Present LNG prices after high oil price period

Higher prices force annual spending for LNG imports to expand by JPY500 billion

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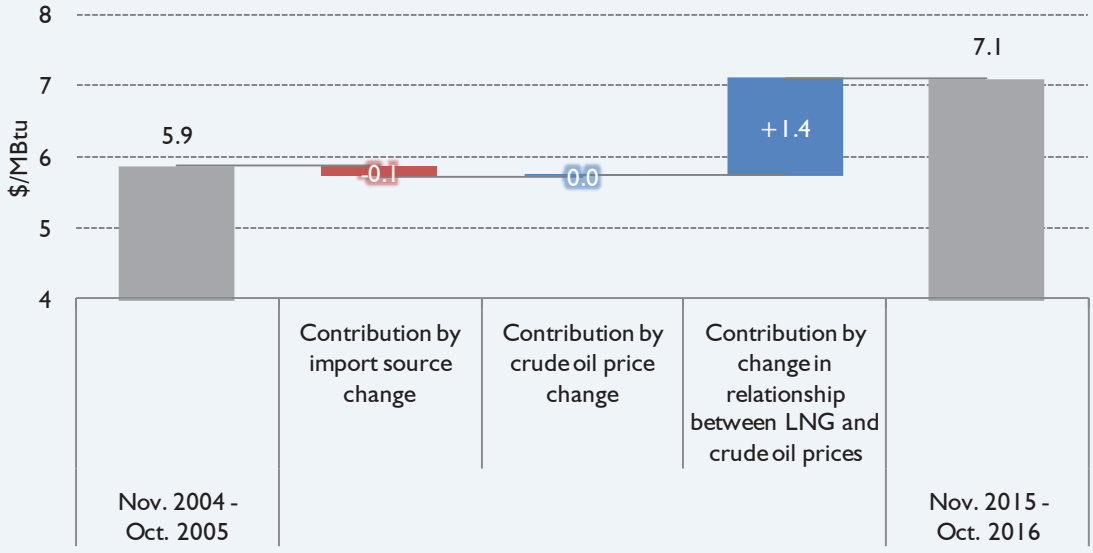
Summary

The price for liquefied natural gas imports in Japan stood at $7.23 per million British thermal unit in October 2016, less than half of the price of more than $15/MBtu in and before 2014. Crude oil price plunges have led to the LNG price decline, which is favourable for LNG users and consumers of city gas and electricity from LNG.

However, the present LNG price level may not be very welcome. This is because the LNG price has not declined to earlier levels despite the loosening supply-demand balance. While the crude oil price (three months ago) for the past year stood at $43 per barrel, close to $44/bbl 11 years ago, the LNG price for the past year came to $7.1/MBtu, up $1.2/MBtu from $5.9/MBtu 11 years ago. LNG, though cheaper than crude oil on a calorific value basis, is higher priced than earlier.

The gap between the 11-year earlier and present LNG prices has been decomposed into contributions by three factors – (1) import source change, (2) crude oil price change and (3) change in LNG prices' relationship with crude oil price. The decomposition indicates that the change in LNG prices' relationship with crude oil price made the greatest contribution of $1.4/MBtu to the price hike. The factor is estimated to have boosted Japan's annual spending for LNG imports by JPY500 billion.

Figure | Contributions to LNG price change [November 2004 - October 2005 → November 2015 - October 2016]



A factor behind the change in the relationship between crude oil and LNG prices may be crude oil prices' hike that lasted for about 10 years. Rumours said that LNG prices were set at relatively higher levels through a pricing formula change when long-term LNG contracts were concluded during the high oil price period. The high oil price period has gone away, leaving such after-effect.

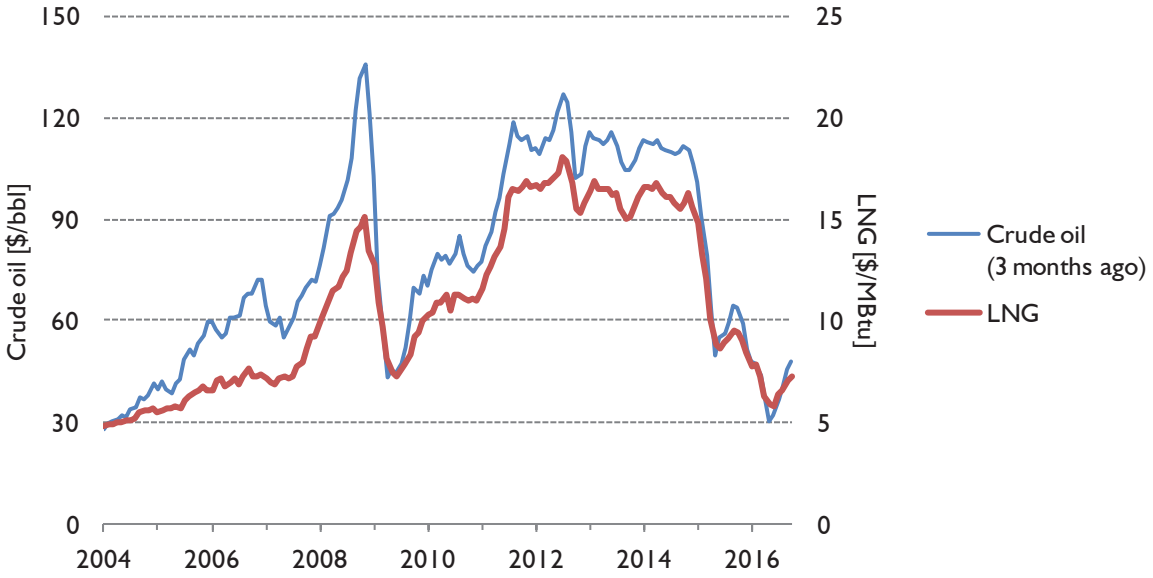
Keywords: LNG price, oil price

LNG prices indexed to crude oil price could impose an additional cost on LNG consuming countries through volatile crude oil fluctuations. The reasonability of indexing LNG prices to crude oil price has declined. The diversification of LNG pricing formulas should be promoted along with the development of a flexible, liquid LNG market and the formation of a benchmark price reflecting the LNG supply-demand balance.

LNG prices have declined. However, …

The liquefied natural gas import price[1] for Japan in October 2016 stood at $7.23 per million British thermal unit, up a little more than $1.4/MBtu from the bottom in June 2016 (Figure 1). Even after the small hike, however, the LNG price is less than half of the price of more than $15/MBtu seen until 2014. This is because the LNG price under long-term contracts is indexed to Japan's crude oil import price[2] about three months ago, although signs of changes in the pricing formula have gradually emerged. Crude oil price plunges from the autumn of 2014 led to the LNG price decline, which is favourable for LNG users and consumers of city gas and electricity from LNG.

Figure 1 | Crude oil and LNG prices



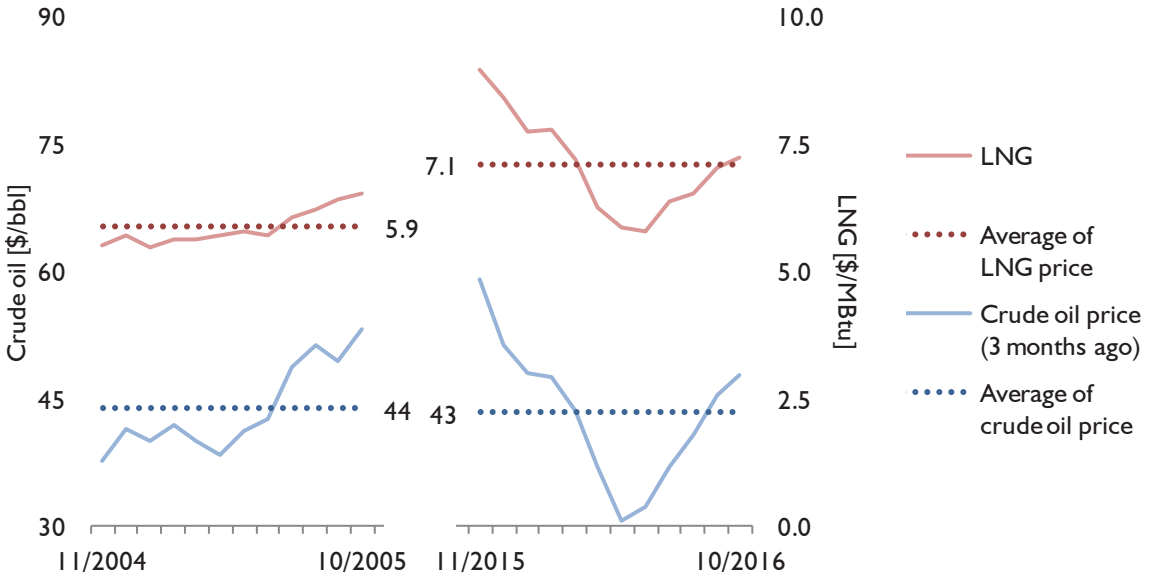
Note: The crude oil price is the level three months ago, to which the LNG price is indexed.
Source: Institute of Energy Economics, Japan, "EDMC Energy Trend"

However, the present LNG price level may not be very welcome. This is because the LNG price has not declined as much as the crude oil price. The LNG price has traditionally been set at a higher level than indicated by the crude oil price during a low oil price period and at a lower level during a high oil price level due to the pricing formula for long-term LNG contracts. In this sense, the fact that the LNG price has not declined as much as the crude oil price indicates the traditional trend.

Another reason for describing the present LNG price as not very welcome is that the LNG price has not declined to earlier levels despite the loosening supply-demand balance. The average crude oil price for the past year (November 2015 - October 2016) is $43/bbl[3], close to $44/bbl 11 years ago (November 2004 - October 2005) (Figure 2). In contrast, the LNG price for the past year is at $7.1/MBtu, up $1.2/MBtu from $5.9/MBtu 11 years ago. In this way, the current LNG price is higher than earlier.

[1] Hereinafter, referred to as the LNG price.
[2] Hereinafter, referred to as the crude oil price.
[3] This price is a simple average of monthly data. This is the same case with the following.

Figure 2 | Crude oil and LNG prices [November 2004 - October 2005 and November 2015 - October 2016]



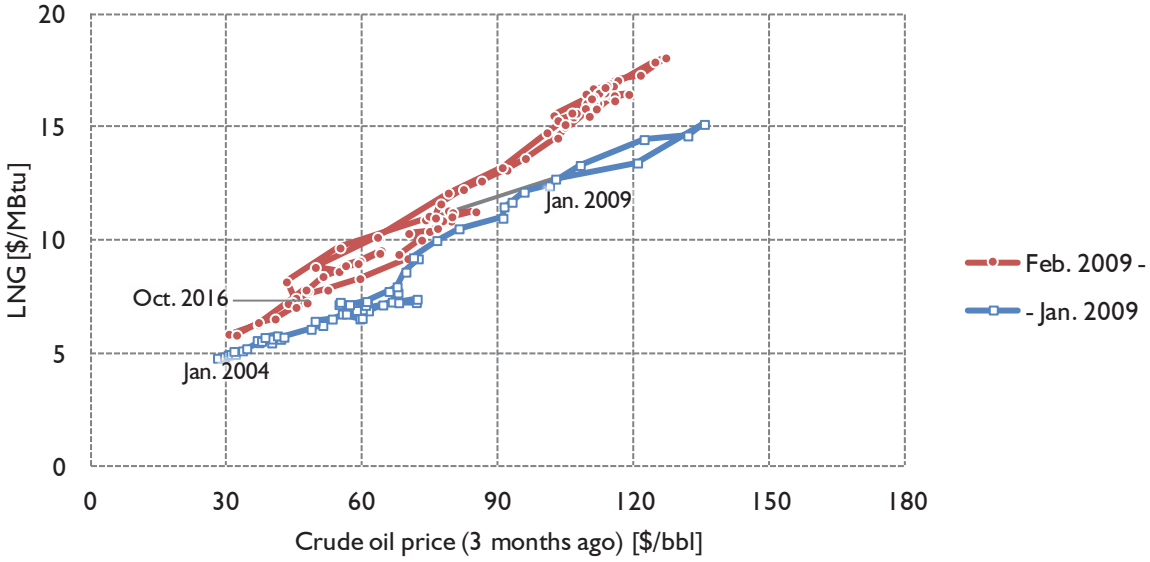
Source: Institute of Energy Economics, Japan, "EDMC Energy Trend"

Change in relationship between crude oil and LNG prices

Why has the LNG price become higher than earlier?

First, let us look into when the LNG price became relatively higher. The LNG price has been higher than earlier in comparison with the crude oil price since around early 2009 as shown in Figure 3. Next, a quantitative analysis is done on the relationship between the crude oil and LNG prices until January 2009 and their later relationship.

Figure 3 | Comparison between crude oil and LNG prices



Source: Institute of Energy Economics, Japan, "EDMC Energy Trend"

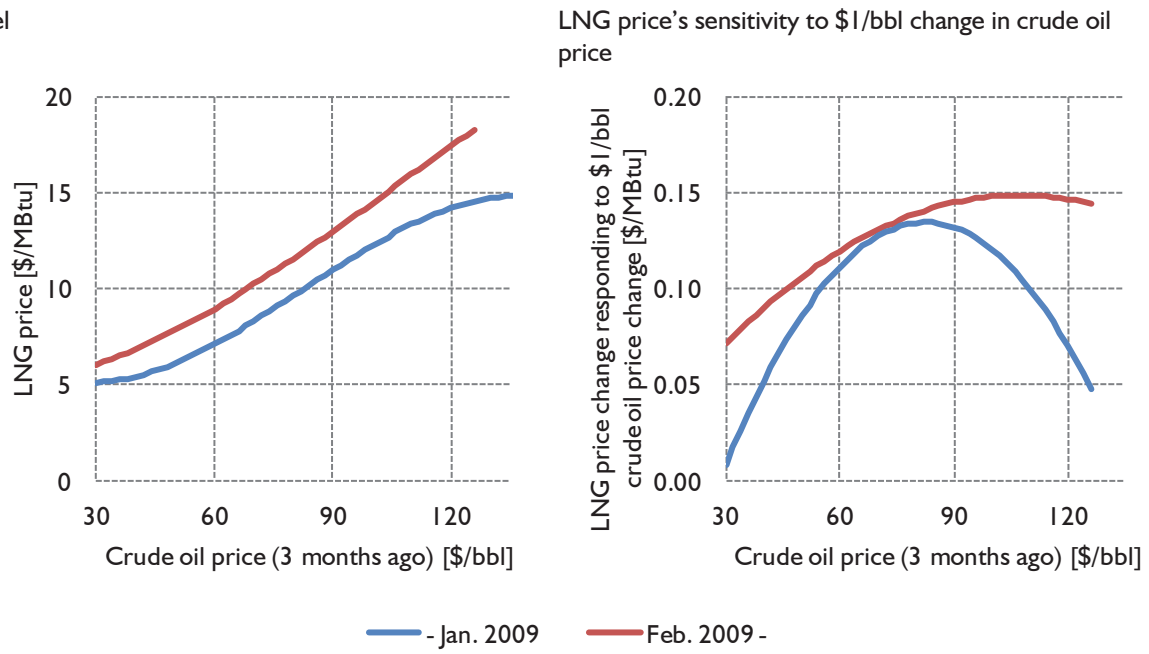
The relationship between P_{LNG} [$/MBtu] for the LNG price and P_{CR} [$/bbl] for the crude oil price between January 2004 and January 2009 were as follows:

$$P_{LNG} = 7.48 - 0.179 \times P_{CR} + 0.00380 \times P_{CR}^2 - 0.0000153 \times P_{CR}^3,\ R^2 = 0.98 \quad (1)$$

The relationship is estimated to have changed to the following between February 2009 and October 2016 (left side of Figure 4)[4]:

$$P_{LNG} = 4.93 - 0.000776 \times P_{CR} + 0.00139 \times P_{CR}^2 - 0.00000433 \times P_{CR}^3, R^2 = 0.99 \quad (2)$$

Figure 4 | Relationship between crude oil and LNG prices



Source: Estimated based on Institute of Energy Economics, Japan, "EDMC Energy Trend"

Indications are that the LNG price is higher than earlier when the crude oil price is $30/bbl or higher. This is attributable to a rise in the fixed portion of the LNG price. Given the present conditions, rewriting the crude oil prices in Equations (1) and (2) as the deviations from the past year's average of $43/bbl into those in Equations (1') and (2') explicitly indicates that the fixed portion of the LNG price rises from $5.61/MBtu to $7.16/MBtu, making the rise easier to understand.

January 2004 - January 2009:

$$P_{LNG} = 5.61 + 0.0637 \times (P_{CR} - 43) + 0.00181 \times (P_{CR} - 43)^2 - 0.0000153 \times (P_{CR} - 43)^3 \quad (1')$$

February 2009 - October 2016:

$$P_{LNG} = 7.16 + 0.0955 \times (P_{CR} - 43) + 0.000832 \times (P_{CR} - 43)^2 - 0.00000433 \times (P_{CR} - 43)^3 \quad (2')$$

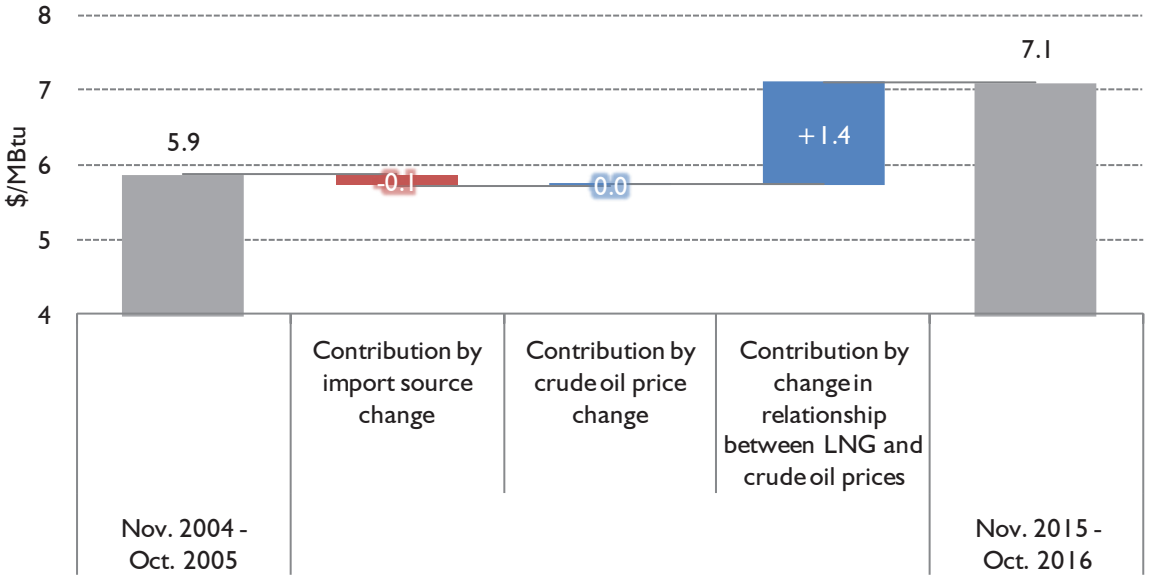
At the same time as the fixed portion rises, the LNG price's sensitivity to the crude oil price increases (right side of Figure 4). If the crude oil price increases on a decision by the Organization of the Petroleum Exporting Countries to cut production as expected, the LNG price's upward deviation from the earlier level may expand further[5].

Similar estimation has been conducted for Australia, Malaysia, Qatar, Indonesia, the United Arab Emirates and Brunei, which cover about 80% of Japan's LNG demand, and other countries. Based on the estimation, the gap of $1.2/MBtu between the 11-year earlier LNG price of $5.9/MBtu and the present level of $7.1/MBtu is decomposed into contributions by three factors – (1) import source change, (2) crude oil price change and (3) change in LNG prices' relationship with crude oil price (Figure 5).

[4] Long-term LNG contracts occasionally establish the so-called S-curve formula. For descriptive purposes, therefore, this paper assumes a model in which the LNG price follows the cubic function of the crude oil price.

[5] Conversely, if the crude oil price slips below $20/bbl, the LNG price's increased sensitivity to the crude oil price may offset the upward deviation of the fixed portion to make the LNG price relatively lower than earlier. In recent years, however, the crude oil price has not slipped below $30/bbl. There are no actual data. Extrapolation into any area lacking actual data should be done carefully if a high-dimensional function were used, as is the case with this paper.

Figure 5 | Contributions to LNG price change [November 2004 - October 2005 → November 2015 - October 2016]



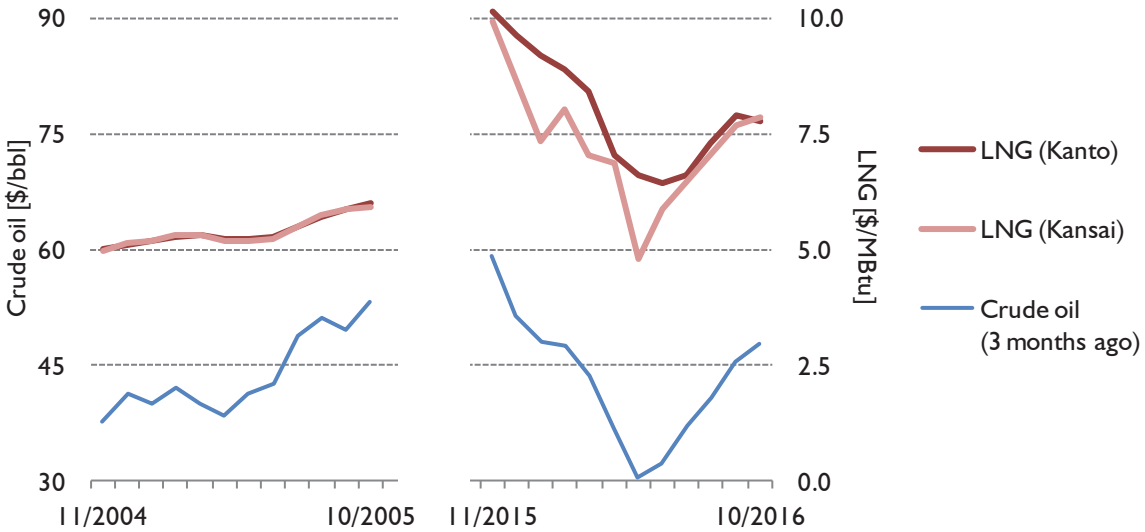
Reflecting decreased natural gas reserves and increased demand in Southeast Asia and new LNG plants in other regions, Southeast Asia's share of LNG imports into Japan is declining with shares increasing for Australia, Qatar and Russia. Such change in the LNG import mix has worked to cut the LNG price by $0.1/MBtu. Given that the crude oil price now stands at almost the same level as 11 years ago, it makes little contribution to the LNG price change.

The change in the relationship between the crude oil and LNG prices made a greater contribution than those changes. The greater contribution comes to a little more than $1.4/MBtu. A factor behind the change in the relationship between crude oil and LNG prices may be crude oil prices' hike that lasted for about 10 years from the mid-2000s[6]. Rumours said that there might be a pricing formula change that could push up the LNG price when long-term LNG contracts were concluded during the high oil price period.

While pricing formulas in specific contracts have not been published, there are cases in which pricing formula changes can be guessed. For example, most LNG imports from Brunei are based on long-term contracts between Brunei LNG as supplier and Tokyo Electric Power Co., Tokyo Gas Co. and Osaka Gas Co. as importers. When these long-term contracts were extended again in March 2013, the pricing formula might have been revised. In fact, Figure 6 indicates a change in the relationship between the crude oil and LNG prices around the re-extension.

[6] An increase in spot LNG transactions over recent years could influence the relationship between the crude oil and LNG prices. However, the spot LNG import price over the past year stood at $6.2/MBtu (according to a spot LNG price survey by the Ministry of Economy, Trade and Industry), slipping below the average price of $7.1/MBtu for all LNG imports. This means that growing spot LNG transactions can mitigate the LNG price's upward deviation from earlier levels.

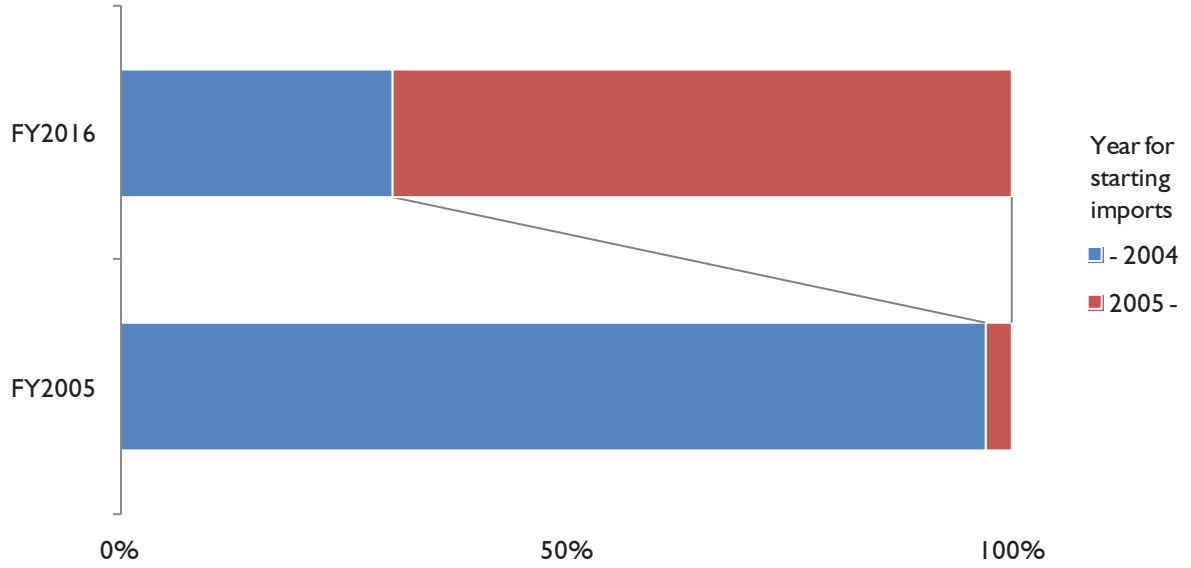
Figure 6 | Crude oil price and price of LNG imported from Brunei [November 2004 - October 2005 and November 2015 - October 2016]



Note: Imports into Kanto cover those through Yokohama, Chiba, Kawasaki and Kisarazu customs houses. Imports into Kansai cover those through Sakai and Himeji customs houses.
Source: Ministry of Finance, "Trade Statistics"

In FY2016, long-term contracts that started in the high oil price period from 2005 account for about 70% of all long-term contracts for LNG imports into Japan (Figure 7). The increase in LNG imports under contracts signed during the high oil price period might have brought about higher LNG prices than earlier.

Figure 7 | Long-term LNG contracts by year for starting imports



Note: Indicative data

Still large after-effect of crude oil price hikes

The LNG price hike of $1.4/MBtu attributable to the change in the relationship between the crude oil and LNG prices is estimated to boost Japan's annual LNG import spending by some JPY500 billion. The sum is four to five times as much as the annual oil and coal tax revenue for LNG of a little more than JPY100 billion. The LNG price's increased

sensitivity to the crude oil price means that future crude oil price hikes could further expand the LNG price's upward deviation from earlier levels. The high oil price period has gone away, leaving such after-effect.

The indexation of LNG prices to crude oil price could impose an additional cost on LNG consuming countries through volatile crude oil price fluctuations. The reasonability of indexing LNG prices to volatile crude oil price has declined. The diversification of LNG pricing formulas should be promoted along with the development of a flexible, liquid LNG market and the formation of a benchmark price reflecting the LNG supply-demand balance.

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