


Initiatives to Achieve Carbon Neutrality



Decarbonization of Gas Energy

For the social implementation of methanation technology, the Daigas Group is engaged in a variety of activities aimed at introducing synthetic methane equivalent to 1%*1 of gas sales by Osaka Gas in 2030. These activities include research and development and building global supply chains. SOEC methanation technology is an innovative technology that offers energy efficiency well in excess of conventional processes by making effective use of waste heat. We will develop the elemental technology and conduct small-scale experiments with the aim of establishing this technology in 2030. This technological development has been selected as a Green Innovation Fund project. We are also conducting research and development into biomethanation technology, in which our fermentation technology is used to convert biogas, derived from sewage sludge and other sources, and hydrogen into methane. In addition, INPEX Corporation and we will conduct a demonstration experiment of the production of synthetic methane from CO₂ collected from INPEX Nagoaka Field Office from the second half of FY2025.3 into FY2026.3. The methanation facility to be developed in this project will have a production capacity of approximately 400 normal cubic meters per hour, making it one of the largest scale operations of its kind in the world.*2

*1 Approximately 60 million m³ (based on city gas sales volumes in FY2021.3) *2 As of October 15, 2021

Progress of major initiatives from FY2022.3

				Plan and details of initiatives	Period	Main operators		
Decarbonization of gas energy	Hydrogen utilization	Methanation	Innovative technology	SOEC methanation*1	SOEC methanation has been adopted by the Green Innovation Fund project (NEDO*2 project)	<ul style="list-style-type: none"> Plan to develop SOEC electrolysis equipment and gas synthesis reaction control technology, optimize overall process, and develop technology for effective use of waste heat 	From FY2023.3 to FY2031.3	Osaka Gas National Institute of Advanced Industrial Science and Technology Toshiba Energy Systems & Solutions Corporation
				Biomethanation	Commence small-scale experiment of biomethanation using biogas generated at sewage treatment plant (MLIT applied research)	<ul style="list-style-type: none"> Produce synthetic methane from CO₂ and H₂ using bioreaction Plan to Conduct an experiment to increase output volume of biogas using lactic acid, which is a decomposition product of waste bioplastics 	From 1st half of FY2023.3 to March 2024 (scheduled)	Osaka Gas Kyoto University NJS CO., LTD. Osaka City
			Existing technology	Sabatier methanation*3	Commence methanation demonstration experiment (Ministry of Environment project) using hydrogen derived from renewable energies and biogas derived from kitchen waste	<ul style="list-style-type: none"> Use renewables-derived hydrogen and biogas generated by methane fermentation of kitchen waste to produce synthetic methane and use it in city gas appliances Use methanation technology of both Sabatier methanation and biomethanation, with a production capacity of 5-7 Nm³/h of synthetic methane. Conduct second half of demonstration experiment at Expo 2025 	From FY2023.3 to FY2026.3 (From FY2023.3 to FY2025.3, trial will be conducted inside Osaka Waste Management Authority Maishima Incineration Plant in Konohana Ward, Osaka Prefecture. Equipment will be relocated to Expo 2025 site in FY2025.3)	Osaka Gas Hitachi Zosen Corporation Osaka City Japan Association for the 2025 World Exposition
					Commence one of the world's largest Sabatier methanation technology development projects (NEDO project) jointly with INPEX Corporation □ P.55	<ul style="list-style-type: none"> At INPEX Nagoaka Field Office (Nagoaka City, Niigata Prefecture), produce synthetic methane from CO₂ captured on site and inject it into INPEX's city gas pipeline Synthetic methane production capacity of 400 Nm³/h Plan to create basic design of commercial-scale methanation facilities (10,000 Nm³/h / 60,000 Nm³/h) and assess their business potential 	From 2nd half of FY2022.3 to Mar. 31, FY2026	INPEX Corporation Osaka Gas Nagoya University (Tokai National Higher Education and Research System)

*1 Use of SOEC equipment to electrolyze water and CO₂ into hydrogen and CO using renewable energy, etc., and then synthesize methane by catalytic reaction.

*2 New Energy and Industrial Technology Development Organization

*3 CO₂ conversion by catalytic reaction with hydrogen derived from renewable energy, etc. to synthesize methane.

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Overseas, we are conducting feasibility studies on methanation projects in Australia and other regions and examining these projects with a view to building a supply chain for synthetic methane. In addition, to examine the potential for the use of synthetic methane in Asia, we are conducting a feasibility study on the methanation business in Singapore.

Further, besides synthetic methane, we are pursuing a variety of initiatives aimed at the decarbonization of gas energy. These include the technical study related to the production and transportation of green hydrogen in Australia and elsewhere, the technology development of small engine system using ammonia as fuel, and a study on the utilization of biomethane in Indonesia.



		Plan and details of initiatives	Period	Main operators		
Decarbonization of gas energy	Methanation	Building global supply chain	Commence a feasibility study on a methanation project in Singapore □□ P.60	<ul style="list-style-type: none"> Conduct site selection and investigation for methanation equipment in Singapore, technical study Examine CO₂ and hydrogen supply and transportation methods 	Scheduled for completion in 2022	Osaka Gas Singapore Pte. Ltd. City Energy Pte. Ltd. City-OG Gas Energy Services Pte. Ltd. Local companies in Singapore
			Commence joint study on decarbonization projects in wide-ranging areas, including methanation, hydrogen and CCUS, with Shell	<ul style="list-style-type: none"> Commence feasibility studies in wide-ranging areas, including methanation, hydrogen, biomethane, and CO₂ capture, utilization, and storage (CCUS), for the realization of a carbon neutral society In the methanation area, reach agreement for a tripartite joint study including TOKYO GAS 	Agreed to proceed with joint study in June 2022	Osaka Gas Shell Eastern Petroleum Pte. Ltd. Tokyo Gas Co., Ltd. (methanation area)
			Commence joint study on Australian methanation business □□ P.60	<ul style="list-style-type: none"> Conduct site selection and investigation for methanation experiment equipment, technical study Examine CO₂ and hydrogen supply methods and synthetic methane transportation and sales methods Examine business model for the domestic market in Australia and export markets, economical evaluation, etc. 	2022 - 2023 (scheduled)	Osaka Gas Australia Pty. Ltd. ATCO Australia Pty. Ltd.
	Hydrogen utilization	Direct use	Conclude joint development agreement for green hydrogen production project in Australia □□ P.60	<ul style="list-style-type: none"> Produce green hydrogen*¹ using water collected from the atmosphere and off-grid solar power Examine to supply green hydrogen to power stations in Australia and export to overseas markets 	Aim to build hydrogen production plant before end of 2023	Osaka Gas Aqua Aerem Pty. Ltd.
			Participate in a feasibility study on green hydrogen hub project in Australia	<ul style="list-style-type: none"> Aim to produce green hydrogen and supply it to operators in Australia, as well as export it to overseas markets Examine construction of production and distribution facilities for green hydrogen and synthetic methane, etc. Conduct demand survey and economical evaluation, etc. jointly with partners 	Scheduled for completion in 2022	Osaka Gas Australia Pty. Ltd. AGL Energy Limited INPEX Corporation, Adbri, Brickworks, Flinders Ports, SK ecoplant, Spark Renewables, Fortescue Future Industries
			Conclude memorandum of understanding on supply of liquid hydrogen to Singapore's Keppel DC	<ul style="list-style-type: none"> Conclude memorandum of understanding to study the technical and commercial feasibility of a long-term, stable supply chain of sustainable liquid hydrogen (LH₂) from Western Australia to Singapore and Japan 	Concluded basic MOU in December 2021	Osaka Gas Singapore Pte. Ltd. City-OG Gas Energy Services Pte. Ltd. Woodside Energy Ltd. Keppel Data Centres Holding Pte. Ltd. City Energy Pte. Ltd.
		Use of ammonia	Commence joint examination in hydrogen areas with ITOCHU Corporation and Nel ASA	<ul style="list-style-type: none"> Explore and progress hydrogen-related businesses and jointly assess and examine business opportunities of individual projects 	Commenced examination in October 2021	ITOCHU Corporation Nel ASA Osaka Gas (joint evaluation and study)
			Commence technological development and demonstration of small engine system for ammonia fuel (Ministry of Environment project)	<ul style="list-style-type: none"> Establish elemental technology for ammonia engine Demonstrate properties of engine system Conduct operational demonstration of engine equipped with actual machine 	From FY2022.3 to end of FY2023.3	Osaka Gas Toyota Industries Corporation
		Use of biogas	Conclude agreement for joint study on the utilization of biomethane in Indonesia	Conclude agreement for joint study on the utilization of biomethane* ² derived from palm oil mill effluent in Indonesia	Concluded agreement for joint study in April 2022	Osaka Gas PT Pertamina, Indonesia INPEX Corporation JGC Holdings Corporation

*1 Hydrogen produced by using renewable energy, etc. without emitting CO₂ in the production process

*2 A biofuel with a higher methane concentration produced by refining biogas (main components are methane and CO₂) resulting from anaerobic fermentation of organic waste derived from living organisms; widely considered as an alternative fuel to natural gas due to properties that are very similar to fossil fuel-based natural gas.