

The socio-political economy of electricity generation in China



Scott Victor Valentine*

Department of Public Policy and the School of Energy and Environment, City University of Hong Kong

ARTICLE INFO

Article history:

Received 27 December 2012

Received in revised form

20 November 2013

Accepted 4 January 2014

Available online 1 February 2014

Keywords:

China

Socio-political economy

Electricity

Energy policy

ABSTRACT

In addition to providing a review of electricity generation developments in China, this paper features the development of a framework for understanding the socio-political economy influencing electricity market development. It documents and presents a critical evaluation of the social, technological, economic and political forces which influence electricity generation policy in China. The analysis provides insight into why China's electricity generation shopping basket is being filled with both coal and CO₂-reduced electricity generation technologies. It concludes that installed capacity of hydro power, wind power, nuclear power and solar PV power will outpace government projections due to inter alia a proclivity on the part of the Chinese government to set conservative (and achievable) targets, waning apathy toward pollution associated with coal-fired power, progressive improvements in grid connection and resilience, increased economic viability of these alternative energy sources and government support for these industries as strategic commercial sectors.

© 2014 Elsevier Ltd. All rights reserved.

Contents

1. Introduction	416
2. Energy in China	417
3. The value of STEP analysis	420
4. STEP analysis of China's electricity generation sector	421
4.1. Socio-cultural Influences	421
4.2. Technological influences on Chinese electricity generation policy	422
4.3. Economic influences on Chinese electricity generation policy	423
4.4. Political influences on Chinese electricity generation policy	425
5. Conclusion	427
Acknowledgment	428
References	428

1. Introduction

Analyzing energy generation developments in China is akin to observing a person emerging from a supermarket with a shopping cart half-full with dietary products and half-full with chocolates and other sweets and trying to determine whether or not the person is going on a diet. On one hand, in 2009, China surpassed the United States as the world's largest emitter of greenhouse gases (GHG). Not only is China the world's largest consumer (and producer) of coal, by 2030, coal consumption in China is expected

to increase 41% from 2010 levels [1,2]. On the other hand, China also boasts the fastest growing wind power market in the world. In 2010, one of every two wind turbines installed in the world were installed in China [3]. As of June 2011, China enjoys top global spot in aggregate installed wind power capacity with 50,000 MW installed, 20% of global capacity [4]. China is also the fastest growing nuclear power market in the world with 40 GW of installed nuclear power capacity expected by 2020.

So what is happening in China's electricity generation sector? Is it going on a CO₂ reduced diet or not? Given its voluminous GHG emissions, mitigating the worst effects of climate change will not be possible without substantial GHG emission reductions in China. Accordingly, gaining an accurate picture of the evolution of China's energy generation sector is a pre-requisite for predicting

* Tel.: +852 3442 8922; fax: +852 3442 0413.

E-mail address: scott.valentine@cityu.edu.hk

the potential for success of global climate change mitigation efforts and for predicting the impact that China's electricity supply strategy will have on global energy markets.

This paper presents a critical evaluation of the social, technological, economic and political forces which influence electricity generation policy in China. As will be demonstrated, unique national circumstances in China dictate policy design and implementation because energy policy in China (like in other nations) is primarily a product of socio-economic political forces which promotes a gradualist approach to electricity mix planning that favors alternative energy development. This may not be optimal in terms of facilitating an expedient transition away from coal-fired production [5]; but it is optimal in terms of facilitating a socio-economic balance that the Chinese leadership (with good justification) views to be crucial for maintaining social, economic and political stability [6].

The layout of this paper is as follows: Section 2 provides an overview of China's electricity generation sector, Section 3 explains the STEP analytical methodology applied in this paper, Section 4 presents the STEP analysis of China's electricity generation sector and, Section 5 concludes by synthesizing the analysis to anticipate trends. In the process, the paper provides insight into why China's electricity generation shopping basket is being filled with both coal and CO₂-reduced electricity generation technologies.

2. Energy in China

Due to the dual distinction of being the world's most populous nation and the world's fastest-growing economy over the past decade, total primary energy (TPE) consumption in China has mushroomed. Upon first glance of Fig. 1, it appears that China's growth in TPE consumption over the past decade has merely kept pace with global growth trends. However, closer examination reveals a more engaging fact – China's TPE consumption growth has largely driven the global increase. Between 2000 and 2011, growth in China's TPE consumption accounted for 54.9% of the global increase. As Fig. 2 illustrates, China's TPE consumption now accounts for a whopping 21.5% of global energy consumption.

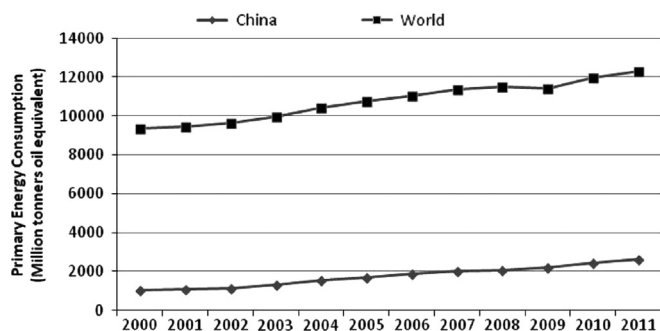


Fig. 1. Primary energy consumption trends 2000–2011.

Source of data: [7]

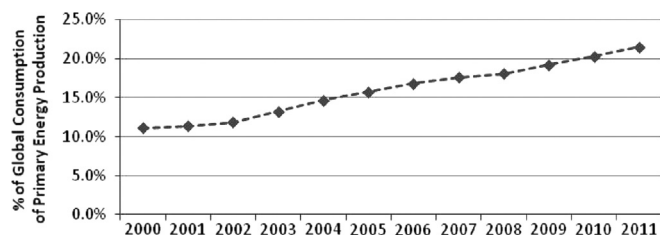


Fig. 2. Global primary energy consumption attributed to China, 2000–2011.

Source of data: [7]

Only the United States with a 18.5% share of global energy consumption comes near to matching China's prodigious consumption levels.

As Fig. 3 suggests, the fact that China's immense energy appetite is currently being satiated by a CO₂-intensive energy mix (largely due to the dominance of coal-fired power) is of great international consternation regarding climate change mitigation efforts.

Fig. 4 graphically illustrates the comparative scale of Chinese coal consumption. Of the top 10 coal consuming nations, China's total coal consumption in 2011 was 35% higher than the nine others combined.

It is primarily due to coal-fired power that China is now the largest contributor of GHG emissions. As Fig. 5 illustrates, between 1990 and 2010, CO₂ emissions in China increased 323%. China's 5.0 Gigatonne increase constituted 54% of the 9.3 Gigatonne global increase over the same period. By 2010, CO₂ emissions in China accounted for 24% of global annual CO₂ emissions. Consequently, China has been criticized internationally for a perceived indifferent approach to climate change mitigation. As former U.S. Secretary of State Colin Powell quipped in 2009, "You know what the first thing is that Hu Jintao does not think about when he wakes up every morning? Climate change." [8].

Yet, such criticism ignores notable developments in China's electricity generation sector which paint a picture of a nation that is far from indifferent to stemming GHG emissions. Expansion of alternative energy generation capacity has been nothing short of remarkable in terms of pace, scale and scope of development.

As Fig. 6 illustrates, wind power in China has flourished. China is now the world's largest wind power market, as measured in installed capacity and annual growth. According to the World Wind Energy Association, in the first half of 2012, China added 5400 MW of installed capacity. The nation now hosts over 20% of all global wind power generation capacity [4]. To illustrate just how aggressive China's energy policymakers have been in supporting wind power development, China released a *Mid-and-Long Term Development Plan for Renewable Energy* in 2006 which set a 2020 target for installed wind power capacity of 30,000 MW [10]. As of June 2012, 67,700 MW of wind power capacity was in place, surpassing the 2020 target by 125%. With technically exploitable wind power potential estimated to be as high as 2548 GW, it appears that wind power hold great promise in China [11].

In hydroelectric development, generation capacity in China tripled between 2000 and 2011, despite a dip in capacity in 2011 (Fig. 7). As of 2011, China possessed 21% of global hydropower generation capacity. China's hydropower output now surpasses the combined hydropower production in Brazil and Canada (the nations with the 2nd and 3rd highest levels of hydropower output).

In terms of nuclear power, China's program is still evolving and the nation's 14 reactors provided less than 1.8% of the country's electricity in 2011 [7]. However, there are 25 reactors under construction – the most in the world – and despite the disaster in Fukushima Japan, some nuclear power analysts in China contend that there is a "high probability" that the government will upgrade its targets to 60–70 GW for 2020 [12]. By 2035, China is projected to displace the US as the nation with the highest amount of installed nuclear power capacity [13] and by 2050, the Communist Party of China (CPC) aims to reach 400 GW of installed capacity (roughly 400 reactors) [14]. To support these ambitions, the CPC actively sponsors major research and development efforts to improve indigenous designs and develop technological prowess in fuel enrichment, fuel processing, and waste storage.

Even China's notorious coal-fired power sector has undergone sweeping changes aimed in part at reducing the adverse environmental impact associated with low-tech coal-fired energy generation [15]. A 2006–2009 government initiative to replace

Download English Version:

<https://daneshyari.com/en/article/8120238>

Download Persian Version:

<https://daneshyari.com/article/8120238>

[Daneshyari.com](https://daneshyari.com)