7th IEEE Conference on Technologies for Sustainability

Technologies that contribute to sustainability in all applications affecting human life

VIRTUAL Technical Sessions: April 24-25, 2020

Contents

Welcome Message from the Conference Chairs

Dear IEEE SusTech 2020 Attendees,

Welcome to the 7th IEEE Conference on Technologies for Sustainability - Technologies that contribute to sustainability in all applications affecting human life.

SusTech is dedicated to explore the development and application of science, engineering and technology that meets the needs of the present without compromising the ability of future generations to meet their own needs. It brings together scientists, engineers, technologists and scholars from multiple disciplines to hold a dialogue on environmental issues and collaborate on ideas to develop and utilize innovative tools and intelligent systems to address them. Attendees learn about the tools, connections and proactive solutions to take their sustainability programs to the next level.

This year's technical program is being presented online due to the Covid-19 virus. The student poster competition will also be held online.

Our program features keynote speakers, nearly 50 paper presentations in 12 sessions over two days, a student poster contest.

Undergraduate and graduate students submitted abstracts for the Student Poster Contest, representing ideas or designs for developing projects/products supporting the sustainability topics areas of the Conference. The selected posters will be presented during the SusTech 2020 online Student Poster Session on Thursday afternoon April 23. Prizes will be awarded to the top three posters; winners will be posted on the website.

We thank our sponsors: the IEEE Oregon, Phoenix, San Fernando Valley, Inland Empire (Foothills), Metro LA, Orange County and Coastal Los Angeles Sections, IEEE Region 6, IEEE-USA; and co-sponsors the IEEE Power and Energy (PES) Society and the IEEE Society on Social Implications of Technology (SSIT).

Your participation is the key to this conference, whether an author, speaker or attendee. Listen, learn, engage and discuss with your fellow participants.

Our website at http://ieee.org/sustech/ will provide you information on the Program for SusTech 2020. You will find the SusTech program schedule with information about the scheduled technical papers for each track, bio-data of distinguished keynote speakers, and student poster contestants.

We hope you enjoy the conference.

Charlie Jackson SusTech 2020 Chair

Gora Datta SusTech 2020 Vice Chair

Ed Perkins SusTech 2020 Emeritus Chair

Sevada Isayan SusTech 2020 Program Chair

Conference Committee

Position	Name	Organization
General Chair	Charlie Jackson	Northrop Grumman
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IEEE Oregon Section

The IEEE Oregon Section serves approximately 3500 members in western and southern Oregon and southwest Washington.

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IEEE Region 6 serves approximately 50,000 members in the Western USA from Alaska to New Mexico and Montana to Hawaii.

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IEEE Orange County Section

The IEEE Orange County Section serves over 2,500 members in Orange County, CA; in addition to working closely with local communities, businesses and educational institutes.

San Fernando Valley Section

IEEE San Fernando Valley Section

Phoenix Section

IEEE Phoenix Section

The IEEE Phoenix Section serves approximately 3000 members in the Phoenix, AZ metropolitan area.

Metro LA

IEEE Metropolitan Los Angeles Section

Foothill Section

IEEE Foothill Section

Our Inland Empire IEEE Foothill section prides itself in providing an ideal place for technical professionals, entrepreneurs, consultants, academics, and university students to meet, share, and give back to our communities. We are over 1,000 members covering all of Riverside and San Bernardino counties in Southern California. We are proud to be continuing sponsors of the Technologies for Sustainability Conference.

IEEE-USA's mission is to recommend policies and implement programs specifically intended to serve and benefit the members, the profession, and the public in the United States in areas of economic, ethical, legislative, social and technology policy concern.

Our vision is to serve the IEEE U.S. member by being the technical professional's best resource for achieving lifelong career vitality and by providing an effective voice on policies that promote U.S. prosperity.

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Program V. Chair	David Gonzalez	US Navy
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Energy Efficiency track chair	Kevin Anderson	California State Polytechnic University at Pomona
Energy Efficiency	Hengzhao Yang	New Mexico Institute of Mining and Technology
Intelligent Transportation System track chair	Dr.Youngil Kim	George Washington University
Internet of Things	Afshin Amini	KONNECTED UNIVERSE
Internet of Things	Gora Datta	CAL2CAL
Internet of Things, Electronics	Kenneth Taira	GCC
Renewable/Alternate Energy track chair	Babak Barazandeh	Virginia Tech
Renewable/Alternate Energy	Mohamed Osman	Washington State University-Tri-Cities
Renewable/Alternate Energy	Jesus Aguila-Leon	
Smart Grid track chair	Bishnu Bhattarai	Pacific Northwest National Laboratory
Smart Grid	Sean Monemi	California State Polytechnic University at Pomona
Societal Implications	James Stewart	University of Maryland University College
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	Julanne McCulley	Weber State University
	Venugopal Pallayil	ARL
	Maxx Patterson	Arizona State University
	Rakeshkumar Mahto	California State University Fullerton
	Salman Kahrobaee	SCE
	Anamitra Pal	Arizona State University
	Sachin Soni	First Solar
	Muhammad Asif Khan	Qatar University

VIRTUAL Program Schedule

Paper Sessions & Keynotes – Friday & Saturday April 24-25

Time	Friday, April 24	Time	Saturday, April 25
8:00 am – 9:00 am	Welcome + Keynote 1 Dong Tan, Northrop Grumman Aerospace Systems "Power Electronics, Smart Grid and Grid Modernization"	8:00 am – 8:40 am	Keynote 3 Kay Das, Life Member IEEE "Challenges of the Connected Vehicle Revolution"
9:00 am – 10:00 am	Session 1 — Intelligent Transportation Systems eWaste	8:40 am – 10:20 am	Session 7 — Sustainable Electronics II
10:00 am – 10:30 am	Break	10:20 am – 10:30 am	Break
10:30 am – 11:50 am	Session 2 — Sustainable Electronics I	10:30 am – 11:50 am	Session 8 — Energy Efficiency II
11:50 am – 12:20pm	Lunchtime	11:50 am – 12:20pm	Lunchtime
12:20pm – 1:00 pm	Keynote 2 Glenn Roquemore, Chancellor, California Southern University "Lessons learned from the July 2019 Ridgecrest, CA earthquakes, changes how we determine seismic risk in buildings"	12:20pm – 1:00 pm	Keynote 4 Seth D. Potter, Ph.D, SDP Space Systems "Orbit Options for Near-Term Space Solar Power"
1:00 pm – 2:00 pm	Session 3 — Smart Grid I	1:00 pm – 2:00 pm	Session 9 — Smart Grid II
2:00 pm – 2:30 pm	Break	2:00 pm – 2:30 pm	Break
2:30 pm – 3:50 pm	Session 4 — Energy Efficiency I	2:30 pm – 3:50 pm	Session 10 — Internet of Things II Societal Implications / Quality of Life I
3:50 pm – 4:00 pm	Break	3:50 pm – 4:00 pm	Break
4:00 pm – 5:20pm	Session 5 — Internet of Things I	4:00 pm – 5:20pm	Session 11 — Societal Implications / Quality of Life II
5:20pm – 5:30pm	Break	5:20pm – 5:30pm	Break
5:30pm – 6:50pm	Session 6 — Water Resources Management	5:30pm – 6:50pm	Session 12 — Sustainable Electronics III Renewable/Alternative Energy

Keynotes

Friday Morning 8:00-9:00 AM	Dong Tan, Northrop Grumman Aerospace Systems "Power Electronics, Smart Grid and Grid Modernization"
Friday Lunch 12:20-1:00 PM	Glenn Roquemore, Chancellor, California Southern University "Lessons learned from the July 2019 Ridgecrest, CA earthquakes, changes how we determine seismic risk in buildings"
Saturday Morning 8:00-8:40 AM	Kay Das "Challenges of the Connected Vehicle Revolution"
Saturday Lunch 12:20-1:00 PM	Seth Potter, SDP Space Systems "Orbit Options for Near-Term Space Solar Power"

Challenges of the Connected Vehicle Revolution

Kay Das, Life Member IEEE

Abstract:

There is currently much on-going activity in the research and design of systems to enhance the safety of vehicular traffic on roads and highways. These include vehicle-to-vehicle based and vehicle-to-infrastructure based electronics systems with extension to personal devices. These systems need to work collaboratively with acceptable latencies in an intelligent and reconfigurable network environment. This is characterized by multiple localized and dynamically changing motion control loops which include each individual vehicle driver (and pedestrian). Systems will comprise a mix of existing and new technologies such as laser, imaging, computer vision, radar, cellular, WiFi, GPS, millimetric Waves, and others. A range of products and systems will compete for market entry from diverse developers and nations and the need for standardization is paramount. The behavior of an autonomously driven vehicle and how it could indeed improve accident rates compared to an intuitive human under diverse conditions is a contentious issue. The cost of failure is high as human life is in the loop. Replacing the intuition-driven human with multiple pre-programmed computing engines and sensor and actuator platforms will present a significant system and software engineering challenge. Not least because the transition from human to computer will not occur overnight.

A significant challenge exists in validating real time software-driven prototypes, final systems, and maintaining performance while in operation. The major players in this traffic evolution will be the government (legislative entity), the insurance companies (risk managing entities) and vehicle manufacturers and their technology partners (product developers). This will create new watersheds in the industry. The customers are vehicle drivers of all kinds: automobiles, trucks, tractors, vehicles with trailers, two-wheeled motorized vehicles, bicycles, and pedestrians. This presentation overviews some of the challenges and offers some directions for this burgeoning industry. A spotlight will be shone on lessons learnt from the aviation industry.

Bio:

Kay Das was GPS Program Manager from 2007 to 2013 for LinQuest Corporation in Los Angeles where he additionally led new business development thrusts in the commercial and automotive safety markets. He has previously held responsibilities as R&D Director for STMicroelectronics' Asia Pacific region in Singapore. He is a past winner of a Singapore Government National Award for "The Initiation and Expansion of High-value R&D and Promotion of Partnerships". He has managed the development of several silicon-based systems with over 40 years industry experience and built engineering teams from scratch in the US, Singapore, China, and Great Britain. He has overseen the development of over eighty patents.

Now in retirement, his current pursuits are the application of communication and location technologies such as 5G/DSRC, Internet of Things, and GPS to automotive safety and the Connected Vehicle revolution. He holds a MS in Electronics Systems from the Cranfield Institute of Technology, UK. A regular presenter of talks and papers, he is an IEEE Life Member and a member of several IEEE societies. His scientific interests include astronomy and cosmology. He is also a professional musician, a published author, and an Internet radio deejay.

Orbit Options for Near-Term Space Solar Power

Seth D. Potter, Ph.D, SDP Space Systems

Abstract:

Studies of space solar power (SSP) for the commercial grid have usually considered transmitting power from geostationary orbit (GEO), via microwaves at frequencies below 10 GHz, where the atmosphere is relatively transparent. Due to beam divergence from that distance at such frequencies, system sizes must be large, leading to power levels of 1000 MW or more. However, the scale of the systems, and the need to develop low-cost routine access to space, make competing with traditional energy sources challenging in the near-term. More recently, studies by the US Naval Research Laboratory have considered SSP for nearer-term niche uses in remote locations. At such locations, providing power by conventional means can be challenging. Many remote locations are typically powered by generators, which depend on fuel delivered at great cost, often through hazardous environments. Power requirements for such users range from a few hundred kilowatts to several megawatts. Furthermore, some remote facilities are at high latitudes, which are inaccessible from geostationary orbit. This presentation will consider alternative orbits. Examples of such orbits are highly inclined orbits, which may be sun-synchronous, or have a repeating ground track, or both. In addition, elliptical orbits may be considered which have relatively long dwell times over ground sites that are beneath their apogee. Since non-GEO orbits

do not remain over their intended ground sites, systems or constellations, of satellites must be designed, in which beam handoffs can provide a given ground site with power much of the time, while making maximum use of the satellites as multiple satellites serve multiple ground sites.

Bio:

Seth Potter has been a leader in spaced based solar power for more than 20 years. He is also a major force behind the Los Angeles Chapter of Oasis, http://oasis-nss.org

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Lessons learned from the July 2019 Ridgecrest, CA earthquakes, changes how we determine seismic risk in buildings

Glenn Roquemore, Chancellor, California Southern University.

Abstract:

Active fault mapping in the Ridgecrest/China Lake area (Roquemore and Zellmer, 1986), was conducted with 1:12,000 scale low sun angle aerial photography and field mapping. Obvious traces of the Little Lake (LLF) and Airport Lake faults (ALF) were plotted on 1:24,000 scale maps and were later (1989) incorporated into the California Alquist-Priolo earthquake fault zone maps, typically used for construction planning. The LLF and ALF faults experienced earthquakes (E. Hauksson, L. Jones, J. Mori, S. Hough, G. Roquemore, 1995), accompanied by surface rupture, in 1982 (M4.9), and in 1995 (M5.4 and M5.8). Earthquake hazards planning in Indian Wells Valley (IWV) has been centered on the LLF and ALF.

On July 4th, a foreshock magnitude 6.4 occurred at the south end of IWV along a short EW trending left-slip fault. On July 5th, a mainshock occurred within IWV with a magnitude of 7.1. The M7.1 event was along a previously unrecognized fault to the east of the LLF and ALF. Unlike the segmented traces of the LLF and ALF, this new rupture was linear and fairly continuous. The 2019 M7.1 Ridgecrest Earthquake was California's largest in more than 20 years and caused $1 Billion in damage. Faults with the most obvious surface traces may not be the ones that produce the next damaging earthquake.

Bio:

Dr. Glenn R. Roquemore received his PhD in Geophysics (1980) from the University of Nevada, Reno, Mackay School of Mines. His research has focused on the study of active faulting, nationally and internationally, but largely along the Eastern California Shear Zone particularly in Indian Wells Valley and the Coso Range, California. Following his work at the University of Nevada, he joined the Earth and Planetary Sciences Division, Naval weapons Center, China lake, California. His primary research focused on earthquake and volcanic hazards along the Pacific Rim. Dr. Roquemore served a President of Irvine Valley College, California for 18 years and is now President Emeritus. Currently, Dr. Roquemore serves as Chancellor of California Southern University.

Power Electronics, Smart Grid and Grid Modernization

Dong Tan, Northrop Grumman Aerospace Systems

Abstract:

As we move forward to transform the current grid from electrical and electromechanical to electronic, electrical, and electromechanical, power electronics will bring a vast reservoir of knowledge in electronic and active control to bear in integrating renewable energy into utility grid. Specific areas where power electronics will make a difference will be discussed in detail. The role of structured microgrids will also be presented as the fundamental building blocks for future grids. Batteries are the last missing piece in grid modernization. Together with solar and wind, it is quickly becoming the preferred peaking reserves for many operators with huge technical and economic benefits for both the utility industry and system operators. Substation modernization will transform the way we deliver electricity in rural and remote areas.

Bio:

Dr. Dong Tan is Northrop Grumman Aerospace Systems Distinguished Engineer and Power Products Manager. He earned his Ph.D. degree from Caltech and is IEEE Fellow (since 2007).

Well-recognized as an authority in near adiabatic power conversion and energy systems, he has pioneered many breakthrough innovations with high-impact industry firsts and record performances. His technologies have attracted significant customer funding and led to four product lines for the company and with hundreds of designs and thousands of delivered flight hardware that "significantly enhancing national security."

He has given more than 50 keynotes and invited talks. He serves frequently on national and international funding, review, award, and prestigious position selection committees.

Small Modular Reactors and Microgrids for Military Use

Marty Waldman, Director of Business Development, Space Information Laboratories

Abstract:

In the not so distant future, all types of fossil and renewable heat sources for generating power will become capable of being retrofitted using new advanced reactor and Microgrid technologies. This will permit modernization of power generation plants without having to replace much of anything except the source and type of heat used to generate steam to power the generators. This can help eliminate the risks of the 'deadly nightmare scenario' of 'what happens if the Grid goes down for months at a time'.

For more information, check out the NDIA website https://ndia-snv.org/reactors-%2F-microgrids

This talk will describe the implementation of America's first Modular Reactor and Microgrid capability at Creech AFB, about 45 miles Northwest of Las Vegas, to provide power 24/7/365, for two to three decades between refueling cycles. Such an extraordinary capability will operations to remain intact, even in the event that 'the grid goes down' for non-expected lengthy periods of time (weeks, months etc.). Chances are that if 'the grid goes down' for such a long a period of time, those RPA operations will be more crucial than ever for protecting America during such a lengthy outage.

Bio:

Marty Waldman brings over 42 years of DoD Navy and Air Force Program Management experience to SIL from his technical involvement with Cruise Missile, Space Shuttle, Titan IV, Minuteman, Peacekeeper and Eastern/Western Range Data Acquisition and Processing Systems.

Having successfully authored and prosecuted numerous Patents, Mr. Waldman's insight and understanding of what's necessary to bring a product to the commercial/military market is continually demonstrated via the fielding of these and other key technologies at SIL.

Leading SIL projects include the Vehicle Based Independent Tracking System (VBITS) Patent # 5739787, Military Grade Small Satellites, Space Rated Battery/Power Systems, Vehicle Based Independent Range System (VBIRS), Patent Publication # US20170328678A1, granted as Patent #10,302,398 on 28 May 2019. All systems support Missile, Rocket, Hypersonic, Satellite, Aircraft and UAV operations.

Recent work with the NevadansCAN and NDIA has enabled Mr. Waldman to become a team-member with the Small Modular Nuclear Reactor/Microgrid development for Nevada test & implementation: https://ndia-snv.org/reactors%2F-microgrids

B.S. Electrical Engineering, Northeastern University. 33+ Years of Navy/Air Force Civil Service prior to his current Private Sector Service.

Program Sessions

Friday, April 24

Friday, April 24 8:00 - 9:00

K1: Welcome & Opening Keynote

Charlie Jackson, SusTech 2020 Chair

"Power Electronics, Smart Grid and Grid Modernization"

Dong Tan, Northrop Grumman Aerospace Systems

As we move forward to transform the current grid from electrical and electromechanical to electronic, electrical, and electromechanical, power electronics will bring a vast reservoir of knowledge in electronic and active control to bear in integrating renewable energy into utility grid. Specific areas where power electronics will make a difference will be discussed in detail. The role of structured microgrids will also be presented as the fundamental building blocks for future grids. Batteries are the last missing piece in grid modernization. Together with solar and wind, it is quickly becoming the preferred peaking reserves for many operators with huge technical and economic benefits for both the utility industry and system operators. Substation modernization will transform the way we deliver electricity in rural and remote areas.

Friday, April 24 9:00 - 10:00

S1: Intelligent Transportation Systems & eWaste

9:00 *Electric Vehicle Charge Management for Lowering Costs and Environmental Impact*
Elpiniki Apostolaki-Iosifidou (SLAC National Accelerator Laboratory, USA); Soomin Woo (University of California, Berkeley, USA); Marco Pruckner (University of Erlangen-Nuremberg, Germany); Timothy Lipman (University of California, Berkeley, USA)
pp. 1-7

9:20 *Thermal Control Compensation of Induction Motor Drive in Electrified Powertrain*
Syed Muhammad Nawazish Ali (Macquarie University, Australia); Jahangir Hossain (University of Technology Sydney, Australia); Vivek Sharma and Muhammad Kashif (Macquarie University, Australia)
pp. 8-13

9:40 *Acceptance of E-waste Recycling Among Young Adults: An Empirical Study*
Mohamed Aboelmaged (University of Sharjah, United Arab Emirates)
pp. 14-19

Friday, April 24 10:00 - 10:30

B24-1: Break 1

Friday, April 24 10:30 - 11:50

S2: Sustainable Electronics I

10:30 *Extracting Clean Energy Through the Design of a Mesoscopic Low-Power Hydrokinetic Turbine*
Raquel Vidorreta-López, Juan Silva-Campos, Jorge Medina-Ruiz and José Manuel Olais-Govea (Tecnologico de Monterrey, Mexico)
pp. 20-25

10:50 *Power System Protection in RTDS*
Sean S Monemi (California State Polytechnic University at Pomona, USA)
pp. 26-31

11:10 *A LoRa-based Dual-CPU Core Salton Sea Environmental Monitoring Wireless Sensor System*
Alejandro Peraza, Andrew Freiha, Carlos Hernandez, Kris Whaley, Thomas Barbarito, Tristan Sizik, Kristian Diaz and Ying-Khai Teh (San Diego State University, USA)
pp. 32-35

11:30 *Power Quality Evaluation of Six-Step Commutation Brushless DC Motor Implemented on 32-Bit ARM Cortex Microcontroller*
Xin Xue and Ying-Khai Teh (San Diego State University, USA)
pp. 36-39

Friday, April 24 11:50 - 12:20

L24: Lunch

Friday, April 24 12:20 - 1:00

K2: Keynote

"Lessons learned from the July 2019 Ridgecrest, CA earthquakes, changes how we determine seismic risk in buildings"
Glenn Roquemore, Chancellor, California Southern University

Active fault mapping in the Ridgecrest/China Lake area (Roquemore and Zellmer, 1986), was conducted with 1:12,000 scale low sun angle aerial photography and field mapping. Obvious traces of the Little Lake (LLF) and Airport Lake faults (ALF) were plotted on 1:24,000 scale maps and were later (1989) incorporated into the California Alquist-Priolo earthquake fault zone maps, typically used for construction planning. The LLF and ALF faults experienced earthquakes (E. Hauksson, L. Jones, J. Mori, S. Hough, G. Roquemore, 1995), accompanied by surface rupture, in

1982 (M4.9), and in 1995 (M5.4 and M5.8). Earthquake hazards planning in Indian Wells Valley (IWV) has been centered on the LLF and ALF.

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Friday, April 24 1:00 - 2:00

S3: Smart Grid I

1:00 *Optimal PID Parameters Tunning for a DC-DC Boost Converter: A Performance Comparative Using Grey Wolf Optimizer, Particle Swarm Optimization and Genetic Algorithms*
Jesus Aguila-Leon (University of Guadalajara, Mexico & Universitat Politècnica de València, Spain); Cristian D. Chiñas-Palacios (Universidad de Guadalajara, Mexico & Universitat Politècnica de València, Spain); Carlos Vargas-Salgado and Elías Hurtado-Pérez (Universitat Politècnica de València, Spain); Edith Garcia (University of Guadalajara, Mexico)
pp. 40-45

1:20 *Comparison of Short-Term Load Forecasting Techniques*
Rajat Sethi and Jan Kleissl (University of California, San Diego, USA)
pp. 46-51

1:40 *Implementation of Critical Care Customer Within a Small-Scale Model of a Smart Grid*
Sean S Monemi (California State Polytechnic University at Pomona, USA)
pp. 52-57

Friday, April 24 2:00 - 2:30

B24-2: Break 2

Friday, April 24 2:30 - 3:50

S4: Energy Efficiency I

2:30 *AC Vs DC Power Efficiency Comparison of a Hybrid Wind/Solar Microgrid*
Diego Aponte-Roa (Universidad Ana G. Méndez, Gurabo Campus, Puerto Rico); Gerardo Guerrero Cabarcas (University of Puerto Rico at Mayaguez Campus, Puerto Rico); Wayne Weaver (Michigan Technological University, USA)
pp. 58-62

2:50 *Optimal Seasonal Wind Curtailment for Islanded Provisional Microgrid Operation*
Tarek Masaud (Marshall University, USA)
pp. 63-67

3:10 *Sensor Node Design for Energy Savings in Building Energy Management Systems*
Daniel Fernando Espejel-Blanco and Jose Hoyo-Montano (Instituto Tecnológico de Hermosillo, Mexico); Jose Chavez and Fredy Hernandez-Aguirre (Tecnológico Nacional de México/Instituto Tecnológico de Hermosillo, Mexico)
pp. 68-74

3:30 *Clean Air with a Mongolian Ger*
Ivyann O Running, Dylan Sellers, Prabhakar Ramaraj and Paul McMullin (Brigham Young University, USA)
pp. 75-79

Friday, April 24 3:50 - 4:00

B24-3: Break 3

Friday, April 24 4:00 - 5:20

S5: Internet of Things I

4:00 *Implementing an IoT Energy Monitoring System Using the Challenge-based Learning Model*
Octavio Lasso-Lopez, Cecilia Gonzalez-Espinoza, Camilo Lozoya, Alberto Venzor-Mendoza, Alfredo Davila-Villalobos and Carlos Royo-Noble (Tecnologico de Monterrey, Mexico)
pp. 80-84

4:20 *Hybrid Environment IOT-Mapping of Over-Tourism and Air Pollution in the Azores Archipelago*
James Olmsted, Steve Mwangi, Korey R Pecha and Orlando Baiocchi (University of Washington, USA); Katalina Biondi (University of Central Florida, USA); Selina Teng (University of Washington, USA); Francisco Baiocchi (City University, London, United Kingdom (Great Britain))
pp. 85-91

4:40 *The Potential of New Data Sources in a Data-Driven Transportation, Operation, Management and Assessment System (TOMAS)*
Francis Aldrine Uy (Mapua Institute of Technology, Philippines); Larry A Vea, Matthew Binag, Keith Anshilo Diaz, Roy Gallardo, Kevin Jorge Navarro, Maria Teresa Pulido, Ryan Christopher Balela Pinca, Billy John Rudolfh I Rejuso and Carissa Jane Santos (Mapua University, Philippines)
pp. 92-99

5:00 *A Modular, Scalable Automation System for a Distribution Substation*
Bamdad Falahati and Tanvi Singla (SEL, USA); Poria Fajri (University of Nevada, Reno, USA); Esmaeil Safaee (SEL, USA)
pp. 100-104

Friday, April 24 5:20 - 5:30

B24-4: Break 4

Friday, April 24 5:30 - 6:50

S6: Water Resources Management

5:30 *Toward Sustainable Water System: Modeling Pipe Failure in Water Distribution Networks*
Thikra Dawood and Emad Elwakil (Purdue University, USA); Hector Mayol Novoa and José Fernando Gárate Delgado (National University of St Augustin of Arequipa, USA)
pp. 105-108

5:50 *Assessment of the Existing Drainage System in Infanta, Quezon Province for Flood Hazard Management Using Analytical Hierarchy Process*
Cris Edward Monjardin and Fibor Tan (Mapua University, Philippines); Francis Aldrine Uy (Mapua Institute of Technology, Philippines); Franz Jayson Bale, Emmanuel Voluntad and Ria Mae Batac (Mapua University, Philippines)
pp. 109-115

6:10 *Application of Artificial Neuro-Fuzzy Interference System in Rainfall-Runoff Modelling at Imus River, Cavite*
Cris Edward Monjardin (Mapua University, Philippines); Francis Aldrine Uy (Mapua Institute of Technology, Philippines); Fibor Tan, Kevin Christian Javate, Russel Carpio and John Patrick Laquindanum (Mapua University, Philippines)
pp. 116-123

6:30 *Smart Watershed Monitoring for near Real-time Hydrologic Modeling in a Tropical Environment: The Case of Magat River Basin in Luzon, Philippines*
Fibor Tan, Francis Aldrine A. Uy, Febus Reidj G. Cruz, Cris Edward F. Monjardin, Marlou Ryan Ga, Ryan Gania, Rose Ann F. Amado, Mark Kevin V. Cachuela and Roy G. Gallardo (Mapua University, Philippines)
pp. 124-128

Saturday, April 25

Saturday, April 25 8:00 - 8:40

K3: Keynote

"Challenges of the Connected Vehicle Revolution"
Kay Das, Life Member IEEE

There is currently much on-going activity in the research and design of systems to enhance the safety of vehicular traffic on roads and highways. These include vehicle-to-vehicle based and vehicle-to-infrastructure based electronics systems with extension to personal devices. These systems need to work collaboratively with acceptable latencies in an intelligent and reconfigurable network environment. This is characterized by multiple localized and dynamically changing motion control loops which include each individual vehicle driver (and pedestrian). Systems will comprise a mix of existing and new technologies such as laser, imaging, computer vision, radar, cellular, WiFi, GPS, millimetric Waves, and others. A range of products and systems will compete for market entry from diverse developers and nations and the need for standardization is paramount. The behavior of an autonomously driven vehicle and how it could indeed improve accident rates compared to an intuitive human under diverse conditions is a contentious issue. The cost of failure is high as human life is in the loop. Replacing the intuition-driven human with multiple pre-programmed computing engines and sensor and actuator platforms will present a significant system and software engineering challenge. Not least because the transition from human to computer will not occur overnight.

A significant challenge exists in validating real time software-driven prototypes, final systems, and maintaining performance while in operation. The major players in this traffic evolution will be the government (legislative entity), the insurance companies (risk managing entities) and vehicle manufacturers and their technology partners (product developers). This will create new watersheds in the industry. The customers are vehicle drivers of all kinds: automobiles, trucks, tractors, vehicles with trailers, two-wheeled motorized vehicles, bicycles, and pedestrians. This presentation overviews some of the challenges and offers some directions for this burgeoning industry. A spotlight will be shone on lessons learnt from the aviation industry.

Saturday, April 25 8:40 - 10:20

S7: Sustainable Electronics II

8:40 *Auto-Configurable Feature in Universal Remote Terminal Unit (uRTU)*
Theerapong Fongjun, Jirayut Phontip, Arnan Jomtarax and Kumpee Suksomboon
(National Electronics and Computer Technology Center, Thailand)
pp. 129-133

9:00 *Sustainability Driven Performance Evaluation of Underground Smart Grid Conversion*
Daniel Chaves (CERTI Foundation, Brazil); Leticia Lagni Dagnese (Fundação CERTI, Brazil); Marcos Aurelio Izumida Martins (CERTI Foundation, Brazil)

pp. 134-141

9:20 *A Solar-Based Stand-Alone Family House for Energy Independence and Efficiency*
Bradley Postovoit, David Susoeff, Daniel Daghbas, Jonathan Holt and Ha Thu Le (California State Polytechnic University Pomona, USA)
pp. 142-147

9:40 *Effect of Printing Technology to Electricity and Environment*
Hisham A Alghamdi (Najran University & College of Engineering, Saudi Arabia)
pp. 148-151

10:00 *Event Flow Measurements in Remote Tropical Watersheds in the Philippines: The Need for Automated Weather-proof Devices*
Fibor Tan, Francis Aldrine A. Uy, Cris Edward Monjardin, Chennie Carissa A. Caja, Roa Shalemar R. Pornasdoro, Jeffrey Dave R. Sy, Larriz M.Samudio, Marc Julius A. Bunag, Jonel B. Tarun, Czeskian Z. Realo, Jasmin M. Domingo, Brylle C. San Agustin and John Cedrec D. Recalde (Mapua University, Philippines), Myra Donne T. Chua and Adonis B. Sigua (Mapua University, Philippines, Department of Public Works and Highways)
pp. 152-156

Saturday, April 25 10:20 - 10:30

B25-1: Break 1

Saturday, April 25 10:30 - 11:50

S8: Energy Efficiency II

10:30 *UAV Power Management, Generation, and Storage System Principles and Design*
Timothy W Kidd (629 E Myrtle Ave. & Cal Poly Pomona, USA); Zhen Yu (California State Polytechnic University at Pomona, USA)
pp. 157-164

10:50 *How the Fluorescent and LED Lamps Affect the DC Home Nanogrids*
Miguel Angel Cordova-Fajardo and E. S. Tututi (Universidad Michoacana de San Nicolás de Hidalgo, Mexico)
pp. 165-169

11:10 *Non-Linear Control Strategy for a Two-Body Point Absorber Wave Energy Converter Using Q Actor-Critic Learning*
Leila Ghorban Zadeh, David Glennon and Ted Brekken (Oregon State University, USA)
pp. 170-174

11:30 *A Better Policy for Electric and Low-Emission Cars Using Systems Thinking*
Arsalan Pasdar (University of South-Eastern Norway, Norway); Mo Mansouri (Stevens Institute of Technology, USA)
pp. 175-180

Saturday, April 25 11:50 - 12:20

L25: Lunch

Saturday, April 25 12:20 - 1:00

K4: Keynote

"Orbit Options for Near-Term Space Solar Power"
Seth D. Potter, Ph.D, SDP Space Systems

Studies of space solar power (SSP) for the commercial grid have usually considered transmitting power from geostationary orbit (GEO), via microwaves at frequencies below 10 GHz, where the atmosphere is relatively transparent. Due to beam divergence from that distance at such frequencies, system sizes must be large, leading to power levels of 1000 MW or more. However, the scale of the systems, and the need to develop low-cost routine access to space, make competing with traditional energy sources challenging in the near-term. More recently, studies by the US Naval Research Laboratory have considered SSP for nearer-term niche uses in remote locations. At such locations, providing power by conventional means can be challenging. Many remote locations are typically powered by generators, which depend on fuel delivered at great cost, often through hazardous environments. Power requirements for such users range from a few hundred kilowatts to several megawatts. Furthermore, some remote facilities are at high latitudes, which are inaccessible from geostationary orbit. This presentation will consider alternative orbits. Examples of such orbits are highly inclined orbits, which may be sun-synchronous, or have a repeating ground track, or both. In addition, elliptical orbits may be considered which have relatively long dwell times over ground sites that are beneath their apogee. Since non-GEO orbits do not remain over their intended ground sites, systems or constellations, of satellites must be designed, in which beam handoffs can provide a given ground site with power much of the time, while making maximum use of the satellites as multiple satellites serve multiple ground sites.

Saturday, April 25 1:00 - 2:00

S9: Smart Grid II

1:00 *A New Model to Analyze Power and Communication System Intra-and-Inter Dependencies*
Sohini Roy, Harish Chandrasekaran and Anamitra Pal (Arizona State University, USA); Arunabha Sen (ASU, USA)
pp. 181-188

1:20 *Disaggregation of Behind-the-Meter Solar Generation in Presence of Energy Storage Resources*
Chung Ming Cheung, Sanmukh Kuppannagari, Rajgopal Kannan and Viktor K. Prasanna (University of Southern California, USA)
pp. 189-195

1:40 *Real Time Indoor Positioning System for Smart Grid Based on UWB and Artificial Intelligence Techniques*

Long Cheng (ABB Inc., USA); Hao Chang (Rensselaer Polytechnic Institute, USA); Kexin Wang (University of Minnesota, Twin Cities, USA); Zhaoqi Wu (University of Illinois at Urbana-Champaign, USA)
pp. 196-202

Saturday, April 25 2:00 - 2:30

B25-2: Break

Saturday, April 25 2:30 - 3:50

S10: Internet of Things II & Societal Implications / Quality of Life I

2:30 *Mitigation of Grid Susceptibility Caused by Behind-the-Meter Solar Generation*
Michael D Balestrieri, Anthony James, Matthew Kedis and Frank M Gonzales (Southern California Edison, USA)
pp. 203-210

2:50 *Electric Utilities' Role in Promoting and Advancing Smart City Solutions*
Emily T Chang (Boston University, USA); Shay Bahramirad and Daniel Kushner (Commonwealth Edison, USA)
pp. 211-215

3:10 *Toward Smart and Sustainable Infrastructure Solution: Assessment and Modelling of Qualitative Factors Affecting Productivity in Microtunneling Projects*
Emad Elwakil (Purdue University, USA); Mohamed Hegab (California State University Northridge, USA)
pp. 216-223

3:30 *MiSA - A System for a Microlending Service to Assist Edge Communities*
Yash Mahajan (Virginia Tech, USA); Dilip Krishnaswamy (Reliance Industries Ltd, India); Pethuru Raj Chelliah (IBM, India)
pp. 224-231

Saturday, April 25 3:50 - 4:00

B25-3: Break

Saturday, April 25 4:00 - 5:20

S11: Societal Implications / Quality of Life II

4:00 *The Community Human Development Index (CHDI): Localizing Sustainable Development Goals Across Scales*
Suraj Sheth and Luis Bettencourt (University of Chicago, USA)
pp. 232-238

4:20 *Expert-based Risk Level Assessment Model for Microtunneling Projects*

Emad Elwakil (Purdue University, USA); Mohamed Hegab (California State University Northridge, USA)
pp. 239-245

4:40 *Big Charging: The Large Power Demanding Future of Electric Vehicles*
Jenna R DeLozier and Katrina Kelly-Pitou (University of Pittsburgh, USA); Joseph Petti (Dominion Energy, USA); Brandon Grainger (University of Pittsburgh, USA)
pp. 246-253

5:00 *Tile Arrays for Space Based Solar Power Satellites*
Charles Jackson (Northrop Grumman, USA)

Saturday, April 25 5:20 - 5:30

B25-4: Break

Saturday, April 25 5:30 - 6:50

S12: Sustainable Electronics III & Renewable/Alternative Energy

5:30 *A Luminous-free Remote Surveillance System with Inherent Video Overlay and IP Encoder*
Muhammad Basit, Mohsin Khalil, Majid Khan and Muhammad Murtaza (National University of Sciences and Technology, Pakistan)
pp. 254-258

5:50 *Optimal Energy Storage Schedules for Load Leveling and Ramp Rate Control in Distribution Systems*
Kevin Morrissey (SGS, USA); Salman Kahrobaee and Andrew Ioan (SCE, USA)
pp. 259-262

6:10 *Gender Considerations in Load Estimation for Rural Electrification*
Jane Namaganda-Kiyimba (The University of Manchester, United Kingdom (Great Britain)); Joseph Mutale (University of Manchester, United Kingdom (Great Britain))
pp. 263-270

6:30 *A Tool for Modernizing the Grid*
Brad T Jensen (ABB, USA); Ryan Uyehara (Burns & McDonnell, USA)
pp. 271-274