5 TWh, with a 2.1 TWh rise in imports. Bulgaria's coal generation was down 1.9 TWh, versus a rise in imports of 1.1 TWh.

Meanwhile Romania's coal generation decreased by 2.8 TWh compared to a 1.5 TWh increase in imports. So even though these countries are not building much wind and solar, it still has not stopped their coal plants from being negatively impacted.

Eleven countries also saw a fall in gas generation. Spain and Italy saw dramatic falls in gas generation of 20% and 16% respectively, at the same time as coal also fell. With low electricity demand regularly reducing coal generation to near-zero, gas generation - as the next most expensive fuel - started to see large falls. With the possibility of an extended demand downturn ahead, and ever-increasing renewables build, 2019 now looks like peak-gas in the power sector - dashing any lingering gas industry hopes of a revival as coal units close.

France was in its own nuclear world: nuclear output suffered due to COVID-19, and fell 1.5 times more than electricity demand did, which was compensated for by more wind generation and better hydro conditions. EDF's nuclear output suffered because staff shortages meant that some plants had to shut down, and those on maintenance took longer to complete the maintenance.

FIGURE 3

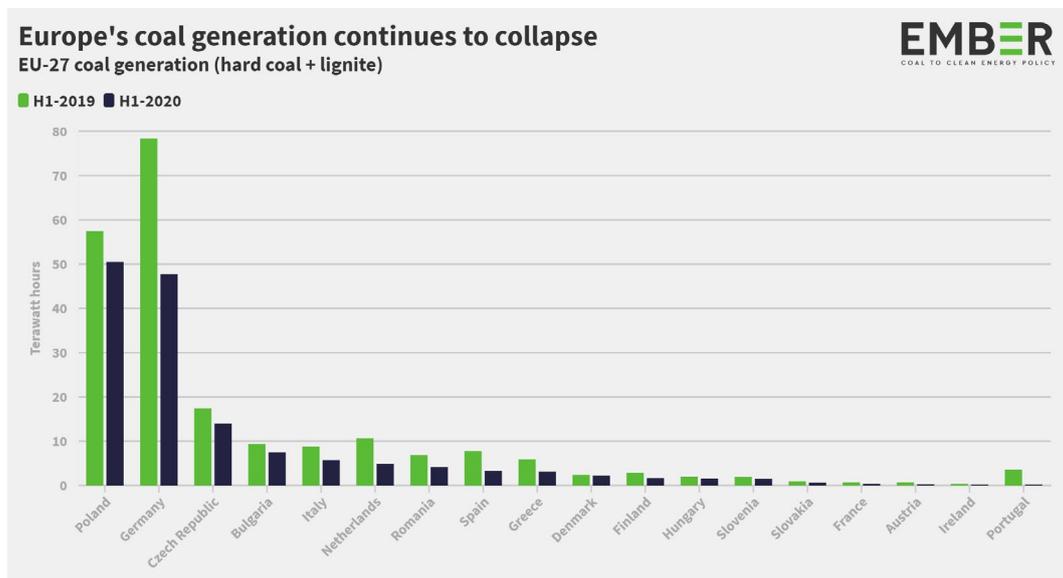


Europe's coal phase-out is gathering pace. Whilst Germany had the biggest fall in absolute terms, it didn't have the biggest fall in percentage terms. Spain's coal generation collapsed 58%, even before it closed half its fleet at the end of June on new air pollution limits. Portugal fell 95% as it saw extended periods completely coal-free; its two last coal plants will be closed by November 2021.

Austria's coal generation more than halved (-54%), as it closed its last coal plant in March; Sweden also closed its last coal plant in March. Greece's coal generation almost halved (-48%) as lignite generation collapsed on lower electricity; PPC had already announced to close all but one lignite plant by 2023. Ireland also fell 48% as its remaining coal plant barely ran.

As coal generation has fallen elsewhere, Czechia was Europe's third largest coal generator so far this year (it was fifth in 2015, since overtaking Spain and Italy), and Bulgaria has risen to fourth (from seventh in 2015).

FIGURE 4



Poland out on a limb

The collapse in coal throughout the rest of Europe has left Poland very exposed. For the first time ever, Germany generated less coal-fired electricity than Poland. Coal also fell in other countries faster than Poland, so that Poland now generates as much coal generation as the remaining 25 EU countries combined.

Poland's reliance on coal, and a lack of wind and solar electricity is keeping prices higher for consumers. Poland's wholesale electricity was 73% more expensive than Germany's in the first half of the year, and second only to Greece for Europe's most expensive electricity.

FIGURE 5

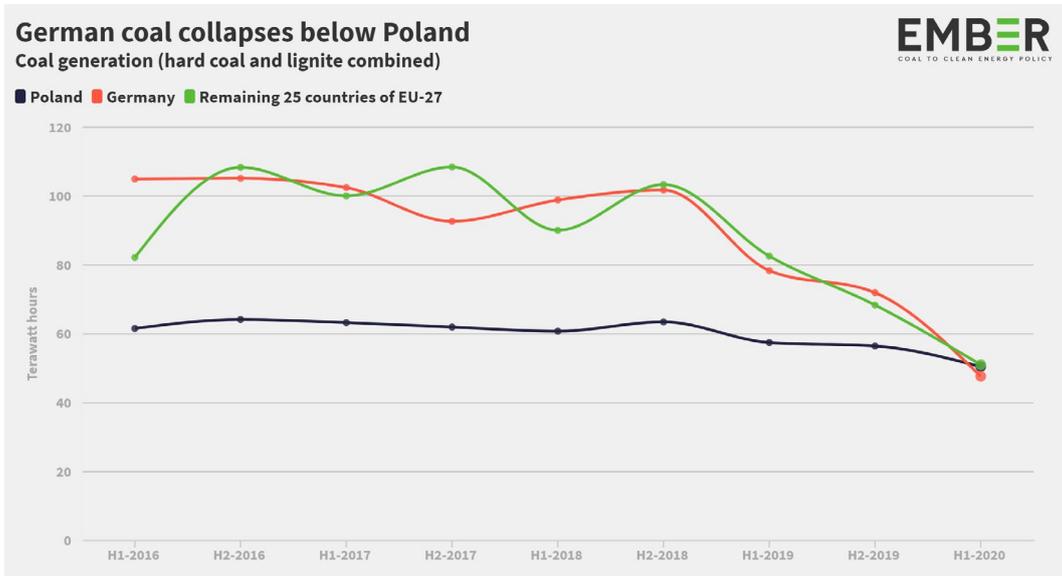
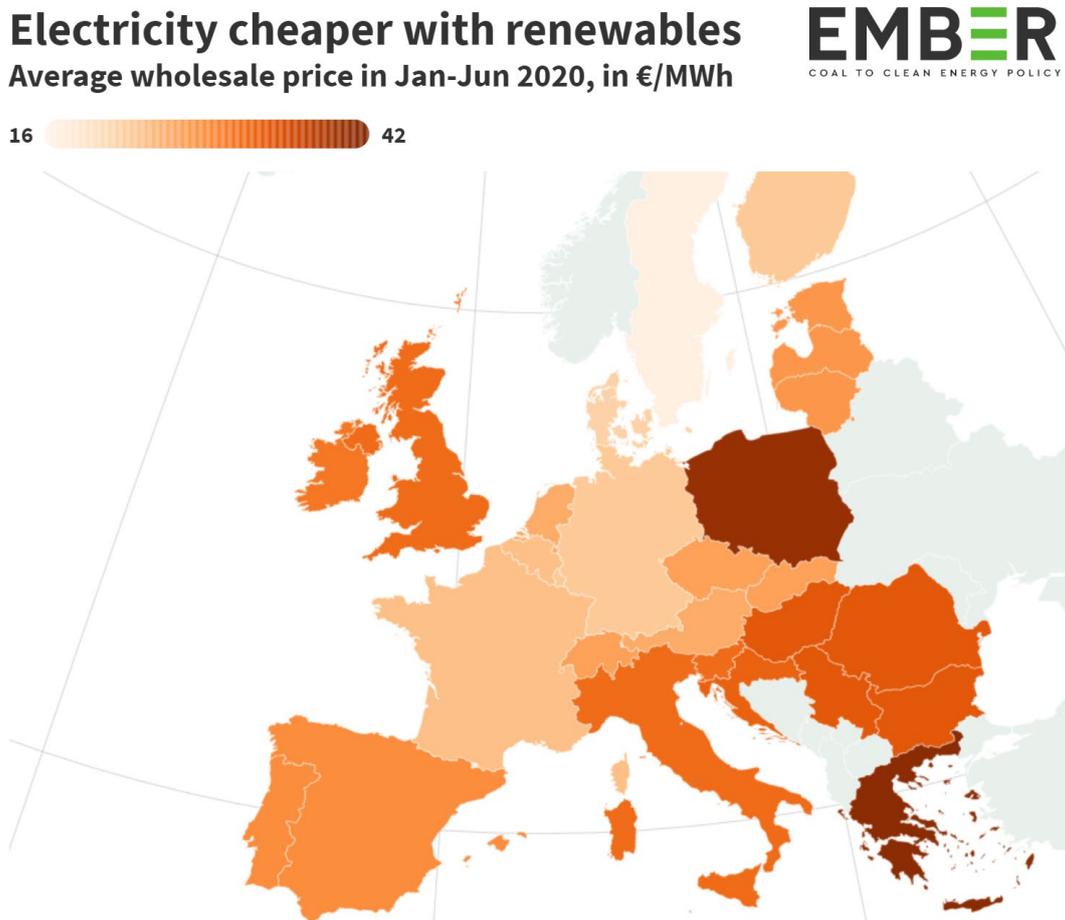


FIGURE 6



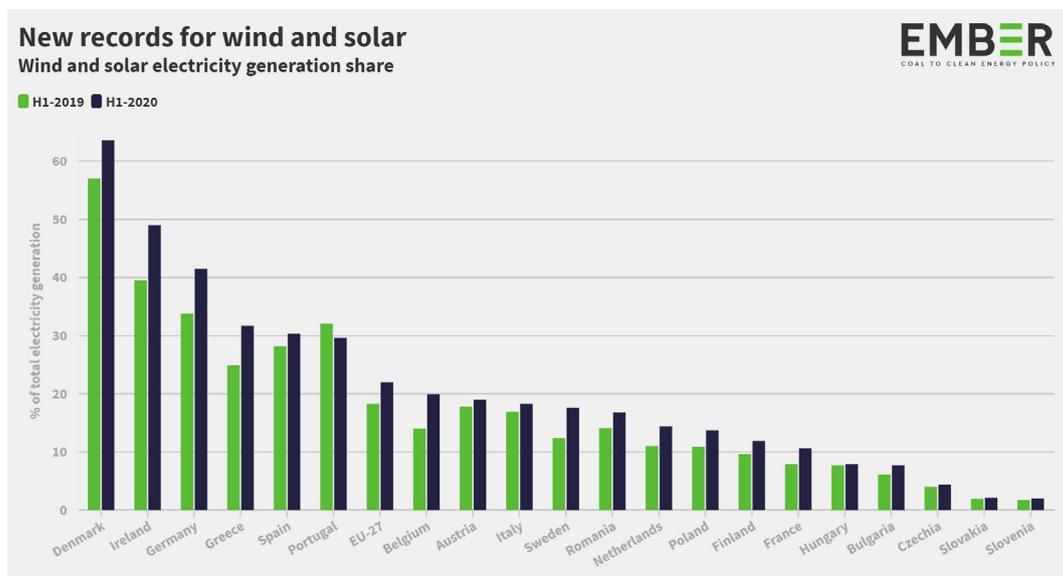
Poland's electricity transition is starting. Poland is stepping up its renewable electricity generation, with solar capacity increasing by [900MW last year](#) and [plans for up to 10GW](#) of offshore wind by 2035. And coal is hurting: the [hard coal mines](#) are struggling to compete against cheaper international coal, and the coal power plants are struggling as carbon prices break €30 per tonne.

But with numerous pots of money available to speed-up the transition, including €40 billion in the newly-expanded Just Transition Fund alone, the coal-to-clean transition can become less of a threat and more of an opportunity.

Wind and solar prove themselves

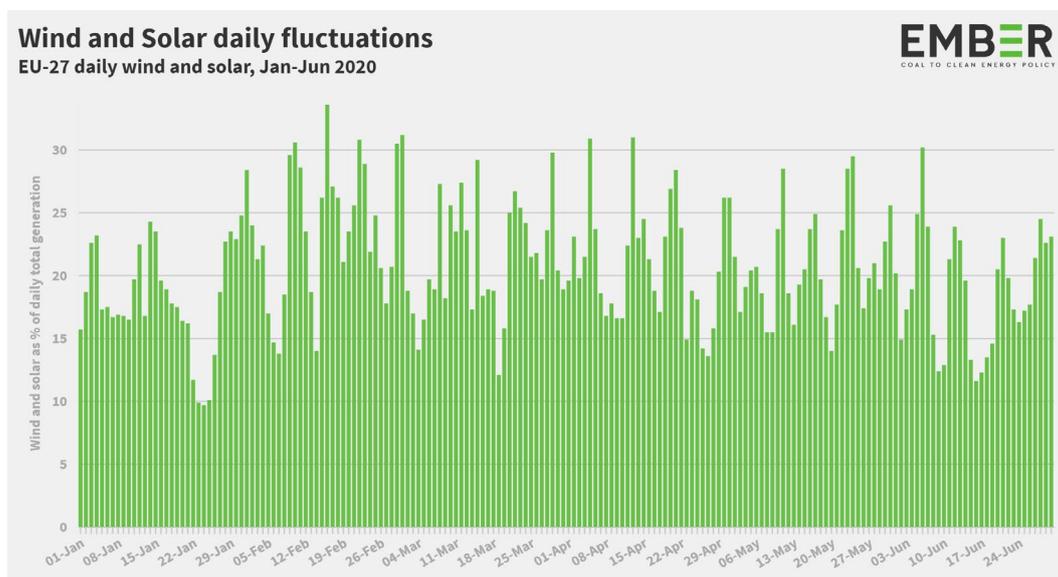
Wind and solar have seen unprecedented market shares this year. That was due to a fall in demand due to COVID-19, but also due to a windy February and a sunny Q2 for much of Europe. Across six months, wind and solar reached 64% of Denmark's total generation, 49% in Ireland and 42% in Germany.

FIGURE 7



Wind and solar alone generated 22% of Europe's electricity generation in the first half of the year. But despite its variability, wind and solar supplied no less than 10% of Europe's electricity generation every day, and no more than 33%. The hourly fluctuations were obviously bigger, especially as solar delivers only during the daylight hours of the day.

FIGURE 8



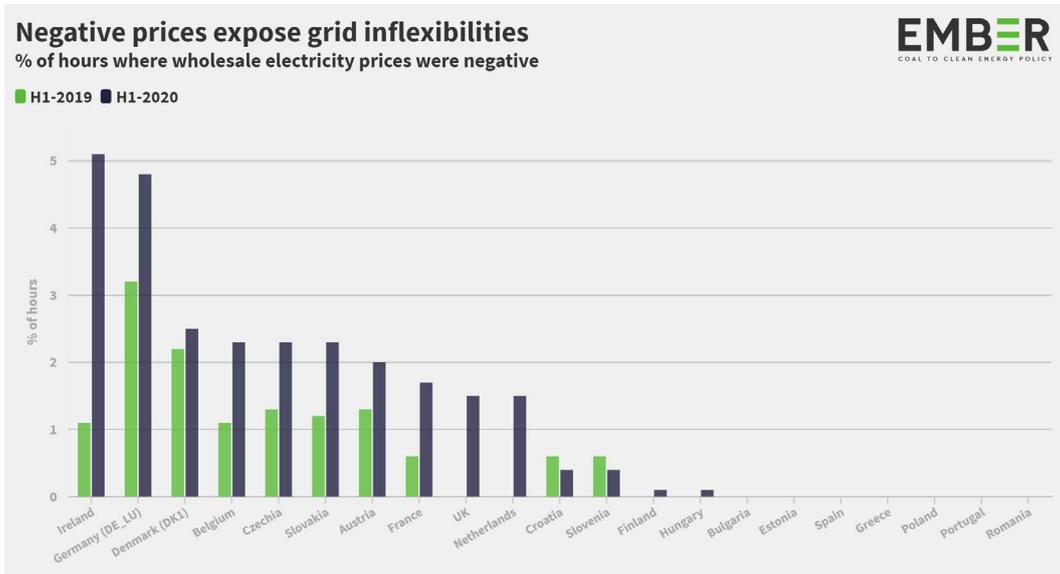
Even with wind and solar's unprecedented share of the electricity mix, Europe's association of electricity grid companies reported no interruptions to [supply](#) in winter, and forecast none for this summer.

However, there have been many instances of negative wholesale electricity prices in many countries. Prices go negative when the supply of electricity is significantly greater than the demand for electricity. Negative prices are an indicator of inflexibility in the electricity system. A lack of flexibility in the electricity system will make the electricity transition more expensive than it would need to be as system operators are forced to take more frequent and more expensive actions to balance the grid. As wind and solar's share of the electricity mix will increase further, there needs to be a big focus by policy-makers on helping to increase the flexibility of the electricity system, to keep the transition as cheap and rapid as possible.

In Ireland, 5% of the time in the first half of 2020 there were negative wholesale electricity prices. The UK, Netherlands, Finland and Hungary showed negative prices for the first time. And elsewhere, the proportion of hours with negative prices increased.

COVID-19 will slow down new wind and solar installations this year. Solar installations will be [lower](#) in Europe in 2020, and wind installations in 2020 are likely to be around 30% [lower](#) than forecast. However, wind and solar installations will need to double or triple in the 2020s compared to last decade, to be on target for 55% emissions reductions by 2030, according to recent modelling by [Climact](#).

FIGURE 9



It's now clear that Europe's coal-to-clean transition is happening quicker than most people expected. On one hand COVID-19 has slowed new wind and solar installations this year, but on the other hand it has shown us that our electricity grids can cope with record shares of wind and solar on the electricity grid, although some inflexibilities have been exposed. Renewables have proved more resilient than fossil fuels in the face of this crisis.

As we move into a period of uncertain economic growth, robust carbon prices and continued renewables expansion it is plain to see that fossil fuels no longer make any economic sense. Now that the European Union has set up funds for a just transition and modernisation for Europe's coal regions, and is agreeing a COVID-19 stimulus package, it's now time for all countries to step up their ambition to cut power sector emissions over the coming decade and complete Europe's transition from coal to clean electricity.¹

1. Footnote on bioenergy: For the purposes of this report, we classify renewables in line with the IPCC (i.e. including bioenergy), however, there is considerable concern that certain uses of bioenergy (in particular the use of forest biomass to replace coal in power stations) will not deliver the same climate benefits as compared to fossil fuels over climate relevant timescales as other forms of renewable energy generation (such as wind and solar). For more information please see Ember's reports: [The Burning Issue](#) (June 2020) and [Playing with Fire](#) (December 2019). Given that wind and solar and hydro alone generated more electricity than fossil fuels, removing bioenergy from 'renewables' figures would not impact the conclusion that renewables generated more electricity than fossil fuels in the EU-27 in the first half of 2020.

