

The Japanese cogeneration power market

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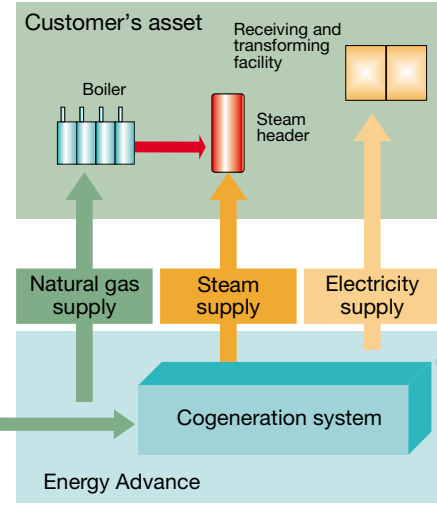
The cogeneration market in Japan continues to grow at a significant rate as awareness of environmental issues increases and the energy industry is deregulated. Demand is rising for larger gas engines (over 4 MW unit power) because the composition of the electrical and thermal output they offer matches cogeneration customer needs. Further demand for gas engines can be expected in the growing power retail business.

Customers benefit from...
No initial investment (off balance sheet)
Energy cost reduction
Energy savings
Low green house gas emission

One-stop service
Consulting
Finance
Design/construction
Maintenance

Gas company

Customer's site



Supply for remaining load

Power company

Energy cost reduction

Asset management by Energy Advance

Fig. 1 An example of the service offered by Energy Advance.

Japan does not have a lot of natural resources and therefore imports much of its primary energy from other countries. The Japanese government, through the Ministry of Economy, Trade and Industry (METI), is giving priority to diversifying energy sources and to increasing the use of energy with low environmental impacts.

METI has constructed a basic energy supply policy with three main elements:

- (1) a stable energy supply,
- (2) environment preservation, and
- (3) reduced energy prices through greater competition.

Within this policy, METI emphasizes the importance of the co-existence of large central power plants and on-site cogeneration. The ministry has subsidized many gas cogeneration projects which achieve energy savings using high-efficiency cogeneration. METI also emphasizes the importance of natural gas because this can be found all over the world and is also an environmentally friendly fuel.

Table 1 shows the growing demand for natural gas in Japan. As we see from Graph 1, the installation of cogeneration power plants has increased from 1981. If the Japanese government enforces energy conservation measures, the number of cogeneration installations is likely to grow in the future.

Stable cogeneration essential

The cogeneration market in Japan is characterized by:

- expensive back-up power contracts



Fig. 2 Energy service at a tyre factory.



Fig. 3 Energy service in a hospital.

- highest demand in the summer
- the trend to daily start and stop these plants (DSS).

Let's look at these in a little more detail.

Japanese electricity companies enforce expensive back-up power contracts. Their customers must pay the basic charge for back-up power regardless of usage, and they also have to pay a significant penalty for unplanned stops such as \$60,000 for just one 30-minute stop in the case of a 6 MW gas engine plant. This means that customers need very stable cogeneration operation in Japan compared with other countries.

Japan is hot and humid in summer and cool in winter, which obviously leads to

higher operating hours in summer. Power prices from the grid are expensive in the summer because of the high demand for air conditioning.

As to the DSS trend, power prices from the grid are higher during the daytime and much lower at night, hence the trend to operate local cogeneration power plants based on a daily starting and stopping regime.

Gas engines the preferred cogeneration system

For the market over 4 MW, gas engines are becoming the preferred source of power in Japan for three reasons. The first is that the power generation efficiency of gas engines is

Potential demand for natural gas in Japan (billion m³)

1999	2005	2010	2015
74	81	94	111

Total gas-fired power generation capacity supplied by Tokyo Gas

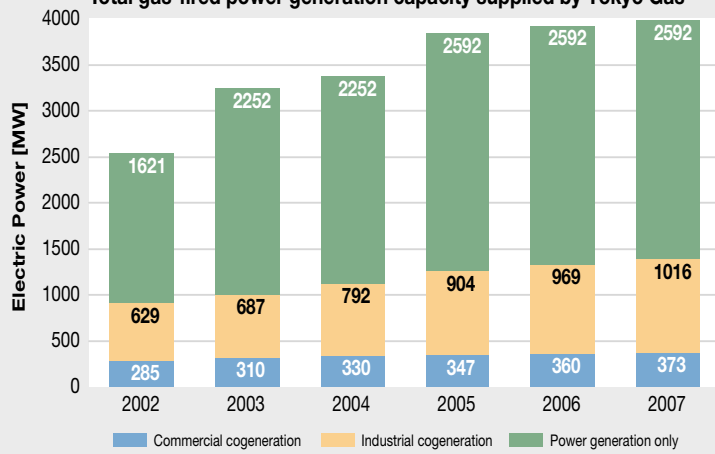
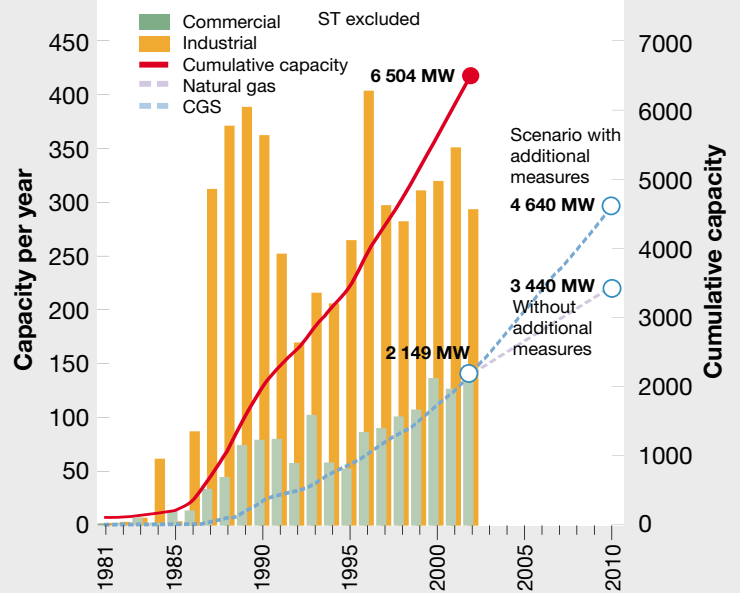


Table 1 Potential demand for natural gas.

MW/year



Graph 1 Trend and outlook for installation of cogeneration in Japan.

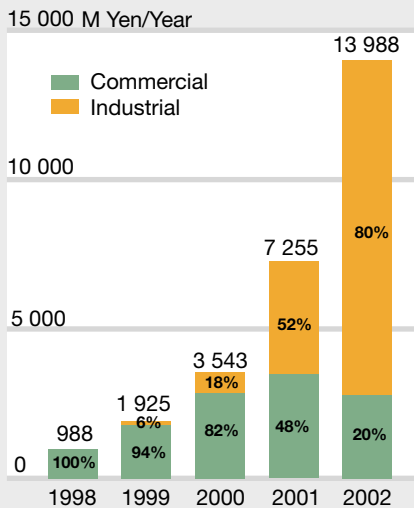


Fig. 4 Trend: installation of on-site energy service.

higher than for a similar size gas turbine plant. As an example, a 6 MW gas engine in simple cycle achieves the same efficiency as a 20 MW gas turbine combi cycle plant.

Second, the electrical and thermal output provided by the gas engine more closely matches customer needs. At many manufacturing plants, the demand for electrical power is increasing, while demand for heat is decreasing. Many Japanese manufacturers have moved their factories with simpler production lines that use a lot of heat to foreign countries such as China, to reduce costs and to avoid the strict environmental regulations in Japan. Thus the production lines remaining in Japan are for the production of high tech products

requiring high power and good quality electricity supply.

Third, deregulation in the electricity industry makes it possible to sell the surplus electricity to the power retailer. This means it pays customers to install larger gas engines with an optimum match to their heat demand, whilst excess electricity is sold to the power retailers. Further demand for gas engines can be expected in the growing power retail business.

On-site energy service

On-site Energy Service Companies (ESCOs) are becoming a popular method of introducing cogeneration in Japan. ESCOs supply one-stop service including financing, asset management, planning, construction and operation & maintenance for energy-saving plants such as cogeneration units.

Utility companies need value-added service to cope with the strong competition resulting from deregulation in the energy industry. There is a great need among customers for outsourcing of operation & maintenance, energy savings and reduction of greenhouse gases such as carbon dioxide. Under these conditions a lot of companies have taken up the option of on-site energy service.

ESCOs can operate profitably given the growing efficiency of cogeneration and the subsidies offered by the Japanese government. Energy Advance, a subsidiary

of Tokyo Gas Co., Ltd, has increased its volume in this sector with 48 units and 56 MWe cogeneration plants installed during the past two years.

The keys to success in Japan

As we noted above, Japanese customers must pay a heavy penalty for unplanned stops. To avoid this penalty, the manufacturer must provide a reliable support mechanism. If the gas engine is purchased from outside Japan, it is especially desirable that the support from the manufacturer or business partner (packager) is reliable. Non-Japanese manufacturers must have supervisors stationed in Japan and a system in place for supplying spare parts.

Customers often request periodical technical meetings with the manufacturer and the packager, which gives the manufacturers a good opportunity to build a reliable relationship with their customers. The manufacturers must also be price-competitive with respect to both initial investment and maintenance costs.

Wärtsilä has the potential to enter and succeed in the Japanese market given the high performance of its power plant products (high power generation efficiency and total efficiency) and the absence of the need for pilot oil for ignition, as long as Wärtsilä builds a reliable support system in Japan and offers a competitive price. ■