

BSUoS Outturn

Average BSUoS charge	£/MWh
Jan-19	1.96
Past 12 months	2.60
2017/18	2.31

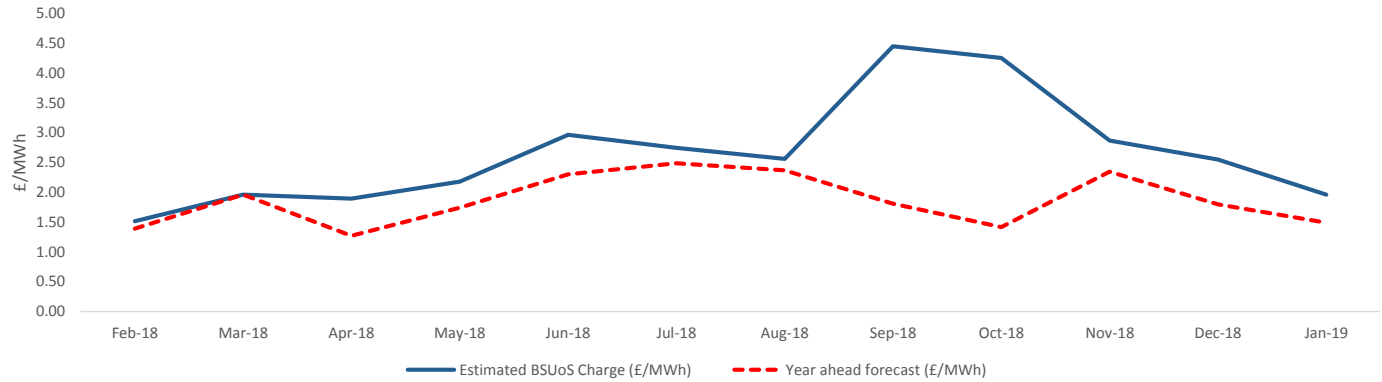
Comparing the month ahead forecast published in the December report. Outturn costs for January were £9.1m lower than forecast. The main drivers was £5m less managing Operating Reserve than expected, and £4.6m less on Energy Imbalance due to a long market in January.

The BSUoS volume was 3.6TWh higher than forecast.

The forecast for January published in the December report was £2.31/MWh, compared to an outturn of £1.96/MWh.

The blue line on the chart shows the estimated monthly average BSUoS charge for the past 12 months. The red line shows our forecast for each month, made at year ahead. The table shows a breakdown of the elements that make up the BSUoS charge (including volume), broken down by cost category. The total cost divided by the volume gives the estimated average charge.

Historical outturn vs year ahead forecast



Month	Feb-18	Mar-18	Apr-18	May-18	Jun-18	Jul-18	Aug-18	Sep-18	Oct-18	Nov-18	Dec-18	Jan-19
Energy Imbalance	-3.0	3.3	-5.7	-6.8	-2.8	-1.1	-3.9	-0.7	0.0	2.5	-2.3	-5.5
Operating Reserve	9.2	15.9	4.1	4.4	3.3	4.6	4.5	5.4	8.0	8.5	8.2	6.7
STOR	8.6	8.1	6.1	7.0	6.6	7.4	6.8	5.8	5.4	5.8	6.0	6.0
Constraints - E&W	4.0	14.2	8.8	20.3	32.3	37.2	32.1	77.7	71.0	29.8	26.5	9.3
Constraints - Cheviot	5.4	2.3	13.2	1.5	7.8	1.4	1.6	18.2	8.8	13.9	2.2	13.3
Constraints - Scotland	2.8	1.4	0.4	2.1	6.3	0.2	1.3	4.1	10.9	5.7	16.4	10.7
Constraints - AS	0.4	3.7	2.7	0.9	3.8	0.8	0.4	1.6	13.2	13.3	7.8	7.3
Negative Reserve	0.1	0.4	0.4	2.1	0.4	0.6	0.4	0.6	0.2	0.4	0.4	0.2
Fast Reserve	6.9	7.8	6.5	6.5	6.0	7.6	8.2	7.6	8.5	7.0	7.5	9.3
Response	9.3	11.6	11.0	12.2	11.5	10.5	10.8	11.4	10.5	12.0	11.7	9.7
Other Reserve	1.2	1.1	0.8	0.9	0.8	1.2	1.1	1.1	1.3	0.8	1.5	1.4
Reactive	5.7	5.9	6.5	7.1	7.4	6.6	6.8	6.1	7.0	6.7	7.6	7.3
Minor Components	1.6	1.2	1.5	1.2	1.3	1.3	2.1	1.5	0.6	1.2	1.8	1.2
Black Start	3.4	3.7	3.4	3.7	3.2	3.1	3.6	3.8	5.1	3.5	3.8	3.7
Total BSUOs	55.3	80.7	59.7	63.1	87.9	81.4	75.7	144.1	150.5	111.2	99.1	80.6
Estimated BSUOs Vol (TWh)	45.4	48.7	40.4	37.0	35.3	36.0	36.4	36.2	39.5	44.7	45.7	50.0
Estimated Internal BSUOs (£m)	12.6	14.0	15.6	16.1	15.6	16.1	16.1	15.6	16.1	15.6	16.1	16.1
Estimated NGET Profit/(Loss)	0.8	0.8	1.2	1.3	1.2	1.3	1.3	1.2	1.3	1.2	1.3	1.3
Estimated BSUoS Charge (£/MWh)	1.51	1.96	1.89	2.18	2.96	2.75	2.56	4.45	4.25	2.87	2.55	1.96
Year ahead forecast (£/MWh)	1.39	1.96	1.27	1.74	2.30	2.49	2.37	1.81	1.42	2.35	1.80	1.49

BSUoS Forecast



Average BSUoS charge	£/MWh
Feb-19	2.29
2018/19	2.72
2019/20	3.07
Next 12 months	3.02

The forecast for February includes initial outturn for 1st-14th.

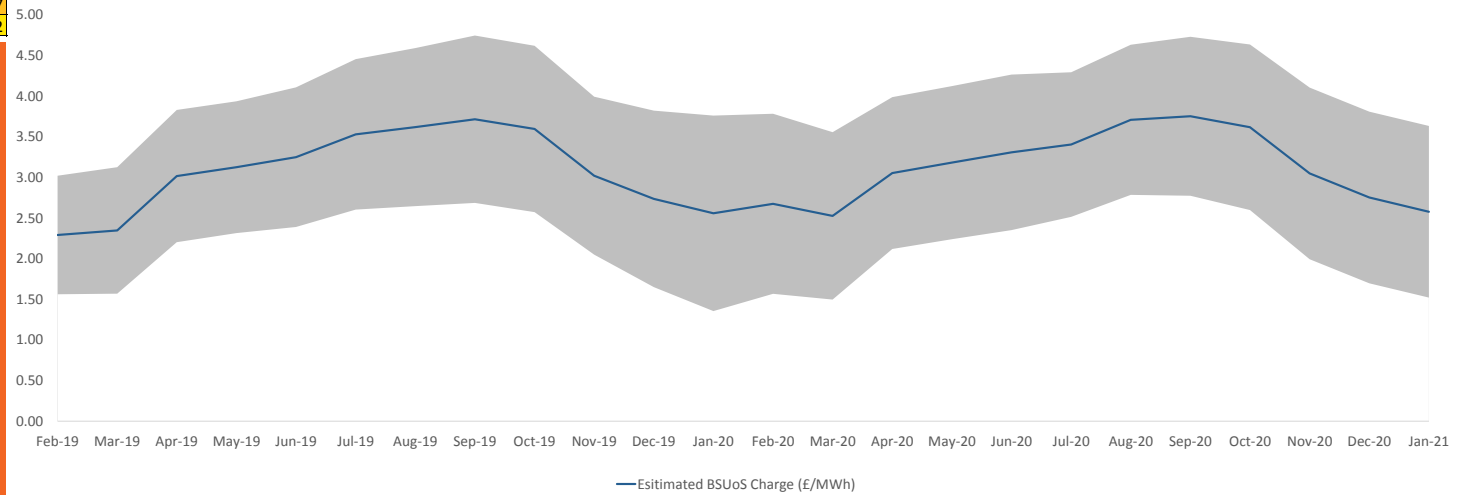
We have increased our forecast for thermal constraints and for managing RoCoF over the next 24 months. There has been an increase in managing RoCoF in 2018/19, and we anticipate that cost will remain at similar levels for the next 2 years while RoCoF relay changes are being made. The cost of managing thermal constraints has also been increased based on outturn costs for 2018/19.

The BSUoS volume has been increased for February and March, as January outturn was 3.6TWh higher than forecast.

We also anticipate the possibility of a high margin cost day (~£10m) over the winter (similar to Nov 2016 and March 2018). We have not included this in our forecast due to the uncertainty of when it may happen, but we wish to inform industry and allow you to build into your own forecasts.

£110m was added to the Internal BSUoS figure in the December issue for 2019/20 following the BSUoS circular sent on 5th December (also available on our website - <https://www.nationalgrideso.com/charging/balancing-services-use-system-bsuos-charges>). The chart shows the average monthly BSUoS forecast for the next 24 months. The grey band shows the upper and lower range of the forecast. The forecast uses a combination of forecast models and historical data. Constraint costs are adjusted in line with major changes to the outage plan, system faults, and commissioning programmes. The other energy cost categories are forecast using a baseline of historical trends with adjustments for expected changes in system operation or balancing services markets.

24 month rolling forecast with error bands



Month	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Oct-19	Nov-19	Dec-19	Jan-20	Feb-20	Mar-20	Apr-20	May-20	Jun-20	Jul-20	Aug-20	Sep-20	Oct-20	Nov-20	Dec-20	Jan-21
Energy Imbalance	-0.1	-1.2	-6.2	-4.2	-3.6	-2.8	-3.4	-1.7	-0.8	-0.9	-1.0	-0.2	1.5	-1.4	-6.4	-4.4	-3.7	-2.9	-3.6	-1.8	-0.9	-1.0	-1.1	-0.3
Operating Reserve	10.7	13.1	8.2	8.9	5.8	7.0	8.2	14.1	16.3	16.1	11.8	10.0	13.0	12.9	8.3	9.0	5.8	7.0	8.2	14.1	16.4	16.1	11.9	10.1
STOR	6.8	6.4	5.0	5.4	5.2	5.8	5.6	6.1	6.0	7.4	7.5	7.6	6.5	7.6	5.2	5.6	5.4	6.0	5.8	6.3	6.2	7.4	7.5	7.6
Constraints	36.4	39.1	38.9	39.5	39.2	47.0	49.5	53.1	56.0	52.6	46.5	39.8	36.4	36.8	38.9	39.5	39.2	40.5	49.5	53.1	56.0	52.6	46.5	39.8
Negative Reserve	0.1	0.2	0.4	0.9	1.6	1.8	1.7	1.8	1.2	0.5	0.5	0.6	0.1	0.2	0.4	0.9	1.6	1.8	1.7	1.8	1.2	0.5	0.5	0.6
Fast Reserve	8.1	9.7	9.0	9.0	8.8	9.1	9.6	8.8	9.1	9.4	10.0	10.3	8.7	9.9	9.0	9.0	8.8	9.1	9.6	8.8	9.1	9.4	10.0	10.3
Response	11.1	11.4	11.8	11.6	11.2	11.8	11.6	11.5	11.7	11.3	11.4	11.2	11.1	11.6	11.8	12.6	11.9	12.6	13.1	11.3	11.2	11.2	11.3	11.1
Other Reserve	1.2	1.1	1.1	0.9	1.0	1.2	1.3	1.0	0.9	0.9	0.9	0.9	0.9	0.9	1.0	1.1	0.9	1.0	1.2	1.3	1.0	0.9	0.9	0.9
Reactive	5.6	6.1	6.7	7.5	7.0	6.9	6.8	6.6	6.7	6.5	7.1	7.0	5.7	6.1	6.7	7.5	7.0	6.9	6.8	6.6	6.7	6.5	7.1	7.0
Minor Components	1.6	-0.8	1.8	2.1	1.4	1.1	0.1	-0.3	0.9	-0.8	0.0	-1.6	1.3	-0.6	3.0	3.0	2.6	2.6	1.5	1.1	2.1	0.6	1.0	-0.6
Black Start	3.4	3.8	3.7	3.8	3.7	3.8	3.8	3.7	3.8	3.7	3.8	3.8	3.5	3.8	3.7	3.8	3.7	3.8	3.8	3.7	3.8	3.7	3.8	3.8
Total BSUOs	84.9	88.8	80.5	85.2	81.6	92.7	94.7	104.7	111.9	106.6	98.5	89.5	88.7	87.8	81.8	87.2	83.5	88.5	97.7	105.9	112.7	107.9	99.3	90.3
Estimated BSUOs Vol (TWh)	43.9	45.3	35.3	35.8	33.1	33.8	33.6	35.1	38.6	43.9	45.8	45.4	42.2	45.3	35.3	35.8	33.1	33.8	33.6	35.1	38.6	43.9	45.8	45.4
Estimated Internal BSUOs(£m)	14.5	16.1	24.9	25.7	24.9	25.7	25.7	24.9	25.7	24.9	25.7	25.7	23.2	25.7	24.9	25.7	24.9	25.7	24.9	25.7	24.9	25.7	24.9	25.7
Estimated NGET Profit/(Loss)	1.2	1.3	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.9	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Estimated BSUoS Charge (£/MWh)	2.29	2.35	3.02	3.12	3.25	3.53	3.62	3.71	3.60	3.02	2.73	2.56	2.67	2.53	3.05	3.18	3.31	3.40	3.71	3.75	3.62	3.05	2.75	2.58

High Error Band (£/MWh)	3.02	3.12	3.83	3.93	4.11	4.45	4.59	4.74	4.62	3.99	3.82	3.76	3.78	3.56	3.99	4.12	4.26	4.29	4.63	4.73	4.63	4.10	3.81	3.63
Low Error Band (£/MWh)	1.56194	1.56894	2.20144	2.31448	2.38893	2.60325	2.6452	2.68529	2.57243	2.04887	1.64905	1.35513	1.56668	1.49581	2.11782	2.23948	2.35124	2.51432	2.78407	2.77351	2.59678	1.9929	1.69626	1.51972

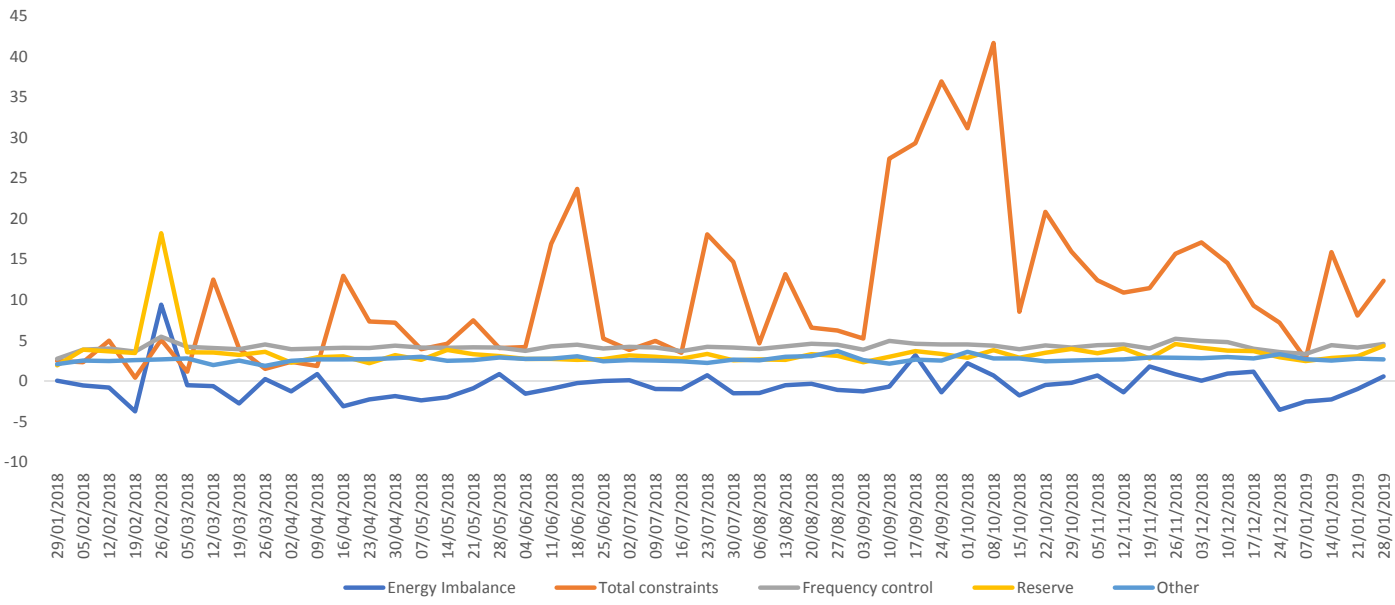
BSUoS Volatility and Forecast Accuracy

The first chart shows the volatility of the cost categories that make up BSUoS. Constraint costs shown in red are the most variable and difficult to predict, mainly driven by the output of wind generation combined with the transmission outage plan at the time. A fault on the transmission system can add to the underlying volatility and cause large unforeseen increases in constraint costs. Reserve, shown in yellow, is generally stable but can have large deviations when the cost of generator margin increases significantly when generation is short. Predicting increases in the cost of reserve is difficult at long timescales, and can have a significant impact on the average BSUoS charge. Energy Imbalance is the other category that contributes to BSUoS volatility, which is the cost of residual balancing when the energy market is long or short. The other cost categories are relatively stable across the year, although there may be longer term trends that we consider.

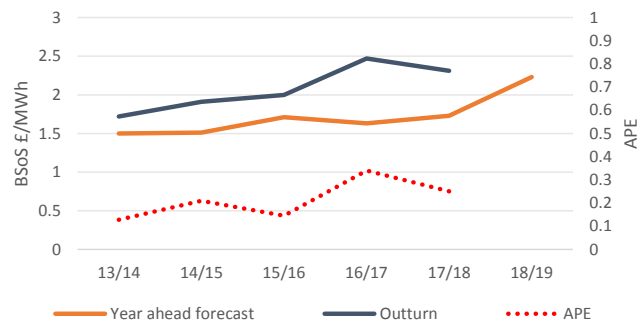
The second chart shows the annual outturn BSUoS charge compared with the forecast made at 12 months ahead, and the absolute percentage error for each year.

The third chart shows the month ahead forecast compared with outturn and absolute percentage error.

Cost volatility by category over past 12 months



Yearly History and APE



Month ahead forecast vs actual and APE

