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AUSTRALIAN ENERGY MARKET OPERATOR

Advanced Systems Integration Group (ASIG)

West Murray Zone (WMZ) - Lessons learned

7 August 2020

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We acknowledge the Traditional Owners of country throughout Australia and recognise their continuing connection to land, waters and culture.
We pay our respects to their Elders past, present and emerging.

AEMO Competition Law Meeting Protocol

AEMO is committed to complying with all applicable laws, including the Competition and Consumer Act 2010 (CCA). In any dealings with AEMO regarding proposed reforms or other initiatives, all participants agree to adhere to the CCA at all times and to comply with this Protocol. Participants must arrange for their representatives to be briefed on competition law risks and obligations.

Participants in AEMO discussions **must**:

1. Ensure that discussions are limited to the matters contemplated by the agenda for the discussion
2. Make independent and unilateral decisions about their commercial positions and approach in relation to the matters under discussion with AEMO
3. Immediately and clearly raise an objection with AEMO or the Chair of the meeting if a matter is discussed that the participant is concerned may give rise to competition law risks or a breach of this Protocol

Participants in AEMO meetings **must not** discuss or agree on the following topics:

1. Which customers they will supply or market to
2. The price or other terms at which Participants will supply
3. Bids or tenders, including the nature of a bid that a Participant intends to make or whether the Participant will participate in the bid
4. Which suppliers Participants will acquire from (or the price or other terms on which they acquire goods or services)
5. Refusing to supply a person or company access to any products, services or inputs they require

Under no circumstances must Participants share Competitively Sensitive Information. Competitively Sensitive Information means confidential information relating to a Participant which if disclosed to a competitor could affect its current or future commercial strategies, such as pricing information, customer terms and conditions, supply terms and conditions, sales, marketing or procurement strategies, product development, margins, costs, capacity or production planning.

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Today's meeting

1. Introduction to West Murray Zone
2. Lessons learned
   - Addressing Murray 5 constraints
   - Readiness to be the front-runners
   - Resolving issues in WMZ and the 5.3.9 process
   - Preparing for Integration studies
3. AEMO updates on WMZ
4. Discussion and Q&A
5. Close

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Welcome & introduction

Alex Wonhas

AEMO

Addressing Murray 5 constraint

Ian Christmas

Edify Energy

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Readiness to be the front runners

Peter Veljkovic

RWE Renewables

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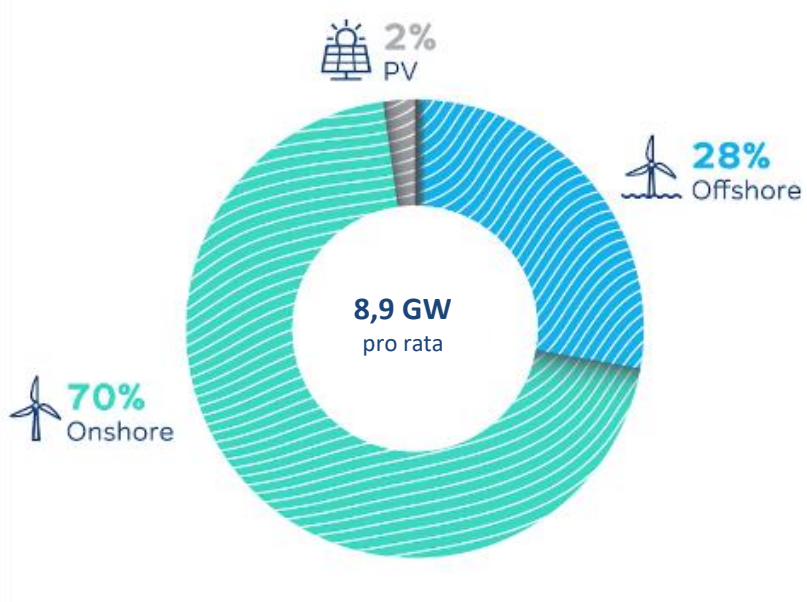
RWE: international, future-oriented and broadly positioned.

Ideal conditions for clean, reliable and affordable electricity.

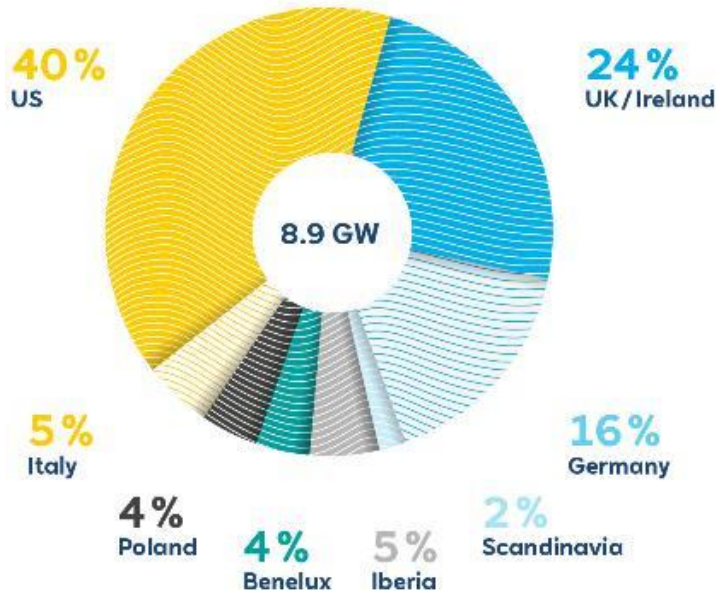
A diversified portfolio …

Renewable capacity by technology



… and a global presence …

Renewable capacity by country



… ensure a strong starting position in the renewables market.

Limondale Solar Farm

Project details

- 249 MW (AC)
  - 220 MW stage (Lim 1)
  - 29 MW stage (Lim 2)
- Balranald, NSW
- SMA inverters
- SunPower modules

Important Factors

Project partners

- Use of quality and supported components (in this case SMA)
- Having the right advisors, for RWE this was:
  - Eneflux
  - Lloyds Register
- No financiers involved

Getting to registration

Forging ahead in collaboration

- Early identification of issues in the network
  - not just a Limondale problem
- Stopping was never an option – solution focussed
  - Guidance by specialist and experienced advisors was most valuable (Eneflux and Lloyds Register)
  - Giving our advisors the scope and ability to identify a solution for the network and our power station
  - Engagement and collaboration between AEMO, TransGrid, SMA and the project to identify pathway forward
  - This required a proactive approach in order to test and validate our models
    - reduced number of submissions due to our own stress testing
- Modelling costs were higher than what most typically budget for. Cost is outweighed by the alternative
- Realistic expectations set by AEMO and TG teams
  - The AEMO and TransGrid teams were really supportive – Thank you

Continuous improvement

How can we keep improving

- Take the time to understand the needs and limitations of the network connection
- Ensure power plant tuning meets the specifics of the network
- “Making it happen”, taking on feedback from NSP & AEMO and providing comprehensive solutions
  - Collaboration is ownership
  - Market is open generator proposed solutions
- Costs, although individually can be high, are relative. This is an investment in a 30 year asset, and must contribute to the stability, reliability and power supply for the future.
  - We as an industry have a responsibility

Resolving issues in the West Murray and the 5.3.9 process

Andrew Dinning

Powercor

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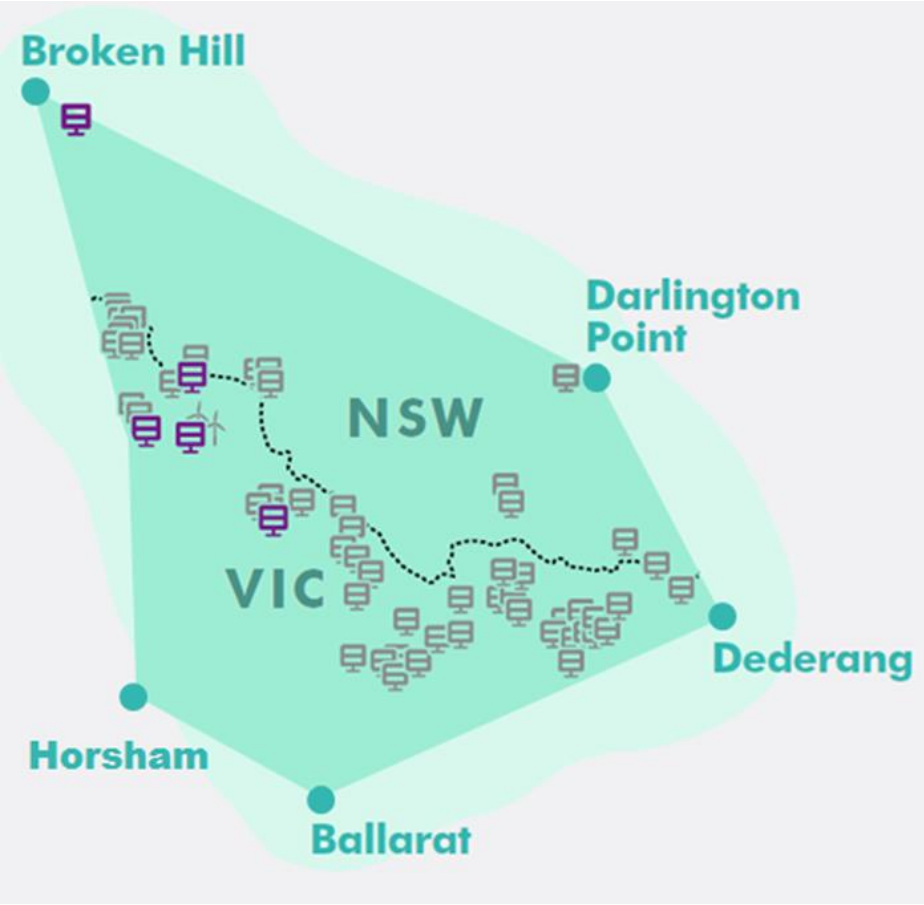
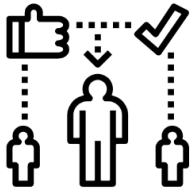
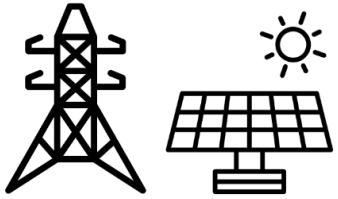
Background on the ‘Murray 5’



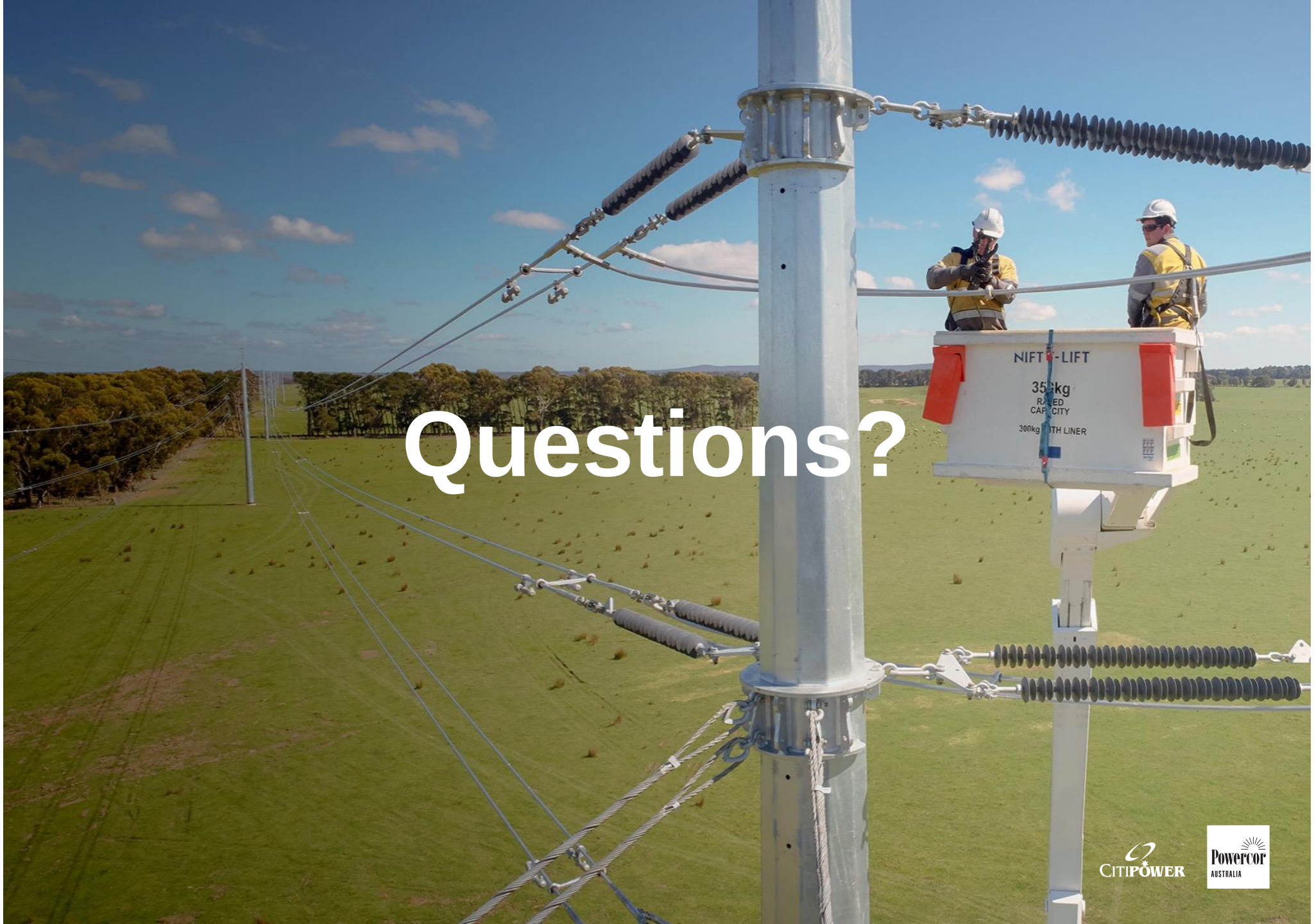
- Situation arose where NSPs and AEMO defined a broad VIC-NSW stability issue, under certain network conditions, driven by asynchronous generation in the West Murray area
- Through modelling the ‘Murray 5’ generators were defined as driving the stability issue
- ‘Murray 5’ generators are connected across Powercor & TransGrid jurisdictions
- Generators were committed before ‘*Managing Power System Fault Levels’* rules change
- Generators were assessed before industry transition to PSCAD for pre-connection studies
- While the stability issue was simulated there was no simple solution that could be implemented by any generator alone

What Next?

Challenges, Actions & Lessons Learned

Stage	Challenges	Lessons Learned
Validation 	• Simulated stability issue • Limitations on data sharing • Concerns over 5.3.9 process	• OEM engagement is critical • Testing to validate the issue • Taking a pragmatic approach to 5.3.9
Development 	• Limitations on data sharing • Development of new systems & responses • Requirement to tune “as a group” to meet local & broad network needs	• Building trust through transparency • Collaborative & pragmatic approach to share workload and exchange ideas/solutions • Enable flexibility where possible
Testing 	• Testing required specific network conditions & dispatch levels • Reducing solar capacity in Autumn • COVID lockdown restrictions	

Note: Creative Commons Icons from www.thenounproject.com as follows - Validation, Development, Testing Tower, Testing Solar


Questions?
CITIPOWER
Powercor
AUSTRALIA

Getting prepared for integration studies

John Howland

Transgrid

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Getting prepared for integration studies

West Murray 5 models

- High level review of received models
- Integrate to TransGrid wide area network model

Wide area network model

- One updated model at a time
- Updated other models in the subsystems (e.g. SVCs, other solar/wind farm models)
- A few test studies after each model integration (e.g. Bendigo – Kerang fault) to ensure acceptable performance

TransGrid

Getting prepared for integration studies cont.

Perform integration studies for registration

- AEMO West Murray sequence followed
- All existing generators included
- All committed generators up to the connection included
- All generation at 100% unless constrained due to other system security requirements (e.g. thermal, voltage, …)
- Large signal (faults/line trips) and small signal (reactive plant switch in/out, set point changes) tests
- Review of scope for special protection schemes and requirements for staged tripping of generators

Perform integration studies for offer to connect

- Appropriate sequencing for the projects at the application stage?

TransGrid

Getting prepared for integration studies cont.

Progress to date (in NSW)

- Silverton WF increased to capacity during daytime
- Broken Hill SF constraints fully lifted
- Limondale 2 SF registered and commissioning in progress
- Limondale 1 SF registered and commissioning in progress

TransGrid

Getting prepared for integration studies - Lessons learnt

What worked?

- Collaboration between AEMO, Proponents, OEMs, Consultants and NSPs
- Some generators proactively offered better control modes (e.g. QV)
- Some generators were prepared to follow the process (e.g. submit 5.3.9s) as required without delays

What can be done better?

- Control systems from OEMs more transparent to NSPs
- Proponents recognise the limitations in the connecting area and offer better performance at early stages (e.g. QV mode)
- Comprehensive model checks before submitting
- Providing a complete package upon submitting for 5.3.9 process

TransGrid

Break

10 Minutes

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AEMO updates on the WMZ

Mark Shilliday and Greg Elkins

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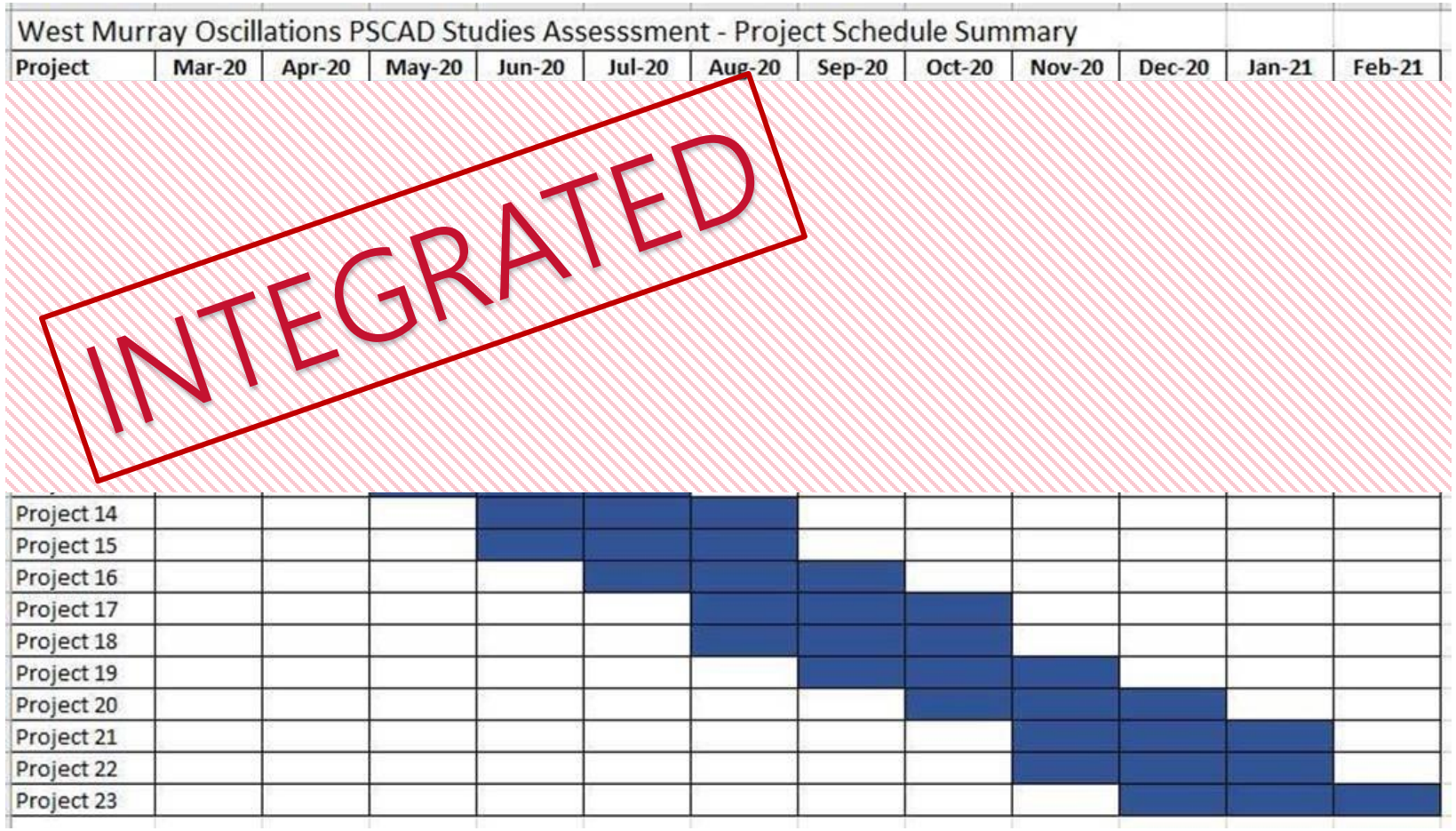
Progress through the connection sequence



Integration studies

- Four Projects in commissioning
- Two new projects registered
- Four projects presently being integrated
- System Strength Gap Finalises and considered in Studies
- One SynCon operational and online

Integration Studies - Challenges

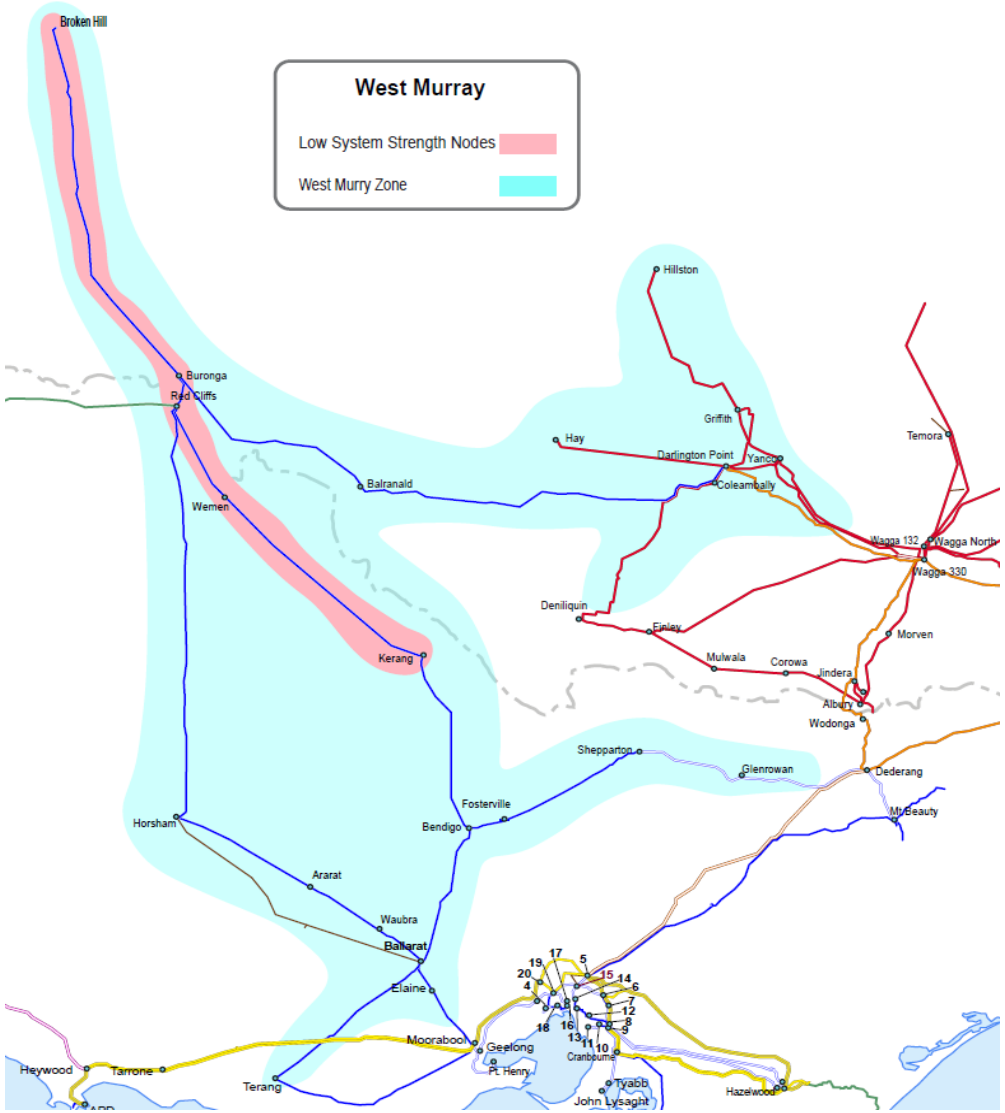
- Insufficient system strength
- Requiring System Strength Gap filling
- System at capacity – new limits advice required
- New firmware new challenges
- Complexity in operational configurations

Revised boundary and system strength gap solution

AEMO has developed a methodology to define system strength zones by ascertaining how much of the system strength in one area is transferred to an adjacent location.

The methodology, to be used across the National Electricity Market moving forward, has been applied to the WMZ to assess the potential for a new generator connection to adversely interact with the unstable generators at the WMZ nodes due to low system strength.

Defining this methodology means the WMZ boundary is confirmed.



Moderated discussion

Lillian Patterson

Clean Energy Council (CEC)

Meeting close

Get in touch on stakeholderrelations@aemo.com

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