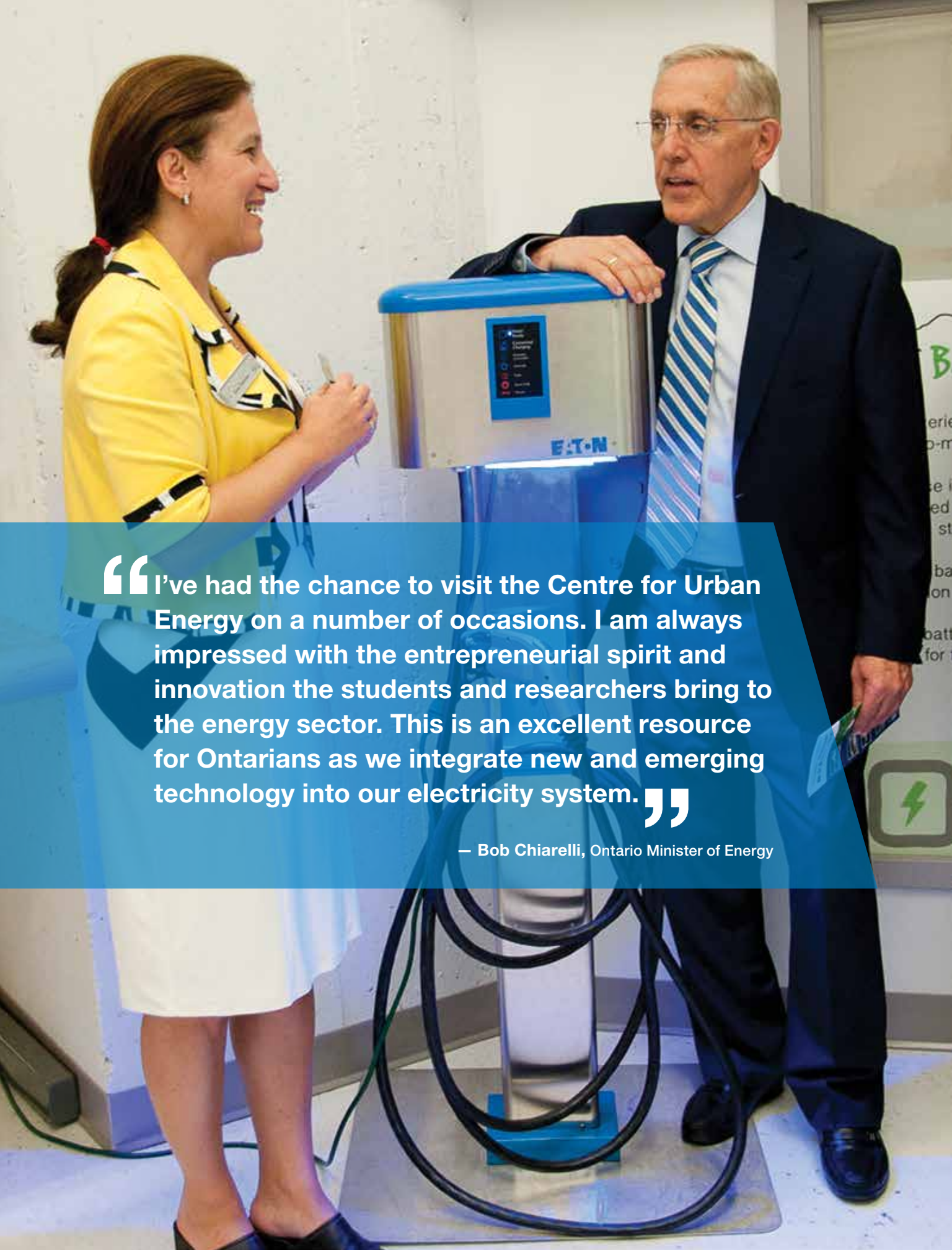




Centre for Urban Energy
Energizing the Future

2013 ANNUAL REPORT

RYERSON
UNIVERSITY

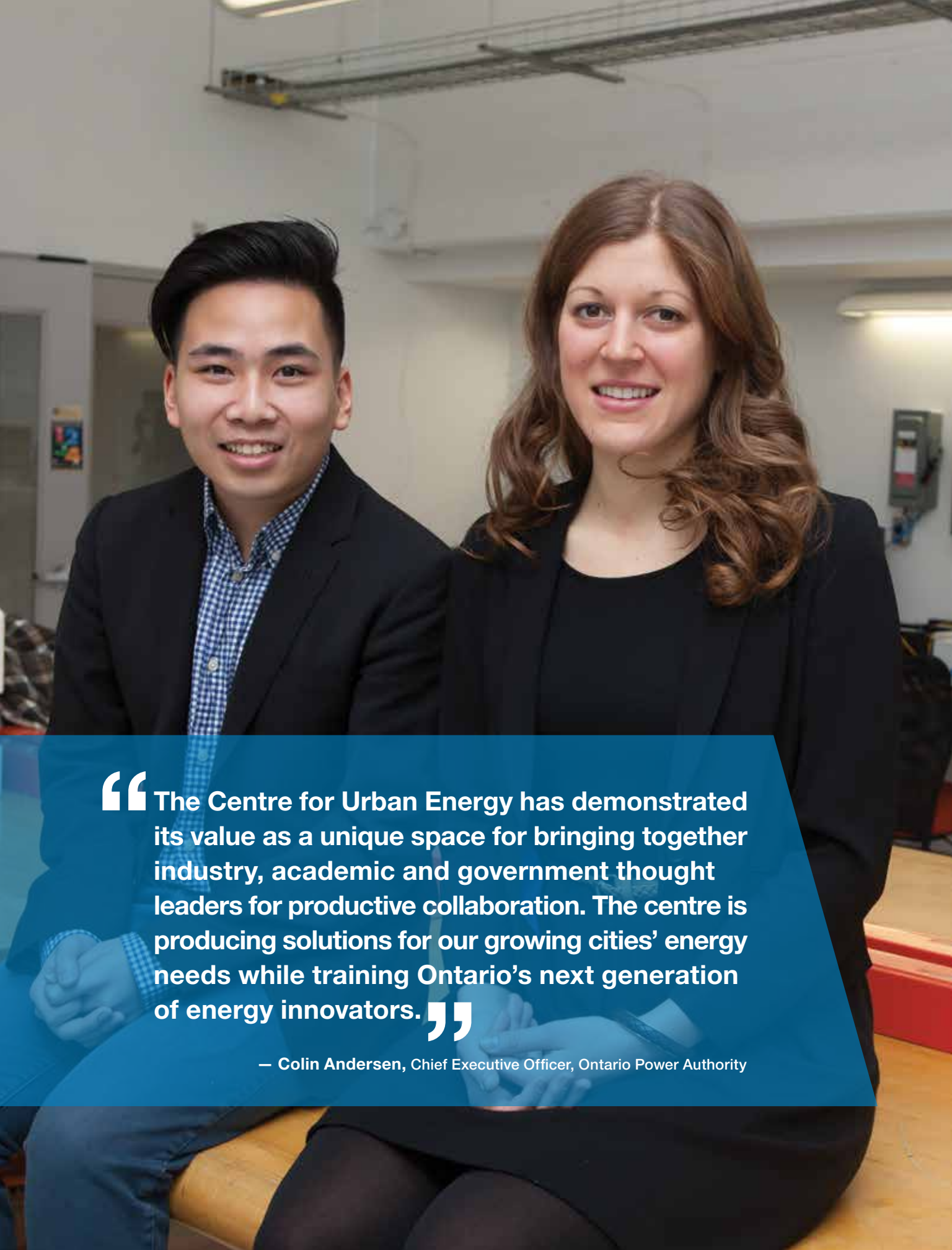


“ I’ve had the chance to visit the Centre for Urban Energy on a number of occasions. I am always impressed with the entrepreneurial spirit and innovation the students and researchers bring to the energy sector. This is an excellent resource for Ontarians as we integrate new and emerging technology into our electricity system. ”

— Bob Chiarelli, Ontario Minister of Energy

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“ The Centre for Urban Energy has demonstrated its value as a unique space for bringing together industry, academic and government thought leaders for productive collaboration. The centre is producing solutions for our growing cities’ energy needs while training Ontario’s next generation of energy innovators. ”

— Colin Andersen, Chief Executive Officer, Ontario Power Authority

THANK YOU TO OUR PARTNERS

Founding Sponsors



Sponsors



Collaborators



MESSAGE FROM OUR ACADEMIC DIRECTOR



Bala Venkatesh
Professor, Electrical and
Computer Engineering
Academic Director

Energy is vital for mankind. Defining issues of our time such as climate change and urbanization are intrinsically intertwined with energy and that's why the Centre for Urban Energy (CUE) continues to play an important role in developing the solutions that will power our rapidly changing world.

Today, CUE houses 34 projects conducted by 70 researchers comprised of students, faculty and staff, collectively worth \$18.9 million. Starting with our three generous founding partners Hydro One, Ontario Power Authority and Toronto Hydro, CUE funding has expanded to include numerous public, government and private sector sponsors such as Schneider Electric, the Ontario Ministry of Energy, Survalent Technology and Electrovaya.

2013 was a highly productive year for CUE and the centre, three years post-launch, continues to grow according to its vision and mission. I'm delighted that several industry-driven and academically led research projects that began in 2010 have generated positive outcomes this past year, including the completion of a Temporal Power flywheel controller, new designs for electric vehicle charging infrastructure and improved modeling of wind and solar power systems. These projects have created commercial opportunities for our partners and led to well-deserved recognition for our talented graduate students.

There is a lot to look forward to in 2014. In partnership with Electrovaya, Hydro One, Ontario Centres of Excellence and Toronto Hydro, CUE will investigate the operational flexibility of a large 1.2 MWh bank of lithium-ion polymer batteries, showcasing world-leading energy solutions created right here in Ontario. In partnership with Schneider Electric and the Ontario Ministry of Energy, CUE will build Canada's first university-based smart grid laboratory. The lab will become a dedicated facility for collaborative research, development and testing of technologies, as well as a platform for the training of the next generation of smart grid engineers, scientists and planners.

Over the following pages, I invite you to learn more about CUE's activities in 2013 and our plans for the next 12 months.

A handwritten signature in black ink, appearing to read 'Bala Venkatesh', with a horizontal line underneath.

MESSAGE FROM OUR EXECUTIVE DIRECTOR



Dan McGillivray

Toronto Hydro
Distinguished Fellow
Executive Director

The Centre for Urban Energy (CUE) remains focused on three key operations: research, education and innovation. Each is important individually, but together they are a testament to Aristotle's observation that "the whole is greater than the sum of its parts." Aristotle also coined the word *energeia* which means "being at work."

In 2014, CUE's research program will increase its *energeia* through the development and demonstration of energy storage and smart grid technologies. We will also house a new laboratory devoted to sustainable transportation. All of this work will prompt the technological breakthroughs needed to unlock the true potential of renewables and increase our drive toward achieving zero-carbon communities. To this end, we welcome new research partners and collaborators.

CUE remains devoted to augmenting its educational programs in response to the new and growing demands of the energy sector. The number of students in our Certificate in Energy Management and Innovation is growing and we are set to launch a new master's degree program in 2014. We are also developing customized executive courses in energy policy and energy innovation and testing Ryerson's unique "zone learning" model through the iCUE, our incubator/accelerator for energy entrepreneurs.

The iCUE has experienced a remarkable first year, expanding well beyond our walls. It is currently incubating six energy startups and has had its first graduate – DanTeb Enterprises, founded by Ryerson alumna Laura Miller. DanTeb is now profitable and looking to hire; the company has signed contracts with some major companies, deployed its cell phone charging stations from coast to coast and is currently manufacturing its units in Ontario at half the original cost. Another success story is Plug'n Drive, a not-for-profit social enterprise advocating for the wider adoption of electric vehicles, which has tripled its staff since joining the iCUE.

Through our sustained *energeia*, CUE will strive to ensure the success of its partners in 2014 and beyond.

A handwritten signature in black ink that reads "Dan". The signature is stylized and appears to be written on a white background.



PROGRESS

2010

Ryerson University opens the Centre for Urban Energy (CUE) with the support of three founding sponsors: Hydro One, Ontario Power Authority and Toronto Hydro

2011

CUE establishes a partnership with Anna University in Chennai, India to develop a joint centre for research and collaboration in urban energy

2012

CUE develops a postgraduate Certificate in Energy Management and Innovation program and launches the iCUE, an incubator and accelerator for innovative new startups working in the energy sector

2013

The Ontario Ministry of Energy and Schneider Electric announce funding to build a smart grid laboratory at CUE, the first of its kind in a university setting anywhere in Canada

ABOUT US

The Centre for Urban Energy (CUE) at Ryerson University is an academic-industry partnership that is exploring and developing solutions to urban energy challenges such as the advancement of smart grid technologies, energy policy and regulatory issues, storage, electric vehicles, net-zero homes and renewables.

VISION

To be a world-class research and innovation centre dedicated to solving urban energy challenges.

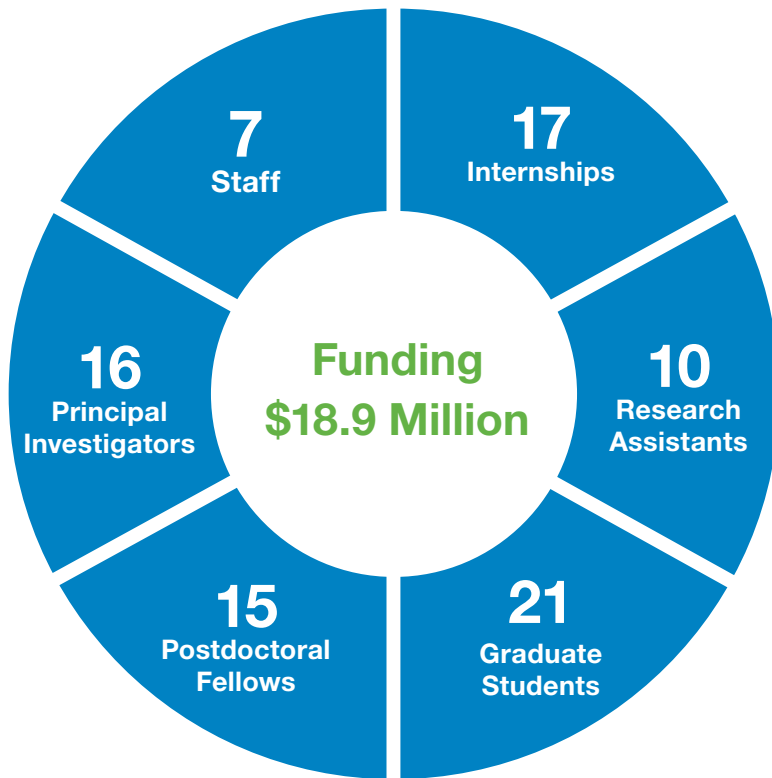
MISSION

- Build academic, public and private sector partnerships
- Conduct research, development and demonstration, leading to commercialization
- Create the next generation of energy entrepreneurs
- Encourage multidisciplinary and collaborative approaches
- Provide scholarship and learning opportunities



Video: Learn more about research and innovation at CUE

BY THE NUMBERS



PRIORITIES



ADVISORY COUNCIL



Chair
Mohamed Lachemi
Provost and Vice President
Academic
Ryerson University



Co-Chair
David Curtis
Director, Asset Management
Hydro One



Tom Chapman
Manager, Economics and
Policy
IESO (Formerly Ontario
Ministry of Energy)



Lisa Dignard-Bailey
Director, Integration of
Renewable and Distributed
Energy Resources R&D
Program
Natural Resources Canada



Sri Krishnan
Interim Dean
Faculty of Engineering and
Architectural Science
Ryerson University



Ivano Labricciosa
Executive Vice-President,
Business Development
Toronto Hydro



Bala Venkatesh
Academic Director
Centre for Urban Energy
Ryerson University



Kim Warren
Vice-President, Operations
and Chief Operating Officer
IESO



Andrew Pride
Vice-President, Conservation
Ontario Power Authority



Ravi Seethapathy
Manager, Systems Innovation
and Advanced Grid
Development
Hydro One

PEOPLE

Principal Investigators

Mohammed Abdoli-Eramaki
Xavier Fernando
Seth Dworkin
Mark Gorgolewski
Ling Guan
Liping Fang
Alan Fung
Darko Joksimovic
Songnian Li
Ravi Ravindran
Russell Richman
Magdy Salama
Farrokh Sharifi
Vijay Sood
Amirnaser Yazdani
Fei Yuan
Phil Walsh
Bin Wu
David Xu

Research Fellows

Mohamed Awadallah, Hydro One Visiting Research Fellow
Sean Conway, Hydro One Distinguished Research Fellow
Jim MacDougall, Toronto Hydro Visiting Research Fellow
Angele Reinders, Hydro One Visiting Research Fellow
Daniel Cheng
Shivkumar Iyer
Srinivas Karanki
Yan Li
Bhanu Opathella
Kai Tian
Jiacheng Wang
Venkata Yaramasu
Peng Yu
Tianqi Xu

Management Team

Bala Venkatesh, Academic Director
Dan McGillivray, Toronto Hydro Distinguished Fellow and Executive Director
Adnan Syed, Project Manager
Matthew Kerry, Marketing and Communications Manager
Denis Arseneault, Administrative Assistant
Diane Chong, Departmental Assistant

Entrepreneur-in-Residence

Marzio Pozzuoli

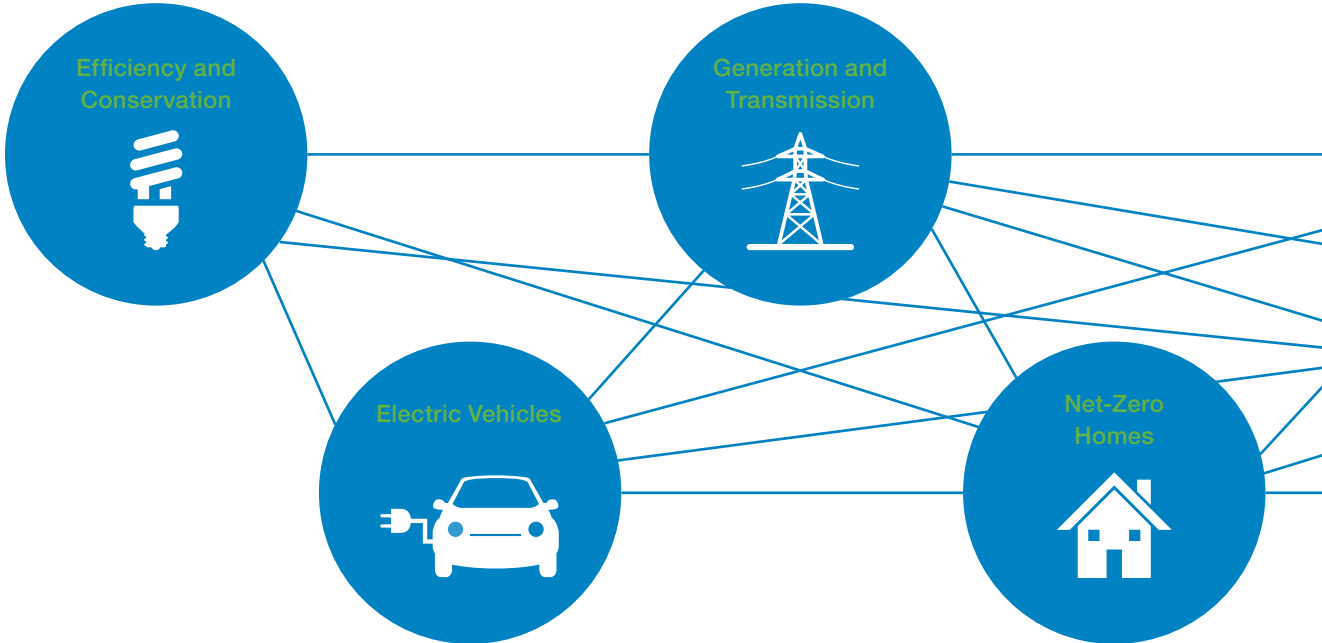
Student Interns

Qian Gao
Saidurga Kalluri
Ujala Mahmood
Gagan Majathia
Sarah Marchionda
Linh Nguyen
Uzodimma Odozor
Mike Pettigrew
Jesuraj Ratnaraj
Hao Quan
Haris Saleem
Ali Siddiqui
Geoffrey Smith
Sanjiv Sohal
Rahanuma Wafa



Left to right: Angele Reinders, Mohamed Awadallah, Daniel Cheng, Bhanu Opathella

RESEARCH FOCUS



Efficiency and Conservation

- ✓ Reducing the carbon footprint at Hydro One
 - ✓ Time-of-use customer analysis
- Building performance assessment using occupant questionnaires and energy data (See *research highlights on page 15*)
- Enbridge energy assessment

Electric Vehicles

- Electrical impact on transformer station components due to electric vehicles
- Chargers, stations, power converter interfaces and power sharing
- Design and development of faster charger and charging stations
- Plug-in hybrid electric vehicle charging station for urban energy systems (See *research highlights on page 16*)

Generation and Transmission

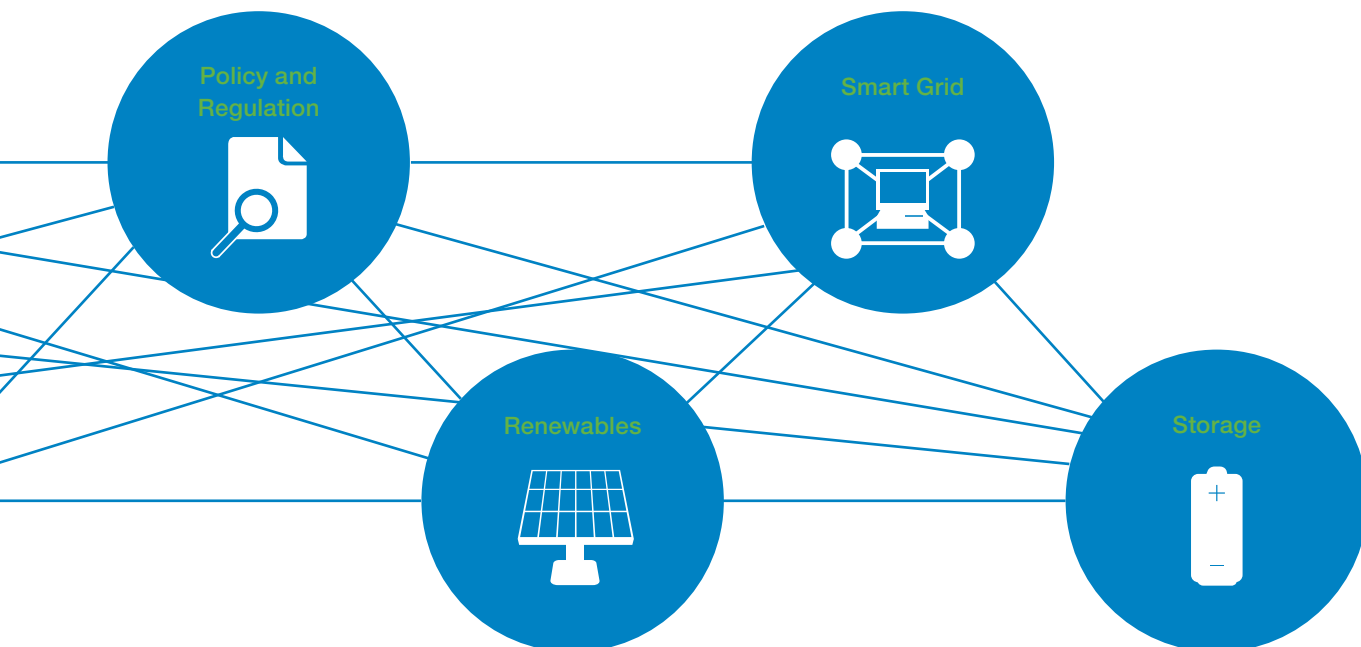
- Anti-islanding detection for multiple inverters in a distribution grid
- Transmission supply diversification challenges in Toronto

Net-Zero Homes

- Development of residential HVAC and air-conditioning demand management and control system

Policy and Regulation

- Shoulder injuries among Toronto Hydro workers — from evaluation to control
- Customer interruption costs meta study



Renewables

The impact of solar panels on transformer station components (See *research highlights on page 14*)

Intelligent wind algorithms

Control and interface for an urban clean energy microgrid

Smart management and control of short circuit currents to increase connectivity of renewable sources

Performance and benefits of urban micro-wind turbines

Urban solar farms

NSERC Wind Energy Strategic Network

Microgrids and their control and operation

Smart Grid

✓ Secure and reliable data communications

Zone energy management and optimization systems

Smart power grids – modelling, planning and control design

Development of urban electric systems

Information processing and communication technology for secure smart grid

Schneider Electric Smart Grid Laboratory

Storage

✓ Temporal flywheel – energy on time

System integration of large-scale energy storage using lithium batteries

Temporal flywheel – electrical impact and transformer storage


Urban bulk energy storage systems

Lithium-ion battery demonstration

Optimizing power systems with energy storage

Third-party monitoring of the Electrovaya battery

✓ = completed

A photograph of two men in a laboratory or industrial setting. The man on the left, wearing glasses and a light blue shirt, is gesturing with his hands as if explaining something. The man on the right, wearing a light grey shirt, is looking at him attentively. In the foreground, there is a complex electronic circuit board with many colorful wires connected to it, mounted on a blue base. The background shows a bright, modern interior with large windows.

“ The Centre for Urban Energy’s partnership with the Ontario Ministry of Energy is advancing research and consumer benefits, with initiatives such as building a smart grid lab in conjunction with global industry giant Schneider Electric, and playing an important role in developing the province’s long-term energy plan. ”

— Sheldon Levy, President, Ryerson University



RESEARCH HIGHLIGHTS

Making solar power even better

As the cost of solar panels decreases, more and more consumers are installing them to reduce their electricity bills, but can too much of a good thing be bad? This project examines the negative impacts of increasing the number of solar panels in the grid network. The focus of the research will be on the distribution transformers and making recommendations to maintain the lifetime and performance of these valuable assets.

What problem is being solved?

- During light load conditions when solar panels are operating at or close to nominal power, active power can cross the distribution transformer backward to the transmission system creating a second-quadrant operating condition.
- Voltage harmonics produced by the inverters associated with solar panels can inject current harmonics into the transformer, reducing their operational life.
- Losses and temperature rise increase the possibility of insulation failure.

Practical applications:

- Preserve the performance and lifetime of a distribution transformer operating alongside solar panels.

Project Sponsor:



Name of Project:

The impact of solar panels on transformer station components

Timeline:

January 2011 – February 2014

Research Focus:

Renewables

Principal Investigator:

Bala Venkatesh

Research Team:

Travis Xu, Mohamed Awadallah, Pauline Dongrazi, Bob Singh (Manager Technology Development, Hydro One)



RESEARCH HIGHLIGHTS

Consumer-generated energy conservation

Given the proliferation of high-rise condos and skyscrapers in Toronto, this project aims to understand and rectify the wasteful use of energy in multi-unit residential buildings, as well as inform better design and management practices. This project will develop a practical methodology to improve our understanding of energy use by combining occupant feedback from questionnaires with suite-level energy data. By collecting bulk building energy data from pilot buildings, the project will also contribute to both a set of benchmarks and a system of making relevant comparisons between buildings.

What problem is being solved?

- Managing energy consumption in multi-unit residential buildings.
- Profligate energy use.
- Significant discrepancies between predicted energy performance and resulting carbon emissions of buildings and their measured performance.

Practical applications:

- Provide designers, managers and consumers with an idea of where both inefficient and efficient energy use is taking place.
- Understanding of real building energy performance and occupants' impact on this.
- Allows targeted programs to reduce energy use based on occupant behaviour.
- Benchmarks can provide a method of comparison between similar buildings and highlight best practices.

Project Sponsor:



Name of Project:

Building performance assessment using occupant questionnaires and energy data

Timeline:

October 2013 – December 2014

Research Focus:

Efficiency and Conservation

Principal Investigator:

Mark Gorgolewski

Research Team:

Craig Brown, Moe Otsubo



RESEARCH HIGHLIGHTS

Fast-tracking electric vehicles

The automotive industry is making important progress in electrified transportation. Plug-in hybrid electric vehicles (PHEVs) and other types of electric vehicles currently on the market offer a clean and environmentally friendly alternative to conventional vehicles. But because of limited range, long charging times and the challenges of integrating them into urban grids, there has been a lukewarm reception from consumers. The rapid-charging technologies being developed at CUE have great commercial potential, benefiting Toronto Hydro and the Canadian economy, as well as jump-starting the widespread adoption of electric vehicles.

What problem is being solved?

- Limited range capacity of PHEVs.
- Long charging times.
- Lack of charging stations.

Practical applications:

- High-efficiency, cost-effective and faster chargers.
- A novel charging station configuration employing a bipolar DC grid.
- Charging stations incorporating batteries and renewable energy systems.
- Optimal power management controls using onboard batteries in vehicles.

Project Sponsor:



Name of Project:

Plug-in hybrid electric vehicle charging station for urban energy systems

Timeline:

January 2011 – December 2014

Research Focus:

Electric Vehicles

Principal Investigator:

Bin Wu

Research Team:

Sebastián Rivera Iunnissi, Venkata Yaramasu, Jiacheng Wang

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“ The Centre for Urban Energy is at the forefront of energy research in Canada providing real-world solutions to real-world problems. Partnering with leading corporations in the field, the centre’s interdisciplinary work on smart grid, alternative energy sources and intelligent buildings is internationally recognized. ”

— Wendy Cukier, Vice-President, Research and Innovation, Ryerson University

STUDENT RESEARCH AWARDS

These awards recognize graduate and undergraduate students from a variety of programs who have shown excellence in a capstone project related to energy. Projects serve as a great experiential learning tool as students are given the opportunity to solve real-world industry problems. They must identify a problem, carry out the research and design, and demonstrate results.

The awards are presented twice a year and made possible by our generous sponsors Toronto Hydro and Hydro One.

Toronto Hydro Student Research Awards 2013

Presented in November 2013

Student	Program	Project
Nabila Alibhai	Architectural Science	Establishing the Toronto 2030 district
Craig Brown	Environmental Applied Science and Management	Developing a multi-tool building performance protocol for six Canadian green buildings
Apparao Dekka	Electrical and Computer Engineering	Grid tied converter with power quality improvement features for renewable energy sources
Faizul Hasan	Civil Engineering	Developing a decision support framework for evaluation of pumped energy storage in Ontario
Raghad Kamel	Mechanical and Industrial Engineering	Performance analysis of roof-integrated photovoltaic/thermal system and air-source heat pump
Cassandra Kani-Sanchez	Building Science	Heat recovery variable refrigerant flow system validation for a sustainable building in a cold climate
Moe Otsubo	Architectural Science	Investigation of the performance gap of a semi-detached residential building in Canada
Freddy Paya	Civil Engineering	Comparison of solar radiation tools for rooftops solar potential analysis
Subrata Saha	Mechanical and Industrial Engineering	Grain refinement of AZ91E alloy using zinc oxide
Kevin Trinh	Mechanical Engineering	Pilot study of energy use and comfort feedback response

Hydro One Capstone Research Awards 2013/2014

Presented in April 2014 to fourth-year students from the Department of Electrical and Computer Engineering

Students	Project
Saleheen Nur Khan, Shams Tabriz, Shimul Yousuf	Battery testing
Manish Rathore, Muhammad Anwar, Palak Sharm	Implement an intelligent meter
Ali Naji, George Karram, Kamyar Ammar-Saidi	Inverter for microgrid
Niloufar Kianirad, Yacob Nur, Dulitha Jayasinghe	Low-energy UPS with an integral transfer switch
Kashish Sood, Sukhdeep Sidhu, Amareet Kaur	Micro-inverter for PV systems
Sanketkumar Patel, Vatsal Patel, Chintan Patel	Programmable fault switch
Pouyan Fazeli-Ilkhechi, Bahareh Goldar, James White	Smart socket
Mohammad Haseeb Butt, Anam Khalid, Syed Haris Khaliq	Switched-mode power amplifier
Matthew Joaquim, Pedram Mohammadi, Sina Tahsini Araghi	Testing inverters
Hamidreza Khuey Torabzadeh, Babak Ghodrati, Mandana Khazrai	Wireless power transfer

CERTIFICATE IN ENERGY MANAGEMENT AND INNOVATION

In the energy sector, for every two people retiring from the workforce, there is only one joining. This is not sustainable, particularly in a sector that is growing rapidly. This certificate program provides adult learners with an opportunity to acquire a level of knowledge and expertise that will permit them to contribute effectively to energy management, conservation, sustainability and public policy governing this regulated sector; and to energy innovation, entrepreneurship, and the challenges and opportunities for developing new energy technologies and business enterprises.

The program was developed in cooperation with the G. Raymond Chang School of Continuing Education. In 2013, students benefited from guest lecturers including Marzio Pozzuoli, founder of RuggedCom, Chris Reid, CEO at Energent, and Gary Thompson, lead, Generation Planning and System Studies at Toronto Hydro. A distance education version of the course is available online and there also plans to launch customized executive courses.

Who should register?

Individuals seeking to expand their expertise, change or advance their careers in the energy sector and those seeking professional development leading to management and leadership roles.

Admission requirements

Mature student status and evidence of relevant college or university level coursework or mature student status together with relevant industrial or professional experience.

Certificate requirements

The successful completion of six courses with a cumulative grade point average of 2.00 or higher.

Required courses

CKEI 100 Energy Innovation and Entrepreneurship

This course explores drivers for innovation in Ontario's energy sector, the opportunities for new business, and the challenges of moving from the idea stage to the marketplace.

CKEI 110 Energy Conservation: Emerging Trends

This course explores the technical and policy dimensions of energy conservation, energy efficiency and demand response, with particular focus on potential contributions to sustainability of urban energy systems.

CKEI 120 Energy and the Public Policy Debate in Canada

This course introduces students to the wide range of factors that influence the development and implementation of energy policy in Canada.

CKEI 130 An Introduction to Smart Grid

This course examines the challenges of modernizing and digitizing the electrical grid in Ontario. It explores the engineering and technological challenges of the smart grid and issues of privacy and security.

Students select a total of two electives:

- CKEI 140 Current Topics in Energy Management and Innovation
- CECN 510 Environmental Economics
- CKES 190 Renewable Energy and Green Technology
- CKPM 202 Fundamentals of Project Management
- CKSS 100 Fundamentals in Sustainability I

Learn more: ryerson.ca/ce/energy





“ This course provides an interesting overview of the political and environmental changes that are driving the need for new technologies in the sector. Guest lecturers from across the industry provide valuable insight into how the energy sector got to where it is today. ”

— JoAnne Hosick, Engineer/Technical Officer, System Performance, IESO

“ With the sharing of knowledge and experience by several guest speakers from the industry, I gained understanding of the challenges that an innovative leader or entrepreneur will face. This course is inspiring and stimulated my interest in energy innovation; I strongly believe that many others will benefit from this certificate program in the coming years. ”



— Siu Ming Edward Mok, Professional Engineer

iCUE

The Innovation Centre for Urban Energy (iCUE) marked its first anniversary in November 2013. iCUE has had a remarkable first 12 months, growing to include six energy startups and celebrating its first graduate – DanTeb Enterprises. Another example of Ryerson University’s unique experiential “zone learning” model, the iCUE is an incubator and accelerator focused on innovation and entrepreneurship. Its goal is to help new energy companies turn their ideas into viable commercial products, services and technologies. Instead of a co-op model where students work for someone else, it provides them with opportunities for collaboration and gives them the support and mentorship they need to start their own successful company. This also provides social and economic value to the Canadian economy.

There are numerous benefits to being part of the iCUE, including access to the wider Ryerson “zone learning” community and weekly office hours with Marzio Pozzuoli, entrepreneur-in-residence and the founder of RuggedCom, which was sold to Siemens in 2012 for \$440 million.

The iCUE is open to anyone with a unique idea. Prospective energy entrepreneurs should contact Dan McGillivray at dan.mcgillivray@ryerson.ca.

Current Enterprises



A student-led not-for-profit, EnergySavers helps Torontonians cut their energy bills by empowering and educating them on the value of conservation and performing energy-saving home retrofits. nrgsavers.ca



By providing free air for commuters and CO2 savings reports, En-Tire Savings’ mission is to reduce greenhouse gas emissions within the transportation sector, lower fuel cost and consumption, and raise environmental awareness amongst the public. en-tiresavings.com



Grid Resources’ technology connects buildings to leverage each structure’s heating and power systems and optimize energy savings, unlocking new economic value in distributed energy for its clients. gridresources.ca



A not-for-profit organization helping consumers make the switch from gas to electric vehicles, Plug’n Drive works with electricity companies, automakers, government, researchers and commercial partners to deliver on three programs: education, home infrastructure and public infrastructure. plugndrive.ca



Truly Local is a group of dedicated and adaptive urban farmers committed to enabling people to grow their own food inside or out using nutrient-enriched soil or energy-efficient technology such as hydroponics or aquaponics - and lowering their carbon footprint in the process. trulylocal.ca

Rigel Scientific Research has an innovative proprietary design for a renewable energy storage system and the company is currently seeking an industry partner to help commercialize it. Recent focus has been on completing detailed design documentation and software to support prototype construction and testing.



“ The iCUE played an integral role in supporting DanTeb through the process of building our own ‘Made in Canada’ product. We met some of our suppliers through the iCUE network, who we are still partnered with today, and it was a great place for idea sharing and learning from mentors such as Marzio Pozzuoli. ”

— Laura Miller, Co-Founder, DanTeb Enterprises

AN iCUE SUCCESS STORY

DanTeb Enterprises was one of the very first startups to incubate at the iCUE and has gone from strength to strength since graduation. The company creates cell phone charging stations that can be placed in high-traffic public places where people may not have access to their own phone charger. Catering to every smartphone and tablet imaginable, a typical charging session lasts 10 minutes and during that time users are able to interact with the digital media components of the stations or simply continue to use their phone while it powers up. All of the charging stations are made in Canada and run off DanTeb’s own operating system.

DanTeb’s client list includes Best Buy, VitaminWater, Rogers, Fido, TELUS and Metro Newspapers. Stations can be found

across Canada in shopping malls, convention centres, university campuses, restaurants and bars.

2014 is gearing up to be a very exciting year. In partnership with Samsung, DanTeb has become the exclusive charging station provider of the Sochi 2014 Olympic Winter Games. The company also plans to launch a new mini charging station, build a larger distribution base and grow its talented team.



OUTREACH

CUE worked with numerous academic, public and private sector organizations in 2013 to inspire the next generation of energy sector workers and entrepreneurs by providing opportunities for education and collaboration. We also opened our doors and allowed the general public to see the cutting edge research being carried out at CUE, learn about its practical applications and meet our researchers and students.



Roundtables



Student Award Ceremonies



Events and Conferences



Technical Seminars



Open House



Tours



Speaking Engagements



Student Info Sessions

Highlights of CUE's 2013 schedule:

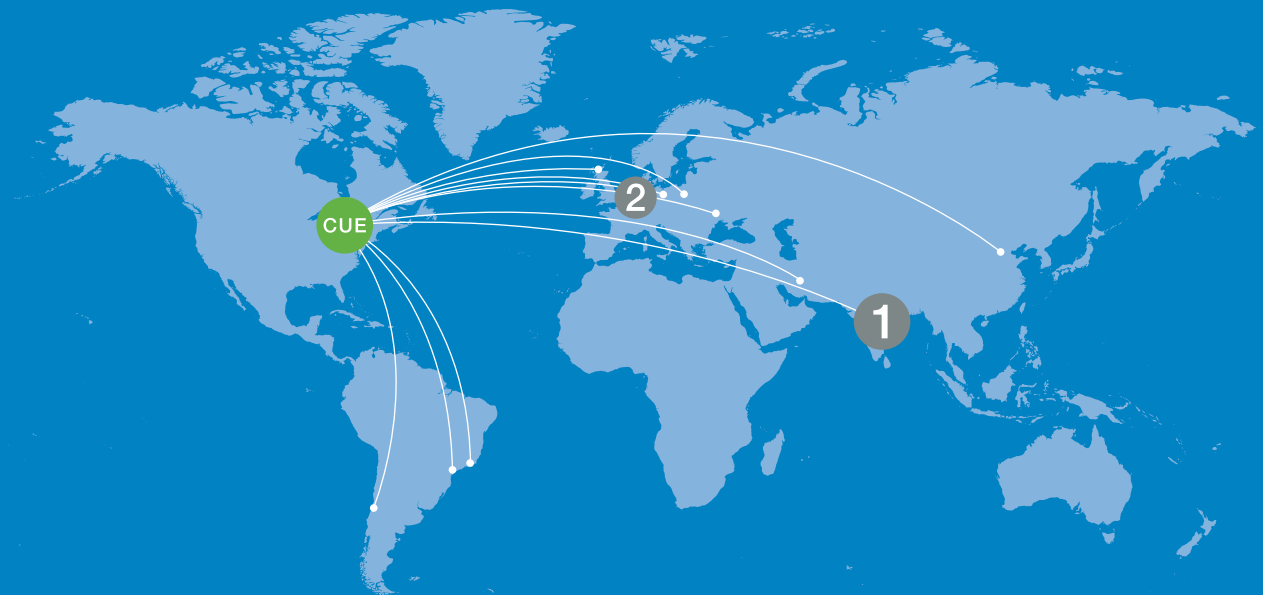
January	Expert panel discussion on community energy planning in partnership with York University Lecture by Gord Miller, Ontario's environmental commissioner: <i>Taking the Big Step to a Smart Grid</i>
February	Exclusive screening of the documentary film <i>Switch</i> followed by panel discussion The Globe and Mail's Shawn McCarthy and the Toronto Star's John Spears discuss why energy issues matter to Canadians
March	Information session with support and resources for Ryerson students looking for a career in energy
May	Ontario Centres of Excellence Discovery Day focuses on innovation
June	Roundtable tackles <i>Innovation and the Regulator</i>
July	Ontario Energy Minister Bob Chiarelli announces his Conservation First strategy during a visit to CUE iCUE's Plug'n Drive takes over Yonge-Dundas Square for Electric Vehicle Day
September	Ontario Deputy Minister Paul Genest tours CUE, meeting with graduate students and researchers A series of technical seminars exploring smart grids gets underway in partnership with the IEEE
November	Hydro One Distinguished Research Fellow Sean Conway delivers opening keynote at Electricity HR Conference Lecture and Q&A with bestselling author Chris Turner examines the German <i>Energiewende</i> Guest lecture on entrepreneurial success by Marzio Pozzuoli, founder of RuggedCom Executive Director Dan McGillivray curates the APPRO 2013 Technical Conference Academic Director Bala Venkatesh gives an inspiring talk at TEDxRyersonU



M. Rajaram, vice-chancellor, Anna University (right) meets with Sheldon Levy, president, Ryerson University to discuss existing and future partnerships between Ryerson and the Chennai, India university in October 2013.

GLOBAL REACH

Being a global leader has always been at the heart of CUE's mission and in 2013 we continued to cultivate partnerships with leading technical institutions and work with the brightest and best researchers and graduate students from around the world.



1. Chennai, India

Spearheaded by President Levy, Ryerson founded a joint research and innovation centre devoted to India's emerging urban energy challenges in August 2011: The Anna University — Ryerson University Urban Energy Centre.

Since then, 12 undergraduate and graduate students from Anna University have arrived at CUE for 45-day sponsored

internships. They have worked on various research projects including solar potential in urban design, reliability analysis of power generating systems, nano materials for solar cell applications and bidirectional power flow control in smart grids.

In September 2013, students at Anna University began CUE's inaugural two-year master's program in Power Engineering and Management, a graduate

program that is provincially recognized and approved by the Tamil Nadu government. In its first year, the program is over-subscribed and has admitted 20 students, six of whom will visit Ryerson on exchange in summer 2014.

The Anna University — Ryerson University Urban Energy Centre has signed a Memorandum of Understanding with the provincial utility, Tamil Nadu Generation

and Distribution Corporation, for undertaking utility-relevant research and development projects.

2. Twente, Netherlands

Hydro One Visiting Research Fellow Angele Reinders is professor of Energy-Efficient Design at Delft University of Technology and associate professor, Faculty of Engineering Technology at University of Twente.



WHAT'S NEXT

2014 promises to be a landmark year for the Centre for Urban Energy as several major initiatives get under way:

Schneider Electric Smart Grid Lab

CUE will build a state-of-the-art smart grid laboratory in partnership with Schneider Electric and the Ministry of Energy. The smart grid lab will be the first of its kind in a university setting anywhere in Canada and will be a collaborative facility for research, development and testing of algorithms, products and systems for Ontario institutions.

Large-Scale Battery

In partnership with Electrovaya, Ontario Power Authority, Hydro One, Toronto Hydro and Ontario Centres of Excellence, CUE will investigate the operational flexibility of a large 1 MWh bank of lithium-ion polymer batteries for short-term energy storage and power regulation. The project will be housed in a 40-foot container and located in an urban parking lot. This project will showcase next-generation energy solutions created here in Ontario.

Energy Storage Network

A new working group will engage stakeholders from the energy industry, researchers and government. They will bring together ideas, resources and expertise to address the challenges that need to be overcome and accelerate the research and development required for energy storage technologies to reach the global market place.



Stay up to date with CUE activities in 2014:

Sign up for our monthly email newsletter at ryerson.ca/cue



“ As we move towards a new era of intelligent energy management, it is increasingly important to continue learning about the ways smart grids are able to transform energy use. Ryerson University is a Canadian leader in education and innovation and we are excited to work with them in this area. ”

— Daniel Péloquin, President, Schneider Electric Canada



Centre for Urban Energy
Energizing the Future

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Paper Performance:

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5 trees	18,934 L of water 54 days of water consumption	232 kg of waste 5 waste containers	763 kg CO2 5,101 km driven	5 GJ 21,041 60W light bulbs for one hour	1 kg NOX emissions of one truck during 3 days



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