INTRODUCTION
The theme of this issue is the development of China’s energy markets: opportunities and challenges. Energy markets are commodity markets that deal specifically with the trade and supply of various types of energy. In some countries, energy markets have been liberalised to protect consumer rights and avoid oligopolies. Regulators seek to discourage price volatility and to reform markets if needed. They also search for evidence of anti-competitive behaviour such as the formation of monopolies. With growing concern about climate change and global warming, renewable forms of energy, such as biofuels, solar, wind and hydro, are being promoted globally in order to stem the emission of carbon into the atmosphere.

The Chinese government is re-examining its energy development strategies together with its long-term economic strategies. There are many reforms underway in China’s energy markets, notably the electricity, coal, oil and gas markets. Besides the national energy/emission reduction targets set in the 12th Five Year Plan (spanning 2011-2015), China’s State Council further announced the “12th Five-Year Plan for Energy Development” in January 2013. This plan clarifies national energy policy priorities through an ambitious set of infrastructure and market targets.

This issue of the Bulletin presents summaries of the presentations delivered at ESI’s 2nd Singapore-China Energy Forum that related to China’s energy market reforms and their impacts, and to China’s contribution to regional energy markets, including the natural gas market, oil market, coal market, renewable energy market, national and regional electricity markets, and energy market integration. Held in October 2014, the speakers were...
from China, Singapore, Hong Kong, Japan, Australia, the United Kingdom, and Norway. The next issue of the Bulletin will provide summaries of the other half of the presentations delivered at this Conference which were on Carbon Markets.

Dr. Feng Lianyong, Professor at China University of Petroleum (Beijing), presented “Analysis of the Expectations for China’s Natural Gas Market in the Context of Shale Gas Development”. He noted that China’s future natural gas developments are mainly driven by the urgent need to improve the air quality in China’s cities and the increasing consumption of gas in the manufacturing and household sectors. The increased demand for natural gas will be met by conventional natural gas (40 per cent), imported pipeline natural gas and LNG (35 per cent), and China’s shale gas development (25 per cent). However, China’s shale gas development faces several challenges: high drilling costs, fiscal system constraints, lack of infrastructure, water scarcities and controlling the associated environmental pollution.

Dr. Zhang Yue-Jun, Professor at Hunan University in China, presented “China’s Crude Oil Futures and International Pricing Power”. The new Shanghai International Energy Exchange, established in November 2013, specialises in crude oil, natural gas and petrochemical transactions. Dr Zhang analysed China’s oil market pricing reform using a SWOT analysis: strengths (e.g., strong support from government and experience in crude oil futures trade), weaknesses (e.g., no independent crude oil pricing system), opportunities (e.g., huge amounts of oil consumption in the Asia Pacific region) and threats (e.g., low crude oil pricing power). He suggested that China ought to establish a domestic crude oil futures market and improve the regulatory system, as well as strengthen its international pricing power.

Dr. Zhang Lei, Associate Professor at the China University of Mining and Technology, presented “Coal Transportation and Electricity Transmission Patterns in China”. Due to the uneven distribution of energy resources in China, having adequate energy transport capacity is critical in satisfying each region’s energy demand, hence the slogans, “west to east and north to south coal transportation” and “west to east electricity transmission”. Dr. Lei used a linear optimisation model to derive the best pattern of coal transportation and electricity transmission in China. In the optimised solution, interprovincial electricity transmission increased by 83 million tons of coal equivalent (tce), while coal transportation decreased by 88 million tce.

Professor Zhang Sufang, Professor at the North China Electric Power University, presented “The Impacts of Power Sector Reforms on Wind Power Development in China”. She discussed three stages of electricity reform in China, i.e., investment institutional reforms from 1985 to 1996, reforms in governmental administration from 1997 to 2001 and market-oriented reforms since 2002. These reforms contributed to accelerated investment in wind power from 2003, but the sector encountered serious problems from 2009. Potential ways to rectify the situation include installing additional transmission infrastructure, augmenting operational flexibility, enlarging the balance area, and improving demand response. However, China’s incomplete electricity market reforms cannot as of yet support these measures. Further electricity market reforms in China are imperative and must also take renewable forms of energy into account.

Dr. Liu Xiying, a Fellow at ESI, presented “China’s Regional Electricity Market Reforms: Supported by the Electricity Direct Purchase Mechanism?” in which she began by outlining the four key components in the latest electricity market reforms starting from 2002. Alongside the electricity market reforms at the national level, reforms at the regional level are geared to building up regional electricity markets with competitive generators and market-oriented pricing schemes. An electricity direct purchase mechanism is included in both the national and regional reforms. Dr. Liu used Yunnan province as an example to illustrate the impacts of a direct purchase mechanism on the local electricity market based on a theoretical double-sided auction model.

Dr. Ruud Egging, Associate Professor at the Norwegian University of Science and Technology, presented “The Role of China in the Global Natural Gas Market”. In the coming years, China is expected to rely more on gas imports in order to reduce its carbon emissions and improve the air quality in the cities. China is importing significant volumes of natural gas from Qatar, Australia, Indonesia, Malaysia, Turkmenistan and other Asian countries. By 2035, China is projected to account for 30 per cent of the absolute global growth in natural gas consumption starting from 2010. The country’s import dependency will be at least about 35 per cent, with imports likely from Turkmenistan, other Central Asian countries and Russia via pipelines, and from shipments of LNG. Based on their Global Gas Model, China’s natural gas consumption is expected to plateau between 2035 and 2040, in a Two Degrees (450ppm) scenario.

Dr. Raymond Li, Teaching Fellow in the School of Accounting and Finance at Hong Kong Polytechnic University, presented “China’s Impact on Global Oil Prices”. He gave an overview of China’s oil demand situation and its developments from the 1990s to 2013. As domestic oil production has lagged the rapid growth in consumption, China has imported steadily increasing amounts of oil from both conventional (e.g. Saudi Arabia) and unconventional (e.g. Sudan) sources. Many studies find that there has been a consistent relationship between China’s crude oil price and the international oil price. Using a co-integration and vector error correction model (VECM) analysis, Dr. Li demonstrated “China’s impact” on world oil prices.

Dr. Shi Xunpeng, a Senior Fellow at ESI, presented “Enhancing the Acceptability of China’s Energy Investment Intentions in the ASEAN”. He delineated a five-dimension framework of analysis for energy market integration issues. Energy market integration, including investment liberalisations, has been actively promoted by the governments of the Association of Southeast Asian Nations (ASEAN) and of East Asia. China has been playing an important role in ASEAN energy investment since 2000 and has recently indicated its intentions to offer financial and technical resources, as well as leadership to facilitate regional connectivity. Dr. Shi discussed some of the criticisms that Chinese investors face in ASEAN, and gave suggestions for improving their image. For example, China could share its valuable experience with rural electrification, as well as with renewable forms of energy with the governments of Southeast Asia.

We hope you find these presentation summaries of interest and welcome your views and comments.

Dr. Su Bin, Senior Fellow
(On behalf of the ESI Bulletin Team)
With the continued rapid development of China’s economy, the demand for energy has been increasing rapidly. Between 2007 and 2013, natural gas was being consumed at an average annual rate of 14.8 per cent, while that for production was only 9.1 per cent. The country consumed 162 billion cubic meters (bcm) of natural gas in 2013, of which 28 per cent was imported from abroad. To date, the demand for natural gas in China has been based on two factors:

a) China’s air quality crisis. Natural gas, a much more cleanly burning fuel, is preferred over the use of coal, especially in the industrial northeast and in the country’s largest cities. The demand for natural gas is expected to continue to grow at the current rate to 2020, or perhaps a little slower. By 2050, total consumption is expected to reach 350 to 400 bcm; and

b) The increasing demand for energy, primarily in the manufacturing and household sectors.

In the coming years, China will import more natural gas from Central Asia and Russia via pipelines. In all, China will import about 130 bcm in 2020, equivalent to the total amount consumed between 2010 and 2012. The cost of these imports will be over one trillion dollars. If the development of unconventional natural gas is not as successful as expected, the scale of imports could be twice as much after 2020.

Based on geological analysis, logging data and seismic studies, China’s shale gas resources are significant, almost equivalent to the conventional natural gas reserves (22 trillion cubic metres). At present, the main companies involved are China National Petroleum Company (CNPC), Sinopec, Shell and Yanchang. The main working areas are in and near the Sichuan, Ordos and Bohai Bay Basins. In 2013, there were more than 200 shale gas wells, and 0.1 bcm of shale gas was produced.

The development of China’s unconventional gas sector has been vastly different from that in the United States. Whereas the cost of a horizontal well in China is 50 to 90 million yuan (equivalent to USD 8-14.5 million), the cost in the US is USD 3 to 11 million. In China, mining rights belong to the central government, whereas in most American states, the mining rights belong to individuals. In China, as pipeline construction is concentrated in mountainous areas, the cost of pipeline construction is higher than in the US. Moreover, far more roads need to be built in China for the trucks to access the wells, whereas the US already had most of the roads it needed. Also gas production and pipeline transportation have not yet been integrated in China and a third party access mechanism has not yet been established. Another difference is the availability of water, of which huge quantities are needed in the fracking process. While the US has plenty of water available, China’s supplies of water have been very badly stretched for decades.

In August 2014, the government revised the initial unconventional gas output target of 60 to 80 bcm per year for 2020 down to 30 bcm. At present, about 40 per cent of China’s natural gas is from conventional land sources and the ocean, about 35 per cent is imported from abroad via pipeline and in the form of LNG, and about 25 per cent is unconventional natural gas. It is hoped that the proportion...
of shale gas in the total mix can increase from about 4 per cent in 2015, to about 9 per cent in 2020, and 16 per cent in 2030.

China can learn some lessons from the “gas revolution” in the US, but cannot entirely replicate it as the geological, environmental, infrastructural, regulatory, etc., conditions are quite different. It will be many years before China can realise large-scale commercial exploitation of shale gas.

China’s Crude Oil Futures and International Pricing Power

By Professor Yue-Jun Zhang, Business School and Center for Resource and Environmental Management, Hunan University, Changsha, Hunan Province, China

The Shanghai International Energy Exchange in the Shanghai Pilot Free Trade Zone was established in November 2013 with a registered capital of 5 billion yuan (US$821 million). This Energy Exchange is the fifth national futures exchange approved by the China Securities Regulatory Commission, and when fully developed, will specialise in crude oil, natural gas and petrochemical transactions.

SWOT Analysis

Strengths
First, China’s government has provided strong institutional and policy support. In recent years, China’s central government has frequently called for full use of market mechanisms to optimise resource configurations and institutional innovations to reform oil pricing mechanisms. Second, China has carried out pilot studies for crude oil futures trading since 2004. These have provided much valuable experience, especially in trading regulations. Finally, China has tremendous crude oil trading volume (see Figure 1). According to a report from the China National Petroleum Company, China’s oil consumption reached 518 million tons in 2014, at a year-on-year growth rate of 3.7 per cent, and will increase to 534 million tons in 2015, which could provide a solid liquidity basis for the operation of a crude oil futures market.
Weaknesses

First, China still does not have an independent crude oil pricing system. As a result, it has weak influence on the international market and its importing prices must passively and uni-directionally follow the international market. Second, China has not built a proper market-based crude oil spot market, falling short of the requirement of the futures market. This is the advanced stage in the crude oil market compared with the spot market. As a result, if a crude oil futures market is launched, much attention will be attached to speculation. Finally, many state-owned enterprises (SOEs) have little interest in a crude oil futures market, due to limits in their accounting and audit systems. In the current performance evaluation system of most SOEs, no matter how many losses they have made in spot operations, the management does not have to shoulder any responsibility. However, if they participate in futures trading, they must take responsibility for their losses. Moreover, in the audit process, spot and futures operations are generally audited separately. If some enterprises have losses in their futures market, their audit reports may display losses even if they make profits in spot markets.

Opportunities

For one thing, from the consumer’s perspective, we may find that oil consumption in the Asia Pacific region surpasses that of America, Europe and Eurasia. Thus, the Asia Pacific region needs a highly effective benchmark pricing system to reflect its supply and demand. Meanwhile, the benchmark market of crude oil in the Asia Pacific may add another eight hours of trading, forming a global 24-hour risk hedging system for investors together with the North American and European markets.

For another, from the producer’s perspective, Russia faces the challenge of stabilising crude oil prices in its huge Asian exports. This is an important opportunity for China. In October 2013, Russia’s national oil pipeline corporation (Transneft) and its national oil corporation (Rosneft) announced that they would construct the Eastern Siberia - Pacific Ocean (ESPO) oil pipeline to increase exports to China, approximately 30 million tons by 2020. On the basis of this, China can attract the two corporations to trade crude oil futures in Shanghai so as to hedge the extreme risks in the market.

Threats

West Texas intermediate and Brent crude oil prices are still the benchmark prices for global crude oil trading. These pose considerable threats for China’s crude oil pricing power. North America, Europe and Eurasia have reached their oil consumption peaks, with continuous decline over the past five years, while oil consumption in the Asia Pacific region has been continuously increasing (see Figure 2), but there is still no typical crude oil benchmark pricing system for Asian countries, including China.

Future Strategies

In order for it to establish a domestic crude oil futures market, improve the regulation systems, and strengthen its international pricing power, China should:

a) Establish domestic crude oil pricing mechanisms, expand the commercial oil storage capacity and improve the oil market institutions.

b) Construct a crude oil futures market, urge institutional innovations and promote the internationalisation process of the oil market.

c) Make use of the international environment in the Shanghai Free Trade Zone and build a global futures trading platform.

d) Emphasise market risk prevention and regulation, and improve the legal systems relating to the crude oil futures market.
Coal Transportation and Electricity Transmission Patterns in China

By Dr. Lei Zhang, Associate Professor in the School of Management, China University of Mining and Technology, China.

To date, most of the theoretical research on China’s coal transportation and electricity transmission has been performed separately. Almost none discusses the relationship between the two industries, apart from economic cost comparisons. It is mostly concerned with local optimisation for specific lines.

The implementation of a combined coal transportation and electricity transmission strategy is obviously very complex and must incorporate economic costs, channel capacity, environmental protection, energy structure and other factors. If we assume that the national electricity market is perfectly competitive, that each province is an “economic agent” and that they all organise their production, transmission and distribution in accordance with the principle of cost minimisation, then: a) there theoretically exists an optimal distribution network which minimises the costs of the whole industry; and b) the provincial electricity flow and its direction in this supply network will reflect the best pattern for coal transportation and electricity transmission.

A linear programming model was constructed for this study. Taking 2011 as an example, the optimised provincial supply was 2,300 billion kilowatt-hours (kwh) and inter-provincial trade was 1,624.8 billion kwh, accounting for 41 per cent of the total electricity consumption. This share increased by 30 per cent compared to the actual 14 per cent proportion of transactions, resulting in the total cost of electricity dropping to 1,767.59 billion yuan, a decrease of 15.83 billion yuan from the actual amount of 1,783.42 billion yuan.

Thus, the optimised transmission pattern is more economical. The provinces can be divided into three types according to whether they source electricity:

(a) Completely self-sufficient provinces/regions, where local power generation can completely meet the local demand for power, including Inner Mongolia, Shanxi, Shaanxi, Ningxia, Qinghai, Xinjiang, Anhui, Guizhou, Fujian, Guangxi, Yunnan and Hainan. Most of these are in China’s main coal producing areas or are the lesser power demand provinces/regions.

(b) Partially self-sufficient regions which derive a portion of their electricity demand locally, with the rest coming from other provinces, including Beijing, Shanghai, Guangdong, Heilongjiang, Jilin, Liaoning, Tianjin, Hebei, Shandong, Henan, Jiangsu, Zhejiang, Hunan, Hubei, Jiangxi and Sichuan Provinces. Among them, the amount of outsourced electricity for Shandong, Jiangsu and Guangdong provinces is the largest. Scarce coal resources and large scale economies are the main characteristics of these regions, and the amount of outsourced electricity in them has a close correlation with the two factors above.

(c) Complete outsourcing areas refers to those whose electricity supply is entirely from outside, such as Chongqing and Gansu which source electricity from nearby Guizhou Province and Ningxia Hui Autonomous Region.
The optimised national thermal electricity generation was 17 million tons coal equivalent (tce) more than the actual, and the corresponding extra demand for thermal coal was 60 million tce.

But because inter-provincial electricity transmission increased by 83 million tce, the amount of coal needing to be transported fell by 88 million tce. This greatly improves the pattern of coal transportation and electricity transmission. Coal demand is completely met in Shanxi, Inner Mongolia, Shaanxi and Ningxia and in other places. They export both electricity and steam coal. In other large electricity export provinces such as Hebei, Liaoning, Anhui, Fujian, Guizhou and Yunnan, the local steam coal output cannot meet their demand. Thus, they need to import thermal coal from other provinces. Shandong, Henan, Jiangsu, Zhejiang, Hubei, Guangdong and other provinces substantially increase the amount of imported electricity. At the same time, they significantly reduce the size of coal imports.

The ratio of coal transportation to electricity transmission decreases from 4.49:1 to 2.65:1. The electricity transmission ratio is generally increasing, but for some places such as Beijing, Tianjin, Liaoning, Jiangxi, Hainan and Chongqing, it increased, i.e., coal transportation is increasing, which shows that the relationship between coal transportation and electricity transmission is definitely not “the two sides of one coin”. Each has its advantages and disadvantages, and they are both integral components of China’s energy strategy. As coal is the main form of energy used in China, satisfying energy demand by electricity transmission is not only realistic, but also economical.

The Impact of Power Sector Reforms on Wind Power Development in China

By Professor Sufang Zhang, School of Economics and Management, North China Electric Power University, Beijing, China.
Reform Commission (NDRC) rather than the SDPC and SETC, enabling a coherent policy. All of these institutional changes together with other incentive policies resulted in huge investment in wind power, as reflected in the dramatic growth of cumulative installed capacity of wind power since the year 2003, which accounted for 28.7 per cent of the world’s total in 2013.

Meanwhile, serious problems have occurred in the wind sector since 2009, particularly in the northeast, north and northwest. According to the National Energy Administration, the average utilisation hours in the Northeast China Grid were only 1,816 hours, 1,490 hours and 1,915 hours, and national wind curtailment was 10 billion kWh, 20 billion kWh and 16.2 kWh in 2011, 2012 and 2013, respectively.

Options for improving the situation include, among others, expanding transmission capacity, enhancing operational flexibility, enlarging the balance area and improving demand response. However, China’s incomplete electricity market reforms have had considerable negative impacts on the implementation of these measures. First, were the impacts on transmission addition. From 2002 to 2006, while growth in power source investment reached 43 per cent, growth in grid investment was only 8 per cent. This was due to the single investment source in the grid as well as the difficulty in the coordination of power source planning and grid planning after the separation of generation and the grid.

Second, were the impacts on the availability of flexible power sources. Flexible power sources such as pumped storage hydropower (PSH) could provide ancillary services. Unfortunately, because the pricing regime failed to incentivise, and actually discouraged the investment and operation of PSH plants after the 2002 reform, the share of cumulative installed capacity of PSH in China’s total generation capacity increased to only 1.8 per cent in 2012 from 1.3 per cent in 2008. Further, the average utilisation hours of PSH units decreased from 2,649 hours to 1,419 hours.

Third, were the impacts on the enlarged balance area. Currently, the provincial grid is the single balance region and 5,000-6,000 hours of generation are usually ensured for each thermal plant. As such, the provincial dispatch centres must resort to wind curtailment when there is limited absorption capacity in their provinces. Further, trans-provincial and trans-regional power trade is based mainly on the planning mechanism.

Fourth, were the impacts on demand response. The 2002 reform failed to acknowledge the potential of demand-side resources in that the dominant measures of demand response were administrative rather than market-based. In addition, the funds and staff for demand response programmes have been insufficient.

In conclusion, many structural reforms have been undertaken in China’s electricity sector, but they have stalled and competitive power markets have not been introduced. While the current state of the power sector has allowed China’s government to pursue its objective of stimulating investment in wind power through incentives, many institutional constraints have posed challenges to sustained development of wind power in the country. Further electricity market reforms are imperative and the government should give full consideration to all the various forms of renewable energy development.

China’s Regional Electricity Market Reforms: Supported by the Electricity Direct Purchase Mechanism?

By Dr. Xiying Liu, ESI Research Fellow

China has been implementing electricity market reforms for decades. The most important policy, Mandate No. 5, launched in 2002, aimed to separate generating companies and grid companies, separate transmission and distribution, rid grid companies of their subsidiary businesses and build up bidding markets for generating companies. However, to date, only the first and the third goals have been achieved.

Right now, most of the focus is on the separation of transmission and distribution. The failure to separate these two sectors is considered the biggest barrier preventing further reform of China’s power sector. However, there may be another way to look at this problem. Even in the “reformed” generation sector, there is still some room for the market mechanism. With the fully regulated on-grid tariff and the equal shares dispatch mechanism, generating companies can neither decide the amount nor the price of the electricity that they sell to the grid companies. Thus, separating the transmission and distribution sectors may not be the only issue to further China’s electricity market reforms.

Regional electricity market reforms were also taken into consideration in the national reforms. Several pilot reforms
took place in the northeast, in the provinces of Heilongjiang, Liaoning and Jilin from 2003 to 2006. The objective of these reforms was to build up the regional electricity market with competitive generators and market-oriented pricing mechanisms. Unfortunately, it failed for various reasons, including the dominance of state ownership in the power industry, fully regulated electricity tariffs (notably the end-user tariffs were largely fixed) and rapidly increasing fuel prices (mainly the coal price), etc.

From 2013, the electricity market reforms were put back on track, especially the regional electricity market reforms. The Inner Mongolia, Shandong, Yunnan and Guangdong local governments all drafted their own regional electricity reforms and had these approved by the central government. The electricity direct purchase mechanism (DPM) was included in all of their plans and was strongly supported by both the local and the central governments.

The DPM can be regarded as a transitioning mechanism from the single-buyer model to the multi-buyer model in the electricity market. As power plants and large consumers can directly trade among themselves, more competition and higher efficiencies are to be expected. Furthermore, the DPM is helpful in building up the transparent and fair transmission and distribution prices, as well as in facilitating the transition of governments’ role from price maker to regulator.

There are some points that need to be noted when implementing the DPM: a) the DPM should be based on phased implementation along with the opening of transmission and distribution networks, which means that it can be implemented before all the generators (or consumers) have fair and open access to the transmission and distribution network; b) it is easier to introduce competition in the generation sector when there is a supply surplus; c) as a pilot reform scheme, the DPM in regional electricity markets can be an effective way to introduce the nation-wide reforms while facing less risks; and d) the DPM is expected to be implemented efficiently because local governments have incentive to support local industries by providing more attractive electricity prices. However, the DPM should not be used to develop energy-intensive industries with cheaper electricity as this contradicts China’s energy efficiency plan.

Yunnan Province can serve as an example to illustrate the impact of the DPM on the local electricity market based on a theoretical model, namely the double-sided auction in the direct purchase market,\(^1\) where there are competitive generators and large consumers, and each one of them is offering their bidding set (with amount and price) to the organiser (assumed to be a grid company who dispatches electricity in China’s power industry) to sell or buy electricity from the market. The double-sided auction is proven to be an incentive compatible model, and the generators and large consumers are both encouraged to bid at the real cost or value in the auction, hence leading to an efficient market. However, the model can only be used to analyse China’s DPM in a theoretical way, as the actual practice of electricity market reform is much more complex and complicated. Moreover, China’s power sector has some unique characteristics, notably its close connection with the government. Thus, China will have to determine and build up its own reform model in practice.

Last but not least, the goal to implement the DPM needs to be clarified as a method to promote the institutional and mechanism reforms in China’s power industry so as to build a safe and efficient electricity market, rather than to provide cheaper electricity to large consumers or to simply reduce the size of grid companies.

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China was self-sufficient in natural gas until 2007 but thereafter had to begin importing large quantities. In 2013 it imported 49 billion cubic meters (bcm) making China the fifth largest natural gas importer. In 2006, the first liquefied natural gas (LNG) imports arrived from Australia. Since 2012, Qatar has been the largest LNG supplier to China, with Australia second. In addition, some Southeast Asian countries, notably Indonesia and Malaysia, export significant volumes of LNG to China. China began importing pipeline gas in 2010 from Turkmenistan, and this country still supplies the largest share of gas imports by pipeline into China, almost 90 per cent in 2013. Recently, Myanmar, as well as Central Asian countries have started supplying larger amounts of natural gas by pipeline to China. Today, slightly more than half of the total imports arrive through pipelines, and slightly less via LNG import terminals.

Future projections show continuously increasing gas consumption volumes, and although domestic production, possibly from shale gas, may grow significantly, it is likely that China’s imports will continue to grow very rapidly. The International Energy Agency’s World Energy Outlook has developed several scenarios with future natural gas demand growing globally at 17 to 55 percent from 2012 to 2035. The global absolute growth in the New Policies Scenario (NPS) was projected at 1600 bcm over this period, starting from 3400 bcm in 2012. China alone is projected to constitute 30 per cent of the absolute volume growth, increasing domestic consumption from slightly below 100 bcm in 2010 to about 550 bcm/year by 2035 (a yearly average increase of 6.6 per cent). By 2035, China will account for about an eighth of global gas consumption, up from less than 5 per cent in 2013.

BP estimates that Chinese domestic production by 2035 will consist of about 200 bcm of conventional gas, just below 100 bcm of shale gas and about 80 bcm of other unconventional sources annually. China’s currently proven reserves are estimated at 3,300 bcm. However, the estimated resource potential is 7 to 9.5 times as high, and there is little doubt that the reserves can sustain the projected production increases. Globally, the amount of natural gas that likely can be produced economically is much higher than the world can afford in terms of climate change, especially under a Two Degrees Scenario (2DS/450ppm).
Current projections for China indicate that by 2035 the share of coal in the fuel mix will have decreased from about two-thirds today to slightly over one half, and the share of gas will have increased to about one-eighth up from less than one-twentieth today. Globally, the gas share will stay more or less constant at a quarter.

Quantitative scenarios with the Global Gas Model show that natural gas consumption in China will plateau around 2035-2040, at 530 to 600 bcm depending on which policy scenario is analysed. In a 2DS scenario, Western countries would reduce their fossil fuel consumption, including natural gas, drastically after 2025. While also reducing its natural gas consumption (compared to an NPS scenario) in a 2DS scenario China would rely more on gas imports and thereby benefit from lower global market prices. Both LNG and pipeline imports would be much higher. Consequently, domestic production would be significantly lower. As such, in the 2DS scenario, production would stabilise around 200 bcm per year by 2040. From 2025 (2DS) or 2030 (NPS) Russia is projected to become the major source for Chinese gas imports.

The global reserves of natural gas are enormous and China is well-positioned to use this fuel as a bridging fuel to mitigate climate change risk and to improve the air quality in its cities.

11. ibid.

Figure 1: Global Gas Model Projections for China’s Natural Gas Supply in NPS and 2DS Scenarios (bcm/year)

China’s primary energy mix is dominated by the domestically abundant coal. Most of the oil consumed must be imported. Despite the relatively minor role that oil plays in the total fuel mix, absolute oil consumption reached 507.4 million tons in 2013, making China the second largest oil consumer in the world, just after the United States.

China is well-positioned to use this fuel as a bridging fuel to mitigate climate change risk and to improve the air quality in its cities.

11. ibid.

China’s Impact on Global Oil Prices

By Dr. Raymond Li, School of Accounting and Finance, Hong Kong Polytechnic University, Hong Kong.

China’s primary energy mix is dominated by the domestically abundant coal. Most of the oil consumed must be imported. Despite the relatively minor role that oil plays in the total fuel mix, absolute oil consumption reached 507.4 million tons in 2013, making China the second largest oil consumer in the world, just after the United States.

In the 1990s, the government wanted to maintain self-sufficiency in oil and therefore issued oil import bans in 1994 and 1998 in an attempt to wean the country off foreign oil. But these measures were effective only in the early phases, after which the demand for oil soared and it was impossible to meet the demand exclusively from domestic
An Old Dongfeng Oil Tanker Parked at a Highway Rest Area, Shaanxi Province, China. Photo by Kevin Poh, May 2009 / Wikimedia Commons (Licensed under CC BY 2.0).

Enhancing the Acceptability of China’s Energy Investment in the ASEAN Region

By Dr. Shi Xunpeng, ESI Senior Fellow Energy

China has played an influential role in ASEAN energy investment since year 2000. Besides being a key player in the ASEAN region’s many energy projects, it is also a major donor to ASEAN’s lesser developed countries. Presently, China has indicated a desire to offer financial and technical resources, as well as leadership to facilitate regional connectivity. This is evidenced by the establishment of the Asia Infrastructure Investment Bank (AIIB).

Theoretically, such investment and cooperation between China and ASEAN should be able to achieve...
win-win outcomes: recipient countries see their demands for investment, technology and capacity met, their infrastructure improved and their resource potential developed, while in return, Chinese investors benefit from business opportunities for goods, services and investment.

The reality, however, is not encouraging. Indeed, Chinese investment in ASEAN has met with much criticism, including claims of China neglecting the environmental impacts of their projects, low sharing of benefits with the local communities, sending large amounts of resources and electricity back to China, and bringing social and cultural disturbances, and even corruption. Another complaint is that both low quality products and workers from China are flooding the host communities. As energy projects, such as hydropower projects, often have significant and complicated social and environmental impacts on local communities, the controversies surrounding Chinese investment cannot be ignored and are important topics for both the Chinese government and investors to consider.

The reasons behind these controversies are at least two-fold. On a micro level, or from the individual investor’s perspective, the problems could have stemmed from inexperience on the part of Chinese investors who are new to international investment practices. Due to their lack of experience in dealing with inter-cultural differences, Chinese investors may have inappropriately applied their domestic practices to overseas contexts. Problems have also arisen when some individual workers and companies have lacked self-discipline. In other cases, investors have been weak in building a sense of ownership within the local community, or there has been over-competition among Chinese investors themselves. On a macro level, tensions have arisen from conflicting views and practices without regard to reconciling China’s geological and economic central roles with ASEAN’s politically central role (“ASEAN Centrality”). Ideally, China must manage the contradictory nature of China’s big economic size but small political voice, quickly resolve the South China Sea dispute and move past historical issues between China and its ASEAN neighbours.

To increase the attractiveness of China’s energy investment in ASEAN and win its acceptance, Chinese investors should emphasise their willingness, and improve their skills in managing environmental, cultural and religious issues in local communities. They also need to recognise that local communities may not share China’s desire for economic development and high efficiency. In China itself, it took decades for Chinese citizens to accept the doctrine of “Development is Absolute”. In fact, in ASEAN communities, such an ideological change has not yet been initiated and economic advancement may not be viewed as a “Win” outcome for them. As such, it might be better instead to invest time in building consensus and a sense of ownership in local communities so as to nurture a good working environment for them rather than swiftly pushing through projects. Hydropower projects for instance, could be started at a small scale, whereby the dramatic impact of relocating large numbers of people could take place only after local communities have accepted the overall benefits of the projects.

Much more could also be done on the part of the Chinese government, namely, realising its obligation to promote good practices in overseas investment. It should, in addition, emphasise its role as a facilitator, not a salesman, and pay more attention to the environmental and social impacts arising from its overseas investment. While it is not feasible to directly regulate the behaviours of the numerous private Chinese investors, the Chinese government, however, could look into creating institutions such as the Japan External Trade Organization (JETRO). Such bodies could assist in coordinating Chinese overseas investment; create legal frameworks to regulate overseas investment; and provide services to improve the capacity of overseas investors. Furthermore, the Chinese government could consider introducing a voluntary performance ranking system by which the Chinese overseas investors’ performance scores could influence financing and other support policies.

Using past lessons and its ongoing energy investment experience in the ASEAN countries, the Chinese government can boost China’s image and further facilitate China’s overseas investment. One way would be through promoting China’s “success stories” in the region. In the energy sector, rural electrification is one such “success story” that is of particular relevance to ASEAN members such as Cambodia, Laos and Myanmar. The achievements of Public Private Partnerships is another good example to share with the developing ASEAN countries facing similar challenges to the ones that China did in the 1970s. China’s rapid progress in renewable energy should also offer useful lessons and experiences for the ASEAN countries. Lastly, the Chinese government could also consider a restructuring of its aid programmes from “image projects” to grassroots initiatives to create a politically resilient impact in ASEAN’s local communities.
**Internationally Refereed Journal Articles**


**ESI Policy Briefs**


**Books**


**Book Chapters**


**Staff Presentations and Moderating**


28 January Anton Finenko participated in a panel discussion on “Russia’s Economic Journey Ahead” organised by the Singapore Business Federation.


22 January Philip Andrews-Speed presented “The Outlook for Shale Gas Outside the USA” to the Energy Association of the Lee Kuan Yew School of Public Policy, NUS.

21 January Melissa Low presented “Outcome of the Lima Climate Talks and the Road to Paris: A Focus on Intended Nationally Determined Contributions”, at the Strathclyde Centre for Environmental Law and Governance, Glasgow, Scotland.


6 January Jacqueline Tao presented, “Analysing the Challenges in Utilising Green Bonds for Financing
Renewable Energy Projects in Developing Asian Countries”, at the 1st Meeting of the Working Group for Financing Renewable Energy Developments in EAS Countries: A Primer of Effective Policy Instruments, organised by the Economic Research Institute for ASEAN and East Asia (ERIA), Jakarta, Indonesia.

15 December Elspeth Thomson presented, “Asia’s Changing Energy Dynamics and Strategy” to GDF SUEZ at ESI.

14-15 December Shi Xunpeng presented “Investment Liberalization in ASEAN and China’s Overseas Energy Investment” to the China-ASEAN Financial Forum 2014, organised by the China-ASEAN Research Institute, Guangxi University.

12 December Shi Xunpeng presented “Energy Cooperation in ASEAN: Lessons and Experience for Northeast Asia” to the 2nd Northeast Asia Energy Security Forum, organised by the Ministry of Foreign Affairs, Republic of Korea and UN ESCAP.

Staff Media Contributions

Philip Andrews-Speed was interviewed by Breaking Energy on China’s oil storage plans, 3 February 2015.

Philip Andrews-Speed was interviewed by Energy Intelligence on foreign investor sentiment in China’s oil and gas sector, 27 January 2015.

Philip Andrews-Speed was interviewed by China Radio International’s English language service for a programme on global oil prices and China’s energy sector, 19 January 2015.

Philip Andrews-Speed was interviewed by Radio Free Asia on China’s shale gas targets, broadcast on 19 January 2015.

Philip Andrews-Speed submitted a written text on the subject of China in the international energy arena at a time of low oil prices to the BBC China Service for a programme on “China in the World in 2015”, 16 January 2015.

Philip Andrews-Speed was interviewed by the Swedish daily Svenska Dagbladet on the effect of low oil prices on Asian economies, 15 January 2015.

Philip Andrews-Speed was interviewed by Channel News Asia on the Russia-China gas pipeline, broadcast on 9 January 2015.

Philip Andrews-Speed was interviewed by the Christian Science Monitor on coal-mine methane in China, 5 January 2015.

Philip Andrews-Speed was interviewed by Reuters on shifts in global oil trade, 23 December 2014.

Philip Andrews-Speed was interviewed by Bloomberg on the likely impact of the ruble crisis on China-Russia economic relations, 18 December 2014.

Philip Andrews-Speed was interviewed by the Globe and Mail on China and OPEC, 28 November 2014.

Philip Andrews-Speed was interviewed by Bloomberg on the geopolitics of oil prices, 11 November 2014.

Yuen Kah Hung was quoted in, “Speeding Up E-Mobility Adoption in Singapore”, Eco-Business, 1 December 2014.

Jacqueline Tao appeared on "Asia’s Tilt at Emission Trading", a programme for the “Between the Lines” series produced by Channel News Asia, 21 January 2015.

Melissa Low was quoted in, “Singapore Faces Constraints in Further Emission Cuts” Today (newspaper), 29 December 2014.

Recent Events

27 November, ESI Symposium

As Singapore’s main energy policy research organisation, ESI invited representatives from the government ministries and statutory boards which have a direct interest in either the provision or use of energy to a symposium entitled, “Evolving Global Energy Issues: Impacts and Implications for Singapore”. Held at the Hotel Jen, the aims of the event were firstly, to demonstrate the breadth and depth of our energy policy research, and secondly, to nurture communication among these various ministries and statutory boards.


Panel of speakers at ESI Symposium

Attendees at ESI Symposium

Dr Yeoh Lean Weng, NRF at ESI Symposium

Dr. Maria Francesch Huidobro, Assistant Professor in the Department of Public Policy at City University of Hong Kong began by noting the growing number of coastal cities around the world which, due to climate change, are increasingly being exposed to the risk of flooding and concomitant huge financial losses. She then went on to explain that in dealing with this problem, city governments are faced with tough challenges that span across three issues. The first relates to spatial planning, in terms of the visions, strategies, plans and programmes for land use development and territorial management. The second relates to the management of flooding, in terms of responses to storm surges, sea-level rise and land subsidence. The third relates to governance, namely, the ability of governmental and non-governmental actors to collaborate in decision-making. For this presentation, Maria focussed on the delta cities of Hong Kong, Guangzhou and Rotterdam and analysed how and why their spatial planning, management of floods and governance dynamics are shaping climate adaptation decisions.

Observer Status for NUS at UN Climate Talks

At the recent Lima Climate Conference (1-12 December 2014), the National University of Singapore (NUS) was formally admitted as an observer organisation to the UN Framework Convention on Climate Change (FCCC). The full list of admitted organisations is available in document FCCC/CP/2014/4. ESI is the designated contact point for NUS, serving as the official channel for the exchange of information with the UNFCCC secretariat, including but not limited to receiving official notifications, nominating representatives for sessions, matters related to side events and exhibits or other session-related activities.

Professor SK Chou, ESI Executive Director and Ms. Melissa Low, ESI Research Associate, attended Week 1 of the two-week Lima Climate Conference. They engaged with the Research and Independent Non-Governmental Organisation (RINGO) constituency and discussed ways to enhance research collaboration around policy and technological solutions to address climate change.

The Lima Climate Conference culminated in the Lima Call for Climate Action, an early stage draft negotiating text for a Paris agreement expected to be signed in December 2015. ESI looks forward to engaging with the international research community and further participation in the UNFCCC process leading up to Paris and beyond.

Contact

● Collaboration as a Partner of ESI (research, events, etc)
● Media Enquiries
● ESI Upcoming Events

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The ESI Bulletin on Energy Trends and Development seeks to inform its readers about energy-related issues through articles on current developments. Our contributors come from ESI’s pool of researchers, local and overseas research institutes, local government agencies and companies in the private sector. You can download past issues from www.esi.nus.edu.sg.

We welcome your feedback, comments and suggestions. The views expressed in each issue are solely those of the individual contributors.