Abnormal Settlement Adjustments Quantification

Richard Cullen – 12th April 2011

Reference: SPP-CR001-002-2.0

This document describes the method used for quantifying the net energy impact of abnormal Settlement adjustments, along with relevant rationale; and quantifies this impact.

1 Introduction

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

This paper presents the results of our analysis into this issue for the two distribution networks operated by SP Energy Networks.

1.1 Method and Data Analysed

The objective of our analysis was to quantify the abnormal adjustments to Settlement data in regulatory years 08/09 and 09/10.

In order to do this, we analysed a large volume of Settlement data provided by ELEXON and "P222 EAC" data provided by **[REDACTED]**

In deciding upon our quantification method, we met with ELEXON and shared our approach – to confirm that they were comfortable that it was reasonable.

1.2 Engage Consulting

Engage Consulting (Engage) provides specialist industry knowledge based consultancy and IS services to the deregulated 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. We led ELEXON's Market Monitoring team for over 5 years, designing and building many of their monitoring systems; and investigated a wide range of 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

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Settlement data for determining losses on behalf of the ENA, liaising both with ELEXON and Ofgem (Ref: NA-CR002-003-2.0).

1.3 Independence

SP Energy Networks has commissioned this analysis. Notwithstanding this, the analysis is independent and we have maintained editorial control on the information presented and views expressed in this paper.

1.4 Disclaimer

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2 Losses

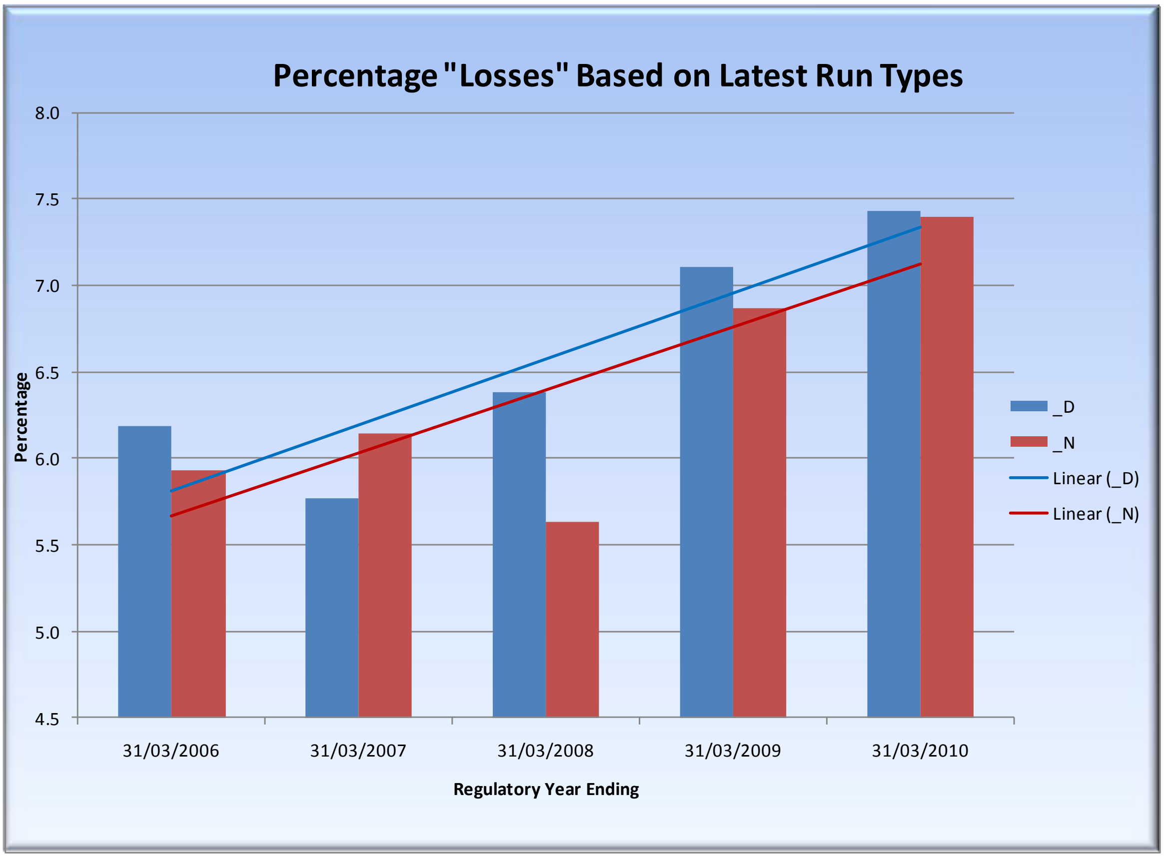
Losses are defined as units entering the network minus units leaving the network, as determined by the BSC Settlement processes. This difference is attributable to "technical losses" – heating in the wires and transformers in the network; and "non technical losses" – including theft and issues with the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

It would appear that several Suppliers have made abnormal adjustments to Settlement data that has artificially inflated the determination of losses. The scale of this can be seen in the following graph, determined from Settlements data as[1]:

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

[1] Calculation is consistent with the regulatory formula, but the results will be slightly different as the data sets used are for GSP Groups and, for simplicity, use GSP Group Takes which treat certain types of demand as negative generation (the most significant of which is CVA registered demand). The objective of the graph is to demonstrate the relative scale of the changes rather than the precise value of loss percentages.

Graph 1 - Scale of Impact on "Losses"



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 the GSP Group.

There are a range of techniques for adjusting Settlement data. These include 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. 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 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 – possible 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 was. 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.

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

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.

Table 1 - Settlement Run Types

Settlement Run Type	Approximate Period after Settlement Day
Initial Settlement – SF	17 WD
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 proportion of annual energy used in each day.

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.

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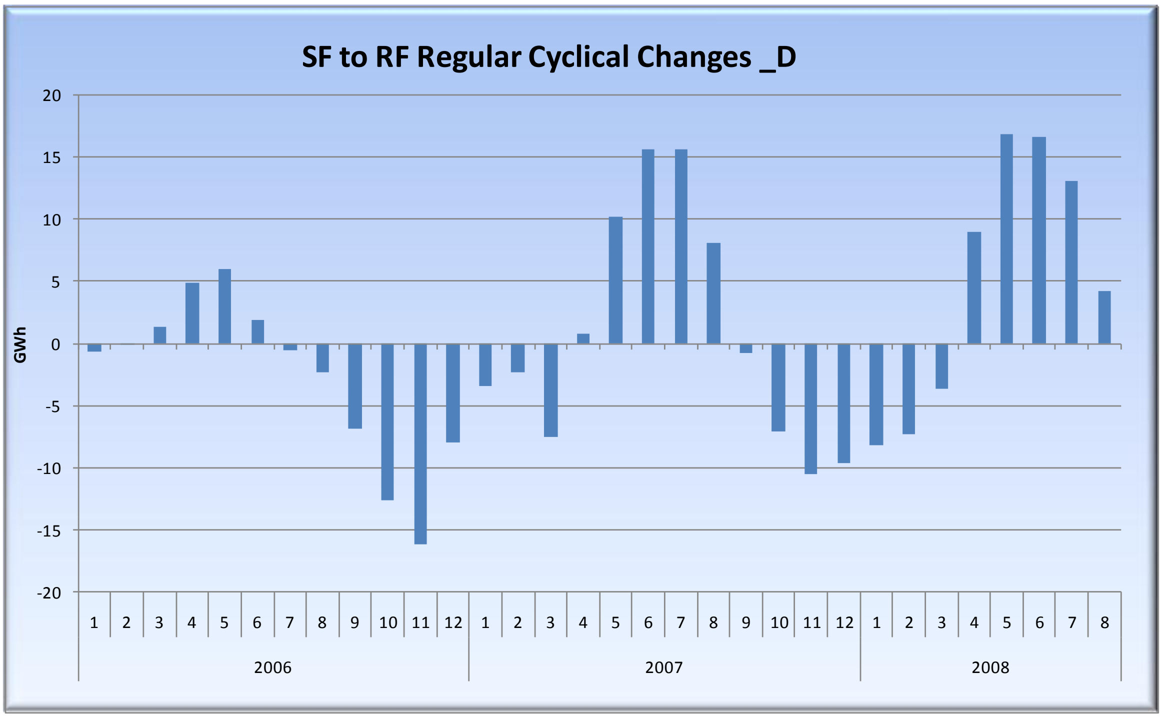
EACs are determined from AAs and previous EACs; and are replaced with AAs when the meter is read subsequently. As a consequence, EACs are usually determined from a different set of Profile Coefficients than the AAs that replace them. The impact of this is a complex function of meter reading cycles; meter 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.

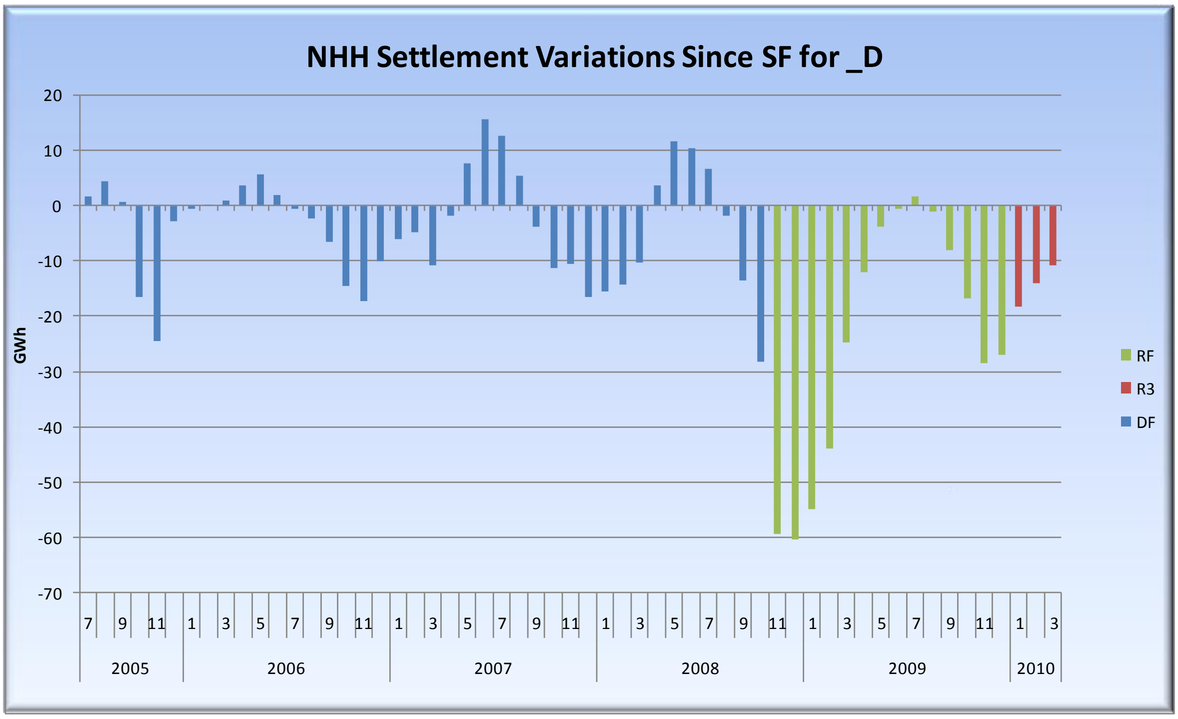
Graph 2 – Example of Regular Cyclical Changes as EACs are Replaced by AAs



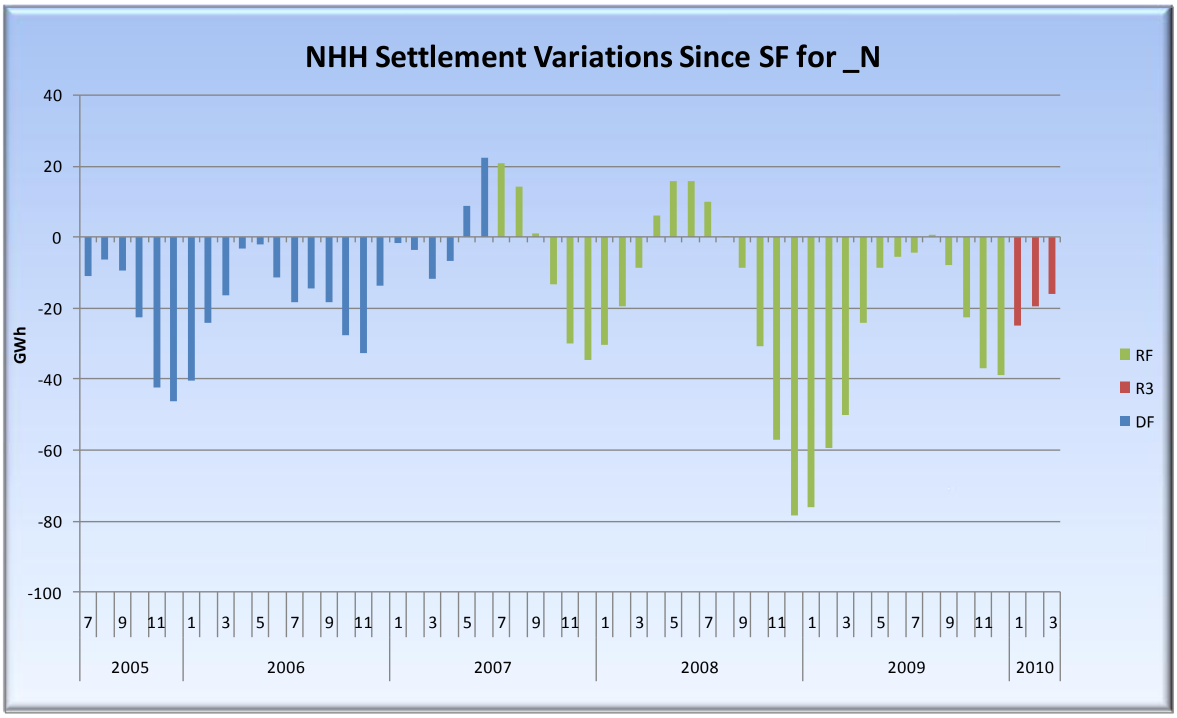
4.3 Observed Variations in NHH Energy between Settlement Run Types

The observed variations in energy between Settlement runs for the Merseyside and North Wales GSP Group (MANW, _D) and the South Scotland GSP Group (SPOW, _N) are shown in the graphs below.

Graph 3 – Observed Settlement Adjustments in the MANW (_D) GSP Group



Graph 4 – Observed Settlement Adjustments in the SPOW (_N) GSP Group



The variations across the reconciliation timetable for regulatory years ending March 2009 and March 2010 are significantly more than the natural variations described in section 4.2.

4.4 Abnormal Run Type Variation Quantification

In order to quantify the Abnormal Variations (AV) between run types, natural variations were determined from "stable" historical periods and these were netted off Observed Variations (OV).

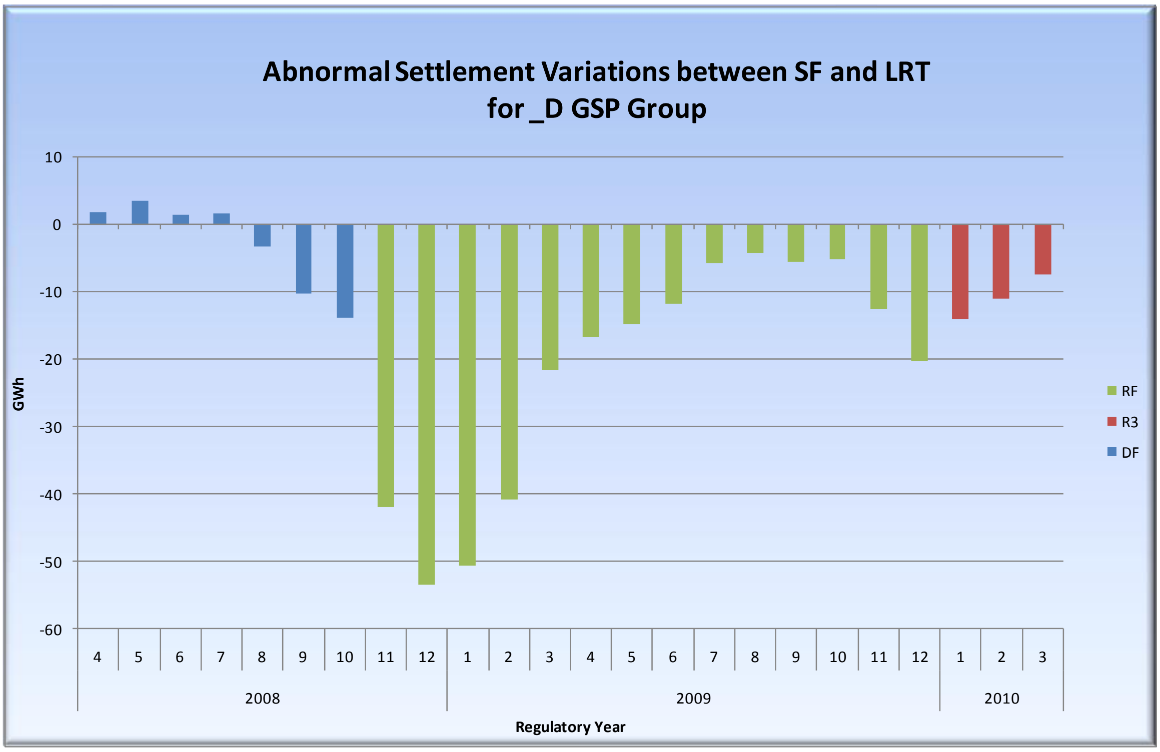
For the MANW GSP Group (_D), the stable period chosen was the earliest date for which data was available from ELEXON (1 July 2005) and 31 August 2008. For the SPOW GSP Group (_N), the stable period chosen was 1 September 2006 to 31 August 2008. The reason for this difference is that, for the SPOW GSP Group, atypical variations are also observable in the latter part of 2005 and early part of 2006[3].

For each of the two GSP Groups, a Percentage Natural Variation (PNV) in energy from non half hourly read meters (NHH) was determined for each combination of run type and later run type, for each month in the historical period (with the same month in different years being considered together).

Then, for each month (m) on and after September 2008, Abnormal Variations (AV) between SF and the latest run type (LRT) that had taken place were determined as:

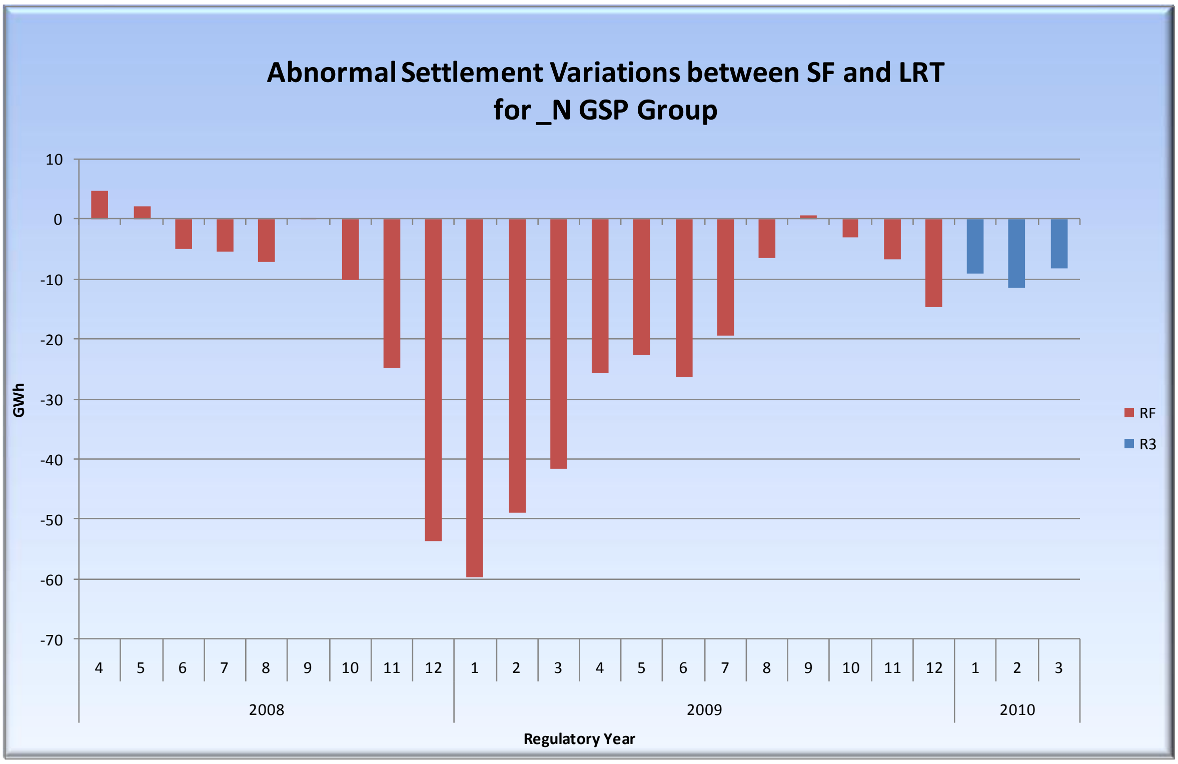
$$AV_{m,sf-lrt} = OV_{m,sf-lrt} - \left(NHH_{m,sf-lrt} * PNV_{m,sf-lrt}\right)$$

Graph 5 – Abnormal Settlement Variations in the MANW (_D) GSP Group

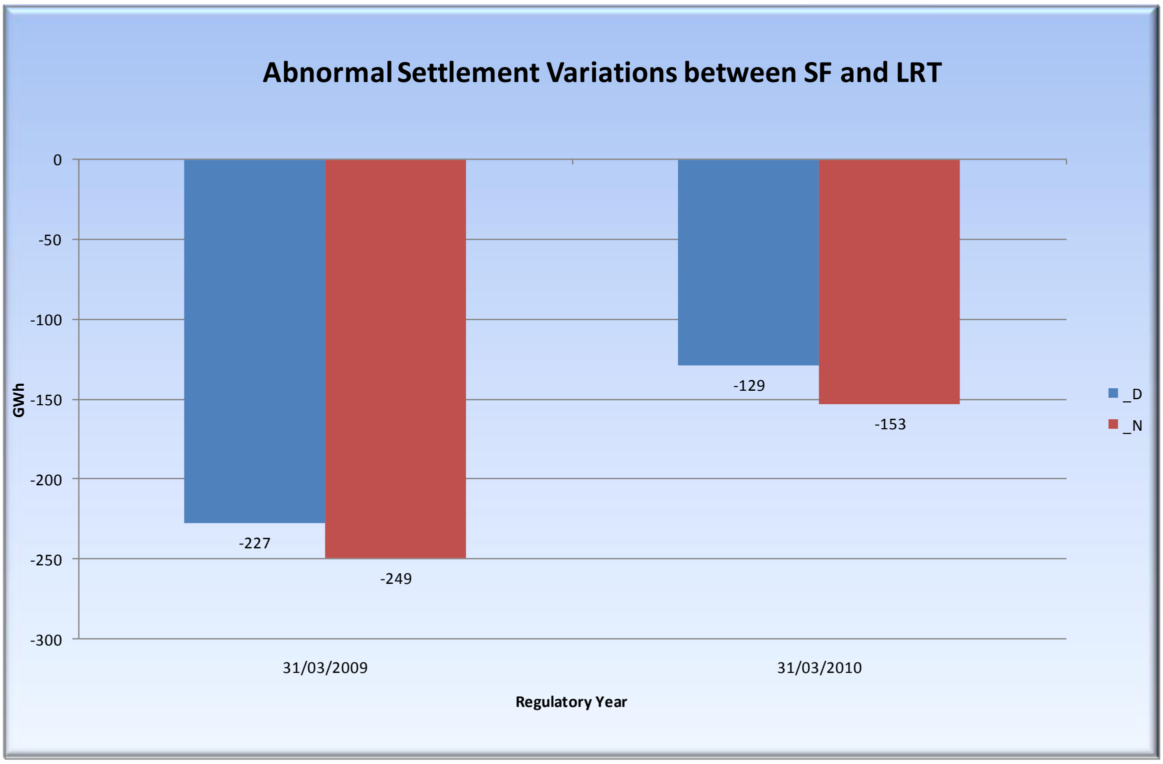


3 These are also due to abnormal Settlement adjustments.

Graph 6 – Abnormal Settlement Variations in the SPOW (_N) GSP Group



Graph 7 – Abnormal Settlement Variations in Regulatory Years 08/09 and 09/10



4.5 Refinement of SF Position

The analysis presented in section 4.4 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.

4.5.1 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 (and 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, 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.

4.5.2 Prior Year Adjustments – and Negative EACs

The abnormal adjustments made to regulatory year 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 period 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, P222 data from the early part of 2010 was analysed and confirms the there was a very significant volume of negative EACs in place, consistent with previous adjustments (particularly through GVC) having been made.

4.5.3 Normalisation of the SF Position

The SF position for regulatory years 08/09 and 09/10 was normalised to remove these complex effects. This was done for each GSP Group, 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.

4.5.3.1 Normalisation Basis

We know:

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

Following the same construct, normalisation parameter APL:

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

Where:

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

This was used to determine a revised Initial Settlement NHH Units Out figure as explained below.

4.5.3.2 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:

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

Therefore, substituting APL for PL:

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

Where:

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

4.5.3.3 Normalisation Results

The normalised and un-normalised SF NHH Units Out were then differenced. This indicates that the un-normalised SF values, used in the determination of the volume of abnormal Settlement run type variances (described in section 4.4 and shown in Graph 7), are overstated (+'ve) and understated (-'ve) by the following amounts.

Table 2 – Abnormal SF Position

Regulatory Year	MANW (_D) (GWh)	SPOW (_N) (GWh)
08/09	44	5
09/10	-117	-192

These results are consistent with the recession being the predominant factor impacting regulatory year 08/09; and negative EACs arising from adjustments in this period being the predominant factor impacting regulatory year 09/10.

4.6 Resultant Quantification of Abnormal Adjustments

The magnitude of the abnormal adjustments is the abnormal run type variances described in section 4.4 minus the abnormal SF starting position as described in section 4.5.

These figures give net abnormal adjustment volumes as show in the table below.

Table 3 – Volume of Abnormal Adjustments

Regulatory Year	MANW (_D) (GWh)	SPOW (_N) (GWh)
08/09	183	244
09/10	246	345

4.7 Impact on Losses

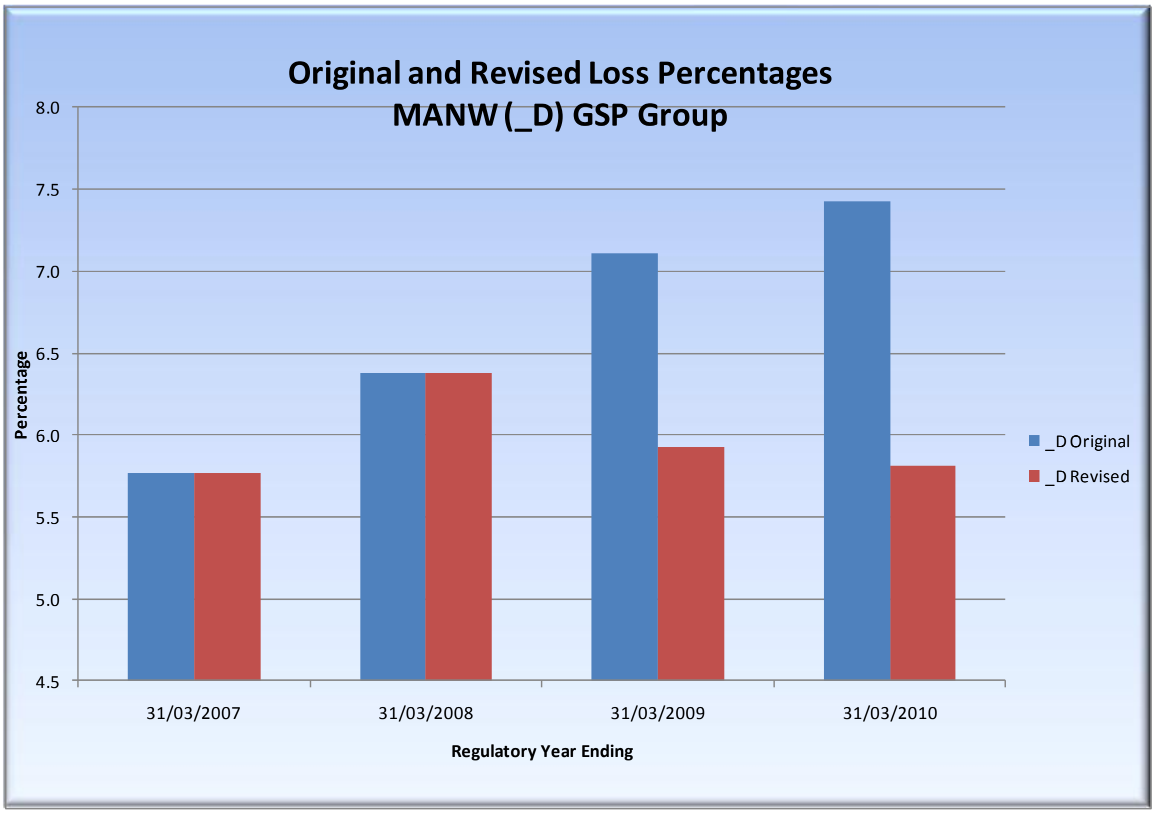
Correcting NHH Units Out, as described in section 4.6, would have the following impact on percentage losses (determined as described in section 2).

Table 4 – Impact on Losses of Abnormal Adjustments

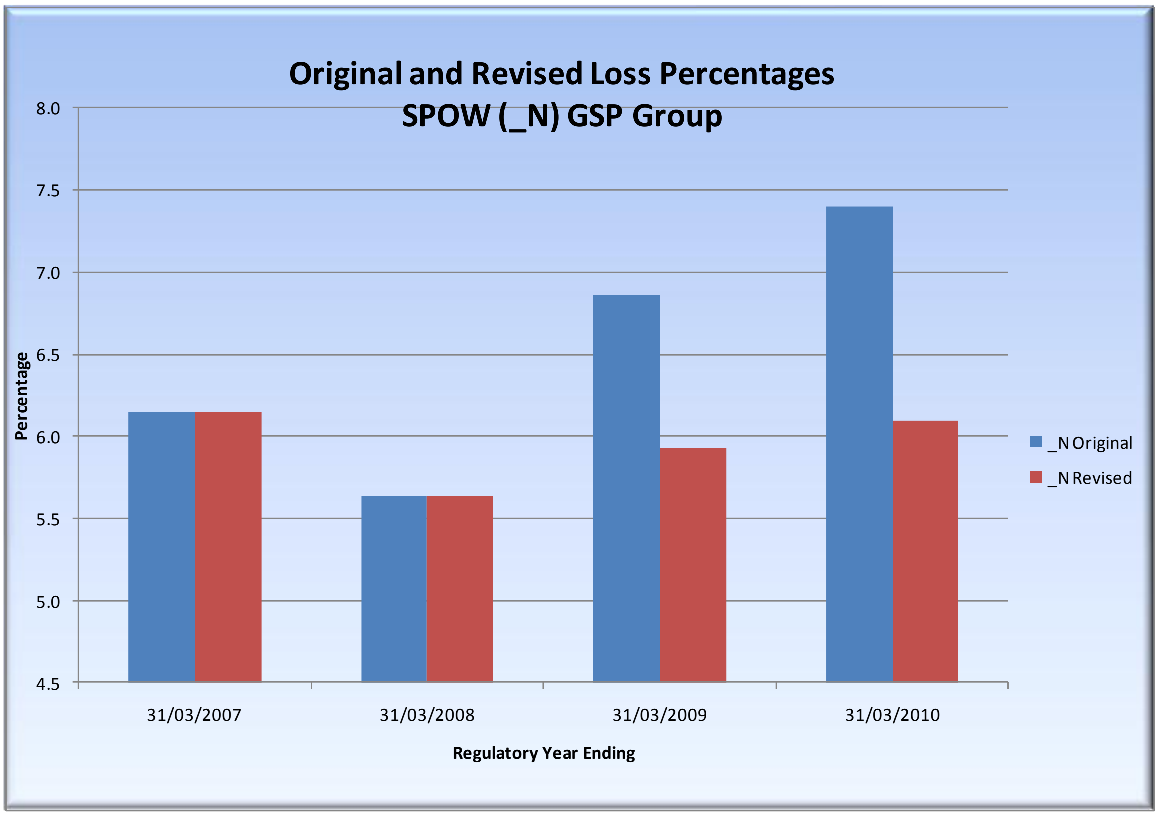
Regulatory Year	MANW (_D)	SPOW (_N)
08/09	5.92%	5.93%
09/10	5.81%	6.10%

With reference to Graph 8 and Graph 9 below, these adjusted loss percentages are entirely consistent with historical values.

Graph 8 – Comparison of MANW Original Loss Percentages and Revised Loss Percentages



Graph 9 – Comparison of SPOW Original Loss Percentages and Revised Loss Percentages



5 Conclusion

Taking into consideration the abnormal Settlement run type variations described in section 4.4, the recessionary impact and impact of prior year adjustments (including negative EACs) as described in section 4.5 – and modelling these impacts – the Units Out determined from the latest Settlement runs[4] appear to be understated, compared to the "normal" situation when the regulatory loss targets were set, by the following amounts.

Table 5 – Volume of Abnormal Adjustments

Regulatory Year	MANW (_D) (GWh)	SPOW (_N) (GWh)
08/09	183	244
09/10	246	345

The reconciliation (and disputes) process has yet to complete for these regulatory years and the situation is likely to get worse, as further adjustments made are reflected in Settlements.

These figures have been determined from GSP Group Settlement data, including GSP Group Takes. This data includes independent networks within the GSP Group; and treats the relatively trivial volume of CVA registered demand as negative generation. The results are therefore expected to be slightly different from values derived using the same method but using regulatory network reporting data.

[4] As at early March 2011.