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Restructuring the Chinese Electricity Supply Sector - *How industrial electricity prices are determined in a liberalized power market: lessons from Great Britain*

EPRG Working Paper 1839

Cambridge Working Paper in Economics 1871

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In this paper, we begin by discussing the components of the price of industrial electricity in Great Britain, as an example of a fully reformed electricity market, where the market is roughly comparable in size to a reasonably large Chinese province. We go on to discuss the key actors in the liberalized electricity system in Great Britain, before unpacking each of the components of the price. We discuss the market determined elements first, then go on to introduce and discuss the regulated elements of the price before finishing with the central government determined price components. Our discussion covers the determination of the wholesale price, the retail margin, transmission charges, system balancing charges, distribution charges and environmental levies and taxes. In each of these cases we discuss the process by which they are determined (led by the market, the regulator, the central government or more than one) and the specific lessons for China.

We offer the following overall conclusions for China from Great Britain.

In general, the focus in a liberalised market is on what the customer is getting for their money and away from the producer, except in the sense that producer needs a fair return on capital. In an initially profitable system – such as in China - reform should be about rebalancing the electricity system away from producer to consumer interests, i.e. from inefficient costs and high profits towards cheaper, cleaner and more reliable electricity supply.

There is a key role for the profit motive in a liberalised market as a guide to decision making. Transparency on price components is important for promoting better regulation and more competition. Wholesale power and ancillary services costs are reduced over the longer run by the use of wholesale spot markets to guide both short term dispatch and long-term investment in fossil fuel power plants. Transmission and distribution charges are an important component of costs, even in the UK these are 20% of the industrial price (where generation costs are 33%) and incentive regulation of network charges can bring large improvements in

both cost efficiency and network quality. In China, there is a need to understand and expand role of retailers by separating them fully from distribution. State Grid Company of China and China Southern Grid (SGCC and CSG) provincial retail should be fully legally unbundled from distribution and allowed to compete nationally for retail customers. Competition in generation and retail needs to be effectively overseen and regulated by both the regulator (the NEA) and the Anti-Monopoly authorities as pressure to consolidate the sector and undesirable price discrimination is likely.

In China, there is a need for a focus on the big picture (e.g. how much have aggregate prices/efficiency/profits changed) rather than *just* the detail (e.g. zonal vs nodal pricing, central vs self-dispatch). The aim should be to stop the power sector being subject to purchasing requirements for domestic technology and domestic natural resources (in GB the electricity industry eventually escaped from its historic commitment to buying expensive British coal). In China, local taxation and non-externality related charges can distort production choices and impose unnecessary industrial policy costs on other industrial electricity customers. Instead the power sector's key role should be understood to be in promoting development in the wider economy by efficient (and fully cost reflective) pricing. It is important to produce electricity efficiently and use taxation to drive up the price to promote energy efficiency and decarbonisation, rather than letting incumbents justify high prices on grounds of energy efficiency.

Challenges remain for all countries, including China, in the future development of the power sector, with the rise of new distributed energy technologies. The current electricity system is characterized by high fixed costs which should be recovered. It is difficult to prevent behind the meter investments to avoid paying towards these fixed costs. This suggests there may be a need to lift some electricity system costs to general taxation (e.g. energy R+D, energy efficiency measures). In China, as the growth in the number of kWhs distributed slows attention to fixed costs will increase. More competition and better network regulation will lower profit margins at home, to the benefit of consumers and the discouragement of wasteful investment abroad and it will reduce concerns about private/foreign ownership in the electricity sector, as has happened in the UK.

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Publication November 2018
Financial Support ESRC Impact Acceleration Award