

Japan's Policies on Hydrogen / Ammonia

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- □ No energy source is perfect.
- □ Fossil fuels, renewable energy, nuclear…
 - All energy sources fuels have their pros and cons.
- □ [Safety][Stability][Cost][Decarbonization]

All have to met continuously and simultaneously with the right balance.

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.







Importance of hydrogen and its derivatives

- Towards carbon neutrality by 2050, <u>hydrogen and its derivatives (i.e. ammonia, e-</u> <u>methane, and e-fuels) are attracting attention as fuel expected to be used in various</u> <u>applications</u>.
- In particular, they are expected to be used in sectors including <u>"hard-to-abate" sectors such</u> as steel and chemicals where conversion is difficult due to few alternative technologies, in the mobility sector, and in power generation.



Japan's Hydrogen Policies

- Japan was the first country to formulate a <u>national hydrogen strategy, in 2017</u>, which was then revised in 2023.
- Established the <u>Green Innovation Fund of approximately ¥2 trillion* in 2021</u>.
 * ¥2 trillion = \$13billion (USD/JPY=150)
- Hydrogen/ammonia as <u>key elements of the strategy under the Green Transformation</u> <u>Promotion Act in 2023</u>.
- Enacted a new Hydrogen Society Promotion Act in 2024 (enforced on October 2024).

Milestones						
2017 •Basic Hydrogen Strategy	2020 •2050 CN Declaration •Green Growth Strategy	2021 •Green Innovation Fund •Revised Strategic Energy Plan	2023 •GX Promotion Act •Basic Hydrogen Strategy update	2024 •Hydrogen Society Promotion Act		
Targets (Set in the Basic Hydrogen Strategy on Dec. 26, 2017 – updated in 2023)						
□Supply & Demand volume: Current (Approx. 2Mt) → 2030 (<u>Approx. 3Mt</u>) → 2040 (<u>Approx. 12Mt</u>) → 2050 (<u>Approx. 20Mt</u>)						
□Hydrogen cost: Current (JPY100/Nm3) → 2030 (JPY30/Nm3) → 2050 (Less than JPY20/Nm3)						
stati	tation retail price $(=USD2.1/kg-H2^*)$ $(=USD1.4/kg-H2^*)$ $\times 1USD = JPY155$					

Support Focusing on the Price Gap

 The government plans to provide a 15-year support to <u>suppliers</u> who aim to develop a <u>commercial-scale supply chain</u> of <u>low-carbon hydrogen and its derivatives</u> which meets Japan's primary energy policy. (i.e., S+3E: Safety + Energy Security, Economic Efficiency, Environment)



Key requirements

- Supply to hard-to-abate sectors, such as steel, chemical and transportation industries
- Start supply by FY2030 and must continue for another 10 years following the support period

* In the approval process, business plans are to be reviewed holistically from Japan's energy and GX policy perspectives

6

Hydrogen Hub Development Program

- The Hydrogen Hub Development Program supports the establishment of infrastructure which leads to large-scale expansion of the use of low-carbon hydrogen and its derivatives and widely benefits a variety of companies, with an aim to stimulate demand creation and the efficient buildout of hydrogen supply chains.
- The Program will subsidize a portion of the CAPEX for developing "<u>facilities necessary to</u> <u>transport low-carbon hydrogen from the receiving terminal to the point of actual</u> <u>use by consumers</u> and <u>used by multiple companies (e.g. shared pipelines and tanks)</u>".



7

Development of Hydrogen Supply Chain

- Japanese industrial sector have technical strength such as <u>water electrolysis and membrane</u> in "Production", <u>large-scale vessels and taks</u> in "Transportation", <u>mobility and power generation</u> in "Utilization".
- Supporting <u>mass-production</u> through the GX Supply Chain Budget since this FY and <u>promoting domestic</u> <u>cutting edge technologies to develop resilient supply chains</u> through support focusing on the price gap.

	Production	Transportation (store)	Utilization
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Core Technologies	Water electrolysisMembrane	•Transportation (LH2, MCH, etc.)	 Fuel cell system/vehicle/truck Power generation
Key Players	<water electrolysis=""> Asahi Kasei, Toyota, Toshiba ESS, Kanadevia, Toray ThyssenKrupp (Germany) Siemens Energy (Germany)</water>	<liquefied carrier="" hydrogen=""> Kawasaki Heavy Industries HD KSOE (South Korea) GTT (France)</liquefied>	<fuel cell=""> Toyota, Honda Daimler (Germany) Hyundai (South Korea) <power generation=""> Mitsubishi Heavy Industries, IHI Siemens Energy</power></fuel>
Strengths (Japan)	Safe and stable operation of water electrolysis and innovative material development	Conducted the world's first demonstration of large-scale hydrogen transportation	Leads technological development of fuel cell and is top class in number of patents

International Multilateral Cooperation

- Capacity building, awareness, sharing objectives and challenges.
- Objective analysis on world's energy outlook (e.g. carbon intensity, cost estimate)
- Advocate for Japan's cases, whilst accommodating views from various countries.











International Partnership for Hydrogen and Fuel Cells in the Economy













- HEM was first held in Tokyo in 2018 as the world's first ministerial meeting exclusively on hydrogen.
- Chaired by Japan with a number of key participants, HEM has been an ideal forum to discuss most recent hydrogen policy developments and emerging issues for policy coordination.
- The 7th HEM will be held in conjunction with the Expo 2025 Osaka alongside other events such as the High-Level Dialogue on Sustainable Fuels.

6th Hydrogen Energy Ministerial Meeting

• Date: September 23, 2023

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- Venue: Tokyo, Japan
- Key outcomes: Issued a chair's summary affirming the following.
 - Global goals to increase <u>hydrogen demand to 150</u> <u>million ton by 2030</u>, and <u>up to 90 million ton for</u> <u>renewable and low-carbon hydrogen</u>.
 - The potential for hydrogen utilization will <u>create new</u> industries and jobs of close to 800,000 by 2030.
 - The importance of developing <u>international standards</u> and certification schemes based on carbon intensity.
 - The importance to strengthen international support for access to <u>financial support in emerging countries</u>.

7th Hydrogen Energy Ministerial Meeting

- Date: October, 2025
- Venue: Osaka, Japan
- Unique cruise experience aboard the hydrogen fuel cell ship "Mahoroba" to the Expo 2025 venue



Bilateral Cooperation

- Ammonia firing can be applied not only to coal-fired power plants, but also to gas-fired power plants.
- <u>2MW class gas turbine for ammonia single-fuel firing is being developed</u>. This is <u>expected to be completed</u> by the end of FY2025, two years ahead of the original schedule.
 - As an objective of this technological development, this single-fuel firing turbine is expected to be commercially installed in Malaysia in FY2026.
- <u>Development of large-scale gas turbine is ongoing with an aim to develop 100% ammonia gas turbines</u> by 2030.

Successfully reduced over 99% GHG during combustion



Image: 2,000-kilowatt-class gas turbine "IM270" at IHI Yokohama Works https://www.ihi.co.jp/en/all_news/2022/resources_energy_environment/1197938_3488.html MOU was signed for development of global green ammonia value chain and commercial demonstration of ammonia-powered gas turbine



https://ptsg1cesgentariwb01.azurewebsites.net/ihi-gentari-sign-mou-to-develop-global-green-ammonia-value-chain-and-commercial-demonstration-of-ammonia-powered-gas-turbine/