COMMENTARY:

China–Russia gas deal for a cleaner China

Wenjie Dong, Wenping Yuan, Shuguang Liu, John Moore, Peijun Shi, Shengbo Feng, Jieming Chou, Xuefeng Cui and Kejun Jiang

The China–Russia gas deal will play an important role in reducing greenhouse-gas emissions and air pollution in China.

China is the world's largest greenhouse-gas emitter and is also facing severe air pollution. In response, China is transforming its energy sector to be more efficient and cleaner. On 21 May 2014, China and Russia finally, after 10 years of negotiations, signed a historic gas deal that will provide 38 billion m^3 of natural gas per year to China for 30 years starting in 2018. The deal is an important milestone for improving Chinese energy structure. It will account for 16–29% of natural gas imports and will reduce coal usage by 50 million tons yr^{-1}. This will mean 46 million tons yr^{-1} less CO_2 emissions, which is comparable to the 2020 CO_2 reductions targets of many individual developed countries. Moreover, it will reduce the emissions of SO_2, a major air pollutant, by 1.11 million tons yr^{-1} (equivalent to 5.4% of 2011 emissions in China). The rippling environmental effects of the deal open the door to broader cooperation between China and Russia, and exemplify the significance of cross-boundary energy treaties in mitigating climate change and air pollution.

As the largest developing country, China has achieved spectacular economic development in the past three decades, propelled by increasing energy consumption. China's energy consumption accounted for 22% of global primary energy consumption in 2012[1] and 28% of global CO_2 emissions in 2011[2]. China is especially dependent on coal for its primary source of energy, burning 50% of the global coal consumed in 2012[1]. Enormous coal consumption is largely responsible for high levels of air pollution in China. In 2013, 92% of Chinese cities failed to meet national ambient air-quality standards, and three major megalopolises (that is, the Yangtze River Delta, Pearl River Delta and Beijing–Tianjin–Hebei) suffered more than 100 days with PM2.5 (particles with an aerodynamic diameter less than 2.5 μm) concentrations at least twice the World Health Organization maximum exposure guidelines[3].

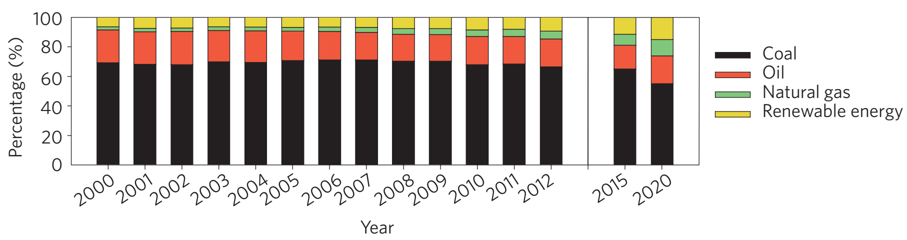

Figure 1 | Historical and target structure of energy consumption in China.

Hence, China has pledged to optimize its energy structure by reducing coal consumption. In 2009, China's State Council announced that the country will cut the carbon intensity — carbon emissions per unit of gross domestic product (GDP) — by 40–45% from 2005 levels by 2020, and this target is included in the long-term planning of China's socio-economic development. Last September, China's State Council released an Airborne Pollution Prevention and Control Action Plan pledging the Chinese government to make significant reductions in coal consumption. The plan details actions needed at the provincial level and includes ambitious coal consumption caps and specific responsibilities for named individuals. The huge challenge has been how to replace coal with alternative energy in China. The China–Russia gas deal is therefore expected to play a critical role in transforming the energy consumption structure of China for the next 30 years. However, its impacts on climate change mitigation and air pollution are unknown.

China–Russia gas deal

On 21 May 2014, Gazprom and the China National Petroleum Corporation signed a 30-year contract stipulating gas supplies of 38 billion m^3 yr^{-1} of natural gas from Russia to China's populous northeast region. Gazprom will start pre-developing the gas deposit in the Chayandinskoye field, constructing the first string of the Power of Siberia gas transmission system and creating gas processing facilities in the Amur Region in 2015. Gas production from the Chayandinskoye field will begin in late 2018. Infrastructure investment from both sides will amount to more than US$70 billion and become the world's largest construction project, with Russia providing US$55 billion upfront and China US$22 billion for pipelines on their respective territories.

Improving energy structure

Coal accounts for the vast majority (66–71%) of China's total energy consumption with oil in second place (18–22%), and natural gas (2–5%) and renewable energy (6–9%) accounting for relatively modest shares (Fig. 1; ref. 4). Emissions of CO_2 and SO_2 from coal burning are, respectively, 70% and 130% more than those of natural gas[5]. The Chinese economic reliance on coal, along with its high emissions factors, explains why China's greenhouse-gas emissions are proportionately high.

Historical dependence on coal in Chinese energy is dictated by its energy resources, with coal accounting for 92.5% and natural gas only 4.2%, and is unlikely to change drastically for quite some time[4]. Chinese natural gas availability is much lower than in Russia (31.8%) and the global average (21.9%) of energy reserves (Fig. 2; ref. 1). Much criticism is aimed at China for being the largest consumer of coal in the world[1], but it is apparent that its large coal consumption was predetermined by its fossil energy resources structure.

The Chinese government plans to cap coal use at 65% in 2015 and 55% in 2020 of total primary energy consumption (Fig. 1) to reduce greenhouse-gas emissions and air pollution. The natural gas provided by the Russia–China deal is equivalent to 50.66 million tons of standard coal (2.12% of total coal consumption in 2011), and 16–29% of imported gas and 7–12% of gas demand from 2020 to 2035 in China (Fig. 3).

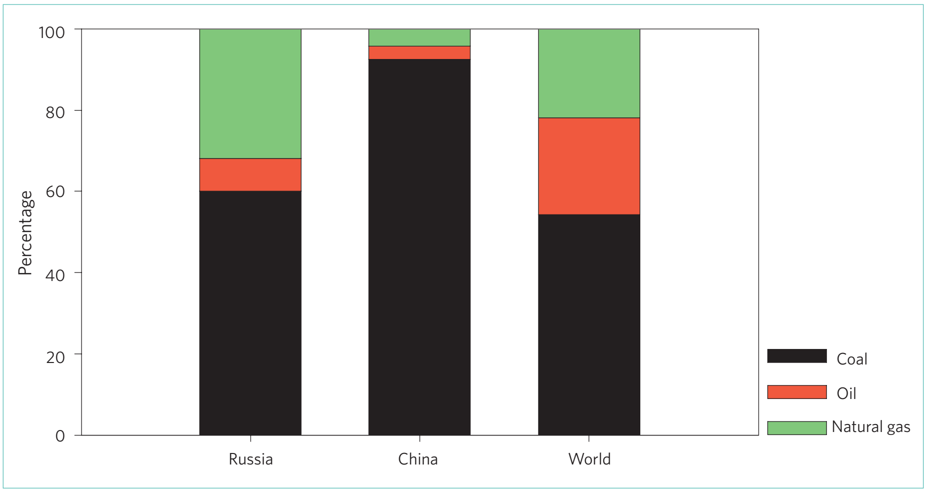

Figure 2 | Comparison of relative energy resources of coal, oil and natural gas in Russia, China and the world.

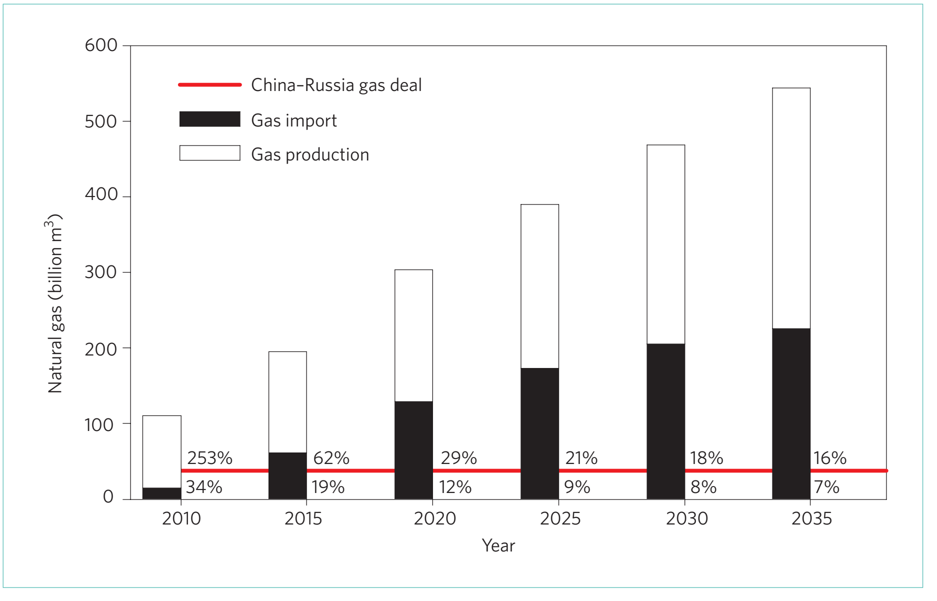

Figure 3 | Contribution of the China–Russia gas deal to the demand and import of natural gas. The red line indicates the magnitude of natural gas from the China–Russia gas deal. Numbers above the red line are the percentage of annual imported gas obtained from the China–Russia gas deal and the numbers below are the percentage of total gas demand obtained from the China–Russia gas deal.

Reducing greenhouse-gas emissions

CO_2 emissions will be reduced by 46 million tons yr^{-1} if gas supplies begin as planned in 2018. This amount can be put in context by comparison with nationally pledged reductions of greenhouse-gas emissions for mitigating climate change[6]; it is comparable to the anticipated emissions reductions of many individual developed countries (Fig. 4). For example, the European Union (27 countries) will need to reduce CO_2 emissions by 121 million tons yr^{-1} by 2020 according to its pledge of 30% of 1990 levels. The China–Russia gas deal avoids CO_2 emissions equivalent to 38% of the pledged CO_2 reductions by the whole European Union.

Cleaning up air pollution

In 2007, the World Bank, working with the Chinese government, estimated that the cost of outdoor air and water pollution to China's economy totalled around US$100 billion annually, or 5.8% of China's GDP[7]. In other words, if non-monetized losses to China's resource assets (for example, clean water, and so on) were netted from the current (financial) accounts, GDP would have been 5.8% lower. This is one reason why environmental protection is now a priority in the Chinese development plan. The natural gas provided by the Russia–China deal should reduce SO_2 emissions by 1.11 million tons yr^{-1}, which is about 5.44% of SO_2 emissions in 2011. Moreover, industrial smoke discharge should be reduced by 10.13 million tons yr^{-1}.

Not the end

China is making great efforts to hunt for cleaner energy and improve its coal-dominated energy portfolio. In June 2014, one month after signing the China–Russia gas deal, the China National Offshore Oil Corporation and British Petroleum signed a long-term deal to supply liquefied natural gas to China worth around US$20 billion for 20 years. Moreover, the Chinese government considers the energy issue strategically important for national development and security. China has to cope with some major challenges, including rising energy demand, supply restraints, huge environmental costs and backward technology[10].

In June 2014, Chinese President Jinping Xi called for five major actions on energy policy:

- Ensure national energy security — China needs to rein in irrational energy use and control the country's energy consumption by fully implementing energy-saving policies.
- Establish a diversified energy portfolio that contains cleaner use of coal and non-coal fuel, including oil, gas, nuclear power and new energy.
- Energy technology innovation as a new powerhouse to fuel economic growth.
- Reforms in pricing mechanism to nurture a competitive energy market.

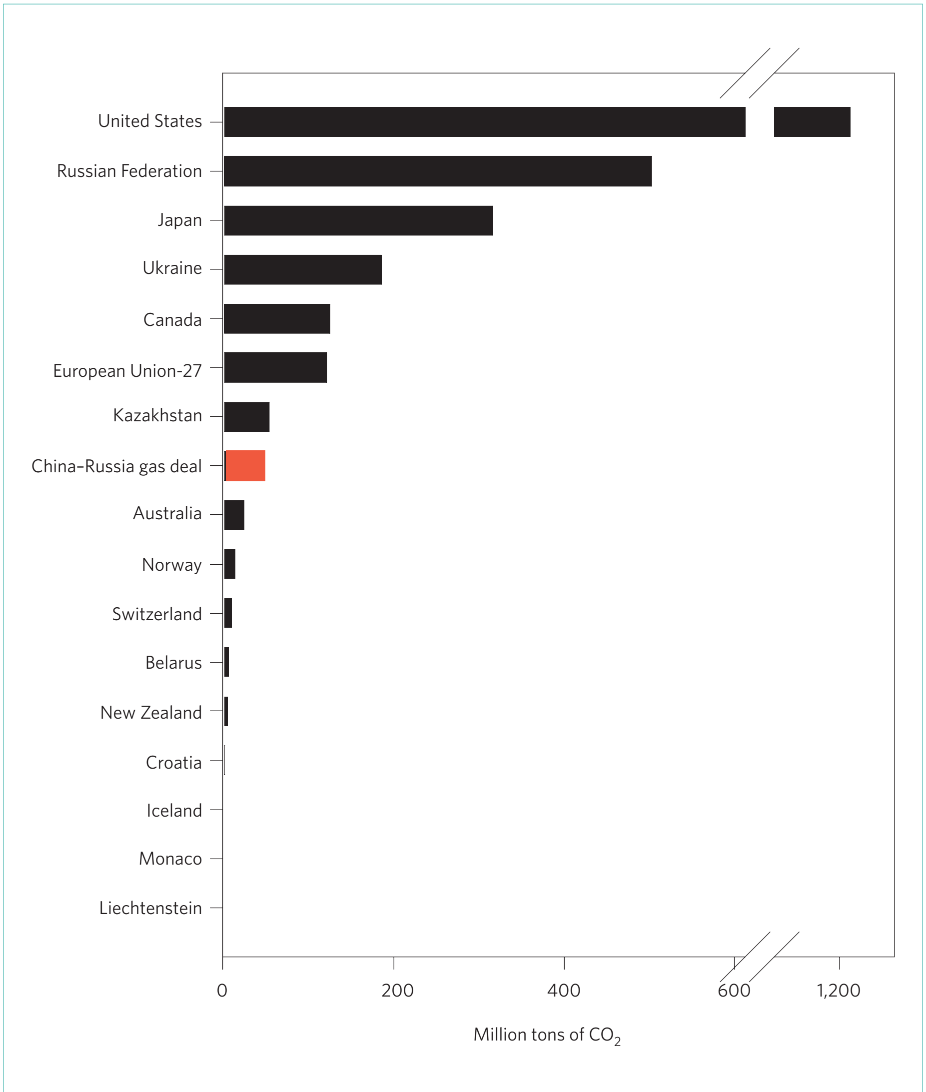

Figure 4 | Potential CO_2 reductions from the China–Russia gas deal compared with the reduction targets of developed countries. The red bar indicates the China–Russia gas deal. Net calorific values[8]: natural gas from Russian Federation = 38,232 kJ m^{-3}; standard coal = 29,271 kJ kg^{-1}. Emissions factors for coal and natural gas: natural gas = 56,100 kg CO_2 TJ^{-1} (default emissions factor)[5]; coal = 2.53 kg CO_2 kg^{-1} standard coal[9].

- Expand oil and gas cooperation with countries in central Asia, Middle East, America and Africa, intensify China's energy exploration and exploitation, and build more oil and gas pipelines and storage facilities.

The China–Russia gas deal is just a beginning, not the end, in improving the energy structure and ensuring energy security. As detailed by President Xi, new guidelines and regulations will accelerate replacement of coal-burning power generators that fail to meet emissions reduction requirements, and long-distance power transmission lines will be rapidly developed. Under the precondition of the highest safety standards, new nuclear projects on the eastern coast will be launched as soon as possible. At the same time, measures to combat pollution problems are forcing the country to reduce the use of fossil fuels and increase energy efficiency.

International cooperation

According to the Copenhagen Accord, all countries should cooperate in achieving the peaking of global and national CO_2 emissions as soon as possible, and developed countries should provide adequate, predictable and sustainable financial resources, technology and capacity-building to support the implementation of adaptation action in developing countries. Enhanced action and international cooperation on adaptation is urgently required to ensure the implementation of an agreement on climate change and support the implementation of adaptation actions aimed at reducing vulnerability and building resilience in developing countries. The China–Russia gas deal is an example of successful cooperation for mitigating climate change. At present, China plans to acquire gas shipments from countries as far away as Australia. Gas gets more expensive as its travelling distance increases. As such, the chance to acquire huge quantities of gas from a next-door neighbour — up to 38 billion m^3 yr^{-1} by 2018 — is a welcome boon to Chinese policymakers who are desperately seeking alternatives to coal. ❐

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Acknowledgements

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