



**ENERGY
STORAGE
INDUSTRIES
ASIA PACIFIC**

ALL-IRON FLOW BATTERY - A SAFER ALTERNATIVE

40 YEAR VFB ANNIVERSARY SYMPOSIUM PRESENTATION 2024

OCTOBER 2024



Agenda

- Technology Overview – what and how the battery works
- Technology Benefits – cleaner, safer, more sustainable, flexible
- Technology Testing – technical viability, regulatory pathways, commercial viability, support
- Energy Storage Industries – Asia Pacific – all Queensland Iron Flow Battery
- Questions and Answers



Simple but revolutionary technology purpose-built to solve energy storage, now and for decades to come

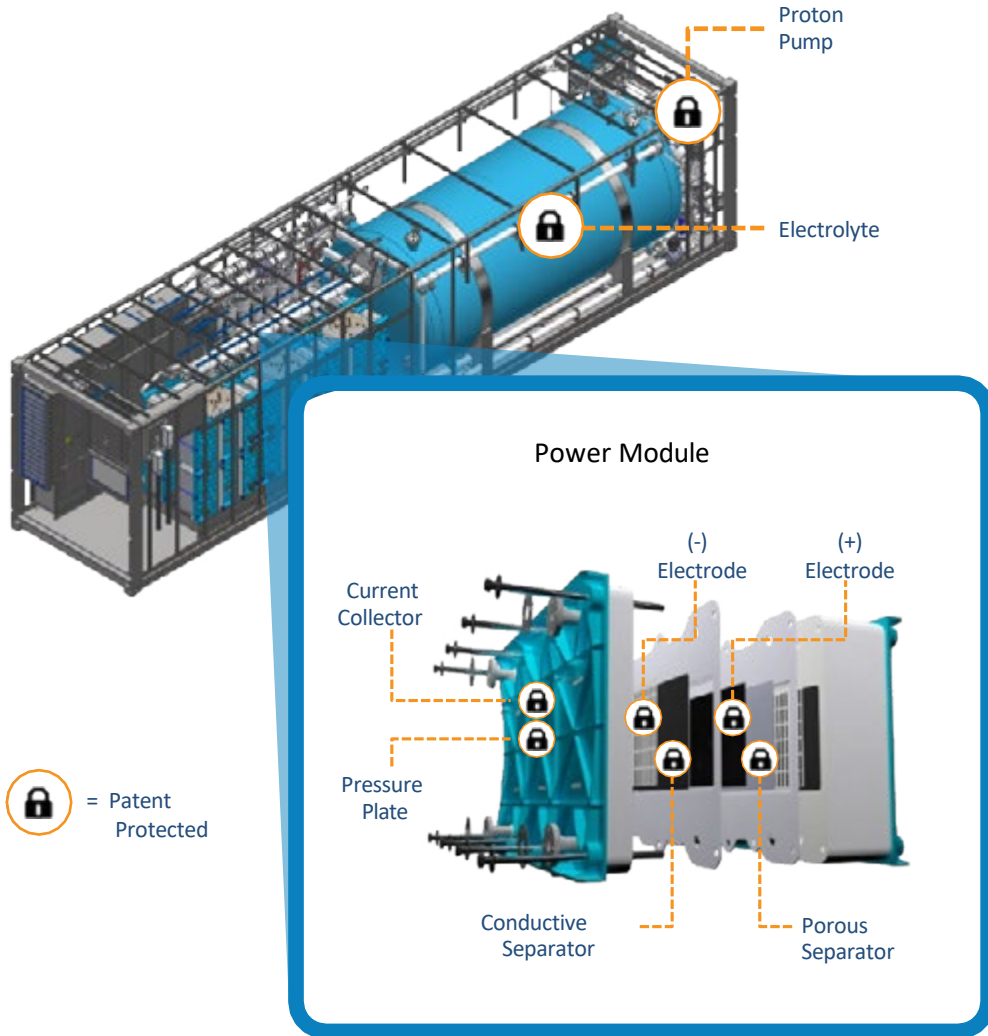


“All-Natural” Battery



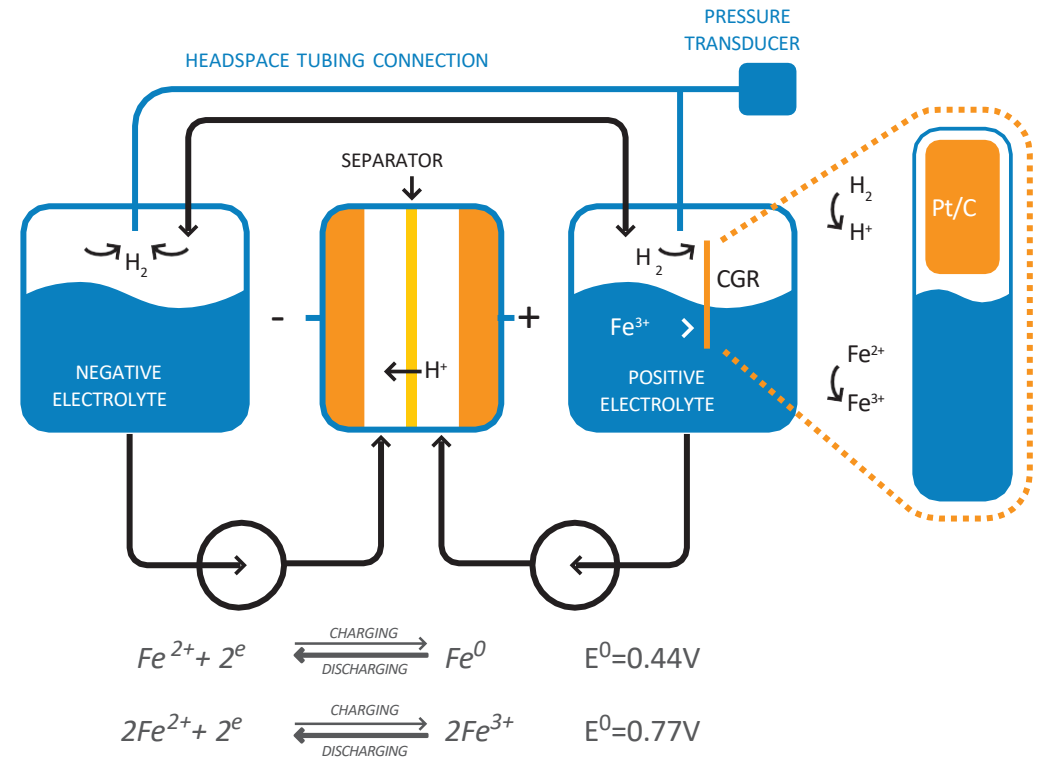
Technology Overview

ESS Critical Technology













Electrochemistry

- During charging, iron collects (electroplates) on the negative electrode
- During discharging, iron dissolves back into solution
- Passive design proton pump continuously refreshes electrolyte in closed-loop system



Supporting a Stable Energy Transition

ESI's technology is transforming the value proposition for long duration energy storage.

FEATURE	BENEFIT	ADVANTAGE
 Longer duration	<ul style="list-style-type: none"> • Up to 14 hours • Beats all other available batteries 	 <ul style="list-style-type: none"> • Transforms the economics of long duration storage • Key enabler for grid resiliency, renewables and micro-grids
 Low cost	<ul style="list-style-type: none"> • Lowest LCOS on the market • Incremental cost of storage <\$20 / kWh 	 <ul style="list-style-type: none"> • Cost competitive with Li-ion at 4 hours and lower cost up to 12 hours
 Power on demand	<ul style="list-style-type: none"> • Under 1 second response time • Unlimited cycle life — marginal cost per cycle essentially zero 	 <ul style="list-style-type: none"> • Can capture all revenue opportunities = Long duration + fast response time + unlimited cycle life • Increases grid resiliency and flexibility
 Safety and Reliability	<ul style="list-style-type: none"> • Non-flammable, non-toxic with no explosion risk • No degradation at elevated temperatures (i.e., no HVAC needed) • Field proven 	 <ul style="list-style-type: none"> • Can deploy anywhere from urban areas to harsh and sensitive environments • Munich RE insures technology risk
 Sustainability	<ul style="list-style-type: none"> • Lowest CO² impact • No lithium, cobalt or nickel • 25-year operating life • Completely recyclable and electrolyte 100% reusable 	 <ul style="list-style-type: none"> • Greenest battery on the market • Accelerates clean energy transition in developed and emerging markets

Technology Overview

Energy Warehouse™ Overview



Specifications

Configurable Range:	75kW
Storage Duration:	4–12 hours
Energy Capacity:	500kWh total; 400kWh rated @75kW
Response Time:	<1 second
Module Cycle Life:	>20,000 cycles
Ambient Temperature:	-5°C to +50°C
Expected Life:	25 year service life
Warranty:	1 year comprehensive 10 year extended warranty on core components

- First commercial deployment was in 2015
- Generation II launched in 2020
- Centralised, fully integrated design for turnkey delivery for behind-the-meter or front-of-meter solutions
- Easy to permit = fast to deploy and commission

Technology Overview



Technology Overview

Energy Centre™ Overview



Power Container



Tank Container

Specifications

Configurable Range:	Customisable up to GW scale – 145kW _{DC} increments
Storage Duration:	8MWh per MW installed (rated) 10MWh per MW installed (total)
Energy Capacity:	GW scale – ten (10) hour duration
Response Time:	<1 second
Module Cycle Life:	>20,000 cycles
Ambient Temperature:	-5°C to +40°C
Expected Life:	25 year service life
Warranty:	1 year comprehensive 10 year extended warranty on core components

- Front-of-the-meter solution
- Deployments starting in late 2024
- Designed for grid scale
- Improved energy density compared to Energy Warehouse™



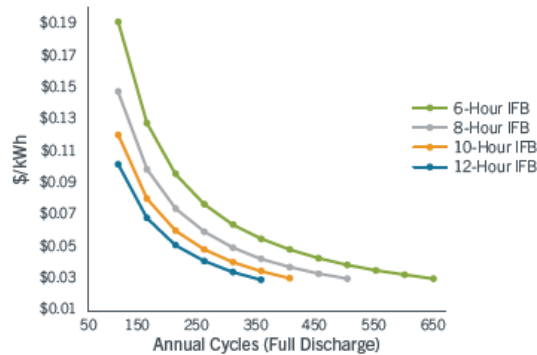
Technology Overview

Unparalleled flexibility

The Energy Center allows the power (the rate of electricity flow) to be decoupled from the capacity (the total amount of energy held). As a result, users have the flexibility to use the battery for a variety of use cases simultaneously on a project.

6 to 12-hour, 25 MW Energy Center

Capital cost / cycle capability, 25-year project life



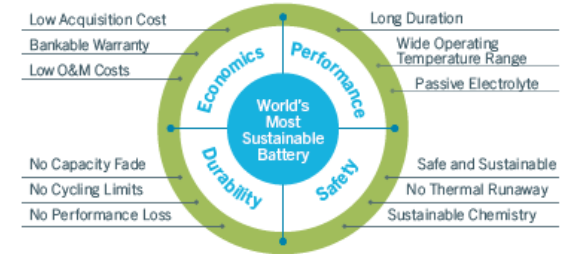
Specifications

Features	
Nameplate Power	145 kW DC
Nameplate Energy Capacity	1,160 kWh
Maximum Charge Rate	174 kW
Voltage	880 VDC ± 5%
Response Time	< 1 second depending on operation mode
Module Cycle Life	>20,000 cycles
Communication	24/7 remote monitoring (MODBUS TCP/Ethernet interface to EMS/SCADA)
Certification	Conforms to UL 1973, UL 9540 (pending), UL9540A (pending)
Environmental	
Battery	Recyclable components
Electrolyte	FeCl ₂ , KCl, H ₂ O; re-usable, recyclable
Ambient Temperature	-5°C to +40°C (+23°F to +104°F) rated power
Warranty	10-year battery module (underwritten by Munich Re) Extended warranty to 25 years available

Lowest cost per kWh

Using earth-abundant materials in its chemistry – iron, water and salt – keeps the cost of manufacturing the Energy Center lower than comparable storage technologies with different chemistry. For applications that can use 6+ hours of discharge and frequent cycling, the iron-flow battery Energy Center delivers the lowest cost per kWh over its 25-year lifetime.

Safest and greenest battery on the planet



Warranty partner

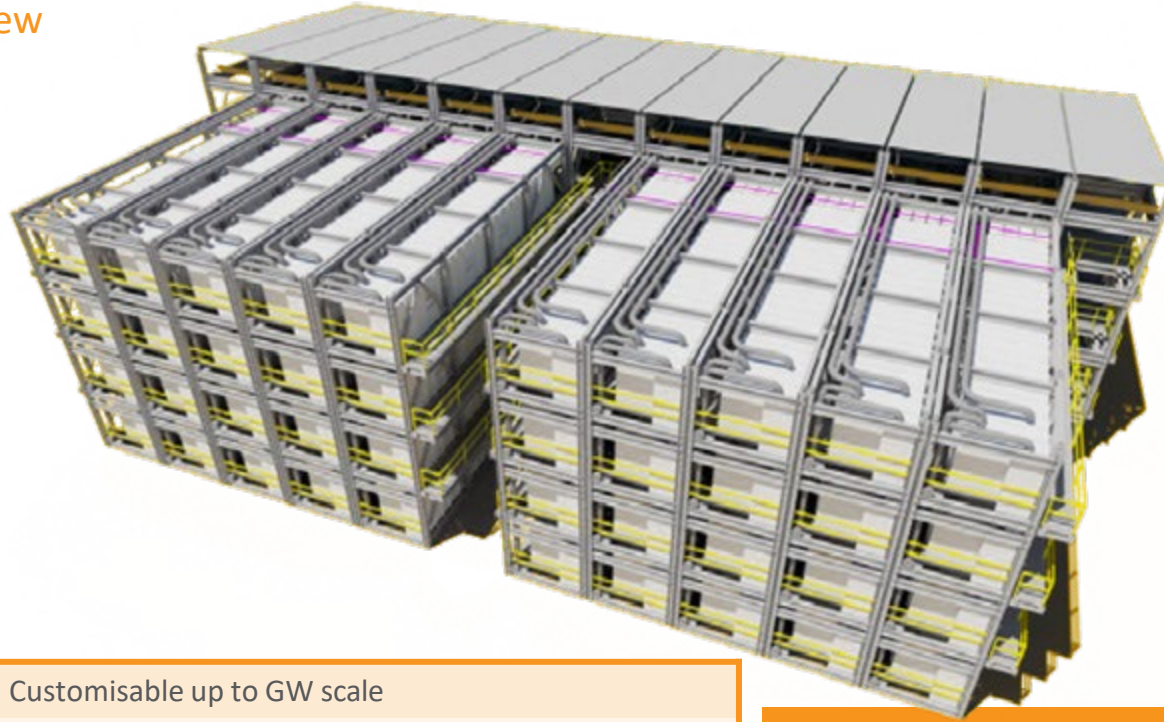


ESS Tech, Inc. has partnered with Munich Re to launch industry-first insurance coverage of its flow batteries. The innovative policy means our long-duration storage solutions are now backed by a full 10-year performance guarantee, regardless of project size or location.

Qualified Projects deployed during the Policy Period of Jan. 1, 2023 – Dec. 31, 2024 can obtain additional warranty back-stop by Munich Re, with insurance capacity exclusively allocated at project level.

Technology Overview

Energy Centre™ Overview



Specifications

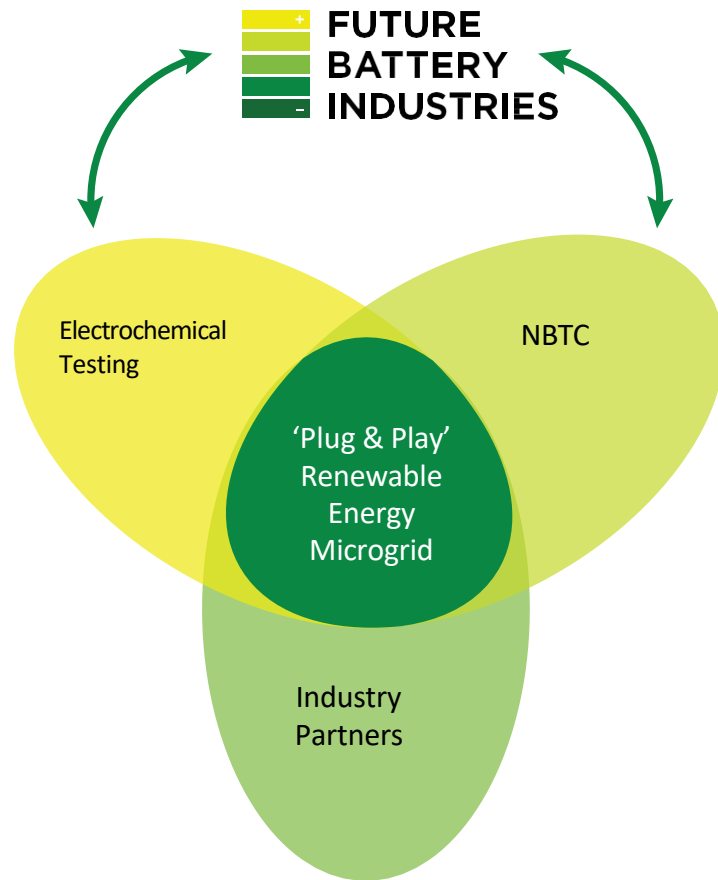
Configurable Range:	Customisable up to GW scale
Storage Duration:	8 hours at nominal power, additional capacity at reduced power
Energy Capacity:	GW scale – ten (10) hour duration
Response Time:	<1 second
Module Cycle Life:	>20,000 cycles
Ambient Temperature:	-5°C to +50°C
Expected Life:	25 year service life
Warranty:	1 year comprehensive 10 year extended warranty on core components

- Front-of-the-meter solution
- Deployments starting in late 2026
- Designed for grid scale
- Improved energy density compared to Energy Centre™

Large Scale Design

- Large scale medium duration storage is key to sustainable grid-scale energy storage
- Our mining industry capability is very relevant – given flow batteries are largely mechanical plant
- Australian Mining Engineering Capability is world best
- Development of large-scale storage facilities utilising world-class Australian mining knowledge and engineering capability will provide a solution, designed, and built to suit Australian conditions and lifecycle requirements
- Large scale medium duration storage will provide substantial benefit for mining and commercial applications
 - simple, effective, and customisable technology for application-specific solutions
 - peak-shaving and low-cost overnight energy
 - solar powered pump stations could be used to provide storage for overnight operations

Local Testing

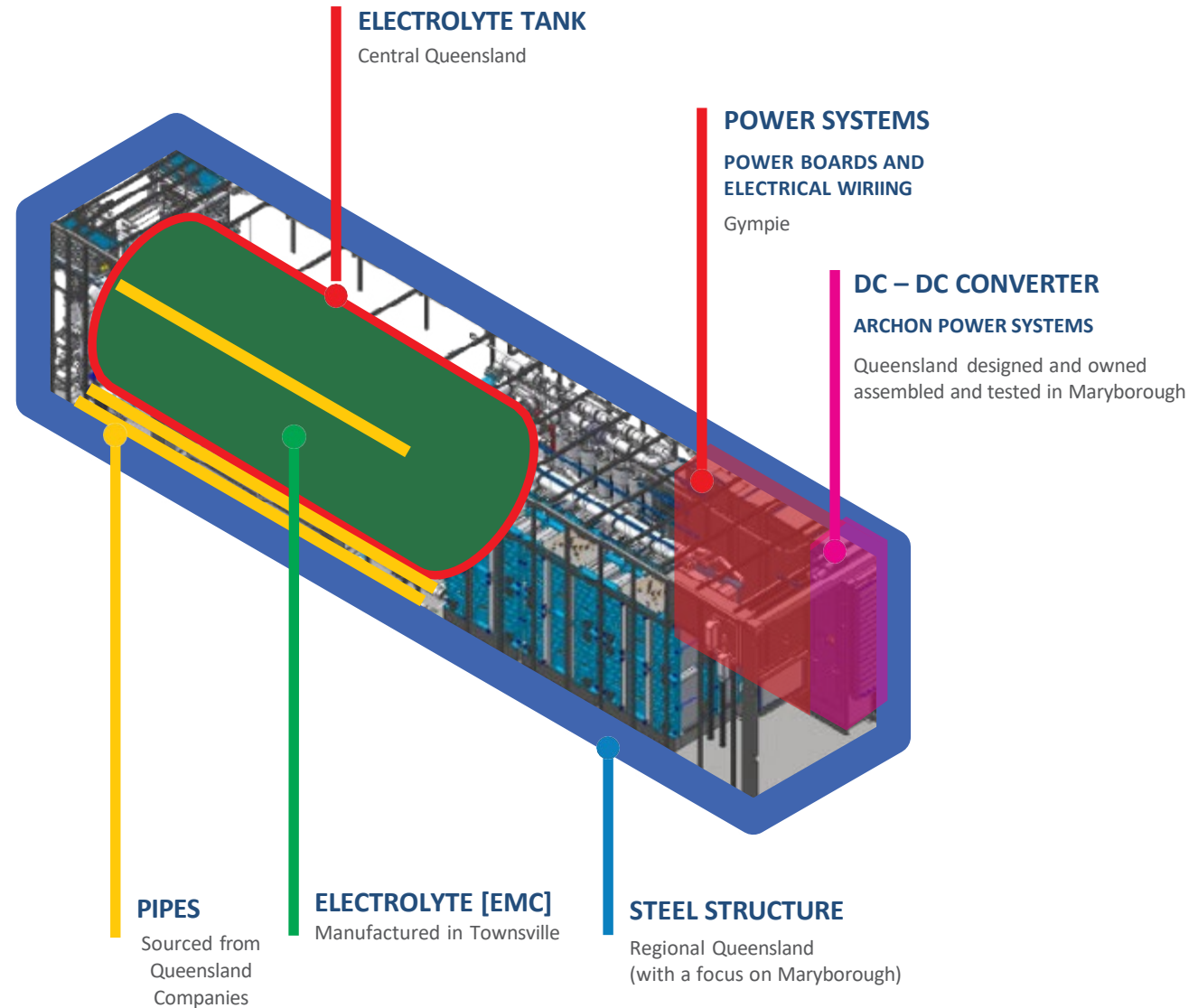


- 1 **technical viability** – gain confidence of the performance and reliability of iron flow battery technology in Australian conditions; confirm the technology can scale; integration
- 2 **regulatory pathways** – navigate the required regulatory pathways for an iron flow battery at a site in Australia
- 3 **Commercial viability** – understand how a long duration iron flow battery can be optimised within a specific energy portfolio and the broader energy market
- 4 **O&M capabilities** – train staff to operate, service and maintain iron flow batteries

Local Manufacture

Our renewable energy future – today!

- Provide reliable and environmentally friendly renewable energy storage solutions
- End-to-end solution provider – manufacture, install, maintain, and finance
- Deliver up to 400MW of energy storage per year by the end of 2026 (and for the next 15 years)























... securing local jobs and communities!

Our Implementation Strategy

Local sourcing resulting in low footprint, low impact solutions

- Leverage established engineering, supply chain, logistics, construction, and operational experience through established relationships and proven contractual arrangements
- Leverage local capability throughout the supply chain “implementation partners” – supplemented with high-volume, low-cost, resilient supply to achieve volume and cost efficiencies

STEPS	POWER TRAIN PRODUCT	PRODUCTION FACILITIES
Project Management		 triumph investment group
Concept Design	 SEDGMAN	 triumph investment group
Detailed Design	 SEDGMAN	  triumph investment group
Supply	 SEDGMAN	
Assembly	 SEDGMAN	
Construction / Installation	SEDGMAN	
Commissioning	 SEDGMAN	
Warranty		
Operate	 CUSTOMERS	
Maintain	  CUSTOMERS  CERTIFIED SERVICE PARTNERS	
O&M Technical Support	  CERTIFIED SERVICE PARTNERS	

- Modular and packaged design solutions applied large-scale storage capacity will enable inclusion of local supply chain partners (of all size and capability) to contribute
- Customised delivery strategy for installation location, site conditions, storage capacity, and energy supply and distribution

Our partnership with Sedgman provides investors and clients with outcome certainty and bankable cost and time profiles to operating storage capacity!

QUESTIONS + ANSWERS

THANK YOU