

GASEX2008 Country Report
- City Gas Industry in Japan -
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This report describes the city gas industry of Japan with emphasis on the following three aspects:

1. National energy policies of Japan
2. Current situation of city gas industry of Japan
3. Efforts made by the city gas utilities of Japan

1. NATIONAL ENERGY POLICIES OF JAPAN

(1) Current energy situation

a. Surge in energy prices

As has been widely broadcast, crude oil prices have been rising for recent years. This has been causing corresponding rises in LNG prices for the east Asian market because of their linkage with crude oil prices.

b. Efforts for preventing global warming

The Kyoto Protocol First Commitment Period started this year, under which Japan is obliged to control greenhouse gas (GHG) emissions during the period from 2008 to 2012 at 6% below the 1990 level.

However, CO₂ emissions from the transport sector and the residential/commercial sector have been increasing. Taking account of such increases, Japan has to reduce GHG emissions by 14% from the present level.

To meet this challenge, the Government revised the Kyoto Protocol Target Achievement Plan in February this year to ensure that the GHG emissions reduction goal agreed in the Kyoto Protocol will be achieved.

Moreover, the G8 Hokkaido Toyako Summit held in July this year addressed the issue of climate change as a main topic, and the G8 leaders declared their intention to share with the rest of the world the goal of reducing global GHG emissions by at least 50% by 2050.

(2) Current national energy policies

With this background, the Government released in March a long-term energy supply-demand outlook for the years up to 2030. This outlook features a *maximum technological deployment case*, that is, estimations based on the assumption that the most advanced energy technologies will be used most extensively. The outlook places high expectations on the expanded use of natural gas that may result from the development and deployment of high-efficiency gas water heaters, cogeneration systems and stationary fuel cell systems.

Also in March, the Government amended the Act on the Rational Use of Energy, to reinforce energy saving in the commercial and residential sectors in which CO₂ emissions has been growing.

Furthermore, in June, an urgent proposal was issued that advocates transforming Japan into a model country for the utilization of new energy. As a specific strategy, the proposal acknowledged the need to develop and deploy fuel cells to establish a hydrogen-based society.

2. CURRENT SITUATION OF CITY GAS INDUSTRY OF JAPAN

(1) Market trends

City gas sales in FY2007 amounted to 1,502 PJ (according to a preliminary estimate), up 6.3% from the previous fiscal year. The growth was driven by a 10.3% growth in gas sales in the industrial sector, thanks to the cultivation of new demand and buoyant production activities of existing industrial customers.

City gas sales have been growing continuously for the last 30 years.

(2) Progress in institutional reforms for the gas industry

The institutional reforms for the gas industry started in 1995 with the subsequent stepwise liberalization of the retail market. In April 2007, the scope of liberalization was expanded to include all customers with the annual demand of 100,000 m³ or more.

In FY2007, a governmental council assessed and examined the results of institutional reforms so far including such liberalization, and in general, favorably evaluated the contributions of gas utilities to achieving policy goals such as ensuring and maximizing the benefits to consumers.

Based on the results of such assessment and examination, further discussions continue as to whether to expand the scope of retail liberalization even further to include residential customers and how to address the challenges of individual institutions.

3. EFFORTS MADE BY THE CITY GAS UTILITIES OF JAPAN

(1) Efforts for expanding demand

In response to the above situation, the Japan Gas Association has formulated “Gas Vision 2030” to help create a low carbon society by expanding the use of natural gas. Efforts being made by the gas utilities for expanding demand are summarized below.

a. Efforts in the residential sector

i) Residential cogeneration

In the residential sector, we are striving to expand the use of “ECO WILL” and residential fuel cell systems as residential cogeneration systems.

a) “ECO-WILL”

“ECO-WILL” is the brand name for small cogeneration systems with the generation capacity of 1 kW. The system has a small gas engine to generate electricity, and the waste heat from the engine is recovered and used to heat water. The heated water is then stored in a hot water tank and used for hot water supply and space heating. The system greatly saves energy, with the total energy efficiency of approximately 85%.

By the end of FY2007, 67,000 units in total had been shipped, including both the city gas and LPG models. The city gas industry, together with the LPG industry, aims to increase the cumulative count to 195,000 units by 2010.

b) Residential fuel cell

Since 1999, with support from the government, the Japan Gas Association has been conducting research and development of polymer electrolyte fuel cells (PEFCs) and solid oxide fuel cells (SOFCs) that excel in generation efficiency.

In April 2005, aided by the government, the New Energy Foundation started a major demonstration project for stationary fuel cells. In this project, they installed a total of 2,187 PEFCs at residential houses in various parts of Japan

by the end of March 2008.

Since the demonstration project produced good results, full-scale deployment is expected to start in April 2009, with fuel cells finally released to the market under the unified brand name of “ENE-FARM.” The sales target of 2013 is over 100,000 in number.

On the other hand, the demonstration project for SOFCs by the New Energy Foundation, also with support from the government, started in 2007. Under this project, a total of 29 SOFCs had been installed at residential houses by the end of March 2008.

ii) High-efficiency water heaters for residential installation
“ECO-JOZU”

“ECO-JOZU” is the brand name for condensing water heaters. By making maximum use of waste heat that is conventionally discarded, “ECO-JOZU” achieves a thermal efficiency of approximately 95%. By the end of FY2007, a total of 790,000 units had been shipped, including both the city gas and LPG models. The city gas industry, together with the LPG industry, aims to increase the cumulative count to 2.91 million units by 2010.

The goal for 2015 is for most water heaters sold in Japan to be high-efficiency water heaters such as “ECO-JOZU” and “ECO-WILL”. To achieve this goal, the Japan Gas Association is now tackling various challenges such as expanding the product lineup, reducing prices, developing installation techniques, and improving public awareness.

iii) Blue & Green Project

With support from the gas industry, the Center for Better Living is conducting the Blue & Green Project for expanding the use of “ECO-WILL” and “ECO-JOZU” as high-efficiency systems that greatly help cut CO₂ emissions.

With this project, a single tree is planted in Thai Ngyuen Province in Viet Nam for each “ECO-WILL or “ECO-JOZU” sold. In 2006 and 2007 about 300,000 trees were planted in the province. The project will continue until one million trees have been planted.

iv) “With Gas”

“All-electric homes” with induction heating cooking appliances and CO₂ heat pump water heaters have been rapidly penetrating the market for household appliances in recent years. It is critically urgent for us to compete against them.

In view of this, the gas utilities of Japan have chosen “With Gas” as the keyword for representing the advantages of living with gas, and use this keyword for promoting to consumers and housing industry participants attractive lifestyles supported by highly efficient gas appliances such as comfort, economy, environmental performance, assurance and safety.

b. Efforts in the commercial and industrial sectors

i) Cogeneration systems for the commercial and industrial sectors

By the end of FY2007, the number of natural gas cogeneration systems installed including those for residential use had reached 62,256, with the total installed capacity of approximately 4.3 GW. Much of the installation capacity comes from the cogeneration systems used in the commercial and industrial sectors.

The Kyoto Protocol Target Achievement Plan, after the earlier-mentioned revision, envisages 4.98 to 5.03 GW as the installed capacity of natural gas

cogeneration systems in the commercial and industrial sectors in FY2010. The city gas industry of Japan is making efforts to achieve this goal.

ii) Development of large 8-MW class gas engines

Among today's industrial and commercial customers, an increasing proportion of customers have more demand for power than for heat. To meet such needs, the Japan Gas Association, jointly with the New Energy and Industrial Technology Development Organization (NEDO) and Mitsubishi Heavy Industries, Ltd., has been conducting a project to improve the generation efficiency of large 8-MW class gas engines. Our efforts resulted in achieving the generation efficiency of 50% (LHV based), which is among the best in the world for a large gas engine with the generation capacity of 3 MW or above.

iii) Gas air conditioning

The installed capacity of gas air conditioning systems including absorption type and gas heat pump type systems amounted to 12.1 million RT by the end of FY2006, up 4.5% from the previous fiscal year. This is equivalent to a 23% share in the total cooling capacity of all units in Japan excluding those for residential use.

Absorption type cooling and heating machines are commonly used in large buildings, while gas engine heat pump systems are commonly used in smaller buildings.

c. Natural gas vehicles

Since 1990, the Japan Gas Association has been supporting the deployment and wider use of natural gas vehicles. As a result, by the end of FY2007, the number of natural gas vehicles had reached 34,203, most of which are commercial vehicles such as trucks and light trucks, and the number of natural gas stations had reached 327.

The Japan Gas Association supports the development and deployment of next-generation low-emission vehicles, and has conducted driving tests of LNG-fuelled and CNG-fuelled large trucks for demonstration purposes. Moreover, to increase the use of natural gas vehicles, the Japan Gas Association supports the market introduction of dual-fuel vehicles with a focus on light trucks, and low-priced package type fuel chargers as a fuel supply system.

(2) Efforts for ensuring safety

The description so far has covered our efforts to expand the use of natural gas, but the most important requirement when supplying gas to our customers is to ensure that they can use city gas with a feeling of security. We have been working to improve the safety of gas appliances and preparing for earthquakes as follows:

a. Gas appliances safety devices fitted as standard

In Japan, gas utilities take the initiative in developing safety technologies for gas appliances.

According to statistics compiled by the Fire and Disaster Management Agency, 5,800 among 33,000 fires in buildings reported annually are caused by gas cooking stoves. To prevent gas cooking stoves from causing fire, gas utilities and gas appliance manufacturers in Japan have jointly developed a device to prevent overheating of cooking oil, and the manufacturers have voluntarily decided to install this device in their appliances.

From October 2008, the installation of this device will become a legal obligation under the Gas Business Act.

According to statistics compiled by the Fire and Disaster Management Agency concerning the causes of fire, there has not been even a single fire caused by a burner equipped with the device to prevent overheating of cooking oil. This demonstrates the effectiveness of the device.

b. Enhancing earthquake preparedness

i) Safeguards against earthquakes

Large earthquakes have hit various localities of Japan in recent years.

Safeguards against earthquakes by the gas industry of Japan focus on three pillars: preventive measures for minimizing earthquake damages, emergency measures for establishing safety immediately after an earthquake, and recovery measures to restore service quickly.

a) Preventive measures

Preventive measures include expanding the use of bend-resistant polyethylene pipes and promoting the use of microcomputer gas meters equipped with a safety feature to automatically shut off the gas upon detecting a leakage or earthquake.

In 1995, when the Great Hanshin Earthquake struck, only 8% of low pressure pipes were made of polyethylene. The proportion increased to approximately 30% by the end of 2005. With our further efforts to expand use, the proportion of polyethylene pipes is expected to reach 60% in 2030. The proportion of antiseismic pipes, including polyethylene pipes and others, will thus reach 90%.

Microcomputer gas meters have already been installed at almost all of our customers.

b) Emergency measures

As emergency measures, gas service areas are divided into smaller blocks for minimizing the area affected by a supply interruption after an earthquake. Following an earthquake, the supply of gas to severely damaged districts must be interrupted to prevent secondary disasters. However, it is important that the scale of supply interruption should be minimized to exclude districts with only minor damage. Therefore, the city gas utilities of Japan divide their distribution networks into smaller blocks to be able to interrupt the supply of gas only to some chosen districts within a wide area covered by their distribution networks.

c) Recovery measures

Regarding recovery measures, the Japan Gas Association has made preparations so that city gas utilities in an earthquake-stricken area can be aided by gas utilities of other areas, helping their recovery activities by dispatching disaster relief teams and sending materials and equipment needed for recovery.

For use by customers in the areas affected by supply interruption, we have prepared simple gas production units and cartridge-type LPG cooking stoves. These are sent to earthquake-struck areas and rented to customers in need.

ii) Niigata-ken Chuetsu Offshore Earthquake

In July 16, 2007, an earthquake of magnitude 6.8 hit the Chuetsu region of Niigata Prefecture. Since the seismic motion at the Gas and Water Authority of Kashiwazaki City near the seismic center met the criteria for stopping supply, they immediately interrupted the supply of gas to about 34,000 households to ensure safety. The earthquake damaged low pressure pipes including house pipes at 3,210 points.

However, no secondary disasters such as fire by gas occurred in the given locality or in the service areas of nearby gas utilities, and there was no damage to polyethylene pipes. These results demonstrate the effectiveness of the measures that we have been promoting, such as increasing the use of polyethylene pipes and microcomputer gas meters.

Immediately after the earthquake, the Japan Gas Association set up and dispatched disaster relief teams totaling about 1,000 persons. The number mobilized was progressively increased, eventually reaching 2,500 persons. In total, more than 60,000 man-days were involved in the recovery activities from 29 gas utilities. However, recovery efforts were often obstructed by destroyed roads and collapsed buildings, and the penetration of water and mud into gas pipes. At some spots, water that had leaked from nearby water pipes entered gas pipes, and came out of them like a fountain.

In spite of such difficulties, the recovery was completed for all households by August 27 without any accident. Finally, the supply was resumed after visiting individual households to confirm safety.

To minimize the inconvenience to customers during the recovery period, gas utilities of all over Japan supplied a total of 9,300 cartridge type cooking stoves and 29,500 gas cylinders. In addition, 17 portable units for gas production were sent from around the country for installation at hospitals, welfare institutions and the like.

The following summarizes lessons learned from the Niigata-ken Chuetsu Offshore Earthquake:

a) Continue efforts to minimize earth quake damages.

It is particularly important to continue increasing the use of polyethylene pipes.

b) Develop and spread technologies for speeding up recovery.

There is an urgent need to spread the use of special-purpose machines for removing water from gas pipes throughout Japan. The Japan Gas Association intends to share the technique by organizing technical seminars, for example. As to the technique for detecting the point of water penetration into a gas pipe and for efficiently removing water, we plan to make improvements based on searches for technical ideas not only in the gas industry but also in other industries and overseas.

c) Be prepared in advance by practicing emergency drills.

When an earthquake strikes, the affected utilities have to promptly study the seismic intensity and identify damages, and interrupt the supply of gas where required. Gas utilities must train themselves by repeating drills so that they can react promptly and properly in an emergency. The Japan Gas Association organizes annual drills in which gas utilities practice coordinated actions following a wide-area earthquake, covering such aspects as

information gathering, communication, and the formation of disaster relief teams.

4. NEED FOR INTERNATIONAL COOPERATION AND COMMUNICATION BETWEEN GAS-PRODUCING AND GAS-CONSUMING COUNTRIES
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As mentioned earlier, the gas industry of Japan is striving to expand the use of natural gas and increase the level of safety and security to help create a low carbon society.

Taking action to solve global environment issues is the responsibility of all of humanity, and the efforts of the gas industry of Japan would also be of major significance in other countries and regions. Therefore, we seek cooperative relationships with other countries, particularly those on the western Pacific region.

Crude oil prices are driven by complex interactions of various factors, making any predictions extremely uncertain. Because of the linkage between crude oil prices and LNG prices, the outlook for LNG prices in the future is also uncertain. I believe this situation requires deeper understanding between gas-producing and gas-consuming countries about circumstances and needs of the both sides. Close communication will continue to become ever more important.