



Revisions to the Basic Hydrogen Strategy

This newsletter describes recent developments in Japan to encourage the development and use of hydrogen as an energy source, including a summary of the revisions announced on June 6, 2023 to the Basic Hydrogen Strategy (the "New Basic Hydrogen Strategy") compared to the previous hydrogen strategies, together with a description of some trends we are seeing in relation to hydrogen production.

1. Japan's Hydrogen Strategy to Date

Japan has taken the lead in implementing proactive measures towards the development and utilization of hydrogen technology. This can be displayed in a couple of initiatives:

- Firstly, Japan was the world's first country to prepare a **Basic Hydrogen Strategy**, which the Government published in December 2017. According to the International Energy Agency's Global Hydrogen Review 2022, by 2022, 26 countries and regions around the world have followed Japan in adopting hydrogen strategies.
- In addition, Japan has hosted the **Hydrogen Energy Ministerial Meeting (HEM)** annually since 2018, with the fourth annual meeting held last year in September 2022.

However, a lot has changed since the publication of the initial Basic Hydrogen Strategy in 2017. Global warming has rapidly advanced, and countries around the world are facing the need to take immediate and decisive action against climate change. In light of these changing circumstances, in October 2020 Japan declared that it is aiming to be carbon neutral by 2050 (the "**CN Declaration**"). As part of this declaration, the Government is targeting that 1% of the power supply in 2030 should be generated by hydrogen and ammonia. In a further effort to achieve carbon neutrality, in June 2021, the Government formulated its Green Growth Strategy Through Achieving Carbon Neutrality in 2050.

This action plan is targeted towards the 14 sectors (offshore wind/solar/geothermal power generation industries, hydrogen/fuel ammonia industries, automobile/battery storage industries, semiconductor/information and telecommunications industries, etc.) for which measures and development are essential to realize carbon neutrality, and for which future growth is expected. To support these efforts, the Government has set up a **2 trillion yen** (around USD 13.5 billion) **Green Innovation Fund**, of which 800 billion yen (around USD 5.4 billion) will be used for the development of hydrogen-related technologies.

Further, the sixth strategic energy plan (the "**Sixth Strategic Energy Plan**") released in October 2021, reviewed Japan's power source composition for 2030 and set the share of renewable energy at 36%-38%, targeting an "ambitious outlook."

In February 2023, the Cabinet approved the "**Basic Policy for the Realization of GX**," which assumes that more than 150 trillion yen (around USD 1.2 trillion) will be required over the next ten years to achieve carbon neutrality by 2050, along with strengthening Japan's industrial competitiveness and achieving economic growth. The Basic Policy outlines plans for a "growth-oriented carbon pricing scheme" to fund such massive GX investments, and includes additional measures such as supporting up-front investment through the issuance of new government bonds, carbon emissions trading, and the introduction of a carbon levy system.

2. New Basic Hydrogen Strategy

As described above, the Government has recently launched a series of aggressive policies in response to the rapid increase in the need for hydrogen. Needless to say, the invasion of Ukraine by Russia that began in February 2022 has also brought about significant changes in the world's energy demand structure. The need to create a “hydrogen society” is becoming more urgent than ever.

In light of these domestic and international circumstances, the Government revised its Basic Hydrogen Strategy in June of this year. The New Basic Hydrogen Strategy clearly states the issues and policies that need to be addressed to achieve carbon neutrality by 2050, and also expresses the will of the nation to realize a hydrogen society as early as possible.

The New Basic Hydrogen Strategy aims to simultaneously achieve three goals through the Green Transformation (GX): (1) stable energy supply; (2) economic growth and enhancement of international industrial competitiveness; and (3) deoxygenation. Specifically, the Government will provide 20 trillion yen (around USD 136 billion) in up-front investment support in order to achieve investments in GX of over 150 trillion yen (around USD 1.2 trillion) by the public and private sectors over the next 10 years.

In addition, Japan's progress towards a hydrogen society has now transitioned from the technology development stage to the commercial stage. Since the success or failure of the realization of a hydrogen society can be said to determine the competitiveness of the nation itself, Japan is more focused than ever on the advancement of hydrogen-related technologies, while remaining very mindful of the developments in overseas markets.

The New Basic Hydrogen Strategy sets out the overall objective of Japan's hydrogen policy and further includes:

- a Hydrogen Industry Strategy, which will serve to strengthen the industrial competitiveness of hydrogen; and
- a Hydrogen Safety Strategy, which is a policy for the safe use of hydrogen.

The Strategy covers not only hydrogen, but also ammonia and carbon recycling products such as synthetic methane (e-methane) and synthetic fuels (e-fuel). In addition, the New Basic Hydrogen Strategy is scheduled to be re-reviewed in five years' time.

(1) Overall Objective

- **15 trillion yen (around USD 102 billion) of public/private investment over the next 15 years**

The New Basic Hydrogen Strategy calls for public and private investment of 15 trillion yen (around USD 102 billion) over the next 15 years in order to build a hydrogen supply chain for full-scale commercial use. The Government will push for the creation of a supply chain system that includes Asia, Australia, the Middle East and other regions.

- **Hydrogen supply to increase 6-fold by 2040**

The supply of hydrogen by Japan is currently at 2 million tons. The New Basic Hydrogen Strategy sets a new target that the supply by 2040 will expand to approximately six times that amount, i.e.12 million tons supplied. This constitutes an additional target on top of the previous supply target of up to 3 million tons by 2030 and approximately 20 million tons supplied by 2050.

- **Hydrogen costs to decline to one third by 2030**

In September 2023 at the time of writing, the cost of hydrogen is 100 yen (around USD 0.68)/Nm³. In order to reduce the cost of hydrogen, the Government has set a goal to reduce the cost to 30 yen (around USD 0.2)/Nm³ by 2030 (less than one third of the current price) and to 20 yen (around USD 0.14)/Nm³ by 2050. This will help achieve an additional goal of making hydrogen cheaper than gas-fired power.

The Government will also consider subsidizing the difference in price so that the sales price of hydrogen can be maintained at the same level as existing fuels such as LNG and coal. Discussions are underway and plans under draft to work out the details of such a subsidy.

(2) Hydrogen Industry Strategy

As international competition regarding hydrogen intensifies, the Government's Hydrogen Industry Strategy aims to maintain Japan's technological superiority in hydrogen-related sectors and further encourages expansion into overseas markets. Specifically, the following five categories and nine bracketed sectors have been designated as core "strategic areas," towards which the Government will focus its support:

- (i) Hydrogen supply (hydrogen production, hydrogen supply chain development);
- (ii) Decarbonized power generation;
- (iii) Fuel cells;
- (iv) Direct use of hydrogen (decarbonized steel, decarbonized chemicals, hydrogen-fueled vessels); and
- (v) Utilization of hydrogen derivatives (fuel ammonia, carbon recycled products).

Of the above categories and sectors, one commercially important example in the hydrogen production sector is water electrolyzers. As the introduction of water electrolyzers are progressing throughout the world, the Government's target by 2030 is to have around 15GW of production by water electrolyzers from Japanese-related companies both in Japan and overseas.

(3) Hydrogen Safety Strategy

The Hydrogen Safety Strategy involves:

- both the public and private sectors acquiring and using scientific data; and
- establishing rules for the technological development/demonstration and commercialization phases; and formulating new technical standards over the next five to ten years,

before full- and large-scale use of hydrogen begins.

The Safety Strategy also includes the development and nurturing of third-party certification bodies and inspection bodies as Centers of Excellence that consolidate know-how, expertise, and experience in the hydrogen industry.

3. Trends, etc. in Japan

(1) Industry Initiatives, etc.

The first effort within Japanese industry is the development of water electrolyzers. Japan is lagging behind foreign countries in the procurement of large-scale projects, and it is now increasingly necessary for Japan to accelerate efforts to take advantage of its technological superiority. It is also essential for Japan to establish an international hydrogen supply chain where hydrogen, ammonia, synthetic methane, synthetic fuels, etc. are produced from renewable energy sources overseas and are then transported by sea on to Japan.

Liquefied hydrogen, methylcyclohexane (MCH), and ammonia have been considered by industry in Japan and are currently under development as hydrogen transport technologies. In 2021, there was a successful demonstration of hydrogen transportation from Australia to Japan. The establishment of partnerships and cooperation with foreign countries and companies is becoming increasingly important in the international hydrogen supply chain and partnership between Japanese and foreign companies is expected to expand in the coming years.

In terms of the industrial use of hydrogen, co-firing, in which hydrogen is mixed with gas or other fuel in turbines of thermal power generation equipment as a fuel for power generation, is being conducted. However, efforts are also being made to commercialize dedicated firing, in which hydrogen alone is burned without any mixing.

In the mobility sector, the full-scale promotion of fuel cell vehicles (FCVs) is underway, primarily for commercial vehicles. In addition to supplying FCVs in Japan, expansion by Japanese companies into China, Europe, and other regions has been recently boosted.

Finally, methanation, a technology that circulates carbon dioxide through a scientific reaction between carbon dioxide and hydrogen to synthesize methane, is also under development.

The Tokyo Metropolitan Government is planning to use HARUMI FLAG, located in the Harumi district of Tokyo, as a supply model for hydrogen. HARUMI FLAG was developed as the athletes' village ahead of the Tokyo Olympics and Paralympics Games, and is surrounded on three sides by the sea. 24 large condominium buildings stand on an 18-hectare site, and the urban development of the area is still underway. The Metropolitan Government's plan is to install a hydrogen pipeline through HARUMI FLAG that will supply hydrogen from a hydrogen station located on an adjacent site to pure hydrogen fuel cells situated at HARUMI FLAG. In turn, this supply will be used to reduce peak electricity demand within Tokyo. The hydrogen pipeline was laid last July, and the supply of hydrogen is targeted to begin by 2024.

(2) Other Trends

The Government has created a new organization, the Agency for Natural Resources and Energy, which will focus on hydrogen and ammonia. The Agency, which is in charge of Japan's energy administration, underwent a reorganization for GX in June of this year, under which a new Hydrogen and Ammonia Division was created. This new division will specialize in hydrogen and ammonia, and will be responsible for supporting the development of supply networks and policies to increase demand.

In terms of international efforts, the Government is also forging partnerships with foreign countries. This includes the establishment of a new framework for hydrogen promotion with the EU in July 2023, together with issuing a joint statement with the leaders of the EU. As for ammonia, since 2021, Japan has been hosting an international conference relating to fuel ammonia.

As mentioned previously, of the 2 trillion yen (around USD 13.5 billion) Green Innovation Fund, a total of 800 billion yen (around USD 543 million) will be allocated towards the development of hydrogen-related technologies. Already as of August 2023, just under 600 billion yen (around USD 407 million) of that has been allocated for hydrogen-related technology projects which are currently being promoted (for example, the Government has allocated 300 billion yen to a large scale hydrogen supply chain project by way of a tender process).

As hydrogen technology development progresses globally, and competition in related industries intensifies, it is expected that the New Basic Hydrogen Strategy will constitute a major step towards Japan achieving carbon neutrality by 2050.

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