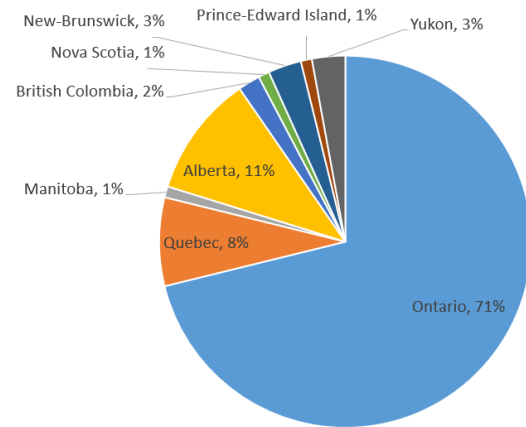
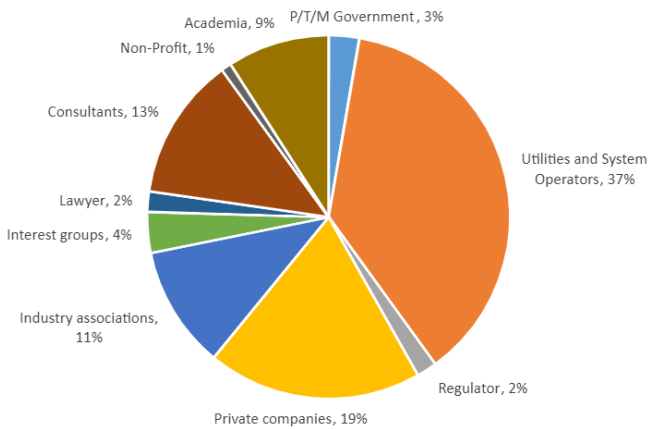


NRCan OERD Smart Grid Symposium
April 9-10, 2024
Ottawa, ON

Summary

Event statistics:

- Approximately 130 attendees
- Sectors represented include provincial, territorial, and municipal electricity utilities, electricity system operators, provincial and federal government, energy regulators, private sector utilities and private sector organizations.
- Representation from 9 provinces and territories.
- Federal agencies including Natural Resources Canada, Environment and Climate Change Canada, Global Affairs Canada, Canada Energy Regulator, Canadian Commercial Corporation, Transport Canada, Privy Council Office.



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Event summary:

- NRCan delivered a results analysis presentation that summarized the findings from the Smart Grid Program (SGP 1.0) portfolio, including a list of projects, categories of solutions tested, key achievements for the portfolio, achievements on a solution basis grouped by technology, business and institutional innovations, recipes for successful innovation projects, and finally, future innovation challenges.
- The Symposium agenda was constructed from the common threads and lessons learned from the Smart Grid program portfolio of demonstration projects. Summaries of panel discussions are included below.
- Common themes included:
 - The distribution system is evolving rapidly from a one-way power flow, passive, centralized model to a two-way, active, decentralized model. The stage is being set for distribution system operator functionalities to emerge and grow.
 - The customer is central to the transition. Customer affordability, engagement, education, performance, and experience are key considerations for system operators.
 - *Financing* the transition will require *new business models and possibly regulatory/legislative changes* to support and incentivize investments in novel solutions.
 - *Standards development* and participating in standards development are both critical to accelerated and safe scale-up of technology solutions, and requires everyone in the industry to put their heads together.
 - *Workforce training and capacity building* are essential – the skillsets of yesterday may not be the skillsets of tomorrow. We must support skill development ASAP. This is true for all actors (utilities, regulators, solution providers, academia, etc.)
 - Current electricity system actors are being asked to deliver new services in new ways – all actors require *new tools* to evaluate innovative solutions effectively and efficiently.
 - *Change management* is hard.
 - *Strategic application of innovation* can support discovery and implementation of enhanced solutions that benefit the system and customers, if the right information is collected by the right people in the right way and sent to the right people who have the right tools to study this information.

NRCan's presentations are available via NRCan's [Clean Growth Collaboration Community](#). Please note that this website requires a free user account before you can download files. There you will find NRCan presentations as well as a summary of the event. These files are public and sharing is not restricted.

Summaries of sessions:

- *Regulatory innovation:*
 - The panel discussed modernizing the grid through innovation in technology, business and regulatory approaches, with examples from their respective projects in ON and NS. Recommendations were to engage stakeholders, especially regulators, early and often.
 - The Nova Scotia Utility and Review Board (NSUARB) was very involved during the project as a regulator. The Board asked NSP to develop an innovation justification criteria (IJC) to support capital expenditure planning related to this project. The IJC charted a

regulatory pathway for innovation where it did not previously exist. This document now sets the standard by which projects are justified and evaluated by the Board.

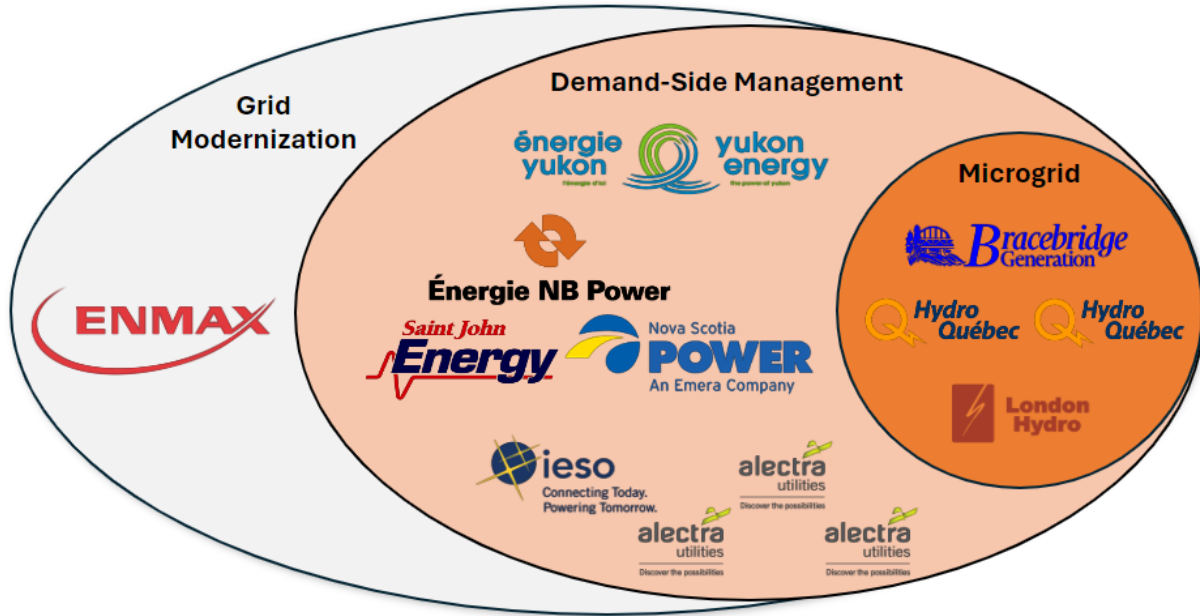
- *Dependability of customer-owned assets as grid resources:*
 - The panel discussed how to design effective demand response programs to manage the electricity grid and engage customers. They emphasized the importance of simplicity, large economic incentives, as well as resource firmness and dependability. They highlighted the need for continued testing and learning to optimize demand response programs for the benefit of utilities and customers. Speakers highlighted the importance of addressing energy affordability and inclusivity in the energy transition. Speakers emphasized the need for coordination between different levels of the grid, particularly in areas with high growth, and the importance of mechanisms that can provide granular price signals and services. Speakers discussed the need for a robust framework to support the development of demand response services in the electricity sector. Take-home message was the need to understand customer preferences and behaviour.
- *The Rapidly Changing Distribution Grid: Advanced metering, DERs, Privacy and Security:*
 - The panel discussed data ownership in the energy sector, with emphasis on the need for trust between utilities and customers. Smart readers have a significant role in the improvement of grid management, if informed by customer insights. As such, data privacy, management, and ownership conversations continue to grow in this domain. The speakers highlighted the importance of leveraging investments in AMI infrastructure, multi-purpose applications, and communication modules within each meter. They stressed the need for careful consideration of data privacy and security and underscored the significance of a web-facing perspective for the future of smart metering and grid management.
- *Bringing it all together: Integration and coordination of technologies, functionalities, capabilities – Roadmaps to Grid Modernization:*
 - The panel emphasized the notion that grid modernization considers non-wire solutions, resiliency, control, and intelligent operations. Standardization and interoperability are crucial in the electric vehicle and grid modernization industry, with challenges and potential solutions related to AI and machine learning. Speakers on the panel emphasized the importance of responsible growth plans and strategic investment planning, cost-effectiveness, change management, and collaboration to support grid modernization. The panel highlighted the parallels between the digitalization of the electricity system and the telecom industry in the 1990s, and emphasized the need to recognize the sector is in a “disrupt or be disrupted” era.
- *Microgrids – A path to net zero communities and affordable electricity?:*
 - The panel focused on why each organization chose microgrids as a solution, the crucial role of community engagement, partnership and leadership in microgrid design and deployment, some of the technical achievements from the microgrid projects (seamless planned islanding, operation of a microgrid on 100% renewables). The success of both projects led to significant interest from other communities in replicating this model, however the current challenge lies in the business case – these

projects were both demonstrations made possible with financial support, so the question for scale up is on how to make the economics work standalone.

- *Smart Energy Utility Benchmarking Project:*
 - This initiative tracks utility investments and capabilities in smart grid systems. The scorecard framework is based on three pillars: clean energy supply, modern grid, and customers and society. The scorecard enables benchmarking across the utility sector that stimulates conversations around no-regret investments, helps justify expenditures, and enables strategic long-term investment planning.
- *Future of Smart Grid:*
 - CanmetENERGY Varennes (CEV), the Federal lab within NRCan that leads renewable energy and smart grid research, provided context on the current and future landscape for renewable energy integration across Canada, and the role that smart grids, distributed energy resources, and other innovative technologies will play in enabling net zero targets. CEV profiled their organizational structure, their research program and the research activities they conduct within these functional areas.
- *Energy Innovation Program: Updates and Mission Innovation Opportunity:*
 - NRCan outlined how the Mission Innovation: Green-Powered Future Mission (GPFM) is an international collaborative program across countries to demonstrate the ability to integrate 100% VRE by 2030. For one project successful in the Smart Grid Demonstration Call – NRCan is offering an International Collaboration Grant to support that project’s international engagement with the Mission Innovation GPFM Community, as Canada’s contribution to the 5 demos in 5 continents project. The selected project would receive additional grant funding (up to \$150,000).
- *Exploring the Benefits of Smart Grid and Non-Wires Solutions:*
 - The panel spoke to some of the pilot projects and regulatory initiatives that help us to better understand the value proposition of non-wires solutions compared to traditional infrastructure. Hydro Ottawa highlighted their customer engagement efforts, EV Everywhere project, retrofit program. Yukon Energy spoke to their demand-side management program and the unique context and challenges to operating an isolated grid with a small rate base in the North. The OEB spoke to how they are looking at the issue of non-wires solutions costs and benefit, their Innovation Sandbox, their new Cost-Benefit Analysis Framework. They have a statutory obligation to facilitate innovation.
- *Business models to support an active distribution grid:*
 - The panel envisioned the business model(s) of the future for electricity system actors to incorporate DERs and meet net zero targets. The panel reflected on projects from each of the panelists and discussed opportunities and challenges to current and new business models, and the drivers behind them. Creating a sustainable business model(s) requires policy innovation and certainty.
- *Persistent Innovation Challenges:*
 - The panel discussed the key challenges they are currently facing, examples include managing EV charging, integrating multiple product types, multiple communications

- protocols. All panelists emphasized the need for more standardization to simplify integration and dispatch – it reduces time and cost, and improves quality of service.
- *Fireside Chat: Pathways to Net Zero and the Role of the Distribution System:*
 - The panel deliberated on the types of question each panelist is trying to answer related to pathways to net zero. Modelling provides independent analysis to decision makers to supplement other information, and modelling that is published publicly helps smaller actors such as municipalities who do not have the budgets to perform these analyses on their own to get the information they need. An analogy was made to how there remains great murkiness (uncertainty) in the pathways to net zero, with many potential obstacles, and how sector collaboration is essential to illuminate the options, avoid obstacles, and chart paths forward.

APPENDIX A: Smart Grid Program Demonstration projects



More information at the Smart Grid Program website: <https://www.nrcan.gc.ca/SmartGridProgram>

APPENDIX B: Smart Grid Symposium Agenda

Day 1: Celebrating Achievements and Learnings from the 2018 Smart Grid Program

Time (EST)	Topic	Speakers
8:00 AM	Registration	
8:20 AM	Welcome	Jennifer Hiscock Director - Electricity, Transportation and Buildings Innovation Office of Energy Research and Development (OERD) Natural Resources Canada (NRCAN)
8:25 AM	Opening Prayer	Elder Verna
8:40 AM	Keynote Address: “Innovation Imperative in the Electricity Sector Transition” Introductory remarks to emphasize the pivotal role of innovation programs in the energy transition, NRCAN’s past achievements and future aspirations.	Amanda Wilson Director General Office of Energy Research & Development (OERD) Natural Resources Canada (NRCAN)
9:00 AM	Smart Grid 1.0 Results Analysis The Office of Energy Research and Development (OERD) will present a comprehensive analysis marking the culmination of the first Smart Grid Program, launched in 2018. This segment presents key performance indicators and summarizes key outcomes of the eleven innovative demonstration projects that are the cornerstone of this program. Slides are publicly available (EN, FR) via NRCAN’s Clean Growth Community (cleangrowthcommunity.ca)	Jason Ivall Science & Technology Advisor, Smart Grid NRCAN OERD
9:45 AM	Networking Break	
10:30 AM	Regulatory Innovation: Building on the lessons from the completed Smart Grid Program this panel explores the evolving regulatory landscape, how utilities are responding to changing grid needs and societal expectations, and the types of support that are needed to enable the rapid deployment of effective regulatory solutions.	Moderator: Bronwyn Lazowski, NRCAN OERD Panelists: Marjorie MacDonald, Lakeland Solutions Mark Peachey, Nova Scotia Power
11:15 AM	Dependability of customer-owned assets as grid resources: Learnings and future directions As the distribution grid – and customers – become an active part of the electricity system, what is the magnitude of the potential flexible resource to the system? How dependable are assets affected by human behaviour? This panel will consider both the utility and the customer perspective to explore the design factors and learnings from customer programs.	Moderator: Monica Gattinger, University of Ottawa Panelists: Brent Staeben, New Brunswick Power Ali Golriz, IESO Giselle de Grandis, Hydro One

Time (EST)	Topic	Speakers
12:00 PM	Networking Lunch	
1:30 PM	<p>The Rapidly Changing Distribution Grid – Advanced Metering, DERs, Privacy and Security</p> <p>This session delves into the evolution of smart meters from basic interval metering to advanced data applications in enabling Distributed Energy Resources (DERs). How are utilities integrating today’s AMI functionality and capability into their planning and control? Areas of discussion include cyber infrastructure and cybersecurity, interoperability challenges and Canadian case studies where smart meters demonstrate how AMI functionality provides value for customers. This also includes discussions around gathering data at a granular level, privacy issues and legal considerations around data storage.</p>	<p>Moderator: <i>Thomas Timmins, Gowling WLG</i></p> <p>Panelists: <i>James Douglas, Executive VP, Customer Experience, Alectra</i> <i>Martin Huang, VP, Strategic Projects and Initiatives, Hydro One</i> <i>Hussain Rizvi, VP Customer and Market Experience, Itron</i></p>
2:15 PM	<p>Bringing it all together: Integration and Coordination of Technologies, Functionalities, Capabilities – Roadmaps to Grid Modernization</p> <p>A modern power grid is different from the grid today. This requires integrating new technology for network visibility, control and also new grid participants and players. The electricity distribution area now requires a DSO – a Distribution System Operator with capabilities beyond poles and wires. Relevant questions in this panel include – what technology and capabilities are needed for the active distribution system of the future? How much can we achieve with existing solutions? What does the DSO business transformation look like?</p>	<p>Moderator: <i>Ted Wigdor, Electricity Distributors’ Association</i></p> <p>Panelists: <i>Glen Fillmore, Saint John Energy</i> <i>Hubert Sugeng, BluWave AI</i> <i>Juval Bothe, ENMAX</i></p>
3:15 PM	Networking Break	
4:00 PM	<p>Microgrids – A path to net-zero communities and affordable electricity?</p> <p>This is a guided interview session featuring presentations from two Smart Grid Program projects - Lac-Mégantic, QC and West 5, London, ON. Both projects feature microgrids and innovative use of renewable energy.</p>	<p>Moderator: <i>Jennifer Hiscock, NRCAN OERD</i></p> <p>Panelists: <i>Gary Stevens, s2e Technologies</i> <i>David-Olivier Goulet, Hydro-Quebec</i></p>
4:50 PM	Smart Energy Utility Benchmarking Project	<i>Jeff Mocha, Oakville Enterprises</i>
5:30 PM	Networking Reception	

Day 2: Innovating during an Energy Transition: Technologies, Markets, and Policies

Time (EST)	Topic	Speakers
8:30 AM	Welcome and recap of Day 1	Jennifer Hiscock Director - Electricity, Transportation and Buildings Innovation Office of Energy Research and Development (OERD) Natural Resources Canada (NRCan)
8:40 AM	Future of smart grid – CanmetENERGY Varennes CanmetENERGY in Varennes, located near Montreal, leads innovative science and research activities to develop and implement solution pathways for a sustainable energy future for Canadians. This presentation features highlights of smart grid research activity at CanmetENERGY Varennes.	Alexandre Prieur Director, Renewable Energy Integration NRCan CanmetENERGY Varennes
9:25 AM	Energy Innovation Program: Updates and Mission Innovation Opportunity Updates on the progress of funding calls, and support for international engagement.	Jason Gadoury Senior Director, Policy and Planning NRCan OERD
9:45 AM	Networking Break	
10:30 AM	Exploring the benefits of smart grid and non-wires solutions Non-wires solutions can provide benefits to the grid and to consumers, but determining the value of smart grid technologies and non wires solutions is a challenge. Deciding between traditional infrastructure and non-wires solutions requires an understanding of the costs of non-wires alternatives to traditional approaches. How can we leverage some of the innovative pilot projects that are happening in Canada to better understand the costs and benefits of NWSs?	Moderator: Rachele Levin, NRCan FS Panelists: Mima Micic, Ontario Energy Board Shane Labrash, Hydro Ottawa Eric Labrecque, Yukon Energy
11:15 AM	Business models to support an active distribution grid The transition to a modern distribution grid requires changes and those changes come with a cost. This panel explores innovative business models for the services that a smart grid creates. There is change on all sides, including the utility and electricity consumers. With the advent of virtual power plants, electricity service aggregation, and the growth of energy resources like electric vehicles – how does the utility business model change? What is the value proposition for the end customer? What market opportunities does the smart grid create? How do we pursue the mythical win-win solutions for the electricity system?	Moderator: Ahmed Hanafy, Dunsky Panelists: Geri Yin, Alectra Benoit Gratton, Gazifère Alex Simakov, Energy Storage Canada
12:00 PM	Networking Lunch	
1:30 PM	Persistent Innovation Challenges	Moderator:

Time (EST)	Topic	Speakers
	<p>A smart grid is only smart because of the technology it includes. That technology itself comes with several challenges. This panel explores aspects such as interoperability experiences, aggregation challenges, the challenge of coordinating millions of devices, the challenge of technology standardization and others. New technology also enables new market opportunities – what are the technology challenges to broader participation in a changing electricity system?</p>	<p>Dave Turcotte, NRCan CanmetENERGY Varennes</p> <p>Panelists: Raed Abdullah, Hydro Ottawa Richard Guo, PowerTech Labs Nathaniel Papay, EPCOR</p>
2:30 PM	<p>Fireside Chat – Pathways to Net Zero and the Role of the Distribution System</p> <p>We end our discussions with a relaxed chat about the role of the distribution system in a net-zero future. Everyone in the room is a participant in electricity distribution. How reliable is your electricity supply? An active distribution system means your lights could stay on during the next ice story – but how we get there? How does the planning for reliability and resiliency change? Who is accountable with things fail?</p> <p>The future sounds great but what are the challenges in getting there? Do our standards and codes require changes? What about the fundamental design assumptions behind our electric system? We will chat about this and more!</p>	<p>Moderator: Thomas Levy, NRCan ESS</p> <p>Panelists: Michael Powell, Electricity Canada Phil McKay, CanREA Éloïse Edom, Trottier Energy Institute</p>
3:15 PM	<p>Wrap Up</p>	<p>Jennifer Hiscock Director - Electricity, Transportation and Buildings Innovation Office of Energy Research and Development (OERD) Natural Resources Canada (NRCan)</p>
3:20 PM	<p>Networking Break</p>	