

# **C2E2 CLEAN ENERGY SYMPOSIUM**

MAY 19-20, 2022 Innovation Partnership Building University of Connecticut





# WELCOME!

It is our pleasure to welcome you to the 2022 C2E2 Clean Energy Symposium. Our inaugural event features 45 research presentations by students and faculty, three keynote lectures, and a panel discussion on the future of the hydrogen economy and careers in energy.

With the C2E2 Clean Energy symposium, we aim to bring academic and industrial researchers together to be inspired by the discussions on the current challenges and advances in clean energy.

At C2E2, we focus on building the nextgeneration energy technologies and tackling various facets of clean energy challenges. From discovering new materials to designing and building new energy devices that enable a more efficient energy conversion and storage, we are proud to have a collaborative research environment that brings experts across various academic departments and industries.



We thank you for attending the 2022 C2E2 Clean Energy Symposium and hope you enjoy the event.

Sincerely,

C2E2 Clean Energy Symposium Organization Committee

Start	End	Thursday May 19, 2022	
08:00	09:00	Symposium Registration & Breakfast (IPB 317)	
09:00	09:15	Opening Remarks (IPB 317)	
09:15	10:15	Keynote I: Ahmad Pe	esaran, NREL (IPB 317)
10:15	10:30	Break	
	11:40	Oral Presentations I	
10:30		Clean Energy Generation, Conversion & Storage - I (IPB 317)	Smart Grid & Renewable Energy Technologies (IPB Foyer)
11:40	11:50	Break	
11:50	12:50	Keynote II: John Ventura & Goodarz Ghanavati, Eversource (IPB 317)	
12:50	13:50	Lunch Break (IPB Foyer)	
13:50	14:50	Panel: Future of Hydrogen Economy and Careers in Energy (IPB 317)	
14:50	15:00	Break	
15:00	17:00	Poster & Networking Session (IPB Foyer)	
Start	End	Friday May 20, 2022	
08:00	09:00	Symposium Registration & Breakfast (IPB 317)	
09:00	09:15	Opening Remarks (IPB 317)	
09:15	10:15	Keynote III: Stephen George, ISO New England (IPB 317)	
10:15	10:30	Break	
10:30	12:30	Oral Presentations II	
		Clean Energy Generation, Conversion & Storage - II (IPB 317)	Biomass, Clean Fuels, Recycling, & Environment (IPB Foyer)
12:30	13:30	Lunch, Awards Ceremony & Closing Remarks (IPB 317)	



# Keynote I

(May 19, 9:15-10:15AM Innovation Partnership Building, Room 317)

#### Ahmad Pesaran

Chief Energy Storage Engineer National Renewable Energy Laboratory



#### About the speaker:

After receiving his Ph.D. in Mechanical Engineering from UCLA, Dr. Pesaran joined the National Renewable Energy Laboratory in 1983. Ahmad has been involved in various R&D activities including advanced air-conditioning, building energy efficiency, ocean energy thermal conversion, electrified vehicles, advanced batteries, and renewable grid. For many years, he was R&D Manager for the Energy Storage Group and led efforts on thermal management and 3D electrochemical-thermal-mechanical simulation of lithium-ion batteries for transportation and grid. He was on off-site assignment between 2016-2018 in Washington DC supporting the DOE Battery R&D Team. Ahmad currently works as the Chief Engineer and a Technical Advisor to DOE's Vehicle Technologies Office. He has published more 150 journal articles and has won many prestigious awards. Ahmad is a Fellow of the Society of American Engineers.

#### Abstract:

NREL is involved in research and development of high-performance, efficient, and gridintegrated energy storage technologies for a clean and resilient power system. NREL researchers work on electrochemical, thermal, mechanical, hydrogen, and other storage technologies and explore ways to integrate them into a renewable energy grid. NREL's research encompass materials and scientific research, applied and engineering development, components and system characterization and evaluation, high performance computing and simulations, and energy and economic analysis. NREL's world-class facilities and capabilities enable our researchers to work with academia and industry to develop solutions toward a decarbonize and equitable grid.



# Keynote II

(May 19, 11:50AM - 12:50PM Innovation Partnership Building, Room 317)



John Ventura Distribution Engineering Manager

**Eversource Energy** 



**Goodarz Ghanavati** Principal Transmission Planning Engineer Eversource Energy

#### About the speakers:

John Ventura is the Manager of Distribution Engineering in the Eastern Massachusetts South Region of Eversource Energy. John has 35 years of experience in the power industry, including work in substation design and distribution standards engineering. He received his BS in Electrical and Computer Engineering from Clarkson University, and an MS in Electrical Engineering and Power Systems Management from Worcester Polytechnic Institute. In his current position John is responsible for the engineering and design for new customer interconnections, system capacity upgrades, and reliability improvement projects for 39 cities and towns in Southeastern Massachusetts. He is also currently the Distribution Engineering lead for the Outer Cape Cod Battery Energy Storage System Project and has been involved with its development since its inception.

Goodarz Ghanavati is a principal transmission planning engineer at Eversource Energy. He received B.Sc. and M.Sc. in Electrical Engineering from Tehran Polytechnic and a Ph.D. in Electrical Engineering from the University of Vermont. Goodarz has 9 years of experience in the power industry. He is currently working on transmission planning studies for future power grid with a large share of renewable generation and distributed energy resources. He has published several papers in various power systems journals and conference proceedings. Goodarz is currently a member of the CIGRE WG C4.60 "GENERIC EMT-type modeling of inverter-based resources for long term planning studies".



# Keynote III

(May 20, 9:15-10:15AM Innovation Partnership Building, Room 317)

#### **Stephen George**

Director, Operational Performance, Training, & Integration System Operations & Market Administration ISO New England



#### About the speaker:

In his current role as the Director, Operational Performance, Training and Integration, at ISO New England, Stephen is responsible for leading the team assigned to lead change management initiatives and projects affecting ISO's System Operations and Market Administration Department. Stephen's team is responsible for leading operations and market-related initiatives, training of system operators and departmental staff, administration of operational procedures and documentation, and human performance improvement initiatives.

Stephen has been with the ISO since 2004. From December 2004 through June 2011, Stephen was a System/Senior System Operator in ISO's control room. From July 2011 to present, Stephen has held a variety of roles in the Operational Performance, Training and Integration group. Before joining the ISO in 2004, Stephen served in the U.S. Navy for six years as a submarine nuclear plant operator. Stephen has more than 24 years of energy industry experience in control room and system operations as well as a Bachelor of Science in Applied Science and Technology, Nuclear Engineering Technology from Thomas Edison State University, and a Master of Business Administration from the University of Massachusetts.

## Panel: Future of Hydrogen Economy and Careers in Energy

(May 19, 1:50-2:50 PM Innovation Partnership Building, Room 317)

Hydrogen is a key to decarbonization and global energy transition. Yet, many challenges still exist for its widespread use in the global energy market. This panel will engage experts of diverse backgrounds and expertise on four keywords – Future, Sustainability, Economy, and Skills in the context of hydrogen economy. The objective is to create a clearer image of what the UConn students should expect in the next 10 years of their career.

#### **Moderator:**



**Dr. Ripi Singh** Chief Innovation & Strategy Coach

**Inspiring Next** 

Ripi Singh is a purposeful innovation coach who loves to discuss about future possibilities with optimism and hope. For over 30 years, he has been learning how to develop products, technologies, processes, and people. He serves, as US expert developing ISO 56000 for innovation management; as an advisor to various universities and corporations around the world; Guest Editor for Springer and Materials Evaluation: and Vice Chair of Global Special Interest Group on NDE 4.0. Former Director R&D Alstom Power (Now GE), Advanced Technology Manager for Pratt and Whitney, and Faculty at Indian Institute of Science, author of 12 books, 100+ publications, and 300+ lectures, he holds a PhD in Engineering and MS in Business Strategy.

**Panelists** 

#### Panelists:



#### Dr. Kathy Ayers

Vice President Research & Development

Nel Hydrogen

Dr. Kathy Ayers is the Vice President of R&D for Nel Hydrogen US, with responsibility for developing and executing Nel's technology strategy in proton exchange membrane electrolysis. She received her Ph.D. in Chemistry at Caltech and spent several years in the battery industry before joining Nel in 2007. Dr. Ayers manages a broad portfolio of internally and externally funded research projects, across a range of collaborators in academia, industry, and National Labs.





Dr. Stoyan Bliznakov Associate Research Professor

University of Connecticut



Digaunto Chatterjee

Vice President System Planning

Eversource Energy



Dr. Natalia Macauley Senior Project Scientist

Giner



Dr. Ryan Ouimet Research Scientist

Nel Hydrogen

Dr. Stoyan Bliznakov is an Associate Research Professor in the Department of Chemical and Biomolecular Engineering, and an Associate Director for the Research Infrastructure at the Center for Clean Energy Engineering at UConn. He earned his Ph.D. degree in Electrochemistry from the Institute of Electrochemistry and Energy Systems at the Bulgarian Academy of Sciences. His research interests are in the development of electrochemical energy conversion and storage devices including water electrolyzers, fuel cells and rechargeable batteries.

Digaunto Chatterjee is the Vice President of System Planning at Eversource. In this role, he is responsible for Transmission and Distribution Planning across Eversource's tri-state footprint. Mr. Chatterjee earned his Bachelors in Power Electronics Engineering from Nagpur University, India. He earned his Master's in Electric Power Engineering from Rensselaer Polytechnic Institute and an MBA from University of Chicago-Booth School of Business.

Dr. Natalia Macauley is a Senior Project Scientist and manages multiple government and commercial programs at Giner. She is active in novel catalyst/electrode, membrane/ionomer, membrane electrode assembly, and bipolar design, synthesis, testing. plate and characterization. Prior to joining Giner, Dr. Macauley was a postdoctoral research associate at Los Alamos National Laboratory. She holds a Ph.D. in Materials Science from Simon Fraser University, and an MS in Alternative Fuel Vehicle Technology from the University of Iceland.

Ryan Ouimet '14(ENG), '21 Ph.D. is a Research Scientist at Nel Hydrogen. At Nel, his research focus is on the optimization and development of various cell components in proton exchange membrane water electrolyzers (PEMWEs). Prior to his time at Nel, Ryan was a graduate research assistant at UConn's C2E2, reporting to Professor Radenka Maric. During his time at UConn, his research focus was on the fabrication and characterization of catalysts using reactive spray deposition technology and the manufacture of electrodes for PEMWEs, PEM fuel cells, and solid oxide fuel cells.



# Thursday May 19, 2022

Oral Presentations - I

Start	End		
10:30	11:40		
		Clean Energy Generation, Conversion & Storage – I (IPB 317)	Smart Grid & Renewable Energy Technologies (IPB Foyer)
10:30	10:47	Additive Integration of Electrospun Nanofibers into Nanoparticle Sprayed Electrodes for Durable Low Iridium Loaded PEM Water Electrolysis Trent Simonetti, Alanna Gado, Sara Pedram, Radenka Maric	Deep Reinforcement Learning for Distribution System Restoration using Renewable Distributed Energy Resources Alaa Selim, Junbo Zhao, Xiangyu Zhang, Fei Ding
10:47	11:04	Using Distribution of Relaxation Times Analysis to Understand Proton Exchange Membrane Water Electrolyzer Hydrogen Crossover Mitigation in Reactive Spray Deposition Technology Fabricated Dual Recombination Layers Alanna Gado, Ryan Ouimet, Stoyan Bliznakov, Leonard Bonville, Radenka Maric	Modeling Microgrids for Space Habitats and Exploring its Failure Modes Leila Chebbo, Ali Bazzi
11:04	11:21	Assessment of the Activity and Durability Performance of Fuel Cell Catalysts by Using Thin Film Rotating Disk Electrode Technique Jack Kissane, Ugur Pasaogullari, Stoyan Bliznakov	Three-Port DC-DC Converter for Multi- directional Energy Exchange in Microgrids Pengwei Li, Matt Silverman, Ali Bazzi
11:21	11:38	Characterization of Pt Nanoparticles within the Reactive Spray Deposition Technology (RSDT) Evangelos K. Stefanidis, Thomas A. Ebaugh, Stoyan Bliznakov, Leonard J. Bonville, Radenka Maric, Francesco Carbone	Bringing Fault Detection and Diagnostics (FDD) Tools into the Mainstream: Retro Commissioning and Continuous Commissioning of HVAC and Refrigeration Systems: Process Evaluation Mohammed Albayati, Julia De Oliveiraa, Ravi Gorthala, Amy Thompson



# Friday May 20, 2022

Oral Presentations – II

Start	End		
10:30	12:30		
		Clean Energy Generation, Conversion & Storage - II (IPB 317)	Biomass, Clean Fuels, Recycling, & Environment (IPB Foyer)
10:30	10:47	A Comprehensive Microscopy Approach toward the Proton Exchange Membrane Fuel Cell Degradations Amir Peyman Soleymani, Marcia Reid, Jasna Jankovic	Using Immobilized Lipase as Biocatalyst for Production of Biodiesel Hasan Nikkhah, Hamid Ziloui, Burcu Beykal
10:47	11:04	<b>Thermoelectric Effects at Nanoscale</b> Md Tashfiq Bin Kashem, Jake Scoggin, Ali Gokirmak, Helena Silva	Advanced Multi-scale Mechanistic Insights of Electrochemical CO <sub>2</sub> Reduction Reaction Towards Predictable Carbon Cycle and Practical Clean Energy Recovery Xingyu Wang, Sanjubala Sahoo, Jose Gascon, Walter Krawec, Mikhail Bragin, Yuankai Huang, Pamir Alpay, Baikun Li
11:04	11:21	Grain and Grain Boundary Photoconduction in Perovskite Solar Cells with Tomographic AFM Luis Ortiz, Yuanyuan Zhou, Jingfeng Song, Bryan D. Huey	The Mechanism of Adsorptive Desulfurization onto CuCeY Zeolite Henry J. Sokol, Stavros Caratzoulas, Julia Valla
11:21	11:38	A Two-electron Transfer Mechanism of Zn-stabilized δ-MnO2 Cathode toward Aqueous Zn-ion Batteries with Ultrahigh Capacity Wen Zhao, Jared Fee, Harshul Khanna, Seth March, Nathaniel Nisly, Samantha Joy B. Rubio, Can Cui, Zhuo Li, Steven L. Suib	Engineering Soil: One Microbe at a Time Azady Pirhanov, Yi-Syuan Guo, Charles M. Bridges, Reed A. Goodwin, Jessica Furrer, Daniel J. Gage, Leslie M. Shor, Yong Ku Cho



11:38	11:55	Internal Triggers and Temperature Measurement for Thermal Runaway in Lithium-Ion Batteries Bailey Fryer, Wilson Chiu, Stoyan Bliznakov	Intensified Reactor for Hydrogen and Nitrogen Production for Distributed Ammonia Synthesis System Adrian R. Irhamna, George Bollas
11:55	12:12	A Developing Microstructure Model of The High Surface Area Carbon Particle in Agglomerate of Proton Exchange Membrane Fuel Cells (PEMFCs) Cathode Alper Can Ince, Ugur Pasaogullari, Mustafa Fazil Serincan, Wilton de Melo Kort-Kamp, Edward F. Holby	Co-pyrolysis of High-density Polyethylene and Biomass Understanding Synergetic Effects on the Production of Bio-oils using Pyrolysis-GC/MS and Thermogravimetric Analysis Jeffrey Page, Lei Yu, Azeem Farinmadeb, Oluwole Ajumobib, Vijay T. Johnb, Julia Valla
12:12	12:29	Towards a Hydrogen Detonation Combustor: Using High-Fidelity Simulation to Quantify Wall Losses for Hydrogen-Oxygen and Hydrogen-Air Detonations in Narrow Ducts Patrick A. Meagher, Sai Sandeep Dammati, Xian Shi, Jackson Crane, Alexei Y. Poludnenko, Hai Wang, Xinyu Zhao	Data-driven Stochastic Optimization of Numerically Infeasible Differential Algebraic Equations: An Application to the Steam Cracking Process Zahir Aghayev, Onur Onel, Melis Onel, Efstratios N. Pistikopoulos, Burcu Beykal



# Thursday May 19, 2022

## 3:00 - 5:00PM, IPB Foyer

Poster Number	Title	Authors
1	Sustainable Solar Siting in Connecticut: Ecological, Energy, and Economic Trade-offs	Adam Gallaher, Sarah Klionsky, Yan Chen, Chuanrong Zhang, Mark Urban
2	Computational Modeling of Tubular Flow Fields for PEM Fuel Cells	Sean Small, Jasna Jankovic
3	Enhancing Effect of Boron-doping on the Activity of NiFe-MOF-74 Towards Oxygen Evolution Reaction in Alkaline	Jiale Xing, Stoyan Bliznakov, Leonard Bonville, Radenka Maric
4	Fault Tolerant Microgrid Configuration	Matt Silverman, Pengwei Li, Ali Bazzi
5	Large–Scale High-Performance Low Catalyst Loaded Membrane Electrode Assemblies for Advanced Proton Exchange Membrane Water Electrolyzers	Zhiqiao Zeng, Stoyan Bliznakov, Leonard Bonville, Ryan Ouimet, Allison Niedzwiecki, Chris Capuano, Katherine Ayers, Radenka Maric
6	Recovery of Transparent Dynamic Models from Black-Box Systems using Symbolic Regression	Benjamin Cohen, Burcu Beykal, George Bollas
7	Novel Automated Image and Data Processing Approaches for Microstructural-level Electrochemical Performance Evaluation of Fuel Cells	Mariah Batool, Andres O. Godoy, Jasna Jankovic
8	A Path to Significant Reduction of the Interfacial Contact Resistance of Sintered Titanium Porous Transport Layers in Advanced Proton Exchange Membrane Water Electrolyzers	Arkid Koni, Radenka Maric
9	Modeling the Source Sectors Contribution to Nitrogen Deposition in U.S. Hydrological Regions	Sharmin Akter, Kristina Wagstrom
10	Evaluation of New Nanostructured Materials to Improve Electric Ship Performance	Arshiah Mirza, Hiep Nguyen, Antigoni Konstantinou, Yang Cao, Ali Bazzi
11	Electrical Design of STEAM Tree	Anthony Ingrassia, Clayton Ehasz, Kevin Knowles, Zachary DiMeglio, Anthony Ingrassia, Sung-Yeul Park



# Thursday May 19, 2022

## 3:00 - 5:00PM, IPB Foyer

Poster Number	Title	Authors
12	A Hybrid Fault Detection and Isolation System for PV Applications	Muhammed Ali Gultekin, Ali Bazzi
13	Anchored Simulation of a Gas Turbine Mixer	Kyle Twarog, Ossama Mannaa, Hukam C. Mongia, Chih-Jen Sung
14	Advanced Electron Microscopy Characterization for Next Generation Fuel Cells	Andres O. Godoy, Saidjafarzoda Ilhom, Ramesh K. Singh, Mor Kattan, Necmi Biyikli, Yair Ein-Eli, Dario R. Dekel, Jasna Jankovic
15	Embedded Electrochemical Impedance Spectroscopy into Battery Management System	Desmon Simatupang, Sung-Yeul Park
16	Electrosprayed Membranes for the Purification of Biogas	Noah Ferguson, Jeffrey McCutcheon, Mayur Ostwal
17	Design and Control of AC Current Injector for Battery EIS Measurement	Abdulraouf Benshatti, S. M. Rakiul Islam, Thomas Link, Sung-Yeul Park, Sungmin Park
18	Characterization of RO Membrane Platform with X-ray Modeling for High Salinity Water Desalination	Mi Zhang, Yara Suleiman, Sina Shahbazmohamadi, Mayur Ostwal, Jeffrey McCutcheon
19	In-Silico Evolution of High-Performing Metal Organic Frameworks for Methane Adsorption	Nicole Beauregard, Ranjan Srivastava
20	Development of 3D-printed membranes for the Production of Low-carbon Intensity Biofuels	Rebecca Lee, Jeffrey McCutcheon, Mayur Ostwal
21	Electrocatalytic Conversion of Phenol as a Bio-oil Model Compound	Jeffrey Page, Lei Yu, Stoyan Bliznakov, Julia Valla
22	Market Design Approach for Unreliable Grid	Leila Chebbo, Ali Bazzi
23	Plasma Enhanced Atomic Layer Deposition of Vanadium Oxide Thin Films for Solar Cell Applications	Adnan Mohammad, Krishna D. Joshi, Saidjafarzoda Ilhom, Brian Willis, Barrett Wells, Necmi Biyikli
24	Deep Reinforcement Learning for Distribution System Restoration using Renewable Distributed Energy Resources	Alaa Selim, Junbo Zhao, Xiangyu Zhang, Fei Ding



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