MARKET REFORM

Progress Report - Gas Market Parameters Review 2018

13 February 2018

Outline

- Introduction
- Methodology & Feedback
- VoLL & MPC
  - Purpose/Criteria
  - Analysis
- CPT/APC
  - Purpose/Criteria
  - Current Protection
- Summary and Next Steps

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Introduction

- AEMO has engaged Market Reform to perform the Gas Market Parameter Review, part of a mandatory review required to be performed for the STTM, currently every 5 years but hereafter every 4 years.
- Opportunity taken to review DWGM at the same time.
- Parameter changes to apply from July 2020 to at least July 2024. Urgent changes (if any) to apply from 2019.
- Review to consider links between markets
  - STTM & DWGM
  - Gas markets & NEM
  - Participants operating across markets
- Reflect industry structure and future developments
  - Current and foreseeable future structure
  - Should not focus on real participants but should look at range of participant sizes, types and their contract / spot positions.
  - Consider directions of other concurrent reviews.
- Use public data or reasonable estimates

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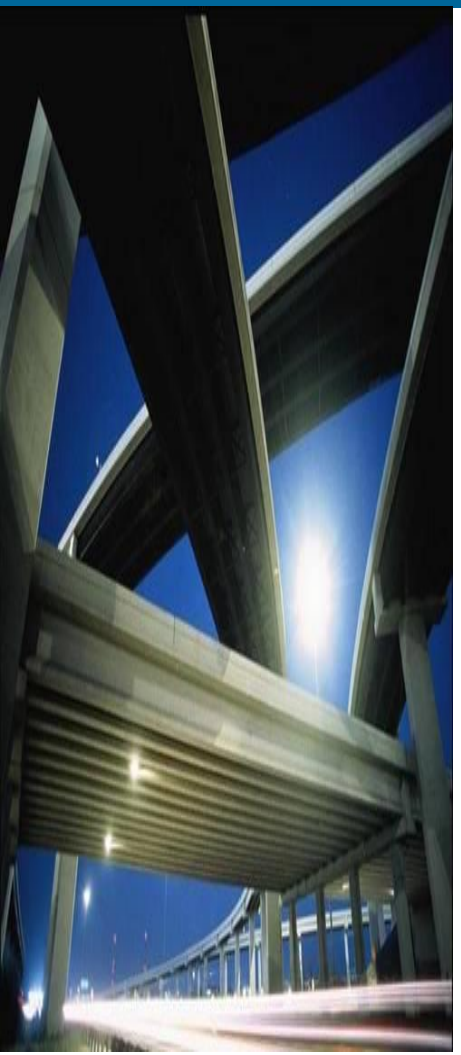


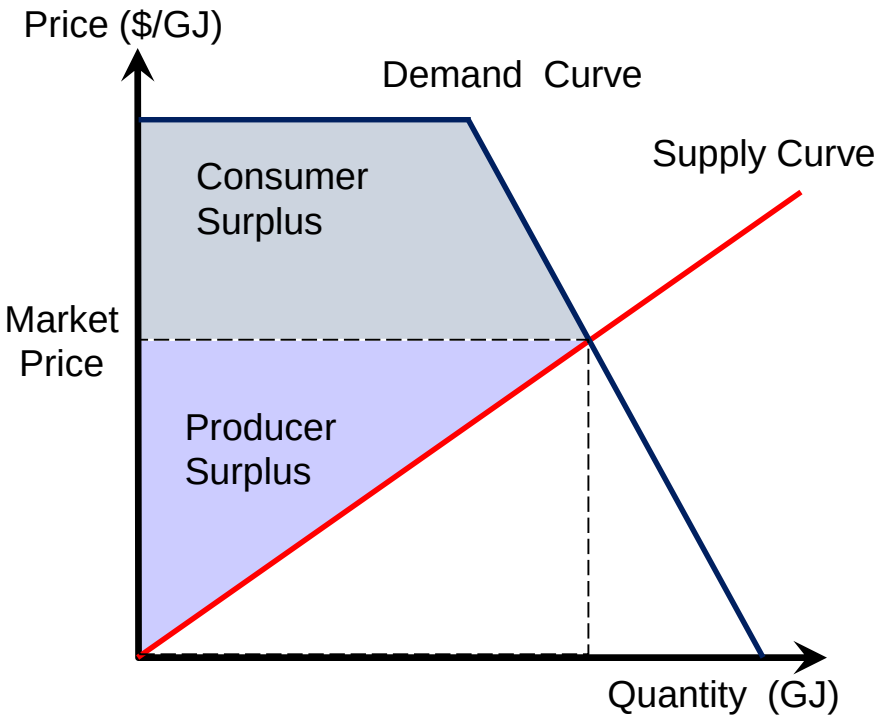
Methodology & Feedback

Maximising Market Efficiency

while

Keeping Participant Risk Acceptable

VoLL/MPC – Measuring Market Efficiency



- Consumer Surplus is the difference between the value of a product and the price paid for it
- Producer surplus is the difference between the price paid for a product and its cost of production
- We can measure Market Efficiency as the sum of Consumer Surplus and Producer Surplus.
- If the market clears where the supply and demand curves cross then market efficiency is maximised.
- Price caps that limit prices, also limit trade
  - Demand response is reduced
  - Supply is potentially withdrawn
- Consumer Surplus and Producer Surplus are typically reduced.
- The market outcome is less efficient.

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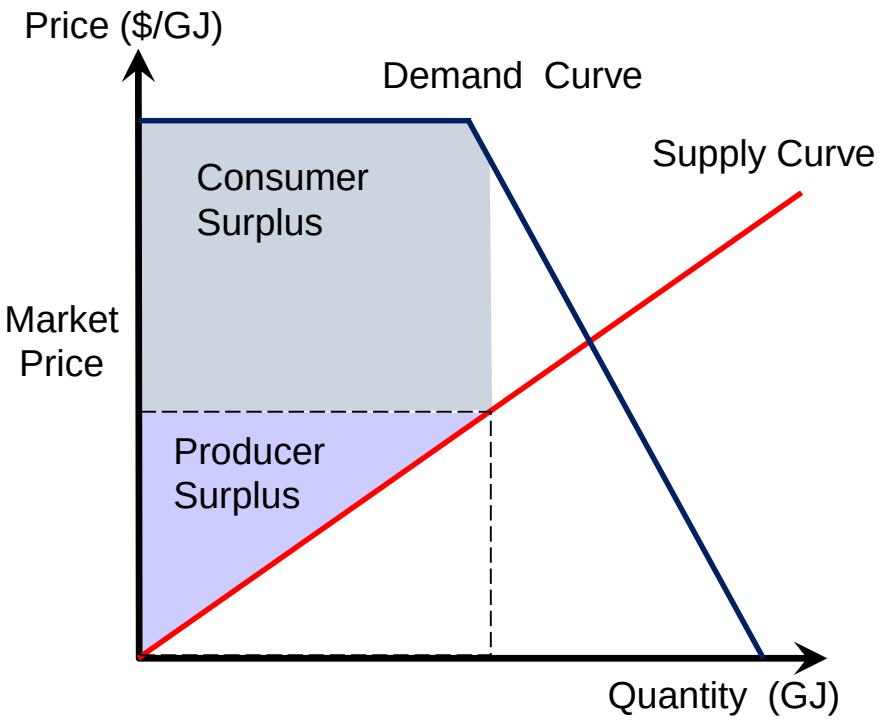
VoLL/MPC – Measuring Market Efficiency



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Acceptable Participant Risk

- On a high priced day, participants incur losses as a result of having to buy gas at prices which are unprofitable.
- Based on annual profits, a participant will have a typical average daily profit.
- The ratio of these is the Days of Lost Profit due to an event.

$$Days\ Lost\ Profit = \frac{Profit\ Lost}{Average\ Daily\ Profit}$$

- The measure used in past reviews is that an Acceptable Participant Risk is no more than 500 days lost profit.

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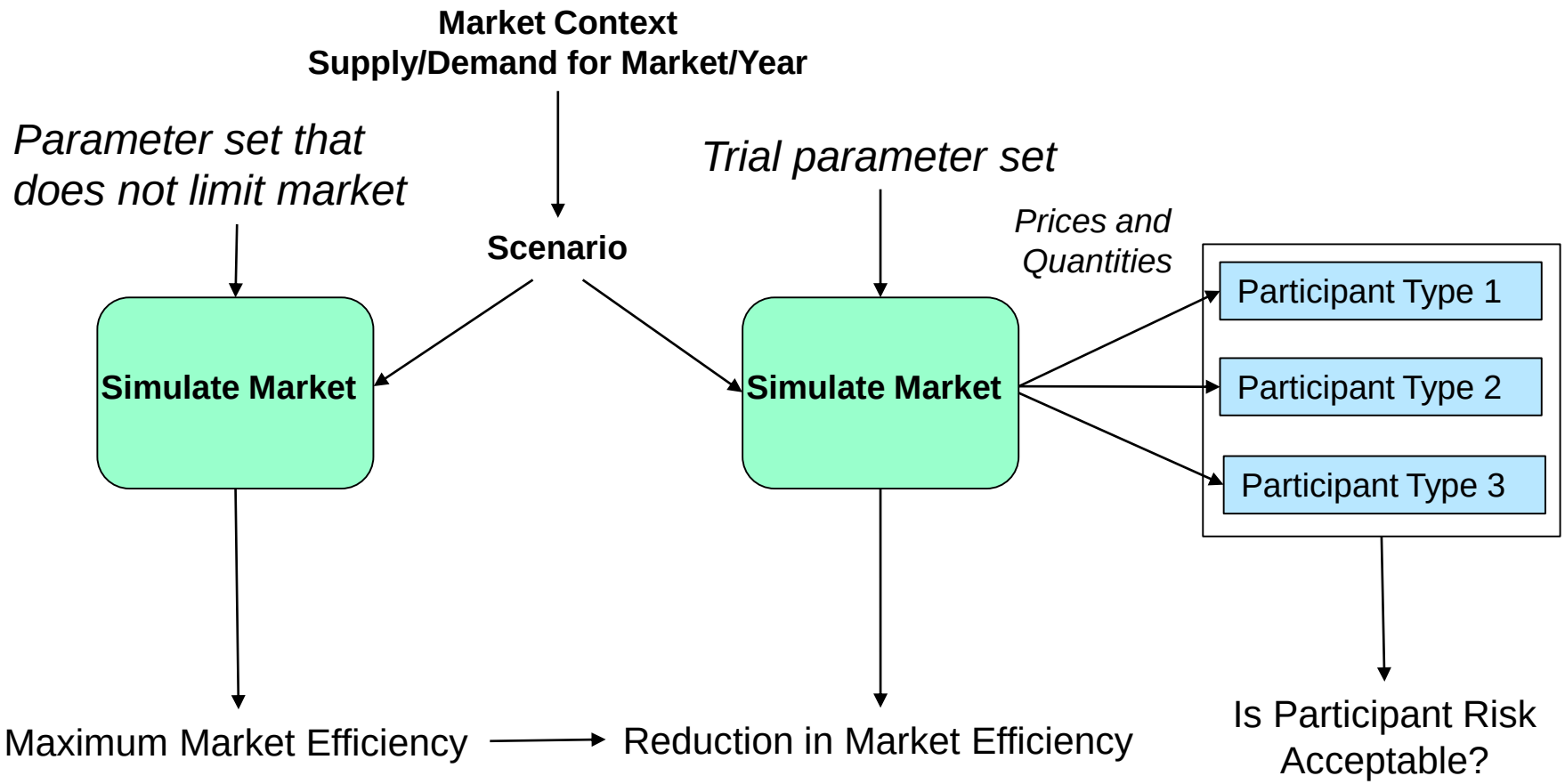
Overview of Approach



Goal: Find the best performing parameters that maximise market efficiency without participants facing unacceptable risk

Scenario Modelling - Overview

- A Gas Market Simulator (GMS) simulates market clearing over a 21 day period in either the DWGM or one of the three STTM hubs

- The model consists of the following steps/components:
  - Base cases reflecting our BAU assumptions for the 21 day period (demand levels, supply availability…)
  - Scenarios which typically involve an event coming into play on day 8 of the simulation
  - Hedge adjustments to supply curves representing reasonable on the day expectations of participants
  - Market Clearance/Deliverability

- Sensitivities are automatically modelled (+/- demand volumes and offer prices)

Scenario Modelling – Base Cases

- The base case provides a backdrop of normal activity for the scenario and is comprised of:
  - Particular years (e.g, 2019, 2021, 2024)
  - Demand conditions (time of year, severity of winter demand levels)
  - Supply volumes (limited by facility capacities, gas supply assumptions)
  - Storage assumptions (e.g. Iona storage levels heading into the scenario)
- Adjustments for the simulation year involve:
  - Demand growth/decline
  - Gas supply growth/decline
- Base cases provide the counterfactual against which participant losses are assessed.

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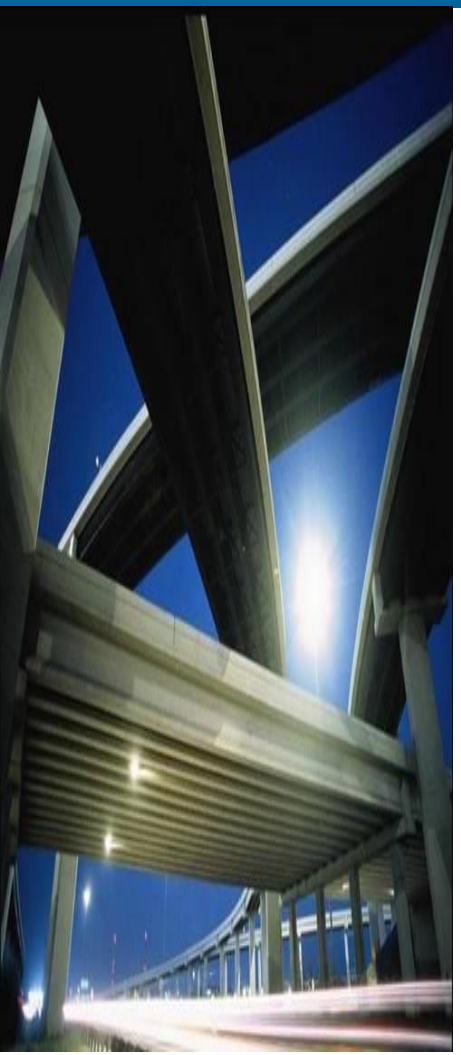
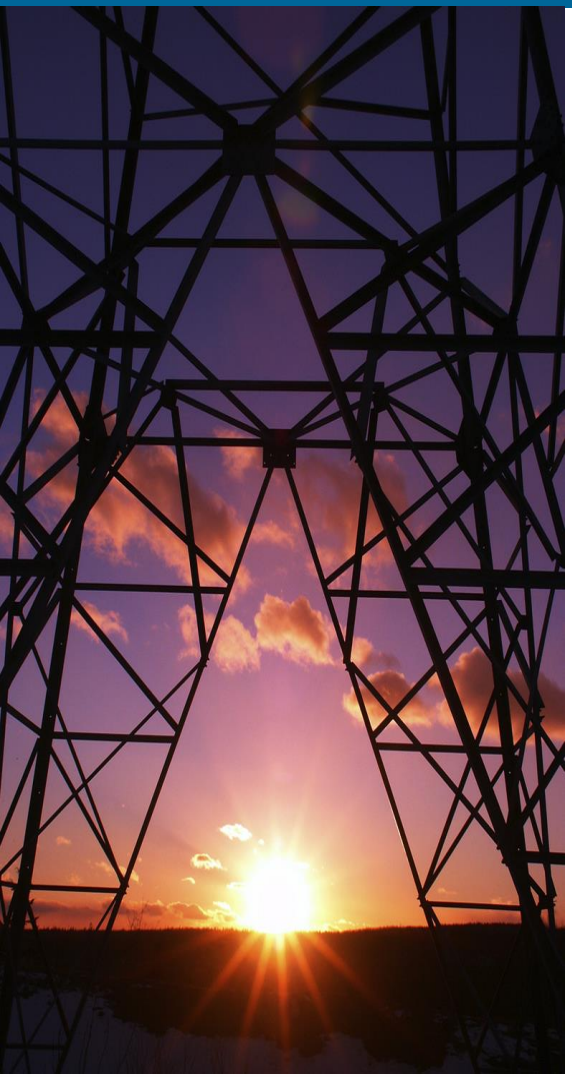
Scenario Modelling – Base Cases



- A conservatively optimistic approach has been taken in terms of assessing the longer term supply situation into the markets
- Have based assumptions from data found in the following reports:
  - NGFR (Dec 16)
  - GSOO (Sep 17 update)
  - VGPR (Mar 17)
- Due to the size of the gas reserves feeding the Moomba node, we assume supplies from there are maintained at today's levels throughout our study period
- Given a view on gas and oil prices, government assurances etc, we have taken a positive view on prospective gas from the Gippsland Basin and assume that while levels are forecast to drop through to 2021, prospective levels will help return production to close to 2019 levels by 2024

Scenario Modelling – Scenario Specification



- Scenarios are comprised of:
  - A description of the event(s)
  - Resulting changes to supply and demand curves
  - Resulting changes to other system features such as deliverability limits and events at other hubs and in other markets
- Single events alone are unlikely to generate significant risk. Typically our scenarios involve combining system outages/restrictions with high demand conditions.
- Scenarios are designed for effect and are not exhaustive

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Scenario Modelling – Scenario Descriptions

- A full list of scenario descriptions is included in the Appendix.
  (Note: Some scenarios described in the Dec-17 consultation report have been removed where their results have been found to be less extreme or equivalent to others in the scenario set)

- Only a subset of these have been considered in the preliminary analysis we are presenting today. We are still in the process of running the remaining scenarios

- Generally scenarios include one or more of the following types of events:
  - High demand
  - High GPG utilisation limiting pipeline capacity into the hub
  - Compressor failures (and associated pipeline capacity reductions)
  - Unexpected reductions in gas facility production
  - Supply interruptions at times of low gas storage

Scenario Modelling – Hedge Adjustment

- Participants adjust offers to meet expected demand from their contracted customers
- Changes in the expected clearing volumes lead to supply curves readjusting, reflecting contract prices around the expected clearing volumes
- We apply this approach to our supply curves taking into consideration:
  - Long term changes in supply volumes
  - Changes in demand levels during the scenario and when participants would have the opportunity to adjust their market bids

Scenario Modelling – Market Clearance

- Final market clearance is based on
  - Updated supply and demand curves
  - Deliverability constraints that can truncate supply curve volumes
- Deliverability Constraints
  - Pipeline capacities
  - GPG units (given heat rates and assumed NEM prices)
  - Not modelling pressures
- Price Parameters
  - Resulting prices generate CP
  - Assessed against CPT/VoLL or MPC

Scenario Modelling – Longford Reduction Evaluation

Example Scenario: Unexpected reduction in Longford production

- Assume high winter demand (1 in 2 levels) and standard supply availability for Schedule 1 of the event day
- Notionally before bids are submitted for Schedule 2 (~just before 9AM), Longford experiences production issues and output is reduced by 75%
- Production is fully restored after 3 days.

Outcomes:

- CPT is breached towards the end of the outage after 2 days of $160/GJ prices

Participant Modelling

- Having determined a set of market outcomes the impact on participants is assessed
- Modelled participants are representative and span a wide range of
  - Cost structures
  - Hedging levels
  - Types
- Describing Participants
  - Average margin
  - Gas contribution to total cost
  - Level of hedging
  - Contract premiums
  - Customer profiles/load Factors
- Outcomes
  - Base case profits
  - Losses due to scenario event(s)
  - Days lost profit as a risk measure

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Consultation Feedback on Approach

- Consistency between gas markets is desirable
  - Our approach considers the relativity of parameters between the STTM and DWGM
- Consideration of relativity between electricity and gas market price caps and thresholds is important.
  - Absolute alignment may not be possible but there should be no further divergence
  - Our approach considers the relativity between gas markets and the NEM
- Important to consider a range of hedging levels among participants
  - Our approach considers a wide range of hedging levels
- Market parameters should be maintained long enough for participants to plan effectively but be flexible enough to respond to industry changes
  - Suggests parameter changes should have solid justification

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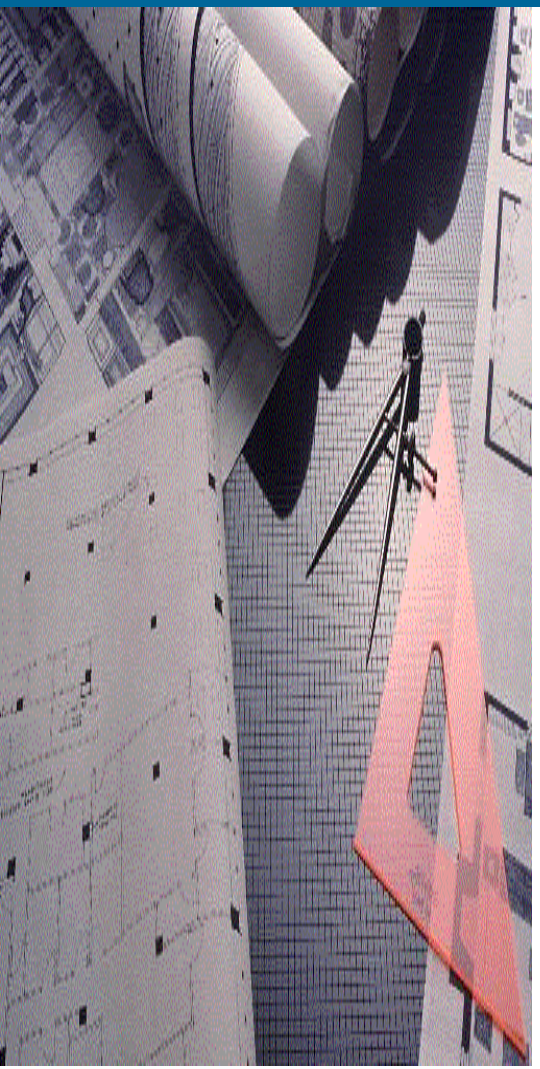

Preliminary Analysis

Preliminary VoLL/MPC Analysis – Parameter Purpose and Criteria

- VoLL and MPC should be set to maximise market efficiency:
  - Within the applicable market
  - Between connected markets
- Within market, VoLL and MPC should not:
  - Prevent natural market clearing on supply or demand-side
  - Dis-incentivise efficient investment
- Between connected markets, VoLL/MPC should not:
  - Generate perverse incentives to divert gas
  - Consistency considered between STTM hubs, DWGM & NEM

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Current Parameter Settings

STTM		
Parameter	**Documented in**	**Current Setting**
Market Price Cap (MPC)	National Gas Rules	$400/GJ
Administered Price Cap (APC)	National Gas Rules	$40/GJ
Cumulative Price Threshold (CPT)	National Gas Rules	$440/GJ over 7 days (110% of MPC)
DWGM		
Parameter	**Documented in**	**Current Setting**
Value of Lost Load (VoLL)	National Gas Rules	$800/GJ
Administered Price Cap (APC)	Wholesale Market Administered Pricing Procedures (Vic)	$40/GJ
Cumulative Price Threshold (CPT)	Wholesale Market Administered Pricing Procedures (Vic)	$1,800/GJ over 35 periods

Preliminary VoLL/MPC Analysis– Supply & Demand Options

- Supply options
  - Both VoLL and MPC are significantly above actual short run costs of gas supply
  - Preliminary analysis suggests a large proportion of VoLL/MPC events will breach the CPT
  - Long term supply viability is difficult to assess
    - Discount rates, Scale Economies, Forecasts
    - Represents a risk when lowering VoLL/MPC
  - No evidence to suggest current levels of VoLL/CPT impinge upon the efficient procurement of supply options
- Demand options
  - In practice demand offers are negligible above
    - $200/GJ in DWGM (2017)
    - $40/GJ In STTM (2017)
  - Average revenue at risk measures in previous studies suggest the cost of demand response may be high
    - Measures are average, not marginal and do not capture specific circumstances or the length of outage
  - Current VoLL/CPT levels appear to accommodate both current demand response options and theoretically generated levels at which demand response may be available.

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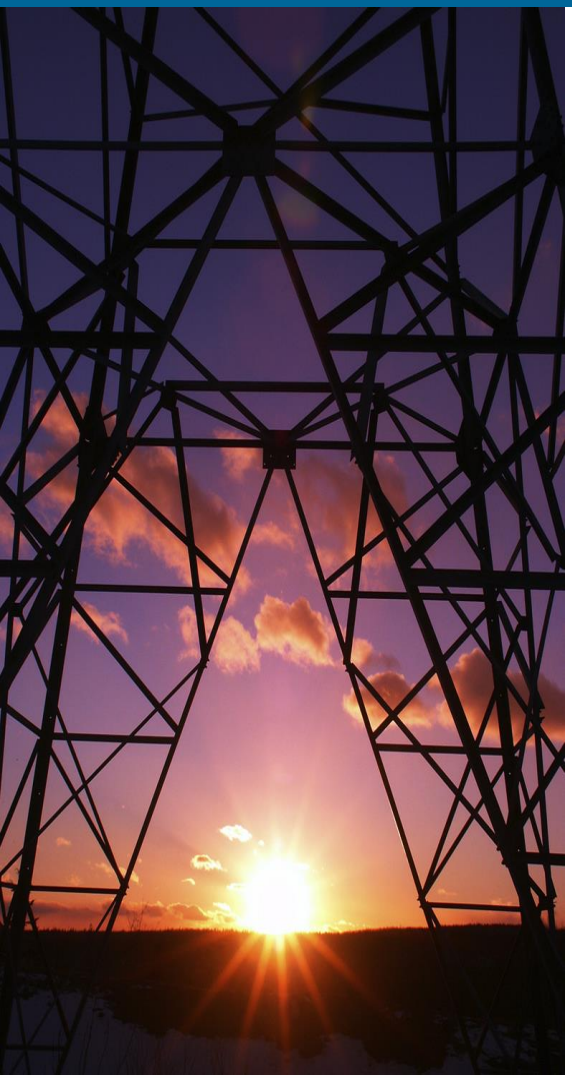
Preliminary VoLL/MPC Analysis – Inter-market Consistency



- Parameters AND timeframes are inconsistent between markets
  - DWGM – VoLL = $800/GJ per 4-8hr period
  - STTM – MPC = $400/GJ per day
  - NEM – approx. $1400/GJ per 5 minute
- VoLL/MPC events often trigger CPT and result in APC
- Return available from gas is more closely related to those parameters than VoLL/MPC:
  - Illustration: Participants consider an extreme event leading to VoLL is possible in future
  - Average STTM price over event = (400+6*40)/7 = $91
  - Average DWGM price over event = (800*2 + 40*33)/35 = $83
- Participants may divert gas from STTM to DWGM
  - Business specific reasons/contracting positions etc
  - Likelihood of APC imposition
    - CPT level
    - Rule variations that may trigger administered pricing for other reasons
- VoLL/MPC should not drive inter-market inefficiency

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Preliminary VoLL/MPC Analysis – Summary

- Indications are that VoLL/MPC may not require adjustment
  - No evidence from our initial analysis to show that supply or demand response options are being curtailed because these parameters are too low
  - Current values have allowed markets to clear
  - Risk in lowering VoLL/MPC values that currently achieve their objective
  - Further analysis is ongoing to test the relative cost of providing risk protection with lower VoLL/MPC as opposed to using other parameters such as CPT/APC but risk management is not the primary role of VoLL/MPC.
- Role of VoLL/MPC discrepancies as source of inter-market inefficiency appears to be small
  - Other parameters are more significant
- Preliminary analysis suggests the adjustment of VoLL/MPC may not be warranted.

Preliminary APC/CPT Analysis – Parameter Purpose and Criteria

- Minimise the welfare loss due to APC/CPT imposition
  - Choose settings that
    - Do not dis-incentivise market participation
    - Allow cost recovery for investment
    - Minimise Inter-market inconsistency
- Subject to protecting participants from risk
- But what level of participant risk should be catered for?
  - New types of participants are entering the market
  - Hedging behaviours may be more complex and varied
  - In the extreme, the market cannot protect those that do not hedge at all. At the other end, expectation of full hedging would be unrealistic
  - A balance needs to be struck.
- Preliminary analysis to follow relates to DWGM only

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Current Parameter Settings

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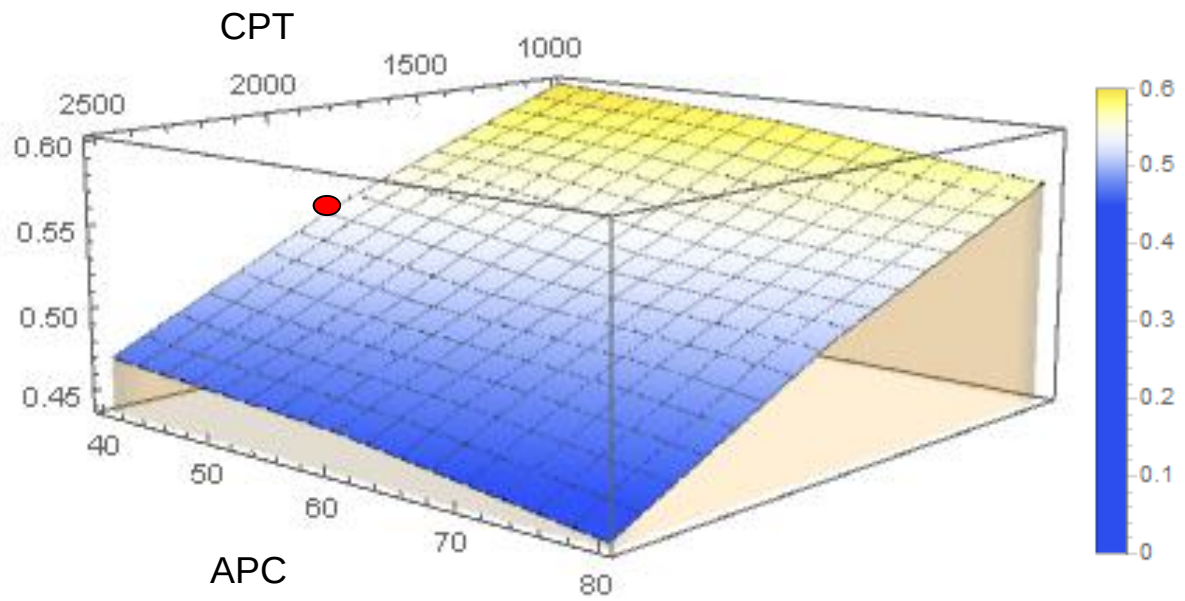
Preliminary APC/CPT Analysis– Welfare Loss

- Welfare Loss
  - Difference between
    - Welfare absent pricing controls
    - Welfare with pricing controls
- Graph shows the proportion of welfare lost given CPT/APC settings for a fixed VoLL/MPC
- Higher CPT and APC reduce welfare loss
- White shading denotes parameter combinations with welfare loss equivalent to current parameters

Welfare Loss (Proportion) by APC/CPT, DWGM Scenarios



Current DWGM Parameter Setting

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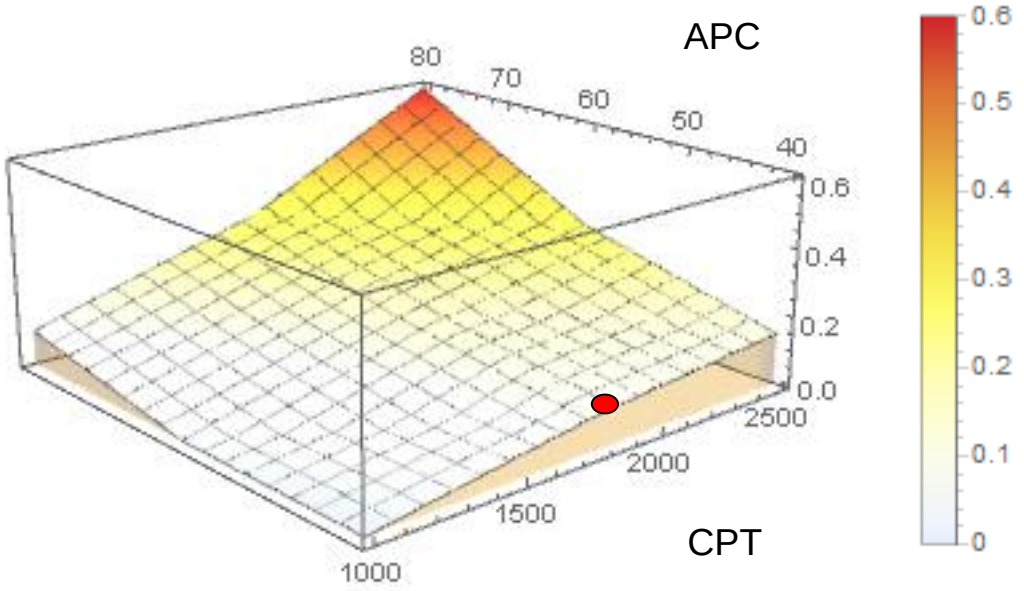
Preliminary Analysis – CPT and APC

- For a given VoLL/MPC we can visualise the suitability of CPT/APC parameters
- Consider the following levels
  - CPT – 440, 600, 1000, 1800, 2500
  - APC – 40, 60, 80
- The chart shows:
  - Proportion of participant risk exceedance across Participants/Scenarios for each CPT/APC setting.
  - White denotes the performance of current market parameters
- Preliminary results show:
  - Current parameters will not protect all modelled participants in all scenarios
  - To protect all participants requires extreme APC/CPT settings

Proportion of Participant Risk >500 days by APC/CPT
DWGM Scenarios



Note: Graph Based on Subset of Results

Current DWGM Parameter Setting

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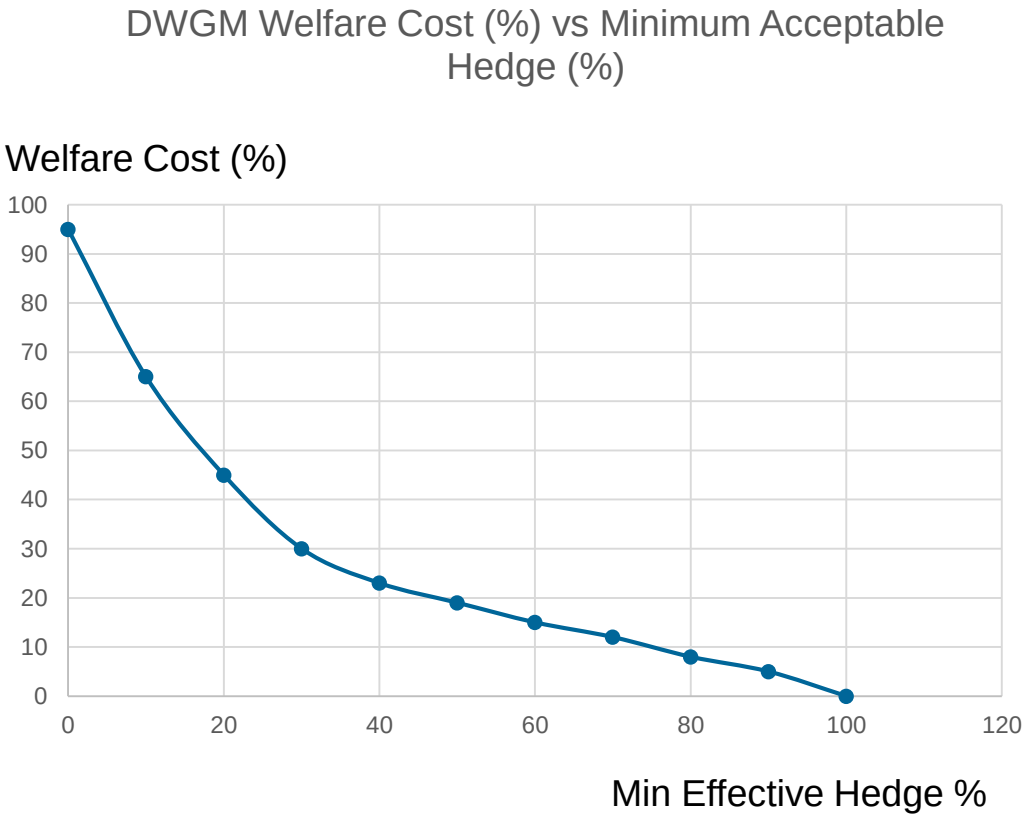
Preliminary APC/CPT Analysis – Cost of Participant Protection

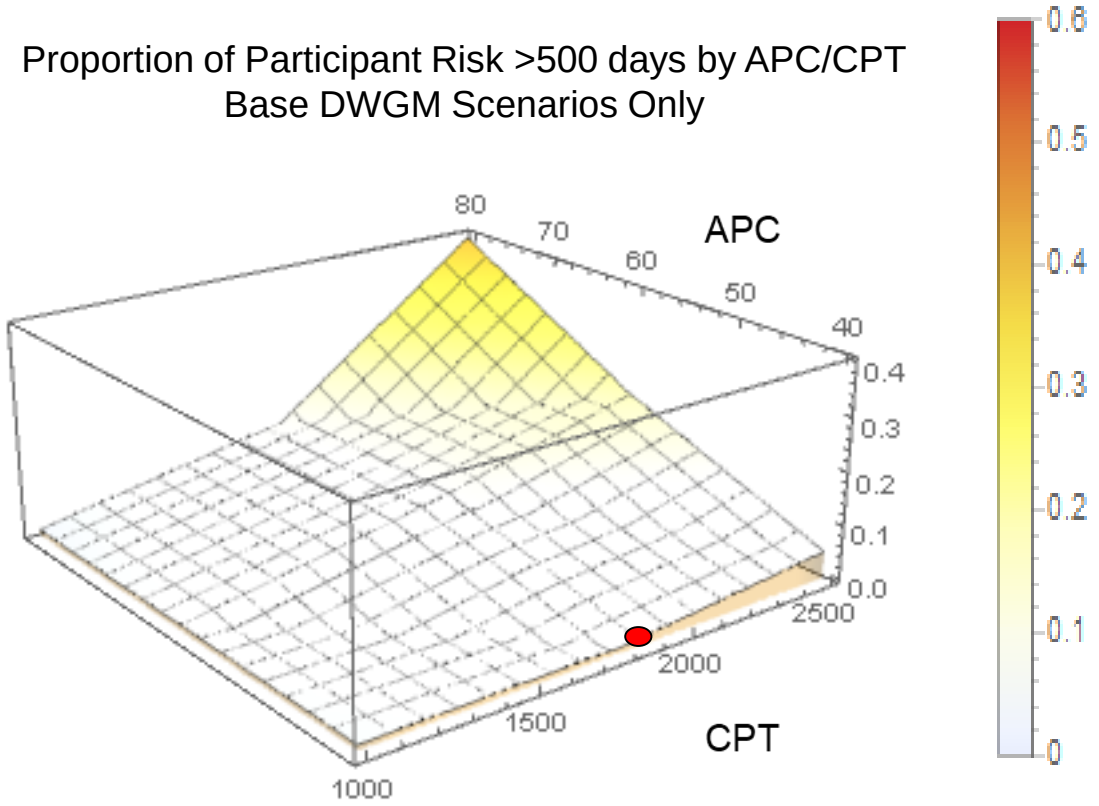
- Participants that choose not to hedge constrain parameter selection.
- Effective hedging is a measure of
  - Hedging coverage
  - Gas contribution to cost structure
- Welfare losses are increased by choosing parameters that accommodate participants with low effective hedging.
- What level of effective hedging is acceptable?
- Suggested approach:
  - Preserve implied current level of protection
  - Analysis to follow



Preliminary APC/CPT Analysis – Current Level of Protection

- Consider only scenarios occurring in base cases, not in future periods
- Base cases generally contain less risk
- White zone shows protection equivalent to that provided by current parameters
- Those with less hedging would not be protected by current market parameters
- Yellow zone relates to participants not covered by current parameters:
  - What is the effective hedging level of these participants?

Proportion of Participant Risk >500 days by APC/CPT
Base DWGM Scenarios Only



Note: Graph Based on Subset of DWGM Results

● Current DWGM Parameter Setting

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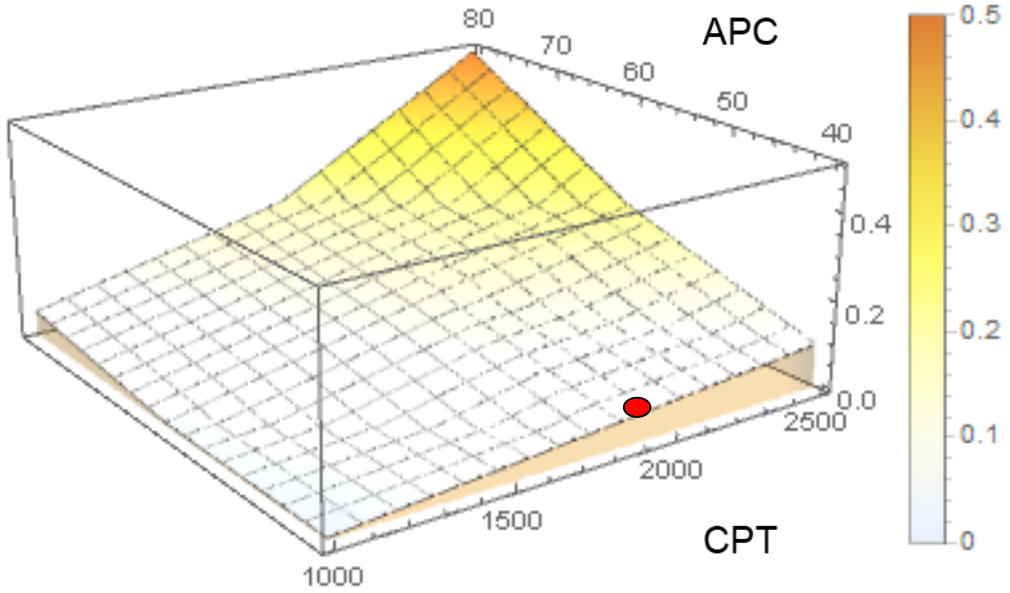
Preliminary APC/CPT Analysis – Achieving Equivalent Protection

- Participants that are not protected in the current market are now excluded from the analysis
- We consider all scenarios using the reduced subset of participants
- Preliminary analysis suggests that
  - CPT and APC adjustments may be required to maintain current levels of protection
  - Main driver is lower profitability due to higher contracting costs
- The analysis defines the contour that achieves required protection

Proportion of Participant Risk >500 days by APC/CPT
All DWGM Scenarios, Participants > Hedging Threshold



Note: Graph Based on Subset of DWGM Results

● Current DWGM Parameter Setting

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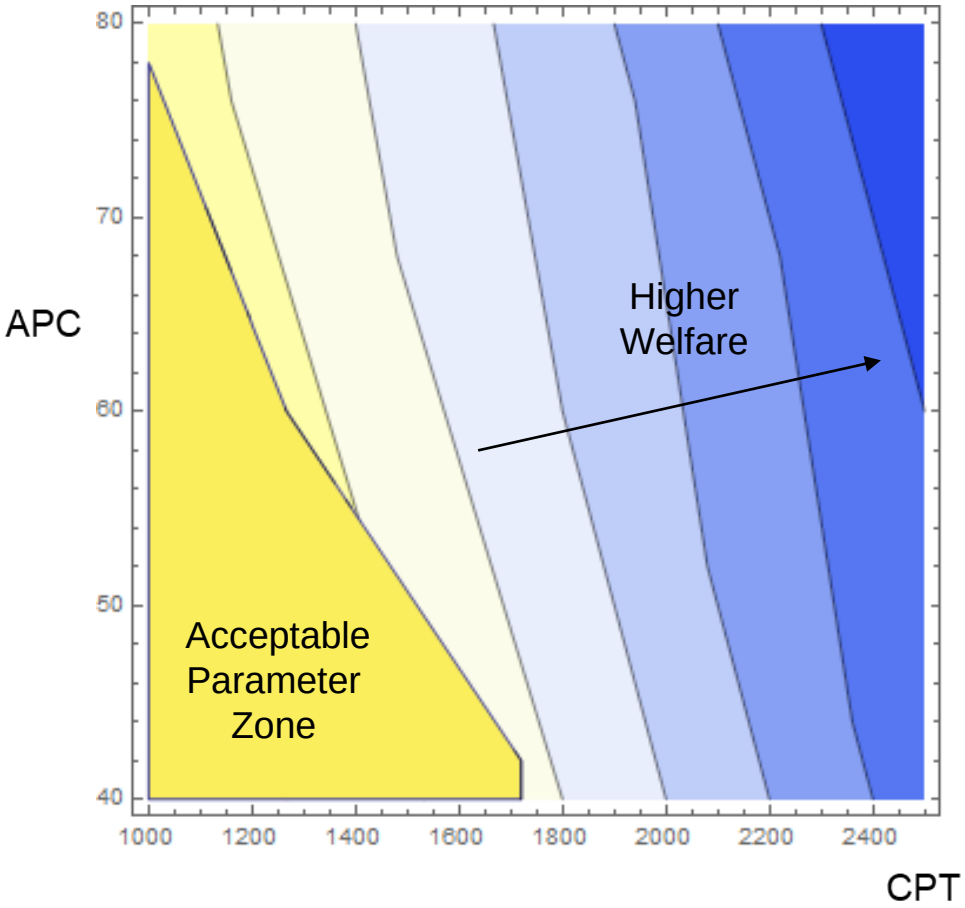
Preliminary APC/CPT Analysis – Efficient DWGM APC/CPT Settings

- The contour map to the right shows the welfare levels that correspond to welfare settings
- We can overlay the feasible parameter range – the parameter settings satisfying risk management objectives.
- The most desirable setting is that which generates the highest welfare and is in the acceptable parameter zone
- Compromise may be necessary where settings are different between markets

Welfare Loss Proportion & Acceptable Parameter Zone
DWGM



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Preliminary Analysis – Summary & Next Steps

- Based on early analysis of our subset of scenarios:
  - There is no evidence yet that VoLL/MPC require adjustment
  - It is inconclusive as to whether APC/CPT need to change
- Further analysis is required:
  - These indications may change as further scenario analysis becomes available
  - Estimates for all STTM hubs and DWGM are not yet available
  - While the general trend is expected to be similar, there is an obligation to ensure that market parameters are consistent
  - This may lead to compromise settings, taking account of differences between STTM hubs, the DWGM and the NEM
- Next Steps:
  - Comments/Feedback welcome
  - Complete scenario analysis
  - Refine search grid once region of interest is identified
  - Draft recommendation due in March

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Appendix – Scenario List

Hub	Event Description
VIC	Unexpected reduction in Longford production
VIC	Compressor failure near Melbourne (capacity reduction of pipeline)
VIC	Moomba supply interruption leading to high flows to SA and NSW on peak day
VIC	High forecasted GPG demand
VIC	High unexpected GPG demand
VIC	Extremely high demand
VIC	High demand day requiring LNG while gas storage is low
SYD	Reduced supply into Sydney due to compressor issue on MSP
ADL	Reduced supply into Adelaide due to high GPG demand (pre ex-ante market)
BRIS	Reduced supply into Brisbane due to high GPG demand (post ex-ante market)
SYD	Contingency gas scenario due to reduced gas supply into Sydney
All	High sustained GPG utilisation requiring balancing of gas across DWGM & STTM
All	Simultaneous gas and electricity market stress causing inter market trade-offs