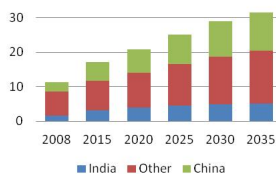


Just before World War I, Winston Churchill, at the time serving as First Lord of the British Admiralty, decided to convert much of the nation's naval fleet fuel to oil from domestically sourced coal. This change would improve fleet tactical performance but it would also leave Britain's navy vulnerable to a reliance on oil imports. Unveiling his strategy to deal with this vulnerability, Churchill explained to Parliament that, "On no one quality, on no one process, on no one country, on no one route, and on no one field must we be dependent. Safety and certainty in oil lie in variety and variety alone." When it comes to natural gas, growing Asian countries should apply Churchill's philosophy. Most Asian economies are growing at a dramatic rate and their consumption of natural gas is projected to grow at an equally rapid pace. Asian reliance on this energy source could increasingly become a significant economic, political and security concern.

Figure 1: Natural gas consumption in non-OECD Asia by country, 2008-2035 (trillion cubic feet)



Source: US Energy Information Administration

In their reference scenario, the US Energy Information Administration estimates that non-OECD natural gas consumption will increase by more than 20 trillion cubic feet annually from between 2008 and 2035. As Figure 1 illustrates, China and India alone will account for more than 12 trillion cubic feet of this noted growth.

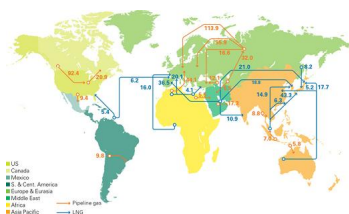
Even with significant growth in production from sources including shale gas, many Asian countries may increasingly find themselves unable to meet their natural gas needs on domestic supplies alone. That will leave the region relying on two avenues for necessary imports. One option includes natural gas pipelines from supply rich but conflict prone areas in Russia, the Middle East and the Caspian region. Another option involves Liquefied Natural Gas (LNG)

which can be imported from around the globe. As shown in Figure 2, LNG exports are dominated by the Middle East as well as by some Asian export locations used for intra-regional use. Another Asian supplier, Australia also exports sizable levels of LNG. In addition to these sources, North American gas could potentially become another option for Asian gas markets. This could be an attractive alternative because it represents another source for gas resource diversification and could improve political and security outlooks in both Asia and the United States.

Indonesia

In 2009, Indonesia was the third-largest exporter of LNG in the world. Geographic proximity to major consumers such as China and Japan makes Indonesia's LNG market indispensable to the region's energy supply. As of 2009, the country had three LNG terminals with another two terminals planned to become operational by the middle of the decade. With the successful operation of these two new locations, Indonesia can expect to have an export capacity of nearly 1.8 trillion cubic feet per year. The majority of LNG exports are currently sent to Japanese terminals and this market will likely continue to be the most important for Indonesian gas in the near-term. With oil and gas representing its chief export commodities, Jakarta has a vested interest in continuing to develop its LNG export market. However, with strong Indonesian domestic growth and with increased domestic natural gas demand, Tokyo could possibly begin to feel some impacts from more limited Indonesian export capability.

Figure 2: Major natural gas trade movements (billion cubic meters)



Source: BP Statistical Review of World Energy June 2011

Australia

Australia exported approximately 500 billion cubic feet of natural gas through its two existing LNG locations in 2008. Through new proposed and expected LNG projects, Australia could triple its export capacity by 2020. This would suit Canberra as commodity exports have been the cornerstone of Australian economic success for the past decade. New Australian gas deals are also demonstrating how empowered Asian economies are further recognizing the need to lock-in long term natural gas contracts for their own energy markets' stability and security. For example, in October of 2010, British based BG Group announced that it had approved the implementation of the first phase of the new Queensland Curtis Liquefied Natural Gas (QCLNG) project. The first LNG exports are planned to begin in 2014 to Chile, China, Japan and Singapore. Multi-state interdependence and far-reaching cooperation is clearly evident in this project. A release from the company explained that BG Group's decision to move forward with the first phase of QCLNG completes the final condition required for their agreements with the China National Offshore Oil Corporation (CNOOC).

Under those agreements CNOOC will purchase 3.6 million tons per annum of LNG for a period of 20 years from the start-up of QCLNG; purchase 5% of BG Group's interests in certain tenements in the Walloons Fairway of the [resource rich] Surat Basin; jointly participate with BG Group in a consortium to construct two LNG ships in China that would be owned by the consortium; and become a 10% equity investor in the first LNG train in the initial phase of the liquefaction plant.

Japan

With extremely limited internal sources of natural gas, Japan is the largest importer of LNG, accounting for roughly one-third of the global LNG market in 2009. Japan has more than three dozen operating LNG import locations with an aggregate capacity greater than overall consumer demand. This has enabled the country to enhance its security and gas resiliency posture. An example of this spare LNG capacity flexibility can be found in the aftermath of the devastating 2011 Tohoku earthquake. Japan is likely to import greater amounts of LNG to compensate for power outages and output reductions from nuclear-sourced power plants.

In fact, in a public Q&A in September of 2011, International Energy Agency (IEA) Senior Gas Analyst Anne-Sophie Corbeau explained two possible scenarios. In August 2011, the IEA laid out a “base case” scenario where nuclear plants come back on-line after an average of six months and a “worst case” scenario where all 54 Japanese nuclear reactors are offline until May of 2012. “With the base case scenario, LNG demand in Japan increases by 18 billion cubic meters compared to 2010 levels. With the worst case scenario, additional LNG demand in Japan would rise to 30 billion cubic meters” explained Corbeau. To put that in perspective, she points out that this is nearly all the amount of additional LNG capacity that is expected to become operational in the 2010-2012 time-frame.

It should be noted that Japan is currently the only recipient of North American natural gas exports. While the amount of LNG shipped is not large, it is not insignificant. In 2010, Japan received about 30 billion cubic feet of North American gas by way of the Kenai terminal on the Alaskan coast. Marathon and ConocoPhillips Alaska delivered this gas for prices that ranged from \$11.59/million Btu (MMBtu) to \$13.09/MMBtu. To put this into context, these price levels are more than twice North American LNG landed prices for imports.

Malaysia

Exporting the second largest amount of LNG in the world, Malaysia is a linchpin in the Asian natural gas market. Malaysia is Japan’s largest natural gas exporter, providing nearly 20% of all Japanese LNG imports in 2010. From the standpoint of quantity of LNG carried, Petroliam Nasional Berhad - a wholly Malaysian government owned company - owns a controlling interest in the largest LNG tanker fleet in the world.

Like Indonesia, Malaysia is increasing its production of natural gas and its LNG export capabilities. However, it too is seeing significant internal economic growth and this could eat away at available exports. Therefore Asian importers may have to look to other locations for product. Sources like Persian Gulf LNG have associated risks. Middle Eastern LNG must navigate through the Strait of Malacca, connecting the Indian Ocean to the South China Sea. This narrow choke-point will continue to be an energy security concern for Middle Eastern sourced imports to Asia and is another compelling reason for Asia to actively pursue other sources to diversify their supply.

China

With more than 100 trillion cubic feet of proven reserves, China continues to increase its domestic gas production. For years, China produced more gas than its own market needed. However, China's breathtaking growth has tipped the scales and in 2007 the country became a net-importer of natural gas. Beijing has been active in developing import capability via pipelines. In 2009, China began operation of its first pipeline for gas imports leading to significant new supplies from Turkmenistan.

In addition to pipelines, China recognizes the need to import gas from LNG terminals (which can be placed closer to China's population centers on the coast). While China does not currently import LNG at the scale of Japan or South Korea, sheer economic growth will likely change that. China, with only one LNG terminal in 2006, is experiencing extremely rapid construction of terminals that will enable Chinese energy firms to greatly increase LNG imports from major regional exporters such as Australia.

With a Chinese emphasis on foreign energy acquisition, development and trade, Beijing will continue to construct an energy strategy around supply variety. North America represents an untapped natural gas resource that could serve this goal while Beijing continues to develop regional and domestic supplies.

United States - a possible major energy exporter once again

Observing the natural gas market, Houston, TX based Cheniere Energy, owner of the LNG terminal Sabine Pass in Louisiana, concluded that new international liquefaction projects were inadequate to meet global gas demand. With this in mind, in 2011, Sabine Pass filed a two-part application requesting authority to export approximately 800 billion cubic feet of natural gas per year by vessel to international markets for a 20-year term.

Potential US exporters of LNG must abide by preexisting legislation regarding the "public

interest” of gas exports found within Section 3(a) of the Natural Gas Act (15 U.S.C. § 717b). In their application to export gas under this requirement, the company argued that the ability to export LNG will improve and enlarge the market for domestic gas producers and therefore encourage production even if lower domestic prices might not otherwise do so. Sabine Pass also argued for approval by citing the federal government’s effort to improve the US balance of payments. Through the export of roughly 2 billion cubic feet of gas per day, the US would see approximately \$5 billion in gas related export revenue.

When it comes to Sino-American relations, these figures serve an important purpose. In the US there has recently been an increase in political energy tilted towards broad economic protectionism. Unemployment is high and China racked up over a \$270 billion trade surplus with the United States in 2010. A significant new stream of exports can blunt some of the more heated rhetoric found within the US political system. Meanwhile, the United States could improve its trade balance with some of its Asian partners.

In responding to the applicant and approving the export of gas the US Department of Energy notes that, “An improvement in natural gas supplies internationally will help certain countries that currently have limited sources of natural gas supplies to broaden and diversify their supply base.” The response continues that, “This will contribute to greater overall transparency, efficiency, and liquidity of international natural gas markets, encouraging a liberalized global natural gas trade and a greater diversification of global natural gas supplies.”

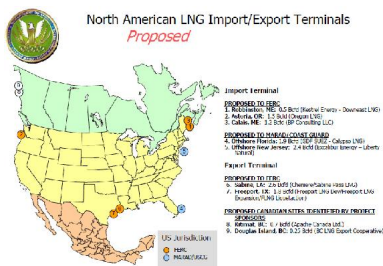
Finally, the question arises: does the United States have enough natural gas resources to sustain sizable exports for a significant length of time while servicing its own market? The answer to this question seems clear. A Massachusetts Institute of Technology (MIT) report in 2010 entitled “The Future of Natural Gas” estimated that under a mean resource estimate, US natural gas production will rise by around 40% between 2005 and 2050. Further, the Potential Gas Committee of the Colorado School of Mines reported that the US possesses a future available gas supply of over 2,100 trillion cubic feet. This is sufficient to meet domestic market needs for around 100 years at current levels of consumption. These figures are largely corroborated by the US Energy Information Administration.

North American gas on the world stage

It appears as if Cheniere Energy with their Sabine Pass terminal may have read the tea leaves correctly. For example, a September 2011 Bloomberg article cited the Eurasia Group, a New York based consultancy, in estimating that North American LNG exports may total about 5 billion cubic feet a day by as early as 2017.

Cheniere Energy is not the only company engaged with possible North American natural gas export. Some Canadian gas currently being exported to the United States may find more demanding and better paying markets in Asia. The Kitimat facility in Canada's British Columbia will almost certainly export LNG to Asian markets. The project is targeting 2015 for launch.

Figure 3: North American proposed LNG import/export terminals

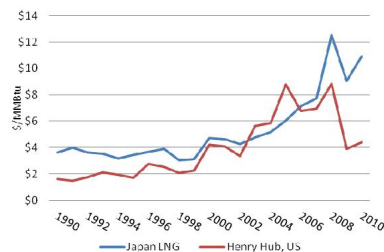


Source: US Federal Energy Regulatory Commission

In a 2010 release from Apache Corporation, a co-owner of Kitimat, G. Steven Farris, the chairman and chief executive officer of the company said, "The growing supply of natural gas in the United States and Canada is transforming North American energy markets, and this increased resource has significant potential for global impact." He continued with, "Development of the Kitimat LNG project has the potential to open new markets in the Asia-Pacific region for gas..."

In addition to the Kitimat project, The Haisla Nation and Houston, Texas based LNG Partners have jointly proposed an LNG facility just north of Kitimat and it is slated to be operational in 2013.

**Figure 4: Natural gas price comparison
(Japan's price includes cost, insurance and freight)**



Source for data: BP Statistical Review of World Energy June 2011

Some current economic indicators point to this type of export-fueled growth. Unlike internationally traded crude oil, natural gas markets are currently relatively isolated with large price discrepancies due to LNG shipping costs and infrastructure costs. As Figure 4 illustrates, in recent years the price of spot market natural gas at Henry Hub and average long-term contract prices in Japan have diverged. In 2010, the price difference between the two measures was greater than \$6/MMBtu. Many Asian gas markets, like Japan, have limited spot market activity and heavily rely on long-term contracts. In addition, natural gas prices are closely linked to crude oil which typically is more volatile. Some North American energy firms may become excited about cashing in on potential gas arbitrage opportunities.

Caveats abound

As noted above, North American physical natural gas reserves are high and the figures have consistently been revised upward. However, these figures do not reflect economically recoverable resources. The 2010 MIT report, "The Future of Natural Gas" includes a group of US gas supply curves based on breakeven price at the point of export. For example, using the mean supply curve, the report notes that at \$8/MMBtu (more than twice the current spot price), around 12,000 trillion cubic feet of gas would be available or roughly half the Potential Gas Committee's claim of physical reserves. Of course, prices can and will fluctuate and price

increases are eventually expected. However, it is important to note that economic constraints will inevitably determine overall North American gas supply levels.

More importantly, North American LNG exports to Asia may never even take off to begin with. Geographically closer regional producers may end up providing all of the needed Asian supply. Vast quantities of Middle Eastern and Russian natural gas can be produced more cheaply and the commodity faces far shorter transportation routes to Asian consumers. North American gas may be too expensive and too far away to make any meaningful difference. Dr. Ernest Moniz, co-author of the MIT report noted in his June 2011 testimony before the U.S. Senate Committee on Energy and Natural Resources, that under a number of assumptions, he actually sees potential increases in US natural gas imports by 2030. His explanation is that markets will prefer the lower cost gas found in other parts of the globe.

A new natural gas reality

Looking to the future, new pipelines will help feed Asia's insatiable appetite for natural gas. Middle Eastern and regional producers will also increasingly export LNG to wanting Asian consumers. Asian countries themselves will also develop some of their own shale and unconventional gas resources that may result in drastically improved domestic production figures. However, the region should continue to seek to further develop other supplies and diversify their sources. Producing nations that maintain relatively stable political, economic and social conditions such as the US and Canada can offer Asian markets and governments a potential hedge against a volatile world. A deeper, more liquid and international gas market could improve overall energy security while providing economic growth, increased supply and stability to producers and consumers.

Contributor Aaron Kraus is an energy consultant in Washington, D.C. He is not currently engaged in any business with the companies referenced in this article.