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November 26, 2021

John Appleseed

UBC Parking Services
6200 University Blvd.
Vancouver, BC Canada
V6T 1Z4

Dear Mr. Appleseed:

Enclosed is the assessment report for Reducing Carbon Emissions through use of Electric Vehicles at UBC Parking Facilities. This report is an extensive analysis of the data collected from anonymous individuals of UBC Parking facilities and from publicly accessible data provided from the province of B.C. and Transport Canada. Thank you for your time in considering this assessment report.

As UBC is a provider of one of the largest parking operations in Canada, it is also a major contributor to carbon emissions for every ICE (internal combustion engine) vehicle. Expanding the availability and accessibility of EV chargers around campus will pose as a positive impact for the environment.

Based on the primary data, the current EV (electric vehicle) charging infrastructure provided is inadequate for the users of UBC Parking facilities. The majority of UBC parking users agree that the chargers are always occupied and if they were to switch electric vehicles, they must have a reliable source to charge their cars as majority also do not have access to a charger at home.

As a university that prides in sustainability efforts, we must take the suggested actions to address the issues posed. These suggestions can be found in the conclusion section of the report.

Please contact me if you have any questions!

All the best,

Daniel Tsui

Daniel Tsui

**Assessment of Reducing Carbon Emissions
through use of Electric Vehicles at
UBC Parking Facilities**

Prepared for
UBC Parking Services
6200 University Blvd.
Vancouver, BC Canada
V6T 1Z4

By
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ENGL 301 Student

November 26, 2021

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ABSTRACT

Many faculty members, staff, and students of UBC now prefer to drive to school as a result of COVID-19. The report analyzes the solution for reducing carbon emissions, however, new problems are introduced.

Through survey and third-party data provided by governmental entities, general consensus is met towards the concerns for electric vehicle ownership within UBC parkades, especially for those who do not have access to a charger at home. The survey reveals that majority of users of UBC parkades are either EV owners or have considered switching to electric vehicles and many have stated that lack of availability of chargers at UBC parkades and the lack of a charger at home is a major deciding factor towards EV ownership.

Through the findings above, a couple recommendations are listed below:

- Increase EV charger availability from 10 to 20 per parkade at UBC
- Implement more fast charging (level 3) DC Fast Chargers around campus and possibly a Tesla Supercharger
- Continually monitor demand for chargers at each parking facility and increase availability as needed

INTRODUCTION

BACKGROUND

UBC Parking Services has been providing parking spots to faculty, students, and visitors for many years. It has proven as an invaluable service for people where public transportation is not as easily accessible and those who live farther away from campus. Additionally, on-campus activities and classes are resuming back to normal, many students prefer to use alternate transportation methods that do not include public transportation due to COVID-19 concerns. UBC Parking Services manages more than 8,300 parking spaces on campus and through surveyed statistics, many people live approximately 15-25km away from campus. As such, that equates to a combined driving distance of 30-50km, round-trip each school day. Such distances is simply sometimes not feasible as the time needed commute to school and back takes up a significant chunk of their time. Additionally, sometimes public transportation isn't as easily accessible for the faculty/student when coming from cities such as North Vancouver, West Vancouver, Surrey, Coquitlam. Multiple transfers may be required and some busses that connect to the Skytrain do not run at frequent times. This represents the majority of students that drive to campus as their primary source of transportation.

STATEMENT OF PROBLEM and PURPOSE OF REPORT

According to Transport Canada Statistics, the average ICE (internal combustion engine) vehicle consumes 8.9 liters of gasoline per 100 kilometers. This equates to 89 liters consumed every month when approximating 1000km travelled per month. This contributes to around 205kg of CO₂ released into the environment per month, per car. When multiplied to every user of UBC parkades, this equates to approximately 18,755tons of CO₂ released per month from UBC

parking facilities. For comparison, the average US household produces 566kg of CO₂ per month. The current global warming temperature rate of increase is rising faster than ever. Public transportation is simply not good enough of an alternative for distant students and faculty as it can take too much time and/or not easily accessible for some people. In light of COVID-19, faculty and students may not feel comfortable being exposed into a tightly packed bus.

Additionally, for the year 2020 alone, 9.4% of all new car sales in B.C. were all electric cars. In the Lower Mainland alone, there were around 29,000 electric vehicles registered according to ICBC. UBC boasts to have provided as many chargers as City of Vancouver provides, but it is no longer the case and UBC is falling behind as electric car sales are exponentially rising. In comparison, UBC Building Operations shares 20 chargers between its own fleet of cars reserved for their use only. Would 10 chargers per parkade be adequate for a parking lot that can house up to 1,650 vehicles (Thunderbird Parkade) at any given time? Based on these numbers alone, UBC Parking Services provide an inadequate amount of electric vehicle chargers to give users confidence in using electric vehicles as their main source of transportation to and from UBC, especially for those who do not have access to an EV charger at home.

As a university that prides in sustainability in recycling and waste nationwide, curbing the carbon emissions through encouragement, will contribute even more to our sustainability efforts. This aims to set an example for other universities and large-scale office towers to follow suit. We must try our best to help the planet, even if it only makes a little difference.

SCOPE OF REPORT

UBC faculty, staff and students who use UBC parking facilities and are concerned about potential EV ownership need to understand the current environmental implications and problems that may arise around EV ownership:

- How far is your daily commute, round-trip?
- What form of transportation do you currently use?
- What are your main concerns of owning/switching to an electric vehicle?
- Will incentivizing parking costs, increased accessibility to chargers, and prime parking spots convince you to switch to an electric vehicle?

RESEARCH METHODS

Questions are answered through surveys anonymously filled out via a link to a Qualtrics survey. Approximately 5 people from each parkade around UBC were filled. These findings aim to understand the challenges users face and to possibly raise awareness to users. Additionally, secondary sources from publicly released data will be used to further support the findings from the surveys.

DATA

- 50 EV Level 2 Chargers are accessible by Faculty and Students (10 per parkade)
- Total of 72 EV Level 2 Chargers accessible by visitors
- Approximately 0.86% of all available parking spots at UBC are allocated for charging
- Only 20 EV Level 2 Chargers are accessible by Faculty and Students on a long-term pass (2 parkade permit)
- Each BEV (Battery Electric Vehicle) qualifies for a federal iZEV rebate of \$5000 & a CleanBC Go rebate of \$3000

Public Level 2 Charging Station Growth

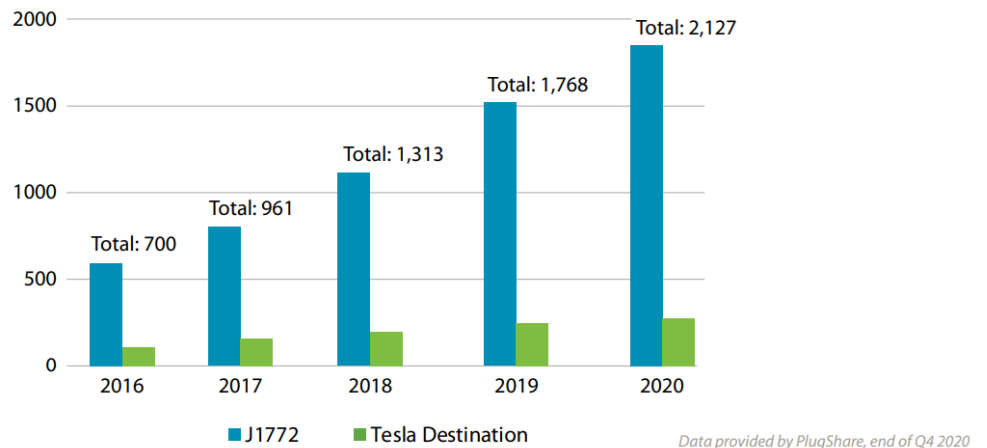


Figure 1. Level 2 EV Charger stations growth in B.C.

British Columbia Light-Duty ZEV Registration Totals

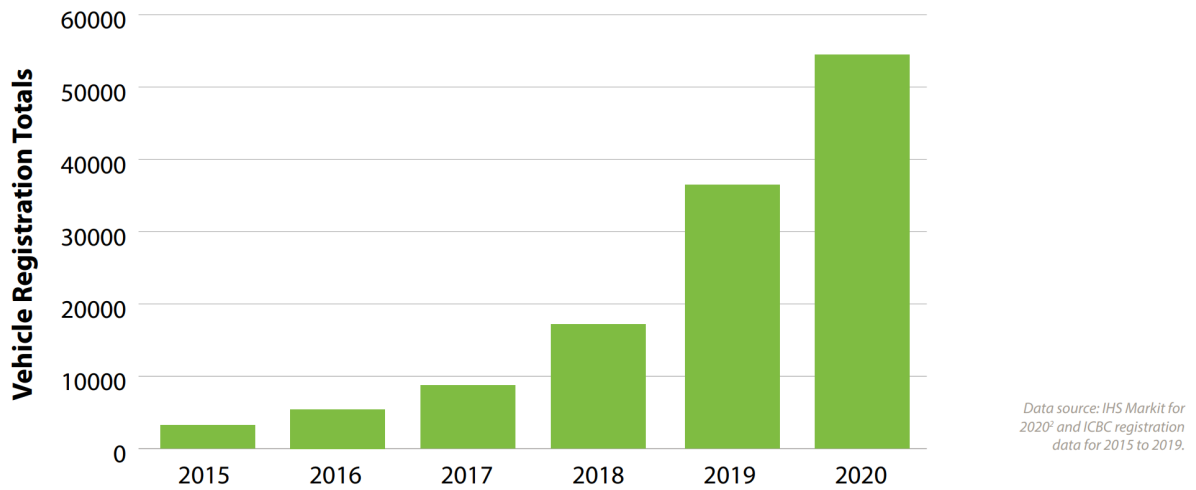


Figure 2. Registrations of Zero Emission Vehicles within B.C.

British Columbia Light-Duty Vehicle ZEV Sales Rates¹

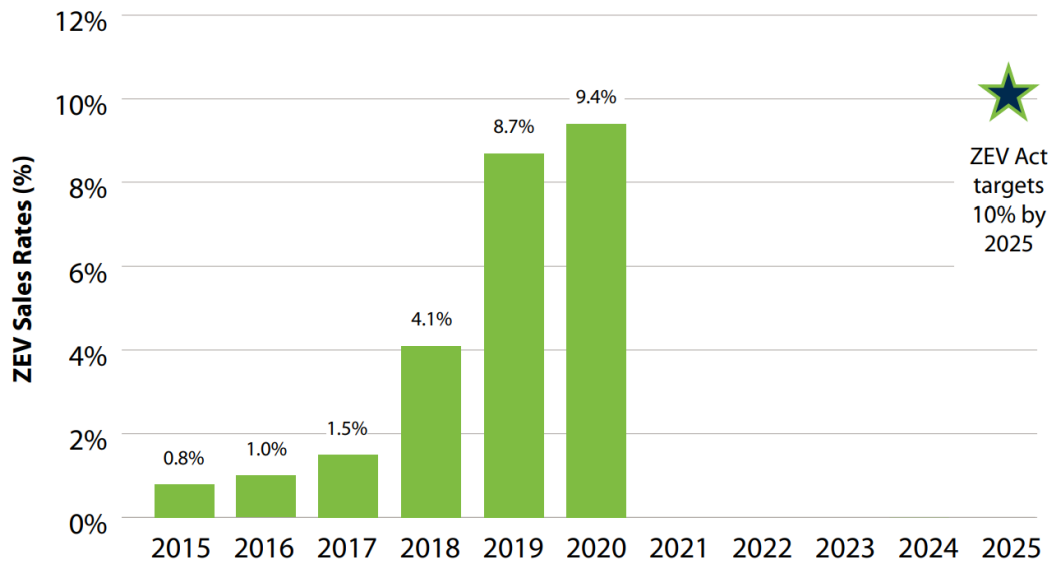


Figure 3. Percentage of Sales of Zero Emissions Vehicles Per Year in B.C.

Out of 25 valid respondents surveyed, 64% of UBC parking users live further than 20km from UBC campus.

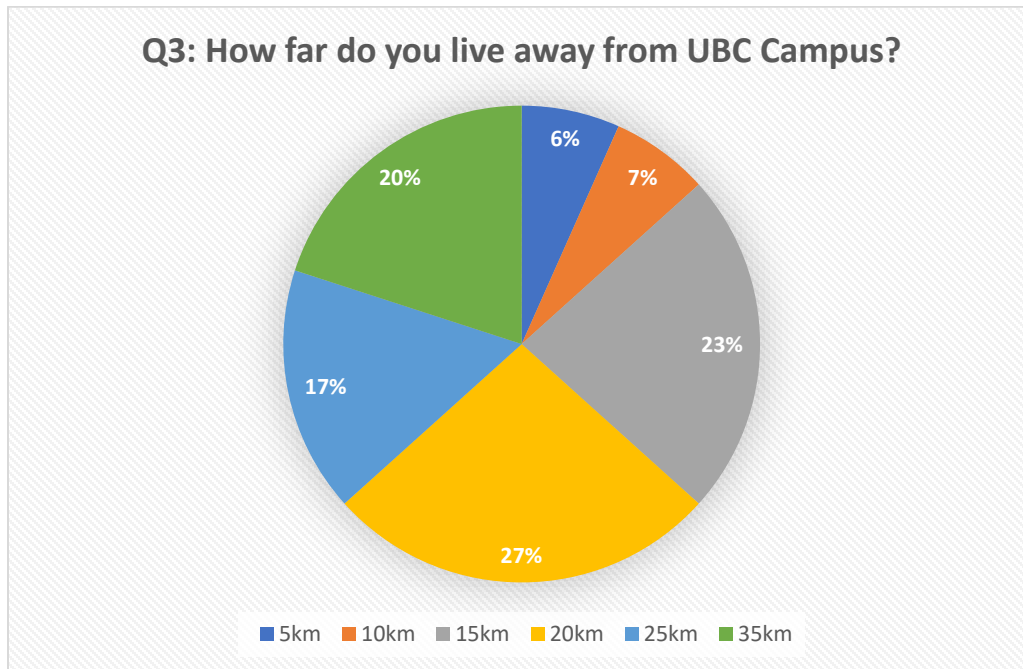


Figure 4. Survey results on distance from UBC Campus

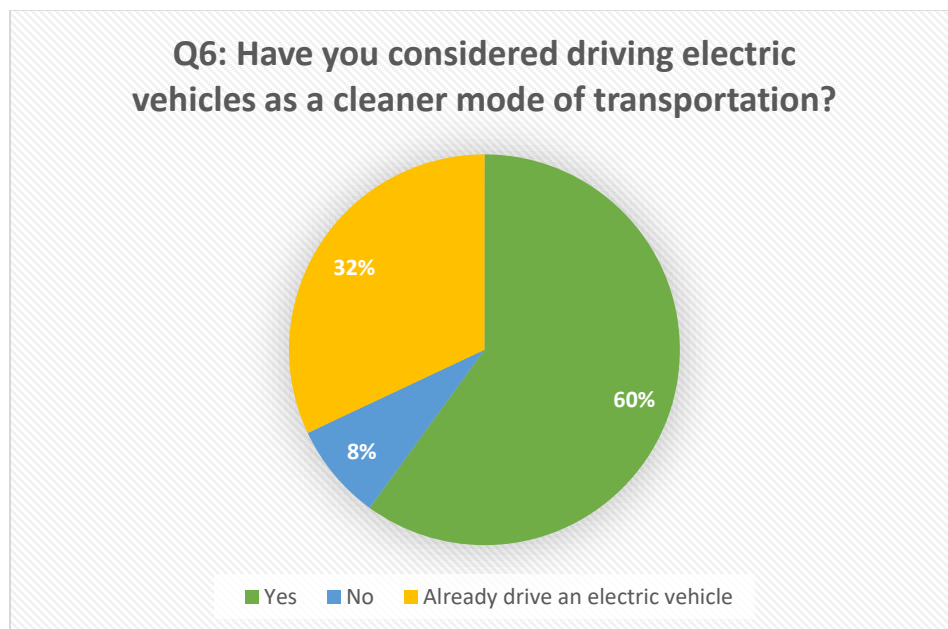


Figure 5. Survey results on interest in electric vehicles among UBC parking users

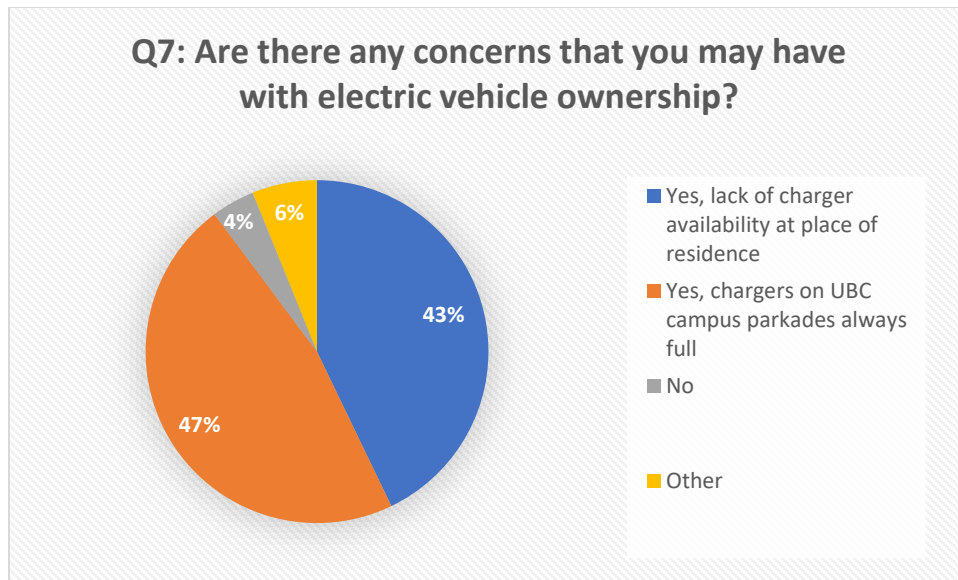


Figure 6. Concerns with EV ownership among UBC parkade users

ANALYSIS OF COLLECTED DATA

Based on the data provided from the province of B.C. (fig. 1), approximately 300+ public level 2 chargers are installed per year. Zero emission vehicles have grown exponentially from 2018 to 2019 and 2020 again. While the 2021 yearly stats are yet to come, I believe the registration has grown tremendous amounts again this year. As B.C. captures up to 9.4% of all new car sales in B.C., it is important to note that (fig. 2) data is more indicative of EV adoption as used EV's may be imported from elsewhere to be sold and operated here in B.C. A total of 64% UBC parking users live further than 20km from UBC campus which contributes to a heavy amount of CO2 gas emissions. Additionally, it seems that there is strong interest in EV adoption by UBC parkade users but similarly in contrast, concerns that may hinder the immediate adoption of EV's. Some surveyed respondents mentioned the issue of limited availability of EV chargers during peak hours (fig. 6). The listed concerns are valid and pose a significant risk for the owner as it would

be their primary source for recharging. 8% of the respondents have not considered driving electric vehicles possibly for various reasons (fig. 5). Between those interested and those who already own an EV (fig. 5) compared to the concerns with EV ownership (fig. 6), there is a strong correlation of the concerns posed for owners and that many people share the same concerns.

CONCLUSION

SUMMARY BASED ON FINDINGS

In summary, based on the data and findings from surveys and statistics, it is apparent that there needs to be more electric vehicle chargers within the UBC Vancouver campus. An inclusion of many more Level 3 Rapid chargers may also allow better accessibility with less charging time in mind as well. Currently from the data (fig. 3), ZEV sales rate has topped at 9.4% with B.C.'s target by 2025 to have 10% of all car sales be ZEV's. As we are already nearing that target well before the goal, it is quite possible that we can reach 100% ZEV sales earlier than the targeted 2040 set by the Zero-Emission Vehicle Act. The data suggests that we may expect an exponential rise in adoption for electric vehicles as more auto manufacturers begin to show their new lineups of zero emission vehicles. We expect to see near-same or slightly less adoption rates for the coming 2021 year as the chip shortage is preventing auto manufacturers from producing enough vehicles, I am confident that the adoption rates will resume once the chip shortage is remedied.

Additionally, among the people interested, they seem to lack the ability to charge at their residing place and will want to rely on UBC EV chargers as their primary charging source. In turn, this will significantly decrease the amount of CO2 emissions released into the environment as a positive side effect.

RECOMMENDATIONS

We recommend UBC Parking services to increase the availability of chargers per parkade from 10 chargers to 20 chargers. Additionally, we also recommend that more Level 3 Fast Chargers be implemented around campus to allow for quick bursts of charging. By doing such, a significant 2% of the parking stalls are for charging EV's. Additional suggestions would be to implement a Tesla Supercharger station on UBC campus on a dedicated parking lot to allow for fast charging for Tesla vehicles. According to the annual report, Tesla electric vehicles was the best selling electric vehicle in 2020 in B.C. alone. Adding a Tesla Supercharger station would allow for a fairer share for other electric vehicle owners to use other chargers rather than having only Tesla electric vehicles occupying the level 2 chargers.

As charging is the new gas station, it is no surprise that prospective and current owners are concerned about their accessibility to a charger when in need. For many owners, UBC is their only primary source for charging their vehicle and if it is not readily accessible, owners may experience some trouble as they are unable to get to their next destination and will require some time to recharge their vehicle before they are on the go.

As shown by the surveyed data, many people are concerned about the inaccessibility of the chargers at UBC as they are constantly occupied. Additionally, they lack a charger at their place of residence which is another huge factor into EV ownership. By giving more potential owners a peace of mind, knowing that they can depend on the charging infrastructure provided by UBC parkades, will significantly increase EV adoption and feasibility for the users. As a university that operates one of the largest parkade operations in Canada, it is important that we do our part

in promoting greener ways of transportation especially when public transportation simply is not feasible due to time and distance required to travel.

FEASIBILITY OF RECOMMENDATIONS

In order to carry out recommended actions, some funding is required. Funding of chargers should be minimal as UBC could qualify for BC Hydro rebates for 50% off charger and installation costs. As chargers are already implemented in parkades, simply doubling the amount of chargers should be possible since the infrastructure is already there. As implementing chargers also require the demand from users, another survey suggests that 77% of B.C. residents are in the market for an EV. Consequently, 61% of Canadians express that they would rather drive than take public transport because of the pandemic. There is certainly some risk that less people may choose to drive after the pandemic ends, however, the pandemic itself has changed many things on how we see and interact with daily life. Most interestingly, people aged 18 – 44 are more likely to buy an EV compared to those who are age 45 and older. As UBC is a research university, many of the students on campus are in the age range of 18 – 44 and may fall into this category. The recommendations serve as a bet on that more and more electric vehicle registrations are bound to happen in B.C. in the near future, whether it be due to environmental conservation efforts, COVID-19 concerns, or gas prices skyrocketing in B.C. It is imperative that more needs to be done soon to allow for better accessibility to EV chargers and that more options are provided to provide a peace of mind to early adopters. It is implied that awareness on EV's are required and some market research is to be done to better understand and meet the needs of UBC parkade users.

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- UBC Parking. “About Us.” *UBC Parking*, 16 Nov. 2021 <https://parking.ubc.ca/about-us>.

APPENDIX

UBC Parkades EV Survey

I am an undergraduate student at UBC that is assigned to a technical writing project.

This survey aims to obtain primary data for a better understanding and analysis to improve your UBC parkade parking experience.

The final formal report will be compiled and addressed to UBC Parking services staff and UBC upper management. Together with your answers and the statistics available from Transport Canada and ICBC websites, will provide the necessary data I need to providing insightful suggestions for increasing electric vehicle adoption. The survey contains 9 multiple-choice questions and it should take no longer than 5 minutes of your time.

Your responses are not mandatory and will be kept anonymous.

Thank you very much for your time in this survey.

Q1: How important is saving the environment to you?

- Not at all important (1)
 - Slightly important (2)
 - Moderately important (3)
 - Very important (4)
 - Extremely important (5)
-

Q2: What is your primary source of transportation to UBC campus? (Please write "n/a" if you live on campus)

- Car (1)
 - Bike (2)
 - Public transportation (3)
 - Other (please specify) (4) _____
-

Q3: Approximately how far do you live away from campus? (in KM)

- Live on campus/near campus (1)
 - 5 km (2)
 - 10 km (3)
 - 15 km (4)
 - 20 km (5)
 - 25 km (6)
 - Other (please specify) (7) _____
-

Q4: How long does it take for you to commute to campus?

If you selected "car" as your previous answer, please answer the following, otherwise select "Not Applicable"

Q5: Which parkades do you use? (Select all that apply)

- North Parkade (1)
 - Rose Parkade (2)
 - West Parkade (3)
 - Thunderbird Parkade (4)
 - Health Sciences Parkade (5)
 - Not Applicable (6)
 - Other (please specify) (7) _____
-

If you selected "car" as your previous answer, please answer the following, otherwise select "Not Applicable"

Q6: Have you considered driving electric vehicles as a cleaner mode of transportation?

- Yes (1)
 - No (2)
 - Not Applicable (3)
 - Already drive an electric vehicle (4)
-

If you selected "yes or no" as your previous answer, please answer the following, otherwise select "Not Applicable".

Q7: Are there any concerns that you may have with electric vehicle ownership? (Select all that apply)

- Yes, lack of charger availability at place of residence (1)
 - Yes, chargers on UBC campus parkades always full (2)
 - No (3)
 - Other (please specify) (4)
-

If you answered "yes" or other to any of the concerns in the previous question, please answer the following otherwise select "Not Applicable".

Q8: How would you rank your experience with UBC Parkades on campus in regards to EV engagement? (Rank 1-5, and 5 being fully satisfied)

- 1 (1)
 - 2 (2)
 - 3 (3)
 - 4 (4)
 - 5 (5)
 - Not Applicable (6)
-

Q9: Is there anything you would like UBC Parking Services to improve EV ownership experience on campus?
