



FLOW
BATTERIES
EUROPE

A united voice for flow batteries

Vanadium Flow Batteries: 40th Anniversary Webinar

30 October 2024 | 09:00 – 10:00 CET

Agenda

1. Breakthroughs that have shaped vanadium flow batteries

- Professor Maria Skyllas-Kazacos AM (The University of New South Wales, Australia)
- Anthony Price OBE (Flow Batteries Europe)

2. Where do we stand now?

- Jana Plananska (Norge Mineraler AS)
- Thomas Lüth (CellCube)

3. Q&A

Breakthroughs that have shaped vanadium flow batteries

MEET THE GUEST EXPERT SPEAKER



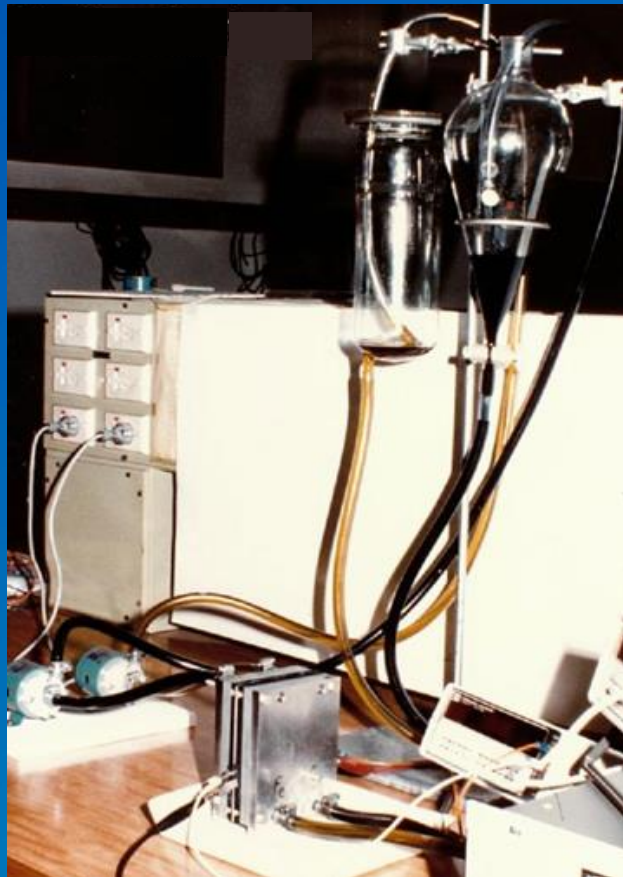
Professor Maria Skyllas-Kazacos AM
University of New South Wales (UNSW)

MODERATOR

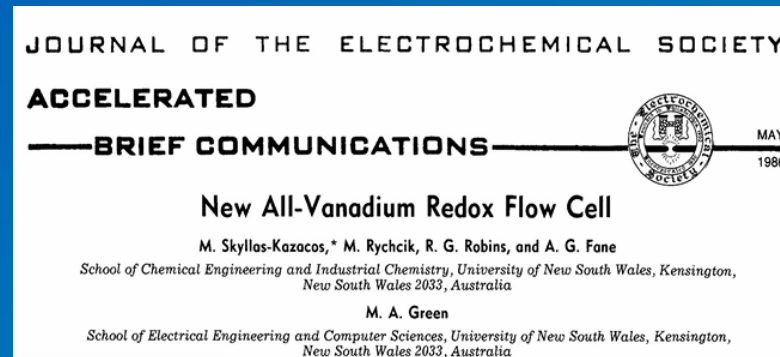


Anthony Price OBE
Flow Batteries Europe (FBE)

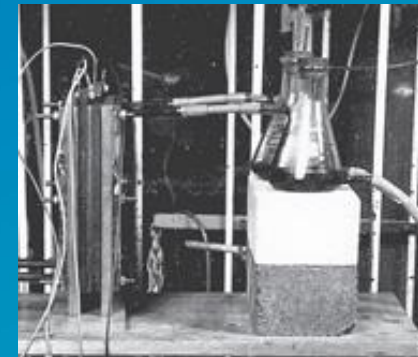
The beginning of the vanadium flow battery



The original seed: Larry Thaller at NASA, and the Fe / Cr project by Martin Green's student, Bob Brand in 1982.



First flow vanadium cell tests, 1986



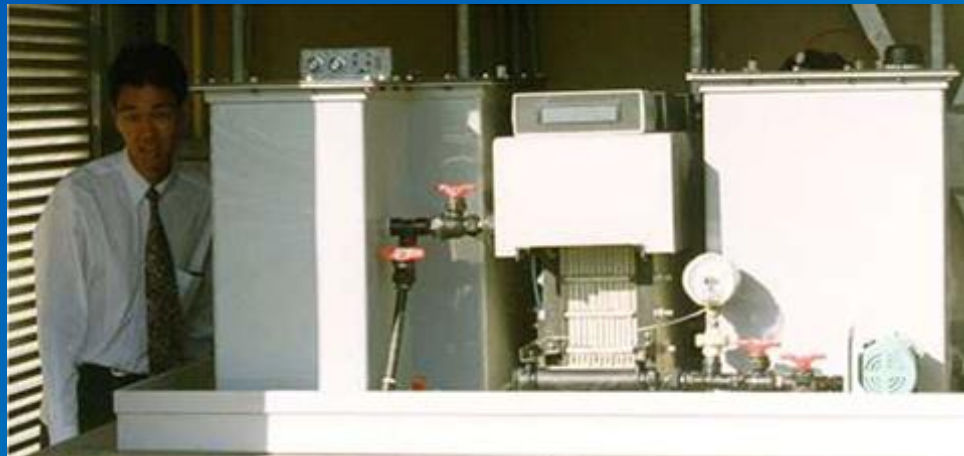
First All-Vanadium Flow Cell fabricated by Franz Grossmith, 1986



First 1 kW VFB multi-cell stack, 1988

The development of the vanadium flow battery in the 1990s

Setting up a laboratory and the solar house project in Thailand, 1993-94



Then in Japan:



Vanadium battery receives backing

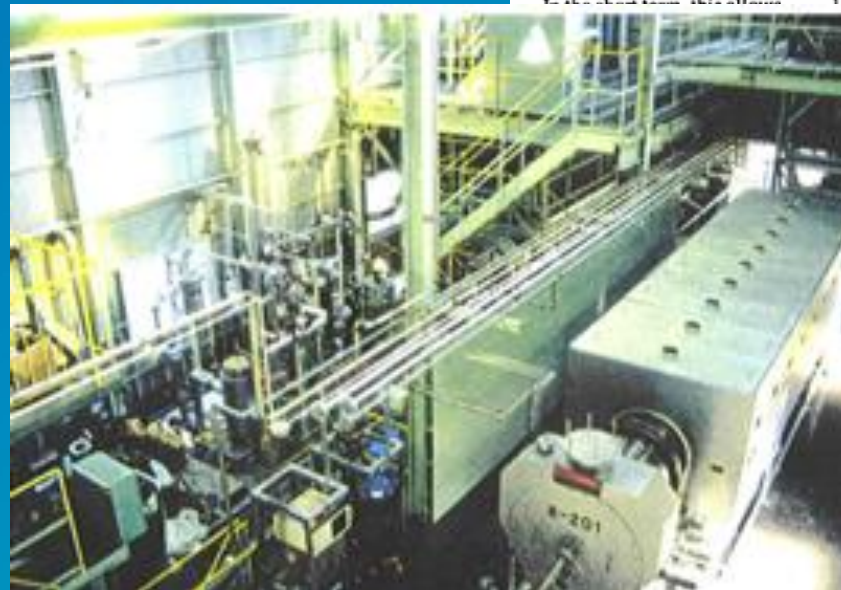
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tion of Asia, Australia and New Zealand.

The intent of the agreement with Mitsubishi and Kashima-Kita is to bring the technology to the stage where it can be used for load levelling – storing electricity produced by power utilities during periods of reduced demand so it can be released at times of peak demand.



The signing of the agreement between Unisearch and Mitsubishi Chemical and Kashima-Kita (standing, from left): Mr Hogg; Mr Sato, Chief Manager of Kashima-Kita's Vanadium Battery Development Division; Mr Hirokazu Takahashi, Power Systems Department, Mitsubishi Corporation; (and sitting from left) Mr Akira Kata; Mr Richard Kaan, Managing Director of Unisearch; Mr Shigematsu, Representative Director of Kashima-Kita Electric Corp; and Professor Skyllas-Kazacos.



The development of the vanadium flow battery in the 1990s

And more projects in Australia:



Department of Defence
project, 1997



VFB-powered light rail
for Sydney



Electric golf cart project,
1996-97

The first commercial VFB systems

1 MW/5 MWh, Sumitomo - Japan



5 MW/10 MWh Rongke Power - China



CellCube – Vienna, Austria



300 kW/3.6 MWh Prudent – California, US



CellCube – Berlin, Germany



Further progress over the past decade until today

Sumitomo 60 MWh VFB in Hokkaido, 2015



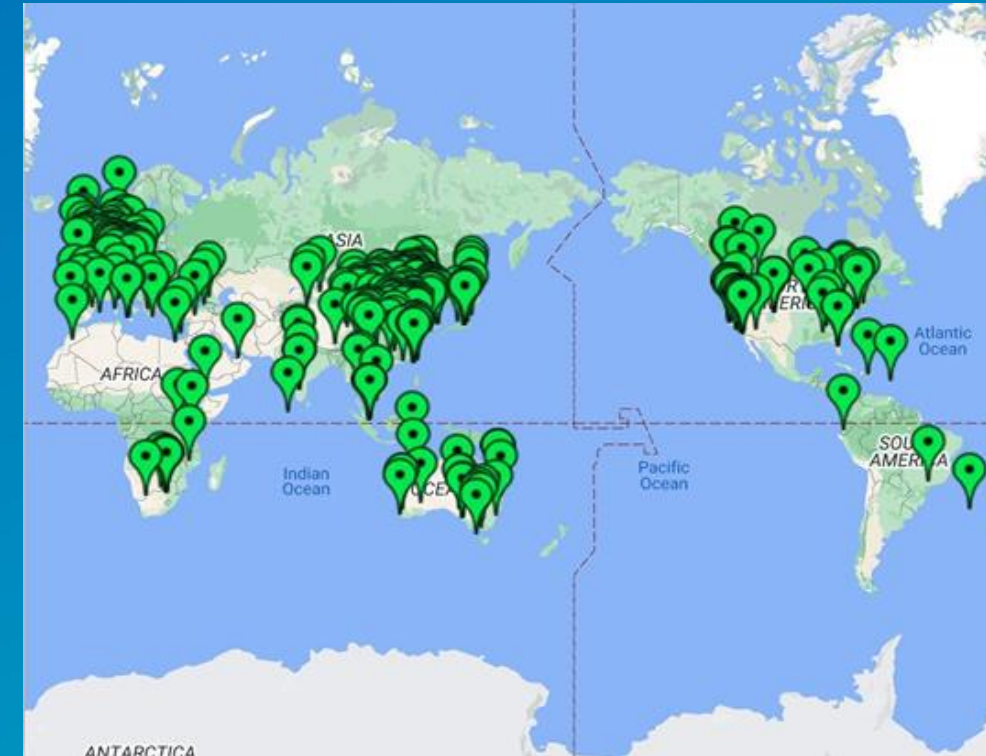
800 MWh Rongke Power Dalian Project and GigaFactory



Invinity currently building Australia's first dispatchable solar power plant with an 8 MWh VFB coupled with a 6MWp solar array in South Australia



Installed and announced VFB installations in 2023



Flow battery projects in Europe

Oxford, UK
Invinity
5 MWh VFB hybrid system,
decarbonisation project



Seraing, Belgium
Sumitomo Electric
1.7 MWh VFB,
Microgrid



Mallorca, Spain
Largo Clean Energy
6.1 MWh VFB, solar
panel integration



Aalst, Belgium
Invinity
800 kWh VFB,
integrated solar PV



Rüsselheim, Germany
CellCube
400 kWh VFB;
Microgrid, PV integration



Simris, Sweden
CellCube, Bryte Batteries
1 MWh VFB, local
distribution grid



Öskü, Hungary
Invinity
1.5 MWh VF, solar
shifting and ancillary
services



Flow battery projects map coming soon at:
www.flowbatterieseurope.eu

European companies
in the flow battery
sector



... and many more

Global Vanadium Production

MEET THE GUEST EXPERT SPEAKER



Dr. Jana Plananska

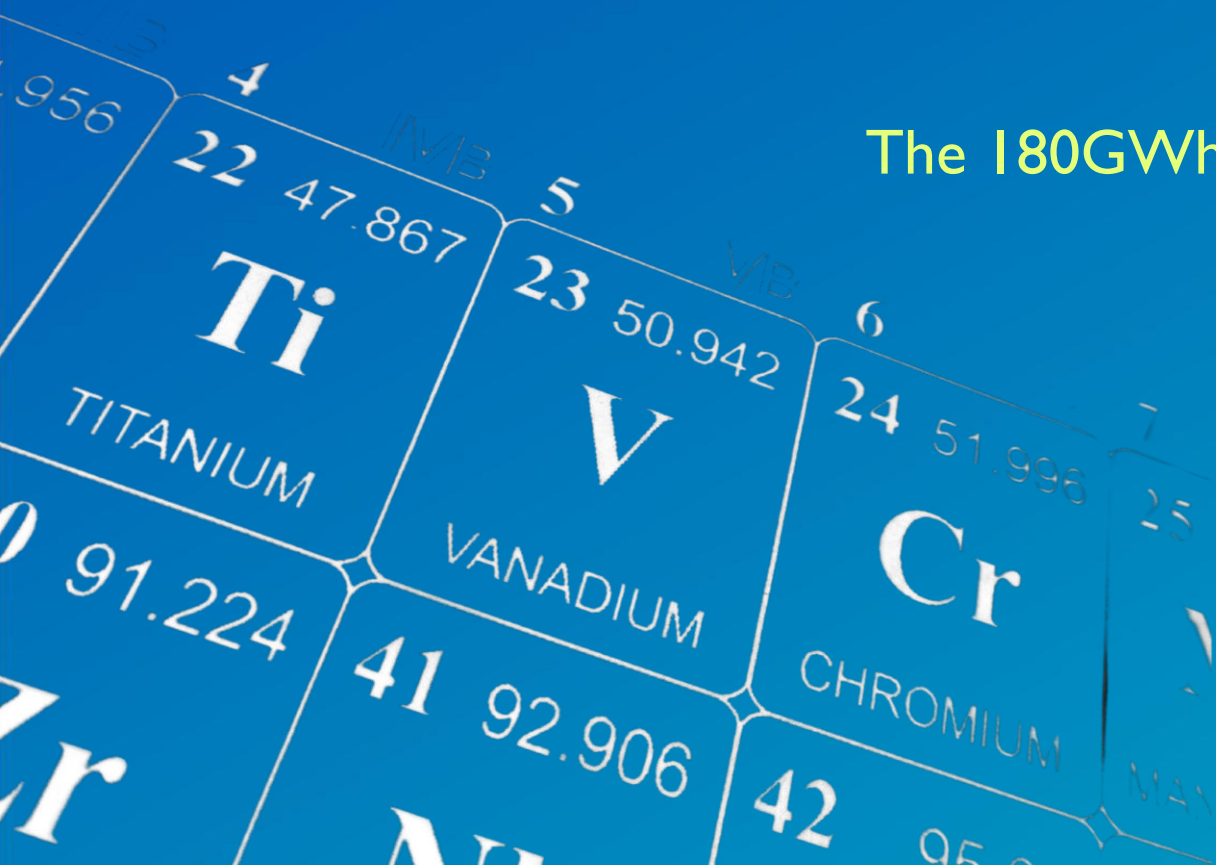
Director EU and Government Affairs
Member of the Board of Advisors,
Norge Mining Ltd

Global Vanadium Production

By 2030, the cumulative installed capacity of electrochemical energy storage will reach 100GW, and the market share of VFBs is estimated to be about 30%, which is 30GW. If the average storage time of VFBs is 6 hours, it will be about 180GWh.

The 180GWh electrolyte requires 1.5 million tons of V_2O_5 .

Prof. Huamin Zhang, Vanitec Conference, China 2023



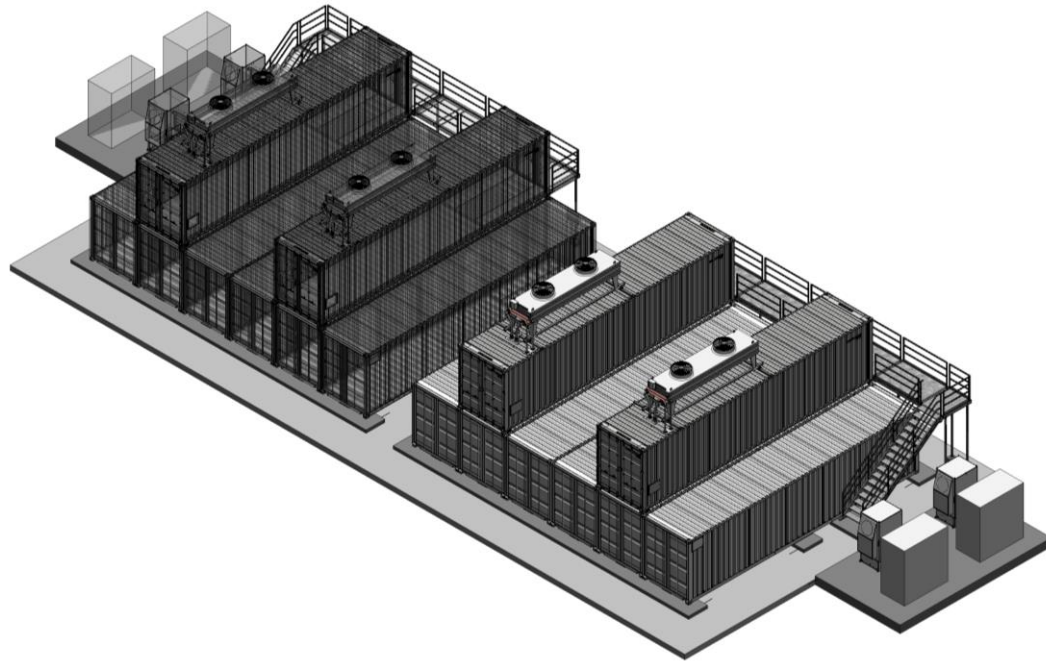
Vanadium Flow Battery Projects

MEET THE GUEST EXPERT SPEAKER



Dr. Thomas Lüth
CellCube

1 MW / 8 MWh REFERENCE



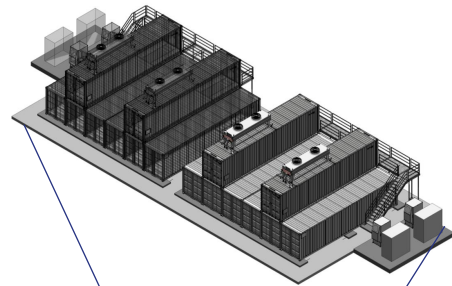
Location	Bridgeport, USA
Rated power	1 MW
Rated capacity	8 MWh
Product	4x CellCube FB 250-2000
Installation/COD	Q2 2025 / Q4 2025
Application	Solar integration, Energy shifting, peak shaving, blackstart, UPS, microgrid resilience

“CellCube’s megawatt-scale vanadium redox flow battery and management system will deploy integrated hardware and software to connect and balance base energy systems hosted in collaboration with the Marine Corps.”

1 MW / 8 MWh REFERENCE



Site in Momo County (CA)	Use Case
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Normal Operations

Normal operations mode where the battery and energy resources are optimized to serve local loads and minimize utility costs.

Planned Disconnect

Planned disconnect mode where scheduled service interruptions, such as Public-Safety Power-Shutoff events, can be proactively managed and islanding transitions can be scheduled.

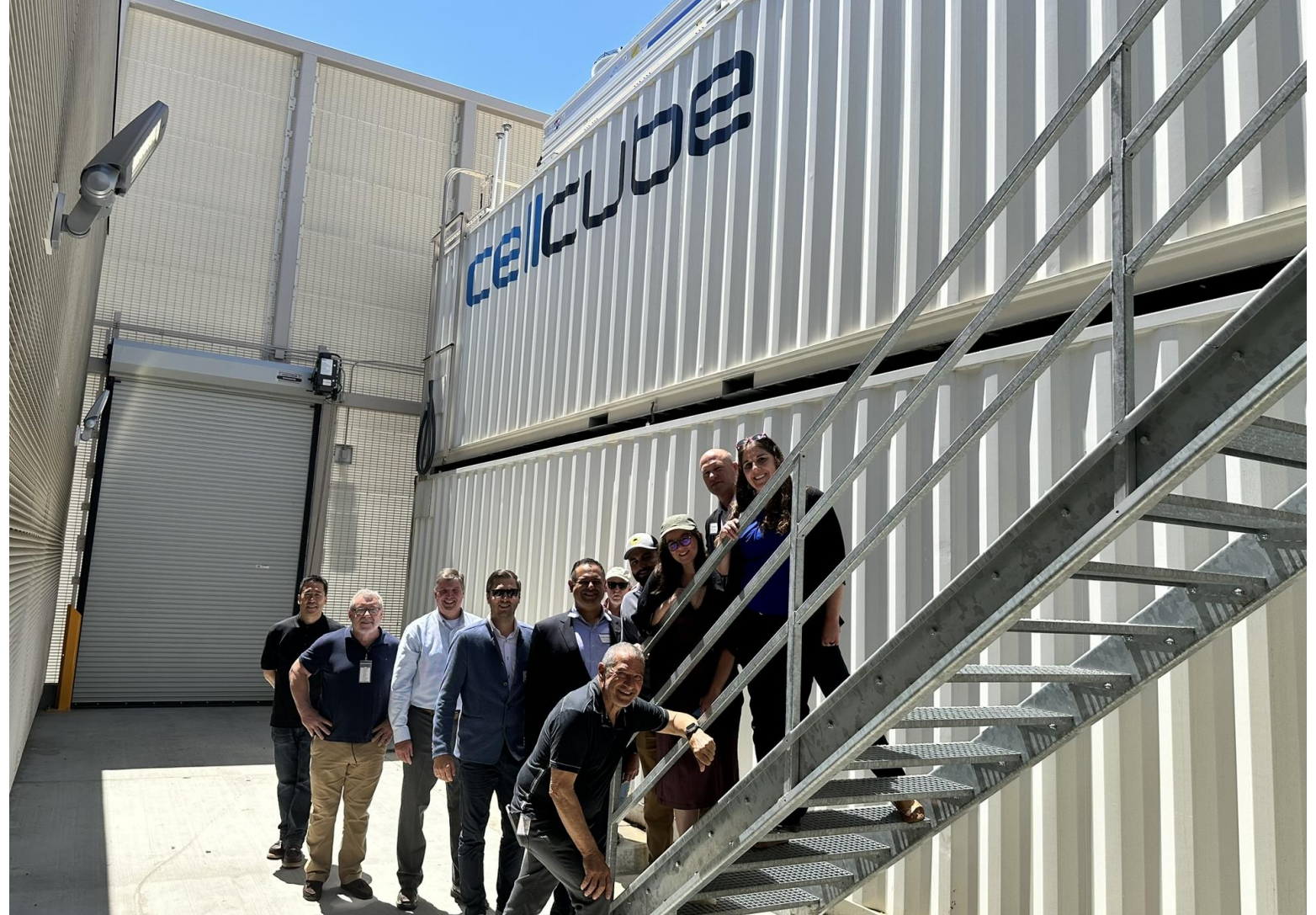
Short Islanding

Short islanding mode is a reactive islanding mode with a relatively short duration. Minimizing diesel operations and environmental impacts.

Long Islanding

Long islanding mode is a reactive islanding mode with an outage duration extending to weeks or months. In these scenarios, the generator would coordinate with the battery to deliver the full. Load management can be used to manage against supply variations and inclement weather.

1 MW / 8 MWh REFERENCE



Join the Discussion

Any Questions?



Flow Batteries Europe (FBE)

- Members-led trade association based in Brussels;
- Represents flow battery stakeholders at European level;
- We aim to shape the legal framework for flow batteries, contribute to the EU decision-making process as well as help to define R&D priorities.

For more information, please visit:
www.flowbatterieseurope.eu



Contact us



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