



The 40th JCCP INTERNATIONAL SYMPOSIUM
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Towards Social Implementation of The Energy Transition Technology

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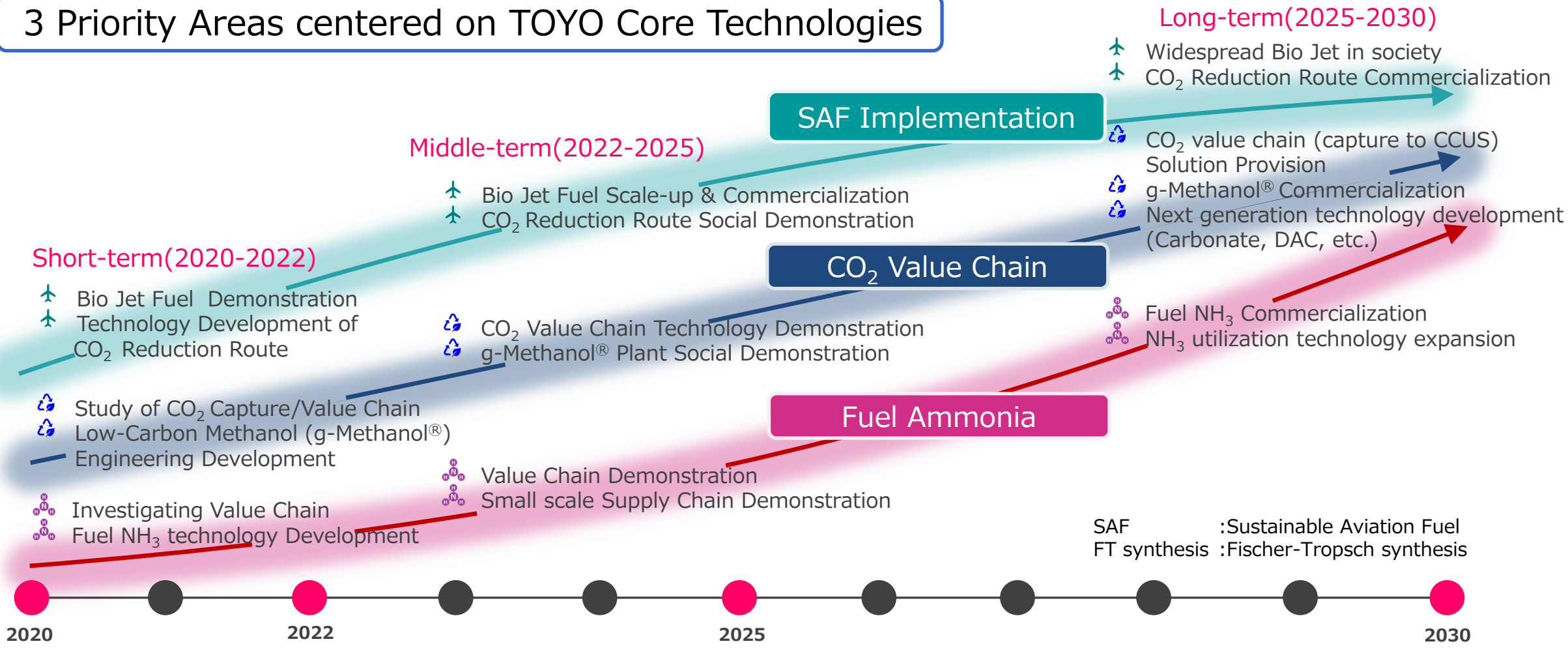
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T-Next
Be a Trailblazer

TOYO's Energy Transition Technology Roadmap

3 Priority Areas centered on TOYO Core Technologies

Social Implementation Level → High



The Energy Transition utilizing Toyo's Core Technologies

- Comprehensive design of SAF plant utilizing FT synthesis technology
- Syngas technology with Methanol Synthesis (MRF-Z[®] reactor)
- NH₃ plant technology through the 85 EPC NH₃ projects

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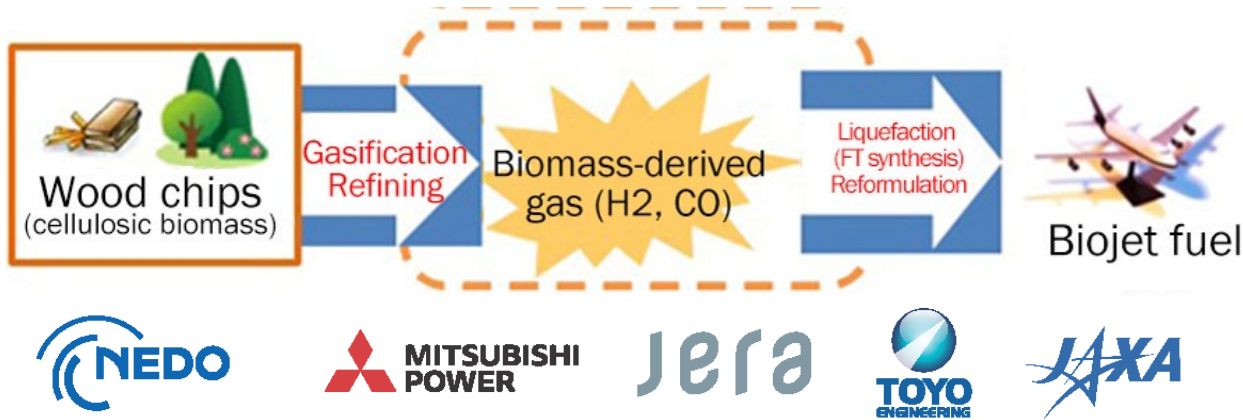
Focus on three fields

- SAF development
- CO₂ value chain
- Fuel NH₃ supply chain

SAF : Biomass Gasification and FT process Demonstration Plant

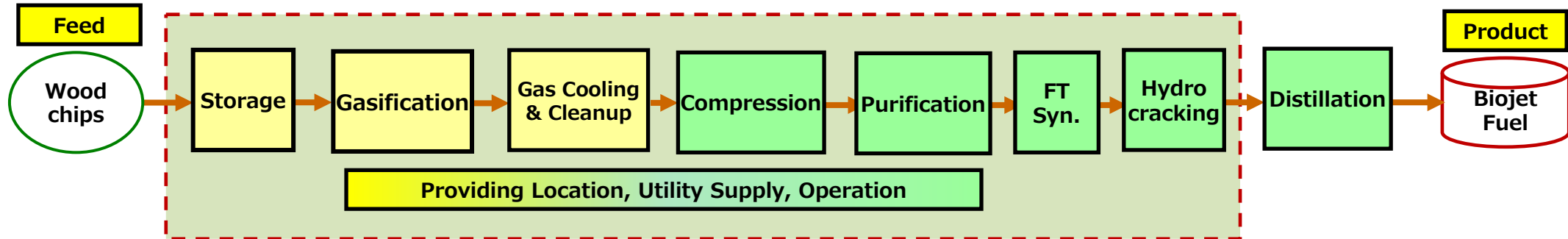
Biojet Fuel Production Technology Demonstration Project of NEDO (2017-2021)

Demonstration plant (Nagoya, Japan)



NEDO : New Energy and Industrial Technology Development Organization

Block flow for integrated biojet production from wood chips



Source: NEDO Homepage. This slide is based on results obtained from a project commissioned by the New Energy and Industrial Technology Development Organization (NEDO)

SAF : Achieved the Flight

- The world's first flight using SAF derived from woody biomass through gasification FT synthesis was successfully completed in June 2021.
- Demonstration of integrated SAF production and realization of refueling supply chain for aircraft



Refueling JAL515 flight from Tokyo to Sapporo

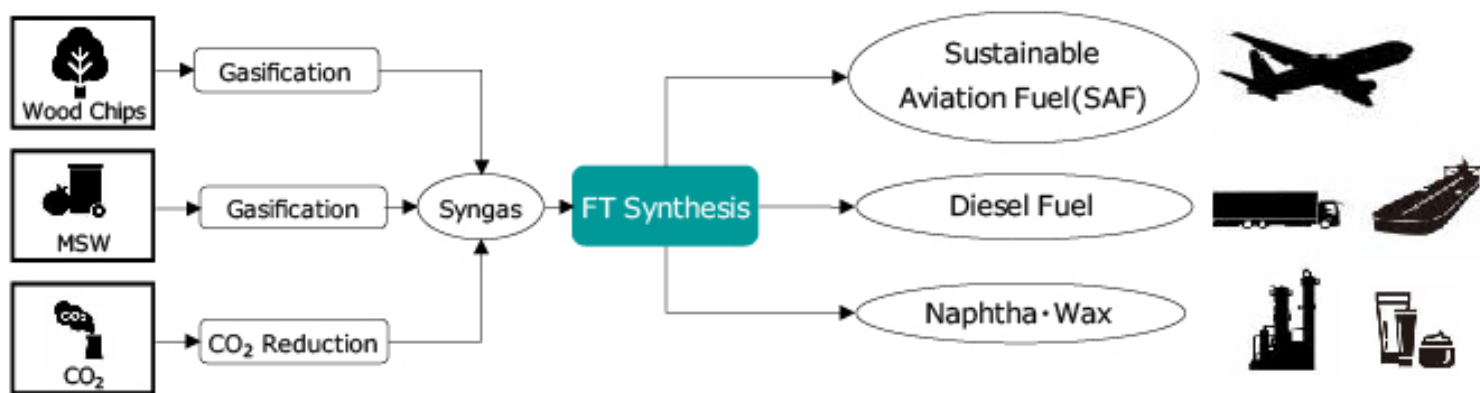


Produced SAF

SAF : Collaboration with Velocys for FT Synthesis Technology

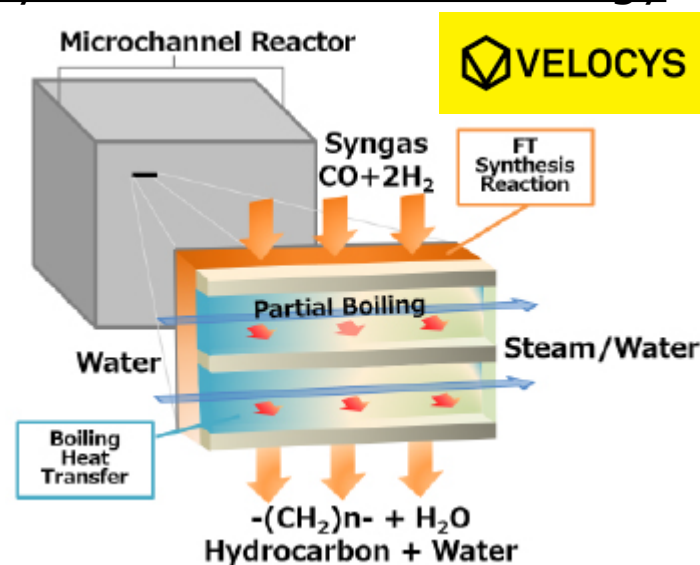
- Solutions with a combination of Velocys's Microchannel technology and TOYO's expertise in plant engineering.
- FT synthesis: Key technology in SAF production from woody biomass, municipal waste and emitted carbon dioxide.

Various types of low CFP Feed Material

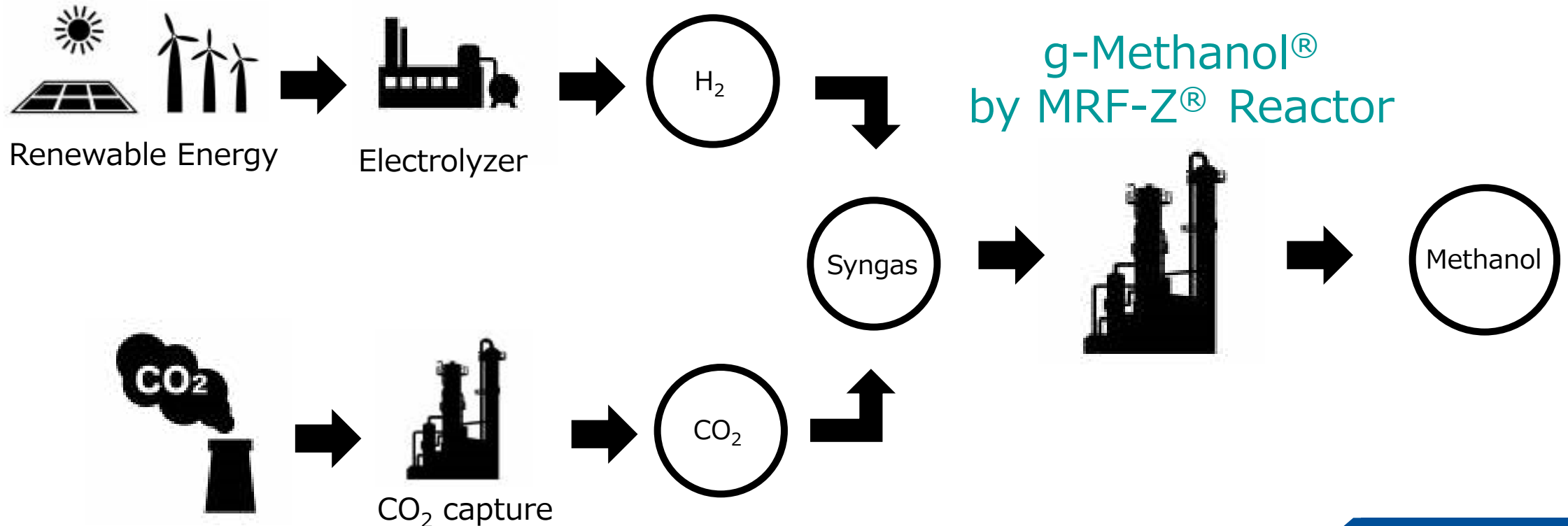


<Source : TOYO's News Release on 9 Feb. 2021>

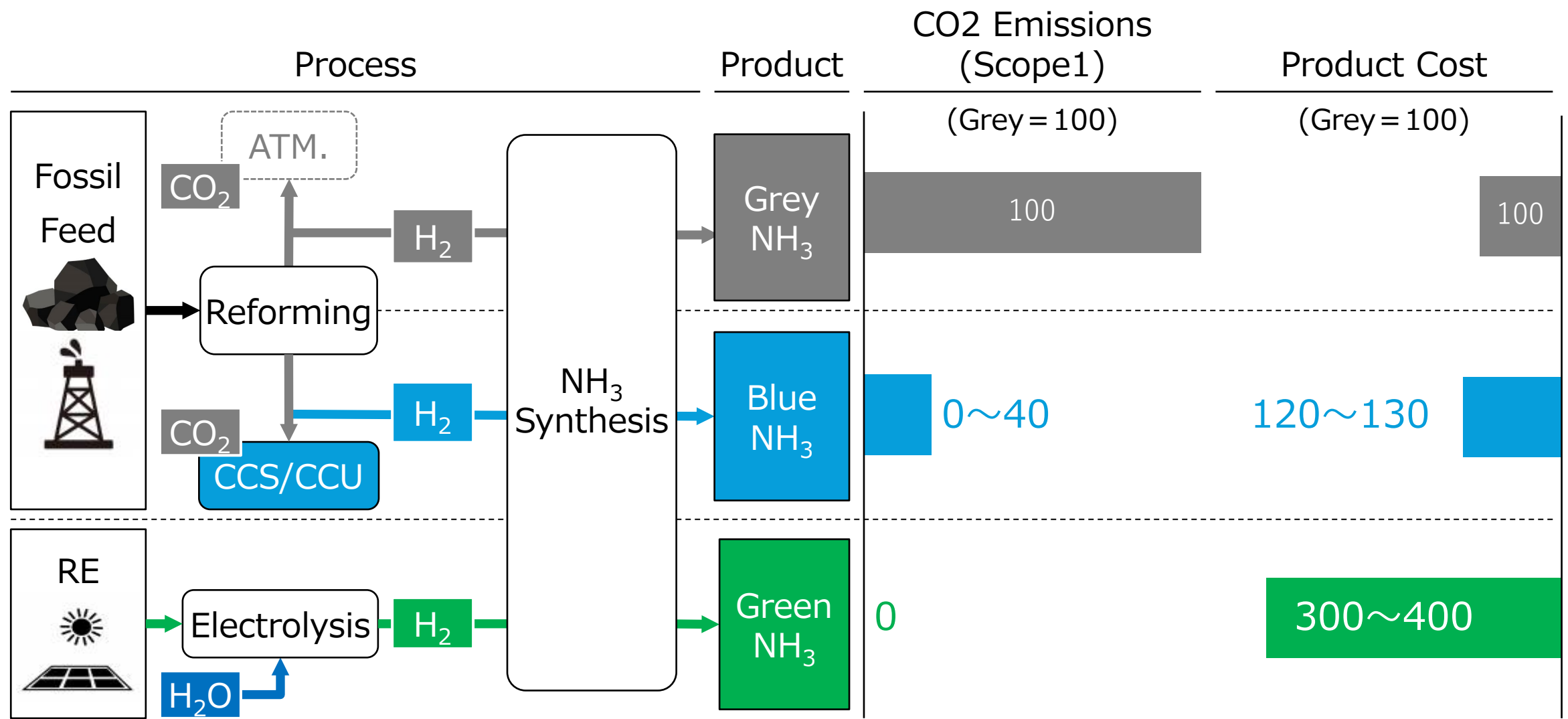
Velocys Microchannel Technology



- g-Methanol[®] is the process for producing methanol by synthesizing CO₂ captured from various exhaust sources and green H₂.
- TOYO's proprietary methanol synthesis reactor, MRF-Z[®] Reactor, is applied to minimize the catalyst volume utilizing a multi-stage indirect cooling system.



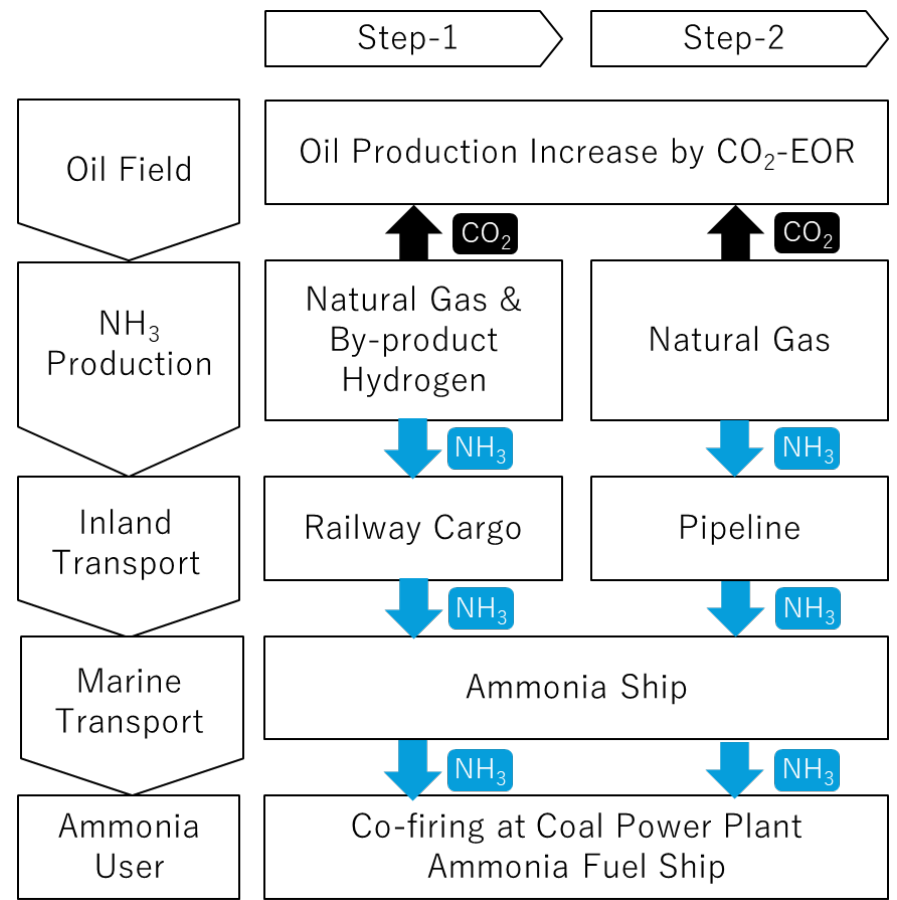
Fuel Ammonia : CO2 emissions and Product Cost



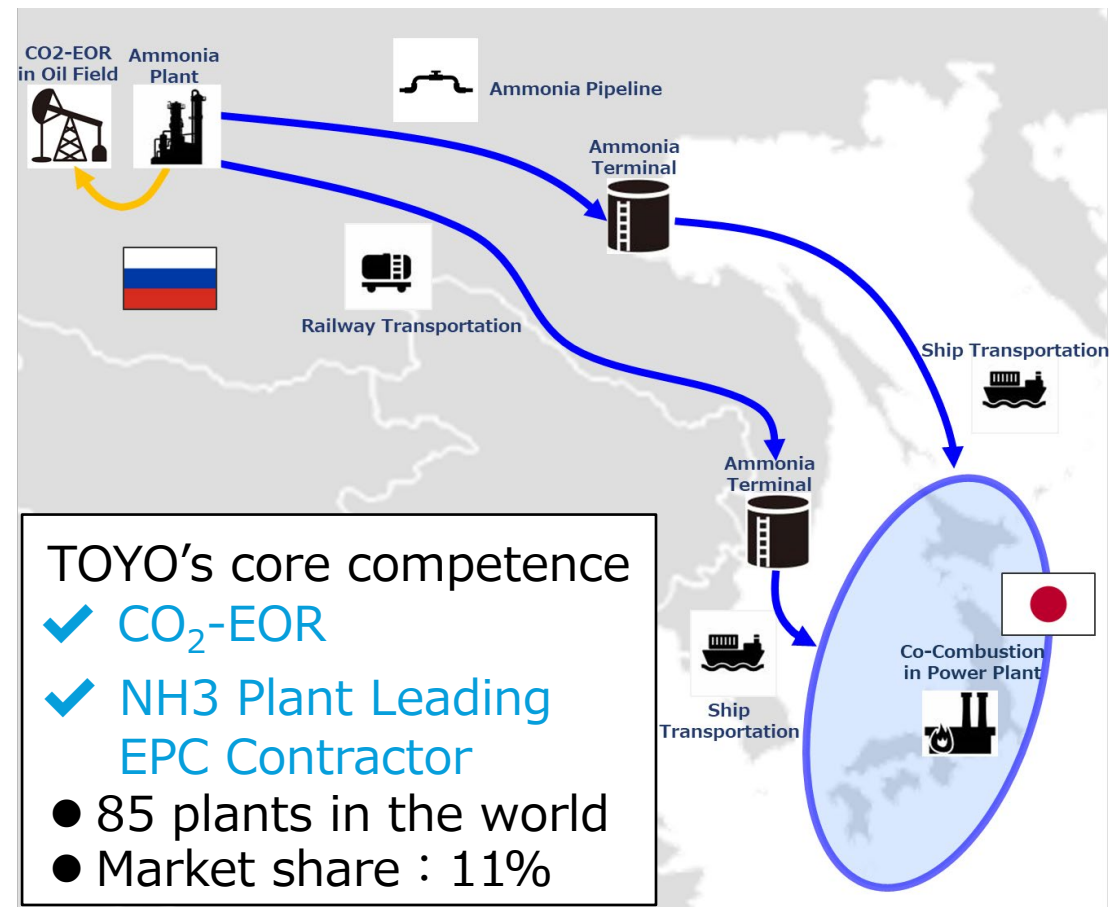
Fuel Ammonia : Blue Ammonia from Eastern Siberia to Japan

Joint Feasibility Study of Blue Ammonia Value Chain with IOC·JOGMEC·ITOCHU is on-going.

Current Plan (Step-1·2)



Ammonia Value Chain (Step-1·2)

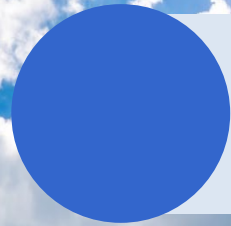
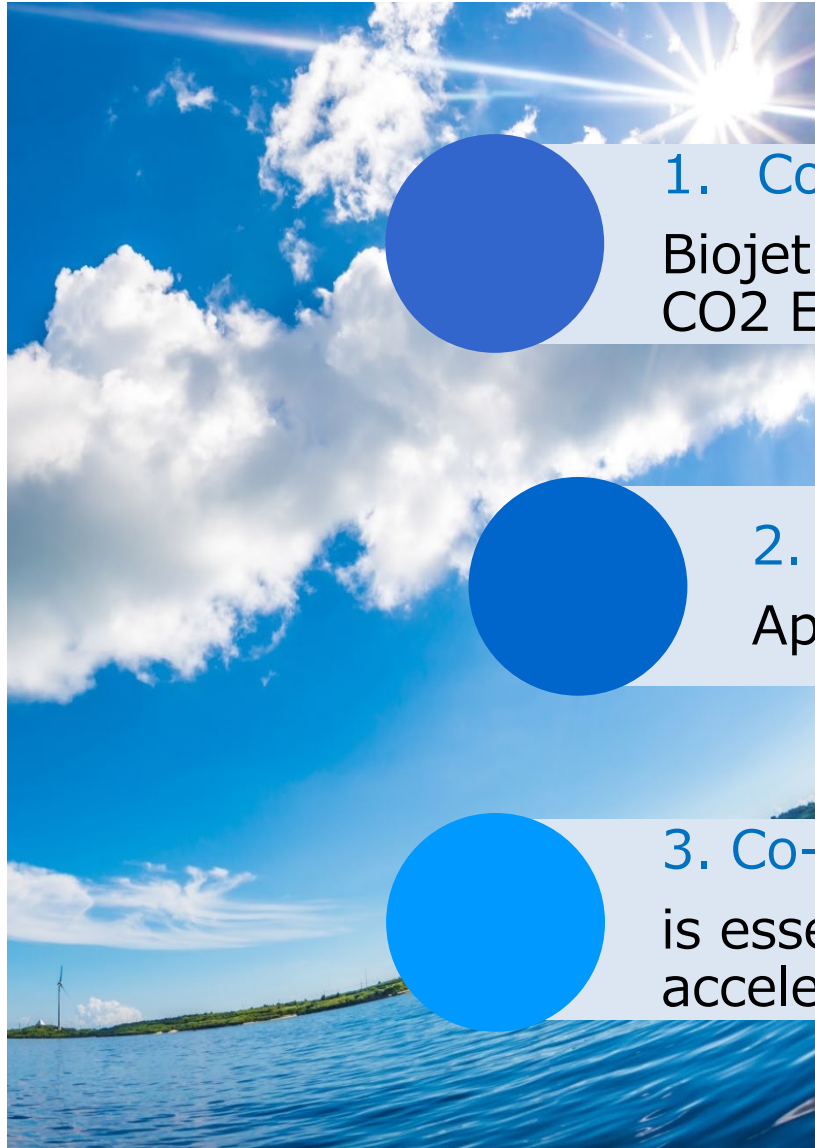


TOYO's core competence

- ✓ CO₂-EOR
- ✓ NH₃ Plant Leading EPC Contractor
- 85 plants in the world
- Market share : 11%

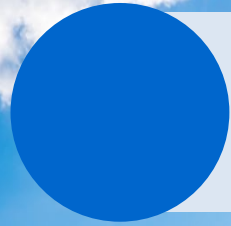
<Source : TOYO's News Release on 7 July, 2021>

IOC: Irkutsk Oil Company
 JOGMEC: Japan Oil, Gas and Metals National Corporation
 ITOCHU: Itochu Corporation



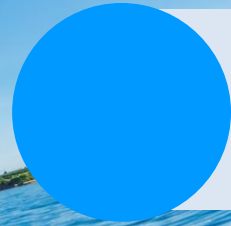
1. Combination of Existing Technologies

Biojet Fuel (FT synthesis), Blue Ammonia (NH₃ Synthesis + CO₂ EOR or CCS), CO₂ Methanol (Methanol Synthesis)



2. Small start and establish a Value chain

Applying available feed (Biomass, gray H₂)



3. Co-Creation

is essential element of international development to accelerate the pace of innovation for the energy transition.



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ENGINEERING

Thank you