# PROPOSED GC/DC KPIS REPORTING

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| **MEETING NAME** | Imbalance Settlement Group |
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| **Purpose of paper** | Information |
| **Classification** | Public |
| **Summary** | This paper illustrates how we plan to report GC/DC KPIs to help the ISG determine if a formal review of GC/DC Limits is necessary. We have used Settlement data from BSC Winter 2017 to illustrate how we will report the KPIs. The GC/DC KPI reporting is scheduled to begin following the end of the Spring 2018 BSC Season. We invite the ISG to comment on the proposed content and reporting style for their use going forward. |

## 1. Overview

1.1 Generation Capacity (GC) and Demand Capacity (DC) are estimates of the Settlement Period maximum demand and generation capacity for a BM Unit in a BSC Season. GC and DC values are used in the calculation of Parties' Credit Assessment Energy Indebtedness (CEI) and Credit Cover Percentage (CCP). Accurate values are essential for the Credit Cover Percentage calculation to operate effectively.

1.2 In accordance with Balancing and Settlement Code (BSC) Section K 'Classification and Registration of Metering Systems and BM Units' 3.4, and BSCP15 'BM Unit Registration', a BM Unit's GC and DC values are derived using either the expected maximum magnitude of negative (indicating Demand) or positive (indicating Generation) BM Unit Metered Volumes for a single Settlement Period in the forthcoming or prevailing BSC Season. The BM Unit Metered Volumes are doubled to convert from MWh to a MW capacity.

1.3 Parties must submit expected maximum positive and negative BM Unit Metered Volume values to the Central Registration Agent (CRA) ahead of each BSC Season. This is to ensure that the CRA updates GC and DC values that reflect the likely operation of the BM Unit in the forthcoming BSC Season and facilitate more accurate calculation of CEI and CCP.

1.4 A breach is defined as when the BM Unit Metered Volumes ($QM_{ij}$) divided by Settlement Period Duration (SPD) for a BM Unit exceeds its declared GC/DC by more than the tolerance limits (TL).If a Lead Party becomes aware of or believes that a breach will occur, it must re-declare maximum BM Unit Metered Volume(s) for its BMU(s). ELEXON regularly monitors BM Unit Metered Volumes and GC/DC values. If a GC or DC limit is breached, ELEXON will send a reminder to the Lead Party. However, the Lead Party is responsible for monitoring and maintaining its estimates of maximum BM Unit Metered Volume.

1.5 Approved modification P357 'Removal of GC/DC tolerance parameters from BSC Section' was implemented 22 February 2018. BSC Modification P357 was raised in order to improve the process for reviewing and amending the tolerance limits used to determine if a GC/DC breach occurs. Prior to BSC Modification P357, the tolerance limits were set in BSC Section K 3.4 and amending them required a BSC Modification. The Issue 68 workgroup identified this lack of flexibility as an issue and BSC Modification P357 was raised to move the limits from the BSC to the BSC Website and implement a more flexible process for amending them.

1.6 Currently, the tolerance limits are (in magnitude):

| Declared GC/DC | Limit |
|---|---|
| <100 Megawatt (MW) | 2 MW |
| 100-500 MW | 2% of declared value |
| >500 MW | 10 MW |

## 2. Reviewing GC/DC Limits

2.1 P357 introduced a requirement that the Panel establish guidance for determining and reviewing the GC/DC limits, 'Demand Capacity and Generation Capacity Limit Review and Determination'. This document explains how ELEXON will provide the Imbalance Settlement Group (ISG) with a quarterly report (after each BSC Season) containing analysis of Settlement data against a set of Key Performance Indicators (KPIs) – Section 3 below provides an example of how these KPIs will be calculated and reported. This analysis will be used by the ISG to assess the performance of BM Unit Metered Volume declarations and suitability of the tolerance limits. At the ISG's September 2019 meeting, the ISG will have year of data collection and reporting and will be in a position to decide whether to trigger a full review of the tolerance limits.

2.2 The guidance document specified at least the following KPIs:

- The number of dormant BM Units, i.e. with no Metered Volumes allocated to them;
- The number of breaches of the tolerance limits for each of the GC and DC per BSC Season;
- The maximum and average amplitude of the breaches in MWh;
- The maximum difference between the relevant BM Units' Metered Volumes and their declared GC and DC; and
- The proportion of distinct BM Units that breached the tolerance limit over a BSC Season.

ELEXON has also performed some additional analysis to complement the mandatory KPIs:

- The number of BM Units which are compliant due to the 1 MWh tolerance limit in place. This helps to identify on average how much of the tolerance limit is used by BM Units to remain compliant.
- The number of BM Units with Demand Capacity equal to zero ('0') but which have Metered Volumes and are compliant due to the 1 MWh tolerance limit.

2.3 ELEXON produced a GC/DC dashboard (Attachment A) which summarises the data analysed over the reporting season. ELEXON would like to invite the ISG to comment on the dashboard.

2.4 The objective of this paper is to review the proposed KPIs (set out in Section 3) and whether they would provide enough information to identify whether the GC/DC limits are set correctly. It would be beneficial to assess whether all the KPIs summarised above and illustrated below are appropriate for the GC/DC reporting. The KPIs must represent a measurable value to evaluate the current GC/DC limits.

2.5 When producing the illustrative KPIs, ELEXON identified some shortcomings and has therefore provided additional analysis, which could be reported quarterly, to complement the mandatory KPIs. In any case, the guidance for determining and reviewing the GC/DC limits provides the ISG and ELEXON with flexibility to provide regular or ad-hoc additional analysis to enable the ISG to review GC/DC limits.

2.6 Please note that this paper does not provide a commentary on the analysis or an assessment of the GC/DC limits at this point. Its purpose is to illustrate the KPIs and seek the ISG's thoughts on the KPIs, the suggested additional analysis and the reporting style.

## 3. Key Performance Indicators

### Active and Dormant BM Units

3.1 A dormant BM Unit is defined as a BM Unit that has no Metered Volume (0.00 MWh) over the entire BSC Season. The KPI helps us to identify and exclude dormant BM Units, which by nature are GC/DC compliant, from our analysis and avoid misleading results. The KPI also helps to monitor the changes of status (i.e. active vs dormant) of BM Units when producing our quarterly report.

3.2 During BSC Winter 2017, 1240 of 3355 (37%) BM Units were dormant. The below table provides a breakdown of all active and dormant BM Units. Out of the 2115 active BM Units, 1663 (79%) are Supplier BM Units (2_). Similarly, 1103 of 1240 (89%) dormant BM Units are Supplier BM Units (2_).

3.3 All subsequent analysis only includes active BM Units.

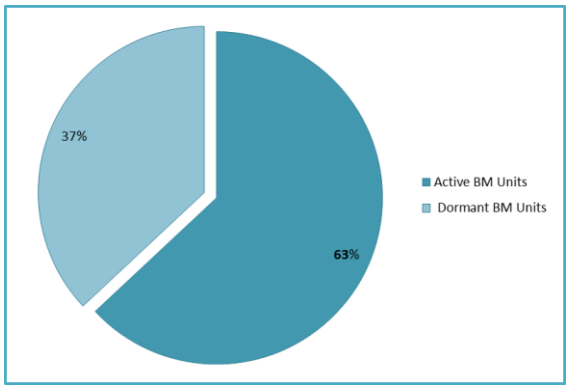


Figure 1: Proportion of BM Units that are dormant

| BM units | Active | Dormant |
|---|---|---|
| 2_ | 1663 | 1103 |
| T_ | 339 | 36 |
| C_ | 3 | 96 |
| E_ | 99 | 5 |
| M_ | 11 | 0 |
| Total | 2115 | 1240 |

### The number of breaches of the tolerance limits for each of the GC and DC

3.4 During BSC Winter 2017, there were 5751 DC breaches and 1229 GC breaches. DC breaches were mainly attributed to Supplier BM Units (2_) with declared Demand Capacity of less than 100 MW. They accounted for a total of 92.4% of DC Breaches in this period. Similarly, 83.66% of GC breaches were also Supplier BM Units (2_) with declared Generation Capacity of less than 100 MW. Directly connected BM Units (T_) accounted for 15.77% of the GC breaches and only 0.26% of the DC breaches. No DC breaches were reported for Embedded (E_), Contract for Difference (C_) and Miscellaneous BM Units (M_) while less than 0.57% GC Breaches were accounted to Embedded BM Units.

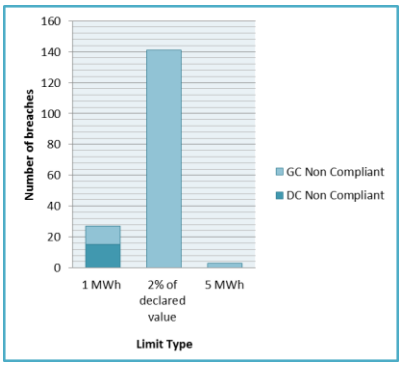


Figure 2: Directly Connected BM Units

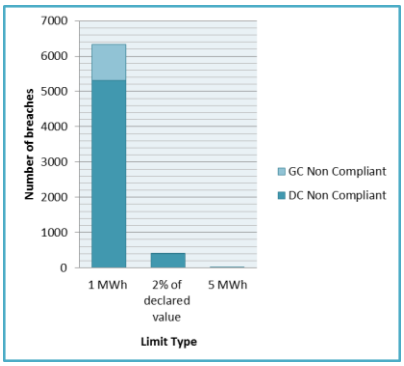


Figure 3: Supplier BM Units

# PROPOSED GC/DC KPIS REPORTING

**Amplitude of Breaches**

3.5 For the purpose of this paper, the following KPIs have been put together to understand the average difference between expected and actual maximum Metered Volume:

- The highest difference between Metered Volume data and GC or DC value + the current tolerance limit: Max (QMij – (GC+TL)) and Max (QMij – (DC+TL)).
- The highest difference between Metered Volume data and GC or DC value: Max (QMij – GC) and Max (QMij – DC).
- The average difference between Metered Volume data and GC or DC value + the current tolerance limit: Average (QMij – (GC+TL)) and Average (QMij – (DC+TL)). This would help understand how much, on average, Parties breach the existing tolerance limit.

3.6 The limit for BM Units that have a capacity between 100 and 500 MW is currently 2% of the declared GC/DC value. The formula "Average (1 -($QM_{ij}$/ (SPD*(GC)))" and "Average (1 -($QM_{ij}$/ (SPD*DC)))" enables to understand by how much the average Metered Volumes of breaching BM Units is above the declared GC/DC.

3.7 DC (indicating Demand) is a negative value while GC (indicating Generation) is a positive value. The greater the difference between DC and maximum Demand, the higher the breach is. The greater the difference between GC and maximum Generation, the higher the breach is.

The two tables below show inconclusive information as the maximum breaches could just be outliers. We invite the ISG to look at the average (QM – GC) and (QM – GC) for all BM Units (whether breached or not), i.e. to show to what extent all Parties are over/under-estimating their GC/DCs. In order to better help the ISG understand the overall levels of declarations, we recommend reporting the standard deviation in the difference between declarations and actual QM, and providing a correlation graph to illustrate the relationship between x and y.

| Maximum and average DC Breaches | | | | |
|---|---|---|---|---|
| **Limit Type** | **BM Unit Type** | **Max($QM_{ij}$ – (DC+ TL)) in MWh** | **Max($QM_{ij}$ – DC) in MWh** | **Average ($QM_{ij}$ – (DC+ TL)) in MWh** |
| **DC 1 MWh Limit** | 2_ | -64.848 | -65.848 | -2.69 |
| | T_ | -14.892 | -15.892 | -3.41 |
| **DC 5 MWh Limit** | 2_ | -33.359 | -38.359 | -17.804 |
| **Limit Type** | **BM Unit Type** | **Max($QM_{ij}$ – (DC+ TL)) in MWh** | **Max($QM_{ij}$ – DC) in MWh** | **Average(1 -($QM_{ij}$/ (SPD*DC))) in %** |
| **2% of declared DC value** | 2_ | -84.245 | -87.64 | 9.37% |

| Maximum and Average GC Breaches | | | | |
|---|---|---|---|---|
| **Limit Type** | **BM Unit Type** | **Max($QM_{ij}$ – (GC+ TL)) in MWh** | **Max($QM_{ij}$ – GC) in MWh** | **Average ($QM_{ij}$ – (GC+ TL)) in MWh** |
| **GC 1 MWh Limit** | 2_ | 135.177 | 136.177 | 11.075 |
| | T_ | 0.546 | 1.546 | 0.503 |
| | E_ | 4.405 | 5.405 | 4.405 |
| **GC 5 MWh Limit** | 2_ | 1.072 | 6.072 | 1.072 |
| **Limit Type** | **BM Unit Type** | **Max($QM_{ij}$ – (GC+ TL)) in MWh** | **Max($QM_{ij}$ – GC) in MWh** | **Average(1 -($QM_{ij}$ /(SPD* GC)) in %** |
| **2% of declared** | 2_ | 441.546 | 442.766 | 190.11%* |

| | | | | |
|---|---|---|---|---|
| GC value | T_ | 28.9 | 33.5 | 5.41% |
| | E_ | 30.633 | 33.033 | 17.64% |

* caused by one BM Unit where Average ($QM_{ij}$/ (1.02GC + GC)) = 725.85%

**Proportion of BM Units that breached the Tolerance Limit of all active BM Units**

3.8 This can be used by the ISG to understand, for each GC/DC Limit Type and BM Unit type, the scale of the breaching process and if there is an issue with the tolerance limit. This should provide, for both GC and DC separately, the percentage of BM Units that breached at least once during the Season, over the total number of active BM Units in the same category.

3.9 During BSC Winter 2017, 354 of 1663 (21%) of active Supplier BM Units were DC non-compliant at least once in the reporting period. Out of 354 DC non-compliant Supplier BM Units, 301 (85%) of the DC non-compliant Supplier BM Units with a DC of less than 100 MW. Similarly, 59 GC non-compliant Supplier BM Units with a GC of less than 100 MW breached on average 17.2 times over the Season. More importantly, ELEXON observed that nine GC non-compliant BM Units with a GC between 100-500 MW breached on average 15.7 times. ELEXON also noticed that two small Directly-Connected BM Units with DC of less than 100 MW were responsible for all of the 49 DC breaches in that category.

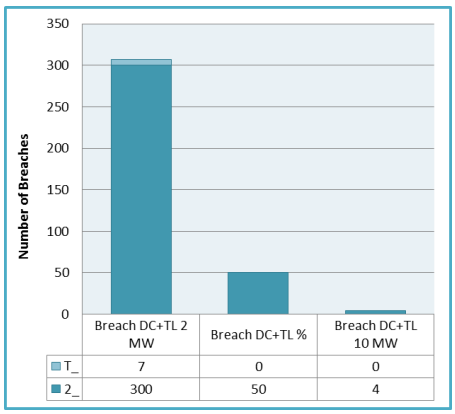


Figure 4: Non-compliant DC BM Units

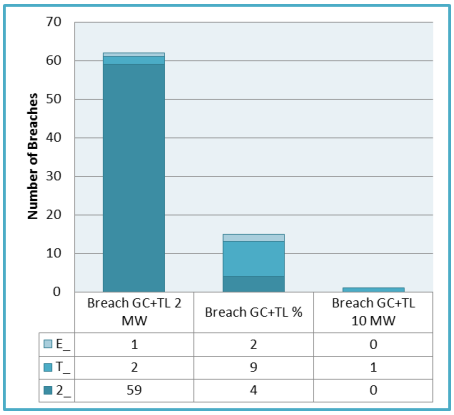


Figure 5: Non-compliant GC BM Units

**Additional analysis**

1. The KPIs above show some valuable information on BM Units that breached their DC and/or GC.

3.10 The KPIs above provide information on BM Units that breached their DC and/or GC. ELEXON started looking at BM Units which aren't breaching due to the tolerance limits in place. This should help to understand if parties are adapting their GC and DC declarations with the tolerance limits.

3.11 ELEXON will perform further analysis to help the ISG understand if the current tolerance limits are being used by Parties to remain compliant. During each quarterly update, we will invite ISG to suggest any additional analysis required. Below are examples of supplementary analysis provided by ELEXON.

3.12 Figure 6 identifies BM Units which are compliant due to the 1 MWh tolerance limit in place. This shows on average how much of the tolerance limit is used by BM Units to remain compliant. Supplier BM Units use on average 38% of the 1 MWh tolerance limit (i.e. 0.38 MWh) to remain GC compliant and 29% (i.e. 0.29 MWh) to remain DC compliant. Similarly, Embedded BM Units use on average 31% of the 1 MWh tolerance limit (i.e. 0.31 MWh) while Directly Connected BM Units only use 16% (i.e. 0.16 MWh) to remain GC compliant.

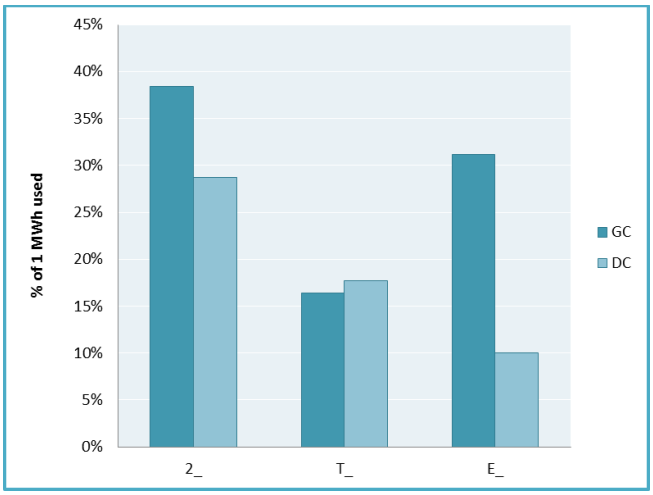


Figure 6: Proportion of 1 MWh TL used by compliant BM Units

3.13 Figure 7 and 8 look at BM Units with Demand Capacity equal to zero ('0') but have Metered Volumes and are compliant due to the 1 MWh tolerance limit. The idea was to understand how much of the tolerance limit is used for BM Units to remain compliant. Supplier BM Units with a zero DC use on average 16.2% of the 1 MWh tolerance limit (i.e. 0.16 MWh) while Embedded BM units use on average 12.4% of the 1 MWh (i.e. 0.12 MWh) and Directly Connected BM Units only use 8.2% (i.e. 0.08 MWh) of the 1 MWh to remain DC compliant.

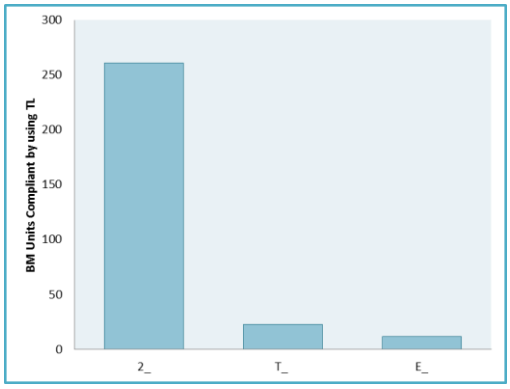


Figure 7: Compliant BM Units (DC=0)

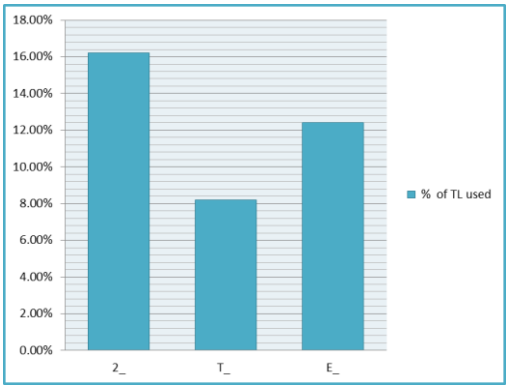


Figure 8: Percentage of 1 MWh TL used to remain Compliant (DC=0)

3.14 The table below shows that 177 of 261 (68%) Supplier BM Units with no Demand Capacity declared, used less than 16.2% of the 1 MWh limit. It would be beneficial to look at the number of zero DC BM Units that breached.

| Zero DC Submissions | Number of BM Units | % of 1MWh TL used |
|---|---|---|
| **Suppliers BM Units** | 177 | <16.2% |
| | 40 | 16.2-30% |
| | 20 | 30 -50% |
| | 24 | >50% |

## 4. Next steps

4.1 ELEXON recognises the need to perform further analysis to complement the agreed KPIs. ELEXON has provided some additional information and suggestions such as:

- Use more advanced statistical analysis such as the standard deviation, which should help ISG to understand how much the performance of BM Units differs from the mean value for the group.
- A correlation graph to understand if the maximum breaches are outliers.
- Provide the number of zero DC BM Units that breached.
- Any other suggestions from the ISG.

4.2 ELEXON will present the first quarterly GC/DC KPI report at ISG's September 2018 meeting. This will be done using Settlement data from the Spring 2018 BSC Season. Any comments made by the ISG on the content of this example paper will be taken into consideration for future reporting papers.

4.3 ELEXON will perform additional analysis to help the ISG to determine whether limits are set too high/low. The ISG will be invited to comment on the data but also to recommend supplementary information.

## 5. Recommendations

5.1 We invite you to:

a) **NOTE** the contents of the paper;

b) **NOTE** the attachment; and

c) **COMMENT** on the proposed reporting and recommendations.

## Attachments

Attachment A – GC/DC KPIs Dashboard

**For more information, please contact:**

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