PRESS RELEASE

Institute of Japan Green LP Gas Promotion
N.E. CHEMCAT Corporation

<JOINT PRESS RELEASE >

Adoption of "Research and Development of LPG Synthesis Technology through Carbon Recycling" for NEDO Project - a Joint Research & Development Project by the Institute of Japan Green LP Gas Promotion, the National Institute of Advanced Industrial Science and Technology and N.E. CHEMCAT Corporation

TOKYO Japan, Feb. 25, 2022

Today, the Institute of Japan Green LP Gas Promotion ("Green Promotion Institute"), the National Institute of Advanced Industrial Science and Technology ("AIST"), and N.E. CHEMCAT Corporation ("NECC") announced that a proposal titled "Research and Development of LPG Synthesis Technology through Carbon Recycling" (hereinafter the "R&D Project") has been adopted by the New Energy and Industrial Technology Development Organization (NEDO) as a funded project. The proposal was submitted jointly by three parties under a public solicitation for NEDO's project "Development of Technologies for Carbon Recycling and Next-Generation Thermal Power Generation/Project for Promotion of Next Generation Thermal Power Generation/Development of Common Fundamental Technologies for Carbon Recycling."

LPG (propane and butane) is used in a wide range of sectors, including household, commercial, chemical raw materials, automobiles and boosting calorific value of city gas. Japan's domestic LPG demand stood at about 13 million tons in the last fiscal year. Due to its portability and property of not deteriorating over time, LPG expects to see new demands including stockpiling as disaster-resistant energy source and possible use for marine fuel in the future. While LPG is an essential energy source that supports the lives of the people and is expected to remain in significant demand in 2050 according to government estimate, industries concerned face a challenge of replacing all LPG demands with "green LPG."

The Institute of Japan Green LP Gas Promotion , AIST, and NECC will gather their technologies and expertise to carry out the R&D Project during FY2022-2024.The objective of the R&D Project is to produce carbon-neutral propane and butane at high yields by catalytic reactions via an intermediate of DME (dimethyl ether) which can be produced from renewable hydrogen and CO_2 captured from power plants and other sites. In view of social implementation, the parties aim to establish the fundamental technologies thereby contributing to the realization of a carbon neutral society in 2050.

PROJECT OUTLINE:

"Research and Development of LPG Synthesis Technology through Carbon Recycling"

■ Project Theme:

Development of Technologies for Carbon Recycling and Next-Generation Thermal Power Generation/Project for Promotion of Next Generation Thermal Power Generation/Development of Common Fundamental Technologies for Carbon Recycling

■ Objectives:

- To conduct research and development of fundamental technologies to produce carbon-neutral LPG from CO_2 and renewable hydrogen based on catalyst design and process optimization techniques.
- To conduct research and development of indirect carbon-neutral LPG synthetic technology to produce propane (C_3H_8) and butane (C_4H_{10}) by catalytic reactions from dimethyl ether (DME) produced using renewable hydrogen and CO2 captured from power plants, etc.

■ Overview of the R&D Project:

- As the R&D Project aims to produce propane and butane via an intermediate of DME synthesized from recycled CO_2 and H_2, the first step is to design and improve the catalysts using lab-scale reactor, and then move on to process design which will finally be optimized and demonstrated in bench scale reactor.
- Based on this R&D Project, we will determine the entire process of carbon recycling and LPG production to verify the scale-up towards social implementation.

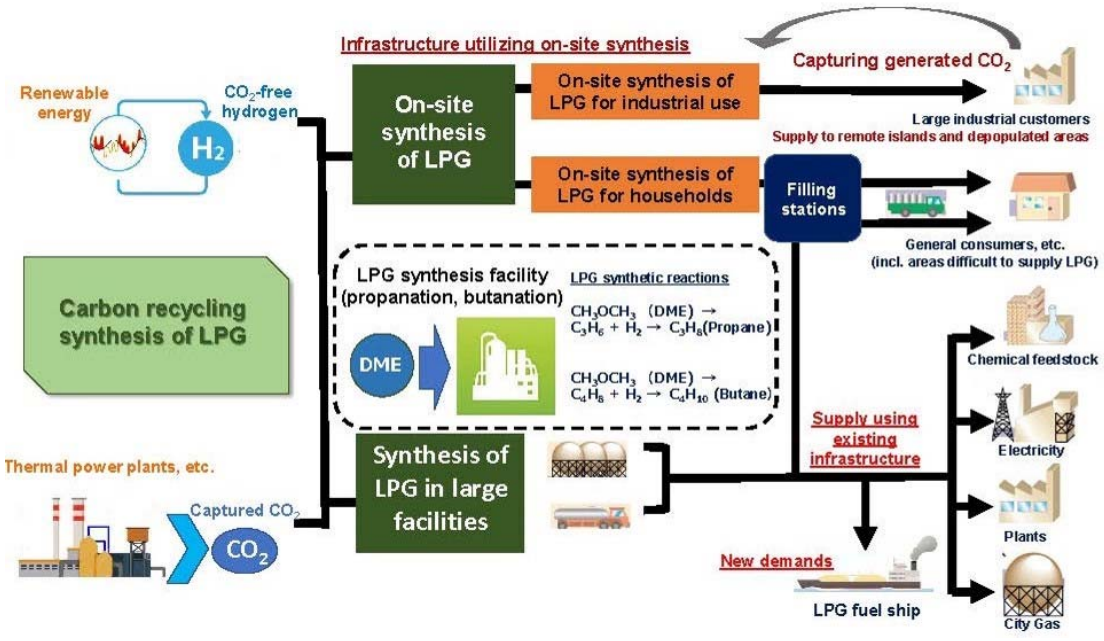
■ Project Members:

The Institute of Japan Green LP Gas Promotion, the National Institute of Advanced Industrial Science and Technology, and N.E. CHEMCAT Corporation

■ Project Period:

FY2022-2024

■ Image of implementation:



About the Institute of Japan Green LP Gas Promotion

The Institute of Japan Green LP Gas Promotion is conducting a series of research and development projects listed below in an aim to realize the social implementation of carbon-neutral LPG. The consortium is formed by five member companies (Astomos Energy, ENEOS GLOBE, Gyxis, Japan Gas Energy and Iwatani) of the Japan LP Gas Association.

1. Greening of LPG using biomass-derived dimethyl ether (DME)
2. Greening of LPG using hydrogen with carbon monoxide and carbon dioxide
3. Other projects for the development of production technologies for greening of LPG, and projects in order to achieve the social implementation

[Address] 4th Floor, Yusei Fukushi Kotohira Bldg. ,14-1 Toranomon 1-chome, Minato-ku, Tokyo
(c/o Secretariat of the Japan LP Gas Association)
[Representative] Tsuyoshi Ogasawara, Representative Director and Chairman
[Established] October 2021

About the National Institute of Advanced Industrial Science and Technology

The National Institute of Advanced Industrial Science and Technology (AIST), one of the largest public research organizations in Japan, focuses on the creation and practical realization of technologies useful to Japanese industry and society, and on “bridging” the gap between innovative technological seeds and commercialization.

[AIST Tokyo Headquarters] 1-3-1 Kasumigaseki, Chiyoda-ku, Tokyo
[Representative] Kazuhiko Ishimura, President
[Established] April 2001 [URL] https://www.aist.go.jp/index_en.html

About N.E. CHEMCAT Corporation

N.E. CHEMCAT Corporation is engaged in the development, manufacturing, and distribution of chemical catalysts, auto exhaust catalysts (including three-way catalysts and diesel auto catalysts), and fuel cell catalysts, and collection/refinement of precious metal catalysts.

[Head Office] 27th floor, World Trade Center Bldg. South Tower, 2-4-1 Hamamatsucho, Minato-ku, Tokyo
[Numazu Plant] 678 Ipponmatsu, Numazu City, Shizuoka Pref.
[Tsukuba Plant] 25-3 Kohshindaira, Bando City, Ibaraki Pref.
[Representative] Matsuru Kushida, Representative Director & President
[Established] April 1964 [Capital] 3.4235 billion yen [URL] https://www.ne-chemcat.co.jp/eg/

CONTACT:

■ **Inquiries on the Project and social implementations:**
The Institute of Japan Green LP Gas Promotion
(c/o Secretariat of the Japan LP Gas Association) Uehira, Mikita TEL: +81-3-3503-5741

■ **Inquiries on technologies:**
N.E. CHEMCAT Corporation
Public Relations, Corporate Administration Dept. E-mail：info-pr@ne-chemcat.co.jp

・Please note that this is a joint press release and may be sent redundantly.