METI
Ministry of Economy, Trade and Industry

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International Movement on Decarbonization

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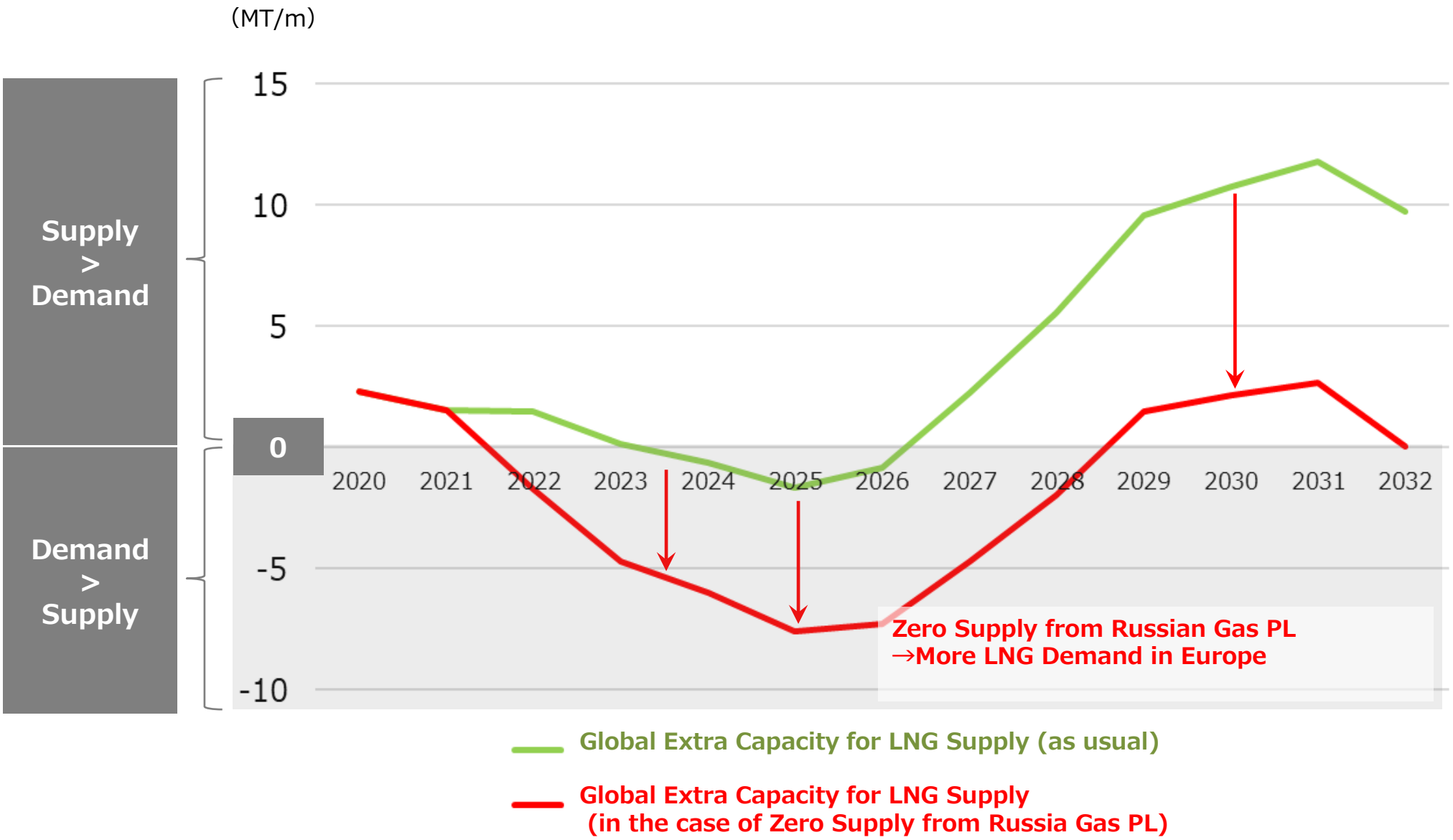
Background: Global Extra Capacity for LNG Supply

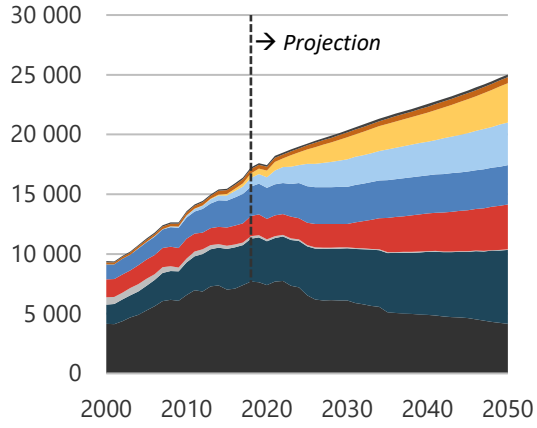


Source: JOGMEC etc.

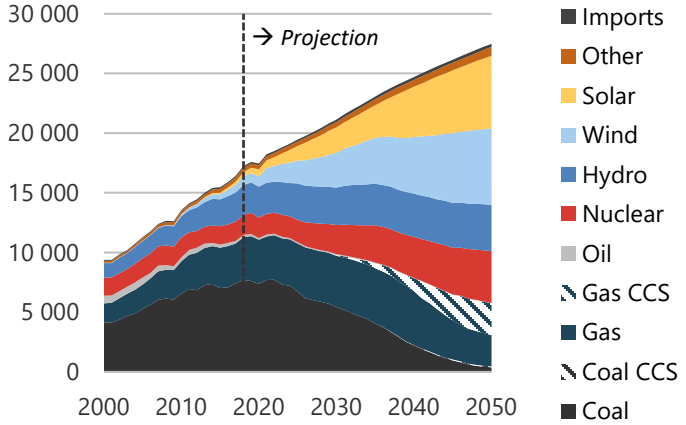
Background

- Electricity generation grows in both scenarios. So, further pursuit of thorough **energy efficiency** is needed.
- **Wind and solar** provide the most incremental generation in both scenarios.
- Natural gas substitution for coal continues and provides balancing and ancillary services.
- Innovation in the thermal power by means of **hydrogen /ammonia** - fired power generation and **CCUS/Carbon Recycling** will be important.
- Economies around the world have set goals to achieve carbon neutrality.

Electricity generation in REF, 2000-2050 (TWh).

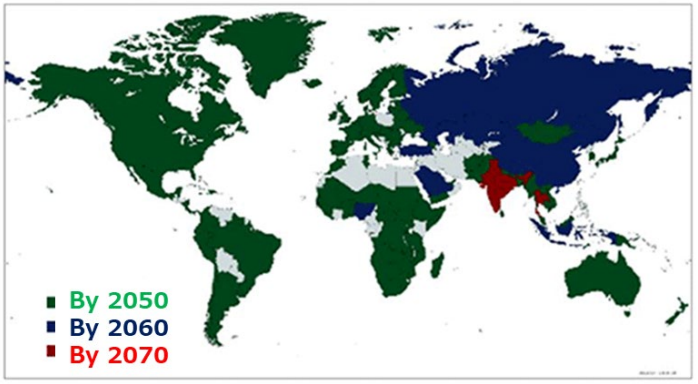


Electricity generation in CN, 2000-2050 (TWh).



Source: APEC Outlook 8th Edition (APERC)

Economies which declared to achieve CN



Source: Energy White Paper 2022 (Japan)

One Goal, Various Pathways

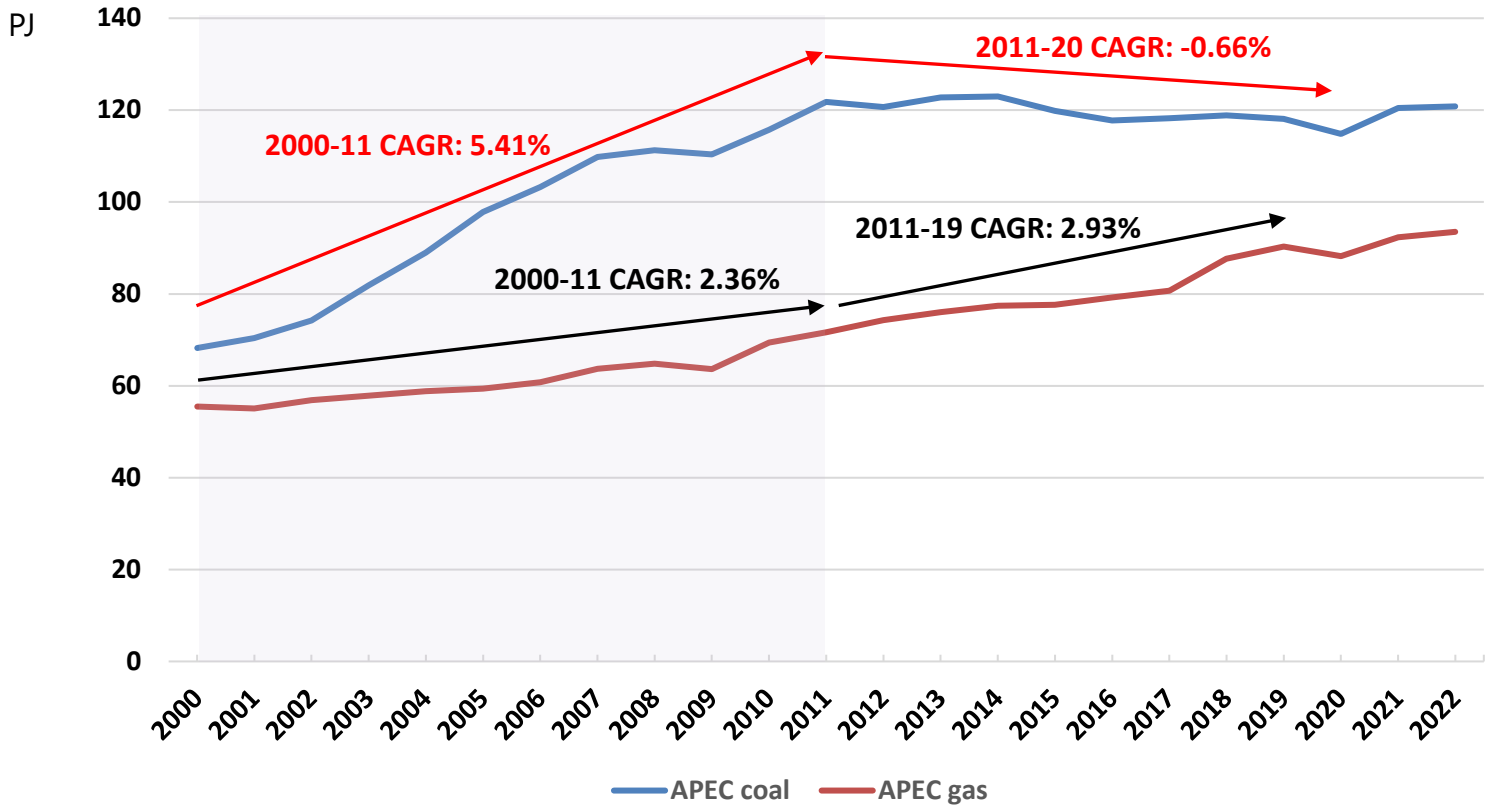
Decarbonization

Trilemma

Economic Growth

Security

High gas prices slowed coal-to-gas fuel switching

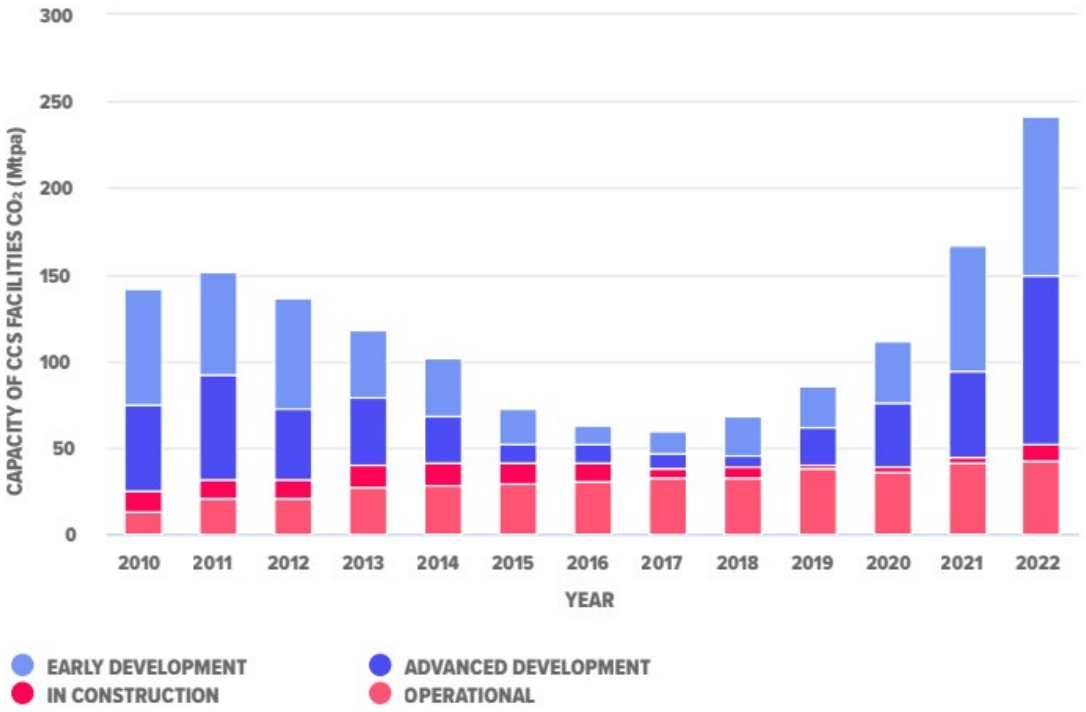


Source: EGEDA, BP, EIA

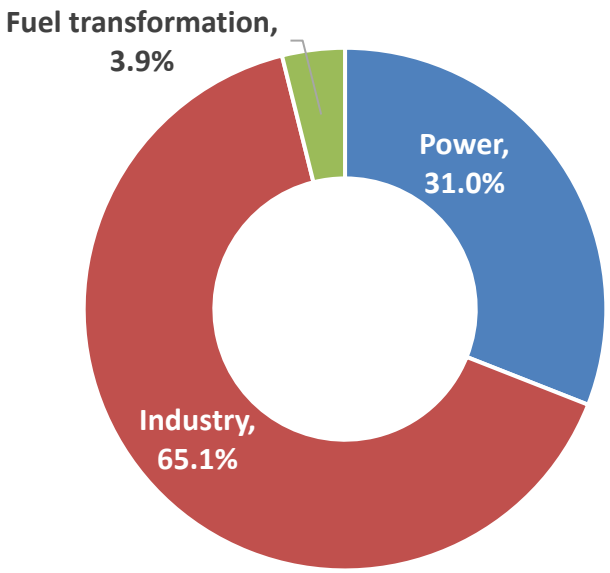
- Gas consumption grew while coal consumption declined over the last decade due to coal-to-gas switching in the APEC economies.
- Coal consumption gradually declined during 2011-2020 (CAGR =-0.66%) but rebounded in 2021/2022 due to high natural gas prices.

Global CCS demonstration and development is accelerating

Capacity of CCS facilities in various development stages



CCS capacity developments by sector as of September 2022

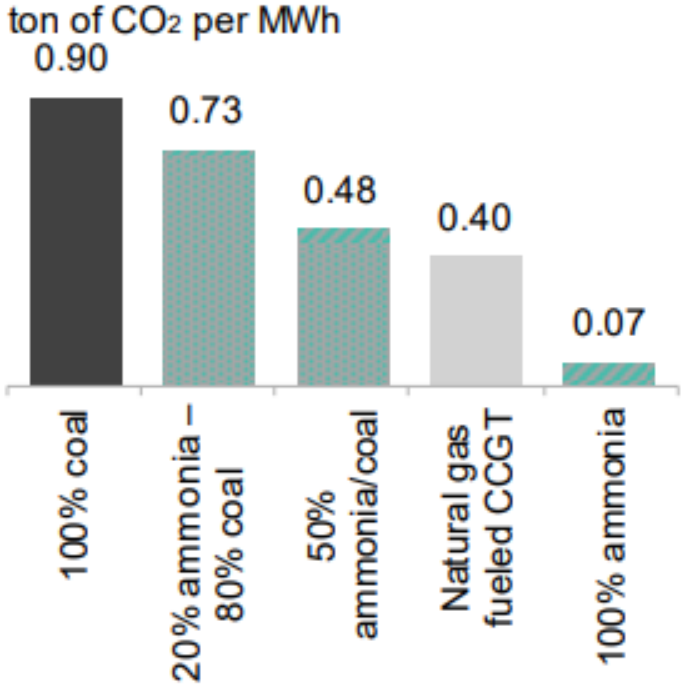


Source: Global CCS Institute

- The 45Q enhancements in the Inflation Reduction Act of 2022 (U.S.) are expected to make carbon capture cost-effective for more sources, creating a new market for the carbon emissions reduction and removal industry.
- Malaysia announced its intention to become a regional hub for carbon capture and storage (CCS).
- Australia accelerated its planned use of the CCS in hydrogen production.

Co-firing power generation

CO_2 emissions from power generation with blue ammonia



Source: BloombergNEF

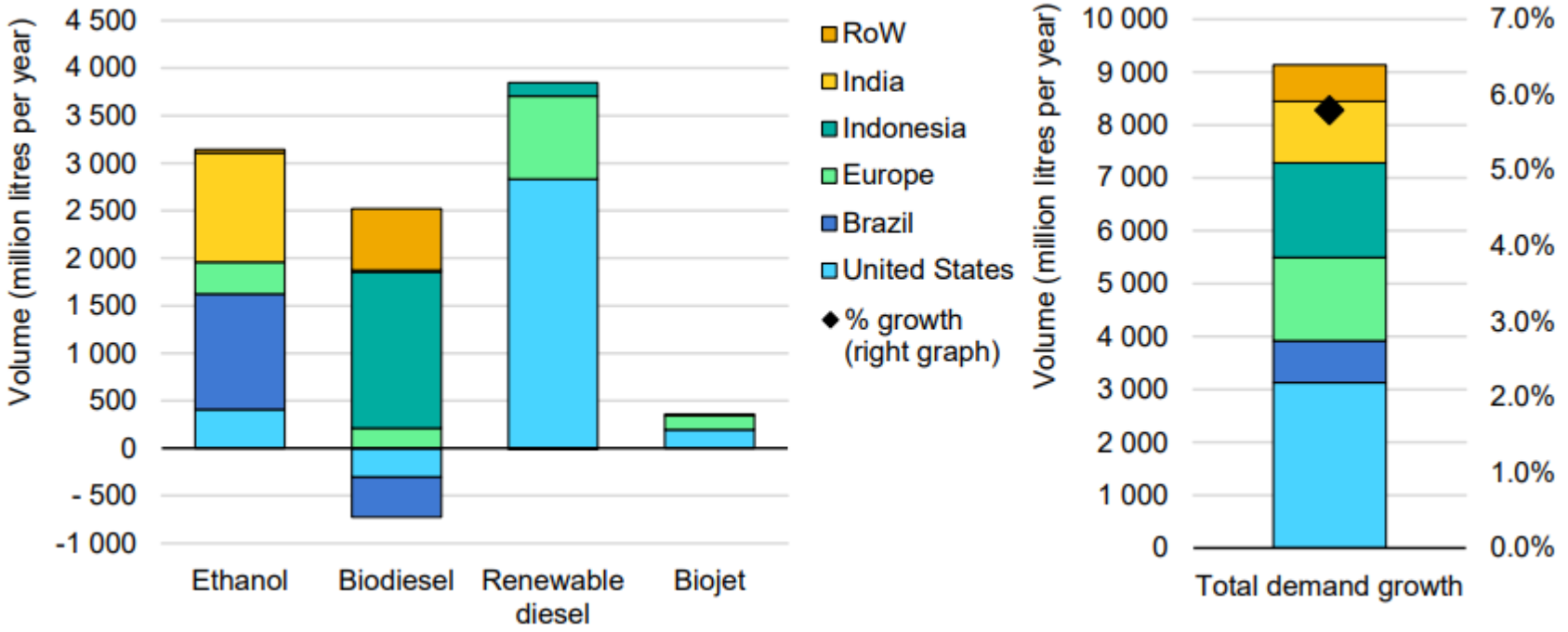
Countries and major companies working on ammonia co-firing technology

Source: BloombergNEF

- Co-firing with ammonia is a key technology to decarbonize fossil fuel-based power and industrial plants.
- Japan and Korea are actively developing ammonia co-firing at coal-fired boilers in the power and industry sectors.
- Japan plans to use 50% of ammonia co-firing in selected coal-fired power plants by 2030, targeting 100% ammonia-fueled thermal plants by 2050.
- Japan successfully conducted a test of 50% of hydrogen co-firing in a gas-fired plant and targeted 100% hydrogen firing by FY2030.

Biofuel consumption grew by 6% in 2022

Biofuel demand growth by fuel and region, 2021-2022

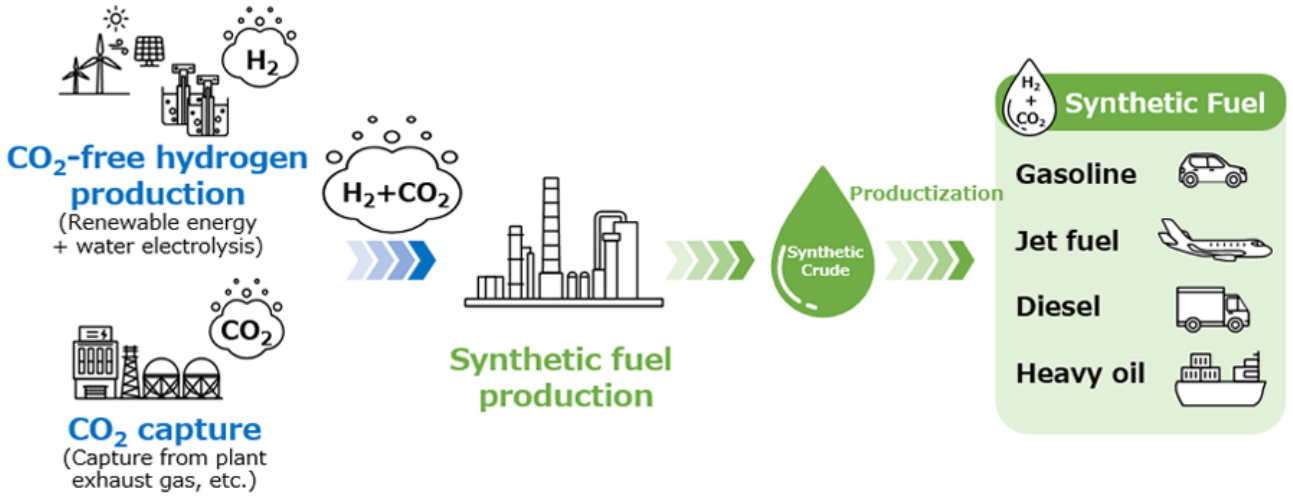


Source: International Energy Agency. Note: RoW = Rest of world.

- Global biofuel demand grew by 6% or 9 100 million litres (160 mb/d) in 2022.
- Renewable diesel demand expanded 40% or 3 900 MLPY (68 mb/d) in 2022.
- Renewable diesel represents the largest share of the biofuels growth in 2022.
- The US accounted for most of this growth due to substantial tax incentives.

E-fuels provide an opportunity to “recycle” carbon

Synthetic fuel production



Source: ENEOS

- Synthetic fuels: result from the combination of green hydrogen and carbon derived from CO_2 capture.
- Synthetic fuels release CO_2 when burned but are considered carbon-neutral as the released CO_2 is “recycled” from previous combustion.
- Japan's New Energy and Industrial Technology Development Organization (NEDO) established a "Green Innovation Fund – Development of Technology for Producing Fuel Using CO_2, etc. Project” in January 2022

G7 Ministers' Meeting on Climate, Energy and Environment

- **April 15 - 16, 2023 Sapporo, Japan**
- **Participants: G7, India (G20 Chair), Indonesia (ASEAN Chair), and UAE (COP28 Chair)**
- **International Organizations: UNFCCC, OECD, IEA, IRENA, ERIA, IUCN, WBCSD**

- While acknowledging **various pathways** according to each country's energy situation, industrial and social structures, and geographical conditions, we highlight that these should lead to our common goal of net zero.
- We commit to holistically address **energy security, the climate crisis and geopolitical risks**.
- We reaffirm our commitment towards collectively **reducing** global anthropogenic **methane emissions by at least 30 percent below 2020 levels by 2030, in line with the Global Methane Pledge**.
- We highlight the role of **energy efficiency** as the "first fuel" as a key pillar in the global energy transition towards net-zero GHG emissions in 2050.
- We reaffirm our commitment to achieving **a fully or predominantly decarbonized power sector by 2035**.
- We recognize low-carbon and renewable **hydrogen** and its derivatives such as **ammonia** should be developed and used where they are impactful as effective emission reduction tools to advance decarbonization across sectors and industries.
- We recognize that **CCU/carbon recycling and CCS** can be an important part of a broad portfolio of decarbonization solutions to achieve net-zero emissions by 2050, **and Carbon dioxide Capture, Utilization(CCU)/carbon recycling** technologies, including recycled carbon fuels and gas (RCFs) such as **e-fuels and e-methane**, also can reduce emissions.
- **Investment in the gas sector** can be appropriate to help address potential market shortfalls provoked by the crisis.

Policies to promote clean fossil energy in APEC (1)

Economies	Programs/Policies	Goal
United States	The Inflation Reduction Act, which is intended to promote alternative fuels	• Extension of Tax Credits for Biodiesel and Renewable Diesel • Extension of Tax Credit for Alternative Fuels • Extension of Second-Generation Biofuel Incentives • Clean Fuel Production Credit
Canada	Federal and provincial regulations to reduce methane emissions (fugitives, venting and flaring) in the oil and gas sector	Achieve methane reduction targets: 40 to 45% below 2012 levels by 2025 and 75% below 2012 levels by 2030.
Canada	Carbon price rising to 130 USD per tonne by 2030, up from 50 USD now	Affect business decisions and consumer behavior to investment in CCUS, biofuels, renewables and low-carbon energy carriers.
Canada	Clean fuel standard (liquid fuels)	Reduce carbon intensity of gasoline, diesel by 15% below 2016 levels by 2030.
Canada	Fund CCUS research; CCUS investment tax credits for eligible equipment	Encourage decarbonization research and investment.
Canada	Hydrogen Strategy	Set out short-, mid- and long-term goals for developing a hydrogen industry in Canada. No specific policy support thus far.
Canada	Provincial renewable natural gas (RNG) blending mandates (e.g., landfill methane)	B.C. mandating a 15% RNG blend by 2030. Quebec mandating a 5% blend by 2025 and 10% by 2030.

Policies to promote clean fossil energy in APEC (2)

Economies	Programs/Policies	Goal
Singapore	National Hydrogen Strategy	Establishes five activities to foster the development of hydrogen technologies and the global hydrogen supply chain.
Singapore	Fund research into emerging low-carbon alternatives	Fund studies and demonstration projects to research and foster the development of low-carbon hydrogen CCUS projects.
Singapore	Carbon price rising from 4 USD per tonne now to 35 to 60 USD per tonne in 2030	Affect business decisions and consumer behavior to investment in CCUS, biofuels, renewables and low-carbon energy carriers.
Australia	Australia’s National Hydrogen Strategy	Designed to establish Australia's hydrogen industry as a major global player by 2030.
Australia	Emissions Reduction Fund (ERF)	The government will purchase lowest cost abatement (in the form of Australian carbon credit units (ACCUs)).
China	Action Plan for Carbon Dioxide Peaking Before 2030	• Promote advanced bio-liquid fuels, sustainable aviation fuels, and other alternatives. • Improve the energy efficiency of end-use fuel products.

Policies to promote clean fossil energy in APEC (3)

Economies	Programs/Policies	Goal
Thailand	The Thailand Board of Investment's Investment Promotion Packages (notification no. Sor. 7/2564)(Nov 2021)	Natural gas separation plants and petrochemical production facilities implementing CCUS will be granted 8-year corporate income tax exemption.
Thailand	Biofuel blending mandate (introduced in 2007)	• E20 as the primary gasohol by 2037. • Biodiesel blend rate is adjusted based on domestic supplies and energy prices.
Korea	Eco-friendly Biofuel Development Measures (Oct 2022)	Expand domestic biofuels by adopting marine biofuel by 2025, sustainable aviation fuel by 2026 and raising its 2030 biofuels blending mandate in the diesel pool.
Japan	2050 Carbon Neutral and 2030 Climate Goal	• Reduce greenhouse gas emissions to net-zero by 2050 . • Reduce its GHG emissions by 46 percent in FY 2030 from its FY 2013 levels. • National Hydrogen Policy
Japan	Basic Policy for Realization of GX(Green Transformation)	• "GX Economic Transition Bonds" (20 trillion yen over the next 10 years) • Introduction of carbon pricing to give incentives for GX investment • Strengthen financial support through public-private partnership