

Master Thesis Electric Vehicle Integration

The fast growth in world population and the associated energy requirements, the announced depletion of fossil fuel resources, the continuing rise in greenhouse gas (GHG) emissions with the induced climatic changes represent some of the major challenges to be taken up in the coming years and decades. Hybridization therefore typically represents a transition technology which can significantly improve the energy and environmental performance of current vehicles, without radically changing their use typologies, while opening the way to new propulsion modes for the longer term. It is nevertheless a complex subject requiring a multidisciplinary approach. This book, which is intended to be exhaustive, considers the vehicle, its components, their association and their control, as well as the global balances determined over the vehicle lifetime. It starts with a general presentation of the various conditions of use of vehicles, to give readers an understanding of the stakes related to the development of hybrid vehicles and the methods used to compare the performance of the various solutions. The principles and the various types of internal combustion engine and electrical drives, onboard energy storage systems, principles, architectures, specific components and operation of hybrid drivetrains, as well as the energy management in these vehicles, are developed. A global analysis of the various drivetrains life cycle assessment (LCA), total costs and availability of sensitive materials is also provided. This book is intended for everyone involved in the design, manufacture and implementation of hybrid drive vehicles and their components. It will also be of interest to students, teachers and researchers wishing to acquire or further their knowledge in all fields impacted by drivetrain electrification. More globally, after consulting this book, readers will be in a position to evaluate the technologies related to the concept of drivetrain hybridization, their implementation, balances and generalization conditions. This book is available in French Under the title "Véhicules hybrides". Contents : 1. Vehicle use. 2. Internal combustion engines. 3. Electric drivetrain. 4. On-board energy storage systems. 5. Hybridization. 6. Control of hybrid vehicles. 7. Comparative study of hybrid vehicles: greenhouse gas emissions, energy consumption, and cost. Appendixes.

Grid Integration of Electric Vehicles in Open Electricity Markets John Wiley & Sons

This book is a printed edition of the Special Issue "Control of Energy Storage" that was published in Energies. This book captures selected peer reviewed papers presented at the 5th International Conference on Sustainable Automotive Technologies, ICSAT 2013, held in Ingolstadt, Germany. ICSAT is the state-of-the-art conference in the field of new technologies for transportation. The book brings together the work of international researchers and practitioners under the following interrelated headings: fuel transportation and storage, material recycling, manufacturing and management costs, engines and emission reduction. The book provides a very good overview of research and development activities focused on new technologies and approaches capable of meeting the challenges to sustainable mobility.

The Urban Data Management Society has organised international symposia at various locations throughout Europe since 1971, and UDMS 2013 marks its second visit to London. From its outset, UDMS has highlighted changes and trends in urban data and urban data management. However, the rate of emergence of new data and new technologies has never been as rapid as it is now. Trends including smart cities, smart phones, social media, 3D modelling, volunteered geographic information, building information modelling and the internet of things all generate information about the urban environment and the people who live there. Additionally the volume of data generated in part through such techniques has in turn resulted in research into 'big data' – how best to handle the data, analyse it, visualise it in different contexts. Thus the challenges and opportunities facing those working with these new types of urban data are manifold. Given this, the general theme for UDMS 2013 was "Recent and Emerging Trends in the Management of New Urban Data." This book contains 20 papers selected from the long papers that were submitted for UDMS 2013. Each paper was reviewed by three independent academic reviewers from around the world, both for academic quality and for clarity in communication. The book is intended to be suitable for different readers – from city planners and architects to academics, students and policy makers and those involved in urban planning.

Since 1991, the National Research Council, under the auspices of the Board on Science, Technology, and Economic Policy, has undertaken a program of activities to improve policymakers' understandings of the interconnections of science, technology, and economic policy and their importance for the American economy and its international competitive position. The Board's activities have corresponded with increased policy recognition of the importance of knowledge and technology to economic growth. The goal of the this symposium was to conduct two public symposia to review and analyze the potential contributions of public-private partnerships and identify other relevant issues for the Department of Energy, Office of Vehicle Technologies, Energy Storage Team's activities in the energy storage research and development area. The symposia will also identify lessons from these and other domestic and international experiences to help inform DoE as to whether its activities are complete and appropriately focused. Additional topics that emerge in the course of the planning may also be addressed. Building the U.S. Battery Industry for Electric Drive Vehicles: Summary of a Symposium gathers representatives from leading battery manufacturers, automotive firms, university researchers, academic and industry analysts, congressional staff, and federal agency representatives. An individually-authored summary of each symposium will be issued. The symposium was held in Michigan in order to provide direct access to the policymakers and industrial participants drawn from the concentration of battery manufacturers and automotive firms in the region. The symposium reviewed the current state, needs, and challenges of the U.S. advanced battery manufacturing industry; challenges and opportunities in battery R&D, commercialization, and deployment; collaborations between the automotive industry and battery industry; workforce issues, and supply chain development. It also focused on the impact of DoE's investments and the role of state and federal programs in support of

this growing industry. This task of this report is to summarize the presentations and discussions that took place at this symposium. Needless to say, the battery industry has evolved very substantially since the conference was held, and indeed some of the caveats raised by the speakers with regard to overall demand for batteries and the prospects of multiple producers now seem prescient. At the same time, it is important to understand that it is unrealistic to expect that all recipients of local, state, or federal support in a complex and rapidly evolving industry will necessarily succeed. A number of the firms discussed here have been absorbed by competitors, others have gone out of business, and others continue to progress.

This book presents ongoing research activities of currently available renewable energy technologies and the approaches towards clean technology for enabling a socio-economic model for the present and future generations to live in a clean and healthy environment. The book provides chapter wise implementation of research works in the area of green energy technologies with proper methods used with solution strategies and energy efficiency approaches by combining theory and practical applications. Readers are introduced to practical problems of green computation and hybrid resources optimization with solution based approaches from the current research outcomes. The book will be of use to researchers, professionals, and policy-makers alike.

This authoritative new resource provides a comprehensive introduction to plug-in electric vehicles (PEVs), including critical discussions on energy storage and converter technology. The architecture and models for sustainable charging infrastructures and capacity planning of small scale fast charging stations are presented. This book considers PEVs as mobile storage units and explains how PEVS can provide services to the grid. Enabling technologies are explored, including energy storage, converter, and charger technologies for home and park charging. The adoption of EV is discussed and examples are given from the individual battery level to the city level. This book provides guidance on how to build and design sustainable transportation systems. Optimal arrival rates, optimal service rates, facility location problems, load balancing, and demand forecasts are covered in this book. Time-saving MATLAB code and background tables are included in this resource to help engineers with their projects in the field.

The world is facing a transition towards a more secure and sustainable future. The energy sector is leading this transition, pushed by the growth of renewable energies, the development of storage technologies and the spread of electric vehicles. However, the integration of these elements in the current power system is quite challenging and requires experts to design new and innovative solutions. In particular, the concepts of smart grids and flexibility are becoming popular and are seen as the possible solution to face this issue. Many projects worldwide are focusing on these topics and one of them is the INVADE, financed by the EU within the Horizon 2020 program. This project is the framework under which the work for this master thesis has been completed. More specifically, the aim of this document is to develop emulators for 3 flexibility devices, a photovoltaic (PV) system, an electric vehicle (EV) charging station and a residential electric water heater (EWH). Together with a battery, these emulators are going to be used to set up a microgrid laboratory test and analyze a use case within the INVADE project. The emulators can simulate the behaviour of real devices and have been coded using C++ language. The set up of the microgrid laboratory test requires the completion of several steps, this master thesis attempts to complete the initial ones. The thesis is structured as follow. Section 1 includes an introduction about the current electric power system and the trends for the future. Section 2 contains a description of the laboratory test and its main objectives. Section 3, 4, 5 focus on the description and functioning of the PV system emulator, the EV charging station emulator and the EWH emulator, respectively. In each of these 3 sections a first part is dedicated to explain the technology and the state of the art, while the second part is focusing on the actual emulator, how it works and the logic behind the code. The complete codes can be found in the Appendix at the end of this document. Finally, Section 6 sums up the work done and outline the future steps needed in order to set up and start the test.

This book focuses on different sustainable products and services, such as electrical vehicles, green buildings, and biophilic and biomimetic systems, at multiple hierarchical levels within its chapters. The authors reflect on individual, organisational, governmental, political, and moral considerations of how Human Factor Ergonomics can build a sustainable future. This book is a must-read for anyone concerned with environmental issues and sustainability.

Electric Vehicle Integration into Modern Power Networks provides coverage of the challenges and opportunities posed by the progressive integration of electric drive vehicles. Starting with a thorough overview of the current electric vehicle and battery state-of-the-art, this work describes dynamic software tools to assess the impacts resulting from the electric vehicles deployment on the steady state and dynamic operation of electricity grids, identifies strategies to mitigate them and the possibility to support simultaneously large-scale integration of renewable energy sources. New business models and control management architectures, as well as the communication infrastructure required to integrate electric vehicles as active demand are presented. Finally, regulatory issues of integrating electric vehicles into modern power systems are addressed. Inspired by two courses held under the EES-UETP umbrella in 2010 and 2011, this contributed volume consists of nine chapters written by leading researchers and professionals from the industry as well as academia.

This book addresses various aspects of electric mobility deployment in public transport. These include transport policy-related issues as well as technical, organizational and technical dimensions of the fleet conversion process (from conventional one towards the increased share of electric vehicles in public transport). In the book, one may find, e.g. the determinants for the successful functioning of electrified transport systems (including charging facilities), models and methods for battery electric bus energy consumption, the analysis regarding the charging strategies (including power-grid) as well as electric vehicle battery issues. As the process of fleet conversion is multi-faceted, the book also contains the issues related to cybersecurity in public transport, autonomous vehicles and hyperloop. The book is dedicated to transport professionals, consulting companies and researchers in the field of electromobility and modern transport systems.

Electric Vehicles for Smart Cities: Trends, Challenges, and Opportunities uniquely examines different approaches to electric vehicle deployment in the context of smart cities. It provides a holistic picture of electromobility within urban areas, offering an integrated approach to city transportation systems by considering the energy systems, latest vehicle technologies, and transport infrastructure. Electric Vehicles for Smart Cities addresses the interaction between grid infrastructure, vehicles, costs and benefits, and operational reliability within an integrated framework. The book examines the role electric vehicles play in the social and

political aspects of climate change mitigation, as well as a renewable energy-based economy. It explains how electric vehicles and their system requirements work, including recharging techniques and infrastructures, and discusses alternative market deployment approaches. Includes case studies from cities around the world, including Amsterdam, London, Oslo, Barcelona, Los Angeles, New York, Silicon Valley, Los Angeles, Beijing, Shanghai, Tianjin, Tokyo, and Goto Islands Traces the developments, innovations, advantages, and disadvantages in the electric car industry Provides learning aids such as discussion questions and text boxes

Master's Thesis from the year 2019 in the subject Business economics - Business Management, Corporate Governance, grade: 1,3, Niederrhein University of Applied Sciences Krefeld (School of Business and Economics), language: English, abstract: Today's world of mobility is characterised by a high degree of dynamism and change is becoming apparent. Currently, around 45 million passenger cars with conventional combustion engines, powered by diesel or petrol, are registered in Germany. The share of electric vehicles is still well below one per cent. Nevertheless, the voices for sustainable and environmentally friendly transport are becoming louder. One political measure in this respect is the implementation of driving bans in major German cities for some conventional combustion cars. Car electrification is a solution for converting cars with conventional combustion engines to electric drives. In the context of this thesis, car electrification is regarded as a transition solution towards a nationwide electrified transport network of new electric cars. A comprehensive concept of a business model approach from a start-up perspective has been developed based on the analysis of the environment, industry, and customer needs. Analysing the structure of the electrical conversion industry revealed that the subject of car electrification is hardly widespread and that current suppliers have only converted a smaller number of cars. Besides the small scale of implementation, the operational execution by existing suppliers can be considered weak in terms of competitiveness and sustainability. The analysis of the needs of potential customers of car electrification using qualitative and quantitative methods has led to incredibly valuable insights for the development of the business model approach. A high openness to purchase was expressed, considering some of the factors mentioned, such as a test drive with an electrified car before purchase and a durability guarantee of the conversion. The high relevance of initial acquisition costs compared to operating expenses in the purchase decision for passenger cars is another precious insight. The business model approach developed based on the findings obtained differs fundamentally from the strategies of today's providers. By incorporating the existing infrastructure of workshops and service points, proximity to the end customer and scalability of the business operation can be achieved. Partnering with universities and industry are two critical elements in the development of a sustainable, secure, and user-friendly technical solution.

Hybridization is an increasingly popular paradigm in the auto industry, but one that is not fully understood by car manufacturers. In general, hybrid electric vehicles (HEV) are designed without regard to the mechanics of the power train, which is developed similarly to its counterparts in internal combustion engines. Hybrid Electric Power Train Engineering and Technology: Modeling, Control, and Simulation provides readers with an academic investigation into HEV power train design using mathematical modeling and simulation of various hybrid electric motors and control systems. This book explores the construction of the most energy efficient power trains, which is of importance to designers, manufacturers, and students of mechanical engineering. This book is part of the Research Essentials collection.

The Power of Design offers an introduction and a practical guide to product innovation, integrating the key topics that 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

Achieving the goal of green and environmentally friendly energy systems is not possible without the concept of energy storage. Such storage should charge when renewable generation, e.g., photovoltaics and wind farms, is abundant and discharge during periods of its scarcity. Although pumped hydropower plants have been widely used as extremely large capacity energy storage, the recent technological developments in lithium-based batteries have made them economically feasible. The major advantages of batteries over a conventional energy storage system, i.e., hydropower, include its modularity and ease of integration with the transport system. This Special Issue is thus focused on both stationary batteries and mobile batteries in electric vehicles. Both should be used to provide flexibility and balancing services to power systems. While stationary batteries are focused solely on the power system, the batteries within electric vehicles need to primarily fulfill the task of providing energy for transportation. This is why their use in power systems is secondary. However, due to generally long parking periods, they can become a detrimental asset in terms of balancing the power system.

The three-volume set CCIS 761, CCIS 762, and CCIS 763 constitutes the thoroughly refereed proceedings of the International Conference on Life System Modeling and Simulation, LSMS 2017, and of the International Conference on Intelligent Computing for Sustainable Energy and Environment, ICSEE 2017, held in Nanjing, China, in September 2017. The 208 revised full papers presented were carefully reviewed and selected from over 625 submissions. The papers of this volume are organized in topical sections on: Biomedical Signal Processing; Computational Methods in Organism Modeling; Medical Apparatus and Clinical Applications; Bionics Control Methods, Algorithms and Apparatus; Modeling and Simulation of Life Systems; Data Driven Analysis; Image and Video Processing; Advanced Fuzzy and Neural Network Theory and Algorithms; Advanced Evolutionary Methods and Applications; Advanced Machine Learning Methods and Applications; Intelligent Modeling, Monitoring, and Control of Complex Nonlinear Systems; Advanced Methods for Networked Systems; Control and Analysis of Transportation Systems; Advanced Sliding Mode Control and Applications; Advanced Analysis of New Materials and Devices; Computational Intelligence in Utilization of Clean and Renewable Energy Resources; Intelligent Methods for Energy Saving and Pollution Reduction; Intelligent Methods in Developing Electric Vehicles, Engines and Equipment; Intelligent Computing and Control in Power Systems;

Modeling, Simulation and Control in Smart Grid and Microgrid; Optimization Methods; Computational Methods for Sustainable Environment. Transportation systems play a major role in the reduction of energy consumptions and environmental impact all over the world. The significant amount of energy of transport systems forces the adoption of new solutions to ensure their performance with energy-saving and reduced environmental impact. In this context, technologies and materials, devices and systems, design methods, and management techniques, related to the electrical power systems for transportation are continuously improving thanks to research activities. The main common challenge in all the applications concerns the adoption of innovative solutions that can improve existing transportation systems in terms of efficiency and sustainability.

Smart Energy Grid Engineering provides in-depth detail on the various important engineering challenges of smart energy grid design and operation by focusing on advanced methods and practices for designing different components and their integration within the grid. Governments around the world are investing heavily in smart energy grids to ensure optimum energy use and supply, enable better planning for outage responses and recovery, and facilitate the integration of heterogeneous technologies such as renewable energy systems, electrical vehicle networks, and smart homes around the grid. By looking at case studies and best practices that illustrate how to implement smart energy grid infrastructures and analyze the technical details involved in tackling emerging challenges, this valuable reference considers the important engineering aspects of design and implementation, energy generation, utilization and energy conservation, intelligent control and monitoring data analysis security, and asset integrity. Includes detailed support to integrate systems for smart grid infrastructures Features global case studies outlining design components and their integration within the grid Provides examples and best practices from industry that will assist in the migration to smart grids

This book gathers the proceedings of the 15th IFToMM World Congress, which was held in Krakow, Poland, from June 30 to July 4, 2019. Having been organized every four years since 1965, the Congress represents the world's largest scientific event on mechanism and machine science (MMS). The contributions cover an extremely diverse range of topics, including biomechanical engineering, computational kinematics, design methodologies, dynamics of machinery, multibody dynamics, gearing and transmissions, history of MMS, linkage and mechanical controls, robotics and mechatronics, micro-mechanisms, reliability of machines and mechanisms, rotor dynamics, standardization of terminology, sustainable energy systems, transportation machinery, tribology and vibration. Selected by means of a rigorous international peer-review process, they highlight numerous exciting advances and ideas that will spur novel research directions and foster new multidisciplinary collaborations.

"...[a] very unique book that integrates benefits of modular systems for enhanced sustainability to meet the global challenges of rapid and sometimes uncontrolled industrialization in the 21st century."—Pinakin Patel, T2M Global This book examines the role of the modular approach for the back end of the energy industry—energy usage management. It outlines the use of modular approaches for the processes used to improve energy conservation and efficiency, which are preludes to the prudent use of energy. Since energy consumption is conventionally broken down into four sectors—residential, transportation, industrial, and commercial—the discussions on energy usage management are also broken down into these four sectors in the book. The book examines the use of modular systems for five application areas that cover the sectors described above: buildings, vehicles, computers and electrical/electronic products, district heating, and wastewater treatment and desalination. This book also discusses the use of a modular approach for energy storage and transportation. Finally, it describes how the modular approach facilitates bottom-up, top-down, and hybrid simulation and modeling of the energy systems from various scientific and socioeconomic perspectives. Aimed at industry professionals and researchers involved in the energy industry, this book illustrates in detail, with the help of concrete industrial examples, how a modular approach can facilitate management of energy usage. Businesses must create initiatives and adopt eco-friendly practices in order to adhere to the sustainability goals of a globalized world. Recycling, product service systems, and green manufacturing are just a few methods businesses use within a sustainable supply chain. However, these tools and techniques must also ensure business growth in order to remain relevant in an environmentally-conscious world. The Handbook of Research on Interdisciplinary Approaches to Decision Making for Sustainable Supply Chains provides interdisciplinary approaches to sustainable supply chain management through the optimization of system performance and development of new policies, design networks, and effective reverse logistics practices. Featuring research on topics such as industrial symbiosis, green collaboration, and clean transportation, this book is ideally designed for policymakers, business executives, warehouse managers, operations managers, suppliers, industry professionals, sustainability developers, decision makers, students, academicians, practitioners, and researchers seeking current research on reducing the environmental impacts of businesses via sustainable supply chain planning.

Thermal Management of Electric Vehicle Battery Systems provides a thorough examination of various conventional and cutting edge electric vehicle (EV) battery thermal management systems (including phase change material) that are currently used in the industry as well as being proposed for future EV batteries. It covers how to select the right thermal management design, configuration and parameters for the users' battery chemistry, applications and operating conditions, and provides guidance on the setup, instrumentation and operation of their thermal management systems (TMS) in the most efficient and effective manner. This book provides the reader with the necessary information to develop a capable battery TMS that can keep the cells operating within the ideal operating temperature ranges and uniformities, while minimizing the associated energy consumption, cost and environmental impact. The procedures used are explained step-by-step, and generic and widely used parameters are utilized as much as possible to enable the reader to incorporate the conducted analyses to the systems they are working on. Also included are comprehensive thermodynamic modelling and analyses of TMSs as well as databanks of component costs and environmental impacts, which can be useful for providing new ideas on improving vehicle designs. Key features: Discusses traditional and cutting edge technologies as well as research directions Covers thermal management systems and their selection for different vehicles and applications Includes case studies and practical examples from the industry Covers thermodynamic analyses and assessment methods, including those based on energy and exergy, as well as exergoeconomic, exergoenvironmental and enviroeconomic techniques Accompanied by a website hosting codes, models, and economic and environmental databases as well as various related information Thermal Management of Electric Vehicle Battery Systems is a unique book on electric vehicle thermal management systems for researchers and practitioners in industry, and is also a suitable textbook for senior-level undergraduate and graduate courses.

The MATSim (Multi-Agent Transport Simulation) software project was started around 2006 with the goal of generating traffic and congestion patterns by following individual synthetic travelers through their daily or weekly activity programme. It has since then evolved from a collection of stand-alone C++ programs to an integrated Java-based framework which is publicly hosted, open-source available, automatically regression tested. It is currently used by about 40 groups throughout the world. This book takes stock of the current status. The first part of the book gives an introduction to the most important concepts, with the intention of enabling a potential user to set up and run basic simulations. The second part of the book describes how the basic functionality can be extended, for example by adding schedule-based public transit, electric or autonomous cars, paratransit, or within-day replanning. For each extension, the text provides pointers to the additional documentation and to the code base. It is also discussed how people with appropriate Java programming skills can write their own extensions, and plug them into the MATSim core. The project has started from the basic idea that traffic is a consequence of human behavior, and thus humans and their behavior should be the starting point of all modelling, and with the intuition that when simulations with 100 million particles are possible in computational physics, then behavior-oriented simulations with 10 million travelers should be possible in travel behavior research. The initial implementations thus combined concepts from computational physics and complex adaptive systems with

concepts from travel behavior research. The third part of the book looks at theoretical concepts that are able to describe important aspects of the simulation system; for example, under certain conditions the code becomes a Monte Carlo engine sampling from a discrete choice model. Another important aspect is the interpretation of the MATSim score as utility in the microeconomic sense, opening up a connection to benefit cost analysis. Finally, the book collects use cases as they have been undertaken with MATSim. All current users of MATSim were invited to submit their work, and many followed with sometimes crisp and short and sometimes longer contributions, always with pointers to additional references. We hope that the book will become an invitation to explore, to build and to extend agent-based modeling of travel behavior from the stable and well tested core of MATSim documented here.

This book includes selected, high-quality papers presented at the International Conference on Intelligent Manufacturing and Energy Sustainability (ICIMES 2019) held at the Department of Mechanical Engineering, Malla Reddy College of Engineering & Technology (MRCET), Maisammaguda, Hyderabad, India, from 21 to 22 June 2019. It covers topics in the areas of automation, manufacturing technology and energy sustainability.

Dominik Pelzer presents a framework for investigating and optimizing the profitability of energy storage systems. The author deploys the methodology to assess the benefits of electric vehicle smart charging and to investigate the financial viability of arbitrage using battery energy storage systems. He evaluates the factors influencing profitability and identifies conditions for profitable operation. Due to the framework's modular design, these considerations can be extended to a large variety of storage technologies and scenarios to identify optimal operating parameters.

This volume presents the proceedings of the 9th Cold Climate HVAC conference, which was held in Kiruna, Sweden in 2018. The conference highlighted key technologies and processes that allow scientists, designers, engineers, manufacturers and other decision makers in cold climate regions to achieve good indoor environmental quality (IEQ) with a minimum use of energy and other resources. The conference addressed various technical, economic and social aspects of buildings and HVAC systems in new and renovated buildings. This proceedings volume gathers peer-reviewed papers by a diverse and international range of authors and showcases perspectives and practices in cold climate building design from around the globe. The following major aspects, which include both fundamental and theoretical research as well as applications and case studies, are covered: (1) Energy and power efficiency and low-energy buildings; (2) Renovating buildings; (3) Efficient HVAC components; (4) Heat pumps and geothermal systems; (5) Municipal and city energy systems; (6) Construction management; (7) Buildings in operation; (8) Building simulation; (9) Reference data; (10) Transdisciplinary connections and social aspects; (11) Indoor environments and health; (12) Moisture safety and water damage; (13) Codes, regulations, standards and policies; and (14) Other aspects of buildings in cold climates.

A guide to a multi-disciplinary approach that includes perspectives from noted experts in the energy and utilities fields *Advances in Energy Systems* offers a stellar collection of articles selected from the acclaimed journal *Wiley Interdisciplinary Review: Energy and Environment*. The journal covers all aspects of energy policy, science and technology, environmental and climate change. The book covers a wide range of relevant issues related to the systemic changes for large-scale integration of renewable energy as part of the on-going energy transition. The book addresses smart energy systems technologies, flexibility measures, recent changes in the marketplace and current policies. With contributions from a list of internationally renowned experts, the book deals with the hot topic of systems integration for future energy systems and energy transition. This important resource: Contains contributions from noted experts in the field Covers a broad range of topics on the topic of renewable energy Explores the technical impacts of high shares of wind and solar power Offers a review of international smart-grid policies Includes information on wireless power transmission Presents an authoritative view of micro-grids Contains a wealth of other relevant topics Written for energy planners, energy market professionals and technology developers, *Advances in Energy Systems* is an essential guide with contributions from an international panel of experts that addresses the most recent smart energy technologies.

This book details the design and technology of the on-line electric vehicle (OLEV) system and its enabling wireless power-transfer technology, the "shaped magnetic field in resonance" (SMFIR). The text shows how OLEV systems can achieve their three linked important goals: reduction of CO₂ produced by ground transportation; improved energy efficiency of ground transportation; and contribution to the amelioration or prevention of climate change and global warming. SMFIR provides power to the OLEV by wireless transmission from underground cables using an alternating magnetic field and the reader learns how this is done. This cable network will in future be part of any local smart grid for energy supply and use thereby exploiting local and renewable energy generation to further its aims. In addition to the technical details involved with design and realization of a fleet of vehicles combined with extensive subsurface charging infrastructure, practical issues such as those involved with pedestrian safety are considered. Furthermore, the benefits of reductions in harmful emissions without recourse to large banks of batteries are made apparent. Importantly, the use of Professor Suh's axiomatic design paradigm enables such a complicated transportation system to be developed at reasonable cost and delivered on time. The book covers both the detailed design and the relevant systems-engineering knowledge and draws on experience gained in the successful implementation of OLEV systems in four Korean cities. The introduction to axiomatic design and the in-depth discussion of system and technology development provided by *The On-line Electric Vehicle* is instructive to graduate students in electrical, mechanical and transportation engineering and will help engineers and designers to master the efficient, timely and to-cost implementation of large-scale networked systems. Managers responsible for the running of large transportation infrastructure projects and concerned with technology management more generally will also find much to interest them in this book.

Current developments in the renewable energy field, and the trend toward self-production and self-consumption of energy, has led to increased interest in the means of storing electrical energy; a key element of sustainable development. This book provides an in-depth view of the environmentally responsible energy solutions currently available for use in the building sector. It highlights the importance of storing electrical energy, demonstrates the many services that the storage of electrical energy can bring, and discusses the important socio-economic factors related to the emergence of smart buildings and smart grids. Finally, it presents the methodological tools needed to build a system of storage-based energy management, illustrated by concrete, pedagogic examples.

With an increasing world population and a steadily rising share of people living in urban areas, traffic density is on the rise, and has become a major issue of urban agglomerations all over the world. These trends are accompanied by the process of the motorization of the individual - with negative effects on both, the society and the individual. While millions of people get injured and die in traffic accidents each year, congestion causes mental stress and economic inefficiencies. Different solutions seek to tackle the problem like strengthening of public transport or encouraging residents to walk or make use of bicycles. However, they have yet failed to combine, for example, individual mobility needs and infrastructural conditions. In order to contribute to the debate of possible solutions, this study investigates the combination of two emerging concepts, carsharing and driverless vehicles. Germany was chosen as the basis of this study for its strong position in the car industry.

This book outlines issues related to massive integration of electric and plug-in hybrid electric vehicles into power grids. Electricity is becoming the preferred energy vector for the next new generation of road vehicles. It is widely acknowledged that road vehicles based on full electric or hybrid drives can mitigate problems related to fossil fuel dependence. This book explains the emerging and understanding of storage systems for electric and plug-in hybrid vehicles. The recharging stations for these types of vehicles might represent a great advantage for the electric grid by facilitating integration of renewable and distributed energy production. This book presents a broad review from analyzing current

literature to on-going research projects about the new power technologies related to the various charging architectures for electric and plug-in hybrid vehicles. Specifically focusing on DC fast charging operations, as well as, grid-connected power converters and the full range of energy storage systems. These key components are analyzed for distributed generation and charging system integration into micro-grids. The authors demonstrate that these storage systems represent effective interfaces for the control and management of renewable and sustainable distributed energy resources. New standards and applications are emerging from micro-grid pilot projects around the world and case studies demonstrate the convenience and feasibility of distributed energy management. The material in this unique volume discusses potential avenues for further research toward achieving more reliable, more secure and cleaner energy.

This book reports on topics at the interface between manufacturing, mechanical and chemical engineering. It gives special emphasis to CAD/CAE systems, information management systems, advanced numerical simulation methods and computational modeling techniques, and their use in product design, industrial process optimization and in the study of the properties of solids, structures, and fluids. Control theory, ICT for engineering education as well as ecological design, and food technologies are also among the topics discussed in the book. Based on the 2nd International Conference on Design, Simulation, Manufacturing: The Innovation Exchange (DSMIE-2019), held on June 11-14, 2019, in Lutsk, Ukraine, the book provides academics and professionals with a timely overview and extensive information on trends and technologies behind current and future developments of Industry 4.0, innovative design and renewable energy generation.

Presenting the policy drivers, benefits and challenges for grid integration of electric vehicles (EVs) in the open electricity market environment, this book provides a comprehensive overview of existing electricity markets and demonstrates how EVs are integrated into these different markets and power systems. Unlike other texts, this book analyses EV integration in parallel with electricity market design, showing the interaction between EVs and differing electricity markets. Future regulating power market and distribution system operator (DSO) market design is covered, with up-to-date case studies and examples to help readers carry out similar projects across the world. With in-depth analysis, this book describes: the impact of EV charging and discharging on transmission and distribution networks market-driven EV congestion management techniques, for example the day-ahead tariff based congestion management scenario within electric distribution networks optimal EV charging management with the fleet operator concept and smart charging management EV battery technology, modelling and tests the use of EVs for balancing power fluctuations from renewable energy sources, looking at power system operation support, including frequency reserve, power regulation and voltage support An accessible technical book for power engineers and grid/distributed systems operators, this also serves as a reference text for researchers in the area of EVs and power systems. It provides distribution companies with the knowledge they need when facing the challenges introduced by large scale EV deployment, and demonstrates how transmission system operators (TSOs) can develop the existing system service market in order to fully utilize the potential of EV flexibility. With thorough coverage of the technologies for EV integration, this volume is informative for research professors and graduate students in power systems; it will also appeal to EV manufacturers, regulators, EV market professionals, energy providers and traders, mobility providers, EV charging station companies, and policy makers.

Electric Vehicle Integration in a Smart Microgrid Environment The growing demand for energy in today's world, especially in the Middle East and Southeast Asia, has been met with massive exploitation of fossil fuels, resulting in an increase in environmental pollutants. In order to mitigate the issues arising from conventional internal combustion engine-powered vehicles, there has been a considerable acceleration in the adoption of electric vehicles (EVs). Research has shown that the impact of fossil fuel use in transportation and surging demand in power owing to the growing EV charging infrastructure can potentially be minimized by smart microgrids. As EVs find wider acceptance with major advancements in high efficiency drivetrain and vehicle design, it has become clear that there is a need for a system-level understanding of energy storage and management in a microgrid environment. Practical issues, such as fleet management, coordinated operation, repurposing of batteries, and environmental impact of recycling and disposal, need to be carefully studied in the context of an ageing grid infrastructure. This book explores such a perspective with contributions from leading experts on planning, analysis, optimization, and management of electrified transportation and the transportation infrastructure. The primary purpose of this book is to capture state-of-the-art development in smart microgrid management with EV integration and their applications. It also aims to identify potential research directions and technologies that will facilitate insight generation in various domains, from smart homes to smart cities, and within industry, business, and consumer applications. We expect the book to serve as a reference for a larger audience, including power system architects, practitioners, developers, new researchers, and graduate-level students, especially for emerging clean energy and transportation electrification sectors in the Middle East and Southeast Asia.

The creation of a flexible, efficient, digitized, dependable and resilient power grid may well be the best route to increasing energy efficiency & security, as well as boosting the potential of renewable & distributed power sources. However, there is still much confusion about the nature of the Smart Grid: What is it? What work needs to be accomplished in order to make it a reality? How will it benefit the drive to diversify energy resources? This book covers Smart Grids from A-Z, providing a complete treatment of the topic, covering both policy and technology, explaining the most recent innovations supporting its development, and clarifying how the Smart Grid can support the integration of Renewable Energy resources. Among the most important topics included are smart metering, renewable energy storage, plug-in hybrids, flexible demand response, strategies for offsetting intermittency issues, micro-grids for off-grid communities, and specific in-depth coverage of wind and solar power integration. The content draws lessons from an international panel of contributors, whose diverse experiences implementing smart grids will help to provide templates for success. If we intend to undertake a meaningful overhaul of the way the world uses energy resources, we ignore grid management issues at our peril. Ultimately, this important book examines what the integration challenges are, what technology and policy needs to be in place in order to support uptake, and what The Smart Grid can do to enable solutions. Provides critical information on the technological, design and policy issues that must be taken into account to ensure that the smart grid is implemented successfully Demonstrates how smart grids can help utilities adhere to increased renewable portfolio standards Provides examples of successful microgrid/smart metering projects from around the world that can act as templates for developers, operators and investors embarking upon similar projects.

In this book, theoretical basis and design guidelines for electric vehicles have been emphasized chapter by chapter with valuable contribution of many researchers who work on both technical and regulatory sides of the field. Multidisciplinary research results from electrical engineering, chemical engineering and mechanical engineering were examined and merged together to make this book a guide for industry, academia and policy maker.

The papers presented in this volume address diverse challenges in energy systems, ranging from operational to investment planning problems, from market economics to technical and environmental considerations, from distribution grids to transmission grids and from theoretical considerations to data provision concerns and applied case studies. The International Symposium on Energy System Optimization (ISESO) was held on November 9th and 10th 2015 at the Heidelberg Institute for Theoretical Studies (HITS) and was organized by HITS, Heidelberg University and Karlsruhe Institute of Technology.

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