

Kawasaki Hydrogen Road

Delivering Large Quantities of Hydrogen Affordably, Stably and Safely.

International Partnership for Hydrogen and
Fuel Cell in the Economy Country Update

In Kobe, JAPAN

11th, May, 2018

Hydrogen Road

Technology Paving the way the Hydrogen Road.

Hydrogen Production

Producing clean, low-cost hydrogen from various resources.

Hydrogen Transportation & Storage

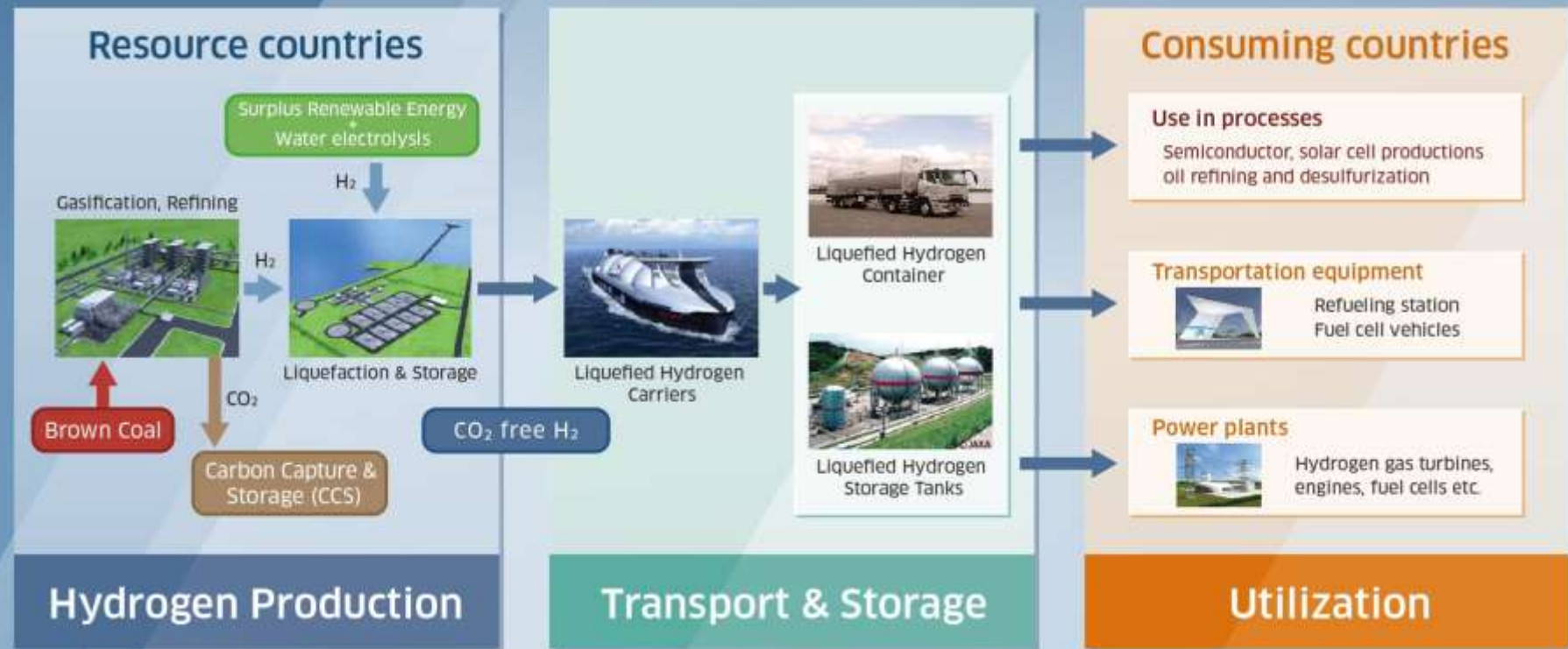
Transportation/storage technology to help disseminate hydrogen energy.

Hydrogen Utilization

Sustainable future realised by hydrogen energy.

Stable energy supply with near zero CO₂ emissions

Stable energy supply with CO₂ emission suppression



Hydrogen Production

The "Hydrogen" solution takes advantage of previously unused resources.

Half of the world's coal is comprised of brown coal. Produce low-cost hydrogen from this abundant, unused resource.

Australian brown coal project

Latrobe Valley, Victoria :
Equivalent to total amount of power
consumption of 240 years of Japan

CCS: CO₂ Storage Location



CarbonNet Project is being promoted by the Australian and Victorian Governments.

Producing hydrogen from Renewable energy

By combining renewable energies and water electrolysis, both production and utilization of hydrogen can be free of CO2 emissions.

Hydrogen made by unstable energy resources can be stored and used when need arises.

Liquid Hydrogen: The Key to Large-Volume Transportation

Kawasaki's cryogenic technology makes large-volume transportation of hydrogen possible.

-253°C

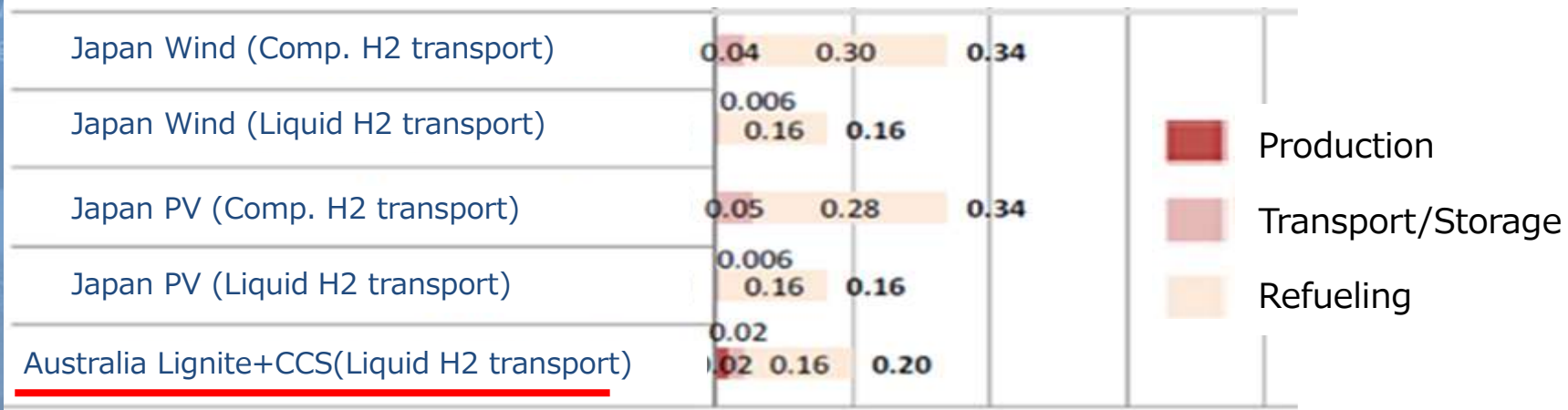


$\frac{1}{800}$

When cryogenically cooled to -253°C, hydrogen changes from a gaseous state to a liquid state, 1/800 of its gaseous volume.

LCA analyzed by Mizuho Information & Research Institute

Well-to-Tank CO₂ emission per 1Nm³-Hydrogen [kg-CO₂e/Nm³-H₂]





Kawasaki Hydrogen Road

Realizing -253°C , cryogenic temperature

Developed Japan's first industrial
hydrogen liquefaction system.

Based on Kawasaki's cryogenics and turbo
machinery technologies, hydrogen liquefier
was developed.

Hydrogen Transportation & Storage



The future proposed by Kawasaki:
Large-scale liquid hydrogen carrier.

Large-scale liquid hydrogen carrier

Cargo size: 40,000m³ x 4

Evaporated hydrogen gas-fuelled engine

Hydrogen Potential from Overseas



Built on more than 25 years of working with rocket fuel



Largest Japanese domestic liquid hydrogen storage tank, equipped with advanced insulation technology for minimising boil-off gas



Type	Spherical double-shell tank
Storage Volume	540m ³

Liquid hydrogen containers to enable on-land transport of liquid hydrogen



Type	ISO 40ft-type container
Volume	45.6m ³

Hydrogen Utilization

Future Society with Widespread Hydrogen Energy
Use in Sight



Hydrogen Refueling Station



Hydrogen gas turbine

Hydrogen Gas Turbine

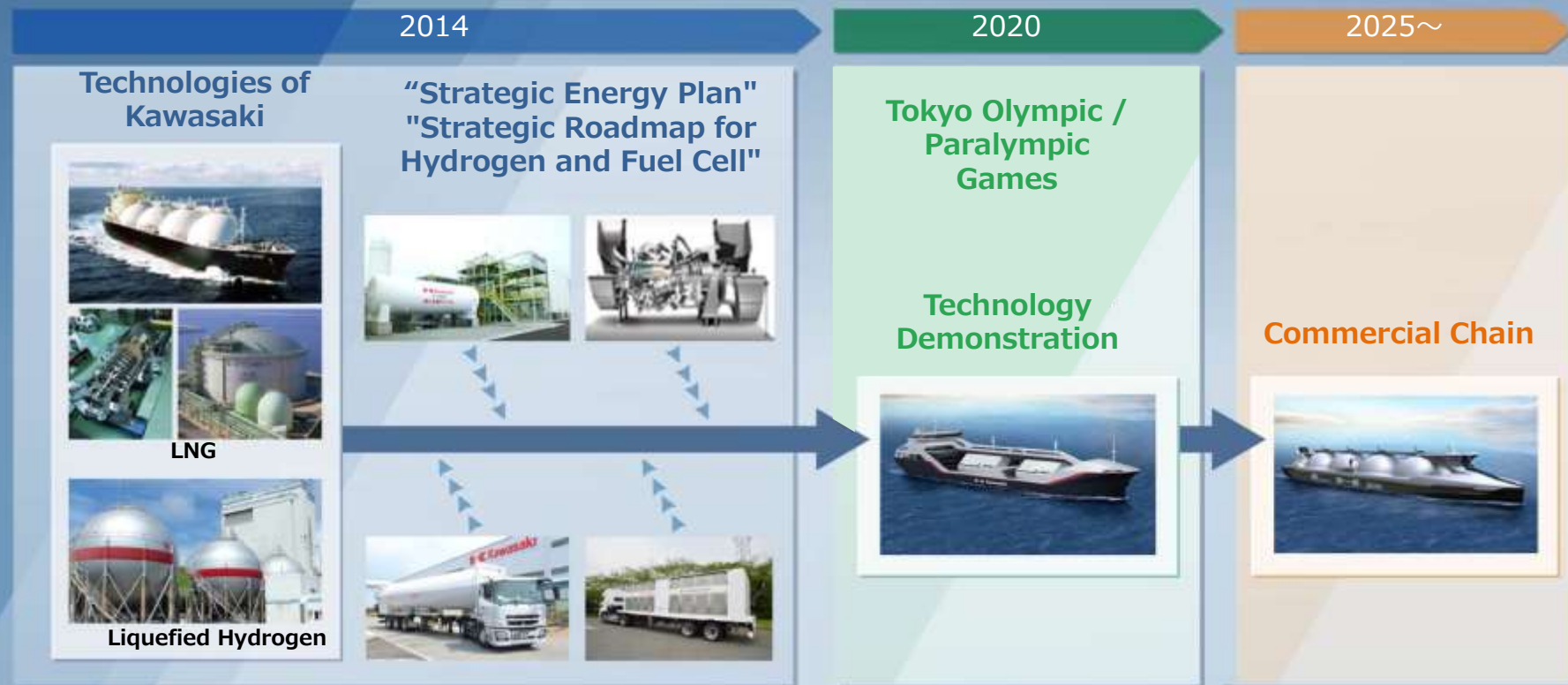
Hydrogen-Natural gases mixed combustion : Demonstrated in our factory
Pure hydrogen gas combustion : Being demonstrated* in Kobe city

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



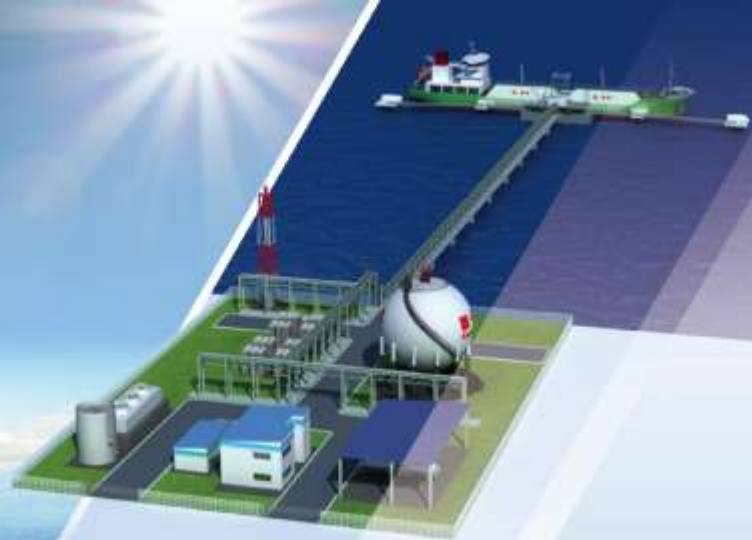
Gas turbine system

Progress of Hydrogen Project



Technology Demonstration

- Brown coal gasification
- Loading and unloading of liquid hydrogen
- Transportation of massive amount of liquid hydrogen



Supported by NEDO
Demonstrate in 2020,
Tokyo Olympic Game year

Promoting the Technology Demonstration

Collaboration with Kobe City

Commencement ceremony on
26th, April, 2018

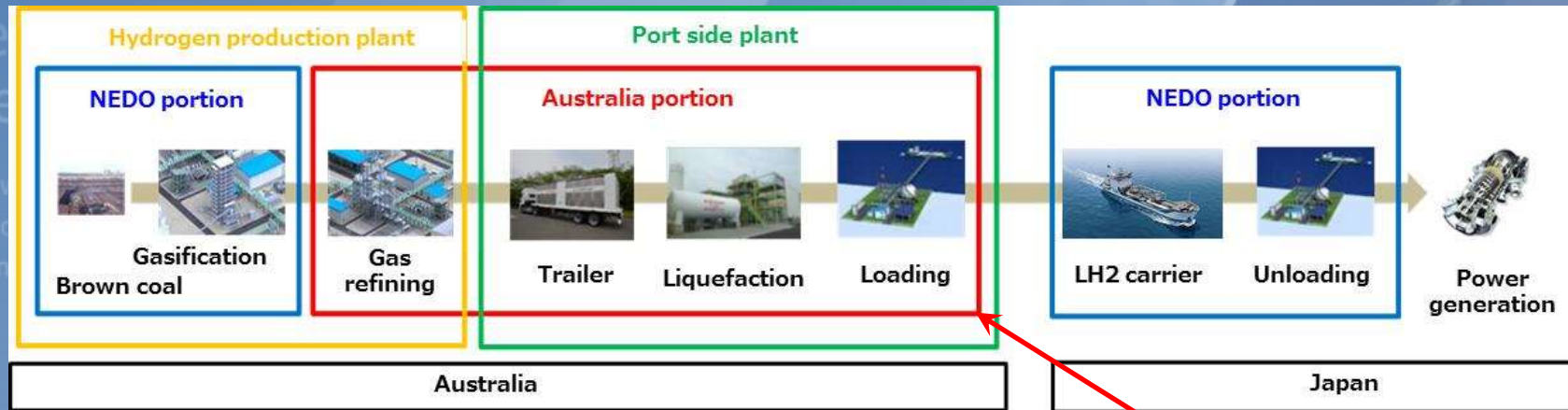
Northeast of Kobe Airport

Approximately 1 ha

Established here

An aerial photograph showing a coastal industrial or port area. In the foreground, there's a large, flat, light-colored area, possibly a parking lot or construction site. To the right, there are several large industrial buildings with blue roofs. A road or railway line runs along the coast. In the background, the sea is visible, and further out, there are more industrial structures and cranes. A blue callout box with the text 'Established here' points to a specific location on the coast.

Announcement of Technical Demonstration in Australia



- Australian portion subsidization was announced in Latrobe Valley on 12th, April
- Prim minister Turnbull and ministers attended the event
- METI and NEDO also attended from Japan
- Kawasaki Heavy Industries, J-POWER, Iwatani Corp, Marubeni and AGL attended from the private sector

Hydrogen Society

This dream energy will help create a sustainable future.

