

『Summary of Activities for Hydrogen Utilization in Chubu in 2030』

February 19th, 2021

Hydrogen Utilization Study Group in Chubu

- Eleven private companies which are promoting hydrogen utilization (listed below) have established the **Hydrogen Utilization Study Group in Chubu** in March 2020 to expand hydrogen demand and to build a supply chain for stable hydrogen utilization in the Chubu region.
- This Group takes its first effort in Japan to conduct cross-sectional studies in various industries such as energy (oil, gas and electricity), petrochemicals, automobiles, steel manufacturing and finance.

<Participating Companies> Alphabetically, ◆ Secretariat companies

Air Liquide Japan G.K. /Chubu Electric Power Co., Inc. /ENEOS Holdings, Inc. /

Idemitsu Kosan Co., Ltd /Iwatani Corporation / Mitsubishi Chemical Corporation/

Nippon Steel Corporation /Sumitomo Corporation◆/Sumitomo Mitsui Banking Corporation◆/

Toho Gas Co., Ltd. /Toyota Motor Corporation◆



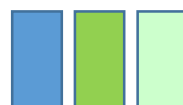
中部電力



TOHO GAS



三井住友フィナンシャルグループ



<Background of Study>

On December 26, 2017, Ministry of Economy, Trade and Industry (hereinafter “METI”) published the Basic Hydrogen Strategy which included the following targets.

▽Realization of low-cost hydrogen usage under the Basic Strategy in order to move towards a hydrogen-based society:

- As a basic approach, procurement of hydrogen at large scale, either by i) use of combination of inexpensive, unused energy of overseas markets with CCS, or ii) use of inexpensive, renewable energy to be used by electrolysis
- Realization of annual procurement of 300 Kt/y of hydrogen, by developing commercial-scale supply chains by around 2030. Aim to realize hydrogen cost of 30 JPY/Nm³.
- In the later phase, further endeavor to lower the hydrogen cost to 20 JPY/Nm³ to allow hydrogen to gain the same competitiveness as traditional energy sources after environmental cost adjustments are incorporated.

<Study Results by the Hydrogen Utilization Study Group in Chubu >

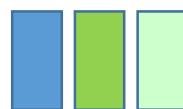
In response to the Basic Hydrogen Strategy, we, Hydrogen Utilization Study Group in Chubu have conducted cross-sectionally studies focusing in areas of ① the potential demand of hydrogen in Chubu, and ② conditions needed to realize a hydrogen supply chain that will realize construction of import terminal, which will supply hydrogen to end users in the Chubu region, assuming large-scale hydrogen import from overseas will be realized. This study is the first effort in Japan ahead of “Green Growth Strategy towards 2050 Carbon Neutrality” announced by METI in Dec 2020.

Results of the study are as following;

- ① **The potential demand of hydrogen in Chubu region in 2030 will reach 110,000 t/y (approx. one-third of national targets set by the Basic Hydrogen Strategy) subject to hydrogen price being able to reach switchable costs in each sector, which is expected to further improve with technological innovation after 2030. In case of social implementation from 2025, there’s a possibility of hydrogen demand emergence around 40,000 t/y.**
- ② **Nevertheless, in the case the hydrogen demand reaches 110,000 t/y level, even if the cost of hydrogen reaches 30 JPY/Nm³ as Japanese government’s target, it is predicted that the total negative spread amount between hydrogen price and switchable costs will reach approx. 20 billion JPY annually, and initial CAPEX which will be needed to realize receiving import hydrogen, transportation and facilities at the end-users’ side to reach around 100 billion JPY.**

Therefore, in order to realize the social implementation in Chubu, development of mid-long term policy to compensate the high CAPEX/OPEX and commitment of offtake agreements by major end-users and realization of a stable hydrogen supply are needed. At the same time, it is also essential to scale-up each facilities from technological viewpoint, to review regulations related to hydrogen supply chain, and to propose necessary regulatory reviews.

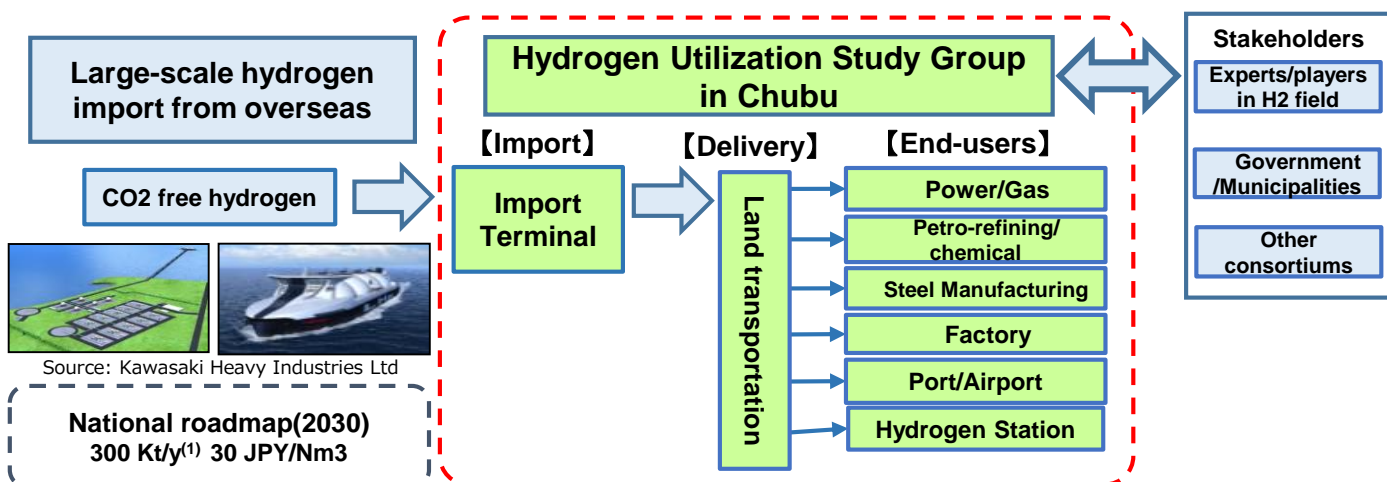
While the “Green Growth Strategy towards 2050 Carbon Neutrality” announced by METI in December 2020 had even ambitious targets than that of the Basic Hydrogen Strategy, Hydrogen Utilization Study Group in Chubu would like to coordinate with the government together with Japan Hydrogen Association and other consortiums in order to realize the large-scale hydrogen utilization in Chubu, as a pioneering model in Japan. Moreover, based on the results, we would like to conduct further study and to continue our activities in order to realize social implementation in 2025 and commercialization in 2030.



1. Overview of Study

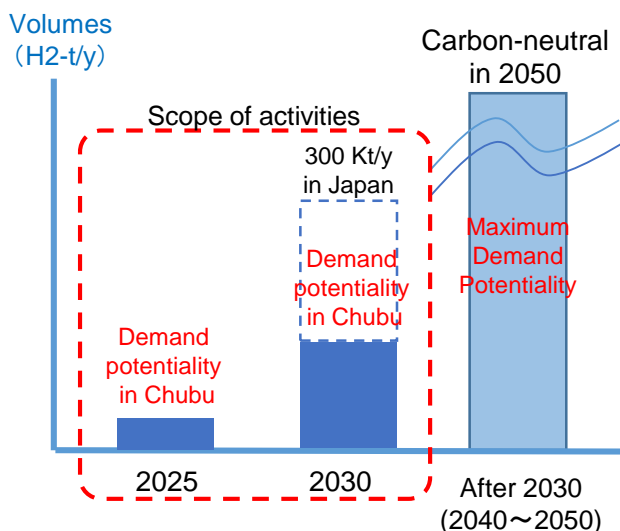
- ① Estimation of **the potential demand of hydrogen** in Chubu in 2025 (social implementation phase) and **2030 (commercialization phase)**, and examination of the possibilities of realizing a hydrogen supply chain from import terminal to end user points in Chubu region, under the assumption that large-scale hydrogen import from overseas will be realized.
- ② Clarification of **challenges needed to be solved** including cost- related topics

Scope of activities

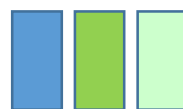
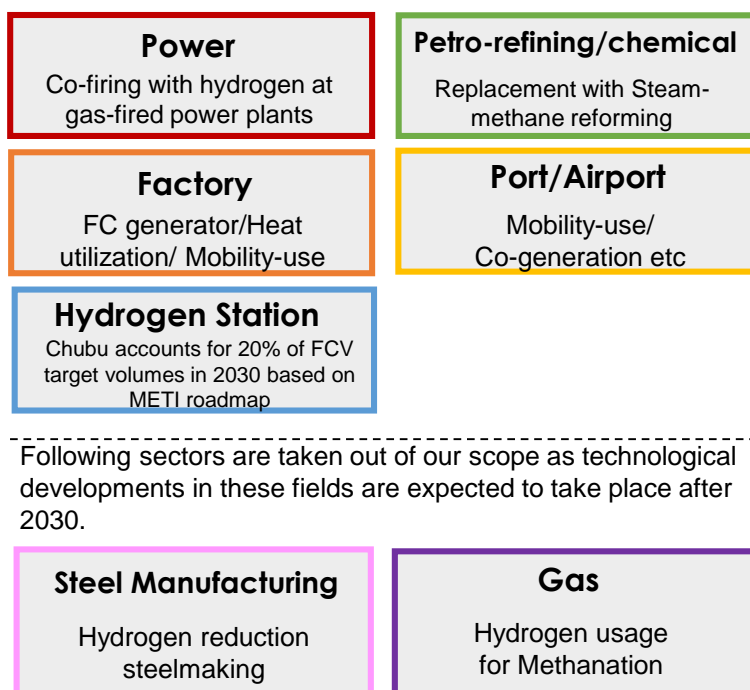


(1) “Green Growth Strategy towards 2050 Carbon Neutrality” announced by METI in Dec 2020 sets the target of clean hydrogen utilization of above 420 Kt/y after 2030.

Hydrogen demand projection in Chubu



Potential end-users in Chubu



2. Study Results

① Estimation of potential hydrogen demand in Chubu

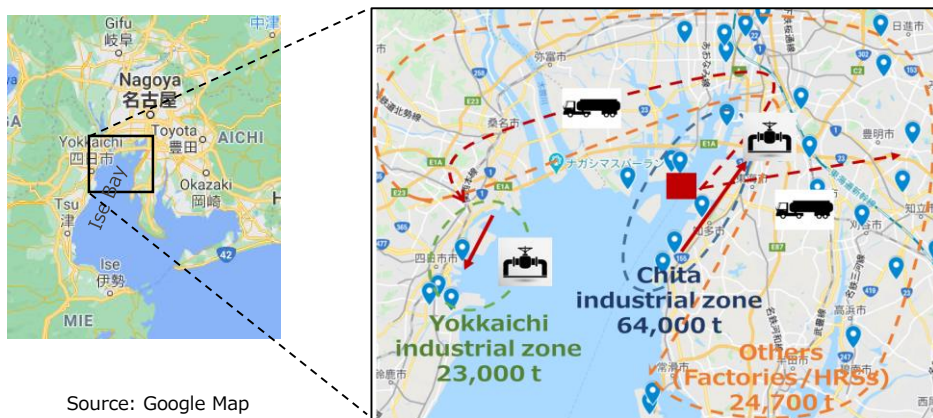
- The potential demand of hydrogen in Chubu region
40,000 t/y in 2025, 110,000 t/y in 2030
 *subject to hydrogen price being able to reach switchable costs in each sector

<Demands by region>

- Demand is expected to **be concentrated by approx. 80% in Chita/Yokkaichi areas**, whereas factories/Hydrogen Stations are sparsely located in other remote areas.

<Demands by sector>

- **Power and Petro-refining/chemical sectors accounts for 80%** of total demand.
- **Remaining 20% demand in Factories/Hydrogen Stations** for mobility-use/fuel cell generator, requiring **high purity hydrogen (above 99.97%)**.



Source: Google Map

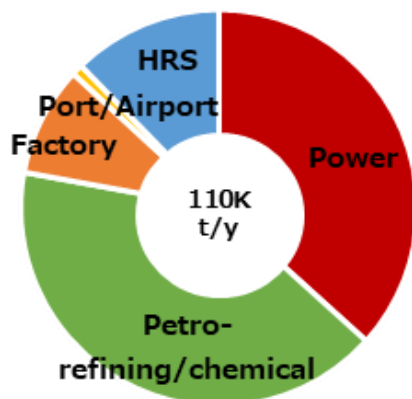
【Concept of supply-chain】

- **Chita** is the most probable candidate area to establish an import terminal, with its large hydrogen demand.
- Utilization of **existing CH4 or new H2 pipelines installation** in Chita industrial zone.
- Delivery of hydrogen from Chita to Yokkaichi and to other areas of remote end-users, to be made **by tank-lorries** from economical perspective.

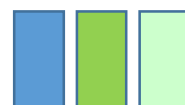
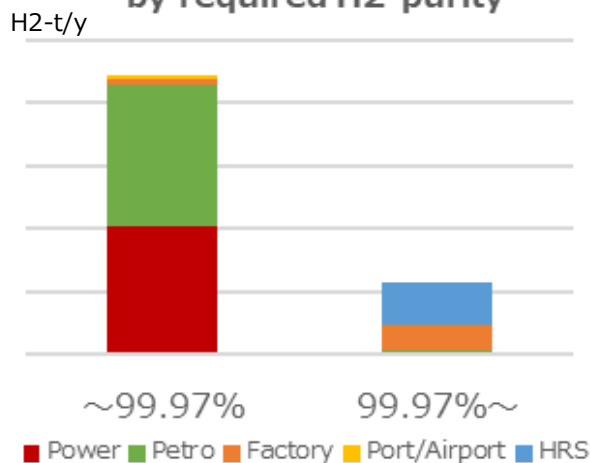
【Criteria for import terminal area selection】

- Draft which would allow large vessels to navigate/unload
- Necessary land area and surrounding facilities for import terminal
 ⇒ Need to select area in line with port planning

Demand breakdown by sector in 2030



Demand breakdown by required H2-purity



② Challenges to be solved including costs-related issues

<Negative spread>

- in the case hydrogen CIF Japan price becomes 30 JPY/Nm³ in 2030, the total negative spread between the hydrogen price and switchable costs is expected to reach approx. **20 billion JPY** annually.

<Initial CAPEX>

- Initial CAPEX is expected to reach approx. **100 billion JPY** including receiving terminal, transportation infrastructure and facilities at end-users.

*As for the negative spread amount and initial CAPEX, there was no significant difference between LH₂ and MCH based on our study implemented so far. We have excluded ammonia from our study scope, as ammonia usage is mostly limited to co-firing at coal-fired power plant.

Necessary actions for social implementation

<Commercial aspects>

- (1) Development of mid/long-term strategic policy and financial support to compensate CAPEX/OPEX
- (2) Commitment of **offtake agreement** with major end-users
- (3) Commitment of **stable hydrogen supply source**
- (4) Selection of optimum **import terminal area**

<Technological aspects>

R&D of scaling up facilities and cost reduction

<Policies>

Review of regulations related to hydrogen supply chain and propose necessary regulatory reviews

