P304 – WORKGROUP'S INITIAL PAR350 ANALYSIS

EXECUTIVE SUMMARY

National Grid raised P304 'Reduction in PAR from 500MWh to 250MWh' to progress the outcomes of Ofgem's Electricity Balancing Significant Code Review (EBSCR). This Modification proposes to reduce the Price Average Reference (PAR) value from 500MWh to 250MWh to make imbalance prices (cash-out prices) more marginal when they are calculated using the Main Price. As part of its assessment of P304, the Workgroup have requested that ELEXON conduct extensive analysis using PAR values of 100MWh, 250MWh and 350MWh.

Further information on this Modification can be found on the P304 page of the ELEXON website or in the P304 Assessment Consultation, to which this document is attached.

Summary of the PAR350 Analysis results

This document details the potential impacts on imbalance prices due to a reduction in PAR from 500MWh to 350MWh using historic data going back to 2010 (post P217 implementation). ELEXON have also run the Settlement Trading Charge calculation using PAR350 imbalance prices to study the impacts across different BSC Parties. **Please note that this analysis does not take into account behavioural changes**.

Our analysis shows that, compared to PAR250, PAR350 will have a weaker effect on sharpening the Main Price when the period Net Imbalance Volume (NIV) is greater than 350MWh or less than -350MWh. This means that there will be an increase in System Buy Price (SBP) when the System is short and decrease System Sell Price (SSP) when the System is long.

The Main Price will not be affected for Settlement Periods with a NIV between +/- 350MWh inclusive. This supports the intention of Ofgem's EBSCR Decision, to make the Main Price a more accurate signal of scarcity in the market.

We have applied PAR350 imbalance prices to BSC Parties' historical Imbalance Volumes to assess the impacts of Imbalance Charges and Residual Cashflow Reallocation Cashflow (RCRC) on BSC Parties. The findings are similar to that of PAR250 analysis, such that Parties with large Credited Energy Volumes will benefit from larger RCRC arising from PAR350 Main Price/Reverse Price spread. There is a smaller impact on BSC Parties compared to PAR100/PAR250. Independent Suppliers (small Suppliers) were more likely to be impacted by higher imbalance prices. However, the net daily impact is below £55 (about half of the impact of PAR250) for 97% of the Suppliers.

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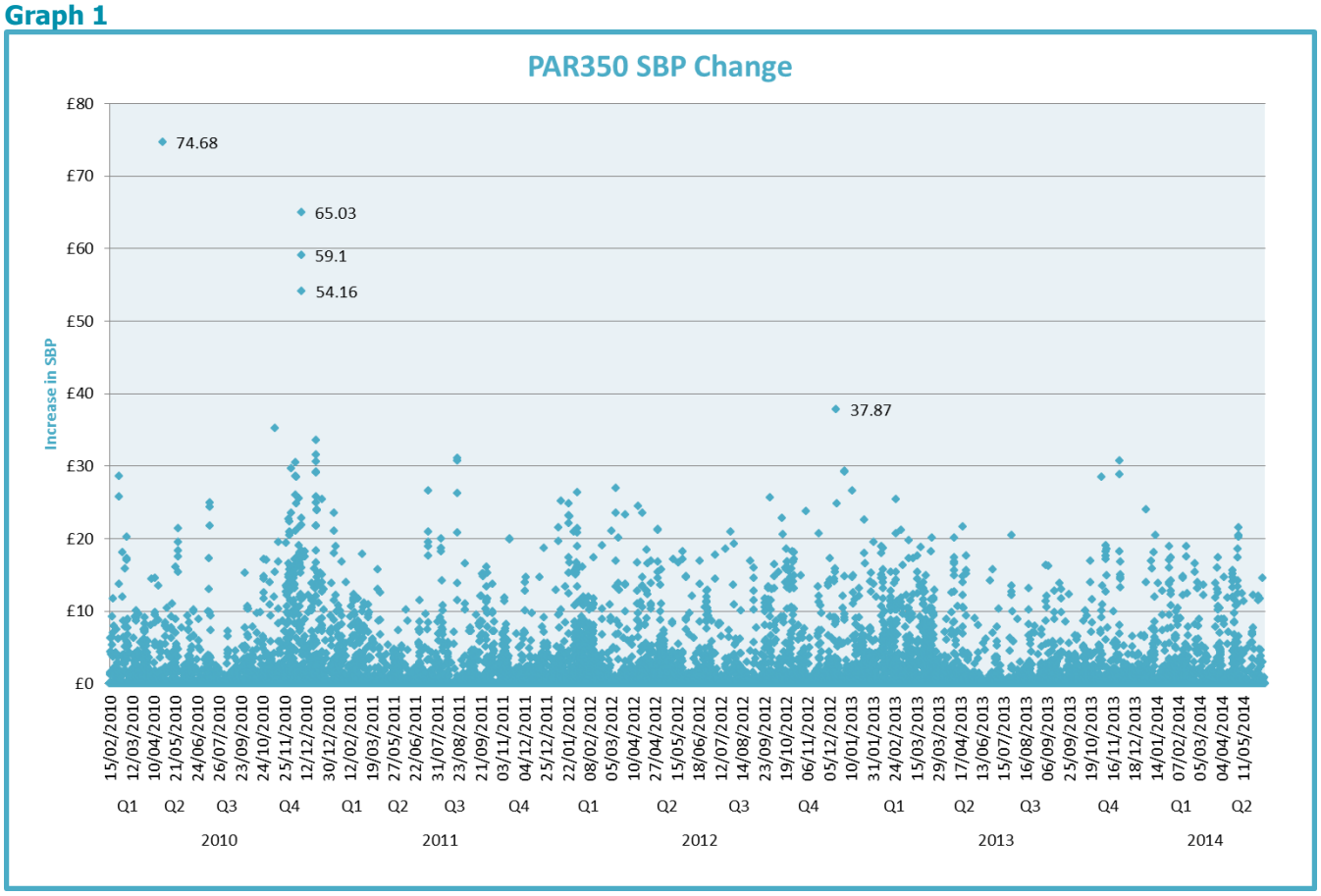
PAR350 MAIN PRICE IMPACT ANALYSIS

Increase in System Buy Price (SBP) as a Result of PAR350

Graph 1 below shows that there were more Settlement Periods with large increases in SBP in 2010 especially during the winter period . SBP increased less compared to PAR100/PAR250 with the maximum SBP increase being £74.68.

Throughout the analysis period, SBP remained unchanged in 75.10% of the total Settlement Periods where SBP was the Main Price (short System). This percentage has increased by 13.12 percentage points compared to PAR250 suggesting that fewer Settlement Periods were affected when increasing PAR from 250MWh to 350MWh.

Graph 1



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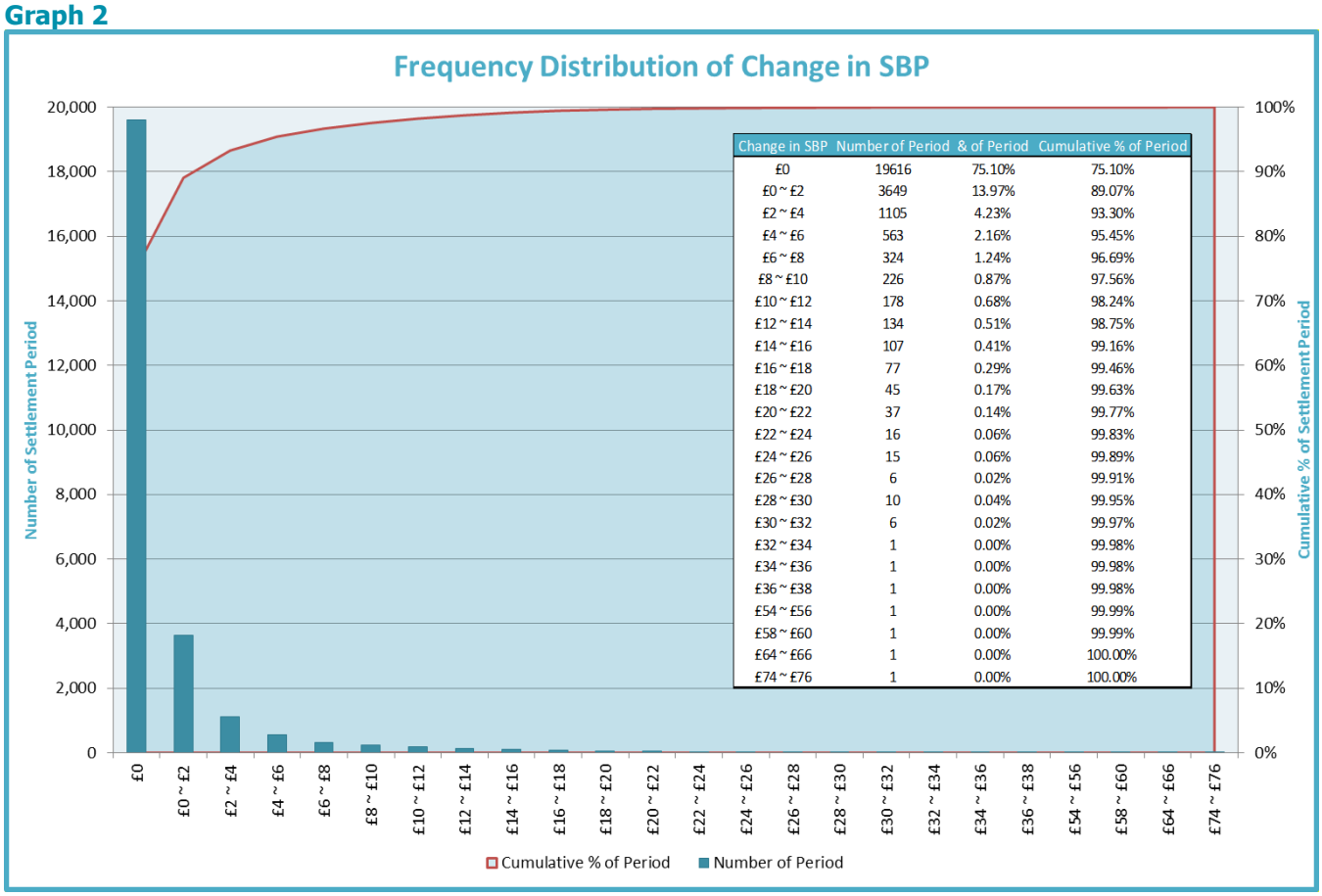
Frequency Distribution of SBP Increase as a Result of PAR350

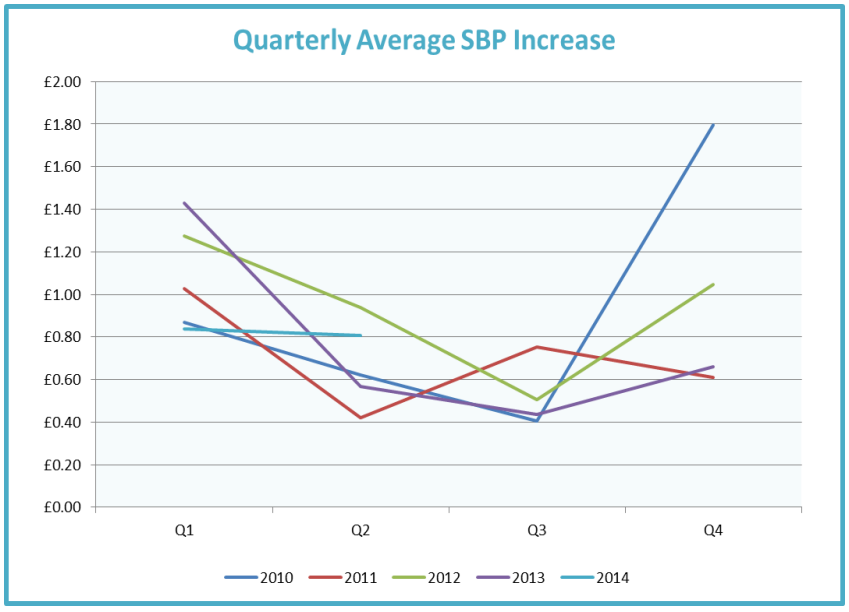
Graph 2 shows the cumulative frequency distribution. Around 89% of the Periods were impacted by less than £2 and around 95% of the Periods were impacted by less than £6.

Graph 2



Change in SBP	Number of Period	& of Period	Cumulative % of Period
£0	19616	75.10%	75.10%
£0 ~ £2	3649	13.97%	89.07%
£2 ~ £4	1105	4.23%	93.30%
£4 ~ £6	563	2.16%	95.45%
£6 ~ £8	324	1.24%	96.69%
£8 ~ £10	226	0.87%	97.56%
£10 ~ £12	178	0.68%	98.24%
£12 ~ £14	134	0.51%	98.75%
£14 ~ £16	107	0.41%	99.16%
£16 ~ £18	77	0.29%	99.46%
£18 ~ £20	45	0.17%	99.63%
£20 ~ £22	37	0.14%	99.77%
£22 ~ £24	16	0.06%	99.83%
£24 ~ £26	15	0.06%	99.89%
£26 ~ £28	6	0.02%	99.91%
£28 ~ £30	10	0.04%	99.95%
£30 ~ £32	6	0.02%	99.97%
£32 ~ £34	1	0.00%	99.98%
£34 ~ £36	1	0.00%	99.98%
£36 ~ £38	1	0.00%	99.98%
£54 ~ £56	1	0.00%	99.99%
£58 ~ £60	1	0.00%	99.99%
£64 ~ £66	1	0.00%	100.00%
£74 ~ £76	1	0.00%	100.00%

Graph 3



Quarterly Average Increase in SBP

As shown in Graph 3, the average SBP increases in quarter 1 and quarter 4 (Calendar Year) were higher than those of other quarters in most of the years. The largest average SBP increase occurred in quarter 4 of 2010.

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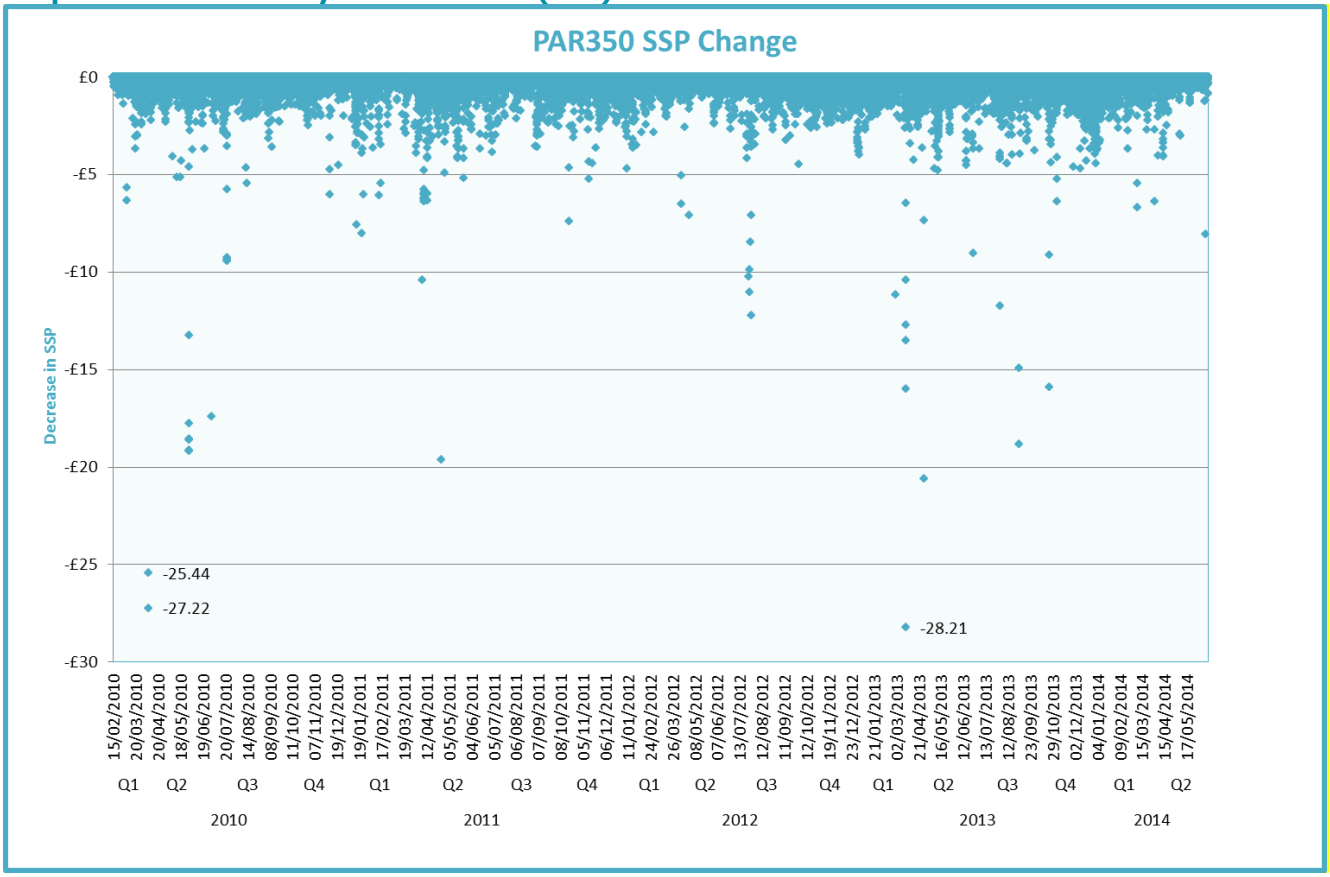
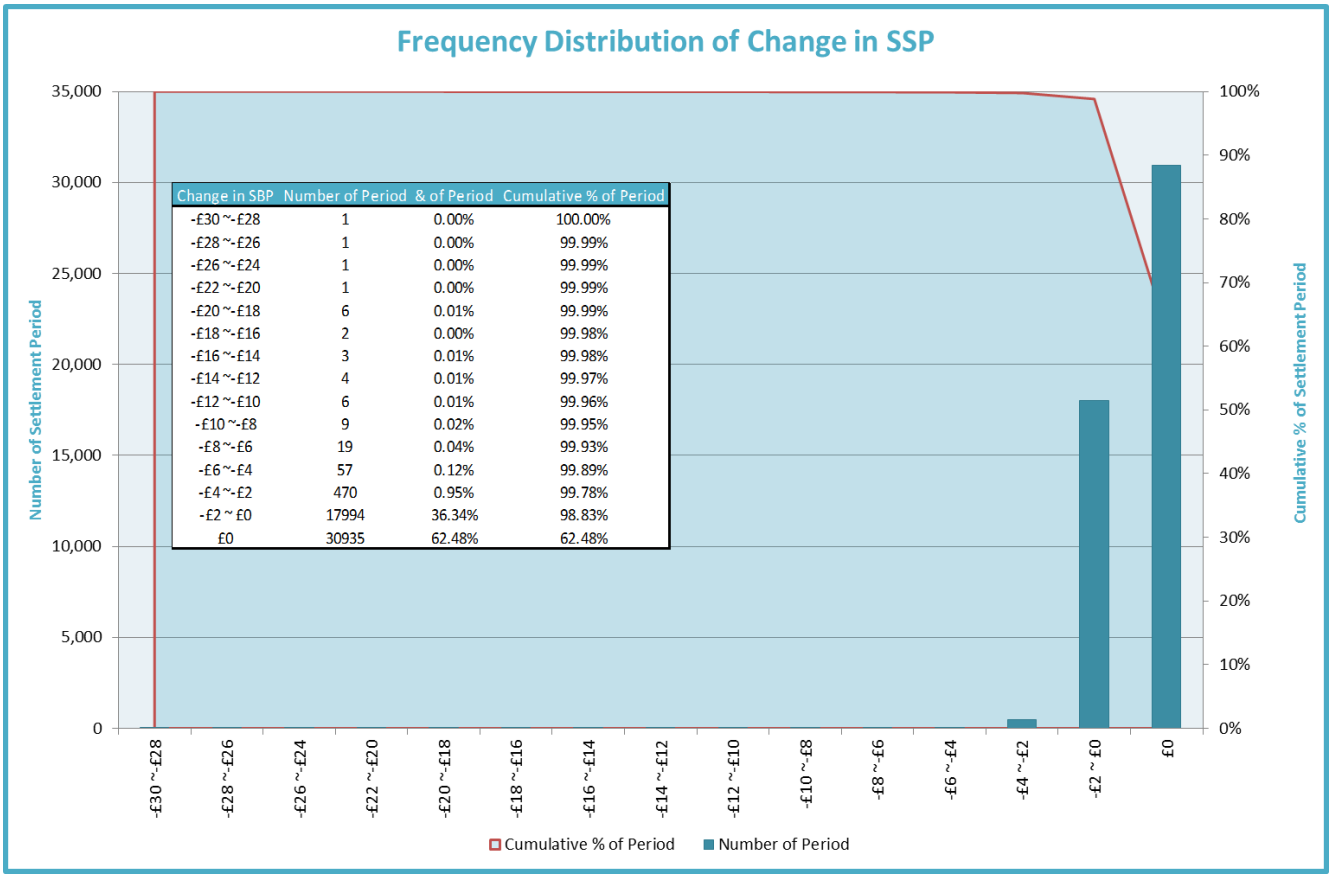
Graph 4 - Decrease in System Sell Price (SSP) as a Result of PAR350



Graph 5 - Frequency Distribution of SSP Decrease as a Result of PAR350



Change in SBP	Number of Period	& of Period	Cumulative % of Period
-£30 ~-£28	1	0.00%	100.00%
-£28 ~-£26	1	0.00%	99.99%
-£26 ~-£24	1	0.00%	99.99%
-£22 ~-£20	1	0.00%	99.99%
-£20 ~-£18	6	0.01%	99.99%
-£18 ~-£16	2	0.00%	99.98%
-£16 ~-£14	3	0.01%	99.98%
-£14 ~-£12	4	0.01%	99.97%
-£12 ~-£10	6	0.01%	99.96%
-£10 ~-£8	9	0.02%	99.95%
-£8 ~-£6	19	0.04%	99.93%
-£6 ~-£4	57	0.12%	99.89%
-£4 ~-£2	470	0.95%	99.78%
-£2 ~ £0	17994	36.34%	98.83%
£0	30935	62.48%	62.48%

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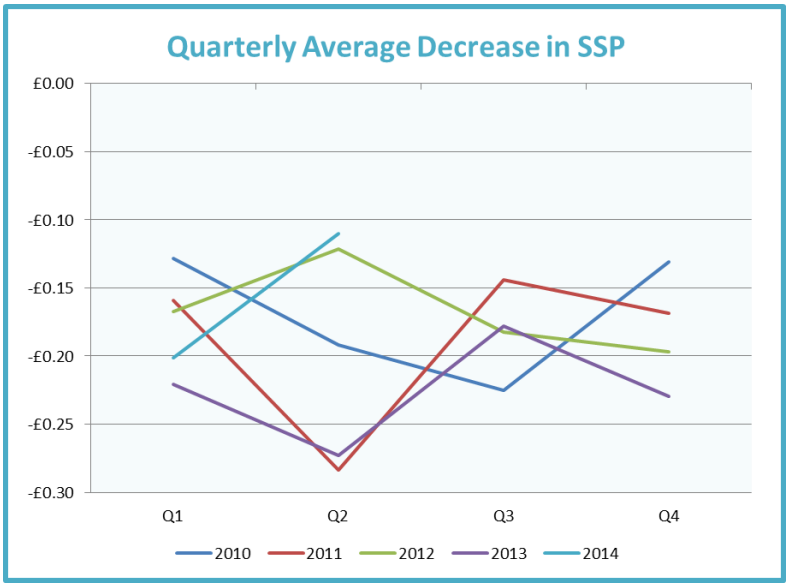
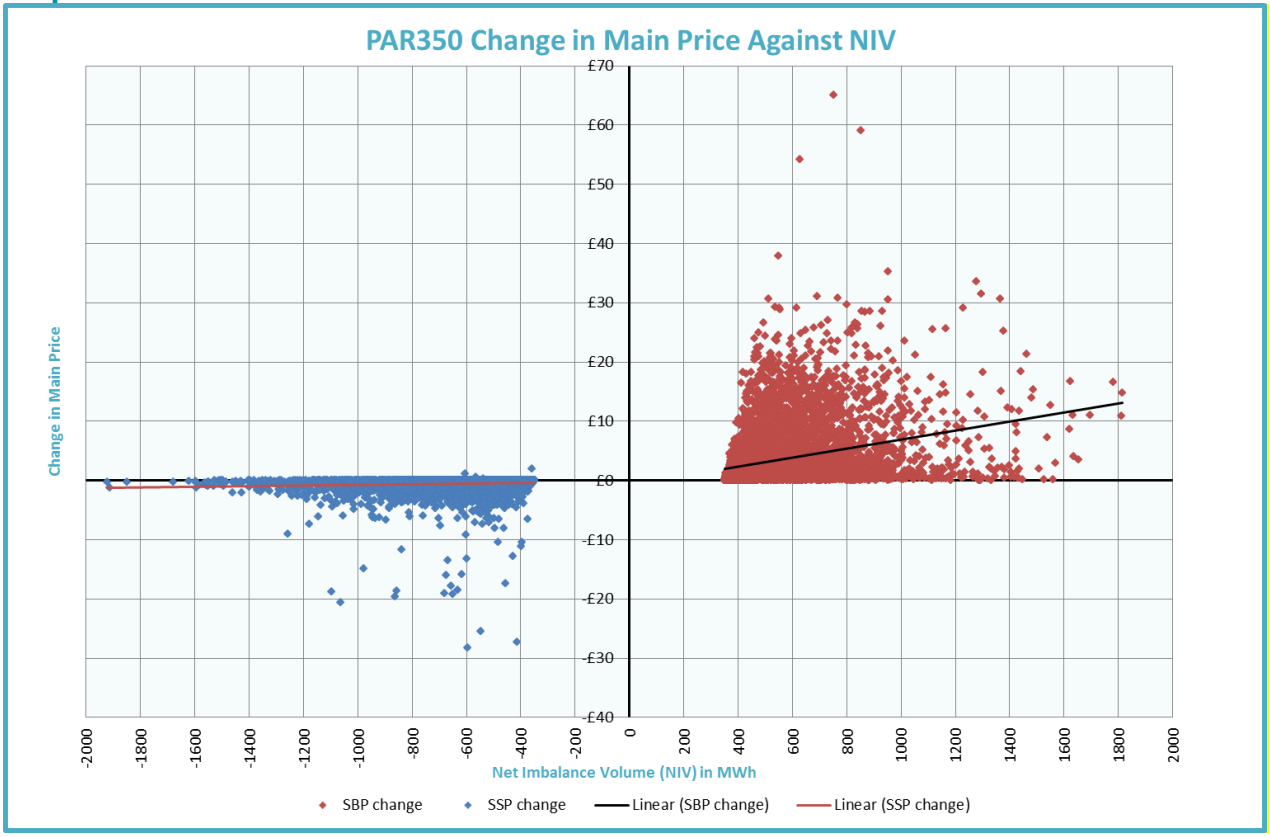
Graph 6 – Quarterly Average Decrease in SSP



Throughout the analysis period, SSP remained unchanged in 62.48% of the Settlement Periods where SSP was the Main Price (long System). This percentage has decreased by 15.4 percentage points compared to PAR250 showing that fewer settlement Periods were affected when increasing PAR from 250MWh to 350MWh. The cumulative percentage suggests that around 98.83% of the Periods were impacted for less than -£2. The maximum decrease in SSP of -£28.21 occurred in Q1 of 2013. Graph 6 suggests that the average changes in SSP are more volatile in Q2.

Change in Main Price against Transmission System Net Imbalance Volume

Graph 7



Graph 7 shows the effectiveness of PAR350 (i.e. sharpen Main Price) when NIV is large in both directions. The best fit line of SBP suggests that SBP increases when NIV increases as a result of PAR350. The graph also shows a visible trend that PAR350 reduces SSP when NIV gets smaller. However, the best fit line is not as steep as that of SBP. We note that this graph shows similar trend to the one provided for PAR250. The main difference is that PAR350 would impact less Settlement Periods and the impacts on Main Price for certain Settlement Periods are less significant.

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PAR350 PARTY TRADING CHARGE IMPACT ANALYSIS

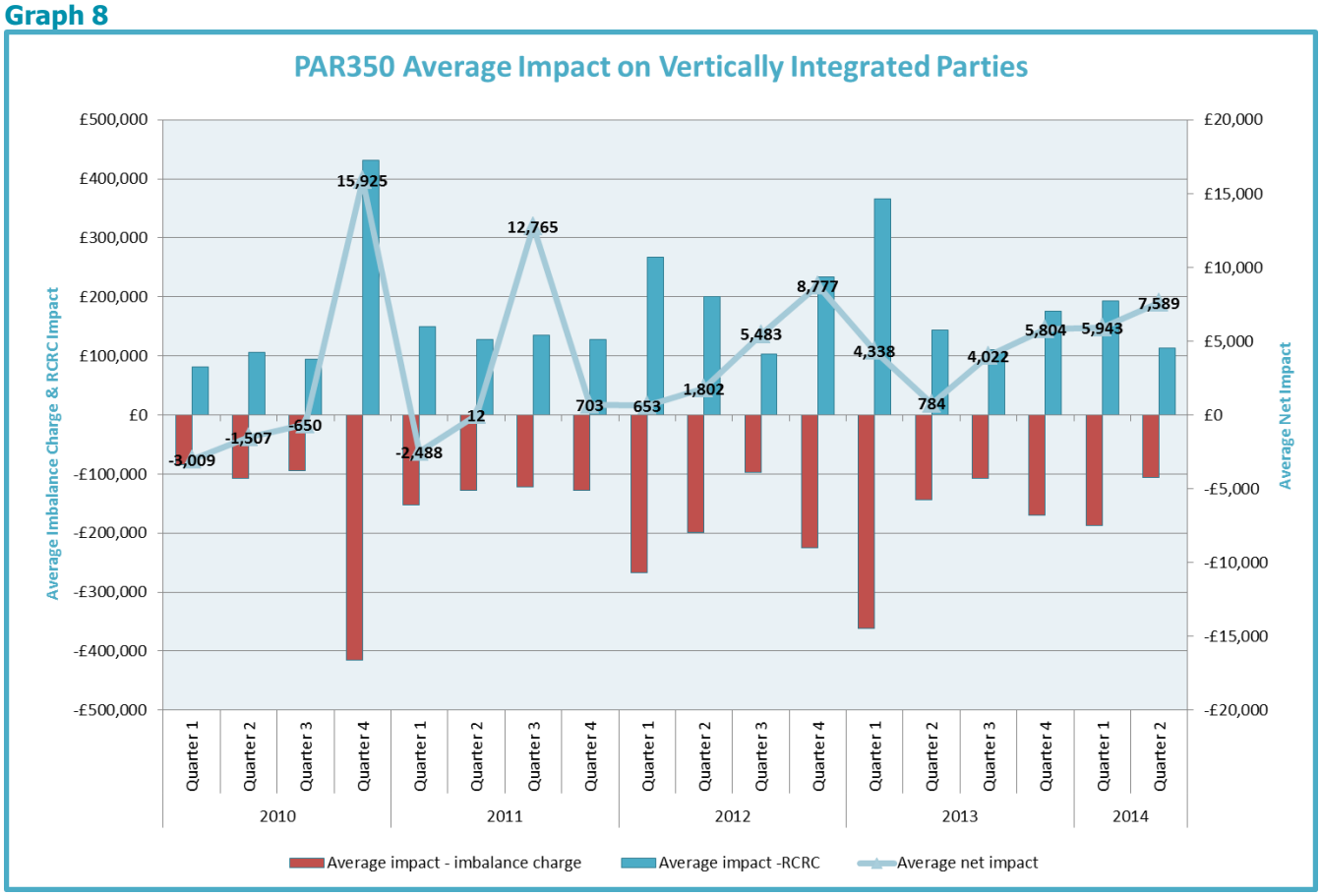
We have run the Imbalance Charge and RCRC calculations using PAR350 cash-out prices to assess the impact to different types of Trading Parties and study whether any particular types of Trading Party would be more heavily affected by sharpened cash-out prices. We note that PAR350 has resulted in higher Imbalance Charge payments for all BSC Parties, especially during Q4 of 2010 and Q1 of 2013 when SBP increased more significantly (see graph 3). This would effectively increase the total RCRC given the Reverse Price remains unchanged and would benefit the Parties with large Credited Energy Volumes[1]. Under the current dual pricing system, reducing PAR would have more impact to Parties with small Credited Energy Volumes as their receivable RCRC does not sufficiently cover the additional imbalance cost arising from sharpened cash-out prices.

Table 3 – BSC Party Grouping

Group
Vertically Integrated
Independent Generator - Thermal
Independent Generator - Wind
Independent Suppliers

Average PAR350 Impact on Vertically Integrated Parties

Graph 8



Graph 8 shows the quarterly average impact on Trading Charges for vertically integrated Parties as a result of PAR350. Each individual vertically integrated Party includes both their supplier and generator businesses. There were negative impacts in quarter 1 to quarter 3 2010 and quarter 1 2011. The higher Imbalance Charge due to sharpened cash-out prices paid by vertically integrated Parties was netted off by higher RCRC payment in the

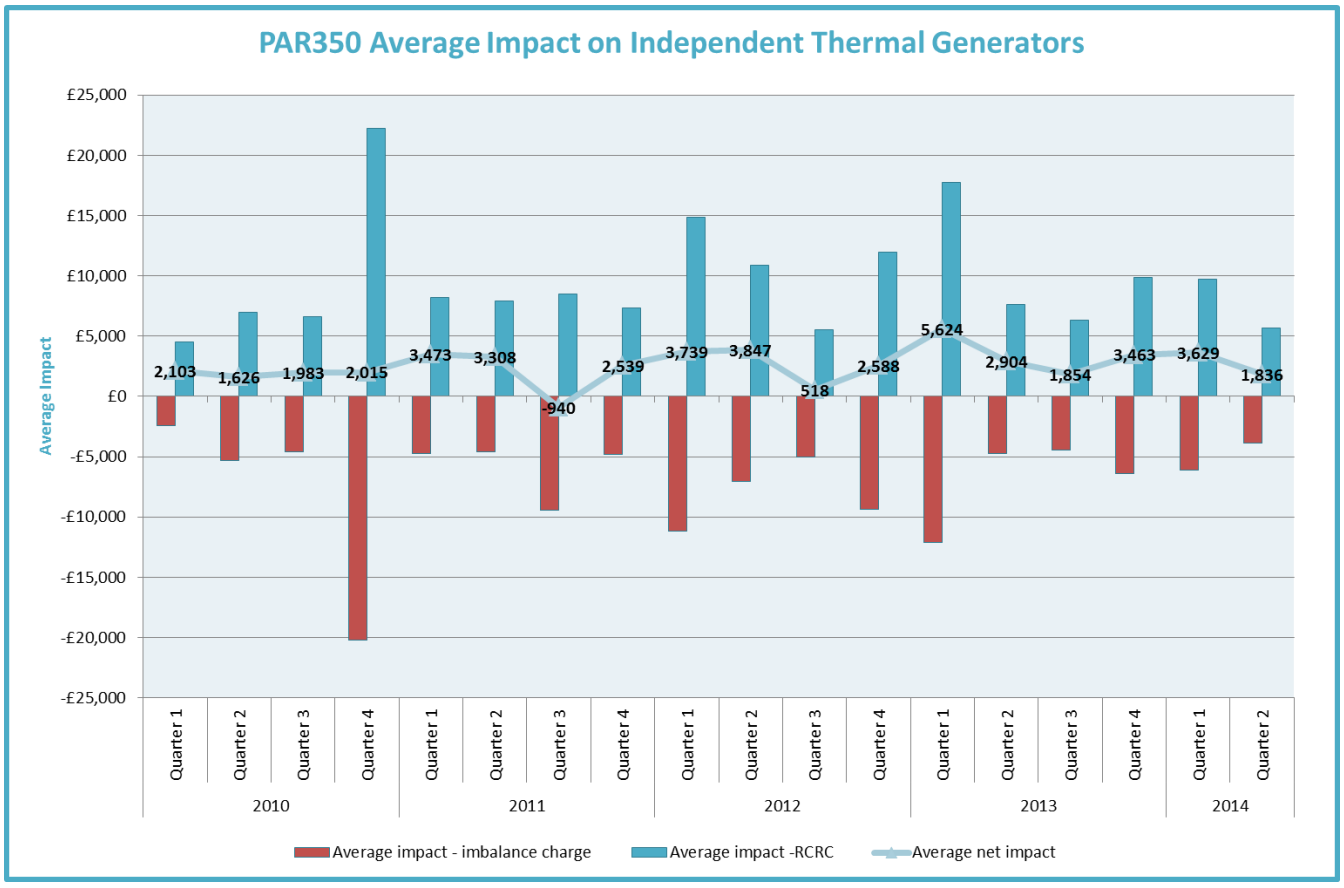
[1] RCRC is net Imbalance Charge payment to be redistributed back to Parties which amount is proportional to the amount of Credited Energy in BSC Parties' trading accounts. Large Trading Parties would therefore receive more money from RCRC because they have more Credited Energy Volumes.

majority of quarters which results in net gain for vertically integrated Parties in these Periods. In comparison to PAR250, the overall net gain was less due to lower RCRC payments arising from smaller PAR350 Main Price/Reverse Price spread.

Average PAR350 Impact on Independent Thermal Generators

Graph 9 shows the quarterly average impact on Trading Charges for independent thermal generators as a result of PAR350. Overall, independent thermal generators would gain in the majority of periods, which is due to a combination of better energy balancing from more predictable station exports and higher receivable RCRC based on large Credited Energy Volumes however the gain would be less compared to PAR250.

Graph 9



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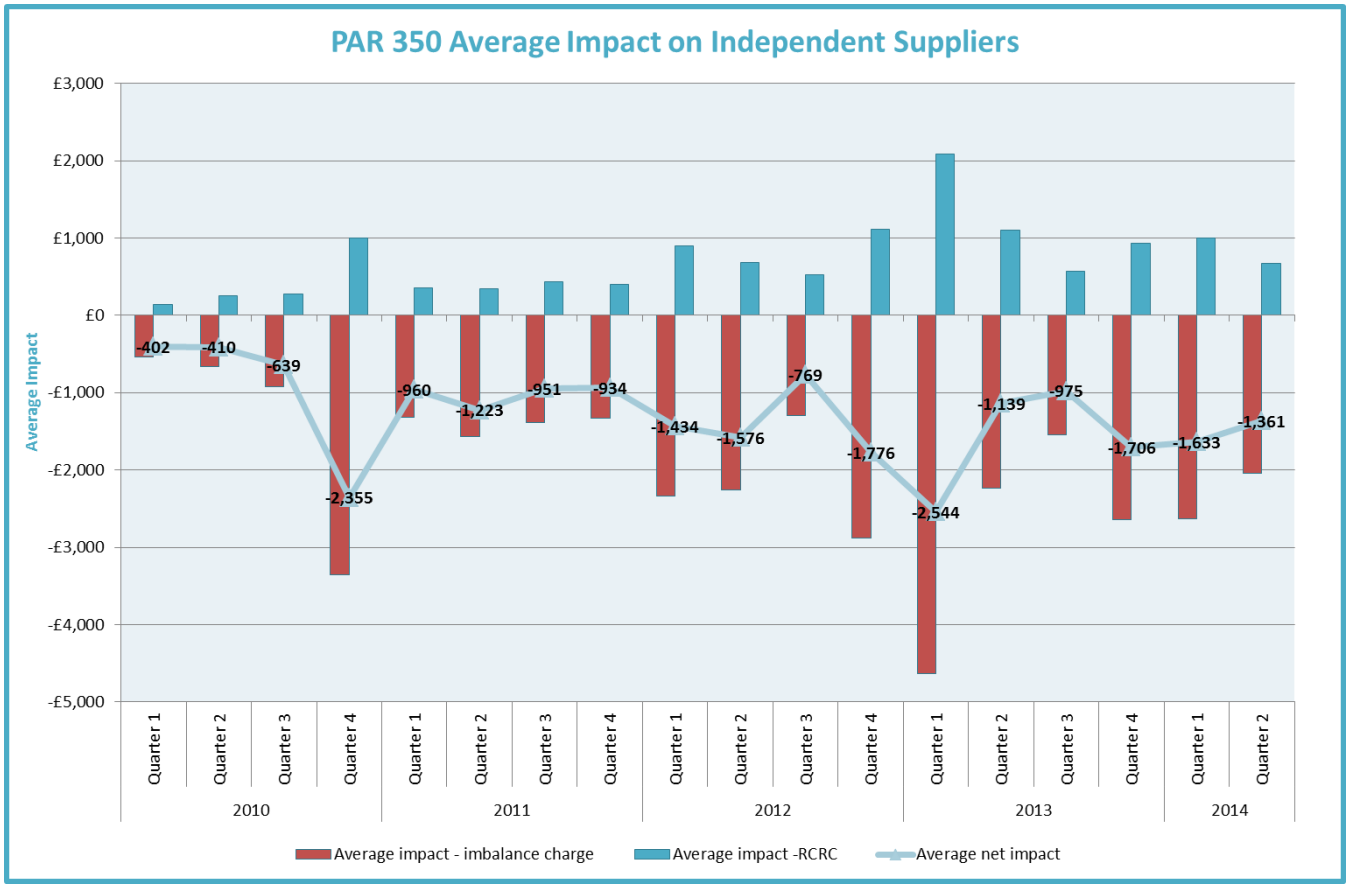
Average PAR350 Impact on Independent Suppliers

Graph 10 shows the quarterly average impact on Trading Charges for independent Suppliers as a result of PAR350. Unlike the other types of Parties, the receivable RCRC for independent Suppliers does not outweigh the additional Imbalance Charges incurred due to sharpened cash-out prices. Independent Suppliers are more likely to be exposed to Imbalance Charges than generators as it is harder for them to predict the consumption of customers. Independent Suppliers also had less Credited Energy Volumes in their trading accounts compared to vertically integrated players and big generators and hence would receive less RCRC. In comparison to PAR250, PAR350 would reduce this impact on independent Suppliers due to smaller cash-out price spread.

Graph 10



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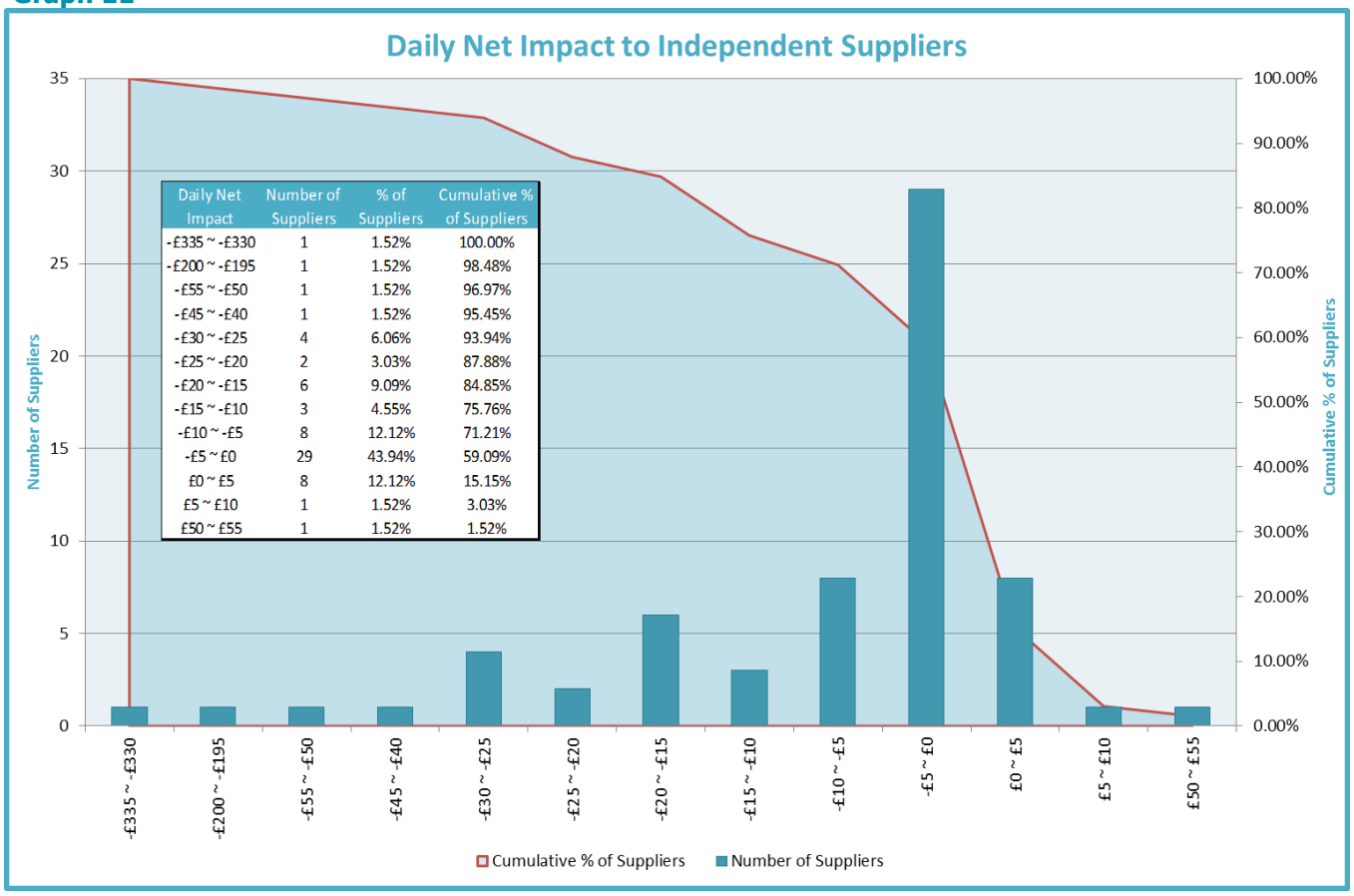
Daily Net Impact on Independent Suppliers

We have looked into the daily net impact for independent Suppliers as shown in Graph 11. Among all the active independent Suppliers (some BSC Parties are registered as Suppliers but had no energy consumption in the past four years, they are excluded from the impact analysis), around 97% of the Suppliers had a daily net impact of less than £55. Two Parties had a daily impact of £196 and £322 respectively, however this was due to the Parties having large Imbalance Volumes during a few specific days/Settlement Periods when the imbalance prices were sharpened by PAR350.

Note that the impact on independent wind generators is not shown in this analysis as the impact is minimal, except for Q3 of 2013 which was due to the abnormal charge of a particular Party (see PAR250 analysis for information).

Graph 11



Daily Net Impact	Number of Suppliers	% of Suppliers	Cumulative % of Suppliers
-£335 ~ -£330	1	1.52%	100.00%
-£200 ~ -£195	1	1.52%	98.48%
-£55 ~ -£50	1	1.52%	96.97%
-£45 ~ -£40	1	1.52%	95.45%
-£30 ~ -£25	4	6.06%	93.94%
-£25 ~ -£20	2	3.03%	87.88%
-£20 ~ -£15	6	9.09%	84.85%
-£15 ~ -£10	3	4.55%	75.76%
-£10 ~ -£5	8	12.12%	71.21%
-£5 ~ £0	29	43.94%	59.09%
£0 ~ £5	8	12.12%	15.15%
£5 ~ £10	1	1.52%	3.03%
£50 ~ £55	1	1.52%	1.52%

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APPENDIX 1: THE MAIN PRICE CALCULATION WITH DIFFERENT PAR VALUE

This is an example of the System Sell Price (Main Price) calculation for Period 30 on 31/08/2013, and here we demonstrate how different PAR values would impact the final price calculation. PAR is an imbalance pricing parameter which determines the maximum volume of most expensive priced energy balancing actions to be volume averaged to calculate the Main Price. The smaller the PAR values, the more marginal the price will be (hence we will take less cheap balancing actions when calculating the Main Price).

The below table shows all of the PAR500 adjusted balancing actions that the live SSP of -£11.48/MWh was calculated based on. When PAR decreases to 350MWh, we exclude more cheap balancing actions (i.e. tightening our selection box in the below table) to calculate the SSP, this effectively sharpens the SSP to -£30.48. As PAR decreases further to 250MWh, the SSP drops to -£53.29/MWh and eventually to -£78/MWh when PAR equals 100MWh.

BOA	Date	Period	BMU	PAR Adjusted Volume	Price	TLM	TLM Adjusted Volume	BOA Final Cost	PAR			
BID	20130831	30	T_WHILW-1	-15.476	-78	0.9909	-15.335	1196.12	PAR 500	PAR 350	PAR 250	PAR 100
BID	20130831	30	T_CLDSW-1	-13.687	-78	0.9909	-13.562	1057.84				
BID	20130831	30	T_GRIFW-1	-13.437	-78	0.9909	-13.314	1038.48				
BID	20130831	30	T_GRIFW-2	-13.437	-78	0.9909	-13.314	1038.48				
BID	20130831	30	T_WHILW-1	-13.15	-78	0.9909	-13.03	1016.36				
BID	20130831	30	T_BLLA-1	-13.15	-78	0.9909	-13.03	1016.36				
BID	20130831	30	T_WHILW-1	-12.3	-78	0.9909	-12.188	950.68				
BID	20130831	30	T_WHILW-2	-12.3	-78	0.9909	-12.188	950.68				
BID	20130831	30	T_GORDW-1	-11.853	-78	0.9909	-11.745	916.1				
BID	20130831	30	T_CLDNW-1	-10.265	-78	0.9909	-10.172	793.38				
BID	20130831	30	T_WHILW-2	-8.856	-78	0.9909	-8.775	684.49				
BID	20130831	30	T_WHILW-1	-8.834	-78	0.9909	-8.753	682.76				
BID	20130831	30	T_CLDCW-1	-7.626	-78	0.9909	-7.557	589.42				
BID	20130831	30	T_WHILW-2	-7.246	-78	0.9909	-7.18	560.03				
BID	20130831	30	T_GORDW-1	-4.249	-78	0.9909	-4.21	328.42				
BID	20130831	30	T_HADHW-1	-2.657	-78	0.9909	-2.633	205.35				
BID	20130831	30	T_CLDCW-1	-2.371	-78	0.9909	-2.349	183.22				
BID	20130831	30	T_TDBNW-1	-2.201	-78	0.9909	-2.181	170.08				
BID	20130831	30	T_HADHW-1	-2.174	-78	0.9909	-2.154	168.01				
BID	20130831	30	T_TDBNW-1	-1.02	-78	0.9909	-1.011	78.82				
BID	20130831	30	T_CLDCW-1	-0.693	-78	0.9909	-0.687	53.58				
BID	20130831	30	E_BETHW-1	-3.042	-76	0.9909	-3.014	229.06				
BID	20130831	30	M_CAS-GAR01	-5.1	-50	0.9909	-5.053	252.67				
BID	20130831	30	M_CAS-GAR01	-3.9	-50	0.9909	-3.864	193.22				
BID	20130831	30	M_CAS-BEU01	-0.908	-50	0.9909	-0.9	45				
BID	20130831	30	M_CAS-BEU01	-0.483	-50	0.9909	-0.479	23.94				
BID	20130831	30	T_DRAXX-1	-18.375	20	0.9909	-18.207	-364.14				
BID	20130831	30	T_DRAXX-4	-17.625	20.1	0.9909	-17.464	-351.03				
BID	20130831	30	T_DRAXX-3	-17.625	20.5	0.9909	-17.464	-358.01				
BID	20130831	30	T_LOAN-2	-52.125	26.5	0.9909	-51.649	-1368.7				
BID	20130831	30	T_LOAN-2	-37.5	26.5	0.9909	-37.158	-984.68				
BID	20130831	30	T_LOAN-4	-64.764	27.5	0.9909	-64.172	-1764.74				
BID	20130831	30	T_RUGPS-7	-7.708	30	0.9909	-7.638	-229.14				
BID	20130831	30	T_RUGPS-6	-7.708	30	0.9909	-7.638	-229.14				
BID	20130831	30	T_RUGPS-7	-1.581	30	0.9909	-1.566	-46.99				
BID	20130831	30	T_RUGPS-6	-1.581	30	0.9909	-1.566	-46.99				
BID	20130831	30	T_RATS-3	-9.208	31	0.9909	-9.124	-282.85				
BID	20130831	30	T_RATS-2	-7.75	31.1	0.9909	-7.679	-238.82				
BID	20130831	30	T_RATS-2	-3.333	31.1	0.9909	-3.303	-102.72				
BID	20130831	30	T_ABTH8	-12.5	34.01	0.9909	-12.386	-421.24				
BID	20130831	30	T_PEHE-1	-19.816	37	0.9909	-19.635	-726.5				
BID	20130831	30	T_PEHE-1	-17.174	37	0.9909	-17.017	-629.63				
BID	20130831	30	T_PEHE-1	-13.211	37	0.9909	-13.09	-484.33				
PAR500				-500		0.9909	-495.43	5687.58	-11.48			
PAR350				-350		0.9909	-346.80	10570.95	-30.48			
PAR250				-250		0.9909	-247.72	13200.87	-53.29			
PAR100				-100		0.9909	-99.09	7728.79	-78.00			