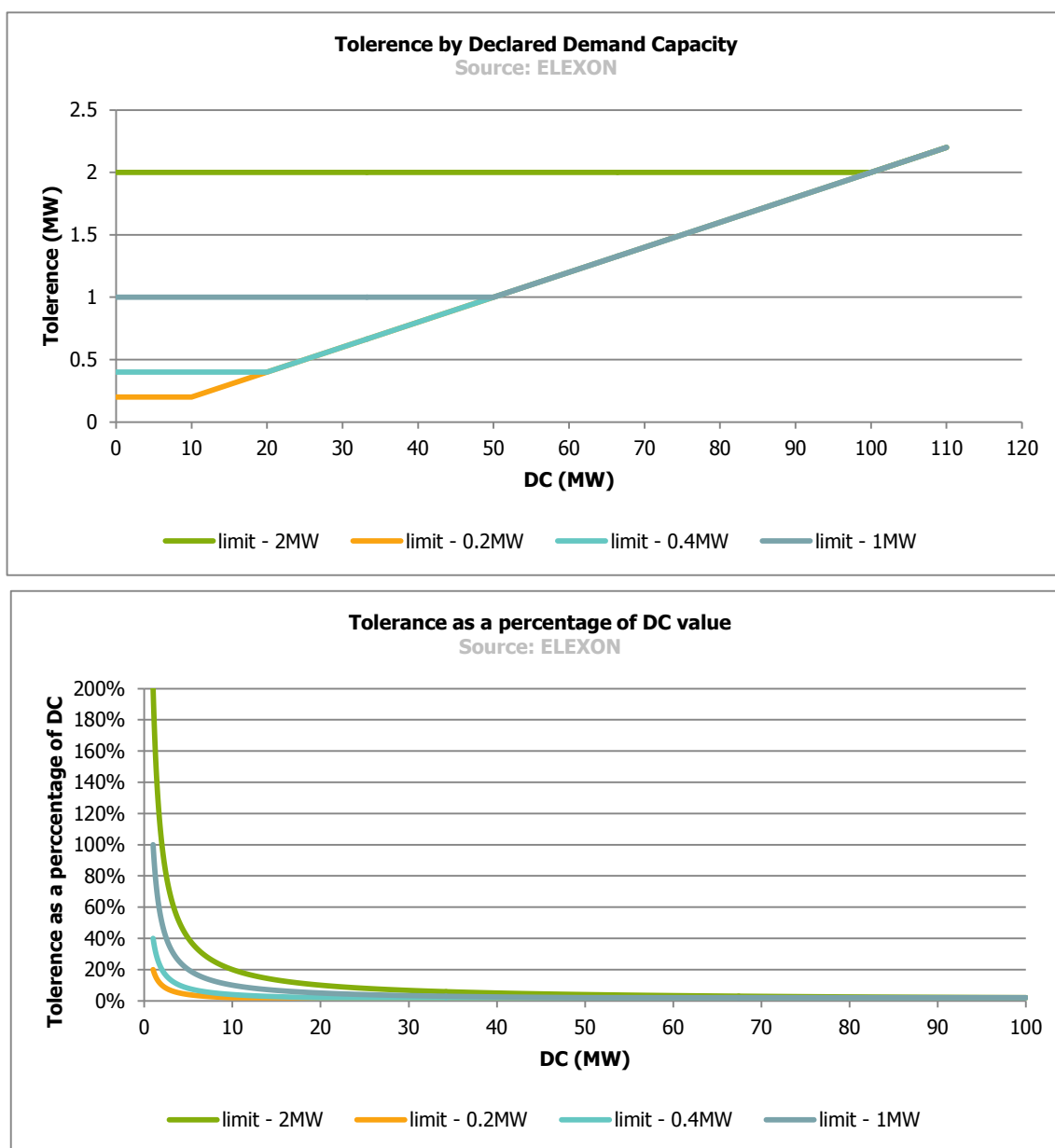


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This analysis has been undertaken by ELEXON to support Issue Group 68 discussion on the underestimation of Demand Capacities (DC). The Balancing Mechanism Units (BMU) data analysed in this section runs from 1 March 2016 to 28 February 2017, this covers four BSC Seasons.

IMPACT OF LOWERING THE TOLERANCE LIMIT

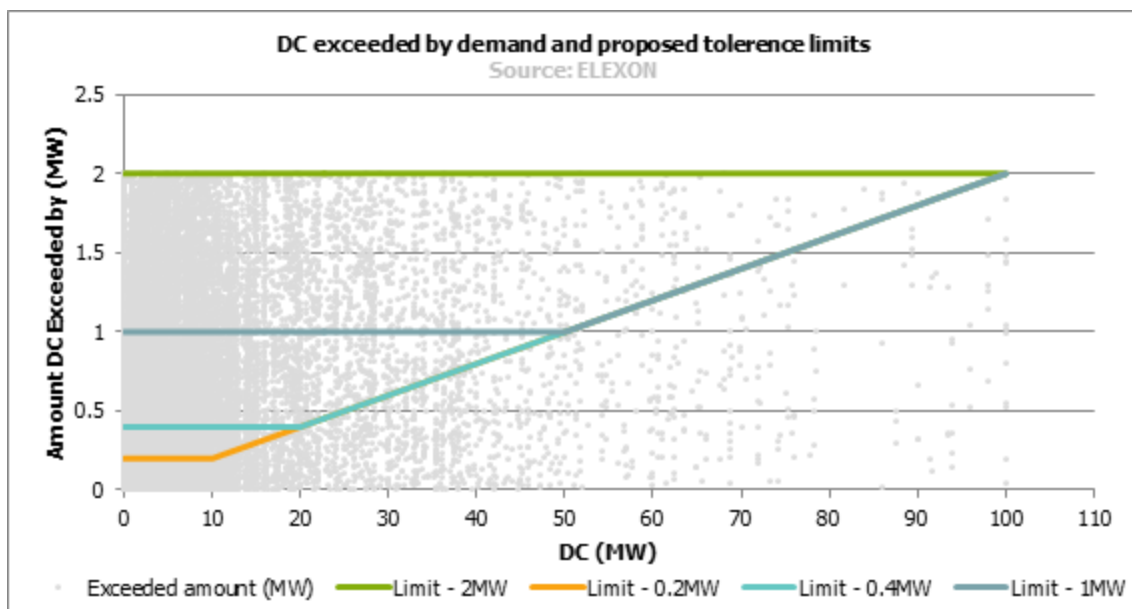
Solution a) outlined in the Issue Form, proposes reducing the lower tolerance limit from 2MW to 0.2MW. The first graph below shows how the tolerance for different DCs would change for this limit (DC values are shown as absolute values). There are two additional lower tolerance limits shown on this graph, 0.4MW and 1MW, for comparison with the existing and proposed values. The DC levels that each of the lower tolerance limits would come into effect are 10MW, 20MW and 50MW compared with the existing 100MW. This is the point at which the lower limit is equal to 2% limit.



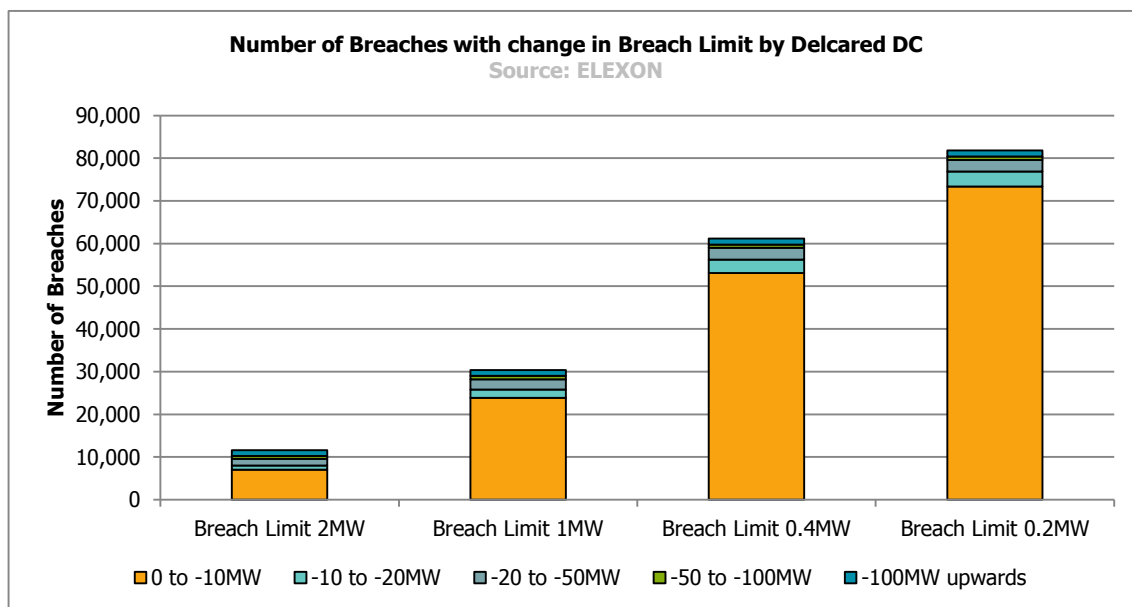
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The graph above shows the tolerance as a percentage of the DC submission for each of the limits where the DC is greater than 1MW. The percentage tolerance in DC submissions decreases with the reduction in lower limit. The parties that would be affected by the change in lower limit would be those with a DC less than 100MW.

The graph below shows the incidences of where maximum demand in a day for active BMUs exceeds the declared DC, where the DC is less than 100MW and the exceeded amount less than 2MW. These are the incidences that may become a breach if the breach limit is lowered.



The graph below shows how based on current data the number of breaches increases with a change in lower breach limit.



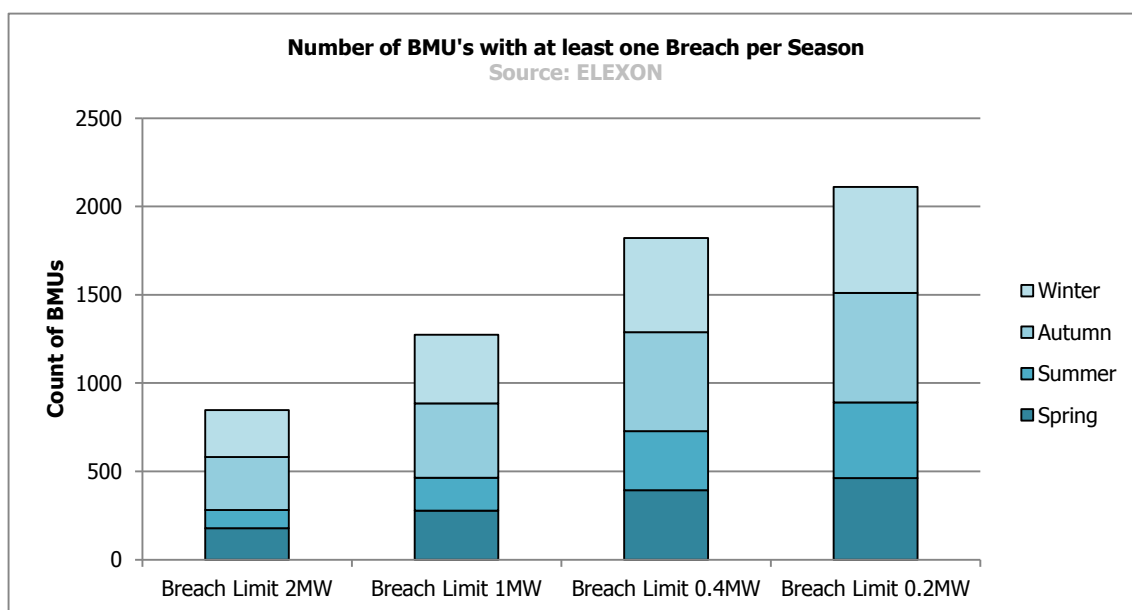
The breaches are grouped by the BMU's declared DC at the point of breach.

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The largest impacted group are Balancing Mechanism Units (BMUs) with a DC between 0 and -10MW, as this is where we see the most incidences of demand exceeding DC. The number of incidences of breaching BMUs for this band would increase by 940% by reducing the lower breach to 0.2MW.

The above graph does not take into account the behavioural change that would result in parties re-declaring their DC values after breaching. If the lower limit was changed to 0.2MW there would be 152 BMUs that would be in breach every day in the winter season. These BMUs would have re-declared during the season resulting in fewer breaches.

This graph below shows the number of BMUs that would have breached at least once in the BSC Season. The reduction to 0.2MW breach limit would result in a 149% increase in the number of BMUs breaching at least once per season over the year. This increase in BMUs is not as high as the number of total breaches, which indicates that some parties are likely undergoing multiple breaches.



CASE STUDIES

We can look at the effect on small growing BSC Parties with some examples of BMU's from small growing suppliers.

To calculate a DC for each of the lower limits these examples make the assumption that when the party breaches the threshold level they set their DC values equal to the point at which they breached. These DC values are referred to as the adapting DC.

The DC is used to approximate the demand for the BMU via the calculation of BM Unit Credit Assessment Import Capability (BMCAIC) and Credit Assessment Credited Energy Volume (CAQCE):

$$\text{M1.6.1 } \text{BMCAIC} = \text{Credit Assessment Load Factor (CALF)} * \text{DC}$$

$$\text{M1.2.3 } \text{CAQCE} = (\text{SPD} * \text{BMCAIC}) (\text{QMPR}/100) + \text{QMFR}$$

Summing the CAQCE over 48 settlement periods gives a daily CAQCE, this has been used in the case study analysis.

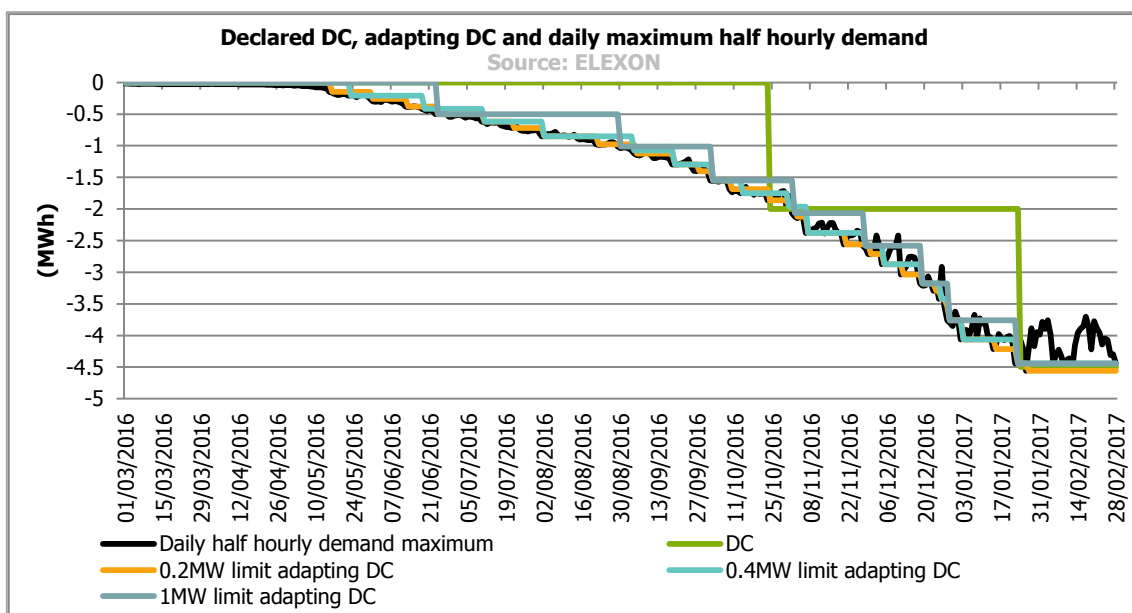
The difference between the sum of CAQCEs and sum of energy contracts gives the Credit Assessment Energy Indebtedness (CEI) which forms part of the Parties Indebtedness.

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Case study BMU 1 – BMU with growing demand

This BMU had no metered volume until January 2016, since then the party has grown to a maximum demand of 4.6MWh during the winter 2016/17 season. Over the year analysed this Party increased their DC declaration twice. Under the possible lower limit values using the adapting DC the number of times this BMU would be:

- 0.2MW lower limit – 30 declarations
- 0.4MW lower limit – 17 declarations
- 1MW lower limit – 8 declarations

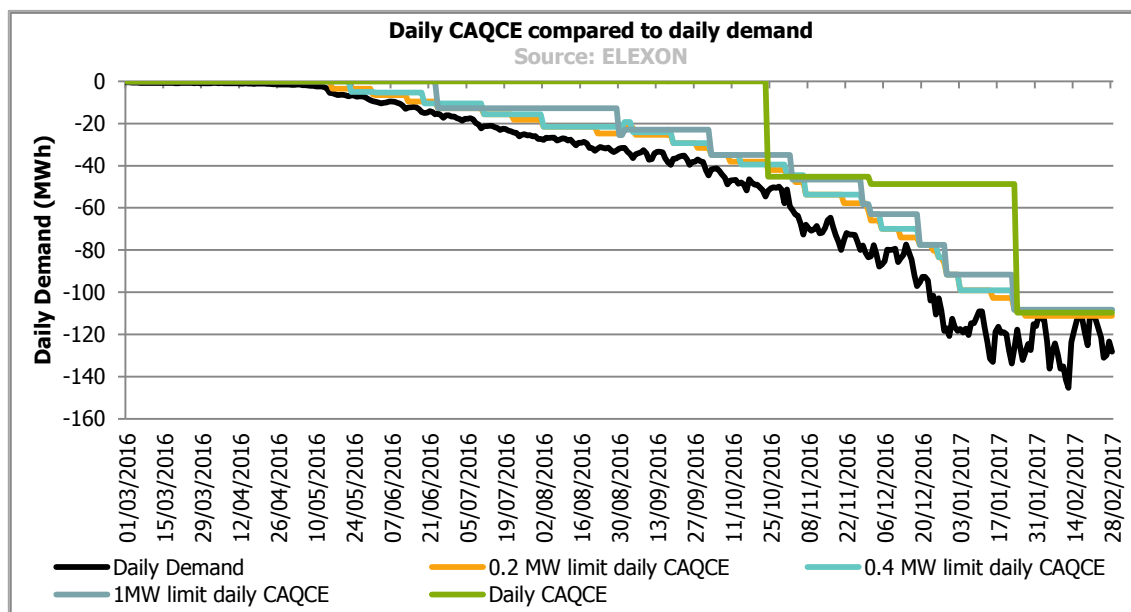


The declared DC is on average 0.59MWh higher than the daily maximum half hourly demand. For the other limits using the adapting DC's the difference is:

- 0.2MW lower limit – 0.04MWh lower
- 0.4MW lower limit – 0.01MWh higher
- 1MW lower limit – 0.13MWh higher

The daily CAQCE used in the calculation can be used to approximate the daily demand for that BMU. The graph below shows the daily CAQCE calculated from the actual and adapting DC values shown above.

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The daily CAQCE calculated using the actual DC values is on average 23MWh higher than the daily demand. Using the Credit Assessment Price (CAP) values for each day to convert the difference into a monetary amount the average difference is £1,403 per day. When the average differences are looked at for the adapting DCs the differences are:

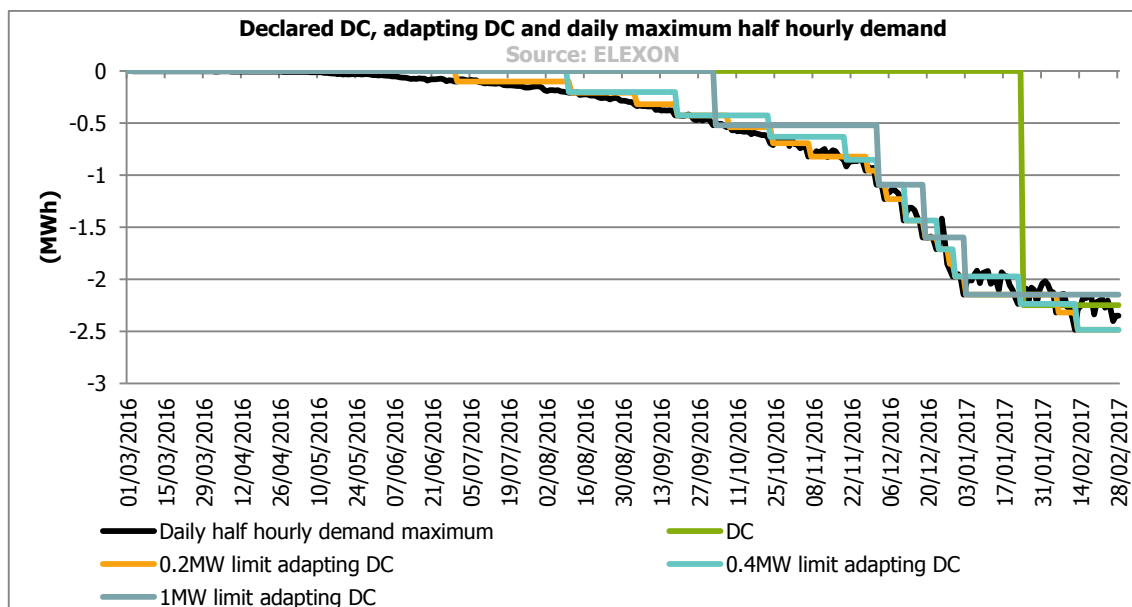
- 0.2MW lower limit – 8.84MWh higher, £546 per day
- 0.4MW lower limit – 9.97MWh higher, £610 per day
- 1MW lower limit – 12.86MWh higher, £764 per day

Case study BMU 2 – BMU with generation as well as demand

Over the year analysed this Party submitted one non-zero DC declarations. Under the possible lower limit values using the adapting DC the number of times this BMU would be:

- 0.2MW lower limit – 18 declarations
- 0.4MW lower limit – 10 declarations
- 1MW lower limit – 4 declarations

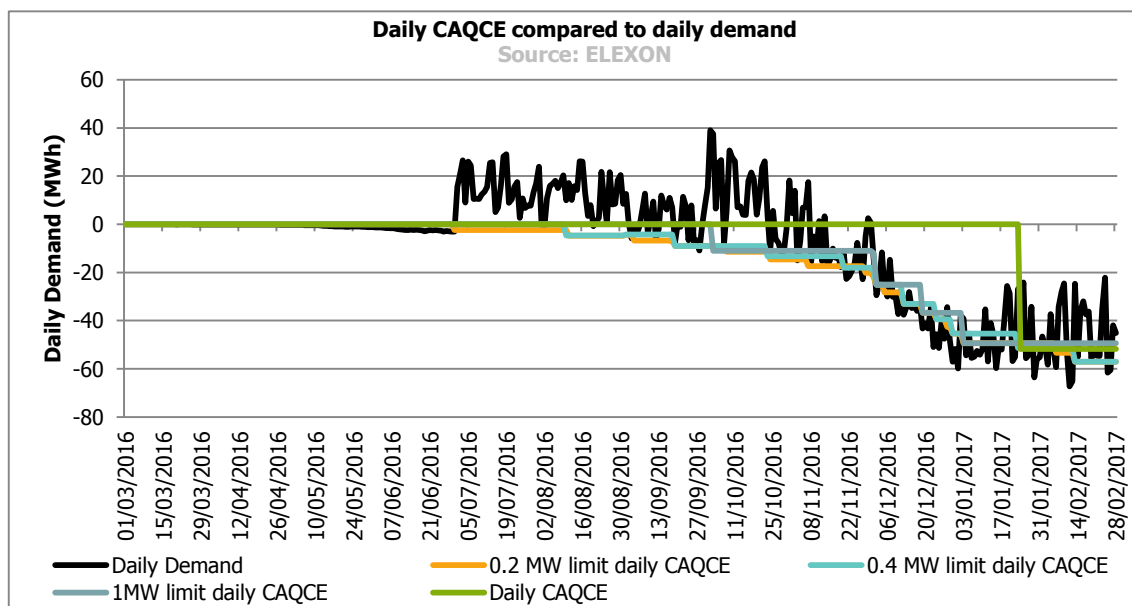
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The declared DC is on average 0.44MWh higher than the daily maximum half hourly demand. For the other limits using the adapting DCs the difference is:

- 0.2MW lower limit – 0.003MWh higher
- 0.4MW lower limit – 0.05MWh higher
- 1MW lower limit – 0.12MWh higher

The daily CAQCE used in the calculation can be used to approximate the daily demand for that BMU. The graph below shows the daily CAQCE calculated from the actual and adapting DC values shown above.



The daily CAQCE calculated using the actual DC values is on average 6.77MWh higher than the daily demand. Using the CAP values for each day to convert the difference into a monetary amount the average difference is £294 per day. When the average differences are looked at for the adapting DCs the differences are:

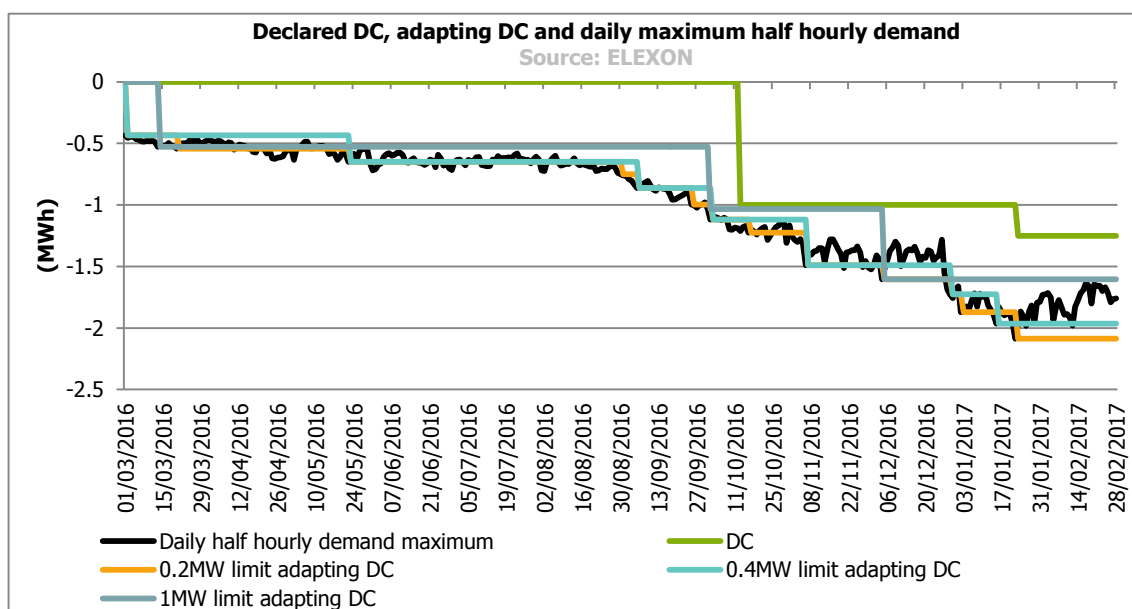
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- 0.2MW lower limit – 5.79MWh higher, £239 per day
- 0.4MW lower limit – 4.20MWh higher, £144 per day
- 1MW lower limit – 2.91MWh lower, £415 per day

Case study BMU 3 – BMU with unrepresentative CALF values

Over the year analysed this Party submitted three increases in DC declarations. Under the possible lower limit values using the adapting DC the number of times this BMU would be:

- 0.2MW lower limit – 13 declarations
- 0.4MW lower limit – 7 declarations
- 1MW lower limit – 3 declarations



The declared DC is on average 0.60MWh higher than the daily maximum half hourly demand. For the other limits using the adapting DCs the difference is:

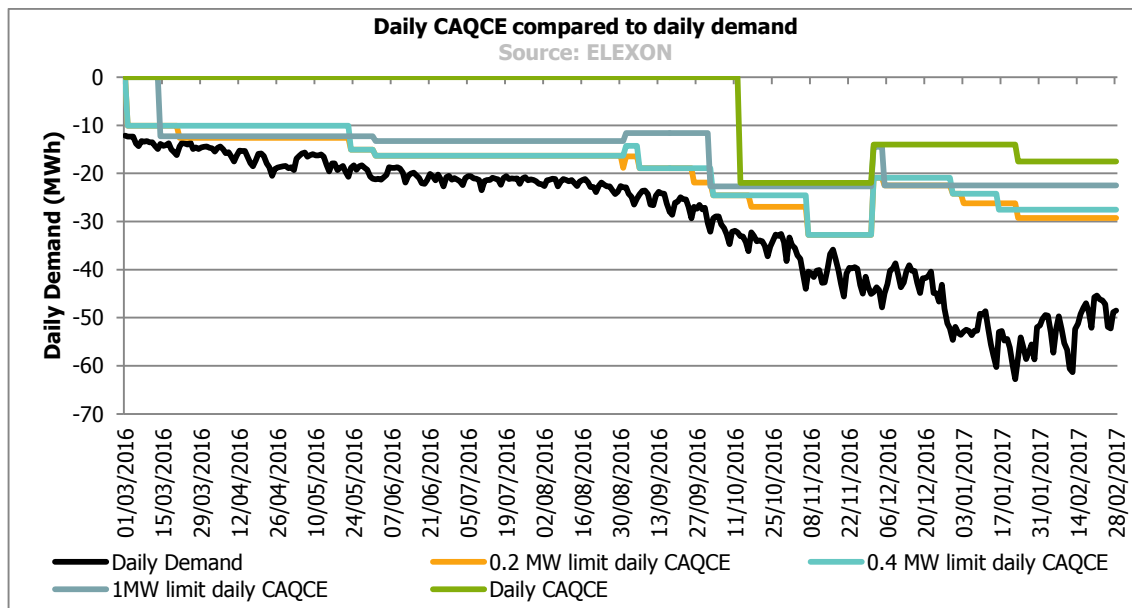
- 0.2MW lower limit – 0.04MWh lower
- 0.4MW lower limit – 0.01MWh higher
- 1MW lower limit – 0.15MWh higher

The daily CAQCE used in the calculation can be used to approximate the daily demand for that BMU. The graph below shows the daily CAQCE calculated from the actual and adapting DC values shown above.

The CAQCE is a function of the DC and the CALF. Where the CALF is ratio of the average and maximum demand for the relevant season in the preceeding year. Where there is insufficient data a standard CALF value for the GSP group is used.

The daily CAQCE is significantly different from the daily demand during the winter season for this example BMU. This difference can be attributed to the submitted CALF. With the adapting DCs the difference between daily CAQCE and daily demand is smaller.

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The daily CAQCE calculated using the actual DC values is on average 23.28MWh higher than the daily demand. Using the CAP values for each day to convert the difference into a monetary amount the average difference is £1,242 per day. When the average differences are looked at for the adapting DCs the difference are

- 0.2MW lower limit – 10.08MWh higher, £632 per day
- 0.4MW lower limit – 11.07MWh higher, £683 per day
- 1MW lower limit – 13.87MWh higher, £827 per day

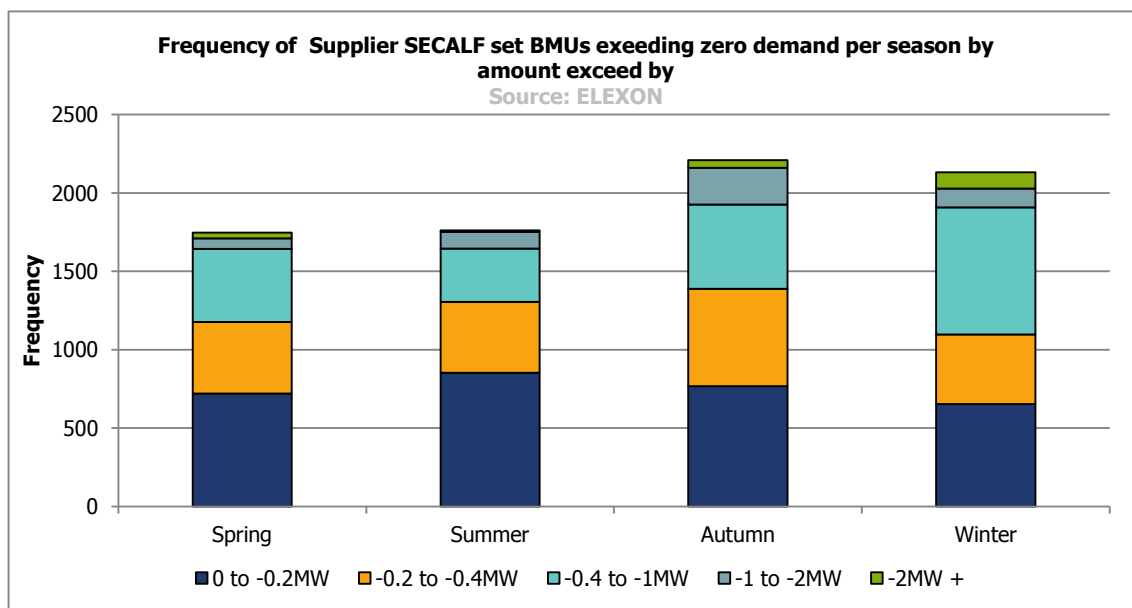
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SUPPLIER EXPORT CALF (SECALF) ACTIVE BALANCING MECHANISM UNITS

The SECALF is used to calculate a CAQCE for Supplier BMUs, where $DC = 0$ and $GC > 0$. In all other instances the CALF is used to calculate the CAQCE. Where a BMU breaches the DC tolerance limits, they are required to submit a new DC. Where the DC is non-zero the CAQCE is calculated from the DC and CALF.

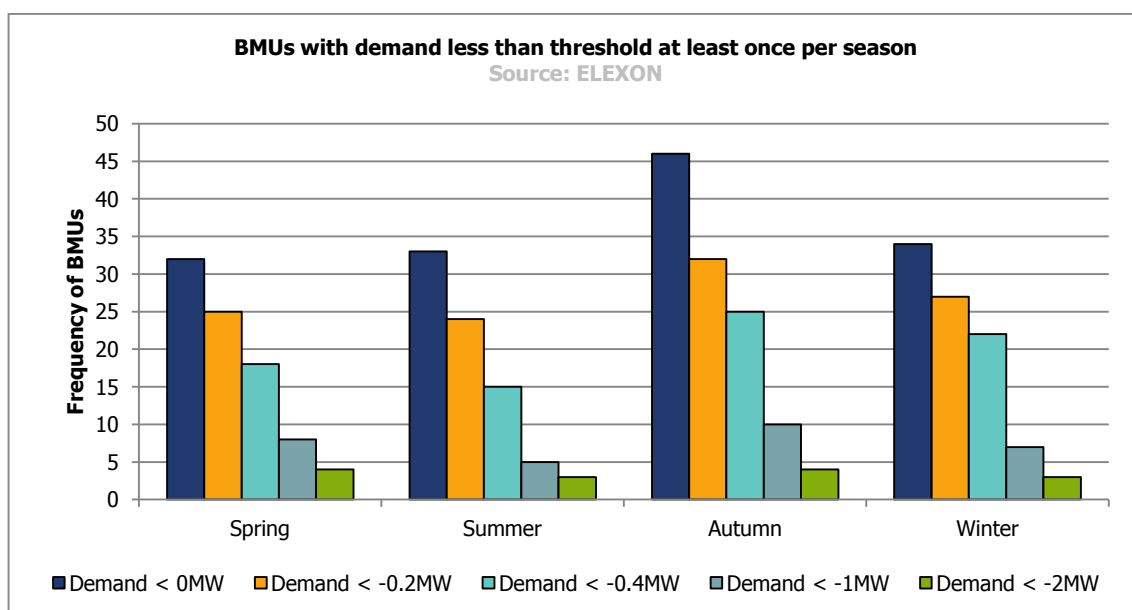
Supplier BMUs with SECALF set

The below graph looks at BMUs with the SECALF set. To have the SECALF set Supplier BMUs must have a DC of zero and GC of greater than zero. There are 130 BMUs with SECALF set over the year. The graph below shows the frequency of incidences of Supplier BMUs with non-zero demand at least once per day. Over the year assessed, 38% of these incidences were between 0 and 0.2MW.



There are four BMUs with non-zero demand at least once for every day over the year. The graph below shows the number of BMUs that have non-zero demand at least once per season.

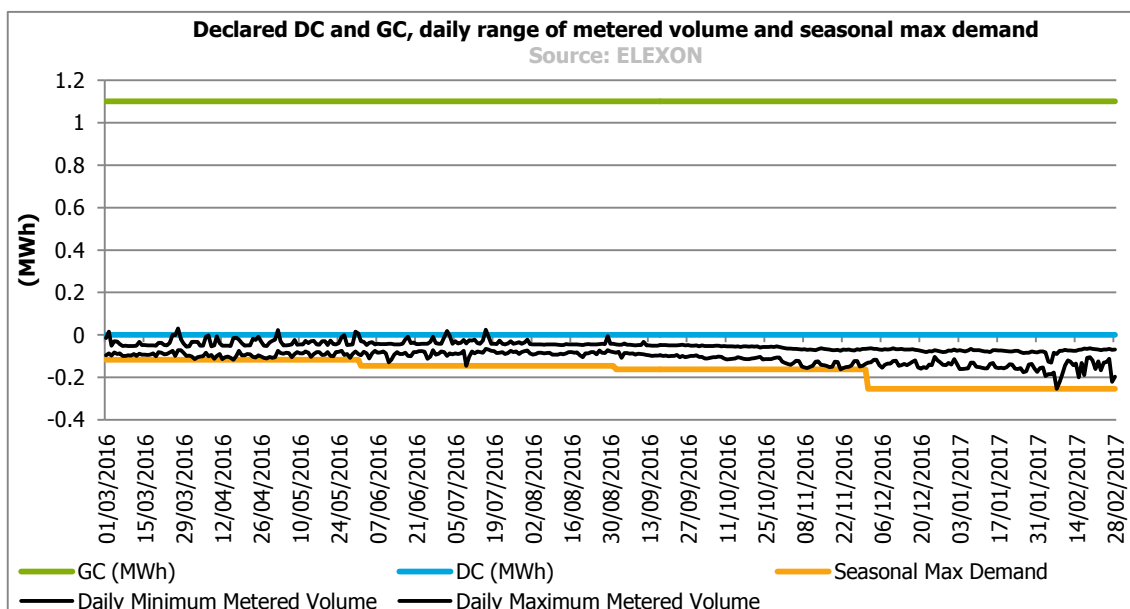
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The analysis shows that 43% of BMUs had non-zero demand at least once over the assessed year. Of these BMUs with at least one day non-zero demand, nine BMUs had net demand for all days they were SECALF qualifying. This may be due to an administrative error in setting the GC/DC as the majority of these BMU's were corrected to not SECALF qualifying by the following season.

Case study BMU 4 - BMU with demand and SECALF set

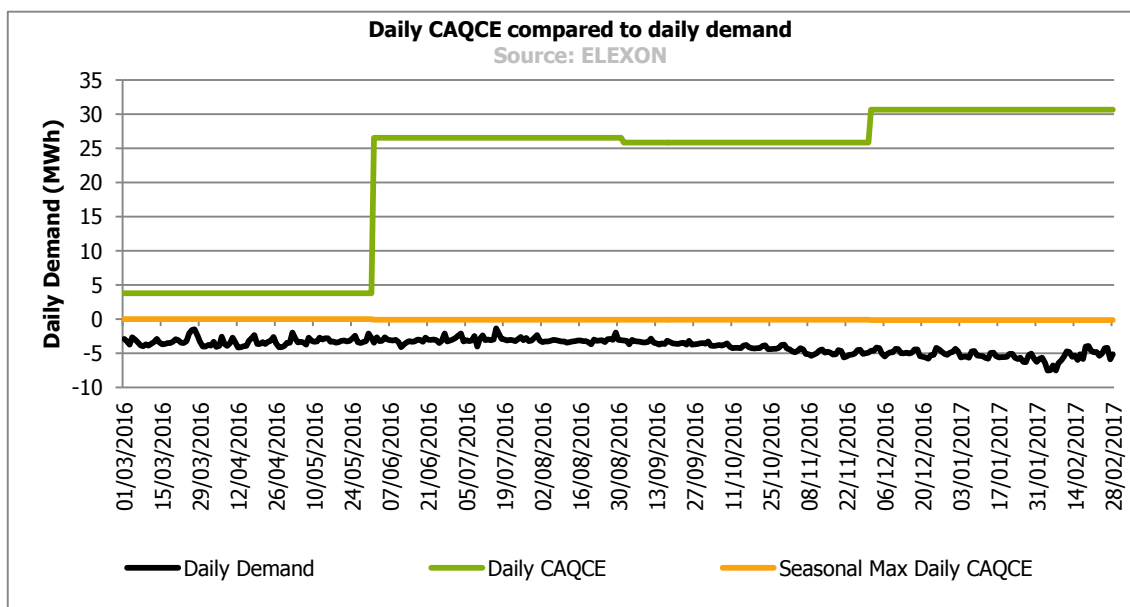
This BMU has a GC of 2.2MW (or 1.1MWh) while having an average metered volume of -0.162MW.



The maximum half hourly demand over the year for this BMU was -0.508MW (or -0.254MWh) and the maximum generation was 0.06MW (or 0.03MWh). The demand remained below the 2MW threshold so the BMU did not have to declare a DC over the year. For comparison the graph above compares what the DC should have been, based on the actual seasonal maximum demand, to what the DC was declared as.

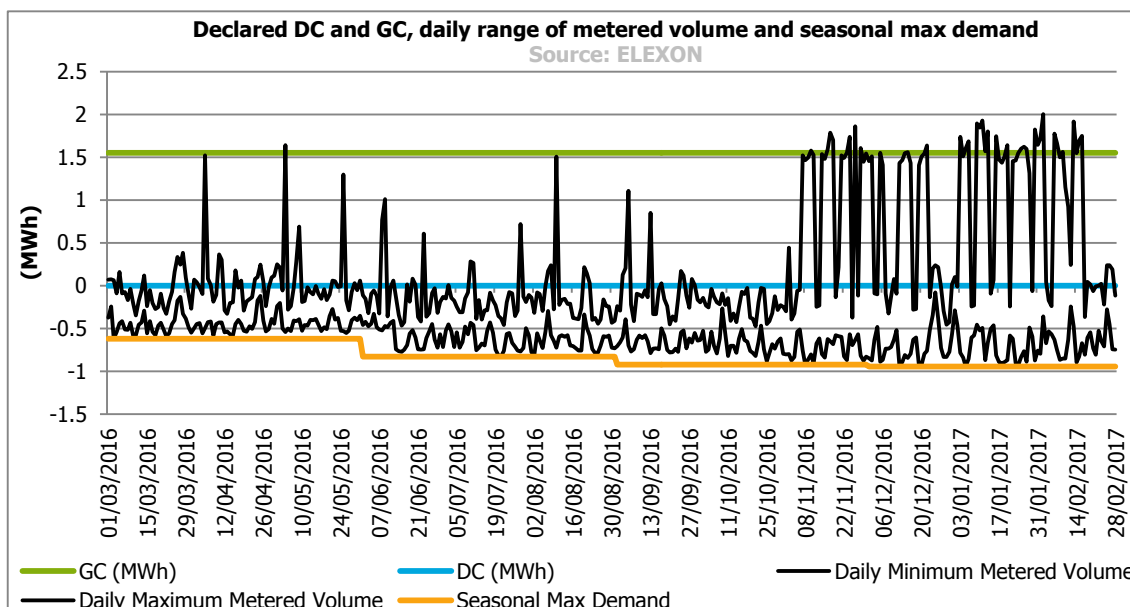
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The daily CAQCE as calculated from the GC and SECALF is compared against the daily demand and a daily CAQCE calculated from the seasonal max demand. For every day in the assessed period this BMU had net demand. The daily CAQCE is an average of 25.56MWh higher than the daily demand. Using the CAP this difference is equivalent to £1,393.



Case study BMU 5 - BMU with demand and SECALF set

This BMU has a GC of 3.1MW (or 1.55MWh) while having an average metered volume of -0.75MW. The maximum generation over the year was 2MW (or 4MWh).

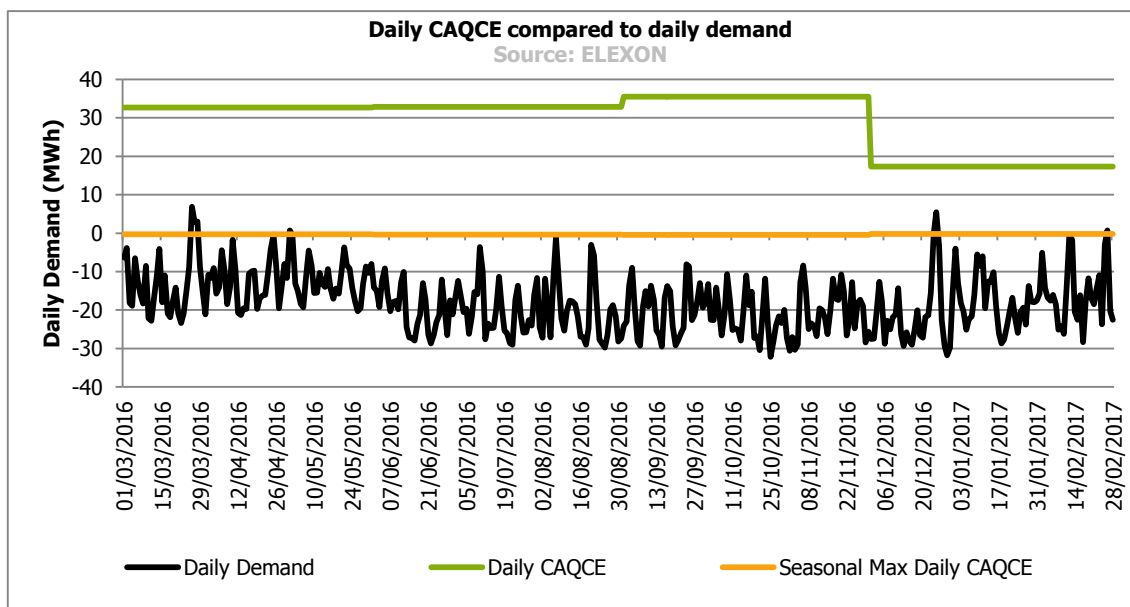


The maximum half hourly demand over the year for this BMU was -1.892MW (or -0.946MWh). As this demand remains below the 2MW threshold the BMU did not have to declare a DC over the year. For comparison the graph

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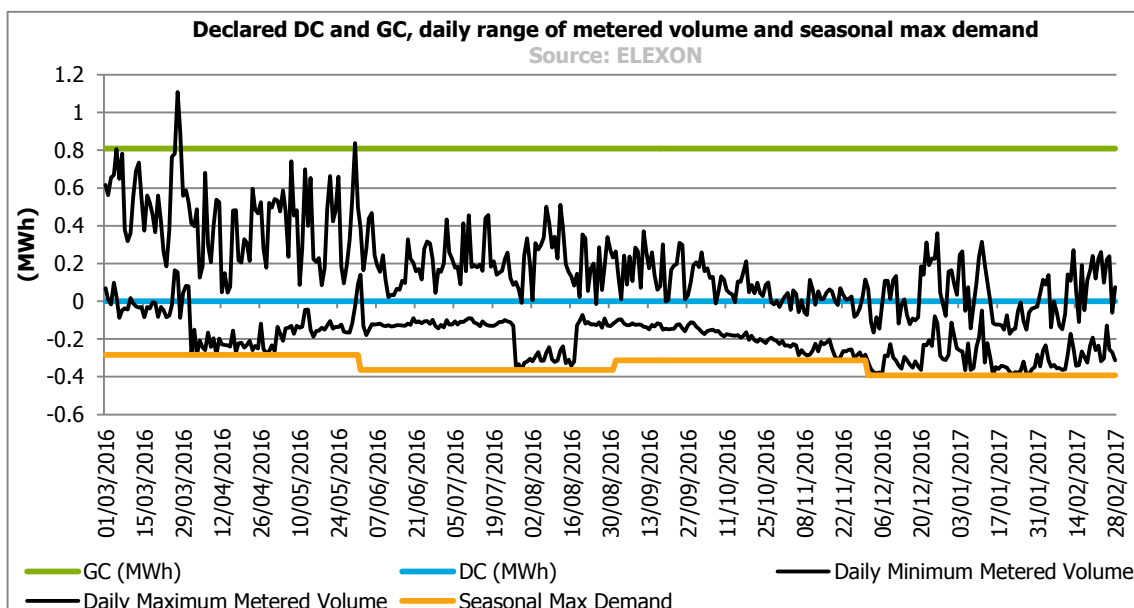
above compares what the DC should have been, from the actual seasonal maximum demand to what the DC was declared as.

The daily CAQCE as calculated from the GC and SECALF is compared against the daily demand and a daily CAQCE calculated from the seasonal max demand. This BMU had daily net demand for 98% of the year assessed. The daily CAQCE is an average of 48MWh higher than the daily demand. Using the CAP to convert this in to a monetary figure, this difference is equivalent to £2,281 per day.



Case study BMU 6 - BMU with demand and SECALF set

This BMU has a GC of 1.61MW (or 0.81MWh) while having an average metered volume of -0.06MW.

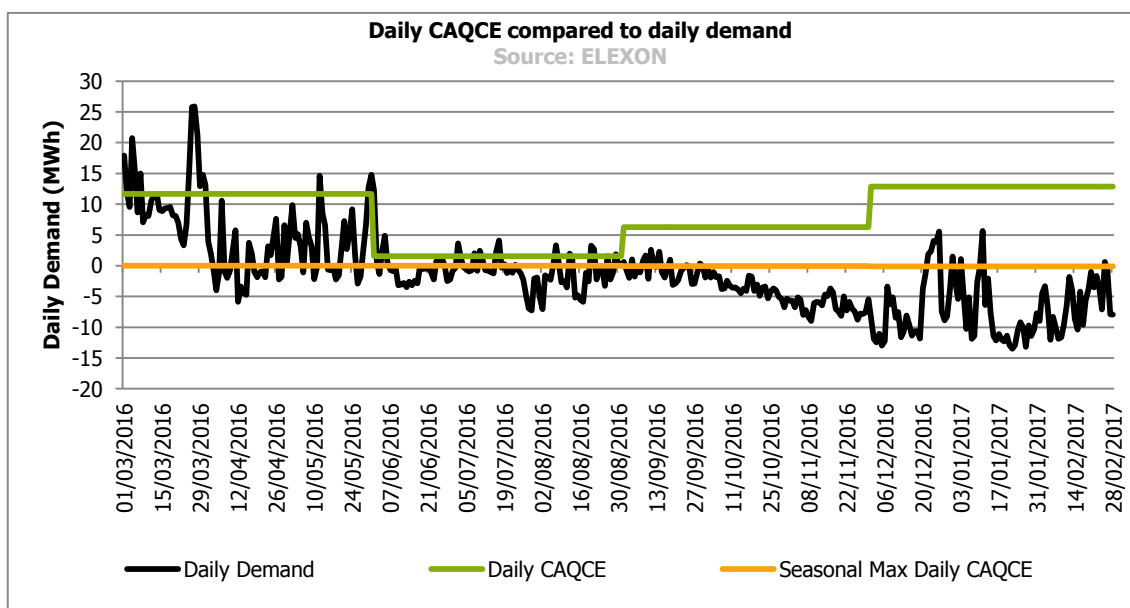


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The maximum half hourly demand over the year for this BMU was -0.79MW (or -0.39MWh) and the maximum generation was 2.22MW (or 1.11MWh). As this demand remains below the 2MW threshold the BMU did not have to declare a DC over the year. For comparison the graph above compares what the DC should have been, from the actual seasonal maximum demand to what the DC was declared as.

This BMU had daily net demand for 69% of the year assessed. The BMU's net demand increased from July 2017 onwards.

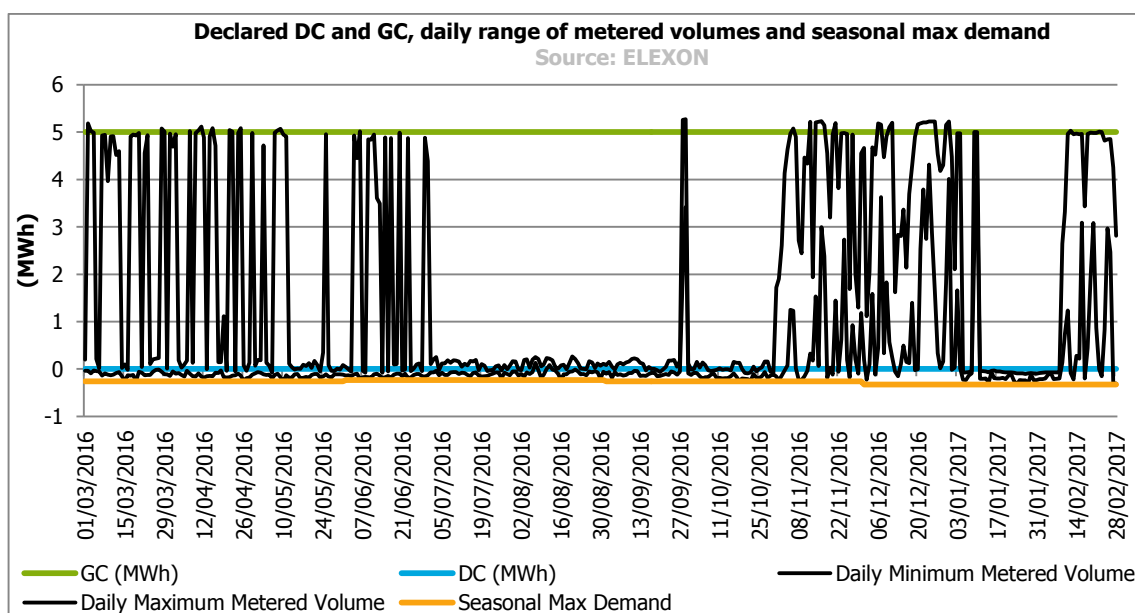
The daily CAQCE as calculated from the GC and SECALF is compared against the daily demand and a daily CAQCE calculated from the seasonal max demand. The daily CAQCE is an average of 9.5MWh higher than the daily demand. Using the CAP to convert this in to a monetary figure, this difference is equivalent to an average of £582 per day.



Case study BMU 7 - BMU with demand and SECALF set

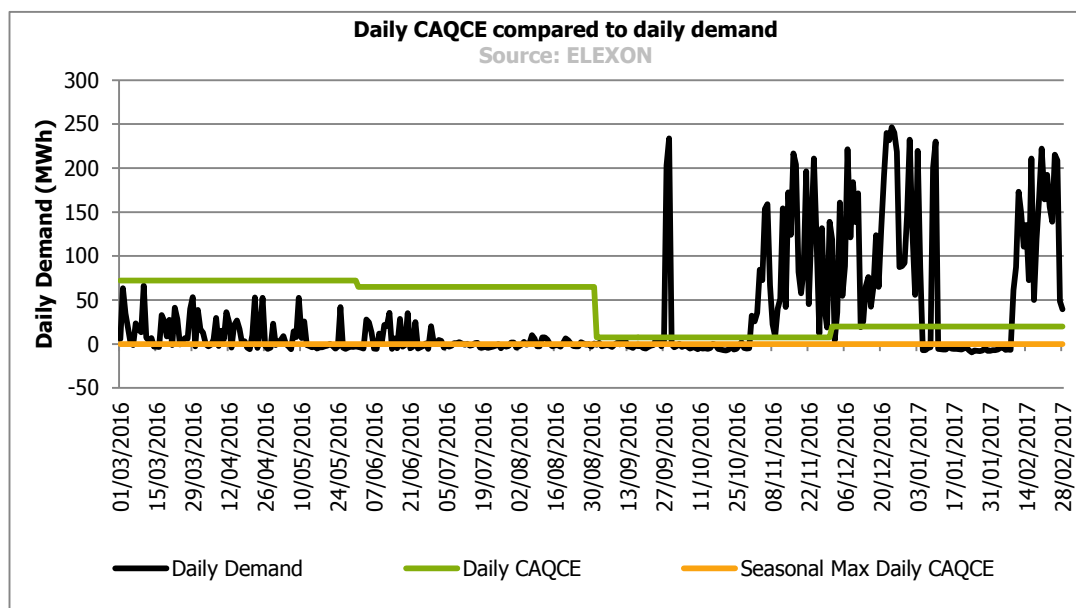
This BMU has a GC of 10MW (or 5MWh) the maximum generation over the year was 10.55MW (or 5.27MWh). The average metered volume was 0.67MWh per half hour.

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The maximum half hourly demand over the year for this BMU was -0.66MW (or -0.33MWh). As this demand remains below the 2MW threshold the BMU did not have to declare a DC over the year. For comparison the graph above compares what the DC should have been, based on the actual seasonal maximum demand, to what the DC was declared as.

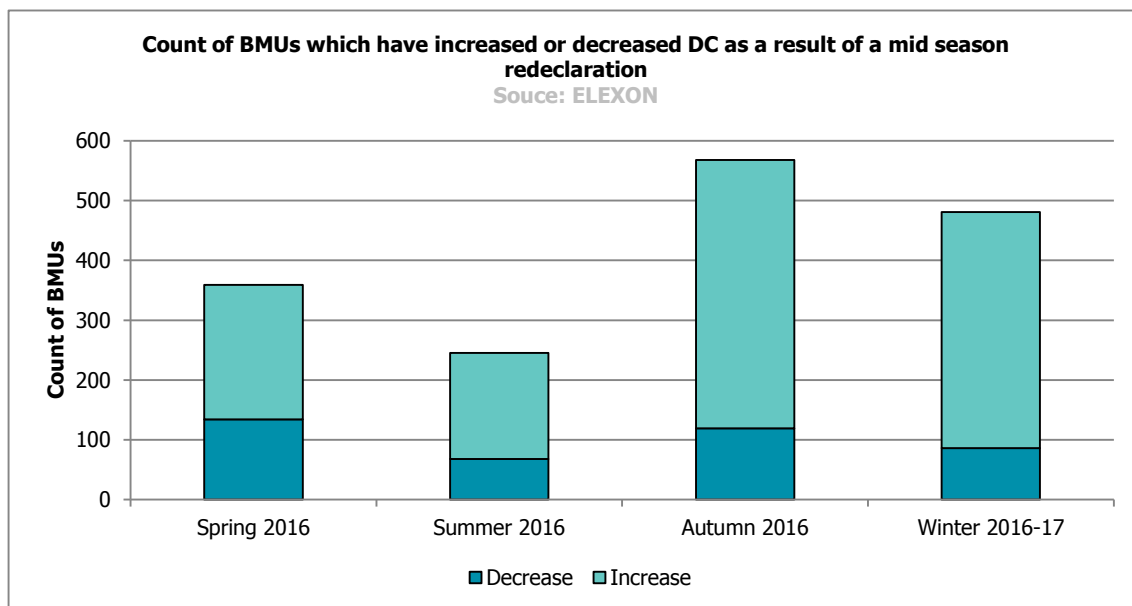
This BMU had daily net demand for 42% of the year assessed. The BMU increased its daily generation from September onwards. The daily CAQCE as calculated from the GC and SECALF is compared against the daily demand and a daily CAQCE calculated from the seasonal max demand. The daily CAQCE is an average of 9MWh higher than the daily demand. However, using the CAP for each day to convert this in to a monetary figure, this difference is equivalent to an average of £726 lower per day. The CAP was £35/MWh in May 2016 and rose to £106/MWh in November 2016 and. Therefore, the differences between the daily CAQCE and daily demand has more of a financial impact in November 2016 than in May 2016.



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MID SEASON DC DECLARATIONS

The current DC declaration rules allow for up to two decreases in the absolute value of the DC per season, there is no limit on increases to the absolute value. The graph below shows the number of BMUs with increases and decreases to the absolute value of DC in each season.



Spring had the highest number of decreases in absolute DC values and autumn has the highest number of increases. Over the year 17% of mid-season declarations were decreases in absolute DC, 53% were increases and 29% of mid-season declarations made no change to the DC of the BMU.

Also, 7% of the mid-season decreases in absolute DC were decreases to zero DC. For 14 of these BMUs the mid-season declaration to zero was to correct an error where DCs had been submitted instead of GCs in the initial declaration. Ten of the BMUs had a non-zero seasonal maximum demand.