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Book review

Distributed Generation and its Implications for the Utility Industry, F.P. Sioshansi. Academic Press, Oxford (2014). li + 520 pages, ISBN: 978-0-12-800240-7

The traditional business model by utilities is under pressure because of low electricity demand growth, rising share of renewables and incentives for decentralized generation and increased appliance efficiency. In addition consumers begin to produce all or part of their electricity needs from on-site generation (*prosumers*).

“Neighborhood electric cooperatives; rooftop systems integrated into a community storage and backup system; utilities as mere dispatching agents or maintenance crews – these are a few of the visions of the urban future. Overnight we have witnessed a dramatic change in the assumptions underlying our electric generation technologies and regulatory procedures. The electricity industry is a classic example of a market ripe for breakout disruptive technologies. The grid was a good idea 100 years ago. So good that we were able to graft a much more resilient network – the Internet – on top of it. It’s time for the grid to learn what the Net already knows”. (Quoted from preface)

This volume explores these developments in different parts of the world and different contexts. It contains 24 articles by scholars, academics, experts and practitioners from different countries and an introduction by the editor.

Collections of articles to a general topic often contain redundant material and the articles are not well connected. One of the strengths of this book is that the editor has tried to direct the authors so that a well-organized volume is the result. For a generally interested reader not all articles or of the same interest: Some articles give a good summary of current developments, others go into details of very specific problems.

For readers of this journal this books contains some very valuable articles summarizing recent developments. Other articles are of more interest to experts in the industry. At the end asking the question how relevant the changes in the direction of distributes generation are, the answer is not unambiguous.

The reviewer has observed the development in the energy industry for many decades and remembers that the decentralized revolution was expected already 25 years ago. In the meantime with the rise of intermittent renewables has changed the landscape enormously. This creates a lot of new problems that are only partly answered in this book.

The book is organized in three parts:

Part I: What is Changing. The reader not familiar with the implications of decentralized energy is well advised to read chapter 1 by Fereidoon P. Sioshansi “Decentralized Energy: Is It as Imminent

or Serious as Claimed?” and chapter 2 by Paul Nillesen and others “New Utility Business Model: A Global View”. Both chapters give an account of the ongoing changes.

In addition chapter 7 by Fereidoon Sioshansi and Carl Weinberg “Lessons from Other Industries Facing Disruptive Technology” is a good starting point to put the ongoing changes into perspective.

Chapter 1 argues that the change to a higher share of decentralized generation is likely to spread to many countries and that the industry has to evolve if it is to make a successful transition. Chapter 2 is based on a comprehensive survey of senior management of many utilities around the world. “Although the creation of new markets, new niches, and new entrants might suggest the demise of big and established utilities, this chapter suggests that they might be able to survive and thrive by scaling up and exploiting the new business opportunities.”

Chapter 7 shows that disruptive technologies allow new players to enter a market if the new product can be delivered at considerably lower cost or through more convenient channels.

The following chapters of this part are partly country studies (Australia, European Power Utilities, Germany, chapters 3, 4 and 6) and on technological change (chapter 5). Chapter 3 by Christoph Burger and Jens Weinmann “Germany’s Decentralized Energy Revolution” shows that the impressive changes in the sources of electricity generation are mainly policy driven and motivated by environmental concerns and have led to a financial burden on consumers and a lot of challenges for network operators. Decentralized energy can be the result of disruptive technologies as well as disruptive policies. The role of policy is taken up in the second part of the volume.

Part II: Implications and Industry/Regulatory Response.

The basic policy problems are taken up in chapter 8 by Macolm Keay and others “Electricity Markets and Pricing for the Distributed Generation Era.” The rapid growth of distributed generation which is often intermittent renewable power poses a number of challenges: “Conventional pricing and market models are not well adapted to a significant share of these generation sources or the incorporation of demand-side resources.” The present market model relies on coordination on the basis of marginal cost. For many new energies marginal cost are more or less irrelevant. In this article the fundamental challenge to the present wholesale market in Europe is shown and possible reforms are analyzed and discussed.

The problems of Decentralized Generation depend on the legal framework and the market environment. Other articles in this part are based on the experience in the US although the problems discussed are very similar independent of the legal framework.

Chapter 9 by Chris King “Transactive Energy: Linking Supply and Demand Through Price Signals” and chapter 10 by Edward G. Cazalet “Transactive Energy: Interoperable Transactive Retail Tariffs”

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both deal with necessary changes in pricing in a world of decentralized energy production.

Chapters 11 by Philip Hanser and Kai Van Horn "The Next Evolution of the Distribution Utility", Chapter 12 by Timothy Brennan "An Expanded Distribution Utility Business Model: Win-Win or Win-Maybe?" and chapter 13 by Tim Nelson, Judith McNeill and Paul Simshauser "From Throughput to Access Fees: The Future of Network and Retail Tariffs" discuss the implications of DG for distribution companies.

Chapter 11 discusses the potential impacts of DG for a redefinition of the fundamental purpose and structure of distribution utilities. Chapter 12 evaluates the possibilities of diversification for distribution utilities, noting that a distribution utility could retain market power even as its market shrinks. Chapter 13 critically evaluates how utilities will need to adjust their tariff structures to compete with new forms of energy production.

Chapter 14 by Jonathan C. Blansfield and Kevin B. Jones "Industry Response to Revenue Erosion from Solar PVs" presents three case studies on the response of utilities to the fast growing residential solar photovoltaic installation.

Chapter 15 by Ahmad Faruqui and Dian Grueneich "Making the Most of the No Load Growth Business Environment" discusses strategies for utilities to deal with the slowdown in growth of electricity sales.

Chapter 16 by William C. Miller, Roland J. Risser and Steven Kline "Regulatory Policies for the Transition to the New Business Paradigm" deals with the rate and regulatory policy options for regulators faced with the changes in the industry.

Chapter 17 by Glenn Platt, Phillip Paevere, Andrew Higgins and George Grozev "Electric Vehicles: New Problem or Distributed Energy Asset?" presents a modeling methodology to analyze the impact of electric vehicles as a potential resource (storage) and challenge (additional load).

Part III: What Future looks into possible future developments.

Chapter 18 by Lorenzo Kristov and Delphine Hou "Rethinking the Transmission-Distribution Interface in a Distributed Energy Future" describes how the proliferation of distributed generation and demand-side resources calls into question the prevailing model of restructured power markets and explores potential solutions.

Chapter 19 by Rajat Sood and Liam Blanckenberg "Decentralized Generation in Australia's National Electricity Market? No

Problem" shows in a country study for Australia that the changes have increased the pace of vertical integration over the past decade as independent generators and retailers have morphed into "gentailers."

Chapter 20 by Frank A. Felder "What Future for the Grid Operator?" examines with the help of two scenarios how microgrids may affect organized wholesale electricity markets.

Chapter 21 by Dustin Thaler and John Jimison "Utility 2.0: Maryland's Pilot Design" explores the questions of whether utilities of today can adapt and survive to become utilities of the future and, if so, how they should start, chiefly through immediate-term experimentation.

Chapter 22 by Kelly Crandall, Heather Bailey, Yael Gichon and Jonathan Koehn "Turning a Vision to Reality: Boulder's Utility of the Future" describes the unique attributes of the city of Boulder, Colorado, and how these traits have contributed to a new vision for localizing energy supply.

Chapter 23 by Jenny Riesz, Magnus Hindsberger, Joel Gilmore and Chris Riedy "Perfect Storm or Perfect Opportunity? Future Scenarios for the Electricity Sector" applies a top-down approach to identify the key drivers that could influence business models. It describes three possible futures in detail. The three futures "centralized", "decentralized" and "disconnected" (most customers disconnecting from the grid) are analyzed.

Chapter 24 by Robert Smith and Iain MacGill "Revolution, Evolution, or Back to the Future? Lessons from the Electricity Supply Industry's Formative Days" looks back to the early history of the electricity industry and concludes that history also cautions that current arrangements and business models have been remarkably adaptive for over a century and may well prove more resilient than imagined.

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