Japan’s vision and actions toward hydrogen-based economy

Hydrogen and Fuel Cell Strategy Office
METI
Why hydrogen?

Energy self-sufficiency
7%

Energy Security

Decarbonizing sectors

CO₂

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.

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**Domestic and international situation and status of strategy formulation**

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<th>December 2017</th>
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<td>Japan formulated Basic Hydrogen Strategy</td>
<td>Some countries formulated hydrogen strategy</td>
<td>PM Suga’s 2050 CN Declaration</td>
<td>Formulation of Green Growth Strategy (Positioning of hydrogen)</td>
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**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

**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
- 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

**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

Approx. $19 billion Green Innovation Fund established
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.)

### Points of outlook for energy supply and demand in FY2030

- **Energy efficiency improvement** (16.55 million kl $\Rightarrow$ 50.30 million kl) 62 million kl

- **Final energy consumption (without energy conservation)** (350 million kl $\Rightarrow$ 377 million kl) 350 million kl

- **Power generation mix**
  - Electricity generated: 1,065 TWh $\Rightarrow$ Approx. 934 TWh
  - renewable energy (18% $\Rightarrow$ 22-24%)
    - Solar: 6.7% $\Rightarrow$ 7.0%
    - Wind: 0.7% $\Rightarrow$ 1.7%
    - Geothermal: 0.3% $\Rightarrow$ 1.0-1.1%
    - Hydropower: 7.8% $\Rightarrow$ 8.8-9.2%
    - Biomass: 2.6% $\Rightarrow$ 3.7-4.6%
  - Hydrogen/Ammonia: 0% $\Rightarrow$ 0%
  - Nuclear: 6% $\Rightarrow$ 20-22%
  - LNG: 37% $\Rightarrow$ 27%
  - Coal: 32% $\Rightarrow$ 26%
  - Oil, etc.: 7% $\Rightarrow$ 3%

- **GHG reduction rate** (14% $\Rightarrow$ 26%) 46%

※If progress is made in utilization and implementation of R&D of renewable energy currently underway, 38% or higher will be aimed at.

(details of renewable) solar 14-16%, wind 5%, geothermal 1%, hydropower 11%, biomass 5%
# Japan Hydrogen Snapshot I

## H₂ Mobility

### H₂ Station Network

- **H₂ station:** 169
  *including 14 under construction*

- **H₂ station for FC bus**

### H₂ Applications

- **FC bus:** over 100
- **FCV:** over 6500

### Joint Venture for H₂ Infrastructure Development

- **FC Truck development**
- **FC train demonstration**

## 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”**
  - ISUZU
  - HONDA
  - HINO
  - TOYOTA
  - IDEMITSU
  - TOYO TANSO
  - TOYO GAS
  - TOHO GAS
  - DBI
  - AIR LIQUIDE
  - JHyM
  - and 10 companies
International hydrogen supply chain development

Japan-Hydrogen Snapshot II

Japan-Brunai Pilot Project

Japan-Australia Pilot Project

Hydrogen power generation

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

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

**GLOBAL ACTION AGENDA PROGRESS REPORT**

- **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

- **2019**
  - 35 countries, region and organizations
  - 600 attendees

**GLOBAL ACTION AGENDA**

- **2020**
  - 23 representatives from countries, region and organizations
  - 2800 registrations/+10,000 views

**2021**

- 30 representatives from countries, region and organizations
- 3200 registrations

**SHARED POLICY DIRECTIONS**

IEA GLOBAL HYDROGEN REVIEW
Thank you for your kind attention