



# Boggabri Vanadium Battery

**Australian mining case study**

24 June 2025



# Our case study

1

**Demonstrate locally**

2

**De-risk the supply chain**

3

**Decarbonise the mining industry**



# Who is Idemitsu?

Established in 1911, Idemitsu Kosan has a rich history of providing energy solutions to the world. Idemitsu Australia has been operating in Australia since 1978 as a subsidiary of Japanese company Idemitsu Kosan Co., Ltd.

Diverse interests around the world across energy, resources, advanced materials, lubricants, retail fuel and agriculture.

As a group, we have ambitious climate targets:

- reducing carbon emissions by 7.3 million tons (46%) from 2013 to 2030
- carbon neutral by 2050.

Idemitsu Australia is advancing local renewable energy generation and energy storage developments as well as green fuels production and export.

Idemitsu Australia is also re-deploying its strong mining capability into critical minerals with investments across mining, processing and electrolyte production of key battery metals.



Consolidated net sales

**¥8.7 trillion**

Operating + equity income

**¥363.0 billion**

## Petroleum



Crude oil processing capacity

**945,000** barrels/day



Fuel oil sales volume in Japan

**35** million kL/year



Number of service stations in Japan

**6,000** locations



Crude oil tankers

**22** vessels



Number of oil terminals

**33** locations



Overseas petroleum trading volume

**30** million kL/year

## Basic chemicals



Ethylene production capacity

**1** million tons/year



Aromatic compounds production capacity

**4.16** million tons/year

## Functional materials



Sales volume of engineering plastic

**150,000** tons/year



Sales volume of lubricants

**1.14** million kL/year



Sales volume of asphalt

**360,000** tons/year

## Resources



Crude oil and gas production volume

**28,000** barrels/day



Coal production volume

**7.22** million tons/year

## Power and renewable energy



Electric power generation capacity

**1.9** million kW



Electricity sales volume

**1,950** million kWh



Adhesive material production capacity

**28,000** tons/year

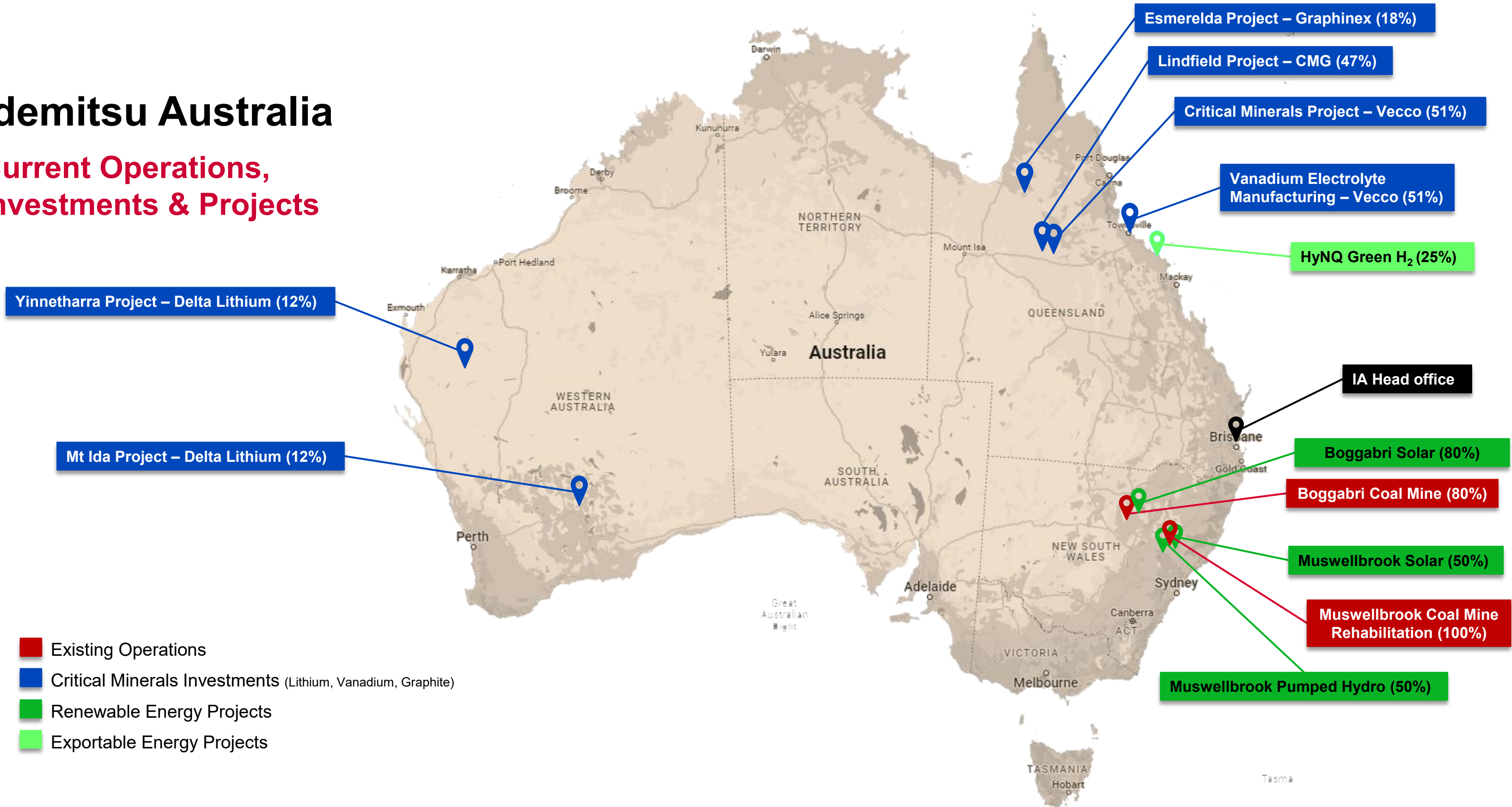


OLED materials production capacity

**26** tons/year

# Idemitsu Australia

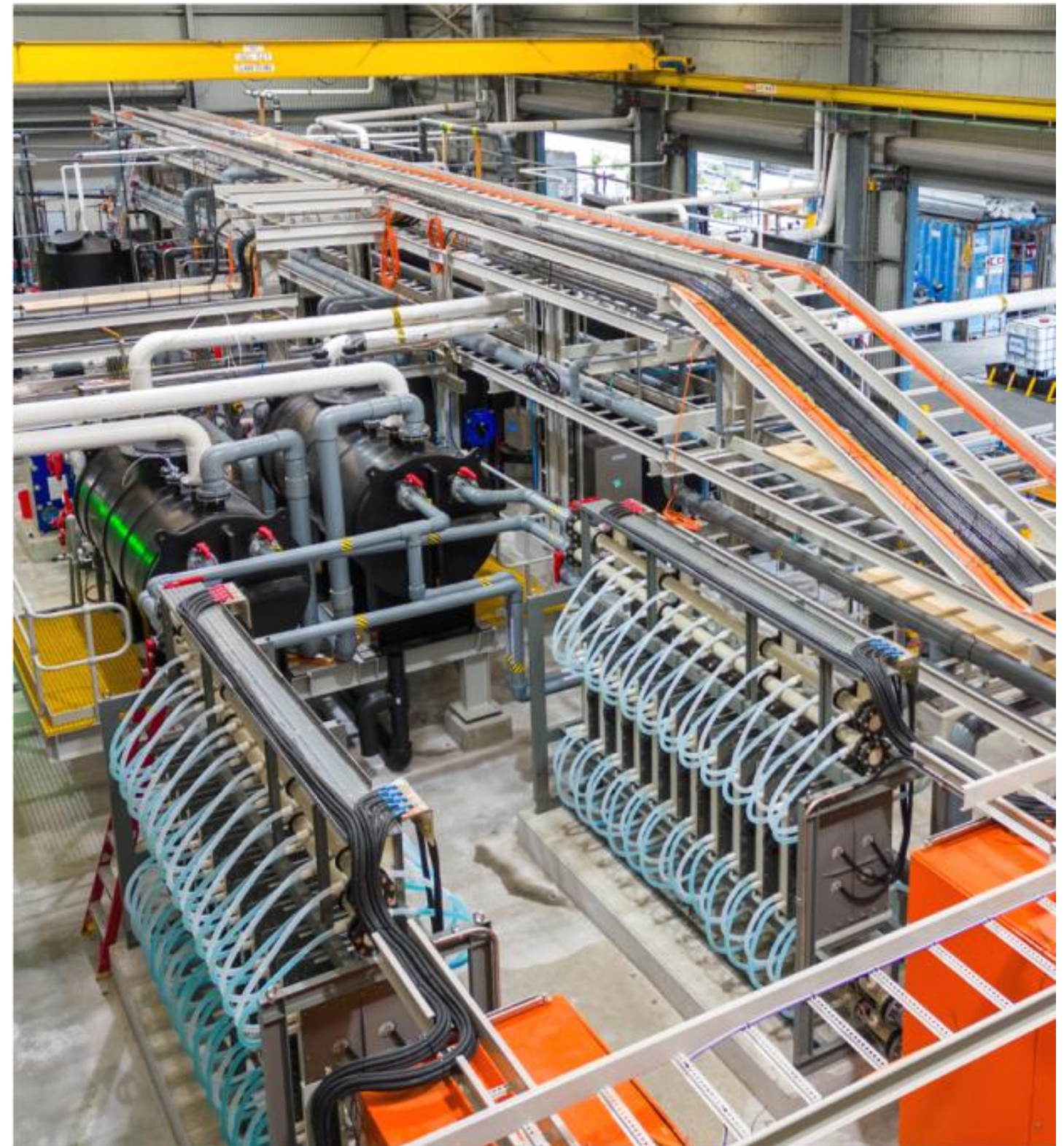
## Current Operations, Investments & Projects



# Vecco electrolyte expansion

## Australian and US production

- Vecco's Integrated Mining and Manufacturing project
- The existing facility in Queensland, Australia has an operating capacity of 35MWh / year
- Stage 1 expansion:
  - 150MWh / year Queensland, Australia (400MWh ultimate)
  - 150MWh / year Texas, USA (600MWh ultimate)
- Vecco Critical Minerals Mine 1GWh / year



# Energex vanadium flow battery

## The first deployment of Vecco electrolyte

- Located at Berrinba depot 30 minutes south of Brisbane, Queensland
- The battery has been operating autonomously since November 2024, solar soaking from the Energex depot's rooftop solar to charge the battery and then supporting the depot's energy usage in the evenings.

Vanadium flow battery supply: 250kW, 750kWh



- Technical Support
- Installation and Commissioning assistance

Vanadium electrolyte supply: 46m<sup>3</sup>



- Electrolyte manufacture in Queensland
- Electrolyte transport and fill
- Mechanical assembly of battery.



# Boggabri vanadium flow battery

## A case study for demonstrating MW scale vanadium flow batteries in Australian conditions

- Idemitsu Australia is the majority owner of the Boggabri Coal Mine in NSW, Australia. Through partnership with our two joint venture partners, we will operate this mine well into the 2030s.

2024

- The Boggabri Coal Joint Venture approve the delivery of a 5MW solar PV asset to be connected to the mine. This project is currently completing construction and will provide a net reduction of 40% in the mine's Scope 2 emissions once commissioned in August this year.

2025

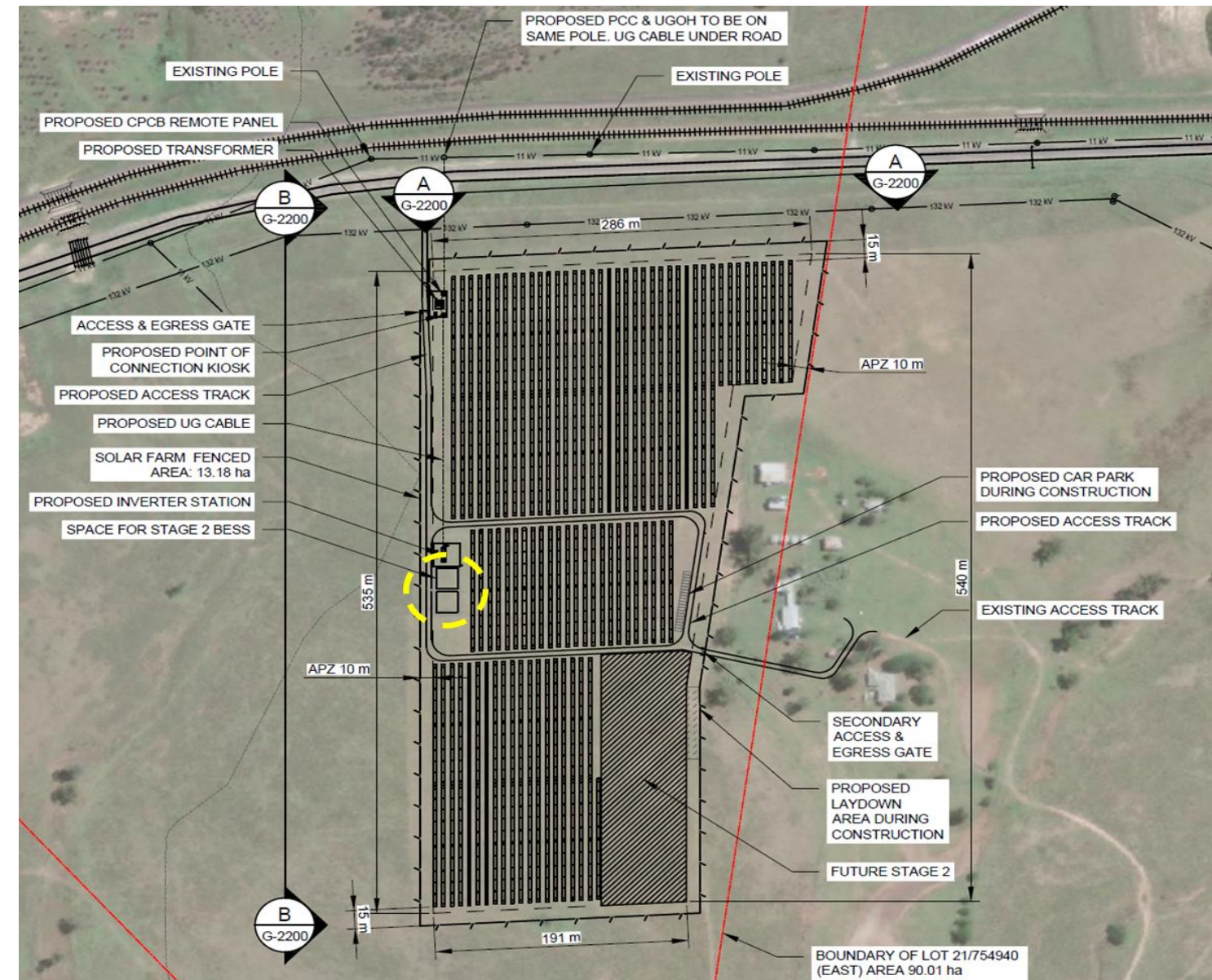
- In 2025, Idemitsu Renewable Developments Australia presented a business case to the Joint Venture to add energy storage to the solar asset, further improving Scope 2 carbon reduction to 60%.
- Following a competitive tender process, review of available technology and relative economics, a vanadium flow battery of 2MW/12.6MWh was selected and is currently under review for capital approval by the Joint Venture.



# Project technical overview

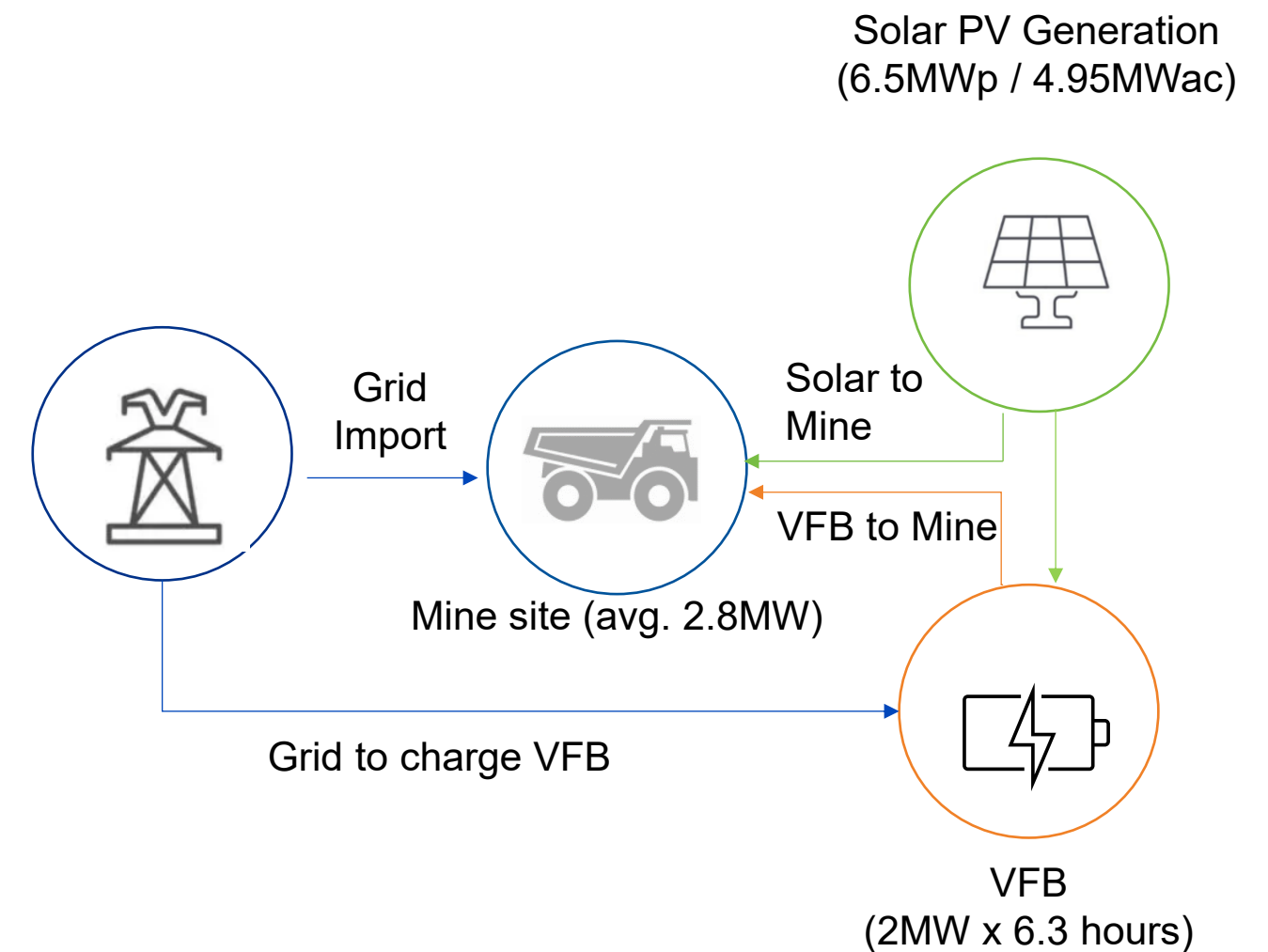


- The Boggabri vanadium battery will consist of:
  - Six Sumitomo Electric latest generation VFBs (12.6MWh)
  - 664,000 litres of vanadium electrolyte to be processed out of Vecco's Townsville facility.
  - 3MVA of inverter capacity, complete with step up transformer to 11kV.
- On an annual basis, around 75% of the charge volume for the battery will be sourced through an AC connection to the neighbouring solar array.

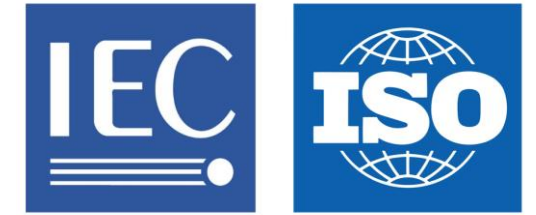


# Operating philosophy

- The battery will be installed initially in a behind-the-meter configuration (no export to grid). This enables faster delivery and avoidance of transmission operator charges.
- The primary purpose of the battery is to reduce the mine's exposure to the most expensive electricity periods (evening peak, typically between 6 pm and 10 pm).
- As electricity cost profiles change over time, the battery's charging and discharging schedule can be adjusted to target the most expensive periods, reducing operational exposure to expected future electricity cost volatility
- The reliability of electricity supply to the Mine will be unchanged, supported by an existing connection to the 132kV grid.



# Compliance with local standards and mining regulations



## Charting the course for flow batteries in Australian mines

- In Australia, Australian Standards are used by engineers in the design of generation and energy storage systems. These are typically standards that have been derived from International Standards (ISO, IEC) and are used as a voluntary guide unless directly referred to in legislation. A commonplace example is AS/NZS 3000, Electrical installations (Wiring Rules).
- The Boggabri vanadium battery will be located outside of the mining lease; however, the battery will be required to comply with workplace health and safety (WHS) regulations specific to parts of the WHS Mines and Petroleum Sites Regulations.



### Example

Australian workplace health and safety regulation (MPS)  
Section 34 – Electrical Safety requires that circuits that run a greater than extra low voltage are required to have:

- Earth fault protection on all distribution circuits
- Earth leakage protection on sub circuits.

### Integration with solar farm and mining operations

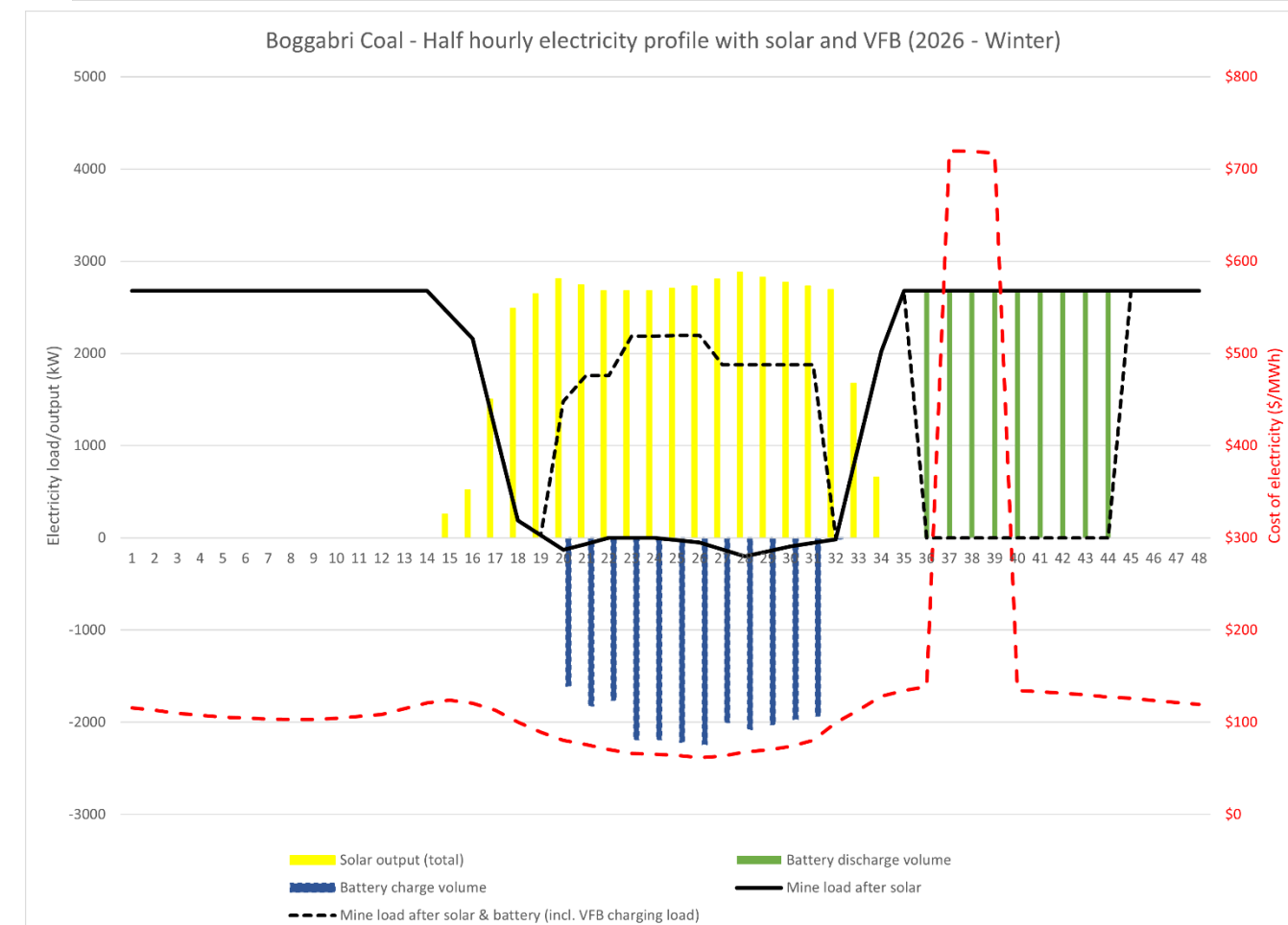
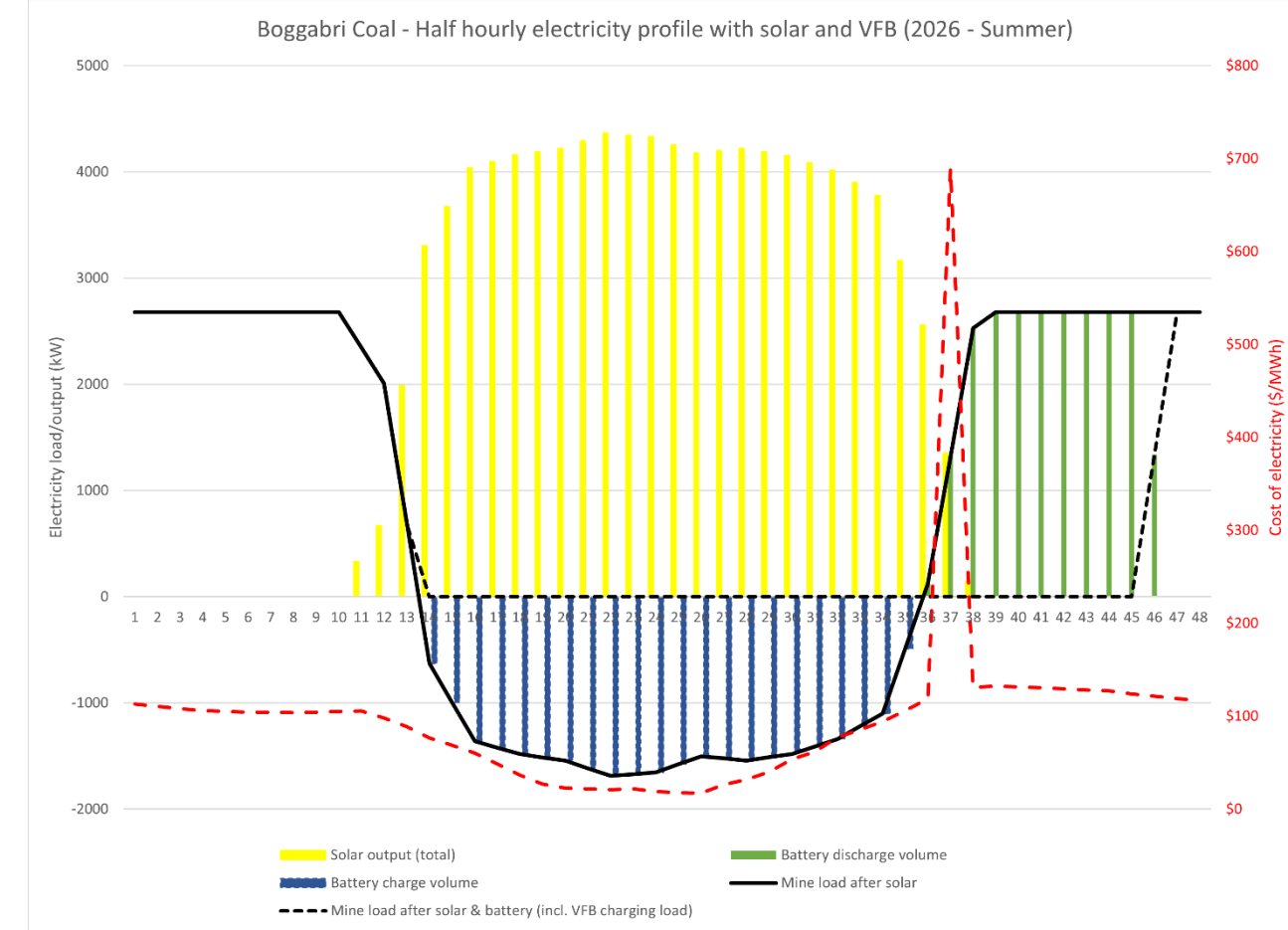
This project will provide a valuable case study for how a VFB system can integrate into an operational solar farm site. Integration will need to consider:

- Limitation of down time for mining operations
- AC connection into existing ring main unit. Third party power plant controller will need to control the solar farm and battery whilst load balance into the mine substation.
- Compliance with power quality requirements for the mine

# Business case

## Reducing exposure to the evening peak

- The Australian energy market does not currently provide a clear value proposition for long duration storage projects (8+ hours). This provides a **difficult pathway to financial close for grid connected assets** where flow batteries and electrolyte remain capital intensive.
- Optimisation of revenues focuses on capturing as much value out of the evening peak as possible. The **market currently only has a two-to-four-hour peak window**, so VFB solutions that can discharge at greater than nameplate rating for shorter periods will provide greater returns in the near term.
- The commercial business case for the Boggabri vanadium battery was supported by the **non-financial benefits of vanadium flow battery technology**. Where our joint venture was required to consider multiple vendors and a comparison with lithium technology, these were key to our selection.
- In Australia, high variability can be seen in the seasonal energy mix. As the energy transition continues, this variability is expected to increase – providing **value those who have behind the meter, flexible generation** at the source of the load.



# Summary

The Boggabri Vanadium Battery will be a pioneer project for a new wave of mining decarbonisation that is founded in the benefits of long duration vanadium flow batteries.

1

## Demonstrate locally

- Expand green electricity supply for Boggabri coal mine – contributing to our emission reduction targets
- Provide a positive return on investment and a payback period within the mine life.

2

## De-risk the supply chain

- Develop the local supply chain for vanadium electrolyte production and delivery to MW scale battery systems.
- Reduce the perceived delivery risk for other developers, investors and debt providers considering VFB technology at scale.

3

## Enable decarbonisation of the mining industry

- Support the mining industry by providing reliable, long duration storage that can time shift cheap solar PV generation into overnight periods.
- Use the Boggabri Coal model to demonstrate the operational benefits of flexible generation on site.
- Grow the uptake of vanadium battery solutions to other industries seeking similar benefits.