P304 – WORKGROUP PAR100 ANALYSIS

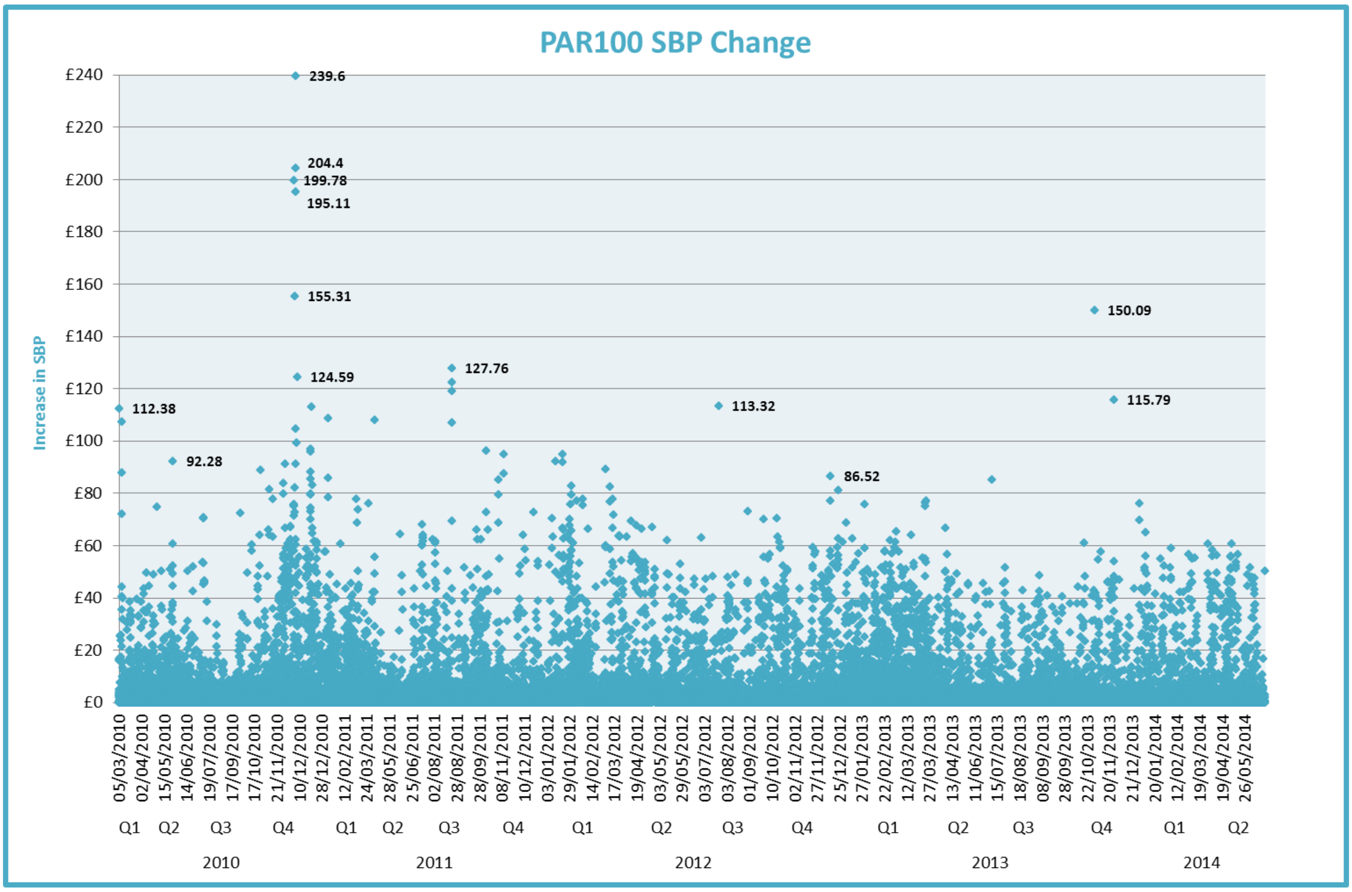
EXECUTIVE SUMMARY

P304 'Reduction in PAR from 500MWh to 250MWh' seeks to reduce the volume of Price Average Reference (PAR) to 250MWh to make System Prices (cash-out prices) more marginal when they are calculated using the Main Price (see Appendix 1 for the effect of PAR in the Main Price calculation). We provide this analysis to assess the impact of an alternative PAR volume – 100MWh on cash-out prices based on historical data starting from 2010 (post P217 implementation). We have also re-run the Settlement Trading Charge calculation using PAR100 cash-out prices to study the impacts to BSC Parties. Note that this analysis does not take into account behavioural changes as a result of PAR100. The full details of P304 can be found on the P304 page of the ELEXON website.

ELEXON's analysis shows that, compared to PAR250, PAR100 will further sharpen the Main Price when the period Net Imbalance Volume (NIV) is greater than 100MWh or less than -100MWh, i.e. increase 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 +/- 100MWh inclusive. This supports the intention of the EBSCR to make the Main Price a more accurate signal of scarcity on the system. We have applied PAR100 cash-out 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 PAR100 Main Price/Reverse Price spread. Independent suppliers were more likely to be impacted by higher cash-out prices however the net daily impact is below £260 (more than double of the impact of PAR250) for 97% of the suppliers.

PAR100 MAIN PRICE IMPACT ANALYSIS

Graph 1 - Increase in System Buy Price (SBP) as a Result of PAR100



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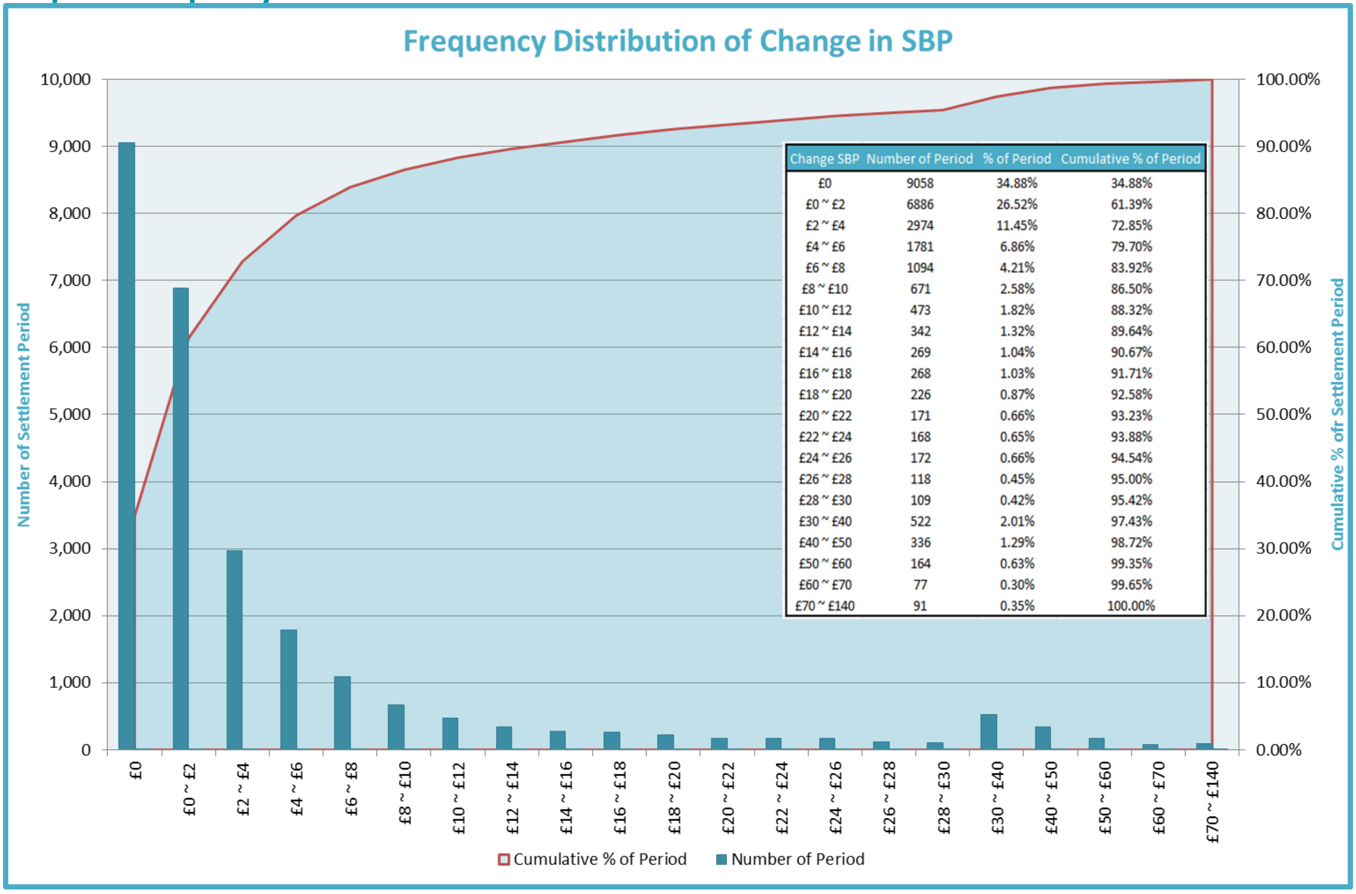
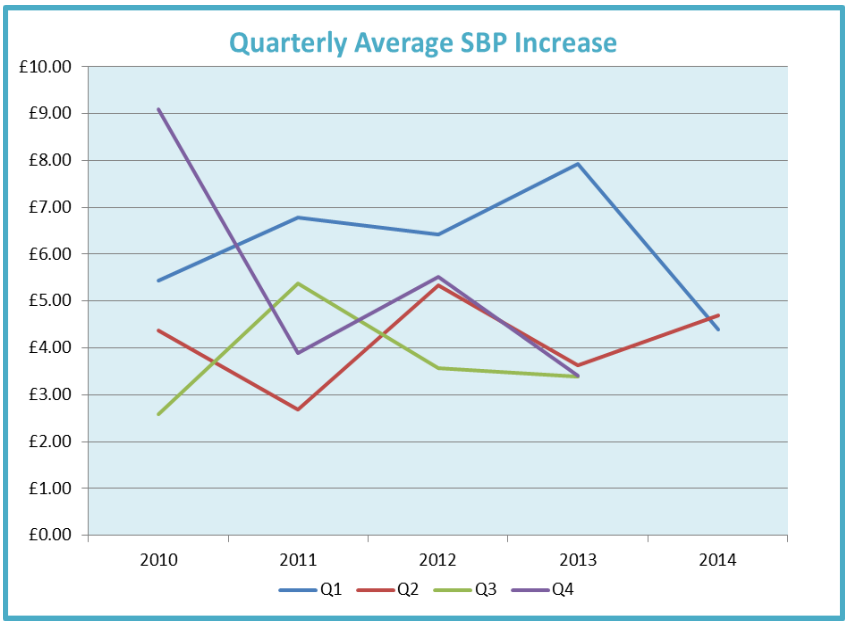
Graph 2 - Frequency Distribution of SBP Increase as a Result of PAR100



Change SBP	Number of Period	% of Period	Cumulative % of Period
£0	9058	34.88%	34.88%
£0 ~ £2	6886	26.52%	61.39%
£2 ~ £4	2974	11.45%	72.85%
£4 ~ £6	1781	6.86%	79.70%
£6 ~ £8	1094	4.21%	83.92%
£8 ~ £10	671	2.58%	86.50%
£10 ~ £12	473	1.82%	88.32%
£12 ~ £14	342	1.32%	89.64%
£14 ~ £16	269	1.04%	90.67%
£16 ~ £18	268	1.03%	91.71%
£18 ~ £20	226	0.87%	92.58%
£20 ~ £22	171	0.66%	93.23%
£22 ~ £24	168	0.65%	93.88%
£24 ~ £26	172	0.66%	94.54%
£26 ~ £28	118	0.45%	95.00%
£28 ~ £30	109	0.42%	95.42%
£30 ~ £40	522	2.01%	97.43%
£40 ~ £50	336	1.29%	98.72%
£50 ~ £60	164	0.63%	99.35%
£60 ~ £70	77	0.30%	99.65%
£70 ~ £140	91	0.35%	100.00%

Graph 1 shows that there were more Settlement Periods with large increases in SBP in 2010 especially during the winter. The maximum SBP increase was £239.60. Throughout the analysis period, SBP remained unchanged in 34.88% of the total Settlement Periods where SBP was the Main Price (short System). This percentage has decreased by 27.1 percentage points compared to PAR250 suggesting that more Settlement Periods were impacted when reducing PAR from 250MWh to 100MWh. Graph 2 shows the cumulative frequency distribution. Around 80% of the Periods were impacted by less than £6 and around 90% of the Periods were impacted by less than £16.

Graph 3 – Quarterly Average Increase in SBP



As shown in Graph 3, the average SBP increase in quarter 1 (Calendar Year) was higher than those of other quarters during most of the years. The largest average SBP increase occurred in quarter 4 2010. The average impact on SBP in the 2013/14 winter was lower than those previous winters.

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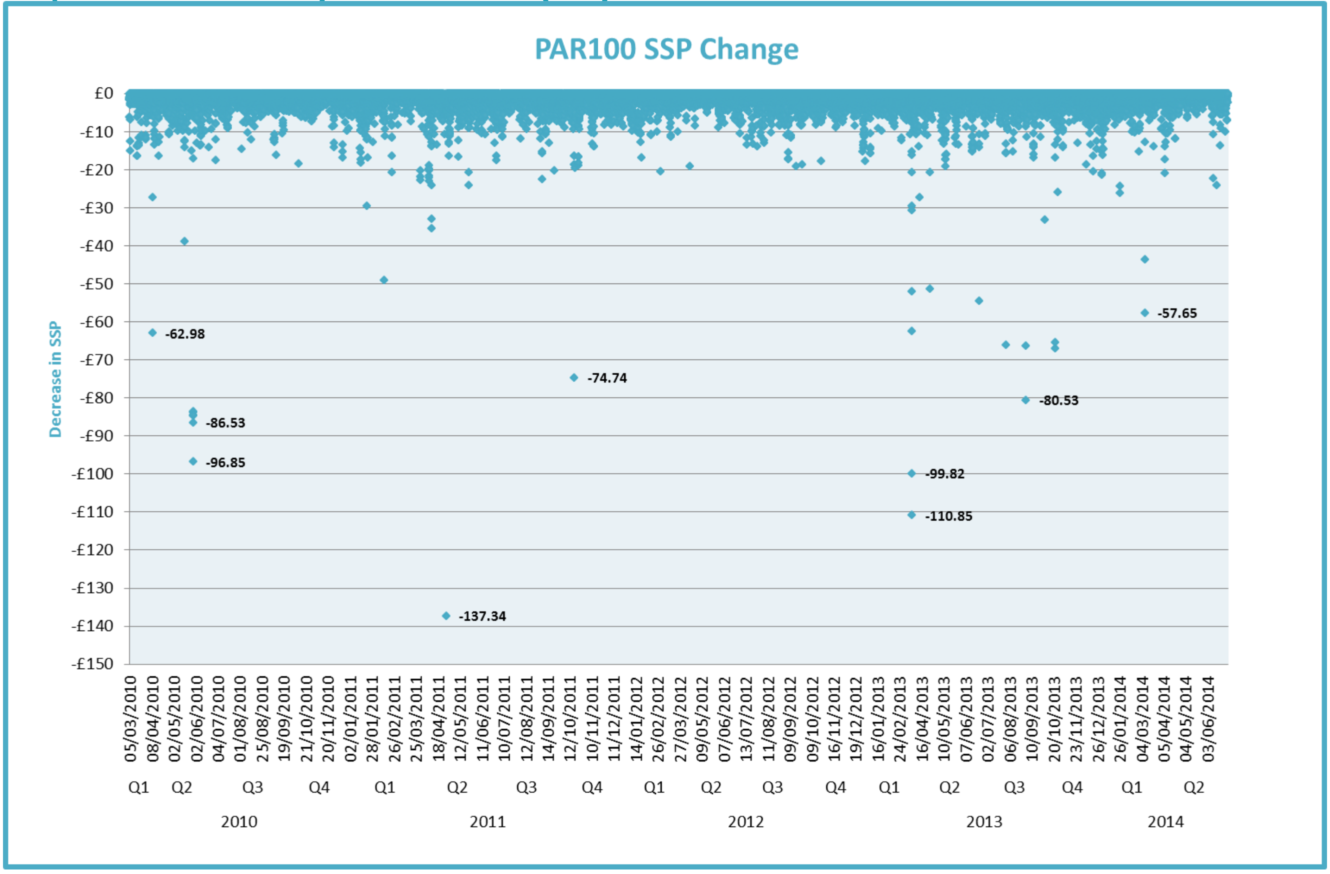
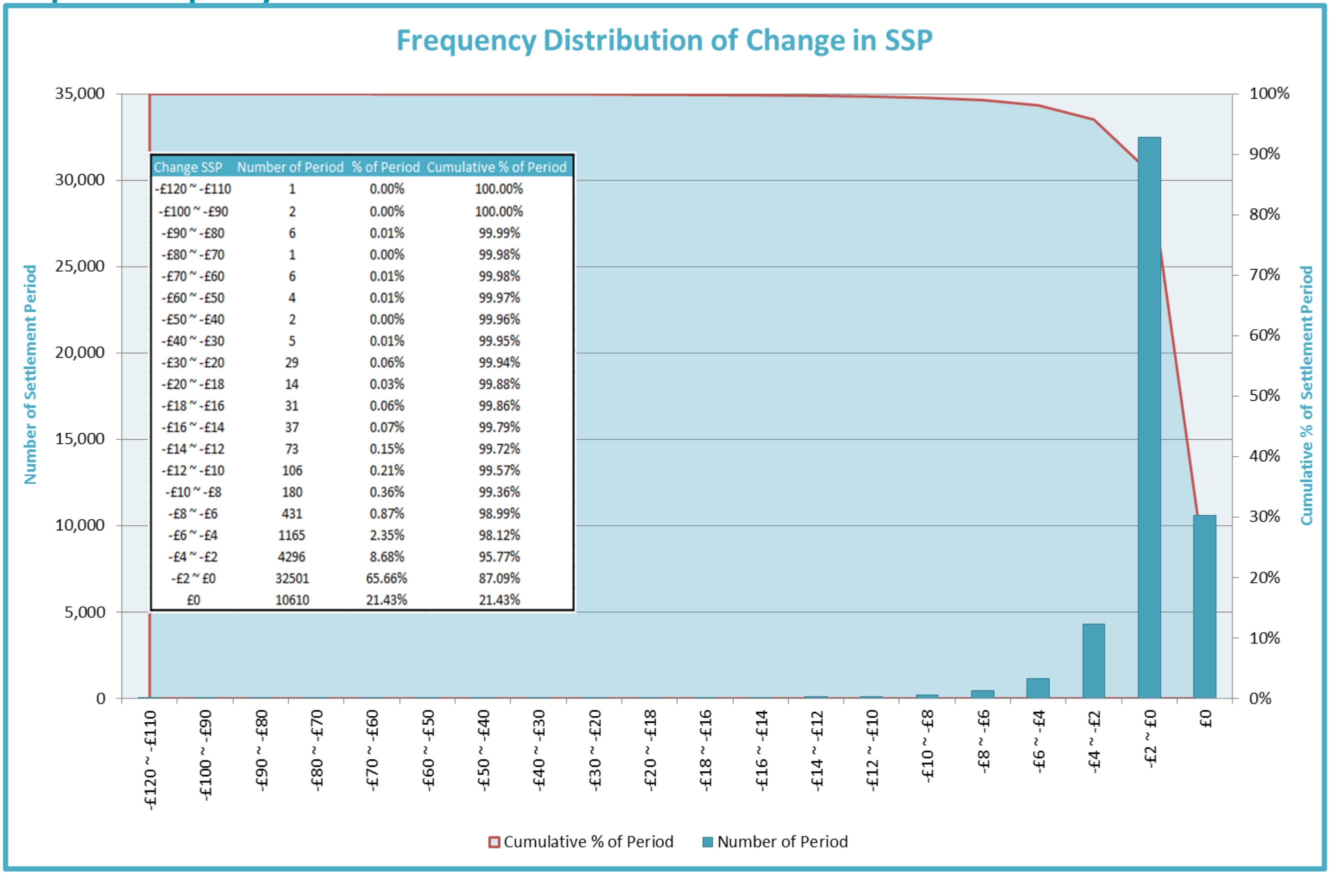
P304 – WORKGROUP PAR100 ANALYSIS

Graph 4 - Decrease in System Sell Price (SSP) as a Result of PAR100



Graph 5 - Frequency Distribution of SSP Decrease as a Result of PAR100



Change SSP	Number of Period	% of Period	Cumulative % of Period
-£120 ~ -£110	1	0.00%	100.00%
-£100 ~ -£90	2	0.00%	100.00%
-£90 ~ -£80	6	0.01%	99.99%
-£80 ~ -£70	1	0.00%	99.98%
-£70 ~ -£60	6	0.01%	99.98%
-£60 ~ -£50	4	0.01%	99.97%
-£50 ~ -£40	2	0.00%	99.96%
-£40 ~ -£30	5	0.01%	99.95%
-£30 ~ -£20	29	0.06%	99.94%
-£20 ~ -£18	14	0.03%	99.88%
-£18 ~ -£16	31	0.06%	99.86%
-£16 ~ -£14	37	0.07%	99.79%
-£14 ~ -£12	73	0.15%	99.72%
-£12 ~ -£10	106	0.21%	99.57%
-£10 ~ -£8	180	0.36%	99.36%
-£8 ~ -£6	431	0.87%	98.99%
-£6 ~ -£4	1165	2.35%	98.12%
-£4 ~ -£2	4296	8.68%	95.77%
-£2 ~ £0	32501	65.66%	87.09%
£0	10610	21.43%	21.43%

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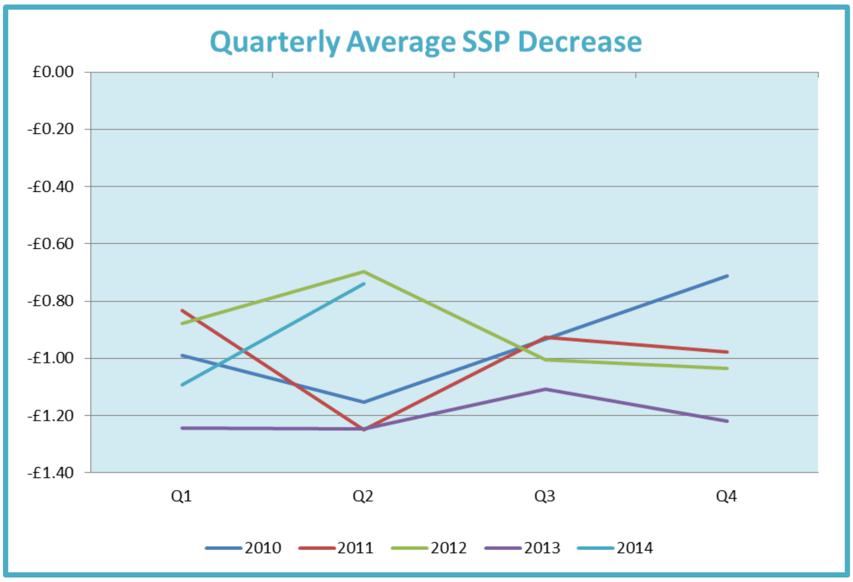
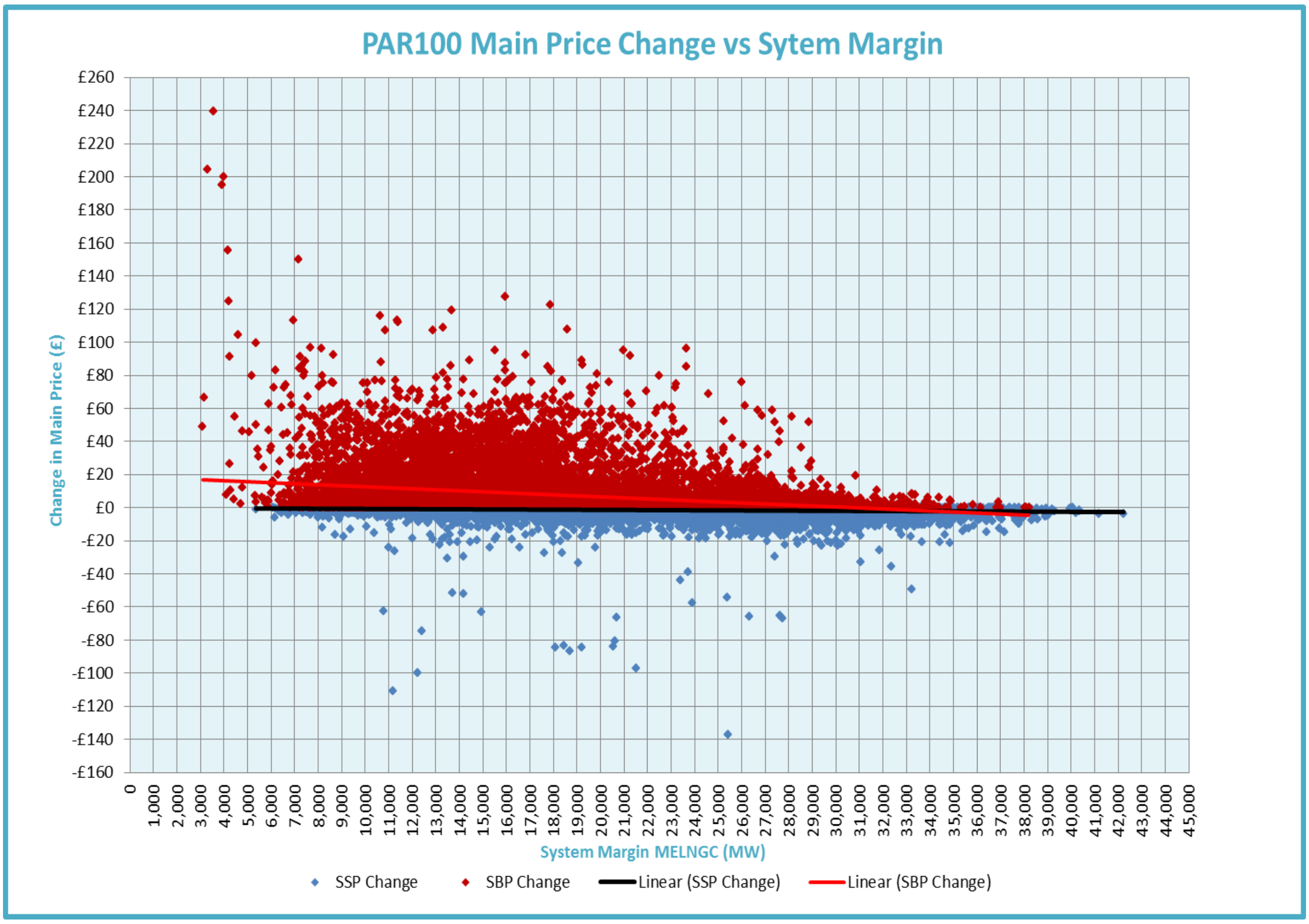
Graph 6 – Quarterly Average Decrease in SSP



Throughout the analysis period, SSP remained unchanged in 21.43% of the Settlement Periods where SSP was the Main Price (long System). This percentage has decreased by 25.65 percentage points showing that more Settlement Periods were affected when reducing PAR from 250MWh to 100MWh. The cumulative percentage suggests that around 95% of the Periods were impacted for less than -£4. The maximum decrease in SSP of -£137.34 occurred in Q2 2011. Graph 6 suggests that the average changes in SSP are more volatile in Q2.

PAR100 AGAINST SYSTEM MARGIN ANALYSIS

Graph 7 – Change in Main Price vs Transmission System Margin (MELNGC)



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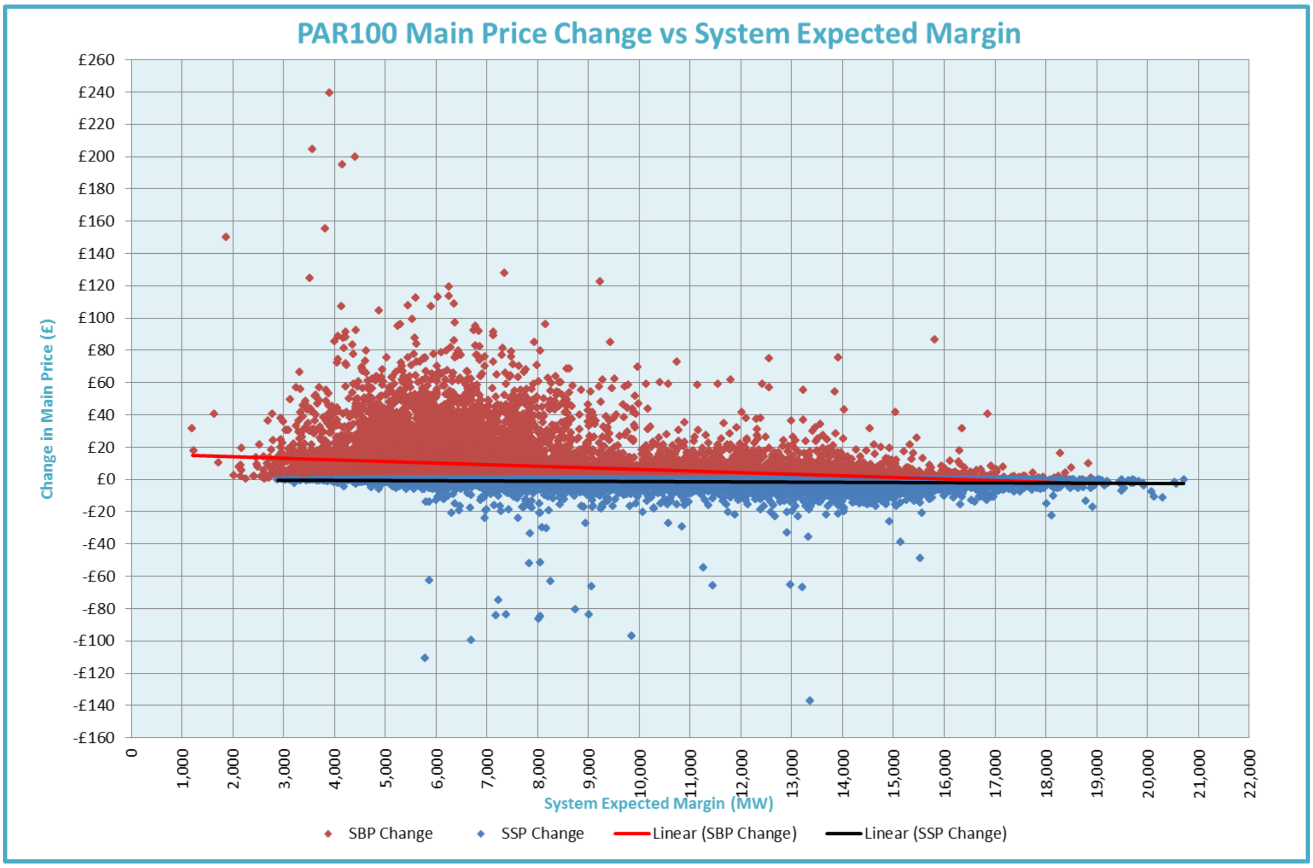
P304 – WORKGROUP PAR100 ANALYSIS

The objective of P304 is to calculate more marginal cash-out prices when System margins are tight. MELNGC is the indicated margin forecast for each Settlement Period and is the difference between the sums of the MELs submitted for that period and the National Demand Forecast made by the System Operator. (The greater the value, the higher the margin between available generation capacity and forecast demand).

Graph 8 – Change in Main Price vs Transmission System Expected Margin



Another measure of System margin is its expected margin which is used by Ofgem in modelling Loss of Load Probability (LOLP). System expected margin is defined as: Available capacity - Demand + Interconnector flow + 900 (Non BM reserve)

Graph 7 & 8 provide the assessment of effectiveness of PAR250 (i.e. sharpen Main Price) when System margin is tight based on MELNGC and expected margin respectively. The best fit line of SBP suggests that SBP increases when System margin is low.

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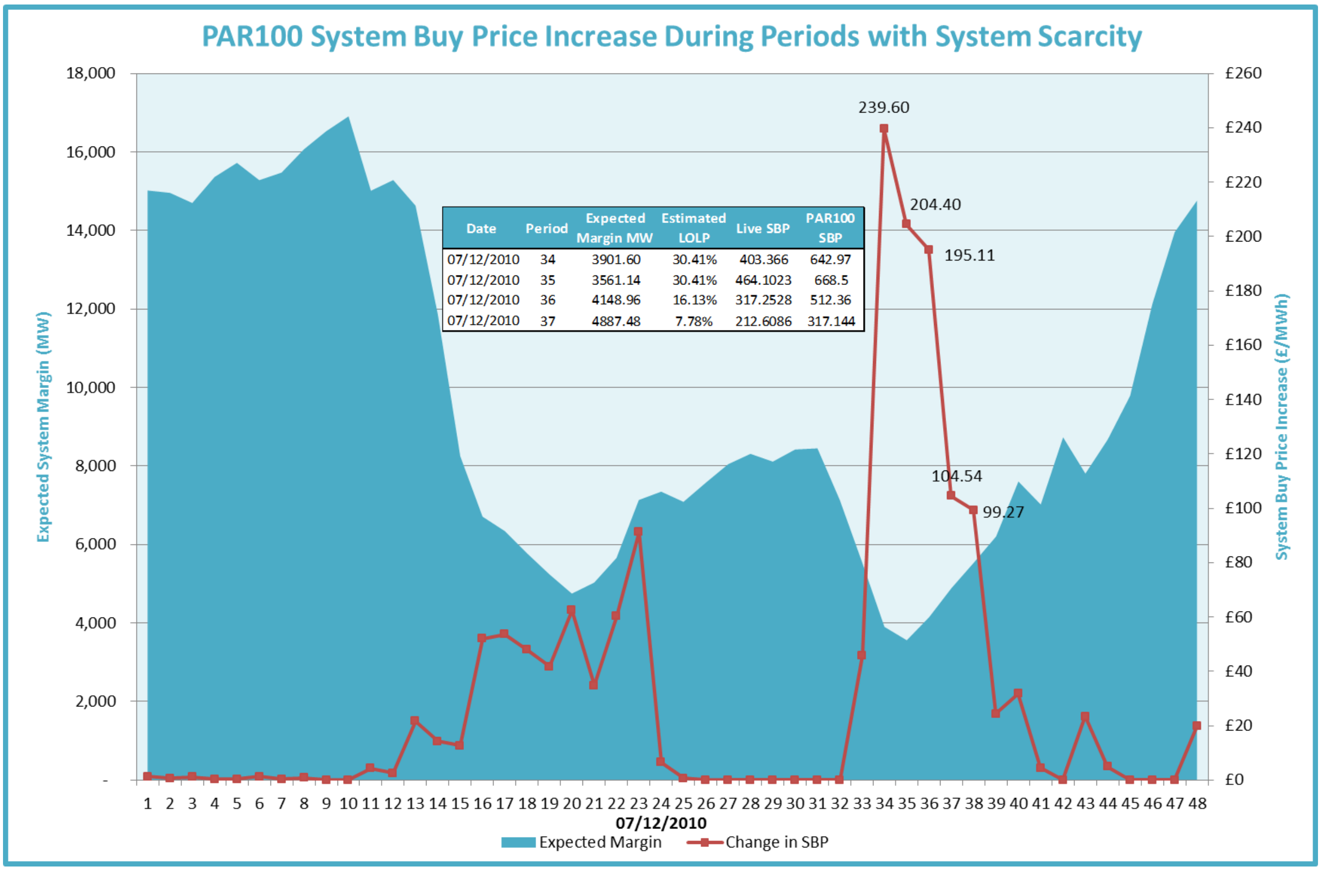
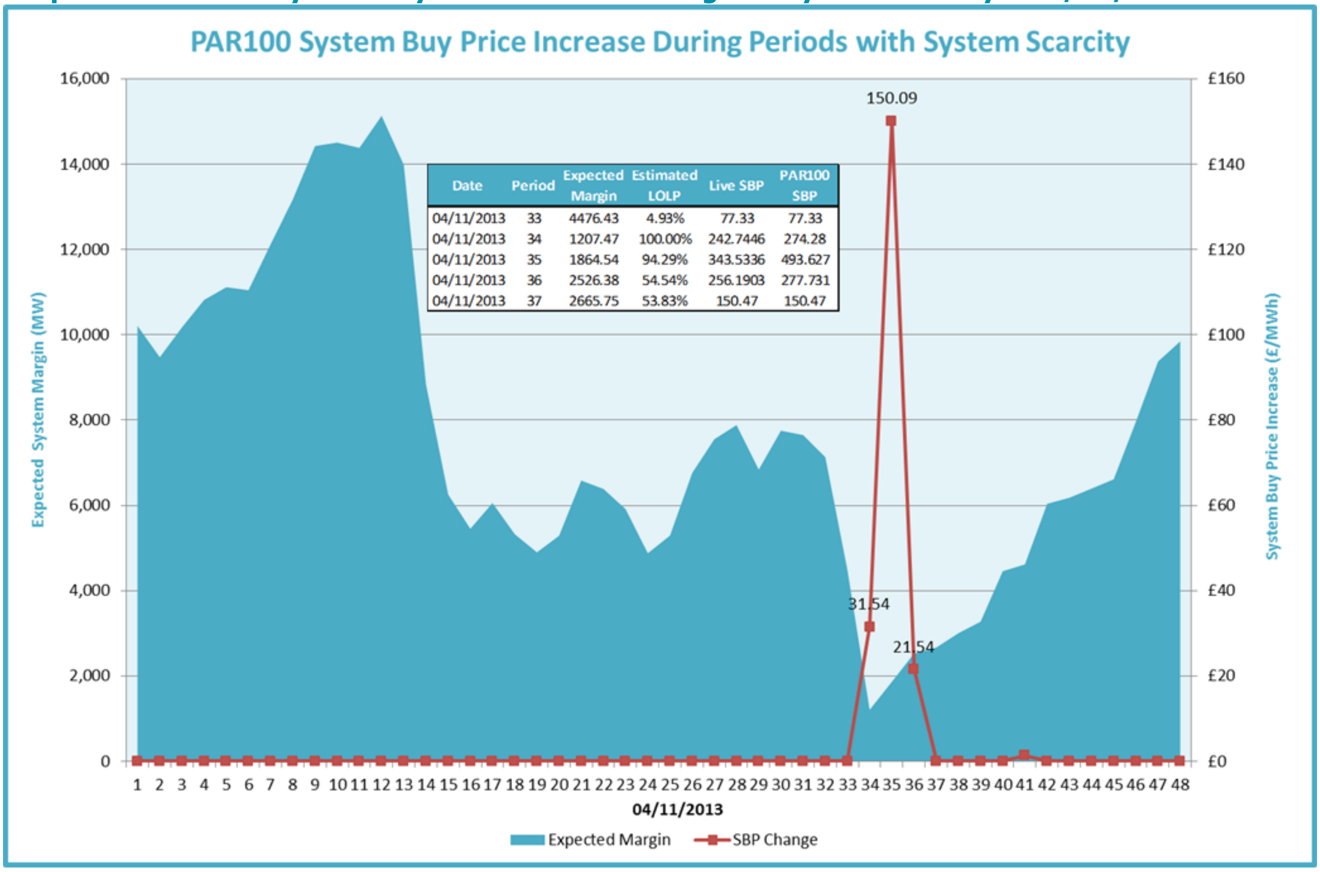
Graph 9 – PAR100 Largest System Buy Price Increase vs System margin on 7/12/2010



Date	Period	Expected Margin MW	Estimated LOLP	Live SBP	PAR100 SBP
07/12/2010	34	3901.60	30.41%	403.366	642.97
07/12/2010	35	3561.14	30.41%	464.1023	668.5
07/12/2010	36	4148.96	16.13%	317.2528	512.36
07/12/2010	37	4887.48	7.78%	212.6086	317.144

Graph 10 – PAR100 System Buy Price Increase vs Highest System Scarcity on 4/11/2013



Date	Period	Expected Margin	Estimated LOLP	Live SBP	PAR100 SBP
04/11/2013	33	4476.43	4.93%	77.33	77.33
04/11/2013	34	1207.47	100.00%	242.7446	274.28
04/11/2013	35	1864.54	94.29%	343.5336	493.627
04/11/2013	36	2526.38	54.54%	256.1903	277.731
04/11/2013	37	2665.75	53.83%	150.47	150.47

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Graph 9 picks up the Periods with largest increase in SBP and determines whether such Periods reflect tight System margins. Graph 10 picks up the Periods where the level of System scarcity is high (high LOLP) and determines whether PAR250 would sharpen the SBP in these Periods. Both graphs show good relationship between SBP increase and high level of System scarcity such that that PAR100 would increase SBP when the System margin is exceptionally tight. This supports the intention to of PAR100.

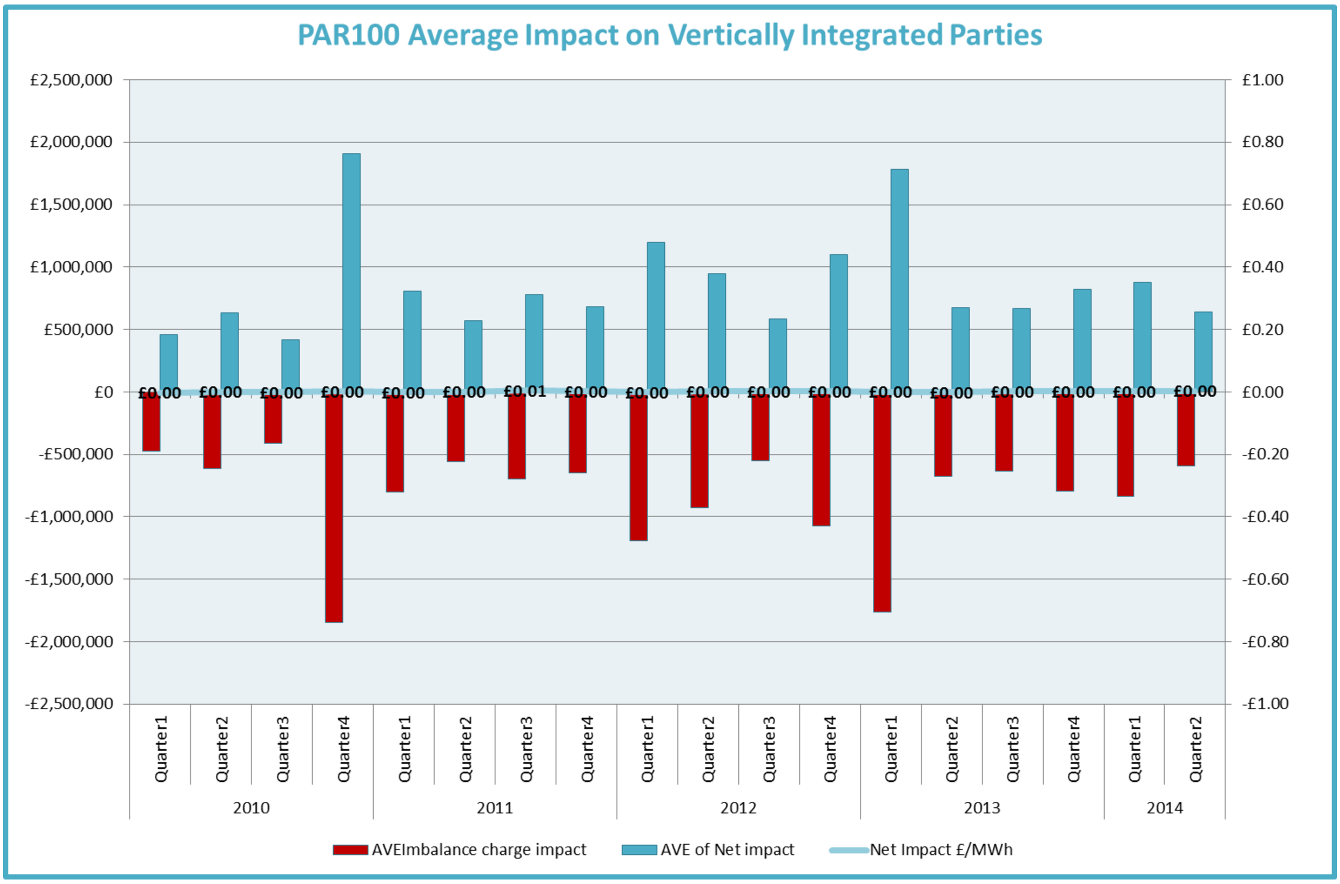
PAR100 PARTY TRADING CHARGE IMPACT ANALYSIS

We have re-run the Imbalance Charge and RCRC calculations using PAR100 cash-out prices to assess the impact on 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 PAR100 has resulted in higher Imbalance Charge payments for all BSC Parties, especially during Q4 2010 and Q1 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

Graph 11 – Average PAR100 Impact on Vertically Integrated Parties



[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.

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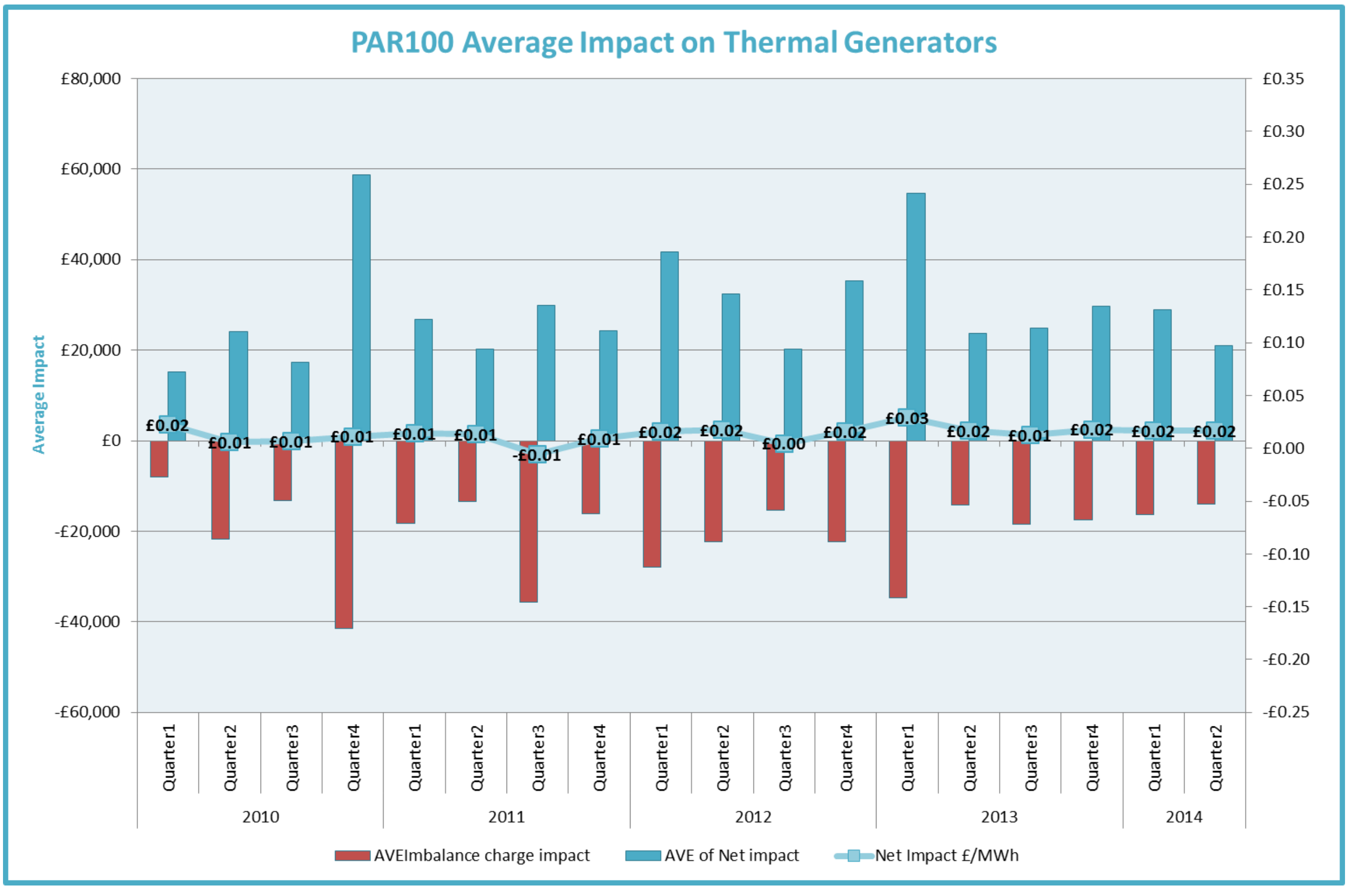
Graph 11 shows the quarterly average impact on Trading Charges for vertically integrated Parties as a result of PAR100. Each individual vertically integrated Party includes both their supplier and generator businesses. There was a negative impact in Q1 2010 only. The higher Imbalance Charges due to sharpened cash-out prices paid by vertically integrated Parties was netted off by higher RCRC payment. This has resulted in net gain for vertically integrated Parties in the majority of the Periods. In comparison to PAR250, the overall net gain was larger due to higher RCRC payments as a result of higher Main Price/Reverse Price spread. The average net impact per MWh of Credited Energy is £0.00/MWh for vertically integrated Parties due to the large amount of energy that is traded by them.

Graph 12 – Average PAR100 Impact on Independent Thermal Generators



Graph 12 shows the quarterly average impact on Trading Charges for independent thermal generators as a result of PAR100. 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. Similar to vertically integrated Parties, PAR100 would favour independent generators due to higher RCRC in comparison to PAR250. The average net impact per MWh of Credited Energy was slightly higher than that of PAR250 for thermal generators.

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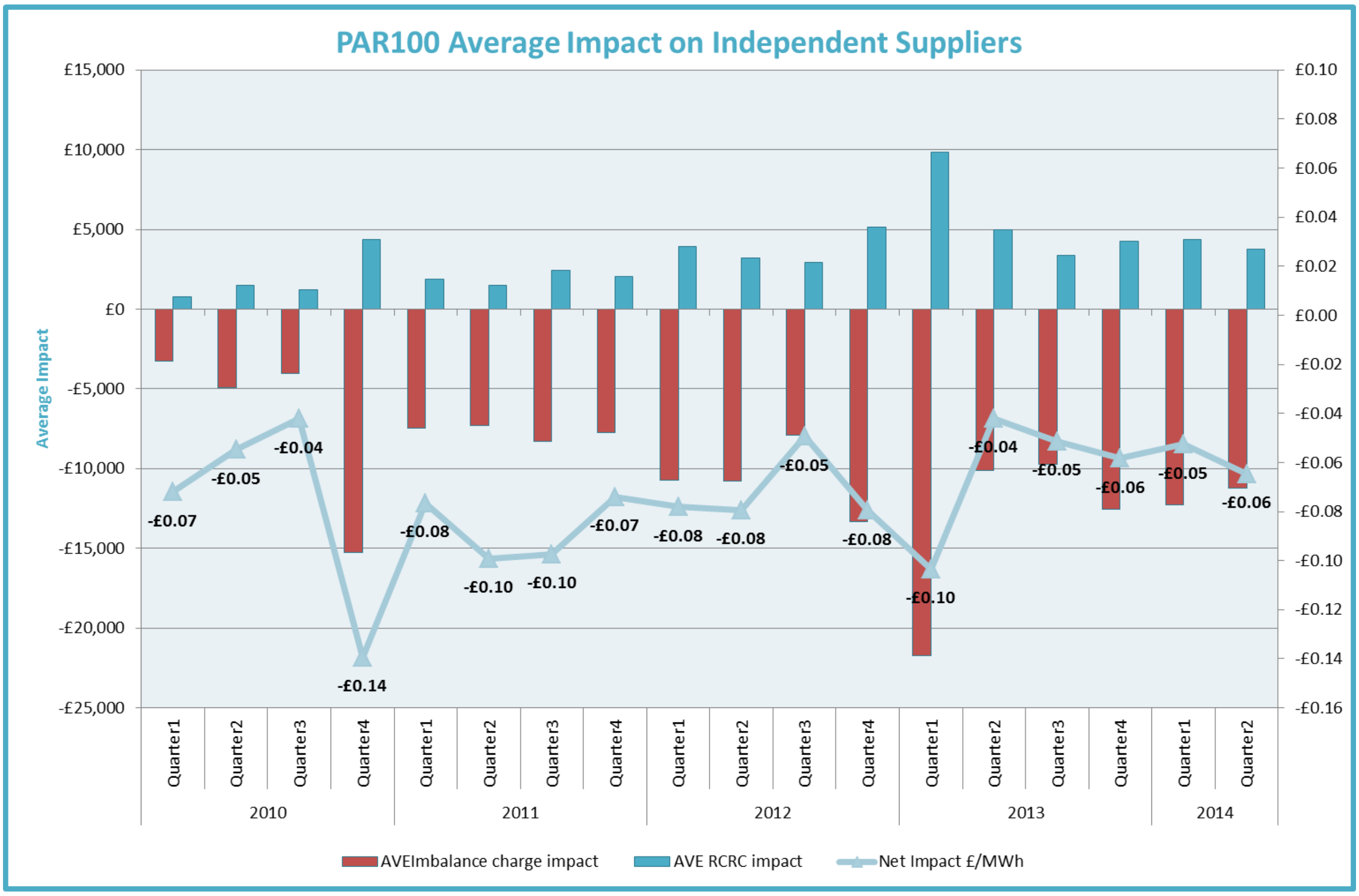
Graph 13 – Average PAR100 Impact on Independent Suppliers



Graph 13 shows the quarterly average impact on Trading Charges for independent suppliers as a result of PAR100. 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. Comparing to PAR250, PAR100 would enlarge this impact on independent suppliers due to higher cash-out price spread. There is a higher net impact per MWh of Credited Energy for independent suppliers compared to PAR250.

Note that the impact on independent wind generators is not shown in this analysis as the impact is minimal, except for quarter 3 2013 which was due to the abnormal charge of a particular Party (see PAR250 analysis for information).

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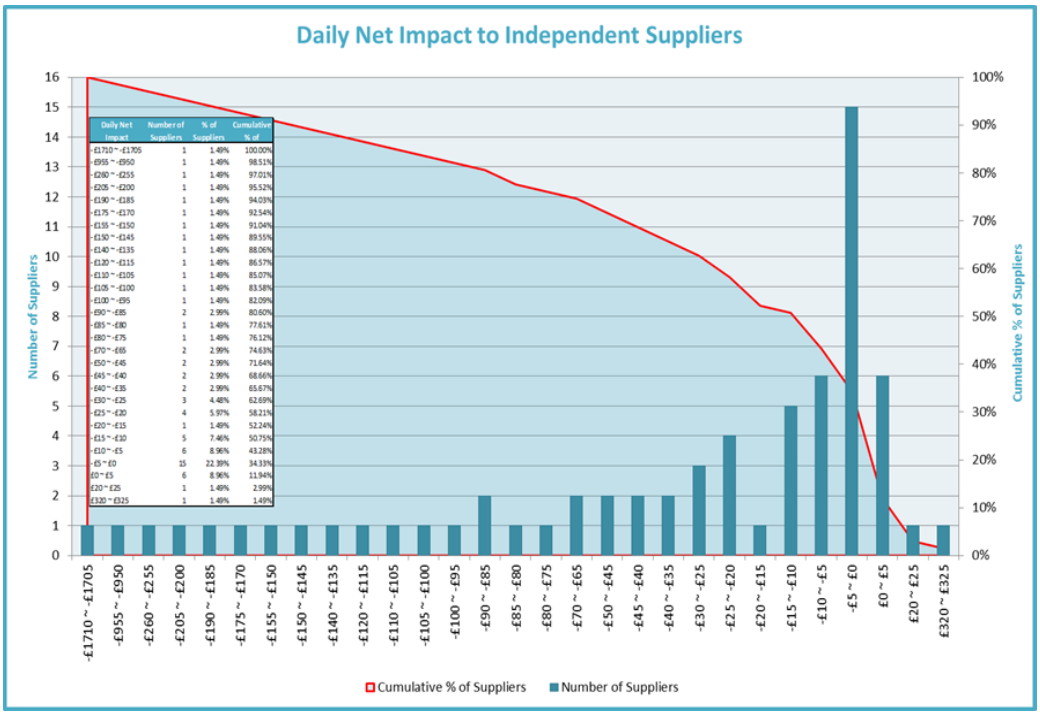
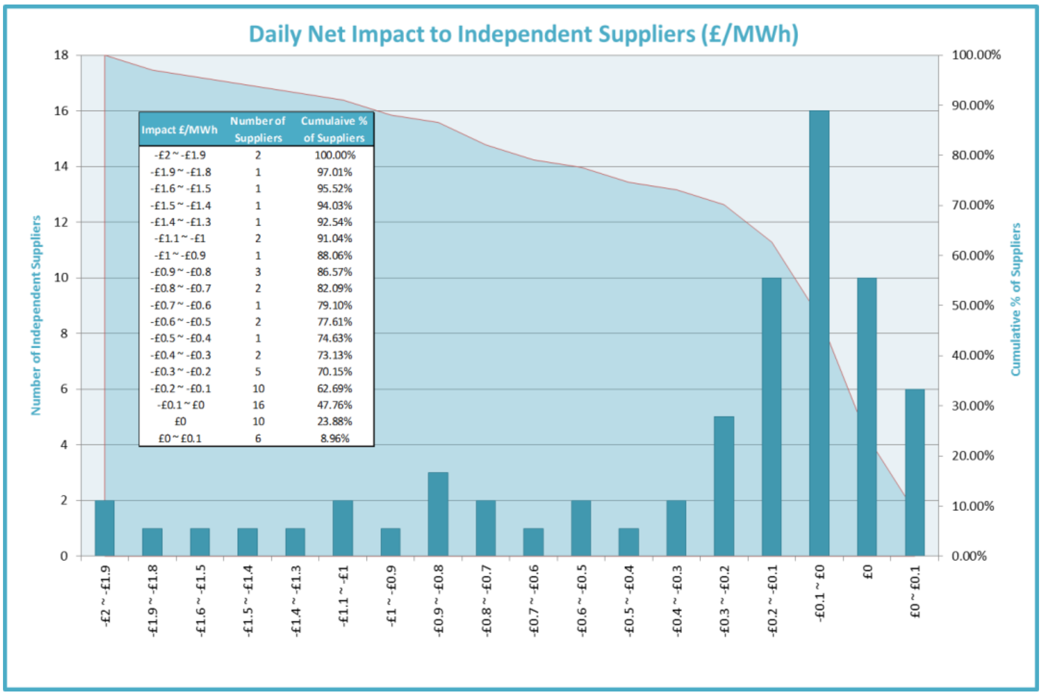
Graph 14 – Daily Net Impact on Independent Suppliers (£)



Graph 15 – Daily Net Impact on Independent Suppliers (£/MWh)



We have looked into the daily net impact for independent suppliers as shown in Graph 14. 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 £260. Two Parties had a daily impact of £954 and £1708 respectively, however this was due to the Parties having large Imbalance Volumes during a few specific days/Settlement Periods when the cash-out prices were significantly sharpened by PAR100. We also looked at the net daily impact using £/MWh to factor the sizes of independent suppliers, this is shown in Graph 15. Over 47.76% of independent suppliers would be impacted by less than -£0.1/MWh and 88.06% of independent suppliers would be impacted by less than £1/MWh.

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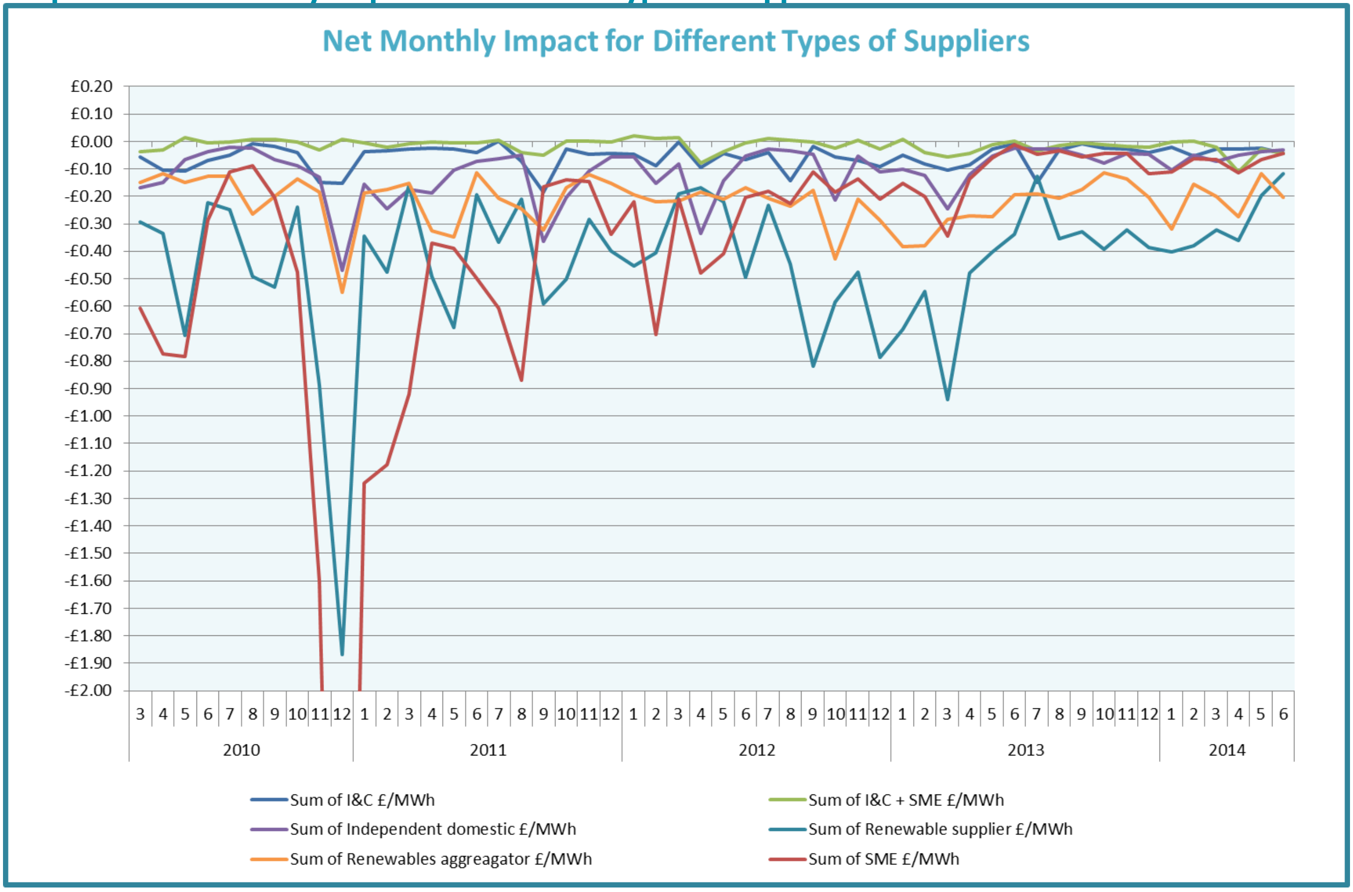
Graph 16 – Net Monthly Impact for Different Types of Suppliers[2]



Graph 16 shows that, despite the spike in December 2010 (-£5.00/MWh) for SME suppliers which was due to one particular Party having an abnormal imbalance in that month, renewable suppliers would have experienced the largest impact as a result of PAR100 with a maximum net impact of -£1.87/MWh in December 2010 when the System Price increased most significantly. All other types of suppliers would have an average monthly impact limited to -£0.55/MWh in a worst case scenario.

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[2] See PAR250 Analysis Table 4 for Supplier Segmentations.

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P304 – WORKGROUP PAR100 ANALYSIS

Appendix 1: The Main Price Calculation with Different PAR Values

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 a cash-out 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 the PAR (500MWh) 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	
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

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