444th Forum on Research Works July 25, 2023

Negative Emission Hydrogen / Ammonia
- Promoting the Acceleration of Decarbonization -
<Summary > ◆

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Hydrogen and Ammonia

1. Today, 50 years after the oil crisis, there is a growing demand to promote energy transitions that will achieve both decarbonization and energy security. Efforts must be strengthened in various fields if this is to be realized, but the all-important key to whether we succeed or whether we fail will be in realizing innovation. There are a variety of efforts already underway within the field of innovation itself, but what the world is currently looking toward is innovative fuels, such as hydrogen and ammonia, and negative emission technologies.
2. During the G7 Hiroshima Summit held in May of this year, G7 leaders affirmed that hydrogen derived from renewable energy is not the only effective means of decarbonization; so long as they meet the 1.5°C target, both fossil fuel hydrogen with CO_2 captured at the production stage and hydrogen-derivatives such as fuel ammonia are also effective means. That the leaders of the G7 countries have agreed upon a pragmatic approach in flexibly adopting hydrogen that greatly contributes to decarbonization rather than excessively insisting on one specific type of hydrogen is significant. With this official recognition of being an effective decarbonized fuel, it is likely that we will see an accelerated use and expansion of ammonia as fuel both domestically in Japan and overseas going forward.
3. The importance of promoting the production and distribution of low-carbon hydrogen based on carbon intensity was also mentioned at the G7 Summit. During the transition period, the oil-producing Middle East and other resource-rich countries will have a cost-competitive advantage when providing low-carbon hydrogen due to their low-cost gas production and plentiful sites suitable for CCS. Though there have been changes in the position of Middle-Eastern-produced crude oil in terms of Japan's overall energy demand over the past 50 years since the oil crisis, maintaining good relations with resource-rich countries in the Middle East will remain crucial for Japan in the future. With that said, resource-rich countries in the Middle East will also need to secure stable hydrogen and fuel ammonia export destinations as the world moves toward carbon neutrality.
4. When it comes to creating international hydrogen trade supply chains, the export side is generally in the lead while the import side is lagging behind. Japan's Basic Hydrogen Strategy, revised in June of this year, describes a policy for developing international supply chains through strengthening resource diplomacy, acquiring upstream interests, and providing financial support for plant construction, but an important step going forward will be to hasten the adoption of hydrogen within importing countries through price differential support and infrastructure development.
5. There is also growing interest in using ammonia as a fuel for applications beyond power generation. The port sector has plans underway to establish bases for importing ammonia in locations such as Shunan City in Yamaguchi Prefecture, Singapore, and Rotterdam. The shipping sector has plans to utilize ammonia as a marine fuel from 2025 and, finally, Japanese companies in the industrial sector are developing industrial furnaces to meet the heat demand in the ceramics and chemical sectors.

◆ Created based on the published research in the 444th Forum on Research Works with the information available as of July 2023.

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Negative Emissions

6. Negative Emission Technologies (NETs) remove greenhouse gases from the atmosphere in the long term. There has been an increasing interest in these technologies over the past few years, both in Japan and abroad. Energy transitions have been progressing alongside ensuring energy security over the past 50 years since the oil crisis, but this will not suffice over the next 50 years; we must also promote energy transitions with a view to achieving carbon neutrality. NETs that offset residual CO_2 emissions will be an essential means to achieving such carbon neutrality.
7. Although there are a wide variety of NETs available, each with its own merits and demerits, technology-based NETs using CCS (DACS, BECCS) have several advantages. They have a relatively high level of technological maturity, they have significant removal potential, they can easily and accurately quantify the actual amount of CO_2 removed, and they have long CO_2 fixation periods.
8. While efforts to introduce CCS are currently being promoted as a means to reduce CO_2 emissions from conventional fossil fuels, this technology will also play a critical role in the future toward negative emissions. As such, swift action regarding the commercialization of CCS is warranted.
9. As NETs are being rolled out, other countries are setting numerical removal targets and linking these with their emissions trading systems. Meanwhile, Japan has finally gotten around to discussing their implementation and is currently financially supporting the technological development of Direct Air Capture and other such technologies, as well as considering how to create and expand upon markets. However, further discussions will be necessary to delve deeper into these matters in the future.

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