

GAS FACTS IN JAPAN

2014



1 Environmentally Friendly City Gas

Natural gas, the main raw material of city gas, is an environmentally superior, ideal energy.

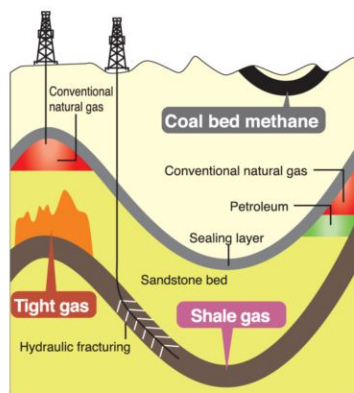
Liquefied natural gas (LNG), the main raw material of city gas, is a clean energy source containing almost no impurities. When natural gas is liquefied to produce LNG, impurities such as sulfur are removed, and transported to Japan by LNG tanker. One of the advantages of natural gas is that it emits a small amount of carbon dioxide (CO₂) compared to other fossil fuels when combusted. Natural gas also emits low levels of nitrogen oxides (NO_x) and no sulfur oxides (SO_x). Natural gas is an environmentally friendly energy source.

Liquefied natural gas



LNG is a colorless clear liquid produced by cooling natural gas. Natural gas becomes liquid when cooled to around -162°C at approximately atmospheric pressure. The volume of this liquid is one six hundredth that of the gas, meaning that large quantities of natural gas can be transported by LNG tanker.

Types of natural gas (Schema)



Natural gas comprises "conventional natural gas" which naturally gushes when a hole is dug into the ground and can be extracted using traditional methods as well as shale gas and other "unconventional natural gas."

1 Conventional natural gas

Natural gas produced from reservoirs in rocks with many pore spaces.

2 Coal bed methane

Natural gas in comparatively shallow coal beds.

3 Tight gas

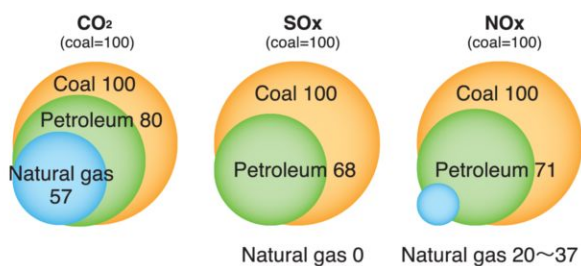
Natural gas near gas fields that does not flow easily.

4 Shale gas

Gas in deep rock (shale) layers.

Fossil fuel combustion emissions

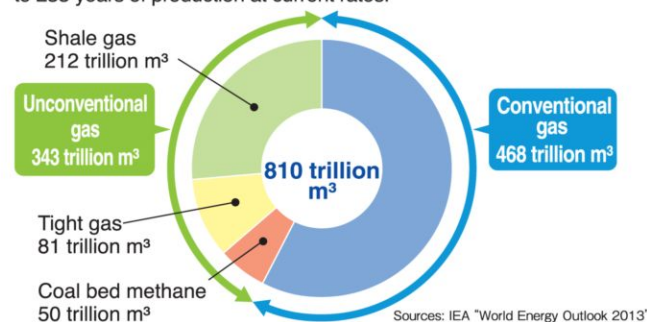
As natural gas emits less CO₂ than coal and petroleum when combusted, it contributes to combating global warming. It also produces lower emissions of NO_x and no SO_x or dust.



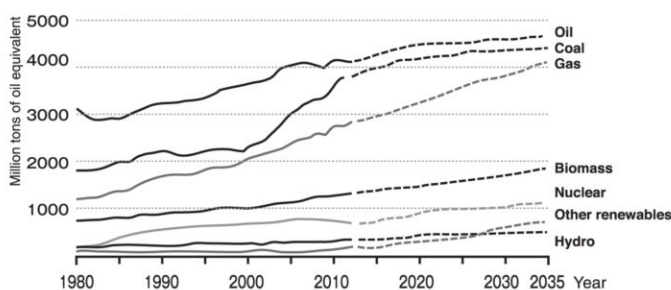
Sources: The Institute of Applied Energy, Report on Evaluation of Effect of Thermoelectric Power Generation on the Atmosphere (March 1990) for CO₂, OECD/IEA, Natural Gas Prospects (1986) for NO_x and SO_x.

Volumes of Natural Gas Resources

There are reportedly enough natural gas resources to last about 60 years (proven resources / annual production volume). With technological advances expanding the production of "unconventional natural gas" that was formerly believed to be difficult to recover from underground, however, remaining recoverable resources are equivalent to 233 years of production at current rates.



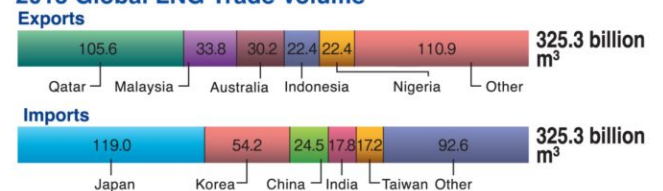
World energy demand by fuel



World LNG Trading

Asian countries account for over half global LNG import volume. Japan is the largest importer, accounting for one-third of global LNG import volume.

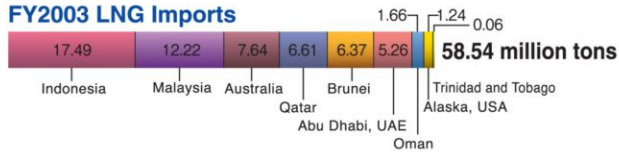
2013 Global LNG Trade Volume



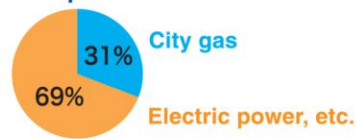
Japanese LNG Imports and Breakdown

The volume of LNG imports into Japan has been greatly increasing in recent years, with increased imports from Australia and Qatar in particular. Japan is now working toward diversification of LNG supply sources, including imports from the U.S. with its expanded production from the shale gas revolution.

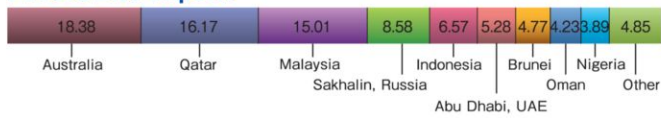
FY2003 LNG Imports



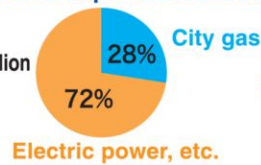
FY2003 LNG Imports Breakdown



FY2013 LNG Imports



FY2013 LNG Imports Breakdown



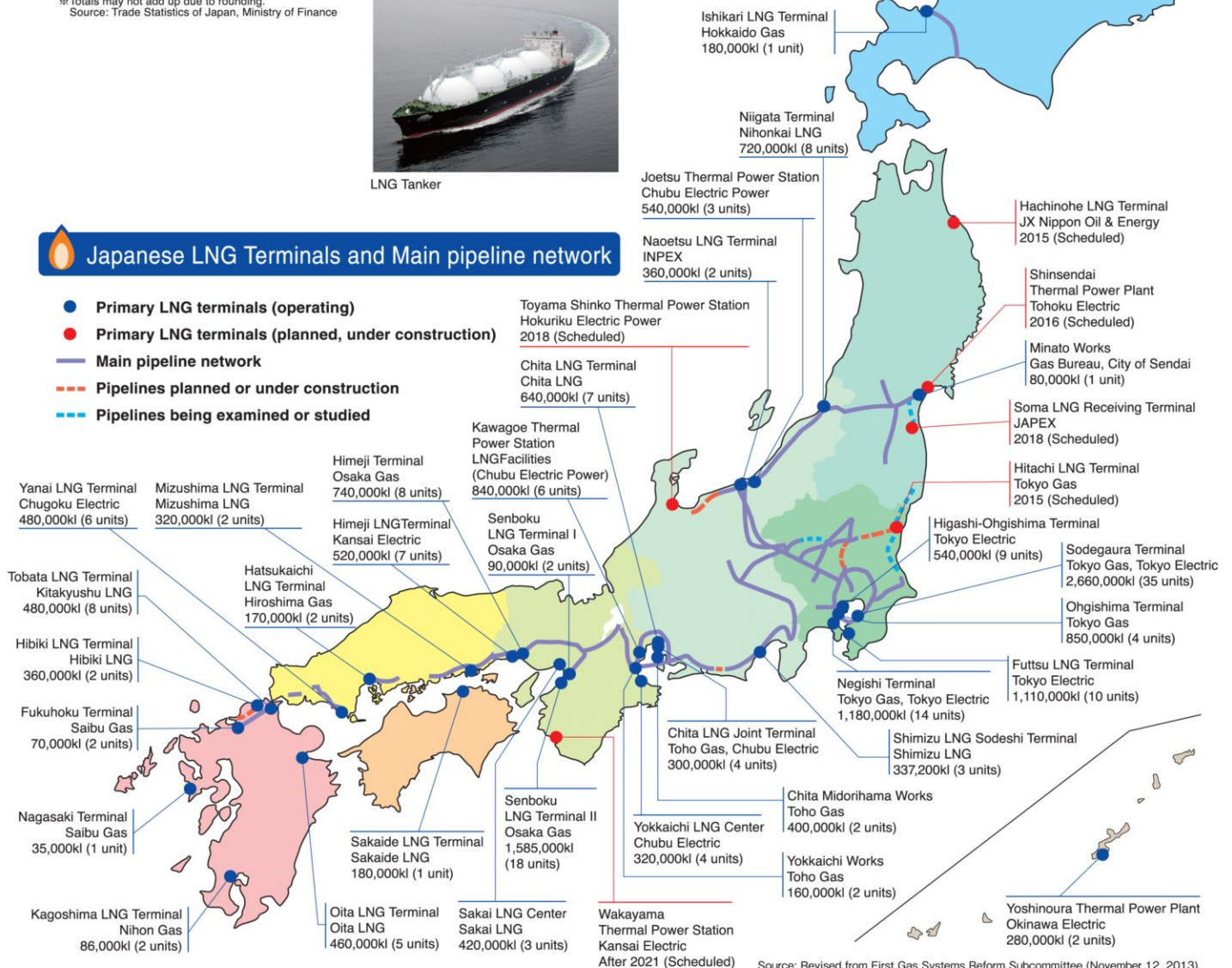
※These figures include imports of industries other than city gas.
 ※Totals may not add up due to rounding.
 Source: Trade Statistics of Japan, Ministry of Finance



LNG Tanker

Japanese LNG Terminals and Main pipeline network

- Primary LNG terminals (operating)
- Primary LNG terminals (planned, under construction)
- Main pipeline network
- - - Pipelines planned or under construction
- - - Pipelines being examined or studied



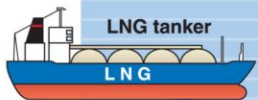
Source: Revised from First Gas Systems Reform Subcommittee (November 12, 2013), Strategic Policy Committee, Advisory Committee for Natural Resources and Energy

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City Gas Supply System which

We introduce new technologies, streamline production processes, and establish and upgrade our supply systems to ensure a safe, stable supply of city gas.

Production



LNG receiving terminal

LNG satellite terminal

Domestic natural gas field

City gas production

LNG which has been liquefied and transported is stored in LNG tanks. The LNG is then gasified, adjusted its caloric value, and given a distinctive odor to become city gas.



Changes the state from liquid to gas

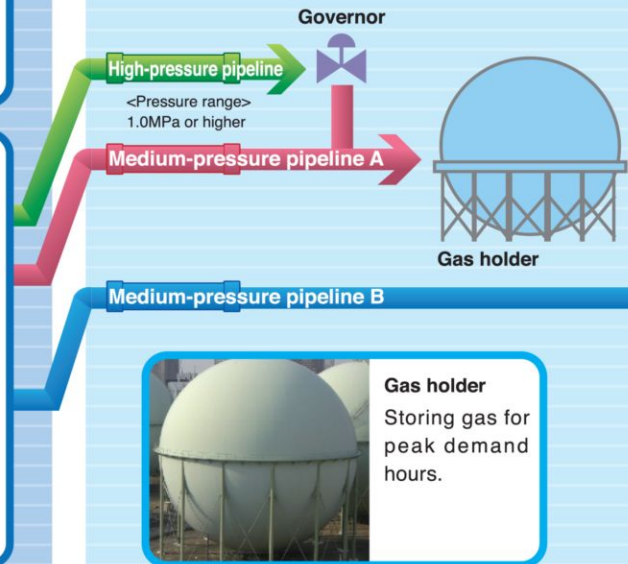
Add LPG to the natural gas for adjustment to a certain caloric value

Gas is odorized so it can be easily detected when gas leaks

City gas

Supply

High-pressure city gas which is sent from the production plant is reduced to medium pressure using pressure governors and distributed to large-scale plants and facilities. The pressure is further reduced to low pressure for distribution to regular households and commercial facilities.



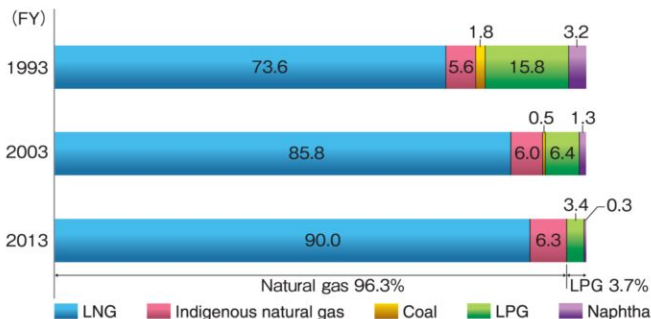
Gas holder

Gas holder
Storing gas for peak demand hours.



Raw Materials for City Gas

LNG and indigenous natural gas account for over 90% of city gas. Natural gas does not contain carbon monoxide (CO), so there is no concern regarding carbon monoxide poisoning from the gas itself.

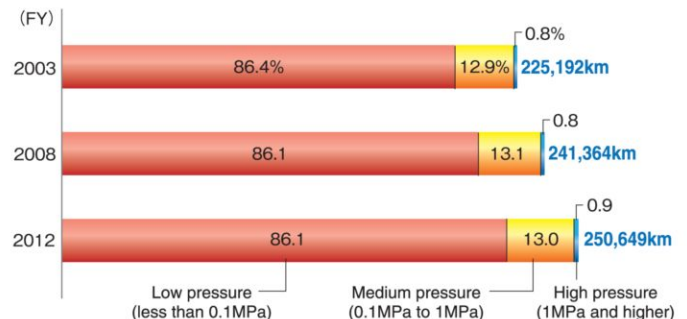


※ Totals may not equal 100% due to rounding.



Pipeline Length

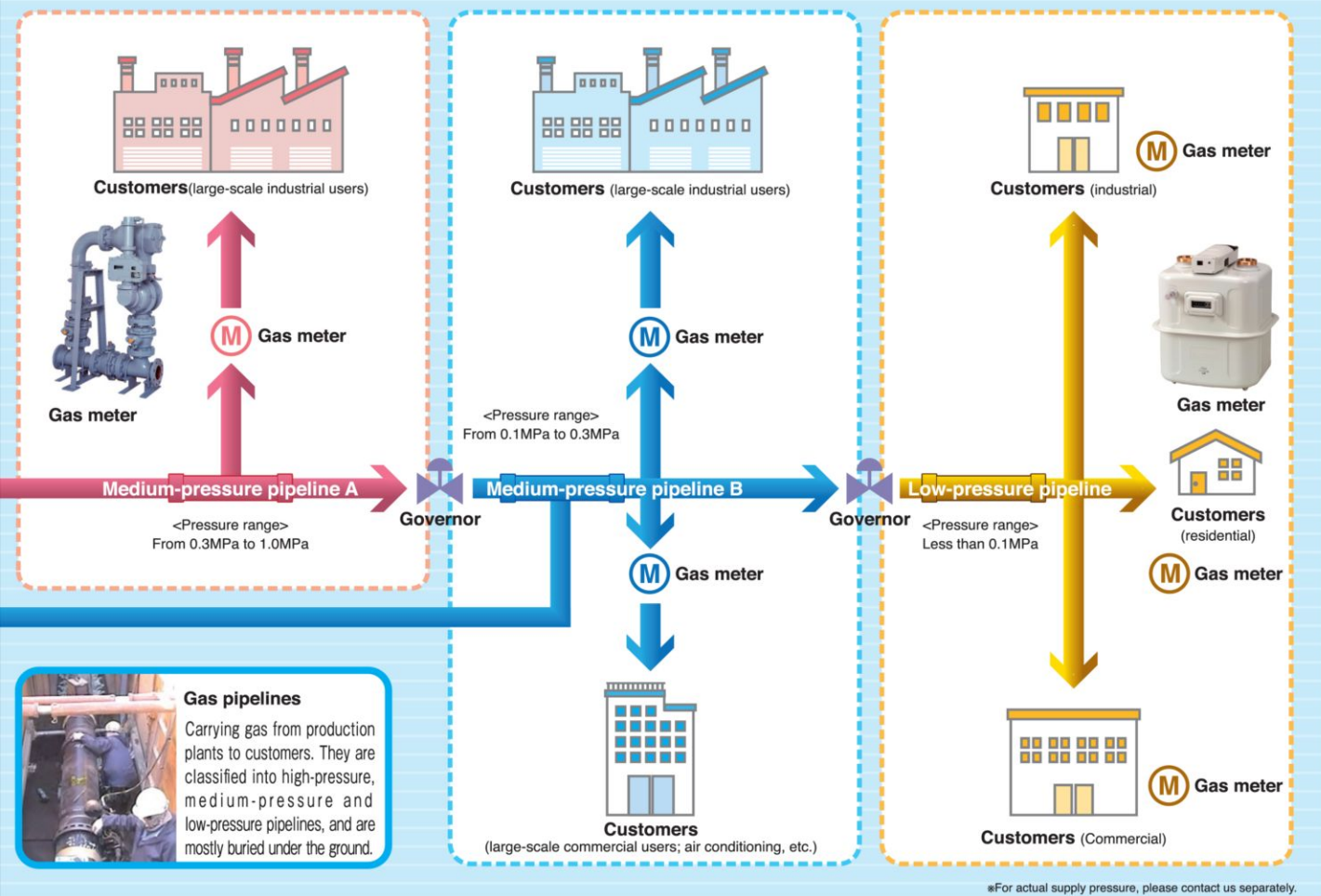
City gas utilities have been expanding their distribution networks to serve new customers by prospecting the gas demand in and nearby their supply areas and considering the investment return.



※ Totals may not equal 100% due to rounding.

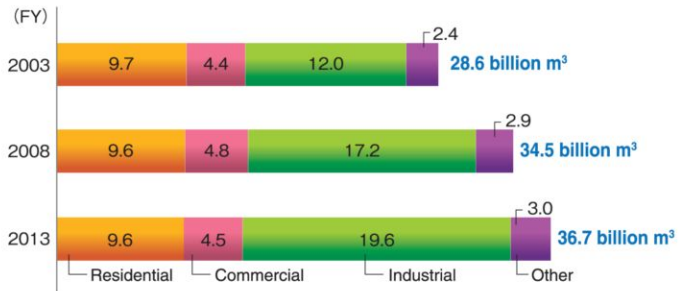
Supports Stable Supply

Natural gas accounts for about 90% of the content of Japanese city gas, and it is almost all imported as LNG from overseas. The LNG is initially stored at tanks inside LNG receiving terminals, and then supplied to customers as city gas after being gasified and having its calorific value adjusted. In some areas without LNG receiving terminals and gas pipelines, the LNG is distributed by trucks or freight trains and supplied after being gasified and having its calorific value adjusted at satellite terminals.



Sales Volume by Type of Use

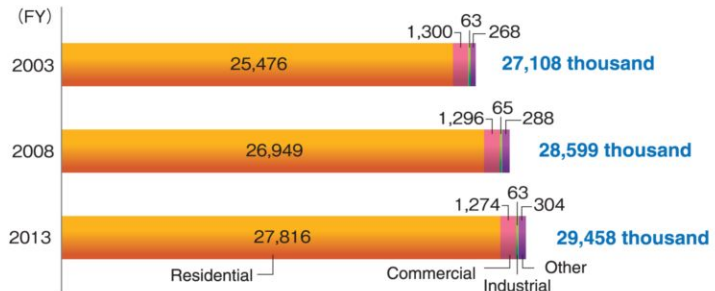
Thanks to its environmental superiority, the introduction of natural gas has been advancing mainly on industrial use with the sales volume rising about 30% over the past 10 years.



*Conversion: 41.8605MJ/m³

Number of Customers by Type of Use

Nationwide, approximately 29.5 million customers use city gas in Japan. In addition to residential customers, natural gas is also supplied for commercial use such as stores and buildings, industrial use such as factories, and "other use" including schools and government offices.



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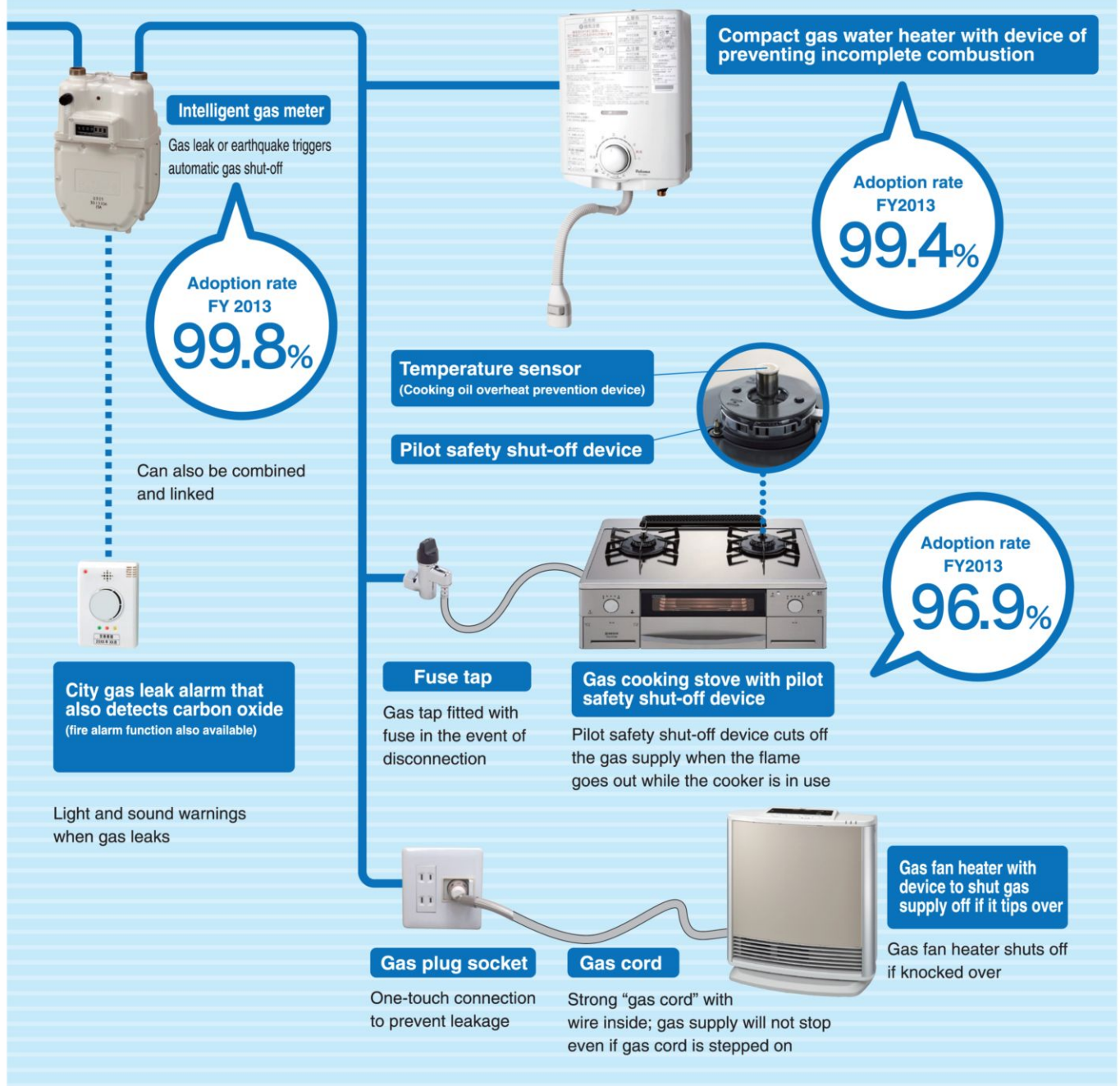
Safety Measures

A comprehensive safety system protects peoples' lives around the clock.

To ensure customer's safe use of city gas, city gas utilities have put in place a comprehensive, 24-hour safety system that monitors all parts of the supply chain, from the city gas plant to the home. Specific measures include proposing that our customers use the latest safety equipment, not only for intelligent gas meters but also for gas pipes, gas valves, and gas appliances -thereby promoting their use. In addition, anti-seismic measures are being actively introduced, including highly earthquake-proof gas facilities and supply shut-off systems.



Gas equipment safety system <To increase safety in using city gas>

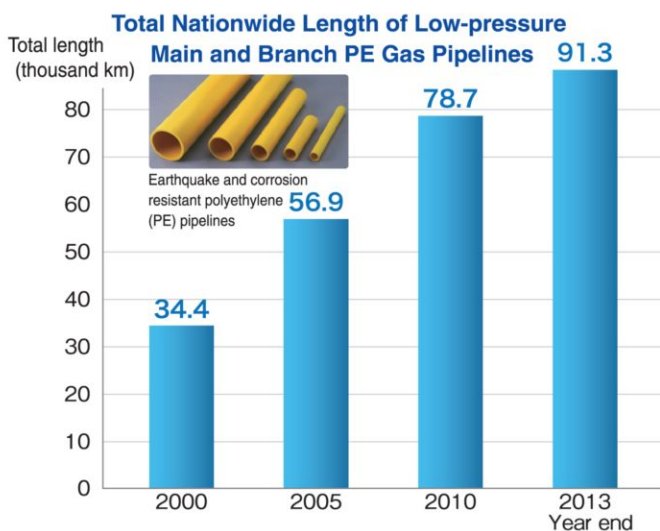




Anti-seismic Measures in the City Gas Business

Facility Measures

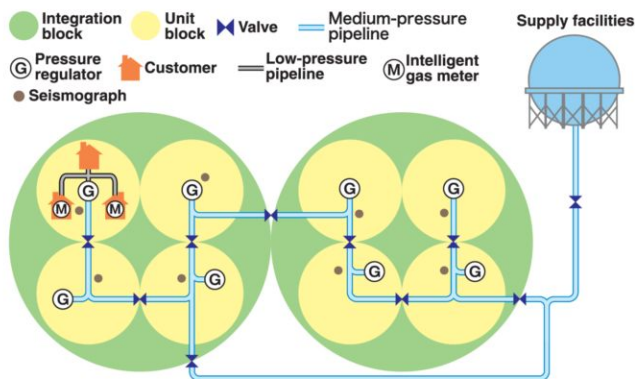
The utilities are promoting the active installation of the earthquake-proof polyethylene pipelines. The total length of these pipelines has doubled over the past decade. Gas utilities are also working to promote intelligent gas meters which shut off gas supply automatically as soon as they sense an earthquake registering approximately a strong 5 on the Japanese intensity scale of 7.



Emergency Measures

In order to prevent secondary disasters when a huge earthquake occurs, gas supplies can be stopped depending on the situation in each of the blocks which comprise the supply area. Seismographs have been installed in every block and are used as benchmarks for shutting off gas supplies.

Intelligent gas meters installed in each house also shut off the gas supply automatically, and some gas equipment models are provided with a quake-sensing shut-off device.



The followings methods are used for shutting off gas supplies on an integration block or unit block basis, based on the magnitude or situation.

- Stopping gas delivery at supply facilities such as gas plants and gas holders
- Shutting off valves installed in medium-pressure pipelines
- Shutting down the pressure regulators within the target block

Recovery Measures

An industry-wide recovery system is in place in case of stoppage of gas production and supply in a major disaster.

Service Restoration: Number of Subject Customers for Recovery and Number of Relief Workers

※Number of customers to which supply was interrupted in the Hanshin-Awaji Earthquake and the Niigata Chuetsu Earthquake.

Niigata Chuetsu Earthquake
 Occurred on Oct. 23, 2004
 Recovery organization (utilities centered around Tokyo)
 Number of relief workers (max.)... **approx. 1,600**
 ※Number of unsupplied customers... approx. 56,800

Niigata Chuetsu Offshore Earthquake
 Occurred on Jul. 16, 2007
 Recovery organization (utilities centered around Tokyo)
 Number of relief workers (max.)... **approx. 2,600**
 ※Number of unsupplied customers... approx. 34,000

Great East Japan Earthquake

Occurred on Mar. 11, 2011

Recovery organization (nationwide utilities)

Number of relief workers (max.)...

approx. 4,600

Number of customers targeted for recovery... approx. 402,000



Gas industry support activities in the Great East Japan Earthquake

Great Hanshin-Awaji Earthquake

Occurred on Jan. 17, 1995

Recovery organization (nationwide utilities)

Number of relief workers (max.)...

approx. 9,700

※Number of unsupplied customers... approx. 857,400

4 Energy Supporting an Abundant

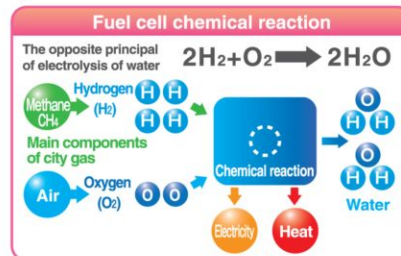
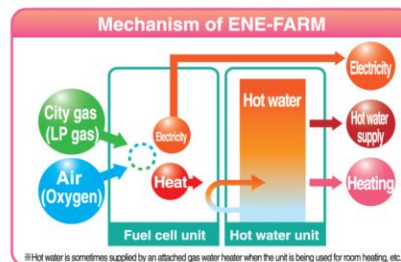
We support a comfortable and convenient lifestyle by providing services that match regional characteristics and are closely linked to customers' lifestyles.

Power generation at home by the residential fuel cell system ENE-FARM

ENE-FARM is a new energy generation system which simultaneously generates electricity and heats water in the home. Japan is the first country in the world to commercialize this system in 2009, and over 70,000 units were distributed by the end of FY2013.

When electric power is generated at large-scale power plants and sent to individual homes, electricity is lost during transmission and the heat produced with the electric power generation is almost all discarded. With ENE-FARM, in contrast, there is little loss since the electricity is used right where it is generated and the heat is also utilized, so energy can be used with minimal waste. Rather than burning gas, ENE-FARM makes a chemical reaction between the hydrogen in the gas and the oxygen in the air, so it is quiet and clean. Also because the heat created in electric power generation is used to boil water and to supply hot water, ENE-FARM uses energy effectively and greatly contributes to energy conservation and reduced CO₂ emissions.

Some models continue to generate electricity during power failures from disasters or other causes, providing the security of electricity and hot water during emergencies. To date, ENE-FARM has mostly been introduced to the detached house market. Toward wider adoption, by strengthening cooperation with the real estate and construction industries, we are now working to promote introduction to new construction condominiums.



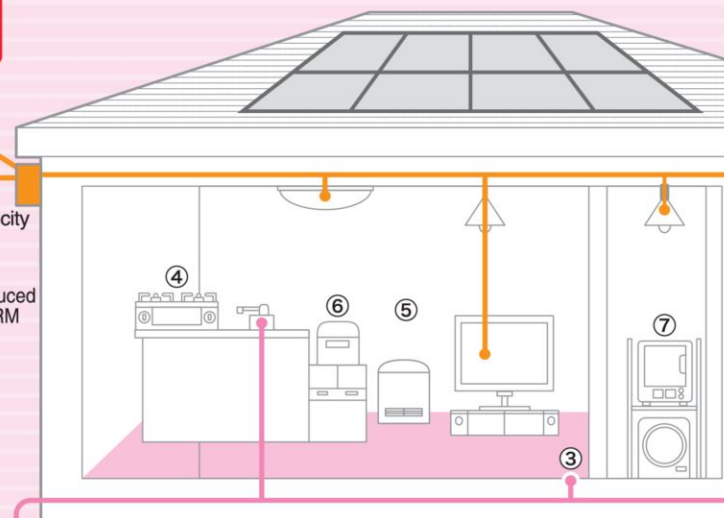
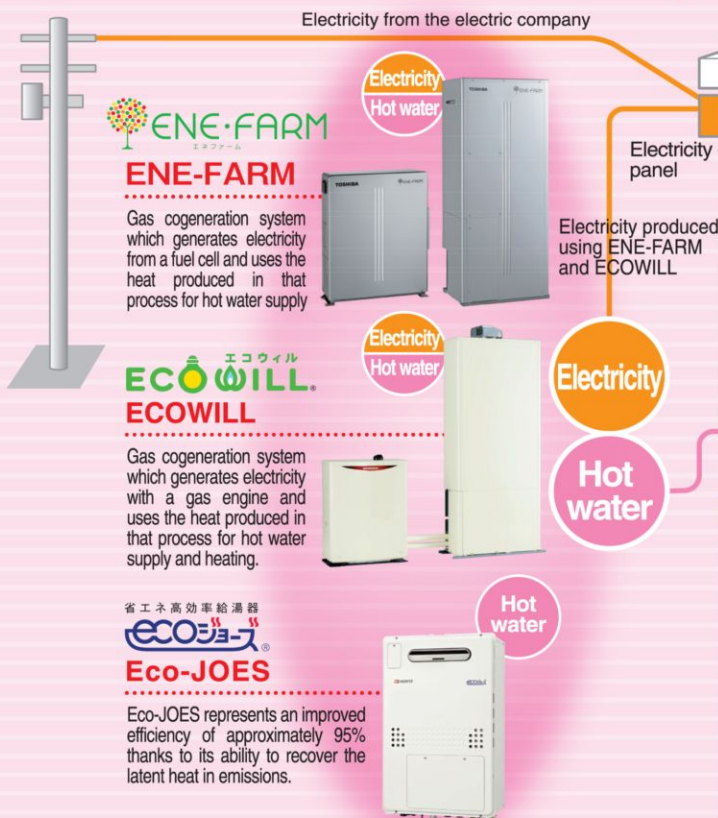
ENE-FARM for Condominiums



ENE-FARM in an condominium pipe shaft

ENE-FARM models have been released for condominiums, where installation space is limited and there are various installation restrictions compared with detached houses.

A smart lifestyle with gas



④ Si Sensor stoves

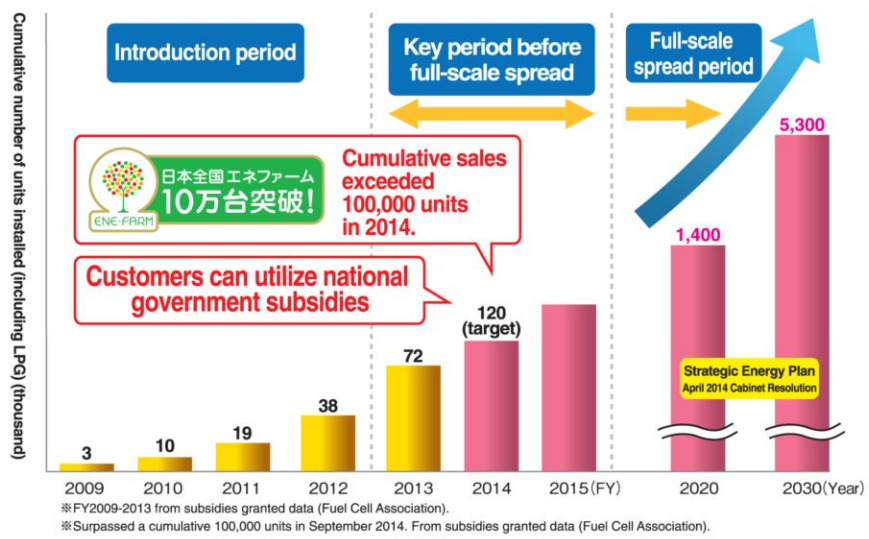
Safe and Convenient Advanced Gas Stoves
Cooking on an open gas fire makes food more delicious. Equipped with sensors on all burners, these stoves provide advanced safety and convenience.

⑤ Gas fan heaters

Powerful and Speedy
Powerful heat at the touch of a button. No bad smells or troublesome fuel refilling.

City gas, which is now essential for the living room, kitchen, bathroom and every part of the home, plays an important role in our lives. Using gas skillfully makes life even more comfortable. We offer a lifestyle with gas so every member of the family can live comfortably with a sense of security every day.

Cumulative number of ENE-FARM units installed (Schema)



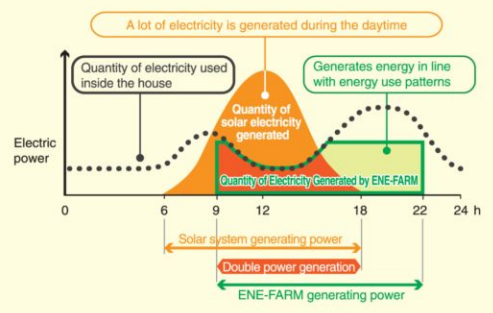
Even more! Combination with solar energy

ENE-FARM, ECOWILL and Solar Power Generation

Double power generation

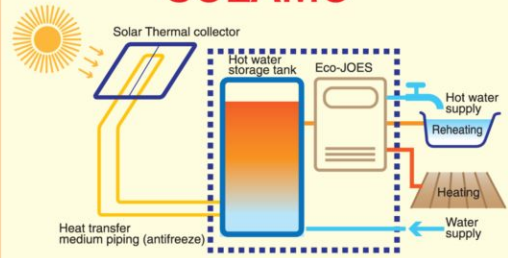
Combining ENE-FARM and ECOWILL with solar power for double power generation can increase the amount of electric power generated for sale. This is not only environmentally friendly, but also supports household finances.

Double Power Generation Operating Pattern (Schema)



Solar-Gas Hot Water System

SOLAMO



A system whereby solar heat is absorbed by solar thermal collector installed on a roof or balcony to heat water in the hot water storage tank for hot water supply, bathing and hot-water heating.

① Gas-powered Bathroom heater/dryer



Preventing heat shock with bathroom heating

Decreasing the temperature differential from inside to outside the bath is important to lessen the burden on the body when bathing. With gas water heating bathroom can be heated quickly and completely, making bathing comfortable and safe even in winter.

② Mist sauna



Health, Beauty & Comfort with a Gentle Mist

Taking a mist sauna has the effects of inducing sweating, maintaining heat and maintaining moisture. Since it does not require the movements of getting into and out of a tub, it reduces the physical burden on people who require care as well as the family providing care.

Gas Rice Cooker



Gas Clothes Dryer



③ Gas-powered in-floor radiant heating



Keeps your head cool and your feet warm

Floor heating can evenly heat entire rooms. Since it does not blow air, there are no concerns about house dust or dry air.

ENE-FARM Partners

"ENE-FARM Partners" is a voluntary association of industries and organizations related to the ENE-FARM residential fuel cell (housing, fuel cell manufacturing, city gas and LP gas) to cooperate and promote ENE-FARM to reduce CO₂ emissions from households (established May 2013, 137 members as of September 2014).



5 Clean and Comfortable Gas Heating

The spread of various large and small gas heating and cooling system is advancing, making use of their merits of low energy consumption with a high heating and cooling effect.

With their wide-ranging applications, gas heating and cooling systems are spreading from office buildings, schools, hospitals and other individual buildings to shopping centers and district heating and cooling. Using city gas to supply the energy required for heating and cooling not only contributes to reducing peak summertime electric power demand but also reduces contract demand (basic electricity charges) and power receiving equipment. Gas heating and cooling systems are expected to spread even further as a result of the development of absorption chillers, which make use of solar heat and waste heat from gas cogeneration systems, and of GHPs (Gas Heat Pumps) which can provide air conditioning and electric power generation even during power outages.

Contribute to energy and electricity conservation

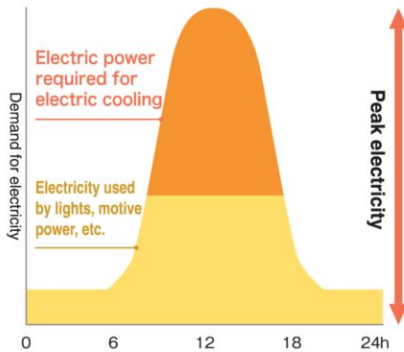
A lot of electric power is used for air conditioning in factories, offices, stores and other buildings. Air conditioning using city gas not only contributes to cutting peak summertime electric power demand but also reduces the amount of electricity consumed, which helps reduce contract demand and power receiving equipment.

Power use of General electrical cooling system

Uses a lot of electric power during peak demand, and requires large-scale power receiving equipment.



Power receiving equipment

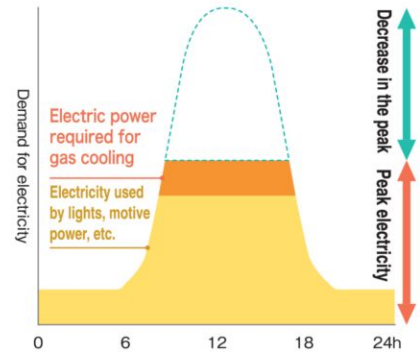


Electricity use of Gas cooling system

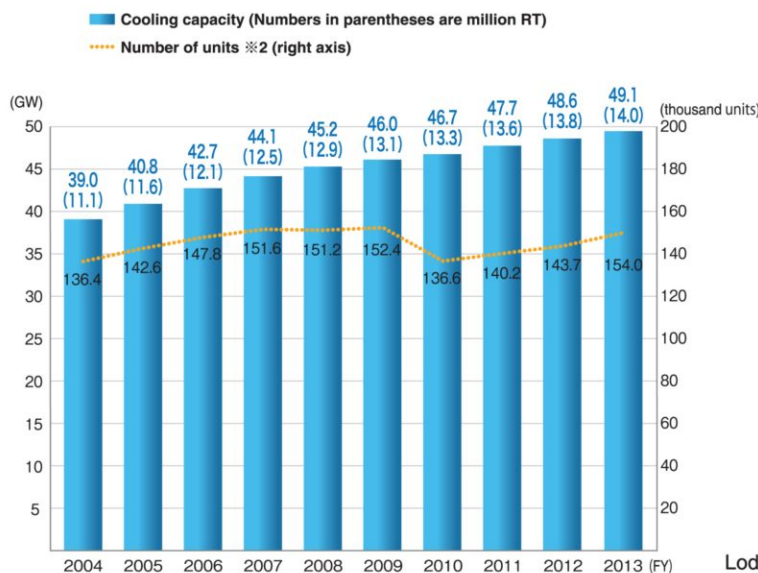
Reduces the amount of electric power consumed during peak demand, and limits power receiving equipment to the minimum



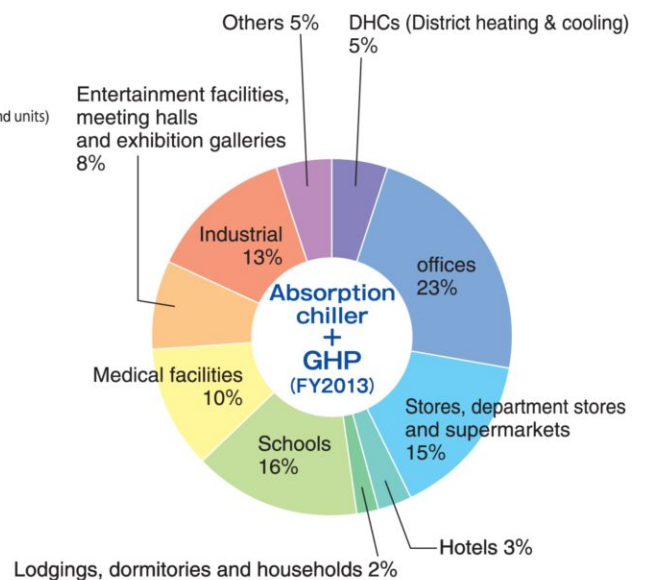
Power receiving equipment



Spread of gas air conditioning (Absorption chiller + GHP) (cumulative total)



Breakdown of gas cooling capacity, by application

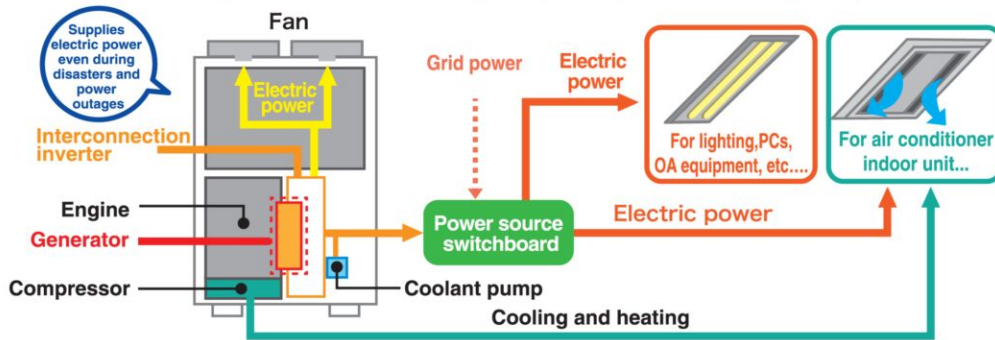


※1 RT (refrigeration ton): 1RT is the amount of heat that has to be removed to convert 2,000 pounds (907kg) of water at 0°C (32°F) to 2,000 pounds of ice at 0°C (32°F) in 24 hours.
 ※2 Since 2009, the installed base for certain utilities is calculated based on the number of premises instead of buildings.

and Cooling System

GHP with electric power generation function

GHPs include GHPs with a power generation function whereby the engine drives a small generator while driving the compressor. There are also air conditioning GHPs with their own power source which can maintain air conditioning and lighting with the power generated by the GHP during disasters and other power outages, and contribute to strengthening BCPs (Business Continuity Plans).



Gas Air Condition Types and Mechanisms

Absorption chiller

This is a system which makes cold water using the vaporization heat generated when water evaporates. The evaporated water is absorbed by lithium bromide, and the gas heat from the process of turning it back into liquid water is used. This is an environmentally friendly air conditioning system without CFCs.



Gas heat pump (GHP)

When a liquid vaporizes, it removes heat from the surrounding space. Conversely, when a gas is condensed and liquefied, it generates heat. Spaces are cooled and heated using this property by repeating a process of compressing refrigerant with a compressor and mechanically liquefying and gasifying it. Gas heat pump (GHP) is systems that use a gas engine to drive the compressor.



Revised Energy Conservation Act

The Energy Conservation Act was revised (in effect from April 2014) to promote energy conservation measures for offices and other commercial use and regular households and to stabilize electric power supply and demand presently. With this revision, a new assessment index electricity demand leveling basic unit, was added which gives a positive assessment when business operators use more than a certain amount of energy conserve electricity during peak demand hours. Also, the "Business Operators Guideline on Measures Contributing to Electricity Demand Leveling at Factories, Etc." clearly states that "cogeneration," "gas cooling," and "gas furnaces and other heating facilities" contribute to electricity demand leveling, and gives a high evaluation to gas systems.

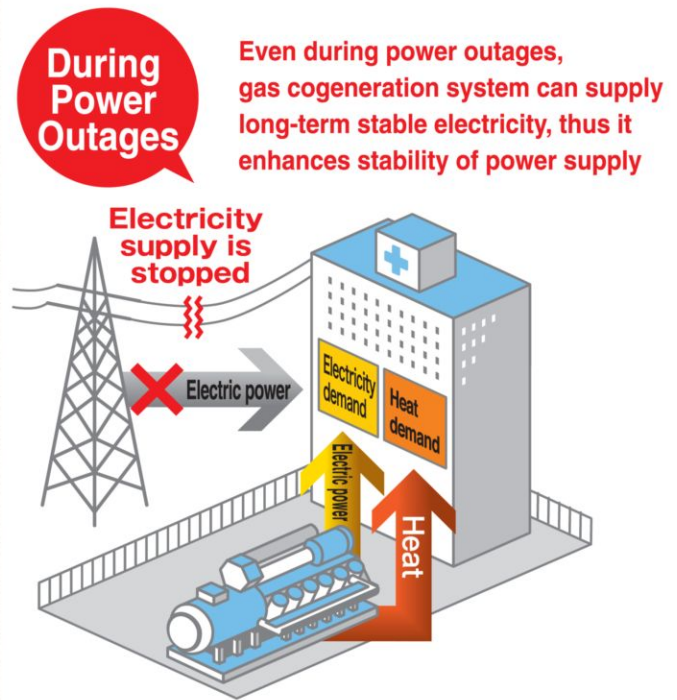
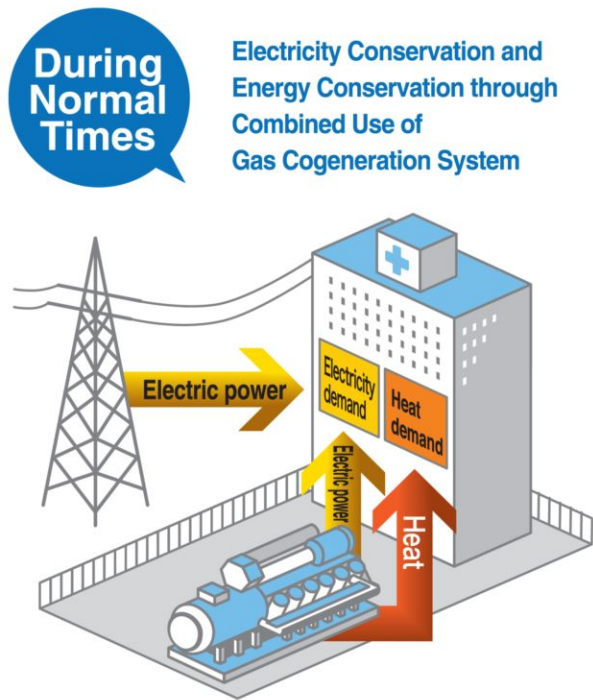
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Gas Cogeneration System realizing a

Gas Cogeneration system is superior in terms of energy conservation and stable power supply because it uses city gas to generate electricity power on site and can effectively use the waste heat for supplying hot water and other uses.

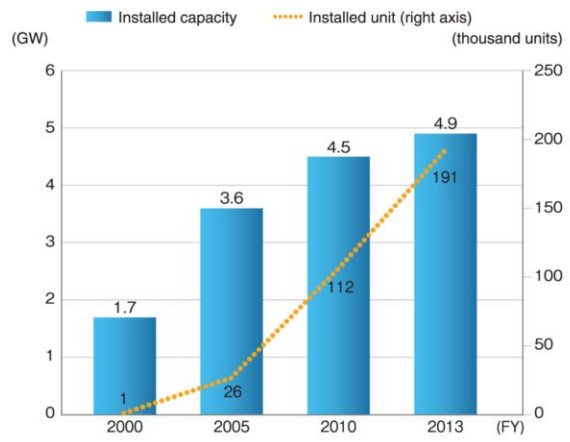
Improved stable power supply with multiplied power sources

In case of power outages, gas cogeneration system can supply stable electricity to cover critical loads over a long time period, as long as the gas supply continues.

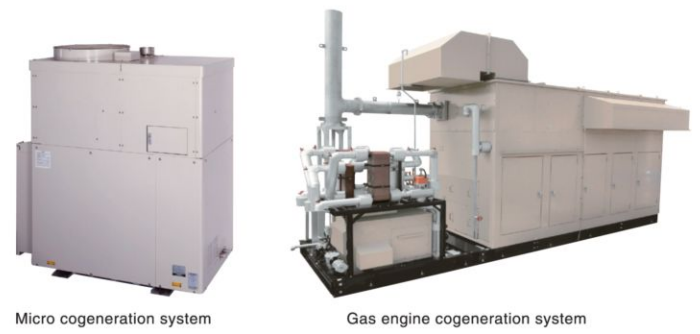


※ This system is not with the standard specifications.

Expansion of Gas Cogeneration System



※ Cogeneration by gas engine, gas turbine and fuel cell (excluding steam turbine).
 ※ The total number of residential cogeneration systems in operation was 184,183 in FY2013.

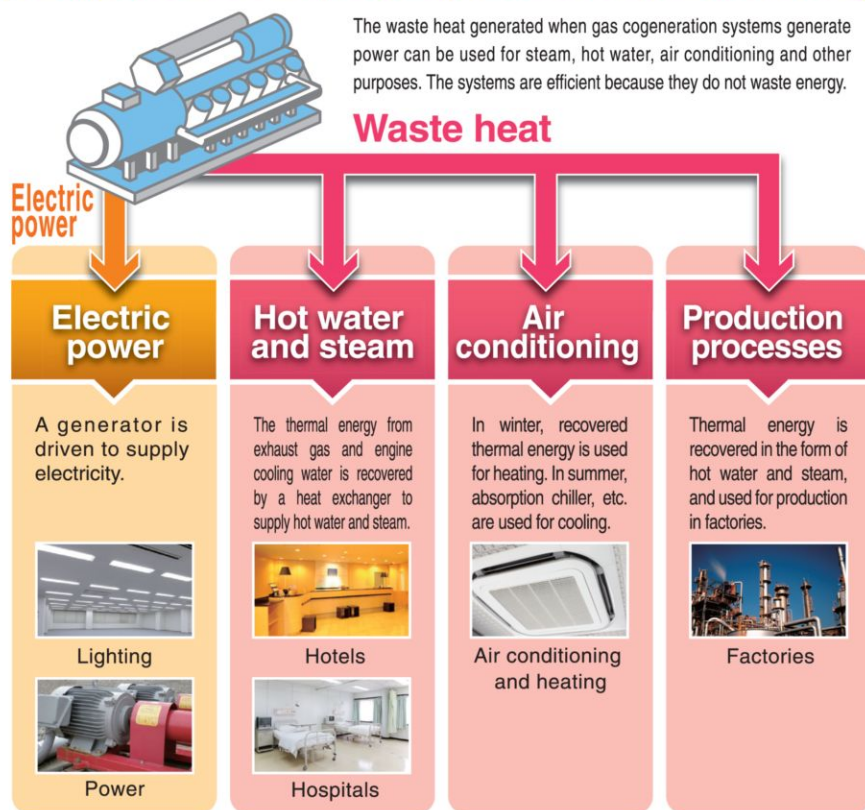


Distributed Energy Society

Gas cogeneration system has a high overall energy efficiency which use city gas as fuel to generate electricity with engines, turbines and fuel cells, and also convert the heat energy generated at that time into steam or hot water. This system is being used effectively for factory production processes, for the provision of hot water and steam for hotels and hospitals, for room heating and cooling, and for the heating of heated pools. As distributed power sources, since the Great East Japan Earthquake gas cogeneration system is expected to serve social functions as energy security equipment, and as power sources to supply grid power. They are also given an important position under national energy policy.

Effective use of energy by gas cogeneration

Cutting peak power demand and achieving energy conservation and CO₂ emissions reductions



June 3, 2014
Cabinet
Resolution

Basic Plan for National Resilience

In the energy field, the Basic Plan calls for promoting "the creation of disaster-resistant, low environmental load regions" that can maintain citizen safety and the minimal urban functions in each area when large-scale disasters occur by supporting disaster prevention bases under local initiative and the introduction of independent distributed energy system to regions. The plan positions cogeneration as independent, distributed energy systems that supply energy to medical and welfare facilities and other important bases.

April 11, 2014
Cabinet
Resolution

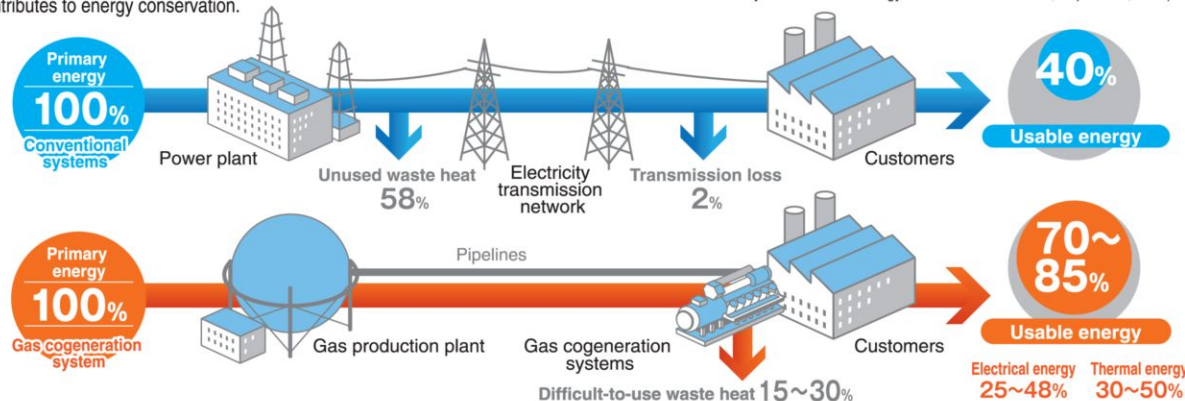
Strategic Energy Plan

The plan says "Cogeneration, which realizes high efficiency energy use by utilizing both heat and electric power, is a hybrid-type secondary energy which helps energy conservation and works well with renewable energies, eases peak power demand, contributes to the diversification and decentralization of electric power source composition, and is resistant to disasters."

Distributed Generation is the Ultimate Electricity Conservation Measure

Changing from conventional, large-scale, centralized generation to distributed generation sources using gas cogeneration system reduces power generation loss and transmission loss, and contributes to energy conservation.

※LHV standards. The heat efficiency and total loss at thermal power plants are calculated from the FY2003 operating performance of the nine electric power companies and electricity wholesale companies. (Energy Efficiency Standards Subcommittee of the Advisory Committee on Energy and Natural Resources, September, 2005).



City gas with its superior clean combustion and controllability is being used in diverse fields of industry.

City gas is used in boilers, industrial furnaces and other aspects of industry because of its superior combustion and ease of handling.



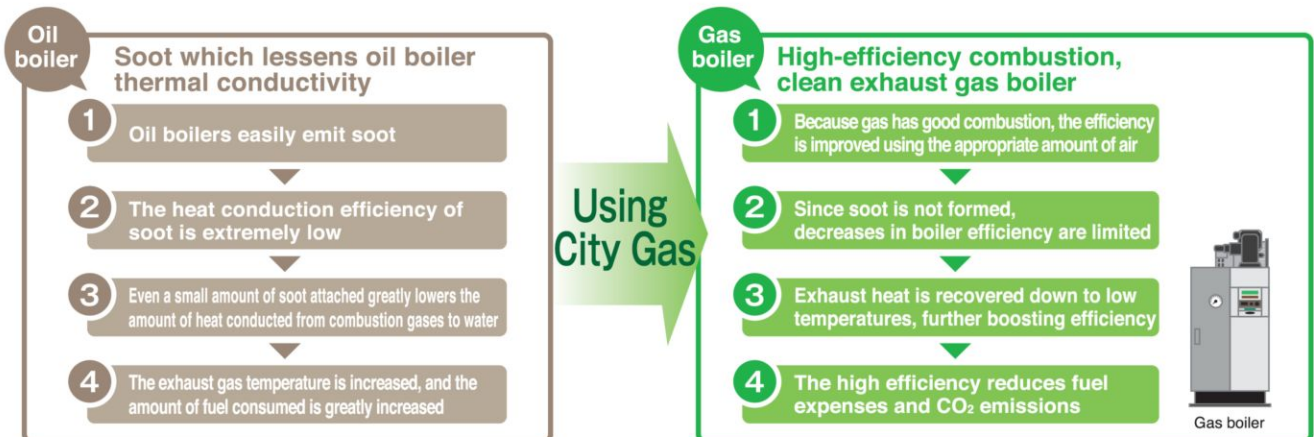
Heating furnace



Boiler

Boiler

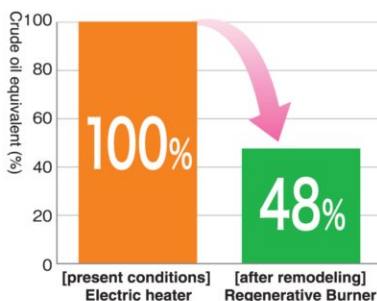
City gas boiler provides superior environmental and energy conservation performance, and reduce the fuel management required when using fuel oil. The areas needed for fuel oil tanks and for parking fuel oil trucks are also unnecessary, freeing up space for effective use.



Industrial furnace

Regenerative Burner

Regenerative burner system is a pair of burners and heat reservoirs which burn alternately about once per several tens of seconds. They achieve high efficiency combustion by recovering the heat from combustion exhaust gas that was formerly lost.



Easy maintenance

The areas around burners are clean so they do not require any exhaust gas processing works (desulfurization, etc.)

Superior combustibility

It can achieve a low air ratio and wide control range (high turndown)

High heating power

Production line speed can be increased because the heating power is higher than electric heaters

※ These figures are examples, and may differ from those achieved by customers
 ※ The crude oil equivalents used are 1.19kl/1000m³N for city gas and 0.257kl/MWh for electricity.

Cooking on a gas fire makes food delicious. Suzuchu provides a comfortable cooking environment.



※涼厨® ["Suzuchu"] and 涼® are registered trademarks of Osaka Gas Co., Ltd.

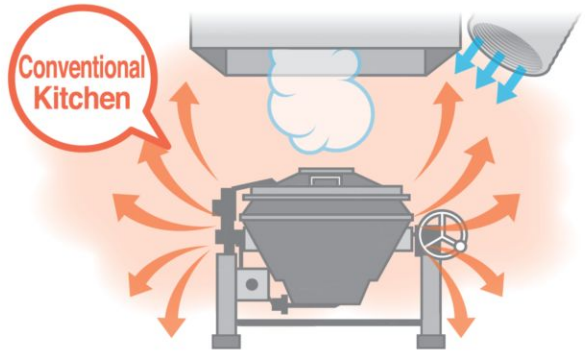
Cooking with gas makes it possible to immediately adjust heat by increasing or decreasing the flame, and draws out the flavor of the ingredients maximum. And there is no need to wait because the powerful flame cooks fast. Advanced gas kitchen provides powerful support to our customers.

Comfortable so it is easy to work – cool so it saves energy and reduces CO₂ emissions

Conventional kitchen is hot because of the heat emitted from the surface of equipment and combustion exhaust, but the gas kitchen equipped Suzuchu can effectively limit temperature increases in the kitchen. Suzuchu provides a cool comfortable cooking environment in the kitchen, without depending on air conditioning, with features which consider the heat while cooking and prevent cooks from getting burns.

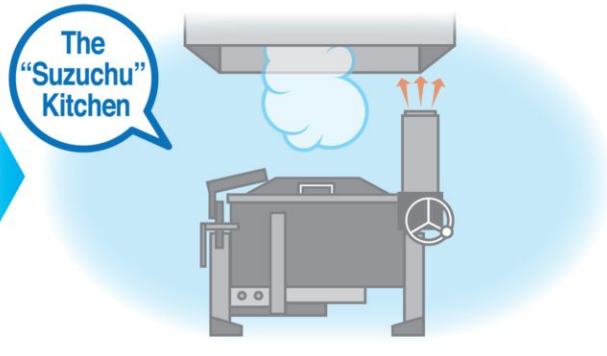
Hot kitchen from radiant heat from equipment, maximum air conditioning

The temperature rises from combustion exhaust and the radiant heat from equipment, and the kitchen is cooled using air conditioning.



Almost no radiant heat – the very image of comfort!

Suzuchu prevents exhaust gas from spreading (with centralized exhaust), restricts radiant heat from equipment, and greatly reduces the perceived temperature.



The mechanism of "Suzuchu"

The diffusion of exhaust gas is prevented by centralized exhaust.

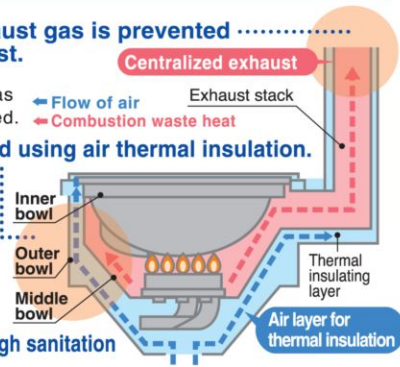
The diffusion of exhaust gas into the kitchen is prevented.

Radiant heat is reduced using air thermal insulation.

Low surface temperature and the absence of the open flame of the appliance allow for a significant reduction of radiant heat, eliminating the risk of burning yourself even if you touch the appliance.

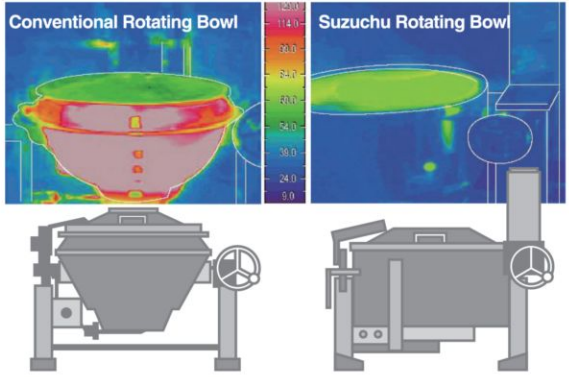
Easy to clean, ensuring high sanitation

The low surface temperature of the appliance prevents excess burning even if a bowl boils over, making it easy to clean.



Not hot, so no concerns about burns

Surface Temperature Comparison between Suzuchu and Conventional Equipment

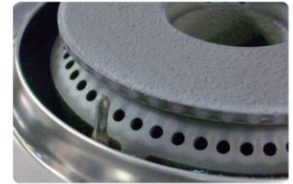


There are also Suzuchu table-top models with shut-off safety devices

Reduces the impact of combustion exhaust heat and radiant heat from equipment on the cook, and achieves a comfortable kitchen environment. Also improves safety with a shut-off safety device.



Suzuchu stove with shut-off safety device



Gas automatically stops when the flame goes out from spills, etc.

As next-generation vehicles, natural gas vehicles are expected to be used more widely.

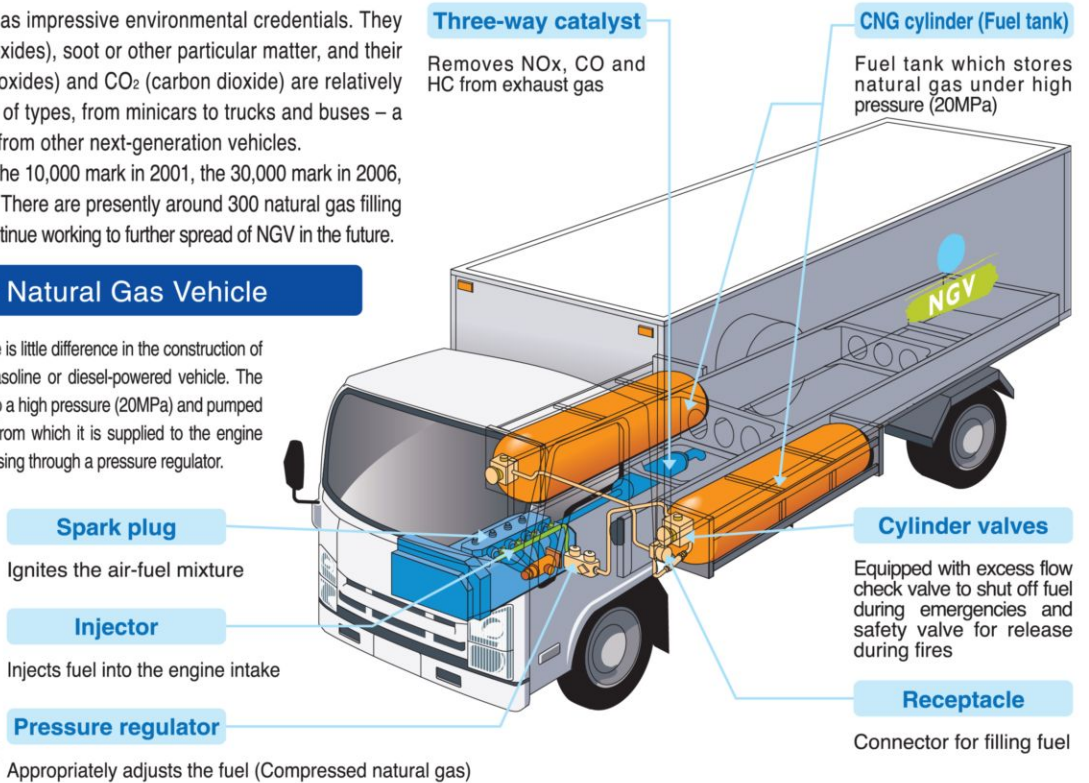
Natural gas vehicle (NGV) has impressive environmental credentials. They emit almost no SOx (sulfur oxides), soot or other particular matter, and their emissions of NOx (nitrogen oxides) and CO₂ (carbon dioxide) are relatively low. NGV comes in a variety of types, from minicars to trucks and buses – a feature that sets them apart from other next-generation vehicles. The number of NGV crossed the 10,000 mark in 2001, the 30,000 mark in 2006, and the 40,000 mark in 2010. There are presently around 300 natural gas filling stations nationwide. We will continue working to further spread of NGV in the future.

Mechanism of Natural Gas Vehicle

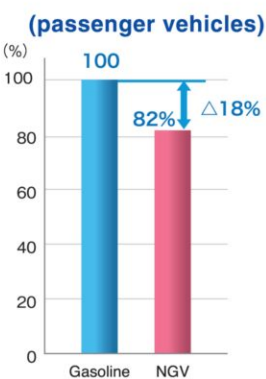
Apart from the fuel system, there is little difference in the construction of an NGV and a conventional gasoline or diesel-powered vehicle. The natural gas fuel is compressed to a high pressure (20MPa) and pumped into the vehicle's gas cylinder, from which it is supplied to the engine through a fuel pipe after first passing through a pressure regulator.



Natural Gas Vehicle (NGV) symbol

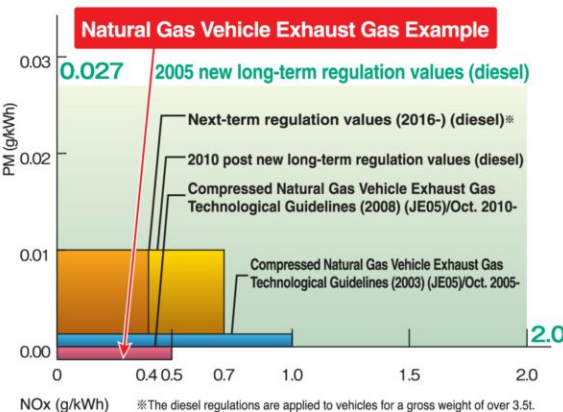


Comparison of CO₂ emissions



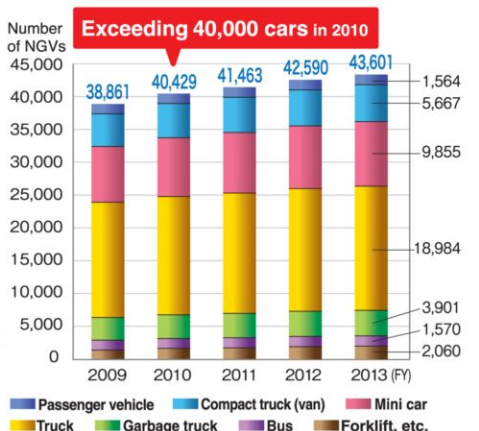
※ Comparison for a 1,500cc domestic compact van, using meter catalog values.

Exhaust gas performance of natural gas vehicles



※ The diesel regulations are applied to vehicles for a gross weight of over 3.5t.

History of introduction of natural gas vehicle in Japan



Delivery truck



Large fixed-route bus



Package type quick refueling facility



Vehicle refueling appliance (Pressure-up gas supplier)



Natural gas station of a logistics company

9

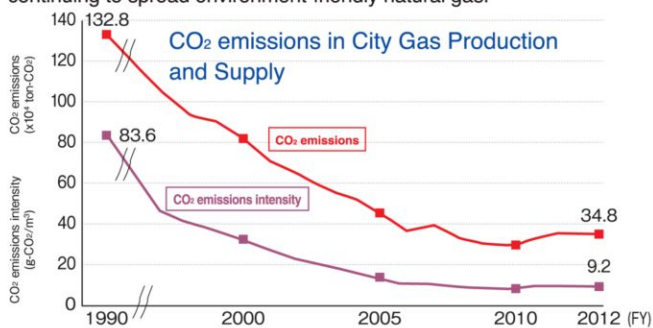
Efforts for Environmental Preservation

Efforts for preventing global warming and building a sound material-cycle society are under way to create a sustainable society.

City gas utilities as suppliers of energy, which is environment-friendly natural gas, shall pursue the efficient use of energy and resources and contribute to achieving a sustainable society through environmental conservation activities regionally as well as globally.

Efforts for preventing global warming

In the production stage, city gas helps reduce CO₂ emissions by using natural gas as the raw material. We are contributing to society by continuing to spread environment-friendly natural gas.



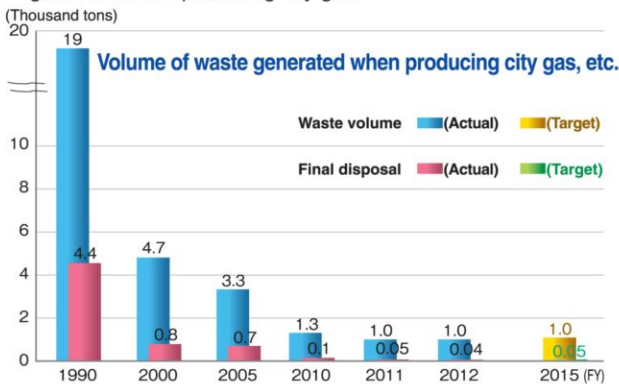
*The above figures are calculated by compensating for the not-evaluated contribution of cogeneration. This compensation involves considering the contribution of cogeneration in reducing the consumption of grid power by the use of the Marginal Emission Factor (MEF), that is, the emission factor for thermal power plants.

We have released the "Environmental Household Accounting Book" on the Internet as a tool to grasp CO₂ emissions at home (www.gas-kakeibo.jp).



Reducing industrial waste

We are working on reducing waste and final disposal volumes generated from producing city gas.



Environment-friendly gas pipeline construction

We are working at the 3Rs (Reduce, Reuse and Recycle) for the earth, sand and road waste materials generated from gas pipeline works. For example, we prevent the emergence of waste materials by adopting the non-excitation method.



Non-excitation method

Recycling of gas pipes

Scraps of polyethylene pipes (PE pipes) produced and old pipelines dug out during pipeline construction are other targets for recycling. They are reused for a variety of materials for gas business and stationery products.



Recycled Products from PE Pipe

Greening Plant Sites and Cleanup Activities

The Japan Gas Association and gas utilities create green belts considering the natural environment and implement cleanup activities together with local government bodies.



Greening in plant sites



River cleanup activities



Planting and caring for trees in the forest

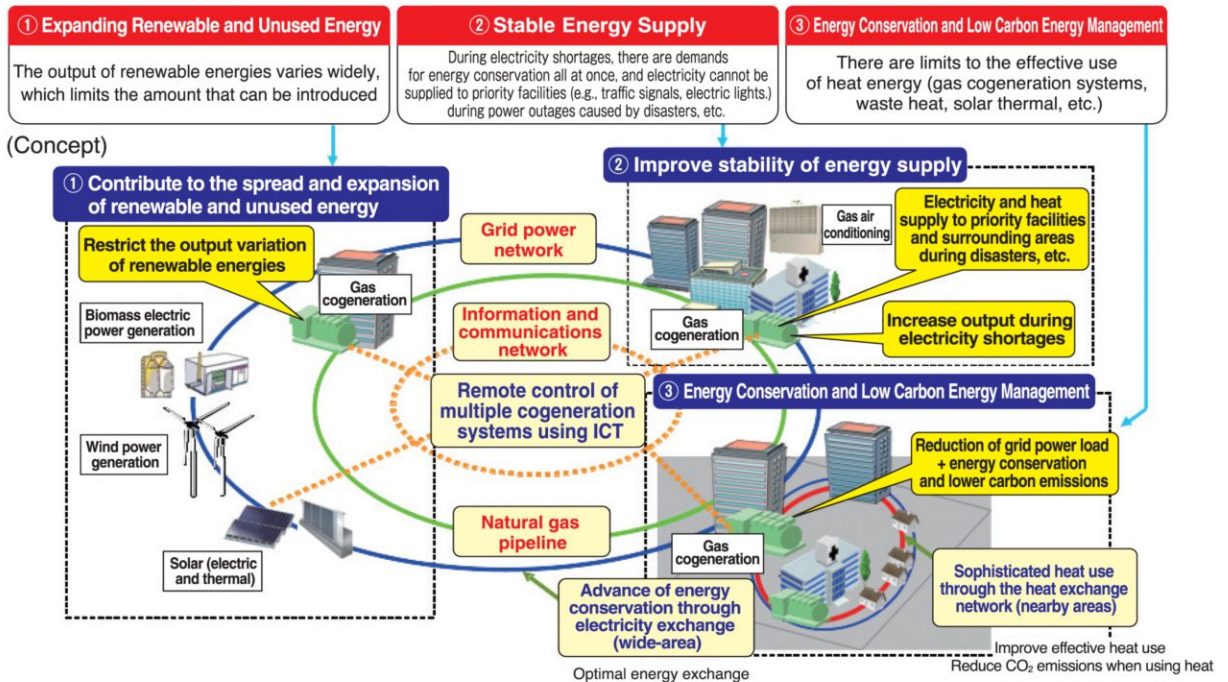


The Japan Gas Association is pursuing additional research and development on city gas technologies for rational comprehensive energy use.

In working toward a low-carbon society, we are constructing smart energy networks for optimal energy use at the regional level, opening hydrogen stations in four major metropolitan areas, and otherwise working to study hydrogen supply infrastructure.

Smart Energy Network

Smart energy network is a system which utilize information and communications technology (ICT) for the optimal use of heat and electricity energy across multiple buildings or in the community at the area level. Renewable and unused energy is introduced to the greatest possible extent to gas cogeneration systems, which is distributed energy systems, and energy networks centered on fuel cells, achieving energy conservation and low carbon emissions in the community, contributing to leveling of electric power load, and securing a certain level of energy supply during emergencies.



Nishi, Osaka city, Osaka



Koto city, Tokyo

Strategic Energy Plan (Cabinet Resolution of April 11, 2014)

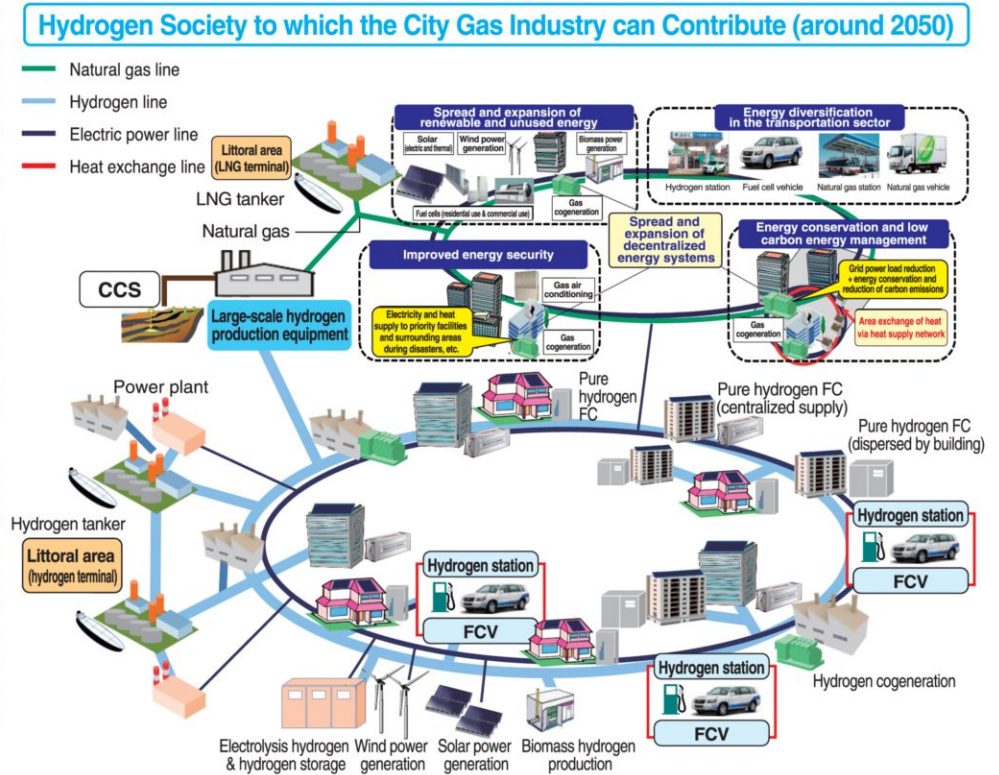
States: "In communities of a certain scale, using renewable energy, cogeneration and other distributed energy ... by supply combining diverse energy sources in line with demand, entire communities can realize large energy savings during normal times and also secure energy supply during emergencies. This is expected to support the infrastructure for life and also strengthen business continuity plans."

Efforts by the City Gas Industry toward a Hydrogen Society

The Strategic Energy Plan (Cabinet Resolution of April 11, 2014), which indicates direction of Japan's middle- to long-term energy policy, states that "hydrogen is expected to play a central role among future secondary energies," and otherwise positions hydrogen as a more important energy than in the past.

Also, the "Strategic Road Map for Hydrogen and Fuel Cells" (announced by the Ministry of Economy, Trade and Industry June 24, 2014) says "Academia, government and industry will collaborate to proactively engage in measures for utilizing hydrogen" in daily life and industrial activities toward realizing a "hydrogen society."

The city gas industry is presently working to spread and expand the use of stationary fuel cells (ENE-FARM, etc.) using hydrogen reformed with natural gas and the construction of hydrogen stations for fuel cell vehicles. Over the long term, we also feel it is an important option to contribute to the realization of a hydrogen society as advocated by the government by supplying hydrogen that does not emit CO₂ when being produced or used (CO₂-free hydrogen).



Hydrogen station for fuel cell vehicles (toward market introduction in 2015)

As leading commercial hydrogen station facilities, while receiving support from the government, there is a plan to construct about 100 commercial hydrogen stations centered on the four major metropolitan areas within FY2015. To date, the city gas industry has decided on construction at the following four locations.

Business Operators	Prefectures	City/Ward	Supply capacity	Supply format
Tokyo Gas	Saitama	Saitama	300Nm ³ /h or higher	On Site
Tokyo Gas	Tokyo	Nerima	300Nm ³ /h or higher	Off Site
Osaka Gas	Osaka	Ibaraki	300Nm ³ /h or higher	On Site
Toho Gas	Aichi	Nisshin	300Nm ³ /h or higher	Off Site



Toyota Ecoful Town Hydrogen Station, Toyota City, Aichi Prefecture (hydrogen station presently conducting demonstration testing)

Latest BSR distribution chart (2009)

An ice-like substance with methane gas and other small gas molecules trapped inside water molecules which is created under low temperature and high pressure conditions. Methane (natural gas) hydrate includes gas with about 170 times the volume of hydrate. Deposits of Methane hydrate are found in the seabed under waters nearby Japan, and the volume of gas is said to be sufficient for 100 years of Japanese gas consumption.

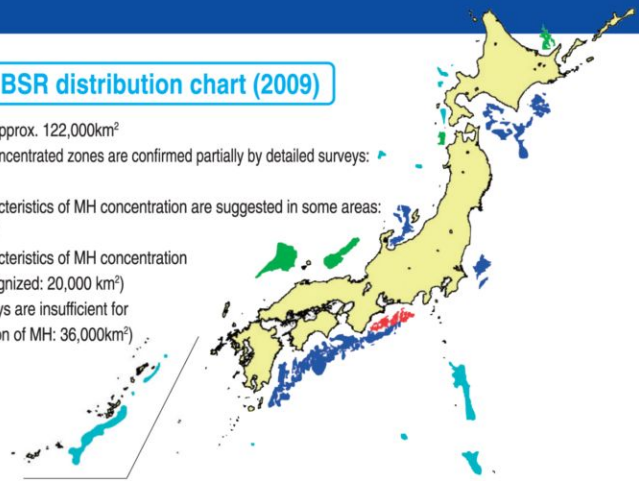


Methane hydrate (artificial) burning

Latest BSR distribution chart (2009)

BSR area = approx. 122,000km²

- BSR (MH concentrated zones are confirmed partially by detailed surveys: 5,000 km²)
- BSR (Characteristics of MH concentration are suggested in some areas: 61,000 km²)
- BSR (Characteristics of MH concentration are not recognized: 20,000 km²)
- BSR (Surveys are insufficient for the evaluation of MH: 36,000km²)



Source: MH21 Research Consortium (photograph and distribution map)

The Japan Gas Association values communication with our customers, and we would like to contribute to the development of regional and international communities.

In addition to conducting safety information activities, we aim to support the development of regional and international society by holding cooking classes for the public and workshops for children, and participating in regional events and international conferences.

Safety Information Activities

We conduct safety information activities and introduces safe gas equipment for better customer understanding about how to use and maintain gas facilities and gas equipment so customers can use gas safely.

Safety Information Activities at Schools



Safety and disaster prevention information activities at a governmental.



Safety information activities at a disaster prevention drill.

Energy and Environmental Education Efforts

We provide "ECO-COOKING" classes which propose an environment-friendly diet, presents the "Learning about Fire program" which teaches children to understand and use fire safely, and support production of supplementary readers for school education.



"ECO-COOKING" ※Classes
※"ECO-COOKING" is a registered trademark of Tokyo Gas Co., Ltd.



Workshop on starting fires in "Learning about Fire" program.

International Exchange

World Gas Conference (WGC)

The World Gas Conference is an international conference on gas energy held by the International Gas Union (IGU) once every three years. The Japan Gas Association participates in the administration of the World Gas Conference and the IGU as a charter member of the IGU.



Japan Gas Association booth at WGC 2012.

Gas Information Exchange in the Western Pacific Area (GASEX)

GASEX is an international conference jointly initiated by the Japan Gas Association and the then Australian Gas Association. GASEX contributes to the development of the gas business in the Western Pacific region through exchanging information and technology.



Keynote address by Mitsunori Torihara, Ex-Chairman of JGA

International Communities

Social Contribution Activities with Related Organizations

The Japan Gas Association has formed the Japan Gas Energy Promotion Council (Popular name: COLLABO) together with the Conference of LP Gas Associated Organizations and the Japan Community Gas Association (JCGA) to work toward the expansion of high-efficiency gas appliances and safe gas cooking stoves, and to provide information on skillful gas use and energy conservation. (See the following column regarding "Gas Energy").

COLLABO cooperates with Japan Federation of Housing Organizations, Japan Association of Kitchen & Bath, and Japan Industrial Association of Gas and Kerosene Appliances. We make proposals realizing "a rich and full life" as the WithGas Club.



The "WithGas Club" has held the "WithGas: National Family Cooking Contest" every year since 2007 as a part of food education, encouraging people to return to home cooking, by recommending a life with the kitchen at the center of the home.

The "WithGas: National Family Cooking Contest" is an opportunity to learn about cooking and food education in a fun, casual way. The contest consists of local preliminary rounds, and demonstration contests held at the showrooms of city gas companies and other locations throughout Japan. The demonstration contests offer opportunities for families to learn more about cooking, and a variety of original food using local specialties is presented.



What is "Gas Energy"?

Most residential customers nationwide use city gas, LP gas or community gas. These are collectively referred to as "gas energy."

	City gas	LP gas	Community gas
Raw materials	Natural gas has methane (a combustible gas) as its main component. Most natural gas is imported from overseas as liquefied natural gas (LNG).	Liquefied Petroleum Gas (LPG) has propane and butane as its main components. Most LPG is imported from overseas.	
Characteristics & Properties	<ul style="list-style-type: none"> (1) While the gas is originally colorless and odorless, odor is added for recognition when gas leaks. (2) When chilled to minus 162°C, the gas becomes a liquid and its volume is reduced to 1/600. (3) Natural gas is lighter than air 	<ul style="list-style-type: none"> (1) While the gas is originally colorless and odorless, odor is added for recognition when gas leaks. (2) When chilled to minus 42°C, the gas becomes a liquid and its volume is reduced to 1/250. (3) LPG is heavier than air. 	
Gas company	Customers obtain city gas through supply contracts with a city gas company or municipal gas department which supplies their area. There are more than 200 gas utilities nationwide.	Customers obtain LP gas through contracts with one of the LP gas companies in the area where they live. There are more than 20,000 LP gas companies nationwide.	Customers obtain community gas through supply contracts with the community gas company which supplies the location where they live. There are more than 1,400 community gas companies nationwide.
Supply method	City gas is supplied through gas pipes buried underneath roads.	LP gas is mostly delivered in LP gas cylinders.	LP gas is supplied through gas pipelines to apartment complexes with over 70 units.

207 city gas utilities nationwide (26 public and 181 private with 29.5 million customers*)

Kyushu district (28 private utilities) (1,718 thousand customers)

- Fukuoka
 - 1 Saibu Gas Co., Ltd.
 - 2 Nishinohon Gas Co., Ltd.
 - 3 Kurume Gas Co., Ltd.
 - 4 Omuta Gas Co., Ltd.
 - 5 Nougata Gas Co., Ltd.
 - 6 Iizuka Gas Co., Ltd.
 - 7 Chikushi Gas Co., Ltd.
 - 8 Takamatsu Gas Co., Ltd.
- Saga
 - 9 Karatsu Gas Co., Ltd.
 - 10 Saga Gas Co., Ltd.
 - 11 Imari Gas Co., Ltd.
 - 12 Tosu Gas Co., Ltd.
- Oita
 - 13 ECORE Co., Ltd.
 - 14 Oita Gas Co., Ltd.
- Nagasaki
 - 15 Kyusyu Gas Co., Ltd.
- 16 Obama Gas Co., Ltd.
- 17 Daiichi Gas Co., Ltd.
- Kumamoto
 - 18 Amakusa Gas Co., Ltd.
 - 19 Yamaga-Toshi Gas Co., Ltd.
- Miyazaki
 - 20 Miyazaki Gas Co., Ltd.
- Kagoshima
 - 21 Nihon Gas Co., Ltd.
 - 22 Akune Gas Co., Ltd.
 - 23 Minaminohon Gas Co., Ltd.
 - 24 Kajiki Gas Co., Ltd.
 - 25 Kokubu Hayato Gas Co., Ltd.
 - 26 Izumi Gas Co., Ltd.
 - 27 Nankai Gas Co., Ltd.
- Okinawa
 - 28 Okinawa Gas Co., Ltd.

Tohoku district (6 public utilities, 31 private utilities)(916 thousand customers)

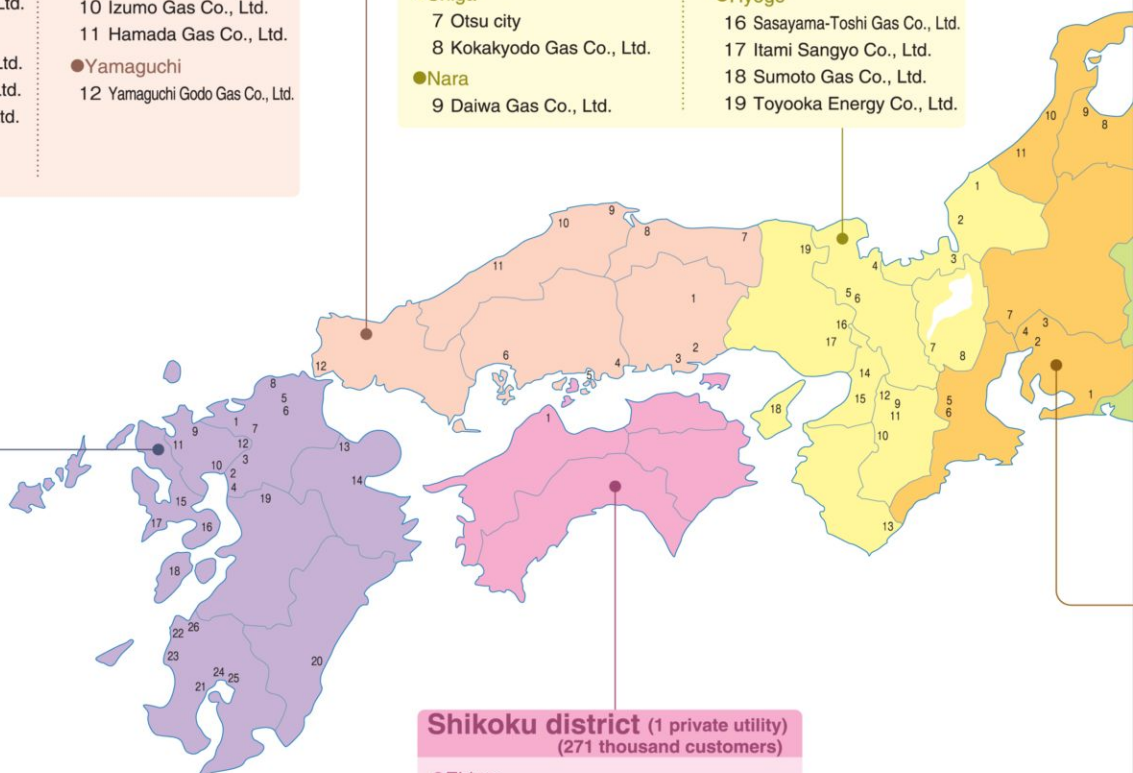
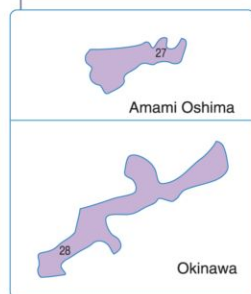
- Aomori
 - 1 Aomori Gas Co., Ltd.
 - 2 Gosityogawara Gas Co., Ltd.
 - 3 Hirosaki Gas Co., Ltd.
 - 4 Towada Gas Co., Ltd.
 - 5 Hachinohe Gas Co., Ltd.
 - 6 Kuroishi Gas Co., Ltd.
- Iwate
 - 7 Morioka Gas Co., Ltd.
 - 8 Hanamaki Gas Co., Ltd.
 - 9 Mizusawa Gas Co., Ltd.
 - 10 Ichinoseki Gas Co., Ltd.
 - 11 Kamaishi Gas Co., Ltd.
- Akita
 - 12 Noshiro Energy Service Co., Ltd.
- 13 Oga-shi
- 14 Koto Gas Co., Ltd.
- 15 Nikaho-shi
- 16 Yurihonjo-shi
- 17 Tobu Gas Co., Ltd.
- Yamagata
 - 18 Sakatatennen Gas Co., Ltd.
 - 19 Tsuruoka Gas Co., Ltd.
 - 20 Shinjo-Toshi Gas Co., Ltd.
 - 21 Sagae Gas Co., Ltd.
 - 22 Yamagata Gas Co., Ltd.
 - 23 Shonai-chubu Gas Co., Ltd.
 - 24 Shonai-machi
- Miyagi
 - 25 Kesennuma-shi
- 26 Furukawa Gas Co., Ltd.
- 27 Ishinomaki Gas Co., Ltd.
- 28 City of Sendai
- 29 Shiogama Gas Co., Ltd.
- 30 Sennan Gas Co., Ltd.
- Fukushima
 - 31 Fukushima Gas Co., Ltd.
 - 32 Wakamatsu Gas Co., Ltd.
 - 33 Soma Gas Co., Ltd.
 - 34 Tohoku Gas Co., Ltd.
 - 35 Joban-Toshi Gas Co., Ltd.
 - 36 Jobankyodo Gas Co., Ltd.
 - 37 Iwaki Gas Co., Ltd.

Kinki district (2 public utilities, 17 private utilities) (7,408 thousand customers)

- Fukui
 - 1 Fukui city
 - 2 Echizen Ene-line Co., Ltd.
 - 3 Tsuruga Gas Co., Ltd.
- Kyoto
 - 4 Tango Gas Co., Ltd.
 - 5 Fukuchiyama City Gas Co., Ltd.
 - 6 Osadano Gas Center Co., Ltd.
- Shiga
 - 7 Otsu city
 - 8 Kokakyodo Gas Co., Ltd.
- Nara
 - 9 Daiwa Gas Co., Ltd.
- 10 Gojo Gas Co., Ltd.
- 11 Sakurai Gas Co., Ltd.
- 12 Otake Co., Ltd.
- Wakayama
 - 13 Singu Gas Co., Ltd.
- Osaka
 - 14 Osaka Gas Co., Ltd.
 - 15 Kawachinagano Gas Co., Ltd.
- Hyogo
 - 16 Sasayama-Toshi Gas Co., Ltd.
 - 17 Itami Sangyo Co., Ltd.
 - 18 Sumoto Gas Co., Ltd.
 - 19 Toyooka Energy Co., Ltd.

Chugoku district (1 public utility, 11 private utilities) (882 thousand customers)

- Okayama
 - 1 Tsuyama Gas Co., Ltd.
 - 2 Okayama Gas Co., Ltd.
 - 3 Mizushima Gas Co., Ltd.
- Hiroshima
 - 4 Fukuyama Gas Co., Ltd.
 - 5 Innoshima Gas Co., Ltd.
 - 6 Hiroshima Gas Co., Ltd.
- Tottori
 - 7 Tottori Gas Co., Ltd.
- 8 Yonago Gas Co., Ltd.
- Shimane
 - 9 Matsue-shi
 - 10 Izumo Gas Co., Ltd.
 - 11 Hamada Gas Co., Ltd.
- Yamaguchi
 - 12 Yamaguchi Godo Gas Co., Ltd.



Shikoku district (1 private utility) (271 thousand customers)

- Ehime
 - 1 Shikoku Gas Co., Ltd.

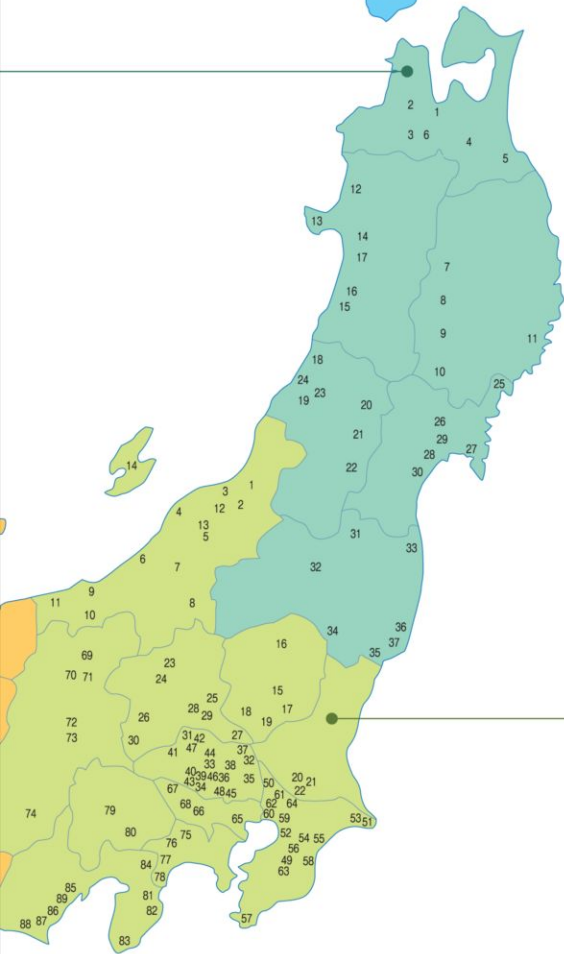
The number of utilities is as of August 2014; the number of customers is as of March 31, 2014
 ※Totals of the districts might not add up to the overall total due to rounding.



**Hokkaido district (1 public utility, 9 private utilities)
(854 thousand customers)**

●Hokkaido

- | | |
|---------------------------|---------------------------|
| 1 Kushiro Gas Co., Ltd. | 6 Obihiro Gas Co., Ltd. |
| 2 Asahikawa Gas Co., Ltd. | 7 Tomakomai Gas Co., Ltd. |
| 3 Takikawa Gas Co., Ltd. | 8 Muroran Gas Co., Ltd. |
| 4 Bibai Gas Co., Ltd. | 9 Hokkaido Gas Co., Ltd. |
| 5 Iwamizawa Gas Co., Ltd. | 10 Oshamanbe-cho |



Kanto district (15 public utilities, 74 private utilities) (14,603 thousand customers)

●Niigata

- 1 Shibata Gas Co., Ltd.
- 2 Echigotennen Gas Co., Ltd.
- 3 Hokuriku Gas Co., Ltd.
- 4 Kanbara Gas Co., Ltd.
- 5 Mitsuke-shi
- 6 Kashiwazaki-shi
- 7 Ojya-shi
- 8 Unuma-shi
- 9 Joetsu-city
- 10 Myoko-shi
- 11 Itoigawa-shi
- 12 Shirone Gas Co., Ltd.
- 13 Sakae Gas Co-op.
- 14 Sado Gas Co., Ltd.

●Tochigi

- 15 Tochigi Gas Co., Ltd.
- 16 Kinugawa Gas Co., Ltd.
- 17 Kitanihon Gas Co., Ltd.
- 18 Ashikaga Gas Co., Ltd.
- 19 Sano Gas Co., Ltd.

●Ibaraki

- 20 Tsukubagakuen Gas Co., Ltd.
- 21 Miho Gas Co., Ltd.
- 22 Tobu Liquefied Petroleum Co., Ltd.

●Gunma

- 23 Numata Gas Co., Ltd.
- 24 Shibukawa Gas Co., Ltd.
- 25 Kiryu Gas Co., Ltd.
- 26 Tomioka-shi
- 27 Tatebayashi Gas Co., Ltd.
- 28 Isesaki Gas Co., Ltd.
- 29 Ota-Toshi Gas Co., Ltd.
- 30 Shimonita-machi

●Saitama

- 31 Honjo Gas Co., Ltd.
- 32 Satte-Toshi Gas Co., Ltd.
- 33 Sakado Gas Co., Ltd.
- 34 Iruma Gas Co., Ltd.
- 35 Tosai Gas Co., Ltd.
- 36 Bushu Gas Co., Ltd.
- 37 Washinomiya Gas Co., Ltd.
- 38 Shinnihon Gas Co., Ltd.
- 39 Hidaka-Toshi Gas Co., Ltd.
- 40 Musashino Gas Co., Ltd.
- 41 Chichibu Gas Co., Ltd.
- 42 Saitama Gas Co., Ltd.
- 43 Seibu Gas Co., Ltd.
- 44 Shoei Gas Co., Ltd.
- 45 Daito Gas Co., Ltd.
- 46 Kakuei Gas Co., Ltd.
- 47 Ina-Toshi Gas Co., Ltd.
- 48 Tojo Gas Co., Ltd.

●Chiba

- 49 Otaki Gas Co., Ltd.
- 50 Noda Gas Co., Ltd.
- 51 Choshi Gas Co., Ltd.
- 52 Chiba Gas Co., Ltd.
- 53 Sobu Gas Co., Ltd.
- 54 Togane-shi
- 55 Kujukuri-town
- 56 Oamishirasato-shi
- 57 Boshu Gas Co., Ltd.
- 58 Shirako-machi
- 59 Narashino-shi
- 60 Keiyo Gas Co., Ltd.
- 61 Higashinihon Gas Co., Ltd.
- 62 Keiwa Gas Co., Ltd.

- 63 Chonan-machi
- 64 Nippon Gas Co., Ltd.

●Tokyo

- 65 Tokyo Gas Co., Ltd.
- 66 Akishima Gas Co., Ltd.
- 67 Ome Gas Co., Ltd.
- 68 Buyo Gas Co., Ltd.

●Nagano

- 69 Nagano-Toshi Gas Co., Ltd.
- 70 Omachi Gas Co., Ltd.
- 71 Ueda Gas Co., Ltd.
- 72 Matsumoto Gas Co., Ltd.
- 73 Suwa Gas Co., Ltd.
- 74 Shinshu Gas Co., Ltd.

●Kanagawa

- 75 Atsugi Gas Co., Ltd.
- 76 Hatano Gas Co., Ltd.
- 77 Odawara Gas Co., Ltd.
- 78 Yugawara Gas Co., Ltd.

●Yamanashi

- 79 Tokyo Gas Yamanashi Co., Ltd.
- 80 Yoshida Gas Co., Ltd.

●Shizuoka

- 81 Atami Gas Co., Ltd.
- 82 Ito Gas Co., Ltd.
- 83 Shimoda Gas Co., Ltd.
- 84 Gotemba Gas Co., Ltd.
- 85 Shizuoka Gas Co., Ltd.
- 86 Shimada Gas Co., Ltd.
- 87 Chuen Gas Co., Ltd.
- 88 Fukuroi Gas Co., Ltd.
- 89 Tokai Gas Co., Ltd.

**Tokai-Hokuriku district (1 public utility, 10 private utilities)
(2,805 thousand customers)**

●Aichi

- 1 Chubu Gas Co., Ltd.
- 2 Toho Gas Co., Ltd.
- 3 Inuyama Gas Co., Ltd.
- 4 Tsushima Gas Co., Ltd.

●Mie

- 5 Ueno-Toshi Gas Co., Ltd.
- 6 Nabari Kintetsu Gas Co., Ltd.

●Gifu

- 7 Ogaki Gas Co., Ltd.

●Toyama

- 8 Nihonkai Gas Co., Ltd.
- 9 Takaoka Gas Co., Ltd.

●Ishikawa

- 10 Kanazawa-shi
- 11 Komatsu Gas Co., Ltd.

GAS FACTS IN JAPAN

2 0 1 4

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Tokyo 105-0001, Japan

<http://www.gas.or.jp/>