

# 9th IEEE Conference on Technologies for Sustainability

## IEEE SusTech 2022



Green Infrastructures for Sustainability

Virtual - April 21-23, 2022

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# IEEE SusTech2022



Green Infrastructures for Sustainability

## Welcome Message from the Conference Chair

It is an honor to welcome you to the 9<sup>th</sup> annual IEEE Technologies for Sustainability Conference (SusTech 2022) held from April 21 to 22, 2022. This is the third year in which we are offering this conference in a virtual environment. This has allowed even more participation of IEEE and Non-IEEE attendees from the Americas, Europe, Africa and Asia/Pacific.

For many years this conference has attracted attendees from government, industry, business and manufacturing sectors. We have scientists, academics, technologists, and scholars from many disciplines that share and contribute to the interesting tracks that we offer in our conference.

Our 3-day program features keynote speakers, panel discussions, peer-reviewed technical paper presentations across 12 thematic sessions, a student poster contest, and a 1-day sustainable aviation forum.

Undergraduate and graduate students submitted abstracts for the Student Poster Contest, representing ideas or designs for developing projects/products supporting the sustainability topics areas of the Conference. The selected posters will be presented during the SusTech 2022 online Student Poster Session Thursday evening April 21, 2022. Prizes will be awarded to the top three posters; winners will be announced at the closing session.

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

We will be using Whova for the SusTech 2022 virtual venue. 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. Our website at <https://iee-sustech.org/> will provide you additional information on the Program for SusTech 2022.

I want to personally want to thank you for participating in this SusTech 2022 virtual conference, which has grown in popularity and attendance year over year. It is our sincere hope that you will enjoy and learn about the innovative developments in the area of sustainability. We will be expecting you at next year's 10<sup>th</sup> anniversary conference!

Sincerely,

prof. David E. González  
BSEE|MBA|MSPM  
SusTech 2022 Conference Chair

## Conference Committee

Position	Name	Organization
<b>Chair</b>	David E. Gonzalez	U.S. Navy
Vice Chair	Sharan Kalwani	DataSwing LLC
Secretary	Sevada Isayan	Glendale Community College
Treasurer	Russell H. Kinner, PE	SSOE group (Retired)
Past Chair	Gora Datta	CAL2CAL
Project Manager	Surinder Tuli	Intel (Retired)
Emeritus Chair and Co-Founder	Ed Perkins	Consultant
<b>Technical Program Chair</b>	Rakeshkumar Mahto	CSU Fullerton
TP Vice Chair	Justin Shi	Temple University
Committee	Siobhan Dolan Clancy	SDC Business Consulting
Keynote Talks Coordinator	Charlie Jackson	Northrup Grumman
Student Poster Chair	Sean Monemi	Cal. State Poly. Univ. Pomona
<b>Publication Chair</b>	Ed Perkins	Consultant
EDAS Chair	Ed Perkins	Consultant
<b>SusTech Talks Coordinator</b>	Charlie Jackson	Northrup Grumman
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<b>Local Arrangements</b>	David E. Gonzalez	U.S. Navy
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	Rick Smith	Intel
<b>Registration Chair</b>	Don Mayer	The Aerospace Corporation (Retired)
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IEEE/Society Social Implications of Technology (SSIT)	Jay Pearlman	SSIT Conferences VP
IEEE/Technology and Engineering Management Society (TEMS)	Mike Andrews	Andrews & Associates
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San Fernando Valley Section	Sevada Isayan	Glendale Community College
Coastal LA Section	Aleksandar Babic	IBM
Foothill Section	Max Cherubin	Pantron
Orange County Section	Irvin Huang	Consultant
Phoenix Section	Vivek Gupta	NXP Semiconductor
Metro LA Section	Yvonne Marchand	Southern Cal. Edison (SCE)

## SusTech 2022 Patrons & Sponsors

### 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](#)



#### 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.

#### [Coastal LA 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.

#### [Orange County Section](#)



**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



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



**Phoenix Section**

IEEE Phoenix Section

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



**Metro LA**

IEEE Metropolitan Los Angeles Section

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

IEEE-USA



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

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



## Technical Sponsors



### [IEEE Power & Energy Society](#)

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



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

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



### [IEEE 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”

## Technical Program Committee

Role	Name	Affiliation
Chair	David E. Gonzalez	U.S. Navy
Vice Chair	Sharan Kalwani	DataSwing LLC
Technical Program Chair	Rakeshkumar Mahto	California State University, Fullerton
Vice Chair	Justin Shi	Temple University
Committee	Siobhan Dolan Clancy	SDC Business Consulting
	Edward Perkins	Self-employed
Keynote Talks Coordinator	Charlie Jackson	Northrup Grumman
Student Poster Chair	Sean Monemi	Cal. State Poly. Univ. Pomona

### Track Chairs

Track	Name	Affiliation
Agriculture and Food Technology	Rakeshkumar Mahto	California State University, Fullerton
Ecological Sustainability and Conservation	Adil Usman	University of California Santa Cruz
Energy Efficiency	Neha Adhikari	Central Power Research Institute
eWaste	Md. Fahim Chowdhury	Auburn University
Intelligent Transportation Systems	Rakeshkumar Mahto	California State University, Fullerton
Internet of Things (IOT) for sustainability	Srihari Yamanoor	Self
Ocean Waste & Pollution Management	Justin Shi	Temple University
Renewable/Alternative Energy	Shafkat Islam	Purdue University
Smart Cities	Yan Wang	Temple University
Smart Grid	Yan Wang	Temple University
Societal Implications / Quality of Life / Public Policy	Edward Perkins	Self-employed
Sustainable Aviation	Siobhan Dolan Clancy	none
Sustainable Electronics	Narasimha Sai Yamanoor	Self
Sustainable Management	Wafaa Shakir	Al-Furat Al-Awsat Technical University
Water Resources Management	Edward Perkins	Self-employed



**Reviewers**

	University of Guadalajara	Mexico	jesus.aguila@academicos.udg.mx
Sheraz Anwar	Xiamen University	China	sheraz@stu.xmu.edu.cn
Kapil Bhatt	Himachal Pradesh University	India	kapilbhatt2016@kuk.ac.in
Gora Datta	CAL2CAL	USA	goradatta@ieee.org
Luca Davoli	University of Parma	Italy	luca.davoli@unipr.it
Susan Dickey	none	USA	sueruthmarie@ieee.org
Daniel Donahoe	1000 Kilometers	USA	dan@1000kilometers.com
David Gonzalez	IEEE	USA	DavidGonzalez@ieee.org
Vivek Gupta	NXP Semiconductor	USA	vmgupta@msn.com
Mohsin Hamzah	University of Technology	Iraq	muhsinnhamza@yahoo.com
Charlie Jackson	IEEE	USA	cornetto45@earthlink.net
Sharan Kalwani	Oakland University	USA	sharan.kalwani@ieee.org
S Kannadhasan	Cheran College of Engineering	India	kannadhasan.ece@gmail.com
Shiv Lal	Rajasthan Technical University, Kota, Rajasthan	India	shivlal1@gmail.com
Russ Lefevre	TSC	USA	r.lefevre@ieee.org
Albert Lin	IEEE SFV Section	USA	AYLIN@IEEE.ORG
Rania Majdoubi	Mohammed V University in Rabat	Morocco	rania_majdoubi@um5.ac.ma
Julanne McCulley	Weber State University	USA	jmcculley@weber.edu
Jerwin Prabu	Bharati Robotic Systems India Pvt Ltd	India	jerwin@brsindia.com
Devasis Pradhan	Acarya Institute of Technology	India	devasispradhan@acharya.ac.in
Deepak Sharma	California State University Fullerton	USA	dsharma@fullerton.edu
Yusheng Xiang	Karlsruhe Institute of Technology	Germany	

## SusTech 2022 Schedule

Thurs. April 21	SusTech 2022		Friday April 22	SusTech 2022		Sat. April 23	SusTech Sustainable Aviation Forum	
Time in PDT	Set Up		Time in PDT	Set Up		Time in PDT	Set Up	
8:00- 9:00 AM	Opening Remarks and Keynote 1	Intro – Hayashi, Region 6; Keynote: “IoT and Sustainability” Drobot	08:00- 09:00 AM	Earth Day, Opening Remarks and Keynote 4	Intro – Gonzalez, Chair SusTech 2022; Keynote: “Leveraging data to drive Sustainability in the Energy sector”, Sinha	7:00- 8:00 AM	Opening Remarks and Keynote 8	“Powering Advanced Air Mobility” Breunig
9:00- 9:10 AM	Short Break		9:00- 9:10 AM	Short Break		8:00- 8:10 AM	Short Break	
9:10- 10:30 AM	Session 1: Agriculture	Session 2: Sustainability Management	9:10- 10:30 AM	Session 7: Water Management	Powering Sustainable Aviation - Special Session	8:10- 9:40 AM	Panel 3	Evolving Aviation Ecosystem
10:30- 10:40 AM	Short Break		10:30- 10:40 AM	Short Break		9:40- 9:50 AM	Short Break	
10:40 AM - 12:00 PM	Panel 1	Accelerating Renewable Energy through Standards	10:40 AM – 12:00 PM	Session 8: Sustainability Management II	Session 9: Energy Efficiency	9:50 - 10:50 AM	Keynote 9	“Sustainable Aviation EcoSystem Model for a Regional Airport”, Debauche
12:00 – 12:20 PM	Lunch Break		12:00 – 12:20 PM	Lunch Break		10:50- 11:05 AM	Short Break	
12:20- 1:20 PM	Keynote 2	“How engineers will save the world”, Koningstein and Fork	12:20- 1:20 PM	Keynote 5	“Climate Risks and Solutions”, Werbos	11:05 AM- 12:05 PM	Keynote 10	“A Bright Era for Electrical in Aviation”, Huang
1:20- 1:30 PM	Short Break		1:20- 1:30 PM	Short Break		12:05 - 12:20 PM	Lunch Break	

# SusTech2022 Schedule

1:30-2:50 PM	Session 3: Intelligent Transportation	Session 4: Renewable Energy	1:30-2:50 PM	Session 10: Social Impact of Tech	Session 11: Sustainability Management III	12:20-1:20 PM	Keynote 11	"How Can We Decarbonize Commercial Aviation by 2050?", Abdullah
2:50-3:00 PM	Short Break		2:50-3:00 PM	Short Break		1:20-1:35 PM	Short Break	
3:00-4:00 PM	Keynote 3	"Engineering in a Responsible World", Huffstetler	3:00-4:00 PM	Keynote 6	"Nuclear Power for a Sustainable Future", Mirsky	1:35 - 2:35 PM	Keynote 12	"Vehicle Management System Challenges in Emerging Air Mobility Aircraft", Barker
4:00-4:10 PM	Short Break		4:00-4:10 PM	Short Break		2:35 - 2:45 PM	Short Break	
4:10-5:30PM	Session 5: Smart Cities	Session 6: Smart Grid	4:10-5:30PM	Panel 2	Developments in Nuclear Energy	2:45 - 3:40 PM	Keynote 13	"Planet Positive 2030", Havens
5:30-5:40 PM	Short Break		5:30-5:40 PM	Short Break		3:40-3:50 PM	Short Break	
5:40-5:55 PM	Wrap Up		5:40-5:55 PM	Wrap Up		3:50-4:15 PM	Student Poster Awards	
5:55 - 6:00 PM	Short Break		5:55-6:00 PM	Short Break		4:20-4:40 PM	Closing Remarks & SusTech 2023	
6:00 - 9:00 PM	Thursday-Student Poster Competition	Spatial Chat: Networking	6:00 - 6:30 PM	Spatial Chat: Networking				

## Keynote Speakers

### SusTech 2020

1. [“Sustainability and The Internet of Things: Translating Technology into Action”](#)  
Adam Drobot, Chairman, OpenTechWorks Inc.
2. [“How engineers will save the world”](#)  
David Fork and Ross Koningstein, Google  
Ref: <https://spectrum.ieee.org/engineers-you-can-disrupt-climate-change>
3. [“Engineering in a Responsible World”](#)  
Jen M. Huffstetler, Intel
4. [“Leveraging data to drive Sustainability in the Energy sector”](#)  
Jayant Sinha, Utilities India Industry Platform, Capgemini
5. [“Climate Risks and Solutions”](#)  
Paul Werbos, National Science Foundation (retired), USA
6. [“Nuclear Power for a Sustainable Future”](#)  
Steven Mirsky, NuScale Power

### Sustainable Aviation Forum

8. [“Powering Advanced Air Mobility”](#)  
Dr. Stefan Breunig – Head of Strategy, Rolls-Royce Electrical
9. [“Sustainable Aviation EcoSystem Model for a Regional Airport”](#)  
Jean Louis Debauche – Founder and CEO of JLD Consultant, Co-Founder of ZE-Glue Limited
10. [“A Bright Era for Electrical in Aviation”](#)  
Dr. Hao Huang, Retired Technology Chief – GE Aviation Electrical Power
11. [“How Can We Decarbonize Commercial Aviation by 2050?”](#)  
Zia Abdullah, National Renewable Energy Laboratory
12. [“Vehicle Management System Challenges in Emerging Air Mobility Aircraft”](#)  
Brian Barker, President and CEO, Hummingbird Aero, LLC
13. [“Planet Positive 2030: Prioritizing Sustainability for Technology”](#)  
John C. Havens, Sustainability Practice Lead, IEEE Standards Association

**Sustainability and The Internet of Things: Translating Technology into Action**  
**Adam Drobot, Chairman, OpenTechWorks Inc.**

**Abstract:**

Much of the popular discourse about sustainable development centers on the framework defined by the Brundtland Report [1]. The report addresses the future of human existence on the planet and the impacts on society, the environment, culture, and economics [2]. The hoped-for results are described by the Sustainability Development Goals [3] that relate a more granular view to desirable, but still vague, traits, behavior, and outcomes. The underlying issues are inherently complex and tangled. The Internet of Things (IoT) and accompanying infrastructure and technologies provide tools for improving our understanding of the state of the planet, the consequences of decisions, resource allocations, and the dynamics that drive outcomes across the SDGs. What I will cover in the talk is Sustainability, the Internet of Things, how the two are related, and in-depth examples that relate how technology can translate into positive outcomes and results. The examples address three important problems and include the application of IoT to Agriculture, Smart Cities, and Cultural Dynamics.

1. The Brundtland Commission: <https://sustainabledevelopment.un.org/content/documents/5987our-common-future.pdf>
2. The four pillars of sustainability: <https://en.unesco.org/themes/education-sustainable-development/what-is-esd/sd>
3. The seventeen Sustainability Development Goals (SDGs): <https://sdgs.un.org/goals>

**Biography:**



**Adam Drobot** is the Chairman of the Board of OpenTechWorks, Inc. He serves on the Boards of multiple early-stage companies. His activities are strategic consulting, start-ups, non-profits, and industry associations. In the past he was the President of Applied Research at Telcordia Technologies (Bellcore) and the company's CTO, and before that the Senior Vice President for Science and Technology at SAIC/LEIDOS.

Adam is a current member of the FCC Technological Advisory Council where he Co-Chairs the Working Group on Artificial Intelligence; the University of Texas Physics Department Advisory Council; and Chairman of FAMES USA a non-profit that organizes programs to attract disadvantaged youths to careers in STEM fields. In the past, he was on the Boards of the Telecommunications Industry Association (TIA) where he Chaired the Technology Committee; the Association for Telecommunications Industry Solutions (ATIS); the New Jersey Technology Council; the US DoT ITS Program Advisory Committee, and the University of Michigan Transportation Research Institute External Advisory Board.

Over the years he has been active in IEEE and served as the Chair of, multiple Committees including the IEEE IoT Activities Board, and multiple major conferences such as the IEEE World Forum on IoT. He is currently a member of the IEEE Press Editorial Board. He has published over 150 journal articles and holds 27 patents. He is a fellow of the American Physical Society. His degrees include a BA in Engineering Physics from Cornell University and a PhD. in Plasma Physics from the University of Texas.

## **How engineers will save the world**

### **David Fork and Ross Koningstein, Google**

#### **Abstract:**

The International Panel on Climate Change reported that to remain within a 1.5 °C warming limit, net greenhouse gas emissions need to be reduced to zero by 2050. Doing so by 2050 with carbon-free energy, energy use changes and carbon sequestration presents a host of challenges.

In our 2021 article in IEEE Spectrum we outlined many of the engineering tasks that can keep us busy in the coming decades. The rate and extent to which global net emissions decline depends both on which solutions get developed and deployed and also on filling significant research gaps in order to realize a full climate solution.

In this talk we will share insights about where we are with respect to some of these challenges and identify where innovations are needed in science, engineering and policy.

#### **Bios:**

**David Fork** is a Renewable Energy Technologist at Google where he did solar receiver assessment on the Renewable Energy Cheaper than Coal (RE<C) project and intelligent inverter control on the Bottom up Grid (BUG) projects. He also designed the Google Bike. He currently serves within Google's Climate and Energy Team. Before Google he was a Principal Scientist at the Palo Alto Research Center (PARC) where he was instrumental in several start up ventures, including two in solar energy. He graduated Summa Cum Laude from the University of Rochester in 1987 with degrees in Physics and Electrical Engineering. He completed his Ph.D. from Stanford University in Applied Physics in 1991.



He has studied and worked primarily on thin film electronic materials and devices. His research activities include complex oxide epitaxial thin films, laser crystallized display materials, organic electroluminescent devices, semiconductor LEDs and lasers, electronic imaging systems, micro-electromechanical systems and photovoltaic devices. Dr. Fork holds over 80 issued US patents and has authored over 100 publications.

**Ross Koningstein** was Google's first director of engineering, and has worked on Google's first energy efficient data centers, renewable energy, advanced nuclear energy and also carbon aware computing.



## **Engineering in a Responsible World**

**Jen M. Huffstetler, VP and GM, Data Center Platform Strategy, Mobilization, Sustainability and Services, Intel**

### **Abstract:**

What is sustainability worth to the next generations? What expectations do we set for ourselves to ensure a more sustainable tomorrow? Intel has established a long-standing commitment to environmental leadership to achieve efficiency, reduce costs, and respond to the needs of our customers and community stakeholders. In this talk, we'll challenge engineers to rethink and reimagine technologies and businesses with sustainability in mind. This will require disruptive solutions that are outside the norm and non-traditional, such as data centers that reuse heat and platforms that are carbon aware. We are solving big problems to help protect our planet and improve the lives of every person. Join us on the journey.

### **Bio:**



**Jen M. Huffstetler** is a Vice President and General Manager of Data Center Platform Strategy, Mobilization, Sustainability and Services at Intel. 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.

## **Leveraging data to drive Sustainability in the Energy sector**

**Jayant Sinha, Senior Principal Consultant, Utilities India Industry Platform, Capgemini**

### **Abstract:**

As the countries around the globe race to meet their net zero deadlines, data plays an important role in analyzing climate change impacts in the energy sector. Also, technology plays a crucial role in mapping the humongous data residing in various forms, at diverse locations, to corresponding energy and carbon performance. In this keynote, I will talk on the role of digital technologies such as machine learning (ML), robotic process automation (RPA) and intelligent instrumentation, in real-time assessment, data visualization, smart analytics and generating insights for predicting potential carbon footprint of various energy practices. These data insights help the energy and utility sector to take decisive actions proactively to mitigate climate change repercussions, reduce emissions and promote sustainability.

### **Bio:**



**Jayant Sinha** is an Energy & Utilities SME, working on energy consultancy, technology services and digital transformation projects. Currently working in Capgemini, Bangalore, Jayant has over three decades of experience in Power, Water and Gas process automation, business transformation and digital innovation, with focus on energy efficiency, net zero initiatives and emission reduction. He is part of a global delivery team for utility projects on Smart Grids, Energy data management, Renewable Energy integration, Demand response management and Sustainability, in large transformational projects across multiple geographies.

Jayant has delivered multiple projects globally on innovative practices in Energy transition and supported his team in developing utility solutions around Sustainability, Circular Economy and Low Carbon technologies. He has delivered training to global customers as part of project delivery in Smart metering, Smart grid, Smart asset analytics, Renewable Energy and Carbon reduction solutions. He has thorough understanding of Electricity & Water regulations, markets, governing standards and best practices, and has over 30 published papers in the Energy domain to his credit.

Javant also writes for a Blog on Energy & Utilities transformation:  
<https://jayantsinha.wordpress.com>.

You may connect with him on <https://www.linkedin.com/in/jayantsinha1>.

## Climate Risks and IEEE Solutions: Much stronger than they told you

Paul Werbos

### Abstract:

From my years running Adaptive and Intelligent Systems and Electric Power Research at NSF (until 2015), I learned that new technologies — some well proven and grounded in work centered in the IEEE Power and Energy Society — would allow us to stop climate destruction much sooner and faster, and at lower cost, than any of the schemes we have heard from policy gatherings like COP26 or legislation anywhere on earth, including even the 2009 Obama climate bill which I evaluated for an office of the US Senate in 2009. Based on my talks and papers on the risks and solutions ([http://www.werbos.com/climate\\_extinction\\_risk\\_and\\_solutions.htm](http://www.werbos.com/climate_extinction_risk_and_solutions.htm)), the IEEE/Wiley Series Editor for Power and Energy asked me to organize an edited book, by creating new connections and dialogue between all the players who are truly at the scientific and technical front lines of the risk and of the new solutions. This was an incredible learning experience, bringing out risks, near-term opportunities and optimal tradeoffs no one on earth knew about before these discussions and new networks. This talk will give an overview of the most important highlights, and opportunities for action.

From the Preface:

When Kumar asked us to organize a new book, to connect the real science, climatology, engineering and economics to address the worst risks coming to us from climate change, even we did not realize how much we had to learn by putting the pieces together, even in the study of climate risks themselves. We did not realize just how serious and near-term the biggest threats actually are. We did not yet know how many critical pieces need to be connected together in ways they have never been connected before, both to understand and reduce the threats.

In August, 2021, Metta Spencer ([https://en.wikipedia.org/wiki/Metta\\_Spencer](https://en.wikipedia.org/wiki/Metta_Spencer)), a leader of Canadian futurist groups, asked what we really know from the very most solid science about the risk that climate change might actually become serious enough to endanger the existence of the human species. The key challenge was to bring together people who had never put the relevant pieces together to assess how bad the risk might be. This discussion, at <https://www.youtube.com/watch?v=SMp9a0PwL3o>, was a great eye-opener to us. But it was only just an opening.

We now know that the most important mass extinctions of life on earth in past history were caused by outgassing of H<sub>2</sub>S (a poison twice as potent per ppm as hydrogen cyanide) from the oceans. The H<sub>2</sub>S was mainly produced by a type of microbe which has different names in different scientific communities, but resulted from two conditions in deep ocean waters: (1) low oxygen; and (2) a high concentration of certain nitrates, such as phosphates, which need to be studied in greater depth.

We are now much more worried than we were at the start of this project, in part because of what Ward and Werbos learned from Wadhams about changes in ocean currents (in the YouTube

video!), but in part because of new information about mass extinctions in the past and data on nutrient flows in the ocean today.

## Bio:



**Paul Werbos** began training as a mathematician, taking many university courses culminating in the graduate course in logic from Alonzo Church at Princeton while in middle and high school. Realizing the limits of deductive logic, he began his quest to understand inductive logic and intelligence in the mind back in those days, inspired by the work of John Von Neumann, Donald Hebb and early AI (Feigenbaum and Feldman). He obtained two degrees in economics from Harvard and the London School of Economics, divided equally between using mathematical economics as a model for distributed intelligence and developing some broader understanding. For his Harvard M.S., he took courses in quantum field theory (QFT) from Julian Schwinger, but did not fully understand the subject until many years later, after he started an activity in quantum technology and modeling at the National Science Foundation (see his papers at [arxiv.org](https://arxiv.org).)

For his 1974 Harvard PhD thesis (reprinted in *The Roots of Backpropagation*, Wiley 1994), he proposed the development of more powerful, more biologically plausible reinforcement learning systems by the then new idea of using neural networks to approximate dynamic programming (ADP), including the value function. In order to implement ADP in a local biologically plausible manner, he translated Freud's theory of "psychic energy" into an algorithm later called backpropagation, and a rigorous general theorem, the chain law for ordered derivatives, which later also became known as the reverse method or adjoint method for automatic or circuit-level differentiation. He has spent many years advancing the fields of ADP and backpropagation and brain-like prediction, aimed at developing and demonstrating the kind of designs which could actually explain the kind of general intelligence we see in the brain and in subjective human experience – collaborating at times with Karl Pribram and Walter Freeman and Pellionisz among others, and proposing biological experiments to test the theory.

In looking for applications which are really important to areas like energy, sustainability and space, he has also gotten deep into domain issues and organization, as reflected at [www.werbos.com](http://www.werbos.com), serving on boards of the National Space Society, the Millennium Project, the Lifeboat Foundation, and the IEEE Energy Policy Committee, and as a Fellow in the Senate in 2009. From 1980-1989, he developed official econometric forecasting models (two based on backpropagation) and was lead analyst for the long-term future at EIA in the Department of Energy. He also has been selected for the 2022 Frank Rosenblatt award, the lead technical award for the IEEE Computational Society, to be awarded at WCCI2022 in Padua.

## **Nuclear Power for a Sustainable Future**

**Steven Mirsky, NuScale Power**

### **Abstract:**

This presentation addresses the global reality of what our world's population is lacking to provide a reasonable standard of living. A brief history of NuScale Power and our unique NRC-licensed small modular reactor design is discussed along with our microreactor. This is followed by information on how nuclear power can be used for a wide spectrum of industrial activities to replace fossil fuels, work with renewable power, and provide critical energy infrastructure. The benefits of nuclear power for reliable base loaded electricity, hydrogen production, clean water are highlighted. In addition the safety and low environmental impact of nuclear power in comparison to fossil and renewable power is also addressed in this presentation.

### **Bio:**

Steven Mirsky has been with NuScale Power for over 11 years. He is currently a Senior Technical Advisor in the NuScale Office of Technology working on micro-reactor designs and innovative applications for the SMR. Previously, he was the NuScale Licensing Manager in which he was responsible for directing U.S. Nuclear Regulatory Commission (NRC) review responses and interactions for some of the chapters and parts of the NuScale Design Certification Application (DCA), Nuclear Energy Institute (NEI) interface, and oversight of all NuScale Rockville office activities.



Mr. Mirsky has more than 44 years of experience in the nuclear industry. He has worked for Science Applications International Corporation (SAIC) and NUS Corporation consulting for U.S. and foreign nuclear power plants, DOE, and the NRC and at the Baltimore Gas and Electric Company (now Exelon) and Virginia Power and Electric Company (now Dominion Power) supporting the safety analysis, design, operation, licensing, and analysis of the Surry, North Anna, and Calvert Cliffs nuclear power plants. He holds an M.S. in Nuclear Engineering from Pennsylvania State University, a Bachelor of Engineering in Mechanical Engineering from Cooper Union, and is a licensed Professional Engineer in Mechanical Engineer in the State of Maryland.



## Panels

1. [“Accelerating Renewable Energy through Standards”](#)  
Moderator: Rudi Schubert
2. [“Developments in Nuclear Energy”](#)  
Moderator: Sharan Kalwani
3. [“Evolving Aviation Ecosystem”](#)  
Moderator: Siobhan Dolan Clancy, Founder & CEO of SDC Business Consulting Ltd.

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### Panel: Accelerating Renewable Energy through Standards

**Date: Thursday, April 21, 10:40 – Noon**

Moderator: **Rudi Schubert**, Director, IEEE New Initiatives

This presentation will discuss recently released standards enabling renewable energy, and engagements related to these standards where IEEE is actively supporting clean energy and climate change solutions, including our involvement in the Global Power Systems Transformation Consortium.

#### Panelists:

- **Mark Siira:** IEEE P2030 Working Group Chair, IEEE Standards Coordinating Committee 21 Chair, IEEE SA Standards Board – Standards Review Committee (RevCom) and Audit Committee (AudCom)
- **Karin Wadsack:** Program Manager, National Renewable Energy Laboratory

#### Speaker Bios:



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

Rudi has a 25+ year record of leading, developing and implementing industry standards and testing programs, and facilitating teams to achieve consensus expectations for functional performance,



interoperability, product robustness and safety. He holds bachelors and masters degrees in mechanical engineering from Stevens Institute of Technology, Hoboken, New Jersey.

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

- Chair of IEEE Standards Coordinating Committee 21 – IEEE Coordinating Committee on Interconnection and Smart Grid Interoperability
- Chair of IEEE P2030 – Guide for Smart Grid Interoperability, IEEE 2030.2-2015 – Guide for Energy Storage Interoperability, Vice-Chair for IEEE1547 Interconnection Standard Revision.
- Mark is also an active participant in the IEEE Power Systems Relaying Committee, including K10 Liaison, C26 Protection Testing.
- Mark is a member of the UL Standards Technical Panels 1741 (Inverters), UL2200 (Generators) and 3001 (Systems).



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



**Karin Wadsack** is a program manager for the National Renewable Energy Laboratory, where she directs the Global Power System Transformation Consortium and performs applied analysis for energy system decarbonization and resilience projects around the world. She has more than 15 years of experience in energy analysis, policy, and project development. Her background also includes business management, international development, and work with Native American tribes across the United States.

Her subject-matter expertise covers:

- Utility-scale renewable energy grid integration and power system modeling
- Data and statistical analysis
- National, state, tribal, and local energy policy
- Energy economic and technical analysis
- Energy education – policymaker, university, K-12, public

Karin holds a PhD in Engineering Sustainable Systems, a certificate in Applied Statistics, master's degrees in Environmental Science & Policy and Journalism, and a bachelor's degree in Government.

Her dissertation research focused on the implications for air quality regulation of power system modeling of high-renewables-and-storage scenarios considering the reduced-hydroelectric effects of climate change in the American Southwest.

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## Panel: Developments in Nuclear Energy

**Date: Friday, April 22, 4:10 – 5:30 pm**

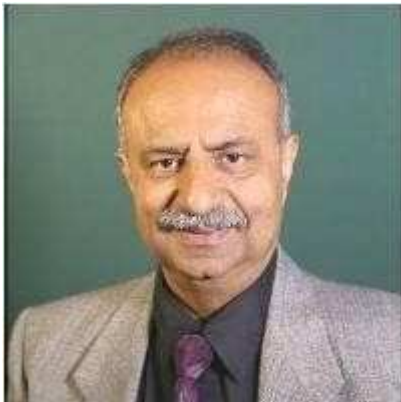
Nuclear power continues to develop technologically. Abundant energy is the base for advanced societies. We are being squeezed by two forces. The first is that our coal and oil burning does inflict lethal damage. The second is that both are finite resource lifetimes. For sustainability we need to focus on technologies that can supply our needs – 24×7 and long term. This panel will discuss recent positive developments and trends in the nuclear industry.

Moderator: **Sharan Kalwani**

### Panelists:

- **Steven Mirsky**, P.E., Senior Technical Advisor, Research Collaborations, Office of Technology, NuScalePower, Greenbelt, Maryland, USA.
- **Marley Smith**, Nuclear Test Engineer, Puget Sound Naval Shipyard, Seattle, State of Washington, USA
- **Dr. Charles Hawkins**, Professor Emeritus, ECE University of New Mexico, Affiliate Professor University of Florida.

### Speaker Bios:



**Sharan Kalwani** is an industry technology specialist with over 25+ years of experience. Sharan has degrees in both Engineering and Computer Science. He has worked in many diverse areas. Sharan is a senior member of IEEE and participates in the IEEE Computer/Education/Power Energy and Vehicle Tech Societies respectively. He is also a member of SAE, ASME, is an emeritus member of Michigan!/user group (mug.org) the oldest of the \*NIX user groups based in Michigan (1985), and has also applied for senior membership elevation with the ACM. He enjoys teaching, holds an Adjunct Faculty position at several local educational institutions. He also serves on the advisory board for the Computer Science department @Loyola University-Chicago. He has published one book “Linux and Internet Security” and is now working on his second. He is a recipient of the IEEE MGA Achievement award for his contributions to IEEE activities in 2018.

**Steven Mirsky** has been with NuScale Power for over 11 years. He is currently a Senior Technical Advisor in the NuScale Office of Technology working on micro-reactor designs and innovative applications for the SMR. Previously, he was the NuScale Licensing Manager in which he was responsible for directing U.S. Nuclear Regulatory Commission (NRC) review responses and interactions for some of the chapters and parts of the NuScale Design Certification Application (DCA), Nuclear Energy Institute (NEI) interface, and oversight of all NuScale Rockville office activities.



Mr. Mirsky has more than 44 years of experience in the nuclear industry. He has worked for Science Applications International Corporation (SAIC) and NUS Corporation consulting for U.S. and foreign nuclear power plants, DOE, and the NRC and at the Baltimore Gas and Electric Company (now Exelon) and Virginia Power and Electric Company (now Dominion Power) supporting the safety analysis, design, operation, licensing, and analysis of the Surry, North Anna, and Calvert Cliffs nuclear power plants. He holds an M.S. in Nuclear Engineering from Pennsylvania State University, a Bachelor of Engineering in Mechanical Engineering from Cooper Union, and is a licensed Professional Engineer in Mechanical Engineer in the State of Maryland.



**Marley Smith** is a Nuclear Test Engineer at the Puget Sound Naval Shipyard in Bremerton, Washington. He graduated from Western Washington University with a B.S. in electrical engineering in 2020. Nuclear energy is one of Marley's biggest passions.

**Dr. Charles Hawkins** is a Professor Emeritus in the Department of Electrical and Computer Engineering at the University of New Mexico and an Affiliate Professor at ECE Florida. His research and graduate teaching was in IC test engineering, reliability, and failure



analysis. He has also worked with the CMOS IC Development Group at Sandia National Lab in New Mexico for 20 years and did on-site research at Intel, AMD, Philips Research Labs, Signetics, and Qualcomm.

## Sustainable Aviation Forum

**Date: April 23, 2022 7:00 AM – 4:40 PM PDT (1400-2340 GMT)**

### Agenda

#### Keynote Speakers:

1. [“Powering Advanced Air Mobility”](#)  
Dr. Stefan Breunig – Head of Strategy, Rolls-Royce Electrical
2. ["Sustainable Aviation EcoSystem Model for a Regional Airport"](#)  
Jean Louis Debauche - Founder and CEO of JLD Consultant, Co-Founder of ZE-Glue Limited
3. [“A Bright Era for Electrical in Aviation”](#)  
Dr. Hao Huang, Retired Technology Chief – GE Aviation Electrical Power
4. [“How Can We Decarbonize Commercial Aviation by 2050?”](#)  
Zia Abdullah, National Renewable Energy Laboratory
5. [“Vehicle Management System Challenges in Emerging Air Mobility Aircraft”](#)\*  
Brian Barker, President and CEO, Hummingbird Aero, LLC
6. [“Planet Positive 2030: Prioritizing Sustainability for Technology”](#)\*  
John C. Havens, Sustainability Practice Lead, IEEE Standards Association

### [Panel: "Evolving Aviation Ecosystem"](#)

**Date: April 23, 8:10 – 9:40 AM PDT (1510-1640 GMT)**

#### Abstract:

We are now seeing a fundamental paradigm shift in the way the aviation sector is embracing a net-zero emissions target by 2050, with a common understanding that it will take multiple stakeholders working together to make it possible. There is a coming together of industry stakeholders including airlines, airports, aircraft /engine manufacturers, fuel suppliers as well as government and regulators in declarations of commitment and partnerships to work together to reach the aggressive emission reduction target while the industry is forecasting passenger numbers and air traffic to double in the same timeframe.

## **Keynotes**

### **“Powering Advanced Air Mobility”**

**Dr. Stefan Breunig – Head of Strategy, Rolls-Royce Electrical**

**Date:** April 23, 07:00-08:00 AM PDT (1400-1500 GMT)

**Abstract:**

Electrification in aerospace is currently driven by developments in the Advanced Air Mobility segment. Hybrid and all-electric Commuter and eVTOL aircraft will transform existing markets or even create completely new markets. The technology to make this happen is there and the route to certification is getting more and more defined.

This is the time to think about the next steps and upcoming challenges: How do we maintain these aircraft? How can we deploy the required charging infrastructure? And what role will digitally-enabled services and new business model play?

**Bio:**



**Dr. Stefan Breunig** is Head of Strategy, Rolls-Royce Electrical, Muenchen, Germany

Stefan is driving strategy definition and execution for Rolls-Royce’s electrification efforts in new emerging markets like Urban and Regional Air Mobility. He joined the Rolls-Royce team in 2019 with the acquisition of Siemens eAircraft where he previously worked as innovation manager. He holds master’s degree and PhD in engineering.

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### **Sustainable Aviation EcoSystem Model for a Regional Airport**

**Jean Louis Debauche - Founder and CEO of JLD Consultant, Co-Founder of ZE-Glue Limited**

**Date:** April 23, 9:50-10:50 AM PDT (1650-1750 GMT)

**Abstract:**

The Aviation industry has been on a journey to reach the future of carbon-neutral air transportation across the globe for four decades and has already made significant achievements through technological advancement and improvements in operations and infrastructure. Now as the aviation industry has committed to Net Zero Carbon emissions by 2050, it will require a fundamental change in how the industry comes together as an Ecosystem of stakeholders to deploy



the technological advancements necessary to reach the net zero targets in the given timeframe. This paper will present a case study to establish a Sustainable Aviation EcoSystem Model for a Regional Airport whose primary objective is to address some key challenges around a rapidly evolving energy supply and distribution system, airport infrastructure and different types of aircraft technology deployment.

**Bio:**

**Jean Louis Debauche** is a senior level Advanced Aerospace Engineer Consultant with more than 40 years experience working with the industry on the evolution of More Electric aircraft. His work has been specifically focused in the field of Actuation Control Systems including Space, Commercial and Military Aviation platforms. Mr. Debauche is an internationally recognized leader in the Advanced Aeronautic Industry. His vast experience and expertise also includes corporate business development and global strategies. Jean Louis designed Trajectory and Thrust Vector Control systems on the ESA Ariane 5 and VEGA launch vehicles. He has worked on numerous commercial flight critical Electrical Actuators including A320 and A380 (Electro Hydrostatic and Electro Mechanical Actuators). Jean Louis joined Microsemi in 2005 until 2018 as Chief Applications Engineer Aerospace and was the Lead Aviation System Engineer in the development of Power Core Modules for Actuation. Before joining Microsemi, Jean Louis was an Engineer for SNCB (société national des chemins de fer Belges), Development and technical manager for SABCA (BE) and Development Director for Serma Technologies (F).



He is a certified Electrical Civil Engineer: Ecole Polytechnique Université de Louvain UCL (BE). Jean Louis has provided technical and strategic services as JLD Consultant for various European and US Aerospace Companies and continues to provide services for his former company SABCA (BE) as well as serving on the European Union’s Advanced Aviation Program as a technical review expert and Member expert of the SAE chapter 6 Actuation System.

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**“A Bright Era for Electrical in Aviation”**

**Dr. Hao Huang, Retired Technology Chief – GE Aviation Electrical Power**

**Date:** April 23, 11:05-12:05 AM PDT (1805-1905 GMT)

**Abstract:**

Aviation is moving into a very special, bright era. The speaker will talk about the challenges and opportunities that Aviation has been facing, and the new roadmap necessary to overcome these challenges and to be ready and successful over this bright era. The speaker will then go through some key perspectives of aviation electrification, which include Electrical Engineering Technology perspective, Additive Manufacturing perspective, WBG perspective, advanced digital



perspective, and Gg CO<sub>2</sub> equivalent minimization perspective that electrical and electronics engineers need to be aware of, prepared for, and contribute to.

**Bio:**



**Dr. Hao Huang** is the Retired Technology Chief of GE Aviation—Electrical Power since May of 2021. He was responsible for generating the technical directions, innovation strategies, and multi-generation product roadmaps for the GE aircraft electrical power division. He has been constantly leading and contributing innovations and inventions of aircraft electrical power technologies.

Dr. Huang is a NAE Member, IEEE fellow, and SAE fellow. He received his Ph.D. Degree in Electrical Engineering from the University of Colorado at Boulder, Boulder, Colorado, USA in 1987. He has 35 years of experience in Aircraft Electrical Power Systems, Power Generations, Engine Starting, Power Electronics and Controls, and Electric Vehicle Drives. He has had US 80 patents including pending and multiple technical publications in the above-mentioned areas. Dr. Hao Huang is the winner of 2019 IEEE Transportation Technologies Award.

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**“How Can We Decarbonize Commercial Aviation by 2050?”**

**Zia Abdullah, National Renewable Energy Laboratory**

**Date:** April 23, 12:20-01:20 PM PDT (1920-2020 GMT)

**Abstract:**

U.S. airlines have set a goal to reduce carbon dioxide (CO<sub>2</sub>) emissions by 50% by 2050 compared to 2005 levels. Aircraft and engine manufacturers have improved efficiency by 130% compared to 1978 levels, however additional efficiency improvements in planes and engines are not likely to be sufficient. The current state of technology readiness for battery electric and hydrogen fueled aircraft is relatively low and is unlikely to be advanced and scaled up rapidly enough and sufficiently to meet 2050 decarbonization goals.

“Drop-In” Sustainable Aviation Fuels (SAF) which have low Carbon Intensity, and which can be safely used in place of conventional Jet-A fuel are the only option that airlines will have in the near-medium term to meet their 2050 decarbonization goals. One challenge for providing SAF is that the size of the jet fuel market is large and growing. US demand was 26 billion gallons in 2019 and is expected to reach 35 billion gallons by 2050. Another challenge is that the price of SAF today is higher than petroleum-based Jet A fuel. Fuel price is a hurdle because fuel is 20%–30% of the operating cost of an airline. SAF are required to be approved under the ASTM D4054 evaluation and qualification process before becoming an approved Annex in ASTM D7566 and be permitted for use in commercial aircraft.

This presentation will provide an overview of the biofuels research at the National Renewable Energy Laboratory, some novel SAF pathways that are under development, and opportunities to accelerate scaleup, approval and deployment of these fuel production pathways to meet the commercial aviation industry’s decarbonization goals.

**Bio:**

As the Biomass Laboratory Program Manager, **Zia Abdullah** fosters NREL’s relationship with the U.S. Department of Energy’s Bioenergy Technologies Office (BETO) program. In addition, he works with senior lab management to set the strategic agenda for NREL's biomass portfolio and with research staff to execute against the research strategy.



He is a mechanical engineer with extensive experience and accomplishments in thermochemically and biochemically converting biomass to fuels and chemicals. His experience includes more than 25 years of research and development in biomass conversion, as well as problem-solving, new product development, business development, and project management.

Zia has won, managed, and led multiple large, competitive projects funded by government agencies. He also has developed close relationships with the U.S. Department of Energy (DOE) and BETO, as well as universities, industry, and other DOE laboratories.

He has received the B.A.Sc., Mechanical Engineering and Ph.D., Mechanical Engineering, both from the University of Ottawa and has a M.B.A., Technology Management, from University of Washington.

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**“Vehicle Management System Challenges in Emerging Air Mobility Aircraft”**

**Brian Barker, President and CEO, Hummingbird Aero, LLC**

**Date:** April 23, 1:35 -2:35 PM PDT (2035-2135 GMT)

**Abstract:**

This talk will examine the role of the VMS in new eVTOL aircraft, the new roles and considerations in its design, and the challenges presented by cost, weight, complexity etc.

**Bio:**



**Brian Barker** leads the Hummingbird Aero organization with more than 35 years of aerospace systems development experience.

Previous to Hummingbird, Brian was employed with Moog Aircraft Group, and focused in the development of advanced fly-by-wire flight controls for military and commercial aircraft. Brian played an instrumental role in the development of early Electrohydrostatic actuation technology and demonstrators leading to their selection and development on the Lockheed Martin F-35 Joint Strike Fighter.

In 1998, Brian founded the hydraulic pump and motor product line for Moog dedicated to providing specialized hydraulic power components for internal actuation needs. These products have been used on flight control actuation systems for the F-18E/F, F-35 Joint Strike Fighter, Airbus A400M and A350 aircraft.

Brian started his career as a designer and developer of hydraulic pumps and motors for both Garrett Fluid Systems and Abex Aerospace, and developed hydraulic power transfer units for both the Airbus A320 and Boeing C-17 aircraft. Brian has served as an executive engineering leader for large engineering organizations at Goodrich Engine Controls and Northrop Grumman Inertial Navigation Systems, supporting the development of complex control systems per ARP 4754. He is experienced in the development of safety critical electronics and software per DO-178/254.

Since 2011, Brian has served as Chairman for the SAE A-6B2 International Panel for Electrohydrostatic Actuation. Brian holds three patents for hydraulic systems technology.

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## **“Planet Positive 2030: Prioritizing Sustainability for Technology”**

**John C. Havens, IEEE Standards Association**

**Date:** April 23, 2:45 -3:40 PM PDT (2145-2240 GMT)

### **Abstract:**

Climate-related risks to health, livelihoods, food security, water supply, human security, and economic growth are projected to grow as the global mean surface temperature increases and reaches 1.5°C or higher above pre-industrial levels (1850-1900). Yet estimates of global emissions of nationally stated reduction goals under the Paris Agreement will lead to GHG emissions by 2030 that will not permit limiting global warming to 1.5°C by 2050 and beyond. We need responsible mitigation and adaptation measures to limit global warming and to adapt to the impact of the on-going changes to the climate, including the responsible transformation of society and infrastructure. IEEE's new Planet Positive 2030 campaign, open for all to join, provides a forward thinking, multidiscipline process leading to a roadmap of measures for change and associated metrics with the goals to

- curtail global warming,
- help adapt to the impacts of the global warming already under way,

and, hence, to the well-being of people, animals, plant life (all life forms) for a healthy planet today, tomorrow and for the next seven generations and more.

### **Bio:**

**John C. Havens** is Lead of the Sustainability Practice of the IEEE Standards Association. Previously at IEEE SA John was Executive Director of [The IEEE Global Initiative on Ethics of Autonomous and Intelligent Systems](#) that had two primary outputs – 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](#) and the recommendation of ideas for Standards Projects focused on prioritizing ethical considerations in A/IS. Currently there are thirteen approved Standards Working Groups and four completed Standards in the [IEEE P7000™ series](#). John was responsible for: the initial ideation, framing and execution for bringing together the more than seven hundred global thought leaders to create *Ethically Aligned Design*; was Founding Chair of IEEE 7000 and IEEE 7010 and helped launch more than a dozen other IEEE Standards Working Groups focused on AI, AI Ethics, AI Governance, and AI Procurement; and continues to work on staff at the IEEE Standards Association to help further design, proliferate, and standardize the concepts of human-centric, applied ethical, values-driven design for Responsible Innovation of all technologies.



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.

## Panel Discussion

### "Evolving Aviation Ecosystem"

**Date:** April 23, 8:10 – 9:40 AM PDT (1510-1640 GMT)

We are now seeing a fundamental paradigm shift in the way the aviation sector is embracing a net-zero emissions target by 2050, with a common understanding that it will take multiple stakeholders working together to make it possible. There is a coming together of industry stakeholders including airlines, airports, aircraft /engine manufacturers, fuel suppliers as well as government and regulators in declarations of commitment and partnerships to work together to reach the aggressive emission reduction target while the industry is forecasting passenger numbers and air traffic to double in the same timeframe.

While aviation has historically been quite successful in leveraging technology to reduce its contributions to climate change, clearly there is more to do. More recently, technological advancements in aircraft/engine design and manufacturing, alternative jet fuels, airport and air traffic management, and maintenance practices have sustainability as part of its core value proposition.

This panel of aviation experts will take a deep-dive into the challenges and opportunities within sustainable aviation including technology innovation, R&D collaborations, regulatory regimes, infrastructure and financing with the ultimate goal of achieving net-zero emissions.

## Key Discussion Points:

- What will air transport in the future look like?
- Airframe and Propulsion Technology innovations – challenges and opportunities
- Challenges in ensuring sustainable Alternative Jet Fuel supply and ways to overcome them
- Airport infrastructure and services needed to build net-zero emission aviation ecosystems
- Evolving regulatory regimes to achieve sustainability targets
- Sustainability as a key enabler to aircraft technology innovations

## Panelists:

- [Steve Csonka](#), Executive Director, CAAFI (Commercial Aviation Alternative Fuels Initiative)
- [Val Miftakhov](#), Founder & CEO of ZeroAvia
- [Melinda Pagliarello](#), Managing Director, Environmental Affairs at the Airports Council International - North America (ACI-NA)
- [Ms. Valentina Vecchio](#), Sustainability Policy & Partnerships Regional Lead, Europe – Boeing Corporation
- [Dan Wolf](#), Founder and Executive Board Chairman, Cape Air

## Moderator:

Siobhan Dolan Clancy, Founder & CEO of SDC Business Consulting Ltd.



**Siobhan Dolan Clancy** is a senior business executive with 25 years' leadership experience in the global semiconductor technology industry. She is Founder & CEO of SDC Business Consulting Ltd. and provides marketing, business development, thought leadership and expert advice on business and strategic transformation in the aerospace industry and its ecosystem globally. She is a member of the Midas Ireland Advisory Board and the Board Diversity Initiative. She is Chair of the Sustainable Aviation track of the IEEE SusTech 2022 conference and is working on projects to expand the sustainable aviation technology ecosystem in Ireland.

Prior to setting up SDC, Siobhan was the Senior Vice President and General Manager of the Discrete & Integrated Solutions Group at Microsemi Corporation (2016 – 2018). Before that she was Corporate Vice President of Worldwide Strategic Marketing & Business Development for Aerospace at Microsemi Corporation (2011 – 2016).



**Panelist Bios:**

**Steve Csonka** is an ardent advocate for the aviation industry who seeks pragmatic solutions to the challenges of aviation growth. Built upon strong technical experience that spanned the breadth of the commercial aircraft/engine life-cycle, Steve’s capabilities and initiative have led to his various engagements in business development and long-term, strategic planning for the aviation enterprise over the past fifteen years. Such work has focused on the nexus of future product requirements, technology progression, and industry value propositions, including aspects of policy, advocacy, regulatory affairs, and environmental impact.



Steve’s overall industry engagement led to his current role as Executive Director of CAAFI (the Commercial Aviation Alternative Fuels Initiative, [www.caafi.org](http://www.caafi.org)) where he leads this Public-Private Partnership working toward the development and commercialization of sustainable alternative jet fuels (SAJF). He has been in this role since 2012, directing the CAAFI efforts of its 1200+ members and 500+ organizations who share the industry vision of enabling the decoupling of net carbon growth from expected sectoral growth. CAAFI engagement occurs through several work teams and public-private initiatives, and it seeks to be a force multiplier for a wide range of efforts required to achieve significant uptake of low net-carbon SAJF.

Steve is a commercial aviation professional with 35 years of broad, strategic airline and aviation OEM experience (GE Aircraft Engines, American Airlines, GE Aviation, and CAAFI). He holds BS and MS degrees in Aerospace Engineering. He has served in leadership, steering committee, and BOD roles with multiple aviation industry organizations (AIA, ICCAIA, IATA, GAMA, ICAO/CAEP, ATAG, Carbon War Room) in areas of technology and environmental progression. His CAAFI role has also led to appointments to advisory/leadership roles with the USDA/DOE BRDB TAC, the USDA/DOT/DOE/Industry *Farm-to-Fly 2.0* initiative, USDA/NIFA/AFRI CAP projects, and study committee work of the National Research Council.

**Val Miftakhov** is the Founder & CEO of ZeroAvia, a company developing a hydrogen-electric powertrain for aviation as the only scalable solution for tackling aviation's growing climate change impact. Val is an avid helicopter and airplane pilot, and a serial sustainable transportation entrepreneur - his previous company eMotorWerks has developed the World’s leading platform for EV battery aggregation to provide grid services, and was acquired in 2017. Prior to that, Val held a number of senior business and product positions at Google and McKinsey & Company, and was a nuclear researcher at Stanford Linear Accelerator. Val holds a Ph.D. in Physics from Princeton University.





**Melinda Pagliarello** is Managing Director, Environmental Affairs at the Airports Council International - North America (ACI-NA). In her role, she has primary responsibility for ACI-NA's activities in aviation environmental matters and sustainability. She coordinates members' responses and represents airport interests on international and federal agency actions, programs, requirements, research and regulations affecting environmental matters for airports in North America. In her role as Environmental Affairs Committee Secretary, she works to facilitate member engagement and learning through her work overseeing nine active working groups, as well as ad hoc task groups.



Using her varied background, Melinda works to incorporate knowledge from other disciplines, specifically airport capital development and funding, as well as Federal agency priorities, to enable environmental and sustainability initiatives at airports. Melinda is also responsible for a number of cross-cutting topics at ACI-NA, including leading the overall coordination of ACI-NA's work on issues related to PFAS and airports. She is also leading efforts related to ESG and airports; airport climate change resiliency; and the airport role in Sustainable Aviation Fuels.

Specific areas of focus within Melinda's portfolio also include airport noise; land use policies; air quality, including oversight of the Airport Carbon Accreditation program in North America; water quality; wildlife and natural resources management; and the range of environmental regulations, policies, and procedures that affect airports in the U.S. and Canada.

Melinda has nearly 20 years of experience in the airport industry. Prior to joining ACI-NA in 2017, she previously worked for Booz Allen Hamilton, LeighFisher, PBS&J, and Landrum & Brown. Her varied background includes work in strategic/ business planning, land use planning, financial feasibility studies, benefit-cost analyses, as well as environmental and master planning. She has worked with a range of clients at the federal (FAA and TSA) and state/local levels, from large hubs to general aviation airports.

She holds a bachelor's degree in political science and Russian studies from Williams College in Williamstown, Massachusetts and a master's degree in Transportation Policy from George Mason University in Fairfax, Virginia.



**Valentina Vecchio** is Boeing Global Sustainability Policy & Partnerships lead for strategic engagement & execution. In this role, Valentina integrates and maximizes the effectiveness of a global team in order to advance Boeing's sustainable aerospace mission.

Valentina joined Boeing in September 2018 and was responsible for representing the enterprise's interests with European institutions, most notably the European Commission, the European Parliament and the European Aviation Safety Agency. In January 2021, Valentina was appointed Boeing regional lead for sustainability and worked across the UK and the EU to manage an integrated sustainability strategy and advance regional business goals.

Since 2021, Valentina is also one of the Board Directors of the Round Table on Sustainable Biomaterials, a global forum to shape the development of renewable fuel sustainability standards.

Most recently, Valentina was a Legal Counsel at Aviapartner, managing customers' contracts and claims.

Valentina is a lawyer by education: she obtained her LL.M. in International and European Union Law from the University of Trento (Italy) and she specialized in aviation law pursuing the Advanced LL.M. in Air & Space Law at Leiden University (The Netherlands). Valentina is the author of several publications in reputed aerospace law journals and received European and international prizes awarded by the European Air Law Association, Women in Aerospace Europe, and the International Institute of Space Law.

In her spare time, Valentina enjoys painting and learning Hindi.

**Dan Wolf** founded Cape Air in 1989 and served as the company's Chief Executive Officer from its founding through 2021. Dan continues to serve the company as the Chairman of the Board of Directors and stays current with his Air Transport Pilot license. In 2009, Cape Air was the first airline to adopt a strategic commitment to the environment and the airline was recognized for its sustainability achievements by the Environmental Protection Agency. Dan has grown the airline with a deep sense of social responsibility. He sees all electric aircraft as an opportunity to reduce the environmental footprint of his airline. He was the first commercial customer for Eviation Aircraft who manufacture the all-electric Alice aircraft which is expected to enter into service by 2024. Cape Air has also committed to the Tecnam P-VOLT which is an all-electric version of the [Tecnam P2012 Traveller](#) for which he was a launch customer.



Dan's secondary education was at Germantown Friends School in Philadelphia, Pennsylvania followed by a bachelor's degree in Political Philosophy from Wesleyan University in Middletown, Connecticut. At the Quaker School of Aeronautics he received a degree in Airframe and Power Plant Maintenance. He has worked as a community and union organizer in the Boston area and managed the Chatham Municipal Airport, where he also worked as a flight instructor and aircraft mechanic.

Dan was elected in November 2010, 2012, and 2014, respectively, to represent Cape Cod and the Islands in the Massachusetts State Senate, where he served from 2011 through 2016. Each term, Dan was appointed as the Senate Chair of the Committee on Labor and Workforce Development, focusing on legislation around labor, workplace safety, and workplace development.

As a business and community leader, Dan has served on many of the region's most important non-profit and civic organizations. He currently serves on the boards of Cape Cod Five Cents Savings Bank, the Center for Coastal Studies, and the Alliance for Business Leadership.

Dan resides with his wife, Heidi Schuetz, in Harwich, Massachusetts. He enjoys a morning bike ride daily and traveling to visit his three grown daughters.

## SusTech 2022 Program

**Thursday, April 21**

**Thursday, April 21 8:00 - 9:00 (America/Los\_Angeles)**

**OPK1: Opening Remarks & K1: IOT and sustainability**

Room: Ballroom

Chair: David Gonzalez (IEEE, USA)

**Opening Remarks and Introduction:**

Kathy Herring Hayashi, IEEE Region 6 Director-elect

**Keynote: "IOT and Sustainability"**

Adam Drobot, Chairman, OpenTechWorks Inc.

Much of the popular discourse about sustainable development centers on the framework defined by the Brundtland Report [1]. The report addresses the future of human existence on the planet and the impacts on society, the environment, culture, and economics [2]. The hoped-for results are described by the Sustainability Development Goals [3] that relate a more granular view to desirable, but still vague, traits, behavior, and outcomes. The underlying issues are inherently complex and tangled. The Internet of Things (IoT) and accompanying infrastructure and technologies provide tools for improving our understanding of the state of the planet, the consequences of decisions, resource allocations, and the dynamics that drive outcomes across the SDGs. What I will cover in the talk is Sustainability, the Internet of Things, how the two are related, and in-depth examples that relate how technology can translate into positive outcomes and results. The examples address three important problems and include the application of IoT to Agriculture, Smart Cities, and Cultural Dynamics.

**Thursday, April 21 9:10 - 10:30 (America/Los\_Angeles)**

**PS1: Agriculture and Food Technology**

Room A

Chair: Rakeshkumar Mahto (California State University, Fullerton, USA)

9:10 [\*Anomaly Detection at the Apiary: Predicting State and Swarming Preparation Activity of Honey Bee Colonies Using Low-Cost Sensor Technology\*](#)

[\*Diren Senger, Carolin Johannsen and Thorsten Kluss\*](#) (University of Bremen, Germany)

9:30 [\*Analysis of Long-Term Sustainability Challenges & Optimization of Solar Thermal Lemongrass Essential Oil Extraction Systems\*](#)

- [Aroun Clément Baudouin-van Os](#) (Amrita Vishwa Vidyapeetham, India); [Maneesha Vinodini Ramesh](#) (Amrita Vishwa Vidyapeetham, Amrita University, India)
- 9:50 [\*Feasibility of Achieving Net-Zero Water Usage Through Rainwater Harvesting at Big-Box Retailers\*](#)  
[Kurt Wurthmann](#) (Nova Southeastern University, USA)
- 10:10 [\*Analysis of Rainwater Harvesting Methods Considering the Impacts of Climate Change\*](#)  
[Cris Edward Monjardin](#), [Anne Louie Ente](#) and [Gladys Mae Lorenzo](#) (Mapua University, Philippines)

**PS2: Sustainability Management I**

Room B

Chair: Edward G Perkins (Self-employed, USA)

- 9:10 [\*The Impact of Strategic Corporate Social Responsibility \(SCSR\) on Employees' Perceived Job Security and Resilience in SMEs: The Moderating Role of Humble Leadership\*](#)  
[Stavroula Mavrommatidou](#) and [Georgios Theriou](#) (International Hellenic University, Greece); [Dimitrios Chatzoudes](#) (Democritus University of Thrace, Greece)
- 9:30 [\*Aerial Drone Use for Sustainable Development in India - A Content Blog Analysis\*](#)  
[Isaac Lukambagire](#) (Amrita Vishwa Vidyapeetham - Amrita University & Amrita Multi Model Applications and Computer Human Interaction Labs, India); [Rao Bhavani](#) (Amrita University, India); [Johanna Sophie von Lieres](#) (Amrita Vishwa Vidyapeetham, India)
- 9:50 [\*Risk Index Spatial Clustering \(RISC\): Identifying High Risk Counties Using Local Moran's I and Spatial Statistics for Natural Disaster Risk Management\*](#)  
[Suraj Sheth](#) (University of Chicago, USA)
- 10:10 [\*An Innovative Enhanced Construction Planning Technique: Analytic & Collaborative Approach\*](#)  
[Qais Amarkhil](#) (Purdue University West Lafayette, USA); [Emad Elwakil](#) and [Bryan Hubbard](#) (Purdue University, USA)

**Thursday, April 21 10:40 - 12:00 (America/Los\_Angeles)**

Room: Ballroom

Chair: Sharan Kalwani (Oakland University, USA)

**PNL1: Panel: Accelerating Renewable Energy through Standards**

**Moderator:** Rudi Schubert, Director, IEEE New Initiatives

This presentation will discuss recently released standards enabling renewable energy, and engagements related to these standards where IEEE is actively supporting clean energy and climate

change solutions, including our involvement in the Global Power Systems Transformation Consortium.

**Panelists:**

- Mark Siira: IEEE P2030 Working Group Chair, IEEE Standards Coordinating Committee 21 Chair, IEEE SA Standards Board - Standards Review Committee (RevCom) and Audit Committee (AudCom)
- Karin Wadsack: Program Manager, National Renewable Energy Laboratory

**Thursday, April 21 12:00 - 12:20 (America/Los\_Angeles)**

Room: Ballroom

**LB1: Lunch Break**

**Thursday, April 21 12:20 - 13:20 (America/Los\_Angeles)**

Room: Ballroom

Chair: Charlie Jackson (IEEE, USA)

**K2: How engineers will save the world**

Ross Koningstein and David Fork, Google

The International Panel on Climate Change reported that to remain within a 1.5 °C warming limit, net greenhouse gas emissions need to be reduced to zero by 2050. Doing so by 2050 with carbon-free energy, energy use changes and carbon sequestration presents a host of challenges.

In our 2021 article in IEEE Spectrum we outlined many of the engineering tasks that can keep us busy in the coming decades. The rate and extent to which global net emissions decline depends both on which solutions get developed and deployed and also on filling significant research gaps in order to realize a full climate solution.

In this talk we will share insights about where we are with respect to some of these challenges and identify where innovations are needed in science, engineering and policy.

**Thursday, April 21 13:30 - 14:50 (America/Los\_Angeles)**

Room A

**PS3: Intelligent Transportation Systems**

Chair: Charlie Jackson (IEEE, USA)

- 13:30 [\*Architecture of an Innovative Route Planning System for Sustainable Commercial Vehicle Fleets\*](#)  
[Florian Anghelache](#) (University Politehnica of Bucharest & iSYS Professional SRL, Romania); [Alexandru Mitrea](#) (University Politehnica of Bucharest, Romania); [Nicolae Goga](#) (University of Groningen, The Netherlands); [Andrei Vasilateanu](#) (Politehnica University of Bucharest, Romania); [Vladut Radulescu](#) and [Dan Musat](#) (iSYS Professional, Romania); [Diana Scurtu](#) (University Politehnica of Bucharest, Romania)
- 13:50 [\*Exploratory Data Analysis of Electric Tricycle as Sustainable Public Transport Mode in General Santos City Using Logistic Regression\*](#)  
[Geoffrey L Cueto](#) (Mapua University & MES Construction, Philippines); [Francis Aldrine Uy](#) (Mapua Institute of Technology, Philippines); [Keith Anshilo Diaz](#) and [Cris Edward Monjardin](#) (Mapua University, Philippines)
- 14:10 [\*System Design and PV Sizing of a Micro Solar Electric Vehicle for Pakistan\*](#)  
[Ali Husnain](#) and [Mohammad Tariq Iqbal](#) (Memorial University of Newfoundland, Canada)
- 14:30 [\*Efficient Utilization of MEMS Accelerometers Embedded in Smart Mobile Devices for Intelligent Transportation Systems Applications\*](#)  
[Murat Bakirci](#) (Tarsus University, Turkey)

#### **PS4: Renewable/Alternative Energy**

Room B

Chair: Sheraz Anwar (Xiamen University, China)

- 13:30 [\*Resilience Metrics for Building-Level Electrical Distribution Systems with Energy Storage\*](#)  
[Spencer Hutchinson](#), [Willy G Bernal Heredia](#) and [Omkar A Ghatpande](#) (National Renewable Energy Laboratory, USA)
- 13:50 [\*Forecast Error Modeling for Microgrid Operation Considering Correlation Among Distributed Generators Using Gaussian Process Regression\*](#)  
[Yeuntae Yoo](#) and [Seokheon Cho](#) (University of California, San Diego & Qualcomm Institute, USA); [Sung-Geun Song](#) (Korea Electronics Technology Institute, Korea (South)); [Ramesh R. Rao](#) (UCSD, USA)
- 14:10 [\*Optimization of a Micro Hydro Power Plant\*](#)  
[Somila Hashunao](#) (NERIST, Deemed University, Nirjuli, Itanagar, India)
- 14:30 [\*An Exploration of Un-Electrified Remote Area Community Life\*](#)  
[Somila Hashunao](#) (NERIST, Deemed University, Nirjuli, Itanagar, India)



**Thursday, April 21 15:00 - 16:00 (America/Los\_Angeles)**

Room: Ballroom

Chair: Md. Fahim Chowdhury (Auburn University, USA)

**K3: Engineering in a Responsible World**

Jen M. Huffstetler, VP and GM, Data Center Platform Strategy, Mobilization, Sustainability and Services, Intel

What is sustainability worth to the next generations? What expectations do we set for ourselves to ensure a more sustainable tomorrow? Intel has established a long-standing commitment to environmental leadership to achieve efficiency, reduce costs, and respond to the needs of our customers and community stakeholders. In this talk, we'll challenge engineers to rethink and reimagine technologies and businesses with sustainability in mind. This will require disruptive solutions that are outside the norm and non-traditional, such as data centers that reuse heat and platforms that are carbon aware. We are solving big problems to help protect our planet and improve the lives of every person. Join us on the journey.

**Thursday, April 21 16:10 - 17:30 (America/Los\_Angeles)**

Room A

**PS5: Smart Cities**

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

16:10 [\*Incentivizing Distributed Energy Resource Participation in Grid Services\*](#)

[Tylor E Slay](#) (Portland State University & MASEEH College of Engineering and Computer Science, USA); [Robert Bass](#) and [John M Acken](#) (Portland State University, USA)

16:30 [\*Protection Relays in a Model of IEEE n-Bus System Using Real Time Digital Simulation\*](#)

[Sean Monemi](#) (California State Polytechnic University at Pomona, USA)

16:50 [\*A Complete State Transition-Based Traffic Signal Control Using Deep Reinforcement Learning\*](#)

[Guoyuan Wu](#) (University of California, Riverside, USA); [Shangrui Liu](#) (University of California at Riverside, USA); [Matthew J Barth](#) (University of California, Riverside, USA)

17:10 [\*Smart Buildings for Sustainable Smart Cities\*](#)

[Vinod Anand Bijlani](#) (AI & IoT Expert)

Room B

**PS6: Smart Grid**

Chair: Yan Wang (Temple University, USA)

16:10 [\*Deferrable Irrigation Load Optimization in Rural Microgrid Clusters\*](#)

[Rohitaa Ravikumar](#) (SSN College of Engineering, India); [Manasvini Venkatraman Srinivasan](#) (College of Engineering, Guindy, India); [Raj Vignesh Karunakaran](#) and [Aditty Srikanth](#) (SSN College of Engineering, India); [Vineeth Vijayaraghavan](#) (Solarillion Foundation, India)

16:30 [\*Shared Trench for Burying Cables in the Conversion of Overhead to Underground Networks\*](#)

[Maileen S Simão](#), [Euler Ribeiro](#), [Beatriz B Cardoso](#) and [Marcos Aurelio Izumida Martins](#) (CERTI Foundation, Brazil); [Moacir F Lopes, Jr.](#) and [Fabricio Rodrigues](#) (Enel Distribuição São Paulo, Brazil)

16:50 [\*A Means for Tuning Primary Frequency Event Detection Algorithms\*](#)

[Sean Keene](#), [Landon Hanks](#) and [Robert Bass](#) (Portland State University, USA)

17:10 [\*Study of Cascading Failure Duration in Power Grid Using Historical Outage Data and Simulation Model\*](#)

[Saikat Das](#) and [Zhifang Wang](#) (Virginia Commonwealth University, USA)

**Thursday, April 21 17:40 - 17:55 (America/Los\_Angeles)**

Room: Ballroom

Chair: Sharan Kalwani (Oakland University, USA)

**WUP1: Day 1 Wrap-up**

**Thursday, April 21 18:00 - 21:00 (America/Los\_Angeles)**

Room: Ballroom

Chairs: Sean Monemi (California State Polytechnic University at Pomona, USA), Justin Y. Shi (Temple University, USA)

**STPC: Student Poster Competition**

**Thursday, April 21 18:00 - 19:00 (America/Los\_Angeles)**

**SPC1: SPATIAL CHAT**

Room: Spatial Chat

## Friday, April 22

**Friday, April 22 8:00 - 9:00 (America/Los\_Angeles)**

Room: Ballroom

### **OPK2: Opening Remarks & Keynote**

Chairs: David Gonzalez (IEEE, USA), Shafkat Islam (Purdue University, USA)

### **K4: Leveraging data to drive Sustainability in the Energy sector**

Jayant Sinha, Senior Principal Consultant, Utilities India Industry Platform, Capgemini

As the countries around the globe race to meet their net zero deadlines, data plays an important role in analyzing climate change impacts in the energy sector. Also, technology plays a crucial role in mapping the humongous data residing in various forms, at diverse locations, to corresponding energy and carbon performance. In this keynote, I will talk on the role of digital technologies such as machine learning (ML), robotic process automation (RPA) and intelligent instrumentation, in real-time assessment, data visualization, smart analytics and generating insights for predicting potential carbon footprint of various energy practices. These data insights help the energy and utility sector to take decisive actions proactively to mitigate climate change repercussions, reduce emissions and promote sustainability.

**Friday, April 22 9:10 - 10:30 (America/Los\_Angeles)**

Room A

### **PS7: Water Resources Management**

Chair: Edward G Perkins (Self-employed, USA)

9:10 [\*Development of Racking and Irrigation System for Industrial Revolution 4.0 Vertical Farming\*](#)

[Vijayapragas Muniandy, Ir](#) (Tunku Abdul Rahman University College, Malaysia)

9:30 [\*A Non-Linear Differentiable Model for Stormwater-Based Irrigation of a Green Roof in Toronto\*](#)

[Chia-Hui Yeh](#) and [Margaret Chapman](#) (University of Toronto, Canada)

9:50 [\*A Sustainable Integrated Rural Water Management with Emphasis on Network Prioritization, Household Water Treatment and Real-Time Feedback\*](#)

[Raghavendra Kumar Raya](#), [Soumya Kar](#) and [Dhanesh Kumar](#) (Birla Institute of Technology and Science, Pilani, India); [Rajiv Gupta](#) (BITS Pilani, India)

10:10 [\*Deterioration Modeling and Failure Analysis of Water Distribution Networks\*](#)

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

Room B

**SSSA: Special Session: Powering Sustainable Aviation**

Chair: Siobhan M Dolan Clancy ( & SDC Business Consulting Ltd., Ireland)

- 9:10 *Cross-Fertilization of Space and Aviation Towards Electrical Systems*  
[Jean-François Lumens](#) (Belgium)
- 9:40 *Airplane-Quadcopter UAV Hybrid Incorporating Power Regeneration Technologies & Weight Minimization*  
[Martin O'Connell](#), [Raven Santos](#), [Brianna Ho](#), [Isaac Hasan](#), [Joshua Kidwell](#), [Lizbeth Gamino](#), [Christian Corral](#), [Diego Portillo-Gonzalez](#), [Luis Ortiz Echeverria](#), [Francesco Ruotolo](#) and [Ivan Sanchez](#) (California State Polytechnic University, Pomona, USA); [Steven Dobbs](#) (California State Polytechnic University at Pomona, USA); [Jesus Rojas](#), [Andrea Dominguez](#), [Derek Mata](#), [Dominic Sanqui](#) and [Mumen Abbas](#) (California State Polytechnic University, Pomona, USA); [Christian A Ruvalcaba](#) (California State Polytechnic University, Pomona & Pacific Transformer, USA); [Hangqing Zhao](#), [Dylan Godfrey](#), [Michael Youssef](#), [Alan Viernes](#), [Christopher Hua](#), [Steven Huynh](#), [Peter Ayad](#), [Christopher Watson](#), [Anthony Damelio](#) and [Reynaldo Martinez Villalobos](#) (California State Polytechnic University, Pomona, USA); [Zhen Yu](#) (California State Polytechnic University at Pomona, USA)
- 10:00 *Hybrid Power Drive Solution for Increased Sustainability in Aircraft Actuation Systems*  
[Shane O'Donnell](#) (University of Nottingham, Ireland & Microchip, Ireland); [Laurence Egan](#) (Microchip Technology, Ireland); [Alan Calmels](#) (Microchip Technology, France); [Patrick Wheeler](#) (University of Nottingham, United Kingdom (Great Britain))

**Friday, April 22 10:40 - 12:00 (America/Los\_Angeles)**

Room A

**PS8: Sustainability Management II**

Chair: Justin Y. Shi (Temple University, USA)

- 10:40 *Automated Identification of Used Beverage Cans for Deposit Return Using Deep Learning Methods*  
[Spencer Ploeger](#) and [Matthew E. Bolan](#) (University of Guelph, Canada); [Lucas Dasovic](#) (Canada)
- 11:00 *Harnessing the Power of Ocean Waves to Make Electric Energy*  
[Reza Kamali-Sarvestani](#) (California State University San Marcos, USA); [Hamed Nademi](#) (California State University-San Marcos, USA)
- 11:20 *Proposed Application for an Entity Component System in an Energy Services Interface*  
[Tylor E Slay](#) (Portland State University & MASEEH College of Engineering and Computer Science, USA); [Robert Bass](#) and [Grace Spitzer](#) (Portland State University, USA)

- 11:40 [\*Novel Robotic Approach to Irrigation and Agricultural Land Use Efficiency\*](#)  
[Alexander W Hoppe](#), [Emmanuel Jefferson](#), [Jake Woodruff](#), [Lachlan McManus](#),  
[Nicodemus Phaklides](#) and [Tia McKenzie](#) (Embry-Riddle Aeronautical University, USA)

Room B

**PS9: Energy Efficiency**

Chair: Charlie Jackson (IEEE, USA)

- 10:40 [\*Enhancing the Performance of Multi-Agent Reinforcement Learning for Controlling HVAC Systems\*](#)  
[Daniel Bayer](#) (Friedrich-Alexander-University Erlangen-Nuremberg, Germany); [Marco Pruckner](#) (University of Erlangen-Nuremberg, Germany)
- 11:00 [\*Balanced Model Order Reduction Techniques Applied to Grid-Tied Inverters in a Microgrid\*](#)  
[Md. Rasheduzzaman](#) (Southeast Missouri State University & Missouri S&T, Southeast Missouri State University, USA); [Poria Fajri](#) (University of Nevada, Reno, USA);  
[Bamdad Falahati](#) (Leidos Inc., USA)
- 11:20 [\*Modeling and Optimization of Energy Performance for a Water-Cooled Chiller Plant Deployed in Multi-Story Office Building\*](#)  
[Yesaswini Chilukuri](#) (Indian Institute of Technology Madras (IITM) Research Park, India); [Samit Bhowmick](#) and [Prashant Dubey](#) (Veratatva Engineering Consultant LLP, India); [Adil Usman](#) (University of California Santa Cruz, USA)
- 11:40 [\*Optimal Seasonal Spinning Reserve Scheduling for Islanded Microgrid Operation Under Contingency Conditions\*](#)  
[Tarek Masaud](#) (University of Colorado Colorado Springs, USA); [Mohammed Siddiqui](#) (Marshall University, USA)

**Friday, April 22 12:00 - 12:20 (America/Los\_Angeles)**

Room: Ballroom

**LB2: Lunch Break**

**Friday, April 22 12:20 - 13:20 (America/Los\_Angeles)**

Room: Ballroom

Chair: Adil Usman (University of California Santa Cruz, USA)

**K5: Climate Risks and Solutions**

Paul Werbos

From my years running Adaptive and Intelligent Systems and Electric Power Research at NSF (until 2015), I learned that new technologies - some well proven and grounded in work centered in the IEEE Power and Energy Society - would allow us to stop climate destruction much sooner and faster, and at lower cost, than any of the schemes we have heard from policy gatherings like COP26 or legislation anywhere on earth, including even the 2009 Obama climate bill which I evaluated for an office of the US Senate in 2009.

Based on my talks and papers on the risks and solutions ([http://www.werbos.com/climate\\_extinction\\_risk\\_and\\_solutions.htm](http://www.werbos.com/climate_extinction_risk_and_solutions.htm)), the IEEE/Wiley Series Editor for Power and Energy asked me to organize an edited book, by creating new connections and dialogue between all the players who are truly at the scientific and technical front lines of the risk and of the new solutions.

This was an incredible learning experience, bringing out risks, near-term opportunities and optimal tradeoffs no one on earth knew about before these discussions and new networks. This talk will give an overview of the most important highlights, and opportunities for action.

**Friday, April 22 13:30 - 14:50 (America/Los\_Angeles)**

Room A

**PS10: Social Impact of Technology**

Chairs: Charlie Jackson (IEEE, USA), Jay Pearlman (USA)

- 13:30 [\*Social Acceptance of Photovoltaic Solar Technology in Saudi Arabia\*](#)  
[Malek Alduhaymi](#), [Saleh Komies](#) and [Abdulaziz Mohammed Alshaya](#) (Imperial College London, United Kingdom (Great Britain))
- 13:50 [\*Does Immurgence of ICT Focused Institutions Increase the Pace of Urban Development? A Provincial Case Study in Iran Using Data from the Ground and Above\*](#)  
[Mohammad Tondro](#) and [Mohammad Jahanbakht](#) (University of Texas at Arlington, USA); [Shourav Bin Rabbani](#) (Data and Design Lab, Bangladesh); [Moinul Zaber](#) (United Nations University, Portugal & University of dhaka, Bangladesh)
- 14:10 [\*Detection of False Data Injection Cyberattacks Targeting Smart Transmission/Distribution Networks\*](#)  
[Ehsan Naderi](#) (Southern Illinois University, USA); [Abdullah Aydeger](#) (Southern Illinois University, Carbondale, USA); [Arash Asrari](#) (Southern Illinois University, USA)



14:30 [\*A Sensor Selection Optimization Framework for Tracking CO2 Flow Movements in Carbonates\*](#)

[Klemens Katterbauer](#) (Saudi Aramco, Saudi Arabia); [Abdallah Alshehri](#) (Georgia Institute of Technology & Saudi Aramco, USA); [Abdulaziz Al Qasim](#) and [Ali Yousif](#) (Saudi Aramco, Saudi Arabia)

Room B

**PS11: Sustainability Management III**

Chair: Srihari Yamanoor (Self, USA)

13:30 [\*Non-Intrusive Electric-Vehicle Load Disaggregation Algorithm for a Data-Driven EV Integration Strategy\*](#)

[Anthony James](#) (Southern California Edison, USA); [Alec Zhixiao Lin](#) (SCE, USA)

13:50 [\*Design and Economic Analysis of a Net-Zero Water and Energy Single-Family Home That Meets Affordable Housing Criteria in Florida\*](#)

[Kurt Wurthmann](#) (Nova Southeastern University, USA)

14:10 [\*Using Smart Meter Data and Machine Learning to Identify Residential Light-Duty Electric Vehicles\*](#)

[Anthony James](#) (Southern California Edison, USA); [Alec Zhixiao Lin](#) (SCE, USA)

**Friday, April 22 15:00 - 16:00 (America/Los\_Angeles)**

Room: Ballroom

Chair: Sharan Kalwani (Oakland University, USA)

**K6: Nuclear Power for a Sustainable Future**

Steven Mirsky, NuScale Power

This presentation addresses the global reality of what our world's population is lacking to provide a reasonable standard of living. A brief history of NuScale Power and our unique NRC-licensed small modular reactor design is discussed along with our microreactor. This is followed by information on how nuclear power can be used for a wide spectrum of industrial activities to replace fossil fuels, work with renewable power, and provide critical energy infrastructure. The benefits of nuclear power for reliable base loaded electricity, hydrogen production, clean water are highlighted. In addition the safety and low environmental impact of nuclear power in comparison to fossil and renewable power is also addressed in this presentation.

**Friday, April 22 16:10 - 17:30 (America/Los\_Angeles)**

Room: Ballroom

Chair: Sharan Kalwani (Oakland University, USA)

**PNL2: Panel: Developments in Nuclear Energy**

Nuclear power continues to develop technologically. Abundant energy is the base for advanced societies. We are being squeezed by two forces. The first is that our coal and oil burning does inflict lethal (yes, lethal) damage. The second is that coal and oil have finite resource lifetimes. They are a fixed resource that we burn huge amounts by the minute. This panel will discuss trends in the nuclear power industry.

**Moderator:** Sharan Kalwani

**Panelists:**

- Steven Mirsky, P.E., Senior Technical Advisor, Research Collaborations, Office of Technology, NuScalePower, Greenbelt, Maryland, USA.
- Marley Smith, Nuclear Test Engineer, Puget Sound Naval Shipyard, Seattle, State of Washington, USA
- Dr. Charles Hawkins, Professor Emeritus, ECE University of New Mexico, Affiliate Professor University of Florida.

**Friday, April 22 17:40 - 17:55 (America/Los\_Angeles)**

Room: Ballroom

Chair: Sharan Kalwani (Oakland University, USA)

**WUP2: Day 2 Wrap Up**

**Friday, April 22 18:00 - 18:30 (America/Los\_Angeles)**

**SPC2: SPATIAL CHAT**

Networking

## **Saturday, April 23**

**Saturday, April 23 7:00 - 8:00 (America/Los\_Angeles)**

Room: Ballroom

Chair: David Gonzalez (IEEE, USA)

### **OPK3: Opening Remarks & K8: Powering Advanced Air Mobility**

Dr. Stefan Breunig - Head of Strategy, Rolls-Royce Electrical

Electrification in aerospace is currently driven by developments in the Advanced Air Mobility segment. Hybrid and all-electric Commuter and eVTOL aircraft will transform existing markets or even create completely new markets. The technology to make this happen is there and the route to certification is getting more and more defined.

This is the time to think about the next steps and upcoming challenges: How do we maintain these aircraft? How can we deploy the required charging infrastructure? And what role will digitally-enabled services and new business model play?

**Saturday, April 23 8:10 – 9:40 (America/Los\_Angeles)**

**Date:** April 23, 8:10 – 9:40 AM PDT (1510-1640 GMT)

Room: Ballroom

### **PNL3: Panel: Evolving Aviation Ecosystem**

Chair: Siobhan M Dolan Clancy ( & SDC Business Consulting Ltd., Ireland)

We are now seeing a fundamental paradigm shift in the way the aviation sector is embracing a net-zero emissions target by 2050, with a common understanding that it will take multiple stakeholders working together to make it possible. There is a coming together of industry stakeholders including airlines, airports, aircraft /engine manufacturers, fuel suppliers as well as government and regulators in declarations of commitment and partnerships to work together to reach the aggressive emission reduction target while the industry is forecasting passenger numbers and air traffic to double in the same timeframe.

While aviation has historically been quite successful in leveraging technology to reduce its contributions to climate change, clearly there is more to do. More recently, technological advancements in aircraft/engine design and manufacturing, alternative jet fuels, airport and air traffic management, and maintenance practices have sustainability as part of its core value proposition.

This panel of aviation experts will take a deep-dive into the challenges and opportunities within sustainable aviation including technology innovation, R&D collaborations, regulatory regimes, infrastructure and financing with the ultimate goal of achieving net-zero emissions.

**Key Discussion Points:**

- What will air transport in the future look like?
- Airframe and Propulsion Technology innovations - challenges and opportunities
- Challenges in ensuring sustainable Alternative Jet Fuel supply and ways to overcome them
- Airport infrastructure and services needed to build net-zero emission aviation ecosystems
- Evolving regulatory regimes to achieve sustainability targets
- Sustainability as a key enabler to aircraft technology innovations

**Moderator:** Siobhan Dolan Clancy, Founder & CEO of SDC Business Consulting Ltd.

**Panelists:**

- Steve Csonka, Executive Director, CAAFI (Commercial Aviation Alternative Fuels Initiative)
- Val Miftakhov, Founder & CEO of ZeroAvia
- Melinda Pagliarello, Managing Director, Environmental Affairs at the Airports Council International - North America (ACI-NA)
- Ms. Valentina Vecchio, Sustainability Policy & Partnerships Regional Lead, Europe - Boeing Corporation
- Dan Wolf, Founder and Executive Board Chairman, Cape Air

**Saturday, April 23 9:50 - 10:50 (America/Los\_Angeles)**

Room: Ballroom

Chair: Siobhan M Dolan Clancy ( & SDC Business Consulting Ltd., Ireland)

**K9: Sustainable Ecosystem Model for a Regional Airport**

Jean Louis Debauche - Founder and CEO of JLD Consultant, Co-Founder of ZE-Glue Limited

The Aviation industry has been on a journey to reach the future of carbon-neutral air transportation across the globe for four decades and has already made significant achievements through technological advancement and improvements in operations and infrastructure. Now as the aviation industry has committed to Net Zero Carbon emissions by 2050, it will require a fundamental change in how the industry comes together as an Ecosystem of stakeholders to deploy the technological advancements necessary to reach the net zero targets in the given timeframe.

This talk will present a case study to establish a Sustainable Aviation EcoSystem Model for a Regional Airport whose primary objective is to address some key challenges around a rapidly evolving energy supply and distribution system, airport infrastructure and different types of aircraft technology deployment.

**Saturday, April 23 11:05 - 12:05 (America/Los\_Angeles)**

Room: Ballroom

Chair: Justin Y. Shi (Temple University, USA)

**K10: A Bright Era for Electrical in Aviation**

Dr. Hao Huang, Retired Technology Chief - GE Aviation Electrical Power

Aviation is moving into a very special, bright era. The speaker will talk about the challenges and opportunities that Aviation has been facing, and the new roadmap necessary to overcome these challenges and to be ready and successful over this bright era. The speaker will then go through some key perspectives of aviation electrification, which include Electrical Engineering Technology perspective, Additive Manufacturing perspective, WBG perspective, advanced digital perspective, and Gg CO2 equivalent minimization perspective that electrical and electronics engineers need to be aware of, prepared for, and contribute to.

**Saturday, April 23 12:20 - 13:20 (America/Los\_Angeles)**

Room: Ballroom

Chair: Susan R Dickey (USA)

**K11: How Can We Decarbonize Commercial Aviation by 2050?**

Zia Abdullah, National Renewable Energy Laboratory

U.S. airlines have set a goal to reduce carbon dioxide (CO<sub>2</sub>) emissions by 50% by 2050 compared to 2005 levels. Aircraft and engine manufacturers have improved efficiency by 130% compared to 1978 levels, however additional efficiency improvements in planes and engines are not likely to be sufficient. The current state of technology readiness for battery electric and hydrogen fueled aircraft is relatively low and is unlikely to be advanced and scaled up rapidly enough and sufficiently to meet 2050 decarbonization goals.

"Drop-In" Sustainable Aviation Fuels (SAF) which have low Carbon Intensity, and which can be safely used in place of conventional Jet-A fuel are the only option that airlines will have in the near-medium term to meet their 2050 decarbonization goals. One challenge for providing SAF is that the size of the jet fuel market is large and growing. US demand was 26 billion gallons in 2019 and is expected to reach 35 billion gallons by 2050. Another challenge is that the price of SAF today is higher than petroleum-based Jet A fuel. Fuel price is a hurdle because fuel is 20%-30% of the operating cost of an airline. SAF are required to be approved under the ASTM D4054 evaluation and qualification process before becoming an approved Annex in ASTM D7566 and be permitted for use in commercial aircraft.

This presentation will provide an overview of the biofuels research at the National Renewable Energy Laboratory, some novel SAF pathways that are under development, and opportunities to accelerate scaleup, approval and deployment of these fuel production pathways to meet the commercial aviation industry's decarbonization goals.

**Saturday, April 23 13:35 - 14:35 (America/Los\_Angeles)**

Room: Ballroom

Chair: Jesus Aguila-Leon (University of Guadalajara, Mexico & Universitat Politècnica de València, Spain)

**K12: Vehicle Management System Challenges in Emerging Air Mobility Aircraft**

Brian Barker, President and CEO, Hummingbird Aero, LLC

This talk will examine the role of the Vehicle Management System (VMS) in new eVTOL aircraft, the new roles and considerations in its design, and the challenges presented by cost, weight, complexity etc.

**Saturday, April 23 14:45 - 15:40 (America/Los\_Angeles)**

Room: Ballroom

Chair: Chair: David Gonzalez (IEEE, USA)

**K13: Planet Positive 2030: Prioritizing Sustainability for Technology**

John C. Havens, IEEE Standards Association

Climate-related risks to health, livelihoods, food security, water supply, human security, and economic growth are projected to grow as the global mean surface temperature increases and reaches 1.5°C or higher above pre-industrial levels (1850-1900). Yet estimates of global emissions of nationally stated reduction goals under the Paris Agreement will lead to GHG emissions by 2030 that will not permit limiting global warming to 1.5°C by 2050 and beyond. We need responsible mitigation and adaptation measures to limit global warming and to adapt to the impact of the on-going changes to the climate, including the responsible transformation of society and infrastructure. IEEE's new Planet Positive 2030 campaign, open for all to join, provides a forward thinking, multidiscipline process leading to a roadmap of measures for change and associated metrics with the goals to

- curtail global warming,
- help adapt to the impacts of the global warming already under way,

and, hence, to the well-being of people, animals, plant life (all life forms) for a healthy planet today, tomorrow and for the next seven generations and more.

**Saturday, April 23 15:50 - 16:15 (America/Los\_Angeles)**

Room: Ballroom

**SPA: Student Poster Awards**

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

**Saturday, April 23 16:20 - 16:40 (America/Los\_Angeles)**

Room: Ballroom

**CLS: Closing Remarks & SusTech 2022**

Chair: David Gonzalez (IEEE, USA)