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Sunday, October 9

Sunday, October 9, 12:00 - 16:00

WM: Makers & Sustainability Workshop

Sunday, October 9, 15:00 - 16:00

PC: Poster Contest

Room: Arizona

Sunday, October 9, 17:30 - 19:00

OR: Opening Reception

Room: Arizona
Chair: Vivek Gupta (NXP Semiconductor & IEEE Phoenix Section, USA)

Monday, October 10

Monday, October 10, 08:00 - 09:30

OK: Opening Remarks and Keynote

Internet of Things — Transformative Megatrends for Sustainability
Mark Goldstein, President, International Research Center

Room: Arizona
Chair: Vivek Gupta (NXP Semiconductor & IEEE Phoenix Section, USA)

The Internet of Things (IoT) will connect tens of billions of new sensors and devices driving sustainability while transforming home, business, government, industrial, medical, transportation, and other complex ecosystems.

Monday, October 10, 10:00 - 12:00

M1A: Energy Efficiency

Session 1A
Julie McCulley

Room: Buckhorn
Chair: Kevin Anderson (California State Polytechnic University at Pomona & Solar Thermal Alternative Renewable Energy Lab, USA)

10:00 ***A Field Study of the Residential Clothes Drying Process*** *1*
Amy Fuchs Heidner, PE and Dennis Heidner (The Rextor Group PLLC, USA)
pp. 1-8

10:20 ***Influential Factors for Accurate Load Prediction in a Demand Response Context*** *9*
Morten G Wollsen, Mikkel Kjaergaard and Bo Jørgensen (University of Southern Denmark, Denmark)
pp. 9-13

10:40 ***Solar Energy Overview and Maximizing Power Output of a Solar Array Using Sun Trackers 14***
Hamid Allamehzadeh (Eastern New Mexico University, USA)
pp. 14-19

11:00 ***Systematic Energy Management: a Foundation for Sustainable Production 20***
Tallal Javied (Friedrich-Alexander-University of Erlangen- Nuremberg, Germany); Alireza Esfandyari (University of Erlangen-Nuremberg & FAPS Institute, Germany); Joerg Franke (FAPS, Friedrich-Alexander-Universität Erlangen-Nürnberg (FAU), Germany)
pp. 20-27

11:20 ***Mining Building Metadata by Data Stream Comparison 28***
Emil Holmegaard and Mikkel Kjaergaard (University of Southern Denmark, Denmark)
pp. 28-33

M1B: Electronics I

Session 1B
Yasser Yasaei

Room: Sagebrush
Chair: Adil Usman (Indian Institute of Technology Mandi, India)

10:00 ***The International Development of RoHS 34***
Debbie Horn (IBM, USA)
pp. 34-38

10:20 ***Solar Photovoltaic Optimization for Commercial Flat Rooftops in Cold Regions 39***
Hadia Awad (University of Alberta & SOLARMAX Power Inc., Canada); Mustafa Gul, Chelsea Ritter, Preshit Verma and Yuan Chen (University of Alberta, Canada); Haitao Yu and Kyle Kasawski (SOLARMAX Power Inc., Canada); K Salim and Mohamed Al-Hussein (University of Alberta, Canada)
pp. 39-46

10:40 ***A Standby Strategy Model for an Energy Efficient Soldering Oven Machine 47***
Alireza Esfandyari (University of Erlangen-Nuremberg & FAPS Institute, Germany); Tallal Javied (Friedrich-Alexander-University of Erlangen- Nuremberg, Germany); Felix Reissmann (Friedrich-Alexander-University of Erlangen-Nuremberg, Germany); Joerg Franke (FAPS, Friedrich-Alexander-Universität Erlangen-Nürnberg (FAU), Germany)
pp. 47-51

11:00 ***Application of Auto-Catalytic Metallization as a Sustainable Technique for Planar Inductor Fabrication 52***
Reza Kamali-Sarvestani, Paul Weber, Epraim Nielson and Ammon Johnston (Utah Valley University, USA)
pp. 52-55

11:20 ***Design and Analysis of Solar Devices in Public Places to Help Meet Energy Demand 56***
Justin Roberts, Justin Halversen, Christopher Running, Nathan Johnson and John Salmon (Brigham Young University, USA)
pp. 56-62

M1C: Renewable Energy I

Session 1C
Maxx Patterson

Room: Ponderosa
Chair: Maxx Patterson (IEEE Sus Tech, Arizona State University, USA)

10:00 ***Towards a Zero Net Energy Community Microgrid 63***
Isaac Jordan (UPR-Mayaguez, Puerto Rico); Efraín O'Neill-Carrillo (University of Puerto Rico-Mayaguez, Puerto Rico); Naysy Lopez (UPR-Mayaguez, Puerto Rico)
pp. 63-67

10:20 ***Heat Transfer Fluids for Parabolic Trough Solar Collectors - A Comparative Study 68***
Reuben Buehler (Seattle University, USA); Sam Yang and Juan Ordonez (Florida State University, USA)
pp. 68-75

10:40 ***Control Strategy for Inverter in a Micro-Grid Under Unbalanced Grid Condition 76***
Ashokkumar L and Sheeba Babu (PSG College of Technology, India)
pp. 76-82

11:00 ***Sizing and Location Identification for an Electrical Energy Storage System in a Renewable Microgrid 83***
Pavan Kumar Penkey, Nathan Gaul, Brian K Johnson and Herbert Hess (University of Idaho, USA)
pp. 83-88

Monday, October 10, 12:00 - 13:30

LK: Lunch and Keynote

Navigating the challenges created by constant innovation on the used electronics industry: The need for collaboration and communication between electronics designers and e-waste recyclers and refurbishers
Karin Harris, President, eGreen-IT Solutions, LLC

Room: Arizona
Chair: Vivek Gupta (NXP Semiconductor & IEEE Phoenix Section, USA)

Monday, October 10, 13:30 - 14:30

M2A: Smart Grid I

Session 2A
Jake Gentle

Room: Buckhorn
Chair: Jake P. Gentle (Idaho National Laboratory & DOE, USA)

1:30 ***Exploring Security Metrics for Electric Grid Infrastructures Leveraging Attack Graphs 89***
Panini Sai Patapanchala, Chen Huo, Rakesh B. Bobba and Eduardo Cotilla-Sanchez (Oregon State University, USA)
pp. 89-95

1:50 ***Improved Protection Scheme for Data Attack on Strategic Buses in the Smart Grid 96***
Charith D Wickramaarachchi, Sanmukh Kuppannagari, Rajgopal Kannan and Viktor K. Prasanna (University of Southern California, USA)
pp. 96-101

2:10 ***Smart Grid Cyber Test Bed Development 102***
Sean S Monemi (California State Polytechnic University at Pomona, USA); Dani Kamand (California State Polytechnic University at Pomona); Rakshith Thayi, Tyler Venrick and Stanley Luong (California State Polytechnic University at Pomona, USA)
pp. 102-108

Monday, October 10, 13:30 - 15:00

M2B: Electronics II

Session 2B
Yasser Yasaei

Room: Sagebrush

Chair: Adil Usman (Indian Institute of Technology Mandi, India)

1:30 ***A General Model for Energy Efficiency Calculation 109***
Marcos Roitman and Dvir Bueno (Sami Shamoon College of Engineering, Israel)
pp. 109-113

1:50 ***Retrofitting and Energy Control of an Academic Building 114***
Jose Hoyo-Montano, Daniel Espejel-Blanco and Diego Schurch-Sanchez (Instituto Tecnológico de Hermosillo, Mexico)
pp. 114-118

Monday, October 10, 13:30 - 14:10

M2C: Renewable Energy II

Session 2C
Maxx Patterson

Room: Ponderosa
Chair: Maxx Patterson (IEEE Sus Tech, Arizona State University, USA)

1:30 ***Wind Energy History, Technology and Control 119***
Hamid Allamehzadeh (Eastern New Mexico University, USA)
pp. 119-126

1:50 ***Energy and Environment in Indonesia 127***
Anjar Priandoyo (University of York, United Kingdom)
pp. 127-133

Monday, October 10, 14:10 - 14:40

M2C-I: Renewable Energy II - Invited talk

Zinc-air Batteries Gain Momentum in Long Duration Applications
Glynne Townsend,VP Business Development, North America, Fluidic Energy

Room: Ponderosa

Advanced energy storage technologies are proving to be optimal solutions for long duration applications and enabling strong momentum in long duration applications that have traditionally faced cost and lifetime obstacles including renewable integration, benefit stacking and off grid microgrids. Fluidic Energy invented and commercialized the first rechargeable and long duration Zinc-air energy storage technology, an optimal technology for long duration applications. With over 40 MWh energy storage and strong momentum, Fluidic Energy's rechargeable Zinc-air technology is filling a void in the clean energy market unlocking commercial viability. Furthermore, this session will cover how Fluidic solutions in these types of applications are going well beyond the chemistry itself to provide vertically integrated solution and a whole product approach.

Monday, October 10, 14:30 - 15:00

M2A-I: Smart Grid I - Invited talk

Enhanced representations of lithium-ion batteries in power systems models and their effect on the valuation of energy arbitrage applications
Apurba Sakti, MIT Energy Initiative

Room: Buckhorn

We develop three novel enhanced mixed integer-linear representations of the power limit of the battery and its efficiency as a function of the charge and discharge power and the state of charge of the battery, which can be directly implemented in large-scale power systems models and solved with commercial optimization solvers. Using these battery representations, we conduct a techno-economic analysis of the performance of a 10MWh lithium-ion battery system testing the effect of a 5-min vs. a 60-min price signal on profits using real time prices from a selected node in the MISO electricity market. Results show that models of lithium-ion batteries where the power limits and efficiency are held constant overestimate profits by 10% compared to those obtained from an enhanced representation that more closely matches the real behavior of the battery. When the battery system is exposed to a 5-min price signal, the energy arbitrage profitability improves by 60% compared to that from hourly price exposure. These results indicate that a more accurate representation of li-ion batteries as well as the market rules that govern the frequency of electricity prices can play a major role on the estimation of the value of battery technologies for power grid applications.

Monday, October 10, 15:30 - 16:30

M3A: Smart Grid II

Session 3A
Jake Gentle

Room: Buckhorn
Chair: Jake P. Gentle (Idaho National Laboratory & DOE, USA)

3:30 ***Redox Flow Batteries for Small Scale Energy Storage 134***
Muhammad Misykat Hiksas and Muhammad L Aninditio (Universitas Indonesia, Indonesia)
pp. 134-139

3:50 ***Reducing Demand Charges and Onsite Generation Variability Using Behind-the-Meter Energy Storage 140***
Bishnu P. Bhattarai, Kurt S. Myers and Jason Bush (Idaho National Laboratory, USA)
pp. 140-146

4:10 ***Adequacy Assessment of Micro-hydro Based Mini-Grid 147***
Nava Raj Karki, Manoj Singh, Netra Gyawali and Mahamad Badrudoza (Institute of Engineering, Tribhuvan University, Nepal); Sumit Paudyal (Michigan Technological University, USA)
pp. 147-150

Monday, October 10, 15:30 - 16:00

M3B: Transportation

Session 3B
Edward Perkins

Room: Sagebrush
Chair: Amelia Regan (University of California, Irvine, USA)

3:30 ***Performance Analysis of Continuously Varying Transmission System for Electric Vehicles 151***
Madhavaram Sai Krishna, Kishore M n and Suresh Nagesh (PES University, India)
pp. 151-155

3:50 ***Dispatch Control with PEV Charging and Renewables for Multiplayer Game Application 156***
Nathan Davis and Brian K Johnson (University of Idaho, USA); Timothy McJunkin and Don Scooffield (Idaho National Laboratory, USA); Sera E White (GravisTech, USA)
pp. 156-161

4:10 ***Key Variable Analysis and Identification on Energy Consumption of Automotive Manufacturing Plant 162***
Lujia Feng (Clemson University, USA); Laine Mears (Clemson University & International Center for Automotive Research, USA); Joerge Schulte (BMW Manufacturing Co., USA)
pp. 162-168

Monday, October 10, 15:30 - 17:00

M3C: Internet of Things (IOT)

Session 3C
Debbie Horn

Room: Ponderosa
Chair: Debbie Horn (IBM, USA)

3:30 ***Field Testing of IoT Devices for Livestock Monitoring Using Wireless Sensor Network, Near Field Communication and Wireless Power Transfer 169***
Lim Teck Beng, Poh Boon Kiat, Lee Ngai Meng and Ngee Cheng Phoa (Nanyang Polytechnic, Singapore)
pp. 169-173

3:50 ***A Case for Open Access Smart Grids (OASIS) 174***
Manuel Rodriguez-Martinez (University of Puerto Rico, Mayaguez, Puerto Rico); Efraín O'Neill-Carrillo (University of Puerto Rico-Mayaguez, Puerto Rico); Marla Perez (University of Puerto Rico, Mayaguez, USA); Fabio Andrade (University of Puerto Rico, Puerto Rico); Wilson Rivera (University of Puerto Rico, Mayaguez, USA); Agustín Irizarry-Rivera (University of Puerto Rico-Mayaguez, Puerto Rico); Rafael Rodriguez (University of Puerto Rico, Mayaguez, USA); Cecilio Ortiz (UPRM, Puerto Rico); Eduardo Lugo (University of Puerto Rico, Mayaguez, USA)
pp. 174-179

4:10 ***Transforming Community-based Screening of Total Hemoglobin Using Non-invasive Devise 180***
Shahzaib Bukhari (Tech4Life Enterprises, Pakistan); Saad Abdullah (Tech4life Enterprises, Pakistan); Saad Khan (Tech4Life Enterprises, Pakistan); Nida Husyin (Tech4Life Enterprises, Saudi Arabia); Nateela Tirmizi, Suha Tirmizi and Dodo Khan (Tech4Life Enterprises, Pakistan); Masood Khan (DOW University of Health Sciences, Pakistan); Rafiq Khanani (Citilab Diagnostic Center, Pakistan); Shariq Khoja (Global CEO - Tech4Life Enterprises, Pakistan)
pp. 180-183

Monday, October 10, 16:30 - 17:00

M3A-I: Smart Grid II - Invited talk

Optimal Real-time Demand Dispatch in Smart Grids
Sumit Paudyal, Michigan Technological University

Room: Buckhorn

With the implementation of Smart Grid technologies, such as sensors, smart meters, smart appliances, more than one-fourth of the US total electricity demand could be dispatchable. Coordinated demand dispatch of customers' loads provides benefits to the customers and the grid both. A complete demand dispatch solution that benefits the customers and the grid involves a large scale optimization problem with underlying complex transmission and distribution grid models. A centralized approach to solve this problem is computationally involving in a practical sized grid with the consideration of comprehensive customer load models and the grid models that include discrete control variables. A practical way to solve this problem is to use hierarchical and distributed computing approaches, where information exchange occurs between the different levels in the hierarchy. This talk presents hierarchical framework to i) optimally dispatch electric vehicle (EV) loads in vehicle-to-grid interaction (V2G) and ii) optimally dispatch commercial building loads in building-to-grid (B2G) interaction. The case studies demonstrate the benefits of optimal demand dispatch of EV and building loads to the customers and distribution grid operation.

Monday, October 10, 18:30 - 20:30

DK: Dinner and Keynote

The Future of the Suburban City: Lessons from Sustaining Phoenix
Grady Gammage, Jr., Gammage Burnham

Room: Arizona

Chair: Vivek Gupta (NXP Semiconductor & IEEE Phoenix Section, USA)

Grady Gammage, Jr. is a part time academic, a practicing lawyer, an author, a sometime real estate developer and a former elected official. Grady has been practicing law in Phoenix for 40 years. His practice has focused on land use, zoning and real estate projects throughout Arizona. He has represented projects ranging from master planned communities and subdivisions to high rise buildings and intense urban mixed-use redevelopment. He thinks life is more interesting if you do lots of different things.
In his academic role, Mr. Gammage is a Senior Fellow at ASU's Morrison Institute. His work there focuses on urban growth and development, quality of life, and local economic issues. He also teaches at the College of Law and at the Herberger Institute for Design and the Arts.

Tuesday, October 11

Tuesday, October 11, 08:00 - 08:30

T4A-I: Smart Grid III - Invited talk

Sustainable System Assessment with Resilient Control Systems Metrics
Timothy R McJunkin, INL

Room: Buckhorn

A relatively new area of research and development known as resilient control systems seeks the means to make systems, that may be complex and distributed, and have human as a necessary or required element of the control loop, maintain acceptable levels of performance in the presence of disturbances generated by nature or man. Current emphasis in resilient control systems is being applied to metrics to measure the relative "resilience" of various changes to the design of the system. For example, the impacts and benefits of adding distributed energy resources to distribution systems or applying advanced control algorithms. There is a strong relationship to how the consumer responds and with respect to how policy is enabled and how competition and cooperation in markets play out. Similar themes can be applied in the area of sustainability as technology is brought online. This talk will discuss distribution system metrics and discuss possible consideration to a more difficult problem of assessing the resilience of proposals for improving sustainability.

T4B-I: Societal Implications - Invited talk

Humanitarian Engineering and Sustainable Global Development
Dr. B.L. Ramakrishna, Emeritus Professor, Arizona State University

Room: Sagebrush

The presentation will A) Illustrate that scientific and technological innovation is key for achieving sustainable development to address the grand challenges especially in developing economies of the world B) Enumerate how designing for the developing world can boost agricultural productivity, provide clean drinking water, expand educational opportunities, empower women, improve child & maternal health and combat infectious diseases and in addition promote environmental sustainability C) Highlight a few examples in the energy, water/sanitation, health and other sectors to show the power of design under extreme constraints to address the needs of more than 2 billion people at the bottom of the pyramid and D) Point out the important considerations at the intersection of science, technology & policy and the need for inventive business models for scaling and sustainability.

T4C-I: Renewable Energy III - Invited talk

OPEN
Room: Ponderosa

Tuesday, October 11, 08:30 - 10:00

T4A: Smart Grid III

Session 4A
Jake Gentle

Room: Buckhorn

Chair: Jake P. Gentle (Idaho National Laboratory & DOE, USA)

8:30 ***Development of Smart Grid Test-bed for Electric Power Distribution System 184***
N Serdar Tunaboylu and Gaddafi Shehu (Mevlana University, Turkey); Mehmet Argin (California State Polytechnic University, Pomona, USA); Tankut Yalcinoz (Mevlana University, Turkey)
pp. 184-187

8:50 ***Modeling of Phasor Measurement Unit for Wide Area Monitoring and Control of Smart Grids with Distributed Energy Resources 188***
Ashokkumar L and Karthikeyan S (PSG College of Technology, India)
pp. 188-194

9:10 ***Dispatchable Renewable Energy Model for Microgrid Power System 195***
Fred Chiou (Weber State University, USA); Jake P. Gentle (Idaho National Laboratory & DOE, USA); Timothy McJunkin (Idaho National Laboratory, USA)
pp. 195-199

T4B: Societal Implications

Session 4B
TBA

Room: Sagebrush
Chair: Lewis Terman (IEEE, USA)

8:30 ***An Engineering Approach for Developing Sustainable Ambient Assisted Living Solutions 200***
Volker Schuermann and Christian Weidauer (Bochum University of Applied Sciences Campus Velbert/Heiligenhaus, Germany)
pp. 200-206

8:50 ***Solar Power Satellites, A Solution to Energy and Carbon 207***
Keith Henson (L5 Society, USA)
pp. 207-212

9:10 ***Modeling Dynamics of a Market-Based Emission Control System: Efficacy Analysis 213***
Mohammadhussein Rafieisakhaei (Texas A&M University, USA); Babak Barazandeh (Virginia Tech, USA)
pp. 213-218

9:30 ***Effect of Localization on the Sustainable Development in Iran's Car Industry 219***
Babak Barazandeh (Virginia Tech, USA); Mohammadhussein Rafieisakhaei (Texas A&M University, USA)
pp. 219-224

T4C: Renewable Energy III

Session 4C
Maxx Patterson

Room: Ponderosa
Chair: Maxx Patterson (IEEE Sus Tech, Arizona State University, USA)

8:30 ***Metering DC Coupled Distributed Energy Resource Systems 225***
Dustin Stapp and Joel Dickinson (Salt River Project (SRP), USA)
pp. 225-228

8:50 ***Fault Current Contribution of Renewable Distributed Generation: An Overview and Key Issues 229***
Tarek Masaud (Texas A&M University- Kingsville, USA); Ronak Deepak Mistry (Texas A&M University - Kingsville, USA)
pp. 229-234

9:10 ***A Solar Simulator for the Renewable Energy Instruction Laboratory 235***
Yousif Dafalla and Mohamed Osman (Washington State University Tri-Cities, USA)
pp. 235-239

9:30 ***A Flocculation Strategy for Harvesting High Lipid Content Microalgae Biomass 240***
Jacqueline Lemos (UFPR, Brazil); Andre Mariano and Jose Vargas (Federal University of Parana, Brazil); Vanessa Kava (UFPR, Brazil); Juan Ordonez (Florida State University, USA)
pp. 240-245

Tuesday, October 11, 10:30 - 11:00

T5A-I: Smart Grid IV - Invited talk

Transactive Energy Market
Paras Mandal, University of Texas at El Paso

Room: Buckhorn

The key elements of the smart distribution systems, such as end-user consumers, distributed energy resources, storage systems, demand response programs and others, need to be actively involved in local coordination tasks for dynamic balancing of supply and demand. In this regard, Transactive Energy (TE) is an emerging concept that shows potential to coordinate the operation of an ever-growing number of intelligent devices and resources by treating economic and control signals of power system. The concept of TE in power grid is in its infancy, however, TE is an area of great opportunities to improve smart grid operations. This talk presents (i) a decentralized TE market mechanism to improve the efficiency, reliability, and performance of the electric power grid in the path towards a sustainable future and (ii) some of the value drivers for the deployment of TE systems. This talk will also highlight the importance of TE market mechanism to provide an interface for DSO and TSO in order to manage the increasing complexity of the grid effectively.

T5C-I: Renewable Energy IV - Invited talk

Effect of Spectral Shift on Solar PV Performance
Mitchell Lee, First Solar

Room: Ponderosa

Photovoltaic module performance is defined at standard test conditions, which includes a defined spectral irradiance distribution. However, environmental conditions in the field often differ from the standard spectrum; this change in spectrum is known as spectral shift or spectral mismatch. Mitchell will discuss the impact of spectral shift on various PV technologies and presents models that have been proposed to characterize this effect when modeling PV system performance.

10:30 ***Effect of Spectral Shift on Solar PV Performance 246***
Kendra Passow and Mitchell Lee (First Solar, USA)
pp. 246-250

Tuesday, October 11, 11:00 - 12:00

T5A: Smart Grid IV

Session 5A
Jake Gentle

Room: Buckhorn
Chair: Jake P. Gentle (Idaho National Laboratory & DOE, USA)

11:00 ***A Novel Solution to Use Big Data Technologies and Improve Demand Response Program in Aggregated Residential Houses 251***
Vivek Abhilash Hanumantha Vajjala (DataFactz, USA)
pp. 251-256

T5C: Renewable Energy IV

Session 5C
Maxx Patterson

Room: Ponderosa
Chair: Maxx Patterson (IEEE Sus Tech, Arizona State University, USA)

11:00 ***Sustainable Energy Via Biodiesel Production From Autotrophic and Mixotrophic Growth of the Microalga Phaeodactylum Tricornutum in Compact Photobioreactors 257***
Keli Morais (UFPR, Brazil); Jose Vargas and Andre Mariano (Federal University of Parana, Brazil); Juan Ordonez (Florida State University, USA); Vanessa Kava (UFPR, Brazil)
pp. 257-264

11:20 ***Ag Nanowire Coated Reduced Graphene Oxide/n-Silicon Schottky Junction Based Solar Cell 265***
Serdar Yavuz and Prabhakar Bandaru (University of California, San Diego, USA)
pp. 265-269

Tuesday, October 11, 13:00 - 14:30

CP: Closing Panel

The Next Big Thing, Approaches in Engineering Design, Manufacturing and Sustainable Design
Steve Goodnick

Room: Arizona
Chair: Vivek Gupta (NXP Semiconductor & IEEE Phoenix Section, USA)

Moderator: Stephen Goodnick, Professor and Senior Sustainability Scientist, Julie Ann Wrigley Global Institute of Sustainability, Arizona State University

Panelists:
Mahesh Morjaria, VP, Systems Development, First Solar Electric
Gary Dirks, Professor and Director of the Julie Ann Wrigley Global Institute of Sustainability, Arizona State University
Sayfe Kiaei, Professor, Motorola Chair Professor in Analog and RFIC, Arizona State University
Todd Brady, Global Sustainability Director, Intel