Advancing physical
energy markets

Training & Education

Fundamentals of
market-based balancing

emsTradepoint

Contents

Market-Based Balancing - MPOC Change Request

The introduction of a market-based balancing (MBB) regime is a further step to address long-standing gas balancing issues on the Maui pipeline. Originally proposed by MDL in October 2014, under this regime imbalance positions at Maui welded points will be cashed-out on a daily basis. In addition, balancing gas may be traded on a wholesale trading platform.

Key changes to the cash-out mechanism:

❯ replacing the current 'Imbalance Limit Overrun Notice' ("ILON") regime with automatic ex-post cashing-out of all operational imbalance outside of tolerance;

❯ allowing the balancing agent to buy and sell balancing gas on a more liquid, open access market; and

❯ linking cash-out prices (currently referred to as Mismatch Prices) to the spot market in lieu of using Balancing Gas Exchange outcomes.

emsTradepoint is currently the trading platform that will set the cash-out prices and resulting Price Risk.

The GIC has issued a final recommendation in support of the MBB Change Request and the expected implementation date is 1 October 2015.

Section 1

Cash-Out Mechanism and Pricing Explained

emsTradepoint

Moving from ILONs to Daily Cash-Outs

emsTradepoint

Current scenario, the ILON process:

* If same direction as the original ILON

Moving from ILONs to Daily Cash-Outs
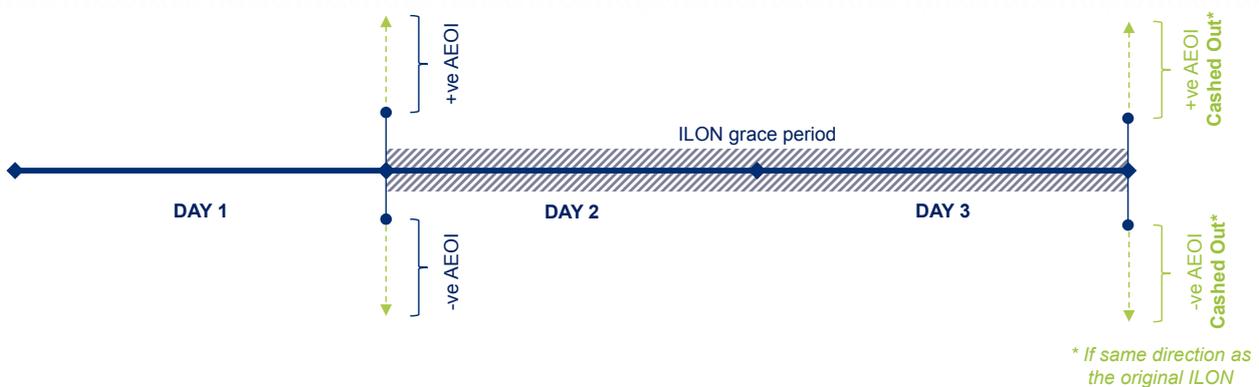
1 October - the Daily Cash-Out process:

+ve AEOI **Cashed Out**

24 HOURS
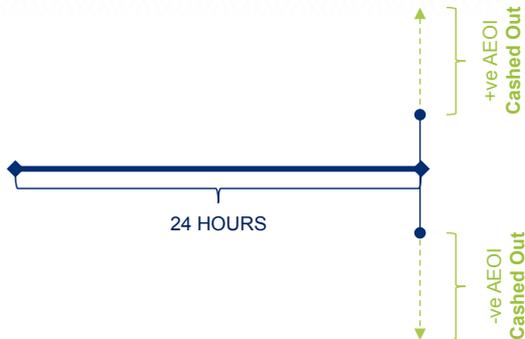
-ve AEOI **Cashed Out**

- The ILON process will be replaced by a 24 hour delivery service

- All Accumulated Excess Operational Imbalance ("**AEOI**") (Operational Imbalance above tolerance) will be automatically cashed out at the end of each day

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Moving from ILONs to Daily Cash-Outs

Transitional Tolerances

There will be a staggered soft landing period where increased tolerances will apply. During this transitional period, existing tolerances at Physical Welded Points located at a Large Station will be multiplied by the ROIL multiplier:

-   Until 1 March 2016 (or a later date notified by MDL):   ROIL multiplier of at least 2
-   For a period of six months after the above date: ROIL multiplier of at least 1.5

MDL has confirmed that the transition period will apply for a period of 18 months following implementation.

The Daily Cash-Out Mechanism: +ve AEOI

ems**Tradepoint**

+ve AEOI Cashed Out

24 HOURS

- A positive AEOI will trigger a title transfer from the Welded Party to the pipeline.
  Welded Party **SELLS** to TSO.

$ - TSO pays Welded Party

TSO (MDL) — Welded Party (Shippers if at a Vector Welded Point)

GJ – TSO takes title to / buys gas

The Daily Cash-Out Mechanism: -ve AEOI

ems**Tradepoint**

24 HOURS

-ve AEOI Cashed Out
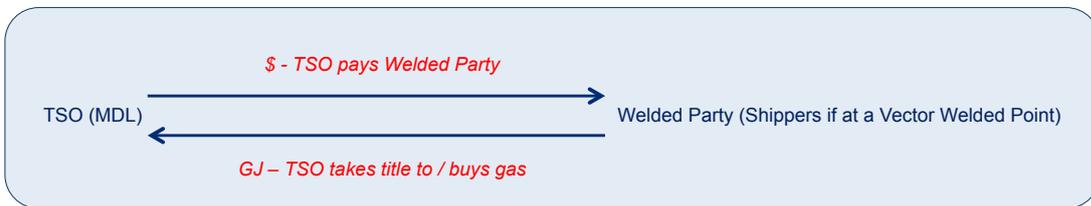
- A negative AEOI will trigger a title transfer to the Welded Party from the pipeline.
  Welded Party **BUYS** from TSO.

$ - Welded Party pays TSO

TSO (MDL) — Welded Party (Shippers if at a Vector Welded Point)

GJ – TSO gives title to / sells gas

The ILON Mechanism: Prices

1. Cash-Out Price set prior to the Delivery Day

Cash-Out Price set   **Delivery Day**

- – The Cash-Out Price (+ve/-ve Mismatch Price) is set at least one-day ahead, and is derived using a methodology set by MDL.
- – Current policy is to use weekdays for which 10 TJ of Put/Call gas is available.

2. Balancing gas is sourced on the BGX:

Historic Call and Put Prices on the BGX

— BGX VWAP (CALL)   — BGX VWAP (PUT)
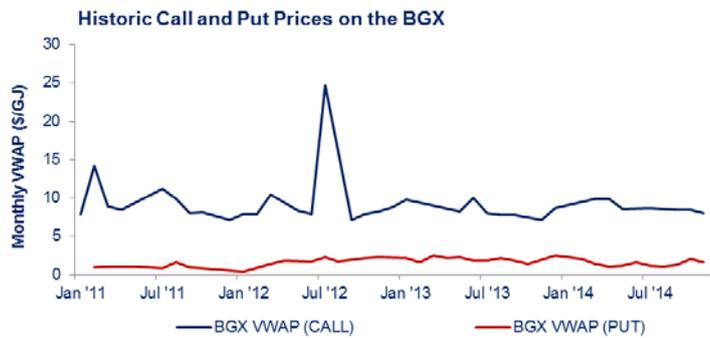
The Daily Cash-Out Mechanism: Prices

Cash-Out Price is calculated based on:

- • the Volume Weighted Average Price of trades on the Trading Platform, executed on that day or the day before, for delivery that day (VWAP); and
- • any Balancing Gas Puts/Calls transacted on the day for that day.

Trade Execution Window for Delivery Day
Only trades executed within this window will be included in the VWAP calculation

Day Prior   **Delivery Day**

Window for Balancing Gas Transactions
Only Balancing Gas puts/calls transacted on the day will be included
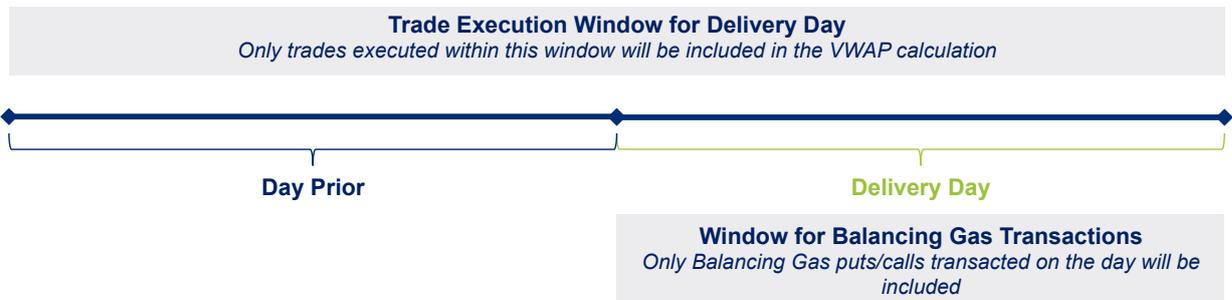
The Daily Cash-Out Mechanism: Prices

POSITIVE CASH-OUTS

The Welded Party will be paid the lower of:

- – Trade VWAP **minus A minus B**; OR

- – The lowest price paid for Put balancing gas **minus B**.

NEGATIVE CASH-OUTS

The Welded Party will pay the higher of:

- – Trade VWAP **plus A plus B**; OR

- – The highest price paid for Call balancing gas **plus B**.

A = 0-10% of VWAP
The percentage adjustment factor, A, will be set by MDL within this range.

B = Cash-Out Transmission Price + Cash-Out Trading Fee Price
The Cash-Out Transmission Price is a proxy for Tariff 1 and 2 between the Welded Point and MDL's Payback Point.
The Cash-Out Trading Fee Price is the average of emsTradepoint's trading fees, currently $0.10/GJ.

EXAMPLE 1: +ve Cash-Out, no Balancing Gas

+ve AEOI Cashed Out

24 HOURS

Cash-Out Volume	10,000 GJ (Sold to MDL)
Put Balancing Gas?	*No Put gas sold by MDL*
emsTradepoint VWAP	*$6.00/GJ*
Adjustment %	*5%*
Cash-Out Transmission Price	*$0.20/GJ*
Cash-Out Trading Fee	*$0.10/GJ*
Cash-Out Price	**$5.40/GJ - $54,000.00**

EXAMPLE 2: -ve Cash-Out, no Balancing Gas

24 HOURS

-ve AEOI Cashed Out

Cash-Out Volume	10,000 GJ (Sold to Welded Party)
Call Balancing Gas?	No Call gas bought by MDL
emsTradepoint VWAP	$6.00/GJ
Adjustment %	5%
Cash-Out Transmission Price	$0.20/GJ
Cash-Out Trading Fee	$0.10/GJ
Cash-Out Price	**$6.60/GJ - $66,000.00**

EXAMPLE 3: +ve Cash-Out, Put Balancing Gas

+ve AEOI Cashed Out

24 HOURS

Cash-Out Volume	10,000 GJ (Sold to MDL)
Put Balancing Gas, Lowest $/GJ	$5.00/GJ
emsTradepoint VWAP	$6.00/GJ (N/A, higher after adjustment)
Adjustment %	5%
Cash-Out Transmission Price	$0.20/GJ
Cash-Out Trading Fee	$0.10/GJ
Cash-Out Price	**$4.70/GJ - $47,000.00**

EXAMPLE 4: -ve Cash-Out, Call Balancing Gas

24 HOURS

-ve AEOI Cashed Out

Cash-Out Volume	10,000 GJ (Sold to Welded Party)
Call Balancing Gas, Highest $/GJ	$6.50/GJ
emsTradepoint VWAP	$6.00/GJ (N/A, lower after adjustment)
Adjustment %	5%
Cash-Out Transmission Price	$0.20/GJ
Cash-Out Trading Fee	$0.10/GJ
Cash-Out Price	**$6.80/GJ - $68,000.00**

End of Year Wash-Up

- On an annual basis, the TSO calculates the overall recovery of balancing gas costs/incomes and cash-out costs/incomes:

> \+ Monies received from Welded Parties for –ve AEOI
> \+ Monies received from consumers of Put Balancing Gas
> \+ Monies received from Peaking Charge
> \- Monies paid to Welded Parties for +ve AEOI
> \- Monies paid to suppliers of Call Balancing Gas
>
> Net = Overall Recovery

If:

- **Overall Recovery > 0:** The TSO redistributes this to users by lowering the tariff in the following year.

- **Overall Recovery < 0:** The TSO shares the cost evenly with all users by increasing the tariff in the following year.

Outstanding Considerations

The following aspects of the MBB regime have yet to be determined:

- **The Default Rule**
  - The pricing rule that will be used to set the cash-out price in the event that the Trading Platform is unavailable or insufficient trading has occurred on a day

- **Percentage Adjustment**
  - Between 0% – 10%

- **Balancing Agent Activity**
  - The Standard Operating Procedures (SOPs) used by the Balancing Agent when cashing-out and buying/ selling balancing gas

Section 2

Risk Identification and Management

Risk Overview

The shortening down of the cash-out mechanism heightens the daily volumetric and price risk to participants.

This sections covers:

– how to **identify** these two risk components; and

– strategies to **mitigate** these risks.

Volumetric Risk

- A party's **'Volumetric Risk'** relates to the risk of ending a day with Accumulated Excess Operational Imbalance ("**AEOI**") directly, or (for parties off the Maui pipeline or nominating via a Transmission Pipeline Welded Point) the liability associated with contributing to AEOI.

- AEOI is deemed to be all Operational Imbalance at a Welded Point above that Welded Point's Running Operational Imbalance Limit ("**ROIL**").

+ve AEOI
At risk of being SOLD to MDL (forced SALE)

ROIL

24 HOURS

-ve AEOI
At risk of being Purchased from MDL (forced PURCHASE)

- If a party's AEOI is **positive**, that party has failed to take gas it owns and that volume is at risk of being **SOLD to MDL** at a price

- If a party's AEOI is **negative**, that party has taken gas it doesn't own and that volume is at risk of being **PURCHASED from MDL** at a price

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Volumetric Risk – Vector

Shippers on the Vector pipeline are cashed-out if they have mismatch AND this mismatch is in the same direction as Vector's AEOI at the relevant Vector welded point.

Therefore, the volume risk on Vector is a factor of two components:

Imbalance at Vector Welded Points

Vector shippers' mismatch positions

Vector's Position

AEOI

ROIL

+ve

A   B   C

D   E

-ve
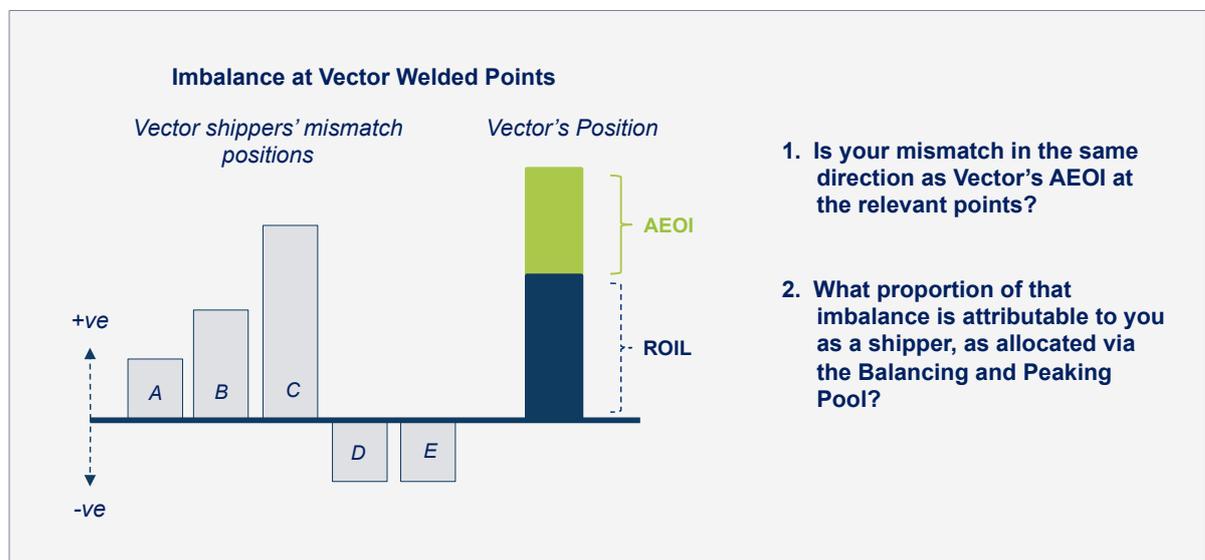
1. **Is your mismatch in the same direction as Vector's AEOI at the relevant points?**

2. **What proportion of that imbalance is attributable to you as a shipper, as allocated via the Balancing and Peaking Pool?**

Tools: Volumetric Risk

- The following tools are available to manage Volumetric Risk:

  - **Maui OATIS, Nominations**

    - A party with a Maui TSA can 're-nominate' intra-day to modify their Scheduled Quantity. Re-nominating using the Intra-Day Cycles without altering Metered Quantities will, in turn, affect your AEOI at the end of the day and adjust your Volumetric Risk.

    - Re-nominating is subject to a party having the contractual arrangements to do so.

    - Trading on the emsTradepoint market will enable a party to effect a re-nomination in the correct direction:

      - **Buying** gas will reduce -**ve AEOI**

      - **Selling** gas will reduce +**ve AEOI**

    - A party that relies on a Shipper to deliver gas beyond the Maui pipeline will need to make arrangements with that party to benefit from this tool.

  - **Metered Quantity**

    - Maintaining nominations, but altering consumption rates (Metered Quantity) will impact end-of-Day AEOI.

Price Risk

- **'Price Risk'** is set by the Cash-Out prices:

  - **Positive AEOI** is subject to the price **MDL will PAY to buy that gas**

  - **Negative AEOI** is subject to the price **MDL will RECEIVE for that gas**

- The risk within the price is one of counterfactuals:

  - Is the price you're being paid for +ve AEOI gas higher or lower than the cost associated with that gas?

    - **FOR EXAMPLE** (for a Shipper / retailer / consumer): Is the price above or below your Gas Supply Agreement?

  - Is the price you're paying for -ve AEOI gas higher or lower than the cost associated with that gas?

- A party's counterfactual price is referred to as the **'break-even'** price for the rest of this document.

Price Risk Matrix

HIGH Cash-Out Price relative to
Break-Even Price

LOSS

GAIN

-ve AEOI

Taken too much gas /
injected too little gas

+ve AEOI

Taken too little gas /
injected too much gas

GAIN

LOSS

LOW Cash-Out Price relative to
Break-Even Price

Tools: Price Risk
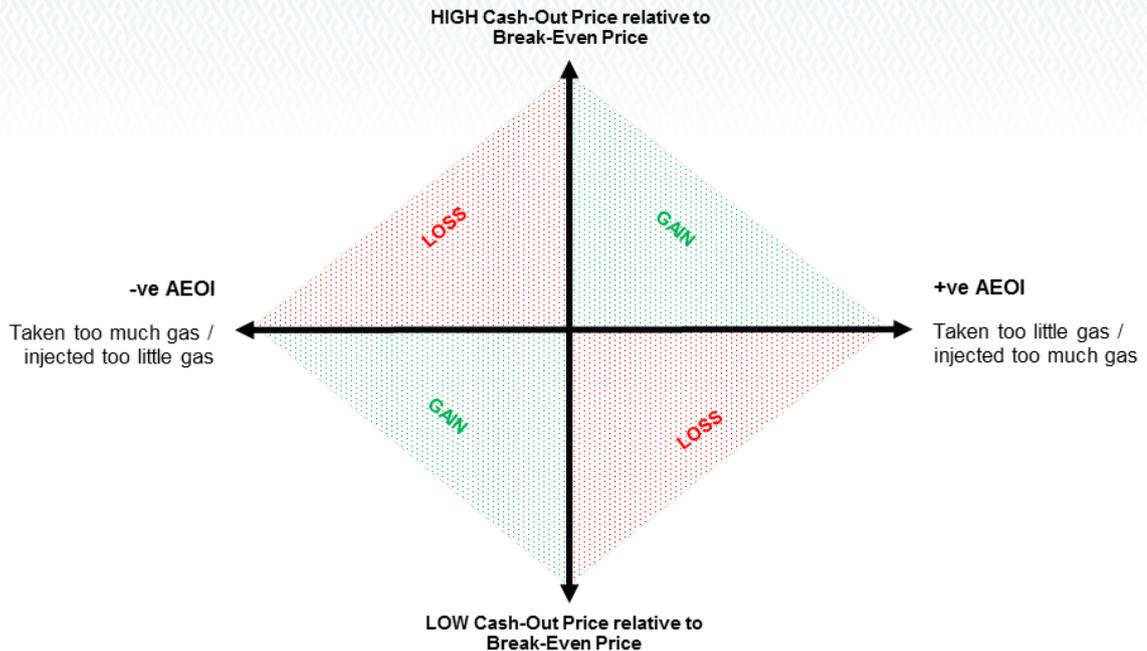
Managing Price Risk via Participation on the 'Trading Platform'

- Under MBB, emsTradepoint will be the trading platform that sets the cash-out prices and resulting Price Risk.

- All trades executed on the day before and on the day of delivery will be included in the Volume Weighted Average Price calculation and set Price Risk.

- If MDL purchases balancing gas (on the same day as that gas is to be delivered), this transaction(s) will set the cash-out price and Price Risk if; (a) a Call purchase has a higher price than the VWAP (plus adjustments), or (b) a Put purchase has a lower price than the VWAP (minus adjustments).

    - Importantly, the MBB CR prioritises the Trading Platform as the source for MDL to purchase balancing gas

- The Price Risk will be published on emsTradepoint's Exchange Platform (https://exchange.emstradepoint.co.nz) and MDL's 'BGIX', and will track from 0930 hours on the day before through to 1630 hours on the day, at which point the Price Risk will be finalised.

Price Risk: Adjustment Factor

- Under MBB, the baseline Price Risk will be the VWAP of 'Standard Products' traded on a 'Trading Platform' executed on the day prior to and on the day of delivery:

Trade Execution Window for Delivery Day
Only trades executed within this window will be included in the VWAP calculation

Day Prior   **Delivery Day**
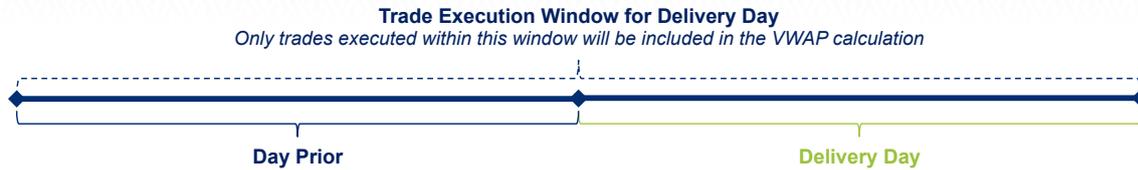
- MDL then applies;
    - an 'adjustment' to the VWAP of up to 10%
    - A 'Cash-Out Transmission Price' (Tariff 1 and 2 proxy between Welded Point and MDL's Payback Point); and
    - A 'Cash-Out Trading Fee Price'. At today's emsTradepoint fees, this would be 10¢/GJ

Price Risk: Example Cash-Out Price Band

- The graph below illustrates what the Cash-Out Price (and Price Risk) might have been over the past 12 months (excluding Transmission Fee and Trading Fee).

- The graph uses emsTradepoint's monthly index (the FRMI, a monthly VWAP) and;

    - adjusts upwards to illustrate –ve AEOI risk: The price you risk paying for gas not injected or taken without title (measured against the relevant nomination(s)); and

    - adjusts downwards to illustrate +ve AEOI risk: The price you risk receiving for gas over-injected or not taken (measured against the relevant nomination(s))

Example Cash-Out Price Range based on emsTradepoint Monthly Index (FRMI)

Legend:
- -ve AEOI Cash Out Price: +10% Adj.
- -ve AEOI Cash Out Price: +5% Adj.
- +ve AEOI Cash Out Price: -5% Adj.
- +ve AEOI Cash Out Price: -10% Adj.
- FRMI
- Average (FRMI)

Risk Management: Example Decision Process

emsTradepoint

Day Prior to Delivery Day

Day of Delivery Day

Price Risk evolves from 0930 HOURS on day prior to delivery, and is finalised at 1630 HOURS on day of delivery

Volumetric Risk evolves across the 24 hour delivery day, and is finalised at 0000 HOURS

0930 HOURS: Price Risk evolution starts

START OF DAY Forecast end-of-day position

Accept forced sale of +ve AEOI at Cash-Out Price

Monitor VWAP to inform Price Risk

NOTE to SELLERS:
If market price is above your $/GJ break-even, consider off-setting some contract volume for tomorrow by offering into the market.

This will improve your breakeven price.

Is the Cash-Out price above your $/GJ break-even?

— NO → **Do you have the ability to renominate?** — NO → **Can you SELL additional gas on the Market at $/GJ ≥current Cash-Out price?** — NO → **Can you reduce metered quantity (if delivering) OR increase metered quantity (if consuming)?** — NO →

1600 HOURS: Changed Provisional nominations due

+ve AEOI forecast

YES → Continue to monitor your forecast end-of-day AEOI

YES → Re-nominate to revised forecast: more if delivering / less if consuming

YES → Execute transaction on emsTradepoint as a SELLER for volume = to +ve AEOI forecast

YES → Increase metered quantity (if delivering) OR reduce metered quantity (if consuming)

Is the VWAP for gas traded today for delivery tomorrow currently above or below $/GJ breakeven?

ABOVE → **Nominate with a risk buffer:** less if injecting / more if consuming

Do you forecast your end-of-day AEOI position to be zero, +ve or -ve?

— NO AEOI → Continue to monitor your forecast end-of-day AEOI

BELOW → **Nominate with a risk buffer:** more if injecting / less if consuming

-ve AEOI forecast

NOTE to BUYERS:
If market price is below your $/GJ break-even, consider off-setting some contract volume for tomorrow by bidding into the market

This will improve your breakeven price.

Is the Cash-Out price below your $/GJ break-even?

Do you have the ability to renominate?

Can you BUY additional gas on the Market at $/GJ ≤ current Cash-Out price?

Can you increase metered quantity (if delivering) OR reduce metered quantity (if consuming)?

— NO → **Accept forced purchase of -ve AEOI at Cash-Out Price**

YES → Continue to monitor your forecast end-of-day AEOI

YES → Re-nominate to revised forecast: less if delivering / more if consuming

YES → Execute transaction on emsTradepoint as a BUYER for volume = to -ve AEOI forecast

YES → Reduce metered quantity (if delivering) OR increase metered quantity (if consuming)

Risk Management: Important Considerations

- **Forecasting:** For some organisations, forecasting end-of-day positions isn't as straight forward as reading a meter. There may be information gaps that impair accuracy probabilities, and increase exposure to Volumetric Risk and reduce the ability to react to Price Risk. This is, to varying degrees, a common risk – no party will have perfect real-time data.

  However, relatively basic analysis should enable a party to reasonably operate within this environment. Both Volume and Price Risk exist only as either a positive or negative (note the Risk Matrix). In other words, a party need only forecast whether it is heading to +ve or –ve AEOI (in absolute terms) and be aware of its break even price to be in a position to form a risk management strategy.

- **Time factor:** A time consideration exists between Volume and Price Risk. The longer a party rides Volumetric Risk, the less time there is to react to Price Risk, and vice versa.

- **Example Decision Process:** In the example flow chart, all tools are given in a particular order. This need not be the case and it is up to each organisation to decide what order the tools available are considered.

- **Price Risk as an opportunity:** Something not put forward in detail in this workbook, but worth noting, is that where there exists Price Risk to one party there also lies the potential opportunity to trade and benefit from what would otherwise be an uneconomic outcome. The ability to do this relies on either; (a) an off-setting imbalance position; or (b) portfolio flexibility (contractual flexibility, operating flexibility, storage, etc.).

Risk Management: Information Sources

- **Balancing Gas (Information) Exchange (BGX / BGIX)**
  - http://bgx.co.nz/market-data.php

- **OATIS**
  - https://www.oatis.co.nz

- **emsTradepoint Exchange Platform**
  - https://exchange.emstradepoint.co.nz

Section 3

Exchange Platform and NGP-TRS

 emsTradepoint

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emsTradepoint Market
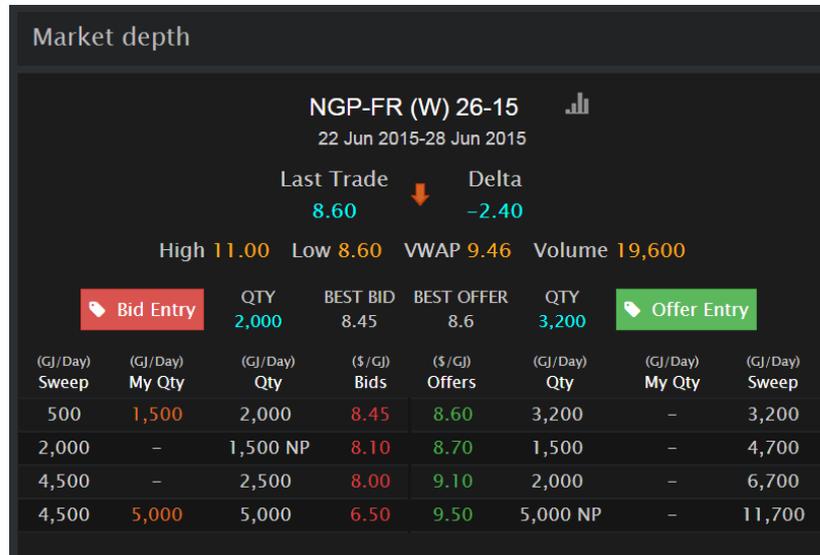
 emsTradepoint

- All products are traded via the emsTradepoint Exchange Platform

- Market hours:
  - On-the-day & Day-ahead: 09:30 to 16:30, 7 days a week

- From 1 October, the MBB implementation date, emsTradepoint's product listing will be a product for delivery on the Maui pipeline - Natural Gas Physical – Trading Region South (NGP-TRS).

- Delivery and receipt at emsTradepoint's TRS Receipt and TRS Delivery points

Maui Product - VWAP

The VWAP is calculated, for all trades executed the day before or on the day, as:

$$VWAP = \frac{\sum Price\left(\frac{\$}{GJ}\right) \times Quantity\left(\frac{GJ}{Day}\right)}{\sum Quantity\left(\frac{GJ}{Day}\right)}$$

Market depth

NGP-FR (W) 26-15
22 Jun 2015-28 Jun 2015

	Last Trade		Delta	
	8.60		−2.40	

High 11.00   Low 8.60   VWAP 9.46   Volume 19,600

		QTY 2,000	BEST BID 8.45	BEST OFFER 8.6	QTY 3,200		
🏷 Bid Entry						🏷 Offer Entry	

(GJ/Day) Sweep	(GJ/Day) My Qty	(GJ/Day) Qty	($/GJ) Bids	($/GJ) Offers	(GJ/Day) Qty	(GJ/Day) My Qty	(GJ/Day) Sweep
500	1,500	2,000	8.45	8.60	3,200	–	3,200
2,000	–	1,500 NP	8.10	8.70	1,500	–	4,700
4,500	–	2,500	8.00	9.10	2,000	–	6,700
4,500	5,000	5,000	6.50	9.50	5,000 NP	–	11,700

Maui Product & Cash-Outs

- NGP-TRS Daily (D), Weekly (W) and Monthly (M) trades may all be used in the calculation of the cash-out price risk; however valid weekly and monthly trades would be limited to those executed on the last day of product availability and then only for the first day of delivery.

- Any cash-out incurred at emsTradepoint's welded points due to a participant's failure to deliver or receive will be passed on to the relevant participant. Thus performance incentives are the same when transacting with the market as at any other Welded Point.

- It is likely that off-exchange trades via emsTradepoint will be excluded from the calculation of cash-out price.

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