Activities of The Research Association of Hydrogen Supply/Utilization Technology

June 4th, 2010

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Division Director of Technical Development Division
The Research Association of Hydrogen Supply/Utilization Technology
Contents

1. Outline and Background of establishment of HySUT
2. Present Activities of HySUT
3. Commercialization Problem of FCVs and H2 stations
Outline of HySUT

**Objective:**
Contribution to preparing of circumstances toward FCV deployment (Technology, Standard, Consumer acceptance, Social system) by operating “Demonstration Test”.

1. Establishment: 2009.7.31

2. Members:

   (1) Energy Supplier
   NIPPON OIL CORPORATION, IDEMITSU KOSAN CO., Ltd., COSMO OIL CO., Ltd., JAPAN ENERGY CORPORATION, Showa Shell Sekiyu. K.K.
   TOKYO GAS CO., Ltd., OSAKA GAS CO., Ltd., TOHO GAS CO., Ltd., Saibu Gas Co., Ltd.
   IWATANI CORPORATION

   (2) Industrial Gas Company, Engineering Company, Device Company
   Air Liquid Japan Ltd., KAWASAKI HEAVY INDUSTRIES, Ltd., MITSUBISHI KAKOKI KAISHA, Ltd., TAIYO NIPPON SANSO Corporation
Organization and Structure of HySUT (at the time of June 4th, 2010)

1. Employees
   24 (7 full time employees, 17 double as their own companies)

2. Organization

   - General Meeting
   - Board of Directors
   - Steering Committee
   - Technical Development Division
     - Administration Department
       - Human affairs
       - Administration
       - Accounting
     - Project Planning and Adjustment Department
       - Whole generalization
       - Project planning and adjustment
     - Hydrogen Highway Project Department
       - Execution of Hydrogen Highway Project
     - Hydrogen Town Project Department
       - Execution of Hydrogen Town Project
Commercialization Scenario of fuel cell vehicles and hydrogen stations

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

Commercialization Scenario for FCVs and H2 Stations

Phase 1
Technology Demonstration [JHFC-2]
- Year 2010: Solving technical issues and promotion of review regulations (Verifying & reviewing development progress as needed)
- Year 2011: Verifying utility of FCVs and H2 stations from socio-economic viewpoint
- Year 2015: Determine specifications of commercial type H2 stations

Phase 2
Technology & Market Demonstration [Post JHFC]
- [Starting Period]: Begin building commercial type H2 stations
- [Expansion Period]: Increase of FCV numbers through introduction of more vehicle models
- [Profitable business Period]: Costs for H2 station construction and hydrogen reach targets, making the station business viable.

Phase 3
Early Commercialization
- Year 2015: Target commercialization start of FCV to general public
- Year 2016: Increase numbers of FCV and H2 stations based on profitable business

Phase 4
Full Commercialization
- Year 2025: Contribute to diversity of energy sources and reduction of CO2 emissions
- Year 2026: Period in which preceded H2 station building is necessary

Vehicle Number
- Approx. 2 million FCVs*

H2 Station Number
- Approx. 1,000 H2 stations*

* Precondition: Benefit for FCV users (price/convenience etc.) are secured, and FCVs are widely and smoothly deployed
1. Outline and Background of establishment of HySUT

2. Present Activities of HySUT

3. Commercialization Problem of FCVs and H2 stations
# HySUT’s Plan of Demonstration Programs

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<td>- Highway running demonstration of FCV</td>
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<td>- Field test of hydrogen pipeline</td>
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<td>- Field test of direct hydrogen fuel cell</td>
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<td>Adopted by METI’s “Demonstration Program for Establishing a Hydrogen-Based Social System”</td>
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<td>Making a plan for next stage demonstration program</td>
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<td>FCCJ is planning of 2011-2015 demonstration program</td>
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**Next Stage Demonstration Programs**

- Field running test of Hydrogen providing infrastructure
- Figure out the user’s fueling actions
- Technical development and test of Mobile/Simple Stations
- Considering the how to improve user’s convenience by IT technology
- Establishing the best location method of hydrogen station and its verification
- Verification of hydrogen introduction and spread policy
- Field test of next stage hydrogen station
- Meeting the international standards
- Promotion and educational activities
Outline of HySUT’s Demonstration Program  2009 ~ 2010

< 2009 ~ 2010 >
Tokyo and Fukuoka

METI : “Demonstration Program for Establishing a Hydrogen-Based Social System”

Hydrogen Highway Project (Tokyo)

- H2 Production
- Transportation
- Construction Operation
- FCV Utilization

Hydrogen Station

Hydrogen Pipeline

Hydrogen Town Project (Fukuoka)

- H2 Production
- CO2 Capture

Hydrogen Town
Outline of 2009-2010 Hydrogen Highway Project

METI: “Demonstration Program for Establishing a Hydrogen-Based Social System”

Hydrogen Highway Project (Tokyo)

Regular long-distance service of FCV and buses on an expressway connecting central Tokyo and Haneda/Narita Airport
Hydrogen Stations Central Control System (Plan)

Central Office (HySUT)
- Control Every Stations
  - Inventory control of each Stations
  - Refueling data of each stations
  - Operation control of each stations

Car Operation Companies
- Car Control
  - Hydrogen usage Table for each cars

Station Control
- Inventory Control
- Refueling data Control
- Operation Control

Information to General Public
- Operating day and hours
- Refueling Capacity

City Gas Base
- Hydrogen Production Plant

Station Control
- Inventory Control
- Production Control
- Operation Control

Order by Phone

Narita Station
- Station Control
  - Inventory Control
  - Refueling data Control
  - Operation Control

Central City Station
- Station Information (Browse)
  - Operation
  - Refueling Capability

Haneda Station
- Station Information (Browse)
  - Operation
  - Refueling Capability

Hydrogen Purifying Device

HySUT
URL: http://hysut.or.jp/

The Research Association of Hydrogen Supply/Utilization Technology
Outline of 2009-2010 Hydrogen Town Project

METI: “Demonstration Program for Establishing a Hydrogen-Based Social System”

Hydrogen Town Project (Fukuoka)

Hydrogen supply to households through about 2km-long city gas pipelines

Steel Plant
Hydrogen Production plant
(existing facilities)

"Fukuoka Hy-Life project"

Kitakyushu H2 station
(existing facilities)

H2 pipeline
(existing facilities)

H2 direct FC

H2 filling device
for FC small applications

Apartment / Residence

H2 pipeline

Shop / Public utility

H2 direct FC
1. Outline and Background of establishment of HySUT

2. Present Activities of HySUT

3. Commercialization Problem of FCVs and H2 stations
3E Requirements of Automotive Fuels

**Environment Protection**
- Minimum CO2
- Zero Emission

**Energy Security**
- Energy Source
- Energy transformation

**Economic Efficiency**
- Cost
- Convenience

**Important Problem**
- Urban Air Pollution (Emission Control)
- Energy Resources (Stable & Sustainable Supply)
- Global Environment (CO2 Reduction)

URL: http://hysut.or.jp/
Cost-down through R/D and Regulation relaxation

1. R/D cost-down

NEDO project etc: Fundamental/Elemental R/D

- Refinery
  - H2 unit
  - H2 Purification
  - Compressor
  - Storage (40MPa)
- Transportation
  - H2 trailer
- Hydrogen Station
  - Compressor
  - Storage (70MPa)
  - Dispenser

- LNG Depot

- Field test of total supply system

2. Regulation relaxation cost-down

< Example >

<Storage capacity limit>
  - Building Standards Law
  - Current: Semi-factory area: 3,500Nm³
    (100FCV charge capa.)
  - Shop/Sales area: 700Nm³
    (20FCV charge capa.)
  - Semi-residence area: 350Nm³
    (10FCV charge capa.)
  - Raising shop/sales area limit to the same as semi-factory area limit

<High pressure equipment in open space for refueling>
  - Fire Service Law
  - Current: Prohibited
  - Set up as an annex to gasoline dispenser

<Distance between H2 dispenser and road>
  - High Pressure Gas Safety Act
  - Current: 6m
    4m, same as gasoline dispenser

<Dispenser in open space for refueling>
  - Fire Service Law
  - Current: Prohibited
  - Set up as an annex to gasoline dispenser

Target: Below gasoline price per driving distance
Missions of “Next Stage Demonstration” toward Deployment

- **R/D**
  - Data for regulation revision
  - Fundamental research for cost down

- **Next Stage Demonstration**
  - Verification of CO2 reduction
  - Best station layout, Verification of user convenience
  - Field data accumulation for regulation revision and cost-down technology application
  - Planning of station arrangement

- **Construction and operation of hydrogen station**
  - Establishment of consumer/social acceptance
  - Verification of hydrogen supply business

- **FCV utilization by individual consumers**
  - Verification of CO2 reduction
  - Best station layout, Verification of user convenience

- **Social system preparation**
  - Revision of regulation
  - Revision of law
  - Deployment enhancement system

- **Hydrogen town & Hydrogen highway**
  - Verification of CO2 reduction
  - Best station layout, Verification of user convenience
  - Field data accumulation for regulation revision and cost-down technology application

URL: http://hysut.or.jp/
Required point of view on Social Demonstration Test

Social Point of View (Social acceptance)
How the Hydrogen energy system is safe and reassured, and contribute to CO2 reduction

User’s Point of View (User’s convenience)
Verify user’s convenience of hydrogen supply network (Hydrogen Stations)
“Locating Hydrogen Stations without losing user’s convenience” “Enabling the hydrogen cost Lower than gasoline equivalence”

Supplier’s Point of View (Business Feasibility)
Verify the feasibility of hydrogen supplying business (Production, Transportation and Hydrogen stations)
“Enabling the competitive price for gasoline”
Energy innovation comes reality

Steps from technical seeds to innovation final

- Fundamental Research
- Application Research
- Business
- Spread

< innovation necessary for FCV >

Hydrogen using social system
“Fourth energy infrastructure”

Darwin’s sea

Death Valley

Technical seeds

academia

industry

government

To spread and settle next generation vehicles
Both technology and society innovations are required

Revising regulations
International standardization
Support and aid

Innovation steps and FCV
Thank you for your attention.