Impacts of the U.S. Shale Gas Revolution on China’s National Energy Security

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In the newly-announced Atmospheric Pollution Prevention Action Plan by China’s State Council, one important measure to address the severe air pollution problem in China is to use natural gas to replace coal in supplying energy. However, because domestic natural gas production cannot meet the rising demand for clean energy, gas imports will have to increase, raising the concern of energy security. Under this new situation, how should China consider its energy security and keep the balance between energy security and environmental protection? At the same time, the United States’ shale gas revolution is reshaping the global energy market. What does this imply for China’s energy security?

The problem of air pollution will worsen with further industrialization and urbanization in the future. A major contributor to air pollution in China is coal’s dominance of the energy mix, coal currently provides about 70% of the country’s total energy consumption, and has contributed more than 85% of China’s carbon dioxide emissions and more than 50% of suspended particulate matter, sulfur dioxide, and nitrogen oxide. As such, in order to control air pollution, restructuring the energy mix is inevitable. As an energy source that is cleaner than coal, safer than nuclear, and more stable than wind and solar power, natural gas should be the first choice on the list to replace coal.

With the same heat content, natural gas only emits half of carbon dioxide and about one-fifth of nitrogen oxide as compared to coal, and almost no sulfur dioxide. Despite these merits, the role of natural gas in China’s energy structure has remained minimal. China’s natural gas consumption accounts for only 5% of primary energy consumption, which is not only far below the United States, Europe, and other developed countries, but also much lower than the international average of 24%.

China’s natural gas resources are relatively scarce, with remaining recoverable reserves of less than 2% of the world’s total, and proven remaining recoverable reserves per capita only about 7% of the world average. Even though some reports indicate that China may have the largest shale gas reserves potential, its shale gas development is still in its infancy stage and any meaningful production may not happen until the 2020’s, not mentioning the uncertainty on underground reserves and the costs to extract them. Although China’s domestic natural gas production increased at an annual rate of 12.5% from 2000 to 2011, it still cannot meet the rapid growth of domestic demand for natural gas. From 2007 to 2012, China’s natural gas imports
increased more than 10 times, from 4 billion cubic meters to 42.5 billion cubic meters. As a result, its import dependence has increased from 2% to 27%.

**RE-EVALUATE ENERGY SECURITY**

The traditional view of a country’s energy security is that the more it relies on foreign imports, the less secure its energy supply is. While high utilization of domestic energy resources is a top contributor to a country’s energy security, this view ignores other dimensions of energy security, such as the diversification of energy supply channels and the pricing mechanism.

The severity of China’s air pollution problem also urges us to re-consider the balance between energy security and environmental protection. When pollution seriously impacts people’s daily lives and threatens their health, it becomes inappropriate to excessively emphasize the self-dependence of energy supply. While vigorously developing domestic resources helps to improve self-sufficiency, improving energy security requires a global disposition. Not only for China, but also for any country in the world, it is unrealistic to achieve national energy security by relying solely on domestic resources and being completely isolated from the world.

**THE U.S. SHALE GAS REVOLUTION AND ITS LNG EXPORTS**

The U.S. shale gas revolution is changing the energy outlook for the U.S. and the rest of the world.

According to the U.S. Energy Information Administration (EIA), U.S. shale gas production increased more than 20 times during the past five years. In 2009, with shale gas production of 584 billion cubic meters, the U.S. for the first time surpassed Russia and became the world's biggest producer of natural gas. Research from a well-known consulting firm, ICF, shows that the U.S. has 90 trillion cubic meters (about 3,000 trillion cubic feet) of natural gas reserves, which can last 130 years, assuming its 2011 annual consumption of 650 billion cubic meters. Of these reserves, about 35 trillion cubic meters (about 1,200 trillion cubic feet) are at a cost of $5 or less per MMbtu.

The shale gas revolution has fundamentally changed the U.S. domestic supply and demand balance for natural gas. In 2007, the U.S. energy industry was investing billions of dollars on the construction of LNG import terminals, but now the U.S. is already in discussion about whether it should export its gas.

According to the Natural Gas Act (NGA), part of Energy Policy Act revised in 1992, any export of natural gas must obtain approval from the U.S. Department of Energy (DOE). One critical condition to obtain this approval is that it must comply with public interest. While natural gas exports to the U.S. Free Trade Agreement (FTA) countries are automatically considered to be in the public interest, exports to non-FTA countries, which include China, Japan, India, etc., require special assessments to get approval. Because the non-FTA countries are where the major
natural gas demand growth will come from in the future, the decisions that the DOE will make about whether these projects can export to non-FTA countries is very important.

There is still uncertainty over the future of U.S. LNG exports and heated debate over its impacts. The supporters, which include natural gas upstream enterprises and free trade supporters, view the natural gas export as a driver for economic recovery, trade deficit reduction, and the reduction of Russia’s global leverage. The opponents, which include manufacturers, chemical industries, and other downstream gas businesses, fear that natural gas exports will result in an increase of domestic gas prices, and thereby reducing the competitiveness of these industries and the employment opportunities in these industries. This is compounded by environmentalists concerned about water consumption, methane leakage, and groundwater pollution issues in the shale gas development process.

Nevertheless, the DOE has approved 3 additional LNG export terminals (Freeport in Texas, Lake Charles in Louisiana, and Cove Point in Maryland) after the completion of two studies commissioned by the DOE, which showed that although the increased export of natural gas will lead to higher domestic gas prices, decreased domestic consumption, and may disfavor some sectors, such as manufacturing, with increasing operating costs, it would benefit the U.S. economy overall. Together with the Sabine Pass LNG export terminal in Louisiana that was approved prior to the two studies, the DOE thus far has approved 4 LNG terminals to export natural gas to non-FTA countries.

**THE U.S. SHALE GAS REVOLUTION HELPS THE DIVERSIFICATION OF CHINA'S LNG IMPORT SOURCES**

The shale gas revolution is changing the U.S. economy and may have a significant impact on the global LNG market.

Not only has the U.S. become a potential LNG exporter due to the shale gas revolution, it also requires reduced imports from Canada, which now has to find new buyers. At the same time, the economic crisis in Europe continues to reduce demands from Europe, and the gas-exporting countries, such as Russia and Qatar, have to find new markets. Asian markets, especially countries with growing demands, such as China and India, have become the important markets. This increases the natural gas available to the Asian market and the negotiation power of the buyers in the Asian market. This shift is reflected in recent progress made towards reaching agreement between China and Russia on importing quantities after discussion over many years.

For China, this means that the possible natural gas import channels include the existing sources, including Central Asia Turkmenistan, Southeastern Asia (Myanmar, Malaysia, and Indonesia), Australia, the Middle East (Qatar), and the new sources such as Russia, the U.S., and Canada. This geographical diversification greatly helps to reduce the risk of import, thereby improving energy security.
THE U.S. SHALE GAS REVOLUTION MAY HELP TO PUT DOWNWARD PRESSURE ON CHINA’S LNG IMPORT PRICES

Since shale gas production has increased, U.S. natural gas prices have remained at very low levels. In 2012, the Henry Hub price reached as low as about $2/MMBtu, as compared to $10/MMBtu in Europe and $15/MMBtu in Asia on average. Today, it is around $3-$4/MMBtu and according to the EIA analysis, the U.S. wellhead price may remain between $3-$8/MMBtu for a long period of time. Including the investments required to build LNG export terminals and infrastructure, as well as transportation fees and other associated costs which total approximately at $5-$10/MMBtu, the total price for gas exported from the U.S. to China is around $8-$18/MMBtu. As a comparison, in 2012, the average LNG import price in China was $11.4/MMBtu. Of all the imported LNG, about 40% of the LNG was at $14/MMBtu or more. In particular, 35% of the import was from Qatar at an average price of $19.8/MMBtu.

This shows that the North American exports may put downward pressure on the natural gas market price, which China can benefit from whether it imports natural gas from the U.S. directly or indirectly.

DIFFERENT PRICING MECHANISM IN NORTH AMERICAN GAS MARKET HELPS TO ENHANCE THE PRICE STABILITY FOR CHINA’S GAS IMPORTS

In addition, North American imports are more unique and appealing because they help to diversify the price mechanism, thus improving price stability. This uniqueness is based on the independent pricing mechanism of the North American natural gas market.

Different from the international oil markets, international natural gas has remained regionalized mainly due to transportation constraints. It is comprised of the North American market (which includes the United States and Canada), the continental Europe market, and the Asia-Pacific market, with Japan and South Korea as major importers and China and India as increasingly important ones. In Continental Europe and Asia-Pacific markets, the price of gas is determined in a similar way in that it is linked to alternative energies, especially oil and petroleum products, and so the price will fluctuate with changes of oil prices. Alternatively, in the North American market, the natural gas price tends to reflect the supply and demand of the natural gas market itself, with only a small influence by oil prices, due to the market deregulation, the large number of suppliers and buyers, the developed natural gas pipeline network system and storage facility, and well-developed financial markets.

In recent years, U.S. shale gas production has led to the decoupling of the gas price and the oil price. Furthermore, the development and wide application of LNG technologies has enabled more and more natural gas to be transported across continents, weakening the boundaries between markets. The confluence of the LNG technologies and the excess shale gas available in North America creates the opportunity for the two different pricing systems to “collide” for the first time. Wherever this happens, it means that the risk of natural gas price associated with the volatility of the international oil prices can be moderated with the North American gas prices.
Although such change has just begun and it is unknown as to how it will ultimately be realized, it is certain that this will help to reduce the volatility of the import natural gas price of the gas importing countries in Asia, including China.

In conclusion, the U.S. shale gas revolution provides a great opportunity for China to improve its energy security for natural gas imports. China should seize the market opportunity and actively explore the international market for natural gas imports to ensure both energy and environmental security.

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