

Impacts of the US shale gas revolution on China's national energy security

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In China's Atmospheric Pollution Prevention Action Plan, newly-announced by the country's State Council, an important measure aimed at addressing China's severe air pollution problem is the use of 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 maintain the balance between energy security and environmental protection? At the same time, the USA's shale

gas revolution is reshaping the global energy market. What does this imply for China's energy security?

Natural gas as a clean fuel and its place in China's energy mix

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 per cent of the country's total energy consumption, and has contributed more than 85 per cent of China's CO₂ emissions and more than 50 per cent of suspended

particulate matter, sulphur dioxide, and nitrogen oxides. 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.

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'CHINA'S NATURAL GAS CONSUMPTION ACCOUNTS FOR ONLY 5 PER CENT OF PRIMARY ENERGY CONSUMPTION;'

With the same heat content, natural gas emits just half the CO₂ and about a fifth of the nitrogen oxides as coal, and almost no sulphur 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 per cent of primary energy consumption; this is not just far below the USA, Europe, and other developed countries, but is also much lower than the international average of 24 per cent.

China's natural gas resources are relatively scarce, with remaining recoverable reserves of less than 2 per cent of the world's total, and proven remaining recoverable reserves per capita only about 7 per cent of the world average. Even though some reports indicate that China may have the world's largest shale gas reserves potential, its shale gas development is still in its infancy, and any meaningful production may not happen until the 2020s – not to mention the uncertainty on underground reserves and the cost of extracting them. Although China's domestic natural gas production increased at an annual rate of 12.5 per cent 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 by more than 10 times, from 4 billion cubic metres (Bcm) to 42.5 Bcm. As a result, its import dependence has increased from 2 per cent to 27 per cent.

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 a country's 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.

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The US shale gas revolution and its LNG exports

The US shale gas revolution is changing the energy outlook for the USA and for the rest of the world.

According to the US Energy Information Administration (EIA), US shale gas production has increased more than 20 times during the past five years. In 2009, with shale gas production of 584 Bcm, the USA 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 USA has 90 trillion cubic metres (Tcm) (about 3,000 trillion cubic feet) of natural gas reserves, which can last 130 years, assuming its 2011 annual consumption of 650 Bcm. Of these reserves, about 35 Tcm (about 1,200 trillion cubic feet) are at a cost of \$5 or less per MMBtu.

The shale gas revolution has fundamentally changed the US domestic supply and demand balance for natural gas. In 2007, the US energy

industry was investing billions of dollars on the construction of LNG import terminals, but now the USA 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 from the USA must obtain approval from the US Department of Energy (DOE). One critical condition required to obtain this approval is that it must comply with public interest. While natural gas exports to the US Free Trade Agreement (FTA) countries are automatically considered to be in the public interest, exports to non-FTA countries, which include China, Japan, and India, require special assessments to gain approval. Because non-FTA countries are those from which the major natural gas demand growth will come in the future, the DOE's decisions about whether US projects can export to non-FTA countries are very important.

There is still uncertainty over the future of US LNG exports and heated debate over its impacts. The supporters, which include natural gas upstream enterprises and free trade supporters, view natural gas exports 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 increased domestic gas prices, thereby reducing the competitiveness of these industries and the employment opportunities they provide. This is compounded by the concerns of environmentalists in relation to water consumption, methane leakage, and groundwater pollution issues in the shale gas development process.

Nevertheless, the DOE has approved three additional LNG export terminals (Freeport in Texas, Lake Charles in Louisiana, and Cove Point in Maryland) following 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 and decreased domestic consumption, and may disfavour some sectors, such as manufacturing, with increasing operating costs, it would benefit the US 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 four LNG terminals to export natural gas to non-FTA countries.

Diversification of China's LNG import sources

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

Not only has the USA become a potential LNG exporter due to the shale gas revolution, it also requires fewer imports from Canada, which now has to find new buyers. At the same time, the economic crisis in Europe continues to reduce demand 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, together with the negotiating power of buyers in the Asian market. This shift is reflected in recent progress made towards reaching agreement between China and Russia on importing quantities, following many years of discussion.

For China, this means that the possible natural gas import channels include both the existing sources, including Central Asia, Turkmenistan, south-eastern Asia (Myanmar, Malaysia, and Indonesia), Australia, the Middle East (Qatar), and the new sources such as Russia, the USA, and Canada. This geographical diversification greatly helps to reduce the risk associated with imports, thereby improving energy security.

Downward pressure on China's LNG import prices

Since shale gas production has increased, US natural gas prices have remained at very low levels. In 2012, the Henry Hub price reached as low as about \$2/MMBtu, in comparison 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 US 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 USA 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 per cent was at \$14/MMBtu or more. In particular, 35 per cent of the imports were 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 USA directly or indirectly.

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.

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In contrast to 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 USA and Canada), the continental Europe market, and the Asia-Pacific market, with Japan and South Korea as major importers and China and India becoming increasingly important. The price of gas is determined in a similar way in continental Europe and the Asia-Pacific markets, 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 oil prices having only a small influence, due to market deregulation, the large number of suppliers and buyers, the developed natural gas pipeline network system and storage facilities, and well-developed financial markets.

In recent years, US 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' in Asia. Wherever this happens, it means that the risk of natural gas prices being affected by the volatility of international oil prices can be moderated by North American gas prices. Although this change has just begun, and it is not known how it will

ultimately be realized, it is certain that it will help reduce the volatility of the price of natural gas imports in the gas importing countries in Asia, including China.

In conclusion, the US 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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