

OPERATIONS AND TECHNOLOGY (WA) YEAR IN REVIEW

6 December 2016



Welcome and Introduction <ul style="list-style-type: none">• Operations and Technology Team• 2016 – Year in Review	Martin Maticka Group Manager, Operations and Technology (WA)
Technology Year in Review <ul style="list-style-type: none">• Data Centre Project	Thomas Killin Team Leader, Infrastructure (WA)
Market Operations Year in Review <ul style="list-style-type: none">• Key WEM and GBB (WA) Observations• Overview of Prudential Requirements• Overview of 2016/17 IRCR	Mark Katsikandarakis Team Leader, Market Services and Operations Process (WA)
System Capacity Year in Review <ul style="list-style-type: none">• Electricity and Gas Major Reports• Reserve Capacity Operational Accomplishments	Neetika Kapani Team Leader, System Capacity (WA)
Concluding Remarks <ul style="list-style-type: none">• 2017 – The year ahead• Participant feedback	Martin Maticka Group Manager, Operations and Technology (WA)

WELCOME AND INTRODUCTION

Martin Maticka
Group Manager, Operations and Technology (WA)



Martin Maticka
Group Manager

Operations and Technology is responsible for the operations and technical support of the Western Australian Wholesale Electricity Market (WEM) and Gas Service Information (GSI) functions.



Neetika Kapani
Team Leader

SYSTEM CAPACITY

Responsible for the operation the Reserve Capacity Mechanism and delivery of the annual WA Gas Statement of Opportunities (GSOO).



Joachim Tam
Senior Analyst



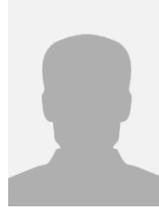
Katelyn Rigden
Analyst



Prem Malhi
Analyst



Rebecca Petchey
Senior Analyst



Luke Dowling
Analyst



Mark Katsikandarakis
Team Leader

MARKET OPERATIONS

Responsible for the day to day operation and settlement of the WEM and the WA Gas Bulletin Board (GBB).



Alan Wong
Market Analyst



Amanda Niklaus
Market Analyst



Andreas Tatt
Market Analyst



Anne-Marie Foo
Market Analyst



Chris Wilson
Market Analyst



Jayesh Halai
Market Analyst



Kate Farnsworth
Graduate Analyst



Kang Chew
Senior Analyst



Mike Hales
Senior Analyst



Stuart MacDougall
Market Analyst



Khadijah Hansia
Team Leader

MARKET SYSTEMS SUPPORT

Responsible for supporting the market systems and processes used in the operation and settlement of the WEM and the GBB.



Amos Zimmermann
Senior Support
Analyst



Steve Raynes
Principal Test
Analyst



Roberta De Cecco
Senior Test Analyst



Thomas Killin
Team Leader

INFRASTRUCTURE SUPPORT

Responsible for maintaining and supporting the hardware and software used to provision the organisation's technology, applications and services upon which AEMO WA market systems reside.



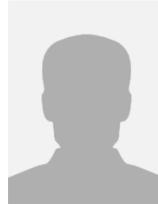
Bruce Pullen
DBA



Daniel McNamara
Senior System
Administrator



Tom Montague
DBA



Jing Zhang
IT Support
Technician



Mark Brodziak
Senior Solutions
Architect

SOLUTIONS ARCHITECT

Responsible for the ongoing strategy and continuing development of the IT systems supporting the WEM and the GSI.

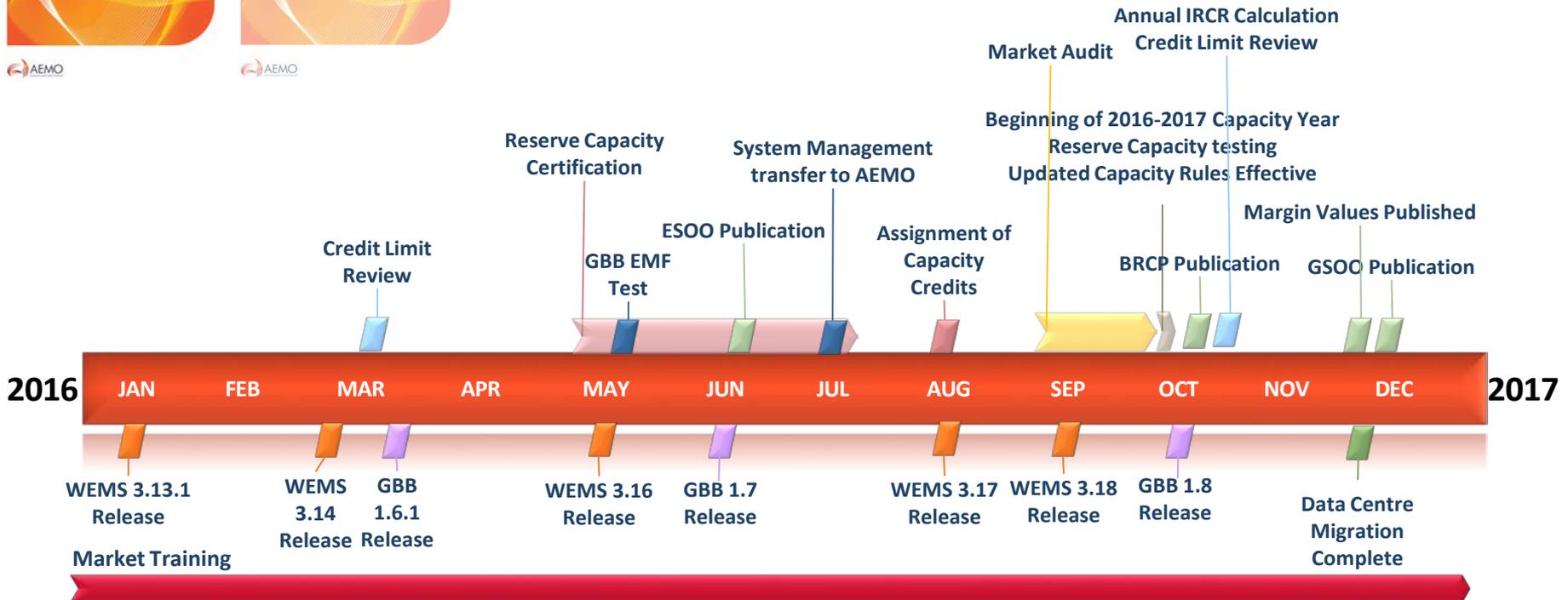
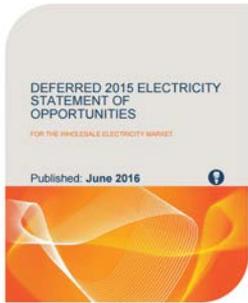


Alex Nistico
Senior Software
Engineer



Winston Cheng
Senior Business
Analyst

2016 YEAR IN REVIEW



Release	Release Date	Key Changes
3.13	29 November 2015	Transition to AEMO
3.13.1	13 January 2016	BAU Fixes (RC Testing)
3.14	2 March 2016	BAU Fixes (RC Testing, Settlement Portal)
3.16	25 May 2016	EMR RCM (RC Certification)
3.17	17 August 2016	EMR RCM (Bilateral Trade Declaration, RC Bilateral Test)
3.18	28 September 2016	EMR RCM (DSP NDL association)

GBB (WA) RELEASES



Release	Release Date	Key Changes
1.6	29 November 2015	Transition to AEMO
1.6.1	30 March 2016	BAU (add new facility)
1.7	15 June 2016	BAU (add new connection point, fix report publication)
1.8	7 November 2016	BAU (add new connection points, fix visualisation)

WA DATA CENTRE MIGRATION PROJECT

Thomas Killin
Team Leader, Infrastructure Support

In late 2015, AEMO WA received notice to vacate the Servicenet Data Centre in East Perth

- Infrastructure Hosting Requirements:
 - Two sites for Disaster Recovery
 - Secure with redundant power, cooling and networking
 - 2008 – 2016 Servicenet and Datacom
- Migration options:
 - Single DC vs. Existing AEMO vs. **New Provider**
 - Greenfield vs. Lift 'n' Shift vs. **Staged**
- Solution:
 - New site in NextDC facility in Malaga
 - Live Migration of Production Services
- Benefits:
 - Industry Certified facility
 - UTI Tier III; highest available in Australia
 - Lower operational costs
 - Improved security
 - Greater performance, resiliency and redundancy

MARKET OPERATIONS YEAR IN REVIEW

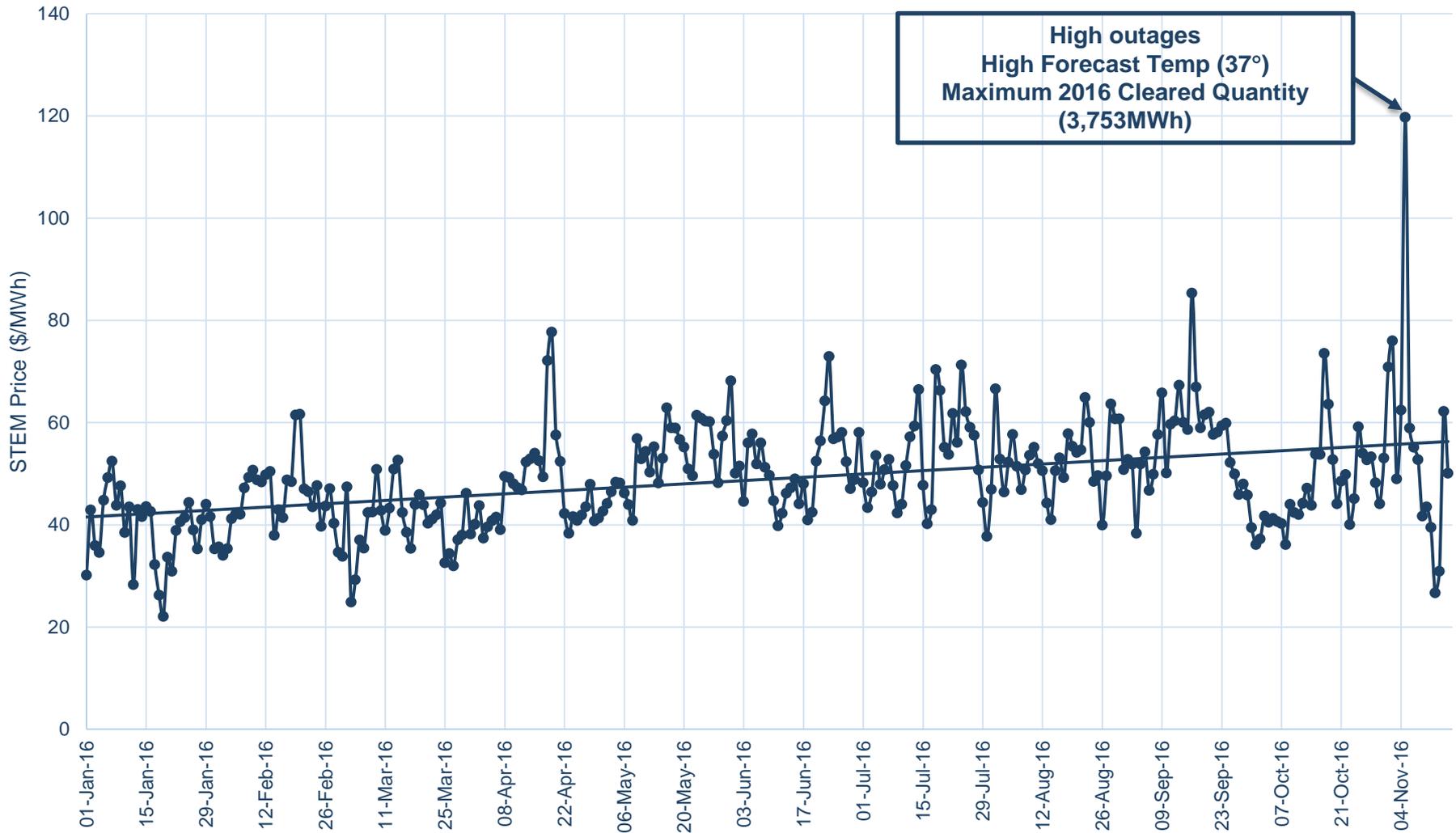
KEY WEM AND GBB (WA) OBSERVATIONS
OVERVIEW OF PRUDENTIAL REQUIREMENTS
OVERVIEW OF 2016/17 IRCR

Mark Katsikandarakis
Team Leader, Market Services and Operations Process

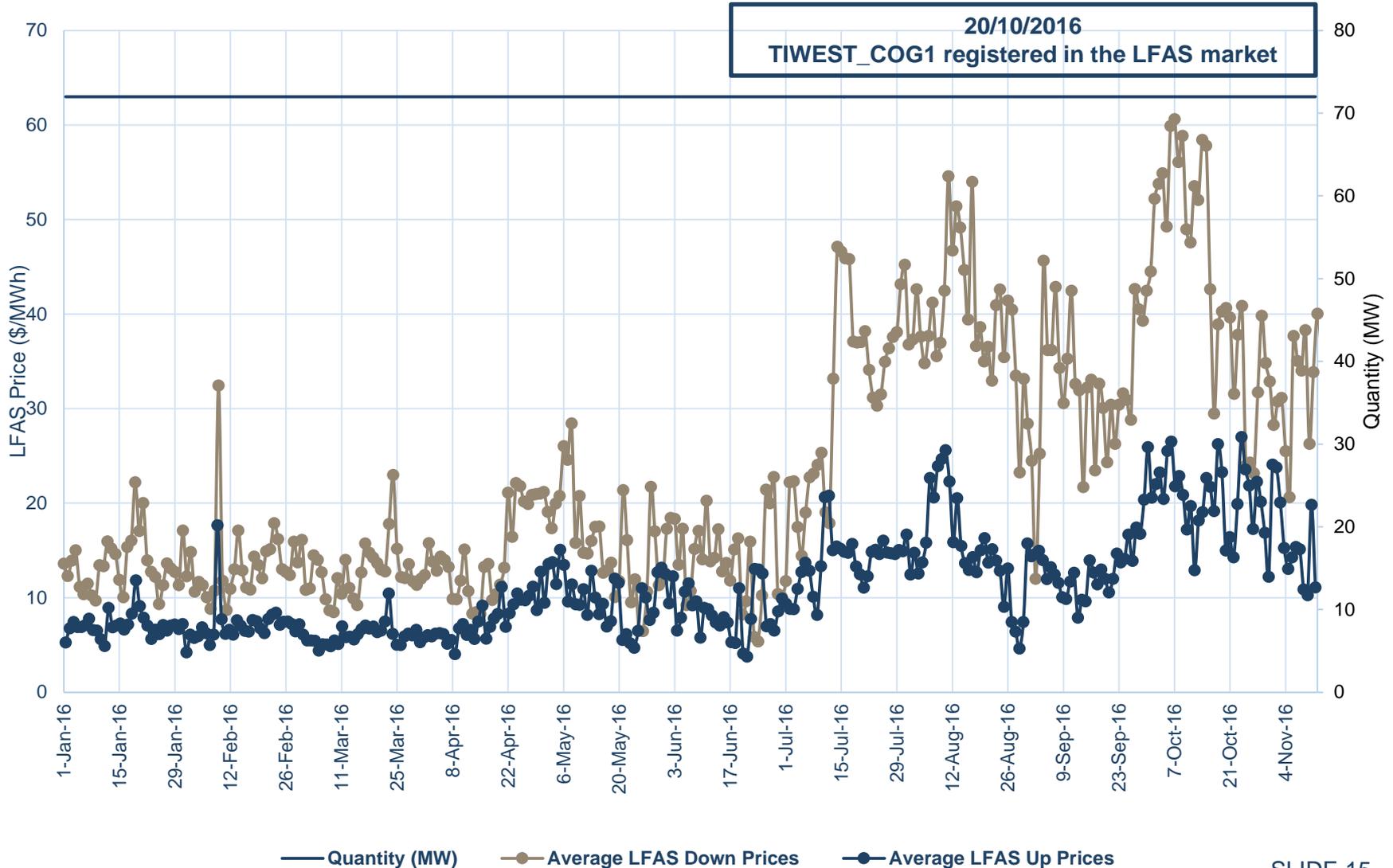
WEM ENERGY MARKET OBSERVATIONS



WEM - 2016 DAILY WEIGHTED AVERAGE STEM PRICE



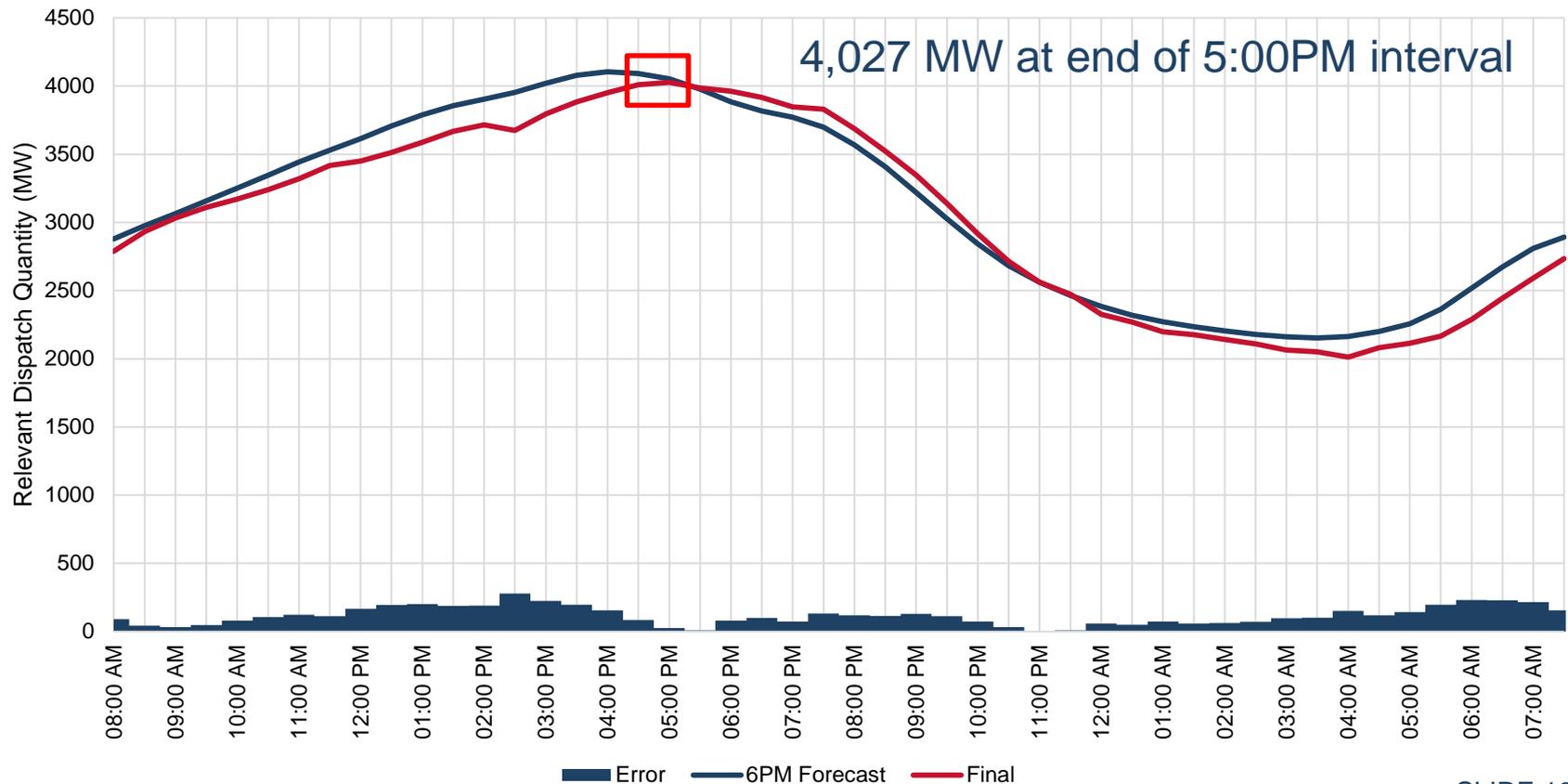
WEM - 2016 DAILY AVERAGE LFAS PRICES



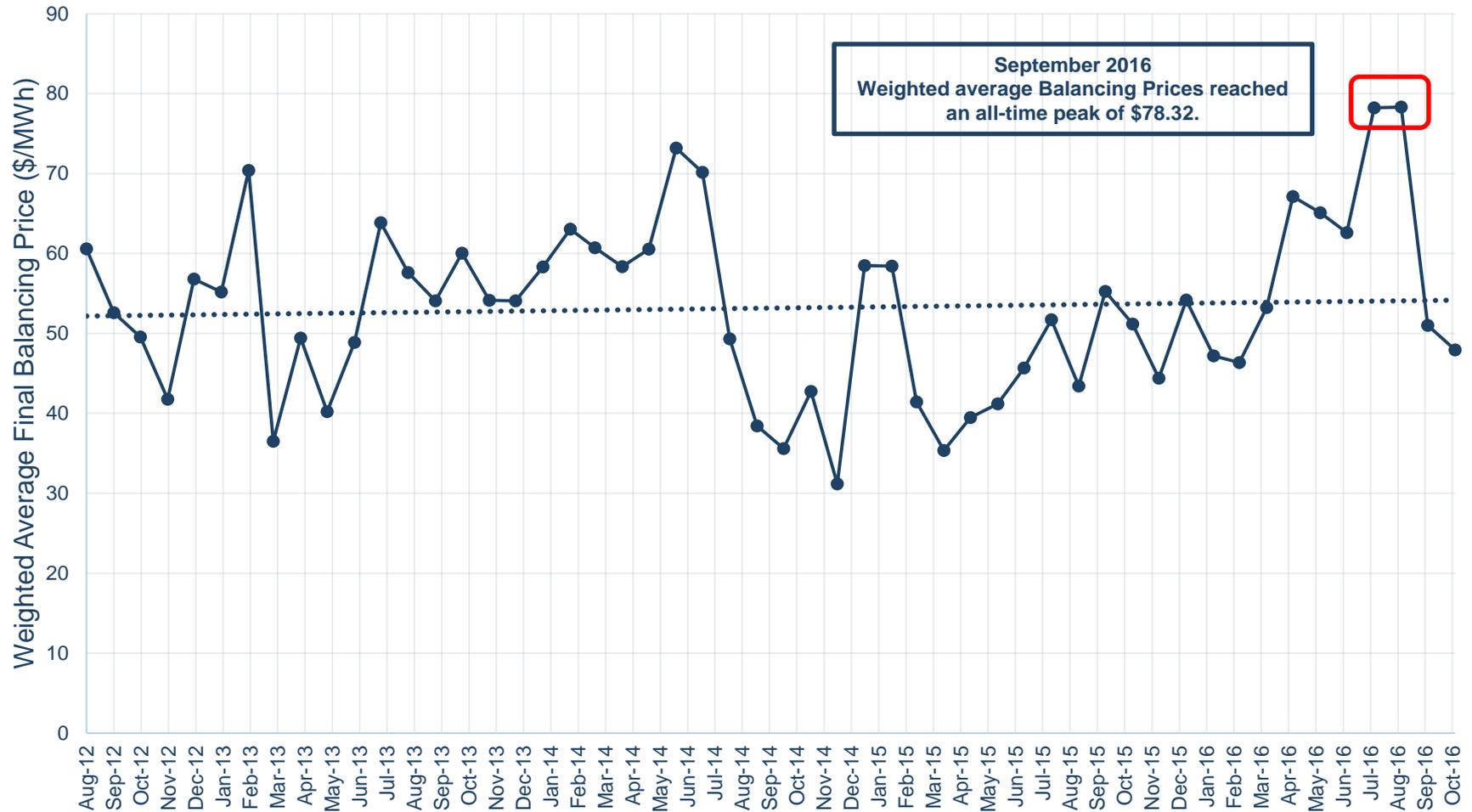
WEM - SYSTEM PEAK 8 FEBRUARY 2016



Saturday 06/02/2016	Sunday 07/02/2016	Monday 08/02/2016	Tuesday 09/02/2016	Wednesday 10/02/2016
34.3	40.4	42.5	41.2	37.6



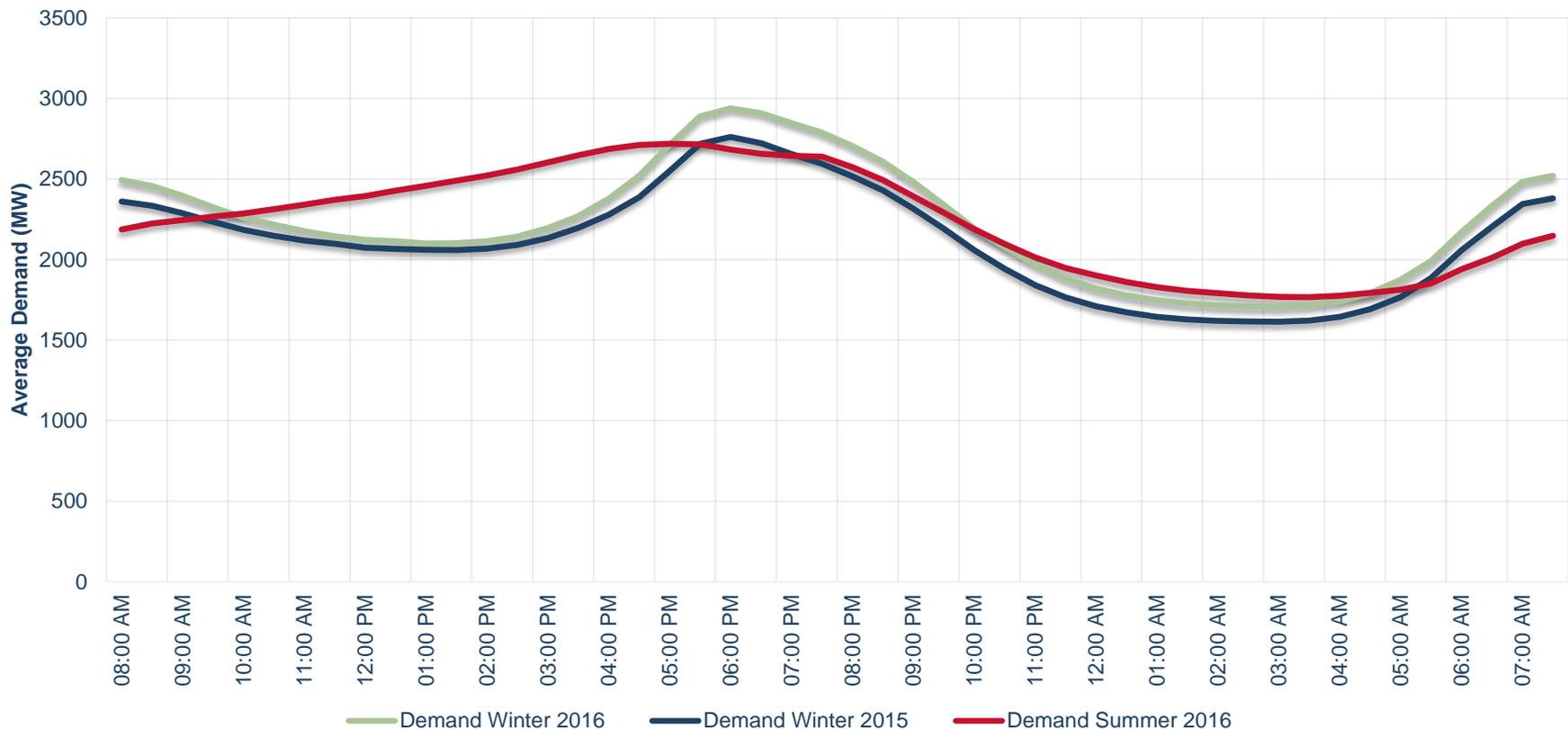
WEM - MONTHLY WEIGHTED AVERAGE BALANCING PRICE



WEM - FACTORS CONTRIBUTING TO HIGH BALANCING PRICES - DEMAND



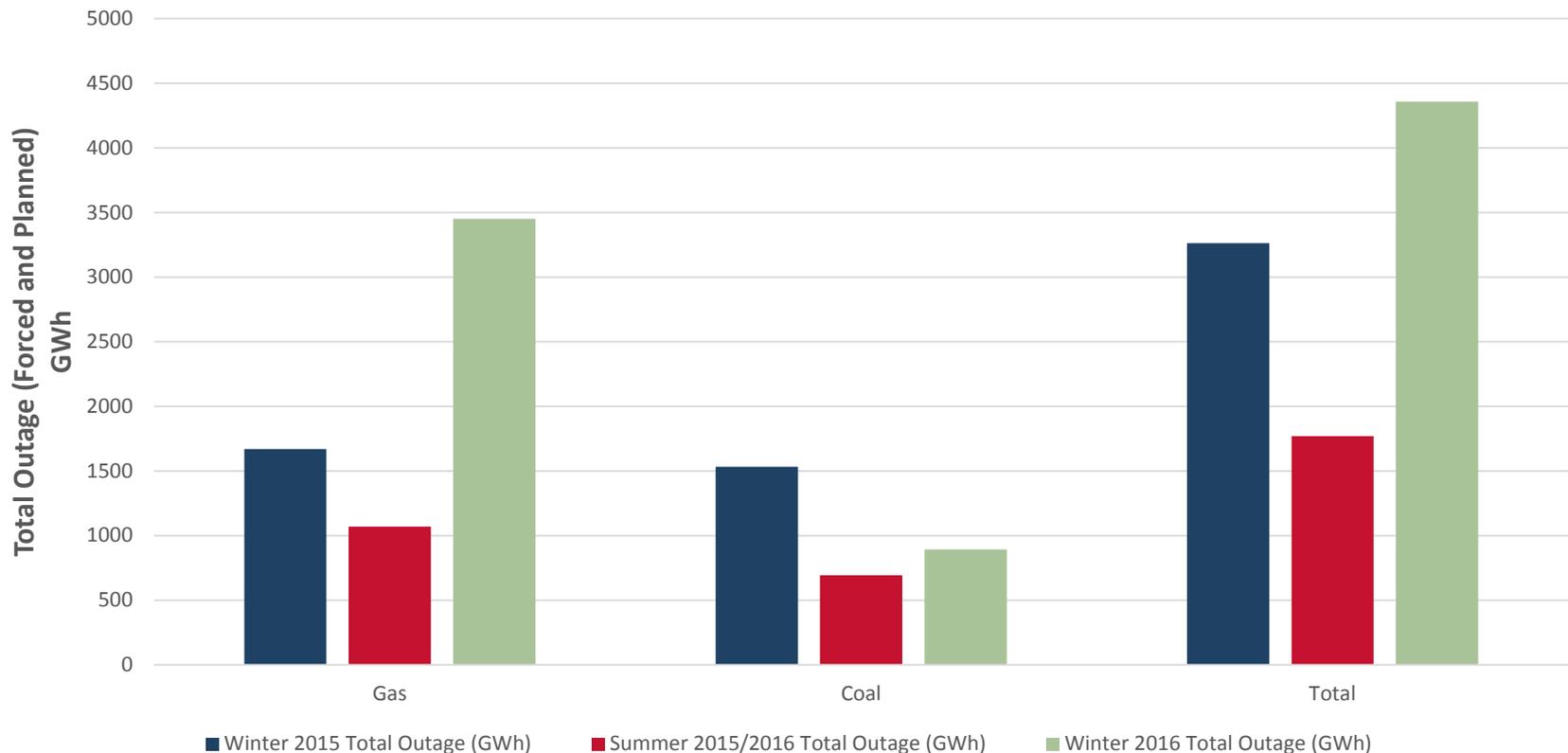
- Demand was 5% higher in winter 2016 than all winter periods since 2012 mainly driven by increased non-contestable load consumption.
- Winter 2016 presented with lowest average temperatures since 2012.



WEM - FACTORS CONTRIBUTING TO HIGH BALANCING PRICES - OUTAGES



- Coal facility outages in winter 2016 were **lower** compared to winter 2015
- Gas facility outages in winter 2016 were **significantly higher** compared to winter 2015.
- Overall there was a significant increase in outages in winter 2016.



GBB (WA) OBSERVATIONS

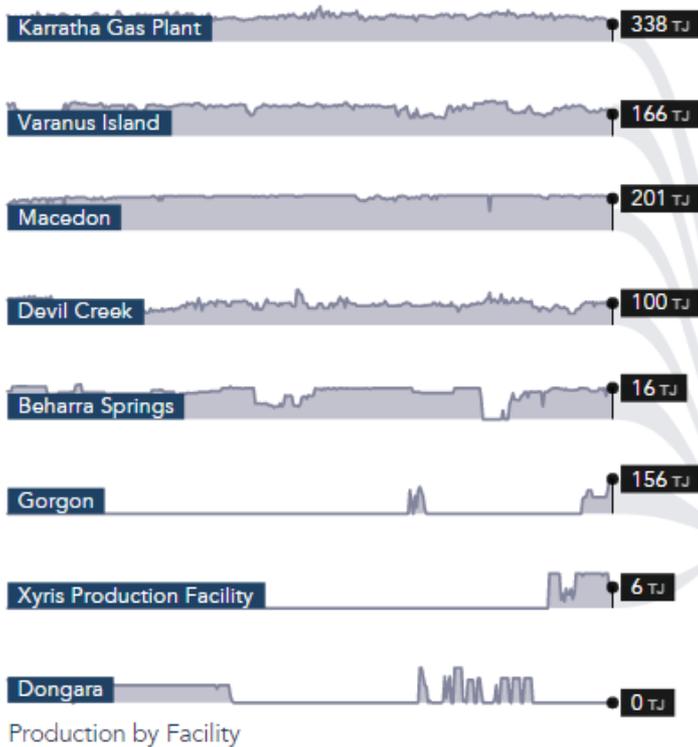


GBB – 2016 REGISTRATIONS

- New Registered Shippers
 - Matilda Operations Pty Ltd
 - Billabong Gold Pty Ltd
 - GSM Mining Company Pty Ltd
 - AWE Perth Pty Ltd
- North West Shelf Lifting Coordinator Pty Ltd registered as the Facility Operator of Karratha Gas Plant
- AWE Perth registered the 10TJ/day Xyris Production Facility
- Chevron Australia Pty Ltd
 - Gorgon registered as a Production Facility and started domestic production in 2016
 - Wheatstone registered as a Large User Facility for the purposes of commissioning.



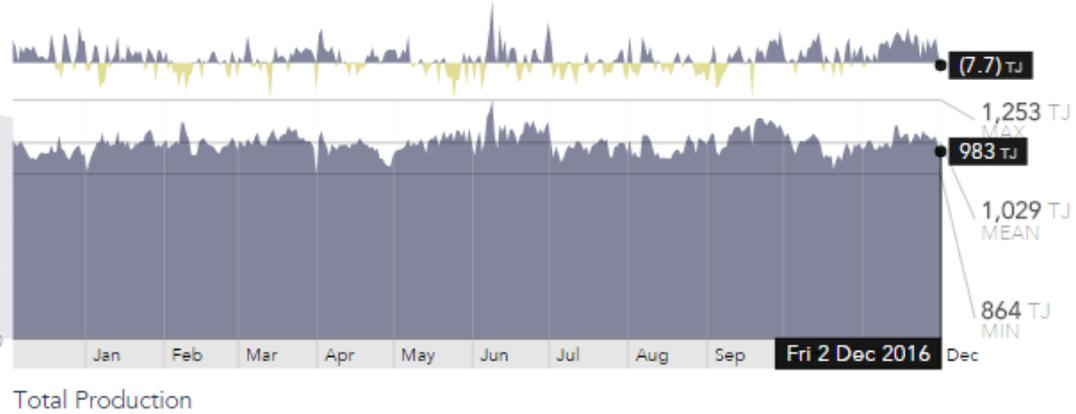
GBB – PRODUCTION



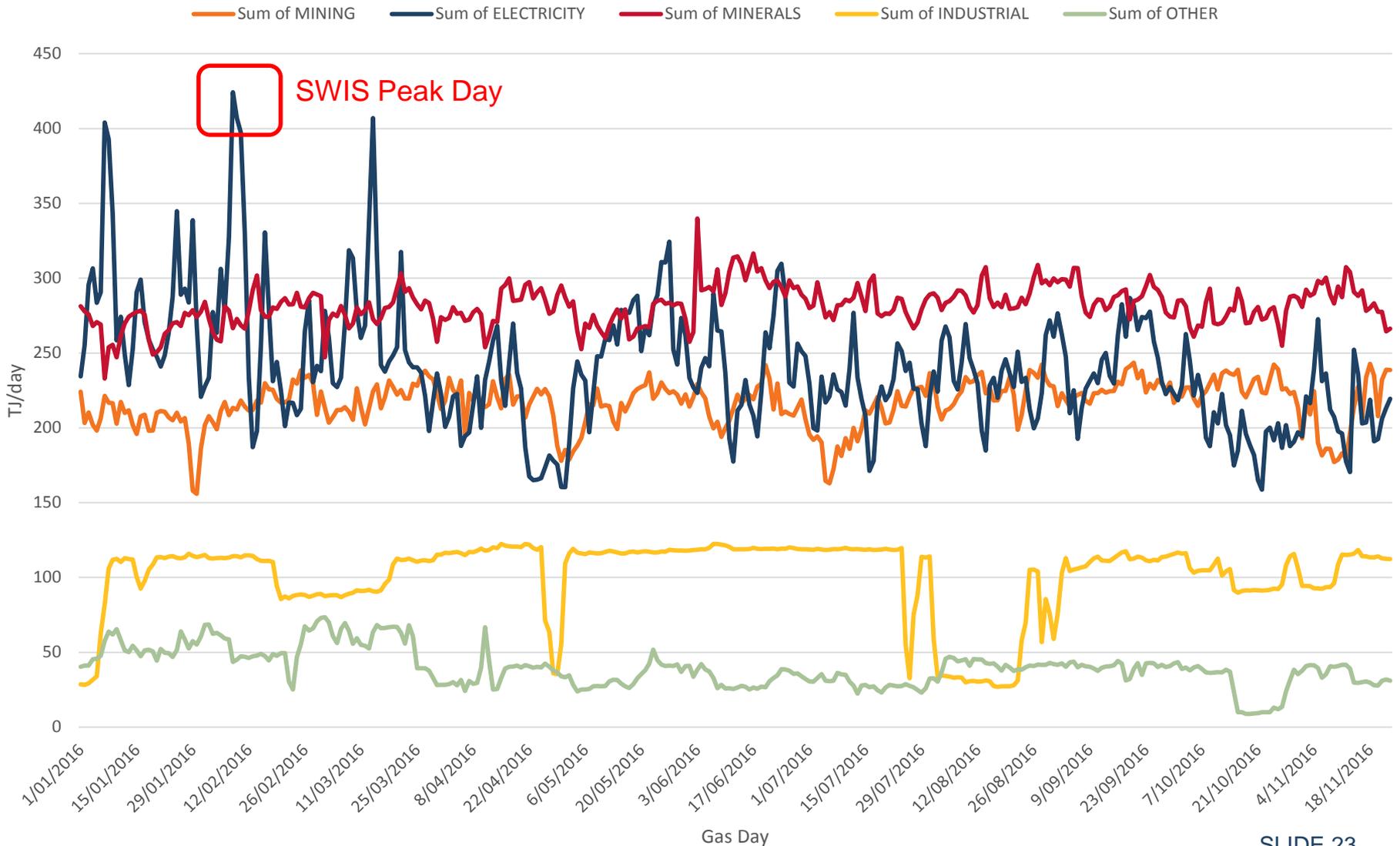
Gas Production by Facility

LAST 12 MONTHS

Net Production vs. Consumption



GBB – CONSUMPTION BY CATEGORY



OVERVIEW OF WEM PRUDENTIAL REQUIREMENTS



PRUDENTIAL REQUIREMENTS - RATIONALE

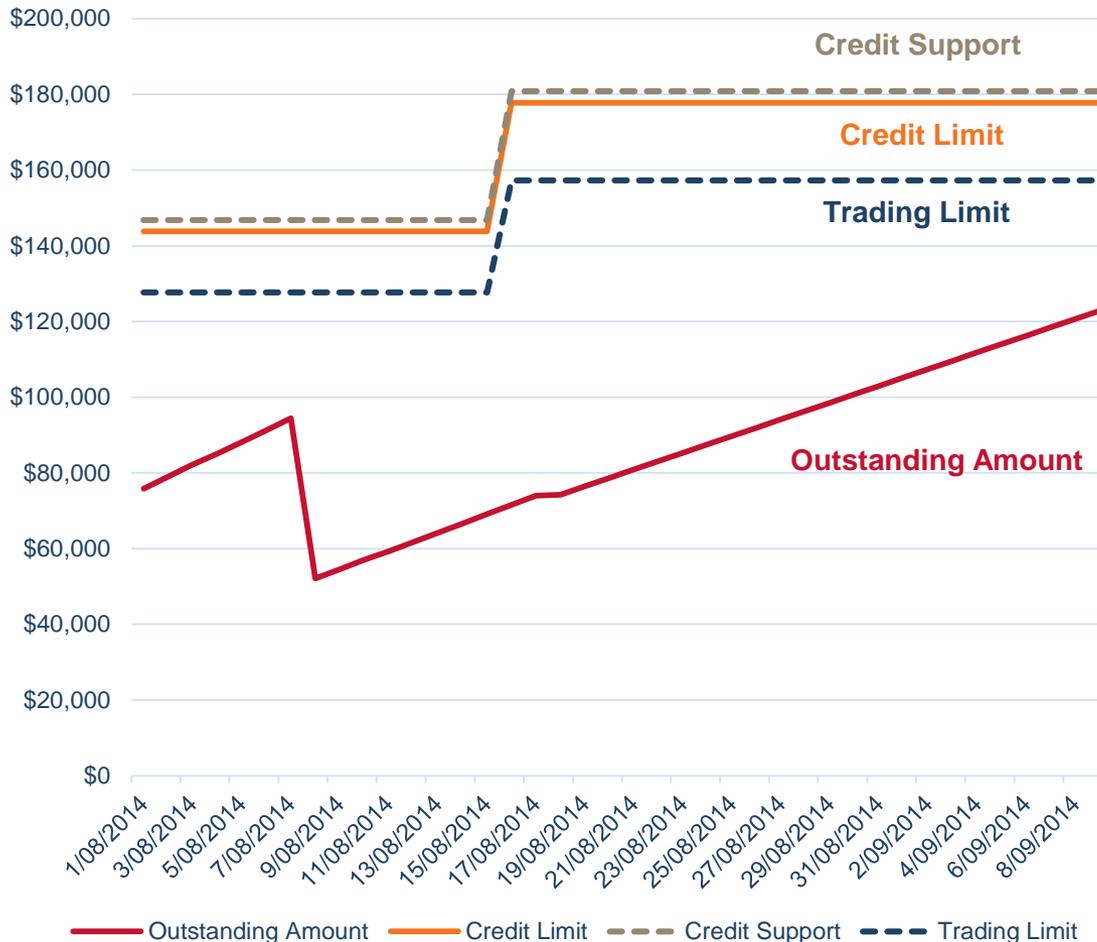


- Prudential security is an essential risk management mechanism to protect all Market Participants operating in the WEM in the event of a default event.
- AEMO reviews the Credit Limit of **all** Market Participants at least twice per year.
- Market Participants must ensure that AEMO holds the Credit Support no less than the most recently determined Credit Limit
- Any failure to provide Credit Support when requested by AEMO is a Suspension Event and will likely result in suspension from the WEM.

PRUDENTIAL REQUIREMENTS - DEFINITIONS



Prudential Monitoring



Credit Support [WEM Rule 2.38]

A Bank Guarantee or cash Security Deposit, in the form specified by AEMO, to the level of the most recently determined Credit Limit.

Credit Limit [WEM Rule 2.37]

AEMO's calculation of the maximum net amount owed by a Market Participant over a 24 month period determined by:

- 70 day maximum NSTEM exposure; plus
- 15 day maximum STEM exposure

Trading Limit [WEM Rule 2.39]

The amount of Credit support held by AEMO multiplied by 0.87.

Outstanding Amount [WEM Rule 2.40]

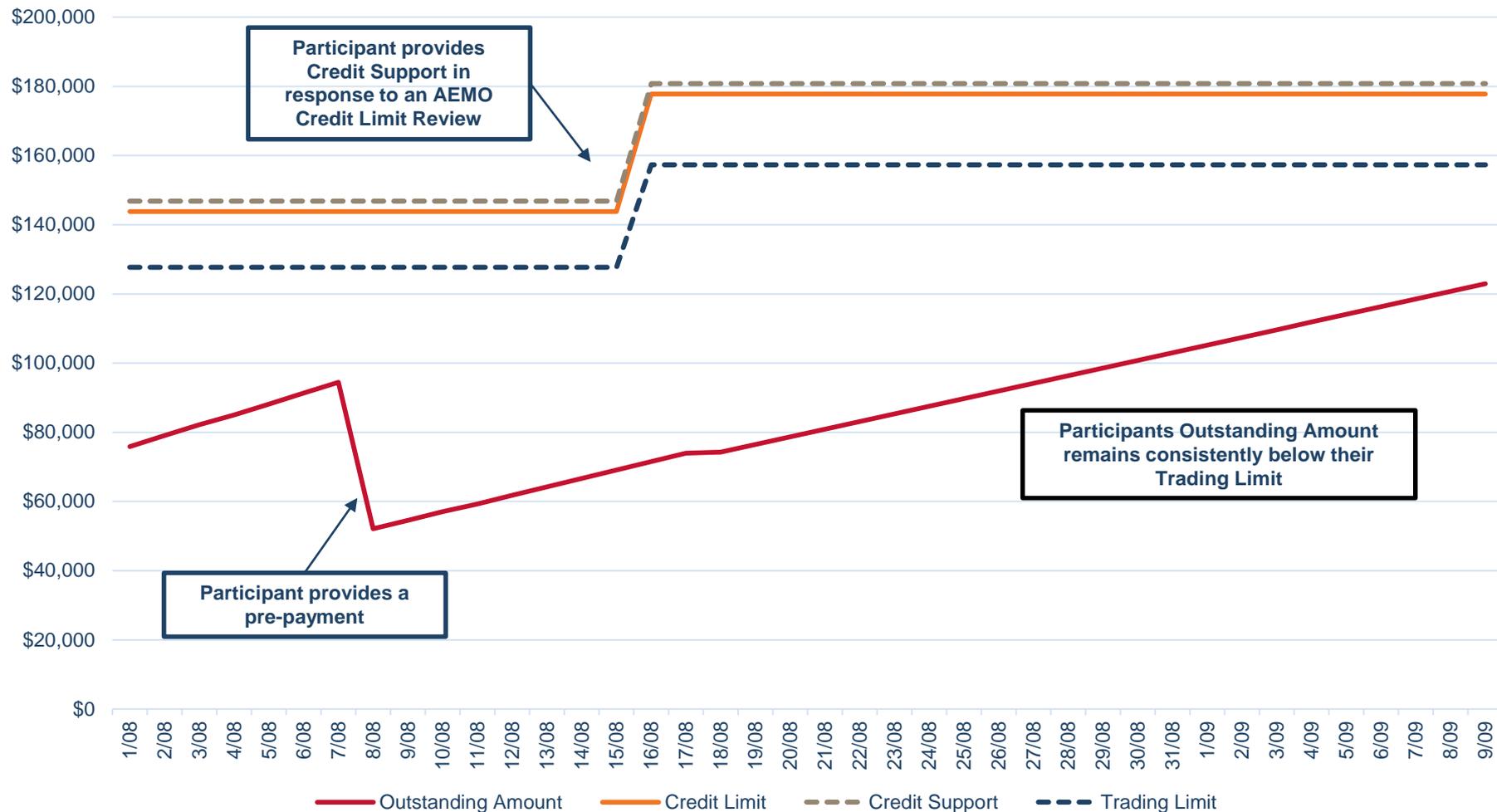
AEMO's estimate of the amount owed by a Market Participant at any time. This is calculated as:

- Estimated NSTEM exposure* **plus**
- Estimated STEM exposure* **plus**
- Invoice amounts not-paid; **minus**
- Any pre-payments provided.

PRUDENTIAL REQUIREMENTS - SCENARIO



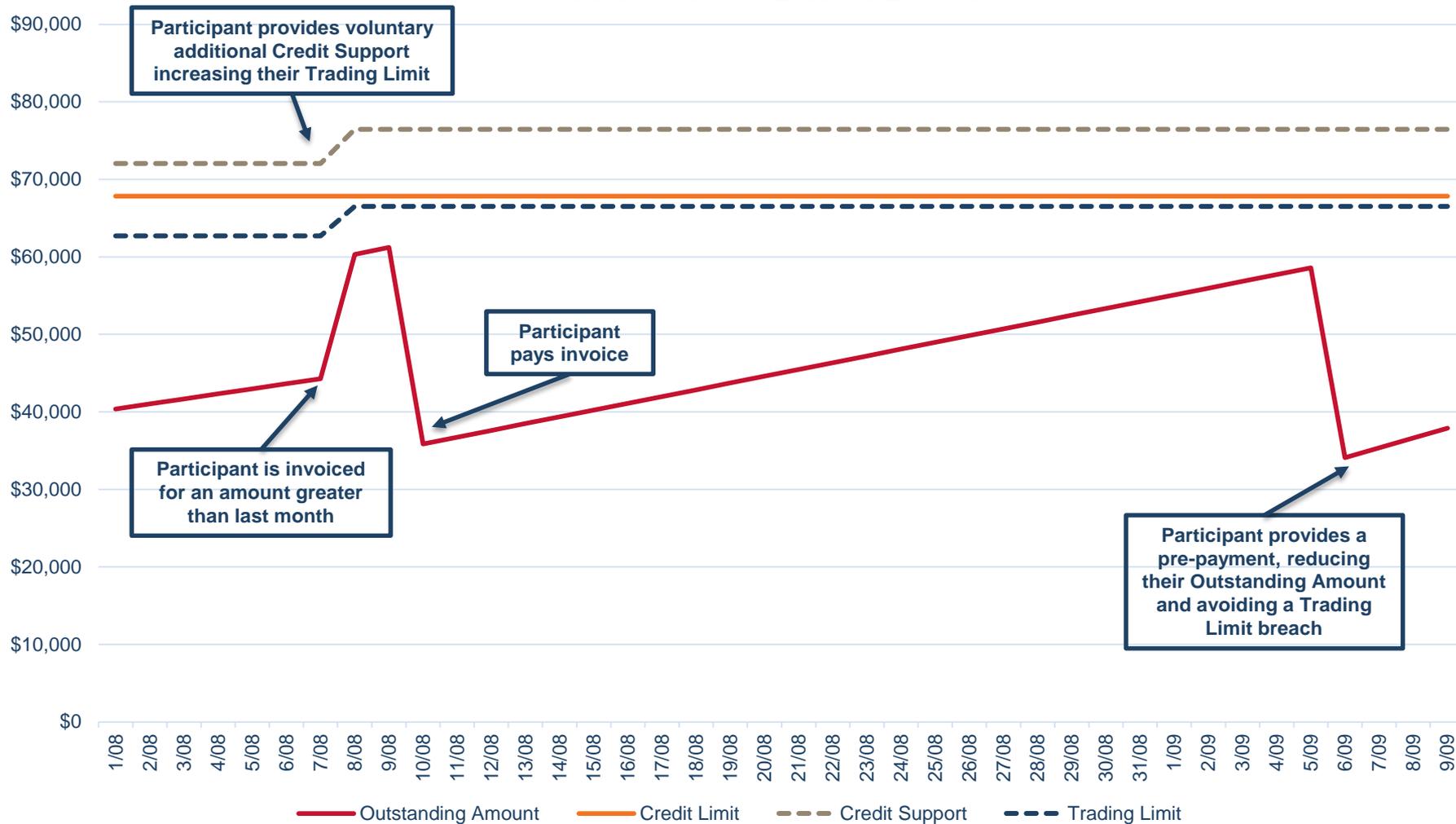
Prudential Scenario 1 - No Breach



PRUDENTIAL REQUIREMENTS - SCENARIO



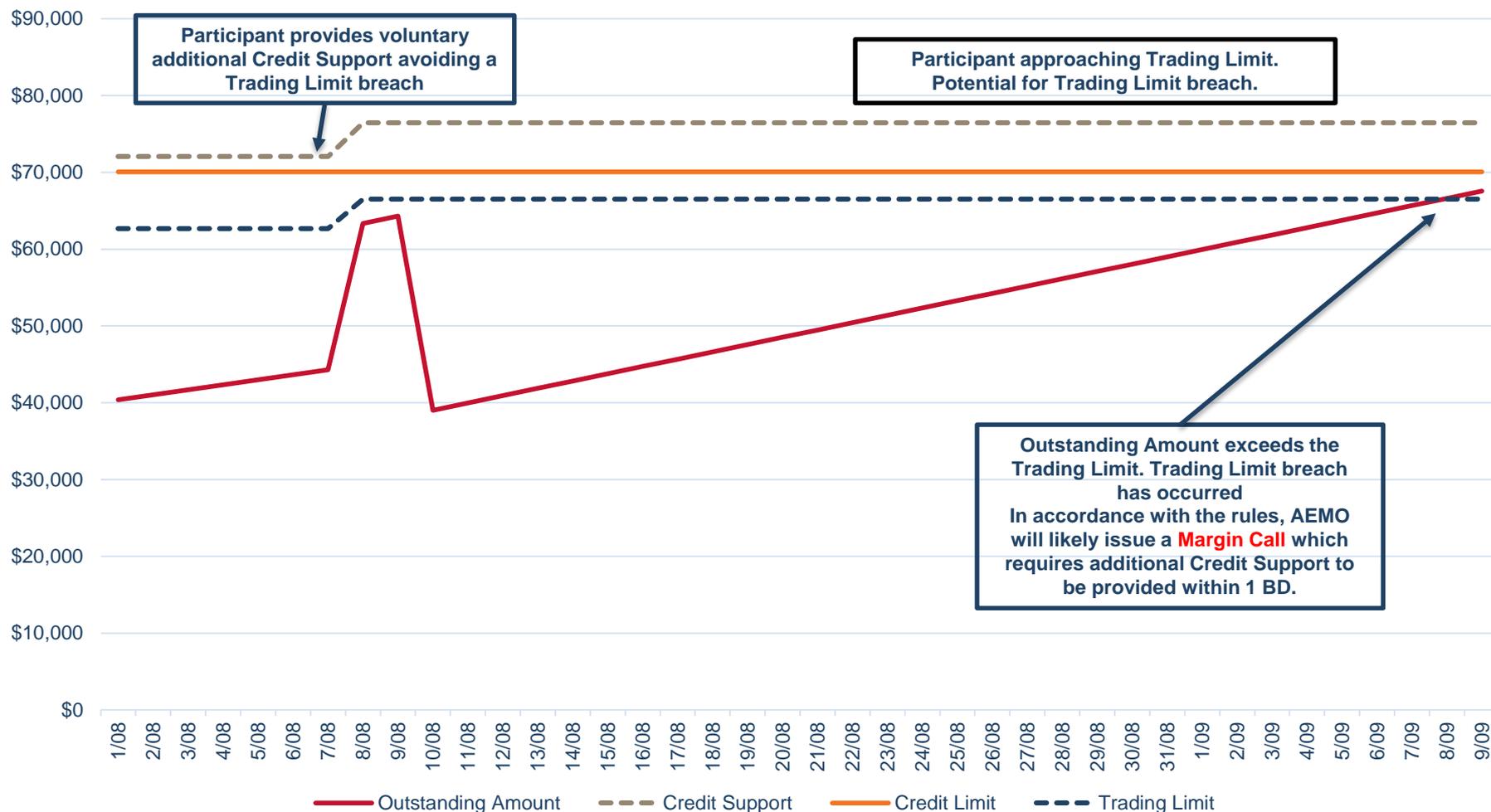
Prudential Scenario 2- Near Breach



PRUDENTIAL REQUIREMENTS - SCENARIO



Prudential Scenario 3 - Trading Limit Breach



OVERVIEW OF 2016/17 IRCR



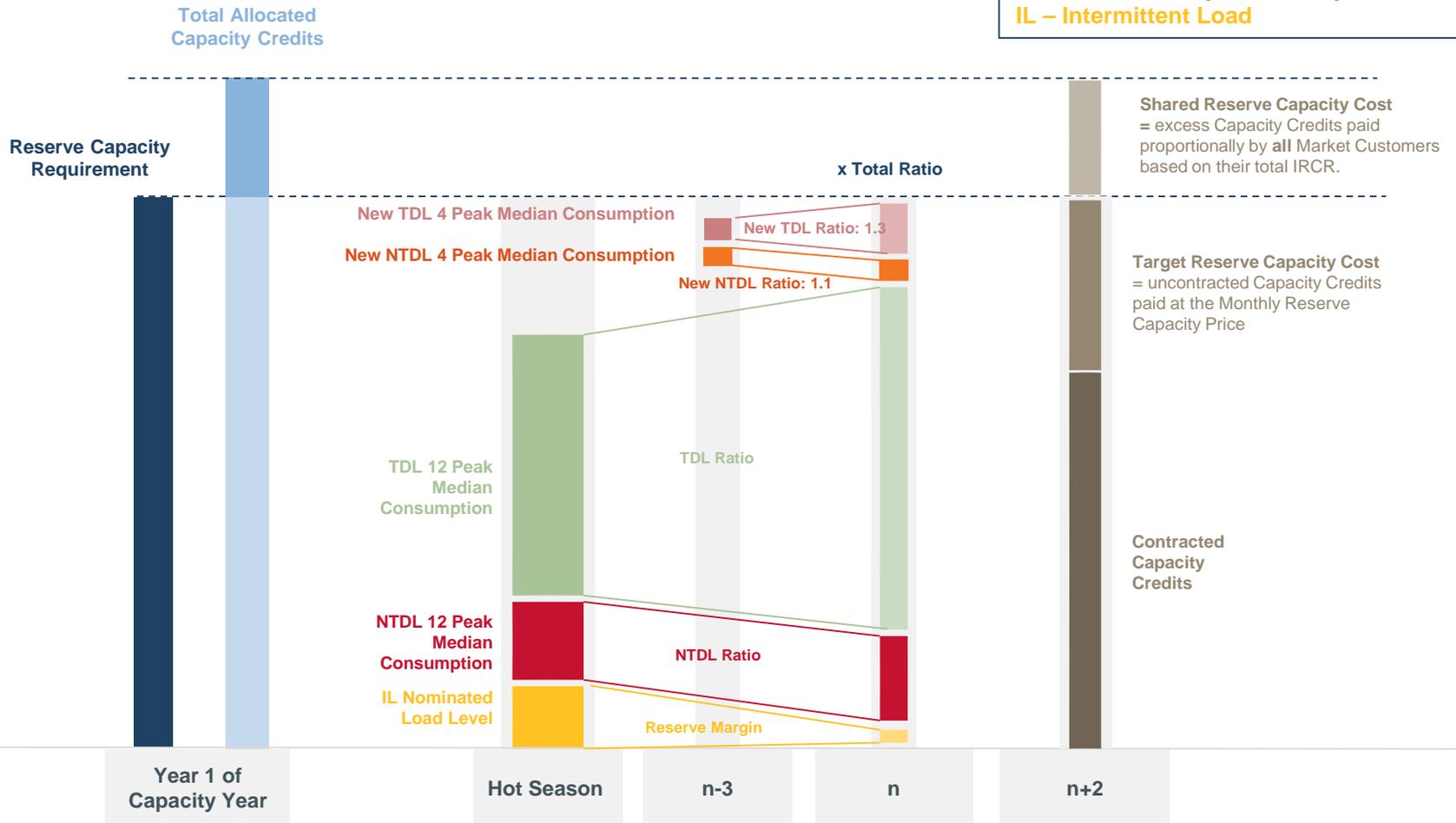
INDIVIDUAL RESERVE CAPACITY REQUIREMENTS (IRCR)



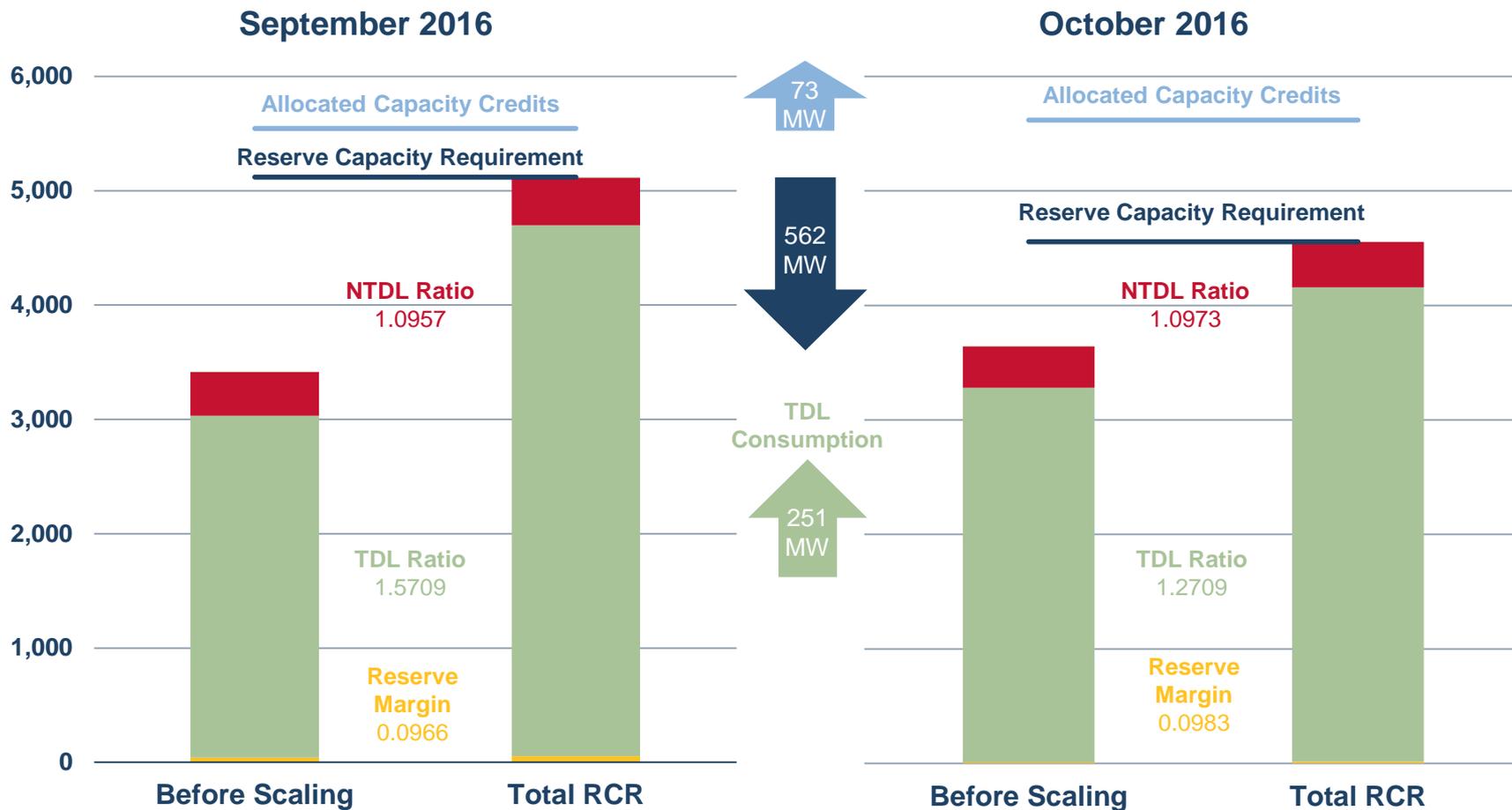
- To fund **Capacity Credits**, AEMO allocates an IRCR to every Market Customer.
- The IRCR is a MW quantity and represents the aggregated contribution of a Market Customer's Loads to total system load during the previous Hot Season (1 December to 31 March).
- The IRCR is relative to the median consumption value for each metered Load during the 12 peak SWIS trading intervals.
- IRCR is initially set for a **Capacity Year**, then adjusted monthly to account for **new meters, meter terminations** and **customer churn**.
- The total IRCR is scaled monthly to ensure it equals the Reserve Capacity Requirement.'
- Different "types" of load are treated differently.

IRCR – MECHANISM

Types of Load
 TDL – Temperature Dependent Load
 NTDL – Non-Temperature Dependent Load
 IL – Intermittent Load



IRCR – OCTOBER 2016



- Overall, less scaling is required
- Redistribution of Capacity Charges between the TRCC and SRCC

SYSTEM CAPACITY YEAR IN REVIEW

ELECTRICITY AND GAS MAJOR REPORTS

RESERVE CAPACITY OPERATIONAL ACCOMPLISHMENTS

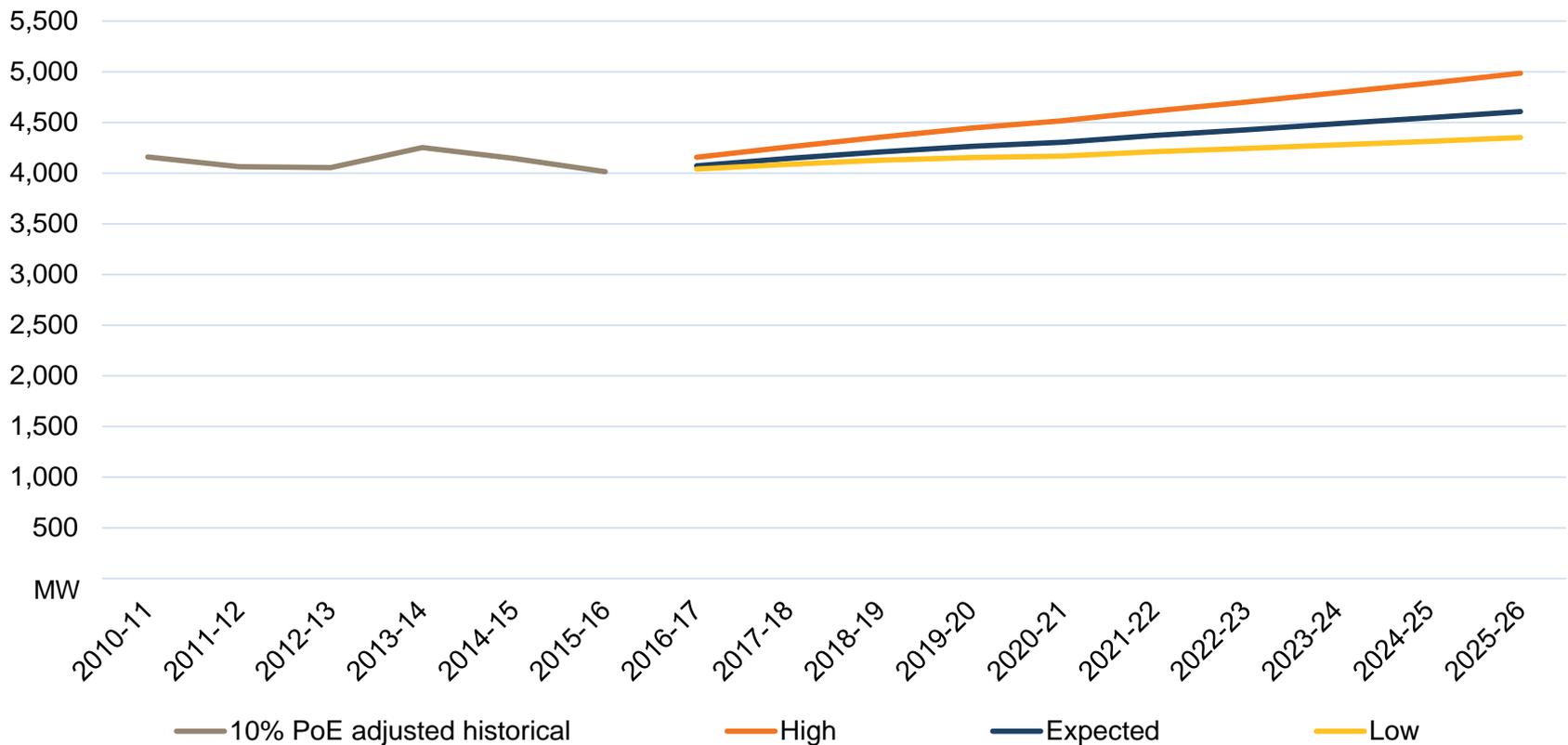
Neetika Kapani
Team Leader, System Capacity

MAJOR REPORTS

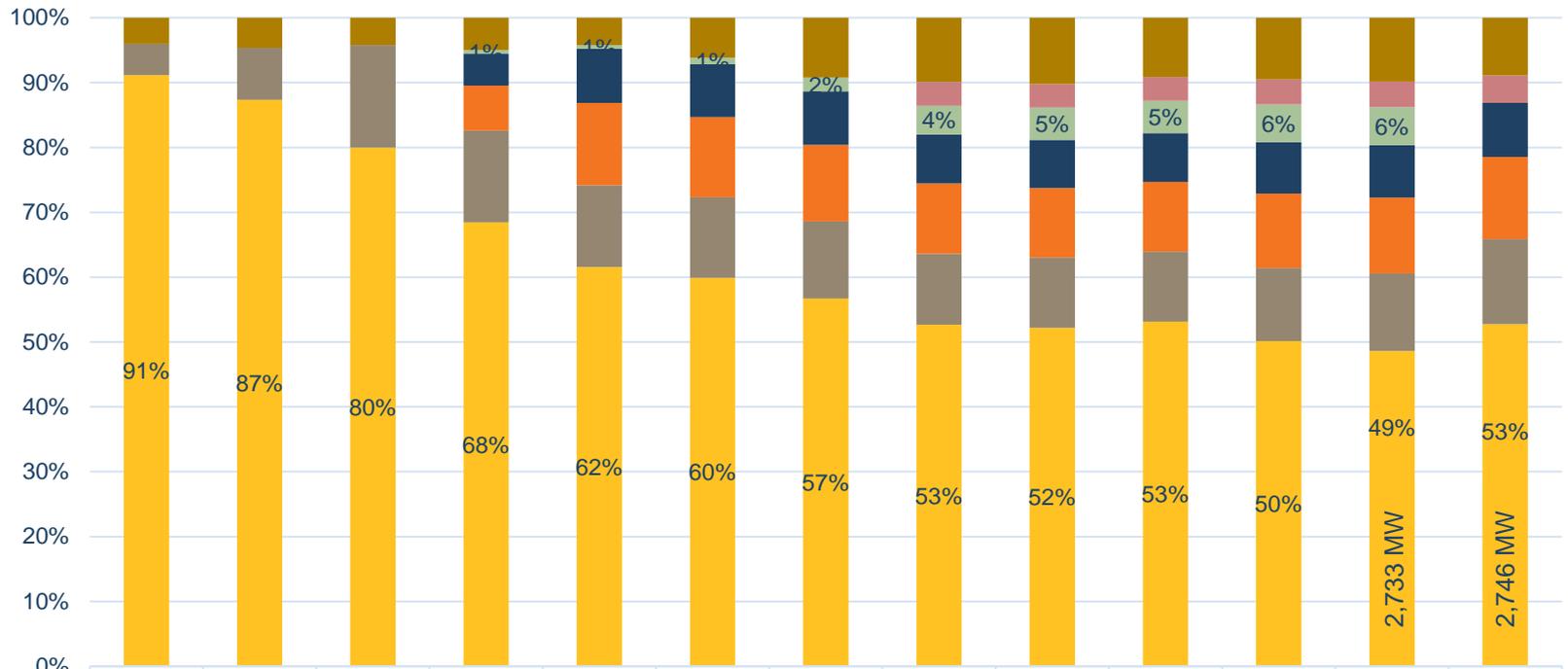


- 2015 WA ES00 was published on 16 June 2016
 - RCT of 4,552 MW set for the 2017-18 Capacity Year
- Implemented changes resulting from WEM Rule changes
 - Availability Classes
 - Publication of DSM pricing information
- Improved solar PV and battery storage forecasts by integrating models with those used for the National Electricity Forecasting Report

Peak demand is forecast to grow at around 1.4% a year for the next 10 years.



CAPACITY CREDITS BY MARKET PARTICIPANT



	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18
Other	4%	5%	4%	5%	4%	6%	9%	10%	10%	9%	9%	10%	9%
Vinalco Energy	0%	0%	0%	0%	0%	0%	0%	4%	4%	4%	4%	4%	4%
EnerNOC	0%	0%	0%	1%	1%	1%	2%	4%	5%	5%	6%	6%	0%
Griffin Power	0%	0%	0%	5%	8%	8%	8%	8%	7%	7%	8%	8%	8%
NewGen	0%	0%	0%	7%	13%	12%	12%	11%	11%	11%	11%	12%	13%
Alinta Energy	5%	8%	16%	14%	13%	12%	12%	11%	11%	11%	11%	12%	13%
Synergy (Verve)	91%	87%	80%	68%	62%	60%	57%	53%	52%	53%	50%	49%	53%

■ Synergy (Verve)
 ■ Alinta Energy
 ■ NewGen
 ■ Griffin Power
 ■ EnerNOC
 ■ Vinalco Energy
 ■ Other

- 2016 WA GSOO to be published on 8 December 2016

The domestic gas market is expected to remain well supplied over the outlook period 2016-2025.

BUT

. . . only if gas reserves continue to be developed to replace depleted gas fields.

AEMO has included a “Remaining reserves linked to production facilities” scenario to show what might happen if no reserves are developed for the market.

Improvements to the GSOO include:

- Increased transparency of forecasting methodology assumptions
- Greater focus on information relevant to WA gas stakeholder needs, where practical

- Previously referred to as Maximum Reserve Capacity Price
- AEMO proposed a draft value of \$145,800 per MW per year (8.8% lower than previous year)

	Impact (\$)	Impact (%)	BRCP (\$)
2016 BRCP			159,800
Escalation factors	-5,100	-3.2	154,700
Power station cost	1,500	0.9	156,200
Margin M	-2,400	-1.5	153,800
Fixed fuel cost	-200	-0.1	153,600
Land cost	-100	-0.1	153,500
Transmission cost	1,500	0.9	155,000
WACC	-7,400	-4.6	147,600
Fixed O&M	-1,800	-1.1	145,800
2017 BRCP	-14,000	-8.8	145,800

SYSTEM CAPACITY OPERATIONAL ACCOMPLISHMENTS



- Implemented improvements to the RC testing tool, including some relevant to DSP verification test tool.
- All scheduled generators completed observation tests during the winter testing period.
- **No Facilities** were called for RC testing between April and September 2016.

New portal in WEMS to allow Market Participants to submit CRC applications.

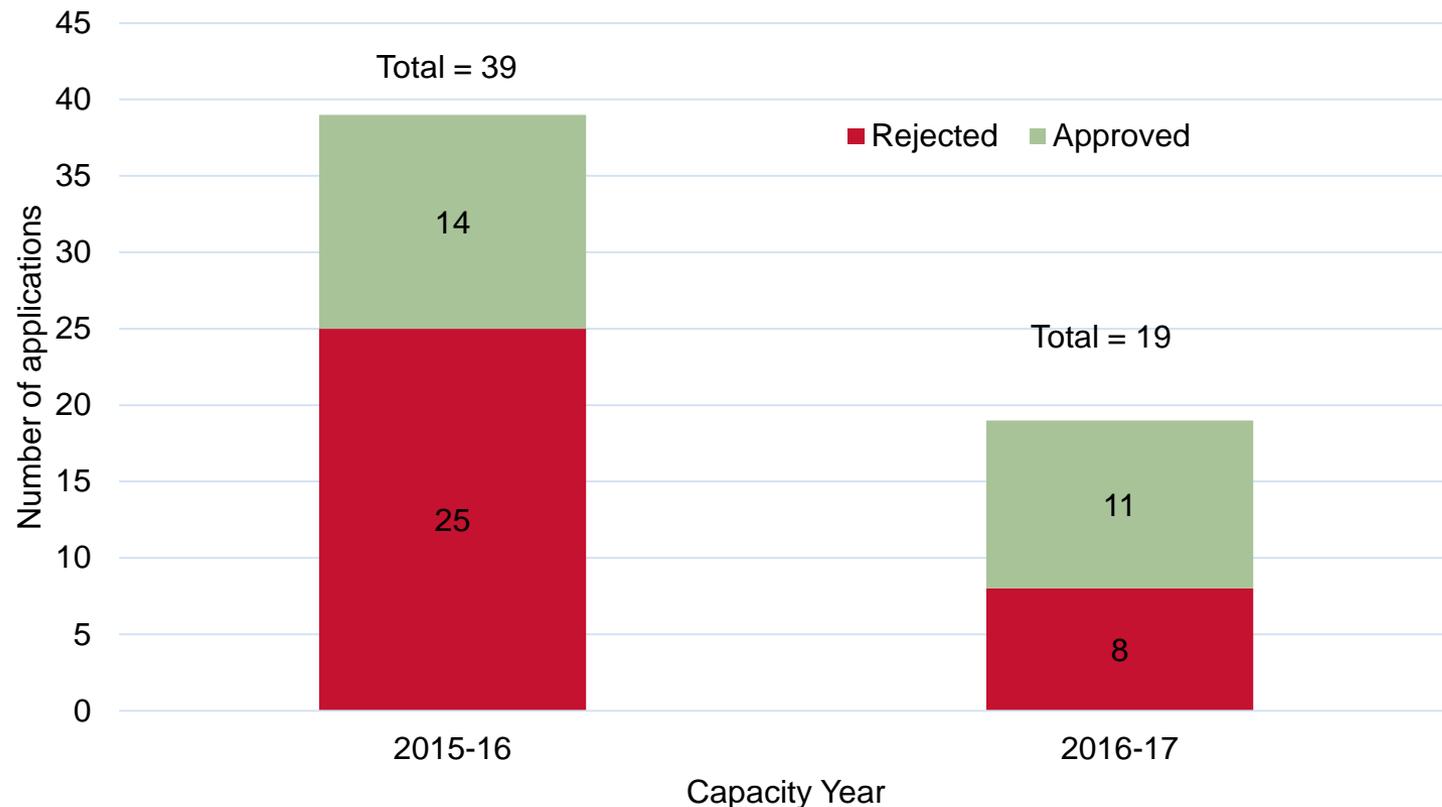
Streamlining the process has

- Allowed for all information related to the CRC application to be in one centralised location
- Removed the manual process of emailing applications.
- Improved auditability and increased clarity on the submission requirements

New tool being developed to automatically calculate EFLSG intervals and Relevant Level of facilities

- Entire process will be free from manual calculation → risk mitigation
- Tool to be independently certified for compliance
- Derived results are now auditable and predictable

Fewer applications this year, following consultation with DSP providers and publication of guideline.



Engagement managers have been regularly meeting with key stakeholders across both electricity and gas industries.

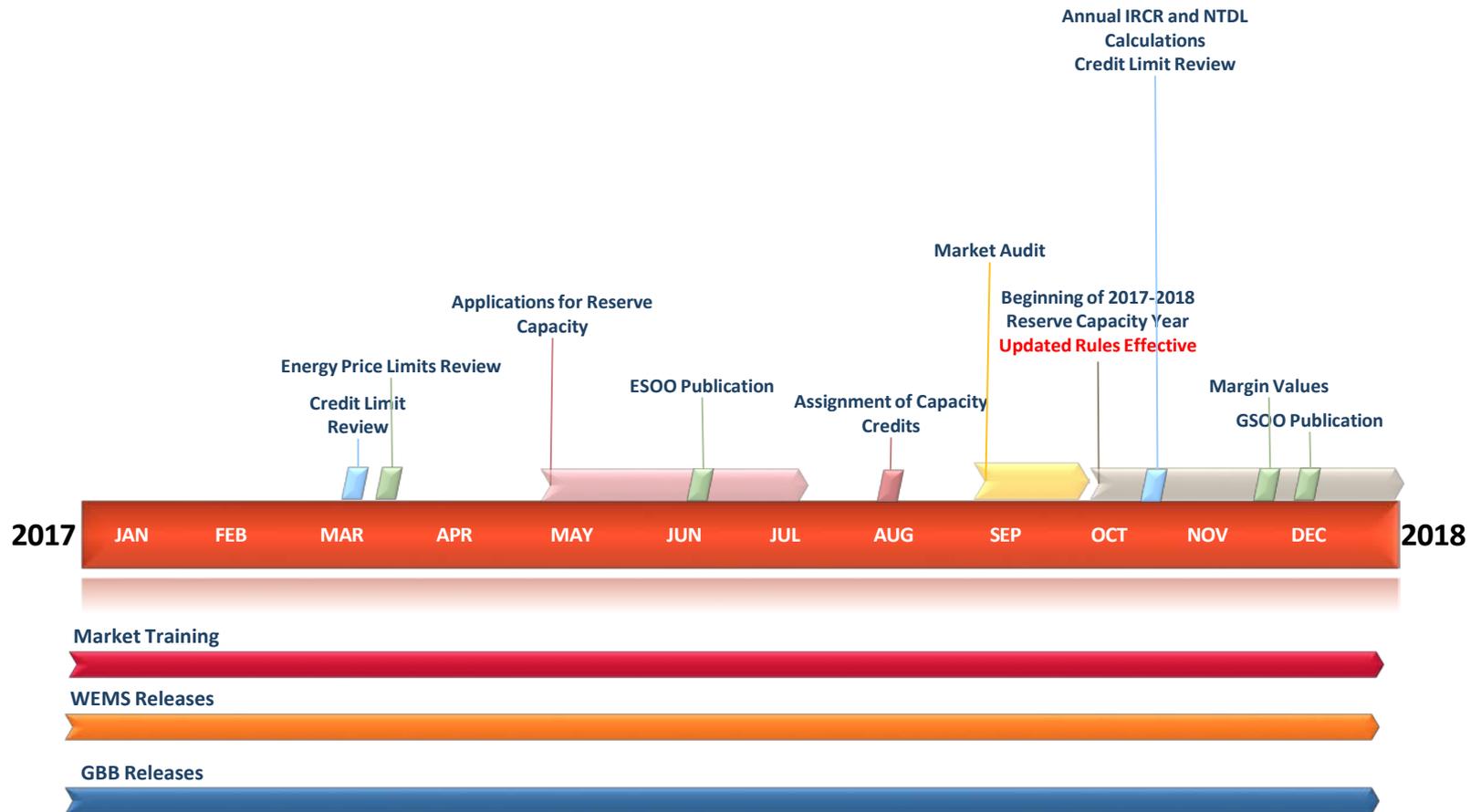
Proactive engagement via WA Electricity and Gas Consultative Forums on the 2016 WA ESOO, 2016 WA GSOO and the 2017 BRCP report

CONCLUDING REMARKS

2017 – THE YEAR AHEAD
PARTICIPANT FEEDBACK

Martin Maticka
Group Manager, Operations and Technology

2017 TIMELINE



THANK YOU AND QUESTIONS



Merry Christmas