
ENGIE
Impact
Climate Resilient
Net Zero Mining
ENERGYANDMINES
AUSTRALIA
SUMMIT
TITLE SPONSOR
JUWI
JUNE
14-15
2023
OPTUS STADIUM

Speaker

Amy Steel

Oceania leader – Climate Risk

ENGIE Impact

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Amy is the Oceania Leader of Climate Risk for ENGIE Impact's team based in Perth. With over 10 years' experience, Amy has provided advisory services in a broad range of sustainability areas, specialising in climate risk and decarbonisation over the last 5 years. The types of projects have ranged from assessing the physical risks resulting from global warming under different emission scenarios, through to establishing decarbonisation targets and trajectories, and evaluating the technology types required to meet these.

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ENGIE Impact accelerates sustainability transformation and aims to capture the full business value of sustainability

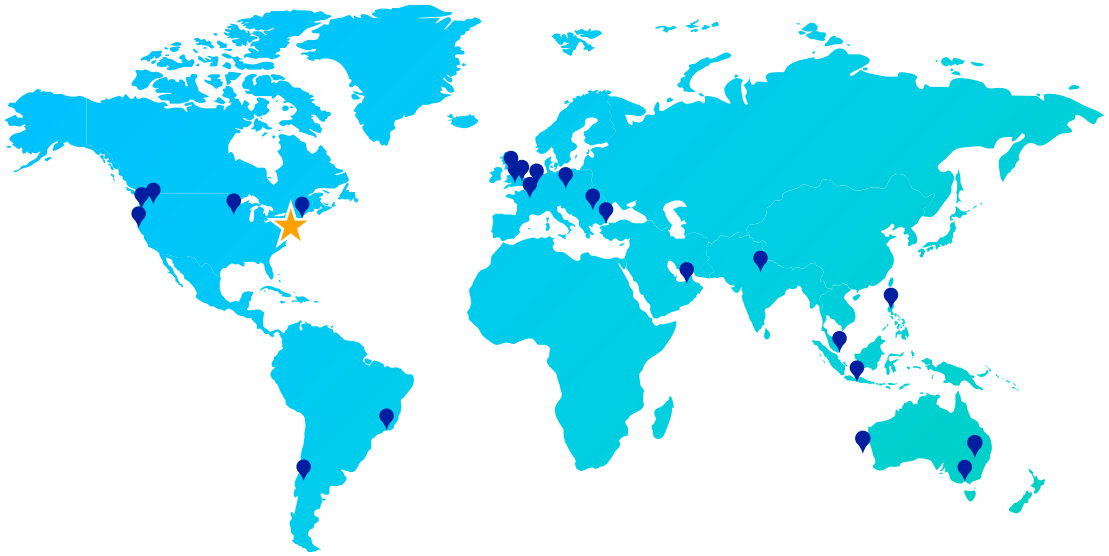
Global Presence & Local Experience

+

Strategy, Business, Engineering & Digital Capabilities

+

Implementation & Financing Support



2,200+
Employees globally

22
Offices Worldwide

1,000,000
Sites under management

1,000+
Corporate, city & government clients

25%
of the corporate's clients in Fortune 500

Clients

OZ

cefc

AngloAmerican

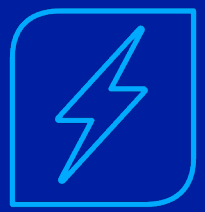
PRONY Resources New Caledonia

Tier 1 gold and mixed commodities mining

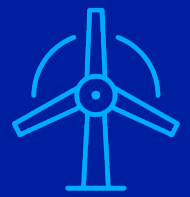
ENGIE Impact

Mine: Location context

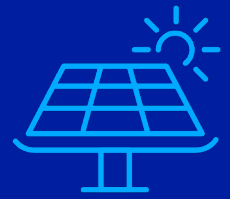
Load
~70MW



Wind
~160MW



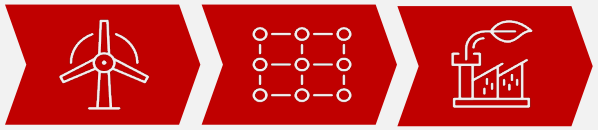
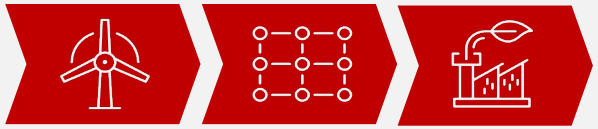
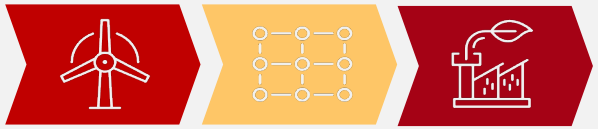
Solar
~150MW



Battery
~100MW
4 hr duration

Threats from climate extremes

Cyclone, severe convective winds, flooding, extreme heat and bushfires all provide increased risk of inefficiency and total outage.

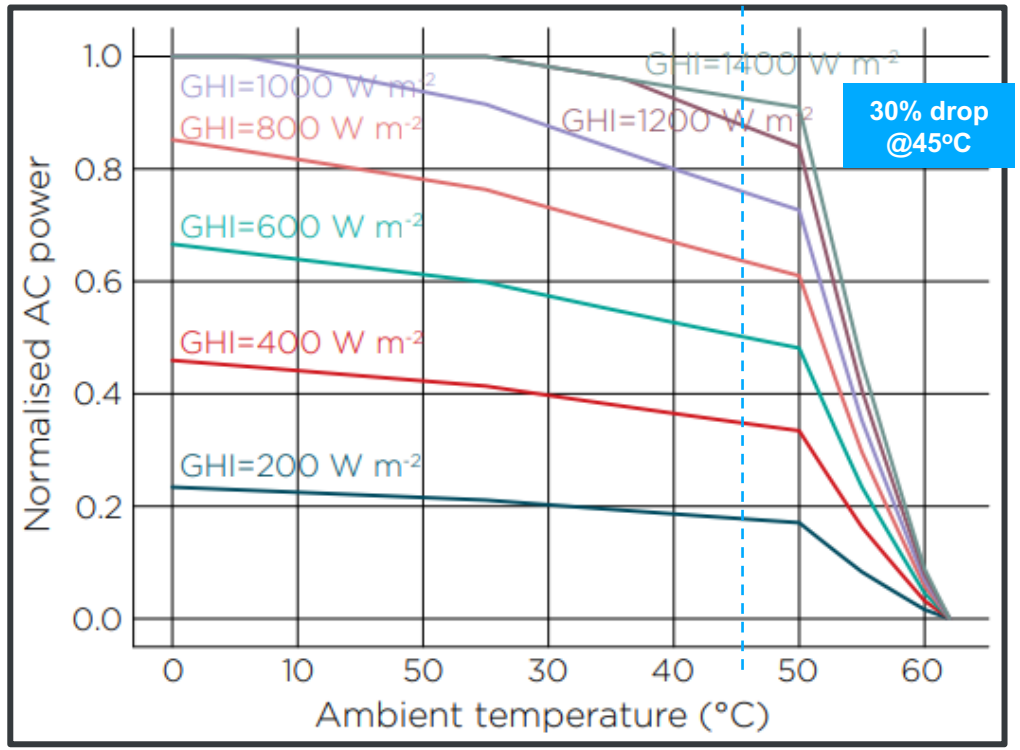
Hazard	Projection	Energy system component	Description
Cyclones and extreme wind	Low confidence in frequency / high confidence in magnitude		• **Severe convective winds cause catastrophic tower failures**, this has occurred in the South-East region of Australia. • **Severe wind events**, often associated with cyclones, can **cause transmission towers to fail**, potentially impacting any nearby roads or dwellings.
Bushfires (fire weather)	High confidence of increase		• **Bushfires** can both damage transmission lines and disrupt power supply / ability to access the region to restore function. Line maintenance and underground wires are strategies to mitigate this risk.
Extreme heat	High confidence of increase		• **Extreme heat events** result in line losses across transmission infrastructure. This means inefficiency in times where the system is already de-rating and facing load pressure.

Impact on solar PV and wind

High temperatures are a known hazard for solar and wind farms and can result in a decrease in energy production at extreme ambient temperatures

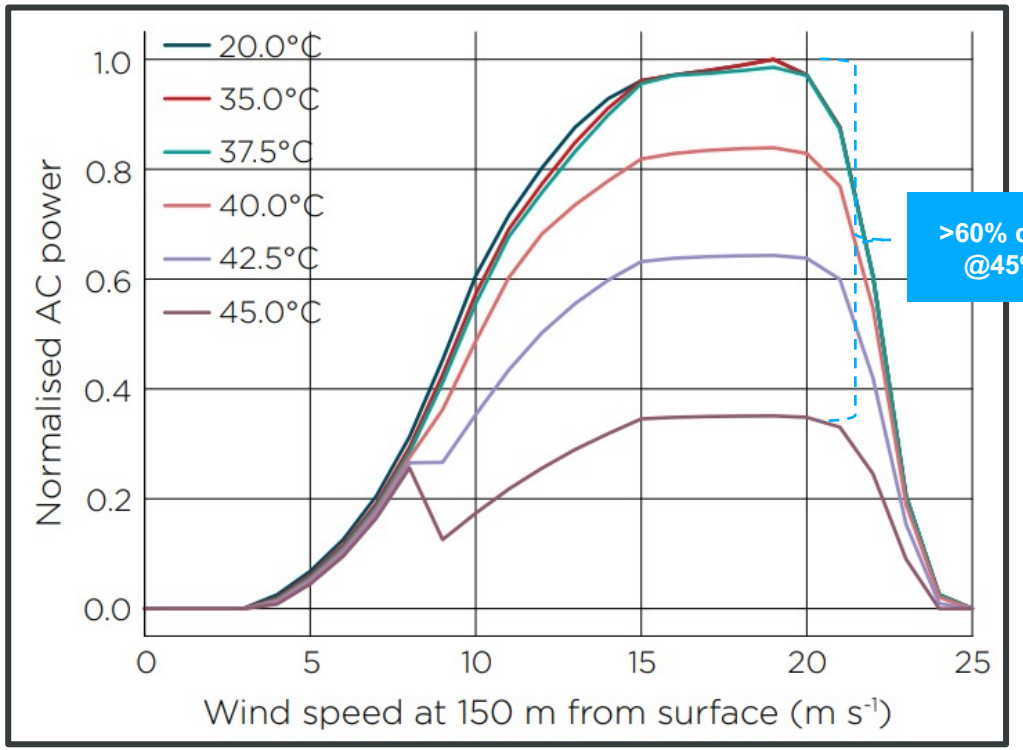
Solar de-rating curve[1]

Depending on the level of solar energy input (GHI) the normalized power output for a solar farm declines slightly with increasing temperature up to about 50ºC



Wind de-rating curve[1]

For wind turbines, power output responds to temperature with response capacity highest up to 37.5ºC, but reduces at higher temperatures.

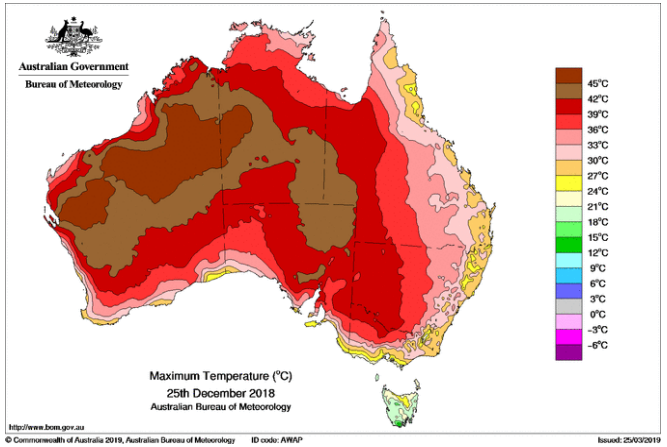


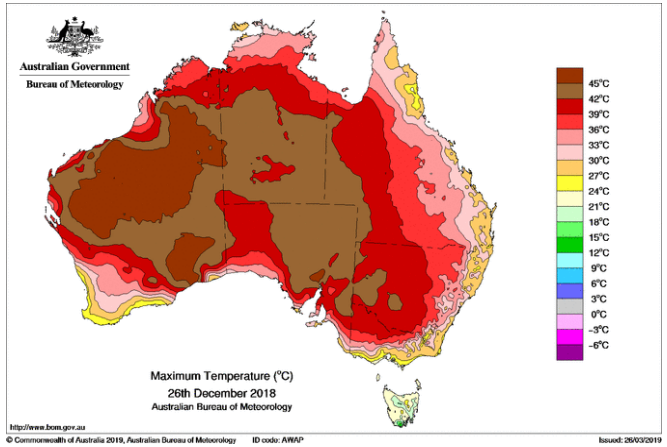
1. ESCI CCIA, case study 1_ extreme heat and VRE

Grid-wide extreme heat

Large components of the NEM, SWIS and NWIS can be concurrently exposed to extreme temperature, and these events can last multiple days.

25th December 2018

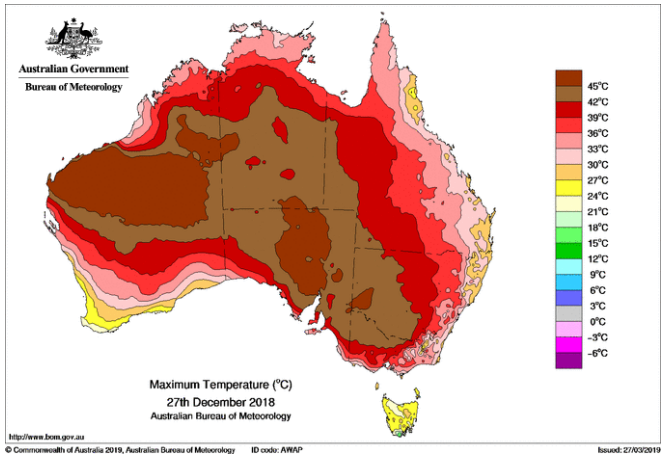


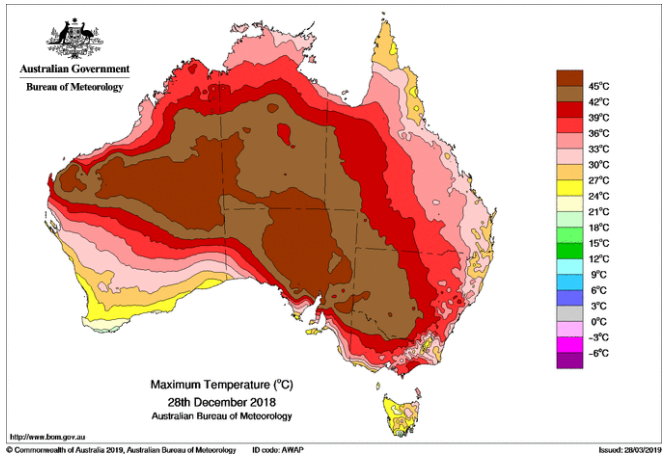


26th December 2018

Pilbara heatwave: Four consecutive days of temperatures exceeding 47°C

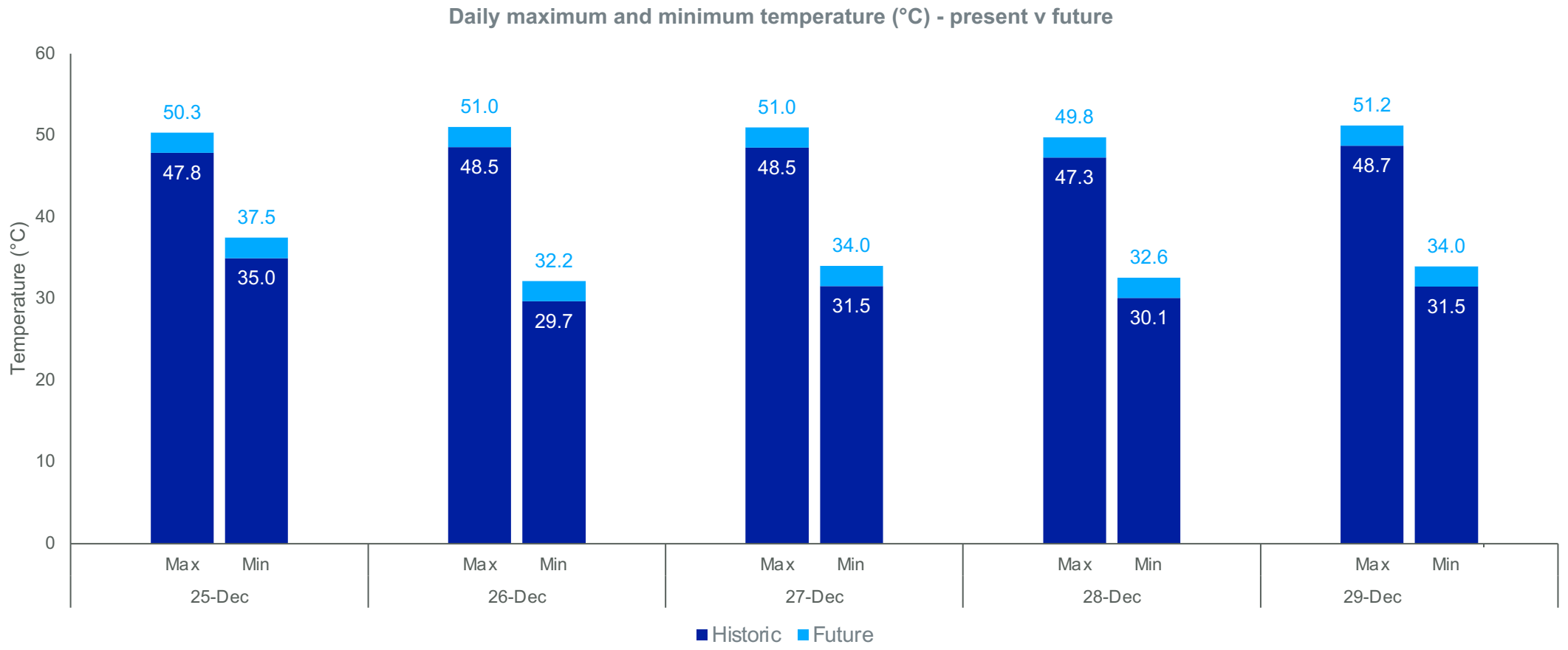
27th December 2018





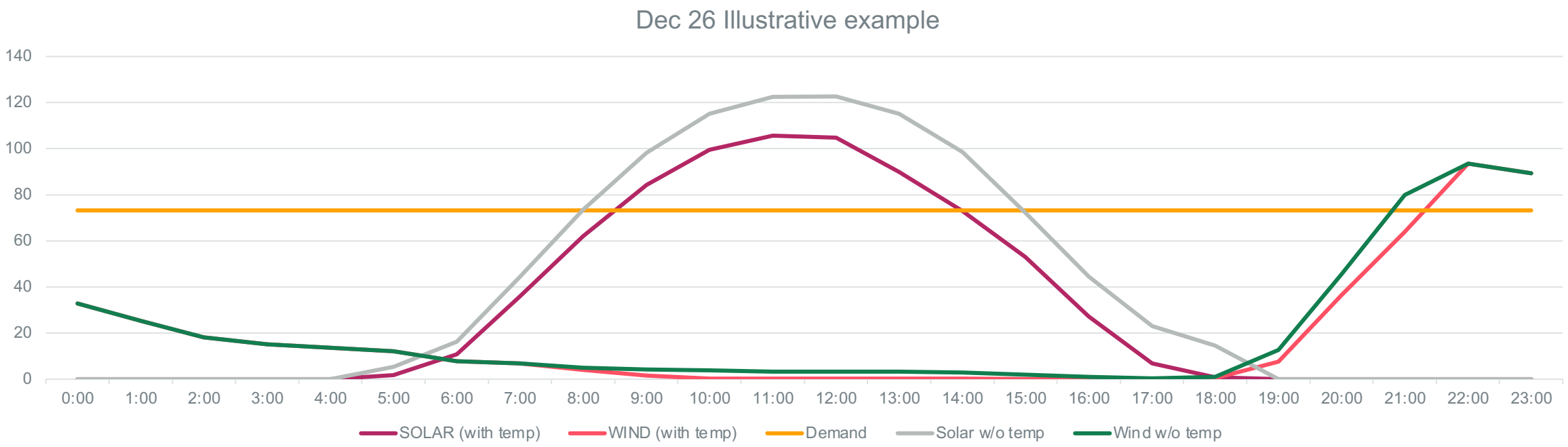
28th December 2018

Multi-day heatwaves can occur and are projected to become more severe and frequent



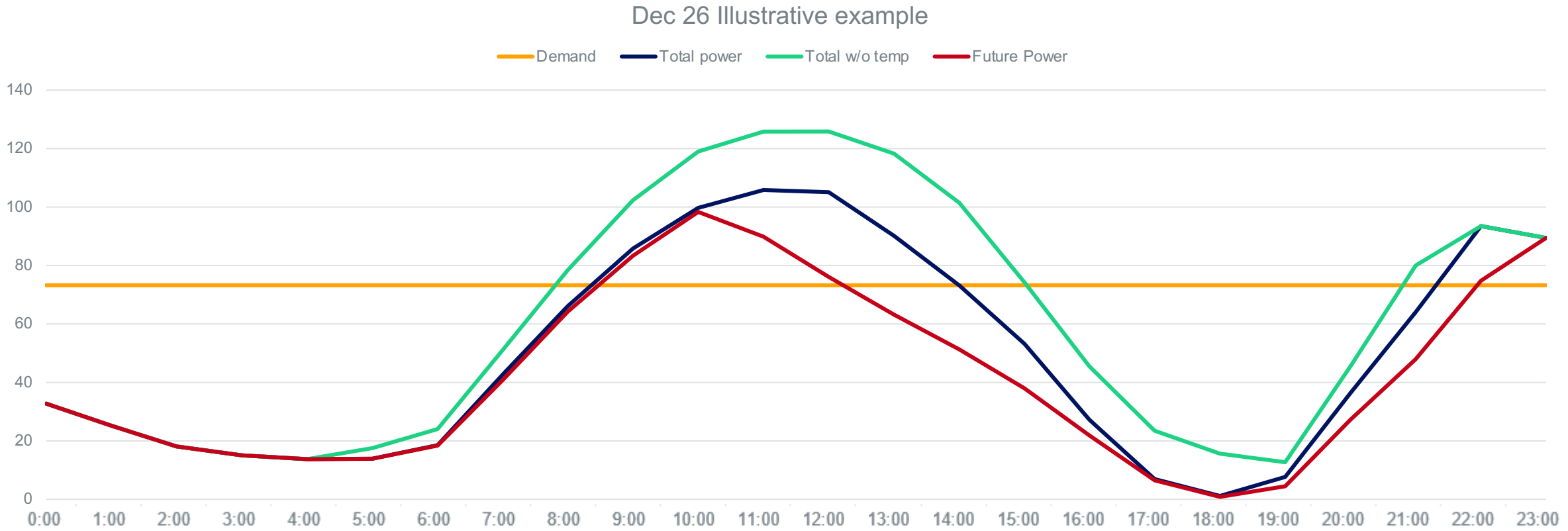
What happens to a VRE system on a high-heat day?

Both wind and solar drop in efficiency and the system relies on battery (or other source)



What does this mean for generation compared to load?

… Day 2 of 5 day heatwave and battery has been fully discharged on day 1

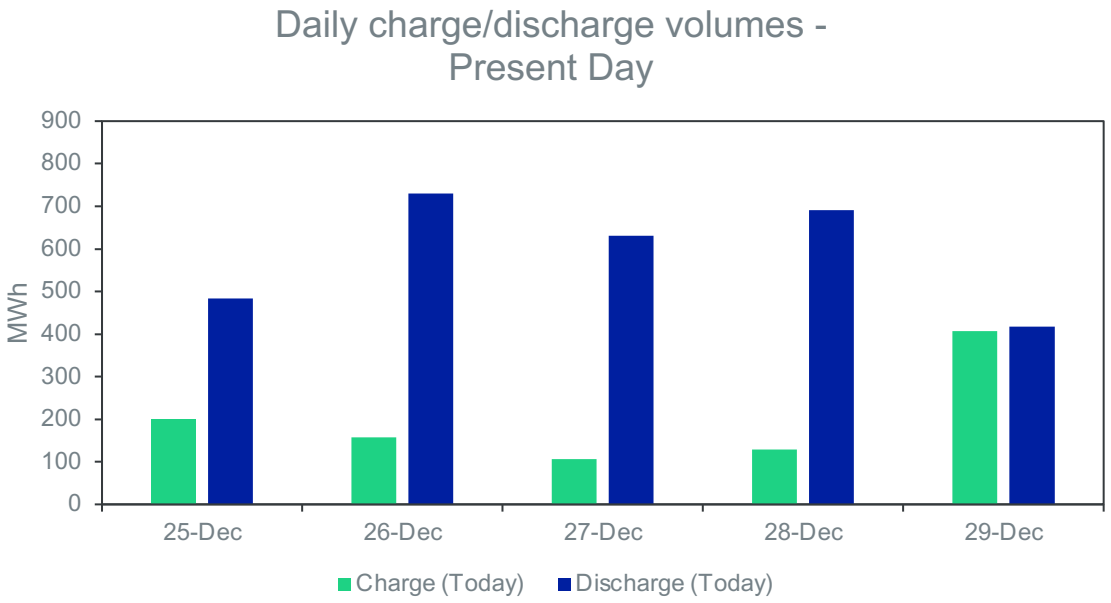


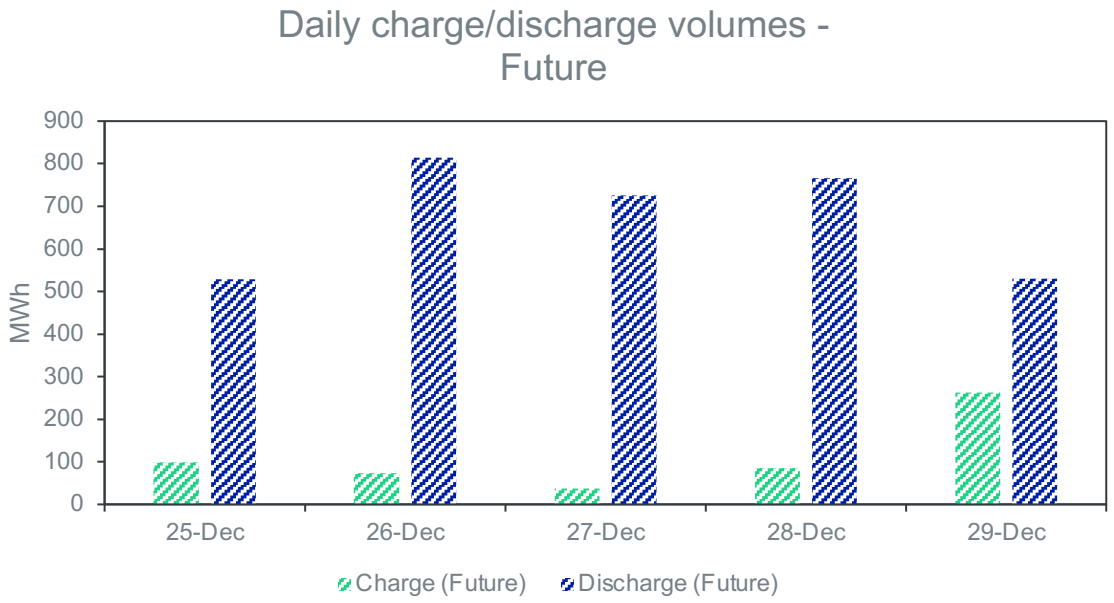
Regular day: 82% load

Present day: 67% load

Future: 58% load

Each day there is significantly more discharge than time spent charging… initial battery size is depleted by day 1



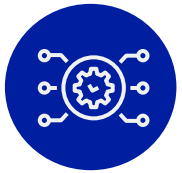


What can you do about it?

1. Drop your production (50% load)
2. Increase RE sizing (about double is required)
3. Increase battery sizing (cost becomes significant)
4. Build in another flexible generation source (green ammonia hydrogen)

Climate risk must be considered as we decarbonise

Points to consider

1.  Renewables are essential but are also exposed to climate risk
2.  To mitigate risk: connect to grid and/or diversify technology
3.  Planning for this has not been done well, but can be retrofit
4.  Each site and context will have a different solution

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Q&A