

# Sumitomo SHI FW

## Energy Storage Technologies

FINHCIP Seminar – May 10, 2023

SFW is part of Sumitomo Heavy Industries' Energy & Lifeline segment

Fiscal Year 2022  
**€5978M**

Fiscal Year 2022



Logistics & Construction

**€2102M**



Energy & Lifeline

**€1003M**



Mechatronic

**€1270M**



Industrial Machinery

**€1574M**



Others

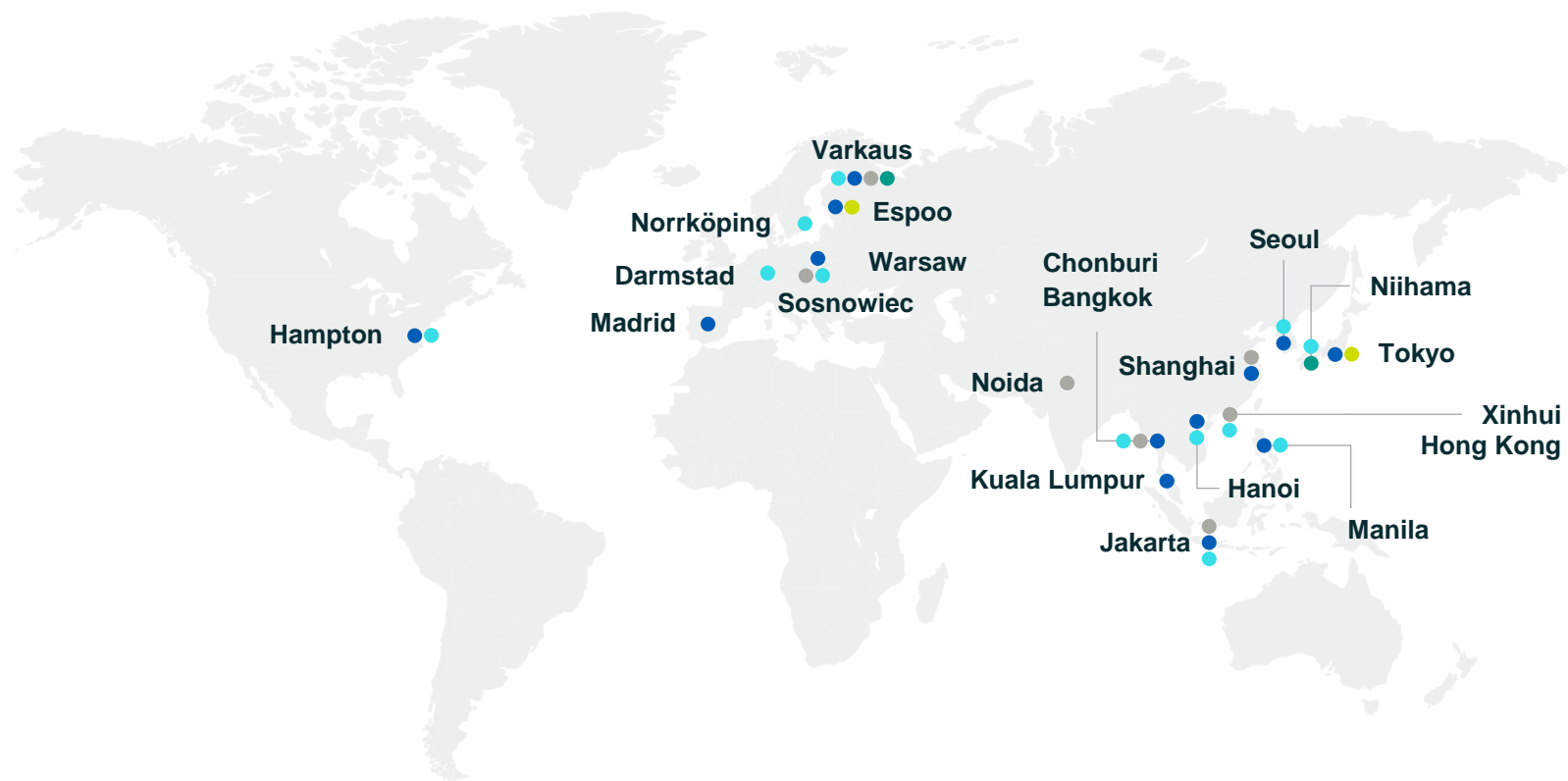
**€29M**

Global reach with

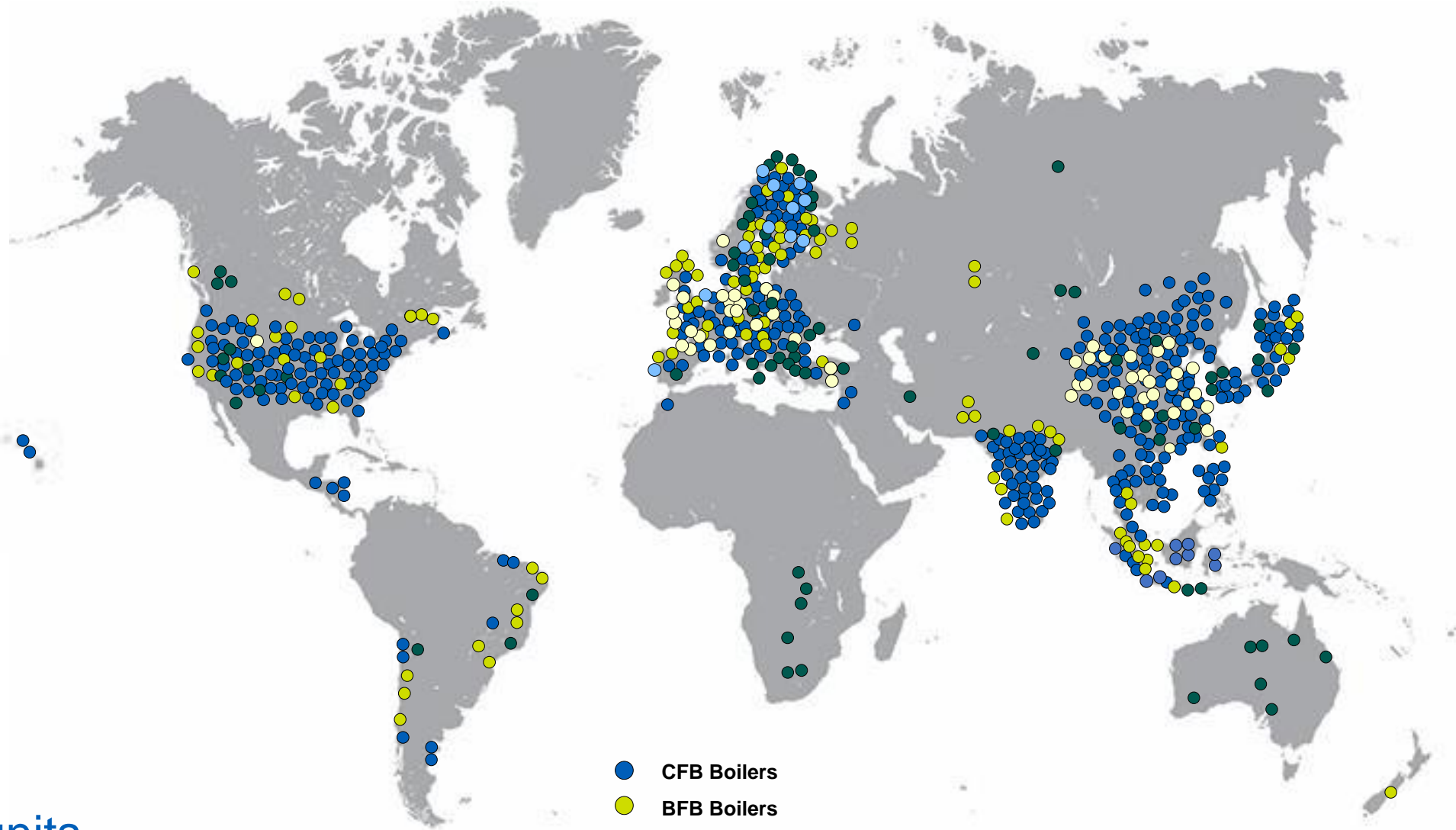
# 1,800

highly skilled people

- Head office
- Engineering centers
- Sales offices
- Factories and after-sales service offices
- Research and development centers



# Our Global References



Over 800 units  
Over 40GWe of power capacity

- CFB Boilers
- BFB Boilers
- Waste Heat Boilers
- CFB Scrubbers
- Biomass Gasifiers

# SFW response to decarbonization and climate change mitigation

Helping our customers to reach decarbonization goals



## Energy generation

Energy from biomass or waste for carbon neutral or carbon negative heat & power applications

## Carbon capture

Carbon neutral traditional energy generation and integration with production of renewable fuels

## Services

Life cycle solutions enabling high plant availability and efficiency

## Waste to value

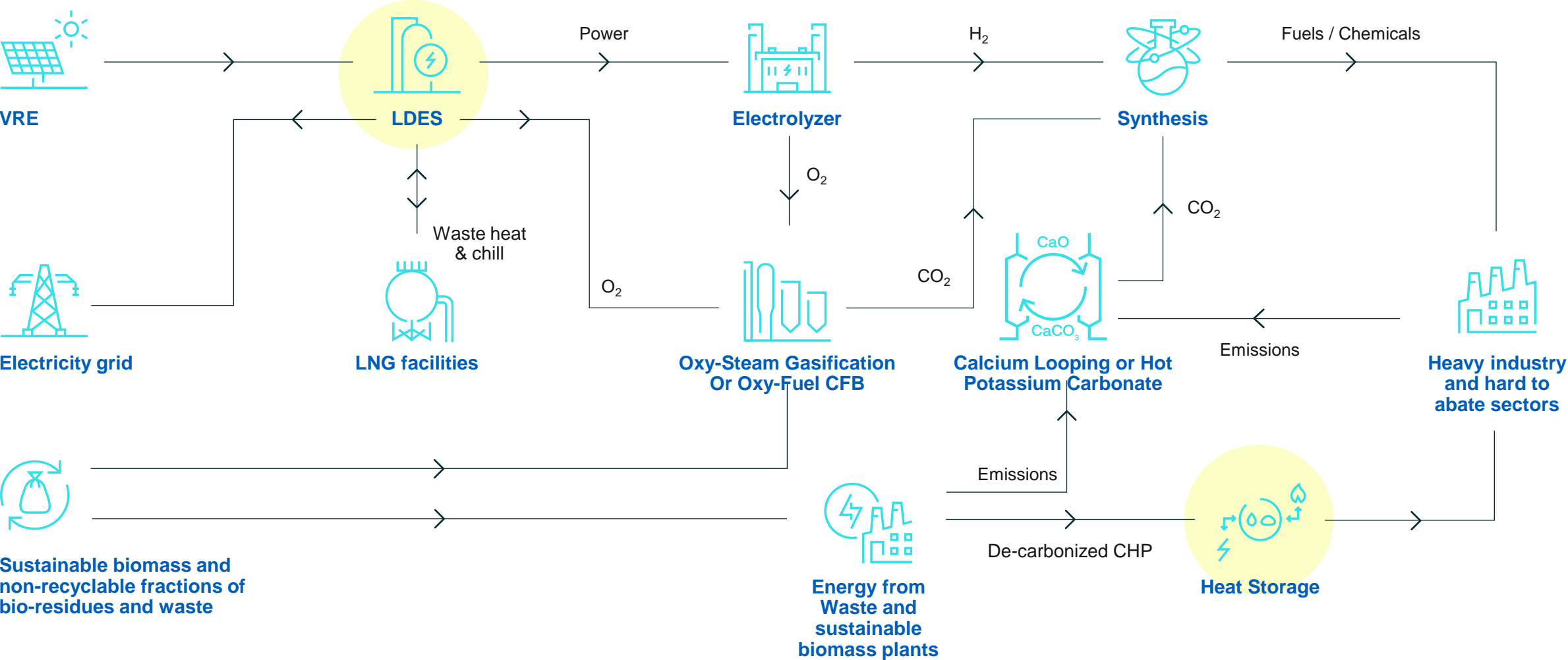
Solid waste into syngas, biofuels & chemicals, or plastics recycling

## Energy storage

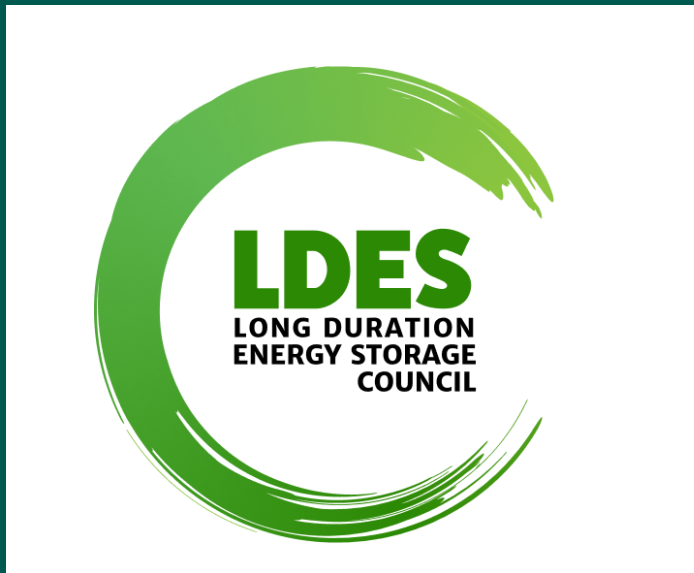
Long Duration - Enabling net zero grid systems to limit the climate change

# Net Zero Energy Ecosystem

Solutions linking variable renewable energy (VRE) with Waste recycling and the Decarbonization of heavy industry



# Long Duration Energy Storage (LDES) Council



# The LDES Council is formed by ~60 companies, from start-ups to large corporates in over 20 countries

## TECHNOLOGY PROVIDERS

## ANCHOR MEMBERS

TECHNOLOGY PROVIDERS					ANCHOR MEMBERS				
					Industry & services customers	Capital providers	Equipment manufacturers	Low-carbon energy system integrators & developers	

## Key principles of the LDES Council

- Executive-led
- Global
- Fact-based
- For societal benefit
- All types of energy storage (Chemical, Thermal, Electrochemical, Mechanical)

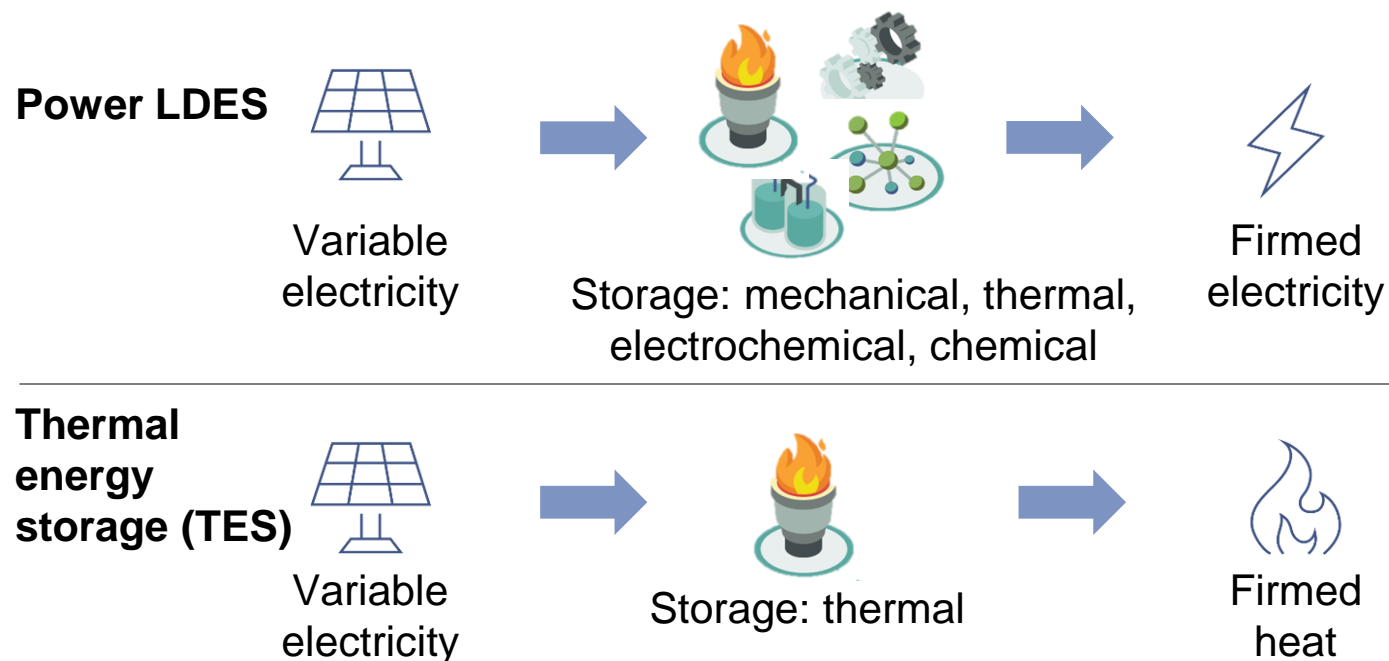


The LDES Council is an independent body with its own governance structure, with the mission to accelerate energy decarbonization through the scale-up of LDES





# There are different types of LDES that offer flexibility across sectors, with TES offering thermal flexibility


## LDES Technologies



Thermal energy storage (TES) provides thermal flexibility, unlocking system benefits:

 **Firming of heat electrification from renewable energy** to serve more inflexible heat loads

 **Provision of heat grade flexibility**, as it enables to upgrade heat sources with stored heat or discharge at various temperatures

 **Ability to serve multiple end uses** within and at the intersection of heat, hydrogen, and power

### 8 TW

total potential LDES capacity deployed by 2040 – including power LDES (1-3 TW) and TES (1-5 TW) – equivalent to 10-35% solar and wind deployment<sup>1</sup>

### \$4 trillion

total capex required to deploy LDES by 2040

### \$540 billion

system savings<sup>2</sup> (in a 8 TW scenario), with USD 10–70 mn savings p.a. per GW of LDES installed

## LDES Impact

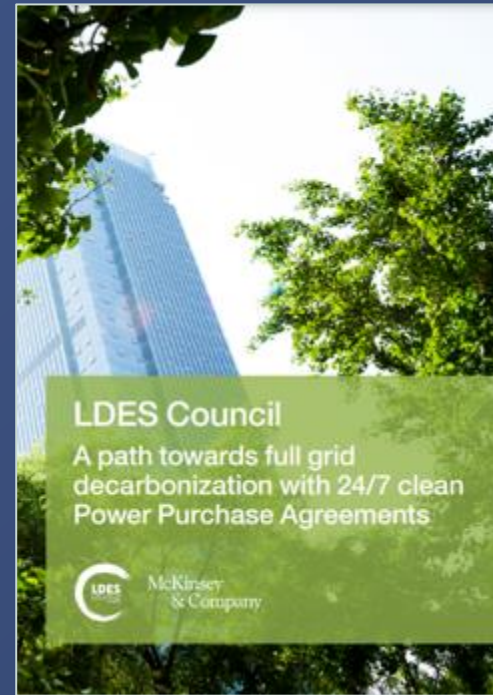
# The LDES Council Reports

## Net-zero power



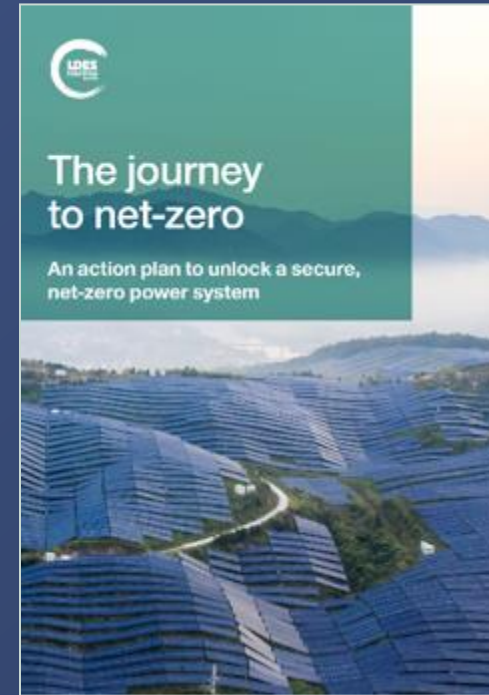
November 2021

## 24/7 clean PPAs



May 2022

## Policy Toolbox



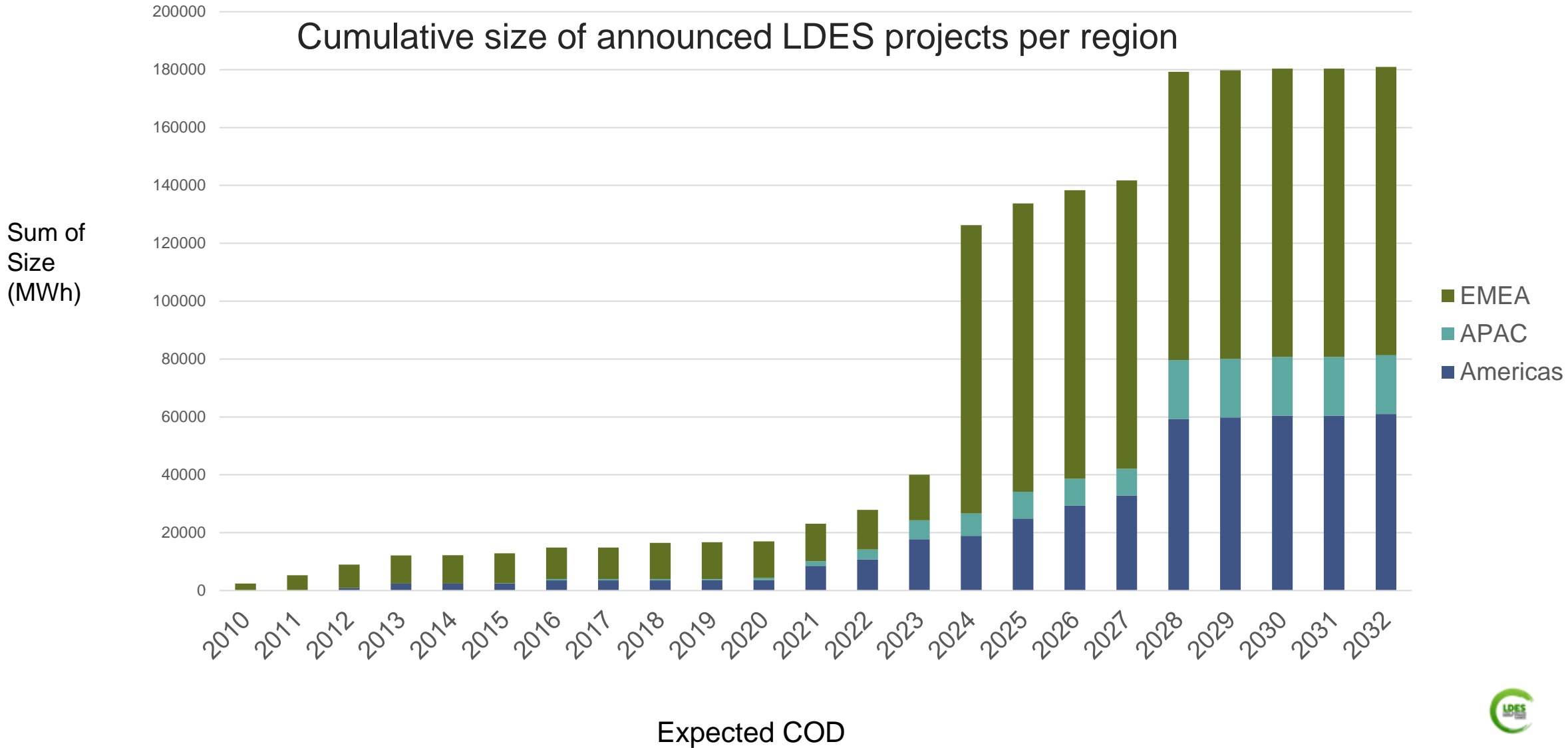
June 2022

## Net-zero heat



November 2022

# LDES Projects Around the World



# Liquid Air Energy Storage

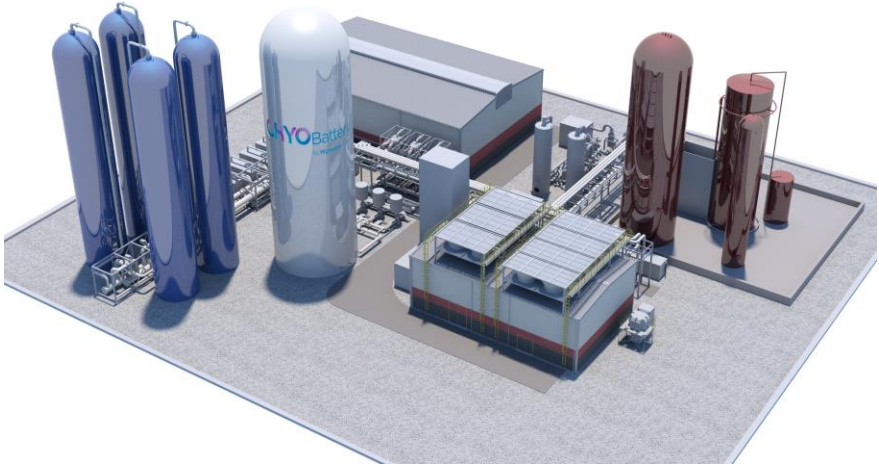
with Highview Power



# Liquid Air Energy Storage (LAES) – Pathway to 100% decarbonized power system

Long duration energy storage systems to provide flexible, sustainable and secure energy infrastructure

- Lifetime >30 years, no capacity degradation
- Clean air as storage medium, no direct emissions
- Decoupled charging and discharging power, synergies with external heat and cold
- Highly scalable storage, location agnostic
- Grid ancillary services: system inertia, reactive power, frequency & voltage support
- Fully recyclable, low supply chain risks

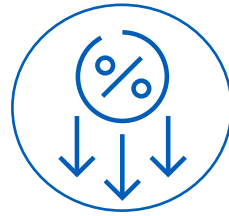
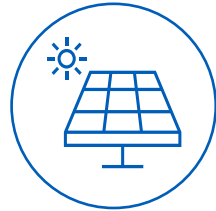


Charge MW	Storage h / MWh	Discharge MW	Footprint
50	8 / 400	50	2 soccer fields
200	8 / 1600	200	4 soccer fields

The larger sized LAES plant can store renewable energy to power 470.000 EU homes for 8 hours

# 100% carbon free electricity – always!

LAES systems provide crucial services for the power grid and support the energy transition



**Energy Shifting**

- Intra-day
- Inter-day
- Weekly storage

**Net zero eco system**

- Integration with external sources of heat or cold such as LNG plants

**Grid ancillary services**

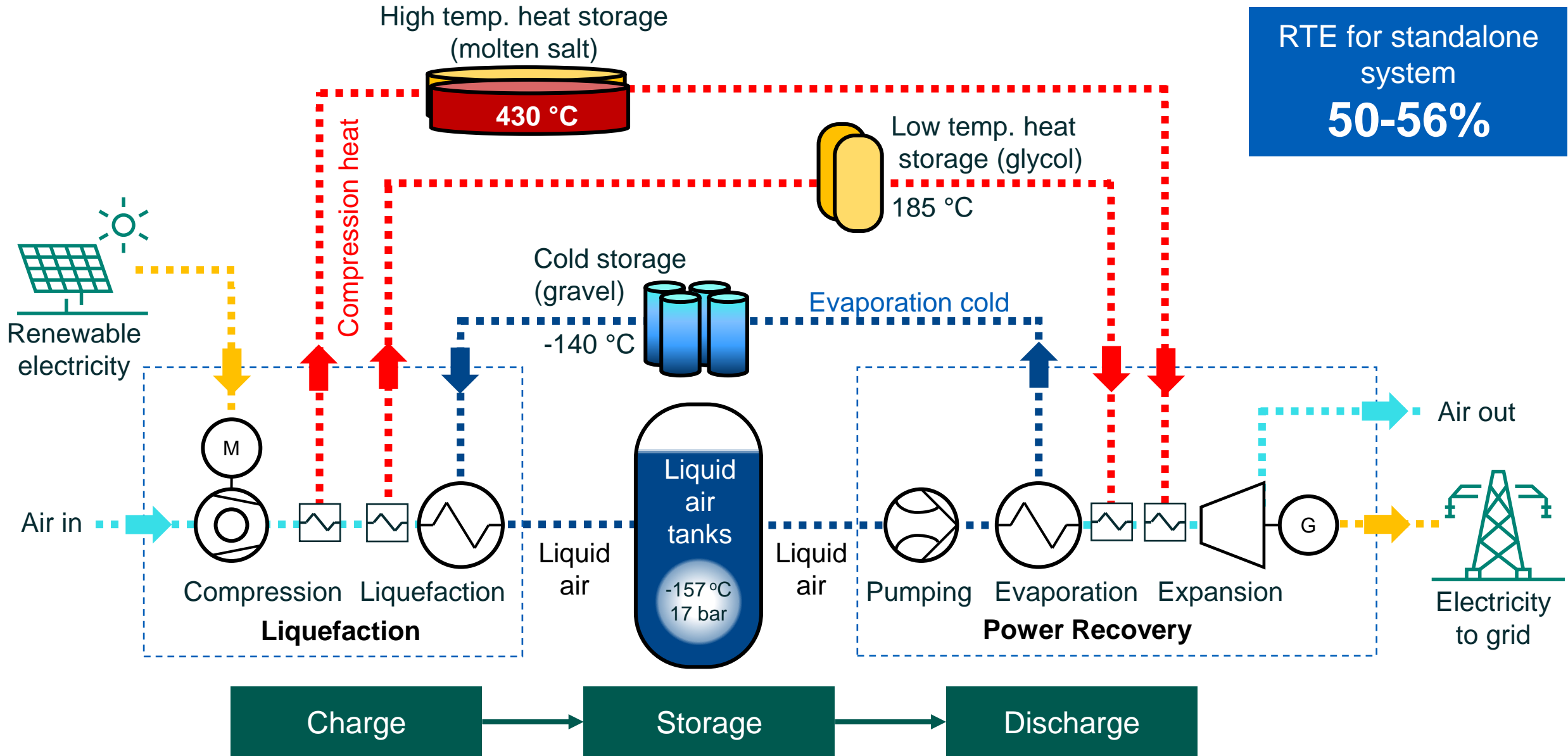
- Rotational inertia
- Frequency support
- Voltage support
- Reactive power
- Spinning reserve

**Islands and off-grid mining**

- Decarbonizing smelting operations
- Reducing fuel consumption
- Enhancing security of energy supply

LAES is a scalable, ultra-flexible, location agnostic long duration energy storage system

# Liquid Air Energy Storage schematic



# Joint implementation of LAES commercial demonstration plant

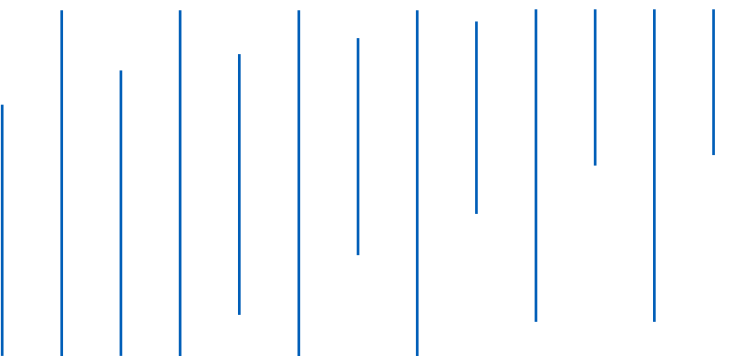
Sumitomo Heavy Industries and Hiroshima Gas Co., Ltd

- Discharge capacity: **5 MW**
- Charge capacity: **4 MW**
- Duration: **4 hours**
- The LAES plant will utilize waste cold from the Hatsukaichi LNG terminal in Hiroshima Prefecture, Japan

- Partnership established with Hiroshima Gas Co., Ltd.
- Highview Power has already demonstrated the technology through their pilot projects in the UK



<https://www.shi.co.jp/english/info/2023/6kgpsq0000003cla.html>





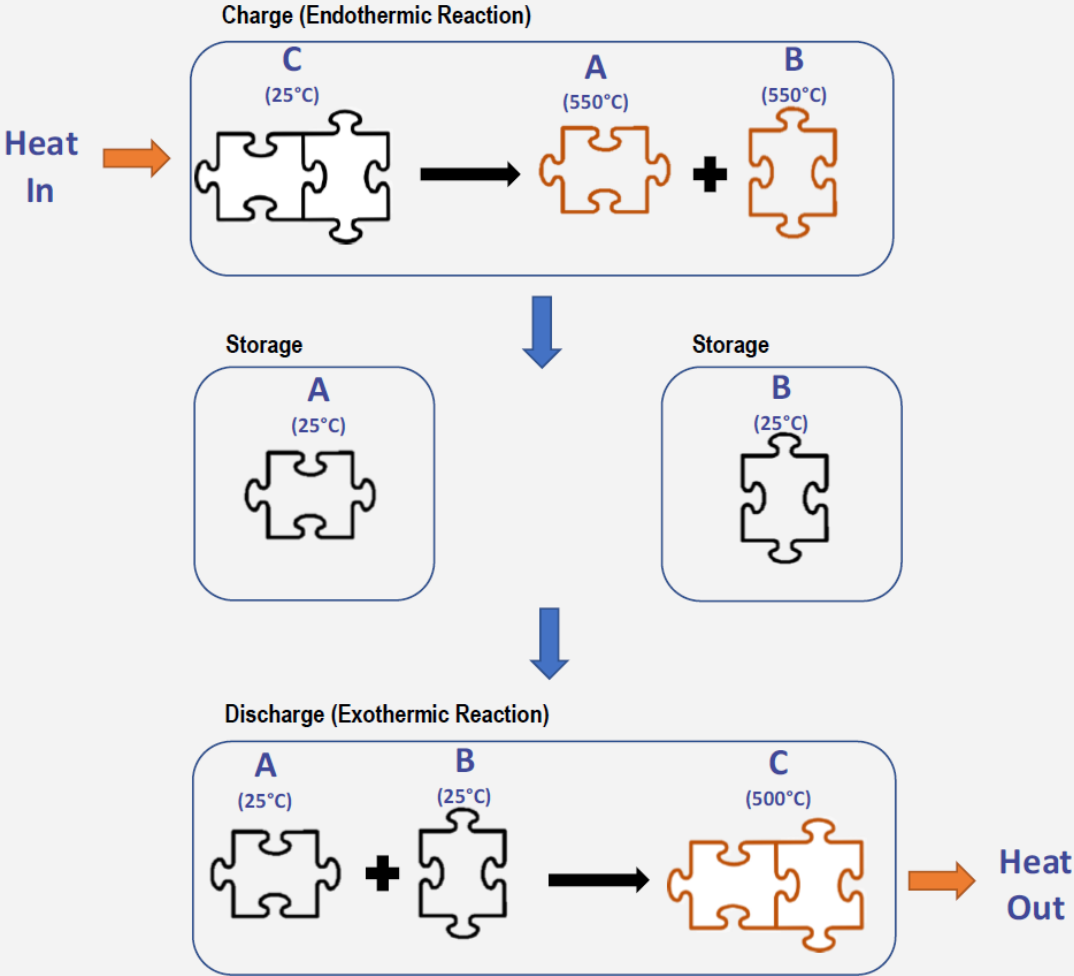
# Calcium Cycling

with SaltX

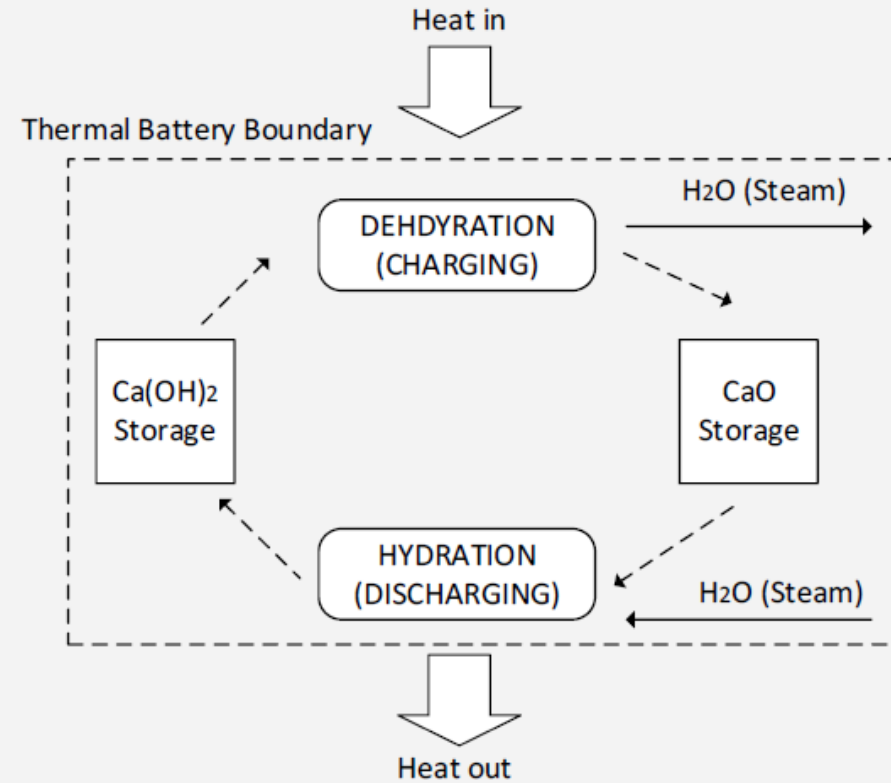
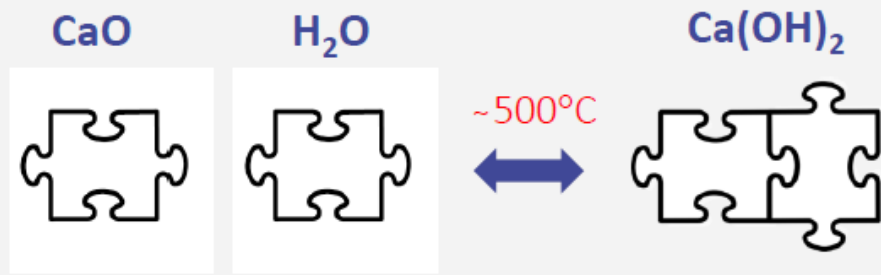


# EnerStore in a Nutshell

## EnerStore District Energy (Flexible storage)



# Thermochemical Energy Storage (TCES)



# Technology Platform for Upscaling, Stockholm, Sweden

## Use Case:

Power to Steam (+District Heating)

## Commissioned

April 2021

## Installation Time

12 months

## 100 kW Discharger

(scalable to 5 MW per unit)

## 200 kW Charger

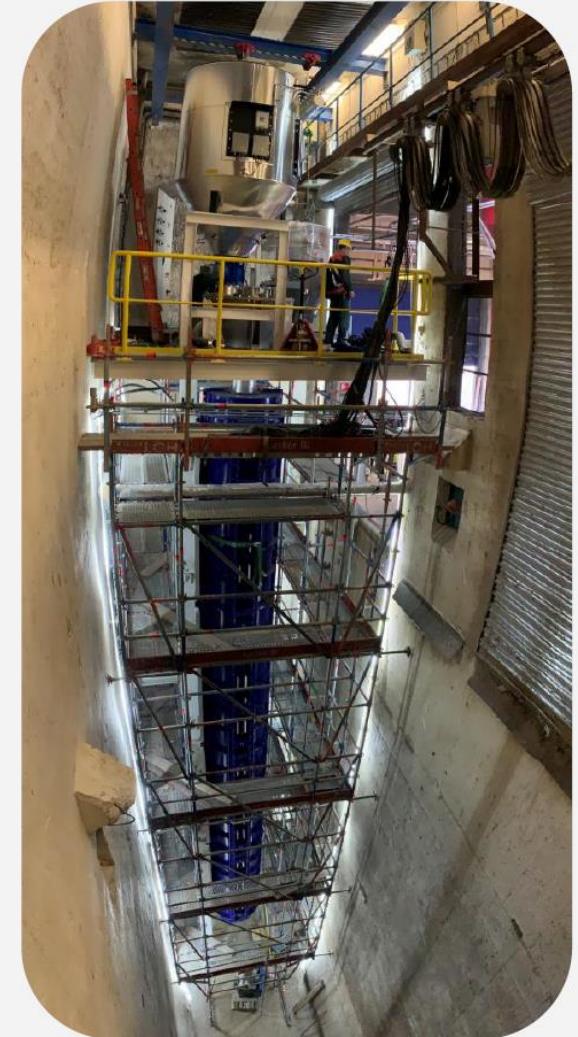
(scalable to 8 MW per unit)

## 8 MWh Storage Capacity

(16 tonnes NCS)

## Status

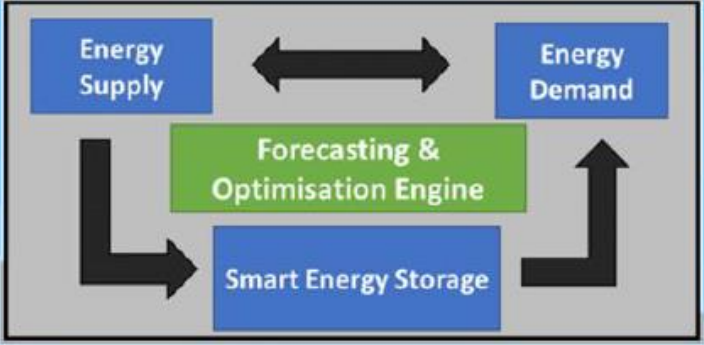
Verification & Optimisation





# The City Solution

CaO Rechargeable fuel



Offshore wind



Fuel-based  
(Backup capacity and peaker plants)



Thermal energy storage (TES)



Thermochemical energy storage (TCES)



Thermochemical energy storage (TCES)



Solar electric



Solar thermal



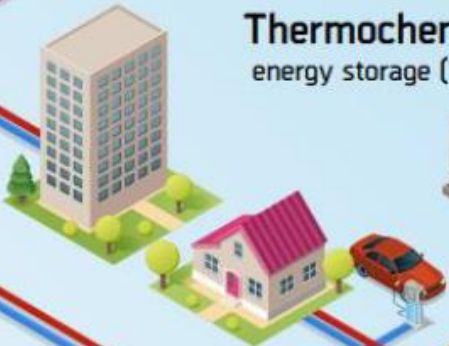
Electric heatpump



Onshore wind



Electric boiler



Heat  
Electricity

