HYDROSTOR

Long Duration Energy Storage

CanREA Energy Storage Summit

June 5th, 2024

About Hydrostor

Hydrostor is the global leader in Advanced Compressed Air Energy Storage (A-CAES)

- Based on proven CAES platform and demonstrated commercially at small-scale
- Low-cost, large-scale and emission-free long duration energy storage (LDES)
- Uses only water & pressurized air with standard equipment from proven supply chains
- Can be flexibly sited where the grid needs it, using 1/20th the water and land vs. equivalent size pumped hydro storage
- Ability to add duration over time to projects
- 700 MW of large-scale projects under advanced development with 400 MW commercially contracted

Founded: **2010**

HQ: **Toronto, Canada**

Full-time employees: **100+**

Capital raised: **US$326 million**

Patent Families: **9+**

Goldman Sachs Asset Management

CPP Investments

Long Duration Energy Storage

LDES Value Proposition

Fossil Plant Replacement

- Synchronous dispatchable generation, and A-CAES long duration enables reliable capacity replacement with flexible siting at the exact location needed
- Can leverage existing interconnection and infrastructure and defer fossil plant remediation

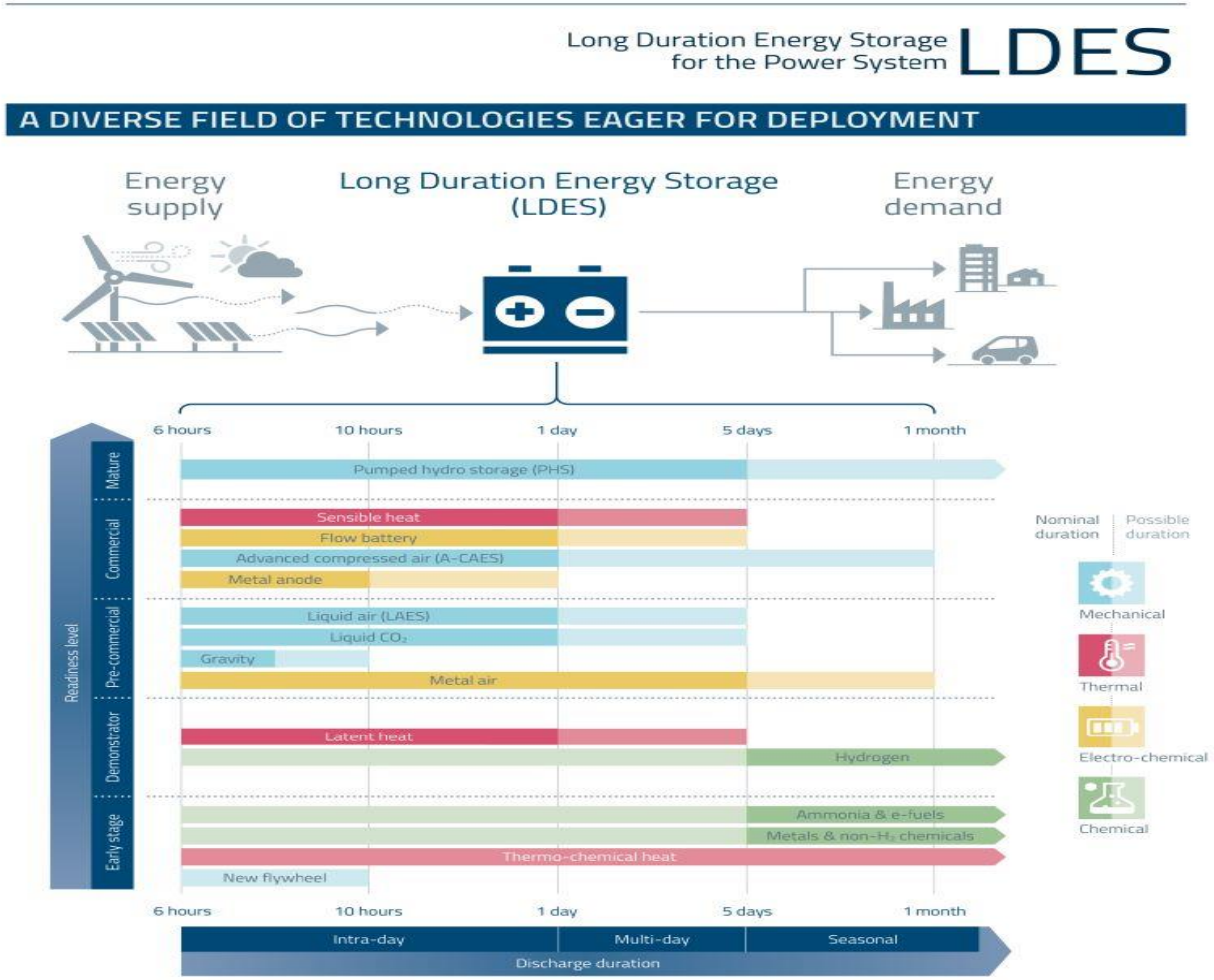
Transmission Deferral

- Non-wires alternative to defer grid network investment
- Long-duration alleviates grid congestion during peak periods, and enables transmission alternatives requiring longer-term outage management
- Locatable reliable power for critical areas and infrastructure

Renewable Integration

- Provide dispatchable or baseloaded renewables
- Optimize large solar/wind project economics through time-shifting to reduce curtailment

LDES – 8+hours; 24 hours; Weekly ….



FCA Future Cleantech Architects

Want to learn more? Visit fcarchitects.org
or contact us: mail@fcarchitects.org

ldescouncil.com

A Diverse Field of Technologies Eager for Deployment

Form of Energy Storage	LDES Technology	Storage Capacity (MW)	Nominal Duration (Hours)	Average Round-Trip Efficiency
Mechanical	Underground pumped hydro	10–100	0–15	50–80%
Mechanical	Liquid air	50–100	10–25	40–70%
Mechanical	Aboveground pumped hydro	200–400	0–15	70–80%
Mechanical	Liquid CO_2	10–500	4–24	70–80%
Mechanical	Compressed air	200–500	6–24	40–70%
Mechanical	Gravity-based	20–1,000	0–15	70–90%
Thermal	Sensible heat	10–500	200	55–90%
Chemical	Power-to-gas-to-power	10–100	500–1,000	40–70%

Contract Pathways

Silver City

Broken Hill
NSW, Australia

Precedent setting project that is providing transmission reliability service with a 200MW, 8-hour (1,600 MWh) long-duration storage project.

Ownership:

- 100% Hydrostor

Offtake contracts:

- TransGrid agreement – Non Wires Alternative
- NEM Offtake - Long Term Service Agreement (similar to Cap and Floor)

Grant:

- ARENA (A$45 million)

Willow Rock

NW of Los Angeles, California, USA

500MW project in Kern County that has been selected/shortlisted to provide half of California's mandate for 1,000MW of 8-hour energy storage.

Ownership:

- 100% Hydrostor

Offtake contracts – Resource Adequacy Framework

- 3CE (200MW)
- Shortlisted (300MW)

Project debt:

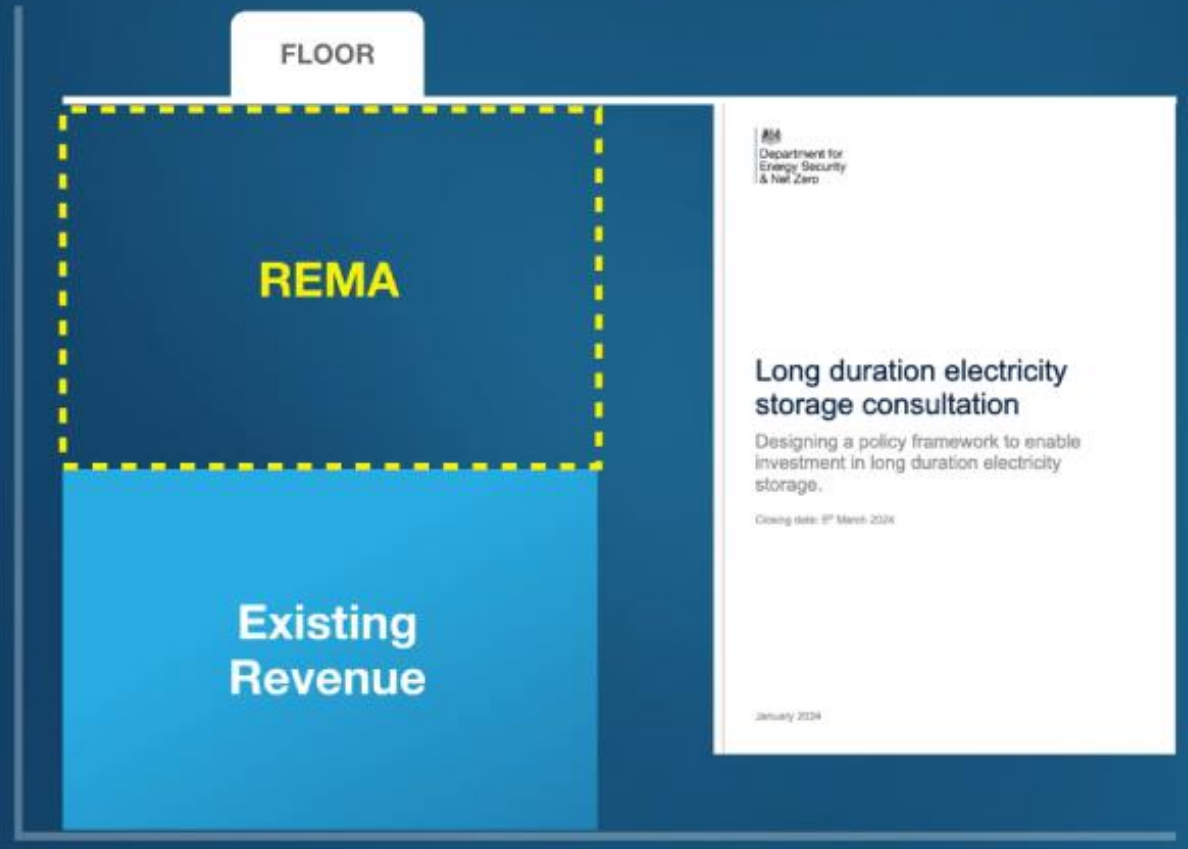
- Potential government loan
- ITC bridge loan

UK Cap and Floor Proposal

Recognition by government that LDES will be pivotal in delivering a smart and flexible energy system. Deploying up to 20 GW of LDES estimated to result in system savings of up to 24bn (3.3%).

Cap and Floor scheme proposal to overcome barriers for deployment:

- Revenue certainty
- High upfront capital costs
- Long lead build times



Hydrostor and A-CAES

The A-CAES process

1

Compression

Off-peak or renewable electricity powers a compressor, which produces compressed air

2

Heat Exchanger: adiabatic heat storage

Heat generated during compression is extracted from the air and stored in the thermal management system for reuse

3

Air Storage

Air is pumped down the shaft into a water filled cavern

4

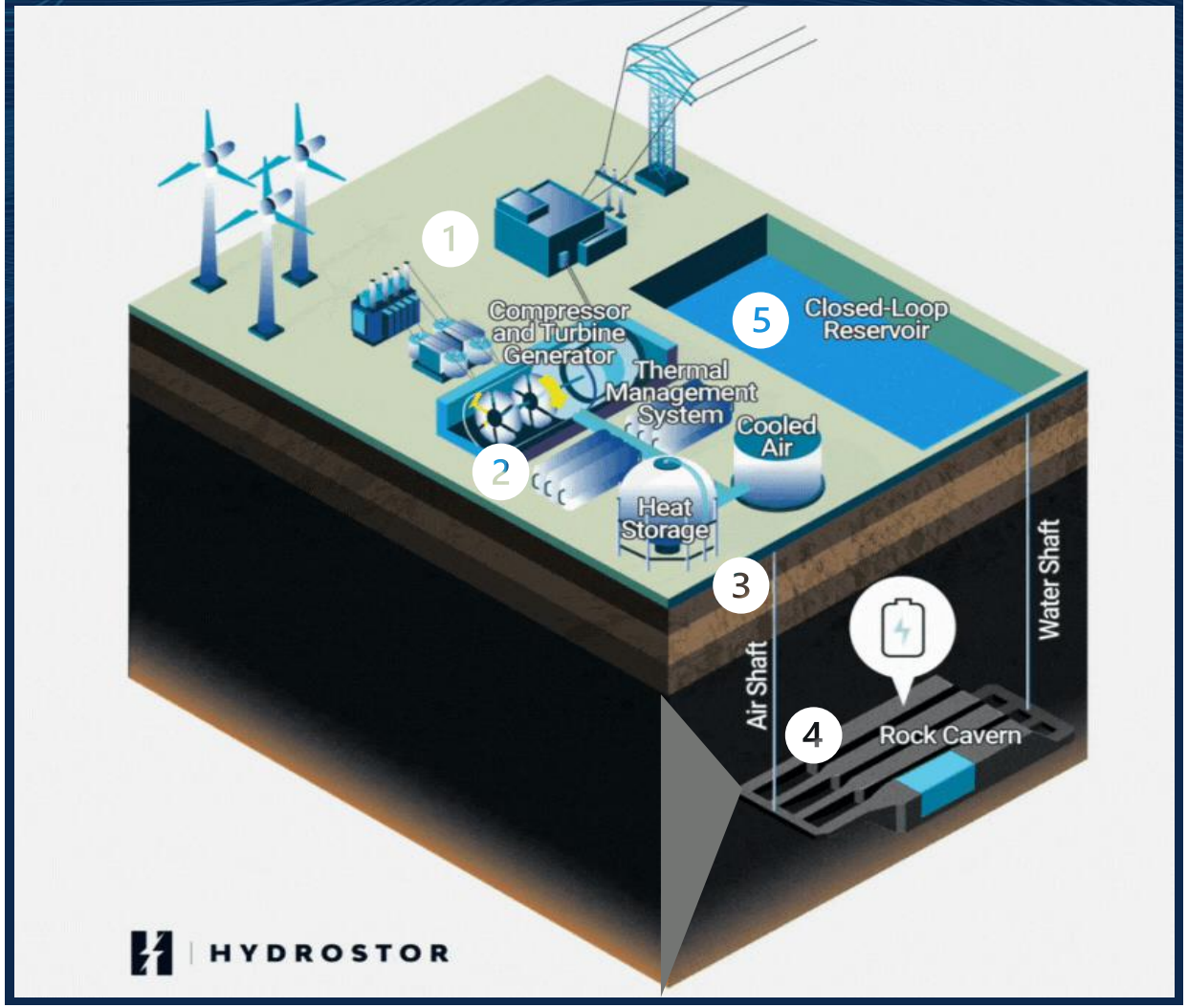
Water Displacement: hydrostatic compensation

Compressed air forces water up the shaft to the surface reservoir

5

Fully Charged State

Once reservoir is filled, the plant is ready to provide electricity on demand by reversing process to drive a turbine



Advanced-CAES improvements to Traditional-CAES

	Traditional-CAES	Advanced-CAES
Proven technology	Yes, >400MW's in service for over 50 years (multiple plants)	Yes, first commercial facility established in Ontario in 2019
Supply chain	Proven and established supply chain	Proven and established supply chain
Emissions	Yes, resulting from burning gas to re-heat air	No, 100% emissions-free
Efficiency	Low round-trip efficiency	Adiabatic process increases system efficiency
Operating cost volatility	Cost volatility dependent on natural gas prices	Stable operating costs based on off-peak electricity rates
Siting flexibility	Limited location options due to salt cavern requirements	Much more flexible due to use of hard rock caverns
Intellectual property	None	9+ patent families

290MW Kraftwerk Huntorf CAES Plant in Germany, operating since 1978

2MW Goderich Plant (Hydrostor's first commercial A-CAES facility)

Long Duration Energy Storage Procurement Recommendations

1. Storage Targets – Resource Adequacy/Legislation
2. Financeable Product/Commercial Pathway
3. Interconnection and Permitting Pathways (Certainty)
4. Review of market arrangements and planning processes to recognize attributes of LDES
5. Incentives that support development for construction (ITC, loan guarantees)

HYDROSTOR

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