GRID INNOVATION FUND 2024
Electrification and Demand Management

Project Brief

Organization: Alectra Utilities Corporation

Project Title: Grid Responsive EV Charging through Alectra V2X and AlectraDrive for Fleets

Project Length: 36 months

IESO Funding Request: $2,023,822.68 (27% of $7,590,219.00 total project value)

Location: Vaughan, Brampton, Guelph, Markham, Hamilton, Richmond Hill, Barrie, Toronto

LDC Partner: N/A (Alectra is the project lead)

Project Summary

This project aims to develop and test program designs that enable customers and utilities to leverage the available flexible capacity from commercial electric vehicles. The project will explore two complementary approaches (1) bi-directional charging (V2X) and (2) managed charging (V1G). It will test communication platforms between the utility and customer energy systems to leverage EVs as a grid-integrated, dispatchable distributed energy resources to provide non-wires solutions.

Alectra has also been awarded funding for the V1G Fleet and V2X school bus projects through NRCan's On-Road Decarbonization Fund. IESO funds will help to build on the project scope to expand scope and provide additional deliverables.

Project Partners

Alectra Utilities is the project lead.

NRCan's On-Road Decarbonization Fund also awarded funding for the V1G Fleet and V2X school bus projects in the amount of $1,944,393 cash contributions.

Barriers and Opportunities

Opportunity to improve reliability and affordability	Barrier keeping opportunity from being realized in Ontario	Solution to be tested / evaluated
1. System flexibility and performance data: Creation of performance data sets is essential to understanding the opportunity for EV loads to serve as DERs.	Managed and bi-directional technologies are nascent, as is adoption of electric vehicles by fleets. Lack of data hinders understanding the scale, program design and implementation considerations to utilize EVs as DERs.	Multiple systems and customer sites will undergo testing and provide results for 12+ months to generate Ontario-specific performance data on charging/discharging cycles and flexibility availability for different fleet types.
2. Program models: A substantial amount of load growth is expected from electric vehicles over the next 30 years; the cost to acquire the resources required to meet this growth can be mitigated through demand side management programs.	Demand side management programs have started to incorporate electric vehicles, although to date these have mainly focused on residential customers in light duty vehicles. Lack of data and industry experience with these types of programs reduces the visibility of the scale of the opportunity and how best to obtain it through a program/market construct.	Alectra will undertake a program design process informed by customer needs, vendor capabilities and system requirements, to develop a distribution-level program that (if successful) Alectra may leverage on an enduring basis as a non-wires solution, as now mandated by OEB for LDCs to use (OEB's Non-Wires Solutions Guideline).
3. System integration: Utility evolution enables DERs to be controlled in a timely (day-ahead/day-of) manner that is responsive to grid needs, protecting infrastructure, reducing commodity and infrastructure costs and enhancing reliability.	Utilities are starting to deploy more advanced monitoring and control capabilities, moving from SCADA to Advanced Distribution Management Systems (ADMS). Older technology did not have the capability to provide actionable or timely site-specific control signals, nor settle incentives with customers based on actual performance.	Through this project, Alectra will test the integration of these distributed energy resources into its operational schema through signals sent through its DER marketplace platform located in its control room, which is designed to serve as a platform to orchestrate the use of DERs into the grid. This marketplace platform will allow Alectra to test a DSO control room capability that will run real-time power flow at a granular level to determine system needs and dispatch services in a safe and

		reliable manner. Alectra will also be able to simulate signals in other areas of grid congestion to model a pathway to resolve grid constraints. This platform will continue operating during and after this pilot, providing an ongoing capability that Alectra can utilize to manage the grid in a DER-populated future. V2X represents an expansion and evolution of current utility processes, assessing the ability to connect distributed generation sources.
4. Non-wires solutions: Evaluation and cost effectiveness can inform operability of non-wires solutions.	Previous energy efficiency/demand-side management programs did not include electric vehicle charging management/V2X as an eligible measure, leading to these solutions being underutilized because there was no effective, accessible market into which these resources could be provided.	With the development of the OEB's Non-Wires Solutions Guidelines and the on-going work to develop a new energy efficiency/demand-side management portfolio, there is now a viable, near-term roadmap for managed charging services to be incorporated into LDC-led customer resource acquisition programs. Alectra program planners can leverage the work done for this pilot for managed/bidirectional charging programs for commercial customers.
5. Customer identification and segmentation: Understanding which fleets are likely to electrify, what their needs and motivations are, their level of technology maturity and other related characteristics.	Barriers include the fact that the fleets that have electrified to date are limited in number and necessarily early adopters who may not be representative of the broader market. A lack of understanding of customers will lead to programs that don't target their needs and interests, resulting in low	Consulting with potential and current customers as well as industry stakeholders and consulting current research and examples from other jurisdictions will lead to improved understanding of customers and inform a program design and marketing strategy that will have a strong chance for success and customer participation.

	participation and lesser efficacy.	
6. Market readiness: Increase market (customer and industry) maturity and readiness.	Most fleet operators are on the sidelines with respect to electrification. Most aren't aware of whether electrification is right for them and how to go about exploring or investing in it. Awareness is the first step to action, and the topic is still at a relatively low level of attention.	This project will engage industry stakeholders as well as customers and the public at large through project communications and Alectra's webpage and marketing materials. Alectra's project partners include industry associations and vendors who can amplify and extend project communications and results (e.g., case studies) through their platforms, leading to higher awareness and interest in participating in non-wires solution programs.

Additional Project Details/Context

This project has two complementary focus areas:

1. Vehicle-to-Everything (V2X) Charging

Seek to install 5 bi-directional chargers for electric school buses and other medium-duty vehicles to test bi-directional capabilities, battery performance, and overall system efficiency across different use cases. The project will examine business and program models for V2X, including the provision of local and bulk-level services, and potential ICI integration. It will also examine codes, standards, best practices for V2X implementation, market readiness, policy and regulatory recommendations, and the technical and economic feasibility of V2X. These findings will help inform the broader deployment of V2X technologies and programs in Ontario (including testing on a DER market platform integrated with our control room to test on current and future constrained transformers).

2. Managed and Optimized Charging For Fleets

Building upon successful GIF-funded projects AlectraDrive @Work and AlectraDrive@Home, this stream will focus development of a program model for distribution-level managed charging programs/energy markets, which provide customers with value through making the inherent flexibility of their charging capacity available to their utility and demonstrate that technological solutions serve the needs of not only the electrical grid, but also customers. Charging stations will be integrated into a managed charging platform facilitated by Alectra, which will optimize the fleet's charging schedule to meet the customer's needs while minimizing site costs (i.e., through reduced site demand charges) and creating revenue opportunities through making their charging flexibility services available to their utility.

Outcomes

If successful, this project will create the following short-term outcomes:

- **Data on performance characteristics** of V1G and V2X in commercial vehicle fleets, which represent large point source new loads that likely cannot be accommodated by the existing electric infrastructure
- **Program Innovation:** Development of new program and business models to unlock flexibility latent in the demand side of energy system.
- **Program readiness:** Validated business models, technologies and customer preferences that can be used as inputs in business cases to create non-wires solutions into future programs based on their benefit to the system and ratepayers.
- **System integration:** Leveraging new utility monitoring and control platforms to base control signals with system conditions to demonstrate the integration capabilities between customer-sited systems with utility grid management systems, which is a pillar of an effective market for energy services.
- **Technology Demonstration:** Validation of smart technologies, including software integrated with hardware that create flexibility, such as EV charging and V2X integration.
- **Customer-centric engagement:** Creation of effective materials and approaches to engage customers, educate them about solutions and benefits, and incentivize their participation in demand management strategies.
- **Insights:** Gathering results to inform the design of future initiatives, including new demand side management programs, T-D interoperability, regulatory policy, and system planning.

By focusing on Vehicle-to-Everything (V2X) and Managed Charging for Fleets, this project aims to pave the way for a more resilient and responsive energy grid in Ontario. The insights and solutions developed here will be crucial for addressing the technical, economic, and policy barriers to the widespread adoption of these advanced energy technologies.