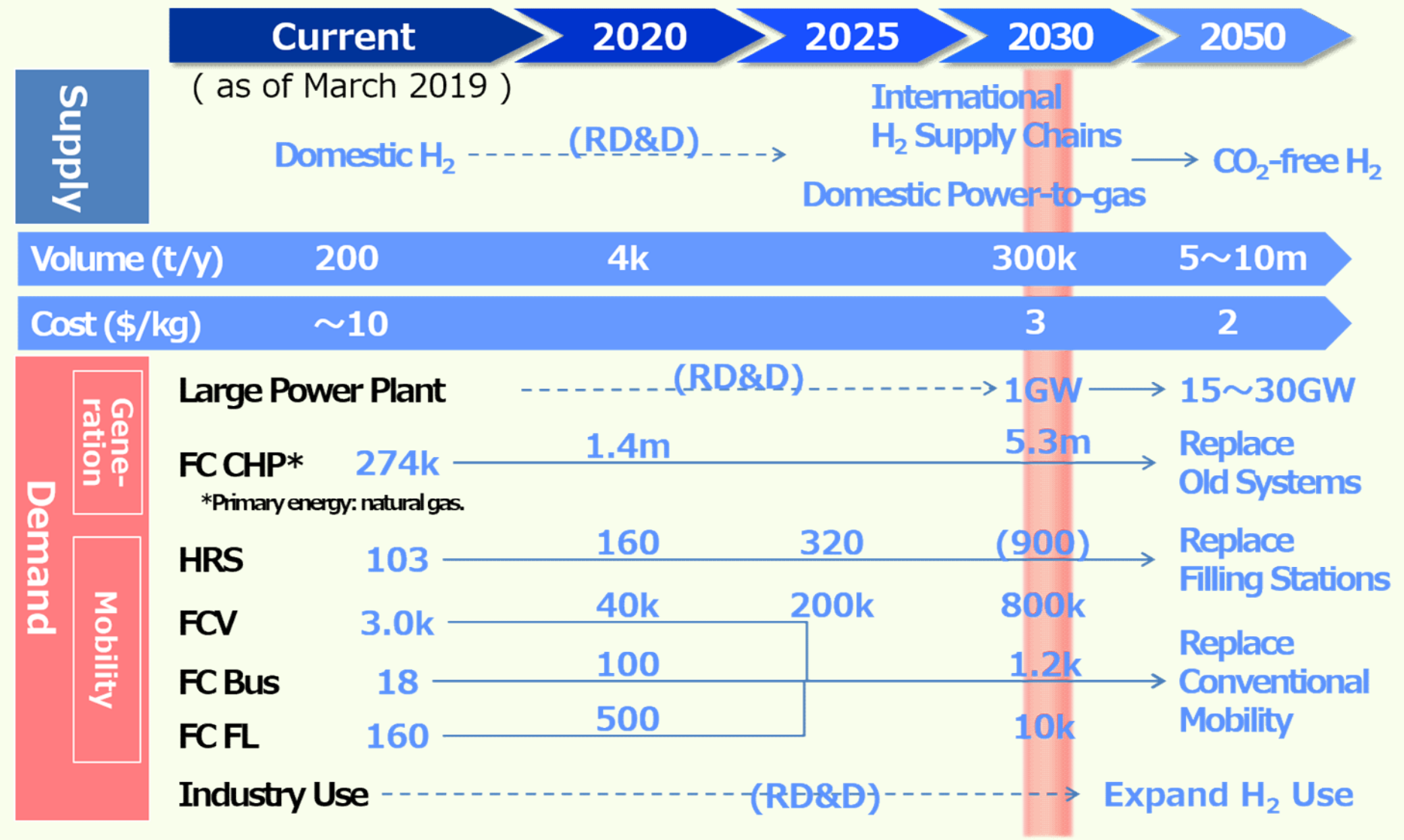
Japan's activity on hydrogen energy

10 September, 2019

Eiji Ohira

New Energy and Industrial Technology Development Organization (NEDO)

Policy: “Basic Hydrogen Strategy”



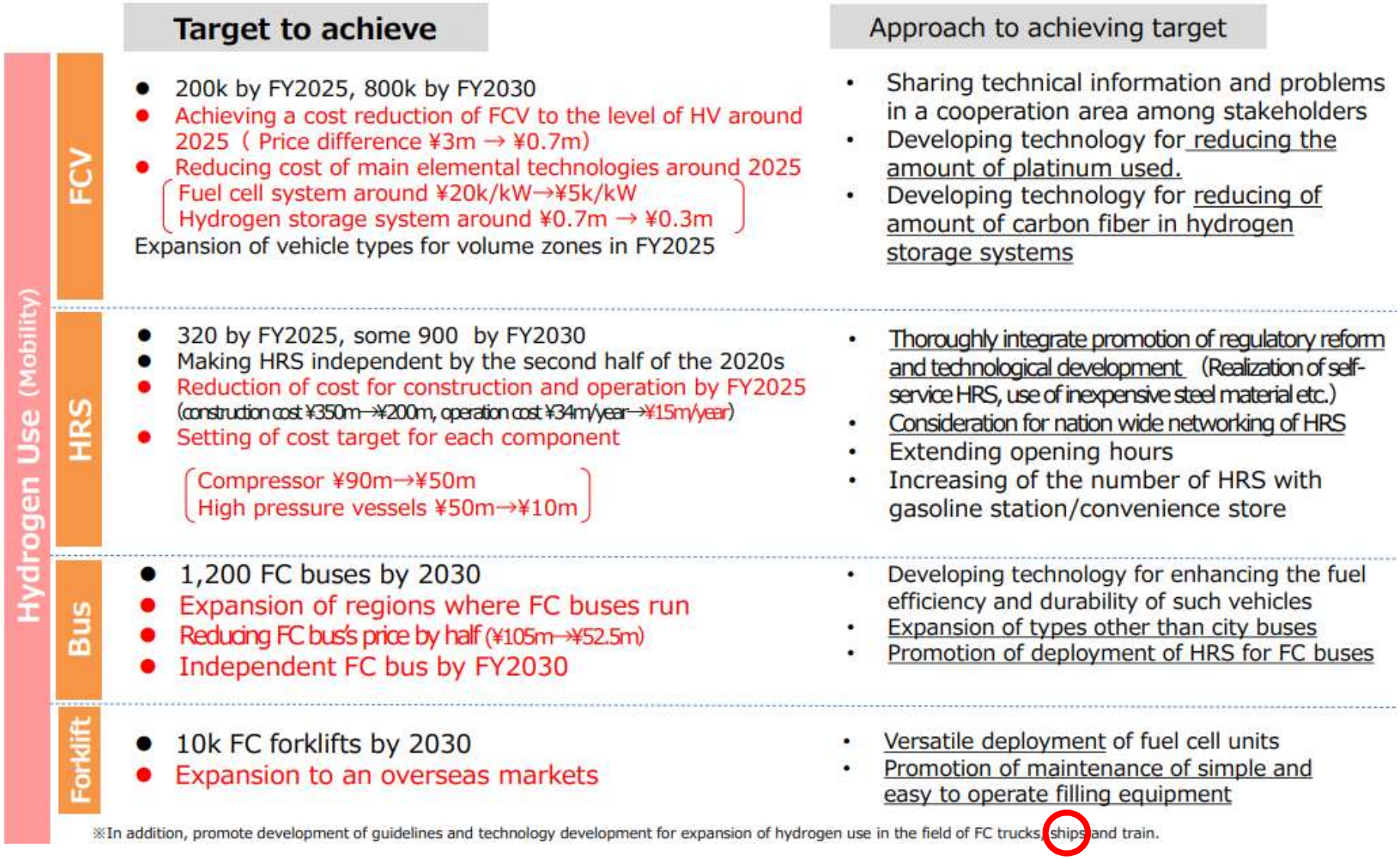
Source: Ministry of Economy, Trade and Industry

Strategic Roadmap for Hydrogen & Fuel Cells

		Goals in the Basic Hydrogen Strategy		Set of targets to achieve	Approach to achieving target
Use	Mobility	FCV 200k by 2025 800k by 2030	2025	● **Price difference between FCV and HV** (¥3m → ¥0.7m) ● **Cost of main FCV system** (FC ¥20k/kW → ¥5k/kW; Hydrogen Storage ¥0.7m → ¥0.3m)	• Regulatory reform and developing technology
		HRS 320 by 2025 900 by 2030	2025	● **Construction and operating costs** (Construction cost ¥350m → ¥200m; Operating cost ¥34m → ¥15m) ● **Costs of components for HRS** (Compressor ¥90m → ¥50m; Accumulator ¥50m → ¥10m)	• Consideration for creating nation wide network of HRS • Extending hours of operation
		Bus 1,200 by 2030	Early 2020s	● Vehicle cost of FC bus (¥105m → ¥52.5m) ※In addition, promote development of guidelines and technology development for expansion of hydrogen use in the field of FC trucks, ships and trains.	• Increasing HRS for FC bus
	Power	Commercialize by 2030	2020	● Efficiency of hydrogen power generation (26%→27%) ※1MW scale	• Developing of high efficiency combustor etc.
	FC	Early realization of grid parity	2025	● Realization of grid parity in commercial and industrial use	• Developing FC cell/stack technology
Supply	Fossil Fuel +CCS	Hydrogen Cost ¥30/Nm3 by 2030 ¥20/Nm3 in future	Early 2020s	● Production: Production cost from brown coal gasification (¥several hundred/Nm3→ ¥12/Nm3) ● Storage/Transport : Scale-up of Liquefied hydrogen tank (thousands m³→50,000m³) Higher efficiency of Liquefaction (13.6kWh/kg→6kWh/kg)	• Scaling-up and improving efficiency of brown coal gasifier • Scaling-up and improving thermal insulation properties
	Green H2	System cost of water electrolysis ¥50,000/kW in future	2030	● Cost of electrolyzer (¥200,000m/kW→¥50,000/kW) ● Efficiency of water electrolysis (5kWh/Nm3→4.3kWh/Nm3)	• Designated regions for public deployment demonstration tests utilizing the outcomes of the demonstration test in Namie, Fukushima • Development of electrolyzer with higher efficiency and durability

Source: Ministry of Economy, Trade and Industry

Action Plan (mobility) on the RM



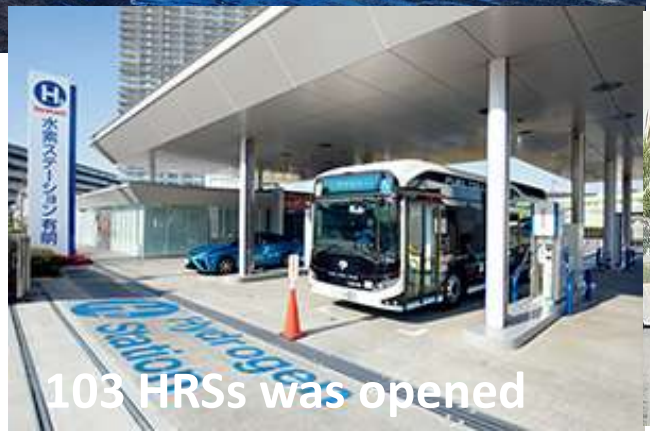
Source: Ministry of Economy, Trade and Industry

Current status of Fuel Cell application

15 Fuel Cell Bus (Toyota SORA)
Regular operation in Tokyo

3,200 FCVs was registered

140 FCFL

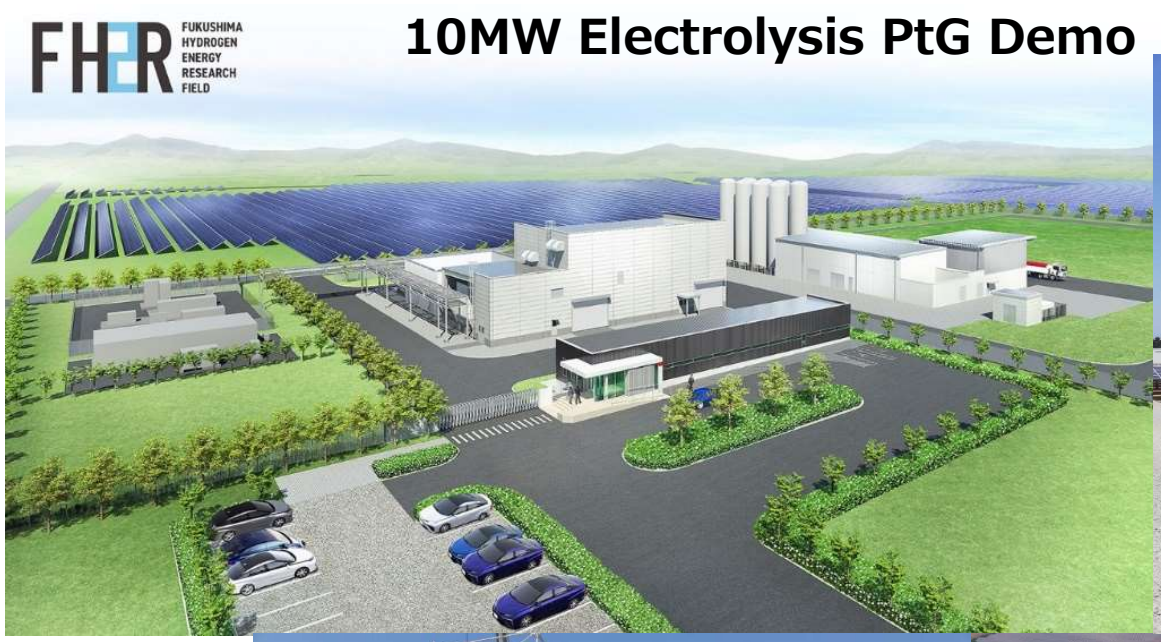


103 HRSs was opened

FC delivery track

RD&D: Scaling-up

10MW Electrolysis PtG Demo



Related Activities: Maritime application

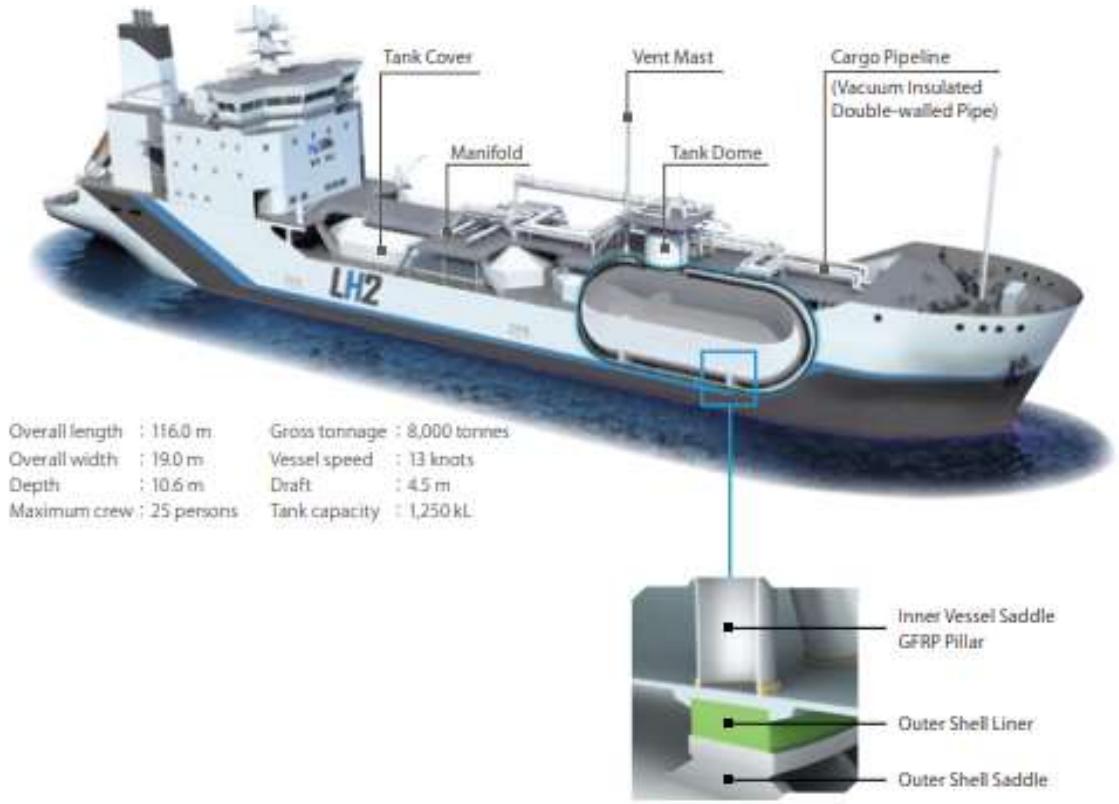
"Raicyo (Ptarmigan) N"
Tokyo University of Marine Science and Technology
Gross tonnage: 9.1 tons
The length of the ship: 12.60 meters
Maximum speed at full load: 11 knots
Fuel cell: PEFC 7 kW (3.5 kW x 2)
Battery: Lithium ion 145 kWh (13.2 kWh x 11 pack)
Propulsion motor: 90 kW (45 kW x 2)

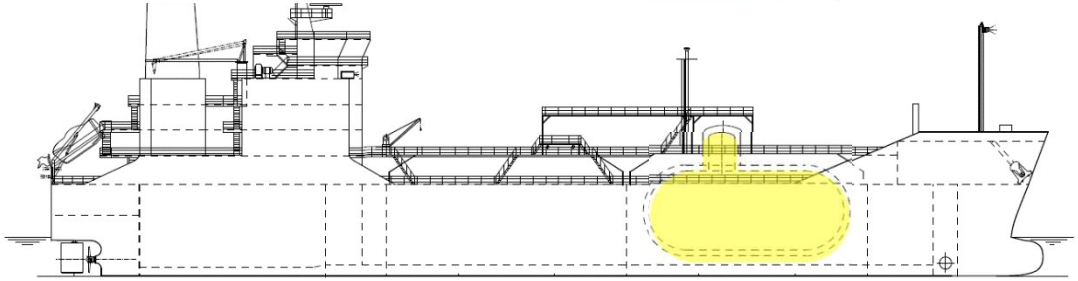
Source: Tokyo University of Marine Science and Technology

"PHEB-3" Osaka City University
Gross tonnage: 2.6 tons
The length of the ship: 9.6 meters
Rated speed: 8 knots
Battery: 24kWh（96V）、2.4kWh（24V）、
1.2kWh（12V）
Propulsion motor: 12 kW (6 kW x 2)

Source: Osaka City University

Related Activities: Transportation

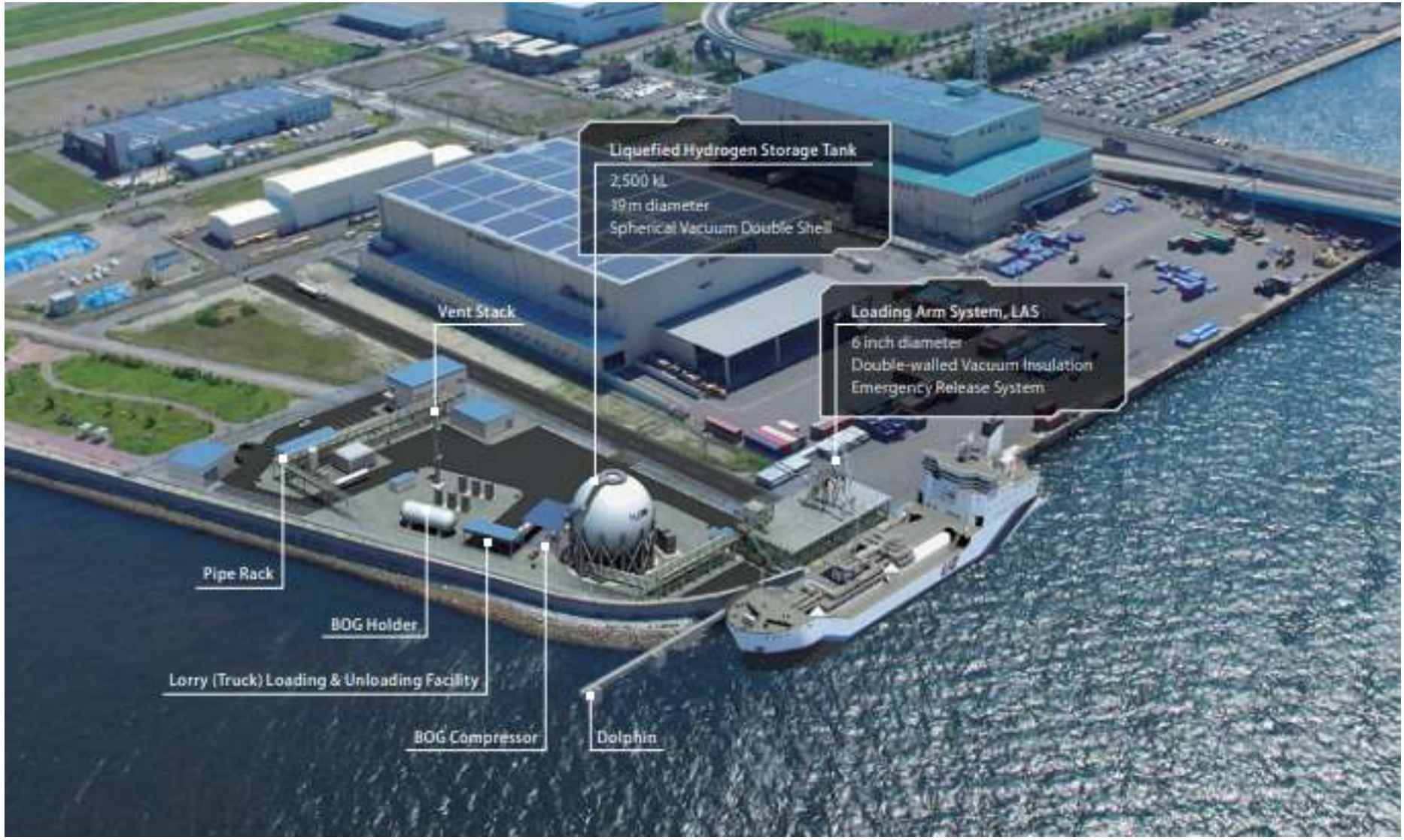




Hydrogen Storage:
- 1,250m^3 x 1 / 75t-H_2
- vacuum insulated
  double-walled structure
- Boil off rate: 0.1 vol %

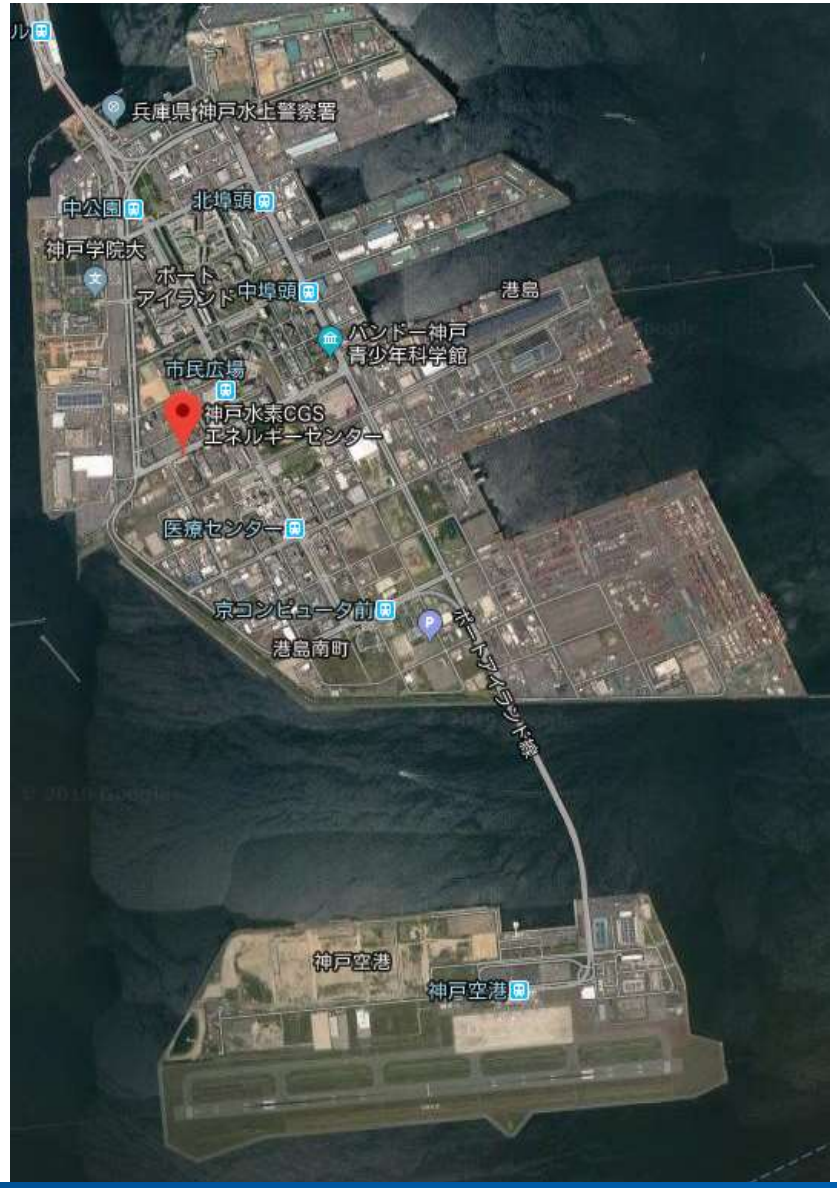
Source: CO_2-free Hydrogen Energy Supply-chain Technology Research Association (HySTRA)

Related Activities : Transportation



Source: CO_2-free Hydrogen Energy Supply-chain Technology Research Association (HySTRA)

Related Activities: @port



Total operation hours: 699 hours
- with hydrogen: 444 hours
  - Hydrogen only: 49 hours
  - H2/NG: 395 hours
- NG only: 255 hours

H2 Consumption: 179,000 Nm3 (16t)
Total Power Generation: 822 MWh
Total Steam Distribution: 547 t
Estimated CO_2 reduction: 109t

Source: KHI, Obayashi

Related Activities: @port

Concept of FC towing tractor

reddot award 2017
winner

Item		Spec
Output	Rated	8kW
	Peak	32kW
H_2 Refueling		35MPa, 1kg (3min)
Working time		8hours
Price: JPY 13,400,000- (US$ 127K)		

Source: Toyota Industries Corporation

Thank you!