Fuel cell vehicle demonstration and Hydrogen infrastructure project in Japan

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1. Introduction

1-1 About HySUT*

*The Research Association of Hydrogen Supply / Utilization Technology

- Goal and Objective -

✓ Our goal is commercialization of hydrogen supply business and FCVs by private companies.
✓ Our objective is to solve the issues of technology, consumer awareness, social acceptance and to assist business establishment through our demonstration program.

<table>
<thead>
<tr>
<th>Date of establishment</th>
<th>July 31st, 2009</th>
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<tbody>
<tr>
<td>Members</td>
<td>19 Companies and Organizations</td>
</tr>
<tr>
<td></td>
<td>4 Petroleum / 4 City gas / 6 Industrial gas, Devices, Engineering &amp; Materials</td>
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<td></td>
<td>3 Automotive / 2 Related organizations</td>
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<td>Term</td>
<td>2009 to FY2015</td>
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2. Japan’s target for FCV and Hydrogen station

2-1 Commercialization Scenario in Japan

<table>
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<th>Phase 1</th>
<th>Phase 2</th>
<th>Phase 3</th>
<th>Phase 4</th>
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<td>Technology Demonstration</td>
<td>Technology &amp; Market Demonstration</td>
<td>Early Commercialization</td>
<td>Full Commercialization</td>
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<td>[JHFC-2]</td>
<td>[Post JHFC]</td>
<td>[Starting Period]</td>
<td>[Expansion Period]</td>
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- **Phase 1**
  - 2010-2011
  - Solving technical issues and promotion of review regulations (Verifying & reviewing development progress as needed)
  - Verifying utility of FCVs and H2 stations from socio-economic viewpoint

- **Phase 2**
  - 2016
  - Expanding production and sales of FCVs while maintaining convenience of FCV users
  - Reducing costs for H2 stations and hydrogen fuel
  - Continuously conducting technology development and review of regulations

- **Phase 3**
  - 2026
  - Year 2025
  - Increase numbers of FCV and H2 stations based on profitable business
  - Year 2015
  - Target commercialization start of FCV to general public

- **Phase 4**
  - Full Commercialization
  - Costs for H2 station construction and hydrogen reach targets, making the station business viable. (FCV 2,000 units/station)
  - Period in which preceded H2 station building is necessary
  - Increase of FCV numbers through introduction of more vehicle models

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*Precondition: Benefit for FCV users (price/convenience etc.) are secured, and FCVs are widely and smoothly deployed.*

2-2 Joint Announcement by 13 Japanese Companies

Automakers (3 private companies):
Toyota Motor Corporation, Nissan Motor Co., Ltd.,
Honda Motor Co., Ltd.

Hydrogen fuel suppliers (10 private companies):
JX Nippon Oil & Energy Corporation,
Idemitsu Kosan Co., Ltd., Iwatani Corporation,
Osaka Gas Co., Ltd., Cosmo Oil Co., Ltd.,
Saibu Gas Co., Ltd., Showa Shell Sekiyu K.K.,
Taiyo Nippon Sanso Corporation,
Tokyo Gas Co., Ltd., Toho Gas Co., Ltd.

1. Automakers are aiming to launch FCVs in the Japanese market—mainly in the country’s four major metropolitan areas—in 2015.

2. Hydrogen fuel suppliers are aiming to construct approximately 100 hydrogen stations by 2015.

3. Automakers and Hydrogen fuel suppliers will work together to expand the introduction of FCVs and develop the hydrogen supply network throughout Japan.

※ METI, Chubu Bureau of METI, Osaka Prefecture and Fukuoka Prefecture simultaneously press released.
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### 3-1 Current Status of National Projects in Japan

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<td>METI’s New subsidy scheme for installation of commercial H₂ stations</td>
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<td></td>
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<td>FY13 (19 H₂ Stations)</td>
<td>FY14</td>
<td>FY15</td>
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<td>NEDO’s New Project “Hydrogen utilization technology development”</td>
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<td>NEDO’s Project</td>
<td>✓ R&amp;D</td>
<td>✓ Streamlining of regulations</td>
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<td>JHFC2</td>
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<td>Technical and Social Demonstration (JHFC3)</td>
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<td>JHFC: Japan Hydrogen &amp; Fuel Cell Demonstration Project</td>
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**NEDO’s Project**
- ✓ R&D
- ✓ Streamlining of regulations

**Technical and Social Demonstration (JHFC3)**

**JHFC: Japan Hydrogen & Fuel Cell Demonstration Project**

**METI’s New subsidy scheme**
- FY13 (19 H₂ Stations)

**NEDO’s New Project**
- “Hydrogen utilization technology development”

**Hydrogen Fueling**
- Fueling Hose
- Hydrogen Quality
- Hydrogen Metering
- Infrastructure Safety

**HySUT**

**JHFC2**

**HySUT**

**Technical and Social Demonstration (JHFC3)**

**JHFC: Japan Hydrogen & Fuel Cell Demonstration Project**
3-2 Hydrogen stations for JHFC3

- Toyota Ecoful Town (70/35MPa, On-site)
- Ebina Chuo (70MPa, Off-site)
- Kaminokura (70MPa, On-site)
- Yokohama-Asahi (70/35MPa, On-site)
- Tokyo-Suginami (35MPa, Off-site)
- Senju (70/35MPa, On-site)
- Narita (35MPa, Off-site)
- Kasumigaseki (70/35MPa, Off-site)
- Ariake (35MPa, Off-site)
- Haneda (35MPa, On-site)
- Newely constructed Technical & Social Demonstration by HySUT and HySUT's members
- Regional Demonstration by local governments etc.
3-3 Ebina Chuo Hydrogen station (Off-site)

H₂ shipping facilities

Differential pressure filling/
Direct filling (combination)

-40°C Pre-cooling

3-3 Ebina Chuo Hydrogen station (Off-site)

H₂ station facilities area (about 470m², the entire area of the gas station is about 3,200m²)
3-4 FCVs & FC Buses Served for JHFC3

- FCHV-adv (Toyota)
- X-TRAIL FCV (Nissan)
- FCX CLARITY (Honda)
- New Kansai International Airport Co., Ltd.
- FCHV-BUS (Toyota, Hino) Shuttle Bus
- ANA CHUBU AIRPORT CO., LTD.
- FCHV-BUS (Toyota, Hino) Ramp Bus
- FCHV-BUS (Toyota, Hino) Airport Limousine
- Manzaki Transport Co., Ltd.
- FCX CLARITY (Honda) ANA Welcome-home Taxi Service
- Airport Transport Service Co., Ltd.

Other FCVs leased from automakers
3-5 FCV & Hydrogen fueling Demonstration

Accomplishments:
> 220,000km driving
~ 2,000 hydrogen fills
> 7,000kg hydrogen dispensed

FCV & FC Bus driving test summary

Accumulated driving distance (km)

- FCVs by automotive companies
- Airport Taxi
- FCHV Bus

2011~13 FY
3-6 Fueling performance test at hydrogen station

**Objectives**
- Evaluate the fueling protocol (JPEC S 0003) through communication device
- Validate fueling performance at each hydrogen station.

**HySUT Test Truck**
- Tank: 36L x 5
- Communication equipment
- Recording device for fueling data
- Hydrogen combustion engine vehicle (JARI approved)

**Validation Test @ Senju H2 station**

**Fueling test**

**Test Apparatus**

**HySUT Test Truck**
3-7 Fueling performance data at hydrogen station

3 minutes fueling

- Start of filling
- Top-off Start
- Compressor Slow-down
- Temperature of vehicle tank
- Outlet pressure of dispenser
- Target pressure
- Pressure Ramp Rate
- Mass Flow
- Surface temperature of H₂ gas pipe
3-8 Social Acceptance Activity at FC EXPO Tokyo


Visitors : over 30,000

**Outcome**
Promoted the understanding of visitors about hydrogen, hydrogen supply chain, FCV and safety measures.

Hydrogen Station booth

Fuel Cell Vehicle booth

Short presentation and movie booth (Audience : About 3,000)

FCV Test Drive : 230
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1) HySUT has been playing an important role in the demonstration program for the FCV and Hydrogen station in accordance with the commercialization scenario in Japan.

2) As a result of the construction of three commercial models of Hydrogen stations, HySUT contributed to the solutions for the practical problems towards commercial Hydrogen stations.

3) HySUT’s test truck made it possible for fueling performance validation test which is necessary for commercial Hydrogen stations.

4) HySUT is improving the social acceptance of general public for FCV and hydrogen infrastructure through the exhibits and outcomes of the demonstration project.

5) METI’s new subsidy scheme began in 2013 for installation of commercial Hydrogen stations.
Thank you very much for your attention!

This program has been supported by New Energy and Industrial Technology Development Organization (NEDO).

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