

Hydrogen Supply from Russia to Japan by SPERA Hydrogen Technology

Chiyoda Corporation
November 6th 2015

1.1 Chiyoda in brief - Who we are

68 years of projects experience
in over **60** countries

**Timely Delivery of
plants**

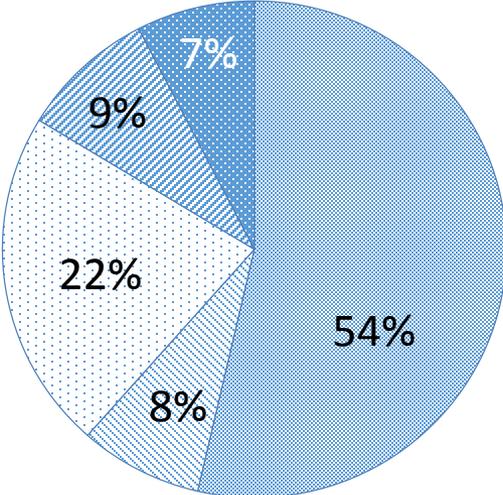
**Reliability No.1
EPC Company**

**High Plant Availability:
No unplanned shutdown**

Courtesy of Qatargas Operating Company Limited

1.2 Chiyoda in brief -Key Figures (FY2014)

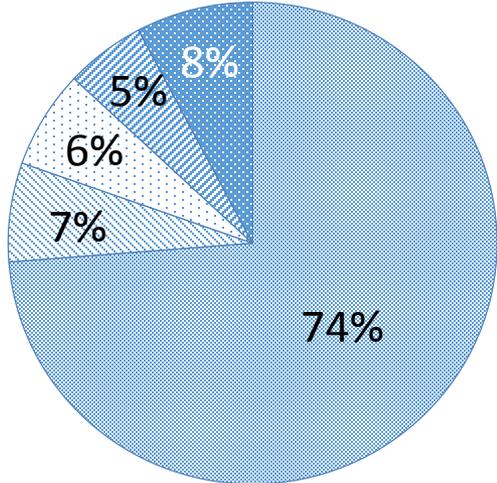
Revenues



4.0

Billion USD

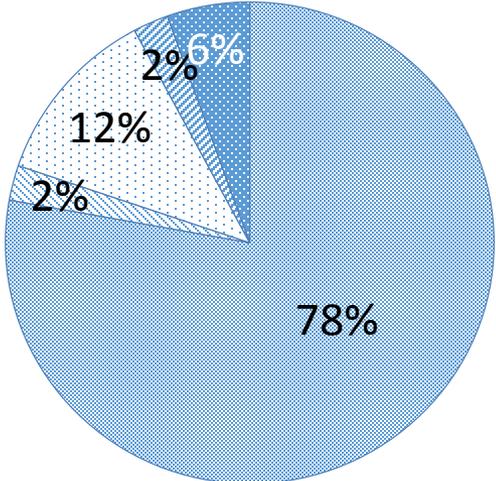
New Orders



6.2

Billion USD

Backlog



11.8

Billion USD

- LNG
- Petroleum and Petrochemical
- Other Gas Related
- Fine Industries
- Others

as of March 2015
Exchange rate: JPY120/\$

1.3 Chiyoda in brief - Global Track Record

World's **No.1** LNG Contractor

Involved in over **40%** of LNG projects over the decade

Executed **75** LNG receiving terminal projects

Over **800** refinery units constructed

Over **500** Petrochemicals / Chemicals plants constructed

Over **1,800** projects in various other fields

Courtesy of Qatargas Operating Company Limited

1.4 Chiyoda in brief - LNG Experience

25 EPC projects* & 31 FEED projects

Oman 2 EPC (3 Trains) 2 FEED

U.A.E. 2 EPC (3 Trains) 2 FEED

Qatar 9 EPC (15 Trains**2) 6 FEED

Egypt 1 FEED

Algeria 1 EPC (1 Trains)

Canada 1 FEED

USA 3 EPC (6 Trains) 1 FEED

Trinidad Tobago 1 FEED

Brazil 1 FEED

Nigeria 2 FEED

Mozambique 1 FEED

Russia 2 EPC (5 Trains) 2 FEED

Indonesia 4 EPC (5 Trains) 4 FEED

Malaysia 1 FEED

Papua New Guinea 1 EPC (2Trains) 1 FEED

Australia 1 EPC (2 Trains) 3 FEED

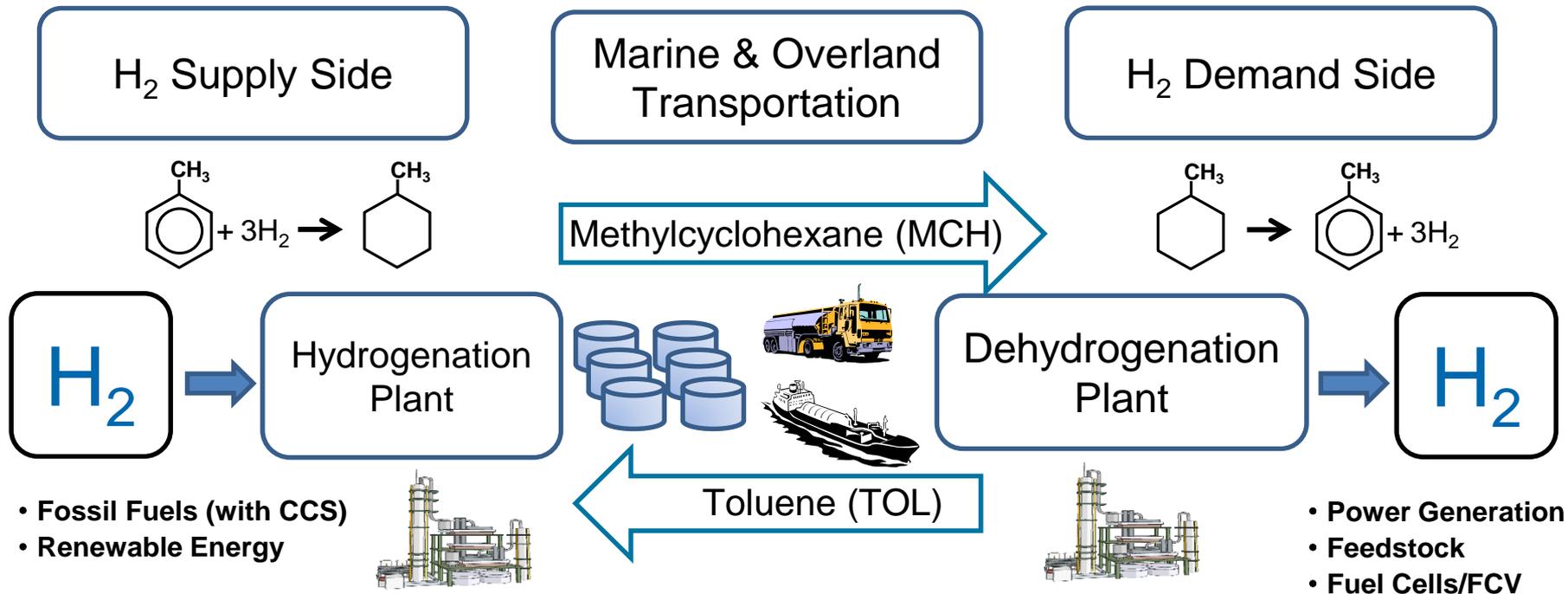


* **42** trains, **168 MTPA** of LNG

**2 include debottlenecking

as of September 2015

2.1 SPERA hydrogen Technology – technology overview



Features:

1. Low Volume: H₂ volume is reduced to <1/500 in MCH
2. Handling : MCH handling classification is similar to petroleum.
3. Common Infrastructure: MCH is stored and transported using conventional petroleum infrastructures at **ambient temperature and atmospheric pressure.**

2.2 SPERA Hydrogen Technology

– Utilization of existing oil infrastructure

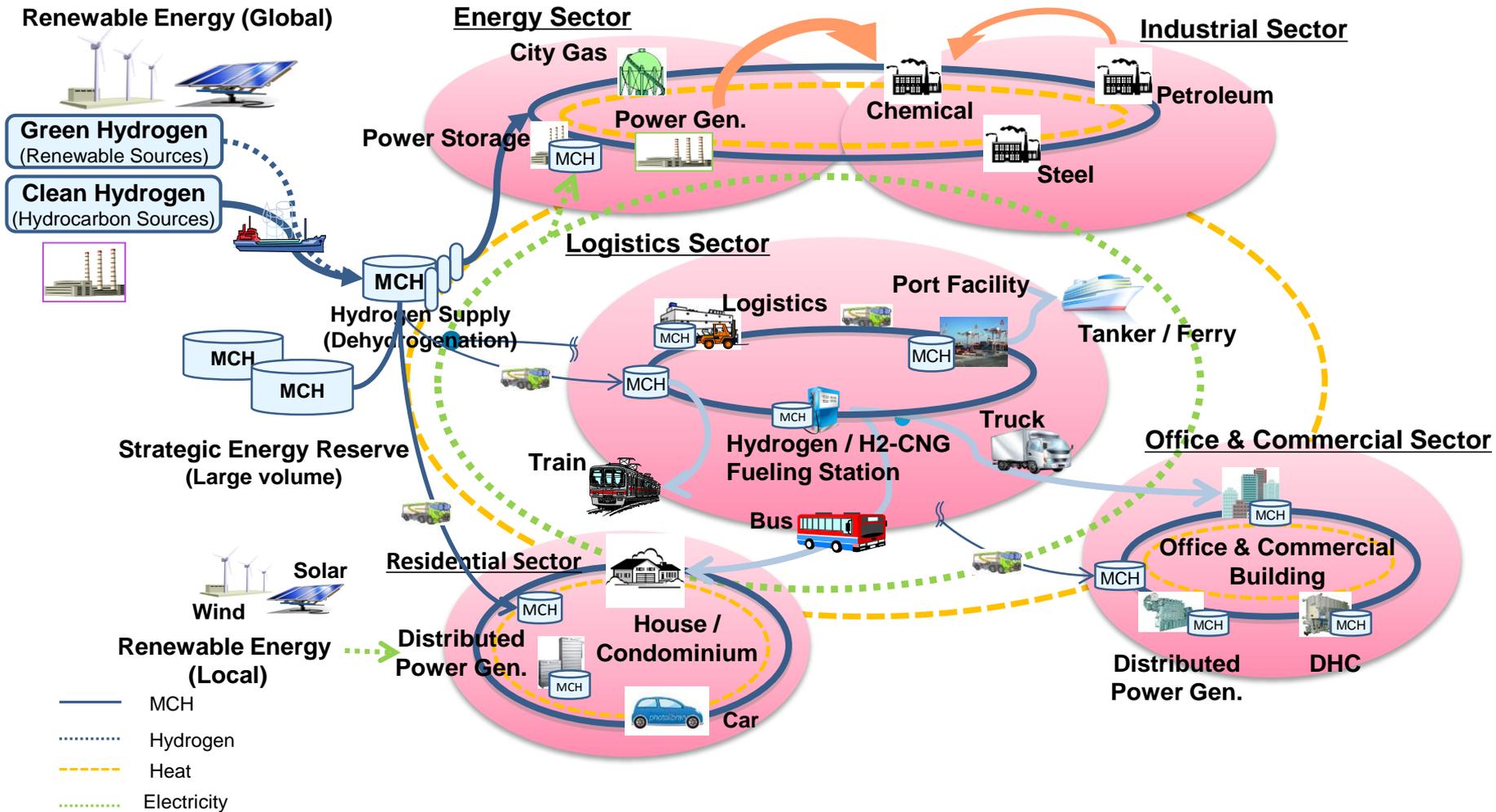
Storage of hydrogen
by conventional tank



Transport of hydrogen
by conventional tanker,
pipeline, tanker truck



2.3 SPERA Hydrogen Technology - Hydrogen supply chain

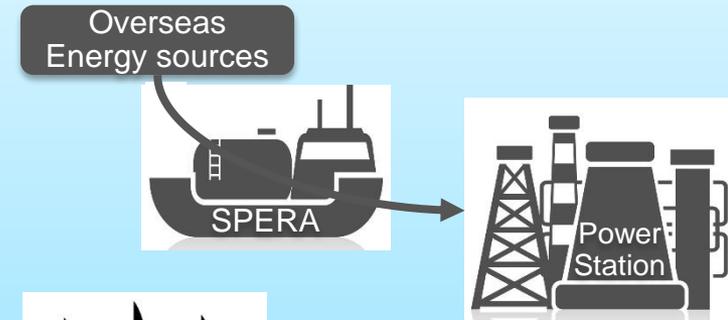


2.4 SPERA Hydrogen Technology - Current Activities

Chiyoda is performing following activities on Hydrogen Business.

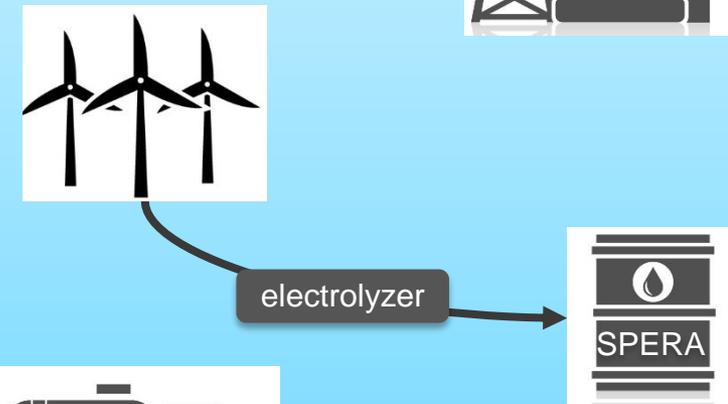
1. Supply Chain from Oversea to Power Plant in Japan

Hydrogen procured overseas will be transported to Japan via SPERA Technology and supplied to the existing power plant. The demonstration operation is expected during the period of Tokyo Olympic and Paralympic Games in 2020. This program is supported by NEDO (the affiliated organization of METI).



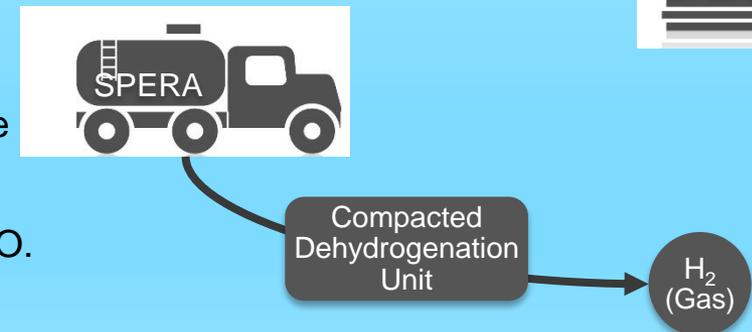
2. Power to Gas

Hydrogen generated by the electrolyzer using the simulated wind power will be converted into MCH in SPERA Process. The demonstration facilities are under construction at Chiyoda R&D Center and operation is scheduled to be completed at the early 2018. This program is supported by NEDO.



3. Dehydrogenation Unit for Fuel Cell

The dehydrogenation unit will be compacted from the plant size of mass capacity to the station size like refueling station for FCEV. Test unit is scheduled to operate in 2017. This program is supported by NEDO.



3.1 FS for RusHydro - Geography

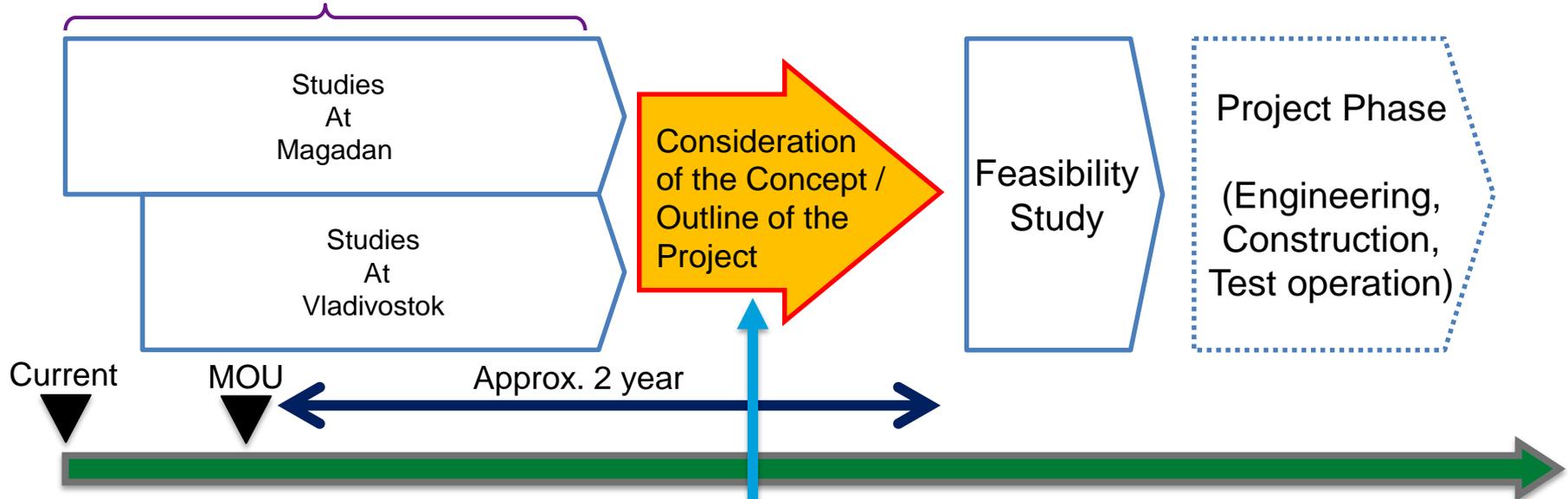


- Hydropower is the most used form of renewable energy in Russia.
- There is large potential in Russia for more use of hydropower.
- Hydropower can be exported in the form of hydrogen produced by electrolysis.

3.2 FS for RusHydro - Schedule

Russia

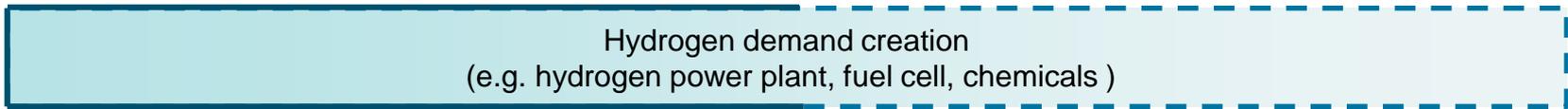
Case Studies



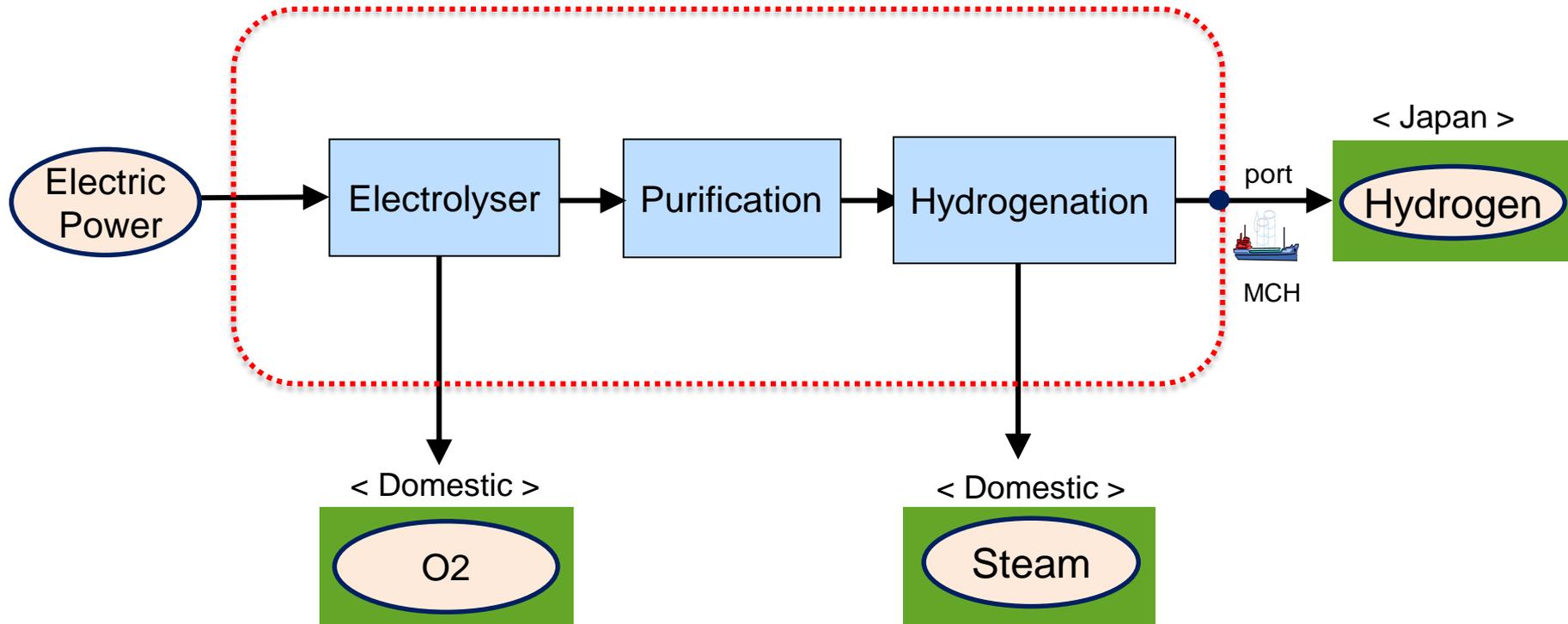
Japan



■ Case Studies are supported by NEDO (New Energy and Industrial Technology Development Organization) and conducted with the collaboration with Mitsui & Co., Ltd.



3.3 FS for RusHydro - Block Flow



THANK YOU



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