EnAppSys
ENERGY INSIGHT

European Electricity Fuel Mix Summary

Full Year 2020

Generation and Contribution by Fuel Type

Renewables: 1,116TWh (+8%) Fossil Fuels: 923TWh (-6%) Nuclear: 688TWh (-13%)

Percentage changes are from the previous year

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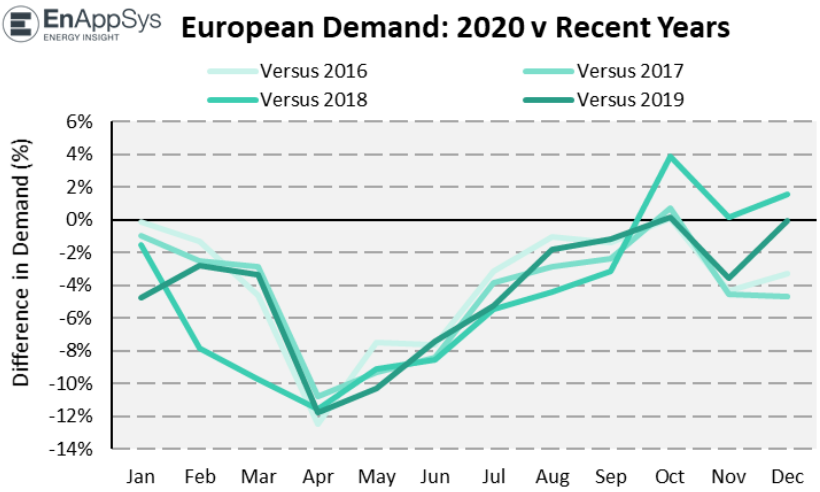
1 Executive Summary

Latest data for year-end shows that total generation levels for 2020 across Europe were 2,727TWh representing a fall of 3% compared with 2019.

Renewable generation (including biomass and waste) contributed 41% of this total continuing the trend of renewables being the largest share of the generation mix that began in 2018. The contribution of wind energy within the renewable segment continues to grow and was 4% higher in 2020 than in 2019, with a 15% share of total generation. Nuclear contributed 25%, gas 19% and coal/lignite 14%.

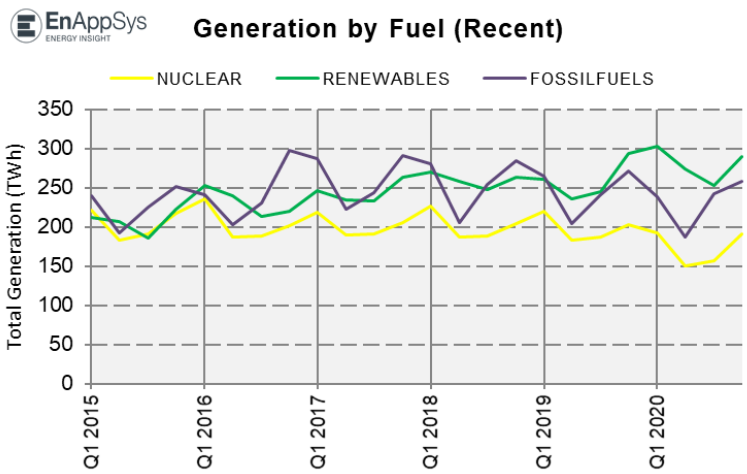
Whilst 2020 generation mix was broadly in line with previous years, the impact of lockdowns on demand levels was noticeable, particularly during Q2 at the height of the lockdowns when reductions in excess of 10% were seen.



2 Fuel Activity Overview

Europe Totals

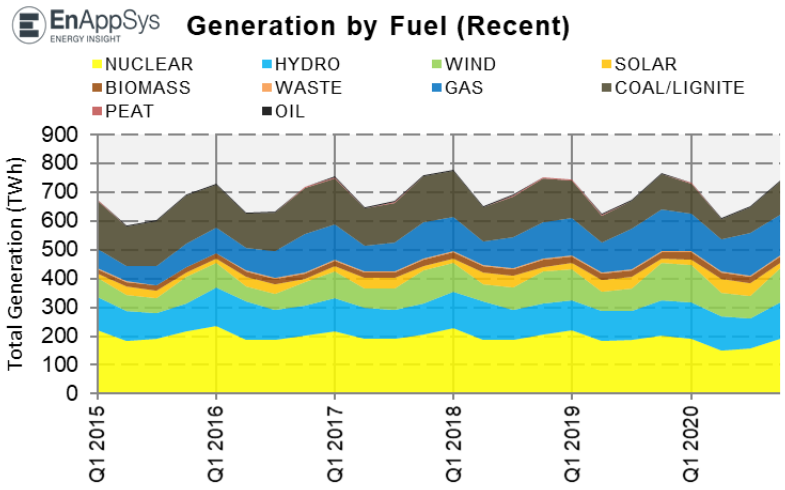
Total generation levels for 2020 across Europe were 2,727TWh representing a fall of 3% compared with 2019.



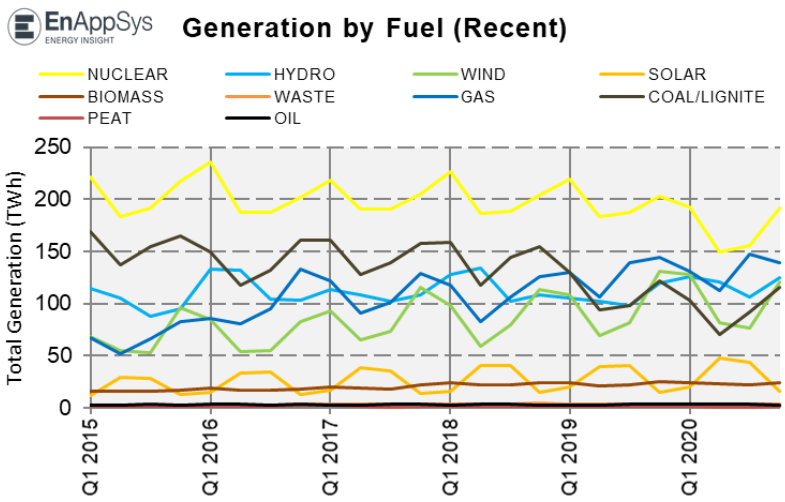
Renewable generation (including biomass and waste) contributed 41% of this total continuing the trend of renewables being the largest share of the generation mix that began in 2018. The contribution of wind energy within the renewable segment continues to grow and was 4% higher in 2020 than in 2019, with a 15% share of total generation. Nuclear contributed 25% and fossil fuels made up 33%.

In total, 1,116TWh was generated by renewables, up 8% from 1,035TWh in 2019.

Fossil fuel generation contributed 923TWh a reduction of 6% from the level of 980TWh seen in 2019, whilst nuclear output contributed 688TWh which was 13% lower than 2019's production of 792TWh.



When individual technology types, rather than groupings (i.e. renewable and fossil fuel), are considered, **nuclear consistently has the largest generation of any single fuel type**. This remains true this year, with the European nuclear total of 688TWh being 159TWh greater than the 529TWh contribution of gas-fired generation, the second highest individual fuel type.



Prior to 2019, hydro and coal/lignite each contributed greater shares of the generation mix than gas-fired generation. However, gas has grown consistently in recent years and the output of 529TWh recorded in 2020 represents a high. Nevertheless, during Q2 as fossil fuel-fired sites across the continent found it harder to run economically under the lower demand of lockdown, hydro contributed more than gas-fired generation.

Interconnector Flows

Across the year, interconnector flows were generally in line with historical norms. France saw a rare month of net imports in Q2. Austria, the Netherlands and Serbia, however, saw net imports in one or two months of Q4, having been net exporters across the summer.

The heatmap below shows net quarterly interconnector flows per country. Blue is net imports and red net exports, with the depth of colour indicating the magnitude of the flow. The countries are ranked left to right by highest to lowest import levels for Q4 2020, with Italy seeing the highest net import levels and Germany the highest net exports.

	ITALY	GB	FINLAND	SWITZERLAND	HUNGARY	AUSTRIA	LITHUANIA	SPAIN	POLAND	BELGIUM	PORTUGAL	GREECE	DENMARK	SLOVAKIA	MACEDONIA	CROATIA	NORWAY	MONTENEGRO	IRELAND (SEM)	LATVIA	ALBANIA	SLOVENIA	ESTONIA	ROMANIA	SERBIA	BOSNIA	NETHERLANDS	BULGARIA	CZECH REPUBLI	SWEDEN	FRANCE	GERMANY
Q1 2015	13.9	4.8	5.1	1.9	1.8	4.1	2.0	0.0	-0.1	4.5	0.3	1.5	1.3	0.4	-0.3	1.2	-1.4	-0.1	0.6	0.5	0.1	0.1	-0.4	-1.3	0.5	-1.0	1.3	-0.3	-2.9	-4.0	-11.0	-20.5
Q2 2015	9.4	5.6	3.1	-2.8	2.7	0.0	1.6	1.2	0.8	5.7	0.8	1.5	2.9	0.3	0.3	1.8	-1.6	0.3	0.4	0.4	-0.1	0.3	0.3	-1.3	-1.3	-0.5	4.2	-2.3	-2.3	-5.6	-14.8	-11.3
Q3 2015	9.5	6.1	4.0	-0.5	2.0	3.2	1.7	0.8	0.1	6.2	1.0	0.6	4.5	0.3	0.7	2.4	-3.3	0.2	0.0	0.6	0.6	-0.3	0.1	-1.8	0.1	-0.5	2.8	-3.2	-1.0	-6.5	-17.0	-14.8
Q4 2015	12.9	4.7	3.9	2.1	1.9	4.4	2.0	3.0	-0.2	4.2	0.2	0.8	2.4	0.5	0.5	1.6	-1.9	0.1	0.1	0.3	0.8	-0.2	-0.2	-2.2	0.2	-0.1	0.5	-1.8	-0.6	-4.7	-15.8	-20.6
Q1 2016	12.2	6.3	5.2	4.1	1.8	4.6	1.9	3.3	0.3	0.7	-2.3	1.4	2.7	0.5	0.3	1.3	-2.8	0.1	0.0	0.6	-0.3	-0.2	-0.1	-1.3	-0.7	-0.9	1.5	-1.2	-1.7	-3.8	-13.1	-20.5
Q2 2016	8.3	5.7	4.1	-2.6	2.5	0.3	1.8	3.2	0.9	2.3	-1.8	1.4	2.9	1.3	0.1	1.5	-3.4	0.0	-0.1	0.2	-0.2	-0.6	-0.2	-1.0	-0.7	-0.6	3.2	-1.4	-2.4	-3.3	-14.2	-9.6
Q3 2016	8.0	4.7	4.7	-1.4	2.0	0.6	2.0	4.4	0.8	0.8	-0.5	1.1	3.0	0.0	0.4	2.3	-3.9	0.2	-0.3	0.7	0.5	-0.6	-1.0	-1.7	-0.6	-0.9	1.9	-2.3	-0.9	-3.3	-9.0	-12.9
Q4 2016	4.4	1.7	4.9	5.0	2.3	3.3	2.0	1.8	-0.9	2.7	-0.5	0.5	0.6	0.8	0.4	1.4	-1.6	0.0	-0.2	-0.1	-0.1	0.2	-0.8	-1.8	0.5	-1.3	-1.8	-1.4	-1.0	-1.6	-0.6	-18.7
Q1 2017	9.6	3.2	5.3	5.4	2.2	3.6	2.3	3.7	-0.6	2.0	-0.5	0.4	0.7	0.9	0.5	1.4	-0.7	0.2	-0.3	-0.3	0.5	-0.2	-0.5	-1.8	1.0	-0.6	-0.8	-0.9	-1.6	-4.4	-8.3	-20.5
Q2 2017	9.0	5.5	5.1	-1.1	2.1	1.7	2.0	5.3	0.6	2.9	-0.5	1.2	2.9	0.9	0.5	2.2	-2.4	0.5	-0.2	0.0	0.3	0.0	-0.8	-1.1	-0.2	-0.2	2.2	-1.2	-2.1	-5.0	-13.3	-15.3
Q3 2017	10.0	5.6	5.1	-1.8	2.3	0.0	2.2	6.1	0.9	-0.3	-1.5	0.4	3.9	0.3	0.4	2.4	-4.7	0.4	-0.6	0.4	1.3	-0.4	-0.6	-0.5	-0.4	-0.5	2.6	-2.0	-1.8	-4.2	-12.3	-11.6
Q4 2017	9.4	1.6	4.7	4.3	2.8	2.5	2.2	0.7	0.9	1.8	0.5	0.5	2.0	0.8	0.3	1.3	-1.8	0.0	0.1	-0.1	0.9	0.0	-0.5	-0.7	0.9	-0.5	-0.4	-1.1	-2.3	-4.1	-1.7	-20.8
Q1 2018	10.4	5.2	5.0	3.4	4.0	3.2	2.5	3.3	1.6	2.4	-0.8	1.1	0.0	0.8	0.0	0.7	-1.5	-0.4	0.1	-0.3	-1.1	-0.1	-0.5	-1.2	0.0	-1.6	0.6	-1.0	-1.0	-3.1	-12.8	-19.4
Q2 2018	9.9	5.1	3.3	-3.8	4.2	0.1	2.2	5.1	2.2	4.6	-0.7	1.2	2.8	1.1	-0.1	1.4	0.1	-0.1	-0.1	-0.3	-1.0	0.0	0.0	-0.4	-0.9	-1.1	4.7	-1.6	-2.1	-6.7	-20.2	-8.7
Q3 2018	9.7	4.9	3.1	-1.6	3.0	4.0	2.3	5.1	0.9	5.0	-1.0	0.8	3.3	1.3	0.0	2.2	-3.1	-0.1	0.0	0.5	0.2	-0.2	-0.7	-0.9	0.3	-1.1	1.7	-2.8	-3.0	-3.1	-15.1	-14.3
Q4 2018	10.4	4.0	2.5	3.9	3.3	4.5	2.7	1.1	1.0	5.3	-0.1	0.4	1.3	1.9	0.4	1.6	-1.9	-0.1	0.2	0.5	0.9	-0.2	-0.1	0.0	1.3	-0.8	-0.4	-2.2	-2.9	-4.3	-11.4	-17.1
Q1 2019	11.5	6.3	5.1	4.5	4.2	3.7	2.5	2.2	2.0	1.8	1.7	0.8	0.7	0.5	0.5	0.4	0.3	0.3	0.3	0.2	0.2	0.1	0.1	0.0	-0.3	-0.4	-1.3	-1.4	-1.9	-5.2	-8.9	-17.9
Q2 2019	9.6	5.6	3.7	-2.1	4.5	-0.7	1.2	2.1	2.6	0.5	1.0	1.8	2.6	0.4	-0.3	0.8	-0.7	0.6	0.0	0.5	-0.1	-0.2	0.6	-0.9	-0.5	-0.4	2.1	-0.1	-1.3	-6.8	-13.1	-2.9
Q3 2019	8.6	4.4	5.1	-5.3	2.8	1.2	2.4	1.2	2.6	-2.9	1.4	2.3	3.1	0.5	0.0	2.4	-3.7	0.6	0.5	0.0	0.1	-0.1	0.4	1.1	0.6	-1.0	1.6	-1.3	-2.3	-5.8	-11.8	-2.8
Q4 2019	10.4	5.2	5.0	0.8	2.6	2.3	2.5	0.7	3.1	-0.9	-0.7	2.6	1.3	0.5	0.7	0.6	1.3	0.3	-0.1	0.1	-0.3	-0.1	0.9	0.7	0.3	-1.1	-0.7	-1.3	-4.2	-6.7	-9.3	-11.8
Q1 2020	11.7	5.6	3.7	1.9	3.4	1.8	2.3	3.0	2.7	0.1	-0.1	3.1	-0.2	0.2	0.8	1.4	-1.1	0.5	-0.1	-0.2	-0.3	0.4	1.0	0.5	0.1	-1.2	0.2	-0.7	-2.0	-8.7	-17.2	-11.7
Q2 2020	2.9	4.6	3.2	-2.9	2.4	-0.4	1.9	1.2	3.7	-0.5	1.6	2.2	2.3	-0.1	0.5	1.4	-5.0	0.2	-0.1	0.2	-0.1	-0.7	1.0	0.6	-0.1	-0.1	0.2	-0.9	-2.0	-5.6	-15.0	3.3
Q3 2020	6.2	2.6	3.9	-3.4	2.6	-0.8	1.8	-1.1	3.6	0.1	0.8	2.3	3.4	0.0	0.1	1.8	-7.2	0.6	-0.3	0.4	0.5	-0.9	0.5	0.6	-0.8	-0.8	-2.9	-1.3	-2.6	-4.7	-1.7	-1.4
Q4 2020	11.4	4.8	3.7	1.0	3.2	1.4	2.1	0.6	2.9	0.3	-0.9	1.3	2.3	0.1	0.8	0.4	-6.5	0.2	-0.2	0.4	0.5	-1.0	1.0	1.1	0.1	-1.1	-0.1	-0.4	-3.1	-5.3	-8.4	-10.7

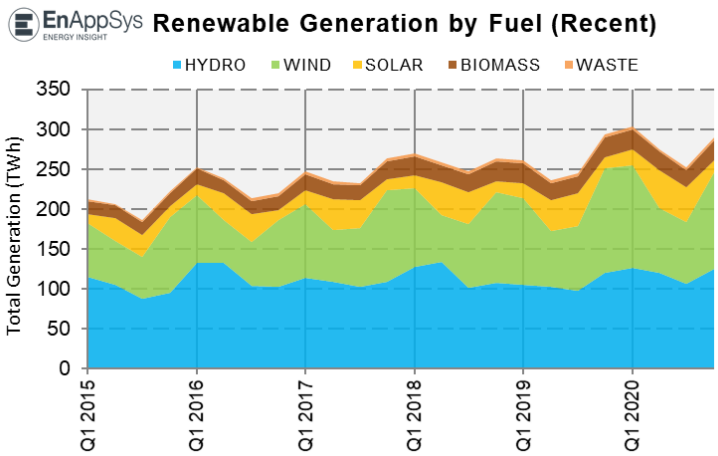
Statistics

The following tables set out key statistics relating to generation this year and the five previous:

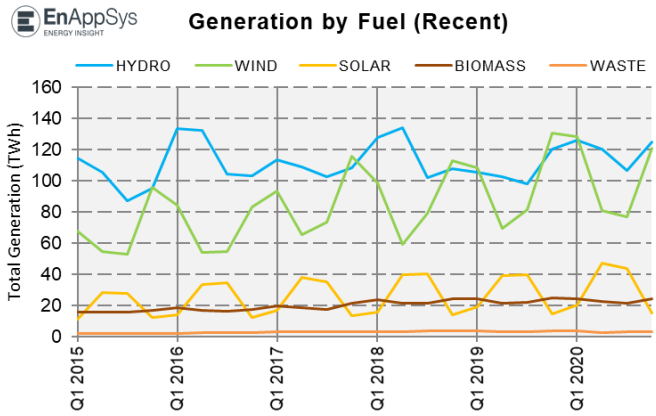
	2015	2016	2017	2018	2019	2020
TOTAL GENERATION BY FUEL (TWh)						
Biomass	64.7	69.9	77.9	91.7	92.7	93.4
Coal/Lignite	624.7	556.5	585.8	575.1	442.4	378.4
Gas	267.9	392.6	441.2	431.2	519.8	529.2
Hydro	402.4	471.7	433.2	471.7	425.7	476.6
Nuclear	813.5	811.0	804.1	806.5	792.9	687.7
Oil	10.4	12.8	12.3	11.4	12.5	12.4
Peat	6.2	6.4	5.3	6.1	5.7	3.2
Solar	80.3	94.7	104.5	111.0	113.2	127.0
Waste	9.6	10.8	13.9	14.9	14.7	13.0
Wind	270.8	275.5	347.8	349.8	389.5	406.3
FOSSIL FUELS	909	968	1,045	1,024	980	923
NUCLEAR	813	811	804	807	793	688
RENEWABLE (INCLUDES WASTE)	828	923	977	1,039	1,036	1,116
TOTAL	**2,550**	**2,702**	**2,826**	**2,869**	**2,809**	**2,727**
Fossil Fuel Percentage	36%	36%	37%	36%	35%	34%
Clean Percentage	64%	64%	63%	64%	65%	66%
Renewable Share of Clean Power	50%	53%	55%	56%	57%	62%
SHARE OF GENERATION (%)						
Biomass	2.5%	2.6%	2.8%	3.2%	3.3%	3.4%
Coal/Lignite	24.5%	20.6%	20.7%	20.0%	15.7%	13.9%
Gas	10.5%	14.5%	15.6%	15.0%	18.5%	19.4%
Hydro	15.8%	17.5%	15.3%	16.4%	15.2%	17.5%
Nuclear	31.9%	30.0%	28.5%	28.1%	28.2%	25.2%
Oil	0.4%	0.5%	0.4%	0.4%	0.4%	0.5%
Peat	0.2%	0.2%	0.2%	0.2%	0.2%	0.1%
Solar	3.1%	3.5%	3.7%	3.9%	4.0%	4.7%
Waste	0.4%	0.4%	0.5%	0.5%	0.5%	0.5%
Wind	10.6%	10.2%	12.3%	12.2%	13.9%	14.9%
FOSSIL FUELS	35.4%	35.6%	36.8%	35.5%	34.7%	33.7%
NUCLEAR	31.9%	30.0%	28.5%	28.1%	28.2%	25.2%
RENEWABLE (INCLUDES WASTE)	32.5%	34.1%	34.6%	36.2%	36.9%	40.9%
Fossil Fuel Percentage	36%	36%	37%	36%	35%	34%
Clean Percentage	64%	64%	63%	64%	65%	66%
Renewable Share of Clean Power	50%	53%	55%	56%	57%	62%
CHANGE SINCE 2015 (%)						
Biomass	0%	8%	20%	42%	43%	44%
Coal/Lignite	0%	-11%	-6%	-8%	-29%	-39%
Gas	0%	47%	65%	61%	94%	98%
Hydro	0%	17%	8%	17%	6%	18%
Nuclear	0%	0%	-1%	-1%	-3%	-15%
Oil	0%	24%	18%	10%	20%	19%
Peat	0%	3%	-15%	-3%	-9%	-48%
Solar	0%	18%	30%	38%	41%	58%
Waste	0%	12%	44%	54%	52%	35%
Wind	0%	2%	28%	29%	44%	50%
FOSSIL FUELS	**0%**	**7%**	**15%**	**13%**	**8%**	**2%**
NUCLEAR	**0%**	**0%**	**-1%**	**-1%**	**-3%**	**-15%**
RENEWABLE (INCLUDES WASTE)	**0%**	**11%**	**18%**	**26%**	**25%**	**35%**

3 Renewables

Across Europe as a whole, 2020 saw 1,116TWh of power production from renewable sources, amounting to 41% of total European electricity generation. This is an increase of 8% from the 1,036TWh in 2019, as wind and hydro output increased.

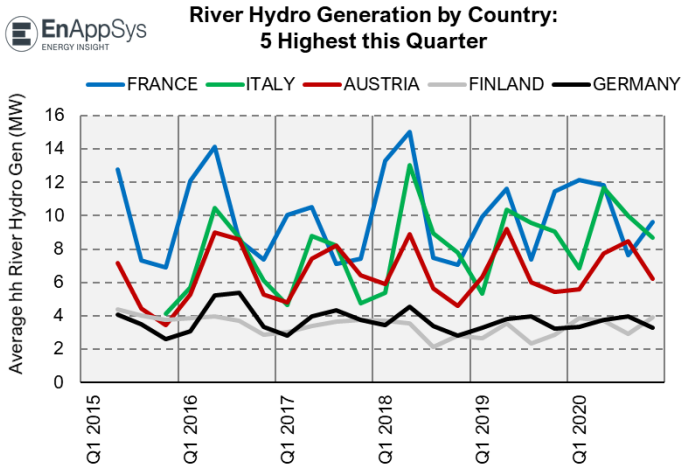


All segments of the renewable sector except waste saw increases in generation from 2019 levels, with solar and hydro seeing increases of 12% in output.

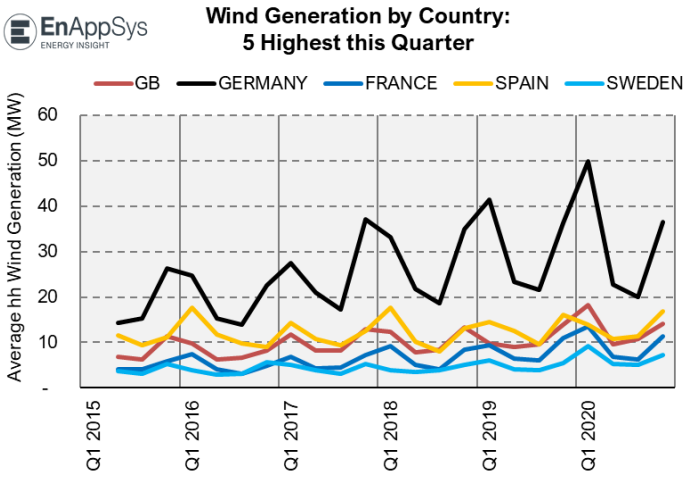


Hydro (reservoir + river) remained the largest individual component of renewable generation contributing 477TWh with wind the next largest segment at 406TWh. This equates to a 43% share of total renewable generation for hydro, versus 36% for wind. Solar provided a further 11% and biomass 8%, with the final 1% from waste.

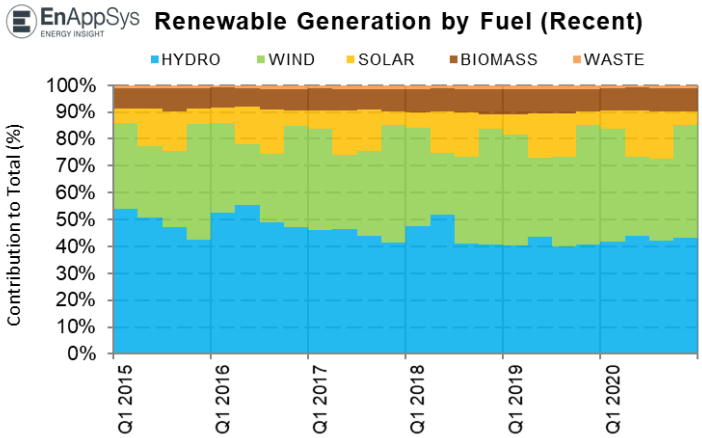
The individual components of hydro generation, run-of-river and reservoir, differ between countries in terms of their largest producers, as can be seen in the chart to the right



The five highest generators of wind energy are shown opposite Germany has maintained its position as highest producer each quarter since 2015.



The fourth largest share of renewable power was the biomass fleet. Biomass output levels have been broadly consistent over the last three years varying from 91.7TWh in 2018 to 93.4TWh in 2020.



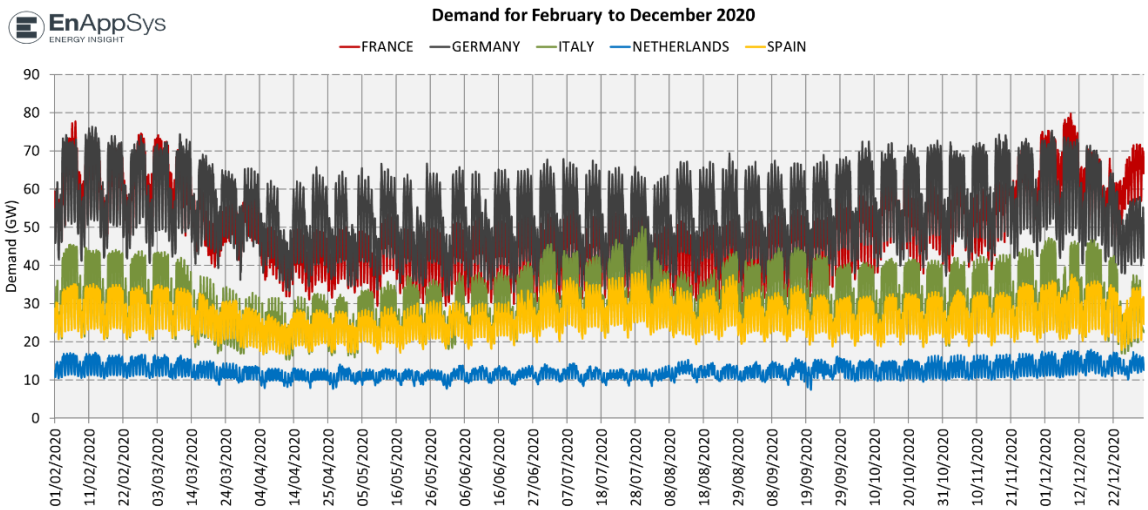
Statistics

The following tables contain some of the key statistics relating to renewable electricity output during the year and the five previous:

	2015	2016	2017	2018	2019	2020
TOTAL GENERATION BY FUEL (TWh)						
Biomass	64.7	69.9	77.9	91.7	92.7	93.4
Hydro	402.4	471.7	433.2	471.7	425.7	476.6
Solar	80.3	94.7	104.5	111.0	113.2	127.0
Waste	9.6	10.8	13.9	14.9	14.7	13.0
Wind	270.8	275.5	347.8	349.8	389.5	406.3
TOTAL	**828**	**923**	**977**	**1,039**	**1,036**	**1,116**
Primary Renewable Source	HYDRO	HYDRO	HYDRO	HYDRO	HYDRO	HYDRO
SHARE OF RENEWABLES (%)						
Biomass	7.8%	7.6%	8.0%	8.8%	8.9%	8.4%
Hydro	48.6%	51.1%	44.3%	45.4%	41.1%	42.7%
Solar	9.7%	10.3%	10.7%	10.7%	10.9%	11.4%
Waste	1.2%	1.2%	1.4%	1.4%	1.4%	1.2%
Wind	32.7%	29.9%	35.6%	33.7%	37.6%	36.4%
CHANGE SINCE 2015 (%)						
Biomass		8%	20%	42%	43%	44%
Hydro		17%	8%	17%	6%	18%
Solar		18%	30%	38%	41%	58%
Waste		12%	44%	54%	52%	35%
Wind		2%	28%	29%	44%	50%

4 Coronavirus Lockdown Effects

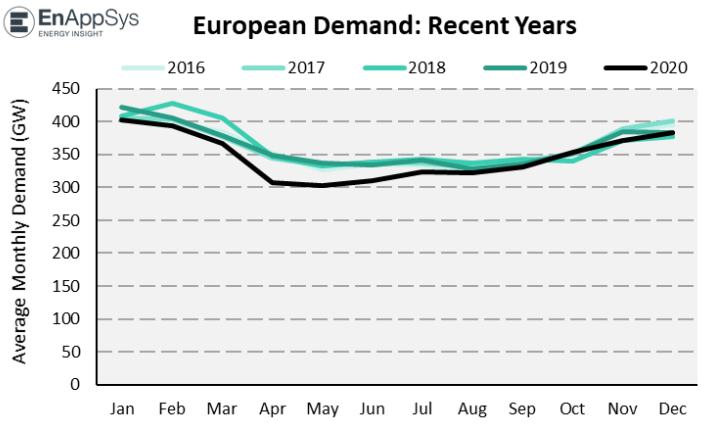
The security measures introduced by the governments of European Nations from Q1 2020 returned in various levels through Q4, having eased somewhat across most of Europe during Q3 2020. Normally demand would be expected to trend upwards in Q4 as the weather in Europe becomes colder, however after an initial rise, decreases were then seen in some countries, such as the examples in the chart below (showing the five countries with the highest demand in Europe).

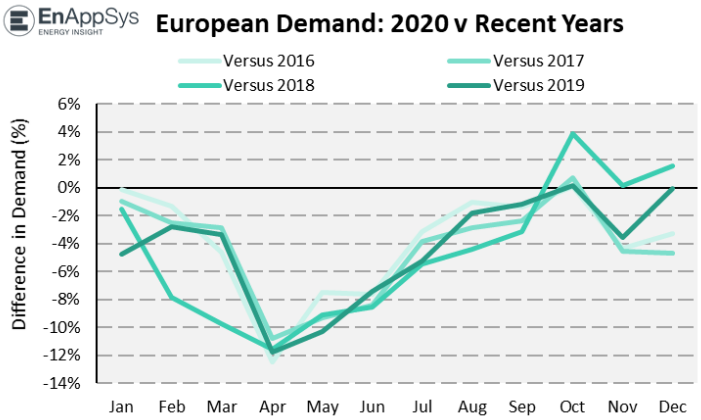


Different European countries have had different demand shapes throughout the pandemic since March, partly due to different strategies of dealing with Covid-19. In February, Germany and France had similar shapes and levels, while in Q2 and Q3, Germany has had significantly higher peaks and lower troughs than France relative to their averages. Moving into Q4, demand in Germany fell more steeply than that in France as the German lockdown increased in severity.

The Italian demand shape saw a large initial dip in February, as steps were first taken to try and control the Coronavirus. Since then, it picked up over the summer, reduced slightly in Q3 and remained relatively stable in Q4.

There can be differences in how demand is reported country to country. Some countries can report it as demand from the grid which excludes demand that is met by local generation and can also include interconnector exports as demand. So, comparisons are not fully on a like for like basis.





The charts to the left compare average monthly demand across Europe as a whole in 2020 against that in 2016-2019. For much of the year, 2020 has seen the lowest average monthly demand of this recent period.

Despite the lockdown effects across the continent, October demand in 2020 was higher than that in all four of these other years (though only very slightly, by ~0.3GW versus 2016).

2018 was the only year to have a consistently lower demand than 2020 across Q4.

5 Notes on the Report

The figures used in the report refer to data provided through ENTSO-E which have been aggregated by EnAppSys into a European total. This data does sometimes suffer from outages or gaps in reporting but is considered to be generally complete. This report is based on the most recently available data as at quarter and year ends.

Included Countries

Albania	Germany	Norway
Austria	Great Britain	Poland
Belgium	Greece	Portugal
Bosnia & Herzegovina	Hungary	Romania
Bulgaria	I-SEM	Serbia
Croatia	Italy	Slovakia
Czech Republic	Latvia	Slovenia
Denmark	Lithuania	Spain
Estonia	Montenegro	Sweden
Finland	Netherlands	Switzerland
France	North Macedonia	

Next to providing a pan-European energy data platform, flexible configurable screens and automated data feeds, EnAppSys offers consultancy services and incredibly detailed market insights for companies in the energy industry.

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