



AEMO Renewable Integration Study update

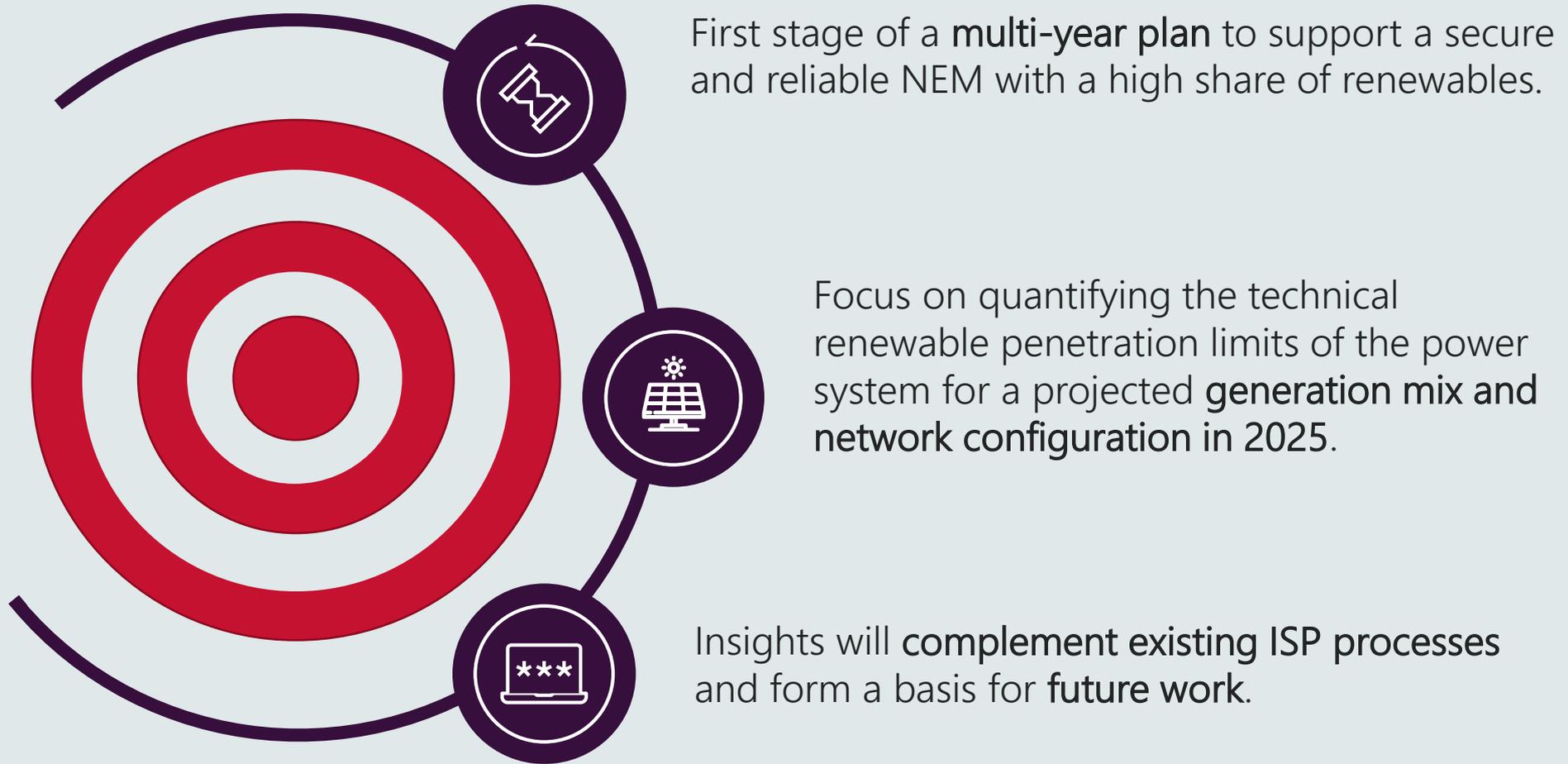
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Overview

1. Renewable Integration Study overview
2. A perspective on the transition underway
3. International insights on renewable integration
4. Next steps

Renewable Integration Study Objectives



The transition of an essential service



- 100 years of experience operating power systems based around big centralised synchronous generators
- Limited experience operating at high levels of wind and solar
- Technologies are fundamentally different – wind and solar technologies are variable, inverter-based, and potentially highly decentralised as well
- Power system's transition is like changing the engines on a plane mid-flight, without landing the plane
- Electricity is an essential service - we cannot afford to get this transition wrong

Navigating the transition

Some ideas on how we can successfully navigate the transition:

1

Learn what we can from others – don't reinvent the wheel unnecessarily

2

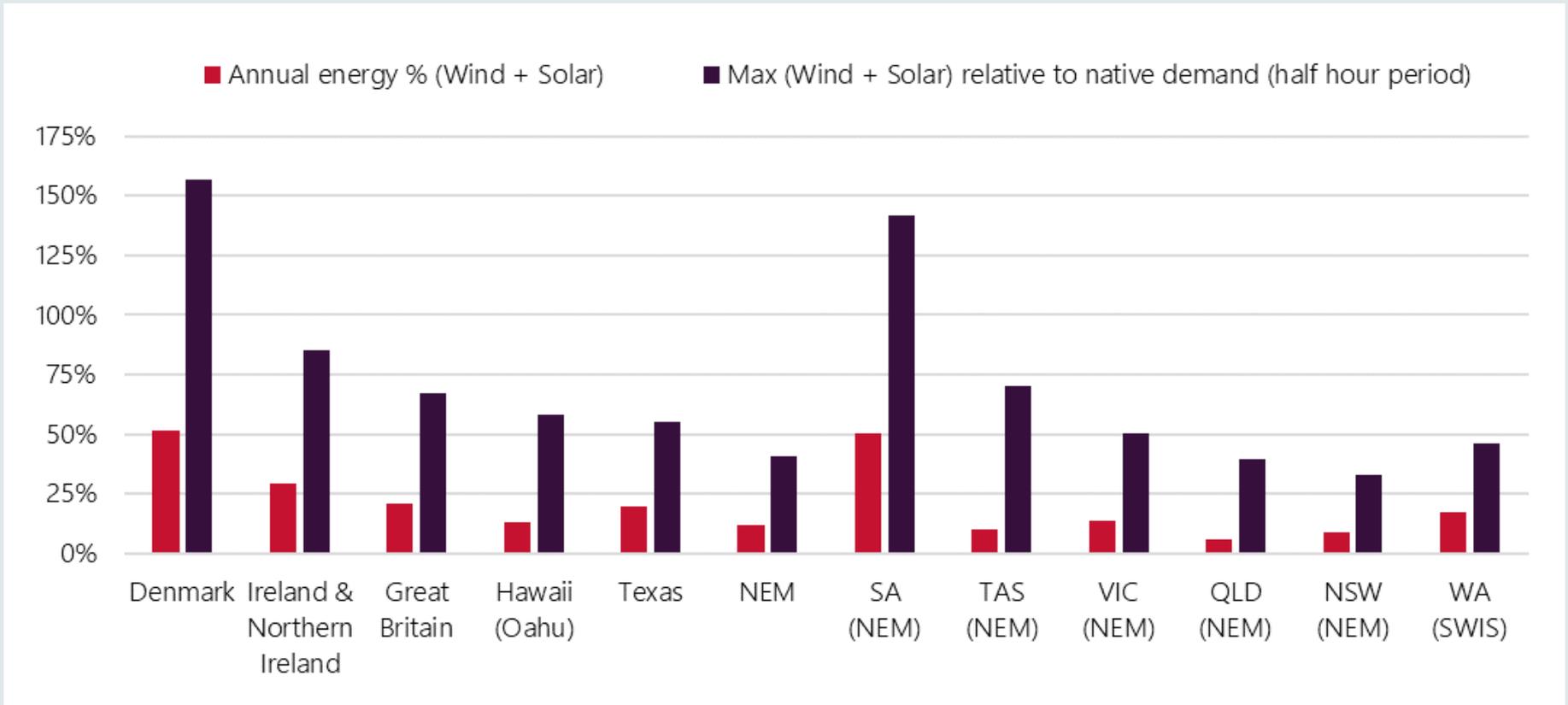
Learn by doing:

- learning as we go from our experiences operating the power system in progressively different ways.
- Large scale proof of concept trials like ARENA's will also play a critical enabling role

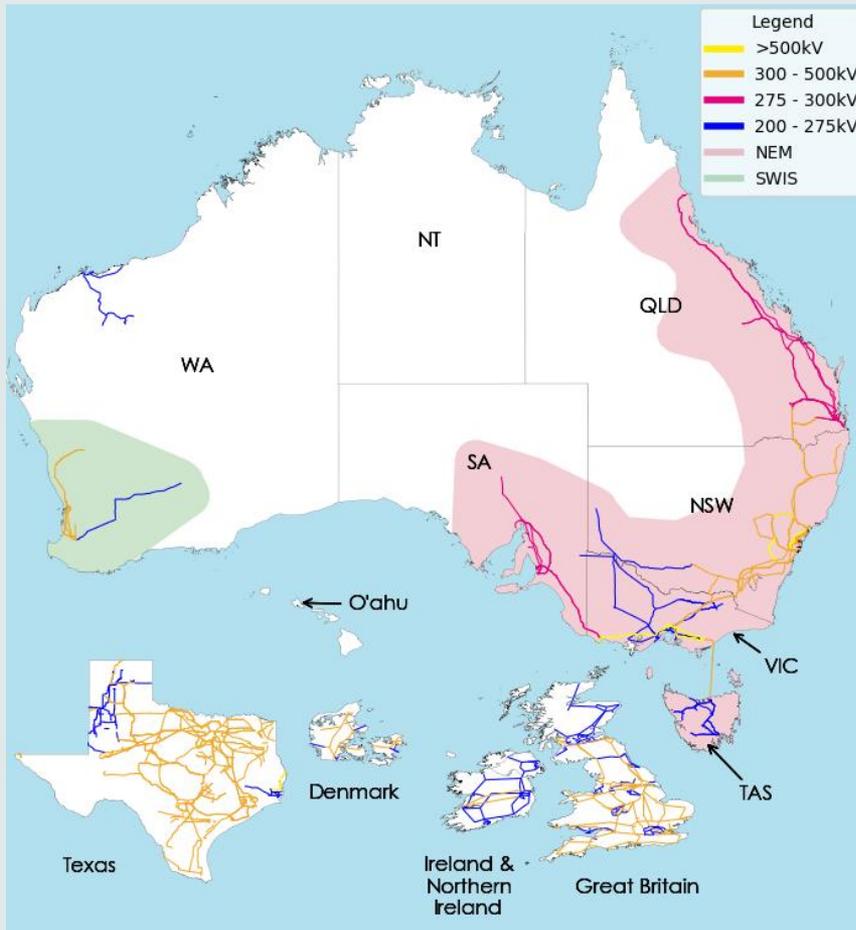
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Set the system up so that it has the resiliency to cope with a variety of unknowns, and the ability to sometimes fail while trialling new things without leading to widespread disruptions.

How does Australia compare?



Comparing different systems



- Geographic size and network topography
- Maximum demand
- Minimum demand
- Flexibility of conventional fleet
- Make-up of variable fleet – wind vs solar, utility-scale vs commercial vs residential
- Level of balancing support – interconnection and energy storage.

What can we learn from others?

Some key insights from the RIS International Review

DER Integration

- **Visibility** and **controllability** of these small distributed devices needed.
- Minimum level of **predictable performance** during power system disturbances also needed.

Frequency control

- Underlying **resilience** needed
- Broad-based **primary frequency control** and **minimum inertia** requirement during normal system operation

System strength

- Australia is at the forefront of challenges in connecting wind and solar generation in areas with low system strength

Staged transition

- Consideration should be given to how new system conditions can be **trialled safely** in the NEM and SWIS.

Next steps

Focus until March on assessing technical limits for the NEM in 2025

1

Detailed analysis into:

- Managing rapid changes in wind and solar output
- Assessing the adequacy of frequency control in the power system
- Analysing potential limits to distributed energy resources
- Assessing the impacts of system strength on generation dispatch

2

Presenting a picture of secure operating zones and key enablers for operating the NEM with increasing penetrations of wind and solar (and DER)

3

Providing a roadmap of priority actions to enable system operation with increasing levels of wind and solar

References

1. AEMO, 2019 RIS International Review, at https://www.aemo.com.au/-/media/Files/Electricity/NEM/Security_and_Reliability/Future-Energy-Systems/2019/AEMO-RIS-International-Review-Oct-19.pdf
2. AEMO, 2018 ISP, July 2018, at <http://aemo.com.au/Electricity/National-Electricity-Market-NEM/Planning-and-forecasting/Integrated-System-Plan>.
3. AEMO, Future Power System Security – Reports and Analysis, at <https://www.aemo.com.au/Electricity/National-Electricity-Market-NEM/Security-and-reliability/FPSSP-Reports-and-Analysis>
4. AEMO, Distributed Energy Resources Program, at <https://www.aemo.com.au/Electricity/National-Electricity-Market-NEM/DER-program>

Engagement

How to get involved

- Engagement in **parallel with ISP** consultation processes, occur once the **study results** become available in March
- AEMO will post relevant engagement information on its **website**



<https://www.aemo.com.au/Electricity/National-Electricity-Market-NEM/Security-and-reliability/Future-Energy-Systems/Renewable-Integration-Study>



For any further enquiries, please contact AEMO's Future Energy Systems team at FutureEnergy@aemo.com.au

Summary

- Transition of an essential service 'mid flight'
- Australia is at the forefront of some of these changes, and is tackling all the dimensions simultaneously, at speed.
- While no single system offers a perfect blueprint, there are a **lessons that we can learn from international systems.**
- We cannot go quickly and get everything perfect. Need to **learn by doing** as we go, and to set the system up with **resiliency to cope with unknowns**
- Watch out for RIS report in March 2020

