The Arctic and Natural Gas in Northeast Asia's Energy Future

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The International Energy Outlook 2011 *published by the U.S. Energy Information Administration forecasts that world energy consumption will grow by 53 percent from 2008 to 2035. Asia's rapidly growing economies will be the primary drivers of increasing global energy demand. By 2035, China's and India's combined energy use are projected to account for 31 percent of total world energy consumption. If current projections hold, by some estimates natural gas may make up to 60 percent of the region's energy mix by 2035. New shipping routes and energy supplies in the Arctic have the potential to multiply the utility of gas in the region's future energy mix.*

New shipping routes and advancements in processing techniques will lead to new ways to exploit the value of natural gas—more specifically liquefied natural gas (LNG). Condensed gas in its liquid form (LNG) has the potential of opening up new horizons in the Asian energy market. A major obstacle to the greater marketability of natural gas in the Asia-Pacific region has been the cost of getting supply to market, as well as the limited infrastructure of Asian countries. Increasing LNG infrastructures, which include transport carriers, re-gasification ports and liquefaction plants, as well as new transport routes that will open up as a result of receding Arctic glaciers due to climate change[1], are creating new possibilities for expanding the role of gas in the Asian energy market.

The Arctic and Northeast Asia's Gas Market [2]

Barring an economic crisis in Asia, energy demand in the region will see exponential growth for the foreseeable future. Rising per capita incomes, industrialization, urbanization, increased transportation and motorization in Asian economies require consistent, stable, and increased energy supplies. Accordingly, the priority that governments' place on energy security has risen—gradually making its way from "low politics"[3] to the national security agenda.[4] In order to ensure energy security, governments in the region are seeking to increase supply and diversify energy resources. A diversified energy mix may be seen as an aegis against increasing security challenges and risks to traditional sources of energy supply.

If present trends in climate change and energy diversification continue, gas seems poised to play an even larger role in the region's energy mix within the next two decades. The growing prominence of gas is being supported by increasing regional energy infrastructure developments and, in the future, by the opening up of new transportation routes via the Arctic region. Furthermore, suppliers are looking to traversable Arctic routes to cut transportation time and costs. These trends combined could be a potential game changer for energy security in the Asia-Pacific.

In general, gas is a cleaner, safer, and a less expensive energy resource. Compared with other fossil fuels, namely, coal and oil), gas supplies in transit to Asian markets do not face as many chokepoints. For instances, Iran's incessant threat to close the Strait of Hormuz, piracy in the Gulf of Aden, political instability throughout the Middle East and North Africa, and other conflicts throughout the African continent are examples of the risks exposed to the oil supply chain and transportation routes. On the other hand, given the geographic location of known gas reserves, supplies are exposed to fewer risks and may be increasingly

[1] Natural gas is the second fastest growing source of electricity generation at 2.6 percent per year from 2008 to 2035.

[2] "Arctic Thaw or New Great Game of the North?", *Eurasia Energy Observer*, Mar 26, 2012, http://www.eurasia-energy-observer.com/news/new/arctic-1

[3] For example, Taiwan's Ministry of Economic Affairs (MOEA) will reflect renewed prioritization on energy security in 2013 when its changes its name to the Ministry of Energy and Economic Affairs (MEEA).

[4] Herberg, Mikkal E. Sept 2011. "Introduction: Asia's Rising Energy and Resource Nationalism."

seen as a preferred option as instability in these regions ensues.

LNG Shipping Routes

As Northeast Asian countries consider a range of options and long-term strategies for energy security, new shipping routes that will connect hitherto inaccessible supplies to market underscores the growing appeal of gas in the region's energy mix. One route that may become increasingly accessible is the Northeast Passage (NEP), a circumpolar network of sea-lanes north of continental Eurasia. The NEP cuts off 4,000 nautical miles and almost halves the distance between Europe and Northeast Asia. The second route, the Northwest Passage—a circumpolar sea network north of Canada—connects the Atlantic and Pacific Oceans, linking North America with East Asia. With shorter travel times and safer passageways, the Arctic's passageways provide a safer environment when compared to the pirate-ridden Suez Canal. By 2030, the NWP and NEP may rival both the Panama and Suez Canals as the world economies transport corridors.

Asian countries are investing in the future commercial opportunities in the Arctic by investing in nautical infrastructure. South Korea's Samsung Heavy is investing a $100 billion in the polar-class icebreaker *Araon*.[5] China is building its second icebreaker, an 8,000 ton ship that will supplement its Ukrainian-built *Xuelong*. South Korea's Samsung Heavy is also working on the first icebreaking LNG carrier ship. Icebreakers, by providing year-round access through Arctic ice, are crucial for any entity with an interest in the region.

With ice melt and shorter transport routes, moving gas via LNG carriers rather than pipelines may become a more cost-effective method of conversion (especially with the significant price disparities among the regional markets). For instance, South Korea is about the same distance from the Northwest Territories as it is from Qatar, its largest supplier of natural gas. Qatar's gas is hinged to world oil prices. In addition to icebreakers, Korea Gas Corporation (KOGAS) is building LNG terminal in the Northwest Territories of Canada. As Asia is the fastest growing market for natural gas, LNG terminals and carriers are becoming cost-effective and profitable investments.[6] In fact, Canada is now reconsidering its pipeline plans in the North Americas and studying the possibility of opening up a LNG export plant, ostensibly to tap into growing Asian markets.[7] At the same time, South Korea, Japan, and China, increasingly aware of the benefits of LNG terminals, have begun cooperative measures to develop gas infrastructure in North America and the Arctic as well as host terminals for receiving natural gas imports.

Environmental and Cost Benefits

In addition to the aforementioned reasons, natural gas may be considered the fossil fuel of choice because it has a smaller carbon footprint than coal or oil. Nuclear power—once heralded as a game changer for its energy output and ability to alleviate

[5] Lim, Ivan. 2012. "Asia's economic power-houses eye Arctic el dorado." *The Asian*, February 8, 2012.http://www.theasian.asia/?p=6465

[6] "LNG option puts Mackenzie pipeline at a disadvantage." *The Edmonton Journal*, March 26, 2007. http://www.canada.com/edmontonjournal/news/opinion/story.html?id=08322f4e-073c-430c-bb95-4df19af8052c

[7] Haggett, Scott. 2012 "UPDATE 2-Imperial Oil eyeing Canadian LNG plant." *Reuters*, May 2, 2012. http://finance.yahoo.com/news/2-imperial-oil-eyeing-canadian-202359730.html

climate change—is undergoing reevaluation after the Fukushima fallout. Meanwhile renewable energy—which the *IEO 2011* predicts will have the fastest growth rate until 2035[8]—retains an insignificant share in the overall energy mix in the short-term. However, the long-term impact of renewable energy in the region's energy mix is contingent on the resources made available to invest in these new technologies.

Gas is not tied to international markets and not subject to the same price volatility and fluctuations as oil. In general, there are three separate regional gas markets: North America, Asia, and Eurasia. Japan pays upwards of $17 per million British thermal until (mmbtu) of LNG while the U.S. can purchase it for less than $3 per mmbtu.[9] When factoring in shipment costs, Northeast Asian consumers can cut costs by importing from North American suppliers. Horizontal drilling and fracturing have made shale and other unconventional gas supplies more commercially viable. The availability of new supplies and more advanced techniques for processing different forms of gas (conventional and unconventional) are raising the utility of natural gas on the government's balance sheet.

China is investing in upstream energy projects in North America and is possibly sitting on the world's largest shale gas reserves.[10] Despite enormous shale gas reserves, China's three largest state-owned energy enterprises—China Petroleum & Chemical Corporation Limited (Sinopec), China National Offshore Oil Corporation (CNOOC) and China National Petroleum Corporation (CNPC)—are actively engaged in expanding their upstream energy projects.[11] China currently lacks the technology and expertise to develop domestic shale gas while those technology and methods used to extract shale gas have been largely developed in the United States. China is still in the research stage and seeking to alleviate its know-how deficiency and deploy practices learned abroad to jump-start domestic shale gas production by working with multi-national partners. In addition, China is interested in Arctic natural gas is due to geological constraints that prevent shale gas from becoming commercially viable at home. Unlike shale gas in the United States, China's shale gas is buried deeper, the formation age is older, and vital water resources (necessary for hydraulic fracturing) are scarce.[12]

If current estimates that the Arctic region will be traversable by cargo vessels by the summer of 2030 are accurate, and moreover, that the melting ice cap will free up energy resources locked beneath, Asian states seeking less reliance on distant and unpredictable supply sources may turn to gas to support their quest for a more diversified energy mix. To be sure, some Asian states are already making preparations by developing stronger refining capacities and capabilities to exploit the commercial and strategic opportunities provided by gas and the opening up of the Arctic.

Northeast Asia's Gas Consumers: Japan, South Korea, and China

Japan is the region's largest importer of natural gas. After the 3-11 earthquake, tsunami, and Fukushima Daiichi nuclear disaster, Tokyo's re-evaluation of the country's nuclear energy policy has led to natural gas gaining currency as an important element in the country's future energy mix. For instance, between January 2011 and

[8] At 3.1 percent per year, beginning in 2008.
[9] Cekuta, Robert F. 2012. "Unconventional Natural Gas: The U.S. Experience and Global Energy Security ." February 6, 2012. http://www.state.gov/e/enr/rls/rem/2012/183875.htm
[10] In March 2012, China Ministry of Land and Resources appraised China's potentially recoverable shale gas resources at 25.1 trillion cubic meters—the largest shale gas reserve in the world. http://www.ft.com/intl/cms/s/2/5f383926-6edf-11e1-afb8-00144feab49a.html#axzz1tiq9CGUw

[11] For example, CNOOC, seeking drilling knowledge, acquired stakes in U.S. shale-gas acreage from Chesapeake Energy Corp. for a total of $1.65 billion in February 2011 and November 2010.
[12] Anthony Kim and Zheng Yu. 2012. "China's vast shale gas potential limited by pipeline infrastructure obstacles." *Financial Times*, March 15, 2012. http://www.ft.com/intl/cms/s/2/5f383926-6edf-11e1-afb8-00144feab49a.html#axzz1tiq9CGUw

January 2012, Japan imported an astounding 39 percent more LNG, an increase from 3,729,421 to 5,189,890 metric tons. In fact during the recent U.S. – Japan summit, President Barack Obama and Prime Minister Yoshihiko Noda addressed energy cooperation (specifically referring to natural gas) as a key pillar of the U.S. – Japan Alliance. With only one nuclear reactor reactivated, gas supply is clearly playing an important role in off-setting the 30 percent supply that nuclear energy comprised prior to 3-11.[13] Weak in natural resources, Japan is also investing heavily in upstream natural gas projects.[14] For example, a Mitsubishi-led consortium owns a 50 percent stake in the Cordova Shale gas project—an abundant shale gas reserve in Western Canada.[15] The consortium is studying the possibility of exporting the shale gas to Japan to diversify Japan's energy imports and secure a stable energy supply.[16]

LNG cargo docked at terminal
Source: LNG World News

South Korea is the world's second largest importer of LNG with imports at over 34 million tons of LNG.[17] State-owned KOGAS, like Japan's energy conglomerates, has been actively looking to invest in upstream natural gas projects particularly in the Northwest Territories. In January 2012, KOGAS execs visited Inuvik to consider building a LNG terminal closer to the Arctic region. In December 2010, KOGAS bought a 1/3 stake in Canada's MGM field and received 20 percent ownership of the field. Notably, this was Korea's first Arctic energy deal. In the past decade South Korea's gas market has expanded more rapidly than Japan's with KOGAS replacing TEPCO in 2002 as the world's largest LNG purchasing entity.[18]

China[19] is potentially the world's largest market for LNG—unlike resource-poor Japan and South Korea, China is looking to ramp up domestic

[13] Adelman, Jacob. 2012. "Japanese Power Utilities Import 39% More LNG in January." *Bloomberg*, February 13, 2012,. http://www.bloomberg.com/news/2012-02-13/japanese-power-utilities-lng-imports-rise-to-5-2-million-tons-in-january.html; and http://www.nytimes.com/2012/07/02/world/asia/japan-restarts-a-nuclear-reactor.html

[14] U.S. Energy Information Agency. 2012. " Japan." Last modified June4. http://205.254.135.7/countries/cab.cfm?fips=JA

[15] "Japanese to pursue multi-billion upstream LNG funding drive for 2012 and beyond." *LNG Journal*, January 18, 2012. http://lngjournal.com/lng/index.php?option=com_k2&view=item&id=2625:japanese-to-pursue-multi-billion-upstream-lng-funding-drive-for-2012-and-beyond&Itemid=161

[16] Mitsubishi Corporation. 2011. "Consortium to Develop Shale Gas in Canada and Funding to be Provided by JBIC,."May 9, 2011. http://www.mitsubishicorp.com/jp/en/pr/archive/2011/html/0000012153.html

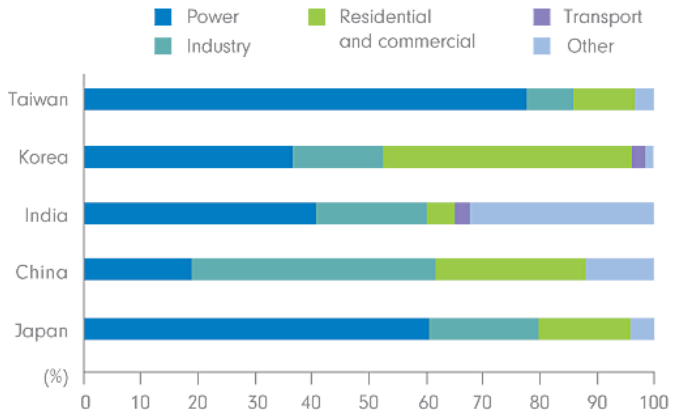
[17] "RasGas, KOGAS Sign A New Long- Term LNG Sale and Purchase Agreement." *Qatar News Agency*, February 9, 2012. http://www.qnaol.net/QNAEn/Local_News/Economics1/Pages/RasGas,KOGASSignANewLong-TermLNGSaleandPurchaseAgreement.aspx

[18] Wood, David. 2004."LNG Poised to Significantly Increase its Share of Global Gas Market." *Petroleum Review*, February 2004. 38 – 39. http://www.dwasolutions.com/images/DWALNGRetRevFeb04.pdf

[19] Chung, Olivia. 2011. "China joins world LNG carrier market." *Asia Times*, July 22, 2011. http://www.atimes.com/atimes/china_business/mg22cb01.html

production of shale gas in Sichuan province and the Ordos Basin in Shangxi province. At the same time, state-owned enterprises are also investing heavily abroad to acquire the know-how and technology to produce shale gas. While China is unlikely to become a major natural gas producer in the near future (due to constraints mentioned earlier), by 2035 China will become the world's third largest gas producer with a 6 percent share in global production.[20] China is building a 20 million mt/year re-gasification capacity. Two Chinese LNG terminals, built by state-owned PetroChina and China National Petroleum Corporation (CNPC), came on line last year—the 3.5 million mt/year Rudong facility in April and the 3 million mt/year Dalian terminal in June—raising China's total import capacity to 18.8 million mt/year.[21]

LNG Usage in Asia



Source: Fidelity, CLSA Asia Pacific Markets, "Chance of a Lifetime – Race for un-contracted Asian Demand," December 6, 2010

Conclusion

As Asian countries take steps to ensure energy security and diversify their respective energy mix, including the development of stronger capacities and infrastructure for natural gas, the potential for new transport routes are expanding the horizon for natural gas in the Asian energy market. While the marketability of gas has been affected by issues related to getting supply to market, these limitations are being overcome by climate change and technological advancements. Additionally, natural gas may be considered the fossil fuel of choice because it has smaller carbon footprint than both coal and oil. With a favorable investment environment and new sea lanes emerging for transport due to receding icecaps in the Arctic, natural gas[22] is well-poised to become a major energy source of the 21st century.

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[20] According to the *World Energy Outlook*.
[21] Hong, Chou Hui. 2011. "The evolution of a new Asian LNG market." *Platts*, February 23, 2011.http://www.platts.com/newsfeature/2011/asialng/index

[22] Natural gas is the second fastest growing source of electricity generation at 2.6 percent per year from 2008 to 2035.