Centre for Urban Energy
Clean Energy EXPO 2026

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Introduction

The 2026 Clean Energy Expo was held in-person on the 14th of May 2026 at Toronto Metropolitan University's (TMU) Centre for Urban Energy (CUE). The event brought together students, researchers, faculty members, and industry professionals to discuss the changing future of the electricity sector. The intention of the expo is to highlight the growing importance of clean energy, smart grids, electrification, energy innovation, and collaboration between universities and industry. The event also included opportunities for attendees to engage with CUE research activities through an interactive student poster session and guided lab tours.

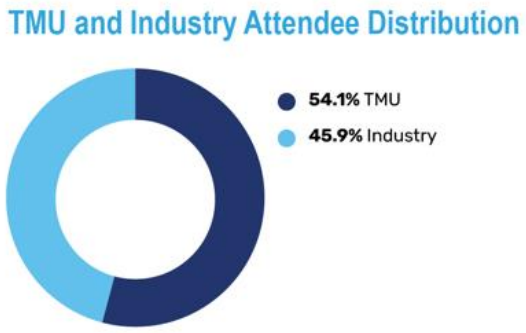

Figure 1 Attendee data

Figure 2 Poster session

TMU's dean of the Faculty of Engineering and Architectural Science, Dr. Sri Krishnan, started by welcoming all the participants and outlining the program structure, which featured two invited presentations, a poster session, lab tours, and lunch. In his address, Dr. Krishnan emphasized TMU's growing capacity in engineering and interdisciplinary research, noting that clean energy, smart grids, nuclear development, small modular reactors, AI-driven energy demand, and data-centre electricity consumption are creating crucial research and industry challenges. He stressed that TMU has the human capital and institutional strength to contribute meaningfully to these challenges through targeted faculty hiring, research chairs, and stronger engagement with the clean energy sector.

A major theme of the Dean's remarks was the importance of turning research into tangible societal impact, highlighting that CUE's work is not only about research, but also about partnerships, innovation, student projects, and real-world outcomes. He particularly emphasized that while universities often have strong technical solution capabilities in areas such as AI, analytics, modeling, digital technologies, and digital twins, the key challenge lies in clearly defining the right industry

Figure 3 Tour of the Schneider Electric Smart Grid Lab

Figure 4 Welcome by Dr. Sri Krishnan

problems. Therefore, collaboration with industry partners is essential for formulating practical problems that engineers and researchers can solve effectively, as industry partners help identify practical challenges while universities contribute research strength, student talent, and technical innovation.

The organizers also acknowledged the contributions of Dr. Bala Venkatesh and the CUE team in coordinating the event. The expo highlighted CUE's vital role as a bridge connecting academic research with real industry needs, creating a space where students, researchers, utilities, consultants, and technology partners can engage with current challenges in grid modernization, electrification, smart charging, energy storage, and customer-side flexibility. This connection between research and practice is important because many of today's energy challenges require both technical knowledge and industry experience.

Session 1: Trends in the Electricity System

Theodore Lyberogiannis, P.Eng, M.Eng, LLM, MBA, Director of Integration, Reliability & Emergency Management at Hydro One, delivered this first presentation focusing on major trends shaping the electricity system in Ontario.

Question: What are the major trends and challenges shaping the future electricity system?
It was emphasized that the electricity sector has become much more dynamic than it was two decades ago, transitioning from a slow-moving infrastructure field to one of the central sectors supporting economic growth, decarbonization, digital infrastructure, transportation, and daily life. It was highlighted that electricity infrastructure is not only about keeping lights on, but also about enabling economic activity and public services, as shown by the example of a new Transmission Station supporting critical loads in downtown Toronto.

Key areas that were discussed are below.

Balancing reliability, affordability, and decarbonization
Discussed was the critical challenge of balancing three major goals: reliability, affordability, and decarbonization, which are often in tension with one another. It was noted that while Ontario's coal phase-out and clean-grid progress were major achievements, decarbonization decisions can affect electricity costs, while reliability improvements require stronger infrastructure and new technological investments. Affordability remains a central concern for customers, utilities, and policymakers.

Strong electricity demand growth and workforce challenges
Lyberogiannis identified demand growth as one of the clearest trends facing the sector, with projections showing that Ontario's electricity demand could increase substantially by 2050. Future demand growth will be driven heavily by population growth, electric vehicles, building electrification, heat pumps, and the rapid expansion of AI data centres. It was stressed that meeting this demand is not only a physical infrastructure challenge involving stations, lines, and generation, but also a

workforce challenge requiring trained professionals, field staff, and technical expertise to plan, build, operate, and maintain the system.

Transmission expansion and diversified supply mix

The need for transmission expansion and a diversified supply was focused upon. Hydro One is planning multiple transmission projects to support future demand growth, and emphasis was placed on working with Indigenous communities as true partners in these infrastructure developments. Additionally, the increasing role of supply diversity—including nuclear, hydro, natural gas, renewables, and energy storage—was highlighted as essential for maintaining system reliability and flexibility as the grid evolves.

Figure 5 Theodore Lyberogiannis

Distribution utility consolidation

The presentation addressed local distribution company consolidation in Ontario. It was explained that while smaller utilities provide strong local representation, they often face challenges related to scale, staffing, modernization, and large capital investments. Consolidation can help utilities manage costs, improve technical and financial capacity, and modernize infrastructure, though it also raises broader questions about local control, service, regulation, and long-term system planning.

Reliability, customer choice, and behind-the-meter batteries

Reliability and customer choice were central parts of the discussion, reflecting how customers increasingly expect reliable service, better information, and more control over electricity use. An example involved the deployment of behind-the-meter battery systems, such as Tesla Powerwalls, to improve reliability for remote or hard-to-serve customers. Instead of building expensive second supply lines, battery backup systems provide a more cost-effective way to reduce outage impacts for customers experiencing long annual outage durations.

Smart meters 2.0 and advanced metering infrastructure


Figure 6 Audience during Q&A session

The growing use of smart meters and advanced metering infrastructure was identified as a major trend. It was explained that Smart Meter 2.0 technologies support load disaggregation, allowing utilities and customers to understand not only how much electricity is being used, but also what specific types of devices are contributing to consumption. This information can support better customer decisions, improved asset utilization, and more efficient grid operation during the energy transition.

In conclusion, the presentation demonstrated that Ontario's electricity system is entering a period of major transformation, where meeting future needs will require infrastructure investment, better use of existing assets, new technologies, customer participation, and long-term planning.

Session 2: Benefits of Smart EV Charging

Tom Chapman, Principal at The Brattle Group, delivered the second presentation, which focused on the economic and grid benefits of smart electric vehicle charging.

Question: How can smart EV charging and emerging technologies unlock real grid savings?
It was argued that electric vehicles should be treated as a serious grid-planning opportunity rather than a side issue, as they represent mobile energy resources with large batteries that can potentially support the power system. Building on the previous presentation, it was discussed how Ontario faces similar challenges related to rising electricity demand, affordability, decarbonization, and grid infrastructure needs.

Key areas that were discussed are below.

EV batteries as underused energy assets
A key point of the presentation was that EV batteries represent a major underused energy asset. While EVs are purchased primarily for transportation, their batteries contain enough energy to supply a home for several days. Since the battery cost is already being paid by the vehicle owner, using a portion of this capacity for grid services can create significant economic value from assets already sitting in driveways. It was shown that if a mere 7.5% of installed EV capacity is utilized, it unlocks immense flexibility. Traditional infrastructure upgrades like generation plants, transformers, switchgear, and distribution networks are very expensive due to rising equipment costs, whereas enabling EV participation requires much lower incremental investment if appropriate monitoring, communication, and charging infrastructure are in place.

Virtual power plants and peak demand support
The use of EVs as part of a virtual power plant (VPP) was discussed as a major use case. Aggregated EV batteries could support the grid during limited high-value hours each year, especially during peak demand periods. It was clarified that EV-based virtual power plants would not replace baseload resources such as nuclear or hydro but could complement the system by acting as an alternative or supporting capacity resource during peak periods.

Coordination with building electrification and heat pumps

Figure 7 Tom Chapman

The presentation connected EV charging with building electrification and heat pumps. It was noted that heat pumps are important for reducing dependence on natural gas, but they can significantly increase winter and local peak electricity demand, creating critical planning concerns. In this context, smart bidirectional EV charging could help reduce peak stress on the grid by charging and discharging in a coordinated way, helping defer expensive distribution and transmission upgrades while still supporting electrification.

Actively managed charging vs. unmanaged load

Another major focus was the implementation of actively managed EV charging. It was explained that unmanaged charging or poorly designed time-of-use rates can create new distribution-system peaks if many customers charge at the same time, causing stress on local feeders and transformers. While basic time-of-use pricing shifts behaviour, it may not align with local grid needs. By contrast, actively managed charging allows utilities to coordinate charging to avoid local network constraints without reducing the customer's transportation value. A study found that active charging management allows networks to host more EVs, defer upgrades, improve operational flexibility, and generate significant cost savings when scaled across many vehicles.

Market design, value stacking, and customer trust

It was emphasized that unlocking these stacked benefits requires progressive market design, utility incentives, regulatory support, data access, and technology deployment. The presentation highlighted the importance of value stacking, where smart EV charging creates benefits across several levels, including customer bills, local distribution networks, wholesale electricity markets, and long-term system planning. Capturing these benefits requires new tools, better data, and clear roles for utilities, technology providers, regulators, and customers, while maintaining attention to customer privacy, transparency, and trust. Chapman also introduced Elocity as a Canadian smart EV charging technology company connected to CUE's innovation ecosystem, demonstrating how research, entrepreneurship, and industry collaboration support practical clean energy solutions.

Conclusion

The Clean Energy Expo provided a comprehensive examination of pivotal subjects related to the future of Ontario's electricity system. Key discussions encompassed topics such as the balancing of reliability, affordability, and decarbonization amid strong electricity demand growth and workforce evolution. Additionally, the sessions delved into significant aspects like transmission expansion, local distribution utility consolidation, supply mix diversity, and how smart EV charging can turn new electricity demand into a flexible energy resource to unlock grid savings and flexibility. These dialogues yielded valuable insights and knowledge essential for shaping the energy systems of the future.

The event reinforced a shared message that the future grid must become more flexible, intelligent, and coordinated by using existing assets more effectively, improving visibility across the grid, coordinating distributed energy resources, and leveraging advanced digital tools like smart meters, EV charging platforms, distributed energy resource management systems, and advanced modeling tools. However, the implementation of these tools must carefully prioritize customer privacy, transparency, and trust.

Figure 8 Drs. Sri Krishnan and Bala Venkatesh

The organizers and the CUE team expressed their gratitude to the guest presenters for their valuable insights and extended appreciation to the engaged audience. The Expo proved to be a significant platform for knowledge exchange and collaboration, paving the way for innovative solutions and advancements in the energy sector. The event's overarching themes emphasized that the clean energy transition is not only a technical challenge, but also an economic, institutional, and collaborative one that requires ongoing coordination among universities, utilities, regulators, technology companies, students, and customers to build a cleaner, smarter, and more reliable energy future.