Member Economy Report

Current Status of Gas Industry in Japan

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The Japan Gas Association

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GASEX2012, Bali, Indonesia
1. Present conditions of Japan’s energy and economy
   (1) General information about Japan
   (2) Primary energy supply and energy self-sufficiency rate
   (3) Final energy consumption

2. Gas industry in Japan
   (1) Overview of the city gas business
   (2) Environment surrounding the city gas industry

3. Energy policy issues since 3.11 and efforts by the city gas industry
   (1) Shift to natural gas and promotion of advanced uses
   (2) Expanded use of distributed energy systems
   (3) Building of next-generation energy systems
General information about Japan

1. Japan’s energy and economy

General information

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area</td>
<td>377,950 km²</td>
</tr>
<tr>
<td>Population</td>
<td>128 million people</td>
</tr>
<tr>
<td>Real GDP (FY2011)*</td>
<td>JPY 511.5 trillion</td>
</tr>
<tr>
<td>GDP growth rate (Apr.-Jun. 2012)</td>
<td>+0.2% (annual rate: +0.7%)</td>
</tr>
<tr>
<td>Primary energy supply (FY2010)</td>
<td>569.9 million KLOE</td>
</tr>
<tr>
<td>Final energy consumption (FY2010)</td>
<td>386.3 million KLOE</td>
</tr>
<tr>
<td>Amount of LNG import (FY2011)</td>
<td>83 million tons (+18% y/y)</td>
</tr>
</tbody>
</table>

Trend of real GDP and growth rate

*GDP growth rates in the first and second quarters of FY2012 are annualized.

Sources: Ministry of Internal Affairs and Communications, Cabinet Office, Agency for Natural Resources and Energy, Ministry of Finance, EDMC of IIEJ
Primary energy supply (FY1965-2010)

Primary energy supply: 569.9 million KLOE
Natural gas: 109.1 million KLOE

The share of natural gas is expected to rise from increased LNG-fired thermal power generation and the shift of heat demand to natural gas.

Growth in demand of LNG for power generation
Shift to natural gas for heat demand

Share of natural gas: 19.1%
Share of petroleum: 75.5%

Sources: “Energy supply and demand results of fiscal 2010” and “Energy white paper 2010”, Agency for Natural Resources and Energy, METI
1. Japan’s energy and economy

(1)-2 Energy self-sufficient rate

**Energy self-sufficient rate (FY2011 estimated)**

- **10.4% (includes nuclear power)**
  - Nuclear power: 5.8%
  - Natural gas (imported): 21.1%
  - Coal (imported): 21%
  - Petroleum (imported): 44.9%
  - Renewable energies: 3.7%
  - Indigenous fossil fuels: 0.9%

**Incremental LNG import (FY2001-2011)**

- 30% of LNG is used for city gas production.
- In FY2011, LNG import increased 12.6 million tons from previous fiscal year and reached 83 million tons.

**Major LNG exporters to Japan (FY2011)**

- Malaysia
- Australia
- Indonesia
- Brunei
- Qatar
- Russia
- UAE
- Oman
- Others

Source: IEA Energy Balances of OECD Countries 2012

(2) Final energy consumption

Final energy consumption by sectors

386.3 million KLOE (FY2010)

Changes in final energy consumption

a. From FY1973 to FY2010, total final energy consumption increased by 35%

By sectors:
- Transportation sector: +89%
- Commercial sector: +176%
- Residential sector: +118%
- Industrial sector: -10%

b. From FY2000 to FY2010, final energy consumption is broadly flat

Changes by energy sources

FY1990: 18 million KLOE
- Natural gas (include city gas): 5.0%
- Petroleum products: 65.5%
- Coal and coal products: 16.4%
- Electricity: 9.2%
- Heat, Industry steam: 8.9%
- Others: 43.9%

FY2010: 39 million KLOE
- Natural gas (include city gas): 10.1%
- Petroleum products: 5.0%
- Coal and coal products: 18.8%
- Electricity: 14.4%
- Heat, Industry steam: 14.4%
- Others: 43.9%

Sources: “Energy supply and demand results of fiscal 2010” and “Energy white paper 2010”, Agency for Natural Resources and Energy, METI

The Japan Gas Association
(1)-1 Overview of the city gas business (Utility)

- Areas covered by city gas utilities
  - 209 city gas utilities
  - City gas is available only in 5% of the country

Sources: Gas Energy News, Japan Gas Association
City gas sales trends in Japan

Sales volume: 35.9 bcm (FY2011)
Approx. 29 million customers (as of March 2012)

Source: Japan Gas Association
Gas utilities in Japan handle everything from the production of city gas through to supply and sales.
Utilizing know-how and networks accumulated through gas business, leading gas companies are developing overseas business through natural gas value chain from upstream to downstream.
Natural gas is in competition with other energies in every fields.
2. Gas industry in Japan

(2)-2 Environment surrounding the city gas industry (Market liberalization)

Liberalization of city gas retail market

- **1995**: 2 million m³ or more\(^*1\) (approx. 46\%\(^*2\))
- **1999**: 1 million m³ or more\(^*1\) (approx. 50\%\(^*2\))
- **2004**: 0.5 million m³ or more\(^*1\) (approx. 54\%\(^*2\))
- **2007**: 0.1 million m³ or more\(^*1\) (approx. 61\%\(^*2\))

Share of new market entrants

- **2 million m³**: 2.0\% in '95, 9 users in '96, 62 users in '04
- **1 million m³**: 7.4\% in '04
- **0.5 million m³**: 13.5\% in '09
- **0.1 million m³**: 245 users

\(^*1\) Annual contracted volume
\(^*2\) Share of gas sales by large-volume supply among total gas sales by the ten major gas companies

Energy policy issues since 3.11 and efforts by the city gas industry

1. Electric power
   - Fukushima nuclear power plant accident
   - Major electric power supply shortage due to halting of nuclear power plant operation across Japan

2. Petroleum
   - Shortages of gasoline and kerosene, etc., in and around disaster areas

3. Gas
   - Supply stopped due to damage from tsunami to LNG receiving and satellite terminals

“Three E’s”

Energy security
Environmental friendliness
Economic efficiency

New issues

(1) Greater safety and assurance
(2) Energy system innovation
(3) Establishment of an energy supply infrastructure toward sustainable growth

City gas industry’s efforts to address medium- to long-term issues

(1) Promoting a shift to natural gas and advanced uses
(2) Expanded use of distributed energy systems
(3) Building next-generation energy systems
3. Issues and efforts by city gas industry

(1) Promoting a shift to natural gas and advanced uses

Efforts in industrial use sector

Shift to natural gas enabled by carrying out advanced use engineering.

Sales and marketing
Thermal measurement and energy diagnosis at user sites

Maintenance
Maintenance and regular inspections
Response to failure and trouble

Technology development
Burner device prototype
Combustion simulation

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Advantages of natural gas cogeneration and fuel cells

(a) Greater energy security from having multiple energy sources

(b) Outstanding energy efficiency
   - High supply efficiency achieved by making effective use of waste heat
   - Help to lower peak of grid power demand and reduce fluctuations

(3) Affinity with renewable energy
   - Expansion of renewable energy use made possible by stabilization of output (adjust for output variation in renewable energy by controlling cogeneration operation)
3. Issues and efforts by city gas industry

(3) Building of next-generation energy systems

Building comprehensive systems for effective use of energy, from local area heat use to renewable and unused energy use.

- (a) Heat
- (b) Use of renewable energy
- (c) Electric power
- (d) Overall energy supply and demand control

**District heat use up to now**

Energy center

Commercial building (retrofit)

Hotel (existing)

Energy saving rate 14.6%
CO2 reduction rate 19.2%

(Planned values at model project introducing district energy networks [model project implemented at six locations])

**Smart energy network**

Energy center

Commercial building (retrofit)

Hotel (existing)

Optimal supply and demand control of energy overall

Electric power network

Electric power

Renewable and unused energy use

Energy saving rate 16.4%, CO2 reduction rate 30.2%

(Planned values for distributed energy optimization demonstration project)
### 3. Issues and efforts by city gas industry

#### Expansion of natural gas use to 2030

Assumes maximum penetration of various gas systems by 2030  
(Japan Gas Association trial calculations)

<table>
<thead>
<tr>
<th>System</th>
<th>Current state</th>
<th>2030</th>
<th>Expected benefits (compared to today)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>(a) Cogeneration</strong></td>
<td>4.6 million kW</td>
<td>30 million kW</td>
<td>CO2 reduction</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Approx. 62 million tons CO₂/year</td>
</tr>
<tr>
<td><strong>(b) Gas air-conditioning</strong></td>
<td>13 million RT</td>
<td>26 million RT</td>
<td>Electric power supply stability</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>- Cogeneration/fuel cells</td>
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<td></td>
<td></td>
<td></td>
<td>25-30 million kW</td>
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<td></td>
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<td></td>
<td>(in terms of electric power, around 15% of total domestic demand)</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>- Electric power peak demand reduction</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>from gas air-conditioning use</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>13 million kW</td>
</tr>
<tr>
<td><strong>(c) Industrial heat demand (%)</strong></td>
<td>10.7%</td>
<td>25.0%</td>
<td>Domestic demand growth (as of 2030)</td>
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<tr>
<td></td>
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<td></td>
<td>- Capital investment in gas systems on the left</td>
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<td></td>
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<td>1.2-1.5 trillion yen/year</td>
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<tr>
<td><strong>(d) Residential fuel cells</strong></td>
<td>20,000 units</td>
<td>5 million units</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>(includes LPG)</td>
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<tr>
<td><strong>(e) Natural gas vehicles (NGV)</strong></td>
<td>40,000 units</td>
<td>500,000 units</td>
<td></td>
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</table>
Thank you for your attention.

Terima kasih di atas perhatian.