

Modernizing Americas Electricity Infrastructure Mit Press

The process of user-centered innovation: how it can benefit both users and manufacturers and how its emergence will bring changes in business models and in public policy. Innovation is rapidly becoming democratized. Users, aided by improvements in computer and communications technology, increasingly can develop their own new products and services. These innovating users—both individuals and firms—often freely share their innovations with others, creating user-innovation communities and a rich intellectual commons. In Democratizing Innovation, Eric von Hippel looks closely at this emerging system of user-centered innovation. He explains why and when users find it profitable to develop new products and services for themselves, and why it often pays users to reveal their innovations freely for the use of all. The trend toward democratized innovation can be seen in software and information products—most notably in the free and open-source software movement—but also in physical products. Von Hippel’s many examples of user innovation in action range from surgical equipment to surfboards to software security features. He shows that product and service development is concentrated among “lead users,” who are ahead on marketplace trends and whose innovations are often commercially attractive. Von Hippel shows how manufacturers should redesign their innovation processes and that they should systematically seek out innovations developed by users. He points to businesses—the custom semiconductor industry is one example—that have learned to assist user-innovators by providing them with toolkits for developing new products. User innovation has a positive impact on social welfare, and von Hippel proposes that government policies, including R&D subsidies and tax credits, should be realigned to eliminate biases against it. The goal of a democratized user-innovation system, says von Hippel, is well worth striving for. An electronic version of this book is available under a Creative Commons license.

The history of the grid, the world’s largest interconnected power machine that is North America’s electricity infrastructure. The North American power grid has been called the world’s largest machine. The grid connects nearly every living soul on the continent; Americans rely utterly on the miracle of electrification. In this book, Julie Cohn tells the history of the grid, from early linkages in the 1890s through the grid’s maturity as a networked infrastructure in the 1980s. She focuses on the strategies and technologies used to control power on the grid—in fact made up of four major networks of interconnected power systems—paying particular attention to the work of engineers and system operators who handled the everyday operations. To do so, she consulted sources that range from the pages of historical trade journals to corporate archives to the papers of her father, Nathan Cohn, who worked in the industry from 1927 to 1989—roughly the period of key power control innovations across North America. Cohn investigates major challenges and major breakthroughs but also the hidden aspects of our electricity infrastructure, both technical and human. She describes the origins of the grid and the growth of interconnection; emerging control issues, including difficulties in matching generation and demand on linked systems; collaboration and competition against the backdrop of economic depression and government infrastructure investment; the effects of World War II on electrification; postwar plans for a coast-to-coast grid; the northeast blackout of 1965 and the East-West closure of 1967; and renewed efforts at achieving stability and reliability after those two events.

Renewable energy in the twenty-first century – Energy transitions – Fire to electricity – The rise of renewables – Renewable wind energy – Financing renewable energy – Energy transitions : oas to oil – The rise of electric vehicles – Parity – Convergence – Consequences – No time to lose

This book provides the needed knowledge related to generation (function, types, steam cycle & critical plant components), transmission (function, design, reliability)& distribution systems (radial, loops, network, reliability), substation (equipment/buses, function & design), transformers (different types, function & ratings), protection, distributed energy resources (solar impact & other DERs), protection (various relays & instrument transformers), reliability, distribution designs, storm response, climate change, blackouts, real & reactive power, load flow (power transfer, normal/emergency system operation) & utility of the future. This book will discuss major electric components from the power plants to the consumer’s home.

Modernizing America’s Electricity Infrastructure

Handbook of Energy Politics

Fighting Political Gridlock

An Analysis of Electric Utility Deregulation

The Fundamentals of the North American Electric Grids in Simple Language

Concrete and Clay

Cool Energy

The second edition of Steven W. Blume ’s bestseller provides a comprehensive treatment of power technology for the non-electrical engineer working in the electric power industry This book aims to give non-electrical professionals a fundamental understanding of large interconnected electrical power systems, better known as the “ Power Grid ” , with regard to terminology, electrical concepts, design considerations, construction practices, industry standards, control room operations for both normal and emergency conditions, maintenance, consumption, telecommunications and safety. The text begins with an overview of the terminology and basic electrical concepts commonly used in the industry then it examines the generation, transmission and distribution of power. Other topics discussed include energy management, conservation of electrical energy, consumption characteristics and regulatory aspects to help readers understand modern electric power systems. This second edition features: New sections on renewable energy, regulatory changes, new measures to improve system reliability, and smart technologies used in the power grid system Updated practical examples, photographs, drawing, and illustrations to help the reader gain a better understanding of the material “ Optional supplementary reading ” sections within most chapters to elaborate on certain concepts by providing additional detail or background Electric Power System Basics for the Nonelectrical Professional, Second Edition, gives business professionals in the industry and entry-level engineers a strong introduction to power technology in non-technical terms. Steve W. Blume is Founder of Applied Professional Training, Inc., APT Global, LLC, APT College, LLC and APT Corporate Training Services, LLC, USA. Steve is a registered professional engineer and certified NERC Reliability Coordinator with a Master’s degree in Electrical Engineering specializing in power and a Bachelor’s degree specializing in Telecommunications. He has more than 25 years ’ experience teaching electric power system basics to non-electrical professionals. Steve’s engineering and operations experience includes generation, transmission, distribution, and electrical safety. He is an active senior member in IEEE and has published two books in power systems through IEEE and Wiley.

Toscano concludes with a call to action and civic engagement, including suggestions for how citizens and public officials can revitalize American democracy.

Global energy is on the cusp of change, and it has become almost a truism that energy is in transition. But what does this notion mean exactly? This book explores the working hypothesis that, characteristically, the energy system requires a strategy of the international community of states to deliver sustainable energy to which all have access. This strategy is for establishing rules-based governance of the global energy value-cycle. The book has four substantive parts that bring together contributions of leading experts from academia and practice on the law, policy, and economics of energy. Part I, ‘The prospects of energy transition’, critically discusses the leading forecasts for energy and the strategies that resource-rich countries may adopt. Part II, ‘Rules-based multilateral governance of the energy sector’, details the development and sources of rules on energy. Part III, ‘Competition and regulation in transboundary energy markets’, discusses principal instruments of rules-based governance of energy. Part IV, ‘Attracting investments and the challenges of multi-level governance’, focuses on the critical governance of the right investments. This book is a flagship publication of the Centre for Energy, Petroleum and Mineral Law and Policy at the University of Dundee. It launches the Hart series ‘Global Energy Law and Policy’ and is edited by the series general editors Professors Peter D Cameron and Volker Roeben, and also Dr Xiaoyi Mu.

Forty years of energy incompetence, villains, failures of leadership, and missed opportunities. Americans take for granted that when we flip a switch the light will go on, when we turn up the thermostat the room will get warm, and when we pull up to the pump gas will be plentiful and relatively cheap. In The End of Energy, Michael Graetz shows us that we have been living an energy delusion for forty years. Until the 1970s, we produced domestically all the oil we needed to run our power plants, heat our homes, and fuel our cars. Since then, we have had to import most of the oil we use, much of it from the Middle East. And we rely on an ever dwindling fuel—coal—to produce half of our electricity. Graetz describes more than forty years of energy policy incompetence and argues that we must make better decisions for our energy future. Despite thousands of pages of energy legislation since the 1970s (passed by a Congress that tended to elevate narrow parochial interests over our national goals), Americans have never been asked to pay a price that reflects the real cost of the energy they consume. Until Americans face the facts about price, our energy incompetence will continue—and along with it the unraveling of our environment, security, and independence.

Enhancing the Resilience of the Nation’s Electricity System

The Origins of Power, Prosperity, and Poverty

Technology, Economics, Markets, and Policy

Smart Power

The Work of the Future

The Power of Change

A Manifesto

An award-winning professor of economics at MIT and a Harvard University political scientist and economist evaluate the reasons that some nations are poor while others succeed, outlining provocative perspectives that support theories about the importance of institutions.

Starting with the fundamentals of the global energy industry, Handbook of Energy Politics goes on to cover the evolution of capital and financial markets in the energy industry, the effects of technology, environmental issues and global warming and geopolitics. The book concludes by considering the future, including the lessons learned from history, where we are most likely to be heading and what steps we can take to mitigate potential energy risks. This Handbook will be an invaluable resource for upper level graduates and postgraduate scholars.

Why the United States lags behind other industrialized countries in sharing the benefits of innovation with workers and how we can remedy the problem. The United States has too many low-quality, low-wage jobs. Every country has its share, but those in the United States are especially poorly paid and often without benefits. Meanwhile, overall productivity increases steadily and new technology has transformed large parts of the economy, enhancing the skills and paychecks of higher paid knowledge workers. What’s wrong with this picture? Why have so many workers benefited so little from decades of growth? The Work of the Future shows that technology is neither the problem nor the solution. We can build better jobs if we create institutions that leverage technological innovation and also support workers though long cycles of technological transformation. Building on findings from the multiyear MIT task force on the future of work, the book argues that we must foster institutional innovations that complement technological change. Skills programs that emphasize work-based and hybrid learning (in person and online), for example, empower workers to become and remain productive in a continuously evolving workplace. Industries fueled by new technology that augments workers can supply good jobs, and federal investment in R&D can help make these industries worker-friendly. We must act to ensure that the labor market of the future offers benefits, opportunity, and a measure of economic security to all.

Fundamentals of Building Energy Dynamics assesses how and why buildings use energy, and how energy use and peak demand can be reduced. It provides a basis for integrating energy efficiency and solar approaches in ways that will allow building owners and designers to balance the need to minimize initial costs, operating costs, and life-cycle costs with need to maintain reliable building operations and enhance environmental quality both inside and outside the building. Chapters trace the development of building energy systems and analyze the demand side of solar applications as a means for determining what portion of a building’s energy requirements can potentially be met by solar energy. Following the introduction, the book provides an overview of energy use patterns in the aggregate U.S. building population. Chapter 3 surveys work on the energy flows in an individual building and shows how these flows interact to influence overall energy use. Chapter 4 presents the analytical methods, techniques, and tools developed to calculate and analyze energy use in buildings, while chapter 5 provides an extensive survey of the energy conservation and management strategies developed in the post-energy crisis period. The approach taken is a commonsensical one, starting with the proposition that the purpose of buildings is to house human activities, and that conservation measures that negatively affect such activities are based on false economies. The goal is to determine rational strategies for the design of new buildings, and the retrofit of existing buildings to bring them up to modern standards of energy use. The energy flows examined are both large scale (heating systems) and small scale (choices among appliances). Solar Heat Technologies: Fundamentals and Applications, Volume 4

Why Nations Fail

A Primer for the Twenty-first Century

The 21st Century Maritime Silk Road

Generation, Transmission & Distribution Made Simple

The Energy Switch

One Man’s Quest to Transform American Energy

How Lateral Power Is Transforming Energy, the Economy, and the World

This timely study evaluates four generic proposals for allowing free market forces toreplace government regulation in the electric power industry and concludes that none of thederegulation alternatives considered represents a panacea for the performance failures associatedwith things as they are now. It proposes a balanced program of regulatory reform and deregulationthat promises to improve industry performance in the short run, resolve uncertainties about thecosts and benefits of deregulation, and positions the industry for more extensive deregulation inthe long run should interim experimentation with deregulation, structural, and regulatory reformsmake it desirable. The book integrates modern microeconomic theory with a comprehensive analysis of economic, technical, and institutional characteristics of modern electrical power systems. It emphasizes that casual analogies to successful deregulation efforts in other sectors of the economyare an inadequate and potentially misleading basis for public policy in the electric power industry,which has economic and technical characteristics that are quite different from those in otherregulated industries.Paul L. Joskow is Professor of Economics at MIT, author of ControllingHospital Costs (MIT Press 1981) and coauthor with Martin L. Baughman and Dilip P. Karnat of *ElectricPower in the United States* (MIT Press 1979), Richard Schmalensee, also at MIT, is Professor ofApplied Economics, author of *The Economics of Advertising and The Control of Natural Monopolies*, andeditor of *The MIT Press Series, Regulation of Economic Activity*.

Something good about the smart city: a human-centered account of why the future of electricity is local. Resilience now matters most, and most resilience is local—even for that most universal, foundational modern resource: the electric power grid. Today that technological marvel is changing more rapidly than it has for a lifetime, and in our new grid awareness, community microgrids have become a fascinating catalyst for cultural value change. In Downtime on the Microgrid, Malcolm McCullough offers a thoughtful counterpoint to the cascade of white papers on smart clean infrastructure. Writing from an experiential perspective, McCullough avoids the usual smart city futurism, technological solutionism, policy acronyms, green idealism, critical theory jargon, and doomsday preppling to provide new cultural context for a subject long a favorite theme in science and technology studies. McCullough describes the three eras of North American electrification: innovation, consolidation, and decentralization. He considers the microgrid boom and its relevance to the built environment as “ architectur’s grid edge. ” Finally, he argues that resilience arises from clusters; although a microgrid is often described as an island, future resilience will require archipelagos—clusters of microgrids, with a two-way, intermittent connectiveness that is very different from the always-on, top-down technofuture we may be expecting. With Downtime on the Microgrid, McCullough rises above techno-hype to find something good about the smart city and reassuring about local resilience.

*Modernizing America’s Electricity Infrastructure*MIT Press

An interdisciplinary account of the environmental history and changing landscape of New York City. In this innovative account of the urbanization of nature in New York City, Matthew Gandy explores how the raw materials of nature have been reworked to produce a “metropolitan nature” distinct from the forms of nature experienced by early settlers. The book traces five broad developments: the expansion and redefinition of public space, the construction of landscaped highways, the creation of a modern water supply system, the radical environmental politics of the barrio in the late 1960s and early 1970s, and the contemporary politics of the environmental justice movement. Drawing on political economy, environmental studies, social theory, cultural theory, and architecture, Gandy shows how New York’s environmental history is bound up not only with the upstate landscapes that stretch beyond the city’s political boundaries but also with more distant places that reflect the nation’s colonial and imperial legacies. Using the shifting meaning of nature under urbanization as a framework, he looks at how modern nature has been produced through interrelated transformations ranging from new water technologies to changing fashions in landscape design. Throughout, he considers the economic and ideological forces that underlie phenomena as diverse as the location of parks and the social stigma of dirty neighborhoods.

An Interdisciplinary MIT Study

The End of Energy

Electric Grid Modernization

The West Texas Power Plant That Saved the World

Building Better Jobs in an Age of Intelligent Machines

Democratizing Innovation

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 energy 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 into 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. Energy Resources: Examining the Facts provides an authoritative, comprehensive overview of economic, political, and environmental drivers of America’s energy picture, from trends in the production and consumption of fossil fuels and renewables to the state of the national energy grid.

Electrical grids worldwide are experiencing major changes in terms of energy generation, transmission, delivery, and distribution in order to enhance the entire system’s control, reliability, efficiency, and safety. Advanced energy systems and technologies such as renewable sources of energy, energy storage systems, and electric vehicles (EVs) as well as equipment such as sensors, smart meters, and communication devices along with innovations in computing technologies, machine learning, and data analytics are used to modernize the electric grid and the way it is planned, operated, and managed. This book provides an overview of several aspects of grid modernization including micro-grids, smart grids, energy storage, and communication systems.

"For well over a century, electricity has made vital contributions to the growth of the U.S. economy and the quality of American life. The U.S. electric grid is a remarkable achievement, linking electric generation units reliably and efficiently to millions of residential, commercial, and industrial users of electricity through more than six million miles of lines and associated equipment that are designed and managed by more than 3,000 organizations, many of which are in turn regulated by both federal and state agencies. While this remarkable system of systems will continue to serve us well, it will face serious challenges in the next two decades that will demand the intelligent use of new technologies and the adoption of more appropriate regulatory policies. This report aims to provide a comprehensive, objective portrait of the U.S. electric grid and the challenges and opportunities it is likely to face over the next two decades. It also highlights a number of areas in which policy changes, focused research and demonstration, and the collection and sharing of important data can facilitate meeting the challenges and seizing the opportunities that the grid will face. This study is the sixth in the MIT Energy Initiative’s “Future of” series."

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

The Third Industrial Revolution

The Renewable Solution to Global Warming: a Report by the Union of Concerned Scientists

Energy, Capitalism, and Climate Change

How Companies and Customers Are Transforming the Electrical Grid and the Future of Power

The Future of the Electric Grid

Innovation for Development and Deployment of Increasingly Clean Electric Power Technologies

Why America’s data system is broken, and how to fix it. Why, with data increasingly important, available, valuable and cheap, are the data produced by the American government getting worse and costing more? State and local governments rely on population data from the US Census Bureau; prospective college students and their parents can check data from the National Center for Education Statistics; small businesses can draw on data about employment and wages from the Bureau of Labor Statistics. But often the information they get is out of date or irrelevant, based on surveys—a form of information gathering notorious for low response rates. In A Data Manifesto, Julia Lane argues that bad data is bad for democracy. Her book is a wake-up call to America to fix its broken public data system.

How one solar power plant might chart a sustainable path forward for enlisting American capitalism in the fight against climate change.

How the interplay between government regulation and the private sector has shaped the electric industry, from its nineteenth-century origins to twenty-first-century market restructuring. For more than a century, the interplay between private, investor-owned electric utilities and government regulators has shaped the electric power industry in the United States. Provision of an essential service to largely dependent consumers invited government oversight and ever more sophisticated market intervention. The industry has sought to manage, co-opt, and profit from government regulation. In *The Power Brokers*, Jeremiah Lambert maps this complex interaction from the late nineteenth century to the present day. Lambert’s narrative focuses on seven important industry players: Samuel Insull, the principal industry architect and prime mover in the utility industry; William Allen, chairman of the Tennessee Valley Authority (TVA), who waged a desperate battle for market share; Don Model, who presided over the Bonneville Power Administration (BPA) in its failed attempt to launch a multi-plant nuclear power program; Paul Joskow, the MIT economics professor who foresaw a restructured and competitive electric power industry; Enron’s Ken Lay, master of political influence and market-rigging; Amory Lovins, a pioneer proponent of sustainable power; and Jim Rogers, head of Duke Energy, a giant coal-fired utility threatened by decarbonization. Lambert tells how Insull built an empire in a regulatory vacuum, and how the government entered the electricity marketplace by making cheap hydropower available through the TVA. He describes the failed overreach of the BPA, the rise of competitive electricity markets, Enron’s market manipulation, Lovins’s radical vision of a decentralized industry powered by renewables, and Rogers’s remarkable effort to influence cap-and-trade legislation. Lambert shows how the power industry has sought to use regulatory change to preserve or secure market dominance and how rogue players have gamed imperfectly restructured electricity markets. Integrating regulation and competition in this industry has proven a difficult experiment.

This book explores the opportunities and challenges that both Europe and Asia face under the framework of the 21st Century Maritime Silk Road Initiative. The 21st Century Maritime Silk Road Initiative (MSR Initiative), put forward by the Chinese government together with the Silk Road Economic Belt, reflects China’s ambition and vision to shape the global economic and political order. The first step and priority under the MSR Initiative, according to documents issued by China, is to build three ‘Blue Economic Passages’ linking China with the rest of the world at sea, two of which will connect China with Europe. This initiative, however, still faces enormous challenges of geopolitical suspicion and security risks. This book seeks to assess these risks and their causes for the cooperation between the Eurasian countries under the framework of MSR and puts forward suggestions to deal with these risks in the interdisciplinary perspectives of international relations and international law. Featuring a global team of contributors, this book will be of much interest to students of Asian politics, maritime security, international law and international relations.

How States Shape Our Nation and Our Lives

Electric Power System Basics for the Nonelectrical Professional

Fundamentals of Building Energy Dynamics

Producing Power

Empires of the Mind

Markets for Power

The Unmaking of America’s Environment, Security, and Independence

The Industrial Revolution, powered by oil and other fossil fuels, is spiraling into a dangerous endgame. The price of gas and food are climbing, unemployment remains high, the housing market has tanked, consumer and government debt is soaring, and the recovery is slowing. Facing the prospect of a second collapse of the global economy, humanity is desperate for a sustainable economic game plan to take us into the future. Here, Jeremy Rifkin explores how Internet technology and renewable energy are merging to create a powerful “Third Industrial Revolution.” He asks us to imagine hundreds of millions of people producing their own green energy in their homes, offices, and factories, and sharing it with each other in an “energy internet.” Just like we now create and share information online, Rifkin describes how the five-pillars of the Third Industrial Revolution will create thousands of businesses, millions of jobs, and usher in a fundamental reordering of human relationships, from hierarchical to lateral power, that will impact the way we conduct commerce, govern society, educate our children, and engage in civic life. Rifkin’s vision is already gaining traction in the international community. The European Union Parliament has issued a formal declaration calling for its implementation, and other nations in Asia, Africa, and the Americas, are quickly preparing their own initiatives for transitioning into the new economic paradigm. The Third Industrial Revolution is an insider’s account of the next great economic era, including a look into the personalities and players — heads of state, global CEOs, social entrepreneurs, and NGOs — who are pioneering its implementation around the world.

Meet Michael Skelly, the man boldly harnessing wind energy that could power America’s future and break its fossil fuel dependence in this “essential, compelling look into the future of the nation’s power grid” (Bryan Burrough, author of The Big Rich). The United States is in the midst of an energy transition. We have fallen out of love with dirty fossil fuels and want to embrace renewable energy sources like wind and solar. A transition from a North American power grid that is powered mostly by fossil fuels to one that is predominantly clean is feasible, but it would require a massive building spree—wind turbines, solar panels, wires, and billions of dollars would be needed. Enter Michael Skelly, an infrastructure builder who began working on wind energy in 2000 when many considered the industry a joke. Eight years later, Skelly helped build the second largest wind power company in the United States—and sold it for \$2 billion. Wind energy was no longer funny—it was well on its way to powering more than 6% of electricity in the United States. Award-winning journalist, Russel Gold tells the story in many ways in the story of our nation’s evolving relationship with renewable energy. Gold illustrates how Skelly’s company, Clean Line Energy, conceived the idea for a new power grid that would allow sunlight wherever abundant to light up homes in the cloudy states thousands of miles away, and take wind from the Great Plains to keep air conditioners running in Atlanta. Thrilling, provocative, and important, Superpower is a fascinating look at America’s future. This comprehensive and up-to-date book explains the economic rationale behind the production, delivery and exchange of electricity. Cret and Fontini explain why electricity markets exist, outlining the economic principles behind the exchange and supply of power to consumers and firms. They identify the specificities of electricity, as compared to other goods, and furthermore suggest how markets should be optimally designed to produce and deliver electricity effectively and efficiently. The authors also address key issues, including how electricity can be decarbonized. Written in a technical yet accessible style, this book will appeal to readers studying power system economics and the economics of electricity, as well as those more generally interested in energy economics, including engineering and management students looking to gain an understanding of electricity market analysis.

There’s probably a good chance that you’ve turned on your television, computer, or an appliance without giving much thought about the electric grid. But when there’s a power outage, its a different story. Suddenly, you’re asking yourself questions such as: What is the electric grid and who owns it? Who controls the grid and how is it controlled? What causes a grid blackout? What is the future of the grid? William L. Thompson, who retired from Dominion Virginia Power after thirty-eight years in the electric business, answers those questions and many more in this book for anyone curious about the electric grid and how it works. In plain, simple language, he reveals what goes on behind the scenes at grid control centers across the country. He also explains how electricity is generated through renewable energy sources such as wind and solar. He also examines the causes behind the largest blackout in United States history and how global warming and technological developments could permanently change Living on the Grid.

Superpower

Biography of an American Technology

The Power Brokers

Challenges and Opportunities for Asia and Europe

Living on the Grid

The Pre-Chernobyl History of the Soviet Nuclear Industry

The Politics of the Past in Early China

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 advantagesworld-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 approachesposition 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.

An examination of how the technical choices, social hierarchies, economic structures, and political dynamics shaped the Soviet nuclear industry leading up to Chernobyl. The Chernobyl disaster has been variously ascribed to human error, reactor design flaws, and industry mismanagement. Six former Chernobyl employees were convicted of criminal negligence: they defended themselves by pointing to reactor design issues. Other observers blamed the Soviet style of ideologically driven economic and industrial management. In *Producing Power*, Sonja Schmid draws on interviews with veterans of the Soviet nuclear industry and extensive research in Russian archives as she examines these alternate accounts. Rather than pursue one “definitive” explanation, she investigates how each of these narratives makes sense in its own way and demonstrates that each implies adherence to a particular set of ideas—about high-risk technologies, human-machine interactions, organizational methods for ensuring safety and productivity, and even about the legitimacy of the Soviet state. She also shows how these attitudes shaped, and were shaped by, the Soviet nuclear industry from its very beginnings. Schmid explains that Soviet experts established nuclear power as a driving force of social, not just technical, progress. She examines the Soviet nuclear industry’s dual origins in weapons and electrification programs, and she traces the emergence of nuclear power experts as a professional community. Schmid also fundamentally reassesses the design theories for nuclear power reactors in the shadow of the Cold War’s arms race. Schmid’s account helps us understand how and why a complex sociotechnical system broke down. Chernobyl, while unique and specific to the Soviet experience, can also provide valuable lessons for contemporary nuclear projects.

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 Willich presents just such a strategy in this book, connecting the dots across electricity’s 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 in delivery of affordable, reliable, secure, and environmentally sustainable electricity services. Willich 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 electricity and 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.

Power System SCADA and Smart Grids brings together in one concise volume the fundamentals and possible application functions of power system supervisory control and data acquisition (SCADA). The text begins by providing an overview of SCADA systems, evolution, and use in power systems and the data acquisition process. It then describes the components of SCADA systems, from the legacy remote terminal units (RTUs) to the latest intelligent electronic devices (IEDs), data concentrators, and master stations, as well as: Examines the building and practical implementation of different SCADA systems Offers a comprehensive discussion of the data communication, protocols, and media usage Covers substation automation (SA), which forms the basis for transmission, distribution, and customer automation Addresses distribution automation and distribution management systems (DA/DMS) and energy management systems (EMS) for transmission control centers Discusses smart distribution, smart transmission, and smart grid solutions such as smart homes with home energy management systems (HEMs), plugged hybrid electric vehicles, and more Power System SCADA and Smart Grids is designed to assist electrical engineering students, researchers, and practitioners alike in acquiring a solid understanding of SCADA systems and application functions in generation, transmission, and distribution systems, which are evolving day by day, to help them adapt to new challenges effortlessly. The book reveals the inner secrets of SCADA systems, unveils the potential of the smart grid, and inspires more minds to get involved in the development process.

The Global Energy Transition

Power Loss

Democratizing Our Data

The Grid

Reworking Nature in New York City

Markets, Competition and Rules

Downtime on the Microgrid

A comprehensive review of the theory and practice for designing, operating, and optimizing electric distribution systems, revised and updated Now in its second edition, Electric Distribution Systems has been revised and updated and continues to provide a two-tiered approach for designing, installing, and managing effective and efficient electric distribution systems. With an emphasis on both the practical and theoretical approaches, the text is a guide to the underlying theory and concepts and provides a resource for applying that knowledge to problem solving. The authors—*noted experts in the field*—explain the analytical tools and techniques essential for designing and operating electric distribution systems. In addition, the authors reinforce the theories and practical information presented with real-world examples as well as hundreds of clear illustrations and photos. This essential resource contains the information needed to design electric distribution systems that meet the requirements of specific loads, cities, and zones. The authors also show how to recognize and quickly respond to problems that may occur during system operations, as well as revealing how to improve the performance of electric distribution systems with effective system automation and monitoring. This updated edition: • Contains new information about recent developments in the field particularly in regard to renewable energy generation • Clarifies the perspective of various aspects relating to protection schemes and accompanying equipment • Includes illustrative descriptions of a variety of distributed energy sources and their integration with distribution systems • Explains the intermittent nature of renewable energy sources, various types of energy storage systems and the role they play to improve power quality, stability, and reliability Written for engineers in electric utilities, regulators, and consultants working with electric distribution systems planning and projects, the second edition of Electric Distribution Systems offers an updated text to both the theoretical underpinnings and practical applications of electrical distribution systems.

Americans' safety, productivity, comfort, and convenience depend on the reliable supply of electric power. The electric power system is a complex "cyber-physical" system composed of a network of millions of components spread out across the continent. These components are owned, operated, and regulated by thousands of different entities. Power system operators work hard to assure safe and reliable service, but large outages occasionally happen. Given the nature of the system, there is simply no way that outages can be completely avoided, no matter how much time and money is devoted to such an effort. The system's reliability and resilience can be improved but never made perfect. Thus, system owners, operators, and regulators must prioritize their investments based on potential benefits. Enhancing the Resilience of the Nation's Electricity System focuses on identifying, developing, and implementing strategies to increase the power system's resilience in the face of events that can cause large-area, long-duration outages: blackouts that extend over multiple service areas and last several days or longer. Resilience is not just about lessening the likelihood that these outages will occur. It is also about limiting the scope and impact of outages when they do occur, restoring power rapidly afterwards, and learning from these experiences to better deal with events in the future.

Prize-winning historian Robert Gildea dissects the legacy of empire for the former colonial powers and their subjects.

History mattered to the political elite in Ancient China. Leung explores why it was so important and to what end.

Power System SCADA and Smart Grids

Energy Resources: Examining the Facts

Economics of Electricity

Electric Distribution Systems

The Energy System

The Electric Power System

Law, Policy and Economics for Energy in the 21st Century

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.

A comprehensive textbook that integrates tools from technology, economics, markets, and policy to approach energy issues using a dynamic systems and capital-centric perspective. The global energy system is the vital foundation of modern human industrial society. Traditionally studied through separate disciplines of engineering, economics, environment, or public policy, this system can be fully understood only by using an approach that integrates these tools. This textbook is the first to take a dynamic systems perspective on understanding energy systems, tracking energy from primary resource to final energy services through a long and capital-intensive supply chain bounded by both macroeconomic and natural resource systems. The book begins with a framework for understanding how energy is transformed as it moves through the system with the aid of various types of capital, its movement influenced by a combination of the technical, market, and policy conditions at the time. It then examines the three primary energy subsystems of electricity, transportation, and thermal energy, explaining such relevant topics as systems thinking, cost estimation, capital formation, market design, and policy tools. Finally, the book reintegrates these subsystems and looks at their relation to the economic system and the ecosystem that they inhabit. Practitioners and theorists from any field will benefit from a deeper understanding of both existing dynamic energy system processes and potential tools for intervention.

A perceptive account of the deregulation of the electric power industry.

Renewable Energy

The Colonial Past and the Politics of the Present

The Struggle to Shape and Control the Electric Power Industry

The Origins of Deregulation and Restructuring in the American Electric Utility System

Architecture, Electricity, and Smart City Islands