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KHI's Liquefied Hydrogen Initiative

Kawasaki Heavy Industries, Ltd.

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Japan’s Hydrogen Policy Move

- Historically Japan started hydrogen/fuel cells R&D back in **1973** (before the oil shock started).
- **The first country to have formulated a national hydrogen strategy (2017).**
- The Prime Minister set **“2050 carbon neutral” declaration (2020)**. **JPY 2 trillion* Green Innovation Fund.**
- Positioned **hydrogen as one of the priority areas** in the Green Growth Strategy.
- **Key part of achieving green transformation economy plan (2023).**

*¥2 trillion = $14.3billion (USD/JPY =140)

Milestones	Japan's Policy Moves			
2017 Basic Hydrogen Strategy	**2020** PM's 2050 CN Declaration Green Growth Strategy	**2021** -Green Innovation Fund -Revised Strategic Energy Plan	**2023** **-GX Promotion Act** **-Basic Hydrogen Strategy updated**	**2024** **-Hydrogen Society Promotion Act**

Targets (Set in the Basic Hydrogen Strategy on Dec. 26, 2017 – updated in 2023)

□ **Supply & Demand volume:**

Current (Approx. 2Mt) → 2030 (**Approx. 3Mt**) → **2040 (Approx. 12Mt)** → 2050 (**Approx. 20Mt**)

□ **Hydrogen cost (@Port)**

2030 (**JPY30/Nm3**) → 2050 (**Less than JPY20/Nm3**)

□ **Electrolyzers (global share that involve Japanese elements) → 2030 (15GW)**

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Japan’s Hydrogen Market Overview

Hydrogen Demand (estimated and target)

	Amount Introduced
Current	
2024	2 million tons (estimated)
National Target	
2030	3 million tons
2040	12 million tons
2050	20 million tons

Most of it is self-produced and consumed

Distribution volume: approx. 15,500 tons

Compressed: 73,000t

Liquified: 82,000t

Photo: Iwatani Corporation website

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Current status of hydrogen product deployment

Items	Japan's Target (in 2030)	Current status
Stationary Fuel Cell		
Regidential Fuel Cells (EneFarm)	3 million	549,575 (Mar. 2025)
Mobility		
Passenger Vehicles	800,000	8,857 (Mar. 2025)
Buses	1,200	180 (Feb. 2025)
Forklifts	N/A	446 (Feb. 2025)
Hydrogen Refueling Station		
700 bar Refueling Stations	1,000	159 (Apr. 2025)

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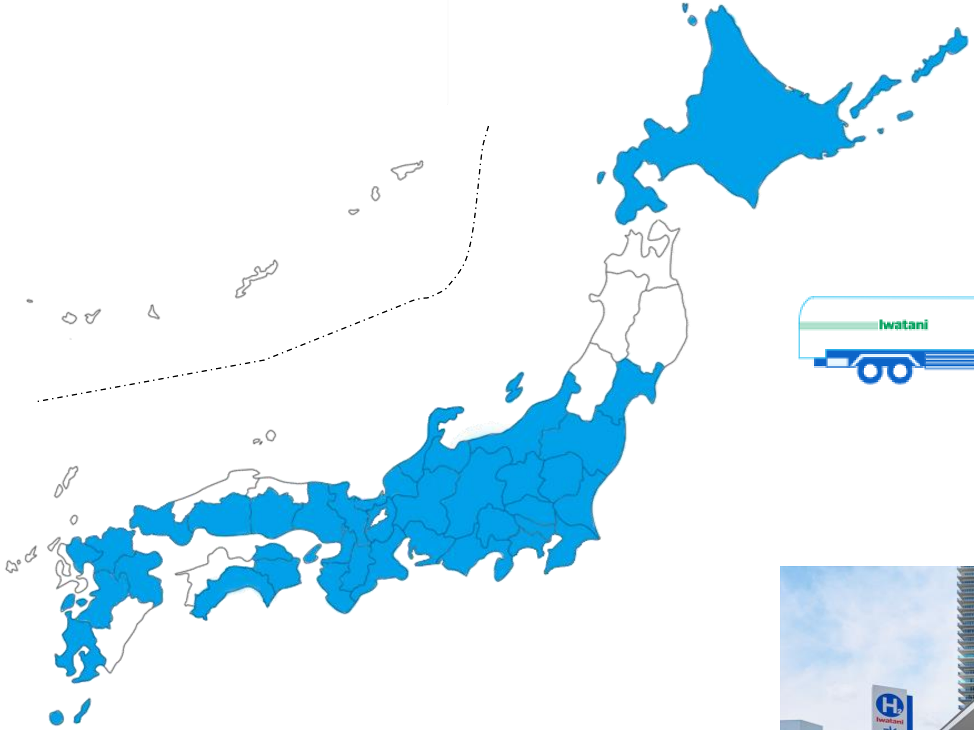
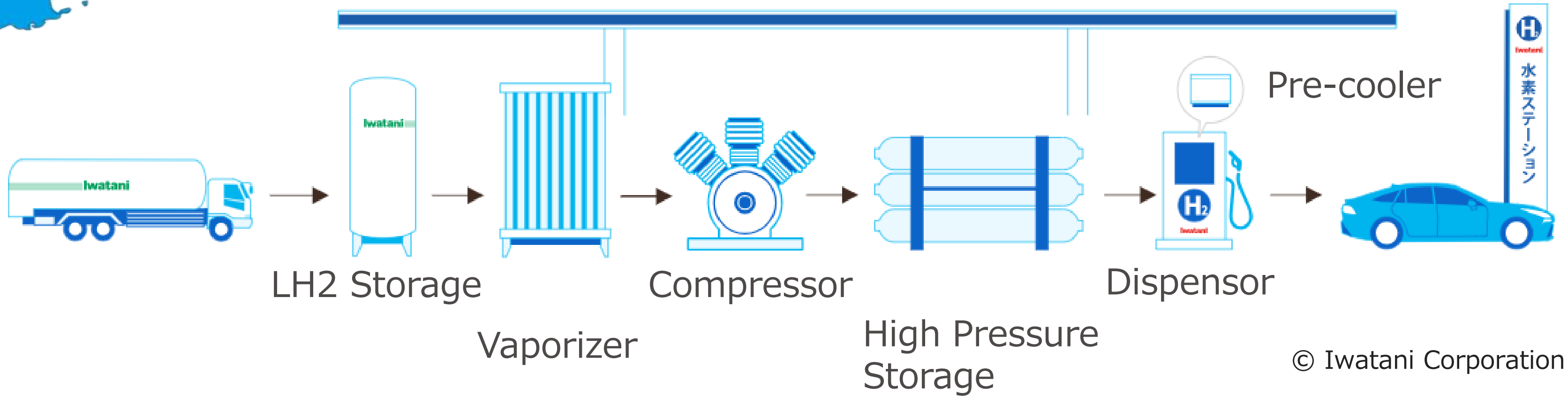
Hydrogen Refueling Station



In Operation: 159
LH_2 stations: 38

Image of LH_2 station



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History of KHI

1878 Founder Shozo Kawasaki opens Kawasaki Tsukiji Shipyard (Tokyo), the first step in modern shipbuilding

1886 The scale of the enterprise expands with the founding of the Kawasaki Dockyard in Kobe

1911 Completion of the first domestically produced steam locomotive, contributing to the spread of railways in Japan.

1918 Start aviation business

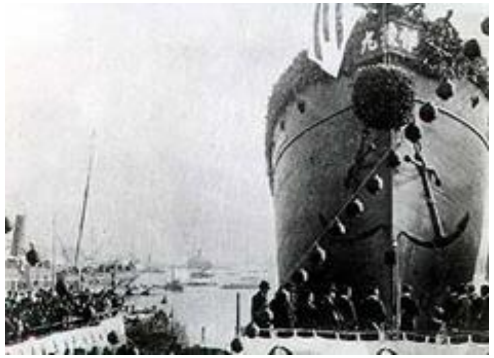
1954 Delivery of Japan’s first helicopter, Start to delivery of motorcycle

1968 Launch robot business in anticipation of automation society to reduce labor burden

1976 Domestic Gas Turbine Power Generation Facility completed for the first time in Japan

1981 Delivery of Japan's first LNG carrier

2004 First export of vehicles for Taiwan High Speed Rail



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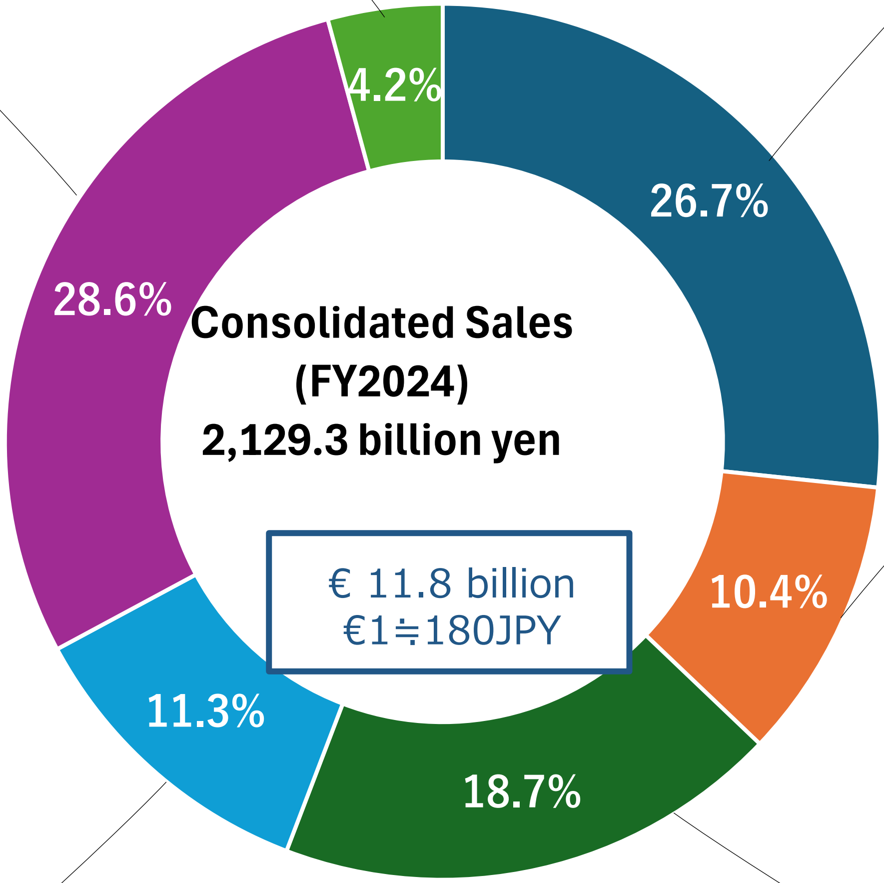
Introducing Kawasaki Heavy Industries, Ltd.

Power Sports & Engine

Others



Aero Space System

Rolling Stocks

Precision Machinery &Robots

Energy Solution & Marine

Number of Employees:40,610

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Kawasaki's Hydrogen Technology Overview

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Realizing Hydrogen Technologies

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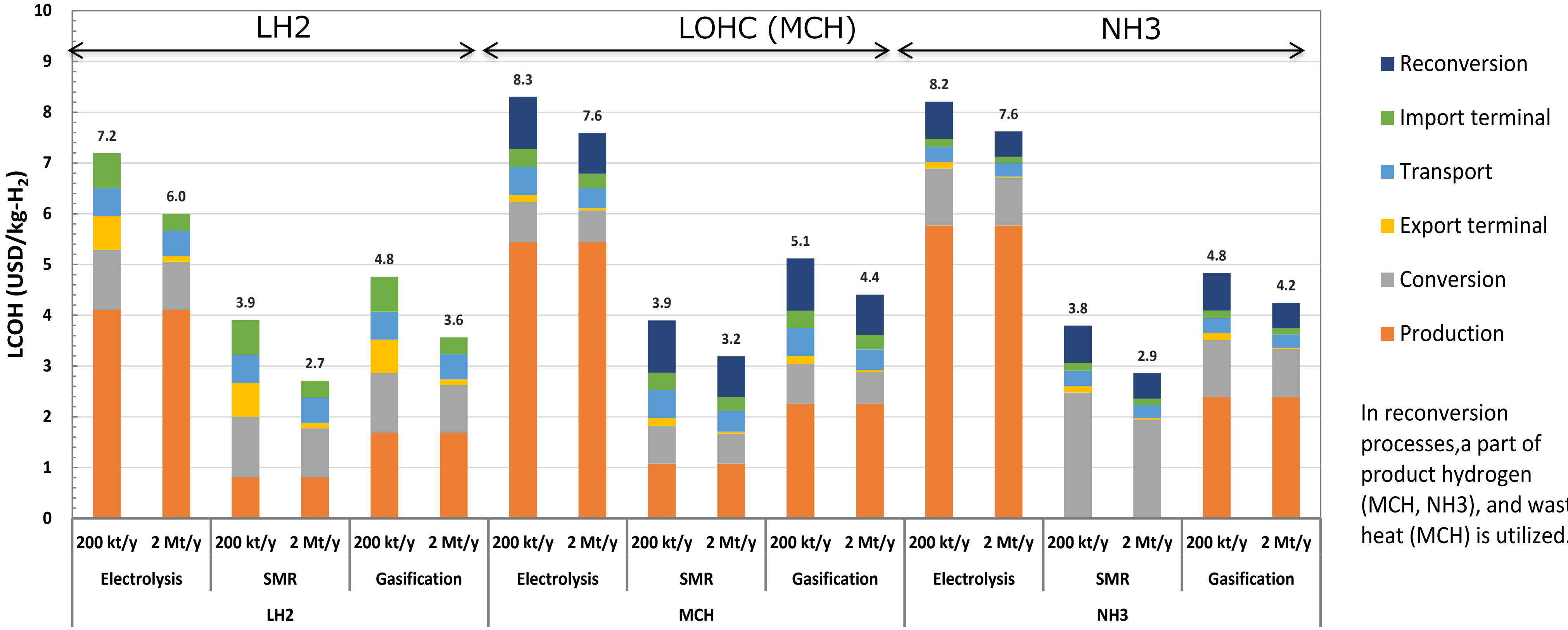
Why Kawasaki chooses liquefied hydrogen

No significant difference between the three major hydrogen carriers

Costs of International Hydrogen Supply Chains with combination of production and carrier technologies (production in Australia)



In reconversion processes,a part of product hydrogen (MCH, NH3), and waste heat (MCH) is utilized.

Yuki Ishimoto and Michio Hashimoto, Technoeconomic Analysis of International Hydrogen Supply Chains to Japan: Balancing Cost and Carbon Intensity, WHTC2025, 21-23 October 2025.

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Why Kawasaki chooses liquefied hydrogen

LNG : -162℃

LH2 : -253℃

Achievements in LNG carriers at -162°C and their scaling up

Japan’s first LNG carrier

History of cost reduction through mass transportation

LNG carrier

45
carriers

(Actual)

LNG tank

58
tanks

(Actual)

40 years of experience in transporting and storing liquefied hydrogen

1978 Delivery of liquefied hydrogen tanks to the liquefied hydrogen rocket engine combustion test facility

1981

1987 Construction of a 600m³ liquefied hydrogen storage tank at JAXA’s Tanegashima Space Center

2010 **Announced our aim to utilize hydrogen as an energy source**

2020 The world’s first LH2 carrier, “Suiso Frontier” completed

2022 Completed maritime transportation Between Japan and Australia

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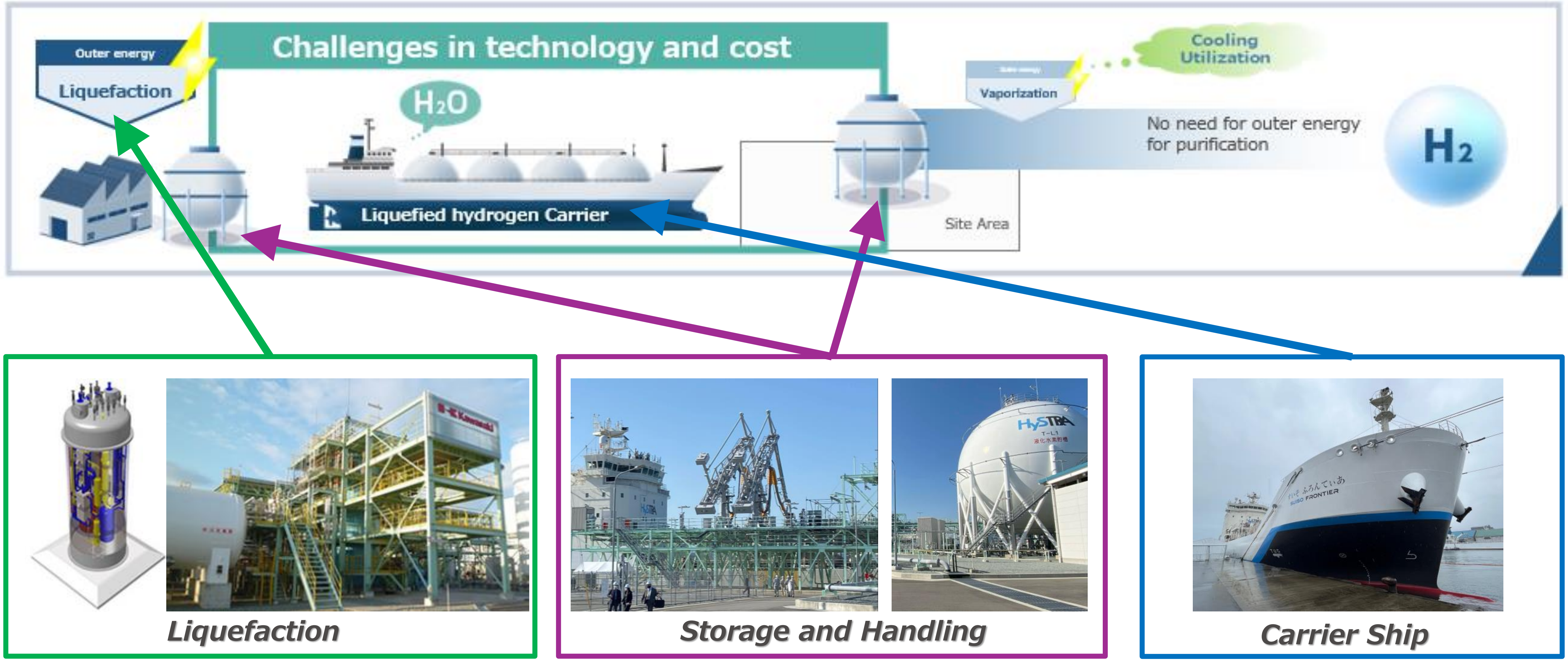
Kawasaki's Challenge in LH_2 Supply Chain



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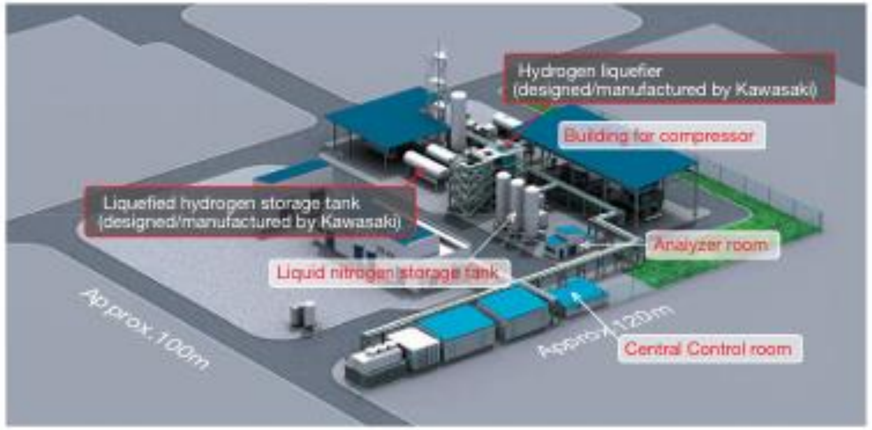
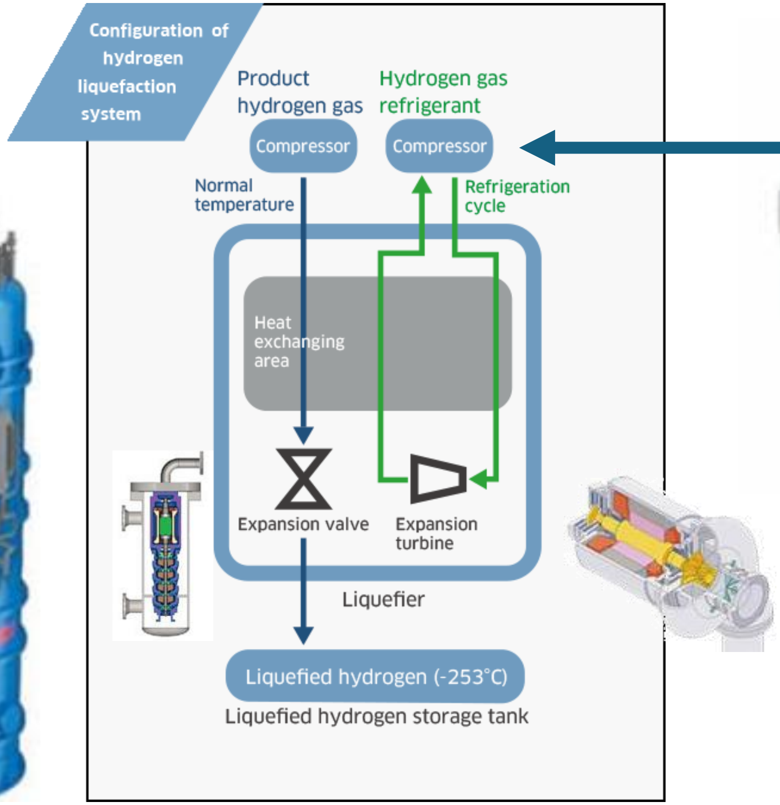
Liquefaction



Capacity: 5-25tpd

Under development: >30tpd



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Scaling up Products for Commercial Chain : Onshore Tank

Volume: 2,500m^3/tank

- Volume: 50,000m^3/tank
- Under development

- Volume : 200,000m^3/tank
- Future project

Pilot Demonstration (2015-)

Commercialization Demonstration (2021-2030)

Commercial Chain

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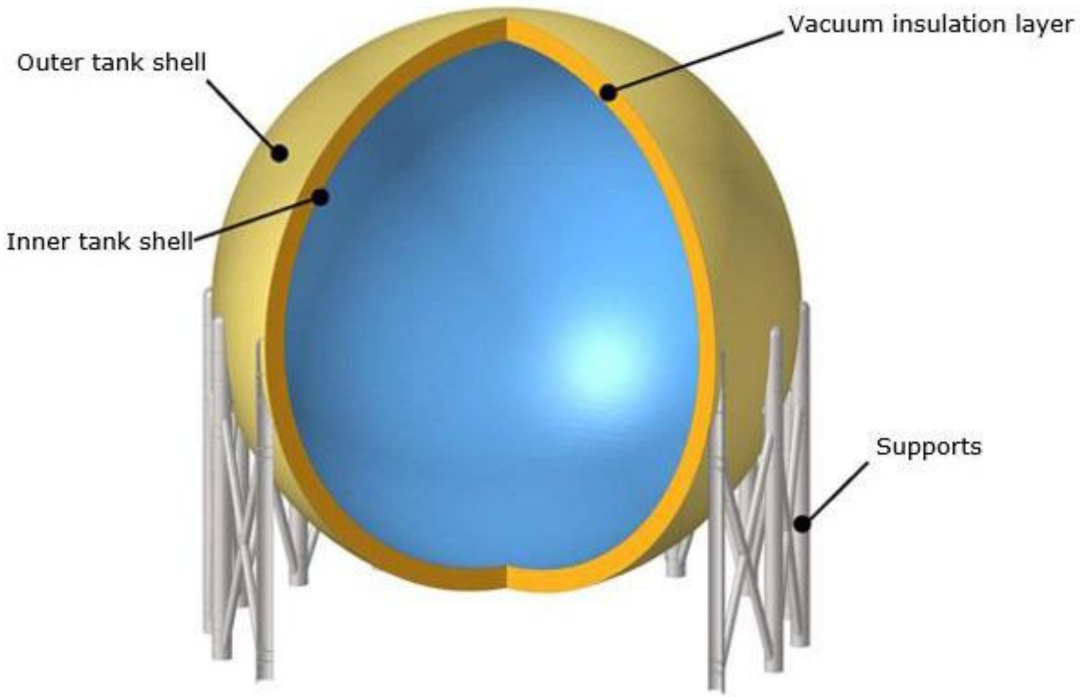
Japan's largest liquefied hydrogen storage tank



BOR 0.06% / day

Groundbreaking ceremony for liquefied hydrogen terminal

Kawasaki-City, Kanagawa Prefecture

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Scaling up Products for Commercial Chain : Ships

Small Scale

(LH2: 1,250㎥ / 75t)

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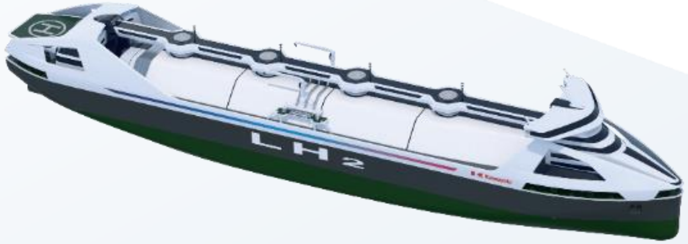
Pilot Demonstration (2015-)

Medium Scale

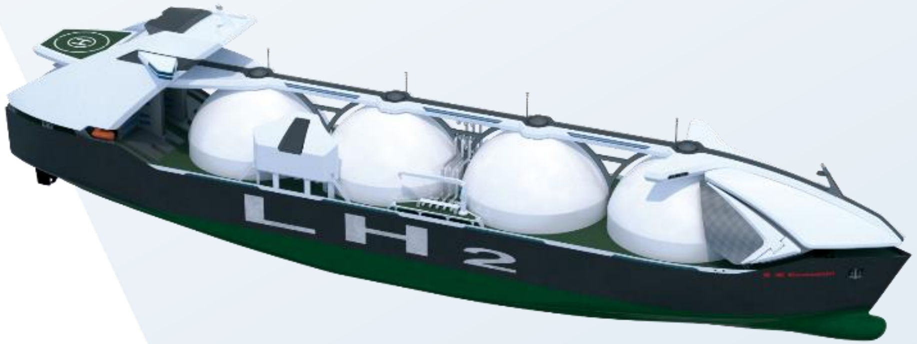
(LH2: 40,000㎥ / 2,400t)



Commercialization Demonstration (2021-2030)

Large Scale

(LH2: 160,0000㎥ / 9,600t)



Commercial Chain

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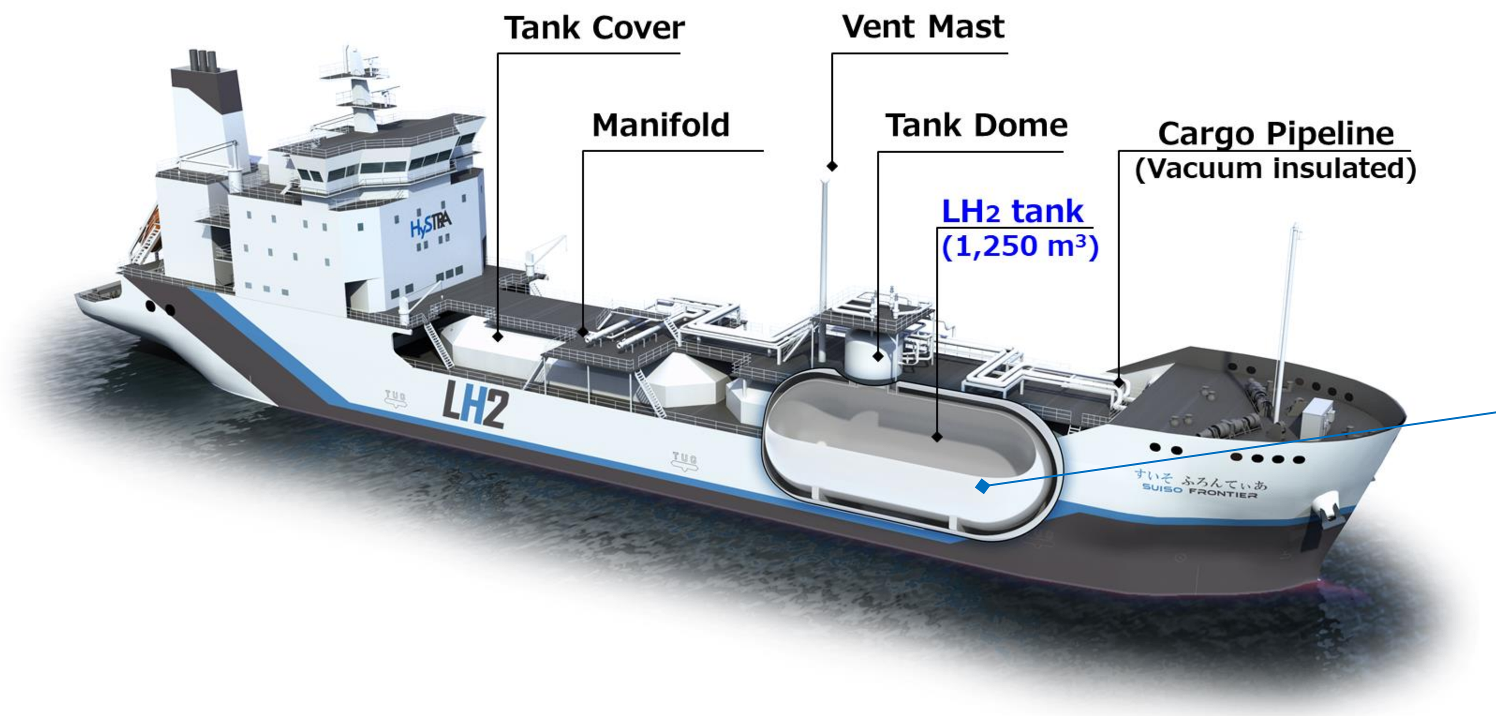
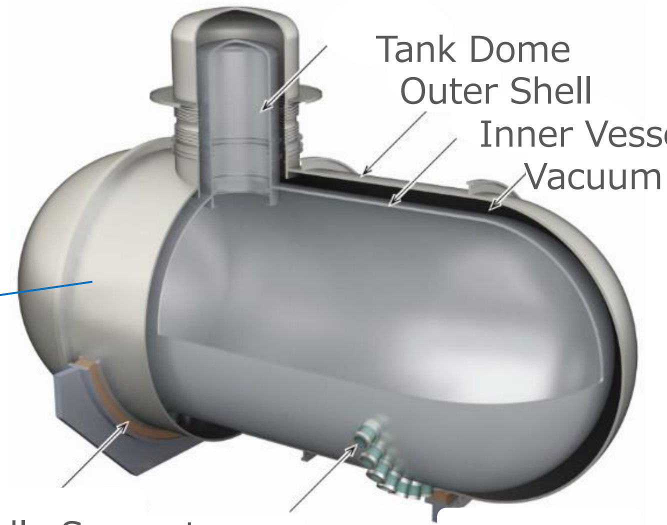
World First LH2 Carrier



Length	116 m	Speed	13 knot
Width	19 m	Draft	4.5 m
Max crew	25 person	Propulsion	Diesel electric

Cargo Containment System (1,250m³)



Vacuum Insulated Double Shell Structure

BOR 0.3% / day

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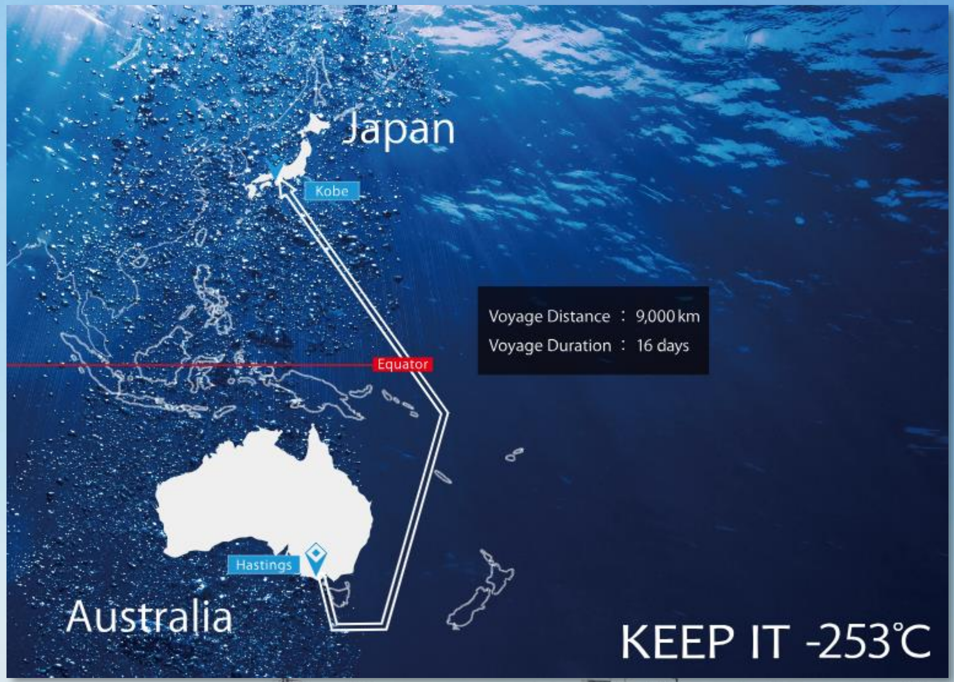
LH$_2$ Carrier Ship



Successful Completion of Pilot Demonstration in 2022

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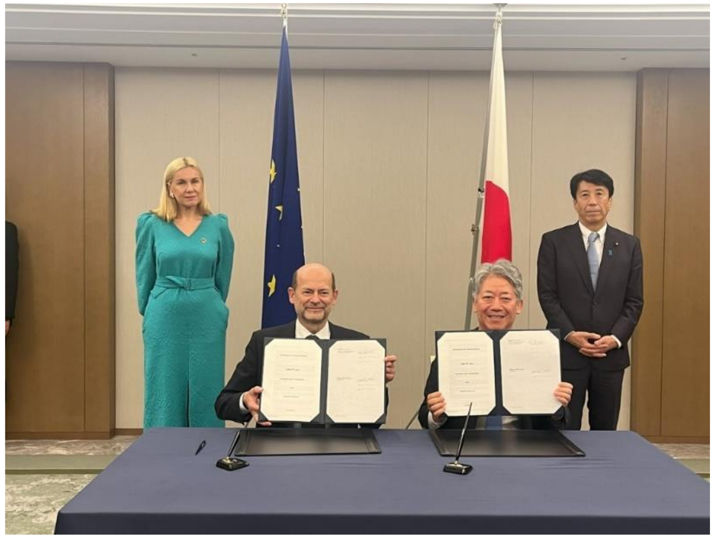
Collaboration in Europe



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