

# **2023 IEEE Conference on Technologies for Sustainability (SusTech 2023)**

**Portland, Oregon, USA  
19 – 22 April 2023**



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# Program

## Program by Session

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See [Panels Tab](#) for Panels Program.

See [Sustainability Forum Tab](#) for Saturday Program.

Download the [SusTech 2022 Sustainability Forum Program \(PDF\)](#)

Download the [SusTech 2022 Program Guide \(PDF\)](#)

Time	Multnomah	Elowah	Willamette	Wakeena
<b>Wednesday, April 19</b>				
13:00-16:00	WK1: Workshop I			
16:00-19:30		SPC: Student Poster Competition		WR: Welcome Reception
<b>Thursday, April 20</b>				
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: <b>Panel - Electricity Transmission Future</b>			
12:00-13:00			L1: Lunch	
13:00-13:45	K2: Keynote 2			
14:00-15:20	PS2A: OPEN	PS2B: Sustainable Electronics		PS2C: Energy Efficiency Buildings
15:30-17:00	PNL2: <b>Sustainable Ocean Energy Technology and Policy</b>			
17:00-18:00	PS3A: OPEN	PS3B: Aviation Tech		PS3C: Energy Efficiency Grid
18:00-19:30	YPR: <b>YP Reception - Climate Change and Sustainability</b>			
<h2>Friday, April 21</h2>				
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: <b>Maintaining Energy Resilience</b>			
12:00-13:00			L2: Lunch	
13:00-13:45	<b>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</b>			
14:00-15:20	PS5A: ML for Sustainable Technology I	PS5B: Intelligent Transportation		PS5C: Renewable/Alt Energy II

15:30-16:15	K5: <b>Everything that moves is going electric</b>			
16:30-17:50	PS6A: ML for Sustainable Technology II	PS6B: IOT		PS6C: OPEN
18:30-20:30			CD: Reception/ Dinner	
<h2>Saturday, April 22</h2>				
08:00-08:50	SFK1: Sustainability Forum - Opening Remarks and Keynote 1			
09:00-09:45	SFK2: <b>Electronics materials and components enabling sustainability</b>			
10:00-11:30	SFP1: <b>Implementing a Sustainable Future for Aviation: An Ecosystem Approach</b>			
11:45-12:15	SFSS: <b>IEEE-USA's policy efforts to support sustainable technology</b>			
12:15-13:15			L3: Lunch	
13:15-14:00	SFK3: <b>Distributed Power Generation and Storage for a Renewable Energy Dominant Future</b>			
14:15-15:00	SFK4: <b>Second-Life EV Batteries for Renewable and Smart Grid Storage Applications</b>			
15:15-16:00	SFK5: <b>From Boundaries to Beauty - The Human Side of Sustainability</b>			
16:15-16:30	SPCA: Student Poster Competition Awards			
16:30-16:45	CLOS: Closing Remarks & SusTech 2024			

Wednesday, April 19

Wednesday, April 19 13:00 - 16:00 (America/Los\_Angeles)

WK1: Workshop I

**Planet Positive 2030: Imagine the Future We can Build Together**

Room: Multnomah

Chairs: David Gonzalez (IEEE, USA), Maike Luiken (Carbovate & Western University, Canada)

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)

OPEN: Opening Remarks

Room: Multnomah

Dan Goodrich, Chair IEEE Oregon Section

Kathy Hayashi, IEEE Region 6 Director

Ed Perkins, IEEE SusTech 2023 Chair

Dan Donahoe, IEEE SusTech 2023 Program Chair

Thursday, April 20 8:00 - 8:50 (America/Los\_Angeles)

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

Room: Multnomah

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

**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)

pp. 1-5

**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)

pp. 6-11

**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)

pp. 12-19

**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)

pp. 20-24

## 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)

pp. 25-32

**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)

pp. 33-40

**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)

pp. 41-48

**10:00 *Minimizing the Cost Gap Between Net Zero Energy and Conventional Buildings***

Elsayed Salem and Emad Elwakil (Purdue University, USA)

pp. 49-54

## 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)

pp. 55-62

**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)

pp. 63-67

**9:40 *Towards Implementation of a Small-Scale Prototype Model of a Smart Grid***

Sean Monemi (California State Polytechnic University at Pomona, USA); Jonathan Aviles, Eric Oliver, Dhruv Prajapati, Michael Nava, Jon-Michael Brown and Spencer Robinson (California State Polytechnic University Pomona, USA)

pp. 68-74

**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)

pp. 75-79

Thursday, April 20 10:30 - 12:00 (America/Los\_Angeles)

## PNL1: Panel - Electricity Transmission Future

Organized by Oregon Department of Energy

Room: Multnomah

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)

PS2A: OPEN

Room: Multnomah

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)

pp. 80-85

**14:20 *Improving the Sustainability of Printed Circuit Boards Through Additive Printing***

Jeff Kettle (University of Glasgow, United Kingdom (Great Britain))

pp. 86-90

**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)

pp. 91-98

## PS2C: Energy Efficiency Buildings

Room: Wakeena

**14:00 *Environment Sensor Node Design for Building Energy Management Systems (BEMS)***

Daniel Fernando Espejel-Blanco (Mexico National Technological Hermosillo Institute of Technology, Mexico); Jose Hoyo-Montano (Mexico National Technological Hermosillo Institute of Technology); Jose Manuel Chavez and Fredy Alberto Hernandez-Aguirre (Mexico National Technological Hermosillo Institute of Technology, Mexico)

pp. 99-103

**14:20 *The Challenges of Transition from Traditional to Net Zero Energy Buildings***

Elsayed Salem and Emad Elwakil (Purdue University, USA)

pp. 104-110

**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)

pp. 111-116

**15:00 *Computer Vision-Based Method to Energy Saving Retrofit: A Study of Improving Energy Efficiency in Existing Construction***

Qais Amarkhil (California State University Northridge)

pp. 117-123

Thursday, April 20 15:30 - 17:00 (America/Los\_Angeles)

## PNL2: **Sustainable Ocean Energy Technology and Policy**

Brought to you by IEEE Oceanic Engineering Society

Room: Multnomah

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 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)

PS3A: OPEN

Room: Multnomah

PS3B: Aviation Tech

Room: Elowah

### **17:00 SINCHDrone Technology Demonstration UAV Hybrid Incorporating Power Regeneration Technologies & Weight Minimization**

Kyrie Kudebeh, Jeff Baez and Liam Austin (California State Polytechnic University Pomona, USA); Zhen Yu (California State Polytechnic University at Pomona, USA); Alton Lo (California State Polytechnic University Pomona, USA); Steven Dobbs

(California State Polytechnic University at Pomona, USA); Joseph Rico (California State Polytechnic University Pomona, USA)

pp. 124-129

**17:20 A Review on Civil Applications of Vertical Take-Off and Landing Vehicles**

Ahmed Alsalem and Mohamed Zohdy (Oakland University, USA)

pp. 130-137

**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)

pp. 138-143

## 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 Boghizan (California State Polytechnic University Pomona, USA)

pp. 144-150

**17:20 Towards Renewable Energy Systems: A Design Framework for a Low Grid-Dependent Residential District**

Meisam Farrokhifar, Lianne Havinga and Pieter-Jan Hoes (Eindhoven University of Technology, The Netherlands)

pp. 151-156

**17:40 Class 2 Transformers: Ubiquitous, Hidden, and Inefficient**

Allen T Nguyen (Dartmouth College); Charles Sullivan (Thayer School of Engineering at Dartmouth, USA)

pp. 157-160

Thursday, April 20 18:00 - 19:30 (America/Los\_Angeles)

## YPR: YP Reception - Climate Change and Sustainability

"Climate Change and Sustainability", with Professor Saifur Rahman, 2023 IEEE President & CEO

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)

ORK3: Opening Remarks and Keynote 3

**Engineers + AI: The New Environmental Stewards**

Ed Perkins, IEEE SusTech 2023 Chair

Dan Donahoe, IEEE SusTech 2023 Program Chair

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

Room: Multnomah

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)

pp. 161-167

**9:20 Impacts of Freight Fleet Electrification**

Natalia Zuniga Garcia, Vincent Freyermuth, Monique Stinson and Olcay Sahin  
(Argonne National Laboratory, USA)

pp. 168-169

**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)

pp. 170-174

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

Christian Kürpick (Fraunhofer Institute for Mechatronic Systems Design IEM, Germany); 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)

pp. 175-182

## PS4B: Software

Room: Elowah

**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)

pp. 183-190

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

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

pp. 191-198

**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)  
pp. 199-204

**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)  
pp. 205-209

## 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)  
pp. 210-217

**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)  
pp. 218-224

**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)  
pp. 225-230

**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)  
pp. 231-236



Friday, April 21 10:30 - 12:00 (America/Los\_Angeles)

### PNL3: **Maintaining Energy Resilience**

Organized by Oregon Department of Energy

Room: Multnomah

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

Friday, April 21 12:00 - 13:00 (America/Los\_Angeles)

L2: Lunch

Room: Willamette

Friday, April 21 13:00 - 13:45 (America/Los\_Angeles)

### **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

Room: Multnomah

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

**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)

pp. 237-238

**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)

pp. 239-244

**14:40 *Using ML Training Computations for Grid Stability in 205***

Scott C. Evans (GE Research, USA); Tapan Shah (GE Global Research, USA)

pp. 245-246

**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)

pp. 247-251

PS5B: Intelligent Transportation

Room: Elawah

**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)  
pp. 252-253

**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)  
pp. 254-255

**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)  
pp. 256-262

## PS5C: Renewable/Alt Energy II

Room: Wakeena

**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)  
N/A

**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)  
N/A

Friday, April 21 15:30 - 16:15 (America/Los\_Angeles)

## K5: Everything that moves is going electric

Jeff Allen, FORTH

Room: Multnomah

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

**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)

pp. 263-268

**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)

pp. 269-274

**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)

pp. 275-279

PS6B: IOT

Room: Elowah

**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)

pp. 280-287

**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)

pp. 288-292

**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 (Sharif University of Technology, USA & University of Texas at Arlington, USA)

pp. 293-298

PS6C: OPEN

Room: Wakeena

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)

SFK1: Sustainability Forum - Opening Remarks and Keynote 1

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

Ed Perkins, IEEE SusTech 2023 Chair

Dan Donahoe, IEEE SusTech 2023 Program Chair

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

Room: Multnomah

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)

## SFK2: **Electronics materials and components enabling sustainability**

Dan Donahoe, 1000 Kilometers LLC

Room: Multnomah

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)

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

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

Room: Multnomah

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)

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

Russell Harrison, Managing Director, IEEE-USA

Room: Multnomah

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)

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

Mahima Gupta, Portland State University

Room: Multnomah

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)

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

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

Room: Multnomah

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

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.

**Saturday, April 22 16:15 - 16:30 (America/Los\_Angeles)**

## **SPCA: Student Poster Competition Awards**

Sean Monemi

Room: Multnomah

**Saturday, April 22 16:30 - 16:45 (America/Los\_Angeles)**

## **CLOS: Closing Remarks & SusTech 2024**

Room: Multnomah