

Innovation For Sustainable Electricity Systems

Innovation for Sustainable Electricity Systems Exploring the Dynamics of Energy Transitions Springer Science & Business Media
Innovation is key to achieving a sustainable electricity system. New technologies and organizational changes can bring about more sustainable, climate-friendly electricity structures. Yet the dynamics of innovation are complex, and difficult to shape. This book, written by experts in the field, sets out to explore the dynamics, the drivers and the setting of innovation processes. Case studies on micro cogeneration, carbon capture and storage, consumer feedback, network regulation and emissions trading provide insights into innovation dynamics in the electricity system and are analyzed to derive strategic implications for innovation policies. A special focus is placed on drivers and barriers of change, and their consequences for shaping the innovation process. This book is an indispensable source of information for researchers and decision makers in energy and climate change as well as for lecturers and students interested in the principles and ramifications of electricity innovation dynamics.

ICT Innovations for Sustainability is an investigation of how information and communication technology can contribute to sustainable development. It presents clear definitions of sustainability, suggesting conceptual frameworks for the positive and negative effects of ICT on sustainable development. It reviews methods of assessing the direct and indirect impact of ICT systems on energy and materials demand, and examines the results of such assessments. In addition, it investigates ICT-based approaches to supporting sustainable patterns of production and consumption, analyzing them at various levels of abstraction – from end-user devices, Internet infrastructure, user behavior, and social practices to macro-economic indicators. Combining approaches from Computer Science, Information Systems, Human-Computer Interaction, Economics, and Environmental Sciences, the book presents a new, holistic perspective on ICT for Sustainability (ICT4S). It is an indispensable resource for anyone working in the area of ICT for Energy Efficiency, Life Cycle Assessment of ICT, Green IT, Green Information Systems, Environmental Informatics, Energy Informatics, Sustainable HCI, or Computational Sustainability.

Global energy network is an important platform to guarantee effective exploitation of global clean energy and ensure reliable energy supply for everybody. Global Energy Interconnection analyzes the current situation and challenges of global energy development, provides the strategic thinking, overall objective, basic pattern, construction method and development mode for the development of global energy network. Based on the prediction of global energy and electricity supply and demand in the future, with the development of UHV AC/DC and smart grid technologies, this book offers new solutions to drive the safe, clean, highly efficient and sustainable development of global energy. The concept and development ideas concerning global energy interconnection in this book are based on the author's thinking of strategic issues about China's and the world's energy and electricity development for many years, especially combined with successful practices of China's UHV development. This book is particularly suitable for researchers and graduated students engaged in energy sector, as well as energy economics researchers, economists, consultants, and government energy policy makers in relevant fields. Based on the author's many years' experience

in developing Smart Grid solutions within national and international projects. Combines both solid background information and cutting-edge technology progress, coupled with a useful and impressive list of references. The key energy problems which are challenging us nowadays are well stated and explained in this book, which facilitates a better understanding of the development of global energy interconnection with UHV AC/DC and smart grid technologies.

This volume features research and case studies across a variety of industries to showcase technological innovations and policy initiatives designed to promote renewable energy and sustainable economic development. The first section focuses on policies for the adoption of renewable energy technologies, the second section covers the evaluation of energy efficiency programs and the final section provides evaluations of energy technology innovations. Environmental concerns, energy availability and political pressure have prompted governments to look for alternative energy resources that can minimize the undesirable effects for current energy systems. For example, shifting away from the conventional fuel resources and increasing the percentage of electricity generated from renewable resources, such as solar and wind power, is an opportunity to guarantee lower CO₂ emissions and to create better economic opportunities for citizens in the long run. Including discussions of such of timely topics and issues as global warming, bio-fuels and nuclear energy, the editors and contributors to this book provide a wealth of insights and recommendations for sustainable energy innovations.

This book presents recent innovative trends in land, water and energy management in Vietnam. Presenting the main projects and outcomes of a close collaboration between Italian and Vietnamese researchers in the last three years, the book is divided into three main sections: environment, climate change and land management in Vietnam; energy for Vietnam; and cities and utilities in Vietnam. The first section focuses on water systems, including rivers and seacoasts, and on new growing methods for more sustainable agriculture. The second section addresses energy and wastewater. The country's rapid growth is a major challenge in terms of reinforcing the electrical infrastructures, and as such this section offers an overview of the government's planned measures and their impact on the Vietnamese power system. The third section highlights cities and utilities in the context of increasing urbanization, exploring the urban morphology of the Vietnamese metropolis, particularly Hanoi and Ho Chi Minh City. Despite decades of effort and billions of dollars spent, two thirds of people in sub-Saharan Africa still lack access to electricity, a vital pre-cursor to economic development and poverty reduction. Ambitious international policy commitments seek to address this, but scholarship has failed to keep pace with policy ambitions, lacking both the empirical basis and the theoretical perspective to inform such transformative policy aims. Sustainable Energy for All aims to fill this gap. Through detailed historical analysis of the Kenyan solar PV market the book demonstrates the value of a new theoretical perspective based on Socio-Technical Innovation System Building. Importantly, the book goes beyond a purely academic critique to detail exactly how a Socio-Technical Innovation System Building approach might be operationalized in practice, facilitating both a detailed plan for future comparative research as well as a clear agenda for policy and practice. Chapter 1 of this book is freely available as a downloadable Open Access PDF under a Creative Commons Attribution-Non Commercial-No Derivatives 3.0 license. [Page 2/16](https://s3-us-</p></div><div data-bbox=)

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This is such a timely book. Combining extraordinary historical insight with the sharpest analysis of where we are now, Walt Patterson carves out the most applied and practical of 'road maps' as to where we need to go if we are to deliver a genuinely sustainable electricity system for the future. As we go into a period of considerable turbulence, primarily because of the impacts of climate change, *Keeping The Lights On* will undoubtedly be seen as a very well informed Guidebook. JONATHON PORRITT CBE, CHAIR, UK SUSTAINABLE DEVELOPMENT COMMISSION A very important and timely book. Walt Patterson persuasively challenges traditional assumptions about how we think of energy and electricity, and presents an exciting vision of an innovative and sustainable future. NICK MABEY, CHIEF EXECUTIVE, E3G (THIRD GENERATION ENVIRONMENTALISM), FORMER SENIOR ADVISER IN THE UK PRIME MINISTERS STRATEGY UNIT Walt has got this exactly right. It should be compulsive reading, if not compulsory reading, for all politicians and other players that determine or have a role to play in energy policy and, more importantly, in tackling climate change. Knowing what we know now, you would not implement such a wasteful and polluting electricity system as centralized power generation. As Walt has indicated, we do have to overcome the grid mindset of those who should know better. ALLAN JONES MBE, CHIEF EXECUTIVE OFFICER, LONDON CLIMATE CHANGE AGENCY What can I say? Clearly thought out, simply written, and straight to the heart of the major issues in energy today. I cant think of anyone else who could bring together the technology, the economics, and the basic human relationship with energy that Walt has here. This is really great stuff. RONAN PALMER, CHIEF ECONOMIST, UK ENVIRONMENT AGENCY Fashions come and fashions go in the energy world. Security of supply, climate change and market liberalization have all vied for our attention. Its good to have one voice thats stayed constant over thirty years of turbulence and change. *Keeping The Lights On* distils Walt Pattersons thinking over the last three decades. As ever, he provokes us to re-examine our own thinking about energy policy. Essential reading as we face up to new challenges. PROFESSOR JIM SKEA OBE, RESEARCH DIRECTOR, UK ENERGY RESEARCH CENTRE 'Even more important now than when first released.' *Energy News In* *Keeping The Lights On*, Walt Patterson starts from a simple premise: that we are making a mess of energy, and this is endangering the planet. Using accessible, everyday language Patterson describes how we could do much better, outlining a different way to think about energy, what we want from it and how we get it. Drawing on over 35 years of work from one of the leading voices in the field, *Keeping The Lights On* explains how we could go about improving energy security and services while reducing costs and vulnerability, globally and rapidly. The book discusses the timely and heated debates surrounding energy and power, and emphasizes that electricity is about infrastructure; we have to stop treating it as a commodity. The result is a comprehensive introduction to the most important issues, providing the reader with innovative and expert ideas and solutions. Published with Royal Institute of International Affairs.

The Power of Design offers an introduction and apractical guide to product innovation, integrating the key topicsthat are necessary

for the design of sustainable and energy-efficient products using sustainable energy technologies. Product innovation in sustainable energy technologies is an interdisciplinary field. In response to its growing importance and the need for an integrated view on the development of solutions, this text addresses the functional principles of various energy technologies next to the latest design processes and innovation methods. From the perspective of product applications, the book provides clear explanations of technologies that are significant for product integration, such as batteries, photovoltaic solar energy, fuel cells, small wind turbines, human power, energy saving lighting, thermal energy technologies in buildings, and piezoelectric energy conversions. The design processes and innovation methods presented in this book include various approaches ranging from technical, societal and creative methods that can be applied in different stages of the design process. Other features include: a methodological approach, enabling readers to easily apply the theory to their research projects and to the actual design of sustainable products with energy technologies discussion on interaction design and smart grid interventions colour photographs that illustrate the final products numerous case studies of product development projects and concepts in practice, enabling readers to understand and design energy-efficient products in several different markets a companion website containing useful information about the cases and an additional design cases with sustainable energy technologies The Power of Design provides a comprehensive and visually appealing opening into the subject for third and fourth year students, postgraduates, and professionals in the areas of energy, environment, product design and engineering

The sustainable energy sources are potentially employed to substitute petrol fuels in transport engines such as buses and small vehicles. Hydrogen-enriched compressed natural gas engines are forthcoming energy carriers for the internal combustion engine, with higher thermal efficiency and less pollutant emissions. The different availability of renewables has allowed various countries to adopt the most appropriate type of renewable energy technology according to their energy source adequacy/abundance. In Taiwan, ocean energy is considered as an abundant source of renewables due to its geographical location as an island. The Taiwanese government has approved the investment to construct an MW-scale demonstration electricity plant. In this book, the Taiwanese ocean energy experience is comprehensively presented. The technical and legal analyses of ocean energy implementation are provided. The challenges that they had to overcome to optimize the utilization of the most available ocean energy potential are discussed. The sustainable transition in South Africa would be a good example for implementing rooftop solar, especially in low-income communities. Apart from the environmental benefits, sustainable energy technologies can boost the socioeconomic level of developing countries. Other advantages may be the continuous supply of energy and creation of new job opportunities. Moreover, sustainable renewable energy sources such as the wind could be employed for generating electricity to operate water purification systems in remote areas. This, in turn, would overcome the health problems associated with drinking water scarcity issues. This book is an attempt to cover the sustainable energy issues from a technical perspective. Furthermore, the sustainable energy applications and existing case studies are helpful illustrations for the broad understanding of the importance of sustainable energy.

This book contains the proceedings of the 12th KES International Conference on Sustainability and Energy in Buildings 2020 (SEB20) held in Split, Croatia, during 24–26 June 2020 organized by KES International. SEB20 invited contributions on a range of topics related to sustainable buildings and explored innovative themes regarding sustainable energy systems. The aim of the conference is to bring together researchers, and government and industry professionals to discuss the future of energy in buildings, neighbourhoods and cities from a theoretical, practical, implementation and simulation perspective. The conference formed an exciting chance to present, interact and learn about the latest research and practical developments on the subject. The conference attracted submissions from around the world. Submissions for the Full-Paper Track were subjected to a blind peer-review process. Only the best of these were selected for presentation at the conference and publication in these proceedings. It is intended that this book provides a useful and informative snapshot of recent research developments in the important and vibrant area of sustainability in energy and buildings.

Energy efficiency touches all parts of the economy and lies at the heart of all plausible strategies for addressing climate change. A fascinating range of new technologies and new business models have emerged in the past few years and are rapidly reshaping the field and driving efficiency improvements — many of them completely unexpected. This book provides a fresh look at energy efficiency written in a way that can be interesting to experts and serve as an entry point for novices. With chapters written by recognized experts in their fields of expertise, the book provides readers with a clear perspective on the state-of-the-art developments of both new technologies and new approaches to system design and operations in buildings, industry, transportation, and urban design. Strategies for electrification and optimization based on data and powerful algorithms are also explored in depth. The discussion includes new mobility systems, smart buildings, reimagined industrial processes, new materials, and smart grid integration.

This open access book addresses the issue of diffusing sustainable energy access in low- and middle-income contexts. Access to energy is one of the greatest challenges for many people living in low-income and developing contexts, as around 1.4 billion people lack access to electricity. Distributed Renewable Energy systems (DRE) are considered a promising approach to address this challenge and provide energy access to all. However, even if promising, the implementation of DRE systems is not always straightforward. The book analyses, discusses and classifies the promising Sustainable Product-Service System (S.PSS) business models to deliver Distributed Renewable Energy systems in an effective, efficient and sustainable way. Its message is supported with cases studies and examples, discussing the economic, environmental and socioethical benefits as well as its limitations and barriers to its implementation. An innovative design approach is proposed and a set of design tools are supplied, enabling readers to create and develop Sustainable Product-Service System (S.PSS) solutions to deliver Distributed Renewable Energy systems. Practical applications of the book's design approach and tools by companies and practitioners are discussed and the book will be of interest to readers in design, industry, governmental institutions, NGOs as well as researchers.

Electricity production and consumption are at the heart of modern life and are therefore of great interest to public policy. Threats

such as security of supply concerns, the volatility of fuel and electricity prices, and especially environmental concerns like climate change, are putting increasing pressure on current electricity systems. One key response by governments has been support for innovation. It is widely acknowledged that electricity systems will have to change fundamentally in order to deliver on political goals. This will require deep cuts in greenhouse gas emissions. Incremental change along established technological trajectories is unlikely to be sufficient. Instead 'system innovations' have been suggested as a solution by scholars and policy makers. What are the politics of such an endeavour? To answer this question this thesis looks at two distinct policy initiatives to promote more sustainable electricity systems: the 'Energy Transition' project in the Netherlands and the 'Carbon Trust' in the UK. While the aim of the two policy initiatives is similar, they try to tackle the challenge in very different ways. The analysis is based on semi-structured interviews as well as a review of documents and secondary literature and follows a process tracing method, combining within-case and cross-case analysis. By utilising a framework based on 'discursive institutionalism' (as per Hajer and Schmidt) the study aims to shed light on the importance of both discourses and institutional contexts in shaping policy initiatives to promote 'system innovations'. It demonstrates the mechanisms by which particular framings of the problem, expressed through new storylines, come to legitimate particular government policies. It emerges that existing institutions not only shape which storylines are politically acceptable but also constitute tangible features of the organisational and technical environment which those initiatives must change. In conclusion, the thesis argues that the politics of governing 'system innovations' can usefully be conceptualised and explained by struggles about meaning. These are shaped in turn through discursive interactions between actors as well as existing institutions. By highlighting the interplay between discourses, interests and institutions, the results provide an input to scholarly debate and policy making alike, in ways that offer to help inform the rethinking of strategies for fostering socio-technical 'system innovations'.

The future of modern societies depends on their ability to deal with the challenge of climate change in the coming decades. One essential component is a better understanding of innovation processes in the energy sector. This book focuses on sustainability innovations in renewable energies, combined heat and power, and energy service contracting, and analyses the institutions, actors and functions within the innovation system. Of particular interest is the question of whether the joint effect of EU-driven market liberalization and climate policies will succeed in establishing market forces that will drive actors towards more climate-friendly energy production. A special focus is on the role of local utilities in the electricity sector as opposed to large transmission net operators or regional net operators. The countries covered in the contributions include Germany, Denmark, the UK, Switzerland, and the Netherlands.

This book gathers the latest advances, innovations, and applications in the field of sustainable energy systems, as presented by researchers and engineers at the International Conference Sustainable Energy Systems: Innovative Perspectives (SES), held in Saint-Petersburg, Russia, on October 29-30, 2020. It covers highly diverse topics, including applications of renewable energy sources, recycling of solid municipal and industrial waste, circular economy based on agricultural waste, energy-efficient and

sustainable buildings, innovation management and technologies of sustainable cities, sustainable construction, creative construction technology and materials, construction simulation and virtual construction, BIM and rapid prototyping for construction, consumption practices in the digital era, sustainable operations management, and supply chain management in the digital era. The contributions, which were selected by means of a rigorous international peer-review process, highlight numerous exciting ideas that will spur novel research directions and foster multidisciplinary collaborations.

In this important new primer, Dustin Mulvaney makes a passionate case for the significance of solar power energy and offers a vision for a more sustainable and just solar industry for the future. The solar energy industry has grown immensely over the past several years and now provides up to a fifth of California's power. But despite its deservedly green reputation, solar development and deployment have potential social and environmental consequences, from poor factory labor standards to landscape impacts on wildlife. Using a wide variety of case studies and examples to trace the life cycle of photovoltaics, Mulvaney expertly outlines the state of the solar industry, exploring the ongoing conflicts between ecological concerns and climate mitigation strategies, as well as current trade disputes and the fate of toxins in solar waste products. This exceptional overview will outline the industry's current challenges and possible future for students in environmental studies, energy policy, environmental sociology, and other aligned fields.

This open access book explores the collision between the sustainable energy transition and the Internet of Things (IoT). In that regard, this book's arrival is timely. Not only is the Internet of Things for energy applications, herein called the energy Internet of Things (eIoT), rapidly developing but also the transition towards sustainable energy to abate global climate is very much at the forefront of public discourse. It is within the context of these two dynamic thrusts, digitization and global climate change, that the energy industry sees itself undergoing significant change in how it is operated and managed. This book recognizes that they impose five fundamental energy management change drivers: 1.) the growing demand for electricity, 2.) the emergence of renewable energy resources, 3.) the emergence of electrified transportation, 4.) the deregulation of electric power markets, 5.) and innovations in smart grid technology. Together, they challenge many of the assumptions upon which the electric grid was first built. The goal of this book is to provide a single integrated picture of how eIoT can come to transform our energy infrastructure. This book links the energy management change drivers mentioned above to the need for a technical energy management solution. It, then, describes how eIoT meets many of the criteria required for such a technical solution. In that regard, the book stresses the ability of eIoT to add sensing, decision-making, and actuation capabilities to millions or perhaps even billions of interacting "smart" devices. With such a large scale transformation composed of so many independent actions, the book also organizes the discussion into a single multi-layer energy management control loop structure. Consequently, much attention is given to

not just network-enabled physical devices but also communication networks, distributed control & decision making, and finally technical architectures and standards. Having gone into the detail of these many simultaneously developing technologies, the book returns to how these technologies when integrated form new applications for transactive energy. In that regard, it highlights several IoT-enabled energy management use cases that fundamentally change the relationship between end users, utilities, and grid operators. Consequently, the book discusses some of the emerging applications for utilities, industry, commerce, and residences. The book concludes that these IoT applications will transform today's grid into one that is much more responsive, dynamic, adaptive and flexible. It also concludes that this transformation will bring about new challenges and opportunities for the cyber-physical-economic performance of the grid and the business models of its increasingly growing number of participants and stakeholders.

In the recent past, environmental innovations have led to a considerable reduction of many pollutants; however, further innovation is required to tackle remaining pollution sources. This work analyses the significance and the effects of framework conditions on innovation activities that contribute to the realisation of a sustainable development. The book links the experiences of different research projects with the aim to develop a system of indicators to evaluate sustainable effects of (environmental) innovations. A comprehensive framework for an indicator system is established that allows to include different environmental innovation fields such as process innovations in the steel production, substitution of dangerous chemicals, organisational innovations in the field of waste disposal or sustainable water management. This book explores the perplexing question of how to increase sustainable energy technology use in the developing world, and specifically focuses on two megacities within Latin America. *Renewable Energy Uptake in Urban Latin America* examines the market and uptake of two sustainable energy technologies (solar water heaters and biogas to produce electricity) in two locations, Mexico City, Mexico and São Paulo, Brazil in the 2000s. Drawing from three systems-based analytical frameworks – including one developed by the author for the purpose of this study – the book examines the varying factors affecting the implementation of renewable energy technologies (RETs) in urban Latin America. These frameworks emphasize the importance of examining socio-political dimensions; rather than conventional explanations that focus on technical and economic aspects only. By doing so, the research improves explanations about renewable energy technology (RET) adoption in the global South. These findings are useful for scholars, policy makers and practitioners working on RET adoption; resulting in a book which helps to inform wider debates regarding innovation, decarbonization, sustainability transitions and energy system change. This book will be of great interest to students and scholars of energy transitions, energy policy, development studies and science and technology studies.

This volume contains the proceedings of the 11th KES International Conference on Sustainability and Energy in Buildings

2019 (SEB19) held in Budapest, 4th -5th July 2019 organised by KES International in partnership with Cardiff Metropolitan University, Wales, UK. SEB-19 invited contributions on a range of topics related to sustainable buildings and explored innovative themes regarding sustainable energy systems. The aim of the conference was to bring together researchers, and government and industry professionals to discuss the future of energy in buildings, neighbourhoods and cities from a theoretical, practical, implementation and simulation perspective. The conference formed an exciting chance to present, interact, and learn about the latest research and practical developments on the subject. The conference attracted submissions from around the world. Submissions for the Full-Paper Track were subjected to a blind peer-review process. Only the best of these were selected for presentation at the conference and publication in these proceedings. It is intended that this volume provides a useful and informative snapshot of recent research developments in the important and vibrant area of Sustainability in Energy and Buildings.

This book argues that renewable electrification in developing countries provide important opportunities for local economic development, but new pathways are required for turning these opportunities into reality. Building Innovation Capabilities for Sustainable Industrialisation provides a novel input into the debate on development of capabilities for sustainable industrialisation and provides key insights for both researchers and policy makers when it comes to the question of how to increase the economic co-benefits of renewables expansion. The chapters in the book use a tailored analytical framework in their studies of renewable electrification efforts in Kenya and other countries in sub-Saharan Africa. The chapters draw on a mix of project, sector and country level case studies to address questions such as the following: What capabilities are developed through on-going renewable electrification projects in developing economies? How can the expansion of renewable electrification be supported in a way that also supports sustainable economic development? What role does international linkages (South-South and North-South) play and what role should they play in the greening of energy systems in developing economies like Kenya? The authors provide a new understanding of how green transformation and sustainable industrialisation can be combined, highlighting the opportunities and constraints for local capability building and the scope for local policy action. This book will be of great interest to students and scholars of development studies, energy studies, sustainability and sustainable development, as well as practitioners and policy makers working in development organisations and national governments.

Electricity transmission and distribution (T&D) networks carry electricity from generation sites to demand sites. With the increasing penetration of decentralised and renewable energy systems, in particular variable power sources such as wind turbines, and the rise in demand-side technologies, the importance of innovative products has never been greater. Eco-design approaches and standards in this field are aimed at improving the performance as well as the overall sustainability

of T&D network equipment. This multidisciplinary reference provides coverage of developments and lessons-learned in the fields of eco-design of innovation from product-specific issues to system approaches, including case studies featuring problem-solving methodologies applicable to electricity transmission and distribution networks. Discusses key environmental issues and methodologies for eco-design, and applies this to development of equipment for electricity transmission and distribution. Provides analysis of using and assessing advanced equipment for wind energy systems. Includes reviews of the energy infrastructure for demand-side management in the US and Scandinavia.

Sustainable consumption and production (SCP) was adopted as a priority area during the World Summit on Sustainable Development in Johannesburg in 2002 and has since become one of the main vehicles for targeting international sustainability policy. Sustainable consumption focuses on formulating equitable strategies that foster the highest quality of life, the efficient use of natural resources, and the effective satisfaction of human needs while simultaneously promoting equitable social development, economic competitiveness, and technological innovation. But this is a complex topic and, as the challenges of sustainability grow larger, there is a need to re-imagine how SCP policies can be formulated, governed and implemented. The EU-funded project "Sustainable Consumption Research Exchanges" (SCORE!) consists of around 200 experts in the field of sustainable innovation and sustainable consumption. The SCORE! philosophy is that innovation in SCP policy can be achieved only if experts that understand business development, (sustainable) solution design, consumer behaviour and system innovation policy work together in shaping it. Sustainable technology design can be effective only if business can profitably make the products and consumers are attracted to them. To understand how this might effectively happen, the expertise of systems thinkers must be added to the mix. System Innovation for Sustainability 1 is the first result of a unique positive confrontation between experts from all four communities. It examines what SCP is and what it could be, provides a state-of-the-art review on the governance of change in SCP policy and looks at the strengths and weaknesses of current approaches. The SCORE! experts are working with actors in industry, consumer groups and eco-labelling organisations in the key consumption areas of mobility, food and agriculture, and energy use and housing – responsible for 70% of the life-cycle environmental impacts of Western societies – with the aim of stimulating, fostering or forcing change to SCP theory in practice. The System Innovation for Sustainability series will continue with three further volumes of comprehensive case studies in each of these three critical consumption areas. Each chapter of this book examines problems and suggests solutions from a business, design, consumer and system innovation perspective. It primarily examines the differing solutions necessary in the consumer economies of the West, but also comments on the differing needs in rapidly emerging economies such as China, as well as base-of-the-pyramid economies. The System Innovation for Sustainability series is the fruit of the only

major international research network on SCP and will set the standard in this field for some years to come. It will be required reading for all involved in the policy debate on sustainable production and consumption from government, business, academia and NGOs for designers, scientists, businesses and system innovators.

New innovations are needed for the invention of more efficient, affordable, sustainable and renewable energy systems, as well as for the mitigation of climate change and global environmental issues. In response to a fast-growing interest in the realm of renewable energy, *Renewable Energy Systems: Efficiency, Innovation and Sustainability* identifies a need to synthesize relevant and up-to-date information in a single volume. This book describes a systems approach to renewable energy, including technological, political, economic, social and environmental viewpoints, as well as policies and benefits. This unique and concise text, encompassing all aspects of the field in a single source, focuses on truly promising innovative and affordable renewable energy systems. Key Features: Focuses on innovations in renewable energy systems that are affordable and sustainable Collates the most relevant and up-to-date information on renewable energy systems, in a single and unique volume Discusses lifecycle assessment, cost and availability of systems Emphasizes bio-related topics Provides a systems approach to the renewable energy technologies and discusses technological, political, economic, social, and environmental viewpoints as well as policies

This book covers the state-of-the-art advances in several areas of energy, combustion, power, propulsion, and environment, focusing on the use of conventional and alternative fuels. It presents novel developments in the areas of biofuels and value added products from various feedstock materials, along with thermal management, emission control and environmental issues from energy conversion. Written by internationally renowned experts, the chapters in this volume cover the latest fundamental and applied research innovations on cleaner energy utilization for a wide range of devices extending from micro scale energy conversion to hypersonic propulsion using hydrocarbon fuels. The book will be useful as a ready reference for managers and practicing and research engineers, as well as graduate students and research organizations and institutions.

System innovation for sustainability 4 is the third of three books of case studies covering respectively the three key consumption areas of mobility, food and agriculture, and energy use and the built environment responsible for 70% of the life-cycle environmental impacts of Western societies with the aim of stimulating, fostering or forcing change to SCP theory in practice. Energy consumption is obviously a key issue for sustainability, primarily because it depletes non-renewable fossil fuels, produces CO₂ and other pollution. As climate change is becoming a key political issue, and as oil prices rise, society has become acutely aware of this issue. Energy is a special case because it is a key input to almost all other consumption and production processes. Housing is, with transport and food, a major consumer of energy, accounting for about one quarter of the environmental impact from the general consumption of products in the European Union, on a par with food and transport. Energy use in houses and buildings is also set to rise as populations and the buildings they need continue to increase. This book addresses the rapidly changing citizen roles in innovation, technology adoption, intermediation, market creation, and legitimacy building for low-carbon solutions. It links research in innovation studies, sustainability transitions, and science and technology studies, and builds a new approach for the study of user contributions to innovation and sociotechnical change. *Citizen Activities in Energy Transition* gives detailed and empirically grounded overall appraisal of citizens' active technological engagement in the current energy transition, in an era when Internet connectivity has given rise to important new forms of citizen communities and interactions. It elaborates a new way to study

users in sociotechnical change through long-term ethnographic and historical research and reports its deployment in a major, decade-long line of investigation on user activities in small-scale renewables, addressing user contributions from the early years to the late proliferation stages of small-scale renewable energy technologies (S-RETs). It offers a much-needed empirical and theoretical understanding of the dynamics of the activities in which users are engaged over the course of sociotechnical change, including innovation, adoption, adjustment, intermediation, community building, digital communities, market creation, and legitimacy creation. This work is a must-read for those seeking to understand the role of users in innovation, energy systems change and the significance of new digital communities in present and future sociotechnical change. Academics, policymakers, and managers are given a new resource to understand the "demand side" of sociotechnical change beyond the patterns of investment, adoption, and social acceptance that have traditionally occupied their attention.

This book examines the technical, market, and policy innovations for unlocking sustainable investment in the energy sector. While finalizing this book, the COVID-19 pandemic is cutting a devastating swath through the global economy, causing the biggest fall in energy sector investment, exacerbating the global trade finance gap, worsening signs of growing income inequality, and devastating the health and livelihoods of millions. What is the parallel between the COVID-19 pandemic and the climate change crisis? The impacts of the global pandemic are expected to last for a few years, whereas those associated with the climate crisis will play out over several decades with potentially irreversible consequences. However, both show that the cost of inaction or delay in addressing the risks can lead to devastating outcomes or a greater probability of irreversible, catastrophic damages. In the context of sustainable energy investment and the transition to a low-carbon, climate-resilient economy, what ways can financial markets and institutions support net-zero-emission activities and the shift to a sustainable economy, including investment in energy efficiency, low-carbon and renewable energy technologies? This book provides students, policymakers, and energy investment professionals with the knowledge and theoretical tools necessary to address related questions in sustainable energy investment, risk management, and energy innovation agendas.

This book contains the proceedings of the 13th KES International Conference on Sustainability and Energy in Buildings 2021 (SEB2021) held in Split, Croatia, during 15–17 September 2021 organized by KES International. SEB21 invited contributions on a range of topics related to sustainable buildings and explored innovative themes regarding sustainable energy systems. The conference formed an exciting chance to present, interact and learn about the latest research and practical developments on the subject. The conference attracted submissions from around the world. Submissions for the Full-Paper Track were subjected to a blind peer-review process. Only the best of these were selected for presentation at the conference and publication in these proceedings. It is intended that this book provides a useful and informative snapshot of recent research developments in the important and vibrant area of sustainability in energy and buildings.

This book addresses the reality that there is no consensus on the extent to which innovations can reconcile ever-growing energy consumption, the shrinking availability of resources, and the environmental consequences of fossil-fuel energy use. The contributors explore how these conflicting scenarios could be reconciled; and how we might shape a more sustainable energy system from the existing one. 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:

Online Library Innovation For Sustainable Electricity Systems

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.

This book contains selected papers presented during the World Renewable Energy Congress (WREC) 2020 at the Instituto Superior Técnico in Lisbon. The WREC is dedicated to promoting renewable energy global development, and features top international experts, policy makers, scientists, engineers, technology developers, and business practitioners addressing the most current research and technological breakthroughs in sustainable energy development and innovation. The contributions address policy and renewable energy technologies and applications in all sectors—for heating and cooling, agricultural applications, water, desalination, industrial applications and for the transport sectors. Sustainable Power Generation: Current Status, Future Challenges and Perspectives addresses emerging problems faced by the transition to sustainable electricity generation and combines perspectives of engineering and economics to provide a well-rounded overview. This book features an in-depth discussion of the main aspects of sustainable energy and the infrastructure of existing technologies. It goes on to evaluate natural resources that are sustainable and convenient forms of energy, and finishes with an investigation of the environmental effects of energy systems and power generating systems of the future. Other sections tackle fundamental topics such as thermal power, nuclear energy, bioenergy, hydropower, challenges and risks to sustainable options and emerging technologies that support global power trends. Sustainable Power Generation explores the future of sustainable electricity generation, highlighting topics such as energy justice, emerging competences, and major transitions that need to be navigated. This is an ideal reference for researchers, engineers, and other technical specialists working in the energy sector, as well as environmental specialists and policy makers. Provides a multidisciplinary, structured approach to electricity generation, focusing on the key areas of technology, business, project management and sustainability Includes analytics and discussions of sustainability metrics, underlying issues and challenges Presents business cases, offering a mix of academic depth and practicality on energy options

The EU-funded project "Sustainable Consumption Research Exchanges" (SCORE!) consists of around 200 experts in the

field of sustainable innovation and sustainable consumption. The SCORE! philosophy is that innovation in SCP policy can be achieved only if experts that understand business development, (sustainable) solution design, consumer behaviour and system innovation policy work together in shaping it. Sustainable technology design can be effective only if business can profitably make the products and consumers are attracted to them. To understand how this might effectively happen, the expertise of systems thinkers must be added to the mix. The publication in 2008 of System Innovation for Sustainability 1 was the first result of a unique positive confrontation between experts from all four communities. It examined what SCP is and what it could be, provided a state-of-the-art review on the governance of change in SCP policy and looked at the strengths and weaknesses of current approaches. System Innovation for Sustainability 4 is the third of three books of case studies covering respectively the three key consumption areas of mobility, food and agriculture, and energy use and the built environment – responsible for 70% of the life-cycle environmental impacts of Western societies – with the aim of stimulating, fostering or forcing change to SCP theory in practice. Energy consumption is obviously a key issue for sustainability, primarily because it depletes non-renewable fossil fuels, produces CO₂ and other pollution. As climate change is becoming a key political issue, and as oil prices rise, society has become acutely aware of this issue. Energy is a special case because it is a key input to almost all other consumption and production processes. Housing is, with transport and food, a major consumer of energy, accounting for about one quarter of the environmental impact from the general consumption of products in the European Union, on a par with food and transport. Energy use in houses and buildings is also set to rise as populations – and the buildings they need – continue to increase. In France, for example, energy consumption in houses and offices accounts for 43% of the total national energy consumption, and one-quarter of national greenhouse gas emissions. The UK's 21 million homes consume around 50 million tonnes of oil equivalent (responsible for 27% of UK CO₂ emissions); this energy use has increased steadily by about 1.3% per year since 1990. Germany's buildings contribute one-fifth of the country's CO₂ emissions. Beyond this, buildings are the environment where we spend most of our lives; they deeply influence many other consumption patterns, and are an important factor for life and comfort. The societal function and nature of buildings as they are currently constructed presents some key difficulties in moving towards sustainable consumption and production. Buildings have a long lifetime; and therefore they are a major target for any structural changes in consumption patterns. Conversely, long lifetimes come with associated strong inertia; therefore the stock of existing buildings is often an obstacle to policies aimed at behavioural change. This book examines, through a case study approach, opportunities to influence energy consumption in housing and buildings and thereby provide options for implementation at a macro, meso and micro level. A growing body of evidence shows that cases demonstrating action

towards SCP in energy use in housing can inspire innovation through a range of actors. The cases include examples of steps towards the sustainable use of energy in houses and buildings, from "local experiments", to "innovative communities", to wider regime or non-local scale change in Europe and North America. The System Innovation for Sustainability series is the fruit of the first major international research network on SCP and will set the standard in this field for some years to come. It will be required reading for all involved in the policy debate on sustainable production and consumption from government, business, academia and NGOs for designers, scientists, businesses and system innovators.

Innovation, Markets and Sustainable Energy is the first attempt to explore fuel cells and hydrogen technologies by embracing a solid theoretical perspective in the field of innovation and management. Adopting a cross-sectional and international perspective, the book analyzes the implications of introducing fuel cells into the industrial system and explores the complexity of market development for new technological solutions. This book presents an in-depth study of the hydrogen and fuel cell industry and markets, concentrating on the disruptive nature of these technologies. It examines the value chain structure and the strategies of relevant industry players, the alliances and inter-organizational learning processes, the development of new markets, and venture capital dynamics. It also provides an overview of the policies that support hydrogen and fuel cell technologies in major countries around the world. Academics focussing on innovation management, strategy, sustainability, and energy and environmental management will warmly welcome this timely book. It will also be of great interest for the fuel cell and hydrogen practitioner community at large and in particular policymakers.

"Unique in linking sustainable energy technologies with innovation and product design, this book offers clear explanation of both and case studies enabling readers to understand and design energy-efficient products in several different markets. The book integrates the subject areas that are necessary for the design of sustainable and energy-efficient products based on sustainable energy technologies. The theory provided is illustrated by cases of design projects and concepts in practice. With the book's methodological approach, the reader is able to apply the information and examples in their research projects or product design processes. This book fills a void in existing literature at the intersection of innovation processes, sustainable energy technologies, energy demand reduction, product development, and user behaviour, which requires an integrated view on the development of sustainable energy solutions. As such, the editors offer a unique publication in "product innovation in sustainable energy technologies and energy-efficiency" that corresponds to the growing interest in the field"--

Sustainable Food Waste-to-Energy Systems assesses the utilization of food waste in sustainable energy conversion

systems. It explores all sources of waste generated in the food supply chain (downstream from agriculture), with coverage of industrial, commercial, institutional and residential sources. It provides a detailed analysis of the conventional pathways for food waste disposal and utilization, including composting, incineration, landfilling and wastewater treatment. Next, users will find valuable sections on the chemical, biochemical and thermochemical waste-to-energy conversion processes applicable for food waste and an assessment of commercially available sustainable food waste-to-energy conversion technologies. Sustainability aspects, including consideration of environmental, economic and social impacts are also explored. The book concludes with an analysis of how deploying waste-to-energy systems is dependent on cross-cutting research methods, including geographical information systems and big data. It is a useful resource for professionals working in waste-to-energy technologies, as well as those in the food industry and food waste management sector planning and implementing these systems, but is also ideal for researchers, graduate students, energy policymakers and energy analysts interested in the most recent advances in the field. Provides guidance on how specific food waste characteristics drive possible waste-to-energy conversion processes Presents methodologies for selecting among different waste-to-energy options, based on waste volumes, distribution and properties, local energy demand (electrical/thermal/steam), opportunities for industrial symbiosis, regulations and incentives and social acceptance, etc. Contains tools to assess potential environmental and economic performance of deployed systems Links to publicly available resources on food waste data for energy conversion

A volume on the political economy of clean energy transition in developed and developing regions, with a focus on the issues that different countries face as they transition from fossil fuels to lower carbon technologies.

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