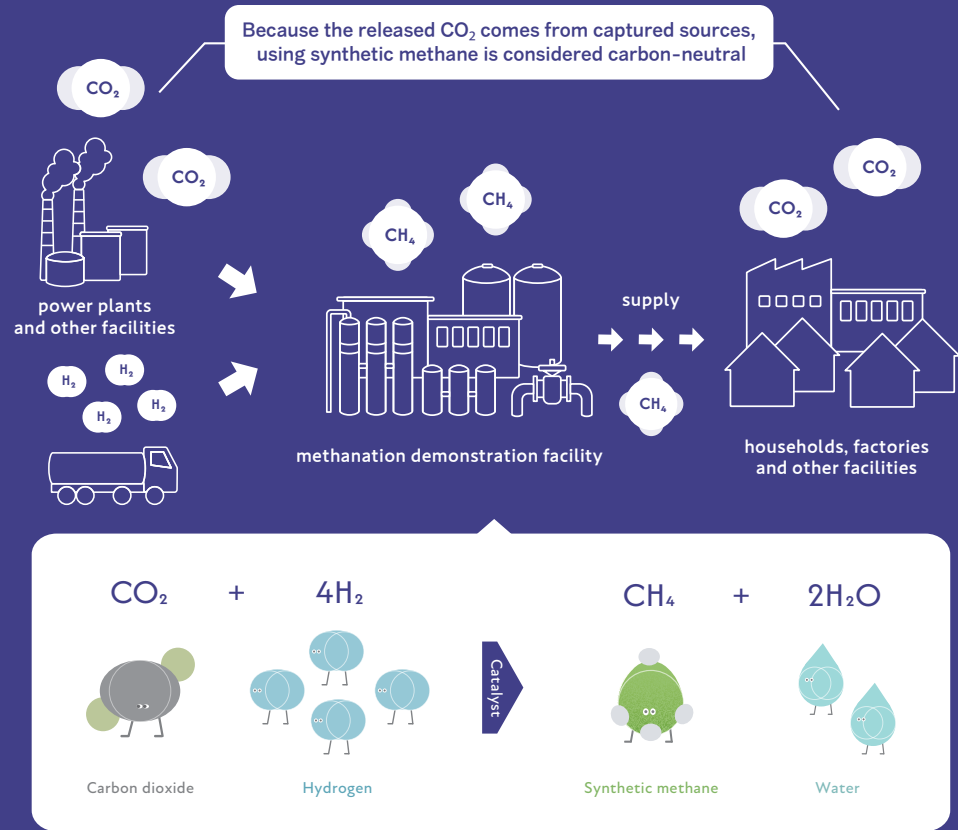


# How does Methanation work?

Methanation technology produces methane—the main component of city gas—by synthesizing hydrogen and CO<sub>2</sub>. The methane is produced using captured CO<sub>2</sub> and is delivered to various regions through INPEX’s natural gas trunk pipeline network. CO<sub>2</sub> emissions from the use of this synthetic methane are offset by the CO<sub>2</sub> captured during the production of city gas, making this a key technology that realizes carbon neutrality.



INPEX CORPORATION, with funding from the New Energy and Industrial Technology Development Organization (NEDO), is working together with Osaka Gas Co., Ltd. and Nagoya University (under the Tokai National Higher Education and Research System) to develop practical technologies for CO<sub>2</sub> methanation, targeting the decarbonization of city gas.

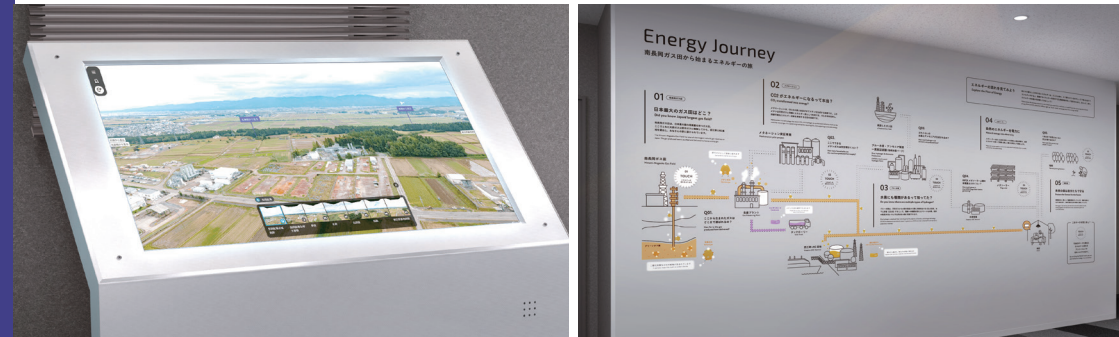


About CO<sub>2</sub>-Methanation

# Nagaoka Energy Studio

The “Nagaoka Energy Studio” is an exhibition and interactive space newly established at INPEX JAPAN’s Nagaoka Field Office. The studio offers an experiential look at “energy today and tomorrow” centered on Nagaoka, showcasing the history of the development of subsurface resources, the future challenges of clean energy and the world-leading nature and characteristics of the methanation demonstration tests.

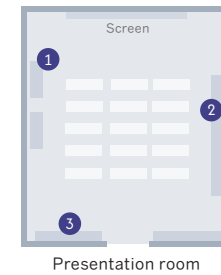
About the Exhibition



- 1 Experiential 3D display of the demonstration facility and the methanation process.
- 2 Interactive showcase of energy flow from the Nagaoka Field Office in association with other INPEX projects.



- 3 A valuable exhibit allowing visitors to see actual condensate samples and equipment used for drilling at the Nagaoka Field Office.



## INPEX Energy for a brighter future

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# Methanation Demonstration



## NAGAOKA METHANATION DEMONSTRATION PROJECT



# Key Functions of the Methanation Demonstration Facility

This is one of the world's largest demonstration facilities that produces synthetic methane from hydrogen and (associated) CO<sub>2</sub> derived from natural gas, and feeds it into existing natural gas pipelines. By leveraging INPEX's gas infrastructure, it can supply enough gas to meet the needs of approximately 10,000 households.

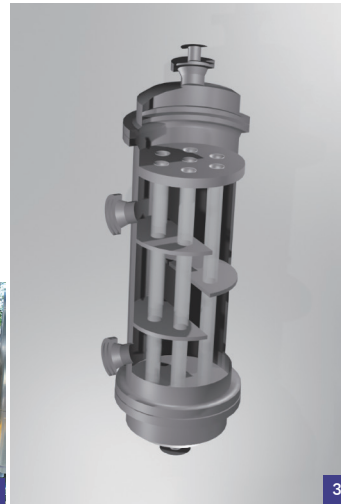
## A Liquefied Hydrogen Storage Unit

Hydrogen, the main feedstock for methanation reaction, is stored in liquid form within a vacuum-insulated double-shell tank. Maintained at an extremely low temperature of -253°C, the liquefied hydrogen is vaporized as needed using a gasification unit, ensuring a stable supply of hydrogen gas in the optimal state for methanation reaction.



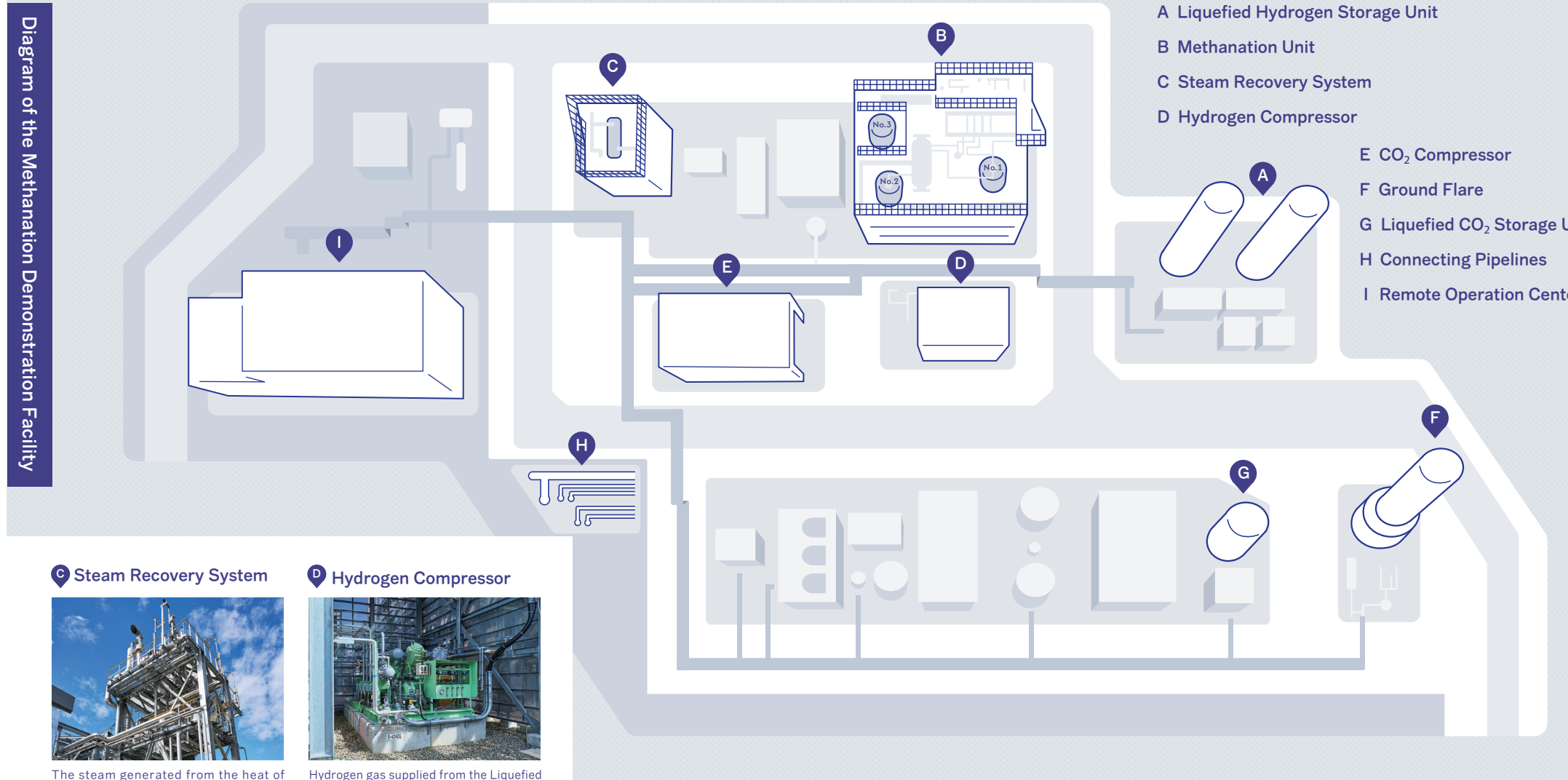
## B Methanation Unit

The methanation unit is the core component that produces synthetic methane from hydrogen and CO<sub>2</sub>. At this unit, methanation reactors are connected in a multi-stage adiabatic configuration, enabling the production of synthetic methane of a quality suitable for direct use in existing city gas infrastructure. Additionally, by testing reactors in different operational modes, the unit conducts experiments that support the future scale-up of production.



- 1 Desulfurization Unit . . . . Removal of hydrogen sulfide from associated CO<sub>2</sub> to avoid the catalytic poisoning.
- 2 No.1/No.2 Methanator . . . . The first and second stages of adiabatic reactors.
- 3 No.3 Methanator . . . . . The third stage is an isothermal reactor, which captures heat as steam from reaction.

## Diagram of the Methanation Demonstration Facility



## C Steam Recovery System



The steam generated from the heat of methanation reaction is condensed back into water for recovery and reuse.

## D Hydrogen Compressor



Hydrogen gas supplied from the Liquefied Hydrogen Storage Unit is pressurized to an optimal reaction pressure of 1.3 MPaG.

## E CO<sub>2</sub> Compressor



Associated CO<sub>2</sub> supplied through connecting pipelines is pressurized to an optimal reaction pressure of 1.3 MPaG.

## F Ground Flare



Off-spec synthetic methane that does not meet city gas standards is combusted for disposal.

## G Liquefied CO<sub>2</sub> Storage Unit



Liquefied CO<sub>2</sub> at a temperature of -57°C is supplied from external sources for storage and supply.

## H Connecting Pipelines



Associated CO<sub>2</sub>, synthetic methane, and utilities are exchanged between the demonstration facility and the Nagaoka Field Office.

## I Remote Operation Center



Supplies power to the demonstration facility and allows the remote control of the entire facility from the central control room.

## Functions of the Nagaoka Field Office

### Natural Gas Processing Facilities (Nagaoka Field Office)



Synthetic methane is purified and compressed in the existing gas processing facilities, and fed into the pipeline.