Sumitomo SHI FW

LAES
Liquid Air Energy Storage

Technology Overview

TMCES Thermal-Mechanical-Chemical
Energy Storage Workshop

Pedro Guimarães Giorni – Applications Manager

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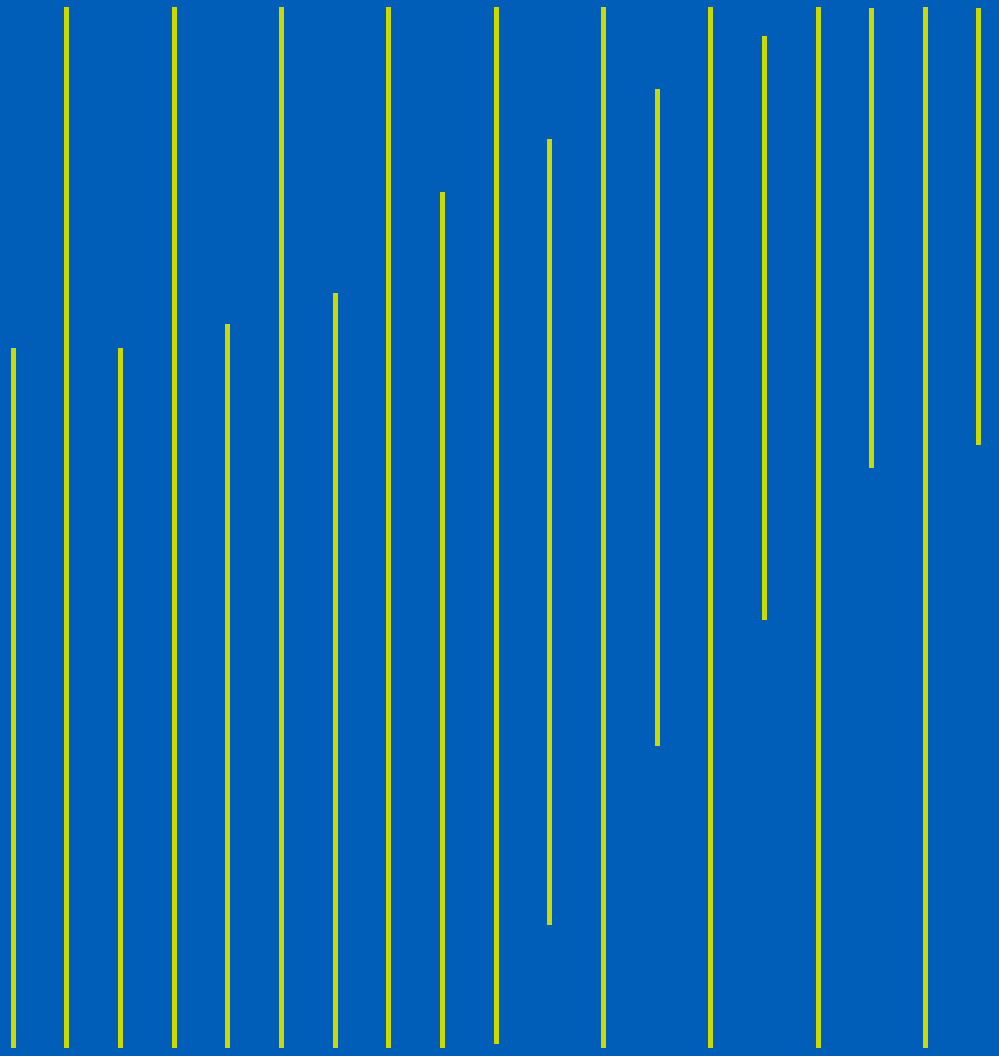
「SFW」

Powering a decarbonized world for everyone



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SFW | Powering a decarbonized world for everyone

1 800
employees
across the globe

20+
locations
around the world

130+
years of
experience

800 +
successful references worldwide

122 Americas | **344** Europe | **419** Asia

4
businesses

Energy Generation

Circular Carbon

Energy Storage

Services

5
values of SFW

- Respect for people
- Committed to customers
- Passion to innovate and grow
- Ownership of results
- Safety, integrity and teamwork

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Worldwide footprint, local connections

we serve you in 20 locations across the globe

Global reach with

20

locations

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

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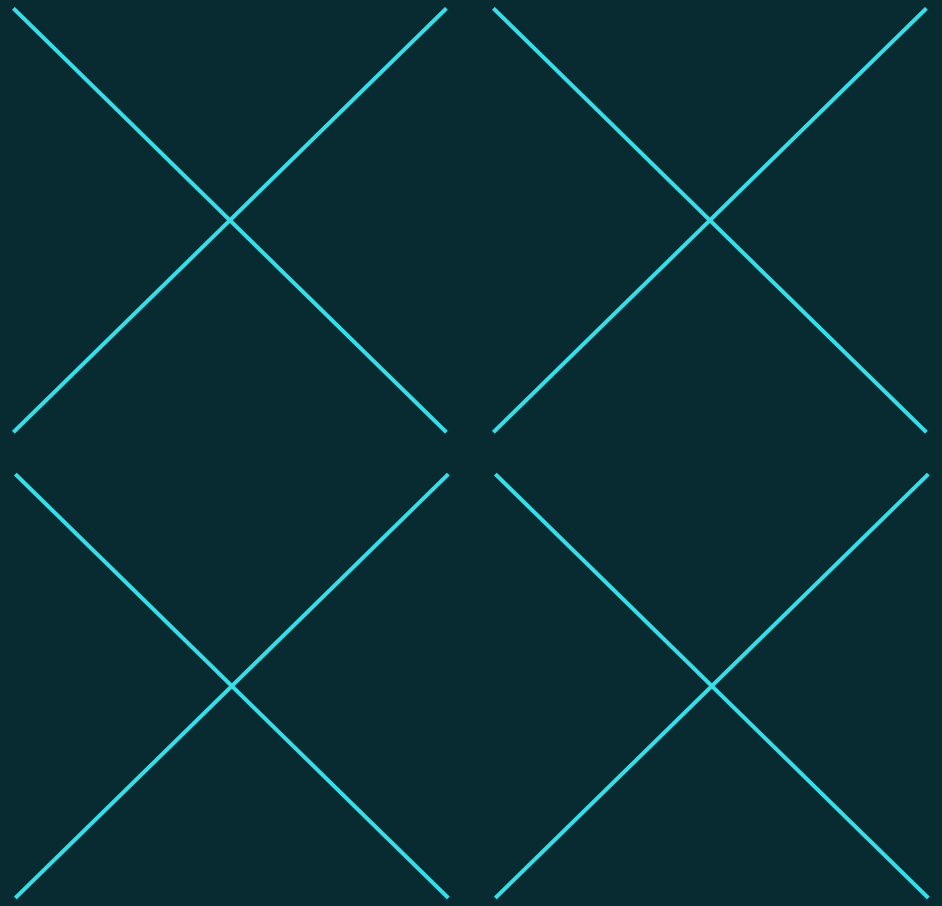
Liquid Air Energy Storage

The technology



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Liquid Air Energy Storage

LAES combines traditional industrial technologies to provide long duration energy storage and grid ancillary services in a compact footprint

Charge	Claude cycle air liquefaction
Storage	Cryogenic tanks and sensible heat media
Power recovery	Conventional steam-type turbines

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A novel approach built upon well-established knowledge

		Air Separation	LNG Facility	Oil Refinery	Power Generation
Liquefier	• Centrifugal Compressors	✓	✓		
	• Gas Adsorption Dryers	✓	✓		✓
	• Radial Expanders	✓	✓		
	• Shell & Tube Heat Exchangers	✓	✓	✓	✓
	• Brazed Aluminum Heat Exchangers	✓	✓	✓	
Energy Storage	• Welded Steel Tanks			✓	✓
	• Vacuum-insulated Cryogenic Tanks	✓	✓		✓
	• Sensible & Latent Heat / Chill Management	✓	✓		✓
Power Recovery	• Cryogenic Pumps	✓	✓		
	• Diffusion-bonded Heat Exchangers		✓	✓	
	• Expansion Turbines	✓	✓		✓
	• Synchronous Generators	✓	✓	✓	✓
Balance of Plant	• Water Pumps	✓	✓	✓	✓
	• Fan Air Coolers	✓	✓	✓	✓
	• Gas Blowers	✓	✓	✓	✓
	• Programmable Logic Controllers	✓	✓	✓	✓

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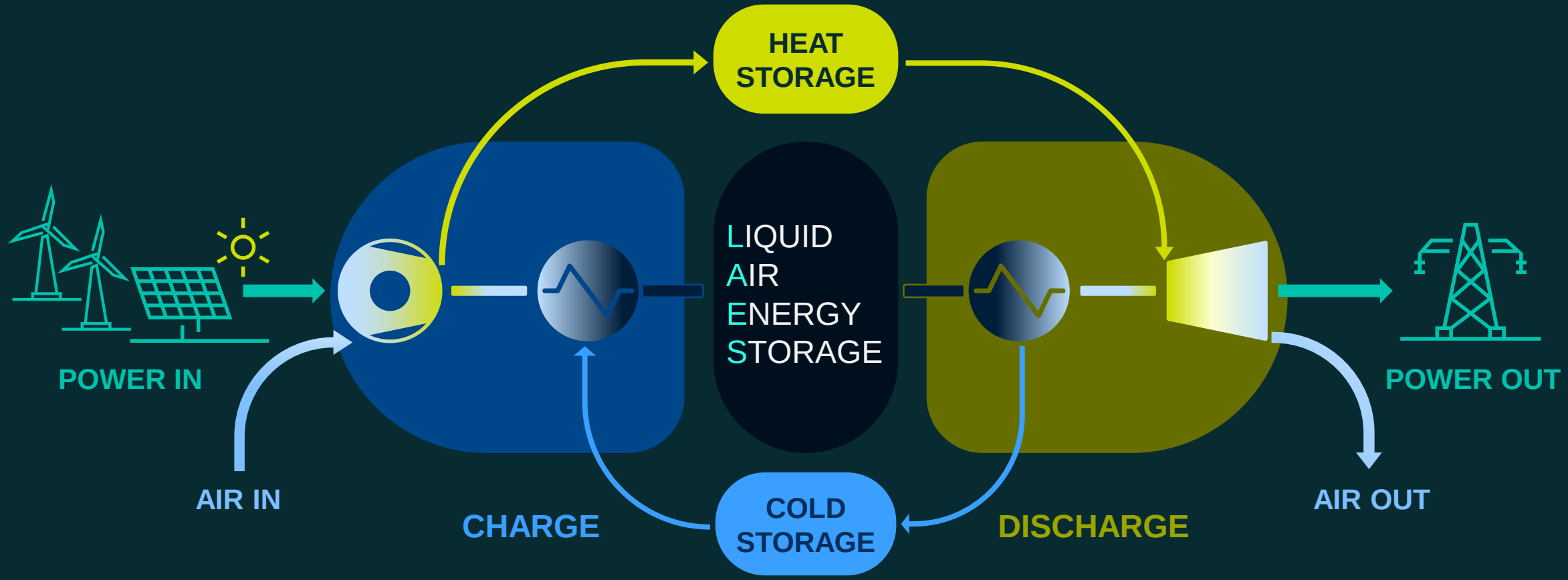
Process overview



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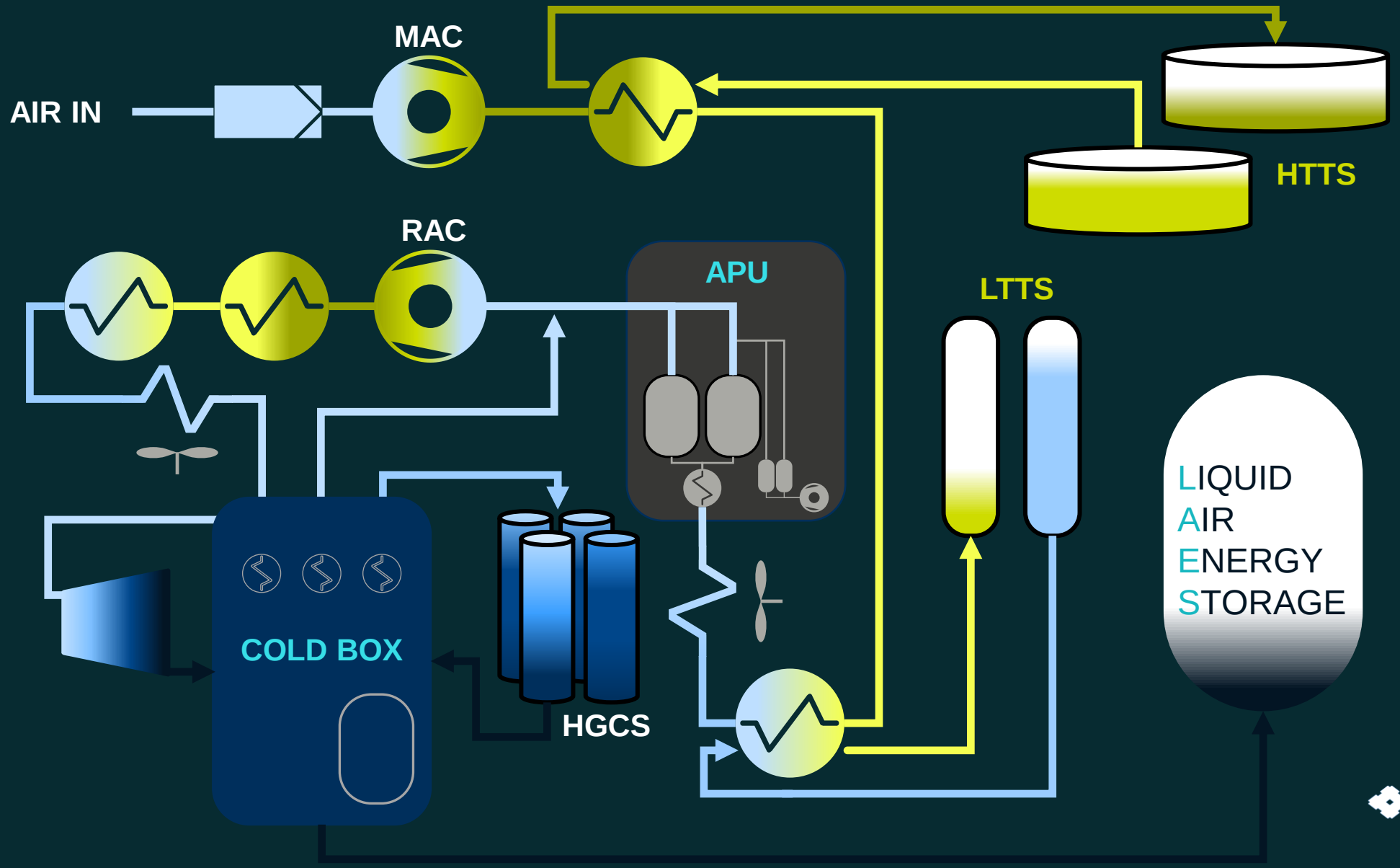
The liquefaction cycle



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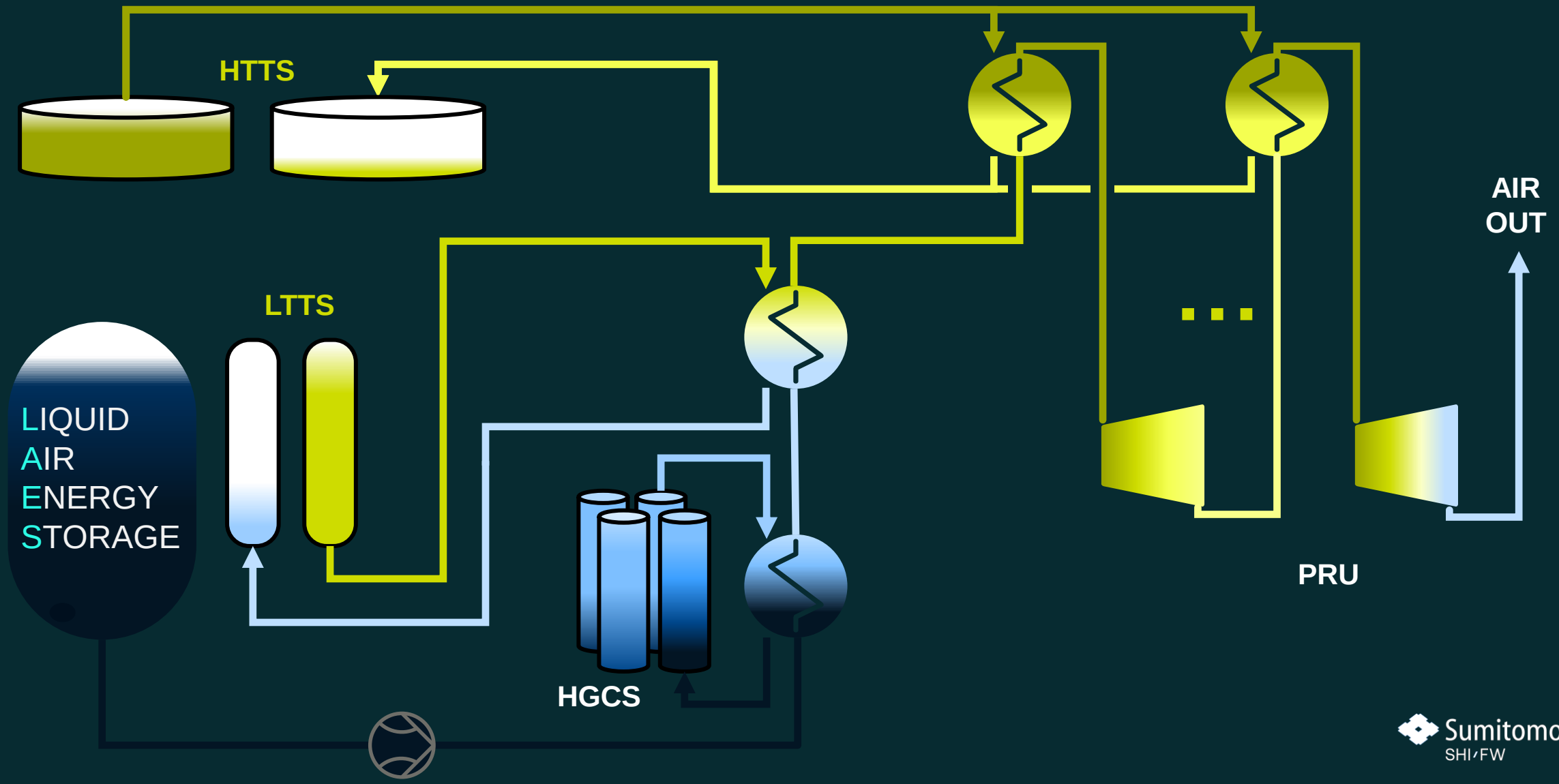
The power recovery cycle



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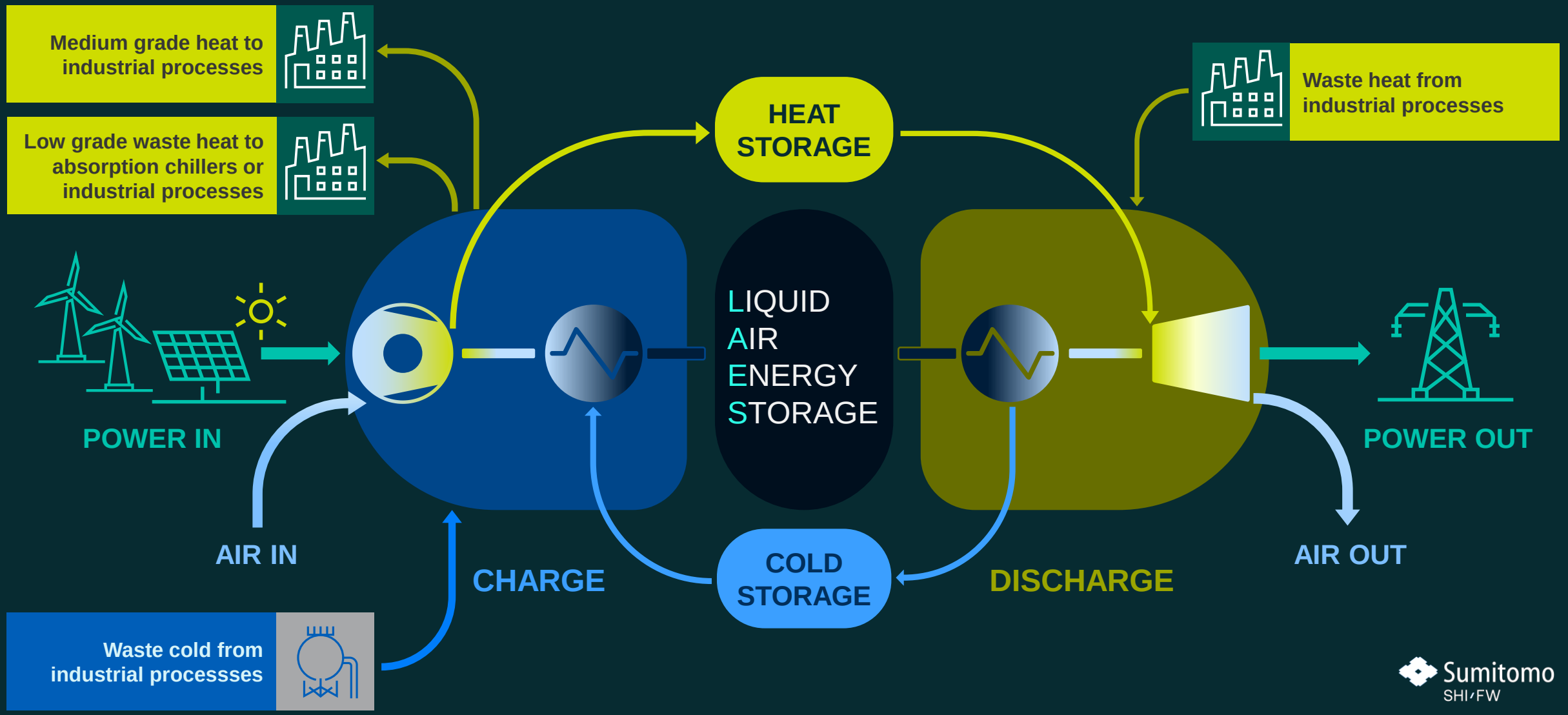
From Standalone to Integrated System



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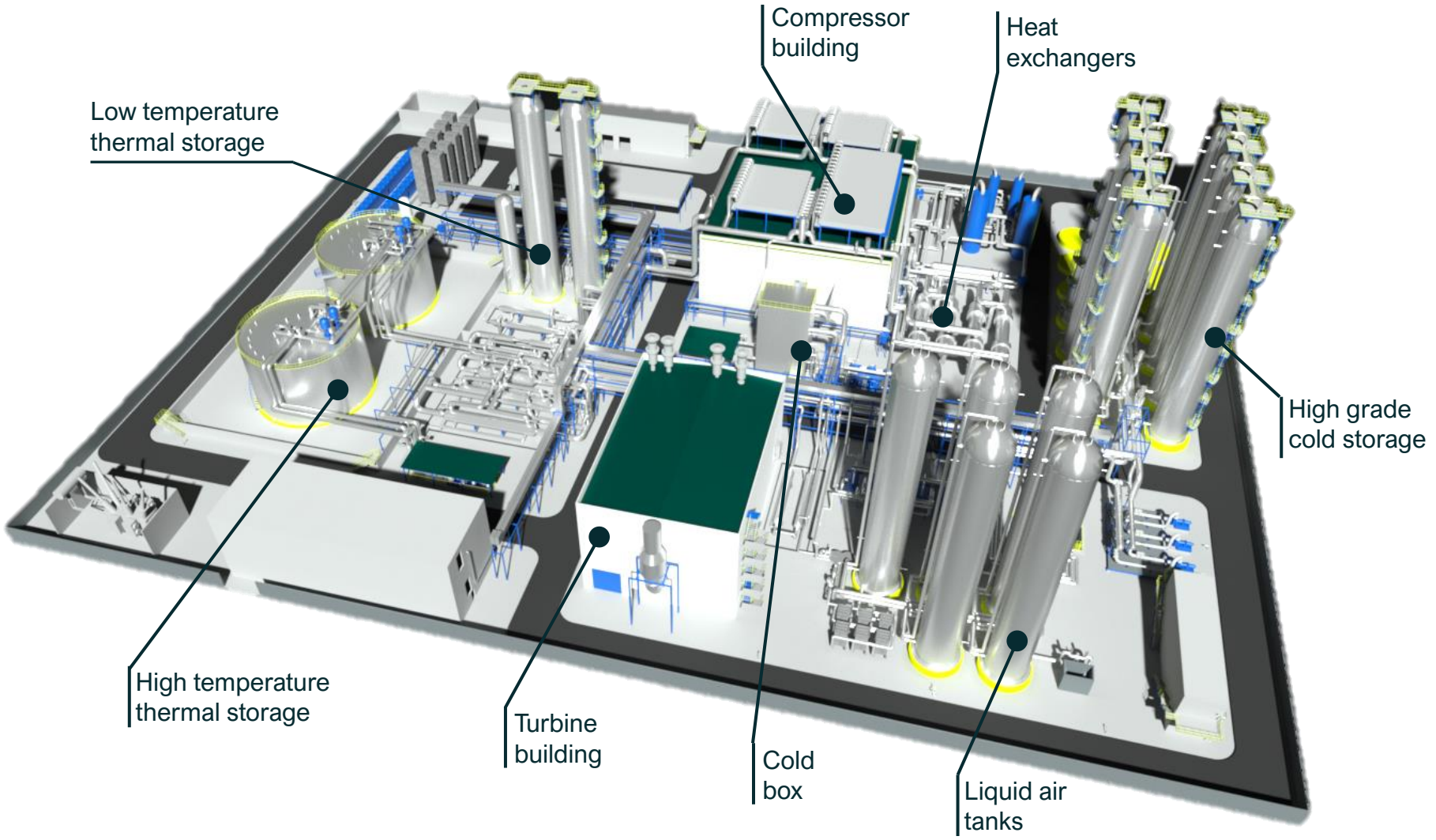
Liquid Air Energy Storage

Bulk renewable energy shifting

Flexible and compact footprint

Grid stability



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Liquid Air Energy Storage (LAES) – technology implementation timeline

The first two commercial LAES plants will be operational by 2025 & 2026 respectively

2008
Highview Power, in partnership with the University of Leeds, demonstrated the concept of cryogenic air as energy storage

2020
SFW's parent company Sumitomo Heavy Industries (SHI), invested USD 46 million in HVP and became the largest shareholder

2023
SHI started construction on a 5 MW / 20 MWh LAES commercial demonstration plant in Hiroshima Prefecture, Japan. The plant is being implemented in collaboration with Hiroshima Gas Ltd.

2024
HVP achieved financial closure for a 50 MW/300 MWh LAES facility in Carrington, UK. The funding also allowed HVP to commence planning for a further 4 LAES facilities with a combined storage capacity of 10GWh

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

LAES Hiroshima Hatsukaichi

Basic data:

Power: 5 MW
Storage: 20 MWh (4h)

Area: 0.62 acres

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Thank you

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53 Frontage road, Suite 251, Hampton, NJ
Phone: 908 713 2700

Pedro Guimarães Giorni
Application Manager, Energy Storage

For more information, please visit: www.shi-fw.com

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