

SMART *power*

Climate Change, the Smart Grid,
and the Future of Electric Utilities



Peter Fox-Penner

Smart Power Climate Change The Grid And Future Of Electric Utilities Peter Fox Penner

David E. McNabb



Smart Power Climate Change The Grid And Future Of Electric Utilities

Peter Fox Penner

Smart Power Peter Fox-Penner,2010-04-05 A new national policy on climate change is under debate in the United States and is likely to result in a cap on greenhouse gas emissions for utilities This and other developments will prompt utilities to undergo the largest changes in their history Smart Power examines the many facets of this unprecedented transformation This enlightening book begins with a look back on the deregulatory efforts of the 1990s and their gradual replacement by concerns over climate change promoting new technologies and developing stable prices and supplies In thorough but non technical terms it explains the revolutionary changes that the Smart Grid is bringing to utility operations It also examines the options for low carbon emissions along with the real world challenges the industry and its regulators must face as the industry retools and finances its new sources and systems Throughout the book Peter Fox Penner provides insights into the policy choices and regulatory reform needed to face these challenges He not only weighs the costs and benefits of every option but presents interviews with informed experts including economists utility CEOs and engineers He gives a brief history of the development of the current utility business model and examines possible new business models that are focused on energy efficiency Smart Power explains every aspect of the coming energy revolution for utilities in lively prose that will captivate even the most techno phobic readers

Power after Carbon Peter Fox-Penner,2020-05-19 As the electric power industry faces the challenges of climate change technological disruption new market imperatives and changing policies a renowned energy expert offers a roadmap to the future of this essential sector As the damaging and costly impacts of climate change increase the rapid development of sustainable energy has taken on great urgency The electricity industry has responded with necessary but wrenching shifts toward renewables even as it faces unprecedented challenges and disruption brought on by new technologies new competitors and policy changes The result is a collision course between a grid that must provide abundant secure flexible and affordable power and an industry facing enormous demands for power and rapid systemic change The fashionable solution is to think small smart buildings small scale renewables and locally distributed green energy But Peter Fox Penner makes clear that these will not be enough to meet our increasing needs for electricity He points instead to the indispensability of large power systems battery storage and scalable carbon free power technologies along with the grids and markets that will integrate them The electric power industry and its regulators will have to provide all of these even as they grapple with changing business models for local electric utilities political instability and technological change Power after Carbon makes sense of all the moving parts providing actionable recommendations for anyone involved with or relying on the electric power system

Power after Carbon Peter Fox-Penner,2020-05-19 As the

electric power industry faces the challenges of climate change technological disruption new market imperatives and changing policies a renowned energy expert offers a roadmap to the future of this essential sector As the damaging and costly impacts of climate change increase the rapid development of sustainable energy has taken on great urgency The electricity industry has responded with necessary but wrenching shifts toward renewables even as it faces unprecedented challenges and disruption brought on by new technologies new competitors and policy changes The result is a collision course between a grid that must provide abundant secure flexible and affordable power and an industry facing enormous demands for power and rapid systemic change The fashionable solution is to think small smart buildings small scale renewables and locally distributed green energy But Peter Fox Penner makes clear that these will not be enough to meet our increasing needs for electricity He points instead to the indispensability of large power systems battery storage and scalable carbon free power technologies along with the grids and markets that will integrate them The electric power industry and its regulators will have to provide all of these even as they grapple with changing business models for local electric utilities political instability and technological change Power after Carbon makes sense of all the moving parts providing actionable recommendations for anyone involved with or relying on the electric power system *The Energy Switch* Peter Kelly-Detwiler, 2021-06-15 The energy industry is changing and it's far more than just solar panels Electric vehicles look to overtake gasoline powered cars within our lifetimes wind farms are popping up in unlikely places traders are transforming energy into a commodity and supercomputers are crunching vast amounts of data in nanoseconds while helping to keep our energy grids secure from hackers The way humans produce distribute and consume power will be cleaner cheaper and infinitely more complex within the next decade In *The Energy Switch* leading energy industry expert Peter Kelly Detwiler looks at all aspects of the transformation how we got here where we are going and the implications for all of us in our daily lives Kelly Detwiler takes readers to the frontlines of the energy revolution Meet Steve Collins an executive from Commercial Development Corporation the company that blew up two 570 million dollar concrete cooling towers to create a staging ground for the new 70 billion U S offshore wind industry Rob Threlkeld a General Motors executive who convinced the auto giant to sign multiple 20 year renewable energy contracts worth hundreds of millions Kevin McAlpin a Texas homeowner who buys the power for his home on the electricity spot market where prices can soar from less than one cent a kilowatt-hour to 9 00 over the course of a single day Dr Kristin Persson who oversees a supercomputer that can process data at 30 quadrillion calculations per second in the quest for better renewable energy and battery technologies and John Davis a Texas rancher who can keep his land intact with help from the royalty payments from seven turbines spinning on his range Energy creation and distribution has driven society's progress for centuries Today people are increasingly aware that it is imperative that humans move towards a cleaner digitized and democratized energy economy *The Energy Switch* is about that multi trillion dollar transformation told from the perspective of those leading us to that bright future [Three Revolutions](#)

Daniel Sperling, 2018-03 Front Cover About Island Press Subscribe Title Page Copyright Page Contents Preface Acknowledgments 1 Will the Transportation Revolutions Improve Our Lives or Make Them Worse 2 Electric Vehicles Approaching the Tipping Point 3 Shared Mobility The Potential of Ridehailing and Pooling 4 Vehicle Automation Our Best Shot at a Transportation Do Over 5 Upgrading Transit for the Twenty First Century 6 Bridging the Gap between Mobility Haves and Have Nots 7 Remaking the Auto Industry 8 The Dark Horse Will China Win the Electric Automated Shared Mobility Race Epilogue Notes About the Contributors Index IP Board of Directors [Designing Climate Solutions](#) Hal Harvey, Robbie Orvis, Jeffrey Rissman, 2018-11-01 With the effects of climate change already upon us the need to cut global greenhouse gas emissions is nothing less than urgent It s a daunting challenge but the technologies and strategies to meet it exist today A small set of energy policies designed and implemented well can put us on the path to a low carbon future Energy systems are large and complex so energy policy must be focused and cost effective One size fits all approaches simply won t get the job done Policymakers need a clear comprehensive resource that outlines the energy policies that will have the biggest impact on our climate future and describes how to design these policies well [Designing Climate Solutions A Policy Guide for Low Carbon Energy](#) is the first such guide bringing together the latest research and analysis around low carbon energy solutions Written by Hal Harvey CEO of the policy firm Energy Innovation with Robbie Orvis and Jeffrey Rissman of Energy Innovation [Designing Climate Solutions](#) is an accessible resource on lowering carbon emissions for policymakers activists philanthropists and others in the climate and energy community In Part I the authors deliver a roadmap for understanding which countries sectors and sources produce the greatest amount of greenhouse gas emissions and give readers the tools to select and design efficient policies for each of these sectors In Part II they break down each type of policy from renewable portfolio standards to carbon pricing offering key design principles and case studies where each policy has been implemented successfully We don t need to wait for new technologies or strategies to create a low carbon future and we can t afford to [Designing Climate Solutions](#) gives professionals the tools they need to select design and implement the policies that can put us on the path to a livable climate future [The Power of Change](#) National Academies of Sciences, Engineering, and Medicine, Division on Engineering and Physical Sciences, Policy and Global Affairs, Board on Energy and Environmental Systems, Board on Science, Technology, and Economic Policy, Committee on Determinants of Market Adoption of Advanced Energy Efficiency and Clean Energy Technologies, 2016-09-30 Electricity supplied reliably and affordably is foundational to the U S economy and is utterly indispensable to modern society However emissions resulting from many forms of electricity generation create environmental risks that could have significant negative economic security and human health consequences Large scale installation of cleaner power generation has been generally hampered because greener technologies are more expensive than the technologies that currently produce most of our power Rather than trade affordability and reliability for low emissions is there a way to balance all three [The Power of Change](#) Innovation for

Development and Deployment of Increasingly Clean Energy Technologies considers how to speed up innovations that would dramatically improve the performance and lower the cost of currently available technologies while also developing new advanced cleaner energy technologies According to this report there is an opportunity for the United States to continue to lead in the pursuit of increasingly clean more efficient electricity through innovation in advanced technologies The Power of Change Innovation for Development and Deployment of Increasingly Clean Energy Technologies makes the case that America's advantages world class universities and national laboratories a vibrant private sector and innovative states cities and regions that are free to experiment with a variety of public policy approaches position the United States to create and lead a new clean energy revolution This study focuses on five paths to accelerate the market adoption of increasing clean energy and efficiency technologies 1 expanding the portfolio of cleaner energy technology options 2 leveraging the advantages of energy efficiency 3 facilitating the development of increasing clean technologies including renewables nuclear and cleaner fossil 4 improving the existing technologies systems and infrastructure and 5 leveling the playing field for cleaner energy technologies The Power of Change Innovation for Development and Deployment of Increasingly Clean Energy Technologies is a call for leadership to transform the United States energy sector in order to both mitigate the risks of greenhouse gas and other pollutants and to spur future economic growth This study's focus on science technology and economic policy makes it a valuable resource to guide support that produces innovation to meet energy challenges now and for the future

Taming the Sun Varun Sivaram, 2019-02-26 How solar could spark a clean energy transition through transformative innovation creative financing revolutionary technologies and flexible energy systems Solar energy once a niche application for a limited market has become the cheapest and fastest growing power source on earth What's more its potential is nearly limitless every hour the sun beams down more energy than the world uses in a year But in Taming the Sun energy expert Varun Sivaram warns that the world is not yet equipped to harness erratic sunshine to meet most of its energy needs And if solar's current surge peters out prospects for replacing fossil fuels and averting catastrophic climate change will dim Innovation can brighten those prospects Sivaram explains drawing on firsthand experience and original research spanning science business and government Financial innovation is already enticing deep pocketed investors to fund solar projects around the world from the sunniest deserts to the poorest villages Technological innovation could replace today's solar panels with coatings as cheap as paint and employ artificial photosynthesis to store intermittent sunshine as convenient fuels And systemic innovation could add flexibility to the world's power grids and other energy systems so they can dependably channel the sun's unreliable energy Unleashing all this innovation will require visionary public policy funding researchers developing next generation solar technologies refashioning energy systems and economic markets and putting together a diverse clean energy portfolio Although solar can't power the planet by itself it can be the centerpiece of a global clean energy revolution A Council on Foreign Relations Book

Digital Decarbonization Varun Sivaram, 2018 As energy industries produce ever more

data firms are harnessing greater computing power advances in data science and increased digital connectivity to exploit that data. These trends have the potential to transform the way energy is produced, transported, and consumed. **Our Renewable Future** Richard Heinberg, David Fridley, 2016-06-02 Over the next few decades we will see a profound energy transformation as society shifts from fossil fuels to renewable resources like solar, wind, biomass. But what might a one hundred percent renewable future actually look like and what obstacles will we face in this transition? Authors explore the practical challenges and opportunities presented by the shift to renewable energy. Page 4 of cover [Small is Profitable](#)

Amory B. Lovins, 2020-11-27 Today's electricity industry: large power stations feeding a nationwide grid will soon be a thing of the past. This book explains why and what will replace it: decentralized and distributed electrical resources which can be up to 10 times as economically valuable. The authors, all leading experts in the field, explain very clearly and thoroughly all the benefits so the engineers will understand the economic advantages and the investors will understand the engineering efficiencies. Here's what industry experts are saying about *Small is Profitable*: A tour de force and a goldmine of good ideas. It is going to have a stunning impact on thinking about electricity. Walter C. Patterson, Senior Research Fellow, Royal Institute of International Affairs, London. An amazing undertaking, incredibly ambitious yet magnificently researched and executed. Dr. Shimon Awerbuch, Senior Advisor, International Energy Agency, Paris. Outstanding. You have thought of some benefits I never considered. A great resource for the innovation in energy services that will have to take place for us to have a sustainable future. Dr. Carl Weinberg, Weinberg Associates, former Research Director, PG&E. This is a brilliant synthesis and overview with a lot of original analytics and insights and a very important overall theme. I think it is going to have a big impact. Greg Kats, Principal, Capital E LLC, former Finance Director for Efficiency and Renewable Energy, U.S. Department of Energy. E.F. Schumacher would be proud of this rigorous extension of his thesis in *Small is Beautiful*. It shows how making systems the right size can make them work better and cost less. Here are critical lessons for the new century technologies tailored to the needs of people, not the reverse: can improve the economy and the environment. Dr. Daniel Kammen, Professor of Energy and Society and of Public Policy, University of California, Berkeley. *Small is Profitable* creates an unconventional but impeccably reasoned foundation to correctly assign the costs and true benefits of distributed energy systems. It has become an indispensable tool for modelling distributed energy systems benefits for us. Tom Dinwoodie, CEO and Chairman, PowerLight Corporation. A unique and valuable contribution to the distributed energy industry. *Small is Profitable* highlights the societal benefits of distributed resources and will be a helpful guide to policymakers who wish to properly account for these benefits in the marketplace. Nicholas Lenssen, Senior Director, Primen. This book will shift the electric industry from the hazards of overcentralization toward the new era where distributed generation will rule. Steven J. Strong, President, Solar Design Associates Inc. Readers will understand why distributed resources are poised to fundamentally alter the electric power system. Its comprehensive review of the benefits of distributed resources is an important part of my library. Dr. Thomas E. Hoff

President Clean Power Research The most comprehensive treatise on distributed generation Great job and congratulations Howard Wenger Principal Pacific Energy Group Densely packed with information and insights goes a long way to demonstrate that the former paradigm of electric power supply no longer makes sense Prof Richard Hirsh University of Vermont Leading historian of the electric power sector Amory Lovins was already the world's most original and influential thinker on the future of energy services in general and electricity systems in particular This remarkable book is a very worthy addition to an extraordinary legacy Ralph Cavanagh Energy Co Director Natural Resources Defense Council This is a book every utility professional should have on the bookshelf Dr Peter S Fox Penner Principal and Chairman of the Board the Brattle Group former Principal Deputy Assistant Secretary of Energy

The Curious Country Leigh Dayton, 2013-12-03 By definition scientists are an inquisitive lot But what are the scientific curiosities and concerns on the minds of Australians What worries them baffles them and sets their curiosity meter to 10 out of 10 To find out the Office of the Chief Scientist OCS took the nation's intellectual temperature surveying 1186 Australians men and women aged 18 to 65 from all education levels and locations around Australia The results frame this book a collection of essays covering the diverse areas of science Australians are curious about Edited by eminent science writer Leigh Dayton and including a foreword from Australia's Chief Scientist Ian Chubb The collection covers a range of issues including food and farming technology environmental upheaval health fuel and energy technology and space exploration

Broadband Networks, Smart Grids and Climate Change Eli M. Noam, Lorenzo Maria Pupillo, Johann J. Kranz, 2012-12-05 In smart grids the formerly separated worlds of energy and telecommunication converge to an interactive and automated energy supply system Driven by social legal and economic pressures energy systems around the globe are updated with information and communication technology These investments aim at enhancing energy efficiency securing affordable energy supply and mitigate climate change In Broadband Networks Smart Grids and Climate Change renowned scholars and managers from the fields of energy and telecommunication address key questions related to technological strategic and regulatory issues revealing consequences and opportunities for businesses evolving with smart grids In particular this book analyzes 1 the effects on climate change protection 2 national energy and broadband politics 3 regulatory approaches and requirements 4 emerging business models

Smart Grids Stuart Borlase, 2017-12-19 What exactly is smart grid Why is it receiving so much attention What are utilities vendors and regulators doing about it Answering these questions and more Smart Grids Infrastructure Technology and Solutions gives readers a clearer understanding of the drivers and infrastructure of one of the most talked about topics in the electric utility market smart grid This book brings together the knowledge and views of a vast array of experts and leaders in their respective fields Key Features Describes the impetus for change in the electric utility industry Discusses the business drivers benefits and market outlook of the smart grid initiative Examines the technical framework of enabling technologies and smart solutions Identifies the role of technology developments and coordinated standards in smart grid including various

initiatives and organizations helping to drive the smart grid effort Presents both current technologies and forward looking ideas on new technologies Discusses barriers and critical factors for a successful smart grid from a utility regulatory and consumer perspective Summarizes recent smart grid initiatives around the world Discusses the outlook of the drivers and technologies for the next generation smart grid Smart grid is defined not in terms of what it is but what it achieves and the benefits it brings to the utility consumer society and environment Exploring the current situation and future challenges the book provides a global perspective on how the smart grid integrates twenty first century technology with the twentieth century power grid CRC Press Authors Speak Stuart Borlase speaks about his book Watch the video [Shorting the Grid](#) MEREDITH. ANGIN,2020-10-19 Shorting the Grid describes how closed meetings arcane auction rules and five minute planning horizons will topple the reliability of our electric grid Hopeful speeches will not keep the lights on **Energy for Sustainability** John Randolph,Gilbert Masters,2018 Despite a 2016 18 glut in fossil fuel markets and decade low fuel prices the global transformation to sustainable energy is happening Our ongoing energy challenges and solutions are complex and multidimensional involving science technology design economics finance planning policy politics and social movements The most comprehensive book on this topic Energy for Sustainability has been the go to resource for courses This new edition has been thoroughly revised and updated to inform and guide students and practitioners who will steer this transformation Drawing on a combined 80 years of teaching experience John Randolph and Gilbert Masters take a holistic and interdisciplinary approach Energy for Sustainability can help techies and policymakers alike understand the mechanisms required to enable conversion to energy that is clean affordable and secure Major revisions to this edition reflect the current changes in technology and energy use and focus on new analyses data and methods necessary to understand and actively participate in the transition to sustainable energy The book begins with energy literacy including patterns and trends before covering the fundamentals of energy related to physics engineering and economics The next parts explore energy technologies and opportunities in three important energy sectors buildings electricity and transportation The final section focuses on policy and planning presenting the critical role of public policy and consumer and investor choice in transforming energy markets to greater sustainability Throughout the book methods for energy and economic analysis and design give readers a quantitative appreciation for and understanding of energy systems The book uses case studies extensively to demonstrate current experience and illustrate possibilities [The Business of Global Energy Transformation](#) M. Larsson,2012-09-25 One of the first books to analyze business and financial aspects of sustainable transport and fuels systems and provides novel insights for researchers managers and politicians who work in energy and sustainability related areas *Psychology and Environmental Change* Raymond S. Nickerson,2002-12-18 This book stimulates thinking on the topic of detrimental environmental change and how research psychologists can help to address the problem In addition to reporting environmentally relevant psychological research the author identifies the most pressing questions from an

environmental point of view Psychology and Environmental Change focuses on ways in which human behavior contributes to the problem deals with the assessment and change of attitudes and with studies of change of behavior proposes ways in which psychological research can contribute to making technology and its products more environmentally benign and introduces topics such as consumption risk assessment cost benefit and tradeoff analyses competition negotiation and policymaking and how they relate to the objective of protecting the environment *Public Utilities* David E.

McNabb,2005-01-01 Professor McNabb has produced an excellent overview of the management challenges facing public utilities in the 21st century His description of the evolution changes and challenges of different types of utilities is insightful What makes this book uniquely valuable is his addressing the variety of utility management responsibilities including human resources information services and strategic planning in a single volume I recommend it highly Jeffrey Showman Washington Utilities and Transportation Commission US An introduction to the current issues and challenges facing managers and administrators in the investor and publicly owned utility industry this engaging volume addresses management concerns in three sectors of the utility industry electric power natural gas and water and wastewater systems Beginning with a brief overview of the historical development of the industry the author looks at policy issues and discusses management ethics He then examines a number of the major challenges in these organizational functions management and leadership planning marketing accounting and finance information technology governance and human resources In the final section of the volume he looks at issues specific to each of the three industry sectors Accessible and comprehensive this thoughtful exploration of the various issues facing managers in public utilities in the new century will prove a useful overview for students of business and economics utility staff and directors of local utility governing boards **Modernizing America's Electricity**

Infrastructure Mason Willrich,2017-11-10 A comprehensive coherent strategy for modernizing America s electricity infrastructure while ensuring affordable reliable secure and environmentally sustainable electricity services America s aging electricity infrastructure is deteriorating rapidly even as the need for highly reliable electric service driven by the explosion of digital technology continues to rise Largely missing from national discussions however is a coherent comprehensive national strategy for modernizing this critical infrastructure Energy expert Mason Willrich presents just such a strategy in this book connecting the dots across electric utilities independent suppliers government bureaucracies political jurisdictions and academic disciplines He explains the need for a coherent approach offers a framework for analyzing policy options and proposes a step by step strategy for modernizing electrical infrastructure end to end in a way that ensures the delivery of affordable reliable secure and environmentally sustainable electricity services Willrich argues that an effective electrical infrastructure modernization strategy must incorporate flexibility adaptability and the capacity to coordinate policies at local state and federal levels He reviews the history of America s electrification from Edison s demonstration of the incandescent light bulb through the recent expansion of wind solar and energy efficiency as carbon free energy resources He describes the

current ownership and operation of the electric industry and the complicated web of federal and state policies that govern it

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