

Hydrogen Supply Chain Demonstration Project of Methanation Utilizing Renewable Hydrogen and Food Waste Biogas in Urban Areas

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Osaka Gas Co., Ltd.

Osaka Gas Co., Ltd. (Representative Director and President: Masataka Fujiwara, hereinafter “Osaka Gas”), in cooperation with Osaka City Government and the Osaka Waste Management Authority, will launch a demonstration project in fiscal 2022 to build a supply chain that performs methanation using hydrogen from renewable energy sources (hereinafter “renewable energy”) and biogas produced by fermentation of food waste and that subsequently transports the produced methane through pipes to be used in city gas consuming appliances, with the aim of realizing a carbon-neutral society. This project was adopted by the Ministry of the Environment as the “Project to Construct and Demonstrate a Model for Reducing the Cost of Hydrogen Supply by Utilizing the Existing Infrastructure in the 4th Year of Reiwa.”¹

Methanation refers to a technology to synthesize methane, the main component of city gas, from carbon dioxide (hereinafter, “CO₂”) and hydrogen (hereinafter, “synthetic methane”).

Biogas is generated from biomass resources, such as sewage sludge and food waste, and is generally composed of approximately 60% methane and approximately 40% CO₂. This project aims to increase methane by the methanation of CO₂ in biogas producing from food waste in urban areas, leading to more effective use of biogas.

This project is positioned as a model for local production and consumption of energy utilizing hydrogen derived from renewable energy and unused biomass in the region, and it aims to reduce CO₂ emissions by substituting natural gas with synthetic methane. First, methane of 5 Nm³/h scale will be produced from hydrogen derived from renewable energy and biogas obtained from 1 t/day of food waste at the waste incineration plant (Maishima Plant) in Konohana Ward, Osaka City, which is operated and managed by the Osaka Waste Management Authority. As methanation facilities, both a facility that has introduced the microbial methanation technology (hereinafter referred to as “biomethanation”) owned by Osaka Gas and a methanation facility of Hitachi Zosen Corporation will be used. Hydrogen is produced by a water electrolyzer using the renewable power generated from facilities owned by the Daigas Group. For kitchen waste, we will utilize the food residue of supermarkets in Osaka City owned by Life Corporation. We use the produced methane in gas cooking appliances, water heaters, etc. and confirm whether stable methane production and utilization are possible.

In fiscal 2024, the equipment will be relocated to the venue of Expo 2025 Osaka, Kansai, Japan to produce methane from hydrogen derived from renewable energy and biogas derived from food waste disposed at the venue, and the methane will be used in heat supply equipment and gas stoves in the kitchen at the venue. This project is expected to contribute to the realization of the “Expo 2025 Green Vision”² set forth by the Japan Association for the 2025 World Exposition (hereinafter referred to as the “Expo Association”).

Furthermore, during the Expo 2025 Osaka, Kansai, Japan, we are considering using CO₂ in the atmosphere as a raw material for methanation to increase the amount of methane production.

After this project, while scaling up the methanation facilities, we plan to introduce a system that produces synthetic methane from hydrogen derived from renewable energy and CO₂ in biogas derived from food waste to incinerators and food processing plants mainly in the Kansai Region by 2030. By building a hydrogen supply chain that can utilize hydrogen derived from renewable energy as synthetic methane with existing city gas infrastructure and appliances without modification, we aim to realize low carbonization for heat demand, reduce additional social costs, improve energy security, and achieve social implementation at an early stage.

Under the “Carbon Neutral Vision” announced in January 2021, the Daigas Group will contribute to the carbon neutrality of city gas through this project.

*1: Adopted on March 30, 2022 as a project for the 4th year of Reiwa. The website below introduces the efforts, including this project, of government agencies to realize a hydrogen society.

https://www.env.go.jp/seisaku/list/ondanka_saisei/lowcarbon-h2-sc/demonstration-business/index.html

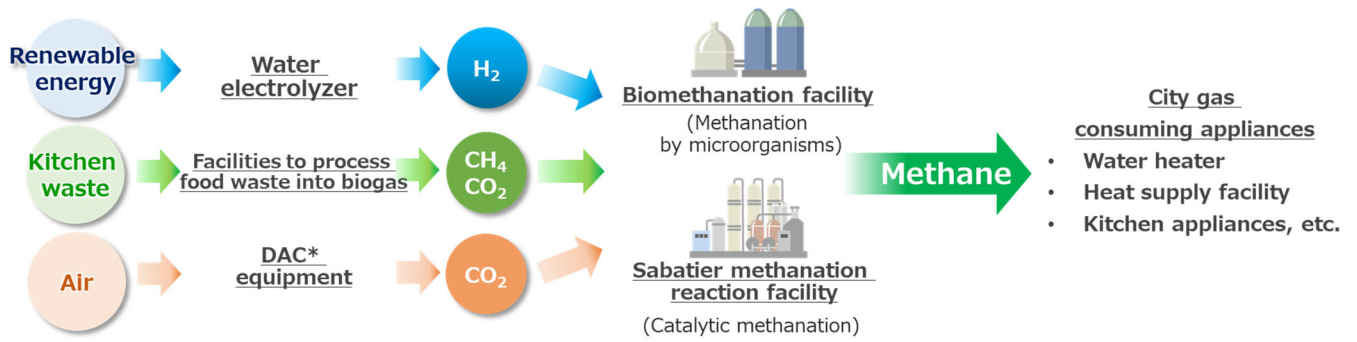
* 2: The Expo Association announced the ideal form of environmental energy, its direction, and specific technical fields that should be targeted at the Expo 2025 Osaka, Kansai, Japan, such as the implementation of carbon neutral measures at the Expo site and the introduction of energy optimization technology and hydrogen energy technology.

<https://www.expo2025.or.jp/news/news-20220427/>

1. Overview of the Project

Project member	Business operator: Osaka Gas Co., Ltd.
Term	FY2022 to FY2025
Location	Inside the Maishima Plant of Osaka Waste Management Authority, Konohana-ku, Osaka City (FY2022 to FY2024) Inside the venue of the Expo 2025 Osaka, Kansai, Japan (FY2024 to FY2025)
Major objectives of demonstration	<ul style="list-style-type: none"> ・ Produce hydrogen by water electrolysis using renewable electricity and biogas by methane fermentation using food waste. ・ Produce methane by performing methanation using the produced hydrogen and biogas. ・ Use the manufactured synthetic methane in city gas appliances.

2. Reference image of building the hydrogen supply chain in this project



※DAC(Direct Air Capture):Direct CO2 capture technology from the atmosphere