Abnormal Settlement Adjustments Quantification

30th April 2011

Reference: ENG-GEN-002-1.0

This is Engage Consulting's response to Ofgem's open letter dated 21st March, inviting views on the approach for "correcting for GVC distortions in DNOs losses reporting". Accordingly, it describes our recommended approach for quantifying the net energy impact of abnormal Settlement adjustments, along with relevant rationale.

1 Introduction

It would appear that several Suppliers have made material adjustments to Settlement data that have inflated the determination of losses and reduced Distribution Network Operator (DNO) allowable revenues.

The scale of these adjustments is such that the situation now, when loss performances are being measured, is materially different from the situation in 2005 when loss targets were set for the DPCR4[1] period.

We believe that a simple method, that is capable of flexing to the individual circumstances, is required to remove the adverse effect of these adjustments from the determination of losses for the purposes of the loss incentive scheme.

Accordingly, this response documents our suggested approach for quantifying the volume of "abnormal" adjustments in each regulatory year. "Abnormal" in this context refers to the fact that the scale of adjustments is different from those observed previously, particularly when the loss incentive targets were set. It does not imply that the adjustments are illegitimate or inappropriate in any way.

1.1 Engage Consulting

Engage Consulting (Engage) provides specialist industry knowledge based consultancy and IS services to the energy sector – primarily electricity and gas.

We have undertaken many similar analysis exercises in the past – for ELEXON, the Energy Networks Association (ENA), and many other market participants. Our consultants led ELEXON's Market Monitoring team for over 5 years, designing and building many of their monitoring systems; and investigated a wide range of

[1] Distribution Price Control Period 4 – running from April 1st 2005 to March 31st 2010.

market issues using Settlement data and data acquired from Suppliers and their agents. In 2009, we also undertook a comprehensive assessment of the use of Settlement data for determining losses on behalf of the ENA, liaising both with ELEXON and Ofgem (Ref: ENA-CR002-003-2.0).

1.2 Independence

Whilst we have supported a number of DNOs in quantifying abnormal Settlement adjustments, the views expressed in this response are independent.

1.3 Disclaimer

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2 Losses

Losses are defined as units entering the network minus units leaving the network; and their derivation is based on data determined by the BSC Settlement processes. This difference is attributable to "technical losses" – heating in the wires and transformers in the network; and "non technical losses" – including theft and issues with the quality of the Settlement data used in the calculation.

3 Settlement Adjustments

With in excess of 28 million MPANs (electricity metering points) in Great Britain and complex industry processes, a certain level of data quality issues is inevitable. Since the residential market opened for competition in 1998, Suppliers and their agents have had to deploy significant resources to address these issues.

However, over the last 2 or 3 years, it is understood that several Suppliers have increased activities in these areas, deploying "revenue assurance" teams. These teams are focused on minimising unbilled volumes (to increase revenue); and ensuring that Settlement volumes are not overstated (to reduce costs).

This has led to a skew in the nature of data quality issues addressed; with there being a predominance of adjustments that remove energy from Settlements. This has resulted in the "units out" part of the losses calculation being artificially low; and the losses appearing artificially high.

These overall adjustments do not affect Suppliers to the same extent as they do DNOs as any net over or understatements of volume in a GSP Group is smeared across all Suppliers in proportion to their non half hourly market share in that GSP Group.

There is a range of techniques for adjusting Settlement data. This includes Gross Volume Corrections and Dummy Meter Exchanges, both of which are described below.

3.1 Gross Volume Corrections

Many of the adjustments to Settlement data referred to above have been made using a technique called Gross Volume Correction (GVC). This is a process that compensates for errors in days that have been subject to Final Reconciliation[2], by adjusting energy volumes for days that have not yet been subject to Final Reconciliation[2]. This is in an attempt to ensure that the right volume of energy is settled, albeit in the wrong days.

For example, if Final Reconciliation took place on a block of days that had 10MWh too much energy associated with it, Suppliers could compensate for this by removing 10MWh from a block of days inside the Settlement reconciliation window.

As Suppliers pay for the volume of energy at Final Reconciliation, they are naturally more inclined to compensate for past overstatements of energy by removing energy from the Settlement reconciliation window, than they are to compensate for past understatements of energy by moving energy into the Settlement reconciliation window. This results in a predominance of energy being removed from Settlements.

3.2 Dummy Meter Exchanges

A similar technique to GVC is that of "dummy" Meter Exchanges. This technique seeks to minimise previous errors (but not compensate for them); and to correct the situation going forward from a point in time.

If a meter reading history was particularly poor – possibly after one or more change of Supplier events – the Supplier and their Data Collector might not be able to establish what the correct reading history is. In these situations, they can obtain a correct reading and use this (or estimate a reading in the past from this correct reading) to act as a "starting point" for correct readings going forward.

To implement this, they follow the Meter Exchange business event – but without a physical meter exchange. This event requires a final reading for the "old meter" and an initial reading for the "new meter". A reading in the period of uncertain meter reading history is used as the final reading; and the good reading obtained or established is used as the initial reading, with all uncertain readings after this time being removed.

Again, as Suppliers pay for the volume of energy at Final Reconciliation, they are naturally more inclined to use this technique to remove (rather than add) energy from Settlements.

4 Quantification of Abnormal Settlement Adjustments

4.1 Settlement Run Types

A 14 month reconciliation process operates for Settlements. Within this, each Settlement Day is subject to a number of different run types. These are as follows.

[2] Disputes Final Reconciliation, when these are being undertaken.

Table 1 - Settlement Run Types

Settlement Run Type	Approximate Period after Settlement Day
Initial Settlement – SF	17 Working Days
First Reconciliation – R1	2 Months
Second Reconciliation – R2	4 Months
Third Reconciliation – R3	7 Months
Final Reconciliation – RF	14 Months

In addition, for several years now, a Dispute Final (DF) run has been undertaken for most GSP Groups to address certain data quality issues, approximately 2 years after the Settlement Day.

4.2 Natural Variations in NHH Energy between Settlement Run Types

Most NHH meters are typically read between every six months and a year. When they are read, the advance between the reading and the previous reading is determined. This advance is annualised by dividing by the sum of the Profile Coefficients in the advance period. These coefficients represent the daily proportion of annual energy used.

So, for example, if there was a reading of 2,000 on 15th December and another reading of 6000 on the 15th March and the sum of the Profile Coefficients over this (winter quarter) period was 0.4, the Annualised Advance (AA) would be (6000-2000)/0.4 = 10,000kWh.

Whenever an AA is calculated, an annualised estimate of future consumption is also calculated. This Estimated Annual Consumption (EAC) is determined from the AA and the previous EAC. This has the effect of "smoothing" changes to EACs. These calculations are undertaken by Supplier agents, using industry standard EAC/AA software provided by ELEXON.

Profile Coefficients are determined by ELEXON from load research and are calculated once a year for each of 5 profiling seasons (winter, spring, summer, high summer and autumn). The impact of different sets of Profile Coefficients across profiling season boundaries and profiling year boundaries is observable in Settlement energy volumes and the correction factors used to account for any over or understated volumes.

EACs are determined from AAs and previous EACs; and are replaced with AAs when the meter is read subsequently. As a consequence, EACs are usually determined from a different set of Profile Coefficients than the AAs that replace them. The impact of this is a complex function of meter reading cycles; meter advance periods; and the Profile Coefficient sets and boundaries. Nonetheless, it does give rise to a regular cyclical pattern throughout the reconciliation period as EACs are replaced by AAs. An example of this effect can be seen in the graph below.

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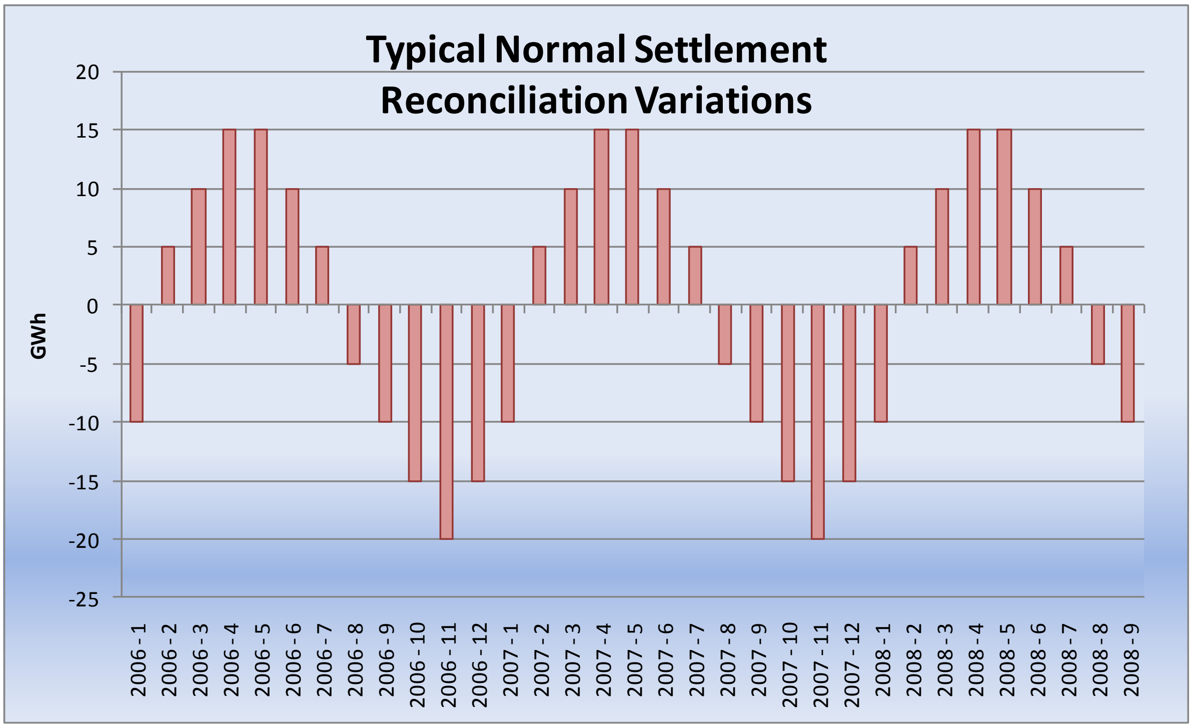
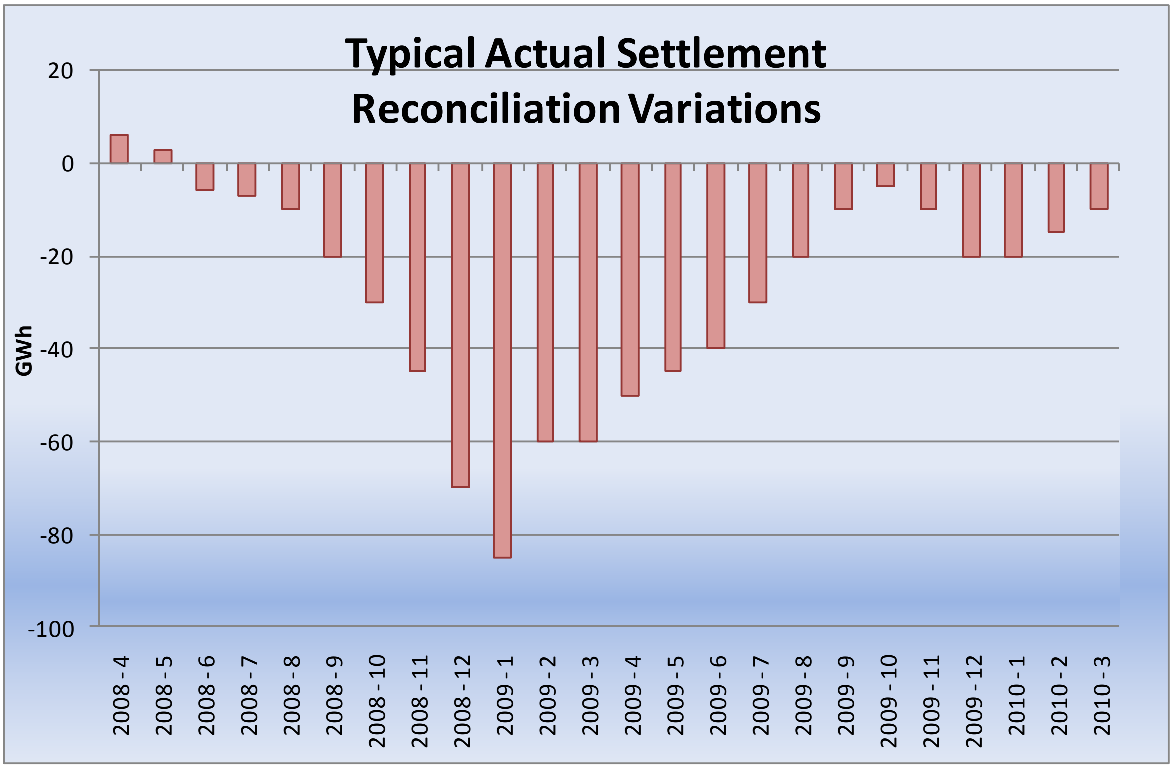
Graph 1 – Hypothetical Example of Regular Cyclical Changes as EACs are Replaced by AAs



4.3 Observed Variations in NHH Energy between Settlement Run Types

The observed variations across the reconciliation period are significantly more than the natural variations described in section 4.2 for most GSP Groups, particularly for regulatory years ending March 2009 and March 2010. An example of this can be seen in the graph below.

Graph 2 – Hypothetical Example of Abnormal Variations Across the Reconciliation Period



This indicates the scale of the difference between the situation when the DPCR4 loss incentive targets were set and the current situation when they are being measured.

5 Abnormal Settlement Adjustment Quantification

One approach to quantify abnormal Settlement adjustments would be to undertake a market wide data collection exercise of the individual adjustments that each Supplier has made to Settlement data over the last five or so years, and then to process this in some way.

We believe that this is not a practical solution. The data collection aspect would present significant logistical issues; and it is unlikely that all Suppliers would be able to provide suitable accurate records over this period to support such an approach. As a consequence we believe that a "top down" approach based on aggregated data is required.

Our method for quantifying abnormal Settlement adjustments comprises two stages.

- Stage 1 – quantifies the abnormal variation in Settlement volumes between run types; and
- Stage 2 – normalises the Initial Settlement position against which these variations are measured.

These stages are described in more detail below.

5.1 Abnormal Run Type Variation Quantification

In order to quantify the Abnormal Variations (AV) in NHH volumes between run types, natural variations should be determined from "stable" historical periods and these should be netted off Observed Variations (OV) from the period with abnormal variations.

The stable period used to model natural variations should be at least 2 years (subject to data being available). It should also exclude any months that have a material isolated operational incident that would be detrimental to this modelling[3].

A Percentage Natural Variation (PNV) in energy from non half hourly read meters (NHH) should be determined for each combination of run type and later run type, for each month (m) in the stable period (with the same month in different years being considered together).

Then, for each Settlement Day (d) in the period with abnormal variations, Abnormal Variations (AV) between SF and the latest run type (LRT) that has taken place (including or excluding Dispute Final runs as appropriate, depending on the DNO's loss reporting method) should be determined as:

$$AV_{d,sf-lrt} = OV_{d,sf-lrt} - \left(NHH_{d,sf} * PNV_{m,sf-lrt}\right)$$

Where, for sign convention purposes, variations are determined as LRT – SF; and m is the month that contains day d.

And the regulatory year (ry) abnormal variations should be determined as:

$$\sum_{d\ in\ ry} AV_{d,sf-lrt}$$

5.2 Normalisation of SF Position

The method presented in section 5.1 determines abnormal run type variations that are attributable to Settlement adjustments. It measures these with reference to the Initial Settlement (SF) position. However, there are two key reasons why the SF position for regulatory years 08/09 and 09/10 would have not been normal. These reasons relate to:

- the recession; and
- prior year adjustments – and negative EACs.

These effects are explained in summary below.

5.2.1 Recession

The recession took place during regulatory period 08/09 and 09/10. It gave rise to a reduction in energy used, particularly for the larger commercial sector that is settled on half hourly meter readings; but also, to a lesser extent; the domestic and smaller commercial sectors that are settled on non half hourly meter readings (in the form of EACs and AAs).

EACs are derived from AAs and previous EACs and so those in effect in the recessionary period, derived from AAs and previous EACs prior to this period,

[3] Typically operational incidents that involve a single MPAN and create an observable spike in GSP Group Correction Factors.

would have been overstated to some extent. SF is based almost exclusively on EACs and so would also have been overstated because of this; far more so than for subsequent Settlement run types where these EACs would have been replaced by AAs.

Modelling the impact of this would be extremely difficult as it is a complex function of many variables.

5.2.2 Prior Year Adjustments – and Negative EACs

The abnormal adjustments made to regulatory year 07/08 and 08/09, will have impacted the forward looking EAC effective for subsequent periods. These adjustments removed a large volume of energy from Settlements; and this will have had the effect of understating in EACs for later periods – particularly for regulatory periods 08/09 and 09/10.

Again, as SF is based almost exclusively on EACs, this too would have been understated for these later periods; far more so than for subsequent Settlement run types where these EACs would have been replaced by AAs.

Modelling this impact would be extremely difficult as it is a function of the nature of the adjustments made and the adjustment techniques used. However, analysis of several sets of P222 EAC data confirms that there was a very significant volume of negative EACs in place, consistent with previous adjustments (particularly through GVC) having been made.

5.2.3 Normalisation of the SF Position

As a consequence, the SF position for regulatory years 08/09 and 09/10 needs to be normalised to remove these complex effects. This can be done by assuming that a hypothetical average percentage losses (APL), determined from SF data and latest run type data in accordance with the formula below, across regulatory years 06/07 and 07/08, should approximate to the same value for regulatory years 08/09 and 09/10. This is a reasonable assumption for these purposes.

5.2.3.1 Normalisation Basis

We know:

$$Percentage\ Losses = PL = 100 * \frac{Units\ In - Units\ Out}{Units\ Out}$$

Following the same construct, normalisation parameter APL:

$$APL = 100 * \frac{LRT\ Units\ In_{ry} - \left(LRT\ HH\ Units\ Out_{ry} + SF\ NHH\ Units\ Out_{ry} \right)}{\left(LRT\ HH\ Units\ Out_{ry} + SF\ NHH\ Units\ Out_{ry} \right)}$$

Where:

- LRT is the latest Settlement run type; and
- *ry* is regulatory year, 06/07 and 07/08.

This can be used to determine a normalised Initial Settlement NHH Units Out figure as explained below.

5.2.3.2 Normalisation

We know:

$$Percentage\ Losses = PL = 100 * \frac{Units\ In - Units\ Out}{Units\ Out}$$

Therefore:

$$Units\ Out = \frac{Units\ In}{\left(\frac{PL}{100}\right) + 1}$$

We also know:

$$Units\ Out = HH\ Units\ Out + NHH\ Units\ Out$$

Therefore:

$$NHH\ Units\ Out = \frac{Units\ In}{\left(\frac{PL}{100}\right) + 1} - HH\ Units\ Out$$

Therefore, substituting APL for PL:

$$Normalised\ SF\ NHH\ Units\ Out_{ry} = \frac{LRT\ Units\ In_{ry}}{\left(\frac{APL}{100}\right) + 1} - \text{LRT HH Units Out}_{ry}$$

Where:

- LRT is the latest Settlement run type; and
- *ry* is regulatory year, 08/09 and 09/10.

And the incorrect position associated with SF (SFI) for each regulatory year 08/09 and 09/10 is:

$$SFI_{ry} = Initial\ SF\ NHH\ Units\ Out_{ry} - Normalised\ SF\ NHH\ Units\ Out_{ry}$$

5.3 Total Abnormal Adjustments

The total abnormal adjustments (TAA) in regulatory year ry is the sum of the abnormal run type variations described in section 5.1 and the incorrect SF position described in section 5.2, determined as:

$$TAA_{ry} = \sum\nolimits_{d\ in\ ry} AV_{d,sf-lrt} + SFI_{ry}$$

6 Settlement Run Date Reporting Impact

For DNOs who report Settlement adjustments for the purposes of the loss incentive scheme in the regulatory year that the reconciliation runs take place (as opposed to the regulatory year in which the Settlement Days fall), the abnormal adjustments quantified as described in section 5 should be mapped to the regulatory years using the Settlement calendar published by ELEXON, using the SVAA run dates. The method for doing this is described below.

6.1 Abnormal Run Type Variation Mapping

In order to map abnormal run type variations to reconciliation run dates, the abnormal variation for each Settlement Day and reconciliation run type first need to be quantified. This should be done as described in section 5.1[4] with the exception that it should be done for each successive run type (SF-R1, R1-R2, R2-R3, R3-RF and, if appropriate, RF-DF), rather than from SF to the latest run type (LRT).

The abnormal variation associated with each Settlement Day and reconciliation run type should then be attributed to the relevant SVAA run date (using the Settlement calendar published by ELEXON) and these abnormal variations should be summed across regulatory years.

6.2 SF Normalisation Mapping

In order to map the error associated with the incorrect Initial Settlement (SF) positions to reconciliation run dates, the incorrect SF position associated with each regulatory year, determined as described in section 5.2.3.2[5], should first be apportioned across each Settlement Day in the regulatory year simply by dividing by 365.

The proportion of this Settlement Day error that is rectified in each reconciliation run type should then be determined. In order to do this, it should be assumed that:

- the incorrect SF position is rectified fully through the Settlement reconciliation process (R1-RF) as estimates (EACs) are turned into actuals (AAs);
- the following average percentages of NHH energy settled on actuals (AAs), taken from the latest BSC Panel Trading Operations Report, apply:
  - R1 31% on AAs;
  - R2 68% on AAs; and
  - R3 89% on AAs.

Accordingly:

- R1 corrects 31% of the SF error;
- R2 corrects 68-31 = 32% of the SF error;
- R3 corrects 89-68 = 21% of the SF error; and
- RF 100-89 = 11% of the SF error.

The SF error associated with each Settlement Day should be apportioned across reconciliation run types by multiplying by the applicable percentages (31%, 32%, 21% and 11% for R1, R2, R3 and RF respectively).

The SF error associated with each Settlement Day and reconciliation run type should then be attributed to the relevant SVAA run date (using the Settlement calendar published by ELEXON) and then these SF errors should be summed across regulatory years.

[4] For $AV_{d,sf-lrt}$
[5] SFI_{ry}

6.3 Accounting Year Mappings

In order to simplify the situation for those DNOs that report reconciliation adjustments in the regulatory year that they account for them, rather than the regulatory year in which the reconciliation runs take place, the method described above in sections 6.1 and 6.2 should be used along with a simple number of days offset to reflect the lag between SVAA reconciliation runs taking place and being accounted for.

7 Conclusion

The scale of Supplier adjustments to Settlement data has undoubtedly changed over the last few years; and is now materially different from the situation in place when the loss targets were set for the DPCR4 period. As a consequence, they are having a significant and adverse impact on DNO allowed revenues.

Variances between reconciliation runs are a natural feature of the BSC Settlement arrangements and so a method is required to distil "abnormal" variations from observed variations – abnormal variation being the volume of variation that is occurring now that was not occurring when the DPCR4 loss incentive targets were set.

However, it needs to be recognised that the recession and prior year abnormal Settlement adjustments will have impacted the estimates upon which Initial Settlement are based. This Initial Settlement position is the baseline against which Settlement reconciliation variations are measured. As a consequence, it requires normalising so that it can be used in conjunction with the abnormal run type variation volumes.

Consequently, our method for quantifying abnormal Settlement adjustments comprises two stages:

- Stage 1 – quantifies the abnormal variation in Settlement volumes between run types; and
- Stage 2 – normalises the Initial Settlement position against which these variations are measured.

Our method then maps these adjustments to regulatory years in a manner that is consistent with individual DNO regulatory loss incentive reporting practices.

This method quantifies "abnormal adjustments" in a simple and reasonable way that could be used consistently for each DNO; using aggregated data that is readily available.

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