Innovation, Science and Economic Development Canada | Innovation, Sciences et Développement économique Canada

# *Consumer Confidence in the Accuracy of Clean Fuel Measurement – Wave 2*

## Final Report

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

Supplier Name: Environics Research
Contract Number: CW2346881
Contract Value: $124,865.00 (including HST).
Award Date: 2024-01-23
Delivery Date: 2024-04-12

Registration Number: POR 117-23

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Canada

**Consumer Confidence in the Accuracy of Clean Fuel Measurement – Wave 2**
**Final report**

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

May 27, 2024

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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 February 27 to March 22, 2024 and the qualitative research was conducted from February 13 to May 10, 2024.



Cat. No. Iu4-417/2024E-PDF

International Standard Book Number (ISBN): 978-0-660-72590-1

Cette publication est aussi disponible en français sous le titre nom *Confiance à l'égard de la mesure des combustibles propres*

N$^{o}$ de cat. Iu4-417/2024F-PDF (Final report, French)

ISBN: 978-0-660-72591-8

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# 1. Executive summary

## 1.1. 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, Environics Research conducted quantitative and qualitative research in 2022 to provide baseline measures of confidence in the accuracy of clean fuels measurement devices.

This is the second iteration of this research study, intended to highlight any changes in consumer confidence of clean fuel measurement devices over the past few years and track awareness of the role Measurement Canada plays in developing regulations and maintaining standards in the sector. These 2024 results aim to provide tracking data that will support and inform further regulatory development in the Canadian clean fuels sector.

## 1.2. Methodology

**Quantitative phase**

Environics Research surveyed 1,268 Canadian EV owners and intenders (aged 18 years and older) between February 27 to March 22, 2024. The sample included 1,030 EV owners, and 238 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 | EV Intenders |
|---|---|---|
| **Canada (Total)** | **1,030** | **238** |
| Atlantic | 47 | 25 |
| Quebec | 402 | 40 |
| Ontario | 214 | 79 |
| MB/SK | 42 | 24 |
| Alberta | 59 | 30 |
| BC/Territories combined | 266 | 40 |

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 February 13 to May 10, 2024. A total of 187 stakeholders from across the country were invited to participate, with 30 agreeing to be interviewed.

## 1.3. Cost of research

The cost of this research was $124,865.00 (including HST).

## 1.4. Key findings

# Abbreviations

| | |
|---|---|
| PHEV | Plug-in Hybrid Electric Vehicle |
| BEV | Batter Electric Vehicle |
| FCEV | Fuel Cell Electric Vehicle |
| ZEV | Zero-Emissions Vehicle |
| EVSE | Electric Vehicle Supply Equipment |

# 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 (7%). 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 seven in ten of those who intend to purchase an EV in the next two years plan to buy a PHEV (72%).

**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, BEV and PHEV owners more commonly use a Level 2 fixed-charging station, followed by a Level 1 standard outlet. PHEV owners (39%) are more likely than BEV owners (25%) to use a standard wall electrical outlet (Level 1) at home, whereas BEV owners are more likely (50%) to use a fixed/hard-wired charging station (Level 2). Around one in ten (9%) say they do not charge at home.

*Use of public charging stations*

- A majority of eight in ten (80%) PHEV and BEV owners charge their EVs away from where they live, about half of whom use free chargers (53%). Use of other options for charging away from home follow a similar proportion as in 2022, but there has been growth in the use of Tesla Supercharger Stations (32% compared to 21% in 2022).
- Among the 20 percent of PHEV and BEV owners who do not charge their EVs away from where they live, four in ten say it is because they do not leave their home range. Other common reasons include range concerns (26%) and saying their EV takes too long to charge outside of their home (21%).
- Among PHEV and BEV owners, Level 1 and Level 2 public charging stations are most frequently used. Half use a Level 1 station (51%) or Level 2 station (50%) at least every two weeks, compared to three in ten (34%) who say the same about Level 3 stations. This data follows a similar pattern as the 2022 results.

*Average cost per charge*

- BEV/PHEV owners who charge away from home were asked to estimate the average cost per charge. One third say charging away from home typically costs less than $10. BEV owners were more likely to estimate a cost under $20. PHEV owners were more likely to estimate costs greater than $20 per charge.

*Experience with billing at public charging stations*

- Consistent with 2022 data, PHEV and BEV owners are most likely to have experience with charge based on time connected to the EV charger ($/min) when billing at public charging stations.
- BEV owners are more likely than PHEV owners to have experience with charge based on energy delivered to the vehicle (33%). On the other hand, PHEV owners are more likely to experience fixed charge per use ($/charge) (37%) and flat rate charge ($/month) (25%).

*Confidence in public charging stations*

- Confidence in billing accuracy is high and growing among both PHEV and BEV owners. Over eight in ten (85%) BEV and PHEV owners feel at least somewhat confident about the billing accuracy of public EV charging stations; one-third of which are ‘very’ confident, representing an increase of six percentage points since 2022 (79%).
- BEV and PHEV owners were asked more specifically about their confidence levels in different billing methods. Confidence is high, at eighty percent or more for each of the billing methods presented. BEV and PHEV owners are most confident in flat rate charge ($/month) (90%), closely followed by charge based on time connected to the EV charger ($/min).
- Overall confidence in various aspects of the charging experience is also high, with over three-quarters feeling confident about each aspect they were asked about. Confidence levels in each aspect have slightly increased since 2022. BEV owners are more likely to be confident that the amount paid to charge their vehicle matched the amount of charge they received (84%) and that the charging services are accurate (82%) compared to PHEV owners.

**Fuelling behaviour – Hydrogen/Fuel Cell EV owners**

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

- Two-thirds (67%) of FCEV owners report purchasing hydrogen fuel at least every two weeks. The proportion of FCEV owners purchasing hydrogen fuel more frequently (3 times per week or more) has almost doubled since 2022.
- Confidence in billing accuracy of hydrogen filling stations is high and growing favourably, but is still largely driven by owners who feel somewhat confident rather than very confident. A majority of eight in ten FCEV owners are generally confident (86%) in the billing accuracy of public hydrogen dispensing stations, a slight increase since 2022.
- Overall confidence in various aspects of the hydrogen fuelling experience is high, with at least three-quarters feeling confident about each aspect they were asked about. Confidence levels in each aspect have slightly increased since 2022.

**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*

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

*Preferences for displays of billing information*

- Most (92%) BEV and PHEV owners and intenders feel it is at least somewhat important to be aware of the cost of charge prior to charging their vehicle. Intenders are more likely to say it is very important (71%) compared to owners (56%).
- Nearly two-thirds of owners and intenders are comfortable with a charger that provides relevant billing information remotely rather than using a visual display on the charger. Comfort with remote displays of information is higher among owners (70%) than intenders (39%).
- Owners feel very confident seeing information in an emailed receipt (47%), a cell phone app (45%), paper receipts (45%) as well as on the charger itself (42%). Intenders express greater confidence in paper receipts (58%) than owners (44%).

*Factors affecting confidence*

- When considering how their confidence in accuracy at public stations might be positively influenced, between eighty-five and ninety-three percent expressed that the proposed options would have a moderate to strong positive influence. Consistent with previous results, immediate billing details is higher (93%), while knowledge that there is an independent dispute resolution mechanism in place is at the lower end (85%). Between owners and intenders, the latter are more likely to consider the options involving accreditation as having a strong or moderate positive influence on their confidence levels.

**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.

- Similar to previous results, when asked about important information to see on a receipt, the total cost in dollars was viewed as most important (89%). The amount of hydrogen dispensed (88%), fixed charges (88%), rate (86%) and sales tax (86%) were all seen as very important to include.
- While many FCEV owners and intenders are satisfied with billing methods at public hydrogen stations, over half consider it difficult to know how much hydrogen their car receives.
- According to FCEV owners and intenders, having billing details provided to the consumer immediately following the transaction and knowing accuracy and performance of retail hydrogen fuel dispensers are reverified periodically by accredited officials would impact confidence levels most positively (57% strong positive influence each).

**Small business owners with EVs**

- Consistent with previous results, 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.
- The proportion of small business owners who use public charging stations has slightly grown since 2022, with over eight in ten (85%) saying they use public chargers for business EVs. When doing so, over half report using free chargers (57%), and almost four in ten report using Tesla Supercharger Stations (37%), with three in ten using ChargePoint locations (31%). These results follow a similar pattern as previous results from 2022.

**Awareness of Measurement Canada**

- EV owners and intenders are most aware of Measurement Canada's responsibility to approve, verify and inspect gas pumps, but are least aware of the organizations role in regulating hydrogen fueling dispensers. Four in ten are aware of their responsibility for EV chargers. Three in ten are not aware that Measurement Canada is responsible for any of the devices.
- Seven in ten have at least seen the Measurement Canada sticker; nearly four in ten are more familiar with it.

**Interest in other clean fuel vehicle types**

- Current EV owners and intenders are most interested in battery electric vehicles (66%), followed by plug-in hybrid electric vehicles (56%). EV intenders are most interested in plug-in hybrid electric vehicles (75%). Interest in hydrogen fuel cell EVs sits at around four in ten. Interest in other engine types is two in ten or less.

## 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 – Measurement Canada and Accuracy and Performance Standards**

Representatives from the ZEV sector are largely aware of Measurement Canada and its responsibility for regulatory oversight of fair billing and accurate measurement of electric vehicle charging, hydrogen dispensing and other renewable fuels dispensing. Typically, representatives are most aware of regulatory oversight within their own sector and assume regulatory oversight occurs in other sectors (i.e., electric vehicle supply equipment manufacturers understand oversight within the EV space, but mostly assume there is similar oversight related to hydrogen dispensing).

The accuracy and performance standards being developed by Measurement Canada are a top-of-mind issue for charging/fuelling service providers and manufacturers of charging equipment, metering devices and other electric vehicle supply equipment (ESVE). All stakeholders interviewed were acutely aware of and closely following the development of the standards and requirements; many belonged to working groups related to this issue, thereby increasing their awareness and level of involvement.

**General reactions**

Reactions to the standards being developed by Measurement Canada vary by organization type but are generally positive – all stakeholders interviewed support some form of standardization within the industry, stating it is necessary, and are happy to see standards and requirements moving toward fruition. The common view is that the standards need to be fair and realistic (to consumers and stakeholders), ensure no bureaucratic bottlenecks and work to move the industry forward. The standards being developed are said to be generally aligned with what is being developed in other jurisdictions, which is a positive step.

Stakeholders feel that standardization and regulation within the sector will increase market and consumer confidence as it ensures fairness and transparency. That said, there were differing views on what the accuracy standards and performance requirements should look like in practice. Key themes are outlined below.

*Testing, approval and recertification requirements should be realistic and feasible to avoid a backlog in the approval process.*

- It is important to ensure chargers/fuel dispensers that exist in the market are tested and approved to be accurate and reliable, particularly if consumers are going to be charged volumetrically. This is something stakeholders feel is long overdue and will impact market and consumer confidence.
- Some representatives feel that the testing and recalibration requirements being proposed by Measurement Canada are not realistic or feasible; most notably, there is a concern that Measurement Canada does not have adequate lab space/testing equipment to conduct testing at scale.
- Further, manufacturers feel testing every individual unit for accuracy is expensive and onerous. This is important when considering testing and approval of chargers entering or currently in the market in that too stringent requirements could delay in-field operability of chargers, slowing adoption.
- Participants suggest solutions to mitigate a backlog in testing and approval processes, such as allowing for type testing rather than individual unit testing, allowing third party accuracy testing, or allowing manufacturers to conduct their own testing.

*Stakeholders stress the need to balance consumer protection with efficient roll-out of accuracy standards.*

- Measurement accuracy is especially important when it comes to consumer protection and transparency. All stakeholders agree that an accuracy standard must be put in place by Measurement Canada to support further adoption of clean fuels.
- Manufacturers feel that measurement accuracy standards that are too strict could be a hinderance and slow down the industry (e.g., minimum resolution of 0.001 kWh). One concern is that the accuracy standard being too strict and imposing further costs on the manufacturer to meet the standards can eventually pass costs onto consumers.
- Representatives from electric utilities, however, note manufacturers are asking for too much flexibility from Measurement Canada. Utility companies have always met and continue to meet high standards set by Measurement Canada and the clean fuel sector should be held to a similar standard.
- Stakeholders suggest looking at accuracy requirements in other jurisdictions to emulate what has worked.

*Registration to meet requirements may impact some organizations more negatively than others.*

- For large organizations such as EVSE manufacturers and major electric utilities, the time it takes to complete the paperwork required to register as a manufacturer, contractor, or service provider is inconsequential. However, for small business owners (i.e., potential contractors) and multi-unit residential boards, the requirements are burdensome and a potential barrier to entry into the market.
- Multiple stakeholders are concerned about the requirements for multi-unit residential buildings, again noting the standards are difficult to navigate with low capacity. This view comes from strata associations as well as electric utilities that work with condo boards to implement charging/fuelling solutions.
- Some suggest that the more paperwork and effort manufacturers, utilities, contractors and other stakeholders need to put into meeting accuracy standards and performance requirements, the higher the cost could be for consumers in the end. The key is finding the balance between what is necessary for consumer protection and what will end up a detriment rather than a benefit.

*Stakeholders note a need for modernization of the Electricity and Gas Inspection Act (EGIA) in order to be more suitable for clean fuel technology.*

- Some participants highlight the notion that the EGIA needs to be modernized in order to catch up to the ZEV market. It is stated that the framework under which the new standards and requirements are being developed is not suitable in that it was designed around vertically integrated utilities, not the multiple stakeholder market that exists in the ZEV space.
- Modernization of the act also relates to the definition of ‘contractor’. Stakeholders mention the challenge of navigating responsibility when it comes to defining a ‘contractor’, handling disputes, recalibration, and recertification, noting there needs to be clarity around onus and responsibility in the developed regulations.

*Harmonization of standards and requirements across borders would create efficiencies for electric vehicle supply equipment manufacturers, enabling a smoother process for deploying equipment.*

- Some charging manufacturers discuss the need to harmonize standards across jurisdictions – that is, requirements should be the same across Canada, and ideally should align with requirements in the United States. Many charging manufacturers develop chargers for both markets, so meeting two sets of requirements presents a challenge.

**Concerns and perceptions about accuracy of clean fuel measurement**

At this time, there is very little concern about the accuracy of clean fuel measurement among industry stakeholders. Manufacturers are confident in the equipment they produce, many building to meet requirements in other jurisdictions as a best practice (e.g., California Type Evaluation Program) or including functionality in their equipment to meet eventual or anticipated standards.

Stakeholders typically believe there is little concern about accuracy of clean fuel measurement among ZEV drivers themselves. This is thought to be due to a lack of understanding that the industry is not regulated combined with an apathy toward the actual cost to use clean fuel – ultimately, the cost is lower than gasoline, so consumers are satisfied. While there is not a lack of confidence, stakeholders still feel that any sort of transparency and oversight within the clean fuel sector will be a positive development toward securing consumer confidence.

**Increasing confidence in clean fuel measurement**

Overall, transparency is essential, and stakeholders believe standardization will increase market and consumer confidence in clean fuel measurement. As the industry continues to grow, it will be important for consumers to understand how they are being charged for clean fuels in order to maintain momentum.

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. Requirements that would have the most impact include charging and fuelling equipment being designed and built to perform in accordance with Canadian standards, and approved and inspected by accredited officials. Participants felt less strongly about requirements to display charging/dispensing information during the transaction, and making information about the charging stations/dispensers and the fueling process is easily available to consumers.

## 1.5. 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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PWGSC contract number: CW2346881

Original contract date: 2024-01-23
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# 2. Introduction

## 2.1. 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 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, Environics Research conducted quantitative and qualitative research in 2022 to provide baseline measures of confidence in the accuracy of clean fuels measurement devices.

This is the second iteration of this research study, intended to highlight any changes in consumer confidence of clean fuel measurement devices over the past few years and track awareness of the role Measurement Canada plays in developing regulations and maintaining standards in the sector. These 2024 results aim to provide tracking data that will support and inform further regulatory development in the Canadian clean fuels sector.

### Research rationale and objectives

This research uses the 2022 Consumer Confidence in Clean Fuel Measurement research study as a baseline against which to measure results and will be used to inform the effectiveness and usefulness of the programs Measurement Canada is developing, as well as their utility in building consumer confidence in the clean fuel market.

This initiative is also in direct support of government-wide priorities to advance clean fuels markets and carbon capture, utilization and storage technologies in Canada.

The research is required to effectively inform Measurement Canada's reporting processes, including consumer confidence data around the fairness of charging and/or refueling stations in investigating clean fuel productions.

## 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.

# 3. Detailed findings – Quantitative research

## 3.1. EV Ownership and Intention

### 3.1.1. EV Ownership

**Similar to previous results, 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.**

This year, more than half (54%) of those who currently own or lease electric vehicles have a plug-in hybrid electric vehicle (PHEV), while nearly four in ten (39%) own a battery electric vehicle (BEV). A small minority (7%) of EV owners in Canada are likely to own a hydrogen fuel cell electric vehicle (FCEV).

**Electric vehicle ownership – by Region**

| Type of Electric Vehicle | 2022 Total (n=1,000) | 2024 Total (n=1,030) | Region (2024) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | BC/Terr (n=266) | AB (n=59) | MB/SK (n=42) | ON (n=214) | QC (n=402) | ATL (n=47) |
| Plug-In Hybrid Electric Vehicle (PHEV) | 56% | 54% | 49% | 63% | 67% | 53% | 55% | 57% |
| Battery Electric Vehicle (BEV) | 39% | 39% | 47% | 27% | 31% | 36% | 39% | 30% |
| Hydrogen/Fuel Cell Electric Vehicle (FCEV) | 5% | 7% | 4% | 10% | 2% | 11% | 6% | 13% |

*Q1 Do you currently own or lease a battery electric vehicle, a plug-in hybrid electric vehicle, or a hydrogen/fuel cell electric vehicle? TOTAL SAMPLE; (n=1,268)*

*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; Non-EV owners (n=360)*

### 3.1.2. Model Year and Range of EV

**Nearly two-thirds of Canadian EV owners have ZEVs with a model year of 2020 or newer.**

Canadians who have electric vehicles are most likely to own newer models, with over six in ten (64%) saying they have a 2020 model or newer (64%). A smaller proportion of one-quarter (25%) own a vehicle with a model year between 2015 to 2019. A much smaller proportion (5%) own EVs that are 2014 or older.

**Model Year of EV owned – by EV Type**

| Model year | 2022 Total (n=1,000) | 2024 Total (n=1,030) | PHEV Total (n=557) | BEV Total (n=404) | FCEV Total (n=69) |
|---|---|---|---|---|---|
| 2011-2014 | 6% | 5% | 5% | 4% | 10% |
| 2015-2019 | 40% | 25% | 27% | 21% | 25% |
| 2020 or newer | 46% | 64% | 62% | 69% | 57% |

*Q4 What is the model year of your ___?*
*SUBSAMPLE; EV Owners (n=1,030)*

**Model Year of EV owned – by Region**

| Model Year | 2024 Total (n=1,030) | Region | | | | | |
|---|---|---|---|---|---|---|---|
| | | BC/Terr (n=266) | AB (n=59) | MB/SK (n=42) | ON (n=214) | QC (n=402) | ATL (n=47) |
| 2011-2014 | 5% | 5% | 8% | 5% | 4% | 5% | 6% |
| 2015-2019 | 25% | 22% | 24% | 19% | 31% | 25% | 17% |
| 2020 or newer | 64% | 65% | 63% | 62% | 62% | 64% | 72% |

*Q4 What is the model year of your ___?*
*SUBSAMPLE; EV Owners (n=1,030)*

Those earning a household income under $40K (18%) more commonly own an older EV made between 2011 to 2014. Those who are more likely to own a vehicle from 2020 or later include those earning over $100K (72%), BEV owners (69%), those with a university degree (69%) and those living in single family homes with parking (68%).

**Similar to previous results, Canadians who own EVs typically have an approximate range of between 200 and 400 km.**

Approximately one-third report a range of 200 km or less (33%) and nearly four in ten (37%) report a range between 200 km and 400 km, and two in ten (23%) percent have a range of over 400 km.

**Range of EV owned – by EV Type (2024)**

| Approximate Range of Electric Vehicle | 2024 Total (n=1,037) | PHEV Total (n=557) | BEV Total (n=404) | FCEV Total (n=69) |
|---|---|---|---|---|
| **NET: <200** | **33%** | **46%** | **16%** | **16%** |
| Less than 100 km | 21% | 33% | 7% | 4% |
| 100-199 km | 12% | 13% | 9% | 12% |
| ***NET: 200-400*** | **37%** | **33%** | **44%** | **36%** |
| 200-300 | 15% | 17% | 11% | 20% |
| 300-400 | 22% | 16% | 32% | 16% |
| ***NET: 400+*** | **23%** | **14%** | **35%** | **29%** |
| 400-500 | 17% | 9% | 28% | 19% |
| 500+ | 6% | 5% | 7% | 10% |
| Not sure | 7% | 7% | 5% | 19% |

**Range of EV owned – by EV Type (2022)**

| Approximate Range of Electric Vehicle | 2022 Total (n=1,000) | PHEV Total (n=558) | BEV Total (n=389) | FCEV Total (n=53) |
|---|---|---|---|---|
| **NET: <200** | **40%** | **53%** | **23%** | **36%** |
| Less than 100 km | 27% | 40% | 11% | 9% |
| 100-200 km | 13% | 13% | 12% | 26% |
| **NET: 200-400** | **37%** | **32%** | **44%** | **30%** |
| 200-300 | 16% | 17% | 15% | 9% |
| 300-400 | 21% | 15% | 29% | 21% |
| **NET: 400+** | **17%** | **10%** | **29%** | **13%** |
| 400-500 | 14% | 7% | 25% | 8% |
| 500+ | 3% | 3% | 4% | 6% |
| Not sure | 6% | 5% | 5% | 21% |

*Q5 What is the approximate all-electric range of your EV? Please indicate the longest range if multiple EVs are owned?*
*BASE: Owners (n=1,030)*

*NOTE: Answer categories were revised in 2024 survey instrument*

**Range of EV owned – by Region**

| Approximate Range of Electric Vehicle | 2024 Total (n=1,037) | BC/Terr (n=266) | AB (n=59) | MB/SK (n=42) | ON (n=214) | QC (n=402) | ATL (n=47) |
|---|---|---|---|---|---|---|---|
| **NET: <200** | **33%** | **30%** | **20%** | **45%** | **26%** | **39%** | **26%** |
| Less than 100 km | 21% | 20% | 10% | 29% | 12% | 28% | 9% |
| 100-199 km | 12% | 11% | 10% | 17% | 14% | 10% | 17% |
| **NET: 200-400** | **37%** | **35%** | **41%** | **38%** | **46%** | **34%** | **36%** |
| 200-300 | 15% | 15% | 19% | 19% | 22% | 9% | 21% |
| 300-400 | 22% | 20% | 22% | 19% | 24% | 24% | 15% |
| ***NET: 400+*** | **23%** | **26%** | **25%** | **12%** | **21%** | **23%** | **30%** |
| 400-500 | 17% | 19% | 10% | 12% | 14% | 18% | 19% |
| 500+ | 6% | 7% | 15% | 0% | 7% | 5% | 11% |
| Not sure | 7% | 9% | 14% | 5% | 7% | 5% | 9% |

*Q5 What is the approximate all-electric range of your EV? Please indicate the longest range if multiple EVs are owned?*
*BASE: Owners (n=1,030)*

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

- BEV owners (35%)
- FCEV owners (29%)
- A vehicle with a model year of 2020 or newer (28%)
- Those earning a household income of $100K or higher (30%)

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

- PHEV owners (46%)
- Model year between 2011-2014 (47%) and 2015-2019 (40%)
- Age 55+ (42%)

### 3.1.3. EV Intention

**Similar to 2022, those who intend to purchase an EV in the next few years are most likely to purchase 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 seven in ten (72%) indicating this preference, an increase since 2022 results. Intention to purchase other EV types is muted with two in ten (23%) saying they intend to buy a BEV and only 5 percent who are considering a FCEV.

**EV Intention – by Region**

| Type of Electric Vehicle | 2022 Total (n=800) | 2024 Total (n=238) | Region | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | BC/Terr (n=40) | AB (n=30) | MB/SK (n=24) | ON (n=79) | QC (n=40) | ATL (n=25) |
| Plug-In Hybrid Electric Vehicle (PHEV) | 60% | 72% | 73% | 70% | 54% | 75% | 73% | 84% |
| Battery Electric Vehicle (BEV) | 33% | 23% | 25% | 27% | 33% | 20% | 23% | 12% |
| Hydrogen/Fuel Cell Electric Vehicle (FCEV) | 7% | 5% | 3% | 3% | 13% | 5% | 5% | 4% |

*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=238)*

## 3.2. Charging Behaviour – BEV and PHEV Owners

### 3.2.1. Charging at Home

**When charging at home, BEV and PHEV owners more commonly use a Level 2 fixed-charging station, followed by a Level 1 standard outlet.**

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 slightly smaller proportion of one-third (33%) use a standard wall electrical outlet (Level 1). These proportions are similar to previous results. Less than two in ten report using other methods of charging, but the proportion of those using portable Level 2 charging stations has increased by 4 percent since 2022.

PHEV owners (39%) are more likely than BEV owners (25%) to use a standard wall electrical outlet (Level 1) at home, whereas BEV owners are more likely (50%) to use a fixed/hard-wired charging station (Level 2).

**Methods of Charging at Home – by Age and Gender**

| Method of charging | 2022 Total (n=947) | 2024 Total (n=961) | PHEV Total (n=557) | BEV Total (n=404) | Gender | | Age | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | Male (n=649) | Female (n=312) | 18-34 (n=252) | 35-54 (n=389) | 55+ (n=320) |
| Standard wall electrical outlet (Level 1) | 36% | 33% | 39% | 25% | 34% | 33% | 33% | 32% | 35% |
| Fixed/hard-wired Level 2 charging station | 38% | 38% | 30% | 50% | 38% | 38% | 33% | 39% | 42% |
| Portable Level 2 charging station | 8% | 12% | 14% | 10% | 12% | 13% | 16% | 13% | 8% |
| Shared Level 2 charging station | 4% | 5% | 6% | 4% | 5% | 6% | 7% | 7% | 2% |
| Shared DC fast charger | 1% | 2% | 2% | 1% | 2% | 1% | 2% | 2% | 1% |
| I do not charge at home | 11% | 9% | 10% | 8% | 10% | 8% | 9% | 7% | 11% |
| Other | 1% | 1% | <1% | 1% | <1% | 1% | <1% | <1% | 1% |

*Q11 If you charge your EV at home, what method of charging do you use?*
*SUBSAMPLE; BEV and PHEV Owners (n=961)*

Fixed/hard-wired (Level 2) use at home is higher among the following types of BEV/PHEV owners:

- Range 400km+ (50%)
- Living in Quebec (47%)
- Aged 55+ (42%)
- Model year 2020 or newer (42%)

**The small proportion of BEV/PHEV owners who use shared charging are likely to be billed for it.**

Similar to previous results, less than one in ten (7%) BEV/PHEV owners use shared chargers. Among them, over three-quarters (77%) say they are billed for it.

**Use of Shared Charging**

| Billed when using shared charging | 2022 Total (n=50) | 2024 Total (n=64) | PHEV Total (n=41) | BEV Total (n=23) |
|---|---|---|---|---|
| Yes | 62% | 77% | 76% | 78% |
| No | 30% | 22% | 22% | 22% |
| Not sure | 8% | 2% | 2% | 0% |

*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=64)*

### 3.2.2. Charging Away from Home

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

Consistent with previous results, eight in ten (80%) PHEV and BEV owners charge their EVs away from where they live, and more than half (53%) do so using free chargers. Use of other options for charging away from home follow a similar proportion as in 2022 but there has been growth in the use of Tesla Supercharger Stations (32% compared to 21% in 2022). BEV owners are more likely to use Telsa Supercharger Stations (39%), FLO Locations (33%) and Circuit Électrique locations (26%) compared to PHEV owners.

**Charging Away from Home – by Gender and Age**

| Method of charging | 2022 Total (n=947) | 2024 Total (n=874) | PHEV Total (n=503) | BEV Total (n=371) | Gender | | Age | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | Male (n=587) | Female (n=287) | 18-34 (n=230) | 35-54 (n=360) | 55+ (n=284) |
| **NET: Yes** | **81%** | **80%** | **80%** | **80%** | **80%** | **80%** | **84%** | **86%** | **69%** |
| Free chargers | 54% | 53% | 54% | 51% | 54% | 51% | 52% | 55% | 50% |
| ChargePoint locations | 30% | 31% | 34% | 28% | 30% | 33% | 35% | 33% | 24% |
| Circuit électrique locations | 25% | 20% | 15% | 26% | 23% | 14% | 8% | 19% | 32% |
| FLO locations | 22% | 22% | 14% | 33% | 22% | 21% | 11% | 21% | 33% |
| Tesla Supercharger Stations | 21% | 32% | 28% | 39% | 31% | 35% | 40% | 36% | 21% |
| BC Hydro EV locations | 14% | 15% | 15% | 15% | 15% | 15% | 14% | 15% | 15% |
| Tesla Destination Charging | 9% | 13% | 14% | 13% | 12% | 15% | 20% | 13% | 7% |
| Other | 6% | 5% | 3% | 8% | 5% | 4% | 1% | 4% | 9% |
| Not Sure | 4% | 2% | 2% | 1% | 2% | 1% | 2% | 2% | 1% |
| **No** | **19%** | **20%** | **20%** | **20%** | **20%** | **20%** | **16%** | **14%** | **31%** |

*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=874)*

*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 charges away from home (n=786)*

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

- Younger than 55 years old (85%)
- In a medium sized community (85%)

Those less likely to charge away from home include:

- Age 55+ (31%)

**BEV/PHEV owners who do not charge outside of their home most commonly say it is because they do not leave their home range.**

Among the 20 percent of PHEV and BEV owners who do not charge their EVs away from where they live, four in ten say it is because they do not leave their home range. Other common reasons include range concerns (26%) and saying their EV takes too long to charge outside of their home (21%). Less common reasons include difficulty locating chargers (17%), doubts about accuracy (7%), not having the necessary app (7%) and difficulty using chargers away from home (5%). This year there were no major trends by EV type for not charging away from home.

**Not charging away from home - Reasons**

| Method of charging | 2022 Total (n=183) | 2024 Total (n=175) | PHEV Total (n=101) | BEV Total (n=74) | Gender | | Age | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | Male (n=119) | Female (n=56) | 18-34 (n=36) | 35-54 (n=51) | 55+ (n=88) |
| I don't leave my home range | 54% | 40% | 39% | 42% | 46% | 27% | 36% | 31% | 47% |
| Not comfortable on long trips (range concern) | 20% | 26% | 27% | 24% | 23% | 32% | 39% | 27% | 19% |
| It takes too long to charge | 23% | 21% | 24% | 18% | 18% | 29% | 19% | 24% | 20% |
| Difficulty locating chargers | 22% | 17% | 15% | 19% | 15% | 20% | 22% | 14% | 16% |
| Doubts about the accuracy of the charge received | 8% | 7% | 6% | 9% | 7% | 9% | 14% | 6% | 6% |
| Don't have an app | 8% | 7% | 7% | 8% | 5% | 13% | 11% | 6% | 7% |
| Cost / expensive | - | 6% | 4% | 8% | 5% | 6% | 3% | 12% | 3% |
| Chargers are difficult to use | 5% | 5% | 5% | 5% | 5% | 5% | 6% | 6% | 5% |
| Other | 13% | 13% | 15% | 11% | 14% | 13% | 6% | 6% | 20% |
| Not sure | 3% | 2% | 0% | 5% | 2% | 4% | 3% | 4% | 1% |

*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=175)*

### 3.2.3. Public charging stations - Frequency

**Similar to previous results, 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. Half use a Level 1 station (51%) or Level 2 station (50%) at least every two weeks, compared to three in ten (34%) who say the same about Level 3 stations. This data follows a similar pattern as the 2022 results.

PHEV owners are more likely to use all three levels of public charging stations more frequently (at least every two weeks) than BEV owners. BEV owners report less frequent charging behaviour and are more likely to say they use these charging stations occasionally throughout the year.

**Public Charging Stations – Frequency of Use – Tracking**

| Type of public charging station | NET At least every two weeks | | | |
|---|---|---|---|---|
| | 2022 (n=764) | 2024 (n=786) | PHEV Owners (n=456) | BEV Owners (n=330) |
| Level 1 public charging station (120 V, 15-20 A) | **48%** | **51%** | 64% | 33% |
| Level 2 public charging station (240 V, up to 80 A) | **45%** | **50%** | 58% | 39% |
| Level 3 public charging station (480 V, 300 A), includes superchargers | **29%** | **34%** | 40% | 26% |
| None of the above | **35%** | **33%** | 25% | 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=786)*

**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) | **51%** | 13% | 21% | 17% | 8% | 18% | 23% |
| Level 2 public charging station (240 V, up to 80 A) | **50%** | 9% | 23% | 19% | 10% | 26% | 14% |
| Level 3 public charging station (480 V, 300 A), includes superchargers | **34%** | 7% | 12% | 15% | 11% | 26% | 29% |

*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=786)*

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 household income under $40K (68%)
- Those living in a single-family home without parking (75%)

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 (59%)
- Those with an approximate range of 200-400 km (60%)

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

- Those aged 18-34 (46%)
- Those with an approximate range greater than 200 km (40%)

### 3.2.4. Public charging station – Average Cost Per Charge

**One-third say charging their EV away from home costs less than $10 on average, per charge. Three in ten are unsure.**

BEV/PHEV owners who charge away from home were asked to estimate the average cost per charge. One third say charging away from home typically costs less than $10. BEV owners were more likely to estimate a cost under $20. PHEV owners were more likely to estimate costs greater than $20 per charge.

**Public Charging Stations – Average Cost Per Use (New Question 2024)**

| Average Cost Per Charge | Total (n=786) | PHEV (n=456) | BEV (n=330) |
|---|---|---|---|
| $1-10 | **29%** | 26% | 32% |
| $11-20 | **17%** | 12% | 25% |
| $21-50 | **16%** | 18% | 12% |
| $51+ | **8%** | 11% | 5% |
| Unsure | **31%** | 34% | 25% |

*Q16A What is your average cost per charge for charging away from home?*

*SUBSAMPLE; BEV and PHEV Owners who charge away from home (n=786)*

### 3.2.5. Public charging stations – Billing Methods

**Consistent with 2022 data, 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.**

Similar to previous results, charge based on time and fixed charge per use are the most common billing method. BEV and PHEV owners who use public charging stations are most likely (38%) to have experienced charge based on time connected to the EV charger ($/min). Three in ten (30%) have experienced Fixed charge per use ($/charge). There has been a slight increase in the proportion of owners who have had experience with charge based on energy delivered ($/kWh) and flat rate charge ($/month).

BEV owners are more likely than PHEV owners to have experience with charge based on energy delivered to the vehicle (33%). On the other hand, PHEV owners are more likely to experience fixed charge per use ($/charge) (37%) and flat rate charge ($/month) (25%).

BEV/PHEV owners who have experience with Fixed charge per use (36%) and flat rate charge (25%) are more likely to be younger than 55.

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

| Billing methods | 2022 Total (n=767) | 2024 Total (n=794) | PHEV Total (n=460) | BEV Total (n=334) | Region | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | BC/Terr (n=213) | AB (n=47) | MB/SK (n=26) | ON (n=157) | QC (n=317) | ATL (n=34) |
| Charge based on time connected to the EV charger ($/min) | **40%** | **38%** | 36% | 42% | 39% | 32% | 35% | 34% | 40% | 47% |
| Fixed charge per use ($/charge) | **29%** | **30%** | 37% | 21% | 31% | 45% | 50% | 35% | 25% | 21% |
| Charge based on energy delivered to the EV ($/kWh) | **20%** | **25%** | 19% | 33% | 28% | 19% | 35% | 30% | 19% | 35% |
| Flat rate charge ($/month) | **16%** | **20%** | 25% | 13% | 19% | 34% | 12% | 25% | 16% | 15% |
| Combination of time-based charge ($/min) and charge based on energy delivered ($/kWh) | **12%** | **12%** | 11% | 14% | 12% | 4% | 12% | 17% | 12% | 9% |
| Other | **2%** | **1%** | 1% | 2% | 1% | 4% | 0% | 3% | 1% | 0% |
| None, not applicable | **15%** | **11%** | 11% | 11% | 13% | 4% | 0% | 5% | 14% | 9% |

*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=794)*

**Public Charging Stations – Billing Methods – by Age and Gender**

| Billing methods | 2024 Total (n=794) | Gender | | Age | | |
|---|---|---|---|---|---|---|
| | | Male (n=537) | Female (n=257) | 18-34 (n=218) | 35-54 (n=343) | 55+ (n=233) |
| Charge based on time connected to the EV charger ($/min) | **38%** | 38% | 39% | 37% | 36% | 43% |
| Fixed charge per use ($/charge) | **30%** | 29% | 32% | 43% | 32% | 15% |
| Charge based on energy delivered to the EV ($/kWh) | **25%** | 26% | 23% | 20% | 28% | 24% |
| Flat rate charge ($/month) | **20%** | 20% | 20% | 28% | 22% | 8% |
| Combination of time-based charge ($/min) and charge based on energy delivered ($/kWh) | **12%** | 12% | 12% | 11% | 14% | 11% |
| Other | **1%** | 1% | 2% | 0% | 2% | 1% |
| None, not applicable | **11%** | 12% | 9% | 5% | 8% | 21% |

*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=794)*

### 3.2.6. Public charging stations – Experiences with Disagreement

**Most PHEV and BEV owners have never 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 17 percent who have had such issues, the most common causes were being overcharged (17%) or chargers not working properly (16%). A smaller proportion felt the bill was expensive (11%) or that the charging took too long (8%). Since 2022, the proportion of those who were overcharged or charged for more power than they received has slightly increased, becoming the top cause. Chargers not working properly is a new theme that was not apparent in 2022 responses.

When asked how these disagreements were resolved, nearly three in ten (28%) came to a solution by talking to or negotiating with the public charging station company. In 2022, it was more common for these issues to go unresolved (21% vs 12% this year) showing a favourable decrease in unresolved disputes.

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

| Experience | 2022 Total (n=649) | 2024 Total (n=708) | PHEV Total (n=410) | BEV Total (n=298) | Gender | | Age | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | Male (n=473) | Female (n=235) | 18-34 (n=207) | 35-54 (n=317) | 55+ (n=184) |
| Yes | **16%** | **17%** | 21% | 11% | 15% | 20% | 20% | 18% | 10% |
| No | **84%** | **83%** | 79% | 89% | 85% | 80% | 80% | 82% | 90% |

*Q22 Have you ever had any issues, disagreements or disputes related to the billing at public charging stations?*
*SUBSAMPLE; BEV and PHEV Owners who use public charging stations and have experience with billing method(s) (n=708)*

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

| Proposed statements | 2024 Total (n=708) | Educational attainment | | | Income | | | |
|---|---|---|---|---|---|---|---|---|
| | | High school or less (n=91) | College/ Appr/ Some univ. (n=252) | University degree or higher (n=362) | Under $40K (n=51) | $40K - <$80K (n=192) | $80K - <$100K (n=117) | $100K+ (n=312) |
| Yes | **17%** | 14% | 19% | 16% | 27% | 23% | 14% | 13% |
| No | **83%** | 86% | 81% | 84% | 73% | 77% | 86% | 87% |

*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 and have experience with billing method(s) (n=708)*

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

| Experience | 2022 Total (n=101) | 2024 Total (n=119) | PHEV Total (n=86) | BEV Total (n=33) | Gender | | Age | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | Male (n=73) | Female (n=46) | 18-34 (n=42) | 35-54 (n=58) | 55+ (n=19) |
| Overcharged/charged for more power than received/charged fees despite not providing a charge | 13% | 17% | 14% | 24% | 16% | 17% | 14% | 14% | 32% |
| Charger not working/not charging properly | N/A | 16% | 15% | 18% | 16% | 15% | 14% | 16% | 21% |
| Pricy/expensive | 18% | 11% | 8% | 18% | 12% | 9% | 7% | 12% | 16% |
| Takes time to charge the battery/slow charging | 7% | 8% | 7% | 9% | 10% | 4% | 10% | 3% | 16% |
| Not satisfied with service/experience | 8% | 5% | 5% | 6% | 5% | 4% | 7% | 2% | 11% |
| Limited battery technology/battery not holding charge | N/A | 4% | 5% | 3% | 3% | 7% | 7% | 3% | 0% |
| Meters not working properly | 7% | 1% | 0% | 3% | 0% | 2% | 0% | 2% | 0% |
| Lack of clear direction/transparency/receipt proof | 6% | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Other | 13% | 13% | 16% | 6% | 11% | 17% | 12% | 17% | 5% |
| Nothing/ all went well | N/A | 5% | 7% | 0% | 3% | 9% | 10% | 3% | 0% |
| Prefer not to say | 41% | 23% | 24% | 18% | 23% | 22% | 21% | 29% | 5% |

*Q23 What was the cause of the issue/disagreement/dispute you experienced?*
*SUBSAMPLE; BEV and PHEV Owners who have experienced a disagreement (n=119)*

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

| Proposed statements | 2024 Total (n=119) | Educational attainment | | | Income | | | |
|---|---|---|---|---|---|---|---|---|
| | | High school or less (n=13) | College/ Appr/ Some univ. (n=47) | University degree or higher (n=59) | Under $40K (n=14) | $40K - <$80K (n=44) | $80K - <$100K (n=16) | $100K+ (n=42) |
| Overcharged/charged for more power than received/charged fees despite not providing a charge | 17% | 15% | 9% | 24% | 21% | 9% | 19% | 24% |
| Charger not working/not charging properly | 16% | 31% | 17% | 12% | 14% | 14% | 6% | 21% |
| Pricy/expensive | 11% | 0% | 13% | 12% | 0% | 5% | 6% | 24% |
| Takes time to charge the battery/slow charging | 8% | 15% | 6% | 7% | 0% | 14% | 6% | 5% |
| Not satisfied with service/experience | 5% | 0% | 4% | 7% | 0% | 9% | 0% | 5% |
| Limited battery technology/battery not holding charge | 4% | 15% | 2% | 3% | 7% | 5% | 13% | 0% |
| Meters not working properly | 1% | 0% | 0% | 2% | 0% | 0% | 0% | 0% |
| Other | 13% | 8% | 19% | 10% | 21% | 14% | 13% | 12% |
| Nothing/all went well | 5% | 0% | 6% | 5% | 0% | 14% | 0% | 0% |
| Prefer not to say | 23% | 15% | 26% | 22% | 36% | 18% | 38% | 17% |

*Q23 What was the cause of the issue/disagreement/dispute you experienced?*
*SUBSAMPLE; BEV and PHEV Owners who have experienced a disagreement (n=119)*

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

| Method of Resolution | 2022 Total (n=62) | 2024 Total (n=98) | PHEV Total (n=69) | BEV Total (n=29) | Gender | | Age | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | Male (n=59) | Female (n=39) | 18-34 (n=35) | 35-54 (n=44) | 55+ (n=19) |
| Talked to/negotiated with them | 11% | 28% | 28% | 28% | 19% | 41% | 29% | 30% | 21% |
| Not resolved | 21% | 12% | 12% | 14% | 19% | 3% | 3% | 14% | 26% |
| Money was refunded/reimbursed | 8% | 12% | 14% | 7% | 14% | 10% | 17% | 9% | 11% |
| Was resolved fast | 10% | 4% | 1% | 10% | 5% | 3% | 3% | 7% | 0% |
| Didn't make a complaint | 8% | 2% | 1% | 3% | 3% | 0% | 0% | 2% | 5% |
| Other | 26% | 22% | 23% | 21% | 25% | 18% | 23% | 20% | 26% |
| Didn't have any issue | 5% | 6% | 7% | 3% | 5% | 8% | 9% | 7% | 0% |
| Prefer not to say | 11% | 13% | 13% | 14% | 10% | 18% | 17% | 11% | 11% |

*Q24 How was the issue/disagreement/dispute resolved?*
*SUBSAMPLE; BEV and PHEV Owners who have experienced a disagreement (n=92)*

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

**Confidence in billing accuracy is high and growing among both PHEV and BEV owners, with over 80 percent feeling confident in their experience with public charging stations.**

Over eight in ten (85%) BEV and PHEV owners feel at least somewhat confident about the billing accuracy of public EV charging stations; one-third of which are 'very' confident, representing an increase in overall confidence levels since 2022. BEV owners (34%) as well as EV owners in Quebec (34%) and the Atlantic (41%), and those who are aware of Measurement Canada and its responsibilities (32%) are more likely to say they are 'very' confident in the billing accuracy of public charging stations.

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

| Confidence | 2022 Total (n=767) | 2024 Total (n=794) | PHEV Total (n=460) | BEV Total (n=334) | Region | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | BC/ Terr (n=213) | AB (n=47) | MB/SK (n=26) | ON (n=157) | QC (n=317) | ATL (n=34) |
| **NET: Confident** | **79%** | **85%** | **83%** | **86%** | **80%** | **87%** | **81%** | **83%** | **88%** | **85%** |
| Very confident | 28% | 30% | 26% | 34% | 23% | 36% | 19% | 27% | 34% | 41% |
| Somewhat confident | 50% | 55% | 57% | 52% | 57% | 51% | 62% | 57% | 54% | 44% |
| **NET: Not confident** | **11%** | **9%** | **10%** | **8%** | **11%** | **4%** | **8%** | **13%** | **6%** | **12%** |
| Not very confident | 8% | 7% | 7% | 7% | 8% | 4% | 8% | 9% | 5% | 9% |
| Not at all confident | 3% | 2% | 2% | 1% | 3% | 0% | 0% | 4% | 1% | 3% |
| Not sure | 10% | 6% | 7% | 6% | 8% | 9% | 12% | 4% | 6% | 3% |

*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=794)*

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

| Confidence | 2024 Total (n=794) | Gender | | Age | | |
|---|---|---|---|---|---|---|
| | | Male (n=537) | Female (n=257) | 18-34 (n=218) | 35-54 (n=343) | 55+ (n=233) |
| **NET: Confident** | **85%** | **84%** | **85%** | **89%** | **86%** | **79%** |
| Very confident | 30% | 31% | 26% | 27% | 29% | 33% |
| Somewhat confident | 55% | 53% | 59% | 62% | 57% | 45% |
| **NET: Not confident** | **9%** | **10%** | **7%** | **8%** | **9%** | **10%** |
| Not very confident | 7% | 8% | 5% | 6% | 8% | 7% |
| Not at all confident | 2% | 2% | 2% | 2% | 1% | 3% |
| Not sure | 6% | 6% | 8% | 4% | 5% | 11% |

*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=794)*

**Public Charging Stations – Confidence in Billing Accuracy – by Awareness of Measurement Canada & Familiarity with MC Sticker**

| Confidence | 2024 Total (n=794) | Aware of MC | | Recognition of MC sticker | |
|---|---|---|---|---|---|
| | | Yes (n=591) | No (n=202) | Recognize sticker (n=534) | Never seen (n=178) |
| **NET: Confident** | **85%** | **86%** | **81%** | **87%** | **77%** |
| Very confident | 30% | 32% | 25% | 30% | 30% |
| Somewhat confident | 55% | 54% | 55% | 57% | 47% |
| **NET: Not confident** | **9%** | **9%** | **9%** | **8%** | **13%** |
| Not very confident | 7% | 7% | 6% | 6% | 10% |
| Not at all confident | 2% | 2% | 2% | 2% | 3% |
| Not sure | 6% | 5% | 10% | 5% | 10% |

*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=794)*

This year, BEV and PHEV owners were asked more specifically about their confidence levels in different billing methods. Confidence is high, at eighty percent or more for each of the billing methods presented. BEV and PHEV owners are most confident in flat rate charge ($/month) (90%), closely followed by charge based on time connected to the EV charger ($/min). These methods might be easier to confirm based on the monthly rate or number of minutes connected to the charger.

**Public Charging Stations – Confidence in Billing Methods – New Question**

| Billing Method | NET Confident | Very confident | Somewhat confident | NET Not confident | Not very confident | Not at all confident | Not sure |
|---|---|---|---|---|---|---|---|
| Flat rate charge ($/month) | **90%** | 37% | 53% | **8%** | 8% | 1% | 1% |
| Charge based on time connected to the EV charger ($/min) | **89%** | 34% | 55% | **9%** | 6% | 3% | 1% |
| Fixed charge per use ($/charge) | **86%** | 31% | 55% | **12%** | 10% | 2% | 2% |
| Charge based on energy delivered to the EV ($/kWh) | **83%** | 32% | 52% | **15%** | 13% | 2% | 2% |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Combination of time-based charge ($/min) and charge based on energy delivered ($/kWh) | **81%** | 31% | 51% | **14%** | 11% | 3% | 4% |

*Q25A How Confident are you in the billing accuracy of the following billing methods?*
*BEV and PHEV Owners who use public charging stations and have experience with billing method(s)*

Overall confidence in various aspects of the charging experience is also high, with over three-quarters feeling confident about each aspect they were asked about. Confidence levels in each aspect have slightly increased since 2022. BEV owners are more likely to be confident that the amount paid to charge their vehicle matched the amount of charge they received (84%) and that the charging services are accurate (82%) compared to PHEV owners.

**Public Charging Stations – Confidence in Aspects of Charging Experience**

| Aspects | NET Confident | | Very confident | Somewhat confident | Not very confident | Not at all confident | Not applicable | Not sure |
|---|---|---|---|---|---|---|---|---|
| | 2022 (n=767) | 2024 (n=794) | | | | | | |
| The amount I paid to charge my vehicle matched the amount of charge I received | **74%** | **80%** | 32% | 48% | 9% | 3% | 5% | 4% |
| The chargers I use deliver the correct amount of charge | **73%** | **78%** | 29% | 49% | 11% | 3% | 4% | 3% |
| I understand the details on the receipt | **72%** | **78%** | 33% | 45% | 11% | 3% | 6% | 2% |
| The charging services I use are accurate | **72%** | **78%** | 28% | 50% | 12% | 3% | 4% | 3% |
| I am getting what I paid for | **71%** | **78%** | 29% | 49% | 11% | 3% | 5% | 3% |
| The receipt accurately reflected the amount of charge (kWh) I received | **72%** | **77%** | 30% | 48% | 10% | 3% | 6% | 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=794)*

**Public Charging Stations – NET Confident in Charging Experience – by Gender and Age**

| Charging experience | 2024 Total (n=794) | PHEV Total (n=460) | BEV Total (n=334) | Gender | | Age | | |
|---|---|---|---|---|---|---|---|---|
| | | | | Male (n=537) | Female (n=257) | 18-34 (n=218) | 35-54 (n=343) | 55+ (n=233) |
| The amount I paid to charge my vehicle matched the amount of charge I received | 80% | 77% | 84% | 80% | 78% | 83% | 82% | 73% |
| The chargers I use deliver the correct amount of charge | 78% | 77% | 80% | 79% | 77% | 77% | 83% | 73% |
| I understand the details on the receipt | 78% | 77% | 79% | 80% | 74% | 79% | 81% | 73% |
| The charging services I use are accurate | 78% | 75% | 82% | 79% | 77% | 78% | 81% | 74% |
| I am getting what I paid for | 78% | 77% | 78% | 77% | 79% | 78% | 80% | 73% |
| The receipt accurately reflected the amount of charge (kWh) I received | 77% | 75% | 80% | 77% | 77% | 78% | 80% | 73% |
| None of the above | 8% | 8% | 8% | 7% | 9% | 5% | 5% | 15% |

*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=794)*

**EV owners and intenders generally agree they will be billed fairly when using a public charger but roughly one-third express concern about the fairness of the fees and difficulty knowing how much charge their car will receive.**

General agreement with each statement about aspects of public charging have increased since 2022. Eight in ten believe they will be billed fairly, and three-quarters are satisfied with the billing methods at these stations. However, there has also been a small increase in the proportion that are concerned about the fairness of charging fees (64%) and in the proportion saying it is difficult to know how much charge their car gets at public stations (55%).

BEV/PHEV intenders are more likely than owners to be concerned about the fairness of fees (80% agreement vs. 60% owners). Owners are more likely to believe they will be billed fairly (81% agreement vs. 70% intenders) and to feel satisfied with the billing methods employed by stations (80% agreement vs. 50% intenders). This pattern is consistent with 2022 data and 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 | NET Disagree | Strongly agree | Somewhat agree | Somewhat disagree | Strongly disagree | Not sure |
|---|---|---|---|---|---|---|---|
| I believe I will be billed fairly when I use a public electric charger | **79%** | **12%** | 25% | 55% | 9% | 2% | 9% |
| I am satisfied with the billing methods employed by public vehicle charging systems | **74%** | **11%** | 24% | 50% | 8% | 3% | 15% |
| I am concerned about the fairness of the fees for electric vehicle charging | **64%** | **28%** | 26% | 38% | 21% | 7% | 7% |
| It is difficult to know how much charge my car actually gets when using a public electric charger | **55%** | **32%** | 16% | 39% | 24% | 8% | 13% |

*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=1,187)*

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

| Statements about experience | 2022 Total (n=1,692) | 2024 Total (n=1,187) | Owners (n=961) | Intenders (n=226) |
|---|---|---|---|---|
| I believe I will be billed fairly when I use a public electric charger | **72%** | **79%** | 81% | 70% |
| I am satisfied with the billing methods employed by public vehicle charging systems | **61%** | **74%** | 80% | 50% |
| I am concerned about the fairness of the fees for electric vehicle charging | **56%** | **64%** | 60% | 80% |
| It is difficult to know how much charge my car actually gets when using a public electric charger | **50%** | **55%** | 55% | 53% |

*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=1,187)*

## 3.3. Attitudes and Perceptions – BEV and PHEV Owners and Intenders

### 3.3.1. Public charging stations – Important Information on Receipt

**Similar to previous results, all information is at least somewhat important, but a majority of BEV/PHEV owners and intenders find the total cost, rate, charge time and fixed charges to be "very important" on a receipt.**

When considering what is very important on a receipt, PHEV and BEV owners consider total cost (78% very important), rate (67%), total charging time (63%), any fixed costs (54%) and energy delivered (53%) to be the top five most important information to include. Less than half consider the name and location of the charger (43%), official language of choice (42%), maximum rate of energy transfer (41%), plug types (39%), type of current (38%) and transaction number (36%) to be very important. This pattern is similar to previous results.

EV intenders are more likely than EV owners to consider most of the information very important. 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 | 2022 NET Important | 2024 NET Important | Very important | Somewhat important | Not very important | Not at all important |
|---|---|---|---|---|---|---|
| Total cost ($) | **97%** | **96%** | 78% | 18% | 3% | 2% |
| Rate ($/kWh) | **95%** | **93%** | 67% | 26% | 4% | 2% |
| Total charging time | **94%** | **92%** | 63% | 30% | 6% | 2% |
| Any fixed charges (e.g. session fee, monthly fee) | **93%** | **91%** | 54% | 37% | 6% | 3% |
| Energy (kWh) delivered | **92%** | **90%** | 53% | 37% | 7% | 3% |
| Sales tax(es) charged | **90%** | **88%** | 50% | 37% | 9% | 4% |
| Other charges | **89%** | **87%** | 51% | 36% | 9% | 4% |
| Time charging ended | **89%** | **87%** | 51% | 36% | 10% | 3% |
| Time charging started | **87%** | **87%** | 51% | 35% | 10% | 4% |
| Date of charge | **86%** | **85%** | 49% | 36% | 12% | 4% |
| Name and location of EV charger | **85%** | **83%** | 43% | 40% | 14% | 3% |
| Maximum rate of energy transfer (i.e. maximum power) | **83%** | **84%** | 41% | 44% | 12% | 3% |
| Type of current (e.g. 7 kW AC, 25 kW DC) | **80%** | **81%** | 38% | 42% | 15% | 5% |
| Plug types (e.g. J-1772, CHAdeMO, CCS/SAE) | **73%** | **76%** | 39% | 37% | 17% | 7% |
| Transaction number | **73%** | **75%** | 36% | 39% | 18% | 7% |
| Official language of choice | **72%** | **77%** | 42% | 34% | 15% | 8% |

*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=1,187)*

**Information on Receipt – Very important – by Owners and Intenders**

| Information on receipt | 2024 Total (n=1,187) | Owner (n=961) | | Intender (n=226) | |
|---|---|---|---|---|---|
| | | PHEV (n=557) | BEV (n=404) | PHEV (n=172) | BEV (n=54) |
| Total cost ($) | **78%** | 75% | 76% | 88% | 85% |
| Rate ($/kWh) | **67%** | 64% | 67% | 77% | 70% |
| Total charging time | **63%** | 58% | 65% | 72% | 69% |
| Any fixed charges (e.g. session fee, monthly fee) | **54%** | 46% | 55% | 73% | 65% |
| Energy (kWh) delivered | **53%** | 49% | 56% | 58% | 57% |
| Sales tax(es) charged | **50%** | 46% | 50% | 65% | 52% |
| Other charges | **51%** | 45% | 54% | 62% | 61% |
| Time charging ended | **51%** | 46% | 54% | 58% | 61% |
| Time charging started | **51%** | 49% | 52% | 56% | 57% |
| Date of charge | **49%** | 43% | 49% | 60% | 61% |
| Name and location of EV charger | **43%** | 36% | 47% | 53% | 50% |
| Maximum rate of energy transfer (i.e. maximum power) | **41%** | 40% | 38% | 49% | 39% |
| Type of current (e.g. 7 kW AC, 25 kW DC) | **38%** | 38% | 36% | 41% | 48% |
| Plug types (e.g. J-1772, CHAdeMO, CCS/SAE) | **39%** | 38% | 35% | 48% | 44% |
| Transaction number | **36%** | 37% | 33% | 37% | 39% |
| Official language of choice | **42%** | 40% | 45% | 45% | 43% |

*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=1,187)*

### 3.3.2. Public Charging Station – Preferences for Displays of Billing Information

**A majority of BEV and PHEV owners and intenders feel that knowing the cost of charge before charging is very important. They are comfortable seeing billing information presented using a variety of different methods, but are most confident in email receipts, cell phone apps, and physical paper receipts.**

Most (92%) BEV and PHEV owners and intenders feel it is at least somewhat important to be aware of the cost of charge prior to charging their vehicle. Intenders are more likely to say it is very important (71%) compared to owners (56%). Those aged 18-34 are more likely to say it is at least somewhat important to know cost before charging (95% compared to 89% for aged 55+), as are those living in single-family homes without parking (96%).

About two-thirds feel comfortable using chargers that provide relevant billing information remotely. Comfort with remote displays of information is higher among owners (70%) than intenders (39%). Owners feel very confident seeing information in an emailed receipt (47%), a cell phone app (45%), paper receipts (45%) as well as on the charger itself (42%). Intenders express greater confidence in paper receipts (58%) than owners (44%). Those aged 18-34 are more comfortable with billing information displayed remotely (78% compared to 50% of those aged 55+).

**Importance of Knowing Costs Before Charging (New Question)**

| Level of Importance | 2024 Total (n=1,187) | Owner (n=961) | Intender (n=226) |
|---|---|---|---|
| **NET Important** | **92%** | **90%** | **98%** |
| Very Important | 59% | 56% | 71% |
| Somewhat Important | 33% | 34% | 27% |
| **NET Not Important** | **8%** | **10%** | **2%** |
| Not very important | 7% | 8% | 1% |
| Not at all important | 1% | 2% | 1% |

*Q28A. How important is it for you to be aware of the cost of charge before charging your vehicle?*

*SUBSAMPLE; BEV/PHEV Owners & intenders (n=1,187)*

**Importance of Knowing Costs Before Charging (New Question) – By Gender & Age**

| Level of Importance | Total (n=1,187) | Gender | | Age | | |
|---|---|---|---|---|---|---|
| | | Female (n=390) | Male (n=797) | 18-34 (n=254) | 35-54 (n=443) | 55+ (n=490) |
| **NET Important** | **92%** | **92%** | **92%** | **95%** | **93%** | **89%** |
| Very Important | 59% | 64% | 56% | 58% | 60% | 58% |
| Somewhat Important | 33% | 28% | 35% | 37% | 33% | 31% |
| **NET Not Important** | **8%** | **8%** | **8%** | **5%** | **7%** | **11%** |
| Not very important | 7% | 7% | 7% | 4% | 6% | 9% |
| Not at all important | 1% | 1% | 2% | 1% | 1% | 2% |

*Q28A. How important is it for you to be aware of the cost of charge before charging your vehicle?*

*SUBSAMPLE; BEV/PHEV Owners & intenders (n=1,187)*

**Importance of Knowing Costs Before Charging (New Question) – By Education & Income**

| Level of Importance | Total (n=1,187) | Education | | | Income | | | |
|---|---|---|---|---|---|---|---|---|
| | | HS or less (n=153) | College/ Appr/ Some univ. (n=415) | Univ. degree + (n=613) | Under $40K (n=90) | $40K - $80K (n=330) | $80K - $100K (n=185) | $100K+ (n=494) |
| **NET Important** | **92%** | **93%** | **90%** | **93%** | **96%** | **91%** | **94%** | **92%** |
| Very Important | 59% | 60% | 54% | 62% | 50% | 62% | 56% | 57% |
| Somewhat Important | 33% | 33% | 36% | 31% | 46% | 29% | 37% | 35% |
| **NET Not Important** | **8%** | **7%** | **10%** | **7%** | **4%** | **9%** | **6%** | **8%** |
| Not very important | 7% | 7% | 8% | 6% | 3% | 7% | 4% | 7% |
| Not at all important | 1% | 1% | 2% | 1% | 1% | 2% | 2% | 1% |

*Q28A. How important is it for you to be aware of the cost of charge before charging your vehicle?*

*SUBSAMPLE; BEV/PHEV Owners & intenders (n=1,187)*

**Importance of Knowing Costs Before Charging (New Question) – By Community Size & Home Type**

| Level of Importance | Total (n=1,187) | Community Size | | | | Home Type | | |
|---|---|---|---|---|---|---|---|---|
| | | Small (n=302) | Medium (n=164) | Large (n=164) | Very large (n=376) | Single fam. w/ parking (n=824) | Single fam. w/out parking (n=57) | Multi-family (n=297) |
| **NET Important** | **92%** | **92%** | **91%** | **91%** | **94%** | **92%** | **96%** | **90%** |
| Very Important | 59% | 56% | 54% | 60% | 63% | 61% | 58% | 54% |
| Somewhat Important | 33% | 36% | 37% | 31% | 31% | 31% | 39% | 36% |
| **NET Not Important** | **8%** | **8%** | **9%** | **9%** | **6%** | **8%** | **4%** | **10%** |
| Not very important | 7% | 7% | 8% | 6% | 5% | 7% | 2% | 8% |
| Not at all important | 1% | 1% | 1% | 3% | 1% | 1% | 2% | 2% |

*Q28A. How important is it for you to be aware of the cost of charge before charging your vehicle?*

*SUBSAMPLE; BEV/PHEV Owners & intenders (n=1,187)*

**Importance of Knowing Costs Before Charging (New Question) – By Identity**

| Level of Importance | Total (n=1,187) | Identity | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Indigenous (n=51) | Black (n=62) | Racialized (n=102) | 2SLGBTQIA+ (n=74) | Disability (n=63) | Under 40 (n=130) | Recent Immigrant (n=63) |
| **NET Important** | **92%** | **96%** | **98%** | **98%** | **92%** | **92%** | **92%** | **94%** |
| Very Important | 59% | 57% | 61% | 69% | 58% | 60% | 56% | 65% |
| Somewhat Important | 33% | 39% | 37% | 29% | 34% | 32% | 36% | 29% |
| **NET Not Important** | **8%** | **4%** | **2%** | **2%** | **8%** | **8%** | **8%** | **6%** |
| Not very important | 7% | 4% | 2% | 1% | 8% | 5% | 7% | 6% |
| Not at all important | 1% | 0% | 0% | 1% | 0% | 3% | 1% | 0% |

*Q28A. How important is it for you to be aware of the cost of charge before charging your vehicle?*

*SUBSAMPLE; BEV/PHEV Owners & intenders (n=1,187)*

**Comfort with(out) Visual Displays of Billing Information (New Question)**

| Preference | Total (n=1,187) | Owner (n=961) | Intender (n=226) |
|---|---|---|---|
| Yes, I am comfortable using chargers that provide relevant billing information remotely rather than using a visual display on the charger itself; | **64%** | 70% | 39% |
| No, chargers must include a visual display that displays all relevant billing information | **36%** | 30% | 61% |

*Q28B. Thinking of a EV charger that does not have a visual display showing billing information such as amount of electricity delivered to your vehicle, price per unit of electricity, and total cost but provides this information through a cell phone app, in-car display, via an email message, or at a remote display located at the charging area, are you comfortable using this kind of charger?*

*SUBSAMPLE; BEV/PHEV Owners & intenders (n=1,187)*

**Comfort with(out) Visual Displays of Billing Information (New Question) – By Gender & Age**

| Preference | Total (n=1,187) | Gender | | Age | | |
|---|---|---|---|---|---|---|
| | | Female (n=390) | Male (n=797) | 18-34 (n=254) | 35-54 (n=443) | 55+ (n=490) |
| Yes, I am comfortable using chargers that provide relevant billing information remotely rather than using a visual display on the charger itself; | **64%** | 61% | 65% | 78% | 72% | 50% |
| No, chargers must include a visual display that displays all relevant billing information | **36%** | 39% | 35% | 22% | 28% | 50% |

*Q28B. Thinking of a EV charger that does not have a visual display showing billing information such as amount of electricity delivered to your vehicle, price per unit of electricity, and total cost but provides this information through a cell phone app, in-car display, via an email message, or at a remote display located at the charging area, are you comfortable using this kind of charger?*

*SUBSAMPLE; BEV/PHEV Owners & intenders (n=1,187)*

**Comfort with(out) Visual Displays of Billing Information (New Question) – By Education & Income**

| Preference | Total (n=1,187) | Education | | | Income | | | |
|---|---|---|---|---|---|---|---|---|
| | | HS or less (n=153) | College/ Appr/ Some univ. (n=415) | Univ. degree + (n=613) | Under $40K (n=90) | $40K - $80K (n=330) | $80K - $100K (n=185) | $100K+ (n=494) |
| Yes, I am comfortable using chargers that provide relevant billing information remotely rather than using a visual display on the charger itself; | **64%** | 64% | 66% | 63% | 63% | 63% | 73% | 65% |
| No, chargers must include a visual display that displays all relevant billing information | **36%** | 36% | 34% | 37% | 37% | 37% | 27% | 35% |

*Q28B. Thinking of a EV charger that does not have a visual display showing billing information such as amount of electricity delivered to your vehicle, price per unit of electricity, and total cost but provides this information through a cell phone app, in-car display, via an email message, or at a remote display located at the charging area, are you comfortable using this kind of charger?*

*SUBSAMPLE; BEV/PHEV Owners & intenders (n=1,187)*

**Comfort with(out) Visual Displays of Billing Information (New Question) – By Community Size & Home Type**

| Preference | Total (n=1,187) | Community Size | | | | Home Type | | |
|---|---|---|---|---|---|---|---|---|
| | | Small (n=302) | Medium (n=164) | Large (n=164) | Very large (n=376) | Single fam. w/ parking (n=824) | Single fam. w/out parking (n=57) | Multi-family (n=297) |
| Yes, I am comfortable using chargers that provide relevant billing information remotely rather than using a visual display on the charger itself; | **64%** | 64% | 72% | 68% | 60% | 62% | 79% | 67% |
| No, chargers must include a visual display that displays all relevant billing information | **36%** | 36% | 28% | 32% | 40% | 38% | 21% | 33% |

*Q28B. Thinking of a EV charger that does not have a visual display showing billing information such as amount of electricity delivered to your vehicle, price per unit of electricity, and total cost but provides this information through a cell phone app, in-car display, via an email message, or at a remote display located at the charging area, are you comfortable using this kind of charger?*

*SUBSAMPLE; BEV/PHEV Owners & intenders (n=1,187)*

**Comfort with(out) Visual Displays of Billing Information (New Question) – By Identity**

| Preference | Total (n=1,187) | Identity | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Indigenous (n=51) | Black (n=62) | Racialized (n=102) | 2SLGBTQIA+ (n=74) | Disability (n=63) | Under 40 (n=130) | Recent Immigrant (n=63) |
| Yes, I am comfortable using chargers that provide relevant billing information remotely rather than using a visual display on the charger itself; | **64%** | 86% | 81% | 59% | 80% | 60% | 80% | 75% |
| No, chargers must include a visual display that displays all relevant billing information | **36%** | 14% | 19% | 41% | 20% | 40% | 20% | 25% |

*Q28B. Thinking of a EV charger that does not have a visual display showing billing information such as amount of electricity delivered to your vehicle, price per unit of electricity, and total cost but provides this information through a cell phone app, in-car display, via an email message, or at a remote display located at the charging area, are you comfortable using this kind of charger?*

*SUBSAMPLE; BEV/PHEV Owners & intenders (n=1,187)*

**NET Confidence in Methods of Presenting Billing Information (New Question)**

| Methods | NET Confident | Very confident | Somewhat confident | Not very confident | Not at all confident | Not sure |
|---|---|---|---|---|---|---|
| Cell phone app | **90%** | 45% | 45% | 7% | 1% | 2% |
| On-charger display | **90%** | 42% | 48% | 6% | 1% | 2% |
| Emailed receipt | **90%** | 47% | 43% | 7% | 2% | 1% |
| In-car display | **86%** | 41% | 46% | 9% | 1% | 3% |
| Physical/paper receipt | **85%** | 45% | 40% | 8% | 3% | 4% |
| Digital billing (e.g., monthly bill based on your usage) | **84%** | 37% | 46% | 11% | 2% | 3% |
| Remote display located at charging area | **83%** | 31% | 52% | 10% | 3% | 4% |

*28C. What is your level of confidence in the following ways of presenting billing information such as amount of electricity delivered to your vehicle, price per unit of electricity, and total cost?*

*SUBSAMPLE; BEV/PHEV Owners & intenders comfortable with no display (n=761)*

**NET Confidence in Methods of Presenting Billing Information (New Question) – By Gender & Age**

| Methods | NET Confident (n=761) | Gender | | Age | | |
|---|---|---|---|---|---|---|
| | | Female (n=239) | Male (n=522) | 18-34 (n=198) | 35-54 (n=318) | 55+ (n=245) |
| Cell phone app | **90%** | 90% | 90% | 86% | 91% | 92% |
| On-charger display | **90%** | 90% | 90% | 88% | 92% | 89% |
| Emailed receipt | **90%** | 91% | 89% | 87% | 89% | 93% |
| In-car display | **86%** | 84% | 87% | 84% | 88% | 86% |
| Physical/paper receipt | **85%** | 89% | 84% | 84% | 85% | 87% |
| Digital billing (e.g., monthly bill based on your usage) | **84%** | 85% | 83% | 85% | 83% | 83% |
| Remote display located at charging area | **83%** | 82% | 84% | 82% | 87% | 80% |

*28C. What is your level of confidence in the following ways of presenting billing information such as amount of electricity delivered to your vehicle, price per unit of electricity, and total cost?*

*SUBSAMPLE; BEV/PHEV Owners & intenders comfortable with no display (n=761)*

**NET Confidence in Methods of Presenting Billing Information (New Question) – By Education & Income**

| Methods | Total (n=761) | Education | | | Income | | | |
|---|---|---|---|---|---|---|---|---|
| | | HS or less (n=98) | College/ Appr/ Some univ. (n=275) | Univ. degree + (n=385) | Under $40K (n=57) | $40K - $80K (n=209) | $80K - $100K (n=135) | $100K+ (n=321) |
| Cell phone app | **90%** | 90% | 89% | 91% | 81% | 88% | 88% | 94% |
| On-charger display | **90%** | 89% | 90% | 91% | 84% | 91% | 89% | 92% |
| Emailed receipt | **90%** | 86% | 89% | 91% | 81% | 89% | 90% | 91% |
| In-car display | **86%** | 89% | 85% | 87% | 81% | 87% | 87% | 86% |
| Physical/paper receipt | **85%** | 86% | 82% | 88% | 82% | 84% | 87% | 86% |
| Digital billing (e.g., monthly bill based on your usage) | **84%** | 84% | 85% | 82% | 74% | 87% | 84% | 84% |
| Remote display located at charging area | **83%** | 86% | 84% | 82% | 84% | 85% | 80% | 84% |

*28C. What is your level of confidence in the following ways of presenting billing information such as amount of electricity delivered to your vehicle, price per unit of electricity, and total cost?*

*SUBSAMPLE; BEV/PHEV Owners & intenders comfortable with no display (n=761)*

**NET Confidence in Methods of Presenting Billing Information (New Question) – By Community Size & Home Type**

| Methods | Total (n=761) | Community Size | | | | Home Type | | |
|---|---|---|---|---|---|---|---|---|
| | | Small (n=192) | Medium (n=194) | Large (n=111) | Very large (n=225) | Single fam. w/ parking (n=512) | Single fam. w/out parking (n=45) | Multi-family (n=200) |
| Cell phone app | **90%** | 90% | 91% | 89% | 91% | 92% | 80% | 89% |
| On-charger display | **90%** | 92% | 89% | 87% | 92% | 93% | 76% | 87% |
| Emailed receipt | **90%** | 91% | 86% | 88% | 93% | 92% | 78% | 87% |
| In-car display | **86%** | 85% | 80% | 89% | 92% | 88% | 78% | 83% |
| Physical/paper receipt | **85%** | 86% | 80% | 87% | 89% | 87% | 73% | 83% |
| Digital billing (e.g., monthly bill based on your usage) | **84%** | 80% | 83% | 85% | 87% | 86% | 73% | 80% |
| Remote display located at charging area | **83%** | 84% | 82% | 82% | 85% | 84% | 87% | 80% |

*28C. What is your level of confidence in the following ways of presenting billing information such as amount of electricity delivered to your vehicle, price per unit of electricity, and total cost?*

*SUBSAMPLE; BEV/PHEV Owners & intenders comfortable with no display (n=761)*

**NET Confidence in Methods of Presenting Billing Information (New Question) – By Identity**

| Methods | Total (n=761) | Identity | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Indigenous (n=44) | Black (n=50) | Racialized (n=60) | 2SLGBTQIA+ (n=59) | Disability (n=38) | Under 40 (n=104) | Recent Immigrant (n=47) |
| Cell phone app | **90%** | 91% | 90% | 95% | 85% | 89% | 85% | 79% |
| On-charger display | **90%** | 86% | 92% | 95% | 88% | 89% | 88% | 74% |
| Emailed receipt | **90%** | 77% | 78% | 93% | 78% | 89% | 88% | 77% |
| In-car display | **86%** | 89% | 88% | 85% | 76% | 82% | 89% | 77% |
| Physical/paper receipt | **85%** | 84% | 88% | 92% | 80% | 79% | 85% | 83% |
| Digital billing (e.g., monthly bill based on your usage) | **84%** | 77% | 76% | 90% | 81% | 82% | 85% | 79% |
| Remote display located at charging area | **83%** | 80% | 86% | 93% | 83% | 76% | 87% | 85% |

*28C. What is your level of confidence in the following ways of presenting billing information such as amount of electricity delivered to your vehicle, price per unit of electricity, and total cost?*

*SUBSAMPLE; BEV/PHEV Owners & intenders comfortable with no display (n=761)*

### 3.3.3. Enhancing Confidence in Public Charging Stations

**Each of the options is seen to positively influence confidence in public charging stations. BEV/PHEV intenders are more likely than owners to say accreditation-related options would increase 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 eighty-five and ninety-three percent expressed that the proposed options would have a moderate to strong positive influence. Consistent with previous results, immediate billing details is higher on the spectrum (93%), while knowledge that there is an independent dispute resolution mechanism in place is at the lower end (85%) of the spectrum. Between owners and intenders, the latter are more likely to consider the options involving accreditation as having a strong or moderate positive influence on their confidence levels.

**Accuracy of Public Charging Stations – Effect on Level of Confidence**

| Proposed statements | 2022 NET Strong/Mod influence | 2024 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%** | **93%** | 62% | 31% | 5% | 3% |
| Accuracy and performance of public EV chargers is reverified periodically by accredited officials | **91%** | **92%** | 56% | 36% | 5% | 3% |
| Public EV chargers that bill according to the amount of energy (kWh) delivered are designed and built to perform in accordance with Canadian standards | **90%** | **92%** | 56% | 37% | 5% | 3% |
| Information about public charging stations and the charging process is easily available to consumers | **92%** | **92%** | 54% | 38% | 5% | 3% |
| Public chargers are approved and inspected by accredited officials | **92%** | **91%** | 60% | 31% | 5% | 3% |
| Charging information is shared and displayed during the transaction | **89%** | **91%** | 53% | 38% | 6% | 3% |
| Knowing there is an independent dispute resolution mechanism in place | **86%** | **85%** | 44% | 41% | 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=1,187)*

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

| Statements about experience | 2024 Total (n=1,187) | Owner (n=961) | Intender (n=226) |
|---|---|---|---|
| Billing details are provided immediately following the transaction | **62%** | 58% | 77% |
| Public chargers are approved and inspected by accredited officials | **60%** | 57% | 74% |
| Accuracy and performance of public EV chargers is reverified periodically by accredited officials | **56%** | 53% | 69% |
| Public EV chargers that bill according to the amount of energy (kWh) delivered are designed and built to perform in accordance with Canadian standards | **56%** | 52% | 71% |
| Information about public charging stations and the charging process is easily available to consumers | **54%** | 52% | 64% |
| Charging information is shared and displayed during the transaction | **53%** | 51% | 62% |
| Knowing there is an independent dispute resolution mechanism in place | **44%** | 42% | 54% |

*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=1,187)*

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

| Proposed statements | 2024 Total (n= 1,187) | Educational attainment | | | Income | | | |
|---|---|---|---|---|---|---|---|---|
| | | High school or less (n=153) | College/ Appr./ Some univ. (n=415) | University degree or higher (n=613) | Under $40K (n=90) | $40K - <$80K (n=330) | $80K - $100K (n=185) | $100K+ (n=494) |
| Billing details are provided immediately following the transaction | **62%** | 62% | 57% | 65% | 53% | 58% | 58% | 65% |
| Public chargers are approved and inspected by accredited officials | **60%** | 59% | 59% | 61% | 59% | 56% | 58% | 62% |
| Accuracy and performance of public EV chargers is reverified periodically by accredited officials | **56%** | 51% | 50% | 61% | 48% | 54% | 54% | 58% |
| Public EV chargers that bill according to the amount of energy (kWh) delivered are designed and built to perform in accordance with Canadian standards | **56%** | 54% | 54% | 58% | 46% | 52% | 48% | 62% |
| Information about public charging stations and the charging process is easily available to consumers | **54%** | 56% | 52% | 54% | 57% | 52% | 51% | 57% |
| Charging information is shared and displayed during the transaction | **53%** | 45% | 50% | 56% | 51% | 50% | 49% | 55% |
| Knowing there is an independent dispute resolution mechanism in place | **44%** | 42% | 40% | 47% | 43% | 43% | 41% | 45% |

*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=1,187)*

# 3.4. Fueling Behaviour – Hydrogen/Fuel Cell EV Owners

## 3.4.1. Purchasing Hydrogen Fuel

**The majority of FCEV owners purchase hydrogen fuel at least every two weeks.**

Two-thirds (67%) of FCEV owners report purchasing hydrogen fuel at least every two weeks. The proportion of FCEV owners purchasing hydrogen fuel more frequently (3 times per week or more) has almost doubled since 2022. Though thirteen percent of FCEV owners say they never purchase hydrogen fuel, the sample size for this subgroup (n=9) precludes quantitative analysis.

Similar to 2022 results, FCEV owners are most likely to have experienced billing by fixed charge per use ($/charge). FCEV owners are still least likely to have experienced a combination of time-based charge ($/min) and hydrogen delivered (15%).

**Purchasing Hydrogen Fuel – Frequency**

| Frequency | 2022 Total (n=53) | 2024 Total (n=69) |
|---|---|---|
| ***NET: At least every two weeks*** | **58%** | **67%** |
| 3 or more times per week | 11% | 23% |
| Once per week | 26% | 28% |
| Once every 1 to 2 weeks | 21% | 16% |
| Once a month | 15% | 10% |
| Occasionally throughout the year | 13% | 10% |
| Never | 13% | 13% |

*Q32 How often do you purchase hydrogen fuel for your hydrogen FCEV?*

*SUBSAMPLE; Hydrogen/Fuel Cell Owners (n=69)*

**Retail Hydrogen Fuel Dispensing Stations – Billing methods**

| Billing method | 2022 Total (n=46) | 2024 Total (n=60) |
|---|---|---|
| Fixed charge per use ($/charge) | 37% | 47% |
| Charge based on mass of hydrogen delivered (kg) | 28% | 37% |
| Charge based on time connected to the dispenser ($/min) | 26% | N/A |
| Flat rate charge ($/month) | 11% | 20% |
| Charge based on the time that hydrogen was dispensed ($/min) | N/A | 17% |
| Combination of time-based charge ($/min) and hydrogen delivered | 11% | 15% |
| None, not applicable | 11% | 3% |

*Q34 At retail hydrogen fuel dispensing stations, which billing method(s) have you had experience with?*
*SUBSAMPLE; Hydrogen/Fuel Cell Owners who have purchased hydrogen fuel (n=60)*

### 3.4.2. Hydrogen fuel dispensing stations – Experience with disagreement

**Although most hydrogen/fuel cell EV owners have never had a billing issue, the number of those who have experienced issues has quadrupled since 2022.**

Nearly one-third of FCEV owners have experienced a disagreement or dispute related to the billing method(s) being used at a public hydrogen fuel station. Although the proportion of FCEV owners experiencing billing issues has increased, the total number (n=18) is too small for proper analysis of the causes and resolutions of their disputes.

**Public Hydrogen Fuel Dispensing Stations – Experience with Disagreement**

| Experience | 2022 Total (n=48) | 2024 Total (n=67) |
|---|---|---|
| Yes | 6% | 27% |
| No | 94% | 73% |

*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=67)*

### 3.4.3. Hydrogen Fuel Dispensing Stations – Confidence in Billing and Experience

**Confidence in billing accuracy of hydrogen filling stations is high and growing favourably, but is still largely driven by owners who feel somewhat confident rather than very confident.**

A majority of eight in ten FCEV owners are generally confident (86%) in the billing accuracy of public hydrogen dispensing stations, a slight increase since 2022. Of those who are confident, one-quarter say they are very confident, an increase from only seventeen percent in 2022.

FCEV owners who use public dispensing stations were also asked to indicate their confidence in specific billing methods. Confidence is high in all methods with a majority of nine in ten of higher saying they are at least somewhat confident in a specific billing method. Confidence is highest in a flat rate charge.

Overall confidence in various aspects of the hydrogen fuelling experience is high, with at least three-quarters feeling confident about each aspect they were asked about. Confidence levels in each aspect have slightly increased since 2022.

**Public Hydrogen Dispensing Stations – Confidence in Billing Accuracy**

| Confidence | 2022 Total (n=53) | 2024 Total (n=69) |
|---|---|---|
| **NET: Confident** | **81%** | **86%** |
| Very confident | 17% | 26% |
| Somewhat confident | 64% | 59% |
| **NET: Not confident** | **11%** | **3%** |
| Not very confident | 8% | 3% |
| Not at all confident | 0% | 12% |

*Q38 In general, how confident are you in the billing accuracy of public hydrogen dispensing stations? SUBSAMPLE; Hydrogen/Fuel Cell Owners (n=69)*

**Public Hydrogen Dispensing Stations – Confidence in Billing Methods**

| Billing Method | NET Confident | Very confident | Somewhat confident | Not very confident | Not at all confident | Not sure |
|---|---|---|---|---|---|---|
| Flat rate charge ($/month) | **100%** | 67% | 33% | 0% | 0% | 0% |
| Fixed charge per use ($/charge) | **96%** | 46% | 50% | 4% | 0% | 0% |
| Charge based on mass of hydrogen delivered (kg) | **91%** | 45% | 45% | 9% | 0% | 0% |
| Charge based on the time that hydrogen was dispensed ($/min) | **90%** | 20% | 70% | 10% | 0% | 0% |
| Combination of time-based charge ($/min) and hydrogen delivered | **89%** | 11% | 78% | 11% | 0% | 0% |

*Q38A How confident are you in the billing accuracy of the following billing methods?*
*SUBSAMPLE; Hydrogen/Fuel Cell Owners who uses public dispensing stations (n=58)*

**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 appli cable | Not sure |
|---|---|---|---|---|---|---|---|---|
| | 2022 (n=53) | 2024 (n=69) | | | | | | |
| I understand the details on the receipt | **66%** | **81%** | 36% | 45% | 9% | 1% | 6% | 3% |
| The stations I use dispense the correct amount of hydrogen | **64%** | **80%** | 33% | 46% | 9% | 1% | 7% | 3% |
| The receipt accurately reflected the weight of hydrogen I received | **64%** | **77%** | 36% | 41% | 7% | 1% | 7% | 7% |
| I am getting what I paid for | **62%** | **75%** | 32% | 43% | 13% | 3% | 6% | 3% |
| The hydrogen fueling stations I use are accurate | **68%** | **75%** | 30% | 45% | 10% | 3% | 7% | 4% |
| The amount I paid to matched the amount of hydrogen I received | **66%** | **74%** | 33% | 41% | 16% | 0% | 6% | 4% |

*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=69)*

# 3.5. Attitudes and Perceptions – Hydrogen/Fuel Cell EV Owners and Intenders

## 3.5.1. Public Hydrogen Fueling Stations – Important Information on Receipt

**All information is seen as at least somewhat important but total cost, hydrogen dispensed (kg) and any fixed charges are deemed most important by FCEV owners.**

FCEV owners were presented with a list of information that could be included on a billing receipt and asked to rate the importance of each being included on a receipt. Similar to previous results, the total cost in dollars was viewed as most important (89%). The amount of hydrogen dispensed (88%), fixed charges (88%), rate (86%) and sales tax (86%) were all seen as very important to include.

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 | 2022 NET Important | 2024 NET Important | Very important | Somewhat important | Not very important | Not at all important | Not sure |
|---|---|---|---|---|---|---|---|
| Total cost ($) | **88%** | **89%** | 68% | 21% | 5% | 1% | 5% |
| Hydrogen dispensed (kg) | **86%** | **88%** | 54% | 33% | 5% | 1% | 6% |
| Any fixed charges | **90%** | **88%** | 51% | 37% | 6% | 1% | 5% |
| Rate ($/kg) | **91%** | **86%** | 64% | 22% | 4% | 5% | 5% |
| Sales tax(es) charged | **88%** | **86%** | 51% | 36% | 5% | 4% | 5% |
| Name and location of hydrogen fuel station | **85%** | **80%** | 49% | 31% | 11% | 4% | 5% |
| Date | **76%** | **80%** | 53% | 27% | 10% | 4% | 6% |
| Other charges | **79%** | **79%** | 48% | 31% | 10% | 4% | 7% |
| Transaction number | **74%** | **78%** | 43% | 35% | 11% | 5% | 6% |
| Official language of choice | **65%** | **75%** | 43% | 32% | 17% | 4% | 4% |
| Pressure of dispenser (MegaPascal (MPa)) (e.g. 35 MPa, 70 MPa) | **73%** | **74%** | 31% | 43% | 15% | 1% | 10% |
| Time fueling ended | **67%** | **74%** | 41% | 33% | 17% | 4% | 5% |
| Time fueling started | **68%** | **73%** | 38% | 35% | 17% | 5% | 5% |
| Which hydrogen fuel dispenser was used at the retail hydrogen fueling station | **65%** | **72%** | 32% | 40% | 19% | 2% | 7% |

*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=81)*

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

| Information on receipt | 2022 Total (n=108) | 2024 Total (n=81) | FCEV Owners (n=69) | FCEV Intenders (n=12) |
|---|---|---|---|---|
| Total cost ($) | **77%** | **68%** | 65% | 83% |
| Rate ($/kg) | **65%** | **64%** | 59% | 92% |
| Hydrogen dispensed (kg) | **56%** | **54%** | 51% | 75% |
| Date | **44%** | **53%** | 51% | 67% |
| Any fixed charges | **55%** | **51%** | 46% | 75% |
| Sales tax(es) charged | **60%** | **51%** | 46% | 75% |
| Name and location of hydrogen fuel station | **47%** | **49%** | 48% | 58% |
| Other charges | **50%** | **48%** | 46% | 58% |
| Transaction number | **35%** | **43%** | 42% | 50% |
| Official language of choice | **36%** | **43%** | 42% | 50% |
| Time fueling ended | **36%** | **41%** | 41% | 42% |
| Time fueling started | **34%** | **38%** | 41% | 25% |
| Which hydrogen fuel dispenser was used at the retail hydrogen fueling station | **31%** | **32%** | 29% | 50% |
| Pressure of dispenser (MegaPascal (MPa)) (e.g. 35 MPa, 70 MPa) | **30%** | **31%** | 32% | 25% |

*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=81)*

### 3.5.2. Confidence in Public Hydrogen Fueling Stations

**While many FCEV owners and intenders are satisfied with billing methods at public hydrogen stations, over half consider it difficult to know how much hydrogen their car 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, having billing details provided to the consumer immediately following the transaction (57% strong positive influence) and knowing accuracy and performance of retail hydrogen fuel dispensers are reverified periodically by accredited officials (57%) would impact confidence levels most positively.

FCVE owners and intenders were also presented with statements about the charging and billing experience and asked to indicate their level of agreement with each one. While majorities (seven in ten or more) believe they will be billed fairly at public hydrogen stations and are satisfied with the billing methods at these stations, over half (53%) agree that it is difficult to know how much hydrogen their car actually gets when using public hydrogen stations indicating a desire for more transparency about the amount of hydrogen dispensed. While agreement that public hydrogen stations are fair and provide a satisfactory experience has increased, this data shows a similar pattern as 2022.

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

| Accuracy of public hydrogen stations | NET Strong/Mod Influence | | Strong positive influence | Moderate positive influence | Little or no influence | Not sure |
|---|---|---|---|---|---|---|
| | 2022 (n=108) | 2024 (n=81) | | | | |
| Hydrogen dispensers are designed and built to perform in accordance with Canadian standards | **83%** | **88%** | 42% | 46% | 4% | 9% |
| Public hydrogen dispensers are approved and inspected by accredited officials | **86%** | **88%** | 48% | 40% | 4% | 9% |
| Hydrogen dispensing information is shared and displayed during the transaction | **84%** | **88%** | 49% | 38% | 5% | 7% |
| Billing details are provided to the consumer immediately following the transaction | **84%** | **88%** | 57% | 31% | 4% | 9% |
| Accuracy and performance of retail hydrogen fuel dispensers are reverified periodically by accredited officials | **87%** | **85%** | 57% | 28% | 6% | 9% |
| Information about public hydrogen stations and the dispensing process is easily available to consumers | **81%** | **80%** | 46% | 35% | 11% | 9% |
| Knowing there is an independent dispute resolution mechanism in place | **79%** | **79%** | 38% | 41% | 11% | 10% |

*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=81)*

**Experiences at Public Hydrogen Fueling Stations – Agreement with Statements**

| Charging experience | NET Agree | | Strongly agree | Somewhat agree | Somewhat disagree | Strongly disagree | Not sure |
|---|---|---|---|---|---|---|---|
| | 2022 (n=108) | 2024 (n=81) | | | | | |
| I believe I will be billed fairly when I use a public hydrogen station | **68%** | **77%** | 32% | 44% | 7% | 4% | 12% |
| I am satisfied with the billing methods employed by public hydrogen stations | **55%** | **72%** | 31% | 41% | 7% | 0% | 21% |
| It is difficult to know how much hydrogen my car actually gets when using a public hydrogen station | **51%** | **53%** | 19% | 35% | 20% | 5% | 22% |

*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=81)*

# 3.6. Small Business Owners – Use of Electric Vehicles

## 3.6.1. Small Business Owners - Profile

**Consistent with previous results, 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, four in ten (41%) were business owners, of which roughly half (55%) were labelled as small business owners. These SME owners were asked whether they use their EVs for business purposes. SME owners who own an FCEV were most likely to say yes (74%). SME owners with PHEVs (50%) and BEVs (45%) were split; roughly half said they use it for business and half do not. These results are fairly consistent with past results.

**Business Owners – Profile**

| Number of employees | 2022 Total (n=376) | 2024 Total (n=476) | Type of EV | | |
|---|---|---|---|---|---|
| | | | PHEV (n=278) | BEV (n=163) | FCEV (n=35) |
| 1-99 (Small Business) | 54% | 55% | 54% | 56% | 51% |
| 100-499 (Medium Business) | 14% | 19% | 19% | 19% | 14% |
| 500+ (Large Business) | 20% | 27% | 27% | 25% | 34% |

*Q9* *Are you currently the owner, partner or senior manager in a Canadian business of any size (including self-employed), who influences the overall direction of the company? SUBSAMPLE; EV Owners (n=1,030)*

*Q10* *Including yourself, approximately how many full-time staff/employees does the company you own or work for, employ in Canada? SUBSAMPLE; EV Owners who are business owners (n=476) NOTE: Number of categories from 2022 to 2024 have been collapsed*

**Small Business Owners – Use of EV for Business (% saying 'yes')**

| SME owner with…. | 2022 | 2024 |
|---|---|---|
| **PHEV** | 54% | 50% |
| **BEV** | 45% | 45% |
| **FCEV** | 72% | 74% |

*Q17* *Do you use one or more battery electric (BEV) or plug-in hybrid vehicle(s) (PHEV) for your business? SUBSAMPLE; SME Owner and BEV or PHEV owner (n=326)*

*Q31* *Do you use one or more hydrogen fuel cell electric vehicles (FCEV) for your business? SUBSAMPLE; SME owner and Hydrogen/Fuel Cell Vehicle Owner (n=23)*

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

**Most small business owners who use an EV for business take advantage of free public chargers.**

The proportion of small business owners who use public charging stations has slightly grown since 2022, with over eight in ten (85%) saying they use public chargers for business EVs. When doing so, over half report using free chargers (57%), and almost four in ten report using Tesla Supercharger Stations (37%), with three in ten using ChargePoint locations (31%). These results follow a similar pattern as previous results.

Level 1 public charging stations are still used the most frequently, with a majority (81%) of SME owners using these chargers to charge their vehicle at least every two weeks, including one-third within that group who use it once per week and two in ten who use it 3 or more times per week.

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

| Use of public chargers | 2022 Total (n=143) | 2024 Total (n=158) | Type of EV | |
|---|---|---|---|---|
| | | | PHEV (n=103) | BEV (n=55) |
| Yes | 80% | 85% | 88% | 78% |
| No | 20% | 15% | 12% | 22% |

*Q18 Do you use public chargers for your business BEV/PHEV?*
*SUBSAMPLE; SME owner who uses BEV or PHEV for business (n=158)*

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

| Type of public EV charger | 2022 Total (n=114) | 2024 Total (n=134) | Type of EV | |
|---|---|---|---|---|
| | | | PHEV (n=91) | BEV (n=43) |
| Free chargers | 50% | 57% | 57% | 56% |
| Tesla Supercharger Stations | 38% | 37% | 32% | 49% |
| ChargePoint locations | 34% | 31% | 34% | 26% |
| Tesla Destination Charging | 24% | 25% | 26% | 21% |
| BC Hydro EV locations | 12% | 22% | 23% | 19% |
| FLO locations | 18% | 12% | 12% | 12% |
| Circuit électrique locations | 19% | 11% | 10% | 14% |
| Other | 2% | 1% | 0% | 5% |

*Q19 When you have used public chargers for your business BEV/PHEV, 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=134)*

**Small Business Owners and BEV/PHEV Owners –Use of Public Stations at least every two weeks - Tracking**

| Type of public charging station | 2022 (n=114) | 2024 (n=134) | Type of EV | |
|---|---|---|---|---|
| | | | PHEV (n=91) | BEV (n=43) |
| Level 1 public charging station (120 V, 15-20 A) | 84% | 81% | 87% | 67% |
| Level 2 public charging station (240 V, up to 80 A) | 79% | 69% | 70% | 65% |
| Level 3 public charging station (480 V, 300 A), includes superchargers | 68% | 60% | 65% | 49% |

*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=134)*

**Small Business Owners and BEV/PHEV Owners – Frequency of Use of Public Stations – 2024**

| 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) | **81%** | 23% | 34% | 24% | 5% | 7% | 7% |
| Level 2 public charging station (240 V, up to 80 A) | **69%** | 16% | 35% | 18% | 13% | 11% | 7% |
| Level 3 public charging station (480 V, 300 A), includes superchargers | **60%** | 19% | 24% | 17% | 16% | 16% | 9% |

*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=134)*

# 3.7. Awareness of Measurement Canada

## 3.7.1. Awareness of Responsibilities for Devices

**EV owners and intenders are most aware of Measurement Canada's responsibility to approve, verify and inspect gas pumps and least aware the organization does this for hydrogen fueling dispensers. Three in ten are not aware that Measurement Canada is responsible for any of the devices.**

Awareness of Measurement Canada's responsibility for different measuring devices is comparable to awareness levels in 2022. Like previous results, EV owners and intenders are most likely to be aware of Measurement Canada's responsibilities for gas pumps (60%). Awareness of the organization's responsibility for electricity meters has increase (51%) and awareness for natural gas meters is stable (47%). Awareness for other devices sits at four in ten or less and is lowest for hydrogen fueling dispensers (27%).

Awareness is generally higher among EV owners compared to EV intenders. Among owners, PHEV and FCEV owners, men, those aged 18-34, and those who use EVs for business purposes are also more likely to be aware of MC's responsibilities for different devices.

**Aware of Measurement Canada (% saying 'yes') – by Region**

| Devices | 2022 Total (n=1,800) | 2024 Total (n=1,268) | Region | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | BC/Terr (n=306) | AB (n=89) | MB/SK (n=66) | ON (n=293) | QC (n=442) | ATL (n=72) |
| Gas pumps | 59% | 60% | 60% | 64% | 61% | 60% | 58% | 65% |
| Electricity meters | 44% | 51% | 57% | 63% | 48% | 56% | 44% | 46% |
| Natural gas meters | 46% | 47% | 51% | 58% | 50% | 52% | 41% | 35% |
| EV chargers billing on the basis of energy (kWh) | N/A | 39% | 43% | 38% | 30% | 43% | 34% | 43% |
| Home heating fuel meters | N/A | 39% | 42% | 51% | 35% | 42% | 31% | 40% |
| Propane meters | N/A | 36% | 35% | 49% | 42% | 33% | 36% | 35% |
| Hydrogen fuelling dispensers | N/A | 27% | 27% | 36% | 27% | 31% | 23% | 24% |
| None of the above | 36% | 30% | 29% | 21% | 32% | 31% | 31% | 32% |

*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=1,268)*

**Aware of Measurement Canada (% saying 'yes') – by Age, Gender**

| Devices | 2024 Total (n=1,268) | Gender | | Age | | |
|---|---|---|---|---|---|---|
| | | Female (n=432) | Male (n=836) | 18-34 (n=291) | 35-54 (n=472) | 55+ (n=505) |
| Gas pumps | 60% | 53% | 64% | 67% | 59% | 57% |
| Electricity meters | 51% | 50% | 53% | 63% | 54% | 42% |
| Natural gas meters | 47% | 43% | 50% | 56% | 51% | 39% |
| EV chargers billing on the basis of energy (kWh) | 39% | 39% | 39% | 53% | 44% | 26% |
| Home heating fuel meters | 39% | 35% | 41% | 48% | 42% | 30% |
| Propane meters | 36% | 33% | 38% | 43% | 39% | 30% |
| Hydrogen fuelling dispensers | 27% | 26% | 28% | 40% | 31% | 16% |
| None of the above | 30% | 37% | 27% | 19% | 28% | 38% |

*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=1,268)*

**Aware of Measurement Canada (% saying 'yes') – EV Status**

| Devices | 2024 Total (n=1,268) | EV Status | |
|---|---|---|---|
| | | EV Owner (n=1,030) | EV Intender (n=238) |
| Gas pumps | 60% | 63% | 49% |
| Electricity meters | 51% | 56% | 34% |
| Natural gas meters | 47% | 50% | 34% |
| EV chargers billing on the basis of energy (kWh) | 39% | 44% | 17% |
| Home heating fuel meters | 39% | 41% | 26% |
| Propane meters | 36% | 39% | 26% |
| Hydrogen fuelling dispensers | 27% | 30% | 12% |
| None of the above | 30% | 26% | 49% |

*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=1,268)*

### 3.7.2. Familiarity with Measurement Canada Sticker

**Seven in ten have at least seen the Measurement Canada sticker; nearly four in ten are more familiar with it.**

EV owners and intenders were shown a picture of the sticker Measurement Canada places on devices used in trade. A majority were familiar with the sticker, with seven in ten saying they have seen it before. Nearly four in ten (37%) have read the sticker before, indicating a higher level of familiarity. Three in ten say they have never seen the sticker before. Familiarity is generally higher among EV owners. They are more likely to have seen the Measurement Canada sticker on a gas pump (42%) than any other measuring device.

**Measurement Canada Sticker – Familiarity (New Question)**

| Level of Familiarity | 2024 Total (n=1,268) | EV Owners (n=1,030) | EV Intenders (n=238) |
|---|---|---|---|
| **NET Seen Before** | **71%** | **76%** | **49%** |
| I have seen and read this sticker on a device before this survey | 37% | 40% | 24% |
| I have seen this sticker on a device but have never read it | 34% | 36% | 26% |
| I have never seen this sticker on a device before | 29% | 24% | 51% |

*Q45. What is your level of familiarity with the Measurement Canada sticker on devices used in trade [display image]? BASE; EV Owners and Intenders (n=1,268)*

**Measurement Canada Sticker – Devices (New Question)**

| Device | 2024 Total (n=902) | EV Owners (n=785) | EV Intenders (n=117) |
|---|---|---|---|
| A gas pump/gas station pump | 42% | 37% | 70% |
| Electric meter | 7% | 7% | 6% |
| EV charging station | 6% | 6% | 2% |
| Propane gas distribution/propane tanks | 4% | 4% | 3% |
| Measurement scale/device/meter (unspecified) | 4% | 5% | 0% |
| Gas meters at home | 3% | 3% | 4% |
| Charger/EV charger | 3% | 3% | 2% |
| Cars/trucks (hybrid/EV/other) | 2% | 3% | 0% |
| Inspection sticker | 2% | 2% | 0% |
| Kilowatt per hour/power rate | 1% | 2% | 0% |
| Charging meter | 1% | 1% | 0% |
| Fire extinguisher | 1% | 1% | 1% |
| Other | 7% | 7% | 4% |
| Nothing | 1% | 1% | 0% |
| DK/NA | 20% | 21% | 13% |

*Q46. On what type of measurement device did you see the Measurement Canada sticker?*

*SUGROUP: Those who have seen the sticker before (n=902)*

### 3.7.3. Interest in learning more about Measurement Canada

**Battery electric vehicles (BEV) and plug-in hybrids (PHEV) garner the most interest.**

Current EV owners are most interested in battery electric vehicles (66%), followed by plug-in hybrid electric vehicles (56%). EV intenders are most interested in plug-in hybrid electric vehicles (75%). Interest in hydrogen fuel cell EVs sits at around four in ten. Interest in other engine types is two in ten or less.

Those who are interested in learning more about clean fuel engine types are most likely to Google the topics, checking the websites that come up (43%). Checking government websites is another common place to check for more information (29%).

**Clean Fuel Engine Types of Most Interest (New Question)**

| Engine Type | 2024 Total (n=1,268) | EV Owners (n=1,030) | EV Intenders (n=238) |
|---|---|---|---|
| Battery electric | 64% | 66% | 53% |
| Plug-in hybrid electric | 59% | 56% | 75% |
| Hydrogen fuel cell electric | 37% | 37% | 36% |
| Natural gas (compressed or liquefied) | 21% | 23% | 14% |
| Biodiesel / hydrogenation-derived renewable diesel (HDRD) | 14% | 14% | 13% |

| | | | |
|---|---|---|---|
| Ethanol | 8% | 7% | 12% |
| Other | 2% | 1% | 4% |
| None of the above | 4% | 4% | 4% |

*Q48. Which of the following clean fuel engine types do you have an interest in? Select all that apply. BASE; EV Owners and Intenders (n=1,268)*

**Most likely information sources (New Question)**

| **Most likely to look….** | **2024 Total (n=1,203)** | **EV Owners (n=977)** | **EV Intenders (n=226)** |
|---|---|---|---|
| All other websites (ex. Google) | 43% | 42% | 45% |
| Government website related to the topic/ canada.ca | 29% | 28% | 31% |
| I would search for/be interested in more details/ information | 5% | 6% | 3% |
| Expiry date on the sticker and next inspection date | 1% | 2% | 1% |
| At a gas station | 1% | 1% | 1% |
| Provincial hydro website | 1% | 1% | 0% |
| On chargers | 1% | 1% | 0% |
| Email | 1% | 1% | 1% |
| Social media | <1% | 1% | 0% |
| Meters readings | <1% | <1% | 1% |
| At an EV/car charging station | <1% | <1% | 0% |
| From people (family, friend, coworker) | <1% | <1% | 0% |
| Other | 5% | 6% | <1% |
| Nothing/not interested | 6% | 7% | 4% |
| DK/NA | 10% | 9% | 14% |

*47. If you are interested in learning about Measurement Canada's initiatives, where are you most likely to look?*

# 4. Detailed findings – Qualitative research

## 4.1. Qualitative Participant Profile

### 4.1.1. Participants

A total of 30 participants were interviewed for this study. Interview participants were from a variety of organizations both private and public across Canada, representing several stakeholders with varying involvement in the clean fuels sector. The stakeholders participating in this research include:

- Manufacturers of vehicles, chargers and other supply equipment;
- Charging/refuelling service providers, including national charging networks and utility companies;
- Fleet owners, representing two municipalities in Canada;
- Investors in clean fuel and clean fuel infrastructure;
- Industry/Stakeholder associations.

## 4.2. Analysis of Key Themes

### 4.2.1. Awareness and perceptions of Measurement Canada

**Almost 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. Similar to the previous wave, most were aware of Measurement Canada's oversight and responsibilities. Representatives were most familiar with oversight in their own sector; for example, a representative from the hydrogen fuel cell sector was not specifically aware that Measurement Canada is responsible for oversight in the electric vehicle space. Representatives in the municipal fleet space were less likely to be aware of oversight in the sector. Several representatives are actively following the progress of Measurement Canada as it relates to the new regulations for the clean fuel sector. Some were also aware due to involvement in working groups with Measurement Canada or through operations as part of their role within their company.

> *Yes, I'm aware of Measurement Canada. We went through temporary dispensation process last year. It went well... Quite seamless to get it done.*

> *I assumed they were on the electric vehicle side, and knew they were on the hydrogen side.*

Similar to the previous interviews, manufacturers and service providers had a higher awareness of Measurement Canada. Investors and municipal fleets did not have a high level of awareness of Measurement Canada itself or its responsibilities.

Those with some awareness of Measurement Canada's oversight mandate were similarly aware of the development of measurement accuracy and performance standards. The release of the requirements is a prominent issue that stakeholders have held on their radar for a several years. In the previous wave, this was top-of-mind due to anticipated temporary dispensation regulations. Now that temporary dispensation has been authorized for registered organizations, other components of the regulations are more pertinent. For example, manufacturers of charging equipment who will need to ensure their equipment meets specific standards are actively following the developments, while utilities providing service to EV charging stations are especially close to the issue as the metering and billing changes and regulations will impact them significantly.

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, some participants were asked how often they think clean fuel devices should be re-inspected. Opinions vary but are relatively in line with the previous wave in that stakeholders suggest modelling regulations that have been effective in other jurisdictions. For example, some pointed to the state of California which has implemented new regulations that includes re-inspection every two years. Others felt the inspections should be aligned with the typical lifecycle of the key parts in the devices. Some manufacturers feel re-inspection and re-calibration is not valuable and actually disrupts the industry more than supports it.

> *I think the range is three to five years, is what we are pushing for... [because of the] effort to train people to inspect, and the test set is quite expensive.*
>
> *The 10-year cycle that's used now is old... I have a feeling it's from when the meters were mechanical. Now with the electronic metres, recalibration is a waste of time.*
>
> *…rather than having routine inspections that would be onerous on everybody involved... the most effective would be to inspect based on complaints received.*
>
> *Every device should be inspected on installation, then every 5 years. [There is a] good chance that after five years you'll be replacing key components.*
>
> *Almost never. Measurement Canada should be asking for the site's energy meter and count off that and compare to the charger's meter. They do not need to inspect the device because the utility meter is already certified. Between the utility meter, the car, and the charger, there is enough data to know if it's accurate. Measurement Canada could request the vehicle logs against the charging networks and spot audit. We have all the data... they don't need to spend money going to sites.*

### 4.2.2. Reactions to new requirements being developed

**Similar to last year, stakeholders react positively to requirements being developed and express overall high levels of support for increased regulation in the clean fuel/EV space. However, there is some criticism for the speed and priorities Measurement Canada is focusing on.**

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.

Most stakeholders agree on the necessity of developing standards for public EV charging stations. They believe it is a positive step for consumer protection and market confidence.

> *It's almost critical to the acceptance of electric, hydrogen and alternate fuels. Originally people charged at home but now that more and more people are charging in public it needs to be fair. People are worried about how much things cost and if they can't understand it, it's challenging... Every obstacle we remove works toward more adoption. It's fine if one is more expensive, as long as I know that what I am going to pay is what I'm going to pay.*

> *It needs to be done. There's no standard for how it's billed.*

> *Necessary - it should be the same as gas dispensing.*

> *It needs to be done for consumer protection.*

> *This is good. We need governance and regulations to manage it. Especially when comparing data – we want to have apples to apples for usage and rates.*

Similar to previous results, participants expressed a sense of urgency for implementing these regulations, prioritizing speed over perfect accuracy. This opinion was more often held by manufacturers of EV charging infrastructure. Stakeholders from utilities felt the accuracy standard that is currently in place for electricity meters should be upheld.

> *Yesterday is always better but today is the next best thing. I'd want to encourage the standards developers to be expeditious instead of being correct to 0.1%, maybe 1% is good enough.*

> *…if it's based on volume of energy, you want that to be reasonably accurate. On the other hand, you want to roll out as quickly as possible and there cost involved in more accurate measurement.*

> *Seems like it's going away from being as stringent as rules as metering to open the flexibility up for EV charger folks. I think it shouldn't be that flexible. I understand why they have to do it.*

Some respondents who are supportive of the requirements noted potential issues with the implementation of new standards, including lab capacity for testing and recertification processes, and the need for harmonized regulations across regions.

> *I'm unconvinced they have the lab capacity to support their ambitions.*

> *Measurement Canada is focused on yesterday's approach of physical inspections. Not focused on data analysis and that's a mistake.*

> *Harmonization is best. We develop for the North American market.*

> *We also want to avoid regulation that conflicts with each other. Some manufacturers supply for US and Canada, so it's easier to have harmonized regulations.*

There were also varied opinions about how costs incurred from new standards will be transferred to consumers and how this will impact the adoption of EVs.

> *[Concern for the] impact it will have on cost of EV charging... will be additional cost for additional certification, so that may eventually pass onto the consumer.*

> *Standardization is helpful but not if it slows everything down. Any additional barrier slows people down. I'm supportive as long as it moves along.*

Others who support regulation of clean fuels were somewhat unclear about the implementation and practicality of the regulations and encouraged continued communication from Measurement Canada to industry stakeholders, especially those directly affected.

> *Not enough clarity... Lack of clarity around the three phased approach - what happens if you fail in year three? Also very concerned with who is doing the testing -- do we have to ship them every three years? Can we use third party testing instead of Measurement?*

> *Still some things about the Electricity Act that need to be modernized that take into account the EV space...Who's defined as a contractor? There needs to be some onus clarification and scope confirmation.*

> *A key piece of the modernization needs to be a complete overhaul and reimagining of the contractor framework to create room between a provincial crown corporation utility and a 7-11… If the contractor responsibility can be deferred to someone else, reducing requirements where necessary, this is what we call a risk-based framework… It's not just black and white, it's all the shades in between and we think Measurement Canada needs to recognize those through modernization.*

### 4.2.3. Concerns and perceptions about accuracy of clean fuel measurement

**Confidence in accuracy is high and similar to last year. The existing concerns related to EV charging are typically not about accuracy.**

When asked about the accuracy of public charging stations or renewable fuel dispensers, most participants said they were very confident in the accuracy, with a few referencing their trust in Measurement Canada as a primary reason.

> *Very; we have a metering solution in place so it's accurate. We calibrate at the factory. We make sure our chargers align with California Type Evaluation Program (CTEP).*

> *Very confident. I also think consumers are pretty confident in billing accuracy. They're more concerned with reliability of functionality.*

Despite high overall confidence in accuracy, stakeholders expressed more concerns than last year about other aspects of public charging. Many participants expressed concern about the reliability of public stations and charging speed.

> *I think consumers are confident… Consumers are more concerned with if the station is working when they show up.*

> *Not a lot of concern about accuracy yet, more concern about whether the chargers will work.*

*Issues I'm hearing are not on accuracy of amount of energy being dispensed, more about speed that it can dispense at.*

*Consumers aren't super concerned…They trust Measurement Canada. Anything is an improvement over what we had before (time-based). Right now, people are just happy it works.*

**Concerns about the accuracy of EV chargers remains low, and stakeholders do not believe consumers are concerned either. However, there is a belief that boosting accuracy can boost consumer confidence too.**

Participants were asked how concerned they are about the accuracy of EV chargers, hydrogen dispensers, and other renewable fuel dispensers. Across stakeholder groups, most respondents expressed minimal concern for the accuracy of EV chargers and renewable fuel dispensers. These participants tend to think consumers are not concerned, or that the cost of charging is not high enough to warrant concern over the accuracy of EV chargers.

*Not concerned... I think if something is at a station, consumers have a confidence that someone must have checked it.*

*Not concerned about it. Performance has been good too. No challenges, everything operated as should.*

*Not concerned... Consumers aren't concerned either. We never have a call about the accuracy, just about the price being too high. The regulations are important but it's a non-issue... Consumers rely on their vehicle to tell them and they believe that to be the source of truth.*

*Not very concerned about it. All that matters is that people feel they're getting value for money. Preciseness isn't particularly important.*

The lack of concern may stem from a lack of awareness and education among consumers or the average EV driver. In other groups, the lack of concern may stem from a general trust in the current technology and systems in Canada. They tend to be more knowledgeable about the technology and are satisfied with current accuracy levels and trust the equipment at charging stations is up to a certain standard.

*I'm not sure consumers even know if regulations are in place.*

*I'm personally an EV driver and I've never thought about it when I charge up outside of my home on whether or not the power that I received is the power I paid for.*

*Not concerned because it's pretty simple circuits, electronic, no moving parts. Very easy to have a design that's within 1% accuracy.*

*Not concerned... It's modern technology, there are no issues.*

While accuracy of EV chargers may not be a primary concern for many, other stakeholders see a regulated market as crucial for sustaining consumer confidence and ensuring fairness for consumers.

*Valid concern about the accuracy of electricity being dispensed; it makes sense for consumers… regulations will help in consumer protection.*

*Needs to be very correct… if there's inaccurate bills, that would impact consumer confidence.*

*Always helpful to have the standard, certification that demonstrates it's verified or approved.*

*If it's unregulated, I'm not confident.*

On the other hand, some stakeholders expressed apprehension about the level of accuracy the regulations would require and where the burden to comply would fall.

*The meter requirement for a revenue-grade [charger] is a hindrance. Responsibility should be on the manufacturer.*

*For me, I'm a little bit concerned to understand the accuracy required by Measurement Canada. We can provide accuracy by 3%... concern would be that it would be 1%.*

*Depends on what micro-accuracy we're talking about.*

**Stakeholders expressed no or limited experience with billing disputes or discrepancies related to accuracy of public charging stations.**

Most stakeholders stated they had never experienced any issues or disputes from consumers being billed at public charging stations. When disputes have occurred, it is less about accuracy and more about price or lack of understanding on the part of the consumer.

*Not yet… It's still early day for doing it by kWh. Relative to fuel… people are paying a lot less. The stakes are lower… Anticipating seeing fewer disputes.*

*There's very limited rules around that... they can charge whatever they want, so they do. So the prices vary widely. Brand to brand, level 2 is different from level 3 in terms of pricing. It's the wild west when it comes to price.*

*People don't know what to expect. Some of the level 3 pricing recently when they switched to kWh from time, the prices went up.*

*Yes - but not about accuracy exactly, more about why prices are set a certain way. For example, utility and condo board sets the pricing, but customer calls [us]. It's like complaining to the gas station that the gas price is too high. It's more an issue of the consumer not understanding that.*

*Disputes come from multi-unit residential. Generally, haven't had too much billing disputes. It's so new and people are still figuring out how to deal with it... Still seeing huge savings over gas.*

Municipalities with EV fleets do not typically encounter any billing issues because their EVs are charged at designated City facilities overnight, so they have very little experience with charging stations outside of their own facilities.

*We don't manage the billing. Trying to plan for the increase power usage.*

Manufacturers, service and utility providers are also generally quite happy with the equipment they currently use. Many of them conduct their own tests and maintain high standards, reducing the frequency of issues with EV charging equipment. However, some feel that although the current performance levels are good, there is still room for improvement when it comes to the reliability of the technology.

*Generally, pretty good. There's always room for improvement. It's a newer industry, everyone is getting better and better. Overall we have been quite happy. Units perform quite well. Even through the winter.*

*We rigorously test for interoperability with software, operation in the field. Putting out hardware that meets industry standard. Equipment is in private settings so less prone to poor weather, vandalism.. we can boast a little more reliability.*

### 4.2.4. Increasing confidence in EV fueling accuracy

Associations and investors were asked whether knowing that there will be government oversight on the accuracy of measurement for EV chargers and renewable fuel dispensers would influence their confidence in EV charging and refuelling equipment. Knowing there is government oversight influences confidence levels but only to an extent – stakeholders need to be confident that the rules and regulations are not only well suited to the market, but also designed by taking the needs of different stakeholders and the general lack of consumer awareness into account.

*Generally, it does... still have concerns about getting the framework right. If we get the right regulatory framework in place, it'll increase investor and consumer confidence.*

*A bit more [oversight] will help things get standardized... it is a bit of the wild, wild west. Certain things don't need government oversight but [some] to help standardizing things would be welcome.*

*A lot of pressure to build public infrastructure but public doesn't know enough about EVs. Many people in Indigenous communities have never driven EVs but know it's the future and want to set up chargers. There is a lot of interest from Indigenous communities but concern is lack of information.*

All participants were asked to describe how specific protocols would affect confidence in accuracy of clean fuel charging/dispensing stations. Similar to previous results, all requirements were seen to 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.

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

While some felt this standard would increase confidence, others noted confidence levels would stay the same. These results are comparable to previous results, where many participants said this requirement would increase their confidence. However, some participants reiterated the importance of harmonized international standards over specific Canadian standards.

*Not Canada-made standards, more important to have aligned standards. Canada's a small market and if they have different standards people might not come into it.*

*Harmonization is best - no Canadian-made standard.*

2. They are approved and inspected by accredited officials.

Last year, participants believed this would increase confidence to a certain extent; many were wary of the burden this may put on the industry. This year, most participants said this requirement would increase their confidence. Very few provided a caveat, acknowledging some concerns that were more evident last year. A few said this requirement would not impact their confidence.

*Increase, except for the time lag. If they could come up with a more streamlined process...*

*Yes, but Canada shouldn't try to meet unique standards.*

*Yes - but balance consumer protection with cost.*

*Neutral. If each device is identical, it's incredibly onerous. If it costs consumer more, rather just say focus on type approval and affordable charging.*

3. Charging/dispensing information is shared and displayed during the transaction.

Many respondents said this would increase their confidence, some specifying it would be more impactful for Level 3 and less so for Level 2 chargers. Some said this requirement would not make much of a difference because people do not pay enough attention and it is not a large enough change to the status quo.

*Already is [required].*

*Most people aren't looking.*

*Don't need physical screen, on the app is fine.*

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

Similar to previous results, participants viewed this statement as beneficial to consumer confidence, as this information would give consumers more power over their buying decisions and increase transparency. Still, some respondents said this requirement would not change their confidence levels.

*This will up everybody's game in general.*

*Would feel more confident if people knew what they were doing.*

*Real time feedback is important, how much energy is used… On screen or on app.*

**Requiring businesses to register with Measurement Canada**

Some participants (associations, manufacturers, and service/utility providers) expressed awareness that businesses must be registered with Measurement Canada in order to charge customers based on the amount of fuel delivered to the vehicle. For several, this requirement increases their confidence in EV charging and refuelling equipment. Others said this requirement does not influence their confidence, citing burdens to small businesses and red tape as a barrier to registration, among other reasons. A utility/service provider mentioned concerns about trust along the supply chain, and another mentioned complexity in the process.

*That requirement makes sense in some spaces but… it's a bit burdensome for people who are not energy professionals. Registering as a contractor increases the level of complexity... it makes sense in public charging.*

*No... Makes me worried there will be less people putting in chargers. Any time red tape is added people might just say no.*

*A little concerned about implementation of 'agent' (owner/operator/contractor) program. If a device needs to be recalibrated, we need a third-party solution. We want the structure itself in place, but not Measurement Canada to be the only one able to do it. It's going to really impact adoption of being a host.*

Some respondents believe that while regulatory requirements are essential for certain levels of charging, they may not be necessary for others.

> *I guess so... People will pay what they're willing to pay. I don't think Level 2 needs interference from a regulator... Level 3 does.*

Others view this requirement as a standard operational expectation that does not necessarily increase their confidence.

> *Doesn't influence one way or another. As an operator we expect that there are certain regulations to be complying with.*

Associations and investors were also asked about the attractiveness of investing in EV charging and their views on government oversight in the sector. One organization that has multiple investments in clean tech companies (mobility, infrastructure, supply chain, etc.) cites zero emission transportation as the way forward and the reason they invest in electrification with Canadian assets.

> *With government and industry commitment to net zero, there is no way to get there without looking at mobility. Electrification and electrification of the grid is something that's coming. We see the trend is going that way and there's going to be growth. Hydrogen is of interest with respect to hydrogen carriers in the transportation sector. We also support a large EV charging manufacturer as well. We want to see that if Canada is building up a network of infrastructure, that it's done with Canadian assets and Canadian players. We think the world is a little more ready for electrification (than hydrogen), but we're focused on both.*

This group of associations and investors believe government intervention and regulations are crucial for growing the sectors in a way that makes the transition to EVs easier and protects consumers and end users. However, there were some questions as to where Measurement Canada's involvement ends.

> *Regulation is important because this is a major tech change we're trying to make happen in an accelerated timeline. It's important to get right.*

> *I think it's appropriate and necessary... consumers have confidence in the sticker. Our group is concerned with the possibility of putting too much effort into ensuring precise accuracy as opposed to taking a more pragmatic approach, accept meters that may not be entirely accurate, but less costly.*

> *In general, we fully recognize that Measurement Canada has the purview to ensure correct measurement… We believe their authority stops at the measurement. Sometimes Measurement Canada believes their authority extends to the bill… Measurement Canada's role is to ensure accuracy of the measurement… We believe Measurement Canada's authority ends at the measurement.*

As a result, the associations and investment groups had some suggestions on how to increase investor confidence in the space. They believe speeding up modernization of the various relevant acts, providing tax credits, and implementing standardization are key for increasing investor confidence in the EV charging sector. These stakeholders seem supportive of all actions Measurement Canada is currently undertaking, but they are disappointed by the pace of action.

> *The Electricity & Gas Inspection Act (EGIA) and its regulations need to be modernized. Forty-year-old legislation that has not kept up with evolution of the sector is not the legislation that should be used to guide the evolution of the sector... We need that work to happen now. Let's get the legislative process*

*started, let's get the regulatory reviews into high gear. Generally, we have not been happy with the pace of change at Measurement Canada.*

*I think what we have to do is roll out some of the tax credits that have been announced a bit faster. Some of the credits just need to be expedited and get through approvals a little bit quicker. I think everyone's waiting for those, they're just taking a long time.*

### 4.2.5. Final thoughts

Stakeholders were asked to share any final thoughts or feedback for Measurement Canada. Themes about managing increased electricity demand, modernizing regulations, and being practical and timely about the regulations that will be implemented are recurring from last year indicating these factors remain of importance to stakeholders in the sector. Stakeholders generally support regulation and government oversight in the space – they expect it and believe it to be necessary to support the transition to ZEVs. Many participants have been involved in Measurement Canada's previous consultation activities and opportunities to engage with the topic, sharing their recommendations and experiences and they are eager to see action.

*Move more rapidly with modernization of the act. That's the hindrance or roadblock at this time. It's 40 years old and doesn't recognize the current marketplace.*

*Harmonization is really important, as is enabling manufacturers to do the testing, or a third party.*

*United States and Canada are so integrated… we've seen Measurement Canada taking a very different approach. United States is using NIST Handbook 44, while Measurement Canada has been going through OIML... the main pain point is not so much the product itself but having to go through two lengthy and costly certification processes, delaying time to market availability.*

*[We are] scrambling to build an entire industry from scratch. The biggest concern is making sure we can continue to grow, continue to serve the rapid demand. Making sure the regulations safeguard consumers, but still facilitate continued growth.*

*If Measurement Canada is developing regulations, sit down with auto makers to consult us to say this is the plan, this is how it'll work, and give us enough time because we're not the experts. We need to ask engineers... give ample time for us to figure it out...*

*Glad to hear this happening. Glad they are asking these kinds of questions. For a change, let's get it right the first time. If you could reliably charge your car in a reasonable amount of time, you would buy an EV no question. The thing that is stopping people is that it doesn't seem clear how I'm going to get fuel into the car. Once it's settled, there will be no reason for gas cars.*

### 4.2.6. 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. Those who currently have fleets own over 40 PHEVs including sedans, SUVs, and pick-up trucks and are actively expanding their fleet. One fleet owner is in the first year of piloting hydrogenation-derived renewable diesel (HDRD) and will begin another pilot with B20 biodiesel for garbage trucks. Participating fleet owners own their charging infrastructure (typically Level 2) because they are exclusive and internal to the corporation. Their fleet are charged daily at their facility, typically overnight so use of public charging stations is not necessary.

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. Some are looking to expand their use of Level 3 fast chargers.

When asked about what billing methods they offer, a variety of billing methods are currently used. In the previous wave, all offered time-based and billing-based on time parked at the charger or dispensing station, as this was the industry standard. Time-based billing is still commonly used but there has been an increase in the amount using energy-based or kWh-based billing following the granting of temporary dispensation. A few are using flat-fee billing or hybrid structures such as time plus a flat fee.

# Appendix A: Quantitative Methodology

This quantitative research is based on data collected through an online survey of 1,268 adult Canadian EV owners and intenders, conducted between February 27 to March 22, 2024.

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.

The survey obtained the following regional distribution:

| Target group | EV Owners | EV Intenders | Total |
|---|---|---|---|
| **Canada (Total)** | **1,030** | **238** | **1,268** |
| Atlantic | 47 | 25 | 72 |
| Quebec | 402 | 40 | 442 |
| Ontario | 214 | 79 | 293 |
| MB/SK | 42 | 24 | 66 |
| Alberta | 59 | 30 | 89 |
| BC/Territories combined | 266 | 40 | 306 |

**Questionnaire design**

Environics worked with the ISED/MC to develop a questionnaire that would cover the objectives as outlined in the Statement of Work. To ensure tracking data, many of the survey questions were unchanged from the 2022 survey instrument. New questions and wording changes were included as needed. 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 was conducted from February 27 – 28, with the survey fully in field on February 28.

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) | 125,560 |
| Invalid (undelivered) | 0 |
| **Broadcasts delivered** | **125,560** |
| **Unresolved (U)** | **116,838** |
| Did not respond | 116,838 |
| **In-scope non-responding (IS)** | **487** |
| Qualified respondent break-off (drop out) | 487 |
| **In-scope – responding (R)** | **8,234** |
| Disqualified | 4,853 |
| Quota filled | 2,113 |
| Completed | 1,268 |
| **Contact rate** [(R+IS)/ (U + IS + R)] | **6.95** |
| **Participation rate** [R / (U + IS + R)] | **6.56** |

**Respondent profile**

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

| Variable | Total sample % |
|---|---|
| **Age** | |
| 18-34 | 23 |
| 35-54 | 37 |
| 55+ | 40 |
| **Gender** | |
| Male | 66 |
| Female | 34 |
| Gender diverse | 0 |
| **Education** | |
| High school or less | 13 |
| College/Apprenticeship/Some uni | 34 |
| University graduate/post-graduate | 52 |
| **Total annual household income** | |
| Under $40,000 | 8 |
| $40,000-<$80,000 | 28 |
| $80,000-<$100,000 | 15 |
| $100,000+ | 41 |
| **Community size** | |
| Small (<10,000 – 49,000) | 26 |
| Medium (50,000 and 199,999) | 23 |
| Large (200,000 and 499,999) | 14 |
| Very large (500,000 or above) | 31 |
| **Home dwelling type** | |
| Single family home with parking | 68 |
| Single family home without parking | 5 |
| Multi-family home (apartment/condo/strata) | 26 |
| **Language of survey** | |
| English | 78 |
| French | 22 |

# Appendix B: Quantitative research instrument

Environics Research
Finalized February 26, 2024

**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 (DRAFT)**

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**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

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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 ###.

If you have questions about the survey or how to complete it, please contact Alanna Sawatzky at ###

Thank you in advance for your participation.

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**< PROGRAMMING NOTE: All questions are mandatory unless specified.>**

**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)

03 – Yes – battery electric vehicle, plug-in, not a hybrid (BEV)
04 – Yes -- hydrogen/fuel cell electric vehicle (FCEV)

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 partner's vehicle, a company vehicle, etc.)?

01 – No
02 – Yes – plug-in hybrid electric vehicle (PHEV)
03 – Yes – battery electric vehicle, plug-in, not a hybrid (BEV)
04 – Yes -- hydrogen/fuel cell electric vehicle (FCEV)

IF NO to own/lease (Q1) or regular use (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)
03 – Yes – battery electric vehicle, plug-in, not a hybrid (BEV)
04 – Yes -- hydrogen/fuel cell electric vehicle (FCEV)

**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 2011-2024 OR NOT SURE

5. What is the approximate all-electric range of your EV or total range in the case of a hydrogen FCEV?

Please indicate the longest range if multiple EVs are owned.
*Select one only*

01 - Less than 100 km
02 -100-199 km
03 - 200-299 km
04 - 300-399 km
05 - 400-499 km
06 - 500 km or more
99 – Not sure

**ASK ALL**
**B. Categorization/analytical variables**

6. In what province or territory do you live?
*Select one only*

DROP DOWN LIST
01-British Columbia
02-Alberta
03-Saskatchewan
04-Manitoba
05-Ontario
06-Quebec
07-New Brunswick
08-Nova Scotia
09-Prince Edward Island
10-Newfoundland and Labrador
11-Yukon
12-Northwest Territories
13-Nunavut

7. To which of the following age categories do you belong?
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
02 - Female
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 (including self-employed), 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 staff/employees 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

**C. 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
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 Q1 OR Q2 = 02 OR 03 AND Q11=01-05, 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 Q11=06:
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 Q11=06:
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) | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Level 2 public charging station (240 V, up to 80 A) | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Level 3 public charging station (480 V, 300 A), includes Superchargers | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

ASK IF Q11=6 OR Q13=1
16A. What is your average cost **per charge** for charging away from home? [open end dollar amount with 'Unsure'] RANGE $1-$100

IF SME OWNER (Q10)

17. Do you use one or more battery electric (BEV) or plug-in hybrid vehicle(s) (PHEV) for your business?
01 – Yes
02 - No

IF SME OWNER WITH ZEV (Q10 and YES AT Q17)

18. Do you use public chargers for your business BEV/PHEV vehicle(s)?
01 – Yes
02 - No

IF YES TO Q18
19. When you have used public chargers for your business BEV/PHEV 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 BEV/PHEV 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) | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Level 2 public charging station (240 V, up to 80 A) | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Level 3 public charging station (480 V, 300 A), includes superchargers | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

IF YES AT Q13 OR Q11=06 AND/OR YES TO Q18
21. At public electric vehicle charging stations, which billing method(s) have you had experience with? (*Select all that apply*)

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 OR Q11=06 AND/OR YES TO Q18
22. Have you ever had any issues, disagreements or disputes related to the billing 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 OR Q11=06 AND/OR YES TO Q18
25. In general, 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 OR Q11=06 AND/OR YES TO Q18
25A. How Confident are you in the billing accuracy of the following billing methods? [ONLY DISPLAY WHAT WAS SELECTED IN Q21]

| RANDOMIZE STATEMENTS | Very confident | Somewhat confident | Not very confident | Not at all confident | Not sure |
|---|---|---|---|---|---|
| Flat rate charge ($/month) | ☐ | ☐ | ☐ | ☐ | ☐ |
| Fixed charge per use ($/charge) | ☐ | ☐ | ☐ | ☐ | ☐ |
| Charge based on time connected to the EV charger ($/min) | ☐ | ☐ | ☐ | ☐ | ☐ |
| Charge based on energy delivered to the EV ($/kWh) | ☐ | ☐ | ☐ | ☐ | ☐ |
| Combination of time-based charge ($/min) and charge based on energy delivered ($/kWh) | ☐ | ☐ | ☐ | ☐ | ☐ |

IF YES AT Q13 OR Q11=06 AND/OR YES TO Q18
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 | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| b) The amount I paid to charge my vehicle matched the amount of charge I received | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| c) I am getting what I paid for | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| d) The chargers I use deliver the correct amount of charge | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| e) I understand the details on the receipt | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| f) The charging services I use are accurate | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

Continued…

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

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

IF INTENDER (Q3=02 OR 03): *The next few questions are about charging an EV at a public charging station (i.e., away from your home).*

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

| RANDOMIZE<br><br>Note: kWh = kilowatt hour | 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 | □ | □ | □ | □ |

Q28A. How important is it for you to be aware of the cost of charge before charging your vehicle?

01 - Very important
02 - Somewhat important
03 - Not very important
04 - Not at all important

Q28B. Thinking of a EV charger that does not have a visual display showing billing information such as amount of electricity delivered to your vehicle, price per unit of electricity, and total cost **but** provides this information through a cell phone app, in-car display, via an email message, or at a remote display located at the charging area, are you comfortable using this kind of charger?

a) Yes, I am comfortable using chargers that provide relevant billing information remotely rather than using a visual display on the charger itself;
b) No, chargers must include a visual display that displays all relevant billing information

IFQ28B=01

28C. What is your level of confidence in the following ways of presenting billing information such as amount of electricity delivered to your vehicle, price per unit of electricity, and total cost?

| RANDOMIZE STATEMENTS | Very confident | Somewhat confident | Not very confident | Not at all confident | Not sure |
|---|---|---|---|---|---|
| Cell phone app | ☐ | ☐ | ☐ | ☐ | ☐ |
| In-car display | ☐ | ☐ | ☐ | ☐ | ☐ |
| Digital billing (e.g., monthly bill based on your usage) | | | | | |
| On-charger display | ☐ | ☐ | ☐ | ☐ | ☐ |
| Emailed receipt | ☐ | ☐ | ☐ | ☐ | ☐ |
| Remote display located at charging area | ☐ | ☐ | ☐ | ☐ | ☐ |
| Physical/paper receipt | ☐ | ☐ | ☐ | ☐ | ☐ |

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 that bill according to the amount of energy (kWh) delivered are designed and built to perform in accordance with Canadian standards | ☐ | ☐ | ☐ | ☐ |
| b) Public chargers are approved and inspected by accredited officials | ☐ | ☐ | ☐ | ☐ |
| c) Charging information is shared and displayed during the transaction | ☐ | ☐ | ☐ | ☐ |
| d) Billing details are provided immediately following the transaction | ☐ | ☐ | ☐ | ☐ |
| 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 | ☐ | ☐ | ☐ | ☐ |
| g) Knowing there is an independent dispute resolution mechanism in place | ☐ | ☐ | ☐ | ☐ |

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

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

Strongly agree
Somewhat agree
Somewhat disagree
Strongly disagree
Not applicable (d only)
Not sure

**E. 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 (FCEV) 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 FCEV?

| 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 FCEV?

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 ($/charge)
03 - Charge based on the time that hydrogen was dispensed ($/min)
04 - Flat rate charge ($/month)
05 - Combination of time-based charge ($/min) and hydrogen delivered
77 - Other (please specify)
99 - None, not applicable (Exclusive)

IF Q34 ≠ 99
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. In general, 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

38A. How confident are you in the billing accuracy of the following billing methods? [ONLY DISPLAY WHAT WAS SELECTED IN Q34]

| RANDOMIZE STATEMENTS | Very confident | Somewhat confident | Not very confident | Not at all confident | Not sure |
|---|---|---|---|---|---|

| | | | | | |
|---|---|---|---|---|---|
| Charge based on mass of hydrogen delivered (kg) | ☐ | ☐ | ☐ | ☐ | ☐ |
| Fixed charge per use ($/charge) | ☐ | ☐ | ☐ | ☐ | ☐ |
| Charge based on the time that hydrogen was dispensed ($/min) | ☐ | ☐ | ☐ | ☐ | ☐ |
| Flat rate charge ($/month) | ☐ | ☐ | ☐ | ☐ | ☐ |
| Combination of time-based charge ($/min) and hydrogen delivered | ☐ | ☐ | ☐ | ☐ | ☐ |

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 | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| b) The amount I paid matched the amount of hydrogen I received | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| c) I am getting what I paid for | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| d) The stations I use dispense the correct amount of hydrogen | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| e) I understand the details on the receipt | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| f) The hydrogen fueling stations I use are accurate and fair | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

Continued…

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

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

IF INTENDER (Q3=04): *The next few questions are about fueling a hydrogen fuel cell electric vehicle at a public charging station (i.e., away from your home).*

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

| RANDOMIZE<br>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 | □ | □ | □ | □ | □ |

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 | □ | □ | □ | □ |
| b) Public hydrogen dispensers are approved and inspected by accredited officials | □ | □ | □ | □ |
| c) Hydrogen dispensing information is shared and displayed during the transaction | □ | □ | □ | □ |
| d) Billing details are provided to the consumer immediately following the transaction | □ | □ | □ | □ |
| 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 | □ | □ | □ | □ |

| | | | | |
|---|---|---|---|---|
| g) Knowing there is an independent dispute resolution mechanism in place | ☐ | ☐ | ☐ | ☐ |

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
98 - Not applicable (d only)
99 - Not sure

ASK ALL

Measurement Canada is a federal agency, 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.

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 | ☐ | ☐ |
| EV chargers billing on the basis of energy (kWh) | ☐ | ☐ |
| Natural gas meters | ☐ | ☐ |
| Propane meters | ☐ | ☐ |
| Hydrogen fuelling dispensers | ☐ | ☐ |
| Home heating fuel meters | ☐ | ☐ |

45. What is your level of familiarity with the Measurement Canada sticker on devices used in trade [display image]?

01 – I have seen and read this sticker on a device before this survey
02 – I have seen this sticker on a device but have never read it
03 – I have never seen this sticker on a device before

IF Q45=01 or 02
46. On what type of measurement device did you see the Measurement Canada sticker?
OPEN-ENDED AND CODE

47. If you are interested in learning about Measurement Canada's initiatives, where are you most likely to look? [OPEN-ENDED]

48. Which of the following clean fuel engine types do you have an interest in? *Select all that apply.* [randomize]
01 – Battery electric
02 – Plug-in hybrid electric
03 – Hydrogen fuel cell electric
04 – Biodiesel / hydrogenation-derived renewable diesel (HDRD)
05 – Ethanol
06 – Natural gas (compressed or liquefied)
07 – Other, please specify _____
08 – None of the above [exclusive]

**G. 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.

A. What type of home do you live in? *Select one only*

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/ other multi-unit residential building
77 - Other (please specify): _____

B. What is the approximate population of your community? *Select one only*

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

C. 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

D. 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

E. 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 - 2SLGBTQIA+ Community
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 30 individuals were interviewed from February 13 to May 10, 2024. 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 187 clean fuel stakeholders from across the country were invited to participate, with 30 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
January 31, 2024

**ISED/MC – Investor and Business Confidence**
**in the Accuracy of Clean Fuel Measurement Wave 2**
*In-depth individual interviews with investors and business with an interest in ZEV/alternative fuels and/or charging.*

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

**Interview Guide (DRAFT)**

Name: _____
Organization: _____
Date: _____, 2024
Interviewer: _____
Interview number: _____

---

**Introduction**
Hello, my name is _____ from Environics Research, 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. With your permission, I'd like to record the call for analysis purposes. The recording will only be used by myself to support me in preparing the report and will not be shared with others.

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**

<table>
<tr><th>Investor: ASK SECTION D</th><th>Business</th></tr>
<tr><td rowspan="2">Crown Corp – Fed or Prov (BDC Cleantech practice, EDC<br>Government organization – Fed, Prov, Muni, IRAP, SDTC<br>Funds / Investors: Angels, Incubators, Venture Capital</td><td>Fleet owners: ASK SECTION A<br>– Private (car rental, O+G/mining, Other<br><br>– Government (F, P, T, municipal, transit)</td></tr>
<tr><td>Charging/fueling service providers – current or prospective: ASK SECTION B</td></tr>
</table>

| | |
|---|---|
| | Manufacturers – ZEV or charging equipment: **ASK SECTION C** |

**A. Fleet Owners (30 minutes)**

- To begin, can you let me know the name of your organization and its relation to the clean fuel sector?

- 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 vehicles that use renewable fuels, such as E85 or biodiesel/HDRD? Yes or No
- **If YES**, how many and what type(s)?
  - E85 Number owned ___
  - Biodiesel Number owned ___
  - HDRD Number owned ___
  - Other, please specify____

- What size of alternative renewable fuel vehicles 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 or other green fuel dispensers? Yes or No
  - **IF YES:**
    - What type(s) of electric vehicle chargers, hydrogen dispensers or other green fuel dispensers does your business own? (note all that apply, ask how many for each mentioned)
      - Level I (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___
      - Other, please specify_____
    - What are the company owned chargers or dispensers 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/alternative green fuel supplied)

**ASK ALL**

- How often are your company's vehicles charged / filled with hydrogen or renewable fuels 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 or renewable fuels**: Are the company vehicles charged/fueled offsite; mostly charged/fueled at your company chargers or is it a mix?

- **IF YES TO renewable fuels:** When renewable fuels are not available, are company vehicles ever filled with a blend of renewable/conventional fuels? (for example, do you ever mix biodiesel with conventional diesel)

- At public charging stations, which billing method(s) have you/your company 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/your company 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 or renewable fuels 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 fueling stations for ZEVs, and for other renewable fuel dispensers.

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, hydrogen dispensing and renewable fuels dispensing?

- Were you aware these requirements specific to electric vehicles, hydrogen dispensers and renewable fuels are in development prior to this interview?

- What is your general reaction to the development of these requirements? (support / oppose / inevitable / other?)

- How concerned are you, if at all, about the accuracy of EV chargers / Hydrogen dispensers/ Renewable fuels dispensers?
  - PROBE: Why, what aspects, what should be done?
  - PROBE: Are the new regulations likely to affect consumer/market confidence in EV charging / hydrogen dispensing / renewable fuels 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, renewable fuels), 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 <u>public EV charging stations, hydrogen dispensers</u> and renewable fuels 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 or renewable stations in the Canadian marketplace and your confidence in their level of accuracy.

**END OF FLEET OWNER INTERVIEW**

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

- To begin, can you let me know the name of your organization and its relation to the clean fuel sector?

- What type(s) of electric vehicle chargers, hydrogen dispensers or renewable fueling dispensers does your business provide? (note all that apply, ask how many for each mention)
    - Level I (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
    - Other, please specify_____

- How happy are you with the charging / dispensing / fueling 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 or renewable fueling? 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 or renewable fuels 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 fueling stations for ZEVs and for other renewable fuel dispensers.

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 and renewable fuels dispensing?

- Were you aware these requirements specific to electric vehicles, hydrogen dispensers and renewable fuels are in development prior to this interview?

- What is your general reaction to these requirements? (support / oppose / inevitable / other?)

- How concerned are you, if at all, about the accuracy of EV chargers/hydrogen dispensers / renewable fuels dispensers?
  - PROBE: Why, what aspects, what should be done?
  - PROBE: Are the new regulations likely to affect consumer/market confidence in EV charging / hydrogen dispensing / renewable fuels 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, renewable fuels), 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 and renewable fuels 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, hydrogen, hydrogen or renewable fueling stations in the Canadian marketplace and your confidence in their level of accuracy.

**END OF SERVICE PROVIDER INTERVIEW**

**C. Manufacturers (30 minutes)**

- To begin, can you let me know the name of your organization and its relation to the clean fuel sector?

Measurement Canada is developing measurement accuracy and performance requirements for electric vehicle charging and hydrogen fueling stations for ZEVs and for other renewable fuel dispensers.

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 and renewable fuels dispensing?

- Were you aware these requirements specific to electric vehicles, hydrogen dispensers and renewable fuels are in development prior to this interview?

- What is your general reaction to these requirements? (support / oppose / inevitable / other?)

- How concerned are you, if at all, about the accuracy of EV chargers/hydrogen dispensers / renewable fuels dispensers?
    - PROBE: Why, what aspects, what should be done?
    - PROBE: Are the new regulations likely to affect consumer/market confidence in EV charging / hydrogen dispensing / renewable fuels 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, renewable fuels), 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 <u>public EV charging stations or hydrogen dispensers</u> and renewable fuels 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, hydrogen or renewable fueling stations in the Canadian marketplace and your confidence in their level of accuracy.

**END OF MANUFACTURING INTEVRIEW**

**D. Investors (30 minutes)**

- To begin, can you let me know the name of your organization and its relation to the clean fuel sector?
- Do you have any interest or investments in the EV charging/renewable fuels sector? What aspects?
- Do you consider EVs / EV charging / renewable fuels to be interesting investment opportunities? In what ways? If not, please explain.
- In general, how do you feel about government oversight in these sectors?
- Are there actions government can take to increase investor confidence?

Measurement Canada is developing measurement accuracy and performance requirements for electric vehicle charging and hydrogen fueling stations for ZEVs and for other renewable fuel dispensers.

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 and renewable fuels dispensing?
- Were you aware these requirements specific to electric vehicles, hydrogen dispensers and renewable fuels are in development prior to this interview?
- What is your general reaction to these requirements? (support / oppose / inevitable / other?)
- How concerned are you, if at all, about the accuracy of EV chargers/hydrogen dispensers / renewable fuels dispensers?
    - PROBE: Why, what aspects, what should be done?
    - PROBE: Are the new regulations likely to affect consumer/market confidence in EV charging / hydrogen dispensing / renewable fuels 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 <u>public EV charging stations or hydrogen dispensers or</u> renewable fuels dispensers? (note: increased confidence, no change, reduced confidence).

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|---|---|
| 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, your confidence in their level of accuracy, and/or your interest in investing in the sector.

**END OF INVESTOR INTERVIEW**

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