

Summary of EPRG Workshop

12 May 2017

“Chinese Power Market Reform and Opportunities for UK Business”

Opening: Michael Pollitt and Christian Romig

The opening session, jointly chaired by Professor Michael Pollitt at the University of Cambridge and Mr Christian Romig from the British Embassy Beijing, introduced the general plan for the workshop and the origin of EPRG's recent Chinese power market reform project. Prof Pollitt thanked Mr Romig for the kind help since their first China trip last year and his initial inspiration for conducting this study. Prof Pollitt also expressed his appreciation for all the great support from Ofgem, National Grid, and Energy@Cambridge. He reminded everyone that the discussions in this workshop apply the Chatham House Rule.

Mr Romig briefly introduced the missions of the renewable energy team at the British Embassy Beijing and their recent policy and commercial engagements with the Chinese stakeholders, such as governments, research institutes and businesses. These engagements aim to accelerate the low-carbon energy transition in China, influence China's energy policies and promote the UK's energy security.

China has the biggest electricity system in the world, which is now leading the world on the global share in electricity production, CO₂ and fuel consumption. Based on the initial findings of this project, the main goal of this workshop is to present a variety of policy and commercial opportunities for both China and the UK.

Session 1: Chinese power market reform overview

In the first session, Prof Pollitt framed his presentation by a discussion of 14 EU/US electricity sector reform model elements and assessed the reform steps within the Chinese case study. These 14 reform model elements are based on Professor Paul Joskow's well-known paper on electricity market reforms and Prof Pollitt's recent research on efficient promotion of low emission technologies. These reform elements cover five major themes: 1) market restructuring and ownership changes, 2) supportive secondary market arrangements, 3) appropriate economic regulation, 4) efficient promotion of low emission technologies, and 5) appropriate transition mechanisms. Given the general reform context in China, Prof Pollitt pointed out that some reform elements, such as full privatization of SOEs, can be seen as optional. China might also need to put emphases on 'social stability' while meeting the challenges of the energy trilemma (of low price, energy security and environmental protection).

The key driver of this No.9 Document (March 2015) set of reforms is the high price of

electricity for industrial customers (compared to the US). The project has presented four major policy measures (e.g. reform of power station dispatch, increasing the efficiency of the grid companies, rebalancing charges away from industrial to residential customers, and reducing the high rate of investment in generation/networks). These measures alone could reduce prices by up to 12%. Also, it is worth mentioning that some of the final industrial price paid is non-electricity related taxation. This should be reduced in line with the government's fuel policy.

Prof Pollitt argued that now is a good moment to push forward with reform. The current final electricity prices are high, and the power industry is profitable. Though the Chinese government's current capacity to regulate a competitive power sector needs to be increased, the No.9 Document has laudable intentions for reforming the current regulatory arrangements surrounding the power sector and there has been real progress in separating out generation/retail from the network businesses. Meanwhile, a number of pilot wholesale projects for industrial power are underway and showing price reductions. In addition, there are strong environmental pressures to rationalize coal, increase renewables as well as end wind curtailment (which is high and mostly due to the hours based contracts held by coal fired power plants). However, the opportunity may pass if commodity prices start rising.

Questions/comments from the audiences covered various topics: the decommissioning progress of China's coal power plants; investments in a more efficient power generation system; overcapacity and rationalisation of coal; hydropower and renewables integration; market drivers and China's new energy storage programme in Beijing; the relationship between energy policy and industrial policy; the impacts of commodity price; the usefulness of UK reform experiences for China; the 'social stability' and 'environmental protection' aspects of China's energy trilemma; and the gap between the western and Chinese perspectives on all these issues.

Session 2: Reforming renewables support in China

Mr Adrian Ross started by introducing Ofgem's E-Serve division, set up in 2009, and its role and expertise for delivering green energy and social schemes on behalf of the UK government. Ofgem E-Serve have hosted multiple Chinese delegations from the government, industry and academia. The Chinese delegations favoured a "Tradeable Renewable Certificates" scheme and invited Ofgem E-Serve to assist them with the design of a new scheme in China.

Due to the existing policy support for renewable energy, China currently has a relatively high level of renewable generation curtailment (20% typically, but up to 50% in some provinces). To achieve China's 2020 renewable energy targets, the new "Renewable Electricity Certificate"(REC) aims to reduce both curtailment and subsidy deficit while improving the air quality. At this moment, there is a subsidy deficit of around 55 billion RMB, and the number is forecasted to rise to about 200 billion RMB by 2020. However, to set up a successful REC scheme, China currently still faces

several issues and challenges, including the determination of eligible generators, REC pricing, incentives of voluntary markets, regulatory design and compliance, and the overall managing capacities of the administration.

The National Development and Reform Commission (NDRC) China has proposed a reform scheme on 3 February 2017. The scheme would introduce a tradable certificate for each megawatt hour of wind and solar energy generated. These certificates will eventually be bought and sold in a market in order for obligated parties to fulfil a requirement for the provision of renewable electricity. The amount of credits to be purchased by obligated parties will be determined as a proportion of their total power output or sales. According to the scheme, non-distributed onshore wind and solar will be able to apply for credits, but hydropower and other low-carbon generation will not participate for now. Regarding the reform timeline, the scheme will be opened up to voluntary participation in July 2017. Also, mandatory participation may be introduced in 2018 'depending on market conditions'. However, the level of obligation for 2018 and obligated parties remain to be determined.

Questions for this session mainly included: the incentives of China's REC scheme; the transmission and distribution system for the next stage of reform; curtailment issues; and the future subsidy reforms in China.

Session 3: Reforming network regulation in China

Mr Lewis Dale, the regulatory strategy manager from the National Grid, presented his observations on reforming network regulation in China. These insights are mainly based on his visit to China in November 2016 (with Prof David Newbery) as well as the more recent discussions with the Chinese delegations from the North China Electric Power University, NDRC and State Grid's Energy Research Institute.

After his five-day trip to China, Mr Dale recognised that China has truly made significant industry restructuring steps and there is significant technical, economic and policy expertise for improving its large electricity system. In the past, meeting high demand growth securely has been priority, but there have been associated delays to structural improvements which might address air pollution challenges, potential dispatch biases, technological lock-ins risks and other under-developed regulatory capacities.

These factual learnings lead to a further discussion of various important topics. For example, what are benefits of simulated competition in networks? Why competition in preference to regulation? How renewable entry is best supported in markets? Do ex-ante network price controls encourage under investment? How are efficient cost allowances (especially around investments and their financing) determined in advance? What is the nature of the relationship between companies and regulators? And, what are the differences between centralized and decentralized development planning? All these issues have not been addressed comprehensively during the

Chinese power sector reform process, and Mr. Dale clearly pointed out that China could benefit from high level learnings from UK experience.

Mr Dale concluded his presentation by mentioning that the Chinese authorities desire to know the details of market reform steps and do not have any problem understanding all the theoretical aspects of power sector reform. However there appeared caution about putting decentralized/market reforms into practice. He also provided a few topics which may be useful to develop further – i.e. priority between dispatch, unit management and investment, market design, market monitoring, regulatory functions, and the measures for reconciling state policy goals with market incentives.

Questions raised in this session discussed: the various factors of renewable curtailments in the UK and China; technical requirements of establishing high-voltage lines in rural areas to connect renewables; and the impacts of the commodity mix on generation in the Chinese context.

Session 4: Supporting Chinese power market reform

Mr Romig's presentation outlined current engagements between the UK and China in the energy sector and identified the future challenges and opportunities. Currently, the UK's existing major energy and climate change engagement with China falls under the 'China Climate Change and Energy Network'. This Network is across 5 offices in China, including Shanghai, Beijing, Guangzhou, Chongqing and Wuhan. In 2016, the Network delivered 40 projects supported by the Prosperity Fund, with diplomatic wraparound support covering: green finance, energy transition, clean technologies, market reform and regulations. The bilateral collaboration on power sector reform is under the UK-China Clean Energy Partnership. These complement key ministerial engagements under the UK-China Energy Dialogue, UNFCCC, G20, EFD and leadership summits.

The aims of these engagements are two-fold – both policy and commercial objectives. For the policy actions, UK's objectives are to help China to reduce GHG emission faster and promote sustainable development. Though China is facing challenges (e.g. 20%+ of global emissions; 50% of global coal consumption), the country now already has established feasible frameworks and technologies to drive low-carbon transition after the 2015 Paris agreement. Also, engaging China can promote global cost reductions of clean technologies. So far many ambitious reform programmes have been implementing under President Xi's Energy Revolution, such as emissions trading and a push towards the electrification of transport.

For the commercial goals, there is already a growth in UK's market share of clean energy, environmental-friendly goods and services in the Chinese markets. In addition, the UK is also attracting Chinese investment in energy infrastructure. China views the UK as a world leader in the low-carbon transition. As reforms progress and competition kicks in, high-value services and expertise will be in greater demand in

policy, commercial and technical areas.

The China power sector programme was launched alongside 'Document No.9 in March 2015. Over 20 expert and commercial exchanges and 12 Prosperity Fund projects have delivered early successful outcomes, especially in the regulatory architectures. For instance, China completed a draft amendment for China's renewable energy law under examination by NPC Environment and Resources Committee. In addition, a draft transmission and distribution pricing model was developed with the UK input in January 2017.

In the future, an expanded Prosperity Fund will continue to enhance the UK-China collaborations in energy and power sector reforms. The targeted 'energy and low carbon' activities will range from domestic technological and system improvements to international energy governance (e.g. South-South engagement & OBOR initiative).

Panel 1: Understanding the Chinese power market

This panel was chaired by Dr. David Reiner and the discussions are composed by five Chinese panelists (each has 5 minutes to share their viewpoints). The main theme of this session is to understand the Chinese power sector reform from a non-western perspective.

The discussions began by addressing the different institutional settings of China and UK's electricity markets. For example, all of the leading electricity and grid companies in China are state-owned, unlike the UK, which privatized its energy industry in the 1990s. The political economy of power sector reform in China is also very different from the UK. Major differences include the preeminence given to energy security in China, the role of relations between national and provincial governments and the strong steer from the central government on the specific issue of power sector reform. However, UK's experiences are still very helpful in terms of the technical and operational issues of electricity markets. That is the reason why the current collaborative initiatives between both sides still benefits from bringing stakeholders to work together.

Compared with the state of the Chinese power sector in 1998, it is clear that the conditions have changed rapidly in the last decade. In this period, the political landscapes, technologies and environmental policies have evolved dramatically at both the domestic and international levels. China is learning from various reform models globally and focusing on both assessment methodologies and reform proposals. Among these models for reform, UK's model usually plays an important role. The transmission and distribution pricing model drafted in January 2017 is a good example of UK-China cooperation.

Panelists offered a diverse range of viewpoints on the potential for reform. Looking over the reform experiences in other sectors, such as telecommunications, oil and gas, the Chinese central government played a dominant role in almost every aspect of the

reforms. The question is how then to successfully address many fundamental issues at the regional and local level. Many previous examples have demonstrated that trust between various stakeholders – e.g. business and government; local and central governmental agencies - is the key element for a successful energy transition.

In conclusion, the Panel highlighted the environmental impacts of power sector reform, especially the link with air pollution problems in China. The reduction of wind curtailment and the reduction in the cost of power generation were identified as two of the main challenges for China in the future. The Panel also pointed out the necessity of establishing an asset accounting system for China's electricity SOEs and the opportunities for the UK businesses and regulators in this field.

Panel 2: Support for business in China

This Panel, chaired by Mr Romig, focused on the existing and future mechanisms that the UK government and other associations provides for supporting business in China. Currently, in China, the UK's Department of International Trade and Foreign and Commonwealth Office are paying attention to the expanding investment and trade opportunities in renewable energy sector, especially offshore wind, and also the wider power sector. Policy collaboration initiatives in this area can act as a platform for UK industries to enter the market. With the incentives and support from the UK government, businesses can re-evaluate the supply chain and identify what opportunities are out there.

Besides UK governmental agencies, there are also related British business and industrial associations providing assistance to UK businesses in China. The China-Britain Business Council and British Chamber of Commerce both have several contact offices across China. Their main missions are to provide updated research, analytical reports and practical information for the UK corporations. Due to China's fast changing energy markets and policies, these information services are especially critical for the large-scale energy projects investors. However, the support from these business associations will also vary, depending on the geographies, scale and capacity of corporations. When it comes to the support for Chinese businesses, last December, a group of Chinese delegations also came to London to discuss investment opportunities in offshore wind and marine energy generation. Therefore, the bilateral engagements will definitely continue in this field.

In the final Q&A discussions, the Panelists shared their first-hand experiences of assisting UK businesses for market competition in Yunnan and Jiangsu provinces. The Panel demonstrated that business/industrial associations are useful platforms for sharing information and resources that can assist UK corporations to land successfully in various geographies in China. Furthermore, the UK governmental agencies and related business associations would also be able to help Chinese companies to identify their UK partners and access to the cutting-edge technologies. When businesses seek help and support, cultural difference among organisations is another important issue.

Businesses should choose their partners wisely.

Closing Remarks

China's electricity system is now the largest in the world producing around 25% of the world's electricity and more than 7% of the world's greenhouse gas emissions. The annual value of electricity sales are up to \$600 bn and annual new investment is around \$137 bn. The sector employs over 4 million people in electricity supply and equipment manufacturing.

China's electricity industry is profitable and the industrial price of electricity is high (50% higher than in the US). High prices are a major driver of a renewed effort by the Chinese government on 'power market reform'. Since March 2015 there has been a push to introduce markets for industrial electricity in order to bring prices down. This has involved the creation of pilot markets, separate use of network charges and the establishment of retail electricity companies.

The ongoing reform of the electricity sector in China draws on the experiences of the UK and other leading electricity reform jurisdictions and creates opportunities for UK based companies in China. Primarily, opportunities are arising in consulting, networks, storage, trading, IT provision, training and financial services.

This one-day workshop has discussed this reform background and introduced both opportunities and challenges to the British businesses and regulators. Based on the collaboration between Energy@Cambridge and the British Embassy in Beijing, the future engagements will continue to explore and support the largest single industry reform project on the planet.