

Energy Policy & Regulation: GB and China

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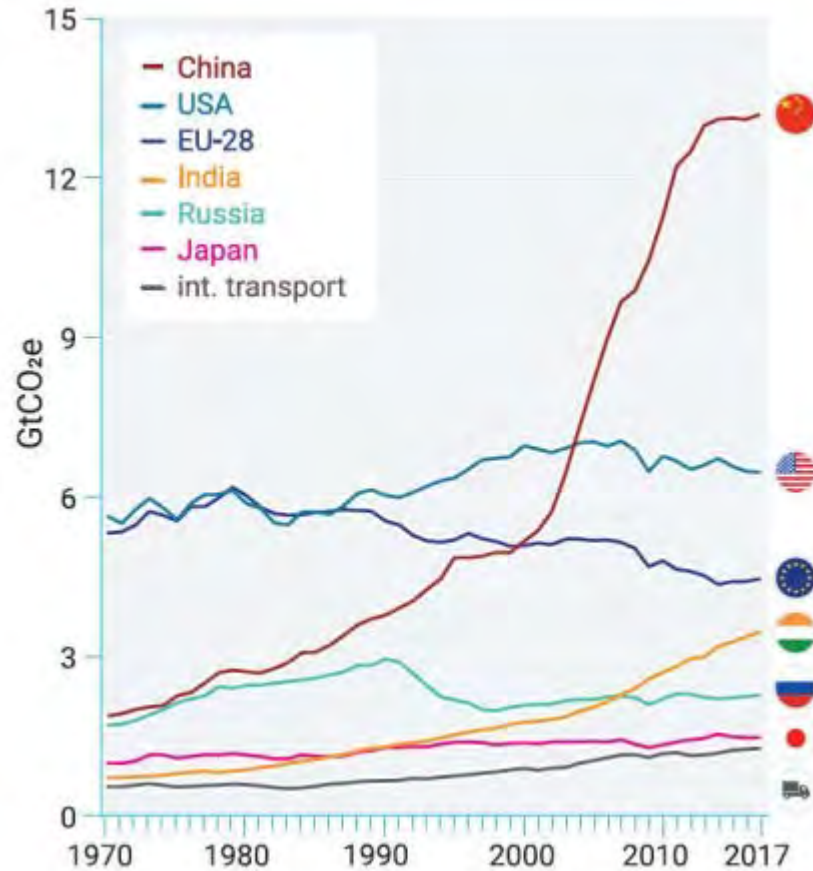
nationalgrid



Content

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Why China?



From UN Environment Emissions gap report
Dec 2018

Figure 5: China's CO₂ Emissions by Sector, 2017

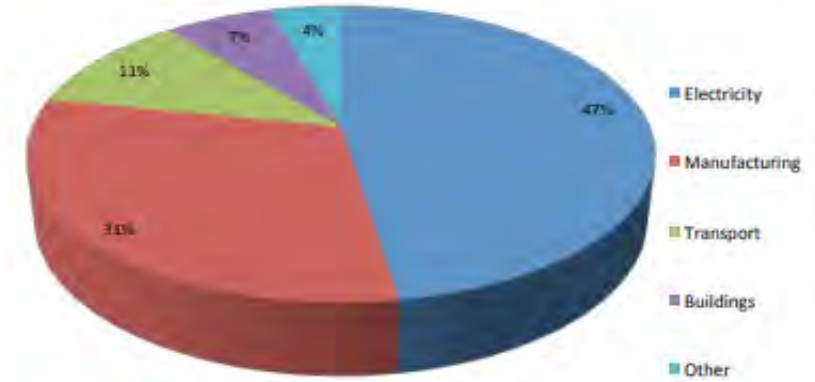
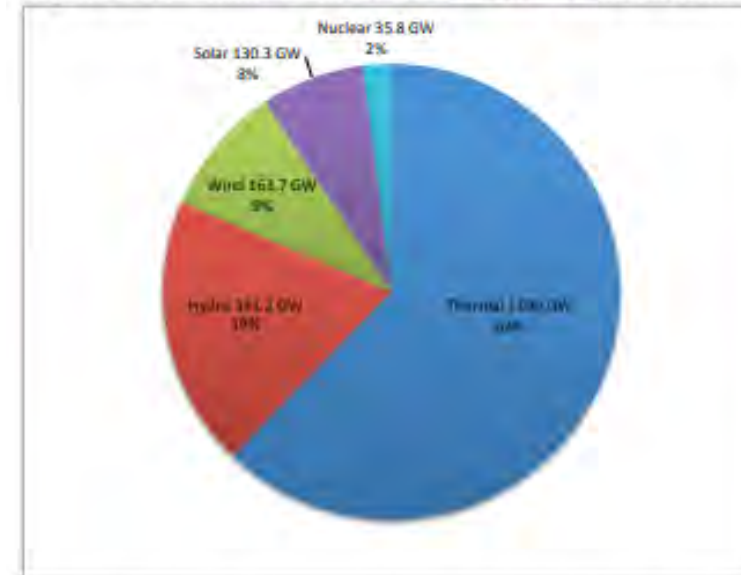


Figure 33: China's Installed Power Generation Capacity in 2017



Source: National Bureau of Statistics (2018)

From "Mapping China's climate & energy policies" British Embassy Beijing, Dec 2018

Oct 2015: UK & China sign the Clean Energy Partnership – agreeing to work together to transition to the low carbon economy

Why National Grid?

- A long-term member of the EPRG's Energy Policy Forum
- Committed to sustainable development and own GHG emission reductions
- A particular perspective from participating in and observing UK energy policy and GB market developments

Why Me?

- Visit to Beijing with Prof David Newbery Nov 2016
- Met visitors from China:
 - North China Electric Power University 24th Nov 2016
 - Energy Research Institute, National Development and Reform Commission 17th Jan 2017
 - State Grid's Energy Research Institute 14th March 2017
- Visit to Guangzhou, Fuzhou, Beijing & Nanjing with Prof Michael Pollitt 17th-23rd March 2019

Previous learnings

China made significant industry restructuring steps:

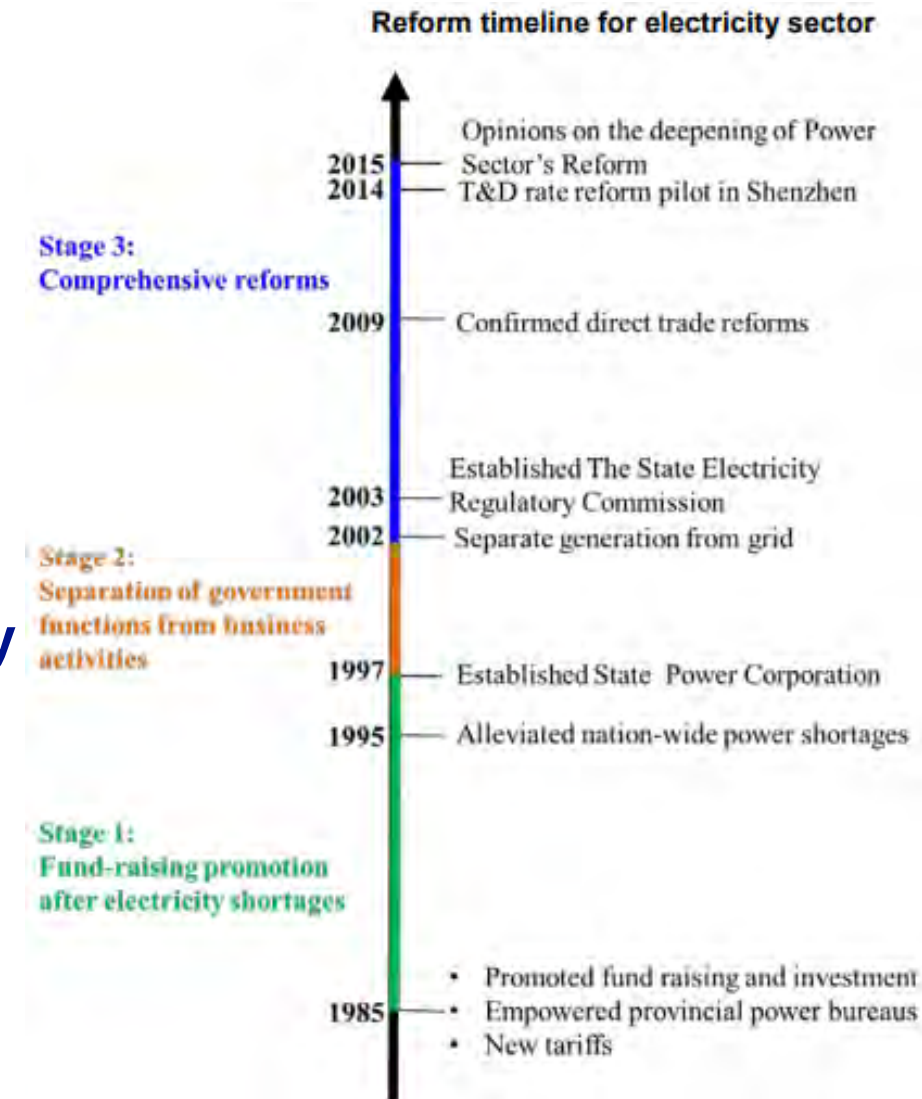
- Separation of generation from network
- Formation >5 generating companies
- Created regulatory structures

There is significant technical, economic and policy expertise

Recent focus on meeting high demand growth securely

Has delayed structural improvements:

- Relatively high energy prices for industry
- Acute air pollution and significant CO2 emission challenges
- Potential dispatch biases (for coal with high curtailment of renewables)



Source: An Bo et al. (2015, p.6).

Market pilots

8 spot market pilots announced 2017

Guangdong, Inner Mongolia, Zhejiang, Shanxi, Shandong, Fujian, Sichuan and Gansu

Guangdong Power Exchange:

2016: 13 wholesale companies approved

2017: New electricity trading, tx & dx regulation frameworks established

2017: Rules for inter-province electricity trading in CSG areas



Source: Liu Y, Gao Y, Hao Y, Liao H. The Relationship between Residential Electricity Consumption and Income: A Piecewise Linear Model with Panel Data. *Energies*. 2016; 9(10):831.

What did we discuss? 1 - China focused

Pricing role: efficiency, fairness or funding?

Market performance - measuring success

Pricing hydropower (market power issue?)

Effects on coal-based long-term plans

Effects of state ownership

Market start: big-bang or phased?

Reducing renewable curtailment

Integrating dispatch layers

Organising inter-province trading

In 2017 Gansu curtailed:
12% wind = 41.9TWh
6% solar = 7.3TWh
“Energy enough for Singapore”

What did we discuss? 2 – more universal issues

Market monitoring
How and Who?

Integrating RES

Accommodating new
retailers

Market design:
US LMPs or EU zones

Market or rule-makers
to determine spatial
resolution?

Market design:
Ancillary services

Who decides tariff
structures?

Who decides network
charge structures?

Benefits of smart/spot
metering

Network charges for
storage

Observations

China's policy makers are focused on measures that will make the most of China's enormous renewable investments. Seeking:

1. Dispatch improvements to give low marginal cost renewables priority (with pollution and CO2 emission benefits) while maintaining security
2. Short-run signals to inform consumers of low cost opportunities and drive best use of key transmission links & stores

Spot markets will also drive discovery of information for better development decisions

The task of figuring out how markets will work with the current coal-based central plans is complex. But parties are well informed:

- Actively discussing design and market issues
- Keen to learn from choices others have made

UK benefits?

Application of learnings from UK experiences can have big impacts on Chinese and hence global CO2 emissions

- Informs what is possible and shows more than one way of achieving it
- Highlights the trade-offs and critical issues for success and not so successful outcomes

A Einstein: “You do not really understand something unless you can explain it ...”

- Reminds us that there may have been other issues and alternatives

Thanks to

Michael and David for inviting me (and putting up with me) on these visits

National Grid for letting me go

British Embassy Beijing and British Consulate Guangzhou & Shanghai for organising discussions, translations and looking after us

Reforming the Chinese Electricity Supply Sector: Lessons from International Experience

EPRG Working Paper 1704
Cambridge Working Paper in Economics 1713

Michael G. Pollitt, Chung-Han Yang, Hao Chen

Abstract We begin with a brief background to the current Chinese power market reforms which began with the State Council No.9 Document of March 2015. We introduce 14 different electricity reform elements from international experience. Under each of these reform elements we will discuss: its theoretical significance; general reform experiences with it; and its application in the Chinese context. Our motivation is how China might bring down the currently high industrial price of electricity. We identify four promising sources of price reduction: the introduction of economic dispatch of power plants; rationalisation of electricity transmission and distribution; reduction of high rates of investment; and rebalancing of electricity charges towards residential customers. We draw out some overall lessons and identify some important points for future research into Chinese power market reform.

Keywords power market reform, international experience, China, industrial electricity price

JEL Classification L94

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Publication March 2017
Financial Support ESRC Global Challenges Research Fund

www.eprg.group.cam.ac.uk

Restructuring the Chinese Electricity Supply Sector: An assessment of the market pilot in Guangdong Province

EPRG Working Paper 1807
Cambridge Working Paper in Economics 1818

Michael G. Pollitt

Chung-Han Yang

Hao Chen

Abstract This paper examines power sector reform in China's largest province, Guangdong, following the publication of the No.9 document of the China State Council on 'Deepening Reform of the Power Sector' in March 2015. We look at the operation of the pilot wholesale power market in Guangdong in the light of international experience. We discuss how the power market pilot is working in Guangdong and the extent to which the current market design is in line with successful power markets we see elsewhere. We examine the evidence on whether the market reform has successfully brought new players into the electricity system in Guangdong. We consider the effects of the reform on the operational and investment decisions of firms in the sector. We conclude with several lessons for the Chinese government's ongoing power sector reform programme.

Keywords power market reform, international experience, Guangdong, China, industrial electricity price

JEL Classification L94

Contact m.pollitt@bs.cam.ac.uk
Publication February 2018
Financial Support ESRC Impact Acceleration Award and the 'In Search of 'Good' Energy Policy' Grand Challenge Project of Energy@Cambridge
www.eprg.group.cam.ac.uk

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

Michael G. Pollitt

Lewis Dale

Abstract 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 conclude by emphasizing some of the high-level lessons on electricity price determination for China.

Keywords Chinese power market reform, industrial electricity price, electricity liberalization

JEL Classification L94

Contact m.pollitt@bs.cam.ac.uk
Publication November 2018
Financial Support ESRC Impact Acceleration Award

www.eprg.group.cam.ac.uk