

Carbon Neutral Research Hub Opens as a Research and Development Site for Carbon Neutral Technology

October 7, 2021
Osaka Gas Co., Ltd.

Osaka Gas Co., Ltd. (President: Masataka Fujiwara; hereinafter referred to as "Osaka Gas") today (October 7) established the carbon neutral technology research and development site "Carbon Neutral Research Hub" (CNRH) in the Torishima district of Konohana-ku, Osaka.

The Company works on research and development aimed at achieving carbon neutrality by 2050 and thoroughly reducing carbon dioxide (CO₂) emissions by then. To accelerate these R&D activities, Osaka Gas will strengthen technical collaboration within the Daigas Group and promote joint research with its alliance partners. At the same time, it will enhance its experimental facilities for various carbon-neutral technologies.

The Torishima district is the place where Osaka Gas began its R&D activities. Since it established its first R&D site in 1947, the Company has been researching and developing technologies for producing city gas at the time from coal and oil and for making advanced use of natural gas as exemplified by cogeneration systems and Ene-Farm, a fuel cell system for residential use. Osaka Gas intends to further polish core technologies, such as catalyst technology and combustion technology, that it has accumulated so far and to proceed with research and development that contributes to carbon neutrality.

CNRH will work on the development of methanation^{*1} technology to make city gas carbon-neutral and chemical looping combustion^{*2} technology to produce green hydrogen. These are just a few examples of CNRH's R&D activities aimed at *creating* future-oriented carbon-neutral energy.

In addition, the Hub will also pursue research and development for making smart *use* of carbon-neutral energy. Examples include development of a small engine system^{*3} that works using ammonia fuel alone, attracting attention as an alternative to fossil fuels, and a virtual power plant (VPP)^{*4} that utilizes dispersed power sources to help stabilize the power grid in society equipped with a vast amount of renewable energy.

Furthermore, CNRH will accelerate R&D, such as the advanced use of natural gas and the utilization of biogas, which Osaka Gas has been promoting, to thoroughly reduce CO₂ emissions at the moment.

For the future, Osaka Gas expects CNRH to welcome visitors from businesses that need to address challenges toward a low-carbon society or decarbonization, government offices, universities and research institutes, companies that are expected to benefit from synergy with R&D pursued by Osaka Gas, and so on. CNRH should grow and thrive through alliances with various industry-government-academia partners.

The Daigas Group, under the "Carbon Neutral Vision" that was announced in January 2021, remains committed to developing technologies and services that contribute to a carbon-free society and solving social issues, including climate change, in order to become a corporate group that helps customers both on the livelihood and business fronts for their "further evolution."

*1: A technology for synthesizing methane from hydrogen and carbon dioxide

*2: Chemical looping is a technology for combustion of fuel using oxygen contained in iron oxides or other metallic

oxides. Use of biomass as fuel enables green hydrogen, electric power, and biomass-derived CO₂ to be produced at the same time.

- *3: Stable combustion is achieved by partly reforming ammonia inside the system into hydrogen and feeding it to the engine. The small engine system is in operation in the Low Carbon Technology Research, Development and Demonstration Program organized by the Ministry of the Environment.
- *4: A virtual power plant is implemented by a business operator known as an “aggregator” who, using information and communication technologies, systematically controls dispersed power sources so that they seem to function as a single power generation facility.

1. Overview of Carbon Neutral Research Hub

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<Major Actions Taken at CNRH (as of October 2021)>

Category	Description of Major Actions	
Creating energy that is carbon neutral	SOEC methanation ^{*5}	<ul style="list-style-type: none"> - Advanced metal-supported SOEC is under development. Advanced solid oxide electrolysis cells and other items are on display. - A dedicated laboratory will be set up for SOEC methanation in March 2022.
	Conventional methanation	<ul style="list-style-type: none"> - A methanation catalyst is under development. - A demonstration of methanation that uses biogas produced typically from food waste has been proposed for Expo 2025 Osaka, Kansai.
	Chemical looping combustion	<ul style="list-style-type: none"> - A small-scale system (cold model) will be introduced in December 2021, which is designed to visualize the flow of metal oxides. - A 300 kW^{*6}-class piece of test equipment will be introduced in 2023 at the earliest.
Using carbon neutral energy in a smart way	Renewable energy/VPP	<ul style="list-style-type: none"> - A VPP demonstration is under way using Ene-Farm, a fuel cell system for residential use. - Using Osaka Gas's proprietary weather forecast technology, a demonstration is under way for sophistication of solar power forecasting.
	Ammonia engine	<ul style="list-style-type: none"> - Technology development is under way for a small engine system that works using ammonia fuel alone.
Thoroughly reducing CO ₂ emissions at the moment	CNRH Annex	<ul style="list-style-type: none"> - Low-carbon or carbon-free services are offered for commercial and industrial customers. - Latest equipment and services are on display for commercial and industrial customers.
	Smart energy home	<ul style="list-style-type: none"> - An experimental house will be in use from January 2022, equipped with a fuel cell system, photovoltaic system, storage battery, and electric vehicle, to name a few.
	Biogas utilization	<ul style="list-style-type: none"> - Low-cost yet highly efficient biogas purification^{*7} will be verified. - D-Bio Methane is an on-site biogasification system designed to produce biogas by processing food waste.
	Radiative cooling material ^{*8}	<ul style="list-style-type: none"> - Verification of the material's effects from incorporation in tents and other products is under way in an environment approximating actual operating conditions.

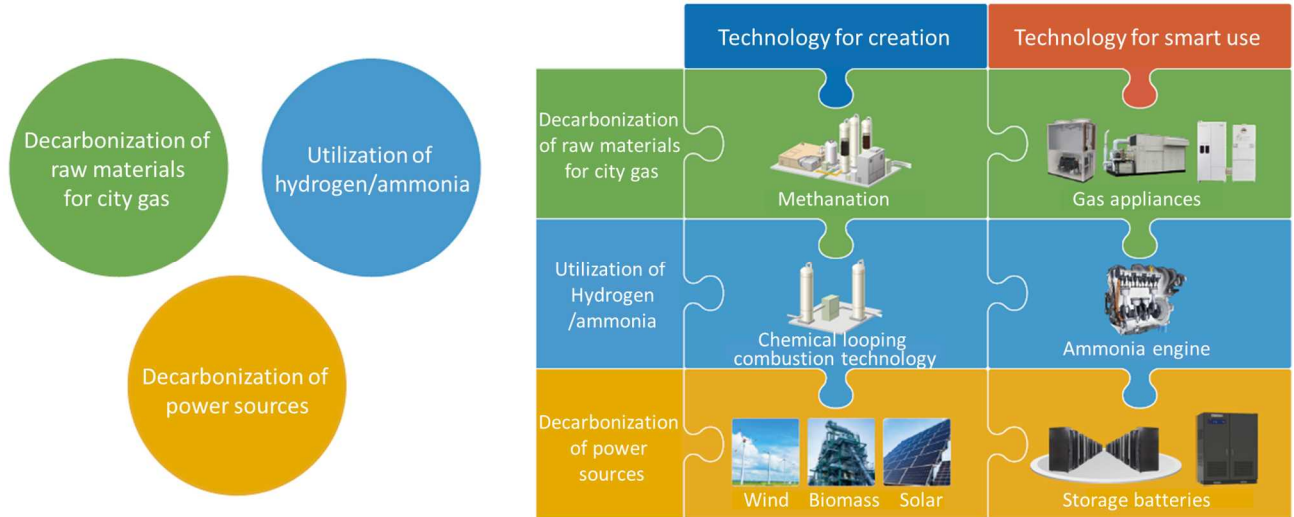
*5: SOEC is the abbreviation for solid oxide electrolysis cell. SOEC methanation denotes the use of SOEC equipment to electrolyze water and CO₂ into hydrogen and CO using renewable power and then synthesize methane by catalysis. This method involves only small energy loss thanks to the effective use of waste heat from the methane synthesis process, so it is expected to achieve higher energy conversion efficiency—85 to 90%—than that of conventional methanation methods (55 to 60%) and hydrogen production through water electrolysis (70 to 80%). Osaka Gas had success in developing Japan's first practical-size prototype cell of advanced metal-supported SOEC (announced in January 2021).

*6: Calorific value of supplied fuel per unit time

*7: Producing and concentrating high-purity methane from biogas by removing impurities, moisture, and CO₂

*8: A material designed to cool down in direct sunlight to a lower temperature than the ambient temperature by allowing its heat to escape to space by radiative cooling without using energy

<Concept of the Site>



<Inside the Site>

