

8th IEEE Conference on Technologies for Sustainability

IEEE SusTech2021



TECHNOLOGIES THAT IMPROVE AIR, WATER, ENERGY, FOOD AND HUMAN LIFE

Virtual - April 22-24, 2021

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Welcome Message from the Conference Chairs

Welcome to the 8th IEEE Conference on Technologies for Sustainability - Technologies that contribute to sustainability in all applications affecting human life, held virtually from April 22 to 24, 2021.

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 entire program is once again online – in fact a format that is now become mainstream!

Our 3-day program features keynote speakers, peer-reviewed technical paper presentations across 11 thematic sessions, a student poster contest, panel discussions and workshop.

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 2021 online Student Poster Session on Wednesday April 21 and Thursday April 22, 2021. 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 Los Angeles, Orange County and Coastal Los Angeles Sections, IEEE Region 6, IEEE-USA; and co-sponsors the IEEE Power and Energy (PES) Society, the IEEE Society on Social Implications of Technology (SSIT), IEEE Technology and Engineering Management (TEMS) Society and exhibitor MECO.

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 <https://iee-sustech.org/> will provide you information on the Program for SusTech 2021. 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.

- Gora Datta, FHL7, SMIEEE SusTech 2021 General Chair
- Charlie Jackson, PhD, FIEEE SusTech 2021 Technical Program Committee Chair
- Ed Perkins, SMIEEE SusTech 2021 Emeritus Chair
- David E González, SMIEEE SusTech 2022 General Chair

Conference Committee

Position	Name	Organization
General Chair	Gora Datta	CAL2CAL
Vice Chair	David E. Gonzalez	U.S. Navy
Emeritus Chair and Co-Founder	Ed Perkins	Consultant
Program Chair	Charlie Jackson	Northrop Grumman
Program V. Chair	Ed Perkins	
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Marketing & Publicity co-Chair	Arie Shen	IEEE Orange County
	Sevada Isayan	Glendale CC
Social Media	Vivek Gupta	NXP Semiconductor
	Catherine Tran	Intel
Ambassador Program Chair	Sharan Kalwani	Automotive Industry
Ambassador Program - University Outreach	Vasilios I. Manousiouthakis	UCLA
University Student Liaison Chair	Alberto Tam Yong	Applied Medical
Local Arrangements	David E. Gonzalez	U.S. Navy
Exhibits Chair	Arie Shen	
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Treasurer	Russ Kinner	
Student Posters Chair	Sean Monemi	Cal Poly Pomona
Website	Ed Perkins	
	Alberto Tam Yong	
Technical Sponsors		
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IEEE/Power and Energy Society (PES)	Pat Ryan	PES Executive Director
IEEE/Society Social Implications of Technology (SSIT)	Jay Pearlman	SSIT Conferences VP
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Coastal LA Section	Aleksandar Babic	
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Phoenix Section	Vivek Gupta	NXP Semiconductor
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SusTech 2021 Exhibitors and Sponsors

Exhibitors

[MECO](#)



MECO is building the next generation of water purification equipment and systems. For over 90 years, we've been committed to providing our customers with efficient, effective solutions with sustainability at their core. Together, we're protecting the planet and changing the way the world interacts with water.



Financial Sponsors



[Oregon Section](#)

IEEE Oregon Section

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



[IEEE Region 6](#)

IEEE Region 6

IEEE Region 6 serves approximately 50,000 members in the Western USA from Alaska to New Mexico and Montana to Hawaii. The Region has 35 Sections and 2 sub-Sections, organized into 5 Areas: Northeast, Northwest, Central, Southern and Southwest.



[Coastal LA Section](#)

IEEE Coastal Los Angeles Section

The Coastal LA Section starts in Long Beach, in the south, and goes to Malibu in the north. They have three engineering schools, UCLA, LMU, and CSULB in the section. There are a number of large companies in their area, including Raytheon, Boeing, Northrop Grumman, and more. It's a great place to be an electrical engineer.



[Orange County Section](#)

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

The IEEE San Fernando Valley Section serves approximately 800 members. IEEE SFV encompasses the geographical area North-West of Los Angeles.



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.



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

Representing beautiful Los Angeles, California, and its close surroundings, the Metro LA IEEE is determined to be a leading force in innovation and in reporting this innovation.

IEEE-USA

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.



Technical Sponsors



[IEEE Power & Energy Society](#)

The IEEE Power & Energy Society (PES) provides the world's largest forum for sharing the latest in technological developments in the electric power industry.



[IEEE Society on Social Implications of Technology](#)

IEEE SSIT discusses the impact of technology on society, including both positive and negative effects.



[IEEE Technology and Engineering Management Society](#)

“Leaders Enabling Projects/Services Success For Good”

Technical Program Committee

Position	Name	Organization
General Chair	Gora Datta	CAL2CAL
Program Chair	Charlie Jackson	Northrup
Program V. Chair	Edward Perkins	Consultant
Tracks		
Electronics	Adil Usman	Indian Institute of Technology Mandi
Energy Efficiency	Hengzhao Yang	New Mexico Institute of Mining and Technology
Intelligent Transportation Systems	Dr. Youngil Kim	George Washington University
Renewable/Alternate Energy	Mohamed Osman	Washington State University-Tri-Cities
Smart Grid	Sean Monemi	California State Polytechnic University at Pomona
Members/Reviewers	Nuno Domingues	ISEL, Portugal
	David Gonzalez	US Navy
	Vivek Gupta	NXP Semiconductor
	Sevada Isayan	CSUN/GCC/IEEE
	Salman Kahrobaee	SCE
	Muhammad Asif Khan	Qatar University
	Russ Lefevre	TSC
	Albert Lin	IEEE SFV Section
	Rakeshkumar Mahto	California State University Fullerton
	Julanne McCulley	Weber State University
	Raja Mohamed	King Faisal University
	Venugopal Pallayil	ARL, Singapore
	Anamitra Pal	Arizona State University
	Sachin Soni	First Solar
	Mojisola USIKALU	Covenant University, Nigeria

Keynote Speakers

Jack Brouwer	<u>“100% Renewable And Zero Emissions Energy With Hydrogen”</u>
Walter Iu	<u>“ESG – Environmental, Social, and Corporate Governance”</u>
Nirupama Prakash Kumar	<u>“New paradigm in renewable microgrids – let’s change our thinking!”</u>
Maike Luiken	<u>“New Initiatives in Advancing IEEE Sustainability Thought Leadership”</u>
Dr. Vasilios I. Manousiouthakis	<u>“Analysis and Synthesis of Sustainable Systems”</u>
Dr. Benjamin Park	<u>“Enabling What Customers Want: The Story of Enevate’s Technology”</u>
Jay Schmuecker and David Toyne	<u>“Our Tractor Fuels and Farm Fertilizer Demonstration System”</u>
Stafford Sheehan	<u>“A new chemical process for ethanol production from carbon dioxide, water, and electricity”</u>
Daniel K. Tabor	<u>“If We Build It They Will Come – The Intersection of Technological Systemization and Customer Proficiency”</u>

100% Renewable And Zero Emissions Energy With Hydrogen

Jack Brouwer, U.C. Irvine

Abstract:

Renewable, ultra-low emissions and high efficiency energy conversion systems will be required to introduce energy resource and environmental sustainability. In particular the dynamic dispatch, massive energy storage capacity, and ubiquitous transmission and distribution of energy that the power-to-gas and hydrogen energy storage concepts provide will become essential to enable a 100% renewable economy. In addition, these concepts enable zero greenhouse gas and zero criteria pollutant emissions energy conversion that spans across applications in the built environment, to transportation, to utility grid network support and sustainability. Recent research on the dynamics and control of electrochemical energy conversion systems to enable this future with the hydrogen vector will be discussed.

Bio:

Jack Brouwer, Ph.D. is Professor, Mechanical and Aerospace Engineering, Civil and Environmental Engineering, U.C. Irvine; and Director, National Fuel Cell Research Center & Advanced Power and Energy Program. Prof. Brouwer is an energy system dynamics expert with research interests in advanced, alternative and renewable energy systems development; dynamic simulation and control systems development; energy system thermodynamics, design, and integration; electrochemical conversion devices and systems such as fuel cells,



electrolyzers and batteries; hydrogen production, storage and conversion systems; and electrochemical reactions with concurrent heat, mass and momentum transfer. Prof. Brouwer obtained his M.S. and B.S. in Mechanical Engineering from the University of California, Irvine and his Ph.D. in Mechanical and Chemical Engineering at MIT.

ESG – Environmental, Social, and Corporate Governance

Walter Iu, PwC Strategy&

Abstract:

Businesses from starts ups to major corporations are fundamentally questioning their purpose. Is profitability and shareholder return the most important goal or is it something else? ESG: Environmental, Social, and Governance concerns are at the forefront of the sustainability discussion. Can profits and sustainability be balanced?

In this talk we'll discuss the current and changing ESG landscape and how to think about each element of the ESG acronym. What concerns are top of mind and what frameworks and metrics can be used to understand what is good or bad? We'll touch on the pros and cons of ESG overall and the challenges that lie ahead.

Bio:



Walter Iu is a Senior Associate at PwC Strategy& where he serves clients across several industries including technology and industrial products. He has helped over a dozen Fortune 500 corporations on a range of problems from transforming portfolios to improving company operations. Walter earned his undergraduate and master's degrees in electrical engineering from the University of Southern California. He has been involved with the IEEE for almost 10 years and has served in variety of volunteer roles especially for Young Professionals in Southern California and Washington D.C.

New paradigm in renewable microgrids – let's change our thinking!

Nirupama Prakash Kumar, Bloom Energy

Abstract:

The race to reduce greenhouse gas emissions is the defining challenge of our time. Pressure is mounting for our electric system to get cleaner, faster. While important strides have already been

made, the rising frequency and intensity of extreme weather events in recent years has underscored the critical need to invest in resiliency.

Stakeholders across the organizational spectrum are navigating an unprecedented risk landscape – energy security has become table stakes as people search for solutions that can keep the lights on amidst the growing frequency of threats.

Fortunately, we are now in a time where there are multiple options for sourcing electricity. Emerging technologies and business models represent a key opportunity to overcome the compounding challenges of reducing carbon emissions while expanding the resilience of our nation’s electric system. This talk will present the new paradigm in renewable microgrids.

Bio:

Nirupama Prakash Kumar, SMIEEE earned her undergraduate degree in power systems engineering from University of Mysore, India. She finished her MS in Energy Systems from the University of Washington in Seattle. Her research interests included effective demand response techniques to improve energy efficiency. She completed her MBA from Cornell University where she was recognized both as an ‘Environmental Finance and Impact Investing Fellow’ as well as an ‘Emerging Markets Fellow’. She has worked for the Pacific Northwest National Laboratory, NextEra Energy, and a FACTS startup called Smart Wires. Currently, she is Senior Product Manager in Microgrids with Bloom Energy. Niru’s interests also include the most cost-effective methods of making technology accessible to the base of the pyramid. Niru is heavily involved with IEEE and its humanitarian technology efforts. She is also the IEEE Region 6 Humanitarian Activities Coordinator and IEEE HAC Project Committee chair. She works with the South Asia Working Group of IEEE Smart Village. She is also part of IEEE USA’s Energy Policy Committee.



New Initiatives in Advancing IEEE Sustainability Thought Leadership

Maike Luiken, IEEE VP MGA 2021

Bio:



Maike Luiken, PhD, SMIEEE, IEEE-HKN, is 2021 IEEE Vice President – Member & Geographic Activities. She served as President of IEEE Canada in 2018 – 2019 and, in 2018, as Chair, Policy Track, IEEE Internet Initiative. Currently Adjunct Research Professor at Western University, she was the founding Director of the Bluewater Technology Access Centre (now Lambton Manufacturing Innovation Centre) following eight years as Dean at Lambton College with a number of portfolios: School of Technology and Applied Sciences, Business Development, Sustainable Development and Applied

Research. Her strategic leadership in the development of the applied research & innovation capacity and portfolio led to Lambton College becoming one of the three top Research Colleges in Canada.

Her areas of interest and expertise span diverse technical areas from ICT, energy and water to advanced manufacturing and nanotechnologies as well as technology design principles, ethics in design and policy associated with their implementation. She has particular interest in how progress in one area, e.g., in ICT, enables advances in other disciplines and in how deployment of various technologies contributes – or not – to achieving sustainable development.

Maïke Luiken has experience in the public and private sectors in Canada and has worked in the USA and Germany. She owns a small technology consulting practice and is a co-owner and managing director at a start-up company.

Analysis and Synthesis of Sustainable Systems

Dr. Vasilios I. Manousiouthakis, UCLA

Abstract:

The field of sustainability has traditionally suffered from a lack of specificity, that leads to misinterpretations regarding a system's sustainability status. The newly introduced concept of "Sustainability Over Set" (SOS) is presented. The SOS concept readily allows the incorporation of human input into system sustainability assessment, by requiring the sustainability practitioner to develop/employ a mathematical model of the studied system, such as for example a set of ordinary differential equations whose solution captures the system's dynamic behavior.

Bio:

Dr. Vasilios I. Manousiouthakis is a Distinguished Professor, UCLA Chemical and Biomolecular Engineering Department, and the Director, Hydrogen Engineering Research Consortium (HERC).

Dr. Manousiouthakis received his Diploma, M.S., and Ph.D. degrees all in Chemical Engineering from the National Technical University of Athens (1981) and the Rensselaer Polytechnic Institute (1985, 1986) respectively. Dr. Manousiouthakis has over 100 refereed journal publications, 2 patents, numerous conference publications and presentations, and has supervised 16 PhD students, many of which are in academic positions. He has received the NSF Presidential Young Investigator Award (1988), the Northrop Outstanding Junior Faculty Research Award (1989) the AIChE Ted Petersen Best Student Paper Award (Co-author 1998, Co-author 2001), a UCLA/AIChE Student Chapter Award (2007), the AIChE Environmental Division Cecil Award (2010), the UCLA/AIChE Student Chapter Professor



of the Year Award (2011), AIChE Fellow (2012), and the AIChE Sustainable Engineering Forum Research Excellence in Sustainable Engineering Award (2014).

He has been at UCLA since 1985, where he currently holds the rank of Professor. He has served as Department Vice-Chair and Chair, Chair of the UCLA Academic Senate Committee on Committees, Co-Chair of the UCLA Teaching Assessment Committee, Co-Director of the UCLA Process/Control Systems Engineering Consortium, and Director of the UCLA Hydrogen Engineering Research Consortium. He is considered the father of mass integration (mass exchange network synthesis) and of the globally optimal process network synthesis conceptual framework termed IDEAS. He is an expert on Green-Engineering/Sustainability, Systems Engineering, and the Hydrogen Economy.

Enabling What Customers Want: The Story of Enevate's Technology

Dr. Benjamin Park, Enevate

Abstract:

Customers demand more and more and vehicle companies will have to compete on features people want. In order to drive widespread adoption of EVs, the vehicles will not only have to match that of ICE vehicles, but they will have to be even more convenient than gas cars. EVs should be able to charge in the same amount of time as ICE vehicles as well as offering other value-added features not available on ICE vehicles. Enevate's pure silicon Li-ion battery technology features unique properties including extreme fast charge while increasing high energy density, wide temperature operation, safety, and reduced cost to help break down barriers to mass adoption of electric vehicles.

Bio:



Dr. Benjamin Park founded Enevate (originally Carbon Micro Battery) in 2005 and, as CTO, leads the battery research, development, and engineering efforts. With more than 18 years of experience, he is an expert in surface and bulk chemistries, novel battery manufacturing techniques, battery materials screening and development, and battery chemistry. Ben has authored more than 45 book chapters, technical journals, talks and conference publications and has more than 100 patents issued or filed. He holds a doctorate in mechanical and aerospace engineering from the University of California, Irvine, a master's degree in electrical engineering from Purdue University, and a bachelor's degree in electrical engineering from Seoul National University in Korea. Dr. Park is also the recipient of several awards, including the Orange County Business Journal Innovator of the Year and the Estus H. and Vashti L. Magoon Award for Excellence in Teaching.

Our Tractor Fuels and Farm Fertilizer Demonstration System

Jay Schmuecker and David Toyne, Pinehurst Farm

Abstract:

The time is approaching when we will be dependent on renewable energy sources. We will address the installation on an Iowa farm the demonstration Hydrogen, Nitrogen, and Ammonia generation system that is used to fuel a tractor internal combustion engine with hydrogen of hydrogen/ammonia. These products are made in batches using solar arrays as the power source. There are no carbon emissions in either the generation or consumption of these products. The ammonia is also used to fertilize corn cropland.

For additional information see <http://solarhydrogensystem.com/>

Bio:

[Jay Schmuecker](#) worked for more than 50 years building planetary spacecraft at NASA's Jet Propulsion Laboratory. Since retiring, he has been developing a solar-powered hydrogen fueling and fertilization system at Pinehurst Farm in eastern Iowa.



A new chemical process for ethanol production from carbon dioxide, water, and electricity

Stafford Sheehan, Air Company

Abstract:

A new chemical process for ethanol production from carbon dioxide, water, and electricity.

Bio:



Dr. Stafford Sheehan is co-founder and Chief Technology Officer of Air Company, where he leads a team scaling up technology that transforms carbon dioxide into consumer products. He and his team constructed and operate a 3,000 sq ft pilot plant in Brooklyn, New York, where they produce carbon-negative ethanol, as well as mix and bottle Air Company's vodka and hand sanitizer products that are available in New York and California.

If We Build It They Will Come – The Intersection of Technological Systemization and Customer Proficiency

Honorable Daniel K. Tabor, President, [MOVE LA](#)

Abstract:

Building a culture of climate awareness that leads to climate proficiency within all customers will require intentional technological systemization across multiple platforms and areas of opportunity. When in realtime information can be synthesized and delivered to adults and youth in ways that support belief systems and values, fewer arguments about the impact humans are having on the climate will result in leaders grabbing their balls, going home, and isolating themselves from the truth and the looming opportunity. Through the stages of identification, monitoring, modeling, predicting, and informing, impacts of human behavior on the environment, climate, and human health can be informed and altered. By closing the gap between what Seniors know through experience and children learn through experimentation we will hasten the achievement of Customer Proficiency.

Bio:

Daniel K. Tabor is currently practicing as an Adjunct Professor in the Child Development, Business, Entrepreneurship and Technology Systems Department, within the School of Business & Civic Engagement, Los Angeles Trade-Technical College, teaching courses in: Business; Small Business Management/Entrepreneurship; Supervision; Organization and Management Theory, Business Law.

Daniel's experience comprises a broad area of human engagement. Expertise within Government / Corporate Management, Policy Development, Research, Intergovernmental Relations, Planning, Program Design, Evaluation & Idea Life-cycle Management, Development & Advancement, Advocacy, Labor Relations / Human Resource Management, Community Engagement.



As President of **MOVE LA**, a coalition of public advocacy organizations, corporations, non-government agencies, community/neighborhood groups, and individuals. We are committed to the improvement and expansion of public transportation in Los Angeles County, the state of California, and the nation. We develop public policy and programs, to assess transportation projects and modalities, to clean the air, addressing climate change, creating sustainable and liveable communities, affordable housing, and promoting local economic and community benefits. I speak and write on these and related issues.

As the **Southern California Liaison, California Task Force, Office of the Secretary, U.S. Department of Commerce during the Clinton Presidency**, Daniel represented the U.S. Commerce Secretary and the Department of Commerce. Tasked to Identify, Initiate and Facilitate the advocacy of federal resources to local efforts that seek to create jobs, revitalize the economy

and business environment. Advise policy development with state and local, public and private sector leaders and labor organizations in coordination with federal and state agencies to design and implement economic programs. TECHNOLOGY TRANSFER – Urban Focus Policy, Program design, Team recruitment, and implementation. Review and recommendation of AARPA and DARPA proposals for the specific deployment of emerging technologies to address economic goals in Southern California Communities. Example: The Drew Tele-Ophthalmology trial provided ophthalmology services to residents of a LA County-operated Housing Development. Services include screening, diagnosis, case management, specialty referral, and job training.

Currently, a partner in three climate and sustainability enterprises Daniel is committed to solutions not simply conversations about saving all life on the planet.

A Pescatarian, Daniel's desired avocation is chasing Tuna.

Focused Sessions & Panels

Day/Time	Sessions Title	ID
April 22 9:05- 10:25 AM	Sustainability for 5G and 6G	FS1
April 23 9:00 – 10:20 AM	IEEE Standards and Initiatives for Sustainability: The path to a smart electric power system	FS2
April 24 11:10 AM – 12:10 PM	IEEE Standards and Initiatives for Sustainability: “Building an Enhanced IEEE Sustainability Community – New Initiatives and Standards Activities to Accelerate and Amplify IEEE Leadership in Supporting Sustainable Development Goals”	FS3
April 22 10:30 – 11:50 AM	The New Norm? Water Supply Challenges and Resiliency for California	Panel 1
April 22 2:45 – 4:10 PM	Future Networks & Applications Roadmap for Sustainable Cities/Societies	Panel 2
April 23 3:50 – 5:10 PM	Cybersecurity for Sustainable Infrastructure	Panel 3
April 24 9:55 – 11:05 AM	Young Professionals Panel – Sustainability in Tech Companies	Panel 4

FOCUSED SESSIONS

FS1: Sustainability for 5G and 6G

Date: April 22, 9:05- 10:25 AM PT

- “6G: Towards a More Connected and Sustainable World”
Mohamed-Slim Alouini, King Abdullah University of Science and Technology (KAUST)
- “A System of Systems (SoS) for Assessing & Optimizing Networks for Energy Efficiency”
Brian Zahnstecher, PowerRox LLC, Co-chair of the IEEE 5G Roadmap Energy Efficiency Working Group

6G: Towards a More Connected and Sustainable World

Mohamed-Slim Alouini, King Abdullah University of Science and Technology (KAUST)

Abstract:

The role of Internet and Communication Technology (ICT) in bringing about a revolution in almost all aspects of human life needs no introduction. It is indeed a well-known fact that the transmission of the information at a rapid pace has transformed all spheres of human life such as economy, education, and health to name a few. In this context, and as the standardization of the fifth generation (5G) of wireless communication systems (WCSs) has been completed, and 5G networks are in their early stage of deployment, the research visioning and planning of the sixth generation (6G) of WCSs are being initiated. 6G is expected to be the next focus in wireless communication and networking and aims to provide new superior communication services to meet the future hyper-connectivity demands in the 2030s. In addition, keeping in mind that urbanized populations have been the major beneficiary of the advances offered by the previous generations of WCSs and motivated by the recently adopted United Nations Sustainability Development Goals intended to be achieved by the year 2030, 6G networks are anticipated to democratize the benefits of ICT and to bring global connectivity in a sustainable fashion in order to contribute to developing tomorrow's digitally inclusive and green world. In this context, this talk aims to (i) provide an envisioned picture of 6G, (ii) serve as a research guideline in the beyond 5G era, and (iii) go over some of the recently proposed green technologies to offer high-speed connectivity not only in urban environments but also in under-covered areas in order to serve and contribute to the development of far-flung regions.

Bio:



Mohamed-Slim Alouini was born in Tunis, Tunisia. He received the Ph.D. degree in Electrical Engineering from the California Institute of Technology (Caltech), Pasadena, CA, USA, in 1998. He served as a faculty member in the University of Minnesota, Minneapolis, MN, USA, then in the Texas A&M University at Qatar, Education City, Doha, Qatar before joining King Abdullah University of Science and Technology (KAUST), Thuwal, Makkah Province, Saudi Arabia as a Professor of Electrical Engineering in 2009.

A System of Systems (SoS) for Assessing & Optimizing Networks for Energy Efficiency

Brian Zahnstecher, PowerRox LLC, Co-chair of the IEEE 5G Roadmap Energy Efficiency Working Group

Abstract:

The International Network Generations Roadmap (INGR) Energy Efficiency Working Group (EE WG) originally wanted to create a block diagram to facilitate working with other WGs and clearly illustrate relations between key stakeholders and network constituents. This effort grew to not only serve as a method to document these relationships, but also quickly became an obvious consolidation of concepts and something we wanted to expand as a usable tool to drive the EE WG roadmap chapter creation methodology.

From this high-level, our goal was to establish a system in which all these black boxes can “talk” to each other in our “global currency” of energy. Once all black box outputs are translated into a global currency, both static and dynamic analyses can be performed to provide an extremely useful tool that allows any one network constituent to assess the state of any network configuration as well as assess the impact of any black box (or boxes) on another. Ultimately, the best situation is to have such a tool that can also be used to optimize a network configuration for energy efficiency. At the very least, it should be able to recognize network bottlenecks and provide reporting and/or recommendations on how to alleviate these bottlenecks and/or optimize specific blocks for maximal energy efficiency.

Bio:

Brian Zahnstecher is a Sr. Member of the IEEE, Chair of the IEEE SFBAC Power Electronics Society (PELS), sits on the Power Sources Manufacturers Association (PSMA) Board of Directors, is Co-founder & Co-chair of the PSMA Reliability Committee, Co-chair of the PSMA Energy Harvesting Committee, and is the Principal of PowerRox. He Co-chairs the IEEE Future Directions (formerly 5G) Initiative webinar series and is the founding Co-chair of the IEEE 5G Roadmap Energy Efficiency Working Group and has lectured on this topic at major industry conferences. He previously held positions in power electronics with industry leaders Emerson Network Power (now Advanced Energy), Cisco, and Hewlett-Packard. He has been a regular contributor to the industry as an invited keynote speaker, author, workshop participant, session host, roundtable moderator, and volunteer. He has over 15 years of industry experience and holds Master and Bachelor degrees from Worcester Polytechnic Institute.



IEEE Standards and Initiatives for Sustainability

FS2: The path to a smart electric power system

Date: April 23, 9:05 – 10:25 AM PT

This session will provide an overview of Smart Grid activities within IEEE, NIST and other industry efforts. We will include a discussion of the NIST Framework and Roadmap for Smart Grid Interoperability (V4.0) and IEEE P2030 Guide for Interoperability of the Electric Power system standard project. We will also discuss other industry activities required to support the deployment of smart grid.

Agenda

Time (PT)	Topic	Description
9:05 AM	Introduction of Smart Grid Activities	Overview of standards projects and outreach activities
9:15	NIST Framework and Roadmap for Smart Grid Interoperability	Review Concept and new elements of Release 4.0
9:40	IEEE 2030 Smart Grid Approach	Discuss Power Systems, Communications Technology and Information Technology
9:45	IEEE P2030 Revision	Overview of Active Project
10:00	Use Cases and Industry Support Activities	Overview of needed industry activities and programs
10:15 AM	Summary and Takeaway Q&A	

Speakers:

- **Avi Gopstein** – Smart Grid Program Manager, National Institute of Standards and Technology (NIST)
- **Doug Houseman** – Principal Consultant at 1898 & Co. A Burns & McDonnell division
- **Mark Siira** – IEEE P2030 Working Group Chair, IEEE Standards Coordinating Committee 21 Chair, IEEE SA Standards Board – Standards Review Committee (RevCom) and Audit Committee (AudCom)

Speaker Bios:

Mark Siira is a senior member of IEEE and currently active as a leader in several standards-making organizations – Concurrent leadership roles related to standards include:

- Chair of IEEE Standards Coordinating Committee 21 – IEEE Coordinating Committee on Interconnection and Smart Grid Interoperability
- Chair of IEEE P2030 – Guide for Smart Grid Interoperability, IEEE 2030.2-2015 – Guide for Energy Storage Interoperability, Vice-Chair for IEEE1547 Interconnection Standard Revision.



- Mark is also an active participant in the IEEE Power Systems Relaying Committee, including K10 Liaison, C26 Protection Testing.
- Mark is a member of the UL Standards Technical Panels 1741 (Inverters), UL2200 (Generators) and 3001 (Systems).

Mark has a Bachelor of Mechanical Engineering Degree from GMI Engineering and Management Institute (now Kettering University), and an MBA from Harvard Business School.

IEEE Standards and Initiatives for Sustainability

FS3: “Building an Enhanced IEEE Sustainability Community – New Initiatives and Standards Activities to Accelerate and Amplify IEEE Leadership in Supporting Sustainable Development Goals”

Date: April 24, 11:05 AM – 12:00 PM PT

Speaker: Rudi Schubert, IEEE Standards Association

Standards are an enabler of emerging technology solutions and a key to the interoperability of products and systems. The IEEE Standards Association (IEEE SA) has published thousands of standards, developed by IEEE volunteers across the spectrum of technology areas covered by IEEE technical societies. In recent years, the IEEE SA has gone beyond standards, using its well established consensus building capabilities to address new technology issues at very early stages to incubate the next generation of standards based solutions. Additionally, the societal context of technology has become increasingly important in establishing the foundational considerations for future standardization initiatives. From the ethical considerations of artificial intelligence to new initiatives in sustainability and renewable energy, IEEE SA programs are working to stay ahead of rapidly evolving technologies and societal priorities. These programs are open, transparent and inclusive, welcoming the ideas and contributions of all. This presentation will provide an overview of IEEE SA programs relative to sustainability, IEEE initiatives to broaden participation of the sustainability community and emerging issues of interest to the SusTech community.

Bio:



Rudi Schubert is the Director, New Initiatives for the IEEE Standards Association, and lead for its Energy Practice. He leads the IEEE Industry Connections program, operating consensus building interest groups across a portfolio of emerging issues and topics including sustainability, renewable energy, autonomous and intelligent systems, big data, next generation vehicle technologies and many others. Before joining the IEEE, Rudi was a principal engineer for EnerNex, providing technical expertise on technology standards and testing programs to the National Institute of Standards and Technology (NIST). He also spent twenty years in progressively expanding leadership roles with Telcordia Technologies (formerly

Bellcore) establishing technical criteria and implementation methodologies that become a mandated compliance and certification standard used by US telecom carriers for technology deployment.

Rudi has a 25+ year record of leading, developing and implementing industry standards and testing programs, and facilitating teams to achieve consensus expectations for functional performance, interoperability, product robustness and safety. He holds bachelors and masters degrees in mechanical engineering from Stevens Institute of Technology, Hoboken, New Jersey.

PANEL SESSIONS

The New Norm? Water Supply Challenges and Resiliency for California

Panel 1: April 22, 10:30 – 11:50 AM

Panelists:

- Diane Gatza, P.E, Water Replenishment District of Southern California
- Russ Lefevre, Metropolitan Water District (MWD) Board of Directors
- Christopher Repp, LADWP

With the onset of Global Warming presenting a serious challenge to water supply in California, three of the major suppliers in the state are working to insure water will be available for the foreseeable future. The Los Angeles Department of Water and Power (LADWP) has a program, Operation NEXT Water Supply Program, to source 70% of water locally and recycle 100% of available treated waste water by 2035. The Water Replenishment District of Southern California (WRD) has initiated a program, WIN 4 ALL, that aims to utilize the 450,000 acre-feet of available storage space in the West and Central groundwater basins in conjunction with available recycled water sources to increase regional resiliency and sustainability. The Metropolitan Water District of Southern California (MWD) that supplies wholesale water to 19 million people in 6 counties is preparing the newest Integrated Water Resources Plan (IRP) whose purpose is to develop a planning document that can insure long-term supply reliability in an environmentally and effective way.

Panelist Bios:



Diane Gatza is a licensed P.E. and Water Resources Planning Engineer with the Water Replenishment District of Southern California(WRD). Diane manages several programs at WRD including the Regional Brackish Water Reclamation Program cleaning up a 600,000 AF salty groundwater plume and a managing a first of its kind joint partnership between WRD and the Los Angeles Department of Water and Power aiming to reclaim over 200 million gallons a day of treated waste water for groundwater basin replenishment. Diane has led large scale planning and high-profile programs in addition to the current programs she is managing. She received her bachelor's degree in Civil Engineering from California State Polytechnic University-Pomona.

Russ Lefevre is a Director on the Board of the Metropolitan Water District of Southern California representing the city of Torrance. He is a Past President of IEEE-USA and the IEEE Aerospace and Electronic Systems Society. He is a member of the Board of Governors of the IEEE Society on the Social Implications of Technology. As an IEEE-USA Congressional Fellow he served as Science Advisor to Senator Jay



Rockefeller of West Virginia. He has a B.S. and M.S. in Physics from the University of North Dakota and a Ph. D. from the University of California, Santa Barbara.

Christopher C. Repp is with Operation NEXT Water Supply Program, LADWP. Christopher holds a Chemical Engineering Bachelors with a Masters in Civil Engineering. Mr. Repp is a registered Civil Engineer with 16 years of engineering experience, having sought employment with the City of Los Angeles, in the Bureau of Sanitation, Engineering, and now, LADWP. His expertise lies mainly in Water Resources over the past decade. More recently his focus is in on Groundwater Rights and Development. He led the LADWP's Groundwater Development and Augmentation Plan, and is now helping to lead staff on the Operation NEXT Water Supply Program, which will serve to supply the City through groundwater replenishment and potable reuse by maximizing recycled water from the Hyperion Water Reclamation Plant.

Future Networks & Applications Roadmap for Sustainable Cities/Societies

Panel 2: April 22 2:40 – 4:00 PM

Panel Moderated by Fawzi Behmann

Speakers:

- [Narendra Mangra](#), GlobeNet LLC
- [Ashutosh Dutta](#), Johns Hopkins University
- [Fawzi Behmann](#), TelNet Management Consulting Inc.

Abstract:

5G is expected to contribute greater than \$100B to the economy within the next ten years; yet there is too little understanding of what it is, what it can do, how it will be used, and what comes next. This IEEE Future Networks session will provide overview of the technical aspects of 5G, discuss the socio-economics of wireless telecommunications and its impact on life in the 21st century, and outline the methods and expected timelines for deployment as 5G initially co-exists with, and eventually replaces, existing 3G/4G networks.

The panel is intended to unveil some of the rich capabilities of future networks empowered by key technologies such as 5G, IoT, AI and others. The focus will be on highlighting some of network capabilities roadmap empowered building new classes of applications and services that result in scalable and sustainable and secure ecosystem solutions.

Key topics that will be addressed:

- Key drivers for network evolution
- Capabilities & features roll out driving enhanced/new applications & services

- Key attributes of end-to-end Network performance: latency, QoS, Security, Management, Net Slicing
- Network Reliability and sustainability

Other topics for consideration:

- Mobile Edge computing/intelligence
- Standards

Along with some walkthrough examples:

- Public Safety
- Health & Wellness
- Autonomous Driving
- Smart Cities

Panelists will provide short positioning statements followed by discussion and Q&A.

Panelist Bios:

Fawzi Behmann, DL, MBA, M. Comp. Sc., Author, is President of TelNet Management Consulting Inc., IEEE ComSoc NA Regional Director and BoG member.



Fawzi is a visionary, thought leader, author and contributor in advancing adoption of technology in serving humanity. Fawzi spent over 35 years in industry and held various executive and leadership positions with Tier 1 companies in the areas of communications & networks. Fawzi as a principle architect at Teleglobe International Carrier, championed the definition and development of nation-wide integrated IoT based network management solution complied to ITU TMN M3000. He was a senior product manager with Nortel Networks for enterprise broadband, carrier edge and core product releases. Fawzi, also served as the Director of Strategic Marketing with Motorola/Freescale for SoC networking & Communications product line in Austin. Fawzi founded TelNet Management Consulting Inc. in

2009 offering consulting services in the areas of technology trends, positioning and development of smart networking ecosystem solutions. Explore disruptive technology enablement such as IoT, 5G, virtualization, analytics and security across multiple markets. www.telnetmanagement.com

Fawzi is a senior member of IEEE, Distinguished Lecturer and IEEE ComSoc Regional Director for North America Board (2020-2021) and BoG member. Fawzi is chairing several society chapters (ComSoc, Signal Processing, Computer, EMB, Cons Elec.). Fawzi is the chair for WCNC 2022 and has organized several events such as smart city summit (2019), Blockchain for Healthcare (2018) and Greentech of Smart Cities (2018) and Advanced technologies in Healthcare (2017). Fawzi has been a keynote speaker at several conferences, distinguished lecturer at different domestic and international events and organized panel session at Globecom, ICC, Himss, BHI, Smart connected cities, Enterprise IoT, and others. He has several publications and co-authored

book on “Collaborative Internet of Things for Future Smart Connected Life and Business” published by Wiley.

Fawzi was the recipient several awards from Industry and IEEE. Freescale CEO Diamond Chip Award in 2008, and IEEE Communications Society Chapter Achievement and Chapter of the year awards in 2015, 2017 and 2019, Outstanding Region 5 member award for 2013, 2014 and 2015. Most recently, Fawzi received IEEE USA Regional Professional Leadership Award in 2018, Outstanding Large section and Section Visionary chair for 2018-2019 and Exceptional Service Award

Fawzi holds a Bachelor of Science with honors and distinction from Concordia University, Montreal; Masters in Computer Science from the University of Waterloo, Ontario and Executive MBA from Queen’s University, Ontario Canada.

Narendra Mangra, GlobeNet LLC

Narendra Mangra, Principal at GlobeNet LLC, has consulted extensively within the wireless mobility ecosystem and network deployment lifecycle stages for academia, government, and industry. His interdisciplinary experience extends across the agriculture, commercial fixed and mobile broadband telecommunications, health care, public safety, and transportation domains. His IEEE leadership roles include the Future Networks International Network Generations Roadmap (INGR), Applications and Services WG, Young Professionals Education, P1950.1 Smart Cities Framework Standard Development, Public Safety Task Force, and the Telehealth Industry Connections Initiative. Narendra is also an Adjunct Professor at the George Mason University.



Narendra has a blended consulting experience that include strategy development, roadmaps, spectrum rebanding, network design and optimization, large mobile and fixed network deployments, cellular and satellite systems integration and commissioning, operations & business support systems, system cutovers, international roaming, procurements, and program management. His interests include 5G and technology convergence, smart cities, and related ecosystems.

Ashutosh Dutta, Ph.D., IEEE Fellow



Ashutosh Dutta is currently senior scientist and 5G Chief Strategist at the Johns Hopkins University Applied Physics Laboratory (JHU/APL). He is also a JHU/APL Sabbatical Fellow and adjunct faculty at The Johns Hopkins University. Ashutosh also serves as the chair for Electrical and Computer Engineering Department of Engineering for Professional Program at Johns Hopkins University. His career, spanning more than 30 years, includes Director of Technology Security and Lead Member of Technical Staff at AT&T, CTO of Wireless for NIKSUN, Inc., Senior Scientist and Project Manager in Telcordia Research, Director of the Central Research Facility at Columbia University, adjunct faculty at NJIT, and Computer

Engineer with TATA Motors. He has more than 100 conference, journal publications, and standards specifications, three book chapters, and 31 issued patents. Ashutosh is co-author of the book, titled, “Mobility Protocols and Handover Optimization: Design, Evaluation and Application” published by IEEE and John & Wiley.

As a Technical Leader in 5G and security, Ashutosh has been serving as the founding Co-Chair for the IEEE Future Networks Initiative that focuses on 5G standardization, education, publications, testbed, and roadmap activities. Ashutosh serves as IEEE Communications Society’s Distinguished Lecturer for 2017-2020 and as an ACM Distinguished Speaker (2020-2022) Ashutosh has served as the general Co-Chair for the premier IEEE 5G World Forums and has organized 73 5G World Summits around the world.

Ashutosh served as the chair for IEEE Princeton / Central Jersey Section, Industry Relation Chair for Region 1 and MGA, Pre-University Coordinator for IEEE MGA and chair of Education Society Chapter of PCJS. He co-founded the IEEE STEM conference (ISEC) and helped to implement EPICS (Engineering Projects in Community Service) projects in several high schools. Ashutosh has served as the general Co-Chair for the IEEE STEM conference for the last 10 years. Ashutosh served as the Director of Industry Outreach for IEEE Communications Society from 2014-2019. He was recipient of the prestigious 2009 IEEE MGA Leadership award and 2010 IEEE-USA professional leadership award. Ashutosh currently serves as Member-At-Large for IEEE Communications Society for 2020-2022.

Ashutosh is a Distinguished Alumnus and obtained BS in Electrical Engineering from NIT Rourkela; MS in Computer Science from NJIT; and Ph.D. in Electrical Engineering from Columbia University, New York under the supervision of Prof. Henning Schulzrinne. Ashutosh is a Fellow of IEEE and senior member of ACM.

Cybersecurity for Sustainable Infrastructure

Panel 3: April 23 4:00 – 5:20 PM

Panel Moderated by David E. Gonzalez

Panelists:

- On Power & Infrastructure: Sri "Chandra" Chandrasekaran - Sr Director, Standards & Technology, IEEE-SA
- Federal Government: Special Agent Joseph "Joe" M. Hooper – FBI
- Healthcare (HL7): Gora Datta, CEO of CAL2CAL and HL7 International Ambassador
- Academia: Sevada Isayan (alternate)

If you’ve been paying attention to the news you can’t help but notice there’s headlines reporting on cyberattacks, hacks, malware, ransomware, breaches, etc. on companies (at every level), hospitals, business, infrastructure, and your personal computers. It definitely is a global problem that we cannot ignore. Our invited panelists come from various sectors and industries that will

provide their knowledge and perspectives on how we as a global community can address this world-wide menace.

Panelist Bios:



David E. González has a Bachelor's of Science degree in Electrical Engineering (BSEE), Master's degree in Business Administration (MBA), Masters of Science in Program Management. Mr. González has worked in the aerospace industry, the US Navy, and the Department of Defense (DoD) for over 25 years. He is a member of the DoD's Cyber Security WorkForce (CSWF). And is a Microsoft Certified Professional (MCP) and CompTIA Network+ and Security+ certified. Mr. González also conducts NIST-based compliance audits for large and small companies. He is a Senior Member of IEEE and is very active within

IEEE and is a member of the Rotary Club. Mr. González is also the incoming chair of SusTech 2022.

Sri "Chandra" Chandrasekaran currently works as Director Standards & Technology and has been with IEEE for past 3 years, and is based in Bangalore, India. In his current role, Sri manages the standardization activities in India across various sectors including leading key emerging technology areas for the IEEE-SA. In his current role in India, Sri has been driving the efforts in enabling participation and contributing to global standards development activities and starting new initiatives in the region. Sri has over 18 years of experience working with Motorola Inc and Freescale Semiconductor Inc as Snr Member of Technical Staff, has a Master's degree in Communication Engineering and also a Senior Member at the IEEE.



Supervisory Special Agent Joe Hooper is the cyber supervisor for FBI Phoenix, where he leads a team of Special Agents, Intelligence Analysts and Computer Scientists who conduct investigations in support of the FBI's Cyber Division mission to impose risk and consequences on cyber adversaries. The FBI leads the U.S. Government's response to significant cyber incidents by investigating, collecting evidence and intelligence, identifying additional

victims, and pursuing disruption opportunities.

Gora Datta is CEO of CAL2CAL and HL7 International Ambassador, and is a US based ICT Subject Matter Expert. He is an accomplished, visionary executive with 36 years of international professional expertise in the field of Computer & Software Engineering and its application to Healthcare, Mobile Health, CyberSecurity in Healthcare, eLearning & Social Protection. His global professional experience spans many countries - Australia, Bangladesh, Canada, France, Greece, India, Indonesia, Japan, Kuwait, New Zealand, Niger, Norway, Philippines, Singapore, South Korea, Spain, Switzerland, Tunisia, UK, and USA.



Sevada Isayan (alternate)



Young Professionals Panel – Sustainability in Tech Companies

Panel 4: April 24 10:00 – 11:00 AM

Panel Moderated by Alberto Tam Yong

As technology and innovations move forward, many tech companies have committed to make a positive impact in the environment with sustainability programs. From direct projects and initiatives to research and offer environmentally friendly solutions to corporate infrastructure, this Young Professionals Panel aims to share awareness and insight on some of these programs and projects at tech companies. Our panelists include young professionals working in the tech industry and will give us a glimpse of what it's like to work at a company that cares about the environment.



Panelists:

- Mehmet Ogut, Technologist, JPL
- Gaurav Uppal, Program Manager, Microsoft

Panelist Bios:



Dr. Mehmet Ogut is a technologist in the Microwave Instrument Science group at Jet Propulsion Laboratory (JPL). His expertise is design, testing, calibration and analysis of microwave and millimeter-wave radar/radiometer instruments, developing innovative concepts in radiometry and artificial intelligence applications in remote sensing. He is the CO-I and JPL lead of Ultra-Wideband Photonic Spectrometer for PBL Sensing funded under NASA ESTO ACT-20, and the Co-I of Smart Ice Cloud Sensing (SMICES) awarded under NASA ESTO IIP-19 program. Dr. Ogut is currently the Young Professional Ambassador of the IEEE GRSS and IEEE Rising Stars Organizing Committee member (2019-2022).

Gaurav Uppal (he/him) is a Program Manager in Microsoft Azure high performance computing and AI, and a 2020 grad of Duke University. He is passionate about employee activism and engagement around climate, environmental justice, and social justice. Since joining Microsoft Atlanta in 2020, he has built up the JustGreen Atlanta community for Sustainability and Environmental Justice to engage conversations on Microsoft Atlanta's impact on the environment and the community as its new office sets to open up later this year. He is also an Americas lead for the Local Chapters program of the Microsoft Worldwide Sustainability Community, which consists of 26 office chapters and over 4000 employees. In his free time, Gaurav enjoys sunrise hikes and appreciating the arts.



Workshop – Home Automation IoT

Date: 24th April 2021 Saturday

Time: 10am – 2.30pm PST (with 30-minute lunch break)

Duration: 4 hours

This hands-on live online 4-hour workshop (+ 1 hour pre-check session) will help attendees explore and simulate a home automation system using the Arduino based Bytes & Bots Innovator Board, IoT, and Web Services.

Participants will create a simple host using a cloud based web service to connect to the Bytes & Bots Innovator board. The cloud based server will use MQTT to transfer data to the board. The UI will be in HTML and the backend will be served by python.

Upon successful completion of the workshop the participants will be able to demonstrate a simulated home automation system.

Upon Successful Completion the workshop attendees will:

- Be familiar with Arduino and Arduino C language
- Have a basic understanding of microcontrollers, input/output and programming vocabulary
- Understand Server requests using MQTT and IoT
- Have a basic understanding of electronics

Those who successfully complete the workshop and demonstrate their working project will earn a Bytes & Bots Skills Badge.

Pre-Workshop/Readiness Check Session: 17th April – Saturday from 10 AM – 11AM PST. Mentors will be available for assistance and questions.

FEE

Workshop Fee: \$150 (Includes hardware kit, US shipping, and live online workshop and readiness check session)

REGISTRATION

Workshop Registration Link: <https://ieee-sustech.org/register/> (Limit: 20); select Workshop option

Must register by March 31, 2021 for shipment of kit

Workshop Zoom link will be sent to registrants one week prior to the workshop.

WORKSHOP REQUIREMENTS AND PREREQUISITES

- Arduino Software Download Link
 - Windows: <https://www.arduino.cc/en/software>
 - Mac: <https://www.arduino.cc/en/software>
- Internet Access to attend the workshop via Zoom
- An optional smart phone with a camera to share video of your project to the mentor for any troubleshooting and technical assistance

WORKSHOP AGENDA

Apr 17, 2021	PRE-CHECK DAY @ 10am – 11am PST
60 min	Introduction and System Readiness Check
Apr 24, 2021	WORKSHOP: 10:00am – 2:30pm PST
30 min	Setup Cloud Web Services
30 min	Bytes & Bots Innovator Board Setup
45 min	Coding to send/receive data
Lunch Break (Working lunch OK. It will give you more time!)	
45 min	Build UI
45 min	Testing and Debugging
45 min	Project Presentation by Workshop Attendees. Take a selfie video of the completed project demo and upload it and enter to win a prize

BYTES & BOTS INNOVATOR KIT INFO

You can use this kit for this workshop and it is reusable for other projects.

HOME AUTOMATION IOT WORKSHOP TRAINER: <https://BYTESANDBOTS.COM>

Kit includes:

- Bytes & Bots Innovator Board
- USB (Type A)
- Temperature/Humidity Sensor
- ESP Wifi board
- 10 x LEDs
- 10 x Resistors
- 1 x Breadboard
- M/F wires



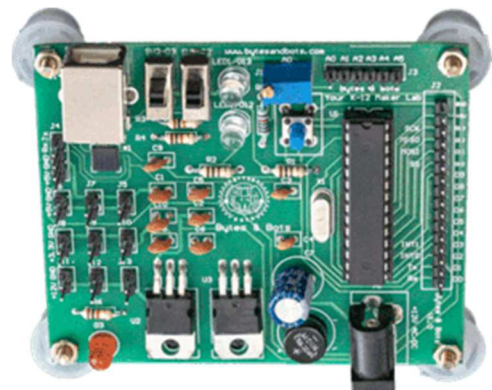
IOT parts



IOT kit



IOT Wi-Fi



IOT Board

Schedule - Thursday

Time in PDT

Thursday, April 22	SusTech 2021	
08:00-09:00 AM	Opening Remarks and Keynote – “If We Build It They Will Come – The Intersection of Technological Systemization and Customer Proficiency”	Welcome by Tim Lee Region 6; Keynote 1: The Honorable Daniel K. Tabor, President, MOVE LA
9:05- 10:25 AM	Papers Session 1- Agriculture/Water	Special Session 1: “Sustainability for 5G and 6G” with Mohamed-Slim Alouini, Brian Zahnstecher
10:30 - 11:50 AM	The New Norm? Water Supply Challenges and Resiliency for California	Panel 1 Moderated by Diane Gatzka and Russ Lefevre
11:50 AM - 12:10 PM	Lunch Break	
12:10-1:10 PM	“Our Tractor Fuels and Farm Fertilizer Demonstration System”	Keynote 2 Jay Schmuecker and David Toyne
1:15- 2:35 PM	Papers Session 2- Energy efficiency	Papers Session 3- Water Resource Management
2:35-2:45 PM	Short Break	
2:45-4:10 PM	Future Networks & Applications Roadmap	Panel 2 Moderated by Fawzi Behmann
4:15- 5:35 PM	Papers Session 4-Intellegent Transportation	Papers Session 5 Solar Topics
5:40- 5:50 PM	Wrap Up	
5:50 - 6:00 PM	Short Break	
6:00 - 9:00 PM	Thursday-Student Poster Competition	2nd Session April 22

Thursday, April 22 8:00 - 9:00

OPK1: Opening Session and Keynote

Room: Plenary/Panel/Featured Session

Welcome - Tim Lee, IEEE Region 6 Director

Keynote - "If We Build It They Will Come - The Intersection of Technological Systemization and Customer Proficiency"

The Honorable Daniel K. Tabor, President, MOVE LA

Building a culture of climate awareness that leads to climate proficiency within all customers will require intentional technological systemization across multiple platforms and areas of opportunity. When in realtime information can be synthesized and delivered to adults and youth in ways that support belief systems and values, fewer arguments about the impact humans are having on the climate will result in leaders grabbing their balls, going home, and isolating themselves from the truth and the looming opportunity. Through the stages of identification, monitoring, modeling, predicting, and informing, impacts of human behavior on the environment, climate, and human health can be informed and altered. By closing the gap between what Seniors know through experience and children learn through experimentation we will hasten the achievement of Customer Proficiency.

Thursday, April 22 9:05 - 10:25

FS1: Sustainability for 5G and 6G

Mohamed-Slim Alouini and Brian Zahnstecher

Room: Plenary/Panel/Featured Session

"6G: Towards a More Connected and Sustainable World"

Mohamed-Slim Alouini, King Abdullah University of Science and Technology (KAUST)

"A System of Systems (SoS) for Assessing & Optimizing Networks for Energy Efficiency"
Brian Zahnstecher, PowerRox LLC, Co-chair of the IEEE 5G Roadmap Energy Efficiency Working Group

PS1: Papers Session 1- Agriculture/Water

Room: Papers A

9:05 *Reliable Tree-Level Evapotranspiration Estimation of Pomegranate Trees Using Lysimeter and UAV Multispectral Imagery*

Haoyu Niu (UC, Merced, USA); Tiebiao Zhao (UC Merced, USA); Dong Wang (USDA ARS, USA); YangQuan Chen (University of California, Merced, USA)

9:25 *Hydrodynamic Analysis of Biomimetic Robot Fish Using OpenFOAM*

Rozie Zangeneh (Lawrence Technological University, USA); Sarhan M. Musa (Prairie View A&M University, USA)

9:45 *Innovative UV-C LED Disinfection Systems for Drinking Water Treatment*

Baskar Vairamohan (EPRI, USA); Cecilia Arzbaecher (Applied Energy Group, USA); James Goodrich (United States Environmental Protection Agency, USA); Gary Hunter (Black & Veatch Corporation, USA); Raymond Ehrhard (Washington University, USA); John Hall (United States Environmental Protection Agency, USA)

10:05 *Slope Stability Analysis as Applied to Rainfall- Triggered Landslide in Itogon, Benguet Province, Philippines*

Kim Gerald Oliver Alcala, Jhoyen Emmanuel Angeles and Paul Kevin Lim (Mapua

University, Philippines); Jocelyn Buluran (Mapúa University, Philippines); Fibor Tan (Mapua University, Philippines)

Thursday, April 22 10:30 - 11:50

PNL1: The New Norm? Water Supply Challenges and Resiliency for California

Room: Plenary/Panel/Featured Session

Panelists:

- Diane Gatza, P.E, Water Replenishment District of Southern California
- Russ Lefevre, Metropolitan Water District (MWD) Board of Directors
- Christopher Repp, LADWP

With the onset of Global Warming presenting a serious challenge to water supply in California, three of the major suppliers in the state are working to insure water will be available for the foreseeable future. The Los Angeles Department of Water and Power (LADWP) has a program, Operation NEXT Water Supply Program, to source 70% of water locally and recycle 100% of available treated waste water by 2035. The Water Replenishment District of Southern California (WRD) has initiated a program, WIN 4 ALL, that aims to utilize the 450,000 acre-feet of available storage space in the West and Central groundwater basins in conjunction with available recycled water sources to increase regional resiliency and sustainability. The Metropolitan Water District of Southern California (MWD) that supplies wholesale water to 19 million people in 6 counties is preparing the newest Integrated Water Resources Plan (IRP) whose purpose is to develop a planning document that can insure long-term supply reliability in an environmentally and effective way.

Thursday, April 22 11:50 - 12:10

LB1: Lunch Break

Room: Plenary/Panel/Featured Session

Thursday, April 22 12:10 - 1:10

K2: Keynote: "Our Tractor Fuels and Farm Fertilizer Demonstration System"

Jay Schmuecker and David Toyne

Room: Plenary/Panel/Featured Session

The time is approaching when we will be dependent on renewable energy sources. We will address the installation on an Iowa farm the demonstration Hydrogen, Nitrogen, and Ammonia generation system that is used to fuel a tractor internal combustion engine with hydrogen of hydrogen/ammonia. These products are made in batches using solar arrays as the power source. There are no carbon emissions in either the generation or consumption of these products. The ammonia is also used to fertilize corn cropland.

For additional information see <http://solarhydrogensystem.com/>

Thursday, April 22 1:15 - 2:35

PS2: Papers Session 2 - Energy Efficiency

Room: Papers A

1:15 *Ideality Factor Based Computational Analysis of Perovskite Solar Cells*

Maniell Workman and Zhi Chen (University of Kentucky, USA); Sarhan M. Musa (Prairie View A&M University, USA)

1:35 *Applications of Supervised-Learning Approaches for Air Conditioning Plants Condition-Based Maintenance*

Binh Dang (Department of Transportation, USA)

1:55 *Investigation on Impact of Solar PV Penetration on the Operation of Protective Relays in a Distribution System Using Python*

Divya S Nair and Rajeev T (APJ Abdul Kalam Technological University)

2:15 *Solar Power Prediction in Different Forecasting Horizons Using Machine Learning and Time Series Techniques*

Kesh B Pun (Wichita State University, USA); Saurav Basnet (550 Huntington Ave & Wentworth Institute of Technology, USA); Ward Jewell (Wichita State University, USA)

PS3: Papers Session 3 - Water Resource Management

Room: Papers B

1:15 *Sediment Transport and Water Quality Analyses of Naic River, Cavite, Philippines*

Cris Edward Monjardin, Raheemah A Gomez, Marc Noblen Dela Cruz, Dennis Limher Capili and Fabor Tan (Mapua University, Philippines); Francis Aldrine Uy (Mapua Institute of Technology, Philippines)

1:35 *Water Availability and Variability Analysis Using Different Earth System Models RCP 2.6, 4.5, and 8.5 Scenarios in Bauan, Batangas Philippines*

Cris Edward Monjardin, Amiel Marvin Lloyd P Castro and Fabor Tan (Mapua University, Philippines)

1:55 *An Intelligent Approach for the Condition Assessment of Water Mains*

Thikra Dawood and Emad Elwakil (Purdue University, USA); Hector Mayol Novoa and José Fernando Gárate Delgado (National University of St Augustin of Arequipa, USA)

2:15 *3D Modeling of Pipe Risk Index for a Sustainable Urban Water System*

Thikra Dawood and Emad Elwakil (Purdue University, USA); Hector Mayol Novoa and José Fernando Gárate Delgado (National University of St Augustin of Arequipa, USA)

Thursday, April 22 2:45 - 4:10

PNL2: Panel: Future Networks and Applications Roadmap for Sustainable Cities/Societies

Moderated by Fawzi Behmann

Room: Plenary/Panel/Featured Session

Panelists:

- Narendra Mangra, GlobeNet LLC
- Ashutosh Dutta, Johns Hopkins University
- Fawzi Behmann, TelNet Management Consulting Inc.

5G is expected to contribute greater than \$100B to the economy within the next ten years; yet there is too little understanding of what it is, what it can do, how it will be used, and what comes next. This IEEE Future Networks session will provide overview of the technical aspects of 5G, discuss the socio-economics of wireless telecommunications and its impact on life in the 21st century, and outline the methods and expected timelines for deployment as 5G initially co-exists with, and eventually replaces, existing 3G/4G networks.

The panel is intended to unveil some of the rich capabilities of future networks empowered by key technologies such as 5G, IoT, AI and others. The focus will be on highlighting some of network capabilities roadmap empowered building new classes of applications and services that result in scalable and sustainable and secure ecosystem solutions.

Key topics that will be addressed:

- Key drivers for network evolution
- Capabilities & features roll out driving enhanced/new applications & services
- Key attributes of end-to-end Network performance: latency, QoS, Security, Management, Net Slicing
- Network Reliability and sustainability

Other topics for consideration:

- Mobile Edge computing/intelligence
- Standards

Along with some walkthrough examples:

- Public Safety
- Health & Wellness
- Autonomous Driving
- Smart Cities

Thursday, April 22 4:15 - 5:35

PS4: Papers Session 4 - Intelligent Transportation

Room: Papers A

4:15 Using OCPP for Data Collection in BC Hydro Time-Of-Use Measurement Trial for Residential EV Charging

Michael Zhang (Powertech Labs Inc., Canada); Hamid Atighechi (Powertech Labs, Canada); Mehran Zamani (Powertech Labs Inc. & Canada, Canada); Angela Das (Powertech Labs Inc., Canada)

4:35 A GA-Based Approach to Eco-Driving of Electric Vehicles Considering Regenerative Braking

Mukesh Gautam, Narayan Bhusal, Mohammed Ben-Idris and Poria Fajri (University of Nevada, Reno, USA)

4:55 Vehicle Dispatching and Scheduling Algorithms for Battery Electric Heavy-Duty Truck Fleets Considering En-Route Opportunity Charging

Zhouqiao Zhao (Center for Environmental Research and Technology, UC, Riverside, USA); Guoyuan Wu and Kanok Boriboonsomsin (University of California, Riverside, USA); Aravind Kailas (Volvo Trucks, unknown)

5:15 A Deep Reinforcement Learning Approach to Traffic Signal Control

Rajiv Gupta (BITS Pilani, India); Aquib Razack and Vysyakh Ajith (BITS, Pilani, India)

PS5: Papers Session 5 - Solar Topics

Room: Papers B

4:15 Molten Salt Based Nanofluids for Solar Thermal Power Plant: A Case Study

Kashif Liaqat and Juan Ordóñez (Florida State University, USA)

4:35 WeatherNet: Nowcasting Net Radiation at the Edge

Enrique Boswell Nueve IV (Northwestern Argonne Institute of Science and Engineering, USA); Robert Jackson, Rajesh Sankaran, Nicola Ferrier and Scott Collis (Argonne National Laboratory, USA)

4:55 Using Analytics to Inform Post-Pandemic Resiliency Strategy

Susanne C Aguilar, Daniel Kushner and Alekski Paaso (Commonwealth Edison, USA); Jacqueline Ratner (National Center for Disaster Preparedness, Earth Institute, Columbia University, USA); Jaime Ortega (Commonwealth Edison, USA); Jeffrey Schlegelmilch (National Center for Disaster Preparedness, Earth Institute, Columbia University, USA)

5:15 Partnerships to Enable Smart Cities

Susanne C Aguilar, Emily Kean and Daniel Kushner (Commonwealth Edison, USA); Peter Larsen (Lawrence Berkeley National Laboratory, USA); Jeffrey Schlegelmilch (National Center for Disaster Preparedness, Earth Institute, Columbia University, USA)

Thursday, April 22 5:40 - 5:50

WU1: Day 1 Wrap-up

Room: Plenary/Panel/Featured Session

Thursday, April 22 6:00 - 9:00

SPC2: Student Poster Competition-Session 2

Room: Plenary/Panel/Featured Session

Schedule - Friday

Time in PDT

Friday, April 23	SusTech 2021	
08:00-09:00 AM	Opening Remarks and Keynote 3 New Initiatives in Advancing IEEE Sustainability Though Leadership Intro by Gora Datta Chair SusTech 2021, Keynote 3 by Maike Luiken, IEEE VP-MGA	
9:00-9:05 AM	Short Break	
9:05- 10:25 AM	Papers Session 6 -Societal Implications	Special Session 2: Smart Grid Stds Panel Moderated by Mark Siira, Chair of IEEE SCC21 and IEEE P2030 project
10:25-10:30 AM	Short Break	
10:30 - 11:50 AM	Papers Session 7-Smart Grid I	Papers Session 8 Renewable Energy / Sustainable Electronics
11:50 AM - 12:10 PM	Lunch Break	
12:10-1:10 PM	"Enabling What Customers Want: The Story of Enevate's Technology" Keynote 4 Benjamin Park	
1:10-1:15 PM	Short Break	
1:15- 2:35 PM	Papers Session 9: Smart Grid II	Papers Session 10: Sustainable Electronics II
2:35-2:45 PM	Short Break	
2:45-3:45 PM	"100% Renewable And Zero Emissions Energy With Hydrogen" Keynote 5 Jack Brouwer	
3:45- 3:50 PM	Short Break	
3:50- 5:10 PM	Cybersecurity for Sustainable Infrastructure	Panel 3 Moderated by David Gonzalez
5:10-5:15 PM	Short Break	
5:15-6:35 PM	Papers Session 11- sustainable management	
6:35-6:40 PM	Short Break	
6:40 -7:00 PM	Wrap Up	

Friday, April 23 8:00 - 9:00

OPK2: Opening Remarks and Keynote

Room: Plenary/Panel/Featured Session

Remarks by Gora Datta, Chair SusTech 2021

Keynote - "New Initiatives in Advancing IEEE Sustainability Thought Leadership"
Maike Luiken, IEEE VP MGA

Friday, April 23 9:05 - 10:25

FS2: IEEE Smart Grid Standards

The path to a smart electric power system

Room: Plenary/Panel/Featured Session

This session will provide an overview of Smart Grid activities within IEEE, NIST and other industry efforts. We will include a discussion of the NIST Framework and Roadmap for Smart Grid Interoperability (V4.0) and IEEE P2030 Guide for Interoperability of the Electric Power system standard project. We will also discuss other industry activities required to support the deployment of smart grid.

Speakers:

- Avi Gopstein - Smart Grid Program Manager, National Institute of Standards and Technology (NIST)
- Doug Houseman - Principal Consultant at 1898 & Co. A Burns & McDonnell division
- Mark Siira - IEEE P2030 Working Group Chair, IEEE Standards Coordinating Committee 21 Chair, IEEE SA Standards Board - Standards Review Committee (RevCom) and Audit Committee (AudCom)

PS6: Papers Session 6 - Societal Implications

Room: Papers A

9:05 *Sustainability Analysis of Ecological Systems in Fire-Prone Areas Using the Concept of Sustainability over Sets (SOS)*

Vasilios Manousiouthakis and Masih Jorat (University of California Los Angeles, USA)

9:25 *AnnaData: Design and Development of a Robust Multi-Sensor Early Warning System for Bacterial Blight Detection in Rice Crop Using Deep Learning Techniques*

Arup Mukherjee (National Rice Research Institute, India); Santosh Kesavan and Soumyaprakash Das (Crosslinks Foundation, India)

9:45 *Sparking Energy Mindset at Home with the Create a Spark Energy House Challenge*

Renée A Skeete (ComEd, USA)

10:05 *Implications for Designing Sustainable Digital Sharing Systems*

Maria Pouri (University of Zurich, Switzerland)

Friday, April 23 10:30 - 11:50

PS7: Papers Session 7 - Smart Grid I

Room: Papers A

10:30 *Intrusion Detection from Synchrophasor Data Propagation Using Cyber Physical Platform*

Vishawjit Roy (Texas Tech University, USA)

10:50 *An Energy Service Interface for Distributed Energy Resources*

Tylor E Slay (Portland State University & MASEEH College of Engineering and Computer Science, USA); Robert Bass (Portland State University, USA)

11:10 *Adaptive Control of Distributed Generation and Demand Side Management in a Microgrid*

Muhammad Shahzad and Muhammad Shahbaz Khan (HITEC University, Pakistan); Muhammad Owais Tariq (Pakistan Institute of Engineering & Technology, Multan, Pakistan); Safee Ullah (HITEC University, Pakistan)

11:30 *Decentralized Peer-To-Peer Energy Trading Model for Networked Microgrids*

Jonathan Warner and Tarek Masaud (Marshall University, USA)

PS8: Papers Session 8 - Renewable Energy / Sustainable Electronics

Room: Papers B

10:30 *High-Endurance UAV via Parasitic Weight Minimization and Wireless Energy Harvesting*

Joel J Lee, Nicholas Papp, Khanh Le, Connor McGarry, Sahaj Bhakta, Kenneth Tarroza and Martin OConnell (California State Polytechnic University, Pomona, USA); Steven Dobbs and Zhen Yu (California State Polytechnic University at Pomona, USA)

10:50 *A Novel Vertically Oscillating Hydrokinetic Energy Harvester*

Michael Wise, Maher Al-Badri, Benjamin Loeffler and Jeremy Kasper (University of Alaska Fairbanks, USA)

11:10 *Power Management of Autonomous Drones Using Machine Learning*

Kanika Sood and Rakeshkumar Mahto (California State University, Fullerton, USA); Harlik Shah and Austin Murrell (California State University Fullerton, USA)

11:30 *Application-Based Methodology for Microgrid Sizing*

Michael D Balestrieri (Southern California Edison, USA); Salman Kahrobaee (SCE, USA); Peter Kim (University of California, Los Angeles & Southern California Edison, USA)

Friday, April 23 11:50 - 12:10

LB2: Lunch Break

Room: Plenary/Panel/Featured Session

Friday, April 23 12:10 - 1:10

K4: Keynote: Enabling What Customers Want: The Story of Enevate's Technology

Benjamin Park

Room: Plenary/Panel/Featured Session

Customers demand more and more and vehicle companies will have to compete on features people want. In order to drive widespread adoption of EVs, the vehicles will not only have to match that of ICE vehicles, but they will have to be even more convenient than gas cars. EVs should be able to charge in the same amount of time as ICE vehicles as well as offering other value-added features not available on ICE vehicles. Enevate's pure silicon Li-ion battery technology features unique properties including extreme fast charge while increasing high energy density, wide temperature operation, safety, and reduced cost to help break down barriers to mass adoption of electric vehicles.

Friday, April 23 1:15 - 2:35

PS10: Papers Session 10 - Sustainable Electronics II

Room: Papers B

1:15 *Building a Solar Microgrid Controller for Reliable Global Power Distribution*

Daniel Lindeman and Veronica Goudzward (Very, LLC, USA)

1:35 *Exploring Social Dynamics of Hard-Disk Drives Circularity with an Agent-Based Approach*

Julien Walzberg (National Renewable Energy Laboratory, USA); Kali Frost and Fu Zhao (Purdue University, USA); Alberta Carpenter and Garvin Heath (National Renewable Energy Laboratory, USA)

1:55 *Improving the Sustainability of Circuits by Using Honey Gate in Transistors for Printing Electronics*

Reza Kamali-Sarvestani (California State University San Marcos, USA)

2:15 *Thermoelectric Insulation for Cold Temperature Vaccine Storage*

Juan Ordonez (Florida State University, USA); Camilo Ordonez (FSU, USA)

PS9: Papers Session 9 - Smart Grid II

Room: Papers A

1:15 Automation of Power Distribution System for a Model of Smart Grid

Sean Monemi (California State Polytechnic University at Pomona, USA); Balsam Boudiab and Ulysses Perez-Ramirez (California State Polytechnic University Pomona, USA)

1:35 A Novel Power Management Strategy for Frequency Regulation in Low Inertia Grid

Manju Mathews (University of Kerala, India); Rajeev T (College of Engineering, Trivandrum, India)

1:55 Developing a Logistic Regression Method for Valuation of Grid-Level Energy Storage Systems

Jacquelynne Hernandez (Energy Storage Technologies, USA); Amir Etemadi (The George Washington University, USA); Samuel J Roberts-Baca (University of Denver & Sandia National Laboratories, USA); Venkat Koushik Muthyapu (University of New Mexico, USA)

2:15 Developing a Distributed Trust Model for Distributed Energy Resources

Sonali Fernando, John M Acken and Robert Bass (Portland State University, USA)

Friday, April 23 2:45 - 3:45

K5: Keynote: 100% Renewable And Zero Emissions Energy With Hydrogen

Jack Brouwer

Room: Plenary/Panel/Featured Session

Renewable, ultra-low emissions and high efficiency energy conversion systems will be required to introduce energy resource and environmental sustainability. In particular the dynamic dispatch, massive energy storage capacity, and ubiquitous transmission and distribution of energy that the power-to-gas and hydrogen energy storage concepts provide will become essential to enable a 100% renewable economy. In addition, these concepts enable zero greenhouse gas and zero criteria pollutant emissions energy conversion that spans across applications in the built environment, to transportation, to utility grid network support and sustainability. Recent research on the dynamics and control of electrochemical energy conversion systems to enable this future with the hydrogen vector will be discussed.

Friday, April 23 3:50 - 5:10

PNL3: Panel: Cybersecurity for Sustainable Infrastructure

Moderated by David E. Gonzalez

Room: Plenary/Panel/Featured Session

Panelists:

- On Power & Infrastructure: Sri “Chandra” Chandrasekaran – IEEE-SA
- Federal Government: Special Agent Joseph “Joe” M. Hooper – FBI
- Healthcare (HL7): Gora Datta, CEO of CAL2CAL and HL7 International Ambassador
- Academia: Sevada Isayan (alternate)

If you've been paying attention to the news you can't help but notice there's headlines reporting on cyberattacks, hacks, malware, ransomware, breaches, etc. on companies (at every level), hospitals, business, infrastructure, and your personal computers. It definitely is a global problem that we cannot ignore. Our invited panelists come from various sectors and industries that will provide their knowledge and perspectives on how we as a global community can address this world-wide menace.

Friday, April 23 5:15 - 6:35

PS11: Papers Session 11 - Sustainable Management

Room: Papers A

5:15 Inherent Delay Assessment in Construction: A Proactive Approach, Mitigating the Impact of Inherent Delay on Schedule

Qais Amarkhil (Purdue University West Lafayette, USA); Emad Elwakil and Bryan Hubbard (Purdue University, USA)

5:35 Opportunities for Infrastructure PPP Projects in Time of Covid-19 - as a Resilience Strategy

Sahar Hasan (Housing and Building National Research Center (HBRC), Egypt); Emad Elwakil (Purdue University, USA); Mohamed Hegab (California State University Northridge, USA)

5:55 AI Legitimacy for Sustainability

Claire Nicodeme (SNCF, France)

6:15 Supervised Classification Techniques in Optimizing Selection of Temporary Housing in Post-Disaster Situation

Mahdi Afkhamiaghda and Emad Elwakil (Purdue University, USA)

Friday, April 23 6:40 - 7:00

WU2: Day 2 Wrap-up

Room: Plenary/Panel/Featured Session

Schedule - Saturday

Time in PDT

Saturday, April 24	SusTech Sustainability Forum/ Young Professional Forum	
08:00-09:00 AM	Opening Remarks and Keynote 6 - "ESG - Environmental, Social, and Corporate Governance"	IEEE Speaker Keynote 6 Walter Iu
9:00-9:05 AM	Short Break	
9:05-9:50 AM	"A new chemical process for ethanol production from carbon dioxide, water, and electricity"	Keynote 7 Dr. Stafford Sheehan is co-founder and Chief Technology Officer of Air Company
9:50-9:55 AM	Short Break	
9:55 -11:05 AM	Young Professionals Panel - Sustainability in Tech Companies	Panel 4 Moderated by Alberto Tam Yong
11:05- 11:10 AM	Short Break	
11:10-12:10 AM	IEEE Standards and Initiatives for Sustainability	Special Session 3: Rudi Shubert, IEEE Standards Association
12:10 -12:30 PM	Lunch Break	
12:30-1:30 PM	"New paradigm in renewable microgrids - lets change our thinking!"	Keynote 8 Niru Kumar
1:30- 1:35 PM	Short Break	
1:35 -2:40 PM	"Analysis and Synthesis of Sustainable Systems"	Keynote 9 Dr. Vasilios I. Manousiouthakis
2:40 -2:45 PM	Short Break	
2:45 -3:00 PM	Student Poster Awards	
3:00- 3:20 PM	Closing Remarks & SusTech 2022	

Saturday, April 24 8:00 - 9:00

OPK3: Opening Remarks and Keynote
Room: Plenary/Panel/Featured Session

Remarks by Charlie Jackson, Program Chair SusTech 2021

Keynote - "ESG - Environmental, Social, and Corporate Governance" Walter Iu, PwC Strategy&

Businesses from starts ups to major corporations are fundamentally questioning their purpose. Is profitability and shareholder return the most important goal or is it something else? ESG: Environmental, Social, and Governance concerns are at the forefront of the sustainability discussion. Can profits and sustainability be balanced?

In this talk we'll discuss the current and changing ESG landscape and how to think about each element of the ESG acronym. What concerns are top of mind and what frameworks and metrics can be used to understand what is good or bad? We'll touch on the pros and cons of ESG overall and the challenges that lie ahead.

Saturday, April 24 9:05 - 9:50

K7: Keynote: A new chemical process for ethanol production from carbon dioxide, water, and electricity
Stafford Sheehan, Air Company

Room: Plenary/Panel/Featured Session

Dr. Stafford Sheehan is co-founder and Chief Technology Officer of Air Company, where he leads a team scaling up technology that transforms carbon dioxide into consumer products. He and his team constructed and operate a 3,000 sq ft pilot plant in Brooklyn, New York, where they produce carbon-negative ethanol, as well as mix and bottle Air Company's vodka and hand sanitizer products that are available in New York and California.

Saturday, April 24 9:55 - 11:05

PNL4: Young Professionals Panel - Sustainability in Tech Companies
Panel Moderated by Alberto Tam Yong

Room: Plenary/Panel/Featured Session

Panelists:

- Mehmet Ogut, Technologist, JPL
- Gaurav Uppal, Program Manager, Microsoft

As technology and innovations move forward, many tech companies have committed to make a positive impact in the environment with sustainability programs. From direct projects and initiatives to research and offer environmentally friendly solutions to corporate infrastructure, this Young Professionals Panel aims to share awareness and insight on some of these programs and projects at tech companies. Our panelists include young professionals working in the tech industry and will give us a glimpse of what it's like to work at a company that cares about the environment.

Saturday, April 24 10:00 - 2:30

WK: Home Automation IoT Workshop

Room: breakout

This hands-on live online 4-hour workshop (+ 1 hour pre-check session April 17) will help attendees explore and simulate a home automation system using the Arduino based Bytes & Bots Innovator Board, IoT, and Web Services.

Participants will create a simple host using a cloud based web service to connect to the Bytes & Bots Innovator board. The cloud based server will use MQTT to transfer data to the board. The UI will be in HTML and the backend will be served by python.

Upon successful completion of the workshop the participants will be able to demonstrate a simulated home automation system.

Upon Successful Completion the workshop attendees will:

- Be familiar with Arduino and Arduino C language
- Have a basic understanding of microcontrollers, input/output and programming vocabulary
- Understand Server requests using MQTT and IoT
- Have a basic understanding of electronics

Those who successfully complete the workshop and demonstrate their working project will earn a Bytes & Bots Skills Badge.

Saturday, April 24 11:10 - 12:10

FS3: IEEE Standards & Sustainability

Building an Enhanced IEEE Sustainability Community - New Initiatives and Standards Activities to Accelerate and Amplify IEEE Leadership in Supporting Sustainable Development Goals

Rudi Schubert

Room: Plenary/Panel/Featured Session

Standards are an enabler of emerging technology solutions and a key to the interoperability of products and systems. The IEEE Standards Association (IEEE SA) has published thousands of standards, developed by IEEE volunteers across the spectrum of technology areas covered by IEEE technical societies. In recent years, the IEEE SA has gone beyond standards, using its well established consensus building capabilities to address new technology issues at very early stages to incubate the next generation of standards based solutions. Additionally, the societal context of technology has become increasingly important in establishing the foundational considerations for future standardization initiatives. From the ethical considerations of artificial intelligence to new initiatives in sustainability and renewable energy, IEEE SA programs are working to stay ahead of rapidly evolving technologies and societal priorities. These programs are open, transparent and

inclusive, welcoming the ideas and contributions of all. This presentation will provide an overview of IEEE SA programs relative to sustainability, IEEE initiatives to broaden participation of the sustainability community and emerging issues of interest to the SusTech community.

Saturday, April 24 12:10 - 12:30

LB3: Lunch Break

Room: Plenary/Panel/Featured Session

Saturday, April 24 12:30 - 1:30

K8: Keynote: New paradigm in renewable microgrids - lets change our thinking!

Nirupama Prakash Kumar

Room: Plenary/Panel/Featured Session

The race to reduce greenhouse gas emissions is the defining challenge of our time. Pressure is mounting for our electric system to get cleaner, faster. While important strides have already been made, the rising frequency and intensity of extreme weather events in recent years has underscored the critical need to invest in resiliency.

Stakeholders across the organizational spectrum are navigating an unprecedented risk landscape - energy security has become table stakes as people search for solutions that can keep the lights on amidst the growing frequency of threats.

Fortunately, we are now in a time where there are multiple options for sourcing electricity. Emerging technologies and business models represent a key opportunity to overcome the compounding challenges of reducing carbon emissions while expanding the resilience of our nation's electric system. This talk will present the new paradigm in renewable microgrids.

Saturday, April 24 1:35 - 2:40

K9: Keynote: Analysis and Synthesis of Sustainable Systems

Vasilios I. Manousiouthakis

Room: Plenary/Panel/Featured Session

The field of sustainability has traditionally suffered from a lack of specificity, that leads to misinterpretations regarding a system's sustainability status. The newly introduced concept of "Sustainability Over Set" (SOS) is presented. The SOS concept readily allows the incorporation of human input into system sustainability assessment, by requiring the sustainability practitioner to develop/employ a mathematical model of the studied system, such as for example a set of ordinary differential equations whose solution captures the system's dynamic behavior.

Saturday, April 24 2:45 - 3:00

SPCA: Student Poster Awards
Room: Plenary/Panel/Featured Session

Saturday, April 24 3:00 - 3:20

CL: Closing Remarks & SusTech 2022
Room: Plenary/Panel/Featured Session