

# Overview of Basic Hydrogen Strategy

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Agency for Natural Resources and Energy

## ▶ Background and overall view of updated Basic Hydrogen Strategy

- The original Basic Hydrogen Strategy was formulated with the aim of effectively developing hydrogen technology and creating a domestic hydrogen market ahead of the rest of the world. Given that the global hydrogen market is expected to generate \$2.5 trillion per year in revenue and create 30 million jobs by 2050, however, the government has decided to update the strategy to not only develop the domestic market but also expand into overseas markets.
- Through green transformation (GX), Japan aims to simultaneously realize stable energy supply, economic growth, enhanced international industrial competitiveness, and decarbonization. In order to draw out more than 150 trillion yen in GX-related investment from the public and private sectors over the next 10 years, the government has indicated a policy of providing upfront investment support on the scale of 20 trillion yen.
- In order to achieve carbon neutrality by 2050 based on the domestic and international situations, the updated Basic Hydrogen Strategy presents the recognition and vision common to the public and private sectors in terms of achieving the goal, while clarifying challenges and policy initiatives, and demonstrates the nation's aspiration of achieving the early realization of a hydrogen society.
- The strategy includes the following as important pillars.
  - (1) Overall objective
  - (2) Hydrogen industry strategy (for enhancing the hydrogen industry's competitiveness)
  - (3) Hydrogen safety strategy (for the safe use of hydrogen)
- The strategy also covers ammonia, e-methane, and synthetic fuel (e-fuel). It aims to promote carbon neutrality by strategically proceeding with the development, demonstration, and introduction of technologies in view of challenges, and a technology development timeline.

## ▶ Points of direction towards realizing a hydrogen society (overall view)

- The introduction of hydrogen in Japan is premised on the **S (Safety) + 3 E (Energy Security, Economic Efficiency, and Environment) principles**.
- Given that hydrogen is a field in which Japan has technological advantages, the strategy sets out a specific direction for hydrogen policy from the perspective of industrial policy.
- In addition to the current target of expanding consumption of hydrogen to around 3 million tons per year by 2030 and about 20 million tons per year by 2050, the strategy **sets forth a new target of about 12 million tons per year (including ammonia) for 2040**.
- The government will try to attain the hydrogen supply cost (CIF) target of 30 yen/Nm<sup>3</sup> for 2030 and 20 yen/Nm<sup>3</sup> for 2050 and the ammonia supply cost (CIF) target of 15-20 yen/Nm<sup>3</sup> for 2030 (\*in terms of hydrogen) by utilizing the Green Innovation (GI) Fund and hydrogen/ammonia for technological development.
- In order to steadily promote carbon neutrality, Japan will **set a target for carbon intensity of hydrogen/ammonia**.
  - The ministerial statement of the G7 Ministers' Meeting on Climate, Energy and Environment in Sapporo **expressly states that hydrogen/ammonia contribute to the decarbonization of the various fields and industries**.
  - At the same time, **the G7 countries affirmed the importance of establishing international standards and certification schemes for carbon-intensity-based transactions**.
  - The importance was also affirmed at the subsequent G7 Hiroshima Summit.
- As for carbon intensity, the government will follow the calculation method presented by the International Partnership for Hydrogen and Fuel Cells in the Economy (IPHE) to **set low-carbon targets comparable to the international level and promote the introduction of hydrogen that meets these targets**.

## ▶ Points of direction towards realizing a hydrogen society [supply side]

- Since hydrogen production in Japan is important from the perspective of strengthening energy security, the government, when supporting efforts to narrow the gap between hydrogen prices and existing fuel prices, will provide maximum support to domestic business projects that are expected to achieve sufficient price reductions and become competitive in the future.
- As global water electrolysis capacity is expected to reach 134 GW in 2030, the introduction of Japanese products in domestic and foreign upstream markets will contribute to enhancing Japan's presence in global energy supply.
  - Japan-related companies' global water electrolysis capacity target is set at 15 GW for 2030.
- In order to pursue low-carbon hydrogen from the earliest stage, the government intend to develop measures for the transition to low-carbon hydrogen, including (1) the consideration of a market design with incentives for consumer payment of some cost for low-carbon hydrogen and (2) the establishment of regulatory guidance measures for low-carbon hydrogen.
- Given that CCU (Carbon Capture and Utilization) and Carbon Recycling initiatives are indispensable for producing low-carbon hydrogen, the government aim to support the development and introduction of CCU and Carbon Recycling technologies, accelerate business environment development efforts, such as the enactment of a law for launching CCS projects by 2030, and secure 6 million to 12 million tons of annual CO<sub>2</sub> storage by 2030.
- Since hydrogen is less unevenly distributed in the world, Japan will enhance relations with various countries with potential hydrogen resources, including new, future resource-rich countries, to accelerate the development of international supply chains and supply bases. The government will aim to achieve both the enhancement of energy security and industrial policy by stabilizing supply based on Japanese companies' involvement in upstream interests, manufacturing, transportation, and overseas plant construction and by adopting products related to Japanese companies in hydrogen production areas.
- Since the early construction of hydrogen supply chains contains significant risks regarding technologies, uncertain demand prospects, and supply chain disruptions through infrastructure development delays, the government will encourage the creation of private insurance and develop a business environment where public organizations can shoulder a portion of the risk to pave the way for easier investment by business operators when risks are considerably high.

## ▶ Points of direction towards realizing a hydrogen society [demand side]

- As hydrogen is expected to make various contributions, including to the decarbonization of heat utilization, the development of zero-emission power sources, and the production of recycled carbon products like synthetic fuels (e-fuel) and e-methane, its roles are anticipated to expand further in the future.
  - **Power generation**  
From the latter half of the 2020s to 2030, the government will aim to expand hydrogen/ammonia consumption for co-firing power generation and promote single-fired hydrogen/ammonia power generation.
  - **Fuel cells**  
With Japanese technological strengths, the government aims to establish Japan's position as a platform provider by ensuring that Japanese fuel cells are available anytime and anywhere in the world.
  - **Using hydrogen as a heat source and raw material**  
The government will promote the development and demonstration of technologies for hydrogen/ammonia burners and boilers and the introduction of co-generation systems using hydrogen gas turbines. In addition, the government will support the development of technologies in steel, petrochemical and other industries to promote the use of hydrogen.
- Based on the revised Act on the Rational Use of Energy, specified business operators will be required to submit medium- to long-term plans and periodic reports on their transition to non-fossil energy.
  - The government will promote the industrial sector's transition to clean hydrogen by assessing measures for the transition to non-fossil energy under the Act on the Rational Use of Energy, based on carbon intensity and other points, beyond the current target year of FY2030.
- It is important to promote community-based construction of regional hydrogen supply chains through the development of hydrogen production, storage, transportation, and utilization facilities and infrastructure networks for their connection and by promoting the construction of demonstration models that combine various supply and demand systems in accordance with regional characteristics.
- In order to gain public understanding, the government will carefully provide information and continue dialogue. While referring to a wide range of overseas cases, the government will provide education, promote familiarization and awareness raising, and create opportunities for understanding hydrogen/ammonia.

# ▶ Points of direction towards realizing a hydrogen society [support schemes]

- **Development towards building large-scale resilient supply chains**
  - For hydrogen developers that plan to start supplying low-carbon hydrogen/ammonia in Japan by around 2030, the government will consider a scheme to support (part or all of) the difference between the strike price (at which a company earns an appropriate profit while recovering costs) and the reference price (the parity price of existing fuel) for hydrogen/ammonia.
  - In light of the revision of the Act on the Japan Organization for Metals and Energy Security (JOGMEC), the government will increase opportunities for blended finance and mobilize large-scale funds through JOGMEC's risk capital and consider support and finance through various public financial institutions, including the Japan Bank for International Cooperation.
- **Development of efficient hydrogen/ammonia supply infrastructure that contributes to demand creation**
  - In order to promote internationally competitive industrial clusters, the government will support the development of supply infrastructure including tanks and pipelines.
  - Over the next 10 years, the government will develop about three large-scale hydrogen/ammonia clusters, mainly in metropolitan regions, and about five medium-scale hydrogen/ammonia clusters that will take advantage of their industrial characteristics to accumulate hydrogen/ammonia demand.
- It is effective to link supply chain development support to cluster development support in order to build large-scale supply chains for hydrogen/ammonia
- At present, investment by public and private sectors in hydrogen/ammonia supply chains is planned to exceed 15 trillion yen in 15 years.
  - When utilizing support for the development of clusters, the government will provide preferential treatment regarding supply chain development support to promote cooperation between the two support schemes.
  - Furthermore, the government will realize seamless support for the implementation of hydrogen/ammonia in cooperation with carbon neutral ports (CNP) and other port initiatives and support measures for manufacturers' fuel transition toward decarbonization.

# ▶ Key points for enhancing the hydrogen industry's competitiveness (1)

- At a time when hydrogen investment and tax credits are implemented in various countries, Japan aims to **take advantage of its technological strengths** to pursue a world where **Japan's core hydrogen technologies (fuel cells, water electrolysis, power generation, transportation, parts and materials, etc.) are utilized** in all hydrogen businesses.
- **Considering early market development, large market sizes and Japanese companies' technological strengths**, the government will focus on the following five categories and nine areas as core strategic fields:
  - (1) Hydrogen supply (hydrogen production, hydrogen supply chain development)
  - (2) Decarbonized power generation
  - (3) Fuel cells
  - (4) Direct use of hydrogen (decarbonized steel, decarbonized chemical products, hydrogen-fueled vessels)
  - (5) Utilization of hydrogen derivatives (fuel ammonia, carbon recycled products)
  - **Hydrogen supply**
    - **Hydrogen production**

While continuing to develop technologies to improve the performance and durability of components, the government will use the GI Fund for supporting the demonstration of technologies to enlarge and modularize equipment and consider supporting **the expansion of production capacity for water electrolyzers and their components**.
    - **Hydrogen supply chain development**

**The government will focus on enhancing production capacity and developing relevant human resources in Japan and increasing Japan's presence in European and other foreign markets through cooperation with partner companies and top-level sales campaigns**. With regard to marine transportation, the government will **promote the demonstration and introduction of hydrogen carriers for large-scale transportation** and the development of domestic infrastructure for their production through GI Fund and other initiatives.
  - **Decarbonized power generation**

It is necessary to develop, demonstrate, and commercialize a combustor that meets the standard CO<sub>2</sub> emission of 270g/kWh for gas-fired power generation, as announced by the European Commission. It is important for the introduction of hydrogen power generation technology to reduce costs throughout supply chains while paying close attention to technological development trends regarding hydrogen supply.

## ▶ Key points for enhancing the hydrogen industry's competitiveness (2)

### ➤ Fuel cells

Japan has technological strengths in fuel cells. Aiming to win in technology and commercialization, Japan aim to promote the early commercialization of fuel cells to develop arrangements for Japanese companies to outpace competitors.

Japan aim to accelerate cost reduction by accelerating the development of an industrial strategy that focuses on domestic and foreign markets for fuel cells that are commonly used as the core of not only individual applications but also their value chains.

### ➤ Direct use of hydrogen

#### • Decarbonized steel

Enhance support for the implementation of low-carbon technologies using hydrogen and the development of hydrogen supply infrastructure.

#### • Decarbonized chemical products

Support the establishment of technologies for realizing markets for plastics and other products made from CO<sub>2</sub> and the development of hydrogen supply infrastructure.

#### • Hydrogen-fueled vessels

Promote initiatives required to introduce zero-emission ships, etc. in shipping, shipbuilding, marine machinery, and seafarer fields.

### ➤ Utilization of hydrogen compounds

#### • Fuel ammonia

A limited range of licensors in the world have ammonia production technology, effectively forming an oligopoly. For the immediate future, Japan will conclude alliance agreements with overseas licensors for projects to design, procure, and construct ammonia production facilities, aiming to expand into the international market.

Ammonia is attracting attention as a hydrogen carrier. The government will support the development of efficient ammonia cracking technology in order to consider the use of ammonia as a hydrogen carrier.

#### • Carbon recycled products

Hydrogen is essential for producing carbon recycled products such as e-methane and e-fuel, as well as liquefied petroleum gas and chemicals that do not use fossil fuels. The government will promote the development and public implementation of Carbon Recycling technologies to contribute to their utilization in non-industrial fields and the decarbonization of air services to directly cut greenhouse gas emissions and expand demand for hydrogen.



## ▶ Key points for safe hydrogen use

- For realizing a safe and secure hydrogen society, **safety is important**. The government will build an environment for **rationalizing and optimizing safety regulations**, in addition to **organizing and clarifying the relationship among applicable laws and regulations** including safety, while utilizing existing laws and regulations.
- Before the full-scale use of hydrogen begins and with a view towards 2050, the government has compiled an interim report on an overall strategy for hydrogen safety (Hydrogen Safety Strategy) as **an action plan for the public and private sectors towards the development of a safety regulation system that covers the entire supply chains**. Based on this strategy, the government will implement the following initiatives:
  - **Initiatives based on scientific data and evidence**  
**It is necessary to strategically acquire scientific data for proving the safety of hydrogen** in order to promote the use of hydrogen on the premise of ensuring safety. Through national projects, etc., the government will **strategically acquire scientific data that will contribute to the formulation of safety standards**.
  - **Rationalization and optimization of rules**  
The government has established the following three concepts for priority areas in the supply chain: **consumption of hydrogen/ammonia, timing to start designing schedules for introduction of hydrogen/ammonia, and policy positioning such as demonstration projects being carried out by project promotion government agencies**. In addition, the government will provide support to local governments that are responsible for ensuring safety in the field of high-pressure gas.
  - **Building an environment for hydrogen use**  
The government and related stakeholders will conduct **risk communication** such as information dissemination and education to deepen understanding of the physical properties of hydrogen, how to handle hydrogen, and safety measures, etc., as well as to **secure human resources for hydrogen safety as the foundation for safety assurance** and **lead discussions in the field of hydrogen safety both in Japan and overseas**. In addition, in order to understand trends in major countries, the government **will collect information and grasp the actual situation** through participation in bilateral and multilateral international conferences and **strengthen relations with related organizations**.