P2 Hybrid Electrification System Cost Reduction Potential

This research systematically compares various electrified vehicles based upon electrification levels and powertrain configurations. A series of novel hybrid electric powertrain systems based on the newly proposed Hybridized Automated Manual Transmission (HAMT) concept are introduced. One representative hybrid powertrain system is selected to illustrate their operation principle. The new HAMT-based hybrid powertrain system overcomes the bottleneck problem of mainstream power-split hybrid systems with relatively low torque capacity and the constraint for utility vehicle electrification, and presents advantages over other hybrid powertrain systems in efficiency and costs. In addition, the new hybrid powertrain system can deliver continuous output torque by filling torque hole during gearshift, through coordinated control of engine, motor, and transmission, improving the driveability of regular Automated Manual Transmission (AMT), whose applications have been hampered by torque hole over the past years. The proposed HAMT-based hybrid systems with improved torque capacity, efficiency, costs, and driveability come with a compact design and more flexible operation through the amount of gearwheels equivalent to a 5-speed AMT to achieve 8 variable gear ratios for the Hybrid Electric Vehicle (HEV) mode and Electric Vehicle (EV) mode operations of a Plug-in Hybrid Electric Vehicle (PHEV). Model-based optimization, dynamics analysis, and powertrain control strategies have been introduced for a PHEV with a representative 8-speed HAMT. Vehicle simulations have been made to study and verify the capability and advantages of the new electrified powertrain system. Firstly, the operation principles of various HAMTs are discussed through detailed power flows at each gear. The fundamental principles of typical HAMT variations are explained using a new power-flow triangle with three ports. Based on the concept of Torque Gap Filler (TGF), a set of HAMT system designs have been introduced and closely studied to provide continuous and stable output torque. The selected hybrid powertrain system equipped with a representative HAMT system supports both HEV mode and EV mode with eight variable gear ratios for each mode. Among the eight forward gear ratios, six are independent and two are dependent on the other gears. Combinations of dog clutches at all gears are designed to eliminate torque holes. Gear ratios and gearshift schedule of the 8-speed HAMT are designed to support the new design. Torque paths at each gear are illustrated and transient scenarios including gearshifts and mode transitions are investigated. The gear ratio of each gear is determined by considering the unique clutch combination of this HAMT, using the classical gear ratio design method - Progressive Ratio Steps. Due to the broader high efficiency operation region of electric motors, a model-based optimization method is used to determine the two gear ratios for the EV mode to achieve better fuel economy and avoid unnecessary gearshifts. Dynamic Programming (DP) is used to identify the optimal gear ratios, considering vehicle fuel economy for the EPA75 and Highway Fuel Economy Fuel Test (HWFET) driving cycles. The 4th and 6th gears among the eight gear ratios in the EV mode of PHEV are based on 2-speed gearbox design for an EV, and their gearshift schedules are determined by optimization. Combining the considerations for the hybrid and EV modes of a PHEV, key elements of the proposed HAMT system, including gearshift schedule, clutch combination, and gear ratios for highly efficient operation are determined. The more challenging driveability issues during mode transition from EV to HEV and power-on gearshift with TGF during acceleration are addressed. Both of these two operations require relatively high power/torque outputs and involve multiple powertrain components, including engine, motor, main clutch and gearbox, within a period of two seconds. A lumped-mass model (LMM) of the HAMT-based hybrid vehicle is built to analyze the driveline dynamics in two steady states and four transient states. Each of these states is analyzed independently, according to states of main clutch and gear selectors, considering different phases of the TGF operation and EV-HEV mode transition. The methods for modeling the discontinuity of clutch torque and dog clutch inside the HAMT are discussed to support the subsequent powertrain system modeling and control development. To identify the optimal control schemes for model transition and gearshift, the model-based optimization method for a post-transmission parallel PHEV is developed. The vehicle powertrain model was initially built using AUTONOMIE and MATLAB/Simulink with primary parameters from a prototype PHEV and its dSPACE ASM model developed at University of Victoria. System dynamics in EV mode and hybrid mode are described as a group of state-space equations, which are further discretized into matrix form to simplify the optimization search. A DP-based global optimization method is used to identify the optimal control inputs, including engine torque, motor torque, and main clutch torque. Four principles for desirable EV-HEV mode transitions are extracted based on the results of the optimization. To model different operation modes and complex power flows, the initial baseline powertrain system model is then replaced by a customized MATLAB/SimDriveline model. In this new physics-based powertrain model, gearshift actuators and controller are added to model the gearshift and mode transition processes. To achieve good driveability, the TGF feature of the HAMT design is split into five transient and two steady phases, each corresponding to a fundamental operating mode. Control logics of upshift and downshift, as well as EV-HEV mode transition are introduced. Four principles of mode transition derived from global optimization results are introduced for powertrain system control. Simulations of the HAMT-based hybrid powertrain operations have been carried out to verify the functionality and advantages of the proposed HAMT design in achieving excellent driveability during mode transition and gearshifts. Through controlled coordination of engine, motor and main clutch, EV-HEV mode transition can be achieved smoothly within a period of 2-3 seconds. Even slight driveline fluctuation can be eliminated by dedicated anti-shuffle control with the motors as actuators. The same simulation model also demonstrates excellent driveability during power-on gearshift. Comparing simulation results with and without TGF shows that this new hybrid powertrain system can effectively eliminate torque holes during gearshift. With the demonstrated advantages of this new system in efficiency, torque capacity, simplicity in design and manufacturing costs over its existing rivals, the research provides a promising alternative to mainstream power-split hybrid electric powertrain system design.

The electric generation systems on islands are based generally on fossil fuel. This fact and its supply make the

electricity cost higher than in systems used in the continent. In this thesis, as a first part, a review of the renewable energy generation systems on islands is elaborated. To do it, 77 islands from 45 different countries were analized. This analysis will allow to know how the implementation of renewable energy sources could help these islands in developing a renewable and sustainable energy sector, including a reduction of electricity generation cost. The de-carbonising in the electricity generation is necessary to reduce fossil fuel consumption, the pollution emitted and to meet the Energy Technology Perspectives 2oC Scenario (2DS) targets. Small islands are not exempt from this target, so this the emphasis of this thesis is placed on a 50-50 target: to reduce the fossil fuel consumption through electricity generation from Renewable Energy Sources (RES) to cover 50% of all electric demand by 2050 on small islands. This analysis will be based on three factors: economical, technical, and land-use possibilities of integrating Renewable Energy Technologies (RETs) into the existing electrical grid. As second part of the thesis, this work shows the results from a study case of the application of renewable energy technology in Cozumel Island, Mexico. This island is located in the Riviera Maya, in the Occidental Caribbean Sea. The analysis developed was made through long- term statistical models. A deterministic methodology was used to perform time-series simulations. As a first integration approaching, the simulations show that for the year 2050 a feasible integration of a system based on wind/PV can be achieved on the Island, reducing the electricity price from 0.37 US$/kWh to 0.24 US$/kWh (2050 in the Base Scenario). This result had a renewable penetration of 22.3% and does not considered a battery system or changes in the existing electric grid. With this scenario, the government will achieve its targets in renewable energy and in the reduction of the emissions of CO_2. This will allow reaching a sustainable electricity sector. In a second approach, and according to the results, all systems proposed are able to completely satisfy the renewable electricity needed by 2050 in all scenarios proposed. From the 12 system proposals that were compared, two systems, System 2 and System 7, were chosen as eligible systems to be installed. The Levelized Cost of Energy (LCOE) result for System 2 was 0.2401 US$/kWh and for System 7 was 0.2008 US$/kWh by 2050 in the Base Scenario. Meanwhile, the Internal Rate of Return (IRR) value fluctuated from 17.6% for System 2 to 31% for System 7, with a renewable fraction of penetration for System 2 of 56.1% and for System 7 of 56.9% by 2050 in the Base Scenario. The selection of the best system was made on the base of a Dimensional Statistical Variable (DSV) through primary and secondary category rankings. The presented proposal of three phases methodology determines the best systems for capturing the lower initial capital cost and the higher competitiveness of this new proposal compared with the current system of electricity generation on the Island, and can be applied on small islands as well. As third part of this thesis, the analysis presents an optimization of the energy planning, a grid assessment, and an economic analysis, considering three growing scenarios (Low, Base and High) in the electricity consumption, to supply the energy demand for a hybrid power system (Photovoltaics/Wind/Diesel/Battery) on a small island by 2050.

This book is a printed edition of the Special Issue "Forecasting Models of Electricity Prices" that was published in Energies

For a century, almost all light-duty vehicles (LDVs) have been powered by internal combustion engines operating on petroleum fuels. Energy security concerns about petroleum imports and the effect of greenhouse gas (GHG) emissions on global climate are driving interest in alternatives. Transitions to Alternative Vehicles and Fuels assesses the potential for reducing petroleum consumption and GHG emissions by 80 percent across the U.S. LDV fleet by 2050, relative to 2005. This report examines the current capability and estimated future performance and costs for each vehicle type and non-petroleum-based fuel technology as options that could significantly contribute to these goals. By analyzing scenarios that combine various fuel and vehicle pathways, the report also identifies barriers to implementation of these technologies and suggests policies to achieve the desired reductions. Several scenarios are promising, but strong, and effective policies such as research and development, subsidies, energy taxes, or regulations will be necessary to overcome barriers, such as cost and consumer choice.

Advances in Automation, Signal Processing, Instrumentation, and Control

Integration of Renewables in Power Systems by Multi-Energy System Interaction

Forecasting Models of Electricity Prices

Energy Systems, Power Electronics and Drives for Hybrid, Electric and Fuel Cell Vehicles

Wind Energy for the Next Millennium

Vol 2: Advanced Intelligent Systems Applied to Energy

Medium- and heavy-duty trucks, motor coaches, and transit buses - collectively, "medium- and heavy-duty vehicles", or MHDVs - are us sector of the economy. The fuel consumption and greenhouse gas emissions of MHDVs have become a focus of legislative and regulato past few years. This study is a follow-on to the National Research Council's 2010 report, Technologies and Approaches to Reducing the Consumption of Medium-and Heavy-Duty Vehicles. That report provided a series of findings and recommendations on the development o for reducing fuel consumption of MHDVs. On September 15, 2011, NHTSA and EPA finalized joint Phase I rules to establish a comprehens Duty National Program to reduce greenhouse gas emissions and fuel consumption for on-road medium- and heavy-duty vehicles. As NHT began working on a second round of standards, the National Academies issued another report, Reducing the Fuel Consumption and Gree Emissions of Medium- and Heavy-Duty Vehicles, Phase Two: First Report, providing recommendations for the Phase II standards. This th report focuses on a possible third phase of regulations to be promulgated by these agencies in the next decade.

Cost, Effectiveness, and Deployment of Fuel Economy Technologies for Light-Duty VehiclesNational Academies Press

This book focuses on the interaction between different energy vectors, that is, between electrical, thermal, gas, and transportation sys purpose of optimizing the planning and operation of future energy systems. More and more renewable energy is integrated into the ele and to optimize its usage and ensure that its full production can be hosted and utilized, the power system has to be controlled in a mo In order not to overload the electrical distribution grids, the new large loads have to be controlled using demand response, perchance t hierarchical control set-up where some controls are dependent on price signals from the spot and balancing markets. In addition, by pe real-time control and coordination based on local voltage or system frequency measurements, the grid hosting limits are not violated.

This expansive reference provides readers with the broadest available single-volume coverage of leading-edge advances in the developm optimization of clean energy technologies. From innovative biofuel feed stocks and processing techniques, to novel solar materials with efficiencies, remote-sensing for offshore wind turbines to breakthroughs in high performance PEM fuel cell electrode manufacturing, pi

materials in green buildings to bio sorption of pharmaceutical pollutants, the myriad exciting developments in green technology describe
will provide inspiration and information to researchers, engineers and students working in sustainability around the world.
Generation, Storage, and Grids
Final Report
Handbook Of Energy Finance: Theories, Practices And Simulations
Designing Complex Products with Systems Engineering Processes and Techniques
Reducing Fuel Consumption and Greenhouse Gas Emissions of Medium- and Heavy-Duty Vehicles, Phase Two
Planning the integration of the renewable energy sources on islands, under the National Electric System in Mexico

This book comprises select proceedings of the International Conference on Smart Technologies for Energy, Environment, and Sustainable Development (ICSTEESD 2018). The chapters are broadly divided into three focus areas, viz. energy, environment, and sustainable development, and discusses the relevance and applications of smart technologies in these fields. A wide variety of topics such as renewable energy, energy conservation and management, energy policy and planning, environmental management, marine environment, green building, smart cities, smart transportation are covered in this book. Researchers and professionals from varied engineering backgrounds contribute chapters with an aim to provide economically viable solutions to sustainable development challenges. The book will prove useful for academics, professionals, and policy makers interested in sustainable development.

In the past few years, interest in plug-in electric vehicles (PEVs) has grown. Advances in battery and other technologies, new federal standards for carbon-dioxide emissions and fuel economy, state zero-emission-vehicle requirements, and the current administration's goal of putting millions of alternative-fuel vehicles on the road have all highlighted PEVs as a transportation alternative. Consumers are also beginning to recognize the advantages of PEVs over conventional vehicles, such as lower operating costs, smoother operation, and better acceleration; the ability to fuel up at home; and zero tailpipe emissions when the vehicle operates solely on its battery. There are, however, barriers to PEV deployment, including the vehicle cost, the short all-electric driving range, the long battery charging time, uncertainties about battery life, the few choices of vehicle models, and the need for a charging infrastructure to support PEVs. What should industry do to improve the performance of PEVs and make them more attractive to consumers? At the request of Congress, Overcoming Barriers to Deployment of Plug-in Electric Vehicles identifies barriers to the introduction of electric vehicles and recommends ways to mitigate these barriers. This report examines the characteristics and capabilities of electric vehicle technologies, such as cost, performance, range, safety, and durability, and assesses how these factors might create barriers to widespread deployment. Overcoming Barriers to Deployment of Plug-in Electric Vehicles provides an overview of the current status of PEVs and makes recommendations to spur the industry and increase the attractiveness of this promising technology for consumers. Through consideration of consumer behaviors, tax incentives, business models, incentive programs, and infrastructure needs, this book studies the state of the industry and makes recommendations to further its development and acceptance.

Recent developments in reliability engineering has become the most challenging and demanding area of research. Modeling and Simulation, along with System Reliability Engineering has become a greater issue because of high-tech industrial processes, using more complex systems today. This book gives the latest research advances in the field of modeling and simulation, based on analysis in engineering sciences. Features Focuses on the latest research in modeling and simulation based analysis in reliability engineering. Covers performance evaluation of complex engineering systems Identifies and fills the gaps of knowledge pertaining to engineering applications Provides insights on an international and transnational scale Modeling and Simulation Based Analysis in Reliability Engineering aims at providing a reference for applications of mathematics in engineering, offering a theoretical sound background with adequate case studies, and will be of interest to researchers, practitioners, and academics.

As the electrical industry continues to develop, one sector that still faces a range of concerns is the electrical distribution system. Excessive industrialization and inadequate billing are just a few issues that have plagued this electrical sector as it advances into the smart grid environment. Research is necessary to explore the possible solutions in fixing these problems and developing the distribution sector into an active and smart system. The Handbook of Research on New Solutions and Technologies in Electrical Distribution Networks is a collection of innovative research on the methods and applications of solving major issues within the electrical distribution system. Some issues covered within the publication include distribution losses, improper monitoring of system, renewable energy integration with micro-grid and distributed energy sources, and smart home energy management system modelling. This book is ideally designed for power engineers, electrical engineers, energy professionals, developers, technologists, policymakers, researchers, academicians, industry professionals, and students seeking current research on improving this key sector of the electrical industry.

Design Fundamentals
Power Sources, Models, Sustainability, Infrastructure and the Market
Electrical Product Compliance and Safety Engineering, Volume 2

Advanced Intelligent Systems for Sustainable Development (AI2SD'2018)

Proceedings of the 7th International Conference and Exhibition on Smart Energy and Smart Mobility for Smart Cities

The 1999 European Wind Energy Conference and Exhibition was organized to review progress, and present and discuss the wind energy business, technology and science for the future. The Proceedings contain a selection of over 300 papers from the conference. They represent a significant update to the understanding of this increasingly important field of energy generation and cover a full range of topics.

This book provides a platform for scientists and engineers to comprehend the technologies of solar wind hybrid renewable energy systems and their applications. It describes the thermodynamic analysis of wind energy systems, and advanced monitoring, modeling, simulation, and control of wind turbines. Based on recent hybrid technologies considering wind and solar energy systems, this book also covers modeling, design, and optimization of wind solar energy systems in conjunction with grid-connected distribution energy management systems comprising wind photovoltaic (PV) models. In addition, solar thermochemical fuel generation topology and evaluation of PV wind hybrid energy for a small island are also included in this book. Since energy storage plays a vital role in renewable energy systems, another salient part of this book addresses the methodology for sizing hybrid battery-backed power generation systems in off-grid connected locations. Furthermore, the book proposes solutions for sustainable rural development via passive solar housing schemes, and the impacts of renewable energies in general, considering social, economic, and environmental factors. Because this book proposes solutions based on recent challenges in the area of hybrid renewable technologies, it is hoped that it will serve as a useful reference to readers who would like to be acquainted with new strategies of control and advanced technology regarding wind solar hybrid systems

This book gathers papers presented at the International Conference on Advanced Intelligent Systems for Sustainable Development (AI2SD-2018), which was held in Tangiers, Morocco on 12–14 July 2018. In addition to the latest research in the field of energy, it offers new solutions, tools and effective techniques, and provides essential information on smart grids, renewable and economical energy. Further, it addresses modeling, storage management and decision support in the field of energy, offering a valuable guide for researchers, professionals and all those who are interested in the development of advanced intelligent systems in the energy sector.

Electric and Hybrid Vehicles: Power Sources, Models, Sustainability, Infrastructure and the Market reviews the performance, cost, safety, and sustainability of battery systems for hybrid electric vehicles (HEVs) and electric vehicles (EVs), including nickel-metal hydride batteries and Li-ion batteries. Throughout this book, especially in the first chapters, alternative vehicles with different power trains are compared in terms of lifetime cost, fuel consumption, and environmental impact. The emissions of greenhouse gases are particularly dealt with. The improvement of the battery, or fuel cell, performance and governmental incentives will play a fundamental role in determining how far and how substantial alternative vehicles will penetrate into the market. An adequate recharging infrastructure is of paramount importance for the diffusion of vehicles powered by batteries and fuel cells, as it may contribute to overcome the so-called range anxiety."" Thus, proposed battery charging techniques are summarized and hydrogen refueling stations are described. The final chapter reviews the state of the art of the current models of hybrid and electric vehicles along with the powertrain solutions adopted by the major automakers. Contributions from the worlds leading industry and research experts Executive summaries of specific case studies Information on basic research and application approaches

Proceedings of the 11th International Symposium on Heating, Ventilation and Air Conditioning (ISHVAC 2019)

Smart Technologies for Energy, Environment and Sustainable Development

Simulation Approach Towards Energy Flexible Manufacturing Systems

Electrochemical Components

Alternative Powertrains and Extensions to the Conventional Powertrain

Select Proceedings of ICSTEESD 2018

Electricity Pricing: Regulated, Deregulated and Smart Grid Systems presents proven methods for supplying uninterrupted, high-quality electrical power at a reasonable price to the consumer. Illustrating the evolution of the power market from a monopoly to an open access system, this essential text: Covers voltage stability analysis of longitudinal power supply systems using an artificial neural network (ANN) Explains how to improve performance using flexible alternating current transmission systems (FACTS) and high-voltage direct current (HVDC) Takes into account operating constraints as well as generation cost, line overload, and congestion for expected and inadvertent loading stress Goes beyond FACTS and HVDC to provide multi-objective optimization algorithms for the deregulated power market Proposes the use of stochastic optimization techniques in the smart grid, preparing the reader for future development Electricity Pricing: Regulated, Deregulated and Smart Grid Systems offers practical solutions for improving stability, reliability, and efficiency in real-time systems while optimizing electricity cost.

The why, what and how of the electric vehicle powertrain Empowers engineering professionals and students with the knowledge and skills required to engineer electric vehicle powertrain architectures, energy storage systems, power electronics converters and electric drives. The modern electric powertrain is relatively new for the automotive industry, and engineers are challenged with designing affordable, efficient and high-performance electric powertrains as the industry undergoes a technological evolution. Co-authored by two electric vehicle (EV) engineers with decades of experience designing and putting into production all of the powertrain technologies presented, this book provides readers with the hands-on knowledge, skills and expertise they need to rise to that challenge. This four-part practical guide provides a comprehensive review of battery, hybrid and fuel cell EV systems and the associated energy sources, power electronics, machines, and drives. The first part of the book begins with a historical overview of electromobility and the related environmental impacts motivating the development of the electric powertrain. Vehicular requirements for electromechanical propulsion are then presented. Battery electric vehicles (BEV), fuel cell electric vehicles (FCEV), and conventional and hybrid electric vehicles (HEV) are then described, contrasted and compared for vehicle propulsion. The second part of the book features in-depth analysis of the electric powertrain traction machines, with a particular focus on the induction machine and the surface- and interior-permanent magnet ac machines. The brushed dc machine is also considered due to its ease of operation and understanding, and its historical place, especially as the traction

machine on NASA's Mars rovers. The third part of the book features the theory and applications for the propulsion, charging, accessory, and auxiliary power electronics converters. Chapters are presented on isolated and non-isolated dc-dc converters, traction inverters, and battery charging. The fourth part presents the introductory and applied electromagnetism required as a foundation throughout the book. • Introduces and holistically integrates the key EV powertrain technologies. • Provides a comprehensive overview of existing and emerging automotive solutions. • Provides experience-based expertise for vehicular and powertrain system and sub-system level study, design, and optimization. • Presents many examples of powertrain technologies from leading manufacturers. • Discusses the dc traction machines of the Mars rovers, the ultimate EVs from NASA. • Investigates the environmental motivating factors and impacts of electromobility. • Presents a structured university teaching stream from introductory undergraduate to postgraduate. • Includes real-world problems and assignments of use to design engineers, researchers, and students alike. • Features a companion website with numerous references, problems, solutions, and practical assignments. • Includes introductory material throughout the book for the general scientific reader. • Contains essential reading for government regulators and policy makers. Electric Powertrain: Energy Systems, Power Electronics and Drives for Hybrid, Electric and Fuel Cell Vehicles is an important professional resource for practitioners and researchers in the battery, hybrid, and fuel cell EV transportation industry. The book is a structured holistic textbook for the teaching of the fundamental theories and applications of energy sources, power electronics, and electric machines and drives to engineering undergraduate and postgraduate students. Textbook Structure and Suggested Teaching Curriculum This is primarily an engineering textbook covering the automotive powertrain, energy storage and energy conversion, power electronics, and electrical machines. A significant additional focus is placed on the engineering design, the energy for transportation, and the related environmental impacts. This textbook is an educational tool for practicing engineers and others, such as transportation policy planners and regulators. The modern automobile is used as the vehicle upon which to base the theory and applications, which makes the book a useful educational reference for our industry colleagues, from chemists to engineers. This material is also written to be of interest to the general reader, who may have little or no interest in the power electronics and machines. Introductory science, mathematics, and an inquiring mind suffice for some chapters. The general reader can read the introduction to each of the chapters and move to the next as soon as the material gets too advanced for him or her. Part I Vehicles and Energy Sources Chapter 1 Electromobility and the Environment Chapter 2 Vehicle Dynamics Chapter 3 Batteries Chapter 4 Fuel Cells Chapter 5 Conventional and Hybrid Powertrains Part II Electrical Machines Chapter 6 Introduction to Traction Machines Chapter 7 The Brushed DC Machine Chapter 8 Induction Machines Chapter 9 Surface-permanent-magnet AC Machines Chapter 10 Interior-permanent-magnet AC Machines Part III Power Electronics Chapter 11 DC-DC Converters Chapter 12 Isolated DC-DC Converters Chapter 13 Traction Drives and Three-phase Inverters Chapter 14 Battery Charging Chapter 15 Control of the Electric Drive Part IV Basics Chapter 16 Introduction to Electromagnetism, Ferromagnetism, and Electromechanical Energy Conversion The first third of the book (Chapters 1 to 6), plus parts of Chapters 14 and 16, can be taught to the general science or engineering student in the second or third year. It covers the introductory automotive material using basic concepts from mechanical, electrical, environmental, and electrochemical engineering. Chapter 14 on electrical charging and Chapter 16 on electromagnetism can also be used as a general introduction to electrical engineering. The basics of electromagnetism, ferromagnetism and electromechanical energy conversion (Chapter 16) and dc machines (Chapter 7) can be taught to second year (sophomore) engineering students who have completed introductory electrical circuits and physics. The third year (junior) students typically have covered ac circuit analysis, and so they can cover ac machines, such as the induction machine (Chapter 8) and the surface permanent-magnet ac machine (Chapter 9). As the students typically have studied control theory, they can investigate the control of the speed and torque loops of the motor drive (Chapter 15). Power electronics, featuring non-isolated buck and boost converters (Chapter 11), can also be introduced in the third year. The final-year (senior) students can then go on to cover the more advanced technologies of the interior-permanent-magnet ac machine (Chapter 10). Isolated power converters (Chapter 12), such as the full-bridge and resonant converters, inverters (Chapter 13), and power-factor-corrected battery chargers (Chapter 14), are covered in the power electronics section. This material can also be covered at the introductory postgraduate level. Various homework, simulation, and research exercises are presented throughout the textbook. The reader is encouraged to attempt these exercises as part of the learning experience. Instructors are encouraged to contact the author, John Hayes, direct to discuss course content or structure.

Hybrid Energy Systems: Strategy for Industrial Decarbonization demonstrates how hybrid energy and processes can decarbonize energy industry needs for power and heating and cooling. It describes the role of hybrid energy and processes in nine major industry sectors and discusses how hybrid energy can offer sustainable solutions in each. Introduces the basics and examples of hybrid energy systems Examines hybrid energy and processes in coal, oil and gas, nuclear, building, vehicle, manufacturing and industrial processes, computing and portable electronic, district heating and cooling, and water sectors Shows that hybrid processes can improve efficiency and that hybrid energy can effectively insert renewable fuels in the energy industry Serves as a companion text to the author's book Hybrid Power: Generation, Storage, and Grids Written for advanced students, researchers, and industry professionals involved in energy-related processes and plants, this book offers latest research and practical strategies for application of the innovative field of hybrid energy.

This book reports on new theories and applications in the field of intelligent systems and computing. It covers cutting-edge computational and artificial intelligence methods, advances in computer vision, big data, cloud computing, and computation linguistics, as well as cyber-physical and intelligent information management systems. The respective chapters are based on selected papers presented at the workshop on intelligent systems and computing, held during the International Conference on Computer Science and Information Technologies, CSIT 2020, which was jointly organized on September 23-26, 2020, by the Lviv Polytechnic National University, Ukraine, the Kharkiv National University of Radio Electronics, Ukraine, and the Technical University of Lodz, Poland, under patronage of Ministry of Education and Science of Ukraine. Given its breadth of coverage, the book provides academics and professionals with extensive information and a timely snapshot of the field of intelligent systems, and is sure to foster new discussions and collaborations among different groups.

Cost, Effectiveness, and Deployment of Fuel Economy Technologies for Light-Duty Vehicles

Novel Advancements in Electrical Power Planning and Performance

Design, Modeling and Optimization of Hybridized Automated Manual Transmission for Electrified Vehicles

CTI SYMPOSIUM 2019

Regulated, Deregulated and Smart Grid Systems

Proceedings of the 13th International Marine Design Conference (IMDC 2018), June 10-14, 2018, Helsinki, Finland

This book presents a state-of-the-art compilation focusing on both technological and policy aspects of sustainable energy production and consumption, which deals with issues like the need for and planning of smart cities, alternative transport fuel options, sustainable power production, pollution control technologies etc. The book comprises contributions from experts from all over the world, and addresses energy sustainability from different viewpoints. Specifically, the book focuses on energy sustainability in the Indian scenario with a background of the global perspective. Contributions from academia, policy makers and industry are included

to address the challenge from different perspectives. The contents of this book will prove useful to researchers, professionals, and policy makers working in the area of green and sustainable energy.

Every year, the international transmission and drive community meets up at the International CTI SYMPOSIA - automotive drivetrains, intelligent, electrified - in Germany, China and USA to discuss the best strategies and technologies for tomorrow's cars, busses and trucks. From efficiency, comfort or costs to electrification, energy storage and connectivity, these premier industry meetings cover all the key issues in depth.

Modeling the dynamics of energy markets has become a challenging task. The intensification of their financialization since 2004 had made them more complex but also more integrated with other tradable asset classes. More importantly, their large and frequent fluctuations in terms of both prices and volatility, particularly in the aftermath of the global financial crisis 2008-2009, posit difficulties for modeling and forecasting energy price behavior and are primary sources of concerns for macroeconomic stability and general economic performance.This handbook aims to advance the debate on the theories and practices of quantitative energy finance while shedding light on innovative results and technical methods applied to energy markets. Its primary focus is on the recent development and applications of mathematical and quantitative approaches for a better understanding of the stochastic processes that drive energy market movements. The handbook is designed for not only graduate students and researchers but also practitioners and policymakers.

This book is a collection of papers presented at the International Conference on Renewable Power (ICRP 2020), held during 13-14 July 2020 in Rajouri, Jammu, India. The book covers different topics of renewable energy sources in modern power systems. The book focusses on smart grid technologies and applications, renewable power systems including solar PV, solar thermal, wind, power generation, transmission and distribution, transportation electrification and automotive technologies, power electronics and applications in renewable power system, energy management and control system, energy storage in modern power system, active distribution network, artificial intelligence in renewable power systems, and cyber-physical systems and Internet of things in smart grid and renewable power.

Hybrid Power

18th International Congress and Expo 9 - 12 December 2019, Berlin, Germany

Scientific and Technical Aerospace Reports

Assessment of Costs and Benefits of Flexible and Alternative Fuel Use in the U.S. Transportation Sector

Advances in Intelligent Systems and Computing V

Proceedings of International Conference on Renewal Power (ICRP 2020)

This book looks at how to design complex products that have many components with intricate relationships and requirements. It also discusses how to manage processes involved in their lifecycle, from concept generation to disposal, with the objectives of increasing customer satisfaction, quality, safety, and usability and meeting program timings and budgets. Part I covers systems engineering concepts, issues, and bases in product design. Part II examines quality, human factors, and safety engineering approaches. Part III describes important tools and methods used in these fields, and Part IV includes other relevant integration topics, interesting applications of useful techniques, and observations from a few "landmark" product development case studies.

This book focuses on the methods of storage commonly used inhybrid systems. After an introductory chapter reviewing the basics ofelectrochemistry, Chapter 2 is given over to the storage ofelectricity in the form of hydrogen. Once hydrogen has been made,we have to be able to convert it back into electricity on demand.This can be done with another energy converter: a fuel cell, thesubject of Chapter 3. Such a system is unable to deliversignificant dynamics in terms of storage and release of electricityand needs to be supplemented with another solution: a detailedstudy of supercapacitors is provided in Chapter 4.While the storagesystems touched upon in the previous three chapters (hydrogenbatteries and supercapacitors) both exhibit advantageouscharacteristics, at present they are still relatively costly. Thus,the days of the electrochemical accumulator by no means appear tobe numbered just yet. This will therefore be the topic of Chapter5. Finally, on the basis of the elements laid down in the priviouschapters, Chapter 6 will focus on electrical hybridization of thesestorage systems, with a view to enhancing the performance (in termsof energy, lifetime, cost, etc.) of the newly formed system. Aimed at an audience of researchers, industrialists, academics,teachers and students, many exercises, along with correctedsolutions, are provided throughout the book. Contents 1. Basic Concepts of Electrochemistry used in ElectricalEngineering. 2. Water Electrolyzers. 3. Fuel Cells. 4. Electrical Energy Storage by Supercapacitors. 5. Electrochemical Accumulators. 6. Hybrid Electrical System. About the Authors Marie-Cécile Péra is a Full Professor at theUniversity of Franche-Comte in France and Deputy Director of theFEMTO-ST Institute (CNRS). Her research activities includemodeling, control and diagnosis of electric power generationsystems (fuel cells – PEMFC and SOFC, supercapacities,batteries) for transportation and stationary applications. She hascontributed to more than 180 articles in international journals andconferences. Daniel Hissel is Full Professor at the University of Franche-Comtein France and Director of the Fuel Cell Lab Research Federation(CNRS). He also leads a research team devoted to hybrid electricalsystems in the FEMTO-ST Institute (CNRS). He has published morethan 250 research papers on modeling, control, diagnostics andprognostics of hybrid electrical systems. Hamid Gualous is Full Professor at the University of Caen LowerNormandy in France and director of the LUSAC laboratory. Hiscurrent research interests include power electronics, electricenergy storage, power and energy systems and energymanagement. Christophe Turpin is Full Researcher at the CNRS (French NationalCenter for Scientific Research). He is responsible for hydrogenactivities within the Laboratory LAPLACE, Toulouse, France. Hisresearch activities include the characterization and modeling offuel cells and electrolyzers, the state of health of thesecomponents, and their hybridization with other electrochemicalcomponents (ultracapacitors, batteries) within optimized energysystems for stationary and aeronautical applications.

Optimal Design and Retrofit of Energy Efficient Buildings, Communities, and Urban Centers presents current techniques and technologies for energy efficiency in buildings. Cases introduce and demonstrate applications in both the design of new buildings and retrofit of existing structures. The book begins with an introduction that includes energy consumption statistics, building energy efficiency codes, and standards and labels from around the world. It then highlights the need for integrated and comprehensive energy analysis approaches. Subsequent sections present an overview of advanced energy efficiency technologies for buildings, including dynamic insulation materials, phase change materials,

LED lighting and daylight controls, Life Cycle Analysis, and more. This book provides researchers and professionals with a coherent set of tools and techniques for enhancing energy efficiency in new and existing buildings. The case studies presented help practitioners implement the techniques and technologies in their own projects. Introduces a holistic analysis approach to energy efficiency for buildings using the concept of energy productivity Provides coverage of individual buildings, communities and urban centers Includes both the design of new buildings and retrofitting of existing structures to improve energy efficiency Describes state-of-the-art energy efficiency technologies Presents several cases studies and examples that illustrate the analysis techniques and impact of energy efficiency technologies and controls

As the demand for efficient energy sources continues to grow, electrical systems are becoming more essential to meet these increased needs. Electrical generation and transmission plans must remain cost-effective, reliable, and flexible for further future expansion. As these systems are being utilized more frequently, it becomes imperative to find ways of optimizing their overall function. Novel Advancements in Electrical Power Planning and Performance is an essential reference source that provides vital research on the specific challenges, issues, strategies, and solutions that are associated with electrical transmission and distribution systems and features emergent methods and research in the systemic and strategic planning of energy usage. Featuring research on topics such as probabilistic modeling, voltage stability, and radial distribution, this book is ideally designed for electrical engineers, practitioners, power plant managers, investors, industry professionals, researchers, academicians, and students seeking coverage on the methods and profitability of electrical expansion planning.

Electric Powertrain

Transit Research Abstracts

Electricity Pricing

Optimal Design and Retrofit of Energy Efficient Buildings, Communities, and Urban Centers

Sustainable Energy Technology and Policies

Strategy for Industrial Decarbonization

This book presents selected papers from the 11th International Symposium on Heating, Ventilation and Air Conditioning (ISHVAC 2019), with a focus on HVAC techniques for improving indoor environment quality and the energy efficiency of heating and cooling systems. Presenting inspiration for implementing more efficient and safer HVAC systems, the book is a valuable resource for academic researchers, engineers in industry, and government regulators.

A thoroughly revised third edition of this widely praised, bestselling textbook presents a comprehensive systems-level perspective of electric and hybrid vehicles with emphasis on technical aspects, mathematical relationships and basic design guidelines. The emerging technologies of electric vehicles require the dedication of current and future engineers, so the target audience for the book is the young professionals and students in engineering eager to learn about the area. The book is concise and clear, its mathematics are kept to a necessary minimum and it contains a well-balanced set of contents of the complex technology. Engineers of multiple disciplines can either get a broader overview or explore in depth a particular aspect of electric or hybrid vehicles. Additions in the third edition include simulation-based design analysis of electric and hybrid vehicles and their powertrain components, particularly that of traction inverters, electric machines and motor drives. The technology trends to incorporate wide bandgap power electronics and reduced rare-earth permanent magnet electric machines in the powertrain components have been highlighted. Charging stations are a critical component for the electric vehicle infrastructure, and hence, a chapter on vehicle interactions with the power grid has been added. Autonomous driving is another emerging technology, and a chapter is included describing the autonomous driving system architecture and the hardware and software needs for such systems. The platform has been set in this book for system-level simulations to develop models using various softwares used in academia and industry, such as MATLAB® /Simulink, PLECS, PSIM, Motor-CAD and Altair Flux. Examples and simulation results are provided in this edition using these software tools. The third edition is a timely revision and contribution to the field of electric vehicles that has reached recently notable markets in a more and more environmentally sensitive world.

The aim of this work, consisting of 9 individual, self-contained booklets, is to describe commercial vehicle technology in a way that is clear, concise and illustrative. Compact and easy to understand, it provides an overview of the technology that goes into modern commercial vehicles. Starting from the customer's fundamental requirements, the characteristics and systems that define the design of the vehicles are presented knowledgeably in a series of articles, each of which can be read and studied on their own. This volume, "Alternative Powertrains and Supplements to the Conventional Powertrain", introduces alternatives and additions to the conventional powertrain of the commercial vehicle. The wide range of options is presented so as to be clearly understandable for those learning and working with them in a practical environment. Hybrid vehicles, electric powertrains and alternative fuels are discussed.

This authored monograph provides in-depth analysis and methods for aligning electricity demand of manufacturing systems to VRE supply. The book broaches both long-term system changes and real-time manufacturing execution and control, and the author presents a concept with different options for improved energy flexibility including battery, compressed air and embodied energy storage. The reader will also find a detailed application procedure as well as an implementation into a simulation prototype software. The book concludes with two case studies. The target audience primarily comprises research experts in the field of green manufacturing systems.

A Transformational Journey, Volume 2

Select Proceedings of i-CASIC 2020

Overcoming Barriers to Deployment of Plug-in Electric Vehicles

Volume II: Heating, Ventilation, Air Conditioning and Refrigeration System

1999 European Wind Energy Conference

Handbook of Research on New Solutions and Technologies in Electrical Distribution Networks

Hybrid energy systems integrate multiple sources of power generation, storage, and transport mechanisms and can facilitate increased usage of cleaner, renewable, and more efficient energy sources. Hybrid Power: Generation, Storage, and Grids discusses hybrid energy systems from fundamentals through applications and discusses generation, storage, and grids. Highlights fundamentals and applications of hybrid energy storage Discusses use in hybrid and electric vehicles and home energy needs Discusses issues related to hybrid renewable energy systems connected to the utility grid Describes the usefulness of hybrid microgrids and various forms of off-grid energy such as mini-grids, nanogrids, and stand-alone systems Covers the use of hybrid renewable energy systems for rural electrification around the world Discusses various forms and applications of hybrid energy systems, hybrid energy storage, hybrid microgrids, and hybrid off-grid energy systems Details simulation and optimization of hybrid renewable energy systems This book is aimed at advanced students and researchers in academia, government, and industry, seeking a comprehensive overview of the basics, technologies, and applications of hybrid energy systems.

The light-duty vehicle fleet is expected to undergo substantial technological changes over the next several decades. New powertrain designs, alternative fuels, advanced materials and significant changes to the vehicle body are being driven by increasingly stringent fuel economy and greenhouse gas emission standards. By the end of the next decade, cars and light-duty trucks will be more fuel efficient, weigh less, emit less air pollutants, have more safety features, and will be more expensive to purchase relative to current vehicles. Though the gasoline-powered spark ignition engine will continue to be the dominant powertrain configuration even through 2030, such vehicles will be equipped with advanced technologies, materials, electronics and controls, and aerodynamics. And by 2030, the deployment of alternative methods to propel and fuel vehicles and alternative modes of transportation, including autonomous vehicles, will be well underway. What are these new technologies - how will they work, and will some technologies be more effective than

others? Written to inform The United States Department of Transportation's National Highway Traffic Safety Administration (NHTSA) and Environmental Protection Agency (EPA) Corporate Average Fuel Economy (CAFE) and greenhouse gas (GHG) emission standards, this new report from the National Research Council is a technical evaluation of costs, benefits, and implementation issues of fuel reduction technologies for next-generation light-duty vehicles. Cost, Effectiveness, and Deployment of Fuel Economy Technologies for Light-Duty Vehicles estimates the cost, potential efficiency improvements, and barriers to commercial deployment of technologies that might be employed from 2020 to 2030. This report describes these promising technologies and makes recommendations for their inclusion on the list of technologies applicable for the 2017-2025 CAFE standards.

This is volume 2 of a 2-volume set. Marine Design XIII collects the contributions to the 13th International Marine Design Conference (IMDC 2018, Espoo, Finland, 10-14 June 2018). The aim of this IMDC series of conferences is to promote all aspects of marine design as an engineering discipline. The focus is on key design challenges and opportunities in the area of current maritime technologies and markets, with special emphasis on: • Challenges in merging ship design and marine applications of experience-based industrial design • Digitalisation as technological enabler for stronger link between efficient design, operations and maintenance in future • Emerging technologies and their impact on future designs • Cruise ship and icebreaker designs including fleet compositions to meet new market demands To reflect on the conference focus, Marine Design XIII covers the following research topic series: •State of art ship design principles - education, design methodology, structural design, hydrodynamic design; •Cutting edge ship designs and operations - ship concept design, risk and safety, arctic design, autonomous ships; •Energy efficiency and propulsions - energy efficiency, hull form design, propulsion equipment design; •Wider marine designs and practices - navy ships, offshore and wind farms and production. Marine Design XIII contains 2 state-of-the-art reports on design methodologies and cruise ships design, and 4 keynote papers on new directions for vessel design practices and tools, digital maritime traffic, naval ship designs, and new tanker design for arctic. Marine Design XIII will be of interest to academics and professionals in maritime technologies and marine design.

This book presents the select proceedings of the International Conference on Automation, Signal Processing, Instrumentation and Control (i-CASIC) 2020. The book mainly focuses on emerging technologies in electrical systems, IoT-based instrumentation, advanced industrial automation, and advanced image and signal processing. It also includes studies on the analysis, design and implementation of instrumentation systems, and high-accuracy and energy-efficient controllers. The contents of this book will be useful for beginners, researchers as well as professionals interested in instrumentation and control, and other allied fields.

Progress in Clean Energy, Volume 2

Technical Report One : Study Objectives and Methodologies

Hybrid Energy Systems

Wind Solar Hybrid Renewable Energy System

ISUW 2021

Renewable Power for Sustainable Growth