

BOOK REVIEWS

Shale Gas and the Future of Energy: Law and Policy for Sustainability, edited by JOHN C. DERNBACH AND JAMES R. MAY (Northampton, MA: Edward Elgar Publishing Inc. 2016), 352 pages, Hardback. ISBN 978 1 78347 614 5; eISBN: 978 1 78347 615 2.

Since it irreverently burst onto the energy scene during the past decade, shale gas has offered a tantalizing prospect as a bridge fuel to a sustainable future (Levi, 2013; Paltsev et al., 2011), with the benefits weighed against costs of environmental disturbance attendant to expanded extraction. Transitioning to a renewable future is speculative, and may be subject to a variety of interpretations. The philosophy of sustainable development provides core arguments for what the end result must be, which in turn helps define the path a bridge fuel must follow. The necessary legal and policy reforms for arranging such a transition path are considered in *Shale Gas and the Future of Energy*. Editors John Dernbach and James May collected a group of papers that address the steps that would need to be taken to assure that shale gas provides a sustainable future for energy. These essays are written from a legal and policy perspective, and focus on the U.S. and especially the Pennsylvania and Marcellus Shale experience.

Sustainable development is a paradigm that differs importantly from the neoclassical model. The first section outlines some of the key conceptual differences and analytic tools that define the sustainable development approach. Dernbach offers a summary of the approach in the first chapter. Sustainable development aspires to unite environmental and developmental concerns, while maintaining a focus on ethical choices from a societal point of view. This latter characteristic distinguishes sustainable development from a neoclassical environmental economics perspective. The environmental, economic, and ethical focuses are sometimes described as “pillars” of sustainable development. This subjects shale gas to evaluation under a broader set of criteria than most neoclassical economic analyses.

This outline of the sustainable development paradigm is followed by an essay by Pamela Ko and Patricia Salkin that highlights the importance of health impact assessments (HIA) as an analytical tool to assess the exploitation of shale gas. Like the notion of sustainable development itself, the HIA is a broad-reaching review of any policy across a range of outcomes, described more as a process than an analysis. Ko and Salkin highlight the review of shale gas development carried out by New York state, which has resulted in a moratorium on development there. It is not clear how information necessary to assess risks will be gathered in the absence of development, especially if pertinent health risks are specific to New York.

As a final foundational essay about the state of shale gas regulation, an appeal for “full-cost accounting” by John Quigley follows. This essay advocates for taking all pertinent costs into account, but is a very difficult read for an economist. An acknowledgment of private and external costs would make the discussion far more cogent, because full-cost seems to mean accounting for all economic costs, even if they are external to the decision-maker. Since writing the essay, Quigley has gone on to be named the Secretary of the Pennsylvania Department of Environmental Protection.

The heart of the book is four groups of essays exploring the impact of developing shale gas on different domains: community, public participation, governance, and climate change. On the community front, Jonathan Williamson and Bonita Kolb focus on issues of housing. Their discussion is bound to frustrate any professional economist—the treatment of the underlying supply and demand forces is reminiscent of a class presentation by a struggling principles student. Diana Stares, James McElfish, and John Ubinger, Jr. follow with a chapter on the prospects for local zoning and community engagement programs to mitigate development impacts for local residents.

Public participation in the development process is addressed in three chapters. In the first, Kenneth Kristl reviews the Pennsylvania experience and suggests that public participation has been subverted. As a remedy, Kristl suggests a NEPA-like public comment period for drilling permits.

Jill Morgan contributes a chapter on the process of developing shale gas in the United Kingdom. A central difference between the UK and U.S. experiences is that the ownership of mineral rights is decentralized in the U.S. but retained by the Crown in the UK. Mineral ownership and receiving production royalties certainly offers important opportunities in the development process. The section concludes with an investigation of the role of transparency in the legislation of shale gas in Pennsylvania by Bernard Goldstein. Goldstein's essay coherently identifies three ways in which transparency could decrease information asymmetry and promote sustainability: intentional secrecy, such as confidential business information provisions for fracturing fluids; impediments to obtaining information, highlighted by the difficulty with which interested parties can learn about drilling and production activities; and intentional blindness, such as not collecting data about the chemical constituents of produced water.

Another of the highlights of the book is the first chapter on governance authored by David Spence, considering the appropriate scale of regulation of shale gas. Spence uses language familiar to economists, considering externalities and transaction costs, and reviewing the evidence for a "race to the bottom" in shale gas regulation. The chapter concludes with a rejection of greater federal oversight and a handful of guiding principles for regulation.

Spence's essay is followed by two chapters outlining the experience in two countries not usually associated with shale gas exploitation: South Africa and New Zealand. This lends an unexpected international feeling to the volume, and addresses questions of how best to structure a regulatory regime when development is still prospective. Jan Glazewski reviews the situation in the Karoo region in South Africa. Trevor Daya-Winterbottom reviews the situation in New Zealand, where a very modest unconventional gas reserve raises issues that might also be applicable to offshore oil or coal-to-gas projects. Because the legal and regulatory settings are different in these countries, these chapters might prove useful to practitioners in other countries who would like to think beyond the U.S. experience, particularly in countries like South Africa and New Zealand that have made commitments to sustainability.

Natural gas is hailed as an important contributor to climate change solutions, where its use as a bridge fuel to future renewable generation is more palatable than alternatives. The final section addresses these challenges. John A. "Skip" Laitner contributes a chapter reviewing large prospective gains from investments in energy efficiency as an alternative to increased natural gas production. It is not entirely clear from the chapter what direct connection that energy efficiency has with development of shale gas. Failure to invest in energy efficiency poses a number of interesting questions—particularly through a behavioral lens—but those are not addressed and energy efficiency is presented as a viable alternative to natural gas development.

The second chapter on climate change impacts raises important questions about the net emissions of greenhouse gases; both carbon dioxide from final combustion but also more potent and short-lived methane that may leak from the supply chain. Donald Brown reviews the controversies surrounding natural gas production with respect to life-cycle emissions and overall global CO₂ concentration targets. The second half of the chapter explores the ethical underpinnings of shale gas and ends with a full-throated call for immediate transition to non-fossil energy sources while simultaneously curtailing demand.

Dernbach and May return for a concluding chapter to synthesize the lessons of the various chapters and answer the volume's central question: "Can shale gas be developed sustainably?" Dernbach and May lay out three criteria that must be met for the answer to be yes. First, "sophisticated and comprehensive" regulation must be in place; second, development must be part of "ambitious" national and international climate targets; and third, the political and legal system must be committed to achieving sustainability. The authors find some hope on the regulatory front, particularly at the state level for U.S. states. The second two criteria have less prospect of being met, though the authors put some hope in the 2015 Paris Agreement to lay the foundation for international coordination to meet climate goals.

Although the book is mixed from an economic point of view, the volume provides valuable detailed material for researchers interested in U.S. shale gas policy especially in the Marcellus (see the chapters by Spence, Goldstein, Brown, and Kristl) or comparative institutional economics for development (see the chapters by Morgan, Glazewski, and Daya-Winterbottom). The negative conclusions in the final chapter are disheartening. It seems that shale gas is not the future of energy—at least not until individual, corporate, national, and international goals are realigned to conform with a vision of sustainable development.

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REFERENCES

- Levi, Michael (2013). "Climate consequences of natural gas as a bridge fuel," *Climatic Change* 118(3–4): 609–623. <http://dx.doi.org/10.1007/s10584-012-0658-3v>.
- Paltsev, Sergey, Henry D. Jacoby, John M. Reilly, Qudisia J. Ejaz, Jennifer Morris, Francis O'Sullivan, Sebastian Rausch, Niven Winchester, and Oghenerume Kragha (2011). "The future of US natural gas production, use, and trade," *Energy Policy* 39(9): 5309–5321. <http://dx.doi.org/10.1016/j.enpol.2011.05.033>.

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Natural Gas—Fuel for the 21st Century, by VACLAV SMIL (Chichester, UK: Wiley, 2015), 264 pages. ISBN 978-1-119-01286-3. E-book ISBN: 978-1-119-01284-9.

This book by the famous professor emeritus of the University of Manitoba in Canada, his 36th, is devoted to natural gas. It is a concise review of several aspects of the supply of natural gas. It starts with the biogenic origins and shows the geological and geographical concentrations. Then, it provides an overview of the basic extracting, processing, transporting, and storing operations. Apart from conventional natural gas, there is a clear exposition of the nonconventionals (shale gas, gas from tight sand, and coal-bed methane) and a critical reflection regarding the – often overly optimistic – industry prospects. Smil provides an account of the industrial uses of natural gas and its role in heating, cooling and cooking. Here, the importance of natural gas for electricity generation is highlighted, as is its usage in chemical industries. Then Smil goes into the internationalization of natural gas. He highlights the recent boom in liquid natural gas shipments. The role of international politics, especially related to the conflicts of interest between Russia, China, and the U.S. are highlighted from the U.S. perspective. These six chapters lay the foundation for the reflections in Chapters 7 and 8 about the future role of natural gas. Chapter 7 covers the potential role for natural gas in energy transitions. Here, Smil relates to the fact that the world derived 88% of its primary commercial energy from fossil fuels in 1990 and it stood at 87% in 2012. From this, he concludes that the transition is likely to be very slow which would offer considerable potential for natural gas. But Smil also lists some of the drawbacks of a larger role for natural gas, especially flaring, methane releases, water use and contamination, and earthquakes. The title of the last chapter reads "The best fuel for the twenty-first century?". In this respect, Smil concludes that natural gas is an excellent fossil fuel whose many inherent advantages could contribute to its increasing use.

The book is well-referenced and provides a *tour d'horizon* of natural gas. It especially focuses on energy technologies and the supply side of natural gas. This is done in the first six chapters of the book which are highly informative for the non-energy expert. The last two chapters are much more speculative as they regard the potential role for natural gas in the transformation of energy systems and the assessment of what would be the best fuel for the twenty-first century. Nevertheless, they are highly interesting and very welcome as such a forward-looking perspective regarding the spread of natural gas also relates to an issue that is decisive for the fate of our society,

namely climate change. Direct or indirect anthropogenic release of greenhouse gases significantly contributes to climate changes. Substituting a 'dirty' fuel, such as coal, with a less-dirty fuel like natural gas may affect the growth rate of greenhouse gas emissions, but will not stop such growth. But the issue of avoiding the release of these emissions in the atmosphere is only very briefly touched upon in the book when carbon capture and storage techniques are discussed. The book does not discuss how a lower concentration of anthropogenic greenhouse gases in the atmosphere can be achieved. Climate change as such is not even included as a lemma in the index. It would be very interesting to read Smil's views about how the fossil fuel industry should effectively manage the external effects of their operations.

Smil is optimistic about the role of natural gas and argues it may complement or even substitute for coal and oil regarding a large number of applications. He also assumes that the dominance of fossil sources is here to stay as he qualifies society as a fossil-fueled civilization. This indeed has been the case since the mid-1850s until current times. However, he does not show that there is something inherent to human civilization that would warrant such qualification. Further, Smil does not acknowledge that previous transformations of the energy system have occurred within a few decades and that some countries (e.g. China, Germany) underwent enormous changes within one decade, which would shed some doubt on the book's claims regarding the prospective role of natural gas. I feel the weakest part of the book is that it seems to ignore social and economic relations: it does not address the role of markets, ambitions and market power of incumbents, changes in the demand side, the role of taste, or politics. This backfires in the last chapter which lacks an analytical framework to arrive at a well-grounded answer to the question what is the best fuel for the 21st century. Let us hope Smil will take this up in one of his next books.

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U.S. Energy Tax Policy edited by GILBERT E. METCALF (Cambridge, Cambridge University Press, 2014), 401 pages. Hardback ISBN 978-0-521-19668-0.

The papers included in this book were presented at a conference held in Washington, D.C., on October 15 and 16, 2009 and the unifying theme is the American Clean Energy and Security Act of 2009 (H.R. 2454), also known as the Waxman-Markey bill. The latter was the first attempt by U.S. lawmakers to regulate greenhouse gas (GHG) emissions on the base of a cap-and-trade market mechanism. The bill was approved by the House of Representatives in June 2009 and the timing of the conference was very appropriate. However, the bill never reached the Senate floor. Nonetheless, the issues that were addressed are still relevant today in light of the initiatives that have been launched, particularly in the electricity sector, and of the U.S. government commitments taken at the United Nations meeting on global warming held in Paris in December 2015.

The first chapter is an introduction written by G. E. Metcalf who presents the topics that are developed in the following nine chapters. Most chapters include comments provided by a university, a government or a center expert in the specific domain. Each chapter is self-contained. It provides the policy relevance of the particular topic, a literature review, the description of the model underlying the analysis and a comprehensive discussion of the results by making use of tables and diagrams. More technical materials appear in appendices. The presentation in each chapter is organized in such a way that policy analysts, researchers and graduate students can easily find the materials that correspond to their specific needs.

It is generally acknowledged that the introduction of carbon pricing will have a regressive impact on final energy consumers. This regressive impact can be made worse by grandfathering

emission permits to producers in a cap-and-trade regime. In order to address these regressive concerns, H. R. 2454 granted 30% of the emission allowances to local electricity distribution utilities (LDC) and 9% to natural gas LDC that have to pass this value to consumers due to rate regulation by states. The impacts on users depend on the ways that the allowance transfers are incorporated into rate schedules, i.e., the fixed or the variable part, and how users react to such transfers. This gives rise to the familiar efficiency distribution trade-off.

In chapter 2, D. Burtraw, M. Walls, and J. Blonz analyze the impacts of the above approach to address such equity concerns with the help of an electricity demand and supply model that aggregates households into 10 income classes over 11 regions to take into account regional mixes of electricity generation resources. They arrive at the conclusion that households are worse off under transfers through electricity rates relative to per capita lump sum distribution. Results vary by regions.

In chapter 3, S. Rausch, G. E. Metcalf, J. M. Reilly, and S. Paltsev study the impacts of a \$15 tax per ton of CO₂ equivalent emission through the use of a static computable general equilibrium (CGE) model that incorporates 10 household income classes and 10 regions; wage rate and capital rate of return are endogenous. They analyze various ways to implement CO₂ revenue neutrality: household lump sum transfer, payroll tax, personal income tax, capital tax, and specific transfers to electricity sector. Their most salient result is that the progressive side of income taxation outweighs the regressive side of energy use resulting from the carbon tax.

The next four chapters deal with policy instrument design. The starting point of the literature on the choice between tax and cap-and-trade to address CO₂ externality is the M. Weitzman (1974) seminal paper considered in the next two chapters. D. Weisbach in chapter 4 and L. Kaplow in chapter 5 provide an assessment of two critical assumptions underlying Weitzman's analysis, namely, the constant rate applied to pollution damage and the failure to adjust rate despite new available information. Weisbach and Kaplow argue that there is no reason why these two restrictive assumptions should be introduced when the global problem of CO₂ emission is considered and that price and quantity mechanisms are equivalent when the two critical assumptions are relaxed.

World negotiations about initiatives to reduce GHG emission have acknowledged the different responsibilities of developed versus less developed countries leading to different efforts required by countries in the two groups. Tractability requires that carbon be priced at the origin rather than downstream when products are consumed. However, severe adverse consequences that are associated with competitive issues, carbon leakage, country transparency and willingness to participate, arise and set the stage for complex border adjustments (BA). In chapter 6, C. E. McLure Jr. provides an extensive analysis of the economic, legal and administrative issues related to BA issues when countries adopt different regimes with respect to GHG emission reduction.

In chapter 7, J. Strand analyzes the effects of tax and cap in Nash equilibrium models that include a country that exports a high-carbon and low-cost fuel and a country that imports fuel and has access to a local low-carbon and high-cost fuel. Such models do not lead to equivalency of tax and cap as policy instruments. The tax is a better instrument to capture some of the rent of the low cost fuel that is produced abroad.

It is a well-known fact that gasoline and diesel taxes are much lower in the U.S. than in other industrialized countries. In chapter 8, I. W. H. Parry analyzes what should be the optimal taxes on these two fuels in U.S. when congestion, accidents, along with global and local air pollution externalities are taken into consideration. He estimates that the current tax per gallon would be multiplied by factors on the order of 3 to 4. Congestion and accidents are the leading factors while global warming is a rather minor factor.

In chapter 9, U. Charkravorty, S. Gerking, and A. Leach study the effects of a severance tax and an exploration tax credit on the total rent generated by the oil industry and on the share that is captured by the states. They perform simulations based on a Hotelling dynamic optimization model that incorporates production and exploration decisions. They find that production and rent

are not very sensitive to tax parameters and that U.S. states could collect more rent through higher severance taxes.

In chapter 10, H. de Gorter and D. R. Just study the social costs and benefits of the U.S. biofuel mandate and tax credit under pre-existing tax distortions. Their main result is that the mandate is superior to the tax credit in the presence of pre-existing suboptimal road fuel taxation because the mandate forces higher gasoline prices to pay for the higher ethanol prices. This result holds over a wide range of parameter values.

Here are three minor critical comments: first, most of the papers included in this book have a normative orientation and adapt the standard economic welfare measure to assess various policies. Little space is devoted to positive questions such as why energy taxes are much lower in the U.S. than in other industrialized countries. Second, the papers deal with energy taxes that are related to the production side rather than the consumption side; consumption ends up being influenced through pass on. There is now a growing literature on tax saliency and consumer behaviour. Third, governments have regularly used efficiency standards applied to cars, appliances and buildings to influence energy use. This widely used policy instrument receives little attention in this book.

Despite the above minor criticisms, the set of papers provides a wealth of energy tax studies done by well-known experts who perform work at the frontiers of energy economics, public finances and public administration.

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