

A large, abstract graphic composed of numerous curved, parallel lines in white, light blue, and green, sweeping across the center of the slide from the bottom left towards the top right.

Transitioning Australia's Energy

FEnEx CRC: Monthly Colloquium – June 2025

Who we are



Extensive experience: Safe and reliable power for mining, industrial, government, and utility sectors.

Market leader: Nearly 1GW of sustainable distributed energy assets.

Trusted partner: Comprehensive in-house services for renewable and traditional power, energy storage, and hydrogen production.

Circa 70% owned by QIC

**A trusted partner in the
clean energy transition.**

Our specialist divisions

Remote Power

- **40+ years of experience**
- **Leading operator:** Australia's largest independent power provider.
- **Industry services:** Mining, utilities and regional townships.
- **Multi-fuel technologies:** Gas, diesel, wind, solar, and battery storage.
- **Build, own and operate:** Off-grid systems for remote power.



Renewables

- **Proven leader:** End-to-end hybrid and renewable power solutions.
- **Specialisations:** Solar, stand-alone power systems, microgrids, battery energy storage systems, and intelligent control systems.
- **Manufacturing:** Switchgear, switchrooms, battery enclosures, and kiosk substations.
- **Custom designs:** Tailored to clients' unique needs.
- **Integration:** Renewable technologies for new and existing remote systems.
- **Comprehensive support:** From design to operations and maintenance.



Connected Energy

- **NEM solutions:** Stand-alone power systems, battery storage, renewable energy integrations.
- **Green hydrogen & gas projects:** 10+ years experience, full-service delivery across Australia.
- **CNG & H2 turnkey partner:** Green hydrogen production, storage refuelling and equipment.
- **Pioneering projects:**
 - Delivering Australian firsts, including the Denham H2 Demo Plant and Australia's first public hydrogen refuelling station in Canberra.
 - Delivering CNG to 10 x Regional towns in Victoria via mobile pipeline for energy security – including biogas & H2 in future



Tropicana

Our flagship renewable energy project, we will integrate 62MW of clean energy into our existing 54MW gas power station at the Tropicana gold mine, for mine owners AngloGold Ashanti and Regis Resources.

AngloGold Ashanti			
Solar	Wind	Battery	Gas
			
24MW	24MW	14MW	54MW

- A Pacific Energy Build-Own-Operate project.
- In-house designed intelligent control system will allow system to provide hydrocarbons-off power for extended periods.
- Wind and solar will displace 96% of diesel and 50% of gas.
- 65,000 tonnes of carbon emissions offset by renewable energy per year.
- Due for completion in early 2025.



Westgold

We partnered with Westgold Resources to consolidate six of the gold miner’s diesel-fired power stations into four new, highly efficient hybrid power systems.

Tuckabianna		
Solar	Battery	Gas
		
6MW	2.5MW	9.5MW

Big Bell		
Solar	Battery	Gas
		
4.2MW	1.7MW	11MW

Fortnum		
Solar	Battery	Gas
		
5.5MW	2.2MW	9.5MW

Bluebird		
Solar	Battery	Gas
		
12.2MW	5MW	12.5MW

- A Pacific Energy Build-Own-Operate project.
- 82MW contracted capacity.
- Systems design centres around virtual generator BESS as the backbone of the systems and features hydrocarbons-off functionality.
- 38 million litre diesel reduction every year.
- 57,000 tonnes of carbon emissions offset by solar every year.



Western Power

Since 2019, we have been delivering utility scale stand-alone power systems (SPS) across Western Australia's regional network as a part of Western Power's ongoing stand-alone power systems program.

- 240 units contracted, 120+ already delivered.
- Solar panels, battery storage and back-up diesel generation.
- Safer, cleaner, more reliable power for end users.
- Built to withstand Australia's harsh conditions.
- Reduced bush fire risk.
- Faults diagnosed and rectified remotely.
- Pacific Energy's rollout for Western Power represents the largest deployment of SPS to an Australian utility to date.



Rapid deploy SPS

Our rapid deploy stand-alone power system (RD-SPS) has been engineered in house to combine modular design and renewable energy technology in a quick-to-install skid mounted system.

- Utility-spec design, all-in-one transportable module.
- Ready to supply power in under 60 minutes from delivery.
- Built to withstand harsh conditions.
- Remote operation.
- 24/7 cloud-based monitoring (3G, 4G and satellite compatible).
- Low maintenance.
- Cleaner, greener power supply.
- Ideal solution for outages caused by natural disasters and unforeseen events.
- Can replace traditional generators in mining, construction and event applications.





BESS Tech Trends

Owen Lock, Principal Applications Engineer

Recent LFP Battery Price Reductions

- Chinese Government now subsidizing “tier II” manufactures
- For the first time ever, manufacturing capacity now exceeds market demand
- Trump abandoning IRA and introducing tariffs has reduced demand
- Battery manufacturers now trying to clear stockpiles
- Battery prices are falling faster than predicted (chart is from 12 months ago)
- now \$70/kWh for large scale, will be \$60/kWh within 12 months

Battery prices are set to sustain the ongoing downwards trend thanks to technological enhancements and extensive production chains



Observed enclosure prices are sourced from Clean Horizon's discussions with market leaders and publicly available data (press articles, manufacturer websites). Forecasts are based on discussions with manufacturers and expected manufacturing, technological improvements, as well as expected evolution of raw material prices.

Virtual Synchronous Machine Technology

How does a Virtual Generator differ from traditional BESS?

- Digitally mimics the performance of rotating machines
- Provides inertia, fault-current and intelligent stabilization algorithms
- Uniquely capable of forming grids and stabilizing power systems of all scales
- VSMs will form the backbone of future large-scale grids
- Spain blackout was due to lack of VSMs.



Function	Grid Following	Grid Forming	Virtual Generator
Spinning Reserve	✗	✗	✓
System Strength (Dynamic Voltage)	✗	✓	✓
Synthetic Inertia (Dynamic Frequency)	✗	✓	✓
Protection Systems support (Fault Current)	✗	✓	✓
Seamless transitions to HOF	✗	✗	✓
Renewables Smoothing	✓	✓	✓
Energy Shifting	✓	✓	✓

Innovation

- Battery and PCS R&D has moved from open source and universities to the private sector
- IP is highly valued is fiercely protected, sometimes the first we hear of innovations is when the products are release
- Solid state battery are coming
 - 40% smaller and lighter
 - No polymers or solvents → virtually fire-proof
 - 8MWh in a 20ft container
- Universities and thought leaders should be thinking about power system with zero rotating generators, VSMs, renewables and loads
- Green hydrogen will be produced using the above combination of technologies.



Where we fit in

World leader in the decarbonisation of MW-scale power systems

- Early adopters of Virtual Synchronous Machine BES technology
- Many MW-scale VSM BESS deployed in our power stations
 - Spinning Reserve
 - Renewables integration
 - HOFF
- Vertically integrated BESS manufacturer
- Extensive power-system engineering expertise
- In-house system studies team



Case study 1: Overview

Tier 1 miner, Spinning Reserve BESS

- 45MW/12MWh Virtual Generator
- Integrated, factory tested, mining-grade BESS modules
- BESS use cases include
 - Spinning Reserve
 - Islanding/backup
 - Protection system support
 - Renewables support
 - Reactive Compensation



Case study 2: Overview

Smart batteries as prime power

- Renewables rich stand-alone mining microgrid
- BESS as spinning reserve and the power-system backbone
- MW-scale Virtual Generator BESS by Pacific Energy Renewables
- High renewables penetration
- Hydrocarbons off mode (similar to transitioning to and from grid) with seamless transitions





Hydrogen Storage

Sean Blythe, Future Fuels Development Lead

Denham H2 demonstration plant

This Australian-first green hydrogen project was being delivered for WA's regional power provider, Horizon Power, to test the technical and commercial viability of renewable hydrogen as a baseload power source.

Horizon Power			
Solar	Electrolyser	Fuel cell	Battery
			
1.3MW	350kWh	100kW	1.55MW

- A Pacific Energy design, supply and install project.
- First-of-its-kind design, produced first hydrogen in October 2022.
- Plant comprises two 174kW electrolyzers, a specialised hydrogen compression and storage system, and a 100kW fuel cell.
- Two solar farms; one to feed hydrogen plant, one to feed town's microgrid.
- 140,000L of diesel offset annually.



The project was funded by Horizon Power, the Western Australian State Government and the Australian Renewable Energy Agency (ARENA). Image supplied by Horizon Power.

Canberra H2 refuelling facility

Pacific Energy acquired the Canberra hydrogen refuelling facility, Australia's first public hydrogen refuelling station (HRS), from ActewAGL in April 2024.

ActewAGL		
Electrolyser	kW	Kilograms/day
 Nel C10 PEM	 62kW	 22kg

- Designed and constructed by Pacific Energy in 2-21
- Nel electrolyser, PDC Machines & Ivys compression and refuelling station
- Designed to refuel up to 30 hydrogen FCEVs per day, with future expansions capabilities built in



Hydrogen Storage & Future – Type 4 Carbon



Pressure level	Size	Cylinder Type	H ₂ Capacity at 15°C in kg at working pressure
300 bar ⁽¹⁾	10 ft	Type IV	178
	20 ft		400
	30 ft		622
	40 ft		844
	45 ft		955
381 bar ⁽¹⁾	10 ft	Type IV	215
	20 ft		484
	30 ft		754
	40 ft		1,023
	45 ft		1,157
500 bar ⁽²⁾	10 ft	Type IV	250
	20 ft		532
	30 ft		836
	40 ft		1,129
	45 ft		1,270

100kg behind a standard hilux ute @350bar



Hydrogen Storage & Future – Metal Hydrides

Scaled Power-to-Power Solutions

nel



GKN HYDROGEN



TOYOTA



Specifications



Electrolyzer

500 kg H2 per 24h



Energy Storage

16.7 MWh chemical
500 kg H₂ @ 30 bar



Fuel Cell

1 MW

Metal hydrides for safe, scalable, and cost-effective storage & transport.



HIGH TEMPERATURE

Magnesium Alloy

H2 DESORPTION TEMP

350 °C

H2 STORAGE CAPACITY

1,000 kg

LOW TEMPERATURE

Manganese Alloy

H2 DESORPTION TEMP

60 °C

H2 STORAGE CAPACITY

300 kg



Feel free to contact us should any of this be of interest to you.

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