



## CONFERENCE PROGRAM

# 2023 IEEE the 11th International Conference on SMART ENERGY GRID ENGINEERING

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August 13-15, 2023  
Ontario Tech University, Oshawa, Canada  
Address: Oshawa, 2000 Somcoe Street North L1H7K4 ON

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## A Conference Venue



### Ontario Tech University

Founded in 2002, Ontario Tech University is a public research university located in Oshawa, Ontario.

Ontario Tech's main campus is located on approximately 400 acres of land in the northern part of Oshawa. There is a secondary campus in the downtown area of Oshawa.

There are seven faculties: the faculty of business and information technology, the faculty of energy systems and nuclear science, the faculty of engineering and applied science, the faculty of science, the faculty of health science, the faculty of social sciences and humanities, the faculty of education, and the faculty of graduate studies.

Fraternities and sororities are a big part of life on campus. These organisations, some of which are residential, host events for students and do philanthropy work for the surrounding community.

Address: Oshawa, 2000 Somcoe Street North L1H7K4 ON

Access Map: <https://ontariotechu.ca/maps/>

## B On-site Registration

Registration desk → Inform the staff of your paper ID → Sign-in → Claim your conference kit.

## C Devices Provided by the Organizer

Laptops (with MS-Office & Adobe Reader) / Projectors & Screen / Laser Sticks

## D Materials Provided by the Presenter

Oral Session: Slides (pptx or pdf version). Format 16:9 is preferred.

Presentations: in English.

## E Duration of Each Presentation

Keynote Speech: 40min, including Q&A.

Oral Presenter: 15min, including Q&A.

## F Notice

※ Please wear your delegate badge (name tag) for all the conference activities. Lending your participant card to others is not allowed.

※ Please take good care of your valuables at any time during the conference. The conference organizer does not assume any responsibility for the loss of personal belongings of the participants during conference day.

※ Please enter the meeting room at least 10 minutes before your session. Your punctual arrival and active involvement will be highly appreciated.


※ Please show name tag and meal coupons when dining.

## G Time Zone:

Greenwich Mean Time (GMT-4) – Oshawa Local Time

Please attention the time difference.

## H Zoom Meeting ID for Online Participant

	Meeting ID	Link
 ✓ Zoom Download	820 0982 3231	<a href="https://us02web.zoom.us/j/82009823231">https://us02web.zoom.us/j/82009823231</a>

Note:

1. We recommend that you install the Zoom platform on your computer beforehand. New users can participate in the Zoom meeting **without registration**.
2. The whole conference will be recorded. We appreciate you proper behaviour and appearance. The recording will be used for conference program and paper publication requirements. The video recording will be destroyed after the conference and it cannot be distributed to or shared with anyone else, and it shall not be used for commercial nor illegal purpose. It will be recorded by the staff only.
3. Please set your display name on Zoom before joining the online meeting. For instance,

Author/Presenter: Paper ID\_Name < GH001\_Li Lei >

Listener: Listener\_Name < Listener\_Li Lei >



We are pleased to welcome you to 2023 IEEE the 11th International Conference on Smart Energy Grid Engineering (SEGE 2023). This event is scheduled for August 13-15, 2023, in Ontario Tech University, Oshawa, Canada, sponsored by Toronto Section NPS Chapter and hosted by Ontario Tech University.

It delightfully welcomes all the researchers and developers to share their experiences and ideas through research talks and presentations from diverse fields in smart energy grid engineering. This event offers a platform in bringing together a forum for students, postdocs and established scientists to exchange their ideas and contributing an integrative approach to smart energy grid engineering. We will provide a good opportunity by admiring your updated research knowledge and also by publishing it in the conference proceedings.

SEGE 2023 consists of 7 keynote/Plenary/Invited speeches, successively delivered by Prof. Leyi Wang (Wayne State University, USA), Dr. Pierluigi SIANO (University of Salerno, Italy), Dr. Waldir Freitas (University of Campinas, Brazil), Dr. Michael Fowler (University of Waterloo, Canada), Prof. Ahmed Mohamed (City University of New York, USA), Prof. Olivier BAHN (GERAD and Department of Decision Sciences, HEC Montréal, Canada) and Dr. Xiaoyu Wu (University of Waterloo, Canada), followed by 7 technical sessions (On-site and online), with topics: Transition to Hydrogen Energy Infrastructures; Power Demand and Load Forecasting; Smart Grid and Power Grid Operation Management; Power Control Systems and Renewable Energy Engineering; Clean Energy and Renewable Energy; Modern Energy Development and Management; Smart Grid and Power Control Technology.

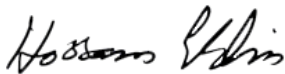
The papers in the proceedings are accepted after being peer-reviewed by conference committee, international reviewers based on the topic and quality. With the keynote speeches, invited speeches, oral sessions, we'll have an exciting program this year, which will allow participants to present and discuss the latest research and industrial developments in these fields.

We're confident that over the three days you'll get the theoretical grounding, practical knowledge, and personal contacts that will help you build long-term, profitable and sustainable communication among researchers and practitioners working in a wide variety of scientific areas with a common interest in energy generation, transmission and distribution infrastructures, energy storage, electrification, information and communications, and security.

On behalf of the organizing committee, we would like to deeply express our heartfelt appreciation to all our delegates, keynote speakers, session chairs, as well as all the committee members involved in the technical evaluation of conference papers and in the organization of the conference for their time, effort, and great contributions.

We also wish that this conference will be an unforgettable and wonderful experience for you.

Dr. Hossam Gabbar

A handwritten signature in black ink, appearing to read 'Hossam Gabbar'.

Founder and General Chair of IEEE SEGE

Ontario Tech University

Oshawa, Ontario, Canada

## **General Chair**

Dr. Hossam A. Gabbar, Ontario Tech University, Canada

## **Technical Program Co-chairs**

Dr. Ehab El-Saadany, U of Waterloo, Canada

Dr. Prasanta Ghosh, Syracuse Univ., USA

Dr. Mohammed Safiuddin, University at Buffalo, USA

## **Local Organization Co-chairs**

Dr. Martin Agelin-Chaab, Ontario Tech University, Canada

Dr. Muhammad Ahmed, Ontario Tech University, Canada

Dr. Ahmed Ramadan, Ontario Tech University, Canada

Dr. Namdar Saniei, Ontario Tech University, Canada

## **Women in Engineering Chair**

Dr. Ruth Milman, Ontario Tech University, Canada

## **Treasurer**

Dr. Manir U. Isham, Ontario Tech University, Canada

## **Publication Chair**

Dr. Ahmed Mohamed, Ontario Tech University, Canada

## **Award Chair**

Dr. Filippo Genco, Ontario Tech University, Canada

## **Technical Program Committees**

Amr Ahmed A. Radwan, Western Washington University, USA

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Hamid Reza Shaker, University of Southern Denmark, Denmark

Panos Kotsampopoulos, National Technical University of Athens, Greece

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Zoya Pourmirza, University of Birmingham, UK

Masoud Taghavi, Mechanical Engineering Department, Faculty of Noshahr at Technical and Vocational University (TVU), Iran

Alexander Sauer, Institute for Energy Efficiency in Production (EEP), University of Stuttgart, Germany

Nikolaos Paterakis, Eindhoven University of Technology, The Netherlands

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MUHAMMAD ARSHAD SHEHZAD HASSAN, The University of Faisalabad, Pakistan

Rania Ibrahim, Arab Academy for Science and Technology and Maritime Transport, Egypt

Georges Abdul-Nour, Université du Québec à Trois-Rivières, Canada

Hui Lin, University of Rhode Island, United States

Thanwadee Chinda, Thammasat University, Thailand

Roni Irrawan, Universitas Gadjah Mada, Indonesia

Jamshid Aghaei, LUT University, Finland

Sami Iqbal, Southeast University, China

## SUNDAY, AUGUST 13, 2023

[Greenwich Mean Time (GMT-4) – Oshawa Local Time]

10:00-12:00	On-site sign-in and pick up conference materials	Outside UA1120 <1st Floor of UA Science Building, Ontario Tech University, Oshawa>
14:00-16:00		
09:00-11:00	Online Zoom Test	Online Room: 820 0982 3231 <a href="https://us02web.zoom.us/j/82009823231">https://us02web.zoom.us/j/82009823231</a>

Participants who are going to do an online presentation are required to join the rehearsal in Zoom on Sunday, August 13. Duration: 2~3min apiece. Feel free to leave after you finish the test.

## MONDAY, AUGUST 14, 2023

[Greenwich Mean Time (GMT-4) – Oshawa Local Time]

**Outside UA1120** <1st Floor of UA Science Building, Ontario Tech University, Oshawa >

08:50-09:20 On-site Registration *For offline participant who is not able to sign in on the first day.*

**UA1120** <1st Floor - UA Science Building> | Online Room A: 820 0982 3231

- 09:20-09:30 Welcome Speech  
**Dr. Steven Murphy** (President, Ontario Tech University, Canada)
- 09:30-09:40 Opening Ceremony  
**Prof. Hossam A. Gabbar** (Ontario Tech University, Canada)
- 09:40-10:20 (Online) Keynote Speech I  
"State Estimation and Contingency Detection in Modern Power Systems: A Stochastic Hybrid System Approach"  
**Prof. Leyi Wang** - (IEEE Fellow, Wayne State University, USA)
- 10:20-10:50 Coffee Break Time  
Outside UA1120 <1st Floor of UA Science Building>
- 10:50-11:30 (Online) Keynote Speech II  
"Smart Energy Communities for the Energy Transition"  
**Dr. Pierluigi SIANO** (University of Salerno, Italy)
- 12:00-12:10 Group Photo

- 12:10-13:30    Lunch Break  
Outside UA1120 <1st Floor of UA Science Building>
  
- 13:30-14:10    Plenary Speech I  
"Resilient Energy and Transportation Infrastructures"  
**Prof. Hossam A. Gabbar** (Ontario Tech University, Canada)
  
- 14:10-14:50    Plenary Speech II  
(Online) "Colours of Hydrogen Production"  
**Dr. Michael Fowler** (University of Waterloo, Canada)
  
- 14:50-15:20    Coffee Break Time  
Outside UA1120 <1st Floor of UA Science Building>
  
- 15:20-17:30    **Special Session:** Transition to Hydrogen Energy Infrastructures  
Invited Speech I, Invited Speech II, GH014, ~~GH015~~, GH017, GH018, GH081, GH089

**UA1220** <2nd Floor - UA Science Building>

- 15:20-17:30    **On-site Session I:** Power Demand and Load Forecasting  
GH008, GH024-A, GH040, GH042, GH050, ~~GH068~~, GH093, GH044
  
- 18:00            Dinner  
Mandarin Restaurant, Oshawa <1319 Airport Blvd, Oshawa, ON L1J 8R6>

## TUESDAY, AUGUST 15, 2023

[Greenwich Mean Time (GMT-4) – Oshawa Local Time]

**Outside UA1120** <1st Floor of UA Science Building, Ontario Tech University, Oshawa >

08:30-09:00 On-site Registration *For offline participant who is not able to sign in on the first day.*

**UA1120** <1st Floor - UA Science Building>

09:00-10:30 **On-site Session II:** Smart Grid and Power Grid Operation Management  
GH055, GH012, ~~GH064~~, GH016, GH085-A, GH056

10:30-10:45 Coffee Break Time  
Outside UA1120 <1st Floor of UA Science Building>

10:45-12:15 **On-site Session III:** Power Control Systems and Renewable Energy Engineering  
GH069, GH039, ~~GH047-A~~, ~~GH067~~, GH077, GH028

12:15-13:45 Lunch Break  
Outside UA1120 <1st Floor of UA Science Building>

13:45-15:15 **On-site Session IV:** Clean Energy and Renewable Energy  
GH004, GH013, ~~GH054~~, GH020-A, GH082, GH053, ~~GH090~~

15:30-16:00 Closing Ceremony & Best Presenters & Best Paper Award Announcement

Online Room A: 820 0982 3231 <<https://us02web.zoom.us/j/82009823231>>

09:00-10:45 **Online Session I:** Modern Energy Development and Management  
GH073, GH036, GH074, GH080, GH083, GH002-A, GH007

10:45-11:00 Break Time

11:00-12:45 **Online Session II:** Smart Grid and Power Control Technology  
GH001-A, GH005, GH038, GH054, GH065, GH071-A, GH088

Online Room B: 835 0539 0465 <<https://us02web.zoom.us/j/83505390465>>

09:00-11:00 **Online Session III:** Smart Energy Grid Engineering  
GH068, GH015, GH064, GH047-A, GH067, GH051, GH090, GH034



- ***Founder and General Chair of IEEE SEGE***

**Prof. Hossam A. Gabbar**

Ontario Tech University, Canada

Dr. Gabbar is a full Professor in the Faculty of Energy Systems and Nuclear Science, and cross appointed in the Faculty of Engineering and Applied Science, at Ontario Tech University (UOIT), where he has established the Energy Safety and Control Lab (ESCL), Smart Energy Systems Lab, and Advanced Plasma Engineering Lab.

Dr. Gabbar is the recipient of the Senior Research Excellence Award for 2016, UOIT. He is recognized among the top 2% of worldwide scientists with high citation in the area of energy. He is leading national and international research in the areas of smart energy grids, energy safety and control systems, and waste to energy using advanced plasma technologies.

Dr. Gabbar obtained his B.Sc. degree in 1988 with first class of honor from the Faculty of Engineering, Alexandria University (Egypt). In 2001, he obtained his Ph.D. degree from Okayama University (Japan). From 2001 till 2004, he joined Tokyo Institute of Technology (Japan), as a research associate. From 2004 till 2008, he joined Okayama University (Japan) as an Associate Professor, in the Division of Industrial Innovation Sciences. From 2007 till 2008, he was a Visiting Professor at the University of Toronto. He also worked as process control, safety, and automation specialist in energy and oil & gas industries. Dr. Gabbar has more than 230 publications, including patents, books / chapters, journal and conference papers.



- ***President and Vice-Chancellor***

**Dr. Steven Murphy**

Ontario Tech University, Canada

Dr. Steven Murphy joined the university as its fourth President and Vice - Chancellor on March 1, 2018. He envisions the university as an active space to reinvent learning while championing why diversity in all forms is important. He believes experiential and co - operative learning opportunities are fundamental training for successful careers. Dr. Murphy strives to reimagine higher learning as an ongoing pursuit that will fuel Canada ' s knowledge economy. He encourages students to embrace a collaborative approach that champions diversity and strives to make society and our planet a better place.

Dr. Murphy is renowned for his organizational and human behaviour expertise across business and industry. Even more notably, his dedication to equity, diversity and inclusiveness underscores every facet of how he lives his life. Beyond the lens of race and gender, he believes firmly in the diversity of thought and ideas that underpins universities.

As Dean of the Ted Rogers School of Management at Ryerson University, Dr. Murphy transformed the school ' s brand, established novel interdisciplinary programs and fostered innovative and entrepreneurial co - op opportunities for students. Previously, he spent more than a decade in progressive academic leadership roles at Carleton University ' s Sprott School of Business, as Associate Dean, Research and External. He holds an esteemed record of academic achievement awards for his work examining the role of emotions in strategic decision - making, leadership and boards, as well as his insightful approach to student - driven teaching.

He earned a Bachelor of Commerce (Honours) in Human Resource Management, a Master in Management Studies (with Distinction) in the Management of Technology and completed his Doctorate in Management, Organizational Behaviour, at Carleton University.

Dr. Murphy currently serves on the Board of Directors of the National Research Council of Canada; as the co-Chair of eCampus Ontario; as Chair of Council of Ontario Universities Audit and Budget Committee; as Vice-Chair of Ontario University Athletics; and as a member of Universities Canada Education Committee.



## Prof. Leyi Wang (IEEE Fellow)

Wayne State University, USA

### **Speech Title: State Estimation and Contingency Detection in Modern Power Systems: A Stochastic Hybrid System Approach**

**Abstract:** Traditional types of uncertainties in control and estimation of dynamic systems involve modeling errors and measurement noises. However, cyber-physical contingencies in modern power systems involve sudden and random changes in system structures, topologies, or parameters, exemplified by transmission line faults, generation failures, communication uncertainties, system reorganizations, physical and cyber attacks, etc. The interaction between continuous physical dynamic systems and discrete events of stochastic contingencies can be naturally modeled as stochastic hybrid systems. Randomly switching uncertainties interrupt system observability and controllability, and introduce some fundamental technical challenges. In this presentation, we summarize some recent progress on observability, observer design, and event detection for randomly switched linear systems whose subsystems are unobservable. An operator must combine information from different subsystems and sensors, and integrate observer design with stochastic data of the switching process to achieve simultaneously estimation of the system's continuous states and detection of contingencies. The coordinated design methods for subsystem observers and their organization for estimating both continuous and discrete states will be discussed. Fundamental conditions and limitations, and convergence properties will be summarized. Applications of the new methodology on state estimation and contingency detection of modern power systems will be presented on some common IEEE bus systems.

**Biography:** Le Yi Wang received the Ph.D. degree in electrical engineering from McGill University, Montreal, Canada, in 1990. Since 1990, he has been with Wayne State University, Detroit, Michigan, where he is currently a professor in the Department of Electrical and Computer Engineering. His research interests are in the areas of complexity and information, system identification, robust control, H-infinity optimization, time-varying systems, adaptive systems, hybrid and nonlinear systems, information processing and learning, as well as medical, automotive, communications, power systems, and computer applications of control methodologies. He was a keynote speaker in several international conferences. He serves on the IFAC Technical Committee on Modeling, Identification and Signal Processing. He was an Associate Editor of the IEEE Transactions on Automatic Control and several other journals, and an Associate Editor of Journal of Control Theory and Applications. He was a Visiting Faculty at University of Michigan in 1996, a Visiting Faculty Fellow at University of Western Sydney, Australia, in 2009 and 2013, a Visiting Faculty at Vienna University of Technology, Austria, in 2016, an Organizer and Lecturer of the Advanced Study Institute in INSA Bourges and INRIA Lille, France, in 2022 and 2023. He is an Eminent Engineer in Tau Beta Pi, a member of Academy of Scholars at Wayne State University, and a Fellow of IEEE.



## Dr. Pierluigi SIANO

Scientific Director of the Smart Grids and Smart Cities Laboratory with the Department of Management & Innovation Systems / University of Salerno, Italy

### Speech Title: Smart Energy Communities for the Energy Transition

**Abstract:** To keep global warming below 2 degrees below pre-industrial levels by the end of this century, and possibly limit it to 1.5 degrees, the 2015 and 2021 United Nations Climate Change Conferences confirmed the commitment to achieve of the so-called Carbon Neutrality (zero emissions) by 2050.

To achieve this goal, the main tool is the energy transition, i.e. the transition from an energy mix centered on fossil fuels to one with low or no carbon emissions, based on renewable sources.

However, it must be considered that, although the energy transition represents an opportunity and offers advantages in terms of environmental impact, some of the interventions associated with it generate additional costs for the community.

In order to reduce emissions, in addition to electrifying processes, increasing the use of renewable energy and reducing consumption, it will be also necessary to favour the development of energy communities.

Energy communities, consisting of interactive prosumers, are reaching a dominant interest in many countries in the last few years. Prosumers, by participating in energy communities, can achieve economic benefits, by maximizing the exploitation of locally produced renewable energy and by providing ancillary services to the system operators. Considering the large scale number of prosumers in an energy community and the requirement to carry out both day-ahead and real-time optimizations, new real-time and distributed optimization methods are necessary to cope with the issue of scalability while preserving the privacy of prosumers.

In this keynote, a new extreme-scale and real-time distributed parallel optimization is proposed to manage a large-scale energy community with Peer to Peer (P2P) energy exchanges. The proposed optimization is highly scalable and privacy-preserving. Simulation tests, carried out on a large energy community consisting of thousands of prosumers, demonstrated the effectiveness of the innovative optimization method both in terms of scalability of the method and privacy protection for the prosumers.

**Biography:** Pierluigi Siano (12,700+ citations, 55+ H-Index) has an MS in Electronic Engineering and PhD in Information and Electrical Engineering from the University of Salerno, Italy. He is a Professor and Scientific Director of the Smart Grids and Smart Cities Laboratory with the Department of Management & Innovation Systems, University of Salerno. Since 2021 he has been Distinguished Visiting Professor in the Department of Electrical & Electronic Engineering Science, University of Johannesburg. His research activities are centered on demand response, on energy management, on the integration of distributed energy resources in smart grids, on electricity markets and on planning and management of power systems. In these research fields he has co-authored more than 650 articles including more than 370 international journal papers.



## Dr. Hossam Gabbar

Founder and General Chair of IEEE SEGE

Ontario Tech University, Canada

### **Speech Title: Resilient Energy and Transportation Infrastructures**

**Abstract:** This talk will present design and operation scenarios of resilient energy and transportation infrastructures. The talk will discuss development strategies of hybrid charging stations and their integration within energy and transportation infrastructures. The design and control strategies of fast charging stations will be presented with hybrid energy storage. Hardware-in-the-loop and real time simulation are used to evaluate the proposed design and implementation scenarios. Integrated nuclear-renewable hybrid energy systems using Small Modular Reactor (SMR) or Micro Modular Reactor (MMR) within micro energy grids are used to achieve resilient energy supply within charging stations. Integration between hydrogen and fuel cell systems are demonstrated to achieve hybrid charging stations and support the transition to clean transportation. Transactive mobility will be discussed to support the deployment of charging stations within energy and transportation infrastructures, as integrated with community applications in city, urban, and remote communities. Performance measures are modeled and evaluated for different design and operation strategies. Resiliency and performance measures will be discussed in view of number of operation and control strategies to meet user requirements.

**Biography:** Dr. Gabbar is a full Professor in the Department of Energy and Nuclear Engineering, the Faculty of Engineering and Applied Science, at Ontario Tech University (UOIT), where he has established the Energy Safety and Control Lab (ESCL), Smart Energy Systems Lab, and Advanced Plasma Engineering Lab. He is the recipient of the Senior Research Excellence Award for 2016, UOIT. He is recognized among the top 2% of worldwide scientists with high citation in the area of energy. He is a Distinguished Lecturer of IEEE NPSS. He is leading national and international research in the areas of smart energy grids, energy safety and control systems, and waste to energy using advanced plasma technologies. Dr. Gabbar obtained his B.Sc. degree in 1988 with first class of honor from the Faculty of Engineering, Alexandria University (Egypt). In 2001, he obtained his Ph.D. degree from Okayama University (Japan). From 2001 till 2004, he joined Tokyo Institute of Technology (Japan), as a research associate. From 2004 till 2008, he joined Okayama University (Japan) as an Associate Professor, in the Division of Industrial Innovation Sciences. From 2007 till 2008, he was a Visiting Professor at the University of Toronto. He also worked as process control, safety, and automation specialist in energy and oil & gas industries. Dr. Gabbar has more than 230 publications, including patents, books / chapters, journal, and conference papers.



## Dr. Michael Fowler

University of Waterloo, Canada

### Speech Title: Colours of Hydrogen Production

**Abstract:** One of the key questions to be addressed in the 'hydrogen economy' is the clean production and distribution of hydrogen. Hydrogen production is now investing in the 'colours of hydrogen'. Through a series of over 40 publications and presentations, his work has furthered the concept of 'clean energy hubs' as distributed energy generation systems. This includes systems such as wind and solar, and large-scale systems with CO<sub>2</sub>-free nuclear energy as a key component of the hubs. Unique to this work is the consideration of the electrical transmission system, specific congestion in the system as a constraint. This work has principally included hydrogen as an energy vector, but also considered the impact of plug-in hybrid electric vehicles within such clean energy hubs. The techno-economic analysis of the use of excess off-peak power to generate hydrogen gas for industrial applications, heating and fuel cell vehicle (FCV) propulsion is a clear outcome of this work. Policy issues explored include a comparative lifecycle assessment of the use of hydrogen produced within a Power-to-Gas concept for powering FCVs and an economic analysis which compared the use of hydrogen as renewable fuel with the use of biofuels/methanation. Power-to-gas (P2G) is a technology concept that converts electrical power into hydrogen through electrolysis, and then used through a variety of energy storage and transformation pathways and is being explored internationally also. A number of publications have demonstrated the potential of Hydrogen Economy for Energy Vectors and energy storage, including energy storage over an extended seasonal timeframe. This work showed the potential for the 'colours' of various ways to produce hydrogen to use CO<sub>2</sub> free nuclear and renewable energy (wind and solar), specifically the using surplus power for environmental and economic benefit in Ontario and how Power-to-Gas pathways can play a role toward a fossil-free economy in the long term.

**Biography:** Dr. Michael Fowler is a Professor in the Department of Chemical Engineering, and Canada Research Chair - Zero-Emissions Vehicles and Hydrogen Energy Systems, at the University of Waterloo with a research interest in electrochemical power sources. Specifically, his research focuses on fuel cell system design and reliability, fuel cell and battery materials durability and green power systems. His research includes modelling of hydrogen production and distribution systems, including Power-to-Gas. With the University of Waterloo Alternative Fuel Team (UWAFT)), he is the co-advisor of the development and building of a number of fuel cell (FCV) and plug-in hybrid vehicles (PHEV) as part of the Advanced Vehicle Technology Competition (see <http://ecocar3.org/>). As a Faculty Advisor for student teams, he has been involved with over seven teams that have won international or national competitions including winning the National Hydrogen Association H2U Student Design Competition three times. He has over a 170 peer reviewed publications mostly related to 'Hydrogen Economy' issues (See Google Scholar h-factor 67 <http://scholar.google.ca/citations?user=hUUCkoMAAAJ&hl=en>).





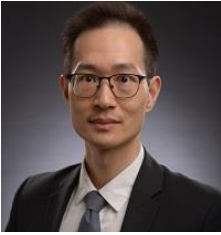
## Prof. Olivier BAHN

GERAD and Department of Decision Sciences, HEC Montréal, Canada

### **Speech Title: Hydrogen potential in the Greater Montreal region: Preliminary insights using the ETEM-YUL energy optimization model**

**Abstract:** In this presentation, we report on progress made at the GERAD research center on integrating hydrogen (H<sub>2</sub>) pathways into the ETEM-YUL model and study the synergies with smart grid developments. GERAD has expertise in integrating promising new technologies such H<sub>2</sub> into several energy and integrated assessment models (NATEM-Qc, NATEM, MERGE) at various geographical levels (Quebec, Canada, and world). This research concerns the Greater Montreal region, and is conducted within the project "Quantifying the Benefits and Risks of Using Hydrogen for Sectoral Integration in Canadian Municipalities towards Net-zero Emissions", funded by Environment and Climate Change Canada, in collaboration with the University of Waterloo and Ontario Tech. It relies on the open-source optimization-based Energy–Technology–Environment Model (ETEM). ETEM is a long-term bottom-up energy model that has the capacity to take into account constraints and options offered by distributed energy resources and smart grids. ETEM-YUL is an ETEM based model that provides insight into the best options for the Greater Montreal (GM) region to procure energy and satisfy useful demands, while abating greenhouse gas emissions. The current phase of our research focuses on the introduction in ETEM-YUL of different types of hydrogen (blue, green, and grey) for the GM region through importations, as well as storage and distribution to several end users in the transportation sector (public buses and private vehicles) and industrial sector (considered in an aggregated manner). The next phase of research will expand the modeling to include as well local production of H<sub>2</sub> and additional demand sectors, with an emphasis on the ones prioritized by the Quebec government. This includes the production of green hydrogen within the GM region, which can then be consumed in industrial processes like iron and steel manufacturing, petroleum refining, and green chemistry applications such as methanol production.

**Biography:** Olivier Bahn holds an M.Sc. in Information Technology from the CNAM (France) and a Ph.D. in Management Science from the University of Geneva (Switzerland). After his doctoral studies, he joined in 1995 the Paul Scherrer Institute (Switzerland), a federal research institute affiliated to the Board of the Swiss Federal Institutes of Technology. For eight years, he led several research projects on Swiss and European climate and energy policies. Since 2003, he has been a professor (Full Professor, since 2015) in the Department of Decision Sciences at HEC Montréal, which he chaired between June 2016 and May 2019. There he teaches, at the postgraduate level, management science courses. In addition to directing GERAD (since June 2019), he is also co-director of the e3c Hub (environment, energy and circular economy) at HEC Montréal (since June 2016). He is an Associate Editor of the journals *Energies*, *Energy Strategy Reviews*, and *Environmental Modeling and Assessment*. His research currently focuses on energy economics (decarbonization issues) and climate policy modeling. His research is published in numerous scientific journals, including: *Applied Energy*, *Automatica*, *Climatic Change*, *Energy Conversion and Management*, *Energy Policy*, *Environmental Science and Policy*, *Journal of Cleaner Production*, *Mathematical Programming*, *The Energy Journal*, and *Renewable and Sustainable Energy Reviews*. He is also a consultant to several companies, governments and organizations.



## Dr. Xiaoyu Wu

University of Waterloo, Canada

### **Speech Title: Analysis of Power-to-hydrogen to Enrich Natural Gas and Enable Fleet Refueling**

**Abstract:** Power-to-hydrogen is a decarbonization pathway to convert low-cost and clean electricity to hydrogen (H<sub>2</sub>), which can be used in the hard-to-abate sectors such as heating and transportation. In this project, we identify a pathway to implement power-to-hydrogen infrastructure into the City of Kitchener. First, H<sub>2</sub> can be blended into the city's natural gas pipeline, thus reducing the total natural gas consumption. We assumed the maximum concentration of H<sub>2</sub> that can be blended into the natural gas pipeline as 5%, and the hydrogen enriched natural gas will be used by Kitchener's top 3 industrial natural gas consumers and 730 homes from the Bridgeport North neighbourhood. Second, another potential use for H<sub>2</sub> is in fuel cell electric vehicles which could potentially be used in the heavy-duty municipal vehicle fleet, i.e., the city owned class 4 to 8 vehicles.

A preliminary model of demand for H<sub>2</sub> and electricity was created to optimize the costs for such a project and to assess requirements for other equipment such as electrolyzers. In conjunction with this model, a preliminary life cycle analysis for the overall process was performed using the software GHGenius in order to confirm that these changes to local infrastructure would be of environmental benefit. The implementation of H<sub>2</sub> infrastructure can contribute to Kitchener's 2030 and 2050 emission reduction targets, while reducing operating costs.

**Biography:** Dr. XiaoYu Wu is an assistant professor in the Department of Mechanical and Mechatronics Engineering at the University of Waterloo, and an associate director in the Waterloo Institute for Sustainable Aeronautics. He received his B.Sc. and M.Sc. degrees from Zhejiang University, and Ph.D. from MIT. His research group, Greener Production @ Waterloo, combines expertise in thermal science, material engineering and techno-economics to develop sustainable technologies for energy conversion and chemical production, such as hydrogen and ammonia conversion, energy storage, and membrane separation. He has published more than 20 papers in peer-reviewed journals such as *Advanced Energy Materials*, *Progress in Energy and Combustion Science* and *Applied Catalysis B: Environmental*. Dr. Wu serves on the Editorial Board for the *International Journal of Green Energy* and is an Associate Editor for *Frontiers in Energy Research*.

## MONDAY, AUGUST 14, 2023 | 15:20-17:30

Special Session: Transition to Hydrogen Energy Infrastructures

Session Chair: Prof. Hossam A. Gabbar, Ontario Tech University, Canada

**UA1120**

<1st Floor - UA Science Building>

- 15:20-15:40  
Invited Speech II  
Hydrogen potential in the Greater Montreal region: Preliminary insights using the ETEM-YUL energy optimization model  
Invited Speaker: Prof. Olivier BAHN, GERAD and Department of Decision Sciences, HEC Montréal, Canada
- 15:40-16:00  
Invited Speech III  
Analysis of Power-to-hydrogen to Enrich Natural Gas and Enable Fleet Refueling  
Invited Speaker: Dr. Xiaoyu Wu, University of Waterloo, Canada
- 16:00-16:15  
GH014  
Predicting long-term electricity demand for electric vehicles in Thailand  
Thanwadee Chinda  
Presenter: Thanwadee Chinda, Thammasat University, Thailand
- 16:15-16:30  
GH015  
~~Assessment of Alternative Fuels for Sustainable Road Transportation~~  
~~Kazeem Aderemi Bello, Omojola Awogbemi and Mukondelcli Grace Kanakana Katumba~~  
~~Presenter: Mukondelcli Grace Kanakana Katumba, Tshwane University of Technology, South Africa~~
- 16:30-16:45  
GH017  
Optimization of Fuel Cell Vehicle-to-Grid in Alberta by Mixed Integer Linear Programming  
Daniel Ding and Xiao-Yu Wu  
Presenter: Daniel Ding, University of Waterloo, Canada
- 16:45-17:00  
GH018  
A Two-Stage Optimization Framework for Electric Vehicle Fleet Day-ahead Charging Management  
Arian Shah Kamrani and Hanane Dagdougui  
Presenter: Arian Shah Kamrani, Polytechnique School of Montreal, Canada
- 17:00-17:15  
GH081  
The role of water networks in hydrogen and energy planning: A new modeling and simulation approach  
Elena Villalobos Herra and Hossam A. Gabbar  
Presenter: Elena Villalobos Herra, Ontario Tech University, Canada
- 17:15-17:30  
GH089  
Implementing a Nuclear-Renewable Hybrid Energy System to Reduce Fossil Fuel Dependency in South Africa: A Case Study  
Otavio Lopes Alves Esteves and Hossam A. Gabbar  
Presenter: Otavio Lopes Alves Esteves, Ontario Tech University, Canada

**MONDAY, AUGUST 14, 2023 | 15:20-17:30**

On-site Session I: Power Demand and Load Forecasting

Session Chair: Dr. Prasanta Ghosh, Syracuse Univ., USA

**UA1220**

&lt;2nd Floor - UA Science Building&gt;

- 15:20-15:35  
GH008      **Fast Contingency Filtering Using Machine Learning for Power System Planning**  
David Alvarez, Georges Abdul-Nour, Mohamed Gaha and Alain Côté  
Presenter: David Leonardo Alvarez Alvarez, Département de génie industriel, Université du Québec à Trois-Rivières, Canada
- 15:35-15:50  
GH024-A      **Towards Carbon-Free Communities: A Compilation of Urban Design Criteria for Sustainable Neighborhoods**  
Atefeh Kalantari  
Presenter: Atefeh Kalantari, Politecnico di Torino, Italy
- 15:50-16:05  
GH040      **Transient Stability Assessment Considering Number and Location of PMUs Using CNN-LSTM**  
Izzuddin Fathin Azhar, Lesnanto Multa Putranto and Roni Irnawan  
Presenter: Lesnanto Multa Putranto, Universitas Gadjah Mada, Indonesia
- 16:05-16:20  
GH042      **Impact of Wind Power's Capacity Credit on the System Reliability Index: A Case Study of Southern Sulawesi Systems**  
Amira Hanun, Sarjiya, Lesnanto Multa Putranto, Tumiran, Muhammad Yasironi, Ira Savitri and Daud Farel  
Presenter: Sarjiya, Universitas Gadjah Mada, Indonesia
- 16:20-16:35  
GH050      **Optimizing multivariate LSTM on real-world data for power load forecasting**  
Vasileios Pentsos, Spyros Tragoudas, Jason Wibbenmeyer and Nasser Khdeer  
Presenter: Vasileios Pentsos, Southern Illinois University, USA
- 16:35-16:50  
GH068      **Residential DC Load Forecasting using Long Short-term Memory Network (LSTM)**  
Noman Shabbir, Roya Ahmadi, Argo Resin, Oleksandr Husev, Tanel Jalakas and Joao Martins  
Presenter: Noman Shabbir, Tallinn University of Technology, Estonia
- 16:50-17:05  
GH093      **Assessing The Impact of Variable Renewable Energy on Generation Expansion Planning and System Reliability: A Case Study of Java Bali System**  
Tumiran, Sarjiya, Lesnanto Multa Putranto, Ahmad Adhiim Muthahhari and Rizki Firmansyah Setya Budi  
Presenter: Tumiran, Electrical and Information Engineering Department Universitas Gadjah Mada, Indonesia
- 17:05-17:20  
GH044      **Two-Stage Secure Bottom-Up Load Coordination Mechanism in Distribution Grids**  
Mohsen Banaei, Razgar Ebrahimi and Henrik Madsen  
Presenter: Razgar Ebrahimi, Technical University of Denmark, Denmark

## TUESDAY, AUGUST 15, 2023 | 09:00-10:30

On-site Session II: Smart Grid and Power Grid Operation Management  
 Session Chair: Prof. Vijay K. Sood, Ontario Tech University, Canada

**UA1120**

<1st Floor - UA Science Building>

- |                        |   |
|------------------------|---|
| 09:00-09:15<br>GH055   | <p>A Quantitative Approach to Improving Operational Resilience in Distribution Networks through Risk Analysis and Smart Grid Techniques<br/>                 Ali Reza Kheirkhah, Carlos Frederico Meschini Almeida, Nelson Kagan, Farangis Johari and Jonatas Boas Leite<br/>                 Presenter: Ali Reza Kheirkhah, São Paulo State University - UNESP, Brazil</p> |
| 09:15-09:30<br>GH012   | <p>Learning from Future: Prediction-based Data Augmentation to Enhance Power Grids Fault Detection<br/>                 Jennifer Rogers, William Danilczyk, Hui Lin and Yan Lindsay Sun<br/>                 Presenter: Jennifer Rogers, University of Rhode Island, USA</p>  |
| 09:30-09:45<br>GH064   | <p><del>Experimental Validation of a Flywheel Energy Storage Energy System for Smart Grid Research Lab</del><br/>                 Nana Kwaku Okai Mensah and Bright Tetteh<br/>                 Presenter: Nana Kwaku Okai Mensah, Ashesi University, Ghana</p>   |
| 09:45-10:00<br>GH016   | <p>A Novel Method for Topology Preserving Static Network Reduction<br/>                 Moritz Weber, Hüseyin Kemal Çakmak, Uwe Kühnapfel and Veit Hagemeyer<br/>                 Presenter: Moritz Weber, Karlsruhe Institute of Technology, Germany</p>   |
| 10:00-10:15<br>GH085-A | <p>Enhancing the Flexibility of the Power Grid with High Penetration of Renewable Energy Sources<br/>                 Bright Tetteh and Komla Folly<br/>                 Presenter: Bright Tetteh, Ashesi University, Ghana</p>   |
| 10:15-10:30<br>GH056   | <p>Small-Signal Stability Study of AC/DC Hybrid Weak Microgrid<br/>                 Saeed Rezaee, Amr Radwan, Mehrdad Moallem and Jason Wang<br/>                 Presenter: Amr Radwan, Western Washington University, USA</p>   |

**TUESDAY, AUGUST 15, 2023 | 10:45-12:15**

On-site Session III: Power Control Systems and Renewable Energy Engineering

Session Chair: Dr. Walid Morsi Ibrahim, Ontario Tech University, Canada

**UA1120**

&lt;1st Floor - UA Science Building&gt;

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|------------------------|--|
| 10:45-11:00<br>GH069   | Mobile Manipulator Robot Path–Tracking Control for Integration in Smart Energy Grid Applications<br>Daniel Galvan-Perez, Francisco Beltran-Carbajal, Ivan Rivas-Camero and Hugo Yañez-Badillo<br>Presenter: Daniel Galvan-Perez, Universidad Politécnica de Tulancingo, Mexico   |
| 11:00-11:15<br>GH039   | Increasing Detection Rate of False Data Injection Attacks Using Measurement Predictors<br>Danushka Senarathna, Spyros Tragoudas, Jason Wibbenmeyer and Nasser Khdeer<br>Presenter: Vasileios Pentsos, Southern Illinois University, USA  |
| 11:15-11:30<br>GH047-A | Modeling Customers' Intentions to Adopt Solar Water Heaters through Unified Theory of Acceptance and Use of Technology<br>Vikas Kumar, Arun Kaushik, Amanpreet Kaur and Prabhjot Kaur<br>Presenter: Vikas Kumar, Indian Institute of Management, India   |
| 11:30-11:45<br>GH067   | Generation of Octagonal Pyramids on Silicon Wafer for Photovoltaics by Swift Anisotropic Chemical Etching Process<br>Sami Iqbal, Azam Hussain, Yi Yang, Xinli Guo and Tong Zhang<br>Presenter: Sami Iqbal, Southeast University, China   |
| 11:45-12:00<br>GH077   | Robust Motion Control For Aerial Robotic Systems in Monitoring Applications<br>Hugo Yañez-Badillo, Francisco Beltran-Carbajal, Irvin Lopez-Garcia, Daniel Galvan-Perez, Alejandro Alvarez-Diaz, Jose Luis Hernandez-Avila and Ivan Rivas-Camero<br>Presenter: Daniel Galvan-Perez, Universidad Politécnica de Tulancingo, Mexico |
| 12:00-12:15<br>GH028   | Electrochemical and Structural Properties of Organic Carbon based Counter Electrode (CE) for DSSCs<br>Kazim Murtaza, Faisal Abbas and Sehar Shakir<br>Presenter: Sehar Shakir, National University of Sciences and Technology, Pakistan  |

**TUESDAY, AUGUST 15, 2023 | 13:45-15:15**

On-site Session IV: Clean Energy and Renewable Energy  
 Session Chair: Prof. Hirohito YAMADA, Tohoku Univ., Japan

**UA1120**

<1st Floor - UA Science  
 Building>

- 13:45-14:00  
 GH004      OpenATE: A Distributed Co-simulation Engine for Transactive Energy Systems.  
 Rafael Arnedo, Nilson Henao, Kodjo Agbossou, Juan Oviedo, Juan Dominguez and David Toquica  
 Presenter: David Toquica, Université du Québec à Trois-rivières, Canada
- 14:00-14:15  
 GH013      Dynamic Energy Flexibility Pricing for Industrial Energy Systems  
 Torolsan, Kerim; Bianchini, Isabella and Sauer, Alexander  
 Presenter: Torolsan, Kerim, Fraunhofer Institute for Manufacturing Engineering and Automation  
 IPA, Germany
- 14:15-14:30  
 GH051      ~~Optimizing Building Heating Efficiency: A Data-driven Approach for Cost and Energy Savings~~  
~~Reyhaneh Banihabib, Fredrik Skaug Fadnes and Mohsen Assadi~~  
~~Presenter: Reyhaneh Banihabib, University of Stavanger, Norway~~
- 14:30-14:45  
 GH020-A      EV Overnight and Overnight-Workplace Charging Strategies in Ontario Residential Building  
 Ahmad Mohsenimanesh, Evgueniy Entchev and Hajo Ribberink  
 Presenter: Ahmad Mohsenimanesh, CanmetENERGY Research Centre, Natural Resources Canada,  
 Canada
- 14:45-15:00  
 GH082      Strategic Prosumer-Side Energy Trading Using A Parameter Independent Convex Model: From A  
 Discussion Toward A Case Study  
 Ali Alizadeh, Moein Esfahani, Innocent Kamwa, Bo Cao and Xu Minghui  
 Presenter: Ali Alizadeh, Laval University, Canada
- 15:00-15:15  
 GH053      Tracking Control Approach of Speed Profiles of Induction Motors used in Electric Vehicles  
 Eduardo Esquivel-Cruz, Francisco Beltran-Carbajal, Ivan Rivas-Cambero, Zeferino Damián-Noriega,  
 Gilberto Álvarez-Miranda and Romy Pérez-Moreno  
 Presenter: Juan Eduardo Esquivel Cruz, Universidad Politécnica de Tulancingo, Mexico

**TUESDAY, AUGUST 15, 2023 | 09:00-10:45**

Online Session I: Modern Energy Development and Management

Session Chair: Dr. Namdar Saniei, Ontario Tech University, Canada

Online Room A:

&lt; 820 0982 3231 &gt;

Link:

<https://us02web.zoom.us/j/82009823231>

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|------------------------|---|
| 09:00-09:15<br>GH073   | Evaluating the Effectiveness of Clean Energy Technologies (Renewables and Nuclear) and External Support for Climate Change Mitigation in Ghana<br>Mark Amoah Nyasapoh, Samuel Gyamfi, Seth Kofi Debrah, Hossam Gaber and Nana Sarfo Agyemang Derkyi<br>Presenter: Mark Amoah Nyasapoh, University of Energy and Natural Resources (UENR), Ghana                   |
| 09:15-09:30<br>GH036   | Dynamic Mapping for Evolutionary Algorithm Based Optimization of Energy Hub Gas Scheduling<br>Rafael Poppenborg, Katharina Beisswanger, Christian Hotz, Kevin Förderer, Thomas Kolb and Veit Hagenmeyer<br>Presenter: Rafael Poppenborg, Karlsruhe Institute of Technology, Germany   |
| 09:30-09:45<br>GH074   | A Hybrid and Scalable Architecture of a Monitoring System for Photovoltaic Installations<br>Nassim Lamrini, Zoubir Barraz, Ibtihal Ait Abdelmoula, Zakariae Ouachakradi, Abdelmalek El Mehdi and Imane Sebari<br>Presenter: Nassim LAMRINI, SMARTICT LAB - National Schools Of Applied Sciences - Oujda, Morocco  |
| 09:45-10:00<br>GH080   | Cost-Optimal Renewable Energy Capacity Planning toward 100% Green Energy in California Considering Climate Change<br>Sihyeon Yoon and Gahyeon Yoon<br>Presenter: Sihyeon Yoon, Valley Christian High School, USA  |
| 10:00-10:15<br>GH083   | Techno-economic analysis of a hydrogen refueling station located in Turin.<br>Adriano Pagano and Hossam Gaber<br>Presenter: Adriano Pagano, Politecnico di Torino, Italy  |
| 10:15-10:30<br>GH002-A | Advanced Electrical Substation Grid Blockchain Multipurpose Test Bed for Electrical Fault Detection, Power Quality Monitoring, Cyber Events, and Distributed Energy Resources<br>Emilio C Piesciorovsky, Raymond Borges Hink, Aaron W. Werth, Gary Hahn, Yarom Polsky and Annabelle Lee<br>Presenter: Emilio C. Piesciorovsky, Oak Ridge National Laboratory, USA |
| 10:30-10:45<br>GH007   | Security Issues on Smart Grid and Blockchain-Based Secure Smart Energy Management Systems<br>Surah Aldakhl, Dafer Alali and Mohamed Zohdy<br>Presenter: Surah Aldakhl, Oakland University, USA  |

**TUESDAY, AUGUST 15, 2023 | 11:00-12:45**

Online Session II: Smart Grid and Power Control Technology

Session Chair: Dr. Muhammad Ahmad, Ontario Tech University, Canada

Online Room A:

< 820 0982 3231 >

Link:

<https://us02web.zoom.us/j/82009823231>

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|------------------------|---|
| 11:00-11:15<br>GH001-A | Event Testing of Advanced Power Line Sensor with Measurement Transformers<br>Emilio C. Piesciorovsky, R. J. Bruce Warmack and Yarom Polsky<br>Presenter: Emilio C. Piesciorovsky, Oak Ridge National Laboratory, USA  |
| 11:15-11:30<br>GH005   | DC Current-controlled Transducer for Fault Current Limitation in Utility-interfaced PV Systems<br>Rania Ibrahim and Nahla Ezz Eldin<br>Presenter: Rania A. Ibrahim, Arab Academy for Science, Technology & Maritime Transport, Egypt  |
| 11:30-11:45<br>GH038   | Climate Change and Disaster Mitigation with the Internet Backpack: Embedded Cognitive Systems for Immediate Situation Awareness in Eastern Democratic Republic of Congo<br>Danielle Taana Smith, Mathe Eliel, Lee W. McKnight, Kathco Karume and Prasanta K. Ghosh<br>Presenter: Danielle Taana Smith, Syracuse University, USA |
| 11:45-12:00<br>GH054   | Evaluating the impact of current-based cycling profiles on a Lithium-ion battery model<br>Javier Urquizo, Ruben Hidalgo-Leon, Viviana Villavicencio and Pritpal Singh<br>Presenter: Viviana Villavicencio, Villanova University, USA  |
| 12:00-12:15<br>GH065   | Privacy-Cost Management in Smart Meters: Classical vs Deep Q-Learning with Mutual Information<br>Mohammadhadi Shateri<br>Presenter: Mohammadhadi Shateri, Université du Québec, Canada  |
| 12:15-12:30<br>GH071-A | Application of Blockchain Technology in Energy Grid Optimization for Secure Data Storage<br>Pranav Kulkarni<br>Presenter: Pranav Kulkarni, Los Angeles Pierce College, USA  |
| 12:30-12:45<br>GH088   | Design and Development of Hybrid Renewable Energy Based Smart Irrigation System.<br>Dipta Ghosh, Arajit Saha, Harun Ar Rashid, Md.Nazmun Shadat Shafin, Pritom Sadhu and Kazi Firoz Ahmed<br>Presenter: Arajit Saha, American International University-Bangladesh, Bangladesh   |

**TUESDAY, AUGUST 15, 2023 | 09:00-11:00**

Online Session III: Smart Energy Grid Engineering

Session Chair: TBA

Online Room B:

&lt; 835 0539 0465 &gt;

Link:

<https://us02web.zoom.us/j/83505390465>

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|------------------------|--|
| 09:00-09:15<br>GH068   | Residential DC Load Forecasting using Long Short-term Memory Network (LSTM)<br>Noman Shabbir, Roya Ahmadi, Argo Rosin, Oleksandr Husev, Tanel Jalakas and Joao Martins<br>Presenter: Noman Shabbir, Tallinn University of Technology, Estonia          |
| 09:15-09:30<br>GH015   | Assessment of Alternative Fuels for Sustainable Road Transportation<br>Kazeem Aderemi Bello, Omojola Awogbemi and Mukondeleli Grace Kanakana-Katumba<br>Presenter: Mukondeleli Grace Kanakana-Katumba, Tshwane University of Technology, South Africa  |
| 09:30-09:45<br>GH064   | Experimental Validation of a Flywheel Energy Storage Energy System for Smart Grid Research Lab<br>Nana Kwaku Okai-Mensah and Bright Tetteh<br>Presenter: Nana Kwaku Okai-Mensah, Ashesi University, Ghana  |
| 09:45-10:00<br>GH047-A | Modeling Customers' Intentions to Adopt Solar Water Heaters through Unified Theory of Acceptance and Use of Technology<br>Vikas Kumar, Arun Kaushik, Amanpreet Kaur and Prabhjot Kaur<br>Presenter: Vikas Kumar, Indian Institute of Management, India |
| 10:00-10:15<br>GH067   | Generation of Octagonal Pyramids on Silicon Wafer for Photovoltaics by Swift Anisotropic Chemical Etching Process<br>Sami Iqbal, Azam Hussain, Yi Yang, Xinli Guo and Tong Zhang<br>Presenter: Sami Iqbal, Southeast University, China                 |
| 10:15-10:30<br>GH051   | Optimizing Building Heating Efficiency: A Data-driven Approach for Cost and Energy Savings<br>Reyhaneh Banihabib, Fredrik Skaug Fadnes and Mohsen Assadi<br>Presenter: Reyhaneh Banihabib, University of Stavanger, Norway                             |
| 10:30-10:45<br>GH090   | Saving Energy and Maintaining Indoor Comfort Level: A Reinforcement Learning Based Approach<br>Salah Bouktif and Ali Ahmad<br>Presenter: Ali Ahmad, United Arab Emirates University, United Arab Emirates  |
| 10:45-11:00<br>GH034   | Comparative Study of Green Energies Exploration in South Africa<br>Mukondeleli G. Kanakana-Katumba, Rendani Maladzhi and Adefemi Adeodu<br>Presenter: Mukondeleli Grace Kanakana-Katumba, Tshwane University of Technology, South Africa               |