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Novel Membranes for Vanadium Redox Flow Batteries

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Energimyndigheten

VATTENFALL

Lithium-based vs. Vanadium Redox Flow Batteries

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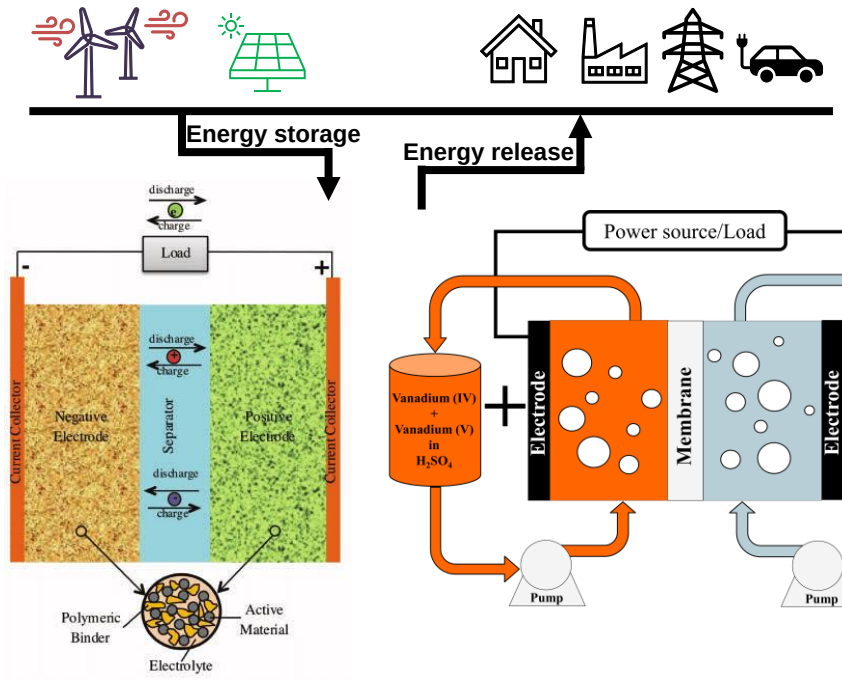

Li-ion Battery **Vanadium Redox Flow Battery**

Why Vanadium RFB?

- Independent scaling up of power and energy density **(**kW to MW**)**
- Suitable for frequency regulation and peak shaving services
- 20 years lifespan (>15000 cycles)
- High depth of discharge
- Temperature range: -5 - +50 ºC
- Non-flammable, non-explosive, no toxic gases
- Vanadium electrolytes can be reused indefinitely.

Vanadium Redox Flow Battery projects

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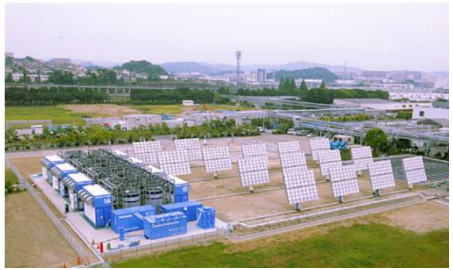
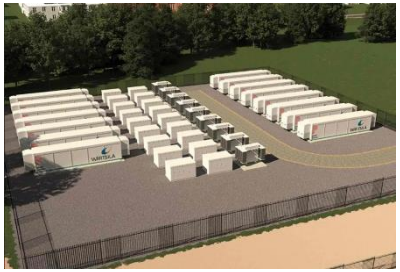
World's largest VRFB project in Dalian, China
800 MWh/200 MW

California community energy group
226 MWh



Sumitomo Electric Industries, Japan
60 MW



The United Kingdom's first grid-scale battery
2 MW

Austrian fish farm
6MWh

Two trial projects to support electric vehicle charging in South Korea and Australia
30 kWh/5 kW

Challenge

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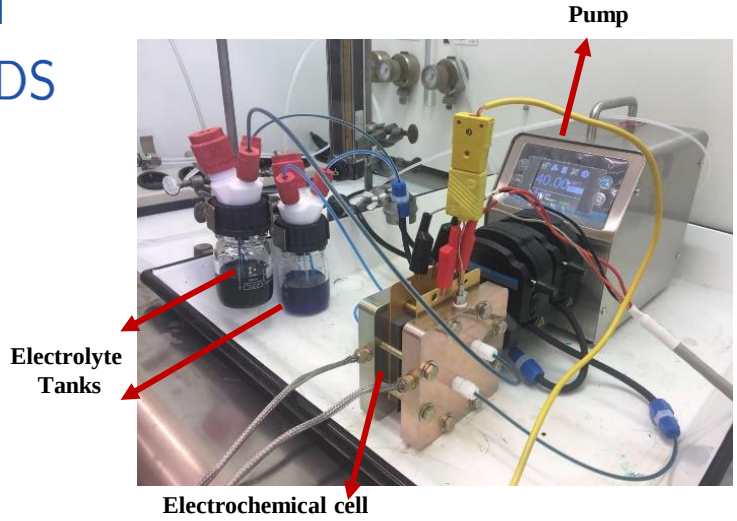
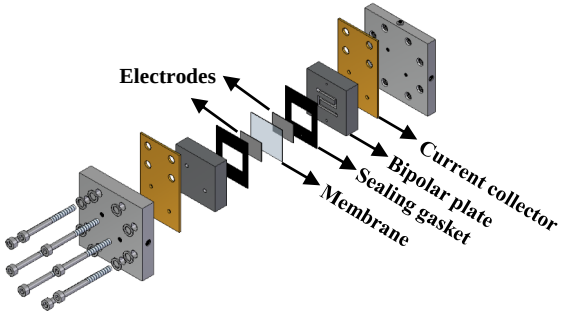
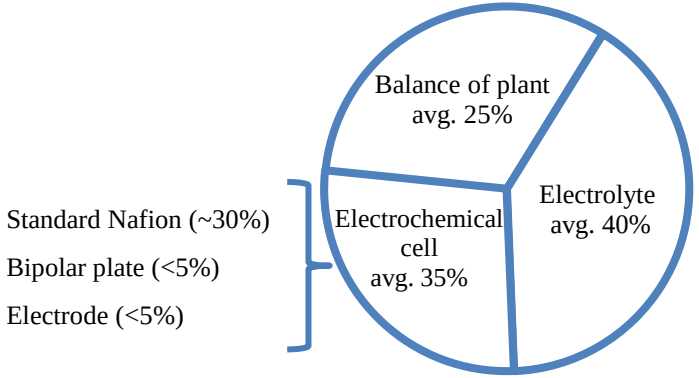


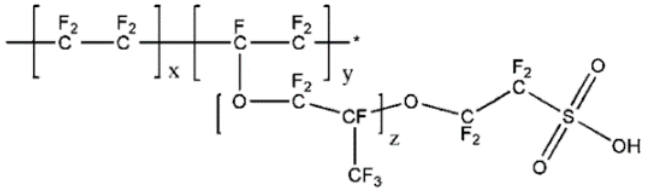




Standard Nafion (~30%)

Bipolar plate (<5%)

Electrode (<5%)



Standard Nafion (500 $/m^2)

Solution

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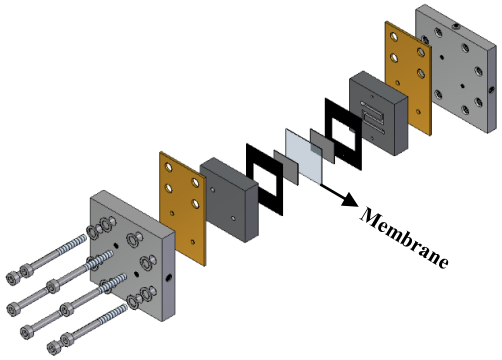
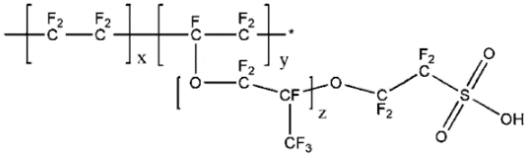
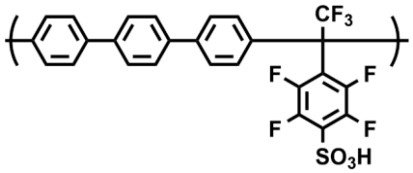
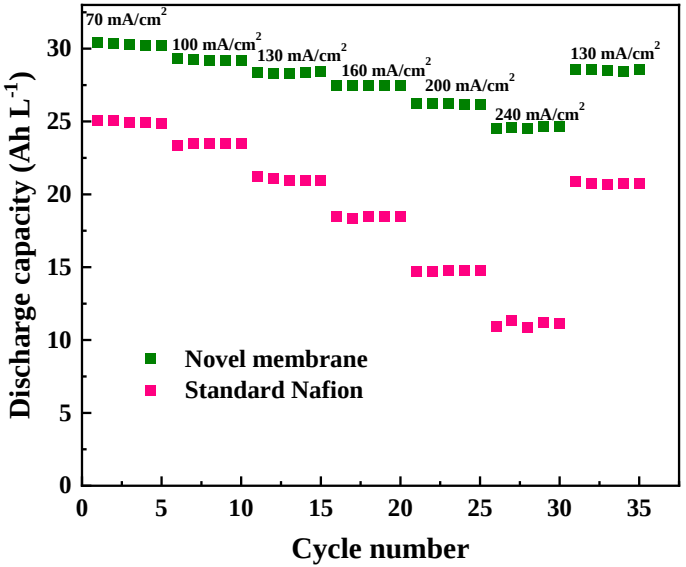




Standard Nafion



Novel membrane



Khataee et al., J POWER SOURCES, 483, 2021.