BOOK REVIEWS

The Final Frontier: E&P Low-Cost Operating Model, by Justin Pettit. (Wiley, 2017), 192 pages, ISBN13: 9781119376545.

Although oil and gas are not likely to go away very soon, recent times have seen some unexpected dramatic changes and stresses to the industry with more expected to come. This book offers business model advice to consider as the industry continues to cope with this ongoing energy transition with special attention to the upstream exploration and production sector. The author offers this advice gleaned from decades of experience in the oil and gas business. He began his career as a process engineer continuing on to corporate development, investment banking, and giving strategic advice on restructuring, business improvement, mergers, and acquisitions. His most recent position is Vice President of Upstream Energy, at IHS Markit.

Ever a volatile industry with changing resource base, resource access, fiscal terms, technology, geopolitics, and more, the industry has evolved with a focus on cost and productivity change. The author argues that this evolution has been accommodative and incremental and that with the current confluence of events, it is time to reconsider the whole business operating model. These events include increasingly more complicated resource base and choices (e. g. enhanced oil recovery from declining conventionals, increasing resource base for unconventionals, and more movement into frontier areas); U.S. shale gale, which has put downward pressure on prices and LNG projects, changed capital flows, altered composition of petrochemical feedstocks and location, and put pressure on coal and nuclear power generation; inadequate operating cash flow exacerbated by reduced prices since 2014; the need for a wider array of technical expertise; new supply chain technologies; and increasing complexity in fiscal terms, regulatory regimes, and social license requirements. The author assumes the reader knows what a company operating model is and does not give a very complete definition with description until chapter 3. It would have been helpful to have the basic elements mentioned in the introduction. These elements are later given as (1) business delineation and performance measure, (2) organizational structure capabilities of workflows, (3) formal management processes, (4) delegation of decision rights, and (5) informal social norms and corporate structure.

Chapter 2, entitled, "The New Agenda" has a strong focus on cost. There are examples of representative costs in different N. American plays and types of resources that some readers might find useful. It highlights the conflict between the short run need to cut costs and the long run need to invest in higher cost resources. The author argues the most productive cost cutting is sustainable and scalable citing examples with these varying characteristics. Another main theme is to consider the relationship between three categories—company strategy, company capabilities and how to source them, and asset portfolio. Decisions on technology choices, business model, and business activities should be made with these categories in mind. There is numerous mention of upstream oil and gas technologies sprinkled throughout the book for the reader to consider.

I found Figure 2.3 that lists 16 categories of organizational capabilities as well as the technology advances in the text and Table 2.2 interesting. However, Figure 2.4 on the subsurface work flow of a geomechanical model, Figure 2.5 on relative technological investment activity by capability area, and Table 2.2 on key costs and capabilities with little discussion in the text were more mysterious. For example, in Figure 2.4 the arrows going from one circle to another suggest some short of link, but what do the arrows pointing to the center imply. In Figure 2.5, there is no legend to indicate what the different colors signify nor are there units on the vertical access. There is no legend in Table 2.2 or later in Table 5.2 to signify what the shading in the little circles indicates.

Chapter 3 focuses on the redesign of the exploration and operating model. It begins by noting the matrix design adopted by most large integrated and national oil companies that "combines geographical asset teams with strong centralized functional capabilities." Although this model has been good for mega projects, future success in the unfolding environment may require a more agile, decentralized, and focused operating model. The chapter contains a more complete description of what an operating model should contain. This chapter would be a useful introduction for a new manager. The discussion on cost (e.g. opportunity, sunk, accounting versus economic metrics, capital versus operating cost, etc.) and their allocation (across joint products, across time, etc.) are standard and important for any manager to consider. Other important decision that were touched upon or discussed include the make or buy decision, to partner or not, attitudes to risk and reward, communication, and design of key performance indicators (KPIs).

The author argues that historically companies have typically evolved in response to market change rather than redesigning their operating models. However, in Chapter 4 looks back at some exceptions where mergers, acquisitions, divestitures or public offerings have spawned redesign. He cites the examples from BP, YPF, and Petro-Canada, where ownership has been nationalize or privatized but reversed later. He references the planned Aramco IPO and cites examples of such IPOs that have been very successful or dismal failures. He cites 5 key success factors for IPOs, some more obvious than others: 1. don't' forecast earnings but focus on long-term performance, 2. communicate long-term strategy and execution rather than specific short term results, 3. align interest of management and owners, 4. reward your star players, and 5. keep the option to stay or go private.

Chapter 5 focuses specifically on national oil companies (NOCs) and their challenges, many of which are similar to those for the large international oil companies (IOCs) including rising social responsibility, political instability, decarbonization policy, as well as competition from unconventionals, natural gas, and renewables. It lays out some interesting dynamics. NOCs have the need to both cooperate with IOCs to receive technology transfer while they are competing with the IOCs to sell more barrels. At the same time, the IOCs and service companies may be competing with each other to service the NOCs. The NOCs also may compete more amongst themselves as they go international and become more vertically integrated. The IOCs, being squeezed out of access to the lowest cost reserves, turn to higher cost reserves with lower profit margins. Further, the author notes that the business models in the NOCs and IOCs are tending to diverge as NOCs are increasing vertical integration and the IOCs are divesting their midstream and downstream assets.

The author notes NOCs have benefits relative to the IOCs—a large low cost reserve base increasingly under their own control through expansion of in house expertise and increased use of service companies. NOCs tend have more insulated home markets, more domestic political clout, stronger government support in international markets, and may need to worry less about the vagaries of Wall Street and the media.

However, he also points out that NOCs may suffer the chronic inefficiency problems facing many government organizations including poor management, excess and unproductive labor, corruption, and political interference. NOCs typically need to improve their management of financial risk, their portfolio, procurement, contracting, risk sharing, forecasting, and talent.

They author stratifies NOCs into four categories: *importers*—in large developed economies, *challenged*—importers in developing economies, *developers*—in developing economics with abundant reserves and a shortage of capabilities and capital, and *exporters*—in mature economies with abundant resources. He indicates actual and potential tactics and strategic capabilities by category for some of these companies. Such tactics include supply agreements, building storage, commercialization of renewables, managing risk with financial instruments, partnerships, production sharing agreements, and local content requirements.

Companies can grow their assets organically by building them, buying them through merges and acquisitions, or borrowing them through cooperative ventures. Chapter 6 considers borrowing assets by focusing on using joint ventures (JV) but also touches upon attributes of strategic alliances, acquisitions, non-operated ventures and greenfield subsidiaries. The author notes various reasons for joint ventures including sharing (of assets, resources, risks) economies of scale, and access (to markets, technology and resources) with examples for each. He also includes discussion of typical provisions needed to design a joint venture including sourcing and use of cash, capital contributions, equity participation, management control, how to ensure ongoing cash needs, profit distribution, how to create real options with contract rights, exit and termination, transfer of interest, and sale or dissolution. The chapter concludes with best practice principles for managing alliances.

I find some points that are unclear or inconsistent in this chapter (e. g. oil and gas joint ventures are increasing, or they are decreasing; JVs create value, or corporate experience with JVs has tended to be poor). Figures 6.1 and 6.3 would have benefited from more explanation.

The book concludes in chapter 7 with financial implications. I found interesting the retreat of banks from providing finance to the industry as the result of regulatory reform. Stepping into the beach have been less transparent and less regulated entities including private trading firms, hedge funds, private capital and pension funds. The chapter contains a straight forward discussion with examples on financial strategy, which includes consideration on what and how much to finance, who might finance and how (debt, equity or a hybrid), capital structure, implications for ownership structure, and implications for operating to ensure proper monitoring and management. The sections on strategic risk management are somewhat more complicated and contain discussions on "what risks to own; risk capacity metrics and targets; objectives and exposure; hedge horizon, hedge ratios and instruments; and operating model and governance. Tactics cited to manage risk include do nothing or self-insure, insure, physical hedges, forwards, futures, swaps, options, structured agreements, and managed trading. The chapter concludes with a discussion of trading models and features of good risk management operating models.

The book has an index but in the electronic version of the book, which I read on the publisher's VitalSource Bookshelf program, there were no pages numbers next to index entries nor were the entries clickable. However, the clickable links in the Glossary of Terms section worked fine. Another irritant was that I was unable to do a global search but could only search within a subsection such as a chapter. Thus, if I found an unrecognized acronym, a search to find its definition could be more problematic than it need be. I could only get the "make note" to work in conjunction with the highlighter. On a brighter note I appreciate the book is divided up into page numbers and you can see what page you are on. The more electronic books behave like print books, the better I like them.

Aside from some of the electronic frustrations, the biggest weakness in the book is the treatment of tables and figures. Typically, very little information is given about the figures and tables in the text. Occasionally a figure or table is not even referred to until after it has appeared. At times, the tables and figures are self-explanatory, but at other times as noted above, the reader does not clearly understand what is being conveyed.

The things I appreciated most about the book, are that the management principals discussed to apply to designing an operating model usually arise from fundamental economic principles and the author supports these principles with a wealth of industry examples (both positive and negative with some even from other industries). These principals are not always named as such but include applications of fixed and marginal cost, economies of scale, comparative advantage, lining up incentives with goals, etc.,

The book is aimed at managers in the upstream oil and gas industries. However, some of these examples on management could be used in other more general basic economics or business management courses. I expect I will incorporate some of them as well as more knowledge of upstream oil and gas technologies in my energy economics course. The book is reasonably straight forward and should be fairly accessible to newbies, who will benefit from a broad introduction to upstream business models. A more seasoned manager could read and rethink their current operating model. The book has more breadth than depth, more principles than detailed instruction, but readers should be able to find other resources with more depth or detailed treatment in areas of interest or need. Indeed, I expect to follow up on changes in financial regulation

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Handbook of the International Political Economy of Energy and Natural Resources, edited by Andreas Goldthau, Michael F. Keating, and Caroline Kuzemko (Edward Elgar Handbooks of Research on International Political Economy, 2018) 416 pages, ISBN 978-1-78347-562-9

This *Handbook* provides a valuable overview of the international political economy (IPE) of energy and natural resources. It is the latest volume in a series published by Edward Elgar that explores the IPE of various industries, and this one contributes to the growing field of the IPE of energy.

This volume contains 25 short chapters organized into four parts. The chapters in Part I address the "big picture" issues in the IPE of energy governance, including the nexus between global public policy and IPE (Chapter 2), the IPE of climate change adaptation (Chapter 3), and feminist perspectives on energy, including analysis of the relationship between energy transitions and the social distribution of resources and power in society (Chapter 5). Part II is organized around the theme of climate change, energy, and low-carbon transitions, with case studies of South Africa (Chapter 7), the European Union and UK (Chapters 8 and 9), the Russian oil and gas company Gazprom (Chapter 11), and the Arctic (Chapter 12). The subject of Part III is energy, resources, and development. The empirical studies of Part III include the IPE of hydroelectric dams (Chapter 14), political conflict over mining (Chapter 17), and the tradeoffs between energy and food (Chapter 18). Part IV considers energy issues from the perspective of the interaction of multiple scales: transnational, national, and local. The empirical studies of Part IV include a comparison of energy transitions in the United States and China (Chapter 22), the IPE of nuclear energy (Chapter 23), and municipal governance of heat networks (Chapter 26).

The introductory chapter makes a compelling case for conceptualizing of the IPE of energy as a distinct school of thought that transcends energy economics, environmental politics, and traditional IPE. Initially, energy was considered from the perspective of the three main schools of IPE thought: liberalism, mercantilism, and Marxism. Liberalism within IPE is influenced most heavily by the Smithian tradition of analysis of markets, while mercantile IPE has its roots in the work of Alexander Hamilton and Friedrich List. Marxist analysis focused on the way in which economic interests mechanically translated into political interests, as well as how the international economic system served to benefit the world's most powerful countries. These perspectives view energy, respectively, as a commodity, a primary or strategic good to be stockpiled, or as an issue for domestic socio-economic management and regulation. Mercantilists, who in international relations are considered realists, viewed energy as part of political power; neoliberal institutionalists emphasized the international regime governing energy; and economists focused on technical aspects of energy markets. Each perspective recognized an important role for energy, but it was not a distinct area of inquiry.

The IPE of energy began to emerge as a distinct field of inquiry as scholars became concerned with global energy governance, which consists of the international architecture of energy regimes, institutions, and practices. Scholars interested in global governance questioned the realist and mercantilist predictions of conflict over energy. Rather, they viewed cooperation as possible, but not inevitable. This *Handbook* continues with these themes by articulating the IPE of energy as an explicitly interdisciplinary perspective that focuses on energy transitions and resource extraction as the outcome of interest, while recognition that international cooperation and conflict occur at multiple levels of governance.

This volume has many strengths. One of its greatest strengths is that it is empirically rich, as one sees from the broad range of case studies. Each of the substantive chapters offers a thorough review of a topic or a case. For example, Chapter 14 considers how ecosystem accounting, which provides better information about the use of natural resources, influences conservation efforts in the Philippines. Chapter 25 uses evidence from Brazil to examine how domestic politics influences how countries respond pressures imposed by international markets. The chapters are mostly descriptive, which is useful for a handbook seeking to show where the field has been and where it is going. The chapters are accessible, which makes them useful not only for scholars interested in IPE of energy and natural resources, but also for policymakers.

Another contribution of the volume is that it embraces the complexity of the IPE of energy. It would not be surprising to see a volume that delves into the granular details of the international regimes governing energy and resources. Several chapters explicitly focus on global governance, such as chapter which analyzes hydroelectric dams. However, this *Handbook* does not remain exclusively at the level of global governance. Rather, it recognizes that IPE cannot be neatly separated from domestic politics and political economy. This book embraces the international regimes but is more compelling because it embraces the complexity of energy and resource governance, especially in how it addresses the challenges of energy transitions. For example, the chapters on South Africa and the UK show the importance of considering the interplay between domestic politics and international economic forces.

Economists will benefit from consideration of the governance context within which energy transitions occur. It is now widely accepted that institutions—the rules of the game in society—are important to understanding economic performance. However, the typical economics focus on technical aspects of energy markets often leaves out much the analysis of institutions and governance. For example, economic analysis of energy can typically identify what constitutes an efficient policy to govern energy transitions but may omit how domestic and international political considerations explain why the optimal regulation is not chosen. This volume brings that aspect to the forefront. The *Handbook* also provides a useful overview of the IPE approach, which will be familiar to sociologists and political scientists but may not be familiar to economists, even ones who work in the areas of international energy markets.

The volume is more of an energy than a natural resources handbook. Those interested in the resource curse will not find much here that is new. The volume also only touches on the shale gas revolution. There is substantial coverage of natural gas in the book, but only Chapter 10 is devoted to shale gas (Chapter 2 briefly considers shale oil and gas). Since shale gas and oil have been so disruptive, it would have been useful to consider more explicitly the domestic political economy of shale gas development, as well as the relationship between shale gas and coal mining. The economics audience may also find the analysis overly descriptive, while empirically oriented scholars may find some of the evidence thin. Finally, while the economics audience may benefit from a richer analysis of institutions, the IPE of energy would also do well to consider more explicitly how public choice analysis—the economic analysis of non-market decision-making—can inform the political analysis of energy transitions at the transnational, national, and local levels of analysis. For example, it would be useful to consider more explicitly the insights from the literature on polycentricity in the tradition of Elinor and Vincent Ostrom to understand energy transitions, as well as to consider more explicitly standard public choice concepts like rent-seeking to the analysis of energy politics.

Despite these few caveats, the volume succeeds in defining the IPE of energy as a field and shows us where it has been and where it is going. It should be very useful to economists, political scientists, and sociologists interested in the political economy of energy, both at the international and domestic levels. This *Handbook* also shows the significant benefits of interdisciplinary collaboration around a topic of global significance.

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