



# GB Electricity Market Summary

**FOURTH QUARTER 2016**  
**OCT TO DEC**

Recorded Levels of GB Generation by Fuel (based upon Ofgem & NG Embedded Forecasts & FUELHH data):

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**GAS:** 17.1GW (+30%)  
**COAL:** 3.6GW (+249%)

**RENEWABLES:** 8.1GW (+16%)  
**INTERCONNECTIONS:** 0.7GW (-66%)

**NUCLEAR:** 7.9GW (+0%)

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## EXECUTIVE SUMMARY

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The fourth quarter of 2016 saw demand for electricity generation climb 31% from the previous quarter to 81.3TWh (up 2% from the levels noted in Q4 2015). This led to increased levels of generation across the market, with gas-fired power stations continuing to be the primary source of electricity generation in the market.

These gas-fired power stations generated 37.7TWh in the quarter; with these levels being significantly up from the 22.5TWh noted in the fourth quarter of 2015 (a rise of 68%). Levels of coal-fired generation by contrast were significantly down at 7.8TWh (from 16.5TWh) across the same year-to-year comparison (a fall of 52%).

This flip came as a result of increased carbon taxes, which has a larger impact upon coal stations due to their higher carbon intensities, and lower gas prices versus Q4 2015.

This activity resulted in levels of fossil fuel generation that were 17% up from 2015, with 45.7TWh of fossil fuel electricity output in the quarter. This rise resulted from the higher levels of demand and lower than usual levels of renewable generation in the quarter, but remains well below the 70.5TWh of fossil fuel generation that was recorded back in Q4 2010.

The fall in levels of renewable generation came as levels of wind generation fell 4% from Q4 2015, dropping from 9.7TWh (in Q4 2015) to 9.2TWh (in Q4 2016) and as levels of hydro generation also fell.

The renewable source that saw the most significant gains the quarter was solar power, with a 37% increase from Q4 2015, although with levels of sunlight being much reduced in winter quarters, solar generated the least power of all sources of renewables; but only just generated less power than hydro plants despite it being a winter quarter.

Biomass saw levels of output climb 4% to 6.5TWh, with both biomass and wind providing significantly more power than hydro and solar, which generated 1.2TWh and 1.0TWh respectively.

Also boosting fossil fuels was a 66% decrease in levels of interconnector imports on a year-to-year basis, with much reduced levels of imports from France being noted and with this occurring as a result of nuclear outages in France that increased their need to import power. France will more typically be exporting power at this time of year as a result of it generating a surplus of power from its nuclear stations.

Aside from the changes in fuel mix composition, the most prominent activity in the quarter were system prices peaks of £1,529/MWh (which compares against a peak of £178/MWh in Q4 2015).

These high prices came as commercial margins in the market fell to 1.2GW, although this excludes 3.5GW of reserve capacity that could not be used commercially and that could only be used as a last resort.

This meant that while the system was secure throughout the quarter, the commercial margins were not, with this resulting in frequent high prices and despite low commodity prices in the quarter, day ahead prices increased from £37.74/MWh in Q4 2015 to £52.25/MWh in Q4 2016 and system prices

increased from £42.20/MWh to £51.45/MWh over the same period. These price increases were driven by the tighter commercial margins.

From next winter the Capacity Mechanism is expected to come in, which will mean that all margin in the market will be commercially available. This should result in fewer high prices and Q4 2016 is likely to be the highest prices fourth quarter for the foreseeable future.

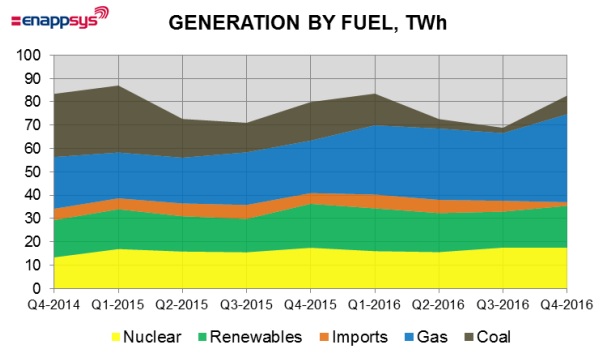
Q1 2017 still has the potential to see some very high priced market activity as commercial margins will remain tight across this period. Otherwise the system should continue its current trends into 2017 with gas plants seeing generating costs marginally less than those at coal stations and with renewables slowly seeing higher levels of output having adjusted for variations in weather conditions as new capacity comes online.

## FUEL ACTIVITY

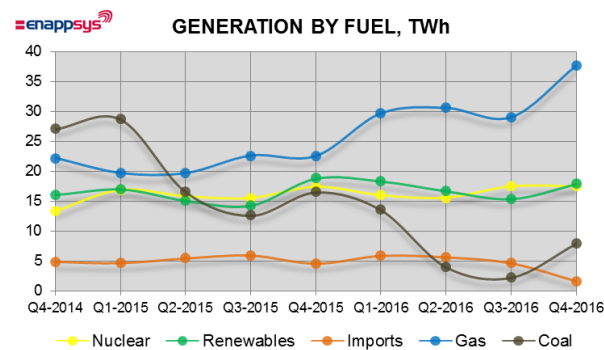
Levels of imports along the interconnectors fell and levels of nuclear generation were similar to those in the third quarter of the year, but otherwise fuel types generally saw increases in levels of generation as demand for electricity generation rose from Q3 to Q4 2016.

Gas-fired power stations were the predominant source of electricity generation in the quarter with 37.7TWh of electricity generation (up 30% from Q3 2016 and up 68% from Q4 2015) and provided 45.6% of total electricity generation in the quarter.

This came as gas prices continue to remain low and as gas-fired power stations continue to be boosted by the high UK-based carbon taxes that have decreased levels of generation at coal-fired power stations.



The next largest source of electricity generation was from renewable generators which provided 17.9TWh of electricity generation in the quarter (up 16% from Q3 2016, but down 5% from Q4 2015).



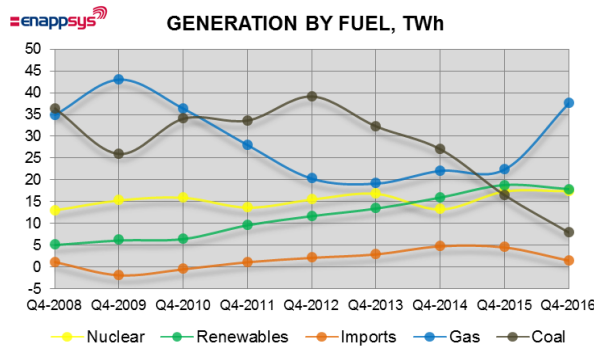
This year-to-year drop came as weather conditions were not as favorable as in 2015 (reducing wind and hydro output).

Despite coal seeing higher generating costs than gas in the quarter, the lower than usual levels of winter renewable generation meant that coal saw an uptick in generation from the very low levels in Q3 2016 when coal for long periods saw

no generation whatsoever.

In the quarter, coal-fired power stations generated 8.0TWh (up 249% from Q3 2016, but down 52% from Q4 2015). This activity shows how the market has changed since the previous year, with a very large rise in gas output resulting in considerably lower levels of coal-fired generation than those noted in the previous year.

The past few years have seen considerable change and in winter this has been most notable in the decreasing levels of coal-fired generation since Q4 2012 with these decreases having primarily benefitted renewables and interconnectors up until Q4 2015, but having significantly benefitted gas-fired power stations in Q4 2016 (as renewable and interconnector generation stalled).



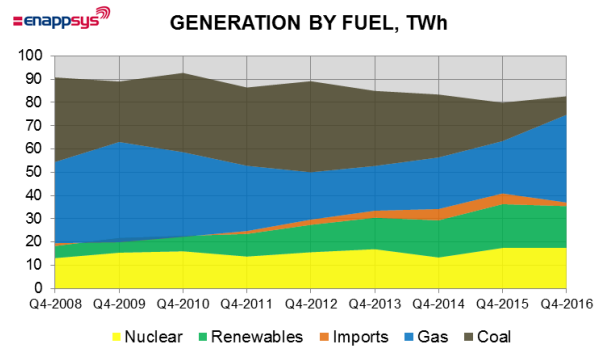
These high levels of gas-fired generation were aided by reductions in levels of renewable generation and imports from the continent with nuclear outages in France resulting in lower imports into Britain from France in the quarter.

These interconnector imports were equivalent to 1.6TWh of generation

(down 66% from both Q3 2016 and Q4 2015).

Nuclear plants continued to see largely unchanged levels of generation and in the quarter generated a total of 17.5TWh which represented no change from either of Q3 2016 or Q4 2015.

For fossil fuels, Q4 has been an increasingly problematic quarter with the share of generation from fossil fuels having fallen from 85.4% in Q4 2008 to 56.7% in Q4 2015.



In 2016 this trend didn't reverse, but the share of generation from fossil fuels only fell very slightly to 55.2%, providing a boost to all fossil fuel generators and in particular gas-fired generators that provided the majority of this electricity generation. However, in terms of absolute levels of generation fossil fuel output was up to 45.7TWh (from 39.0TWh) offsetting some of the large drop from 70.5TWh back in Q4 2010.

In the quarter gas-fired power stations generated to most power (at 45.6%), then renewables (at 21.7%), then nuclear (at 21.2%), then coal-fired stations (at 9.6%) and interconnector imports providing the remaining power at 1.9% of the total.

## Statistics

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

*GB Only (Excludes Northern Ireland)	Q4-2014	Q1-2015	Q2-2015	Q3-2015	Q4-2015	Q1-2016	Q2-2016	Q3-2016	Q4-2016
<b>TOTAL GENERATION BY FUEL (TWh)</b>									
Coal	27.07	28.70	16.60	12.63	16.53	13.56	4.05	2.28	7.97
Gas	22.18	19.65	19.63	22.57	22.50	29.68	30.58	29.02	37.70
Imports	4.86	4.69	5.48	5.98	4.60	5.92	5.67	4.65	1.57
Nuclear	13.34	16.90	15.81	15.51	17.45	15.98	15.57	17.51	17.52
Renewables	16.00	17.05	15.15	14.31	18.83	18.37	16.74	15.42	17.90
<b>TOTAL</b>	<b>83.44</b>	<b>86.99</b>	<b>72.67</b>	<b>71.01</b>	<b>79.91</b>	<b>83.51</b>	<b>72.61</b>	<b>68.88</b>	<b>82.66</b>

<b>SHARE OF GENERATION (%)</b>									
Coal	32.4%	33.0%	22.8%	17.8%	20.7%	16.2%	5.6%	3.3%	9.6%
Gas	26.6%	22.6%	27.0%	31.8%	28.2%	35.5%	42.1%	42.1%	45.6%
Imports	5.8%	5.4%	7.5%	8.4%	5.8%	7.1%	7.8%	6.7%	1.9%
Nuclear	16.0%	19.4%	21.8%	21.8%	21.8%	19.1%	21.4%	25.4%	21.2%
Renewables	19.2%	19.6%	20.9%	20.2%	23.6%	22.0%	23.1%	22.4%	21.7%

*GB Only (Excludes Northern Ireland)	Q4-2008	Q4-2009	Q4-2010	Q4-2011	Q4-2012	Q4-2013	Q4-2014	Q4-2015	Q4-2016
<b>TOTAL GENERATION BY FUEL (TWh)</b>									
Coal	36.35	26.01	34.10	33.68	39.18	32.31	27.07	16.53	7.97
Gas	34.93	43.10	36.41	28.06	20.37	19.24	22.18	22.50	37.70
Imports	1.23	-1.78	-0.40	1.22	2.22	3.01	4.86	4.60	1.57
Nuclear	13.08	15.41	16.01	13.76	15.60	16.93	13.34	17.45	17.52
Renewables	5.21	6.29	6.61	9.73	11.80	13.51	16.00	18.83	17.90
<b>TOTAL</b>	<b>90.80</b>	<b>89.03</b>	<b>92.74</b>	<b>86.46</b>	<b>89.18</b>	<b>85.01</b>	<b>83.44</b>	<b>79.91</b>	<b>82.66</b>

<b>SHARE OF GENERATION (%)</b>									
Coal	43.6%	29.9%	46.9%	47.4%	49.0%	38.7%	37.3%	24.0%	9.6%
Gas	41.9%	49.6%	50.1%	39.5%	25.5%	23.0%	30.5%	32.7%	45.6%
Imports	1.5%	-2.1%	-0.6%	1.7%	2.8%	3.6%	6.7%	6.7%	1.9%
Nuclear	15.7%	17.7%	22.0%	19.4%	19.5%	20.3%	18.4%	25.3%	21.2%
Renewables	6.2%	7.2%	9.1%	13.7%	14.8%	16.2%	22.0%	27.3%	21.7%

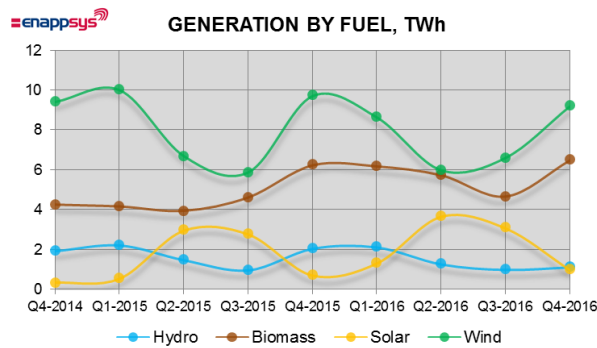
## RENEWABLES

Levels of renewable generation in the quarter were up 16% from the previous quarter, but total levels of generation remained 5% down from the levels achieved in the fourth quarter of the previous year.

Whilst solar saw significant growth from the same quarter in the previous year (with overall generation levels in the quarter being only marginally less than those achieved by the hydro fleet), both wind and hydro saw reduced output levels as weather conditions were less favorable to those present in previous years.

The highest levels of renewable generation were achieved at wind farms, which saw levels of generation totaling 9.2TWh in the quarter.

These levels were up 39% from the previous quarter (with wind speed generally being reduced in



the summer months), but down 5% from the fourth quarter in the previous year as the quarter was less windy than is usual for the time of year. Wind farms provided 51.5% of total renewable generation in the quarter.

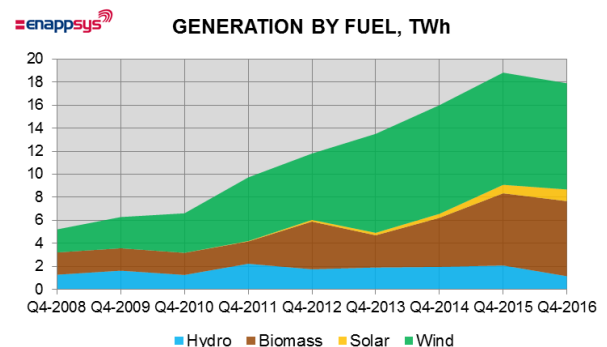
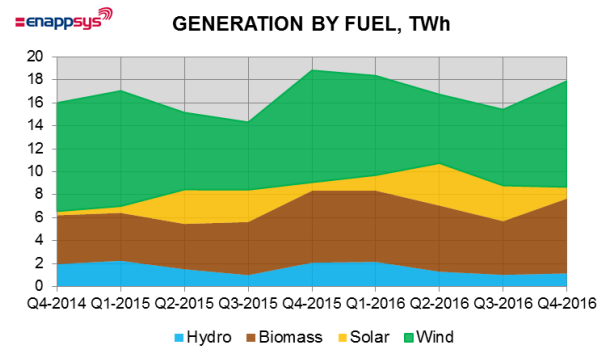
The next highest levels of generation were achieved at biomass plants which provided 36.4% of renewable generation

in the quarter.

Levels of biomass generation totaled 6.5TWh, up 39% from the previous quarter and up 4% from the same quarter in the previous year. The increased levels have come about due to the conversion of an additional Drax unit from coal to biomass that means that that power station is running at 50% biomass.

Despite the fourth quarter generally seeing high levels of hydro generation, the fourth quarter saw weather conditions that resulted in below average levels of output from the hydro fleet.

Total hydro output amounted to 1.2TWh (up 39% from the previous quarter, but down 45% from the fourth quarter of the previous year).







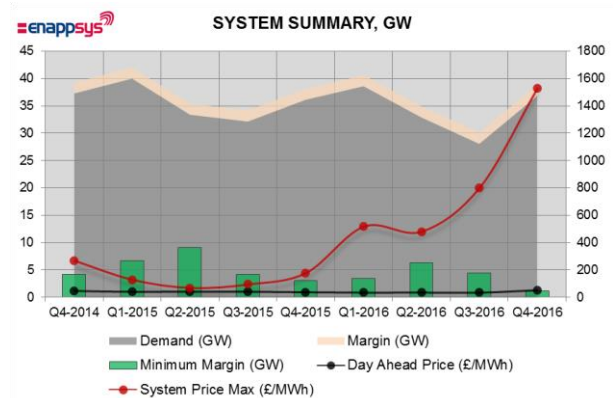
## DEMAND, MARGIN AND PRICES

Q4 2016 saw levels of power demand climb 31% from Q3 up to 81.3TWh as the market moved into the winter half of the year, with levels of demand being 2% higher than those noted in Q4 2015 as November saw a colder than usual spell for that time of year.

Otherwise the most notable activity in the quarter were some very high peak system prices which resulted from very tight minimum system margins of 1.2GW pushing system prices up as high as £1,529/MWh (versus a peak of £178/MWh in Q4 2015).

These levels of margin are very tight, but do exclude 3.5GW of Supplemental Balancing Reserve (SBR). This is a reserve service that can only be used as a last resort and not as a response to high market prices; and that is thus excluded from the main commercial market.

This meant that while as far as the market was concerned margins fell as low as 1.2GW (driving the very high prices), the true margin was 4.7GW resulting in a secure, but very expensive market.



From next winter (2017/18) SBR will cease to exist in the market and will be replaced by the Capacity Mechanism. Under this approach the minimum required margin is all commercially available and so the high prices seen this winter are unlikely to be replicated in Q4 2017.

In the quarter, day ahead prices peaked as high as £999/MWh which meant that average day ahead prices increased from £37.74/MWh in Q4 2015 to £52.25/MWh in Q4 2016. This came despite low commodity prices for gas and coal. Average system prices were also up from Q4 2016, rising from £42.20/MWh to £51.45/MWh.

## Statistics

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

*GB Only (Excludes Northern Ireland)	Q4-2014	Q1-2015	Q2-2015	Q3-2015	Q4-2015	Q1-2016	Q2-2016	Q3-2016	Q4-2016
<b>WHOLESALE PRICES (£/MWh)</b>									
Day Ahead Price	45.21	40.88	41.97	41.41	37.74	34.63	35.07	34.59	52.25
Within Day Price (MIDP)	44.62	40.47	40.80	41.19	37.33	34.28	34.06	33.36	50.45
<b>WITHIN DAY PRICE BREAKDOWN (£/MWh)</b>									
Off-Peak Hours	35.10	33.62	34.38	35.28	29.72	28.72	28.65	27.75	37.13
Peak Hours (excl Superpeak)	45.46	41.09	43.64	43.62	37.97	33.86	35.78	36.95	48.29
Superpeak Hours	63.20	53.91	45.33	46.06	52.37	48.26	40.28	33.36	87.81
<b>SYSTEM BUY PRICE (£/MWh)</b>									
Maximum	266.11	128.33	68.56	94.41	178.22	517.55	480.38	801.77	1528.72
Average	52.62	46.47	45.79	47.22	42.20	36.67	34.62	35.91	51.45
Minimum	6.45	3.65	-2.61	17.54	-73.48	-63.02	-100.00	-114.99	-153.89
<b>SYSTEM SELL PRICE (£/MWh)</b>									
Maximum	266.11	128.33	68.56	94.41	178.22	517.55	480.38	801.77	1528.72
Average	40.34	36.54	35.46	36.86	37.20	36.67	34.62	35.91	51.45
Minimum	-57.23	-35.33	-61.79	0.75	-73.48	-63.02	-100.00	-114.99	-153.89
<b>DEMAND (MW)</b>	37,276	39,988	33,392	32,141	36,121	38,594	32,890	28,063	36,827
<b>AVAILABILITY (MW)</b>	100,728	105,146	109,464	113,832	118,248	122,664	127,030	131,398	135,814
<b>MARGIN (MW)</b>	2,014	2,015	2,015	2,015	2,015	2,016	2,016	2,016	2,016
<b>MIN MARGIN (MW)</b>	4,233	6,638	9,125	4,217	3,007	3,482	6,259	4,439	1,213
<b>DEMAND (TWh)</b>	82.3	86.4	72.9	71.0	79.8	83.4	71.8	62.0	81.3
<b>AVAILABILITY (TWh)</b>	222.4	227.1	239.1	251.3	261.1	265.0	277.4	290.1	299.9
<b>MARGIN (TWh)</b>	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.5	4.5
<b>MIN MARGIN (TWh)</b>	9.3	14.3	19.9	9.3	6.6	7.5	13.7	9.8	2.7

## **NOTES ON THE REPORT**

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The figures used in the report refer to GB only, against DECC figures that refer to GB and Northern Ireland. This selection has been made since Northern Ireland is separate from GB and is more closely linked to the electricity grid of the Republic of Ireland.

Generation levels by fuel from 2009 are based upon National Grid FUELHH data, which give the operationally metered totals by fuel, down to a 5-minute resolution.

Prior to 2009, individual plant data has been aggregated from our databased matching of National Grid fuel-type relationships.

To account for embedded wind and solar, the National Grid forecasts for these generators have been used as if they were output figures. Embedded hydro and biomass have been accounted for using analysis of Ofgem data on certificate awards.

Within this report, levels of offshore wind have not been separated from the wind total. This is because this can only be reliably done using metered volumes at a generating unit level. This is not a publicly available data stream and figures can only be estimated and not distributed. FPNs at wind farms do not correlate well with metered volumes and so cannot be used reliably.

Price and demand data primarily comes from Elexon (as does the FUELHH data), with the exception of the APX day-ahead prices.

Availability levels are calculated by totaling levels of recorded availability at all plants in the market.

## **ABOUT ENAPPSYS**

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

The company has a GB power market database stretching back to 2002 and an online platform that provides readily available information ranging from forwards market prices to historic generator operations.

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 and extending the geographic and sector coverage beyond the UK and the electricity market.

The company's business objective is to make available timely, optimal and insightful information, analysis and systems to the energy sector to ensure all sizes of company have the best available tools and information to make informed decisions and to optimise their business strategy.

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