

Creating an Equitable and Inclusive Experience for Fully Accessible EV Charging

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ECOCITY WORLD
SUMMIT 2023
CONNECTING COMMUNITIES

Introduction

OBJECTIVES of the research are to engage with the disabled community to understand barriers and challenges with using electric vehicle (EV) charging infrastructure; and to create positive change for equitable and inclusive access to EV infrastructure for disabled and aging populations.

- British Columbia (BC) leads all of the Canadian provinces in electric vehicle (EV) adoption.
- Even in BC cities there are currently no fully accessible charging stations.
- This forms a barrier for drivers with disabilities as well for many seniors.
- Maneuvering wheelchairs, curb access, and lifting the charger cable are just some of the obvious challenges.
- We are in the early stages of EV adoption and at a point where we can get it right.
- As a community, persons with disabilities, has largely been excluded from climate action.

This poster summarizes research that is on-going.

Defining the Problem

- In 2017 the *Canadian Survey on Disability* indicated that 22% of the country's population identified as having at least one disability.
- Among the most common disabilities are flexibility, mobility, and dexterity.
- This research project targets persons with disabilities, including age related issues.
- Study participants are being recruited through existing contacts, social media, local news feeds, flyers, and word of mouth.

Use of Surveys

- Online surveys will help to define the specific EV charging needs of the target groups and identify where EV charging infrastructure is lacking from an accessibility perspective.
- The intent is to engage a large variety and number of individuals in a format that allows participants time and mental space and supports anonymity.

Use of Focus Groups

- Participants will take part in a moderated focus group using either an in-person or an online (via Zoom) format.
- Depending on format the focus groups will include a combination of virtual analysis (photos and videos) and in-person navigation of different EV parking and charging configurations.
- During the focus group sessions participants will be prompted to *think out loud* expressing their needs, challenges, design issues and ideas related to electric vehicle charging stations.

Ethics

- The specifics of this research study have been reviewed and approved by BCIT's Research Ethics Board.
- A summary of findings will be made available to participants on request.

Standards and Regulations



Initial review of existing standards supporting accessible charging among leaders in EV adoption, including Canada, the US, Europe, the UK, and Australia and New Zealand has found the following:

Canada

- No Canadian standards are currently in place, however, the *Canadian Standards Group (CSA)* is developing a draft standard.

United States

- The federal *US Access Board* has a set of design guidelines for federally funded charging facilities.
- *Access California* has accessibility regulations for all types of EV charging sites.

United Kingdom

- *Publicly Available Specification (PAS) 1899:2022* is a comprehensive set of requirements developed under the auspices of the British Standards Institution applicable to all public charge points.

Europe

- No specific standards for accessible charging infrastructure have yet been identified.

Australia and New Zealand

- No nation-wide standards have been found.
- The Royal Automobile Association of South Australia is currently developing design guidance.

Where guidelines do exist they often focus on requirements for numbers of chargers and space requirements, excluding other considerations.

Today's Technologies

Technologies exist that can support accessibility but are often applied to other situations. Some include:

Wireless Charging

- Uses an induction circuit between a ground pad and a receiving unit on the vehicle, providing a charge without a physical connection.
 - Drawbacks currently include longer charge times and the need to retrofit the vehicle with a receiving unit.
 - Tech vendors including Momentum Dynamics and Witricity have pilot projects underway.

Robotics & Cable Management

- Cable management can aid with lifting challenges
- Robotic cable systems can eliminate carrying the weight of the charger connection and potentially fully automate the connection process.
 - Tech vendors including Kuka, RocSys, Hyundai, and Ford have pilots in development.

Mobile Apps

- Existing mobile apps can help initiate and complete a charge without exiting the vehicle.
- Similarly mobile apps exist to support payment.

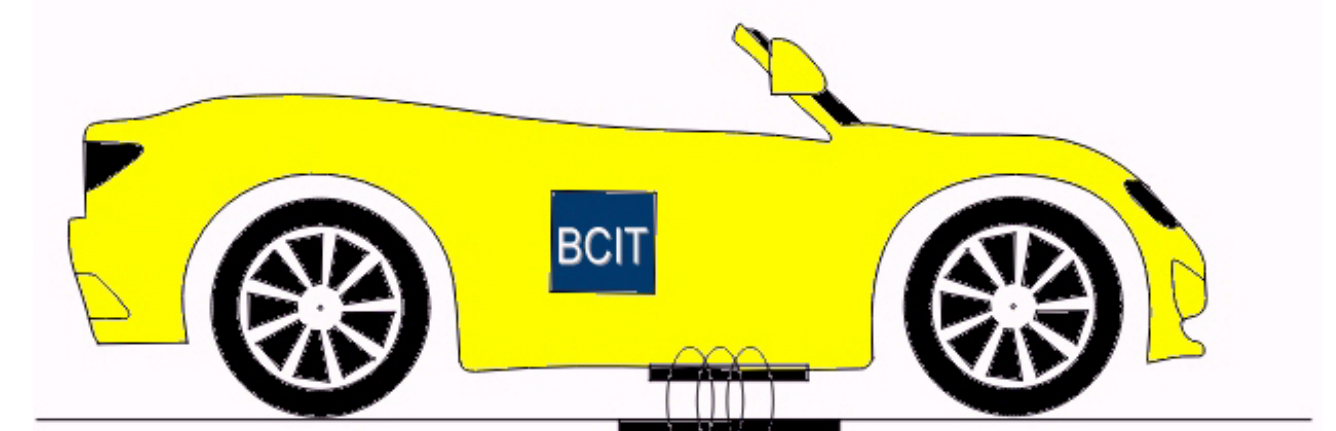
Portable Charging

- Portable charging systems bring the charge point to the vehicle and provide short duration (and range) charges for emergency type situations.

Solutions & Future Work

Technologies exist but are often developed in silos and stop short of full solutions.

- Wireless charging is one of those and something of an outlier. It can provide a hands-free solution but requires vehicle retrofit, has longer charge times, and is slow coming to market.

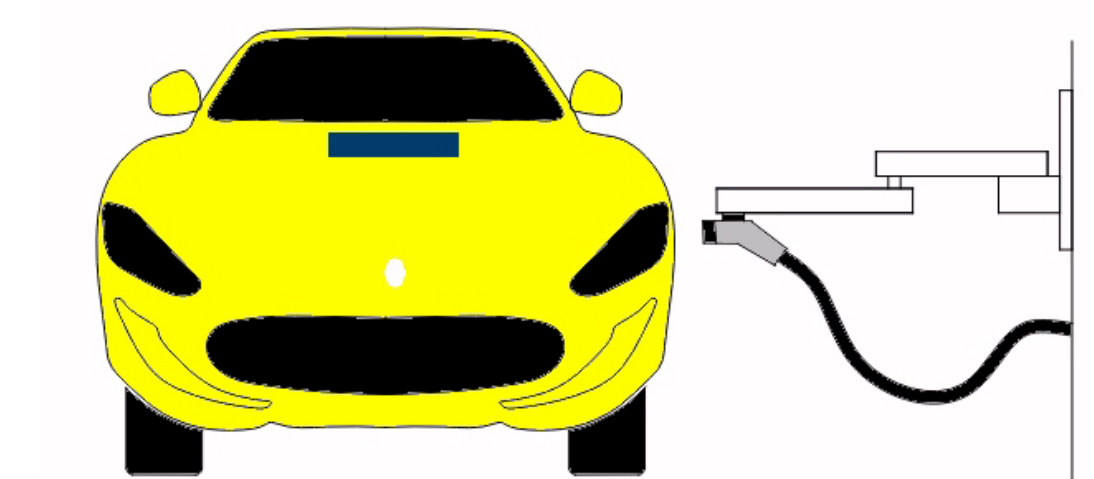


Proposed Solutions

- Proposed solutions will be drawn from this research including defined challenges, standards from various jurisdictions, and the technologies identified.
- Demonstrated through progressive mock-ups enabling additive stages towards envisioning a fully hands-free charging that could include:
 - Space redesign;
 - Cable management;
 - Potentially charge point interface redesigns;
 - Potentially fully autonomous charging.
- The demonstrations are intended to highlight the challenges and showcase what is possible.

Future Work

- Future work (outside current project scope) will draw on experiences with the mock-ups to develop a functional working prototype.
- Current technologies will be leveraged towards a fully autonomous solution.
- The work will use an additive, phased rollout in partnership with disabled communities, and with industry.
- The prototype will be integrated into BCIT's research charging facilities to support ongoing data collection and further research activities.



Acknowledgements

This project is being funded by British Columbia Institute of Technology Institute Research Funds

Feedback and subject matter expertise has been provided by:

- Dr. Jaimie Borisoff, Director MAKE+, BCIT
- Mark Dabell, Principal KMD
- Kelly Carmichael, Research Associate, SMART, BCIT
- Vancouver Electric Vehicle Association
- The City of New Westminster
- BC Hydro & Power Authority

BCIT's campus is located on the unceded territory of the Coast Salish peoples who have been stewards of the lands for millennia.