

Commercial supply chain and hydrogen strategy roadmap for Asia Pacific - Japan

Part-11 (Global demand clusters, international trade and development hydrogen strategy roadmaps for different geographies)

Asia

Japan will develop commercial scale supply chains by around 2030 to procure 300,000 tonnes of hydrogen annually and ensure that the cost of hydrogen reaches 30 yen/Nm³

JAPAN

In July 2021, Japan released the first draft of new 6th Strategic Energy Plan. To achieve 46 percent GHG reduction target by JFY (Japan Fiscal Year) 2030, ANRE (Agency of Natural Resources and Energy) proposes to reduce the total primary energy generation to approximately 430 billion litres crude oil equivalent (COE) by JFY 2030 from the JFY 2030 target of 489 billion litres COE in the 5th Strategic Energy Plan. ANRE expects this reduction to occur through decreased demand due to improved energy efficiency and energy conservation. Several other key changes in JFY 2030 targets from the 5th SEP to the draft 6th SEP include -

(i) increase in the use of renewables; (ii) reduction in reliance on petroleum and coal; and (iii) **addition of hydrogen and ammonia to the list of energy sources.**

BASIC STRATEGY FOR REALIZING A HYDROGEN BASED SOCIETY

A. Realizing low-cost hydrogen use – Japan will develop commercial scale supply chains by around 2030 to procure 300,000 tons of hydrogen annually & ensure that the cost reaches 0.26 USD /NM³. In the later future , Japan will try to lower the hydrogen cost to 0.17 USD/NM³ to allow hydrogen to have the same cost competitiveness as traditional energy sources

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Japan's target is to cut GHG emissions by 26% by 2030 from 2013 level. In accordance with the Paris Agreement , Japan will attempt to cut GHG emissions by 80% by 2050

– APERC Annual Conference 2021

Japan will develop energy carrier technologies to enable efficient hydrogen transportation and storage

B. Developing international hydrogen supply chains. Japan will demonstrate a liquefied hydrogen supply chain by the mid -2020s for commercialization around 2030.

C. Renewable energy expansion in Japan and regional revitalization. Japan will attempt to develop and commercialize power to gas systems by around 2032 and reduce the cost of hydrogen from renewable energy to as low as that of imported hydrogen in the later future.

The utilization of unused regional resources (including renewable energy , waste plastics , sewage sludge and by product hydrogen) will contribute not only to expanding the use of low carbon hydrogen but also to improving regional energy self sufficiency rates.

D. Hydrogen use in power generation

In the future , Japan will attempt to make hydrogen power generation including environmental values as cost competitive as LNG power generation. To this end, Japan's annual hydrogen procurement may have to be 5-10 million tons (amounting to 15-30 GW in power generation capacity).

Japan seeks to commercialize hydrogen power generation as well as international hydrogen supply chains and cut the unit hydrogen power generation cost to **17 yen/kWh around 2030**. Japan's annual hydrogen procurement may have to reach around **300,000 tons** (amounting to 1 GW in power generation capacity)

E. Hydrogen use in mobility

Japan aims to increase the number of FCVs in Japan to 40,000 units by 2020, to **200,000 units by 2025** and to **800,000 units by 2030**. Japan also aims to increase the number of hydrogen stations in Japan to 160 by FY2020 and to **320 by FY2025** and make hydrogen stations independent by the second half of the 2020s. Japan aims to increase the number of FC buses in Japan to around 100 by FY2020 and to around **1,200 by FY2030**. Japan aims to increase the number of FC forklifts in Japan to around 500 by FY2020 and to around **10,000 by FY2030**

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Japan will aim to achieve net zero greenhouse gas emissions by 2050. To decarbonize its economy Japan is increasingly looking to future fuels such as hydrogen and innovative technology

– Mr. Yoshihide Suga,
Prime Minister, Japan

Japan will develop energy carrier technologies to enable efficient hydrogen transportation and storage

F. Potential hydrogen use in industrial processes and heat utilisation

CO₂-free hydrogen can (a) be used as fuel for energy areas where electrification is difficult, and (b) replace industrial-use hydrogen from fossil fuels, contributing to cutting carbon emissions

G. Utilizing innovative technologies

With an eye on 2050, it is necessary to develop innovative technologies for highly efficient water electrolysis for hydrogen production as well as low-cost, highly efficient energy carriers and highly reliable, low-cost fuel cells

H. Utilizing fuel cell technologies

As for Ene-Farms, Japan will seek to lower the price to **800,000 yen** for a standard polymer electrolyte fuel cell (PEFC) and **to 1 million yen** for a standard solid-oxide fuel cell (SOFC) by FY2020 to secure their later autonomous diffusion

I. Innovative expansion

Japan will lead international standardization through international frameworks. Japan will promote technological development and cooperation with relevant organizations.

J. Promoting regional cooperation

It is necessary that the understanding of the safety of hydrogen and the significance of hydrogen use is shared among citizens. To this end, the central government will adequately provide information in cooperation with local governments and business sectors

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Government of Japan and New Zealand has signed a Memorandum of Cooperation on green hydrogen in 2018. The Memorandum seeks to encourage industry and research institutes to collaborate in the field of hydrogen.

– Japan Strategic Roadmap

Hydrogen strategy roadmap and targets for Japan – A landscape view till 2030

Hydrogen Utilization Objective

A. Mobility

Objective	Fuel Cell Vehicle – 200,000 units by 2025 - 800,000 units by 2030
	Refuelling Stations – 320 locations by 2025 - 900 locations by 2030
	Buses – 1200 by 2030

B. Power

Objective	Commercialization by 2030
	Grid parity early realization by 2025

Hydrogen Supply Objective

A. Fossil + CCS

Objective	Reduction in hydrogen production cost – 30 yen /NM3 by 2030 20 yen /NM3 by 2050
	Please note – 1 Yen = 0.0087 USD (As on Jan 2022) 1 NM3/hr= 1.295 kg/hr

B. Reenergised hydrogen

Objective	Cost of water electrolysis system - 50,000 yen /KW by 2030
	Water electrolysis efficiency- 4.3 kWh/NM3

Landscape of Hydrogen in Japan as on 2021

¥77 Billion
Public funds allocated in year 2021 for development of hydrogen & fuel cells

¥2 Trillion
Investment anticipated by the government of Japan by 2030 for developing hydrogen & fuel cells

Currently Japan Has

- 3800** FCVs
- 135** Hydrogen Refueling STs
- 91** Fuel cell buses
- 250** Fuel cell forklifts

Key Demand Centers

Tomakomai in Hokkaido

Fukushima in Main Island

Yamashi in Main Island

Key industry archetypes focused in Japan for hydrogen usage

- Maritime
- Transport
- Buildings
- Industry
- Refinery
- Power

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