Institution: BRUNEL UNIVERSITY (H0113)

Unit of Assessment: 18 – Economics and Econometrics

Title of case study: Electricity Industry, Pricing and Future Reform in China

1. Summary of the impact (indicative maximum 100 words)

This study is part of a research project on China's electricity industry conducted jointly with the Université de la Méditerranée in France, and Swiss Electricity Ltd, and is funded by the EU. Despite three decades of market-oriented reforms in China, the electricity price-formation process is still state-controlled. The study shows how this process induces electricity producers to manipulate costs to gain an advantage when negotiating prices with the state. Consequently, despite government intervention, industrial consumers in China pay as much as their counterparts in developed Western economies with liberalised electricity sectors. These findings have informed the latest plans for price reform being prepared by the electricity regulator in China.

2. Underpinning research (indicative maximum 500 words)

We were funded by EU Grant Scheme of Marie Curie Actions – Industry-Academia Partnerships and Pathways for research on China's Electricity Industry: Efficiency, Growth and the Environment (CEI-EGE) over the period between 9. 2008 to 3. 2012 with project reference number 218246 and the call identifier FP7- PEOPLE-2007-3-1-IAPP. The project team consisted of 6 researchers from Brunel University, University de la Mediterranee in France and Swiss Electricity Ltd, and the study the pricing issues of the industry is part of tasks delegated to Brunel team headed by Prof Guy Liu. Over a period of four years, our research team has analysed data and surveys from more than 300 Chinese electricity firms, and undertaken field studies of the relationship between Chinese power firms and the industry regulator. We have identified that, although China has pursued market-oriented economic reforms for three decades, its electricity industry is still governed by a planned system whereby the state regulates not only the output of each firm, but also both its on-grid price (the price at which the firm sells its output) and the end-user prices. Furthermore, we have explored, both theoretically and empirically, how the state regulates firms' on-grid prices. We have found that the prices are set through a bargaining process between the state and the firms that aims to balance the need to stimulate overall economic growth (by supplying low cost electricity) and the needs of the power industry for sustainable development. As a result of this process, if a firm has a higher cost it is allowed to sell at a higher regulated price, and this creates an incentive for the manipulation of costs by the power firms.

The study refers to this cost-based negotiated price as creating a 'soft price constraint' in the Chinese electricity sector. Currently, the state-owned grid company purchases output produced by power firms at a state-controlled on-grid price and resells output to end-users also at a state-controlled price. Consistent with this study, the company complains about the controlled high on-grid prices charged by high-cost electricity producers. Our study also examines how far the soft price constraint raises the cost of electricity supply in the economy. It explores the issue further through an international review of electricity prices and identifies that, although the labour costs faced by Chinese power firms are only one-tenth of those of their OECD counterparts, the cost of power supply in China is no less than the average OECD standard for both industrial users and household users. In fact, in terms of the purchasing power, Chinese households pay more than their OECD counterparts. Our study suggests that the Chinese electricity producers would be able to reduce their costs if provided with the correct pricing mechanism. Such significant cost savings would also enable the firms to invest in environment-friendly technologies without putting pressure on end-user prices.

The results of this project have been reported to the State Electricity Regulatory Commission of China. They were presented at research conferences attended by government officials from the Commission (Beijing Oct 2011 and Geneva Oct 2012). They have also been submitted as academic articles in both Chinese and English versions (Liu 2012, and Beirne et al 2012) to the Department of Price and Finance of the Commission. The relevance of our argument about the current on-grid pricing mechanism and its adverse impact on the restructuring of the power industry and the market efficiency has been recognised by the officials of the Commission. They commented that "the arguments made by the study have helped us understand more about the

problems of the current plan system, adding a further impact on us as an electricity policy maker of the country to prioritise our plan on reform of the current on-grid prices towards a more market-oriented pricing system. The study provides significant evidence in support of the political will of the government against the impediment of interest groups for the reform."

3. References to the research (indicative maximum of six references)

References to key research outputs:

Beirne, John; Liu, Guy; Zhang, Liang (2012), The Electricity Pricing in China and the Role of the State, *Economics Bulletin*, Vol 32, Issue 1, pp466-474 http://www.accessecon.com/Pubs/EB/2012/Volume32/EB-12-V32-I1-P43.pdf

Liu, Guy; Zhang, Liang (2012), Understanding the Performance of the Electric Power Industry in China, *Asian Economic Papers*, Vol 11, No 2, pp62-98 http://dx.doi.org/10.1162/ASEP_a_00143

Liu, Guy; Girardin, Eric; Zhang, Liang; Zhang, Guangfeng (2012), China's Electricity Industry – Factual Development and Economic Analysis, (a book draft)

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4. Details of the impact (indicative maximum 750 words)

China has been very successful in increasing its power supply capacity by more than twelve times over the last three decades, and now has become the largest electricity producer in the world. The country has chosen a radical approach to power industry regulation that includes controlling the price and the output of each firm. In contrast, most other countries have liberalised their electricity markets. Why has China chosen a different approach and does it work well? In this context, the results of our study are highly relevant. Below we present our contribution and impact:

(1) China's macroeconomic performance has drawn the world's attention, but studies of the energy sector which fuels economic growth had only limited success in understanding the system. Our study of China's electricity sector has bridged this gap and provided valuable insights into the industry and, especially, price and output setting.

(2) The study explored the industry theoretically and empirically with a focus on understanding how China prices its electric power to support its significant growth over the last two decades. The soft price constraint impedes the restructuring of the industry and efficiency improvements, so that ultimately the regulatory framework fails to deliver the desired outcome. The problem identified in this study shows the importance of price reform for the Chinese economy. The electricity regulator needs to improve the cost efficiency of the industry by implementing alternative pricing mechanisms that provide the firms with the right incentives to lower costs and invest in sustainable technologies.

(3) This project has had an impact on the regulatory processes in China. The officials in the Chinese State Electricity Regulatory Commission have used a related article (the Chinese version) as one of the main references to support their price reform initiatives. The proposed reforms of the Commission aim to change the pricing system through co-ordination with other government departments such State Development and Reform Commission. The findings of our project provide strong scientific evidence that allows the policy makers to understand the importance of the pricing system reform and speed up the planning and implementation of an alternative framework when a new Chinese government comes to the power.

(4) The issues related to cost efficiency improvement in China addressed by our study have wider policy implications for governments and central banks in advanced economies. To the extent to which the prospective electricity sector reforms in China will increase the cost efficiency of power supply and, ultimately, the country's competitiveness, this is likely

to have an effect on global capital flow configurations and other economies.

(5) The soft price constraint shows that the inefficient firms are not directly subsidised by the 'soft budget', but by the 'soft price'. This is a new economic phenomenon that may be relevant to other transition economies. In effect, our study contributes to the existing literature on the economics of transition and opens new directions for research that complement the studies of the 'soft budget constraint' (e.g. Kornai, 1992) by focusing on the novel soft price constraint.

(6) Why has China chosen a different electricity market regulatory approach? The government believed that the controlled price system could help regulate the industry more effectively while serving its strategic interest in providing cheaper electricity to the economy and supporting growth. Our study shows that the regulation in its current form fails to lower the cost and, consequently, the prices. Rather, it induces the firms to manipulate upwards their costs in order to sell at a higher controlled price. Our empirical evidence has convinced the Chinese government and has also strengthened its political will by highlighting the need for price reform that improves the cost efficiency of power supply. This impact claim is made on the basis of the comments given by the Deputy Director for the Price and Finance Division of the State Electricity Regulatory Commission, who oversees electricity prices in China.

China is the largest electricity producer in the world with 80% of the power produced from its coal-fired power firms. Any policy that would result in lower costs could have wider implications and may result in global benefits if the cost saving helped the Chinese producers to invest in environmental projects and reduce pollution. Well-designed price reforms would have significant effects both on productive efficiency and also on environmental improvement.

5. Sources to corroborate the impact (indicative maximum of 10 references)

1) Civil Servant Pro-Forma received from the Deputy Director General of Department of Tariffs and Financial Regulation, State Electricity Regulatory Commission of China, Beijing, China. The statement confirms that 'the finding of the study has a major impact on China's electricity regulator in restructuring of the industry for more efficient supply via reform of the current plan system'.

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