

## CAE Roadmap to Resilient Ultra-Low Energy Built Environment with Deep Integration of Renewables in 2050 – Low-Carbon and Positive Energy Resilient Communities Webinar – October 12, 2021

All times displayed in EST. Register in advance for this meeting at the Zoom link below:

<https://concordia-ca.zoom.us/meeting/register/tZEpd--grjloGdRgyiMkqN74M2rVXIO3VIMj>

**Scope:** The webinar will focus on lessons learned and experiences from existing and ongoing developments in high profile low-carbon and positive energy communities in Canada and Europe, and informing the CAE Roadmap on current status and future opportunities and challenges

<b>Online connection</b>	10:55– 11:00
<p><b>Opening/Welcome Remarks</b>  <b>Yves Beauchamp</b>, FCAE/FACG, President CAE, VP Administration &amp; Finance, McGill University  <b>Mourad Debbabi</b>, Dean Gina Cody School of Engineering &amp; Computer Science, Concordia University</p> <p><b>Setting the Framework for Zero Carbon Communities</b>  <b>Andreas Athienitis</b>, FCAE, <b>Roadmap Co-Chair</b>, Professor and NSERC/Hydro-Québec Industrial Research Chair &amp; Concordia Chair, Concordia University  <b>Andrew Pape-Salmon</b>, FCAE, <b>Roadmap Co-Chair</b>, Adjunct Professor, University of Victoria  <b>Ursula Eicker</b>, Professor, Canada Excellence Research Chair and <b>IEA Positive Energy Districts Subtask Leader</b>, Concordia University  <b>Caroline Hachem-Vermette</b>, Associate Professor and <b>IEA SHC Solar Neighborhood Planning Subtask Leader</b>, Environmental Design, University of Calgary</p>	11:00 – 11:30
<b>CASE STUDIES - SESSION I</b>	
<b>Co-Chairs: Bruno Lee and Mohamed Ouf, Concordia University</b>	
<p><b>Dirk Pietruschka</b>, Stuttgart University, Germany:  <b>Low Depth Geothermal District Energy System in Wüstenrot</b></p>	11:30 – 11:45
<p><b>Silvia Croce</b>, Eurac, Italy:  <b>The European Project SINFONIA: Building and District Energy System Retrofit in Bolzano</b></p>	11:45 – 12:00
<p><b>Gilles Desthieux</b>, HEPIA, Switzerland:  <b>Cité Carl Vogt Heritage Neighborhood Retrofit in Geneva</b></p>	12:00 – 12:15
<p><b>Rongling Li</b>, Technical University of Denmark, Denmark:  <b>Energy Flexibility in Buildings – Heating Energy Flexibility in Copenhagen</b></p>	12:15 – 12:30
<p>David-Olivier Goulet, Hydro Quebec, and Stéphane Vachon, City of Lac Mégantic, QC, Canada  <b>Lac-Mégantic Microgrid: A community is mobilizing around the energy transition</b></p>	12:30 – 12:45

<b>BREAK</b>		12:45 – 13:00
<b>CASE STUDIES - SESSION II</b>		
<b>Co-Chairs: Hua Ge and Leon Wang, Concordia University</b>		
<b>Walter Mérida, University of British Columbia, BC, Canada:</b> <b>Feathers and Dinosaurs: A Living Laboratory for Smart Energy Districts</b>		13:00 – 13:15
<b>Bill Wong, NRCan, ON, Canada:</b> <b>Drake Landing Solar Community – Lessons Learned</b>		13:15 – 13:30
<b>Milfred Hammerbacher, S2e Technologies, ON, Canada:</b> <b>West 5 Net Zero Community and Smart Grid Project</b>		13:30 – 13:45
<b>Nayeem Ninad, NRCan, ON, Canada:</b> <b>PV-Storage-Diesel Hybrid Microgrid of Colville Lake</b>		13:45 – 14:00
<b>BREAK</b>		14:00 – 14:05
<b>PANEL DISCUSSION:</b> Co-Chairs: <b>Ted Stathopoulos, FCAE and Andreas Athienitis, FCAE</b> <b>All presenters</b>		14:05 – 14:25
<b>Closing remarks</b>	Webinar Chair and Roadmap Co-Chair: <b>Andreas Athienitis</b>	14:25 – 14:30

In collaboration with IEA Positive Energy Districts (Annex 83) and SHC Solar Neighborhood Planning (Task 63):





**Dr. Andreas K. Athienitis, FCAE**, is a Professor of Building Engineering and Director of the Centre for Zero Energy Building Studies at Concordia University. He holds the NSERC/Hydro Québec Industrial Research Chair “Optimized Operation and Energy Efficiency: Towards High Performance Buildings” and a Concordia University Research Chair. He is a Fellow of the Canadian Academy of Engineering, Fellow of IBPSA and Fellow of ASHRAE. He obtained a B.Sc. in Mechanical Engineering (1981) from the University of New Brunswick and a PhD in Mechanical Engineering from Waterloo (1985). He led as Principal Investigator the NSERC Smart Net-zero Energy Buildings Strategic Research Network and the NSERC Solar Buildings Research Network with over 30 researchers from 15 Canadian Universities and about 30 industry and public sector partners. He was profiled as one of 25 top innovators in Québec by Actualité Magazine. He has published over 300 refereed papers, including seven that received best paper awards, and several books. Andreas played a leading role in the conception and realization of several award-winning innovative buildings such as the Varennes net-zero energy Library. He is currently co-chair of the Canadian Academy of Engineering Roadmap to Resilient, Ultra-Low Energy Built Environment with Deep Integration of Renewables in 2050.



**Andrew Pape-Salmon, FCAE**, is a part-time Adjunct Professor with the Department of Civil Engineering at the University of Victoria. He is also a full-time Commissioner with the BC Utilities Commission. Over the past 21 years Andrew has worked as a professional engineer on topics of energy, buildings, and safety policy, resource economics, resilient communities, super-efficient building construction, deep-energy retrofits of existing buildings and renewable energy resources. In 2019 Andrew was a co-founder of the Canadian Academy of Engineering initiative to develop a Roadmap to resilient, ultra-low energy buildings with deep integration of renewables. Andrew has degrees from University of Waterloo Systems Design Engineering and SFU Resource and Environmental Management.



**Dr. Ursula Eicker** is the new Canada Excellence Research Chair (CERC) for Next-Generation Cities Institute (NGCI) at Concordia University Montréal. A German physicist, Eicker has held leadership positions at the Stuttgart University of Applied Sciences and its Centre for Sustainable Energy Technologies. She coordinated many international research projects in the fields of energy efficiency in buildings and sustainable energy supply systems for more than two decades.

Since June 2019, Ursula leads an ambitious research program to establish transformation strategies toward zero-carbon cities. The 7-year research program receives 10 million CAD government funding and is supported by a further 10 million Dollars by Concordia University, who invests in the city cluster research with five professor positions in buildings and electrical engineering, biodiversity, philosophy and design. The Concordia Next Generation Cities Cluster addresses the challenges of the urban transformation with a transdisciplinary approach and develops tools and strategies for a sustainable future. She has published 7 Books, 23 book contributions, 77 Peer Reviewed Papers and 317 Conference Papers.



**Dr. Caroline Hachem-Vermette** is an associate professor at the University of Calgary, School of Architecture, Planning and Landscape. Her research area includes the investigations of multifunctional energy-efficient, resilient neighborhood patterns, solar potential and energy implications of building shapes, building envelope design, developing multifunctional facades for multistory buildings, and others. Her research is multidisciplinary, it plays a bridging role between building engineering and architectural and urban design. She is currently leading a subtask on developing strategies for net-zero energy solar communities, within the International Agency Energy Task (IEA) 63- Planning Solar Neighborhoods. She was also an expert on 2 others IEA tasks on solar energy in architecture and urban planning. She is widely published on the topic of energy efficiency and solar energy, including a book (with Springer) on designing solar buildings and neighborhoods. Dr. Hachem-Vermette is a recipient of a number of awards including the 2019 Peak Scholar Award, 2016 sustainability award, e-sim/ IBPSA award for innovation in modelling, and Hangai prize for young researchers.



**Dr. Dirk Pietruschka** studied building physics and renewable energy systems at the Stuttgart University of Applied Sciences and received his doctorate in the field of control optimization of sustainable heating and cooling systems at De Montfort University (DMU) in Leicester, UK. As a researcher at the Stuttgart University of Applied Sciences, he has been working on the development of sustainable energy systems for buildings and districts since 2005. Since May 2019, he is head of the research centre for Sustainable Energy Technologies at HFT Stuttgart - zafh.net. He is also co-founder and managing partner of enisyst GmbH, founded in October 2015, which deals with the intelligent control of sustainable energy systems in buildings and districts.



**Dr. Silvia Croce** is a researcher at the Institute for Renewable Energy, Eurac Research (Italy). She is a building engineer - architect by training and holds a PhD in Engineering at the University of Padova.

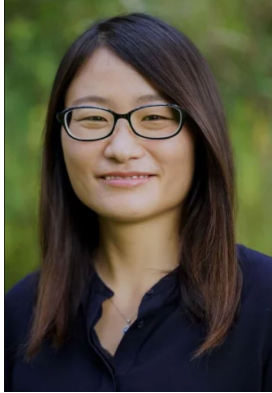
Her research work aims at gaining insights into solutions for an integrated design of the urban built and natural environment, with focus on outdoor microclimate, thermal comfort, energy savings and renewable energy production. At the same time, it intends to raise awareness on the interlinkages of those topics and to activate different actors in developing integrated and systemic solutions.

Silvia is active in several European projects, including Varcities, and JUSTNature. She was actively involved in IEA SHC Task 51 “Solar energy in urban planning”, and currently is co-leading sub-task B “Economic strategies and stakeholder engagement” of IEA SHC Task 63 “Solar neighborhoods planning”.





**Dr. Gilles Desthieux** is an associate professor at the Geneva Institute of Landscape, Engineering and Architecture (HES-hepia) and a consultant in urban energy planning in the company Amstein+Walthert Genève. He holds an MA in environmental engineering and sciences and a PhD from the Swiss Federal Institute of Technology Lausanne (EPFL). His recent and current research & consultancy activities deal with integrated urban and energy planning at district and municipal levels, development of GIS tools for energy mapping and planning, 3D urban modeling for environmental assessment – solar energy (application to the solar cadaster in Geneva) and flood risks, platforms for eco-neighbourhood development support, collaborative urban planning support based on geographical indicator systems.



**Dr. Rongling Li** is an associate professor at DTU Civil Engineering. She has been working on projects of smart energy systems and smart cities, including IFD CITIES, EUDP EnergyLab Nordhavn, EUDP IEA EBC Annex 67 and Annex 82, IFD SEM4Cites, EU Combiotes, and EU ARV. Her focus in the projects is on building energy flexibility including thermal and electrical flexibility, using modelling and data-driven approaches.

Rongling has (co)supervised five PhD students who graduated successfully and is (co)supervising two working on the topics of energy flexibility in buildings using data-driven approaches. She is the operating agent of the IEA EBC Annex 82, an international collaboration running from 2020 to 2025 on the topic of energy flexible buildings towards resilient low-carbon energy systems. She has been a member of evaluation committees for PhD theses for universities including, UC Dublin, TU Eindhoven, Chalmers University of Technology, etc.

Her research interest includes smart cities, smart buildings, energy demand flexibility, energy system modelling, big data analysis, data mining, machine learning, building physics and services.



**David-Olivier Goulet, P. Eng., MBA**, is part of the Hydro-Québec team since 2017. Most of his efforts are devoted to the Lac-Mégantic microgrid project for which he works as a project engineer. In addition, David-Olivier also helps identifying new initiatives and conducts opportunity studies for grid modernization team. His professional experience started with an energy efficiency firm where he worked as a project manager simultaneously leading several energy efficiency projects in different establishments. David-Olivier has a bachelor's degree in mechanical engineering from École de technologie supérieure (ÉTS) as well as a master's degree in business administration (MBA) from the University of Quebec in Montreal (ESG-UQAM).



**Stéphane Vachon** was born in Lac-Mégantic and worked in business development and marketing for 29 years both nationally and internationally. In July 2020, he returned to his home town when a great opportunity to contribute to the development of his city came about. He is motivated by the economic, social and cultural development of his beloved city where he oversees activities in the field of energy transition. He has a bachelor's degree in administration from Bishop's University in Lennoxville and a Master degree of Science in administration (M.Sc.) from the University of Sherbrooke.



**Dr. Walter Mérida** is an internationally recognized clean technology innovator. He has developed energy system architectures, integrated hydrogen solutions, and techno-economic models to enable a low-carbon society. His research spans the scales of energy conversion: from fundamental electrochemical catalyst characterization, to supercritical water electrolysis, to city-scale testbeds linking energy storage, telecommunications and urban design. He is a Professor of Mechanical Engineering, the Associate Dean of Research and Industrial Partnerships for Applied Science, and a Senior Advisor to UBC's President and Vice-Chancellor. He serves on several Advisory Boards, and most recently, he co-chaired UBC's Climate Emergency Taskforce.



**Bill Wong, P.Eng.**, currently a senior renewable energy specialist with Natural Resources Canada, has 40 years technical and business experience in the energy and environment sectors with expertise in renewable energy technologies, community/district energy systems, innovative technology implementation, and business model analysis. He worked on a wide range of low carbon technology solutions for the built-environment across Canada. He was the renewable energy consultant for the implementation of 5 net-zero energy homes in Ottawa and worked on the implementation and the performance monitoring of the Drake Landing Solar Community in Okotoks, AB.

Bill has a Bachelor's degree in Engineering Science and a Master's degree in Mechanical Engineering from the University of Toronto, and a Master's degree in Business Administration from the University of Ottawa. He is the Canadian representative on the IEA Solar Heating & Cooling (SHC) TCP Executive Committee.



With 30 plus years of photovoltaic and energy experience, **Milfred Hammerbacher** has lived and managed businesses in four countries. As co-founder and CEO of S2E Technologies, Inc, his team built the largest solar factory in Canada, partnered with Samsung to build the largest solar farms in Canada, and developed over 800MW's of solar projects operating today. 7 years ago, the company began a transition into Sustainable Community and Building development, with projects in London, Ontario, Punta De Mita, Mexico and a coming soon in Colorado.



**Dr. Nayeem Ninad** received his Ph.D. degree from Concordia University in Canada. He is working as Research Engineer in the Renewable Energy Integration group at the CanmetENERGY lab of Natural Resources Canada. He has been working on various research projects related to power electronic converters, remote community microgrid, real-time simulation, and grid impact of inverter-based renewable integration. He is also currently the task leader of the DER Test Protocol Working group, which is a technical task of IEA ISGAN Annex 5 also known as SIRFN. He is also involved in inverter and interconnection (grid code) standards in Canada and US.



## Webinar Session Co-Chairs



**Dr. Theodore (Ted) Stathopoulos, FCAE**, is currently Professor at Concordia University, Montreal, Canada. His research in the area of wind effects on buildings and their codification has been influential in the development of codes and standards around the world. He has an extensive publication record with more than 500 articles in refereed journals and conference proceedings. He is a member of the ASCE 7 Committee on Minimum Wind Loads and the respective committee of the Canadian Code. He is a Fellow of the Canadian Academy of Engineering, the Institution of Civil Engineers and the American Society of Civil Engineers and its Structural Engineering Institute. He is the Editor of the Journal of Wind Engineering and Industrial Aerodynamics. He has been appointed Distinguished Professor in Building Physics, Urban Physics and Wind Engineering by the Technical University of Eindhoven, The Netherlands. He has received an Honorary Doctorate from the Aristotle University of Thessaloniki, Greece; and another one from the Technical University of Eindhoven, The Netherlands.



**Dr. Bruno Lee** specializes in building energy modelling and simulation. His work focuses on investigating how to better employ different computational simulation techniques to study the performance of the built environment in an integrated manner. The objectives of his research are to facilitate building design decisions that are based on objective and data driven reasoning, and to advance evaluation means to ensure robust design solutions that survive future challenges in a dynamic environment. Bruno's current work involves applying building performance simulation, sensitivity analysis, cost-benefit analysis, life-cycle analysis, multi-criteria decision making, multi-objective optimization, automated design space exploration, stochastic risk analysis to different types of built environment to address various concerns.



**Dr. Mohamed Ouf, P.Eng.**, is an Assistant Professor at Concordia University's Building, Civil and Environmental Engineering Department. He is the principal investigator of the Intelligent Buildings and Cities Lab (IBCL) and a member of Concordia's Centre for Zero Energy Building Studies (CZEBS) as well as the newly established Next-Generation Cities Institute (NGCI). His research focuses on using data-driven approaches to investigate occupant-building interactions at multiple scales, ranging from zone- to building- and up to urban-scales. As an early career researcher, he published over 40 peer-reviewed journal and conference papers and received several prestigious awards, such as the Best Paper Award at the 7th International Building Physics Conference. Within the past couple of years, he also established collaborations with multiple industry and government partners, and raised over \$400k in research funding. He currently supervises a team of 10 graduate students at IBCL with expertise in multiple disciplines ranging from mechanical, civil and building engineering to architecture and data science.



**Dr. Hua Ge** is an Associate Professor in the department of Building, Civil and Environmental Engineering and a member of Centre for Zero Energy Building Studies at Concordia University. She is a Tier II Concordia University Research Chair (CURC) in High Performance Building Envelope for Climate Resilient Buildings. She received her Ph.D. in Building Engineering from Concordia in 2003. She is a registered Professional Engineer and member of ASHRAE.

Hua's expertise is in large-scale laboratory testing, field monitoring and modeling of hygrothermal performance of building envelopes, and quantifying wind-driven rain loads by field measurements and CFD modeling, and low-energy buildings. Her current research focuses on energy efficient, durable, climate resilient building envelopes. She has published over 130 technical papers in peer reviewed Journal and conference proceedings and has trained over 60 HQPs.



**Dr. Leon Wang** is currently an associate professor and member of the Centre for Zero Energy Building Studies (CZEBS) at Concordia, and was a Concordia University Research Chair (CURC) – in Building Airflow and Thermal Management. He earned a Ph.D. degree in Mechanical Engineering from the School of Mechanical Engineering at Purdue University, West Lafayette, Indiana, USA, in 2007. Leon is the vice-chair of ASHRAE TC 4.10 - Indoor Environmental Modeling and the editorial member of the international journal of Energy and Buildings, Journal of Wind Engineering and Industrial Aerodynamics. His research contributed directly to the International Energy Conservation Codes (IECC), Air Movement and Control Association (AMCA) and ASHRAE 189.1 and 90.1 codes and standards. Dr. Wang is currently leading the project “Assessment and mitigation of summertime overheating conditions in vulnerable buildings of urban agglomerations” with a team of 10 researchers from the National Research Council – Construction Research Center (NRC-CRC), Health Canada (HC), and the Environment and Climate Change Canada (ECCC).