

Energy in Japan

Research Analysts

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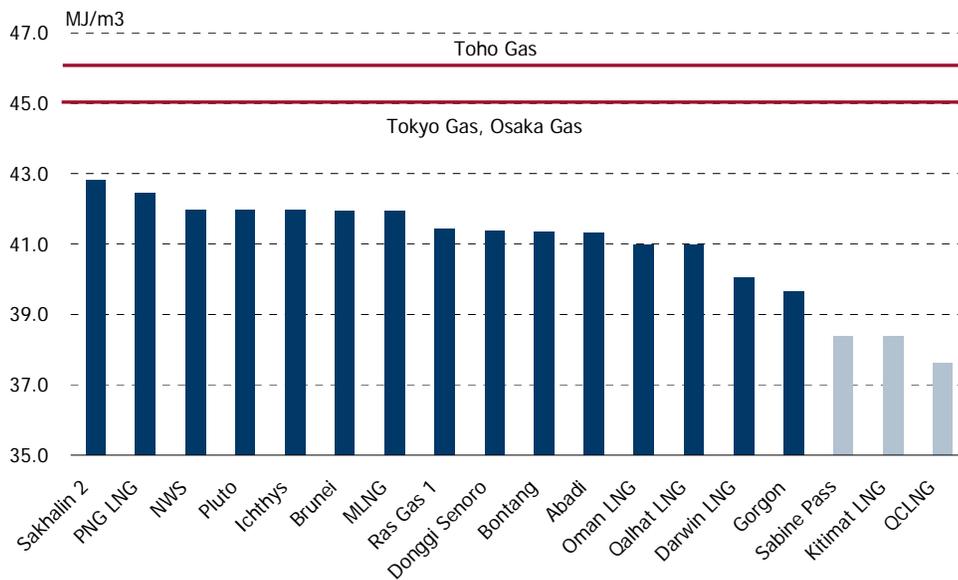
COMMENT

No.3: On the introduction of shale gas (3)

- **Various categories of natural gas:** In this report, we compare the calorific value of shale gas and other natural gas resources. Just as crude oil can be classified as either light or heavy, gas has various properties. The main difference lies in the amount of energy generated; in short, the calorific value. Generally speaking, unconventional natural gases are described as “lean”, in the sense of having low calorific value. (That same concept was behind the lean-burn technology employed in automotive engines a little while ago.)
- **City gas has calorific value of 45–46MJ/m³:** With some exceptions, the gas supplied by Japan's major city gas vendors has a calorific value of around 45–46 megajoules per cubic meter. Gas-burning equipment, especially industrial gas burners is designed to suit this calorific value. Any divergence can result in non-optimal combustion, with less-than-ideal results.
- **Calorific value averages 41–42MJ/m³ for conventional LNG, 37–38MJ/m³ for unconventional natural gases:** For the most part, the LNG procured by Japan's city gas vendors has a calorific value of 41–42MJ/m³. By contrast, projects producing unconventional natural gas (i.e., Sabine Pass, Kitimat, and Queensland Curtis Liquefied Natural Gas [QCLNG]) have a calorific value of 37–38MJ/m³.
- **LPG added to adjust calorific value:** Even LNG based on conventional natural gas does not meet the calorific value benchmark of 45–46MJ/m³ required for city gas supplies; LPG is added for the purpose of energy content adjustment. Based on their fuel cost adjustment system coefficients, we estimate that the gas supplied by Tokyo Gas (9531, UNDERPERFORM, TP ¥320) has an LPG content of roughly 3%, as compared with about 2% at Osaka Gas (9532, NEUTRAL, TP ¥300), and around 7% for Toho Gas (9533, UNDERPERFORM, TP ¥400). If the gas companies make greater use of lean LNG, we would also expect increased consumption of LPG for the purpose of boosting the heating value.
- **Tokyo Gas to introduce lean LNG:** Tokyo Gas in 2015 will start procuring 1.2mn tonnes per year of lean LNG from QCLNG, sourced from coal bed methane (CBM) gas. This amounts to roughly 11% of Tokyo Gas' FY10 LNG procurement volume of 10.69mn tonnes (strictly speaking, though, the ratio is likely lower owing to the low calorific value of the QCLNG supplies). With this, the company is planning to consume 8.49mn tonnes of LPG in FY15, up 72% YoY.
- **Minimal investment required to support increase in LPG consumption:** While a steep increase in LPG consumption would require the installation of additional LPG tanks, for the purposes of procuring gas from QCLNG we think Tokyo Gas can make do with existing facilities. Ultimately, though, the cost of building LPG tanks is not all that great, and should not prove an impediment to use of lean LNG.

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Figure 1: Comparison of calorific values for various LNG projects



Source: Industry data, Credit Suisse estimates

Lack of visibility on LPG pricing: If there are challenges, we think they come in the form of pricing, and environmental concerns. The current international LPG benchmark price is the weighted average of contract prices (CPs) set monthly by Saudi Aramco for the main constituents, propane and butane. As such, there is a certain lack of visibility on LPG pricing. That said, the impact of LPG pricing on city gas suppliers' overall input costs is less than it once was.

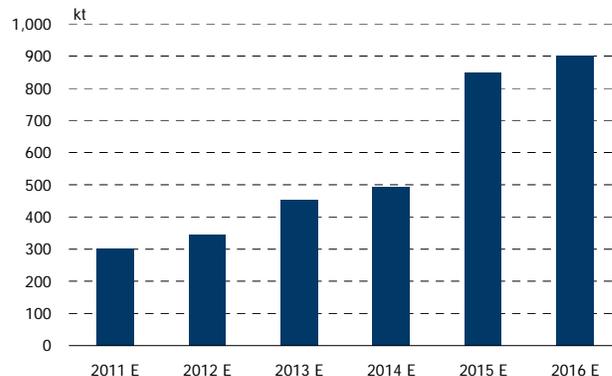
Diminishing price gap between LNG and LPG, on calorific parity basis: According to data for FY02–10 from the Agency for Natural Resources and Energy, an CIF price index assuming calorific parity shows that LNG has generally been priced at around 60–70 where LPG = 100. In short, because LNG was cheaper on a calorific parity basis, the use of LPG for energy content adjustment had the effect of increasing overall costs. Since FY11, however, LNG prices have been rising, such that in February 2012, LNG stood at 91.3 to LPG's 100.

Figure 2: LNG price assuming calorific parity (LPG = 100)



Source: Agency for Natural Resources and Energy

Figure 3: Tokyo Gas' forecast LPG consumption

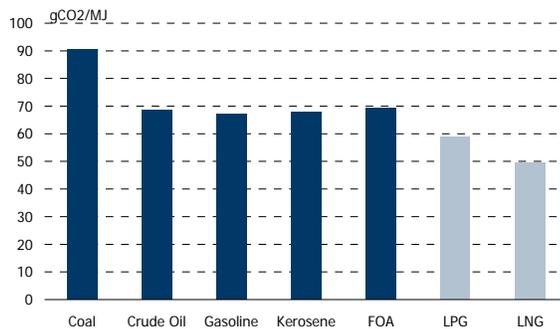


Source: Company data

Impact on gas rates also conceivable: As a consequence of the diminishing price gap between LNG and LPG on a calorific parity basis, LPG now has less impact on city gas companies' average input costs. Owing to the aforementioned lack of visibility on LPG pricing, however, it is difficult to predict how the relationship will change. If a city gas company decided to procure large volumes of lean LNG at a time when the cost of LPG was again markedly higher, this would inflate the average cost of raw materials, which would likely have an impact on gas rates.

LPG's CO₂ emissions 19% higher than those for LNG: It is cause for some concern that an increase in LPG consumption would bring about growth in CO₂ emissions. According to the Japan LP Gas Association, LPG emits 59g of CO₂ per megajoule of energy produced, 19% higher than the equivalent figure of 49.5g for LNG. While LPG is considered more environmentally friendly than either coal (90.6g CO₂) or crude oil (68.6g), the comparison with LNG is not so favorable.

Figure 4: CO₂ emissions resulting from combustion of various fuels



Source: Ministry of the Environment

Possible to reduce emissions through fuel changeover...: There may not be too much need for concern, in that the increasing number of options for sourcing LNG offers city gas companies the opportunity to rein in procurement costs, accelerating fuel changeover from oil-fired burner to natural gas-fired, and in doing so lower overall emission volume. At a time, though, when a declining nuclear capacity factor makes a total mockery of Japan's goal of reducing CO₂ emissions to 25% below 1990 levels, one has to wonder about the wisdom of a change in tack that would have CO₂ emissions increasing, even if only slightly.

Lowering sendout rates another option: Earlier in this report, we mentioned that combustion of fuels with a non-optimal sendout rates can deliver less-than-ideal results. In reality, this only applies to industrial applications where temperatures must be strictly controlled. Providing the city gas used is of the 13A specification, there is no such concern with residential gas appliances. A comparison of the 13A standard with current sendout rates suggests that there is scope for the major city gas suppliers to lower calorific values by another 2MJ or so. Lowering sendout rates would likely become a realistic option if city gas companies were to start utilizing large volumes of lean LNG.

Likely to be no great impact on power generation: Thus far in this report we have confined our discussion to city gas companies. Finally, we would like to comment on the implications for gas-fired power generation. According to the electric power companies we interviewed, their boilers can cope with some disparity in calorific values, and even if that were not the case, it would not require too much work to bring the boilers up to par. That concludes for now our discussion on the introduction of shale gas. In the next in our series on Energy in Japan, we will be looking at LNG demand in Japan.

Reports in this series:

[Energy in Japan: No.2: On the introduction of shale gas \(2\)](#) (12 April 2012)

[Energy in Japan: No. 1: On the introduction of shale gas \(1\)](#) (9 April 2012)

Companies Mentioned (Price as of 16 Apr 12)

Osaka Gas (9532, ¥326, NEUTRAL, TP ¥300, MARKET WEIGHT)

Toho Gas (9533, ¥493, UNDERPERFORM, TP ¥400, MARKET WEIGHT)

Tokyo Gas (9531, ¥387, UNDERPERFORM, TP ¥320, MARKET WEIGHT)

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