Tokyo Gas’s Fuel Cell CHP Business for Residential Use

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Kiyoshi Okamura
Tokyo Gas Co., Ltd.
Residential Fuel Cell Business Dept.
1. Japanese Gas Industry and Tokyo Gas
2. Our motivation to focus on development of PEFC CHP
3. Our approach until PEFC CHP, “ENE-FARM” was commercialized
4. Present position of “ENE-FARM” from the point of view of one merchandise
5. Future plan
Japanese gas industry still keeps conventional vertically integrated value chain.

Most of the gas utility companies deal with only gas distribution service.

- Purity of gas composition is high
- No obstacle such as nitrogen without sulfur
Tokyo Gas Fact

- Tokyo gas is the largest gas utility company in Japan.
- The geographical business area is Tokyo metropolitan area and its surroundings.

**Founded**: October 1, 1885
**Capital**: $1.4 Billion
**Net sales**: $14.5 Billion
**# of Employees**: 7,579
**P/L network**: 57,158 km (Consolidated)
**Gas sales volume**: 14 billion m³
**# of customers**: 10 million

(as of March 31, 2009. Non-consolidated)

(1$=¥100)
High Efficiency CHP Appliance for Residential Use

PEFC (ENE-FARM)
- Commercialization started in 2009

Generation Efficiency: 37%
Energy Savings: 32%
CO2 Reduction: 45%

SOFC (Higher Efficiency)
- Demonstration Research Project is ongoing under government subsidy.

Generation Efficiency
Residential (achieved): 45%
Industrial (target): 67%
(combined with GT)

The most practical appliance

Reciprocating Engine (Commercialized in 2006)

Generation Efficiency: 22%
Energy Savings: 21%
CO2 Reduction: 32%
The Road Map of PEFC CHP Development

- Strong initiative by METI, manufactures and energy companies was needed to achieve present stage.
- Collaboration between them is needed in future, too.
Joint Declaration Ceremony in Jan, 2009
Panasonic and Tokyo Gas Commercialized “ENE-FARM” on May 1st, 2009

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<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Electrical Output</td>
<td>300W ~ 1kW</td>
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<tr>
<td>Electrical Efficiency</td>
<td>33%HHV, 37%LHV</td>
</tr>
<tr>
<td>Thermal Efficiency</td>
<td>47%HHV, 52%LHV</td>
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<tr>
<td>Capacity of Hot water tank</td>
<td>200 litter (60°C)</td>
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</table>

✓ Durability: 40,000hs / 4000 SS-cycles / 10 years
System Components of ENE-FARM

- Fuel cell unit
- PEFC stack
- Heat recovery System
- Fuel processing system
- Inverter
- Backup boiler
- Hot water storage tank
- City gas (CH4)
- City gas
- H2
- DC
- Exhausted heat
- Hot water unit
- Hot water
- AC
- Air (O2)
Performance of ENE-FARM (1)
Result of Large-Scale Stationary Fuel Cell Demonstration

258 units

- Average power output (W)
- Electrical efficiency
- Thermal efficiency

Efficiency (LHV %)

- 258 units
- Average power output (W)

Efficiency (LHV %)

- Electrical efficiency
- Thermal efficiency
Performance of ENE-FARM (2)
Result of Large-Scale Stationary Fuel Cell Demonstration

258 units

High performance of ENE-FARM was actually demonstrated!
Operation Data of “ENE-FARM”

- Ave. electricity demand: 18kWh/day
- Ave. ENE-FARM coverage ratio: 50%

- Ave. hot water demand: 11kWh/day
- Ave. storage tank coverage ratio: 89%
Price of “ENE·FARM”

**FY2009**

3,100 K JPY*
*Model case

1. Retail price of ENE-FARM

2. Installation

Subsidy

Expense of customer

The scheme of subsidy

\[
\left( (1 - 230 \text{ KJPY}^{**}) + 2 \right) \times 1 / 2
\]

or MAX. 1,400 K JPY

* *The price of conventional boiler

1,700 K JPY

**FY2010**

2,830 K JPY*
*Model case

1. Retail price of ENE-FARM

2. Installation

Subsidy

Expense of customer

The scheme of subsidy

\[
\left( (1 - 230 \text{ KJPY}^{**}) + 2 \right) \times 1 / 2
\]

or MAX. 1,300 K JPY

* *The price of conventional boiler

1,530 K JPY
Running Cost Merit of “ENE·FARM”

- Recovery of initial cost by 10 years’ operation is impossible at present.
- The customer of ENE-FARM is the people concerning environmental issues.
Sales Results of “ENE-FARM”

**FY2009**
- Tokyo Gas : 1,500 units
  - Newly built house : 850 units
  - Collaboration with house builders
  - Existing house : 650 units
  - Marketing to the wealthy customer through existing channel

**FY2010**
- Tokyo Gas : 2,500 units
  - Newly built house : 1,500 units
  - Existing house : 1,000 units
Prospect of Stationary PEFC CHP

Road Map of PEFC in Japan

- Introduction phase (2005~2009)
- Penetration phase (2009~)
- Expansion phase (2013~)


Medium-term management plan of Tokyo Gas’s ENE-FARM

Panasonic launched action plan “Green Plan 2018” (Oct 6, 2010)

“Acquire global top share in fuel cell cogeneration systems”
Our Tasks for Expansion Phase

➢ **Cost reduction**
  - Target system cost
    - 2-2.5M JPY in 2010
    - 0.5-0.7M JPY in 2015
    - 0.4-0.5M JPY in 2020
  *Quoted from NEDO road map

➢ **Size compact**
  - Apply to apartment house, narrow space

➢ **Expansion of Market**
  - Apply to national-NG area, Global market
  - Combination with PV
  - Back up power
  - Smart energy network, Local hydrogen network
Thank you for your attention！！