446th Forum on Research Works December 22, 2023

Hydrogen/Ammonia Policy Challenges for 2024

--Continuous discussions required from diverse viewpoints while developing systems to support introduction--

<Summary>

Yoshiaki Shibata
Senior Research Director, Manager, New Energy System Group
Assistant Director, Clean Energy Unit
The Institute of Energy Economics, Japan

Global Hydrogen Adoption Outlook

1. If all announced hydrogen projects (including those under construction, final investment decision, feasibility study, and concept announcement stages) come into the production stage, hydrogen supply is expected to reach up to 38 million tons (on a hydrogen basis; the same applies hereafter) in 2030, according to the Global Hydrogen Review 2023 by the International Energy Agency. The total projected supply (27 million tons from water electrolysis and 10 million tons from fossil fuels with CCUS (Carbon dioxide Capture, Utilization and Storage)), though representing a 50% increase from a year-earlier projection, falls far short of the 70 million tons required for 2030 under the IEA's Net Zero Emissions by 2050 scenario. Hydrogen supply under projects with final investment decisions is limited to only 4% of the total.
2. By region, Europe and North America lead the market. Europe has a tendency to use renewable energy sources for water electrolysis hydrogen, while the United States has a trend of using fossil fuels with CCUS for hydrogen production. On the other hand, hydrogen projects in Japan are very limited.

2024 hydrogen policy focus

3. Japan plans to introduce price difference compensation (contract for difference: CfD) and production base development systems to support hydrogen projects, as seen in Europe and the United States. Japan’s framework for selecting hydrogen projects not only from the viewpoint of efficiency but also from various other perspectives is commendable. Hydrogen policy challenges include how to distribute a limited budget for supporting hydrogen projects and how to judge the rationality of hydrogen production and use.

Need to secure hydrogen demand

4. Japan will have to import a certain amount of hydrogen. However, buyers, or off-takers, have yet to be fixed for about 60% of announced hydrogen trade projects. Due to the high maturity of commercialized transportation technologies, ammonia accounts for most hydrogen carriers in the hydrogen trade.
5. In order to secure hydrogen demand, costs should be reduced for cracking ammonia into hydrogen and for other hydrogen carriers such as liquefied hydrogen and methylcyclohexane (MCH).
6. Next, from the viewpoint of users, hydrogen demand is categorized into existing and new one. Given that equipment and distribution networks have been developed for existing gray hydrogen with high carbon intensity, only the conversion of gray hydrogen into clean hydrogen may be required. However, attention should be paid to the impact of the conversion on existing processes and the expected scale of CO_2 reduction. With regard to new hydrogen demand, it is important to identify and secure applications that are difficult to realize decarbonization without hydrogen, including long-distance and large-scale transportation, industrial high-temperature heat demand, and cold-region heat demand.
7. In order to secure and expand demand for hydrogen, it is necessary to consider not only financial support such as price gap compensation (CfD) and tax incentives and carbon pricing for inducing hydrogen use, but also mandatory hydrogen usage obligations promoted under the European Union's renewable energy directive.

Issues regarding domestic hydrogen network development

8. The key is how to economically transport and distribute hydrogen to consumers. As for imported hydrogen, liquefied hydrogen, MCH, ammonia, e-methane, and e-fuel are being considered as hydrogen carriers. For domestic hydrogen networks, compressed hydrogen and hydrogen pipelines as well are technology options. The optimal network type differs depending on distances from hydrogen import ports and domestic hydrogen production bases to consumers, the scale of hydrogen demand, and geographical constraints. It is necessary to discuss desirable future hydrogen networks by taking into account the whole of imports and domestic distribution.

Need to enhance Japan's international competitiveness in water electrolysis

9. While the Basic Hydrogen Strategy aims to increase the share of Japanese products in the global water electrolysis market, it is expected that market shares for European, U.S., Chinese, and Indian products will be high. In order to increase the market share

for Japanese products, Japanese companies should not only expand sales of parts and equipment, but also market hydrogen energy management systems that aim optimal operations from hydrogen production with water electrolysis to hydrogen supply to consumers. To this end, it is necessary to strengthen domestic Power-to-Gas initiatives.

Contact: report@tky.ieej.or.jp