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Energy Industry Forecasting Systems

North America LNG Exports to the Eastern Hemisphere
An Emerging Sea Change in World Gas Prices

Dr. Thomas J. Woods, RBAC Inc., October 18, 2012

North American LNG imports began to grow strongly in the mid-1990s, peaking at almost 2.4 Bcf/d in 2007, almost 10% of world LNG imports in that year. North American gas demand was growing, but North America gas production was not. Prospects for continued strong growth in LNG imports appeared solid.

However, since 2007, North American gas production has grown strongly, and is on a pace to approach 31 Tcf in 2012. This reflects rapidly expanding gas production from shales, which should account for about one third of North American gas production in 2012. Because this growth has outstripped the growth in North American gas demand, LNG imports have fallen substantially. In 2012, U.S. imports are on a pace to be down more than three fourths from their 2007 peak. Canada imports are down almost half from their 2011 peak; Mexico imports are down about 10% from their 2010 peak, despite a new terminal in Manzanillo.

In fact, some LNG imported into North America began to be re-exported in late 2009 to take advantage of arbitrage opportunities between North American LNG prices and non-North American prices. In 2010, 28 Bcf of LNG were re-exported from Gulf Coast terminals, about 7% of total U.S. LNG imports. In 2011, almost 54 Bcf of LNG were re-exported, more than 15% of LNG imports. Even one LNG cargo was re-exported from Costa Azul in Baja California in 2011. In 2012, the United States has re-exported 10 Bcf, about 10% of total imports during the period.

Prospects for continued production growth are good, especially in the United States and Canada, with production possibly exceeding 40 Tcf in the next 25 years. This would very likely exceed growth in North American gas demand, and render it difficult for Arctic gas to enter North American gas markets without setting off strong gas-on-gas competition. As a result, a large part of North American gas production could be looking for markets outside of North America.

Growth in gas production has been accompanied by strong declines in North American gas prices, which are down more than three fourths from their mid-2008 peak. However, imported gas prices in the Asia Pacific Rim and in Europe, which are generally linked to crude oil prices, are running well above North American gas prices. In late September, North Asia spot prices are more than $10/MMBtu above Henry Hub, and prices in Northwest Europe are about $7/MMBtu above Henry Hub. If these price differentials remain wide, this could provide opportunities for North American LNG to profitably compete for market share in the Asia Pacific Rim and Europe.

However, significant market resistance has begun to develop in Asia and Europe to the linkage between oil and gas prices. As a result, price differentials between North American and Asia Pacific Rim/Europe gas prices could begin to narrow. Such a narrowing would not necessarily preclude North American LNG exports, but they could affect their prospects. This essay will provide a context within which to assess prospects for North American LNG exports to markets in Asia or Europe and the extent to which those opportunities reflect competitiveness of these exports or their attractiveness in enhancing LNG supply diversity and weakening the oil-gas price linkage.

North America LNG Exports to the Eastern Hemisphere

World LNG Prices

Spreads between world LNG prices and U.S. gas wellhead prices exceed the costs to liquefy gas and transport LNG to non-North American gas markets. Figure 1 presents annual landed LNG prices for Korea and Japan (North Asia) and for Belgium and the United Kingdom (Northwest Europe) since 1995. With the exception of 2005, North Asia LNG prices have exceeded Northwest Europe prices. Through 2004, the difference was a bit over $1 per Mcf. Beginning in 2007, the difference began to grow. Thus far in 2012, North Asia prices have averaged more than $7.50 per Mcf above Northwest Europe prices. A large part of the growth since 2004 reflects the rise in world oil prices.

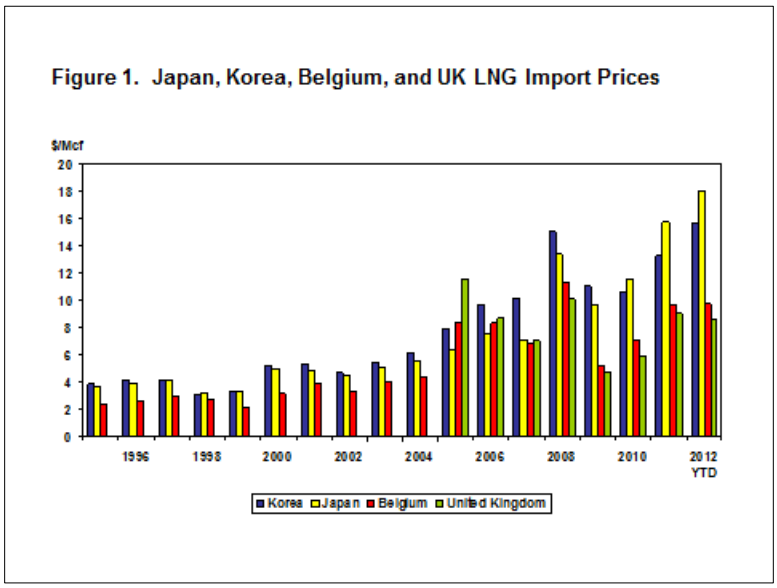

Figure 2 presents spreads between annual North Asia and Northwest Europe LNG prices and average U.S. wellhead prices. Current wide spreads between are a recent occurrence. In the late 1990s, spreads narrowed, especially in Northwest Europe. Between 2000 and 2004, Northwest Europe LNG prices were often less than U.S. wellhead prices. Between 2002 and 2005, North Asia LNG prices fluctuated about U.S. wellhead prices. After 2007, spreads began to grow significantly, especially in North Asia.

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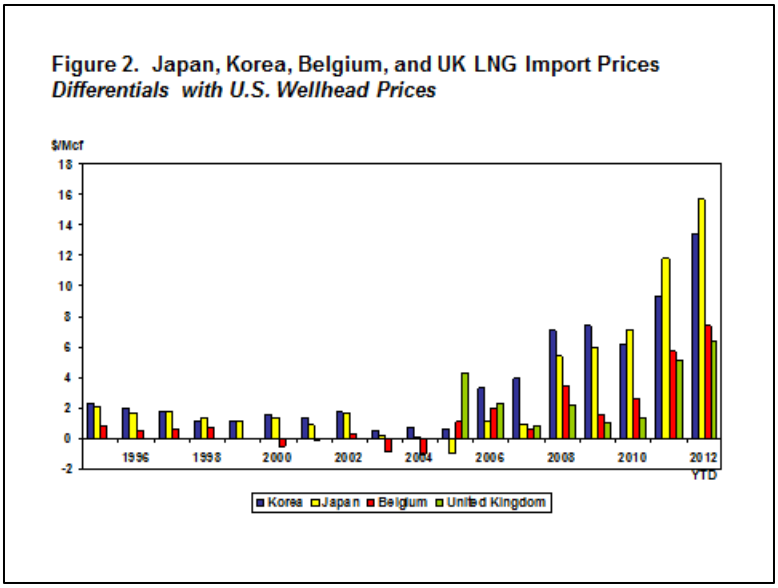

The recent widening spreads have been principally driven by three factors.

- The first factor is the continued linkage between LNG prices and oil prices, especially in North Asia. Year-to-date in 2012, Brent prices are averaging about $40 per barrel above their 2007 level.
- The second is the widening spread between U.S. gas and oil prices, reflecting effects of gas-on-gas and gas-on-coal competition in North American gas markets. Year-to-date in 2012, U.S. wellhead oil prices are averaging about $14.50 per MMBtu above gas wellhead prices, compared to only about $1.70 per MMBtu in 2005.
- The third factor is a wide spread that has developed between U.S. oil prices and world oil prices (e.g., Brent and WTI prices) since mid-2010. Year-to-date in 2012, Brent prices are averaging almost $16 per barrel above WTI prices, compared to $0.13 per barrel in 2010.

Figure 2 shows that, year-to-date in 2012, North Asia (Korea and Japan) average prices are running about $14.50 per Mcf above U.S. wellhead gas prices, compared to $2.40 per Mcf in 2007. About one fourth of the growth since 2007 reflects the widening spread between U.S. and world oil prices. The spreads between Northwest Europe (Belgium and UK) and U.S. prices are running almost $7.00 per Mcf, compared to less than $0.70 per Mcf in 2007. More than 40% of this growth reflects the widening spread between U.S. and world oil prices.

North American LNG Export Market Opportunities

Investments to liquefy North American gas production for delivery to Eastern Hemisphere markets are unlikely to be made without long-term, base-load delivery agreements. Such agreements will be based on either a desire to diversify supply sources, even if delivered North American LNG prices are somewhat higher than other sources or expectations that North American LNG prices will be competitive with other, principally Eastern Hemisphere, LNG sources. Because most non-North America liquefaction plant-gate prices are likely to be comparable to or lower than North American liquefaction plant-gate gas prices, transportation charges will play a critical role in the competitiveness of North American LNG exports. The greater the shipping distance advantage for North America LNG, the larger its competitive cushion to compete for market share.

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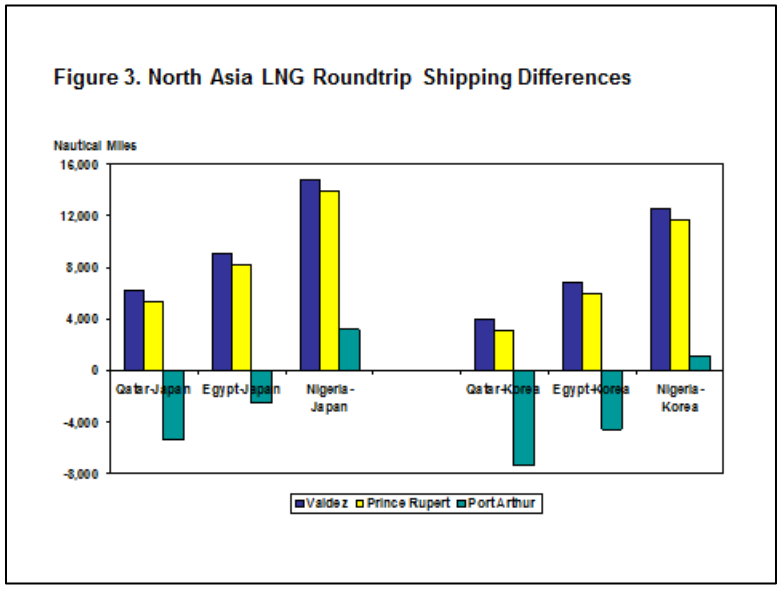
Figure 3 compares nominal, roundtrip shipping differences for North America LNG exports to North Asia (Korea and Japan) from Valdez, Alaska, Prince Rupert, British Columbia, and Port Arthur, Texas. Positive differences indicate lower North America LNG shipping charges; negative differences higher shipping charges. Both Valdez and Prince Rupert exports have positive shipment differences over Middle East (Qatar), Mediterranean (Egypt), and West Africa (Nigeria). Viewed in a different way, a single ship running to North Asia from Prince Rupert (at 18.5 knots) could make almost three round trips in the time it would take a ship to make a single round trip between Nigeria and North Asia. Relative to Mediterranean sources, the difference would be about two roundtrips. As a result, it appears reasonable to expect that Alaska and British Columbia have a strong competitive cushion vis-à-vis Mediterranean and West Africa LNG deliveries to North Asia. While they also have a shipping advantage over Middle East LNG, the shipping advantage might not be sufficient to offset the Middle East liquefaction plant-gate price cushion.



Gulf Coast (Port Arthur) LNG only has a shipping advantage over West Africa sources. It has a modest advantage over West Africa LNG for deliveries to Tokyo, but a very small advantage for shipments to Korea. Because Gulf Coast shipments pass through the Panama Canal, tolls and added shipping time would reduce the Japan advantage or could essentially eliminate the Korea advantage. This suggests that Gulf Coast LNG deliveries to North Asia would more likely reflect long-term contracts to diversify LNG sources and weaken the oil-gas price linkages.

Figure 4 compares nominal, roundtrip shipping differences for Gulf of Mexico LNG exports to Northwest Europe (Belgium) and Southwest Europe (Spain) from Port Arthur, Texas. Gulf Coast LNG exports to Europe have no positive shipping cushions over Mediterranean and West African ports, but a significant cushion over deliveries to Northwest Europe from the Middle East. About three roundtrips could be completed between Port Arthur and Zeebrugge in the time it would take for about two roundtrips between Qatar and Zeebrugge. However, Persian Gulf LNG sources have a large liquefaction plant-gate price advantage over Gulf Coast LNG facilities, which can probably offset the Gulf Coast shipping distance advantage. This suggests that Gulf Coast LNG deliveries to Northwest Europe would more likely reflect long-term contracts to diversify LNG sources and weaken the oil-gas price linkages.

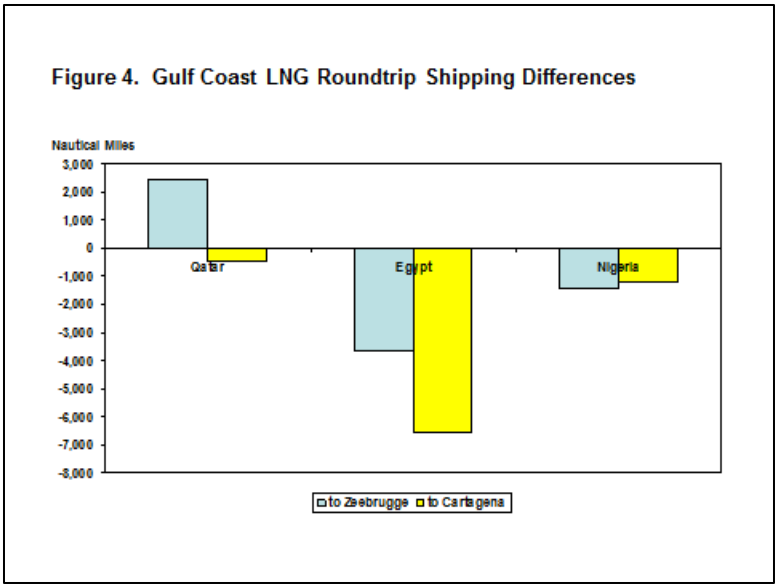
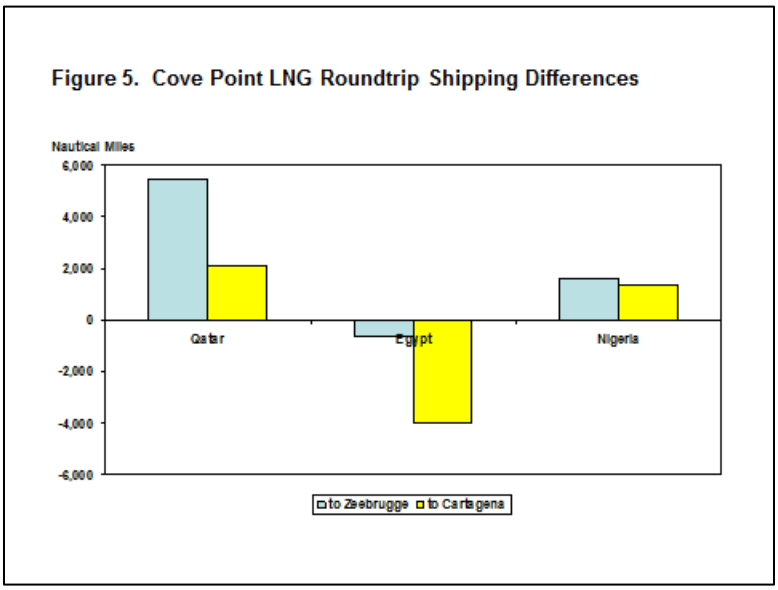


Figure 5 compares nominal, roundtrip shipping differences for Cove Point (Atlantic Coast) LNG exports to Northwest Europe (Belgium) and Southwest Europe (Spain). Cove Point LNG exports to Europe have no positive shipping cushions for Mediterranean ports, but a significant cushion over deliveries to Northwest Europe from the Middle East and a more modest advantage over LNG from West Africa. Almost two roundtrips could be completed between Cove Point and Zeebrugge in the time that only about one roundtrip between Qatar and Zeebrugge. About four roundtrips could be completed between Port Arthur and Zeebrugge in the time for about three roundtrips between West Africa and Zeebrugge, but that difference would widen for West Africa sources south of Nigeria (e.g., Angola).



Cove Point will liquefy Appalachian Basin gas production, and Appalachian Basin wellhead gas prices are likely to become the lowest gas prices in North America in coming years. As a result, Cove Point LNG may be able to compete head-to-head in Northwest Europe with Middle East gas and possibly some West Africa LNG, especially south of Nigeria.

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North Asia LNG Export Market Prospects

Through 2002, almost all North Asia LNG imports were obtained from Pacific Rim or Middle East countries. After 2002, "spot cargos" began to be delivered from Mediterranean and Atlantic Basin sources. After 2009, a modest volume of re-exported LNG was delivered from Europe or North America. Figure 6 presents the trend in annual LNG deliveries to North Asia from sources outside the Pacific Rim and Middle East ("spot cargos"). The figure also shows horizontal lines at 600 MMcf/d and 1,800 MMcf/d, the current capacity range for the Kitimat project.

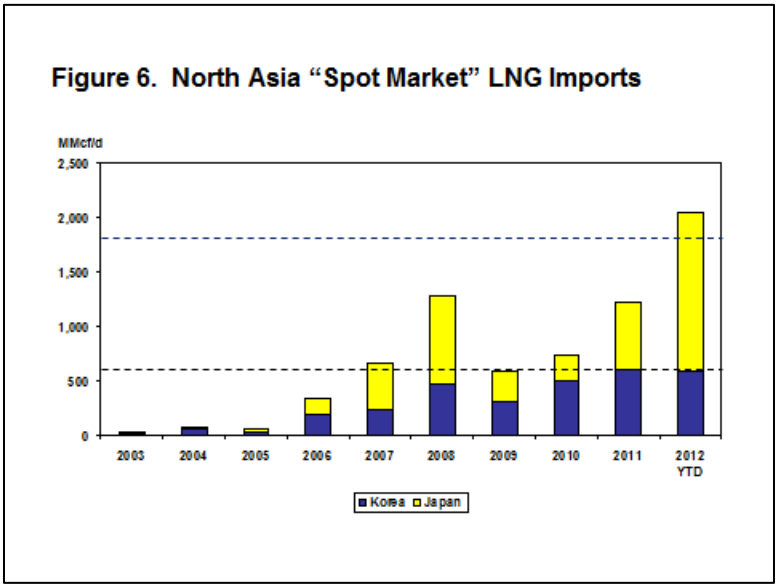

Figure 6 shows a strong, but erratic growth in "spot market" LNG imports by North Asia. Most of the variability in the growth occurs for Japan. Korea "spot market" trends show a less erratic upward trend. The 2006-08 surge reflects effects of a limited Japan nuclear shutdown, and the 2011-12 surge reflects the total nuclear shutdown following the 2011 earthquake and tsunami. Currently, Korea "spot market" annual purchases are averaging about 600 MMcf/d, and should continue to grow. Japan "spot market" purchases are more than double those of Korea, but the difference mostly reflects the nuclear shutdown.

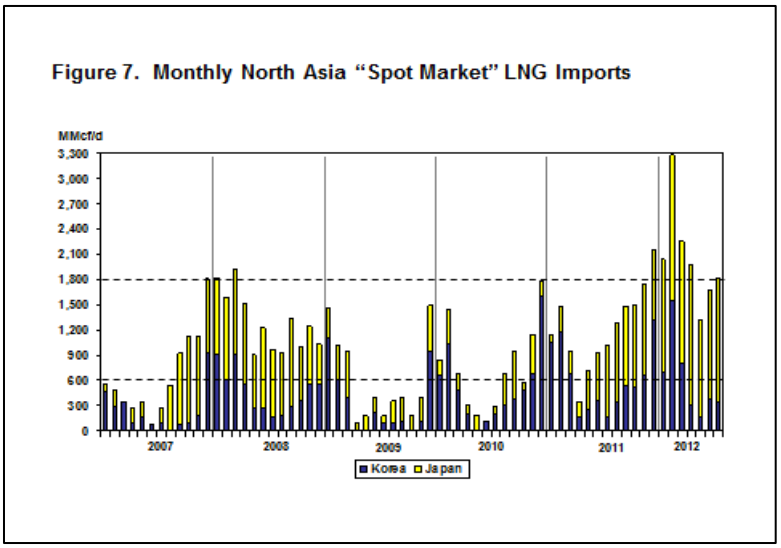

Figure 7 presents monthly North Asia "spot market" LNG imports. The "spot market" imports show a seasonal pattern that peaks in the winter. However, the seasonality has flattened out due to the large demand for LNG to replace the lost nuclear generation in Japan. If nuclear power in Japan remains shut down, then Kitimat LNG and ultimately Alaska LNG might be able to fit into the seasonal variability of the North Asia "spot market." If nuclear generation largely resumes in Japan, then Alaska LNG might have to look for additional markets.

Final Observations

As recently as five years ago, a strong linkage between oil and gas prices existed throughout the world, even in North America. In fact, for a brief period, U.S. gas prices and oil prices were at parity. But over the last five years, North America gas prices have diverged strongly from oil prices due to a growing surplus of gas supply. While the lower prices resulting from this surplus are displacing coal in the electricity generation market, the growth in North American gas demand has been insufficient to soak up surplus gas supply.

While non-North American gas prices remain strongly linked to oil prices, growing pressure is developing in Europe and Asia to weaken this linkage, if not eliminate it altogether. The emergence of North American LNG as a source of new supply could play a critical role in weakening the oil-gas price linkage in world gas markets, *providing some solid prospects for near-term growth.* North American LNG will be attractive to Eastern Hemisphere markets in the near-term as a lever to reduce imported gas prices or at least cap their growth. As a result, *current spreads between LNG landed prices and North America wellhead gas prices are unlikely to be long-term if North America LNG becomes noticeable in Eastern Hemisphere gas markets.*

Long-term growth in North American LNG exports will depend on its continued value to LNG supply diversity or its ability to compete against other LNG sources. Prospects for long-term growth will be affected by locations of North American LNG export terminals. Exports from the North Pacific Coast (Canada and Alaska) can compete in North Asia vis-à-vis West Africa and Mediterranean LNG, if their fob prices are within about $1-2 per MMBtu of West Africa and Mediterranean LNG export terminals. Exports from the Atlantic Coast can compete in Northwest Europe vis-à-vis West Africa, if their fob prices are near those of West Africa LNG export terminals. Exports to Northwest Europe from Gulf Coast liquefaction terminals are uncertain, unless they can at least match fob prices at West Africa and Mediterranean LNG export terminals or compete in North Asia against North Pacific Coast LNG (Brownfield versus Greenfield liquefaction costs).