Title	MSP Demand Issue - Interim Report
Version	DRAFT
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Introduction

The purpose of this document is to provide an interim report on the analysis carried out by SEMO with respect to the issues noted in the determination of the Schedule Demand as used in the MSP software.

This interim report is prepared specifically to review the impact of the incorrect Schedule Demand with respect to Trading Dates which have been previously studied as part of the Dual Rating Modification process.

Background

After very large SO-SO Trades were observed on the Moyle Interconnector in October and November 2008, an investigation was undertaken by SEMO after large Energy Imbalances were noted on the same dates as these SO-SO Trades took place.

After this investigation and following up with the vendor of the SEM central market systems, it was discovered that there was an issue with how the system pre-processes data inputs for the MSP software. With regard to the derivation the Schedule Demand, it was observed that the Dispatch Quantity for the Interconnector Residual Capacity Unit was not being correctly calculated. This has lead to an incorrect value of Schedule Demand being observed on dates where SO-SO Trades (managed in SEM as the IRCU) were encountered.

Further analysis determined that the full value of Interconnector Metered Generation was being included in the Schedule Demand. This meant that on days where SO-SO Trades existed, these trades would be counted twice in the derivation of Schedule Demand - once as Dispatch Quantity for the IRCU and again as part of the total Interconnector Metered Generation. However, as a result of this on days where no SO-SO Trades existed, the inclusion of the total Interconnector Metered Generation meant that the Metered Generation for the Interconnector Error Units was incorrectly included in the Schedule Demand.

As a result, all pricing runs since the start of the SEM are affected by this error.

SEMO has undertaken to deliver a body of analysis to assess the impact on SEM prices and schedules and to indicate the materiality of the issue. It is hoped that this analysis will be completed by the end of February 2009 and reported to Participants shortly after.

The analysis will comprise of -

- Complete offline studies for all days with SO Trades;
- Offline studies of dates with IEU volumes which are identified as possibly having material impact on the SEM;
- Complete offline studies for all days where the Kilroot step into its oil price is a greater MW value than the quantity of the error;
- Offline studies for other "unaffected" dates for use as control dates;
- Review of the dates studied for the Dual Rating Modification.

In each case, SEMO will re-run the SEM using the MSP software in offline mode and will do a comparative analysis between the original published schedule (the base-case) and the new study (the re-run case). This comparison will follow the process as set out in the report issued by SEMO on the calculation and application of the Settlement Recalculation Threshold. The report to be issued to the Participants will highlight major variances in System Marginal Price, noting where the re-run case showed that the SEM for that Trading Date would have changed by greater than the Settlement Recalculation Threshold.

A number of study dates have been identified based on the criteria above and the requirement to report for the Fourth Dual Rating Modification Working Group. The full list of dates and the reasons for their selection is included in Appendix 1 to this document. They can be summarised in the following graph.
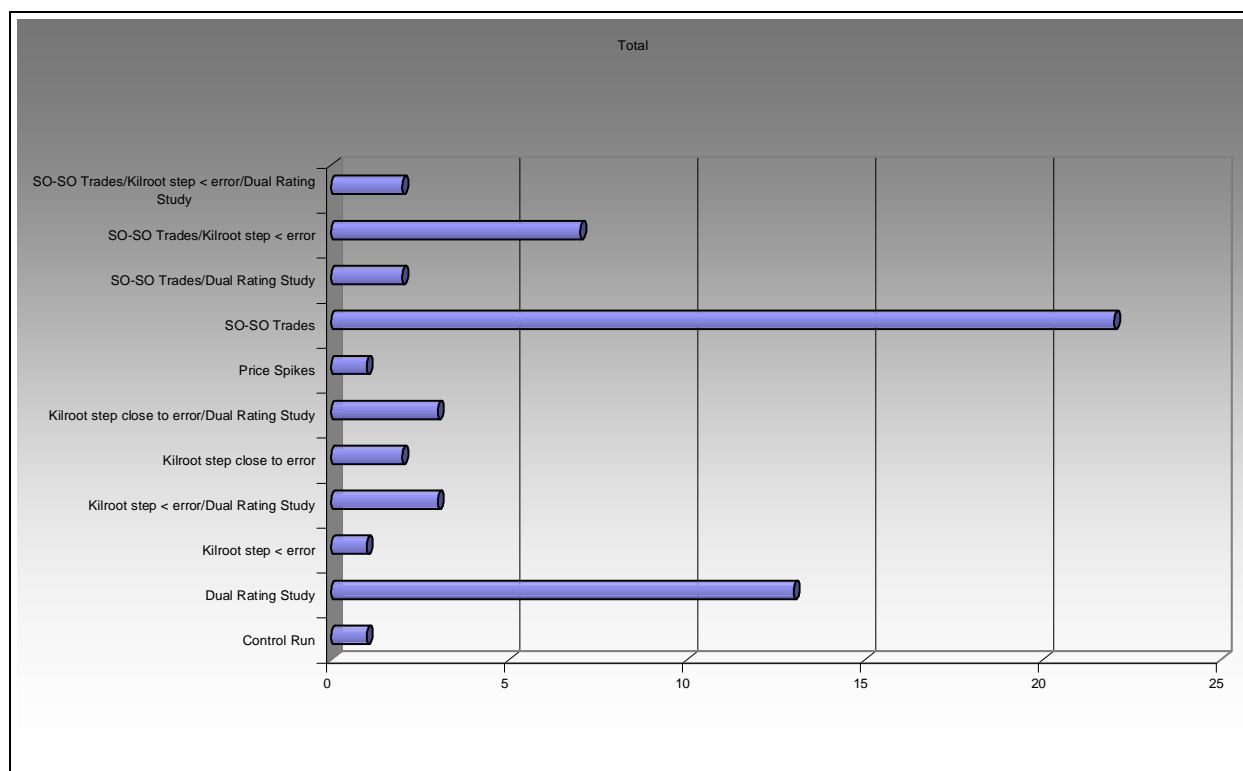
Figure 1 - Study Days

SEMO is still in the process of determining dates to be studied with respect to the inclusion of the Metered Generation for the Interconnector Error Unit.

Process

To support the Dual Rating Modification Working Group, SEMO initially undertook analysis of 10 Trade Dates. After first meetings of the Working Group, it was agreed that a further 14 Trade Dates would be studied bringing the total to 24 Trade Dates. These days were selected based on the occurrence of a price spike which was triggered by the Dual Rated Generator Units active in SEM, the Kilroot Generator Units, moving into their higher priced oil bid step.

Because of the noted issue with the derivation of the Schedule Demand in the MSP software, it should be considered that not all observed price spikes may have been due to the Kilroot issue. If there was a significant error quantity relating to the SO-SO Trades or the Metered Generation for the Interconnector Error Unit in the Trading Period with the price spike, correction of the Schedule Demand could mean that the MSO software would not have scheduled the Kilroot Generator Units into their higher bid step.

On reviewing the occasions when either of the Kilroot Generator Units set the SMP while in its oil bid step, it was found that on 17 occasions the MW quantity of the error in the Schedule Demand was greater than the MW quantity by which the Kilroot unit had moved into the oil bid step. However, a number of these did not produce price spike events. Of occasions where the

SMP was above €400 and the event happened, there were only 7 occasions where the MW quantity of the error in the Schedule Demand was greater than the MW quantity by which the Kilroot unit had moved into the oil bid step.

These are demonstrated in the table below. (The full list of instances where Kilroot moved into the oil bid step is included in Appendix 2)

TRADE DATE	DELIVERY HOUR	DELIVERY INTERVAL	Marginal Generator Unit	SMP	MW Into Oil Bid Step	SO-SO Trade	MGEU MW
19/12/2007	18	2	GU_500060	477.22	8.194	0	-0.094
19/12/2007	19	1	GU_500060	477.22	3.676	0	0.566
20/12/2007	18	1	GU_500070	482.74	3.632	0	0.072
21/12/2007	18	2	GU_500070	474.47	29.274	0	0.072
21/12/2007	19	1	GU_500060	474.47	22.202	0	-0.034
29/12/2007	18	2	GU_500070	435.63	3.275	0	0.152
29/12/2007	19	1	GU_500070	435.63	23.534	0	0.132
03/01/2008	12	1	GU_500060	460.98	7.583	0	0.672
03/01/2008	18	2	GU_500060	463.03	1.556	0	0.112
03/01/2008	19	1	GU_500060	463.03	0.659	0	0.628
05/01/2008	18	2	GU_500060	452.78	14.293	0	0.072
10/01/2008	18	2	GU_500060	432.52	4.399	0	1.054
21/01/2008	18	2	GU_500070	421.93	1.393	29.564	9.338
25/01/2008	18	2	GU_500070	430.96	16.077	0	-0.088
25/01/2008	19	1	GU_500070	430.96	1.959	0	0.408
27/01/2008	13	2	GU_500070	440.19	16.837	0	0.132
27/01/2008	14	1	GU_500070	440.19	17.634	0	0.072
30/01/2008	12	2	GU_500070	417.61	7.419	26.79	0.58
30/01/2008	13	1	GU_500070	417.61	23.538	0	0.232
01/02/2008	19	1	GU_500070	414.2	7.827	0	0.186
04/02/2008	18	2	GU_500070	468.32	3.065	0	1.164
18/02/2008	19	2	GU_500070	409.67	1.497	0	-0.14
20/02/2008	19	1	GU_500070	415.95	18.496	0	0.012
20/02/2008	19	2	GU_500070	415.95	4.045	0	0.072
26/02/2008	20	2	GU_500070	403.53	3.515	0	0.488
13/03/2008	20	1	GU_500060	417.87	5.976	0	0.928
19/03/2008	20	2	GU_500060	439.56	0.045	0	0.848
29/03/2008	20	1	GU_500060	422.77	26.398	0	0.104
23/04/2008	9	1	GU_500060	494.56	13.146	0	0.072
23/04/2008	9	2	GU_500070	494.56	32.526	0	0.072
23/04/2008	10	1	GU_500060	494.56	9.462	0	0.132
23/04/2008	10	2	GU_500060	494.56	30.82	0	0.072
06/05/2008	22	2	GU_500070	499.68	5.798	0	0.212
19/05/2008	18	1	GU_500070	525.44	0.025	0	0.272
13/06/2008	12	1	GU_500060	525.7	5.17	150.074	0.398
21/08/2008	12	2	GU_500070	551.46	1.461	0	-0.86
13/10/2008	20	1	GU_500070	430.39	11.775	0	-1.192
14/10/2008	18	1	GU_500060	405.66	6.016	300.248	0.8
14/10/2008	18	2	GU_500060	405.66	12.678	300.248	0.8
15/10/2008	20	1	GU_500060	404.72	18.559	0	-0.268

Table 1 - Kilroot step into Oil vs Error

Because of the impact this issue could have on the Dual Rated Modification, offline studies were carried out for all dates that had included a price spike event that were part of the previous analysis provided to the Dual Rated Modification Working Group.

To complete this analysis, original savecase files of the published runs of the SEM for these dates were restored. The inputs to the MSP software were edited in that the value of Interconnector Metered Generation was replaced by the summed quantity of all the Modified Interconnector Unit Nominations for each Interconnector Unit. The result of this change was that the SO-SO Trade was only included once in the calculation and there was no inclusion of the Metered Generation of the Interconnector Error Unit in the calculation. The MSP software was run, using the Langrangian Relaxation option with the exception of two separate Trading Days as noted below, with no capping of the availability of the Kilroot units.

The Trade Date of December 25th 2007 was not re-run for this study as no price spike occurred on this date.

Analysis

Date	Approx Generator Revenues			Peak SMP		Dual Rated Generator still causing peak
	Base Case	Re-Run	% Variance	Base Case	Re-Run	
05/12/2007	€6,541,616.87	€6,469,829.32	1.10%	€482.27	€128.21	NO
10/12/2007	€8,679,179.03	€8,811,310.82	-1.52%	€474.96	€216.39	NO
19/12/2007	€12,038,200.27	€12,199,099.22	-1.34%	€477.22	€477.22	YES
21/12/2007	€8,364,308.08	€8,372,719.85	-0.10%	€474.47	€474.47	YES
29/12/2007	€6,804,672.65	€6,227,514.21	8.48%	€435.63	€435.63	YES
03/01/2008	€11,768,157.56	€10,917,087.13	7.23%	€463.03	€462.92	YES
05/01/2008	€7,333,006.06	€7,488,793.99	-2.12%	€452.78	€452.78	YES
15/01/2008	€12,169,075.88	€11,792,352.86	3.10%	€326.66	€326.66	YES
19/01/2008	€8,222,876.31	€8,258,820.33	-0.44%	€333.64	€333.64	YES
21/01/2008	€8,843,834.19	€8,355,695.90	5.52%	€421.93	€241.85	NO
25/01/2008	€8,602,811.92	€8,602,064.18	0.01%	€430.96	€430.96	YES
27/01/2008	€7,497,379.70	€6,230,254.70	16.90%	€440.19	€119.79	NO
04/02/2008	€11,458,193.71	€11,566,161.16	-0.94%	€468.32	€445.76	YES
16/02/2008	€7,770,407.22	€7,770,998.41	-0.01%	€332.26	€332.26	YES
20/02/2008	€9,812,504.00	€9,545,746.86	2.72%	€415.95	€415.95	YES
29/02/2008	€8,331,580.34	€8,448,900.16	-1.41%	€390.98	€390.98	YES
19/03/2008	€9,240,141.72	€8,940,503.71	3.24%	€439.56	€182.93	NO
29/03/2008	€7,603,283.68	€7,606,037.74	-0.04%	€422.77	€422.77	YES
23/04/2008	€13,339,202.58	€12,151,438.40	8.90%	€494.56	€252.63	NO
06/05/2008	€9,230,124.97	€8,451,629.73	8.43%	€499.68	€161.91	NO
19/05/2008	€9,868,298.67	€9,238,070.85	6.39%	€525.44	€126.79	NO
	€9,868,298.67	€13,119,212.30	-32.94%	€525.44	€525.44	YES
13/06/2008	€11,520,391.75	€11,330,607.33	1.65%	€525.70	€298.69	NO
18/06/2008	€9,243,704.69	€9,254,168.13	-0.11%	€302.93	€253.58	NO
	€9,243,704.69	€9,576,952.07	-3.61%	€302.93	€615.90	YES

Table 2 - Summary of analysis

Based on the results of the analysis, it was found that on 10 of the 23 dates studied, the application of the correct value of Schedule Demand would have resulted in the price spikes not occurring in the SEM. Of these 10 dates, 4 of these (21/01/2008, 19/03/2008, 19/05/2008 and 13/06/2008) were among the 7 dates noted above as having a MW error value that was greater than the value of the Kilroot unit's step into its oil bid.

23/04/2008 shows a considerable change in production cost and peak SMP where the Kilroot unit set the peak SMP in its oil bid step for 4 Trading Periods in the original run whereas with corrected Schedule Demand, the unit never sets the peak. This produces significantly lower Approx Generator Revenues. However, there were no SO-SO Trades on this date and the average per Trading Period value of the Metered Generation for the Interconnector Error Unit

was less than 0.3MW. This outcome only serves to demonstrate how small changes to the Schedule Demand can cause the MSP solver to arrive at a different solution.

On all the remaining 13 dates, the price spike as observed in the original run of the MSP software recurred. Apart from small changes to the value of uplift on two of the days, the peak SMP was the exact same as on the original run.

On two dates, the number of peaks observed was reduced thereby giving a lower production cost. On 29/12/2007, the market outcome had the Kilroot unit setting a peak SMP based on its oil bid in two Trading Periods in the original run whereas in the study run, the unit only set the peak SMP in one Trading Period though still using its oil bid. Similarly, on 03/01/2008, the original schedule had a peak SMP based on the oil bid in three Trading Periods whereas the study run only had this in two Trading Periods.

With respect to the Trade Dates of 19/05/208 and 18/06/2008, studies were completed for both of these dates using both Langrangian Relaxation and Mixed Integer Programming methods. This was done because SEMO had at that time adopted the process of re-running schedules with price spikes caused by the Kilroot unit's oil bid with the MIP solver. On both these dates, significant high prices were observed using the LR solver and these were mitigated by use of the MIP solver. As a result, the published schedules and prices in SEM for those dates were based on the outcomes of MIP runs. However, for the purposes of this study, both days were re-run as LR with corrected Schedule Demand values to assess if the original high prices were accurate and the LR outcomes were compared with the published MIP base case. These days were also completed using the MIP solver as the MIP solver had originally produced high prices, though not as high as the LR solver.

On both these dates, the new MIP run with the corrected Schedule Demand resolved to a lower peak SMP, though the reduction for 18/06/2008 was not largely significant and showed a marginal increase in Approx Generator Revenues. However, in both instances the LR runs for these dates still produced very high prices and Approx Generator Revenues. The peak SMP of €525.44 occurred in five Trading Periods on 19/05/2008 showing that the Approx Generator Revenues of the MIP optimal solution were almost 33% less than the LR solution.

Of the dates studied, nine dates would require re-pricing if measured under the process as set out in the report issued by SEMO on the calculation and application of the Settlement Recalculation Threshold.

Conclusion

Although the analysis carried out so far would indicate that a number of days have been incorrectly priced and that, if the process as set out in the Settlement Recalculation Threshold report were applied, would warrant a re-pricing of the SEM for those dates, this is only nine dates out of the 23 that were studies. The remaining 14 dates would not require a re-pricing.

However, the intent of this interim report was to review the impact that the application of the incorrect Schedule Demand would have on dates where the Dual Rated Generator Units at Kilroot had caused price spikes based on their oil bid step. As such, although the studies carried out have shown that the number of instances where the price spike is caused in this manner was less than originally thought, the correction of the Schedule Demand resulted in the Kilroot units setting the System Marginal Price based on their oil bid on 13 out of the 23 dates studied.

This result indicates that while having an impact on the number of price spike events, the incorrect derivation of the Schedule Demand in the MSP software was not the primary cause of the Dual Rated Units setting peak System Marginal Prices based in their oil bid step.

Appendix 1 – Study Dates Identified

Dates	SO-SO Trades	Dual Rating Study	Kilroot step close to error	Kilroot step < error
02/11/2007	x			
14/11/2007	x			
05/12/2007		x		
10/12/2007		x		
14/12/2007	x			
19/12/2007		x		
20/12/2007	x			
21/12/2007		x		
28/12/2007	x			
29/12/2007		x		
03/01/2008		x	x	
05/01/2008		x		
15/01/2008		x		x
19/01/2008		x	x	
20/01/2008	x			
21/01/2008	x	x		x
22/01/2008	x			
25/01/2008		x	x	
27/01/2008		x		
29/01/2008	x			
30/01/2008	x			x
01/02/2008	x			
04/02/2008	x	x		
16/02/2008		x		
18/02/2008			x	
20/02/2008		x		
26/02/2008	x			
29/02/2008		x		
03/03/2008			x	
04/03/2008				x
19/03/2008		x		x
21/03/2008	x			
29/03/2008	x	x		
30/03/2008	x			
31/03/2008	x			
01/04/2008	x			
22/04/2008	x			
23/04/2008		x		
24/04/2008				
06/05/2008		x		
08/05/2008	x			
19/05/2008		x		x

Dates	SO-SO Trades	Dual Rating Study	Kilroot step close to error	Kilroot step < error
27/05/2008	x			
13/06/2008	x	x		x
18/06/2008		x		
20/06/2008	x			
10/07/2008	x			
31/07/2008	x			
20/08/2008	x			
14/09/2008	x			
14/10/2008	x			x
15/10/2008				
19/10/2008	x			x
15/11/2008	x			x
16/11/2008	x			x
17/11/2008	x			x
19/11/2008	x			x
Total Days	33	23	5	13

Appendix 2 – Error MW compared to Dual Rated Generator step into Oil

TRADE DATE	DELIVERY HOUR	DELIVERY INTERVAL	Marginal Generator Unit	SMP	MW Into Oil Bid Step	SO-SO Trade	MGEU MW
19/12/2007	18	2	GU_500060	477.22	8.194	0	-0.094
19/12/2007	19	1	GU_500060	477.22	3.676	0	0.566
20/12/2007	18	1	GU_500070	482.74	3.632	0	0.072
21/12/2007	18	2	GU_500070	474.47	29.274	0	0.072
21/12/2007	19	1	GU_500060	474.47	22.202	0	-0.034
29/12/2007	18	2	GU_500070	435.63	3.275	0	0.152
29/12/2007	19	1	GU_500070	435.63	23.534	0	0.132
03/01/2008	12	1	GU_500060	460.98	7.583	0	0.672
03/01/2008	18	2	GU_500060	463.03	1.556	0	0.112
03/01/2008	19	1	GU_500060	463.03	0.659	0	0.628
05/01/2008	18	2	GU_500060	452.78	14.293	0	0.072
10/01/2008	18	2	GU_500060	432.52	4.399	0	1.054
15/01/2008	18	1	GU_500060	326.66	1.258	0	1.232
15/01/2008	19	1	GU_500060	326.66	0.087	0	1.152
15/01/2008	20	1	GU_500060	326.66	3.656	0	1.466
16/01/2008	18	2	GU_500060	328.47	14.195	0	1.032
17/01/2008	18	2	GU_500060	360.3	6.188	0	0.844
19/01/2008	19	1	GU_500060	333.64	1.67	0	-0.134
20/01/2008	12	1	GU_500060	332.8	2.031	0	0.072
21/01/2008	18	2	GU_500070	421.93	1.393	29.564	9.338
25/01/2008	18	2	GU_500070	430.96	16.077	0	-0.088
25/01/2008	19	1	GU_500070	430.96	1.959	0	0.408
27/01/2008	13	2	GU_500070	440.19	16.837	0	0.132
27/01/2008	14	1	GU_500070	440.19	17.634	0	0.072
30/01/2008	12	2	GU_500070	417.61	7.419	26.79	0.58
30/01/2008	13	1	GU_500070	417.61	23.538	0	0.232
01/02/2008	19	1	GU_500070	414.2	7.827	0	0.186
04/02/2008	18	2	GU_500070	468.32	3.065	0	1.164

TRADE DATE	DELIVERY HOUR	DELIVERY INTERVAL	Marginal Generator Unit	SMP	MW Into Oil Bid Step	SO-SO Trade	MGEU MW
07/02/2008	19	1	GU_500070	398.6	24.041	0	0.392
15/02/2008	19	2	GU_500070	348.57	22.934	0	0.212
16/02/2008	19	1	GU_500060	332.26	7.323	0	0.072
16/02/2008	19	2	GU_500060	332.26	12.455	0	0.132
18/02/2008	19	2	GU_500070	409.67	1.497	0	-0.14
20/02/2008	19	1	GU_500070	415.95	18.496	0	0.012
20/02/2008	19	2	GU_500070	415.95	4.045	0	0.072
26/02/2008	20	2	GU_500070	403.53	3.515	0	0.488
29/02/2008	20	1	GU_500070	390.98	9.972	0	0.472
03/03/2008	20	1	GU_500060	394.65	1.957	0	0.362
04/03/2008	20	1	GU_500060	384.47	0.559	0	0.598
04/03/2008	20	2	GU_500060	384.47	14.785	0	0.538
13/03/2008	20	1	GU_500060	417.87	5.976	0	0.928
19/03/2008	20	2	GU_500060	439.56	0.045	0	0.848
29/03/2008	20	1	GU_500060	422.77	26.398	0	0.104
23/04/2008	9	1	GU_500060	494.56	13.146	0	0.072
23/04/2008	9	2	GU_500070	494.56	32.526	0	0.072
23/04/2008	10	1	GU_500060	494.56	9.462	0	0.132
23/04/2008	10	2	GU_500060	494.56	30.82	0	0.072
06/05/2008	22	2	GU_500070	499.68	5.798	0	0.212
19/05/2008	18	1	GU_500070	525.44	0.025	0	0.272
13/06/2008	12	1	GU_500060	525.7	5.17	150.074	0.398
21/08/2008	12	2	GU_500070	551.46	1.461	0	-0.86
13/10/2008	20	1	GU_500070	430.39	11.775	0	-1.192
14/10/2008	18	1	GU_500060	405.66	6.016	300.248	0.8
14/10/2008	18	2	GU_500060	405.66	12.678	300.248	0.8
15/10/2008	20	1	GU_500060	404.72	18.559	0	-0.268
16/10/2008	20	1	GU_500060	397.91	5.578	0	-0.31
18/10/2008	19	2	GU_500060	299.85	2.163	0	-0.826
19/10/2008	19	2	GU_500060	220.55	27.39	100	0

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TRADE DATE	DELIVERY HOUR	DELIVERY INTERVAL	Marginal Generator Unit	SMP	MW Into Oil Bid Step	SO-SO Trade	MGEU MW
21/10/2008	9	1	GU_500070	289.24	2.53	0	-1.434
21/10/2008	19	2	GU_500070	289.24	8.554	0	0.108
22/10/2008	19	2	GU_500060	224.35	40.615	0	0.102
22/10/2008	20	1	GU_500060	224.35	24.259	0	-0.102
28/10/2008	18	2	GU_500060	225.62	39.109	0	-15.86
30/10/2008	18	2	GU_500070	337.15	33.02	0	-0.846
31/10/2008	18	2	GU_500060	289.12	10.56	0	-0.16
01/11/2008	18	2	GU_500060	260.93	4.982	0	-15.8
03/11/2008	18	2	GU_500060	204.22	21.945	0	-0.818
03/11/2008	19	2	GU_500070	200.57	9.797	0	-1.356
04/11/2008	18	2	GU_500060	200.78	34.352	0	-0.74
05/11/2008	18	2	GU_500070	265.05	12.53	0	-0.776
07/11/2008	18	2	GU_500070	211.03	3.426	0	-0.8
08/11/2008	18	2	GU_500060	201.3	34.816	0	-15.86
08/11/2008	19	1	GU_500070	201.3	32.19	0	-15.8
09/11/2008	18	2	GU_500060	164.81	11.016	0	-0.94
10/11/2008	18	1	GU_500060	157.22	1.882	0	-0.858
10/11/2008	19	1	GU_500060	173.84	8.017	0	-0.892
11/11/2008	18	2	GU_500060	189.79	26.857	0	0.256
11/11/2008	19	1	GU_500070	189.79	29.653	0	-1.862
12/11/2008	18	1	GU_500070	233.53	1.559	0	-0.958
12/11/2008	18	2	GU_500060	233.93	23.934	0	-0.598
14/11/2008	18	2	GU_500070	217.88	21.449	0	-1.296
15/11/2008	18	2	GU_500070	257.94	8.952	425	1.14
16/11/2008	18	2	GU_500070	187.44	9.256	450	18.792
16/11/2008	19	1	GU_500070	178.88	13.374	450	26.384
16/11/2008	19	2	GU_500070	178.88	7.83	450	26.52
16/11/2008	20	2	GU_500070	178.88	5.122	450	26.52
17/11/2008	18	1	GU_500070	178.88	19.248	0	-0.906
17/11/2008	18	2	GU_500070	181.3	13.693	0	-0.8

TRADE DATE	DELIVERY HOUR	DELIVERY INTERVAL	Marginal Generator Unit	SMP	MW Into Oil Bid Step	SO-SO Trade	MGEU MW
19/11/2008	18	1	GU_500060	213.95	19.36	280	0.52
19/11/2008	18	2	GU_500060	224.02	30.804	278.148	2.452
20/11/2008	18	1	GU_500070	200.74	9.037	0	-0.8
20/11/2008	18	2	GU_500070	200.74	29.64	0	-0.74
22/11/2008	18	2	GU_500060	234.17	36.346	0	-0.938
22/11/2008	19	1	GU_500060	234.17	11.694	0	-15.8