P212 Scenario analysis: Model and Results

1 Introduction

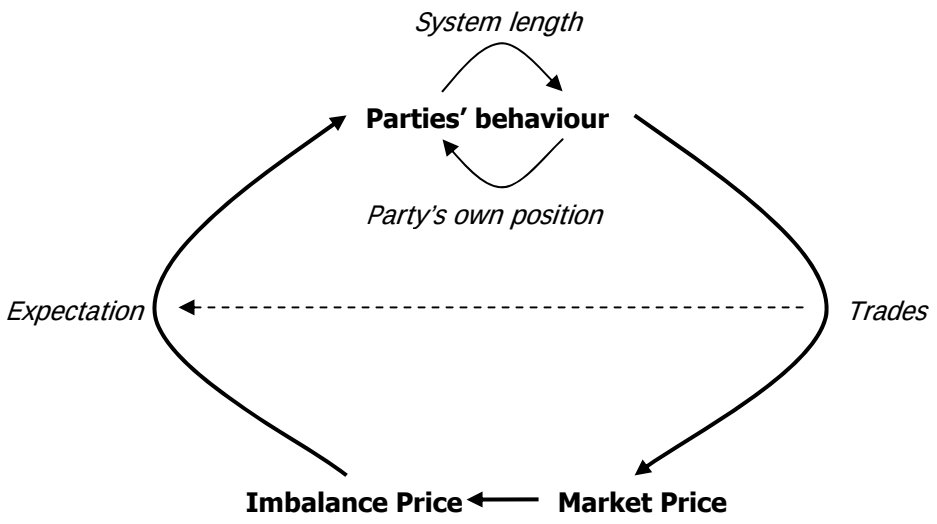
The P212 Modification Group has developed a simplified market model to enable scenarios of potential Party behaviour under P212 to be captured. The Modification Group has considered the model, assumptions, scenario analysis, and conclusions. This paper details the full set of scenarios and conclusions discussed by the Group.

2 Background

The current structure of the supply and demand curves reflected in Bid/Offer Acceptances (BOA's) and the resultant Energy Imbalance Prices presents an asymmetric risk to Parties who are potentially exposed to the main Energy Imbalance Price. Current judgements of the efficient level of Party imbalance is based on the opportunity cost of imbalance exposure which is made up of the expectation of what the System Operator (SO) costs are to balance the system in each half hour. At present most Parties on average maintain a long imbalance position, although this behaviour does not necessarily occur on a Settlement Period basis.

For the period 1 March 2006 to 31 March 2007, the system was long 75% of the time. However, for the period 1 November 2006 to 31 August 2007[1], the system was long 63% of the time. There was also noticeable difference between individual Settlement Periods (SP) with SP 10 (04:30) long on 88% of occasions and SPs 25 and 35 (12:00 and 17:00) being short 58% of the time.

3 P212 Price setting feedback loop



A decision made by a Party has the potential to impact Energy Imbalance Prices. This potential impact should be taken into account when a Party makes a decision to trade or not. This creates the above feedback loop where a Party will take into account the consequences of their actions when deciding their optimal strategy. The link from market price to imbalance price under the current imbalance cash out mechanism is less firm than under P212. The 5% premium or discount under P212 makes this a direct link and this allows for a relatively straightforward model of rational behaviour to be built. Under a P212 market it is clear what

[1] This includes the introduction of PAR500 on 2 November 2006.

impact a Party's trade will have on their imbalance position, the market price, and the main Energy Imbalance Price (although a Party would still have to determine whether they expect System Buy Price (SBP) or System Sell Price (SSP) to be the main Energy imbalance Price based on their expectation of the direction of the system).

4 Parties' assessment of how to operate in the market

The main assumption regarding a Party's behaviour in a P212 market is that they will aim to maximise their profits (or minimise their costs) and not their imbalance exposure[2]. Nor will a Party be seeking to discover an efficient level of imbalance where it becomes more cost effective for the SO to balance on a Party's behalf.

Parties will use the following information in establishing their trading strategy and imbalance position:

a) The price of the initial trade (considered critical, as this is the price that subsequent trading will revolve around);

b) The default price will influence whether an initial trade will occur;

c) Price and volume of trades subsequent to the initial trade;

d) Expectation of the Party's own imbalance position; and

e) Expectation of Energy Imbalance Price which is based on:
   - (a), (b) and (c) above;
   - Expectation of system length;
   - The impact of any potential trade entered into; and
   - Other Parties' behaviours.

P212 is based on a market price which is calculated in accordance with the Market Index Definition Statement (MIDS). The market price is a volume weighted average of trades made in the previous 20 hrs (½ hour, 2 hour and 4 hour trades only).

Any new trade made will influence the market price dependent on both its price and volume and price and volume of the previous trades making up the expected market price.

For example if the current expected market price is £30 per MWh based on 200MWh of trade and a new trade is made at £60 per MWh for 100MWh;

The new expected market price = [(30x200) + (60x100)] / [200+100]
= (6000 + 6000)/300
= £40 per MWh.

Additionally, because a 2 or 4 hour trade qualifies to enter market price for any half hour Settlement Period covered by the trade, behaviour may be influenced by more than just the market state for an individual half hour. For example, if a Party can purchase a 4 hour trade that is of large benefit for the first 3.5 hours but leaves them neutral for the final half hour then it could be shown to be rational to enter this trade. Therefore, market price in the last half hour is impacted via optimising over a longer period than an individual half hour. Whilst it is noted that there is potential for such scenarios to occur this was not progressed in the modelling in the interests of simplicity. It is assumed that Parties maximise profits (or minimise costs) in discrete half hour blocks.

[2] Note that this is relaxed in the model in order for an initial trade to occur where trading in the market is confined within the bounds of the premium and discount. (Referred to as the 'restricted' state).

5 Model assumptions and analysis inputs

Initial assumptions are:

1. An assumed level of information available to all Parties. This includes:
    a. Own imbalance position[3];
    b. System direction length (long/short). This assumes a correct initial expectation from when trading starts of the outturn direction of the system;
    c. Any trade that occurs will not change the correct initial expectation of the direction of the system; and
    d. Their own RCRC allocation;
2. Each Party acts rationally based on the concept of maximising utility (to maximise profit or minimise cost). A party's imbalance costs/income is the total of the cost/income made on the trade in the market plus the cost/income as a result of the exposure in the imbalance mechanism, plus an allocation of RCRC e.g. Total costs = cost from trade + cost of imbalance + RCRC feedback;
3. Parties maximise profits (or minimise costs) in discrete half hour blocks;
4. Parties make their decisions to maximise profits (or minimise costs) independently of past trades. Any costs or revenue from a past trade is considered 'sunk' or 'banked' such that Parties will use rational behaviour for whether to enter a subsequent trade;
5. The impact on Balancing Services Use of System (BSUoS) cash flow is not modelled due to the complexity of doing so[4];
6. Cost of generation is excluded from the calculations. The model focuses on the interaction of trades with the market price and hence imbalance costs;
7. There are no transaction costs;
8. An initial expectation of all Parties is that in a restricted state, the initial opening trade price for the scenario analysis will be £30 per MWh. This is an approximation of the current average price of gas/coal;
9. A non-restricted state may occur if it is rational for Parties to enter into trades which relate purely to maximising profit (or minimising cost) and which do not relate to market fundamentals;
10. The role of non-physical traders has not been modelled to ensure simplicity. Potential non-physical traders behaviours are considered similar to those of players under a non-restricted state;
11. The SO trading in the market has not been modelled to ensure simplicity. The impact on SO costs shall be determined through separate analysis based on any conclusions formed from the scenario analysis;
12. One Settlement Period is used for the analysis (rational behaviour applies only to maximising profit in the one Settlement Period);
13. Energy Imbalance Prices are set as Market Price plus or minus 5%;
14. It is a liquid market (where counterparties for trades exist);
15. Prices of each trade will move the market due to the nature of the P212 imbalance price calculation;
16. The initial trade will meet the MIDS liquidity threshold[5];

[3] This is considered a reasonable assumption because even if a Party does not know its imbalance position exactly, it will know what its forecast error and will therefore still have a position that is its best estimate of its position.
[4] Note that the impact on SO costs via BSUoS is considered separately in the P212 Assessment.
[5] Note that whilst it is recognised that the liquidity threshold is 25MWh it is not believed this would add anything to the scenarios undertaken. Note, MID price is calculated in the current rules:

17. It is likely there should be no default, due to incentives to trade, see analysis presented in Appendix A; and
18. Every trade is delivered.

6 Detailed Model Description

The P212 Modification Group has built a simplified model to explore Party behaviour. This model has five players with an assumed level of imbalance for each. The market as a whole has demand of 10,000MWh. The players and their initial positions are shown the table below.

It is noted that there are many variations of this model that could have been built. However, it is not believed that such variations would alter the general conclusions able to be drawn from this model.

Player	Physical Position (MWh) [6]	RCRC Allocation
Generator (G)	8,000	40.00%
Large Supplier (LS)	-7,000	35.00%
Small Generator (SG)	2,000	10.00%
Small Supplier 1 (SS1)	-2,500	12.50%
Small Supplier 2 (SS2)	-500	2.50%

The model starts with a balanced market. The physical positions are changed to model a short or long market. The model then assumes different levels of opening contract position for each Party to establish their opening imbalance position (being the difference between the physical position and opening contract position).

The model assumes there are two trades. A first trade occurs to initiate the market. A final trade occurs that confirms what System Buy Price (SBP) and System Sell Price (SSP) will be.

The Group has identified two states in which a first trade will occur:

- A restricted state in which trades occur only within the range set by the premium and discount; and
- A non-restricted state where trades may occur outside the range set by the premium and discount.

<u>Restricted State</u>

It is assumed that there is a rational trade based on the marginal costs of a generator. For the purposes of this modelling we assumed the marginal cost to be £30/MWh[7]. For this first trade to occur there needs to be both a long and a short player willing to reduce their levels of imbalance. We assumed that the G and LS would make this trade (although this is not a critical assumption).

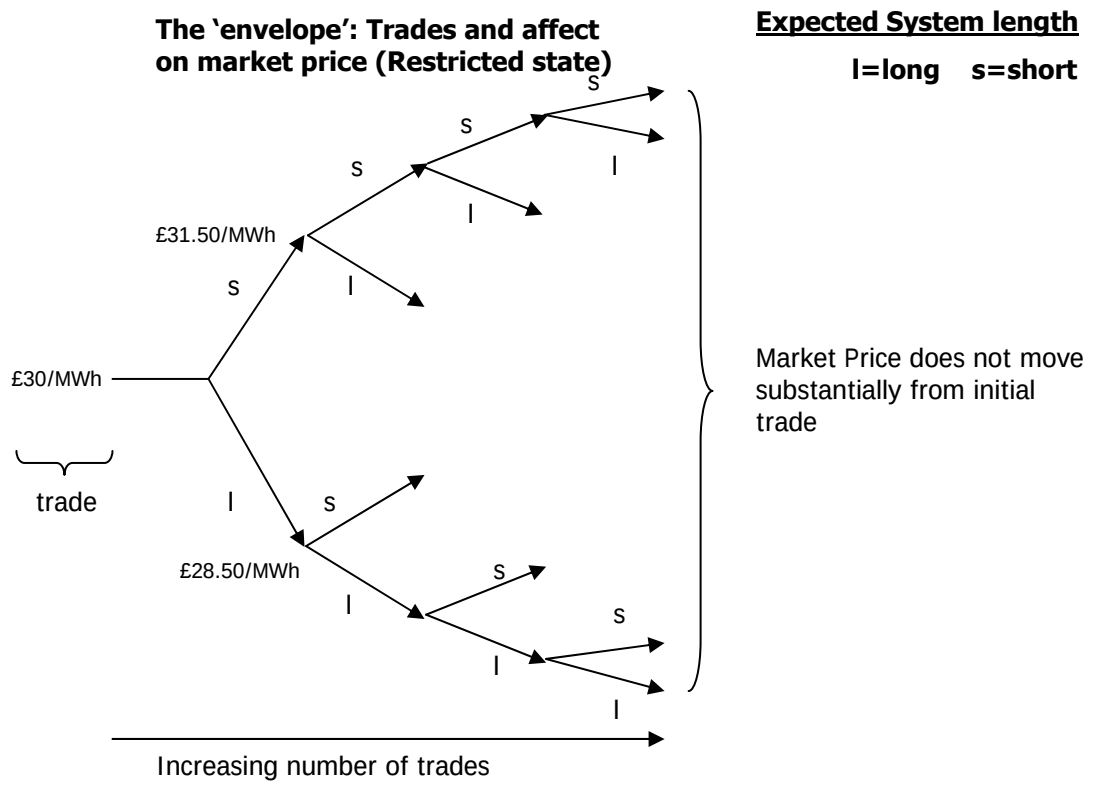
In a restricted state there is an envelope which is presented in the diagram below in which rational trades will occur. The diagram assumes that each trade occurs at the same volume. At a first trade of £30/MWh the limit of potential rational trades between a long and a short Party occur within the 5% range (i.e. £28.50/MWh and £31.50/MWh) depending on the expectation Parties have of the system being long or short. After a second trade has occurred between £28.50/MWh and £31.50/MWh there is a new envelope of potential trades that can occur. However this is likely to be narrower due the fact that the volume of the next trade will

a. ½ hour, 2 hour and 4 hour trades with equal weighting;
b. All matched trades in 20 hour before Gate Closure; and
c. Liquidity Threshold is 25 MWh.

[6] A positive number indicates energy injected onto the Grid with a negative number indicating energy withdrawn from the Grid.

[7] The £30/MWh value is not critical to the analysis and is not based on any evidence that this is the current marginal cost for any generator. The assumption that the trade occurs at marginal cost is the key point.

have smaller impact on the (volume weighted average) market price. Similarly the outer bounds of the envelope increases at a decreasing rate due to the reduced ability for subsequent trades to impact the market price.



Non-restricted State

It is assumed that there is a rational initial trade based on the criteria of maximising profit (or minimising loss). For the purposes of the model we assumed that this would be a price of £500MWh traded between two long Generators.

Trades can be shown to occur in a restricted state within the bounds of the premium or discount. However, the restricted state is vulnerable to one trade occurring outside of these bounds that may potentially tip the market into a non-restricted state in which Parties strategies could subsequently change. Whether such a tipping point occurs is not related to the Settlement Period in question being one of system stress. It is noted that the greater the volumes traded in a restricted state, the more difficult it is for one trade to impact the price, however the trade occurring outside the range of the premium/discount provides a signal to the market of a Party's trading strategy (although the market will not know which Party).

Upon an initial trade in the model (in either a restricted state or a non-restricted state) Parties cash flow positions are updated based on:

- Price of first trade = market price;
- Market length which determines which is the main price;
- Cost/revenue of the first trade;
- Volume of first trade (adjusts imbalance exposure for Party's involved in the trade);
- Remaining imbalance cost/revenue; and
- RCRC and RCRC distribution.

The first and second trades occur independently. That is, there is a first trade that adjusts all Parties positions (via the impact on market and thus imbalance prices and RCRC). Any costs or revenue from the first trade is then considered 'sunk' or 'banked' such that Parties will use rational behaviour for whether to enter a second trade.

For a trade to occur, both Parties' total cash flow must be better than if they had not traded. In the scenarios in Appendix B, this is shown by comparing the cashflows in the "no offer" column of the second table of each scenario (which is equivalent to the Imbalance exposure plus RCRC column in the first table of each scenario) to those cash flows in the other priced columns in the second table. As cash flow is affected as described above, it is shown that there is always a range of prices within which two Parties are willing to trade that is within the 5% premium/discount range.

7 Scenarios

Scenarios were modelled as follows (total number of scenarios = 18):

a. Scenario 1 – Long Market, Restricted State, Initial trade at £30/MWh [1]
b. Scenario 2 – Short Market, Restricted State, Initial trade at £30/MWh [1]
c. Scenario 3 – Long Market, Non-restricted state, Initial trade at £500/MWh [1]
d. Run scenarios 1 and 2 at the following percentages: 10%, 20% and 100% [6]
e. Run scenarios 1 and 2 with no RCRC feedback [2]
f. Run scenario 3 with a different initial trade price @ £60/MWh [1]
g. Run scenarios 1 and 2 with different size trades, e.g. 1st trade 400MWh, 2nd trade 50MWh and then 1st trade 50MWh, 2nd Trade 400MWh [4]
h. Run scenarios 1 and 2 with a 3rd and 4th trade [2]

The detail of the scenarios can be found in Annex B.

8 Conclusions

The conclusions drawn are broken down into restricted state and non-restricted state as different behaviours can occur under each. Whilst there are a lot of conclusions that the Modification group have been able to make, a key conclusion that relates to both states is that the initial trade is critical as this sets the price for which the market will then trade to.

Restricted State Conclusions

- Incentive to trade first as this sets the market trading pattern for the Settlement Period;
- The 2nd trade impacts the market price. The level of impact depends on the relative volumes and prices of each trade (volume weighted average price);
- The change to level of imbalance as a result of the 2nd trade of both trading Parties impacts total cash flow for each Party and therefore the price at which they are willing to trade;
- 2nd trade change to RCRC impacts total cash flow thus the incentive to trade;
- Trades impact non-trading Parties:
    - Potential incentive to let others trade first where this is to their benefit – i.e. when you are in imbalance in the opposite direction to the system. (For example, in Scenario 2, SG benefits without trading if that trade is £30.70). This may be riskier but potentially more financially rewarding;
    - Parties may race to be first trade counterparty when this is to their benefit – i.e. when you are in imbalance in the same direction as the system. For example, LS and SS1 in Scenario 2 would wish to strike the next trade with G which is likely to see G take all the profits (price tend toward £30.70)[8]; and
    - A balanced Party is always worse off from 2nd trade due to change in RCRC;

[8] As an additional test on this model, the price range in which a trade will occur if G trades 150MWh with SS1 (to make SS1 balanced), is £30.49 to £31.32. SS1 is prepared to pay a higher price due to the fact they can close out their position. Thus G could offer at £31.32 where only SS1 is willing to trade. (Although it can be shown that G would prefer this trade had it known that someone else in the market would take it).

- Range of prices where trade will occur is likely to be low (The example here is trade will only occur within a range 1/5th the size of the premium/discount);
- The assumption of knowing system direction will cap the price in a long market at the level of the initial trade (as short Parties will never pay more than this price as that is what they would pay in imbalance). Similarly, the assumption of knowing system direction will create a floor for the price in a short market at the level of the initial trade (as long Parties will never sell for less than this price as that's what they would pay in imbalance);
- Relaxing the assumption of 'knowing the system direction' will adjust the cap and floor levels at the initial trade price plus or minus the premium;
- Whether a party can close out their position impacts the price at which they are willing to trade (see footnote 9); and
- Entering a 2nd trade sends a signal to the market of the expected direction of the system.

The table below gives the generic conclusions based on the model where a long and short Party trade and how behaviour is subsequently affected.

Generic table of outcomes from model: restricted behaviour

Part Position	**Long market**		**Short market**	
	1st trade	**2nd trade**	**1st trade**	**2nd trade**
Long Party entering first trade	Trade to initiate market	Will trade within restricted bounds less than market price but above the discount	Trade to initiate market	Will trade within restricted bounds less than the premium and above the market price
Short Party entering first trade	Trade to initiate market	Will trade within restricted bounds less than market price but above the discount	Trade to initiate market	Will trade within restricted bounds less than the premium and above the market price
Long Party not trading	There is an opportunity cost of not being included in the initial trade as the initial trade price is more favourable than in imbalance	Incentive to beat other long Parties to a trade to get a more favourable price than in imbalance		Incentive to delay trading until after another long Party to get a more favourable imbalance price
Short Party not trading		Incentive to delay trading until after another short Party to get a more favourable imbalance price	There is an opportunity cost of not being included in the initial trade as the initial trade price is more favourable than in imbalance	Incentive to trade before another short Party to get more favourable price than in imbalance
Balanced Party not in first trade	RCRC means all trades lead to worse position	RCRC means all trades lead to worse position	RCRC means all trades lead to worse position	RCRC means all trades lead to worse position

Non-restricted Conclusions

- Resultant price has nothing to do with fundamentals such as fuel price or energy scarcity;
- In an unregulated market, short Parties trade with short Parties to influence price to zero;
- In an unregulated market, long Parties trade with long Parties to influence price to a high level;
- No trades between short Parties and long Parties;
- Traded prices may become volatile and oscillate between very high and very low as Parties attempt to influence the resultant market and imbalance prices. Required volumes to impact market price will need to increase with each trade;
- On average large players with large volume can influence price more;
- Small players could try and take positions greater than their physical capacity but may be limited by amount of cash they can post on APX and risk strategy (if get it wrong then potential to bust);
- There could be situations where it is beneficial for Parties to go ever more into imbalance to make gains in the imbalance market. Likely to result in increasingly higher imbalances that favours large players as they have greater portfolios to allow to take this risk;
- Risk increases (via greater imbalance position) with the number of trades;
- Non-steady state favours long Parties as zero is an effective floor price[9] but there is no upper limit;
- A resultant high price known ex-ante could lead to large amounts of spill onto the system (if assumption of fixed physical positions is relaxed). Large incentive to replace tripped plant;
- If resultant low price known ex-ante provides no incentive to replace tripped plant and also to reduce FPNs (potentially to zero) and increase Bid Offer prices in the Balancing Mechanism. The SO has to accept many balancing actions (BOAs) to ensure that demand is met. This is likely to be a system security problem;
- Greater imbalance (from the two points directly above) leads to greater NIV magnitude and volatility;
- Regulatory oversight might prevent extremes but this non-restricted state 'effect' could occur at much lower levels of price and volume;
- Parties not participating are heavily affected by trades made to influence price; and
- Both counterparties in such trades could have the same parent company although this might be a risky strategy in a regulated market.

Generic table of outcomes: Non-restricted behaviour

Position	**Long or short market**	
	1st trade	**2nd trade**
Long Party entering first trade	Trade to initiate market and make large gains. Is willing to go longer to influence price.	Incentive to continue strategy and influence price
Short Party (not entering first trade)		Is willing to increase imbalance exposure (go shorter) to decrease price
Long Party entering first trade	Trade to initiate market and make large gains. Is willing to go longer to influence price.	Incentive to continue strategy and influence price
Short Party (not entering first trade)		Is willing to increase imbalance exposure (go shorter) to decrease price
Balanced Party not in first trade	RCRC impacts	RCRC impacts

[9] APX cannot allow negative prices this may be considered as a result of P212 approval.

Appendix A: analysis supporting No Default assumption

Scenario i)
Assume that the current default price is expected to be £50/MWh and 1 Party is 100MWh short, therefore SBP would be £52.50 the Party would pay £5,250 if it remained 100MWh in imbalance. This scenario would work at any expected default price greater than £0 per MWh.

If the Party sells 30MWh at £0 as the last trade before the market stops (and trade is matched[10]), the market price becomes £0. Party is 130MWh short but pays £0 as SBP becomes £0. It is assumed that this trade is not delivered.

As a cost of £0 is better than a cost of £5,250 the Party should rationally make this trade. This is a feature of not being required to deliver on the contracts made in the Exchange market.

Scenario ii): Long market
Default price = £50/MWh
1 Party is 100MWh long
Party would get paid £4,750 if remained 100MWh long (100MWh times £47.50 [£50 less 5%])
If the Party buys at £500/MWh for 30MWh, then Market Prices becomes £500/MWh
Party is 130MWh long and therefore:

- gets paid £61,750 for 130MWh long (130x£47.50)
- pays £15,000 in market (30x£500)
- net gain £42,000 [£61,750-(£15,000+£4,750)]

Note that these scenarios are used to illustrate extreme trades. Given the potential for such behaviour to be considered market manipulation it may be that actual trades would be closer to a price considered within the realms of market fundamentals.

[10] This may require a counterparty that will not be negatively impacted by the resultant imbalance price. (e.g. a Party who will becomes balanced as a result of the trade.

Appendix B: Detail of the Scenarios

Scenario 1: Long market, different % premiums/discounts

The base case of the scenario is that:

Player	Physical Position (MWh)	Contract position (MWh)	Opening Imbalance[11] (MWh)
Generator (G)	8,000	7,500	-500
Large Supplier (LS)	-7,000	-6,500	500
Small Generator (SG)	2,000	1,900	-100
Small Supplier 1 (SS1)	-2,450	-2,400	50
Small Supplier 2 (SS2)	-500	-500	0

All trades that take place are between the Generator and the Large Supplier. 1st trade of 250MWh @ £30/MWh, 2nd Trade of 100MWh at different prices. This changes the Imbalance position of the Generator and Large Supplier to -250MWh and 250MWh respectively.

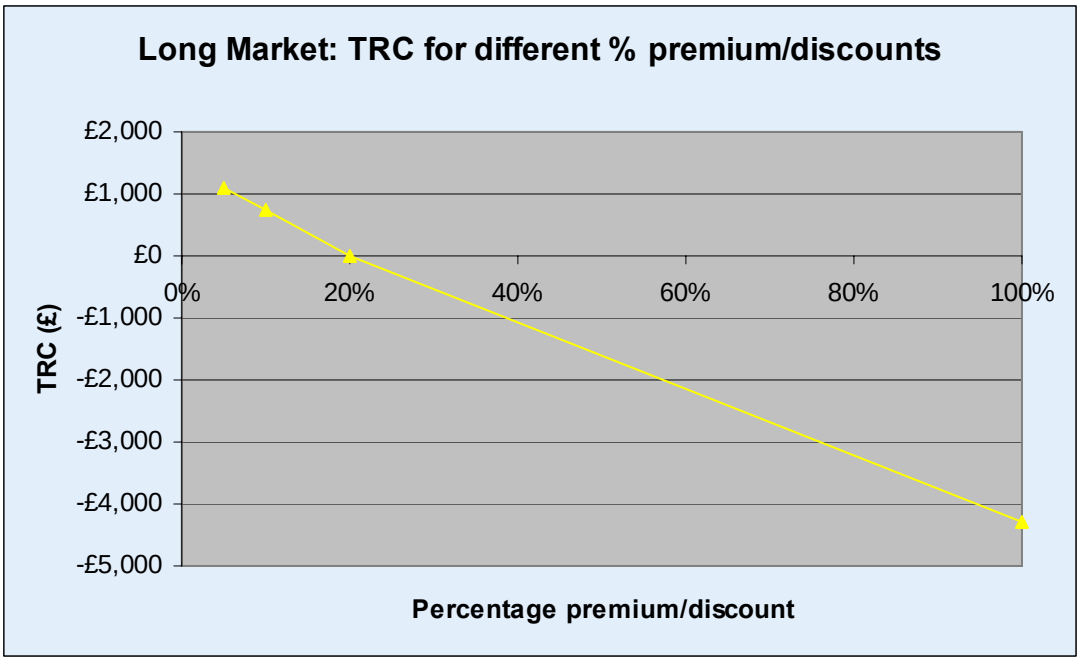
The following variations on Scenario 1 that were run are:

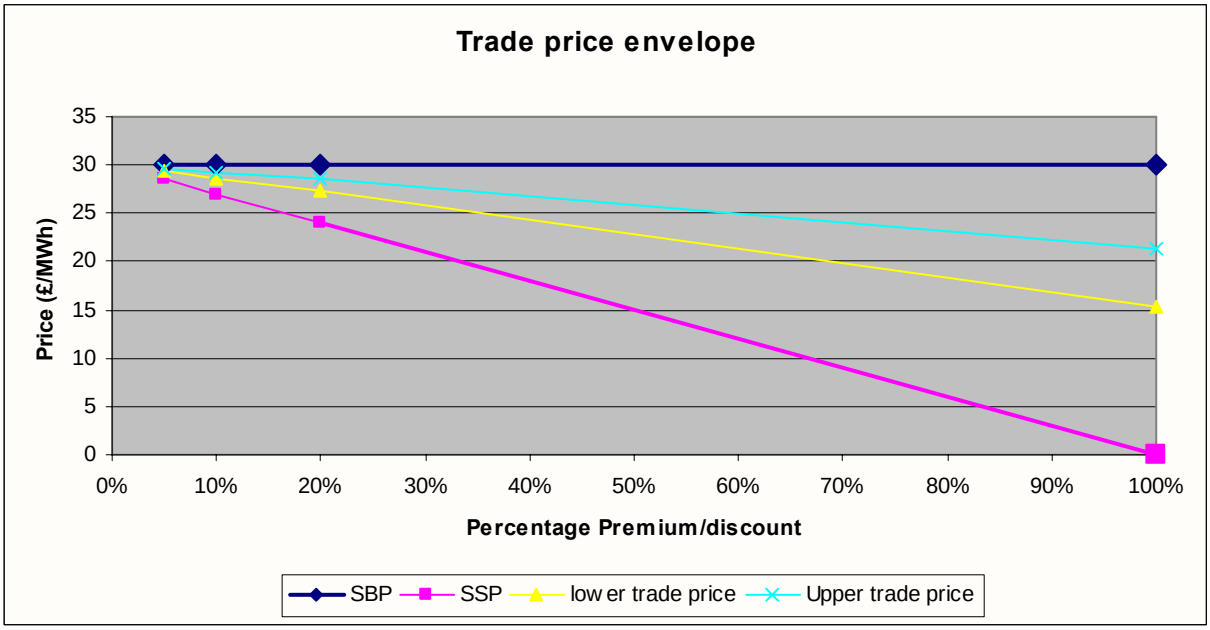
Scenario 1a: 5% premium/discount
Scenario 1b: 10% premium/discount
Scenario 1c: 20% premium/discount
Scenario 1d: 100% premium/discount

Summary of graphs below:

- **Total System Residual Cashflow (TRC) goes from positive to negative as % premium/discount increases[12]**
- **SSP declines linearly with % premium/discount**
- **Price range in which trade will occur increases linearly with % premium/ discount**

[11] Here a positive number indicates a short position and a negative number indicates a long position.
[12] Note that the percentage level that TRC changes from a positive to a negative level is unique to this model and does not indicate a percentage level in which this might occur if P212 were to be implemented.





The lower and upper trade prices are the ranges in which trades would occur for each percentage (given the construction of the model).

1a: Premium discount 5%

Initial cash flow (after 250 MW trade at £30/MWh)

Player	Trade Revenue (£)	Imbalance exposure (£)	RCRC Allocation (£)	Imbalance exposure plus RCRC	Total cash flow (1st trade)
Generator (G)	£7,500	£7,125	-£391	£6,734	£14,234
Large Supplier (LS)	-£7,500	-£7,500	-£342	-£7,842	-£15,342
Small Generator (SG)	-	£2,850	-£98	£2,752	£2,752
Small Supplier 1 (SS1)	-	-£1,500	-£120	-£1,620	-£1,620
Small Supplier 2 (SS2)	-	0	-£24	-£24	-£24

The first trade has the following impacts:

- Sets the price for the whole market; and
- Affects all Parties cash flows via RCRC (SS2 who is balanced has to pay £24 when they have not participated).

For a second trade to rationally occur both Parties (G and LS) total cash flow needs to be higher than if they do nothing.

Different 2nd trade prices (2nd trade 100MWh)

- trade price range = £29.35-£29.64 (29p)
- the revenue or cost of the first trade is not shown in this table as the value of this is assumed to have been banked/paid for. This table compares the cash flows for the various parties to show what price it is beneficial for the Generator and Large Supplier to trade (e.g. compares 'Imbalance exposure plus RCRC' column above)
- ticks indicate where a Party is better off due to the trade between G and LS occurring than it not occurring.

Offer	No offer	£28.51	£29.35	£29.64	£29.99
SBP	30.00	29.57	29.81	29.9	29.997
SSP	28.50	28.10	28.32	28.40	28.497
G cash flow	£6,734	£6,621	£6,735 √	£6,775 √	£6,823 √
LS cash flow	-£7,842	-£7,676 √	-£7,799 √	-£7,841 √	-£7,893
SG cash flow	£2,752	£2,698	£2,720	£2,728	£2,736
SS1 cash flow	-£1,620	-£1,615 √	-£1,628	-£1,633	-£1,638
SS2 cash flow	-£24	-£28	-£28	-£28	-£28

Net gain/loss after 2nd trade

- this table shows the net gain/loss for each party after the 2nd trade at the different trade prices

Offer	No offer	£28.51	£29.35	£29.64	£29.99
SBP	30.00	29.57	29.81	29.9	29.997
SSP	28.50	28.10	28.32	28.40	28.497
G cash flow	0	-£113	£1	£41	£89
LS cash flow	0	£166	£43	£1	-£51
SG cash flow	0	-£54	-£32	-£24	-£16
SS1 cash flow	0	£5	-£8	-£13	-£18
SS2 cash flow	0	-£4	-£4	-£4	-£4

Second trade points to note:

- Range of prices in which a trade would occur is reduced due to RCRC, and the level of imbalance remaining in relation to the impact the second trade has on the imbalance prices;
- Range of prices in which a trade would occur is low – £0.29 which is 1/5th of the original 5% spread (£1.50); and
- Incentive for non-trading Parties (SG SS1 and SS2) to discourage trading OR incentive to trade prior to the 2nd trade between G and LS as:
    - SG and SS2 are never better off due to 2nd trade; and
    - SS1 is only better off if a trade occurred at a price at the lower end of the 5% discount. However, this is not at a price in which the trade would have occurred.

1b: Premium discount 10%

Initial cash flow (after 250 MW trade at £30/MWh)

Player	Trade Revenue (£)	Imbalance exposure (£)	RCRC Allocation (£)	Imbalance exposure plus RCRC	Total cash flow (1st trade)
Generator (G)	£7,500	£6,750.00	-£180.45	£6,569.55	£14,069.55
Large Supplier (LS)	-£7,500	-£7,500.00	-£157.89	-£7,657.89	-£15,157.89
Small Generator (SG)	-	£2,700.00	-£45.11	£2,654.89	£2,654.89
Small Supplier 1 (SS1)	-	-£1,500.00	-£55.26	-£1,555.26	-£1,555.26
Small Supplier 2 (SS2)	-	£0.00	-£11.28	-£11.28	-£11.28

Different 2nd trade prices (2nd trade 100MWh)

- trade price range = £28.68-£29.27 (59p)

Offer	No offer	£27.01	£28.68	£29.27	£29.99
SBP	£30.00	£29.15	£29.62	£29.79	£29.997
SSP	£27.00	£26.23	£26.66	£26.81	£26.997
G cash flow	£6,569.55	£6,343.48	£6,570.11√	£6,650.18√	£6,747.89√
LS cash flow	-£7,657.89	-£7,328.52√	-£7,571.28√	-£7,657.04√	-£7,761.70
SG cash flow	£2,654.89	£2,550.07	£2,591.81	£2,606.56	£2,624.56
SS1 cash flow	-£1,555.26	-£1,546.77√	-£1,572.09	-£1,581.04	-£1,591.95
SS2 cash flow	-£11.28	-£18.26	-£18.56	-£18.67	-£18.80

Net gain/loss after 2nd trade

- this table shows the net gain/loss for each party after the 2nd trade at the different trade prices

Offer	No offer	£27.01	£28.68	£29.27	£29.99
SBP	£30.00	£29.15	£29.62	£29.79	£29.997
SSP	£27.00	£26.23	£26.66	£26.81	£26.997
G cash flow	0	-£226	£1	£81	£178
LS cash flow	0	£329	£87	£1	-£104
SG cash flow	0	-£105	-£63	-£48	-£30
SS1 cash flow	0	£8	-£17	-£26	-£37
SS2 cash flow	0	-£7	-£7	-£7	-£8

1c: Premium discount 20%

Initial cash flow (after 250 MW trade at £30/MWh)

Player	Trade Revenue (£)	Imbalance exposure (£)	RCRC Allocation (£)	Imbalance exposure plus RCRC	Total cash flow (1st trade)
Generator (G)	£7,500	£6,000.00	£240.60	£6,240.60	£13,740.60
Large Supplier (LS)	-£7,500	-£7,500.00	£210.53	-£7,289.47	-£14,789.47
Small Generator (SG)	-	£2,400.00	£60.15	£2,460.15	£2,460.15
Small Supplier 1 (SS1)	-	-£1,500.00	£73.68	-£1,426.32	-£1,426.32
Small Supplier 2 (SS2)	-	£0.00	£15.04	£15.04	£15.04

Different 2nd trade prices (2nd trade 100MWh)

- trade price range = £27.33-£28.52 (£1.19)

Offer	No offer	£24.01	£27.33	£28.52	£29.99
SBP	£30.00	£28.29	£29.24	£29.58	£29.997
SSP	£24.00	£22.63	£23.39	£23.66	£23.998
G cash flow	£6,240.60	£5,795.63	£6,241.46√	£6,401.26√	£6,598.66√
LS cash flow	-£7,289.47	-£6,644.29√	-£7,118.57√	-£7,288.57√	-£7,498.57
SG cash flow	£2,460.15	£2,263.09	£2,338.97	£2,366.17	£2,399.77
SS1 cash flow	-£1,426.32	-£1,414.43√	-£1,461.86	-£1,478.86	-£1,499.86
SS2 cash flow	£15.04	£0.00	£0.00	£0.00	£0.00

Net gain/loss after 2nd trade

- this table shows the net gain/loss for each party after the 2nd trade at the different trade prices

Offer	No offer	£24.01	£27.33	£28.52	£29.99
SBP	£30.00	£28.29	£29.24	£29.58	£29.997
SSP	£24.00	£22.63	£23.39	£23.66	£23.998
G cash flow	0	-£445	£1	£161	£358
LS cash flow	0	£645	£171	£1	-£209
SG cash flow	0	-£197	-£121	-£94	-£60
SS1 cash flow	0	£12	-£36	-£53	-£74
SS2 cash flow	0	-£15	-£15	-£15	-£15

1d: Premium discount 100%

- No imbalance revenue for spilling parties (only RCRC reallocation)

Initial cash flow (after 250 MW trade at £30/MWh)

Player	Trade Revenue (£)	Imbalance exposure (£)	RCRC Allocation (£)	Imbalance exposure plus RCRC	Total cash flow (1st trade)
Generator (G)	7,500	£0.00	£3,609.02	£3,609.02	£11,109.02
Large Supplier (LS)	-7,500	-£7,500.00	£3,157.89	-£4,342.11	-£11,842.11
Small Generator (SG)	-	£0.00	£902.26	£902.26	£902.26
Small Supplier 1 (SS1)	-	-£1,500.00	£1,105.26	-£394.74	-£394.74
Small Supplier 2 (SS2)	-	£0.00	£225.56	£225.56	£225.56

Different 2nd trade prices (2nd trade 100MWh)

- trade price range = £15.39-£21.42 (£6.03)

Offer	No offer	£0.01	£15.39	£21.42	£29.99
SBP	£30.00	£21.43	£25.83	£27.55	£29.997
SSP	£0.00	£0.00	£0.00	£0.00	£0.00
G cash flow	£3,609.02	£1,719.81	£3,610.24√	£4,351.41√	£5,404.79√
LS cash flow	-£4,342.11	-£1,711.75√	-£3,600.53√	-£4,341.05√	-£5,393.51
SG cash flow	£902.26	£429.70	£517.81	£552.35	£601.45
SS1 cash flow	-£394.74	-£545.19	-£656.97	-£700.80	-£763.09
SS2 cash flow	£225.56	£107.43	£129.45	£138.09	£150.36

Net gain/loss after 2nd trade

- this table shows the net gain/loss for each party after the 2nd trade at the different trade prices

Offer	No offer	£0.01	£15.39	£21.42	£29.99
SBP	£30.00	£21.43	£25.83	£27.55	£29.997
SSP	£0.00	£0.00	£0.00	£0.00	£0.00
G cash flow	0	-£1,889	£1	£742	£1,796
LS cash flow	0	£2,630	£742	£1	-£1,051
SG cash flow	0	-£473	-£384	-£350	-£301
SS1 cash flow	0	-£150	-£262	-£306	-£368
SS2 cash flow	0	-£118	-£96	-£87	-£75

Scenario 2: Short market, restricted state, different % premiums/discounts

The base case of the scenario is:

Player	Physical Position (MWh)	Contract position (MWh)	Opening Imbalance (MWh)
Generator (G)	8,000	7,500	-500
Large Supplier (LS)	-7,000	-6,500	500
Small Generator (SG)	2,000	1,900	-100
Small Supplier 1 (SS1)	-2,550	-2,400	150
Small Supplier 2 (SS2)	-500	-500	0

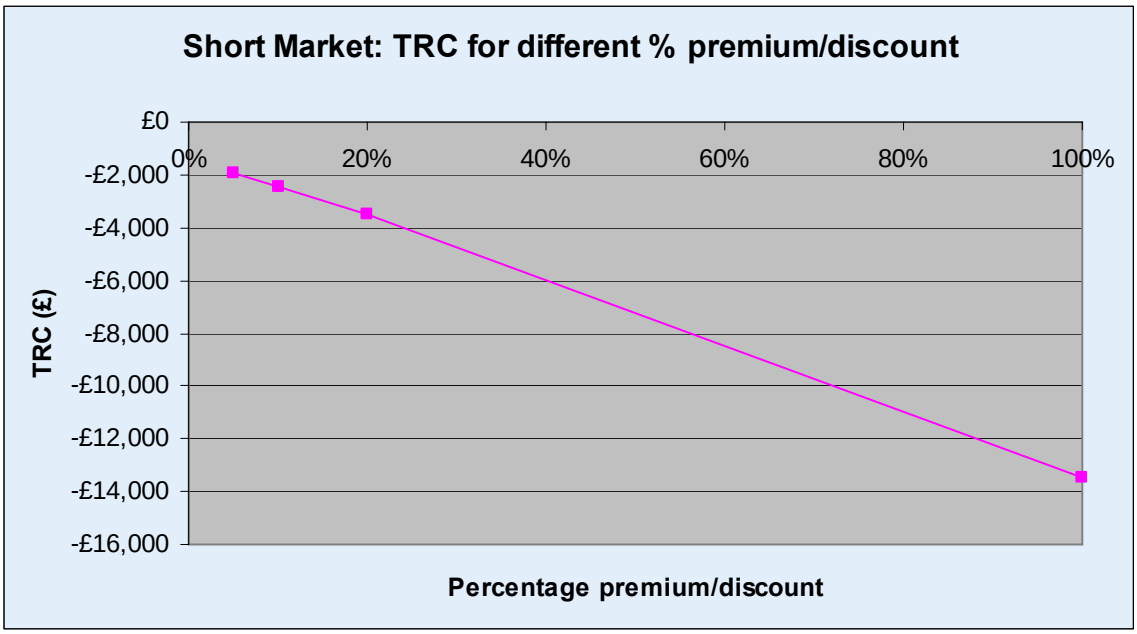
All trades that take place are between the Generator and the Large Supplier. 1st trade of 250MWh @ £30/MWh, 2nd Trade of 100MWh at different prices

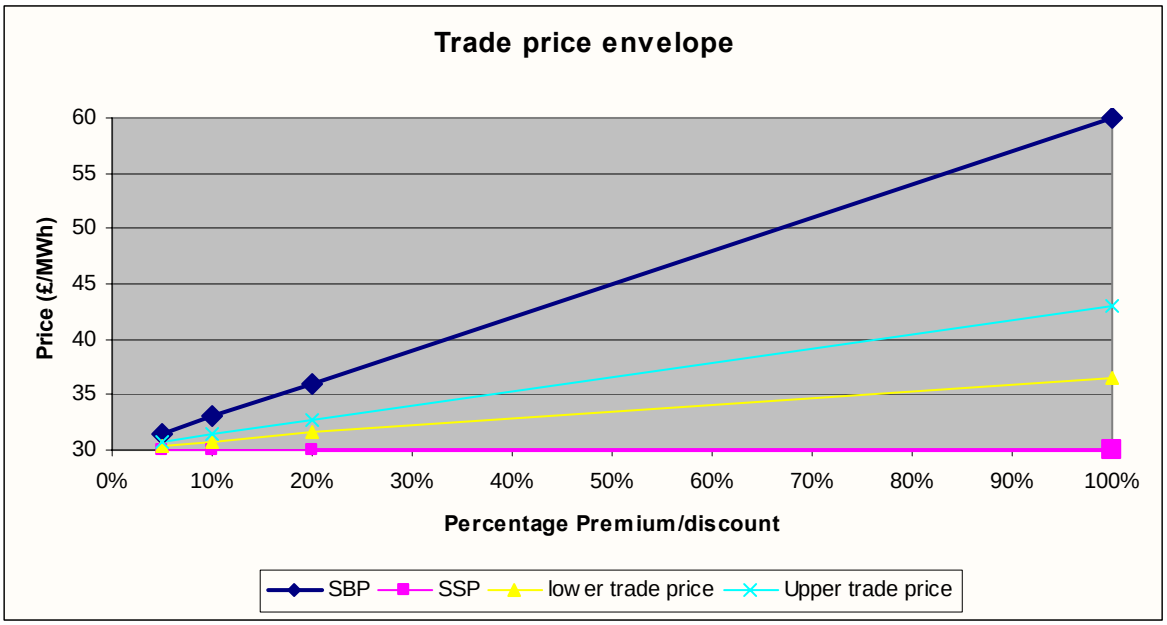
The following variations on Scenario 2 that were run are:

Scenario 2a: 5% premium/discount
Scenario 2b: 10% premium/discount
Scenario 2c: 20% premium/discount
Scenario 2d: 100% premium/discount

Summary:

- **Total System Residual Cashflow (TRC) goes more and more negative as % premium/discount increases**
- **SBP increases linearly with % premium/discount**
- **Price range in which trade will occur increases linearly with % premium/ discount**





The lower and upper trade prices are the ranges in which trades would occur for each percentage (given the construction of the model).

2a: Premium discount 5%

Initial cash flow (after 250 MW trade at £30/MWh)

Player	Trade Revenue (£)	Imbalance exposure (£)	RCRC Allocation (£)	Imbalance exposure plus RCRC	Total cash flow (1st trade)
Generator (G)	£7,500	£7,500.00	£837.91	£8,338	£15,837.91
Large Supplier (LS)	-£7,500	-£7,875.00	£733.17	-£7,142	-£14,641.83
Small Generator (SG)	-	£3,000.00	£209.48	£3,209	£3,209.48
Small Supplier 1 (SS1)	-	-£4,725.00	£267.08	-£4,458	-£4,457.92
Small Supplier 2 (SS2)	-	£0.00	£52.37	£52	£52.37

Different 2nd trade prices (2nd trade 100MWh)

- trade price range = £30.40-£30.70 (30p)
- ticks indicate where a Party is better off due to the trade between G and LS occurring than it not occurring.

Offer	No offer	£30.01	£30.40	£30.70	£31.49
SBP	31.50	31.503	31.62	31.71	31.95
SSP	30.00	30.003	30.11	30.20	30.43
G cash flow	£8,338	£8,279	£8,338 √	£8,383 √	£8,502 √
LS cash flow	-£7,142	-£7,046 √	-£7,100 √	-£7,141 √	-£7,251
SG cash flow	£3,209	£3,195	£3,207	£3,216 √	£3,240 √
SS1 cash flow	-£4,458	-£4,477	-£4,494	-£4,507	-£4,541
SS2 cash flow	£52	£49	£49	£49	£49

Net gain/loss after 2nd trade

- this table shows the net gain/loss for each party after the 2nd trade at the different trade prices

Offer	No offer	£30.01	£30.40	£30.70	£31.49
SBP	31.50	31.503	31.62	31.71	31.95
SSP	30.00	30.003	30.11	30.20	30.43
G cash flow	0	-£59	£0	£45	£164
LS cash flow	0	£96	£42	£1	-£109
SG cash flow	0	-£14	-£2	£7	£31
SS1 cash flow	0	-£19	-£36	-£49	-£83
SS2 cash flow	0	-£3	-£3	-£3	-£3

Points to note after second trade**:**

- Range of prices in which a trade will occur is reduced due to RCRC, and the level of imbalance remaining in relation to the impact the second trade has on the imbalance prices;
- Range of price in which a trade will occur is low – £0.30 which is 1/5th of the original 5% spread (£1.50);
- Incentive for non-trading Parties (SG SS1 and SS2) to discourage trading OR incentive to trade prior to the 2nd trade between G and LS as:
    - SG is only better off due to 2nd trade if G strikes a trade at a high enough price;
    - SG might be better off waiting for G to trade as the trade leads to a beneficial increase in SBP and does not reduce SG's imbalance volume;
    - SS1 is never better off due to 2nd trade (incentive to trade before SG); and
    - SS2 is worse off from the 2nd trade.

2b: Premium discount 10%

Initial cash flow (after 250 MW trade at £30/MWh)

Player	Trade Revenue (£)	Imbalance exposure (£)	RCRC Allocation (£)	Imbalance exposure plus RCRC	Total cash flow (1st trade)
Generator (G)	£7,500	£7,500.00	£1,077.31	£8,577.31	£16,077.31
Large Supplier (LS)	-£7,500	-£8,250.00	£942.64	-£7,307.36	-£14,807.36
Small Generator (SG)	-	£3,000.00	£269.33	£3,269.33	£3,269.33
Small Supplier 1 (SS1)	-	-£4,950.00	£343.39	-£4,606.61	-£4,606.61
Small Supplier 2 (SS2)	-	£0.00	£67.33	£67.33	£67.33

Different 2nd trade prices (2nd trade 100MWh)

- trade price range = £30.79-£31.40 (61p)

Offer	No offer	£30.01	£30.79	£31.40	£32.99
SBP	£33.00	£33.003	£33.25	£33.44	£33.94
SSP	£30.00	£30.003	£30.23	£30.40	£30.85
G cash flow	£8,577.31	£8,459.13	£8,577.67√	£8,670.37√	£8,912.02√
LS cash flow	-£7,307.36	-£7,113.49√	-£7,222.03√	-£7,306.92√	-£7,528.19
SG cash flow	£3,269.33	£3,239.71	£3,263.77	£3,282.59√	£3,331.65√
SS1 cash flow	-£4,606.61	-£4,645.21	-£4,679.71	-£4,706.69	-£4,777.03
SS2 cash flow	£67.33	£59.86	£60.30	£60.65	£61.55

Net gain/loss after 2nd trade

- this table shows the net gain/loss for each party after the 2nd trade at the different trade prices

Offer	No offer	£30.01	£30.79	£31.40	£32.99
SBP	£33.00	£33.003	£33.25	£33.44	£33.94
SSP	£30.00	£30.003	£30.23	£30.40	£30.85
G cash flow	0	-£118	£0	£93	£335
LS cash flow	0	£194	£85	£0	-£221
SG cash flow	0	-£30	-£6	£13	£62
SS1 cash flow	0	-£39	-£73	-£100	-£170
SS2 cash flow	0	-£7	-£7	-£7	-£6

2c: Premium discount 20%

Initial cash flow (after 250 MW trade at £30/MWh)

Player	Trade Revenue (£)	Imbalance exposure (£)	RCRC Allocation (£)	Imbalance exposure plus RCRC	Total cash flow (1st trade)
Generator (G)	£7,500	£7,500.00	£1,556.11	£9,056.11	£16,556.11
Large Supplier (LS)	-£7,500	-£9,000.00	£1,361.60	-£7,638.40	-£15,138.40
Small Generator (SG)	-	£3,000.00	£389.03	£3,389.03	£3,389.03
Small Supplier 1 (SS1)	-	-£5,400.00	£496.01	-£4,903.99	-£4,903.99
Small Supplier 2 (SS2)	-	£0.00	£97.26	£97.26	£97.26

Different 2nd trade prices (2nd trade 100MWh)

- trade price range = £31.55-£32.78 (£1.23)

Offer	No offer	£30.01	£31.55	£32.78	£35.99
SBP	£36.00	£36.003	£36.53	£36.95	£38.05
SSP	£30.00	£30.003	£30.44	£30.79	£31.71
G cash flow	£9,056.11	£8,818.26	£9,057.57√	£9,248.71√	£9,747.54√
LS cash flow	-£7,638.40	-£7,248.28√	-£7,465.59√	-£7,638.35√	-£8,089.21
SG cash flow	£3,389.03	£3,329.49	£3,378.32	£3,417.32√	£3,519.10√
SS1 cash flow	-£4,903.99	-£4,980.77	-£5,053.82	-£5,112.16	-£5,264.41
SS2 cash flow	£97.26	£82.30	£83.51	£64.47	£86.99

Net gain/loss after 2nd trade

- this table shows the net gain/loss for each party after the 2nd trade at the different trade prices

Offer	No offer	£30.01	£31.55	£32.78	£35.99
SBP	£36.00	£36.003	£36.53	£36.95	£38.05
SSP	£30.00	£30.003	£30.44	£30.79	£31.71
G cash flow	0	-£238	£1	£193	£691
LS cash flow	0	£390	£173	£0	-£451
SG cash flow	0	-£60	-£11	£28	£130
SS1 cash flow	0	-£77	-£150	-£208	-£360
SS2 cash flow	0	-£15	-£14	-£33	-£10

2d: Premium discount 100%

Initial cash flow (after 250 MW trade at £30/MWh)

Player	Trade Revenue (£)	Imbalance exposure (£)	RCRC Allocation (£)	Imbalance exposure plus RCRC	Total cash flow (1st trade)
Generator (G)	£7,500	£7,500.00	£5,386.53	£12,886.53	£20,386.53
Large Supplier (LS)	-£7,500	-£15,000.00	£4,713.22	-£10,286.78	-£17,786.78
Small Generator (SG)	-	£3,000.00	£1,346.63	£4,346.63	£4,346.63
Small Supplier 1 (SS1)	-	-£9,000.00	£1,716.96	-£7,283.04	-£7,283.04
Small Supplier 2 (SS2)	-	£0.00	£336.66	£336.66	£336.66

Different 2nd trade prices (2nd trade 100MWh)

- trade price range = £36.55-£42.94 (£6.39)

Offer	No offer	£30.01	£36.55	£42.94	£59.99
SBP	£60.00	£60.01	£63.74	£67.39	£77.14
SSP	£30.00	£30.003	£31.87	£33.70	£38.57
G cash flow	£12,886.53	£11,691.35	£12,886.59√	£14,054.41√	£17,170.42√
LS cash flow	-£10,286.78	-£8,335.67√	-£9,321.91√	-£10,285.54√	-£12,856.70
SG cash flow	£4,346.63	£4,047.77	£4,299.86	£4,546.17√	£5,203.39√
SS1 cash flow	-£7,283.04	-£7,766.32	-£8,142.71	-£8,609.16	-£9,853.74
SS2 cash flow	£336.66	£261.87	£278.18	£294.11	£336.63

Net gain/loss after 2nd trade

- this table shows the net gain/loss for each party after the 2nd trade at the different trade prices

Offer	No offer	£30.01	£36.55	£42.94	£59.99
SBP	£60.00	£60.01	£63.74	£67.39	£77.14
SSP	£30.00	£30.003	£31.87	£33.70	£38.57
G cash flow	0	-£1,195	£0	£1,168	£4,284
LS cash flow	0	£1,951	£965	£1	-£2,570
SG cash flow	0	-£299	-£47	£200	£857
SS1 cash flow	0	-£483	-£860	-£1,326	-£2,571
SS2 cash flow	0	-£75	-£58	-£43	£0

Scenario 1aa: Long market, restricted state, no RCRC and 5% premium/discount

This is based on the conditions of Scenario 1a. All trades that take place are between the Generator and the Large Supplier. 1st trade of 250MWh @ £30/MWh, 2nd Trade of 100MWh at different prices.

Summary:

- **Price trade range is £1.05, it increased by 76p with range starting at a higher price right up to £30/MWh**

1aa: Premium discount 5%

Initial cash flow (after 250 MW trade at £30/MWh)

Player	Trade Revenue (£)	Imbalance exposure (£)	RCRC Allocation (£)	Imbalance exposure plus RCRC	Total cash flow (1st trade)
Generator (G)	£7,500	£7,125	0	£7,125.00	£14,625.00
Large Supplier (LS)	-£7,500	-£7,500	0	-£7,500.00	-£15,000.00
Small Generator (SG)	-	£2,850	0	£2,850.00	£2,850.00
Small Supplier 1 (SS1)	-	-£1,500	0	-£1,500.00	-£1,500.00
Small Supplier 2 (SS2)	-	0	0	0.00	0.00

Different 2nd trade prices (2nd trade 100MWh)

- trade price range = £28.94- £29.99 (£1.05)

Offer	No offer	£28.51	£28.94	£29.99
SBP	£30.00	£29.57	£29.70	29.997
SSP	£28.50	£28.10	£28.21	28.497
G cash flow	£7,125.00	£7,065.34	£7,125.84√	£7,273.59√
LS cash flow	-£7,500.00	-£7,287.14√	-£7,348.57√	-£7,498.57√
SG cash flow	£2,850.00	£2,809.56	£2,821.23	£2,849.73
SS1 cash flow	-£1,500.00	-£1,478.71√	-£1,484.86√	-£1,499.86√
SS2 cash flow	£0.00	£0.00	£0.00	£0.00

Net gain/loss after 2nd trade

- this table shows the net gain/loss for each party after the 2nd trade at the different trade prices

Offer	No offer	£28.51	£28.94	£29.99
SBP	£30.00	£29.57	£29.70	29.997
SSP	£28.50	£28.10	£28.21	28.497
G cash flow	£0.00	-£60	£1	£149
LS cash flow	£0.00	£213	£151	£1
SG cash flow	£0.00	-£40	-£29	£0
SS1 cash flow	£0.00	£21	£15	£0
SS2 cash flow	£0.00	£0	£0	£0

Scenario 2aa: Short market, restricted state, no RCRC and 5% premium/discount

This is based on the conditions of Scenario 2a. All trades that take place are between the Generator and the Large Supplier. 1st trade of 250MWh @ £30/MWh, 2nd Trade of 100MWh at different prices

Summary:

- **Price trade range is £1.02, it increased by 72p with range starting at £30/MWh**

2aa: Premium discount 5%, no RCRC

Initial cash flow (after 250 MW trade at £30/MWh)

Player	Trade Revenue (£)	Imbalance exposure (£)	RCRC Allocation (£)	Imbalance exposure plus RCRC	Total cash flow (1st trade)
Generator (G)	£7,500	£7,500.00	0	£7,500.00	£15,000.00
Large Supplier (LS)	-£7,500	-£7,875.00	0	-£7,875.00	-£15,375.00
Small Generator (SG)	-	£3,000.00	0	£3,000.00	£3,000.00
Small Supplier 1 (SS1)	-	-£4,725.00	0	-£4,725.00	-£4,725.00
Small Supplier 2 (SS2)	-	£0.00	0	£0.00	£0.00

Different 2nd trade prices (2nd trade 100MWh)

- trade price range = £30.01- £31.03 (£1.02)

Offer	No offer	£30.01	£31.03	£31.49
SBP	31.50	31.503	£31.81	£31.95
SSP	30.00	30.003	£30.29	£30.43
G cash flow	£7,500.00	£7,501.43√	£7,647.14√	£7,712.86√
LS cash flow	-£7,875.00	-£7,726.45√	-£7,874.35√	-£7,941.05
SG cash flow	£3,000.00	£3,000.29√	£3,029.43√	£3,042.57√
SS1 cash flow	-£4,725.00	-£4,725.45	-£4,771.35	-£4,792.05
SS2 cash flow	£0.00	£0.00	£0.00	£0.00

Net gain/loss after 2nd trade

- this table shows the net gain/loss for each party after the 2nd trade at the different trade prices

Offer	No offer	£30.01	£31.03	£31.49
SBP	31.50	31.503	£31.81	£31.95
SSP	30.00	30.003	£30.29	£30.43
G cash flow	£0.00	£1	£147	£213
LS cash flow	£0.00	£149	£1	-£66
SG cash flow	£0.00	£0	£29	£43
SS1 cash flow	£0.00	£0	-£46	-£67
SS2 cash flow	£0.00	£0	£0	£0

Scenario 3: Long market, Non-restricted state: extreme prices (£500/MWh and £60/MWh)

Summary:

- **un-restricted behaviour still applies even with less extreme initial trade price of £60/MWh**
- **even after 2nd trade at £0/MWh in both scenarios, there is an incentive for some parties to try and move the price back up again ('yo-yo' affect)**

Background

The base case of the scenario is that the same physical positions, contract positions and opening imbalance positions of each party as per Scenario 1. The 5% premium/discount and RCRC reallocation is also applied.

The following variations on Scenario 3 that were run are:

- Scenario 3a: initial trade at £500/MWh between Generator and Small Generator for 100MWh, 2nd trade at £0.00/MWh for 100MWh between Large Supplier and First Small Supplier
- Scenario 3b: as per 3a but with initial trade at £60/MWh

Scenario 3a: 5% premium/discount, initial trade at £500/MWh

- initial trade at £500/MWh for 100MWh (between Generator and Small Generator)
- second trade at £0.00/MWh for 100MWh (between Large Supplier and First Small Supplier)

Initial cash flow (SBP = £500/MWh, SSP = £475/MWh)

Player	Trade Revenue (£)	Imbalance exposure (£)	RCRC Allocation (£)	Imbalance exposure plus RCRC	Total cash flow (1st trade)
Generator (G)	£50,000	£190,000	-£4,010	£185,990	£235,990
Large Supplier (LS)	-	-£250,000	-£3,509	-£253,509	-£253,509
Small Generator (SG)	-£50,000	£95,000	-£1,003	£93,997	£43,997
Small Supplier 1 (SS1)	-	-£25,000	-£1,228	-£26,228	-£26,228
Small Supplier 2 (SS2)	-	£0	-£251	-£251	-£251

Cash flow after 2nd trade (SBP = £250/MWh, SSP = £237.50/MWh)

- the revenue or cost of the first trade is not shown in this table as the value of this is assumed to have been banked/paid for
- it should be noted that for the Small Generator it is worse off after the second trade (approx £3,000), therefore it would seek to trade at another high price to maintain its revenue

Player	Trade Revenue (£)	2nd trade Imbalance exposure (£)	RCRC Allocation (£)	Position before 2nd trade	Cash flow after 2nd trade
Generator (G)	-	£95,000	-£1,754	£185,990	£93,246
Large Supplier (LS)	£0	-£150,000	-£1,535	-£253,509	-£151,535
Small Generator (SG)	-	£47,500	-£439	£93,997	£47,061
Small Supplier 1 (SS1)	£0	£11,875	-£537	-£26,228	£11,338
Small Supplier 2 (SS2)	-	£0	-£110	-£251	-£110

Scenario 3b: 5% premium/discount, initial trade at £60/MWh

- initial trade at £60/MWh for 100MWh (between Generator and Small Generator)
- second trade at £0.00/MWh for 100MWh (between Large Supplier and First Small Supplier)

Initial cash flow (SBP = £60/MWh, SSP = £57/MWh)

Player	Trade Revenue (£)	Imbalance exposure (£)	RCRC Allocation (£)	Imbalance exposure plus RCRC	Total cash flow (1st trade)
Generator (G)	£6,000	£22,800	-£481	£22,319	£28,319
Large Supplier (LS)	-	-£30,000	-£421	-£30,421	-£30,421
Small Generator (SG)	-£6,000	£11,400	-£120	£11,280	£5,280
Small Supplier 1 (SS1)	-	-£3,000	-£147	-£3,147	-£3,147
Small Supplier 2 (SS2)	-	£0	-£30	-£30	-£30

Cash flow after 2nd trade (SBP = £30/MWh, SSP = £28.50/MWh)

- the revenue or cost of the first trade is not shown in this table as the value of this is assumed to have been banked/paid for
- it should be noted that for the Small Generator it is worse off after the second trade (approx £400), therefore it would seek to trade at another high price to maintain its revenue

Player	Trade Revenue (£)	2nd trade Imbalance exposure (£)	RCRC Allocation (£)	Position before 2nd trade	Cash flow after 2nd trade
Generator (G)	-	£11,400	-£211	£22,319	£11,189
Large Supplier (LS)	£0	-£18,000	-£184	-£30,421	-£18,184
Small Generator (SG)	-	£5,700	-£53	£11,280	£5,647
Small Supplier 1 (SS1)	£0	£1,425	-£64	-£3,147	£1,361
Small Supplier 2 (SS2)	-	£0	-£13	-£30	-£13

Scenario 4: Long market, restricted state, 5% premium/discount and different trade sizes

Summary:

- **Both price and volume of 1st trade is a significant consideration for Parties wishing to trade**
- **There are competitive forces with regards to setting the 1st price and volume between the Generator and Large Supplier**
- **In a long market the long party wants the 1st trade to be of a higher volume (as the trade price will be better than the imbalance price). The short party prefers smaller volumes (as the imbalance price will be better than the trade price).**
- **Price trade range increased by 8p**
- **Trade price increased**
- **More weighting to 1st price**

Background

The base case of the scenario is that the same physical positions, contract positions and opening imbalance positions of each party as per Scenario 1. The 5% premium/discount and RCRC reallocation is also applied.

The following variations on Scenario 4 that were run are:

- Scenario 4a: initial trade at £30/MWh between Generator and Large Supplier for 400MWh, 2nd trade at different prices for 50MWh between Generator and Large Supplier
- Scenario 4b: as per 4a but with initial trade for 50MWh and 2nd trade for 400MWh

4a: Premium/discount 5%, large 1st trade

- 1st trade 400MWh @ £30/MWh
- 2nd trade 50MWh @ various prices

Initial cash flow (after 400 MWh trade at £30/MWh)

Player	Trade Revenue (£)	Imbalance exposure (£)	RCRC Allocation (£)	Imbalance exposure plus RCRC	Total cash flow (1st trade)
Generator (G)	£12,000	£2,850.00	-£481.20	£2,368.80	£14,368.80
Large Supplier (LS)	-£12,000	-£3,000.00	-£421.05	-£3,421.05	-£15,421.05
Small Generator (SG)	-	£2,850.00	-£120.30	£2,729.70	£2,729.70
Small Supplier 1 (SS1)	-	-£1,500.00	-£147.37	-£1,647.37	-£1,647.37
Small Supplier 2 (SS2)	-	£0.00	-£30.08	-£30.08	-£30.08

Different 2nd trade prices (2nd trade 50MWh)

- trade price range = £29.16-£29.53 (37p). Increase over scenario 1a by 8p
- the revenue or cost of the first trade is not shown in this table as the value of this is assumed to have been banked/paid for. This table compares the cash flows for the various parties to show what price it is beneficial for the Generator and Large Supplier to trade (e.g. compares 'Imbalance exposure plus RCRC' column above)

Offer	No offer	£28.51	£29.16	£29.53	£29.99
SBP	£30.00	£29.83	£29.91	£29.95	£29.999
SSP	£28.50	£28.34	£28.41	£28.45	£28.499
G cash flow	£2,368.80	£2,334.18	£2,368.88√	£2,388.63√	£2,413.19√
LS cash flow	-£3,421.05	-£3,362.12	-£3,399.31√	-£3,420.48√	-£3,446.80
SG cash flow	£2,729.70	£2,707.16	£2,713.71	£2,717.44	£2,722.08
SS1 cash flow	-£1,647.37	-£1,647.44	-£1,651.43	-£1,653.70	-£1,656.52
SS2 cash flow	-£30.08	-£31.78	-£31.86	-£31.90	-£31.95

Net gain/loss after 2nd trade

- this table shows the net gain/loss for each party after the 2nd trade at the different trade prices

Offer	No offer	£28.51	£29.16	£29.53	£29.99
SBP	£30.00	£29.83	£29.91	£29.95	£29.999
SSP	£28.50	£28.34	£28.41	£28.45	£28.499
G cash flow	0	-£35	£0	£20	£44
LS cash flow	0	£59	£22	£1	-£26
SG cash flow	0	-£23	-£16	-£12	-£8
SS1 cash flow	0	£0	-£4	-£6	-£9
SS2 cash flow	0	-£2	-£2	-£2	-£2

4b: Premium/discount 5%, large 2nd trade

- 1st trade 50MWh @£30/MWh
- 2nd trade 400MWh @ various prices

Initial cash flow (after 50 MWh trade at £30/MWh)

Player	Trade Revenue (£)	Imbalance exposure (£)	RCRC Allocation (£)	Imbalance exposure plus RCRC	Total cash flow (1st trade)
Generator (G)	£1,500	£12,850.00	-£270.68	£12,554.32	£14,054.32
Large Supplier (LS)	-£1,500	-£13,500.00	-£236.84	-£13,736.84	-£15,236.84
Small Generator (SG)	-	£2,850.00	-£67.67	£2,782.33	£2,782.33
Small Supplier 1 (SS1)	-	-£1,500.00	-£82.89	-£1,582.89	-£1,582.89
Small Supplier 2 (SS2)	-	£0.00	-£16.92	-£16.92	-£16.92

Different 2nd trade prices (2nd trade 50MWh)

- trade price range = £29.16-£29.53 (37p). Same range as scenario 4a (Increase over scenario 1a by 8p)

Offer	No offer	£28.51	£29.16	£29.53	£29.99
SBP	£30.00	£28.68	£29.25	£29.58	£29.991
SSP	£28.50	£27.24	£27.79	£28.10	£28.492
G cash flow	£12,554.32	£12,277.38	£12,554.98√	£12,713.00√	£12,909.45√
LS cash flow	-£13,736.84	-£13,265.40√	-£13,562.90√	-£13,732.25√	-£13,942.79
SG cash flow	£2,782.33	£2,602.00	£2,654.43	£2,684.27	£2,721.37
SS1 cash flow	-£1,582.89	-£1,583.44	-£1,615.35	-£1,633.51	-£1,656.09
SS2 cash flow	-£16.92	-£30.54	-£31.16	-£31.51	-£31.95

Net gain/loss after 2nd trade

- this table shows the net gain/loss for each party after the 2nd trade at the different trade prices

Offer	No offer	£28.51	£29.16	£29.53	£29.99
SBP	£30.00	£28.68	£29.25	£29.58	£29.991
SSP	£28.50	£27.24	£27.79	£28.10	£28.492
G cash flow	0	-£277	£1	£159	£355
LS cash flow	0	£471	£174	£5	-£206
SG cash flow	0	-£180	-£128	-£98	-£61
SS1 cash flow	0	-£1	-£32	-£51	-£73
SS2 cash flow	0	-£14	-£14	-£15	-£15

Scenario 5: Short market, restricted state, 5% premium/discount, different trade sizes

Summary:

- **Both price and volume of 1st trade is a significant consideration for Parties wishing to trade**
- **There are competitive forces with regards to setting the 1st price and volume between the Generator and Large Supplier**
- **In a short market the short party wants the 1st trade to be of a higher volume (as the trade price will be better than the imbalance price). The long party prefers smaller volumes.**
- **Equilibrium range increased by 9p**
- **Equilibrium price increased**
- **More weighting to 1st trade price**

Background

The base case of the scenario is that the same physical positions, contract positions and opening imbalance positions of each party as per Scenario 2. The 5% premium/discount and RCRC reallocation is also applied.

The following variations on Scenario 5 that were run are:

- Scenario 5a: initial trade at £30/MWh between Generator and Large Supplier for 400MWh, 2nd trade at different prices for 50MWh between Generator and Large Supplier
- Scenario 5b: as per 5a but with initial trade for 50MWh and 2nd trade for 400MWh

5a: Premium discount 5%, large 1st trade

- 1st trade 400MWh @ £30/MWh
- 2nd trade 50MWh @ various prices

Initial cash flow (after 400 MWh trade at £30/MWh)

Player	Trade Revenue (£)	Imbalance exposure (£)	RCRC Allocation (£)	Imbalance exposure plus RCRC	Total cash flow (1st trade)
Generator (G)	£12,000	£3,000.00	£748.13	£3,748.13	£15,748.13
Large Supplier (LS)	-£12,000	-£3,150.00	£654.61	-£2,495.39	-£14,495.39
Small Generator (SG)	-	£3,000.00	£187.03	£3,187.03	£3,187.03
Small Supplier 1 (SS1)	-	-£4,725.00	£238.47	-£4,486.53	-£4,486.53
Small Supplier 2 (SS2)	-	£0.00	£46.76	£46.76	£46.76

Different 2nd trade prices (2nd trade 50MWh)

- trade price range = £30.52-£30.91 (39p). Increase over scenario 2a by 9p
- the revenue or cost of the first trade is not shown in this table as the value of this is assumed to have been banked/paid for. This table compares the cash flows for the various parties to show what price it is beneficial for the Generator and Large Supplier to trade (e.g. compares 'Imbalance exposure plus RCRC' column above)

Offer	No offer	£30.01	£30.52	£30.91	£31.49
SBP	31.50	31.501	£31.56	£31.61	£31.67
SSP	30.00	30.001	£30.06	£30.10	£30.17
G cash flow	£3,748.13	£3,718.79	£3,748.48√	£3,771.18√	£3,804.95√
LS cash flow	-£2,495.39	-£2,447.11	-£2,474.39√	-£2,495.26√	-£2,526.29
SG cash flow	£3,187.03	£3,179.67	£3,185.67	£3,190.27√	£3,197.10√
SS1 cash flow	-£4,486.53	-£4,496.24	-£4,504.73	-£4,511.23	-£4,520.88
SS2 cash flow	£46.76	£44.89	£44.97	£45.04	£45.14

Net gain/loss after 2nd trade

- this table shows the net gain/loss for each party after the 2nd trade at the different trade prices

Offer	No offer	£30.01	£30.52	£30.91	£31.49
SBP	31.50	31.501	£31.56	£31.61	£31.67
SSP	30.00	30.001	£30.06	£30.10	£30.17
G cash flow	0	-£29	£0	£23	£57
LS cash flow	0	£48	£21	£0	-£31
SG cash flow	0	-£7	-£1	£3	£10
SS1 cash flow	0	-£10	-£18	-£25	-£34
SS2 cash flow	0	-£2	-£2	-£2	-£2

5b: Premium/discount 5%, large 2nd trade

- 1st trade 50MWh @ £30/MWh
- 2nd trade 400MWh @ various prices

Initial cash flow (after 50 MWh trade at £30/MWh)

Player	Trade Revenue (£)	Imbalance exposure (£)	RCRC Allocation (£)	Imbalance exposure plus RCRC	Total cash flow (1st trade)
Generator (G)	£1,500	£13,500.00	£957.61	£14,457.61	£15,957.61
Large Supplier (LS)	-£1,500	-£14,175.00	£837.91	-£13,337.09	-£14,837.09
Small Generator (SG)	-	£3,000.00	£239.40	£3,239.40	£3,239.40
Small Supplier 1 (SS1)	-	-£4,725.00	£305.24	-£4,419.79	-£4,419.76
Small Supplier 2 (SS2)	-	£0.00	-£59.85	£59.85	-£59.85

Different 2nd trade prices (2nd trade 50MWh)

- trade price range = £30.52-£30.91 (39p). Same range as scenario 4a (Increase over scenario 2a by 9p)

Offer	No offer	£30.01	£30.52	£30.91	£31.49
SBP	£31.50	£31.51	£31.99	£32.35	£32.89
SSP	£30.00	£30.01	£30.46	£30.81	£31.32
G cash flow	£14,457.61	£14,222.86	£14,460.38√	£14,642.01√	£14,912.13√
LS cash flow	-£13,337.09	-£12,950.85	-£13,169.16√	-£13,336.09√	-£13,584.36
SG cash flow	£3,239.40	£3,180.49	£3,228.54	£3,265.28√	£3,319.92√
SS1 cash flow	-£4,419.79	-£4,497.40	-£4,565.35	-£4,617.30	-£4,694.57
SS2 cash flow	£59.85	£44.90	£45.58	£46.10	£46.87

Net gain/loss after 2nd trade

- this table shows the net gain/loss for each party after the 2nd trade at the different trade prices

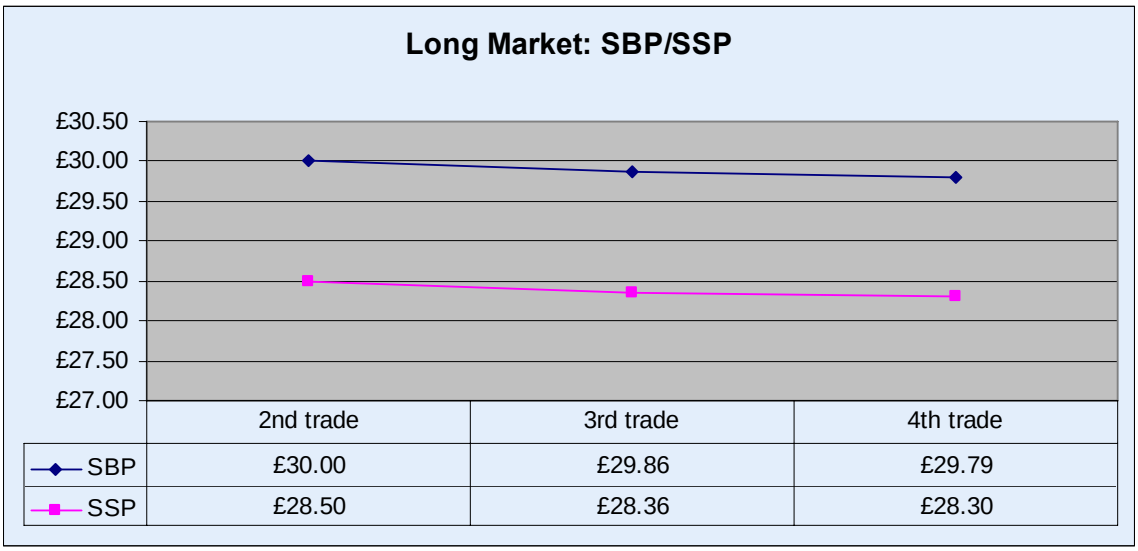
Offer	No offer	£30.01	£30.52	£30.91	£31.49
SBP	£31.50	£31.51	£31.99	£32.35	£32.89
SSP	£30.00	£30.01	£30.46	£30.81	£31.32
G cash flow	0	-£235	£3	£184	£455
LS cash flow	0	£386	£168	£1	-£247
SG cash flow	0	-£59	-£11	£26	£81
SS1 cash flow	0	-£78	-£146	-£198	-£275
SS2 cash flow	0	-£15	-£14	-£14	-£13

Scenario 6: Long market, restricted state, 5% premium/discount, 3rd and 4th Trades, all between Generator and Large Supplier

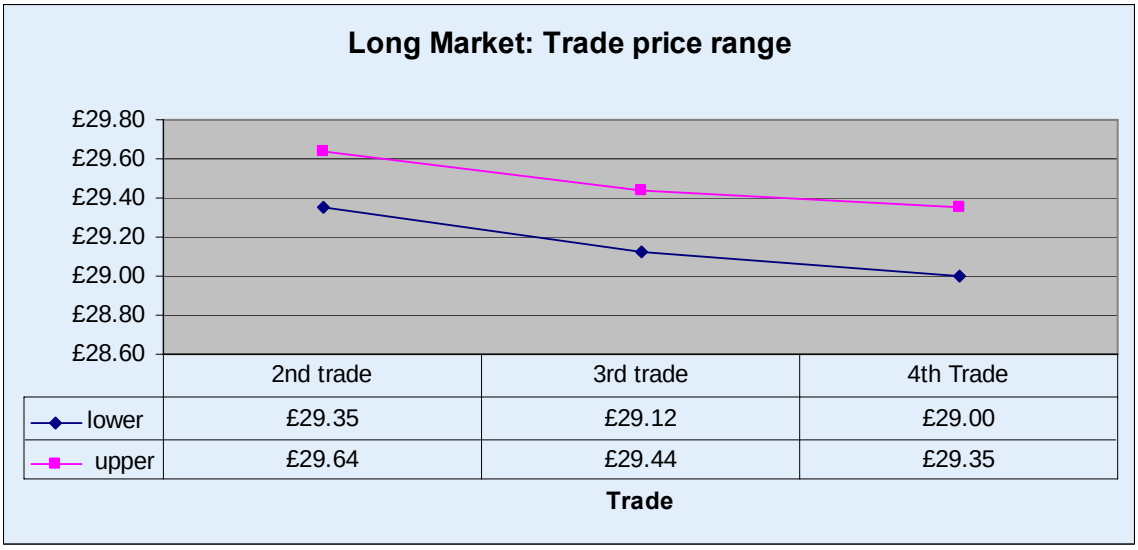
This is based on the conditions of Scenario 1a. All trades that take place are between the Generator and the Large Supplier. 1st trade of 250MWh @ £30/MWh, 2nd Trade of 100MWh at different prices.

Summary:

- **imbalance prices reduce as further trades are made**
- **trade price range slightly increases (but depends on price and volume of trades made)**



	2nd trade	3rd trade	4th trade
SBP	£30.00	£29.86	£29.79
SSP	£28.50	£28.36	£28.30



	2nd trade	3rd trade	4th Trade
lower	£29.35	£29.12	£29.00
upper	£29.64	£29.44	£29.35

Trade

6a: Middle priced trades between Generator and Large Supplier

This is where the prices of the 2nd and 3rd trade are priced in the middle of the trade price range.

- 1st trade 250MWh @ £30.00/MWh
- 2nd trade 100MWh @ £29.50/MWh
- 3rd trade 50MWh @ £29.28/MWh
- 4th trade 25MWh @ different prices

Initial cash flow of 1st Trade of 250MWh at £30/MWh

Player	Trade Revenue (£)	Imbalance exposure (£)	RCRC Allocation (£)	Imbalance exposure plus RCRC	Total cash flow (1st trade)
Generator (G)	£7,500	£7,125	-£391	£6,734	£14,234
Large Supplier (LS)	-£7,500	-£7,500	-£342	-£7,842	-£15,342
Small Generator (SG)	-	£2,850	-£98	£2,752	£2,752
Small Supplier 1 (SS1)	-	-£1,500	-£120	-£1,620	-£1,620
Small Supplier 2 (SS2)	-	0	-£24	-£24	£24

2nd trade of 100MWh, different 2nd trade prices

- trade price range = £29.35-£29.64 (29p)
- the revenue or cost of the first trade is not shown in this table as the value of this is assumed to have been banked/paid for. This table compares the cash flows for the various parties to show what price it is beneficial for the Generator and Large Supplier to trade (e.g. compares 'Imbalance exposure plus RCRC' column above)

Offer	No offer	£28.51	£29.35	£29.64	£29.99
SBP	30.00	29.57	29.81	29.9	29.997
SSP	28.50	28.10	28.32	28.40	28.497
G cash flow	£6,734	£6,621	£6,735 √	£6,775 √	£6,823 √
LS cash flow	-£7,842	-£7,676 √	-£7,799 √	-£7,841 √	-£7,893
SG cash flow	£2,752	£2,698	£2,720	£2,728	£2,736
SS1 cash flow	-£1,620	-£1,615 √	-£1,628	-£1,633	-£1,638
SS2 cash flow	-£24	-£28	-£28	-£28	-£28

Net gain/loss after 2nd trade

- this table shows the net gain/loss for each party after the 2nd trade at the different trade prices

Offer	No offer	£28.51	£29.35	£29.64	£29.99
SBP	30.00	29.57	29.81	29.9	29.997
SSP	28.50	28.10	28.32	28.40	28.497
G cash flow	0	-£113	£1	£41	£89
LS cash flow	0	£166	£43	£1	-£51
SG cash flow	0	-£54	-£32	-£24	-£16
SS1 cash flow	0	£5	-£8	-£13	-£18
SS2 cash flow	0	-£4	-£4	-£4	-£4

3rd trade of 50MWh (2nd trade of £100MWh at middle of equilibrium range £29.50)

- Different 3rd trade prices
- trade price range = £29.12-£29.44 (32p).

Offer	No offer	£28.37	£29.12	£29.44	£29.85
SBP	£29.86	£29.67	£29.77	£29.81	29.856
SSP	£28.36	£28.19	£28.28	£28.31	28.363
G cash flow	£3,805.66	£3,761.34	£3,806.24√	£3,825.40√	£3,849.95√

LS cash flow	-£4,871.43	-£4,802.06√	-£4,850.25√	-£4,870.82√	-£4,897.16
SG cash flow	£2,724.18	£2,699.79√	£2,708.32√	£2,711.96√	£2,716.62√
SS1 cash flow	-£1,630.36	-£1,629.32√	-£1,634.46	-£1,636.66	-£1,639.47
SS2 cash flow	-£28.06	-£29.75	-£29.84	-£29.88	-£29.93

Net gain/loss after 3rd trade

- this table shows the net gain/loss for each party after the 3rd trade at the different trade prices

Offer	**No offer**	**£28.37**	**£29.12**	**£29.44**	**£29.85**
SBP	£29.86	£29.67	£29.77	£29.81	29.856
SSP	£28.36	£28.19	£28.28	£28.31	28.363
G cash flow	0	-£44	£1	£20	£44
LS cash flow	0	£69	£21	£1	-£26
SG cash flow	0	-£24	-£16	-£12	-£8
SS1 cash flow	0	£1	-£4	-£6	-£9
SS2 cash flow	0	-£2	-£2	-£2	-£2

4th trade of 25MWh (3rd trade of £50MWh at middle of equilibrium range £29.28)

- Different 4th trade prices
- trade price range = £29.00-£29.35 (35p)

Offer	**No offer**	**£28.31**	**£29.00**	**£29.35**	**£29.78**
SBP	£29.79	£29.70	£29.74	£29.76	£29.785
SSP	£28.30	£28.21	£28.25	£28.27	£28.296
G cash flow	£2,351.82	£2,332.50	£2,351.97√	£2,361.85√	£2,373.98√
LS cash flow	-£3,396.54	-£3,364.96√	-£3,385.84√	-£3,396.43√	-£3,409.45
SG cash flow	£2,710.14	£2,698.52√	£2,702.21√	£2,704.08√	£2,706.38√
SS1 cash flow	-£1,635.56	-£1,635.36√	-£1,637.59	-£1,638.73	-£1,640.12
SS2 cash flow	-£29.86	-£30.70	-£30.75	-£30.77	-£30.79

Net gain/loss after 4th trade

- this table shows the net gain/loss for each party after the 4th trade at the different trade prices

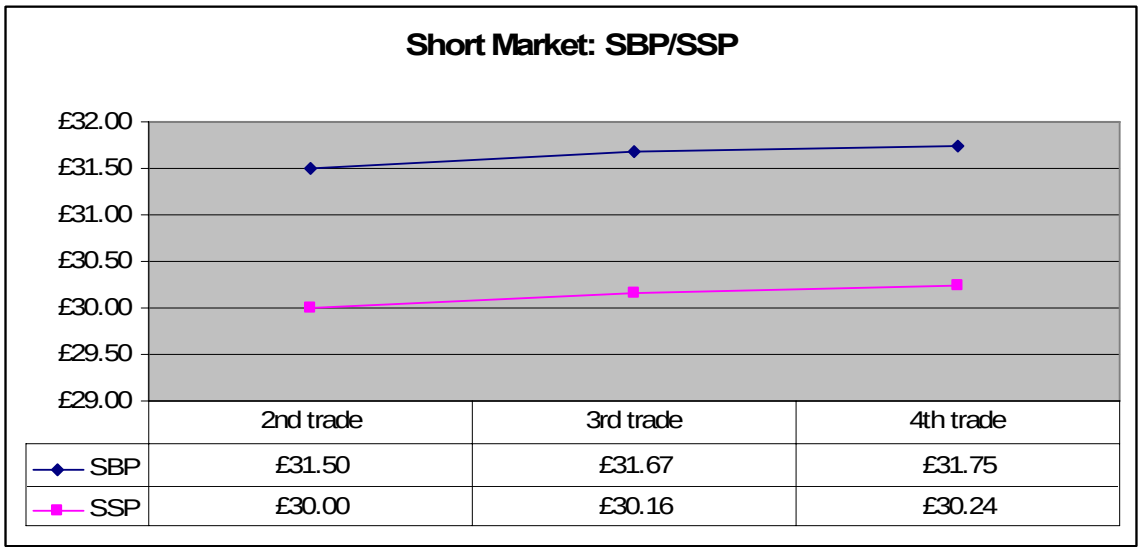
Offer	**No offer**	**£28.31**	**£29.00**	**£29.35**	**£29.78**
SBP	£29.79	£29.70	£29.74	£29.76	£29.785
SSP	£28.30	£28.21	£28.25	£28.27	£28.296
G cash flow	0	-£19	£0	£10	£22
LS cash flow	0	£32	£11	£0	-£13
SG cash flow	0	-£12	-£8	-£6	-£4
SS1 cash flow	0	£0	-£2	-£3	-£5
SS2 cash flow	0	-£1	-£1	-£1	-£1

Scenario 7: Short market, restricted state, 5% premium/discount, 3rd and 4th Trades all between Generator and Large Supplier

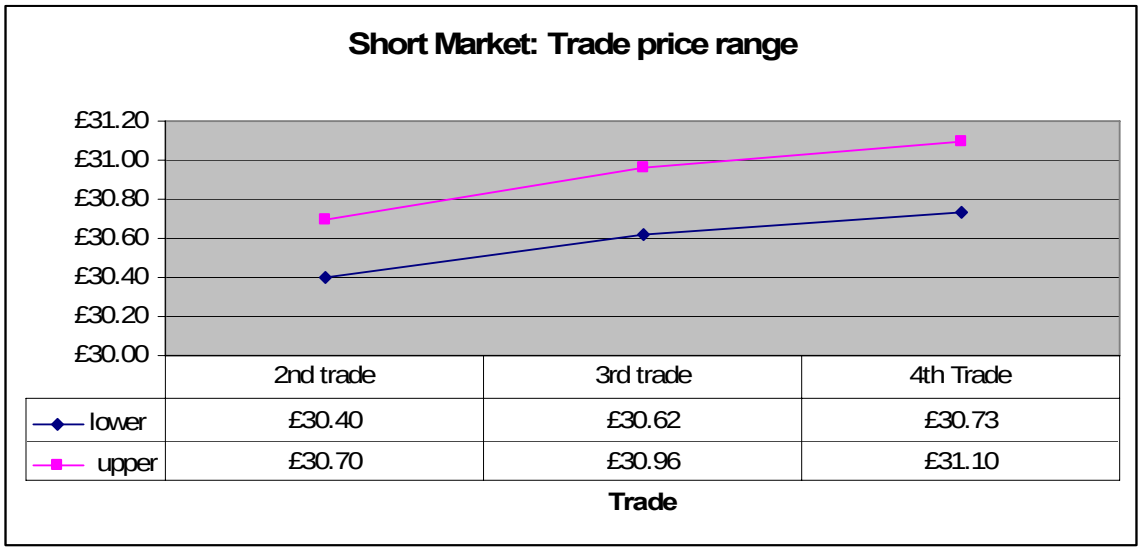
This is based on the conditions of Scenario 2a. All trades that take place are between the Generator and the Large Supplier. 1st trade of 250MWh @ £30/MWh, 2nd Trade of 100MWh at different prices.

Summary:

- **imbalance prices increase as further trades are made**
- **trade price range slightly increases (depends on price and volume of trades made)**



	2nd trade	3rd trade	4th trade
SBP	£31.50	£31.67	£31.75
SSP	£30.00	£30.16	£30.24



	2nd trade	3rd trade	4th Trade
lower	£30.40	£30.62	£30.73
upper	£30.70	£30.96	£31.10

Trade

7a: Middle priced trades between Generator and Large Supplier

- 1st trade 250MWh @ £30.00/MWh
- 2nd trade 100MWh @ £30.55/MWh
- 3rd trade 50MWh @ £30.79/MWh
- 4th trade 25MWh @ different prices

Initial cash flow of 1st Trade of 250MWh at £30/MWh

Player	Trade Revenue (£)	Imbalance exposure (£)	RCRC Allocation (£)	Imbalance exposure plus RCRC	Total cash flow (1st trade)
Generator (G)	£7,500	£7,500.00	£837.91	£8,338	£15,837.91
Large Supplier (LS)	-£7,500	-£7,875.00	£733.17	-£7,142	-£14,641.83
Small Generator (SG)	-	£3,000.00	£209.48	£3,209	£3,209.48
Small Supplier 1 (SS1)	-	-£4,725.00	£267.08	-£4,458	-£4,457.92
Small Supplier 2 (SS2)	-	£0.00	£52.37	£52	£52.37

2nd trade of 100MWh, different 2nd trade prices

- trade price range = £30.40-£30.70 (30p)
- the revenue or cost of the first trade is not shown in this table as the value of this is assumed to have been banked/paid for. This table compares the cash flows for the various parties to show what price it is beneficial for the Generator and Large Supplier to trade (e.g. compares 'Imbalance exposure plus RCRC' column above)

Offer	No offer	£30.01	£30.40	£30.70	£31.49
SBP	31.50	31.503	31.62	31.71	31.95
SSP	30.00	30.003	30.11	30.20	30.43
G cash flow	£8,338	£8,279	£8,338 √	£8,383 √	£8,502 √
LS cash flow	-£7,142	-£7,046 √	-£7,100 √	-£7,141 √	-£7,251
SG cash flow	£3,209	£3,195	£3,207	£3,216 √	£3,240 √
SS1 cash flow	-£4,458	-£4,477	-£4,494	-£4,507	£4,541
SS2 cash flow	£52	£49	£49	£49	£49

Net gain/loss after 2nd trade

- this table shows the net gain/loss for each party after the 2nd trade at the different trade prices

Offer	No offer	£30.01	£30.40	£30.70	£31.49
SBP	31.50	31.503	31.62	31.71	31.95
SSP	30.00	30.003	30.11	30.20	30.43
G cash flow	0	-£59	£0	£45	£164
LS cash flow	0	£96	£42	£1	-£109
SG cash flow	0	-£14	-£2	£7	£31
SS1 cash flow	0	-£19	-£36	-£49	-£83
SS2 cash flow	0	-£3	-£3	-£3	-£3

3rd trade of 50MWh (2nd trade of £100MWh at middle of equilibrium range £30.55)

- Different 3rd trade prices
- trade price range = £30.62-£30.96 (34p)

Offer	No offer	£30.17	£30.62	£30.96	£31.66
SBP	£31.67	£31.667	£31.73	£31.77	£31.86
SSP	£30.16	£30.159	£30.22	£30.26	£30.35
G cash flow	£5,305.70	£5,276.46	£5,305.99√	£5,328.30√	£5,374.23√
LS cash flow	-£4,065.39	-£4,017.09√	-£4,044.27√	-£4,064.81√	-£4,107.08
SG cash flow	£3,211.25	£3,203.90√	£3,209.87√	£3,214.39	£3,223.68
SS1 cash flow	-£4,500.45	-£4,510.27	-£4,518.69	-£4,525.04	-£4,538.13
SS2 cash flow	£48.88	£47.01	£47.09	£47.16	£47.30

Net gain/loss after 3rd trade

- this table shows the net gain/loss for each party after the 3rd trade at the different trade prices

Offer	No offer	£30.17	£30.62	£30.96	£31.66
SBP	£31.67	£31.667	£31.73	£31.77	£31.86
SSP	£30.16	£30.159	£30.22	£30.26	£30.35
G cash flow	0	-£29	£0	£23	£69
LS cash flow	0	£48	£21	£1	-£42
SG cash flow	0	-£7	-£1	£3	£12
SS1 cash flow	0	-£10	-£18	-£25	-£38
SS2 cash flow	0	-£2	-£2	-£2	-£2

4th trade of 25MWh (3rd trade of £50MWh at middle of equilibrium range £30.79)

- Different 3rd trade prices
- trade price range = £30.73-£31.10 (37p)

Offer	No offer	£30.25	£30.73	£31.10	£31.74
SBP	£31.75	£31.749	£31.78	£31.80	£31.84
SSP	£30.24	£30.237	£30.27	£30.29	£30.32
G cash flow	£3,777.65	£3,762.99	£3,777.80√	£3,789.21√	£3,808.96√
LS cash flow	-£2,515.04	-£2,490.83√	-£2,504.45√	-£2,514.95√	-£2,533.11
SG cash flow	£3,212.13	£3,208.45√	£3,211.44	£3,213.75	£3,217.75
SS1 cash flow	-£4,521.87	-£4,526.79	-£4,531.02	-£4,534.28	-£4,539.91
SS2 cash flow	£47.13	£46.19	£46.23	£46.26	£46.32

Net gain/loss after 4th trade

- this table shows the net gain/loss for each party after the 4th trade at the different trade prices

Offer	No offer	£30.25	£30.73	£31.10	£31.74
SBP	£31.75	£31.749	£31.78	£31.80	£31.84
SSP	£30.24	£30.237	£30.27	£30.29	£30.32
G cash flow	0	-£15	£0	£12	£31
LS cash flow	0	£24	£11	£0	-£18
SG cash flow	0	-£4	-£1	£2	£6
SS1 cash flow	0	-£5	-£9	-£12	-£18
SS2 cash flow	0	-£1	-£1	-£1	-£1