Frequency Contribution Factor Procedure

Stakeholder Technical Workshop 2 (Reporting)

1:30pm-3:00pm AEDT
28 Feb 2023

Agenda

| #	Time	Topic	Presenter(s)
1	10 min	**Introductions**	Hugh Ridgway
2	45 min	**Operational Data**	Shantha Ranatunga/Valerie Lim
3	15 min	**Settlements**	Dimi Botha
4	15 min	**Further discussion (participant led)**	
5	5 min	**Thanks and close**	Hugh Ridgway

Please note that this forum will be recorded for the purposes of assisting AEMO accurately capturing feedback.

Rules requirements

Information	Published when?
Data used to determine default contribution factors (this is historical performance values)	5 business days in advance
Parameters used in the determination of FM, RCR, or Usage	5 business days in advance
CFs, FM (4 second resolution), RCR, Usage	ASAP after Trading Interval
Data used to determine CFs (4 second resolution of unit output/load)	In accordance with the timetable (Spot Market Operations Timetable)

Operational data
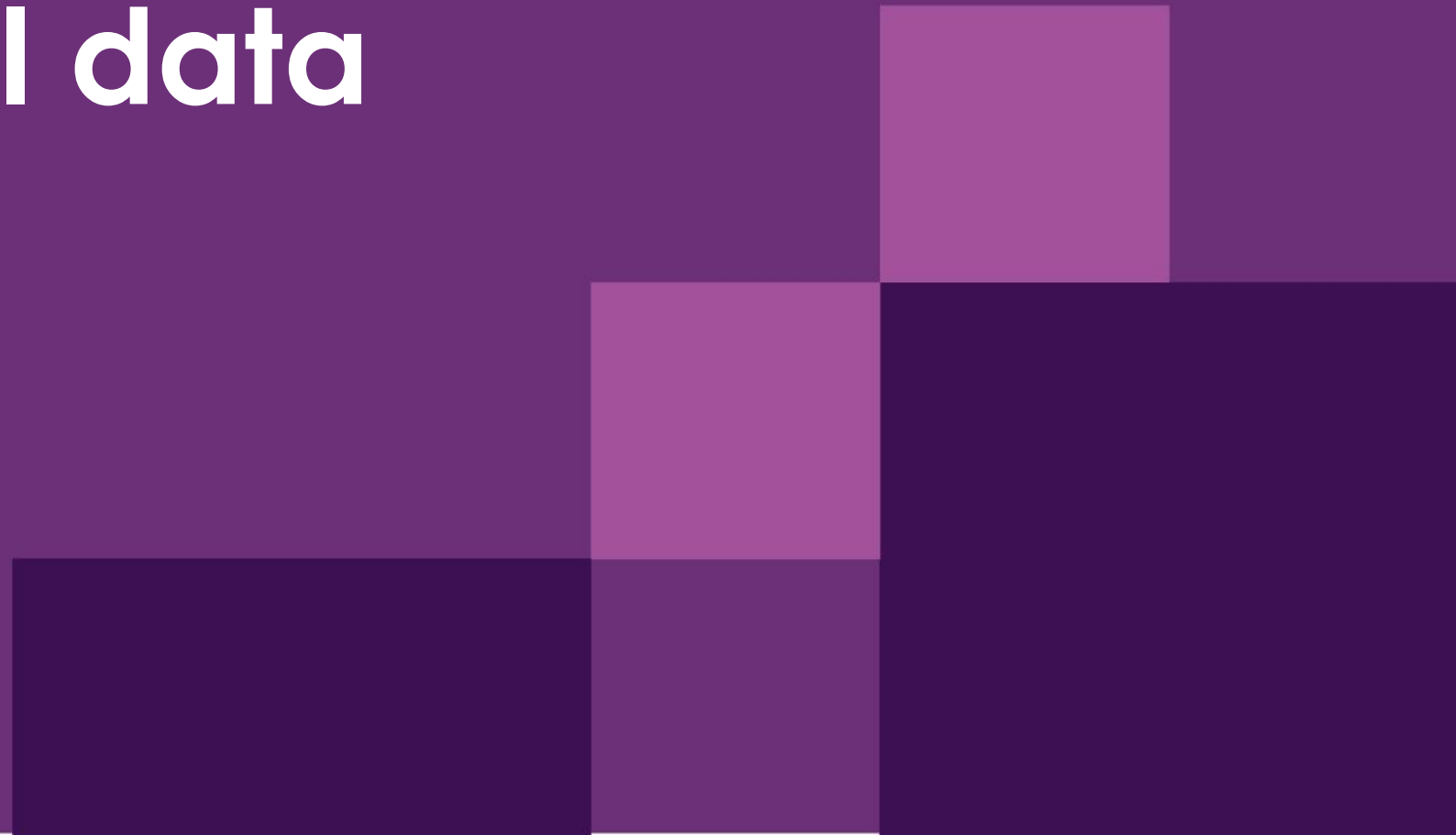
Recap on Trading Amount (TA)

Repeated for every binding requirement (ie binding constraints with regional regulation terms on LHS)

	For individual units	For residual
FPP Payment or recovery	$CF \times \dfrac{P_{regulation}}{12} \times RCR$	$RCF \times \dfrac{P_{regulation}}{12} \times RCR \times \dfrac{TE}{ATE}$
Used Regulation Recovery	$TSFCAS \times U \times NCF$	$TSFCAS \times U \times NRCF \times \dfrac{TE}{ATE}$
Unused Regulation Recovery	$TSFCAS \times (1-U) \times DCF$	$TSFCAS \times (1-U) \times DRCF \times \dfrac{TE}{ATE}$

Term	Common definition
$P_{regulation}$	Marginal cost of the constraint
TSFCAS	Regulation cost to be recovered (after any cost splitting with 5min)
TE	Absolute value of energy
ATE	Sum of absolute value of energy

CF = Contribution factor
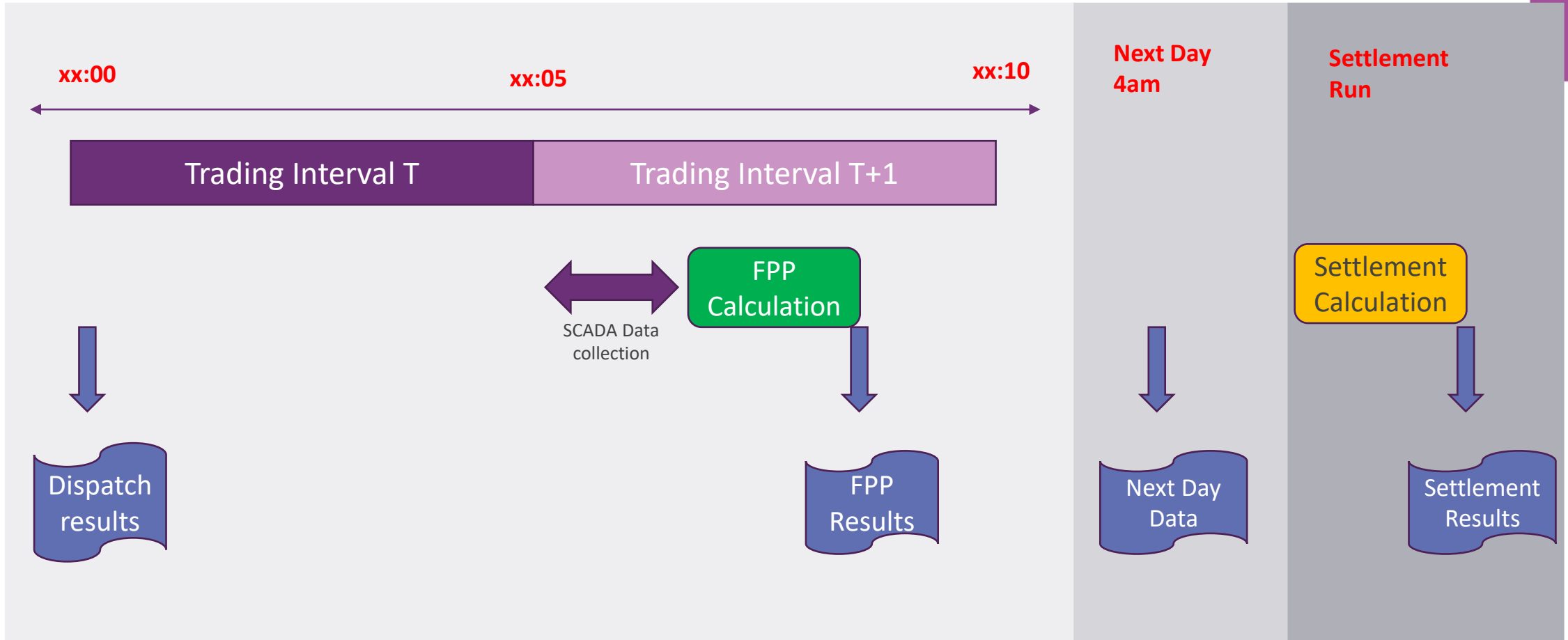- For any requirement
- Sum(**CF**) + **RCF** = 0

NCF = Negative contribution factor
- **NCF** = Min(0, **CF**)   **NRCF** = Min(0, **NCF**)
- Sum(**NCF**) + **NRCF** = -1

DCF = Default contribution factor
- Historical average of NCFs
- Sum(**DCF**) + **DRCF** = -1

5

Conceptual timeline

xx:00   xx:05   xx:10

Trading Interval T	Trading Interval T+1

Next Day 4am

Settlement Run

SCADA Data collection

FPP Calculation

Settlement Calculation

Dispatch results

FPP Results

Next Day Data

Settlement Results

There will also be weekly publication of default performance values

Dispatch Results
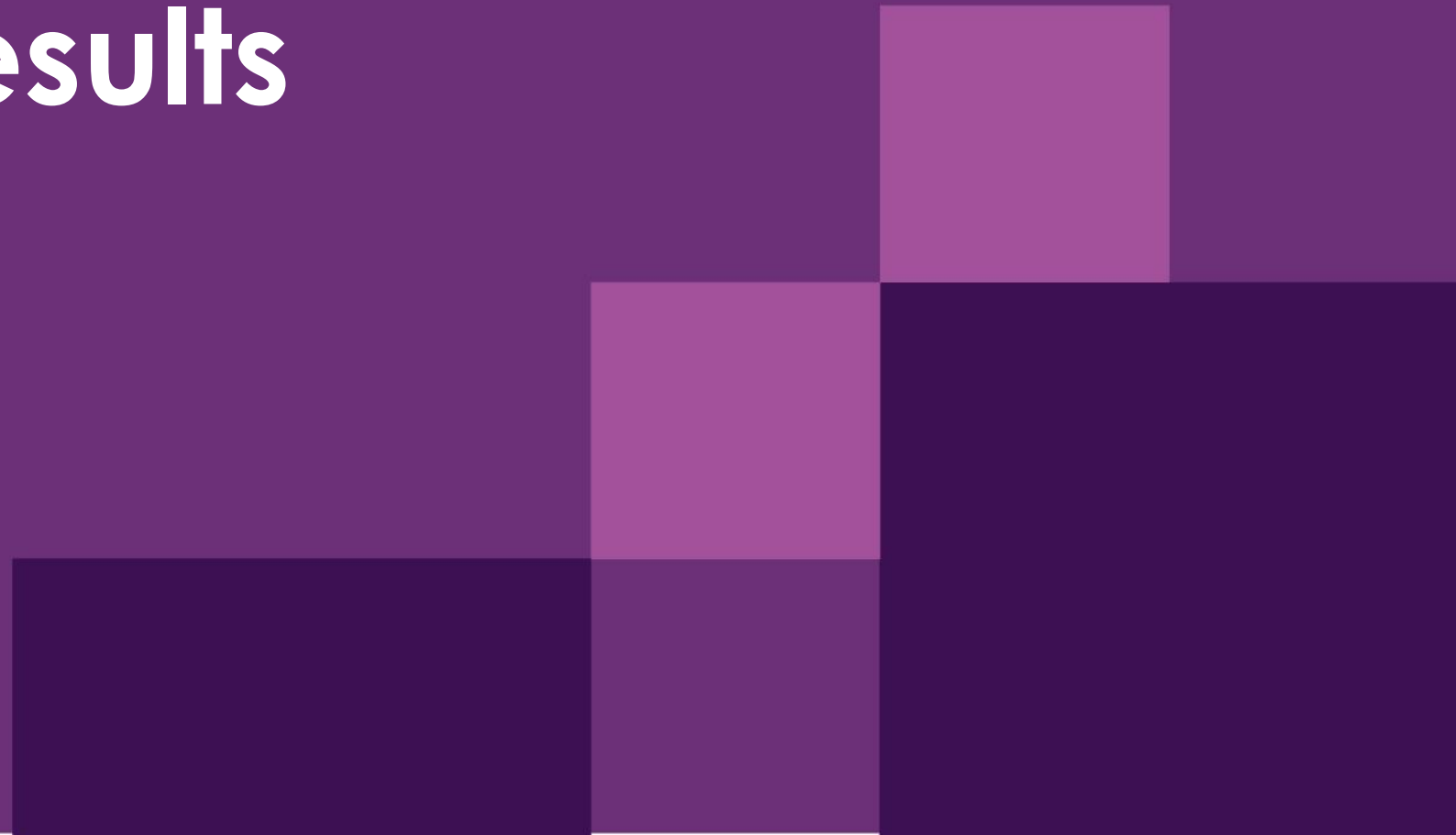
NEMDE results and FCAS requirements

- Published at the start of the Trading Interval
- Dispatch data related to units, interconnectors and constraints

- DISPATCH_FCAS_REQ information
  - Table will be revised since Market Participant Factors (MPFs) and estimated rates are not available at the start of the interval
  - It will include information on binding FCAS constraints
    - Marginal Cost – to be used as $P_{regulation}$
    - Adjusted Cost – to be used as *TSFCAS*

FPP inputs and results

Frequency Measure (FM): 4-seconds resolution

- Will be published after the FPP calculation
- NER 3.14.6AA(k)(2)

Item	Sample
DTime	20/07/2021 04:06:16
RegionID	NSW1
Frequency_Deviation (*FD*)	0.015
Frequency_Measure (*FM*)	0.02116

Private: Unit Performance and Contribution Factors (CF)

- Will be published confidentially after the FPP calculation
- NER 3.15.6AA(l) and (k)(1)

Item	Sample
Interval_DateTime	20/07/2021 04:10
UnitID	xxx01
Raise_Performance (P^{raise})	4.8972
Lower_Performance (P^{lower})	-0.4188

Item	Sample
Interval_DateTime	20/07/2021 04:10
UnitID	xxx01
ConstraintID	F_I+RREG_0220
Bidtype	RAISEREG
Contribution_Factor (CF)	0.0028

Performance and CF for residual will also be published to all

Requirement for Corrective Response (RCR) and Regulation Usage (U)

- Will be published after the FPP calculation
- NER 3.15.6AA(k)(3) and (4)

Item	Sample
Interval_DateTime	20/07/2021 04:10
ConstraintID	F_I+RREG_0220
Bidtype	RAISEREG
Requirement_for_Corrective_Response (RCR)	332.62
Usage (U)	0.3455

Exclusions due to FM or Bad Inputs

Item	Sample
Interval_DateTime	20/07/2021 04:10
Regionid	NSW1
FCAS_Type	RAISEREG
Region_Exclusion_code	2

Region Exclusion Code	comment
1	Majority Bad SCADA
2	4sec intervals with correct FM sign below minimum count
3	FM value not reaching the threshold
4	…

Item	Sample
Interval_DateTime	20/07/2021 04:10
ConstraintID	F_I+RREG_0220
Const_Exclusion_code	1

Constraint Exclusion Code	comment
1	FM test not passing all relevant regions
2	Good quality test not passing all relevant regions
3	FM mismatch between regions
4	FM mismatch between islands
5	…

Estimated recovery rates

- Can be published after the FPP calculation

- Rates can be per performance value or contribution factor

- Residual rates are per MWh of energy

Item	Sample
Interval_DateTime	20/07/2021 04:10
ConstraintID	F_I+RREG_0220
Bidtype	RAISEREG
P_Regulation ($P_{regulation}$)	
TSFCAS	
PAYMENT_RATE_UNIT_FPP	
PAYMENT_RATE_RESIDUAL_FPP	
RECOVERY_RATE_UNIT_FPP	
RECOVERY_RATE_RESIDUAL_FPP	
RECOVERY_RATE_UNIT_USED	
RECOVERY_RATE_RESIDUAL_USED	
RECOVERY_RATE_UNIT_UNSUSED	
RECOVERY_RATE_RESIDUAL_UNUSED	

Example

- Rates per performance value vs rates per contribution factor

Item	Sample
UnitID	xxx01
Performance for xxx01 (P)	5
Absolute value of sum of performance for requirement (AP)	100
Contribution Factor for xxx01 (CF)	0.05
RCR for requirement	600
$P_{regulation}$ for requirement	30
PAYMENT_RATE_UNIT_FPP per Performance ($/MWHz) $$\frac{TA}{P} = \frac{1}{AP} \times \frac{P_{regulation}}{12} \times RCR$$	= (1/100) x (30/12) x 600 = 15
PAYMENT_RATE_UNIT_FPP per Contribution Factor ($) $$\frac{TA}{CF} = \frac{P_{regulation}}{12} \times RCR$$	= (30/12) x 600 = 1500

Question:

- What is the value to participants of AEMO publishing TA estimates (near) real time?

- Would it be beneficial to wait till the next day for settlement estimates?

- Note: Not possible to estimate TA amounts for residual loads since we are not able to estimate the TE for individual loads

Next Market Day Publications
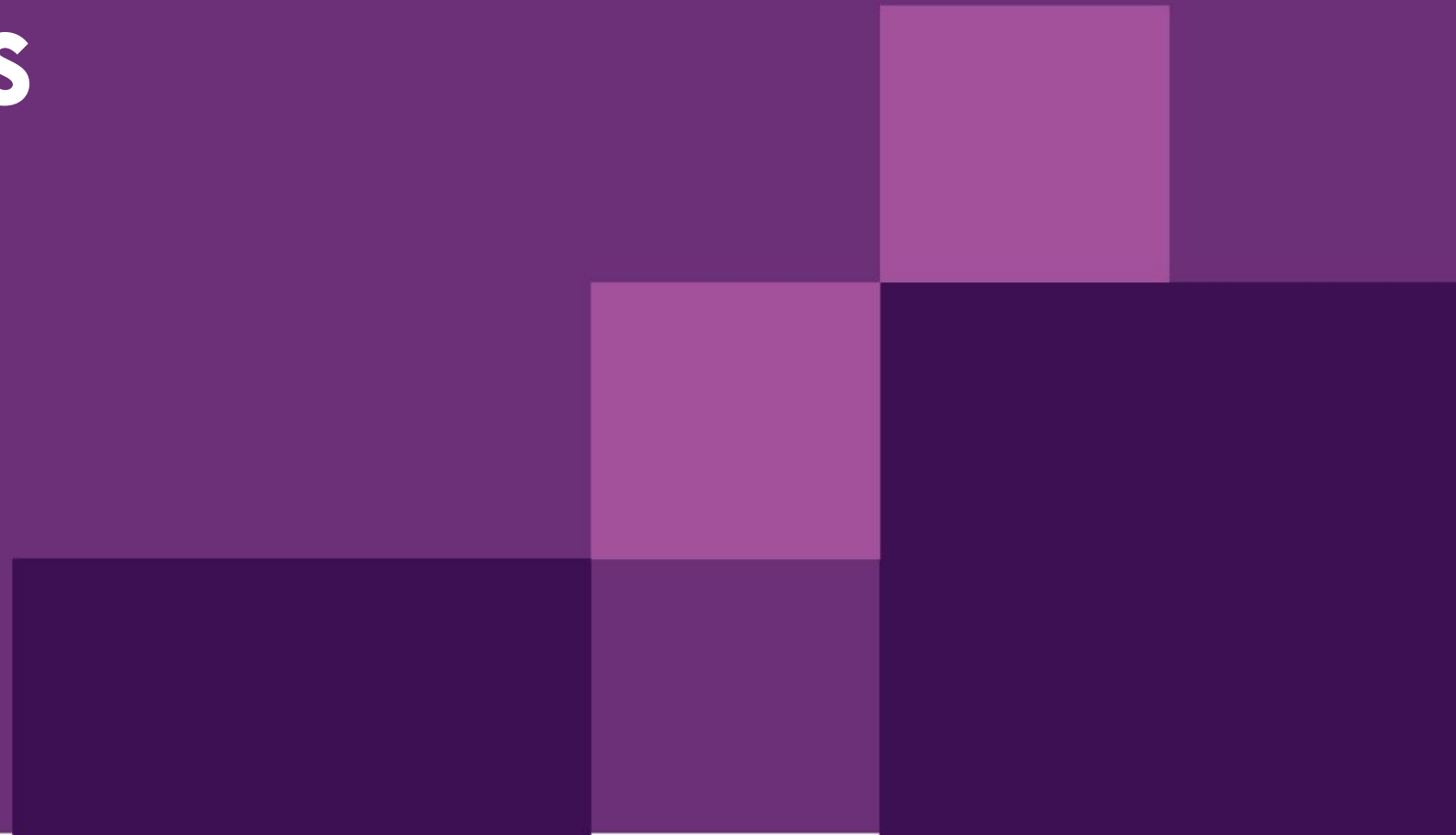
Unit data: 4 second resolution

- Unit outputs are confidential during the market day
- Volume can be over 10 million rows per day
- Proposed to publish on next market day through NEMWEB

Public: Unit Performance and Contribution Factors

- Will be published to all next market day

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Interval_DateTime	20/07/2021 04:10
UnitID	xxx01
Raise_Performance (P^{raise})	4.8972
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Item	Sample
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ConstraintID	F_I+RREG_0220
Bidtype	RAISEREG
Contribution_Factor (CF)	0.0028

Performance and CF for residual will also be published to all
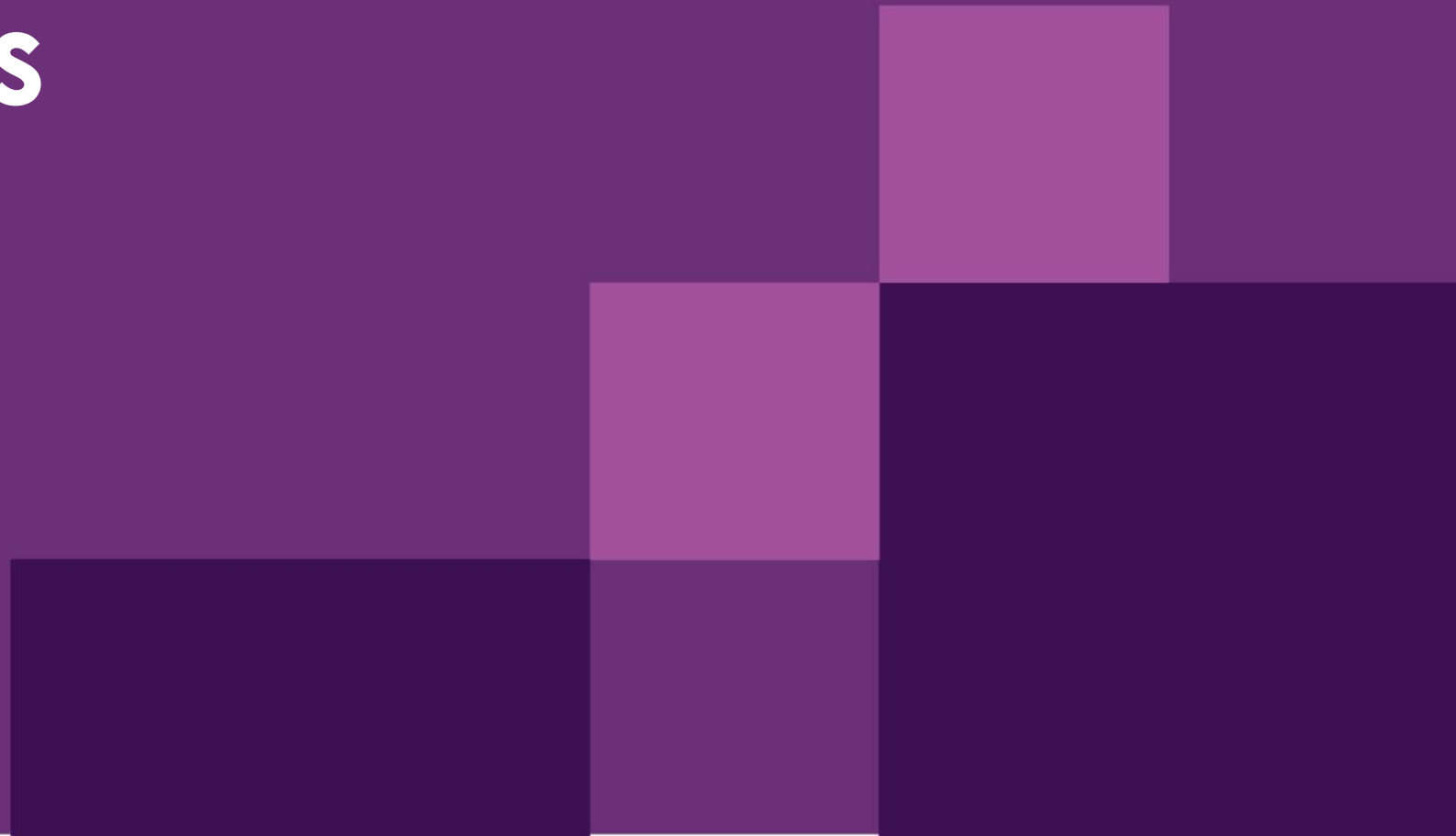
Weekly Data Publications
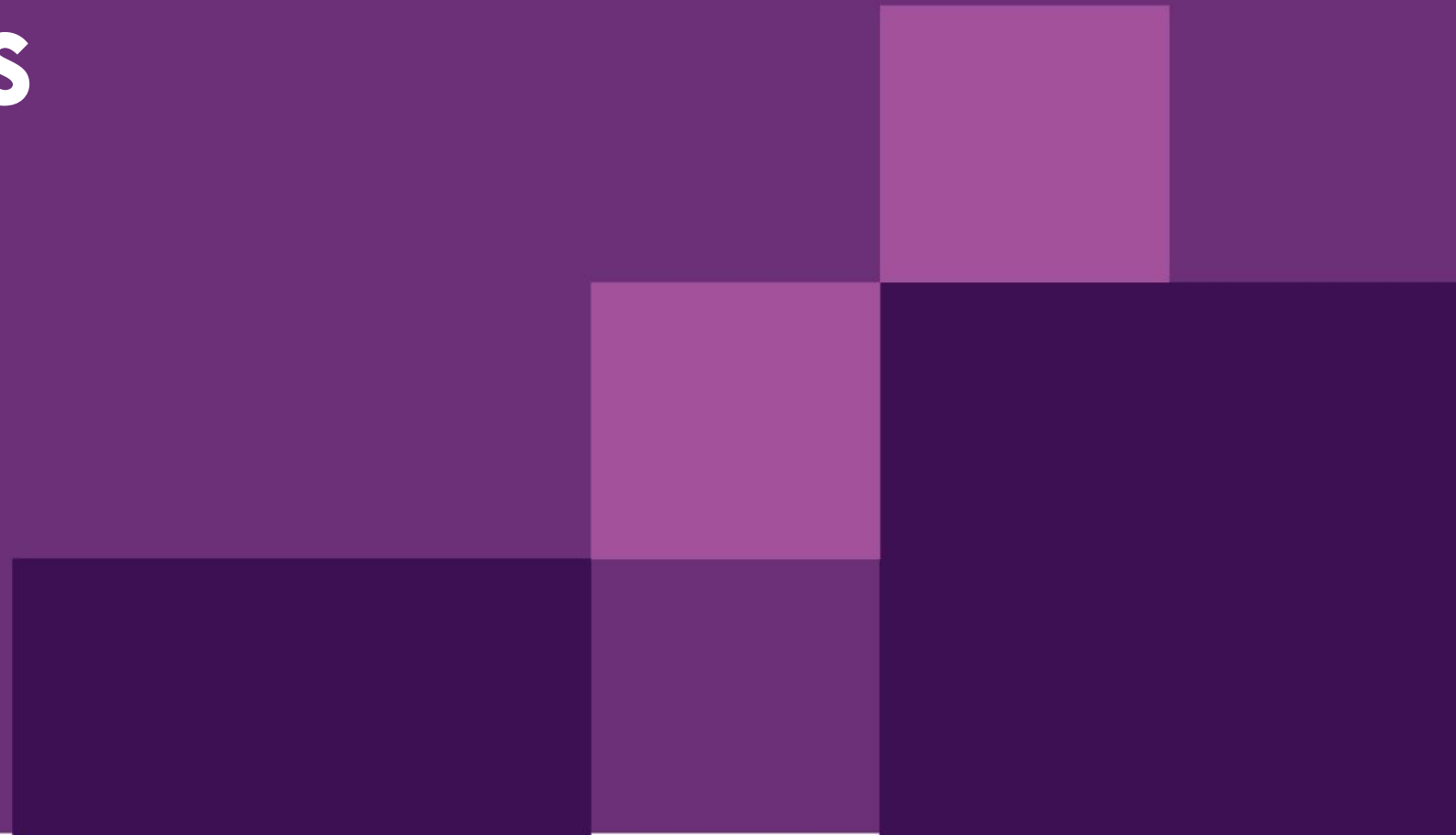
Default contribution factors

- Published weekly
- NER 3.15.6AA(i)

Item	Sample
WeekStarting	20/07/2021 00:00
WeekEnding	27/07/2021 00:00
UnitID	Xxx01
Regulation FCAS Default_Raise_Performance	-0.32
Regulation FCAS Default_Lower_Performance	-1.42
FPP Default_Raise_Performance	0
FPP Default_Lower_Performance	-2.64

Pre-dispatch publications

Pre-dispatch publication requirements

Same as dispatch constraint information can be published for pre-dispatch

- Predispatch_fcas_requirement

Contribution factors are calculated ex-post

- There is no way to estimate the CF in pre-dispatch time
- RCR and usage also can't be forecasted

FPP amounts and used recovery amounts can't be forecasted

Default CFs are known at the pre-dispatch time

- Is there any value in forecasting regulation recovery costs assuming U=0 ?

Configuration parameters

- 5 days in advance as per NER 3.15.6AA(j)
- α (alpha) Smoothing Factor
- RCR cap coefficient

Data Visualisations

- AEMO is considering feasibility of including visualisations
- Please indicate what information would be useful for example:
  - Graphic showing contribution factors across time with respect to each DUID and requirement

Settlement Reports

Reporting Changes (1/3)

EMMS Participant Portal Statements and Reconciliation files

Report Type	Updates/Comments
PDF Settlement Statement	No change
Settlement report (SR) - TXT	Addition of FPP reconciliation summary by willing week for payment and recovery. Ie Eligible/Residual as well as used and unused totals.
Confidential settlements	Update to include eligible and residual payment/recovery reconciliation for used and unused calculations on a daily/5min interval level
Confidential Billing	Aggregation of changes made to Confidential settlements report by billing week
Public Settlements	Limited change, update of FPP summary of service type recovery amounts on market level
Public billing	No Change

The following *INDICATIVE* settlement table/report changes to accommodate the FPP rule requirements and may be subject to change during development and requirements.
We are seeking your feedback/input proposed changes.

Reporting Changes (2/3)

Data Interchange Public and Private tables

Report Type	Updates/Comments
SET_ANCILLARY_SUMMARY	Update to include eligible and residual payment/recovery reconciliation for used and unused calculations on 5min interval level
SET_FCAS_PAYMENT	Update to include eligible and residual **payment** reconciliation on 5min interval level
SET_FCAS_RECOVERY	Update to include eligible and residual **recovery** reconciliation for used and unused calculations on 5min interval level
SET_FCAS_REGULATION_TRK	May be deprecated and replaced with new contribution factors table - current table decommissioned post go live
BILLINGASPAYMENTS	Aggregate of SET_FCAS_PAYMENT table changes by billing week
BILLINGASRECOVERY	Aggregate of SET_FCAS_RECVOERY table changes by billing week

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Reporting Changes (3/3)

AEMO Website and NEMWEB

Report Type	Expected change
AEMO Website : • AS Payment summary file • AS Recovery summary file	additional eligible and residual payment and recovery columns
NEMWEB: Public settlements report	No change

The following *INDICATIVE* settlement table/report changes to accommodate the FPP rule requirements and may be subject to change during development and requirements.
We are seeking your feedback/input proposed changes.

Useful links

- NEMWEB
  http://nemweb.com.au/Reports/Current/
- DATA MODEL
  http://nemweb.com.au/Reports/Current/MMSDataModelReport/Electricity/MMS%20Data%20Model%20Report_files/MMS_297.htm#1
- AEMO Ancillary services
  https://aemo.com.au/en/energy-systems/electricity/national-electricity-market-nem/data-nem/ancillary-services-data/ancillary-services-payments-and-recovery

Further Discussion

For more information visit

aemo.com.au

https://aemo.com.au/consultations/current-and-closed-consultations/frequency-contribution-factors-procedure