



AUSTRALIAN PROJECT UPDATES

UNSW Flow Battery 40th Anniversary Symposium
October 2024

- A global leader in **vanadium flow batteries**
- Standardized, UL/CE/ICE-certified **factory-built** products
- **More than 1,200** flow batteries delivered globally
- **+2200** cell stacks manufactured
- **Largest** flow battery installations in Canada, UK, U.S., Australia
- Currently developing **GEN4** solution for commercial release late in 2024

Global Footprint
175 MWh



EDF Renewables
5 MWh / Oxford, UK



Spencer Energy
8 MWh / South Australia



Elemental Energy
8 MWh / Alberta, Canada



82

PROJECTS

Across 15 countries on five continents

175

MWH

Deployed, contracted or awarded

152

EMPLOYEES

The most experienced team in flow batteries

81

PATENTS

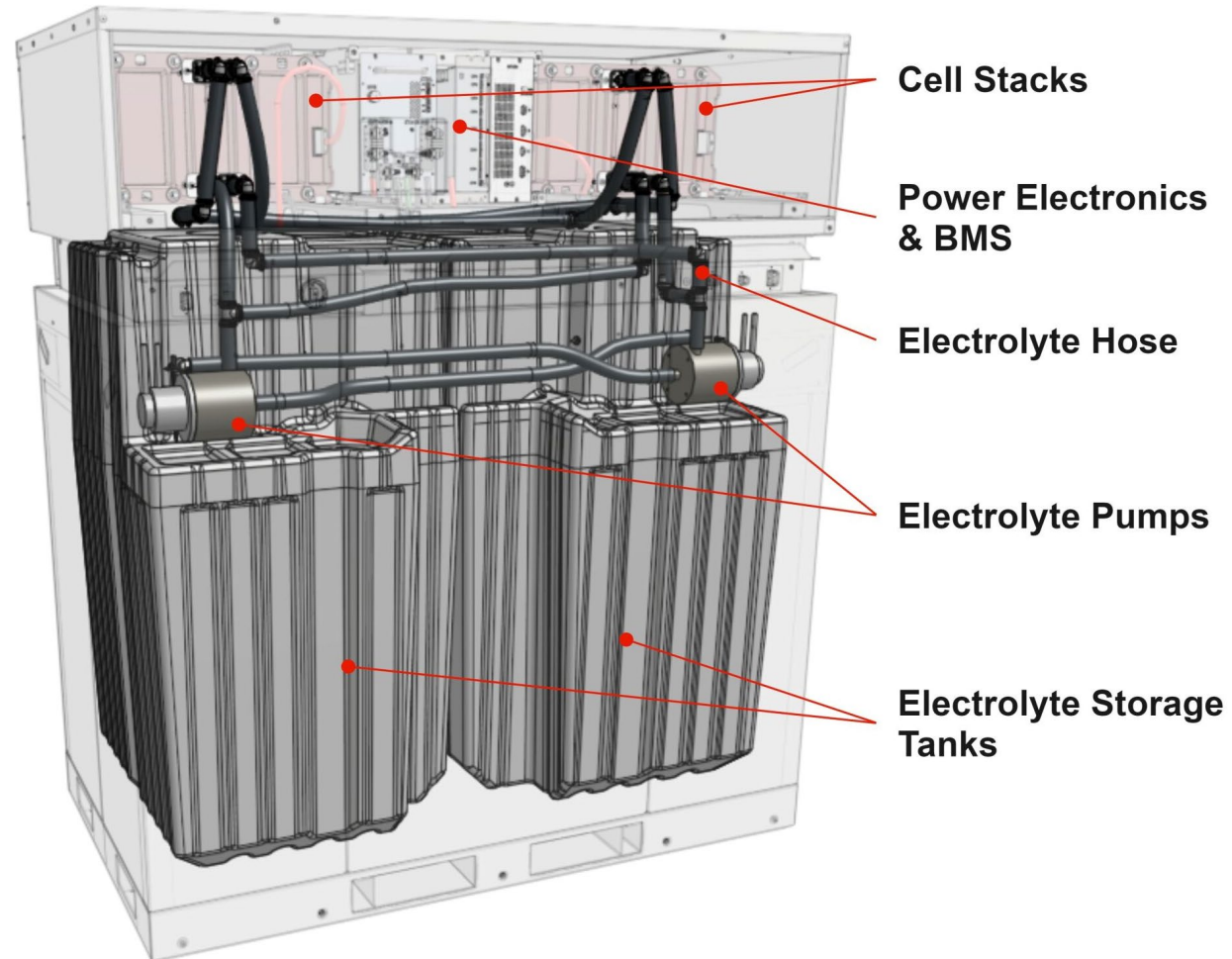
Granted or pending, plus trade secrets

15+

YEARS

R&D investment in product and manufacturing

Safe / Economical / Proven / 25+ Year Life



VANADIUM

□ AVAILABLE

Element 23, readily available and more abundant in the Earth's crust than copper. Accessible reserves in Australia, South Africa, United States, Canada, Russia

□ REUSABLE

Virtually unlimited working life. 97% proven recovery rate from used electrolyte

□ SAFE

Electrolyte is ~70% water, non-flammable with no risk of thermal runaway

Invinity VS3-022



 **Safe. Long Life.
Economical. Proven.**

**RATED POWER:
CONTINUOUS**

**78
kW**

**ENERGY STORAGE:
NOMINAL**

**230
kWh**

**ENERGY STORAGE:
DURATION**

**2-12
HOURS**

LIFETIME:

**25
YEARS**

**RECOMMENDED
DEPTH OF
DISCHARGE:**

100%

**CYCLE LIFE:
UNLIMITED**

Invinity Solutions are in service and being deployed



CANADA'S LARGEST VANADIUM FLOW BATTERY
Solar plus Storage 8.4MWh

2023



NORTH AMERICA'S LARGEST VANADIUM FLOW BATTERY / California
Microgrid Resilience 10 MWh

2023



AUSTRALIA'S FIRST DISPATCHABLE SOLAR PLANT
Solar plus Storage 8.3 MWh

2023

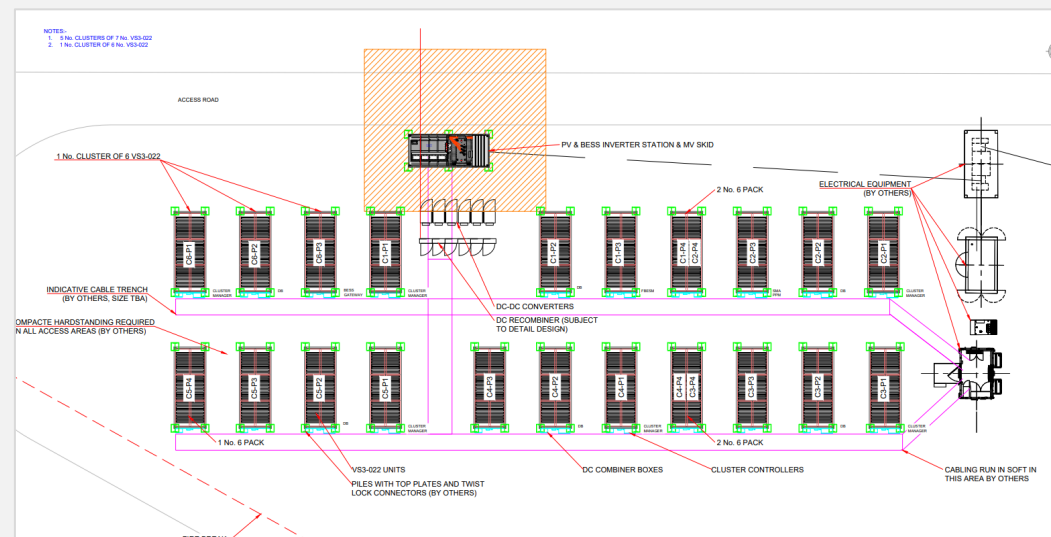


HIGH THROUGHPUT DEMONSTRATOR / KEPCO
Grid Services 1.5 MWh

2023

Yadlamalka - South Australia

<p>Key Technical Characteristics</p>	<ul style="list-style-type: none"> ▪ 2 MW / 8 MWh ▪ PV- Battery DC Coupled ▪ Single 4.9 MVA SMA MVPS ▪ 6 MW PV
<p>Value Stack and Revenue Stream</p>	<ul style="list-style-type: none"> ▪ PV + Battery Grid Export ▪ Grid Support Load Shifting and FCAS
<p>Project Challenges Overcome</p>	<ul style="list-style-type: none"> ▪ First DC coupled system with SMA MVPS + 6 DC-DC Converters ▪ Thermal modelling of VFB behaviour
<p>Main reasons for choosing Invinity VFB</p>	<ul style="list-style-type: none"> ▪ VFB Safety (vs lithium); hot climate conditions ▪ Long duration grid support infrastructure



Spencer Energy (South Australia)

Charge-discharge cycles performed for ARENA test specification.

- Full 100% DoD cycle at 2 MW nominal power
 - Capacity 7.90 MWh AC (8.49 MWh DC) at PCS
 - Aux consumption: 1.1 MWh ($3.6\text{kW} \times 41 \times 7.5\text{hrs} = 1.1\text{MWh}$)
 - RTE (excl. Aux): 71.66% (Higher efficiency possible by lowering power, with peak efficiency at $\sim 1.2\text{MW}$)
 - Electrolyte temperature: 27.4 °C (Efficiency a few points higher with optimal temp $\sim 35^\circ\text{C}$)

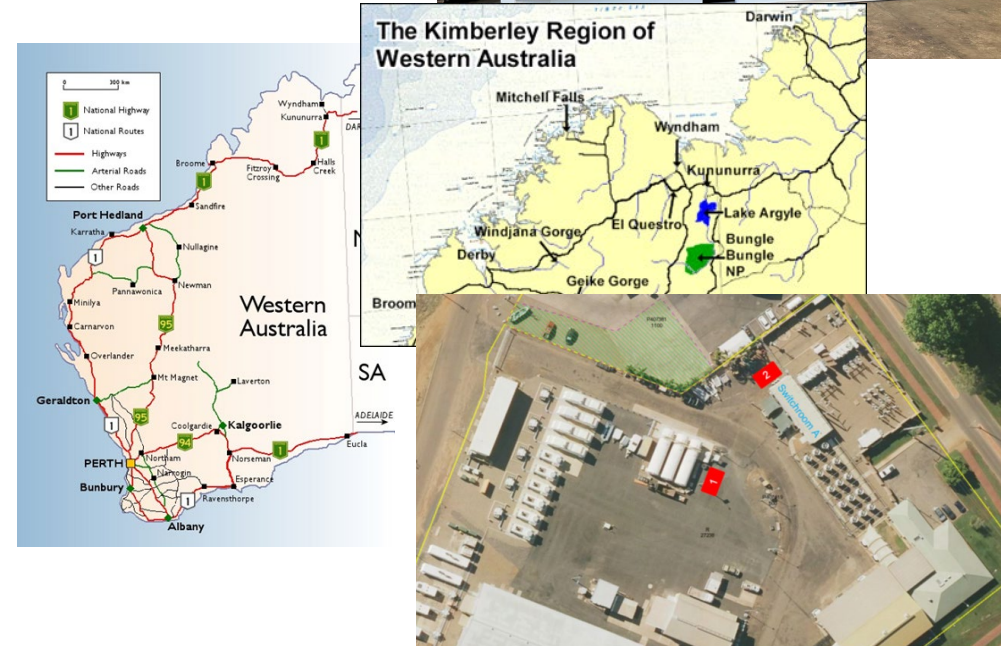
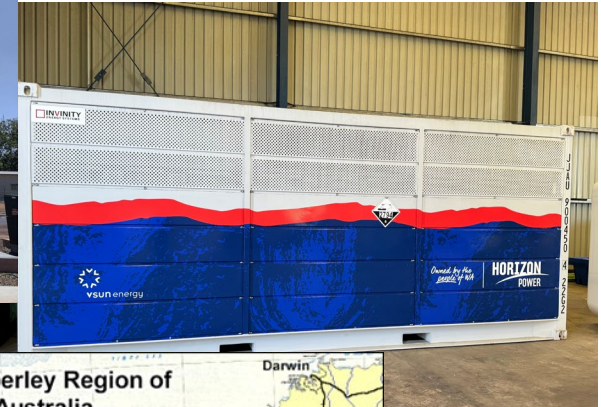
Commissioned: April 2024

- Full operation of all 6 clusters available since CoD
- >1 GWh discharged
- High availability: cycling at varying power levels btw 2 MW and 3 MW max power daily.



Horizon Power VFB Pilot

- Horizon Power has engaged VSUN Energy to install and commission an Invinity Energy Systems VFB with a 78kW/220kWh capacity
- A VFB module contains vanadium electrolyte manufactured by AVL in Western Australia.
- Factory Acceptance Testing has been successfully completed in Perth.
- Site Acceptance Testing and commissioning is currently underway in Kununurra, Western Australia.
- The VFB will be tested extensively in the extreme weather conditions, with Kununurra regularly exceeding 40°C in summer.
- The use of the VFB will provide Horizon Power the ability to define the technologies use cases in its network of power assets.
- The success of this project will pave the way for further collaboration between Horizon Power, VSUN Energy and Invinity.



Invinity Gen4 VFB Codename "Mistral"



Safe. Long Life. Economical. Proven.

**RATED POWER:
CONTINUOUS**

300
kW DC

**ENERGY STORAGE:
NOMINAL**

1.2
MWh DC

**ENERGY STORAGE:
DURATION**

4-12
HOURS

LIFETIME:

25
YEARS







**RECOMMENDED
DEPTH OF
DISCHARGE:**

100%

**CYCLE LIFE:
UNLIMITED**

Mistral: Evolution & Optimisation

Mistral will **amplify the capabilities of Invinity's existing core technology** to increase performance, simplify installation and **dramatically cut both capital and maintenance costs.**

	VS3		Mistral	Improvement
Efficiency	67%		78%	17%
MWh Footprint	96m ²		38m ²	60%
Field Wiring Connections	11		4	55%
Tanks and Pumps	12		2	83%
Battery Controllers	7		2	71%
Levelized Cost	\$0.11/kWh		\$0.06/kWh	45%

The commercial release of "Mistral" late in 2024 will open-up a pipeline of projects ranging from 5-50MW and in durations of 4-10Hrs



Utility-Grade Energy Storage