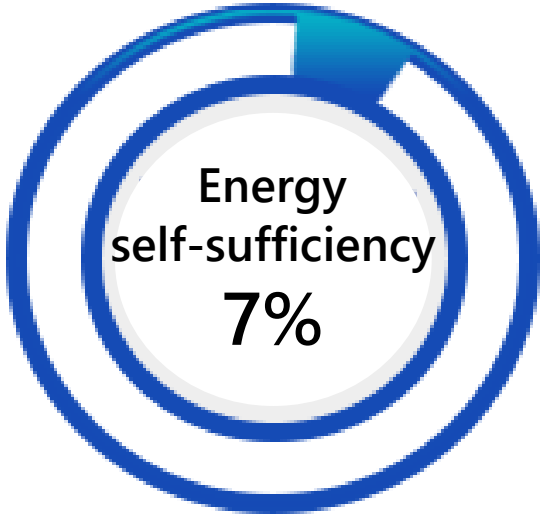
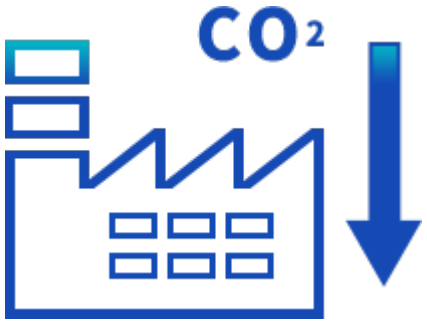
Japan’s vision and actions toward hydrogen-based economy

Hydrogen and Fuel Cell Strategy Office

METI

Why hydrogen?





Energy Security

Decarbonizing sectors

Economic Impact

Japan's strategies/policies towards hydrogen economy

- Japan was **the first country in the world to formulate Basic Hydrogen Strategy** in December 2017. In recent years, hydrogen has been positioned as an essential energy source for decarbonization, and **many countries and regions are strengthening their hydrogen-related initiatives.** For Japan to lead in this field, it will be necessary to **strengthen its efforts even further.**
- Following the CN declaration by Prime Minister Suga in October last year, we have positioned **hydrogen as one of the priority areas in the Green Growth Strategy** formulated at the end of last year. We aim to **expand the amount of hydrogen introduction** and **reduce the supply cost** in supply and demand.

Domestic and international situation and status of strategy formulation

December 2017
Japan formulated Basic Hydrogen Strategy

2019-2020
Some countries formulated hydrogen strategy
Focus on hydrogen in economic measures

October 2020
PM Suga's 2050 CN Declaration

December 2020
Formulation of Green Growth Strategy (Positioning of hydrogen)

2021-
Revising the next Basic Energy Plan and the Basic Hydrogen Strategy

Amount and Cost Targets in Green Growth Strategies

☐ **Annual introduction*: Widely use in power generation, industry, transportation and other fields**
Current (Approx. 2Mt) → 2030 (Up to 3Mt) → 2050 (Approx. 20Mt)
*The amount of direct combustion fuels such as ammonia (hydrogen equivalent) is also included.

☐ **Costs: Achieve a level comparable to fossil fuels in the long term**
Current (¥100/Nm3) → 2030 (¥30/Nm3) → 2050 (Less than ¥20/Nm3)

Green Growth Strategy toward Carbon Neutrality by 2050

Goals

- ✓ Cost ($/kg): $3/kg by 2030 & less than $2/kg by 2050
- ✓ Hydrogen demand : up to 3 mil tonnes by 2030 & around 20 mil tonnes by 2050

Prime Minister Suga

Hydrogen utilization

- ✓ Deploy FCVs & demonstrate FC trains and FC trucks
- ✓ Demonstrate large scale hydrogen power generation
- ✓ R&D for zero-carbon steel & chemicals
- ✓ Fuel Cells development & incentives for production facility


FC Truck


Hydrogen Gas Turbines


Zero-carbon steel

Production

- ✓ Scale up electrolyzers R&D to reduce cost (PEM & AEM)
- ✓ Innovative R&D to further reduce cost of hydrogen

Transportation/Infrastructure

- ✓ Scale-up international hydrogen supply chain
- ✓ Develop H2 station for FC trucks

Cross- cutting issues

- ✓ Create regional models through demonstration projects
- ✓ Foster international collaborations, including with potential H2 suppliers


Power to Gas


Liquefied H2 carrier


MCH carrier

Support R&D & Deployment

Approx. $19 billion Green Innovation Fund established

Points of outlook for energy supply and demand in FY2030

- In the light of new GHG emission reduction target in FY2030, this outlook shows **energy supply and demand on the ambitious assumption that various challenges in both aspects of supply and demand** in promoting thorough energy conservation and expansion of non-fossil energy **will be overcome**.

- In implementing the measures towards this ambitious outlook, **degree and timing of implementation of the measures need to be carefully considered for stable supply of energy not to be impaired.** (e.g. If fossil fuel power sources are immediately curtailed at a stage prior to full introduction of non-fossil fuel power sources, stable supply of electricity can be impaired.)

		(2019 ⇒ previous energy mix)		Energy mix in FY2030 (ambitious outlook)	
Energy efficiency improvement		(16.55 million kl ⇒ 50.30 million kl)		**62 million kl**	
Final energy consumption (without energy conservation)		(350 million kl ⇒ 377 million kl)		350 million kl	
Power generation mix Electricity generated : 1,065 TWh ⇒ Approx. 934 TWh	**Renewable energy**	(18% ⇒ 22-24%)	solar 6.7% ⇒ 7.0% wind 0.7% ⇒ 1.7% geothermal 0.3% ⇒ 1.0~1.1% hydropower 7.8% ⇒ 8.8~9.2% biomass 2.6% ⇒ 3.7~4.6%	**36-38%** **※If progress is made in utilization and implementation of R&D of renewable energy currently underway, 38% or higher will be aimed at.**	
	Hydrogen/Ammonia	(0% ⇒ 0%)		**1%**	
	Nuclear	(6% ⇒ 20-22%)		**20-22%**	(details of renewable) solar 14～16% wind 5% geothermal 1% hydropower 11% biomass 5%
	LNG	(37% ⇒ 27%)		**20%**	
	Coal	(32% ⇒ 26%)		**19%**	
	Oil, etc.	(7% ⇒ 3%)		**2%**	
(＋ non-energy related gases/sinks)					
GHG reduction rate		(14% ⇒ 26%)		**46%** **Continuing strenuous efforts in its challenge to meet the lofty goal of cutting its emission by 50%**	

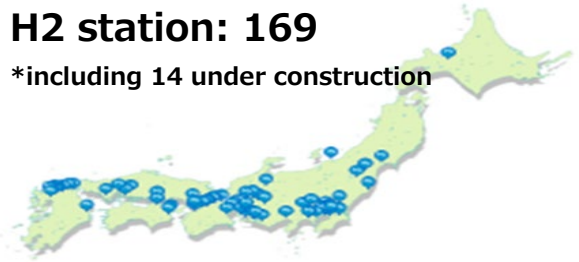
Japan Hydrogen Snapshot I

H_2 Mobility

H_2 Station Network

H2 station: 169

*including 14 under construction



H2 station for FC bus

H_2 Applications

FC bus: over 100

FC Truck development

FCV: over 6500

FC train demonstration

ISUZU HONDA The Power of Dreams

HINO TOYOTA

FC Truck

Joint Venture for H_2 Infrastructure Development

NISSAN JXTG Group IDEMITSU HONDA TOYOTA JAPAN H₂ MOBILITY JHyM Iwatani TOKYO GAS TOHO GAS DBJ TOYOTA TSUSHO Air Liquide

Local/regional projects

Fukushima prefecture

10MW electrolyser with 20MW solar PV

Creating Hydrogen Hubs

"Hydrogen Utilization Study Group in Chubu"

Sumitomo Corporation TOYOTA SMBC

and 12 companies

"Hydrogen Utilization Council in Kobe/Kansai area"

Iwatani Marubeni **and 10 companies**

Japan Hydrogen Snapshot II

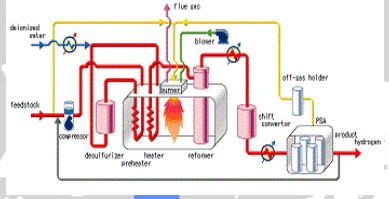
International hydrogen supply chain development

Japan-Brunai Pilot Project

AHEAD

Off-gas

Steam Methane Reforming



Hydro-genation*
(TOL→MCH)

Chemical Tanker

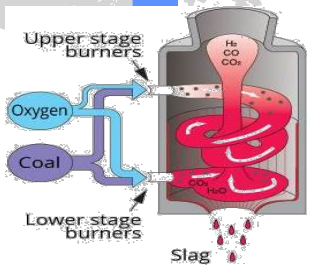
Dehydro-genation*
(MCH→TOL)

Japan-Australia Pilot Project

HySTRA

Brown Coal +CCS

Gasification



Liquefied H_2 Carrier*

Loading Facility*

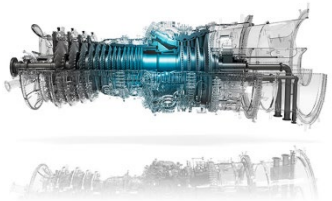
Hydrogen power generation

In Utah State in US, a power generation project started, with 30% H2 blending by 2025 and 100% H2 by 2045.

LA DWP Los Angeles Department of Water & Power

MITSUBISHI POWER

Plans have also been launched in other states in the United States (NY, VA, OH) and Singapore.



Source: Mitsubishi Power

Stationary Fuel Cells

FC CHP for home use: More than 400,000 units

Design and build Global Hydrogen Supply Chain for Carbon Neutral Era

- We need to design/build global hydrogen supply chain bringing value to all countries.

Source: Hydrogen Strategy for Canada

Promoting global cooperation through Hydrogen Energy Ministerial Meeting

2020

23 representatives from countries, region and organizations

2800 registrations/**+10,000** views

GLOBAL ACTION AGENDA PROGRESS REPORT

2019

35 countries, region and organizations

600 attendees

GLOBAL ACTION AGENDA

2018

21 countries, region and organizations

300 attendees

TOKYO STATEMENT

- Harmonization of Regulation, Codes and Standards
- Joint Research and Development
- Study and Evaluation of Hydrogen's Potential
- Education & Outreach

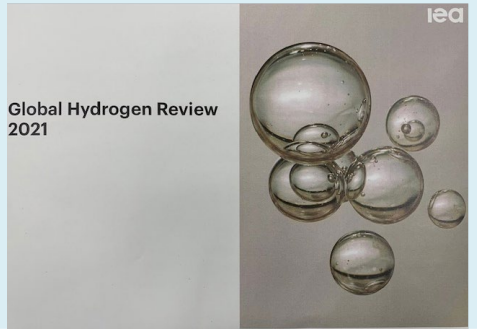
2021

30 representatives from countries, region and organizations

3200 registrations

SHARED POLICY DIRECTIONS

IEA GLOBAL HYDROGEN REVIEW



Thank you for your kind attention