



Innovation, Science and
Economic Development Canada

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Développement économique Canada

Consumer Confidence in the Accuracy of Clean Fuel Measurement

Final Report

**Prepared for Innovation, Science and Economic Development Canada (ISED)
and Measurement Canada (MC)**

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Consumer Confidence in the Accuracy of Clean Fuel Measurement

Final report

Prepared for Innovation, Science and Economic Development Canada (ISED) and Measurement Canada (MC) by Environics Research

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This public opinion research report presents the results of quantitative and qualitative research conducted by Environics on behalf of ISED and MC. The quantitative research was conducted online with the general population, from May 16 to June 3, 2022 and the qualitative research was conducted from May 19 to July 15, 2022.

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Executive summary

1. Background and objectives

To encourage Canadians across the country to adopt zero emission vehicles over the next ten to fifteen years, the Government of Canada announced \$56.1 million in the 2021 Federal Budget for Measurement Canada to develop and implement a set of codes and standards for retail zero-emission vehicles (ZEV) charging and fueling stations. This measure is intended to provide regulatory certainty to providers of charging services and facilitate the development of the charging network.

To support the success of this initiative and encourage consumer confidence in the clean fuels market, Measurement Canada sought to gauge investor, business, and consumer confidence in the accuracy of clean fuels measurement devices.

This research directly informs Measurement Canada on the effectiveness and usefulness of the clean fuel measurement devices programs and services it is developing, as well as their utility in building consumer confidence in the clean fuel market. This research is also in direct support of government-wide priorities to advance clean fuels markets and carbon capture, utilization, and storage technologies in Canada.

The study also helps inform baselines against which to measure results and to effectively inform Measurement Canada's reporting processes, including consumer confidence data around the fairness of charging and/or refueling stations. It also conveys levels of consumer confidence with clean fuel charging and refueling equipment currently in the market.

2. Methodology

Quantitative phase

EnviroNics Research surveyed 1,800 Canadian EV owners and intenders (aged 18 years and older) between May 16 to June 3, 2022. The sample included 1,000 EV owners, and 800 Canadians who are considering the purchase of an EV in the next two years. The survey results offer a reflection of provincial distribution of EV/hybrid car ownership in Canada, as well as Canadians considering this purchase. The survey data also identified owners and senior managers of Canadian small businesses that use ZEV or hybrid vehicles.

Survey respondents were selected from registered members of an online panel. Since the samples used in online panel surveys are based on self-selection and are not a random probability sample, no formal estimates of sampling error can be calculated. The survey obtained the following regional distribution:

Target group	EV Owners (Total)	EV Intenders (Total)
Canada (Total)	1,000	800
Atlantic	29	58
Quebec	408	170
Ontario	224	308
MB/SK	32	50
Alberta	40	86
BC/Territories combined	267	132

More information about the methodology for this survey is included in Appendix A.

Qualitative phase

The qualitative phase consisted of in-depth interviews with investors, fleet owners, manufacturers, and clean fuel service providers. ISED provided Environics with stakeholder lists including members of various working groups, electric vehicles owners, and manufacturers. Environics also conducted desk research to compile a list of contacts at businesses and organizations that qualified for the study. Participants were recruited via email and invited to a telephone or Zoom interview. The interviews took place from May 19 to July 28, 2022. A total of 93 clean fuel stakeholders from across the country were invited to participate, with 32 agreeing to be interviewed.

3. Cost of research

The cost of this research was \$124,945.70 (including HST).

4. Key findings

Results from both the quantitative and qualitative research suggest that standardization within the ZEV space is a step in the right direction for creating a more robust industry and encouraging consumer adoption of ZEVs. While consumers indicate high levels of confidence in the accuracy of clean fuel measurement, it may be that they aren't aware that the chargers are not currently regulated. From an industry stakeholder perspective, accuracy of clean fuel measurement is not a high concern, though implementing billing methods that are fair and equitable is top of mind.

There is work to be done from a communications standpoint on increasing awareness of Measurement Canada outside of industry. This will be important in creating consumer trust in the EV charging and refueling network. At this time, many consumers and industry stakeholders alike assume that EV chargers are built and regulated to specific standards, similar to gasoline pumps. This likely creates the relatively high level of confidence in the accuracy of clean fuel measurement noted in this study. When Measurement Canada moves forward with the new requirements, they should be communicated in a way that is easy for consumers to understand and instills confidence that will aid in adoption.

The requirements in development received an overall positive reaction from all stakeholders, and consumers agreed that many of the statements meant to increase their confidence would do so. While consumers were more concerned with actions such as transparency in billing methods and information being provided to them at the charging stations immediately after charging their vehicles, industry stakeholders were more focused on standards being put into place as soon as possible that would not disrupt the already growing industry.

Quantitative findings

EV ownership and intention

Owners of Zero-Emission Vehicles (ZEVs) and those considering purchasing ZEVs were asked about their current vehicle or the vehicle they plan to purchase.

- Electric vehicle owners in Canada are most likely to own a Plug-in Hybrid Electric Vehicle (PHEV) (54%), and least likely to own a Hydrogen/Fuel Cell Electric Vehicle (FCEV) (5%). About four-in-ten own a Battery Electric Vehicle (BEV). Owners of EVs are likely to drive a 2020 model or newer and have an approximate

range of 200-400 km. More than half of those who intend to purchase an EV in the next two years plan to buy a PHEV (60%).

Charging behaviour - BEV/PHEV owners

Owners of BEVs and PHEVs were asked a series of questions related to their patterns and experiences with charging at home and at public charging stations.

Charging at home

- When charging at home, it is most common for BEV and PHEV owners to use a standard wall electrical outlet (Level 1) or a fixed/hard-wired (Level 2) charging station. PHEV owners are more likely to use a standard wall electrical outlet (Level 1) at home (41% vs. 29%), whereas BEV owners are more likely to use a fixed/hard-wired charging station (Level 2) (46% vs. 33%). Around one in ten (11%) say they do not charge at home.

Use of public charging stations

- A majority of eight in ten (81%) PHEV and BEV owners charge their EVs away from where they live, more than half of whom use free chargers (56%). Close to one third use ChargePoint locations (30%), with smaller proportions using Circuit électrique (25%) and FLO locations (22%).
- Among those who do not charge away from home, BEV owners are more likely (63%) to point to not leaving their home range as their reason, while PHEV owners are more likely to say it takes too long to charge (31%) or that it is difficult to locate chargers (28%).
- PHEV owners use Level 1 and Level 2 public charging stations most frequently, with close to half (45%-48%) saying they use one or the other at least every two weeks. BEV owners are more likely to use Level 2 and Level 3 charging stations occasionally throughout the year.

Experience with billing at public charging stations

- When using public charging stations, PHEV and BEV owners most commonly have experience being billed based on time connected to the charger (\$/min).
- General confidence in billing accuracy is high among both PHEV and BEV owners, with close to eight in ten (79%) feeling at least somewhat confident in all aspects of their charging experience, including billing fairness and accuracy. Compared to other regions, BEV/PHEV owners in Quebec are the most confident in billing accuracy at public charging stations. The majority of PHEV and BEV owners have not experienced an issue, disagreement or dispute related to billing at public charging stations.

Confidence in public charging stations

- When considering statements related to BEV/PHEV experience at public charging stations, agreement is generally soft. For instance, while over seven in ten (72%) agree that they will be billed fairly when using a public electric charger, only two in ten (21%) of those strongly agree, while over half (52%) somewhat agree. Feeling satisfied with the billing methods employed by public EV charging systems is highest in Quebec (69%) compared to the other regions.

Fuelling behaviour – Hydrogen/Fuel Cell EV owners

Owners of FCEVs were asked as a series of questions related to purchasing hydrogen, as well as their experiences with hydrogen fuel dispensing stations.

- Almost six in ten (58%) FCEV owners purchase hydrogen fuel at least every two weeks, with a proportion of thirty-seven percent billed by fixed charge per use. Overall, confidence in billing accuracy of hydrogen filling stations is quite high at eighty one percent, though this proportion is made up largely of owners who are just somewhat confident in billing accuracy.
- While close to seven in ten (68%) FCEV owners and intenders believe they will be billed fairly at fuelling stations and more than half (55%) are satisfied with billing methods there, a proportion of fifty-one percent consider it difficult to know how much hydrogen their car actually receives.

Attitudes and perceptions - BEV/PHEV Owners and intenders

Both BEV/PHEV owners and intenders were asked a series of questions to understand their attitudes and perceptions towards public charging stations.

Information on receipt

- When considering information on a receipt, PHEV and BEV owner majorities consider items such as total cost (83%), rate (71%), total charging time (64%) and any fixed charges (62%) as *very* important. Less than half say the same about items such as name and location of EV charger, official language of choice, maximum rate of energy transfer, type of current plug types, and transaction number. EV intenders are more likely than EV owners to consider most of the information very important.
- When considering how their confidence in accuracy at public stations might be positively influenced, the idea that billing details would be provided immediately following the transaction is at the higher end of the spectrum (65%), while having knowledge that there is an independent dispute resolution mechanism in place is at the lower end (46%) of the spectrum. Between owners and intenders, the latter are always more likely to consider the options to have a strong positive influence on their confidence. This is important to note from a perspective in increasing adoption, as these types of confidence-enhancing mechanisms are what will encourage more people to purchase EVs.

Attitudes and perceptions - FCEV Owners and intenders

FCEV owners and intenders were asked a series of questions to understand their attitudes and perceptions towards hydrogen dispensing stations.

- When asked about important information to see on a receipt, a majority of FCEV owners and intenders consider total cost, rate and sales taxes to be very important. Similar to patterns among BEV/PHEV owners and intenders, FCEV intenders consider most information to be very important more often than owners.
- According to FCEV owners and intenders, ensuring public hydrogen dispensers are approved and inspected by accredited officials and designed and built to perform in accordance with Canadian standards would have strong positive influences on their level of confidence (55% each).

Small business owners with EVs

- SME owners who own BEVs or PHEVs are split between using their vehicle for business, with about half saying they do (51%) and half saying they do not (49%).

- Among SME owners who do use their EV for business, a majority of eighty percent use public chargers for their vehicle, with half taking advantage of free chargers. Level 1 public charging stations are used the most frequently, with a majority (84%) of SME owners using it to charge their vehicle at least every two weeks, including forty percent within that group who use it once per week and thirty-one percent who use it 3 or more times per week.

Awareness of Measurement Canada

- EV owners and intenders across Canada are mostly aware of Measurement Canada's responsibility for gas pumps, but are less aware of its responsibility for natural gas and electricity meters. This points to another reason for a robust communications plan when implementing new standards.

Qualitative findings

The qualitative research was aimed at assessing awareness of Measurement Canada and its role within the clean fuels industry, as well as awareness and perceptions of the measurement accuracy and performance requirements for electric vehicle charging and hydrogen dispensing stations currently being developed in Canada.

Awareness of Measurement Canada

- The results suggest that among key stakeholders within the clean fuels industry, Measurement Canada is relatively well-known. There is an opportunity to increase awareness among stakeholders such as prospective investors and businesses newer to the industry, like fleet owners. In fact, increased communications across all groups is essential at this time. Manufacturers and service providers alike emphasized a need to be kept aware of developments related to regulatory issues, and further agreed that open communication and transparency with consumers will be crucial moving forward.

Reactions to new requirements in development

- The release of the upcoming requirements is an important issue that is top-of-mind for charging/fuelling service providers and manufacturers of both charging equipment and ZEVs. The subject is being discussed across the industry as stakeholders await guidance from Measurement Canada. Two groups that had lower awareness of the impending requirements and consequently no strong opinion about them were fleet owners and investors.
- There was overall support for the new requirements being developed by Measurement Canada, with several participants emphasizing the need for regulations to be implemented as quickly as possible, especially allowing energy-based billing in place of the current standard of time-based billing. Participants stated that time-based billing is extremely inconsistent and inaccurate, particularly for Level 3 or DC-Fast Charging (DCFC) stations.
- While there was broad support for the development of requirements, some participants were wary of too much government oversight creating bottlenecks in the industry, and new standards effectively nullifying current equipment. The consensus was that government involvement is necessary in the way of financial aid and standardizations to maintain momentum and confidence within the industry, though with as few limitations on the market as possible.
- Charging/fueling service providers and manufacturers were quick to highlight the importance of the implementation plan, including a need for increased communications about timelines, a retrofitting plan for equipment currently in the market, possible government subsidies, and information about the allocation of carbon credits. The hydrogen fuel cell industry is still quite nascent but faces similar challenges as the electric vehicle industry in that there are no approved metering devices on the market.

Concerns and perceptions about accuracy

- Most manufacturers and service providers are highly confident in the functionality of the charging / dispensing equipment they currently produce, own, or lease and for the most part have not experienced many issues related to the billing methods.

- When asked directly about their concerns with accuracy, most participants indicated a low level of concern with the accuracy of clean fuel measurement. Interviewees were also asked if the new regulations would affect consumer and market confidence in EV charging and hydrogen dispensing stations. There is a perceived high level of consumer trust in the current stations, likely coming from a belief that the chargers are regulated already. While consumer confidence may not be low to begin with, it was suggested that introducing regulations around charging stations will likely increase that level of confidence.

Increasing confidence in EV fueling accuracy

- Participants were asked to describe how specific protocols would affect confidence in accuracy of clean fuel charging/dispensing stations. The consensus was that the four requirements would increase consumer and market confidence in the accuracy of clean fuel measurement, though they did not have a strong impact for many stakeholders already in the industry.

5. Political neutrality statement and contact information

I hereby certify as a senior officer of Environics that the deliverables fully comply with the Government of Canada political neutrality requirements outlined in the Communications Policy of the Government of Canada, and Procedures for Planning and Contracting Public Opinion Research. Specifically, the deliverables do not include information on electoral voting intentions, political party preferences, standings with the electorate, or ratings of the performance of a political party or its leaders.



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Introduction

6. Background

Measurement Canada is an agency of Innovation, Science and Economic Development Canada (ISED). It is responsible for ensuring accuracy in the selling of measured goods, developing and enforcing the laws related to measurement accuracy, approving and inspecting measuring devices and investigating complaints of suspected inaccurate measurement. Innovation, Science and Economic Development Canada works with Canadians in all areas of the economy and in all parts of the country to improve conditions for investment, enhance Canada's innovation performance, increase Canada's share of global trade and build a fair, efficient and competitive marketplace.

To encourage Canadians to adopt zero emission vehicles (ZEV) over the next ten to fifteen years, the Government of Canada announced 56.1 million in the 2021 Federal Budget for Measurement Canada to develop and implement, in coordination with international partners, a set of codes and standards for retail ZEV charging and fuelling stations.

Measurement Canada is working to report on results of its investments in the development of codes, standards and regulations for charging and refuelling measurement for existing and new zero-emission vehicles charging technologies. Using this current and future research, Measurement Canada will:

- Have the capacity to provide both pre-market approvals for clean fuels measurement devices (e.g., electric chargers, hydrogen refueling stations) as well as post market surveillance of these devices as they are used in measurement-related trade;
- Have consumer confidence data around fairness at charging or refueling stations;
- Learn more about the expectations of consumers with EV vehicles when it comes to proposed technology and preferred billing methods;
- Understand the effectiveness and usefulness of the clean fuel measurement devices programs and services it is developing, as well as its utility in building consumer confidence in the clean fuel market;
- Directly support government-wide priorities to advance clean fuels markets and carbon capture, utilization and storage technologies in Canada.

7. Research rationale and objectives

The market change from fossil fuel powered vehicles to clean fuels requires both supply chains and consumers to have confidence that this emerging market will have measurement certainty through government oversight. This means that Measurement Canada must have the capacity to provide both pre-market approvals for clean fuels measurement devices (e.g., electric chargers, hydrogen refueling stations), as well as post-market surveillance of these devices as they are used in measurement-related trade.

Consumer confidence data around fairness at charging or refueling stations is not readily available through other research programs related to zero-emission vehicles.

This research was conducted to inform Measurement Canada on the effectiveness and usefulness of the clean fuel measurement devices, programs and services it is developing, as well as its utility in building consumer confidence in the clean fuel market.

The objectives of the research include selecting and developing baselines against which to measure results and to effectively inform Measurement Canada's reporting processes, including consumer confidence data around the fairness of charging and/or refueling stations.

In addition, Measurement Canada seeks to better understand levels of consumer confidence with clean fuel charging and refueling equipment currently in the market. To that end, a two-phase approach of a quantitative survey and qualitative online interview aims to canvass current consumers and users of clean fuel charging and refueling devices.

8. About this report

This report begins with an executive summary outlining key findings and conclusions, followed by a detailed analysis of the quantitative and qualitative results. A detailed description of the quantitative methodology is presented in Appendix A and the qualitative methodology is in Appendix C. The research instruments used to conduct this study are presented in Appendix B (quantitative) and D (qualitative).

Quantitative results were analyzed by the total responding and by key subgroups of the population (that is, by region, age, gender, household income and education, and other factors such awareness of Measurement Canada's responsibilities). Noteworthy subgroup differences are highlighted where relevant.

Note: Throughout this report the columns and rows in the quantitative results tables may not add to 100% due to rounding or multiple mentions. Base size is specified depending on total sample, or stratified by EV owners and EV intenders.

Detailed findings – Quantitative research

EV Ownership and Intention

1. EV Ownership

Electric Vehicle owners in Canada are most likely to own a Plug-In Hybrid EV, and least likely to own a Hydrogen/Fuel Cell EV.

Among Canadians with electric vehicles, over half (56%) own a Plug-In Hybrid Electric Vehicle (PHEV). Close to four in ten (39%) own a Battery Electric Vehicle (BEV), leaving a very small minority (5%) who own a Hydrogen/Fuel Cell Electric Vehicle (FCEV).

Electric vehicle ownership – by Region

Type of Electric Vehicle	Total (n=1,000)	Region					
		BC/Terr (n=267)	AB (n=40)	MB/SK (n=32)	ON (n=224)	QC (n=408)	ATL (n=29)
Plug-In Hybrid Electric Vehicle (PHEV)	56%	52%	58%	28%	51%	63%	59%
Battery Electric Vehicle (BEV)	39%	42%	35%	59%	43%	34%	34%
Hydrogen/Fuel Cell Electric Vehicle (FCEV)	5%	6%	8%	13%	6%	4%	7%

Q1 Do you currently own or lease a battery electric vehicle, a plug in hybrid electric vehicle, or a hydrogen/fuel cell electric vehicle?

Q2 Do you have regular use of a battery electric vehicle, a plug in hybrid electric vehicle, or a hydrogen/fuel cell electric vehicle (e.g. your spouse or partners vehicle, a company vehicle, etc.)?
SUBSAMPLE; EV Owners (n=1,000)

Among EV owners in Canada, residents of Quebec (63%) are most likely to own a PHEV.

Ownership of BEVs is higher among the following:

- Men (41% vs 35% women)
- Those aged 55+ (46%)

2. Model Year and Range of EV

About half of Canadian EV owners own a vehicle with a model year of 2020 or newer.

Canadians who have electric vehicles are most likely to own a model from the last two years (46%). A smaller but similar proportion of forty percent own a vehicle with a model year between 2015 to 2019.

Model Year of EV owned – by EV Type and Region

Model year of EV	Total (n=1,000)	PHEV Total (n=558)	BEV Total (n=389)	FCEV Total (n=53)	Region					
					BC/Terr (n=267)	AB (n=40)	MB/SK (n=32)	ON (n=224)	QC (n=408)	ATL (n=29)
2011-2014	6%	6%	6%	9%	4%	10%	13%	4%	7%	3%
2015-2019	40%	43%	36%	42%	39%	40%	25%	45%	39%	38%
2020 or newer	46%	43%	52%	34%	48%	35%	56%	42%	47%	41%

Q4 What is the model year of your ____?
 SUBSAMPLE; EV Owners (n=1,000)

Males (42% vs. 36% of females) and those earning a household income of between \$80-<\$100K (52%), more commonly own a vehicle made between 2015-2019. Those who are more likely to own a vehicle from 2020 or later include BEV owners (52%) and those with a household income of \$100K+ (51%).

Canadians who own EVs typically have an approximate range of up to between 200 and 400 km.

Approximately four in ten each report a range of 200 km or less (40%) or between 200 km and 400 km (47%). Close to eight in ten (77%) say their vehicle’s range is 400 km or less, and 17 percent have a range of over 400 km.

Range of EV owned – by EV Type and Region

Approximate Range of Electric Vehicle	Total (n=1,000)	PHEV Total (n=558)	BEV Total (n=389)	FCEV Total (n=53)	Region					
					BC/Terr (n=267)	AB (n=40)	MB/SK (n=32)	ON (n=224)	QC (n=408)	ATL (n=29)
NET: <200	40%	53%	23%	36%	37%	30%	53%	36%	46%	34%
Less than 100 km	27%	40%	11%	9%	24%	23%	34%	22%	32%	24%
100-200 km	13%	13%	12%	26%	13%	8%	19%	14%	14%	10%
NET: 200-400	37%	32%	44%	30%	40%	53%	25%	39%	33%	24%
200-300	16%	17%	15%	9%	19%	20%	9%	18%	13%	14%
300-400	21%	15%	29%	21%	21%	33%	16%	21%	20%	10%
NET: 400+	17%	10%	29%	13%	18%	13%	9%	18%	17%	31%
400-500	14%	7%	25%	8%	12%	13%	6%	16%	15%	17%
500+	3%	3%	4%	6%	6%	-	3%	3%	2%	14%
Not sure	6%	5%	5%	21%	6%	5%	13%	7%	5%	10%

Q5 What is the approximate all-electric range of your EV? Please indicate the longest range if multiple EVs are owned?
 BASE: Owners (n=1,000)

EV owners with an approximate range of 400km+ is higher among:

- BEV owners (29%)
- Those earning a HH income of \$100+ (21%)
- A vehicle with a model year of 2020 or newer (24%)

EV owners with an approximate range of <200km is higher among:

- PHEV owners (53%)
- A vehicle with a model year between 2011-2014 (59%)

3. EV Intention

More than half of those who intend to purchase an EV in the next two years plan to purchase a PHEV.

Those who intend to purchase an EV in the next two years are more likely to have their sights set on a PHEV with six in ten (60%) indicating this. Another one third (33%) intend to buy a BEV, leaving just under one in ten who are considering a FCEV.

EV Intention – by Region and Age

Type of Electric Vehicle	Total (n=800)	Region					
		BC/Terr (n=132)	AB (n=86)	MB/SK (n=50)	ON (n=308)	QC (n=170)	ATL (n=54)
Plug-In Hybrid Electric Vehicle (PHEV)	60%	53%	64%	62%	59%	62%	69%
Battery Electric Vehicle (BEV)	33%	41%	29%	28%	31%	36%	30%
Hydrogen/Fuel Cell Electric Vehicle (FCEV)	7%	6%	7%	10%	10%	2%	2%

Q3 Are you considering purchasing a battery electric vehicle, a plug in hybrid electric vehicle, or a hydrogen/fuel cell electric vehicle in the next two years?

SUBSAMPLE; EV Intenders (n=800)

Women (69%) and individuals living in single family homes without parking (79%) are most likely to consider a PHEV in the next two years include, while men are more likely (30%) to consider a BEV.

Charging Behaviour – BEV and PHEV Owners

1. Charging at Home

When charging at home, BEV and PHEV owners more commonly use a standard wall electrical outlet (Level 1) or a fixed/hard-wired Level 2 charging station.

When asked about their methods of charging at home, close to four in ten (38%) BEV and PHEV owners use a fixed/hard-wired Level 2 charging station. A similar proportion of 36 percent use a standard wall electrical outlet (Level 1). Less than one in ten reports using a Portable (8%) or Shared (4%) charging station or a shared DC fast charger (1%). Around one in ten say they do not charge at home.

PHEV owners (41%) are more likely than BEV owners (29%) to use a standard wall electrical outlet (Level 1) at home, whereas BEV owners are more likely (46%) to use a fixed/hard-wired charging station (Level 2).

Methods of Charging at Home – by Age and Gender

Method of charging	Total (n=947)	PHEV Total (n=558)	BEV Total (n=389)	Gender		Age		
				Male (n=694)	Female (n=248)	18-34 (n=187)	35-54 (n=371)	55+ (n=389)
Standard wall electrical outlet (Level 1)	36%	41%	29%	34%	42%	34%	33%	40%
Fixed/hard-wired Level 2 charging station	38%	33%	46%	42%	28%	29%	42%	39%
Portable Level 2 charging station	8%	7%	10%	8%	10%	11%	11%	4%
Shared Level 2 charging station	4%	4%	3%	4%	5%	9%	4%	2%
Shared DC fast charger	1%	2%	1%	2%	0%	5%	1%	0%
I do not charge at home	11%	12%	11%	11%	13%	12%	9%	13%
Other	1%	1%	1%	0%	2%	1%	-	1%

Q11 If you charge your EV at home, what method of charging do you use?
SUBSAMPLE; BEV and PHEV Owners (n=947)

Standard wall electrical outlet (Level 1) use at home is higher among the following types of BEV/PHEV owners:

- Women (42% vs men 34%)
- Those with a range of <200 km (50%)
- Those earning a HH under \$40K (51%)

BEV/PHEV owners who are men are more likely (42%) than women (28%) to use a fixed/hard-wired Level 2 charging station at home.

The small proportion of BEV/PHEV owners who use shared charging are likely to say they are billed for it. Less than one in ten (5%) BEV/PHEV owners use shared chargers. Among them, six in ten (62%) say they are billed for it.

Use of Shared Charging

Billed when using shared charging	Total (n=50)	PHEV Total (n=34)	BEV Total (n=16)
Yes	62%	62%	63%
No	30%	35%	19%
Not sure	8%	3%	19%

Q12 Are you billed for charging your EV using a shared Level 2 charging station/a shared DC fast charger?
 SUBSAMPLE; BEV and PHEV Owners who use shared chargers (n=50)

2. Charging Away from Home

The majority of PHEV and BEV owners charge their EVs away from where they live and are most likely to use free chargers when doing so.

Eight in ten (81%) PHEV and BEV owners charge their EVs away from where they live, and more than half (56%) do so using free chargers. Close to one third use ChargePoint locations (30%) and smaller proportions use Circuit électrique (25%) and FLO locations (22%). BEV owners are more likely to use ChargePoint locations (35%), FLO locations (33%) and Tesla Supercharger Stations (30%).

Charging Away from Home – by Gender and Age

Method of charging	Total (n=947)	PHEV Total (n=558)	BEV Total (n=389)	Gender		Age		
				Male (n=694)	Female (n=248)	18-34 (n=187)	35-54 (n=371)	55+ (n=389)
NET: YES (n=764)	81%	81%	80%	83%	75%	88%	86%	72%
Free chargers	54%	53%	55%	53%	55%	51%	55%	54%
ChargePoint locations	30%	27%	35%	29%	32%	27%	34%	27%
Circuit électrique locations	25%	25%	24%	27%	20%	24%	25%	25%
FLO locations	22%	14%	33%	24%	15%	15%	22%	27%
Tesla Supercharger Stations	21%	15%	30%	20%	23%	36%	18%	16%
BC Hydro EV locations	14%	14%	14%	14%	15%	16%	14%	14%
Tesla Destination Charging	9%	8%	11%	8%	12%	18%	11%	2%
Other	6%	3%	10%	7%	4%	-	4%	11%
Not Sure	4%	4%	3%	4%	4%	4%	3%	5%
No (n=183)	19%	19%	20%	25%	17%	12%	14%	28%

Q13 Do you ever charge your personal battery electric vehicle or plug in hybrid electric vehicle away from where you live?
 SUBSAMPLE; BEV and PHEV Owners (n=947)

Q15 When you have charged your personal battery electric vehicle or plug-in hybrid vehicle away from home what type of publicly available electric vehicle chargers have you used?
 SUBSAMPLE; BEV and PHEV Owners who uses public charging stations (n=764)

BEV/PHEV owners who charge away from home are likely to be:

- Younger than 55 years old (87%)
- Men (83% vs 75% women)
- Those earning a HH between \$80k and <\$100k (87%)

Those less likely to charge away from home include:

- Age 55+ (28%)
- Women (25% vs 17% men)

When charging away from home, BEV/PHEV owners most likely to use free chargers include racialized persons (64%). Those who typically use ChargePoint locations when charging away from home are living in single family homes with parking (33%).

BEV/PHEV owners who do not charge outside of their home say it is because they do not leave their home range or that it takes too long charge.

Among the 19 percent of PHEV and BEV owners who do not charge their EVs away from where they live, over half (54%) say it is because they do not leave their home range. Other reasons include their EV takes too long to charge outside of their home (23%) or that they experience difficulty locating chargers (22%).

BEV owners more commonly (63%) point to not leaving their home range as their reason. PHEV owners are more likely to say it takes too long to charge (31%) or that they have difficulty locating chargers (28%).

Not charging away from home - Reasons

Method of charging	Total (n=183)	PHEV Total (n=107)	BEV Total (n=76)	Gender		Age		
				Male (n=121)	Female (n=62)	18-34 (n=22)	35-54 (n=53)	55+ (n=108)
I don't leave my home range	54%	47%	63%	56%	48%	50%	45%	58%
It takes too long to charge	23%	31%	12%	22%	24%	27%	28%	19%
Difficulty locating chargers	22%	28%	14%	22%	23%	32%	34%	15%
Not comfortable on long trips (range concern)	20%	17%	24%	21%	16%	27%	23%	17%
Doubts about the accuracy of the charge received	8%	8%	8%	8%	8%	18%	8%	6%
Don't have an app	8%	8%	7%	6%	11%	5%	6%	9%
Chargers are difficult to use	5%	5%	7%	7%	3%	5%	11%	3%
Other	13%	7%	21%	10%	19%	-	11%	17%
Not sure	3%	4%	1%	2%	5%	-	4%	3%

Q14 Why do you not charge your personal battery electric vehicle or plug in hybrid electric vehicle away from where you live?
 SUBSAMPLE; BEV and PHEV Owners who do not charge away from home (n=183)

3. Public charging stations - Frequency

PHEV and BEV owners most frequently use Level 1 or Level 2 public charging stations. Three-in-ten use Level 3 charging stations when charging away from home.

Among PHEV and BEV owners, Level 1 and Level 2 public charging stations are most frequently used. About half say they use a Level 1 station (48%) or Level 2 station (45%) at least every two weeks, compared to three in ten (29%) who say the same about Level 3 stations.

Owners of PHEVs are likely to use all three levels of public charging stations more frequently (at least every two weeks) than BEV owners. BEV owners are more likely to say they use Level 2 (36%) and Level 3 (37%) charging stations occasionally throughout the year. They are also more likely to say they use none of the above as frequently as every two weeks (46%).

Public Charging Stations – Frequency of Use

Type of public charging station	NET At least every two weeks	3 or more times per week	Once per week	Once every 1 to 2 weeks	Once a month	Occasionally throughout the year	Never
Level 1 public charging station (120 V, 15-20 A)	48%	13%	22%	14%	5%	17%	30%
Level 2 public charging station (240 V, up to 80 A)	45%	10%	19%	16%	11%	26%	17%
Level 3 public charging station (480 V, 300 A), includes superchargers	29%	6%	12%	11%	10%	24%	37%

Q16 How often do you charge your personal vehicle at the following type of public charging stations?
SUBSAMPLE: BEV and PHEV Owners who charge away from home (n=764)

Public Charging Stations – At least every two weeks – By EV type

Type of public charging station	Total (n=764)	PHEV Owners (n=451)	BEV Owners (n=313)
Level 1 public charging station (120 V, 15-20 A)	48%	56%	36%
Level 2 public charging station (240 V, up to 80 A)	45%	52%	36%
Level 3 public charging station (480 V, 300 A), includes superchargers	29%	34%	23%
None of the above	35%	28%	46%

Q16 How often do you charge your personal vehicle at the following type of public charging stations?
SUBSAMPLE: BEV and PHEV Owners who charge away from home (n=764)

Level 1 public charging station use at least every two weeks is higher among the following types of BEV/PHEV owners:

- Younger people aged 18-34 (68%)
- Those earning a HH income under \$40K (81%)

- Those living in a single-family home without parking (80%)
- Those with an approximate range of 200-400 km (57%)

Use of Level 2 public charging station at least every two weeks is higher among the following types of BEV/PHEV owners:

- Those younger than 55 (58%)
- Those with an approximate range of 200-400 km (58%)
- Those living in a single-family home without parking (73%)

Level 3 public charging station at least every two weeks is higher among the following types of BEV/PHEV owners:

- Those aged 18-34 (52%)
- Those with an approximate range of 200-400 km (40%)

4. Public charging stations – Billing Methods

PHEV and BEV owners are most likely to have experience with charge based on time connected to the EV charger (\$/min) when billing at public charging stations.

When it comes to billing methods, BEV and PHEV owners who use public charging stations are most likely (40%) to have experienced charge based on time connected to the EV charger (\$/min). Almost three in ten (29%) have experienced Fixed charge per use (\$/charge).

Compared to their PHEV counterparts, owners of BEVs are more likely to have experience with charge based on time connected to the EV charger (\$/min) (50%) and charge based on energy delivered to the EV (\$kWh) (24%).

On the other hand, PHEV owners are more likely to experience fixed charge per use (\$/charge) (37%).

Billing Methods at Public Charging Stations – by EV type and Region

Billing methods	Total (n=767)	PHEV Total (n=452)	BEV Total (n=315)	Region					
				BC/Terr (n=206)	AB (n=26)	MB/SK (n=20)	ON (n=164)	QC (n=331)	ATL (n=20)
Charge based on time connected to the EV charger (\$/min)	40%	33%	50%	43%	31%	40%	35%	42%	40%
Fixed charge per use (\$/charge)	29%	37%	19%	22%	15%	20%	35%	32%	30%
Charge based on energy delivered to the EV (\$/kWh)	20%	17%	24%	22%	19%	20%	27%	15%	15%
Flat rate charge (\$/month)	16%	17%	13%	15%	15%	15%	23%	12%	15%
Combination of time-based charge (\$/min) and charge based on energy delivered (\$/kWh)	12%	10%	16%	13%	12%	5%	16%	11%	10%
Other	2%	1%	3%	3%	4%	-	2%	1%	-
None, not applicable	15%	15%	16%	18%	27%	35%	13%	12%	15%

Q21 At public electric vehicle charging stations, either for business or personal reasons, which billing method(s) have you had experience with?
SUBSAMPLE; BEV and PHEV Owners who use public charging stations (n=767)

Public Charging Stations – Billing Methods – by Age and Gender

Billing methods	Total (n=767)	PHEV Total (n=452)	BEV Total (n=315)	Gender		Age		
				Male (n=576)	Female (n=186)	18-34 (n=167)	35-54 (n=319)	55+ (n=281)
Charge based on time connected to the EV charger (\$/min)	40%	33%	50%	41%	37%	35%	43%	40%
Fixed charge per use (\$/charge)	29%	37%	19%	29%	31%	37%	34%	19%
Charge based on energy delivered to the EV (\$/kWh)	20%	17%	24%	20%	20%	29%	18%	17%
Flat rate charge (\$/month)	16%	17%	13%	15%	19%	32%	15%	6%
Combination of time-based charge (\$/min) and charge based on energy delivered (\$/kWh)	12%	10%	16%	13%	11%	16%	12%	11%
Other	2%	1%	3%	2%	1%	-	1%	4%
None, not applicable	15%	15%	16%	14%	19%	11%	12%	22%

Q21 At public electric vehicle charging stations, either for business or personal reasons, which billing method(s) have you had experience with?
SUBSAMPLE; BEV and PHEV Owners who use public charging stations (n=767)

BEV/PHEV owners who have experience with Fixed charge per use (\$/charge) are more likely to be younger than 55 (36%).

5. Public charging stations – Experiences with Disagreement

The majority of PHEV and BEV owners have not experienced an issue, disagreement or dispute related to billing methods at public charging stations.

A large majority of PHEV and BEV owners have not experienced an issue, disagreement or dispute related to the billing method(s) used at public charging stations. Among the sixteen percent who *have*, close to two in ten (18%) say it was because the charge was expensive. A smaller proportion felt overcharged (13%), were simply dissatisfied with their experience (8%), or felt the charge went too slow (7%).

When asked how this disagreement was resolved, two in ten (21%) of those who offered an answer say that it was not resolved. About one in ten (11%) say they resolved the disagreement by talking/negotiating, and around the same proportion say it was resolved fast (10%).

Public Charging Stations – Experience with Disagreement – by Gender and Age

Experience	Total (n=649)	PHEV Total (n=383)	BEV Total (n=266)	Gender		Age		
				Male (n=496)	Female (n=150)	18-34 (n=149)	35-54 (n=281)	55+ (n=219)
Yes	16%	18%	12%	16%	15%	27%	16%	7%
No	84%	82%	88%	84%	85%	73%	84%	93%

Q22 Have you ever had any issues, disagreements or disputes related to the billing method(s) used at public charging stations?
SUBSAMPLE; BEV and PHEV Owners who use public charging stations (n=649)

Public Charging Stations – Experience with Disagreement – by Education & Income

Proposed statements	Total (n=649)	Educational attainment			Income			
		High school or less (n=72)	College / Apprentice /Some university (n=227)	University degree or higher (n=348)	Under \$40K (n=46)	\$40K - <\$80K (n=169)	\$80K - <\$100K (n=107)	\$100K+ (n=287)
Yes	16%	21%	19%	12%	20%	27%	15%	9%
No	84%	79%	81%	88%	80%	73%	85%	91%

Q22 Have you ever had any issues, disagreements or disputes related to the billing method(s) used at public charging stations?
SUBSAMPLE; BEV and PHEV Owners who use public charging stations (n=649)

Public Charging Stations – Experience with Disagreement – by Gender and Age

Experience	Total (n=101)	PHEV Total (n=70)	BEV Total (n=31)	Gender		Age		
				Male (n=77)	Female (n=23)	18-34 (n=40)	35-54 (n=46)	55+ (n=16)
Pricy/expensive	18%	19%	16%	18%	17%	18%	15%	27%
Overcharged/charged for more power than received/charged fees despite not providing a charge	13%	10%	19%	12%	17%	8%	13%	27%
Not satisfied with service/experience	8%	11%	-	8%	9%	10%	7%	7%
Takes time to charge the battery/slow charging	7%	6%	10%	9%	-	5%	7%	13%
Meters not working properly	7%	9%	3%	8%	4%	-	9%	20%
Lack of clear direction/transparency/receipt proof	6%	3%	13%	8%	-	10%	4%	-
Other	13%	17%	3%	12%	13%	13%	11%	20%
Prefer not to say	41%	40%	42%	39%	48%	48%	41%	20%

Q23 What was the cause of the issue/disagreement/dispute you experienced?
 SUBSAMPLE; BEV and PHEV Owners who have experienced a disagreement (n=101)

Public Charging Stations – Experience with Disagreement – by Education & Income

Proposed statements	Total (n=101)	Educational attainment			Income			
		High school or less (n=15)	College / Apprentice /Some university (n=44)	University degree or higher (n=42)	Under \$40K (n=9)	\$40K - <\$80K (n=45)	\$80K - <\$100K (n=16)	\$100K+ (n=27)
Pricy/expensive	18%	20%	18%	17%	33%	16%	13%	19%
Overcharged/charged for more power than received/charged fees despite not providing a charge	13%	20%	11%	12%	0%	11%	19%	19%
Not satisfied with service/experience	8%	0%	14%	5%	11%	9%	13%	4%
Takes time to charge the battery/slow charging	7%	0%	9%	7%	0%	4%	6%	15%
Meters not working properly	7%	0%	9%	7%	0%	4%	0%	15%
Lack of clear direction/transparency/receipt proof	6%	7%	5%	7%	11%	7%	0%	0%
Other	13%	7%	14%	14%	11%	11%	13%	11%
Prefer not to say	41%	53%	39%	38%	33%	49%	44%	33%

Q23 What was the cause of the issue/disagreement/dispute you experienced?
 SUBSAMPLE; BEV and PHEV Owners who have experienced a disagreement (n=101)

Public Charging Stations – Method of Resolution – By Gender and Age

Method of Resolution	Total (n=62)	PHEV Total (n=43)	BEV Total (n=19)	Gender		Age		
				Male (n=49)	Female (n=12)	18-34 (n=23)	35-54 (n=27)	55+ (n=12)
Not resolved	21%	16%	32%	22%	17%	13%	19%	42%
Talked to/negotiated with them	11%	14%	5%	10%	17%	22%	7%	-
Was resolved fast	10%	12%	5%	10%	8%	17%	7%	-
Didn't make a complain	8%	7%	11%	8%	8%	-	7%	25%
Money was refunded/reimbursed	8%	9%	5%	10%	-	-	15%	8%
Other	26%	28%	21%	24%	25%	22%	33%	17%
Didn't have any issue	5%	2%	11%	4%	8%	4%	7%	-
Prefer not to say	11%	12%	11%	10%	17%	22%	4%	8%

Q24 How was the issue/disagreement/dispute resolved?
 SUBSAMPLE; BEV and PHEV Owners who have experienced a disagreement (n=62)

BEV/PHEV owners aged 18-34 years old are among the most likely (27%) to have experienced an issue related to billing methods.

6. Public Charging stations – Current Levels of Confidence in Billing Accuracy and Experience

Confidence in billing accuracy is high among both PHEV and BEV owners, with over seven in ten feeling at least somewhat confident in all aspects of their charging experience.

Close to eight in ten (79%) BEV and PHEV owners feel at least somewhat confident about the billing accuracy of public EV charging stations, with twenty-eight percent feeling very confident, and fifty percent feeling somewhat confident.

Public Charging Stations – Confidence in Billing Accuracy – by EV Type and Region

Confidence	Total (n=767)	PHEV Total (n=452)	BEV Total (n=315)	Region					
				BC/Terr (n=206)	AB (n=26)	MB/SK (n=20)	ON (n=164)	QC (n=331)	ATL (n=20)
NET: Confident	79%	79%	77%	74%	54%	55%	77%	85%	80%
Very confident	28%	26%	31%	21%	15%	20%	20%	38%	30%
Somewhat confident	50%	53%	46%	53%	38%	35%	57%	47%	50%
NET: Not confident	11%	13%	9%	11%	35%	10%	10%	10%	15%
Not very confident	8%	10%	6%	9%	12%	10%	7%	8%	10%
Not at all confident	3%	3%	3%	2%	23%	-	3%	2%	5%
Not sure	10%	8%	14%	15%	12%	35%	12%	5%	5%

Q25 Based on your experience, how confident are you in the billing accuracy of public electric vehicle charging stations?
 SUBSAMPLE; BEV and PHEV Owners who uses public charging stations (n=767)

Public Charging Stations – Confidence in Billing Accuracy – by Gender and Age

Confidence	Total (n=767)	PHEV Total (n=452)	BEV Total (n=315)	Gender		Age		
				Male (n=576)	Female (n=186)	18-34 (n=167)	35-54 (n=319)	55+ (n=281)
NET: Confident	79%	79%	77%	80%	76%	89%	79%	72%
Very confident	28%	26%	31%	29%	25%	32%	26%	28%
Somewhat confident	50%	53%	46%	50%	52%	57%	53%	44%
NET: Not confident	11%	13%	9%	11%	12%	7%	14%	10%
Not very confident	8%	10%	6%	7%	11%	7%	11%	6%
Not at all confident	3%	3%	3%	3%	1%	-	3%	4%
Not sure	10%	8%	14%	10%	11%	4%	7%	18%

Q25 Based on your experience, how confident are you in the billing accuracy of public electric vehicle charging stations?
SUBSAMPLE; BEV and PHEV Owners who uses public charging stations (n=767)

Confidence in billing accuracy among BEV/PHEV owners is higher among:

- Residents of Quebec (85%)
- Those aged 18-34 (89%)
- Those with a university degree or more (83%)

Overall confidence in various aspects of the charging experience are also high, with around three-in-ten feeling very confident and four-in-ten feeling somewhat confident about each of the statements they were presented with.

BEV owners are more likely to be very confident about understanding the details on the receipt (39% vs 31% PHEV), chargers delivering the correct amount of charge (35% vs 28% PHEV), receipt accurately reflecting the amount of charge received (34% vs 26% PHEV) and getting what they paid for (33% vs 25% PHEV).

PHEV owners are likely to express less confidence in all the provided aspects of their charging experience.

Public Charging Stations – Confidence in Aspects of Charging Experience

Charging experience	NET Confident	Very confident	Somewhat confident	Not very confident	Not at all confident	Not applicable	Not sure
The amount I paid to charge my vehicle matched the amount of charge I received	74%	32%	42%	10%	4%	8%	3%
The chargers I use deliver the correct amount of charge	73%	31%	42%	11%	4%	7%	5%
I understand the details on the receipt	72%	34%	38%	11%	4%	10%	3%
The charging services I use are accurate and fair	72%	27%	45%	12%	3%	7%	5%
The receipt accurately reflected the amount of charge (kWh) I received	72%	29%	42%	10%	4%	9%	5%
I am getting what I paid for	71%	29%	42%	13%	4%	8%	4%

Q26 Thinking about your experiences paying to charge electric or plug-in hybrid vehicles, how confident are you about these aspects of your charging experience?
 SUBSAMPLE; BEV and PHEV Owners who uses public charging stations (n=767)

Public Charging Stations – NET confidence in Charging Experience – by Gender and Age

Charging experience	Total (n=767)	PHEV Total (n=452)	BEV Total (n=315)	Gender		Age		
				Male (n=576)	Female (n=186)	18-34 (n=167)	35-54 (n=319)	55+ (n=281)
The amount I paid to charge my vehicle matched the amount of charge I received	74%	74%	73%	75%	72%	77%	74%	72%
The chargers I use deliver the correct amount of charge	73%	71%	76%	73%	73%	73%	73%	73%
I understand the details on the receipt	72%	72%	73%	74%	69%	74%	73%	71%
The charging services I use are accurate and fair	72%	71%	73%	74%	68%	73%	71%	72%
The receipt accurately reflected the amount of charge (kWh) I received	72%	70%	75%	73%	69%	71%	75%	69%
I am getting what I paid for	71%	70%	73%	72%	68%	72%	70%	72%
The amount I paid to charge my vehicle matched the amount of charge I received	13%	13%	14%	13%	15%	10%	12%	18%

Q26 Thinking about your experiences paying to charge electric or plug-in hybrid vehicles, how confident are you about these aspects of your charging experience?
 SUBSAMPLE; BEV and PHEV Owners who uses public charging stations (n=767)

Feeling very confident in understanding the details on the receipt is highest among residents of Quebec (41%).

Overall, the majority of EV owners and intenders believe they will be billed fairly when using a public charger. Smaller proportions but still a majority are concerned about the fairness of the fees and are satisfied with billing methods.

When considering statements related to their experience at public charging stations, strong agreement is quite low. For instance, while over seven in ten (72%) generally agree that they will be billed fairly, only two in ten (21%) of those strongly agree, and over half (52%) somewhat agree. This trend is fairly consistent when it comes to concern about fairness of fees, satisfaction with billing methods, and difficulty knowing how much charge their car receives.

BEV/PHEV intenders are more likely than owners to be concerned about the fairness of fees (66% agreement vs. 56% owners), and owners are more likely to believe they will be billed fairly (77% agreement vs. 66% intenders), to feel satisfied with the billing methods employed by stations (70% agreement vs. 39% intenders) and that it is difficult to know how much charge their car actually gets (54% vs. 45% intenders). This is likely because owners have current experience with their EVs, while intenders do not.

Public Charging Stations – Level of Agreement with Statements

Statements	NET Agree	Strongly agree	Somewhat agree	Somewhat disagree	Strongly disagree	Not sure
I believe I will be billed fairly when I use a public electric charger	72%	21%	52%	9%	3%	16%
I am concerned about the fairness of the fees for electric vehicle charging	61%	23%	38%	21%	6%	12%
I am satisfied with the billing methods employed by public vehicle charging systems	56%	16%	40%	9%	3%	32%
It is difficult to know how much charge my car actually gets when using a public electric charger	50%	15%	35%	19%	7%	25%

Q30 To what extent do you agree or disagree with the following statements about battery electric or plug in hybrid vehicles?

SUBSAMPLE; BEV/PHEV Owners & Intenders (n=1,692)

Public Charging Stations – NET Agreement with statements – by Owners and Intenders

Statements about experience	Total (n=1,692)	Owners (n=947)	Intenders (n=494)
I believe I will be billed fairly when I use a public electric charger	72%	77%	66%
I am concerned about the fairness of the fees for electric vehicle charging	61%	56%	66%
I am satisfied with the billing methods employed by public vehicle charging systems	56%	70%	39%
It is difficult to know how much charge my car actually gets when using a public electric charger	50%	54%	45%

Q30 To what extent do you agree or disagree with the following statements about battery electric or plug in hybrid vehicles?

SUBSAMPLE; BEV/PHEV Owners & Intenders (n=1,692)

Agreeing that they will be billed fairly when using a public electric charger is higher among men (76% vs. 64% women).

Concern about the fairness of fees for EV charging is higher among those earning a household income <\$40k (71%).

Feeling satisfied with the billing methods employed by public EV charging systems is highest in Quebec (69%), compared to the other regions.

Attitudes and Perceptions – BEV and PHEV Owners and Intenders

1. Public charging stations – Important Information on Receipt

While all information is at least somewhat important, a high majority of BEV/PHEV owners and intenders find the total cost, rate, charge time, and fixed charges to be “very important” items on a receipt.

When considering information on a receipt, PHEV and BEV owner majorities consider total cost (83%), rate (71%), total charging time (64%) and any fixed charges (62%) to be very important. Less than half consider name and location of EV charger (46%), official language of choice (40%), maximum rate of energy transfer (39%), type of current (39%) plug types (35%) and transaction number (35%) to be very important.

EV intenders are more likely than EV owners to consider most of the information very important. For instance, while sixty-five percent of EV owners are likely to consider rate (\$/kWh) to be very important information on their receipt, seventy-nine percent of EV intenders say the same.

Compared to PHEV owners, BEV owners are more likely to consider a lot of the information to be very important.

Important information on Receipt – Level of Importance

Information on receipt	NET Important	Very important	Somewhat important	Not very important	Not at all important
Total cost (\$)	97%	83%	14%	2%	1%
Rate (\$/kWh)	95%	71%	24%	3%	1%
Total charging time	94%	64%	30%	5%	1%
Any fixed charges (e.g. session fee, monthly fee)	93%	62%	31%	6%	2%
Energy (kWh) delivered	92%	58%	34%	7%	2%
Sales tax(es) charged	90%	57%	33%	8%	2%
Other charges	89%	56%	33%	8%	3%
Time charging ended	89%	51%	38%	9%	2%
Time charging started	87%	51%	37%	10%	3%
Date of charge	86%	54%	32%	10%	4%
Name and location of EV charger	85%	46%	38%	13%	3%
Maximum rate of energy transfer (i.e. maximum power)	83%	39%	44%	14%	4%
Type of current (e.g. 7 kW AC, 25 kW DC)	80%	39%	41%	16%	4%
Plug types (e.g. J-1772, CHAdeMO, CCS/SAE)	73%	35%	38%	21%	7%
Transaction number	73%	35%	38%	21%	6%
Official language of choice	72%	40%	32%	20%	9%

Q27 How important is it for you that the receipt from a public charging station include the following information?

SUBSAMPLE; BEV/PHEV Owners & Intenders (n=1,692)

Important information on Receipt – Very important – by Owners and Intenders

Information on receipt	Total (n=1,692)	Owner (n=947)		Intender (n=747)	
		PHEV (n=558)	BEV (n=389)	PHEV (n=481)	BEV (n=264)
Total cost (\$)	83%	75%	82%	88%	92%
Rate (\$/kWh)	71%	62%	70%	80%	77%
Total charging time	64%	58%	64%	69%	67%
Any fixed charges (e.g. session fee, monthly fee)	62%	53%	59%	69%	70%
Energy (kWh) delivered	58%	51%	63%	58%	61%
Sales tax(es) charged	57%	49%	54%	63%	64%
Other charges	56%	47%	55%	61%	65%
Time charging ended	51%	47%	51%	55%	50%
Time charging started	51%	47%	51%	56%	47%
Date of charge	54%	47%	54%	60%	60%
Name and location of EV charger	46%	40%	50%	51%	47%
Maximum rate of energy transfer (i.e. maximum power)	39%	36%	41%	42%	38%
Type of current (e.g. 7 kW AC, 25 kW DC)	39%	37%	44%	40%	36%
Plug types (e.g. J-1772, CHAdeMO, CCS/SAE)	35%	33%	35%	36%	38%
Transaction number	35%	31%	34%	40%	35%
Official language of choice	40%	43%	41%	39%	34%

Q27 How important is it for you that the receipt from a public charging station include the following information?
 SUBSAMPLE; BEV/PHEV Owners & Intenders (n=1,692)

Only a small sample size of PHEV/BEV owners and intenders offered other examples of information they would find important on a receipt, most of which were repeated from previous question.

2. Enhancing Confidence in Public Charging Stations

BEV/PHEV intenders are always more likely than owners to say that each of the proposed options would have a strong positive influence on their confidence.

Owners and intenders saw several statements and were asked to rate the level of influence each would have on their confidence in public charging stations. Between forty-six and sixty-five percent expressed that the proposed options would have a strong positive influence. That billing details would be provided immediately following the transaction is at the higher end of the spectrum (65%), while knowledge that there is an independent dispute resolution mechanism in place is at the lower end (46%) of the spectrum.

Between owners and intenders, the latter are always more likely to consider the options to have a strong positive influence on their confidence.

Among owners, BEV owners are more likely than PHEV owners to say their confidence would be positively influenced if public EV chargers were designed and built to perform in accordance with Canadian standards (60% vs 50% PHEV) and if information about public charging stations and the charging process were easily available to consumers (55% vs 48% PHEV).

Accuracy of Public Charging Stations – Affect on Level of Confidence

Proposed statements	NET Strong/Mod Influence	Strong positive influence	Moderate positive influence	Little or no influence	Not sure
Billing details are provided immediately following the transaction	93%	65%	28%	4%	3%
Public chargers are approved and inspected by accredited officials	92%	63%	30%	4%	3%
Information about public charging stations and the charging process is easily available to consumers	92%	56%	36%	5%	3%
Accuracy and performance of public EV chargers is reverified periodically by accredited officials	91%	60%	32%	5%	3%
Public EV chargers are designed and built to perform in accordance with Canadian standards	90%	61%	30%	7%	3%
Charging information is shared and displayed during the transaction	89%	53%	36%	7%	4%
Knowing there is an independent dispute resolution mechanism in place	86%	46%	39%	9%	6%

Q29 To what extent would each of the following affect your level of confidence in the accuracy of the public charging stations?

SUBSAMPLE; BEV/PHEV Owners & Intenders (n=1,692)

Accuracy of Public Charging Stations – Strong Positive Influence on Confidence – by Owners and Intenders

Statements about experience	Total (n=1,692)	Owner (n=947)		Intender (n=745)	
		PHEV (n=558)	BEV (n=389)	PHEV (n=481)	BEV (n=264)
Billing details are provided immediately following the transaction	65%	57%	62%	72%	73%
Public chargers are approved and inspected by accredited officials	63%	55%	60%	69%	70%
Public EV chargers are designed and built to perform in accordance with Canadian standards	61%	50%	60%	68%	70%
Accuracy and performance of public EV chargers is reverified periodically by accredited officials	60%	52%	58%	66%	69%
Information about public charging stations and the charging process is easily available to consumers	56%	48%	55%	59%	66%
Charging information is shared and displayed during the transaction	53%	47%	51%	58%	61%
Knowing there is an independent dispute resolution mechanism in place	46%	43%	46%	46%	55%

Q29 To what extent would each of the following affect your level of confidence in the accuracy of the public charging stations?

SUBSAMPLE; BEV/PHEV Owners & Intenders (n=1,692)

Accuracy of Public Charging Stations – Strong Positive Influence on Confidence – by Education & Income

Proposed statements	Total (n= 1,692)	Educational attainment			Income			
		High school or less (n=226)	College / Apprentice/ Some university (n=584)	University degree or higher (n=873)	Under \$40K (n=146)	\$40K - <\$80K (n=421)	\$80K - <\$100K (n=254)	\$100K+ (n=715)
Billing details are provided immediately following the transaction	65%	67%	66%	64%	60%	62%	65%	67%
Public chargers are approved and inspected by accredited officials	63%	59%	65%	63%	62%	60%	58%	67%
Public EV chargers are designed and built to perform in accordance with Canadian standards	61%	60%	64%	59%	55%	55%	59%	65%
Accuracy and performance of public EV chargers is reverified periodically by accredited officials	60%	59%	61%	59%	58%	57%	59%	63%
Information about public charging stations and the charging process is easily available to consumers	56%	54%	56%	56%	53%	50%	58%	58%
Charging information is shared and displayed during the transaction	53%	51%	52%	54%	49%	53%	48%	56%
Knowing there is an independent dispute resolution mechanism in place	46%	45%	49%	45%	49%	44%	43%	48%

Q29 To what extent would each of the following affect your level of confidence in the accuracy of the public charging stations?

SUBSAMPLE; BEV/PHEV Owners & Intenders (n=1,692)

Those most likely to feel that billing details provided immediately would have a strong positive influence on their confidence include:

- Those aged 55+ (74%)
- Women (69% vs 62% men)
- Those living in a single-family home with parking (67%)

Those who say that public chargers being approved and inspected by accredited officials would have a strong positive influence on their confidence are likely to be aged 55+ (73%).

Fueling Behaviour – Hydrogen/Fuel Cell EV Owners

1. Purchasing Hydrogen Fuel

More than half of FCEV owners purchase hydrogen fuel at least every two weeks.

Almost six in ten (58%) FCEV owners report purchasing hydrogen fuel at least every two weeks.

When purchasing, close to four in ten (37%) FCEV owners have experienced billing by fixed charge per use (\$/charge). FCEV owners are least likely to have experienced flat rate charge (11%), or combination of time-based charge (\$/min) and hydrogen delivered (11%).

Purchasing Hydrogen Fuel – Frequency

Frequency	Total (n=53)
<i>NET: At least every two weeks</i>	58%
3 or more times per week	11%
Once per week	26%
<i>Once every 1 to 2 weeks</i>	21%
Once a month	15%
Occasionally throughout the year	13%
Never	13%

Q32 How often do you purchase hydrogen fuel for your hydrogen fuel cell electric vehicle(s)?

SUBSAMPLE; Hydrogen/Fuel Cell Owners (n=53)

Though thirteen percent of FCEV owners say they never purchase hydrogen fuel, the sample size for this subgroup (n=7) precludes quantitative analysis.

Retail Hydrogen Fuel Dispensing Stations – Billing methods

Billing method	Total (n=46)
Fixed charge per use (\$/charge)	37%
Charge based on mass of hydrogen delivered (kg)	28%
Charge based on time connected to the dispenser (\$/min)	26%
Flat rate charge (\$/month)	11%
Combination of time-based charge (\$/min) and hydrogen delivered	11%
None, not applicable	11%

Q34 At retail hydrogen fuel dispensing stations, which billing method(s) have you had experience with?

SUBSAMPLE; Hydrogen/Fuel Cell Owners who have purchase hydrogen fuel (n=46)

2. Hydrogen fuel dispensing stations – Experience with disagreement

The majority of hydrogen/fuel cell EV owners have not experienced disagreement related to billing methods.

Only a small minority of FCEV owners have experienced disagreement or dispute related to the billing method(s) being used at a public hydrogen fuel station. The sample size of those who have this type of experience (n=3) is too small for quantitative analysis.

Public Hydrogen Fuel Dispensing Stations - Experience with Disagreement

Experience	Total (n=48)
Yes	6%
No	94%

Q35 Have you ever had any issues, disagreements or disputes related to the billing method(s) used at public hydrogen fuel stations?
SUBSAMPLE: Hydrogen/Fuel Cell Owners who use public charging stations (n=48)

3. Hydrogen Fuel Dispensing Stations – Confidence in Billing and Experience

Overall, confidence in billing accuracy of hydrogen filling stations is quite high, though this proportion is made up largely of owners who are just somewhat confident.

While a majority of eight in ten FCEV owners are generally confident (81%), that total is composed of sixty four percent who is only somewhat confident, leaving seventeen percent who say they are very confident.

Feelings of confidence may be driven by considering fuelling stations to be accurate and fair (68% confident), understanding details of the receipt (66%) and that the amount paid matches the amount of hydrogen received (66%).

Public Hydrogen Dispensing Stations – Confidence in Billing Accuracy

Confidence	Total (n=53)
NET: Confident	81%
Very confident	17%
Somewhat confident	64%
Not very confident	8%
Not at all confident	-
NET: Not confident	11%

Q38 Based on your experience, how confident are you in the billing accuracy of public hydrogen dispensing stations?
SUBSAMPLE: Hydrogen/Fuel Cell Owners (n=53)

Public Hydrogen Dispensing Stations – Confidence in Aspects of Experience

Charging experience	NET Confident	Very confident	Somewhat confident	Not very confident	Not at all confident	Not sure	Not applicable
The hydrogen fueling stations I use are accurate and fair	68%	19%	49%	13%	8%	4%	8%
I understand the details on the receipt	66%	25%	42%	23%	4%	2%	6%
The amount I paid to matched the amount of hydrogen I received	66%	19%	47%	11%	4%	8%	11%
The receipt accurately reflected the weight of hydrogen I received	64%	25%	40%	15%	6%	9%	6%
The stations I use dispense the correct amount of hydrogen	64%	13%	51%	15%	8%	6%	8%
I am getting what I paid for	62%	25%	38%	19%	4%	8%	8%

Q39 Thinking about your experiences paying to charge your hydrogen fuel cell vehicle(s), how confident are you about these aspects of your experience?

SUBSAMPLE; Hydrogen/Fuel Cell Owners (n=53)

Attitudes and Perceptions – Hydrogen/Fuel Cell EV Owners and Intenders

1. Public Hydrogen Fueling Stations – Important Information on Receipt

A majority of FCEV owners and intenders consider total cost, rate and sales taxes to be very important information on their receipts.

While all the proposed information is deemed at least somewhat important by the majority of FCEV owners and intenders, this group is likely to consider total cost (77%), rate (65%) and sales tax(es) charged (60%) very important information on a receipt.

Similar to patterns among BEV/PHEV owners and intenders, FCEV intenders consider most information to be very important more often than owners.

Public Hydrogen Fueling Stations – Important Information on Receipt

Information on receipt	NET Important	Very important	Somewhat important	Not very important	Not at all important	Not sure
Rate (\$/kg)	91%	65%	26%	5%	1%	4%
Any fixed charges	90%	55%	35%	6%	1%	4%
Sales tax(es) charged	88%	60%	28%	6%	2%	5%
Total cost (\$)	88%	77%	11%	6%	1%	6%
Hydrogen dispensed (kg)	86%	56%	31%	7%	-	6%
Name and location of hydrogen fuel station	85%	47%	38%	5%	4%	6%
Other charges	79%	50%	29%	11%	1%	9%
Date	76%	44%	31%	14%	2%	8%
Transaction number	74%	35%	39%	13%	4%	9%
Pressure of dispenser (MegaPascal (MPa)) (e.g. 35 MPa, 70 MPa)	73%	30%	44%	10%	2%	15%
Time fueling started	68%	34%	33%	16%	6%	10%
Time fueling ended	67%	36%	31%	16%	6%	11%
Which hydrogen fuel dispenser was used at the retail hydrogen fueling station	65%	31%	33%	19%	3%	13%
Official language of choice	65%	36%	29%	21%	9%	5%

Q40 How important is it for you that the receipt from a retail hydrogen fueling station include the following information?
 SUBSAMPLE; Hydrogen/Fuel Cell Owners and intenders (n=108)

Important information on Receipt – Very important – by Owners and Intenders

Information on receipt	Total (n=108)	FCEV Owners (n=53)	FCEV Intenders (n=53)
Total cost (\$)	77%	68%	85%
Rate (\$/kg)	65%	51%	78%
Sales tax(es) charged	60%	49%	71%
Hydrogen dispensed (kg)	56%	47%	64%
Any fixed charges	55%	45%	64%
Other charges	50%	38%	62%
Name and location of hydrogen fuel station	47%	32%	62%
Date	44%	32%	56%
Time fueling ended	36%	36%	36%
Official language of choice	36%	34%	38%
Transaction number	35%	30%	40%
Time fueling started	34%	28%	40%
Which hydrogen fuel dispenser was used at the retail hydrogen fueling station	31%	26%	36%
Pressure of dispenser (MegaPascal (MPa)) (e.g. 35 MPa, 70 MPa)	30%	26%	33%

Q40 How important is it for you that the receipt from a retail hydrogen fueling station include the following information?
SUBSAMPLE; Hydrogen/Fuel Cell Owners and intenders (n=108)

2. Confidence in Public Hydrogen Fueling Stations

While more than half of FCEV owners and intenders are satisfied with billing methods at public hydrogen stations, another half consider it difficult to know how much hydrogen their car actually receives.

FCEV owners and intenders were presented with statements and asked to rate how much each one would affect their level of confidence in the accuracy of public stations. According to FCEV owners and intenders, ensuring public hydrogen dispensers are approved and inspected by accredited officials as well as designed and built to perform in accordance with Canadian standards, would have strong positive influences on their level of confidence (55% each).

Accuracy at Public Hydrogen Fueling Stations – Effect on Level of Confidence

Accuracy of public hydrogen stations	NET Strong/Moderate Influence	Strong positive influence	Moderate positive influence	Little or no influence	Not sure
Public hydrogen dispensers are approved and inspected by accredited officials	86%	55%	31%	3%	11%
Hydrogen dispensers are designed and built to perform in accordance with Canadian standards	83%	55%	29%	6%	11%
Billing details are provided to the consumer immediately following the transaction	84%	54%	31%	5%	11%
Accuracy and performance of retail hydrogen fuel dispensers are reverified periodically by accredited officials	87%	53%	34%	2%	11%
Information about public hydrogen stations and the dispensing process is easily available to consumers	81%	49%	32%	6%	13%
Hydrogen dispensing information is shared and displayed during the transaction	84%	44%	40%	5%	11%
Knowing there is an independent dispute resolution mechanism in place	79%	32%	46%	6%	15%

Q42 To what extent would each of the following affect your level of confidence in the accuracy of the public hydrogen stations?
 SUBSAMPLE; Hydrogen/Fuel Cell Owners and Intenders (n=108)

General confidence may be driven by the belief that they will be billed fairly at public hydrogen stations (18% strongly agree; 50% somewhat) and those who generally agree they are satisfied with the billing methods employed by public hydrogen stations (55%). Despite this, a notable proportion (51%) find it difficult to know how much hydrogen their car actually gets when using a public hydrogen station

Experiences at Public Hydrogen Fueling Stations – Agreement with Statements

Charging experience	NET Agree	Strongly agree	Somewhat agree	Somewhat disagree	Strongly disagree	Not sure
I believe I will be billed fairly when I use a public hydrogen station	68%	18%	50%	9%	-	23%
I am satisfied with the billing methods employed by public hydrogen stations	55%	14%	41%	8%	1%	36%
It is difficult to know how much hydrogen my car actually gets when using a public hydrogen station	51%	19%	31%	11%	3	35%

Q43 To what extent do you agree or disagree with the following statements about hydrogen fuel cell electric vehicles?
 SUBSAMPLE; Hydrogen/Fuel Cell Owners and Intenders (n=108)

Small Business Owners – Use of Electric Vehicles

1. Small Business Owners - Profile

SME owners who own BEVs or PHEVs are split between using their vehicle for business, with about half who do and half who do not.

Among EV owners, close to four in ten were business owners, of which eighty percent were labelled as small business owners. SME owners who own BEVs or PHEVs are split between using their vehicle for business, with about half saying they do (51%) and half saying they do not (49%).

The sample size (n=18) of SME owners with FCEVs is too small for quantifiable analysis.

Business Owners – Profile

Number of employees	Total (n=376)	Type of EV		
		PHEV (n=223)	BEV (n=133)	FCEV (n=20)
NET: Small business owner	80%	79%	79%	90%
<50	54%	51%	57%	75%
50-99	11%	12%	10%	10%
100-499	14%	17%	12%	5%
500-999	6%	4%	8%	5%
1000+	14%	16%	13%	5%

Q9 Are you currently the owner, partner or senior manager in a Canadian business of any size, who influences the overall direction of the company?
SUBSAMPLE; EV Owners (n=1,000)

Q10 Including yourself, approximately how many full-time staff does the company you own or work for, employ in Canada?
SUBSAMPLE; EV Owners who are business owners (n=376)

Small Business Owners – Use of EV for Business

Use of EV for business	SME owner with PHEV (n=177)	SME owner with BEV (n=105)	SME owner with FCEV (n=18)
Yes	54%	45%	72%
No	46%	55%	28%

Q17 Do you use one or more battery electric (EV) or plug-in hybrid vehicle(s) for your business?
SUBSAMPLE; SME Owner and BEV or PHEV owner (n=282)

Q31 Do you use one or more hydrogen fuel cell electric vehicles for your business?
SUBSAMPLE; SME owner and Hydrogen/Fuel Cell Vehicle Owner (n=18)

3. Small Business and BEV or PHEV Owners - Use of Public Charging Stations

The majority of BEV/PHEV and SME owners use a public charger for their vehicle, with half likely taking advantage of free chargers.

Eight in ten BEV/PHEV and small business owners use public chargers for their vehicle. When doing so, half report using free chargers, and almost four in ten report using Tesla Supercharger Stations (38%) or ChargePoint locations (34%).

Level 1 public charging stations are used the most frequently, with a majority (84%) of SME owners using it to charge their vehicle at least every two weeks, including forty percent within that group who use it once per week and thirty-one percent who use it 3 or more times per week.

Small Business Owners and BEV/PHEV Owners – Use of Public Chargers

Use of public chargers	Total (n=143)	Type of EV	
		PHEV (n=96)	BEV (n=47)
Yes	80%	81%	77%
No	20%	19%	23%

Q18 Do you use public chargers for your business EV/Hybrid vehicle(s)?
SUBSAMPLE; SME owner who uses BEV or PHEV for business (n=143)

Small Business Owners and BEV/PHEV Owners – Type of Public EV Charger

Type of public EV charger	Total (n=114)	Type of EV	
		PHEV (n=78)	BEV (n=36)
Free chargers	50%	46%	58%
Tesla Supercharger Stations	38%	37%	39%
ChargePoint locations	34%	37%	28%
Tesla Destination Charging	24%	23%	25%
Circuit électrique locations	19%	17%	25%
FLO locations	18%	17%	22%
BC Hydro EV locations	12%	10%	17%
Other	2%	-	6%

Q19 When you have used public chargers for your business EV/Hybrid vehicle(s), what type of publicly available electric vehicle chargers have you used?
SUBSAMPLE; SME owner who uses BEV or PHEV for business and uses public chargers (n=114)

Small Business Owners and BEV/PHEV Owners – Public Charging Station – Frequency

Type of public charging station	NET At least every two weeks	3 or more times per week	Once per week	Once every 1 to 2 weeks	Once a month	Occasionally throughout the year	Never
Level 1 public charging station (120 V, 15-20 A)	84%	31%	40%	13%	5%	4%	6%
Level 2 public charging station (240 V, up to 80 A)	79%	18%	34%	27%	6%	10%	5%
Level 3 public charging station (480 V, 300 A), includes superchargers	68%	18%	29%	21%	11%	11%	10%

Q20 Typically, how often are your company battery electric vehicles or plug in hybrids charged at the following type of public charging stations?
 SUBSAMPLE; SME owner who uses BEV or PHEV for business and uses public chargers (n=114)

Awareness of Measurement Canada

Six in ten EV owners and intenders across Canada are aware of Measurement Canada’s responsibility for gas pumps, and less than half are aware of their responsibility for natural gas or electricity meters.

Measurement Canada – Level of Awareness – by Region

Devices	Total (n=1,800)	Region					
		BC/Terr (n=399)	AB (n=126)	MB/SK (n=82)	ON (n=532)	QC (n=578)	ATL (n=83)
Gas pumps	59%	56%	67%	65%	59%	59%	58%
Natural gas meters	46%	47%	53%	49%	48%	43%	35%
Electricity meters	44%	44%	48%	39%	47%	41%	37%
None of the above	36%	38%	30%	32%	36%	35%	41%

Q44 Prior to this survey, were you aware that Measurement Canada is responsible for the approval, verification, and inspection of the following measuring devices? BASE; EV Owners and Intenders (n=1,800)

Measurement Canada – Level of Awareness – by Age, Gender

Devices	Total (n=1,800)	Gender		Age		
		Male (n=1,239)	Female (n=551)	18-34 (n=317)	35-54 (n=706)	55+ (n=777)
Gas pumps	59%	67%	41%	50%	54%	68%
Natural gas meters	46%	52%	32%	42%	42%	51%
Electricity meters	44%	49%	32%	48%	41%	45%
None of the above	36%	28%	54%	38%	41%	30%

Q44 Prior to this survey, were you aware that Measurement Canada is responsible for the approval, verification, and inspection of the following measuring devices? BASE; EV Owners and Intenders (n=1,800)

Measurement Canada – Level of Awareness – EV Status

Devices	Total (n=1,800)	EV Status	
		EV Owner (n=1,000)	EV Intender (n=800)
Gas pumps	59%	63%	54%
Natural gas meters	46%	50%	41%
Electricity meters	44%	50%	36%
None of the above	36%	30%	43%

Q44 Prior to this survey, were you aware that Measurement Canada is responsible for the approval, verification, and inspection of the following measuring devices? BASE; EV Owners and Intenders (n=1,800)

Awareness of at least some of Measurement Canada’s responsibilities is higher among:

- EV owners (50%-63%) vs EV intenders (36% - 54%)
- Those aged 55+ (51% - 67%)
- Men (49%-67%) vs women (32%-41%)
- Individuals in single family homes without parking (60% - 71%)

Detailed findings – Qualitative research

Qualitative Participant Profile

1. Participants

A total of 32 participants were interviewed for this study. Interview participants were from a variety of organizations both private and public across Canada. Participants were identified as members of any of the following groups: investors; fleet owners; manufacturers (vehicle or charging equipment); or charging/fuel service providers.

Details on participants' involvement in the clean fuels industry are provided below:

- Fleet owners, which included a regional municipality as well as privately owned companies, were largely still piloting large vehicles such as busses wherein charging typically occurs in-depot overnight.
- Investors included crown corporations, government organizations, incubators, and venture capitalists currently or planning to invest in the clean fuels market.
- Manufacturers included participants from both the vehicle and charging equipment industries.
- Charging/refuelling service providers were largely from national charging networks and utility companies.

Analysis of Key Themes

2. Awareness and perceptions of Measurement Canada

Nearly all interviewed participants reported awareness of Measurement Canada and its responsibilities.

Interviewees were asked about their awareness of Measurement Canada and its responsibility for oversight of fair billing and accurate measurement of EV charging and hydrogen dispensing. With the exception of investors, nearly all interviewed participants reported awareness of Measurement Canada, typically due to involvement in working groups with Measurement Canada or through operations as part of their role within their company. Investors did not have a high level of awareness of Measurement Canada itself or its responsibilities.

I assumed... I would not have known it would be Measurement Canada, but I assumed there would be oversight in this space.

Awareness of the development of measurement accuracy and performance requirements paralleled awareness of Measurement Canada itself in that those familiar with Measurement Canada's role were largely aware of the upcoming requirements and the consultation. The release of the upcoming requirements is an important issue that is top-of-mind for charging/fueling service providers and manufacturers of both charging equipment and ZEVs. The subject is being discussed across the industry as stakeholders await guidance from Measurement Canada and the market continues to expand. Fleet owners, who typically charge in-depot rather than off-site, and investors had lower awareness of the requirements that are in development, and consequently did not have strong opinions.

After being made aware that Measurement Canada approves and inspects measurement devices for accuracy and performance, participants were asked how often they think clean fuel devices should be inspected. EV charging and hydrogen dispensing service providers pointed to other countries that are more advanced in the field and suggested relying on data to inform the most effective and efficient policies.

I think they could leverage what's being done in other countries that are further ahead in this space, such as Western Europe and California.

Will depend on what they find during certification process. Annually would be sufficient unless there's some issue that's been identified. It should be a data-driven decision.

Let's determine how accurate metering can get before we assume how often we need to calibrate. There's not enough data to even know if there's any calibration needed at this time.

3. Reactions to new requirements being developed

Overall support for requirements is clear, with many noting the urgency for implementation.

Participants were read the following preamble and asked about their reaction to the new requirements being developed by Measurement Canada:

Measurement Canada is developing measurement accuracy and performance requirements for electric vehicle charging and hydrogen fuelling stations for ZEVs.

This will ensure that suppliers and retailers all follow the same codes and standards when selling clean fuels to Canadian consumers.

Suppliers and retailers will also be subject to regulatory oversight by Measurement Canada, in the same way that suppliers and retailers of gasoline and diesel fuels are, in order to ensure consumers receive accurate and reliable measurement.

Reactions to the new requirements ranged from broad to very specific. There was overall support for the new requirements being developed, with several participants emphasizing the need for regulations to be implemented as quickly as possible.

I think it's positive for consumers, positive for industry, and positive for government because it would incentivize and bring infrastructure investment. I do think everybody wins.

It's definitely a positive thing... It should have been done 5 years ago.

[I'm] happy that they're in development. Companies, industry and EV drivers should be very pleased that those rules are in development because a lot of EV drivers ask: "Why do I get billed on a time basis?" It is a common question and consumers seem concerned about it.

I think it's a good thing. Standardization and making sure the same regulatory oversight that's applied to gas/diesel is coming to an emerging technology like electric vehicle charging is positive.

I think it's good because it allows us to reference another standard. Gives us the confidence that it's being monitored to a standard beyond our own.

I think it's a good thing. You need some sort of government oversight to ensure that the consumer is getting what they think they are getting.

Several interviewees noted the requirements would help to enhance consumer confidence and trust when purchasing clean fuels. It was said that this type of confidence is important for electric vehicle adoption.

It's good that they're doing it. [It should be treated] the same as traditional gas infrastructure. Creates confidence that you get what you pay for and also provides safety.

We want that transparency too. We want everyone to play by the same rules. I'm looking forward to when they come out with these standards so that everyone can abide by them.

Glad to hear it. I think accuracy is important, so people are getting what they are paying for. Standardization will be important. Different cars have different information available. Standardization on rates and energy delivered will be useful and contribute to decision making around which suppliers to use.

There was also specific attention paid to allowing energy-based billing in place of the current standard of time-based billing. Participants stated that time-based billing is extremely inconsistent and inaccurate, particularly for Level 3 or DC-Fast Charging (DCFC) stations.

Time-based vehicle charging just isn't the correct way.

Time-based is past its prime. It's still in its infancy in terms of EV adoption but now that rates are increasing in terms of uptake [of EVs], as should the policy and all standards.

Enabling kWh will impact consumers, manufacturers, and operators positively. Billing is transparent and it is a more accurate way of planning what you should be billing vs costs of the operating network.

Others were surprised that these requirements aren't already in place and expressed an overall acceptance of this progression. They aligned the advancements to those of the gasoline industry and pointed to the growing adoption of electric vehicles which calls for a policy refresh.

I think my general reaction for the EV space is that it's probably time for evolution and a review of the current state.

[It's] necessary given the anticipated increase of zero-emissions vehicles on the road. Surprised it hasn't been done earlier; EVs are not new.

While there was broad support for the development of requirements, some participants mentioned concerns or caveats to their responses. For example, investors cautioned that too much government oversight could be a detriment to the industry and that a "laissez-faire" approach alongside self-regulation would lead to a more competitive market.

Other stakeholders worried about potential bottlenecks that could occur with requirements that are too burdensome to achieve. Exceptionally high standards or standards that disqualify chargers currently on the market may be a disincentive to site hosts, investors, manufacturers, and service providers. Some also noted the need for Canada's requirements to match other jurisdictions (e.g., USA and Europe) as a way to mitigate this and align standards. Participants highlighted the role of small businesses and community site hosts that provide a charging system as a service to their community but who might be disincentivized by burdensome requirements.

The consensus was that government involvement is necessary in the way of financial aid and standardizations to maintain momentum and confidence within the industry. Some suggestions that would alleviate backlogs included a sampling approach to testing charging stations, a phased approach to facilitate rapid deployment,

and postponing or staggering approval processes for equipment that is already proven to meet specific standards.

It creates more confidence and reliability. Stations go down, have issues... [creates a] lack of confidence for the consumer and is bad for the EV business as a whole. On the other side, do I want onerous regulation that's going to cause issues, no.

This is such a transitional field that a lot of manufacturers are still evolving ... I hope it doesn't bog down what they're able to do at present. I'm concerned whether the regulations will help enable the continuous development or if it's going to hinder the progress.

In some ways, my bias is to let business do its thing. But at the same time on some macro issues... government support and intervention is required to "prime the pump", but not ownership and control. If there are ways to provide financing to the private market to help them deploy, then great, as that is sort of the missing piece.

The result will be losing some older stations and having more difficulty finding partners ... If they're going to be more burdensome, they will not do it. Low maintenance and low administration is needed. For charging stations already installed we need something flexible. Hotels, restaurants, etc. will not host anymore due to administrative obligations.

Charging/fuelling service providers and manufacturers were quick to highlight the importance of the implementation plan, including a need for increased communications about timelines, a retrofitting plan for equipment currently in the market, possible government subsidies, and information about the allocation of carbon credits. Ultimately, these stakeholders were not clear on what the implementation plan will look like, and stakeholders felt that the lack of consistent communication from Measurement Canada was a key concern.

The roll-out will be key. If there are hurdles to get equipment certified, then it will cause problems.

Who does the cost fall on? I don't know what this meter would cost... We'd require clarity around how it will work and what it will look like. How is the government going to help subsidize these retrofits? The sooner the better so the manufacturers can start to integrate the technology at the time of build.

If it's going to have anything to do with calculating carbon credits, The owner of the station should own carbon credits. The network should not get the carbon credits.

As an investor, we see it as another regulatory hurdle for the company, so if that is cumbersome in terms of time and money it is a disincentive for the private capital investor to get into it. It can be a hurdle that keeps capital on the side-lines.

We want to evolve with them and what we fear is that Measurement Canada would impose specific accuracy. So, if we have a charger that is 3.5% and the limit is 3%, what do we do with the devices?

I understand it's still a nascent industry, there is a small number of stations. I understand there isn't an urgency to get certified equipment or verification methods in place. Having said that, we are installing more and more and if any of them was found to not be compatible with verification requirements, it would be problematic... Will we need to do complex retrofits if it turns out the requirements for fair billing and dispensing was not fully compatible with equipment we have in place.

There was also concern about the current delay in outlining the new requirements, as many companies are feeling pressure from consumers regarding the fairness of time-based billing.

Biggest disappointment is around delays. Without Measurement Canada putting in standards, we must do time-based billing and we can't move forward with energy-based billing.

We're overdue in getting clarity from Measurement Canada in terms of how we handle this. A lot more EV drivers across province and a lot of people asking why they're still being billed by time.

Government side is behind, networks are in place... Really surprised consumers are driving EVs and this is not in place.

This standard needs to be in place and it's been on the table for some time and there's a lot of pressure right now that we're getting from our customers to go to energy-based billing.

I give them credit for their ambitious timeline, but the process has been a bit disjointed and there's been a lack of clarity to us as manufacturers as to what the bigger picture is... It seems to be very disjointed and clunky. Feels like there hasn't been good communication between departments at Measurement Canada.

Some participants noted the fact that Canada is behind other countries in terms of progress around these requirements.

A lot of people at charging infrastructures and automakers pushing government to do this because other countries are doing this already... Get on with it. It's been long enough already.

Canada is not the last but not in the front. Canada has been dragging its feet on this. It's happening in the US and Europe. It's frustrating that they've been slow.

It is good that they are doing. But it feels like we are slow internationally.

Participants also noted the need for flexibility rather than a mandate when it comes to billing methods. It was suggested that providers be able to offer a hybrid billing system, and that to mandate kWh-billing would be similar to mandating time-based billing.

There needs to be more clarity... is it possible to have a hybrid approach? Do [the requirements] make it so that kWh is mandated or simply an option?

I'd be disappointed if the regulations were kWh billing only.

Will time-based billing be disallowed? I don't know that that flexibility should be taken away

4. Concerns and perceptions about accuracy of clean fuel measurement

Stakeholders are largely confident in the accuracy of clean fuel measurement and showed very little concern.

Clean fuel service providers and manufacturers were asked about their satisfaction with equipment they currently use. Most manufacturers and service providers are highly confident in the functionality of the charging / dispensing equipment they currently produce, own, or lease. Issues that have arisen with the equipment were generally focused on maintenance, reliability and connectivity. For the most part, though, participants have not experienced a high number of issues, disputes or disagreements related to the billing method at public charging

stations. There is occasional customer confusion regarding the time-based billing method, and frustration with charging stations being inoperable.

Very confident in our chargers! We've been building devices with robust meters. We are confident with accuracy and technology in the field.

Generally, we are satisfied... For the DCFC... reliability could be better for all manufacturers. Hard to compare because there are no standards.

We do well because our products are robust – they last 7-10 years. Stations are very well suited for the Canadian climate.

Equipment itself, we are largely satisfied. No hardware issues, but there are software issues with communications and connectivity for billing purposes.

We are probably the company with the oldest chargers in the country. Any charger after 2017 we are pretty confident. All the new generation equipment we are very confident. For the older ones its harder to know how they are performing. We are confident against the rest of the market as well.

Confident in the accuracy of how time is being calculated but where I'm less confident is in the fairness of the system.

When asked directly about their concerns with accuracy, most participants indicated a low level of concern with the accuracy of clean fuel measurement. Given that the information is provided to consumers through their vehicle and their fuel app, stakeholders believe there are enough checkpoints to determine discrepancies if any exist. It was noted several times that accuracy with energy will always be variable based on the temperature of the vehicle, temperature of the environment, the age of the battery, age of the vehicle, and the ability of the battery to accept a charge. There is also energy loss during the transfer itself. This seems to be an inherent challenge with electric vehicle charging and accepted by stakeholders.

Energy delivered to the battery of the vehicle will always be less than what is billed because there are losses and active loads (a/c, lights, etc).

Not at all concerned... There are monitoring devices from the utilities, monitoring devices on the vehicles that tell you how much charge is being accepted. And then on the charging device.

Not at all concerned as there are three points you can call out on: station, car and app.

Not super concerned because there are the checks and balances. Never have people complain about the discrepancy between cars and chargers.

The concern that emerged, however, was the inequity of the current billing structure that accompanies time-based billing. Manufacturers were more likely to show a level of concern for the accuracy of charging stations related to time-based billing, while service providers and fleet owners were far more confident in the accuracy of the current equipment.

The main concern is for the user. It would be more fair to have a 10% inaccuracy on the charging station through kWh than the current time-based billing model.

My concerns are about time-based billing. For the consumer, it's not the most accurate way.

Far more concerned with accuracy of existing system. How much you're being billed vs. how much energy you're getting; the current system could not be more inaccurate.

Concerned...When you look at EV charging it's still seen as a wild west, not clear about standardization, not clear if you are getting the same fill as you would at a gas pump.

Time-based vs. energy: time based is the only one we're able to do. We're locked into it. We see the challenges in the world of price discrimination. Time-based is transparent but it's not fair or reasonable.

Participants noted the inequity of time-based billing for Level 3/DC Fast Charging stations, but indicated time-based billing is not as inequitable for Level 2 and Level 1 chargers. Many participants stated that if the regulations that will allow energy-based billing are not applicable to DC Fast Charging stations, then the focus of the requirements is misaligned with current industry needs. Note: Coinciding with the qualitative interviews, Measurement Canada had an open consultation paper on specific approaches the Agency could take to oversee legacy Level 1 and 2 EV chargers, which make up the bulk of chargers currently in the Canadian marketplace. In responding to the interview questions, some respondents may have inferred from the consultation that MC was only considering approving Level 1 and 2 chargers to sell electricity by the kWh, and wouldn't be addressing Level 3 fast chargers or other scenarios such as multi-unit residential buildings. Measurement Canada should consider some proactive communications in this area to address these perceptions and to clarify the path forward for moving to all commercial EV chargers charging by the kWh.

Time-based billing is not the right solution. Especially not for DC (level 3). There needs to be a solution to enable kwh billing on DC fast stations

When you're billing on Level 2, all cars can accept all charging speeds. It is far more urgent for Level 3 chargers.

The need is for Level 3 chargers, but the regulations seem to be focusing on Level 2.

5. Increasing confidence in EV fueling accuracy

While confidence in accuracy is high, regulatory standards within the industry is believed to be a positive advancement that can only enhance confidence.

Interviewees were asked if the new regulations would affect consumer and market confidence in EV charging and hydrogen dispensing stations. There is a perceived high level of consumer trust in the current stations, likely coming from a belief that the chargers are regulated already. While consumer confidence may not be low to begin with, it was suggested that introducing regulations around charging stations will likely increase that level of confidence. Confidence in fuelling accuracy seemed to be important when it comes to more widespread adoption of electric vehicles. It was noted that there will be a need for communications to ensure consumers are aware of the standards, oversight, and accreditation in order to ensure an understanding of the system and to build confidence that they are getting what they pay for.

I don't have any [concerns] in particular... Some cheaper models may not be as accurate... there should be standardization to ensure they're accurate especially as the industry grows.

Perhaps it will [impact confidence]. Nothing wrong with a confidence angle for consumers related to what they are buying.

It would be ultimately a good thing if there is a Measurement Canada approval of a dispensing device. Gives confidence to the consumer and clarity to the supplier.

When a consumer is buying fuel such as an EV charge, I think they want to know what they bought. I see certification of the dispenser and/or the receipt that states you bought this is a good thing.

Yes, the better the standards, the more confidence people will have in charging and in making the switch to electric.

I think it will increase confidence. A fair playing field and fairness and being able to get customer confidence will help with investors.

If it's got a Measurement Canada sticker on it, people will trust it.

Consumers will be okay paying more if they know regulations and standards are in place... The audit label on the gas station pumps creates confidence. Something similar in EV/hydrogen space will also be good... There has to be a monitoring for accuracy and communicate that to the consumers.

For the average person, I don't think the average person questions the gas pump and they likely wouldn't question the EV charging station.

Majority of consumers aren't aware of it... Most folks wouldn't be aware of the difference in charge. It might even create confusion.

Consumers do not seem to be concerned about accuracy. They have their own ability to calculate how many kWhs that are filled.

I don't know if consumers know the difference. If more people know it will provide the assurance, but most assume they're receiving the correct amount.

Participants were asked to describe how specific protocols would affect confidence in accuracy of clean fuel charging/dispensing stations. The consensus was that the four requirements would increase consumer and market confidence in the accuracy of clean fuel measurement, though they would not move the needle much for many stakeholders already in the industry.

They are designed and built to perform in accordance with Canadian standards

Most participants felt this standard would increase confidence, with a handful noting confidence levels would stay the same.

They are approved and inspected by accredited officials

Participants believed this would increase confidence to a certain extent; many were wary of the burden this may put on the industry. It was suggested that inspections and approvals be done at the point of manufacturing, or that manufacturing companies be pre-approved so that every charger did not need to be inspected individually. Another option put forth for inspections/approval was to use software telematics.

Charging/dispensing information is shared and displayed during the transaction

This statement was seen as particularly important from a consumer perspective and will allow EV drivers to understand the process and feel as though the system is transparent.

Information about charging stations/dispensers and the fueling process is easily available to consumers

Participants viewed this statement as beneficial to consumer confidence, as this information would give consumers more power over their buying decisions and increase transparency.

6. Final thoughts

Stakeholders were asked to share any final thoughts or feedback for Measurement Canada. One common key message reiterated by participants following the interviews were concerns about the exclusion of Level 3 charging stations in the new requirements.

Please add level three charging stations. It's a must. If it's left behind, it's only done halfway. It's missing the big piece which is the fast charger.

Why the focus on Level 2 chargers? This is not the need. They need to understand how consistent and linear AC [Level 2] charging is, and how inconsistent and variable DC [Level 3] charging is. Hopefully we can get to what is really important to consumers which is not being charged more because they have a slower charging vehicle.

They're starting with the least urgent (AC levels 1 and 2). The focus on should be on DC because it has the most impact on consumers.

The standard – and option to move to energy-based billing is most needed in the context of fast charging.

This issue is most important for fast chargers because that's where you get this disparity. It's a bit of an issue for Level 2, but a much more acute issue for level 3. Include level 3 in the requirements.

A second theme that emerged was a caution around infrastructure limitations; participants worried that Canada is not prepared with enough clean fueling stations in place to meet the demands of a growing market.

From my perspective the whole hydrogen roll-out has some safety and science and commercialization gates to pass through. I think EV is ahead of the game – that train has left the station, so the accredited roll out of charging infrastructure makes sense.

Hydrogen fuelling is a far way away, but it is good government is starting to plan so we don't scramble at the end.

When the huge influx of ZEVs happens, there is a risk of not having enough charging/fuelling stations. There will be frustration if demand is not met. Government focus on getting rid of IC engines is creating demand for infrastructure and we may not be ready.

Primary concern is not enough publicly available EV charging stations. Don't see an ambitious enough plan to build. Don't see a coordinated federal plan to get this done. There is a gap in terms of generation, and grid to support the needed charging infrastructure... Charging infrastructure is changing.

EV charging and electric vehicles are a newer industry... allowing a little more leeway and allowing it to grow might be more beneficial than having strict regulations [right now]. EV chargers... there's a lot that don't work or no one checks on them. Having operational chargers is more important and should be more of a priority at this time.

Thirdly, participants restated the need for kWh pricing to be available in the market.

We should look at what US is doing and do a temporary dispensation and allow kWh pricing until we develop certification. We shouldn't hold the industry back knowing this is so important for consumer adoption and for the business case.

We are eagerly awaiting kWh pricing standard. People want it, we want to be able to offer it. We need Measurement Canada to put a pause on the rules without certified metering devices. My hope is if we have the pause people would be able to bill kWh now.

If they were to be switched over to energy or hybrid, for us it would reflect a more accurate way of billing the EV and will lead to more accurate billing for the sites... I think switching to energy-based billing would be better for the marketplace.

7. Ownership and use of EV and hydrogen fuel cell vehicles and charging stations

Fleet owners were asked about their ownership/planned ownership of both EVs and EV chargers. Two among three fleet owners or intenders owned/planned to deploy large buses and will use Level 3 bi-directional chargers. The third indicated a variety of vehicle types including light duty cars, trucks, and larger trucks depending on what is available in the market; chargers planned are a combination of Level 2 and Level 3 systems.

Charging/refuelling service participants were asked how many and what type of chargers their company provided. Participants most commonly provide both Level 2 and Level 3 charging stations within their network, while a handful only provide Level 3 fast charging stations.

When asked about what billing methods they offer, all participants charge based on time parked at the charger or dispensing station, as this is the industry standard. At this time, in order to charge by kWh or by mass (hydrogen), stations must be approved, but there are no approved devices currently on the market.

Appendix A: Quantitative Methodology

This quantitative research is based on data collected through an online survey of 1,800 adult Canadian EV owners and intenders, conducted between May 16 and June 3, 2022.

Survey respondents were selected from registered members of an online panel. Since the samples used in online panel surveys are based on self-selection and are not a random probability sample, no formal estimates of sampling error can be calculated. Although opt-in panels are not random probability samples, online surveys can be used for general population surveys provided they are well designed and employ a large, well-maintained panel.

Sample design and quotas

The survey results offer a reflection of provincial distribution of EV/hybrid car ownership in Canada, as well as Canadians considering this purchase. In addition, the survey data includes owners/managers of Canadian businesses who have ZEV/hybrid vehicles.

To accurately reflect the current environment of EV owners in Canada, Environics Research used data readily available from ISED's report *Electric Vehicle Chargers: Online Consultation Interim Findings (2021)*, to find the approximate proportion of EV owners within provinces and regions. To achieve representation across the country, quotas were set on EV owners in Ontario, Quebec and BC – which according to Statistics Canada's Automotive Statistics, represent 93.4% of new zero-emission vehicles registered in Canada in 2021. Quotas were also set by gender, to ensure a healthy balance between female and male respondents.

Data gathered from *Canadians' Awareness, Knowledge and Attitudes Related to Zero Emission Vehicles (ZEVs)*, prepared for Natural Resources Canada, provided baseline data to balance sample of eight-hundred EV intenders, according to EV consideration distribution across Canada. The survey obtained the following regional distribution:

Target group	EV Owners (Total)	EV Intenders (Total)
Canada (Total)	1,000	800
Atlantic	29	58
Quebec	408	170
Ontario	224	308
MB/SK	32	50
Alberta	40	86
BC/Territories combined	267	132

Questionnaire design

Environics worked with the ISED/MC to develop a questionnaire that would cover the objectives as outlined in the Statement of Work. Upon approval of the English questionnaire, the Environics Research translated the questionnaire into French.

Environics' data analysts programmed the questionnaires, then performed thorough testing to ensure accuracy in set-up and data collection. This validation ensured that the data entry process conformed to the surveys' basic logic. The data collection system handles sampling invitations, quotas and questionnaire completion (skip patterns, branching, and valid ranges).

Prior to finalizing the survey for the field, a pre-test (soft launch) was conducted in English and French. The pre-test assessed the questionnaires in terms of question wording and sequencing, respondent sensitivity to specific questions and to the survey overall, and to determine the survey length; standard Government of Canada pre-testing questions were also asked. To optimize clarity, a few changes were made to the final survey following the pre-test. Since these changes did not impact data quality, the n=128 responses (including English and French) were included in the final data set.

The final survey questionnaire is included in Appendix B.

Fieldwork

The main survey was conducted by Environics using a secure, fully featured web-based survey environment. The pre-test, soft launch of the online survey took place from May 16 to May 19, 2022. The official launch took place ended on June 3, 2022.

All respondents were offered the opportunity to complete the surveys in their official language of choice. All research work was conducted in accordance with the Standards for the Conduct of Government of Canada Public Opinion Research – Online Surveys, and recognized industry standards, as well as applicable federal legislation (Personal Information Protection and Electronic Documents Act, or PIPEDA). The study was registered with the Canadian Research Insights Council’s Research Verification Service so respondents could validate its authenticity.

Completion results

The completion results are presented in the following table.

Contact disposition – online survey

Disposition	N
Total number of sample units invited to participate (automated)	117,658
Invalid (undelivered)	-
Broadcasts delivered	117,658
Unresolved (U)	88,521
Did not respond	88,521
In-scope non-responding (IS)	1,132
Qualified respondent break-off (drop out)	1,132
In-scope – responding (R)	28,005
Disqualified	16,824
Quota filled	9,381
Completed	1,800
Contact rate $[(R+IS) / (U + IS + R)]$	24.76%
Participation rate $[R / (U + IS + R)]$	23.8%

Respondent profile

The following table presents the distribution of survey participants by key demographic and other variables.

Variable	Total sample %
Age	
18-34	18
35-54	39
55+	43
Gender	
Male	69
Female	31
Gender diverse	.4
Education	
High school or less	14
College/Apprenticeship/Some uni	35
University graduate/post-graduate	51
Total annual household income	
Under \$40,000	9
\$40,000-<\$80,000	25
\$80,000-<\$100,000	15
\$100,000+	42
Community size	
Small (<10,000 – 49,000)	25
Medium (50,000 and 199,999)	24
Large (200,000 and 499,999)	13
Very large (500,000 or above)	32
Home dwelling type	
Single family home with parking	73
Single family home without parking	4
Multi-family home (apartment/condo/strata)	22
Language of survey	
English	76
French	24

Appendix B: Quantitative research instrument

Environics Research Group
April 21, 2022

ISED/MC – Consumer Confidence in the Accuracy of Clean Fuel Measurement

10-minute online survey with 1000 owners of battery electric vehicles (EV), hybrid electric vehicles, or hydrogen/fuel cell electric vehicles, and 800 intenders (aged 18+).

Objectives: Better understand levels of consumer confidence with clean fuel charging and refueling equipment currently in the market.

Questionnaire

LANDING PAGE

LANDING PAGE

Please select your preferred language for completing the survey / Veuillez sélectionner la langue de votre choix pour remplir le sondage.

01–English / Anglais

02–Français / French

Welcome to the survey. Environics Research, an independent research company, is conducting this survey about current issues of interest to Canadians, on behalf of the Government of Canada. The survey will take about 10 minutes of your time.

Your participation is entirely voluntary, and all of your answers will be kept completely anonymous and confidential, and will be administered in accordance with the Privacy Act.

This study has been registered with the Canadian Research Insights Council's Research Verification Service so that you may validate its authenticity. If you would like to enquire about the details of this research, you can visit CRIC's website www.canadianresearchinsightscouncil.ca. If you choose to verify the authenticity of this research, you can reference project code 20220426-EN108.

If you have questions about the survey or how to complete it, please contact Maysa Hussein at maysa.husseini@environics.ca.

Thank you in advance for your participation.

A. "Ownership"

1. Do you currently own or lease a battery electric vehicle, a plug in hybrid electric vehicle, or a hydrogen/fuel cell electric vehicle?

01 – No

02 – Yes – plug in hybrid electric vehicle (PHEV) EV OWNER QUOTA

03 – Yes – battery electric vehicle, plugs in, not a hybrid (BEV) EV OWNER QUOTA

04 – Yes -- hydrogen/fuel cell electric vehicle (FCEV) EV OWNER QUOTA

IF NO to own/lease:

2. Do you have regular use of a battery electric vehicle, a plug in hybrid electric vehicle, or a hydrogen/fuel cell electric vehicle (e.g. your spouse or partners vehicle, a company vehicle, etc.)?

01 – No

02 – Yes – plug in hybrid electric vehicle (PHEV) EV OWNER QUOTA

03 – Yes – battery electric vehicle, plugs in, not a hybrid (BEV) EV OWNER QUOTA

04 – Yes -- hydrogen/fuel cell electric vehicle (FCEV) EV OWNER QUOTA

ASK IF NO to Q2

3. Are you considering purchasing a battery electric vehicle, a plug-in hybrid electric vehicle, or a hydrogen/fuel cell electric vehicle in the next two years?

01 – No

02 – Yes – plug in hybrid electric vehicle (PHEV) INTENDER QUOTA

03 – Yes – battery electric vehicle, plugs in, not a hybrid (BEV) INTENDER QUOTA

04 – Yes -- hydrogen/fuel cell electric vehicle (FCEV) INTENDER QUOTA

IF NO TO OWN/LEASE/USE AND INTENT (Q1, Q2, Q3): Thank and end interview

IF Q1 OR Q2 = 02, 03 OR 04

4. What is the model year of your

IF Q1 OR Q2 = 02: PHEV?

IF Q1 OR Q2 = 03: BEV?

IF Q1 OR Q2 = 04: FCEV?

DROP DOWN MENU WITH YEARS 2011-2022 OR NOT SURE

IF Q1 OR Q2 = 02, 03 OR 04

5. What is the approximate all-electric range of your EV?

Please indicate the longest range if multiple EVs are owned.

Select one only

01 - Less than 100 km

02 -100-200 km

03 - 200-300 km

04 - 300-400 km

05 - 400-500 km

06 - More than 500 km

99 – Not sure

ASK ALL

A. Categorization/analytical variables

6. In what province or territory do you live?

Select one only

DROP DOWN LIST

01-British Columbia SEE QUOTAS

02-Alberta

03-Saskatchewan

04-Manitoba

05-Ontario SEE QUOTAS

06-Quebec SEE QUOTAS

07-New Brunswick

- 08-Nova Scotia
- 09-Prince Edward Island
- 10-Newfoundland and Labrador
- 11-Yukon
- 12-Northwest Territories
- 13-Nunavut

7. In which of the following age categories do you belong?

SEE AGE QUOTAS

- 01 - less than 18 years old (thank and terminate)
- 02 - 18 to 24
- 03 - 25 to 34
- 04 - 35 to 44
- 05 - 45 to 54
- 06 - 55 to 64
- 07 - 65 or older

8. Are you...

- 01 - Male SEE QUOTAS
- 02 - Female SEE QUOTAS
- 03 - Gender diverse
- 99 - Prefer not to say

9. Are you currently the owner, partner or senior manager in a Canadian business of any size, who influences the overall direction of the company?

- 01 - Yes, Owner/ Partner
- 02 - Yes, Senior Manager (e.g., C-level, director of marketing/digital/sales or a similar position)
- 03 - No

IF Q9 = 01 OR 02

10. Including yourself, approximately how many full-time staff does the company you own or work for, employ in Canada?

RECORD NUMBER

- IF 1-99 CODE AS Small business = SME OWNER
- IF 100-499 CODE AS Medium business = SME OWNER
- IF 500+ CODE AS Large business ≠ SME OWNER

B. BEV and PHEV Owners – Charging Behaviour

ASK IF Q1 OR Q2 = 02 OR 03

Next are some questions about charging electric vehicles...

11. If you charge your EV at home, what method of charging do you use?

- 01 - Standard wall electrical outlet (Level 1)
- 02 - Fixed/hard-wired Level 2 charging station
- 03 - Portable Level 2 charging station
- 04 - Shared Level 2 charging station
- 05 - Shared DC fast charger
- 06 - I do not charge at home SKIP TO Q15
- 77 - Other (please specify): _____

IF Q11 = 04 OR 05

12. Are you billed for charging your EV using [IF Q11 = 04] a shared Level 2 charging station?
[IF 11 = 05] a shared DC fast charger?

- 01 – Yes
- 02 – No
- 99 – Not sure

ASK IF Q11 = 01, 02, 03, 04, 05, 77

13. Do you ever charge your personal battery electric vehicle or plug in hybrid electric vehicle away from where you live?

- 01 – Yes
- 02 - No

IF NO to charge away from where you live (Q13):

14. Why do you not charge your personal battery electric vehicle or plug in hybrid electric vehicle away from where you live? *Select all that apply*

- 01- Not comfortable on long trips (range concern)
- 02 - I don't leave my home range
- 03 - It takes too long to charge
- 04 - Chargers are difficult to use
- 05 - Don't have an app
- 06 - Difficulty locating chargers
- 07 - Doubts about the accuracy of the charge received
- 77 - Other, please specify _____
- 99 – Not sure

IF YES to charge away from where you live (Q13) OR 06 AT Q11:

15. When you have charged your personal battery electric vehicle or plug-in hybrid vehicle away from home, what type of publicly available electric vehicle chargers have you used? *Select all that apply.*

- 01 - Free chargers
- 02 - Tesla Supercharger Stations
- 03- Tesla Destination Charging
- 04 - ChargePoint locations
- 05 - Circuit électrique locations
- 06 - FLO locations
- 07 - BC Hydro EV locations
- 77 – Other, Please specify _____
- 99 – Not sure

IF YES to charge away from where you live (Q13) OR 06 AT Q11:

16. How often do you charge your personal vehicle at the following type of public charging stations?

	3 or more times per week	Once per week	Once every 1 to 2 weeks	Once a month	Occasionally throughout the year	Never
Level 1 public charging station (120 V, 15-20 A)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Level 2 public charging station (240 V, up to 80 A)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Level 3 public charging station (480 V, 300 A),	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

includes Superchargers						
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IF SME OWNER (Q10)

17. Do you use one or more battery electric (EV) or plug-in hybrid vehicle(s) for your business?

- 01 – Yes
- 02 - No

IF SME OWNER AT Q10 and YES AT Q17)

18. Do you use public chargers for your business EV/Hybrid vehicle(s)?

- 01 – Yes
- 02 - No

IF YES TO Q18

19. When you have used public chargers for your business EV/Hybrid vehicle(s), what type of publicly available electric vehicle chargers have you used? *Select all that apply.*

- 01 - Free chargers
- 02 - Tesla Supercharger Stations
- 03- Tesla Destination Charging
- 04 - ChargePoint locations
- 05 - Circuit électrique locations
- 06 - FLO locations
- 07 - BC Hydro EV locations
- 77 - Other (Please specify _____)
- 99 – Not sure

IF YES TO Q18

20. Typically, how often are your company battery electric vehicles or plug in hybrids charged at the following type of public charging stations?

	3 or more times per week	Once per week	Once every 1 to 2 weeks	Once a month	Occasionally throughout the year	Never
Level 1 public charging station (120 V, 15-20 A)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Level 2 public charging station (240 V, up to 80 A)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Level 3 public charging station (480 V, 300 A), includes superchargers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

IF YES AT Q13 AND/OR YES TO Q18 AND/OR 06 AT Q11

21. At public electric vehicle charging stations, either for business or personal reasons, which billing method(s) have you had experience with? (*Select all that apply*)

Note: kWh = kilowatt hour

- 01 - Flat rate charge (\$/month)
- 02 - Fixed charge per use (\$/charge)
- 03 - Charge based on time connected to the EV charger (\$/min)
- 04 - Charge based on energy delivered to the EV (\$/kWh)
- 05 - Combination of time-based charge (\$/min) and charge based on energy delivered (\$/kWh)
- 77 - Other (please specify)
- 99 None, not applicable SKIP TO Q25

IF YES AT Q13 AND/OR YES TO Q18 AND/OR 06 AT Q11

22. Have you ever had any issues, disagreements or disputes related to the billing method(s) used at public charging stations?

- 01 – Yes
- 02 - No

IF YES TO Q22

23. What was the cause of the issue/disagreement/dispute you experienced?

OPEN-ENDED AND CODE

99 – Prefer not to say

IF OTHER THAN 99 AT Q23

24. How was the issue/disagreement/dispute resolved?

OPEN-ENDED AND CODE

99 – Prefer not to say

IF YES AT Q13 AND/OR YES TO Q18 AND/OR 06 AT Q11

25. Based on your experience, how confident are you in the billing accuracy of public electric vehicle charging stations?

- 01 - Very confident
- 02 - Somewhat confident
- 03 - Not very confident
- 04 - Not at all confident
- 99 - Not sure

IF YES AT Q13 AND/OR YES TO Q18 AND/OR 06 AT Q11

26. Thinking about your experiences paying to charge electric or plug-in hybrid vehicles, how confident are you about these aspects of your charging experience?

RANDOMIZE STATEMENTS	Very confident	Somewhat confident	Not very confident	Not at all confident	Not sure	Not applicable
a) The receipt accurately reflected the amount of charge (kWh) I received	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b) The amount I paid to charge my vehicle matched	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

the amount of charge I received						
c) I am getting what I paid for	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d) The chargers I use deliver the correct amount of charge	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e) I understand the details on the receipt	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f) The charging services I use are accurate and fair	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Note: kWh = kilowatt hour

Continued...

C. BEV/PHEV owners, regular users, and Intenders – Attitudes / Perceptions

IF Q1 OR Q2 OR Q3 = 02 OR 03 AND/OR Q18 = YES

The next few questions are about charging an EV at a public charging station (i.e., away from your home). Even if you do not have experience yet with owning an EV, we are interested in your thoughts on this topic.

27. How important is it for you that the receipt from a public charging station include the following information?

RANDOMIZE	Very important	Somewhat important	Not very important	Not at all important
a) Total cost (\$)				
b) Energy (kWh) delivered				
c) Rate (\$/kWh)				
d) Maximum rate of energy transfer (i.e. maximum power)				
e) Type of current (e.g. 7 kW AC, 25 kW DC)				
f) Plug types (e.g. J-1772, CHAdeMO, CCS/SAE)				
g) Any fixed charges (e.g. session fee, monthly fee)				
h) Sales tax(es) charged				
i) Other charges				
j) Name and location of EV charger				
k) Date of charge				
l) Time charging started				
m) Time charging ended				
n) Total charging time				
o) Transaction number				
p) Official language of choice				

Note: kWh = kilowatt hour

28. Is there any other information you would consider important to have on the receipt you get from a public charging station?

OPEN ENDED AND CODE

29. To what extent would each of the following affect your level of confidence in the accuracy of the public charging stations?

RANDOMIZE STATEMENTS	Strong positive influence	Moderate positive influence	Little or no positive influence	Not sure
a) Public EV chargers are designed and built to perform in accordance with Canadian standards	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b) Public chargers are approved and inspected by accredited officials	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c) Charging information is shared and displayed during the transaction	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d) Billing details are provided immediately following the transaction	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e) Accuracy and performance of public EV chargers is reverified periodically by accredited officials				
f) Information about public charging stations and the charging process is easily available to consumers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
g) Knowing there is an independent dispute resolution mechanism in place	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

30. To what extent do you agree or disagree with the following statements about battery electric or plug in hybrid vehicles. (RANDOMIZE)

- a) It is difficult to know how much charge my car actually gets when using a public electric charger.
- b) I believe I will be billed fairly when I use a public electric charger.
- c) I am satisfied with the billing methods employed by public vehicle charging systems
- d) I am concerned about the fairness of the fees for electric vehicle charging

Strongly agree
 Somewhat agree
 Somewhat disagree
 Strongly disagree
 Not sure

D. Hydrogen/Fuel Cell EV Owners – Fueling Behaviour

IF Q1 OR Q2=4

IF SME OWNER (Q10)

31. Do you use one or more hydrogen fuel cell electric vehicles for your business?

- 01 – Yes
- 02 - No

IF Q1 or Q2 = 4 AND/OR Q31 = YES

32. How often do you purchase hydrogen fuel for your hydrogen fuel cell electric vehicle(s)?

3 or more times per week	Once per week	Once every 1 to 2 weeks	Once a month	Occasionally throughout the year	Never

IF Q32 = NEVER

33. Where do you get hydrogen for your hydrogen fuel cell electric vehicle?

OPEN ENDED AND CODE

IF Q32 ≠ NEVER

34. At retail hydrogen fuel dispensing stations, which billing method(s) have you had experience with? (*Select all that apply*)

- 01 - Charge based on mass of hydrogen delivered (kg)
- 02 - Fixed charge per use (\$/charge)
- 03 - Charge based on time connected to the dispenser (\$/min)
- 04 - Flat rate charge (\$/month)
- 05 - Combination of time-based charge (\$/min) and hydrogen delivered
- 77 - Other (please specify)
- 99 - None, not applicable SKIP TO Q38

35. Have you ever had any issues, disagreements or disputes related to the billing method(s) used at public hydrogen fuel stations?

- 01 – Yes
- 02 - No

IF YES TO Q35

36. What was the cause of the issue/disagreement/dispute you experienced?

OPEN-ENDED AND CODE

99 – Prefer not to say

IF OTHER THAN 99 AT Q36

37. How was the issue/disagreement/dispute resolved?

OPEN-ENDED AND CODE

99 – Prefer not to say

IF Q1 or Q2 = 4 AND/OR Q31 = YES

38. Based on your experience, how confident are you in the billing accuracy of public hydrogen dispensing stations?

- 01 - Very confident
- 02 - Somewhat confident
- 03 - Not very confident
- 04 - Not at all confident
- 99 - Not sure

39. Thinking about your experiences paying to charge your hydrogen fuel cell vehicle(s), how confident are you about these aspects of your experience?

RANDOMIZE STATEMENTS	Very confident	Somewhat confident	Not very confident	Not at all confident	Not sure	Not applicable
a) The receipt accurately reflected the weight of hydrogen I received	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b) The amount I paid to matched the amount of hydrogen I received	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c) I am getting what I paid for	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d) The stations I use dispense the correct amount of hydrogen	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e) I understand the details on the receipt	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f) The hydrogen fueling stations I use are accurate and fair	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Continued...

E. Hydrogen Fuel Cell EV owners, regular users, and Intenders – Attitudes / Perceptions

IF Q1 OR Q2 OR Q3 = 04 OR Q31 = YES

The next few questions are about fueling a hydrogen fuel cell electric vehicle at a public charging station (i.e., away from your home). Even if you do not have experience yet with owning a hydrogen fuel cell electric vehicle, we are interested in your thoughts on this topic.

40. How important is it for you that the receipt from a retail hydrogen fueling station include the following information?

RANDOMIZE Note: kg = kilogram	Very important	Somewhat important	Not very important	Not at all important	Not sure
a) Total cost (\$)					
b) Hydrogen dispensed (kg)					
c) Rate (\$/kg)					
d) Pressure of dispenser (MegaPascal (MPa)) (e.g. 35 MPa, 70 MPa)					
e) Which hydrogen fuel dispenser was used at the retail hydrogen fueling station					
f) Any fixed charges					
g) Sales tax(es) charged					

h) Other charges					
i) Name and location of hydrogen fuel station					
j) Date					
k) Time fueling started					
l) Time fueling ended					
m) Transaction number					
n) Official language of choice					

41. Is there any other information you would consider important to have on the receipt you get from a public hydrogen station?

OPEN ENDED AND CODE

42. To what extent would each of the following affect your level of confidence in the accuracy of the public hydrogen stations?

RANDOMIZE STATEMENTS	Strong positive influence	Moderate positive influence	Little or no positive influence	Not sure
a) Hydrogen dispensers are designed and built to perform in accordance with Canadian standards	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b) Public hydrogen dispensers are approved and inspected by accredited officials	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c) Hydrogen dispensing information is shared and displayed during the transaction	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d) Billing details are provided to the consumer immediately following the transaction	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e) Accuracy and performance of retail hydrogen fuel dispensers are reverified periodically by accredited officials				
f) Information about public hydrogen stations and the dispensing process is easily available to consumers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
g) Knowing there is an independent dispute resolution mechanism in place	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

43. To what extent do you agree or disagree with the following statements about hydrogen fuel cell electric vehicles.

- a) It is difficult to know how much hydrogen my car actually gets when using a public hydrogen station.
- b) I believe I will be billed fairly when I use a public hydrogen station.
- c) I am satisfied with the billing methods employed by public hydrogen stations

- 01 - Strongly agree
- 02 - Somewhat agree
- 03 - Somewhat disagree
- 04 - Strongly disagree
- 99 - Not sure

ASK ALL

44. Prior to this survey, were you aware that Measurement Canada is responsible for the approval, verification, and inspection of the following measuring devices?

Randomize	Yes, aware	No, not aware
Gas pumps		
Electricity meters		
Natural gas meters		

F. Demographics

The following are a few questions about you and your household, for statistical purposes only. Please be assured all of your answers will remain completely confidential.

45. What type of home do you live in?

- 01 - Single family house/townhouse with dedicated parking
- 02 - Single family house/townhouse without dedicated parking
- 03 - Rental apartment in high-rise building
- 04 - Rental apartment in low-rise building (e.g., duplex, triplex, basement apartment)
- 05 - Condominium/strata
- 77 - Other (please specify): _____

46. What is the approximate population of your community?

- 01 – Below 10,000
- 02 – Between 10,000 and 49,999
- 03 – Between 50,000 and 199,999
- 04 – Between 200,000 and 499,999
- 05 – 500,000 or above
- 99 – Not sure / Prefer not to answer

47. What is the highest level of formal education you have completed?

Select one only

- 01–Less than a high school diploma or equivalent
- 02–High school diploma or equivalent
- 03–Registered Apprenticeship or other trades certificate or diploma
- 04–College, CEGEP or other non-university certificate or diploma
- 05–University certificate or diploma below bachelor’s level
- 06–Bachelor’s degree
- 07–Post graduate degree above bachelor’s level
- 99–Prefer not to answer

48. Which of the following categories best describes your total household income? That is, the total income of all persons in your household combined, before taxes?

Select one only

- 01—Under \$20,000
- 02—\$20,000 to just under \$40,000
- 03—\$40,000 to just under \$60,000
- 04—\$60,000 to just under \$80,000
- 05—\$80,000 to just under \$100,000
- 06—\$100,000 to just under \$150,000
- 07—\$150,000 and above
- 99—Prefer not to answer

49. Do you identify with any of the groups below? *Select all that apply*

- 01 - Indigenous person, including First Nations, Inuk or Métis
- 02 - Black person
- 03 - Member of another racialized community
- 04 - LGBTQ2+ person
- 05 - Person living with a disability
- 06 - Under 40 years of age
- 07 - Recent immigrant to Canada (i.e., landed in Canada in the last 5 years)
- 08 - None of the above
- 99 - Prefer not to say

That concludes the survey. This survey was conducted on behalf of Innovation, Science and Economic Development.

In the coming months the report will be available from Library and Archives Canada. We thank you very much for taking the time to answer this survey, it is greatly appreciated.

Appendix C: Qualitative Methodology

The target population audience for the **individual interviews** consisted of four key groups:

- Investors (e.g., Crown Corporation, government organization, venture capital, incubators)
- Fleet owners (e.g., private, government)
- Charging/fuelling service providers (current or prospective)
- Manufacturers (e.g., zero-emissions vehicles or charging equipment)

A total of 32 individuals were interviewed from May 19 to July 28, 2022. Interviews were conducted on each participant's choice of Zoom videoconference or telephone, and the interview length was approximately 30 minutes.

Participants were recruited to interviews in two ways:

1. **Recruiting from client-supplied lists:** ISED/MC provided Environics with a list of stakeholders that included members of various working groups, electric vehicles owners, and a manufactures mailing list.
2. **Desk research:** Environics also conducted desk research to compile a list of contacts at businesses and organizations that qualified for an interview.

Participants were recruited through email with an invitation to participate in research on behalf of Measurement Canada. Individuals received one invitation and a maximum of two follow-up emails. A total of 88 clean fuel stakeholders from across the country were invited to participate, with 33 agreeing to be interviewed, and 32 ultimately completing an interview.

At the outset of each interview, participants were informed of the purpose of the exercise, the time commitment, and notified that their responses would remain anonymous in research reporting. The discussion guide for this research was developed in consultation with the project team. Each group had a slightly different set of questions that reflected their role in the ZEV market. The guide was translated into French.

This research was qualitative in nature, not quantitative. As such, the results provide an indication of participants' views about the issues explored, but they cannot be generalized to the full population of zero-emission vehicles stakeholders.

Appendix D: Qualitative Research Instruments

Environics Research
April 20, 2022

ISED/MC – Investor and Business Confidence in the Accuracy of Clean Fuel Measurement

*In-depth Individual Interviews with Investors and Business
with an interest in ZEV and/or Charging.*

Objectives: Better understand levels of confidence with clean fuel charging and refueling equipment currently in the market.

Interview Guide

Name: _____
 Organization: _____
 Date: _____, 2022
 Interviewer: _____
 Interview number: _____

Introduction

Hello, my name is _____ from Environics, and I am calling to conduct our scheduled interview.

As you know, we are conducting interviews with stakeholders about the Accuracy of Clean Fuel Measurement. We would like you to share your thoughts and experiences.

The interview will take approximately 30 minutes to complete, depending on your responses.

Your responses will not be linked to your name or organization (your identity will remain confidential).

Do you have any questions before we begin?

Type of Organization – ASK EACH ONLY ONE OF SECTIONS A TO D

Investor: ASK SECTION D	Business
<u>Crown Corp</u> – Fed or Prov (BDC Cleantech practice, EDC)	<u>Fleet owners: ASK SECTION A</u> – Private (car rental, O+G/mining, Other) – Government (F, P, T, municipal, transit)
<u>Government organization</u> – Fed, Prov, Muni, IRAP, SDTC	<u>Charging/fueling service providers</u> – current or prospective: ASK SECTION B
<u>Funds / Investors</u> : Angels, Incubators, Venture Capital	<u>Manufacturers</u> – ZEV or charging equipment: ASK SECTION C

A. Fleet Owners (30 minutes)

- Do you own or lease zero emission vehicles for business purposes? Yes or No
- IF YES, how many and what type(s)?
 - BEV (battery electric vehicles); Number owned ____
 - PHEV (plug in hybrid electric vehicles); Number owned ____
 - FCEV (fuel cell electric vehicles or buses); Number owned ____
- What size of ZEV does your organization own or lease?
 - Car; Approximate number ____
 - SUV; Approximate number ____
 - Light truck; Approximate number ____
 - Truck; Approximate number ____
 - Bus; Approximate number ____
 - Other, specify _____; Approximate number ____
- Does your business own or lease electric vehicle chargers or hydrogen dispensers? Yes or No
IF YES:
 - What type(s) of electric vehicle chargers does your business own? (note all that apply, ask how many for each mentioned)
 - Level 1 (120 Volts, 15-20 Amps); Number owned ____
 - Level 2 (240 Volts, up to 80 Amps); Number owned ____
 - Level 3 (480 Volts, 300 Amps) includes Superchargers; Number owned ____
 - Hydrogen dispenser; Number owned ____
 - What are the company owned chargers used for:
 - fleet vehicle charging
 - free use by customers/ staff/ members
 - use by customers/ staff/ members for a fee?
 - IF CHARGE FOR FEE: How are users charged currently?
(Note answer, listen for user fee, time connected and/or by electricity/hydrogen supplied)

ASK ALL

- How often are company EVs charged / filled with hydrogen away from your place of business (i.e. offsite)?
- IF YES to EV chargers: Do you know what kind of chargers tend to be used: level 1, Level 2 or Level 3 charging stations?
- IF YES TO EV chargers or hydrogen dispensers: Are the company EVs mostly charged offsite; mostly charged at your company chargers or is it a mix?

- At public charging stations, which billing method(s) have you had experience with? *Note response, listen for:*
 - Flat rate charge (\$/month)
 - Fixed charge per use (\$/charge)
 - Charge based on time connected to the EV charger or hydrogen dispenser (\$/min)
 - Charge based on energy delivered to the EV (\$/kWh)
 - Charge based on mass of hydrogen delivered (kg)
 - Combination of time-based charge (\$/min) and charge based on energy/mass delivered
 - Other, specify:
- Have you ever had any issues, disagreements or disputes related to the billing method(s) used at commercial charging stations? PROBE: What was the cause of the issue/disagreement/dispute you experienced? Was it resolved?
- Based on your experience, how confident are you in the billing accuracy of public charging stations or hydrogen dispensers?
Very confident Somewhat confident Not very confident Not at all confident

PROBE: Why do you say that?

Listen for: Accuracy, fairness, not getting what they paid for, issues with receipts, etc.

Moving on...

Measurement Canada is developing measurement accuracy and performance requirements for electric vehicle charging and hydrogen fuelling stations for ZEVs.

This will ensure that suppliers and retailers all follow the same codes and standards when selling clean fuels to Canadian consumers.

Suppliers and retailers will also be subject to regulatory oversight by Measurement Canada, in the same way that suppliers and retailers of gasoline and diesel fuels are, in order to ensure consumers receive accurate and reliable measurement.

- Were you aware that Measurement Canada is responsible for oversight of fair billing and accurate measurement of fuels?
- Were you aware these requirements are in development?
- What is your general reaction? (support / oppose / inevitable / other?)
- How concerned are you, if at all, about the accuracy of EV chargers / Hydrogen dispensers? Why, what aspects, what should be done?

PROBE: Is this likely to affect consumer/market confidence in EV charging / hydrogen dispensing?

- Are you aware that when a business charges customers based on the amount of fuel delivered to a vehicle (e.g. electricity, hydrogen, gasoline), the business must be registered with Measurement Canada?
- Does that requirement influence your confidence in EV charging and refueling equipment? (please elaborate)
- To what extent would each of the following affect your confidence in the accuracy of public EV charging stations or hydrogen dispensers? (note: increased confidence, no change, reduced confidence).

They are designed and built to perform in accordance with Canadian standards	
They are approved and inspected by accredited officials	
Charging/dispensing information is shared and displayed during the transaction	
Information about the charging stations/dispensers and the fueling process is easily available to consumers	

- Please share any additional ideas or concerns you have about public EV charging or hydrogen fueling stations in the Canadian marketplace and your confidence in their level of accuracy.

END OF FLEET OWNER INTERVIEW

B. EV Charging / Hydrogen Dispensing Service Providers (30 minutes)

- What type(s) of electric vehicle chargers does your business provide? (note all that apply, ask how many for each mention)
 - Level 1 (120 Volts, 15-20 Amps); Number owned_____
 - Level 2 (240 Volts, up to 80 Amps); Number owned_____
 - Level 3 (480 Volts, 300 Amps) includes Superchargers; Number owned_____
 - Hydrogen dispensers: Note type(s) and number(s) owned
- How happy are you with the charging / dispensing equipment you are using?
- Probe for accuracy, cold weather performance, maintenance / repair needs, supply chain.
- Are you aware that Measurement Canada approves and inspects devices for accuracy, performance, etc. before they can be put into service?

- How often do you believe these devices should be re-inspected by Measurement Canada? (Probe if needed: Gas station pumps are done every 2 years, would that suit here?)
- Please describe the billing method(s) used by your company?
Note response(s), listen for:
 - Flat rate charge (\$/month)
 - Fixed charge per use (\$/charge)
 - Charge based on time connected to the EV charger or hydrogen dispenser (\$/min)
 - Charge based on energy delivered to the EV (\$/kWh)
 - Charge based on mass of hydrogen delivered (kg)
 - Combination of time-based charge (\$/min) and charge based on energy/mass delivered (\$/kWh or \$/kg)
 - Other, specify:
- Have you ever had any issues, disagreements or disputes related to the billing method(s) used at your public stations either for EV charging or hydrogen dispensing? PROBE: What caused the issue/disagreement/dispute? Was it resolved?
- How confident are you in the billing accuracy of your EV chargers and/or hydrogen dispensers?
NOTE response for one or both
Very confident Somewhat confident Not very confident Not at all confident

PROBE: Why do you say that?

Moving on...

Measurement Canada is developing measurement accuracy and performance requirements for electric vehicle charging and hydrogen fuelling stations for ZEVs.

This will ensure that suppliers and retailers all follow the same codes and standards when selling clean fuels to Canadian consumers.

Suppliers and retailers will also be subject to regulatory oversight by Measurement Canada, in the same way that suppliers and retailers of gasoline and diesel fuels are, in order to ensure consumers receive accurate and reliable measurement.

- Were you aware that Measurement Canada is responsible for oversight of fair billing and accurate measurement of EV charging and hydrogen dispensing?
- Were you aware these requirements are in development?
- What is your general reaction? (support / oppose / inevitable / other?)
- How concerned are you, if at all, about the accuracy of EV chargers/hydrogen dispensers? Why, what aspects, what should be done?

PROBE: Is this likely to affect consumer/market confidence in EV charging / hydrogen dispensing?

- Are you aware that when a business charges customers based on the amount of fuel delivered to a vehicle (e.g. electricity, hydrogen, gasoline), the business must be registered with Measurement Canada?
- Does that requirement influence your confidence in EV charging and refueling equipment? (please elaborate)
- To what extent would each of the following affect your confidence in the accuracy of public EV charging stations or hydrogen dispensers? (note: increased confidence, no change, reduced confidence).

They are designed and built to perform in accordance with Canadian standards	
They are approved and inspected by accredited officials	
Charging/dispensing information is shared and displayed during the transaction	
Information the charging stations/dispensers and the fueling process is easily available to consumers	

- Please share any additional ideas or concerns you have about public EV charging or hydrogen fueling stations in the Canadian marketplace and your confidence in their level of accuracy.

C. Manufacturers (30 minutes)

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Suppliers and retailers will also be subject to regulatory oversight by Measurement Canada, in the same way that suppliers and retailers of gasoline and diesel fuels are, in order to ensure consumers receive accurate and reliable measurement.

- Were you aware that Measurement Canada is responsible for oversight of fair billing and accurate measurement of EV charging and hydrogen dispensing?
- Were you aware these requirements are in development?
- What is your general reaction? (support / oppose / inevitable / other?)
- How concerned are you, if at all, about the accuracy of EV chargers/hydrogen dispensers? Why, what aspects, what should be done?

PROBE: Is this likely to affect consumer/market confidence in EV charging / hydrogen dispensing?

- Are you aware that when a business charges customers based on the amount of fuel delivered to a vehicle (e.g. electricity, hydrogen, gasoline), the business must be registered with Measurement Canada?
- Does that requirement influence your confidence in EV charging and refueling equipment? (please elaborate)
- To what extent would each of the following affect your confidence in the accuracy of public EV charging stations or hydrogen dispensers? (note: increased confidence, no change, reduced confidence).

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- Please share any additional ideas or concerns you have about public EV charging or hydrogen fueling stations in the Canadian marketplace and your confidence in their level of accuracy.

D. Investors (30 minutes)

- Do you have any interest or investments in the EV sector? What aspects?
- Do you consider EVs / EV charging to be interesting investment opportunities?
- In general, how do you feel about government oversight in this sector?
- Are there actions government can take to increase investor confidence?

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Suppliers and retailers will also be subject to regulatory oversight by Measurement Canada, in the same way that suppliers and retailers of gasoline and diesel fuels are, in order to ensure consumers receive accurate and reliable measurement.

- Were you aware that Measurement Canada is responsible for oversight of fair billing and accurate measurement of EV charging and hydrogen dispensing?
- Were you aware these requirements are in development?
- What is your general reaction? (support / oppose / inevitable / other?)
- How concerned are you, if at all, about the accuracy of EV chargers/hydrogen dispensers? Why, what aspects, what should be done?

PROBE: Is this likely to affect investor confidence in EV charging / hydrogen dispensing?

- Does the knowledge that there will be government oversight on the accuracy of measurement for EV chargers and hydrogen dispensers influence your confidence in EV charging and refueling equipment? Please elaborate (note positive or negative influences).
- To what extent would each of the following affect your confidence in the accuracy of public EV charging stations or hydrogen dispensers? (note: increased confidence, no change, reduced confidence).

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- Please share any additional ideas or concerns you have about public EV charging or hydrogen fueling stations in the Canadian marketplace, your confidence in their level of accuracy, and/or your interest in investing in the sector.

On behalf of Measurement Canada, thank you very much for taking the time to speak to me.