INTERNATIONAL PARTNERSHIP FOR
HYDROGEN AND FUEL CELLS IN THE ECONOMY

IPHE Country Update May 2018: Japan

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1. New Policy Initiatives on Hydrogen and Fuel Cell

- In December 2017, the “Basic Hydrogen Strategy” was formulated and published, which defines the direction or vision for realizing a hydrogen-based society with an eye on 2050 and provides an action plan for its realization. In order to make hydrogen a new energy alternative, the strategy aims to make hydrogen affordable and cost-competitive in comparison to conventional energy sources such as natural gas. The target number of applications to be installed such as Fuel Cell Vehicles (FCVs), Hydrogen Refuelling Stations (HRSs), and stationary fuel cells is indicated. To enhance the introduction of hydrogen energy, the Ministry of Economy, Trade and Industry (METI) of Japan has a budget of around US$300 million for FY2018 by which various demonstration projects including a hydrogen power generation plant, an international hydrogen supply chain, and power-to-gas as well as financial incentives for hydrogen utilization including mobility sectors are being implemented.
- In December 2017, NEDO published the “Technology Development Roadmap for Fuel Cell”, the first part of its revised "Technology Development Roadmap for Fuel Cells and Hydrogen”. In this revision, NEDO, for the first time, announced technical targets (ultimate goals) to be achieved beyond 2040 by promoting R&D with sharing its long-term vision between industry, academia and government stakeholders. The “Technology Development Roadmap for Fuel Cell”, covers FCVs and stationary fuel cells for residential, commercial and industrial use. NEDO will release other parts of the roadmap, including hydrogen stations, hydrogen power generation, Power-to-Gas, and the entire NEDO Technology Development Roadmap will be released in the future.

2. Hydrogen and Fuel Cell R&D Update

- In December 2017, NEDO built a demonstration hydrogen-fuelled 1 MW gas turbine in Kobe Port Island. It is the world's first hydrogen-fuelled cogeneration system in an urban area, which supplies both heat and electricity to nearby public facilities. The system reached 100% hydrogen-feeding in April 2018. Through the demonstration, NEDO will collect data on hydrogen gas turbine, such as year-round turbine performance with seasonal fluctuations, and optimum control on balance between heat and power, in order to establish a new energy supply system with efficient energy use of electricity, heat and hydrogen.
- "Demonstration Project for Building of International Supply-Chain on Hydrogen from Brown Coal" in City of Kobe is an international demonstration project jointly promoted by Japan and Australia, to develop the whole supply-chain from brown coal gasification, liquefaction of hydrogen, transport, and unloading of liquefied hydrogen. In 2017, NEDO started to build facilities, including a hydrogen storage tank and unloading facility in Japan. In 2018, facilities including brown coal gasification, hydrogen liquefaction, in-land transportation, and loading will be built in Australia. By connecting operations in both countries, a hydrogen supply-chain between Japan and Australia will be established.

3. Demonstration and Deployments Update

- In February 2018, Japan H2 Mobility (JHyM) was initially established by eleven leading companies aiming to accelerate the dissemination of FCVs and the development of hydrogen stations. JHyM, with its planned business period of 10 years, aims to install about 80 hydrogen stations by FY 2021. JHyM now has 16 members, consisting of Toyota Motor Corporation, Nissan Motor Co. Ltd., Honda Motor Co. Ltd., JXTG Nippon Oil & Energy Corporation, Idemitsu Kosan Co. Ltd., Iwatani Corporation, Tokyo Gas Co. Ltd., Toho Gas Co. Ltd., Air Liquide Japan Ltd., Toyota Tsusho Corporation, Development Bank of Japan Inc., JA MITSUI LEASING, LTD., Sompo Japan Nipponkoa Insurance Inc., Sumitomo Mitsui Finance and Leasing Company, Limited, NEC Capital Solutions Limited, and Mirai Creation Fund (Managing Company :SPARX Group Co,. Ltd.).
- In March 2018, Toyota launched "Sora", the first FC bus in Japan to acquire vehicle type approval. Over 100 buses are expected to be introduced by 2020, mainly in Tokyo metropolitan area, to serve the 2020 Olympic/Paralympic Games. Public awareness on hydrogen is expected to improve with the increase in the number of FC buses on the roads in the metropolitan area.

4. Events and Solicitations

- FC-EXPO 2018, international exhibition on hydrogen and fuel cell, was held from February 28 to March 2, 2018 in Tokyo. The exhibition showcases a variety of technologies, components, materials, devices and systems, from R&D to production, on fuel cells and hydrogen. The keynote speakers for the "National Initiatives to Achieve the Efforts of Each Country to Realize a Hydrogen Society" were: Mr. Masayoshi Yamakage, Director of Advanced Energy Systems and Structure Division in the Agency for Natural Resources and Energy; Dr. Sunita Satyapal, Director of the U.S. DOE Fuel Cell Technologies Office; and Dr. Klaus Bonhoff, Managing Director (Chair) of NOW GmbH, and others.

5. Investments: Government and Collaborative Hydrogen and Fuel Cell Funding

Promotion of FCVs, hydrogen stations, and stationary FCs, and hydrogen supply-chain: JPY 28.4 billion (US$ 260.5 million)
Main items and budget are listed below.
1. Subsidies for Micro-CHP FC sales: JPY 7.65 billion (US$70.2 million)
2.1 Subsidies for hydrogen stations: JPY 5.6 billion (US$51.3 million)
2.2 Subsidies for clean energy vehicles, including FCVs: JPY 13 billion (US$119 million)
3. Demonstration of hydrogen supply-chain: JPY 8.93 billion (US$81.9 million)
4. R&D on FC technology: JPY 2.90 billion (US$26.6 million)
5. R&D on hydrogen technology: JPY 2.40 billion (US$22.0 million)

6. Regulations, Codes & Standards Update

- METI established an Advisory Council on regulatory streamlining of hydrogen and FCVs in August 2017, and held three meetings since December 2017. At the council, 37 items has been reviewed, and 11 items for regulatory streamlining have been completed.
- NEDO’s Call for Proposals from the new program "R&D on Ultra-High Pressure Hydrogen Infrastructure" closed on April 23. Hydrogen station-related R&D projects will start in mid-June. The projects include the regulatory reviews (e.g., criteria for hydrogen embrittlement of metals, better system configuration based on risk assessment), and R&D for the reduction of CAPEX/OPEX of hydrogen stations, in order to realize the world's fastest spread of FCVs.

Summary Country Update May 2018: Japan

Transportation	Target Number	Current Status	Partnerships, Strategic Approach	Policy Support
Fuel Cell Vehicles[1]	40,000 by 2020 200,000 by 2025 800,000 by 2030	2,459 (as of March 2018)	-	• Subsidy for purchase (national government initiative)
FC Bus	Over 100 by 2020 (Tokyo Government)	6 (as of March 2018)	-	• Subsidy for R&D, demonstration (national government initiative)
Fuel Cell Trucks[2]	No Target	-	-	• Subsidy for R&D, demonstration (national government initiative)
Forklifts	No Target	77 (as of March 2018)	-	• Subsidy for R&D, demonstration (national government initiative)
H_2 Refueling Stations	**Target Number**	**Current Status**	**Partnerships, Strategic Approach**	**Policy Support**
70 MPa On-Site Production	160 by 2020 320 by 2025	16 (Open 15) (as of April 2018)	• Initially focusing on four major metropolitan areas	• Subsidy for CAPEX / OPEX (national government and partially local government initiative)
70 MPa Delivered		85 (Open 85) (as of April 2018)		
35 MPa On-Site Production	100	26（Open 22） Ministry of Env. (as of March 2018)	• Municipality lead introduction as official vehicles	• Subsidy for CAPEX / OPEX (national government and partially local government initiative)

[1] Includes Fuel Cell Electric Vehicles with Range Extenders

[2] As above

35 MPa Delivered	No target	-		
Stationary	**Target Number[3]**	**Current Status**	**Partnerships, Strategic Approach**	**Policy Support**
Small[4]	1.4 mil by 2020 5.3 mil by 2030	235,276 (as of March 2018)	• Establishing ENE-FARM partners (manufacturers, gas companies and constructors)	• Subsidy for purchase (national government initiative)
Medium[5]	No target	21: SOFC 50: PAFC (as of March 2018)	• Commercializing fuel cells for industrial application by 2017' (Strategic Roadmap, METI)	• Subsidy for R&D, demonstration (national government initiative)
Large[6]	No target	-	-	-
District Grid[7]	No target	-	-	-
Regional Grid[8]	No target	-	-	-
Telecom backup	No target	-	-	-
H_2 Production	**Target[9]**	**Current Status**	**Partnerships, Strategic Approach**	**Policy Support**
Fossil Fuels[10]	No target	-	• Commercialized at on-site HRSs	-

[3] Targets can be units installed and/or total installed capacity in the size range indicated
[4] <5 kW (e.g., Residential Use)
[5] 5kW – 400 kW (e.g., Distributed Residential Use)
[6] 0.3MW – 10 MW (e.g., Industrial Use)
[7] 1MW – 30 MW (e.g., Grid Stability, Ancillary Services)
[8] 30MW plus (e.g., Grid Storage and Systems Management)
[9] Target can be by quantity (Nm^3, kg, t) and by percentage of total production; also, reference to efficiency capabilities can be a target
[10] Hydrogen produced by reforming processes

Water Electrolysis [11] (PEM, Alkaline, SOEC)	No target	-	• Promoting under renewable H2 project (effectively converting surplus renewable energy into hydrogen as an energy storage)	• Subsidy for R&D, demonstration (national government initiative)
By-product H_2	No target	-	• Commercialized at off-site HRS	-
Energy Storage from Renewables	**Target[12]**	**Current Status**	**Partnership, Strategic Approach**	**Policy Support**
Power to Power[13] Capacity	No target	-	• Utilization of hydrogen to support expansion of renewable energy	-
Power to Gas[14] Capacity	No target	-	-	-

[11] Please indicate if targets relate to a specific technology (PEM, Alkiline, SOEC)
[12] Can be expressed in MW of Installed Capacity to use the electricity from renewable energy generation, and Annual MWh of stored energy capacity
[13] Operator has an obligation to return the electricity stored through the use of hydrogen back to electricity
[14] Operator has the opportunity to provide the stored energy in the form of hydrogen back to the energy system through multiple channels (e.g., merchant product, enriched natural gas, synthetic methane for transportation, heating, electricity)