10th IEEE Conference on Technologies for Sustainability

April 19-22, 2023

Portland, Oregon

IEEE SusTech2023
10th Anniversary
2013-2023

SusTech2023

Contents

Welcome Message from the Conference Chair

It is an honor to welcome you to the 10th anniversary IEEE Technologies for Sustainability Conference (SusTech 2023) held from April 19 to 22, 2023, in Portland, Oregon

For over ten years this conference has attracted attendees from government, industry, business and manufacturing sectors as it rotated from its beginning in Portland through Arizona, California, Utah and now Oregon. We have scientists, academics, technologists, and scholars from many disciplines that share and contribute to the themes and tracks that we offer in the conference. And who have published over 550 papers in IEEE Xplore.

This year's program features an interactive workshop on challenges from climate change, keynote speakers, panel discussions, peer-reviewed technical paper presentations across 15 thematic sessions, a student poster contest, and a 1-day sustainability fórum featuring a unique blend of experts in policy, leadership, and technology.

All sessions will be in a hybrid format using Zoom. You will find the program schedule with information about the scheduled technical papers for each track; bio-data of distinguished keynote speakers, and panelists; and student poster contestants in the Program Guide and on our website https://ieee-sustech.org/. The technical papers can be found in in the attendee proceedings.

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 accepted posters will be presented during the online SusTech 2023 Student Poster Competition Wednesday afternoon April 19, 2023. Prizes will be awarded to the top three posters; winners will be announced at the closing session.

We thank our sponsors: the IEEE Oregon, San Fernando Valley, Foothill, Orange County and Coastal Los Angeles Sections, IEEE Region 6, IEEE-USA; and co-sponsors IEEE Industry Applications Society (IAS), Oceanic Engineering Society, Power and Energy (PES) Society, Society on Social Implications of Technology (SSIT), Standards Association (IEEE-SA) and Technology and Engineering Management (TEMS).

I want to personally thank the members of the Organizing and Program Committees whose support and dedication have enabled us to reach this 10th milestone. And to thank you for participating in this SusTech 2023 hybrid conference. It is our sincere hope that you will enjoy and learn about the innovative developments in the area of sustainability.

Sincerely,

Edward G. Perkins
SusTech 2023 Chair

Conference Committee

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Track	Name	Affiliation	Country
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Intelligent Transportation Systems	Adil Usman		
Sustainable Electronics	Adil Usman		
Internet of Things (IOT) for sustainability	Susan Dickey	none	USA
Energy Efficiency	Mohamed Osman	Washington State University-Tri-Cities	USA
Renewable/Alternative Energy	Mohamed Osman		
Smart & Micro Grids	Salman Kahrobaee	SCE	USA
Ocean Waste & Pollution Management	Fausto Ferreira	University of Zagreb	Croatia
	Venugopal Pallayil	ARL	Singapore
Societal Implications / Quality of Life / Public Policy	Jay Pearlman	none	USA
Sustainable Management	Jay Pearlman		
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	Vivek Gupta	NXP Semiconductor	USA
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	Mohammadreza Mehrabian	South Dakota School of Mines	USA
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Exhibitors and Sponsors

Exhibitor

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.

Marketing Patron

Forth is a nonprofit organization with over 40 staff based in Portland, OR, and working nationwide to electrify transportation. The Forth Roadmap Conference is the nation's premier electric transportation gathering, and will attract well over 1,000 people to Portland May 15-17, 2023.

Financial Sponsors

IEEE Oregon Section

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

Oregon Section

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.

IEEE Region 6

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.

IEEE 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

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 Industry Applications Society

The Industry Applications Society, as a transnational organization, is interested in advancement of the theory and practice of electrical and electronic engineering in the development, design, manufacture and application of electrical systems, apparatus, devices and controls to the processes and equipment of industry and commerce; promotion of safe, reliable and economic installations; industry leadership in energy conservation and environmental, health, and safety issues; creation of voluntary engineering standards and recommended practices; and the professional development of its membership.

IEEE Oceanic Engineering Society

The United Nations Decade of Ocean Science for Sustainable Development 2021-2030 (referred to as 'the Ocean Decade'), is a once in a lifetime opportunity for ocean actors across the world to come together to generate knowledge and foster the partnerships needed to support a well-functioning, productive, resilient, sustainable and inspiring ocean. The Ocean is our largest and most important ecosystem for human survival on Earth, and it requires a concerted effort from humanity to change our relationship with the ocean. The Ocean Decade Initiative (ODI) aims to boost OES's participation in this global movement, and interface its actions and activities with the Decade.

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 Standards Association (IEEE SA)

IEEE SA provides a neutral and open environment that empowers innovators – across borders and disciplines – to develop standards and solutions that shape and improve technology for the benefit of industry, society and humanity.

IEEE Technology and Engineering Management Society

"Leaders Enabling Projects/Services Success For Good"

SusTech2023 Schedule At-a-Glance

SusTech Day 1 – April 19 (Wednesday)			
12:00-05:00 pm	**Registration**		
01:00-04:00 pm	**Workshop: Planet Positive 2030 (Multnomah)**		
04:00-07:30 pm	**Student Poster Contest (Elowah)**		
06:00-07:30 pm	**Opening Reception (Wakeena)**		
SusTech Day 2 – April 20 (Thursday)			
	Multnomah	Elowah	Wakeena
7:50 am	**Opening Remarks and Keynote 1: K John Holmes, NAS**		
9:00 am	Agriculture Tech	Societal Implications I	Smart and Micro Grids
10:30 am	**Panel 1: Electricity Transmission Future**		
Noon	**Lunch Break (Willamette)**		
1:00 pm	**Keynote 2: Ian Beil, PGE,**		
2:00 pm	OPEN	Sustainable Electronics	Energy Efficiency: Bldgs
3:30 pm	**Panel 2: Renewable Ocean Energy – IEEE OES**		
5:00 pm	OPEN	Aviation Tech	Energy Efficiency: Grid
6:00 pm	**Day Wrap Up**		
6:00 – 7:30 pm	**YP Reception Event (Multnomah)**		
SusTech Day 3 – April 21 (Friday)			
	Multnomah	Elowah	Wakeena
8:00 am	**Opening Remarks and Keynote: Jen M. Huffstetler, Intel**		
9:00 am	ML Intel Trans/Soc Impl II	Software	Renewable/Alt Energy I
10:30 am	**Panel 3: Maintaining Energy Resilience**		
Noon	**Lunch Break (Willamette)**		
1:00 pm	**Keynote 4: John Borland, J.O.B Technologies**		
2:00 pm	ML for Sust Technology I	Intelligent Transportation	Renewable/Alt Energy II
3:30 pm	**Keynote 5: Jeff Allen, FORTH**		
4:30 pm	ML for Sust Technology II	IOT -	OPEN
6:00 pm	**Day Wrap Up**		
6:30-9:00 pm	**Reception/Dinner (Willamette)**		
SusTech Day 4 – April 22 (Saturday)			
Sustainability Forum (Multnomah)			
8:00 am	**Opening Remarks and Keynote: Eric Olson, NEEA**		
9:00 am	**Keynote: Dan Donahoe, 1000 Kilometers LLC**		
10:00 am	**Panel: Implementing a Sustainable Future for Aviation: An Ecosystem Approach** (AIAA)		
11:45 am	**Special Session: Russ Harrison, IEEE-USA**		
12:15 pm	**Lunch Break (Willamette)**		
1:15 pm	**Keynote: Mahima Gupta, PSU**		
2:15 pm	**Keynote: Chris Mi, San Diego State University**		
3:15 pm	**Keynote: John C Havens, IEEE-SA**		
4:15 pm	**Student Poster Awards**		
4:30 pm	**Closing Remarks & SusTech 2024**		
4:45 pm	**End**		

Special Workshop Event (included with SusTech registration)

Wednesday April 19, 1:00 – 4:00 pm PT (UTC-7)

Planet Positive 2030: Imagine the Future We can Build Together: Sustainability by Design

What happens when sustainability programs and products are designed with a specific end in mind? By using a "backcasting" (versus forecasting) methodology, attendees can discover how to pragmatically work towards a 2030 where the world's temperatures stay under 1.5 and we keep 30% of our planet's land and water safe for all. These boundary conditions leverage engineer's systems thinking capabilities in a pragmatic and positive context.

In this workshop, we will first be presenting an overview of the Planet Positive 2030 Initiative, https://sagroups.ieee.org/planetpositive2030/, created by the IEEE Standards Association that brings together a global, open community of experts to help envision and make recommendations to achieve a technologically supported, flourishing planet for many generations into the future. And we will share part of the work from our committee members.

During the second and highly interactive part of the workshop, you will have an opportunity to contribute to this initiative by adding your thoughts, comments, and recommendations: about the challenges posed by Climate Change and the UN Sustainable Development Goals and how to meet those challenges – utilizing science around climate change combined with technological solutions applied in the context of societal and economic reality.

Our panelist will consist of IEEE Members that are part of the IEEE-SA (IEEE-Standards Association) and are involved in the Planet Positive 2030 Initiative and in the development of standards and guidelines for technical professionals in the areas of sustainability, ethics, and professional development of professionals throughout our world."

It takes all of us to meet the formidable challenges of our time – together we can and will succeed! we welcome participation by SusTech 2023 attendees.

Workshop Panelists:

- Maike Luiken, chair of Planet Positive 2030 – an initiative of the IEEE Standards Association – as well as the P7800 Standards Working Group
- David E. González, co-chair and co-author of the IEEE Standards Association (IEEE-SA) P7800
- John C. Havens, Lead of the Sustainability Practice of the IEEE Standards Association

Bios

Maike Luiken, PhD, SMIEEE, IEEE-HKN, FEIC, chairs Planet Positive 2030 – an initiative of the IEEE Standards Association – as well as the P7800 Standards Working Group: Recommended Practice for Addressing Sustainability, Environmental Stewardship and Climate Change Challenges in Professional Practice. She served as the IEEE VP, Member & Geographic Activities, 2021, as President of IEEE Canada during 2018-19 and, 2018, as Chair, Policy Track, IEEE Internet Initiative.

Maike is and has been for more than 15 years a very strong supporter of sustainable development.

She is a managing director, R&D, at CARBOVATE, a start-up company and Adjunct Research Professor, Western University, Canada.

Previously, in Sarnia, she led the Bluewater Sustainability Initiative, 2006 – 2013, and was the founding Director of the Bluewater Technology Access Centre following eight years as Dean at Lambton College: School of Technology & Applied Sciences, Business Development, Sustainable Development & Applied Research. Her strategic leadership 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 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.

Maike has experience in the public & private sectors in Canada, USA, and Germany. She has 20+ years experience serving on Boards of Directors of local, regional, and global organizations.

David E. González is past chair of the IEEE Conference on Technologies for Sustainability (SusTech) 2022. He is also the co-chair and co-author of the IEEE Standards Association (IEEE-SA) P7800 as well as an active member of the IEEE Sustainable Infrastructures & Community Development Program (SICDP). And finally, he is part of the Draft Guide for Smart Grid Interoperability of Energy Technology and Information Technology Operation with the Electric Power System (EPS).

With three decades of combined aerospace industry and federal government experience, Mr. González has served in leadership positions in the aerospace industry, U.S. Navy, local Rotary Club, and many IEEE committees and activities.

He has worked in aerospace industry and U.S. Federal Government as a software programmer, project manager, training coordinator, XML Subject Matter Expert (SME), member of DoD Cyber Security Workforce (CSWF) – IAT2, member of Department of the Navy Acquisition Corps,

Defense Acquisition University (DAU) – Acquisition Level-3, CompTIA & Microsoft certified professional. He is also passionate about education of primary and secondary school age children, and adult education. His goal is to bring science and technology to socioeconomically depressed populations.

Mr. González earned a Bachelor of Science in Electrical Engineering (BSEE) from California State Polytechnic University Pomona (1996), Master of Business Administration (MBA) from University of Redlands (2000), and completed coursework of Masters in Science of Program Management (MSPM) from the Naval Postgraduate School (2009).

John C. Havens is Lead of the Sustainability Practice of the IEEE Standards Association where he drives the strategy, coordination, and vision for the IEEE SA Planet Positive 2030 Program. He is also Executive Director of The IEEE Global Initiative on Ethics of Autonomous and Intelligent Systems which was responsible for the creation and iteration of a body of work known as *Ethically Aligned Design: A Vision for Prioritizing Human Well-being with Autonomous and Intelligent Systems* that was utilized by the United Nations, the OECD, IBM and dozens of organizations to create their AI principles, policies, and technology.

Previously, John was an EVP of Social Media at PR Firm, Porter Novelli, led Business Development at BlogTalkRadio, and was a professional actor for over 15 years. John has written for Mashable and The Guardian and is author of the books, *Heartificial Intelligence: Embracing Our Humanity To Maximize Machines* and *Hacking Happiness: Why Your Personal Data Counts and How Tracking it Can Change the World*. For more information, follow John on LinkedIn or *@johnchavens* on twitter. John currently has over ninety citations on Research Gate and dozens of articles for outlets such as The Guardian, Quartz, IEEE Spectrum and Mashable.

SusTech 2023 Keynotes and Plenary Speakers

All times and dates shown in Pacific Time (UTC-7)

Thursday, April 20, 2023

Session ID	Time (PT)	Title
K1	8:00 am	Technology, Policy, and Societal Dimensions of Decarbonization: Where We Are Now, Where Did We Come From, and Where Are We Headed
K2	1:00 pm	Electric Island
YP Reception	6:30 pm	Climate Change and Sustainability

Friday, April 21, 2023

K3	8:00 am	Engineers + AI: The New Environmental Stewards
K4	1:00 pm	Energy Equity or Energy Divide
K5	3:30 pm	Everything that moves is going electric

Saturday, April 22, 2023
Sustainability Forum

SFK1	8:00 am	Where We Thought We Would Be and Where We Think We're Going
SFK2	9:00 am	Electronics materials and components enabling sustainability
SFSS	11:45 am	IEEE-USA's policy efforts to support sustainable technology
SFK3	1:15 pm	Distributed Power Generation and Storage for a Renewable Energy Dominant Future
SFK4	2:15 pm	Second-Life EV Batteries for Renewable and Smart Grid Storage Applications
SFK5	3:15 pm	From Boundaries to Beauty – The Human Side of Sustainability

Technology, Policy, and Societal Dimensions of Decarbonization: Where We Are Now, Where Did We Come From, and Where Are We Headed

Thursday, April 20, 2023 @8:00 am

K John Holmes, Scholar and Director of Energy and Environmental Systems, National Academies of Sciences

Abstract:

The United States has begun a transformation of its energy system from one dominated by fossil fuel combustion to one with net-zero emissions of carbon dioxide. This decarbonization is the result of ongoing revolutions in energy technology, public policy, changing economics of energy options, and growing preferences for renewable and zero-carbon supply. The energy transformation will require not only a technological shift but also an equally fundamental economic and social transition. This transition began in earnest in the last decade and will continue through decades to come.

K John Holmes is the senior director and scholar of the National Academies' Board on Energy and Environmental Systems (BEES). The portfolio for BEES is broad and includes activities on climate mitigation and assessment, electricity system modernization, fuel economy technologies for light-duty vehicles, and energy innovation. Dr. Holmes currently leads the cross-Academies initiative on the technological, societal, and policy issues related to deep decarbonization of the United States energy system. That work includes public events on a host of topics related to decarbonization and the February 2022 report *Accelerating Decarbonization of the U.S, Energy System*. His other recent activities include: co-directing studies on the future of the electricity system and negative emissions technologies; directing a study on electricity system resiliency; and organizing workshops on sub-national climate assessment and scaling deep decarbonization technologies.

He has directed studies and published on a range of topics including energy technologies, climate change, renewable electricity, sub-national climate assessment, air quality management, stratospheric ozone depletion, water resources management, and carbon emissions trading. He has a personal interest in the long-term development of technology and policy and published "A historical perspective on climate change assessment" and "A Century of Environmental Technologies for Light-Duty Vehicles" related to these interests. He received a B.S. from Indiana University, M.S.E. from University of Washington, and Ph.D. from The Johns Hopkins University.

Electric Island – An innovation site for heavy duty electric vehicle charging infrastructure located in North Portland

Thursday, April 20, 2023 @1:00 pm

Ian Beil, Manager, Transmission Planning, Portland General Electric

Ian Beil is an electrical power system engineer, researcher, and instructor. Ian leads the Transmission Planning team at Portland General Electric, which studies a host of long-term transmission system phenomena. He has held previous industry positions involving transportation electrification and energy storage projects, renewable energy integration studies, and electromagnetic transient analysis. He also serves as an adjunct faculty member at PSU's Maseeh College of Engineering.

Beil holds a BS in electrical engineering from Washington University in St. Louis and an MS and PhD in electric engineering from the University of Michigan, Ann Arbor. His doctoral dissertation focused on control algorithms to optimize electric vehicle fleet charging in a capacity-constrained distribution system environment.

He is a licensed Professional Engineer in the state of Illinois, a member of the the IEEE Power & Energy Society, and a sub-group lead for the NERC System Planning Impacts from Distributed Energy Resources working group.

Climate Change and Sustainability

YP Reception, Thursday, April 20, 2023 @6:30 pm

Professor Saifur Rahman, 2023 IEEE President & CEO

Abstract:

This lecture will address what is climate change, what is causing it and how it is impacting the daily lives of citizens around the world. In the context the author will the issue of greenhouse gas emissions and how it can be reduced to help mitigate the effect of climate change.

There has been a major focus placed on the carbon produced through electricity generation, as it is responsible for roughly 30% of emissions globally. When focusing on the energy sector alone, it is apparent that nation states are coalescing into two groups when targeting carbon reductions:

- Industrialized nation states, which have been responsible for the vast majority of the total CO2 emissions thus far.

- Emerging economies, which are less responsible for past carbon emissions, but increasing their carbon emissions at a much faster rate.

A nuanced approach to reduce carbon emissions from the electric power sector will be presented which will require industrialized nation states to collaborate with emerging economies to deploy a portfolio of solutions with low-carbon generation including nuclear, hydrogen, storage and demand side management with advanced technology focusing on energy efficiency.

Professor Saifur Rahman is the founding director of the Advanced Research Institute at Virginia Tech, USA where he is the Joseph R. Loring professor of electrical and computer engineering. He also directs the Center for Energy and the Global Environment. He is a Life Fellow of the IEEE and an IEEE Millennium Medal winner. He is the 2023 IEEE President & CEO and was the president of the IEEE Power and Energy Society (PES) for 2018 and 2019.

He was the founding editor-in-chief of the IEEE Electrification Magazine and the IEEE Transactions on Sustainable Energy. He has published over 160 journal papers and has made over five hundred conference and invited presentations. He has conducted several energy efficiency, blockchain and sensor integration projects for Duke Energy, Tokyo Electric Power Company, the US National Science Foundation, the US Department of Defense, the US Department of Energy and the State of Virginia. He has a PhD in electrical engineering from Virginia Tech.

Engineers + AI: The New Environmental Stewards

Friday, April 21, 2023 @ 8:00 am

Jen M. Huffstetler, Chief Product Sustainability Officer,
VP & GM, Intel Future Platforms and Sustainability Group

Abstract:

Engineers harnessing the power of Artificial Intelligence is the key to a sustainable compute future. A future of data centers connecting energy-optimized devices, powered by 100% renewable energy, and intelligently controlled by AI to save electricity and water. As the engineers responsible for making this future a reality, join us for this talk of industry progress to date and steps needed to reach a sustainable compute future.

Jen M. Huffstetler is Chief Product Sustainability Officer, VP & GM, Intel Future Platforms and Sustainability Group. In this role she is responsible for driving the Xeon PnL strategy building, integration & execution across corporate-wide across Intel's Data Platform technologies & business strategies to drive future growth, incubating Data Center services, and driving corporate level strategy and action for Sustainability.

Previously, she led Data Center product management and storage; where she was responsible for the delivery to market of all data center processor products, GPUs and Intel DIMMs, driving overall data center revenue, as well as storage processor segment PnL.

Huffstetler joined Intel in 1996 as a fab process engineer and has spent the majority of her career applying her extensive technical and marketing experience to lead product management and product marketing efforts for a number of core Intel businesses, spanning the mobile (including Intel® Centrino Mobile Technology), desktop and Intel Server boards and systems.

Huffstetler holds a Bachelor's degree in chemical engineering from MIT, and an MBA from Babson College, F.W. Olin Graduate School in Corporate Entrepreneurship. She is also a certified Executive Leadership Coach from Hudson Institute, Korn-Ferry Interpreter, and Birkman Certified.

Energy Equity or Energy Divide: IEEE Electron Device Society Brings Energy Equity to Native Hawaiian Homesteaders on Molokai Living Without Access to Grid Electricity

Friday, April 21, 2023 @ 1:00 pm

John O. Borland, J.O.B. Technologies

Abstract:

The IEEE Electron Device Society (EDS) approved funding a humanitarian project to bring Energy Equity to Native Hawaiian Homesteaders on Molokai living without access to electricity from the Grid. Molokai is an island community of ~7,300 residents (>62% Native Hawaiians) relying on tourism and government subsidies. Approximately 514 residents (129 families) live off-grid on Hawaiian Homestead Lands using imported fossil fuel for heating and to power electric generators. A family monthly expense for off-grid living averages ~$750 and varies depending on the costs of imported fossil fuel that is shipped by barge from Honolulu (gasoline ~$6/gallon and propane is $7.60).

Three homestead sites with 2 to 6 multi-generational family dwellings have been selected. Everyday life on Molokai involves using portable propane tanks for heating hot water and cooking. Gasoline stored in 5-gallon containers is used to power electric generators for electricity used for internet, computer, cell phone charging, TV/entertainment and lights. One homestead uses ice chests/boxes to chill medicine and food, while another uses wood and charcoal for cooking. Homesteaders live off the land, but end up polluting the air from all the fossil fuel they use.

To truly be self-sustaining/sufficient, we will replace all fossil fuel use with Solar + Storage + Wind for 100% clean energy from the Sun (light & heat) to create a healthier clean environment

and reduce Energy Burden for Energy Equity, improving Quality of Life and never having to take a cold shower again. Each Island Nano-Grid system will provide energy sharing between each family and will be equipped with energy efficient household appliances, LED lighting and heat pumps.

The expected >$500/month (>$6,000/year) savings, "dollar saved is a dollar earned" will reduce the need for Molokai to generate cash inflow of $774K/year thereby creating a new source of cash inflow for Molokai from Passive Renewable Energy reducing tourism and government subsidies needs. This will end sending money off island to big oil companies.

John Ogawa Borland was raised in Honolulu, Hawaii and received his BS and MS degrees in Material Science and Engineering from MIT (Massachusetts Institute of Technology). BS thesis on InP Liquid Phase Epitaxy at Hughes Malibu Research Labs and MS thesis on InGaAsP Molecular Beam Epitaxy at Nippon Telegraph and Telephone Musashino Labs in Japan. He has published 168 technical and invited papers in the areas of advanced semiconductor device manufacturing, high efficiency c-Si solar cells and residential Solar + Storage energy cost savings. He has also been awarded 7 patents. In June 2020, he published a book chapter on residential Island Nano-Grid using 100% Energy from the Sun.

He started his career in Silicon Valley working for National Semiconductor on 1.25um CMOS latch-up immunity and intrinsic gettering, then moved to Applied Materials developing advanced CMOS Si-deposition techniques (Epi, Selective Epi & Poly with interface control). At Genus he was Director of Process Development & Marketing, then VP of Strategic Technology developing W-CVD technology and high energy implantation for CMOS Twin and Triple Well technology which moved him back to the Boston area. Varian (VSEA) acquired Genus, he was Director of Advanced Business Development developing Ultra-Shallow Junction technologies for CMOS scaling.

In 2003 he founded J.O.B. Technologies, a strategic technical marketing consulting company providing services to the semiconductor industry in the area of advanced CMOS process technology now focused on the 3nm node CMOS technology. He was Director of Operations at Advanced Integrated Photonics' Hawaii 150mm silicon photonics development Fab in 2013 and 2014. Interesting note is his patent on Triple Well CMOS technology was used to successfully counter a lawsuit against Samsung DRAM and Flash Memory manufacturing in 2020.

For the solar industry he developed high efficiency c-Si solar cells using ion implantation and laser melt annealing for selective emitter technology. Currently he is focused on residential Solar + Storage to Fight Climate Change by bringing Energy Equity to the underserved communities. This involves home energy usage audit to ID options to reduce energy burden and maximize energy cost savings.

The IEEE Molokai humanitarian project is the pilot demonstration for this. He is a senior member of IEEE, the IEEE Region 6 Central Area chair, past-chair of the IEEE Hawaii section, IEEE

Electron Device Society/Solid-State Circuits Society Hawaii chapter chair and IEEE Power and Energy Society Hawaii chapter chair. He is also a member of the Electrochemical Society and Materials Research Society.

Everything that moves is going electric

Friday, April 21, 2023 @ 3:30 pm

Jeff Allen, Executive Director, Forth

Abstract:

Ten years ago, electric vehicles were just beginning to enter the US market. In 2022, 18.8% of all new cars sold in California (and 5.8% nationwide) were electric. Dozens of countries, states, and major automakers have set definite and legally binding deadlines to end the sale of new internal combustion vehicles altogether. Meanwhile, we are seeing the rapid deployment of electric buses, trucks, tractors and more. Electric transportation will play a pivotal role in meeting our climate targets. What is the state of the industry today? What is coming next? And what are the technologies and policies that are needed to sustain this momentum?

Forth is a nonprofit organization with over 40 staff based in Portland and working nationwide to electrify transportation. The Forth Roadmap Conference is the nation's premier electric transportation gathering, and will attract well over 1,000 people to Portland May 15-17, 2023.

Jeff Allen has served as Executive Director of Forth since its founding in 2011. Forth is a nonprofit organization with over 40 staff based in Portland and working nationwide To electrify transportation by bringing diverse stakeholders together to eliminate pollution and barriers to access. Mr. Allen previously served as Executive Director or organizational development consultant to several nonprofit organizations, including the Oregon Environmental Council, where he served as Executive Director from 1996-2006. He holds a Master's degree in Public Policy from the Goldman School of Public Policy at the University of California, Berkeley and graduated Phi Beta Kappa from the University of Michigan.

FORTH

See www.forthmobility.org.

Where We Thought We Would Be and Where We Think We're Going

Saturday, April 22, 2023 @ 8:00 am

Eric Olson, Manager of Emerging Technology and Product Management at the Northwest Energy Efficiency Alliance (NEEA)

Abstract:

Innovative and emerging technologies are crucial in energy efficiency and achieving sustainability goals. What technologies did experts think would be successful a decade ago but are struggling for adoption, and what are some that have surprised us all? Multiple technologies are available and in development that can support energy efficiency goals. We will examine barriers stakeholders can address to increase awareness and adoption and discuss some successfully promoted products.

Eric Olson is the Manager of Emerging Technology and Product Management at the Northwest Energy Efficiency Alliance (NEEA). He leads a team of product managers that collaborate with efficiency organizations, utilities, and national laboratories to identify, test, and vet products, technologies, and practices that help NEEA's 140 utility stakeholders achieve their energy efficiency goals.

Olson has launched multiple innovative products throughout his nearly 25-year career, with more than ten years in environmentally focused products and industries. He focuses on discovering opportunities for product development that drive market adoption. Before joining NEEA, he was the manager of product management and product marketing for the largest and most experienced solar cell and solar panel manufacturer in the western hemisphere, launching pioneering photovoltaic products and dealer programs; developing long-term field testing with Sandia National Labs and NREL to measure the performance and durability of solar panels across various climates; and contributed to UL and IEC standards for photovoltaics. Olson also has deep experience developing and bringing consumer, commercial, and industrial engine and motor-powered equipment to market.

Olson holds a Bachelor's degree in Business Administration and an MBA.

Electronics materials and components enabling sustainability

Saturday, April 22, 2023 @ 9:00 am

Dan Donahoe, 1000 Kilometers LLC

Abstract:

Clayton Christensen's 1997 book *The Inventor's Dilemma* popularized the word "disruption" explaining innovation by depicting technology against time as an "S-Curve". The "S" is formed by phases of slow growth followed by rapid growth and finally by slowing growth constrained by "carrying capacity". A series of incremental improvements of said technology, each with its own "s-curve", agglomerates into a class forms a logarithmic curve such as the familiar Moore's Law. Specifically, this presentation reflects on advances in materials that enabled these technology leaps with an eye to how technology impacts sustainability. Behind each of these advances are marvelous stories about people and how their work continues to enable mankind to grow population far beyond the planet's natural carrying capacity for humans in their historical role of hunter-gatherers.

Dan Donahoe has worked around electronics for over 4 decades. He has worked for defense companies and for the Air Force, worked for computer companies, and worked as a consultant. Dan's business is named *1000 kilometers*. Dan is a Life Senior Member of IEEE and has served as a Section Chair, as an Associate Editor, as a Member at Large on both the IEEE-USA Board and the Electronics Packaging Society (EPS) Boards, as an ad hoc committee chair for IEEE TAB, and as General Chair for SusTech 2015 and Program Chair for SusTech 2023. In 2022, Dan was awarded the inaugural IEEE EPS Distinguished Achievement Certificate for Professional Engagement and Service and the Utah Engineers Council's Engineer of the Year 2022. In 2021 he was honored by the Air Force Meritorious Civilian Service Award. He has a BS & MS from the University of Illinois, MBA from Santa Clara and PhD from the University of Maryland. He is a Registered Professional Engineer in several states.

IEEE-USA's policy efforts to support sustainable technology

Saturday, April 22, 2023 @ 11:45 am

Russell Harrison, Managing Director, IEEE-USA

Abstract:

IEEE-USA government relations addresses sustainability in a variety of ways. In energy policy, electric grid issues have been a longstanding focus.

- How can the US ensure strong physical and cybersecurity of the grid so that when natural disasters strike, Americans regardless of geographic location can have access to electricity? This talk will address grid policy issues in both rural as well as urban areas and will also address the current issues in all aspects of grid security, including cybersecurity.
- Sustainability in space policy is another area where IEEE-USA is looking to build better federal policy. Remote sensing is critical to mitigating and recovering from natural disaster. Satellite protection, including physical and cybersecurity is vital to space sustainability.
- IEEE-USA has been a leader in advocating for support for the basic research programs at the National Institute of Standards and Technology as well as the National Science Foundation. Many of these programs have implications for environmental sustainability and the development of technology used in sustainability practices. This talk will provide an overview of IEEE-USA's advocacy efforts for these agencies.
- Lastly, this talk will cover how IEEE-USA staff are working on sustainable artificial intelligence policy.

Russell Harrison is the Managing Director of the IEEE-USA, which focuses on the unique needs and concerns of IEEE members in the United States. Over his 20-year career with IEEE-USA, Russ has represented IEEE members to the American government on dozens of policy issues including autonomous vehicles, digital privacy, AI, federal research funding, export control, and immigration. In addition to directly engaging with policy makers, Russ strives to build bridges between technology professionals and politicians. He has spoken at over 300 local, national, and international events about public policy and the need for technology professionals to interact with their elected leaders.

Prior to IEEE-USA, Russ represented recycling facilities and the steel industry on Capitol Hill. He has a Master's in Public Management from the University of Maryland and a B.A. in Political Science from Allegheny College.

Distributed Power Generation and Storage for a Renewable Energy Dominant Future

Saturday, April 22, 2023 @ 1:15 pm

Mahima Gupta, Portland State University

Abstract:

Replacing fossil fuels with clean and sustainable energy sources is essential to avoid critical disruptions due to climate change. The electric grid in many countries have high fractions of renewables: Iceland (100%), Norway (97%), Kenya (90%), Brazil (80%), Canada (65%). As per the U.S. Energy Information Agency, in 2021, the share of renewables in the U.S. electricity generation resource mix is 21% and could reach 42% by 2050. Could we aim for higher? How would a 100% Green U.S. Electric Grid look like? What is the expected mix of renewable energy resources? What technological advancements are essential for a renewable energy dominant future? This talk focuses on the role of distributed power generation and storage systems in a renewable energy dominant future, from its definition to the system-level aspects, with emphasis on power electronics systems designs.

Mahima Gupta received her Ph.D. and M.S. degree in Electrical and Computer Engineering from University of Wisconsin-Madison, Madison, WI, in 2019 and 2015 respectively. At UW-Madison, she was affiliated with the Wisconsin Electric Machine and Power Electronics Consortium (WEMPEC). She received her B.E. degree in Electrical and Electronics Engineering from Birla Institute of Technology and Science, Pilani, India. Currently, she is an Assistant Professor at Portland State University, Portland, OR.

Her research interests include power electronic conversion & control, modular multilevel power converters, motor drive systems, and electromagnetic interference issues due to power electronics. Prior to joining PSU in 2020, she was a part of the Research and Advanced Engineering group with Ford Motor Company at Dearborn, MI where she worked on next-generation electrified powertrains.

Dr. Gupta, in recognition of her teaching and research excellence, was the recipient of the 2018 Gerald Holdridge Teaching Award, and the 2016 Edward R. Felber Power Fellowship. Her research has been funded by the National Science Foundation.

Second-Life EV Batteries for Renewable and Smart Grid Storage Applications

Saturday, April 22, 2023 @ 2:15 pm

Chris Mi, Fellow of IEEE & SAE, San Diego State University

Abstract:

The number of electric vehicles (EVs) on roads is growing rapidly. EV batteries today, almost exclusively lithium-ion based, can last about 10 years before they can no longer provide the required performance such as power and range. They cost heavily in both production and recycling. So economically dealing with retired EV batteries is an important topic. It is estimated that the first huge wave of EV battery retirement will hit in 2025, and more retired batteries will be available each year thereafter.

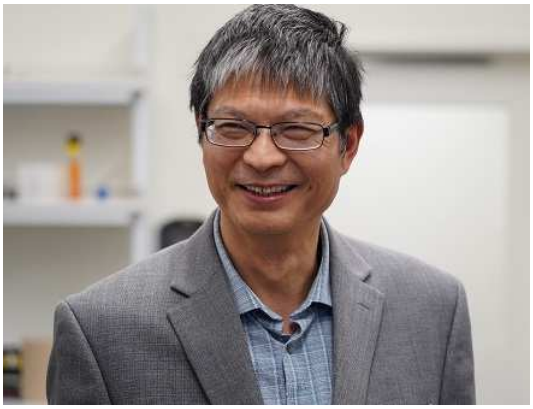
On the other hand, renewable energy, such as solar photovoltaic (PV) and wind, also enjoy a high rate of penetration. To buffer the volatile nature of the energy output of renewable energy systems, battery energy storage systems (BESSs) are frequently incorporated to balance out the variability in power generation, efficiently manage the dynamics of demand and supply, mitigate the potential failure of the grid due to over generation, provide power during a power outage, and enable cost savings by shifting the peak use and reduce demand charge. However, the high cost of new batteries in renewable and grid storage systems is a major concern for potential home and business owners.

Batteries in EVs degrade gradually over the lifetime of the vehicle and will reach the point that it is no longer able to provide the required performance, such as range and acceleration. Second-life EV batteries include not only the batteries that are discarded from EVs due to degraded conditions; but also in-warranty replacements; road accidents; test vehicle batteries; and unsold batteries. Second-life EV batteries, though no longer roadworthy in the vehicle, still have considerable capacity for renewable energy and smart grid applications where the requirement for energy and power density is not as stringent in vehicles. The use of second-life EV batteries in grid BESS extends the life cycle of batteries after their first life in EVs, improves the environment, reduces EV ownership cost by selling them for second-life use, and reduces the cost of BESS in renewable energy systems.

However, there are a number of barriers to overcome in the deployment of second-life EV batteries, including how to properly remove them from vehicles, transport, store, test, and select second-life batteries for storage applications; how to quickly, and accurately identify the battery health conditions of every cell before and after deployment in grid storage; how to dynamically manage them so as to minimize degradation and optimize usage; and how to meet various standards related to fire hazardous mitigation/prevention, certification, permit, and safety.

This talk will holistically look at these issues and address how second-life EV batteries can be used in renewable energy and smart grid applications. The talk will include storage system design, battery management, battery balancing, size optimization, and system control and optimization for demand charge management and peak shaving. We will also look at the various testing

requirements for identifying the conditions of used EV batteries. The aging mechanism of second-life EV batteries will be presented. Various topologies for storage applications, safety, standard, and permit-related issues, will also be discussed.



Chris Mi is distinguished Professor of Electrical and Computer Engineering at San Diego State University. He is a Fellow of IEEE (Institute of Electrical and Electronics Engineers) and SAE (Society of Automotive Engineers). He is also the Director of the US Department of Energy-funded Graduate Automotive Technology Education (GATE) Center for Electric Drive Transportation at SDSU. He was previously a faculty member at the University of Michigan-Dearborn from 2001 to 2015, and an Electrical Engineer with General Electric from 2000 to 2001. He also served as the CTO of 1Power Solutions from 2008 to 2011 and is currently the CTO of EV Safe Charge, Inc. Dr. Mi received his Ph. D from the University of Toronto, Canada, in 2001.

Dr. Mi has published five books, 204 journal papers, 126 conference papers, and 25 issued and pending patents. He served as Editor-in-Chief, Area Editor, Guest Editor, and Associate Editor of multiple IEEE Transactions and international journals, as well as the General Chair of over ten IEEE international conferences. Dr. Mi has won numerous awards, including the "Distinguished Teaching Award" and "Distinguished Research Award" from the University of Michigan-Dearborn, IEEE Region 4 "Outstanding Engineer Award," IEEE Southeastern Michigan Section "Outstanding Professional Award," and SAE "Environmental Excellence in Transportation (E2T) Award." He is the recipient of three Best Paper Awards from IEEE Transactions on Power Electronics and the 2017 ECCE Student Demonstration Award. In 2019, he received the Inaugural IEEE Power Electronics Emerging Technology Award. In 2022, he received the Albert W. Johnson Research Lectureship and named the Distinguished Professor, the highest honor given to a SDSU faculty member and only one award is given each year.

Dr. Mi was the Chair (2008-2009) and Vice-Chair (2006-2007) of the IEEE Southeastern Michigan Section. Dr. Mi was the General Chair of the 5th IEEE Vehicle Power and Propulsion Conference, Area Editor of IEEE Transactions on Vehicular Technology, associate editor of IEEE Transactions on Power Electronics, Associate Editor of IEEE Transactions on Industry Applications. He is the topic chair for the 2011 IEEE International Future Energy Challenge and the General Chair for the 2013 IEEE International Future Energy Challenge. Dr. Chris Mi is a Distinguished Lecturer (DL) of the IEEE Vehicular Technology Society.

He is Guest Editor-in-Chief of IEEE Journal of Emerging and Selected Topics in Power Electronics – Special Issue on WPT, Guest Co-Editor-in-Chief of IEEE Transactions on Power Electronics Special Issue on WPT, Guest Editor of IEEE Transactions on Industrial Electronics – Special Issue on dynamic wireless power transfer, and steering committee member of the IEEE Transportation Electrification Conference (ITEC- Asian). He is Program Chair or General Chair of a number of international conferences, including Workshop on Wireless Power Transfer (WoW), IEEE International Electric Vehicle Conference (IEVC), and IEEE International

Transportation Electrification Conference – Asia-Pacific. He is the Guest Editor of a Special Issue of the Proceedings of the IEEE – Electric and Hybrid Vehicles.

From Boundaries to Beauty – The Human Side of Sustainability

Saturday, April 22, 2023 @ 3:15 pm

John C. Havens, Lead of Sustainability Practice, the IEEE Standards Association

Abstract:

Engineers use "boundary conditions" that provide constraints when determining solutions to design or manufacturing challenges. By providing these conditions, refinements for scope and goals become specific and actionable. When dealing with issues of climate change, however, engineering becomes a "wicked problem," where systems thinking must reckon with multiple variables in regards to planetary and societal elements of design. This widening of scope to include societal and cultural issues becomes a challenge for existing boundaries, especially when there isn't a common definition for what "sustainability" even means.

Many well-intentioned efforts to minimize emissions or be "green" stem from the need to adhere to current or potential regulatory measures. Whereas the word "sustainability" literally translates to "longevity," today most organizations position climate change mitigation or adaptation efforts via short-term planning to maintain fiscal growth for investors and shareholders versus adapting more holistic "boundary conditions" that includes employees, customers, communities, and the ecosystems comprising all stakeholders in a value chain. Where design factors in this paradigm are framed via Environmental, Social, and Governance (ESG) metrics where any of these three elements can be prioritized, "weak" sustainability determines outcomes of design. In contrast, "strong" sustainability recognizes that earth's resources are finite and climate change is not determined by economic or cultural factors in isolation.

By prioritizing ecological flourishing and human wellbeing at the outset of design we can recognize and reinforce the regenerative power of people and planet to honor the boundaries that will bring beauty now and for generations to come.

John C. Havens is Lead of the Sustainability Practice of the IEEE Standards Association where he drives the strategy, coordination, and vision for the IEEE SA Planet Positive 2030 Program. He is also Executive Director of The IEEE Global Initiative on Ethics of Autonomous and Intelligent Systems which was responsible for the creation and iteration of a body of work known as *Ethically Aligned Design: A Vision for Prioritizing Human Well-being with Autonomous and Intelligent Systems* that was utilized by the United Nations, the OECD, IBM and dozens of organizations to create their AI principles, policies, and technology.

Previously, John was an EVP of Social Media at PR Firm, Porter Novelli, led Business Development at BlogTalkRadio, and was a professional actor for over 15 years. John has written for Mashable and The Guardian and is author of the books, *Heartificial Intelligence: Embracing Our Humanity To Maximize Machines* and *Hacking Happiness: Why Your Personal Data Counts and How Tracking it Can Change the World*. For more information, follow John on LinkedIn or *@johnchavens* on twitter. John currently has over ninety citations on Research Gate and dozens of articles for outlets such as The Guardian, Quartz, IEEE Spectrum and Mashable.

SusTech 2023 Panels

All times and dates shown in Pacific Time (UTC-7)

Thursday April 20, 10:30 am	**"Electricity Transmission Future"** Organized by Oregon Department of Energy
Thursday April 20, 3:30 pm	**"Sustainable Ocean Energy Technology and Policy"** Organized by the IEEE Oceanic Engineering Society (OES)
Friday April 21, 10:30 am	**"Maintaining Energy Resilience"** Organized by Oregon Department of Energy
Saturday April 22, 10:00 am	**"Implementing a Sustainable Future for Aviation: An Ecosystem Approach"** Organized by the American Institute of Aeronautics and Astronautics (AIAA)

Electricity Transmission Future

Organized by Oregon Department of Energy

Date & Time: April 20, 10:30 am
Venue: Multnomah Falls

Transmission line infrastructure is expanding across the U.S. and the world. Local, state, and national decarbonization policies; economics; and national security interests are driving an unprecedented demand for large-scale renewable electricity generation projects across the world – which in turn is driving the need to proactively plan and develop a vast expansion of bulk, high-voltage transmission networks to deliver renewables to load centers. This panel will discuss the history, current driving forces, benefits, and challenges of expanding transmission infrastructure in the context of the Pacific Northwest.

Organizer & Moderator: Jason Sierman, Oregon Department of Energy

Panelists:

- **Ricky Bustamante**, Bonneville Power Administration (BPA)
- **Shaun Foster**, Portland General Electric (PGE)
- **Scott Beyer**, PacifiCorp
- **Adam Schultz**, California Independent System Operator (CAISO)

Moderator Bio:

Jason Sierman is a Sr. Energy Policy Analyst with the Oregon Department of Energy. His areas of focus span a variety of power grid topics, such as utility power planning, transmission, storage, and offshore wind. Prior to his current role, he was an Energy Policy Analyst with the Department's Siting Division that supports Oregon's Energy Facility Siting Council. Jason has a B.S. in Civil & Environmental Engineering, an M.B.A., and a J.D. with a focus on Sustainable Environmental, Energy & Resources Law.

Panelist Bios:

Scott Beyer is the Director of Transmission Expansion Planning at PacifiCorp, an electric utility operating 17,100 miles of high-voltage transmission lines across 10 western states and a diverse range of climate zones. In his role, Scott is responsible for planning the transmission system that serves PacifiCorp's Washington, Oregon and Northern California customers to ensure new renewable resources can be delivered reliably and effectively to meet customer needs. Scott has approximately 15 years of experience in regional transmission planning roles at PacifiCorp and the Western Power Pool, and 20 years of experience overall in the electric power industry.

Richard Bustamante is the Manager of Transmission Planning at the Bonneville Power Administration in Portland, Oregon where he oversees BPA's Transmission Reliability, Expansion, and Interconnection Planning. Richard has previous experience in Testing and Commissioning, Construction contract management, and Control and Protection design. Richard has a Bachelor's degree in Electrical Engineering from Rice University.

Shaun Foster has worked for PGE for over 15 years, holding a variety of roles, and currently is the manager of Transmission, Interconnection, & Contract Services. Shaun's responsibilities include the administration of PGE's Open Access Transmission Tariff, which includes both transmission and interconnection service, national and regional transmission policy advocacy, management of PGE's relationship with regional transmission peers, as well as development and delivering PGE's transmission development strategy.

Adam Schultz is the Manager of Regional Coordination for the California Independent System Operator, where he engages with utilities across the western United States to expand regional coordination in the power sector through expanding market solutions. Before joining the ISO, Adam was the Lead for the Electricity & Markets Policy Group at the Oregon Department of Energy. Previously he also managed the UC Davis Energy Institute, worked on renewable energy procurement at the California PUC, and served as the Wayne Morse Legal Fellow for U.S. Senator Ron Wyden. He has a B.A. in Political Science from Tufts University and a J.D. from the Benjamin Cardozo School of Law.

Sustainable Ocean Energy Technology and Policy

Brought to you by the IEEE Oceanic Engineering Society

Date & Time: April 20, 3:30 pm
Venue: Multnomah Falls

This panel will focus on the various ways in which the ocean can be harnessed as a source of clean and sustainable energy, such as through the use of offshore wind, wave and tidal power. Panelists will discuss the current state of technology in this field, as well as the potential for future growth and development. They will also address the public policy and financial barriers to to fully realize the potential of ocean energy, such as the high costs of building and maintaining ocean energy systems and the mitigating potential environmental impacts. Overall, the discussion would aim to provide a comprehensive overview of the state of the field and the opportunities and challenges that lie ahead.

Panelists:

- **Bryson Robertson,** Associate Professor at Oregon State University and Director of the Pacific Marine Energy Center
- **Varner Seaman, CPA**
- **Joseph H. Prudell, PE,** Director Oregon Corporate Operations, C·Power
- **Jonathan Z. Bird,** Associate Professor, Portland State University
- **Jason Sierman,** Sr. Energy Policy Analyst, Oregon Department of Energy

Moderator:

Jason Busch is Executive Director of the Pacific Ocean Energy Trust (POET), an organization that supports the responsible development of marine energy and decarbonization of the maritime sectors. Mr. Busch also is active in a number of organizations, including the Marine Energy Council, Offshore Wind California, and the Renewable Hydrogen Alliance.

Prior to joining Oregon Wave Energy Trust, Mr. Busch was an attorney specializing in land use, energy, and project development.

Panelist Bios:

Bryson Robertson, PhD is an Associate Professor at Oregon State University and Director of the Pacific Marine Energy Center. Dr. Robertson's research and teaching interests include the wave mechanics, hydrodynamics of floating bodies and mooring systems, and renewable energy. Working with partners in industry and the US National Laboratories, he focuses on wave, tidal and offshore wind energy resource characteristics; the co-design and modeling of hydrodynamically active offshore wind and wave renewable technologies; and numerically integrating marine power within the emerging Blue Economy. His research utilizes field measurements, hydrodynamic multi-body numerical models, and physical prototype build/test. Prior to coming to OSU, he spent five years working at the University of Victoria and consulting for marine energy companies. In complementary research, Dr. Robertson also looks at the future of our global energy systems; the nexus of technology, climate change, policy, economics and society on the decarbonization of electrical systems; and the public trust requirements to transition power systems. His research has been funded by the DOE, Navy, the State of Oregon and National Science and Engineering Council of Canada.

Varner Seaman, CPA Mr. Seaman has extensive experience in energy and utility policy. Varner consults with leading advocacy organizations focused on offshore wind development and improved regional governance of the western electric interconnect. In his roles with American Clean Power- California and Renewable Northwest Varner is one of the leading advocates on the west coast focused on the development of this new industry. He has testified in front of the California Coastal Commission, California Energy Commission, California Assembly and the Oregon Legislature and spoken at conferences on issues related to offshore wind on both the east and west coast. Prior work experience includes managing state government relations for Portland General Electric as well as EDP Renewables.

Joseph H. Prudell, PE, Director Oregon Corporate Operations at C·Power in Corvallis, OR, and senior research and development engineer specializing in electrical systems and power generation. He has developed electrical system designs for CH2M Hill, control designs for NACCO Materials Handling Group, and worked for PGE Marking as a transmission engineer performing extensive studies on HV and HV DC transmission lines throughout the Pacific Northwest.

Joe was one of the founding engineers of C·Power while performing research at OSU specializing in wave energy. While at OSU he was the laboratory manager, worked with the late Dr. Alan Wallace, and helped

create the Wallace Energy Systems and Renewables Facility (WESRF) in line with Dr. Wallace's vision for wave energy research. His research at OSU in electrical engineering led to the design and construction of the permanent-magnet synchronous tubular linear generator used in the SeaBeav I and Blue-Ray L10 WEC prototypes, the first production of electrical power off the Oregon coast.

Joe has numerous patents and publications from 19 years of research in wave energy technologies, including topics on ultra-low speed generator designs, power electronics, power systems, and control technologies. He has prior U.S. Navy nuclear engineering service aboard fast attack submarines and is a licensed professional engineer and a member of IEEE and NSPE..

More information: https://www.linkedin.com/in/waveenergy/

Jonathan Z. Bird, PhD, Dr. Bird was recently awarded a 4-year Department of Energy research and development grant that involves supplying variable negative stiffness magnetics springs to AquaHarmonics Inc. for utilization in a wave energy converter. AquaHarmonic Inc will then be testing the wave energy converter at the new Department of Energy testing site (PacWave).

Dr. Bird received his M.S. and Ph.D. degrees in Electrical and Computer Engineering from the University of Wisconsin-Madison, he was a Senior Design Engineer with the General Motors Advanced Technology Center, Assistant then Associate Professor with the University of North Carolina at Charlotte. Since 2015 he has been an Associate Professor with the Portland State University, Portland, OR, USA. His primary research interests include magnetic geared electrical machines, electrodynamic wheel maglev technology and variable stiffness magnetic springs for renewable energy applications. Dr. Bird's research has been primarily funded by the Department of Energy the National Science Foundation and NASA. He is an Associate Editor of the IEEE Transactions on Magnetics.

Jason Sierman is a Sr. Energy Policy Analyst with the Oregon Department of Energy. His areas of focus span a variety of power grid topics, such as utility power planning, transmission, storage, and offshore wind. Prior to his current role, he was an Energy Policy Analyst with the Department's Siting Division that supports Oregon's Energy Facility Siting Council. Jason has a B.S. in Civil & Environmental Engineering, an M.B.A., and a J.D. with a focus on Sustainable Environmental, Energy & Resources Law.

Maintaining Energy Resilience

Organized by Oregon Department of Energy

Date & Time: April 21, 10:30 am
Venue: Multnomah Falls

This panel will address why resiliency is becoming increasingly important in the context of the electricity system. While our economy and communities become increasingly reliant on electricity, climate change is creating unpredictable and extreme conditions that increase the risk of disruptive grid events. What strategies and technologies are available to help increase resiliency in the electricity system, and what are some of the major trade-offs, challenges, opportunities, and next steps associated with those strategies? This panel will discuss these issues and describe actions utilities and transmission operators are taking to increase resiliency in the electricity system.

Organizer & Moderator: Amy Schlusser, Oregon Department of Energy

Panelists:

- Molly Hatfield, Bonneville Power Administration (BPA)
- Greg Alderson, Portland General Electric (PGE)
- Jeni Hall, Energy Trust of Oregon
- Les Perkins, General Manager, Farmers Irrigation District

Moderator:

Amy Schlusser is senior clean energy policy analyst for the Oregon Department of Energy. Prior to joining the agency in October 2022, Amy worked as a staff attorney with the Green Energy Institute at Lewis & Clark Law School for more than nine years. She has extensive experience with a broad variety of legal and regulatory frameworks relating to renewable energy, climate change, and transportation. Amy received J.D. and LL.M. degrees from Lewis & Clark Law School's Environmental, Natural Resources, and Energy Law program. She received her bachelor's degree from Penn State University. In November 2021, Amy was appointed to the Oregon Environmental Quality Commission, the policy and rulemaking board for the Oregon Department of Environmental Quality.

Bios:

Greg Alderson is Senior Environmental Policy Manager at PGE, focused on state policy that will help PGE achieve Oregon's HB 2021 electricity greenhouse gas reduction targets affordably and reliably in partnership with our customers, stakeholders, communities, and regulators.

Molly Hatfield is the Sustainability Program Manager at the Bonneville Power Administration. She leads Sustainability Office efforts to reduce the environmental impacts of BPA's internal operations through strategic planning, targeted research and initiatives, and culture change. During her seven years at BPA, the agency has been recognized with 19 awards for outstanding sustainability performance by the Environmental Protection Agency, the Department of Energy, and others. Molly has been deeply involved in the sustainability field for over 15 years and maintains a strong commitment to promoting best practices throughout the region. She has an MSc in Environmental Change and Management from the University of Oxford.

Jeni Hall is a Program Manager at Energy Trust of Oregon. Her focus is working with Oregon communities and utility partners on projects that balance customer benefits and energy resilience with the future of the electric grid. She is responsible for the leading the organization's strategy on how energy efficiency and renewable energy can support community energy resilience and create grid interactive efficient buildings that are durable and high performing grid assets. Prior to joining Energy Trust Jeni served as co-owner and director of operations for Synchro Solar, a residential and small commercial solar installer based in Portland. She holds a graduate degree in Aerospace Engineering and before following her passion into working with solar was employed by Sikorsky Aircraft to evaluate the handling qualities of Blackhawk helicopters.

Les Perkins has a degree in Biology from Lewis and Clark College, has worked as a microbiologist, co-founded FCA, an energy and water focused non-profit, and currently manages Farmers Irrigation District in Hood River, OR. Farmers Irrigation District owns and operates two LIHI certified hydropower facilities, providing about 9% of Hood River County's annual energy demand. Les is the Chair of the Community Renewable Energy Association, serves on the Energy Trust of Oregon Renewable Energy Advisory Council, is an Executive Board member for the Hood River Energy Council, and was appointed to serve on the Community Renewable Energy Program Advisory Committee. Les has also served as a Hood River County Commissioner for over 20 years, focusing on energy, water, and forestry.

Implementing a Sustainable Future for Aviation: An Ecosystem Approach

Organized by the American Institute of Aeronautics and Astronautics (AIAA)

Date & Time: April 22, 10:00 am
Venue: Multnomah Falls

Sustainable aviation is a cross-industry priority requiring cooperation across aerospace disciplines, including both classical aeronautics science and engineering, as well as adjacent fields such as chemical engineering and transportation planning, to determine the priorities and implement a vision which can be both scaled and maintained. In this panel, organized by the American Institute of Aeronautics and Astronautics (AIAA), speakers will share their perspectives on sustainable aviation developments in policy, practice, and implementation. Panel discussion will emphasize an inclusive ecosystem approach that attempts to embrace a comprehensive view of all technology elements—vehicles, fuels, infrastructure—necessary for a sustainable future for aviation.

Panelists:

- Carol Sim, Assistant Director of the Aviation Sustainability Center (ASCENT) at Washington State University

- Matt Orr, Associate Technical Fellow in Product Development at The Boeing Company

Moderator:

Ashira Beutler-Greene, Senior Manager, Content and Product Strategy at the American Institute of Aeronautics and Astronautics (AIAA)

Bios:

Ashira Beutler-Greene, Ph.D. is responsible for the management of initiatives related to sustainable aviation and advanced air mobility at the American Institute of Aeronautics and Astronautics (AIAA). She enjoys providing opportunities for cross-industry stakeholders to share their perspectives on common areas of concern. Prior to her role at AIAA, she managed educational media programming for the Annual Meeting of the American Association for the Advancement of Science. Ashira holds degrees from University College London, Carnegie Mellon University, and Wellesley College.

Ms. Carol Sim is an Assistant Director in the Washington State University Office of National Laboratory Partnerships and supports the FAA Center of Excellence for Alternative Jet Fuel and the Environment (commonly known as ASCENT) – an aviation-based research organization providing science-based solutions for many of aviation's environmental challenges. Carol also facilitates the Washington Sustainable Aviation Biofuels Work Group- a diverse group of public and private stakeholders – working to promote sustainable aviation fuels as a productive industry in Washington. Prior to joining WSU, Carol was the Director of Environmental Affairs for Alaska Airlines.

Dr. Matthew Orr is an Associate Technical Fellow, Boeing Commercial Airplanes Product Development, with over 20 years of experience in aircraft design. Matt's career has been focused on improving fuel efficiency and reducing the environmental footprint of commercial aviation. He is an American Institute for Aeronautics and Astronautics (AIAA) Associate Fellow and a member of the Aircraft Design Technical Committee, Student Activities Committee, and the Sustainable Aviation Task Force within the AIAA.

Sustainability Forum

Saturday April 22, 8:00 am – 4:45 pm PT (UTC-7)

The Sustainability Forum is a unique conference track at SusTech 2023 that focuses on the aspirations and goals of industry practitioners and technical professionals. This one-day event features a unique blend of experts in policy, leadership, and technology. It features talks on: energy efficiency goals and barriers to achieve them; the role advances in electronic materials and components play in advancing sustainability; policy efforts to support sustainability; distributed power generation and storage; and the role of people in achieving sustainability. There will be a panel on "Implementing a Sustainable Future for Aviation: An Ecosystem Approach" organized by the AIAA.

CEU/PDH credit is available upon request.

SusTech 2023 Sustainability Forum Agenda

Time	Session	Speaker(s)
8:00 am	**Opening Remarks and Keynote 1:**	Where We Thought We Would Be and Where We Think We're Going, Eric Olson, Northwest Energy Efficiency Alliance (NEEA)
9:00 am	**Keynote 2**	Electronics materials and components enabling sustainability, Dan Donahoe
10:00 am	**Panel 1**	Implementing a Sustainable Future for Aviation: An Ecosystem Approach (organized by AIAA)
11:45 am	**Special Session**	IEEE-USA's policy efforts to support sustainable technology, Russell Harrison, Managing Director, IEEE-USA
12:15 pm	**LUNCH**	
1:15 pm	**Keynote 3**	Distributed Power Generation and Storage for a Renewable Future, Mahima Gupta, Portland State University
2:15 pm	**Keynote 4**	Second-Life EV Batteries for Renewable and Smart Grid Storage Applications, Chris Mi, San Diego State University
3:15 pm	**Keynote 5**	From Boundaries to Beauty – The Human Side of Sustainability, John Havens, Lead of Sustainability Practice, the IEEE Standards Association
4:15 pm	**Student Poster Awards**	Prof. Sean Monemi, Cal Poly Pomona
4:30 pm	**Closing Remarks & SusTech 2024**	

Special Events at SusTech 2023

Student Poster Competition

Join us for the SusTech 2023 online Student Poster Competition
Worldwide entrants from undergrad and grad students.
Presentations by recording with live Q&A.
Each contestant has 12 minutes including Q&A.

Date: Wednesday April 19, 2023
Time: 4:00 – 7:30 pm
Location: Elowah

Welcome Reception

Join us for the SusTech 2023 attendee Welcome reception

Meet your fellow attendees and SusTech Committee members

Date: Wednesday April 19, 2023
Time: 6:00 – 7:30 pm
Location: Wakeena

Cash bar & light refreshments

YP Reception – Climate Change and Sustainability

Join us on Thursday April 20 at SusTech 2023 for a special reception organized by the Oregon Section Young Professionals.

Date: Thursday April 20, 2023
Time: 6:00 – 7:30 pm
Location: Multnomah

Cash bar & light refreshments

6:30 pm - Special remote guest presentation

"Climate Change and Sustainability"

by **Professor Saifur Rahman**, 2023 IEEE President & CEO

This lecture will address what is climate change, what is causing it and how it is impacting the daily lives of citizens around the world. In the context the author will the issue of greenhouse gas emissions and how it can be reduced to help mitigate the effect of climate change.

There has been a major focus placed on the carbon produced through electricity generation, as it is responsible for roughly 30% of emissions globally. When focusing on the energy sector alone, it is apparent that nation states are coalescing into two groups when targeting carbon reductions:

- Industrialized nation states, which have been responsible for the vast majority of the total CO2 emissions thus far.
- Emerging economies, which are less responsible for past carbon emissions, but increasing their carbon emissions at a much faster rate.

A nuanced approach to reduce carbon emissions from the electric power sector will be presented which will require industrialized nation states to collaborate with emerging economies to deploy a portfolio of solutions with low-carbon generation including nuclear, hydrogen, storage and demand side management with advanced technology focusing on energy efficiency.

Professor Saifur Rahman is the founding director of the Advanced Research Institute at Virginia Tech, USA where he is the Joseph R. Loring professor of electrical and computer engineering. He also directs the Center for Energy and the Global Environment. He is a Life Fellow of the IEEE and an IEEE Millennium Medal winner. He is the 2023 IEEE President & CEO and was the president of the IEEE Power and Energy Society (PES) for 2018 and 2019.

He was the founding editor-in-chief of the IEEE Electrification Magazine and the IEEE Transactions on Sustainable Energy. He has published over 160 journal papers and has made over five hundred conference and invited presentations. He has conducted several energy efficiency, blockchain and sensor integration projects for Duke Energy, Tokyo Electric Power Company, the US National Science Foundation, the US Department of Defense, the US Department of Energy and the State of Virginia. He has a PhD in electrical engineering from Virginia Tech.

Conference Dinner

Join us for the SusTech 2023 10th Anniversary Conference Dinner
(Tickets required, purchase in advance or at Registration)

Date: Thursday April 20, 2023
Time: 6:30 – 9:00 pm
Location: Willamette Ballroom (1st floor)

Cash bar & light appetizers

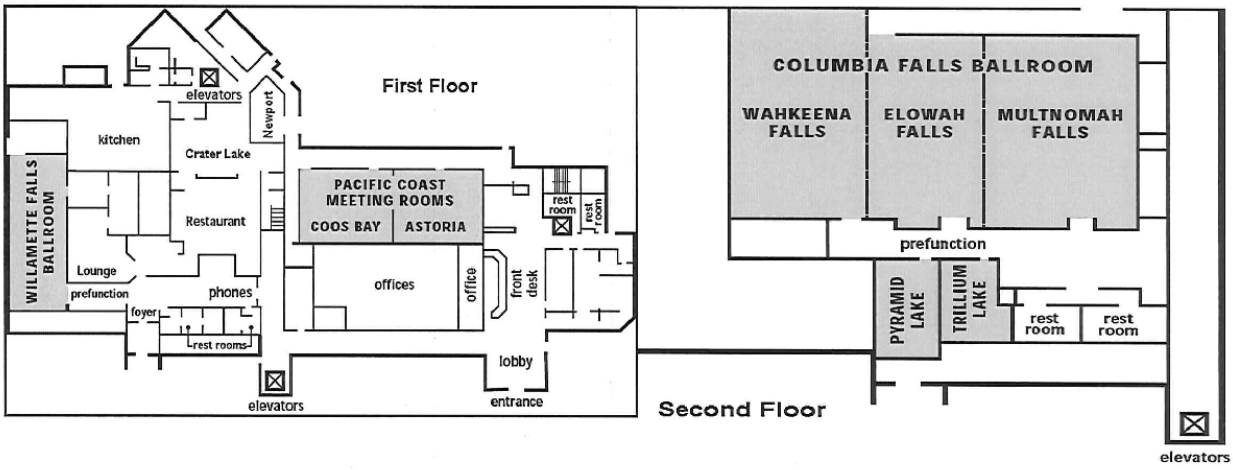
Dinner @ 7:00 pm

2023 IEEE Conference on Technologies for Sustainability (SusTech) Program and Floor Plan

Time (PT)	Multnomah	Elowah	Wakeena	Willamette
Wednesday, April 19				
13:00-16:00	WK1: *Workshop I*			
16:00-19:30		SPC: *Student Poster Competition*	WR: *Welcome Reception*	
Thursday, April 20				
07:50-08:00	OPEN: *Opening Remarks*			
08:00-08:50	K1: *Keynote1*			
09:00-10:20	PS1A: *Agriculture Tech*	PS1B: *Societal Implications I*	PS1C: *Smart and Micro Grids*	
10:30-12:00	PNL1: *Panel - Electricity Transmission Future*			
12:00-13:00				L1: *Lunch*
13:00-13:45	K2: *Keynote 2*			
14:00-15:20		PS2B: *Sustainable Electronics*	PS2C: *Energy Efficiency Buildings*	
15:30-17:00	PNL2: *Sustainable Ocean Energy Technology and Policy*			
17:00-18:00		PS3B: *Aviation Tech*	PS3C: *Energy Efficiency Grid*	
18:00-19:30	YPR: *YP Reception - Climate Change and Sustainability*			
Friday, April 21				
08:00-08:50	ORK3: *Opening Remarks and Keynote 3*			
09:00-10:20	PS4A: *ML for Intell Transp/Social Impl II*	PS4B: *Software*	PS4C: *Renewable/Alt Energy I*	
10:30-12:00	PNL3: *Maintaining Energy Resilience*			
12:00-13:00				L2: *Lunch*
13:00-13:45	K4: *Energy Equity or Energy Divide: IEEE Electron Device Society Brings Energy Equity to Native Hawaiian Homesteaders on Molokai Living Without Access to Grid Electricity*			
14:00-15:20	PS5A: *ML for Sustainable Technology I*	PS5B: *Intelligent Transportation*	PS5C: *Renewable/Alt Energy II*	
15:30-16:15	K5: *Everything that moves is going electric*			
16:30-17:50	PS6A: *ML for Sustainable Technology II*	PS6B: *IOT*		
18:30-20:30				CD: *Reception/Dinner*

Saturday, April 22				
Time (PT)	**Multnomah**	**Elowah**	**Wakeena**	**Willamette**
08:00-08:50	SFK1: *Sustainability Forum - Opening Remarks and Keynote 1*			
09:00-09:45	SFK2: *Electronics materials and components enabling sustainability*			
10:00-11:30	SFP1: *Implementing a Sustainable Future for Aviation: An Ecosystem Approach*			
11:45-12:15	SFSS: *IEEE-USA's policy efforts to support sustainable technology*			
12:15-13:15				L3: *Lunch*
13:15-14:00	SFK3: *Distributed Power Generation and Storage for a Renewable Energy Dominant Future*			
14:15-15:00	SFK4: *Keynote:*			
15:15-16:00	SFK5: *From Boundaries to Beauty - The Human Side of Sustainability*			
16:15-16:30	SPCA: *Student Poster Competition Awards*			
16:30-16:45	CLOS: *Closing Remarks & SusTech 2024*			

Hotel Floor Plan



Wednesday, April 19

Wednesday, April 19 13:00 - 16:00 (America/Los_Angeles)

WK1: Workshop: Planet Positive 2030: Imagine the Future We can Build Together

Room: Multnomah

Workshop Panelists:

- Maike Luiken, chair of Planet Positive 2030 - an initiative of the IEEE Standards Association - as well as the P7800 Standards Working Group
- David E. González, co-chair and co-author of the IEEE Standards Association (IEEE-SA) P7800
- John C. Havens, Lead of the Sustainability Practice of the IEEE Standards Association

In this workshop, we will first be presenting an overview of the Planet Positive 2030 Initiative, https://sagroups.ieee.org/planetpositive2030/, created by the IEEE Standards Association that brings together a global, open community of experts to help envision and make recommendations to achieve a technologically supported, flourishing planet for many generations into the future. And we will share part of the work from our committee members.

During the second and highly interactive part of the workshop, you will have an opportunity to contribute to this initiative by adding your thoughts, comments, and recommendations: about the challenges posed by Climate Change and the UN Sustainable Development Goals and how to meet those challenges - utilizing science around climate change combined with technological solutions applied in the context of societal and economic reality.

Wednesday, April 19 16:00 - 19:30 (America/Los_Angeles)

SPC: Student Poster Competition

Room: Elowah

Chair: Sean Monemi (California State Polytechnic University at Pomona, USA)

SusTech 2023 invited undergraduate and graduate students to submit abstracts for the Student Poster Contest. Abstracts cannot be based on any paper submitted to SusTech 2023.

Students were invited to send in ideas or designs for developing projects/products supporting the sustainability topics areas of the Conference. The selected posters will be presented during the SusTech 2023 Student Poster Competition Virtual Session.

WR: Welcome Reception

Room: Wakeena

All are invited to the Welcome Reception.
Cash bar and light refreshments.

Thursday, April 20

Thursday, April 20 7:50 - 8:00 (America/Los_Angeles)

Room: Multnomah

OPEN: Opening Remarks

Speakers:

- Dan Goodrich, Chair IEEE Oregon Section
- Kathy Hayashi, IEEE Region 6 Director
- Ed Perkins, IEEE SusTech 2023 Chair
- Dan Donahoe, IEEE SusTech 2023Program Chair

Thursday, April 20 8:00 - 8:50 (America/Los_Angeles)

Room: Multnomah

K1: Keynote1

Technology, Policy, and Societal Dimensions of Decarbonization: Where We Are Now, Where Did We Come From, and Where Are We Headed

K John Holmes, Scholar and Director of Energy and Environmental Systems, National Academies of Sciences

The United States has begun a transformation of its energy system from one dominated by fossil fuel combustion to one with net-zero emissions of carbon dioxide. This decarbonization is the result of ongoing revolutions in energy technology, public policy, changing economics of energy options, and growing preferences for renewable and zero-carbon supply. The energy transformation will require not only a technological shift but also an equally fundamental economic and social transition. This transition began in earnest in the last decade and will continue through decades to come.

Thursday, April 20 9:00 - 10:20 (America/Los_Angeles)

PS1A: Agriculture Tech

Room: Multnomah
Chair: Chair: Daniel N Donahoe, PE (1000 Kilometers, USA)

9:00 *Hyperspectral Sensing for Soil Health*
Kim Fleming and Amy Gardner (Persistence Data Mining, USA); Penelope Nagel (United States & Persistence Data Mining, USA); Yuxin Miao and Katsutoshi Mizuta (University of Minnesota, USA)

9:20 *A UAV and Deep Transfer Learning Based Environmental Monitoring: Application to Native and Invasive Species Classification in Southern Regions of USA*
Sayani Sarkar and Robert Kelley (Bellarmine University, USA)

9:40 *PEDS-AI: A Novel Unmanned Aerial Vehicle Based Artificial Intelligence Powered Visual-Acoustic Pest Early Detection and Identification System for Field Deployment and Surveillance*
Ryan R Zhang (The Harker School, USA)

10:00 *Greenhouse Smart Irrigation Based on Soil Moisture and Vegetation Index Measurements*
Mary Cervera-Díaz, María Fernanda León-Chávez, Cosme Santiesteban-Toca and Camilo Lozoya (Tecnologico de Monterrey, Mexico)

PS1B: Societal Implications I

Room: Elowah
Chair: Yesaswini Chilukuri (SIND Consultants, India)

9:00 *The Community Human Development Index (CHDI) as a Precision Public Health Vulnerability Metric and Risk Indicator for Predictive Analytics*
Suraj Sheth and Luis Bettencourt (University of Chicago, USA)

9:20 *A Precision Public Health Study on the Divergence of Life Expectancies over Time in United States Counties*
Suraj Sheth and Luis Bettencourt (University of Chicago, USA)

9:40 *Ethical Leadership and Turnover Intentions: A Systematic Literature Review*
Chrisalena Athanasiadou (International Hellenic University, Greece); Dimitrios Chatzoudes (Democritus University of Thrace, Greece); Georgios Theriou (International Hellenic University, Greece)

10:00 *Minimizing the Cost Gap Between Net Zero Energy and Conventional Buildings*
Elsayed Salem and Emad Elwakil (Purdue University, USA)

PS1C: Smart and Micro Grids

Room: Wakeena
Chair: Adil Usman (National Renewable Energy Laboratory, USA)

9:00 *Detecting Fast Frequency Events in Power System: Development and Comparison of Two Methods*
Hussain A Alghamdi, Midrar A Adham, Umar Farooq and Robert B Bass (Portland State University, USA)

9:20 *Optimal Microgrid Scheduling for Minimizing CO2 Emission Considering the Impact of Utility Grid Renewable Energy Penetration Factor*
Emmanuel Nwaulu and Tarek Masaud (University of Colorado Colorado Springs, USA)

9:40 *Towards Implementation of a Small-Scale Prototype Model of a Smart Grid*
Sean Monemi, Jonathan Aviles, Eric Oliver, Dhruv Prajapati, Michael Nava, Jon-Michael Brown and Spencer Robinson (California State Polytechnic University Pomona, USA)

10:00 *Model Predictive Voltage Control of Large-Scale PV or Hybrid PV-BESS Plants*
Omar Abu-Rub (Georgia Institute of Technology, USA); Phani Marthi (ORNL, USA); Suman Debnath (Oak Ridge National Laboratory, USA); Maryam Saeedifard (Georgia Tech, USA)

Thursday, April 20 10:30 - 12:00 (America/Los_Angeles)

Room: Multnomah

PNL1: Panel - Electricity Transmission Future

Organized by Oregon Department of Energy

Transmission line infrastructure is expanding across the U.S. and the world. Local, state, and national decarbonization policies; economics; and national security interests are driving an unprecedented demand for large-scale renewable electricity generation projects across the world - which in turn is driving the need to proactively plan and develop a vast expansion of bulk, high-voltage transmission networks to deliver renewables to load centers. This panel will discuss the history, current driving forces, benefits, and challenges of expanding transmission infrastructure in the context of the Pacific Northwest.

Organzier & Moderator: Jason Sierman, Oregon Department of Energy

Panelists:

- Ricky Bustamante, Bonneville Power Administration (BPA)
- Shaun Foster, Portland General Electric (PGE)
- Scott Beyer, PacifiCorp
- Adam Schultz, California Independent System Operator (CAISO)

Thursday, April 20 12:00 - 13:00 (America/Los_Angeles)

L1: Lunch

Room: Willamette

Thursday, April 20 13:00 - 13:45 (America/Los_Angeles)

K2: Keynote 2

Electric Island - An innovation site for heavy duty electric vehicle charging infrastructure located in North Portland
Ian Beil, PGE
Room: Multnomah

Thursday, April 20 14:00 - 15:20 (America/Los_Angeles)

PS2B: Sustainable Electronics

Room: Elowah
Chair: Adil Usman (National Renewable Energy Laboratory, USA)

14:00 *Bio-Inspired Multiobjective Optimizacion Approach for Total Harmonic Distortion Reduction in a DC-AC Power Converter*
Jesus Aguila-Leon (University of Guadalajara, Mexico & Universitat Politècnica de València, Spain); Miriam Lucero-Tenorio, Dácil Díaz-Bello and Carlos Vargas-Salgado (Universitat Politècnica de València, Spain); Carlos Jesahel Vega-Gómez (University of Guadalajara, Mexico)

14:20 *Improving the Sustainability of Printed Circuit Boards Through Additive Printing*
Jeff Kettle (University of Glasgow, United Kingdom (Great Britain))

14:40 *A Readiness Model for Facilitating the Implementation of Metal Additive Manufacturing at SMEs*
Mathias Sæterbø (The Arctic University of Norway UiT, Norway); Wei Deng Solvang (UiT The Arctic University of Norway, Norway)

PS2C: Energy Efficiency Buildings

Room: Wakeena
Chair: Robert B Bass (Portland State University, USA)

14:00 *Environment Sensor Node Design for Building Energy Management Systems (BEMS)*
Daniel Fernando Espejel-Blanco, Jose Hoyo-Montano, Jose Manuel Chavez and Fredy Alberto Hernandez-Aguirre (Mexico National Technological Hermosillo Institute of Technology, Mexico)

14:20 *The Challenges of Transition from Traditional to Net Zero Energy Buildings*
Elsayed Salem and Emad Elwakil (Purdue University, USA)

14:40 *Sustainability on a University Campus Considering Recent Energy Efficiency Initiative in Saudi Arabia*
Abdullah Alhaqbani, Saleh Albadaily and Walied Alfraidi (Imam Mohammad Ibn Saud Islamic University, Saudi Arabia)

15:00 *Computer Vision-Based Method to Energy Saving Retrofit: A Study of Improving Energy Efficiency in Existing Construction*
Qais Amarkhil (California State University Northbridge)

Thursday, April 20 15:30 - 17:00 (America/Los_Angeles)

Room: Multnomah

PNL2: Sustainable Ocean Energy Technology and Policy

Brought to you by IEEE Oceanic Engineering Society

This panel will focus on the various ways in which the ocean can be harnessed as a source of clean and sustainable energy, such as through the use of offshore wind, wave and tidal power. Panelists will discuss the current state of technology in this field, as well as the potential for future growth and development. They will also address the public policy and financial barriers to to fully realize the potential of ocean energy, such as the high costs of building and maintaining ocean energy systems and the mitigating potential environmental impacts. Overall, the discussion would aim to provide a comprehensive overview of the state of the field and the opportunities and challenges that lie ahead.

Panelists:

- Bryson Robertson, Associate Professor at Oregon State University and Director of the Pacific Marine Energy Center
- Varner Seaman, CPA
- Joseph H. Prudell, PE, Director Oregon Corporate Operations, C·Power
- Jonathan Z. Bird, Associate Professor, Portland State University
- Jason Sierman, Sr. Energy Policy Analyst, Oregon Department of Energy

Moderator:

Jason Busch, Executive Director of the Pacific Ocean Energy Trust (POET)

Thursday, April 20 17:00 - 18:00 (America/Los_Angeles)

PS3B: Aviation Tech

Room: Elowah
Chair: Daniel N Donahoe, PE (1000 Kilometers, USA)

17:00 *SINCHDrone Technology Demonstration UAV Hybrid Incorporating Power Regeneration Technologies & Weight Minimization*
Kyrie Kudebeh, Jeff Baez, Liam Austin, Zhen Yu, Alton Lo, Steven Dobbs and Joseph Rico (California State Polytechnic University at Pomona, USA)

17:20 *A Review on Civil Applications of Vertical Take-Off and Landing Vehicles*
Ahmed Alsalem and Mohamed Zohdy (Oakland University, USA)

17:40 *Identifying Deforested Areas Through Convolutional Neural Network for Drone Reforesting*
Jose Villalobos-Montiel, Alberto Aguilar-Gonzalez, Luis Orona and Camilo Lozoya (Tecnologico de Monterrey, Mexico)

PS3C: Energy Efficiency Grid

Room: Wakeena
Chair: Adil Usman (National Renewable Energy Laboratory, USA)

17:00 *A Protection Scheme in RTDS Model of an IEEE 16-Bus System*
Sean Monemi (California State Polytechnic University at Pomona, USA); Angine Boghzian (California State Polytechnic University Pomona, USA)

17:20 *Towards Renewable Energy Systems: A Design Framework for a Low Grid-Dependent Residential District*
Meisam Farrokhifar, Lisanne Havinga and Pieter-Jan Hoes (Eindhoven University of Technology, The Netherlands)

17:40 *Class 2 Transformers: Ubiquitous, Hidden, and Inefficient*
Allen T Nguyen (Dartmouth College); Charles Sullivan (Thayer School of Engineering at Dartmouth, USA)

Thursday, April 20 18:00 - 19:30 (America/Los_Angeles)

YPR: YP Reception - Climate Change and Sustainability

Room: Multnomah

Cash bar and light refreshments

Special remote guest presentation by Professor Saifur Rahman, 2023 IEEE President & CEO @ 6:30 pm

This lecture will address what is climate change, what is causing it and how it is impacting the daily lives of citizens around the world. In the context the author will the issue of greenhouse gas emissions and how it can be reduced to help mitigate the effect of climate change.

Friday, April 21

Friday, April 21 8:00 - 8:50 (America/Los_Angeles)

Room: Multnomah

ORK3: Opening Remarks and Keynote 3

Ed Perkins, IEEE SusTech 2023 Chair
Dan Donahoe, IEEE SusTech 2023 Program Chair

Engineers + AI: The New Environmental Stewards

Keynote: Jen M. Huffstetler, Chief Product Sustainability Officer, VP & GM, Intel Future Platforms and Sustainability Group

Engineers harnessing the power of Artificial Intelligence is the key to a sustainable compute future. A future of data centers connecting energy-optimized devices, powered by 100% renewable energy, and intelligently controlled by AI to save electricity and water. As the engineers responsible for making this future a reality, join us for this talk of industry progress to date and steps needed to reach a sustainable compute future.

Friday, April 21 9:00 - 10:20 (America/Los_Angeles)

PS4A: ML for Intell Transp/Social Impl II

Room: Multnomah
Chair: Adil Usman (National Renewable Energy Laboratory, USA)

9:00 *Classification Framework for Vehicle Routing Problem*
Amal Belmabrouk (LASEM, Mechanical Engineering Departement, National Engineering School of Sfax, Tunisia & R and D in Green Power Company, Tunisia); Arij Lahmar (University of Dubai & University of Sfax, United Arab Emirates); Houcem Chouikhi (King Faisal University, Saudi Arabia); Hatem Bentaher (LASEM Mechanical Engineering Departement National Engineering School of Sfax, Tunisia)

9:20 *Impacts of Freight Fleet Electrification*
Natalia Zuniga Garcia, Vincent Freyermuth, Monique Stinson and Olcay Sahin (Argonne National Laboratory, USA)

9:40 *Spatial Demand Forecasting for the Isolated Island with Potential Development Characteristics as a Local Government Centre and Tourist Destination*
Ruly Sitanggang (PT PLN (Persero)); Indra Ardhanayudha Aditya (PT PLN, Indonesia); Sudarmono Sasmono (Telkom University & PT Quadran Energi Rekayasa, Indonesia); Tito Waluyo Purboyo, Igpo Indra Wijaya and Yasarah Labibah (Telkom University, Indonesia)

10:00 *Framework for Dual Transformation: A Systematic Literature Review on the Interplays Between Digitalization and Sustainability*

Christian Kürpick and Luca Olszewski (Fraunhofer Institute for Mechatronic System Design IEM, Germany); Roman Dumitrescu (Heinz Nixdorf Institute University of Paderborn, Germany); Arno Kühn (Fraunhofer-Einrichtung für Entwurfstechnik Mechatronik IEM, Germany)

PS4B: Software

Room: Elowah
Chair: Kathy Hayashi (Qualcomm, USA)

9:00 *SHIFTing to Sustainable Behavior: An Ethical-Persuasive Approach for Mobile Application Development*

Ali Mehellou and Mohamad Saifudin Mohamad Saleh (Universiti Sains Malaysia, Malaysia)

9:20 *Quantum Software Architecture Blueprints for the Cloud: Overview and Application to Peer-2-Peer Energy Trading*

Corey O'Meara, Marina Fernández-Campoamor and Giorgio Cortiana (EON Digital Technology GMbH, Germany); Juan Bernabé-Moreno (University of Granada, Spain)

9:40 *Customizing Smart Warehouse Management for Large Scale Production Industries*

Natalia Khan (UiT The Arctic University of Norway, Norway & Equinor ASA, Norway); Wei Deng Solvang and Hao Yu (UiT The Arctic University of Norway, Norway)

10:00 *E-Waste Recycling Gets Smarter with Digitalization*

Nermeen Abou baker (Ruhr West University of Applied Sciences - Bottrop, Germany); Jonas Stehr (Technical University Dortmund, Germany); Uwe Handmann (University of Applied Sciences Ruhr West, Germany)

PS4C: Renewable/Alt Energy I

Room: Wakeena
Chair: Robert B Bass (Portland State University, USA)

9:00 *Photovoltaic Panel and Battery Design for Solar-Powered Charging Devices in Public Spaces*

Michael D Yancey, Justin Roberts and John Salmon (Brigham Young University, USA)

9:20 *Design and Techno-Economic Analysis of a 150-MW Hybrid CSP-PV Plant*

Kashif Liaqat (Rice University, USA); Juan Ordonez (Florida State University, USA); Laura Schaefer (Rice University, USA); Alexander J. Zolan (National Renewable Energy Laboratory, USA)

9:40 *Maximal Triglyceride Production by Co-Cultivation of Isochrysis Galbana and Bacillus Megaterium for Third-Generation Biofuels*

Madhalasa Iyer (Plano Senior High School, USA)

10:00 *Assessing the Impact of Renewable Energy Sources to Achieve Net Zero Emissions*

Yesaswini Chilukuri (SIND Consultants, India); Adil Usman (National Renewable Energy Laboratory, USA); Bharat Singh Rajpurohit (IIT Mandi, India)

Friday, April 21 10:30 - 12:00 (America/Los_Angeles)

Room: Multnomah

PNL3: Maintaining Energy Resilience

Organized by Oregon Department of Energy

This panel will address why resiliency is becoming increasingly important in the context of the electricity system. While our economy and communities become increasingly reliant on electricity, climate change is creating unpredictable and extreme conditions that increase the risk of disruptive grid events. What strategies and technologies are available to help increase resiliency in the electricity system, and what are some of the major trade-offs, challenges, opportunities, and next steps associated with those strategies? This panel will discuss these issues and describe actions utilities and transmission operators are taking to increase resiliency in the electricity system.

Moderator: Amy Schlusser, Oregon Department of Energy

Panelists:

- Molly Hatfield, Bonneville Power Administration (BPA)
- Greg Alderson, Portland General Electric (PGE)
- Jeni Hall, Energy Trust of Oregon
- Les Perkins, General Manager, Farmers Irrigation District

Friday, April 21 12:00 - 13:00 (America/Los_Angeles)

L2: Lunch

Room: Willamette

Friday, April 21 13:00 - 13:45 (America/Los_Angeles)

Room: Multnomah

K4: Energy Equity or Energy Divide: IEEE Electron Device Society Brings Energy Equity to Native Hawaiian Homesteaders on Molokai Living Without Access to Grid Electricity

John Borland, J.O.B. Technologies

The IEEE Electron Device Society (EDS) approved funding a humanitarian project to bring Energy Equity to Native Hawaiian Homesteaders on Molokai living without access to electricity from the Grid. Molokai is an island community of ~7,300 residents (>62% Native Hawaiians) relying on tourism and government subsidies. Approximately 514 residents (129 families) live off-grid on Hawaiian Homestead Lands using imported fossil fuel for heating and to power electric generators.

Three homestead sites with 2 to 6 multi-generational family dwellings have been selected. We will replace all fossil fuel use with Solar + Storage + Wind for 100% clean energy from the Sun (light & heat) to create a healthier clean environment and reduce Energy Burden for Energy Equity, improving Quality of Life and never having to take a cold shower again. Each Island Nano-Grid system will provide energy sharing between each family and will be equipped with energy efficient household appliances, LED lighting and heat pumps.

Friday, April 21 14:00 - 15:20 (America/Los_Angeles)

PS5A: ML for Sustainable Technology I

Room: Multnomah
Chair: Mohamed Osman (Washington State University Tri-Cities, USA)

14:00 *Optimizing Emissions for Machine Learning Training*
Sachini Piyoni Ekanayake (University at Albany SUNY, USA); Tapan Shah (GE Global Research, USA); Scott C. Evans (GE Research, USA)

14:20 *Day Ahead Load Forecasting Using Random Forest Method with Meteorological Variables*
Jayati Vaish (AKTU, India); Khadim Moin Siddiqui (Shri Ramswaroop Memorial College of Engineering and Management, India); Zeel Maheshwari (Northern Kentucky University, USA); Amit Kumar (Shri Ramswaroop Memorial College of Engineering and Management, India); Sandhya Shrivastava (Shri Ramswaroop Memorial College of Engineering and Management, USA)

14:40 *Using ML Training Computations for Grid Stability in 205*
Scott C. Evans (GE Research, USA); Tapan Shah (GE Global Research, USA)

15:00 *Machine Learning and Thermography Applied to the Detection and Classification of Cracks in Buildings*
Nara Almeida, Angela Busheska and Nicholas Sabella (Lafayette College, USA); Eudes Rocha (Universidade de Pernambuco, Brazil)

PS5B: Intelligent Transportation

Room: Elowah
Chair: Daniel N Donahoe, PE (1000 Kilometers, USA)

14:00 *Sustainable Fleet Operation Strategies to Minimize the Economic and Societal Emission Costs*

Hamid Mozafari, Amirali Soltanpour, Farish Jazlan, Mehrnaz Ghamami and Ali Zockaie (Michigan State University, USA)

14:20 *Sustainable Fleet Management Strategies Considering Environmental Concerns, Covid-19 Pandemic, and Electric Vehicles*

Hamid Mozafari, Amirali Soltanpour, Farish Jazlan, Mehrnaz Ghamami and Ali Zockaie (Michigan State University, USA)

14:40 *Electric Bus Charge/Discharge Scheduling Optimization Method for Power Flow Smoothing in a Distribution System*

Natsuno Kato, Yuto Ihara, Yasuhiro Kodama, Yutaka Iino and Yasuhiro Hayashi (Waseda University, Japan); Ryo Maeda, Kohei Oishi and Kenjiro Mori (TEPCO Power Grid, Japan)

PS5C: Renewable/Alt Energy II

Room: Wakeena
Chair: Robert B Bass (Portland State University, USA)

14:00 *An Optimal Control Framework for Wireless Subsurface Sensors for Oxygen Injection Optimization of Hydrogen Production*

Klemens Katterbauer, Abdallah A AlShehri, Abdulaziz Al Qasim and Ali Yousif (Saudi Aramco, Saudi Arabia)

14:20 *Intelligent Sensor Based Hydrogen Volume Assessment for Subsurface Storage*

Klemens Katterbauer, Abdallah A AlShehri, Abdulaziz Al Qasim and Ali Yousif (Saudi Aramco, Saudi Arabia)

14:40 *An Efficient Energy Management System for Renewable Energy Sources Based Microgrid for Remote Areas*

Muhammad Shahzad, Muhammad Shahbaz Khan and Safee Ullah (HITEC University, Pakistan); Tahir Nadeem Malik (Hitec University, Pakistan)

Friday, April 21 15:30 - 16:15 (America/Los_Angeles)

Room: Multnomah

K5: Everything that moves is going electric

Jeff Allen, FORTH

Ten years ago, electric vehicles were just beginning to enter the US market. In 2022, 18.8% of all new cars sold in California (and 5.8% nationwide) were electric. Dozens of countries, states, and major automakers have set definite and legally binding deadlines to end the sale of new internal combustion vehicles altogether. Meanwhile, we are seeing the rapid deployment of electric buses, trucks, tractors and more. Electric transportation will play a pivotal role in meeting our climate targets. What is the state of the industry today? What is coming next? And what are the technologies and policies that are needed to sustain this momentum?

Friday, April 21 16:30 - 17:50 (America/Los_Angeles)

PS6A: ML for Sustainable Technology II

Room: Multnomah
Chair: Mohamed Osman (Washington State University Tri-Cities, USA)

16:30 *Using Historical Activity Data for RTU Fault Prediction with Machine Learning and Deep Learning*
Alec Zhixiao Lin and Michelle U. Nguyen (SCE, USA)

16:50 *A New Method for Predictive Checkpointing in Transiently-Powered IoT Sensor Devices with Thermal Energy Harvesting*
Carl Christian Rheinländer and Frederik Lauer (University of Kaiserslautern, Germany); Norbert Wehn (RPTU Kaiserslautern-Landau, Germany)

17:10 *An Efficient Urban Water Management Practice Based on Optimum LPCD Estimated Using the MLR-GA Optimization Approach- A Case Study for Jaipur, Rajasthan (India)*
Deshbhushan Savindra Patil (BITS Pilani, India); Soumya Kar (Birla Institute of Technology and Science, Pilani, India); Rajiv Gupta (BITS Pilani, India)

PS6B: IOT

Room: Elowah
Chair: Kathy Hayashi (Qualcomm, USA)

16:30 *Trust Model System for the Energy Grid of Things Network Communications*
Sonali Fernando, John M Acken, Robert Bass and Zhongkai Zeng (Portland State University, USA)

16:50 *Creation of an FPGA-WSN-Based Forest Fire Alert System Using Data-Driven Attribute Relationship Determination*
Srimonti Dutta (Indian Institute of Technology Guwahati, India); Rahul Dinesh Khamkar (Purdue University, USA)

17:10 *Utilizing IoT Technological Innovation by Startup Businesses for Sustainable Smart Transportation in Developing Countries*
Mohammad Tondro (University of Texas at Arlington, USA); Mohammad Jahanbakht (University of Texas at Arlington, USA & Sharif University of Technology, Iran)

Friday, April 21 18:30 - 20:30 (America/Los_Angeles)

CD: Reception/Dinner

Room: Willamette

Saturday, April 22

Saturday, April 22 8:00 - 8:50 (America/Los_Angeles)

Room: Multnomah

SFK1: Sustainability Forum - Opening Remarks and Keynote 1

Ed Perkins, IEEE SusTech 2023 Chair
Dan Donahoe, IEEE SusTech 2023Program Chair

Where We Thought We Would Be and Where We Think We're Going

Keynote: Eric Olson, Manager of Emerging Technology and Product Management at the Northwest Energy Efficiency Alliance (NEEA)

Innovative and emerging technologies are crucial in energy efficiency and achieving sustainability goals. What technologies did experts think would be successful a decade ago but are struggling for adoption, and what are some that have surprised us all? Multiple technologies are available and in development that can support energy efficiency goals. We will examine barriers stakeholders can address to increase awareness and adoption and discuss some successfully promoted products.

Saturday, April 22 9:00 - 9:45 (America/Los_Angeles)

Room: Multnomah

SFK2: Electronics materials and components enabling sustainability

Dan Donahoe, 1000 Kilometers LLC

Clayton Christensen's 1997 book The Inventor's Dilemma popularized the word "disruption" explaining innovation by depicting technology against time as an "S-Curve". The "S" is formed by phases of slow growth followed by rapid growth and finally by slowing growth constrained by "carrying capacity". A series of incremental improvements of said technology, each with its own "s-curve", agglomerates into a class forms a logarithmic curve such as the familiar Moore's Law. Specifically, this presentation reflects on advances in materials that enabled these technology leaps with an eye to how technology impacts sustainability. Behind each of these advances are marvelous stories about people and how their work continues to enable mankind to grow population far beyond the planet's natural carrying capacity for humans in their historical role of hunter-gatherers.

Saturday, April 22 10:00 - 11:30 (America/Los_Angeles)

Room: Multnomah

SFP1: Implementing a Sustainable Future for Aviation: An Ecosystem Approach

Organized by the American Institute of Aeronautics and Astronautics (AIAA)

Sustainable aviation is a cross-industry priority requiring cooperation across aerospace disciplines, including both classical aeronautics science and engineering, as well as adjacent fields such as chemical engineering and transportation planning, to determine the priorities and implement a vision which can be both scaled and maintained. In this panel, organized by the American Institute of Aeronautics and Astronautics (AIAA), speakers will share their perspectives on sustainable aviation developments in policy, practice, and implementation. Panel discussion will emphasize an inclusive ecosystem approach that attempts to embrace a comprehensive view of all technology elements-vehicles, fuels, infrastructure-necessary for a sustainable future for aviation.

Moderator:
Ashira Beutler-Greene, Senior Manager, Content and Product Strategy at the American Institute of Aeronautics and Astronautics (AIAA)

Panelists:

- Carol Sim, Assistant Director of the Aviation Sustainability Center (ASCENT) at Washington State University
- Matt Orr, Associate Technical Fellow in Product Development at The Boeing Company

Saturday, April 22 11:45 - 12:15 (America/Los_Angeles)

Room: Multnomah

SFSS: IEEE-USA's policy efforts to support sustainable technology

Russell Harrison, Managing Director, IEEE-USA

IEEE-USA government relations addresses sustainability in a variety of ways. In energy policy, electric grid issues have been a longstanding focus.

- How can the US ensure strong physical and cybersecurity of the grid so that when natural disasters strike, Americans regardless of geographic location can have access to electricity? This talk will address grid policy issues in both rural as well as urban areas and will also address the current issues in all aspects of grid security, including cybersecurity.

- Sustainability in space policy is another area where IEEE-USA is looking to build better federal policy. Remote sensing is critical to mitigating and recovering from natural disaster. Satellite protection, including physical and cybersecurity is vital to space sustainability.
- IEEE-USA has been a leader in advocating for support for the basic research programs at the National Institute of Standards and Technology as well as the National Science Foundation. Many of these programs have implications for environmental sustainability and the development of technology used in sustainability practices. This talk will provide an overview of IEEE-USA's advocacy efforts for these agencies.
- Lastly, this talk will cover how IEEE-USA staff are working on sustainable artificial intelligence policy.

Saturday, April 22 12:15 - 13:15 (America/Los_Angeles)

L3: Lunch

Room: Willamette

Saturday, April 22 13:15 - 14:00 (America/Los_Angeles)

Room: Multnomah

SFK3: Distributed Power Generation and Storage for a Renewable Energy Dominant Future

Mahima Gupta, Portland State University

Replacing fossil fuels with clean and sustainable energy sources is essential to avoid critical disruptions due to climate change. The electric grid in many countries have high fractions of renewables: Iceland (100%), Norway (97%), Kenya (90%), Brazil (80%), Canada (65%). As per the U.S. Energy Information Agency, in 2021, the share of renewables in the U.S. electricity generation resource mix is 21% and could reach 42% by 2050. Could we aim for higher? How would a 100% Green U.S. Electric Grid look like? What is the expected mix of renewable energy resources? What technological advancements are essential for a renewable energy dominant future? This talk focuses on the role of distributed power generation and storage systems in a renewable energy dominant future, from its definition to the system-level aspects, with emphasis on power electronics systems designs.

Saturday, April 22 14:15 - 15:00 (America/Los_Angeles)

Room: Multnomah

SFK4: Second-Life EV Batteries for Renewable and Smart Grid Storage Applications

Chris Mi, Fellow of IEEE & SAE, San Diego State University

The number of electric vehicles (EVs) on roads is growing rapidly. EV batteries today, almost exclusively lithium-ion based, can last about 10 years before they can no longer provide the required performance such as power and range. They cost heavily in both production and recycling.

Batteries in EVs degrade gradually over the lifetime of the vehicle and will reach the point that it is no longer able to provide the required performance, such as range and acceleration. Second-life EV batteries include not only the batteries that are discarded from EVs due to degraded conditions; but also in-warranty replacements; road accidents; test vehicle batteries; and unsold batteries. Second-life EV batteries, though no longer roadworthy in the vehicle, still have considerable capacity for renewable energy and smart grid applications where the requirement for energy and power density is not as stringent in vehicles.

This talk will holistically look at these issues and address how second-life EV batteries can be used in renewable energy and smart grid applications. The talk will include storage system design, battery management, battery balancing, size optimization, and system control and optimization for demand charge management and peak shaving. We will also look at the various testing requirements for identifying the conditions of used EV batteries. The aging mechanism of second-life EV batteries will be presented. Various topologies for storage applications, safety, standard, and permit-related issues, will also be discussed.

Saturday, April 22 15:15 - 16:00 (America/Los_Angeles)

SFK5: From Boundaries to Beauty - The Human Side of Sustainability

John C Havens, Lead of Sustainability Practice, the IEEE Standards Association

Room: Multnomah

Saturday, April 22 16:15 - 16:30 (America/Los_Angeles)

Room: Multnomah

SPCA: Student Poster Competition Awards

Sean Monemi

Saturday, April 22 16:30 - 16:45 (America/Los_Angeles)

Room: Multnomah

CLOS: Closing Remarks & SusTech 2024