Asia-Pacific Economic Cooperation

Utilizing Carbon-Free Energy Technologies to Expand Clean Electricity in APEC

Introduction to Japan's Policies and Initiatives

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Key messages of the 7th Strategic Energy Plan in Japan

◆Changing energy landscape:

- Growing need for **economic security**, due to events including tension in the Middle East.
- **Increasing electricity demand** expected due to digitization and green transformation.
- Need for **strong industrial policy** to make energy structure transformation into economic growth.

◆Policy Direction toward 2040:

- Secure **decarbonized power sources** to meet the growing electricity demand and enhance **competitiveness**.
- **maximize the deployment of renewable energy as our major power source** and aim for **a balanced power source structure** that does not overly rely on specific power sources or fuel sources
- **maximize the use of renewable energy, nuclear power**, and other power sources **that contribute to energy security and have high decarbonizing effects.**

◆Renewable Energy:

- Expanding the adoption of **domestically produced renewable energies** and improving the **technology self-sufficiency ratio** will contribute to **strengthening** Japan's **industrial competitiveness in** addition to decarbonization, and from this perspective, it is necessary to **promote the development and public implementation of next-generation renewable energy technologies** as well as coping with output fluctuations.
- **Adoption of perovskite solar cells** (target of 20 GW introduction by 2040), **floating offshore wind power** in the EEZ, etc.
- **Development of inter-regional interconnection lines and introduction of storage batteries**, etc.

Key messages of the 7th Strategic Energy Plan in Japan

◆Nuclear power:

Promote R&D of **next-generation innovative reactors** (innovative light water reactors, small light water reactors, fast reactors, high-temperature gas reactors, nuclear fusion), etc., while working strengthening supply chain and human resources.

◆Hydrogen and its derivatives（including ammonia, e-fuels and e-methane）:

Enhance competitiveness through **technological development**, and promote **capital investment** by front runner companies to expand global supply chain through strong support measures including **the Hydrogen Society Promotion Act.**

◆CCS:

Support **systems to encourage investment in CCS projects**, develop **technologies to reduce costs**, develop storage sites, etc.

◆Thermal power:

maintain and secure the generation capacity (kW) necessary for a stable supply of thermal power as a whole, **while reducing the amount of electricity generated (kWh), mainly from inefficient coal-fired thermal power.** Specifically, **secure LNG-fired thermal power** as a means of **transition**, promote **decarbonization of thermal power** by utilizing hydrogen, ammonia, CCUS, etc.,

(Reference) Outlook for Energy Supply and Demand in FY2040

- The outlook for energy supply and demand in FY2040 is presented **as a certain range using multiple scenarios**, keeping in mind the **existence of various uncertainties**, while also referring to analytical methods used in other countries.

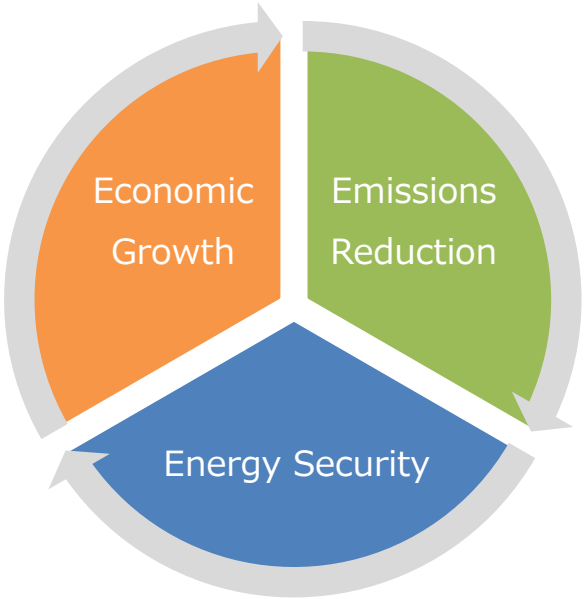
		Fiscal Year 2023 (Preliminary figures)	Fiscal Year 2040 (Forecast)
Energy self-sufficiency rate		**15.2% (in %)**	**Approx. 30-40%.**
Amount of electricity generated		**985.4 billion kWh**	**1.1 to 1.2 trillion kWh approx.**
Power Supply Configuration	**Renewable energy**	**22.9% (%)**	**Approximately 40-50%.**
	Sunlight	9.8% (9.8%)	Approx. 23% to 29%
	Wind power	1.1% (1.1%)	Approx. 4-8%
	Hydraulic power	7.6% (7.6%)	Approx. 8-10%
	Geothermal power	0.3% (0.3%)	Approx. 1-2%.
	Biomass	4.1% (4.1%)	Approx. 5-6%
	Nuclear power	**8.5% (8.5%)**	**Approx. 20%**
	Thermal power	**68.6% (%)**	**Approx. 30-40%.**
Final energy consumption		**300 million kL**	**Approx. 2.6 to 2.7 billion kL**
Percentage reduction in greenhouse gas emissions (compared to FY2013)		**22.9% (%) (Actual results for FY2022)**	**73%**

Green Transformation's Three Principals

Triple breakthrough

Japan aims to simultaneously achieve

- Emissions Reduction
- Economic Growth
- Energy Security

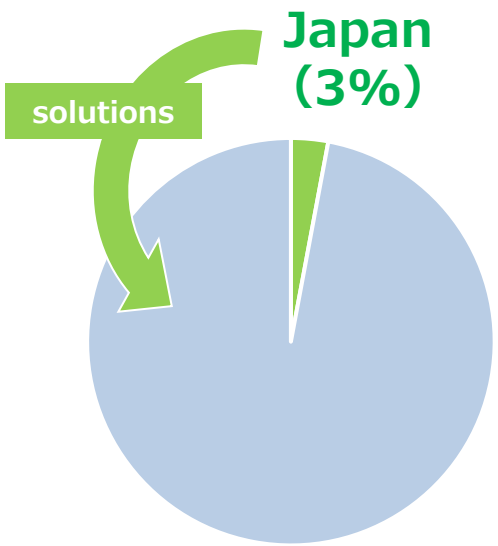


One goal, various pathways

Toward our common goal of achieving net zero, we will make practical energy transitions through various pathways depending on the circumstances of each country.

Solution to the world

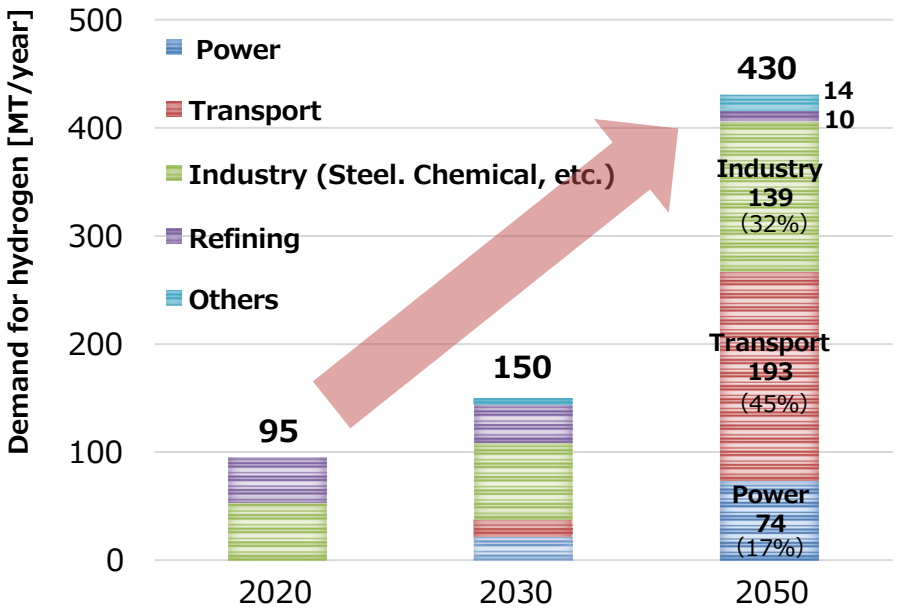
Japan will decarbonize itself, but also contribute to global decarbonization by providing solutions outside Japan.



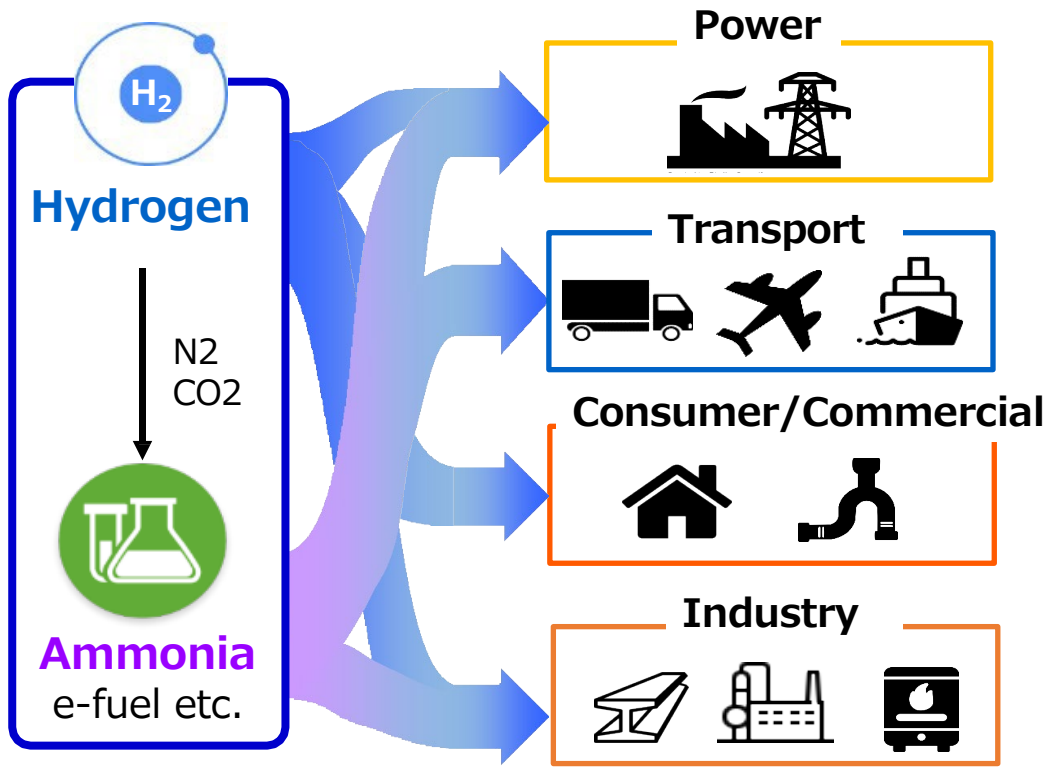
Hydrogen essential for carbon neutrality

- **Global demand for hydrogen and its derivatives (i.e., ammonia, e-methane, and e-fuels) is expected to grow** towards carbon neutrality by 2050.
- They are expected to be utilized in various sectors, including **"hard-to-abate" sectors** such as steel and chemicals, where conversion is difficult due to few alternative technologies, as well as in the **mobility sector** and **power generation**.

<World Demand for hydrogen>

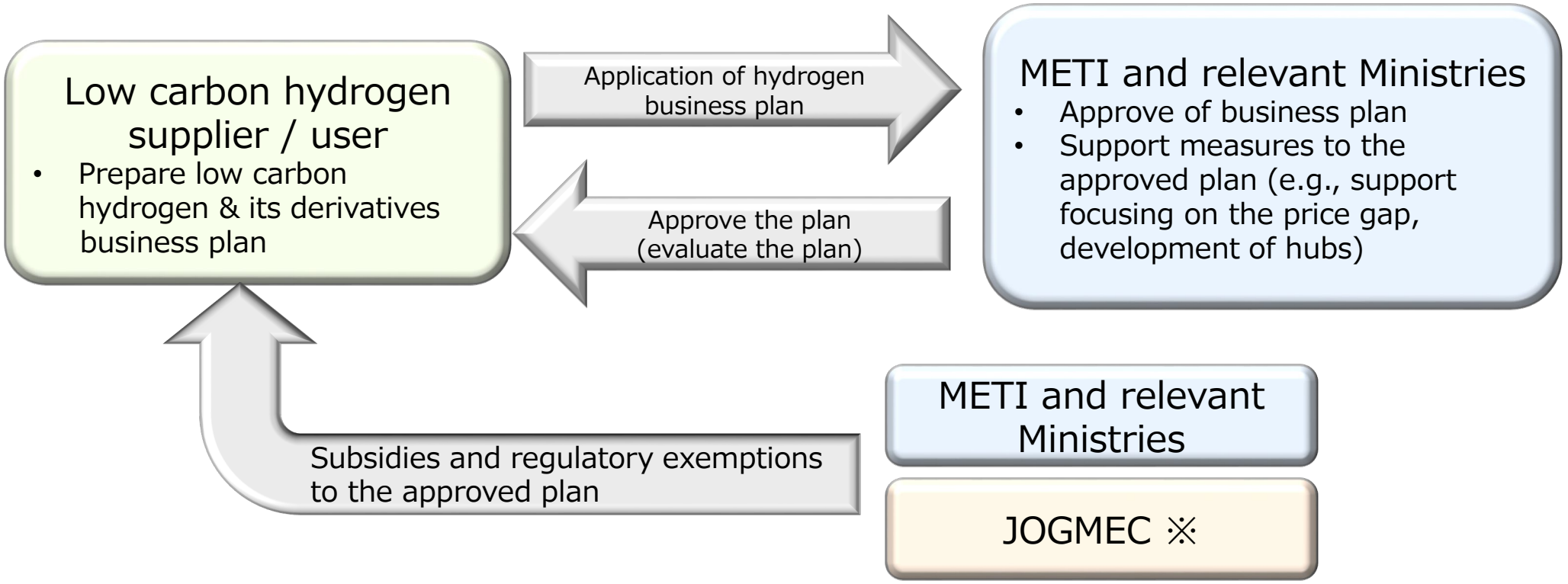


Ref : IEA「Net-Zero Roadmap」 (2023/9)
※ Calculated based on NZE (Net Zero Achieved in 2050) scenario



Hydrogen Society Promotion Act（Passed on May 17th,2024）

- There are challenges in realizing CN2050 in promotion of GX in hard-to-abate sectors and realization of stable energy supply, decarbonization, economic growth.
- **Hydrogen and its derivatives are key enablers for achieving carbon neutrality** in industrial sectors, including iron and steel, chemicals, mobility and power generation.
- **The Government will provide supporting measures to the approved hydrogen business plans** to promote the supply and utilization of low carbon hydrogen and its derivatives.

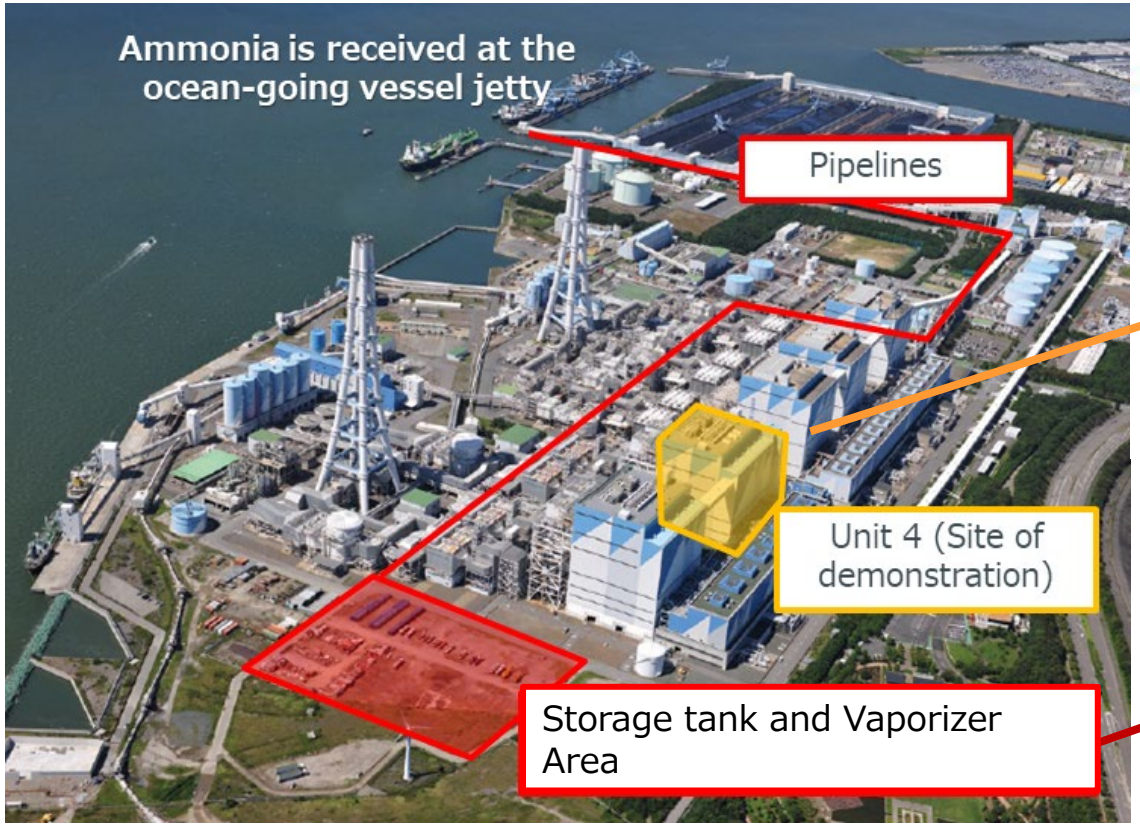


※ Japan Organization for Metals and Energy Security

Ammonia power generation

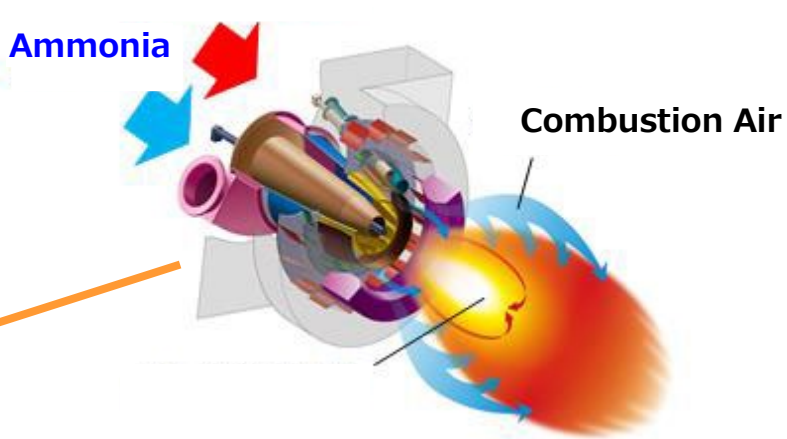
- As Japan's original technology, **stable combustion and reduced NOx emissions with 20% ammonia co-firing have been already achieved**. The **demonstration using actual large-scale equipment (a 1 GW power plant)** was **completed in 2024**.

JERA Hekinan Thermal Power Station



Source: JERA press release, revision by ANRE

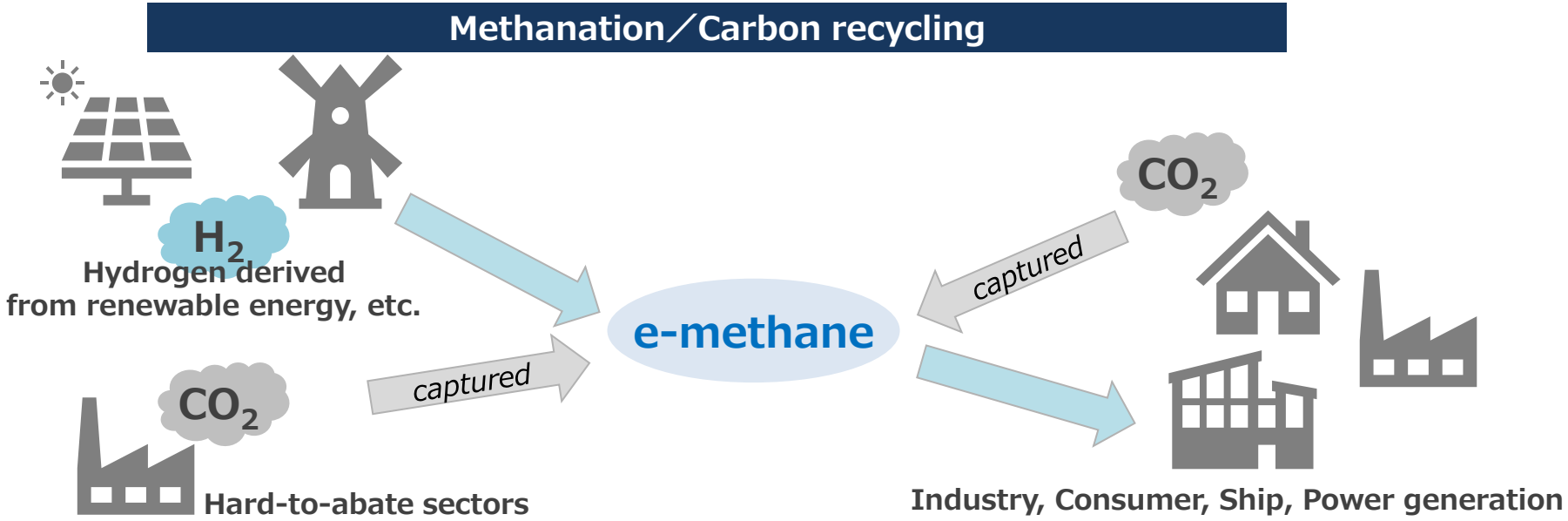
Co-firing burner (image)



Ammonia Storage Tank

e-methane

- **Effective for carbon neutrality in heat demand**
  → *e-methane can achieve decarbonization in the high temperature zone.*
- **Contributing to low carbon and carbon neutrality**
  → *No new CO_2 is additionally emitted.*
- **Existing LNG and natural gas infrastructure** can be used for e-methane.
  → *Decarbonization can be achieved while keeping equipment costs down.*



Future direction in Strategic Energy Plan (2021)
→ Inject 1% e-methane into existing infrastructure by 2030

Global e-methane projects

- **e-methane projects are being promoted by companies around the world.**

Nordic Ren-Gas
Construction to begin in
2025-27

- **Shell,** Tokyo Gas, Osaka Gas – supply chains study
- **ENGIE**, Osaka Gas – MOU for Asian market
- **Total Energies**, Toho Gas, Toyota Tsusho Corp - FS

TES, Tokyo Gas, Osaka Gas, Toho Gas, Mitsubishi Corp., engie, Sempra, Total Energies

e-NG COALITION

INPEX, Masdar,
Tokyo Gas, Osaka Gas
– FS in UAE

IHI, Pertamnia
– FS near existing LNG plants

Osaka Gas, IHI, Petronas
FS (biogenic e-methane)

Santos, Tokyo Gas, Osaka Gas, Toho Gas– Pre-FEED (Cooper Basin)

Green Plains
TALLGRASS ENERGY
Daigas Group

Osaka Gas, Tallgrass
Green Plains – FS in
U.S. Midwest

Mitsubishi Corporation, Tokyo Gas,
Toho Gas, Sempra Infrastructures
Partners
- FS Cameron LNG terminal

https://www.inpex.co.jp/news/2023/2023-7_b.html
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Thank you for your kind attention.