

# Kawasaki Heavy Industries Liquefied Hydrogen Supply Chain Project

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# Introduction of Kawasaki Heavy Industries, Ltd.



**Powersports & Engine**  
**32.0%**



**Precision Machinery & Robot**  
**12.3%**



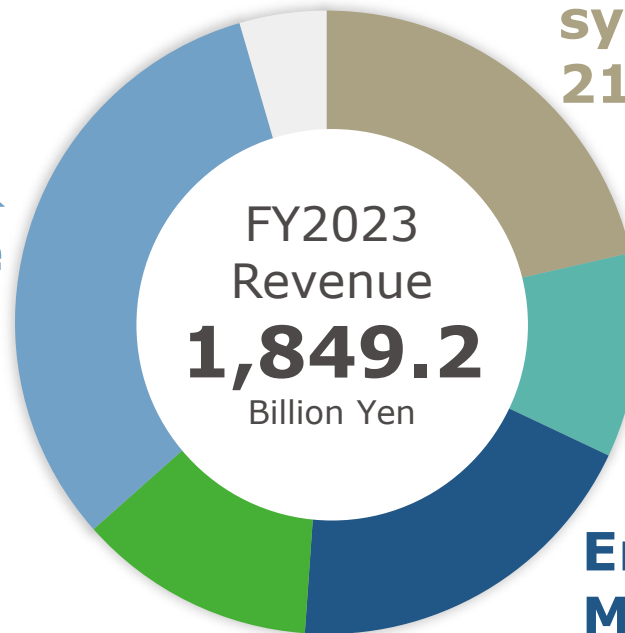
**Others**  
**4.5%**

**Aerospace systems**  
**21.4%**



**Rolling Stock**  
**10.6%**

**Energy Solution & Marine Engineering**  
**19.1%**



New Values



A Safe and Secure  
Remotely-Connected Society



Cross Over

# Trustworthy Solutions for the Future



“Near-Future” Mobility

Frontier

Energy and Environmental Solutions



## Achieving Carbon neutrality

# Hydrogen introduction target in Japan (Government of Japan)

Government of Japan released “Basic Hydrogen Strategy” in 2017

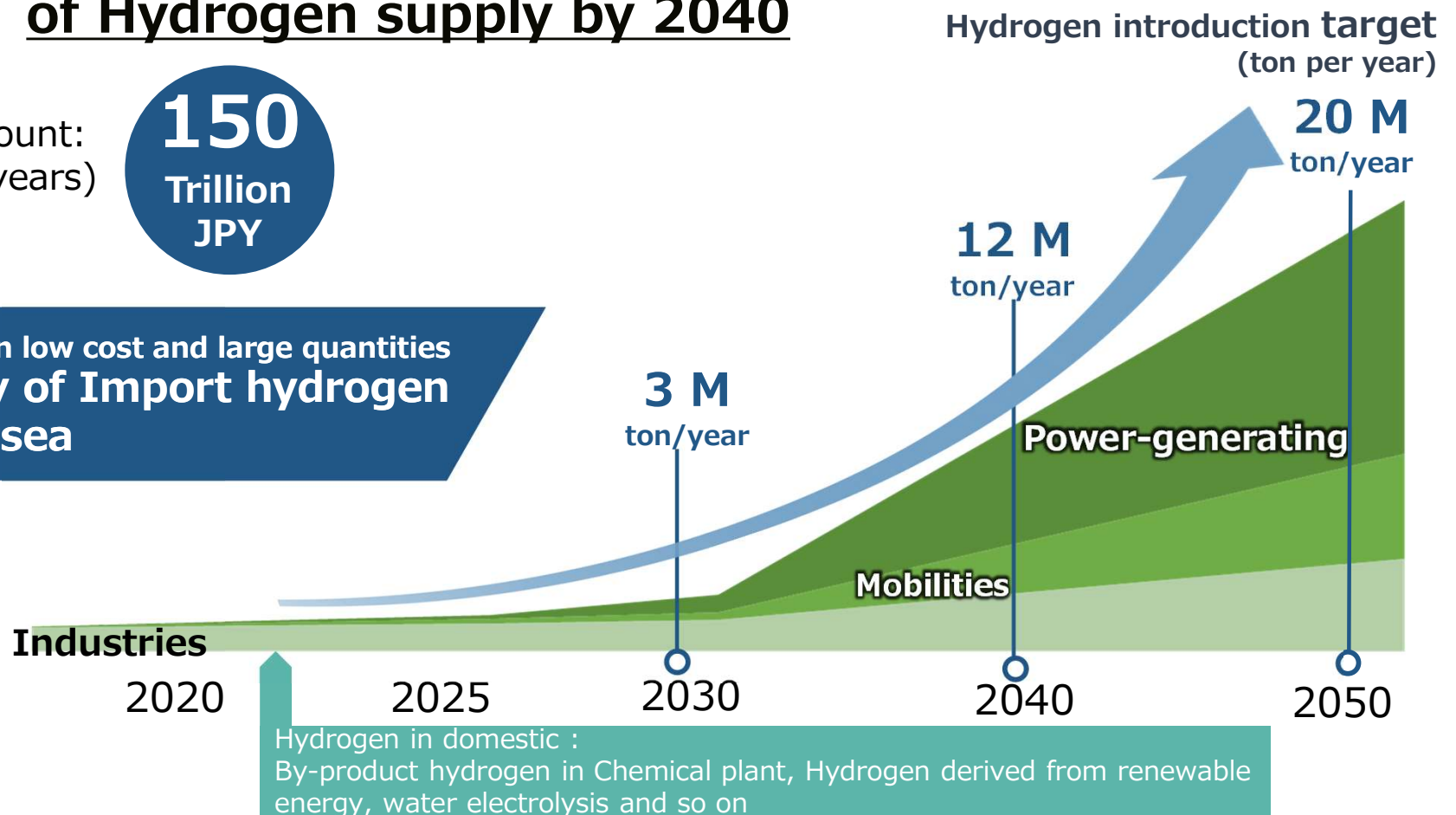
**In 2023, revised “Basic Hydrogen Strategy”**

**New target : 12 million tons per year (Six times current)**  
**of Hydrogen supply by 2040**

Investment amount:  
(in the next 10 years)

**150**  
Trillion  
JPY

To introduce in low cost and large quantities  
**Necessary of Import hydrogen  
from overseas**



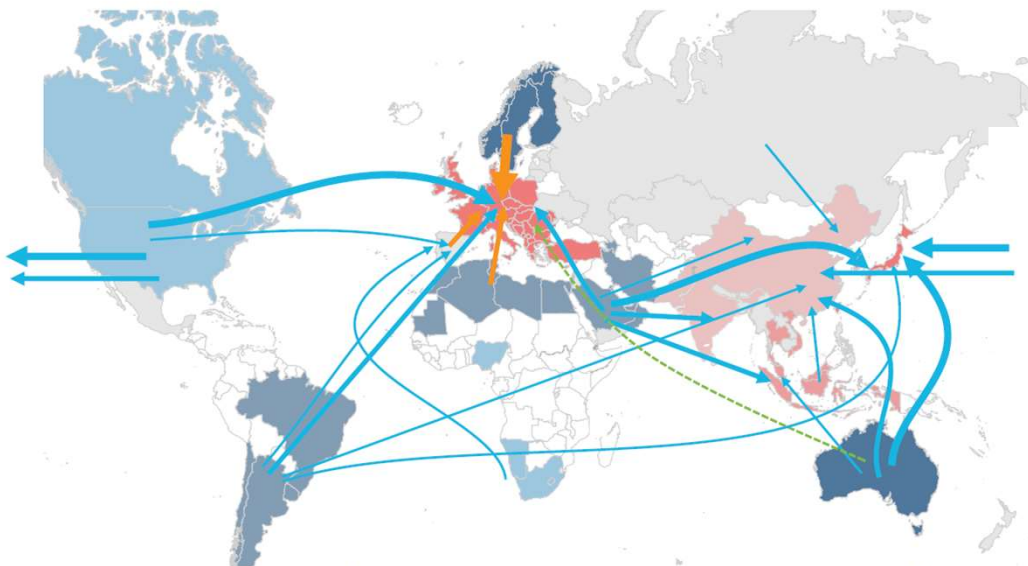
KHI created based on Ministry of Economy, Trade and Industry “Basic Hydrogen Strategy” (June 6<sup>th</sup>, 2023) etc.



# Vision for the global liquefied hydrogen supply chain

By 2050, extensive and deep trade links will connect the globe

Main Interregional flows of hydrogen and derivatives 2050 – Further Acceleration, mtpa H<sub>2</sub> equivalent



Note: Arrows show trade flows between 13 regions (i.e., Latin America, North America, core Europe, peripheral Europe, North Africa, Sub-Saharan Africa, Middle East, CIS, India + Pakistan, China, Northeast Asia, Southeast Asia and Australia)

Source: McKinsey Global Hydrogen Flow Model



**Trade flows in 2050 from study by McKinsey & Company in Nov. 2023**

- Europe : mostly pipeline
- Other : mostly sea transport



**Hydrogen carrier will play an important role**

"Hydrogen Council and McKinsey & Company" Global Hydrogen Flows: Hydrogen trade as a key enabler for efficient decarbonization, Nov. 2023

# Why Kawasaki Heavy Industries chooses liquefied hydrogen

LNG : -162℃

Liquefied hydrogen : -253℃

Experience of  
LNG carrier

**“Transport” “Storage” for Liquefied hydrogen : 40-year Kawasaki pride**

**1978**

Install Liquefied hydrogen tank for  
Combustion test facility of Liquefied hydrogen  
Rocket engine in Noshiro, Akita city



LNG carrier (Japan's first)

**1981**



**1987**

Construct Liquefied hydrogen Storage tank(600m<sup>3</sup>) at  
JAXA (Japan Aerospace Exploration Agency)'s Tanegashima  
Space Center rocket launch facilities

**2010**

**Released Hydrogen energy strategy  
in Kawasaki Business vision 2020**

**2020**

the world's first liquefied hydrogen  
carrier "SUISEI FRONTIER"



**2022**

The world's first demonstration test of  
marine transport (from AUS to JPN)

**Achieve Low cost by  
Large quantities transport**  
LNG carrier: 45 ships  
LNG tank: 58 groups



**Apr. 9th in 2022 :  
Ceremony for completing  
the demonstration test**



## Challenge to Construction of Liquefied hydrogen carrier with Low cost

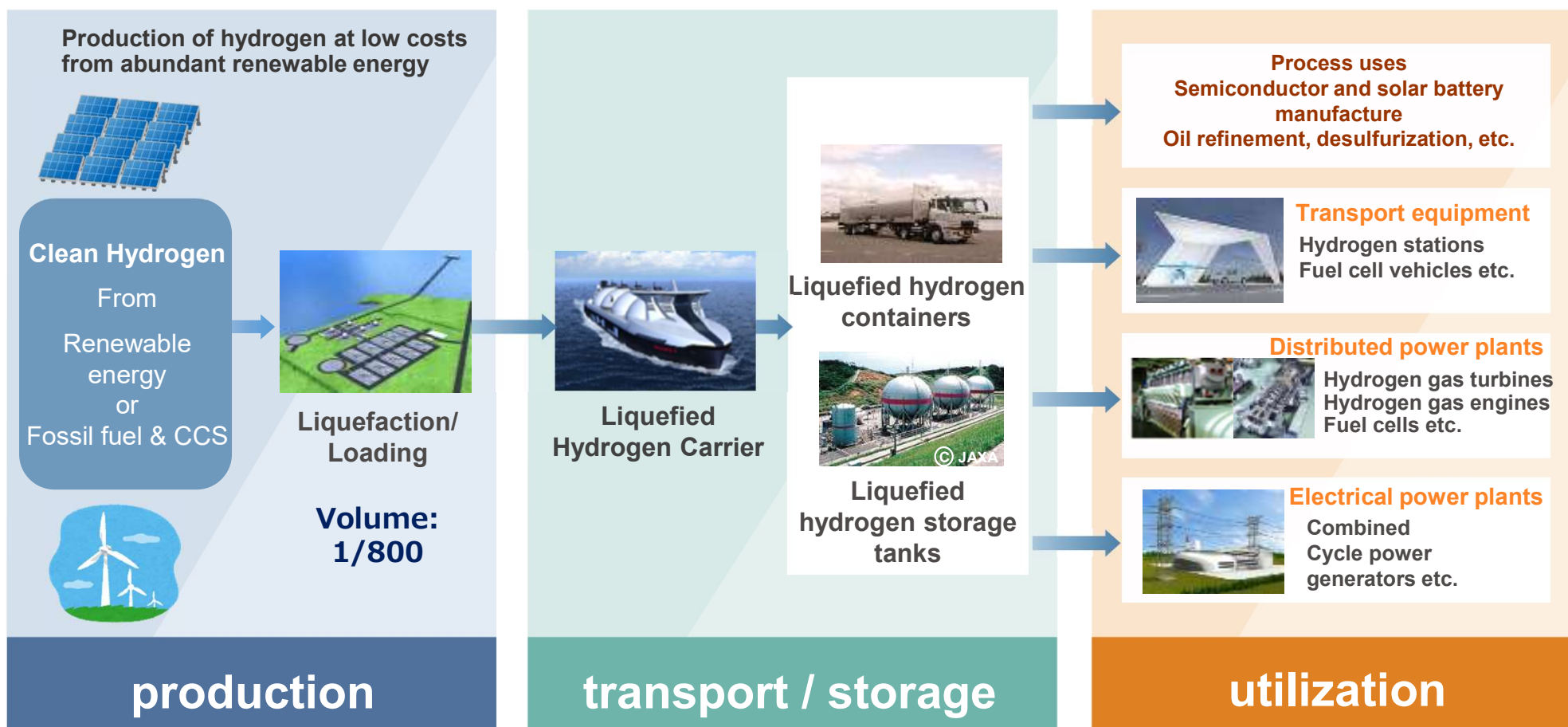
Supported by NEDO(New Energy and Industrial Technology Development Organization)

# Concept of CO<sub>2</sub>-free Global Liquefied Hydrogen Supply Chain

## Stable energy supply while reducing CO<sub>2</sub> emissions

### Resource-rich country

### Utilization country





# Pilot demonstration contributes to Commercialization

## Pilot carrier tank: 1,250m<sup>3</sup>



## Commercial carrier tank:



160,000m<sup>3</sup> class



40,000 - 80,000m<sup>3</sup> class

## Pilot receiving terminal tank: 2,500m<sup>3</sup>



50,000m<sup>3</sup> class



200,000m<sup>3</sup> class



# Development of major commercial-scale equipment

## - Cargo tanks for large liquefied hydrogen carriers

Jun. 2023 **Completed technological development**

of cargo tank for large liquefied hydrogen carriers (granted by NEDO (New Energy and Industrial Technology Development Organization))

Completing the technical challenges of increasing size and verifying tank operation technology



Large liquefied hydrogen carriers are planned to be Zero-Emission powered carriers using boiled-off hydrogen as fuel for maritime transportation.

The government of Japan and our company are leading the revision of the international regulations on transport requirements for liquefied hydrogen to be adopted by the IMO\_MSC108 (Maritime Safety Committee) in May of 2024

# Superior thermal insulation performance of liquefied hydrogen storage tank

**Both BORs have achieved the same level of performance as LNG carriers and storage tanks of the same class**

BOR (Boil off Rate) : Ratio of liquid evaporated per day by external heat

**"Suiso Frontier" BOR 0.3%/day**

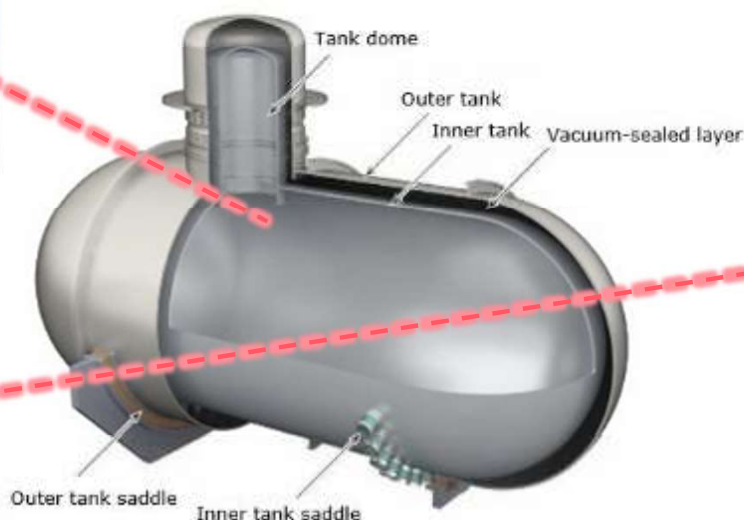
**"Hy touch Kobe" BOR 0.06%/day**



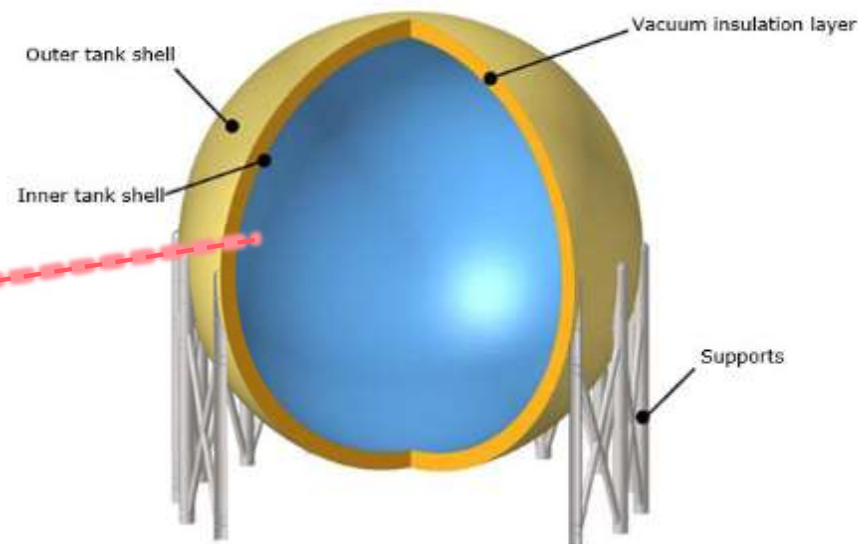
**Suiso Frontier**



**Hy touch Kobe**



Tank used on the *SUISO FRONTIER*



Tank used at Hy touch Kobe

CG-rendered images of the double-shell vacuum-insulation structure

