# An Australian Perspective

## *IEA Hydro: Sharing International Perspectives on Hydropower Value*


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NHA
National Hydropower Association

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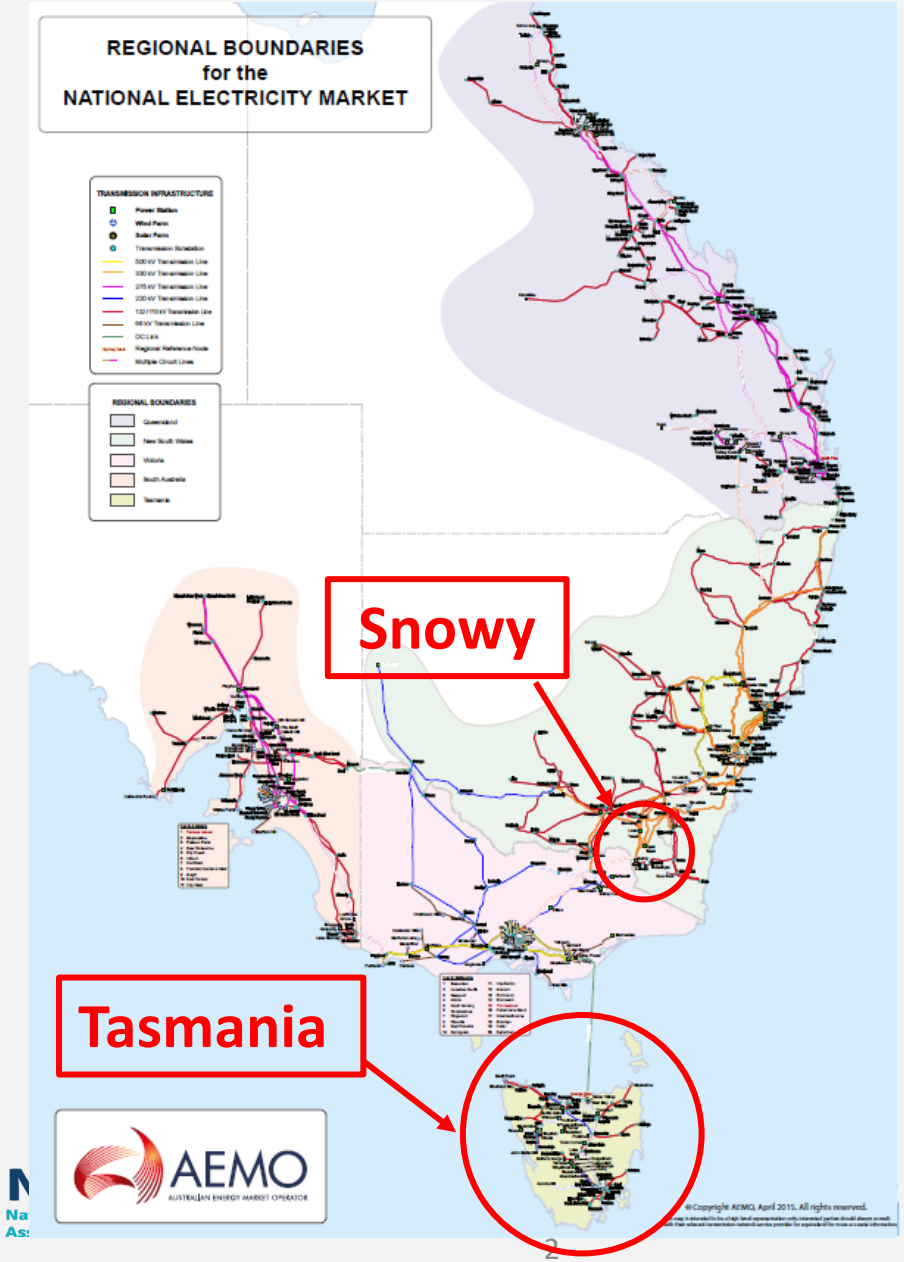
# What is Australia's NEM?

Australia's **National Electricity Market (NEM)**

- Energy only market, with separate FCAS markets (ancillary services)
- NEM supplies about **204 terawatt hours** of electricity to businesses and households each year – 10.7 Million customers
- Has **~40,000km** of transmission infrastructure across 5 regions.
- **Tasmania is connected to the NEM via Basslink** (500MW subsea HVDC cable) – ~90% Hydro generation, **~9TWh p.a.**



# The transition is underway…

- **Economy-wide emissions reduction target of 43% by 2030** (targeting 82% renewables by 2030)
- Currently **32.5% renewables as of 2023** – a long way to go!

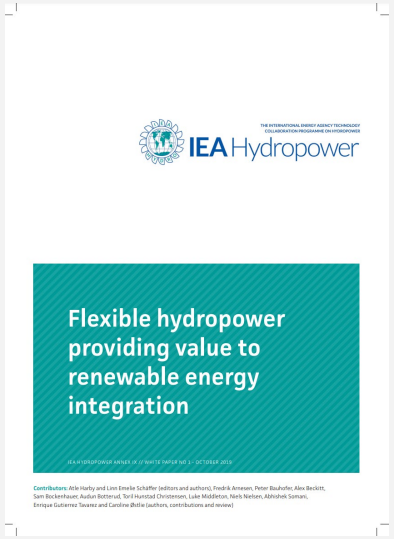
- ***What does this mean?***
  - *Economic **pressure on coal** to close.*
  - *Increasing **focus on storage** and firming.*
  - *AEMO's Integrated System Plan is trying to tackle the unknown.*
  - ***Forecasting nine-times current VRE,** and needing **46GW / 640GWh of new storage** by 2050!*

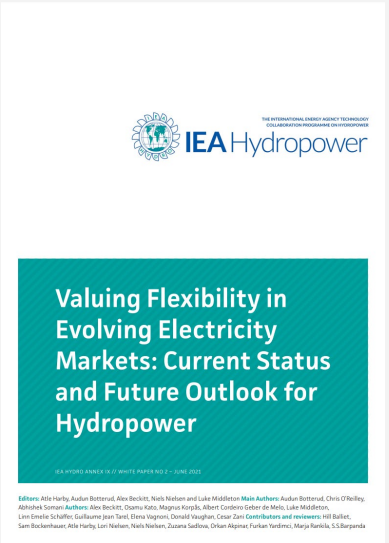

*Liddell coal station (NSW) closed in May (~1600MW)*

- *How can we utilise existing data and power system observations to **quantify the scale of the challenge** that lies ahead, and **appropriately value the role hydropower** moving forward?*

# IEA Hydro – Task IX

- **Two core topics** of *Task IX- Valuing Hydropower Services*:
  - Energy, grid services and flexibility; and
  - Climate change services adaptation.
- **Two white papers / technical reports already released.**
  - **White Paper 1:** Conceptualizing flexibility, and role of hydropower in VRE integration, range of services etc.
  - **White Paper 2:** How to value flexibility in evolving markets. Snapshots of approaches globally.
- We are now working on **White Paper 3, led by US DOE/PNNL** in collaboration with **TCP members, IHA, and others:**
  - *How can we quantify the **depth, duration and frequency of VRE droughts** to inform the optimal deployment of long-duration energy storage?*



# VRE Drought Indicators

- **PNNL's model comprises three approaches/indicators:** 1. Wind drought indicator; 2. Solar drought indicator; and 3. Combined wind and solar drought indicator.

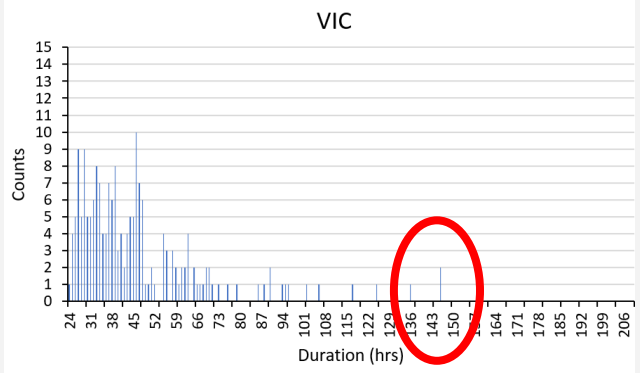
$$Wind\ Drought\ Event = \frac{\sum^{n(hours)} Wind\ Output}{n(hours)} < 10\% \frac{\sum^{x(days)*24} Wind\ Output}{x(days) * 24}$$

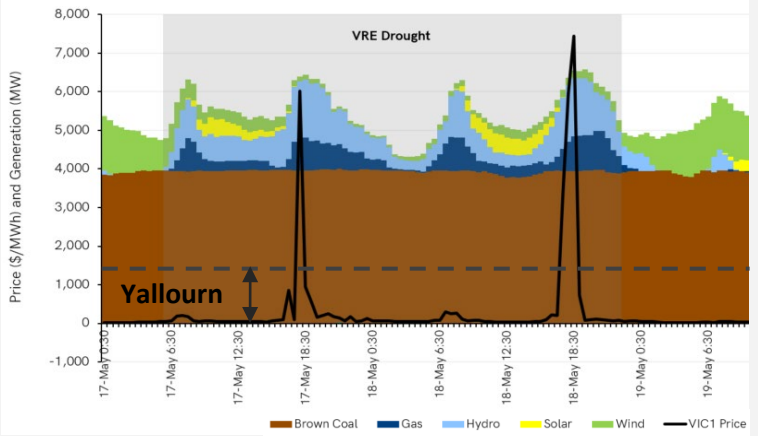
- **In a nutshell:**
  - Model calculates a **rolling 30 day average of VRE outputs** from historical data.
  - Whenever average VRE **output over a 24-hour+ period falls below a specified threshold (xx%) of the 30-day average**, this is labelled a "VRE drought".
  - If there are **consecutive 24-hour VRE drought events**, these will be considered part of a **single long-duration drought event**.
- We have applied this model to Australian data, using a **40% threshold**.

# Quantifying wind and solar droughts in the NEM

- Applying the proposed solar/wind metric, we've identified **192 events of 24+ hours in VIC** (2018-2023) - **Two events spanning five to six days!**
- These droughts have **largely been manageable, with sufficient thermal generation still operating…**
- Case study (bottom graph) is the state of **Victoria on 17 and 18 May 2021 –** Wind and solar depleted…
- **3 Major brown coal stations retiring** – Yallourn (1450MW) first to retire in 2028 (dashed line – indicative only). **4800MW retiring by 2045 (if not sooner)!**

***What can be relied upon to replace retiring capacity and manage these events going forward?***



# Case Study: Preliminary observations

- ***What are the options available to manage these events into the future?***
  - ***Brown coal –*** Costly to extend life, contradicts emissions targets.
  - ***Gas peaking –*** Costly fuel, contradicts emissions targets.
  - ***Wind and solar –*** Substantial overbuild required to close the gap completely.
  - ***Batteries –*** Insufficient duration to manage longer-events.
  - ***Demand-side –*** Re-tooling cost and productivity impacts.

- **We believe the optimal way to enhance the resilience of our power system is to invest in:**
  - ***More Interconnection:*** *Capitalize on* ***resource diversity*** *across regions*
  - ***More Hydro and PSH:*** *Ensure sufficient* ***flexible and long-duration assets*** *available*

***We need policy and market frameworks to incentivise LDES NOW!*** *Revenue certainty and programs to de-risk investments are essential. Australia has an evolving approach, including a new Capacity Investment Scheme.*

# Closing remarks

***IEA Hydro's work, in collaboration with the IEA-Secretariat in Paris, the IHA and others can ensure the ongoing development and tools we all need to appropriately value the role of hydropower in transitioning energy markets globally.***

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**Thank you**