MOE

MOEJ's Green Hydrogen Vision

1st March, 2024

Yoshinori SUGA

Director for Sustainable Infrastracture

Office of Director for International Cooperation for Transition to Decarbonization and Sustainable Infrastructure,

Ministry of the Environment, Japan (MOEJ)

SUSTAINABLE DEVELOPMENT GOALS

Re-Style

COOL CHOICE

つなげよう、支えよう 森里川海

Plastics Smart

Basic Hydrogen Strategy

MOE

● "Basic Hydrogen Strategy" (Former Prime Minister Abe's Initiative)

- ✓ **First comprehensive national strategy**
- ✓ **H_2 as a future energy option toward 2050**
- ✓ **Goals : making H_2 affordable**
  ($3/kg by 2030 ⇒ $2/kg by 2050)

3 conditions for realizing affordable hydrogen

【Supply】 ① **Inexpensive feedstock** (unused resources, renewables)
② **Large scale H_2 supply chains**
【Demand】 ・・・ ③ **Mass usage** (Mobility ⇒ Power Generation ⇒ Industry)

● Key Technologies to be Developed

Production
- Electrolysis System
- Gasification + CCS

→ **Transportation**
- Energy Carrier
(LH_2, MCH, NH_3, etc.)

→ **Use**
- Fuel Cells (Mobility, Generation)
- H_2-fired Generation

Updated Basic Hydrogen Strategy

- **Key points of the revised "Basic Hydrogen Strategy"**
  - ✓ Targets and cost targets for the introduction of hydrogen and other substances are set.
  - ✓ Target of around 15 GW of water electrolysers to be installed by Japanese-related companies in Japan and abroad by 2030.

	2030	2040	2050
Hydrogen and other introduction targets	3 million tonnes	12 million tonnes	20 million tonnes
cost target	¥30 /Nm3	-	¥20 /Nm3

  - ✓ Supply chain establishment. Organising support schemes for supply infrastructure development.
  - ✓ G7 agreement on carbon intensity, transition to low carbon hydrogen, etc.
- **Hydrogen Industry Strategy (Policy to enhance industrial competitiveness).**
  - ✓ Aiming for a world where Japan's core hydrogen technologies (fuel cells, water electrolysis, power generation, transport, sub-materials, etc.) are utilised in all hydrogen businesses, taking advantage of Japan's technological strengths.
- **Hydrogen security strategy (policy for safe utilisation).**

Development of Hydrogen Usage Technologies

FC Forklift

Courtesy of Toyota Industries Corp.

- R&D 2014-2016
- Released from 2016

FC Bus

Courtesy of Toyota Motor Corp.

- R&D 2013-2015
- Released from 2017

FC Power Supply Vehicle (2019-2021)

Courtesy of Denyo Co., Ltd.

FC Truck (2016-2019)

Courtesy of Tokyo R&D Co., Ltd.

FC Vessel (2014-2015)

Courtesy of Toda Corp.

FC Garbage Truck (2015-2017)

Courtesy of Flat Field Co ., Ltd.

[1] **F**uel **C**ell

Demonstration Projects for Hydrogen Supply Chain using Local Resources and Infrastructure

MOE

Production

Water Electrolysis

Renewable Energy

By-product

By-product of Caustic soda production, etc.

Transformation

Gasification of used plastics

Reformation of biogas

Storage & Transportation

Compressed hydrogen fuel trailer

Compressed hydrogen tube trailer

Hydrogen-absorbing alloys carried by delivery trucks

Hydrogen fueling truck

Pipelines

Use

Fuel Cell

Swimming Pool

Children's Clubhouse

Fish Breeding facilities

Hotels / Buildings

FCV[2]s

FC[1] Buses

FC[1] Forklifts

CO2 Free Energy Sources / Sources of H2

Transportation of H2

Applications

[1] Fuel Cell
[2] Fuel Cell Vehicle

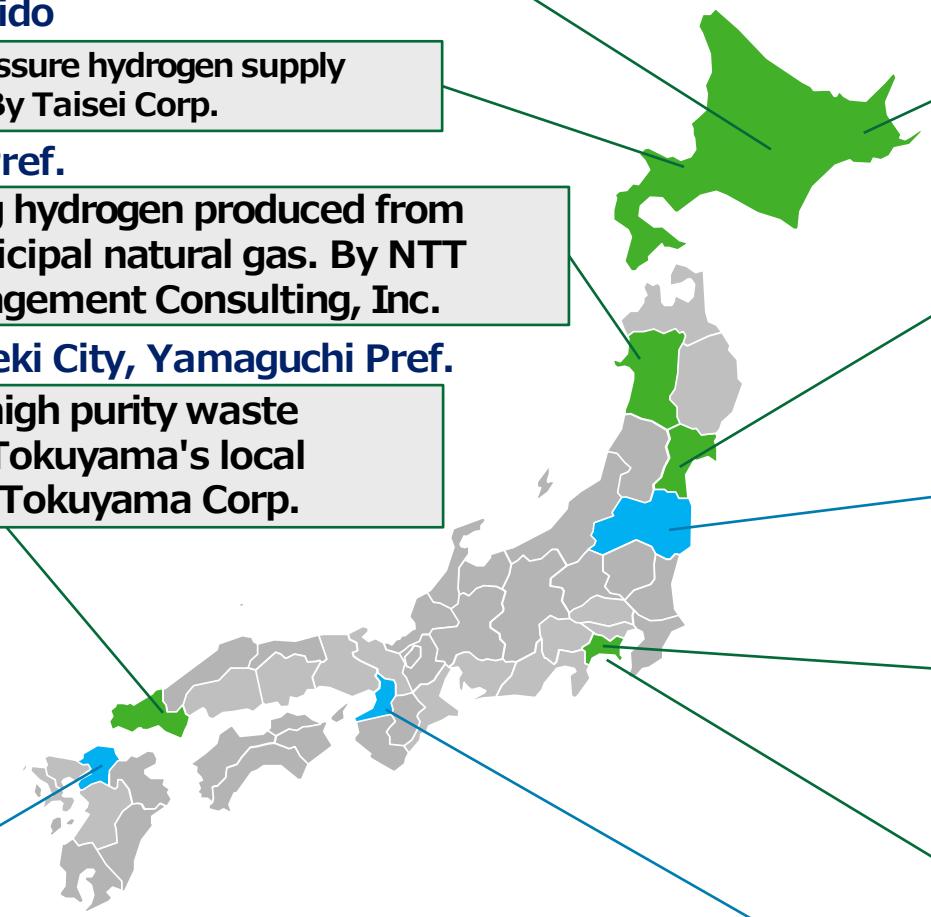
Hydrogen Supply Chain Projects

MOE

Conducting supply chain demonstrations that produce, carry and use hydrogen by utilizing local resources for a construction of self-sustaining decentralized societies. (Gray boxes were finished.)

: Prefectures demonstrating a regional, low carbon hydrogen supply chain

: Prefectures creating and demonstrating low-cost hydrogen models using existing facilities and infrastructures (As of March 2022)



②Shikakoi Town, Hokkaido

Demonstration using clean hydrogen (biogas from livestock excreta). By Air Water INC

⑧Muroran City, Hokkaido

Demonstration of low pressure hydrogen supply chain using wind power. By Taisei Corp.

⑦Noshiro City, Akita Pref.

Demonstration mixing hydrogen produced from wind power with municipal natural gas. By NTT Data Institute of Management Consulting, Inc.

③Shunan & Shimonoseki City, Yamaguchi Pref.

Demonstration using high purity waste hydrogen supplied by Tokuyama's local caustic soda plant. By Tokuyama Corp.

⑨Kitakyushu City, Fukuoka Pref.

Demonstration using green hydrogen from waste-to-energy and local renewable energy. By Kitakyushu Power Co., Ltd.

⑤Shiranuka Town, Hokkaido

Demonstration using clean hydrogen (small hydraulic power). By Toshiba Corp.

⑥Tomiya City, Miyagi Pref.

Demonstration of low carbon supply chain utilizing existing distribution network and pure hydrogen fuel cell. By Hitachi Ltd.

⑩Namie Town, Fukushima Pref.

Demonstration constructing a low-cost renewable hydrogen supply chain. By Obayashi Corp.

④Kawasaki City, Kanagawa Pref.

Demonstration using waste plastics for hydrogen. By Showa Denko K.K

①Kawasaki & Yokohama City, Kanagawa Pref.

Demonstration using clean hydrogen (wind power). By Toyota Motor Corp.

⑪Osaka City, Osaka Pref.

Demonstration of supply chain using methanation of clean hydrogen (renewable power) and biogas from compostable waste in cityside. By Osaka Gas.

Deliver hydrogen to home～Hydrogen in daily life～

MOE

❻Tomiya City, Miyagi Pref.

Water electrolyzer from Solar power

3 Hydrogen absorbing alloys in a cassette (17 kg / cassette)

Fuel-Cells for Home

Delivery

Delivery

Fuel-Cells
- Co-op (Supermarket)
- Children's clubhouse

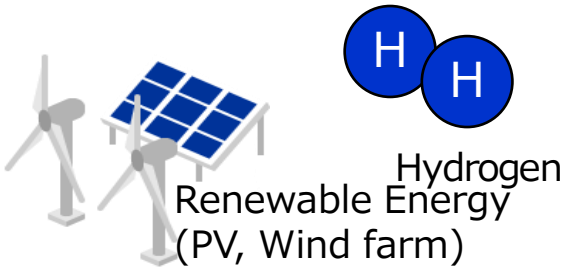
Co-op truck for delivery

Handling hydrogen in daily life

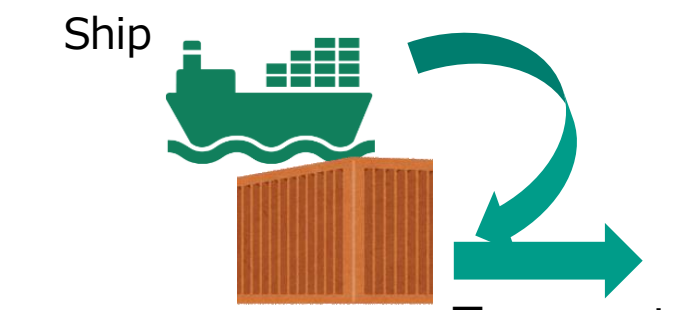
Pilot project for comprehensive support throughout the whole hydrogen supply chain abroad

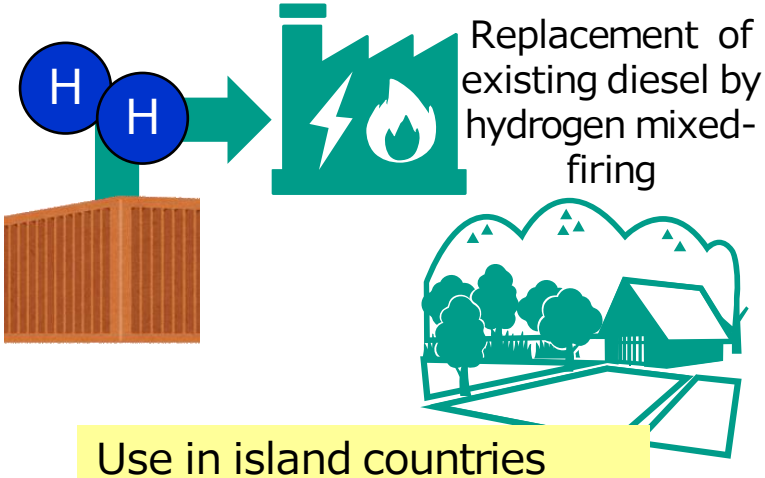
■ Cultivate demand market by supplying renewable hydrogen to island countries, which will lead to JCM projects and help developing countries transition to a decarbonized society.

Production | **Storage & Transportation** | **Supply & Use**



Produce hydrogen by using surplus RE in a third country
※Large amount of surplus RE is needed. (ex. Australia)





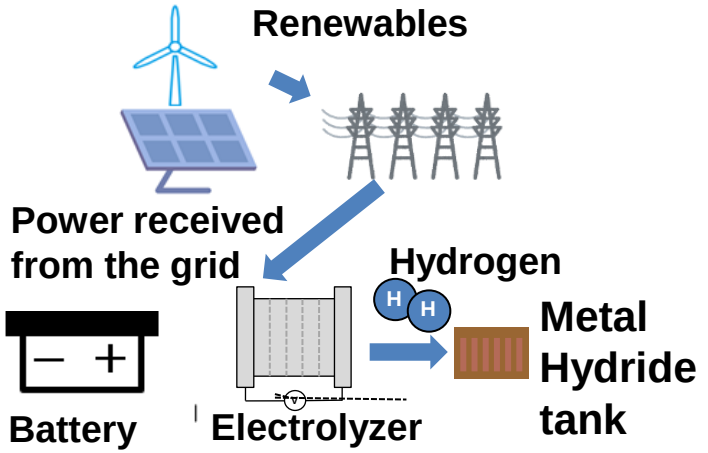
Future Vision
JCM project, horizontal expansion

※This project start from FY2021 as a part of JCM model project

Pilot Project 1: Marubeni Corporation

■ Production of economical green hydrogen in South Australia, transportation of hydrogen by metal hydride to Indonesia and utilization of hydrogen through fuel cell in industrial town in Indonesia

Production (South Australia)



- **Effective use of grid surplus power** come from renewable energy
- **Improving the utilization rate of electrolyzer** by using the energy charged in the battery
- Developing and operating **the EMS**

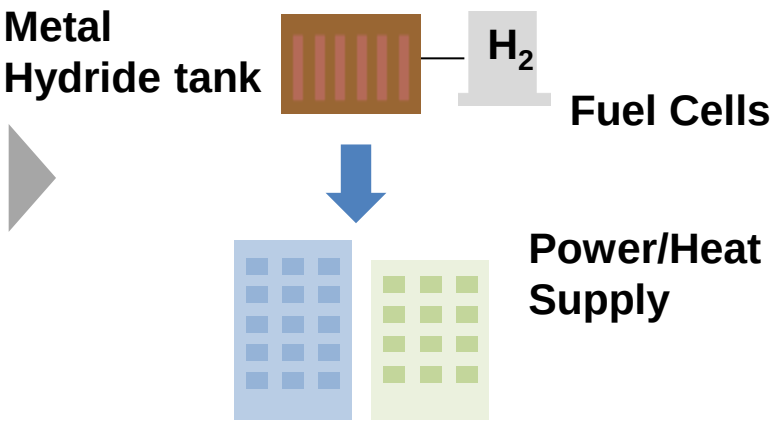
- **Inexpensive and stable production of green hydrogen**
- **Contribution to solving the instability of the grid**

Transportation

- Transport the green hydrogen to Indonesia by using the **metal hydride tank**

- Carriers depending on use and region

Utilization (Indonesia)

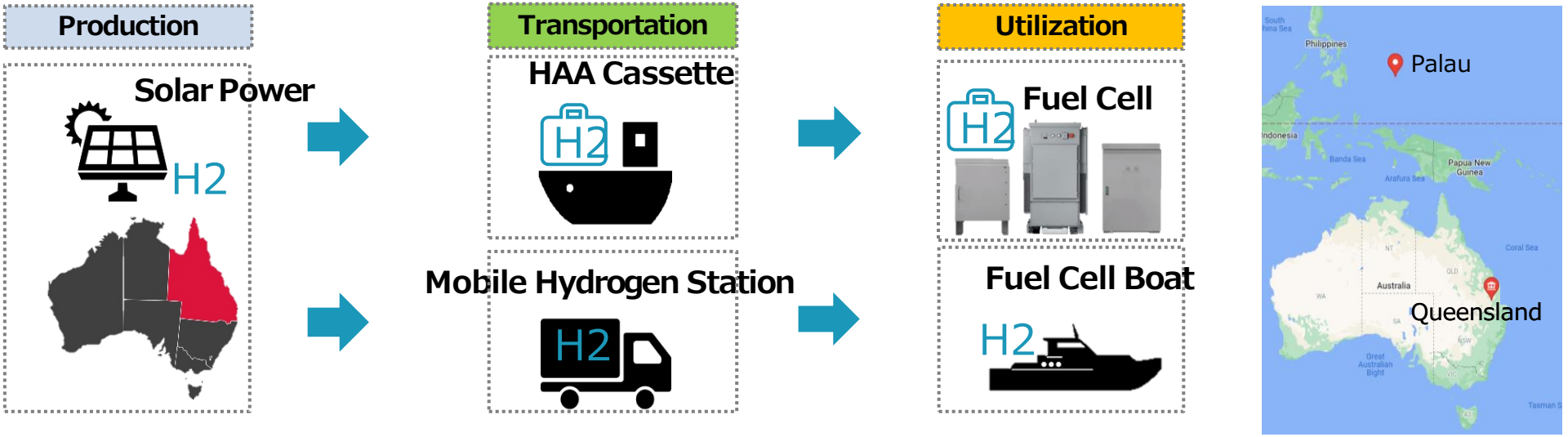


- **Supply power/heat in the industrial town in Indonesia** by using the newly installed 2MW fuel cells in Bekasi, West Java, Indonesia.

- **Alternative to diesel power** in Indonesia and Pacific island countries

Pilot Project 2: Sojitz Corporation

■ Demonstration Project on Green Hydrogen Production in Australia, its Transportation to Palau and Utilization by Fuel Cell and Fuel Cell Boat



- The use of solar power generation to produce green hydrogen in Queensland, Australia

1. Transport hydrogen to Palau by **Hydrogen Absorbing Alloy (HAA) cassette**
2. Transport hydrogen by **Mobile Hydrogen Station**

1. Demonstrations will be conducted with the aim of implementing **stationary fuel cell**
2. Demonstrations with **hydrogen fuel boats** will first be carried out off the coast of Queensland, Australia.

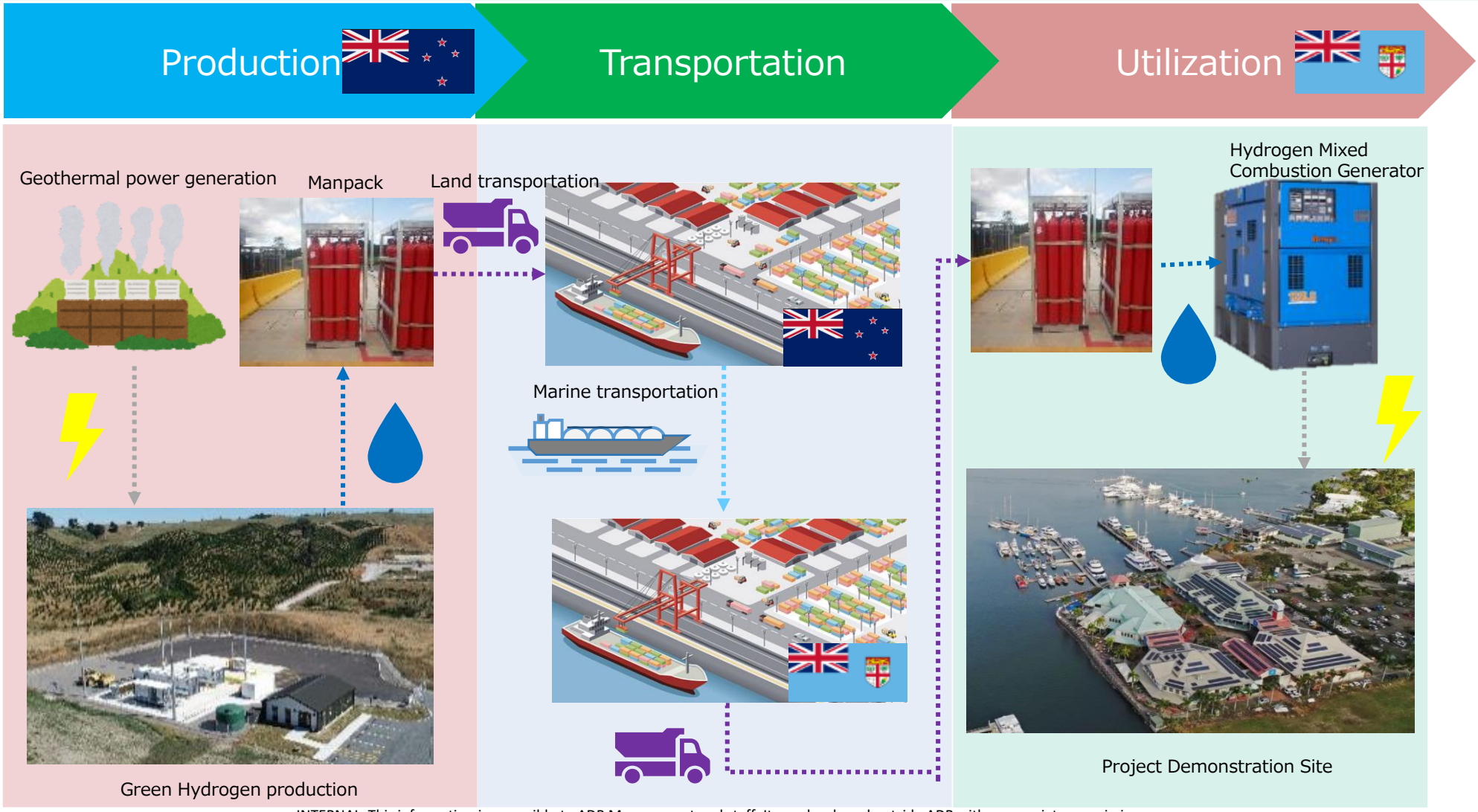
- Contribution to solving the instability of the grid

- Carriers depending on use and region

- **Realization of a distributed power supply and backup power sources**
- **Decarbonization of diesel-powered small vessels,** a transportation vehicle for island nations

Pilot Project 3: Obayashi Corporation

- Renewable hydrogen production from geothermal power using water electrolysis unit in New Zealand, transportation by sea using shipping containers in which hydrogen is compressed and filled.
- Utilization of installed hydrogen-mixed combustion generator at a port facility in Fiji.



Thank you very much for your kind attention!