



## Disruptive Innovation over the Wires: Business Models for Success



**November 9, 2017**  
University of Waterloo  
Federation Hall

## Innovation Showcase

The Technology Innovation and Policy Forum is pleased to present the Innovation Showcase featuring displays and projects, state-of-the-art products and information from institutional, corporate, government agencies and funding sources. Academia, entrepreneurs, innovators and industry representatives will be pleased to connect with you during the networking session times from: 12:30 to 2:30pm and 4:00 to 5:30pm. Auto industry representatives and the University of Waterloo Alternative Fuels Team (UWAFT) have electric vehicles on display outdoors and welcome the opportunity to showcase their products.

The University of Waterloo is investing heavily in the necessary infrastructure and development of human capital to maximize its capacity to support fundamental and applied research and development (R&D) for Smart Energy Networks (SENs). Our faculty members are working closely with utilities, industry and government to support the transition of the smart energy system.

The Waterloo Institute for Sustainable Energy (WISE) was established at the University of Waterloo in 2008. The Institute comprises more than 100 faculty members with graduate students and postdoctoral fellows working as multi-disciplinary research teams across Engineering, Science, Mathematics, Arts and Environment. The Institute is the focal point at the University of Waterloo (UW) for research in energy studies. In collaboration with utilities, private sector partners, government agencies and civil society groups, the Institute's goal is to foster the development of innovative technologies and alternatives to existing energy production and delivery systems, and to promote energy efficiency and environmental sustainability. At WISE, there are 29 state-of-the-art labs that can be used for applied research, technological development, and equipment testing.

The Department of Electrical and Computer Engineering (ECE) is Waterloo's largest academic department, with over 2,500 students, 86 full-time faculty members, and more than 50 supportive staff. Our research activities cover a wide range of fields, from high-voltage engineering and sustainable energy to breakthroughs in wireless technology that will enhance communications across our global society.

The High Voltage Engineering, Electricity Market Simulation and Optimization, Smart Distribution Research, Power Electronics, Advanced Battery Technologies, Center for Advanced Photovoltaic Devices and Systems, Solar Thermal Research, Fuel Cell and Green Energy R&D, Wind Energy, Green and Intelligent Automotive, and Maglev Microrobotics research lab facilities have been actively pursuing R&D and commercialization initiatives in the discipline of smart grid electrical systems at the national and international level.

Thank you to our supporters



## INSTITUTIONAL SHOWCASE



### **P1 Investigating the Effect of Renewable Energy Incentives and Hydrogen Storage on Advantages of Stakeholders in a Microgrid**

Ehsan Haghi, Chemical Engineering, University of Waterloo

### **P2 Electricity Theft Detection in Power Distribution System**

Côme Carquex, Electrical and Computer Engineering, University of Waterloo

### **P3 Microgrid Control and Optimization**

Mostafa Farroukhabadi, University of Waterloo

### **P4 Power to Gas Pathways**

Suaad Al-Zakwani, Chemical Engineering, University of Waterloo

### **P5 EMS for Isolated Microgrids**

Bharatkumar Solanki, PhD Candidate, Electrical and Computer Engineering, University of Waterloo

### **P6 Combining Thermal Energy Storage (TES) with Compressed Air Energy Storage (CAES) with the Goal to Improve Cycle Efficiency**

Logan Erskin Miller  
Yash Vyas  
Mateus Tinel  
Mike DeWeerd

Geological Engineering  
University of Waterloo



### **T1 Novel Optimization of Solar Powered Reverse Osmosis Drinking Water Treatment Systems for Remote Communities**

Marina Freire-Gormaly, PhD Candidate, University of Toronto

#### **Abstract**

According to the World Health Organization, 663 million people lack access to clean water. Solar photovoltaic reverse osmosis (PVRO) systems are stand-alone water and energy purification systems that can help alleviate this need. To best provide the water requirements of a given community, these PVRO systems require custom design. However, the design expertise required to configure such a system is often lacking in these remote communities. To alleviate this limitation, PVRO systems can be designed using modular design approaches from commercially available components for the cost optimal design. This method has been used to design a one cubic metre of water per day system in La Mancalona, Mexico from a brackish water source (high saline and high mineral content well). However, the current methodology did not consider the potential effects of membrane fouling along with the water pre-treatment and operational considerations to enable robust operation throughout the system lifespan. This novel optimization is on the development of robust design methods to configure custom small-scale (ten cubic meters/day and less) PVRO systems from modular components while considering the effects of variable community water needs, location specific solar insolation, and membrane fouling. The methods enable the configuration of both the system components and operational conditions to provide reliable water to remote communities for the entire life-span of the system. The methods utilize experimentally validated models of system degradation under different operating conditions in conjunction with optimization methods to arrive at an appropriate system configurations for given community water needs.

**Website:** <http://werl.mie.utoronto.ca/research/pvro/>  
**Recent publications:** <http://www.sciencedirect.com/science/article/pii/S0011916417311104>

## CORPORATE, ASSOCIATIONS AND GROUPS SHOWCASE

### **T2** **Salient Energy** **Commercializing a New Type of Zinc-Ion Battery**



Ryan Brown, Chief Executive Officer  
Dr. Brian Adams, Chief Technology Officer

#### **Abstract**

Salient Energy is commercializing a revolutionary new type of battery called the zinc-ion battery. The zinc-ion battery is safer, longer-lasting, and less expensive than lithium-ion batteries, and will be a complete replacement for lithium in stationary energy storage applications. Additionally, the zinc-ion battery is completely compatible with lithium-ion manufacturing, allowing it to retain its cost advantage over lithium-ion even as lithium-production continues to ramp up globally.

**Website:** <http://salientenergy.ca>

### **T3** **HITCH** **Smart Wireless Mesh Router and Predictive Content Caching Software Platform**



Uche Onuora, Co Founder at HITCH (by Flexfinty)

#### **Abstract**

HITCH is a Smart Wireless Mesh Router and Predictive Content Caching Software Platform, that pre-downloads relevant online content once, so many users can access the same information quickly without an Internet connection. Globally, over 4 billion people don't have sustainable (available, affordable and accessible) broadband. Most of these users are un/underserved by existing coverage and service infrastructure; and live in rural and urban emerging markets, and, are denied the ability to benefit from real technology-driven economic growth. Flexfinty has developed HITCH – an enhanced smart wireless mesh router that enables communities to automatically build, operate, and sustain self-contained Internet platforms; accelerating sustainable broadband in emerging markets.

**Website:** <http://tryhitch.com/>



### **T4** **Toyota Tsusho Canada Inc.** **Yanmar 35 kW micro-Combined Heat and Power (micro-CHP)**

Andy Lehman, Sales Engineer

#### **Abstract**

Toyota Tsusho Canada Inc. (TTCI) develops new business streams by introducing innovative technology across a variety of sectors.

TTCI Energy Solutions Group recently introduced Yanmar 35 kW micro-Combined Heat and Power (micro-CHP) to the Canadian market. Yanmar micro-CHP has been utilized globally to provide clean, reliable and economical electricity for commercial applications. Hot water, a byproduct of electricity production, can be distributed for space heating, DHW or process use. Yanmar micro-CHP is a plug and play solution featuring Inverter technology. Inverter technology contains logic to produce high quality electricity, grid synchronization and safeguards.

As the electricity market evolves, development of micro grids will require reliable technology that is easy to apply and integrate and proves cost-effective. Yanmar micro-CHP used in conjunction with renewables guarantees a reliable power supply with proven technology that can work seamlessly in conjunction with the grid or as a standalone power generator.



### **T5** **CoLab** **Research and Development Services Based at the Velocity Garage**

David Morris, Founder

#### **Abstract**

CoLab is an online marketplace for R&D services based at the Velocity Garage. Companies use CoLab to ease budgets, shorten timelines and reduce technical risk so they can iterate and get to market faster. Corporate, academic and government labs use CoLab to generate more revenue from their underused equipment.



## **T6 Sustainable Waterloo Region Sustainable Program Collaboration for Waterloo Region**

Olivia Muysson, Program Coordinator,  
Sustainable Waterloo Region

Allan Taylor, Program Development Manager,  
Sustainable Waterloo Region

### **Abstract**

Our mission is to foster collaborations that enable local organizations to convert their sustainability interest into action. These organizations participate in our programs to achieve environmental and economic benefits. By building networks, setting a common direction for results, and publicly reporting on progress, we are working to maximize both the individual and collective successes of organizations in Waterloo Region.



## **T7 AE4H Global Change Initiative Affordable Energy for Humanity Global Change Initiative**

Nigel Moore, Manager, Waterloo Institute for Sustainable Energy, University of Waterloo

### **Abstract**

The Affordable Energy for Humanity Global Change Initiative is an emerging international collaboration between the world's leading scientists, technology developers and practitioners on the topic of universal energy access.

Our Vision is to deliver the next generation technologies, innovations and practical solutions that will drive the costs of energy services to a level low enough for a revolution in energy access without the need for tax incentives and subsidies.

Participants in this initiative are guided by a common purpose to apply their skills, expertise and knowledge to the urgent cause of improving the affordability of clean energy in contexts where it matters most. Harnessing the resources and enthusiasm of researchers in order to change the energy access equation is the primary inspiration behind the initiative.

## **GOVERNMENTAL FUNDING AGENCIES SHOWCASE**



## **T8 Natural Sciences and Engineering Re- search Council (NSERC) of Canada**

Andrew Sinclair, Manager, Ontario Regional Office

### **Abstract**

The Natural Sciences and Engineering Research Council of Canada (NSERC) aims to make Canada a country of discoverers and innovators for the benefit of all Canadians. The agency supports university students in their advanced studies, promotes and supports discovery research, and fosters innovation by encouraging Canadian companies to participate and invest in post-secondary research projects. NSERC researchers are on the vanguard of science, building on Canada's long tradition of scientific excellence.

Website: <http://www.nserc-crsng.gc.ca>

## **T9 Mitacs**



Ashley Hannon, Business Development Specialist

### **Abstract**

Mitacs is a national, not-for-profit organization that has designed and delivered research and training programs in Canada for 18 years. Working with 60 universities, thousands of companies, and both federal and provincial governments, Mitacs builds partnerships that support industrial and social innovation in Canada. Mitacs builds partnerships between academia, industry, and the world – to create a more innovative Canada.

Mitacs was founded in 1999 as a Canadian Network of the Centres of Excellence, dedicated to supporting applied and industrial research in mathematical sciences and associated disciplines. In 2003, we launched a research internship program designed to increase deployment of highly educated graduates into the private sector. Open to all disciplines since 2007, Mitacs has expanded in response to industrial and university needs, including programs in R&D management, professional skills development, and international research training. Fully independent since 2011, Mitacs remains committed to its core vision of supporting research-based innovation and continues to work closely with its partners in industry, academia, and government.

# ELECTRIC VEHICLE SHOWCASE – OUTDOOR DISPLAY



## L1 University of Waterloo Alternative Fuels Team

Ramin Shaikhi, Project Manager  
Master of Applied Science, Mechanical Engineering

Patrick DiGiacchino, Engineering Manager  
Master of Applied Science, Mechanical Engineering

Sid Kakodkar, Associate Project Manager  
Master of Applied Science, Mechanical Engineering

Cole Powers, Modelling Lead  
Bachelor of Applied Science, Mechanical Engineering  
with Entrepreneurship Option

Michael Wu, Controls Lead  
Bachelor of Applied Science, Mechatronics  
Engineering

Jake McGrory, Controls & Modelling Lead  
Bachelor of Applied Science, Chemical Engineering

Edward Chao, ADAS Lead  
Master of Applied Science, Computer Engineering

### Abstract

The University of Waterloo Alternative Fuels Team (UWAFT) has been a leader in advanced vehicle technology development, education and awareness for nearly 20 years. Our mission is to develop and integrate groundbreaking technology into production road vehicles while promoting sustainable transport through the community at large.

UWAFT works with a variety of automotive technologies and benefits candidates from many disciplines of engineering, including but not limited to; mechanical, electrical, controls, modelling, simulation, software, firmware, project management and manufacturing.

UWAFT is currently taking part in a competition called EcoCAR 3. EcoCAR 3 is the latest U.S. Department of Energy (DOE) Advanced Vehicle Technology Competition (AVTC) series. As North America's premier collegiate automotive engineering competition, EcoCAR 3 is challenging 16 North American university teams to redesign a Chevrolet Camaro to reduce its environmental impact, while maintaining the muscle and performance expected from this iconic American car. UWAFT is one of only two Canadian universities competing in EcoCAR 3, making the competition even more of a unique and exciting experience!

Visit the UWAFT Team in the Electric Vehicle Showcase outdoor display.

**Website:** <https://uwaterloo.ca/sedra-student-design-centre/directory-teams/university-waterloo-alternative-fuels-team-uwaft>

## L2 Waterloo Region Electric Vehicle Association Volt Vehicle Showcase



Mark Coughlan, WISE Member (2017 Chevy Volt)  
Ian Graham, WISE Member (2015 Chevy Volt)

### Abstract

Promoting electric vehicle adoption and use within and around the Region of Waterloo, Ontario, Canada. All EV owners/enthusiasts welcome. WREVAG@gmail.com WREVA will be at Federation Hall showing off their electric vehicles. Check out a 2015 and a 2017 Chevy Volt and meet the members of this great local group!

**Twitter:** @WREVAGroup



## L3 Parkway Ford Waterloo Ford C-Max Energi or Hybrid

Dan Bolarino, Sales and Leasing Consultant

### Abstract

Parkway Ford will be providing test drives from 12:30 to 2:30 pm at the Electric Vehicle Showcase outdoor display.



## L4 Forbes Motors Chevy Volt or Chevy Bolt

Manni Birhanu, Sales and Leasing

### Abstract

The Forbes family has been a part of the automotive history since the beginning with the involvement of Russell Arthur Forbes. Russell served as Henry Ford's personal secretary, and later held the position of business manager for Mr. Ford's newspaper, the Dearborn Independent.

Forbes Motors is a 69-year-old family operated General Motors dealership. We represent the Chevrolet, Buick, Cadillac and GMC nameplates as well as GM Optimum vehicle brands.

Forbes Motors was started by Russell Arthur Forbes in the 1940s, and then run by his sons, Jack and Ralph. Today, the business is run by Russell Forbes Sr., Ralph's son, along with Russell's son, Russ Forbes Jr., who is in charge of the GM dealership. Russell's daughter, Leigh Forbes, is the company's online marketing co-ordinator.



## L5 Tesla Owners Club of Ontario / Southern Ontario

Prof. Alan Morgan, University of Waterloo  
Michael Chau-tran  
Paul Church  
Bryan Duarte  
John Hanna  
Ankit Juthani  
Karl Nieva  
Vicknesh Ramachandran  
Stefan Schader  
Aleksandar Susnjar  
Luna Wang

### Abstract

The Tesla Owners Club of Ontario/Southern Ontario is comprised of friendly and enthusiastic Tesla owners and reservation holders. The Club meets on a regular basis to discuss anything related to its passion for Tesla vehicles. Club Members exchange ideas and learn from each other, have fun and meet new friends. Our club is a member of Tesla Motors' official Owners Club program which provides direct access to the company and provides community support.

**Website:** <http://ontario.teslaownersclub.ca/>

Thank you to all the partners, supporters and innovators who made this year's Technology Innovation and Policy Forum possible.



# INNOVATION SHOWCASE

Innovation Showcase Hours: 12:30 to 2:30pm  
4:00 to 5:30pm

## Innovation Showcase Participants

### Poster Board Presentations

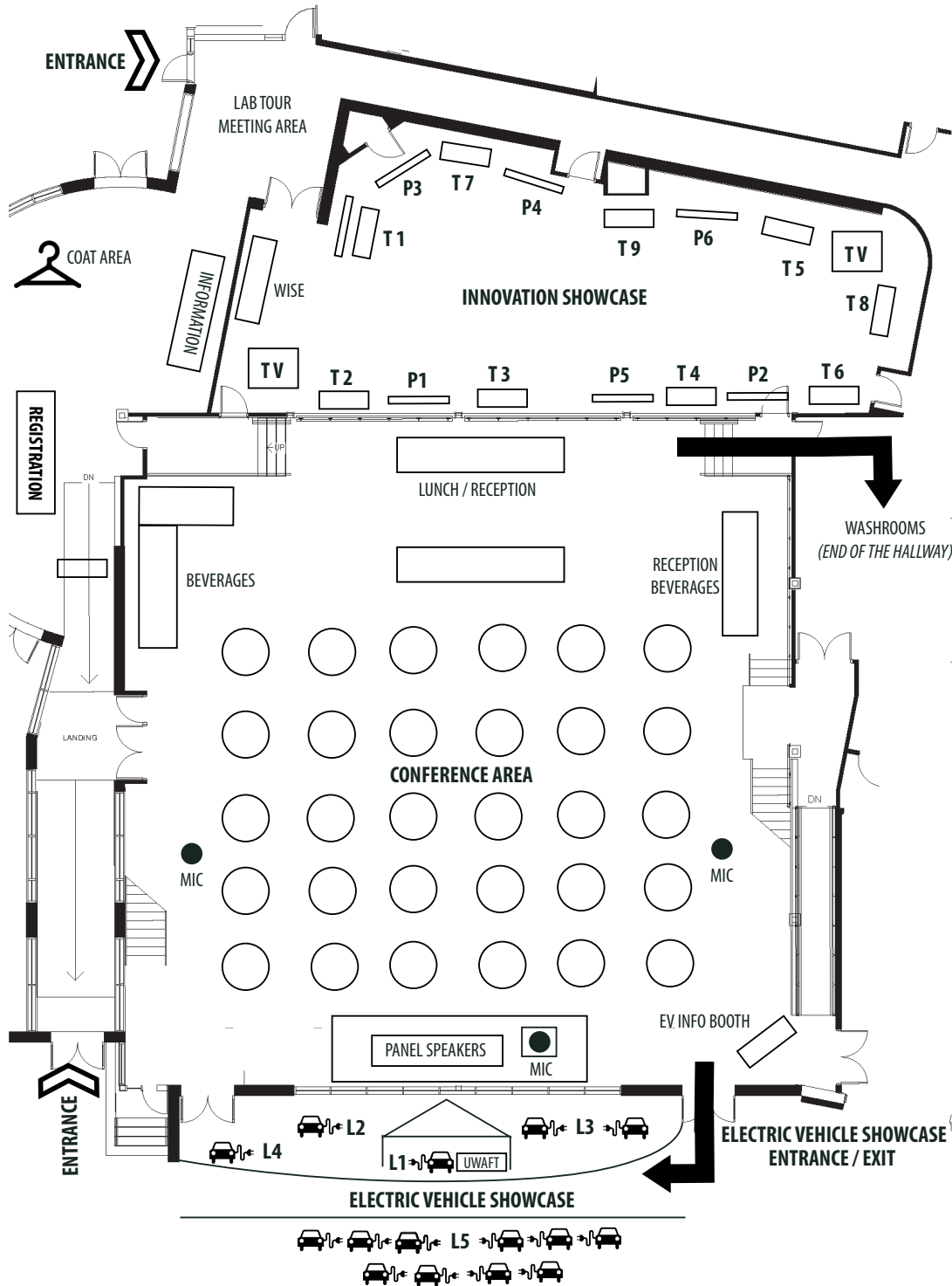
- P1 – Investigating the Effect of Renewable Energy Incentives and Hydrogen Storage on Advantages of Stakeholders in a Microgrid
- P2 – Electricity Theft Detection in Power Distribution System
- P3 – Microgrid Control and Optimization
- P4 – Power to Gas Pathways
- P5 – EMS for Isolated Microgrids
- P6 – Combining Thermal Energy Storage (TES) with Compressed Air Energy Storage (CAES) with the Goal to Improve Cycle Efficiency

### Table Presentations

- T1 – Novel Optimization of Solar Powered Reverse Osmosis Drinking Water Treatment Systems for Remote Communities
- T2 – Salient Energy Commercializing a New Type of Zinc-Ion Battery
- T3 – HITCH Smart Wireless Mesh Router and Predictive Content Caching Software Platform
- T4 – Toyota Tsusho Canada Inc. Yanmar 35 kW micro-Combined Heat and Power (micro-CHP)
- T5 – CoLab Research and Development Services Based at the Velocity Garage
- T6 – Sustainable Waterloo Region Sustainable Program Collaboration for Waterloo Region
- T7 – AE4H Global Change Initiative Affordable Energy for Humanity Global Change Initiative
- T8 – Natural Sciences and Engineering Research Council (NSERC) of Canada
- T9 – Mitacs

### Electric Vehicle Showcase – Outdoor Display

- L1 – University of Waterloo Alternative Fuels Team
- L2 – Waterloo Region Electric Vehicle Association Volt Vehicle Showcase
- L3 – Parkway Ford Waterloo Ford C-Max Energi or Hybrid
- L4 – Forbes Motors Chevy Volt or Chevy Bolt
- L5 – Tesla Owners Club of Ontario / Southern Ontario



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