



MEInetwork24 Seminar Series

5 September 2024

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#MEInetwork



Melbourne
Energy
Institute

Seminar #5: Energy markets in an isolated grid

Speaker:

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Head of DER & Engineering, Synergy

Moderator:

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Transport, Mechanical Engineering
University of Melbourne*

Disclaimer



5 September 2024

Leading Western Australians to their intelligent energy future



WA's largest
electricity generator
and energy retailer



1.1 million +
electricity customers



Generate
~6,500 GWh
of electricity p.a



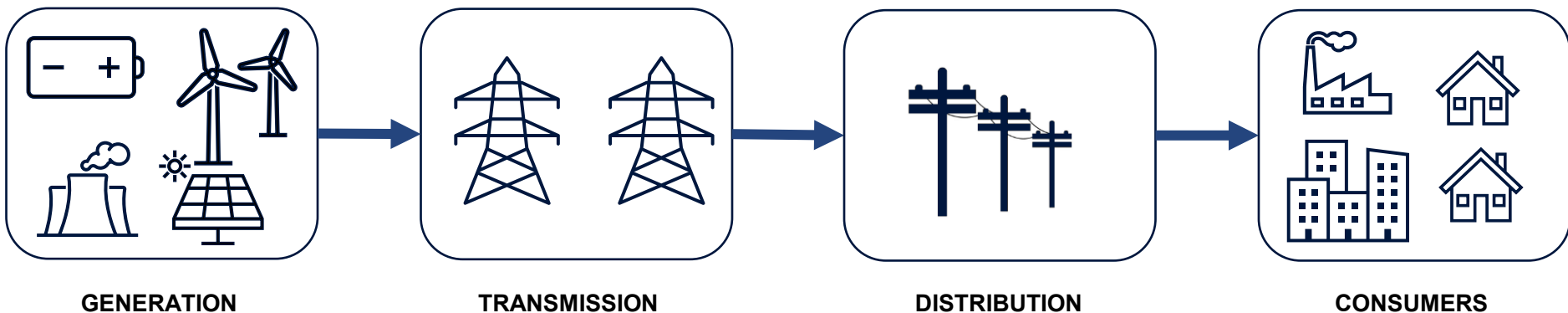
Workforce of 1,500+
employees
and contractors



Part 1: Electricity Systems and Markets

5 September 2024





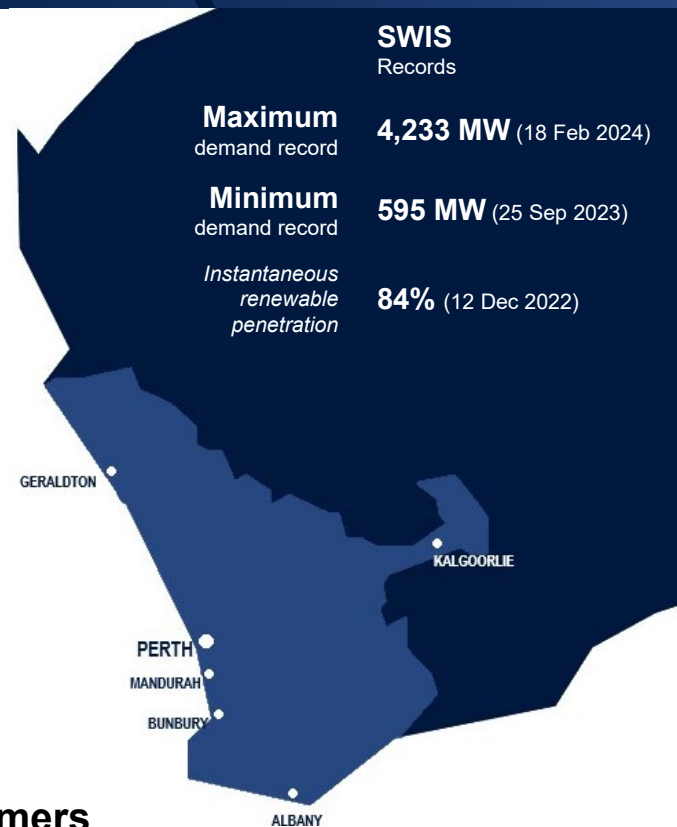
- Incorporates all network and generation assets, an isolated system (no interconnection), not part of the “National Electricity Market”
- Remainder of the state supplied by Horizon Power/private networks

United Kingdom

- 243,000 km²
- 67 million people

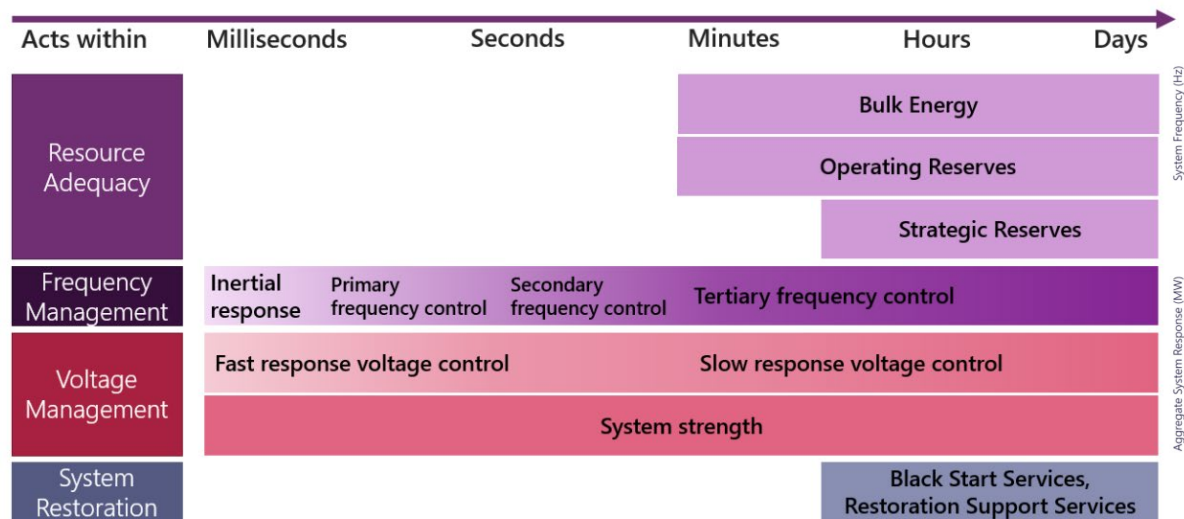
SWIS

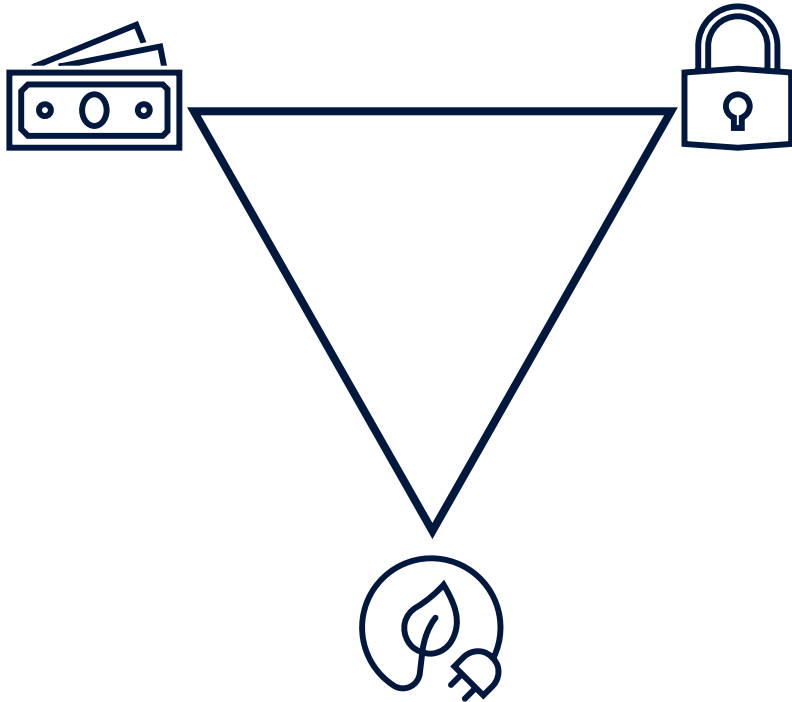
- 255,000 km²
- Over 2 million people



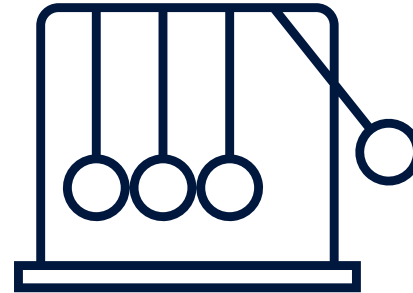
50% of SWIS network assets provide services to 3% of customers

Figure 1 Operation timescales for services needed



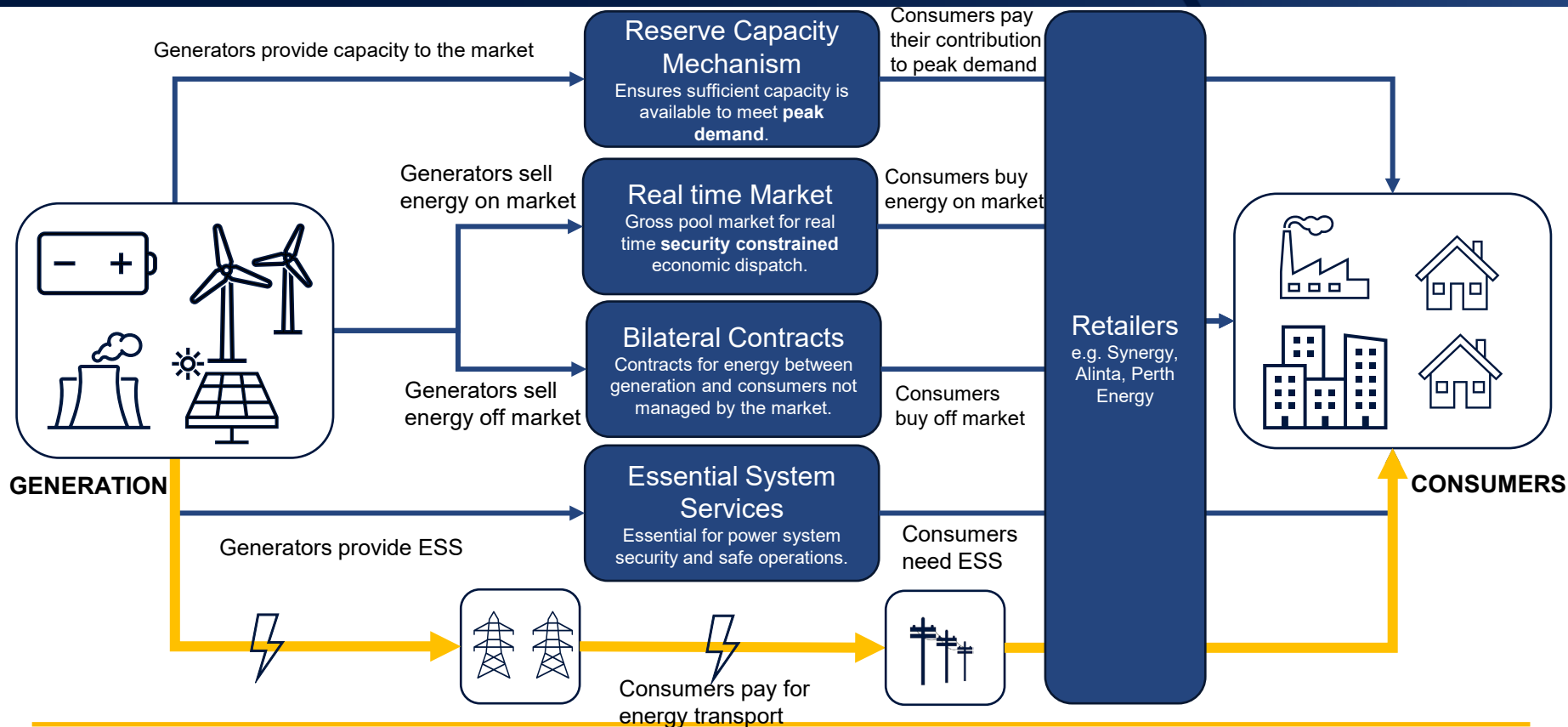


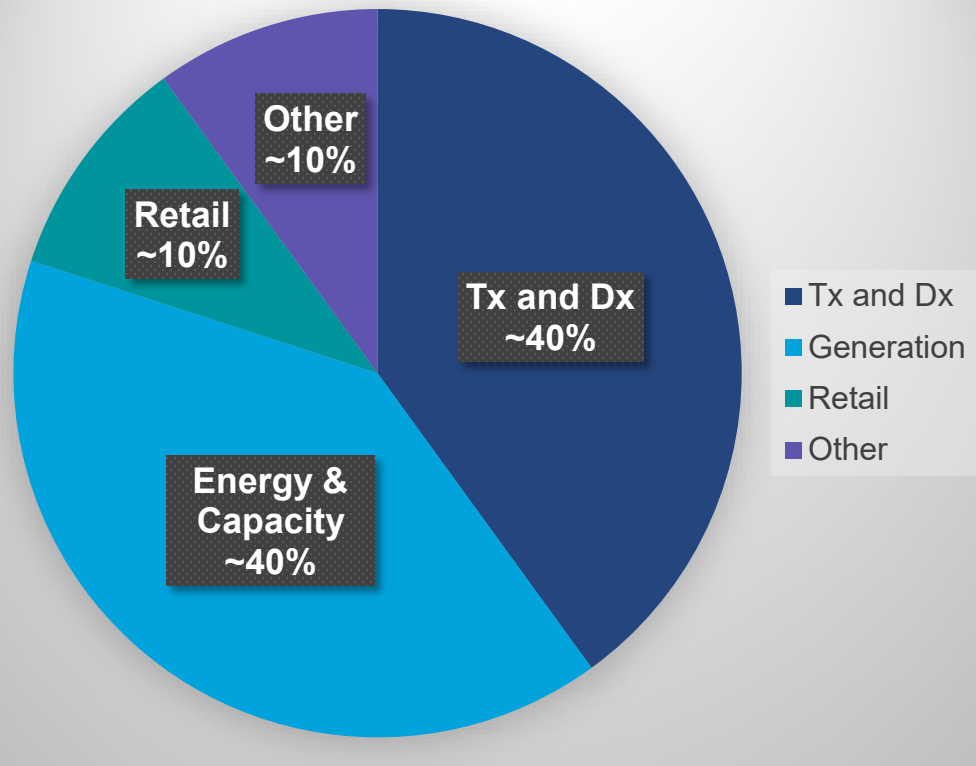
Who pays?



The WEM vs NEM

WEM		NEM
Energy: 20 terawatt hours Capacity: 5,859 MW	Size	Energy: 200 terawatt hours Capacity: 54,421 MW
Designed as a net pool market where participants declare their energy commitments through a bilateral market and trade around those positions' day ahead and in real time	Market Design	Gross pool market designed for both SRMC & LRMC cost recovery through participant offers in real time
SRMC recovered through the real time market, and LRMC recovered through the Reserve Capacity Mechanism (RCM)	Cost Recovery	Both SRMC & LRMC recovered in the real time market
Using long-term energy offtake agreements and the day ahead energy market	Financial Products	Using ASX instruments and Over the Counter products
10 dynamic price quantity pairs which can be changed up until 5-minute before the interval. Requirement to offer all certified capacity into the energy market	Real Time Market	10 price quantity pairs which freeze day before, however, quantities can be dynamically shifted between bands depending on operational conditions

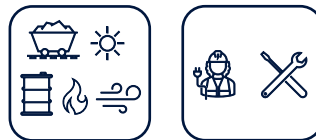




Fixed



Variable



Synergy Home Plan® (A1) tariff

One flat rate all day, everyday

A simple option for busy homes

Item	Price inc. GST
Supply charge	113.2200 cents per day
Supply charge for additional homes	45.0158 cents per day
Electricity charge	31.5823 cents per unit

Average residential bill ~ \$1,500 - \$2,000

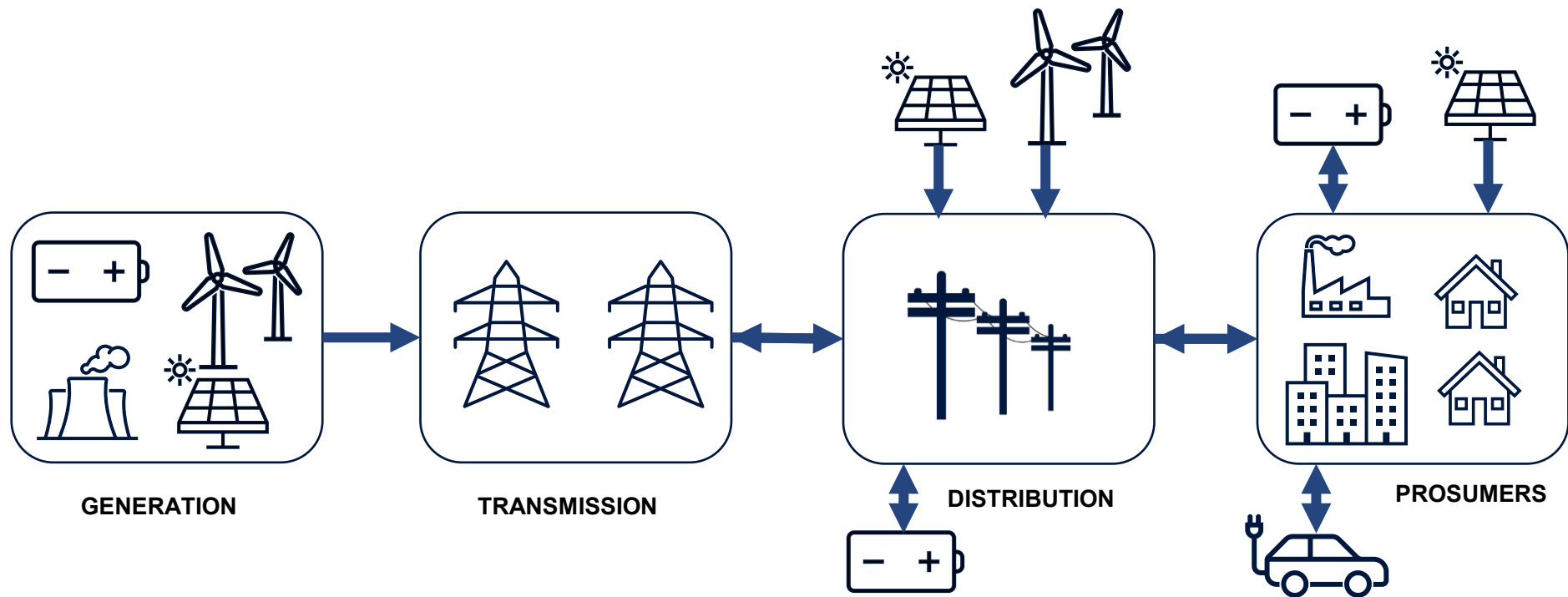
- Supply/fixed costs are not the main driver of bill
- Energy costs the same any time of day
- Save money, use less energy... or...



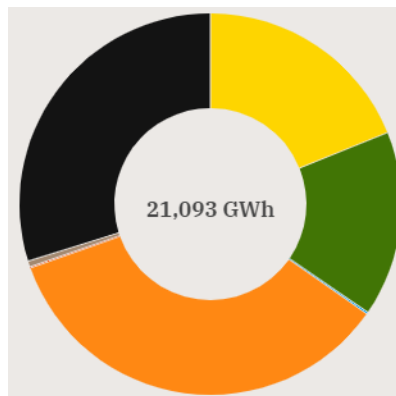
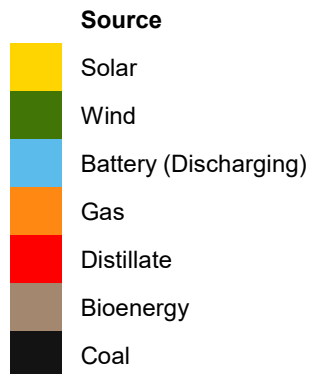
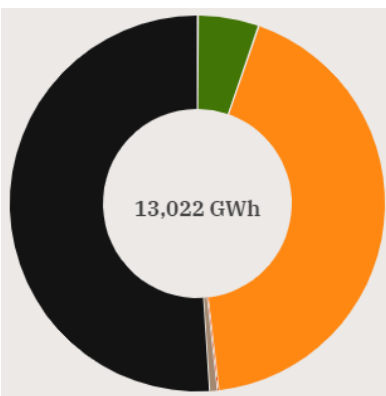
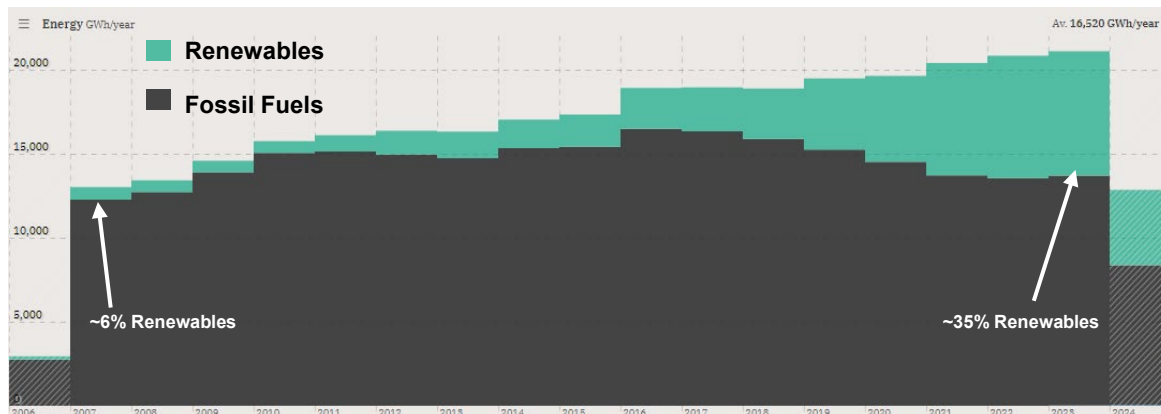
Part 2: Energy Transition in the West

5 September 2024

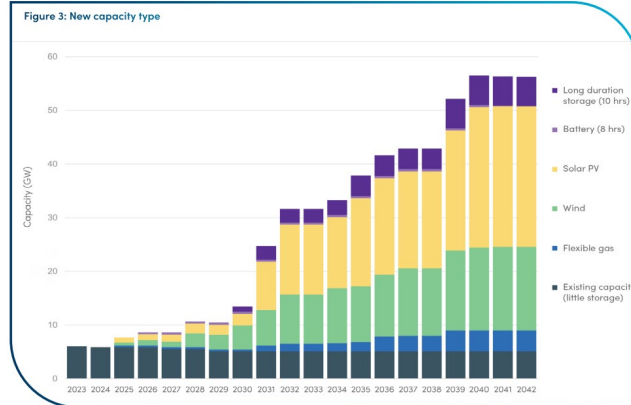


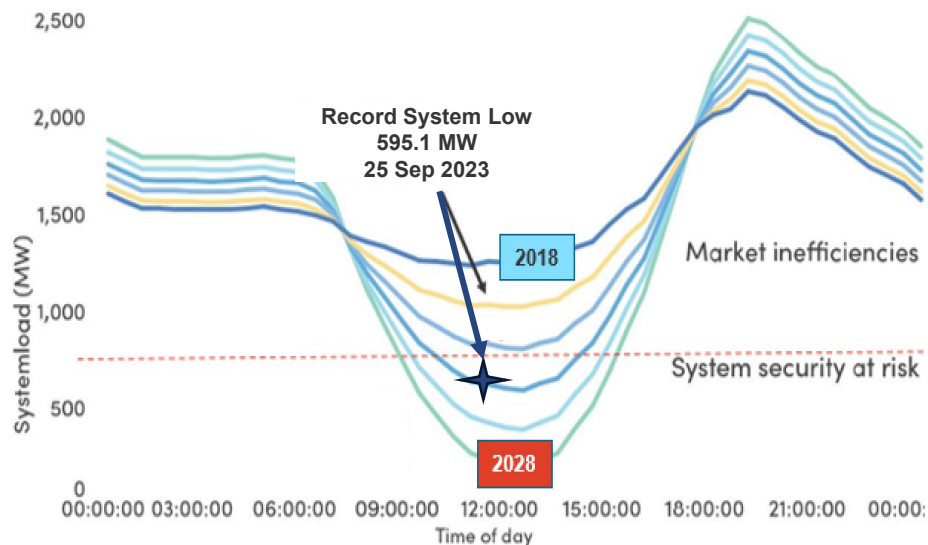


Electricity System – Supply side



So, heading in the right direction?





2023
~39% of households
have solar



2033
Predict over 73% of
households will have
solar

2023
~13,000 EVs
in WA

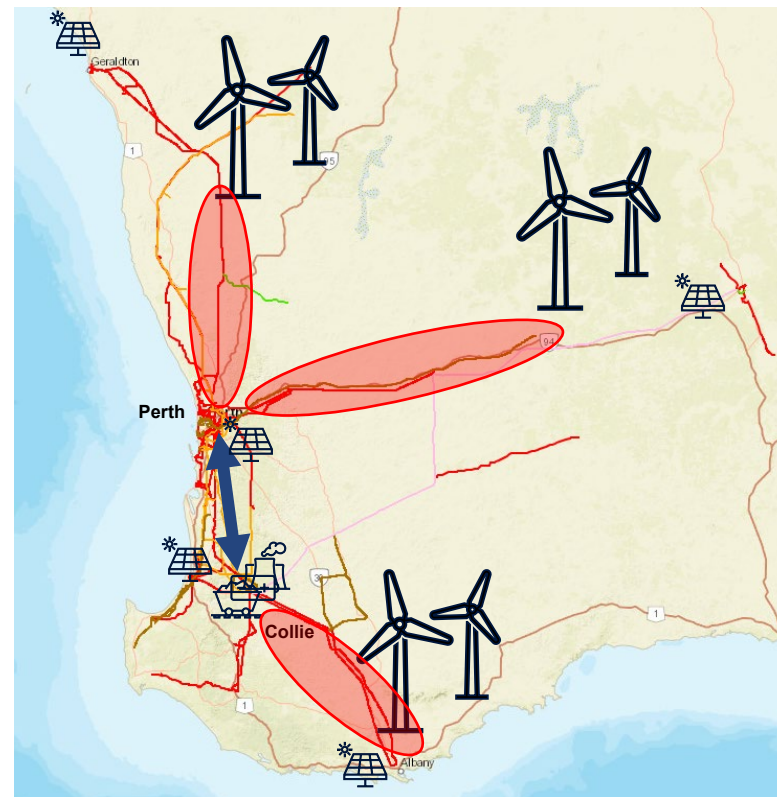
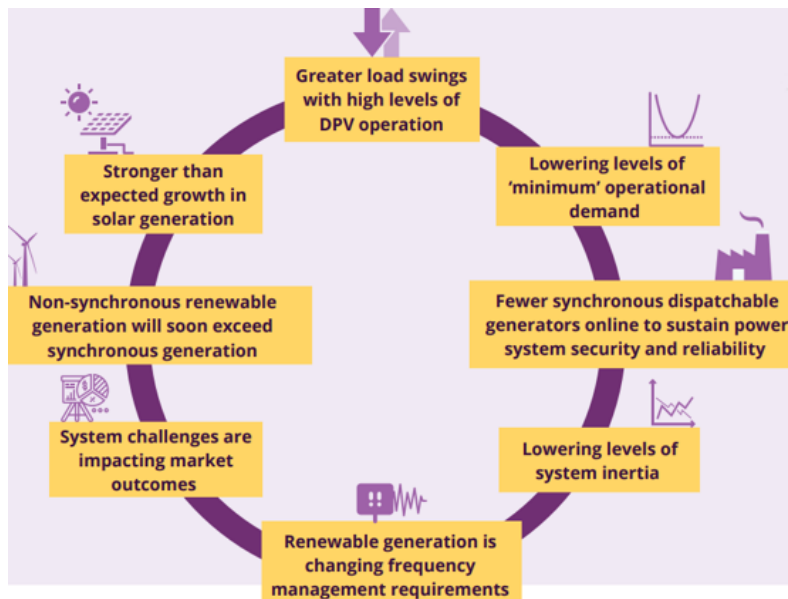


2030
EV charging expected to
add 250 GWh of energy
demand to the network

2023
<260MWh BTM
battery capacity
in WA

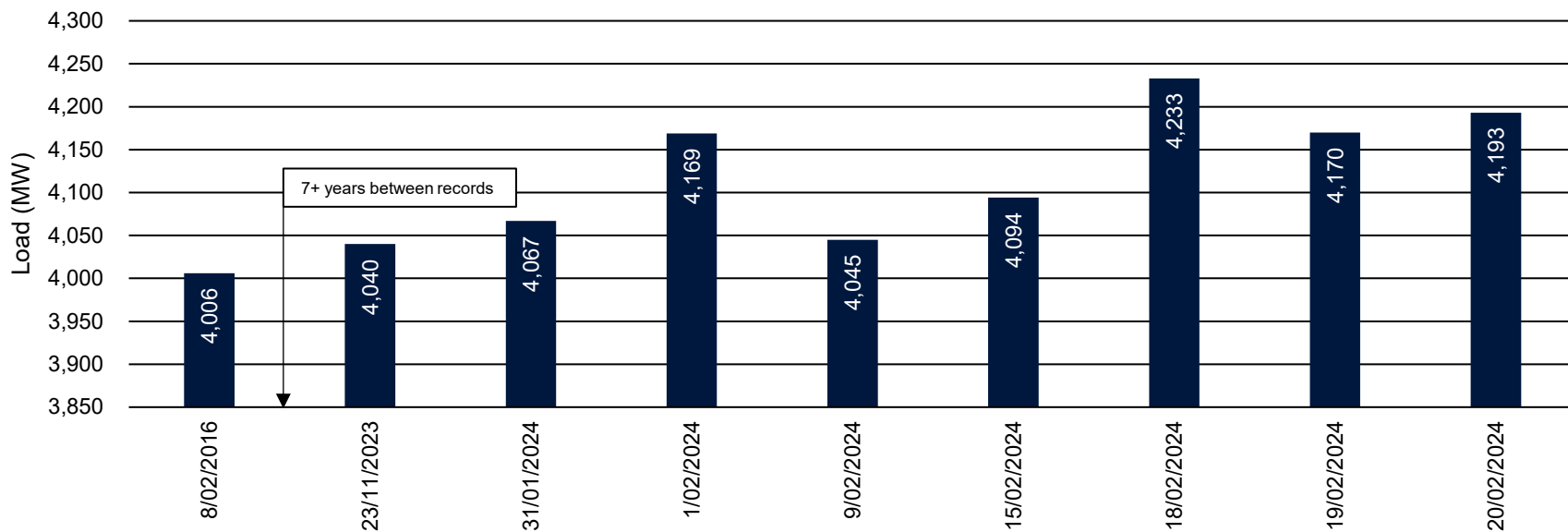


2031
Expected to grow
to 2,500 MWh



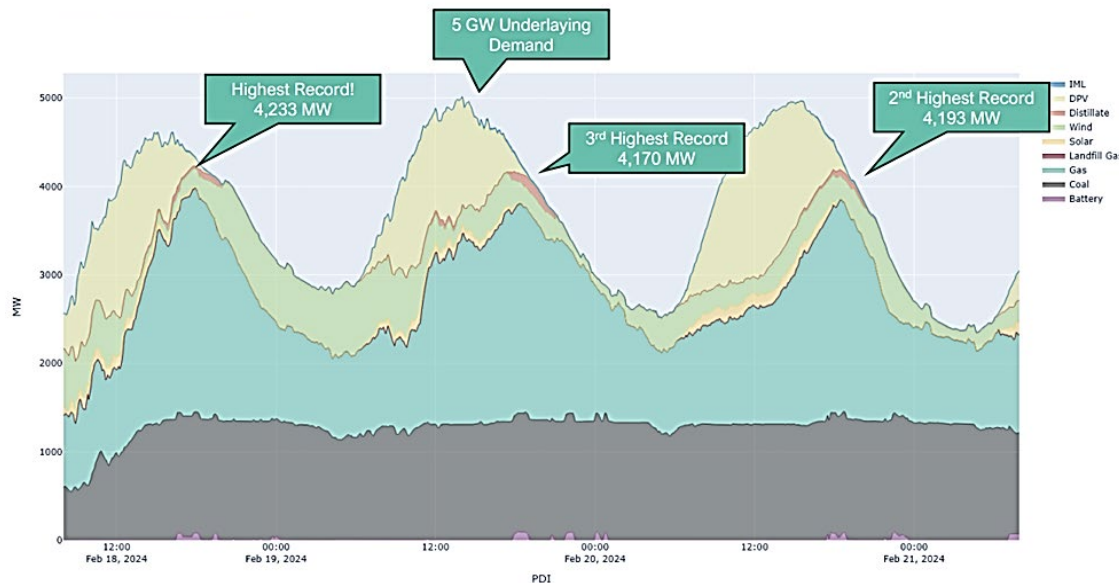
Average operational demand records continued to fall over summer, with a peak demand of 4,233 MW recorded at 17:55 on 18 February 2024, which was a Sunday!

Peak Average Operational Demand (MW)



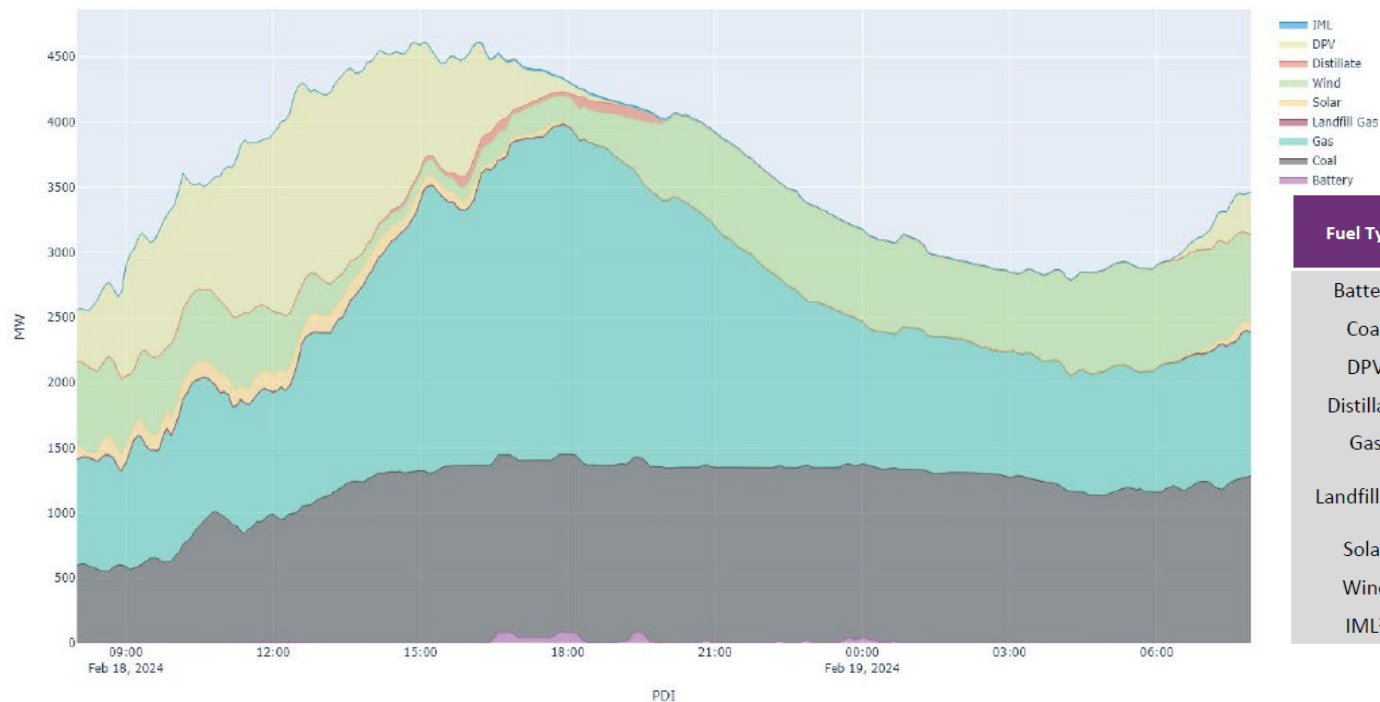
Extreme weather conditions placed unique pressure on AEMO as the limits of the power system were tested

Fuel mix by dispatch interval
18 February to 21 February 2024
Megawatts



- AEMO utilised all available levers dispatching liquid capacity, customer demand side management, supplementary reserve capacity and non-market facilities.
- The **highest underlying demand of 5,016MW occurred on Monday 19th**. That is, without rooftop DPV, a further ~800MW of large-scale capacity would have been required to meet underlying peak demand.
- On all three days, the **loss of a single large generator could have resulted in customer load shedding**.

18 February 2024: Fuel mix by dispatch interval

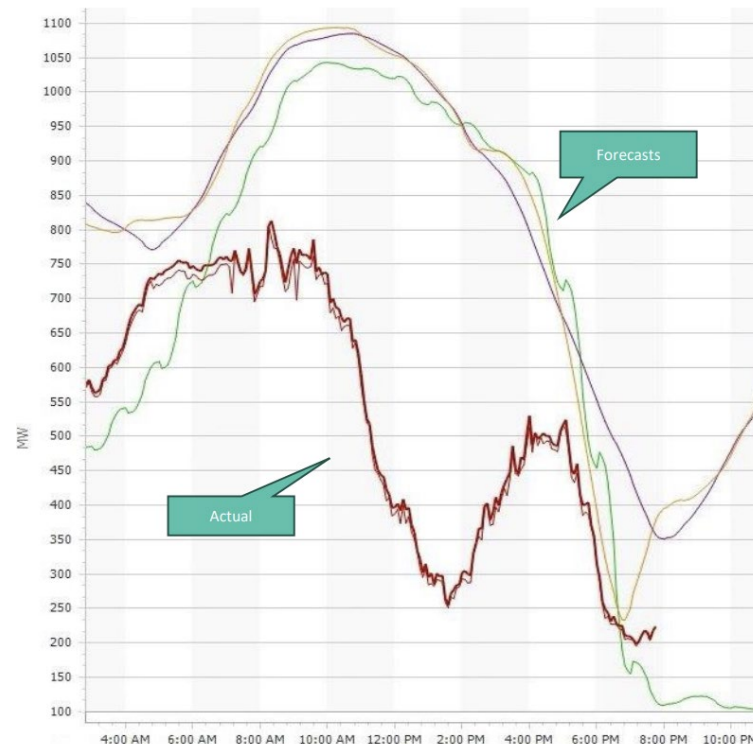
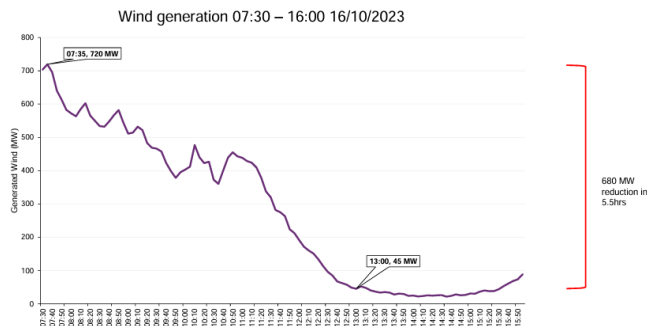


5:55 PM: Peak Demand Fuel Mix

Fuel Type	MW	Fuel Mix OD %	Fuel Mix UD %
Battery	85.7	2.0%	2.0%
Coal	1,364.1	32.1%	31.5%
DPV	90.4	¹	2.1%
Distillate	30.8	0.7%	0.7%
Gas	2,528.9	59.6%	58.3%
Landfill Gas	7.1	0.2%	0.2%
Solar	12.8	0.3%	0.3%
Wind	203.4	4.8%	4.7%
IML ²	12.5	0.3%	0.3%

Intermittent forecast vs actuals | 19 January 2024

- Management of wind and solar generation volatility is an increasingly important factor for secure and reliable power system operations
- Actual wind and solar generation often vary significantly from near-to-real-time forecasts
- At around 1.30pm on 19 January (3rd highest peak demand day) actual wind generation was ~700MW below forecast
- This created a generation planning shortfall equivalent to ~3.5 Muja units which was managed through a combination of battery storage and fast-start gas turbines



Alinta receives approval for BESS in Western Australia

By [George Heynes](#)

Julia **COLLIE**
BATTERY

[HOME](#) [ABOUT](#) ▾

OVERVIEW

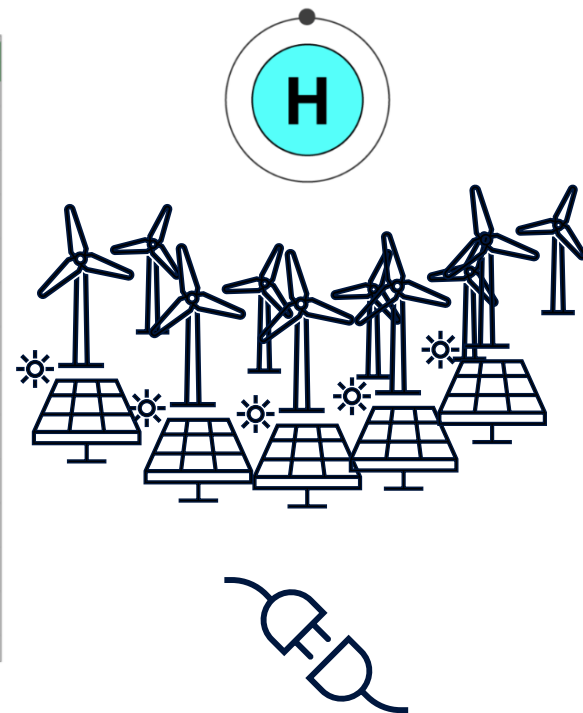
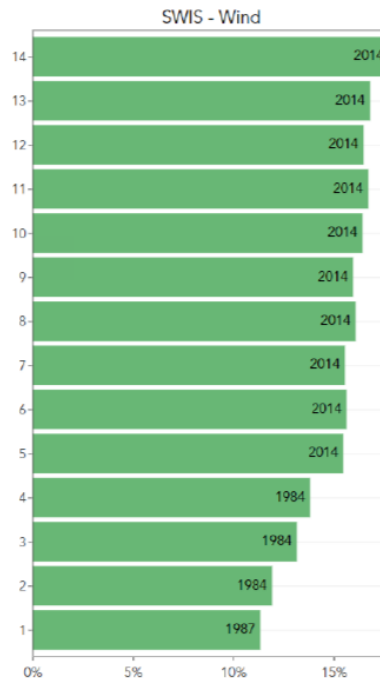
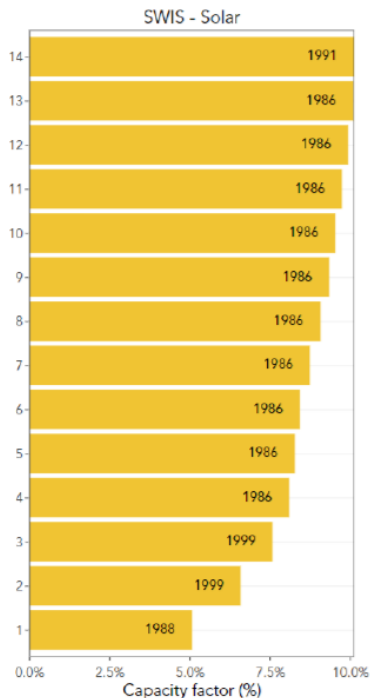
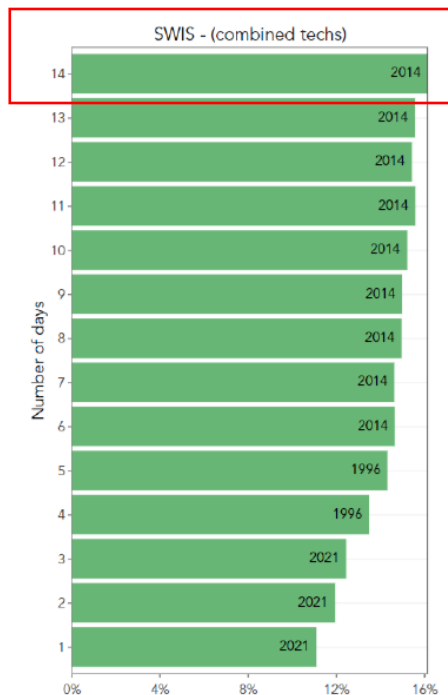
Collie Battery is Neoen's first 4-hour long duration battery & its first major project in Western Australia. The project has development approval for 1 GW / 4 GWh.

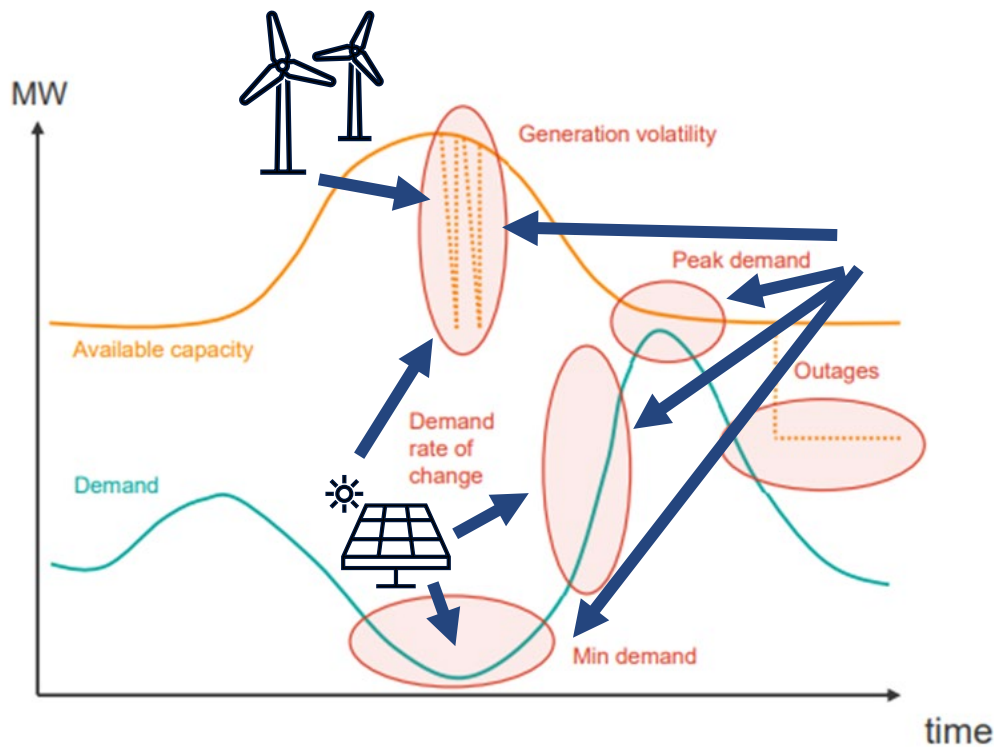
Collie Battery is currently being built in stages, two of which are currently under construction:

- Stage 1 is sized at 219 MW / 877 MWh
- Stage 2 is sized at 341 MW / 1,363 MWh

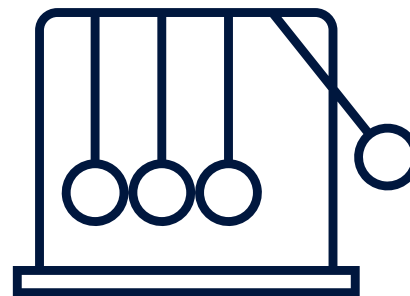


Combined generation across the SWIS still suffers infrequent, but significant, long duration drought

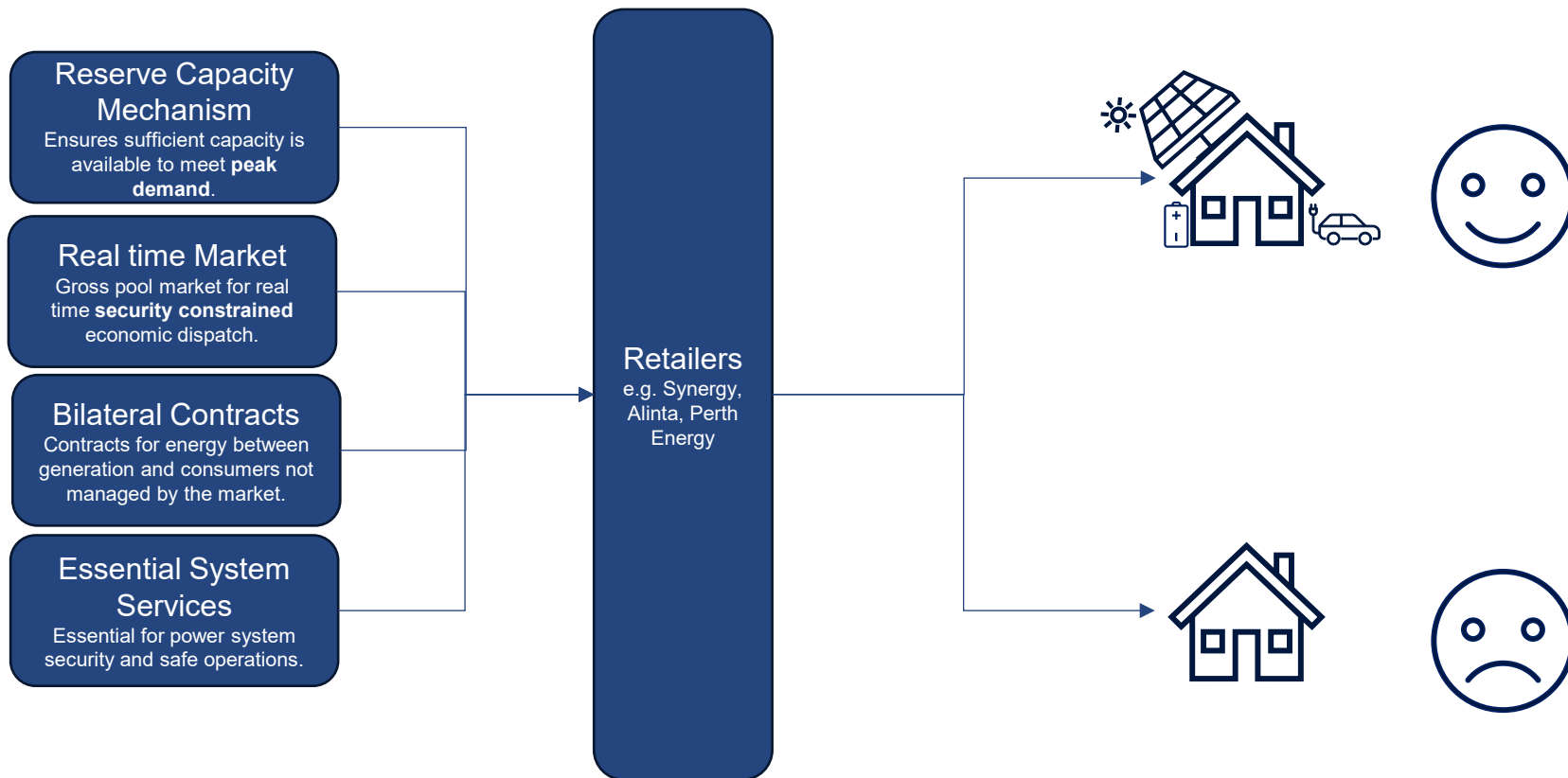




- New energy is required
- New capacity is required
- New services are required
- Storage is required



Customer Impact – Winners and Losers



Panic break... look at this
nice field...don't forget to
breathe

Easy is boring!



Our renewable energy future



Operational

Renewable generation 255.4 MW
Storage capacity 100 MW / 200 MWh



Albany Wind Farm
– 35.4 MW



Warradarge Wind Farm 1
– 180 MW



Greenough River Solar Farm*
– 40 MW



Kwinana Battery Energy
Storage System 1
– 100 MW / 200 MWh



Construction

Storage capacity
700 MW / 2,800 MWh



Kwinana Battery Energy
Storage System 2
– 200 MW / 800 MWh



Collie Battery Energy
Storage System 1
– 500 MW / 2,000 MWh



Development

Renewable generation 258 MW



King Rocks Wind Farm
– 150 MW



Warradarge Wind Farm 2*
– 108 MW



Feasibility

Renewable generation 250 MW
Storage capacity 500 MW / 2,000 MWh+



Wind farm opportunities
– 100MW and 150 MW

Exploring third-party partnerships
and acquisitions



Battery opportunities
– 500 MW / 2,000 MWh

Delivery by 2029



DER / VPP opportunities
- 1,000 MW / 500 MWh? (TBC)
- Delivery by 2030

Our renewable energy future



Thank you

