

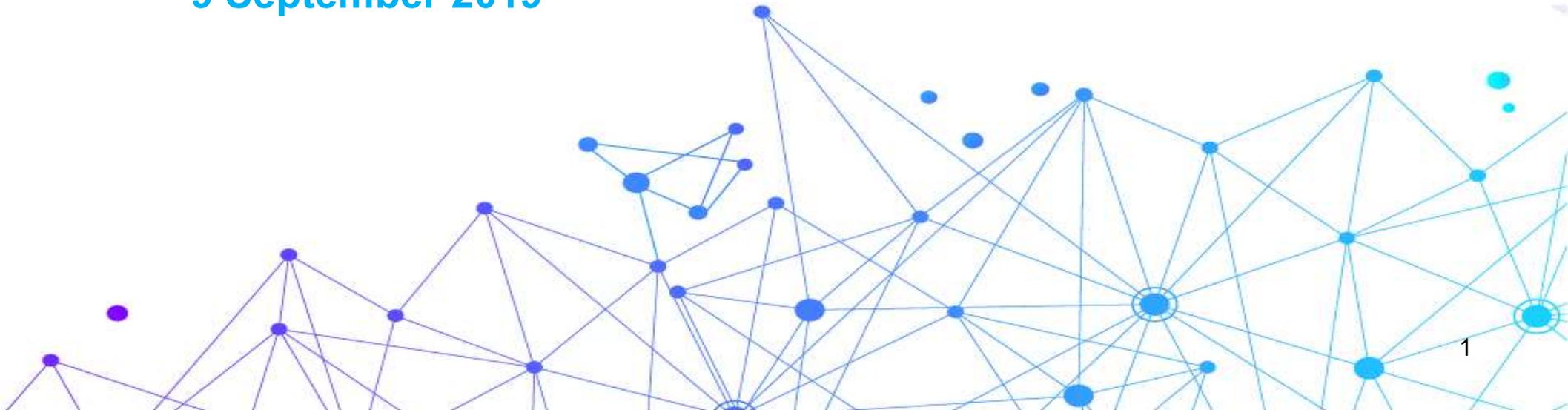


**Energy Transformation
Implementation Unit**

Transformation Design and Operations Working Group

Meeting 2

9 September 2019



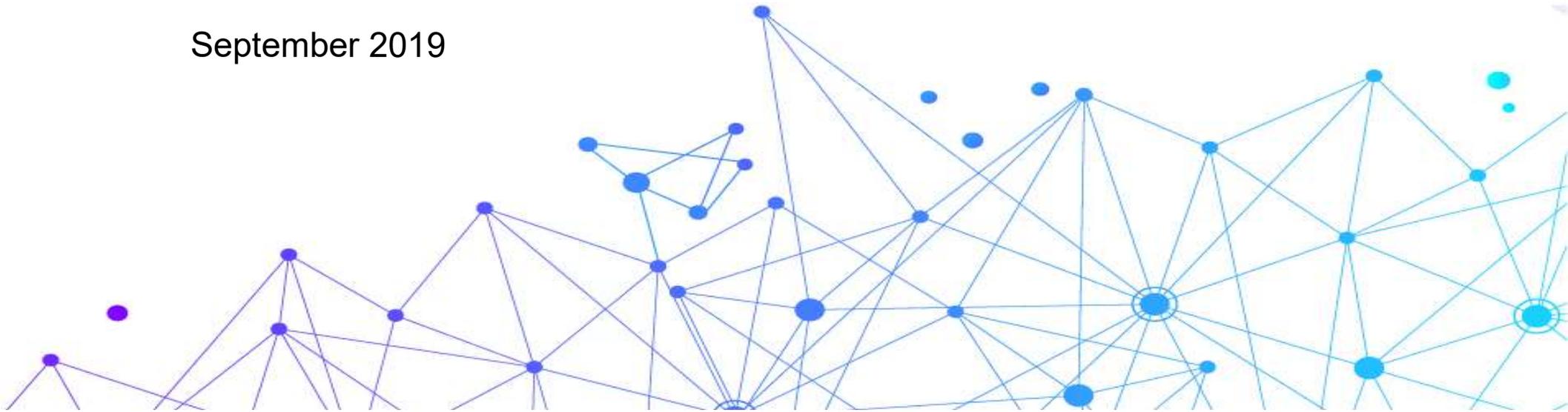


**Energy Transformation
Implementation Unit**

Settlement – Part 1

TDOWG Meeting 2

September 2019



SETTLEMENTS OVERVIEW

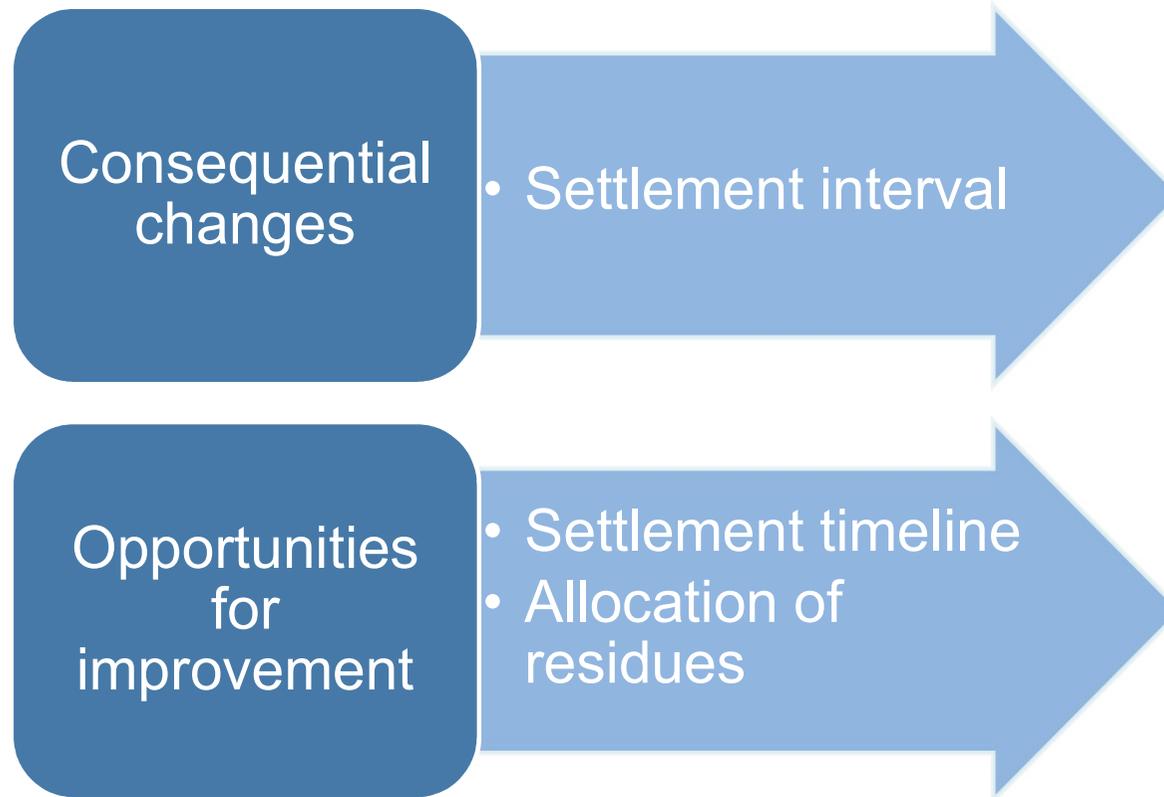
Settlement Part 1

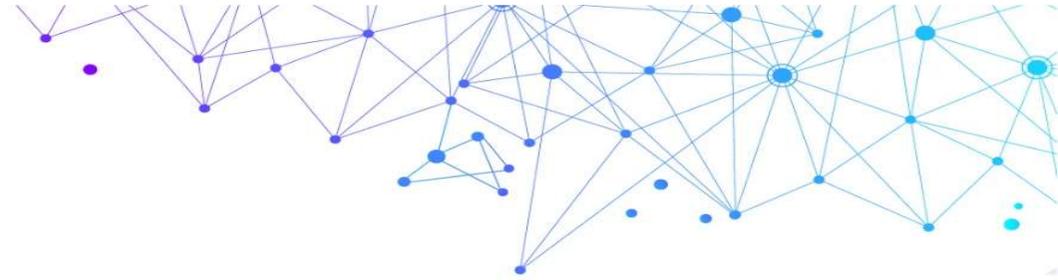
- Settlement interval
- Settlement timeline
- Allocation of settlement residues

Settlement Part 2

- Changes to settlement of energy, ESS and RCM
- Uplift payments

CONTEXT





1. Settlement interval

MISALIGNMENT WITH DISPATCH INTERVAL

A 5 minute dispatch interval and 30 minute settlement interval would create several economic inefficiencies:

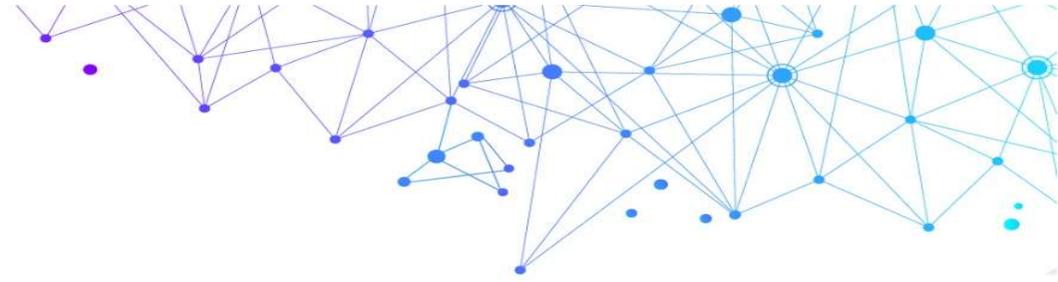
Dilute
investment
signals

Disorderly
bidding

Inaccurate
uplift
payments

Inaccurate
allocation of
ESS costs

Dispatch and settlement intervals will be aligned to five-minutes.



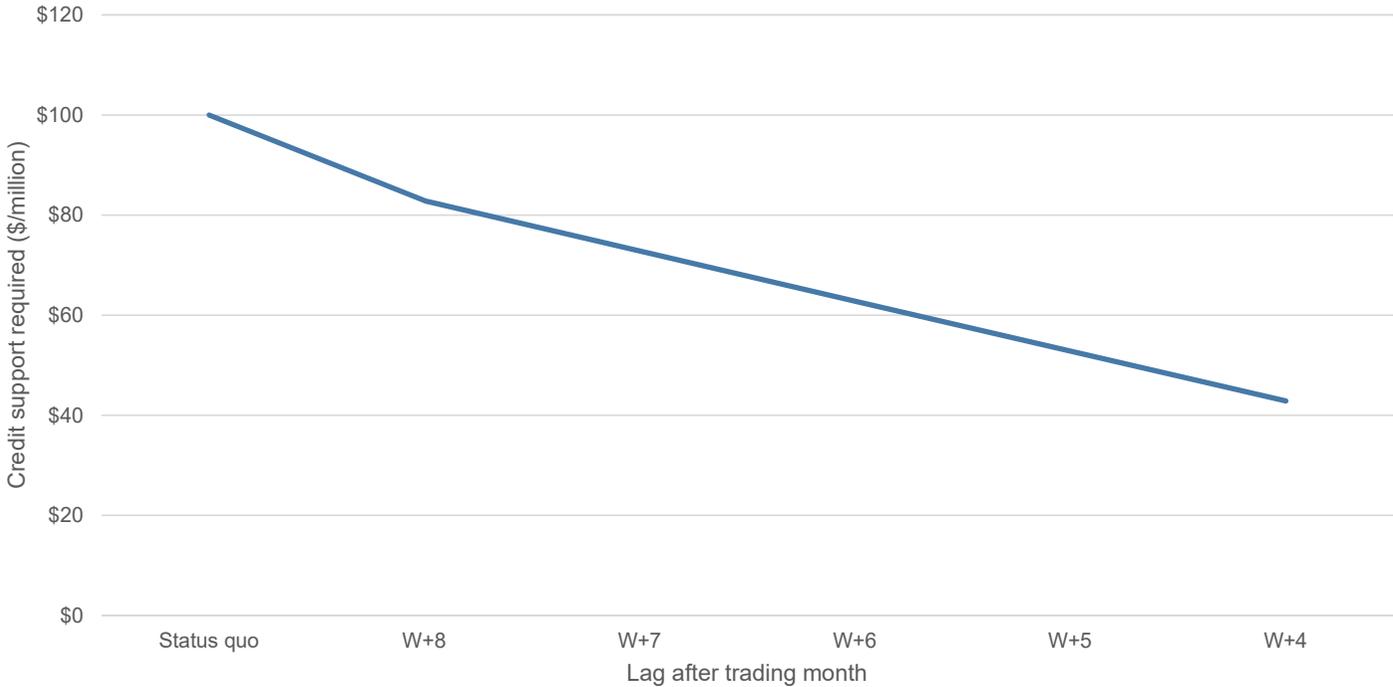
2. Settlement timeline

CURRENT SITUATION



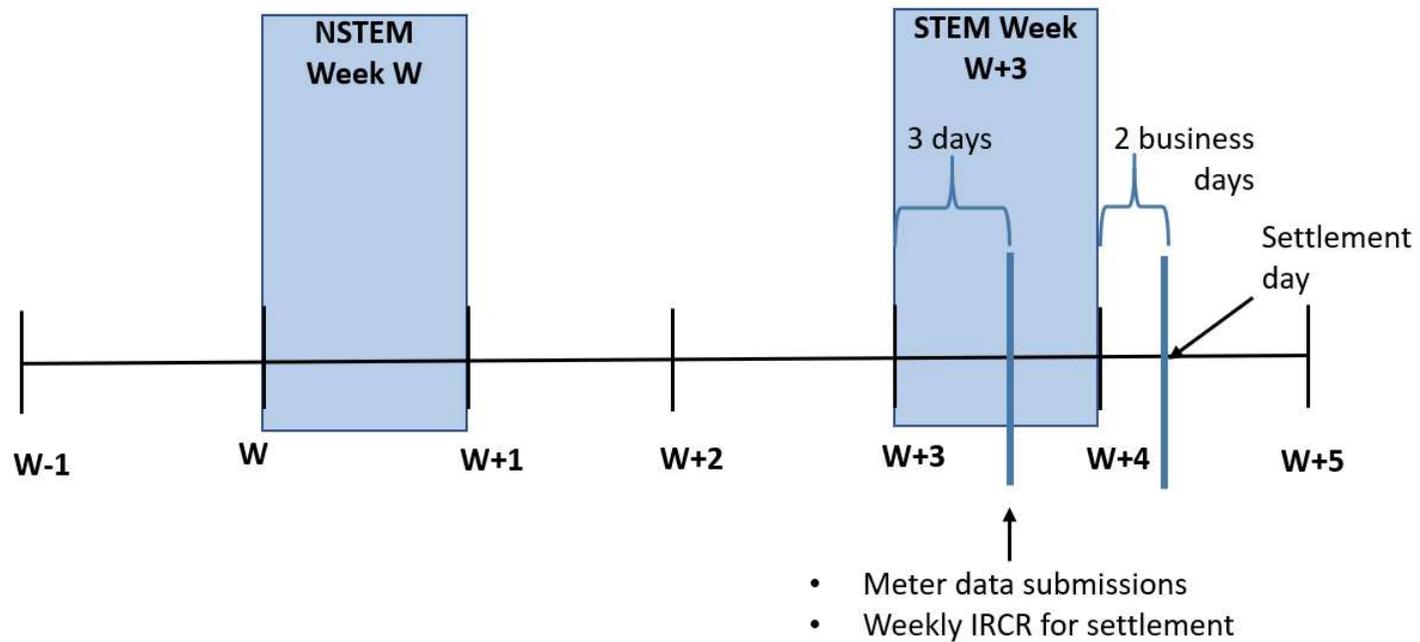
Barrier to entry

DECREASE PRUDENTIAL REQUIREMENTS

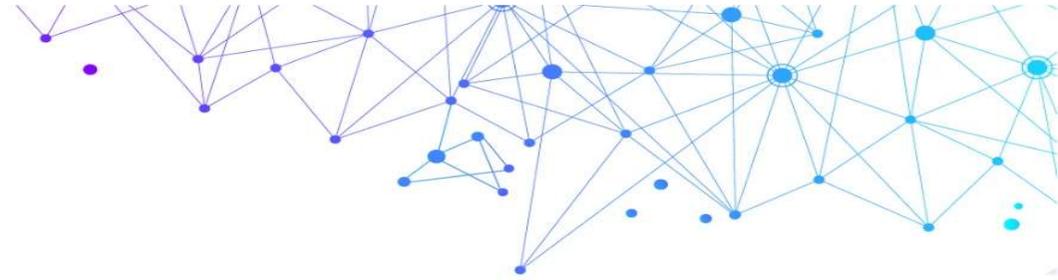


Decreased barrier to entry

SETTLEMENT TIMELINE

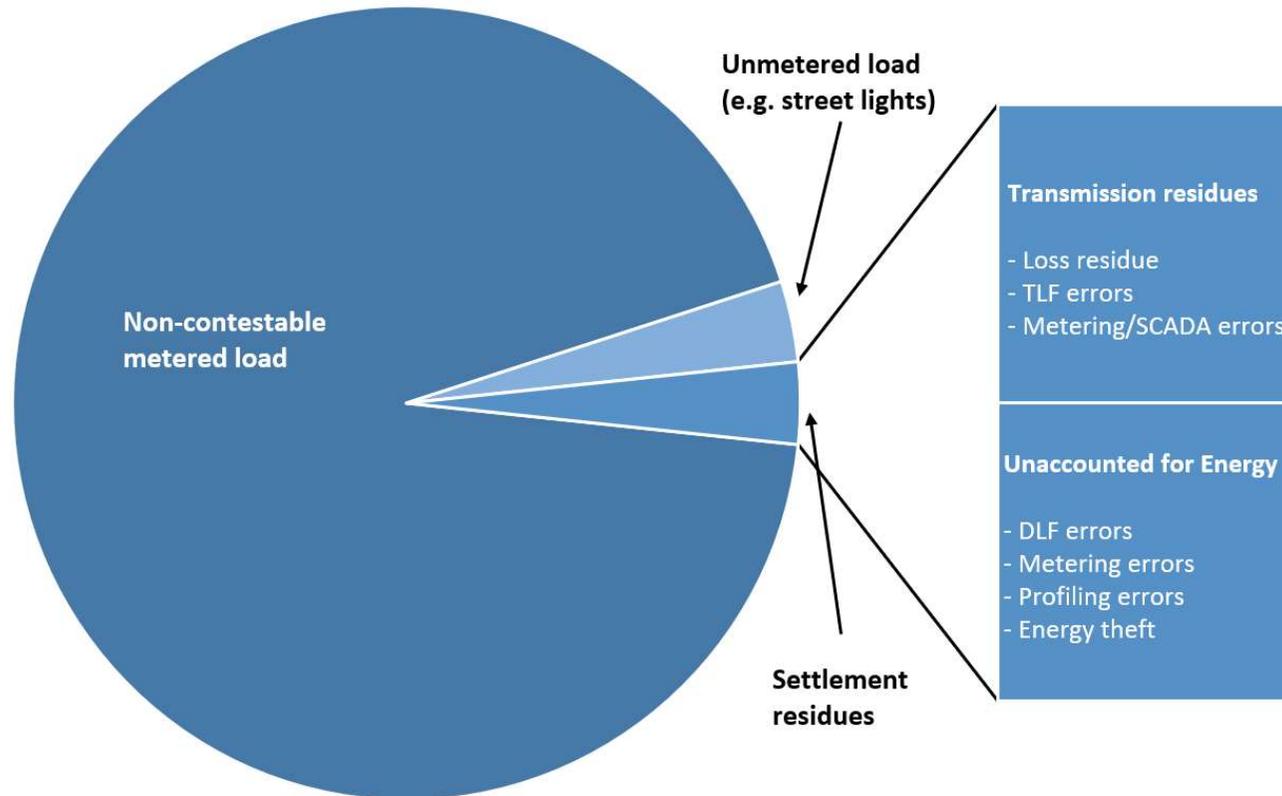


Decrease administration costs



3. Settlement residues

NOTIONAL WHOLESALE METER



This chart is for illustrative purposes only.

ALTERNATIVE APPROACHES

Global settlement

- Transmission and distribution residues are explicitly calculated. This enables both transmission and distribution residues to be calculated explicitly rather than allocated by default to the NWM.

Settlement by difference

- Only transmission residues are explicitly calculated. This enables transmission residues to be calculated explicitly. Distribution residues are allocated Synergy.

SETTLEMENT BY DIFFERENCE

- Implementation can be challenging.
- Residues vary from year to year.

Retain the Notional Wholesale Meter at this time



Outage Management

TDOWG Meeting 02
9 September 2019

Introduction

- The purpose of these slides is to share the thinking we have done around the applicability of the current outage management framework for a move to SCED.
- The investigation so far has focused on the key principles in the current framework that:
 - Should be retained
 - Have been recently modified, and determining ongoing suitability
 - Should be modified
 - Should be removed
- The following slides will walk through the key principles of outage management in the WEM considering each of the above points.

Principle # 1

Retain Centralised Outage Management

AEMO carries an obligation in the WEM to centrally manage participant outages, for both generation and network operator participants.

There are two key reasons for having a centralised outage management process;

- to ensure security and reliability and to assess and manage risks, and
- to provide the best opportunity to enhance market efficiency through transparency and coordination.

Additionally the RCM mechanism uses outages as a mechanism for managing refunds and outage rates.

Principle #2

Retain the definition of unavailability

- The Outage framework revolves around the core concept of identifying facilities or equipment that are obliged to submit or notify outages. It also requires a definition of when a participant is required to submit or notify.
- Retain the 2013_15 rule change, clause 3.18.1B for the definition of 'unavailability' for the purpose of outage submission.
- Retain the obligation not to submit a planned outage if it is aware of potential unavailability during the outage period.

Principle #3

Retain the 2013_15 rule changes for availability declaration requirements

- If conditions change after an outage has been processed that results in the participant no longer being able to confirm the facility would have otherwise been available during the outage period, this does not affect the status of the planned outage.
- Market participants are obliged to notify AEMO of the changed circumstances (and update relevant outage details) as this will affect outage extension requests.
- Market participants are exempt from this notification when conducting Mandatory Routine Maintenance, and the timeframe for being able to reasonably re-schedule that maintenance has expired.

Principle #4

Retain the principle of developing, maintaining and publishing equipment list

- AEMO must develop, maintain and publish a list of equipment and facilities that is required to be subject to the outage scheduling process.
- Not practical to cover all equipment in the SWIS in a “list” (e.g. all network equipment). Key criteria for only those equipment and facilities that have the potential to affect power security and reliability (including partial outages/de-ratings).
- Retain the 2013_15 rule changes, but also consider expanding to include:
 - Inclusion of secondary assets covering protective relaying and SCADA/communication equipment.
 - Allow for information only network outages (similar to self-scheduling outage facilities).

Principle #5

Retain requirement for notification of outages to AEMO for non-equipment list generation facilities

- Currently registered facilities with nameplate capacity of less than 10 MW are not on the Equipment List, but must still notify outages.
- With the 2013_15 rule change:
 - All Scheduled facilities with capacity credits must be on the Equipment List
 - Non-Scheduled facilities with capacity credits and nameplate capacity ≥ 10 MW must be on the Equipment List
 - Intermittent Loads with nameplate capacity ≥ 10 MW must be on the Equipment List
 - Other registered facilities not on the Equipment List are required to notify only.
 - Non-scheduled facilities have a deadband (materiality threshold for reporting outages) for which they are not required to submit outages.
- AEMO still require the information about the availability of these type of facilities as this may impact outage and other security/reliability assessments. Consideration:
 - Intermittent load permission to consume additional load from the network

Principle #6

Retain and modify the requirement for participants to submit outage information

- AEMO to be able to define certain data requirements in a market procedure with the WEMR defining minimum requirements. This allows for different types of information to be provided for different purposes (e.g. service outage).
- This would provide greater flexibility to either add or remove data requirements easily and would minimise rule complexity.
- Some of the potential data to be considered;
 - Single point of contact, identified by name or position and contact number
 - Type of Outage (derating, inspection, complete outage)
 - Brief description of the purpose of the outage and specific requirements or information pertinent to the outage such as loading levels for the test of a generation facility.

Principle #7

Retain the key
timelines for outage
plan submission

- Participants are able to submit an outage plan to AEMO:
 - Up to 3 years in advance
 - With regards to clause 3.18.5, equipment list outages should be submitted at least one year prior to the proposed start date (but “may” submit later).
 - There are benefits to market participants submitting outage plans >1 year in advance – queueing concept and compensation
 - The hard cut off for scheduled outages is 2 days prior to the proposed start date
 - Changes to start/end date to expand the outage window, or increases in outage quantity are treated as new outage submissions
 - Must reflect shorten outage details prior to coming back in service
- For Forced Outages, notify asap after outage Within 15 business days provide full details.
- With the move to a constrained access regime, binding network constraints can have a significant impact on market participants and market outcomes. Therefore something to consider is a specified timeline for formal notifications of Forced Outages rather than just asap. This is something that we will investigate for future working groups.

Principle #8

- Retain the principle of opportunistic maintenance

- Duration of the outage does not exceed 24 hours.
- Outage period is separated by at least 24 hours from another opportunistic outage period.
- Subject to AEMO approval;
 - Sufficient information available
 - Sufficient time available to assess
 - Meets the assessment criteria (which would be slightly different to normal assessment criteria).
- Some considerations to resolve:
 - Opportunistic outage approval criteria with regards to network/market impacts
 - Having no gate closure, has implications for approval timeline.

- 3.18.11. System Management must apply the following criteria when evaluating Outage Plans:
- (a) the capacity of the total generation and Demand Side Management Facilities remaining in service must be greater than the second deviation load forecast published in accordance with clause 3.16.9(a)(iii) or clause 3.17.9(a)(iii), as applicable;
 - (aA) the total capacity of the generation Facilities remaining in service, and System Management's reasonable forecast of the total available Demand Side Management, must satisfy the Ready Reserve Standard described in clause 3.18.11A;
 - (b) the transmission capacity remaining in service must be capable of allowing the dispatch of the capacity referred to in clause 3.18.11(a);
 - (c) the Facilities remaining in service must be capable of meeting the applicable Ancillary Service Requirements;
 - (d) the Facilities remaining in service must allow System Management to ensure the power system is operated within the Technical Envelope; and
 - (e) notwithstanding the criteria set out in clause 3.18.11(a) to (d), System Management may allow an outage to proceed if it considers that preventing the outage would pose a greater threat to Power System Security or Power System Reliability over the long term than allowing the outage.

Principle #9

DSM capacity to count towards available capacity

- Historically DSM capacity has not been used in reserve margin calculations, but System Management is currently investigating this.
- If an outage potentially would be 'denied' or rescheduled, the assessment would look at the DSM availability as part of the decision.
- Some technical issues that need to be investigated:
 - Estimation of available DSM capacity over longer time periods (e.g. PASA)
 - Monitoring of available DSM capacity in shorter time periods.

Principle #10

Retain the principle of meeting Essential System Service requirements

- As part of the outage assessment, facilities remaining in service must be capable of meeting the applicable Essential System Service requirements;
 - E.g. sufficient system restart unit, sufficient regulation and contingency service.
- Per recommendation in GHD report, review/revise the wording of the current Ready Reserve Standard to align with ESS framework;
 - E.g. ensuring sufficient capacity is available to recover services within appropriate timeframes.

Principle # 1 1

Retain the principle of sufficient network capacity to maintain security/reliability

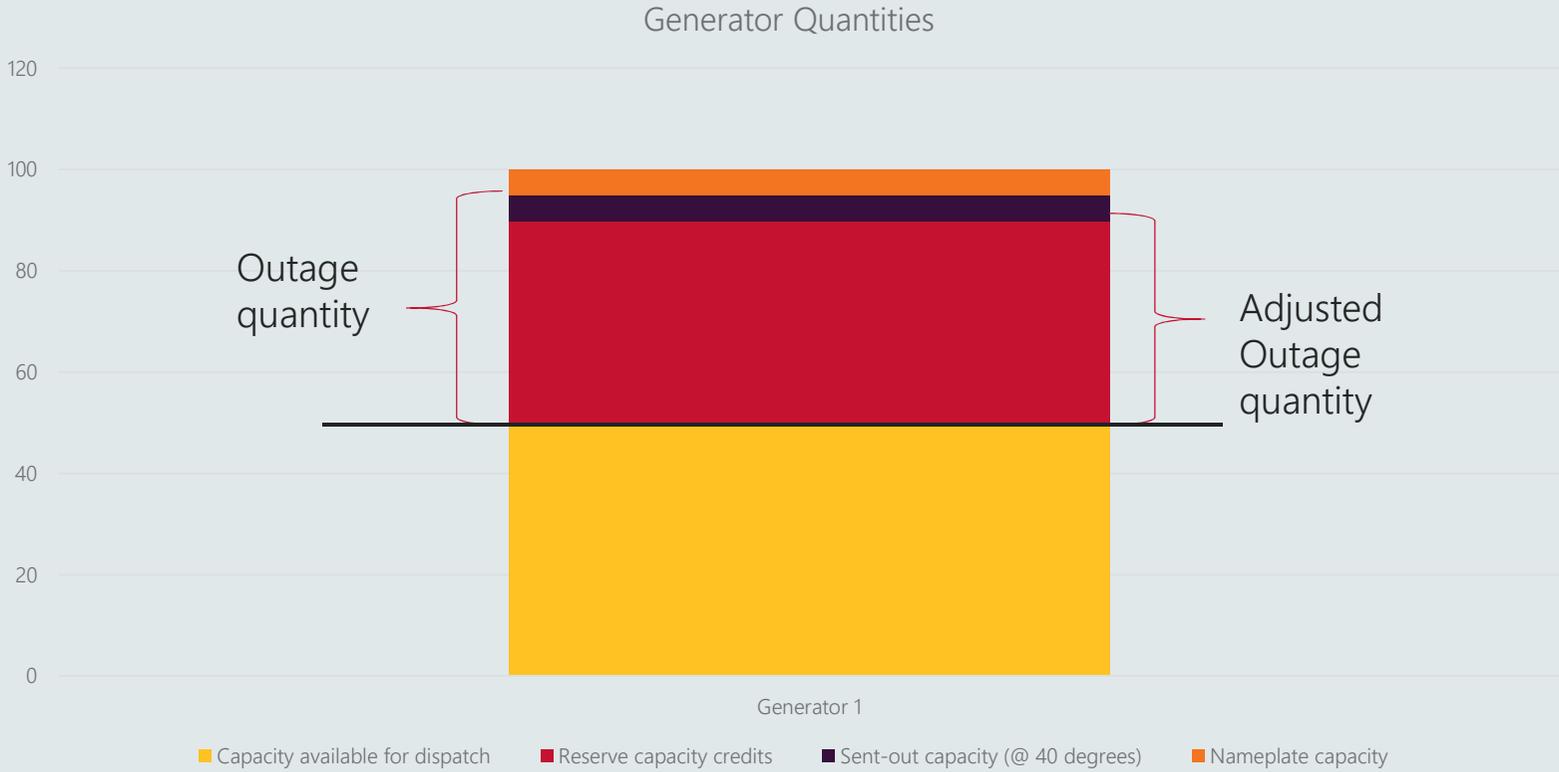
- Network capacity remaining in service must be capable of allowing the dispatch of the capacity expected.
- To ensure the power system is operated within the technical envelope and to maintain the reliability and security of the power system.
- Consideration:
 - the demand forecast used to be in the procedures, to allow for more dynamic choice (e.g. based on assessment timeframe)

Principle #12

Removal of Consequential Outages

- The method of dispatch will account for network outages via constraints.
- Proposed STEM design removes the obligation to offer based on adjustments for ESS and network outages.
- Based on the above, there is no specific need to capture Consequential Outages from participants to avoid capacity refunds under network constraint situations.
- Considerations;
 - Identification of Forced network outages constraining MPs
 - Identification of network outages impacting future generation dispatch
 - Taking into account generation start up times
 - NSG estimated quantities to support RCM

Generator Quantities

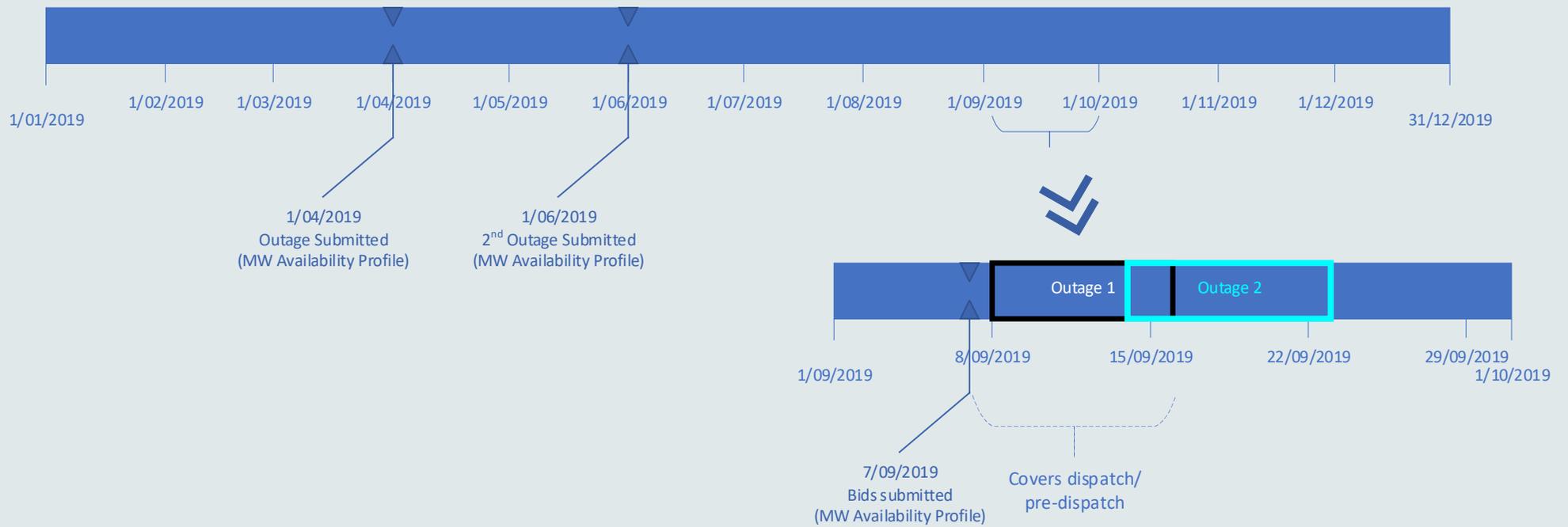


Principle #13

Modify outage quantities

- Participants are currently required to submit outage quantities that reflect the quantity of “unavailable” capacity.
- RC 2014_03 proposes some changes to the way that temperature derating works for the purposes of determining capacity adjusted quantities.
- SCED, Pre-Dispatch and PASA will require knowledge of available quantities for dispatch via bids (as opposed to “unavailable” capacity).
- Look to align information required by participants to submit for dispatch/PASA and outage submissions.
- Some complexities to resolve:
 - Alternative maximum sent-out quantities (based on different fuel types)
 - Adjusted outage quantities for Reserve Capacity
 - Temperature adjustment
 - Forced outage quantities
 - Partial outages, and overlapping outages
 - Fuel outage notification
 - ESS service outages

Outage Submission



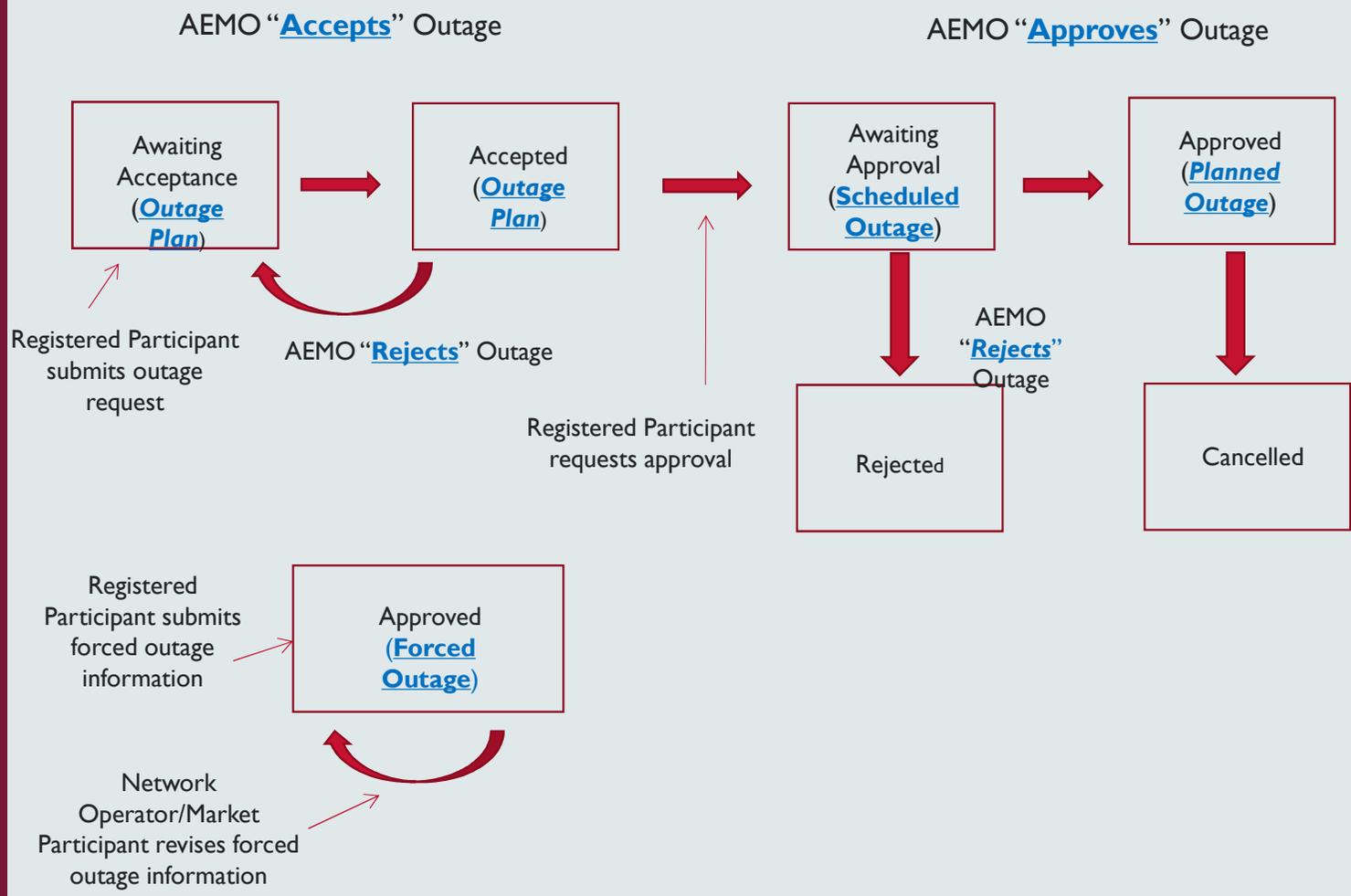
Principle #14

Retain late
cancellation/recall
compensation

- Currently if a previously scheduled outage is rejected within 48 hours of the scheduled start time, the participant may apply for compensation.
- This compensation only applies if the outage was submitted at least one year in advance.
- Compensation is for additional maintenance costs incurred based on deferment/cancellation if request is submitted within 3 months with accompanying documentation.
- Propose to retain this principle

Current Outage Process

Is the requirement for final approval beneficial?



Options

Some potential ideas for future outage process

- We are looking at possible options to streamline the current outage process.
- Some potential ideas:
 - Move to a process similar to NEM that provides early indications of likely or unlikely to proceed
 - Applicable Participants submit their outage plan by a particular date in the year Y-1. AEMO will approve the annual outage plan yearly.
- Considerations:
 - Ensuring principles identified earlier are maintained
 - Balancing certainty and flexibility.
- Other thoughts from working group members?

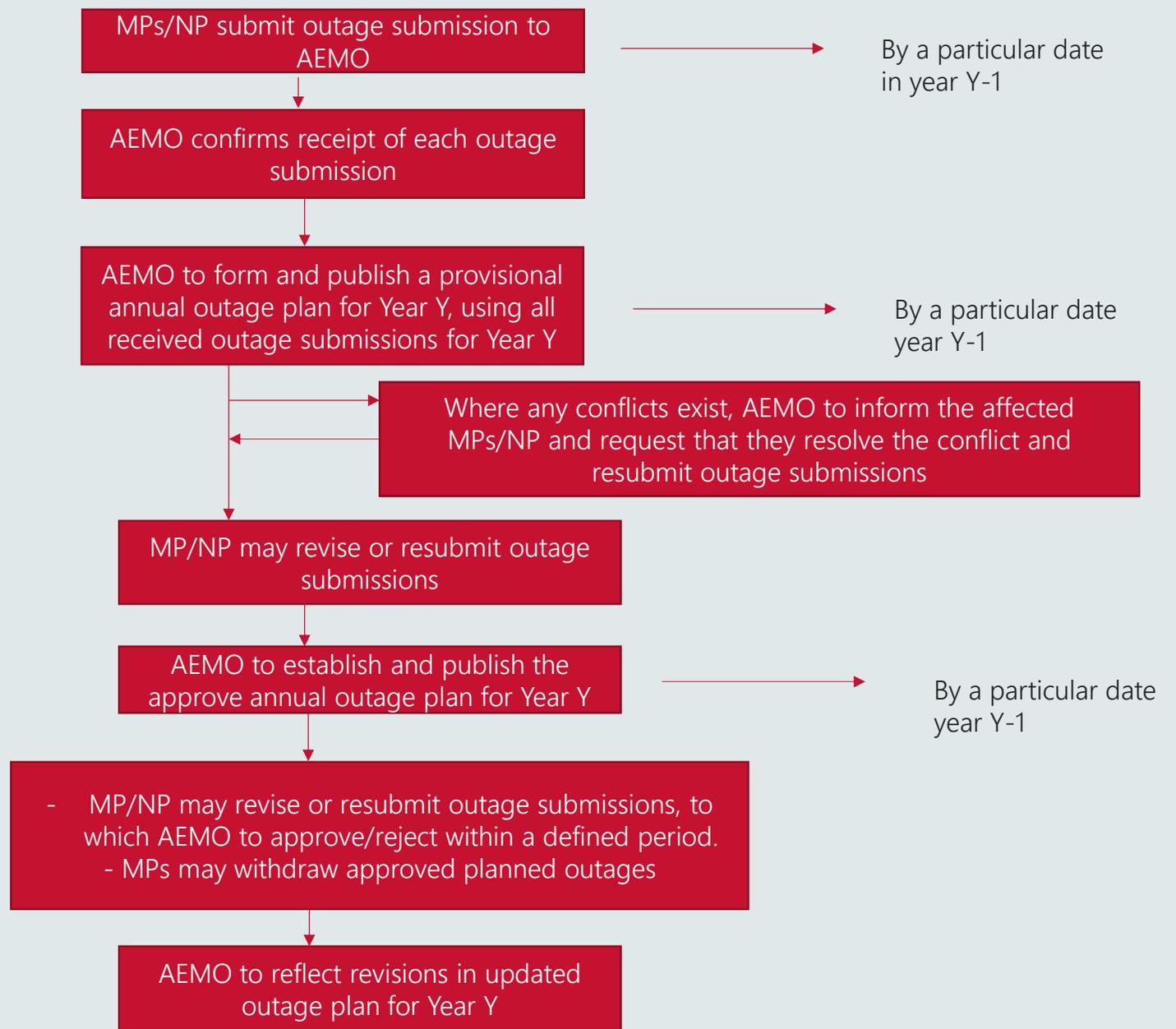
Idea #1

Move to a 1-stage process, similar to NEM

- When a market participant submits an outage plan, it will have “unassessed” flag
 - Following AEMO’s assessment the outage would either “likely to proceed” or “unlikely to proceed” based on the assessment criteria
 - AEMO will continue to reassess outage plan and may move back to “unlikely to proceed” based on changed circumstances (as is currently the case)
 - Queueing principles could be maintained based on submission dates
 - Each state change is published online for outage transparency

Idea #2

Move to an annual planning approach, similar to Singapore



Outage Management: Next Steps

- Draft the ETF paper
 - Sets out the current arrangements and the key principles to be retained, modified and removed in the market design
 - Design issues to be addressed
 - Recommended changes to the WEM rules and the outage management proposals
 - Further updates to TDOWG
- Investigate Commissioning process for integration with SCED



Questions

Clause 3.18.1B

Retain the definition of
unavailability

- For the purposes of this section 3.18 and section 3.19, capacity or capability associated with an Outage Facility is deemed to be unavailable for service in a Trading Interval if the capacity or capability could not, in response to an instruction or direction to the Market Participant or Network Operator from System Management that was consistent with:
 - (a) the Outage Facility's Equipment Limits;
 - (b) any relevant limits or information relating to the capacity or capability of an Outage Facility provided to System Management in accordance with the Power System Operation Procedure referred to in clause 2.28.3A(a); or
 - (c) any relevant limits specified in an Ancillary Service Contract, (as applicable), be used to provide the relevant service expected from the capacity or capability of the Outage Facility. To avoid doubt, capacity of a Non-Scheduled Generator is not deemed to be unavailable for service because of a shortfall of the intermittent energy source used by the Non-Scheduled Generator to generate electricity.

Clause 3.18.5D

Retain the availability
declaration
requirement

- Subject to clauses 3.18.5E and 3.19.2G, a Market Participant or Network Operator must not submit an Outage Plan to System Management if it is aware or ought to be aware in the circumstances that, if System Management rejected the Outage Plan, any of the capacity or capability to which the Outage Plan applies would be unavailable for service for any part of the relevant outage period.

Clause 3.18.5

Qualifying Market Participants to submit outage plan at least one year in advance

- Market Participants:
 - (a) must, subject to clause 3.18.5A, submit to AEMO details of a proposed Outage Plan at least one year but not more than three years in advance of the proposed outage, where:
 - i. the outage relates to an Equipment List Facility in respect of which a Market Participant holds Capacity Credits at any time during the proposed outage;
 - ii. The Equipment List Facility has a nameplate capacity greater than 10 MW; and
 - iii. the proposed outage has a duration of more than one week; and
 - (b) otherwise may submit an Outage Plan to AEMO not more than three years and not less than two days in advance of the proposed outage.



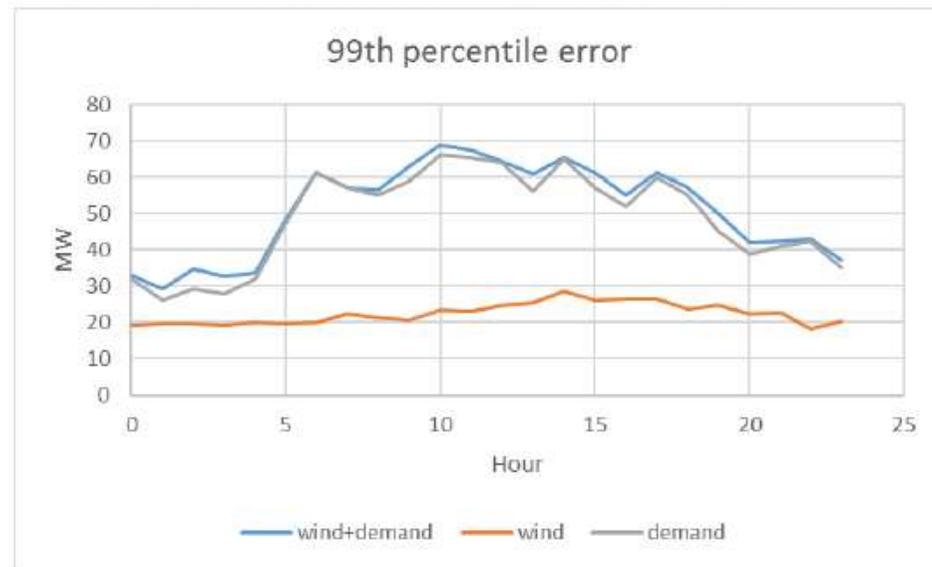
SWIS Regulation Requirements

9 September 2019

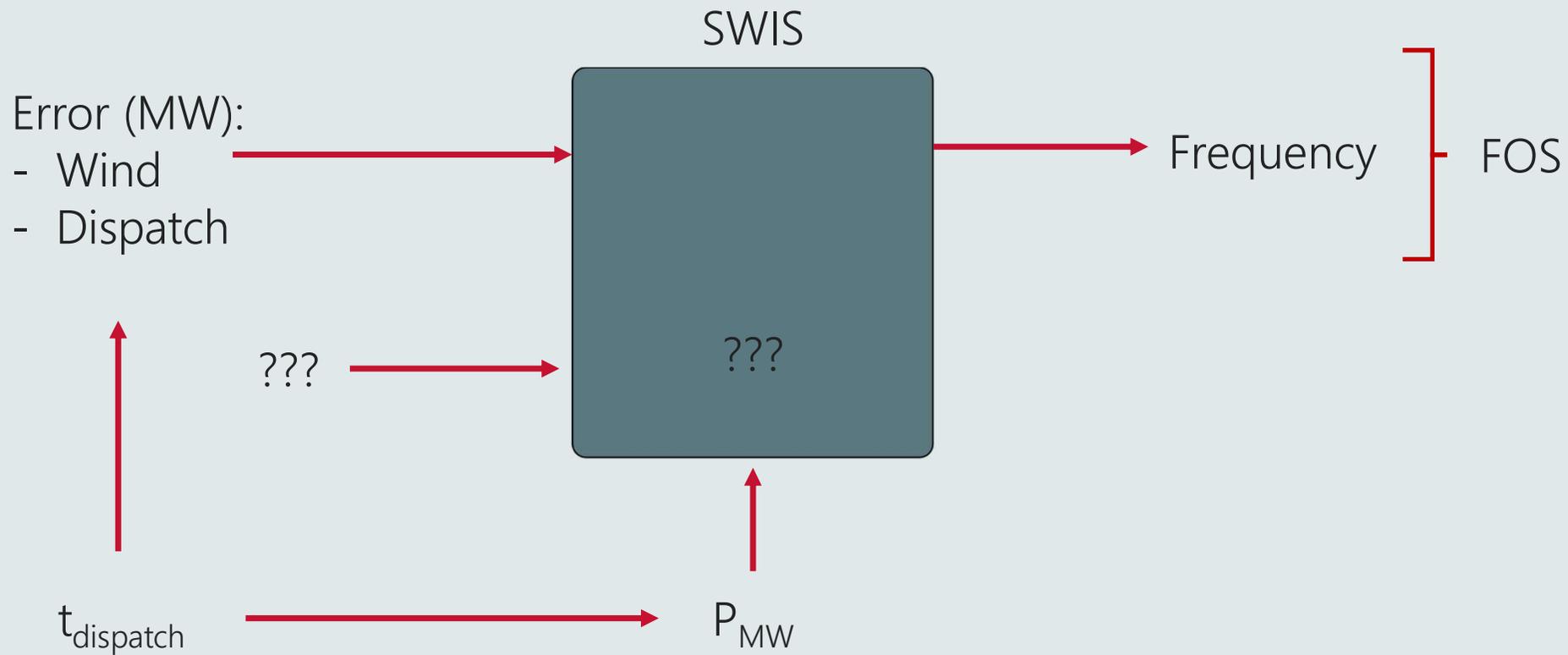
Frequency error sources (GHD Report)

Quantity	Forecast source	Entire year			Night and Day	
		Days	Night	All periods	May to September	October to April
Wind	Persistence	20	17	23	24	
Demand	Metrix	51	41	54	58	
Wind + Demand	Metrix + Persistence	52	42	56	59	

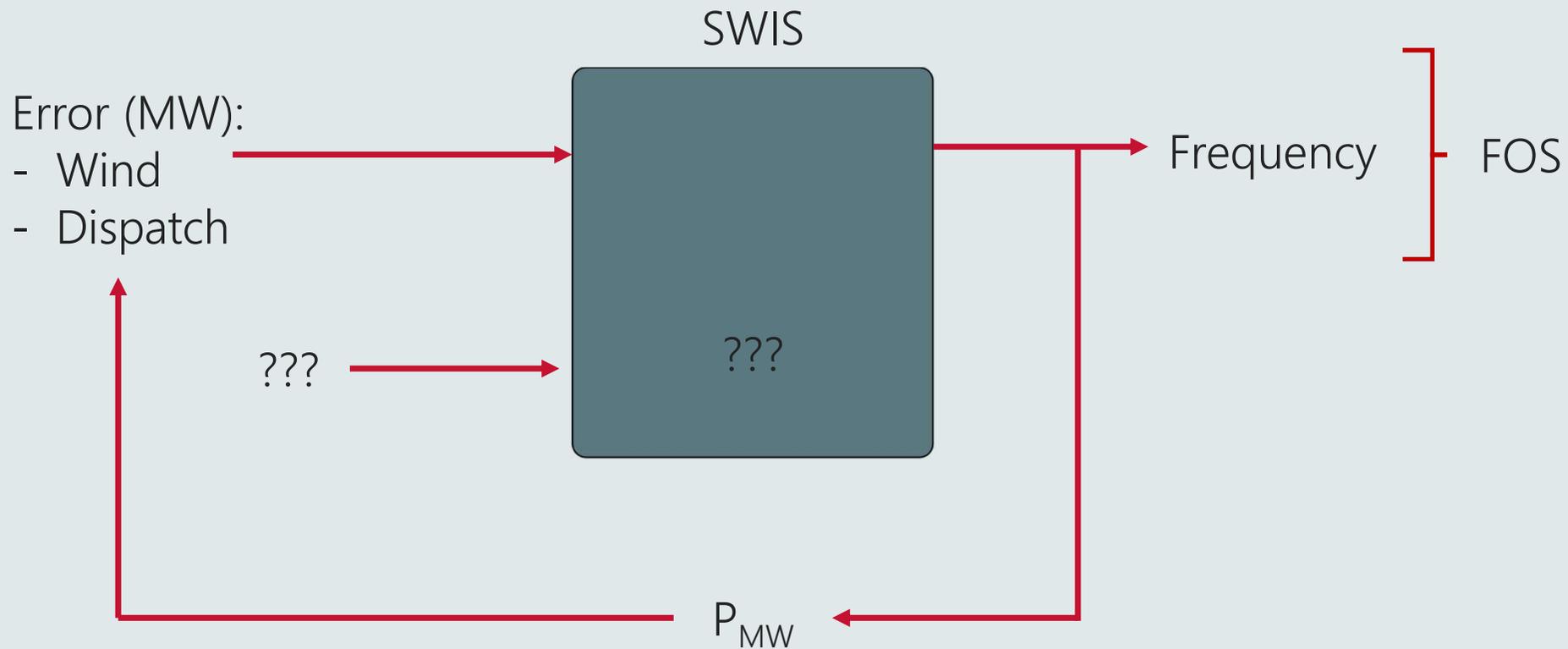
Figure 14: Wind and demand forecast error for maximum of 24 hour period in 2017



Frequency error sources



Frequency control sources



Part 2 analysis: service usage

Figure 15: Analysis of SCADA data - cumulative LFAS usage across 5 and 10 minute intervals for 4th September 2017

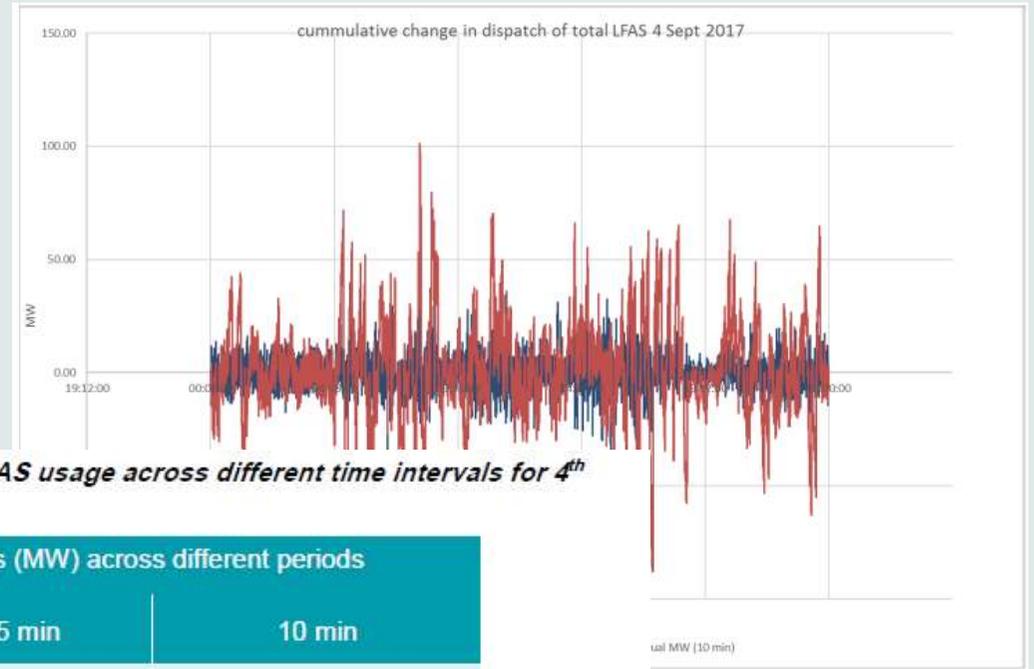
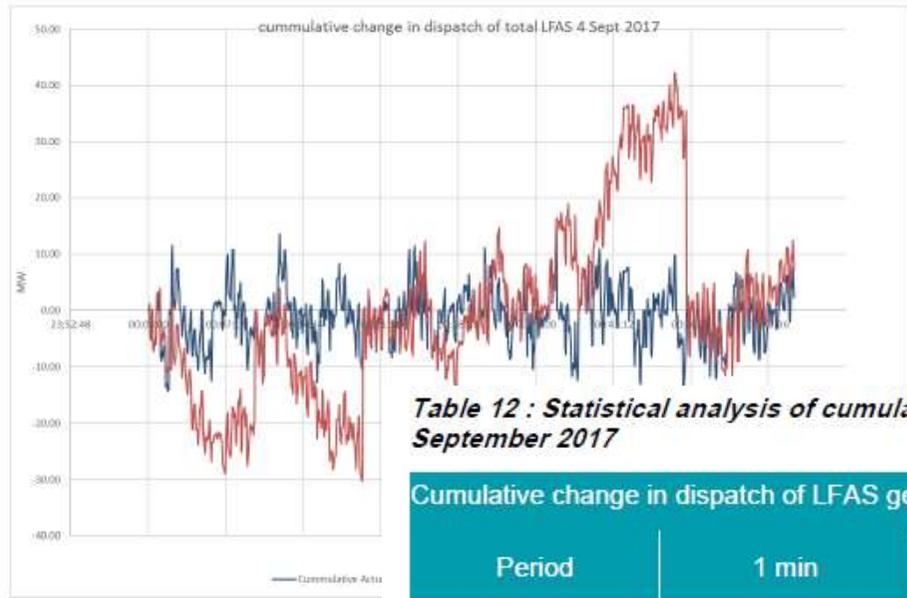
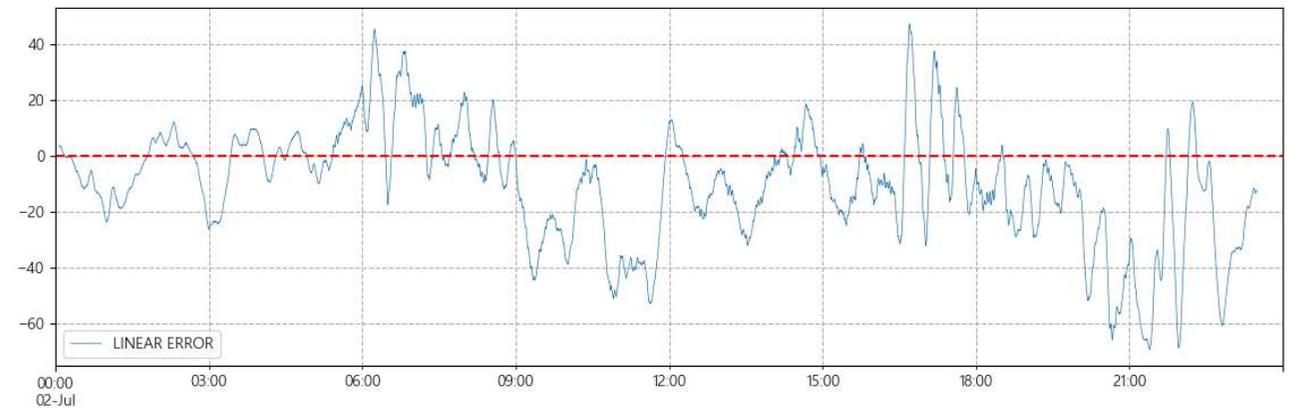
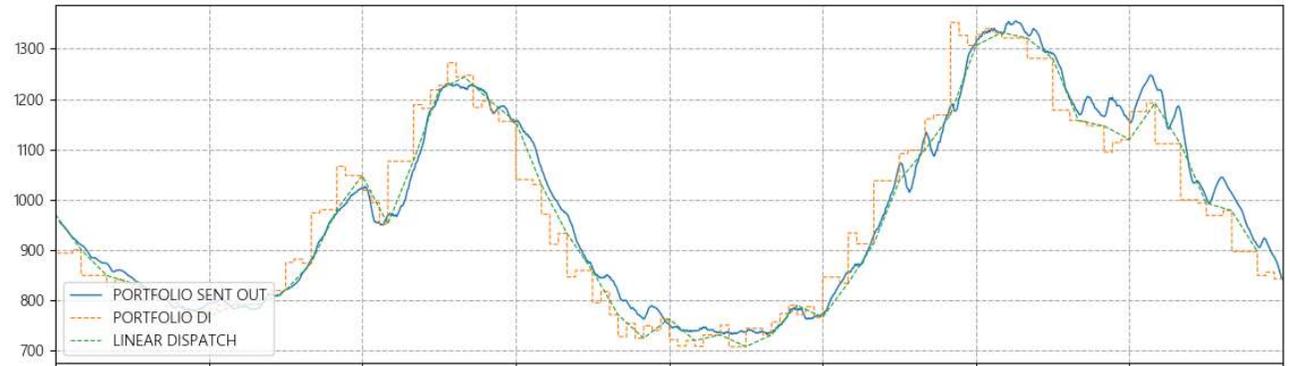


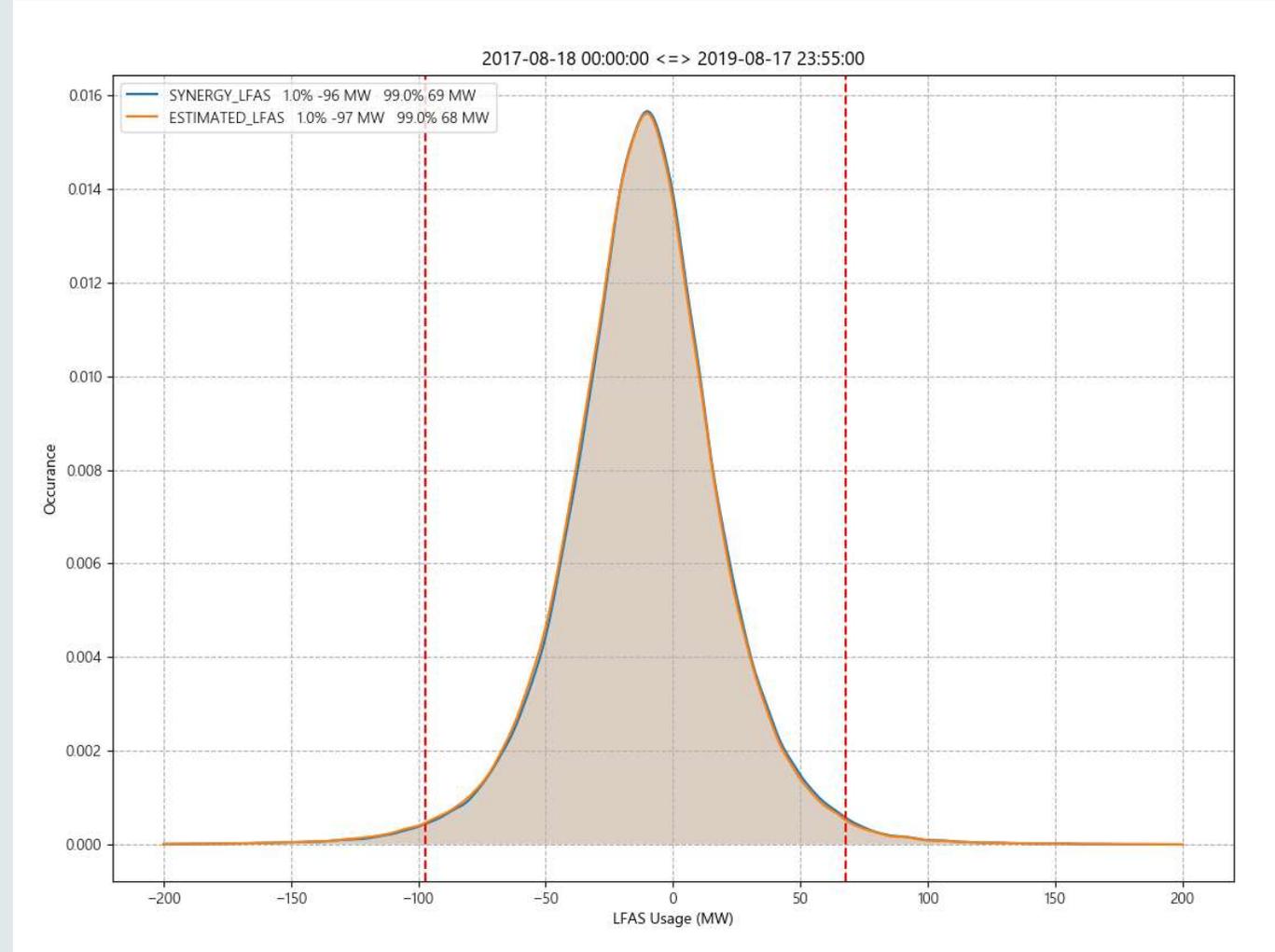
Table 12 : Statistical analysis of cumulative LFAS usage across different time intervals for 4th September 2017

Cumulative change in dispatch of LFAS generators (MW) across different periods			
Period	1 min	5 min	10 min
Daily Max	44	67	101
Daily Min	-35	-66	-87

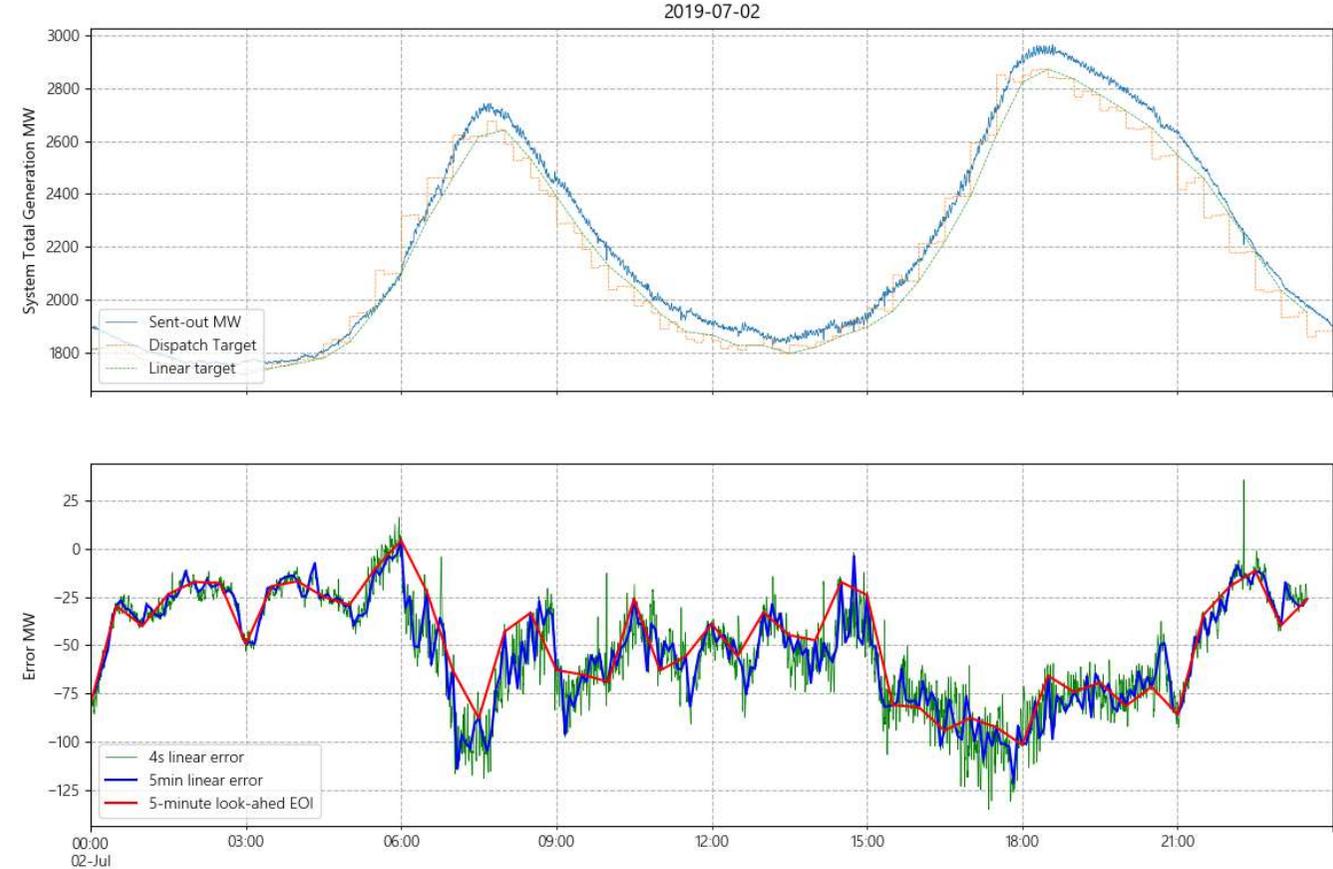
Portfolio LFAS estimation



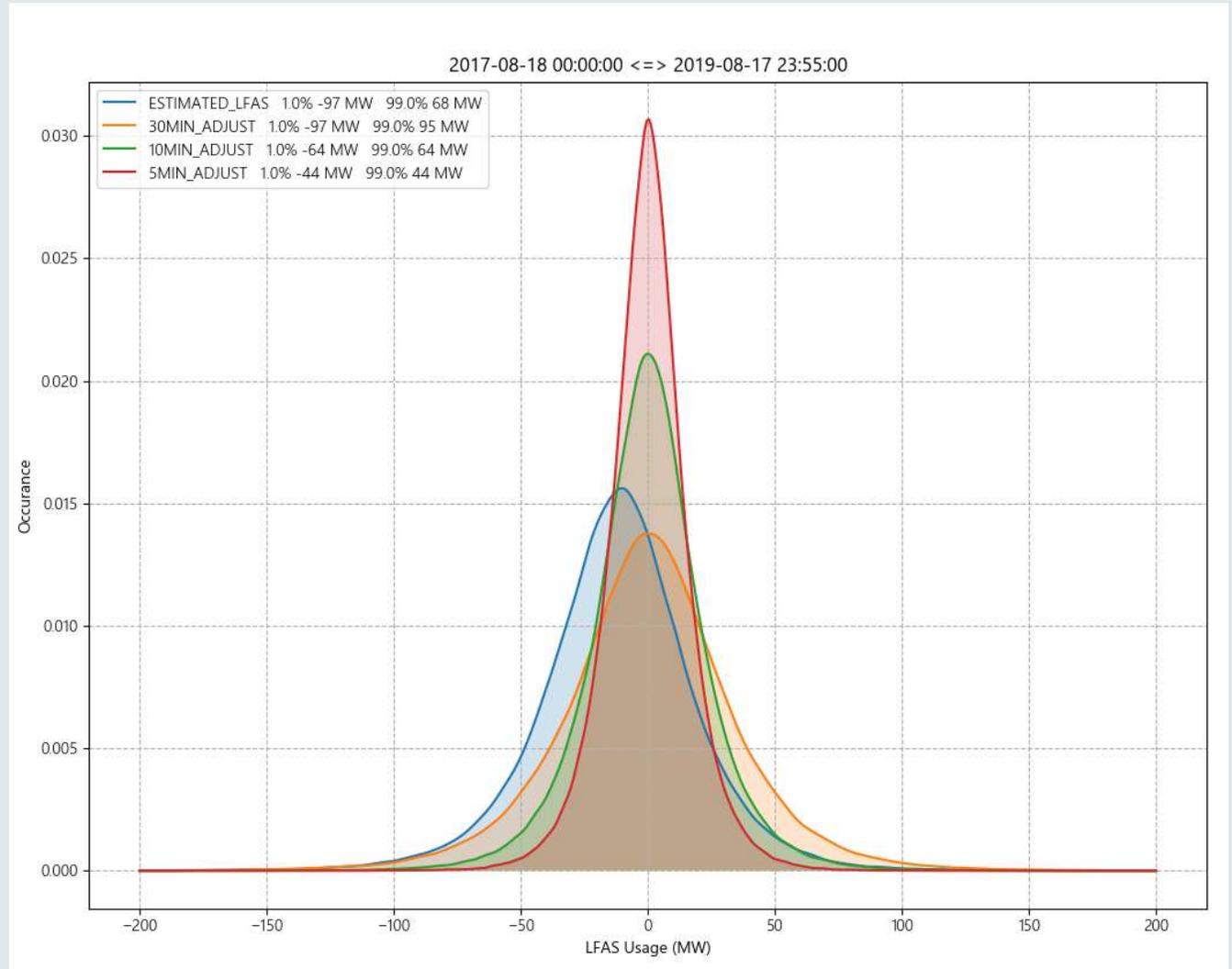
Long-term LFAS usage



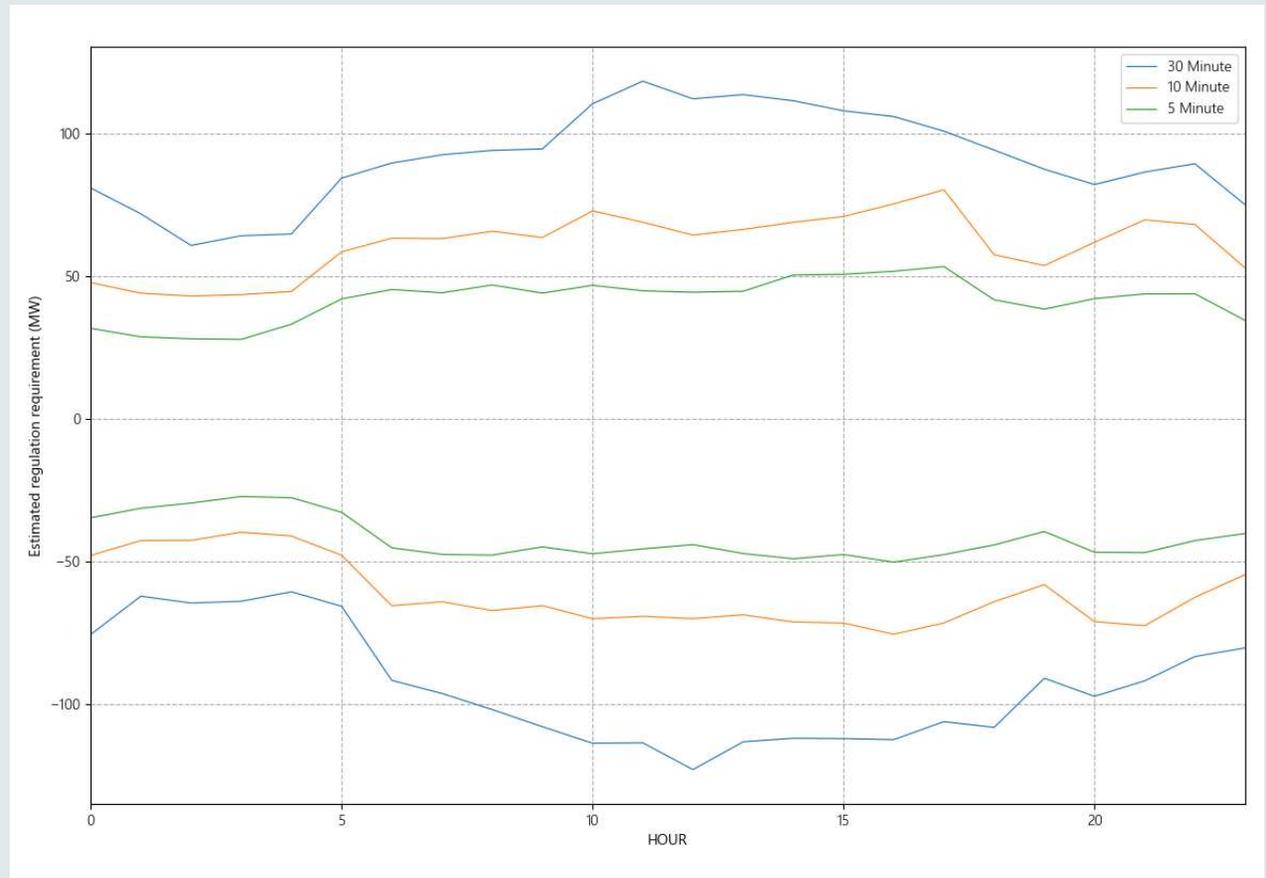
End of interval error



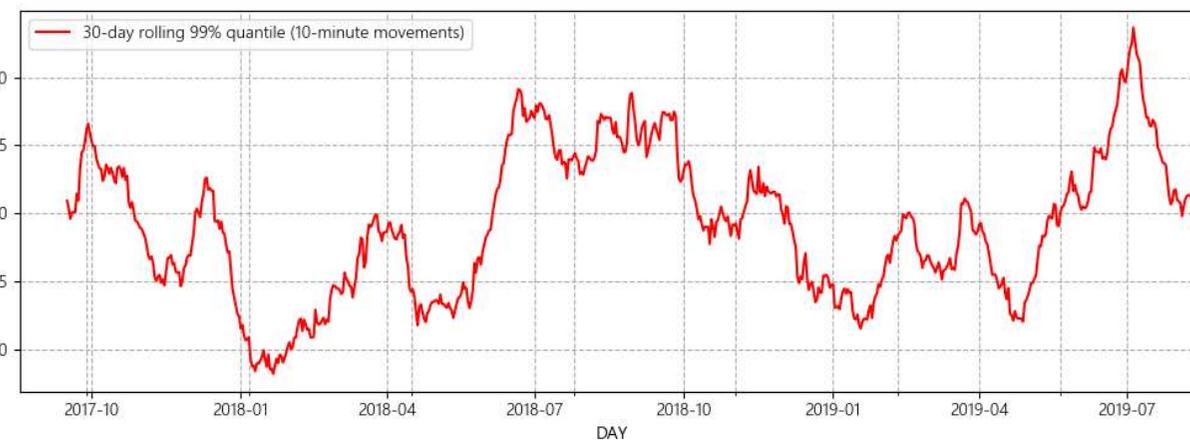
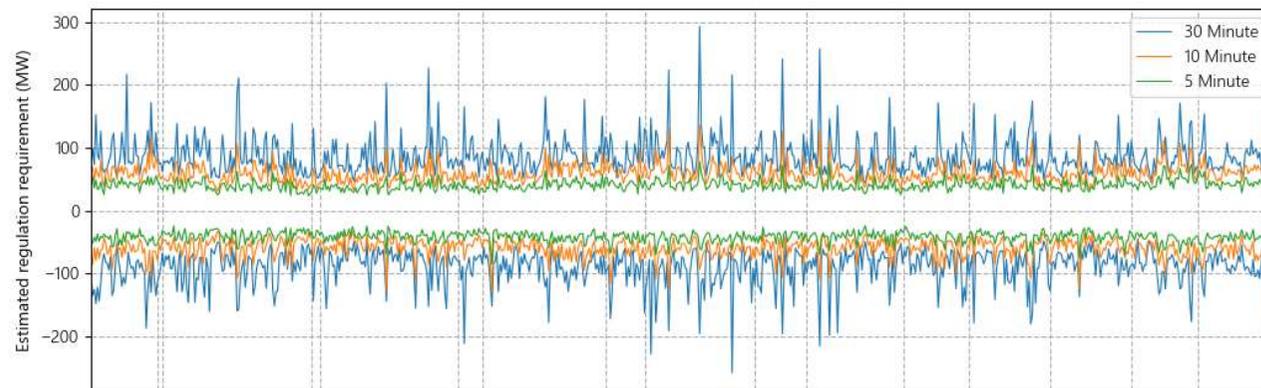
Historical Quantities



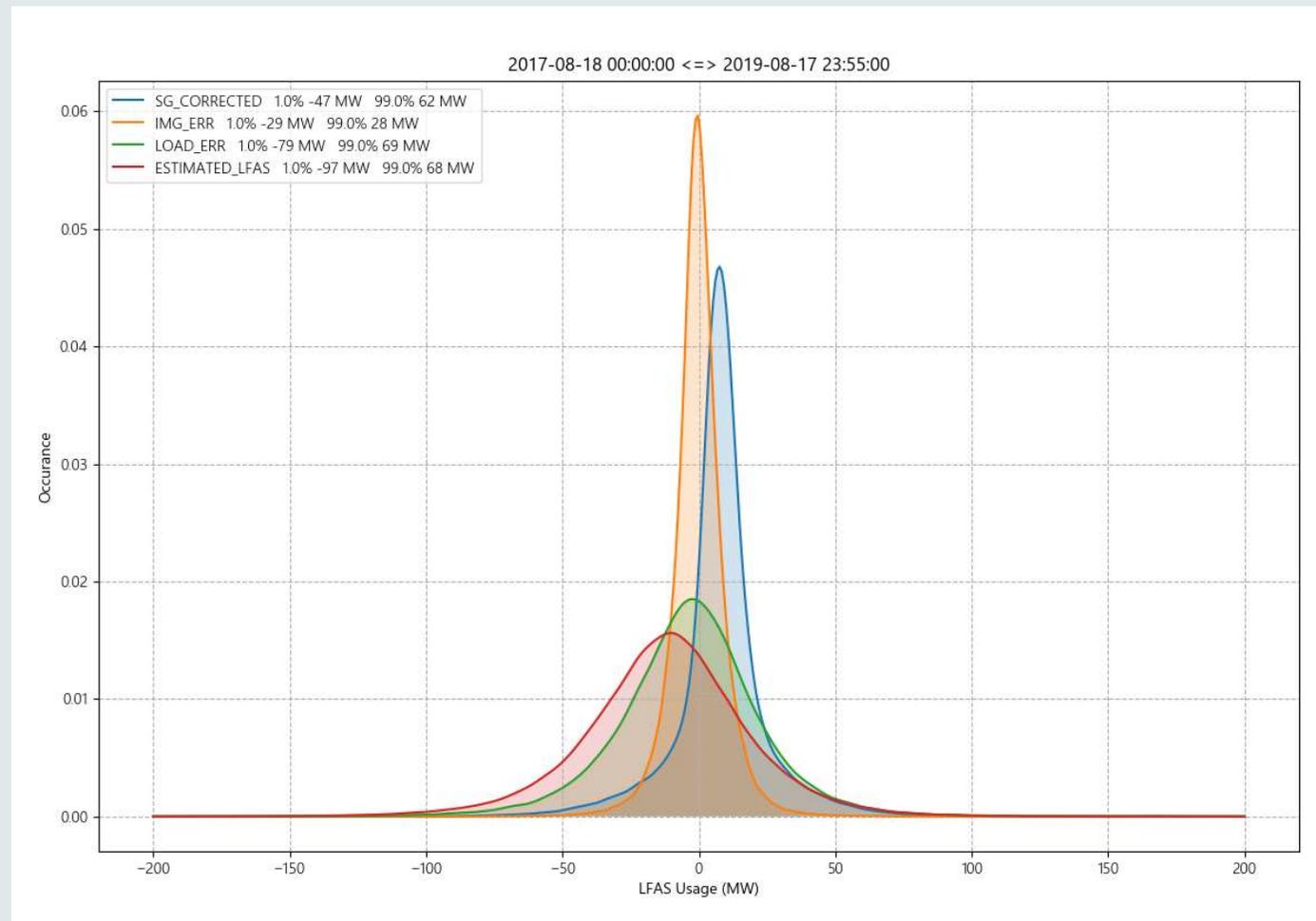
Time of day



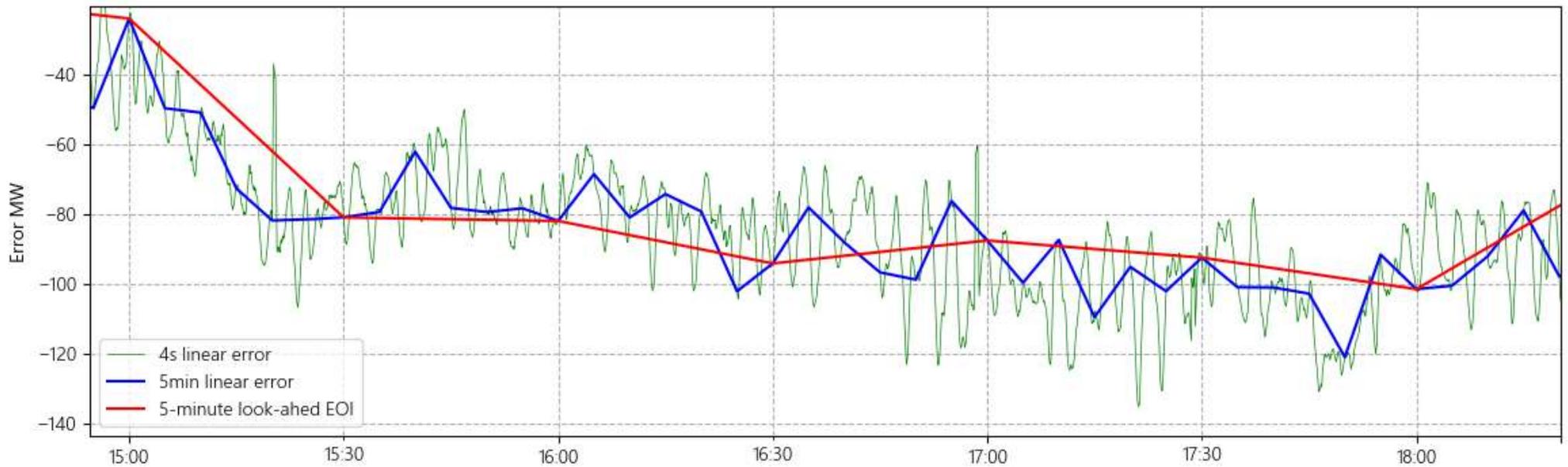
Day to day variation



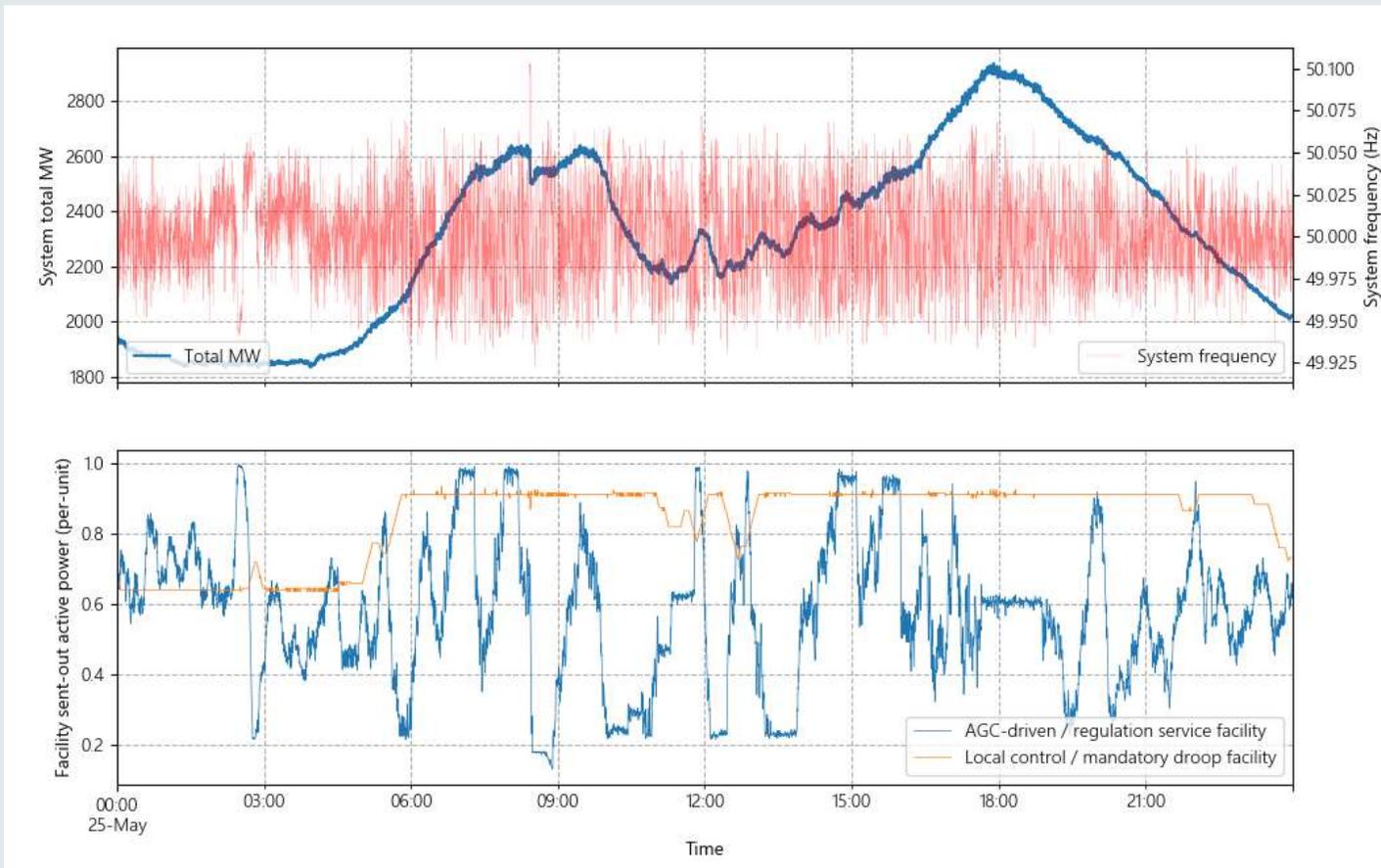
Historical relative error



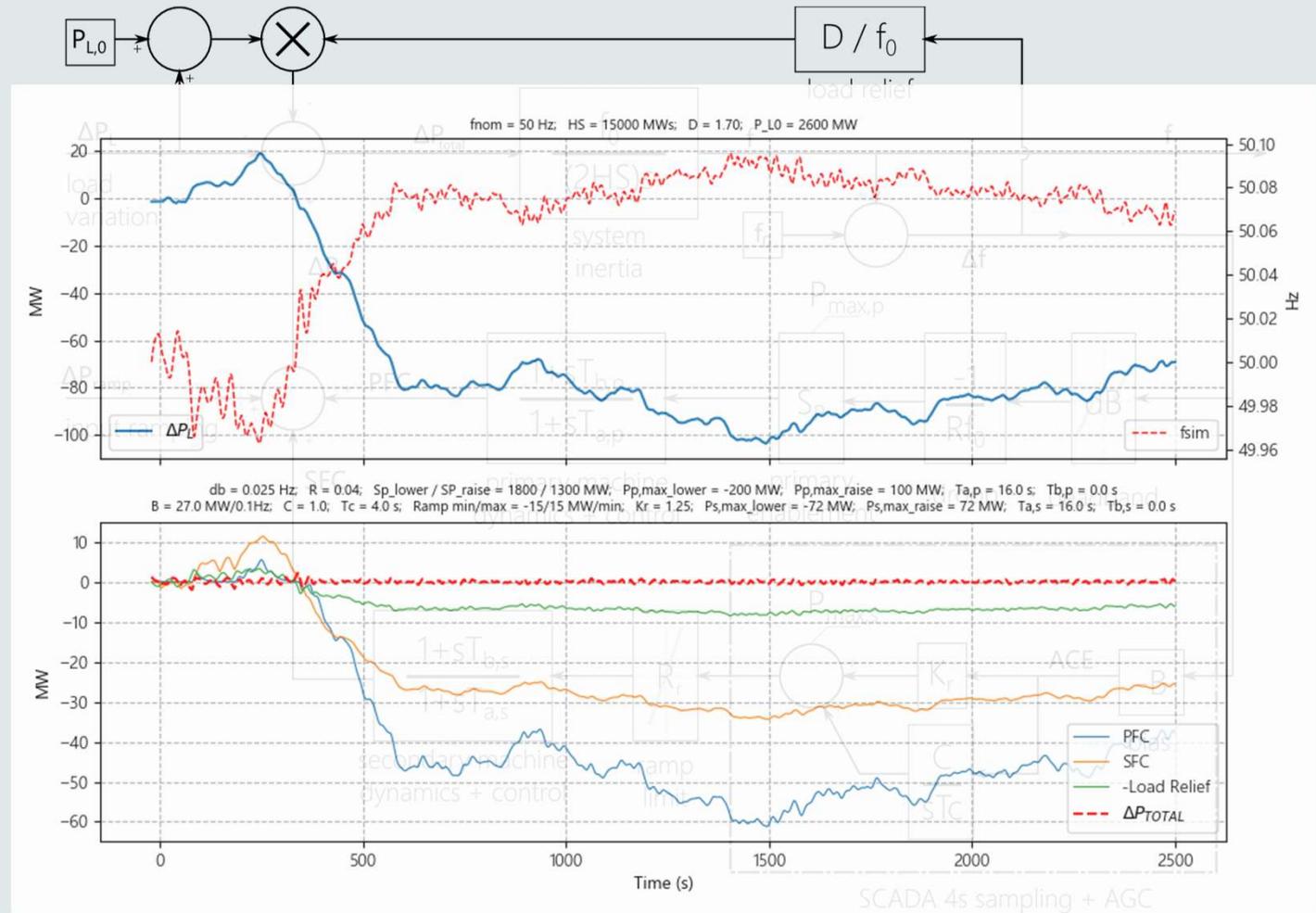
Sub-interval oscillation



Current dynamic



Regulation system model



Summary and next steps

- Historical usage can set requirements for disaggregation and shortened dispatch interval + new engine at market start
- Results from new AEMO model suggest possibility to predict and determine requirements under new requirements
- Next steps: further live testing and AGC tuning to calibrate model
 - simulation results not yet validated for live deployment



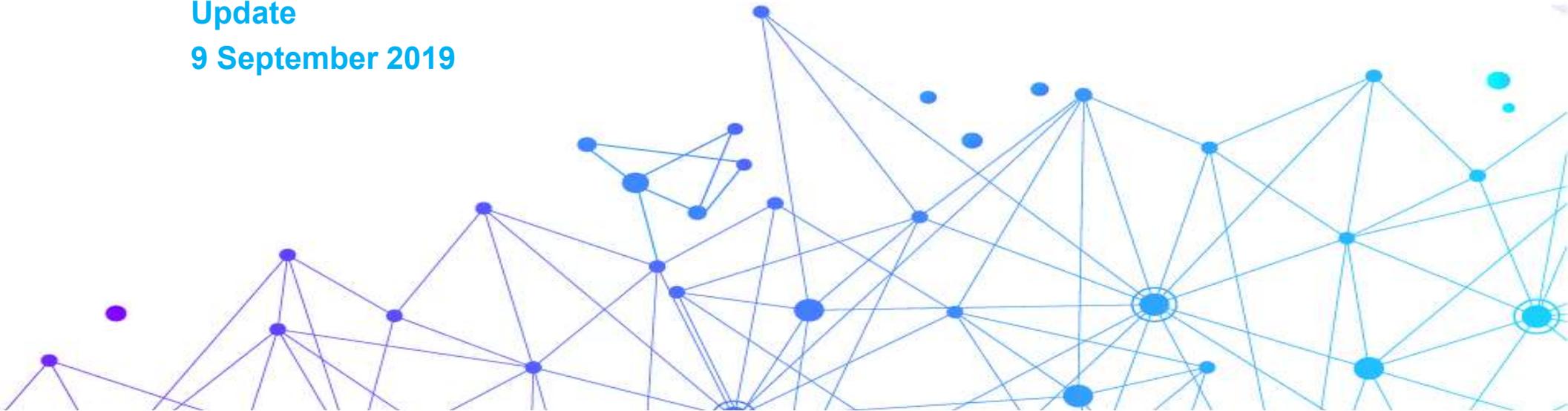
**Energy Transformation
Implementation Unit**

Capacity Credits in a Constrained Network

Transformation Design and Operation
Working Group (TDOWG) Meeting #2

Update

9 September 2019



CAPACITY CREDIT RIGHTS

Key issues to be considered in the Design Proposal

Tenure
(duration) of
rights

Allocation of
initial rights

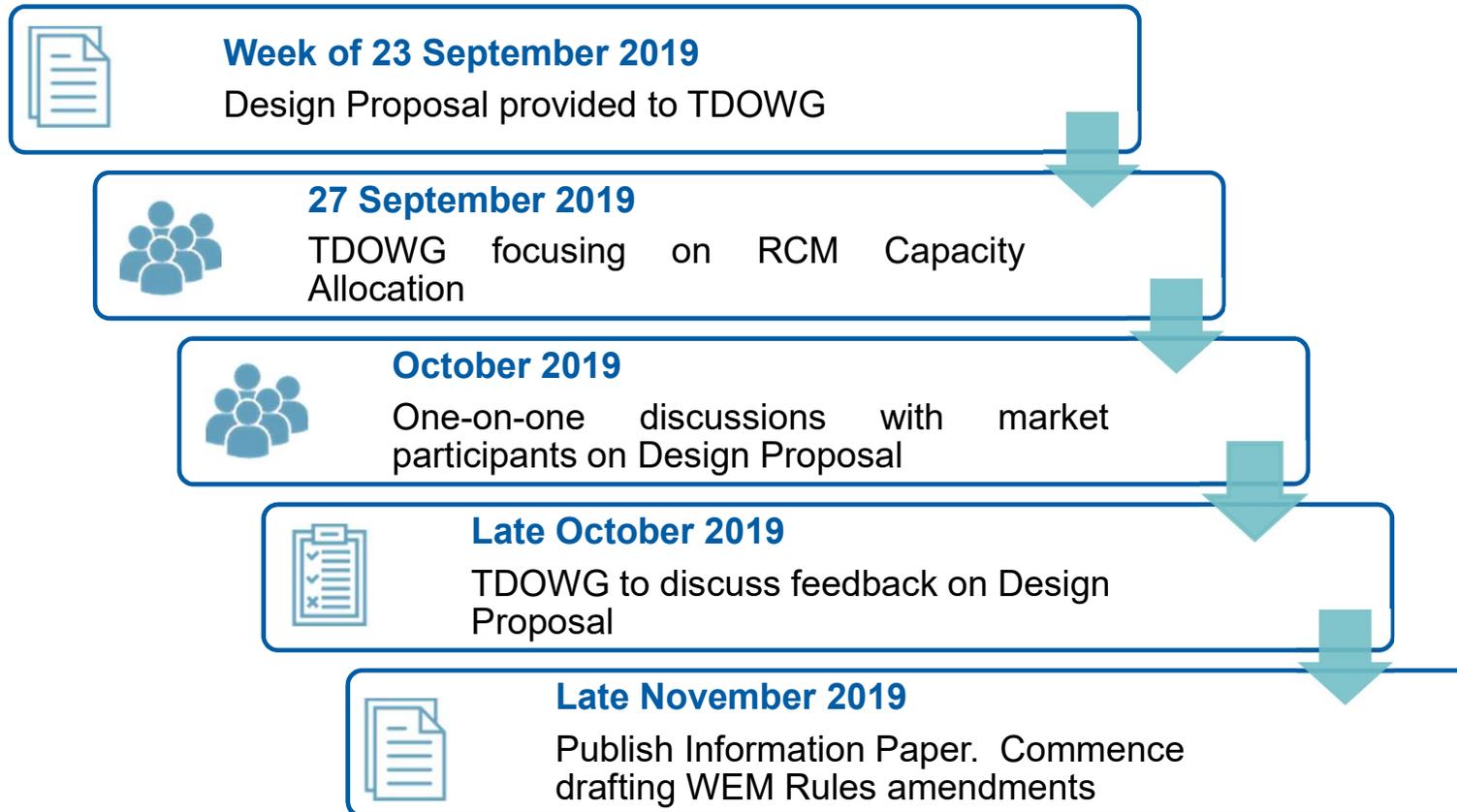
Allocation of
new rights

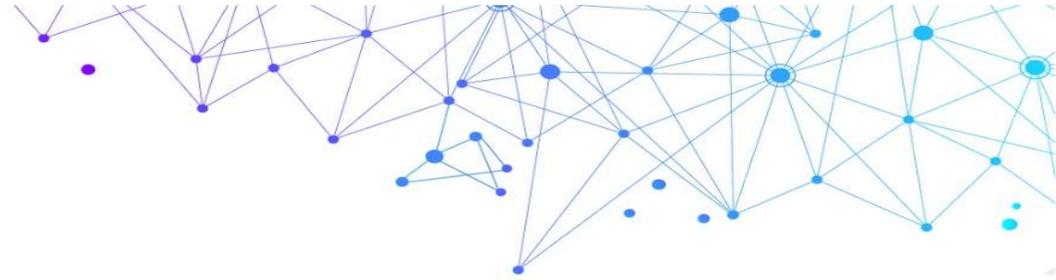
Competing
applications

Relinquishing
rights

Capacity
Cycle process
key steps

NEXT STEPS





Further information

Ashwin Raj

Project Lead, Improving Access

ashwin.raj@treasury.wa.gov.au

+61 8 6551 1047

WEM Regulation and Rule Changes

Presentation for TDOWG meeting 2

