

GRID INNOVATION FUND 2024

Electrification and Demand Management

Project Brief

Organization: Attridge Transportation Inc.

Project Title: Attridge-Toronto Hydro-Electric Services Limited (THESL) EV Storage Project

Project Length: 36 months

IESO Funding Request: \$2,611,279 (20.7% of \$ \$12,601,287 total project value)

Location: Etobicoke and Hamilton, Ontario

LDC Partner: Toronto Hydro-Electric Services Limited (THESL) and Alectra Utilities

Project Summary

The Attridge-THESL EV-Storage Project aims to demonstrate the potential of bi-directional medium-duty electric school bus fleets as dynamic energy storage systems to provide grid flexibility services. The project will deploy bi-directional electric school buses and corresponding EV supply equipment (EVSE) across two sites in Etobicoke and Hamilton, Ontario. The primary goals include demonstrating demand response and flexibility services, enhancing LDC tools and integrating DER systems with LDC control systems, while making recommendations to support the future development of LDC and IESO grid flexibility services.

The project will integrate an energy management system (EMS) to coordinate and manage energy flows between the aggregated EV buses, EV supply equipment (EVSE), and the grid. Key activities involve simulating participation in THESL's Local Demand Response program, conducting flexibility service tests, and performing multi-nodal aggregation tests. The flexibility services to be tested include managed charging, peak shaving, absorbing excess generation during periods of low electricity prices, and discharging electricity from the fleet into the distribution network to demonstrate the technical capabilities of V2G and provide load relief to grid infrastructure.

Project Partners

Attridge Transportation: Project lead. Attridge will procure the EVs, chargers and energy management system (EMS), as well as conduct engineering and construction activities. Attridge will

provide project management and oversight, supervision of drivers and other staff who will be participating in the project, access and use of its depots in Etobicoke and Hamilton

Toronto Hydro-Electric Services Limited (THESL): Project co-lead. THESL will provide expertise and support for the project to effectively design and implement test cases, collect relevant data and analyze collected data to develop insights and recommendations that will support its own development and continued innovation and evolution of the sector. THESL will also explore the integration of this facility into their Local Demand Response program, and associated tools and systems.

Alectra Utilities: Secondary utility partner. Alectra will develop a V2G dispatch protocol, test cases and operating parameters for dispatching the V2G school bus. Alectra will integrate the EV-EVSE at Hamilton into their dispatch system leveraging Fermata's EMS.

Barriers and Opportunities

Opportunity to improve reliability and affordability	Barrier keeping opportunity from being realized in Ontario	Solution to be tested / evaluated
1. Develop flexibility service programs for small storage and EV-storage	Lack of programs that small storage resources are eligible to provide energy injecting flexibility services	Demonstrate the capability and availability of EV-storage to provide 5 flexibility services including energy injection for THESL's LDR program.
2. Develop THESL automation and communications for LDR notification	Limited communication infrastructure and integration capabilities between EV storage systems and THESL's Energy Center	Explore the use of system for LDR event notification and confirmation, integrating telemetry with real-time monitoring and dispatch messaging.
3. Increase adoption and participation of EV-storage systems through improved economic incentives	Insufficient economic incentives and unclear cost-benefit analysis for EV storage systems in providing grid services	Analyze costs and potential of providing flexibility services, provide recommendations for economic incentives, including changes to demand charge and global adjustment calculation methods
4. Reduce greenhouse gas emissions of school buses by stimulating EV adoption through reducing Total Cost of Ownership gap between EV and diesel-powered school buses	Lack of economic opportunities to provide flexibility services during idle periods	Deploy EV school buses and bi-directional EVSE, integrating them into the grid to provide flexibility services, and measure emissions reductions and value to distribution and bulk systems.
5. Achieve scalability and replication of EV	Limited successful case studies and lack of	Provide a scalable and replicable model for EV storage systems based on project

storage solutions across Ontario	economic model for EV-storage to provide distribution and bulk system needs	outcomes, including detailed analysis of operational, technical and economic factors, and recommendations for broader adoption.
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Outcomes

If successful, the Attridge THESL EV-Storage Project will provide the following learning regarding the capabilities and value of EV-storage for Ontario's electricity system.

1. Program Design: THESL, Alectra, IESO will have validation of small storage capabilities regarding assessed flexibility services to modify and/or inform new programs for small storage resources that enable them to provide flexibility services, creating value for rate payers and EV-storage owners.
2. Capabilities and Limitations in Providing Flexibility Services: Determination of the capabilities and limitations of EV-storage in providing tested grid flexibility services to support the system needs of LDC and the IESO.
3. Operational Insights: Detailed understanding of the impacts that EV-charging (unidirectional fleet) and EV-storage (bi-directional fleet) systems have on Dx and TX systems and how forecasting, visibility and management of the charging or storage systems can mitigate risks and enhance Dx and Tx capacity and flexibility.
4. Planning and Operational Intelligence: Generate comprehensive load profiles for the participating EVs, capturing Ontario-specific hourly demand data that will support LDC and IESO planning for future adoption of medium duty EVs.
5. Greenhouse Gas Emissions Reduction: Achieve a significant reduction in greenhouse gas emissions by replacing diesel-powered school buses with electric buses.
6. Scalability and Replication: Develop a scalable and replicable model for EV storage systems based on the project's outcomes