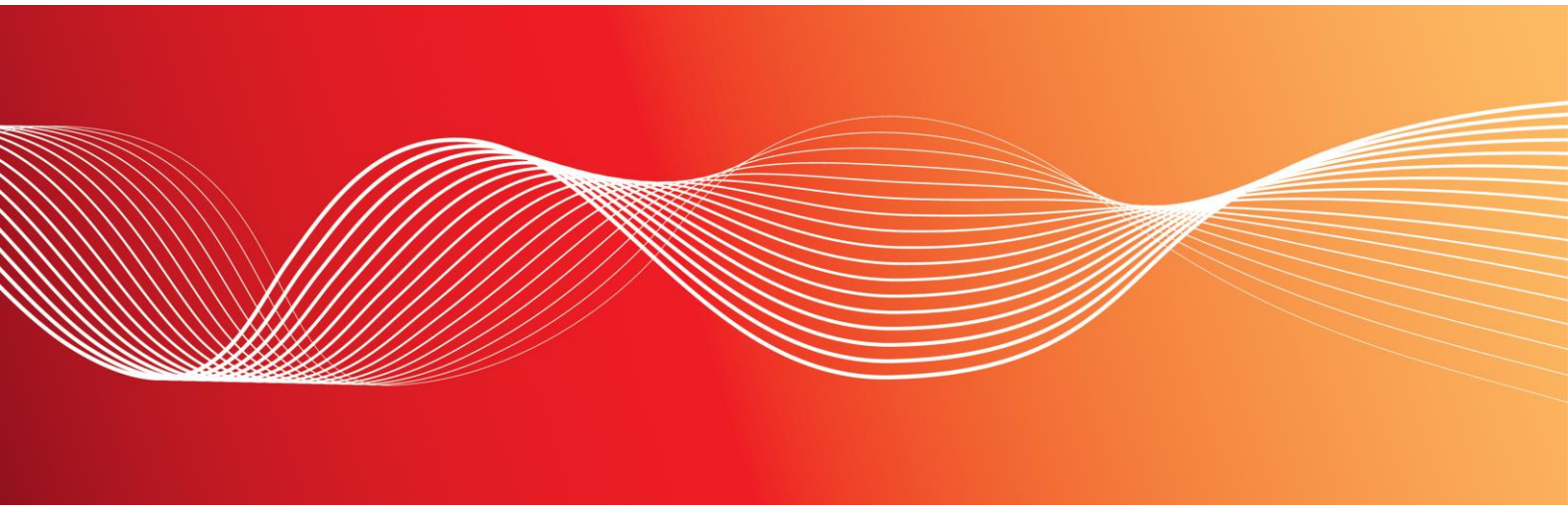
END TO END EXAMPLE

MARCH 2014



AEMO
AUSTRALIAN ENERGY MARKET OPERATOR

Version: Final 1.0
Reference:

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Notes

Documents made obsolete

The release of this document changes only the version of End to End Example.

Further Information

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Figures

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Tables

Abbreviations and Symbols

These abbreviations, symbols, and special terms assist the reader's understanding of the terms used in this document. For definitions of these terms, the reader should always refer to the applicable market Rules.

Abbreviation	Abbreviation explanation
AEMC	Australian Energy Market Commission
AEMO	Australian Energy Market Operator
AER	Australian Energy Regulator
DWGM	Declared Wholesale Gas Market
ETS	Exchange Trading System
NEM	National Electricity Market
NGL	National Gas Law
NGR	National Gas Rules
QGP	Queensland Gas Pipeline
RBP	Roma Brisbane Pipeline
STTM	Short Term Trading Market
SWQP	South West Queensland Pipeline

1 Introduction

1.1 Purpose

The purpose of this document is to guide participants through the processes and calculations that support the operation of the Gas Supply Hub from the submission of orders through to the settlement of transactions.

1.2 Approach

This guide presents a fictional set of participants and transactions onto which an end-to-end example has been formulated. A broad range of transactions and calculations for all participants underpins the worked example. However, to assist with comprehension of the of the example only data for *Participant One* is presented in this document.

The example presented in the guide includes the following functions:

- Netting of gas delivery obligations
- Settlement of Physical Gas Transactions
- Exposure associated with Physical Gas Transactions

Where practicable the guide presents the inputs to a calculation, the equation and the calculated results.

This guide does not describe the rules and procedures under which the supply hub operates and assumes that the reader is familiar with the terms and concepts on which the supply hub is based.

1.3 Participants

The end-to-end example considers a small set of fictional gas market participants to illustrate a range of potential transactions.

Table 1:Participant List

Participant	Description
One	Energy Retailer
Two	Energy Retailer

Participant	Description
Three	End User
Four	Producer
Five	Producer
Six	Gas Powered Generator

1.4 Transactions

1.4.1 Trading Products

The Trading Products included in this example include:

- *Trading Locations:* RBP and SWQP
- *Delivery Periods:* Balance-of-day, Day-ahead, Daily and Weekly

1.4.2 Sample Transactions

The order quantity for a Balance-of-day Trading Product is quoted in GJ per hour. As shown in Table 2, the Transaction Quantity is the product of the Order Quantity and the number of hours in the transaction's delivery period.

Participant One is the buyer of Transaction #20…

Table 2: Balance-Of-Day Transactions

Ref	Order Quantity (GJ/hr)	Transaction Time	Hours in Transaction	Transaction Quantity (GJ/day)
20	100	21/05/2013 10:15	20	2,000
21	500	21/05/2013 15:45	15	7,500
22	200	21/05/2013 16:50	14	2,800

1.4.3 Transaction List – RBP

NOTE: For the complete transaction list see Appendix A.

Table 3: Participant One RBP Transaction List

Ref	Buyer	Seller	Price	Qty	Delivery Point	From	To	Product Group	Product Type	Transaction Type	Transaction Time
1	1	5	7.00	4,000	Run 4	21/05/2013	27/05/2013	RBP	Week	Pre-matched	17/05/2013 10:00
3	2	1	4.95	5,000	Run 4	20/05/2013	20/05/2013	RBP	Day	Auto-matched	17/05/2013 12:00
9	1	3	7.50	2,000	Run 3	21/05/2013	27/05/2013	RBP	Week	Auto-matched	18/05/2013 15:00
10	1	2	5.40	6,000	Run 3	21/05/2013	21/05/2013	RBP	Day	Auto-matched	18/05/2013 16:00
11	4	1	7.75	4,000	Run 3	21/05/2013	27/05/2013	RBP	Week	Auto-matched	19/05/2013 10:00
18	1	4	7.50	4,000	Run 3	21/05/2013	21/05/2013	RBP	Day-ahead	Auto-matched	20/05/2013 10:15
20	1	4	8.00	2,000	Run 7	21/05/2013	21/05/2013	RBP	Balance-Of-Day	Auto-matched	21/05/2013 10:15
30	2	1	7.80	4,000	Run 3	25/05/2013	25/05/2013	RBP	Day	Auto-matched	21/05/2013 16:00
31	6	1	7.20	4,000	Run 3	23/05/2013	23/05/2013	RBP	Day	Auto-matched	21/05/2013 16:10

1.4.4 Transaction List - SWQP

Table 4: Participant One SWQP Transaction List

Ref	Buyer	Seller	Price	Qty	Delivery Point	From	To	Trading Location	Delivery Period	Transaction Type	Transaction Time
23	1	5	6.25	5,000	Run 6	21/05/2013	27/05/2013	SWQP	Week	Auto-matched	17/05/2013 10:00
25	2	1	6.50	2,000	Run 6	21/05/2013	21/05/2013	SWQP	Day	Auto-matched	19/05/2013 10:00

1.4.5 Active Orders

Table 5: Participant One Active Orders

Ref	Buyer	Seller	Price	Qty	Delivery Point	From	To	Trading Location	Delivery Period	Transaction Type	Transaction Time
41	1		6.50	4,000		24/05/2013	24/05/2013	RBP	Day		22/05/2013 10:00
42		1	8.25	2,000	Run 3	26/05/2013	26/05/2013	RBP	Day		22/05/2013 10:00

1.4.6 Reallocations

Table 6: Participant One Reallocations

Ref	Debit Participant	Credit Participant	From	To	Reallocation Type	Amount	Trading Location	Contractual Agreement
1	4	1	21/05/2013	27/05/2013	Dollar	10,000	NA	Yes
2	5	1	21/05/2013	27/05/2013	Energy	5,000	RBP	Yes

2 Delivery Netting

2.1 Process

Gas delivery obligations (also referred to as delivery transactions) are generated in one of two ways:

- Delivery obligations that are linked to a transaction (non-netted Trading Products), or
- The netting of delivery obligations across the relevant transactions for each Trading Location. (netted Trading Products).

Delivery netting is applicable to Daily and Weekly Trading Products. The process is run at 17:00 two days prior (D-2) the netting gas day. The netting process is run separately for each Trading Location and Gas Day.

Table 7: Netting Rules

Netting Time	Relevant Transactions	Trading Locations
17:00 D – 2	Daily, Weekly	Netting processed separately for RBP, SWQP and QGP.

AEMO determines each participant's net delivery position by aggregating buy and sell transactions across all netted products for each Trading Location and Gas Day. AEMO matches net buy and net sell positions to form a gas delivery schedule.

Outlined in this section are the processes and the calculations supporting the netting of delivery obligations.

2.2 Relevant Transactions

The netting of delivery obligations is applicable to all Daily and Weekly Trading Products.

Pre-matched transactions are included in the delivery netting process.

In this example, the netting gas day is 21 May 2013.

Table 8: Participant One Relevant Transactions

Ref	Buyer	Seller	Price	Qty	Delivery Point	From	To	Trading Location	Delivery Period
1	1	5	7.00	4,000	Run 4	21/05/2013	27/05/2013	RBP	Week
9	1	3	7.50	2,000	Run 3	21/05/2013	27/05/2013	RBP	Week
10	1	2	5.40	6,000	Run 3	21/05/2013	21/05/2013	RBP	Day
11	4	1	7.75	4,000	Run 3	21/05/2013	27/05/2013	RBP	Week

2.3 Net Position

2.3.1 Net Position

Offsetting buy and sell transactions are aggregated together to determine the net delivery position for each Gas Day and Trading Location.

In this example, net buy positions have a positive value and net sell position are shown with a negative value.

Table 9: Net Positions for RBP and Gas Day 21/05/2013

Participant	1	2	3	4	5	6
Net Position (GJ)	8,000	7,000	0	-8,000	-12,000	5,000

2.3.2 Assign Delivery Point to Sell Positions

The delivery point relevant to a net delivery position is determined based on the delivery point submitted by a seller at the time of their order submission.

The seller can enter into multiple transactions for gas day selecting a different delivery point for each transaction. As such, a Trading Participant's offsetting buy and sell transactions could result in a net sell position that could be attributable to multiple delivery points.

In this event, the seller's net position is split by delivery point. The splitting by net delivery point ensures that each matched gas delivery obligation has a specific delivery point. The delivery point(s) associated with the most recent transactions is assigned to the net delivery position.

In the example, Participant 5 has an aggregate sale quantity of 19,000 GJ and a net sell position of 12,000. Multiple delivery points can be attributed to this net position. As illustrated below in Table 10, the delivery points associated with the most recent transactions are retrieved and then used to split the net delivery position.

Table 10: Transaction Delivery Point Information

Ref.	Transaction Quantity	Delivery Point	Transaction Time	Application to Net Position
8	5,000	Run 3	18/05/2013 12:00:00 PM	5,000
5	10,000	Run 7	17/05/2013 2:00:00 PM	7,000
1	4,000	Run 4	17/05/2013 10:00:00 AM	0

The resulting net buy and sell positions for all participants are shown below in Table 11.

Table 11: Net Buy and Sell Positions

Participant	Net Position	Delivery Point
1	8,000	
2	7,000	
4	-8,000	Run 3
5	-5,000	Run 3
5	-7,000	Run 7
6	5,000	

Participant Three has a zero net transaction position. The transactions it has entered into are financially settled but it does not have any gas delivery obligations.

2.4 Match Delivery Positions

Net delivery and receipt positions are matched together to form gas delivery obligations. AEMO uses a simple matching algorithm that aims to minimise the number of matched delivery obligations. The matching algorithm can be summarised as:

1. Match all buy and sell positions that have an equal quantity.
2. For any remaining positions match the largest buy and sell position together. Any residual quantity is retained for use in another match.
3. Repeat steps 1 & 2 until all buy and sell positions have been matched.

The matched gas delivery obligations resulting from the example buy and sell positions are shown below in the Table 12.

Table 12: Matched Delivery Schedule

Ref.	Gas Day	Trading Location	Receipting Participant	Delivering Participant	Delivery Quantity	Delivery Point
101	21/05/2013	RBP	1	4	8,000	Run 3
102	21/05/2013	RBP	2	5	7,000	Run 7
103	21/05/2013	RBP	6	5	5,000	Run 3

2.5 Gas Delivery Obligations

The ***Delivery Obligations Report*** is issued to participants at the completion of each delivery netting run. The netting process is run separately for each Trading Location and as such, the publication of the report is triggered separately for each location.

The report contains information required by Trading Participants to carry out their gas delivery obligations including:

- Gas date
- Gas delivery counterpart
- Gas delivery quantity
- Delivery point

The report is also issued upon the execution of a transaction in a product that isn't netted for delivery.

Table 13: Delivery Obligation Records

Ref	Gas Day	Trading Location	Rec Part.	Del. Part.	Delivery Quantity	Delivery Point	Source	Related Transaction
50	21/05	RBP	1	4	4,000	Run 3	Trans.	18
51	21/05	RBP	1	4	2,000	Run 7	Trans.	20
101	21/05	RBP	1	4	8,000	Run 3	Delivery Netting	

Ref	Gas Day	Trading Location	Rec Part.	Del. Part.	Delivery Quantity	Delivery Point	Source	Related Transaction
105	21/05	SWQP	1	5	3,000	Run 6	Delivery Netting	

3 Settlement Calculations

Settlement of trading activity within the Gas Supply Hub is comprised of the following elements:

- *Physical Gas Transaction Settlement:* is the settlement of the face value of each Physical Gas Transactions in accordance with its price and quantity.
- *Delivery Variance Settlement:* is the true-up (and any applicable compensation) of any under or over gas delivery.
- *Reallocation Settlement* is the transfer of an amount from one participant to another in accordance with a Reallocation.
- *Market Fees*: are payable by participants in accordance with their category of participation. A variable transaction fee is settled based on each participant's quantity of transactions.
- *Ad hoc settlement:* miscellaneous settlement item.

Settlement amounts for the supply and receipt of gas are calculated and presented separately on the Settlement Statement as Payments and Charges.

Positive settlement amounts represent an amount payable by the Market Participant to the Operator. Negative settlement amounts represent an amount payable by the Operator to the Market Participant.

3.1 Average Price Calculations

3.1.1 Average Price

The Average Price is an input into the Delivery Variance Settlement (see 3.3.4) as well as the settlement of Energy Reallocations (see 3.4.2).

The Average Price is calculated for each Gas Day and Trading Location and is determined following the end of trading on the specific Gas Day (i.e after the Balance-of-day has finished trading). The Average Price calculation is a volume weighted average across all transactions covering the Gas Day and Trading Location.

The Average Price calculation does not include pre-matched trades.

Gas Day	Trading Location	Total Transaction Value ($)	Total Transaction Quantity (GJ)	Average Price ($/GJ)
(d)	(l)	$\Sigma_c \Sigma_{t^*}$ (TP(t*) x TQ(t*,d,c,l))	$\Sigma_c \Sigma_t$ TQ(t*,d,c,l)	AP(d,l)
21/05/2013	RBP	540,000	75,000	7.20
21/05/2013	SWQP	95,250	15,000	6.35

3.1.2 Rolling Average Price

The Rolling Average Price is an input into the forward-looking prudential exposure estimate for Energy Reallocations (see 4.3.2). The Rolling Average Price is average of the Average Prices (AP) for the most recent 30 Gas Days.

In the example the Rolling Average Price applicable to processing day 22 May 2013 for the RBP Trading Location is 6.20 ($ / GJ).

3.2 Physical Gas Transaction Settlement

All transactions executed on the exchange are financially settled by AEMO. For each transaction, the buyer makes a payment to AEMO (Physical Gas Charge) and in turn, AEMO makes a payment to the seller (Physical Gas Payment).

The settlement amount is the product of the transaction price and the transaction quantity. Settlement for all Transactions, including Weekly Trading Products, is calculated separately for each Gas Day.

Settlement of supply and receipts are determined separately.

3.2.1 Sales

Physical Gas Payments are settled to sellers of a Physical Gas Transaction.

SP 4.1.1: $PGP(p,d) = \Sigma c \, \Sigma l \, \Sigma t \, (TP(t) \times TQ(t,d,c,l) \times -1)$

Settlement of Participant One's sale transactions is set out in Table 14.

Table 14: Participant One Sales Transaction Settlement

Ref	Gas Day	Delivery Period	Trading Location	Transaction Price ($/GJ)	Transaction Quantity (GJ)	Payment ($)
(t)	(d)	(c)	(l)	TP(t)	TQ(t,d,c,l)	PGP(p,d)
11	21/05/2013	Week	RBP	7.75	4,000	-31,000.00
25	21/05/2013	Day	SWQP	6.50	2,000	-13,000.00
Total						-44,000.00

3.2.2 Purchases

Physical Gas Charges are settled to buyers of a Physical Gas Transaction.

SP 4.1.2: $PGC(p,d) = \Sigma c \, \Sigma l \, \Sigma t \, (TP(t) \times TQ(t,d,c,l))$

Settlement of Participant One's purchase transactions is set out in Table 15.

Table 15: Participant One Purchase Transaction Settlement

Ref	Gas Day	Delivery Period	Trading Location	Transaction Price ($/GJ)	Transaction Quantity (GJ)	Charge ($)
(t)	(d)	(c)	(l)	TP(t)	TQ(t,d,c,l)	TQ x TP
1	21/05/2013	Week	RBP	7.00	4,000	28,000.00
9	21/05/2013	Week	RBP	7.50	2,000	15,000.00
10	21/05/2013	Day	RBP	5.40	6,000	32,400.00
18	21/05/2013	Day-ahead	RBP	7.50	4,000	30,000.00
20	21/05/2013	Balance-Of-Day	RBP	8.00	2,000	16,000.00
23	21/05/2013	Week	SWQP	6.25	5,000	31,250.00
Total						152,650.00

3.3 Delivery Variance Settlement

Delivery Variance Settlement is an optional settlement item that facilitates the transfer of compensation between the buyer and seller for a variation between the gas delivery obligation and the actual gas delivery.

A relatively small variation (within tolerance) is settled at the transaction price (or the average transaction price where netting applies). For relatively large variations (outside tolerance) additional compensation is paid by the party at fault to their counterparty.

3.3.1 Actual Delivery Quantity

Trading Participants use the Delivered Quantity interface to communicate actual gas delivery information to AEMO for settlement purposes.

Actual gas deliveries corresponding to Participant One's obligations on gas day 21/05/2013 are set out in Table 16.

Table 16: Actual Delivered Quantity Records

Ref.	Delivery Obligation	Gas Day	Receipt / Delivering Participant	Delivery Quantity	Actual Delivered Quantity	Reason for variation
50	*Individual*	21/05/2013	Receipting	4,000	**4,040**	**Delivery**
51	*Individual*	21/05/2013	Receipting	2,000	**2,100**	**Delivery**
101	*Netted*	21/05/2013	Receipting	8,000	**8,080**	**Delivery**
105	*Netted*	21/05/2013	Receipting	3,000	**2,700**	**No fault**

3.3.2 Delivery Variance Quantity

The Delivery Variance Quantity (DVQ) is the difference between the Delivery Quantity (obligation) and the Actual Delivery Quantity. The tolerance levels are set at 5% above and below the Delivery Quantity.

There are separate equations for the Delivering Participant and the Receipting Participant. A positive value of DVQ will result in a charge to the Trading Participant.

Delivering Participant Equation

SP 3.1.1.a: DVQ(p,dt,d) = DQ(dt,d) - ADQ(dt,d)

Receipting Participant Equation

The calculation is reversed for the Receipting Participant;

SP 3.1.1.b: DVQ(p,dt,d) = ADQ(dt,d) - DQ(dt,d)

In this example, equation 4.1.2 is used as Participant 1 is the Receipting Participant for each of the Gas Delivery Obligations (dt).

Table 17: Participant One Delivery Variance Quantity

Ref	Gas Day	Receipt / Delivering Participant	Actual Delivered Quantity	Delivery Quantity (GJ)	Delivery Variance Quantity (GJ)
(dt)	(d)		ADQ(dt,d)	DQ(dt,d)	DVQ(p,dt,d)
50	21/05/2013	Receipting	4,040	4,000	40
51	21/05/2013	Receipting	2,100	2,000	100
101	21/05/2013	Receipting	8,080	8,000	80

105	21/05/2013	Receipting	2,700	3,000	-300

3.3.3 Outside Tolerance Flag

If a participant is responsible for a large variation from their gas delivery obligation then they are required to pay additional compensation to their counterpart as part of the Delivery Variance Settlement mechanism.

The Outside Tolerance Level (OTL) is a market parameter that is an input into the Delivery Variance Settlement. The product of the Outside Tolerance Level and the Delivery Quantity sets the absolute tolerance quantity for each gas delivery obligation.

Table 18: Outside Tolerance Level Value

Name	Variable	Value
Outside Tolerance Level	OTL	0.05

The value of the Outside Tolerance Flag is calculated separately for the Delivering Participant and the Receiving Participant based on the gas delivery information provided by Trading Participants.

A participant that is assigned an Outside Tolerance Flag with a value of 1 pays compensation to their counterparty (with a flag value of -1).

As set out in the table below, if DVQ is within tolerance or a variation is not the fault of either participant then the value of the flag is 0. If the DVQ is outside tolerance then the participant at fault will have a flag with a value of 1.

SP 3.1.2: Outside Tolerance Flag Values

Table 19: Outside Tolerance Flag Values

Variation from Delivery Quantity	Reason for variance	Receiving Participant (OTF(p,dt,d))	Delivering Participant (OTF(p,dt,d))
Within tolerance: ABS(DVQ(p,dt,d)) < (OTL x DQ(dt,d))	Delivery, Receipt and No Fault	0	0
Outside tolerance: ABS(DVQ(p,dt,d)) ≥ (OTL x DQ(dt,d))	No fault	0	0
	Delivery	-1	1
	Receipt	1	-1

The Outside Tolerance Flag Values are determined in accordance with rules in set out Table 19 and the gas delivery information submitted and confirmed by the parties to the delivery schedule.

Table 20: Outside Tolerance Flag Records

Ref	Receipt / Delivering Participant	Delivery Variance Quantity (GJ)	Tolerance Quantity (GJ)	Tolerance	Reason for variation	Outside Tolerance Flag
(dt)		DVQ(p,dt,d)	OTL x DQ(dt,d)			OTF(dt,d)
50	Receipting	40	200	Within tolerance	Delivery	0

51	Receipting	100	100	Outside tolerance	Delivery	-1
101	Receipting	80	400	Within tolerance	Delivery	0
105	Receipting	-300	150	Outside tolerance	No fault	0

Analysis of the Outside Tolerance Flag can be summarised as:

- No additional compensation will be settled for records #50 and #101 because the variation is within tolerance.
- No additional compensation will be settled for record #105 because the variation is meets the definition of Force Majeure and as such is not the fault of either party.
- Participant One will receive compensation (OTF = -1) for record #51 because their counterparty is at fault for the variation.

3.3.4 Delivery Variance Settlement Price

If Delivery Netting applies to a Transaction, then the Delivery Price (DP) is equal to the Average Price (AP) for that Gas Day and Trading Location. If Delivery Netting does not apply to a Transaction, DP is equal to the Transaction Price (TP) associated with the gas delivery obligation.

SP 3.1.3.b: DP(dt,d) = AP(d,l) If dt formed as part of:

- Delivery Netting Schedule, or
- the Close Out and Offset Procedure.

Else

TP(t) Of the corresponding Transaction (t)

Table 21: Delivery Price Records

Ref	Gas Day	Transaction type	Trading Location	Transaction Price ($/GJ)	Average Price ($/GJ)	Delivery Price ($/GJ)
(dt)	(d)		(l)	TP(t)	AP(d,l)	DP(dt,d)
50	21/05/2013	Individual	RBP	7.50	7.20	7.50
51	21/05/2013	Individual	RBP	8.00	7.20	8.00
101	21/05/2013	Netted	RBP	NA	7.20	7.20
105	21/05/2013	Netted	SWQP	NA	6.35	6.35

3.3.5 Delivery Variance Settlement

A payment or charge will be applicable to each party to a confirmed gas delivery record.

Each gas delivery obligation record is assessed against the payment and the charge equation and at least one of the calculations will be calculated as zero.

Payment Equation

SP 3.1.4: $DVP(p,d) = \Sigma_{dt}$ Min (DVQ(p,dt,d) x DP(dt,d)

+ ABS(DVQ(p,dt,d)) x OTF(p,dt,d) x DP(dt,d) x OTR, 0).

Charge Equation

SP 3.1.5: $DVC(p,d) = \Sigma_{dt}$ Max (DVQ(p,dt,d) x DP(dt,d)

+ ABS(DVQ(p,dt,d)) x OTF(p,dt,d) x DP(dt,d) x OTR, 0).

The calculated Delivery Variance Payments and Charges for Participant One are set out in Table 22.

Table 22: Delivery Variance Settlement Amounts

Ref	Gas Day	Delivery Variance Quantity (GJ)	Delivery Settlement Price ($/GJ)	Charge ($)	Payment ($)
(dt)	(d)	DVQ	DP(dt,l)	DVC(dt,d)	DVP(dt,d)
50	21/05/2013	40	7.50	300.00	-
51	21/05/2013	100	8.00	600.00	-
101	21/05/2013	80	7.20	576.00	-
105	21/05/2013	-300	6.35	-	-1,905.00
Total				1,476.00	-1,905.00

Analysis of the Delivery Variance Settlement for Participant One can be summarised as:

- Participant One is charged for the additional gas receipted for record #50 at the Transaction Price.
- Participant One is charged for the additional gas receipted for record #101 at the Average Price.
- Participant One is charged for the additional gas receipted for record #51 at the Transaction Price ($8.00), but the charge is reduced by the compensation from the Delivering Participant. The effective charge for additional gas receipted ($6.00) is 25% less than the Transaction Price ($8.00).
- Participant One is paid back for gas it did not receive for record #105 at the Average Price.

3.4 Reallocations

A reallocation is a financial arrangement between two Market Participants and AEMO to transfer settlement commitments between the Market Participants. The Gas Supply Hub supports Dollar Reallocations and Energy Reallocations.

The Credit Participant's settlement amount has a negative sign (offsetting a pre-existing payment obligation) and the settlement amount of the Debit Participant has a positive sign.

The settlement amount is determined separately for each Gas Day of the Reallocation. If a Reallocation covers multiple Billing Periods then the Reallocation Amount for each Gas Day is settled for the Billing Period in which that Gas Day falls.

Reallocations for Participant One covering gas day 21/05/2013 are detailed in Table 6.

3.4.1 Dollar Reallocation

The Dollar Amount specified for each Gas Day of the Reallocation is debited to a Market Participant (Debit Participant) and credited to another Market Participant (Credit Participant).

SP 4.3.1.b: DRC(p,r,d) = DA(r,d) x -1

Table 23: Dollar Reallocation Settlement Amount

Ref	Role	Dollar Amount ($)	Dollar Reallocation Amount
		DA(r,d)	DRC(p,r,d)
201	Credit	10,000	-10,000

3.4.2 Energy Reallocation

The Reallocation Amount debited to the Debit Participant and credited to the Credit Participant is the product of the Energy Reallocation Quantity (GJ/day) and the Applicable Reference Price ($/GJ).

The Reallocation Request for Energy Reallocations must specify a Trading Location, which will determine the Applicable Reference Price.

SP 4.3.2.b: ERC(p,r,d) = GQ(r,d) x AP(d,l) x -1

Table 24: Energy Reallocation Settlement Amount

Ref	Role	Energy Amount (GJ)	Trading Location	Average Price ($/GJ)	Energy Reallocation Amount ($)
		GQ(r,d)	(l)	AP(d,l)	ERC(p,r,d)
202	Credit	5,000	RBP	7.20	-36,000

3.5 Participation Fees

Market Fees consist of a fixed participation fee and a variable transaction fee.

3.5.1 Participation fees

A fixed fee is payable by each participant in accordance with their participation category.

Table 25: Participation fees

Participant Type	Annual Fee ($)
Trading Participant	14,500
Trading Participant Additional Licence	5,500
Reallocation Participant	9,000
Viewing Participant	5,500

Fees for Market Participants (Trading Participants and Reallocation Participants) are billed monthly as part of the regular Billing Period settlement of transactions. Whereas the participation fee for a Viewing Participant is paid upfront on an annual basis.

SP 4.2.1 MPF(p,d*) = ATF / 12

+ Number of additional licences x ALF / 12

+ ARF / 12

In the example, Participant One is a Trading Participant and does not have any additional licences.

MPF (1/5/2013) = ATF/12 + 0 x ALF / 12 + ARF /12

= 14,500/12 + 0 + 0

= 1,208.33

3.5.2 Transaction fees

Transaction fees are settled based on the quantity of transactions executed by a Trading Participant. The transaction fee applied is different for weekly and daily type Trading Products.

Table 26: Transaction Fee Rate

Delivery Period	Transaction Fee ($/GJ)
Balance-of-day, Day-Ahead, Daily	0.03
Weekly	0.02

The Transaction Fee is settled with reference to the day the transaction is executed. Transactions executed by Participant One on 17/5/2013 are set out below in Table 27.

Table 27: Participant One Transactions 17/05/2013

Ref	Trading Location	Delivery Period	Transaction Quantity (GJ/day)	From	To	Transaction Time
1	RBP	Week	4,000	21/05/2013	27/05/2013	17/05/2013 10:00

Ref	Trading Location	Delivery Period	Transaction Quantity (GJ/day)	From	To	Transaction Time
23	SWQP	Week	5,000	21/05/2013	27/05/2013	17/05/2013 10:00
3	RBP	Day	5,000	20/05/2013	20/05/2013	17/05/2013 12:00

The gas day for settlement of the transaction fee is the day of the transaction. Settlement is determined by aggregating the Transaction Quantity for each Delivery Period and then applying the relevant transaction fee.

SP 4.2.2: $TTF(p,d) = \Sigma_c (\Sigma_t \Sigma_l \Sigma_{d'}(TQ(p,d',c,l) \times TF(c)))$

Table 28: Transaction Fee Amount – 17 May 2013

Delivery Period	Aggregate Transaction Quantity (GJ)	Fee Rate ($/GJ)	Transaction Fee ($)
(c)	$\Sigma_t \Sigma_l \Sigma_{d'} TQ(p,d',c,l)$	TF(c)	TTF(p,d)
Week	63,000	0.02	1,260
Day	5,000	0.03	150
Total			1,410

3.6 Trading Amount

The Exchange Agreement refers to the net aggregate Gas Day settlement value for a Billing Period (bp).

Settlement Amount $FSA(p,Bp) = \Sigma_d(PGP(p,d) + PGC(p,d) + DVP(p,d) + DVC(p,d) + MPF(p,d) + TTF(p,d) + TRD(p,d) + TRC(p,d) + AHP(p,d) + AHC(p,d))$

Table 29: Participant One Trading Amount 21 May 2013

Physical Gas Transactions		Delivery Variance		Transaction Fees	Reallocation	Trading Amount
PGP(p,d)	PGC(p,d)	DVP (p,d)	DVC (p,d)	TTF (p,d)	TRC(p,d)	For a Gas Day (21/05/2013)
-44,000	152,650	-1,905	1,476	300	-46,000	62,521

4 Prudential Exposure

The prudential exposure of a Market Participant is an amount calculated by AEMO reflecting the maximum net aggregate amount actually or contingently owing to the Operator in relation to their trading activity.

This section of the document outlines the prudential exposure calculations associated with the Participant One's trading activity. Exposure calculations presented in this section assume a processing day of 22/05/2013.

4.1 Outstanding Amount

The Outstanding Amount is the aggregate of all settlement amounts for Gas Days in the past.

4.1.1 Delivery Settlement Adjustment

The settlement amount owing to the Delivering Participant is reduced for any delivery obligations for which the actual delivery information has not been submitted **and confirmed**. The adjustment is applicable to the Delivering Participant only and is used in the prudential exposure calculation only.

SP 5.1.2.a: $DSA(p,d) = \Sigma_{dt} (DQ(dt,d) \times DP(dt,d) \times S(d))$

As detailed in section 3.3.1, information was submitted and confirmed for all gas delivery obligations for Gas Day 21/05/2013. Participant One is the Delivering Participant for gas delivery obligation #40 on gas day 20/05/2013 for which the actual delivery information has not been confirmed.

Table 30: Delivery Settlement Adjustment for Gas Day 20/05/2012

Ref	Receipt / Delivering Participant	Delivery Quantity	Price	Margin Rule	Delivery Settlement Adjustment
(dt)		DQ(dt,d)	DP(dt,d)	B(d), S(d)	DSA(p,d)
40	Delivery	5,000	4.95	0.2	4,950

4.1.2 Initial Settlement Estimate

Settlement of transactions occurs after the end of each monthly Billing Period. As such, an estimate of the likely settlement amounts is calculated daily until the day on which the Final Settlement Statement for a Billing Period is issued to Market Participants.

The latest transaction and gas delivery information is an input into the calculation of the settlement estimates. Trading Amounts and any Delivery Settlement Adjustments are aggregated together to calculate the Initial Settlement Estimate.

SP 5.1.2.b: $INE(p) = \Sigma_d [(DTA(p,d) + DSA(p,d)) \times (1 + GST(d))]$

The Initial Settlement Estimate for Participant One is presented in Table 31 below. The calculation of the Trading Amount for Gas Day 21/05/2013 was presented in section 3.6 and the Trading Amounts associated with all transactions have been included for completeness.

Table 31: Initial Settlement Estimate

Gas Day	Trading Amount	Delivery Settlement Adjustment	Initial Settlement Estimate
	DTA(p,d)	DSA(p,d)	INE(p)
1/05/2013	1,208		1,329
17/05/2013	1,410		1,551
18/05/2013	460		506
19/05/2013	620		682
20/05/2013	-24,630	4,950	-21,648
21/05/2013	62,521		68,773
Total			51,193

4.1.3 Total Security Deposit Amount

Cash deposits are treated as an interest bearing security deposit. Security deposits reduce a participant's Prudential Exposure (rather than increasing their trading limit).

Interest is applicable to the invoicing of security deposits but is not considered in the prudential exposure calculation.

SP 5.1.2.c: $TSDA(p) = \Sigma_s \Sigma_{bp} SD(p,s,bp)$

Participant One has a security deposit for $50,000 assigned to the July 2013 Billing Period.

$TSDA(p) = 50,000$

4.1.4 Outstanding Amount

The Outstanding Amount is the aggregate of actual and estimated exposures relating to historical gas days.

SP 5.1.3.a: $OA(p) = SNP(p) - TSDA(p) - EPA(p) + INE(p) + AE(p)$

Table 32: Outstanding Amount Calculation

Settlement Amount not due for payment	Total Security Deposit Amount	Early Payment Amount	Initial Settlement Estimate	Adjustment Estimate	Outstanding Amount
SNP(p)	TSDA(p)	EPA(p)	INE(p)	AE(p)	OA(p)
0	50,000	0	51,193	0	1,193

Changes to gas delivery information after the final settlement require a revision of the Settlement Amount. Revised settlement occurs in the 4th month after the end of the Billing Period. The Adjustment Estimate is calculated daily for historical billing periods until the revised settlement occurs. There is no revised gas delivery information in this example.

Payments against a Settlement Statement that are made prior to the payment due date (Early Payment) are recorded and reduce a participant's exposure. There are no early payments in this example.

4.2 Forward Trading Exposure

Forward trading exposure is an estimate of exposure associated with transactions for gas delivery in the future.

The calculation has two components:

- *Exposure on the Net Position:* The difference between a member's buy and seller transactions is their net position. To estimate the exposure, a margin is applied to the net position.
- *Gain or loss on the offset position:* A member's offset position is the quantity of buy transactions that are offset by sell transactions. There is no gas delivery obligation associated with offsetting transaction but they will need to be settled. As such, any gain or loss on the offset position is incorporated in the exposure.

4.2.1 Average Buy and Sell Price

The difference between a participant's average buy and sale prices is used to measure the gain or loss on the offset position.

Average Buy Price

SP 5.2.2.a: $ABP(m,d,l) = \Sigma_c \Sigma_{t'} (TP(t') \times TQ(t',d,c,l)) / \Sigma_c \Sigma_{t'} (TQ(t',d,c,l))$

Average Sell Price

SP 5.2.2.b: $ASP(m,d,l) = \Sigma_c \Sigma_{t''} (TP(t'') \times TQ(t'',d,c,l)) / \Sigma_c \Sigma_{t''} (TQ(t'',d,c,l))$

Table 33: Average Portfolio Price Calculations

Gas Day	Total Buy Quantity	Total Sell Quantity	Buy Value	Sell Value	Average Buy Price	Average Sell Price
(d)	$\Sigma_c \Sigma_{t'}$ TQ(t',d,c,l)	$\Sigma_c \Sigma_{t''}$ TQ(t'',d,c,l)	$\Sigma_c \Sigma_{t'}$ (TP(t') x TQ(t',d,c,l))	$\Sigma_c \Sigma_{t''}$ (TP(t'') x TQ(t'',d,c,l))	ABP (m,d,l)	ASP (m,d,l)

22/05	6,000	4,000	43,000	31,000	7.17	7.75
23/05	6,000	8,000	43,000	59,800	7.17	7.48
24/05	10,000	4,000	69,000	31,000	6.90	7.75
25/05	6,000	8,000	43,000	62,200	7.17	7.78
26/05	6,000	4,000	43,000	31,000	7.17	7.75
27/05	6,000	4,000	43,000	31,000	7.17	7.75

Average buy and sell prices are presented to two decimal places. However, the actual calculation is to eight decimal places.

4.2.2 Trading Position

Net Position

The Net Position is calculated for each Gas Day and Trading Location as the difference between a participant's aggregate buy and sell transactions.

SP 5.2.3.a: $NTQ(m,d,l) = \Sigma_c \Sigma_{t'} TQ(t',d,c,l) - \Sigma_c \Sigma_{t''} TQ(t'',d,c,l)$

Offset Position

The Offset Quantity is also calculated for each Gas Day and Trading Location and is the quantity of buy transactions offset by sell transactions.

SP 5.2.3.b: $OFQ(m,d,l) = MIN(\Sigma_c \Sigma_{t'} (TQ(t',d,c,l)), \Sigma_c \Sigma_{t''} (TQ(t'',d,c,l)))$

The buy quantity includes active orders but the sell quantity only includes transactions in both the Net Quantity and Offset Quantity calculations.

Table 34: Trading Position Calculations

Gas Day	Total Buy Quantity	Total Sell Quantity	Net Quantity	Offset Quantity
(d)	$\Sigma_c \Sigma_{t'}$ TQ(t',d,c,l)	$\Sigma_c \Sigma_{t'}$ TQ(t'',d,c,l)	NTQ (m,d,l)	OFQ (m,d,l)
22/05	6,000	4,000	2,000	4,000
23/05	6,000	8,000	-2,000	6,000
24/05	10,000	4,000	6,000	4,000
25/05	6,000	8,000	-2,000	6,000
26/05	6,000	4,000	2,000	4,000
27/05	6,000	4,000	2,000	4,000

4.2.3 Forward Trading Exposure

The Forward Trading Exposure is calculated for each Gas Day and Trading Location.

Exposure on the Net Position

A margin is applied to the net position to estimate the exposure. As detailed in Table 35, the margin applied is different for net long and short positions.

Table 35: Margin Values

Date Range	Buyer Margin Rule (B(d))	Seller Margin Rule (S(d))	
		Member not subject to Trading Halt*	Member subject to Trading Halt*
d* < d < pd	0	0.20	1.25
pd ≤ d ≤ pd + 1	1	0.80	-0.25
d > pd + 1	1	-0.25	-0.25

Gain or loss on the offset position

A member's offset position is the quantity of buy transactions that are offset by sell transactions. The difference between a participant's average buy and sell price is used to measure the gain or loss on the offset position.

SP 5.2.4.a: $FTE(m) = \Sigma_d \Sigma_l$ [If{ NTQ(m,d,l) > 0,

Then NTQ(m,d,l) x ABP(m,d,l) x B(d),

Else NTQ(m,d,l) x ASP(m,d,l) x S(d)}

+ OFQ(m,d,l) x (ABP(m,d,l) - ASP(m,d,l)) x (1+GST(d))]

Table 36: Participant One Forward Trading Exposure

Gas Day	Margin	Net Position	Exposure on Net Position	Offset Qty	Exposure on Offset Position	Forward Exposure
(d)	B(d) , S(d)	NTQ(m,d,l)		OFQ(m,d,l)		FTE(m)
22/05	100%	2,000	14,333	4,000	-2,333	13,200

23/05	80%	-2,000	-11,960	6,000	-1,850	-15,191
24/05	100%	6,000	41,400	4,000	-3,400	41,800
25/05	-25%	-2,000	3,888	6,000	-3,650	261
26/05	100%	2,000	14,333	4,000	-2,333	13,200
27/05	100%	2,000	14,333	4,000	-2,333	13,200
Total for RBP						66,470
Total for SWQP						206,250
Total						272,470

4.3 Forward Reallocation

The Forward Reallocation Amount is an estimate of the exposure associated with reallocations from the current processing day into the future. Reallocations decrease the exposure of the Credit Participant but increase that of the Debit Participant.

Different equations exist for estimating the exposure for Dollar and Energy Reallocations and there are different equations for the Debit Participant and the Credit Participant.

The exposure is calculated for each reallocation (4.3.1, 4.3.2) and then aggregated into a total Forward Reallocation Amount (4.3.3).

4.3.1 Dollar Reallocation

The exposure is simply the dollar amount for the specified Gas Days

SP 5.3.2.b: FDRC(p,r) = Σ_d (DA(r,d) x -1)

Settlement of Participant One's (Credit Participant) Dollar Reallocation is set out in Table 37.

Table 37: Forward Dollar Reallocation Estimate

Gas Day	Dollar Reallocation Amount	Forward Estimate
(d)	DA(r,d)	FDRC(p,r)
22/05/2013	10,000	-10,000
23/05/2013	10,000	-10,000
24/05/2013	10,000	-10,000
25/05/2013	10,000	-10,000
26/05/2013	10,000	-10,000
27/05/2013	10,000	-10,000
Total		-60,000

4.3.2 Energy Reallocation

The exposure is the product of the Energy Reallocation Quantity (GJ), applicable Rolling Average Price and the Multiplier.

SP 5.3.2.d: FERC(p,r) = Σd (GQ(r,d,l) x RAP(pd-1,l) x cm x -1)

Table 38: Value of Multipliers

Name	Variable	Value
Debit Participant Multiplier	dm	1.25
Credit Participant Multiplier	cm	0.75

Settlement of Participant One's (Credit Participant) Energy Reallocation is set out in Table 39.

Table 39: Forward Energy Reallocation Estimate

Gas Day	Energy Reallocation Amount	RAP	Multiplier	Forward Estimate
(d)	GQ(r,d)	RAP(pd-1,l)	dm, cm	FDRC(p,r)
22/05/2013	5,000	6.20	0.75	-23,250
23/05/2013	5,000	6.20	0.75	-23,250
24/05/2013	5,000	6.20	0.75	-23,250
25/05/2013	5,000	6.20	0.75	-23,250
26/05/2013	5,000	6.20	0.75	-23,250
27/05/2013	5,000	6.20	0.75	-23,250
Total				-139,500

4.3.3 Forward Reallocation Amount

The forward estimate is the aggregate, for each participant, across its roles as Debit Participant and Credit Participant and across dollar and energy reallocations.

SP 5.3.3: FRA(p) = Σr (FDRD(p,r) + FDRC(p,r) + FERD(p,r) + FERC(p,r))

FRA(p) = -60,000 + -139,500

= -199,500

4.4 Prudential Exposure

The Prudential Exposure is the aggregate of historical and forward-looking exposures associated with Physical Gas Transactions and Reallocations.

SP 5.4: PE(m) = Σp (OS(p) + FRA(p)) + FTE(m)

PE(m) = 1,193 + -199,500 + 272,720

= 74,414

Appendix A

1.1.1 Full Transaction List - RBP

Ref	Buyer	Seller	Price	Qty	Delivery Point	From	To	Product Group	Product Type	Transaction Type	Transaction Time
1	1	5	7.00	4,000	Run 4	21/05/2013	27/05/2013	RBP	Week	Pre-matched	17/05/2013 10:00
2	2	4	6.25	6,000	Run 3	21/05/2013	21/05/2013	RBP	Day	Auto-matched	17/05/2013 11:00
3	2	1	4.95	5,000	Run 4	20/05/2013	20/05/2013	RBP	Day	Auto-matched	17/05/2013 12:00
4	3	4	6.00	3,000	Run 3	21/05/2013	27/05/2013	RBP	Week	Auto-matched	17/05/2013 13:00
5	3	5	7.40	10,000	Run 7	21/05/2013	27/05/2013	RBP	Week	Auto-matched	17/05/2013 14:00
6	2	5	5.50	10,000	Run 3	20/05/2013	20/05/2013	RBP	Day	Auto-matched	18/05/2013 10:00
7	3	4	7.25	3,000	Run 3	21/05/2013	27/05/2013	RBP	Week	Auto-matched	18/05/2013 11:00
8	6	5	7.35	5,000	Run 3	21/05/2013	27/05/2013	RBP	Week	Auto-matched	18/05/2013 12:00
9	1	3	7.50	2,000	Run 3	21/05/2013	27/05/2013	RBP	Week	Auto-matched	18/05/2013 15:00
10	1	2	5.40	6,000	Run 3	21/05/2013	21/05/2013	RBP	Day	Auto-matched	18/05/2013 16:00
11	4	1	7.75	4,000	Run 3	21/05/2013	27/05/2013	RBP	Week	Auto-matched	19/05/2013 10:00
12	5	2	6.25	4,000	Run 3	21/05/2013	21/05/2013	RBP	Day	Auto-matched	19/05/2013 11:00
13	2	3	7.75	7,000	Run 3	21/05/2013	27/05/2013	RBP	Week	Auto-matched	19/05/2013 11:00
14	5	4	6.20	3,000	Run 3	21/05/2013	21/05/2013	RBP	Day	Auto-matched	19/05/2013 11:00
15	4	3	6.00	3,000	Run 3	21/05/2013	21/05/2013	RBP	Day	Auto-matched	19/05/2013 11:00
16	2	4	5.15	5,000	Run 7	20/05/2013	20/05/2013	RBP	Day-ahead	Auto-matched	19/05/2013 11:00

Ref	Buyer	Seller	Price	Qty	Delivery Point	From	To	Product Group	Product Type	Transaction Type	Transaction Time
17	2	3	7.50	4,000	Run 4	21/05/2013	27/05/2013	RBP	Week	Auto-matched	19/05/2013 11:00
18	1	4	7.50	4,000	Run 3	21/05/2013	21/05/2013	RBP	Day-ahead	Auto-matched	20/05/2013 10:15
19	2	3	7.75	3,000	Run 3	21/05/2013	21/05/2013	RBP	Day-ahead	Auto-matched	20/05/2013 10:15
20	1	4	8.00	2,000	Run 7	21/05/2013	21/05/2013	RBP	Balance-Of-Day	Auto-matched	21/05/2013 10:15
21	3	5	9.00	4,500	Run 7	21/05/2013	21/05/2013	RBP	Balance-Of-Day	Auto-matched	21/05/2013 15:01
22	6	2	12.00	1,500	Run 4	21/05/2013	21/05/2013	RBP	Balance-Of-Day	Auto-matched	21/05/2013 15:59
30	2	1	7.80	4,000	Run 3	25/05/2013	25/05/2013	RBP	Day	Auto-matched	21/05/2013 16:00
31	6	1	7.20	4,000	Run 3	23/05/2013	23/05/2013	RBP	Day	Auto-matched	21/05/2013 16:10

1.1.2 Full Transaction List - SWQP

Ref	Buyer	Seller	Price	Qty	Delivery Point	From	To	Trading Location	Delivery Period	Transaction Type	Transaction Time
23	1	5	6.25	5,000	Run 6	21/05/2013	27/05/2013	SWQP	Week	Auto-matched	17/05/2013 10:00
24	2	4	6.25	6,000	Run 6	21/05/2013	27/05/2013	SWQP	Week	Auto-matched	18/05/2013 10:00
25	2	1	6.50	2,000	Run 6	21/05/2013	21/05/2013	SWQP	Day	Auto-matched	19/05/2013 10:00
26	6	4	6.75	2,000	Run 6	21/05/2013	27/05/2013	SWQP	Week	Auto-matched	19/05/2013 10:00