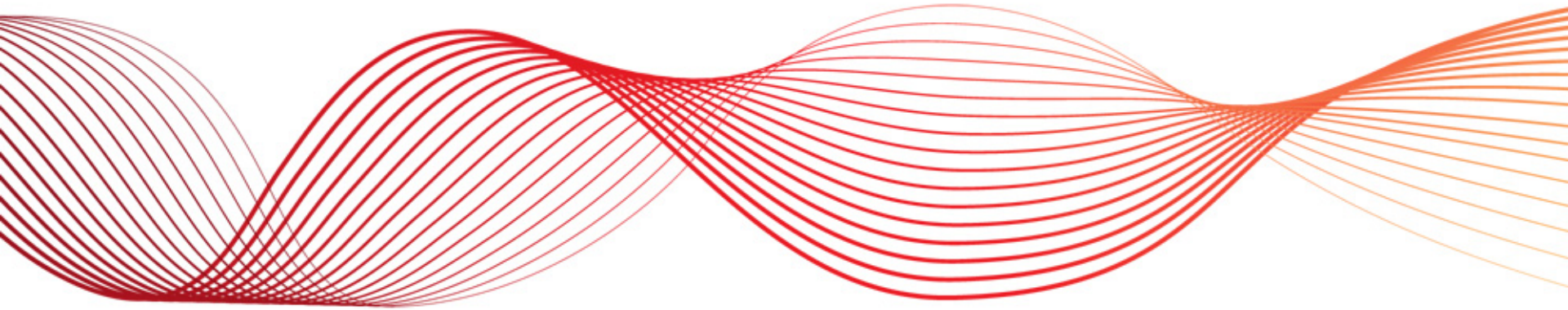
WA MARKET REFORM PROGRAM

SETTLEMENTS FORUM – MEETING 1

25 OCTOBER 2016

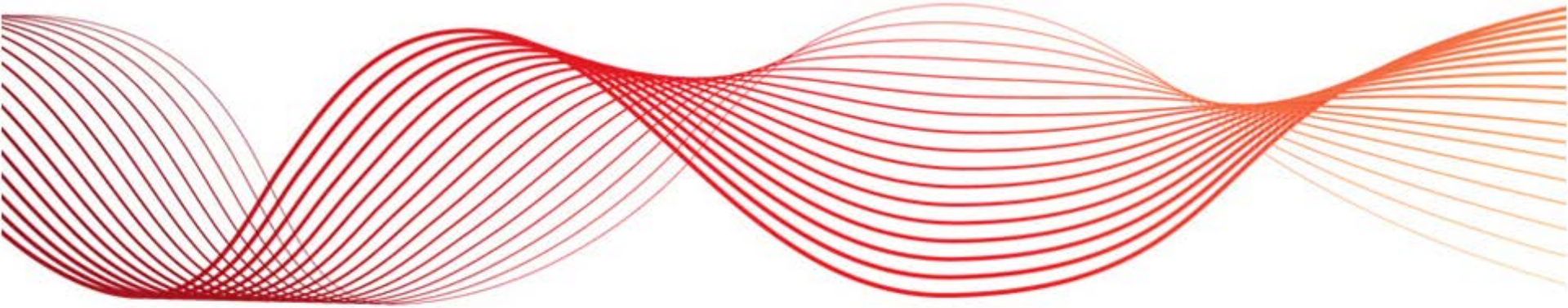


AEMO
AUSTRALIAN ENERGY MARKET OPERATOR

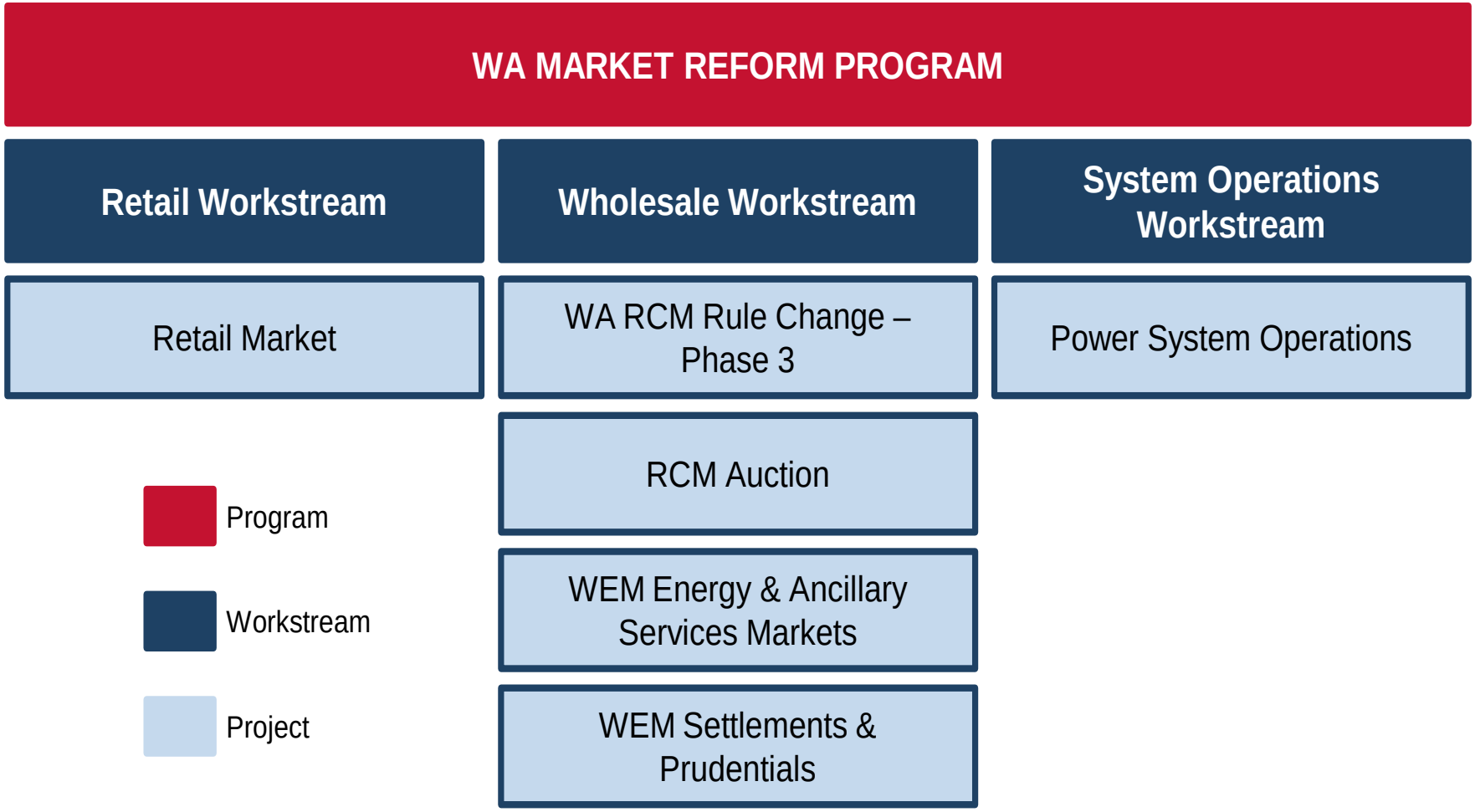
AGENDA

1. Welcome and confirm agenda
2. Wholesale workstream and participant engagement
3. Introduction to settlements
4. Market billing cycles
5. Break
6. Introduction to NEM prudentials
7. Prudential assessment and management
8. Forward plan for engagement
9. Settlement systems and interfaces
10. Next meeting and closing

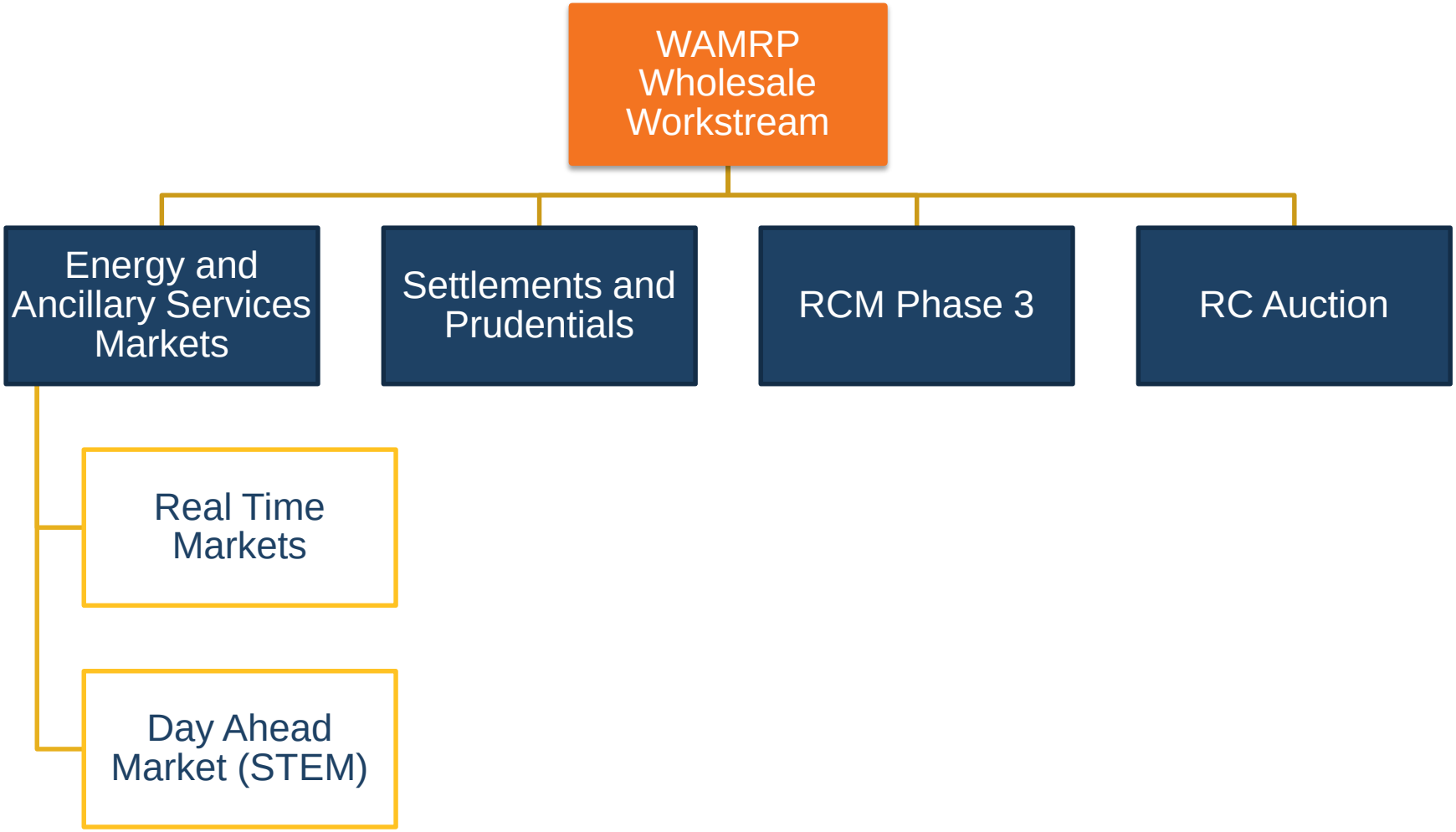
WHOLESALE WORKSTREAM AND PARTICIPANT ENGAGEMENT



WAMRP STRUCTURE



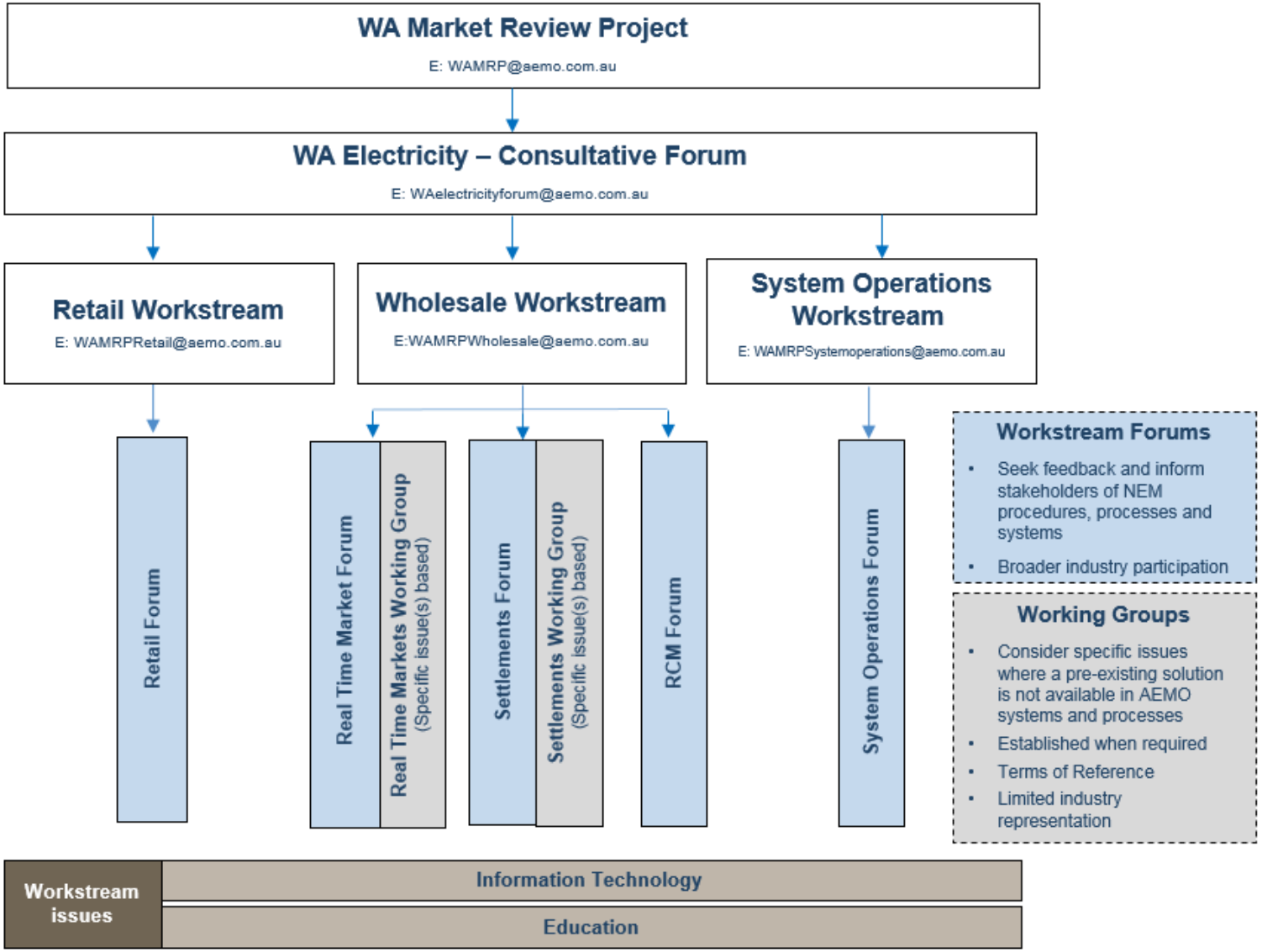
WHOLESALE WORKSTREAM OVERVIEW



WORKSTREAM OBJECTIVES

Project	Objective
Real time markets	Introduce energy and ancillary services real time markets with 5 minute dispatch and pricing subject network security constraints
Day ahead market	Implement system changes to allow STEM to be integrated with new real time markets
RCM Phase 3	Implement changes associated with transitional arrangements for RCM to become effective 1 October 2017
RC Auction	Establish an auction process for the procurement of reserve capacity
Settlement and Prudentials	Implement new settlement and prudential processes for WA markets which leverage NEM systems and processes

STAKEHOLDER ENGAGEMENT APPROACH



PURPOSE OF THE FORUM

- Provide introductory information to participants on AEMO's processes and systems used in the NEM
- Share AEMO's thoughts on approach and design, to assist participants in developing their work program
- Assist participants in providing input to the Energy Market Operations and Processes Consultation Group
- Meeting schedule:
  - 25 October
  - 23 November
  - 14 December
  - 2017: TBC, but targeting monthly until at least June

MORE INFORMATION

- Website: http://www.aemo.com.au/Stakeholder-Consultation/Industry-forums-and-working-groups/WA-Forums/WAMRP-Settlements-Forum
- Email: WAMRPWholesale@aemo.com.au
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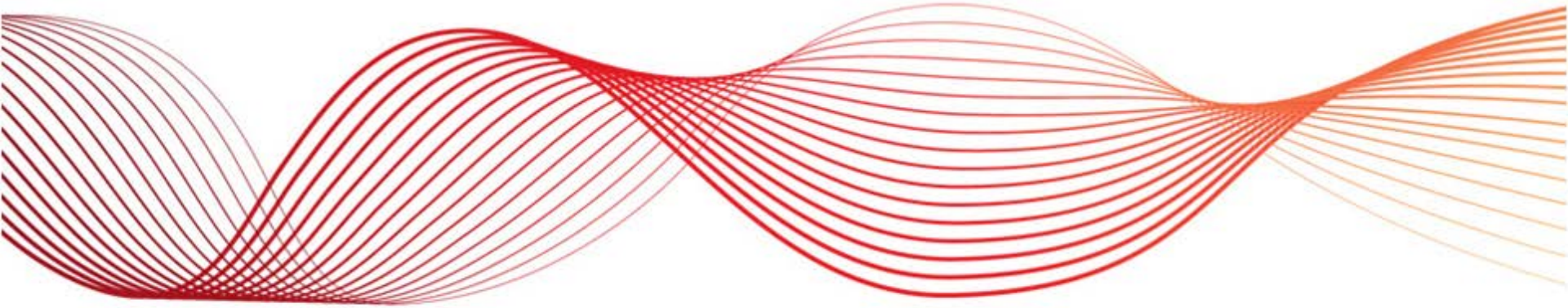
INTRODUCTION TO SETTLEMENTS



SESSION OBJECTIVES

1. WEM3 statement breakdown
2. Payment and Default
3. Dispute vs Disagreements
4. Supporting tools and documents
5. STEM, WEM3 and real-time ops billing timelines

KEY SETTLEMENTS ITEMS

- Energy transactions
- Ancillary service transactions
- Market fees
- TNSP Residue
- Reallocation transactions
- Reassignments
- Adjustments

NEM VS WEM3

NEM

Summary of NEM Transactions
for Week 38: 11 Sep 2016 - 17 Sep 2016

Description	$
Energy	0.00
Ancillary Services	0.00
Settlement Residue Auction	0.00
Market Fees	0.00
TNSP Residue	0.00
Smelter-Reduction	0.00
Security Deposits	0.00
Reallocation	0.00
Revision Adjustment	0.00
Revision Interest	0.00
Early Payment Interest	0.00
Other	0.00
GST	0.00
Reassignment	0.00
Total	**0.00**

WEM3

Summary of WEM3 Transactions for
WEM3 for week 38: 11 Sep 2016 - 17 Sep 2016
STEM for week 41: 02 Oct 2016 - 08 Oct 2016

Description	$
Energy	0.00
Ancillary Services	0.00
~~Settlement Residue Auction~~	~~0.00~~
Market Fees	0.00
TNSP Residue	0.00
~~Smelter-Reduction~~	~~0.00~~
Security Deposits	0.00
Reallocation	0.00
Revision Adjustment	0.00
Revision Interest	0.00
Early Payment Interest	0.00
Other	0.00
GST	0.00
Reassignment	0.00
RCM	0.00
STEM	0.00
Constrained-on	0.00
Total	**0.00**

ENERGY

NEM

- Energy values are based on Connection point or virtual transmission node figures

$$TA = \text{Aggregate of } (AGE \times RRP \times TLF)$$

where:
AGE: *Is the adjusted gross energy for a connection point or virtual transmission node.*
RRP: *Is the price for energy per MWh in the relevant region.*
TLF: *Is the Transmission Loss Factor of the relevant notional connection point.*

WEM3

$$TA = (\text{Aggregated of } (AGE \times TLF) - NCP) \times RRP$$

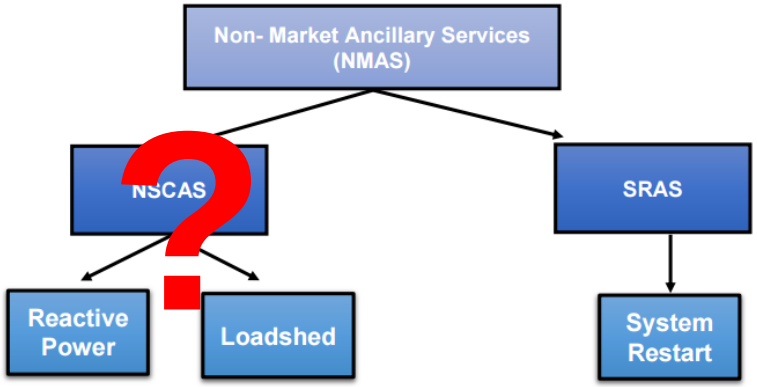
where:
AGE: *Is the adjusted gross energy for a connection point or virtual transmission node.*
RRP: *Is the price for energy per MWh in the relevant region.*
TLF: *Is the Transmission Loss Factor of the relevant notional connection point.*
***NCP**: Net Contract position*

ANCILLARY SERVICES (NON-MARKET)

System Restart Ancillary Services (SRAS)

- **Payment**:

Based on contractual agreements



- **SRAS recovery (Recovered 100% from Cust)**:

$$TA = TSRP \times \frac{TCE}{ATCE} \times -1$$

where:

TA (in $): *the trading amount to be determined (which is a negative number);*
TSRP (in $): *the total of all amounts payable by AEMO in respect of the trading interval under ancillary services agreements in respect of the provision of system restart;*
TCE (in MWh): *the customer energy for the Market Customer for the trading interval; and*
ATCE (in MWh): *the aggregate of the customer energy figures for all Market Customers for the trading interval.*

ANCILLARY SERVICES (MARKET)

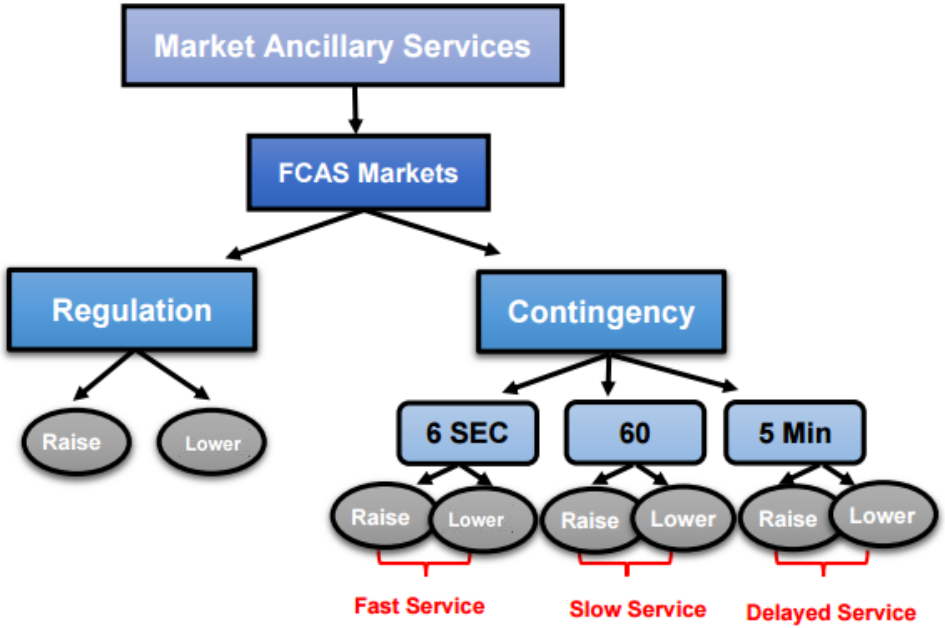
REGULATION – (Load following)

- Regulation FCAS is the generation / demand balance correction in response to **minor** deviations in demand or generation. There are two types of Regulation FCAS services:
  - Regulation Raise (RaiseReg)
  - Regulation lower (RaiseLower)

CONTINGENCY (Spinning Reserve)

- Contingency FCAS refers to generation/demand balance correction in response to **major** contingency events such as the loss of a generating unit or a loss of load.

- There are six types of contingency FCAS services



ANCILLARY SERVICES (MARKET)

PAYMENT

For both contingency and regulation FCAS payment calculation:

$$TA = \text{The aggregate of } \frac{EA \times ASP}{(12)}$$

Where:

TA (in $) = *Trading amount*

EA (in MW) = *the amount of relevant market ancillary service which the AS generating unit or load has been enabled to provide in the dispatch interval*

ASP (in $ per MW per hour) = *the AS price for that market ancillary service for the dispatch interval the AS generating unit or load has been enabled*

DETAILED STATEMENT PAYMENTS

Non Market Ancillary Service Transactions - Payments

NMAS Type	Service Provided	Amount ($)
SRAS	System Restart	$53,432.00
NSCAS	Reactive	$49,934.34
NSCAS	Loadshed	$30,203.98
Total Payment From AEMO		$133,570.32

Ancillary Service Transactions

Market Ancillary Service Transactions - Payments

Service Provided		Amount ($)
Fast raise	Contingency FCAS	$6,334.60
Fast lower	Contingency FCAS	$2,332.32
Slow raise	Contingency FCAS	$10,027.88
Slow lower	Contingency FCAS	$17,158.67
Delayed raise	Contingency FCAS	$2,671.52
Delayed lower	Contingency FCAS	$48,623.25
Regulation raise	Regulation FCAS	$11.53
Regulation lower	Regulation FCAS	$1,494.03
Total Payments By AEMO		$88,653.80

REGULATION RECOVERY INPUTS

MPF and Causer pays procedure

- Contribution factors (MPF) are determined for the purpose of assigning the costs of Regulating FCAS to those Market Participants who have caused the need for those services
- Based on 28-day period of five-minute factors for market generators and loads
- A residual percentage attributable to Market Customers is based on an energy weighted basis for those who do not have contribution factors calculated for them
- MPF are determined in accordance with the NEM rules and 'Causer pays' procedure

- MPF – Causer Pays Procedure can be found:

https://www.aemo.com.au/Electricity/National-Electricity-Market-NEM/Security-and-reliability/Ancillary-services/Ancillary-services-causer-pays-contribution-factors

ANCILLARY SERVICES (MARKET)

REGULATION RECOVERY: LOWER & RAISE

CAUSER PAYER: Market generators or customers participants **with MPF**

$$TA = \text{the aggregate of } (TSFCAS \times \frac{MPF}{AMPF}) \times -1$$

Where:

TA (in $): the *trading* amount to be determined

TSFCAS (in $) : the amount calculated for the *regulating raise service* or the *regulating lower service* in respect of the *dispatch interval*;

MPF (a number): the causer pays factor last set by *AEMO* for the *Market Customers and Generators* for relevant regulation raise of lower service

AMPF (a number): the aggregate of the MPF figures for all *Market Participants* for the *trading interval* relevant to regulation raise or lower service.

ANCILLARY SERVICES (MARKET)

RESIDUAL: Market customers **without an MPF**

$$TA = \text{the aggregate of } \left(TSFCAS \times \frac{MPF}{AMPF} \times \frac{TCE}{ATCE}\right) \times -1$$

Where:

TA (in $): the *trading* amount to be determined

TSFCAS (in $) : the amount calculated for the *regulating raise service* or the *regulating lower service* in respect of the *dispatch interval*;

MPF (a number): Residual **c**omponent of MPF that is not attributed to a metered facility

AMPF (a number): the aggregate of the MPF figures (including residual component) for all *Market Participants* for the *trading interval*.

TCE (in MWh): the customer *energy* for the *Market Customer* for the *trading interval*;

ATCE (in MWh): the aggregate of the *customer energy* figures for all *Market Customers* for whom the trading amount is not calculated in accordance with (a) above, for the *trading interval*.

ANCILLARY SERVICES (MARKET)

CONTINGENCY RECOVERY

RAISE (Recovered from generators):

Full runway methodology to be used.

LOWER (Recovered from customers):

$$TA = TCLSP \times \frac{TCE}{ATCE} \times -1$$

where:

TA (in $)	the *trading amount* to be determined (which is a negative number);
TCLSP (in $)	the total of all amounts calculated for the *fast lower service, slow lower service* or *delayed lower service* in respect of *dispatch intervals* which fall in the *trading interval*;
TCE (in MWh)	the *customer energy* for the *Market Customer* for the *trading interval*; and
ATCE (in MWh)	the *aggregate customer energy* figures for all *Market Customers* for the *trading interval*.

DETAILED STATEMENT

FCAS Compensation – may be paid to market participant if AEMO makes a direction.

Market Frequency Control Ancillary Services by Transmission Connection Point (Payments By AEMO)

Trans. Node	FCAS Comp.	Fast raise	Fast lower	Slow raise	Slow lower	Delayed raise	Delayed lower	Reg raise	Reg lower	Total
AAAA	$0.00	$0.00	$0.00	$3,892.20	$0.00	$0.00	$2,984.87	$2.92	$0.00	$6,879.99
BBBB	$0.00	$0.00	$0.00	$0.00	$10,063.00	$520.00	$0.00	$1.77	$0.00	$10,584.77
CCCC	$0.00	$56.50	$234.00	$0.00	$0.00	$68.74	$0.00	$3.25	$35.08	$397.57
DDDD	$0.00	$0.00	$266.65	$0.00	$432.35	$0.00	$120.42	$1.23	$0.00	$820.65
EEEE	$0.00	$0.00	$778.67	$224.43	$0.00	$0.00	$0.00	$0.00	$6.00	$1,009.10
FFFF	$0.00	$5492.66	$0.00	$5,290.38	$0.00	$2,082.78	$3.23	$1.86	$474.55	$13,345.46
GGGG	$0.00	$0.00	$1,053.00	$0.00	$0.00	$0.00	$20,021.73	$0.00	$920.98	$21,995.71
HHHH	$0.00	$785.44	$0.00	$620.87	$6,663.32	$0.00	$25,493.00	$0.50	$57.42	$33,650.55
Total	$0.00	$6,334.60	$2,332.32	$10,027.88	$17,158.67	$2,671.52	$48,623.25	$11.53	$1,494.03	$88,653.80

Contingency raise services are not recovered from customers

Contingency lower services are not recovered from generators

Market Ancillary Service Transactions - Recovery

Service Provided		Customer Amount ($)	Generator Amount ($)	Total Amount ($)
Fast raise	Contingency FCAS	$0.00	-$54.28	-$54.28
Fast lower		-$20.53	$0.00	-$20.53
Slow raise		$0.00	-$34.98	-$34.98
Slow lower		-$96.88	$0.00	-$96.88
Delayed raise		$0.00	-$47.58	-$47.58
Delayed lower		-$54.23	$0.00	-$54.23
Regulation raise	Regulation FCAS	-$480.62	$0.00	-$480.62
Regulation lower		-$532.89	$0.00	-$532.89
Total Recovery(Payment to AEMO)		-$1,185.15	-$136.84	-$1,321.99

MARKET FEES

Two general categories:

- Fixed Fees: paid on a daily basis and are always the same
- Variable fees: paid on a MWh basis, and can apply to either Market Customers or Scheduled Generators

MARKETFEEPERIOD	DESCRIPTION	F/V
BAND$	Mkt AND Scheduled Gen & MNSP Alloc Fee	Fixed
BAND$	Mkt Gen & MNSP Alloc Fee	Fixed
BAND$	Fee included for FPP funding purposes	Fixed
BAND$	Fee included for FPP funding purposes	Fixed
BAND$	Mkt Gen Fee included for FPP funding purposes	Fixed
BAND$	Participant Compensation Fund	Fixed
BAND$	Additional IT Services	Fixed
MWh	Market Customer Allocated Fee	Variable
MWh	National Smart Metering	Variable
MWh	National Transmission Planner	Variable
BAND$	Energy Consumers Australia	Variable
MWh	FRC Establishment	Variable
MWh	End User Advocacy Panel	Variable
MWh	FRC Operations	Variable
MWh	NEM Variable Fee	Variable

MARKET FEES

Function	Budget 2016-17 $'000	Rate [1]	Paying Participants
NEM			
General Fees (unallocated)	20,981	$0.11663/ MW·h of customer load	Market Customers
Allocated Fees			
- Market Customers	26,436	$0.14695/ MW·h of customer load	Market Customers
- Generators[2] and Market Network Service Providers	22,520	Daily rate calculated on 2015 capacity/ energy basis	Generators and Market Network Service Providers
Participant Compensation Fund	Nil	Daily rate calculated on capacity/ energy basis	Scheduled Generators, Semi-Scheduled Generators and Scheduled Network Service Providers
Registration fees	426	Refer to table 6	Intending Participants
Other	1,948		Dependent on service provided
TOTAL NEM	**72,311**		
FRC ELECTRICITY			
FRC Operations	10,047	$0.06100/ MW·h of customer load in jurisdictions with FRC	Market Customers with a Retail Licence
Other	50		Dependent on service provided
TOTAL FRC ELECTRICITY	**10,097**		
National Transmission Planner	2,889	$0.01606/ MW·h of customer load	Market Customers
Electricity Consumer Advocacy Panel	4,781	$0.00951/ connection point for small customers/ week	Market Customers
Additional Participant ID		$5,000 per additional participant ID	Existing Participants

[1] All fees and rates are exclusive of GST
[2] Excluding non market non scheduled generators

NEM Variable fee

Market Alloc fee Cust

Market Alloc fee Gen

FRC operations

National transmission fee

New WEM3 Retail fee/NMI

TNSP RESIDUE

- Inter-regional residue: N/A
- Intra-regional residue: losses when transmitting energy, Calculation:

EP + EC + (EXP * RRP)

Where:

- **EP:** *Is the amount paid for energy in the relevant region in respect to the current trading interval.*
- **EC:** *Is the amount charged for energy (excluding purchased energy submitted through a generator meter file) in the relevant region in respect to the current trading interval.*
- **EXP:** *Is the net inter-regional flow along any interconnectors connected to the relevant region*.
- **RRP:** *Is the Regional Reference Price in the relevant region in respect to the current trading interval.*

CONSTRAINED – ON

- Constrained-on functionality doesn’t exist in NEM.
  - Generators not compensated for being constrained on
- Recovery discussion
  - To be funded from intra - regional residue in the first instance
  - Any remainder to be funded from customers

REALLOCATIONS

Transaction undertaken by two participants and AEMO, where AEMO credits one MP and debits the other.

Two types:

- **Energy reallocation:** MW amount specified per trading interval which is then multiplied by SPOT price.
- **Dollar reallocation:** straight dollar amount per trading interval

REASSIGNMENTS

- For companies with more than one participant id that wish to consolidate
- For example companies that are generator and retailer
- Reassignments are used for netting statements so only one $ amount needs to be settled

REPORT FOR Sample Energy
FINAL Settlements ref 2007/045/002/SAMPLEA

STATEMENT REASSIGNMENTS

Transfer from SAMPLEB	$1,000.00
TOTAL AMOUNT PAYABLE TO AEMO	-$2,000.00

REPORT FOR Sample Energy
FINAL Settlements ref 2007/045/002/SAMPLEB

STATEMENT REASSIGNMENTS

Transfer to SAMPLEA	-$1,000.00
TOTAL AMOUNT PAYABLE BY AEMO	$0.00

REMAINING LINE ITEMS

- Revision adjustments
- Revision interest
- Other (APC, Directions, mandatory restrictions

- Early payments
- Security deposits

} Covered in Prudentials

REVISION ADJUSTMENTS AND INTEREST

- Adjustments are attached to the first final at least 8 business days after the issue of the revised statement

- Interest is calculated from daily rates between original payment date and adjustment payment

Adjustments (Prior to Current Week)

Contract Year	Week No.	Bill Run No.	Amount Paid ($)	Revised Amt ($)	Net Adjustment ($)	Interest Amount ($)	Amount Payable ($)
2016	11	15	-$2,902,227.31	-$2,901,358.39	$868.92	$7.40	$876.32
2016	21	14	-$3,561,790.75	-$3,613,176.38	-$51,385.64	-$275.36	-$51,661.00
Total			-$6,464,018.05	-$6,514,534.77	-$50,516.72	-$267.96	-$50,784.68

TOTAL ADJUSTMENTS PAYABLE TO AEMO -$50,784.68

R1 adjustment= Any differences between R1 and Finals

R2 adjustment= Any differences between R2 and R1

PAYMENT AND DEFAULT PROCEDURE

- Settled through Austraclear
- Cash transfers in Austraclear require two “sides” of a transaction to be entered - one by the sender and one by the receiver

- **AEMO Receipts**: Paying participant funds must be cleared by 10:30am (NEM)
- **AEMO Payments**: Paying participant funds must be cleared by 2:00pm (NEM)

- If participant defaults:
  - AEMO may issue default notice to be remedied within 24 hours
  - Draw on credit support or security deposits provided

Market clearing Guide:
https://www.aemo.com.au/Electricity/National-Electricity-Market-NEM/Settlements-and-payments/Prudentials-and-payments/Clearing-procedures-and-guides

DISPUTES VS DISAGREEMENTS

- NEM doesn't require a formal process to raise an issue for resolution
  - Generally corrected in routine revised statements
- Inconsistencies may be raised up to 6 months after billing period
- Allow for special revisions – adjustment amount > 5% or if both routine revised statement are issued
- Payments need to be made on final whether participant agrees or not
- If agreement cannot not be reached or additional argument can be provided this can be elevated to Dispute resolution advisor

Related documents

Revisions policy:

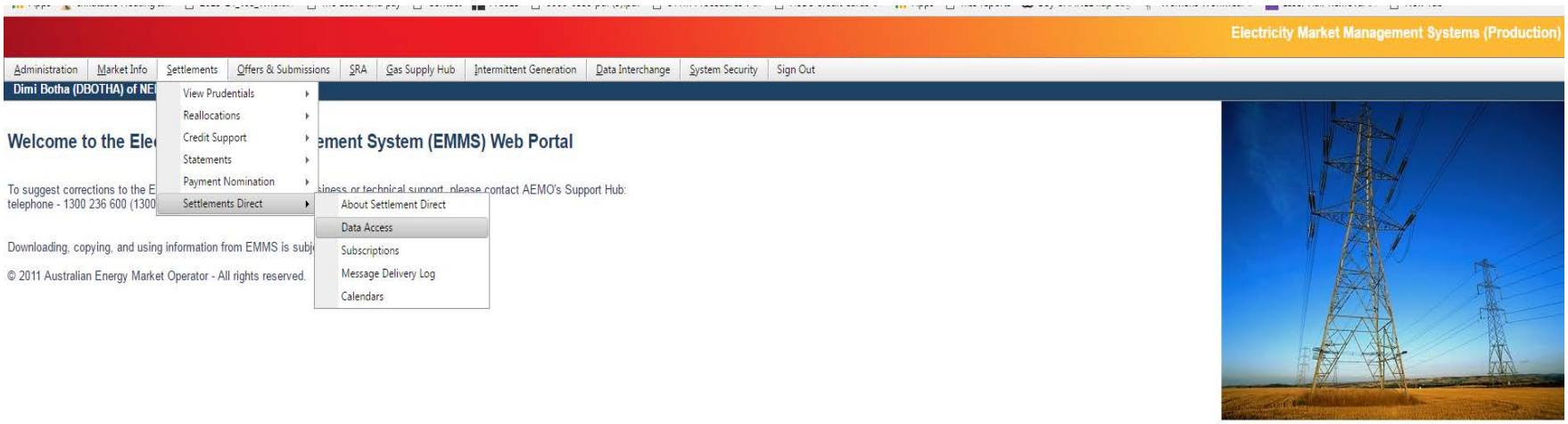
https://www.aemo.com.au/media/Files/Other/settlements/NEM_Settlement_Revisions_Policy.pdf

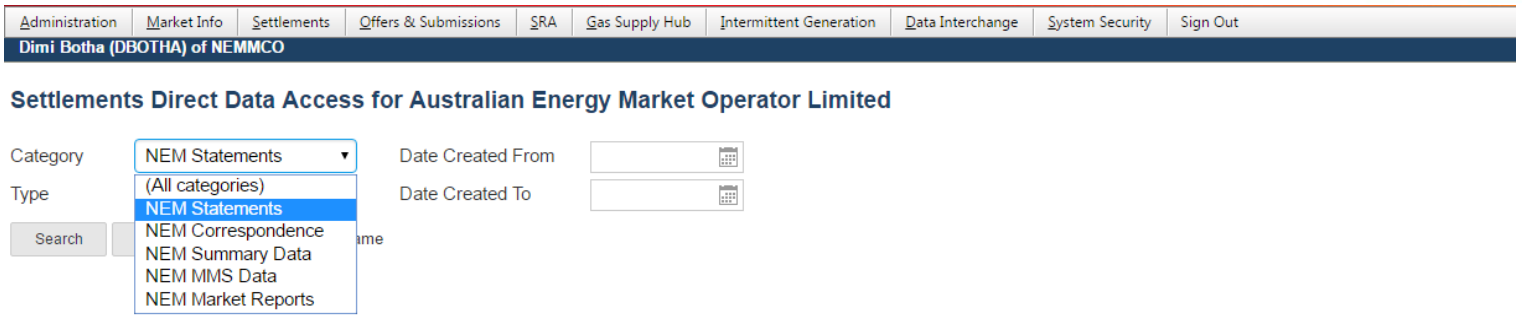
Dispute Management system

https://www.aemo.com.au/Datasource/Archives/Archive68

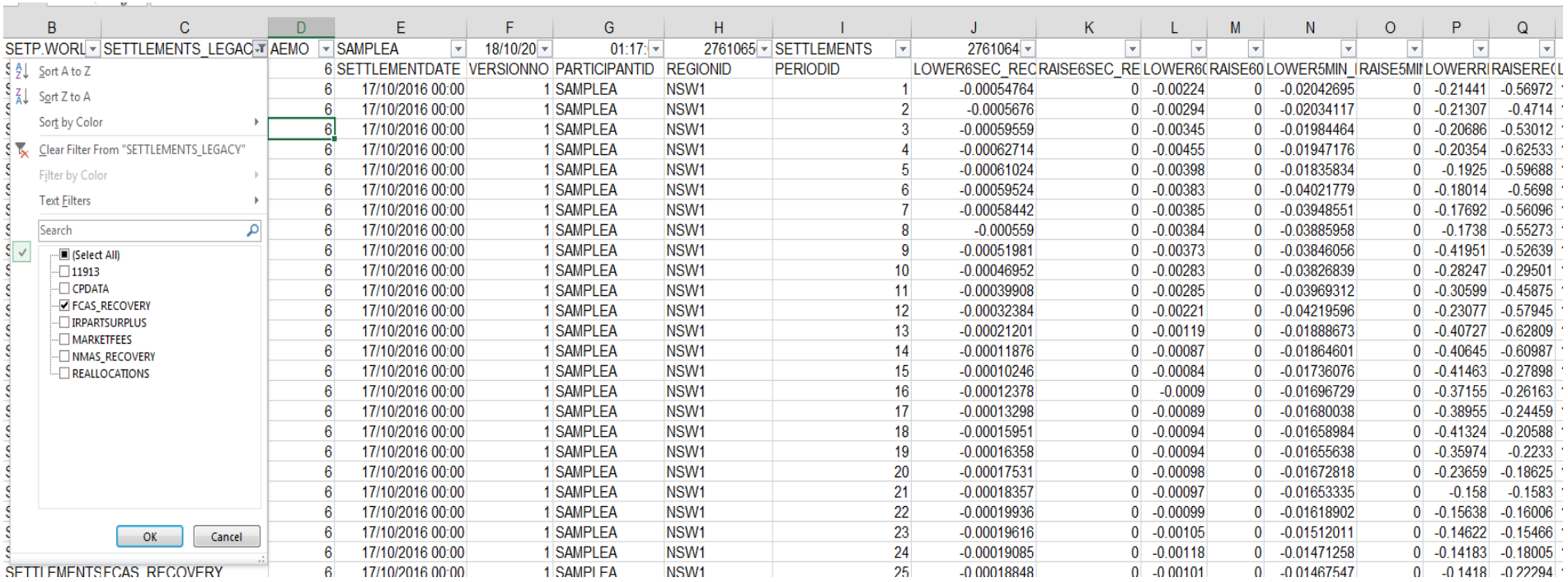
SETTLEMENTS DIRECT

- **Electricity Market Management Systems(EMMS)** web portal for participants





SUPPORTING DATA - RECONCILIATION



B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
SETP.WORL	SETTLEMENTS_LEGAC	AEMO	SAMPLEA	18/10/20	01:17:	2761065	SETTLEMENTS	2761064							
		6	SETTLEMENTDATE	VERSIONNO	PARTICIPANTID	REGIONID	PERIODID	LOWER6SEC_REC	RAISE6SEC_RE	LOWER60	RAISE60	LOWER5MIN_I	RAISE5MI	LOWERR	RAISERE(
		6	17/10/2016 00:00	1	SAMPLEA	NSW1	1	-0.00054764	0	-0.00224	0	-0.02042695	0	-0.21441	-0.56972
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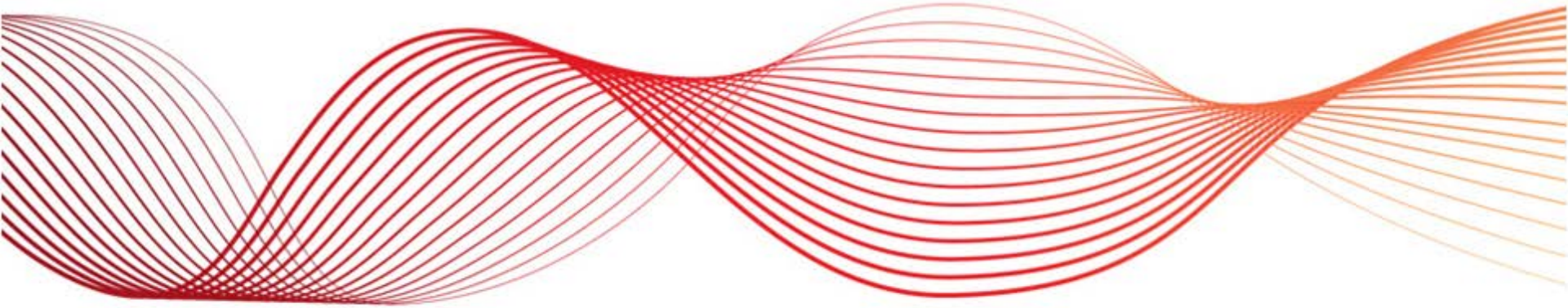
		6	17/10/2016 00:00	1	SAMPLEA	NSW1	12	-0.00032384	0	-0.00221	0	-0.04219596	0	-0.23077	-0.57945
		6	17/10/2016 00:00	1	SAMPLEA	NSW1	13	-0.00021201	0	-0.00119	0	-0.01888673	0	-0.40727	-0.62809
		6	17/10/2016 00:00	1	SAMPLEA	NSW1	14	-0.00011876	0	-0.00087	0	-0.01864601	0	-0.40645	-0.60987
		6	17/10/2016 00:00	1	SAMPLEA	NSW1	15	-0.00010246	0	-0.00084	0	-0.01736076	0	-0.41463	-0.27898
		6	17/10/2016 00:00	1	SAMPLEA	NSW1	16	-0.00012378	0	-0.0009	0	-0.01696729	0	-0.37155	-0.26163
		6	17/10/2016 00:00	1	SAMPLEA	NSW1	17	-0.00013298	0	-0.00089	0	-0.01680038	0	-0.38955	-0.24459
		6	17/10/2016 00:00	1	SAMPLEA	NSW1	18	-0.00015951	0	-0.00094	0	-0.01658984	0	-0.41324	-0.20588
		6	17/10/2016 00:00	1	SAMPLEA	NSW1	19	-0.00016358	0	-0.00094	0	-0.01655638	0	-0.35974	-0.2233
		6	17/10/2016 00:00	1	SAMPLEA	NSW1	20	-0.00017531	0	-0.00098	0	-0.01672818	0	-0.23659	-0.18625
		6	17/10/2016 00:00	1	SAMPLEA	NSW1	21	-0.00018357	0	-0.00097	0	-0.01653335	0	-0.158	-0.1583
		6	17/10/2016 00:00	1	SAMPLEA	NSW1	22	-0.00019936	0	-0.00099	0	-0.01618902	0	-0.15638	-0.16006
		6	17/10/2016 00:00	1	SAMPLEA	NSW1	23	-0.00019616	0	-0.00105	0	-0.01512011	0	-0.14622	-0.15466
		6	17/10/2016 00:00	1	SAMPLEA	NSW1	24	-0.00019085	0	-0.00118	0	-0.01471258	0	-0.14183	-0.18005
SETTLEMENTSFCAS_RECOVERY		6	17/10/2016 00:00	1	SAMPLEA	NSW1	25	-0.00018848	0	-0.00101	0	-0.01467547	0	-0.1418	-0.22294

MARKET BILLING CYCLES



REAL-TIME OPS

Real-time days	Time frames/definition
Registration day	Midnight – Midnight (WST)
Trading day	Expected 8am – 8am (WST)
STEM day	8am – 8am (WST)
STEM Billing period	Sunday – Saturday
Customer transfer day	Midnight – Midnight (WST)

BUSINESS DAY

- Consistent with current WEM Rules, being a day that is not:
  - a Saturday or Sunday; or
  - a WA public holiday;
- Settlement also to be shifted away from NSW public holidays for Austraclear

NSTEM AND STEM SETTLEMENT CYCLES

NSTEM

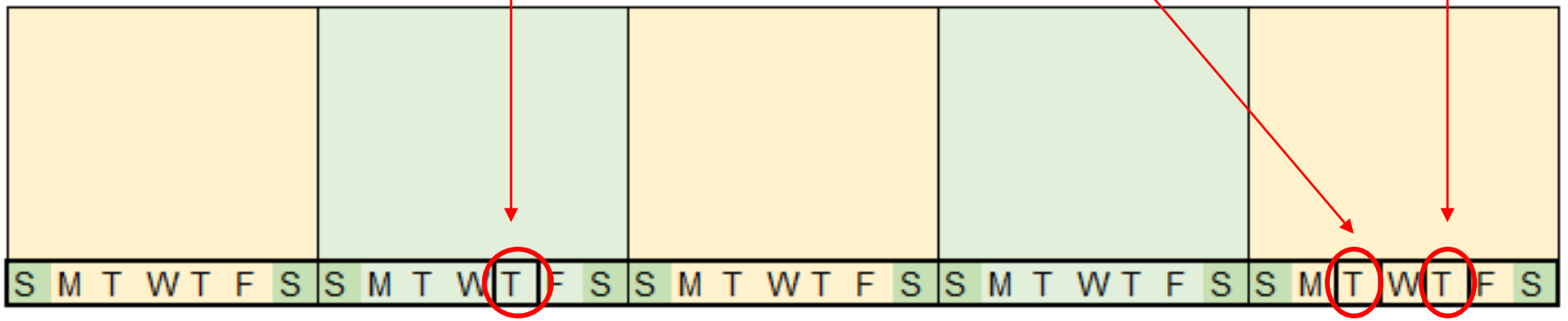
20-week and 30-week revisions attached

WEM 3 $ unpaid billing period

Prelim statement + 4 business days

Final Statement issued +17 business days

Settlement day +19 business days



STEM

STEM $ unpaid billing period

Final Statement issued +2 business days

Settlement day +4 business days

TYPES OF STATEMENTS

- **Prelim**: Indication of amounts to be included in final (No payment)
- **Final**: Net settlement amount due or payable -incorporating any metering or billing configuration changes from prelim.
  - Each final has a 20 week and 30 week revision attached
  - Final is only statement to be settled
- **20 & 30 week revision:** cover any additional adjustments, may also cover disputes raised within 6 months (No payment – attached to final)

NEM Settlements process:

https://www.aemo.com.au/Electricity/National-Electricity-Market-NEM/Settlements-and-payments/Prudentials-and-payments/-/media/E426F899A8124D988815A96DEF0FF298.ashx

PUBLISHING TIMES/DAYS

- Statements are usually issued by 12 noon

Statement	Day
Prelim	Usually Thursday
Final	Usually Tuesday
20-week revision	Wednesday ?
30-week revision	Friday ?

METERING TIMELINES FOR REVISIONS

- Revision calendar is related to the timing of metering and customer transfer processes
  - Metrology procedures are expected to be similar to the NEM, i.e. a meter read at least every 6 months
  - Customer transfer processes expected to involve similar timeframes for retrospectivity (i.e. 6 months)
- NEM approach to routine revisions (20 and 30 week) expected to be adequate

DOCUMENTS

- Spot market op Timetable – to be consulted

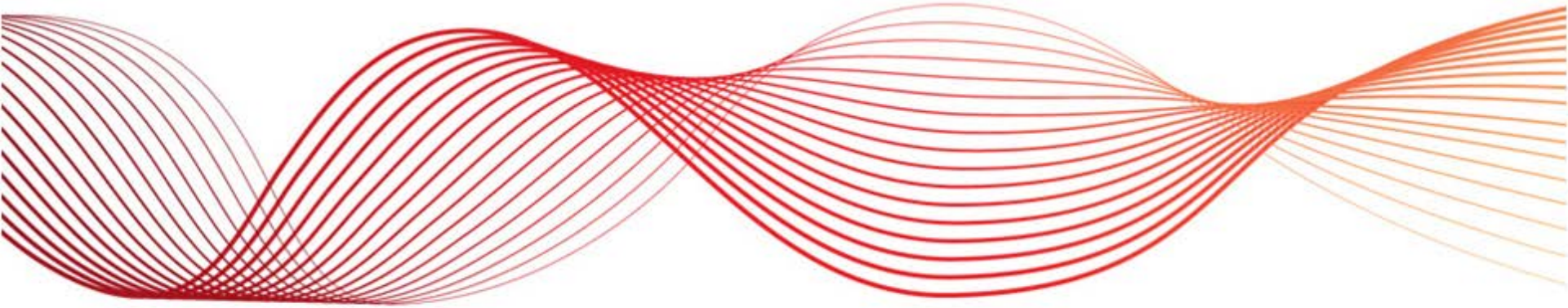
https://www.aemo.com.au/Datasource/Archives/Archive1103

CALENDAR

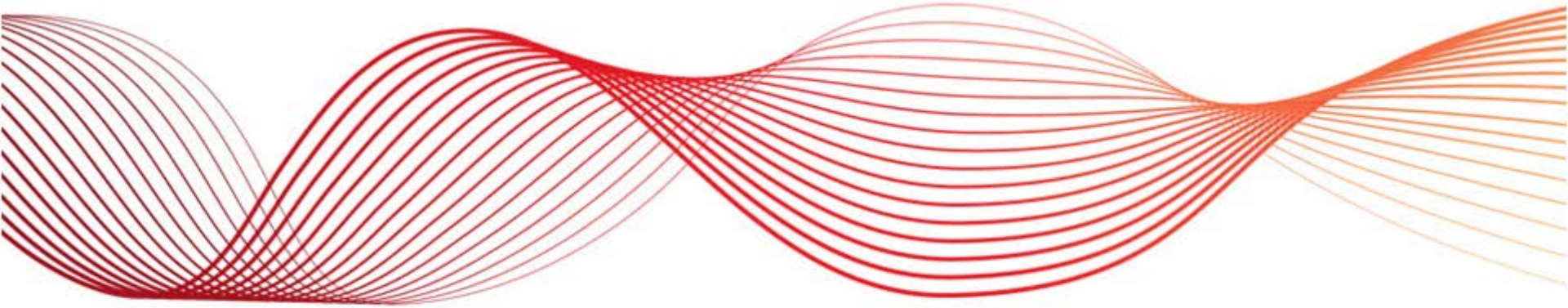
2015 NEM Calendar

Wk ID	Billing Period Start	Billing Period End	Preliminary Statement	Final Statement	Payment Date	20-Week Revised Statement	30-Week Revised Statement	Wk ID
1	Sun 28-Dec-14	Sat 03-Jan-15	Fri 09-Jan-15	Thu 29-Jan-15	Mon 02-Feb-15	Tue 19-May-15	Thu 30-Jul-15	1
2	Sun 04-Jan-15	Sat 10-Jan-15	Fri 16-Jan-15	Thu 05-Feb-15	Mon 09-Feb-15	Tue 26-May-15	Thu 06-Aug-15	2
3	Sun 11-Jan-15	Sat 17-Jan-15	Fri 23-Jan-15	Thu 12-Feb-15	Mon 16-Feb-15	Tue 02-Jun-15	Thu 13-Aug-15	3
4	Sun 18-Jan-15	Sat 24-Jan-15	Mon 02-Feb-15	Thu 19-Feb-15	Mon 23-Feb-15	Tue 09-Jun-15	Thu 20-Aug-15	4
5	Sun 25-Jan-15	Sat 31-Jan-15	Fri 06-Feb-15	Wed 25-Feb-15	Fri 27-Feb-15	Tue 16-Jun-15	Thu 27-Aug-15	5
6	Sun 01-Feb-15	Sat 07-Feb-15	Fri 13-Feb-15	Wed 04-Mar-15	Fri 06-Mar-15	Tue 23-Jun-15	Thu 03-Sep-15	6
7	Sun 08-Feb-15	Sat 14-Feb-15	Fri 20-Feb-15	Wed 11-Mar-15	Fri 13-Mar-15	Tue 30-Jun-15	Thu 10-Sep-15	7
8	Sun 15-Feb-15	Sat 21-Feb-15	Fri 27-Feb-15	Wed 18-Mar-15	Fri 20-Mar-15	Tue 07-Jul-15	Thu 17-Sep-15	8
9	Sun 22-Feb-15	Sat 28-Feb-15	Fri 06-Mar-15	Wed 25-Mar-15	Fri 27-Mar-15	Tue 14-Jul-15	Thu 24-Sep-15	9
10	Sun 01-Mar-15	Sat 07-Mar-15	Fri 13-Mar-15	Wed 01-Apr-15	Tue 07-Apr-15	Tue 21-Jul-15	Thu 01-Oct-15	10
11	Sun 08-Mar-15	Sat 14-Mar-15	Fri 20-Mar-15	Fri 10-Apr-15	Tue 14-Apr-15	Tue 28-Jul-15	Thu 08-Oct-15	11
12	Sun 15-Mar-15	Sat 21-Mar-15	Fri 27-Mar-15	Fri 17-Apr-15	Tue 21-Apr-15	Tue 04-Aug-15	Thu 15-Oct-15	12
13	Sun 22-Mar-15	Sat 28-Mar-15	Tue 07-Apr-15	Fri 24-Apr-15	Tue 28-Apr-15	Tue 11-Aug-15	Thu 22-Oct-15	13
14	Sun 29-Mar-15	Sat 04-Apr-15	Mon 13-Apr-15	Thu 30-Apr-15	Mon 04-May-15	Tue 18-Aug-15	Thu 29-Oct-15	14
15	Sun 05-Apr-15	Sat 11-Apr-15	Fri 17-Apr-15	Wed 06-May-15	Fri 08-May-15	Tue 25-Aug-15	Thu 05-Nov-15	15
16	Sun 12-Apr-15	Sat 18-Apr-15	Fri 24-Apr-15	Wed 13-May-15	Fri 15-May-15	Tue 01-Sep-15	Thu 12-Nov-15	16
17	Sun 19-Apr-15	Sat 25-Apr-15	Fri 01-May-15	Wed 20-May-15	Fri 22-May-15	Tue 08-Sep-15	Thu 19-Nov-15	17
18	Sun 26-Apr-15	Sat 02-May-15	Fri 08-May-15	Wed 27-May-15	Fri 29-May-15	Tue 15-Sep-15	Thu 26-Nov-15	18
19	Sun 03-May-15	Sat 09-May-15	Fri 15-May-15	Wed 03-Jun-15	Fri 05-Jun-15	Tue 22-Sep-15	Thu 03-Dec-15	19
20	Sun 10-May-15	Sat 16-May-15	Fri 22-May-15	Thu 11-Jun-15	Mon 15-Jun-15	Tue 29-Sep-15	Thu 10-Dec-15	20
21	Sun 17-May-15	Sat 23-May-15	Fri 29-May-15	Thu 18-Jun-15	Mon 22-Jun-15	Tue 06-Oct-15	Thu 17-Dec-15	21
22	Sun 24-May-15	Sat 30-May-15	Fri 05-Jun-15	Thu 25-Jun-15	Mon 29-Jun-15	Tue 13-Oct-15	Thu 24-Dec-15	22
23	Sun 31-May-15	Sat 06-Jun-15	Mon 15-Jun-15	Thu 02-Jul-15	Mon 06-Jul-15	Tue 20-Oct-15	Thu 31-Dec-15	23

BREAK



INTRODUCTION TO NEM PRUDENTIALS



SESSION OBJECTIVES

1. Maximum Credit Limit
2. Prudential Margin
3. Trading Limit
4. Outstandings
5. Trading Margin
6. Daily Process

MAXIMUM CREDIT LIMIT (MCL)

- MCL is the minimum amount of collateral which must be provided as
  - NEM: Bank Guarantee
  - WEM: Bank Guarantee or Security Deposit
- MCL level is established based on:
  - NEM: level to meet a 2% probability of loss given default
  - WEM: historical 24 month ‘worst case’ position
- MCL review frequency:
  - NEM: four times a year (three seasons)
  - WEM: once a year
- Prudentials and MCL is determined at the company level
  - NEM: a company can have multiple participant ids (parent child relationship)
  - WEM: one to one company to participant relationship

PRUDENTIAL MARGIN (PM)

- PM is the buffer that must be maintained between credit support and outstandings at all times.
  - NEM: PM is calculated to cover reaction period (and meet 2% prudential standard)
  - WEM: PM is 13% of credit support (not formally defined as PM)
- Reaction period is the period taken to remove a defaulting participant
  - NEM: 7 days – time from breach through call notice, default notice, suspension.
  - WEM: 7 days plus – margin call, cure notice, suspension

TRADING LIMIT

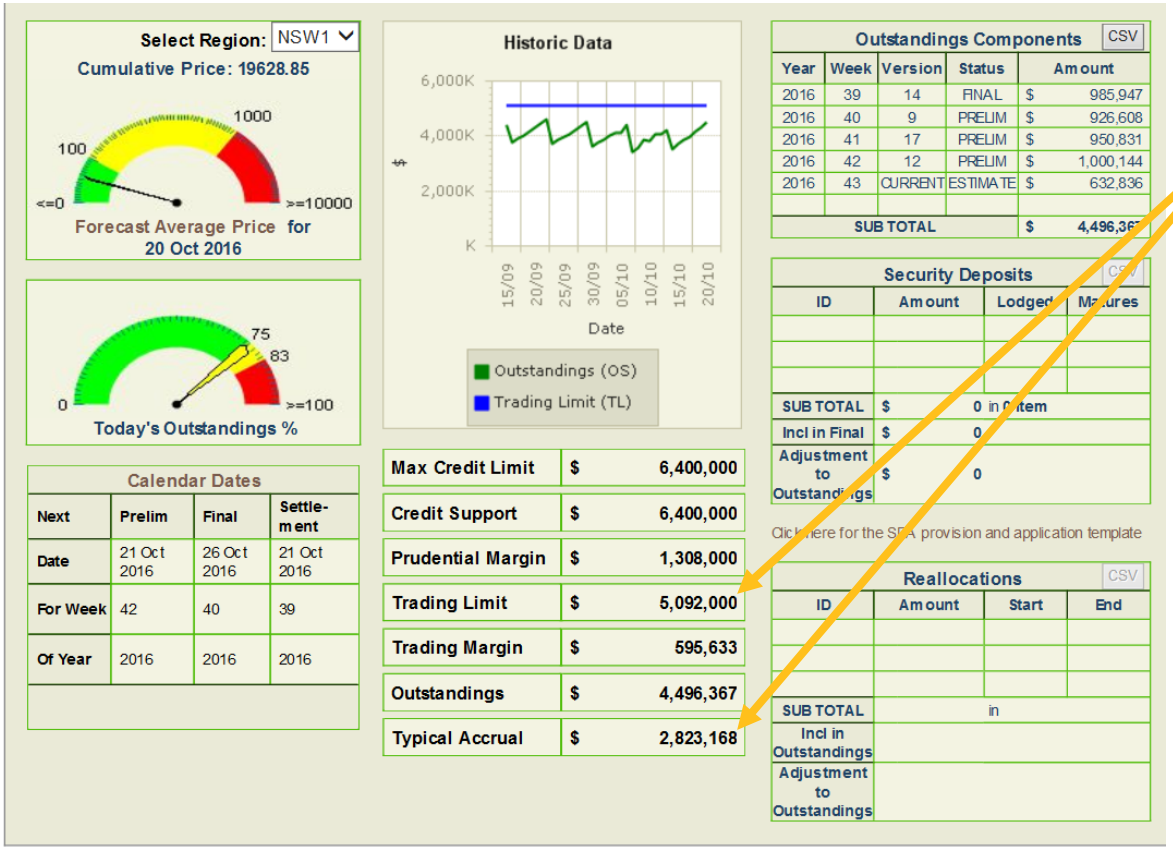
- Trading limit is the amount to which outstandings can accrue
  - NEM: credit support less prudential margin
  - WEM: 87% of credit support
- In the NEM the MCL is determined as the sum of two values:
  - MCL = outstandings limit + prudential margin
- If credit support = MCL i.e. no voluntary BG
  trading limit = outstandings limit

OUTSTANDINGS AND TRADING MARGIN

- Outstandings is the current best estimate of a Market Participants' liabilities:
  - NEM: up to midnight last night
  - WEM: estimate based on most recent invoice
- Trading margin is the difference between trading limit and outstandings
- Trading margin is the additional amount by which outstandings can accrue before action is taken
- A negative trading margin requires management by Market Participant to avoid a call
  - NEM: call notice which will require reduction of outstandings to typical accrual level
  - WEM: Margin call which will require reduction of outstandings to trading limit

NEM DAILY PROCESS

- The NEM daily process is designed to avoid the formal call process
- Market participants actively manage their position by 11.30 am



- Typical accrual here is $2.3M below trading limit
- Daily process incentivises avoidance of call notice process

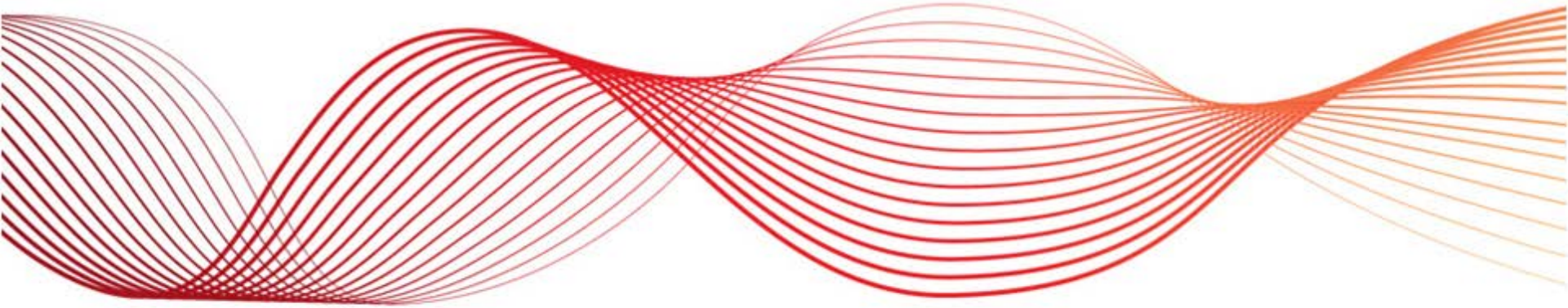
NEM DAILY PROCESS

- Market Participants are provided with a prudential dashboard to view their prudential components
- Market Participants can manage their position by decreasing outstandings:
  - Security deposit (cash)
  - Reallocation (transfer of credit from another Market Participant)
  - Early payment (if settlement day is tomorrow)
- Market Participants can manage their position by increasing their trading limit:
  - Bank Guarantee
- No call notice has been issued in the NEM in the last 10 years

NEM DAILY PROCESS

- Prudential assessments update each time new information is received by the system:
  - new settlement / billing runs
  - authorised reallocations
  - bank guarantee
  - security deposit
  - early payment
- During the process to close out the morning prudential position only updates which relate to prudential management are taken into account
  - This ensures that there isn’t a moving target for 11.30 am

PRUDENTIAL ASSESSMENT AND MANAGEMENT

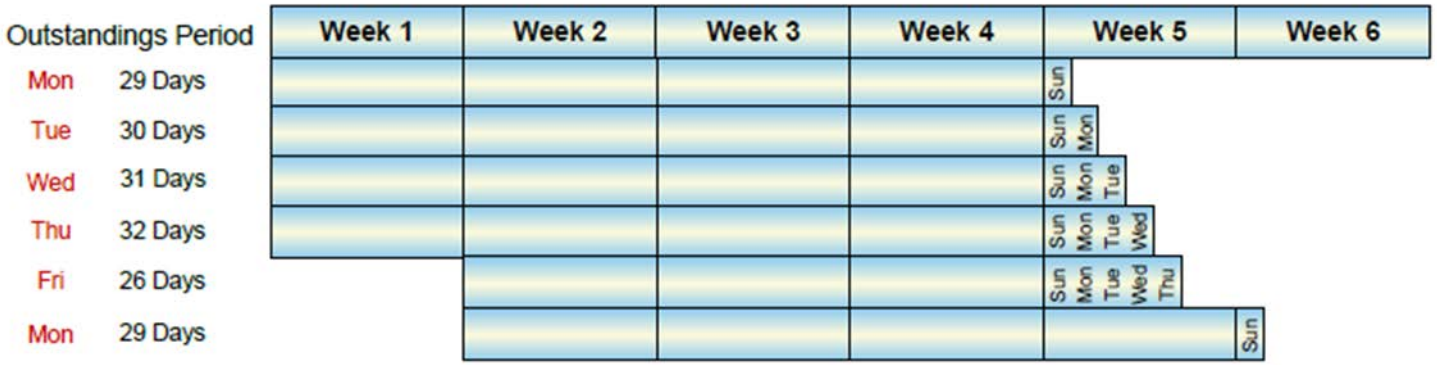


SESSION OBJECTIVES

1. Outstandings Period
2. Settlement amounts
3. Settlement estimation
4. Security deposits
5. Reallocations
6. Early Payments

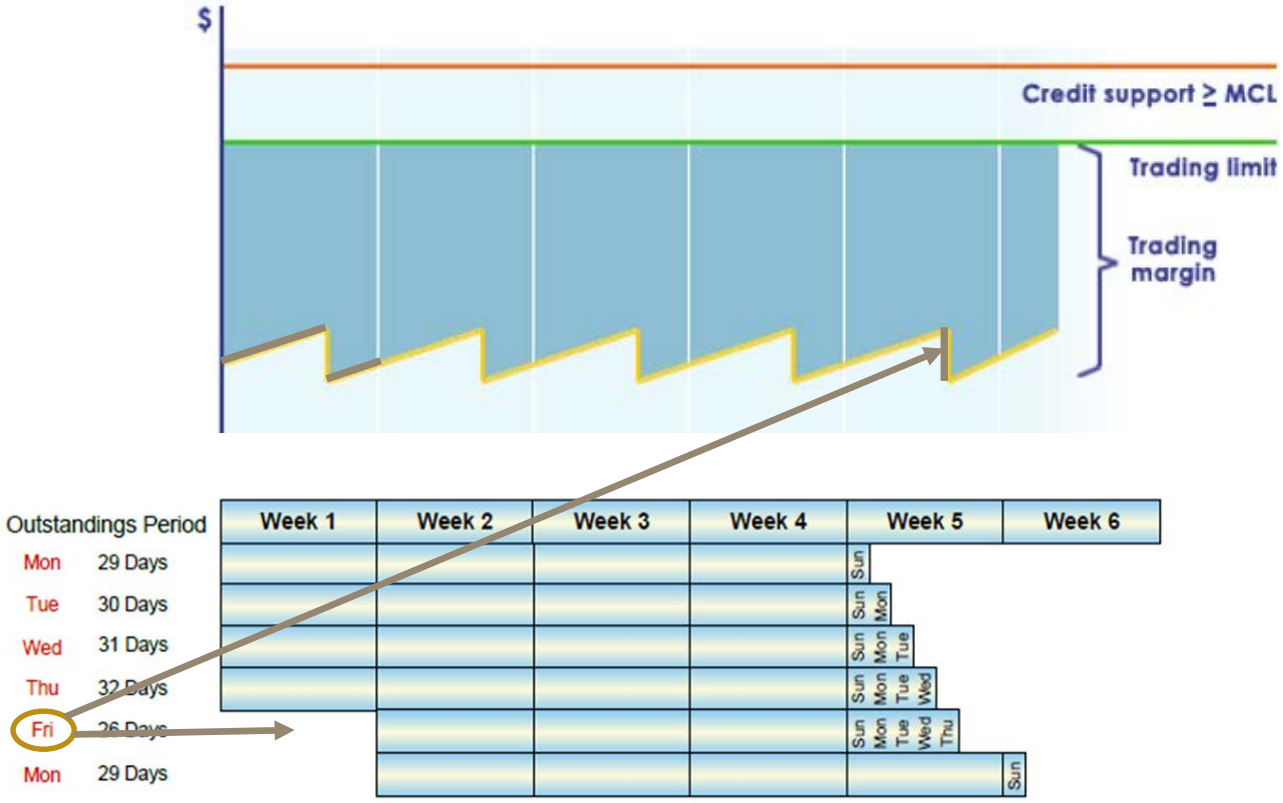
OUTSTANDINGS PERIOD

- The outstandings period is the timeframe for which amounts that feed into the prudential assessment are included
- Includes all settlement days for which a final statement has not been settled
- For each prudential day (bus. day) outstandings is an estimate of net liabilities from beginning of outstandings period to midnight last night
- In the NEM billing cycle the outstandings period is typically 26 to 32 days long
- This can be extended due to public holidays.



OUTSTANDINGS AND SETTLEMENT

- The outstandings typically has a saw tooth look reflecting settlement cycle



OUTSTANDING COMPONENTS

- The following information is included in outstandings:
  - Settlement amounts
  - Security deposits (not included in a settlement amount)
  - Ex post reallocations (not included in a settlement amount)
  - Early Payments (can pay settlement a day early)

  - Outstandings = settlement amounts (liability is a +ve amount)
    less security deposits
    less credit reallocations (reduce liabilities)
    plus debit reallocations (increase liabilities)
    less early payments

SETTLEMENT AMOUNTS

- Settlement amounts are included as billing runs.
- Billing run types are Final, Preliminary, Interim and Daily
- Daily and Interim bill runs are known as settlement estimates

SETTLEMENT ESTIMATION

- Settlement estimation is a three step process:
  1. Energy estimation run calculates half hourly energy for each participant
  2. Settlement run calculates half hourly settlement amounts using energy estimates
  3. Billing runs aggregate settlement runs (up to a one week period)
- Settlement data becomes more accurate as actual meter data is provided in MSATS

- The prudential process requires that settlement estimation is accepted as the basis for outstandings

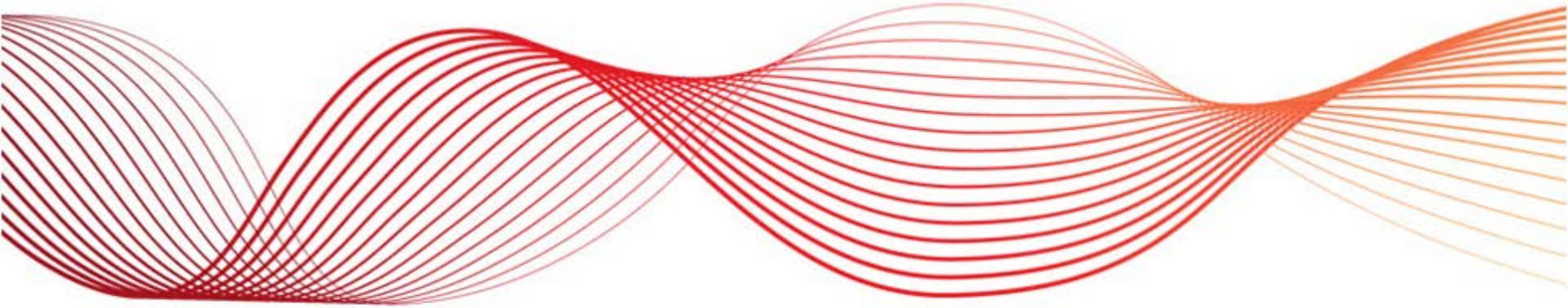
NON SETTLEMENT AMOUNTS IN OUTSTANDINGS

- Security deposits
  - Put on term deposit to mature on a final settlement date
  - Only returned in settlement process
  - Interest is always returned at maturity, principal can be rolled
- Reallocations
  - Bi lateral arrangements to transfer credit/debit amounts
  - Typically used to allow a retailer to manage their outstandings and a generator to leverage their credit position
  - Ex-post reallocations (reallocations that apply to a day prior to today) are validated for prudentials to inhibit a trading limit excursion
- Early Payments
  - Participant chooses to pay a day early and avoid risk of settlement deadline (10.30 am 19th business day after billing week)

CURRENT WEM PRUDENTIALS

- Security deposits
  - Acceptable form of credit support
- Prepayments
  - Used to reduce outstandings
  - Applied to settlement invoices in the order in which they fall due
- Outstanding estimation
  - Material errors in outstandings are taken into account when determining whether or not to issue a margin call

FORWARD PLAN FOR ENGAGEMENT



SESSION OBJECTIVES

1. Timelines
2. Procedures
3. Stakeholder engagement

TIMELINES

- Policy development is ongoing over the course of the next few months
- Package 1 – end of year
  - Constrained on payments
- Package 2 – Q1 2017
  - Settlement Calculations
  - Invoicing
  - Prudentials and credit support
- Rules drafting to commence once policy is established
- Procedures consultation once draft rules are determined

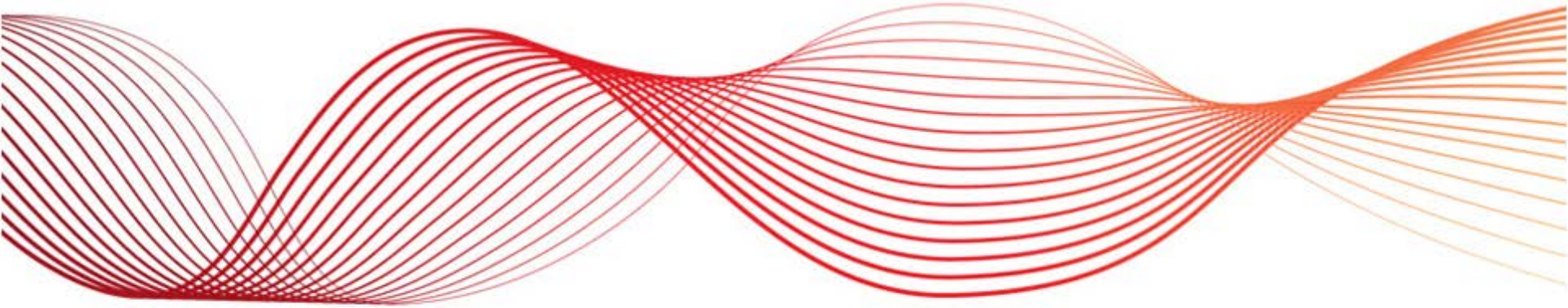
PROCEDURES

- It is anticipated that the WEM consultation process will be followed in determining the procedures
- Procedures to be consulted on include:
  - Settlement procedure(s)
  - Prudential procedure(s)
  - Credit limit procedure (standalone or subset of prudential procedure)
- To meet reform timelines it will be necessary to engage on concepts to be included in the procedures prior to draft rule and formal consultation process
- For example :
  - credit limit calculation
  - constrained on payments
  - full runway methodology

STAKEHOLDER ENGAGEMENT

- Settlement working group used as forum for informal consultation to help inform AEMO's design
- Concepts shared and developed with the working group to ensure 'no surprises' when formal consultation begins
- Through these working groups will work to ensure
  - participants have understanding of NEM processes and formulations as required
  - participants have input into development of new formulations and methodologies that are to be consulted on
  - position participants to understand key concepts and make informed submissions to formal consultation process

SETTLEMENT SYSTEMS AND INTERFACES



SETTLEMENT MARKET SYSTEMS – INTRODUCTION

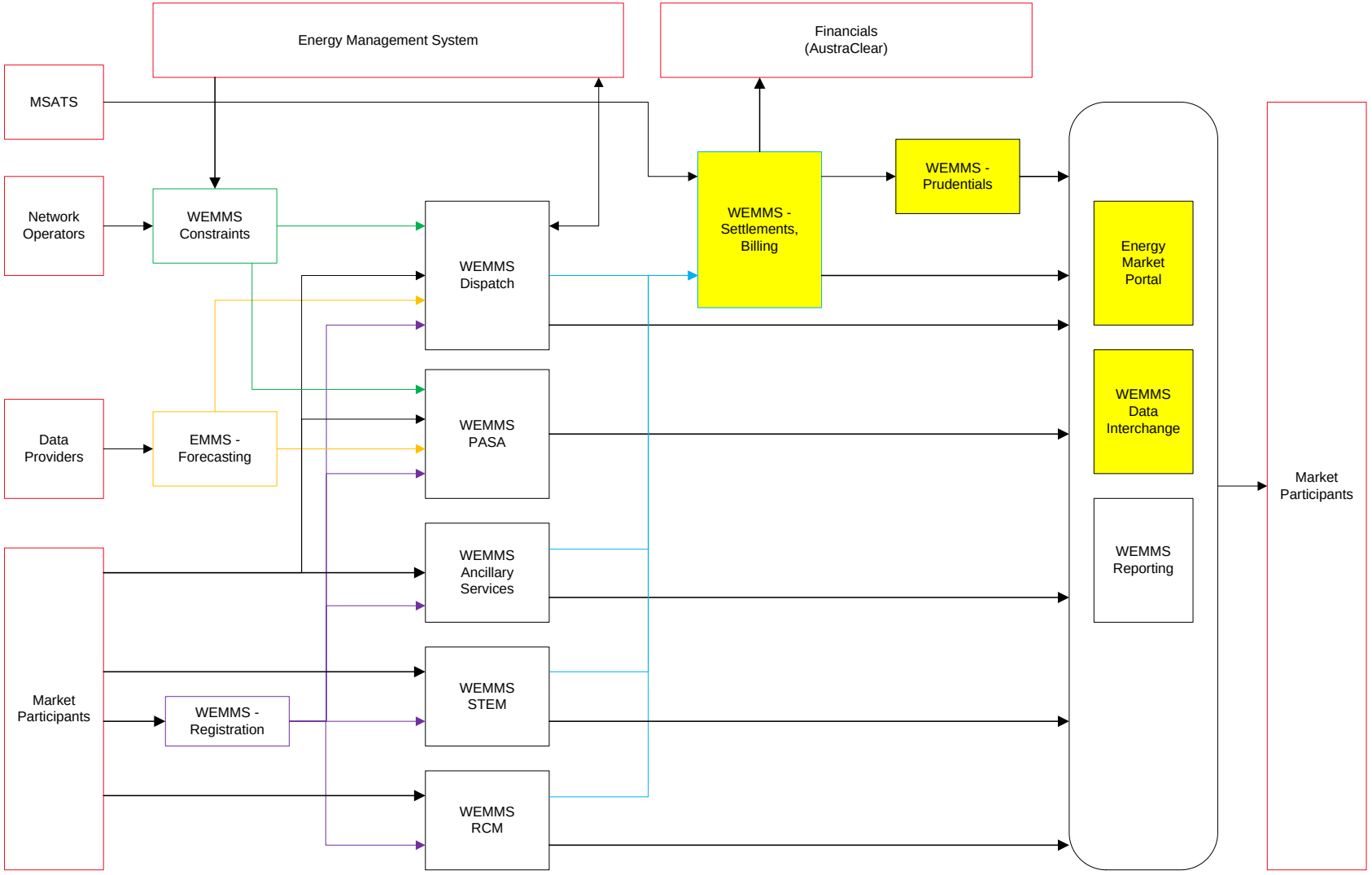
- AEMO's proposed approach is to leverage existing expertise and market systems currently deployed to the NEM to deliver on requirements for WA

- Leveraging AEMO's market systems supports:
  - Reduced implementation and operation cost
  - Lower risk by using known solutions
  - Reduce barriers to entry by harmonising interfaces to Australian energy markets

- A key principal in our project decision framework is to deliver on WA requirements in the following prioritised approaches
  1. Consolidation of NEM and WA systems into a single solution
  2. Configuration of NEM system for WA
  3. Customisation of NEM system for WA

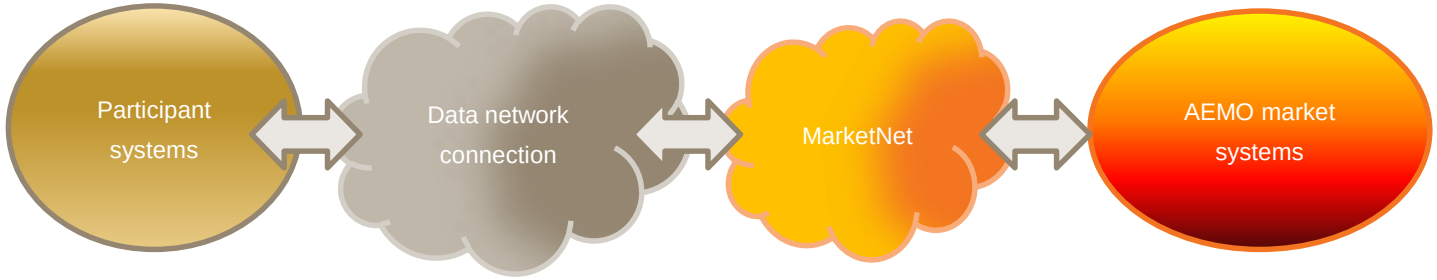
  This precedence of approaches ensure our decisions are consistent with the over-arching value proposition and managing delivery risk

SETTLEMENT MARKET SYSTEMS OVERVIEW



ACCESSING THE SETTLEMENT MARKET SYSTEM

- Any access to AEMO's market systems requires a data network connection to MarketNet



- AEMO provides two types of connection options:
  - A permanent continuous connection, available as either a dedicated link or via VPN
  - A variable connection, intermittently connected for short durations. For security reasons, the connection is dropped if there is no activity for 30 minutes.

- Further reading: Guide to Information Systems v2.03

INTERACTIONS WITH THE SETTLEMENT MARKET SYSTEMS

The Settlement Market Systems offer two primary methods of access for market participants:

- Batch interface
- Browser interface

Both access methods support the core Market-to-Business interactions associated with the wholesale electricity settlement function.

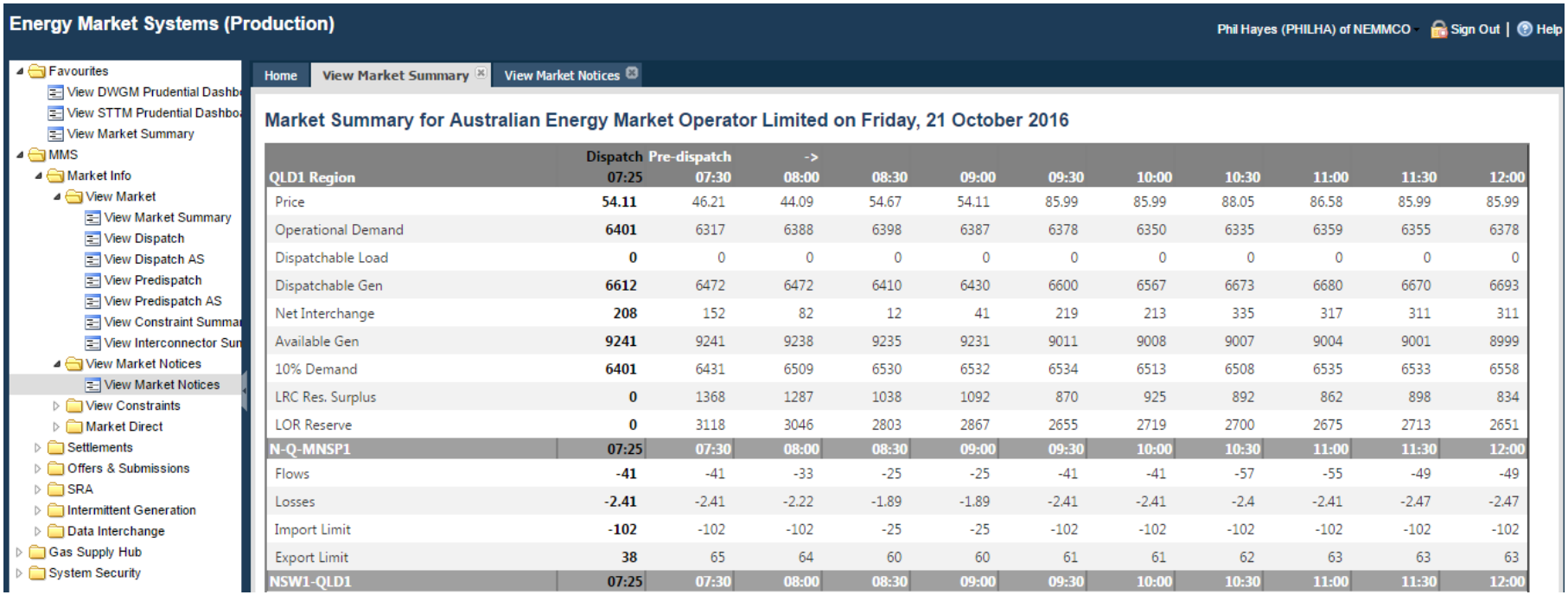
Comprehensive data sets are available via the batch interface to supporting settlement reconciliation

BROWSER INTERFACE - ABOUT

The browser access is delivered via the “Energy Market Systems Portal” Wholesale Market Systems. This facility is largely equivalent to the MPI. The Web Portal can cut participant’s cost and client side footprint by:

- Reducing the requirement for participants to maintain an IT infrastructure at their site.
- Allowing participant business user access 24 hours a day, 7 days per week for 365 days per year—wherever a connection to MarketNet is available.
- Being fully maintained and supported by AEMO.
- Being available to all participants at no additional cost.
- Providing a secure web interface with access rights managed by participants.
- Allowing the use of multiple participant IDs.
- Being easy to learn with user interface guides available for each web application—requiring less staff training.
- Providing a consistent look and feel across each web application.

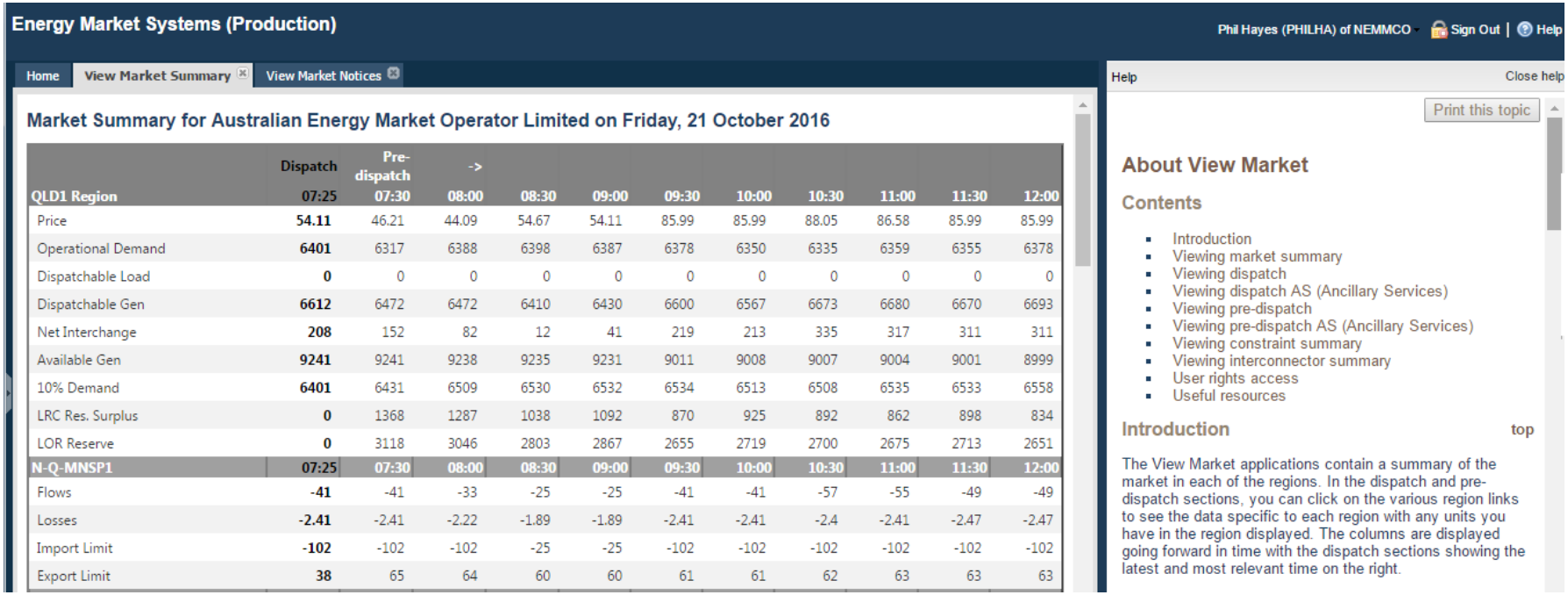
BROWSER INTERFACE – EXAMPLE 1



Market Summary for Australian Energy Market Operator Limited on Friday, 21 October 2016

	Dispatch	Pre-dispatch	->								
QLD1 Region	**07:25**	**07:30**	**08:00**	**08:30**	**09:00**	**09:30**	**10:00**	**10:30**	**11:00**	**11:30**	**12:00**
Price	**54.11**	46.21	44.09	54.67	54.11	85.99	85.99	88.05	86.58	85.99	85.99
Operational Demand	**6401**	6317	6388	6398	6387	6378	6350	6335	6359	6355	6378
Dispatchable Load	**0**	0	0	0	0	0	0	0	0	0	0
Dispatchable Gen	**6612**	6472	6472	6410	6430	6600	6567	6673	6680	6670	6693
Net Interchange	**208**	152	82	12	41	219	213	335	317	311	311
Available Gen	**9241**	9241	9238	9235	9231	9011	9008	9007	9004	9001	8999
10% Demand	**6401**	6431	6509	6530	6532	6534	6513	6508	6535	6533	6558
LRC Res. Surplus	**0**	1368	1287	1038	1092	870	925	892	862	898	834
LOR Reserve	**0**	3118	3046	2803	2867	2655	2719	2700	2675	2713	2651
N-Q-MNSP1	**07:25**	**07:30**	**08:00**	**08:30**	**09:00**	**09:30**	**10:00**	**10:30**	**11:00**	**11:30**	**12:00**
Flows	**-41**	-41	-33	-25	-25	-41	-41	-57	-55	-49	-49
Losses	**-2.41**	-2.41	-2.22	-1.89	-1.89	-2.41	-2.41	-2.4	-2.41	-2.47	-2.47
Import Limit	**-102**	-102	-102	-25	-25	-102	-102	-102	-102	-102	-102
Export Limit	**38**	65	64	60	60	61	61	62	63	63	63
NSW1-QLD1	**07:25**	**07:30**	**08:00**	**08:30**	**09:00**	**09:30**	**10:00**	**10:30**	**11:00**	**11:30**	**12:00**

BROWSER INTERFACE – EXAMPLE 2



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Price	**54.11**	46.21	44.09	54.67	54.11	85.99	85.99	88.05	86.58	85.99	85.99
Operational Demand	**6401**	6317	6388	6398	6387	6378	6350	6335	6359	6355	6378
Dispatchable Load	**0**	0	0	0	0	0	0	0	0	0	0
Dispatchable Gen	**6612**	6472	6472	6410	6430	6600	6567	6673	6680	6670	6693
Net Interchange	**208**	152	82	12	41	219	213	335	317	311	311
Available Gen	**9241**	9241	9238	9235	9231	9011	9008	9007	9004	9001	8999
10% Demand	**6401**	6431	6509	6530	6532	6534	6513	6508	6535	6533	6558
LRC Res. Surplus	**0**	1368	1287	1038	1092	870	925	892	862	898	834
LOR Reserve	**0**	3118	3046	2803	2867	2655	2719	2700	2675	2713	2651
N-Q-MNSP1	**07:25**	**07:30**	**08:00**	**08:30**	**09:00**	**09:30**	**10:00**	**10:30**	**11:00**	**11:30**	**12:00**
Flows	**-41**	-41	-33	-25	-25	-41	-41	-57	-55	-49	-49
Losses	**-2.41**	-2.41	-2.22	-1.89	-1.89	-2.41	-2.41	-2.4	-2.41	-2.47	-2.47
Import Limit	**-102**	-102	-102	-25	-25	-102	-102	-102	-102	-102	-102
Export Limit	**38**	65	64	60	60	61	61	62	63	63	63

BROWSER INTERFACE - USERS

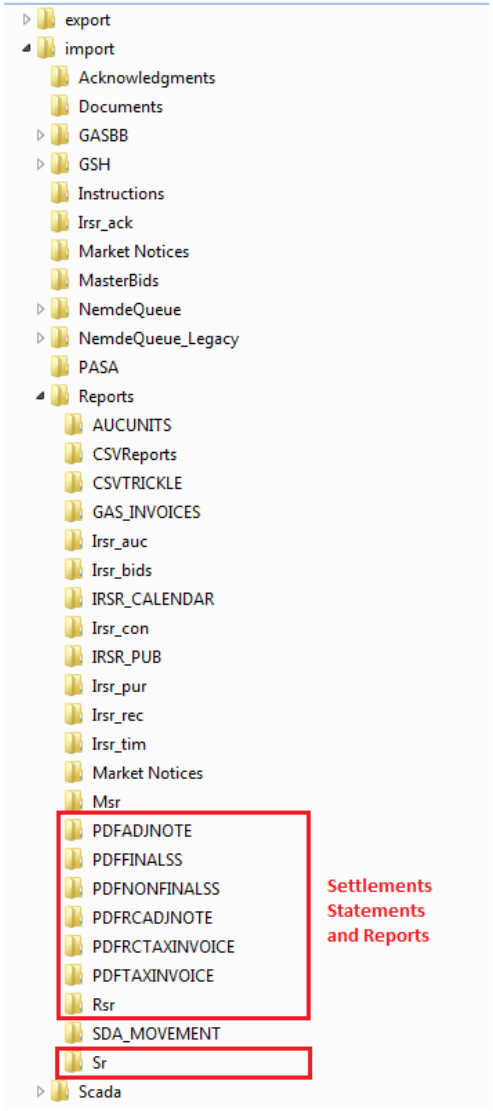
- Is managed through “User Rights Management” (URM)
- URM is a centralised identity repository with de-centralised user administration
- For each Market Participant:
  - AEMO creates a “Participant Administrator” (PA) user
  - The PA can define “Rights” which are a collection of access permissions to the web applications contained within the Portal. These “Rights” definitions are private to the Participant.
  - The PA can create additional users associated with their Participant ID, assigning them “Rights” which match a desired level of access
  - The PA can perform administrative functions such as password resets
  - The PA is responsible to ensure that user accounts within their associated Participant ID are appropriate.
- Further reading: Guide to Information Systems v2.03

BATCH INTERFACE - ABOUT

- Is provided by a file server
- Each Participant has their own private directory
- A standard folder structure is established within each participants private directory
- There are no Business to Market batch transactions for the Wholesale Settlements system. There are some transactions available through the retail system (MSATS) that can assist participants to reconcile their statement to daily NMI energy. This is an optional process.
- Market to Business transactions (e.g. publishing of settlement statement) are completed by publishing the statement file into the appropriate directory.

BATCH INTERFACE – SETTLEMENT STATEMENT

- AEMO publishes settlement statements and reports to specific directories on the participant file server
- Poll the relevant directories to download the files of interest
- Persist these files on your local system when they are retrieved.
- The files can either be left or deleted from the AEMO source directory
- AEMO may purge any uncollected files after a period of time
- There are functionalities within the browser to retrieve files and also place file back in the original publishing directory on the participant file server



DATA INTERCHANGE - OVERVIEW

- DI manages, monitors, and replicates data between AEMO's Electricity Market Management System (EMMS) and a participant's database conforming to the Electricity and/or Gas Data Models
- The core elements of DI are:
  - AEMO applications generate compressed, structured .CSV files into the participant file server, according to the subscriptions managed by participants
  - Participant runs software to download the compressed data from the participant file server across a MarketNet connection.
  - Participant runs software to load this data into one or more local databases at the participant's site, with optional monitoring.
  - Participants manage their local databases.

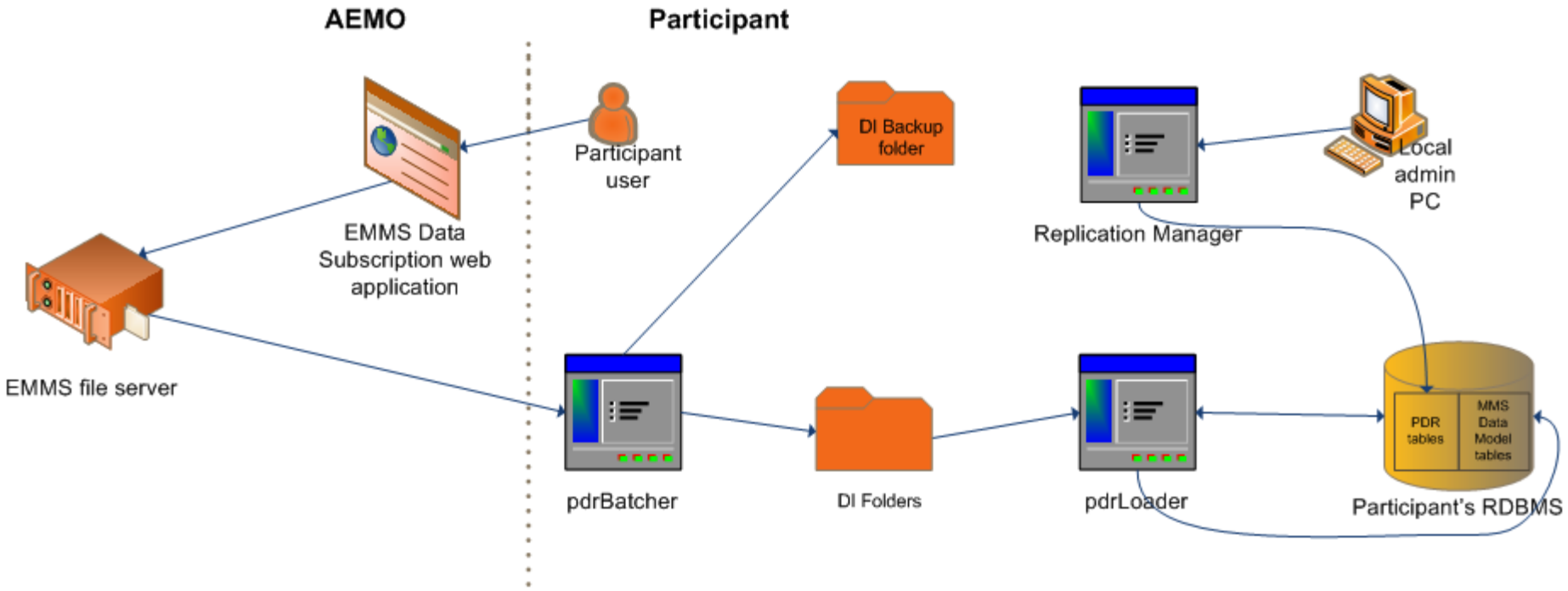
DATA INTERCHANGE - BENEFITS

- A consistent logical data model across the industry
- Supports both high speed delivery (dispatch committed to participants database within 60 seconds), delivery of large data volumes (145MB largest single data set) with QOS
- Fully managed delivery, including data reconciliation and recovery processes to detect and re-fetch missing data

DATA INTERCHANGE – FACTS AND FIGURES IN THE NEM

- Delivering over 4 million files per week to market participants
- Published data volumes at around 130GB/week
- Managed data delivery to over 60 participant sites
- Oracle (11g, 12c) and SQL Server (2008,2012) supported
- Platform independent – installations running on Windows, Linux and Solaris
- Delivered as CLI and full GUI based installer packages

DATA INTERCHANGE - OVERVIEW



DATA INTERCHANGE – ELEC DATA MODEL

- Viewing the market data published in the data model will require the user to have skills in developing SQL queries to retrieve information. Full documentation of the data model tables and entity-relationship diagrams are provided to assist participants with querying the data model
- Fully versioned settlement, billing and prudential data, including the supporting data necessary for a participant to perform a detailed reconciliation of their statement, are available in the data model
- The intention is to extend this data set to cover WA specific settlement functions such as STEM and RCM

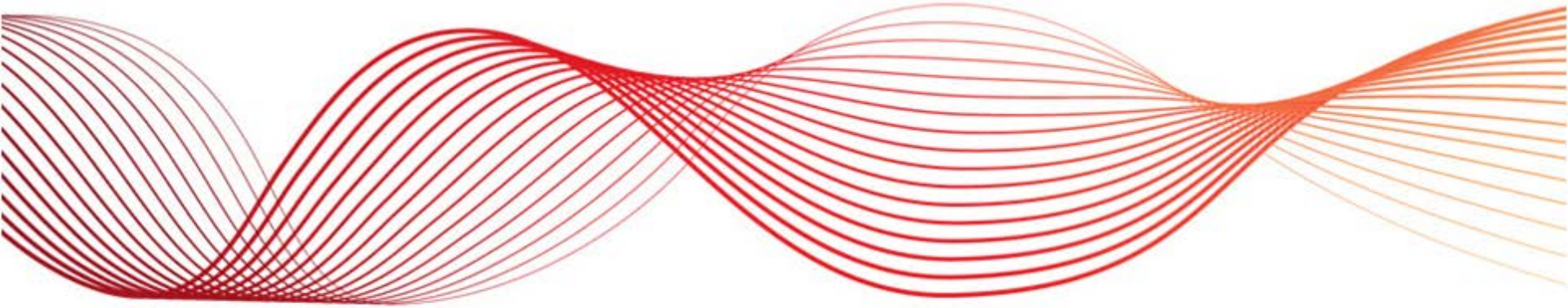
DATA INTERCHANGE – INSTALLATION

To install and maintain a Data Interchange system will require:

- MarketNet connection and Participant ID
- Access credentials to the AEMO participant file server and the Energy Market Systems Portal
- A database to support the participant DI environment. Current supported database platforms are Oracle and Microsoft SQL Server.
- The participant is responsible for hardware, OS and database licencing costs.
- The participant should also have suitable IT support capabilities (platform and DBA) to establish and support the environment.
- Implement updates to the Electricity Data Model every 6 months as new and updated data feeds become available
- Maintain AEMO supplied software on supported versions

QUESTIONS

NEXT MEETING AND CLOSING



NEXT STEPS

- Next meeting: 23 November 2016
- Suggested topics:
  - Constrained on payments
  - Contingency raise recovery
  - Prudential arrangements
- Any other suggestions or comments?