



July 2021

Japan Energy Newsletter

**Japan Electric Power
Information Center, U.S.A.**

Table of Contents

1	Current Development and Deployment of CCUS/Carbon Recycling Technologies by Japanese entities	3
1.1	Background	3
1.2	Japanese government activities on CCUS development and deployment	4
1.3	Private Sector Efforts on CCUS/carbon recycling technology	6
2	METI Released a Draft Revision to the Energy Basic Plan by 2030—Rapid Increase of Renewable Energy Penetration	7

1 Current Development and Deployment of CCUS/Carbon Recycling Technologies by Japanese entities

Demonstration projects and work on research and development (R&D) for Carbon Capture, Utilization and Storage (CCUS) have recently been on the rise in Japan because CCUS has the potential to help reach Japan's goal of achieving carbon neutrality by 2050. Japan's Ministry of Economy, Trade and Industry (METI) and the Ministry of Environment (MOE) have established partnerships with other countries to promote the technology at home and overseas. JERA, a power generating company established as a joint venture between Tokyo Electric Power Company (TEPCO) and Chubu Electric Power (Chuden), has also announced that it will conduct a feasibility study on CO₂ capture and methanation¹ in the United States. This report analyzes the current trends for the development and demonstration of CCUS/carbon recycling technologies that are being explored by the Japanese government and private companies.

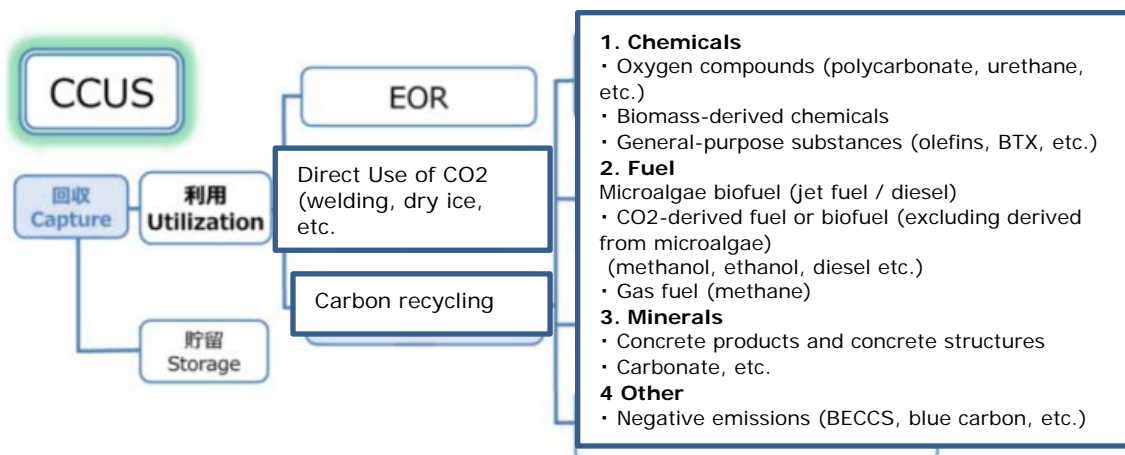
1.1 Background

CCUS is one of several promising decarbonization technologies that can be used in tandem with other energy pathways such as renewable energy, hydrogen power generation, nuclear energy, and energy conservation to help to achieve the Suga administration's goal of carbon neutrality by 2050. The Green Growth Strategy Through Achieving Carbon Neutrality in 2050, which was issued by METI in December 2020, describes carbon utilization/carbon recycling technology using CO₂ as a resource as a key technology for achieving a carbon neutral society.

In the past years, the majority of the large-scale CCS (Carbon Capture and Storage) demonstration projects worldwide have predominantly been outside of Japan due to geographic requirements. However, one CCS demonstration project has been implemented and completed in Tomakomai City, Hokkaido Prefecture, Japan. CCS technology deployment in Japan has had some limitations due to the lack of suitable underground storage sites and applicable oil fields and gas fields. Therefore, instead of CCS, carbon recycling technologies in which CO₂ is reused as raw materials for a wide variety of products such as chemicals, fuels, and minerals, have recently been gaining attention in Japan as a method to reduce greenhouse gas emissions from conventional power plants.

¹ Methanation is an approach to synthesizing methane by combining carbon dioxide (CO₂) and hydrogen as raw materials.

The Concept of the CCUS and Carbon Recycling Technology



Source: Ministry of Economy, Trade and Industry (METI) ²

The public's increased interest in addressing global climate change and strong pressure from investors to address these issues has led to a growing number of nations targeting aggressive greenhouse gas emission reductions and new goals to accelerate their divestment from fossil-fuel assets. CCUS is considered a promising technology for continuously maintaining fossil-fuel power sources while simultaneously achieving greenhouse gas reduction goals. The International Energy Agency (IEA) states that a fast transition to net zero worldwide increase the need for CCUS, which accounts for nearly 15% of the expected cumulative reduction in emissions by 2070. The Japanese government and private companies have been actively developing and demonstrating CCUS technology in domestic and international markets.

1.2 Japanese government activities on CCUS development and deployment

The government of Japan has recently been working towards introducing CCUS technologies overseas, especially in Asia. On June 22, 2021, METI announced the launch of an international platform, the Asia CCUS Network, to promote the use of the CCUS, in collaboration with the 10 member states of the Association of Southeast Asian Nations (ASEAN), Australia, the U.S., and more than 100 companies and institutions.³ The energy demand in Southeast Asia is expected to increase, and fossil fuel power generation will continue to be necessary, meaning that CCUS is positioned to play a major role in the region.

To achieve its greenhouse gas emission reduction goals, Southeast Asia would need to capture approximately 35 million tons of CO₂ in 2030 and over 200 million tons in 2050, which will require huge investments in CCUS annually by 2030. The Asia CCUS Network will carry out activities to promote the deployment of CCUS throughout Asia, such as facilitating capacity building and hosting workshops to share knowledge and experience about CCUS and conducting research activities to improve the business

² <https://www.city.tomakomai.hokkaido.jp/kigyoritchi/ccs/ccsnogaiyo.html>

³ <https://www.meti.go.jp/press/2021/06/20210622005/20210622005.html>

environment.⁴ These workshops have been part of the Asia Energy Transition Initiative (AETI), which was launched by METI in May 2021 to work towards carbon neutrality throughout Asia while also securing sustainable economic growth. AETI assists the ASEAN member countries based on the following five pillars:⁵

- Support the development of energy transition roadmaps
- Present and disseminate the concept of an Asian transition finance model
- Provide \$10 billion in financial support to advanced projects on renewable energy, energy saving and Liquefied Natural Gas (LNG)
- Promote technology development and demonstration by utilizing a 2 trillion Japanese yen fund
- Share knowledge of decarbonization technologies and workforce development throughout the Asia CCUS Network

Meanwhile, the MOE held the 2nd CCUS and Hydrogen International Symposium in March 2021, showcasing current CCUS R&D and demonstration activities/efforts around the world. In addition to Japanese government agencies such as METI, and Japanese industry and academic participants, many international guests also joined the symposium, including government agencies, energy companies, and academia from Europe, the U.S. and Asia.⁶ During the conference, the Japanese government and others introduced their own CCUS and hydrogen policies, as well as related research, development, and demonstration projects.

In order to achieve carbon neutrality by 2050, the Japanese government is currently working on demonstration projects for the establishment of CCUS technology and for building comprehensive hydrogen capabilities, such as production, storage, transportation, and utilization. Japan is leveraging CCUS and hydrogen as two major pillars to create a circular economy. The government plans to utilize recycled CO₂ for a wide variety of applications, like producing methane and ethanol chemical products by combining CO₂ and hydrogen captured from waste disposal facilities. The symposium was intended to promote CCUS and hydrogen technology development in Japan and foster international momentum.⁷

In another related development, the New Energy and Industrial Technology Development (NEDO), a quasi-public R&D funding agency, announced in mid-July 2021 that it will seek companies to participate in CO₂ utilization/carbon recycling technology development. In order to utilize carbon recycling in the fields of chemicals, fuels, and minerals, it will be necessary to address challenges for cost reduction, technical development, and social implementation. In this project, NEDO will focus on the development of carbon recycling technologies applied for chemicals, liquid fuels, carbonates, concrete products and structures, and gas fuels. All of the funded projects will be carried out for five years, from FY2021 to FY2025.⁸

⁴ <https://www.meti.go.jp/press/2021/06/20210604007/20210604007.html>

⁵ <https://www.meti.go.jp/press/2021/05/20210528007/20210528007.html>

⁶ http://www.env.go.jp/earth/ccs/symposium_2th.html

⁷ <http://www.env.go.jp/press/109252.html>

⁸ https://www.nedo.go.jp/koubo/EV1_100235.html

NEDO will also assist with various CCUS/carbon recycling R&D and demonstration projects, such as the Large-Scale Demonstration Test in Tomakomai City, Hokkaido Prefecture, which will use existing CCS facilities.⁹ In September 2020, the Tomakomai CCUS Carbon Recycling Promotion Council was reorganized to discuss the implementing a carbon recycling project to synthesize ethanol from recycled CO₂.¹⁰ The previous CCS project in Tomakomai City had reached a notable milestone in November 2019 when it captured a total of 300,000 tons of CO₂ from nearby oil refineries and stored them underground.

1.3 Private Sector Efforts on CCUS/carbon recycling technology

Private companies, including electric utilities, are also exploring CCUS/carbon recycling technologies. JERA announced in June 2021 that it was commissioned by NEDO to conduct a feasibility study on CO₂ capture and methanation in the United States.¹¹ The study will examine the potential economic benefits of utilizing hydrogen and CO₂ recycled from existing thermal power plants and oil refineries. It will also explore the possibility of producing CO₂-free LNG using methane gas as a raw material for use in LNG-related infrastructure. The study will run from June 2021 through February 2022, taking advantage of the knowledge of JERA's subsidiary, JERA Americas.¹²

The Central Research Institute of Electric Power Industry (CRIEPI) announced in July 2021 that it had developed EeTAFCON, a next-generation concrete that can reduce CO₂ emissions by about 70 percent compared to existing cement-based concrete.¹³ The product was invented jointly through a partnership between Nakagawa Humepipe Industry Co. (H-NAC) and the Japan Coal Frontier Organization (JCOAL). EeTAFCON does not use cement. Instead, it incorporates by-products such as fly ash and blast furnace slag powders released from thermal power plants and steel plants, which can be more sustainable.

In the same month, Tokyo Gas and Kajima Corporation, a major construction company, announced that they will produce CO₂-SUICOM, the world's first kind of concrete that can absorb the CO₂ developed by Kajima.¹⁴ CO₂-SUICOM replaces more than half of the cement with a special admixture called γ-C₂S, which is made from the industrial by-products from chemical factories, which hardens while absorbing CO₂. To commercialize CO₂-SUICOM, the two companies plan to increase the amount of CO₂ absorption and to apply CO₂-SUICOM to various products such as blocks for solar power generation facilities.

⁹ https://www.nedo.go.jp/koubo/EV3_100225.html

¹⁰ <https://www.city.tomakomai.hokkaido.jp/kigyoritchi/ccs/meibo.html>

<https://www.city.tomakomai.hokkaido.jp/files/00004100/00004176/%E6%94%B9%E7%B5%84%E3%81%AB%E3%81%A4%E3%81%84%E3%81%A6.pdf>

¹¹ https://www.jera.co.jp/information/20210616_697

¹² https://www.jera.co.jp/information/20210616_697

¹³ https://criepi.denken.or.jp/press/pressrelease/2021/07_07.html

https://criepi.denken.or.jp/press/pressrelease/2021/07_07press.pdf?v2

¹⁴ <https://www.tokyo-gas.co.jp/news/press/20210707-01.html>

Moreover, Tokyo Gas announced in July 2021 that in FY 2021 it will start a methanation demonstration project for advancing urban gas decarbonization technologies.¹⁵ The project will also attempt to produce hydrogen through renewable energy facilities and to manufacture methane through processing recycled CO₂ from their customer's gas usage. Tokyo Gas will collaborate with other organizations to advance the development of the technologies for synthetic methane production. In the future, Tokyo Gas will examine local consumption models for regional carbon neutralization by conducting lab tests, implementing large-scale demonstration projects at the company's LNG base, and working to establish supply chains for production.

2 METI Released a Draft Revision to the Energy Basic Plan by 2030—Rapid Increase of Renewable Energy Penetration

On July 21, 2021, METI released a draft revision to the Energy Basic Plan. METI revised the plan based on the recommendations of the Advisory Committee for Natural Resources and Energy, an advisory body to METI¹⁶. The draft revised plan significantly raises the target for renewable energy in the energy mix, from 22-24% at the current target level to 36-38% in 2030. The 2030 target for other power resources is as follows:

- Nuclear power will remain at 20-22%,
- Liquefied Natural Gas (LNG): 20%,
- Coal: 19%,
- Oil: 2%, and
- Hydrogen and Ammonia: 1%.

METI has set an ambitious goal for the 2030 power generation mix based on increasing renewable energy sources and enhancing energy-saving mechanisms while securing a stable power supply.¹⁷ The draft revised plan aims to maximize the share of renewable energy, making it one of the main power sources. The government also proposes to promote the introduction and deployment of the use of hydrogen and CCUS at fossil fuel power plants and effectively utilize nuclear power while ensuring its safety¹⁸.

¹⁵ <https://www.tokyo-gas.co.jp/news/press/20210707-03.html>

¹⁶ Japan's Energy Basic Plan is revised every three years by METI. The draft version plan that was released on July 21 was discussed and modified in another committee meeting held on August 4th.

¹⁷ There are concerns about ensuring a sufficient, stable power supply if Japan decreases the share of fossil fuel power before the introduction of renewable energy meets the power demand.

¹⁸ The Federation of Electric Power Companies (FEPC), a Japanese industry organization of electric utilities, made a statement on the nuclear plan described in the draft Energy Basis Plan during the regular press conference held on July 16. FEPC will work to restart nuclear power plants as soon as possible and improve their operations through long-term cycle operations, in order to secure a nuclear power ratio of 20-22% in 2030, as stated in the Basic Energy Plan. FEPC hopes that the government will also review the operation period system, taking into account the opinions expressed by the Nuclear Regulation Authority. In addition, as the FEPC moves forward with the restart of nuclear

The revised energy portfolio targets to 2030 in the draft Energy Basic Plan are as follows.

Ambitious Goals For 2030 Energy Mix

	FY2019	Current Goal	2030 Goal
Renewable Energy	18%	22~24%	36~38%
Nuclear Power	6%	20~22%	20~22%
Thermal Power	76%	56%	41%
Hydrogen and Ammonia	0%	0%	1%

Source: METI

Based on the revised plan, the total generation amount of renewable energy will increase from 236.6 billion~251.5 billion kWh at current levels to 330 billion~350 billion kWh by 2030. However, the plan also stresses that this is not the upper limit and that Japan would seek a higher deployment if possible. The expected types of renewable energy resources include solar power, onshore and offshore wind power, geothermal, hydrogen, and biomass. Japan plans to increase the deployment of solar power considerably and to take the following measures:

- Expand the use of wind power by upgrading transmission systems: Accelerate the construction of long-distance DC transmission systems, allowing power generated by wind power farms in rural areas to be transmitted to large energy consumption areas and to maintain regulating power through storage batteries. The plan seeks to increase the wind power generation capacity in the Hokkaido area to approximately 4GW by 2030.
- Promote the introduction of community-based renewable energy: the Ministry of the Environment (MOE) has proposed the Promotion of Community-Based Renewable Energy project to increase the capacity of renewable energy sources by a total of 4.1GW. In addition, it will partner with the Ministry of Agriculture, Forestry and Fisheries (MAFF) to promote a program that boosts renewable energy deployment in harmony with the natural environment in rural areas.
- Encourage the private sector to adopt renewable energy systems: The government of Japan will encourage businesses to install solar power equipment on their premises and purchase renewable energy power generated through power purchase agreements (PPA).

power plants, it will be important to ensure the safety of the plants and build up the trust of the people in the areas where the plants are located, and to maintain and develop the nuclear industrial base such as personnel and technologies. Moreover, it is necessary to secure future prospects for replacing and expanding the existing nuclear power plants, based on the lead time for construction. Therefore, in the next basic energy plan, the FEPC would like to firmly position the importance of nuclear power and present a medium- to long-term vision for the replacement and expansion of nuclear power plants, as well as the development of new reactors and next-generation reactors. https://www.fepec.or.jp/about_us/pr/kaiken/__icsFiles/afieldfile/2021/07/16/kaiken_20210716.pdf

- Strengthen measures on promoting the use of other emerging renewable energy technologies, such as geothermal and hydrogen: The government will strengthen policies and measures that will improve the capacity of geothermal and small and medium-sized hydrogen power generation facilities to meet the current energy mix goals. For instance, the capacity of geothermal power plants can be enhanced by developing technologies that will increase and stabilize the amount of steam that is generated from water being injected underground.

The revision of the Energy Basic Plan is part of the Suga administration's efforts to achieve carbon neutrality by 2050. In April, the administration set a goal to reduce greenhouse gas emissions in 2030 by 46% compared to 2013. The 2030 energy mix goal will be achieved by promoting the rapid expansion of various renewable energy sources. The draft revised plan was practically approved in a committee meeting held on August 4th, and will be disclosed for public comments. Then it will be submitted to the Cabinet for approval.¹⁹

¹⁹

https://www.enecho.meti.go.jp/committee/council/basic_policy_subcommittee/2021/046/046_004.pdf