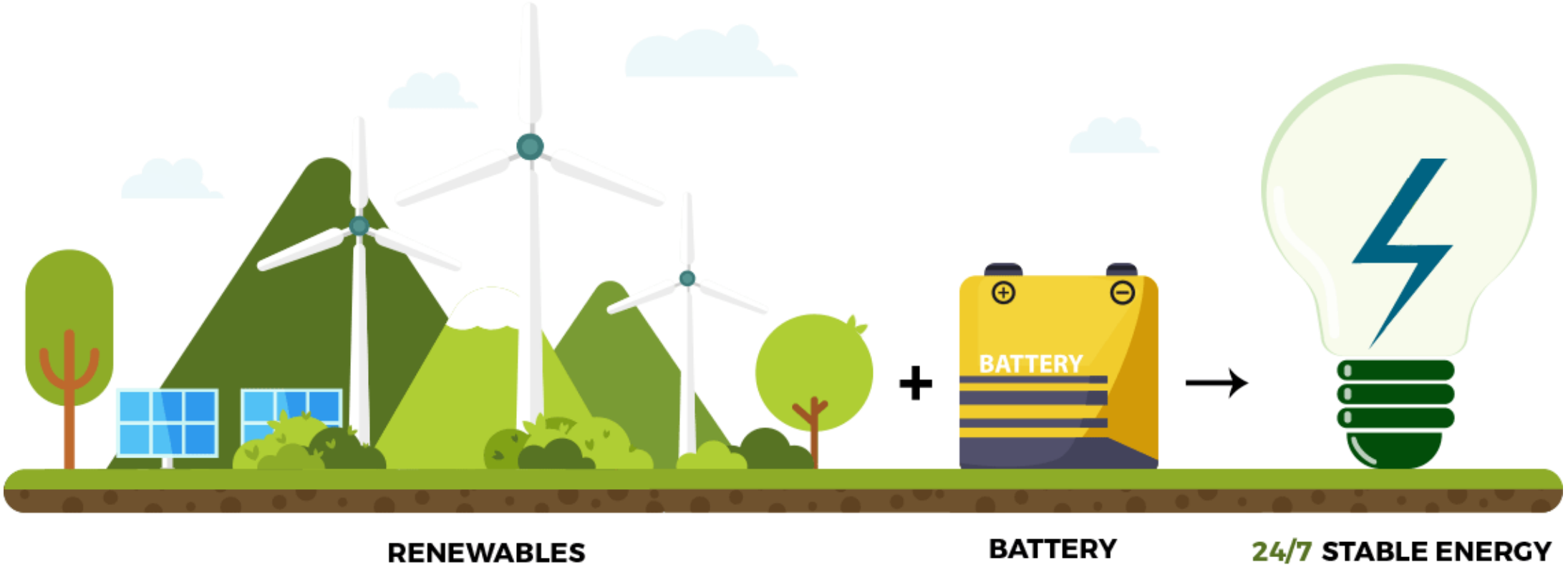
Innovative, reliable storage solutions to unlock the full power of renewables

V-Flow Tech | Powering Tomorrow

EMA Energy Innovation 2021 | Presentation

LONG DURATION ENERGY STORAGE IS KEY TO UNLOCK THE FULL POTENTIAL OF RENEWABLES

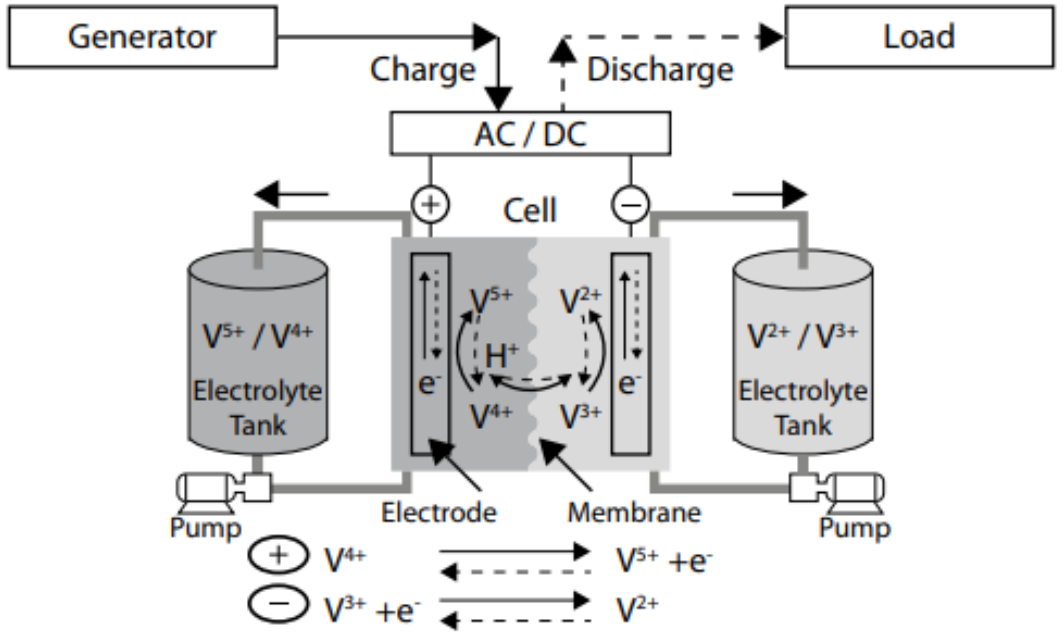


Cost of renewable energy has dropped exponentially over the decade

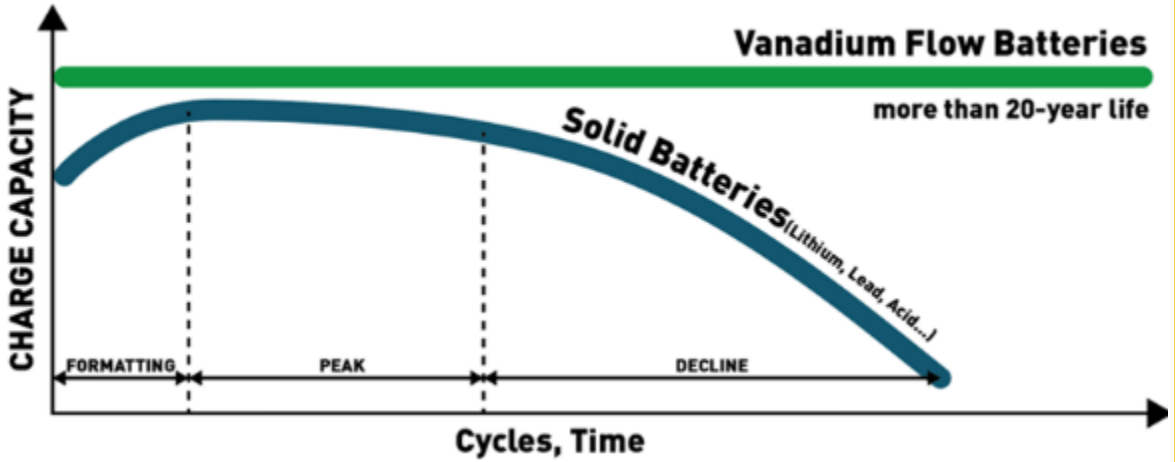
Urgent need for long duration energy storage to drive the renewable demand further

KEY BENEFITS OF VANADIUM REDOX FLOW BATTERIES

Working mechanism



No degradation



Safe to use

100% Recyclable

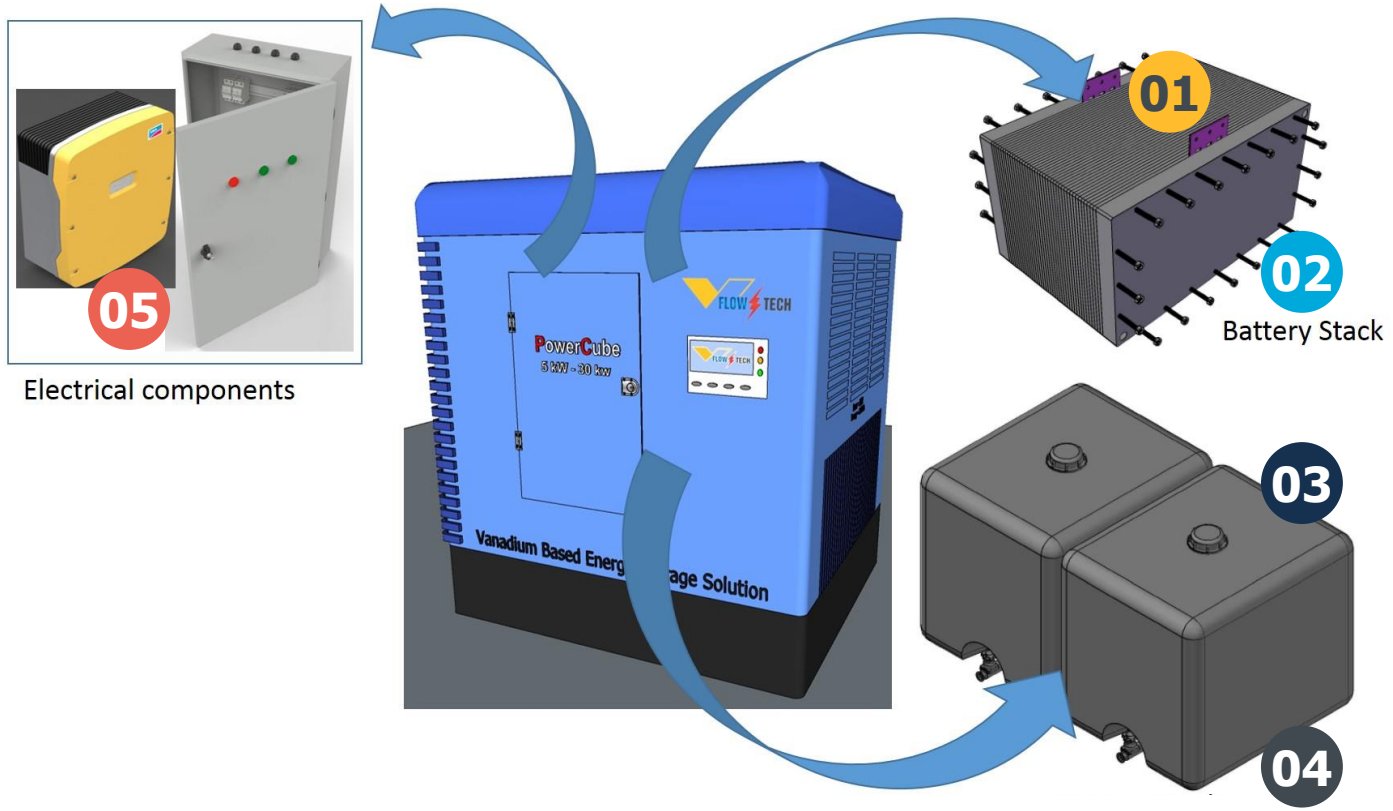
>25-year Life

100% Depth of Discharge

Long (dis) charge time

V-FLOW PROPRIETARY INNOVATION

V-flow tech is a spinoff from NTU, Singapore commercializing vanadium redox flow batteries leveraging proprietary IPs and know-how to deliver energy storage solution (ESS)



Our Key Innovations

- Stack design
- Compact and scalable design

- Reduced parasitic losses
- High and stable efficiency & capacity

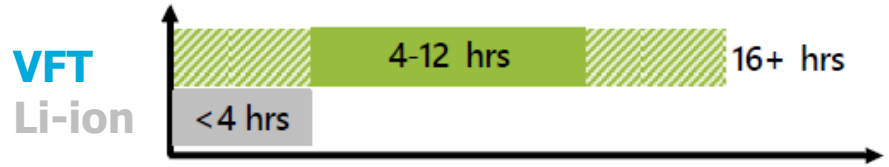
- Novel Chemistry
- Allows better thermal window

- Higher solubility of vanadium
- 25% Higher energy density

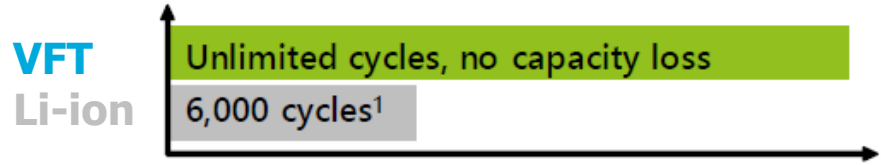
- Proprietary BMS and EMS
- >IOT and Load management capabilities

VFT OUTPERFORMS IN LONG DURATION ENERGY STORAGE

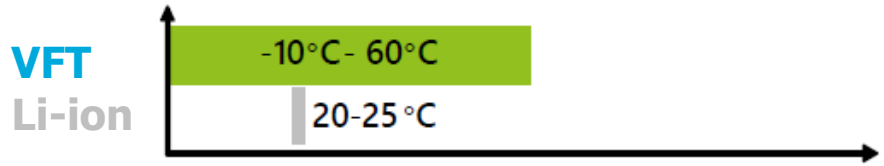
Operational Flexibility



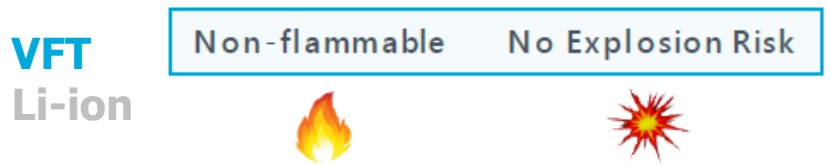
Longer Asset Life



Wider Operating Temp.



Safe & Reliable

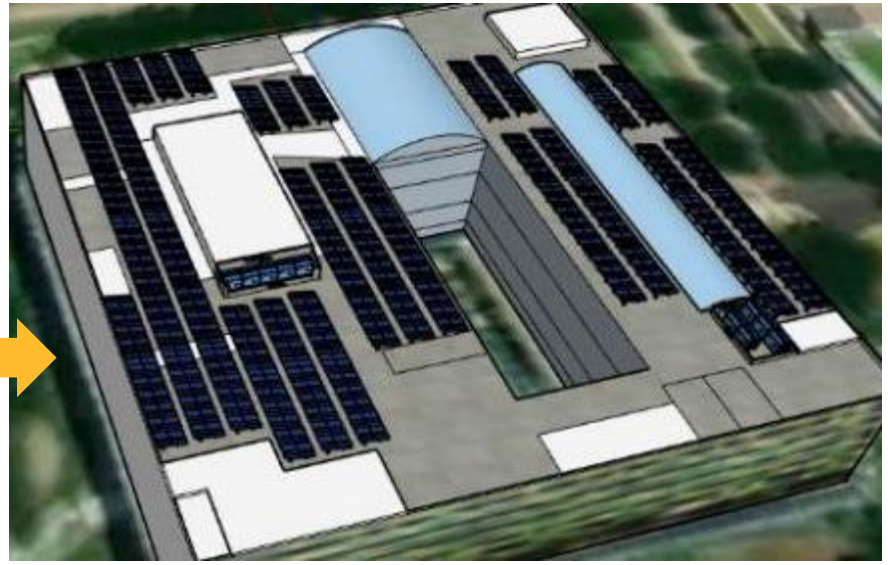


Compelling Performance

- ✓ Battery Life time independent of cycle life.
- ✓ Operates at Peak efficiency independent of outside environment.
- ✓ No heating/cooling systems needed.
- ✓ Safe for deployments to urban areas of Harsh climatic conditions.

POWERING BUILDING WITH RENEWABLES

JTC office



250 kW Solar rooftop

Corridor lighting

Lift

Space partner

jtc
Breaking New Ground

Funding partner

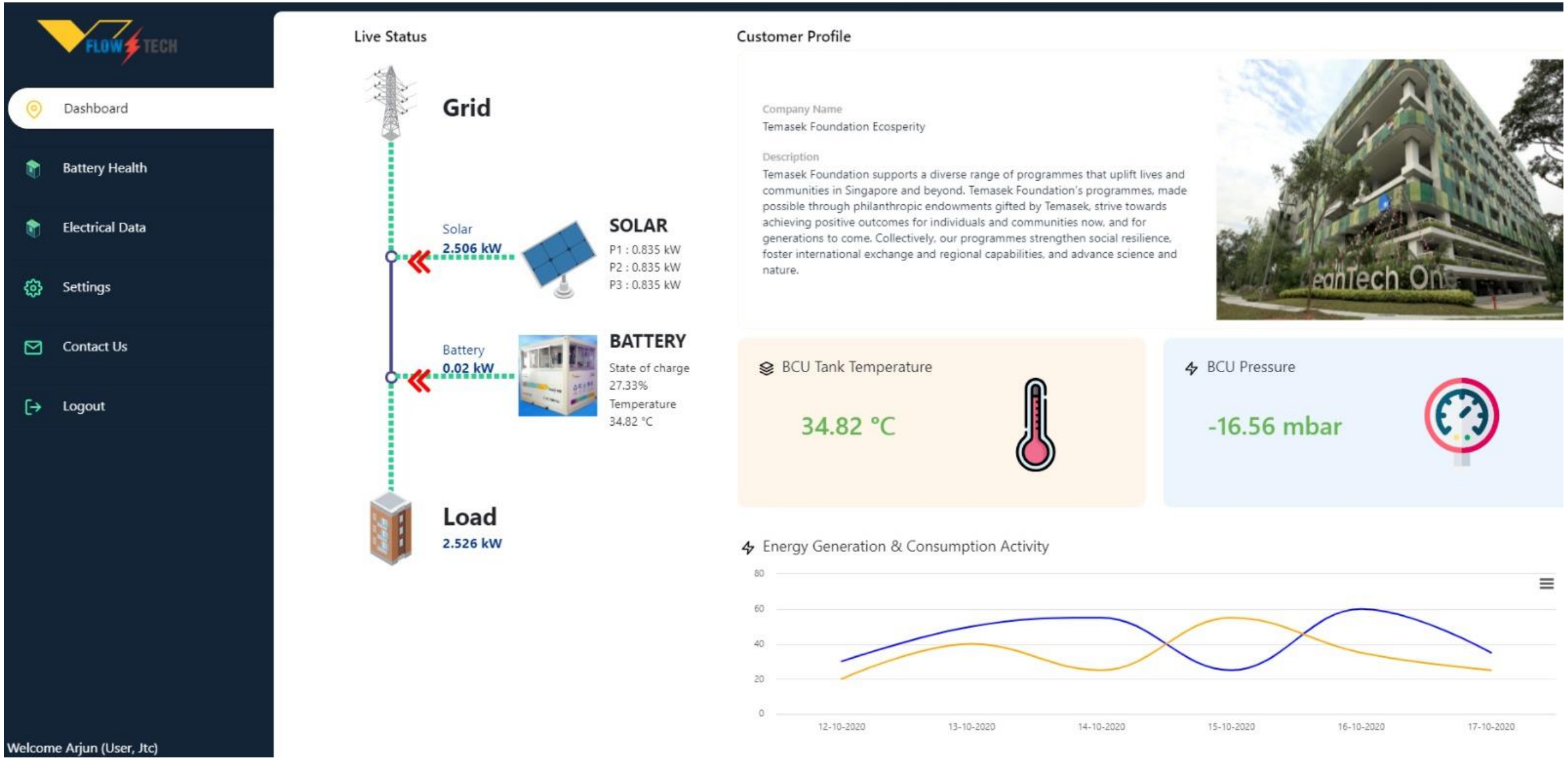
TEMASEK FOUNDATION ecosperity

2.4 m

10 kW/100 kWh V-Flow Battery System deployed at Site

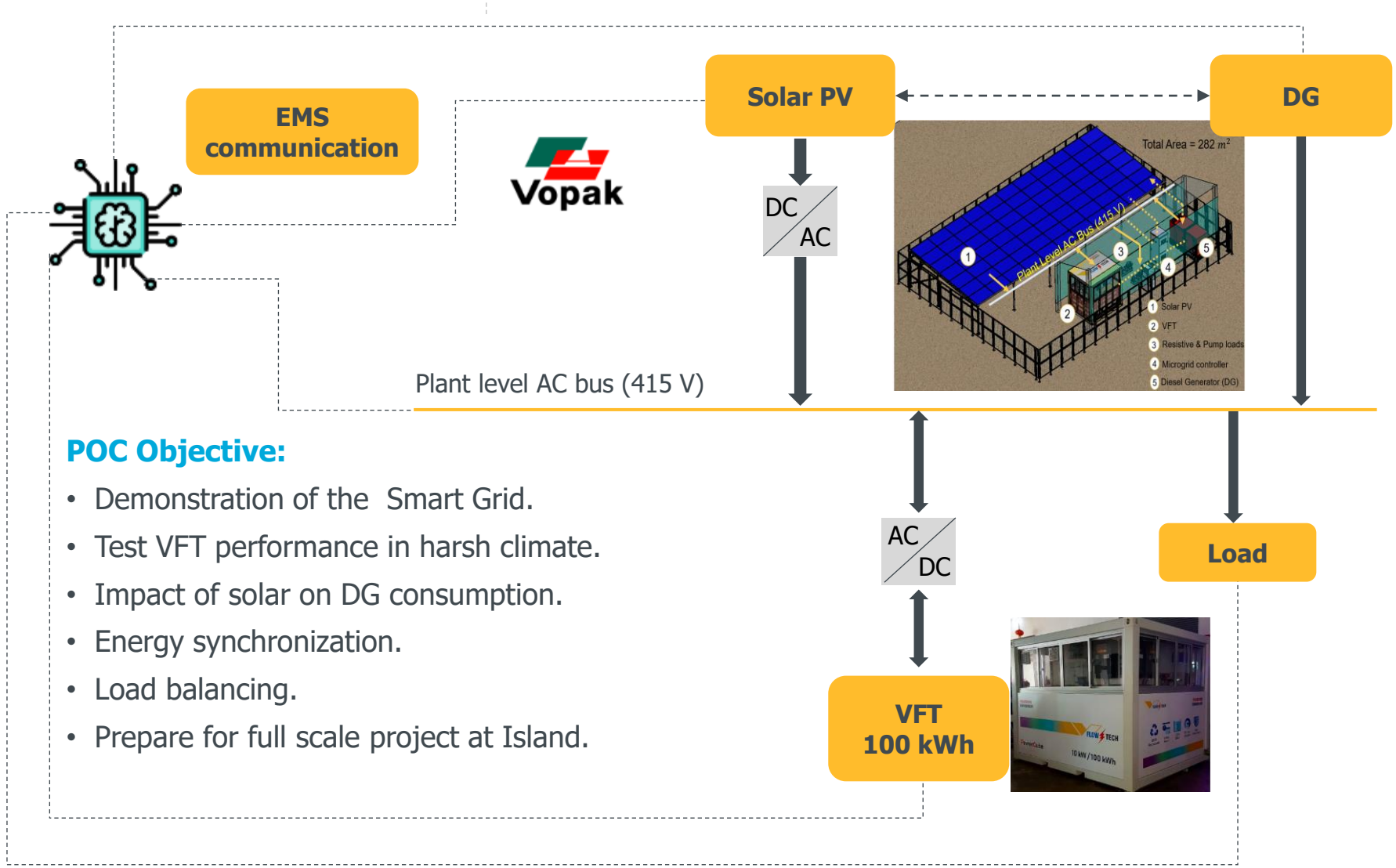
Carpark lighting load

BUILDING MONITORING



OFF-SHORE MICRO GRID ON REFINERY ISLAND (Singapore)

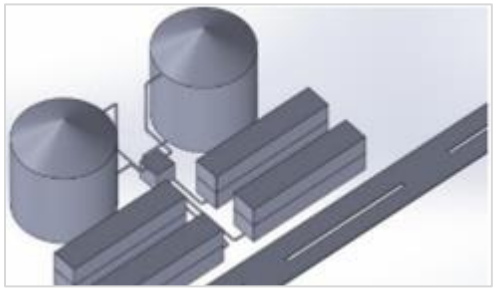
~7000 Litres of Diesel was saved in 3 month of operation



POC Objective:

- Demonstration of the Smart Grid.
- Test VFT performance in harsh climate.
- Impact of solar on DG consumption.
- Energy synchronization.
- Load balancing.
- Prepare for full scale project at Island.

Site location: Jurong port.

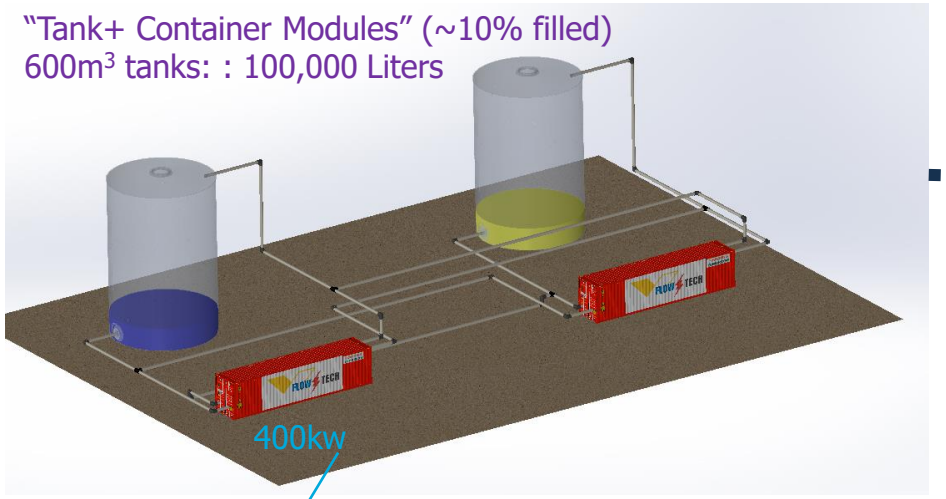


2 MWh full scale project

MWh-GWh Scale

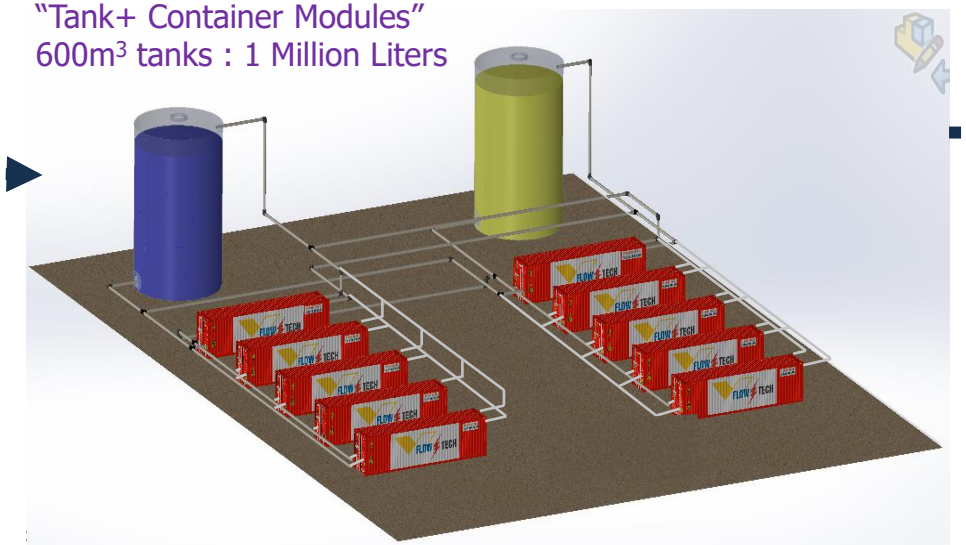
Liquid tank in container can easily scaled to stores 40 MWh energy

"Tank+ Container Modules" (~10% filled)
600m^3 tanks: : 100,000 Liters



By end 2021: Improvised 40 ft Container module:
400kW/4 MWh module (5h)

"Tank+ Container Modules"
600m^3 tanks : 1 Million Liters

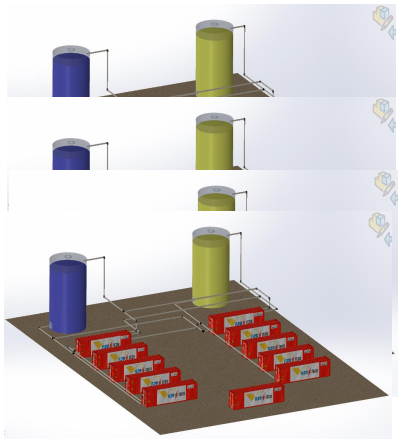


Multiple 40 ft Container Modules (could be stacked):
Total at 4MW/40 MWh without issues in series (5hr)

10X stack power

10X electrolyte volume

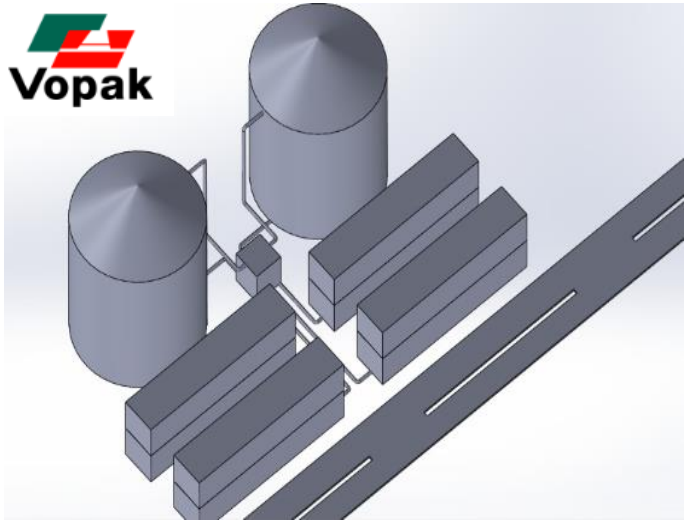
25 repeated of this to give 1 GWh

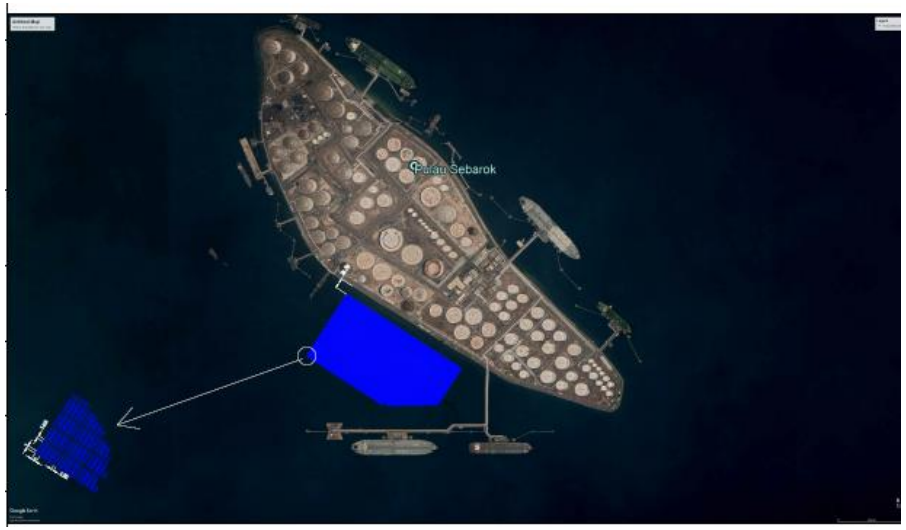


- Storing in Tanks allow scalability from MWh to GWh.
- Modular stack unit of stack from 400 kW.
- Large tank and piping design will be a game changer for utility scale projects.

ROADMAP TO GWh Flow Battery Demonstration

~5M Litres of Diesel to be saved each year





Validation 1 – 100kWh
Validation 2 - 2MWh

2020-2022

Sebarok Microgrid

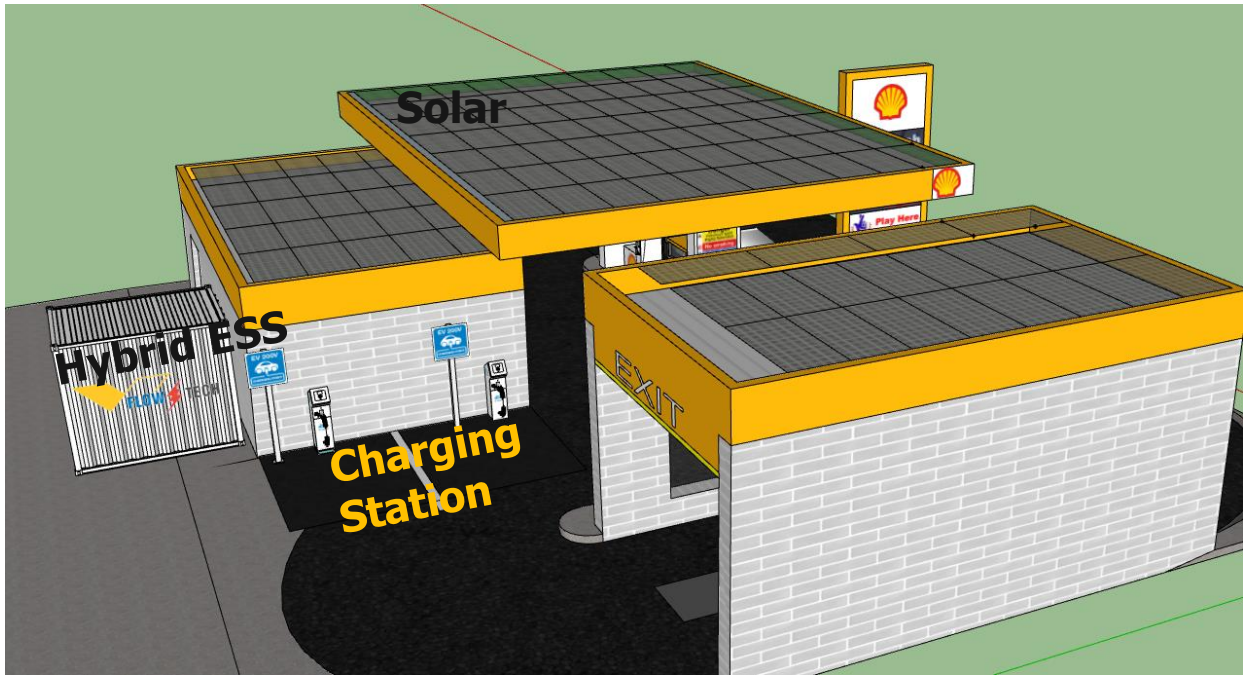
2022-2023

Large Scale

2023-2024

- Validation 1 completed & 2 currently being done in parallel/staggered.
- Showcase at Sebarok via Sebarok Microgrid.
- Commercialization can take place earliest after Validation 2 at large scale at 2022-2023.

VRFB TO ENABLE GREEN CHARGING STATION-KOREA

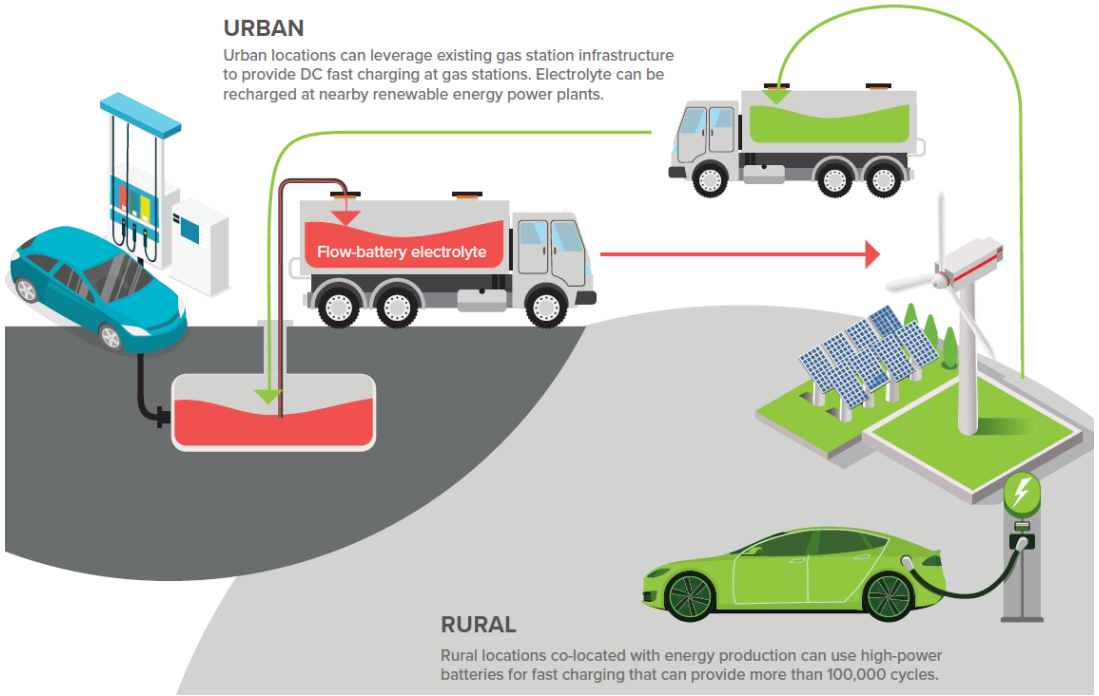


- 500 kWh ESS System with 150 KW System
- Charging infrastructure at an existing gas station

Proposed

Future

- Develop a UST ESS in a smart microgrid set-up for green charging application
- Develop specific IPs on UST ESS, smart microgrid and Fast charging.
- Revenue model from charging of vehicle.
- Scalable project



MARKET TRACTION

Interest grows in going with the vanadium flow

The choice of battery storage technologies in support of solar energy supply is broadening to suit a variety of emerging applications. VSUN has just made its first power play for vanadium-redox-flow batteries in the off-grid residential market.

NOVEMBER 24, 2020 NATALIE FILATOFF

TECHNOLOGY AND R&D | UTILITY SCALE STORAGE | AUSTRALIA

TNG signs deal to commercialise vanadium redox flow batteries using output from Mount Peake project

*By **Imelda Cotton** - April 13, 2021*

TNG is joining forces with Singapore's V-Flow Tech to commercialise VRFBs for renewable power systems in remote and regional Australia.

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Perth-based resource and mineral processing technology company TNG (ASX: TNG) has moved closer to delivering its green energy strategy with the execution of an agreement for an incorporated joint venture with leading Singapore-based battery technology development company V-Flow Tech.

Vanadium flow batteries considered for integration into green hydrogen project in Malaysia

TNG joins vanadium

Vanadium redox flow batteries (VRFB) could be integrated into a green hydrogen production technology through a collaboration between Australian resources company TNG and Malaysian renewable energy consultancy AGV Energy.

AGV Energy is developing a technology to create hydrogen from demineralised water electrolysis, powered by renewable energy and is planning to use the solution, which it has branded HySustain, at its Malaysian Green Hydrogen Project.

TNG meanwhile, which is a minerals and resources company targeting market share in strategic metals markets, has already formed a partnership with V-Flow Tech, a VRFB tech company headquartered in Singapore.

TNG and V-Flow are in discussions about forming a joint venture (JV) to develop and commercialise green energy systems using the long-duration, non-degrading long lifetime battery technology for

JV WITH SING FUEL TO BUILD MICROGRIDS IN AFRICA

- **840 Million People in Africa has no Access to reliable Electricity.**
  - 400 TWh of energy is required to meet the need
  - Revenue Potential of Over $200 B
  - Smart meter and Internet of energy
- **Huge O&M market**
  - On site testing of operational Microgrids and batteries installed.
  - Software as Service for cloud platform
- **World Bank and ADB Subsidy**
  - Easy access to impact fund and low interest debt from world bank and ADB

RECEIVED MULTIPLE AWARDS & RECOGNITION

V-Flow tech is one of the company selected by TF to build next generation technology for resilient community

TEMASEK FOUNDATION ecosperity

- Demonstration of the 100kwh System
- Test VFT performance in office.
- Impact of Solar intermittency.
- Energy security.

Enterprise Singapore

- Innovation grant to develop next generation Fuel cell based high density stack.
- Supported by German central innovation programme (ZIM)

Federal Ministry for Economic Affairs and Energy

LEADERSHIP TEAM OBSESSED WITH EXECUTION

Dr. Avishek Kumar, CEO

- PhD in Solar Technology
- > 10 years experience in renewable energy
- Product Development expert
- Deep domain knowledge in Manufacturing.

Dr. Arjun Bhattarai, CTO

- PhD in Materials Science
- In-depth know-how of VFRB
- Patents on VFRB technology
- >500 citations

Ting Cheong, COO

- Master in Electrical Engineering
- >25 years of leadership in Operations excellence
- Management experience with large semiconductor fabs.
- Experience with OEM

Jaspreet Singh, Engineering

- Master in Power Engineering
- >5 years of microgrid related projects
- Expert in power electronics interfaces, ESS & power management for microgrids

SUPPORTED BY WORLD-CLASS ADVISORS

Nyunt Wai,
Scientific Advisor

- >20 years energy storage and deep expert in VRB
- Pioneer in applying vanadium storage with solar
- Energy Research Institute @ NTU

Peter Ridley,
Technical Advisor

- > 25 Years of experience in Flow battery domain.
- In-depth know-how of VFRB
- Several Patents in VFRB technology
- 20 years as Technical Director of Red-T VRFB system

Michael Gryseels
Investor & Board Member

- Angel Investor, Board Member and Mentor of 40+ deep tech start-ups across the world
- 20 years with McKinsey & Company, APAC leader of McKinsey Digital Labs
- Currently CEO of True Digital

Ad Ketelaars,
Investor & Advisor

- Angel Investor, Advisor and Mentor for 20+ Technology start-up and SME companies
- >30 years experience as CEO in Telecom, Electronics & IT industry

Innovative, reliable energy storage solutions

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