Hydrogen Society in the World and Japan.
Potential of Egypt and Japan Hydrogen Value Chain for the Sustainable Low Carbon World！

2021 Oct. 20 Egypt - Japan Business Seminar

Dr. Katsuhiko Hirose

CEO and Chief Consultant,HyWealth CO.

WPI Visiting Professor, International Institute for Carbon Neutral Energy Research Kyushu University

Japan's Efforts for Hydrogen

Early Stage (Energy Security)

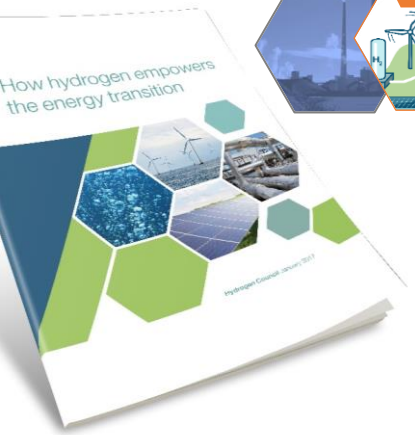
- Alternative fuel for oil and provide clean fuel for unreliable future oil market
- Local emission improvement (Zero Emission Vehicle) and improve energy efficiency (Enefarm)

Latest Target

- Important Vector for Carbon Neutral Society and green grow strategy

Hydrogen can help mitigate all these challenges

Enable the renewable energy system → Decarbonize end uses



Enable **large-scale renewables integration** and **power generation**

Distribute energy across sectors and regions

Act as a **buffer** to increase system resilience

Decarbonize **transportation**

Decarbonize **industrial energy** use

Help decarbonize **building heat and power**

Serve as renewable **feedstock**

SOURCE: Hydrogen Council

Green Growth Strategy Toward Carbon Neutrality by 2050

Goals

- ✔ Cost ($/kg): $3/kg by 2030 & less than $2/kg by 2050
- ✔ Hydrogen demand: up to 3 Mts by 2030 & around 20 Mts by 2050

Hydrogen utilization

- ✔ Deploy FCVs & demonstrate FC trains and FC trucks
- ✔ Demonstrate large scale hydrogen power generation
- ✔ R&D for zero-carbon steel & chemicals
- ✔ Fuel Cells development & incentives for production facility

Production

- ✔ Scale up electrolyzers R&D to reduce cost (PEM & AEM)
- ✔ Innovative R&D to further reduce cost of hydrogen

Transportation/Infrastructure

- ✔ Scale-up international hydrogen supply chain
- ✔ Develop H2 station for FC trucks

Cross- cutting issues

- ✔ Create regional models through demonstration projects
- ✔ Foster international collaborations, including with potential H2 suppliers


FC Truck


Hydrogen Gas Turbines


Zero-carbon steel


Power to Gas


Liquefied H2 carrier

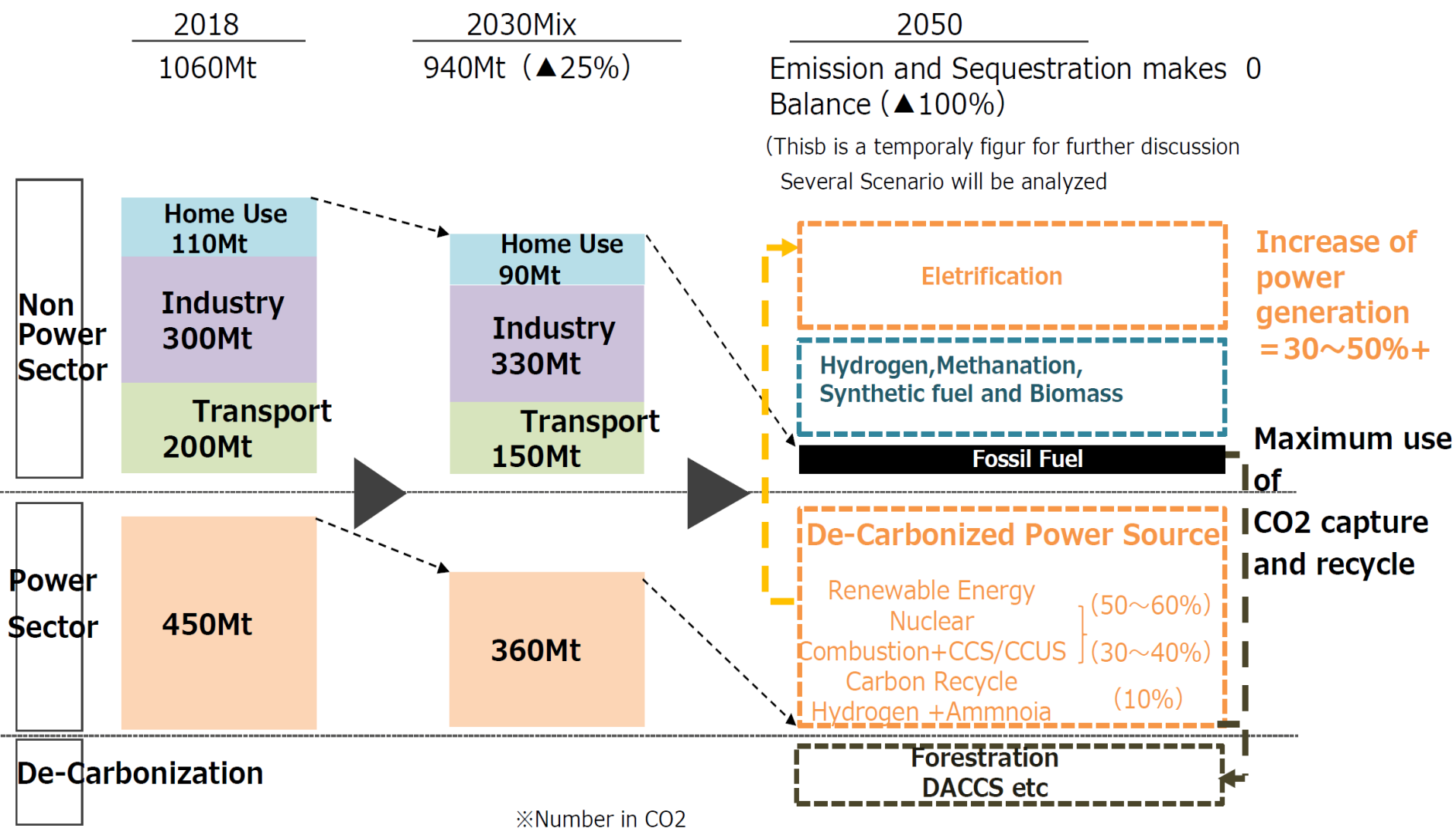

MCH carrier

Support R&D & Deployment

Approx. $19 billion Green Innovation Fund established

Slide from EU-Japan Forum METI presentation

2050 Carbon Neutral CO2 Emission



2050 Carbon Neutral CO2 Emission

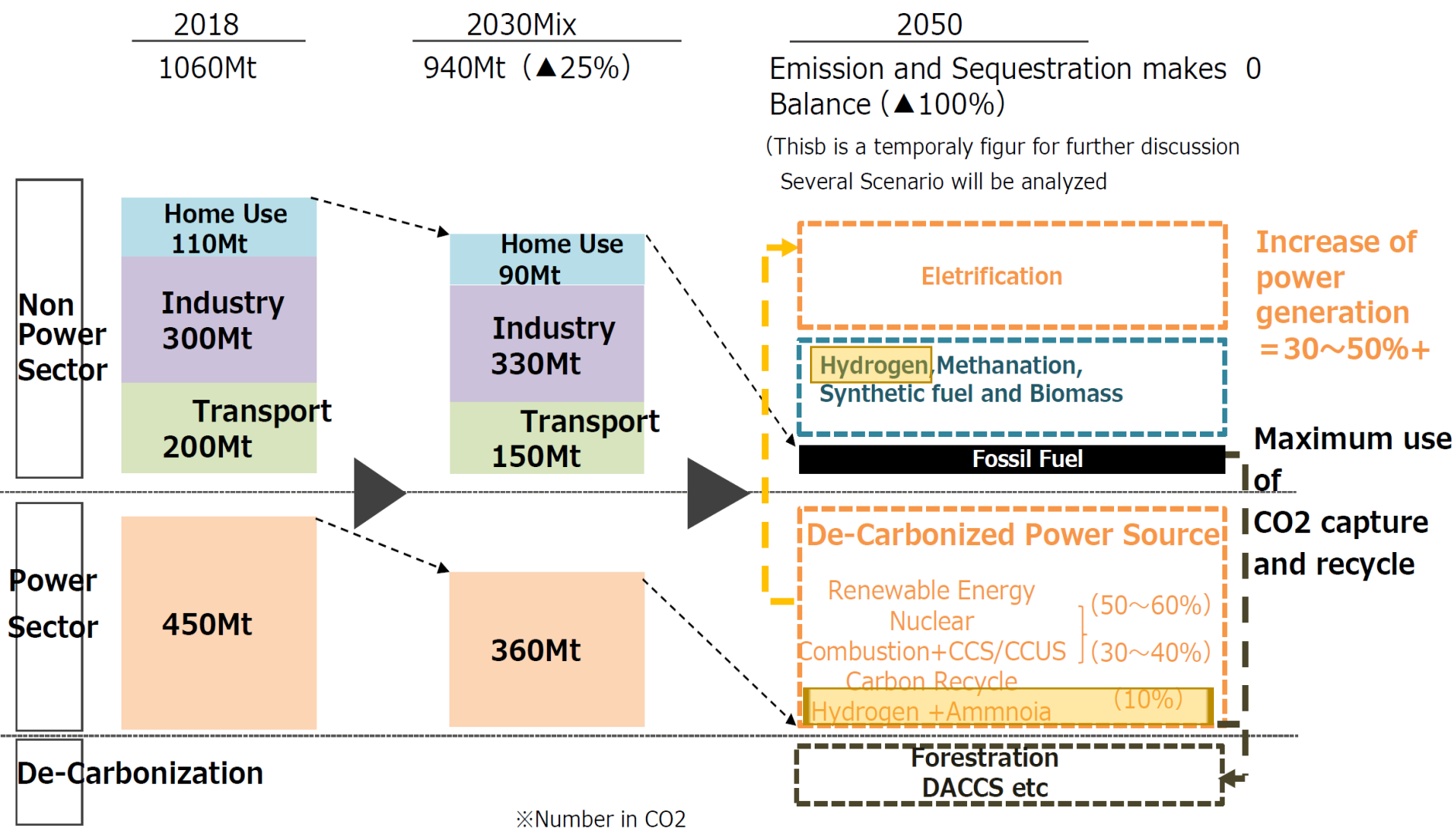
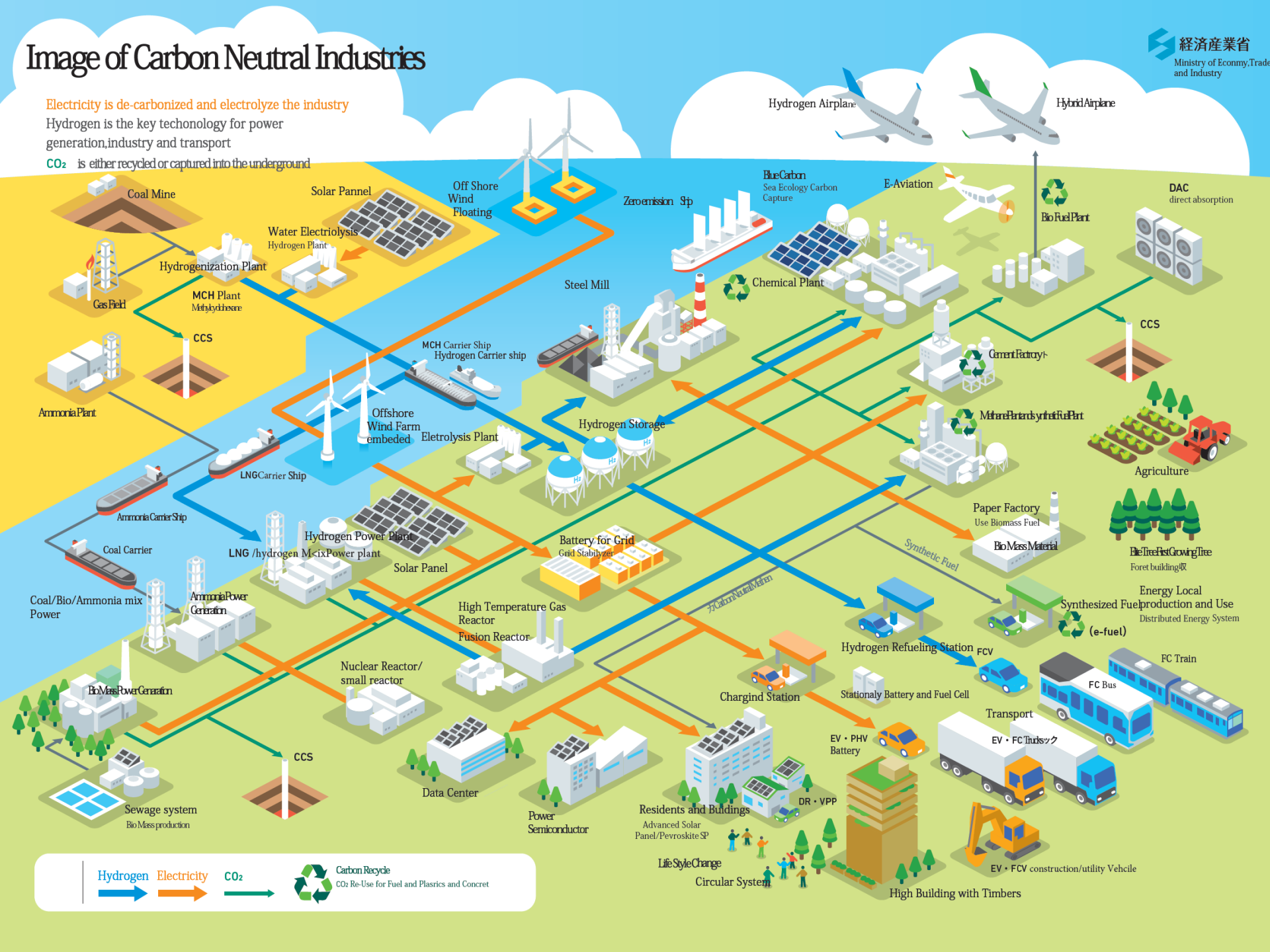


Image of Carbon Neutral Industries

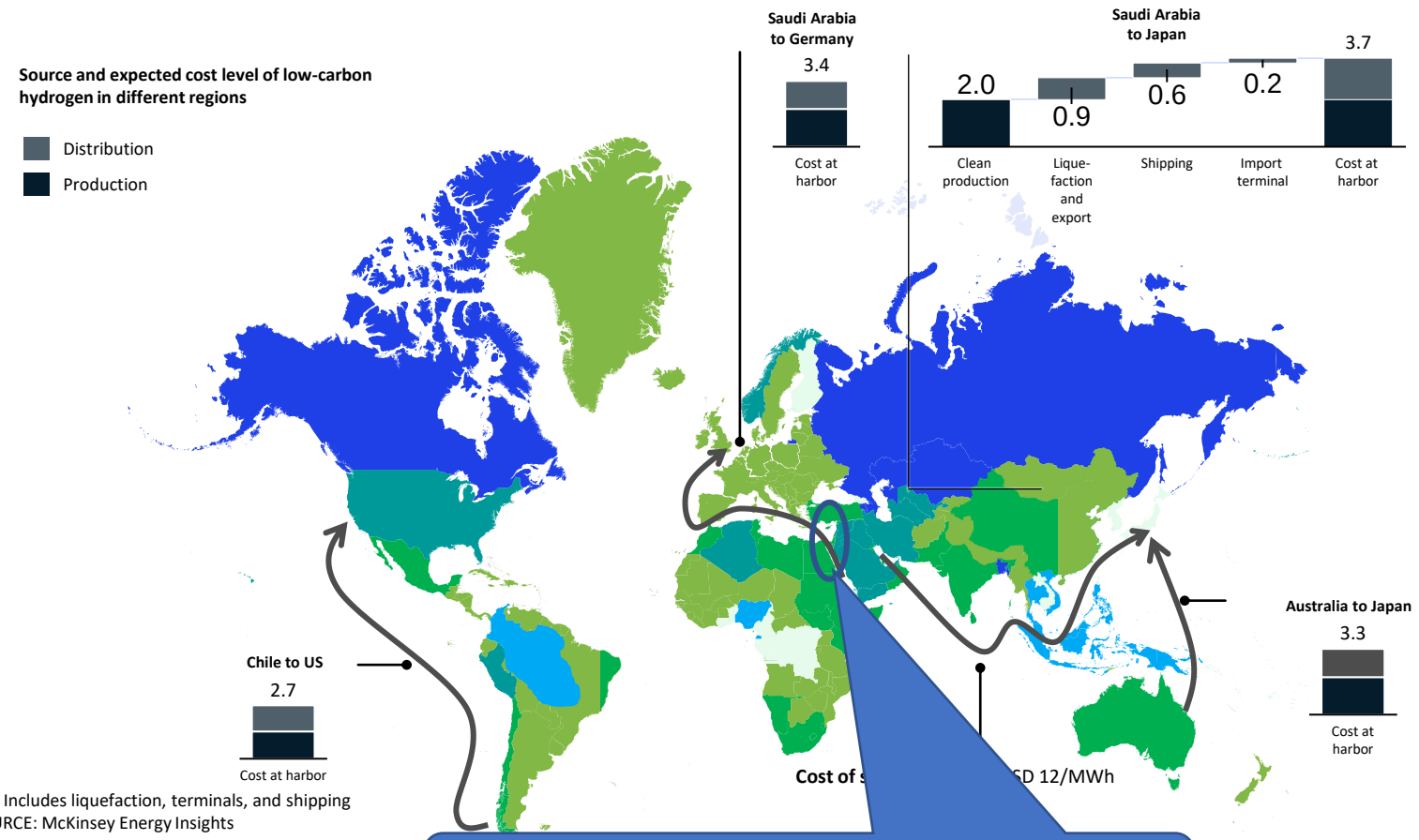
経済産業省
Ministry of Econmy,Trade and Industry

Electricity is de-carbonized and electrolyze the industry
Hydrogen is the key techonology for power generation,industry and transport
CO_2 is either recycled or captured into the underground



GCC/North Africa is the very attractive place to provide Low Carbon Hydrogen to the World

Cost of shipping liquid hydrogen across regions, 2030 (USD/kg)



1. Includes liquefaction, terminals, and shipping
SOURCE: McKinsey Energy Insights

Eygpt has big potential of low cost green hydrogen for Euroep and Japan/asia

8

In progress
R&D

Japan Hydrogen Snapshot I

H_2 Mobility

H_2 Station Network

H2 station for FC bus opened

H_2 Applications

FC bus deployment
104 FC buses

FC Truck development

R&D

5268 FCV

FC train demonstration

FC train

ISUZU HONDA
HINO TOYOTA

FC Truck

Local/regional projects

Fukushima prefecture

a 10M electrolyser with 20M solar PV started

Creating Hydrogen Hubs

"Hydrogen Utilization Study Group in Chubu"

2020

Sumitomo Corporation TOYOTA SMBC and 7 companies

"Hydrogen Utilization Council in Kobe/Kansai area"

Japan Hydrogen Association

2020

JAPAN HYDROGEN ASSOCIATION

Slide from EU-Japan Forum METI presentation

Japan Hydrogen Snapshot II

International hydrogen supply chain

Japan-Brunai Pilot Project

AHEAD

Off-gas

Steam Methane Reforming

Hydro-genation*
(TOL ・MCH)

Chemical Tanker

Dehydro-genation*
(MCH ・TOL)

Japan-Australia Pilot Project

HySTRA

Brown Coal +CCS

Gasification

Liquefied H_2 Carrier*

Loading Facility*

Hydrogen power generation

In Utah State in US, a power generation project started, with a 30% H2 blending by 2025 and 100% H2 by 2045.

LA DWP Los Angeles Department of Water & Power

MITSUBISHI POWER

Plans have also been launched in other states in the United States and Singapore.

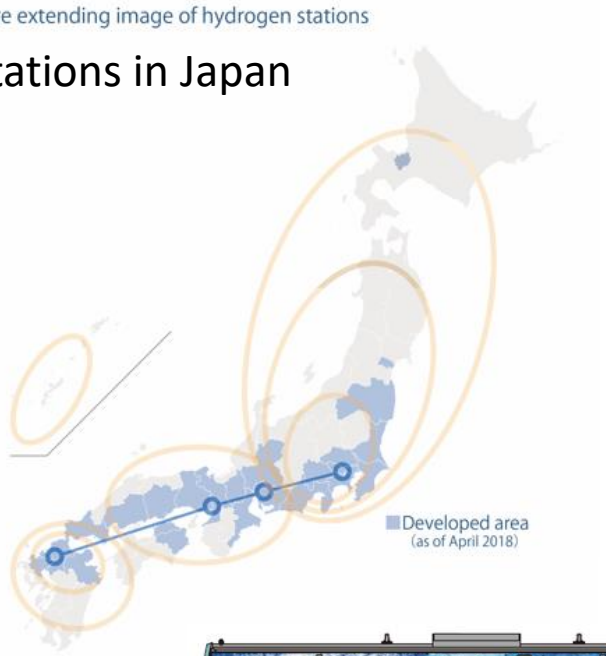
Source: Mitsubishi Power

Stationary Fuel Cells at home

FC CHP* for home use: More than 300,000 units installed

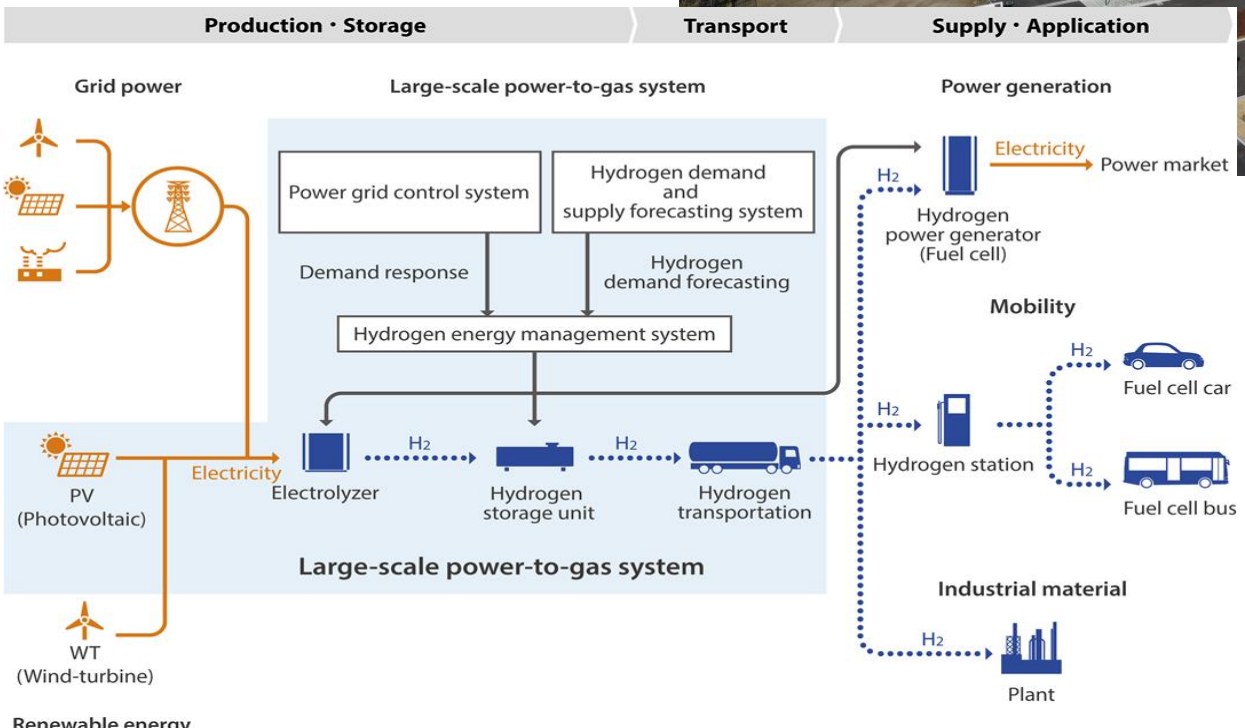
Slide from EU-Japan Forum METI presentation

Hydrogen in transport

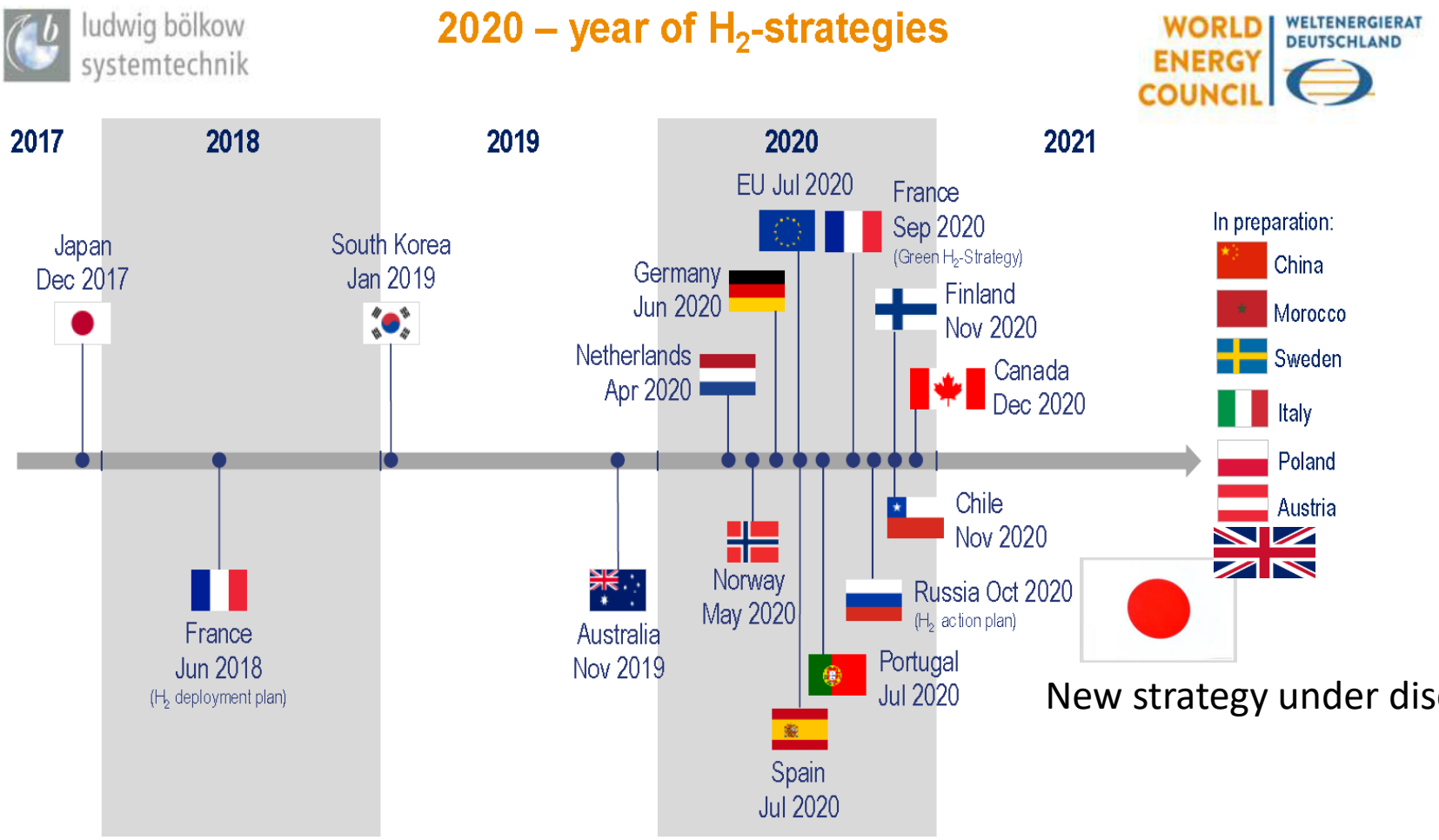


147 Hydrogen stations in Japan

Fukushima
World largest electrolysis facility



Japan led world to adopt hydrogen strategy



Hydrogen transport Technology development
International Liquid Hydrogen transport

Large Demonstration Project
Production of Low Carbon hydrogen, export, import hydrogen system development
Australia to Japan expected first Voyage in 2022

Carrier development

LH2 Carrier Ship
Suiso(Hydrogen) Frontier
2019.12

Other Facility development

Hydrogen
from brown Coal
2020,10

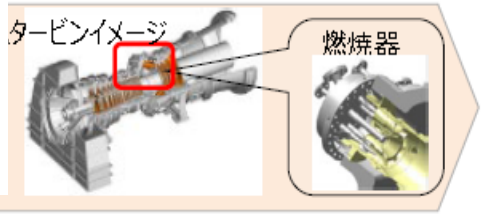
Liquefication
factory
2020, 6

Port Facility to
receive LH2
2020, 6

Power generation from hydrogen

- 500Mw in large scale
- 1MW co-generation
- Involvement for large project world wide
-

- Large Scale 500MW class
- Starting 30% mixture in 2018
- 100% in progress from 2020



- CO-generation system
- 0-100% H2 flexibility
- Starting to supply city(Kobe) in 2018


神戸市のポートアイランドに整備された
水素発電施設（水素CGS）

World in progress

- Netherland
- Mitsubishi Power
- Joining Magnum project440MW Starting operation 2025

- USA Uta
- 840MW power generation
- Starting operation 2025 with 30% Mix
- Toward 100% in 2045

Why Japan Bet for hydrogen

- Energy security
- CO2 reduction-> Achieve carbon Neutrality in 2050
- Value Chain-> Energy and industrial Value Chain

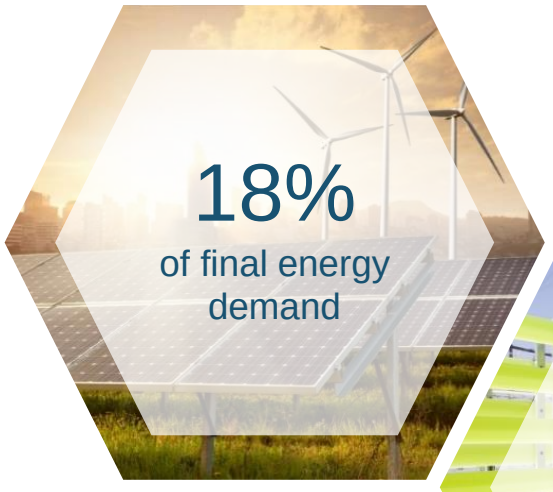
Hydrogen production, transport and application

Japan's innovations in the past are changing the world

- Semiconductor
- Solar Panel
- Lithium-ion battery

Hydrogen can benefit the energy system, environment and economy

Estimated impact in 2050

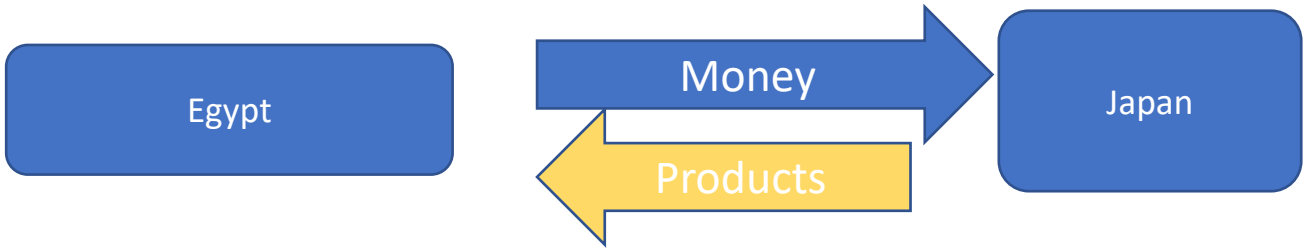


1 Value add of fuel cells

SOURCES: Hydrogen Council, IEA ETP Hydrogen and Fuel Cells CBS, National Energy Outlook 2016

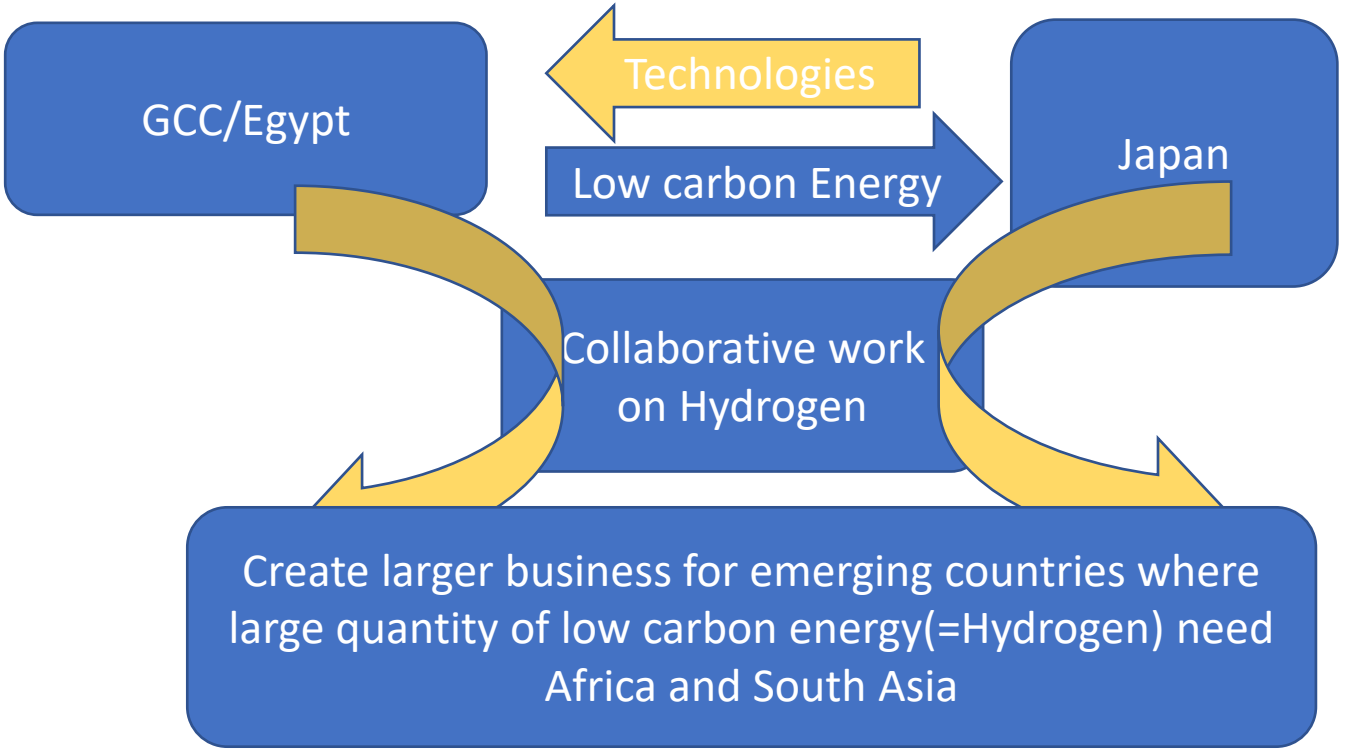
Potential of Future of Egypt and Japan

Now



Energy transition will enhance the relation between the UAE and Japan

Future



“End of stone age was not due to the lack of stone”

The technological innovations and new ideas change the society.

Let’s enjoy designing our future together

Thank you