

Sumitomo SHI FW (SFW)

Decarbonization - new products of SHIFW in real cases

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Ostravice, September 2025

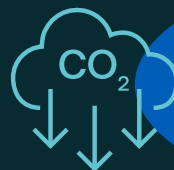
SFW response to decarbonization and climate change mitigation

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

Oxyfuel carbon neutral and negative CFB plants, Calcium looping for hard to abate industries and Hot potassium carbonate for biomass and WtE



Services

Life cycle solutions enabling high plant availability and efficiency



Waste to value

Gasification of solid waste into syngas, biofuels & chemicals, or plastics recycling



Energy storage

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

Our presence in Czech Republic (delivered under Foster Wheeler brand)

Start Up Year	 Account Name	Boiler technology	Electric Output MWe (Gross)	Main steam pressure (bar)	steam temperature (°C)	Primary Fuel Type	Secondary Fuel Type
2013	Teplarna Kladno s.r.o. K5	CFB	135	132,3	541	Coal - Brown	Biomass, Sludges
1998	Veolia Energie ČR, a.s.- Olomouc K5	CFB	40	134,03	535	Coal - Brown	
1996	CEZ a.s. Porici Power Plant K7	CFB	60	100	520	Coal - Brown	Biomass
1998	CEZ a.s. Porici Power Plant K8	CFB	60	100	520	Coal - Brown	
1998	Mondi Steti K11	CFB	50	94	535	Coal - Brown	Biomass - Bark
1997	CEZ, a.s. Elektrárna Hodonin K1	CFB	35	96	510	Coal - Brown	Biomass
1997	CEZ, a.s. Elektrárna Hodonin K2	CFB	35	96	510	Coal - Brown	

Agenda

Carbon Capture – Capsol Technologies

Hot Potassium Carbonate (HPC) – pilot plant test campaign and results

Long Term Energy Storage

LAES – Liquid Air Energy Storage – plant in Hiroshima, Japan

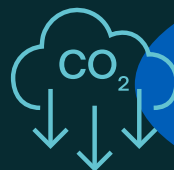
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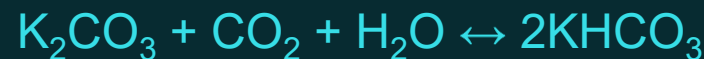
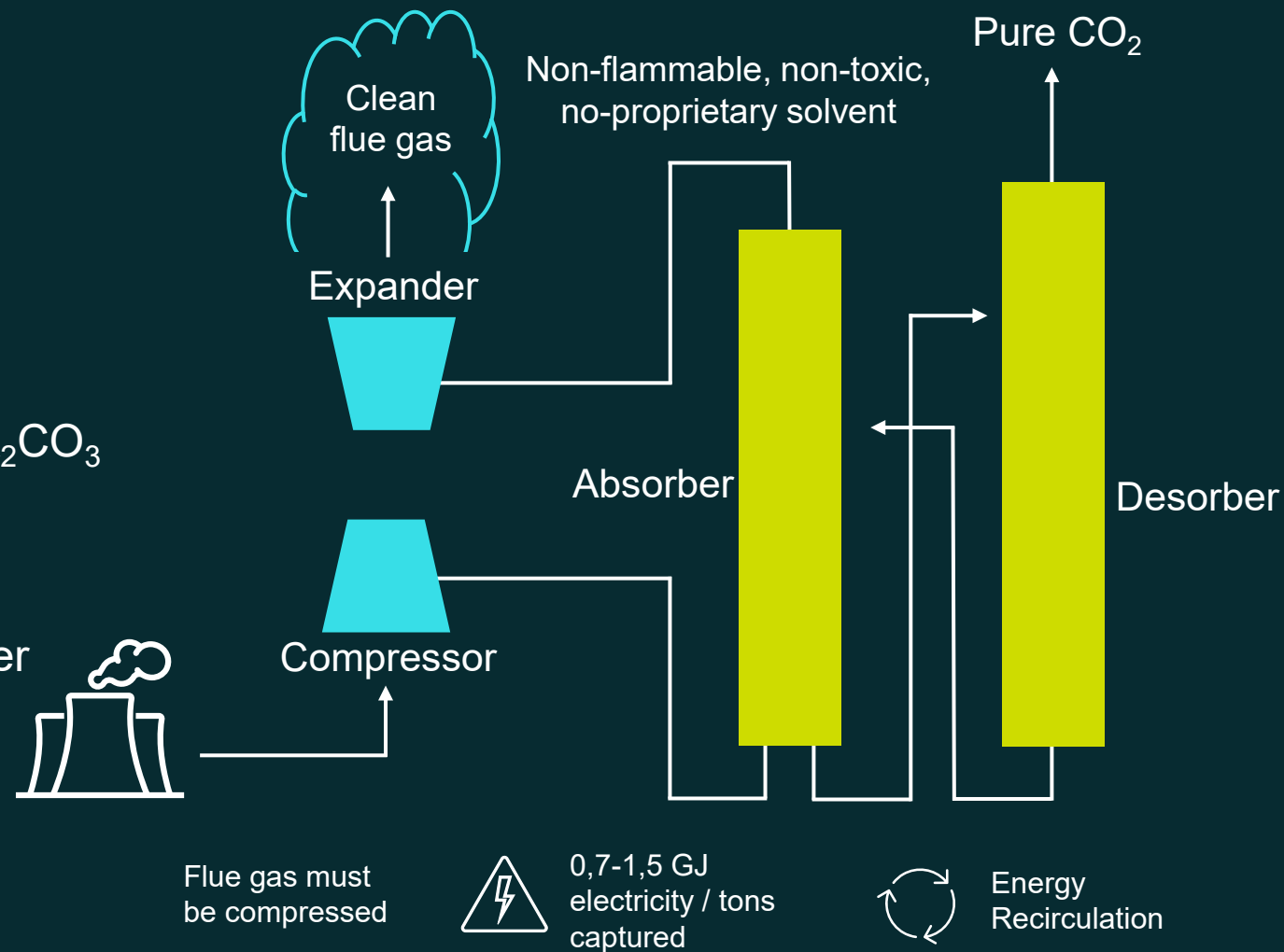
Energy storage

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

How does it work?

Technology based on efficient heat recovery for low energy penalty and increased district heat production:

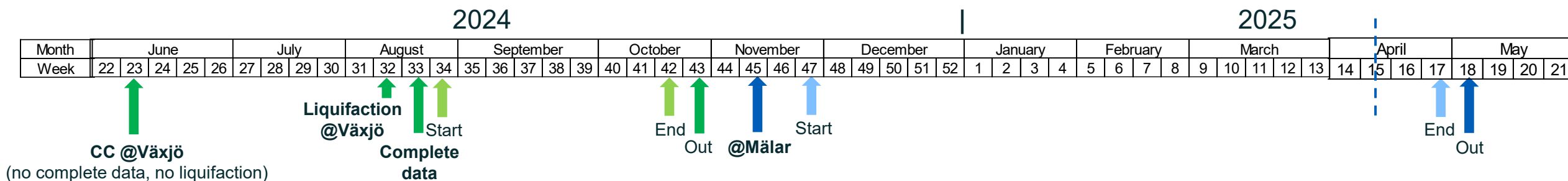
- Uses aqueous **safe solvent** of 25 wt.% K_2CO_3
 - Proven as solvent in 100s carbon capture plants
- Uses pressure swing and waste heat for regeneration
- Recovery compression energy in expander
- **Capture rate over 90%**
- **Produces high purity $\text{CO}_2 > 99\%$**
- Can be powered by **electricity only**, steam only, or combination
- **Electricity consumption**
0,7 - 1,5 GJ / ton of CO_2
- Low-temperature heat can be used in **district heating**



CapsolGo 2 testing campaigns in Sweden – schedule and plan as of 10.Apr.2025

8

Schedule



- Pressure 4 - 6 barg
- L/G: 6 - 10
 - Solvent: 900-1300 kg/h
 - Flue gas: 100-120 Nm³/h
- All heat recovery config.
 - Reboiler only
 - Reboiler + lean flash
 - Reboiler + condensate flash
 - All (2 tests only)
- 25% K₂CO₃
 - No additives
 - 1.4 & 2.6% H₃BO₃
 - No V₂O₅
- Essentially no CO₂ liquifaction

- Pressure 4 - 8 barg
- L/G: 6 - 10
 - Solvent: 900-1300 kg/h
 - Flue gas: 100-180 Nm³/h
- All heat recovery config.
 - Reboiler only
 - Reboiler + lean flash
 - Reboiler + condensate flash
 - All
- 25% K₂CO₃
 - No additives
- Liquefaction only daytime

- Pressure, L/G, and heat recovery configurations subset from previous period (including “champion run” for max capture rate)
- 25% K₂CO₃
 - 2.6 & 5.0% H₃BO₃
 - 0 & 1.4% V₂O₅
- Liquefaction long operation (Additional tests agreed with E&E, Capsol and Mälar)

CapsolGo 2 testing campaigns – biomass and WtE

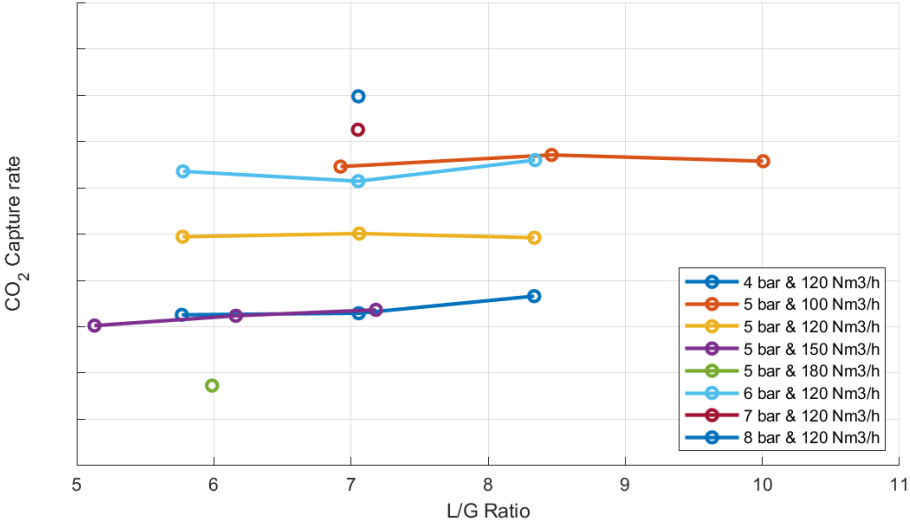
Status at MälarEnergi

On schedule:

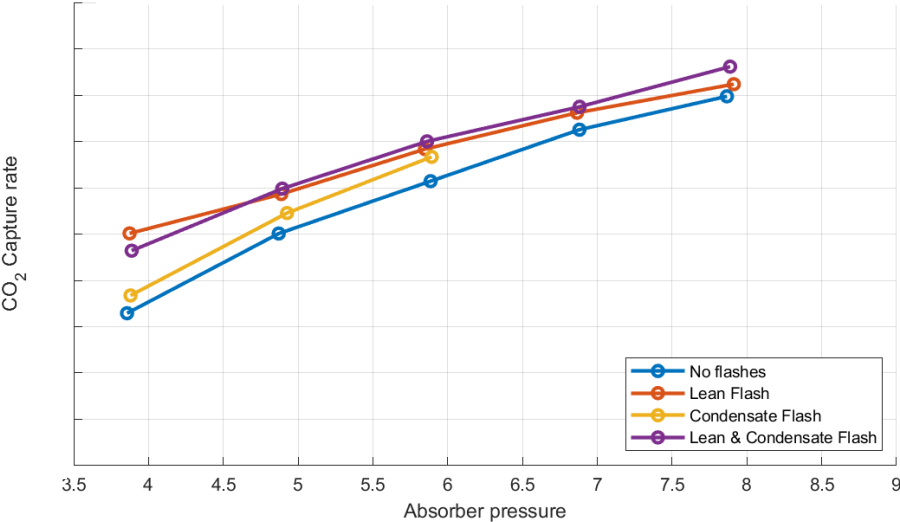
- Tests at Mälar started on November 18th
- 78 tests conducted so far of which 64 accepted and with analyses ready and checked.
 - Liquefaction unit has been in continuous operation since 6.Mar.2025
- So far, 20 tests exceeded 90% CO₂ capture rate, and 8 tests exceeded 95%
 - Highest capture rate: 96,5% at high pressure (8 barg), L/G ratio (10), low flue gas flow (100 Nm³/h) and solvent K₂CO₃ 25% + H₃BO₃ 5% (boric acid).
 - Effect of pressure and flue gas flowrate quantified; optimum L/G range confirmed
 - Effect of heat recovery solutions (flashes) quantified
 - Fate of contaminants (oxygen, acid gases, heavy metals,...) measured
 - Effect of H₃BO₃ additive quantified (effect of V₂O₅ under testing)

HPC pilot CapsolGo3: selected results

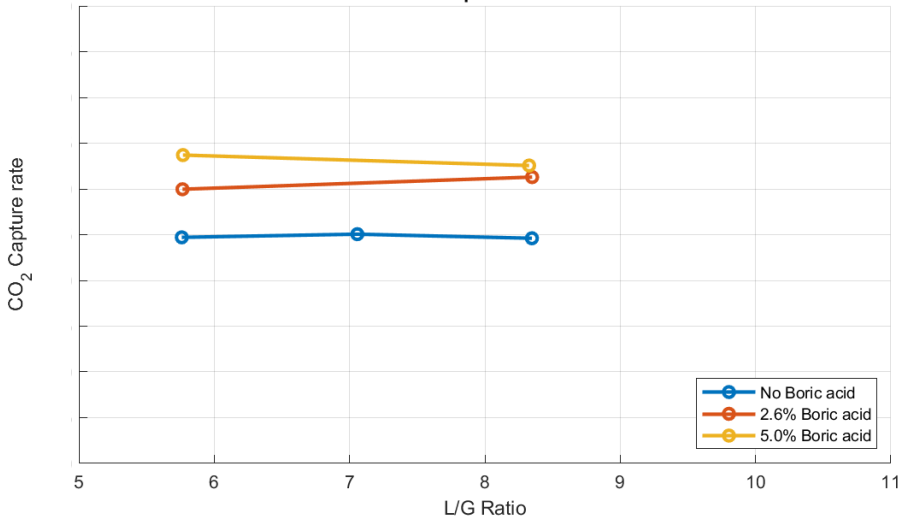
Effect of FG flowrate



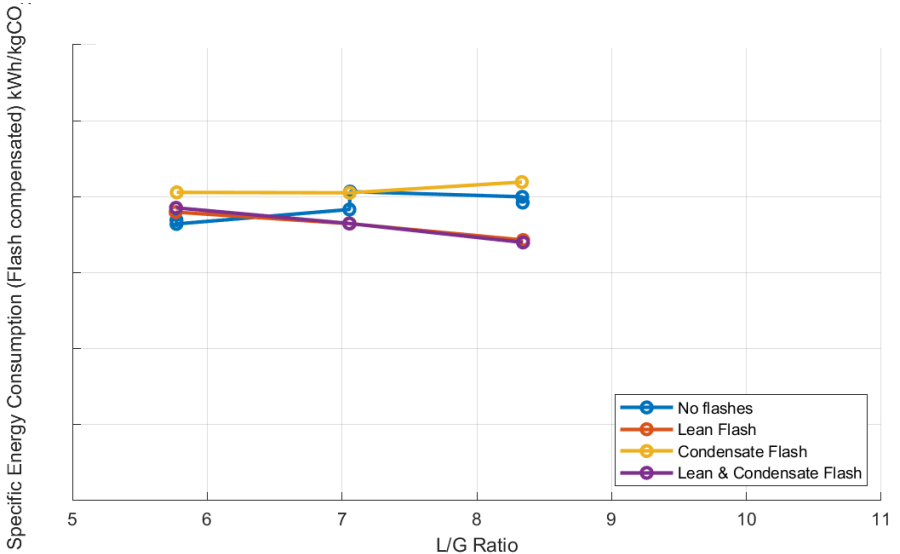
Effect of pressure



Effect of Boric Acid (H₃BO₃)

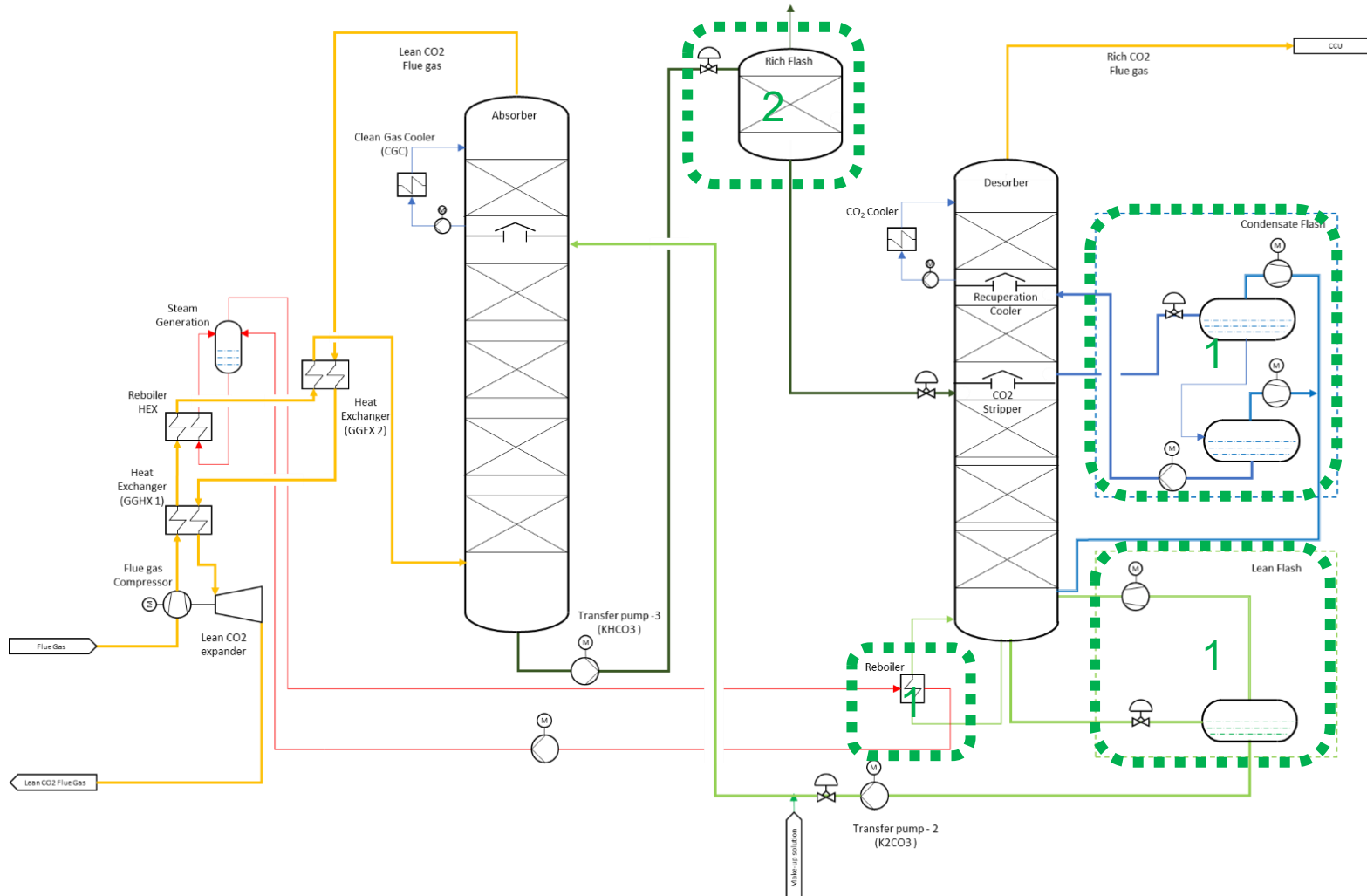


Effect of heat recoveries



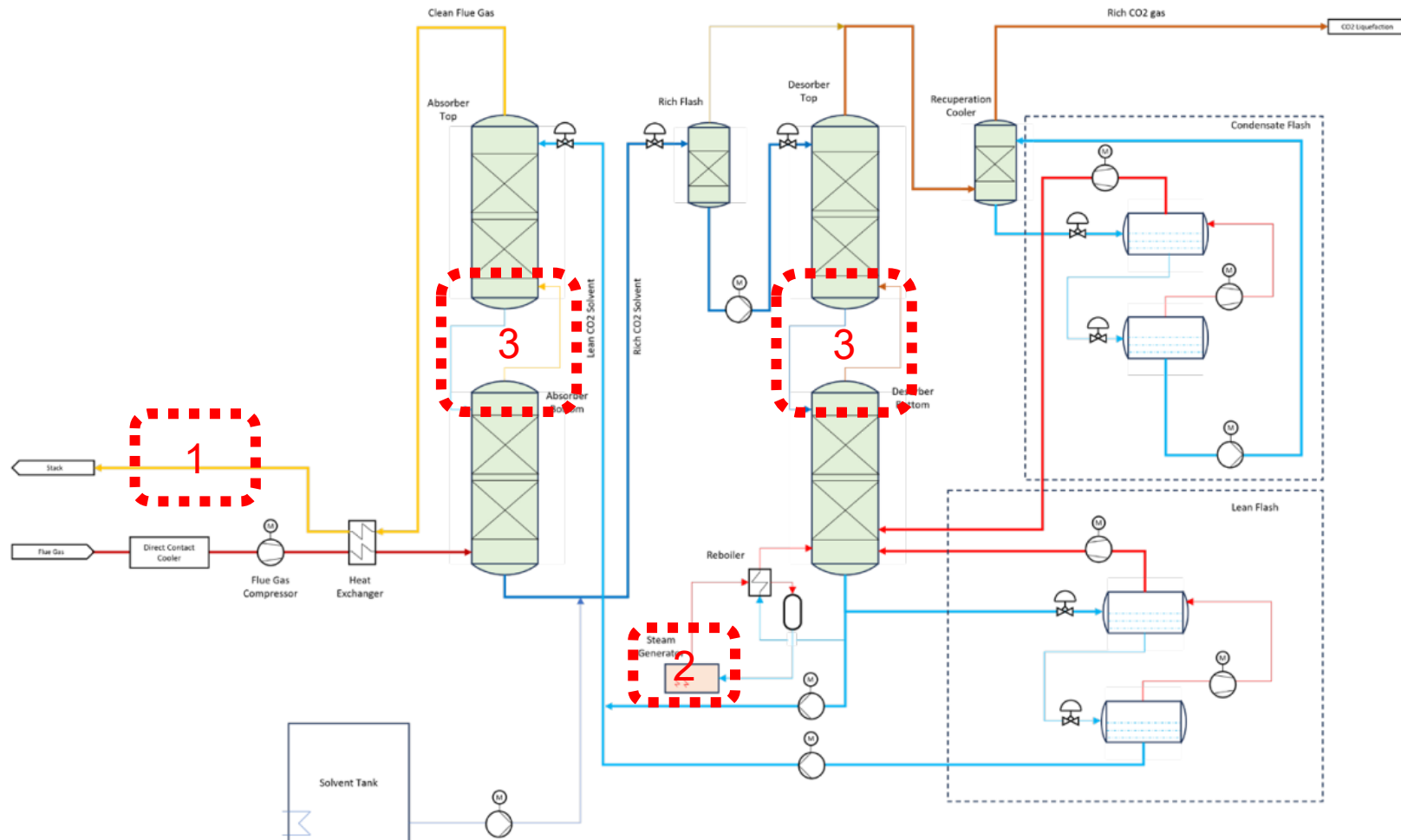
CapsolGo3 pilot – inclusions critically focusing on energy efficiency

1. Includes all critical heat-recovery systems: reboiler, condensate flash, lean flash
2. Includes energy-efficient means to increase CO₂ purity: rich flash



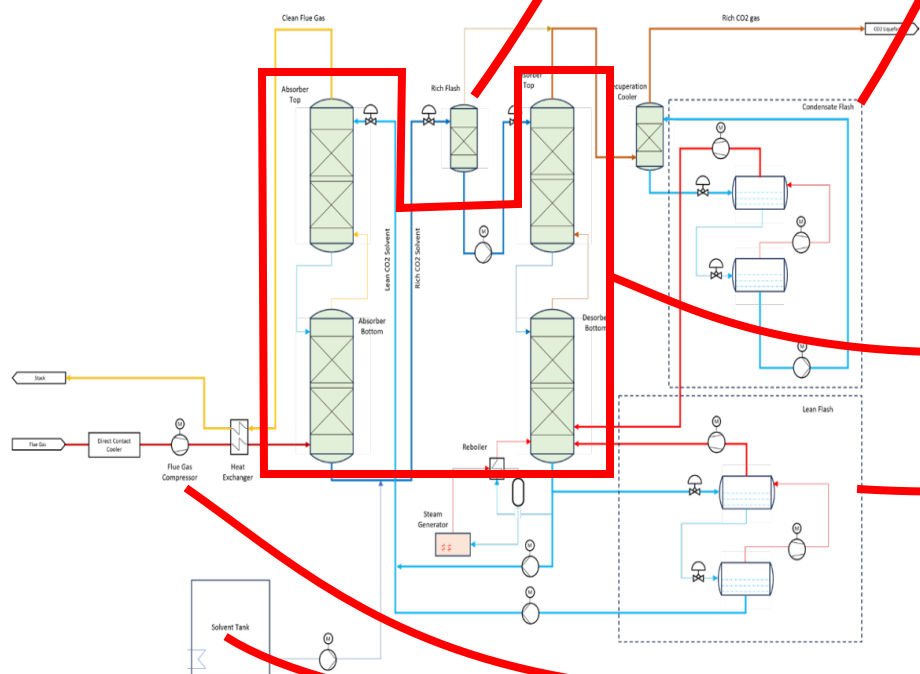
CapsolGo3 pilot – main differences from commercial unit

1. No expander
2. Heat recovery from compressor to reboiler simulated with electric input
3. All key components (including absorber & desorber) split into two columns



HPC pilot CapsolGo3 at Mälar

What you are going to see



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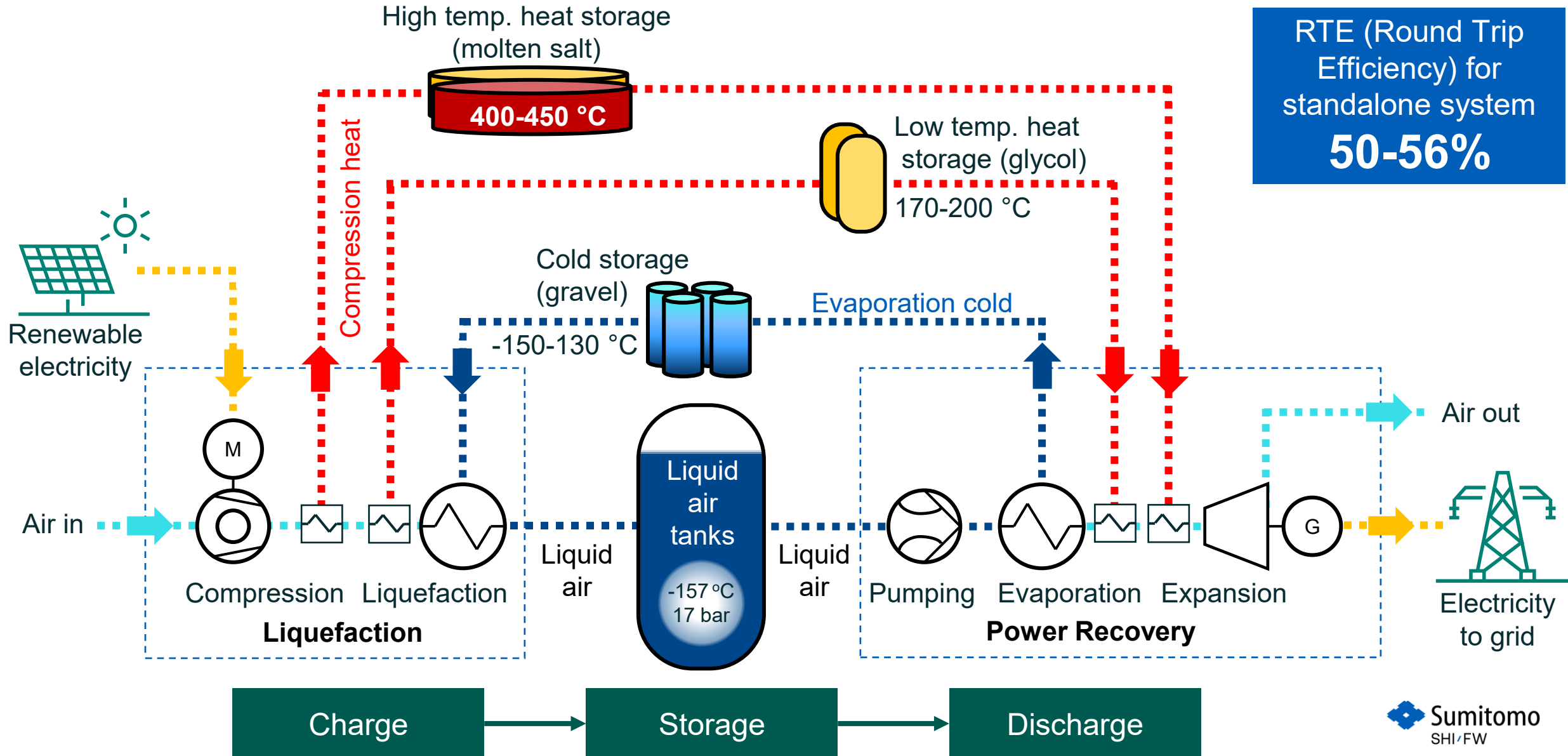
Agenda

LAES (Liquid Air Energy Storage) – plant components, theory

LAES – pilot scale plant Hiroshima, Japonia



Liquid Air Energy Storage schematic



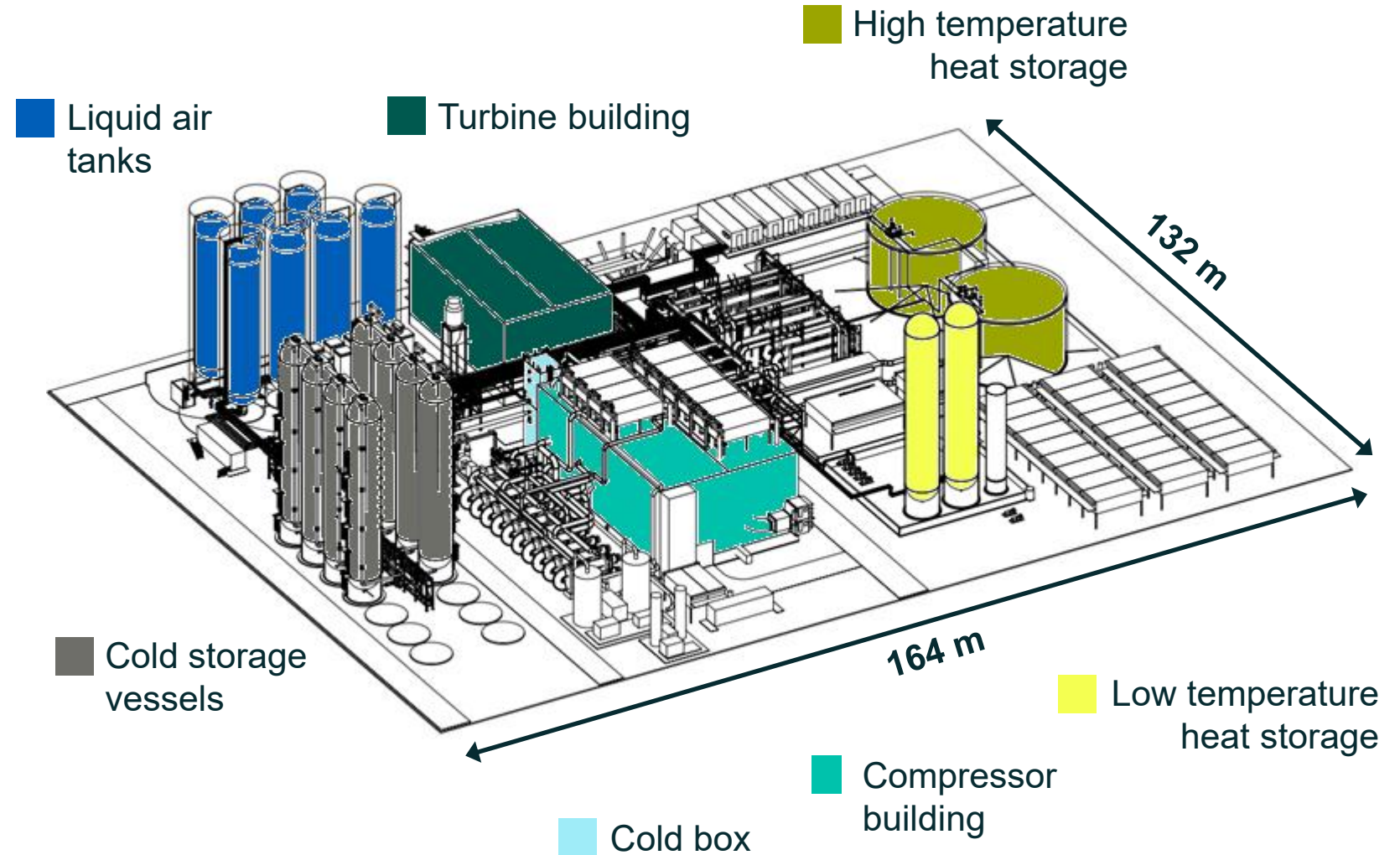
Reference LAES plant layout

50 MW LAES plant require approximately 20 000 m²

LAES discharge capacity **50 MW**

LAES charge capacity **100 MW**

Duration **8 hours**



20 MWh LAES – projekt demonstracyjny

Projekt wspólny Sumitomo Heavy Industries and Hiroshima Gas Co., Ltd

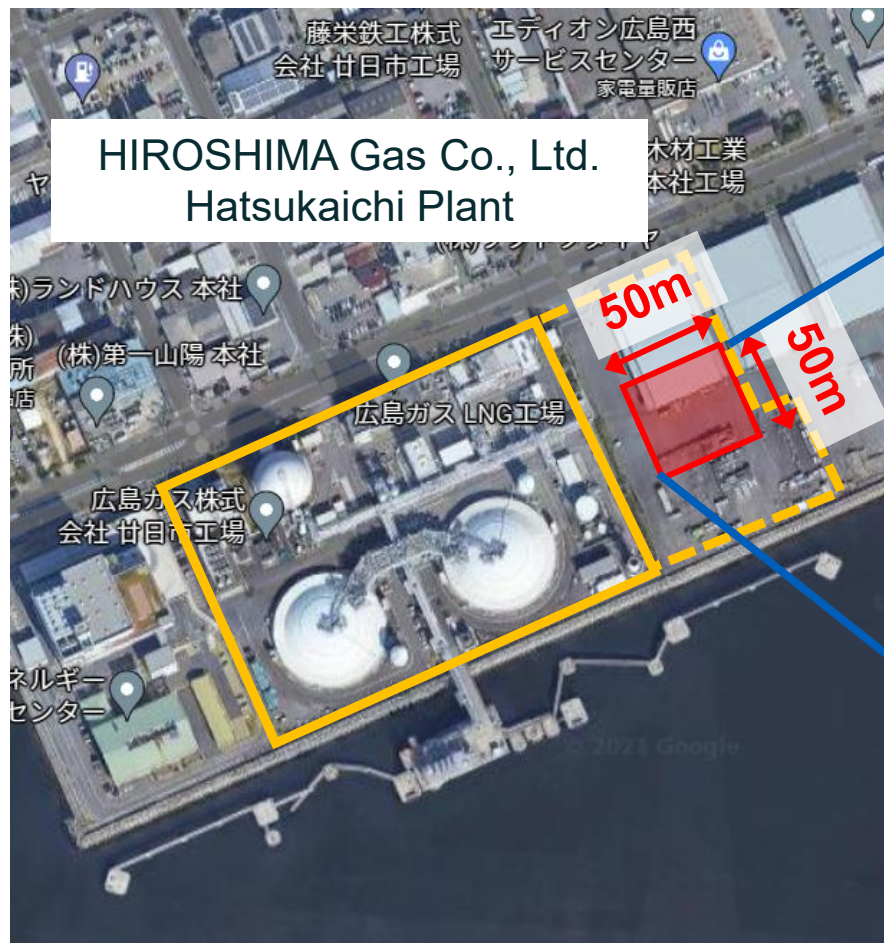


Image of construction site

20 MWh demonstration scale commercial plant in Hiroshima

Joint development by Sumitomo Heavy Industries and Hiroshima Gas Co., Ltd



Hiroshima Gas Co., Ltd.
Hatsukaichi Plant



LAES Hiroshima Hatsukaichi – Oct. 2024

LAES Hiroshima Hatsukaichi

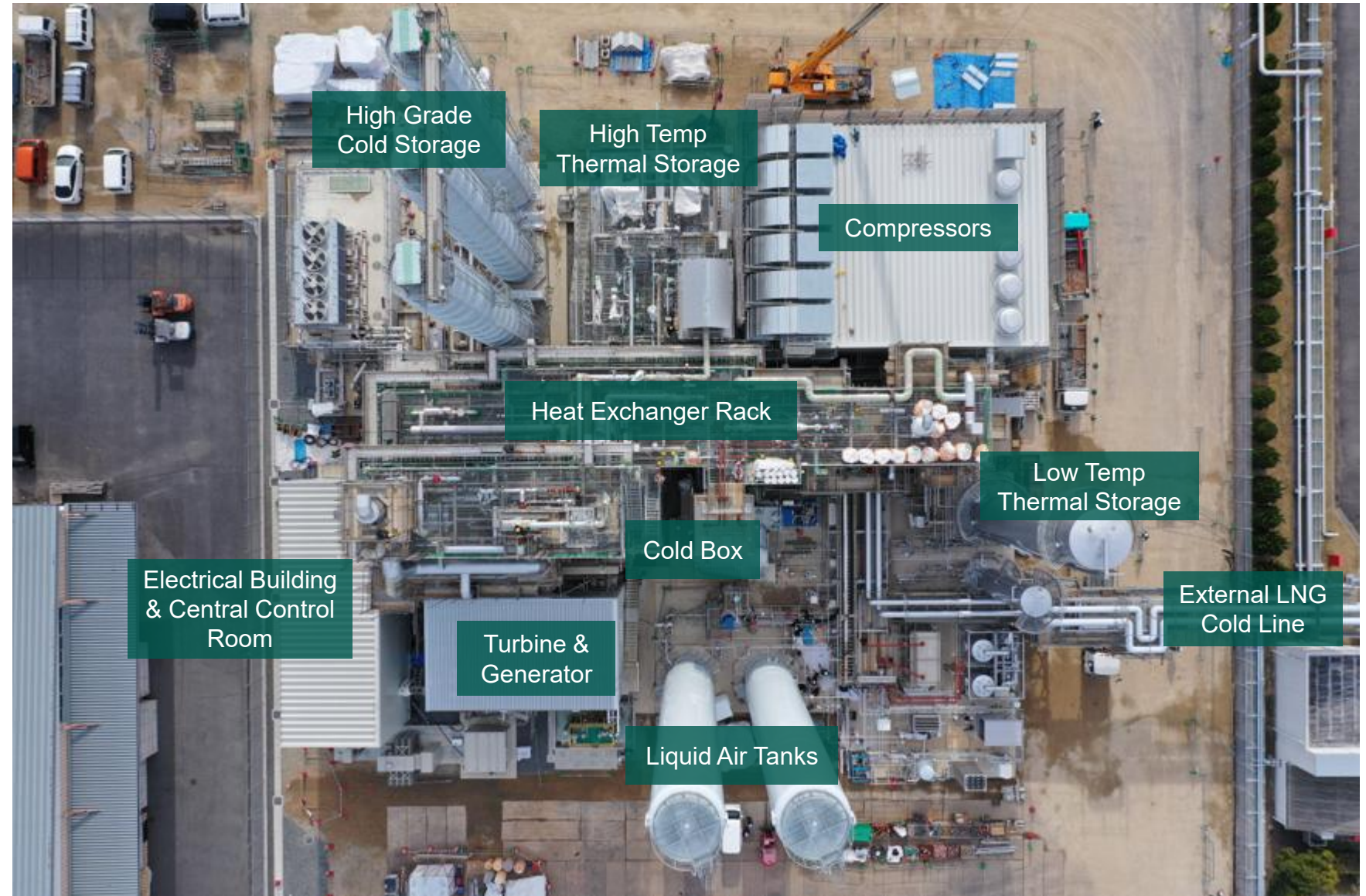
Power	5 MW
Storage	20 MWh (4h)
Area	0.62 acres 2 500 m ²

Hiroshima plant configuration and site overview

Discharge 5 MW

Duration 4 hours

Site footprint 50m x 60m



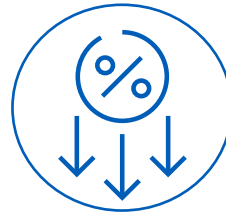
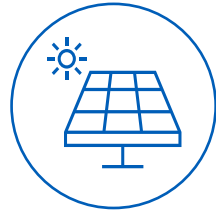
Status September 2025

- Mechanical installation completed.
- The commissioning is happening right now and is on schedule.
- COD is on schedule for November.
- The plant is welcoming visitors after COD, so basically after November



100% carbon free electricity – always!

LAES systems provide crucial services for the power grid and support electrification of rural areas



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

LAES OPERATION CHARACTERISTICS

LAES performance is comparable to a peaking power plant

Solid performance
with synchronous
generation for
secure grid
operation

Charge

- Startup time to full power: 5 minutes
- Partial load operation: 75-100%
 - Multiple charging trains improve partial load capability, specially for large plants

Discharge

- Startup time to full power: 10 minutes
 - Startup ramp rate: 12.5%/min after synchronization
- Partial load operation: 25-100%

Minimal constraints

- No minimum uptime before turn-off
- No minimum downtime between runs
- No cap on depth of discharge

Dziękuję za uwagę!

Thank you

Więcej informacji na:

www.shi-fw.com

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