

## BOOK REVIEWS

*Energy and Environmental Policy in China: Towards a Low-Carbon Economy*, by ZHONGXIANG ZHANG (Edward Elgar Publishing Limited, 2011) 175 pages, ISBN 978 1 84844 546 8, Hardcover, \$110.

China has pulled 300 million people out of poverty in less than a decade. This feat has never before been achieved in human history. This astonishing economic growth was largely fueled by the burning of massive amounts of relatively dirty coal. As is almost universally true, China's firms and consumers do not pay for the full costs of their activities, which is nowhere more apparent than in the unprecedented deterioration of environmental quality in China. China is now the leading emitter of greenhouse gases and in fact emits more CO<sub>2</sub> from coal alone than does the United States from all fuels combined. Air quality in some Chinese cities has deteriorated so badly, that concentrations on bad days are higher than any ever recorded in the history of the United States. The World Bank has put the total cost of air and water pollution at about 5.8% of China's GDP. Significant policy interventions will be required in order to clean up China's air and slow the growth of its greenhouse gas emissions. China has set ambitious goals in terms of its Carbon Intensity—a 40–45% reduction by 2020. Further, 15% of its energy requirements are supposed to be met by renewable sources of energy. ZhongXiang Zhang's recent slender monograph provides is a collection of five edited lectures, which seek to shine light on the challenges and opportunities behind controlling the growth of energy consumption and emissions.

After a brief introduction laying out the overall challenges, chapter 2 tackles the issues arising from increasing decentralization of power from the federal to the provincial and local level. Professor Zhang correctly points out that local officials have to pursue multiple goals, and often prioritize economic growth over the enforcement of environmental regulation. The chapter describes tactics pursued by the central government to incentivize local governments and moves on to discuss which factors contribute to the severely limited success in terms of cooperation by local officials. It closes by discussing a number of concrete policies, which may fix some of the sources of the breakdown.

The third chapter outlines China's attempts to reduce energy consumption, emissions of pollutants and to increase the use of renewable sources of energy, nuclear power and engagement in Clean Development Mechanism projects under the Kyoto Protocol. The chapter argues that most of the reported reductions in CO<sub>2</sub> are not due to the CDM, but additional to them. Chapter 4 picks up this thread and investigates what the historical record implies for the pledges made for 2020. The chapter makes the important, but somewhat obvious, point that intensity targets depend crucially on reported GDP figures, which have been revised and questioned before. The chapter concludes that the proposed intensity targets may only be somewhat more stringent than a business as usual path and meaningful targets need to both be significant *and* credible.

Chapter 5 engages in some big thinking about what a roadmap for China's climate commitments towards 2050 would look like. The author argues that China needs to take on specific limits to its total emissions only by 2030 and questions whether this would be possible from a political economy perspective. He suggests that a transition to such a total cap would require further credible energy saving commitments now, halving carbon intensity by 2020 followed by ever tightening targets.

Chapter 6 turns its focus to potential carbon tariffs, which would be enforced at the U.S. borders if the U.S. ever adopted a national carbon tax or cap and trade program. The chapter carefully examines WTO provisions against formerly proposed emissions allowances and discusses the trade policy implications of such a policy and China's potential responses. The book concludes with a synthesis of the previous chapters and a look forward.

ZhongXiang Zhang has published work on China's energy and carbon future for the past 15 years and there are few scholars who understand the big picture challenges better than he does. As the book is a compilation of lectures, it is a bit narrower in scope than the title suggests and does not fully reflect the breadth of the author's overall research agenda. The book takes a very macro scale look at the challenges and not everyone will agree with its policy prescriptions. What I was really missing is a much more detailed discussion of the potential for market based instruments, such as a domestic carbon tax or cap and trade. Since most of the emissions come from a single fuel, the imposition of a tax really far upstream would generate incentives throughout the Chinese economy for conservation, fuel switching and increased energy efficiency. The repeated failure to meet the centrally set energy intensity goals leads this reader to believe that the author is right in his assessment that current policies are not working—maybe due to increasing decentralization. Further, a more detailed discussion of China's success in growing the share of renewables and its drivers would be interesting. Finally a critical assessment of what we should expect the future fuel mix to be under the current policy mix versus alternate policies would complement the discussion in this book quite nicely.

From a policy perspective, the author's proposed way forward may be potentially acceptable to the central government, but certainly not sufficient to put us on a path towards the already questionable 2 degree goal. He proposes increasing energy conservation and the use of "clean energy" until 2018, when a set of voluntary "no lose" targets would go into effect. These would be followed by a set of internationally binding intensity targets until 2027 with binding caps potentially going into effect by 2030. The work done by Robert Stavins and collaborators under the Harvard Project on Climate Agreements at the Belfer Center provides a much more comprehensive overview of potential policy options taking into account domestic political economy constraints.

Overall, I do find the book worth reading and it is appropriate for students at the Masters level interested in China's energy future. It is important, however, to keep in mind that this volume presents a very specific view of the problem and should be complemented by additional readings which examine the benefits and costs of more stringent and price based policies.

*Maximilian Auffhammer*  
*University of California, Berkeley*

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***Transforming the Grid: Electricity System Governance and Network Integration of Distributed Generation***, by DIERK BAUKNECHT, (Baden-Baden: Nomos Publishers, 2012), 250 pages, ISBN: 978-3-8329-7202-8.

Dierk Bauknecht's book addresses the following question: How can electricity market liberalization and sustainability be reconciled? He analyzes ". . . whether and how the standard model of network regulation that is part of the standard model of electricity market liberalization can be developed and adapted to accommodate DG [distributed generation] and network developments necessary to integrate a higher share of DG" (p. 20). He concludes that the additional objectives that sustainability entail cannot be incorporated into a market framework through efficient price signals alone. Instead, a governance mechanism is needed to overcome the lock-in of the existing system and to coordinate innovation processes.

According to Bauknecht, it is not sufficient to design markets that produce prices that incorporate all social costs. Even if technical innovations were to "fall from heaven," as the author puts it, they may not fit into the existing socio-technical regime even if prices are socially efficient. It is the need for controllability of a DG-based power system that requires both the political vision

to make this happen along with a governance structure that will result in the Distribution System Operator (DSO) having the right investment and innovation strategies.

The author does not believe that the policy solution is a matter of correcting two major market failures of not pricing negative externalities and of not correcting the public good problem associated with innovation. According to Bauknecht, the problem is more fundamental: “. . .the evolutionary economics literature argues that innovation is not a rational optimization with perfect foresight, but is characterized by bounded rationality and imperfect information as well as institutional factors that influence a company’s decision-making” (p. 133). Thus, incentive regulation is not sufficient because it is only focused on increasing efficiency and does not support broader objectives, which requires a broader political dimension and therefore a governance (as distinct from government) solution.

Is it the case that sustainability is a broader objective than efficiency such that even if society’s use of its resources were efficient, it could still be on an unsustainable path? This fundamental divergence between social efficiency and sustainability is a critical assumption made by the author that merits further examination. The author does argue that liberalization focuses on short-term efficiency. But is it the case that being efficient in the short run means not being sustainable in the long-run? Bauknecht believes that it is due to technological lock-in: the current system is efficient although it is being inefficiently locked-in the wrong technological path.

The book mentions several other social objectives besides efficiency such as network integration of DG and network innovation and transformation, and even states that the primary objective is not efficiency but that DG should be integrated efficiently (p. 156). Since the author does not lay out in detail his definition of sustainability but takes that objective as a given and DG as the solution, it is difficult to try to evaluate his conclusions based upon his analysis as opposed to what has already been prepackaged in these two critical assumptions. This is further exacerbated by the book’s confusion of final or ends objectives (e.g., efficiency, sustainability) with the means (or means objectives) to achieve the desired ends.

The book’s assumption that DG is necessary is common but nonetheless needs to be demonstrated. If in practice sustainability means that the electric power system does not use fossil fuels, DG would consist of solar, small-scale wind, and net-neutral biomass with substantial backup from either grid-based or distributed energy storage and/or controllable load. It is certainly possible that a less expensive sustainable electric grid could involve large-scale, non-carbon emitting generation with grid-based storage and/or controllable load but with relatively little distributed generation. If it turns out that a sustainable centralized power system is more cost effective than DG (or some combination of centralized and decentralized system), then a governance approach that implements only DG risks locking in an inferior solution.

Perhaps the author’s response would be that if a more cost-effective, sustainable centralized solution materializes, the analysis is still fundamentally sound because all this does is shift the question of governance to the level of the transmission system operator but the core problem remains, which is that efficient price signals are not sufficient. Thus, the author’s thesis perhaps does not hinge on distributed generation but on governance and therefore can be extended to apply to governance at the transmission level or even to a combined governance of transmission and distribution.

Accepting the author’s argument that governance, not price signals, is the fundamental issue, then what is the specific governance structure that is needed? The book presents two case studies from the United Kingdom and Denmark to flesh out these issues. The UK case study focuses on the liberalization model’s application to DG whereas the Danish case study discusses how that country moved beyond the liberalization approach.

Dierk Bauknecht has written a well-researched and thoughtful book that questions the basic assumptions and limitations of liberalization of the electric power sector in the context of

sustainability and DG. It is up to the reader and policymakers to assess whether his thesis is sustainable, and if the book's thesis is accepted, then the question of how is the governance process is governed arises. In other words, who watches the watchman?<sup>1</sup>

*Frank A. Felder*  
*Center for Energy, Economic and Environmental Policy*  
*Bloustein School of Planning and Public Policy, Rutgers University*

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***Energy Economy in China: Policy Imperatives, Market Dynamics, and Regional Developments*** by KANG WU, (World Scientific Publishing, 2012). ISBN 978-981-4335-67-6, Paperback, 270 pages.

China, as the world's most populous country and the largest energy consumer with rapid economic growth, faces a formidable energy challenge. 'Energy security' is one of its critical strategic goals to support Chinese economic growth. This support can come in the form of demand management policies (e.g. changing the energy consumption mix to increase the share of low-pollution energies, improving energy efficiency, and imposing pricing reform), as well as supply management policies (e.g. encouraging domestic and overseas investment and diversifying its energy trade). This book provides an in-depth analysis of such major issues related to China's energy sector, with a special focus on oil and gas, as well as a general view of the Chinese economy. Structural changes in the oil and gas system, natural gas pricing, energy security, rules and regulation for oil business, regional petroleum products and gas balance, and energy strategies and policies especially overseas oil and gas investment strategy are among the critical and interesting issues in this book.

The author of this book, Dr. Kang Wu, is an energy expert who has conducted numerous studies on various aspects of energy industries including: policy, security, supply, demand, trade, environment, energy and the economy, modeling, and market development. As a senior fellow at the East-West Center and a senior advisor at Fact Global Energy (FGE); his work focuses the Asia-Pacific region and he supervises the China Energy Project at the Center.

In the first chapter, Dr. Wu discusses the current situation and future prospect of primary energy production (PEP) and consumption (PEC) mix as well as providing a review of economic development and energy intensity in China. His review shows that China was the largest consumer of primary energy in 2010 and its per-capita PEC, 14.5 Barrel Oil Equivalent (boe)/person, has been slightly higher than the world's average, 14 boe/person. Coal has played a dominant role in China's PEP and PEC and in spite of its gradual declining share in PEC mix, its importance will remain much the same in the future. China will still be a net importer of oil and gas in the next decades, although the policy of substituting renewable energy for fossil energies will be followed to reduce carbon emission intensity.

Despite the global financial crisis at the end of the first decade of 21st century, remarkable economic growth along with a boom in foreign trade and foreign investment have been the major characteristics of China's economy over the past 25 years. The author believes that both economic and population growth are critical factors influencing PEC.

The second chapter provides a comprehensive and informative discussion regarding institutional changes in the petroleum industry from the mid 1970s, the formation of state-owned oil companies and their tasks as well as Chinese oil law. China's petroleum industry faced two important

1. F. A. Felder, "Who Watches the ISO Watchman," *The Electricity Journal*, December 2012, Volume 25, Issue 10, pp. 24-37.

events at end of the 1990s and early 2000s; the first was consolidating and streamlining corporate structures and size of three state oil companies namely China National Petroleum Corporation(CNPCF)/PetroChina, Sinopec and China National Offshore Oil Company (CNOOC), and the second was China's entry into the World Trade Organization (WTO) in 2001. After its membership into the WTO, China agreed to enforce new rules in the oil trade and marketing sectors, which include lowering tariffs on crude oil and products, expanding oil products imports by non-state oil companies and opening up the retail and wholesale oil business to foreign investment. China's energy policies are also reviewed in this chapter. The author mainly focuses on social, economic and energy goals set by the 12th 5-year plan (2011–2015).

China's current situation and future prospects for oil and gas supply and demand are discussed in the 3rd chapter. The author defines China's upstream development activities in five phases; 1949–59: low oil production and consumption, 1960–65: discovery of large oil fields, 1966–78: start of Cultural Revolution and continued self-reliance policy, 1979–99: growing oil production in order to sustain economic growth, and 2000 till now: continued economic growth and increasing dependence on energy imports.

The author emphasizes that coal bed methane (CBM) "is facing challenges such as investment barriers, infrastructure constraints and pricing issues". I would add that all forms of energy production and supply will face such challenges given the rapid economic growth of China. Therefore, it would be helpful if future work could provide more in-depth information about long-term capital requirements and financing options, information about China's overseas activities to finance domestic energy projects along with bilateral and multilateral Chinese cooperation with other countries and companies.

Chapter 4 is dedicated to the downstream refining industry. The author presents comprehensive information about refining capacity and ownership mix. During the 1970s and 1980s, oil refining capacity was not developed due to stagnation of crude oil production and government policy to maximize crude export, respectively. However, rapid changes were made to expand oil refinery capacity from the early 1990s. In addition, the author has an interesting discussion about the problems that locally-owned refineries are facing and government fiscal policies (e.g. taxes, customs, and duties), which affects refining interests. He then talks about opportunity interests of state-refineries provided by governmental supports, and also the attempt of locally-owned refineries to overcome their problems so they can survive and maintain their independence. Scrutinizing the valuable information provided about state and private refineries and their economic relationships along with long-term impacts of these relationships on the competitive environment of energy industry would have made a valuable addition to this chapter.

In the 5th chapter, crude and product market deregulation and their price reforms have been analyzed. First, the author explains oil market deregulation from the late 1990s, which was part of China's concessions made for entering WTO; he also talks about the opening up of the market and steady changes in the oil market since December 2001. Additionally, the author reviews the crude oil and product price regime before joining the WTO from the late 1990s to 2001, and after joining, 2001 until now. Although the linkage of domestic and international crude and product prices has been followed since 1998, the linkage pattern of the main domestic product prices has been changed in 4 distinctive phases: June 1998, Oct. 2001, Feb. 2007, and Jan. 2009 to present. The finding of the author regarding the future of the oil industry shows that China will become a crude and product net importer by 2030, under the base-case scenario. Therefore, a diversification policy is being considered to reduce vulnerability of China's economy by decreasing imports from the Asia-Pacific and increasing them from the Atlantic Basin. The Middle East, Russia, Central Asia and Latin America are other important potential exporters of crude.

Chapters 6 and 7 focus on the natural gas and liquefied natural gas (LNG) markets. In chapter 6, the author presents information for the period 1990–2011, but his concentration is mainly on the gas consumption mix in 2010. He shows that the industrial, residential/commercial and

power sectors were the major gas consumers that year. Further, he reviews the pricing regime of the natural gas supply chain and end-user gas prices with special attention to regulation of ex-plant prices including wellhead prices and gas plant fees, as well as pipeline tariffs. According to China's discriminatory pricing mechanism, natural gas price is higher for non-residential users and also increases with distance from supply sources.

The author believes that, the magnitude of natural gas resources, environmental problems, substitution of gas for other kinds of energy, and rapid economic growth in China are the key factors in predicting gas demand. On the other hand, the development of the natural gas sector will face some challenges which mainly include regulatory issues, infrastructure, price regime, and restriction on foreign investment.

In the 7th chapter, the author reviews China's LNG industry. Based on his analysis, Chinese LNG regasification capacity will increase from 12 MMt/y in 2011 to 62 MMt/y by the end of 2015 (with an annual average growth rate of about 50%). Sources of finance for this astonishing growth would have been an interesting addition. Moreover, he includes an interesting discussion about competition between LNG and domestic gas (domgas), pipeline gas imports, unconventional gas as well as other substitutable energy carriers. His review shows that domgas is not an important competitor for LNG because it is insufficient to meet growing demand. However, with sufficient development unconventional gas may affect LNG imports. Finally, the author emphasize that LNG can compete well in the three sectors mentioned above, if LNG prices are low enough.

Energy security is discussed in the 8th chapter of this book. The author believes that China's energy sector vulnerability results from the increase of energy consumption, excess of demand over domestic supply, the growth of dependence on energy imports, inappropriate energy mix, energy environmental effects, low energy efficiency, and inadequacy of the well-functioning regulatory frameworks in the energy sector. I would recommend that all energy experts and decision makers of oil-rich and gas-rich countries read about China's loan-for-hydrocarbons strategy, which exchanges access to its market for access to resources and also competition of National Oil Companies (NOCs)-to-other NOCs and NOCs-to-private companies for overseas investment.

An important vulnerability not mentioned by the author is the increasing reliance on shipments through the narrow Malacca Straits, where sabotage or accidents could disrupt tanker flow.

Chapter 9 focuses on China's regional development with a new regional segmentation of the country and an examination of each of the defined regions based on economic indicators (volume of foreign trade, export and import, per-capita GDP, and foreign investment), energy indicators (demand, supply and balance of primary and secondary energy), and regional energy outlook over the next two decades.

In the last chapter, the author summarizes predictions about China's economy and energy industry. They include: the growth of economy averaging 7% to 2030, a high dependence on gas, crude, and product import by 2030, an increase in the share of Middle Eastern crude imports which will amount to 61% by 2030, modest domestic oil production growth by 2030, the achievement of energy security through high overseas investment and implementation of loan-for-oil and gas policy, and finally a failure to fully implement oil and product prices reform. Furthermore, the author makes some recommendations about China's future policy-making in the energy sector which are as follow: a necessity for speeding up the reform of natural gas prices by the government through setting natural gas prices competitively, following an energy diversification policy to reduce vulnerability of the economy, and the necessity for expanding domestic gas supply infrastructure due to the remarkable growth of gas consumption.

The author concludes with the following reminders about security. Energy security, touches not only the energy sectors but has profound implications for the rest of the economy as well; there is no such thing as absolute security; security always comes with a cost. Further, since the energy security policy of one country impacts the security of other countries, joint security policy design and implementation is essential for achieving a "win-win" situation.

This book is suitable for all energy and energy economy researchers, as well as energy policy makers of all countries especially major oil and gas importers and all oil-rich and gas-rich countries. I appreciated this book, since Dr. Wu provides a transparent and comprehensive picture of China's energy and especially the oil and gas industry. As Dr. Fereidun Fesharaki mentioned in his preface, this book is a major guide to researchers to understand the complexity of China's energy sector now and in the future. With so many abbreviations in the book, I would have appreciated a table of abbreviations and the author might consider adding such table at the end of the book or even putting one online.

*Shahla Khaleghi*  
*Head of Long-Term Plan Affairs,*  
*Corporate Planning Dep., National Iranian Oil Company (NIOC)*