

# Coal and Climate Change: “The Chinese Way”?

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International Energy Roundtables organised in partnership with the Asia-Europe Fondation (ASEF)

Seminar 1

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This report is issued within Asia Centre's energy program, which has been gathering the large energy actors (governments, corporates, experts and NGO's) around energy and environment policies or managerial practices dominating the Chinese landscape. For the 9<sup>th</sup> year in a row, and for the first time with the Asia Europe Foundation (ASEF) as a partner and a sponsor (on top of Chinese fellow institutions), Asia Centre organized the last to date energy roundtable in June 26-27, 2014.

After focusing on local policies for sustainable cities in 2012 and on China's gas challenge in 2013, Asia Centre turned to tackling a key issue for the 2014 session: the “slave/ master” bond between China and its abusive utilization of coal within the primary energy mix.

This report gathers the information and discussions which represent the output from the seminar.

Together with the opening remarks by ASEF's executive director, H.E.Ambassador Zhang Yan, the French Ambassador to China, H.E. Sylvie Berman, reminded the strong cooperation in energy matters between France and China in her welcoming speech. Underlying the role of the long-dated exchanges in matter of nuclear energy with China, but also the growing importance of cooperation in renewable energy, she emphasized the recent contracts signed during President Xi Jinping's visit to France in matter of clean coal technologies. Climate change being a common concern, both countries should keep on working hand in hand towards a better use of coal, and with the aim of facilitating COP21 negotiations, hosted by France in 2015.



## Introduction

Accounting for about 66% of China's total primary energy consumption and nearly 80% of its power generation, coal has been feeding China's economic growth for decades. With 13% of global coal reserves, the country is now the largest producer of the polluting fuel (mainly steam and coking coal, targeted at power and heat generation as well as steel and construction industries) and consumes alone as much as the rest of the world. Coal is thus essential for China's energy mix and represents, for the time being and many years to come, the core of its energy security.

However, with a huge part of its population rapidly accessing middle class and higher living standards, China became a net importer in 2009 and has witnessed a critical rise in its imports in the past few years. Despite abundant domestic coal, several other factors contribute to the sudden rise in imports, including the higher cost of domestic coal, bottlenecks in transporting domestic coal to power plants, coking coal resource restraints, environmental and safety concerns, and greater efficiency investments in the industry.

Despite forecasts reviewed downward due to some environmental policies implemented several years ahead of plans, the IEA still predicts that coal demand will grow at an average rate of 2.3% per year through 2018, mainly driven by China. Given that China's total energy consumption is still growing along with the economy, coal production will continue to grow apace. Notwithstanding national policies and targets increasingly favoring natural gas and renewable energy use, as well as recent measures taken against most polluting and inefficient mines and power generators, China cannot possibly consider moving away from coal in the medium-term, probably not in the long-term either.

This obviously raises several questions in terms of energy security as regards to increasing environmental challenges. Indeed, in consideration of a growing discontent among Chinese population and international pressure, the question arises as how is China going to maintain its energy supply while ensuring environmental sustainability? Is there still a future for coal, or is it destined to be gradually phased-out? Will China be able to overcome technological, financial and institutional challenges to develop clean coal technologies? The 12th Five Year Plan (2011-2015) acknowledges the fact that the Chinese energy market will have to undergo significant liberalization in order to ensure a safe development of the coal industry, and stimulate innovation in more efficient technologies. The underlying question which remains pending is thus: will these reforms be sufficient to cope with air, water and soil pollution induced by the coal supply chain, while ensuring energy security for China in the long run?

The roundtable presented four large panels and large debate sessions in order to answer these questions. The first panel was dedicated to climate change issues and the struggle for China to maintain its energy security while preserving its environment and sanitary conditions for its

large population, and the current role played by coal in developing economies.

The second panel aimed at exploring solutions to this dual issue: by developing on the field of environmental reforms at first, and in a second time by making a review of technological improvements and solutions that are currently envisaged by the Chinese government. The second day, also composed of two panels, started with presentations on the current challenges met by different economic actors in the coal industry, and more precisely in the supply chain.

Finally, the last panel aimed at opening the debate by taking a more international point of view and analyzing geopolitical aspects of internationalization and cooperation.



## An industry facing hardship

China is more and more aware of its responsibilities in terms of greenhouse gases emissions but to sustain its industrialization, the use of coal remains essential. The last Five Year Plan (FYP) is very specific on this matter, and aims to put 860 million tons of new coal production capacity into operation over the five years to 2015, more than the entire annual output of India.

With the increase in electricity demand, production basins progressively moved to the west, from less than 30% of the production in 2000 to 53% at the moment, a 15% annual increase. Unfortunately, China is endowed at 40% of low ranking coal (15% of high sulfur coal, 13% of lignite, 30% of high hash content coal), not ideal for application to clean coal technologies. The three main provinces (Inner Mongolia, Shanxi and Xinjiang) providing 80% of the production are also concerned. Despite a world-class power generation technology, China has troubles making the most value of this coal. New power plants are built according to specific coal quality standards but in practice the quality of the coal used is often very different.

Despite the use of low ranking coal, the move of production to the west increased travel distance to the consuming basins, and remaining inefficiencies in mining and coal processing significantly higher the price of the commodity. For instance, some experts mentioned the fact that even the biggest and most technologically advanced coal companies ignore their exact output.

Moreover, the transport bottleneck is far from being solved despite constant investment in mileage and capacity. According to experts, with such a network of land, rail and waterways, combined to the current high utilization rate of those transport channels, the network should be able to carry even more than the companies' output capacity. The inefficient rail network has been held partly responsible for long blackouts in the winters 2003 and 2008. Inefficiency makes logistics costs account for half of the price of coal, making it less competitive than the one coming from neighboring countries such as Indonesia or Australia. In some provinces like Xinjiang,

where the resource is abundant and cheap, moving coal to the biggest consuming areas of the countries (the East coast) makes no economic sense, since the final price is composed at 80% of transport fees. On average, the total transport price in China represent 10 to 15 times those in the USA. Administrative measures and corruption have long contributed to these inefficiencies (currently high officials of the National Energy Administrative are under investigation), with the rail bureau allowing coal transport arbitrarily and independently of economic logics.

However, the sluggish coal demand, due to environmental measures imposed by the government, tends to ease the burden on transport communications, so that the use of railway is declining 2% every year. To tackle the crucial transport issue, the National Development and Reform Commission (NDRC) recently issued the Coal Planning Roadmap in order to provide better solutions to local logistics. Meanwhile, localities take their own initiatives to improve coal supply. Some municipalities set up their own coal exchange platforms with transport bases, improving storage capacities, logistic efficiencies and costs. For the first time Shenhua established an e-commerce platform for coal in order to optimize delivery from the most coherent mining location in relation to the customer's geographic position.

These local initiatives improve market-based mechanisms for coal trading but high comparative costs drive imports upward. The attempts from the Chinese government to impose quality restrictions on imports failed due to local companies' pressure. Dependency on foreign production remains relatively low if compared to oil imports dependency, but reflect the Chinese industry's structural problem and lack of clear price signals.

Despite the strategic nature of the coal industry that slows the process of deregulation, this situation has been recognized by the government, which has been gradually opening some portions of the energy sector to market rules.



### **Restructuration and Environmental regulations growing**

The bulk of the reform aims at reducing the environmental impact along the supply chain while providing some financial help to this recessing sector, still essential to the economic growth. The ongoing "FYP" targets include, among several others, a reduction in the country's overall CO<sub>2</sub> emissions by at least 40% between 2005 and 2020, a limitation of the production and consumption to 3.9 billion tons by 2015, a reclamation of mined land rating over 60% and a 16% reduction in energy intensity by 2015 from 2010 levels. All will require serious technological investments in renewable energies but also in dirtier fuels, since they remain essential for China's energy security. After severe pollution outcasts

this winter, the China National Energy Administration has recently set a target of lowering coal's share of energy use

to below 65% in 2014 from last year's 65.7%, three years ahead of initial plans. Several sets of reforms, targeting the industry structure, institutional and price mechanisms as well as technological innovation and investment, have been recently put in operation in order to better reflect environmental and structural challenges.

Efficiencies improvements and better allocation of resources should be achieved first by a complete restructuration and consolidation of the Chinese coal industry. Authorities, who successfully removed 70 GW of coal-fired generation from polluting and inefficient generators between 2006 and 2010, will remove 20GW more by 2015 and push for vertical integration between mining companies and electricity generators. Along with the decommissioning of out of date power generators, new-built ones have to respect some standards even more stringent than the European and American ones, while old ones have to be rehabilitated according to the new regulation if not phased out. This method has proved beneficial in terms of efficiency gains but raises concerns over the domination of the market by a few large, state-owned companies. Some Chinese experts at the conference openly expressed their discontent regarding corruption mechanisms favored by a state regulated and heavily concentrated market, but also mentioned the idea that a fully competitive market itself would not be for the best of the Chinese people (in terms of commodity prices for instance) and would absolutely not guarantee environmental protection.

Several measures are being taken to improve air quality especially. While two conflicting directives in the EU (the Large Combustion Plant Directive and the Integrated Pollution Prevention and Control) are being combined into a new one (the Industrial Emissions Directive) in order to improve the enforcement of emission standards, China has opted for a stringent and clear control regulation to control air pollution. China is thus expected to become a major importer of particulates, SO<sub>2</sub>, NO<sub>x</sub> and mercury monitoring devices in the next decade, with large national suppliers to emerge on international markets.

Alarmed by public health disorders (respiratory diseases, cancers developed due to mercury emissions, soil pollution...) and the 7% GDP loss per year related to the use of coal, 19 working units (Danwei) from several ministries and research centres started to work hand in hand with NGOs (like the Natural Resources and Reform Council) on a project of national coal cap to be applied between 2017 and 2020. In the three largest consuming and most populated regions (Beijing/Tianjin/Hebei, Yangtze River Delta and the Pearl River Delta), caps should be in place by 2015. They should be followed by 10 other city-clusters from 2016 to 2020. The national cap is designed to be sectoral, with power generation accounting for 58% of the consumption only. As any environmental regulation in China, a national coal cap is extremely difficult to design due to the large gap in economic development between regions. While eastern parts of the country are able to bear an extra-cost for a more diversified energy mix, other regions endowed with heavy industries for instance still need cheap coal to develop quickly. 9 provinces already proposed their own targets representing 30% of the total predicted reduction (1.4 billion tons of coal per year), the 22 other provinces still need to define their objectives.

The question of the extra cost for technology development and environmental protection is also to be considered in the design of the Emission Trading Scheme (ETS). The question of implementing a resource tax or a carbon trading market has been long discussed in China and despite divergent opinions among experts and administrations, it seems that China is now moving toward the ETS. With 7 pilot cities (all on the east coast, more polluted but rich enough), the program is already well advanced and a national harmonized ETS should be put in place by 2020. The national benchmark should be between RMB20-90 per ton or CO<sub>2</sub>, a range currently in place in the pilot zones depending on their industrial structure, ability to bear the cost, economic development and so on). The NDRC will release more details on figures and implementation details by the end of the year 2014.

The key for the government is to give a nationwide signal to consumers: harmonize auction mechanisms, legal systems and ceilings between provinces. It is also essential to set proper penalty levels and improve the regulatory capacity which makes default at the moment. Rescaling the experiences made in the pilot regions to the national size is a serious challenge and obstacles are already obvious. Some experts leading research groups on the topic already expressed their concern that the nationwide market will not be able to be set up by 2020. Indeed, the government intervention in the market distorts prices and reduces risks visibility for economic actors. Some companies thus refuse to take part in the auction process, and stick with the primary market considered as less risky than the secondary one. Moreover, even though power companies still hold a strong financial influence and benefit from most of the quotas attributed, the future declining power demand (due to efficiencies and environmental regulations) coupled with the auction mechanism will probably have a significant impact on their cash flow. Steel and cement industries benefitting from less quotas are already hardly hit by the new financial burden.



### Betting on new technologies

The Chinese government heavily invests in the “technological revolution” to take the strategic coal industry out of the crisis. The current supporting mechanism is being reformed in order to create a fund dedicated to the promotion of new coal technologies, coupled with the set up of demonstration projects (18 cities are involved in projects for energy efficiency in coal technologies). But experts noted that over-subsidies are not efficient and to be useful this reform should promote a market oriented fiscal support, which might not happen.

Large companies already possess world-class technology for mining, processing and burning coal. Mechanization rates in the biggest mines held by companies like Shenhua or Yankuang hit 100%. Coal washing water treatment is gradually recycled into solid waste that can be reused in coal-fired power plants again with a subsidized technology that improves coal waste’s heat content.

The government also heavily bet on coal transformation technologies, with two Coal to Gas (CTG) projects already in operation and one Coal to Oil (CTO) project. This choice is extremely controversial since it proves not to be so environmentally efficient, with a downstream chemical industry dramatically water consuming and already saturated. Besides, the discussions showed that it is in contradiction with emission reduction goals stated by the FYP.

Indeed, to reach the target the best scenario would be to phase out old power plant to replace them first by renewables, then by gas. Transferring the power plant elsewhere would have a zero reduction factor at the national scale (and yet heavily polluted regions or cities like Beijing extensively use this technique), while CTO and CTG facilities actually worsen air, water and soil pollution.

Carbon Capture Utilization and Storage (CCUS), as expected, proved to be a hot topic by largely fueling the debates. The MOST (Ministry of Science and Technology) and NDRC strongly support the development of this technology internationally, and China leads at the moment 12 projects at development stage. China added the term “utilization” in the original concept in order to mitigate the cost of the technology, tremendously expensive. Foreign experts tended to be skeptics about the potentials of CCUS development, especially considering recent studies showing that soils that have been used for shale gas production would be improper to CCUS afterwards. Chinese researchers replied that the challenge was indeed huge but that no scenario limiting temperature increase within 2 degrees in China would work without CCUS.



### The Chinese coal industry opens up to international markets

China has been long self sufficient in terms of coal production. Now that the industry struggles and that a market restructuring seems to be unavoidable, Chinese companies increasingly look for businesses to develop abroad, but also for joint ventures with foreign companies in order to acquire technologies and funds.

Companies like Air Liquide, Total, Shell, Birtley or EDF are increasingly allowed to take part in the Chinese coal market, traditionally very much closed to foreign intervention and visibility. The “bring in” strategy mainly applies to fields requiring high investment and long-term technology development, like coal transformation, UGCC, sludge drying or CCS.

On the other side, Chinese companies widely practice the “going out” principle emphasized by the government by acquiring assets abroad and investing in mining rights like Yankuang and Shenhua do in Australia and Indonesia. Even though this coal is for now mainly sold out of China, a strong concern for coal supply security is perceptible behind these practices. If the country does not lower its coal consumption growth rate, in 67 years its indigenous resources will be exhausted. Besides, China has 92% of

underground mines with an average depth of 400 meters, compared to a world average of 60% underground mines. Underground mines higher production costs and working accidents, while exploration and extraction is made more difficult. The advantage of acquiring mining rights abroad is thus obvious for Chinese mining giants.

The other reason for going abroad lies in the structure of the Chinese industry : it still lacks concentration. 30 000 mining sites operate in China, among which a few big players accumulated huge amounts of capital in a need to be reinvested. Besides, Chinese companies are going global by selling their own expertise in world-class power plants, mainly to India and other Asian markets. But internationalization also puts Chinese companies at risk, especially considering the fact that state owned companies might still lack managing capabilities and make counterproductive decisions. Shenhua investments conducted during ten years in Mongolia and designed at improving the quality of coal extraction ended as a failure, while cooperation with Russia also proves difficult in this field. Yankuang has difficulties now with its investments in Australia, facing a depreciating Australian currency.



## Conclusion

Overall, two dynamics appear in the current Chinese coal industry landscape. It seems to be obvious that old practices derived from a planned socialist industry are nearing their end by the day :

- awareness on environmental issues and structural problems have arisen
- reforms are harshly being put in place with strong penalties for those resisting the consolidation of the industry and the sustainable development move.

However, economic development logics sometimes push the government to take decisions against environmental and social well being. As long as coal serves as a benchmark for energy prices, the expected switch to other kinds of energy sources, more expensive as they inevitably are, will remain as a stumbling block. China seems again to follow its traditional approach to reforms. It tries to tackle huge problems while setting for itself targets, which apparently are beyond reach. And yet, China has already proven itself able previously to reach overambitious goals. As an example the collapse in energy intensity during the implementation of the 11th FYP is quite illustrative, as is the recent decrease in coal share within the primary energy mix. Most experts believed it were unachievable one year ago. The development of more efficient and less polluting technologies embraced by the country is a strong sign of political will, that could be confirmed by the Chinese commitments, including possibly during the upcoming "COP's" (Lima, Paris).