



**EnAppSys**  
ENERGY INSIGHT

# European Electricity Fuel Mix Summary

**2019**

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**Renewables:** 1029.1TWh (-1%)

**Fossil Fuels:** 941.3TWh (-10%)

**Nuclear:** 777.0TWh (-3%)

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## Executive Summary

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European power markets saw renewables overtake fossil fuels in 2019 as generation from fossil fuels dropped 10% from 2018.

This came as fossil fuels generated 941.3TWh, versus the 1029.1TWh produced by renewables and the 777.0TWh produced from nuclear plants.

Overall since 2015, fossil fuels have seen modest growth of 4%, but this fossil fuel generation has become cleaner as generation from gas-fired plants has climbed by 88% over the same period, whilst coal/lignite-fired generation has fallen by 32%.

In 2019, gas-fired plants produced 500.5TWh (up from 265.7TWh in 2015) versus 419.6TWh from coal/lignite (up from 617.6TWh in 2015). This was a shift from the previous year when gas-fired plants generated less power than coal/lignite plants.

Of the power produced from renewables, the majority continue to come from hydro plants, which generated 425.8TWh, with these levels being down from the previous three years.

Whilst growth in hydro generation has been very limited across Europe, wind farms have seen significant changes since 2015, and generated 382.5TWh in 2019 (up from 272.7TWh back in 2015).

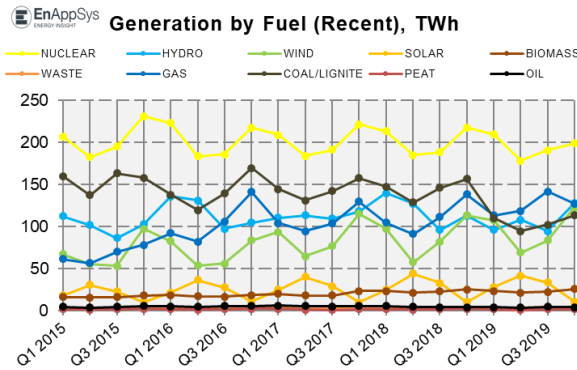
Growth has been much slower at solar projects across Europe which saw generation climb from 81.0TWh in 2015, up to 113.5TWh in 2019. Biomass by contrast has seen more significant growth, but a lower output level for the year just elapsed, climbing from 65.7TWh to 92.6TWh.

In 2019, 37.5% of generation came from renewable projects, 34.3% from fossil fuels and 28.3% from nuclear plants.

On a more detailed basis, 28.3% came from nuclear plants, 18.2% from gas plants, 15.5% from hydro, 25.3% from coal/lignite, 13.9% from wind, 4.1% from solar, 3.4% from biomass, 0.6% from oil, 0.5% from waste and 0.2% from peat.

## Fuel Activity Overview

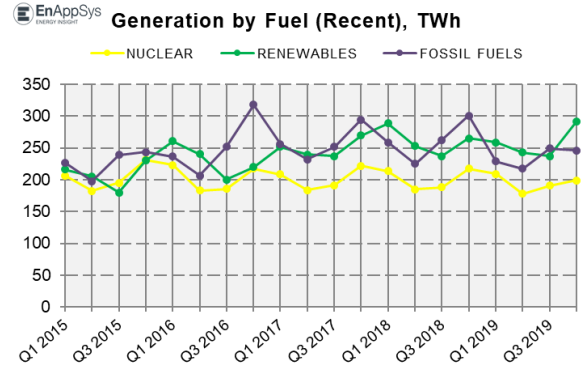
The power markets across Europe have seen levels of fossil fuel fired generation climb



year-on-year from 2015 through to 2018, but 2019 has seen this trend reverse with generation from fossil fuels dropping back from 1047.2TWh in 2018 to 941.3TWh in 2019.

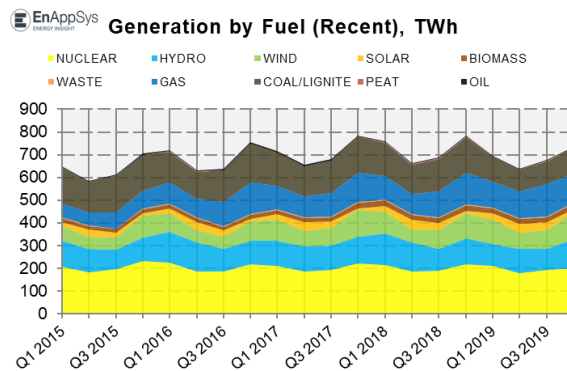
Across this period the levels of generation from fossil fueled plants has risen by 4% from 907.4TWh in 2015, representing a small year-on-year growth.

Over the same period renewables have seen more significant growth, rising by 24% from 831.5TWh in 2015, up to 1029.1TWh in 2019. The consequence of this rise is that in 2019 the data available indicated that renewables in Europe overtook the combined output from fossil generators for the first time.



This comes as across Europe a

number of countries have seen significant growth in renewable output at the expense of



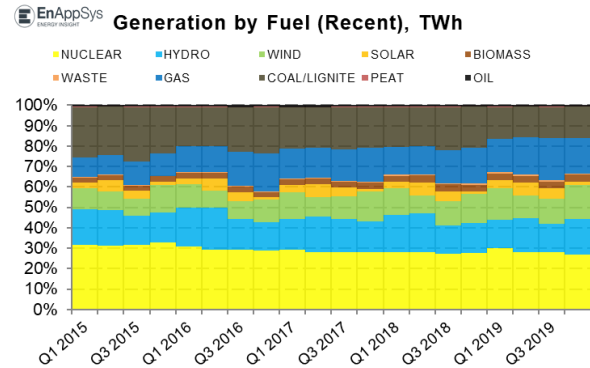
fossil fuels, whilst other countries already had a high share of generation from renewable sources thanks to a large hydro resource; with hydro remaining the largest source of renewable generation in Europe by some margin in 2019.

Over the same period, levels of

nuclear generation have seen a drop from 815.2TWh in 2015, to 804.3TWh in 2018 and then down to 777.0TWh in 2019.

This represents a 5% drop over the full period.

In the year 37.5% of generation came from renewable sources, 34.3% from fossil fuels and 28.3% from nuclear projects. This means that around two-thirds of generation in the year came from clean sources.



### Fossil Fuels

One of the major changes seen in Europe in recent years - and in particular in 2019 – has been a transition from coal and lignite sources to gas.

Coal and lignite still generated a lot of power, amounting to 419.6TWh in 2019, but this was 27% down from the 578.3TWh generated in 2018 and down 32% from the 617.6TWh generated in 2015.

This represents a significant reduction in what is a dirty fuel type with this transition being driven by the low price of gas and increased carbon prices.

In the context of fossil fuels seeing a 4% rise in activity from 2015 to 2019, this transition is key in preventing increased carbon emissions over the period, with increases in gas-fired production at the expense of coal-fired production producing emissions savings that will have more than offset this rise.

As levels of generation from coal and lignite have fallen, gas plants have seen generation increase by 88% from 2015 and by 12% from 2018. Levels of generation in 2015 from gas-fired plants amounted to 265.7TWh in 2015, with this having climbed to 444.9TWh in 2018 and then up to 500.5TWh in 2019.

Levels of fossil fuel generation from oil and peat remain comparatively insignificant at 15.8TWh and 5.4TWh in the year.

### Statistics

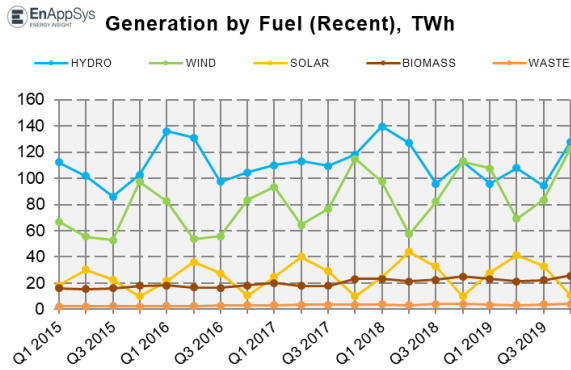
The following tables contain some of the key statistics relating to the year and the quarter:

	2015	2016	2017	2018	2019
<b>TOTAL GENERATION BY FUEL (TWh)</b>					
Biomass	65.7	70.0	79.4	92.4	92.6
Coal/Lignite	617.6	565.6	575.5	578.3	419.6
Gas	265.7	420.9	432.1	444.9	500.5
Hydro	402.6	468.5	450.6	475.1	425.8
Nuclear	815.2	809.4	805.4	804.3	777.0
Oil	17.7	20.3	21.5	17.8	15.8
Peat	6.3	6.3	5.1	6.3	5.4
Solar	81.0	95.6	104.0	111.0	113.5
Waste	9.5	11.2	14.0	15.0	14.7
Wind	272.7	275.3	349.5	349.6	382.5
<b>FOSSIL FUELS</b>	<b>907.4</b>	<b>1013.1</b>	<b>1034.1</b>	<b>1047.2</b>	<b>941.3</b>
<b>NUCLEAR</b>	<b>815.2</b>	<b>809.4</b>	<b>805.4</b>	<b>804.3</b>	<b>777.0</b>
<b>RENEWABLE (INCLUDES WASTE)</b>	<b>831.5</b>	<b>920.6</b>	<b>997.5</b>	<b>1043.1</b>	<b>1029.1</b>
<b>TOTAL</b>	<b>2554.1</b>	<b>2743.1</b>	<b>2837.0</b>	<b>2894.7</b>	<b>2747.3</b>
Fossil Fuel Percentage	36%	37%	36%	36%	34%
Clean Percentage	64%	63%	64%	64%	66%
Renewable Share of Clean Power	50%	53%	55%	56%	57%
<b>SHARE OF GENERATION (%)</b>					
Biomass	2.6%	2.6%	2.8%	3.2%	3.4%
Coal/Lignite	24.2%	20.6%	20.3%	20.0%	15.3%
Gas	10.4%	15.3%	15.2%	15.4%	18.2%
Hydro	15.8%	17.1%	15.9%	16.4%	15.5%
Nuclear	31.9%	29.5%	28.4%	27.8%	28.3%
Oil	0.7%	0.7%	0.8%	0.6%	0.6%
Peat	0.2%	0.2%	0.2%	0.2%	0.2%
Solar	3.2%	3.5%	3.7%	3.8%	4.1%
Waste	0.4%	0.4%	0.5%	0.5%	0.5%
Wind	10.7%	10.0%	12.3%	12.1%	13.9%
<b>FOSSIL FUELS</b>	<b>35.5%</b>	<b>36.9%</b>	<b>36.5%</b>	<b>36.2%</b>	<b>34.3%</b>
<b>NUCLEAR</b>	<b>31.9%</b>	<b>29.5%</b>	<b>28.4%</b>	<b>27.8%</b>	<b>28.3%</b>
<b>RENEWABLE (INCLUDES WASTE)</b>	<b>32.6%</b>	<b>33.6%</b>	<b>35.2%</b>	<b>36.0%</b>	<b>37.5%</b>

	Q4 2017	Q1 2018	Q2 2018	Q3 2018	Q4 2018	Q1 2019	Q2 2019	Q3 2019	Q4 2019
<b>TOTAL GENERATION BY FUEL (TWh)</b>									
Biomass	23.3	23.3	21.4	22.6	25.1	23.1	21.4	22.3	25.8
Coal/Lignite	157.6	147.3	128.6	145.9	156.6	109.9	94.5	102.2	113.0
Gas	129.7	104.7	90.9	111.2	138.1	113.3	118.4	141.5	127.2
Hydro	118.0	139.6	126.9	95.9	112.7	96.0	107.8	94.4	127.6
Nuclear	221.6	213.3	185.0	188.4	217.6	209.2	178.3	190.7	198.8
Oil	5.2	5.2	4.2	4.2	4.1	3.9	3.6	4.2	4.1
Peat	1.4	1.7	1.1	1.5	2.0	1.7	0.8	1.3	1.6
Solar	9.9	24.5	43.8	32.6	10.1	28.2	41.3	33.1	10.9
Waste	3.6	3.7	3.2	4.0	4.0	3.7	3.1	3.9	4.0
Wind	115.0	97.3	57.4	82.0	112.9	107.6	69.0	83.5	122.5
FOSSIL FUELS	294.0	258.9	224.8	262.7	300.8	228.8	217.3	249.3	245.8
NUCLEAR	221.6	213.3	185.0	188.4	217.6	209.2	178.3	190.7	198.8
RENEWABLE (INCLUDES WASTE)	269.8	288.4	252.8	237.1	264.8	258.5	242.6	237.2	290.8
<b>TOTAL</b>	<b>785.4</b>	<b>760.6</b>	<b>662.7</b>	<b>688.1</b>	<b>783.2</b>	<b>696.4</b>	<b>638.2</b>	<b>677.3</b>	<b>735.4</b>
Fossil Fuel Percentage	37%	34%	34%	38%	38%	33%	34%	37%	33%
Clean Percentage	63%	66%	66%	62%	62%	67%	66%	63%	67%
Renewable Share of Clean Power	55%	57%	58%	56%	55%	55%	58%	55%	59%
<b>SHARE OF GENERATION (%)</b>									
Biomass	3.0%	3.1%	3.2%	3.3%	3.2%	3.3%	3.4%	3.3%	3.5%
Coal/Lignite	20.1%	19.4%	19.4%	21.2%	20.0%	15.8%	14.8%	15.1%	15.4%
Gas	16.5%	13.8%	13.7%	16.2%	17.6%	16.3%	18.6%	20.9%	17.3%
Hydro	15.0%	18.4%	19.2%	13.9%	14.4%	13.8%	16.9%	13.9%	17.4%
Nuclear	28.2%	28.0%	27.9%	27.4%	27.8%	30.0%	27.9%	28.2%	27.0%
Oil	0.7%	0.7%	0.6%	0.6%	0.5%	0.6%	0.6%	0.6%	0.6%
Peat	0.2%	0.2%	0.2%	0.2%	0.3%	0.2%	0.1%	0.2%	0.2%
Solar	1.3%	3.2%	6.6%	4.7%	1.3%	4.1%	6.5%	4.9%	1.5%
Waste	0.5%	0.5%	0.5%	0.6%	0.5%	0.5%	0.5%	0.6%	0.5%
Wind	14.6%	12.8%	8.7%	11.9%	14.4%	15.4%	10.8%	12.3%	16.7%
<b>TOTAL GENERATION BY FUEL (TWh)</b>									
Biomass					18.0	18.4	23.3	25.1	25.8
Coal/Lignite					157.9	169.6	157.6	156.6	113.0
Gas					78.3	140.9	129.7	138.1	127.2
Hydro					102.7	104.6	118.0	112.7	127.6
Nuclear					231.2	217.4	221.6	217.6	198.8
Oil					5.4	5.2	5.2	4.1	4.1
Peat					2.0	2.1	1.4	2.0	1.6
Solar					10.0	10.5	9.9	10.1	10.9
Waste					2.3	3.1	3.6	4.0	4.0
Wind					97.4	83.4	115.0	112.9	122.5
FOSSIL FUELS					243.5	317.8	294.0	300.8	245.8
NUCLEAR					231.2	217.4	221.6	217.6	198.8
RENEWABLE (INCLUDES WASTE)					230.4	220.0	269.8	264.8	290.8
<b>TOTAL</b>					<b>705.1</b>	<b>755.2</b>	<b>785.4</b>	<b>783.2</b>	<b>735.4</b>
Fossil Fuel Percentage					35%	42%	37%	38%	33%
Clean Percentage					65%	58%	63%	62%	67%
Renewable Share of Clean Power					50%	50%	55%	55%	59%
<b>CHANGE SINCE Q1 2015 (%)</b>									
Biomass						2%	29%	39%	43%
Coal/Lignite						7%	0%	-1%	-28%
Gas						80%	66%	76%	63%
Hydro						2%	15%	10%	24%
Nuclear						-6%	-4%	-6%	-14%
Oil						-3%	-2%	-23%	-24%
Peat						5%	-29%	3%	-20%
Solar						5%	-1%	0%	9%
Waste						36%	58%	76%	74%
Wind						-14%	18%	16%	26%
<b>FOSSIL FUELS</b>						<b>31%</b>	<b>21%</b>	<b>24%</b>	<b>1%</b>
<b>NUCLEAR</b>						<b>-6%</b>	<b>-4%</b>	<b>-6%</b>	<b>-14%</b>
<b>RENEWABLE (INCLUDES WASTE)</b>						<b>-5%</b>	<b>17%</b>	<b>15%</b>	<b>26%</b>

## Renewables

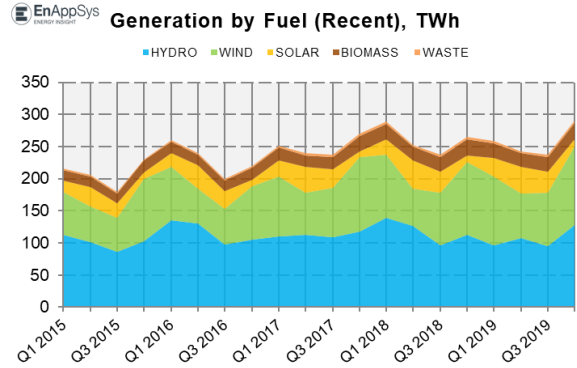
Overall levels of renewable generation dropped slightly (by 1%) between 2018 and 2019,



but have risen by 24% from 2015. This has seen a rise from 831.5TWh in 2015, up to 1029.1TWh in 2019.

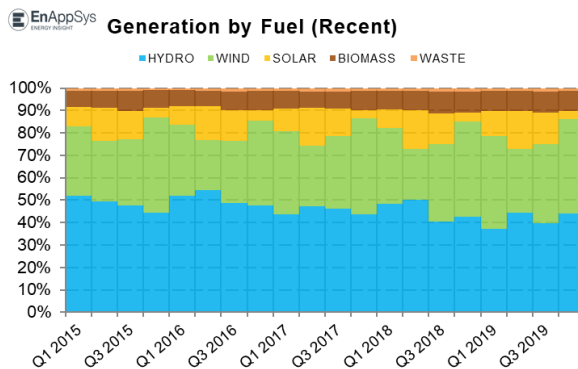
Over this period the smallest rise has come from the hydro fleet, but this fleet continues to generate the largest share of renewable power across Europe as a whole.

Although levels of hydro generation have risen by 6% since 2015, generation levels in 2015 were low and the 425.8TWh of hydro power produced in 2019 was less than the 468.5TWh produced in 2016 and the 475.1TWh produced in 2018.



This effectively means that levels of generation from hydro plants has not been increasing over the period, but despite this hydro plants continue to produce over 40% of all European renewable power.

The next largest share of renewable generation came from wind farms in 2019 and it is



wind farms that have seen the most significant levels of growth since 2015, with 56% of the growth in renewable generation coming from wind farms.

This came as wind farms generated 382.5TWh in the year, with this being up from 272.7TWh in 2015



and 349.6TWh in 2018 (a year-to-year increase of 9%).

The next highest levels of renewable generation came from solar farms, which generated 113.5TWh, with this being marginally up from the 111.0TWh produced in 2018 (up by 2%). These levels have been gradually rising since 2015, when solar farms produced 81.0TWh.

Slightly behind solar projects were biomass projects which have seen significant growth of 41% since 2015 and these projects generated 92.6TWh in 2015.

### Statistics

The following table contains some of the key statistics relating to the year and the quarter:

	2015	2016	2017	2018	2019
<b>TOTAL GENERATION BY FUEL (TWh)</b>					
Biomass	65.7	70.0	79.4	92.4	92.6
Hydro	402.6	468.5	450.6	475.1	425.8
Solar	81.0	95.6	104.0	111.0	113.5
Waste	9.5	11.2	14.0	15.0	14.7
Wind	272.7	275.3	349.5	349.6	382.5
<b>TOTAL</b>	<b>831.5</b>	<b>920.6</b>	<b>997.5</b>	<b>1043.1</b>	<b>1029.1</b>
Primary Renewable Source	HYDRO	HYDRO	HYDRO	HYDRO	HYDRO
<b>SHARE OF RENEWABLES (%)</b>					
Biomass	7.9%	7.6%	8.0%	8.9%	9.0%
Hydro	48.4%	50.9%	45.2%	45.5%	41.4%
Solar	9.7%	10.4%	10.4%	10.6%	11.0%
Waste	1.1%	1.2%	1.4%	1.4%	1.4%
Wind	32.8%	29.9%	35.0%	33.5%	37.2%

	Q4 2017	Q1 2018	Q2 2018	Q3 2018	Q4 2018	Q1 2019	Q2 2019	Q3 2019	Q4 2019
<b>TOTAL GENERATION BY FUEL (TWh)</b>									
Biomass	23.3	23.3	21.4	22.6	25.1	23.1	21.4	22.3	25.8
Hydro	118.0	139.6	126.9	95.9	112.7	96.0	107.8	94.4	127.6
Solar	9.9	24.5	43.8	32.6	10.1	28.2	41.3	33.1	10.9
Waste	3.6	3.7	3.2	4.0	4.0	3.7	3.1	3.9	4.0
Wind	115.0	97.3	57.4	82.0	112.9	107.6	69.0	83.5	122.5
<b>TOTAL</b>	<b>269.8</b>	<b>288.4</b>	<b>252.8</b>	<b>237.1</b>	<b>264.8</b>	<b>258.5</b>	<b>242.6</b>	<b>237.2</b>	<b>290.8</b>
Primary Renewable Source	HYDRO	HYDRO	HYDRO	HYDRO	WIND	WIND	HYDRO	HYDRO	HYDRO
<b>SHARE OF RENEWABLES (%)</b>									
Biomass	8.6%	8.1%	8.5%	9.5%	9.5%	8.9%	8.8%	9.4%	8.9%
Hydro	43.7%	48.4%	50.2%	40.4%	42.6%	37.1%	44.4%	39.8%	43.9%
Solar	3.7%	8.5%	17.3%	13.8%	3.8%	10.9%	17.0%	13.9%	3.7%
Waste	1.3%	1.3%	1.3%	1.7%	1.5%	1.4%	1.3%	1.6%	1.4%
Wind	42.6%	33.7%	22.7%	34.6%	42.6%	41.6%	28.4%	35.2%	42.1%
<b>TOTAL GENERATION BY FUEL (TWh)</b>									
Biomass					18.0	18.4	23.3	25.1	25.8
Hydro					102.7	104.6	118.0	112.7	127.6
Solar					10.0	10.5	9.9	10.1	10.9
Waste					2.3	3.1	3.6	4.0	4.0
Wind					97.4	83.4	115.0	112.9	122.5
<b>TOTAL</b>					<b>230.4</b>	<b>220.0</b>	<b>269.8</b>	<b>264.8</b>	<b>290.8</b>
Primary Renewable Source					HYDRO	HYDRO	HYDRO	WIND	HYDRO
<b>CHANGE SINCE Q1 2015 (%)</b>									
Biomass						2%	29%	39%	43%
Hydro						2%	15%	10%	24%
Solar						5%	-1%	0%	9%
Waste						36%	58%	76%	74%
Wind						-14%	18%	16%	26%

## Notes on the Report

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The figures used in the report refer to data provided through Entsoe which have been aggregated into a European total. This data does sometimes suffer from outages in reporting, but is generally complete.

EnAppSys provides services to companies in the energy and power markets, specifically by providing data, information and consultancy services.

EnAppSys is focused on providing information and analytical services covering the energy sector and is actively growing the business to provide products with enhanced analysis and forecasting capabilities.

The company has a European platform which covers underlying activity across all European markets with more detailed information available across Ireland, Belgium and the Netherlands with additional content in other regions being continuously built out.

To find out more about EnAppSys contact the company at [info@enappsys.com](mailto:info@enappsys.com) or visit the company's website at [www.enappsys.com](http://www.enappsys.com).