THE UNIVERSITY of ADELAIDE

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How much Energy Storage does Australia need?

Outline

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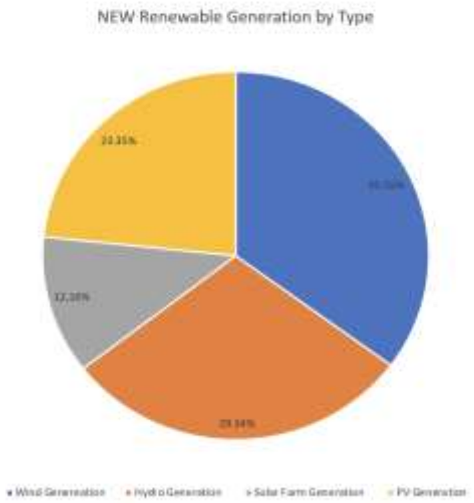
• Introduction : Project Aims and motivation

- Aim: to Gain perspective on how much energy storage is needed to ensure demand supply balance due to the intermittency of renewable energy sources.

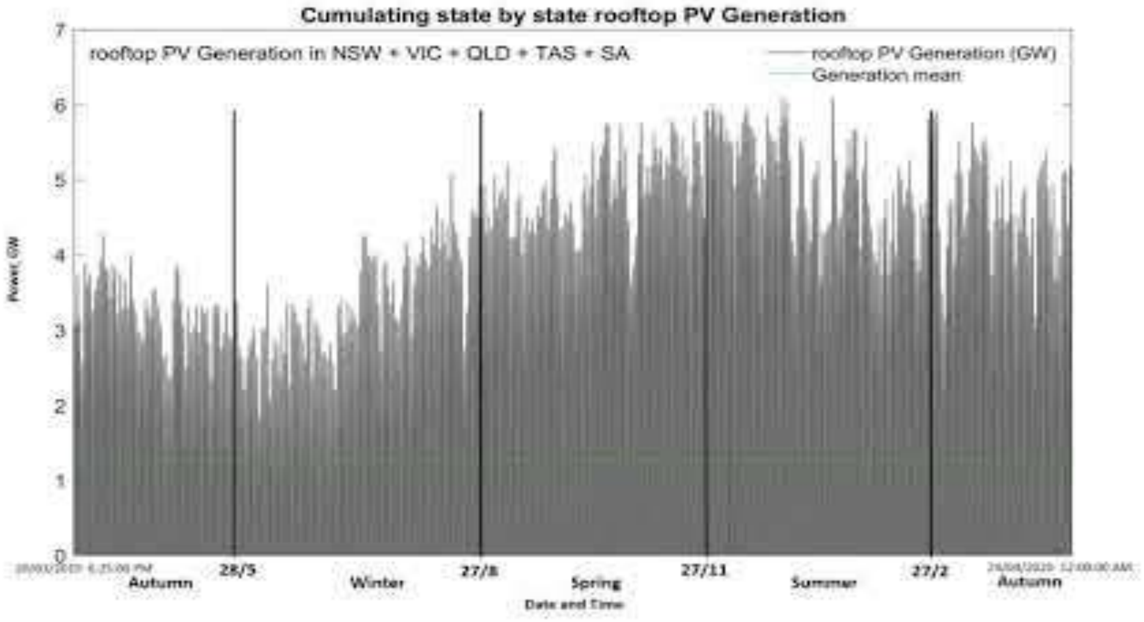
- Motivation: A significant amount of renewable energy generation has been added since 2018. In 2019, 24% of Australia’s electricity generation is from renewables.

Data Collection and NEM network

- Australian Energy Market Operator (AEMO)



NEM Renewable Generation Video



Project Methodology and Approach

- **Collect Data from AEMO** website, wind, solar, rooftop PV, and hydro power generation as well as power demand.

- Generate a graph to compare **Total Power generation(GW) versus Power demand(GW)** from March 2019 to April 2020.

- Calculate and plot Net power(GW) graph, such that **Net power (GW) = Power generation(GW) – Power demand(GW)**, for each time interval.

- **Integrate the Net power (GW)** graph, in order to obtain Energy storage required (GWh) graph for each time interval.

- The **highest value** in **Energy storage required (GWh)** graph is the battery capacity that ~~is needed to meet the power demand and avoid power outages.~~

Energy storage option

Hornsdale Power Reserve

Discharging capacity and storage capacity are **150MW/193.5 MWh**

Snowy 2.0 pumped hydro scheme

Discharging capacity and storage capacity are **2GW/350 GWh**

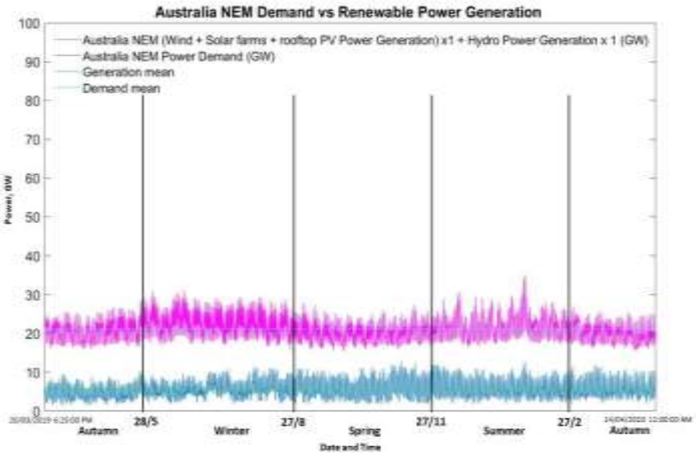
Gordon Dam

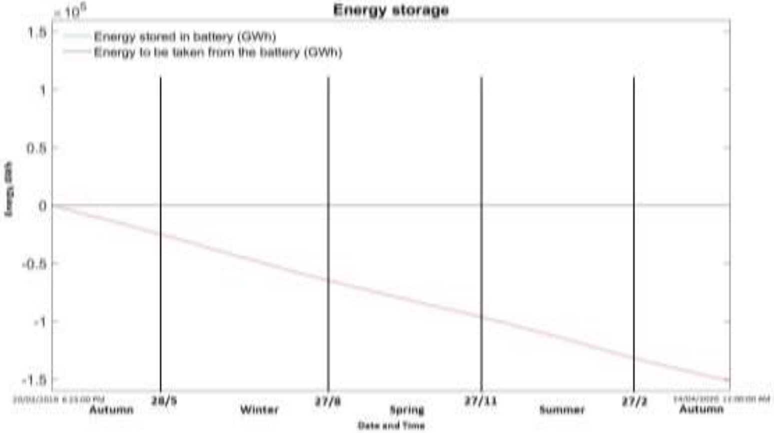
Discharging capacity and storage capacity are **432 MW /4715 GWh**

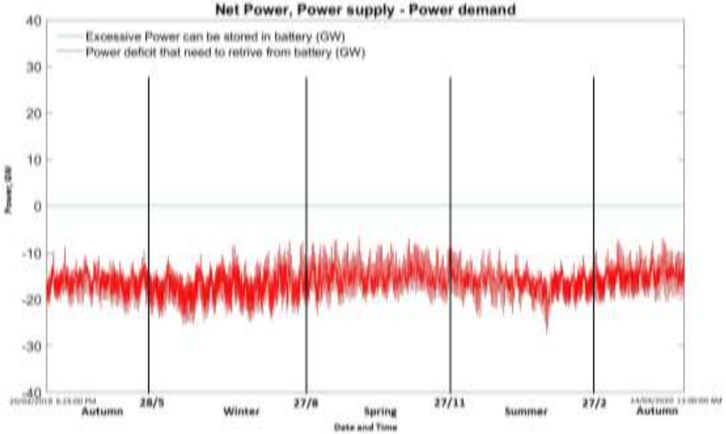
Baseline case

- Storage required

  = 151700 GWh

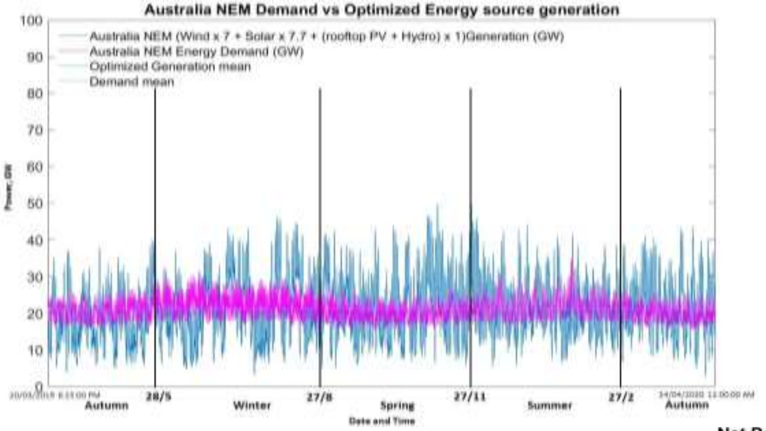




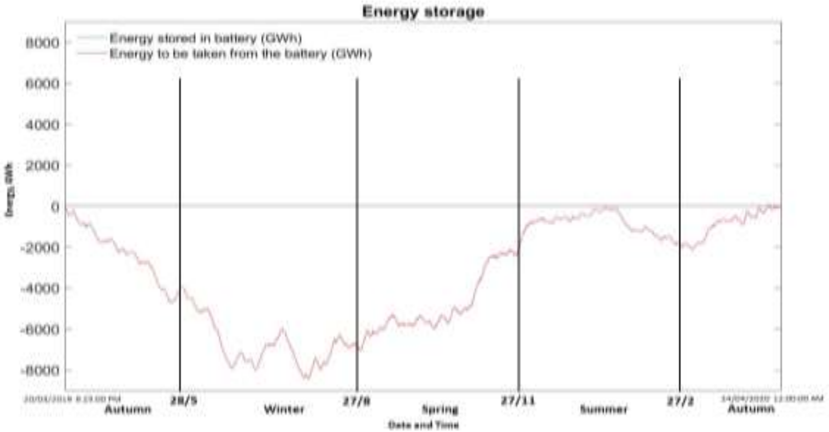


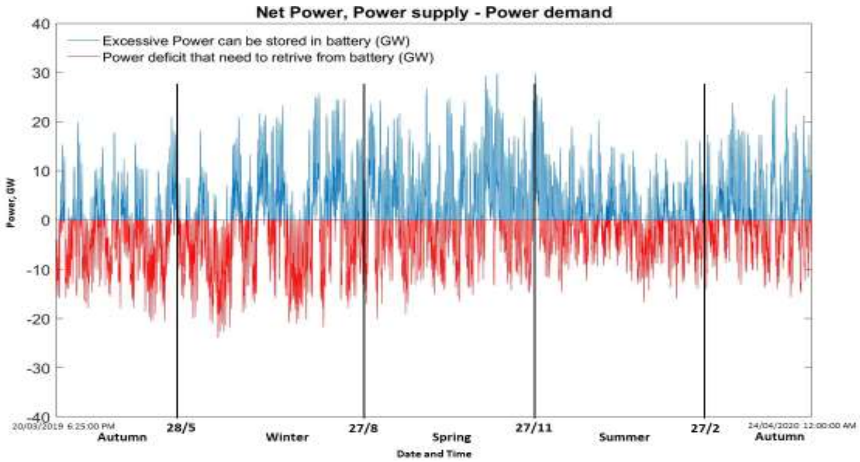
Optimized case

- Storage required = 8440.4 GWh



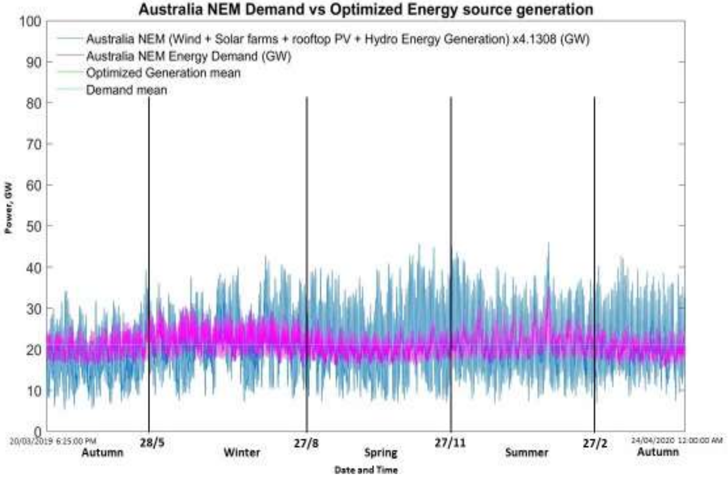
- Highest discharging capacity required = 23.9032 GW



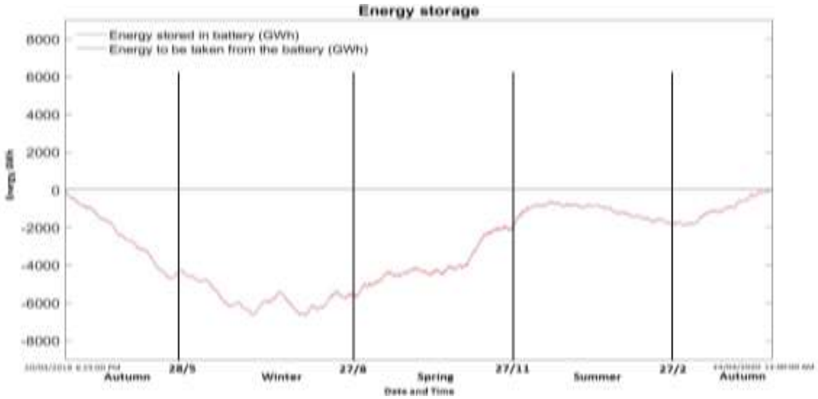


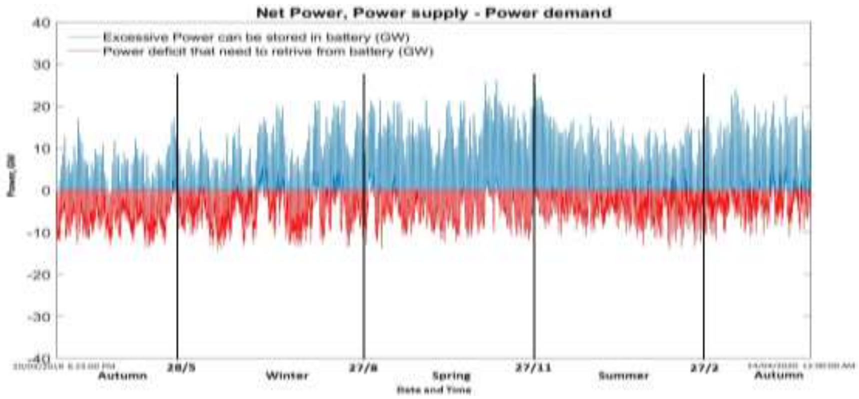
Scaling Factor Case

- Storage required = 6687.1 GWh



- Highest discharging capacity required = 14.4101 GW





Comparison for all cases

	Baseline Case	Optimized Case	Scaling factor Case
Hornsdale Power Reserve	783979	43620 Σ Discharging capacity = 6543 GW	34559 Σ Discharging capacity = 5200 GW
Snowy 2.0 pumped hydro scheme	433	25 Σ Discharging capacity = 50 GW	20 Σ Discharging capacity = 40 GW
Gordon Dam	32.2	1.8 Σ Discharging capacity = 777.6 MW	1.4 Σ Discharging capacity = 604.8 GW
	power deficient always exists, no limit of battery storage capacity	Ideal Case	Less feasible

Future work

- Further optimization is required
- Use data from bureau of meteorology to determine the optimal locations for the required renewable solar and wind farms.
- Conduct financial analysis of over installing renewables for investment purposes.

Conclusion

- Optimized case is the Ideal case
- Snowy 2.0 pumped hydro scheme is the best energy storage option

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Thank you for Listening

Any Questions ?