Carbon-Recycled Methanol

The collaborative research project commissioned by NEDO

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Basic project data

- Joint research on the effective recycling of carbon dioxide (CO2) emitted from the refinery at Tomakomai City, Hokkaido Japan, where the CO2 is captured and stored by the existing CCS demonstration plant, which has just completed press fit of 300,000 ton CO2
- Headed by NEDO (New Energy and Industrial Technology Development Organization)
- Consortium of Mitsubishi Hitachi Power Systems (MHPS), Mitsubishi Heavy Industries Engineering (MHI ENG), and Mitsubishi Gas Chemical (MGC) were commissioned to execute research activities for CO2 Capture and Utilization (CCU) in order to produce methanol from captured CO2.
- If the result of the research is positive, NEDO will go to the next step, and a carbon-recycled methanol synthesis plant will be installed adjacent to the existing CCS facility.

Who we are and what we do?

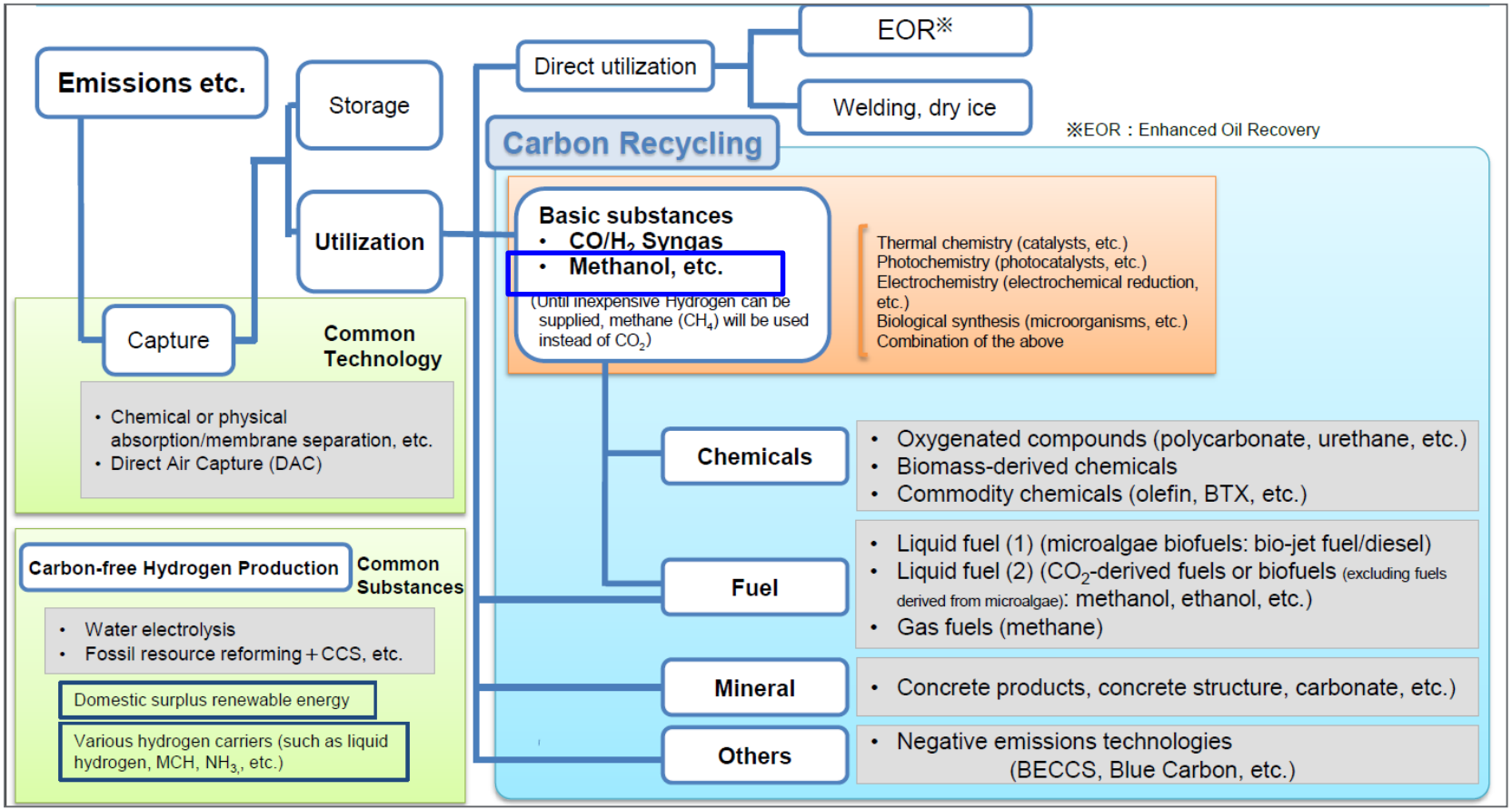
Three Mitsubishi group companies combine the strengths of each

- MGC
  provide supply chain expertise related to methanol production and synthesis catalysts, as well as process technology for methanol production in cooperation with MHIENG
- MHIENG
  leverage its track record of global EPC for a number of large-scale methanol plants
- MHPS (Consortium leader)
  deploy its experience with worldwide EPC for a variety of business

Why methanol?

- Methanol is a key raw material in a wide range of industries.

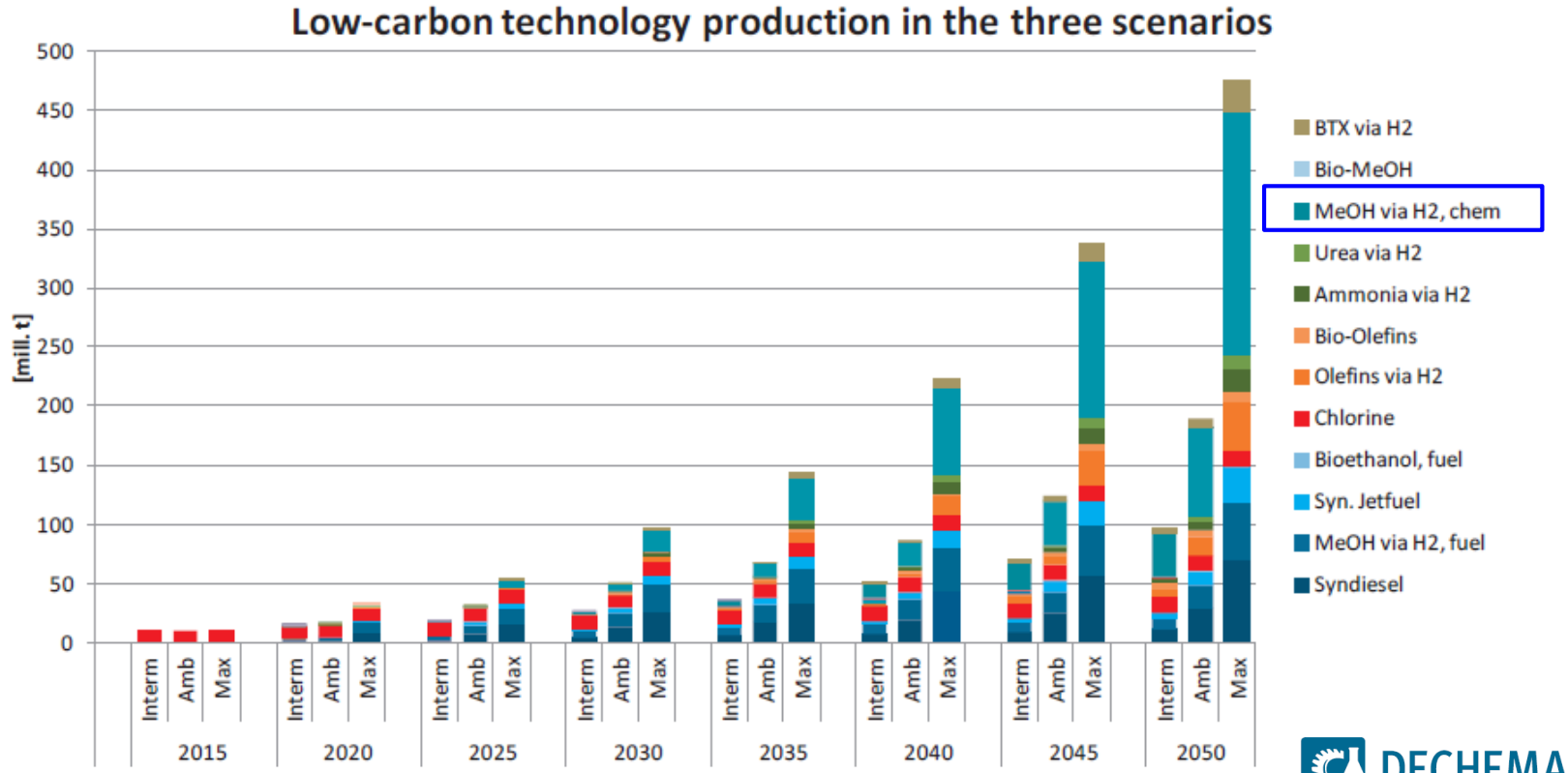
Abstract from **Roadmap for Carbon Recycling Technologies** published in June 2019 by METI (Ministry of Economy, Trade and Industry)



Why methanol?

- Current market size of methanol : 100 million ton / year
- Potential of big growth is expected by several institutes

Example for European market forecast

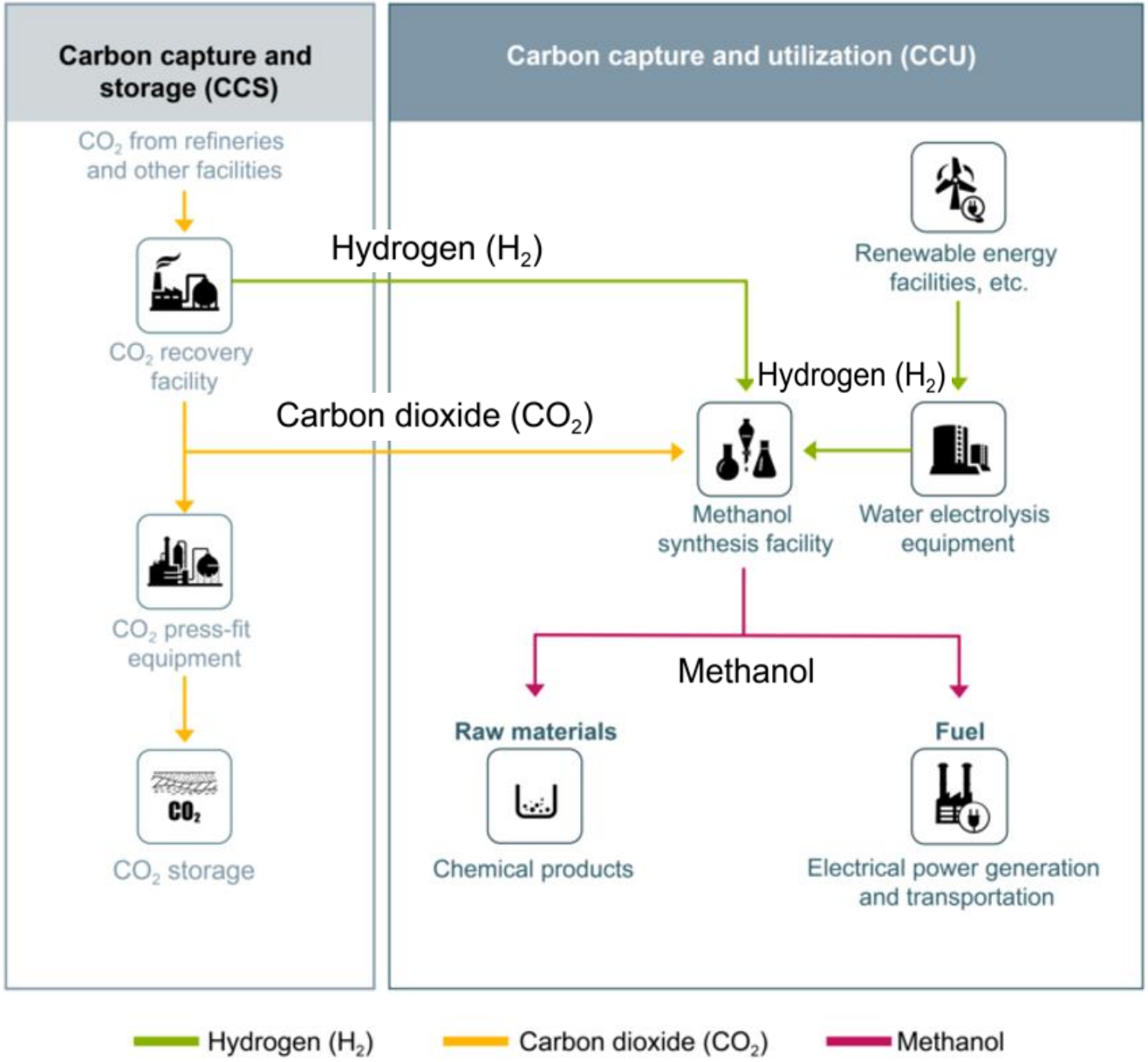


DECHEMA
Gesellschaft für Chemische Technik und Biotechnologie e.V.

Figure 24: Production volumes based on low carbon technologies, all scenarios

Source : Low carbon energy and feedstock for the European chemical industry, 2017

How we produce the methanol?



Technology highlights

- Captured CO2 (in metric ton) per Methanol produced (in metric ton) > 1.3

- Synthesis of methanol from CO2 yields more by-product water than the traditional process from synthesis gas (CO+CO2+H2, SMR Process), and higher water resistance of synthesis catalyst is one of key technologies.

  Reaction Formula from synthesis gas (SMR Process) :

  $CO_2 + 3H_2 \Rightarrow CH_3OH + H_2O$

  $CO + H_2O \Rightarrow CO_2 + H_2$

  Reaction formula from CO2:

  $CO_2 + 3H_2 \Rightarrow CH_3OH + H_2O$

- The hybrid system of CCS and CCU brings a benefit of sharing CO2 recovery functions and enhances the interoperability of both facilities

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