Carbon Neutral Strategy Briefing

MITSUBISHI GAS CHEMICAL COMPANY, INC.

April 11, 2022

Securities Code
4182

Index

1. Carbon Neutral Strategy (Overview)

Toward a Sustainable Society -Medium-Term Management Plan-

– We are committed to realizing a sustainable society by balancing social and economic value based on our Mission of creating value to share with society.

– Initiatives aimed at carbon neutrality are one of our top strategic priorities.

Social issues

Changes in international situation

Demographic changes

Advancements in ICT/Mobility

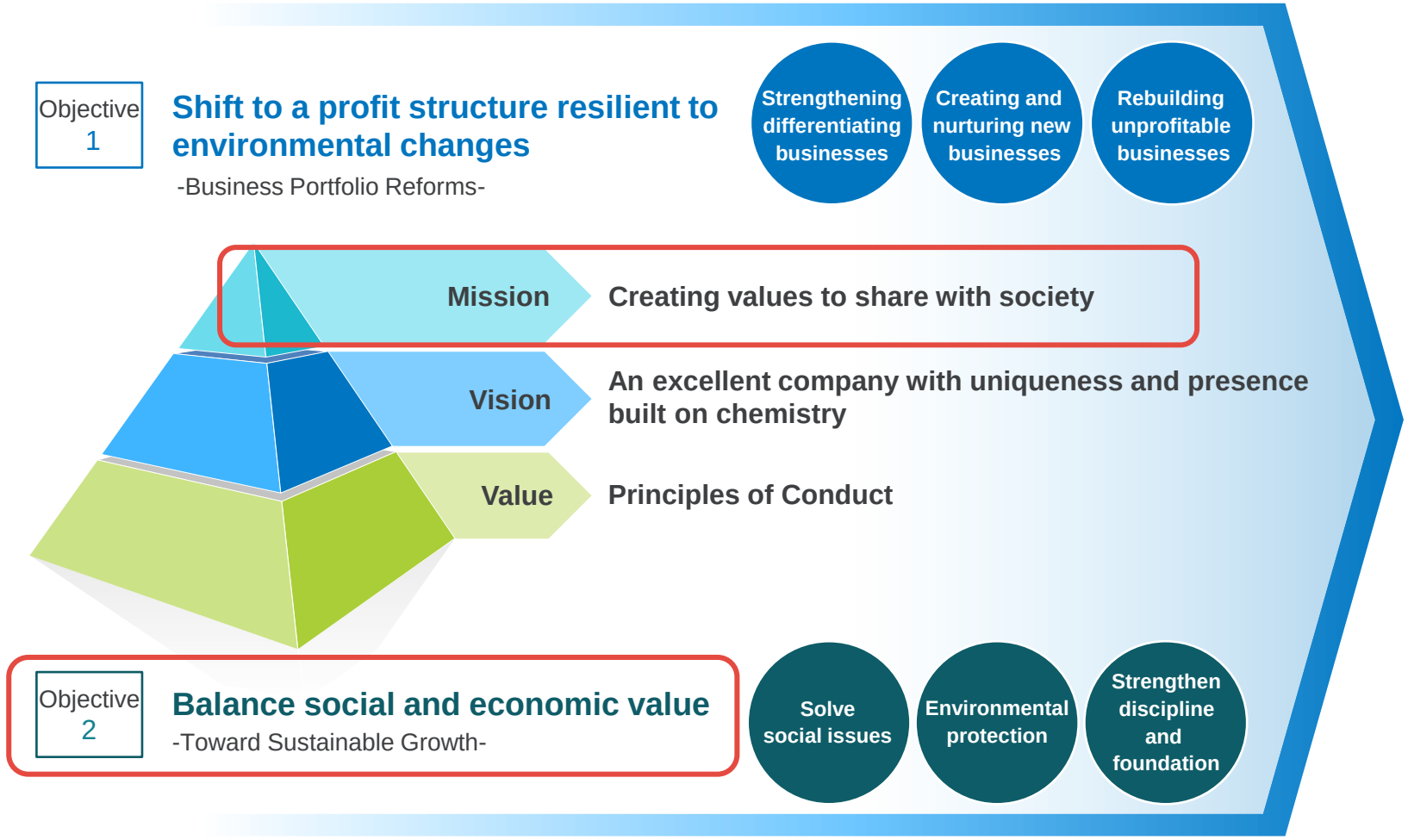
Climate change

Biodiversity crisis

Environmental impact reduction

Diversity

Behavioral changes under COVID-19

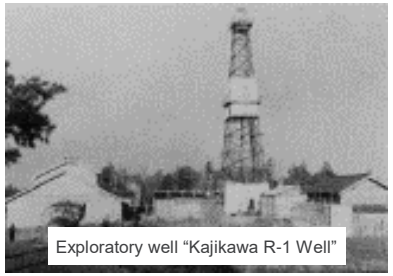


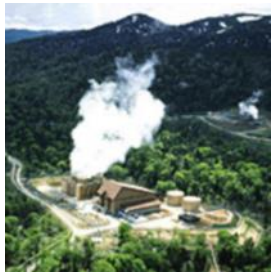
Solving social issues

Achieving sustainable growth

MGC's Strengths in Carbon-Neutral Technologies (Accumulation of Energy Resources and Environmental Technologies)

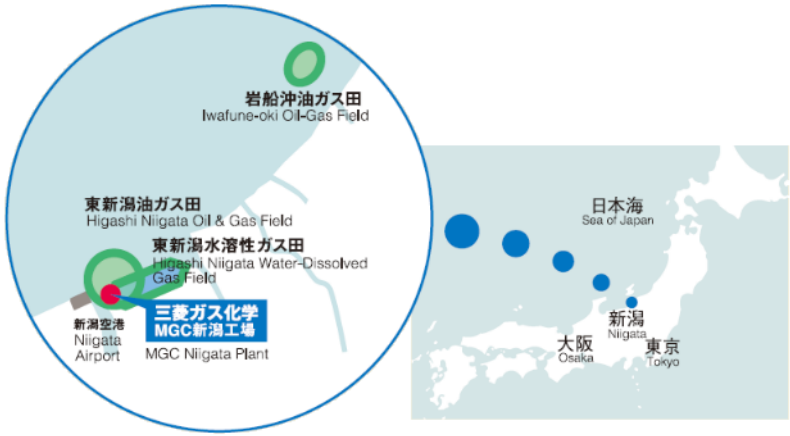
- Over a period of around 60 years, MGC (on a stand-alone basis) deployed a business to develop natural gas. It has exploration and development technologies that are unique among those found at chemical manufacturers.
- Furthermore, MGC has implemented crude oil and natural gas exploration technologies on a joint basis with other resource development companies.
- MGC has also deployed businesses in the compatible areas of geothermal development and LNG-fired power generation.
- Over many years, MGC developed catalysts used in methanol synthesis.


Exploratory well "Kajikawa R-1 Well"




Fukushima Natural Gal Power Plant
Provided by Fukushima Gas Power Co., Ltd.


Tomakomai CCS Demonstration Project Center



1952
Methanol synthesis
1953
Development of water-dissolved natural gas
1957
Ammonia synthesis

1981
Development of geothermal power

2016
LNG power generation[*1]

2016
CCS[*2]

2021
Production of water-dissolved natural gas[*3]

Accumulated intellectual property and know-how adapted and applied to capturing, storing and recycling CO_2, as well as to building of hydrogen supply chains

*1 Investment in Fukushima Gas Power Co., Ltd.
*2 Commenced press fitting of CO_2 within Carbon dioxide Capture & Storage (CCS) demonstration project conducted in Tomakomai City
*3 New production of water-dissolved gas for first time in 50 years by TOHO EARTHTECH, INC., an MGC subsidiary

How We Are Pursuing Carbon Neutrality (1)

- Pursue development of products and technologies conducive to carbon neutrality by leveraging distinctive technologies found only at MGC
- Move forward with efforts such as promotion of energy efficiency, introduction of new energy, CCUS* implementation, and feedstock switching to reduce GHG emissions (Scope 1)

*Carbon dioxide Capture, Utilization and Storage

Development of Products and Technologies Conducive to Carbon Neutrality

Methanol manufacturing technologies using CO_2 as raw materials

Hydrogen manufacturing technologies using methanol as raw materials (catalysts)

Polycarbonates using CO_2

Procurement of clean ammonia (fuels, green hydrogen raw materials)

Solid-state batteries (for EVs)
Fuel cells (for FCVs)

Energy control systems: Semiconductor materials

Biodegradable polymers

Chemical recycling

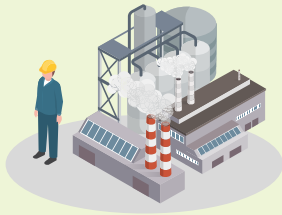
Direct air capture (DAC)**: Specialty amines**

Methanol: Hydrogen carrier

Operational streamlining: Optical polymers for sensing cameras for automotive use

Initiatives Aimed at GHG Emission Reductions (Scope 1)

- **Promotion of energy efficiency, end use of fuel oil**
- **New energy system/ CCUS implementation**
- **Reconfiguring business portfolio**
- **Smart-factory**



Also contributing to reduction of energy derived from fossil fuels (Scope 2)

LNG power generation + CCUS

Geothermal power generation

How We Are Pursuing Carbon Neutrality (2)

- Set qualitative targets and formulate action plans to solve energy and climate change problems as one priority
- Expedite commercialization of carbon-negative technology by setting a target to invest a cumulative ¥12.0 billion in 2021–23 toward solving problems

Solve social issues through business

Materiality	Qualitative Targets and Action Plans	KPI		
		Fiscal 2020 results	Fiscal 2023 targets	Fiscal 2030 targets
	(Qualitative Targets) Contribute through business to ICT, AI, robotics, blockchain, CASE and other digital innovations, and work to enhance corporate value (Action Plans) Turn out new products that contribute to digital innovation and lighter weight mobility	Sales from ICT/mobility applications ¥234.2 billion	 **¥320.0 billion**	Create new businesses that accelerate digital innovation
	(Qualitative Targets) Contribute to solving energy and climate change problems by participating in geothermal and LNG power generation, by developing products using CO_2 and biomass as raw materials, and through products that contribute to the environment, and work to enhance corporate value (Action Plans) Development of manufacturing technology using CO_2 as a raw material (Ex.: CO_2-derived methanol, polycarbonate)	Investment aimed at solving problems (Three-year cumulative) ¥8.6 billion	 **¥12.0 billion**	Commercialization of carbon-negative technology
	(Qualitative Targets) Contribute through business to QOL improvements, extended healthy life expectancy, anti-aging and reduction of food and beverage waste loss, and work to enhance corporate value (Action Plans) Expansion of sales of products that contribute to QOL, further development of markets in pharmaceutical and medical fields, etc.	Sales from medical and food applications ¥39.4 billion	 **¥50.0 billion**	Advances in preventive and predictive medicine, enhanced healthy life expectancy Further advances in food storage technology

Other materiality management

- **Harmonize value creation with environmental protection (air quality control, reduction of industrial waste)**
- **Strengthen discipline and foundation supporting business activities (job satisfaction, occupational health and safety, energy and resources efficiency, R&D)**

MGC's Roadmap toward Its Ultimate Goal of Carbon Neutrality

– Aim to achieve reduction of 36% by 2030 in comparison with 2013 and carbon neutrality by 2050

	Scope	2013 - 2019	2020 - 2023	2024 - 2030	2030 - 2050
Main initiatives (CO_2 Reduction)	1	• Improve energy efficiency • Reconfigure business portfolio **258kt in total**	• Improve energy efficiency **16kt** • Stop using heavy oil **13kt** • Reconfigure business portfolio • Deploy new energy systems/CCUS, switch feedstocks (R&D/collaboration) **610kt in total**	• Improve energy efficiency **28kt**	• Improve energy efficiency **40kt**
	2	—	• Source 10% of energy from renewables **14kt** • Use transitional energy **10kt**	• Source 50% of energy from renewables **55kt**	• Source 100% of energy from renewables **69kt**

Businesses & technologies

Fukushima Natural Gas Power Plant
Provided by Fukushima Gas Power Co., Ltd.

Wasabizawa Geothermal Power Station
Provided by Yuzawa Geothermal Power Corp

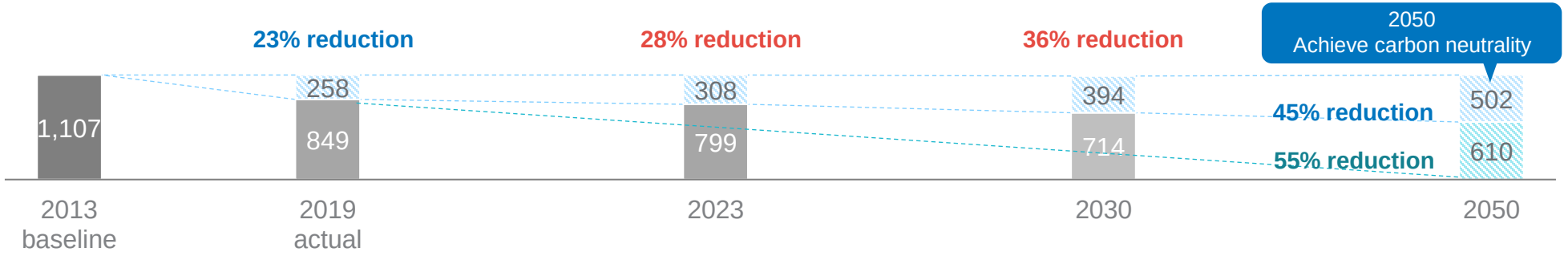
Pilot plant for consideration of circular carbon methanol

JAPAN HYDROGEN ASSOCIATION

Collaboration

Feedstock switching

CO_2 emissions (kt of CO_2/year)

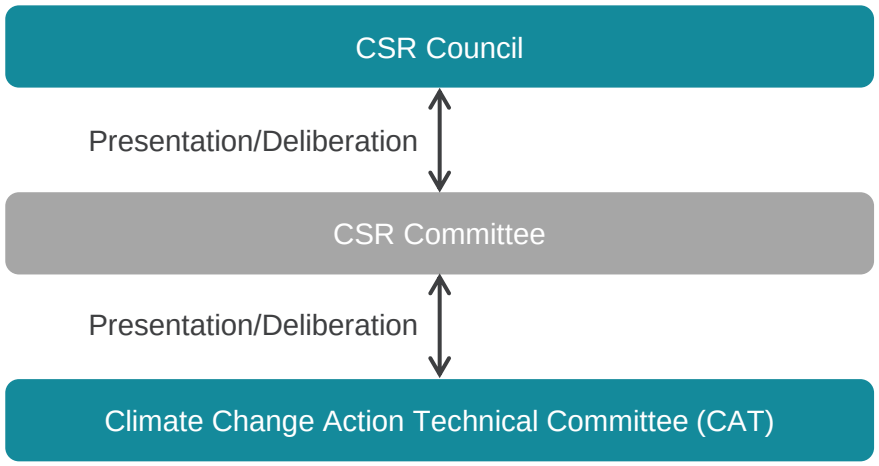


Date of public announcement: March 29, 2021

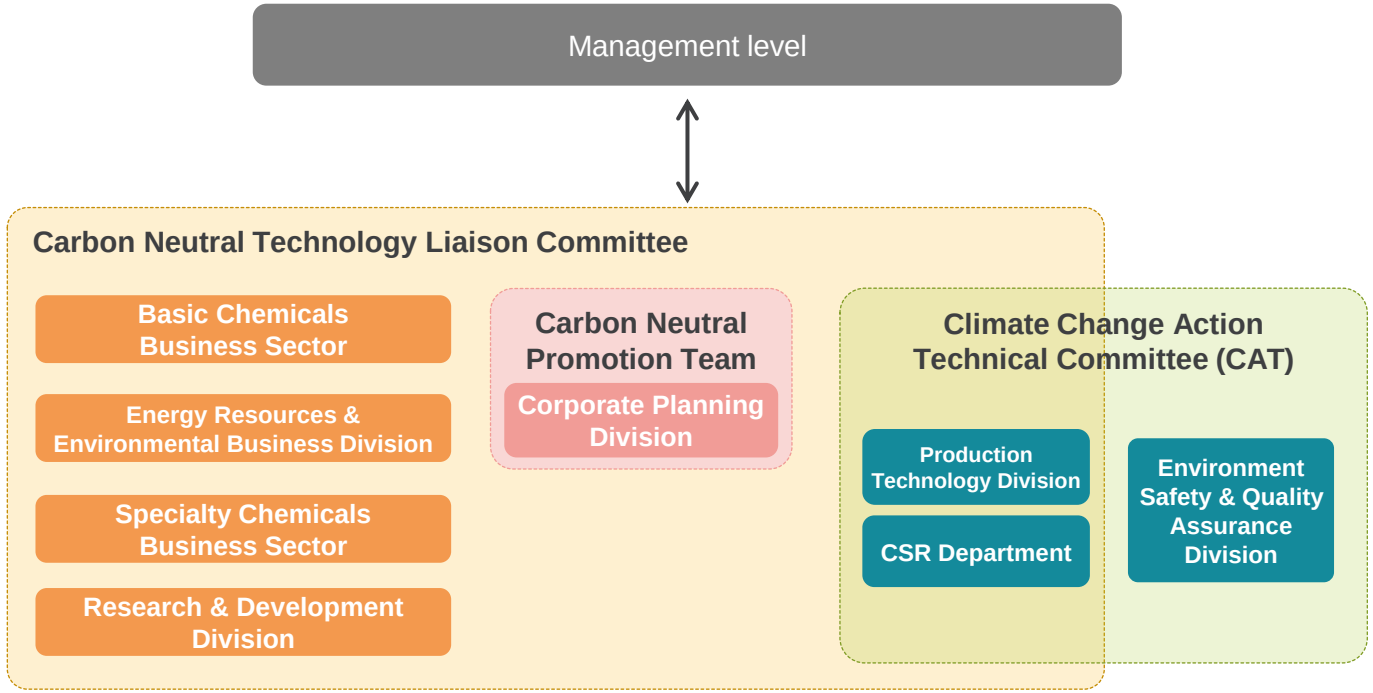
Carbon Neutral Promotion System

- Climate change risk and other CSR priority issues deliberated and decided by the CSR Council, comprised of members of the Board and chaired by the President
- Establishment of Carbon Neutral Technology Liaison Committee, enabling centralized management of MGC Group technology information and promotion of initiatives

Climate Change Governance System



Carbon Neutral Promotion System



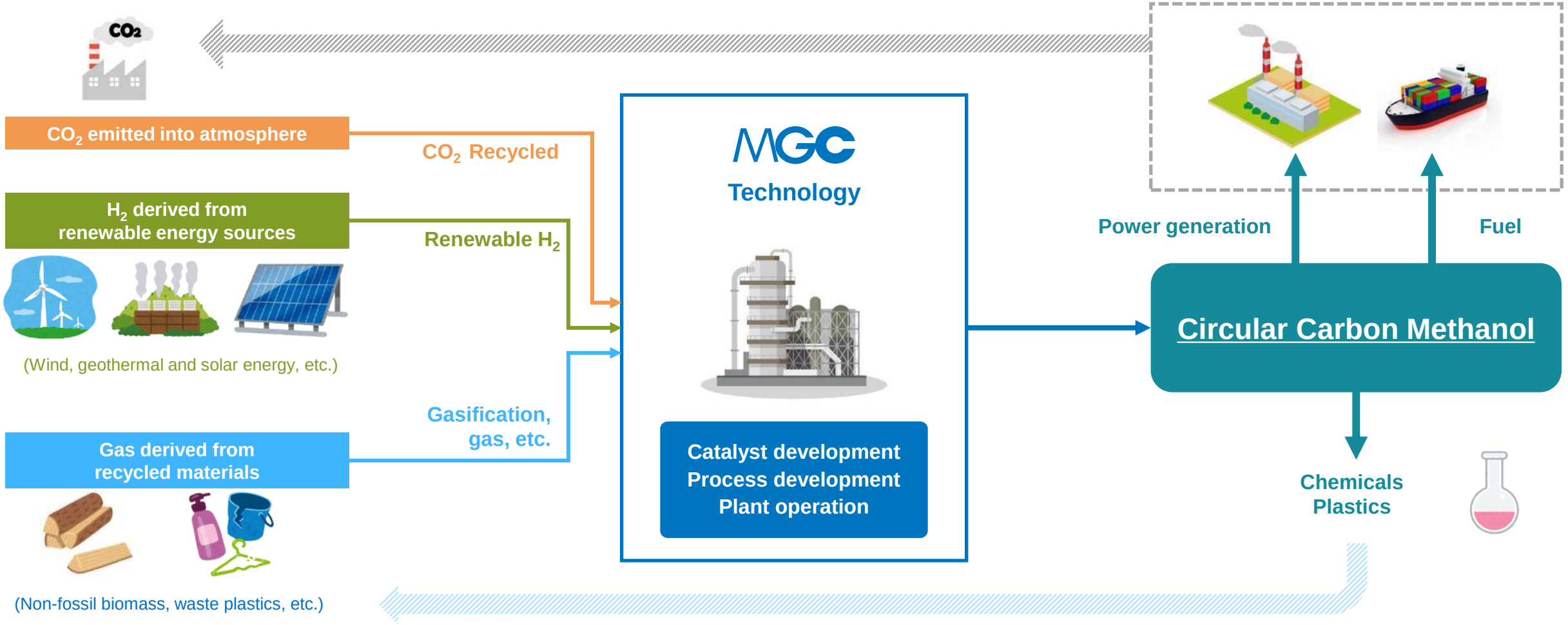
2. Examples of Our Carbon Neutral Initiatives

Examples of Our Carbon Neutral Initiatives

1. **Circular Carbon Methanol**
2. **Clean Ammonia**
3. **Promotion of Utilization of CCU (Carbon dioxide Capture & Utilization)**
   - Manufacture of polycarbonate from CO_2
   - Direct air capture (DAC) technology
4. **Renewable Energy Business Development**
   - Geothermal and biomass power generation
5. **Promotion of Utilization of CCS (Carbon dioxide Capture & Storage)**
   - Large-scale CCS demonstration project in Tomakomai
   - Collaborative study of effective CO_2 utilization
   - Collaborative study of CCUS (Carbon dioxide Capture, Utilization & Storage) in water-dissolved natural gas fields

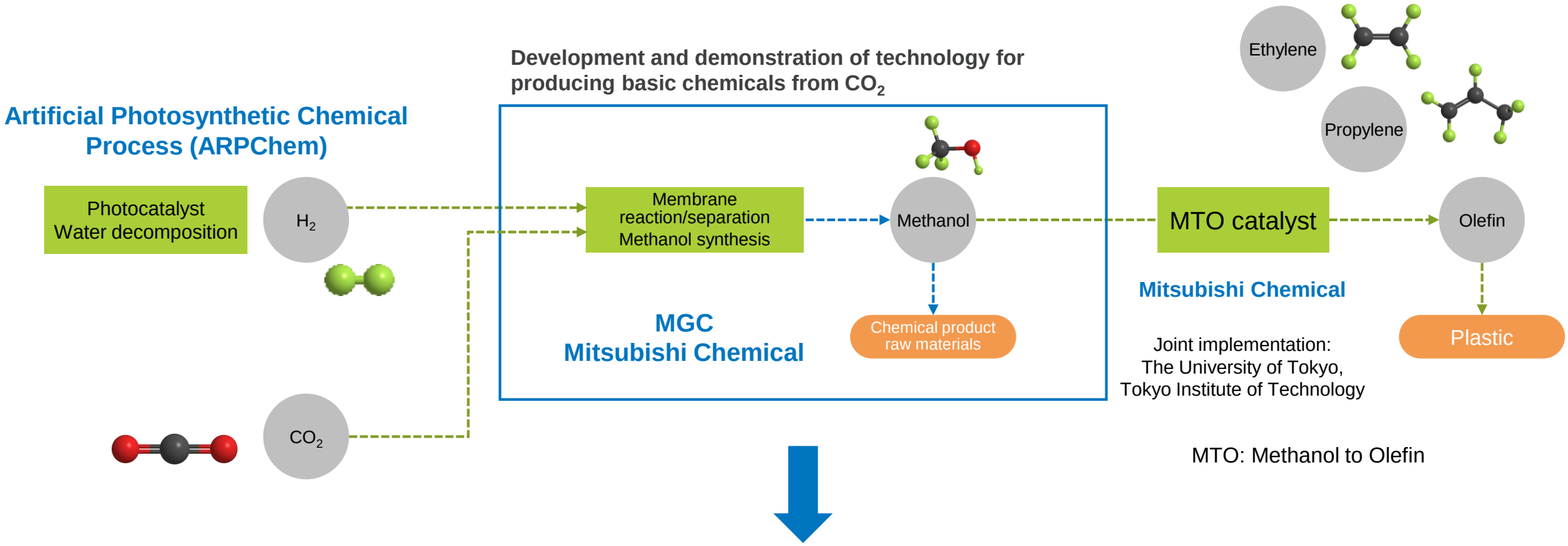
1. Circular Carbon Methanol (1): Overview

- We have been manufacturing methanol from CO_2 and H_2 on a pilot basis at our Niigata Plant since August 2021
- We are pursuing a comprehensive approach that includes out-licensing of methanol production technologies, operational support and product sales thorough cross-industry collaborations with Japanese and foreign companies and local governments



1. Circular Carbon Methanol (2): Selection as a NEDO GI Fund Project

– MGC and Mitsubishi Chemical selected for Green Innovation Fund ／Development of Technology for Producing Raw Materials for Plastics Using CO_2 and Other Sources／[Research and Development 4] “Development of technology for producing chemicals from alcohols” (period of FY2021 to FY2028)



Aiming for high-efficiency production of methanol using CO_2 and green hydrogen as raw materials

1. Circular Carbon Methanol (3): Business Model

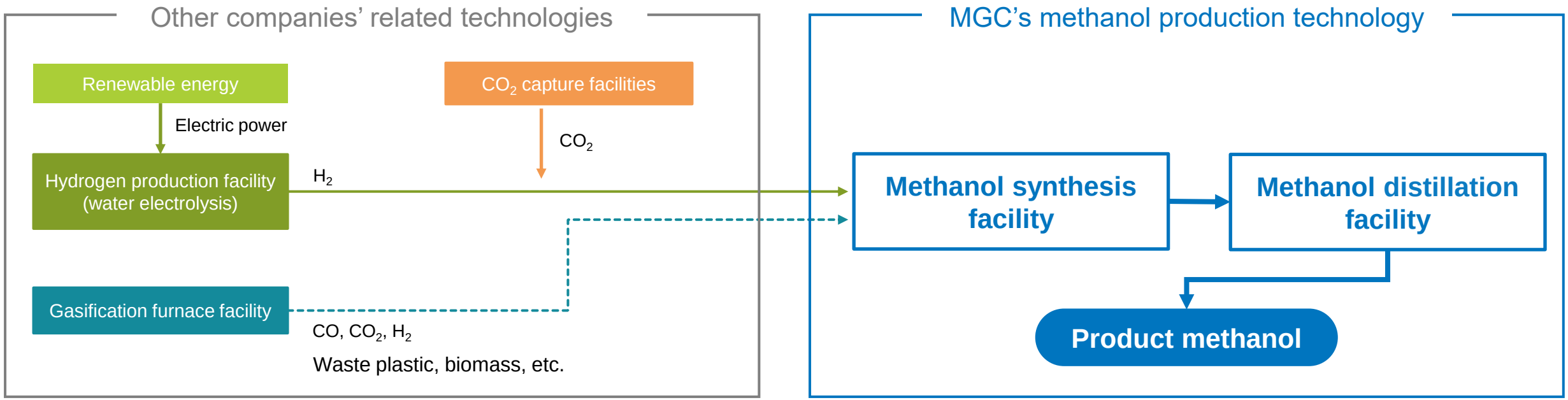
- Establish foundation for sustainable methanol production business that converts sustainable resources into Circular Carbon Methanol
- Promote carbon neutrality and resource recycling through cross-industry initiatives and develop businesses that contribute both environmentally and economically

Sustainable resources
(CO_2, waste hydrogen, biomass)

→ **Circular Carbon Methanol Business** →

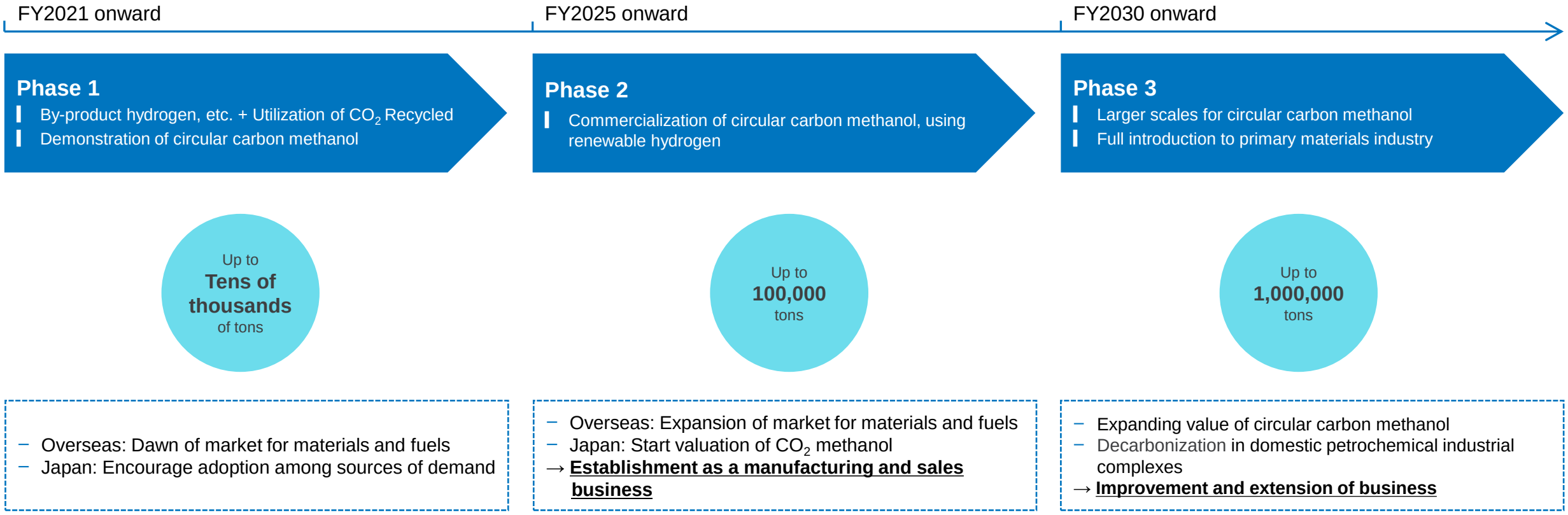
Expanded application based on Circular Carbon Methanol

Deployment in society of our methanol production technology in combination with other companies' related technologies



1. Circular Carbon Methanol (4): Image for Commercialization and Increasing Scale

– **We will aim for the commercialization of Circular Carbon Methanol in the amounts of 100,000 tons by FY2030, and a maximum of 1,000,000 tons from FY2030 onward.**



2. Clean ammonia

- We are studying CCS in collaboration with an Indonesian investee that manufactures ammonia
- We have started to work on jointly sourcing clean ammonia with three other chemical manufacturers

Ammonia

Ammonia as next-generation clean energy

- **Does not emit CO_2 when burned**
- **Transportable and storable with existing infrastructure**
- **Rich in hydrogen**

Ammonia producer/PAU (MGC investee) involved in joint CCS study in Indonesia

Participating members

- **PAU (MGC investee)**
- **Mitsubishi Corporation**
- **Japan Organization for Metals and Energy Security (JOGMEC)**
- **University of Indonesia / Bandung Institute of Technology**

Sourcing of clean ammonia

Four chemical manufacturers have started working on jointly sourcing clean ammonia with MGC playing a key role.
We aim to secure stable and competitive clean ammonia in Japan.

Participating members

- **UBE**
- **Sumitomo Chemical**
- **Mitsui Chemicals**
- **MGC**

Pursuing widespread adoption of clean ammonia fuel

3. Promotion of Utilization of CCU (1): Pilot Production of Polycarbonate (PC) from CO_2 (CO_2 to PC)

- We have promoted technological development of producing polycarbonate by melt polymerization method since the 1990s
- In FY2020, we conducted a foundational study under the NEDO's Leading Research Program; target level of basic research now completed

Overview

Diphenyl carbonate (DPC) is the raw material for the melt polymerization process, the main manufacturing method for polycarbonate (PC) resin, over 5 million tons of which is produced worldwide each year.

The purpose of this research is to develop a new process for efficiently generating DPC precursor dialkyl carbonate (DRC) from CO_2 and alcohol.

MGC is examining this new process's potential for reducing carbon emissions to make net zero and negative carbon-emitting societies a reality.

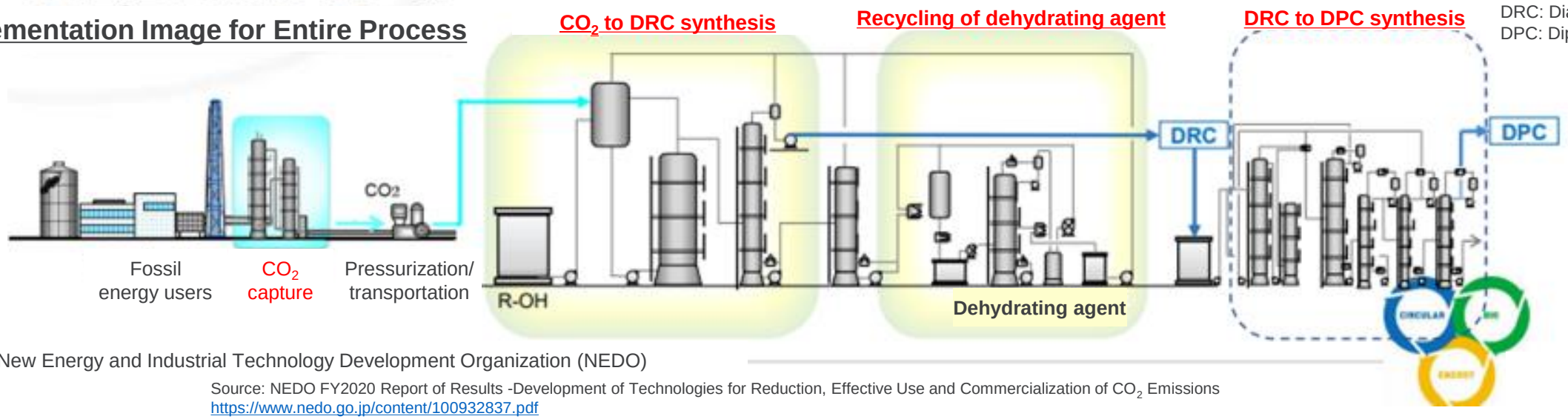
Implementation period

June 2020 to March 2021

Implementation structure

Mitsubishi Gas Chemical Company, Inc.
Nippon Steel Corporation
Nippon Steel Engineering Co., Ltd.
Tohoku University

Implementation Image for Entire Process

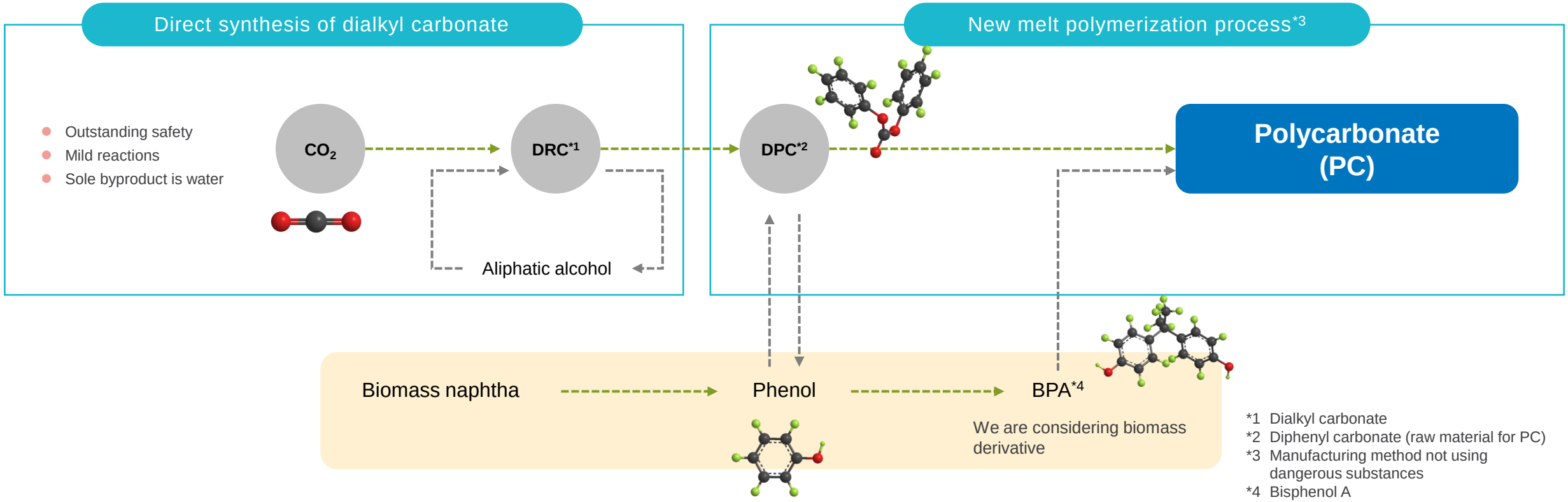


New Energy and Industrial Technology Development Organization (NEDO)

Source: NEDO FY2020 Report of Results -Development of Technologies for Reduction, Effective Use and Commercialization of CO_2 Emissions
https://www.nedo.go.jp/content/100932837.pdf

3. Promotion of Utilization of CCU (2): Pilot Production of Polycarbonate (PC) from CO_2 (CO_2 to PC)

- MGC and Tosoh were selected for Green Innovation Fund ／Development of Technology for Producing Raw Materials for Plastics Using CO_2 and Other Sources／[Research and Development 3] “Development of technology for producing functional chemicals from CO_2” (period of FY2021 to FY2028)
- Joint research: Tohoku University, University Public Corporation Osaka, others

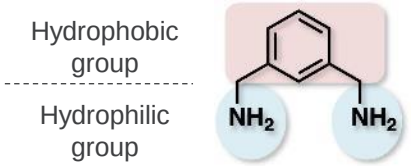


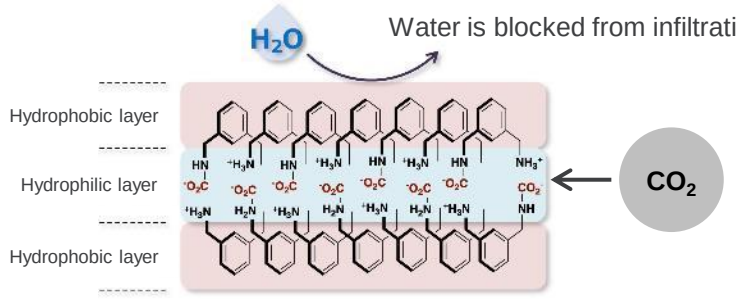
- **DPC bench plant verification is to be completed by FY2024.**
- **We aim to complete DPC pilot plant (2000t/y) and PC pilot plant (600t/y) verification by FY2028.**

3. Promotion of Utilization of CCU (3): Direct Air Capture (DAC)

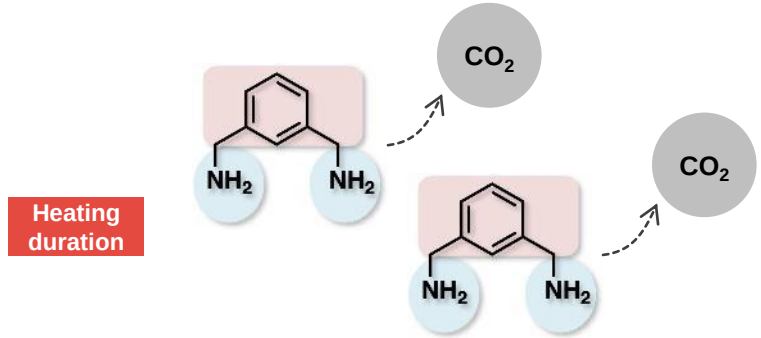
- Together with Kobe Gakuin University, we are conducting proof of concept testing of a DAC system that uses meta-xylenediamine (MXDA)
- Viability of new amines (under development) will be determined by around 2030 through basic research and scalability testing

MXDA





Selective absorption of CO_2 alone with no impact on atmospheric water content



Highly energy-efficient CO_2 desorption by virtue of absence of water

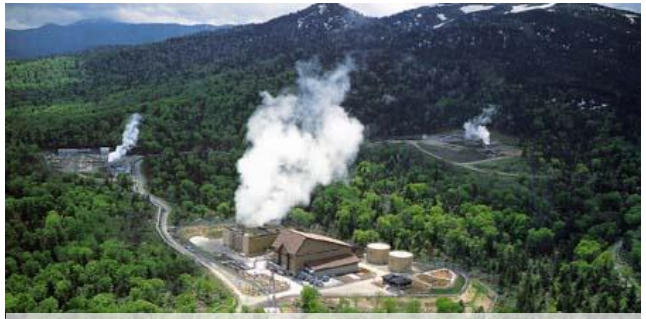
CO_2 source	IGCC (Integrated coal gasification combined cycle)	Blast furnace gas	Thermal power generation	Atmosphere
CO_2 concentration	40%	22%	13%	400ppm
Principal technologies	← Separation membrane →	← Absorbent solution →	← Solid absorbent →	
			New amine (under development)	

4. Renewable Energy Business Development (Geothermal and Biomass Power, Others)

- Since 1981, we have been developing geothermal resources using exploration and development technologies. In addition to operating three geothermal power plants in Japan, we are also doing feasibility study in new regions.
- Capitalizing on our experience in the electric power business, we are involved in biomass power generation in Hokkaido.

Geothermal power generation

Hachimantai Green Energy Corporation



Sumikawa Geothermal Power Station

In operation since 1995

Output: **35,000** kW

Joint venture with
Mitsubishi Materials Corporation

Yuzawa Geothermal Power Corporation

Wasabizawa Geothermal Power Station

In operation since 2019

Output: **43,000** kW

Joint venture with
Electric Power Development Co.,Ltd.,
Mitsubishi Materials Corporation

Appi Geothermal Energy Corporation

Appi Geothermal Power Station

Under construction;
scheduled to begin operating in 2024

Planned output: **14,900** kW

Joint venture with
Mitsubishi Materials Corporation,
Electric Power Development Co., Ltd.

Biomass power generation

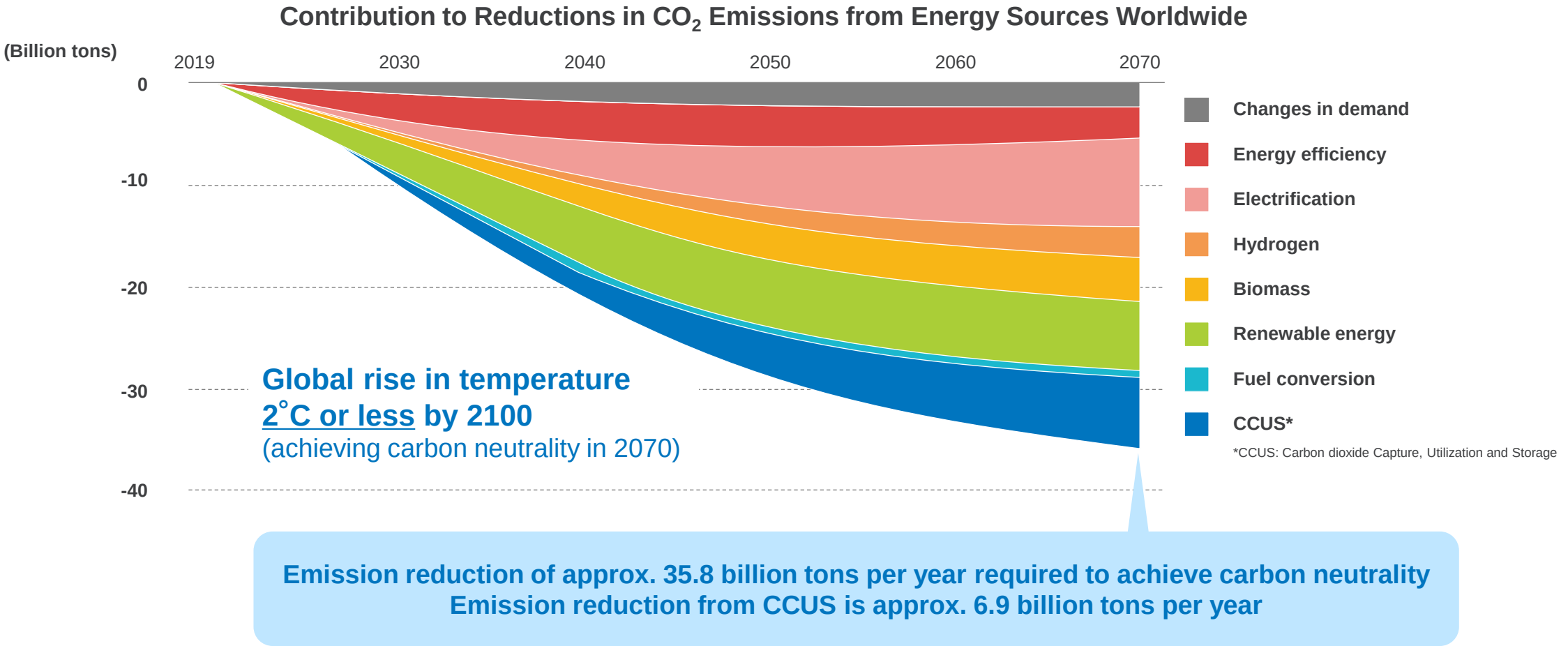
We are involved in biomass power generation in Hokkaido,
using domestically grown timber (from forest thinning)

Scheduled to begin operating in 2022

Output: **19,800** kW

5. Promotion of Utilization of CCS

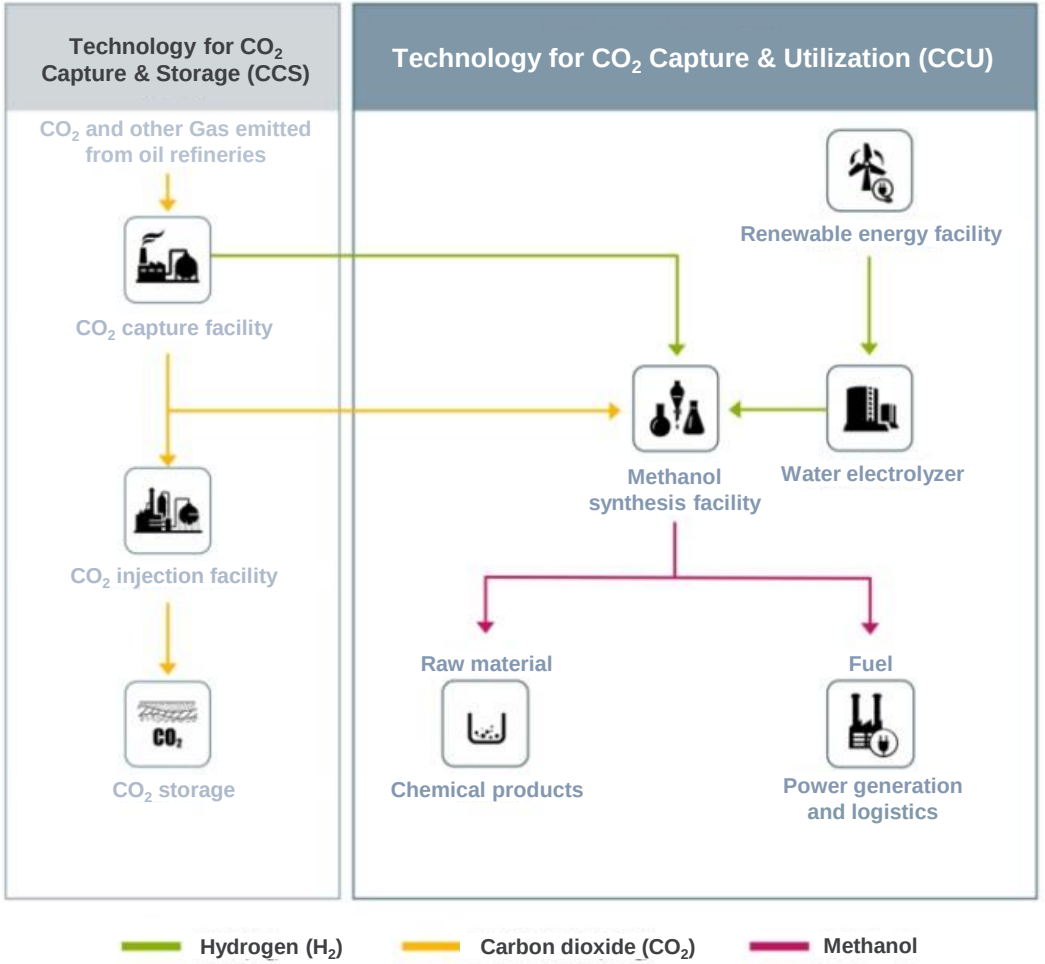
– CCUS positioned as a vital measure toward achieving carbon neutrality



Reference: IEA “Energy Technology Perspectives 2020” Figure 2.2
Source: “NEDO Environment Department Activity Report 2020” https://www.nedo.go.jp/content/100932840.pdf

5. Promotion of Utilization of CCS: Large-scale CCS Demonstration Project in Tomakomai (1)

- We are involved in the NEDO's large-scale CCS demonstration project in Tomakomai.* *through our investee Japan CSS Co., Ltd.
- We synthesize methanol as a chemical raw material and fuel from captured CO_2, H_2 produced as a byproduct by oil refineries and H_2 produced by water electrolyzers.



5. Promotion of Utilization of CCS: Large-scale CCS Demonstration Project in Tomakomai (2)

– We launched demonstration project in FY2012 and achieved cumulative underground storage of 300,000 tons in November 2019

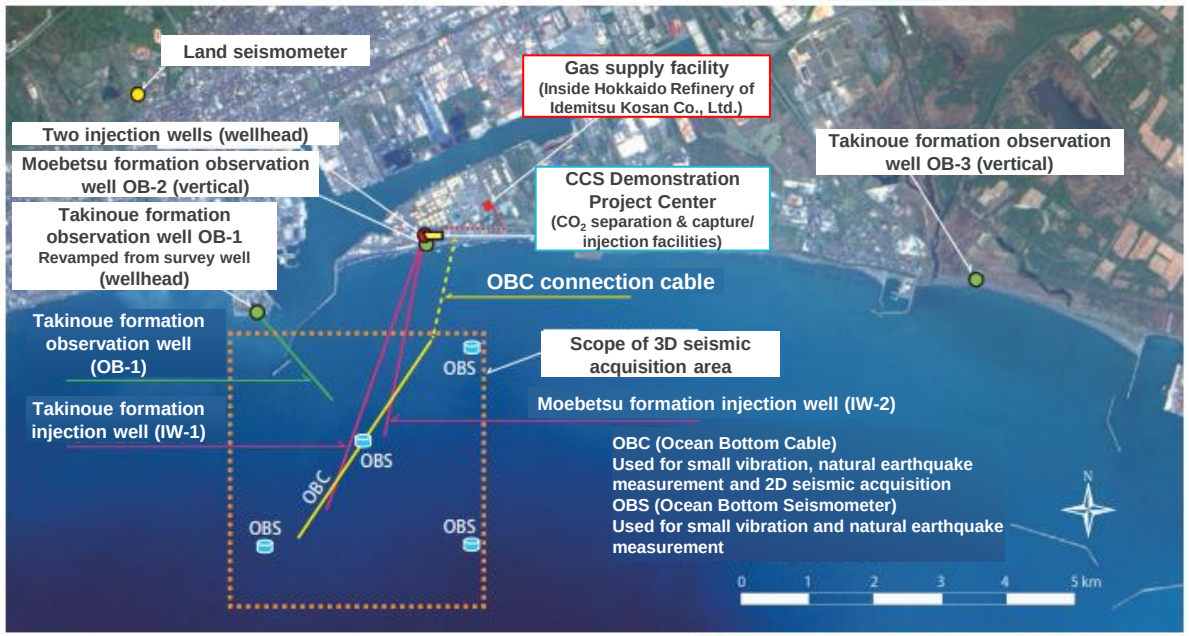
Demonstration timeline

From FY2012 to FY2015, drilled two observation wells and two injection wells.

From April 2016, initiated CO_2 injection.

In November 2019, achieved underground storage of a total of 300,000 tons.

Currently, we are busy monitoring to verify the behavior of stored CO_2.



Halted and withdrew from OBS and land seismometer operation in FY2021

Source: processed "LC81070302016141LGN00, courtesy of the U.S. Geological Survey"

Photo credit: Japan CCS Co., Ltd.

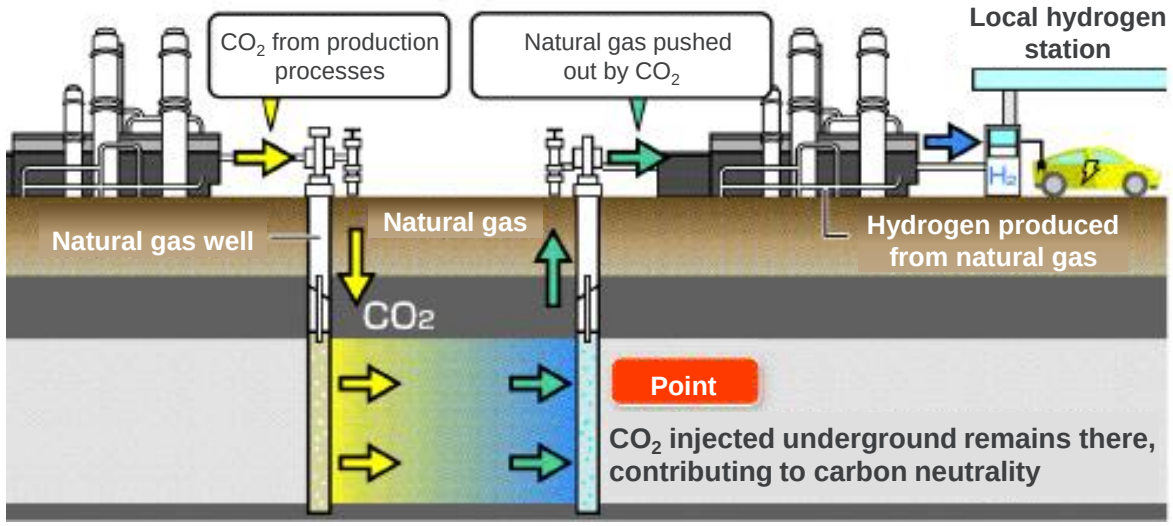
5. Promotion of Utilization of CCS: Collaborative Study of Effective Utilization of CO_2 with JAPEX

- We are conducting study with JAPEX of effective utilization of CO_2 from the Niigata Plant
- Injection of CO_2 from hydrogen production and excess CO_2 into the Higashi-Niigata Oil and Gas Field for use to increase oil and natural gas production (EOR/EGR*)

Higashi-Niigata Oil and Gas Field

(Niigata City, Niigata Pref.)

How EGR (enhanced gas recovery) works



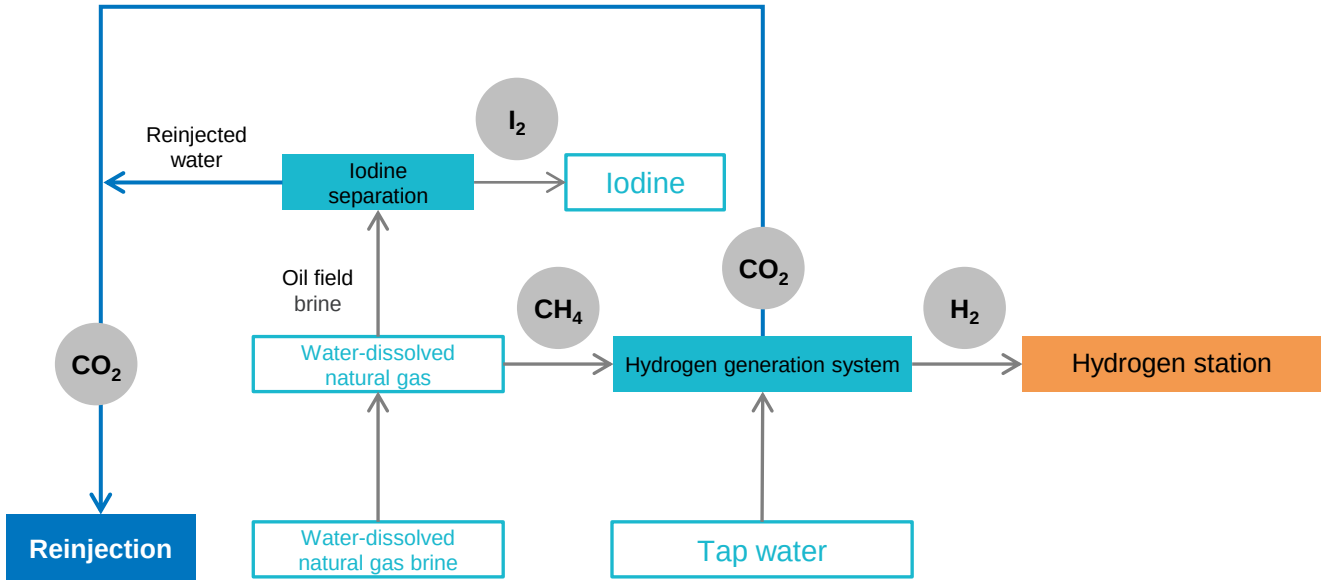
Source: Niigata Nippo (Niigata Daily News), January 1, 2022

*EOR: Enhanced oil recovery
*EGR: Enhanced gas recovery

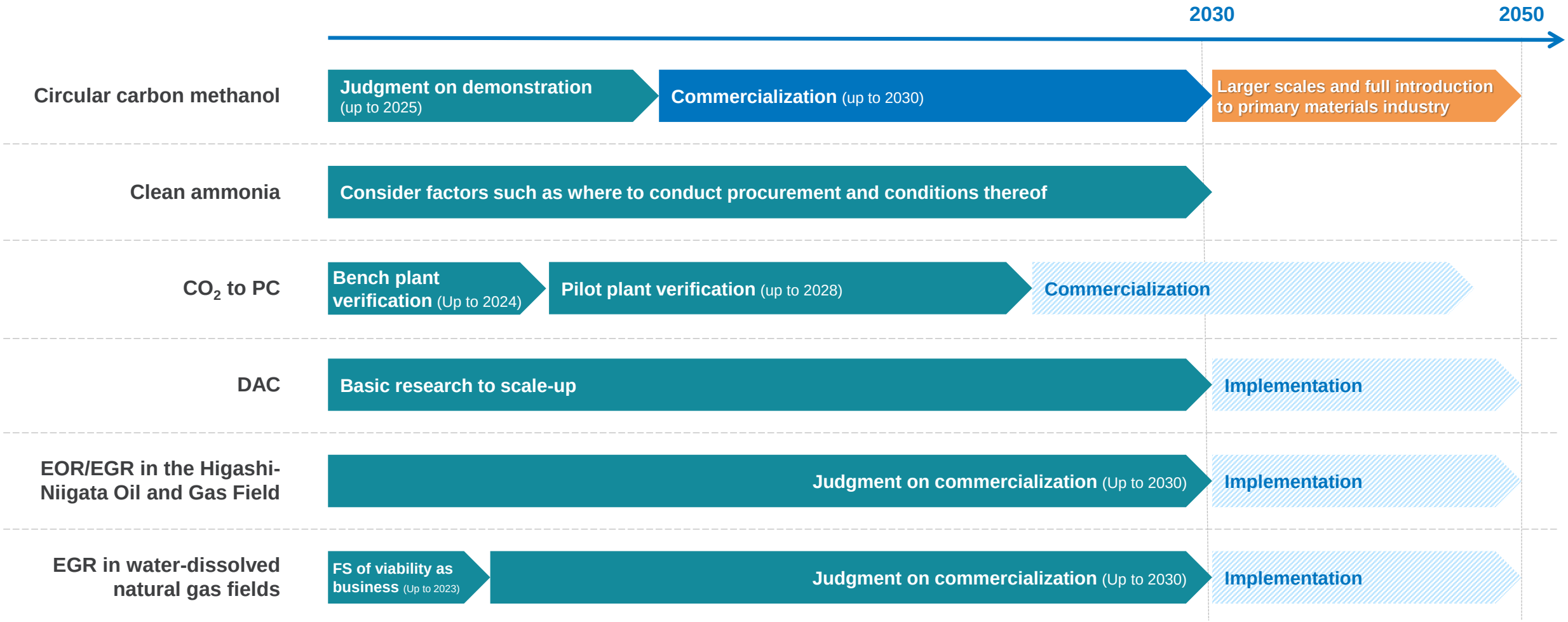
5. Promotion of Utilization of CCS: Collaborative Study of CCUS in Water-Dissolved Natural Gas Fields

- We are promoting of EGR (enhanced gas recovery) initiatives
- Business feasibility study will be conducted until FY2023; decision to achieve proof-of-concept by 2030

After extracting natural gas and iodine from water-dissolved natural gas brine, once hydrogen is separated from the natural gas, the resulting CO_2 will be injected underground with the brine, allowing secondary gas recovery to be attempted.



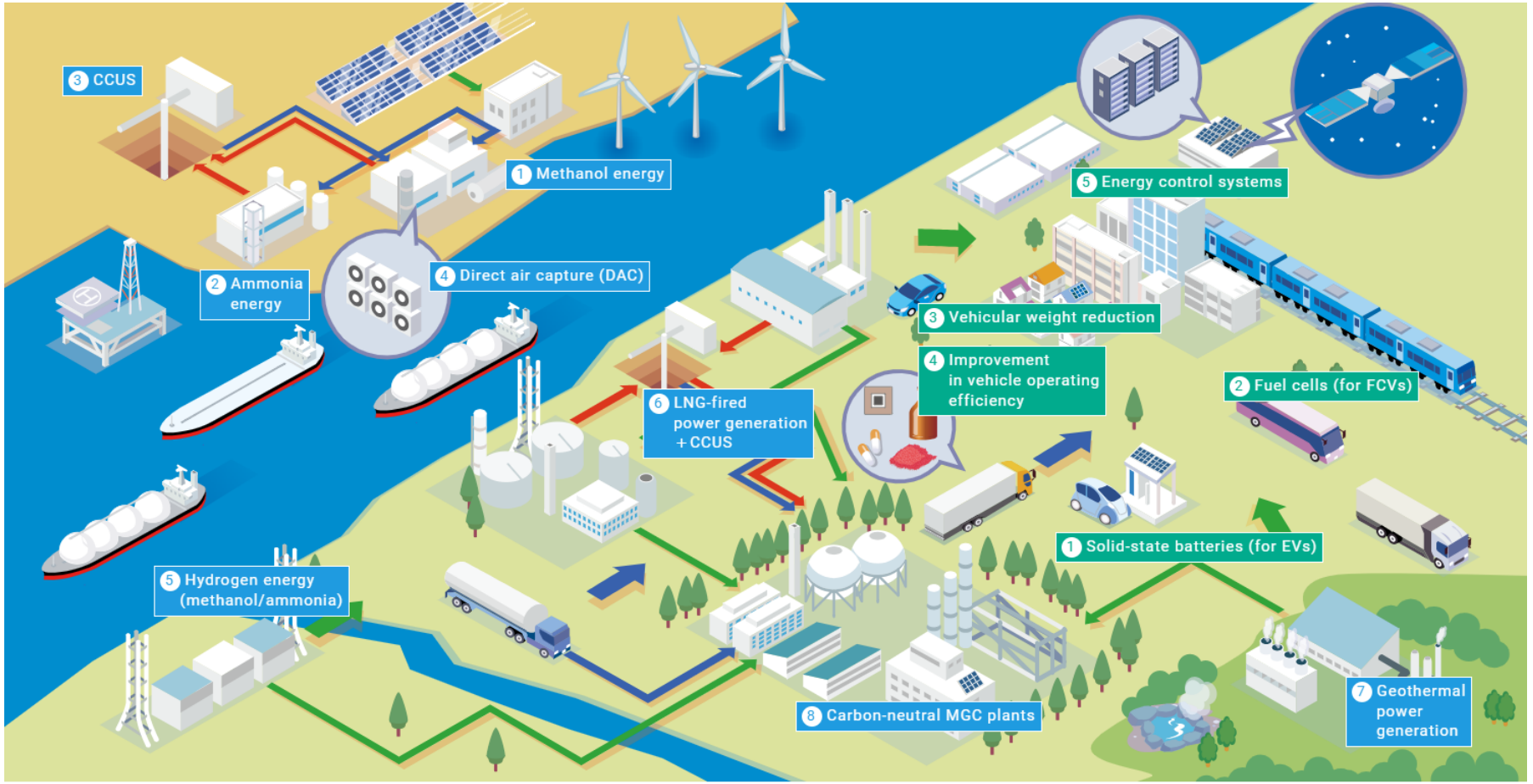
Carbon Neutrality Promotion Goals



Carbon Neutral World of 2050 as Imagined by MGC

– We have many products and technologies that contribute to preventing global warming, conserving energy and other resources and preserving the environment

– As a chemical manufacturer, we are in a perfect position to positively impact the earth's environment.



3. Supplementary Materials and Topics

Topic: Selection for Green Innovation Fund Project (1)

February 18, 2022 News Release

Green Innovation Fund, the Development of Technologies for Producing Raw Materials for Plastics Using CO_2 and/or Other Sources

4. Development of Technology to Manufacture Chemicals from Alcohols (i)

- Development for commercialization of chemical raw material production through artificial photosynthesis
  - (2) Development and demonstration of technology for production of basic chemicals from CO_2

Project objectives and overview

a. Development of methanol membrane reaction/separation process When synthesizing methanol from CO_2, because it is a static reaction, previous technologies enabled a yield of around 30 to 40%, thus requiring a significant amount of recycling. With development of a new membrane reaction/separation process, we aim to improve the inversion rate by a wide margin.
b. Development of innovative MTO catalytic process We will develop catalysts to enable high-yield manufacture of target ethylene and propylene. Development of continuous catalyst regeneration technology will enable more than 10,000 hours of continuous regeneration, equivalent to more than 1 year. MTO: Methanol to olefine

Implementation structure

Mitsubishi Chemical Corporation [the contact company]
Mitsubishi Gas Chemical Company, Inc.

Project period

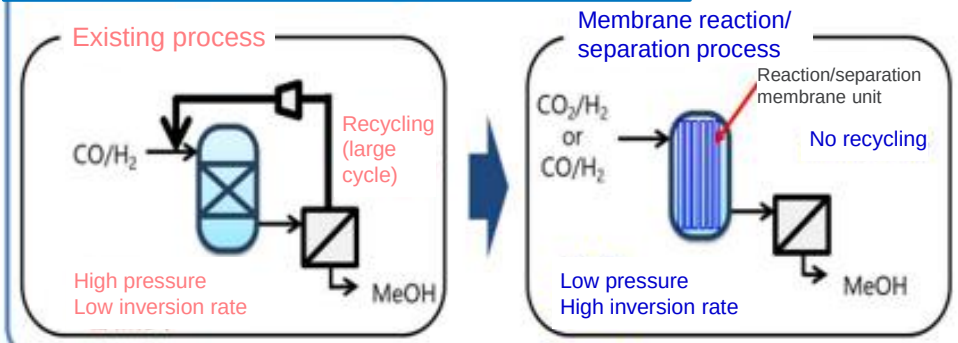
From FY2021 to FY2028 (eight years)

Project scale

☐ Project scale (a+b) : Approx. ¥21.11 billion
☐ Support scale (a+b) : Approx. ¥13.38 billion*
*Includes incentives. Subject to change.
☐ Subsidy rate
a, b : 2/3 subsidy→1/2 subsidy (incentive rate: 10%)

Project concept

a. Methanol membrane reaction/separation process



b. Innovative MTO catalytic process

Source: Mitsubishi Chemical Corporation and Mitsubishi Gas Chemical Company, Inc.

Topic: Selection for Green Innovation Fund Project (2)

February 18, 2022 News Release

Green Innovation Fund, the Development of Technologies for Producing Raw Materials for Plastics Using CO_2 and/or Other Sources

3. Development of Technology to Manufacture Functional Chemicals from CO_2 (i)

- Development of manufacturing technology for functional plastic materials using CO_2 as a raw material

Project objectives and overview

a. Development of manufacturing technology for polyurethane raw materials We will develop manufacturing technology for isocyanates, a raw material for polyurethane, and PCD using CO_2 as a raw material, utilizing CO_2 directly from exhaust gas of factories, etc., instead of the conventional raw material phosgene. With these CO_2 derivatives, we aim to realize eco-friendly, high-performance polyurethane.
b. Development of new intermediates synthesis technology for polycarbonate production and of a high-performance process for non-phosgene polycarbonate We will develop a new synthesis technology for the production of DPC precursors using CO_2 as a raw material instead of phosgene. We aim to realize a process to enhance the functionality of polycarbonate using the DPC obtained by this technology.

Implementation structure

Tosoh Corporation [the contact company]
Mitsubishi Gas Chemical Company, Inc.

Project period

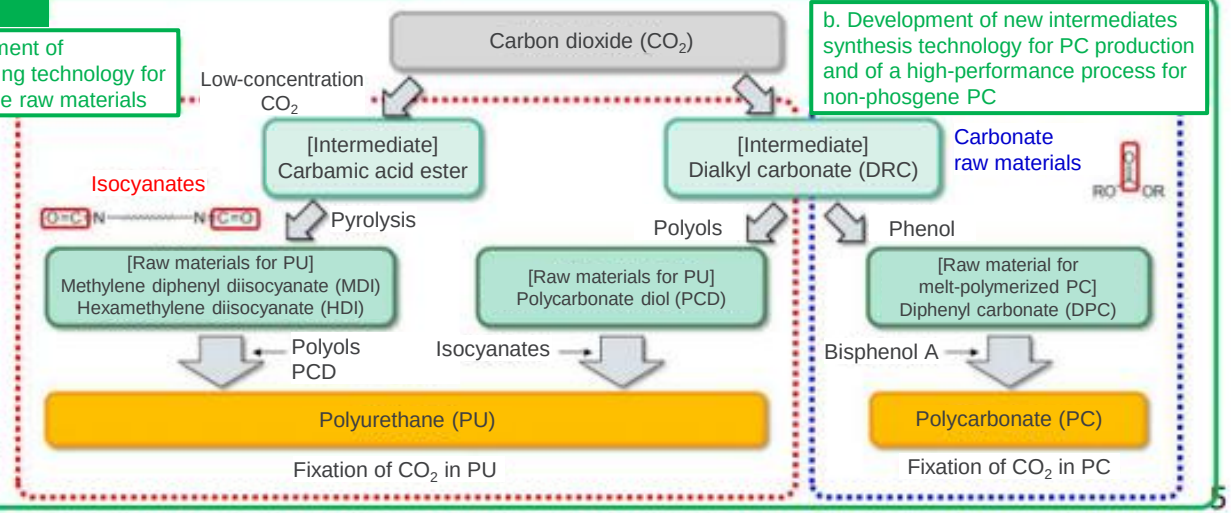
From FY2021 to FY2028 (eight years)

Project scale

☐ Project scale (a+b) : Approx. ¥30.69 billion
☐ Support scale (a+b) : Approx. ¥19.80 billion*
*Includes incentives. Subject to change.
☐ Subsidy rate
a, b : 2/3 subsidy→1/2 subsidy (incentive rate: 10%)

Project concept

- Synthesis functional chemicals, which are used as plastic raw materials from CO_2 raw materials.
- Fix CO_2 as plastics.
- Enhance energy efficiency of processes.
- Reduce CO_2 emissions compared with conventional manufacturing method.



Source: Tosoh Corporation and Mitsubishi Gas Chemical Company, Inc.

Topic: Conclusion of Agreement for DBJ Sustainability Linked Loan with Engagement Dialogue with Development Bank of Japan

February 10, 2022 News Release

Mitsubishi Gas Chemical Company, Inc. (MGC; Head office: Chiyoda-ku, Tokyo; President: Masashi Fujii) today announced that it has concluded a loan agreement (agreement period: 10 years; ¥10 billion) with the Development Bank of Japan (DBJ; Head office: Chiyoda-ku, Tokyo; President: Hajime Watanabe) on a DBJ Sustainability Linked Loan with Engagement Dialogue (SLL with Engagement Dialogue).

SLL with Engagement Dialogue is a financial instrument designed to encourage sustainable growth for both borrowers and society as a whole. Based on the Green Loan and Sustainability Linked Loan Guidelines drafted by Japan's Ministry of the Environment, SLL with Engagement Dialogue works through dialogue between DBJ by establishing the borrower key performance indicators (KPIs) appropriate for helping the borrower raise the level of sophistication of their sustainability management, and sustainability performance targets (SPTs) aligned with sustainability strategy. Loan terms and conditions are linked to SPT achievement.

Conclusion of this loan agreement was the result of evaluation of KPIs and SPTs (listed on the right) pertaining to the Circular Carbon Methanol Concept, a concrete action plan for addressing energy and climate change issues by using CO_2 and waste plastic as raw materials to produce methanol, found in MGC's Medium-Term Management Plan Grow UP 2023.

KPI

Circular Carbon Methanol Concept Realization

SPT (1)	Conclude demonstration operation of Circular Carbon Methanol pilot plant by FY2023
SPT (2)	Complete construction of Circular Carbon Methanol mass production plant with annual production volume of 10,000 tons or more by FY2029

Topic: Participation in Initiative to Study Japan's Energy Transition [ETI-CGC]

November 8, 2021 News Release

Mitsubishi Gas Chemical Company, Inc. (MGC; Head office: Chiyoda-ku, Tokyo; President: Masashi Fujii) today announced its participation in "ETI-CGC (Energy Transition Initiative-Center for Global Commons," a voluntary initiative launched by the University of Tokyo's Center for Global Commons and Japanese enterprises. ETI-CGC will conduct studies concerning Japan's energy transition based on the five principles highlighted below.

1. **We will safeguard the sustainability of our environment, the Global Commons. To this end, we will chart pathways to reduce Japan's greenhouse gas emissions to net zero by 2050.**
2. **Capitalizing on findings and scientific insights across the world and in Japan, we will study pathways compatible with local circumstances in order to achieve carbon neutrality, while safeguarding well-being and wealth.**
3. **With these pathways, we aim to become an international model case for countries with unique local circumstances and subsequently make contributions to the carbon neutrality of the entire world.**
4. **We will consider the implementation of the pathways an opportunity to transform Japan's industrial structure and economic/social system as well as our behavioral pattern towards the future. We will also discuss how we can take advantage of this opportunity.**
5. **We will make policy proposals and take a leadership role in stimulating discussions on a broader basis in Japan.**

Energy **T**ransition **I**nitiative - **C**enter for **G**lobal **C**ommons

What is ETI-CGC?

- ETI-CGC is a platform for linking industry and academia in voluntary cooperation between business leaders and the academic world to imagine Japan's pathway to net zero
- Secretariat: The University of Tokyo's Center for Global Commons
- Member List

AGC	Mitsui & Co.
JERA	Hitachi
Sumitomo Chemical	Tokyo Electric Power Company Holdings
Toyota Motor	Sumitomo Mitsui Financial Group
SoftBank	**Mitsubishi Gas Chemical**
Daikin Industries	Mitsubishi Chemical
Mitsubishi UFJ Financial Group	The University of Tokyo Institute for Future Initiatives

Topic: Initiative for Resourcification Business Targeting Used Plastic

November 9, 2020 News Release

Initiative for resourcification business targeting used plastic
Capital participation in new company R Plus Japan Ltd.

Initiatives under the joint venture

R Plus Japan Ltd. will join forces with U.S.-based biochemical venture Anellotech Inc. to promote development of technology with low environmental impact for the efficient resourcification of used plastic.

This move should contribute to solving common issues worldwide regarding plastic through cross-industry collaboration encompassing recovered plastic sorting and treatment, monomer and polymer production, packaging and container manufacturing, trading companies, beverage and food product manufacturers and other entities, with sights on practical applications in 2027.

R Plus Japan Members

History of Resource Development at Mitsubishi Gas Chemical (1)

1951	Japan Gas Chemical Co., Inc. established
1953	Successfully developed water-dissolved natural gas in a mining area in Yamanoshita District of Niigata City with forerunner to Water&Geo-Tech Engineers, Nissaku
1955	Began development of water-dissolved natural gas following excavation of “Kajikawa R-1 Well,” a test well in the Higashi-Niigata region
1959	Discovered “Higashi-Niigata Oil and Gas Field” (Higashi-Niigata SK-1 Well), a deep non-associated gas field in the Higashi-Niigata region in cooperation with Japan Petroleum Exploration Co., Ltd.
1960	Began solo development of shallow layer non-associated gas at depths of up to 1,000m in the Higashi-Niigata region (Higashi-Niigata R-11 Well). 10 sites excavated by 1965
1967	Discovered “Shin-Tainai Gas Field” (Shin-Tainai NS-2 Well), located near the mouth of the Tainai River in the Kitakambara region in collaboration with Japan Petroleum Exploration Co., Ltd.
1971	Japan Gas Chemical Co., Inc. and Mitsubishi Edogawa Chemical Co., Ltd. merged to become Mitsubishi Gas Chemical Company, Inc. Launched first attempt at commercialization (experimented on balanced extraction method by calendar date for water-dissolved natural gas)

Water-dissolved natural gas well excavation during initial development

Water-dissolved natural gas production facility during initial development

History of Resource Development at Mitsubishi Gas Chemical (2)

1981	Reopened solo developed shallow layer non-associated gas at depths up to 1,000m in the Niigata region (Higashi-Niigata MG-21 Well). 13 sites excavated by 1985 Began surveying aimed at building a geothermal power station in the Hachimantai-Sumikawa region of Akita Pref. in collaboration with Mitsubishi Metal Corporation [today: Mitsubishi Materials Corporation]
1983	Discovered “Iwafune-oki Oil and Gas Field” (Iwafune-oki SIM-1 Well) through four-way collaboration with Japan Petroleum Exploration Co., Ltd., Japex Offshore Ltd. and Niigata Petroleum Development Co., Ltd.
1990	Launched Iwafune-oki Oil and Gas Field production Established MGCRA to conduct coal-seam gas exploration in Queensland, Australia
1994	Joined forces with Mitsubishi Materials to establish Hachimantai Geothermal Co., Ltd. [today: Hachimantai Green Energy Co., Ltd.] in Kazuno City, Akita Pref., to supply steam to the Tohoku Electric Power Sumikawa Geothermal Power Station
1995	Started three-way operation of Sumikawa Geothermal Power Station in conjunction with Tohoku Electric Power Co., Inc. and Mitsubishi Materials Corporation
1996	Reopened solo developed medium-depth non-associated gas at depths up to 1,450m in the Higashi-Niigata region (Higashi-Niigata MG-34 Well excavation) Withdrew from coal-seam gas exploration business in Queensland, Australia

Test production at non-associated natural gas well in Higashi-Niigata

Steam releasing at Sumikawa Geothermal Power Station

History of Resource Development at Mitsubishi Gas Chemical (3)

2002	Excavated reinjection wells “K1-5” and “K2-5” for groundwater from water-dissolved natural gas in the Higashi-Niigata region (new water-dissolved well excavation for first time in approx. 40 years)
2004	Launched joint surveying in the Akinomiya region with Mitsubishi Materials
2006	Participated in natural gas exploration in the Zitong mining zone, Sichuan Province, China
2008	Together with Japan Petroleum Exploration Co., Ltd. and Japex Offshore Ltd., excavated three test wells in the Sea of Japan - “Seiro-oki MS-1 Well,” “Tainai-oki MS-1 Well” and “Aganogawa-oki MS-1 Well” - using excavation barge HAKURYU-5. Established Japan CCS Co., Ltd., with MGC and eight partners as the originating companies
2010	Established Yuzawa Geothermal Power Corporation with Electric Power Development Co., Ltd. and Mitsubishi Materials Corporation to build a geothermal power plant in Yuzawa City, Akita Pref.
2012	MGC, with nine other companies, inaugurated the Fukushima Geothermal Project in the Azuma and Adatara regions of Fukushima Pref.
2013	Excavated the geothermal survey well “Musadake SMMG-1 Well” in the Musadake region of Hokkaido Pref. with Japan Petroleum Exploration Co., Ltd. and Mitsubishi Materials Corporation Began a joint survey of geothermal resources in the Bandai, Azuma and Adatara regions of Fukushima Pref.
2014	In British Columbia, Canada, participated in shale gas development in North Montney and LNG business in Prince Rupert
2015	Established Appi Geothermal Energy Corporation through a joint venture with Mitsubishi Materials Corporation to advance study of geothermal power commercialization in the Appi region of Hachimantai City, Iwate Pref.

Semisubmersible ocean excavation rig “HAKURYU-5”

Oil and natural gas excavation in Sichuan Province, China

History of Resource Development at Mitsubishi Gas Chemical (4)

2016	Entered the LNG-fired power generation business through investment in Fukushima Gas Power Co., Ltd. Started injection of CO_2 in CCS demonstration project in Tomakomai City, Hokkaido Pref.
2018	Established MGC Energy Co., Ltd. to consolidate electric power procurement, supply and sales functions for the entire Mitsubishi Gas Chemical Group Electric Power Development Co., Ltd. participated in Appi Geothermal Energy Corporation
2019	Halted geothermal survey in the Bandai region of Fukushima Pref. Commercial operations launched at Wasabizawa Geothermal Power Station in Yuzawa City, Akita Pref. Started construction of Appi Geothermal Power Station Achieved cumulative insertion of 300,000 tons of CO_2 in the Tomakomai CCS Demonstration Project
2020	Withdrew from shale gas and LNG business in Canada Commercial operations launched at Fukushima Natural Gas Power Plant Withdrew from geothermal project in the Musadake region of Hokkaido Pref.
2021	TOHO EARTHTECH, INC. (MGC consolidated subsidiary) launched production of newly developed water-dissolved natural gas in the Nishikambara region of Niigata Pref.

Tomakomai CCS Demonstration Project Center
Photo credit: Japan CCS Co., Ltd.

Current water-dissolved natural gas production facility

Turning Ancient Underground Water into Niigata's Strength
-Water-dissolved Natural Gas, Iodine-

Gas dissolved in brine

Water-dissolved natural gas

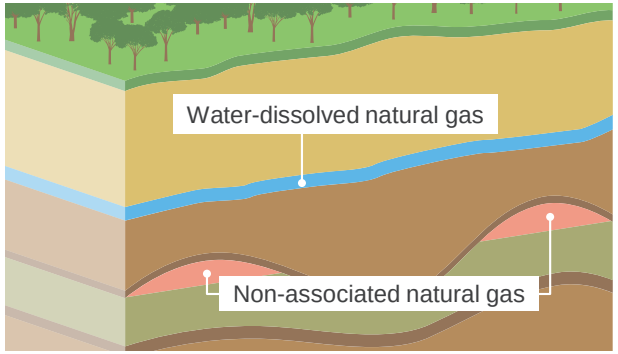
The main component is methane.
Collected from drawn brine where dissolved.
Abundant reserves verified in Niigata Pref. and Chiba Pref.

[Broad Applications for Natural Gas]

In addition to use in general households, natural gas is also used as fuel for thermal power generation. It is also widely utilized as a raw material for methanol, ammonia and other chemicals.

[Water-dissolved Natural Gas and Non-associated Natural Gas]

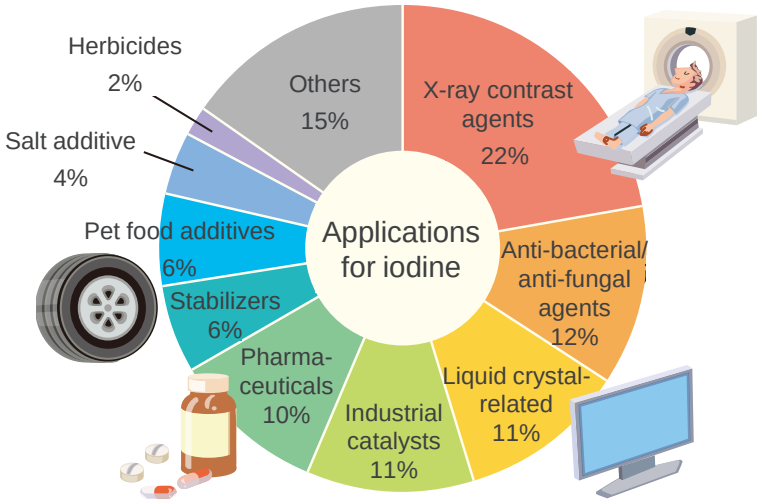
Water-dissolved natural gas in Niigata Pref. is primarily located 500 to 1,000 m underground, with non-associated natural gas also present at lower depths.



A precious element, and one essential to human health

Iodine

This element is critical for the creation of thyroid hormones necessary for body growth, and can be consumed through various types of seaweed. In some landlocked countries, the addition of iodine to table salt and other foods is mandated by law. Collected mainly from minerals and **brine**, iodine's antibacterial and chemical properties are leveraged for use in a wide range of applications from pharmaceuticals to industrial products.



Water-dissolved natural gas and iodine are extremely important resources that hold the potential to become strengths for Niigata.

Turning Ancient Underground Water into Niigata's Strength https://www.gas-youso.com/

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