Webinar : Shaping the Future of Green Hydrogen Economy

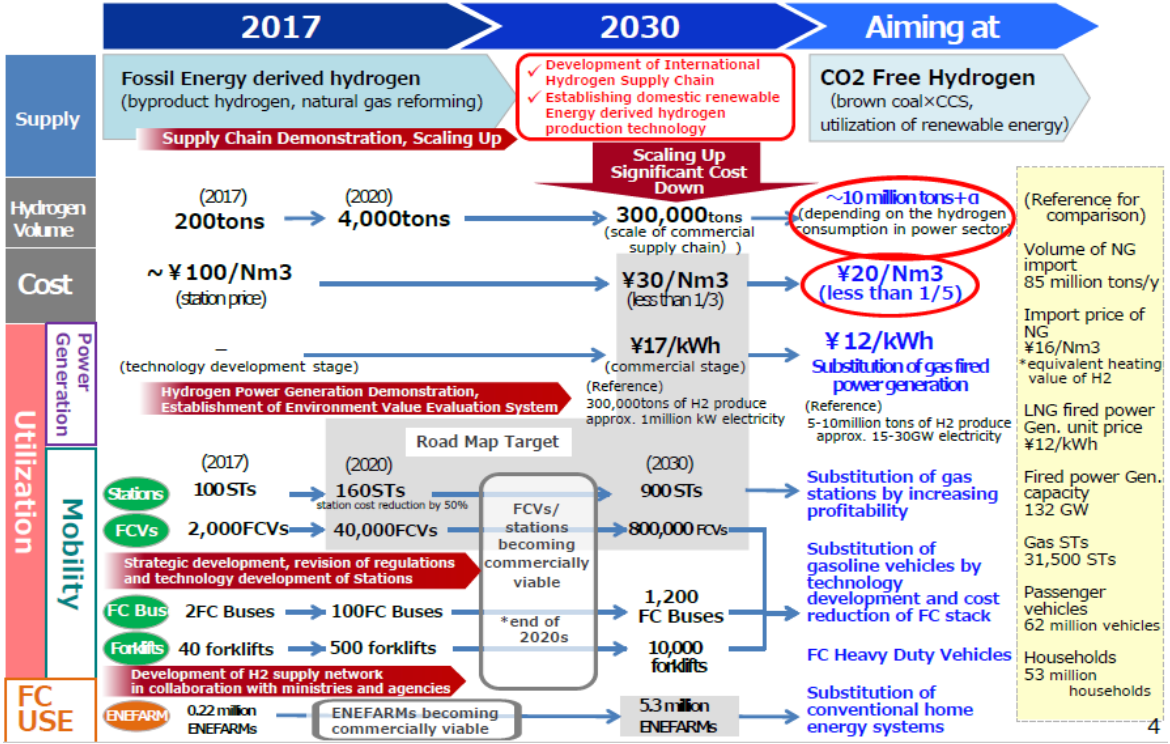
Our Approach toward the Commercialization of LOHC (Liquid Organic Hydrogen Carrier)

23rd July, 2020

Hydrogen Business Planning & Development
Chiyoda Corporation

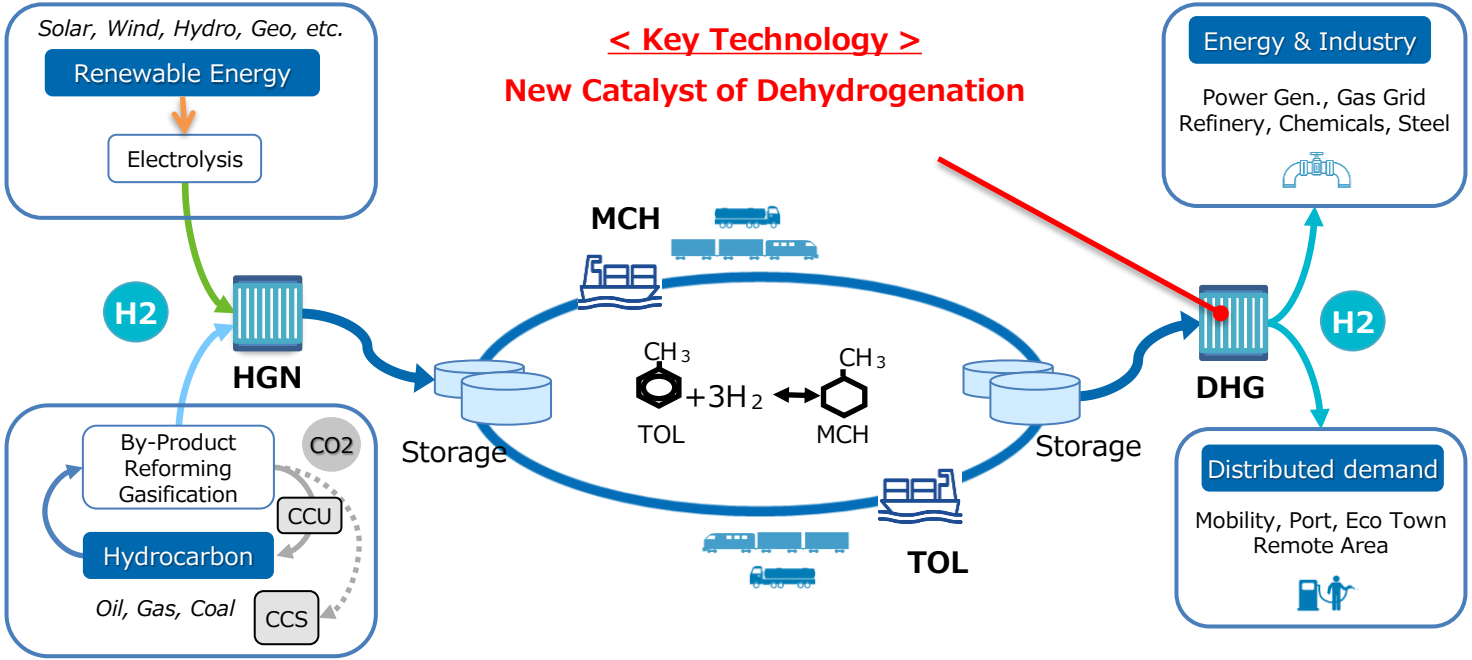
Basic Hydrogen Strategy (Japan)

- The Japanese Government decided on the “Basic Hydrogen Strategy (December, 2017)” to show the plan of action until 2030, the future vision in 2050.



Hydrogen Supply Chain Technology Overview

- Chiyoda has established an efficient and large scale H2 storage and transportation system.
- Methylcyclohexane(MCH), an H2 carrier, stays in a liquid state under ambient conditions anywhere.



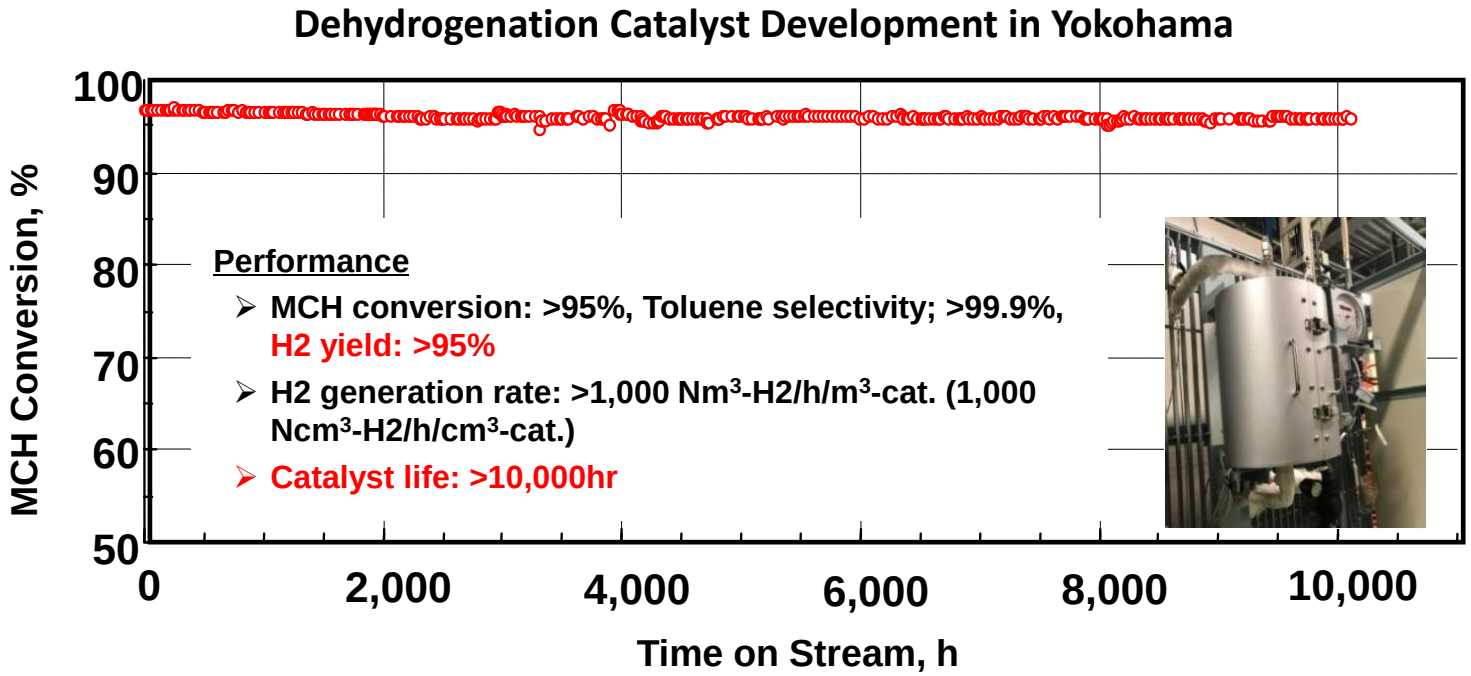
HGN: hydrogenation, DHG: dehydrogenation TOL: toluene, MCH: Methylcyclohexane

Key Features of SPERA Hydrogen Technology

Long term storage & long distance transport	Chemically stable, very minor MCH (H2) loss by long term storage and long distance transport
Easy to handle	Liquid under ambient temperature and pressure Approx. 1/500 in volume
Use of existing oil infrastructure	Physical property is similar to petroleum oil
Reduced risk of H2 storage and transport	Risk for H2 storage and transport is reduced to that of petroleum oil.
Combination of proven technologies	Combination of conventional equipment except for new catalyst for dehydrogenation.

Technology Development : Phase-1 (Labo scale)

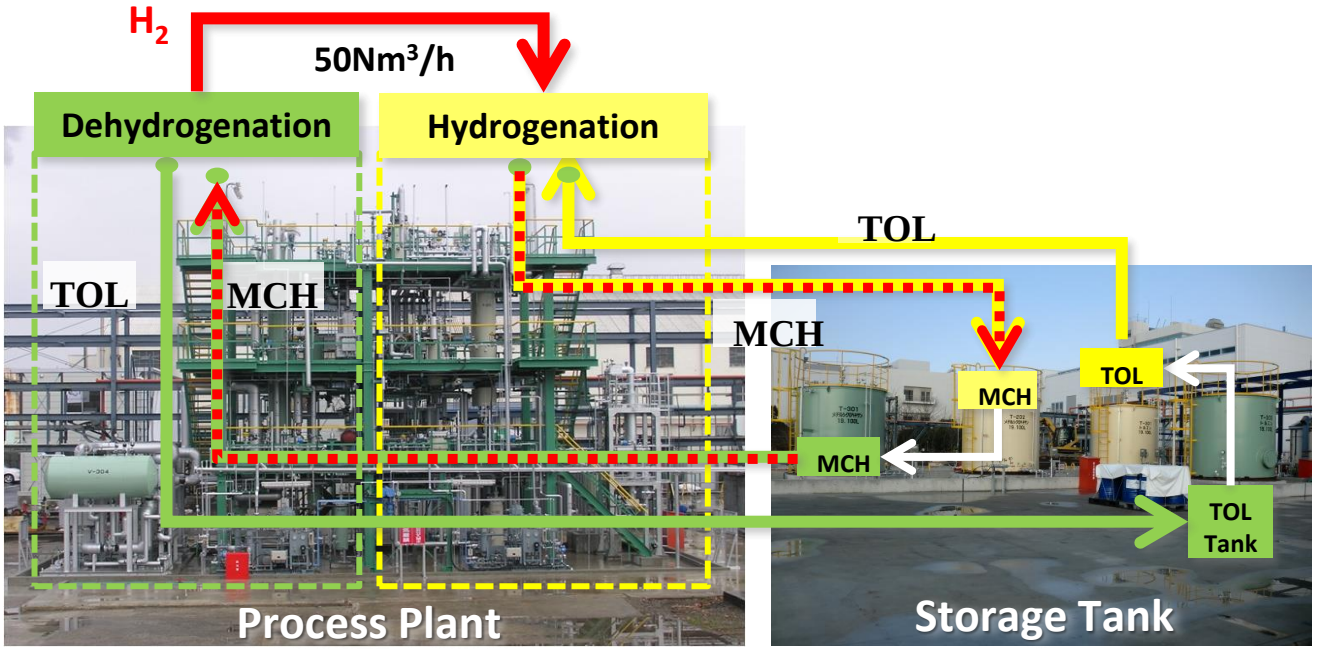
- Chiyoda has succeeded to develop dehydrogenation catalyst in 2008 at its R&D center, that has achieved continuous operation (12,000hours) with high performance.



Technology Development : Phase-2 (Pilot scale)

- From Apr. 2013 to Nov. 2014, 10,000 hours of pilot plant operation was successfully completed, and the expected performance and life of the catalyst were confirmed.

SPERA Hydrogen Demonstration Plant in Yokohama



Technology Development : Phase-3 (Demo scale)

- Chiyoda and its partners established the new entity “AHEAD”, and started the world’s first global hydrogen supply chain demonstration project toward 2020.

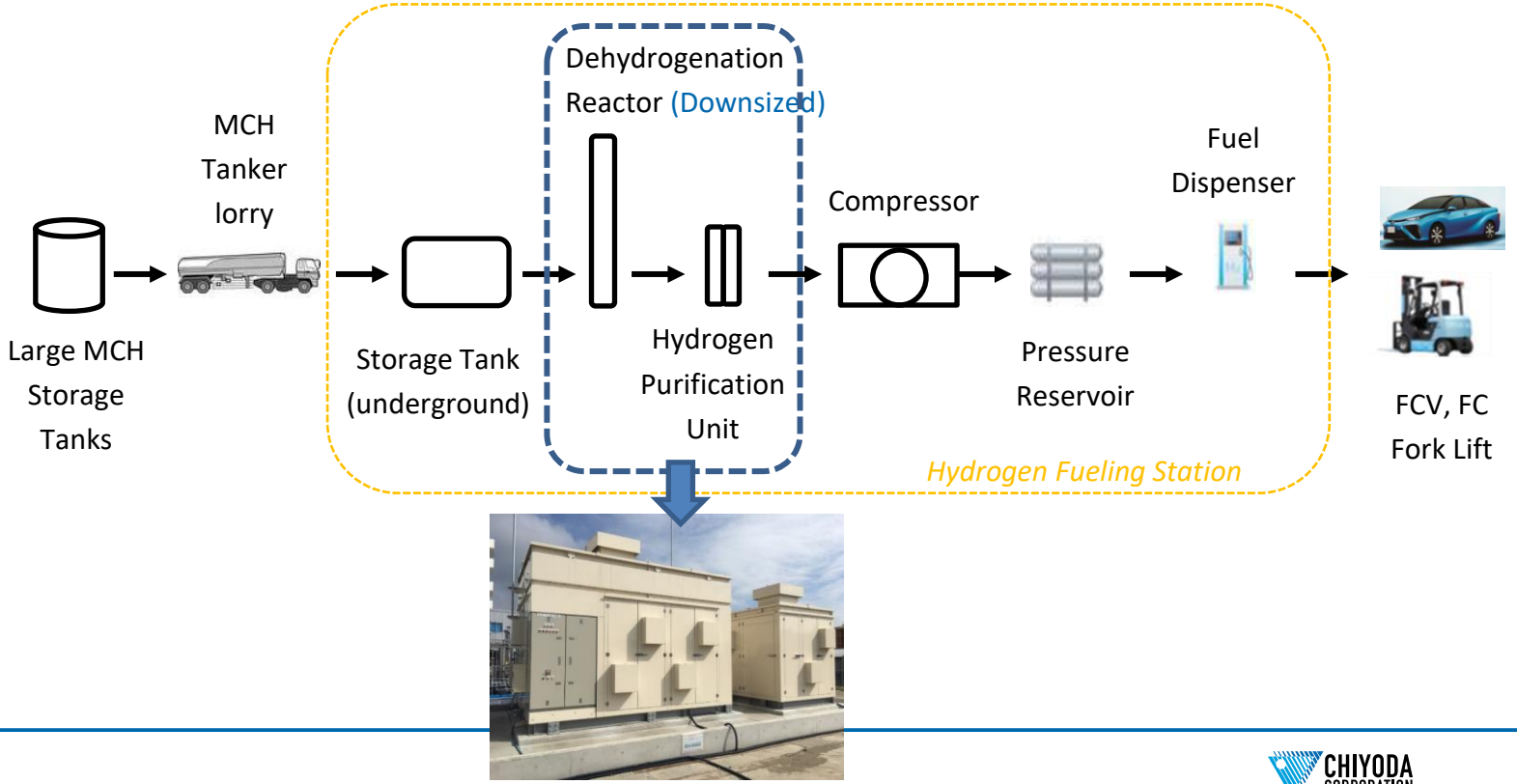
Description	
Scale	210 tons/year (max.)
Duration	One year (Jan. 2020 - Dec. 2020)
Hydrogen Supply	Brunei Darussalam (hydrogen Production)
Hydrogen Demand	Kawasaki City (fuel for gas turbine power plant)
Transportation	ISO tank container (container ship/truck)
Business Scheme	Association for Technology Development.(NEDO funded*)

** Technology Development for the Realization of the Hydrogen society（funded by NEDO）*
“Demonstration of Hydrogen Supply Chain by Organic Chemical Hydride Method Utilizing Unused Energy“

CHIYODA CORPORATION

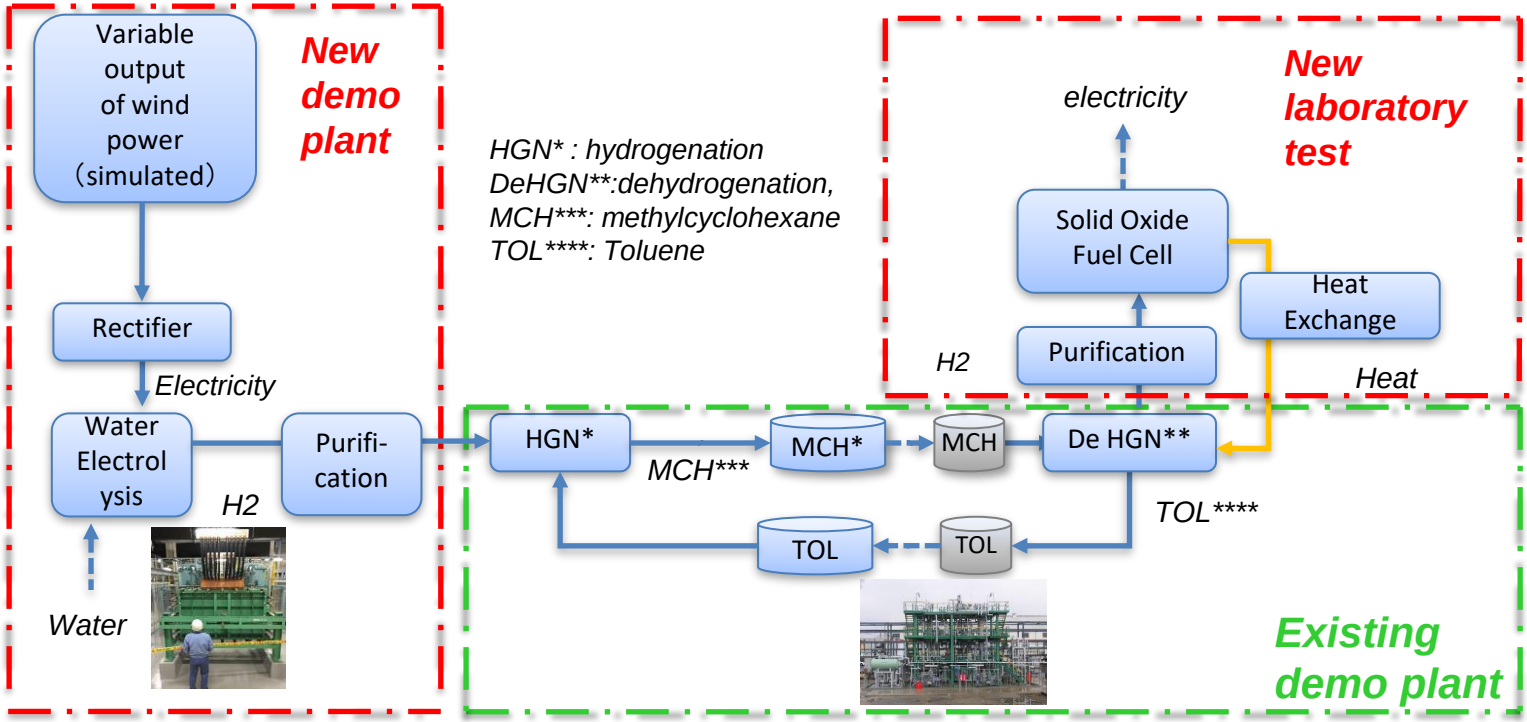
Application-1 : H2 Refueling Station Technology

- Develop compact-type dehydrogenation facility (downsizing and automatic operation) to fit FCV fuel stations, funded by NEDO.



Application-2 : H2/MCH Storage System

- Demonstration project to produce hydrogen by variable renewable energy, funded by the New Energy and Industrial Technology Development Organization (NEDO).

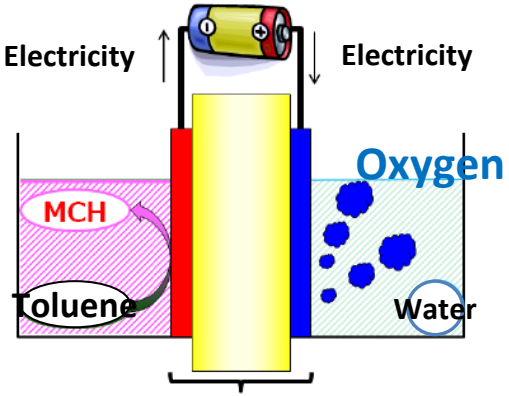


Advanced Technology Development (Power to MCH)

- MCH electrochemical synthesis technology is under development, that MCH will be produced directly from electricity, water and toluene. (Labo-scale test completed in 2019)

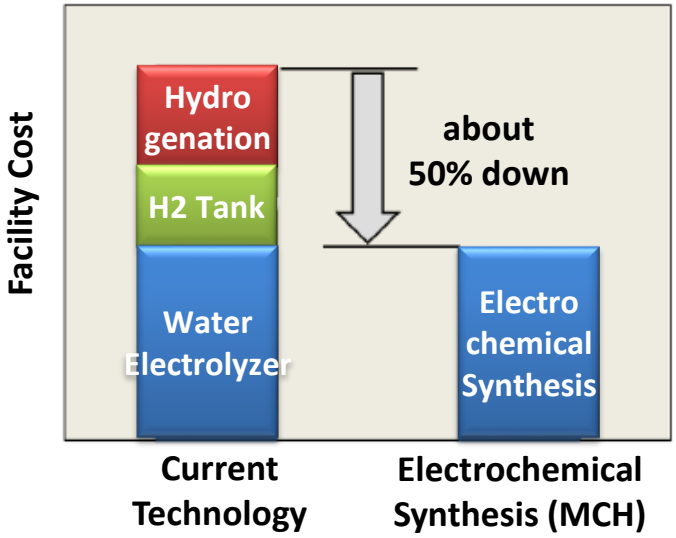
MCH Electrochemical Synthesis technology

(Electricity -> MCH)



Special electrolytic cell

Facility Cost reduction potential

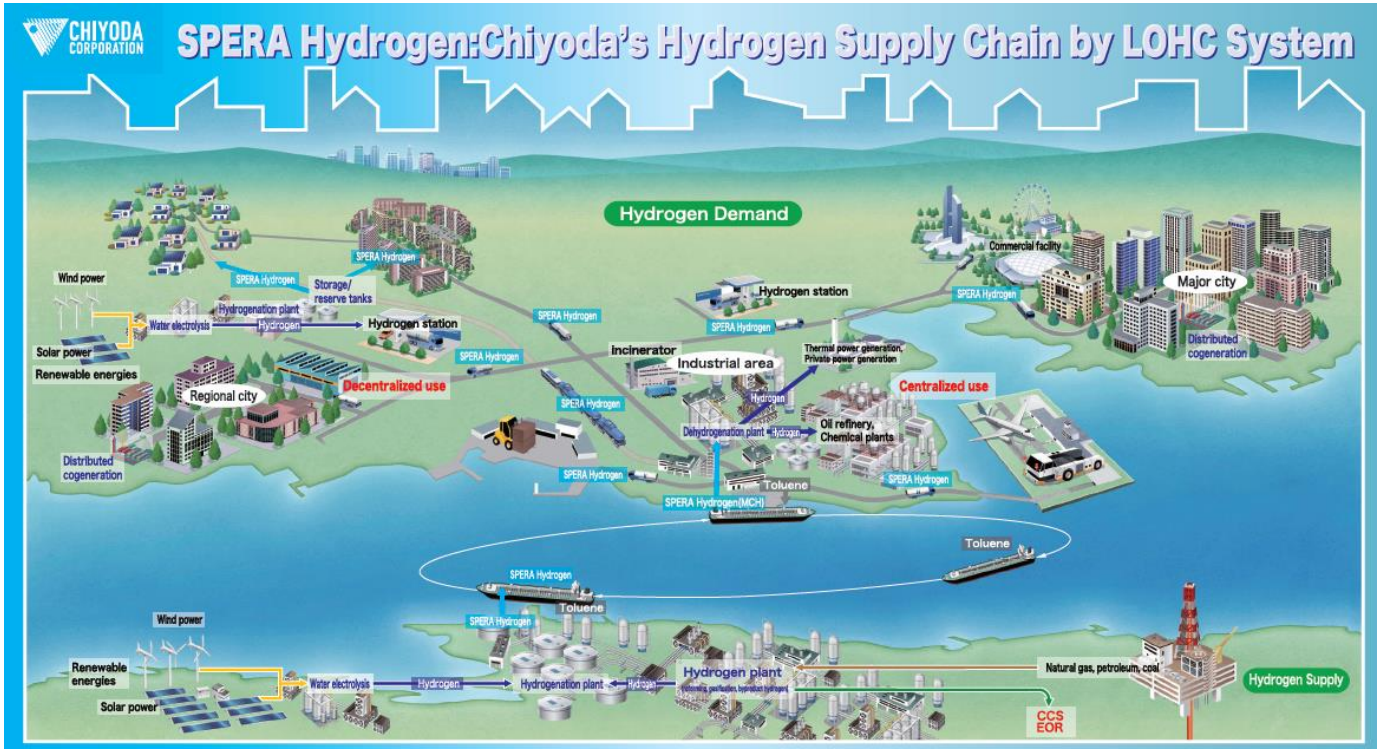


** In case of 6,000Nm3/h-H2 (3MW scale)*

(Source) Press Release from JXTG / Chiyoda / University of Tokyo / QUT

Building Global Hydrogen Supply Chain Network

- We hope to collaborate with various entities from various countries with various technologies to establish global hydrogen supply chains for the sustainable future of the human beings.



Terima kasih