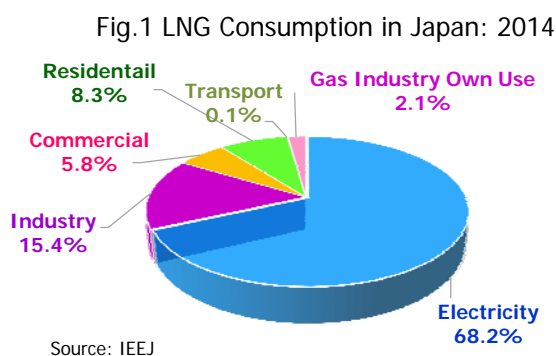


## South Africa Gas Options: Natural Gas Sale to Industrial Sector<sup>1</sup>

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Introducing LNG to South Africa, there is no doubt that power plants are elephants to consume LNG. Gas thermal plants are essential to introducing LNG, which provide the anchor demand for operating an LNG terminal. In this regard, I would like to congratulate the decision of the IPP Office to step forward to construct gas powered IPPs at Richards Bay and Coega.<sup>2</sup>



Next giants are the industrial facilities. Then, people tend to think that natural gas is used at large plants in a huge quantity in the industrial sector and the users are very sensitive to its price. But the reality is a bit different.

Let us look into this. In considering gas consumption by industrial users, they may be classified into three categories, that is, to use natural gas as:

- 1) Feedstock
- 2) Process heat at plants, and
- 3) For other general purposes as power to drive machines including electricity generation, for cooking foods and manufacturing materials and for space heating/cooling

Among the category 1, gas based chemical industries such as fertilizer and methanol and liquid fuel industries such as GTL are the typical industries to use natural gas as feedstock. They use, in LNG equivalent, half a million tons to one million tons a year per plant. They are large consumers next to power plants.

<sup>1</sup> Under a program of Japan International Cooperation Agency (JICA), the IEEJ is supporting the IPP Office, Department of Energy, of South Africa on its Gas Utilization Master Plan study. This paper is prepared from the script for the presentation at the “South Africa Gas Options” conference held on October 3-5, 2016 in Cape Town, Republic of South Africa.

<sup>2</sup> At the conference, the IPP Office, Department of Energy, announced Information of Memorandum that they have decided construction of the country’s first LNG based gas IPP; 2,000MW at Richards Bay and 1,000MW at Coega, Port Elizabeth. Both shall be bundled projects using FSRU. Request for Information (RFI) for pre-qualification will be issued in November 2016, and the final Request for Proposal (RFP) will be released in August 2017 for the shortlisted applicants. This will open up an LNG era in South Africa. Once LNG import facility is installed, imported gas will also be used for gasification of the country in industrial and residential/commercial sectors. The IPP office explained that, although Saldanha Bay (another candidate port 120km northwest of Cape Town) was not selected this time, the location will surely be considered in the next round as they expect country’s gas consumption will keep growing.

Among the category 2, energy-intensive industries such as steel and cement use natural gas for process heat. Their consumption may be slightly smaller than those under category 1.

As these industries use huge amount of natural gas, they will calculate economics of investment for shifting to gas very keenly. If the outcome is positive and gas is available, they will take action. So, if you approach them, they will listen to you with keen interest and respond according to their findings. However, in case of Japan, we do not have industries under category 1 to use imported natural gas as feedstock. Huge energy intensive industries such as steel and cement coming under category 2 use coal rather than natural gas. As shown in Figure-2, coal consumption is greater than natural gas in Japan.

Instead, for category 3, other natural gas users are much smaller and silent. But they are the majority of gas users. They use gas for multiple purposes such as power to drive engines and machines, process heat, space heating/cooling and distributed power generation.

In 2014 in Japan, an average annual gas use per industrial user was only 330 tons in LNG equivalent, for about 63,000 users, totaling above 20 million tons a year. It was 3.5 tons for a commercial user and 300kg for a household as shown in Table-1. LNG consumption of 330 tons a year compares to about 1,000kW electricity consumption for 12 hours a day at 35% generation efficiency.

Table-1 City Gas Consumption per User and Number of Users

	Residential	Commercial	Industrial	Others	Average
City Gas Consumption	m3/year	m3/year	m3/year	m3/year	m3/year
2010	406	4,841	367,362	13,965	1,391
2011	405	4,635	393,167	13,224	1,412
2012	402	4,686	403,657	13,232	1,417
2013	389	4,691	421,582	13,308	1,422
2014	387	4,557	441,506	12,828	1,427
LNG Equivalent	t/year	t/year	t/year	t/year	t/year
2010	0.31	3.7	279.6	10.6	1.06
2011	0.31	3.5	299.2	10.1	1.07
2012	0.31	3.6	307.2	10.1	1.08
2013	0.30	3.6	320.8	10.1	1.08
2014	0.29	3.5	336.0	9.8	1.09
Number of Users	thousands	thousands	thousands	thousands	thousands
2010	27,258	1,287	64	292	28,902
2011	27,397	1,282	64	296	29,039
2012	27,588	1,278	64	300	29,230
2013	27,816	1,274	63	304	29,458
2014	28,089	1,271	63	308	29,731

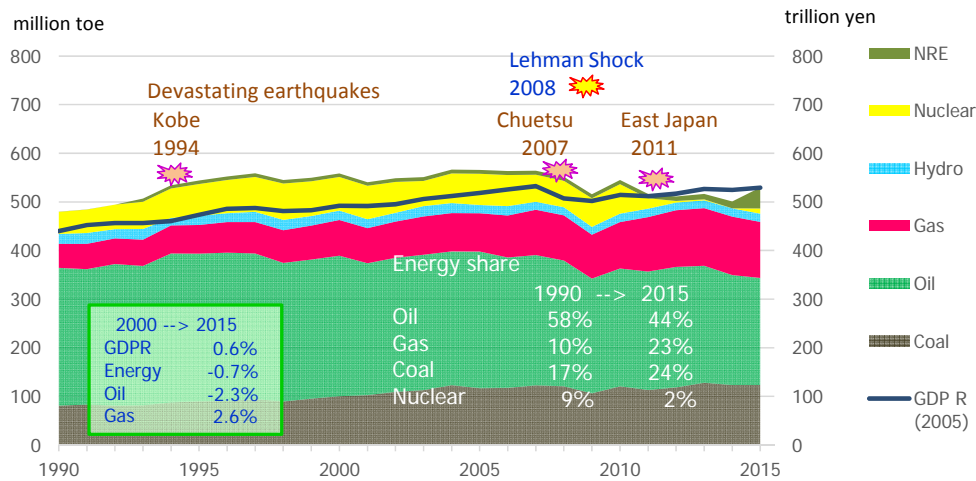
Source: IEEJ

This means, compared with big users, general industrial users consume much smaller amount of gas. However, they may constitute the majority of demand in future. The key issue here is that they are individually too small to initiate construction of gas supply system, but they may take up gas when gas supply becomes available. Aiming at rationalization of the country's

energy mix with natural gas, we should consider how to accommodate these individually tiny but a massive number of users.

In the recent decades, Japanese energy consumption has been leveling off, or, after the East Japan Great Earthquake and Tsunami, it is decreasing reflecting significant efforts for improving energy efficiency. During the recent process of energy upgrading, natural gas consumption increased steadily. Its share among the primary energy supply increased from 10.0% in 1990 to 17.0% in 2010. After the 2011 incident, its share increased to 24.0% to supplement electricity supply lost by shutdown of all nuclear plants in Japan. With re-starting up of several nuclear plants, now the share of natural gas is slightly declining to around 21.0% in 2016.

Fig.2 Primary Energy Supply in Japan



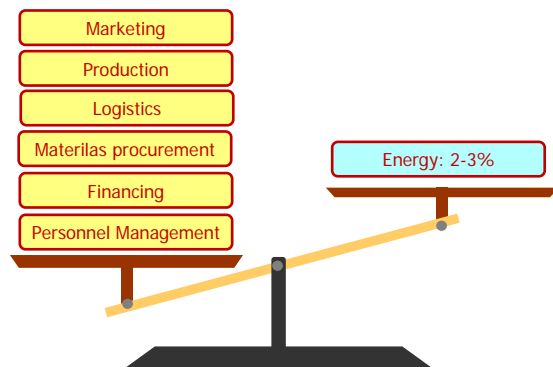
Source: IEEJ

Here, I would like to give one important note.

For most of smaller gas users, price does not matter much in adopting gas as far as they feel it is in a socially acceptable range.

According to our survey, among general industries in Japan except for energy intensive ones, energy cost is around 2-3% of their annual turnover. Therefore, they would not care about energy very much as far as it is convenient to use, supplied stably, of good quality and at a reasonable price. Good energy for these users is an energy of which they need not to care about. Convenience and quality are most important motives for them to select energy rather than its price while an

Fig.3 Priority in Business Management



energy is supplied stably at an affordable and socially acceptable price.

Natural gas is, like electricity, a convenient modern energy. If you need it, you can just turn it on. These two energies are characterized as follows:

- 1) Quick: at any time you can turn it on and off
- 2) Clean: nobody would claim about using it
- 3) Easy to control accurately: precise plant/machine operation is possible
- 4) No technicians needed for energy operation: unlike use of coal or oil
- 5) No stock and delivery management are needed: just signing a contract, you can get it at any time according to the contract
- 6) No price negotiation: for small users, price will be set by the national regulator

Thus, business management would not be bothered by energy. They can allocate their business resources more to the core sectors. In addition, if combined heat and power (CHP) with high energy efficiency is applicable, users can save energy and hence expense a lot. It will be another bonanza.

In this manner, natural gas will significantly contribute to developing economy. Therefore, it is an important social requirement for the government to prepare stable and reliable gas supply networks, with a reasonable gas price, for those tiny but massive energy users who cannot initiate gasification by themselves.

Thank you

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