



August 10, 2021

### **Commencement of Demonstration for Extraction of Hydrogen from Organic Hydride (MCH) at ENEOS Refineries - First demonstration in Japan to feed MCH into existing facilities -**

ENEOS Corporation (President: Ota Katsuyuki; "ENEOS") announces that it will commence a demonstration using extracted hydrogen from methylcyclohexane ("MCH")<sup>\*1</sup>, an organic hydride that serves as a hydrogen carrier, at ENEOS refining facilities toward the development of a CO<sub>2</sub>-free hydrogen supply chain. This is the first MCH dehydrogenation demonstration project using existing refining facilities in Japan.

Today, ENEOS concluded the purchase agreement of MCH for the demonstration with the Advanced Hydrogen Energy Chain Association for Technology Development (formed by Chiyoda Corporation, Nippon Yusen Kabushiki Kaisha, Mitsubishi Corporation and Mitsui & Co., Ltd.; "AHEAD"). AHEAD will manufacture MCH from hydrogen derived from unused energy in Brunei Darussalam.<sup>\*2</sup>

This demonstration has been selected as a project for technology verification under the FY2021 program of the Consortium for Resilient Oil Supply System ("CROS") that provides subsidies for improving productivity and resilience in petroleum complexes (subsidies for infrastructure development projects of petroleum complexes).<sup>\*3</sup>

In anticipation of a hydrogen-oriented society toward decarbonization, ENEOS is striving to develop a CO<sub>2</sub>-free hydrogen supply chain in Japan and overseas.

Due to the coastal location of refineries with berths that allow mooring of large vessels and the presence of large-scale hydrogen consumers such as power plants, steel plants and petrochemical plants in the neighboring areas, refineries have a huge potential to be a base for supplying CO<sub>2</sub>-free hydrogen manufactured overseas. Since the demonstration of the MCH dehydrogenation process utilizing existing refining facilities does not require large-scale investment, the demonstration is believed to contribute the development and expansion of the CO<sub>2</sub>-free hydrogen supply chain in the future.

The demonstration verifies a series of processes from receiving MCH produced overseas to dehydrogenation and consumption by utilizing existing refining facilities at three refineries as candidates, including Kawasaki refinery. The demonstration includes assessment of its impact on facility operation to estimate acceptable dehydrogenation quantity of MCH for refineries. The hydrogen produced from MCH will be utilized for desulfurization of petroleum products and other uses.

This initiative is consistent with United Nations Sustainable Development Goals (SDGs) 7. Affordable and clean energy, 9. Industry, innovation and infrastructure, and 13. Climate action. ENEOS is contributing to the stable and efficient supply of low-carbon energy through development of CO<sub>2</sub>-free hydrogen supply chains.

\*1 Normal temperature, normal pressure liquid with a mass of 1/500 of hydrogen gas. It is characterized by ease of handling in storage, transport, etc.

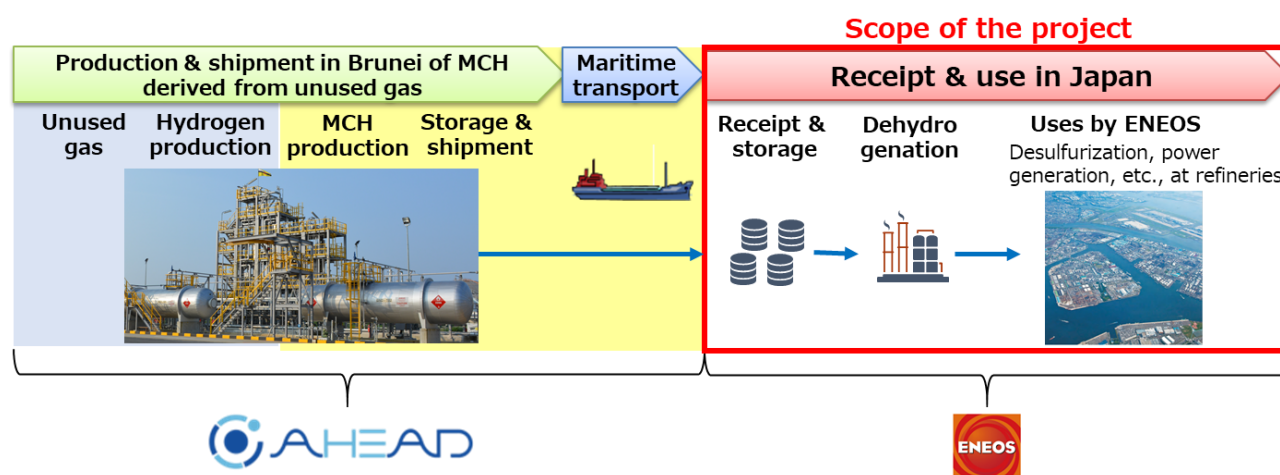
\*2 In MCH production, AHEAD will use facilities utilized in verification projects of the New Energy and Industrial Technology Development Organization (NEDO).

\*3 The subsidies cover expenses needed in structural improvement for greater productivity of petroleum complexes and activities aimed at "greener" operation of oil refineries.

<Overview of the project>

Overview	Demonstration of the series of processes from receiving MCH to dehydrogenation and consuming of hydrogen using facilities in operation at refineries.
Project proposed sites	Kawasaki Refinery, Wakayama Refinery and Mizushima Refinery
Principal project content	<ul style="list-style-type: none"> <li>· Receipt of MCH using chemical tankers and other carriers</li> <li>· Feeding MCH into refining facility with dehydrogenation function</li> <li>· Impact of MCH input on the toluene recovery unit</li> </ul>
Project period	Until the end of FY2023 (planned)

<Overview of the project flow>



<Overview of AHEAD>

Company name	Advanced Hydrogen Energy Chain Association for Technology Development
Established	July 3, 2017
Association members	Chiyoda Corporation Mitsubishi Corporation Mitsui & Co., Ltd. Nippon Yusen Kabushiki Kaisha (Total of four companies, in alphabetical order)
Representative	Takakazu Morimoto, President
Description of project	<p>This association is involved in the following activities in order to conduct experimental research on and plan the practical application of hydrogen supply chains that stably supply existing but unused energy transported in a stable manner from overseas to Japan using the Organic Chemical Hydride Method.</p> <ol style="list-style-type: none"> <li>1. Accumulation of the know-how and expertise needed to design, construct, and operate supply chains. The study of optimal overall designs for commercial supply chains.</li> <li>2. Verification of the durability and availability of facilities in environments similar to a commercial supply chain through the demonstration operation of hydrogen supply chains.</li> <li>3. Confirming the effectiveness of a stable hydrogen supply from overseas through the demonstration operation of hydrogen supply chains.</li> </ol>
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