Social background behind LNG introduction

The ceremony for signing a long-term contract with the Alaska LNG Project

Tokyo Gas was Japan's first company to discover the outstanding value of natural gas and to overcome the challenges to achieve the introduction of LNG and help resolve social issues.

Our predecessors' sophisticated business judgment and courage motivated the next generation. Today, natural gas is a basic source of energy that supports the Japanese society and economy.

In the 1960s, Japan experienced a sharp rise in energy demand following its population growth and remarkable postwar reconstruction. However, urban air and other pollution had emerged as social issues and Japan faced an urgent need to shift from conventional coal- and oil-based materials to environmentally friendly and reliable energy sources for the future that would not impair economic efficiency.

Tokyo Gas found liquefied natural gas (LNG) to be an optimal solution to those social problems, because it was expected to attain both environmental friendliness and economic efficiency. The company decided to introduce it.

LNG has changed society

Fifty years ago, natural gas, which was a third alternative in fossil fuels beyond coal and oil, was introduced to bring about dramatic changes to Japan's energy situation.

There were a number of unknown challenges behind its introduction.

Actions towards LNG introduction

Actions with an eye towards the widespread use of LNG

1960s 1969

1964

Gas pipeline construction

The main loop natural gas pipeline was completed at 220 km in length, surrounding the entire Kanto region.

- A high-pressure pipe with a diameter of 750 mm was introduced. It was the first introduction of this type of pipeline in the Japanese city gas industry.

1966

1971

Terminal construction

Construction of Japan's first LNG terminal was completed

- The construction was so large in scale that it took three years and involved a cumulative total of 230,000 workers.
- Cutting-edge technologies in those days were incorporated to withstand ultra-low temperatures.

Major energy shift: Attempted 50 years ago

The Polar Alaska

1969 1972

Procurement

Japan's first LNG procurement

- Joint purchase with Tokyo Electric Power (currently JERA)
  (A pioneering case of a joint purchase between a city gas company and an electric power company)
- Attempt at mass transport by ship
  (with equipment that withstands -162°C)

The introduction of LNG required extensive efforts, including those for securing consent from the public and cooperation from customers as well as actions to meet growing demand. Tokyo Gas carried out these actions to accomplish a major energy shift.

Social and environmental issues facing Japan

1
Response to soaring energy demand following economic development and population growth

2
Combating pollution problems

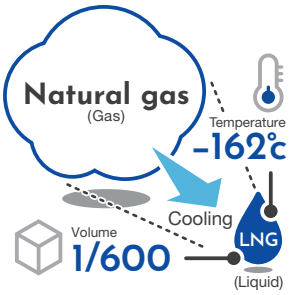
3
Ensuring a stable energy supply

Withdraw from dependency on oil and the Middle East

Ensuring stable supply in the future

A solution to social and environmental issues

LNG introduction



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Characteristics of natural gas led to higher transport efficiency

Natural gas transforms from gas into liquid, namely LNG, when it is chilled to -162°C. In the liquid state, it is 1/600 of its volume in a gaseous state, which means higher efficiency in terms of transport. LNG is imported efficiently from different places around the world with special LNG tankers that can withstand ultra-low temperatures.

1975

Chiba main pipeline work

Full completion of the calorific value change in the area served by the Tokyo Higashi Branch Office

1977

Underwater main pipeline construction

Globally unprecedented underwater main pipeline crossing Tokyo Bay was completed

- After three years of consideration, the massive construction project took extra four years.The work was done 24 hours a day, under a two-shift system.

1988

Calorific value change

The change in calorific value for the then 5.5 million consumers in the Greater Tokyo area took 17 years before it was completed.

Tokyo Gas staff visited customers one by one to change the calorific value of gas appliances. Later, as a pioneering firm, Tokyo Gas helped at least 200 operators across the country with calorific value changes.

Appliance adjustment work for calorific value change at a customer's residence

COLUMN

Calorific value change served social development

The calorific value change refers to an initiative for uniformly supplying natural gas 13A with a high calorific value. It was a large project joined by at least 200 operators nationwide to build a foundation for today's city gas operations. Tokyo Gas embarked on the change for all of its then 5.5 million customers in the Greater Tokyo area in 1972. Over 17 years, and involving 7.8 million employees, it was decisive for the future of the company. The shift to the universal supply of high-calorie natural gas 13A doubled the supply volume using the pipeline with the same diameter and length. This led to higher supply efficiency and eventually to social development.

The introduction of LNG and the universal supply of high-calorie natural gas 13A improved the city gas supply capacity and facilitated the widespread use of natural gas. They also paved the way for the advanced use of city gas. The application was expanded from conventional household consumption to business and industrial use. City gas acted as a driving force during the period of rapid economic growth. Today, Southeast Asian countries, who are exporters of natural gas, are experiencing a soaring energy demand amid their high-speed economic growth and the introduction of LNG is spreading. Tokyo Gas will contribute to social and economic development in Southeast Asia by offering its technologies and expertise in natural gas, LNG and city gas, which has nurtured over the past 50 years.

2000 2010

Kashima Offshore Wind Power Generation (conceptual drawing)

Natural gas is a basic energy source that supports society and the economy. It will play an increasingly significant role in building a low-carbon society.

A combination of renewable energy with natural gas

Natural gas is defined by the Japanese government as an effective low-carbon measure towards 2050 in its fifth Energy Basic Plan. It is expected to play a key role around the world as well. When renewable energy, which is susceptible to weather conditions, is positioned as a core power source, natural gas power generation will become significant for two reasons. First, it can be flexibly operated. Second, it has a limited environmental impact. Expanded use of renewable energy will help expand the effective use of natural gas.

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Serving as an official partner in the category of gas and gas utility services for the Tokyo 2020 Olympic and Paralympic Games

Tokyo Gas is an official partner in the category of gas and gas utility services for the Tokyo 2020 Olympic and Paralympic Games. It will work for successful sporting events by stably supplying energy, taking security and other actions. It will also take part in model projects for advanced environmental cities in the Harumi district and elsewhere to move forward with progressive efforts in terms of energy.

TOKYO 2020 TOKYO GAS TOKYO 2020 PARALYMPIC GAMES

Tokyo 2020 Official Gas & Gas Utility Services Partner

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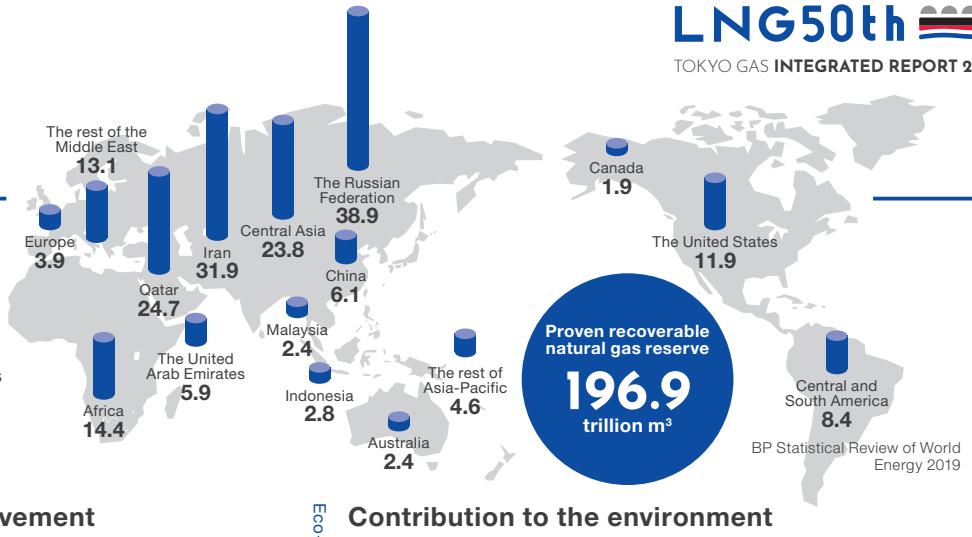
LNG's superiority

As a result of introducing and spreading the use of LNG, Tokyo Gas attained both a stable supply of energy and contribution to the environment.



BP Statistical Review of World Energy 2019

Stability of supply

Energy security improvement

There are natural gas reserves from which LNG is produced in many different locations around the world that offer stable production and supply regardless of circumstances. In addition, technological progress has paved the way for the development of shale gas. Today, it is said that natural gas reserves will be sufficient to meet global energy demand for at least 200 years.

High transport efficiency

When natural gas is cooled to -162°C to form liquefied natural gas (LNG), its volume is around 1/600 of its usual size, facilitating efficient mass transport.

Higher supply capacity

High in calorific value, LNG ensures a large supply capacity. It will thus meet future increases in demand and ensure stable supply.

Eco-friendliness

Contribution to the environment

Natural gas is clean and does not contain hazardous substances. Carbon dioxide emissions from its combustion are lower than those from coal and oil. It is an effective energy source for carbon reduction.

Hiroshi Anzai, the then president of Tokyo Gas shakes hands with the then Governor of Tokyo Ryokichi Minobe after the announcement of the cooperation on anti-pollution initiatives of the Tokyo Metropolitan Government.

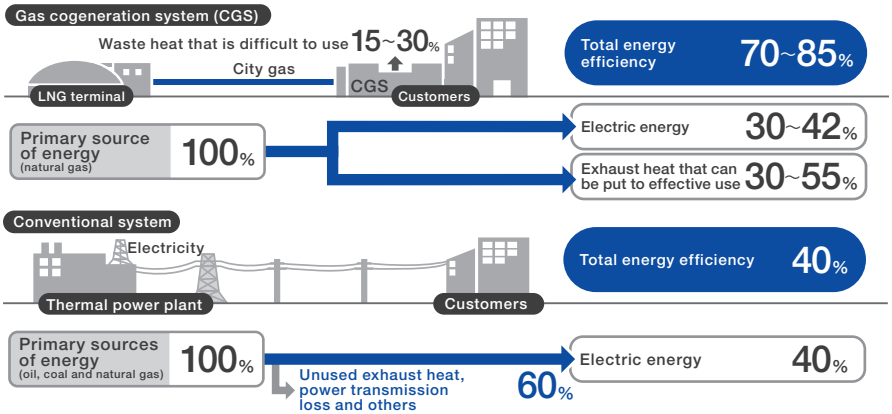
Comparison of emissions from combustion,
(in which a value of 100 indicates emissions from coal combustion)

	CO_2	NOx (nitrogen oxide)	SOx (sulfur oxide)
Coal	100	100	100
Oil	80	70	70
Natural gas	60	40	0

2020

Gas cogeneration system

A gas cogeneration system is a system under which city gas is burned to produce electric power where it is used, while the heat generated from combustion is used for cooling, heating, hot water supply, steam generation and other purposes. It uses energy without being wasteful to exhibit high total energy efficiency, achieving energy conservation and CO_2 reduction. When combined with renewable energy with unstable output, it helps disperse energy systems and makes significant contributions to the construction of a low-carbon society.



* Calculated under the preconditions determined by Tokyo Gas

Smart energy network (SEN)

A smart energy network (SEN) is a regional energy network centered on a large, high-efficiency gas cogeneration system that uses ICT technology for providing and receiving heat and electric power to and from different positions in an area according to the supply and demand. Surplus heat and electricity are supplied to places where they are needed to optimize the demand-supply balance in the area and to achieve energy conservation and CO_2 reduction. It also ensures the stable procurement of energy in emergency situations. Solutions to local environmental, disaster control and other issues will increase real estate value.

*1 Smart Energy Network Energy Management System
*2 Gas cogeneration system