Winter 2018 – Victorian Gas Operations outlook

Melbourne 8 May 2018

Introduction

Matthew Clemow, Group Manager Gas Real Time Operations

Agenda

1:15 - 1:25	Introduction
1:25 - 1:40	Year in Review
1:40 - 1:55	Summary of Gas Market Reviews
1:55 - 2:05	Victorian Gas Planning Report Update
2:05 - 2:35	System Augmentations and Modifications (APA)
2:35 - 2:45	Winter Weather Outlook (Weatherzone)
2:45 - 3:10	Break
3:10 - 4:05	Gas Transmission Operations
4:05 - 5:00	Gas Market Operations
5:00 - 6:00	Networking

Winter Strategy - Importance

- Winter demand challenges
  - High morning and evening peak flows
  - System linepack utilisation increases
  - Reduced support for Gas Powered Generation (GPG)
  - Weather can be colder or warmer than forecast
  - Market outcomes change injection locations
- Consistent and efficient operations
  - Predictable outcomes for participants
- Manage DTS operational risks
  - Per the AEMO Gas Safety Case

Winter Strategy - Implementation

- Analysis of transmission system changes
  - Supply source changes, e.g. forecast increase in VNI imports, reduced Longford supply
  - Demand changes, e.g. forecast high GPG similar to Winter 2017, more SWP withdrawals
  - Pipeline changes, e.g. Brooklyn compression direct connection into the BLP/SWP
  - How AEMO will manage these changes
- Preparation and Training
  - Information for Industry Participants
    - Winter Strategy Presentation
    - Winter Strategy Paper
  - AEMO Gas Operations Engineers
    - Pre-winter training

Winter Strategy - Benefits

- Provides participants with information about:
  - System changes
  - AEMO’s operations and scheduling
  - Highlights any potential risks
- Increases transparency
- Opportunity to ask questions
- Provides confidence and assurance that AEMO is prepared and ready to manage winter operations

AEMO Gas Real Time Operations
Roles and Responsibilities

- Victorian gas operations
  - Scheduling (DWGM)
  - Transmission (DTS System Security)
  - Gas Quality
  - Emergency Management
  - Planning (Victorian Gas Planning Review)
  - Metering and Connections
- Outage and maintenance coordination for southeast Australia
  - Producers (Longford, Moomba, Otway, Minerva, Lang Lang)
  - Storage facilities (Iona UGS, Dandenong and Newcastle LNG)
  - Pipelines (DTS, EGP, SEA Gas, MAPS, MSP including Culcairn, TGP)
- STTM operations
- Gas Supply Guarantee (assessing gas supply for Gas Powered Generation)
- National Gas Emergency Response Advisory Committee (NGERAC) support

Service Envelope Agreement with APA

AEMO
Independent operator of the DTS

APA Group
Owner of DTS infrastructure

- The Service Envelope Agreement (SEA) is a contract between AEMO and APA which specifies the responsibilities each have in respect to operation maintenance and asset performance.

DWGM and STTM comparison

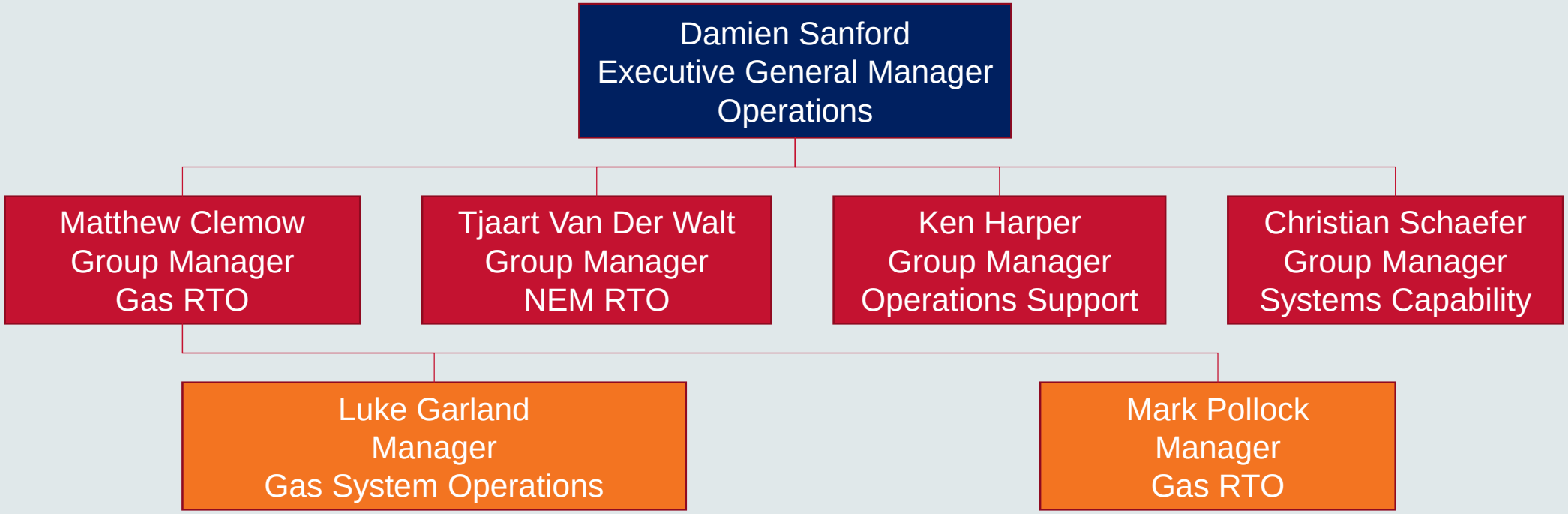
DWGM – NGR Part 19

- AEMO operates market and the transmission system including gas quality management and metering
- Covers the whole state
- Market carriage throughout the market
- Intra-day scheduling
- AEMO can issue directions in response to a threat to system security including curtailment
- AEMO manages industry emergency response

STTM – NGR Part 20

- AEMO is the market operator
- Covers the capital city area (hub)
- Contract carriage supply pipelines
- Day ahead scheduling
- AEMO can seek a market response to a gas supply shortfall through the Contingency Gas process
- Asset owners responsible for system security and emergency response
- Assesses gas supply during an emergency on behalf of NGERAC

AEMO Operations Structure



Gas Transmission Group
Maintenance, Planning (VGPR)
SCADA, Gas Quality
Metering and Connections
Capacity Modelling
Service Envelope Agreement

Gas Systems Group
Gas Market Systems
Demand Forecasting
STTM Operations

Gas Control Room
Transmission Operations
DWGM Scheduling
Emergency Response
Business Continuity
Gas Safety Case

Questions?

2017 in Review

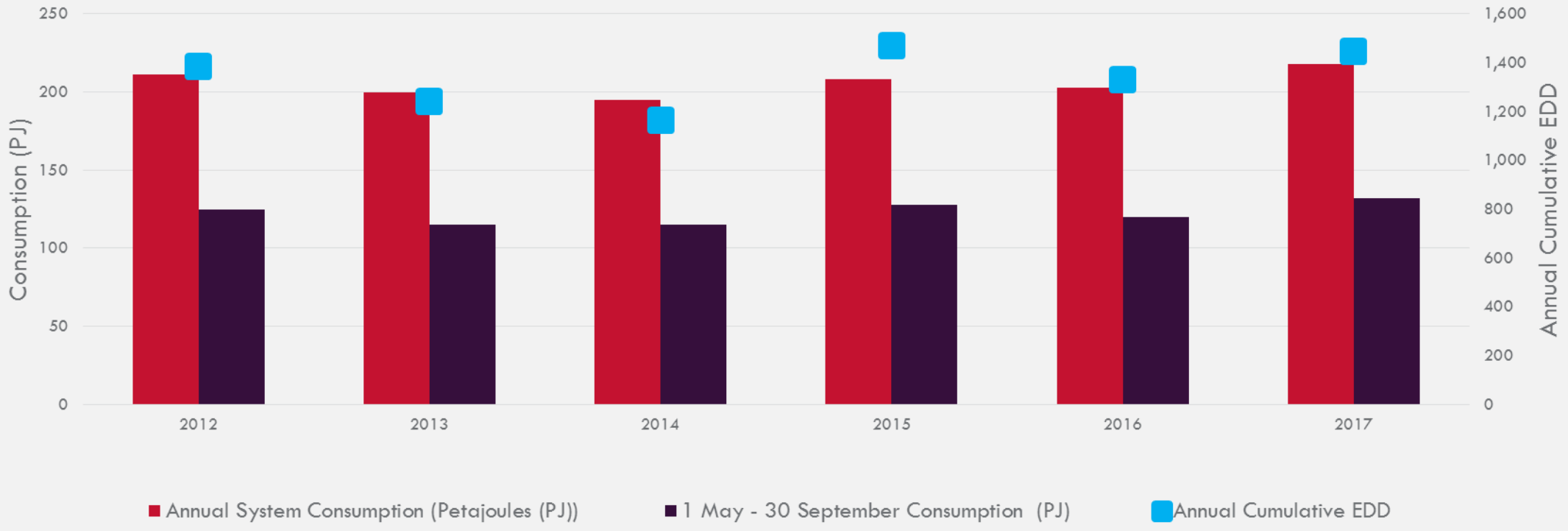
Presented by Mark Pollock

Purpose

- Demand Trends
- Supply Trends
- Significant Events in 2017

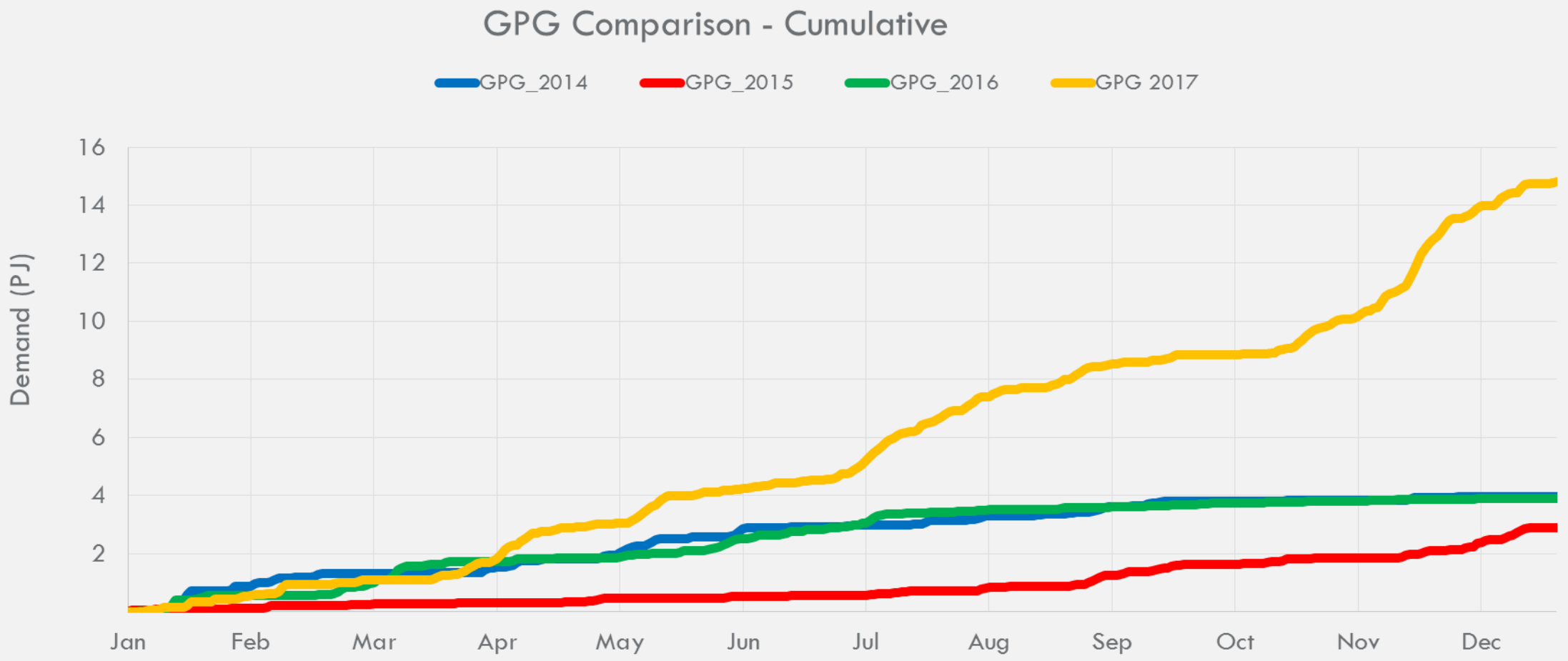
Demand Trends

Annual System Consumption, Winter System Consumption & Cumulative EDD

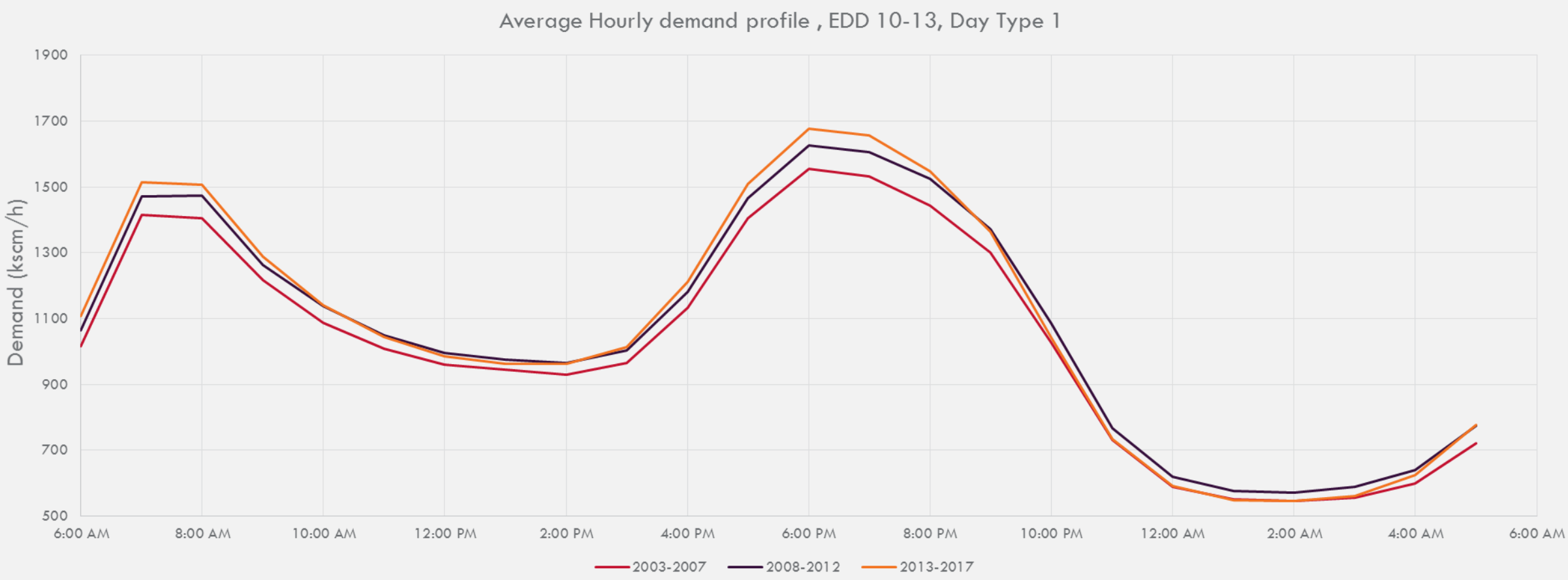


	2012	2013	2014	2015	2016	2017
Annual Consumption (PJ)	211	200	195	208	203	2018
Winter Consumption (PJ)	125	115	115	128	120	132
Highest Demand Day Total Demand (TJ/d)	1,092	1,165	1,214	1,179	1,187	1,279

Victorian DTS GPG Trend



Hourly Demand Profile



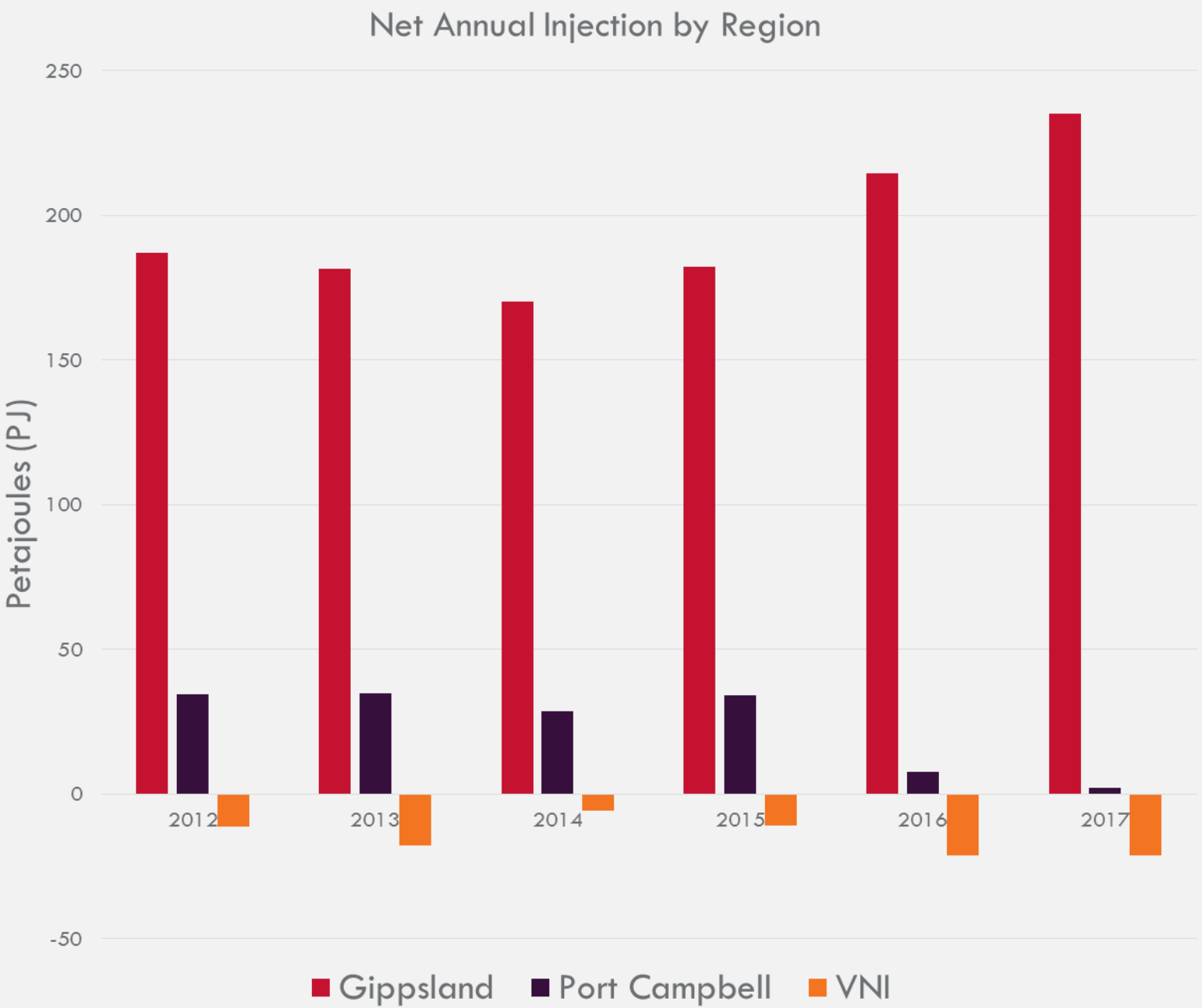
Summary of demand trends

- Annual System Consumption remains fairly constant
- Demand has changed
  - Higher peaks
  - More Tariff V, less Tariff D
- Higher GPG in 2017
  - Typically occurs over peaks
- What does this mean?
  - Closer to system capacity at peak times

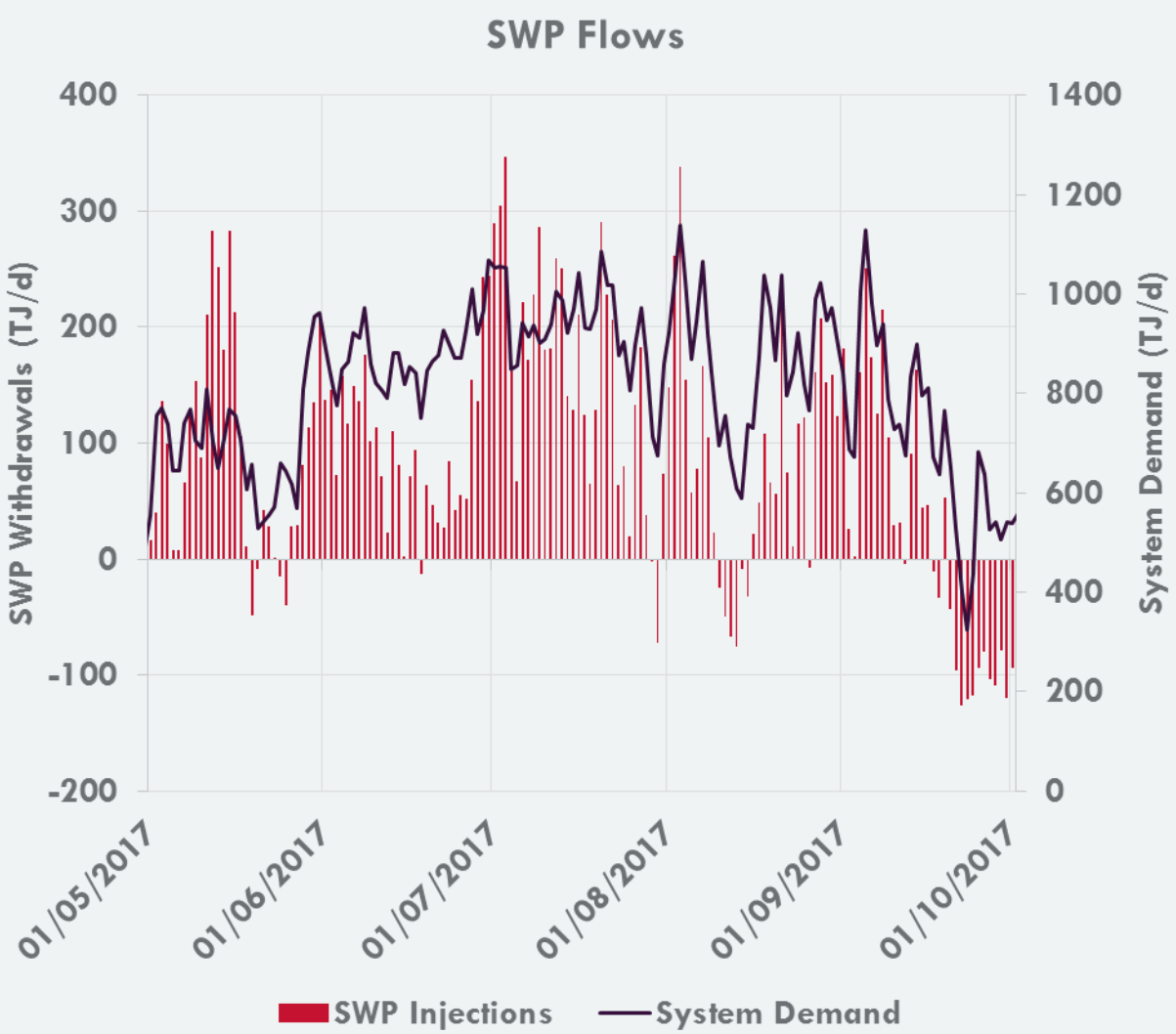
Supply Trends

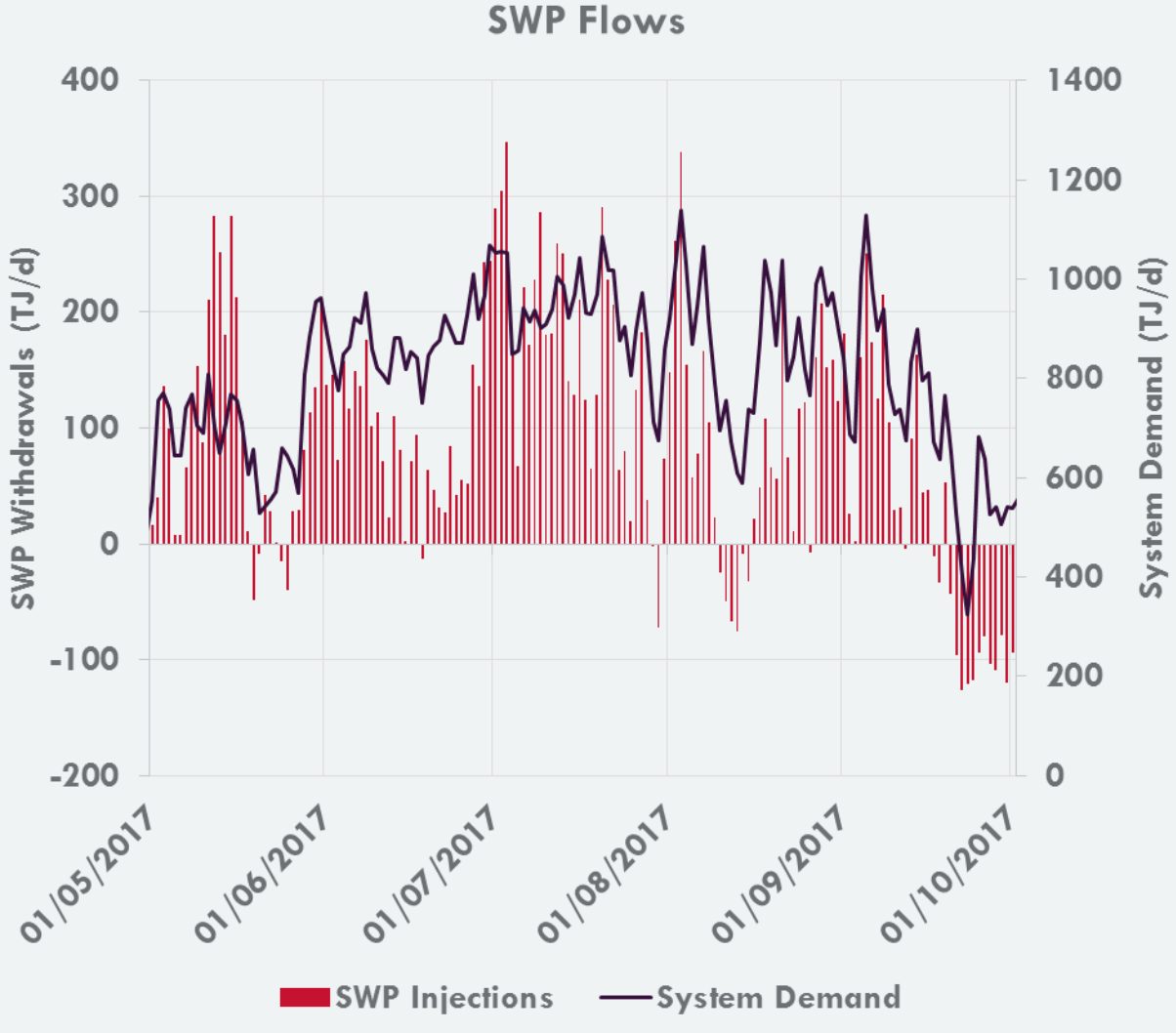
Supply by region

- Increasing injection from Gippsland region
- Reduced net injection from Port Campbell region
- Increased net withdrawal through VNI



System Operations Overview – Winter Review





Summary of supply trends

- Supply from Gippsland into Victoria has been increasing
- Net supply from Port Campbell has been decreasing
- Net VNI exports increasing, however more supply into Victoria on high demand days

Significant Events 2017

Five highest demand days 2017

Most days had net imports from Culcairn on the peak days. Only 30th June had net exports.

	System Demand TJ	Total Demand TJ	GPG TJ	Culcairn TJ	EDD
03-Aug	1139	1268	129	68	13.4
20-Jul	1086	1216	130	49	13.0
05-Sep	1129	1157	28	99	13.4
30-Jun	1067	1157	90	-26	13.3
07-Aug	1066	1151	85	65	11.8

Significant Events 2017

- 26 May – Brooklyn Outage
  - 41 TJ Out of merit order injections
- 3 August – 17.9 TJ Peak Shaving LNG
  - 2nd Highest demand day on record
- 30 November – Ad Hoc Schedule
  - Longford plant supply interruption
- 20 December – Brooklyn Compressor Station Outage
  - 20 TJ Out of merit order injections

Summary

- System Consumption is steady
- GPG consumption step change increase in 2017
- Instantaneous Demand is increasing
  - higher peaks, higher temperature sensitive load, GPG
- More volatility in supply
  - Tightening supply, more dependency on storage, swings in pipeline flow direction

Questions?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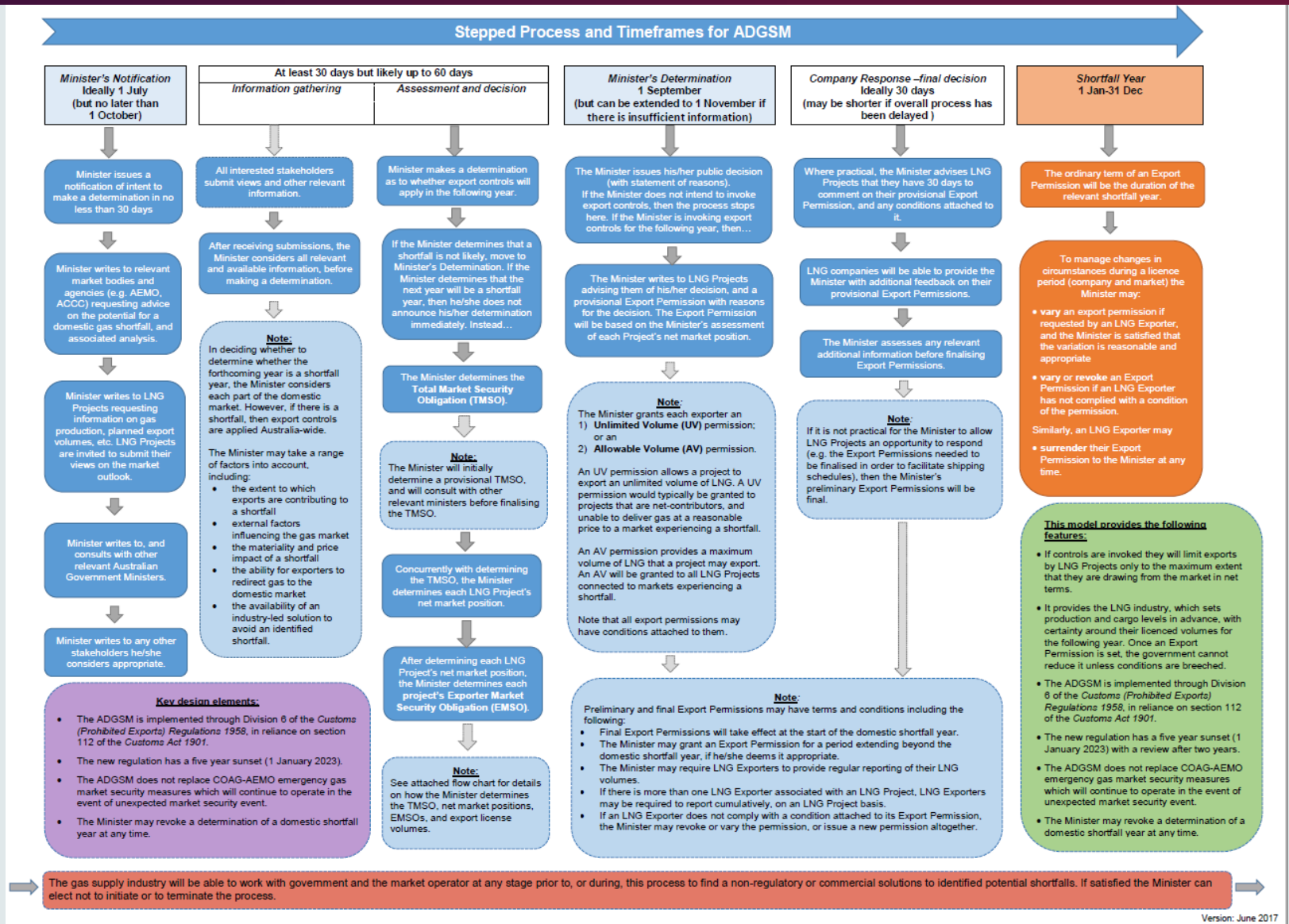
A Review of the Reviews

Presented by Luke Garland

Agenda

1. New mechanisms
2. Completed reviews
3. Reviews underway
4. Summary of findings

ADGSM process



ADGSM vs GSG

Mechanisms	What it is	Purpose	How it will work
Australian Domestic Gas Security Mechanism (ADGSM)	Restrictions on export of LNG from LNG projects if there is expected supply shortfall in domestic market	Sufficient supply of gas to meet the needs of Australian gas consumers (public and industry) Encourage investment in new gas fields and discourage LNG exporters from buying from domestic market	Resource Minster has power to: 1. Determine when a year will be a domestic shortfall year 2. Grant permissions to LNG exporters to export LNG in a domestic shortfall year (i.e. condition on volume of gas that can be exported). • Expected to be in place for up-to 5 years. • Reviewed in 2020. • Minister for Resources and Northern Australia kicked off the process in July (for year 2018) with a determination in October. • Minister will consult ACCC, AEMO and Producers when making its determination.
Gas Supply Guarantee (GSG)	Mechanism to ensure gas is available during NEM peak periods.	In March 2017, Production Facility Operators and Pipeline Operators made commitments to the Commonwealth Government to make gas available to meet peak demand periods in the NEM	• Arrangements developed by market bodies and industry participants • AEMO monitors electricity and gas market demand and supply conditions. • If a Market Participant or AEMO is concerned about a gas supply issue impacting the NEM, a series of conferences are held to share information and seek an industry repose to secure additional supply.

Completed Reviews

Completed Reviews

Review	Conducted by	Completed by
Eastern Australian Wholesale Gas Market and Pipelines Framework Review (STAGE 1)	AEMC	July 2015
Review of Governance Arrangements for Australian Energy Markets	Independent panel for COAG Energy Council	October 2015
NSW Gas Plan	NSW Chief Scientist and Engineer	December 2015
Victorian energy infrastructure capability assessment	Deloitte for Infrastructure Victoria	February 2016
East Coast Gas Inquiry	ACCC	April 2016
Eastern Australian Wholesale Gas Market and Pipelines Framework Review (STAGE 2)	AEMC	May 2016
Queensland gas supply and demand action plan	Queensland Government Department of Natural Resources and Mines	November 2016
Examination of the current test for the regulation of gas pipelines	Dr Vertigan for COAG Energy Council	December 2016

Completed Reviews

Review	Conducted by	Completed by
National Gas Law Amendment Package – Pipelines Access Arbitration	COAG Energy Council	January 2017
Report on Unconventional Reserves, Resources, Production, Forecasts and Drilling Rates	Geoscience Australia for COAG Energy Council	May 2017
Review of the Victorian Declared Wholesale Gas Market	AEMC	June 2017
West – East Gas Pipeline Pre-feasibility Study	ACIL Allen, in conjunction with GHD	October 2017
Gas inquiry 2017–2020	ACCC	December 2017
Scientific Inquiry into Hydraulic Fracturing in the Northern Territory	Independent panel for NT Government	March 2018
Biennial review into liquidity in wholesale gas and pipeline trading markets	AEMC	April 2018

Key Themes

- Accessing capacity (Supply and Transportation)
- Level of complexity within the East Coast Gas Market
- Lack of transparency
- Uncertainty in the supply outlook

Key Themes - Accessing Capacity

Report	Outcome
Eastern Australian Wholesale Gas Market and Pipelines Framework Review (STAGE 2)	• Facilitating short-term pipeline capacity trading markets, including a short-term auction for unused capacity
Review of the Victorian Declared Wholesale Gas Market	• Improve pipeline capacity allocation and introduce capacity rights trading • Establish a forward trading exchange over the DTS while retaining the existing daily DWGM.
Examination of the current test for the regulation of gas pipelines	• Task the GMRG with developing a detailed design of the arbitration framework.

- The commercial arbitration framework was implemented into the NGL on 1 August 2017
- The GMRG is drafting the initial National Gas Rules to implement the final design of the arbitration framework
- Creation of the Capacity trading market has been handed to the GMRG with a target implementation date of 1 March 2019
- In the DWGM, for AMDQ / transportation rights and supply, a trading platform similar to the capacity trading platform and the GSH has been recommended to the Victorian Government

Key Themes - Complexity

Report	Outcome
Eastern Australian Wholesale Gas Market and Pipelines Framework Review (STAGE 1)	• Harmonised gas market start times to 6AM
Review of the Victorian Declared Wholesale Gas Market	• Provide a cleaner wholesale market price
Eastern Australian Wholesale Gas Market and Pipelines Framework Review (STAGE 2)	• Concentrating wholesale gas trading at two hubs – a Northern Hub at Wallumbilla in Queensland and a Southern Hub in Victoria • Standardisation of provisions in capacity agreements

- Harmonisation of gas market start times has been brought forward by the GMRG from 1 April 2021 to 1 October 2019
- A cleaner DWGM price which incorporates congestion pricing has been recommended to the Victorian Government
- Standardisation of contract terms has been handed to the GMRG standardisation project team as part of the capacity trading reform

Key Themes - Lack of Transparency

Report	Outcome
Eastern Australian Wholesale Gas Market and Pipelines Framework Review (STAGE 1)	• Gas price index compiled by the ABS • Enhancing information on the Gas Bulletin Board
Examination of the current test for the regulation of gas pipelines	• the disclosure and transparency of pipeline service pricing and contract terms and conditions be enhanced
Eastern Australian Wholesale Gas Market and Pipelines Framework Review (STAGE 2)	• Improving information provided through the Gas Bulletin Board to enable market participants to make better-informed decisions about trading, investing in, or using gas.

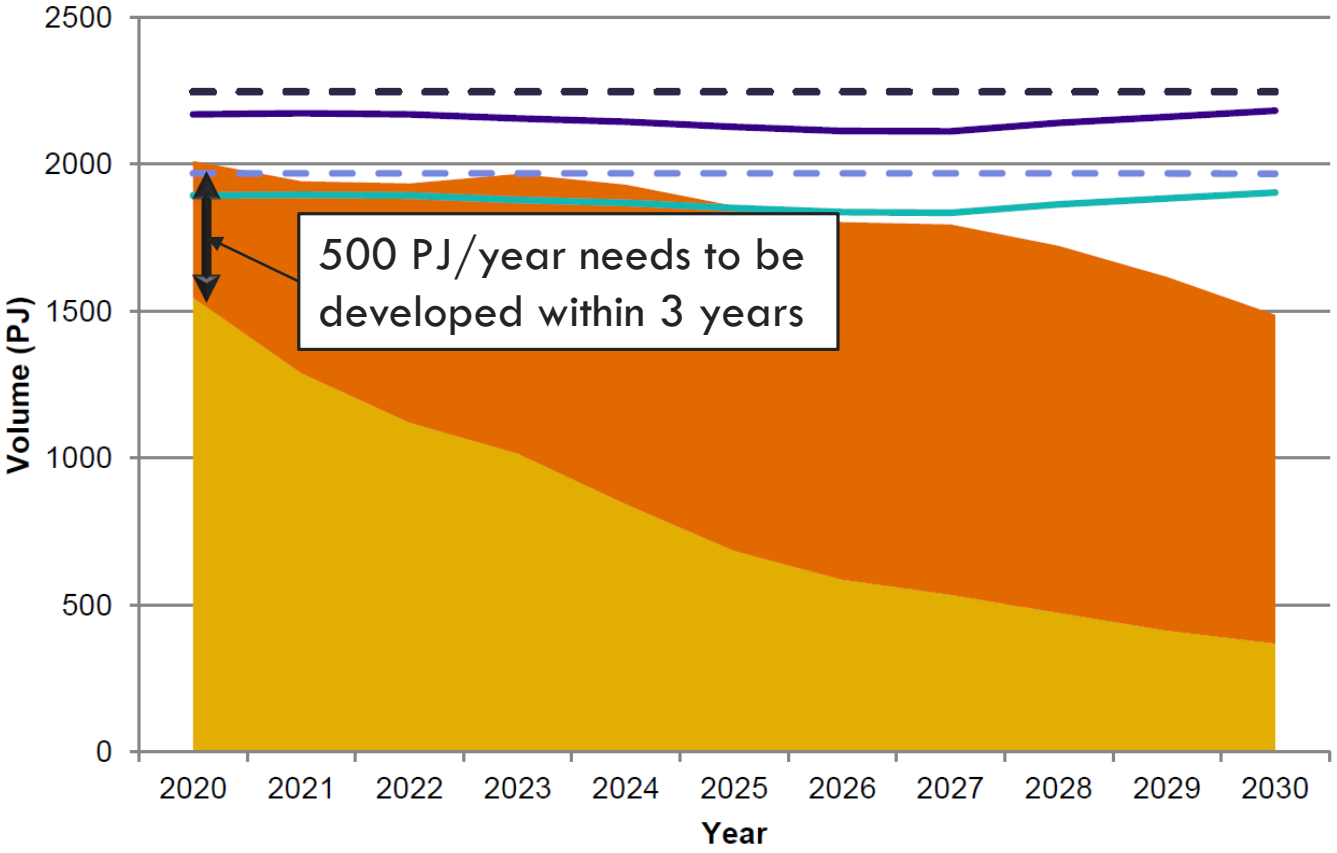
- Producer price indexes, domestic gas extraction series commenced publication by the ABS in December 2015
- Three large updates have occurred to the Gas Bulletin Board since 2015
- A fourth update to the Gas Bulletin Board is planned for release in September 2018.

Key Themes - Uncertain supply outlook

Report	Outcome
East Coast Gas Inquiry (ACCC - 2015)	• Governments should consider adopting regulatory regimes to manage the risks of individual gas supply projects on a case by case basis rather than using blanket moratoria.
Gas inquiry 2017–2020	• The state governments and the Australian Government should continue implementing programs to strengthen the gas sector's future.
Eastern Australian Wholesale Gas Market and Pipelines Framework Review (STAGE 2)	• The operators of gas fields with proved and probable (2P) reserves – to report 2P reserves on an annual basis
Victorian energy infrastructure capability assessment	• Facilitate development and uptake of further gas storage.
West – East Gas Pipeline Pre-feasibility Study	• ACIL Allen, in conjunction with GHD

- The ACCC and the GMRG are working together in the first half of 2018 to provide advice on options to improve transparency across all elements of the gas supply chain, including production, storage and retail.
- The Victorian Gas Program commenced early 2017 to run until 2020

ACCC - Forecast gas supply (including Arrow Energy and Northern Territory) compared to forecast gas demand, East Coast Gas Market



Reviews Underway

Reviews Underway

Review	Conducted by
Victoria's gas network safety framework review	Department of Environment, Land, Water and Planning
Review into the scope of economic regulation applied to covered pipelines	AEMC
Victorian Gas Program	Department of Economic Development, Jobs, Transport and Resources

Victorian Gas Program

- The Victorian Gas Program scope includes
  - Supporting commercial exploration for further discoveries of gas off Victoria’s coast to help increase gas supply
  - Identify risks, benefits and impacts of onshore conventional gas to inform future government decisions
  - Investigating the opportunities for further underground gas storage
  - Environmental studies combined with community and stakeholder engagement
- A Progress report was published January 2018
  - Three-dimensional geological model of the onshore Victorian Otway Basin is expected to have preliminary results by June 2018. Gippsland survey next.
  - There are currently 13 Petroleum Production Licences with a number of fields identified as having potential for gas storage. Detailed technical studies expected to be complete by end of 2018.
  - In May 2018, a release of new petroleum acreage will occur off the Victorian coast, specifically in the Otway Basin
  - Commenced development of an extensive community and stakeholder engagement program

Questions?

2018 VGPR Update Key Findings

Presented by Luke Garland

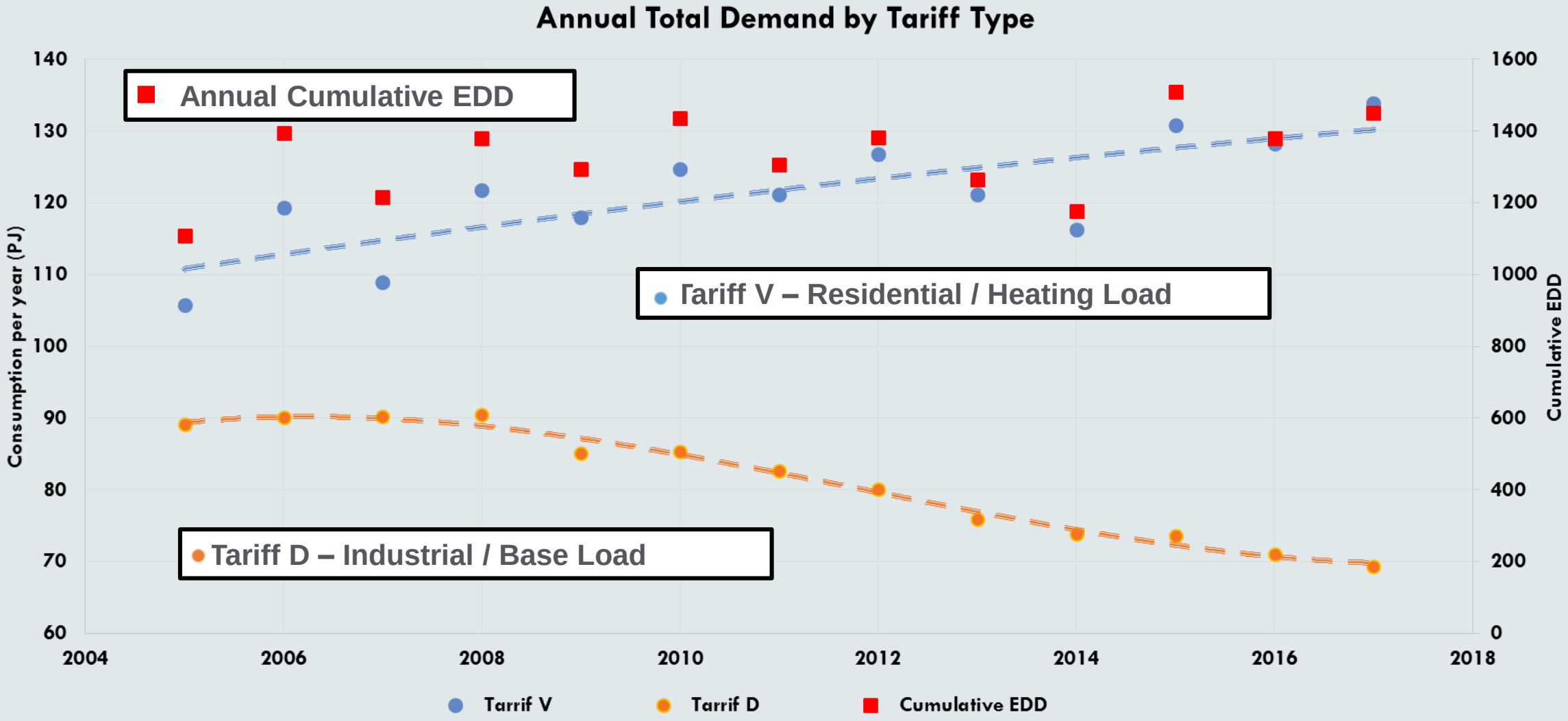
Overview

1. Need for an update
2. Demand
3. Supply
4. Options for New Supply
5. Updates on Threats to System Security Identified in 2017 VGPR

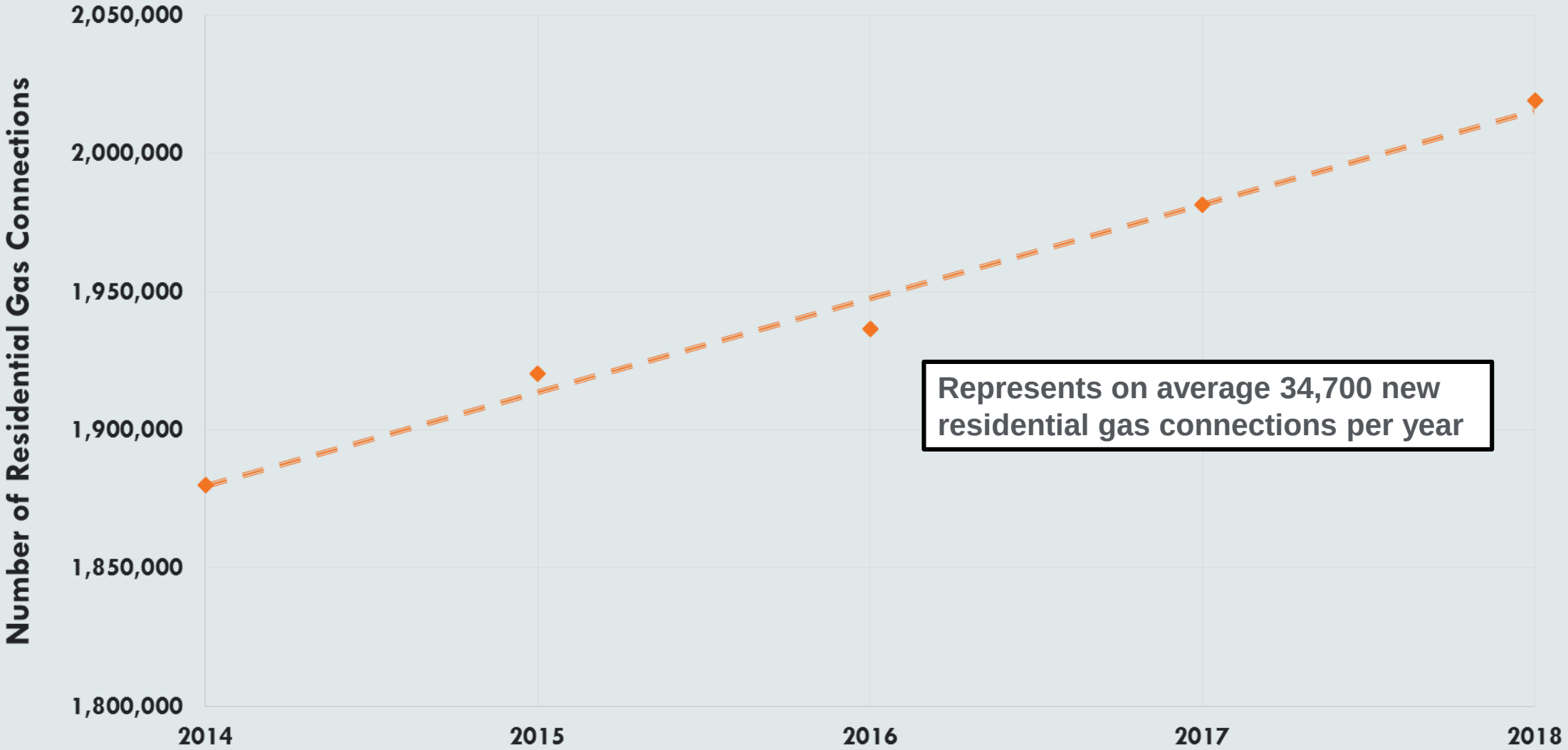
Need for an update

- NGR 323(5) If AEMO becomes aware of any information that materially alters the most recently published planning review, AEMO must update that planning review as soon as practicable, and provide Registered participants with the details of that update.
- Triggered by;
  - new demand forecasts
  - new supply forecasts
  - system augmentations
  - these combined have a material impact to the supply demand balance from 2021

Changing Load



Why the increase in Tariff V?



GPG Consumption Uncertainty

- In 2017, DTS connected GPG consumption increased by 500% above the 2016 amount to 15 PJ, due to the March 2017 closure of Hazelwood (as forecast in VGPR)
- 565 MW of new Wind and Solar committed projects in Victoria
- 8,383 MW of new Wind and Solar proposed projects in Victoria[1]
- AEMO is currently conducting a Regulatory Investment Test for Transmission (RIT-T) to assess solutions to address the forecast electricity network congestion in Western Victoria[2]

[1] http://www.aemo.com.au/Electricity/National-Electricity-Market-NEM/Planning-and-forecasting/Generation-information

[2] http://www.aemo.com.au/Electricity/National-Electricity-Market-NEM/Network-connections/Network-connection-initiatives

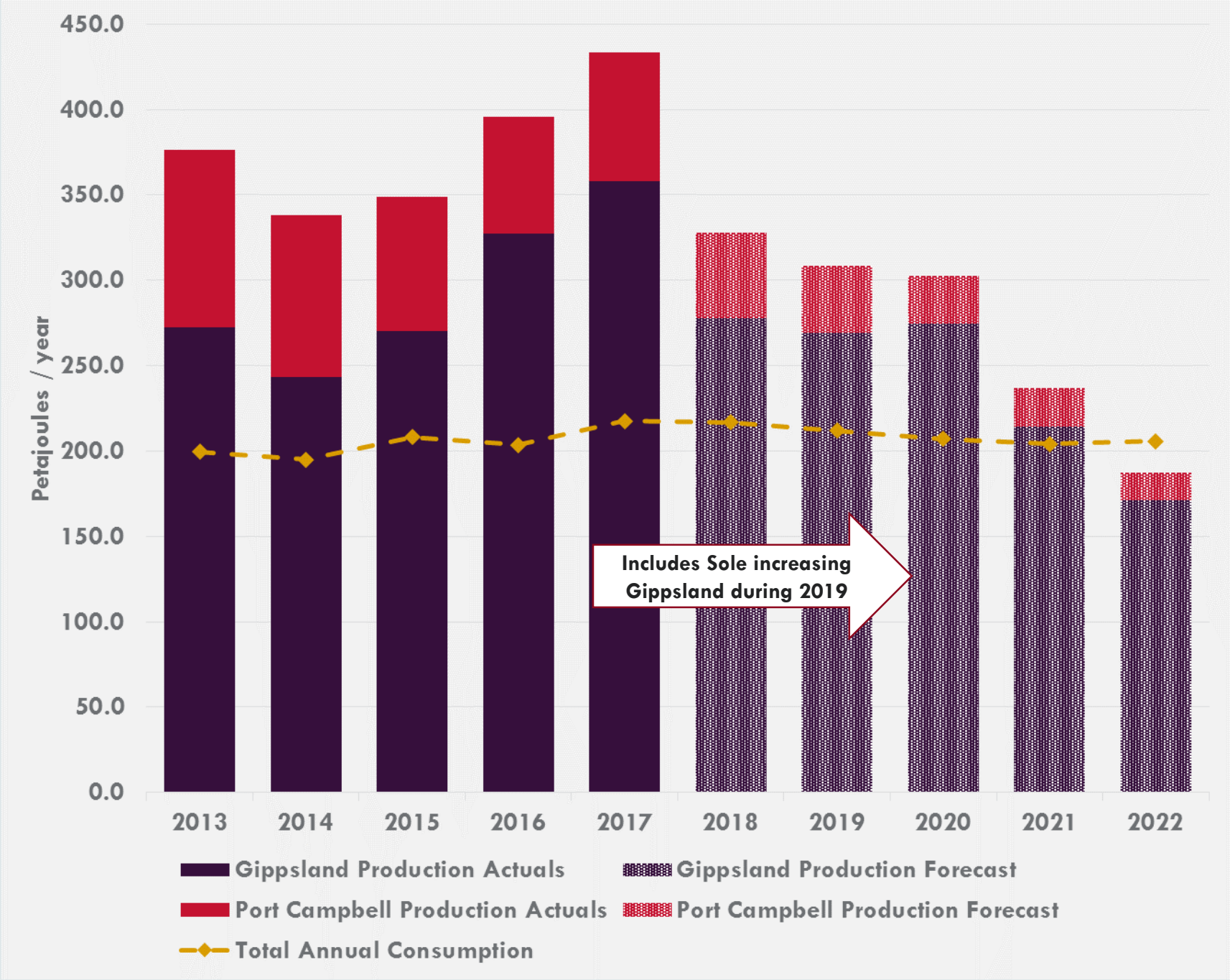
Types of Supply

- ‘Available supply’ is from existing production and storage facilities as firm gas supply contracted by market participants.
- ‘Prospective supply’ is made up of two components:
  - Production and storage facility capacity from existing facilities that is available to be contracted by market participants but is not currently contracted.
  - Committed projects which are not currently operational. (Any projects or developments which have passed FID)
- ‘Total Supply’ = Available + Prospective

- If AEMO receives information on uncommitted projects, they are assessed on their impact to the DTS and the supply-demand balance, however are not included in the ‘Total Supply’

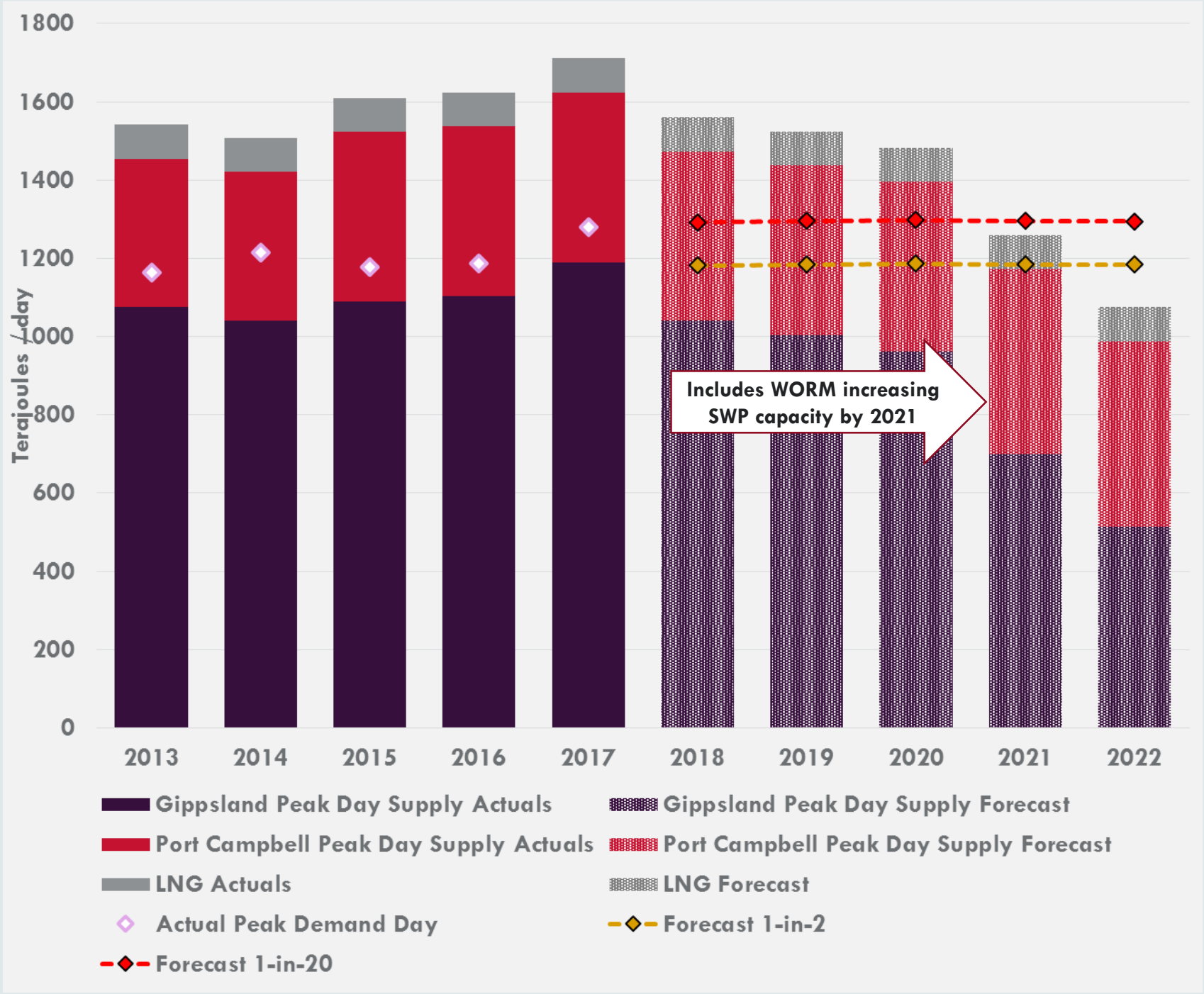
Production Decline

- Production decrease to 2022
  - Gippsland 38%
  - Port Campbell 68%
- Victorian production less than demand in 2022 by 19 PJ

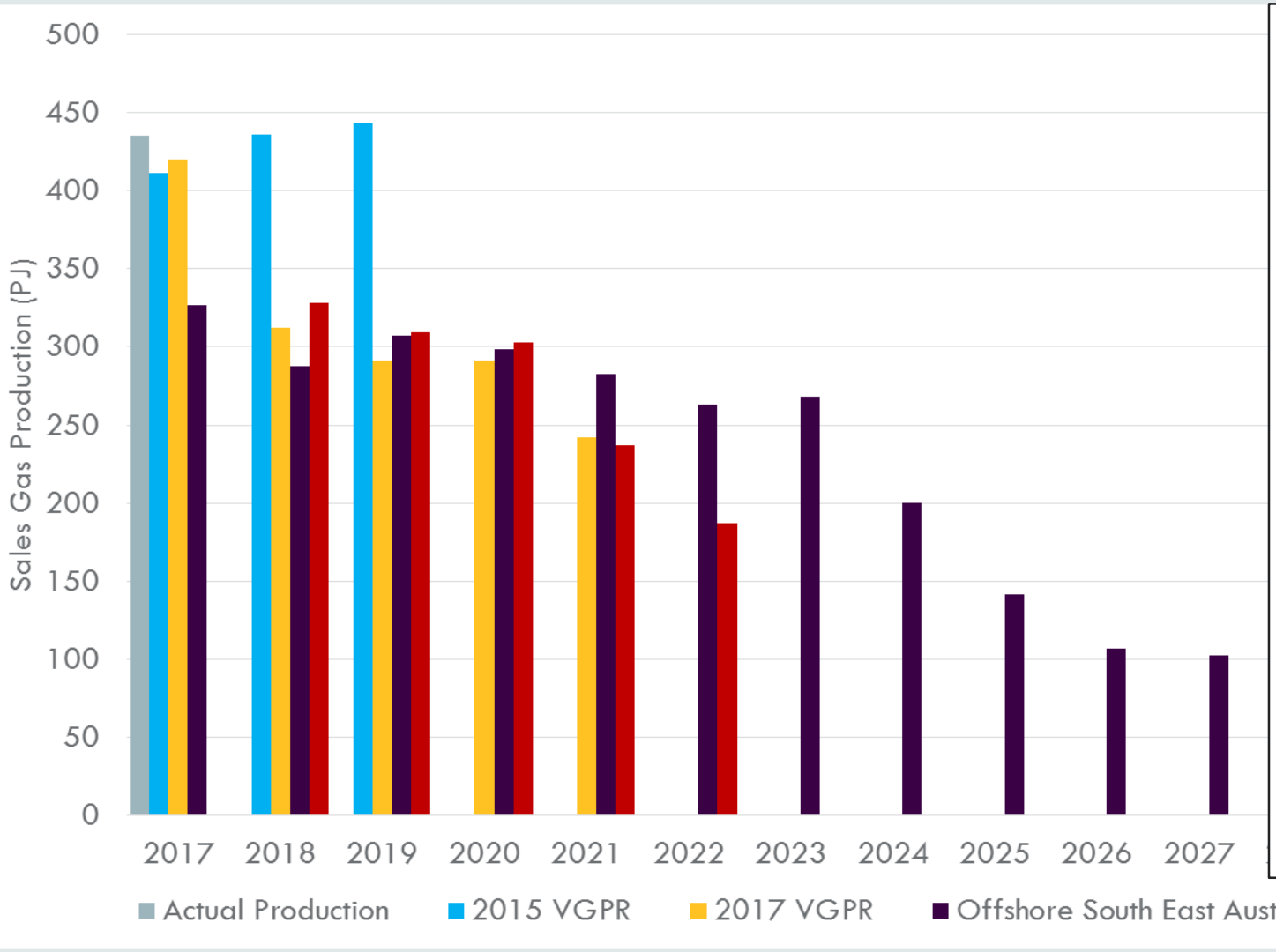


Production Decline

- Max daily production decline to 2022
  - Gippsland by 50%
  - Port Campbell by 76%
- Increased reliance on Iona UGS
- Cannot supply peak day demand from 2021
  - 36 TJ shortfall in 2021
  - 220 TJ shortfall in 2022



Comparison of supply forecasts



- Large change from 2015 producer supply forecasts to 2017 producer supply forecasts
- Large drop in 2022 is the trigger for the VGPR update
- Offshore Gas Supply Study conducted using 2016 data
- Greater production in 2017 reduces gas available in 2021 onwards

Supply Options

- Production
  - West Barracouta
  - Basker-Manta-Gummy
  - Black Watch
  - Dory
- LNG import terminal
- Increased pipeline import capacity
- More underground or LNG storage

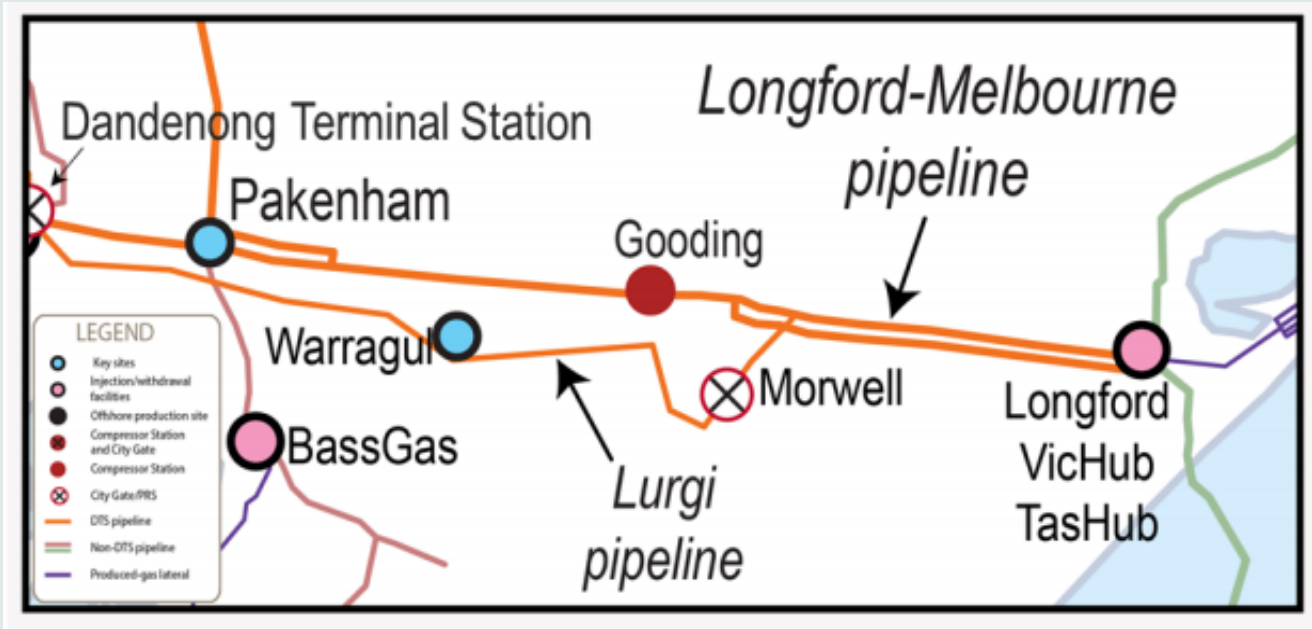
Threats to System Security

2017 VGPR identified two threats to system security:

1. Maintaining supply to the Warragul CTM on peak demand days
2. SWP withdrawal capacity insufficient to refill Iona UGS reservoirs

Threat to System Security - Warragul

- Risk to continuity of supply for winter 2018
  - Operational strategies remain in effect
- AEMO will issue curtailment notices if forecast that supply cannot be maintained
- APA plan to duplicate Warragul lateral prior to winter 2019
- Augmentation will remove threat



Threat to System Security – Iona UGS refill

- Augmentation at Brooklyn and Winchelsea bi-directional skid to increase SWP withdrawal capacity
- Notice of threat removed in 2018 VGPR Update
- Future constraint on SWP withdrawals likely due to decline in Port Campbell production in 2021
- This constraint will be removed with the completion of the WORM

SWP Withdrawal Capacity

Questions?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APA Victorian Transmission System

Winter 2018 Gas Operations Outlook

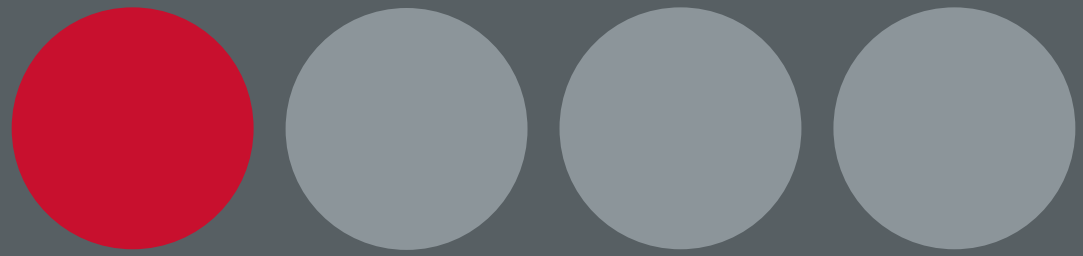
VTS - System Augmentations and Modifications

8 May 2018

energy. connected.

contents

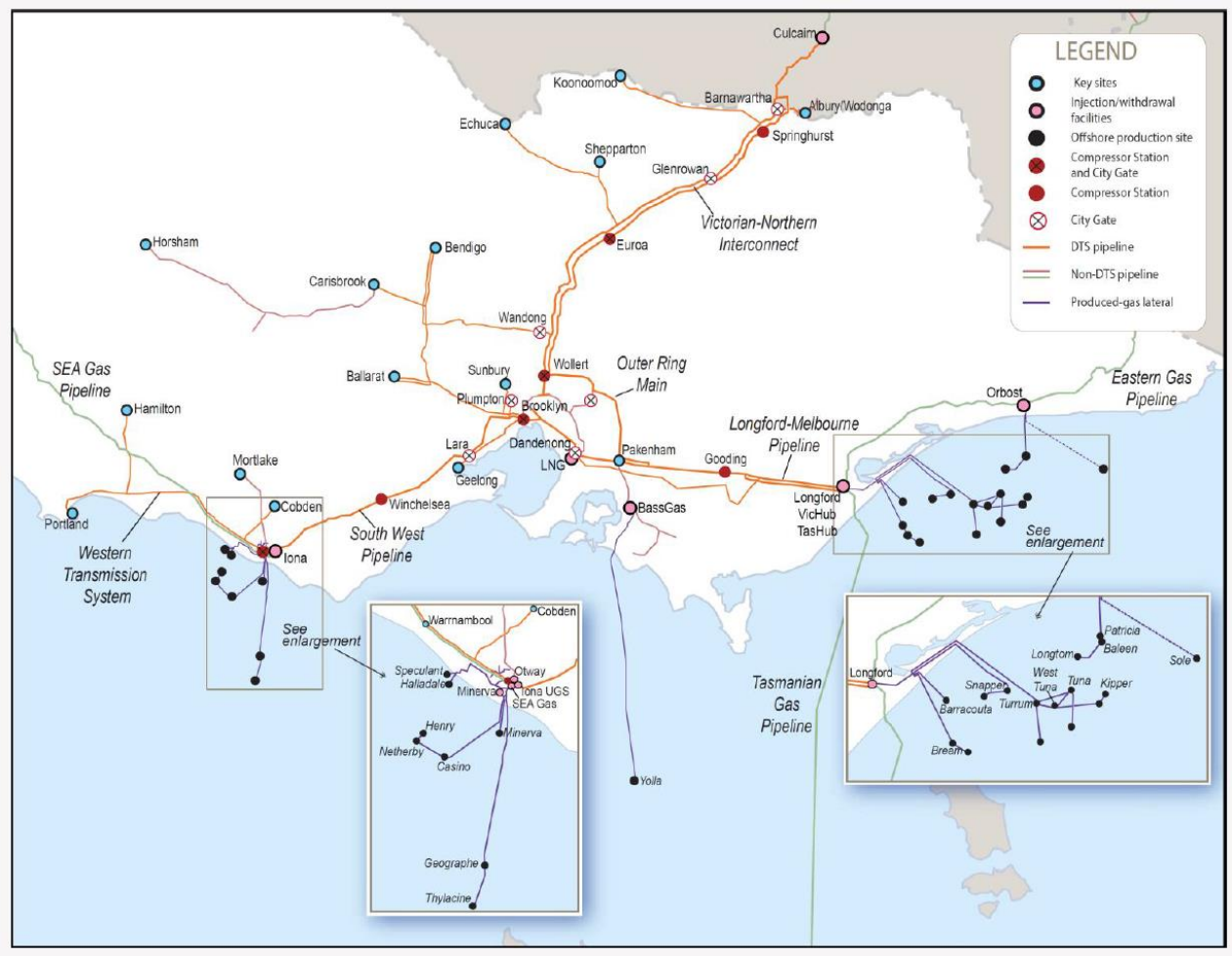
1.0 asset overview



1.1 asset description

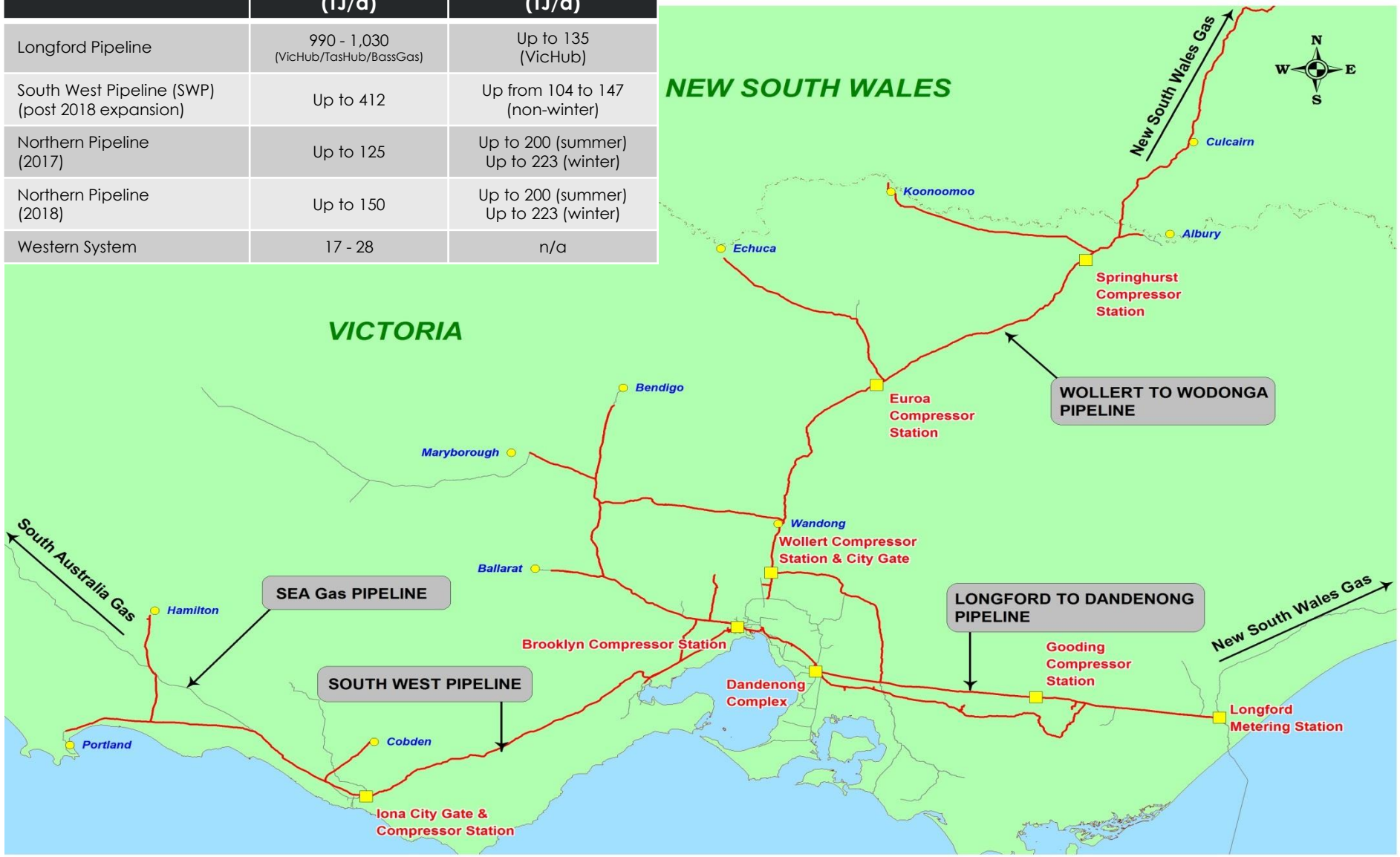
Gas Supply Sources

- Esso Longford
- Cooper and Seven Group – via VicHub (&TasHub)
- Port/Campbell/Iona – also connection to Adelaide via SEA Gas
- Queensland gas via Moomba Sydney Pipeline at Culcairn with south flow to Victoria
- Pakenham – BassGas
- APA Dandenong LNG (DLNG)

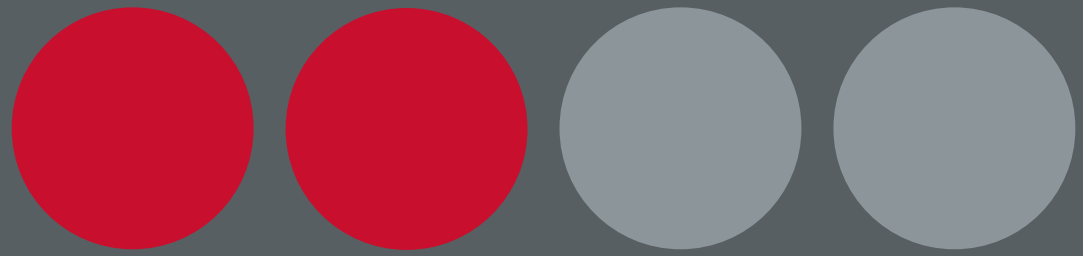


1.2 asset boundary & capacities

Pipeline	Import Capacity (TJ/d)	Export Capacity (TJ/d)
Longford Pipeline	990 - 1,030 (VicHub/TasHub/BassGas)	Up to 135 (VicHub)
South West Pipeline (SWP) (post 2018 expansion)	Up to 412	Up from 104 to 147 (non-winter)
Northern Pipeline (2017)	Up to 125	Up to 200 (summer) Up to 223 (winter)
Northern Pipeline (2018)	Up to 150	Up to 200 (summer) Up to 223 (winter)
Western System	17 - 28	n/a



2.0 recent expansions



2.1 pre- SWP Expansion (reminder)

Interim solution (May/Sept'17 to Mar'18) – Re-life of Mothballed Brooklyn Compressor

Background

- Brooklyn Compressor Station (BCS) units 11 and 12 currently supply capacity to the South West Pipeline (Iona refill)
- BCS Unit10 had not run for 9 years, is only an emergency back up to units 11 or 12

Proposal / Benefits

- Carried out major service and minor repairs to unit 10
- Provided solution to ensure that there was sufficient capacity for Iona refill from May 2017 to 28 March 2018 (i.e. until VTS SWP Expansion in operation)

Issues to resolve along the way

- Licensing issues to be addressed included EPA (NOx, noise, vibration) and ESV
- APA worked with all stakeholders and other authorities
- In late February 2018 an event comprised of exhaust bellows failure on all three large Brooklyn units (due to simultaneous operation and as a result of metal fatigue of the external expansion skin of the exhaust bellows), units 11 and 12 were returned to service within two days of event and permanent repairs were completed mid-March 2018

2.1 SWP Expansion

Brooklyn CS

BCS Modifications:

- Connection tie-in point at DN500 flanged valve
- Approximately 150 metres of buried DN350 pipework
- Connect a class break skid

2.1 SWP Expansion (cont.)

Winchelsea CS

WCS Modifications:

- Flow Reversing Skid
- Additional valving

2.1 SWP Expansion (cont.)

SWP Expansion

- AEMO Chart from DWGM Event report dated 16 Apr'18
- Further drivers for SWP expansion, linked to Iona UGS expansion

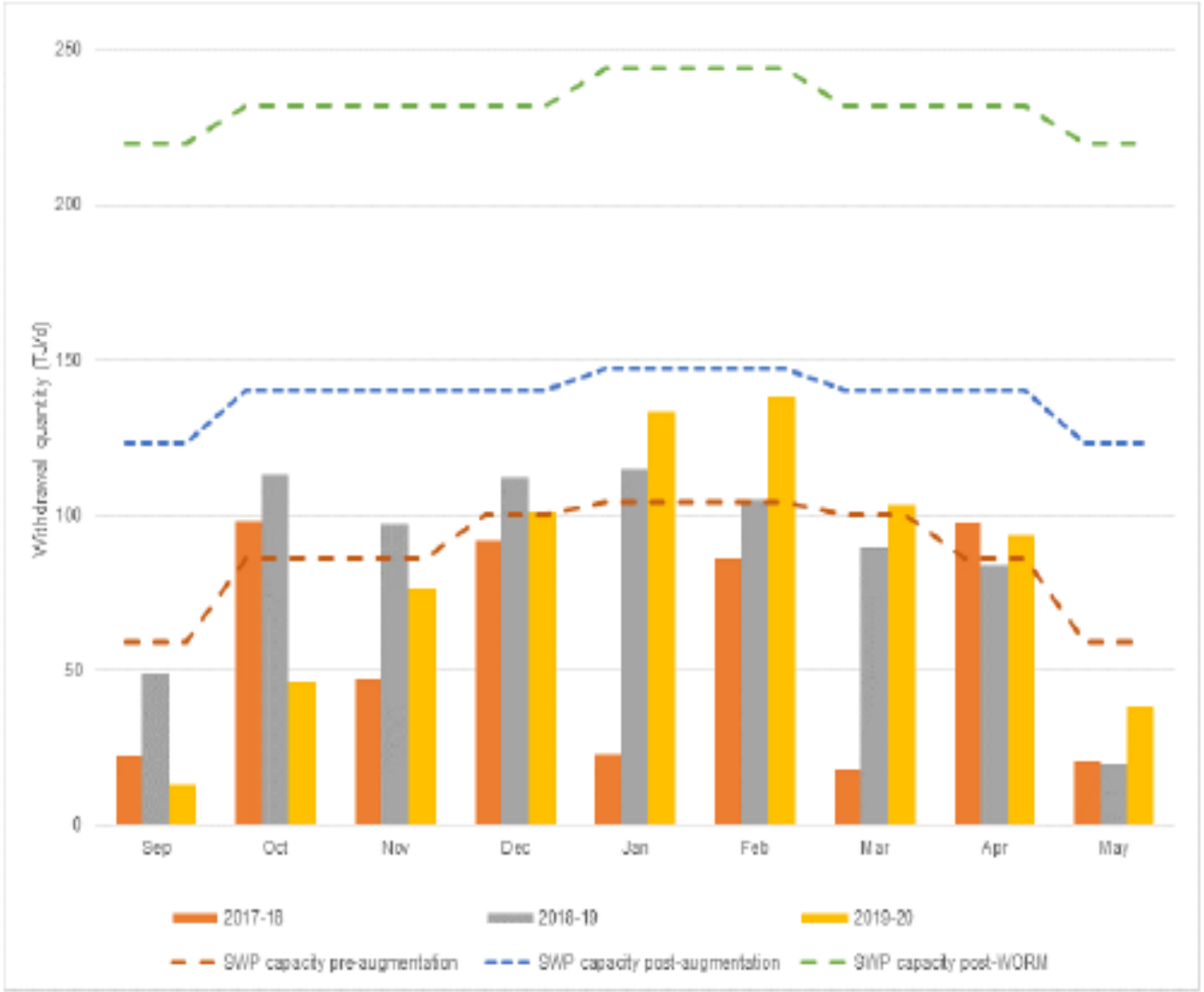
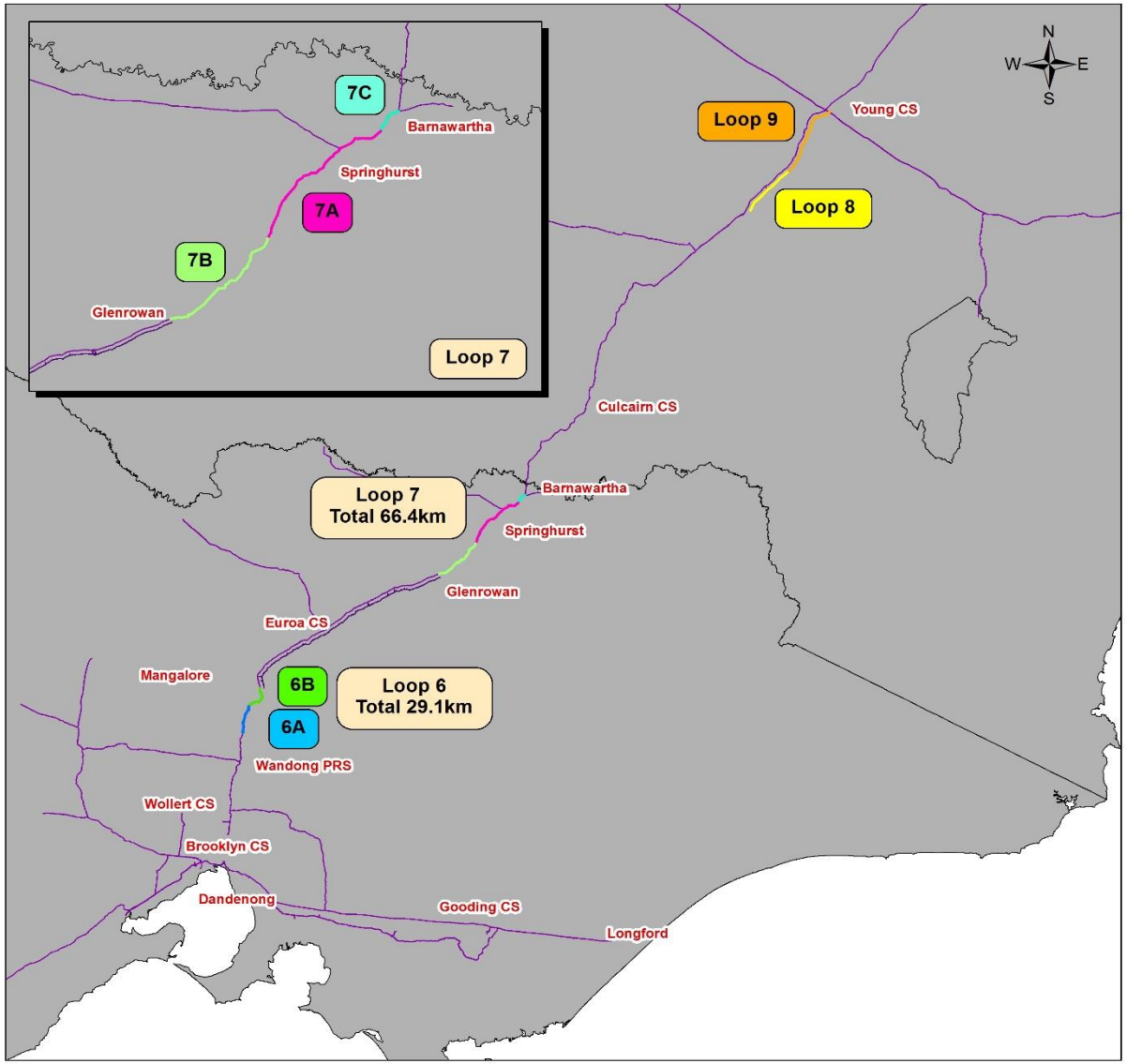


Figure 6 – Comparison of SWP capacities pre and post augmentation

2.2 Culcairn South / North



Legend

- Existing APA Group Pipelines
- Existing Loopings
- Loop 6A — *Loop 6A Length 16.2km*
- Loop 6B — *Loop 6B Length 12.9km*
- Loop 7A — *Loop 7A Length 33.4km*
- Loop 7B — *Loop 7B Length 27.4km*
- Loop 7C — *Loop 7C Length 5.6km*
- Loop 8 — *Loop 8 Length 30km*
- Loop 9 — *Loop 9 Length 40km*

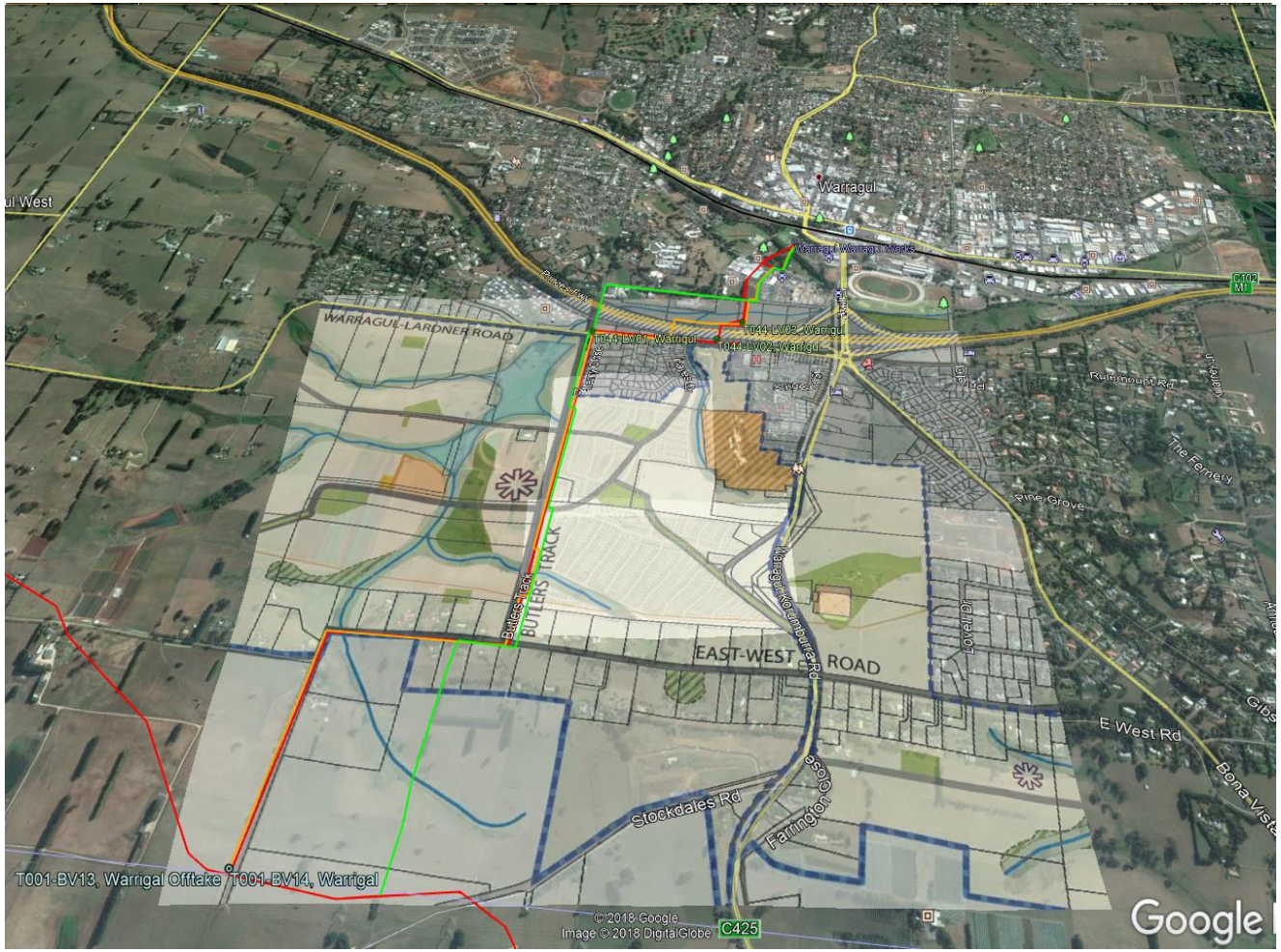
3.0 further expansions

3.1 Warragul Looping (committed expansion)

Warragul Looping

Modifications:

- Connection tie-in and tapping point to DN450 "Lurgi" pipeline
- Approximately 4.8 kilometres of buried DN150 pipework
- Connect to existing Warragul city gate



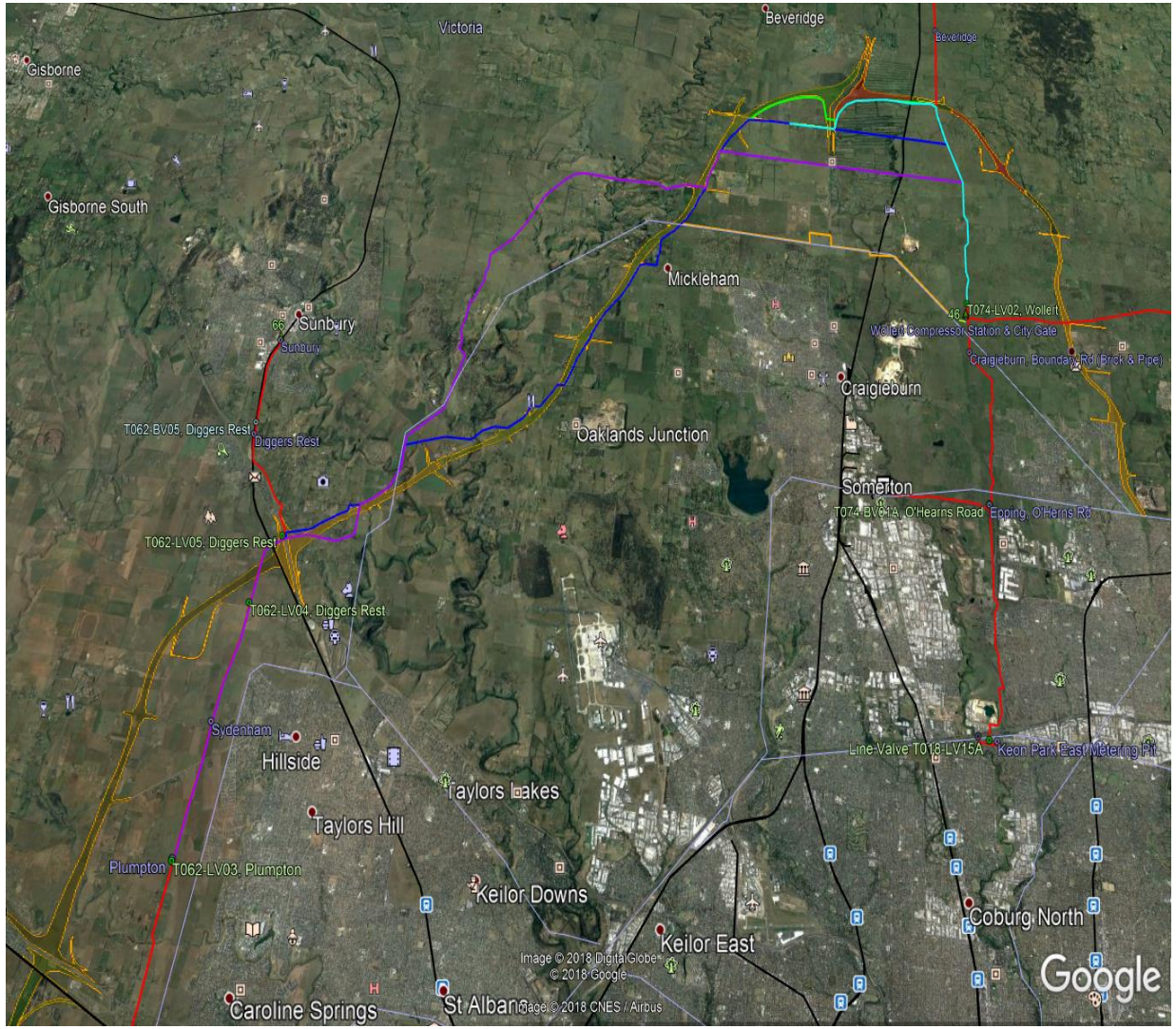
3.2 WORM (Western Outer Ring Main)

(corridor selection and land access and approvals)

WORM

Modifications:

- New 50 km (approx.) DN500 pipeline Wollert to Plumpton
- Installation of additional compression (new WCS6) at Wollert
- A new interconnecting Pressure Reduction Station at Wollert



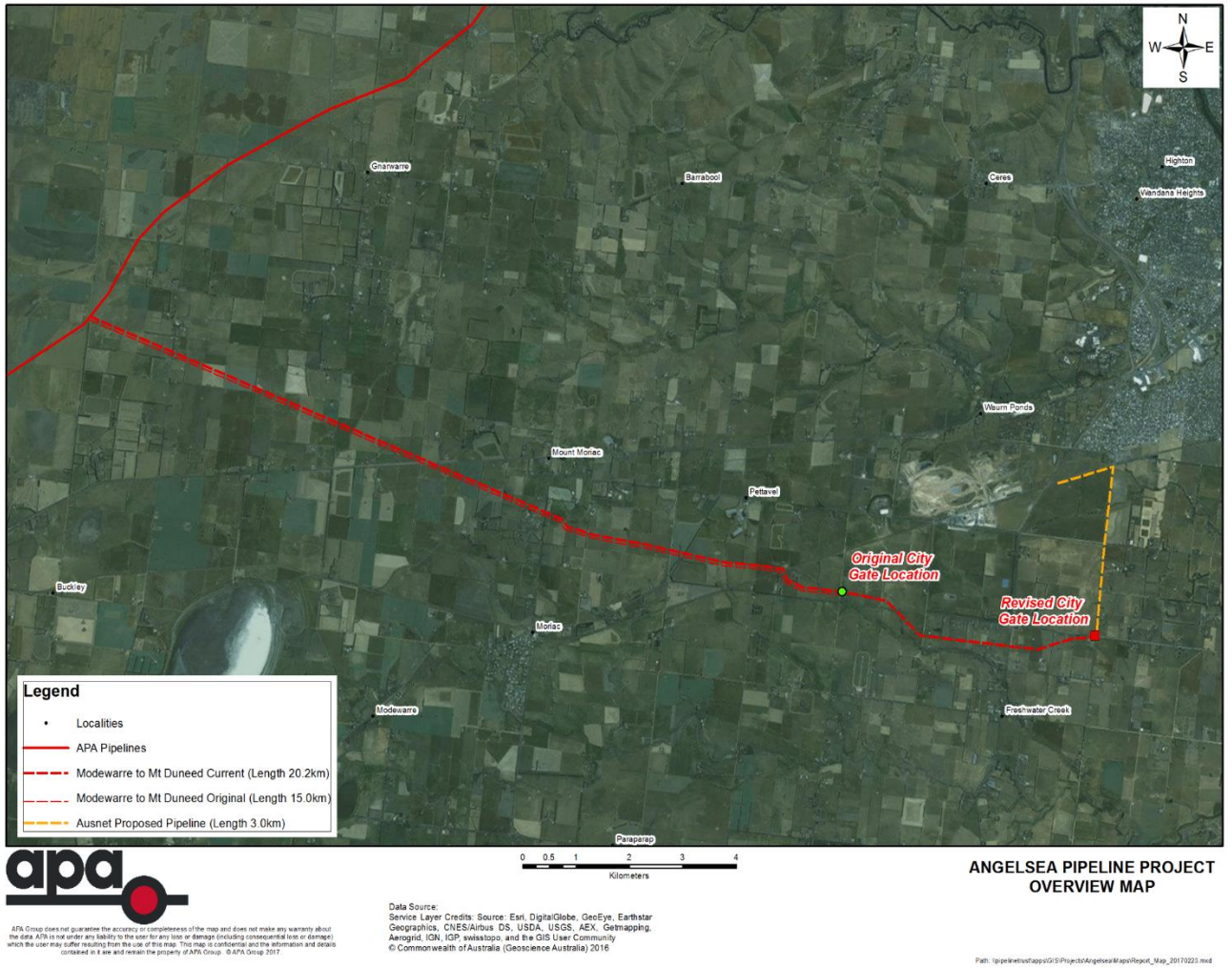
3.3 Anglesea Pipeline extension

(corridor selection and land access and approvals)

Anglesea Extension

Modifications:

- Connection tie-in and tapping point to DN500 SWP
- Approximately 20.2 kilometres of buried DN250 pipework
- Connect to new AusNet city gate



4.0 where to next

4.1 possible developments

	**New DTS Connections & SWP Expansions**	• New connections, including domestic growth and GPG • Stonehaven Compressor Station • Additional Compression • Pipeline Looping
	**New LNG Storage**	• A second LNG liquefaction and storage facility connected to the DTS, close to the Melbourne metropolitan demand centre, most suitable location for such a facility would likely be Wollert
	**Culcairn Expansions**	• Further de-bottlenecking and reliability improvements to the northern transmission assets (current 150TJ/d southbound and 223TJ/d northbound capacity for DTS) • Additional capacity could be unlocked before the DTS becomes the limiting factor (southbound DTS import capacity is 223 TJ/d)
	**West-East Gas Pipeline**	• Federal Government has commissioned a pre-feasibility study for the construction of a West-East Gas Pipeline • DTS benefit dependent on where connecting into east coast grid
	**AGL Gas Import Jetty**	• AGL is investigating procuring a Floating Storage and Regasification Unit (FSRU), which would receive LNG via shipments from interstate or overseas, store it, and then convert it to its gaseous form for pipeline transport to DTS

Questions?

For further information contact:

Name: Daniel Tucci
Title: Asset Manager (VTS)
Tel: 03 8533 2111 / 0417 383 196
E-mail: daniel.tucci@apa.com.au

Or visit the APA website at:
www.apa.com.au

VICTORIAN GAS WINTER OUTLOOK

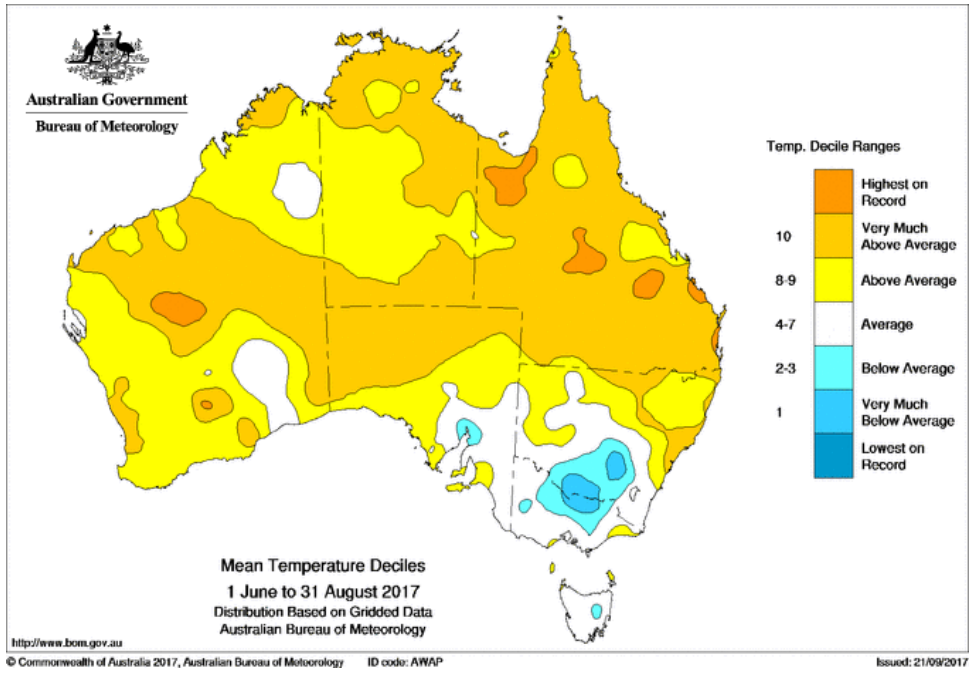
Josh Fisher – Meteorologist/Account Manager

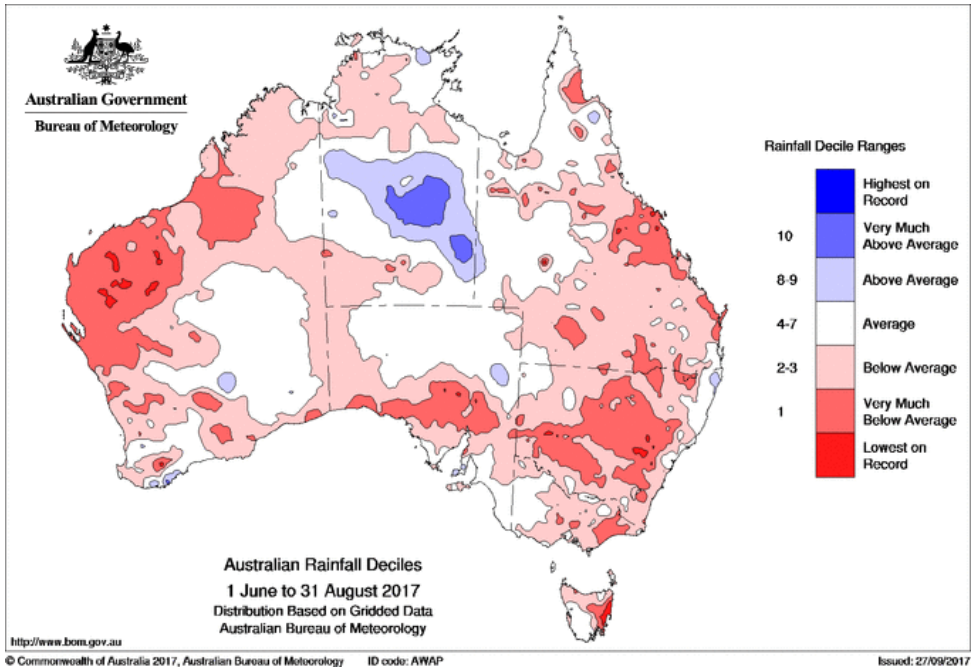
Overview

- Winter 2017 review
- Current and forecast state of the climate
- Winter 2018 outlook
- Outlook Summary

Winter 2017 Review

weatherzone





Weatherzone Long Range Verification

Skill Score	MAE	Blowouts
50%	0.84C	5

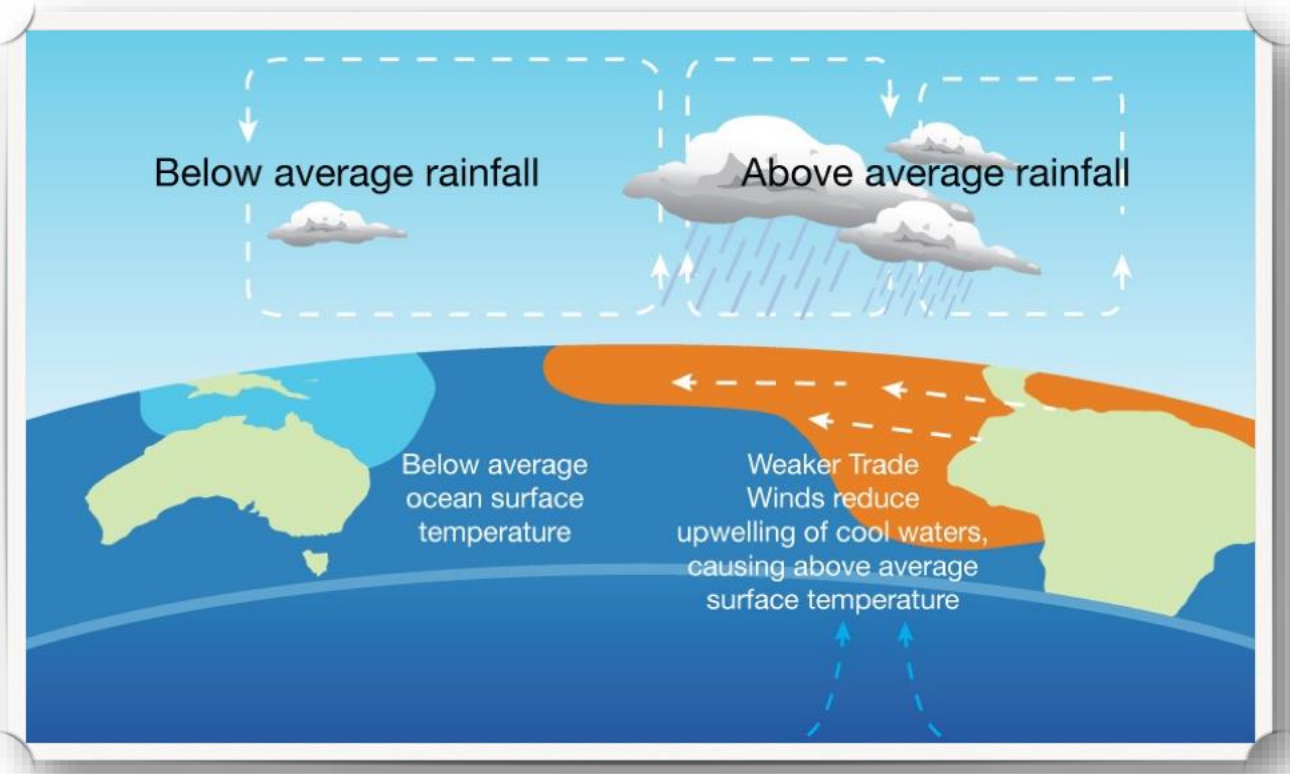
Climate Drivers

weatherzone

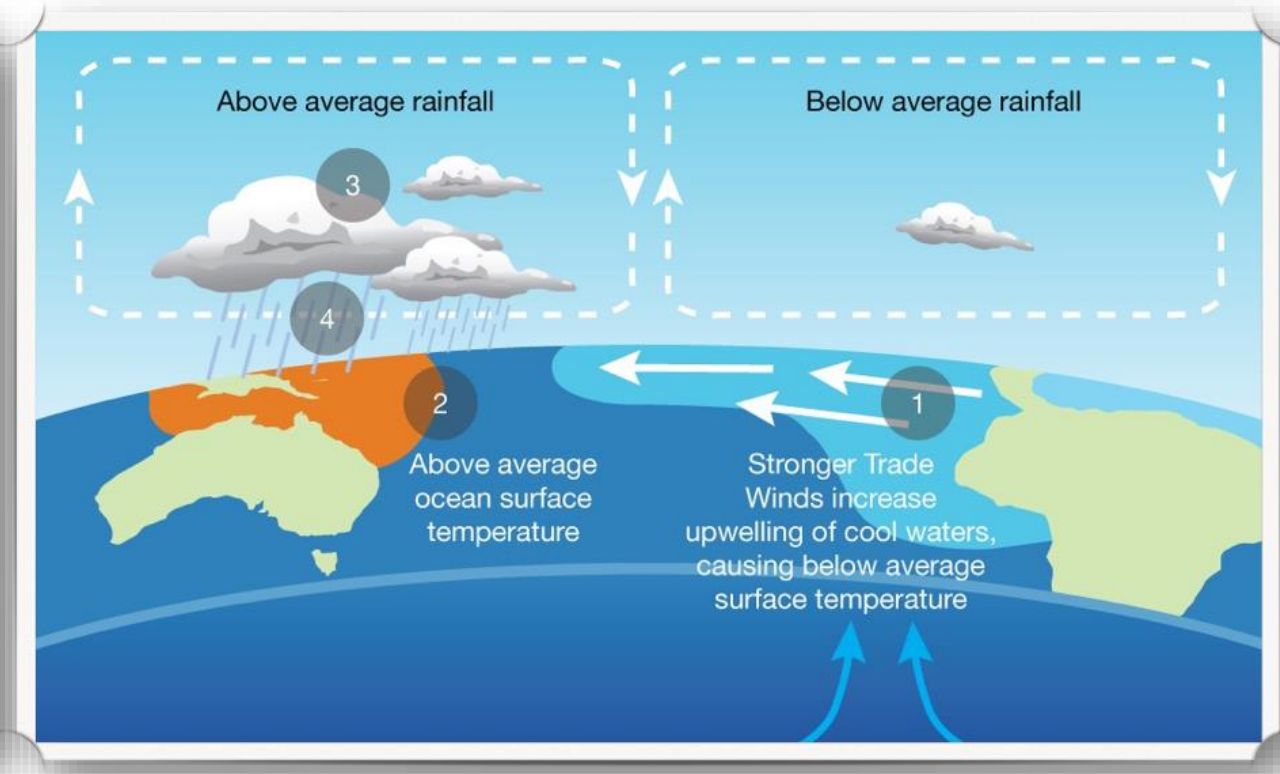
ENSO Background

weatherzone

El Nino

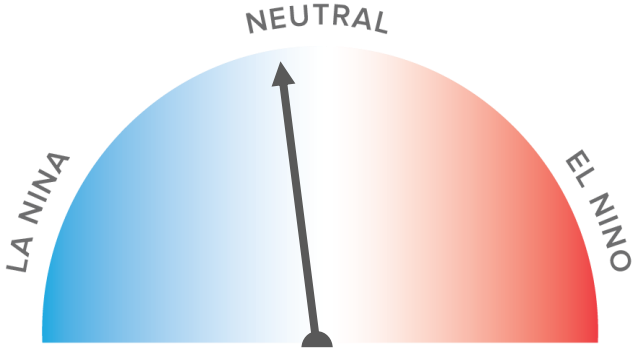


La Nina



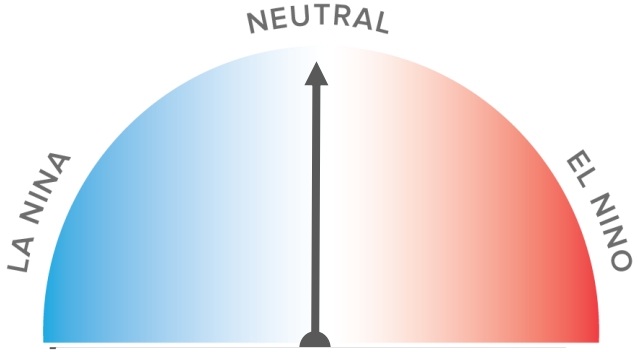
NINO3.4 Index

Current International Consensus



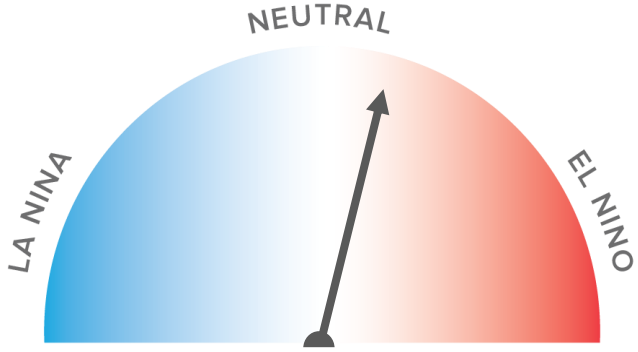
May

NINO3.4 Index: -0.3



July

NINO3.4 Index: +0.1

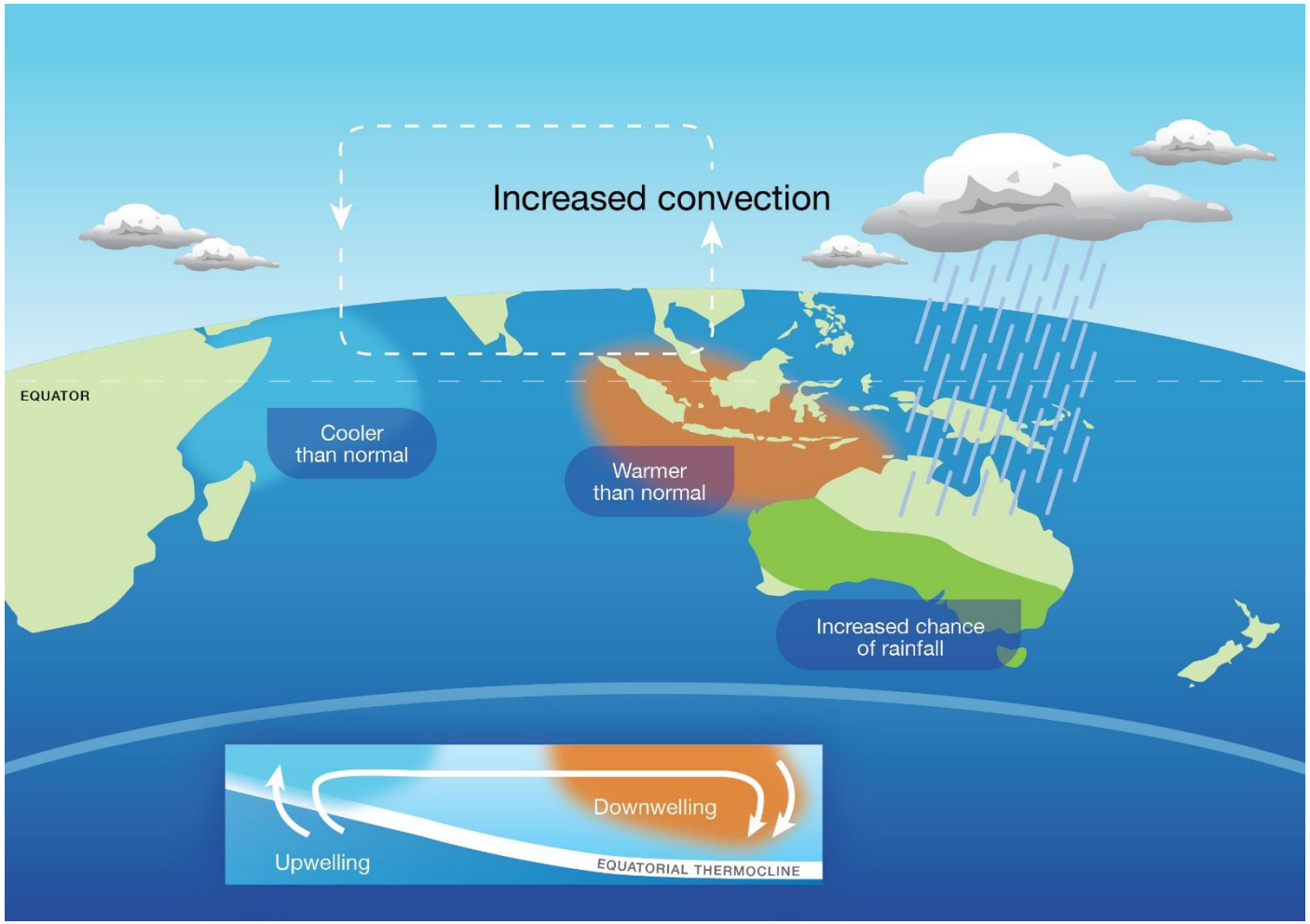


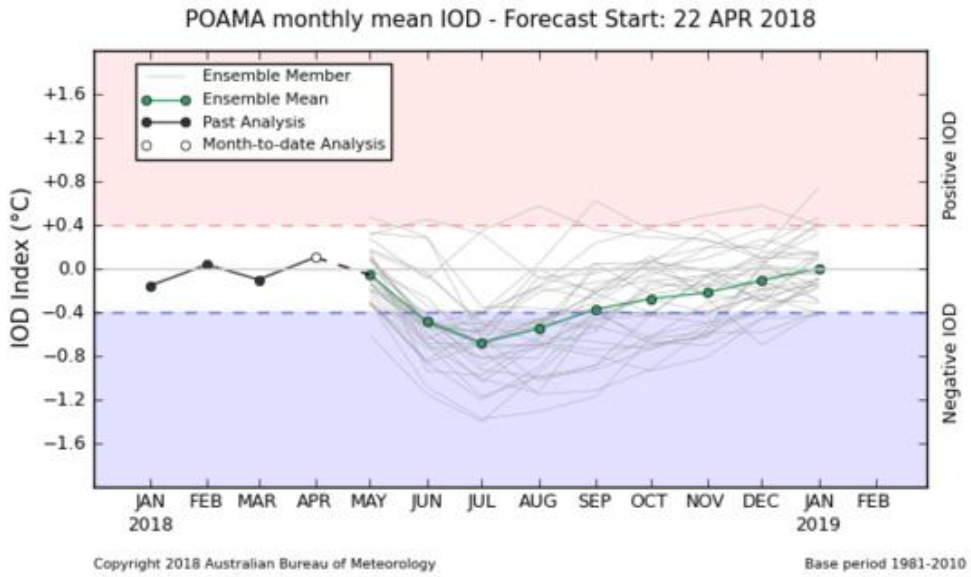
September

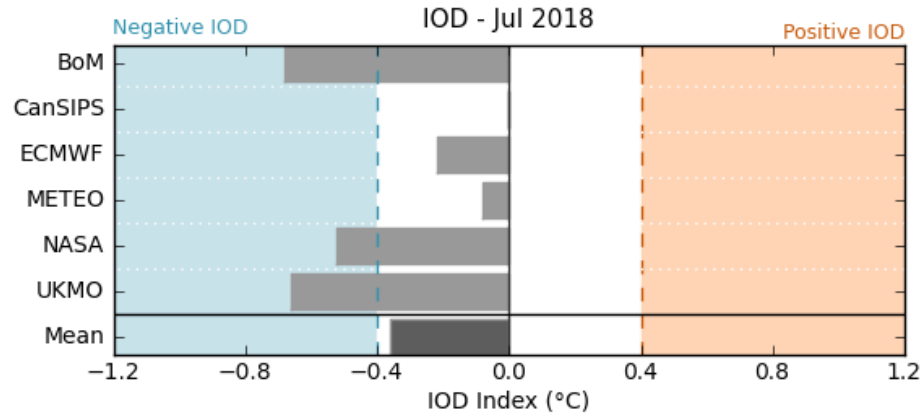
NINO3.4 Index: +0.3

*"For a **La Nina (-0.8)/El Nino (+0.8)** to be declared, thresholds need to be met for at least 3 consecutive months"*

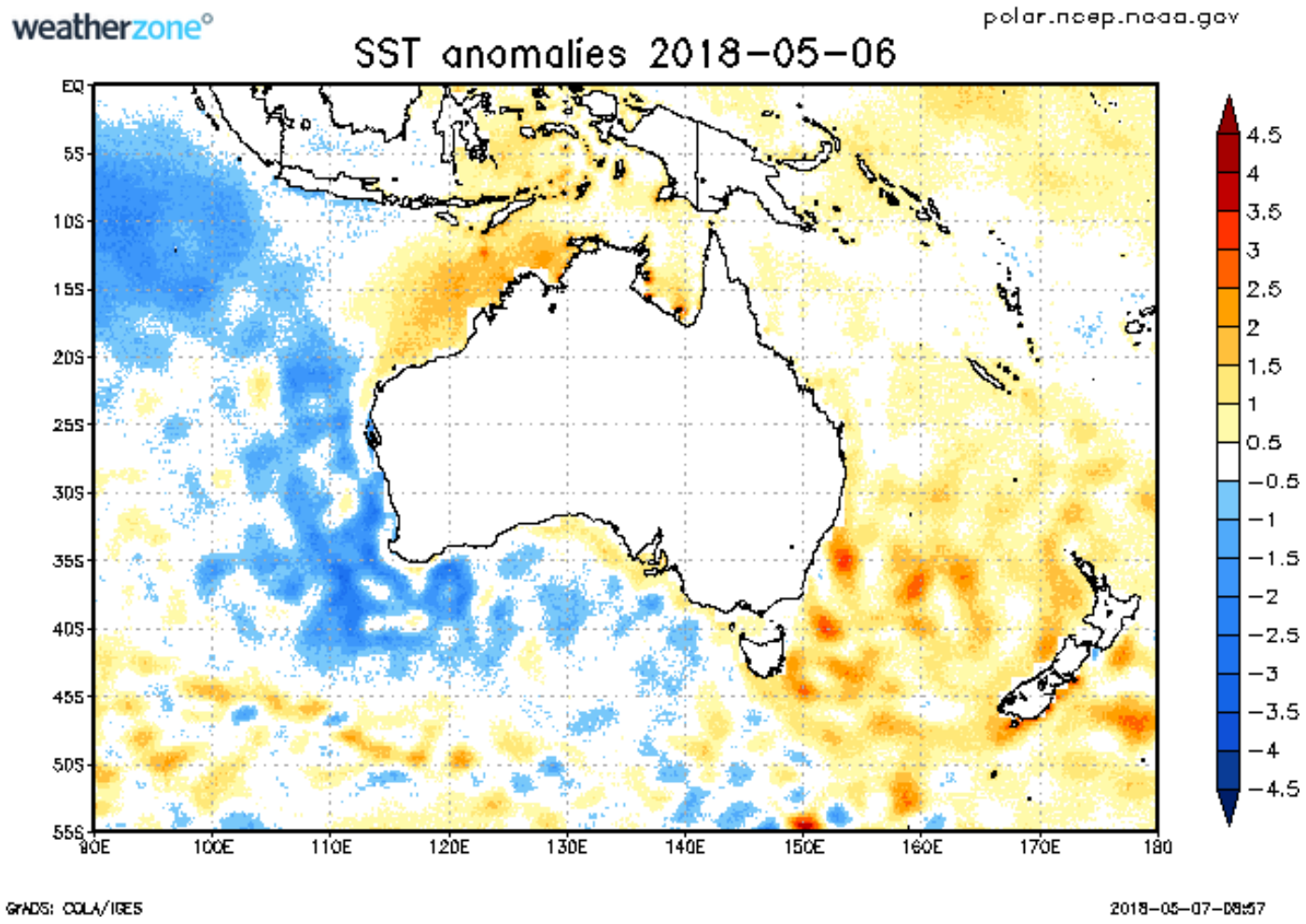
Outlook

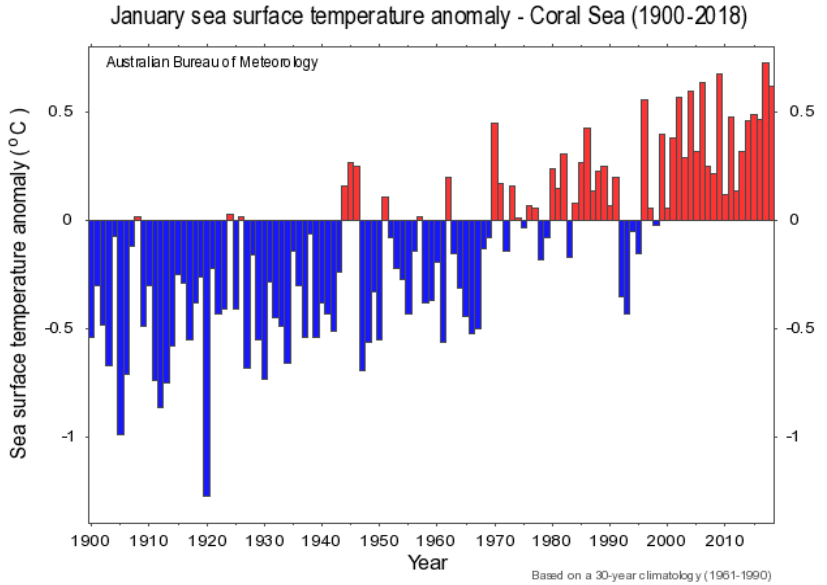


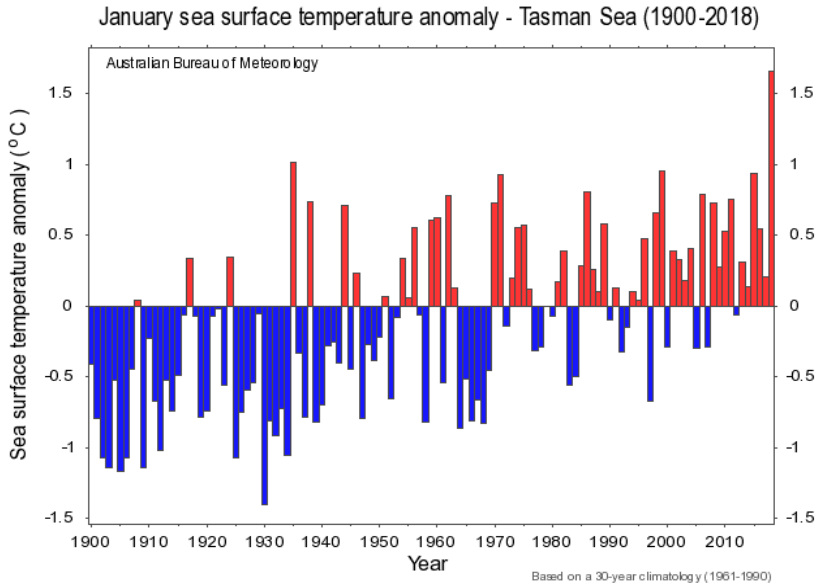




Temperatures







Climate Drivers

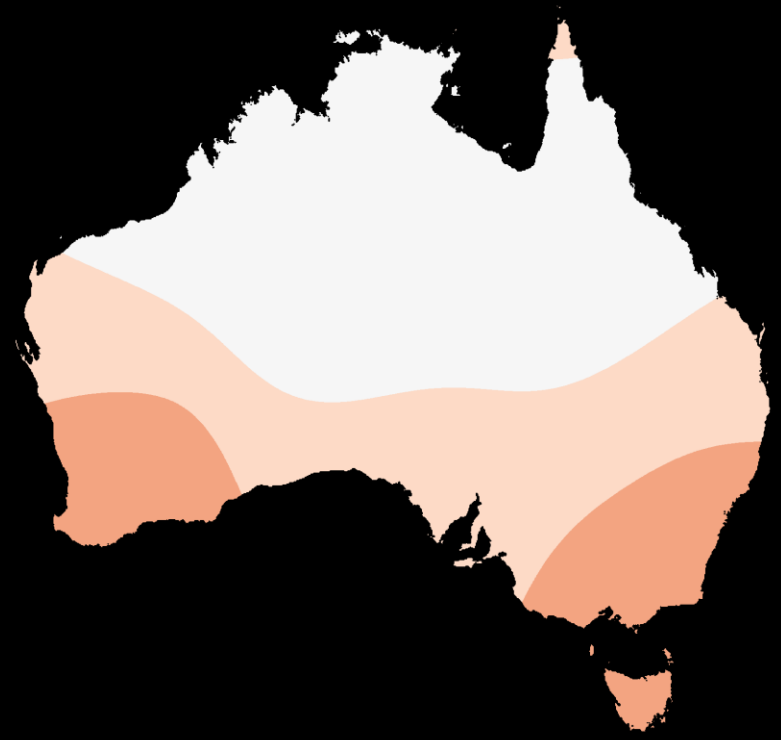
weatherzone

Winter Outlook

National Temperature Outlook (JJA)

weatherzone

Maximums

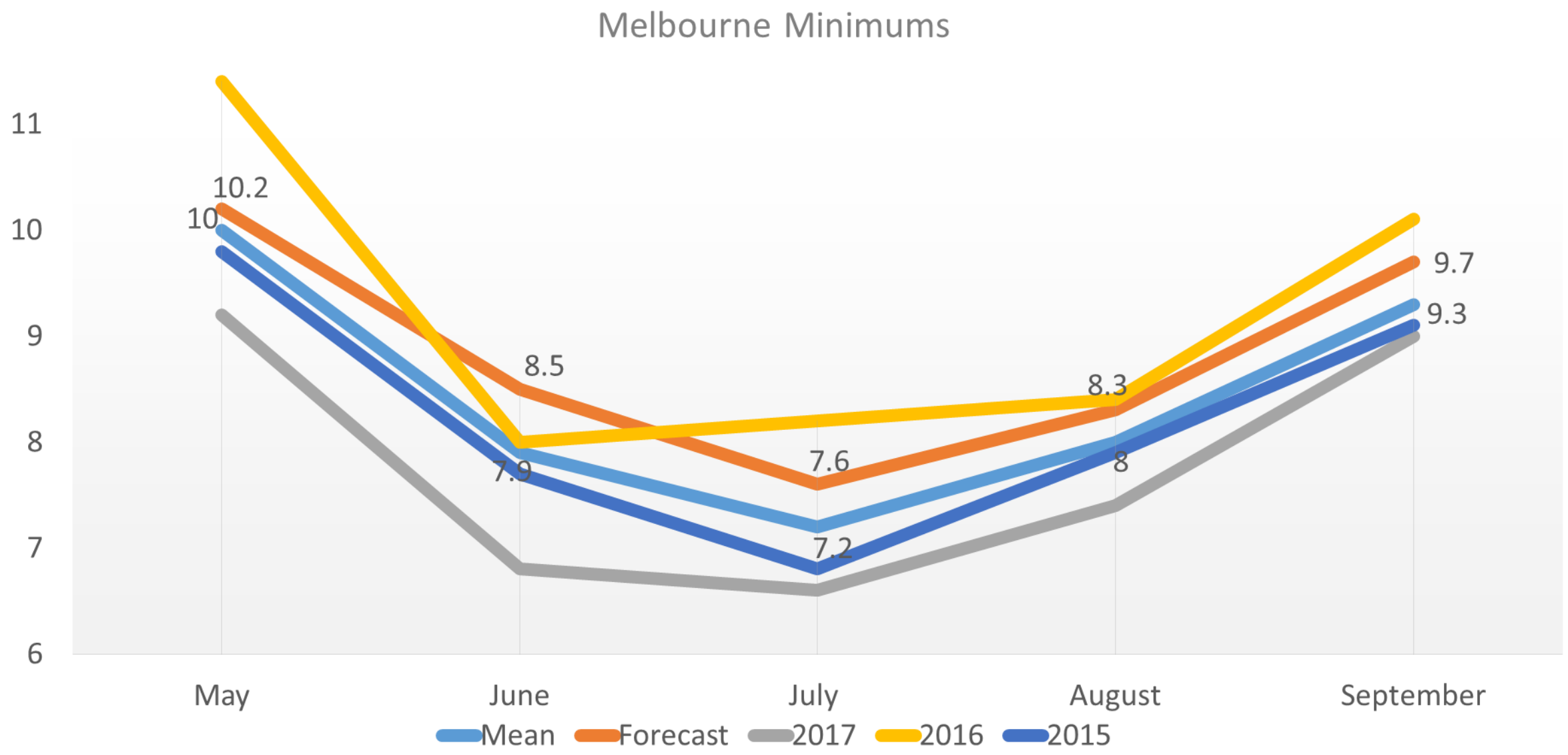


Minimums

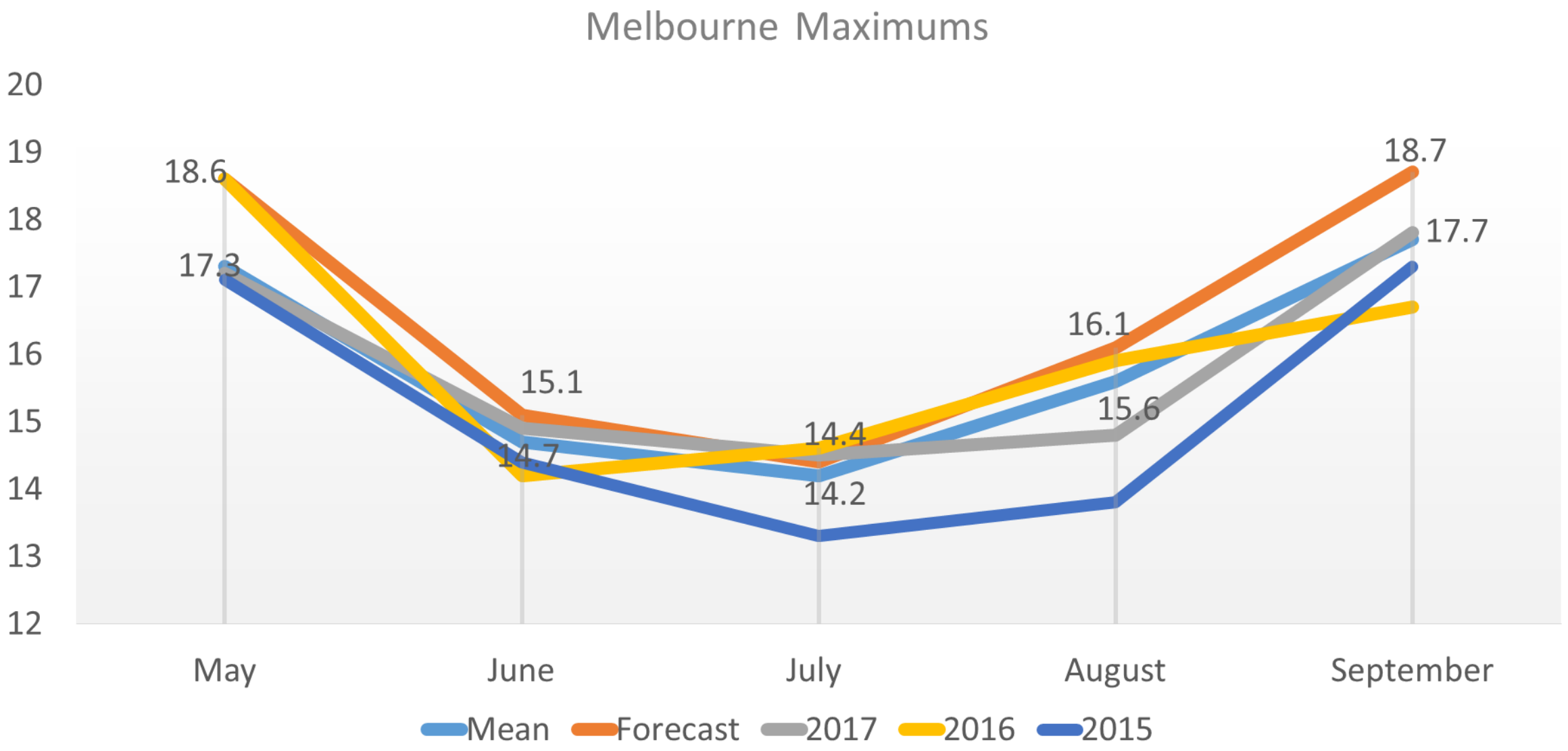
Decile

1 2 3 4 5 6 7 8 9 10

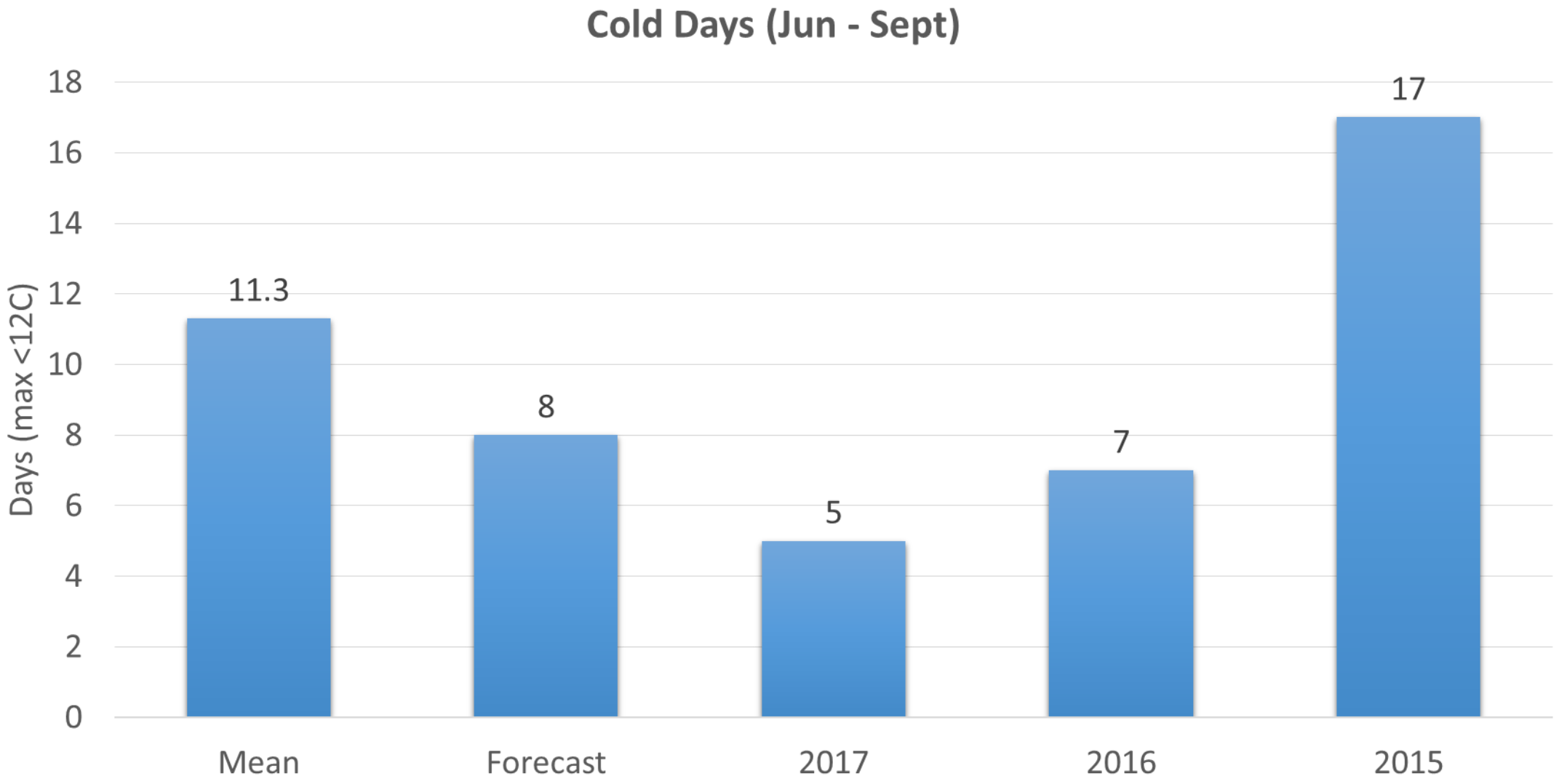
Melbourne Temperature Outlook



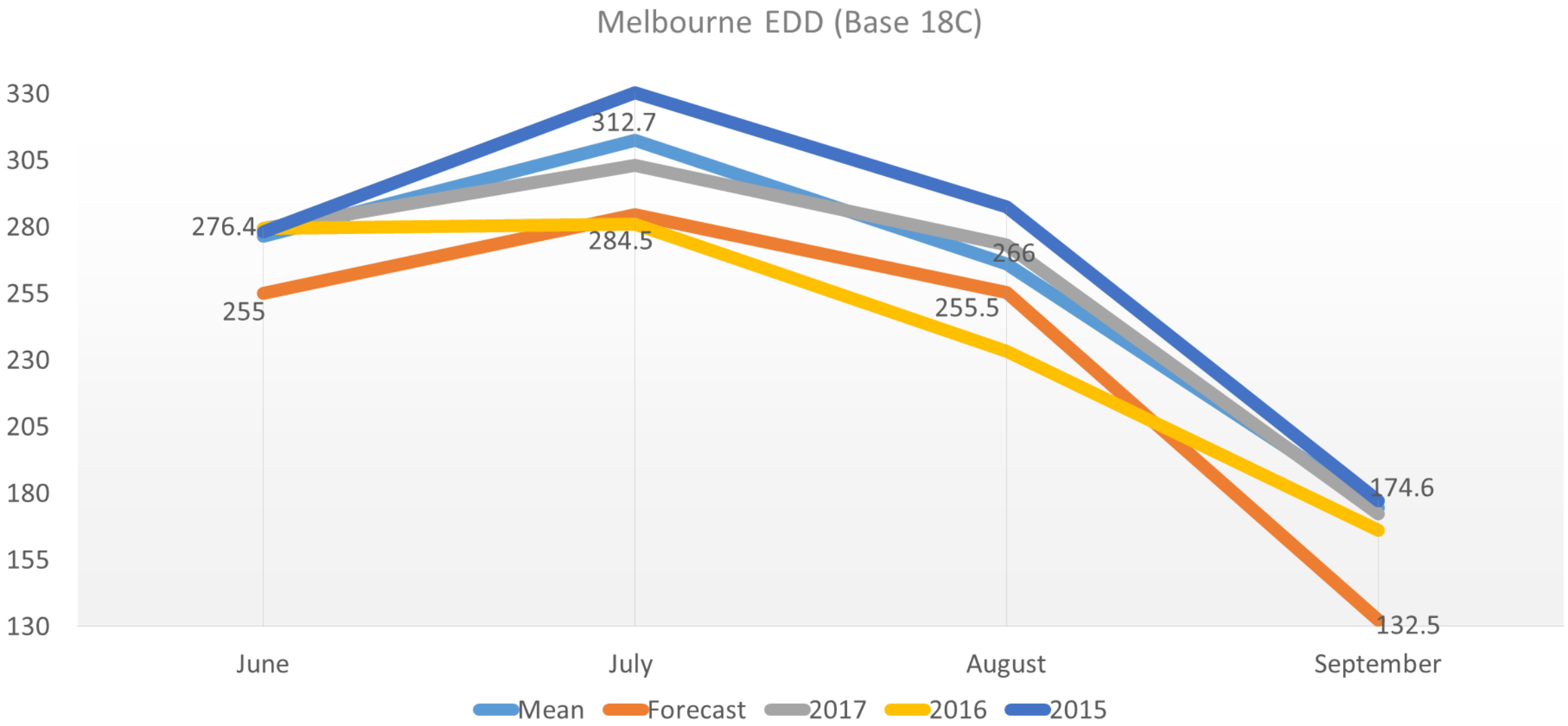
Melbourne Temperature Outlook



Melbourne Cold Days (max <12C)



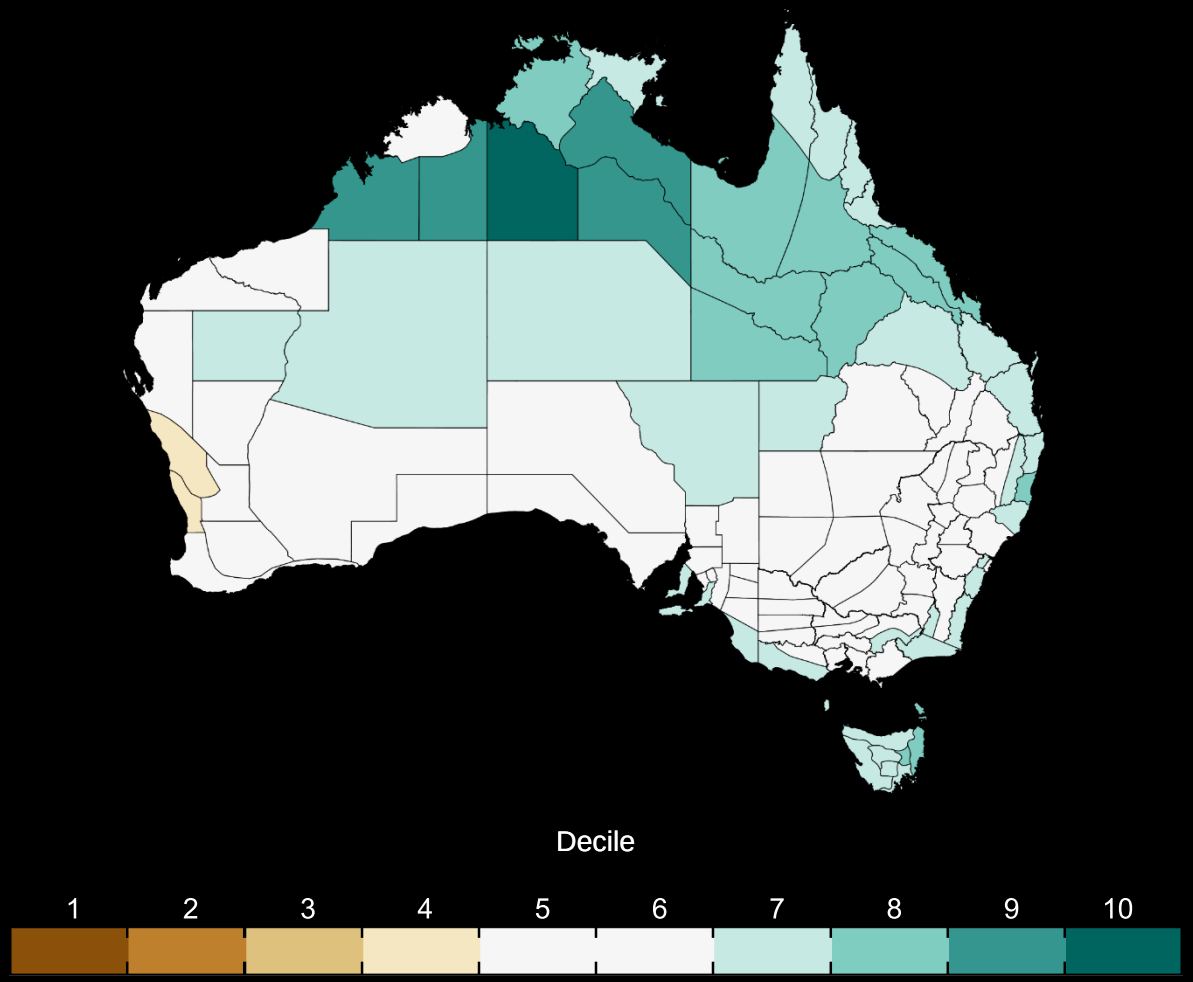
Melbourne EDD



Rainfall Outlook (JJA)

weatherzone

Rainfall



Outlook Summary WINTER

ENSO Status: Neutral

Indian Ocean Dipole: Trending negative

Warmer than average sea surface temperatures continue to be the dominant feature, particularly off eastern Tasmania and NSW

Warm seas are likely to influence temperatures, maintaining warmer than average days and nights through coastal southeastern Australia

Slightly below average number of cold days with half the total number of extreme days forecast for this season expected to occur during July

Most closely correlated to winter 2016

Questions?

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AEMO
AUSTRALIAN ENERGY MARKET OPERATOR

Winter 2018 Outlook Transmission Operations

Presented by Tim Abernethy (Gas Operations Engineer)

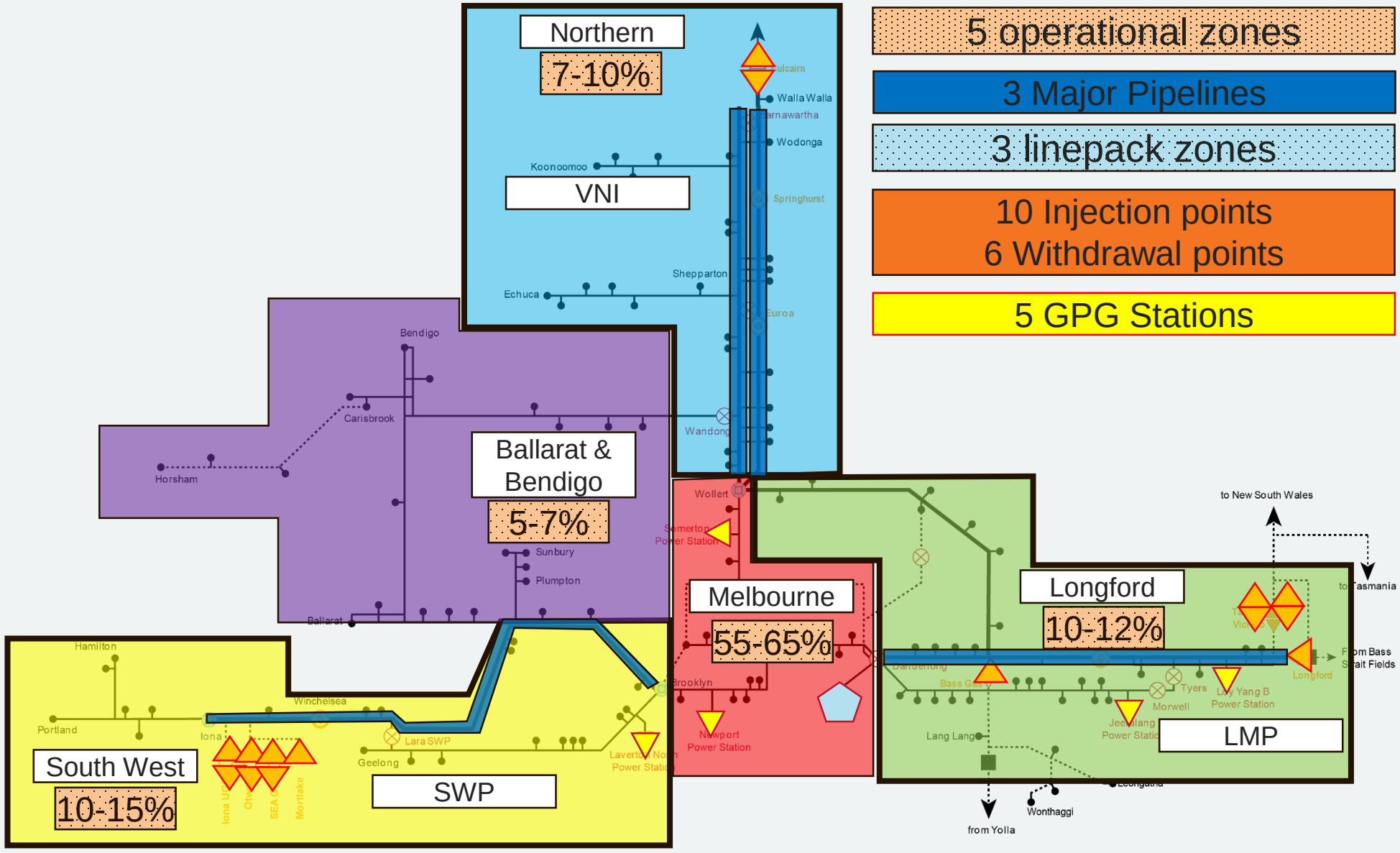
Purpose

- Describe how we operate the Declared Transmission System (DTS) in winter
- Highlight changes to operation from previous years
- Highlight how you can help us

Overview

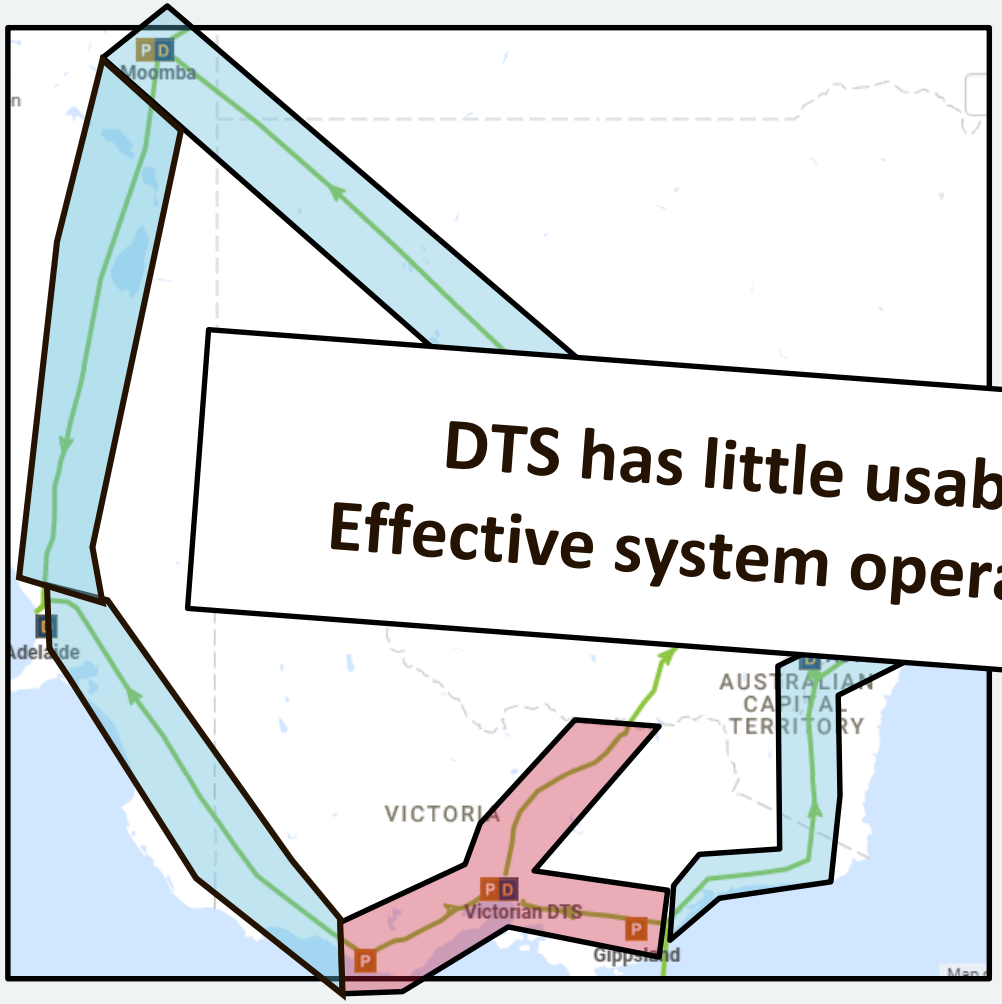
- Declared Transmission System Overview
- System Operations
  - Demand Forecasting
  - Operational Strategy
  - Response to a Threat
- 3 August 2017 Case Study

Declared Transmission System Overview



Declared Transmission System Overview

DTS Linepack vs. Other Pipelines



NSW/SA demand supplied by **two** major pipelines.

2-4 days of usable linepack!

DTS has little usable linepack.
Effective system operation is critical.

one small
work.

Very large demand!

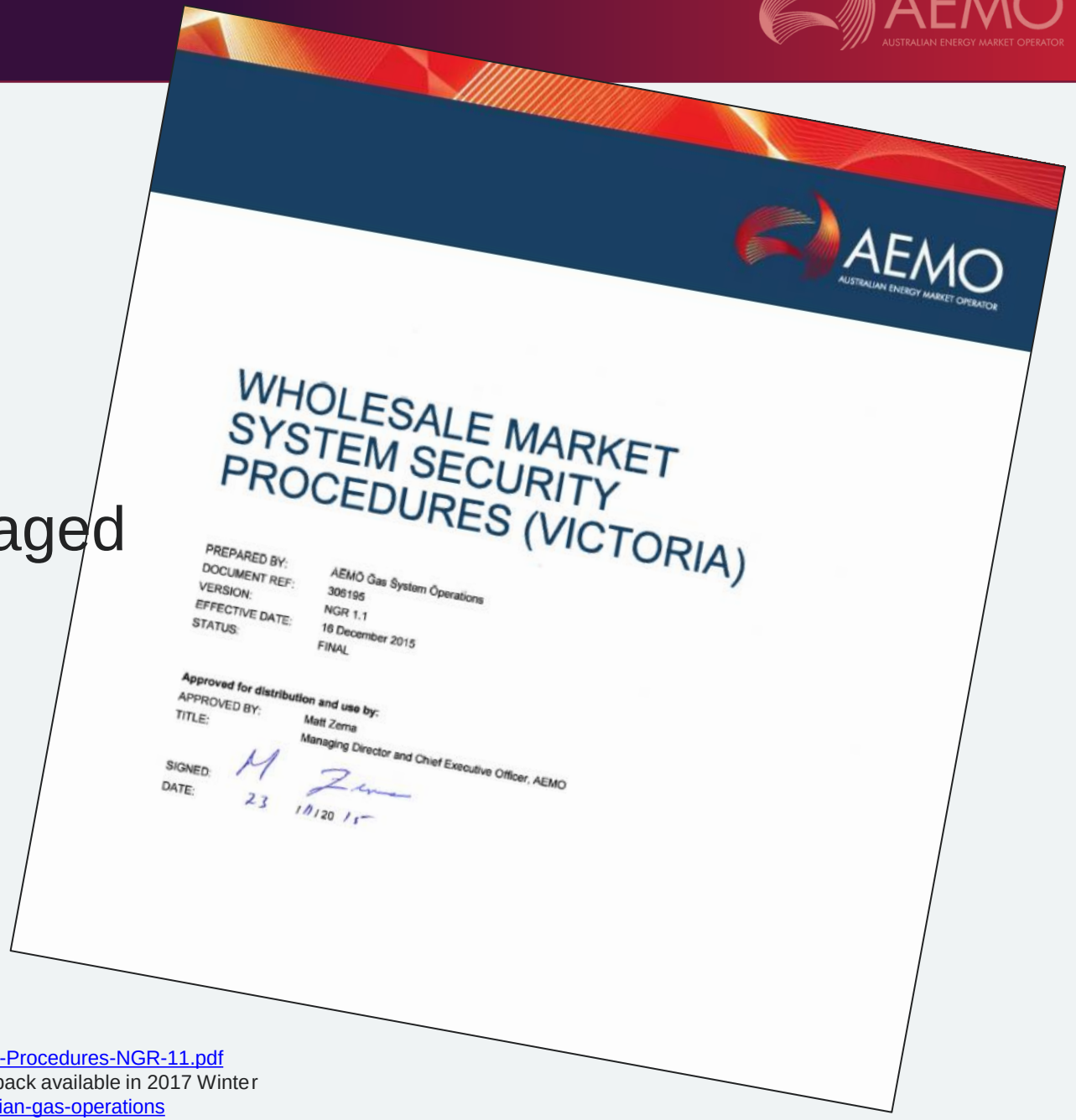
Only **2-4 hours** of usable linepack!

System Operations

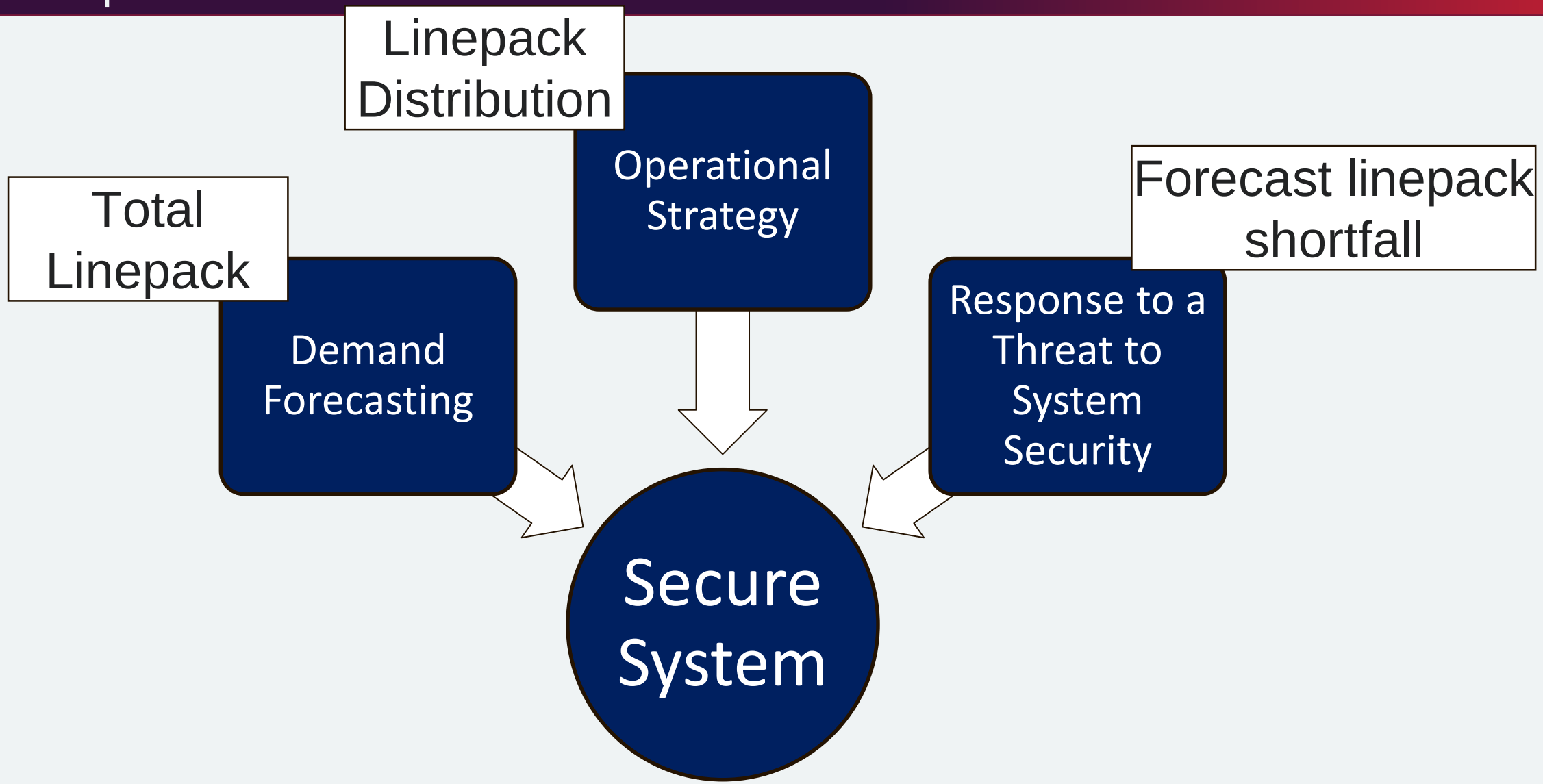
What's a secure system?

What is a Secure System?

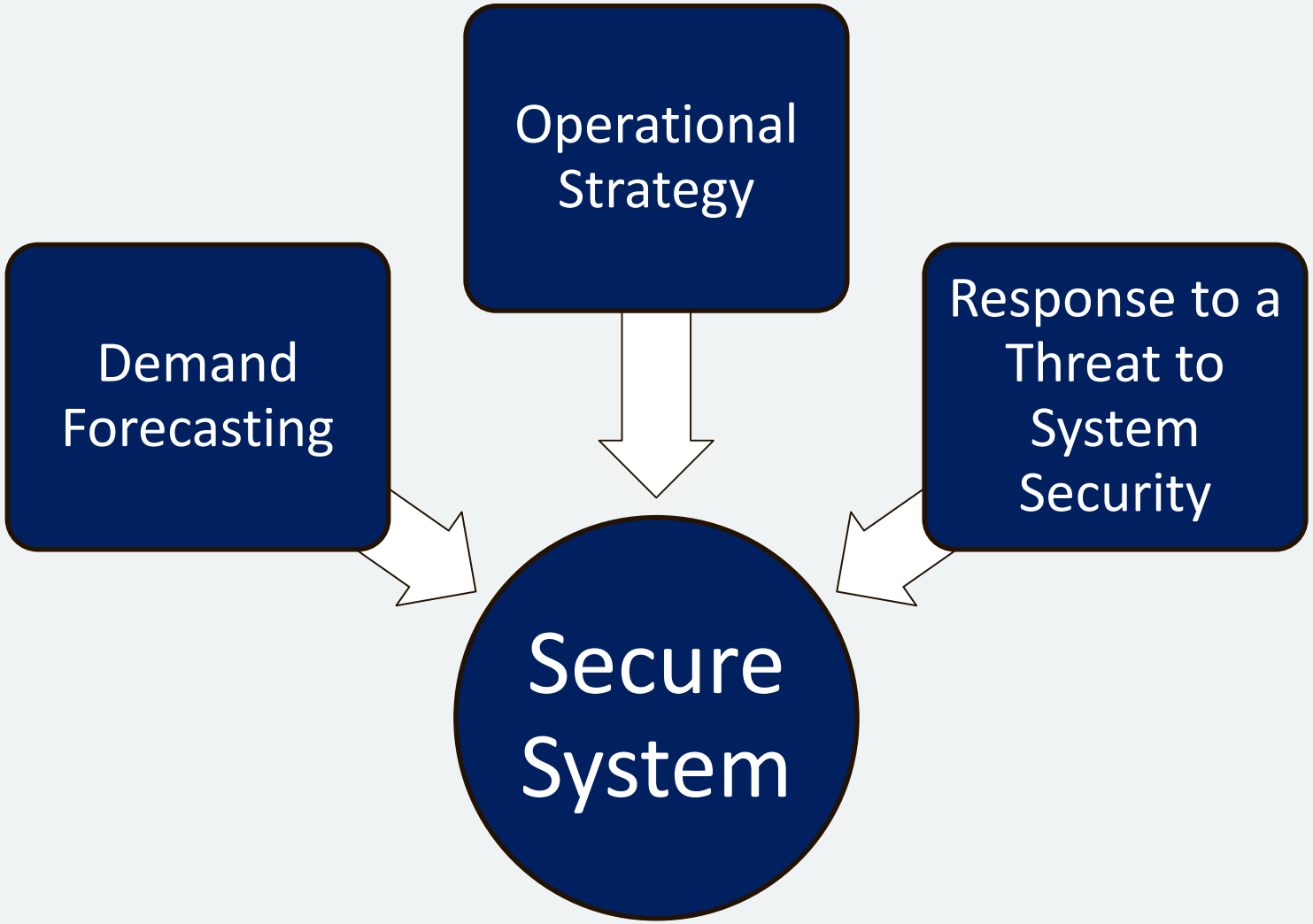
- Forecast pressures are within minimums and maximums
- Unplanned events can be managed operationally
- Pressure ≈ Linepack



Available at: https://www.aemo.com.au/-/media/Files/PDF/AEMO-Wholesale-Market-System-Security-Procedures-NGR-11.pdf
Explanation of active and passive linepack, and that minimum pressures correspond to minimum linepack available in 2017 Winter Outlook presentation: https://www.aemo.com.au/Gas/Declared-Wholesale-Gas-Market-DWGM/Victorian-gas-operations


Linepack Distribution
Total Linepack
Operational Strategy
Forecast linepack shortfall
Demand Forecasting
Response to a Threat to System Security
Secure System

System Operations

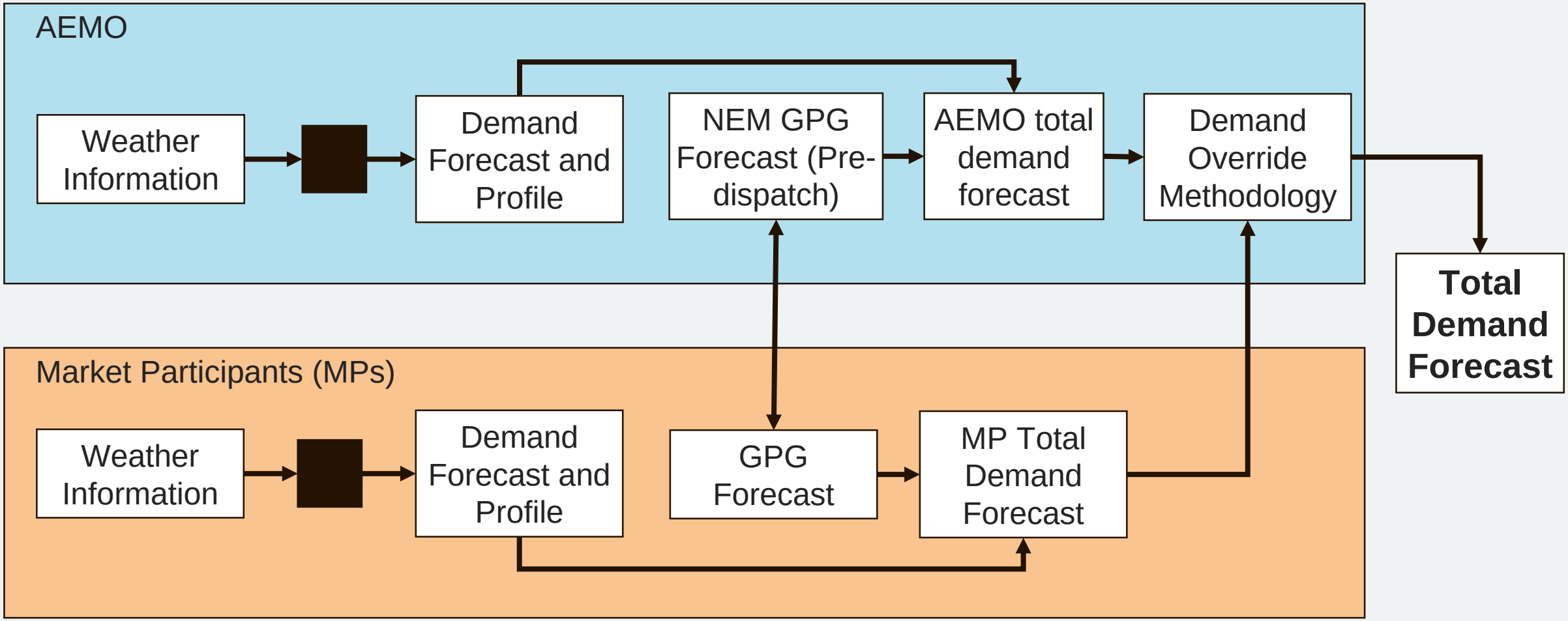


Demand Forecasting

Total Linepack

- Process overview
- Sources of uncertainty
- Impacts of uncertainty

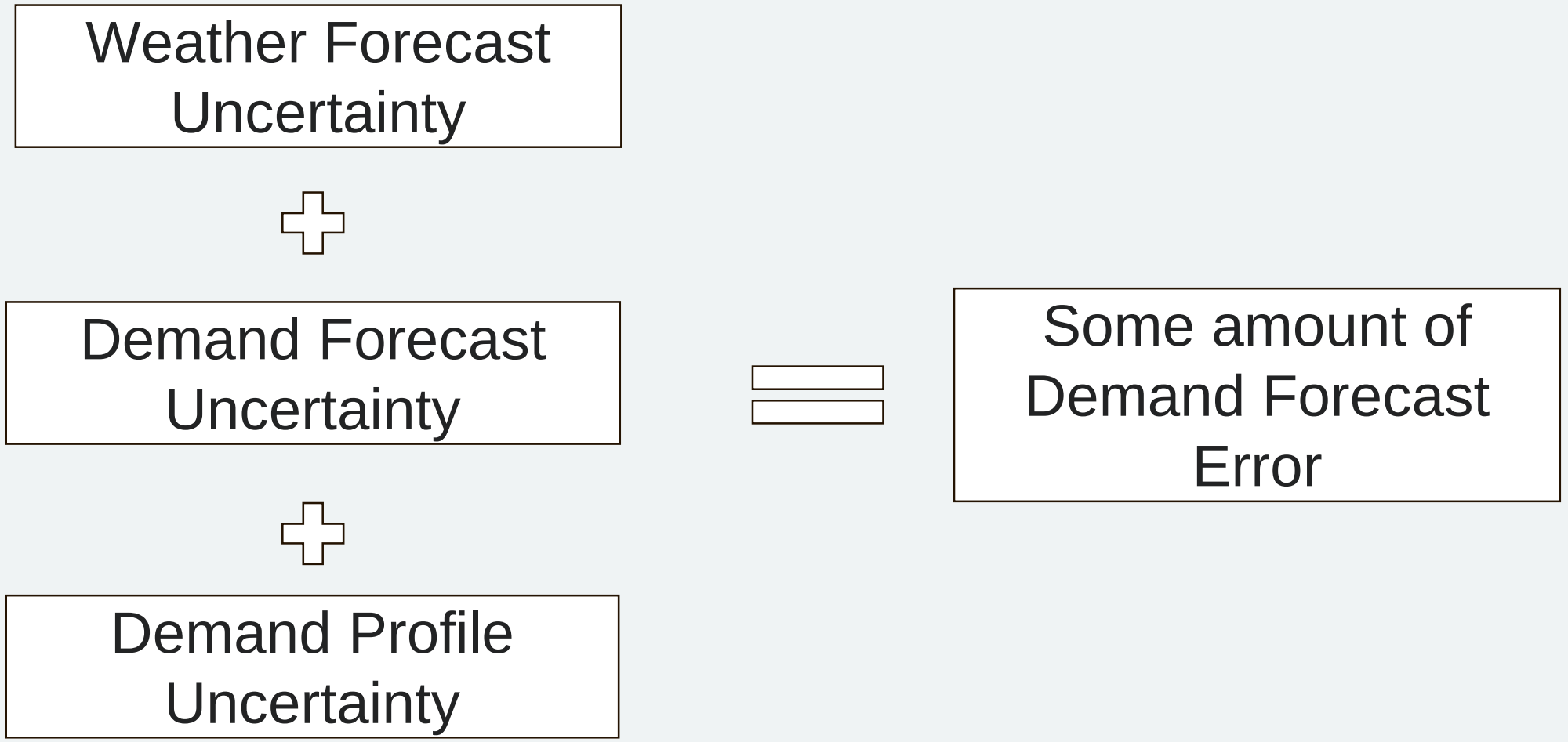
Demand Forecast



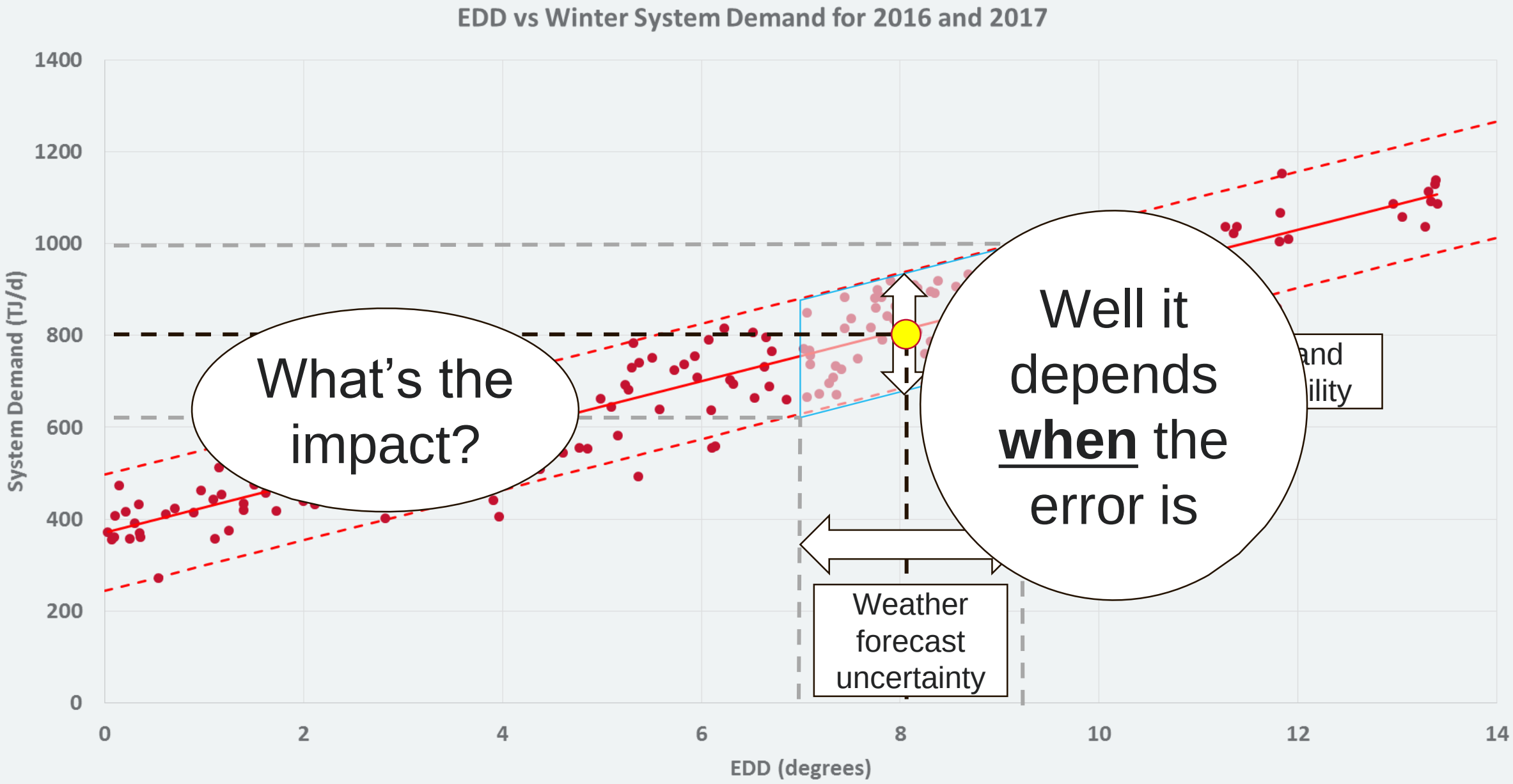
Explanation of demand forecasting process is provided in 2017 Winter Outlook Presentation available at:
https://www.aemo.com.au/Gas/Declared-Wholesale-Gas-Market-DWGM/Victorian-gas-operations

Demand Override Methodology available at: https://www.aemo.com.au/-/media/Files/PDF/Demand-Override-Methodology.pdf

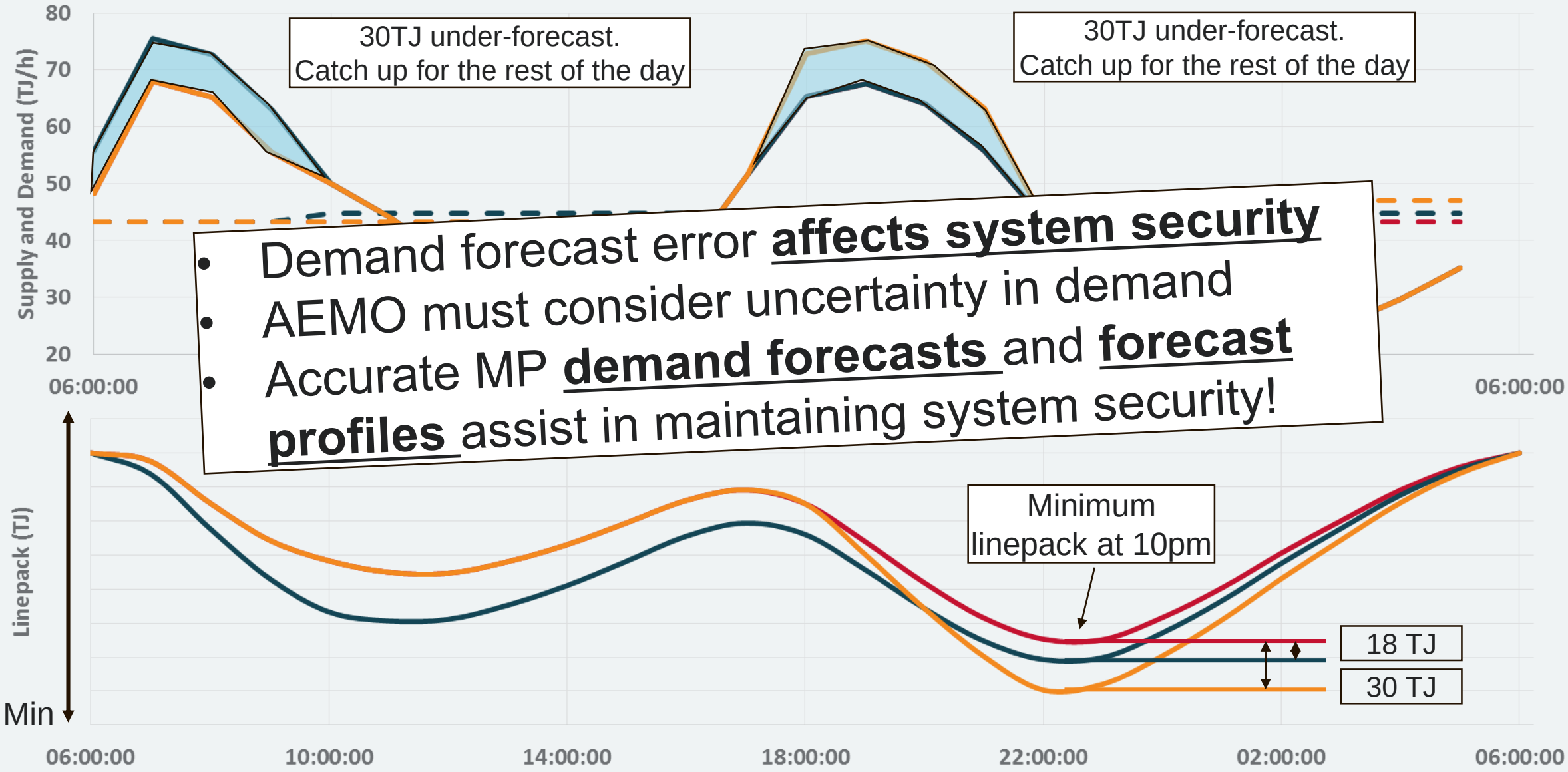
Demand Forecast – Sources of Uncertainty



System Operations – Demand Forecast Uncertainty

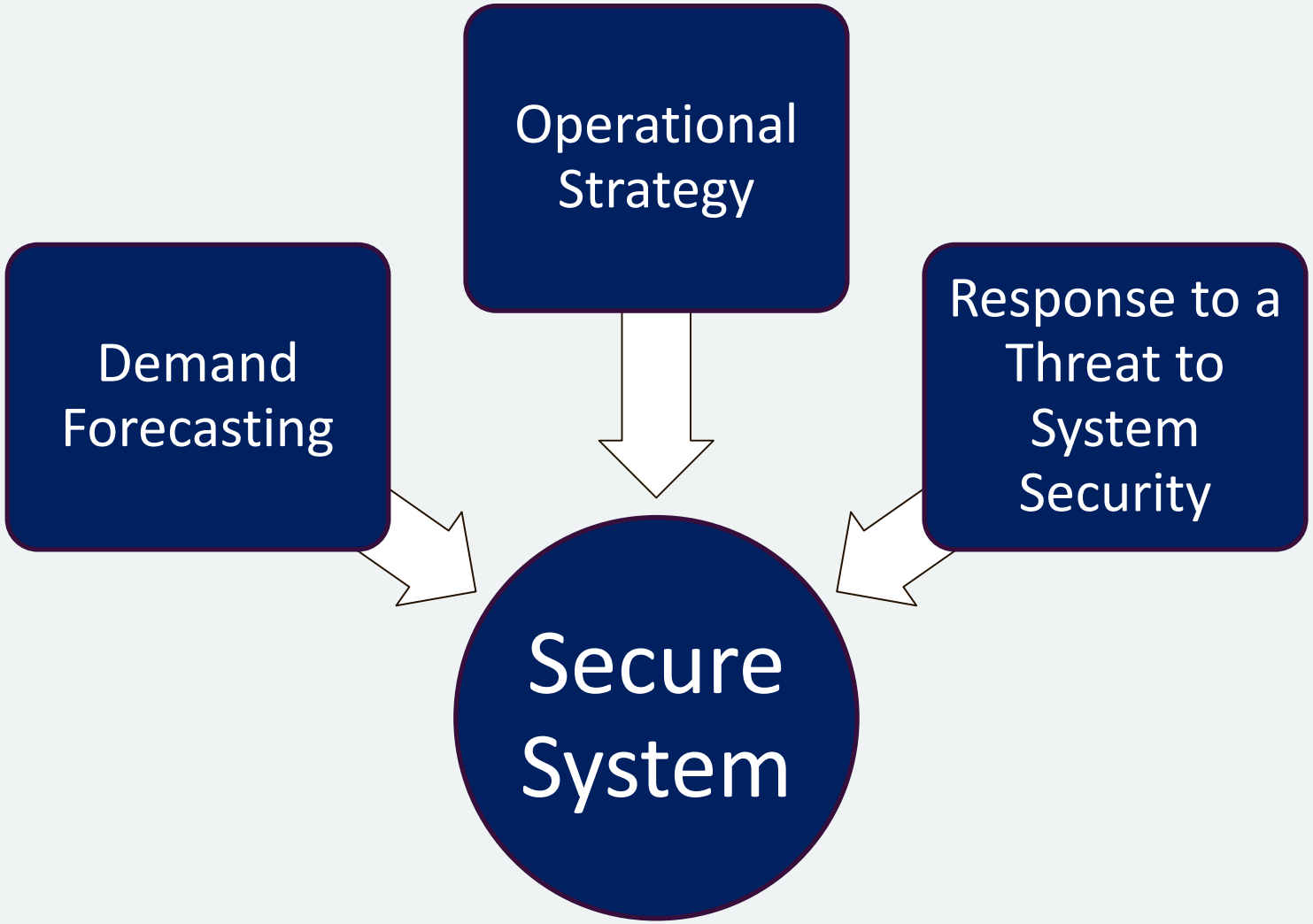


System Operations – Forecast Profile Error



- Demand forecast error **affects system security**
- AEMO must consider uncertainty in demand
- Accurate MP **demand forecasts** and **forecast profiles** assist in maintaining system security!

System Operations



Operational Strategy

Linepack

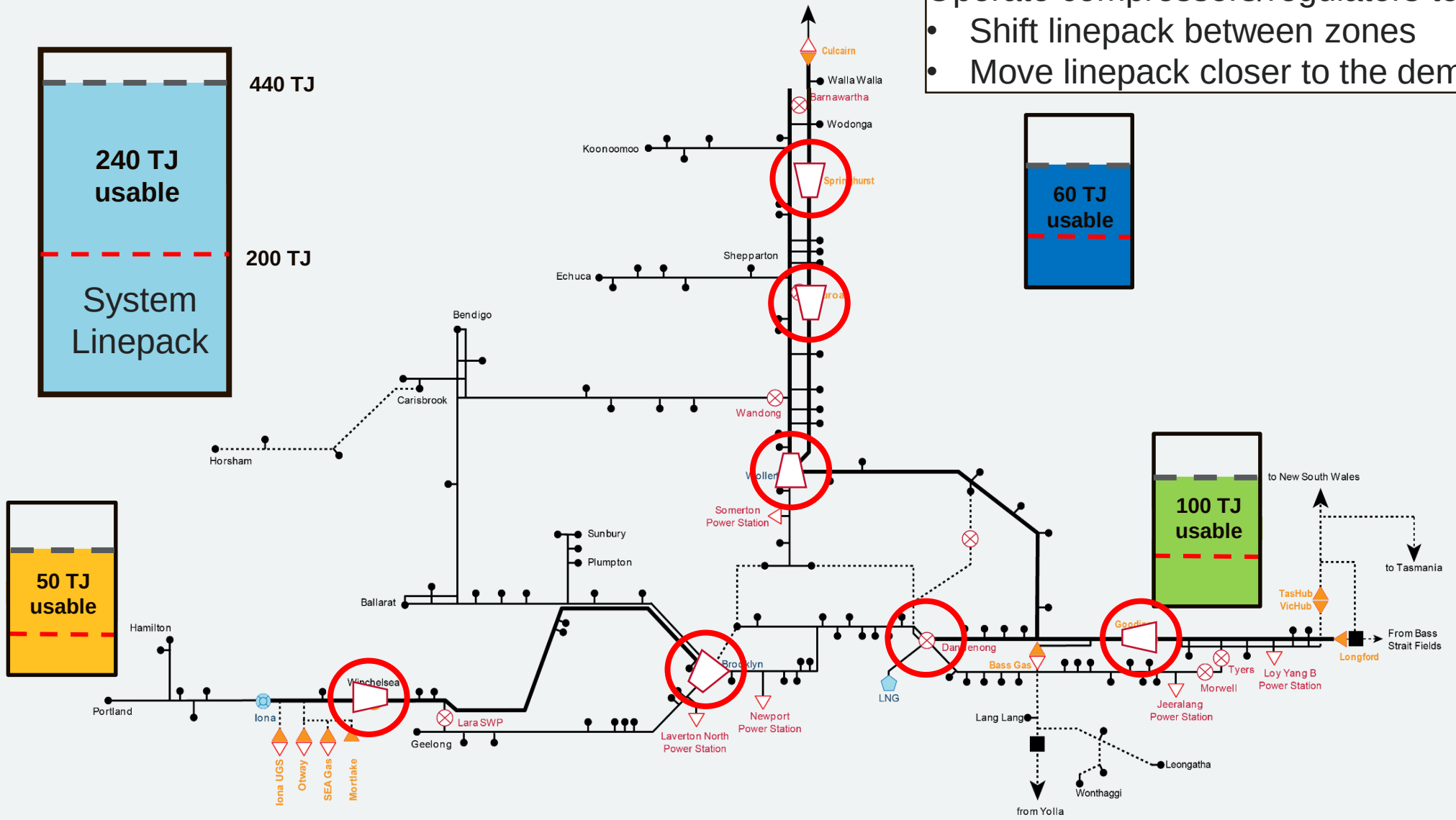
Distribution

- Operational Strategy overview
- Expected flow trends
- How they are managed

System Operations Overview –Winter 2017/18 Strategy

Operate compressors/regulators to:

- Shift linepack between zones
- Move linepack closer to the demand centre

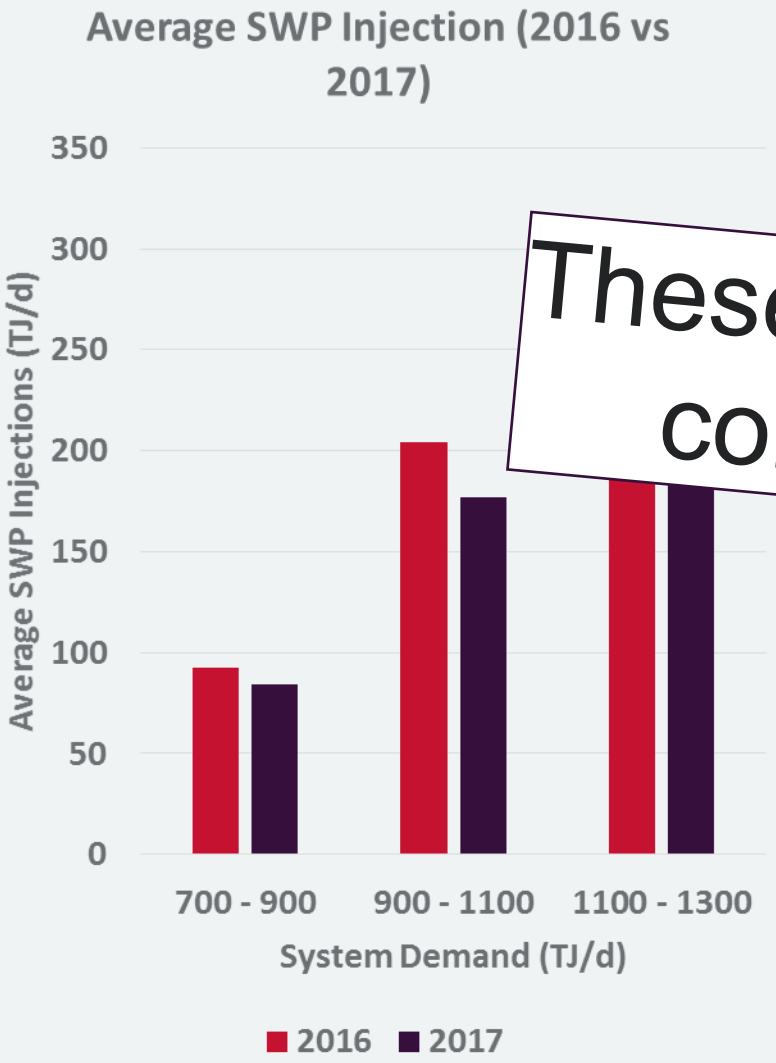


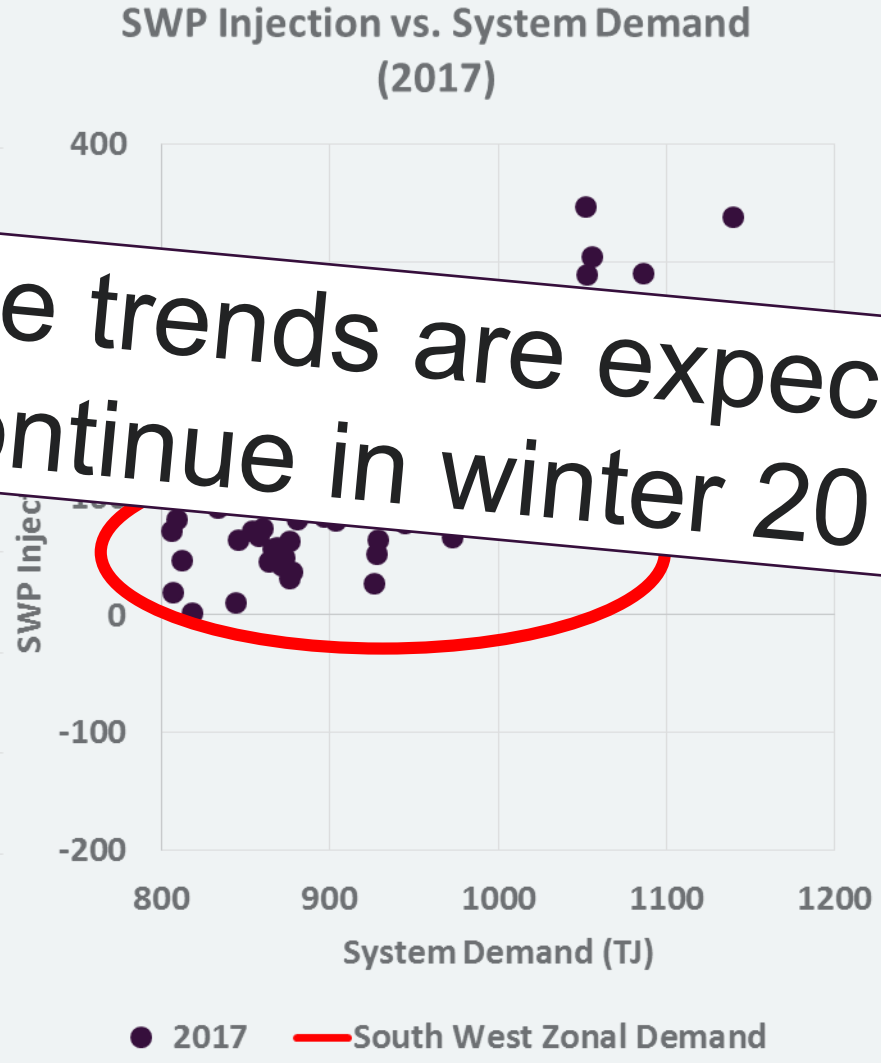
System Operations Overview – Winter 2017 Review

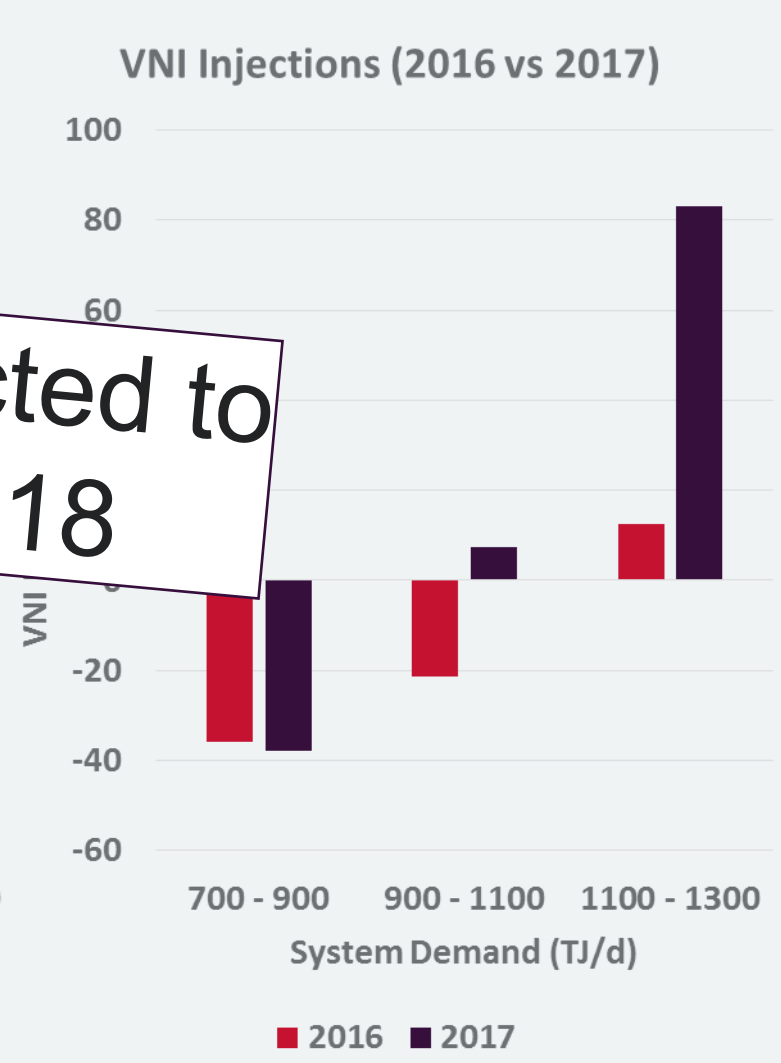
Less SWP Injections on average compared to 2016…

…at times lower than South West zonal demand…

Greater VNI Injections compared to 2016



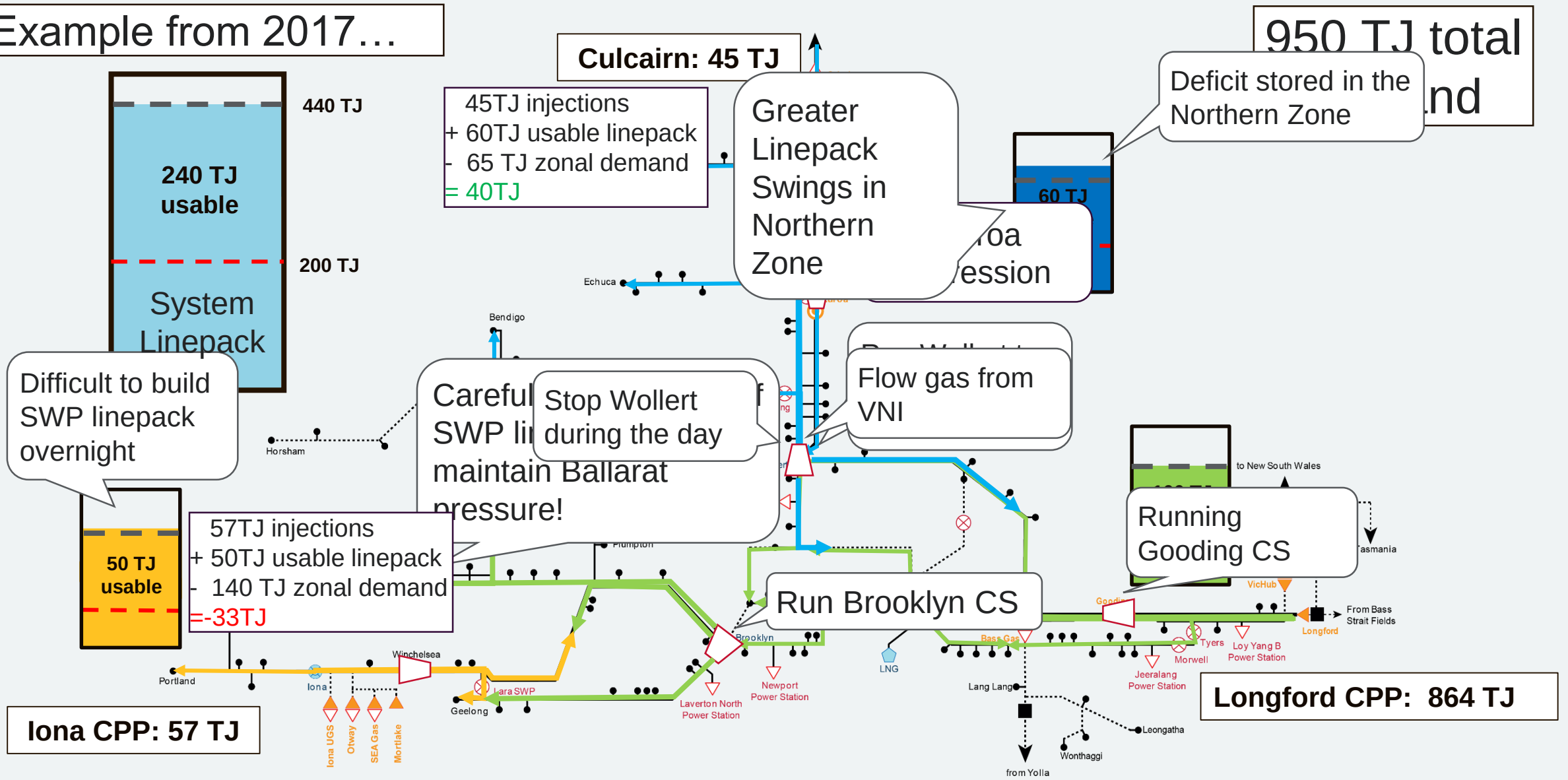




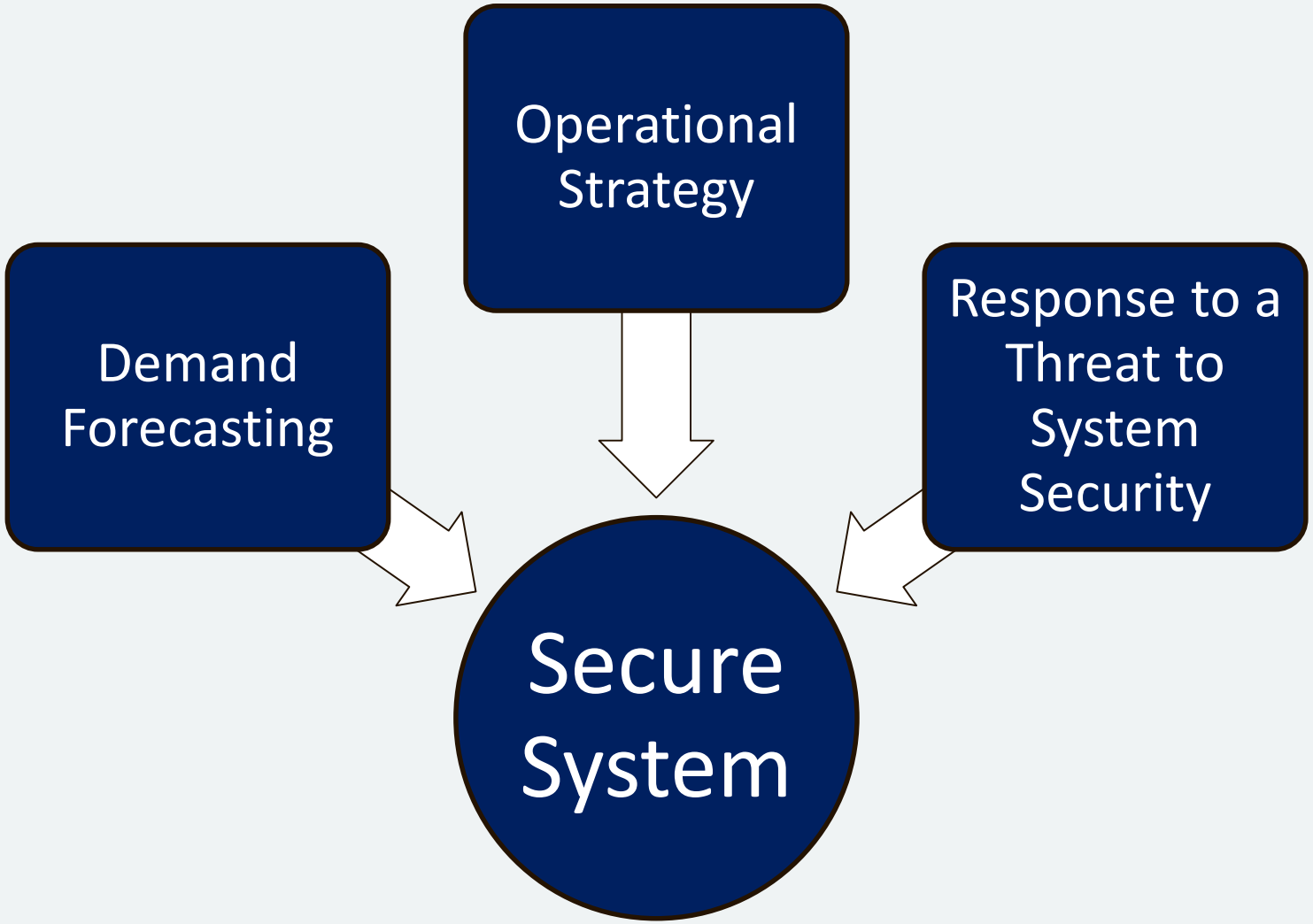
These trends are expected to continue in winter 2018

System Operations Overview –Winter 2017/18 Strategy

Example from 2017…



System Operations



Response to a Threat to System Security

What to do if we forecast a linepack shortfall

- Causes of a threat
- Identifying a threat
- Responses to a threat

System Operations Overview – Possible Causes of a Threat

- Demand larger than forecast (including GPG)
- Production facility trip
- Equipment failure
- System at or near capacity

A threat to system security is more likely on a high demand day!

System Operations Overview – Identifying a Threat

Forecast Demand + Uncertainty

+

Anticipated Injection and Withdrawals + Uncertainty

+

Planned System

⇩

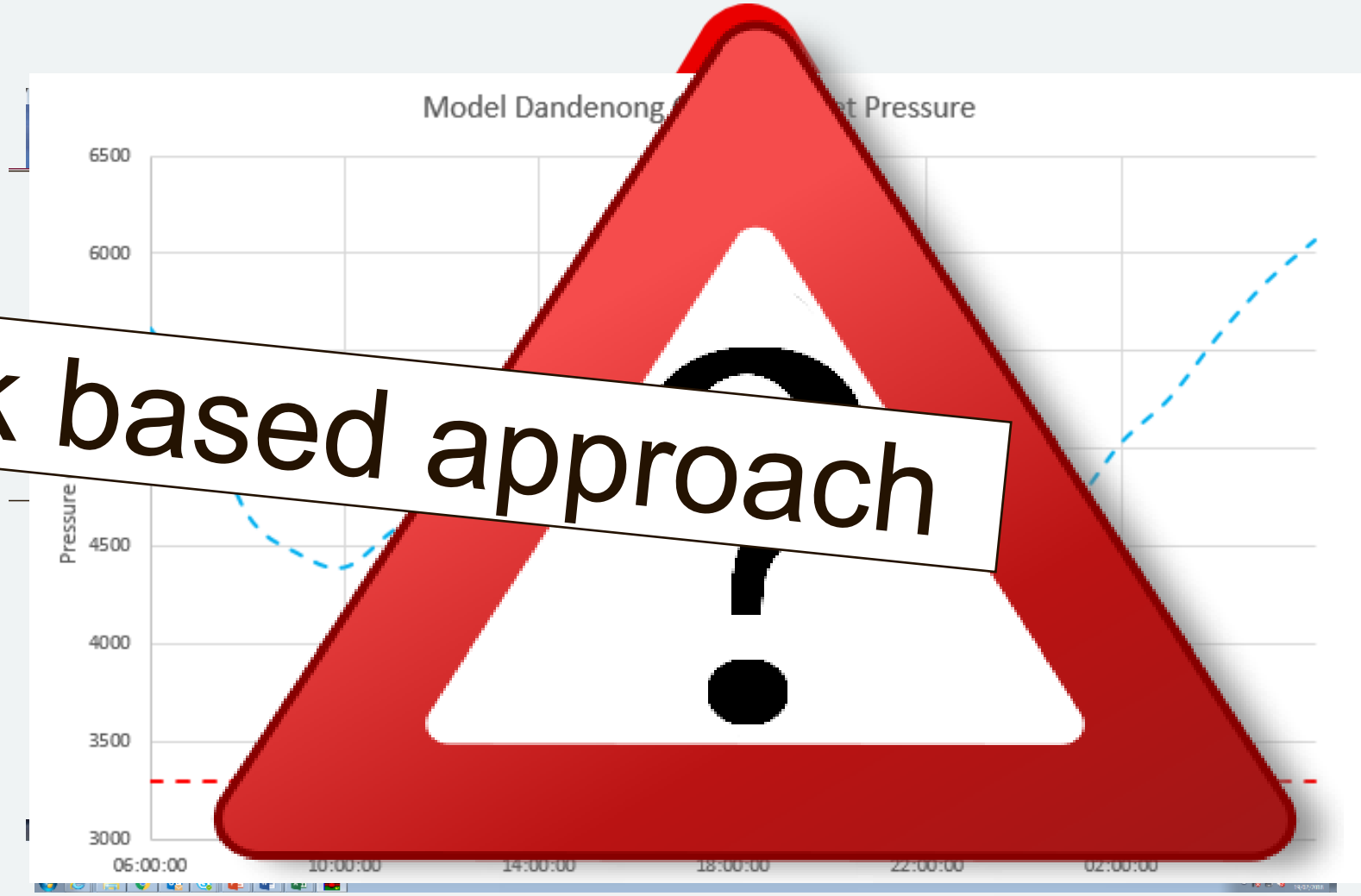
Gregg Engineering

=

Forecast Pressures and Linepack + Uncertainty

⇩

Assessment of a Threat



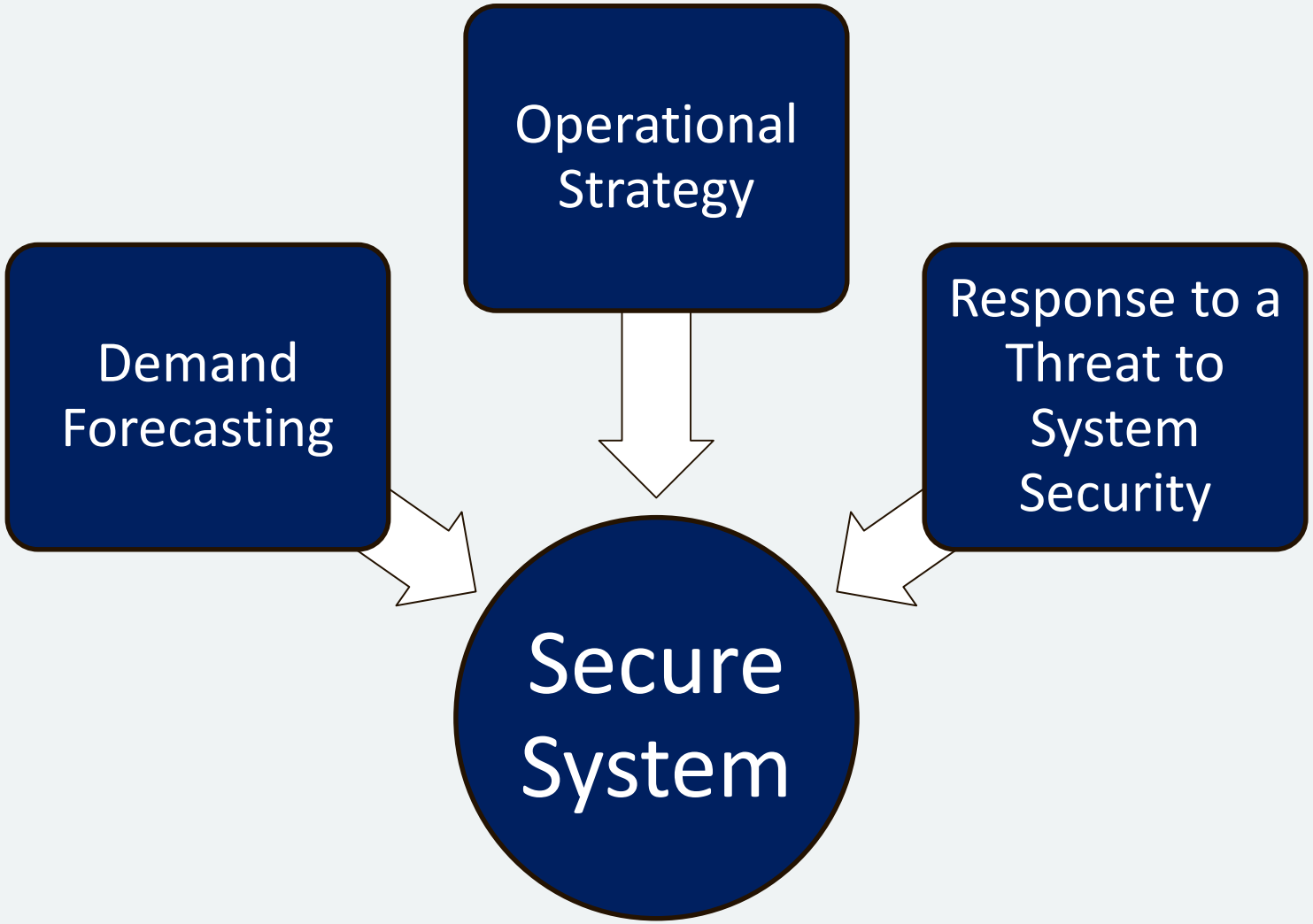
Risk based approach

Responses

1. Market Response
2. Action at the next schedule
3. Action at an Ad Hoc schedule
4. Directions (including non-firm and off-spec gas)
5. Curtailment

Dandenong LNG Tank, Source: The Australian Pipeliner

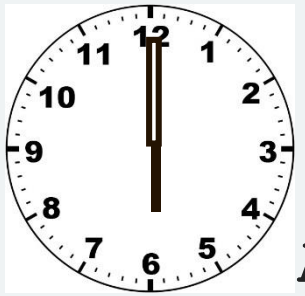
System Operations



3 August 2017 Case Study

- Total demand 1,279 TJ (2nd highest demand day ever!)
- Coldest Melbourne day in winter 2017
- AEMO injected peak-shaving LNG to avert a threat

Case Study – Demand Forecast 6am



AM

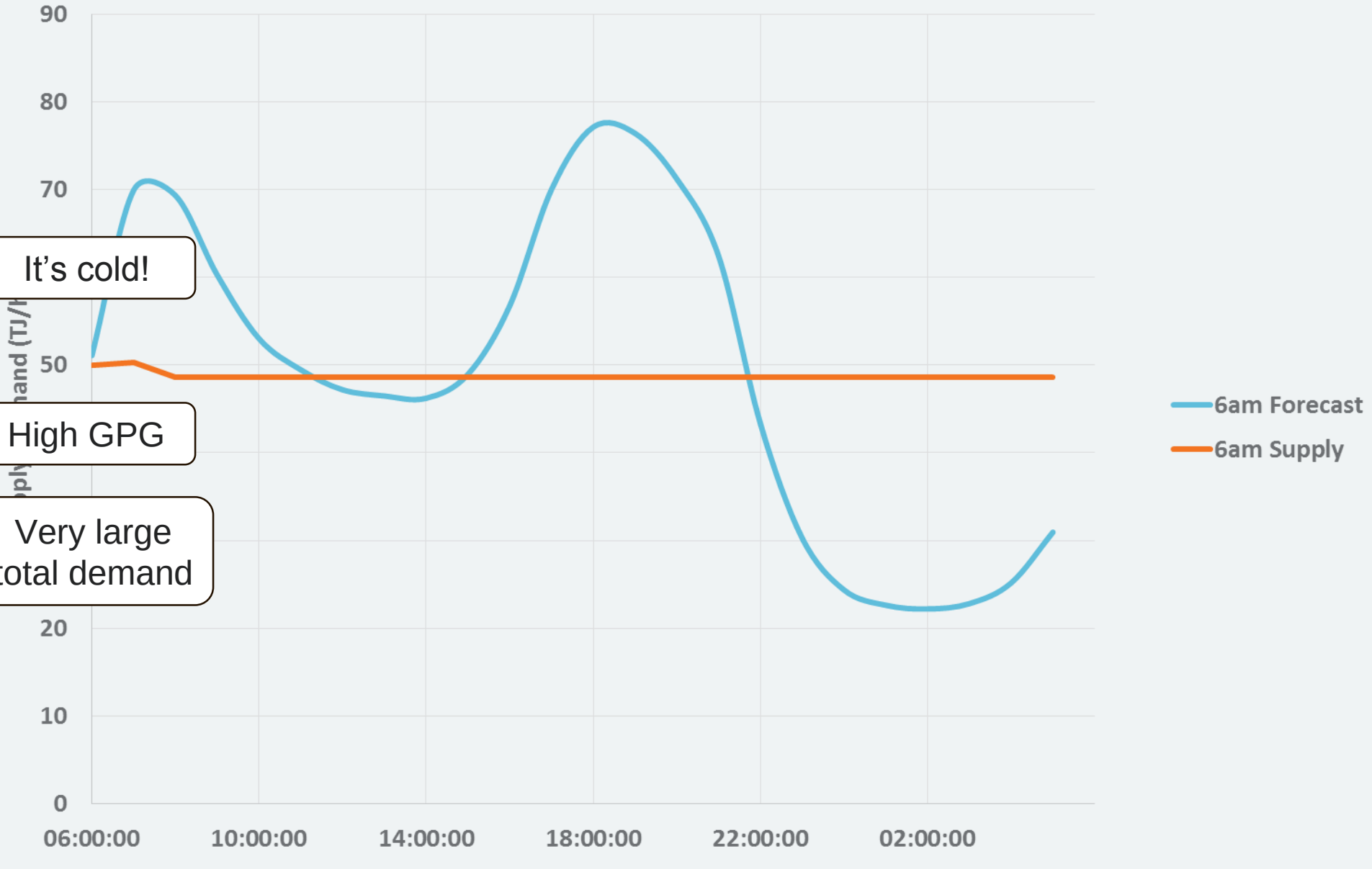
Forecast:

Avg Temp	7.6 C
EDD	12.8
MP Demand Forecast	1,050 TJ
GPG	95 TJ
Override	33 TJ
Total Demand Forecast	1,178 TJ

It's cold!

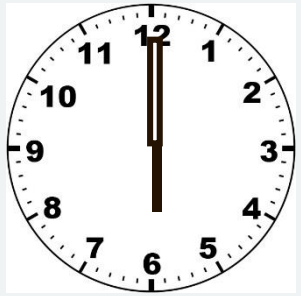
High GPG

Very large total demand



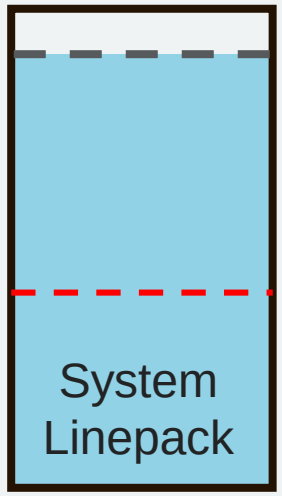
Case Study – 3 August 2017

Time

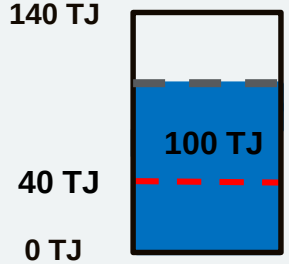


AM

Mix of injections stays roughly the same

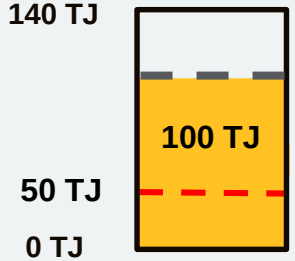


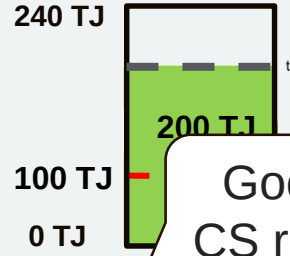
Culcairn: 41 TJ



Stop Wollert CS

Wollert CS running





Gooding CS running

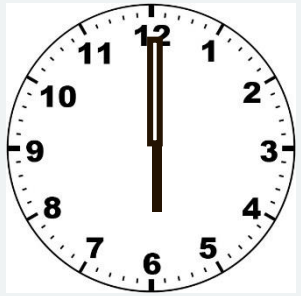
Start flowing through Brooklyn City Gate

Iona CPP: 280 TJ

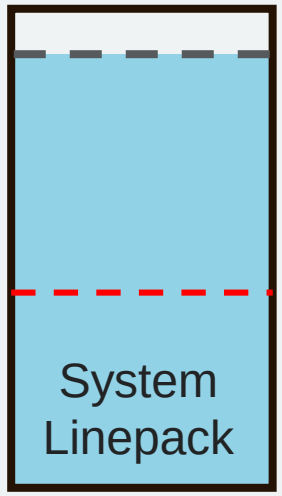
Longford CPP: 865 TJ

Case Study – 3 August 2017

Time



AM



Culcairn: 41 TJ

140 TJ
40 TJ
0 TJ
85 TJ

Flow out of Northern Zone

140 TJ
50 TJ
0 TJ
85 TJ

Start Winchelsea CS

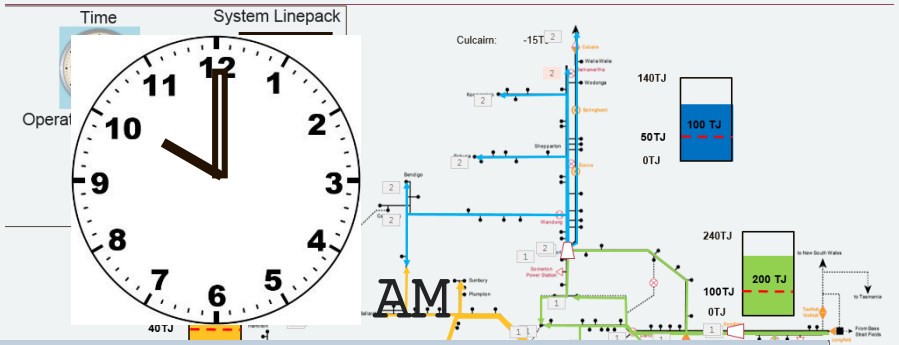
100 TJ
0TJ
150 TJ

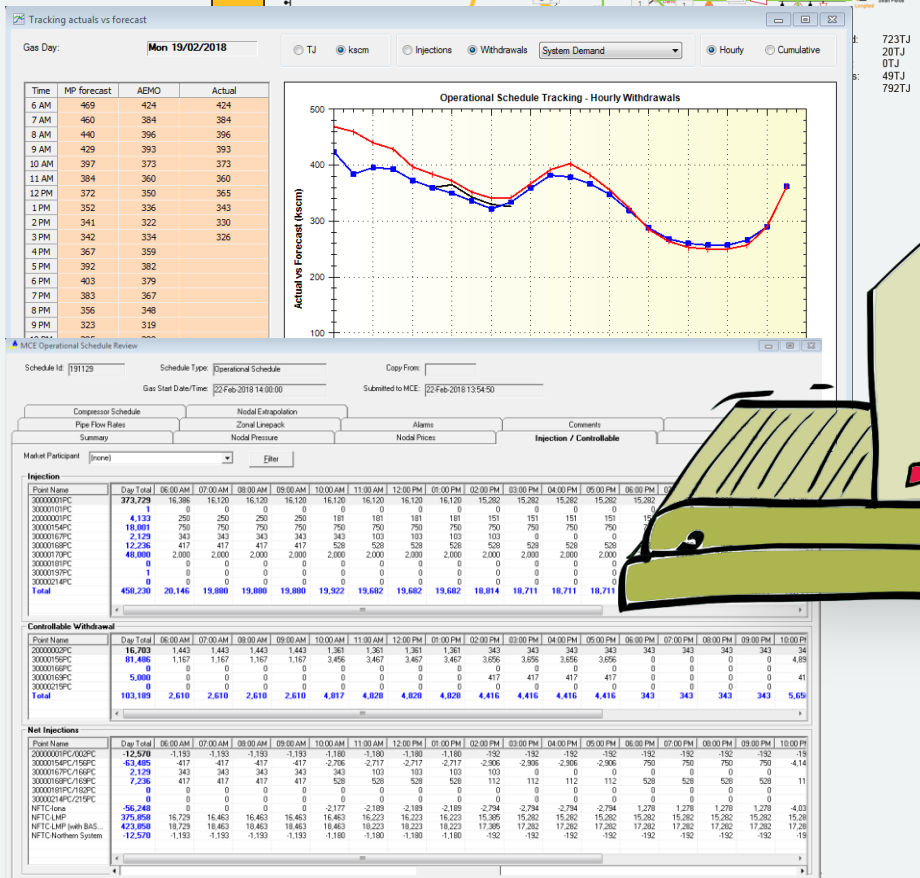
Iona CPP: 280 TJ

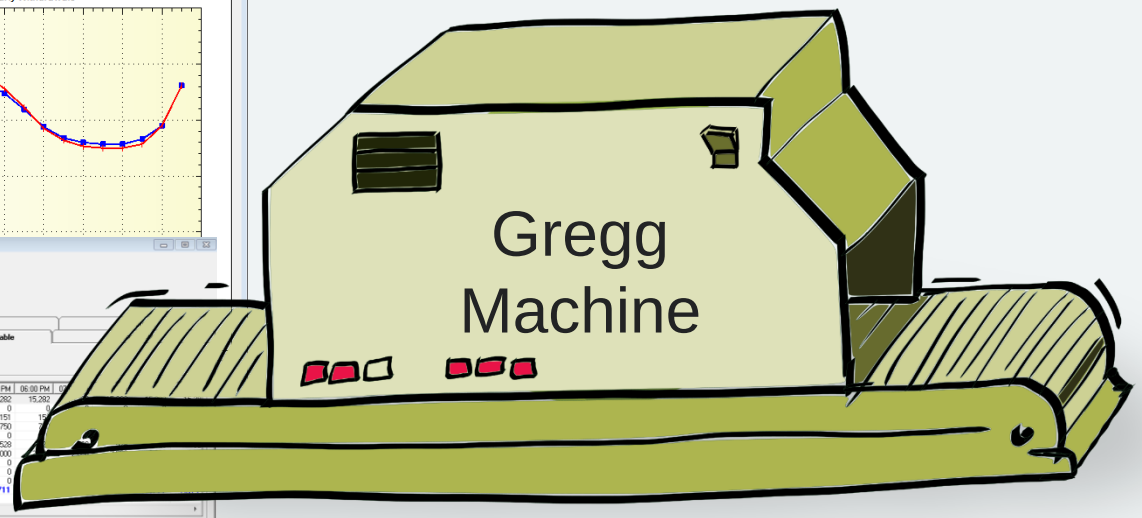
Newport: -93TJ
Laverton: -31TJ

Longford CPP: 865 TJ

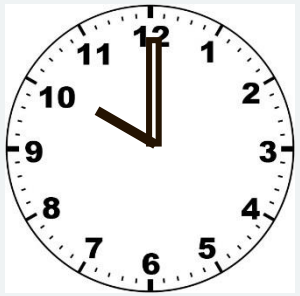
Case Study – 3 August 2017







Case Study – Demand Forecast 2pm



PM

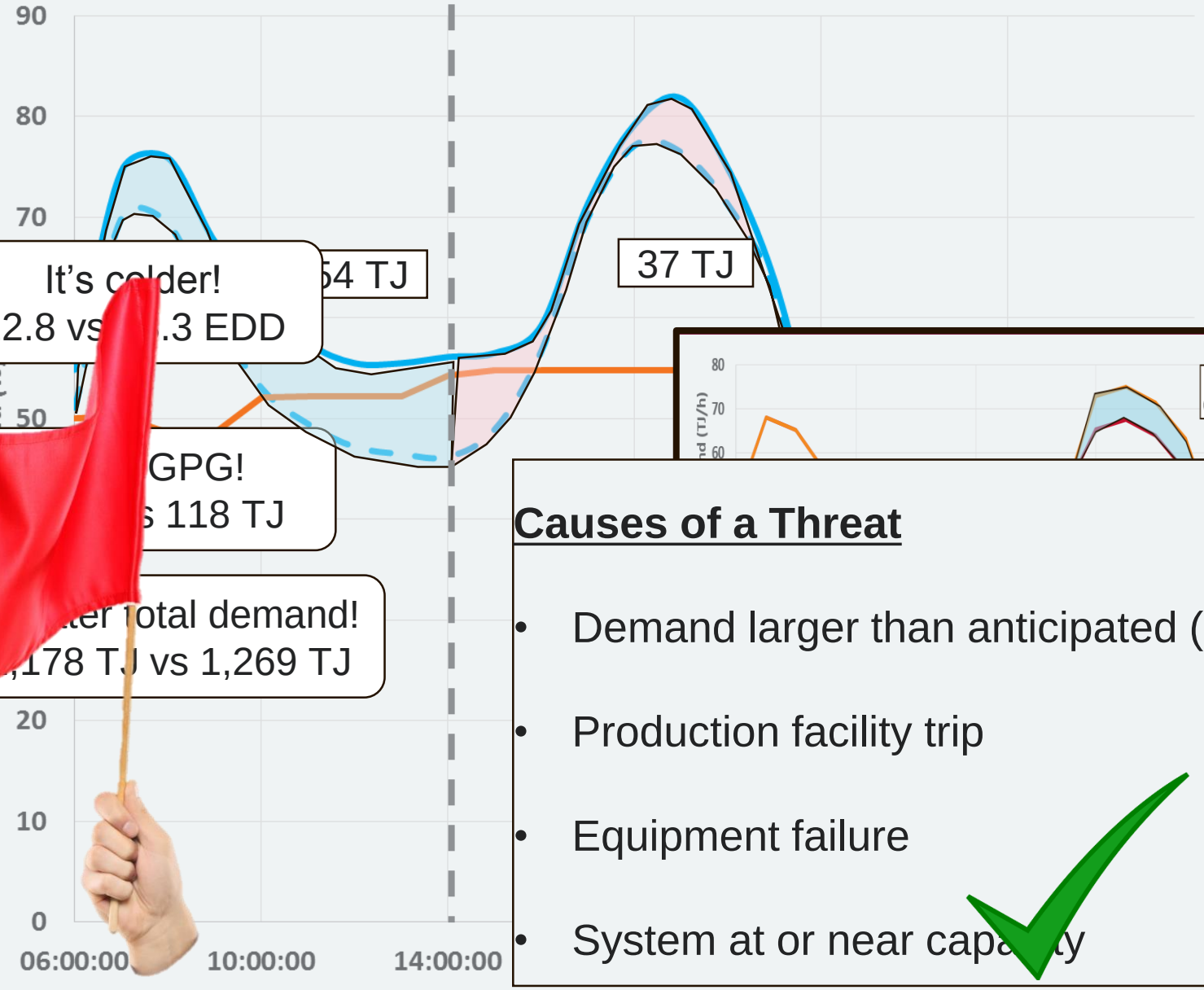
Forecast:

Avg Temp	7.3 C
EDD	13.3
MP Demand Forecast	1
GPG	
Override	
Total Demand Forecast	

It's colder!
12.8 vs .3 EDD

GPG!
s 118 TJ

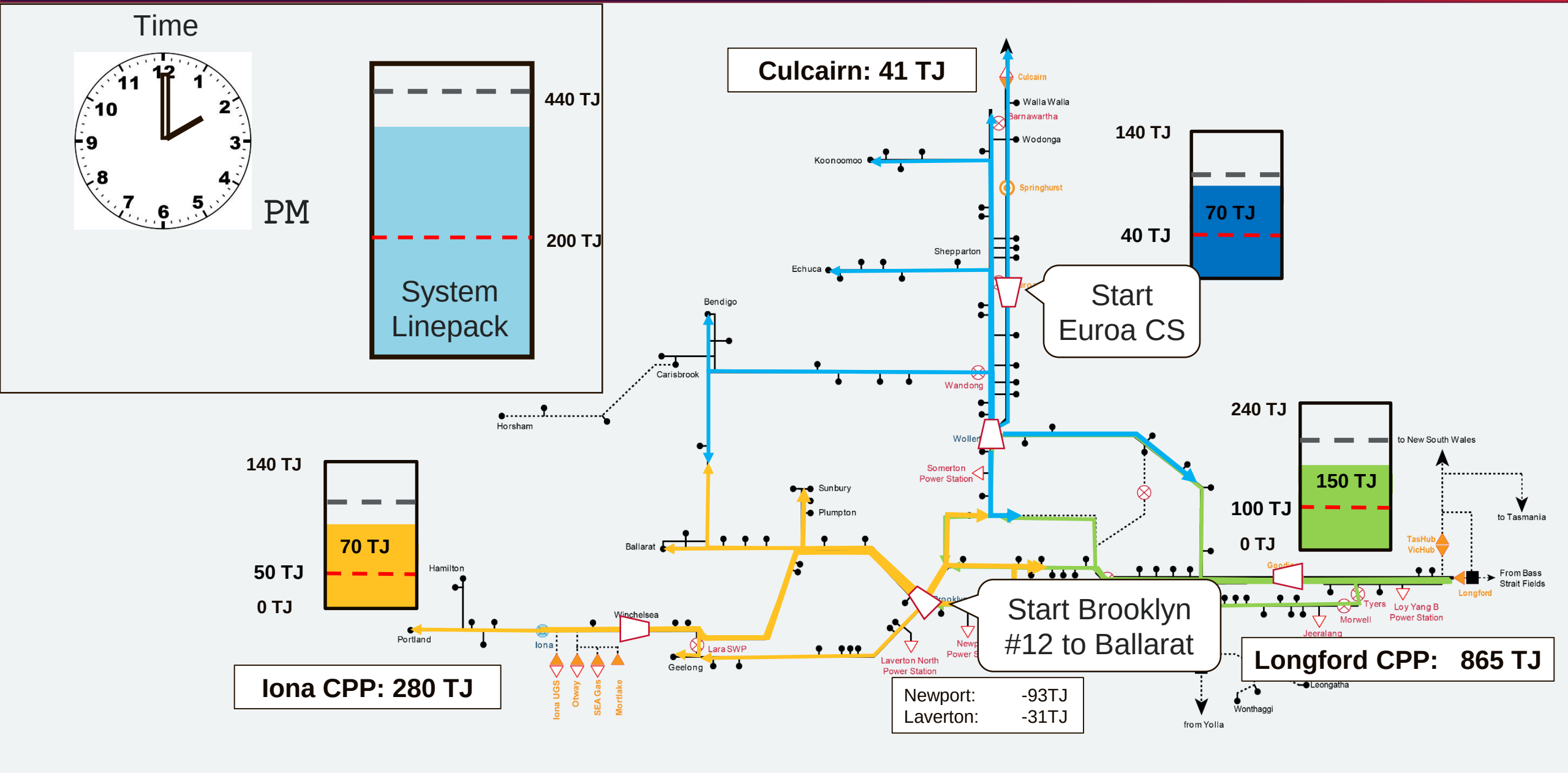
ter total demand!
,178 TJ vs 1,269 TJ



Causes of a Threat

- Demand larger than anticipated (incl ng GPG)
- Production facility trip
- Equipment failure
- System at or near capa ty

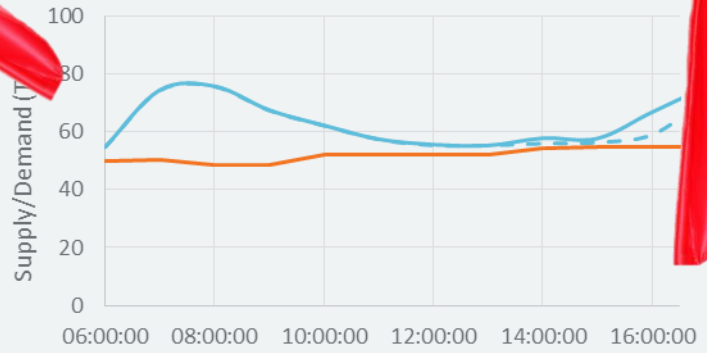
Case Study – 3 August 2017



Case Stu… August 2017

PM

Demand was tracking slightly above forecast

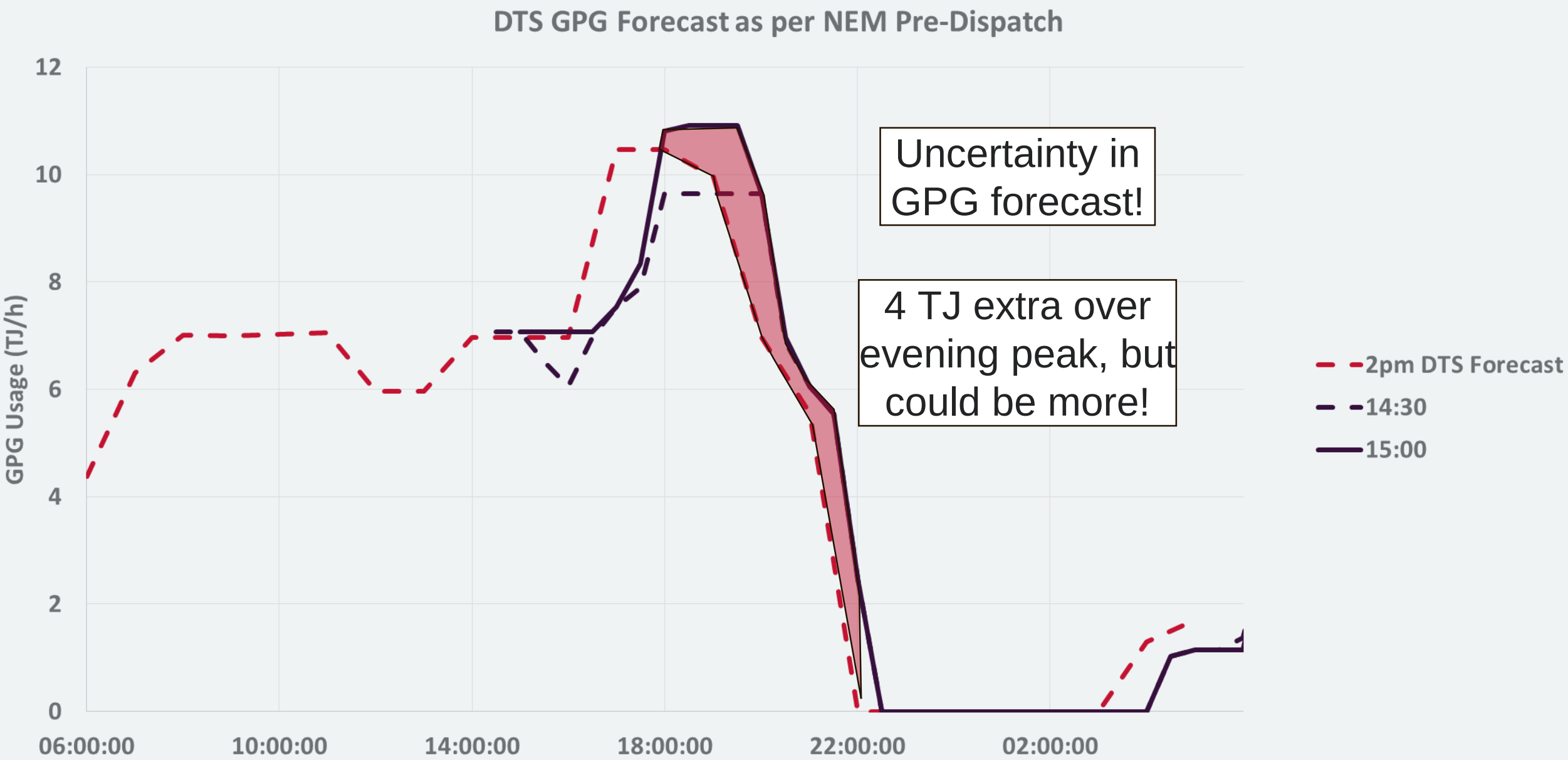


Weather forecast not improving

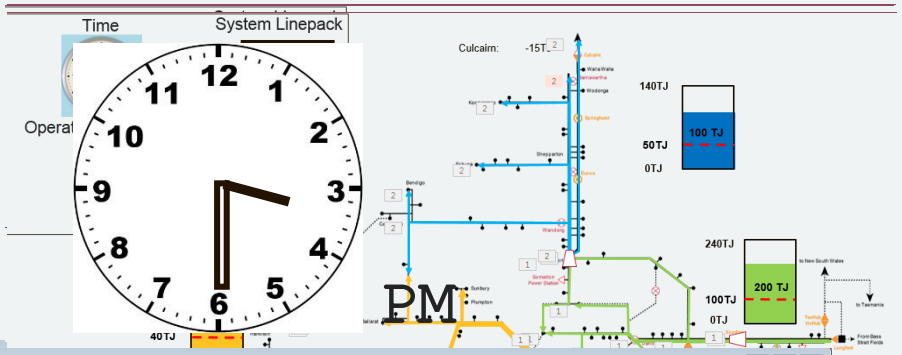
GPG forecast variable in NEM Pre-dispatch

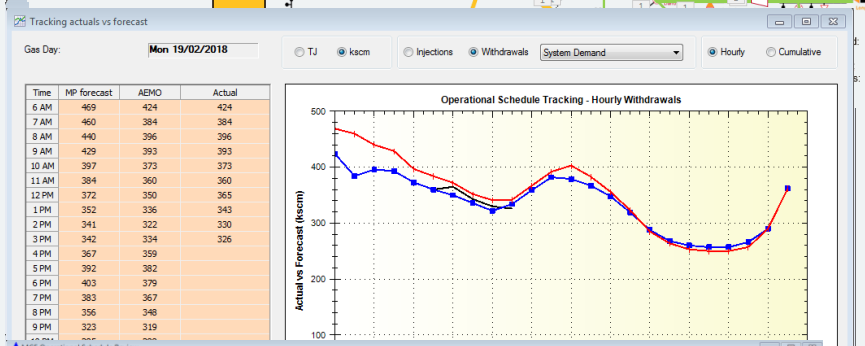
How big was th… …ning peak goin…

Case Study – 3 August 2017

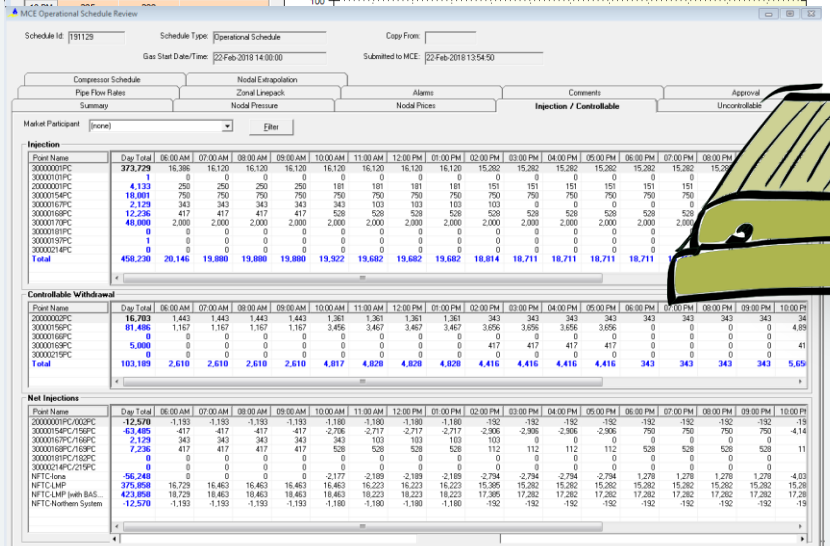


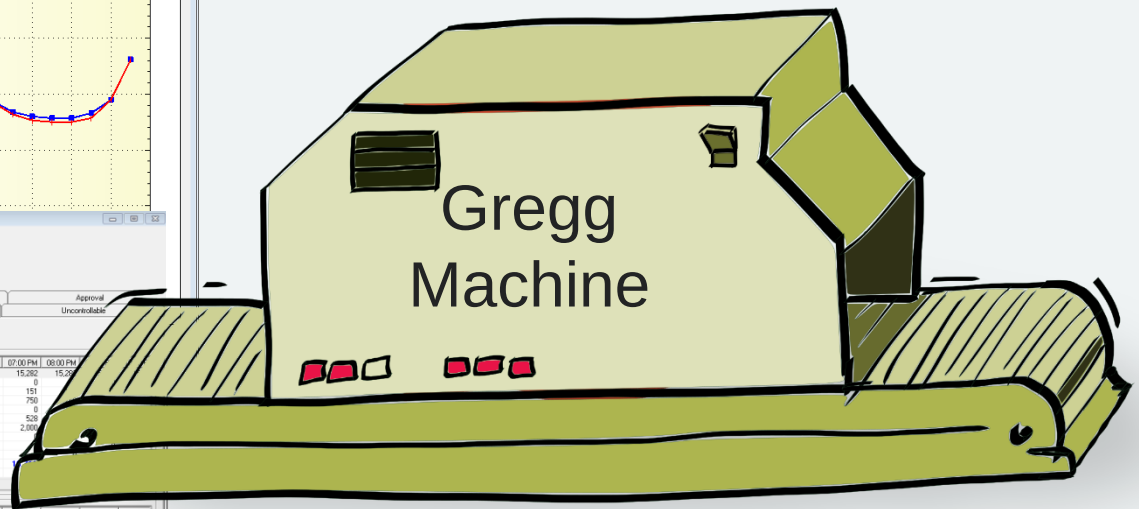
Case Study – 3 August 2017



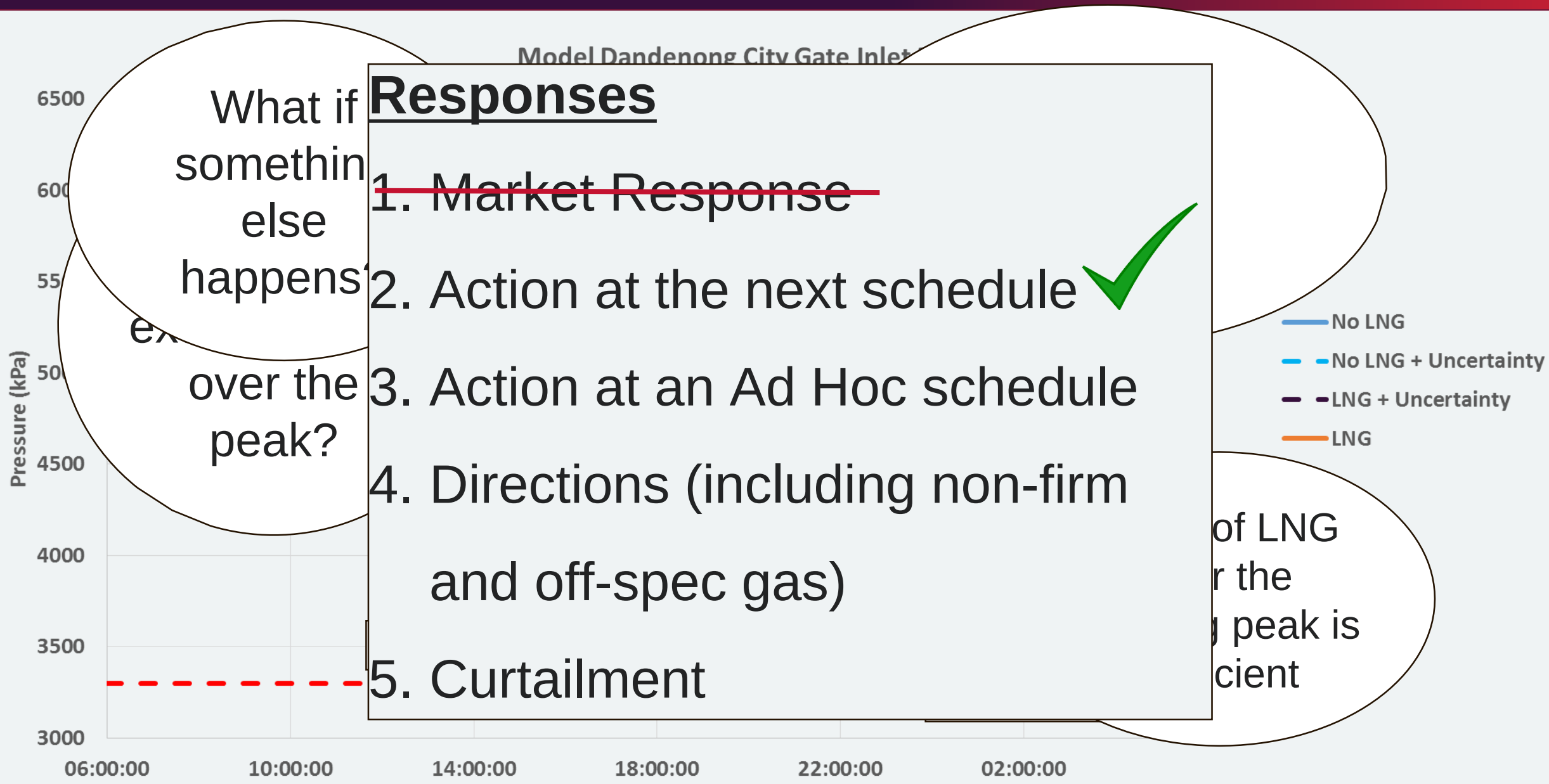


Time	MP forecast	AEMO	Actual
6 AM	469	424	424
7 AM	460	384	384
8 AM	440	396	396
9 AM	429	393	393
10 AM	397	373	373
11 AM	384	360	360
12 PM	372	350	365
1 PM	352	336	343
2 PM	341	322	330
3 PM	342	334	326
4 PM	367	359	
5 PM	392	382	
6 PM	403	379	
7 PM	383	367	
8 PM	356	348	
9 PM	323	319	





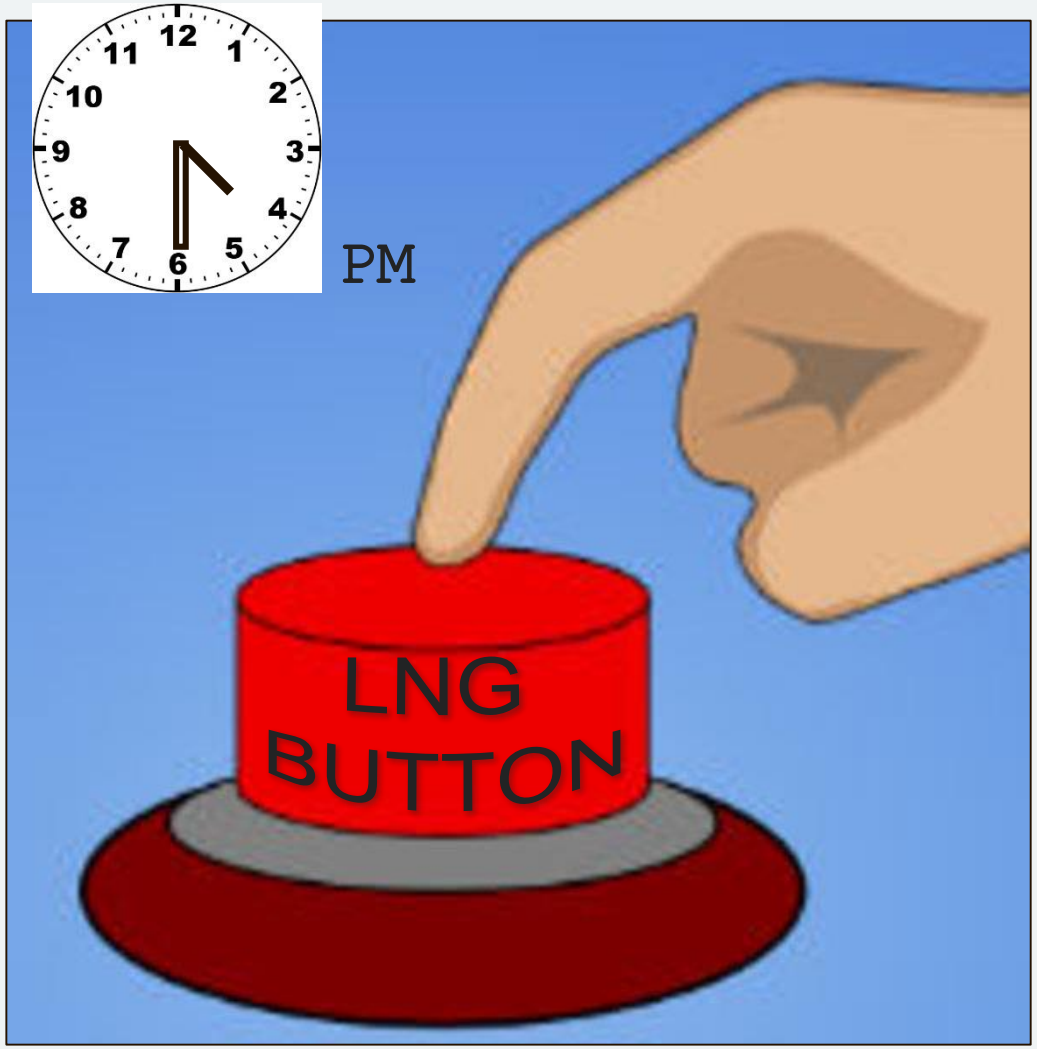
Case Study – 3 August 2017



Responses

1. ~~Market Response~~
2. Action at the next schedule
3. Action at an Ad Hoc schedule
4. Directions (including non-firm and off-spec gas)
5. Curtailment

Case Study – 3 August 2017



Thu, 3 Aug, 16:26

AEMO is taking action at the next schedule in response to a threat to system security for gas day 03/08/2017. Please see MIBB attachment.

Notice of a Threat to System Security

Reference: *National Gas Rules (NGR), Part 19, Division 5, Subdivision 5, Notice of Threat to ity*

1 of the NGR, AEMO is notifying participants of a threat to system security in the ısmission System.

s that the threat to system security is due to:

upply sources incapable of meeting forecast gas demand

ply and demand imbalance exists such that the projected pressure at Dandenong ate may breach the minimum operating pressure of 3300 kPa.

ıreat to system security is expected to start at 18:00 AEST 03/08/2017 and end at AEST 03/08/2017.

system security is likely to impact:

- ☐ Total System
- ☐ Gippsland Withdrawal Zone
- ☐ Geelong Withdrawal Zone
- ☐ Western Withdrawal Zone
- ☐ Melbourne Withdrawal Zone
- ☐ Northern Withdrawal Zone
- ☐ Ballarat Withdrawal Zone

AEMO has determined that there is insufficient time for the market to coordinate a response to the threat and that a response in the next operating schedule is required.

AEMO intends to alleviate the threat by increasing injections from Dandenong LNG Facility to obtain a total net daily injection quantity of 17.9 TJ.

The production of a feasible Operating Schedule under 215(3) is is not an intervention under rule 343 of the NGR.

There will be a market notice to advise the removal of the threat to system security.

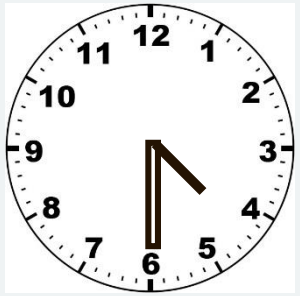
Issued on 3/08/2017

Matthew Clemow
Senior Manager Gas Real Time Operations
Australian Energy Market Operator

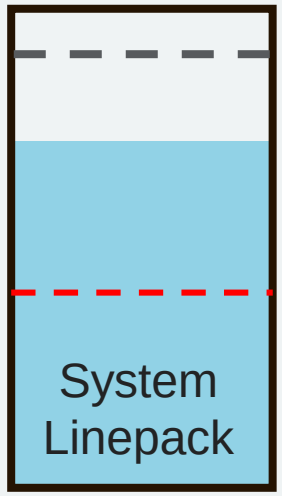
AEMO intervention report for 3 August 2017 available at: https://www.aemo.com.au/-/media/Files/Gas/DWGM/2017/DWGM-ER-17-002-03-Aug-2017.pdf

Case Study – 3 August 2017

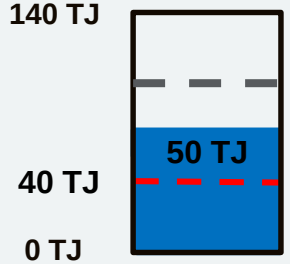
Time



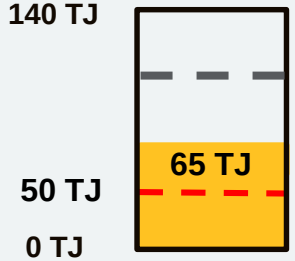
PM

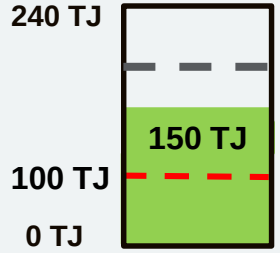


Culcairn: 41 TJ



Stop flowing out of Northern Zone





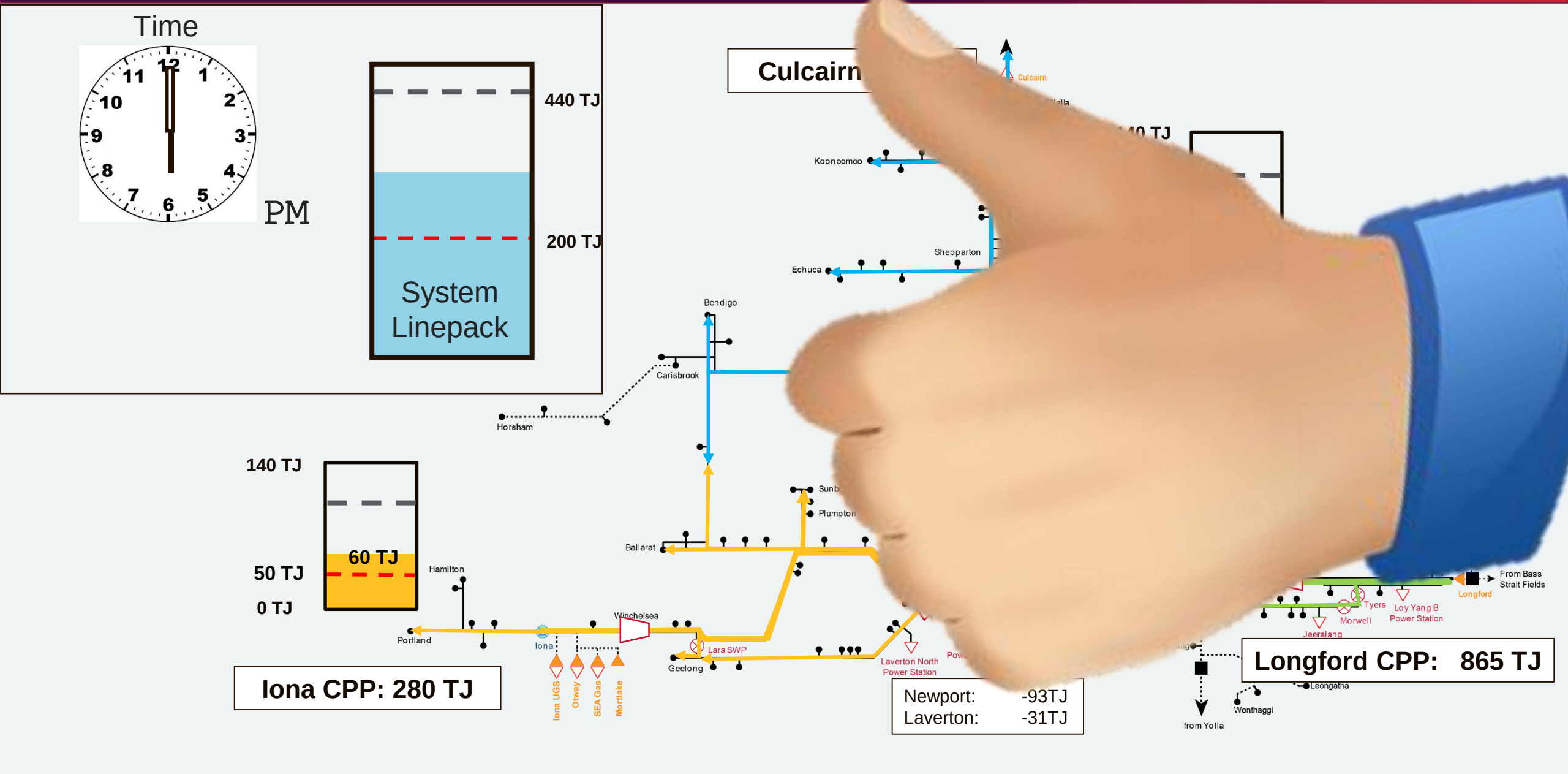
LNG injections begin

Iona CPP: 280 TJ

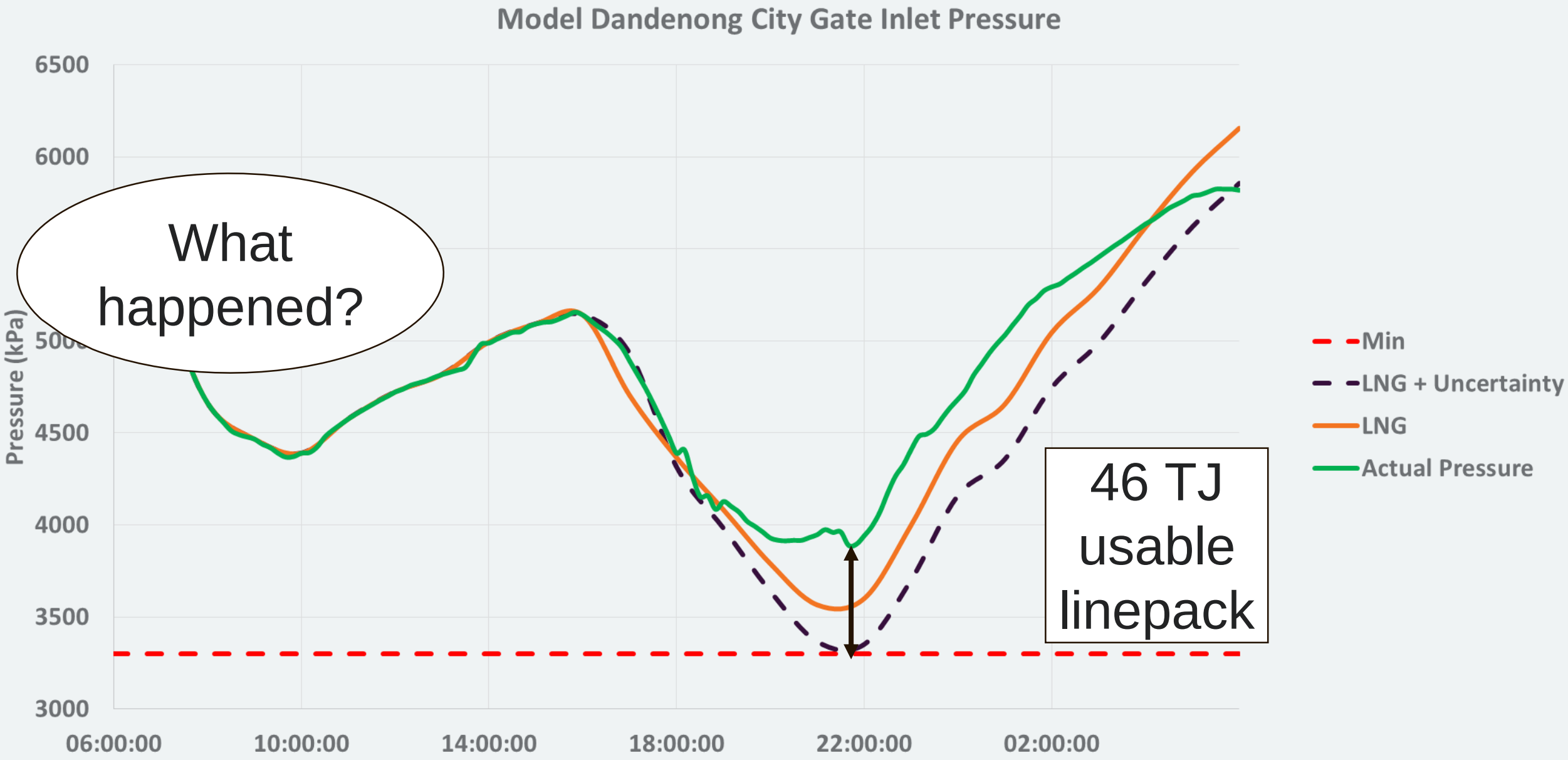
Newport: -93TJ
Laverton: -31TJ

Longford CPP: 865 TJ

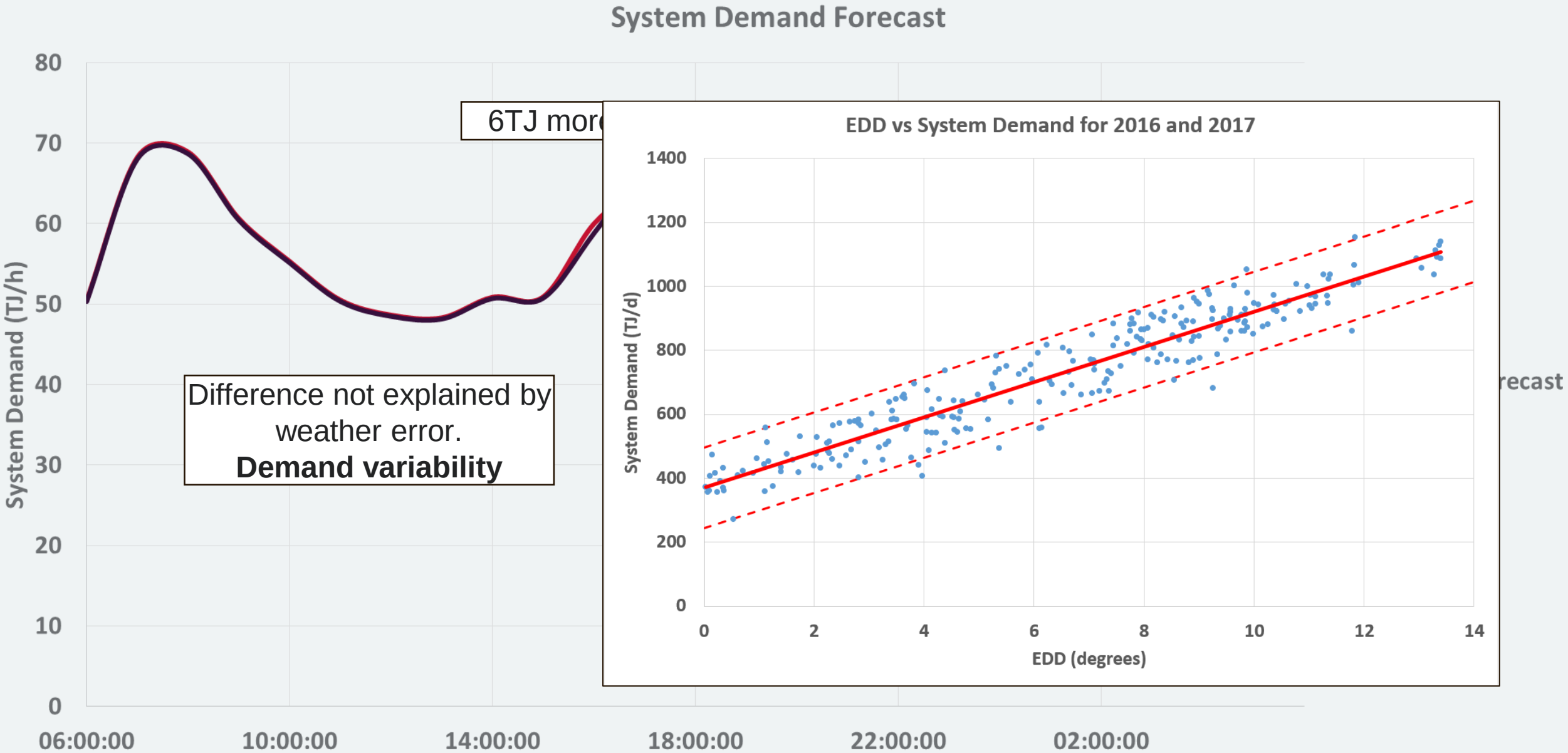
Case Study – 3 August 2017



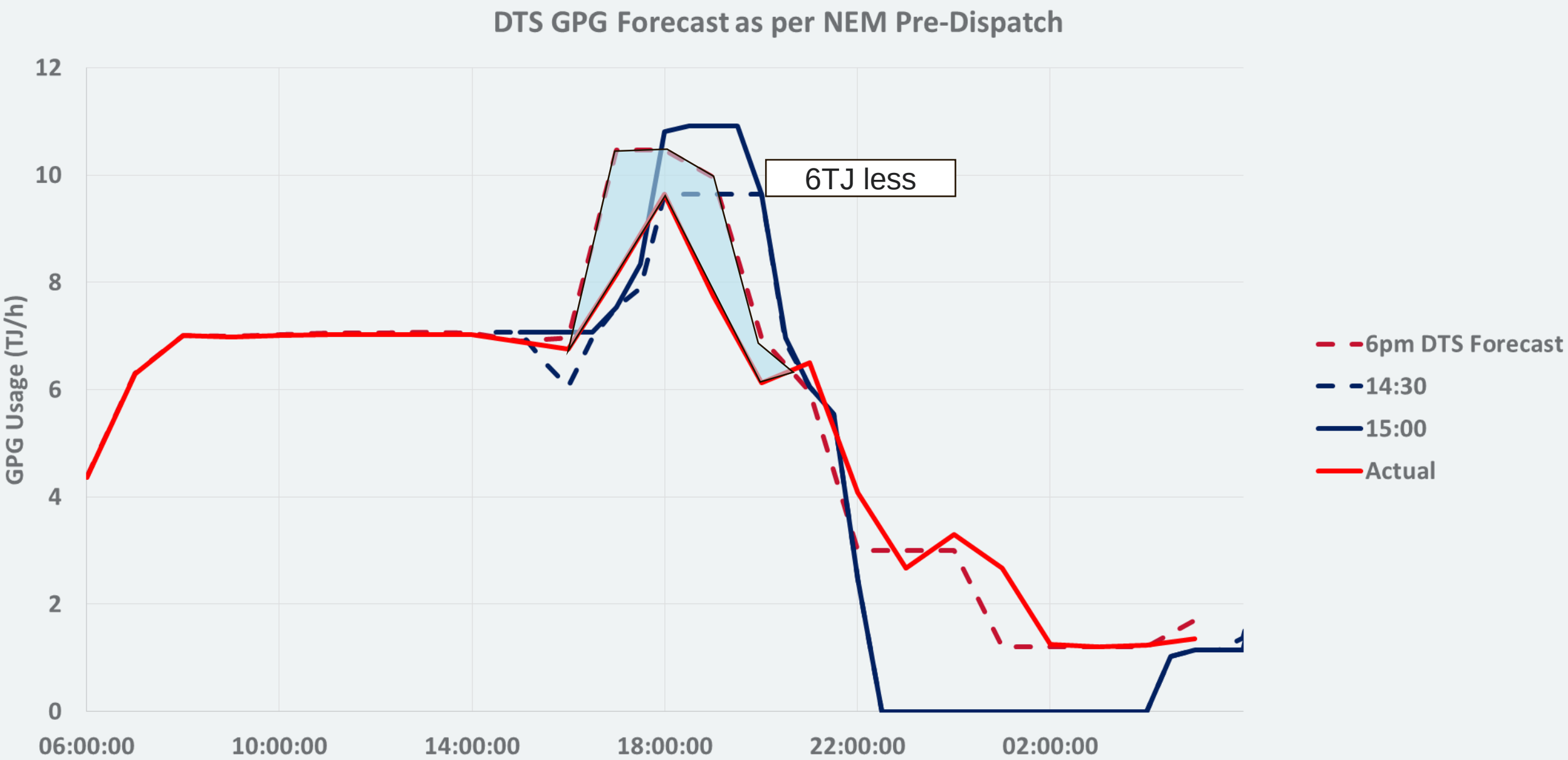
Case Study – 3 August 2017



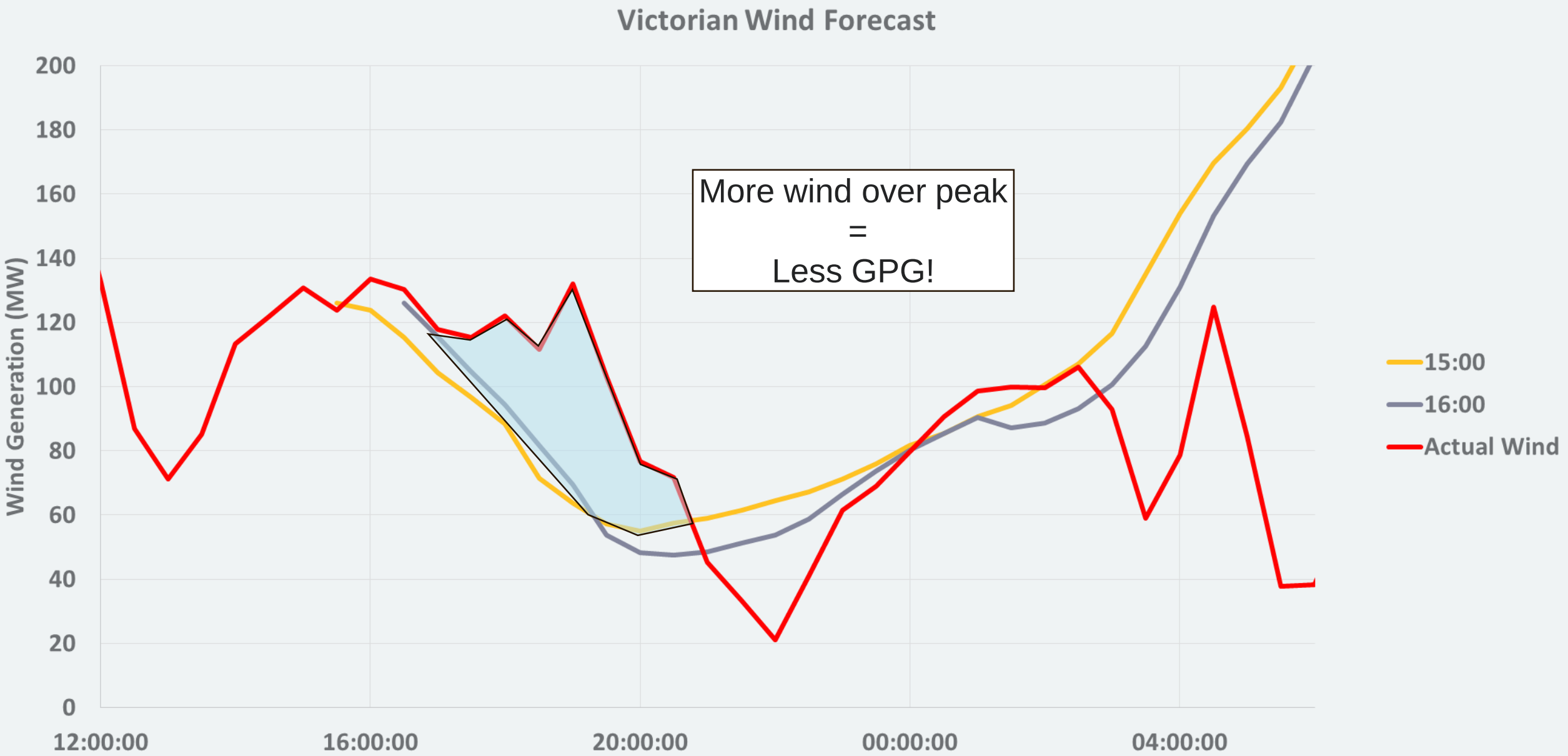
Case Study – 3 August 2017



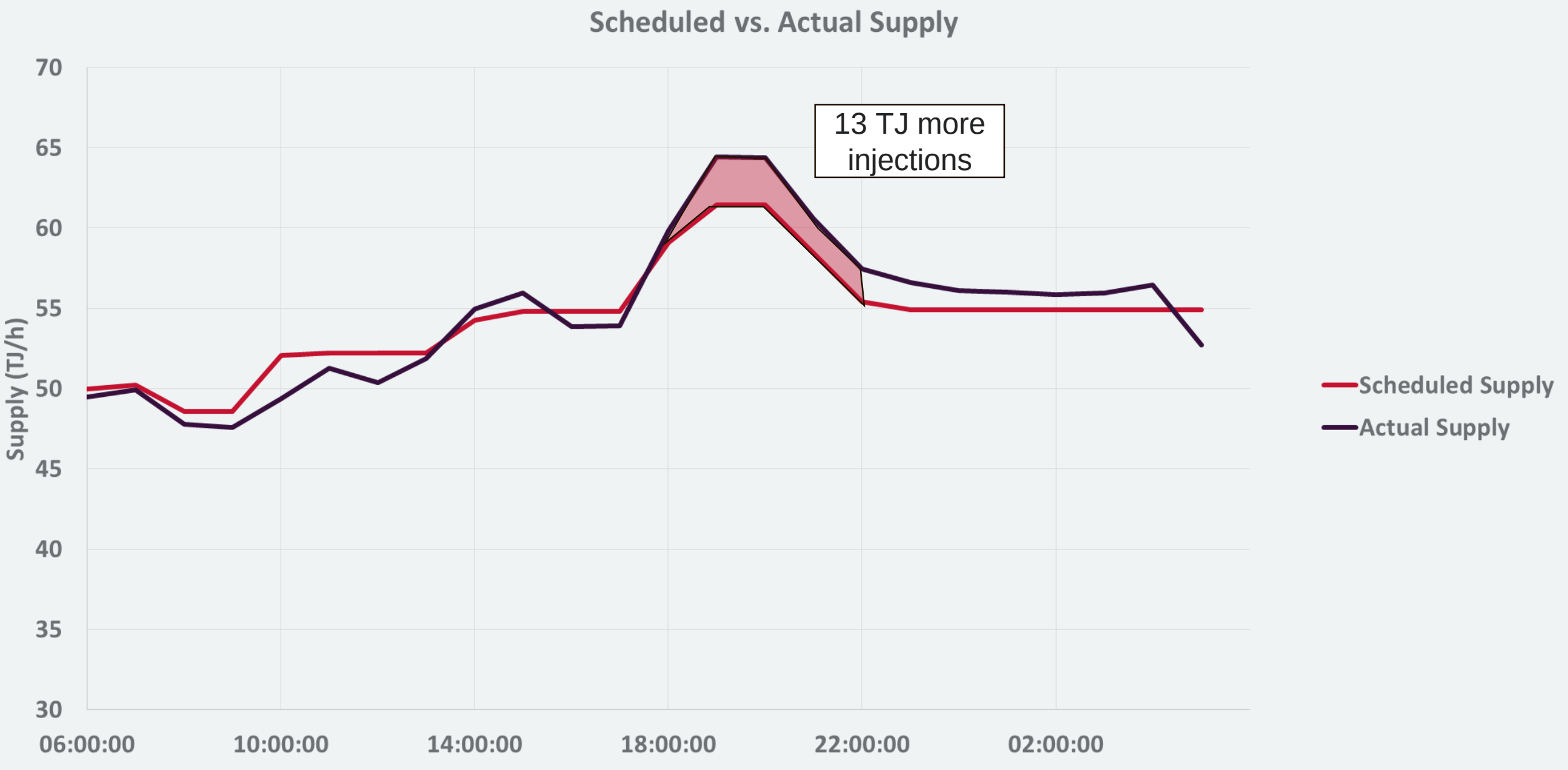
Case Study – 3 August 2017



Case Study – 3 August 2017



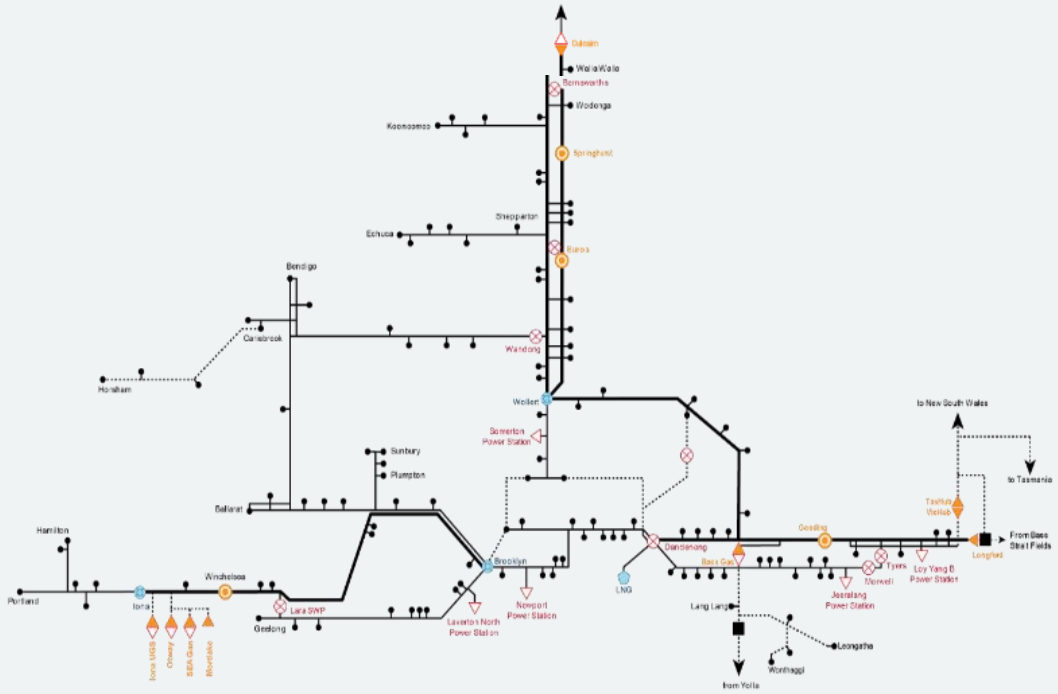
Case Study – 3 August 2017



Summary

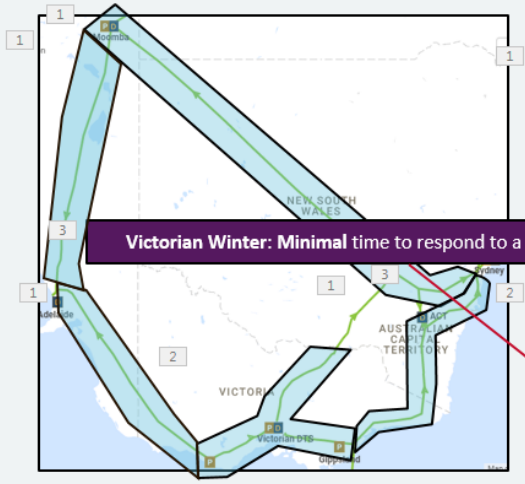
SUMMARY – DTS OVERVIEW

Complicated, yet flexible system



Limited Linepack

DTS Linepack vs. Other Pipelines



NSW/SA demand supplied by **two** major pipelines.

If major supply failure, **usable linepack** could **support NSW/SA** demand for up to **five days**

Victorian Winter: Minimal time to respond to a major supply failure

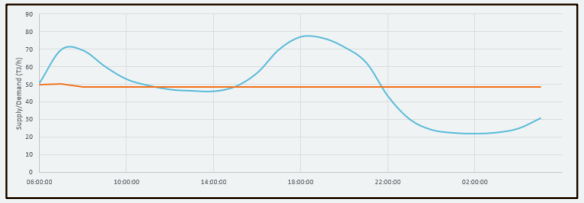
VIC demand supplied by **one** small interconnected network.

If major supply failure, **usable linepack** could **support VIC** demand for **2-4 hours**

SUMMARY – SYSTEM OPERATIONS

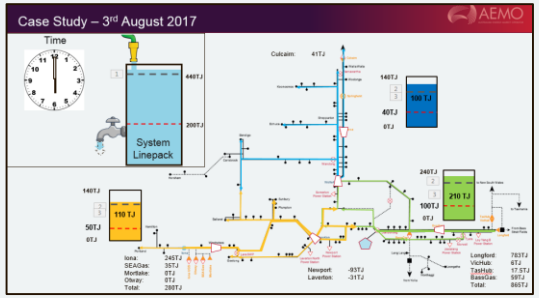
Secure System

Demand Forecasting



- **Total system linepack** level
- Accurate MP demand forecasts, and forecast profiles assist in maintaining system security.
- AEMO plays active role in GPG forecasting

Operational Strategy



- Operate compressors and regulators to achieve appropriate **linepack distribution**
- Can be a complicated task!

Response to a threat

- AEMO resolves a threat when we **forecast a linepack shortfall**.
- This includes injecting peak-shaving LNG at Dandenong.

Questions?

Winter 2018 Outlook Market Operations

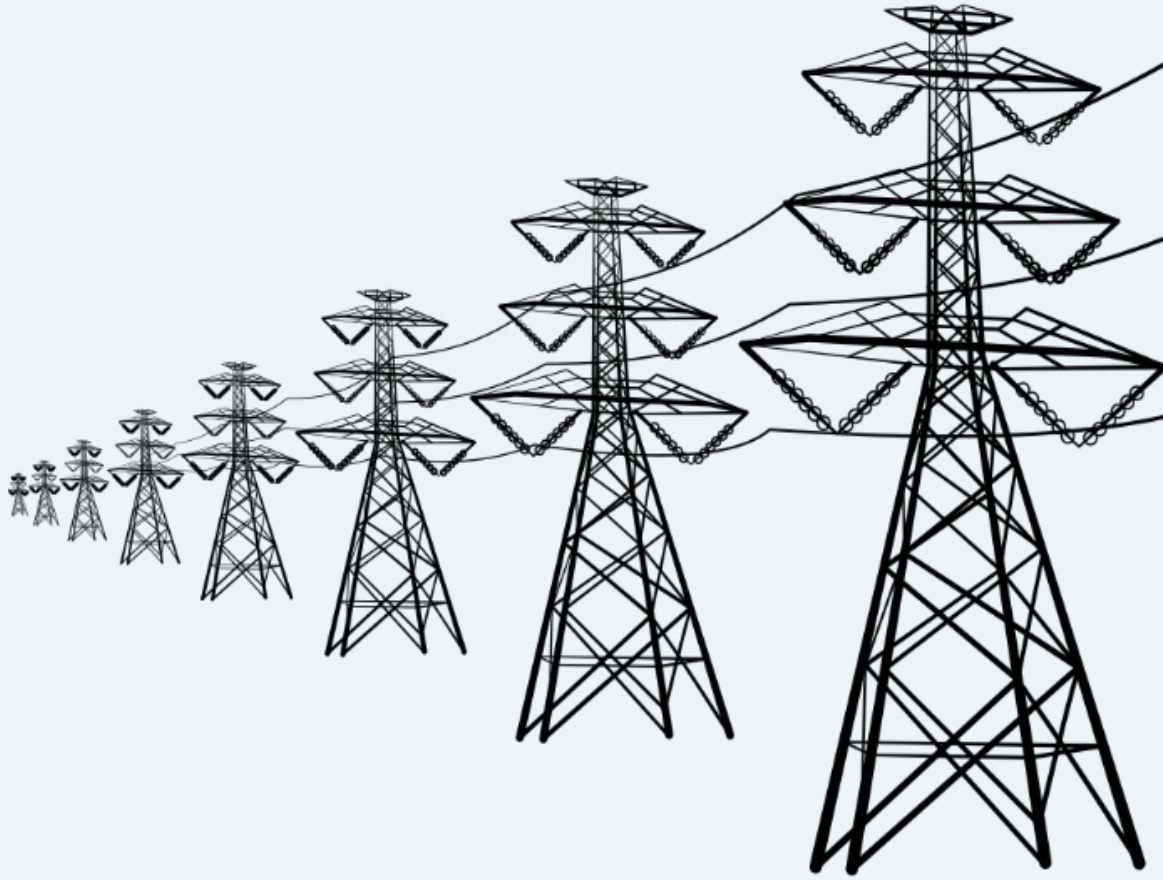
Andrew Stobie (Gas Operations Engineer)

Overview

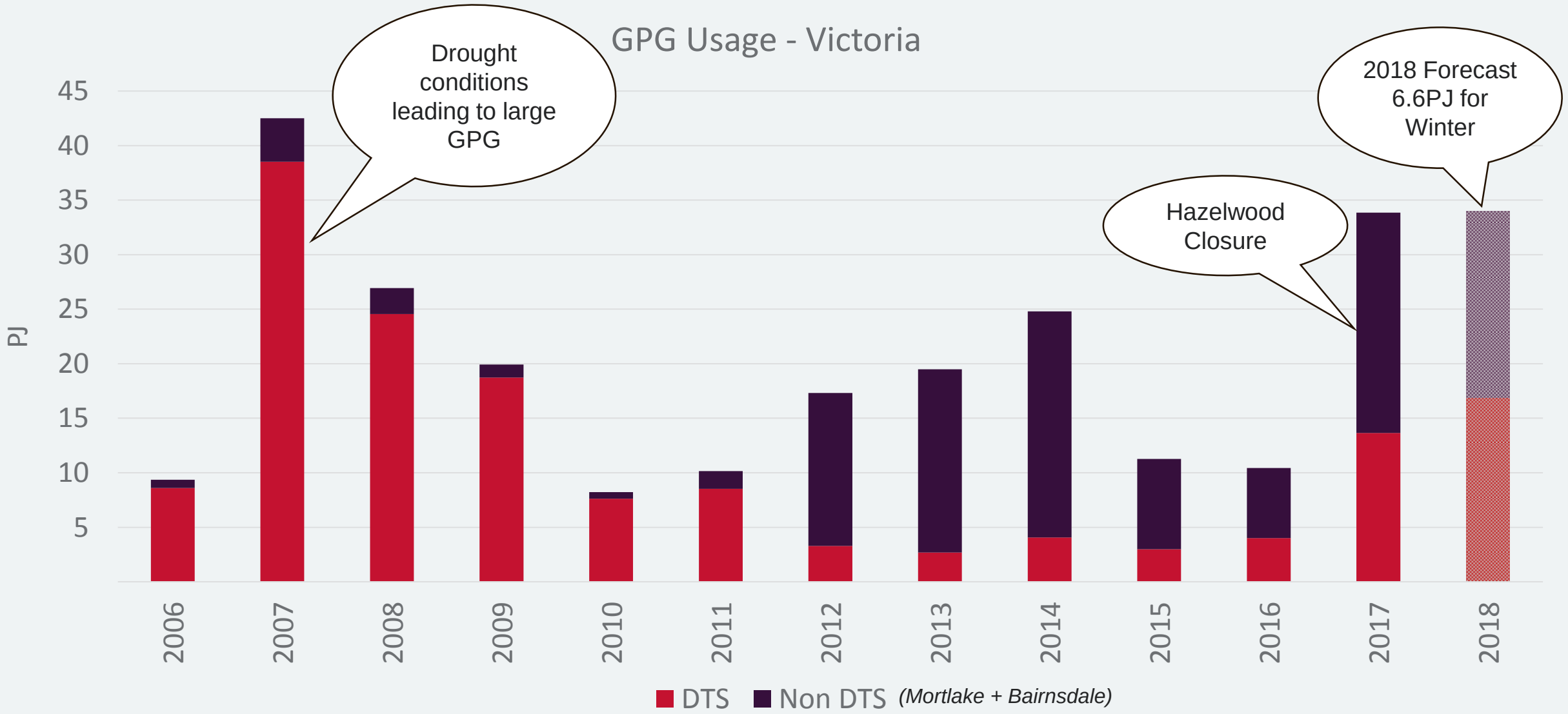
Winter
1 May – 30 September

- GPG Interactions
- System capacity and constraints
- Abnormal scheduling conditions with examples from 2017
- Admin Pricing Procedure (Update)

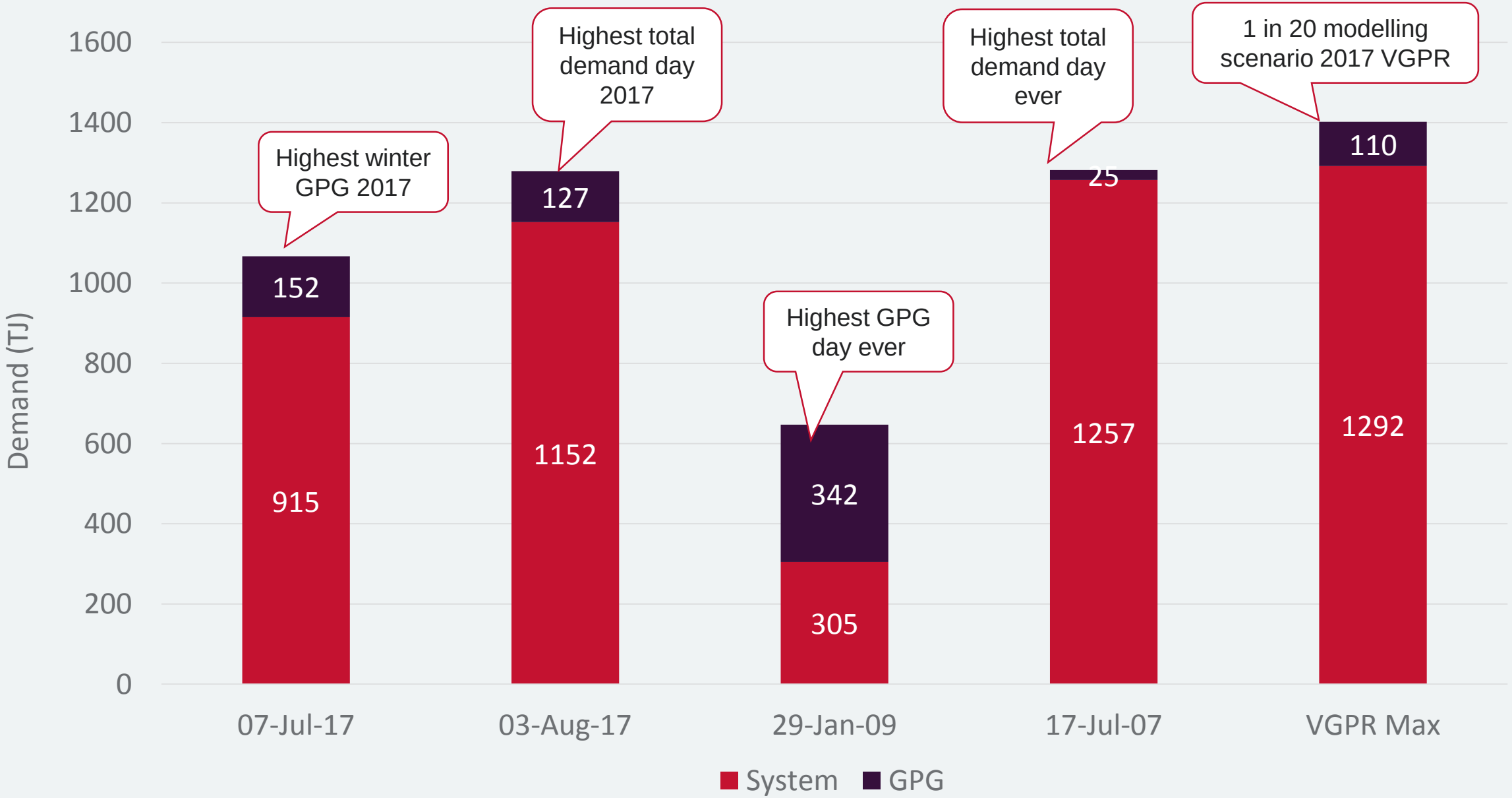
GPG INTERACTIONS



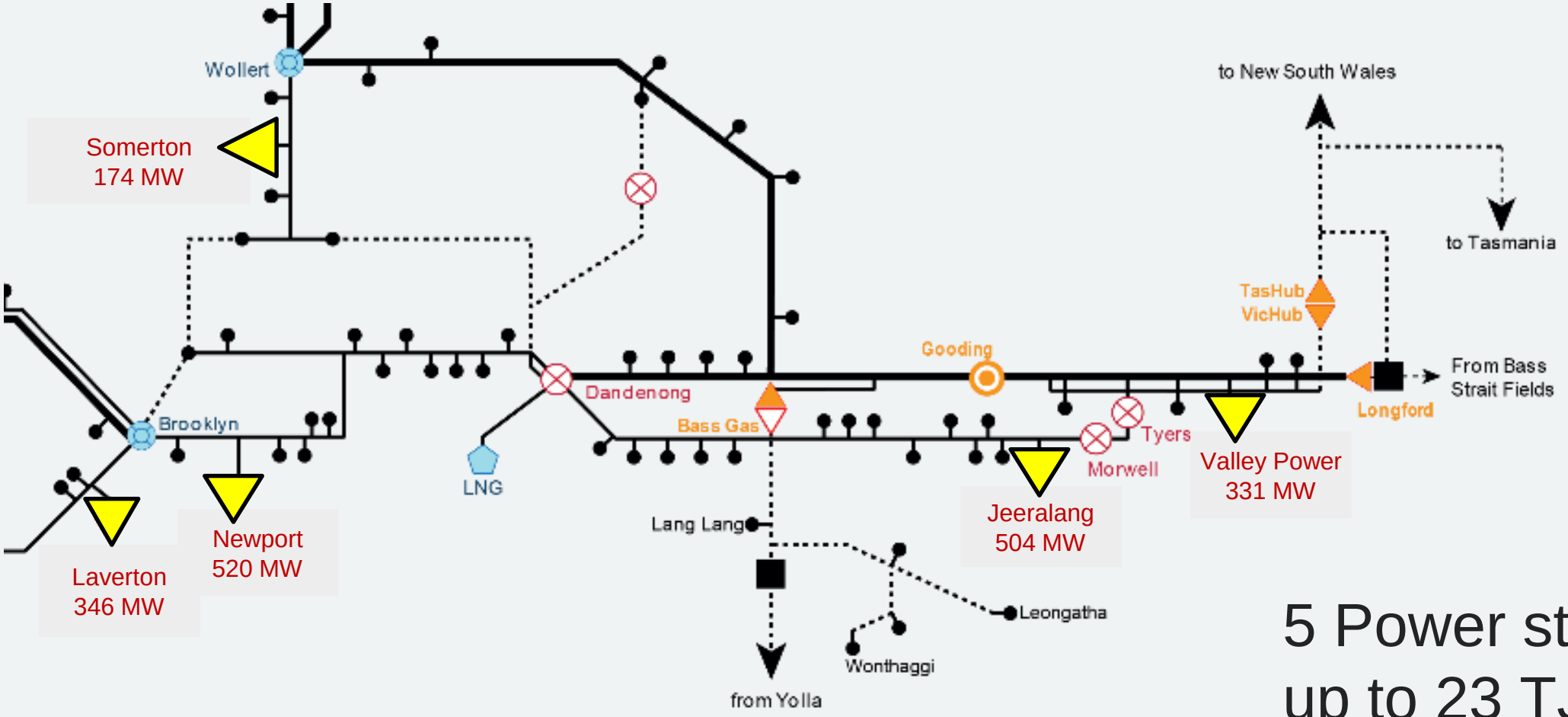
GPG DEMAND TRENDS



GPG USAGE STATS



DTS GPG

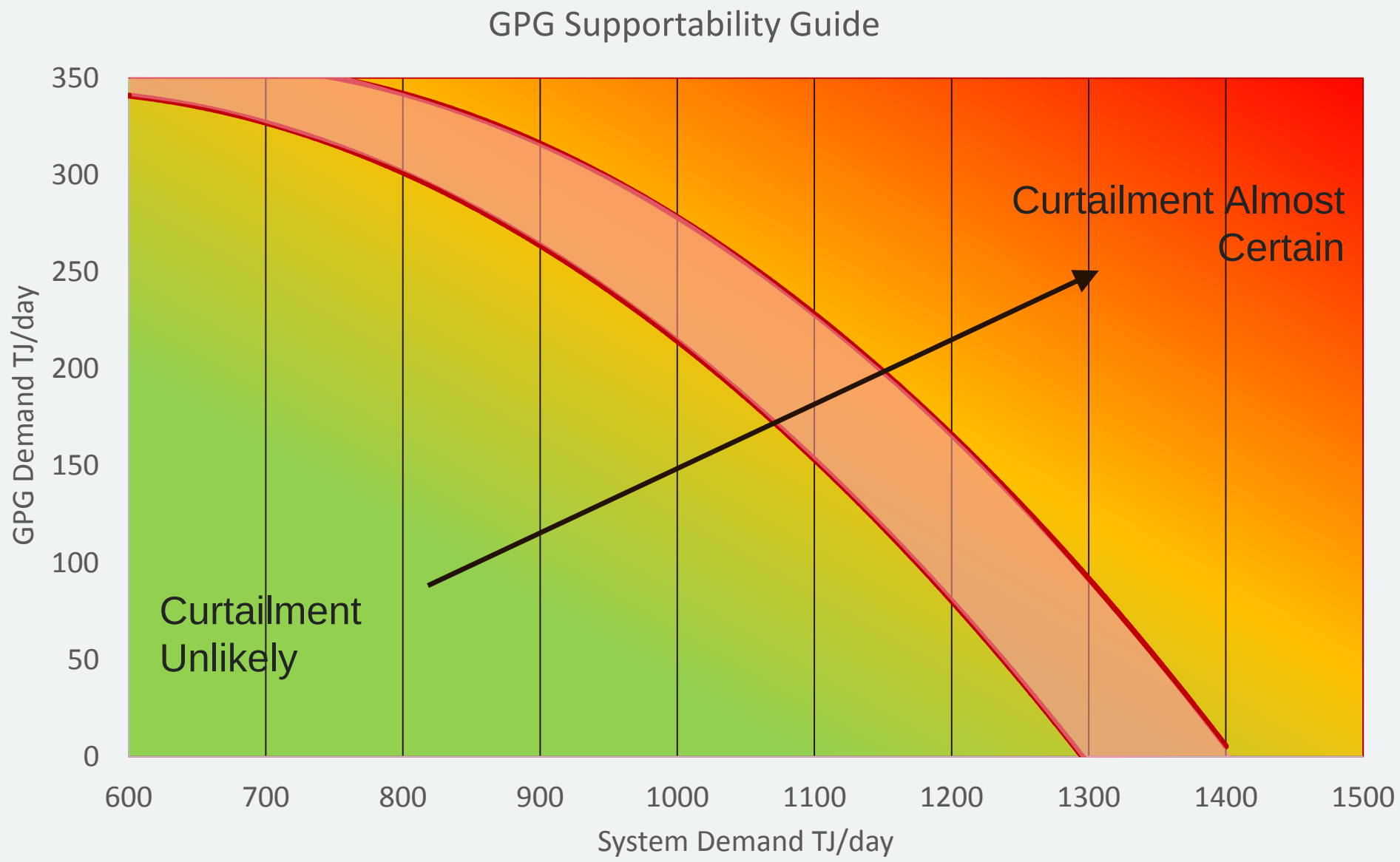


5 Power stations
up to 23 TJ/hr
(1875 MW)

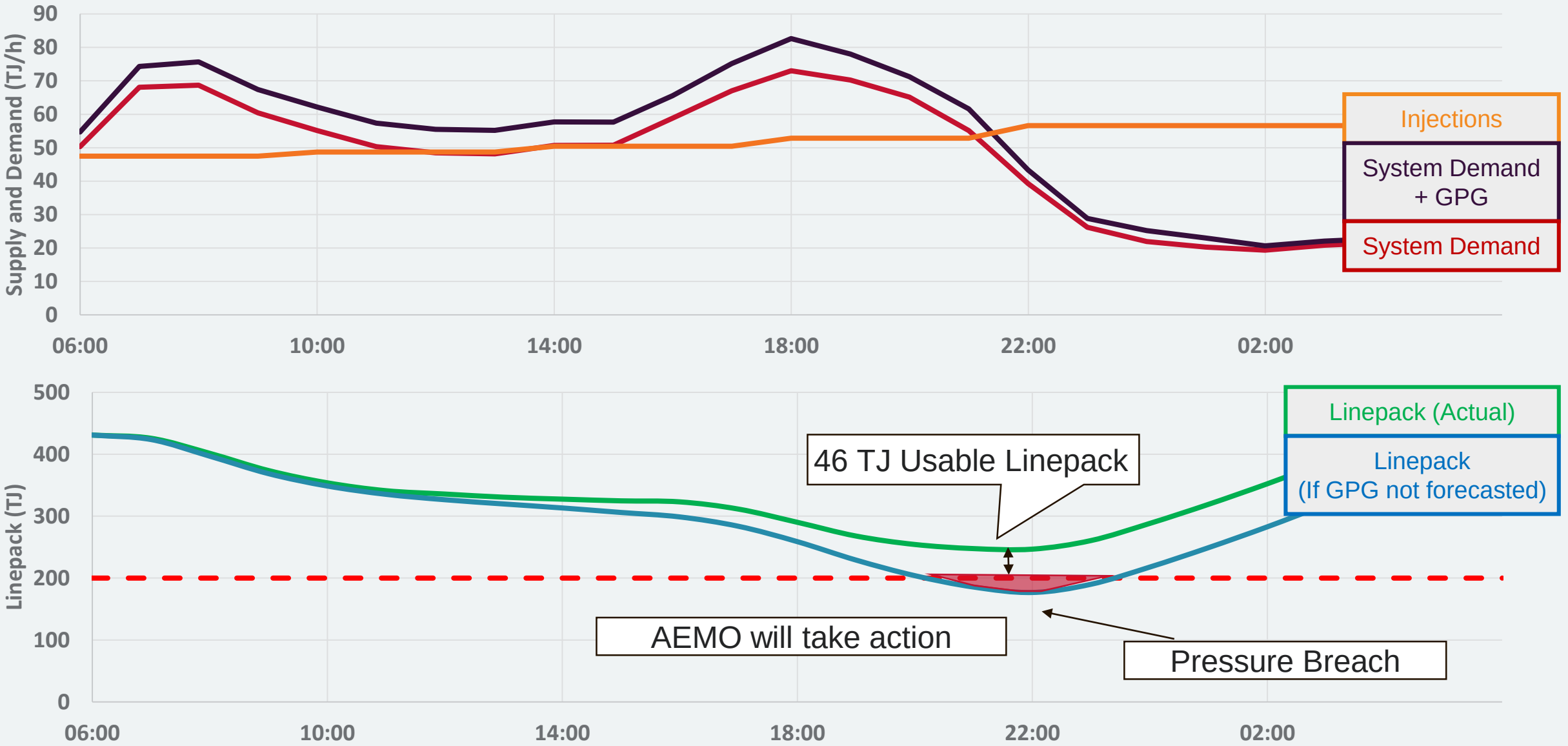
GPG SUPPORTABILITY GUIDE

Variables

- GPG needs to be forecast at 6am
- BOD linepack position
- Accuracy of weather forecast
- Injection sources, GPG locations and timing



GPG FORECAST IMPORTANCE – 3 August 2017 example



SUPPORTING GPG WITH CAPACITY REDUCTIONS

Scenario Conditions (3 August 2017)

- 1152 TJ System Demand
- 127 TJ GPG
- Total of 1279 TJ/d

What if…..

Compressor trips

City gate run failure

Injection issue

Material capacity reduction occurring at 4pm

SUPPORTING GPG WITH CAPACITY REDUCTIONS

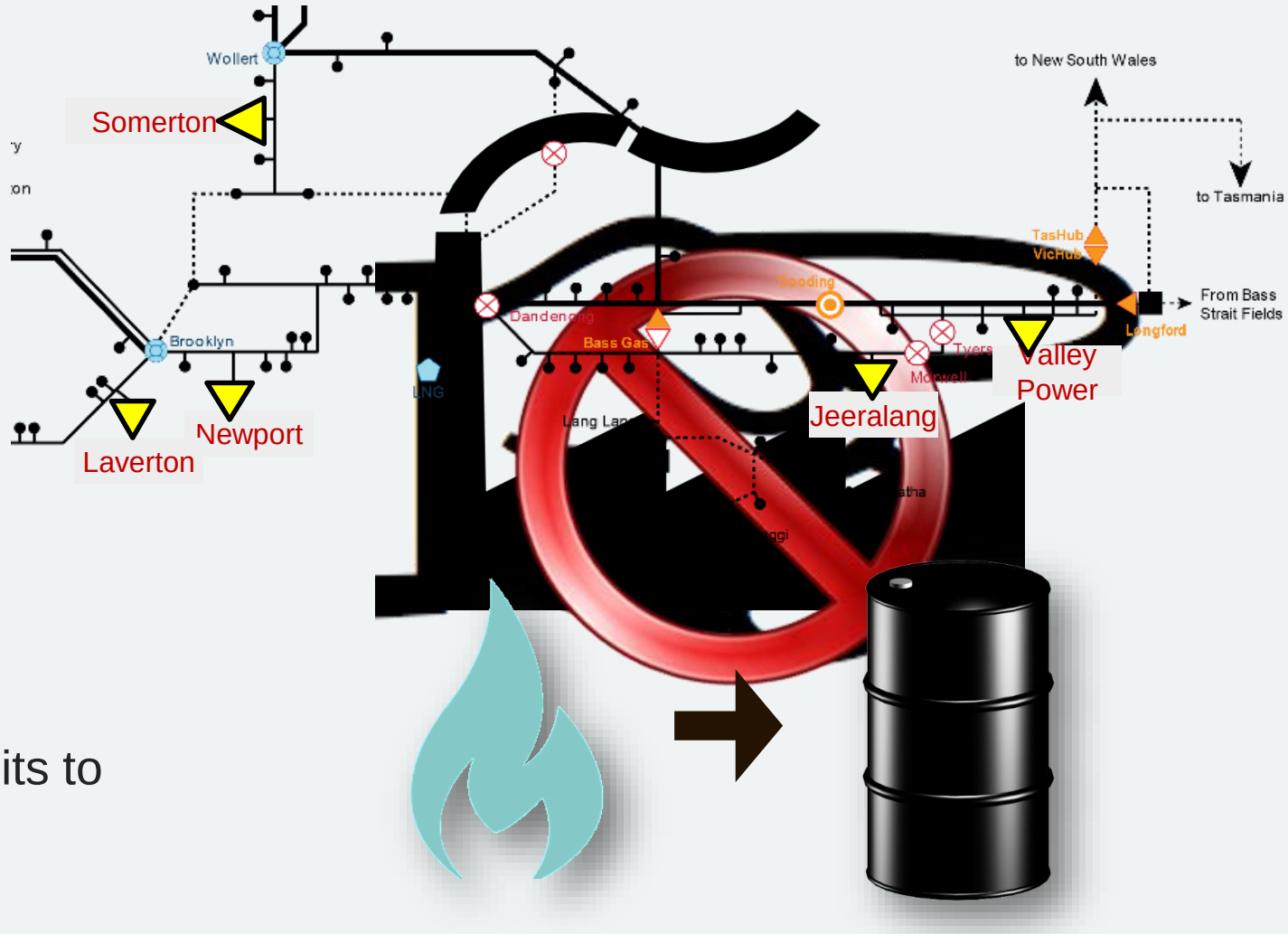
Process of supporting GPG

- ~~Market response~~
- ~~Adhoc Schedule~~
- Direct injections
  - LNG, Longford CPP, Iona CPP, Culcairn

- Curtail Controllable withdrawals
- ~~Curtail Tariff D with no AMDQ?~~
  Due to dynamic situation may not be practical in the short term

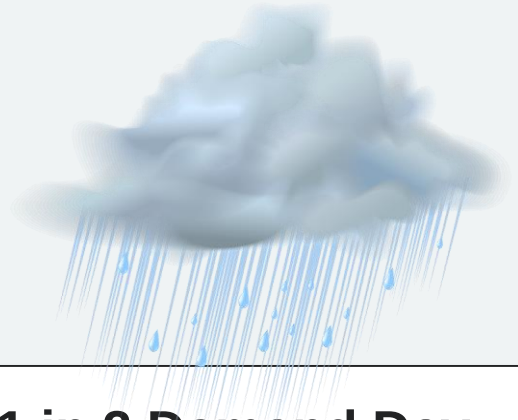
- Curtail GPG as required

- NEM control room may direct GPG units to use alternative fuel as available



SYSTEM CAPACITY & CONSTRAINTS

PEAK DAY SUPPLY



1 in 2 Demand Day
1182 TJ

1 in 20 Demand Day
1292 TJ

(Excludes GPG)

1935 TJ

Culcairn (150TJ)

LNG (87TJ)

Iona CPP (658 TJ)

Longford CPP (1040 TJ)

SUPPLY

1564 TJ

[2018 VGPR Table 15]

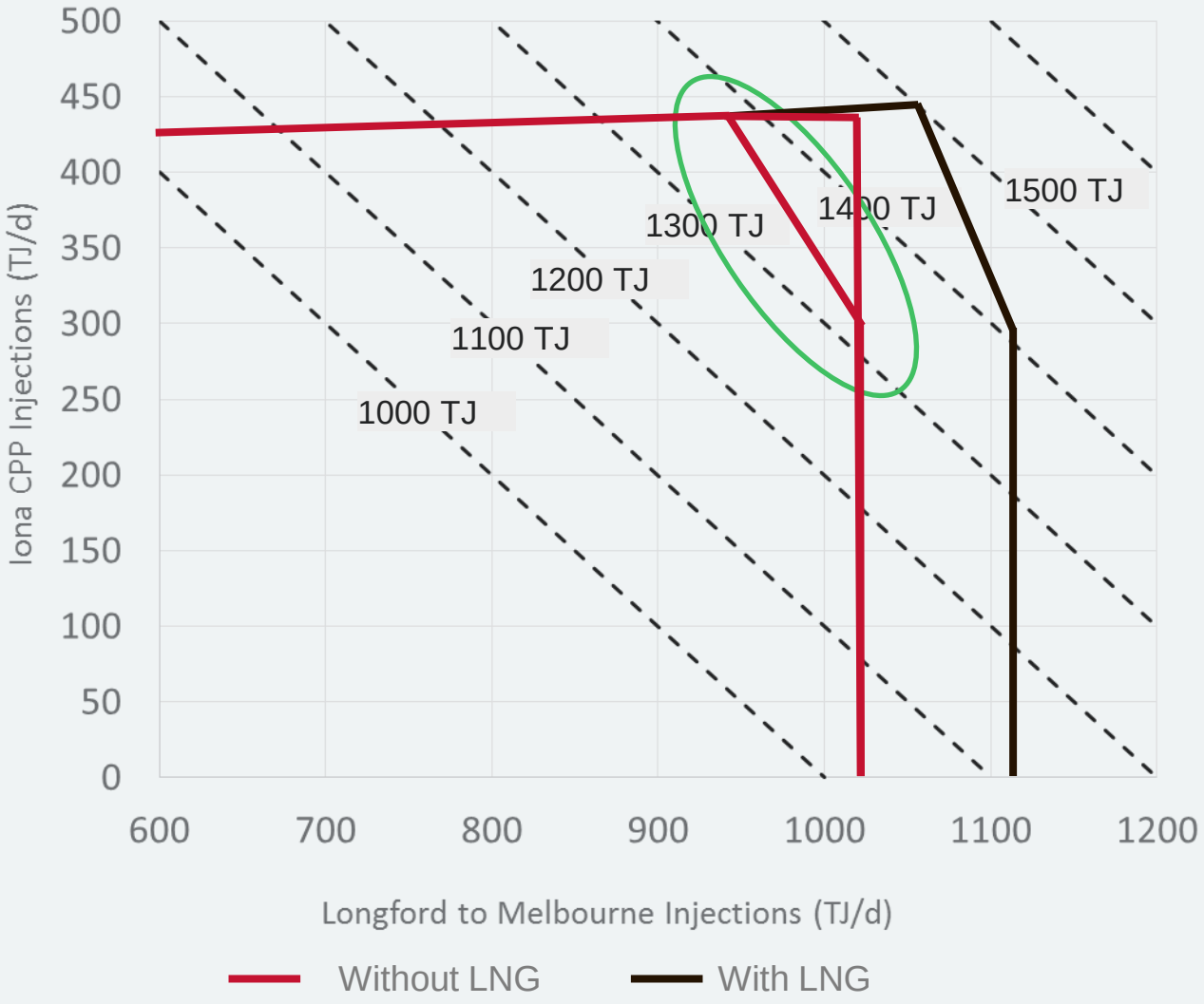
Firm LNG (87 TJ)

SWP (434TJ)

LMP / VNI (1030 TJ)

TRANSPORT

PIPELINE CAPACITY - Injections

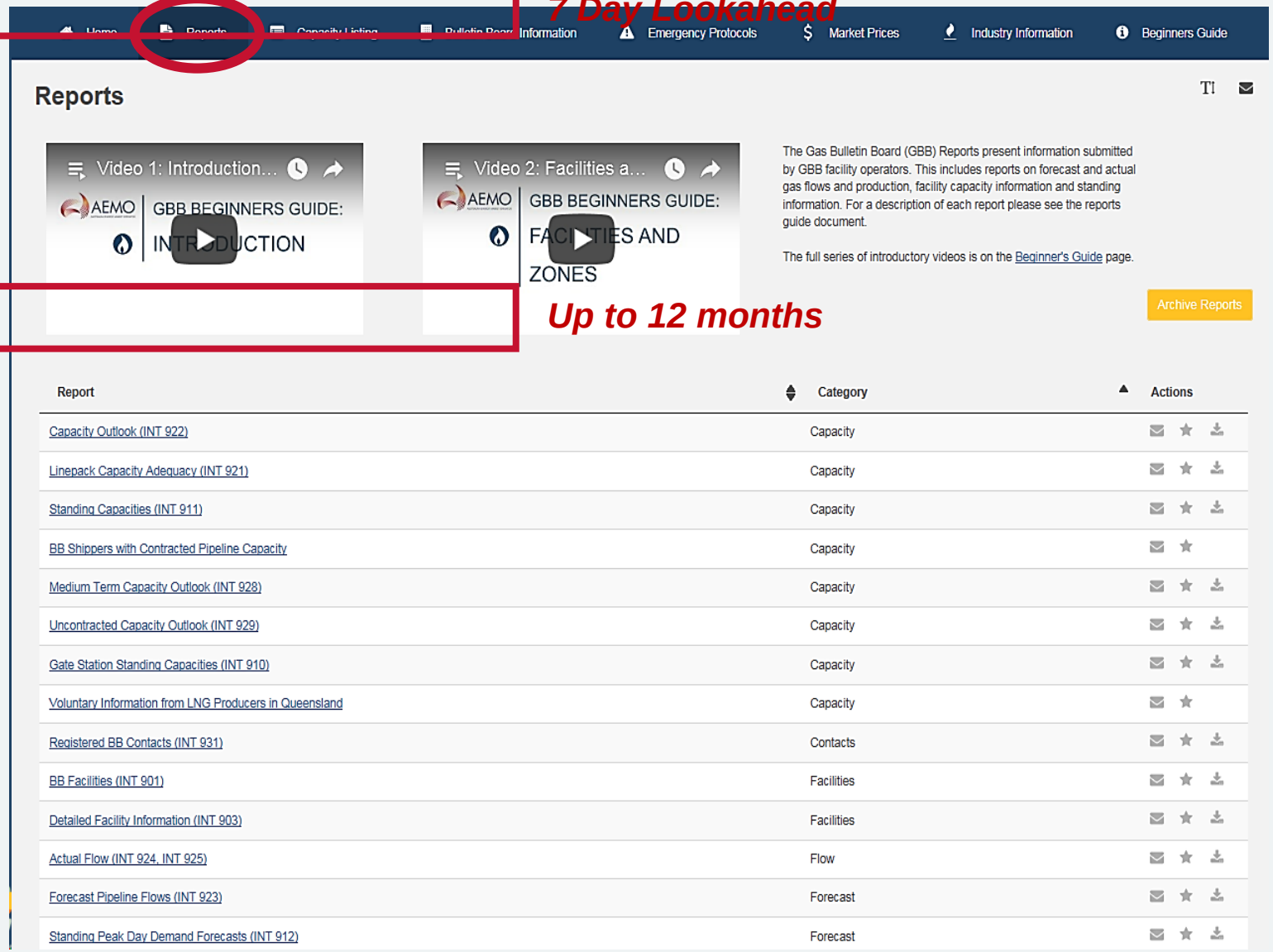


- Chart excludes VNI.
  VNI will approximately reduce LMP by 1:1 ratio, will not affect overall capacity
- Capacity depends on compressor availability. This chart assumes all compressors available

LMP includes Vichub, Longford, Bassgas and Tashub

What about VNI?

FACILITY CAPACITY – GASBB



www.gasbb.com.au

YouTube

7 DAY PIPELINE CAPACITY – INT 922

Gas Day: 01/03/2018 | Selected Plants: Longford to Melbourne,... | Outlook Types: All selected | View: Graph / Table | View Report | Export to CSV

Toggle column: Outlook type - 01/03/2018 - 02/03/2018 - 03/03/2018 - 04/03/2018 - 05/03/2018 - 06/03/2018 - 07/03/2018

Show 10 **entries**

Plant Name	Outlook type	01/03/2018	02/03/2018	03/03/2018	04/03/2018	05/03/2018	06/03/2018	07/03/2018
Longford to Melbourne	TRANC	1030	1030	1030	1030	1030	1030	1030
NSW-Victoria Interconnect	REVC	125	125	125	125	116	116	125
NSW-Victoria Interconnect	TRANC	200	213	213	213	172	172	213
South West Pipeline	REVC	147	104	104	147	38	38	38
South West Pipeline	TRANC	206	196	164	171	206	205	201

Showing 1 to 5 of 5 entries

Previous 1 Next

http://www.gasbb.com.au/Reports/Capacity%20Outlook.aspx

CONSTRAINTS IN DWGM

SDPC	• Supply demand point constraint
NFTC	• Net flow transportation constraint (Operating Schedule Only)
DFPC	• Directional flow point constraint

http://www.aemo.com.au/media/Files/Other/corporate/Technical_Guide_to_the_Victorian_Declared_Wholesale_Gas_Market.pdf

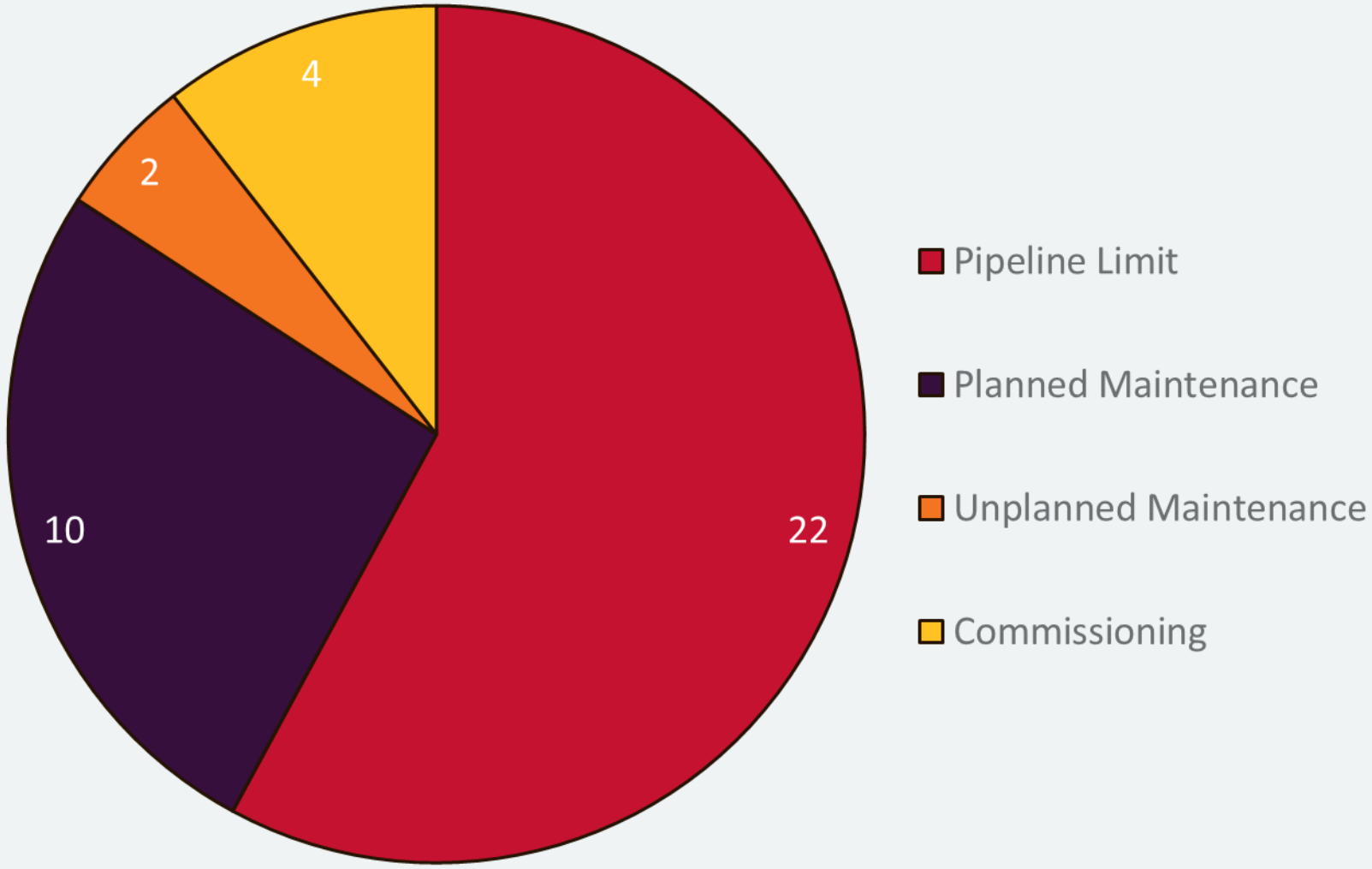
NFTC on Exports

EXAMPLE OF NFTC CAUSES – 2017 VNI EXPORTS

VNI Exports

- NFTC applied on 38 different days for 2017
  8 times during winter
- Only expect to see constraints on VNI due to compressor maintenance in 2018

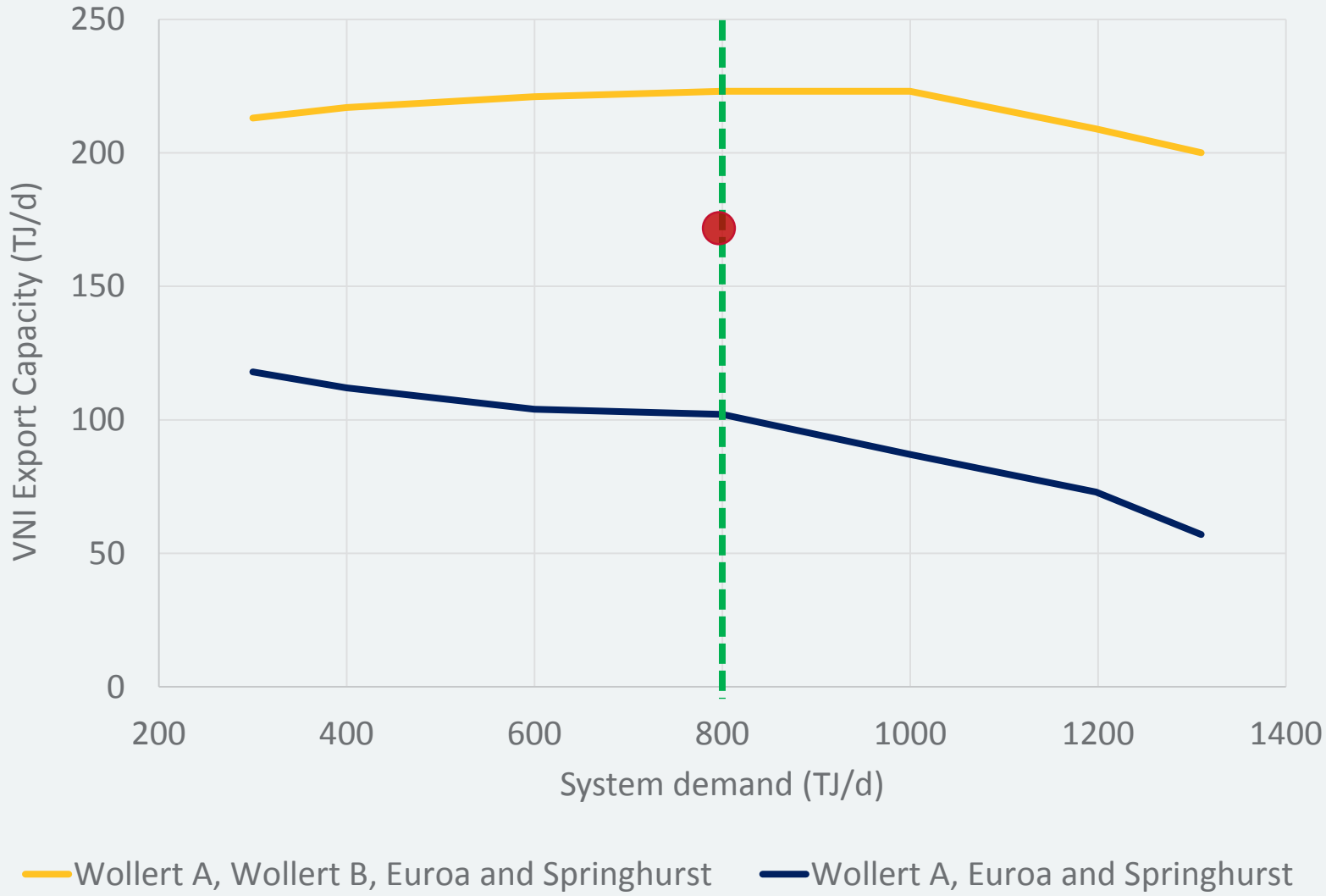
What causes a NFTC?



EXAMPLE SCENARIO – NFTC ON CULCAIRN EXPORTS

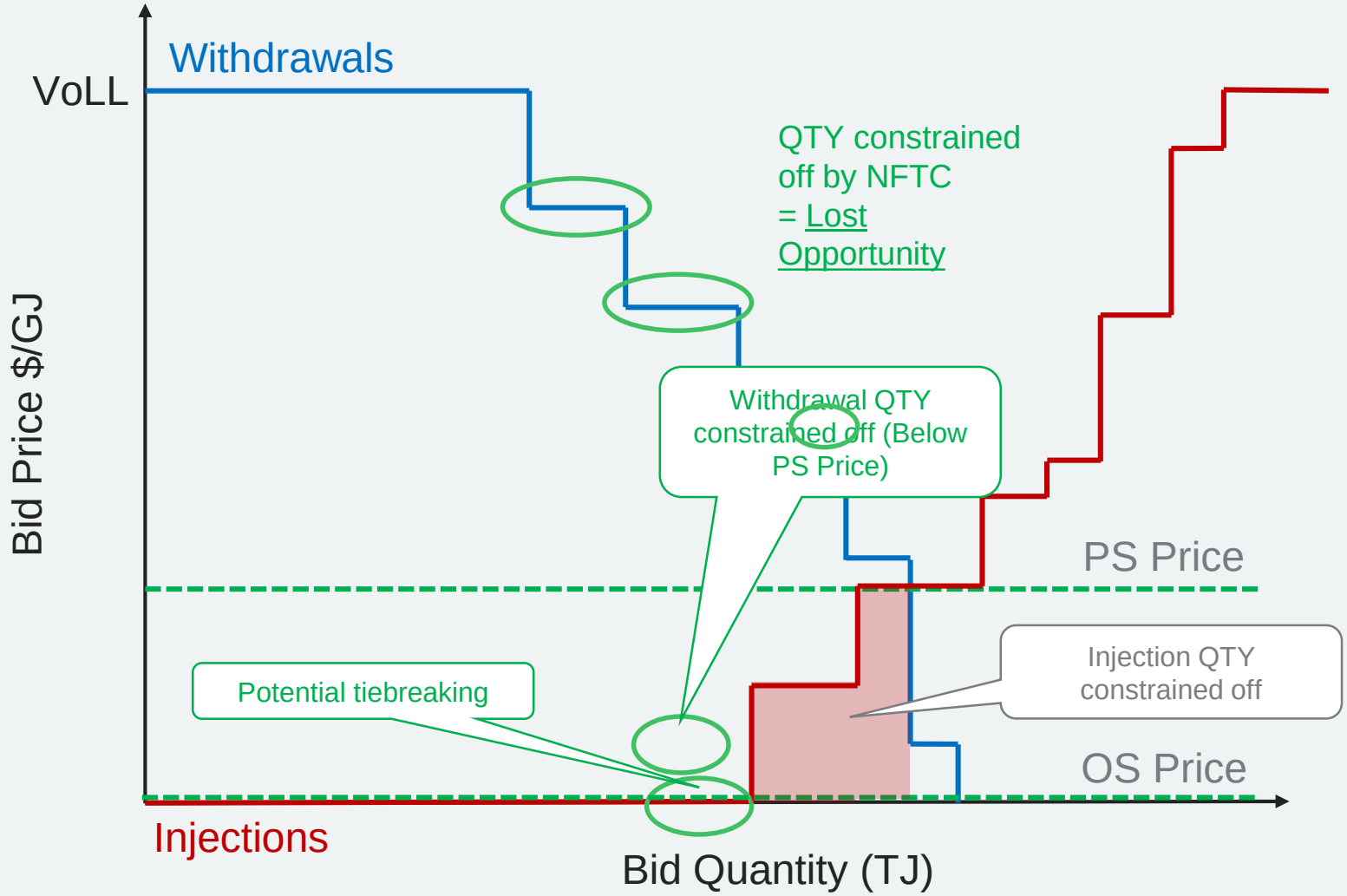
Scenario Conditions

- System demand = 800 TJ
- Culcairn scheduled net exports 170 TJ/d
- Wollert B maintenance, capacity reduced to 100 TJ/d
  (4160 GJ/hr)



EXAMPLE SCENARIO – NFTC ON CULCAIRN EXPORTS

- Withdrawal bids are removed at Culcairn with an OS only constraint to bring net exports to VGPR limit, 4160 GJ/hr
- May result in some $0.00 injection offers being constrained off (depends on the bid stack at the time)
- MIBB report INT039b shows OS prices for previous 7days



EXAMPLE OF TIEBREAKING

- 800 TJ of offers at Longford in un-constrained schedule
- 70 TJ constrained off due to NFTC
- Assume all is taken from Longford
- Need to reduce Longford quantity to 730 TJ

Participant	offer qty (TJ)	offer price ($/GJ)	AMDQ	(%)	PS qty (TJ)	OS qty (TJ)
A	300	0.00	Yes	39	300	284
B	300	0.00	Yes	39	300	284
C	170	0.00	Yes	22	170	162
D	10	0.00	No		10	0
E	20	3.00	Yes		20	0
Total	770	-	-	100	800	730

offers with no AMDQ removed next

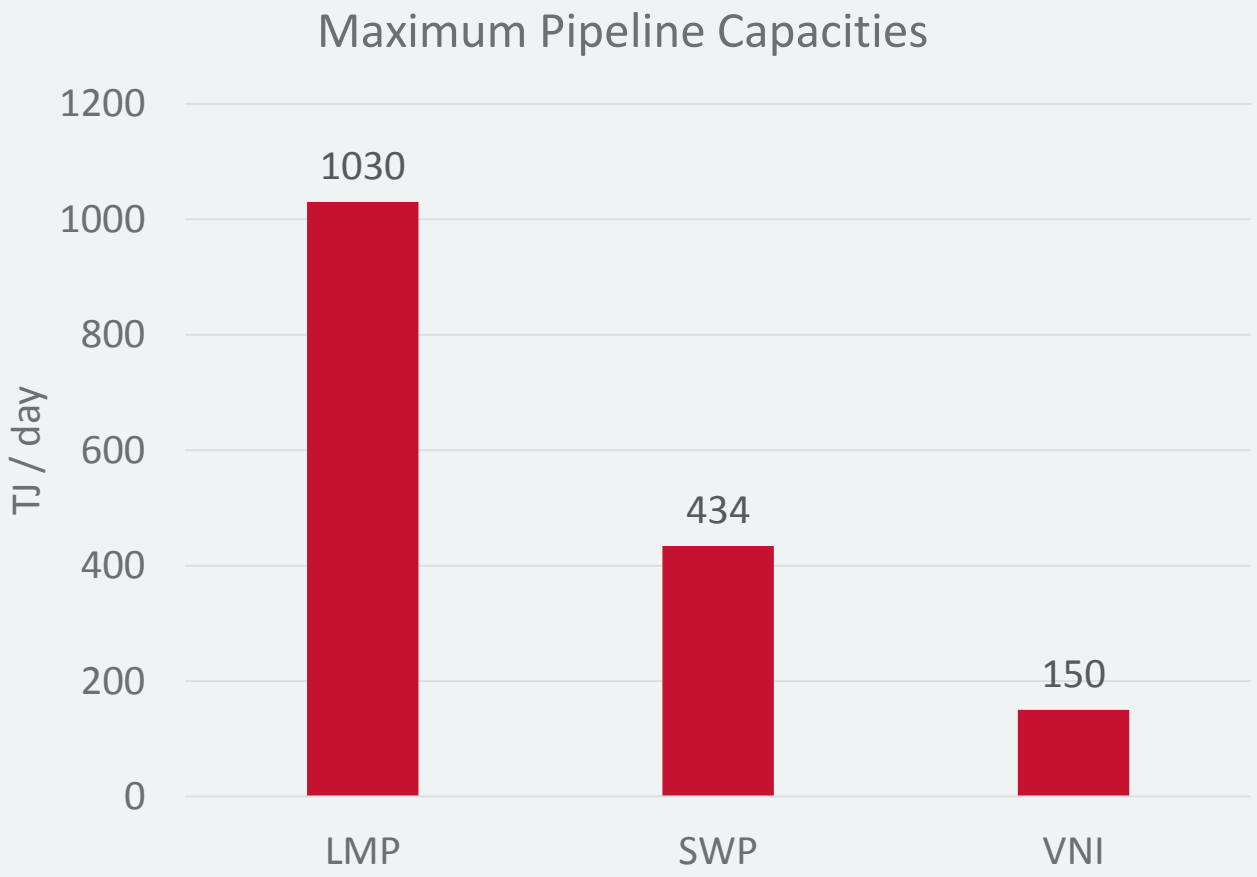
Highest price offers removed first

Offers scheduled Pro Rata

http://www.aemo.com.au/-/media/Files/Gas/DWGM/2016/Injection-Tie-Breaking-Right-Functional-Design.pdf

NFTC on Injections

MAX PIPELINE CAPACITY - Injections

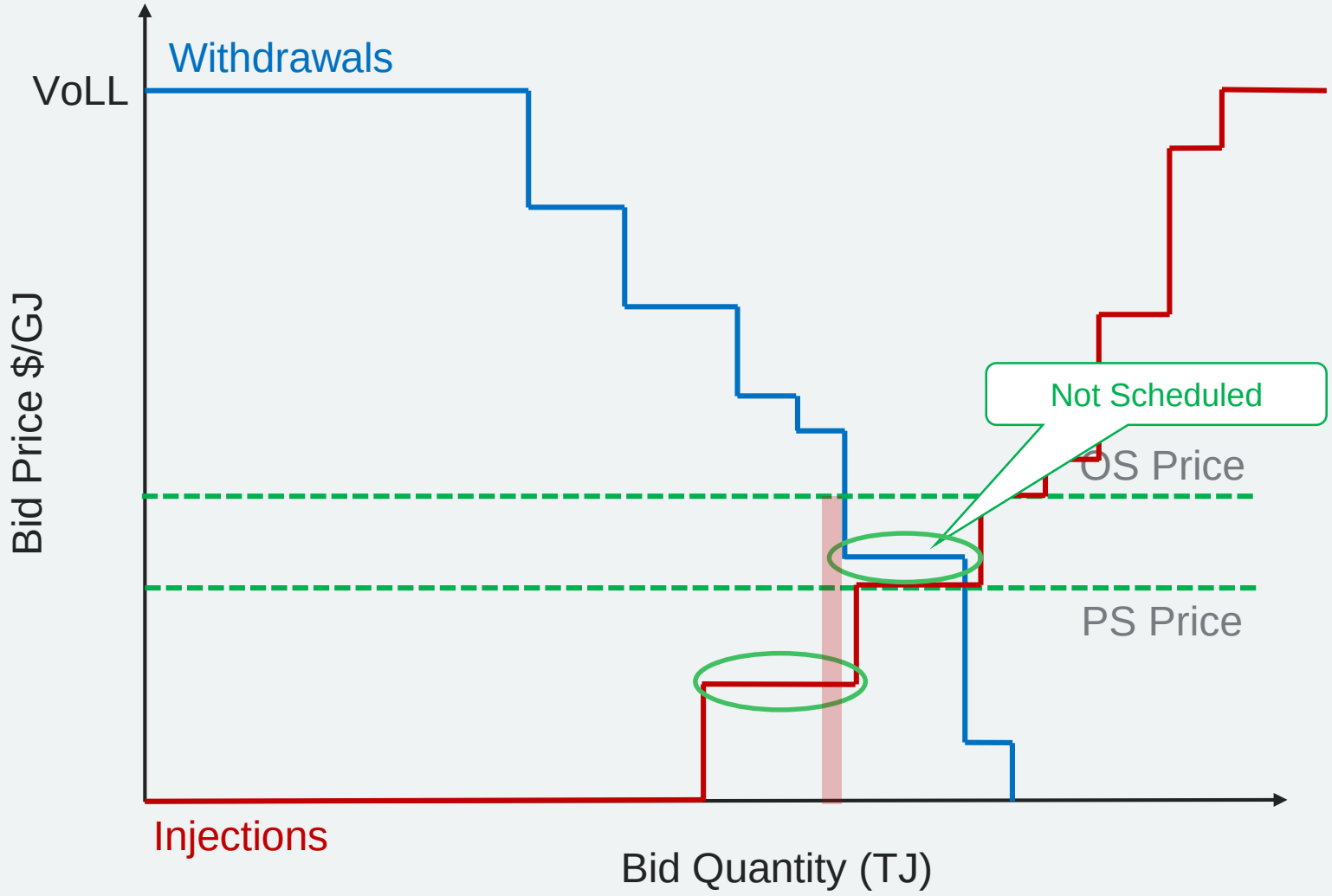


- The capacity is a function of system demand and compressor availability
- If offers at a CPP (Close Proximity Point) exceed pipeline capacity then a NFTC is applied to OS only
- No injection NFTC applied during 2017

http://www.aemo.com.au/-/media/Files/Gas/National_Planning_and_Forecasting/VGPR/2017/2018---Victorian-Gas-Planning-Report-Update.pdf

EXAMPLE SCENARIO – NFTC INJECTIONS

- OS only constraint is applied to reduce injection offers to the VGPR limit
- This may result in a reduction in withdrawals and possibly gas being injected from other sources
- Uplift payments are used to fund any additional gas injected above the PS price



ABNORMAL SCHEDULING

ABNORMAL SCHEDULING

Advanced Warning | Minimum Warning | Event

1. Market Response, Localised Injections

1. Ad Hoc Schedule

1. Directions
2. Curtailment

http://www.aemo.com.au/-/media/Files/PDF/AEMO-Wholesale-Market-System-Security-Procedures-NGR-11.pdf

EXAMPLE SCENARIO – 26TH May 2017

Advanced Warning | Minimum Warning | Event

1. Market Response, Localised Injections

EXAMPLE SCENARIO – 26TH May 2017

- 26th May – Brooklyn compressor station planned outage.
- AEMO issues threat to system security asking for market response
- Notice sent with MIBB attachment
- Insufficient market response

EXAMPLE SCENARIO – 26TH May 2017

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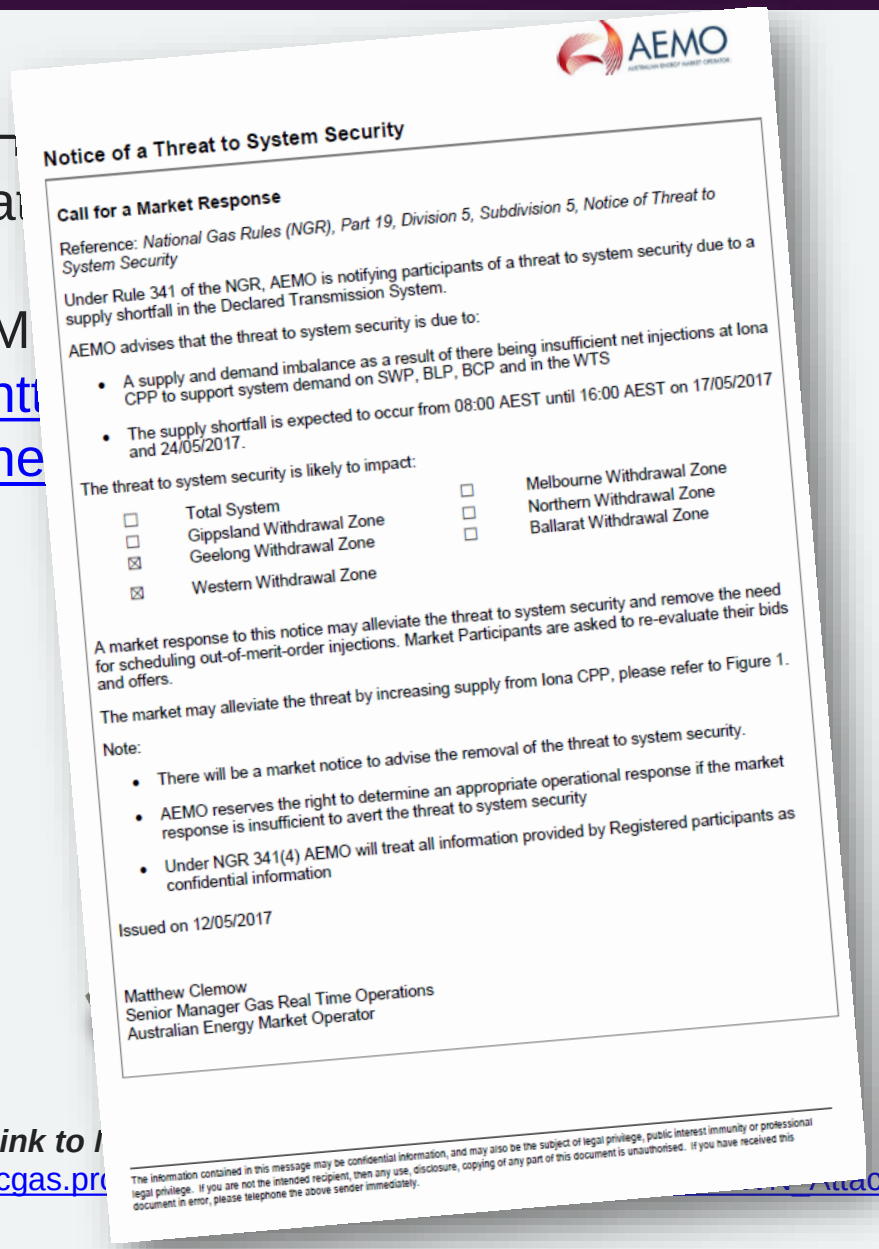


AEMO

Notice of a Threat to System Security

Call for a Market Response

Reference: *National Gas Rules (NGR), Part 19, Division 5, Subdivision 5, Notice of Threat to System Security*

Under Rule 341 of the NGR, AEMO is notifying participants of a threat to system security due to a supply shortfall in the Declared Transmission System.

AEMO advises that the threat to system security is due to:

- A supply and demand imbalance as a result of there being insufficient net injections at Iona CPP to support system demand on SWP, BLP, BCP and in the WTS
- The supply shortfall is expected to occur from 08:00 AEST until 16:00 AEST on 17/05/2017 and 24/05/2017.

The threat to system security is likely to impact:

☐	Total System	☐	Melbourne Withdrawal Zone
☐	Gippsland Withdrawal Zone	☐	Northern Withdrawal Zone
☒	Geelong Withdrawal Zone	☐	Ballarat Withdrawal Zone
☒	Western Withdrawal Zone		

A market response to this notice may alleviate the threat to system security and remove the need for scheduling out-of-merit-order injections. Market Participants are asked to re-evaluate their bids and offers.

The market may alleviate the threat by increasing supply from Iona CPP, please refer to Figure 1.

Note:

- There will be a market notice to advise the removal of the threat to system security.
- AEMO reserves the right to determine an appropriate operational response if the market response is insufficient to avert the threat to system security
- Under NGR 341(4) AEMO will treat all information provided by Registered participants as confidential information

Issued on 12/05/2017

Matthew Clemow
Senior Manager Gas Real Time Operations
Australian Energy Market Operator

Direct link to I
http://vicgas.pr Attachment/

AEMO

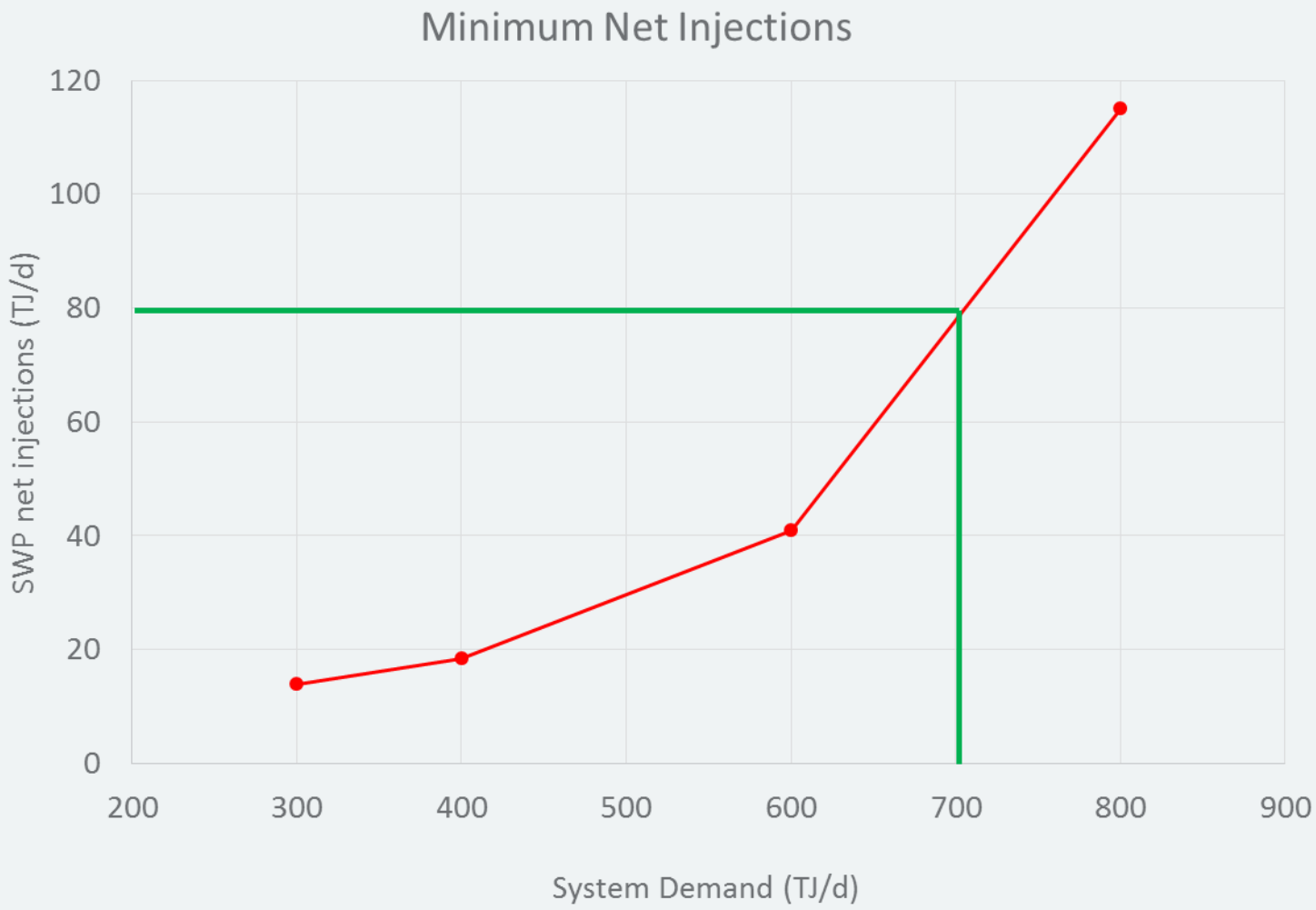
- 22 Mar 2018 16:29:24 - DWGM market systems (MIBB and Webexchanger) outage from 18:00 to 21:00 on 23/03/18 due to planned cutover to new database host servers.
- 22 Mar 2018 15:29:13 - Brooklyn CS maintenance complete. SWP withdrawal capacity no longer restricted.
- 22 Mar 2018 13:23:54 - Constraint revised at Longford injection meter to 261.3 TJ/d on gas day 23/03/18 due to planned maintenance.
- 21 Mar 2018 12:36:13 - Constraint revised at Longford injection meter to 271.2 TJ/d on gas day 22/03/18 due to planned maintenance.
- 19 Mar 2018 16:22:29 - Constraint applied at Mortlake inj meter to 0 GJ/hr from 07:00 to 17:00 on 27/4/18 & 1/6/18 due to planned maint.
- 19 Mar 2018 16:17:45 - Constraint applied at SeaGas inj/wdl meter to 0 GJ/hr from 07:00 to 15:00 on 7/5/18 & 10/5/18 due to planned maint.
- 19 Mar 2018 16:11:52 - Constraint applied at Mortlake inj meter to 0 GJ/hr from 08:00 on 4/4/18 to 18:00 on 26/4/18 due to planned maint.
- 19 Mar 2018 16:06:47 - Constraint applied at SeaGas inj/wdr meter/s to 0 GJ/hr from 06:00 to 17:00 on 25/3/18 due to planned maint.
- 19 Mar 2018 16:03:28 - Constraint applied at Otway inj/wdr meter/s to 0 GJ/hr from 07:00 to 15:00 on 22/3/18 due to planned maint.
- 19 Mar 2018 15:59:30 - Constraint applied at Mortlake & Otway inj/wdr meter/s to 0 GJ/hr from 07:00 to 08:00 on 24/3/18 due to planned maint.
- 19 Mar 2018 15:54:32 - Constraint applied SeaGas inj/wdr meter/s to 0 GJ/hr from 06:00 to 17:00 on 24/3/18 due to planned maint.
- 16 Mar 2018 15:47:30 - SWP withdrawal capacity may be impacted due to planned maintenance at Brooklyn CS from 19/03/18 06:30 until 23/03/18 15:00
- 08 Mar 2018 06:37:22 - Constraint applied at Longford inj meter to 300 TJ/d from 08/03/18 to [illegible]/18 as indicative constraint (to be revised on day ahead) due to planned maintenance.
- 27 Sep 2017 [illegible] - Daylight saving time will begin on Sunday 01/10/17 at 02:00 EST. Bid cut-off and publishing times are not affected by this change and will remain at EST.
- 10 Mar 2017 15:42:35 - AEMO gives notice of a threat to system security due to the SWP constraint causing a possible gas supply shortfall for winter 2018. See MIBB attachment
- 10 Mar 2017 15:35:02 - AEMO gives notice of a threat to system security due to a supply constraint and possible shortfalls for Warragul CTM in winter 2019. See MIBB attachment

EXAMPLE SCENARIO – 26TH May 2017

- Without Brooklyn compressors there needs to be net Iona CPP injections

- **700TJ/d forecast demand = 80 TJ/d net injections required at Iona CPP**

  Iona CPP
  - Mortlake
  - Seagas
  - Otway
  - Iona UGS



http://vicgas.prod.marketnet.net.au/Public_Dir/Documents/SWN_Attachment/SWN%20MIBB%20attachment%20for%20Brooklyn%20CS%20Annual%20Outage%20-%20v2.pdf

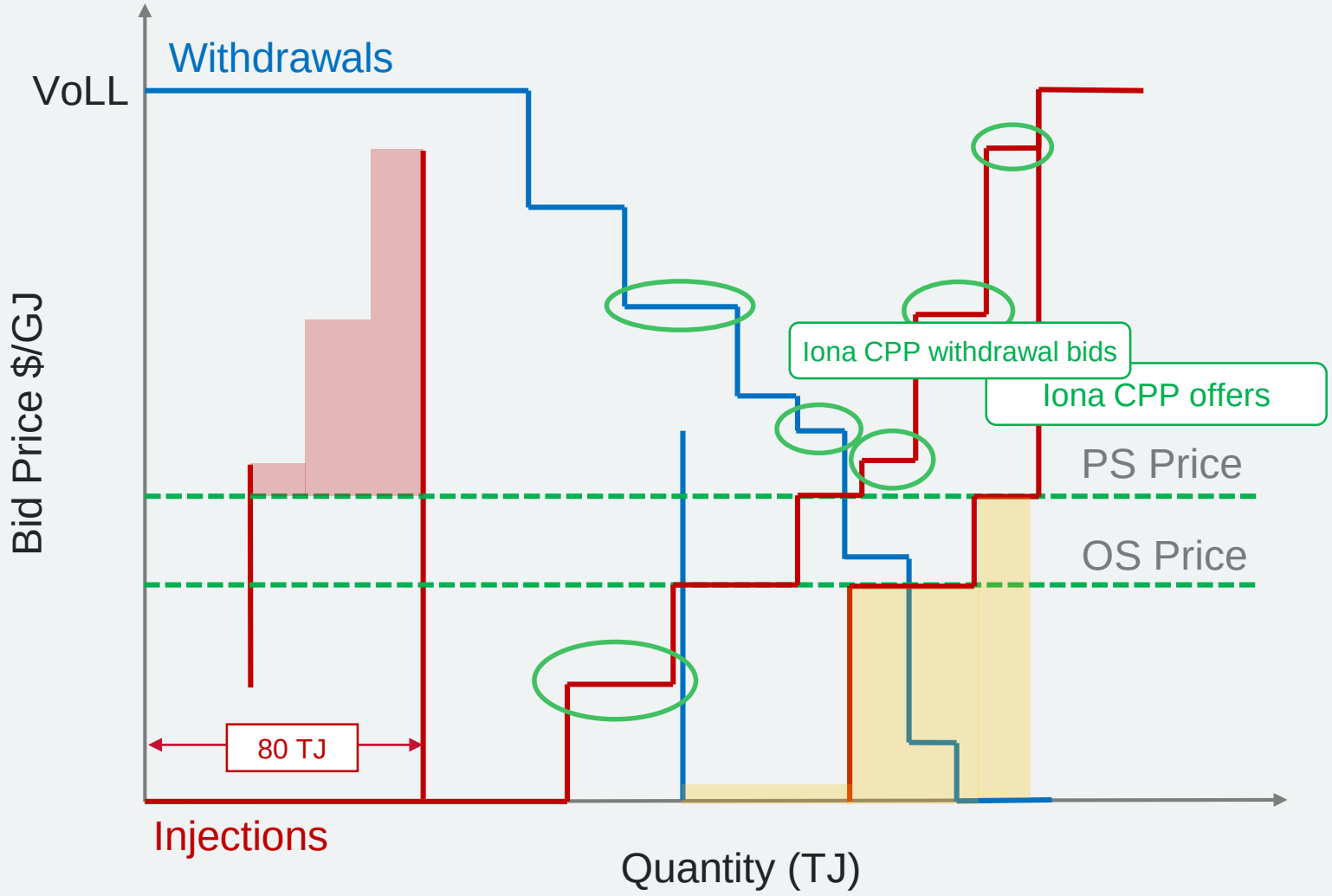
EXAMPLE SCENARIO – 26TH May 2017 – Out of Merit Order Injections

- Any withdrawal bids removed at Iona CPP with a OS only constraint

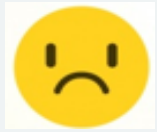
- Check net injections
- Keep injections at Iona CPP

- Put Out Of Merit Order (OOMO) offers in the schedule to achieve 80 TJ/day net injections

- OOMO injections displace lower price offers



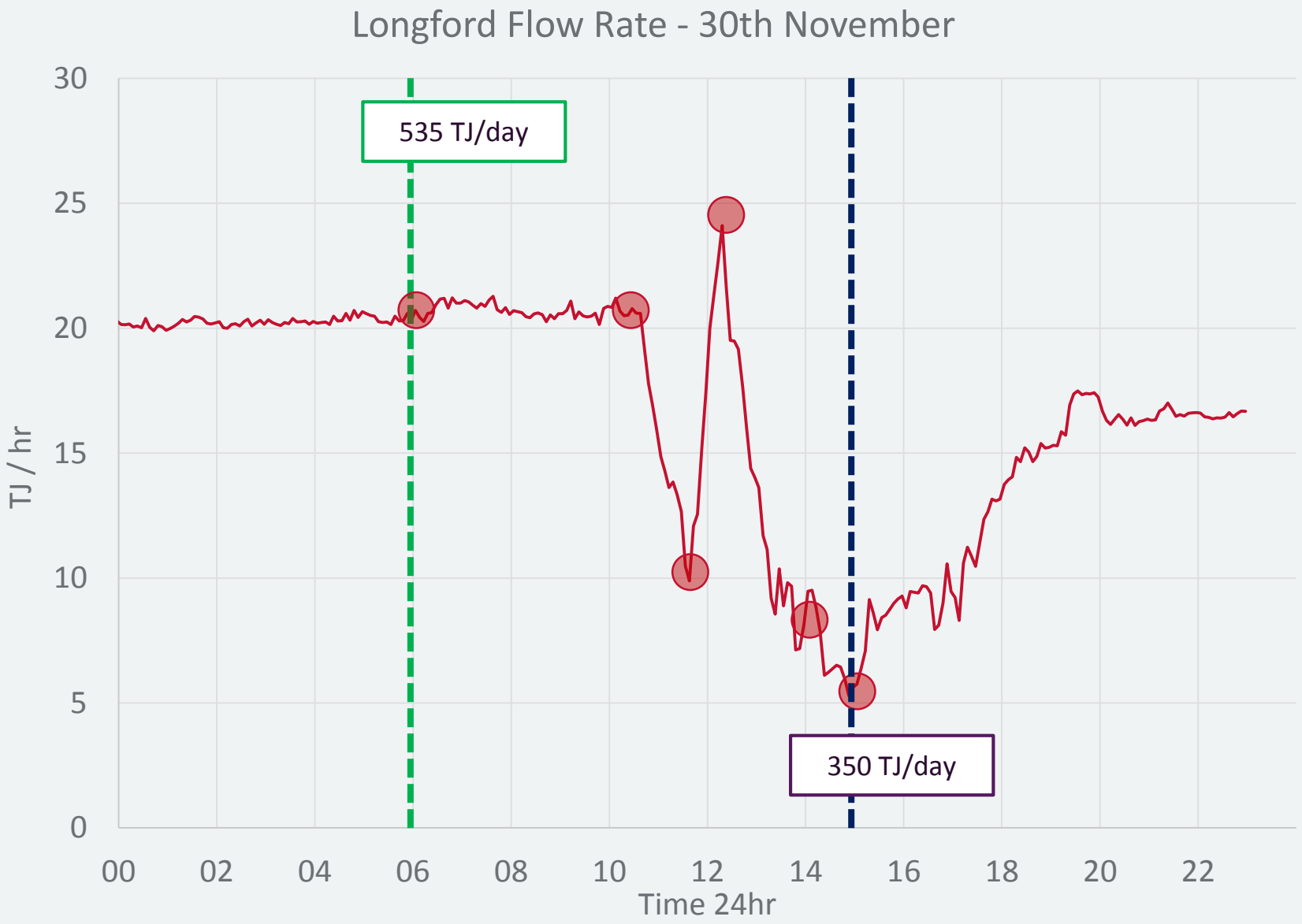
AD HOC EXAMPLE – 30TH November 2017



Advanced Warning | Minimum Warning | Event

1. Ad Hoc Schedule

AD HOC EXAMPLE – 30TH November 2017



- 06:00 - Schedule published, Longford 535TJ/day
- 10:40 – Rate dropped rapidly, discussions between control rooms
- 11:40 - Rate starts to improve
- 12:20 – Rate starts to decline, discussions with Longford.
- 13:55 SDPC received
- 14:00 - Schedule published, market price $6.44
- 15:00 - Adhoc Schedule published

EXAMPLE SCENARIO – 30TH November 2017

Status of situation at 2pm

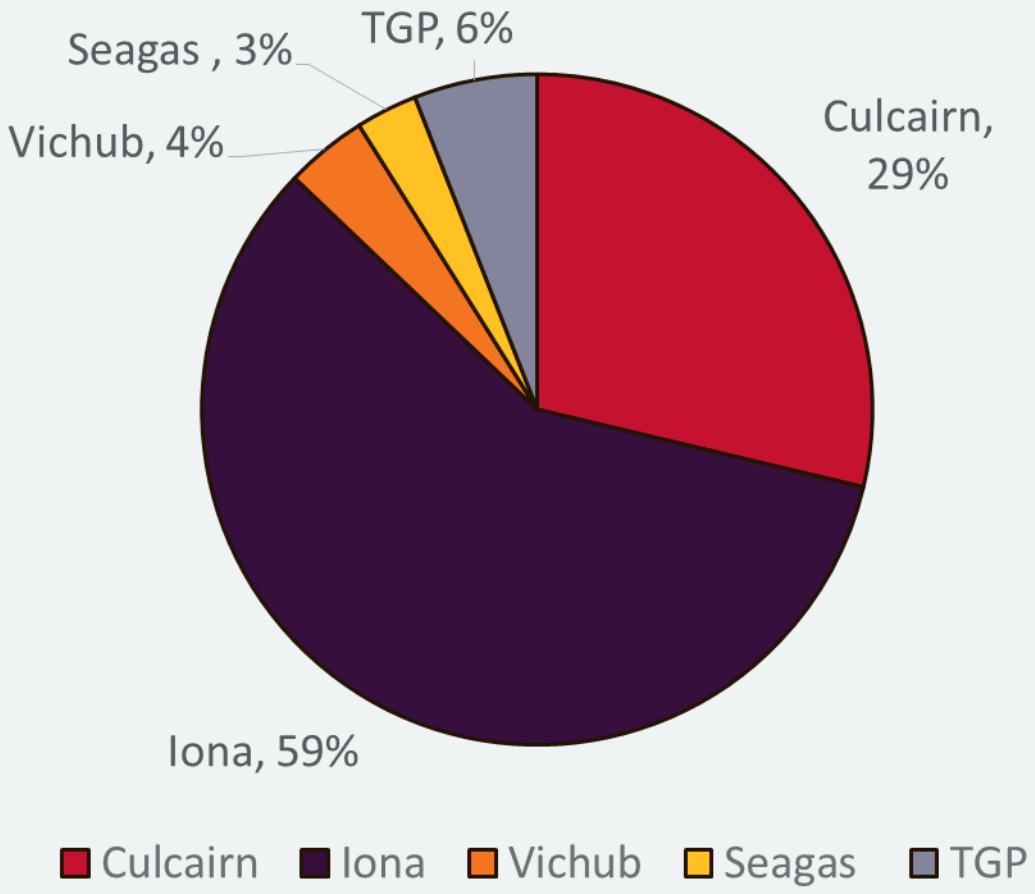
- 300 TJ System demand
- 205 TJ GPG demand
- LOR2 status in Victoria forecast
- RERT activated in Victoria

Modelling indicated requirement to run Ad-Hoc in order to conserve linepack in LMP for GPG and CTMs. Pressure breach at Sale CTM predicted

LMP – Longford Melbourne Pipeline
CTM – Custody Transfer Meter
GPG – Gas Power Generation

AD HOC EXAMPLE – 30TH November 2017

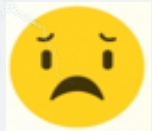
OOMO Breakdown at 15:00 schedule

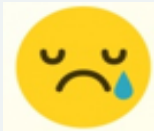


- Total OOMO scheduled 174 TJ for Ad Hoc Schedule
- Actual OOMO scheduled for gas day was 32.7 TJ
  - 6pm SDPC was in PS and OS
  - Participants re-bid
  - OOMO de-scheduled
- $266k Ancillary Payments covered by uplift payments
- 90% Surprise
- 9% Common
- 1% Congestion

http://www.aemo.com.au/-/media/Files/Gas/DWGM/2017/DWGM-ER-17-003-30-Nov-2017.pdf

DIRECTIONS AND CURTAILMENT





Advanced Warning | Minimum Warning | Event

1. Directions
2. Curtailment

DIRECTIONS

- Performed in accordance with NGL clause 91BC or NGR rule 343
- AEMO may issue directions to facilities to either inject or stop withdrawing. Includes non firm gas
- Direct GPG units to stop using gas

http://www.aemo.com.au/-/media/Files/PDF/AEMO-Wholesale-Market-System-Security-Procedures-NGR-11.pdf

CURTAILMENT

- Curtailment may be system wide or localised to a pipeline or even just a CTM
- Occurs as a result of production facility outage or major pipeline infrastructure outage

T - 0	Tariff D customers with NO AMDQ
T - 1	Withdrawals into Underground storage and Exports Gas Power Generation
T – 2 to 8	Stepped Curtailment of Tariff D customers with MDQ

T – 9	Customers with uninterruptible continuous processes
T – 10	Residential Customers, small commercial (Tarrif V)
T – 11	Essential Services

Participant curtailment tables found at INT-133 on the MIBB

http://www.aemo.com.au/-/media/Files/PDF/0990-0005-pdf.pdf

CURTAILMENT NOTICE

EXAMPLE

Appendix D - Direction to Curtail Load

NATIONAL GAS LAW
DIRECTION TO CURTAIL LOAD

To: Jims Gas
Fax:

This direction is given to Registered participants by AEMO under section 91BC of the National Gas Law for the purposes of maintaining or re-establishing the security of the declared transmission system. This direction is an intervention by AEMO under rule 347 of the National Gas Rules.
Terms defined in the National Gas Rules have the same meaning in this declaration.

AEMO directs:
1. the Retailer listed above to instruct its gas customers classifed in the Tables below to curtail gas consumption;
2. each Market Customer listed above to curtail gas consumption at its site(s) classifed in the Tables below;
3. each Trader listed above to curtail withdrawals of gas from the declared transmission system at delivery p
in the Tables below.
Note: See attachment for Tables.

In each case, gas consumption or withdrawal must be curtailed in accordance with the Gas Load Curtailmen
Rationing and Recovery Guidelines forming part of the emergency protocol.
This direction applies to gas loads at allocations using gas that has been transported through the declared transmission system unless specified in attachment.

Penalty for Non-Compliance
Under section 91BC(5) of the National Gas Law, the maximum penalty for non-compliance with this direction is $25,000 for a natural person, or $100,000 for a body corporate.

A person who fails to comply with a direction under this section within the period allowed in the direction commits a further offence for every day the non-compliance continues after the end of that period and is liable to a further penalty of $10,000 for each such offence.

Signed for Australian Energy Market Operator Limited (ACN 072 010 327) by its duly authorised office:

	AEMO
Signature	Position
	16:00
Date	Time

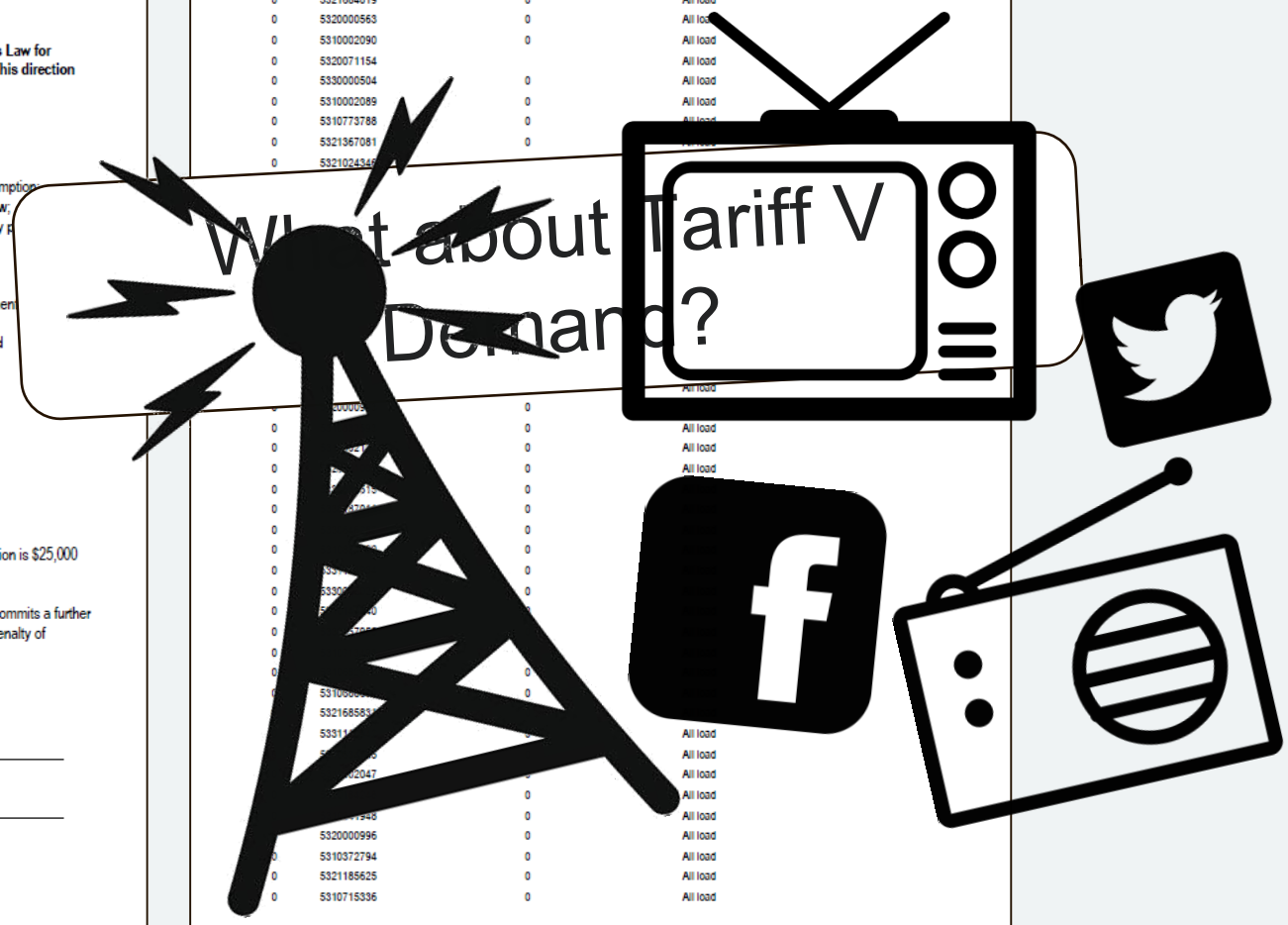
1

- State wide messaging service
- Social Media
- TV and Radio
- Media Statements

EXAMPLE

Appendix D - Direction to Curtail Load Attachment

Table	Mirn	AMDQ(GJ)	Gas Load Curtailed (GJ)
0	5330986334	0	All load
0	5321684019	0	All load
0	5320000563	0	All load
0	5310002090	0	All load
0	5320071154		All load
0	5330000504	0	All load
0	5310002089	0	All load
0	5310773788	0	All load
0	5321367081	0	All load
0	5320000996	0	All load
0	5310372794	0	All load
0	5321185625	0	All load
0	5310715336	0	All load



ADMIN PRICING UPDATE

ADMINISTERED PRICING PROCEDURE UPDATE

- Updates to ADMINISTERED PRICING PROCEDURE effective from 28th July 2017

WHOLESALE MARKET ADMINISTERED PRICING PROCEDURES (VICTORIA)

PREPARED BY: AEMO Markets
DOCUMENT REF: MARKETS-35-201
VERSION: 3.0
EFFECTIVE DATE: 28 July 2017
STATUS: Final

Approved for distribution and use by:
APPROVED BY: V Mouchaileh
TITLE: Acting Executive General Manager, Markets

DATE: 6 July 2017

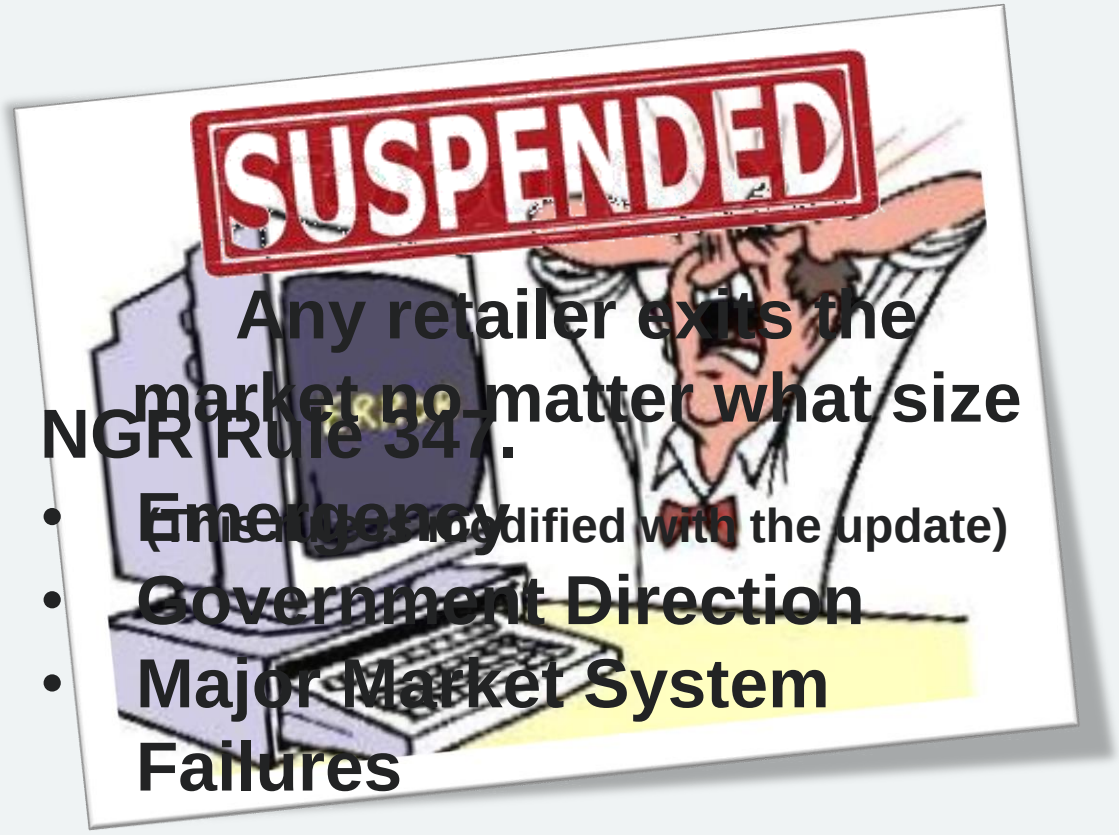
AEMO

Australian Energy Market Operator Ltd ABN 94 072 010 327 www.aemo.com.au info@aemo.com.au
NEW SOUTH WALES QUEENSLAND SOUTH AUSTRALIA VICTORIA AUSTRALIAN CAPITAL TERRITORY TASMANIA WESTERN AUSTRALIA

http://www.aemo.com.au/-/media/Files/Gas/DWGM/2017/DWGM-Administered-Pricing-Procedures--Version-30--Effective-28-July-2017--PDF.pdf

EXISTING ADMINISTERED PRICING TRIGGERS

- Unable to Publish Price Schedule
- Exceed Cumulative Price Threshold
- Market Suspension
- ROLR



Any retailer exits the market no matter what size

NGR Rule 347:

- **Emergency** (Emergency modified with the update)
- **Government Direction**
- **Major Market System Failures**

NEW ADMINISTERED PRICING TRIGGERS

Minor RoLR event

Major RoLR event

Material Curtailment

Retailer with 20% - 40% Market Share voluntarily exits

The customers transferred by host retailers

Curtailment affecting significant part of the system, customers in Table 2 and above

Admin period up to 10 business days

http://www.aemo.com.au/-/media/Files/Gas/DWGM/2017/DWGM-Administered-Pricing-Procedures--Version-30--Effective-28-July-2017--PDF.pdf

Summary

- Greater system capacity than 2017. Same market constraint procedures as 2017
- Same strategy for abnormal scheduling as 2017
- Similar GPG demand to 2017
- Update to Admin pricing procedure