Feasibility of Mobile Energy Hubs for Urban Communities

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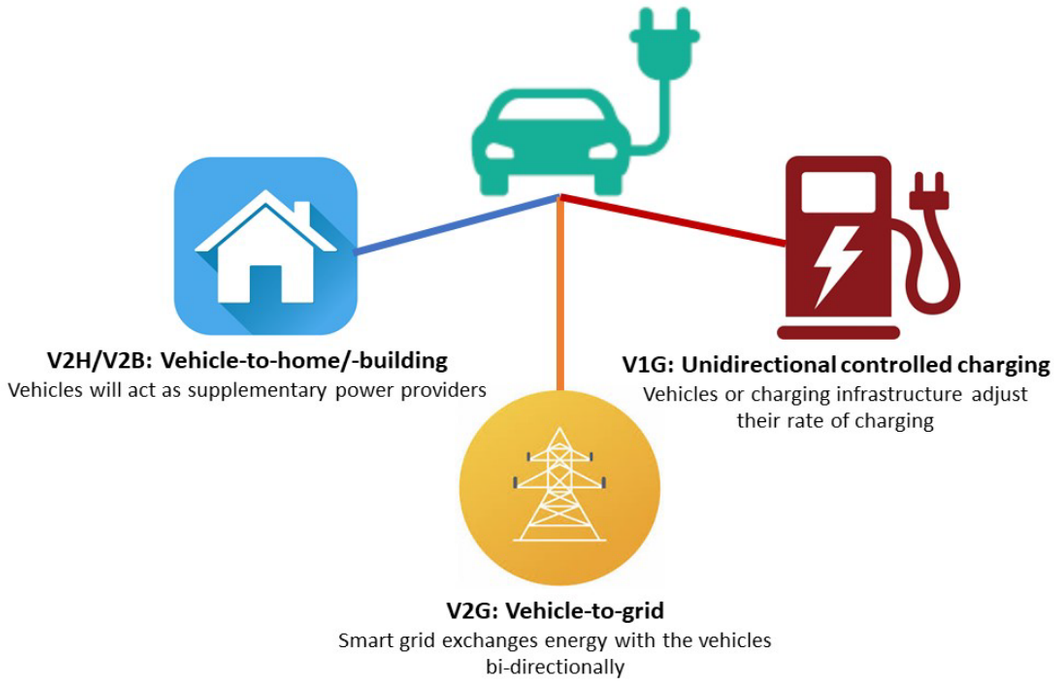
About the projects

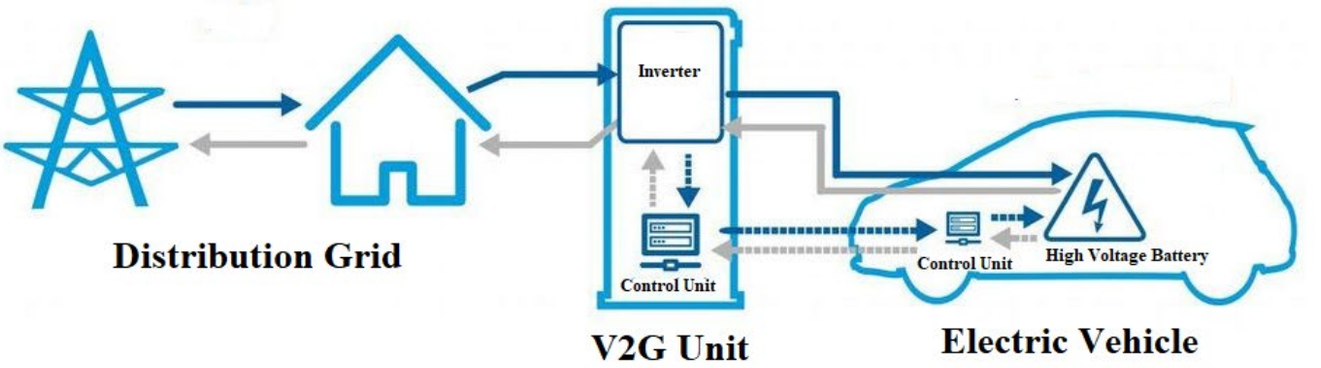
Electric vehicles (EVs) can decarbonize urban transportation, but cars sit in parking roughly 95% of the time. Mobile energy hubs (MEHs) use parked and plugged-in EVs as power banks that can transfer energy back to the electric grid to help balance peak loads and integrate renewable energy. Feasibility of MEHs needs careful study of EV market trends, socioeconomic impacts, and stakeholder acceptance showing that the city of Kelowna can implement roughly 130 EV recharging units to provide an added grid capacity of 120,000 MWh for an investment of $14 million by 2050.

Project Highlight:

The current environmental and energy emergencies have augmented the transition towards carbon neutral transportation systems; hence electric vehicles (EVs) are viewed as the most desirable instruments to reduce the automobile industry's dependence on fossil fuels based on their ability to integrate energy from clean sources. The adoption of the smart power grid concept has seen EVs being explored as energy hubs since they can be connected to the power grid with the implementation of the vehicle to grid (V2G) concept. EVs interacting with the power grid based on scheduled demand requirements are seen to have a major impact on society. Cars sit in parking spaces 95% of the time, thus with careful planning and the right infrastructure, parked and plugged-in EVs could become mass power banks, stabilizing the electric grids of the future. EVs aggregated together in parking lots can be utilized as mobile energy hubs (MEH). They can also power households and integrate renewable energy with storage systems. However, the successful implementation and widespread adoption of V2G presents a multi-faceted problem. This research focuses on developing a research framework to assess and plan MEHs for urban communities. Accordingly, it aims to identify EV market trends, socio-economic impacts, and stakeholder acceptance of MEHs.



Find the research group website *here* and the faculty profile of Dr. Kasun Hewage *here*.



The specified research objectives can be listed as follows:

1. **Explore EV recharging and vehicle-to-grid technologies and their potential to balance the load curves**
   a. Data collection on current technology, charging infrastructure, current EV use, growth rates, and component specifications from literature and FortisBC.
   b. Identify control inputs affecting the techno-economic feasibility and social acceptance of the MEH concept.
   c. Identify the key technical barriers for MEH facilities and explore possible solutions.

2. **Develop techno-economic scenarios for MEH deployment**
   a. Develop scenarios for the future considering combinations of technical, economic, EV growth rates, and societal acceptability criteria.
   b. Identify control inputs affecting the techno-economic feasibility and social acceptance of the MEH concept.

3. **MEH planning for urban communities**
   a. Develop a spatial and temporal planning model for MEHs considering developed scenarios.
   b. Explore and prioritize incentive schemes and tariff policies to enhance the economic feasibility of MEHs in British Columbia.

4. **Recommend best management practices to deploy MEH facilities in urban communities**
   a. Survey-based data collection from multiple-stakeholders including governments, car owners, and utilities.
   b. Evaluate the technical, economic, and social viability of re-defined scenarios. Recommend the scenario selection procedure for different communities.