



Portland General Electric
121 SW Salmon Street · Portland, Ore. 97204

August 10, 2020

Via Electronic Filing

Public Utility Commission of Oregon
Attn: Filing Center
201 High Street, S.E., Suite 100
P.O. Box 1088
Salem, OR 97308-1088

Re: UM 1938 Evaluation of PGE's Transportation Electrification Pilot

Dear Filing Center:

In accordance with PGE's Transportation Electrification (TE) Plan approved by Order No. 18-054 in Docket No. UM 1811 and the TE Pilots Deferral in Docket No. UM 1938, enclosed is the 2019 evaluation of Portland General Electric Company's (PGE's) Transportation Electrification Pilots (i.e. Electric Mass Transit (Tri-Met), Electric Avenue (EA), and Outreach & Education). This evaluation is aimed at addressing the required learnings agreed to by parties in Docket UM 1811 and approved in Order 18-124 as well as the reporting requirements stated in OAR 860-087-0040. The UM 1938 Pilot Deferral also includes cost detail that includes the evaluation.

In providing this first evaluation, we note that there has been no Commission action on PGE's Pilot Deferral originally filed more than two years ago on April 23, 2018 and docketed as UM 1938. Since then, PGE has submitted two reauthorizations of the original deferral application.

The Evaluation

PGE contracted with a third-party evaluator, Opinion Dynamics or ODC, to track progress towards Pilot goals; document implementation successes, challenges and key learnings; and offer recommendations for continuing implementation. ODC's 2019 evaluation report is enclosed.

Importantly, this is the first of multiple evaluation reports that will be produced, and the report appendix lists evaluation activities planned in 2020 through 2023 (some 2020 activities may be revised in response to the COVID-19 pandemic). In particular, the 2020 report will include ODC's first analyses of TriMet and EA charger utilization and load impacts. These analyses were not conducted in 2019 to allow for completion of all six EAs and stabilization of TriMet electric bus services in 2020.

Some of the key findings from Opinion Dynamics' 2019 evaluation include:

Electric Mass Transit:

- Over the first year of the Pilot, TriMet, and PGE have learned to work together, and with community partners, to ensure the success of the new bus line. The pilot allowed

stakeholder groups, including local organizations and public safety officials, to learn about working with high voltage charging equipment. The local permitting agency and emergency response agencies developed lines of communication with pilot stakeholders for responding to any potential emergencies involving the equipment. PGE, TriMet, and the charger supplier have worked together to maintain the charging equipment, ensure its reliability, and minimize downtime.

- Early feedback from bus operators and riders has been positive. Operators reportedly enjoy driving the buses and riders were quick to contact TriMet and express dismay when they temporarily removed the buses from their regular line.

The positive pilot experience and reliable charging have given TriMet confidence to expand its electrification efforts. TriMet is planning to electrify another route and purchase more electric buses and chargers and is coordinating with PGE on additional infrastructure needed to support the expansion.

Electric Avenue:

- Partnering with local municipal governments is critical for planning, developing, and marketing successful electric vehicle (EV) charging facilities. Municipal governments are ideal partners in EA projects as they share the same climate action goals, and they can leverage relationships with local organizations for additional outreach resources.
- Although EA chargers received low customer ratings and encountered frequent hardware-related issues during initial deployment, problems and customer complaints over time have decreased due to added customer service resources by PGE's hardware and software partners, as well as improved coordination between all entities. Added resources for PGE's operations and maintenance team may result in further improvement in EA success, including fewer issues and charger downtime.
- Customers have been receptive to the EA Pilot. The initial unveilings of the EA charging facilities were publicized and well-attended events, and, as of October 2019, the network has seen increasing utilization among EV drivers, as documented by PGE and its partners. The team will conduct detailed utilization analysis for all EA sites in 2020.
- Residential customer awareness of PGE's EA locations has increased considerably—33% aware in 2019, up from 13% in 2018.

Outreach & Education:

- Customers exhibit moderate to high levels of familiarity with EVs and plug-in hybrid electric vehicles (PHEVs); however, being “very familiar” with EVs and PHEVs lags significantly behind being “very familiar” with diesel and gasoline vehicles. Marketing for EVs by original equipment manufacturers is minimal compared to non-EVs, suggesting that significant education and outreach activities are needed to increase familiarity.
- Customers are mostly in agreement that EVs and PHEVs are the most environmentally friendly vehicle types available which, along with operational savings, factors heavily into their consideration of these vehicle types.

- There has been considerable change in residential customers' consideration and intention to purchase or lease an EV since 2018. The proportion of customers intending to purchase or lease an EV or PHEV has increased considerably to 24% in 2019, up from 17% in 2018.
- Range is becoming less of a concern to residential customers as battery range improves and the availability of charging increases. Vehicle cost and degree of familiarity, however, continue to be barriers to purchasing or leasing an EV or PHEV.
- Residential customers report receiving information about EVs from a variety of sources, with PGE being an important source of information. About one-fifth (20%) of survey respondents reported seeing at least one PGE EV resource, campaign, or discount. Customers are most aware of EV-related emails from PGE and PGE's EAs.
- Ride-and-drive participants are satisfied with the events, which have been effective in increasing attendees' likelihood of purchasing or leasing EVs in the future, including among Transportation Network Company (TNC) drivers.¹
- Ride-and-drive attendance levels have not met expectations at EA opening events, as noted by PGE staff and pilot partners. Evaluation findings suggest additional outreach and different venues, such as the National Drive Electric Week event, will be needed to increase attendance and attract different types of attendees.
- Nearly all nonresidential technical and education recipients reported having seen or being aware of at least one PGE EV resource, campaign, or discount, primarily PGE's EAs.
- Businesses and builders report high satisfaction with the assistance or education they received from PGE staff, which they also note has been effective in preparing them to install workplace charging, electrify fleets, and build EV-ready homes.
- Early findings suggest that technical assistance provided by PGE staff has been influential in encouraging businesses to install workplace charging.

Evaluation activities included in this report do not cover the full deployment of the Electric Avenues and TriMet Pilots. During 2019, the evaluation team conducted research on the first two Electric Avenue sites (Milwaukie and Hillsboro) and gathered feedback on the initial deployment of the TriMet electric buses and charging infrastructure, which had been in operation for less than one year. The evaluation team provided no recommendations in 2019 because, at the time of the evaluation, pilot implementation had been going well. The 2020 evaluation activities will include additional research on the remaining four Electric Avenue sites, additional interviews with TriMet Pilot partners, and an evaluation of the impact of the pilots on PGE's distribution system. The evaluation team plans to provide recommendation for these two pilots as part of the 2020 Annual Report.

At this time, ODC did not provide recommendations to change the TriMet and EA pilots. PGE is making the following changes to the Education and Outreach pilot in response to findings from the evaluation:

¹ TNC's are companies that share customers' vehicles to provide transportation services (e.g. Lyft or Uber).

ODC Recommendation	Actions
<p>Additional ride-and-drives are needed to increase EV familiarity and should occur at events that attract more people, and more diverse groups of people who are considering an EV. However, during the COVID-19 pandemic, reaching customers with social distanced methods, such as mass marketing, may be the only way to make substantial gains to increase familiarity.</p>	<p>PGE is working with partner organizations to plan a virtual National Drive Electric Week in October 2020. This event will include created virtual content and will be distributed through our various marketing channels along with our partners. We will evaluate our approach depending on customer engagement.</p>
<p>PGE should track EV sales that occur because of participation in ride-and-drive events to better understand the influence of events on customer purchasing decisions.</p>	<p>Through our dealer engagement and outreach initiative launching Q4 2020 we will be better positioned to evaluate the effectiveness of our various outreach and engagement activities.</p>
<p>In future outreach, emphasizing the lower operating costs associated with EVs and the increasing availability of fast charging may be effective in increasing EV consideration.</p>	<p>We are simplifying our EV messaging to focus on four primary benefits of EV ownership, of which Fuel Cost/Operating Cost is a key component. In addition, we are adding a total cost of ownership tool to our PGE webpages which will help to reinforce how inexpensive EV's are to own and operate.</p>

If you have any questions or require further information, please contact Alina Nestjorkina at (503) 464-2144. Please direct all formal correspondence and requests to the following e-mail address pge.opuc.filings@pgn.com.

Sincerely,

/s/ Jaki Ferchland
 Jaki Ferchland
 Manager, Regulatory Affairs

Enclosure
 cc: UM 1811 Service List
 Eric Shierman, OPUC
 UM 1938 Service List



Opinion **Dynamics**

Portland

503 287 9136 tel
503-281-7375 fax

3934 NE MLK Jr. Blvd.
Suite 300
Portland, OR 97212



Evaluation of Portland General Electric's Transportation Electrification Pilot Programs 2019 Annual Report

July 30, 2020



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1. Executive Summary

1.1 Pilot Summary and Evaluation Activities

Portland General Electric (PGE) launched a coordinated set of three pilot programs in late 2018 that encourages greater electrification of the transportation sector. While each pilot program has its specific activities and immediate targets, they work together to bring about several overlapping near-term outcomes including increasing customer awareness and use of electric vehicles (EVs), buses, and charging stations and to lower barriers to adoption of EVs. The following summarizes each pilot's objectives and related evaluation activities conducted by Opinion Dynamics ("the team") in 2019.

Outreach, Education, and Technical Assistance Pilot (OE&TA) Pilot



- **Residential customers:** PGE is providing outreach to potential EV purchasers and lessees via ride-and-drive events and social media, sponsoring interactive educational kiosks at auto dealerships and providing dealer training, and partnering with original equipment manufacturers (OEMs) to offer rebates to PGE customers.
- **Evaluation approach:** Interviews with pilot staff and partners, intercept surveys with ride-and-drive attendees, and surveys with residential customers.



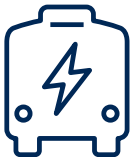
- **Nonresidential customers:** Technical assistance and education to customers interested in fleet electrification or workplace charging and EV-ready home education to individuals involved in the home building industry.
- **Evaluation approach:** Interviews with pilot staff and partners and surveys with recipients of technical assistance consultations and PGE-sponsored education.

Electric Avenue (EA) Pilot



- PGE is installing six EA charging sites geographically dispersed throughout its service territory.
- **Evaluation approach:** Interviews with pilot staff and partners and surveys with residential customers.

Electric Mass Transit 2.0 (TriMet) Pilot



- PGE installed and owns two bus depot charging stations (150kW each) and one en-route charging station (450kW), while TriMet procured five electric buses with 200 kWh batteries.
- **Evaluation approach:** Interviews with pilot staff and partners.

1.2 Key Findings

The following section provides key evaluation findings, by pilot. **Evaluation activities will continue through 2023 which will allow the team to monitor and expand on these findings, in particular with the EA and TriMet Pilots, as operations stabilize, and load impacts are assessed (See Appendix A for summary of future evaluation activities – note some scheduled 2020 evaluation activities may be moved to 2021 due to COVID-19).**

Outreach, Education, and Technical Assistance (OE&TA) Pilot

- **Residential Customer Awareness and Consideration of EVs**
 - Customers exhibit moderate to high levels of familiarity with EVs and plug-in hybrid electric vehicles (PHEVs), however, being “very familiar” with EVs and PHEVs lags significantly behind being “very familiar” with diesel and gasoline vehicles. Customers are mostly in agreement that EVs and PHEVs are the most environmentally friendly vehicle types available which, along with operational savings, factors heavily into their consideration of these vehicle types.
 - There has been considerable change in residential customers consideration and intention to purchase or lease an EV since 2018. The proportion of customers intending to purchase or lease an EV or PHEV has increased considerably to 24% in 2019, up from 17% in 2018. The change is largely due to a significant decrease in the proportion of customers who are considering an EV or PHEV for their next vehicle (i.e., customers are more confident in their plans to purchase/lease an EV or PHEV).
 - Range is becoming less of a concern to residential customers as battery range improves and the availability of charging increases. Vehicle cost and degree of familiarity, however, continue to be barriers to purchasing or leasing an EV or PHEV.
- **Customer Awareness of PGE’s Outreach and Education efforts**
 - Residential customers report receiving information about EVs from a variety of sources, with PGE being an important source of information. About one-fifth (20%) of survey respondents reported seeing at least one PGE EV resource, campaign, or discount. Customers are most aware of EV-related emails from PGE and PGE’s EAs.
 - Nearly all nonresidential technical and education recipients reported having seen or being aware of at least one PGE EV resource, campaign, or discount, primarily PGE’s EAs.
- **Ride-and-Drive Events**
 - Ride-and-drive participants are satisfied with the events, which have been effective in increasing attendees’ likelihood of purchasing or leasing EVs in the future, including among Transportation Network Company (TNC) drivers.
 - Ride-and-drive attendance levels have not met expectations at Electric Avenue opening events, as noted by PGE staff and pilot partners. Evaluation findings suggest additional outreach and different venues, such as the National Drive Electric Week event, will be needed to increase attendance and attract different types of attendees.
- **Technical Assistance and Education for Business and Builders**
 - Businesses and builders report high satisfaction with the assistance or education they received from PGE staff, which they also note has been effective in preparing them to install workplace charging, electrify fleets, and build EV-ready homes.
 - Early findings suggest that technical assistance provided by PGE staff has been influential in encouraging businesses to install workplace charging.

Electric Avenue (EA) Pilot

- Partnering with local municipal governments is critical for planning, developing, and marketing successful EV charging facilities, as was apparent in the EA Pilot. Municipal governments are ideal partners in EA projects as they share the same climate action goals and they can leverage relationships with local organizations for additional outreach resources.
- Although EA chargers received low customer ratings and encountered frequent hardware-related issues during initial deployment, problems and customer complaints over time have decreased due to added customer service resources through PGE's hardware and software partners, as well as improved coordination between all entities. Added resources for PGE's operations and maintenance team may result in further improvement in EA success: fewer issues and charger downtime.
- Customers have been receptive to the EA Pilot. The initial unveilings of the EA charging facilities were publicized and well-attended events, and as of October 2019, the network has seen increasing utilization among EV drivers, as documented by PGE and its partners. The team will conduct detailed utilization analyses for all EA sites in 2020.
- Residential customer awareness of PGE's EA locations has increased considerably – 33% aware in 2019, up from 13% in 2018.

Electric Mass Transit 2.0 (TriMet) Pilot

- Over the first year of the Transit Pilot, TriMet and PGE have learned to work together and with community partners to ensure the success of the new bus line. The pilot allowed stakeholder groups, including local organizations and public safety officials, to learn about working with high voltage charging equipment. The local permitting agency and emergency response agencies developed lines of communication with Pilot stakeholders for responding to any emergencies involving the equipment. At the same time, PGE, TriMet, and the charger supplier have worked together to maintain the charging equipment, ensure its reliability, and minimize downtime.
- Early feedback from bus operators and riders has been positive. Operators reportedly enjoy driving the buses and riders were quick to contact TriMet and express dismay when they temporarily removed the buses from their regular line.
- The positive Pilot experience and reliable charging have given TriMet confidence to expand its electrification efforts. TriMet is planning to electrify another route and purchase more electric buses and chargers and is coordinating with PGE on additional infrastructure needs to support the expansion.

1.3 Conclusions and Recommendations

The team offers a conclusion about each of the pilots and recommendations for enhancing the OE&TA efforts. Note that evaluation activities included in this report do not cover the full deployment of the EA and TriMet Pilots. During 2019, the team conducted research on the first two EA sites (Milwaukie and Hillsboro) and gathered feedback on the initial deployment of the TriMet electric buses and charging infrastructure, which had been in operation for less than one year. The team provides no recommendations for the two pilots because, at the time of the evaluation, pilot implementation had been going well. The 2020 evaluation activities will include research on the remaining four EA sites, additional interviews with TriMet Pilot partners, and an evaluation of the impact of the pilots on PGE's distribution system. The team plans to provide recommendations for the two pilots as part of the 2020 Annual Report.

- **Conclusion 1:** PGE outreach efforts are important because marketing for EVs by OEMs is minimal compared to non-EVs. Further, while overall awareness EVs is moderate to high, the lower proportion of

customers who are very familiar with EVs compared to diesel and gasoline vehicles, suggests that significant education and outreach activities are needed to increase familiarity. PGE's marketing efforts to date, however, have not demonstrated large effects.

- **Recommendation 1:** Additional ride-and-drives are needed to increase EV familiarity and should occur at events that attract more people, and more diverse groups of people who are considering an EV. Given the challenges during the COVID-19 pandemic, however, reaching customers with social distanced methods such as mass marketing may be the only way to make substantial gains to increase familiarity. If possible, PGE and their implementers should track EV sales that occur because of participation in ride-and-drive events to better understand the influence of events on customer purchasing decisions.
- **Recommendation 2:** More targeted marketing and outreach events will be required to reach larger numbers of customers, increase EV familiarity, and shift more customers into the considerers category. Emphasizing the lower operating costs associated with EVs and the increasing availability of fast charging may be effective in increasing EV consideration.
- **Conclusion 2:** The process of implementing and maintaining PGE's new EA sites has been a learning process for PGE. Interviews with PGE staff and pilot partners suggest that EA sites currently coming online will experience fewer issues.
- **Conclusion 3:** The partnership with TriMet on the Electric Mass Transit Pilot has been a valuable learning experience and is paving the way for PGE to work more effectively with other transit agencies.

2. Introduction

2.1 Transportation Electrification Pilot Background

PGE launched a coordinated set of pilot programs in late 2018 that encourages greater electrification of the transportation sector. While each pilot program has its specific activities and immediate targets (Table 1), they work together to bring about several overlapping near-term outcomes. PGE customers will see and use EVs, buses, and charging stations, helping to lower barriers to the adoption of EVs. Multifamily and low-income customers will have better access to EV transportation. Furthermore, businesses and the construction trades will receive technical assistance and education that will improve their ability to support an EV-ready infrastructure and encourage adoption of EV fleets.

Table 1. Description of PGE’s Pilot Activities and Outcomes

Outreach, Education, and Technical Assistance Pilot (OE&TA)
<p>This pilot relies on the following strategies to increase the adoption of EVs in PGE’s territory:</p> <ul style="list-style-type: none"> ▪ EV technical assistance to commercial and industrial customers, non-profits, transit agencies and providers, low-income service providers, and community-based organizations (CBOs) that are considering fleet electrification, workplace charging, or procurement of EVs. ▪ Specialized educational sessions to builders, architects, electricians, facility managers, building managers, workplace sustainability managers, and other relevant industry groups. ▪ EV ride-and-drive events. ▪ Educational kiosks and education of auto dealer staff on a proprietary EV charger labeling system and mobile application for EV drivers who reside in PGE territory. ▪ Partnerships with OEMs (BMW, Chevrolet, and Nissan) to offer combined PGE and OEM incentives for an EV to PGE customers (referred to as “bulk purchase partnerships”). ▪ Partnerships with TNCs to educate drivers about the benefits of driving EVs and increase EV utilization through discounted charging initiatives.
Electric Avenue Pilot
<p>PGE is installing six EA charging sites geographically dispersed throughout its service territory. The pilot will test pricing signals to encourage off-peak charging and charging when excess renewable energy is available. The pilot will also examine the impact of community charging on increasing adoption of EVs by TNCs.</p>
Electric Mass Transit 2.0 (“TriMet”) Pilot
<p>PGE installed and owns two bus depot charging stations (150 kW each) and one en-route charging station (450 kW), while TriMet procured five electric buses with 200 kWh batteries. The pilot will gather bus charging data from the stations to assess the energy and cost impacts of electrifying an entire bus route over time as well as operations impacts to TriMet. PGE will also work with other mass transit agencies in the region to help electrify additional bus routes.</p>

The end of pilot activities will be staggered, with the EA Pilot ending in 2020 and the OE&TA Pilot in 2022. The TriMet portion of the Electric Mass Transit Pilot will end in 2020, with remaining pilot activities ending in 2026.¹

2.1.1 Pilot Accomplishments

The following provides a summary of accomplishments during the first year of pilot activities (2018-2019) and planned activities for 2020, by pilot.

Outreach, Education, and Technical Assistance Pilot

¹ Portland General Electric, Transportation Electrification Plan, filed March 2017.

Since the beginning of the OE&TA Pilot in late 2018, PGE has conducted several outreach and education activities, including:

- **Installing EV educational kiosks:** Chevrolet dealership (December 2018), a pre-owned EV dealership (June 2019), and a BMW dealership (July 2019).
- **Partnering to offer financial incentives for EVs and chargers to PGE customers:** a \$3,500 rebate on the Nissan Leaf (87 rebates issued in 2019), and a \$500 rebate on the Chevrolet Bolt or a free Level 2 home charger at a Chevrolet dealership (12 Chevrolet Bolt rebates issued in 2019), and providing \$5,000 in a raffle towards an EV for National Drive Electric Week.
- **Sponsoring several Ride-and-Drive events:** Portland International Auto Show (January 2019), at a Chevrolet dealership (February 2019), EA grand openings (April, May, and October 2019), The Electric Car Guest Drive (June 2019), National Drive Electric Week (September 2019), and for drivers of a TNC company (November 2019).
- **Business technical assistance:** PGE staff provided workplace charging and fleet electrification technical assistance to commercial, industrial, non-profit organizations as well as local governments and transit authorities. In total, 89 individuals consulted with PGE staff since September 2018 (34 in 2018 and 89 in 2019), representing 60 local organizations (18 in 2018 and 42 in 2019).
- **Educational events webinars, classes, and conference sessions:** Two educational events co-sponsored by a builder training implementor for those interested in building EV-ready homes, two workplace charging webinars, two fleet electrification classes, an electrifying school transportation session at the 2018 Oregon Pupil Transportation Conference, and a workplace charging session at the 2019 Northwest Facilities Expo. In total, 92 individuals attended an educational events, webinar, or class since May 2018.
- **Social media activity:** A total of 330 posts on Twitter, Facebook, and Instagram since 2018 (97 in 2018 and 233 in 2019) resulting in 3,435 engagements (830 “likes”, comments, and shares in 2018 and 2,605 in 2019) and a reach of 2.2 million (394,000 in 2018 and 1.8 million in 2019).

Electric Avenue Pilot

In 2019, PGE opened three of the six planned EA sites. These openings included the EA in Downtown Milwaukee (April 2019), the EA at Sunset Esplanade in Hillsboro (May 2019), and the EA at Eastport Plaza in East Portland (October 2019). PGE will open three additional EAs in 2020, one in Wilsonville, one in Beaverton, and one in Salem.

Electric Mass Transit 2.0 (TriMet) Pilot

TriMet and PGE completed the installation and commissioning of two 150 kW Merlo Garage chargers and one 450 kW overhead fast charger at Sunset Transit center in early 2019. An electric bus manufacturer delivered the first of five electric buses in April 2019. As of October 2019, all five buses on Line 62 had been delivered and are currently in service.

2.2 Evaluation Objectives

This evaluation is the first of a five-year evaluation that covers pilot activities that began in late 2018 and continued through December 2019. There are three primary objectives for the evaluation:

- Understand how PGE can improve its program implementation during and after the pilots;
- Quantify the impacts of the pilots on EV awareness, sales, use and barriers; and

- Determine the load impacts of public chargers and electric bus chargers.

This report primarily documents the first and second objectives above for the first year of pilot activities. Determining the load impacts of public and electric bus chargers will be explored as part of 2020 evaluation activities. Appendix A provides a summary of planned evaluation activities for the remainder of the pilot.

2.3 Research Approach and Evaluation Activities

The team uses an integrated research approach across the pilots to capture primary data to inform research objectives where feasible. The team leverages a series of primary data collection activities that cover research objectives outlined in the report and will conduct subsequent research efforts to augment these findings and address load impacts. The team will build on that understanding with interviews and surveys.

Just as the pilot programs have overlapping objectives, some research activities will generate data that provide insights on multiple pilots. For example, the same survey of PGE residential customers will assess the effectiveness of outreach and education activities as well as customers' awareness of and experiences with EAs. The team will conduct additional intercept surveys of EV drivers both at the charging stations (starting in 2021) and at ride-and-drive events (currently in progress). These activities will provide information relating to all three pilots.

Other research activities primarily target a single pilot program. The team will conduct focus groups in 2021 with owners and managers of multi-family buildings to assess the effects of the EA Pilot on the multi-family sector. GIS mapping of EV owners and lessees, in combination with survey data, will shed light on the EA Pilot's influence on purchase/lease decisions, including among multi-family residents. Interviews with technical assistance and education recipients will primarily inform the evaluation of the OE&TA Pilot, as will time-series analysis of EV registration data.

The team conducted five research activities in 2019, outlined below, to address the research questions. Data collection activities covered in the report began in January 2019 and ended in November 2019.

2.3.1 Logic Modeling

The team worked closely with the program staff to prepare logic models for each of the pilots. These logic models provide a graphical representation of the theory that led program designers to choose specific activities to achieve outputs and to elicit behavior change outcomes such as increased EV adoption. Logic modeling was an iterative process that involved four activities:

- **Program staff in-depth interviews:** The team reviewed program documentation to help draft questions for program staff interview guides. The team also asked program staff to prepare a brief program theory description before interviews to facilitate discussion.
- **Interactive meetings:** Building on the interviews, the team led each pilot team in an interactive meeting to populate and identify the logical connections between activities, outputs of the activities, and intended outcomes and behavioral changes. During the meeting, the team reviewed staff's proposed key performance indicators (KPIs) and progress indicators (PIs) for relevance, evaluability, and logical relationship to the activities, outputs, and outcomes.
- **Update program theories, logic models, KPIs, and PIs:** After the meetings, the team updated the program theories, logic models, and KPIs/PIs based on the meeting discussions and sought input from program staff on additional refinements. During this process, the team scheduled a one-hour over-the-phone meeting with each team to walk through the revised materials
- **Finalize logic models:** After receiving PGE's feedback, the team finalized the documents by confirming that the logic models accurately depicted the pilot program theories, and that the KPIs/PIs were

relevant, sufficient, and evaluable. The team then transferred the logic models to relevant PGE staff for ownership and future updating.

The team used the logic models to develop data collection instruments and to guide the reporting of program metrics. In 2020, the team may suggest adjustments to the program theory and logic models based on findings from the evaluation and will communicate proposed changes to PGE as part of the Second Year Annual Report.

2.3.2 PGE Program Staff and Pilot Partner Interviews

The team conducted the first of two rounds of PGE program staff and pilot partner in-depth interviews in 2019. The purpose of the interviews was to document successes and challenges associated with the three pilots after the first year of program activities. The team used feedback from program staff when developing the pilot logic models. During the first round of interviews, the team interviewed 12 program staff and 14 pilot partners (Table 2). The team will conduct a second wave of interviews in 2020 to document the second year of activities and their success and challenges.

Table 2. Count of 2019 Program Staff and Pilot Partner Interviews Conducted

Pilot	Program Staff	Pilot Partners	Total
OE&TA	4	7	11
Electric Avenue	4	4	8
TriMet	4	3	7
Total	12	14	26

2.3.3 Ride-and-Drive Intercept Surveys

In 2019, the team conducted Ride-and-Drive intercept surveys at two ride-and-drive events: 1) at the Milwaukie EA grand opening event in April 2019, and 2) at a rideshare community event and information session in Downtown Portland sponsored by PGE’s ride-and-drive implementer and a TNC company in November 2019. The April event targeted general public drivers, and the November event targeted TNC drivers. The team will conduct one additional round of Ride-and-Drive intercept surveys in 2021. The key objectives of the surveys are to understand:

- How attendees heard of the Ride-and-Drive event and reasons for attending;
- Satisfaction with the event and the EV they test drove;
- Consideration and intention to purchase or lease an EV in the near future;
- Attendee exposure to other PGE outreach and education campaigns or resources; and
- Characteristics of those attending (income, location, and experience with an EV).

The team attempted to survey all individuals who test drove an EV at each event. The team completed 15 surveys at the April event and 24 surveys at the November event (Table 3). Although the sample is small, it does account for most individuals who test drove vehicles at the events and is thus reflective of the Ride-and-Drive populations.

Table 3. Summary of Ride-and-Drive Participants and Dispositions

Disposition	April 2019 Count	November 2019 Count
Approximant number of attendees ^a	100	47
Number of individuals who test drove a vehicle	18	30

Disposition	April 2019 Count	November 2019 Count
Screen-outs ^b	2	0
Refusals	1	2
Completed surveys with those who test drove a vehicle	15	24

^a Number of attendees is a rough estimate provided by PGE staff.

^b The team, in collaboration with PGE Evaluation, Measurement and Verification (EM&V) staff, decided to screen out any PGE or City employees.

In addition to the two ride-and-drive surveys conducted by Opinion Dynamics, PGE staff conducted a brief survey at the National Drive Electric Week event in September 2019. The event drew about 400 attendees, of which about 100 drivers completed 200 test drives. Seventy-nine event attendees who participated in a ride-and-drive completed the brief survey.

2.3.4 Business Technical Assistance and Builder Education Survey

The team implemented an online survey with businesses who received individualized technical assistance, attended PGE-sponsored sessions on workplace charging or fleet electrification, or who attended PGE-sponsored builder education sessions (conducted by a third-party implementer) on EV-ready homes. The survey explored several key research questions, including:

- Experience and satisfaction with the technical assistance received or education.
- How understanding of charger siting, maintenance, and costs changed as a result of receiving technical assistance or education.
- If the technical assistance and education resulted in additional charger installations, EV fleet purchases, or building of EV-ready homes.
- The influence the technical assistance or education had on installations, purchases, charger installations, EV fleet purchases, or building of EV-ready homes.

In the first wave, 25 organizations completed the survey, including 14 who received technical assistance from PGE staff, nine who attended an educational session, and two who attended a workplace charging or fleet session at a conference (Table 4). In 2020, the team will field two additional waves of the survey to those who received a consultation or who attended sessions on workplace charging or fleet electrification. The team will also field three waves of follow-up surveys to businesses who received technical assistance or attended workplace charging or fleet electrification sessions and who responded to the preceding survey wave beginning in 2020, to see if and how they are progressing towards electrification.

Table 4. Business Technical Assistance and Builder Education Survey Dispositions

Interaction Type	Number of Attendees Invited	Number of Surveys Completed
Business Technical assistance consultations	75	14
Builder EV-ready home education	53	9
Electrifying School Transportation Conference Session	2	1
Making the Business Case for Workplace Charging Webinar	2	1
Total	152	25

Respondents represent a variety of organizations, including cities, non-profits, apartments, a school district and businesses including a car manufacturer, construction companies, designing and architectural business, and trucking companies.

2.3.5 Post-pilot Launch General Population Residential Survey

In 2018, PGE conducted a baseline survey with the general population of residential customers who indicated they were considering purchasing a vehicle in the next five years to assess EV awareness and perceptions in the PGE territory. The team adapted the 2018 Baseline survey to create a post-pilot launch survey. There will be three general population survey waves conducted as part of the pilot; the first conducted in 2019 (“Wave 1”) and summarized below, the second in 2020 (“Wave 2”), and the third in 2022 (“Wave 3”). In addition to the general population, the Wave 2 and Wave 3 surveys will include a supplemental list of probable EV owners in PGE’s territory.² For the 2018 Baseline survey, a random sample of PGE residential customers with email addresses was invited to take the web-based survey via email invitation. Customers who completed the survey were entered into a drawing to win one of six gift cards (one \$500 and five \$100). The team conducted the Wave 1 survey using the same methodology as used for the Baseline survey.

Both the baseline and Wave 1 surveys contained a set of questions designed to screen customers who were under the age of 18, those that may have a conflict of interest (employed in an industry environmental, marketing, media, utility or automotive industry), those not involved in the decision making for purchasing a vehicle, and those who were not planning to purchase a vehicle in the next five years. The team asked any respondents who met any of the above criteria to supply demographic information and exit from the survey. The survey included questions about pilot awareness, consideration of purchase, and intention to purchase or lease an EV or PHEV as well as questions explicitly addressing the pilot activities, such as if customers are familiar with any pilot campaigns.

Table 5 provides a disposition summary of completed surveys for the Baseline and Wave 1 general population surveys. Overall, 929 (54%) of baseline and 1,026 (59%) of Wave 1 survey respondents reported planning to purchase a vehicle in the next five years and completed the survey. Chapter 6 provides a summary of findings from Wave 1 respondents and provides an overall comparison to Baseline survey respondents. A detailed discussion of the survey sampling and survey weighting approach is found in Appendix E.

Table 5. Disposition Summary of Baseline and Wave 1 Surveys

Disposition	Baseline (2018)		Wave 1 (2019)	
	Count	Percent	Count	Percent
Total Completed Screening Questions	1,736	100%	1,752	100%
Total Screened Out	763	44%	648	37%
Likely vehicle purchasers within the next five years	929	54%	1,026	59%
EV Owners ^a	44	3%	78	4%
Overall Response Rate	8%		11%	

^a The team excluded EV or PHEV owners from the Wave 1 survey analysis in this report. The team will include these respondents in the 2020 analysis for EV owners.

3. OPUC Learnings

PGE provides the Oregon Public Utilities Commission (OPUC) with learnings associated with each pilot as part of the effort to monitor the progress of the pilots.³ Table 6 through Table 8 provide findings associated with

² The Wave 1 survey contained a series of questions for EV owners. A total of 78 survey respondents indicated they owned an EV or PHEV and completed the EV owner questions. These respondents, however, are excluded from the findings presented in this report due to small sample sizes. The team will combine these respondents with the 2020 EV owner survey oversample respondents. The team will also look to see how responses between each survey wave change over time.

³ Report on Finalized Learnings for PGE’s Transportation Electrification Programs (2018): <https://apps.puc.state.or.us/orders/2018ords/18-124.pdf>

the OPUC learnings by pilot. Data collection activities related to some OPUC learnings are in progress or have not yet been initiated. The team labeled these learnings as to be determined (TBD) in the tables below.

3.1.1 Outreach, Education, and Technical Assistance Pilot

Table 6. Outreach, Education, and Technical Assistance Pilot OPUC Learnings Key Findings

OPUC Learning	Key Findings
1.The impact of outreach efforts (e.g., ride-and-drive events, education) and marketing (e.g., ads), if available, on:	<ul style="list-style-type: none"> ▪ Consumer requests for ride-and-drive events have been increasing ▪ Ride-and-drive events at dealerships have been of mixed success and could be improved with additional support from PGE ▪ Partnerships with dealerships may lead to future ride-and-drive events, but so far, the partnerships' effectiveness at promoting ride-and-drive events has been mixed ▪ The partnership between the ride-and-drive implementer and PGE can be leveraged further to increase attendance at ride-and-drive events in the future
1a. PGE customer awareness of EVs in the service area as measured through PGE customer surveys, focus groups, one-on-one interviews, program data, etc.;	<ul style="list-style-type: none"> ▪ About three-quarters of customers report being familiar with EVs (73%) or PHEVs (78%)
1b. The consideration of an EV for new car shoppers; and	<ul style="list-style-type: none"> ▪ Dealers say that EV educational kiosks help to explain EVs to new-car shoppers and alleviate their concerns regarding range and where and how to charge ▪ Among likely vehicle purchasers, about half report they are either considering (25%) or intending (24%) to purchase an EV or PHEV in the next five years.
1c. Overall sales and leases of EVs in the service area as measured through the evaluation of recent EV purchasers/lessees.	TBD
2. The impact of technical assistance programs and marketing on the installation of workplace EV chargers.	First survey with small sample suggests technical assistance from PGE was influential in decision to install workplace charging (6 of 8 respondents indicated PGE's technical assistance was highly influential); more surveys to be conducted.
2a. Number of recipients of technical assistance that result in charger installations.	About three-quarters (8 of 11) of technical assistance recipients who provide on-site parking have installed chargers or outlets for charging since receiving assistance.
3. The change to participation rates in TOU rate schedules by EV owners.	TBD
4. The change in EV charging load characteristics, influenced by education efforts.	TBD
5. The major challenges business customers face when planning for and siting EV charging infrastructure.	Business customers noted a variety of challenges including the installation taking more time to complete than expected, stations not working as intended, the project going over budget, permitting taking longer than expected, and the stations still not functioning properly

OPUC Learning	Key Findings
5a. Evaluate the efficacy of outreach effort including challenges; and	TBD
5b. Adjustments to outreach efforts to increase effectiveness and response to barriers.	TBD
6. Gather data on customer awareness of EVs and their exposure to PGE's EV marketing campaigns.	<ul style="list-style-type: none"> ▪ Consumer requests for ride-and-drive events have been increasing ▪ One-fifth (20%) of likely vehicle purchasers indicated seeing at least one PGE EV resources, campaign, or discount.
7. Develop and implement a plan to gather sample information from a variety of populations in PGE's service territory, including those listed below:	Evaluation meets this requirement
7a. General sample of PGE customers;	Evaluation meets this requirement
7b. Recent EV purchasers;	Evaluation meets this requirement
7c. Recent technical assistance customers;	Evaluation meets this requirement
7d. Recent non-EV purchasers;	Evaluation meets this requirement
7e. Trade allies (e.g., dealers, manufacturers); and	Evaluation meets this requirement
7f. Key stakeholders (e.g., ride-and-drive implementer, transportation authorities, program staff).	Evaluation meets this requirement

3.1.2 Electric Avenue Pilot

Table 7. Electric Avenue Pilot OPUC Learnings Key Findings

OPUC Learning	Key Findings
1. Effect of EV charging on PGE's system to determine how EVs can be used to create a system benefit	TBD
2. The impact of the presence of visible, reliable, and accessible charging infrastructure on:	TBD
2a. Customers' willingness to purchase an EV; and	TBD
2b. Customers' willingness to take longer trips in an EV.	TBD
3. The extent possible, learning who the predominant users of the charging infrastructure are:	TBD
3a. Whether there are distinct use cases with predictable load profiles;	TBD
3b. Whether the chargers are regularly utilized by non-PGE customers; and	PGE and site hosts expect a diverse group of customers to use the EA sites, including PacifiCorp customers and tourists. Customer response TBD via intercept surveys.
3c. If possible, use by and effects of TNCs.	PGE has used EAs as a tool to engage the TNC community by partnering with a TNC company to provide its drivers with subsidized monthly EA charging subscriptions (paid for by the TNC company). Future results forthcoming.
4. Utilization and/or demand for quick chargers versus Level 2 chargers, including the time of day and pricing information.	The EA site hosts anticipate downtown commuters will use the quick chargers to support their commute to work; local residents may use the L2 chargers when visiting the community for lengthier visits, such as for shopping. Customer response TBD

OPUC Learning	Key Findings
5. To the extent possible, learning who is not using the charging infrastructure and why?	TBD
6. Network load profiles and the impacts on PGE's distribution system, including coincident and noncoincident peak loads of DC fast chargers and power quality in the vicinity of the chargers.	TBD
6a. Gathering of information to assist with analysis of impacts to PGE' s system, including how many users are charging off-peak and how that affects the system.	TBD
7. A comparison of customer use of charging infrastructure under time-variant rates versus free charging.	TBD
7a. Gathering of information to assist with analysis of whether price signals change charging behavior and why or why not.	TBD
8. Impact of, and customer interest in, unlimited monthly charging versus other pricing options (e.g., single use, who uses, behavior),	The current EA pricing structure, including the unlimited monthly price plan option, has been well-received by EV drivers, according to PGE staff. EA utilization by time will be assessed in 2020. Customer response TBD
9. The additional PGE infrastructure, if any, needed to support and ensure highly reliable public charging infrastructure (and applicable costs).	Additional resources for the PGE EA operations and maintenance team would help them effectively operate the EA network to ensure infrastructure is operable and reliable: <ul style="list-style-type: none"> ▪ Dedicated EV/PHEVs used for troubleshooting ▪ Storeroom to store charger equipment

3.1.3 Electric Mass Transit 2.0 (TriMet) Pilot

Table 8. Electric Mass Transit 2.0 (TriMet) Pilot OPUC Learnings Key Findings

OPUC Learning	Key Findings
1. Pilot design elements, including an exploration of:	
1a. Program Implementation (Pricing and Suppliers)	<ul style="list-style-type: none"> ▪ An electric bus manufacturer supplied five buses to TriMet for \$930,000 each (including warranties and upfitting). ▪ A transit charging vendor supplied the charging systems for a total cost of \$789,000 for equipment. ▪ TriMet estimated the total make-ready cost (installation, engineering, design, and permits) for both charging systems was \$787,670.
1b. PGE physical infrastructure and cost (line extension, line drop, and distribution equipment requirements)	<ul style="list-style-type: none"> ▪ At Merlo Garage, transformer pads and primary power connections were designed to ensure larger transformers and additional secondary runs could be accommodated in the future. ▪ The Sunset Transit Center has capacity for a second 450kW charger.
1c. Customer service and technical assistance needs	<ul style="list-style-type: none"> ▪ TriMet trained its drivers on bus operation and charging and trained its dispatchers so their advice to operators matched their bus.

OPUC Learning	Key Findings
	<ul style="list-style-type: none"> ▪ PGE and TriMet determined the scope of O&M to include routine maintenance, emergency repair, having spare parts on site, and monitoring services. ▪ PGE monitors charger operation and informs TriMet and, if needed, the charging vendor of any problems.
2. Actual impacts of bus charging load on system infrastructure	TBD
2a. Additional infrastructure and cost, if any, needed to support and ensure reliable bus charging infrastructure.	No feeder or substation upgrades were required for the Merlo Garage/Sunset Transit Center chargers.
3. Actual impacts of bus charging load on the distribution system loading	TBD
3a. Total load and non-coincident peak load compared to feeder loading.	TBD
3b. Coincident peak demand, summer and winter of combined depot chargers.	TBD
4. Actual impacts to the bus fleet and fleet facility, of which TriMet will provide some information.	<ul style="list-style-type: none"> ▪ In 2019 all buses had mechanical and electronic-related performance issues impacting reliability and availability. ▪ Some bus components wore down quicker than expected, such as the bus suspension system and tires, due to the extra weight of the batteries and charging system components.
4a. How does the integration of chargers impact the internal logistics of route planning? (Benefits and costs to operations).	TBD
4b. How does their optimal schedule for charging align with system load?	TBD
4c. How flexible is their charging need such that it could better align with system loading?	First-year found there is little flexibility to shift buses charging at Sunset Transit Center to off-peak times. Merlo depot chargers are used primarily during the overnight, off-peak times to replenish batteries to full.
4d. TriMet staff feedback on operations and charging compared to existing fleet resources.	Operators enjoyed the buses because of their performance and quietness.
4e. Total combined costs from PGE and TriMet, including charging infrastructure installation, operation, and maintenance costs.	See 1a above for charging and infrastructure costs.
5. PGE's initial deployment with TriMet will include TOU rates with demand charges (through Schedule 85-P). PGE intends to study the system impacts on peak days, evaluate the bus charging use case, and assess the customer's needs.	TBD

4. Logic Modeling

PGE intends to use the logic models to guide the ongoing implementation of the pilots. The evaluation team facilitated the development of the logic models both as a process to train PGE staff in how to develop logic models and to provide final drafts for PGE staff to use. The team described the methodology above. In this section the team presents the final program theory for each pilot. The program theory provides the basis for

the evaluation and the assessment of pilot progress and effectiveness. The team provides the final program theory and logic model diagram and associated KPIs in Appendix B.

4.1 Outreach, Education, and Technical Assistance Pilot

There are separate OE&TA program theory and logic models for the non-residential and residential sectors.

4.1.1 The Non-Residential Sector Program Theory

PGE's OE&TA Pilot aims to increase non-residential customer awareness of charging options and awareness and consideration of EVs. PGE will offer education and custom technical assistance on charging options and fleet electrification. These activities will increase knowledge of EV charging options and awareness of EV options for fleets (including public transit) among businesses, municipal and institutional customers. In addition, homebuilders will get information on building EV-ready homes. Knowing these options and associated benefits will result in increased non-residential fleet electrification and investment in charging infrastructure ultimately contributing to the PGE's corporate as well as statewide decarbonization goals of achieving 100,000 registered EVs and increased electric vehicle miles traveled (eVMT) by 2025.

4.1.2 The Residential Sector Program Theory

PGE's OE&TA Pilot aims to increase residential customer awareness of charging options and awareness and consideration of EVs. PGE will partner with OEMs, dealerships, a dealer engagement implementer, and TNCs, as well as sponsor Ride-and-Drive events and conduct promotion and education of EV benefits at outreach events and in the market. These activities will increase awareness of both charging options and EV models among residential customers and TNC drivers, as well as dealer sales staff. By increasing awareness and acceptance of EVs in the market, residential customers and TNC drivers will purchase, and dealer sales staff will promote EV vehicles in PGE service territory, ultimately contributing to the PGE's corporate as well as statewide decarbonization goals of achieving 100,000 registered EVs and increasing eVMT by 2025.

4.2 Electric Avenue Pilot

There is a single program theory for the EA Pilot. PGE's EA Pilot aims to increase awareness of and access to charging infrastructure throughout PGE territory. The pilot also aims to increase EV adoption, support those with no off-street parking or in need of DC fast chargers (e.g., TNC drivers), as well as efficiently integrate electric vehicle load into the PGE's distribution system. PGE is building and commissioning six EAs and will manage the EA operation and maintenance (O&M). These activities will increase awareness of charging options among PGE customers and TNC drivers. By increasing awareness of charging options, PGE customers and TNC drivers will purchase EV vehicles and charge them at EAs.

4.3 Electric Mass Transit 2.0 (TriMet) Pilot

There is a single program theory for the TriMet Pilot. PGE's Electric Mass Transit 2.0 Pilot aims to increase deployment of electric buses and charging infrastructure, as well as increase knowledge of heavy-duty vehicle charging impacts on the distribution system throughout PGE territory. The development of this pilot was in collaboration with the Tri-County Metropolitan Transportation District of Oregon or TriMet. PGE is helping TriMet build and commission the charging infrastructure, provide ongoing technical assistance for future EV investments, and manage the charging infrastructure O&M. These activities will increase PGE knowledge of EV charging options for fleets and transit agencies, and through outreach to other transit agencies, lead to increased transit electrification and O&M and fuel cost savings by 2023.

5. Staff and Partner In-Depth Interview Findings

This section presents key findings organized by pilot from in-depth interviews conducted with program staff (n=12) and pilot partners (n=14) throughout 2019.

5.1 Outreach, Education, and Technical Assistance Pilot

OE&TA Pilot has five main strategies for increasing EV adoption: educational events, technical assistance, ride-and-drive events, EV educational kiosks at dealerships, and TNC partnerships.

5.1.1 Training Events

A builder training implementor, in partnership with PGE and Energy Trust of Oregon, provided training to builders and developers to encourage the building of EV-ready homes. Two training sessions have occurred since the launch of the OE&TA Pilot, one in October 2018 and one in April 2019.

- The October 2018 training was part of a networking and training event that covered future code cycles and building homes to these codes. A PGE representative presented on a portion of the EV-Ready homes code. The 43 attendees included a mix of builders, developers, energy efficiency consultants, architects, utility program representatives, specialty contractors, affordable housing providers, and local government representatives. Some attendees of the October event have developed specifications or plans for EV-ready homes that include a 240v outlet in the garage.
- At the April training event, which was part of a sustainable home building training, a representative from PGE presented on smart home technologies. The 16 attendees included builders, contractors, architects, designers, and home energy assessors.

The intended outcome from the builder education events is to increase builders' awareness of EV-related technologies, their benefits, and how to communicate the value of EVs to their customers. To measure these intended outcomes, PGE used an adapted version of the Kirkpatrick evaluation model.⁴ Results from the Builder Education survey assesses behavior and feedback from the training (see Section 7).

Coordination with PGE has been effective in identifying training presenters; however, the timing of the site observations could be improved in the future. Site observations of some of the building projects in South Hillsboro were planned as part of the builder education event to provide examples to trainees. The observations were not conducted, however, since some of the homes in the South Hillsboro development were behind schedule.

Trainings were promoted through a variety of channels, including email and social media. The builder training implementor promoted both events through email blasts to several thousand building professionals. The training implementor also used social media event calendars hosted by their industry partners Energy Trust of Oregon and Better Buildings Network. Social Media channels included Facebook and Instagram. Data collected at the events included attendees and their contact information, as well as feedback on the training.

PGE and the builder training implementor held training events to encourage EVs. One event, not specific to builders and open to anyone, addressed workplace charging, including site selection, determining how much to charge for use, and maintenance. Another event included a fleet electrifications class for businesses

⁴ The Kirkpatrick Evaluation Model recommends four progressive levels of assessment of training effectiveness: Reaction ("the degree to which participants find the training favorable, engaging, and relevant to their jobs"), Learning ("the degree to which participants acquire the intended knowledge, skills, attitude, confidence and commitment based on their participation"), Behavior ("the degree to which participants apply what they learned during training when they are back on the job"), and Results ("the degree to which targeted outcomes occur as a result of the training and the support and accountability package")

interested in converting to an all-electric fleet. This class discussed which vehicle types have suitable electric replacements and the impacts of charging.

5.1.2 Technical Assistance

Many customers who have sought a technical assistance consultation from PGE lack awareness and familiarity with the EV-related technologies and have concerns with installing and providing EV charging. Organizations also have many questions about chargers for larger-scale vehicles such as trucks and SUVs. Consultations in general help to alleviate customers' concerns, answer questions, and more directly, promote fleet electrification and EV charger installations.

Typically, consultations begin with a conversation over the phone with PGE staff and may include a site visit. Staff conducted at least five to six consultations per month. During the consultations, PGE staff discuss the benefits of fleet electrification and workplace charging, provide estimates on the costs associated with operations, the cost savings for the fleet, state and federal tax incentives. Additionally, staff explain PGE's line extension allowance if a line extension is required to install the charging equipment. Results from the Technical Assistance survey assesses behavior and feedback from the consultations (see Section 7).

5.1.3 Ride-and-Drive Events

Marketing efforts for ride-and-drive events are evolving and set to match the community. PGE and a ride-and-drive implementer work together to market ride-and-drive events. Depending on the venue and target audience, PGE and the ride-and-drive implementer will work with other partners to increase marketing reach. For the EA openings, PGE and the ride-and-drive implementer targeted local PGE customers and businesses using PGE flyers and social media. The November 2019 ride-and-drive event targeted TNC drivers and was marketed through social media and a newsletter sent out by the ride-and-drive implementer. The ride-and-drive implementer worked with a TNC company to promote the event through the TNC company's app. In September 2019, PGE sponsored the National Drive Electric Week event, which drew about 200 attendees, of which 100 participated in at least one ride-and-drive. PGE is satisfied with the level of ride-and-drive participation at the National Drive Electric Week Event and has plans to hold future ride-and-drive events at similar events with broader marketing.

Both PGE and the ride-and-drive implementer collect data from the Ride-and-Drive events, which could be improved by recording car sales at dealership events. The ride-and-drive implementer collects data at their ride-and-drive events including the number of people that attended, how many participated in a ride-and-drive, and email addresses of the attendees. The ride-and-drive implementer provides a report with this information to PGE for any co-sponsored events. The report typically has a Learning and Recommendations section. One contact explained, "We had a couple of car sales [after the event] but the dealership does not report that to us. We are hoping that with the new dealership engagement program we can record what comes out of these events as well."

There are opportunities to collaborate with the ride-and-drive implementer to further increase attendance at ride-and-drive events in the future. Though PGE has been very supportive of the ride-and-drive implementer's activities, one contact suggested that PGE could help to increase attendance at events by offering additional incentives to entice attendance, such as raffles. The contact also noted that ride-and-drive events could be improved if PGE and the ride-and-drive implementer had a larger network of partner dealerships in the area. For example, at the ride-and-drive event at the opening of the Hillsboro EA, only one dealership was in attendance.

PGE and the ride-and-drive implementer noted that consumer requests for ride-and-drive events have been increasing. One contact explained that the increase in requests is largely due to increased availability of EV infrastructure and awareness of the financial benefits associated with EVs.

Partner dealerships report that some ride-and-drive events increased interest in EVs, yet both dealers and PGE need to do more to make them more effective. Two dealership partners noted that the events seemed to help increase interest in EVs; however, one contact indicated that the event was not as successful as they and their staff had hoped. This contact attributed the lack of success to inclement weather and lack of PGE marketing. PGE staff noted it can be difficult to partner with dealerships who do not have sufficient stock of EVs or PHEVs because they are often less engaged.

5.1.4 Dealership Engagement

Partner dealerships and PGE's dealer engagement implementer view the partnership with PGE as largely positive however, more data are necessary to determine whether PGE's efforts have increased customer awareness and interest in EVs. Dealership partnerships with PGE have involved ride-and-drive events and installing EV educational kiosks at dealerships.⁵ Anecdotally, two (of three interviewed) dealerships noted that the kiosks have led to increased customer awareness and interest in EVs.⁶ The degree to which increased customer awareness and interest in EVs can be attributed to PGE's efforts at three dealerships is difficult to quantify, due to a lack of data.

Collaboration between the dealer engagement implementer and PGE has been largely positive. The dealer engagement implementer contact spoke positively about his collaboration with PGE, noting the confidence PGE has shown in the implementer and the support they have provided in helping to foster the relationship with a dealer association in Oregon. A PGE contact noted that the implementer's leadership is well-versed in EV messaging, which is helpful to educate and interest consumers, but that the implementer's success as a platform will be clearer in the future.

There were no issues reported with the installation of the EV educational kiosks at dealerships, and the response from dealerships has been positive, suggesting EV educational kiosks could be useful at more dealerships. Auto dealer staff are generally not trained on how to sell EVs and the EV educational kiosks are often the only resource that staff have when selling EVs. Dealers mentioned that the kiosks provide staff with tools to sell EVs with confidence and that the kiosks have helped to increase their staff's knowledge of EVs.

The EV educational kiosks can alleviate consumers' EV concerns; however, additional PGE outreach and engagement may be needed. The primary concerns that consumers have about EVs are vehicle range, where to charge their EV, the cost of charging, and the charging process. Two contacts noted that the kiosks help to address these concerns. One contact noted, however, that there is a limit to what information the kiosks can provide to customers and that additional outreach and engagement to consumers by PGE is still needed. All contacts, however, said they would recommend the kiosks to other dealerships.

EV sales and future sales goals vary depending on the dealership, making the effect of PGE-partnerships on EV sales difficult to measure. One dealership contact noted that their goal depends on the currently available stock of EVs and two others noted a range of goals and indicated that they do not anticipate any problems achieving their goals for the next few years. Dealerships' view of current EV sales are also mixed, with contacts across the dealerships noting that EV sales have increased, decreased, and stayed the same, respectively. Dealers opined that the zero-emission vehicle (ZEV) mandate had not affected EV sales.

Dealerships discuss a range of options to make EVs more affordable to consumers, but more training could help dealership staff provide consumers more options. Dealerships discuss options including state and federal incentives, tax credits, discounts, and seasonal promotions or manufacturer rebates. One contact suggested

⁵ EV educational kiosks (also referred to as beacons) are interactive screens installed at dealerships that help orient potential customers to EVs and charging. The kiosks provide information on charging locations, charging times, costs, and available incentives.

⁶ Five surveyed technical assistance recipients also reported being familiar with the EV educational kiosks, though they were not asked about their experience with the kiosks. The 2020 EV owner survey, however, will collect data on customer experience with the EV educational kiosks.

that PGE could further help by providing training to the staff on all the opportunities available to make EVs more affordable to consumers.

5.1.5 TNC Partnerships

The collaboration between a TNC company partner and PGE has been positive; however, driver uptake of the unlimited charging offer has been minimal so far and more time is needed to determine its success. Through PGE's unlimited monthly charging offer, a TNC company pays for discounted memberships under the Retail EV Charging tariff (Schedule 50) three months at a time. While this offer is potentially helpful to drivers, the contact mentioned that driving an EV may still be cost-prohibitive for many drivers. The contact noted, however, that uptake has doubled since Q3 2019, the first full quarter they implemented the unlimited charging offer. Future quarters will indicate the success of the unlimited charging offer.

In addition to the subsidized monthly charging subscriptions, the TNC company partner has introduced an option for riders to request an EV, PHEV, or hybrid vehicle and is considering incorporating EVs into its weekly rental program, to encourage EV adoption among their drivers.

5.2 Electric Avenue Pilot

To aid in the growth of EV adoption and support the growing network of EV charging infrastructure, notably fast-charging equipment, PGE developed the EA Pilot Program under its Transportation Electrification Plan. Under this plan, six EA sites – which include both fast chargers and Level 2 chargers – will be installed in PGE's service territory. An EA opened in Milwaukie in April 2019 and the one in Hillsboro came online in May 2019. The third EA at Eastport Plaza in Southeast Portland came online in October 2019. Three additional EAs were completed in 2020: Wilsonville, Salem, and Beaverton. The team did not evaluate the EA that opened in October 2019 or the three EA sites completed in 2020 as part of this report but will evaluate these sites in 2020.

5.2.1 Building the Electric Avenues

Determining Site Criteria

Developing the siting criteria was a collaborative process among PGE teams; location, equity, EV incidence, and cost-effectiveness were all factors taken into consideration. The first step in developing the EAs was deciding which factors should be considered in identifying potential EA sites. PGE pulled expertise and resources from many of their internal teams to determine important aspects in selecting an EA site. A siting committee was created to ensure that a thorough and inclusive list of factors was developed and used when evaluating a potential site. The EA site selection considered the following criteria:

- **High visibility and accessibility.** EA sites needed to be in areas that were visible to the community: centrally located and next to high-traffic, commuter roads to increase charger awareness and utilization among both EV and non-EV drivers. While the Portland area has a high penetration of EV chargers per vehicle, there is a perception that chargers are not available. Thus, siting the facilities near the main corridors was an important consideration.
- **EV incidence and predicted EV adoption.** EA sites would see the highest utilization if located in areas with high EV incidence, as well as high projected EV growth. When developing this siting criteria, PGE leveraged resources and expertise from their internal GIS and Customer Insights teams to determine current and future EV ownership patterns. The teams utilized marketing, EV ownership, ODOT, and customer profile data to understand EV purchasing patterns, where owners drive EVs, the location of existing DC fast chargers, where EV owners reside, and where EV drivers may live in the future.

- **Safety and security of area.** The location of EA sites needed to be in safe areas, as well as have adequate lighting so that customers feel safe and secure when charging at night. Fixed EA Pilot budgets, however, may limit PGE's ability to deploy such value-add features.
- **Close proximity to amenities, low-income and disadvantaged communities, new residential construction developments, multifamily housing, and distribution equipment.** The location of EA sites needed to be in areas close to shopping, certain types of housing, and electrical distribution equipment for convenience, equity, and cost-effectiveness purposes. Sites needed to be close to places customers can spend time while charging, such as grocery stores or coffee shops. In terms of low-income communities, many lower-income areas have a dearth of public charging infrastructure, thus situating charging sites close to these underserved areas would equitably provide customers with access to chargers. PGE staff also used GIS to identify areas where population growth is expected due to residential housing developments. The location of the Hillsboro EA is close to a new residential housing development, which will attract additional homeowners that may be interested in purchasing EVs. PGE also considered proximity to multifamily buildings, as customers who live in multifamily housing often do not have access to charging. Lastly, getting the required electricity to a site for fast charging can be costly; situating an EA site close to the primary voltage distribution network is more cost-effective.

Identifying and Engaging with Site Hosts

Municipal governments are critical partners in developing charging facilities. Once the siting criteria was determined, the EA team connected with the Government Affairs Team to understand which local municipalities had relevant climate goals and plans that would align with participation in the pilot. PGE's local government affairs representative was integral in this process as they had existing relationships with municipalities. They served as a bridge between PGE and site hosts by helping to facilitate city council meetings, partnerships, and communications. In these discussions, PGE found that municipalities were ideal partners as they shared the same visions and goals in terms of climate action planning. The EA team also worked with PGE's Key Customer Managers (KCMs) to leverage relationships with customers who had expressed interest in EV charging.

The EA team reached out to city governments to start the conversation around potentially hosting an EA site. One city had installed several public charging stations over the last decade, thus the PGE partnership was consistent with its focus on public EV services. Another city was focusing on carbon emission reduction strategies as part of its Climate Action Plan (CAP). One strategy identified by this city was to increase awareness of EVs and provide EV charging infrastructure to the community. Through these relationships and discussions, partnerships with PGE were developed and planning of the first EAs commenced.

Stakeholder involvement was also important in EA site selection: municipal representatives engaged with stakeholders to gather feedback about the siting of chargers in the community. One city convened a large group of stakeholders to decide which sites in the community would provide the most benefit – the city mapped out areas that had a dearth of public infrastructure, as well as those that would meet equity and affordability goals. Charging infrastructure was already located on multiple city-owned properties; thus, a private-sector partner was an appealing site host.

Another city worked with its Community Development Director to identify city-owned properties that could host the chargers. The Community Development Director had ties with the downtown business association, which also participated in discussions about EA siting.

Site Evaluation

PGE staff evaluated potential EA sites from different perspectives to assess feasibility. With the identification of the sites, PGE staff worked with service design and contract services and inspection teams to ensure the sites could be feasibly and cost-effectively constructed. They assessed the sites to understand where service

would be pulled from and what distribution system upgrades would be needed. The siting committee evaluated the site as well to ensure they were meeting the siting criteria discussed above. PGE Service Design staff along with construction managers visited potential sites to understand the pros and cons of each site fully.

Siting, design, and contracting processes to develop EA sites differ by site ownership structure. Four of the EA sites are located on property owned by municipalities (Milwaukie, Wilsonville, Salem, and Beaverton) and two EA sites are located on privately owned property (Hillsboro and Eastport Plaza). PGE owns all charging infrastructure at the EA sites. While the development of first site initially started with the municipality, the bulk of the decision-making fell on the property owner and manager. When the municipality approached the property manager about the EA site, they discovered that property was being sold. Despite this change in ownership, both the property manager and property owner were interested and agreed to host the EA. Tenants also perceived the development of the EA as a positive addition. The EA involved no cost or risk on their end and saw this as an amenity to their property. The second EA went through a different process than first EA, as the site was on city-owned property, rather than private.

5.2.2 Bidding, Permitting, and Construction

Identifying Charger Suppliers

PGE chose software and hardware vendors that provided the best mix of value, flexibility, and functionality. In 2018, an RFP was sent to about 15 hardware and software companies to bid on the EA charging equipment. An EV charging software provider (or EVSP) was awarded the project in May of 2018. PGE chose the EVSP as its software provider because it offered the best value proposition: PGE had previous experience with them managing the World Trade Center EA software, the bid price was reasonable, and it proposed multiple, flexible options for future offerings, software, and capabilities. The role of the EVSP is to process the payments and enable revenue collection, collect data from the stations, and help detect, diagnose, and resolve issues with chargers.

PGE selected the charger equipment vendor primarily for their flexibility. The equipment had the functionality to add additional charging capacity over time as batteries and technology evolve. This flexibility is also critical for PGE's goals of eventually upgrading the EAs to accommodate additional load growth. PGE contracted with the EA charging equipment vendor to supply charging equipment for all six EA sites.

Once awarded, PGE negotiated the hardware and software terms and conditions with the EA EVSP and the charging equipment vendor. This was an efficient negotiation, with the completion of an agreement between the parties occurring within 60-days.

Site Design, Permitting, and Construction

Flexibility and upgradability were key components of the EA design to plan for future load growth and demand. The design of each EA has four fast chargers and one dual-port Level 2 charger allowing up to six EVs to charge at once. The layout of the chargers differs between the Milwaukie and Hillsboro sites. Hillsboro has a similar configuration as the World Trade Center EA, where EVs can park head-in or back-in for charging. Milwaukie is oriented so that the parking spaces are stalls. The chargers are designed to be reconfigured and upgraded for increased electricity output in the future. PGE wanted to plan for that and "future proof" the chargers with the expectation of increased EV adoption and changes in battery technology. PGE planned for increased load capacity at the EA sites by installing transformer pads and conduits that can accommodate larger transformers in the future.

PGE adapted its contracting structure after the first EAs to expedite design and construction of the remaining EAs. PGE utilized a design-bid-build contracting structure for the first EA sites, which involved 1) hiring a design firm to help design the charge facilities, 2) inviting contractors to bid on executing the electrical and civil work,

and 3) selecting electrical and civil contractors to build the facilities. For the first EA sites – a vendor from PGE’s preferred list of vendors was selected to engineer and design the charging stations. For the remaining EA sites, PGE switched to a design-build approach, which expanded PGE’s vendor network and helped to reduce project costs and shorten design and construction timelines. Throughout the design and construction process, PGE found that EV charging infrastructure presented new and unique site design challenges for many design and engineering vendors.

PGE’s Property Services Team helps to make the EA permitting process seamless. The permitting processes for first two EA sites were straightforward due to the collaborative work between PGE’s Property Services Team and municipal planning departments. The Property Services Team, a PGE resource that manages permits and is familiar with jurisdictional permitting differences, worked with the municipalities through the permitting process. This team understood what permits were required, how much time it typically takes for processing, and they possessed the materials needed for permitting, including templates, language, narratives, and knowledge of needed site improvements. Site host representatives reported there were no delays in the permitting process.

5.2.3 Marketing and Opening the Electric Avenues

The initial unveiling of the first two EAs were successful, well-attended events due to collaborative efforts between PGE and site hosts. Site hosts and PGE worked together to market the openings of the EA sites. PGE took the lead in providing resources, materials, messaging, and signage, while site hosts leveraged local communication channels to market the events. For one EA site, a city official worked with PGE on outreach resulting in higher than expected turnout. PGE invited 29,000 current or likely EV drivers in the area via their preferred communication channel to attend the EA opening. For another EA site, municipal staff conducted outreach to local businesses about the event. The site host utilized a variety of channels to advertise the event, which included social media posts, the city website, a story map in their CAP, their monthly newsletter, the city events calendar, handouts, signs, and in-person outreach. PGE invited approximately 13,000 current or likely EV drivers in the area to attend the event. The opening event was well-received by community members and municipal staff. Site host representatives noted that they are not actively conducting ongoing marketing for the EA.

5.2.4 Electric Avenue Operations and Maintenance

Roles and Responsibilities

PGE, the EA EVSP, the EA charging equipment vendor, and the site hosts all contribute to the O&M of the EA sites. Outlined below are the roles and responsibilities of each entity. PGE may modify the roles and responsibilities of these entities over time.

The PGE EV O&M Team

PGE has a dedicated team responsible for maintaining the EA sites, the TriMet chargers, and PGE workplace charging. This team consists of several internal employees and third-party contractors. Once an EA site has been built and commissioned, the monitoring and management of the chargers is handed over to the PGE O&M team. They actively monitor the charging stations for issues using the EA EVSP’s dashboard and check PlugShare for customer ratings and complaints.⁷ The PGE EV O&M team routinely conducts site visits to inspect chargers to ensure they are up-and-running. To track issues, the team utilizes an internal Excel-based

⁷ PlugShare is a third-party comprehensive online database that provides EV drivers with charging station locations and near real-time operational status. The PlugShare platform also allows drivers to add, review, and edit charging station information.

spreadsheet on *SharePoint*. As EA sites come online, the team is continuously monitoring and learning hardware, software, and user error issues to fully understand and anticipate issues.

The EA EVSP

One of the key responsibilities of the software provider for PGE's EA network, is to detect, diagnose, and resolve software and hardware-related issues with the chargers. When there is an issue with a charger, the EVSP typically receives a report from their monitoring tool, or a phone call or email from a customer. Then, their Network Operations Center picks up the issue and attempts to resolve the issue remotely and immediately. They use communication protocol logs to track the issue and determine the next steps for resolution. If the dashboard shows that the entire charger is offline, then PGE and the EA charging vendor are notified immediately. When the issue is neither user error nor an EVSP software glitch, and cannot be resolved easily or remotely, the EVSP contacts PGE and the charging equipment vendor to begin troubleshooting. Thus, the resolution process depends on the nature of the charger issue.

The EA Charging Equipment Vendor

The EA charging equipment vendor is the supplier of all EA charging equipment, except for the World Trade Center (WTC) location. In addition to supplying the hardware, the vendor contracted with PGE to provide maintenance services. They negotiated an annual maintenance Service Level Agreement (SLA) for six EA sites, which covers preventative maintenance and emergency repairs. The SLA stipulates that the vendor is responsible for resolving hardware issues that are unable to be resolved by PGE staff (i.e., by restarting the equipment) and send a field staff to the EA site if necessary.

Site hosts

Site hosts play a small role in the O&M at EA sites. A site host may work with their KCM to alert PGE of any issues at their EA. Site hosts that are public entities are responsible for posting EV-only parking signage and enforcing parking rules. For example, one site host created the signage for its EA, and the municipal parking team monitors and enforces the parking. For private entities, PGE provides the signage, but the property owner provides the security and enforcement for the parking.

5.2.5 Charger Issues and Resolution

Hardware and software issues were initially common across the EA network, but have decreased in frequency since deployment. EA sites received poor ratings on PlugShare after the initial opening. On average, charging station issues occurred weekly, although one EA site had more issues than other sites, with problems occurring several times per week. Most of the time, issues were software-related and could be resolved remotely. Roughly once a month, PGE would call one of their technicians to go to a site to troubleshoot and resolve a hardware issue. Hardware issues usually took at least one to two weeks to resolve. The hardware and software issues experienced with the first EA sites were largely due to the state-of-the-art nature of the charging equipment selected, which could be expected with any new technology that has not been widely deployed.

Common issues and complaints reported at EA sites included: customers were unable to pay due to malfunctioning credit card readers, customer account issues (e.g., getting a refund or changing a password), charging cables were damaged, charging cables too short, not enough chargers available, and orientation of chargers and parking space creating parking difficulties.⁸

⁸ Electrify America has documented similar issues with new charging equipment installed throughout the United States. <https://insideevs.com/news/389891/exclusive-interview-electrify-america-problems-solutions/>

While customer satisfaction was low and issues were common in the initial stages of deployment, issue resolution has become more streamlined. Coordination and communication between PGE, the EVSP, and the EV charging equipment vendor has improved significantly since the initial deployment of the first two EA sites. The EVSP and EV charging equipment vendor have increased customer service efforts thereby improving the customer experience as evidenced through higher PlugShare ratings.

5.2.6 Charger Utilization

Expected EA Users

PGE and site hosts expect a diverse group of customers to use the EA sites. PGE staff anticipate that customers who are “home charge challenged” (those who want to purchase an EV but are unable to charge at home – generally multifamily residents) will primarily utilize the EA sites. Having an EA located close to these customers may encourage EV adoption. PGE also expects the EA sites to be used by current EV owners who regularly charge at home but want to be able to drive further distances with their EVs. The sites will essentially serve as route enablement charging. PGE staff noted that TNC drivers will also be a group who will utilize the sites.

Representatives of one EA site host anticipate residents who drive downtown to shop, eat, and work will charge their EVs at the EA site, primarily during business hours. The other EA site is also on a popular commuter route – those using Highway 99 to commute will likely use the facility for fast-charging.

Measuring and Monitoring Utilization

EA fast charging utilization is reported to be higher than the national average and is gradually increasing. The EVSP tracks charger utilization data, including the total number of sessions per station, energy consumption, duration of charge, and revenue. PGE staff access the EVSP’s data portal to monitor utilization. As of October 2019, DC fast chargers at the EA sites were used an average of 2.7 sessions per day, which the EVSP representatives describe as higher than the national average. The WTC EA is a highly utilized facility, likely because it is the only DC fast charger located in downtown Portland, offers free parking, and has been online longer than the other EAs, since 2015. The WTC EA is utilized by many ride-hailing drivers as well, because downtown Portland is a popular trip destination. Through 2019, the Hillsboro EA was getting less usage, potentially due to its more recent opening and less-central location. The average usage of each EA charging station, excluding the WTC EA location, is seven sessions per day; this includes both the DC fast chargers and the dual-port Level 2 chargers. The EVSP describes these as well-utilized when compared to other charging sites. Charger utilization has also been gradually increasing, as noted by the EVSP representatives. The evaluation team will conduct detailed utilization analysis using PGE and EVSP data for the 2020 Annual Report.

Pricing Structure

The EA pricing structure has been well-received by EV drivers. Prior to 2018, the City of Portland collected parking fees for the WTC EA location and PGE provided complementary charging.⁹ In 2018, PGE piloted a new revenue-generating pricing structure at the WTC EA: \$3 per two-hour session using a Level 2 charger, \$5 per two-hour session using a DC fast charger, or an unlimited charging plan for \$25 per month.¹⁰ Users of the WTC EA provided positive feedback about this new price structure, which was then implemented at the other EA sites as they opened. To take peak time into account and shape demand, PGE charges an additional 19 cents per kWh when customers charge their EVs at the EA sites between 3 pm and 8 pm.

⁹ In early 2018, World Trade Center Properties sponsored the parking costs for EV drivers who charged at the WTC EA. This sponsorship money went to the City of Portland and allowed EV drivers to park at the WTC EA for no cost while charging.

¹⁰ The two-hour charging time limit is dictated by the parking signage installed at the EA sites and not the tariff.

5.2.7 Challenges and Lessons Learned

Site hosts had initial concerns about the economic and aesthetic impacts of charging facilities on their communities. In the initial phases of designing and permitting the EA sites, stakeholders voiced concerns about the impact of the charging stations on the community. For example, at one EA site, a local business association had apprehensions about taking away public downtown parking spaces and reducing the city's revenue. At another EA site, the property owner of the site was unsure of the initial site mock-ups of the site. Despite these concerns, site hosts reported that PGE staff addressed stakeholder apprehensions through outreach efforts focusing on walkability messaging, additional discussions with local business, and revised drawings of the charging site.

Negotiations to secure the EA sites were challenging under an expedited timeline and required PGE staff to quickly address issues brought up by property owners. Starting in February 2019, PGE staff moved quickly to select six potential EA sites to have all sites designed, built, and commissioned by March 2020. PGE learned that getting property owners to agree to a 10-year lease for the charging site requires many discussions and negotiations. PGE found that a tailored approach to negotiations was required for securing each site because each property owner and ownership structure had unique concerns and challenges to address.

Finding knowledgeable, experienced, and interested contractors to design and build the sites in a constrained construction market was challenging. PGE encountered problems when selecting electrical and civil contractors to build the first two EA sites. Many contractors were not interested in bidding on the projects, as building the charging facilities was perceived as a small job, not worth contractors' time and effort. When PGE received bids from interested contractors, the quotes were highly variable. PGE also learned that some contractors did not bid on the projects because they have no interest in building projects that other contractors have designed. These contractor firms would prefer to design and build such facilities. Additionally, they discovered through this bidding process, as well as from the design of the first EA sites, that contractors are still new and inexperienced when it comes to EV charging equipment. The design of the first EA sites had multiple issues, such as missing information and unrealistic mockups, which caused re-work and a prolonged timeline.

Challenges were encountered working with emerging charging technologies, but coordination with vendors has improved over time. PGE and the EVSP representatives reported that the EA charging equipment frequently encountered both hardware and software issues initially. These issues were largely due to the state-of-the-art nature of the EA charging infrastructure. In response to equipment issues, the charging equipment vendor modified their customer service to more promptly respond to charger issues. Despite these issues, there has been an improvement in coordination among PGE, the equipment vendor, and the EVSP to address performance issues more promptly. Communication has improved, and as a result, there is a more efficient resolution to these issues.

The PGE EV O&M team could benefit from additional staffing as the Electric Avenue Network sees increased utilization. PGE representatives noted that the EV O&M team that services and monitors the EA network, TriMet chargers, and PGE work site charging experienced challenges related to staffing levels. In 2019, two internal staff were monitoring and managing the EA network. Because of this, resolving charger issues could be a lengthy process as staff did not have the time or resources to fix problems. The team expressed the need for hiring additional permanent staff for the EV O&M team, who could be dedicated to troubleshooting and resolving issues with charging facilities on site (i.e., field technicians or electricians). Additional staff could travel to the charge facilities more regularly to ensure the equipment is in good working order and the site is clean. In addition to more staff, the PGE EV O&M team expressed the need for more resources, such as a dedicated EV to use for testing the chargers and a storeroom for charger equipment and parts. These resources would help streamline issue resolution across the EA network.

5.3 Electric Mass Transit 2.0 (TriMet) Pilot

As part of its effort to transition its buses from fossil-based fuels to zero-emission vehicles, TriMet submitted a grant application to the Federal Transportation Administration’s Low or No-Emission (Low-No) Bus Program. They partnered with PGE and an electric bus manufacturer on the application and, once the grant was awarded, had the project approved by the OPUC.

5.3.1 The Contracting Process

The contracting process took about eight months, which interviewees mentioned was longer than expected. This longer timeline was due to:

- Bus and charger technologies are new to the stakeholders;
- Education of stakeholders on the charging equipment, its use, and the bus technology; and
- Planning for charger operations, given that TriMet purchased them and PGE would operate and maintain them.

5.3.2 Bus and Charger Procurement

The delivery of the electric buses from the manufacturer to TriMet was delayed significantly. TriMet ordered five, 40-foot buses with 200 kWh batteries from an electric bus manufacturer at a cost of \$916,000 each. The warranty and additional upfitting and accessory parts brought the total to \$930,000 each. The buses have a 200kWh battery energy storage system and connect to the manufacturer’s analytics system. The manufacturer did not have an electric bus in production at the time the Low-No program application was submitted. When the project started in 2017, TriMet hoped to have the buses by the following winter. The delivery of the first pilot bus was ultimately delayed until June 2018. The delays were largely due to the manufacturer needing to get all the parts together and test them. Once the parts became available, the manufacturer had earlier bus orders to fill, further delaying the completion of TriMet’s buses. The first battery electric bus entered revenue service in mid-April 2019. The buses have an expected lifetime of at least 12 years.

In consultation with the manufacturer, TriMet purchased three bus charging systems from a transit charging vendor. Two of the charging systems were installed at the Merlo Garage, each with two 150 kW charging boxes capable of providing sequential charging to six buses.¹¹ The other charging system is an overhead fast charger at the Sunset Transit Center. The fast charger’s capacity is 450 kW, which was the highest power fast-charger the charging vendor had available and the first they installed in North America. Both chargers have a two-year warranty and an expected lifetime of 15 years, when maintained according to the charging vendor’s maintenance schedule.

Table 9: Bus and Charger Details

	Buses	Chargers
Number in operation/installed	5	3
Capacity/Output	200 kWh batteries	Two 150 kW, One 450 kW
Expected lifetime	12 years	15 years

¹¹ Sequential charging is when the buses are charged one at a time. The software switches the charging to the next bus when the first bus’s battery is full.

	Buses	Chargers
Total cost	\$4,650,000	\$789,000 for equipment plus \$787,670 for make-ready (installation, engineering, design, permits)

Interviewees reported more challenges to obtaining the charging infrastructure than they did for obtaining the buses. The only challenge interviewees reported related to bus procurement was the delay in their delivery. Space availability at the Merlo Garage, however, did present some challenges in finding a charging equipment vendor. The Merlo Garage had only 3.5 square feet of available space in the bus staging area to install the charging equipment. One charger manufacturer TriMet considered was unable to deliver a charger for that space in the time needed. The chosen vendor, on the other hand, would be able to deliver a charger that met the space constraints and the grant and permitting requirements promptly. A TriMet staff person reported, “It was just difficult finding a vendor that had the proven technology we needed.”

5.3.3 Route Selection

Route specification was first based on space available at TriMet’s bus depots (Merlo Garage being the only location with space at the time), and then by the following six criteria: 1) having limited or no interlining, 2) be in service seven days per week, 3) require no more than four to five buses at peak times, 4) have a 17 hour or more weekday span, 5) be 11 or more miles in length, and 6) have 1,500 or more boarding rides.¹² The bus line also needed to allow for en-route charging, which Sunset Transit Center could provide. TriMet’s Line 62 met all specified requirements and could demonstrate the capabilities of the bus and charging infrastructure included in the grant application.

5.3.4 Installation and Make-Ready

PGE provided technical assistance to ensure both sites were prepared for future charging infrastructure needs, with Merlo Garage requiring more upgrades than Sunset Transit Center. PGE worked with TriMet’s engineers to provide them with an upgradable design to accommodate additional charging capacity in the future. For example, at Merlo Garage, transformer pads and primary power connections were designed to ensure larger transformers and additional secondary runs could be accommodated in the future. The Sunset Transit Center has capacity for a second 450 kW charger and Merlo Garage can charge up to 12 buses using sequential charging. PGE contracted with a third-party they had worked with previously to install the chargers. After charger installation, the transit charging vendor performed the commissioning.

The local permitting jurisdiction’s lack of familiarity with EV infrastructure led them to take a cautious approach, which led to delays and challenges for stakeholders. Both PGE and TriMet staff reported that the conservative approach taken by permitting staff was their biggest challenge related to charger installation. Complying with safety certification processes caused a several month delay in implementing the pilot.

PGE’s electrical contractor obtained the electrical permit and TriMet obtained the building permit. To obtain the permits, pilot stakeholders invested time answering the inspectors’ questions and educated them on the safeguards, such as protection to prevent vehicles from colliding with equipment. Pilot stakeholders completed safety trainings and coordinated with local emergency services such as the police and fire departments, including developing lines of communications with these groups.

Logistical challenges at the Merlo Garage also presented a constraint. There are two overnight sequential charging systems at the Merlo Garage, each with three charging boxes. The two charging systems required workers to avoid a 100-year old oak tree on the site. It was also a challenge to not impede operations at the Merlo Garage while underground digging and boring was done to connect the two charging systems to the bus

¹² Interlined routes are two routes connected end-to-end, and the same bus travels on both routes before going back to the garage.

parking bays. TriMet and PGE coordinated with each other and with their staffs to ensure the project teams and their equipment had access to the construction space and staging space when they needed it. When stakeholders began the underground utility work at Sunset Transit Center, they encountered the concrete footing of the adjacent parking structure that had not been noticed when originally reviewing the mapping. The excavation of the additional concrete was beyond the project scope, requiring a change order to cover an additional \$20,000 cost, which TriMet paid.

Electrifying a bus line required changes to processes at TriMet, including training for bus operators, maintenance crew, and dispatchers. TriMet and its safety department established a training that drivers must complete before using the electric buses. TriMet is training enough operators so that when an operator is absent, there will always be a fully trained operator available. Operators are allowed to choose which route they want, and the most senior operators get the first choice. TriMet is hoping that the operators trained on the electric bus will want to stay on that route, reducing future training needs. TriMet also trained its dispatchers to ensure that the directions and advice they give operators matches the type of bus they are driving.

5.3.5 Operations and Maintenance

Buses

The buses have been performing above expectations so far in terms of miles per charge, though there are some questions about the accuracy of data from the telemetry system. Buses need to be able to function during days with suboptimal conditions, such as cold winter days, when the battery supplies energy for space heating. Given that the period of pilot performance so far has been during warmer months, this may explain why the buses have performed better than expected. There have been some discrepancies between the bus and charging vendors' analytic reporting platforms. At the time of the interview, TriMet was working with the vendors to identify the cause of the discrepancies and looking at the possibility of installing a third-party telematics system on the buses to ensure the accuracy of performance data.

The interviewed TriMet representative reported that two of the buses had some electronic-related performance issues and noticed that some bus components are wearing down quicker than expected, such as the bus suspension system, due to the extra weight of the batteries. A full year's worth of performance data will inform how reliable the buses are and how they impact ridership and operator turnover on the route. The team will conduct a follow-up interview with TriMet Staff in 2020 to see how the buses are performing after a year in service.

Bus charging

There is little flexibility to shift bus charging at Sunset Transit Center to off-peak times. The bus battery supplies 60 to 100 miles of range, requiring the bus to charge each time it stops at the Sunset Transit Center – about every two hours or up to nine times per day. Each charging session ranges from 15 to 25 minutes. If the fast charger failed for some reason, the bus would have enough range to be able to skip one charging session and make a round trip again, which minimizes the need to deploy diesel backup buses. At the time of the interviews, TriMet reported that the fast charger has been “robust and working reliably.”

At the end of the day, the buses arrive at the Merlo Garage between 7:00 p.m. and 10:30 p.m. with battery charges ranging between 35% and 60%. The buses are charged up to 90%, which usually occurs by 3:00 a.m. or sooner, which is “not that long,” according to the TriMet representative.

Chargers

PGE and the transit charging vendor work together to ensure charger performance. During the contracting process, TriMet and PGE agreed that PGE would handle all day-to-day care and ongoing maintenance of the charging equipment. This contract includes emergency repair, routine maintenance, monitoring services, and having replacement parts on-site. PGE, in turn, has an annual SLA with the charging vendor that stipulates the vendor provides yearly preventative maintenance of the charger and replacement of parts on an as-needed basis.

The charging vendor provides a dashboard through which PGE staff can monitor operations; PGE staff found it useful but also limited in its information. The dashboard has information on when the buses charge, the charge amount, and remaining capacity, but it lacks detailed information when a problem occurs, what is currently happening with the chargers, and the charging history. Staff at PGE monitors this dashboard every day and it is also set up to notify PGE staff if an issue occurs automatically. PGE staff notify TriMet staff immediately when an issue occurs but can only relay the limited information. The charging vendor is notified in the cases where issues require a "deeper dive" because the vendor has access to more information on the chargers than PGE can access through the dashboard. Interviewed charging vendor staff corroborated that they have greater troubleshooting capabilities than PGE has through the monitoring service. One interviewed PGE staff person expressed the desire for the charging vendor to more proactively monitor the charging equipment.

When an error with the charging equipment occurs, PGE staff respond within minutes and work with TriMet to determine if the error is with how TriMet staff are using the equipment or if there is a mechanical or equipment failure. If a mechanical or equipment failure, PGE works directly with the charging vendor to troubleshoot the issue.

Early communication challenges have been resolved. The transit charging vendor acknowledged there were some initial challenges associated with the SLA with PGE. The SLA stipulates that the charging vendor respond to any issues with the chargers within eight hours. The charging vendor's general practice is to offer customers a standard response time of 72 hours. The shorter response resulted in some initial delays in addressing charger issues. The charging vendor has since set up a 24x7 support phone number and has staff available to troubleshoot issues remotely, and if necessary, has local contractors on-call to make site visits.

If the problem relates to a part of the charger that is under warranty, the charging vendor will cover the cost. If the issue is related to operator error, for example a charger cable that was run over and broken, then the transit charging vendor will charge PGE to resolve the issues. There have been a few issues related to the charging equipment:

- **Each charging box (6) at Merlo Garage should have had its own breaker.** Instead, two series of three boxes were "daisy-chained" together to two breakers, because the installation guidance was unclear. Also, the third-party installation company did not size one of the breakers properly, which was causing it to trip often. The charging vendor and PGE noted the issue and had the installation company come back to fix the undersized breaker. The charging vendor reports that the situation has improved, and PGE has requested that the vendor update its installation guidance to clearly require individual breakers.
- **There were interoperability challenges between the charging boxes and the buses preventing the buses from charging sequentially.** The electric bus manufacturer and the charging vendor are reportedly making changes to their software to allow it to meet PGE and TriMet's sequential charging requirements.
- **The bus operators experienced challenges to stopping the bus in the precise place to make solid contact with the overhead charger at Sunset Transit Center.** When the bus was not in the right position, the operators were using the emergency stop button on the fast charger to rest the system. The electric bus manufacturer staff corroborated this finding and reported the bus operators had some issues with the bus not charging fully. They said these issues occurred early on. TriMet has since conducted

operator training on proper use of the fast charger and reported improper use of the emergency stop button has reduced substantially.

5.3.6 Feedback from Operators and Riders

Early feedback from operators and riders has been positive. An interviewed TriMet representative reported anecdotal feedback that drivers enjoy driving the electric buses because of how quiet they are and how they perform. The riders have also reportedly grown fond of the new buses. There was one week where TriMet did not run the electric buses, and operators received numerous inquiries from riders asking where the electric buses went and wanted to know when they would be back in service.

5.3.7 Stakeholder Coordination and Communication

TriMet reported that PGE staff have been “attentive and responsive” and communicate within minutes if they notice an issue. Interviewed TriMet and PGE staff noted that they have good working relationships, have developed trust over time, and that there are fewer meetings now that this trust has been established. No interviewed staff reported communication challenges between TriMet and the electric bus manufacturer; the manufacturer maintained communication early during the delay of the bus delivery.

PGE staff reported some communication challenges with the transit charging vendor early in the pilot. The charging vendor acknowledged that internal changes caused some challenges for PGE when the service team who took over PGE’s contract was not initially aware of the contract’s 8-hour response window. As noted above, there was a resolution to that issue. There was also a communication challenge related to the 1-800 numbers not routing correctly to the charging vendor’s engineering support staff. After several conversations and meetings between PGE and the charging vendor, both organizations reported the communication process has gotten “substantially better” and response times have decreased.

5.3.8 Future Electrification Plans

TriMet will expand its electric bus fleet. It has purchased or has plans to purchase the following equipment and has already identified the routes they will travel on:

- Five long-range buses with a minimum capacity of 450 kWh from a different electric bus manufacturer;
- Three extended-range buses from another electric bus manufacturer;
- Converting three diesel buses to an electric platform; and
- A 60-foot bus with an electric platform (in consideration, but no manufacturer identified).

TriMet has had trouble finding manufacturers with buses that can reliably operate with a 150-mile range, which is what they need for many of their routes. They are being cautious with their electric bus fleet expansion, anticipating new battery technology coming onto the market in the next five years will guarantee greater range.

TriMet plans to prepare the Powell Garage to be ready for electric buses as well. This East Portland garage will contribute to social equity goals because it serves a transit-dependent area of Portland. PGE’s distribution and planning team met with TriMet about this garage, which might power up to 100 buses. Such a large load may require a new feeder and substation upgrades, and both stakeholders want to minimize cost and space footprint. As one interviewee said, “PGE has been really active on the utility infrastructure development side to get our partner [TriMet] to think through those concepts.”

At the same time, TriMet is considering whether it can reduce the power load at Sunset Transit Center during summer months when the bus batteries do not deplete as much as they do in the winter. TriMet staff suggested that 200 kW may be sufficient in the summer to meet the electric bus charging needs.

6. Ride-and-Drive Intercept Surveys

This section presents key findings from the two Ride-and-Drive intercept surveys conducted with attendees of the April 2019 Milwaukie EA grand opening event and at a rideshare community event and information session in Downtown Portland. The April event targeted the general public, and the November event targeted TNC drivers. This section also provides findings from 79 surveyed 2019 National Drive Electric Week Ride-and-Drive participants.¹³ Detailed findings from the April and November events can be found in Appendix I and Appendix J.

In 2020 or 2021, the team will conduct one additional intercept survey at a larger PGE-sponsored Ride-and-Drive event. The team will also conduct a focus group with TNC drivers to gather insights about their views on EVs and EV charging.

6.1 Current Vehicle Use

Vehicle battery range and charging needs vary between the general public and TNC drivers. As shown in Table 10, about three-quarters (12 of 15) of April survey respondents reported driving 200 miles or less each week, which suggests that EVs with a 100-miles-per-charge range can likely fulfill the driving needs of these respondents. Whereas over half (13 of 24) of November TNC driver respondents reported driving over 400 miles each week for their TNC rides, suggesting these respondents need long-range EVs coupled with easily accessible public charging. TNC drivers were also more likely to report owning more than one vehicle (17 of 24 vs. 8 of 15). However, over half (14 of 24) of TNC respondents indicated that the vehicle they use for TNC rides is also for personal use.

Table 10. Respondents' Vehicle Use, by Survey Wave

Respondent Vehicle Use	April 2019 Count (n=15)	November 2019 Count (n=24)
Miles driven per week for <u>TNC rides</u>^a		
100 or less	N/A	2
101 to 400	N/A	4
401 to 700	N/A	3
701 to 1,000	N/A	7
Over 1,000	N/A	3
Don't know	N/A	5
Miles driven per week for <u>personal reasons</u>		
50 or less	3	7
51 to 100	3	7
101 to 200	6	3
201 to 400	2	2
Over 400	1	0
Don't know	0	5

^a Only asked of TNC drivers in the November survey.

¹³ The National Drive Electric Week ride-and-drive survey was fielded by PGE staff in September 2019 to attendees who participated in a ride-and-drive. About 100 attendees completed at least one test drive during the event.

6.2 Awareness of Other PGE EV Campaigns

Few surveyed ride-and-drive participants reported being aware of PGE EV campaigns and resources, with more April survey respondents indicating being aware of campaigns than November survey respondents. Surveyed participants were most likely to report being aware of PGE’s EAs, PGE’s and Nissan’s combined discount on the Nissan Leaf, and social media information from PGE (Table 11). April participants were more likely to report being aware than November participants.

About half (53%) of surveyed National Drive Electric Week ride-and-drive participants reported hearing or seeing information about EVs from PGE.¹⁴

Table 11. PGE EV Resources, Campaigns, or Discounts Seen Before Attending the Event, by Survey Wave (Multiple Responses Allowed)

PGE Resource, Campaign, or Discount	April 2019 Count (n=15)	November 2019 Count (n=24)
PGE’s EAs	3	3
PGE’s and Nissan’s combined \$3,500 discount for the Nissan Leaf	1	2
Social media information from PGE on EVs	5	2
Free charging subscriptions for TNC EV drivers at EAs	N/A	1
PGE website information on EVs	1	1
National Drive Electric Week advertising (in 2018)	1	0
Did not see any of these resources	9	19

6.3 Reasons for Attending

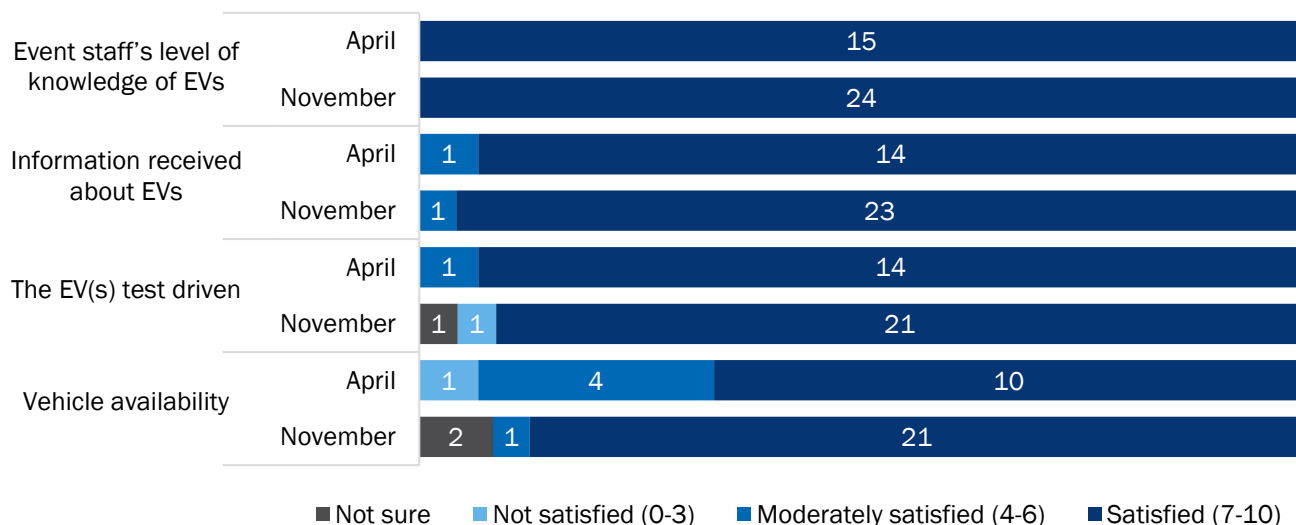
The Ride-and-Drive events appeared to be targeting the right audience. About two-thirds (9 of 15) of April respondents and three-quarters (20 of 24) of November TNC respondents reported they had never driven an EV prior to the event. Eleven of 15 April respondents and 20 of the 24 November respondents reported attending the event to test drive an EV.

6.4 Event Feedback

Survey respondents reported being generally satisfied with both events. As shown in Figure 1, all respondents reported high satisfaction with event staff’s level of knowledge of EVs, and nearly all were highly satisfied with both the EV they test drove and the information they received about EVs. April event survey respondents reported lower satisfaction with the availability of EVs they could test drive. The research team observed some April attendees being disappointed that there was not a Tesla model available to test drive and having to wait to test drive their preferred EV model.

¹⁴ Note, the research team did not implement the National Drive Electric Week Ride-and-Drive survey. Since the survey was structured differently from the other two Ride-and-Drive surveys, results are not included in the table.

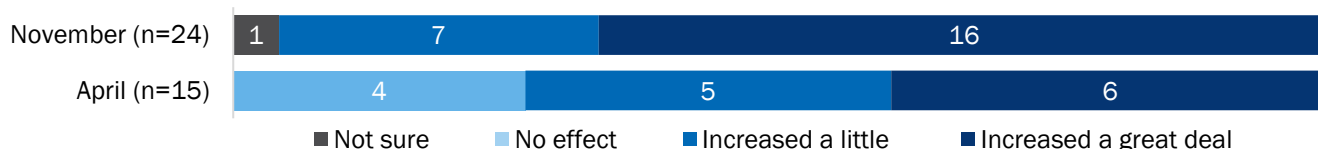
Figure 1. Respondent Satisfaction with the Event, by Survey Wave (April n=15; November n=24)



The Ride-and-Drive events appear to be increasing attendees' likelihood of purchasing or leasing an EV in the next five years, especially among TNC drivers. Most respondents April (14 of 15) and November (20 of 24) survey respondents reported they would be "somewhat" or "very" likely to purchase or lease an EV within the next five years. About one-third (6 of 15) in April and two-thirds (16 of 24) of November survey respondents indicated that the Ride-and-Drive event increased their likelihood of purchasing or leasing an EV "a great deal" (Figure 2).

Similarly, nearly all (99%) of surveyed National Drive Electric Week ride-and-drive participants reported that they were "very likely" to consider an EV for their next vehicle purchase and about two-thirds (66%) reported the ride-and-drive made them "much more likely" to purchase an EV in the future.

Figure 2. Event Effect on Likelihood of Purchasing EV in Next Five Years, by Survey Wave



Nearly half (11 of 24) of November survey respondents reported the availability of the new EA fast charging in Milwaukie, Hillsboro, and East Portland had influenced their consideration of EVs.¹⁵ About two-fifths (9 of 24) of respondents indicated not being aware of PGE's EAs, and four reported being aware of the EAs, but indicated they were not influential in their consideration of EVs.

Even after the test drive, respondents mentioned a variety of concerns they had about purchasing or leasing an EV. As seen in Table 12, both April and November survey respondents were primarily concerned about the purchase price of the vehicle and the vehicle driving range. Surveyed National Drive Electric Week ride-and-drive participants provided similar responses, with about three-quarters (72%) reporting the purchase price as a barrier to purchasing an EV, followed by the driving range (37%) and availability of public chargers (25%; multiple responses allowed).

¹⁵ Note that only November survey respondents were asked this question.

Table 12. Potential Barriers Preventing Respondents from Purchasing or Leasing an EV or PHEV, by Survey Wave (Multiple Responses Allowed)

Purchasing or Leasing Barrier	April 2019 Count (n=15)	November 2019 Count (n=24)
Purchase price of vehicle	7	14
Driving range (number of miles on a single charge)	7	12
Ability to charge at home	4	5
Time required to charge battery	2	4
Availability of public charging stations	3	3
Body types and sizes available	2	3
Performance and handling	3	0
Other barriers	5	7
Not applicable - already own or lease an EV	2	0
Don't know	0	1

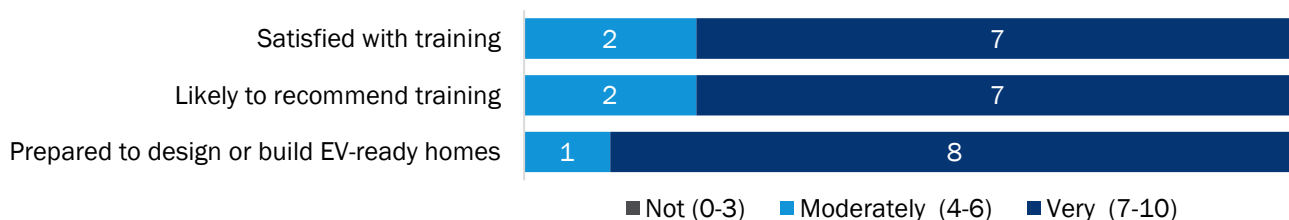
7. Business Technical Assistance and Builder Education Survey

The following section provides key findings from the Business Technical Assistance and Builder Education Survey. Findings are presented separately for builder education participants (n=9) and business and governmental organizations who received technical assistance from PGE staff (n=14). Two respondents who attended a fleet electrification session at a conference (n=1) or a webinar on workplace charging (n=1) where a PGE representative presented. These two respondents' responses are incorporated into the business technical assistance section. Respondents represent a variety of organizations, including construction companies, architectural and design firms, not-for-profits, local governments, and a manufacturer of commercial vehicles. Appendix K provides detailed survey findings.

7.1 Builder Education Feedback

Attendees reported finding information presented at the educational events to be appropriate and were largely satisfied with the events. All attendees reported that the information related to EV or charging concepts presented by PGE staff at the event was "about right." Over three-quarters (7 of 9) of respondents indicated they were very satisfied with PGE's portion of the event and indicated they would be very likely to recommend the event to a colleague or other industry professional (Figure 3). Most (8 of 9) respondents indicated that after attending PGE's and the builder training implementor's presentation on EV-ready homes, they very prepared to make a new home "EV-ready."

Figure 3. Respondent Satisfaction with the PGE-sponsored EV-Ready Home Training, Likelihood to Recommend Training, and Preparedness to Design or Build EV Ready Homes (n=9)



7.2 Reasons for Attending Business Technical Assistance and Classes and Recipient Feedback

Most respondents indicated they were in the middle stages of deciding about EV options or charging investment and wanted to learn about how PGE could help. Among respondents who received technical assistance:

- Nearly all (12 of 14) indicated they were either considering or planning their investment (6 of 14) or actively evaluating their plan (6 of 14),
- Six indicated they had already designed or purchased equipment but were looking for advice,
- Three indicated being in the design or purchasing process, and
- One respondent indicated they were seeking out information (multiple responses allowed).

Most respondents, who chose from a list of multiple reasons, reported receiving the technical assistance to either learn about potential distribution upgrades (9 of 14) or learn about what technical expertise and resources PGE has available (Table 13).

Table 13. Reported Reasons for Receiving Technical Assistance (Multiple Responses Allowed; n=14)

Reason for Receiving Technical Assistance	Count
Learn about potential PGE distribution system upgrades needed	9
Learn about technical expertise and resources available	8
Learn about EV incentives available	8
To understand costs associated with charger	7
To understand best location to place chargers	5
Get help selecting chargers	4
Learn the benefits of EVs for business or organization	3

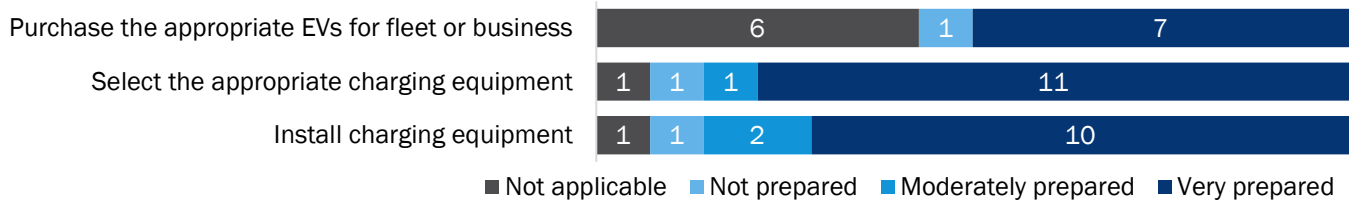
As shown in Figure 4, nearly all respondents indicated being very satisfied with the technical assistance they received (12 of 14) and would be very likely to recommend PGE’s the technical assistance they received to a colleague or other industry professional (11 of 14).

Figure 4. Respondents’ Satisfaction with the Technical Assistance they Received from PGE and Likelihood to Recommend the Technical Assistance Received from PGE (n=14)



The technical assistance provided by PGE staff is effective in preparing business and organizations to electrify their fleets and install workplace charging. As shown in Figure 5, respondents were largely in agreement that after receiving a consultation from PGE staff, they were very prepared to purchase the appropriate EVs for their fleet or business, select the appropriate charging equipment, and to install charging equipment.

Figure 5. Respondents' Preparedness after Receiving a Consultation from PGE (n=14)



7.3 Awareness of PGE EV Pilot Efforts

Nearly all (21 of 25) respondents reported having seen or being aware of at least one of PGE EV resources, campaigns, or discounts (Table 14).

Table 14. PGE EV Resources, Campaigns, or Discounts Respondents Have Seen or Heard Of, by Respondent Type (Multiple Responses Allowed)

PGE EV Resources, Campaigns, or Discounts	Builder Education (n=9)	Technical Assistance (n=16) ^a
PGE's Electric Avenues ^b	3	12
PGE's Electric Avenues in downtown Portland	3	10
PGE's Electric Avenues in Milwaukee	1	10
PGE's Electric Avenues in Hillsboro	1	9
PGE's Drive Change Fund	1	10
Website information on EVs	3	9
National Drive Electric Week advertising	0	7
PGE and Chevy's \$500 EV discount or free Level 2 charger	0	6
EV educational kiosks at dealerships	4	5
PGE's and Nissan's \$3,500 Nissan Leaf discount	4	5
Social media information on EVs	3	5
Emails on EV services or classes	2	5
Nothing	2	2

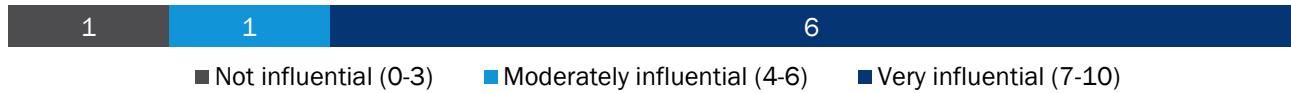
^a Note: Column counts include results from the two respondents who attended a conference session and webinar.

^b The builder education survey was implemented prior to the opening of PGE's Eastport Plaza EA.

7.4 Influence of PGE on Workplace Charger Installations and Fleet Electrification

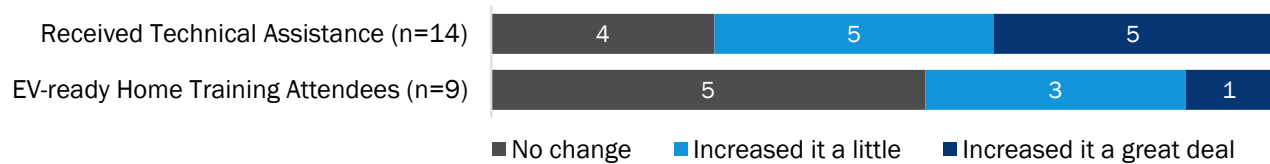
Surveyed technical assistance recipients indicated that the consultations they received were very influential in their decision to install chargers and without it, they would have scaled back their projects. Three-quarters of respondents (6 of 8) rated the consultation they received as very influential in their decision to install their charger(s) (Figure 6). Further, 4 of 8 said that without receiving the technical assistance they would have scaled their project back. The remaining respondents indicated they would have postponed installing the charging equipment for two to three years (1 mention), done the exact same installations (1 mention), or did not know what they would have done (2 mentions).

Figure 6. Influence of PGE Consultation on Respondents' Decision to Install Chargers (n=8)



Technical assistance and education have increased some respondents' likelihood of purchasing or leasing an EV within the next three years, but not all. About a third (5 of 14) of respondents who received a consultation and one of nine respondents who attended a EV-ready home training indicated that their consultation or education increased their likelihood of purchasing or leasing an EV within the next three years “a great deal” (Figure 7). Another third of respondents who received a consultation and three of nine EV-ready home training attendees said that it “increased [their likelihood] a little.” Nine respondents total indicated it did not change their likelihood.

Figure 7. Consultation or Education Impact on Likelihood of Purchasing or Leasing an EV



8. General Population Residential Customer Survey

This section presents key findings from Wave 1 of the general population survey fielded to PGE residential customers in November 2019 and makes comparisons to the Baseline survey fielded in 2018 where questions are comparable. The survey included questions about pilot awareness, consideration of purchase, and intention to purchase or lease an EV as well as questions specifically addressing the pilot activities. In the Wave 1 survey, 1,026 residential customers indicated they were likely to purchase or lease a vehicle in the next five years. The findings are broken out into three segments: EV/PHEV Non-Considerers, EV/PHEV Considerers, and EV/PHEV Intenders (see Table 15 for definitions of each segment). The team conducted statistical testing to detect any significant differences between the three segments and survey wave. To summarize the results in this chapter, the team excludes some survey questions and detailed response options from figures and text. Please see Appendix G for detailed survey findings.

The number of customers intending to purchase an EV or PHEV in the next five years has increased significantly since the Baseline survey (24%, up from 17%), largely due to a shift from the number of EV or PHEV considerers to the number of EV or PHEV intenders (Table 15). The decrease in considerers was largely among respondents who were considering a PHEV for their next vehicle; respondent consideration of EVs remained the same between the two surveys.

Table 15. General Population Customer Survey Analysis Segments

Segment and Definition		Baseline (2018)		Wave 1 (2019)	
		n	%	n	%
All likely vehicle purchasers	PGE Residential customers who indicate that they expect to purchase or lease a new or used vehicle within the next five years.	929	100%	1,026	100%
EV/PHEV Non-Considerers	Likely Vehicle Purchasers who indicate they are not planning to consider an EV or PHEV for their next vehicle purchase.	494	53%	526	51%
EV/PHEV Considerers	Likely Vehicle Purchasers who indicate they will consider an EV or PHEV for their next vehicle but selected another type of vehicle	276	30%	253	25% ^a

Segment and Definition		Baseline (2018)		Wave 1 (2019)	
		n	%	n	%
	when asked which one type they are most likely to acquire the next time they purchase or lease a vehicle.				
EV/PHEV Intenders	Likely Vehicle Purchasers who selected EV or PHEV when asked: "Considering everything you currently know, which one type of vehicle listed below are you most likely to acquire the next time your household purchases or leases a vehicle?"	159	17%	247	24%*

* Indicates a statistically significant difference between Baseline and Wave 1 survey all likely vehicle purchasers (z-test for proportions, p<.05).

8.1 Customer Familiarity and Consideration of EVs and PHEVs

Customers have moderate to high levels of familiarity with EVs and PHEVs, which is consistent with Baseline survey findings. About three-quarters of respondents indicated they were at least somewhat familiar with EVs (73%) and PHEVs (78%; Figure 8). Respondents in the Considerer and Intender segments are significantly more likely to report being familiar with EVs and PHEVs compared to those in the non-considerer segment.

Figure 8. Respondent Familiarity with Vehicle Fuel Types, by Survey Wave and Segment (Multiple Responses Allowed)

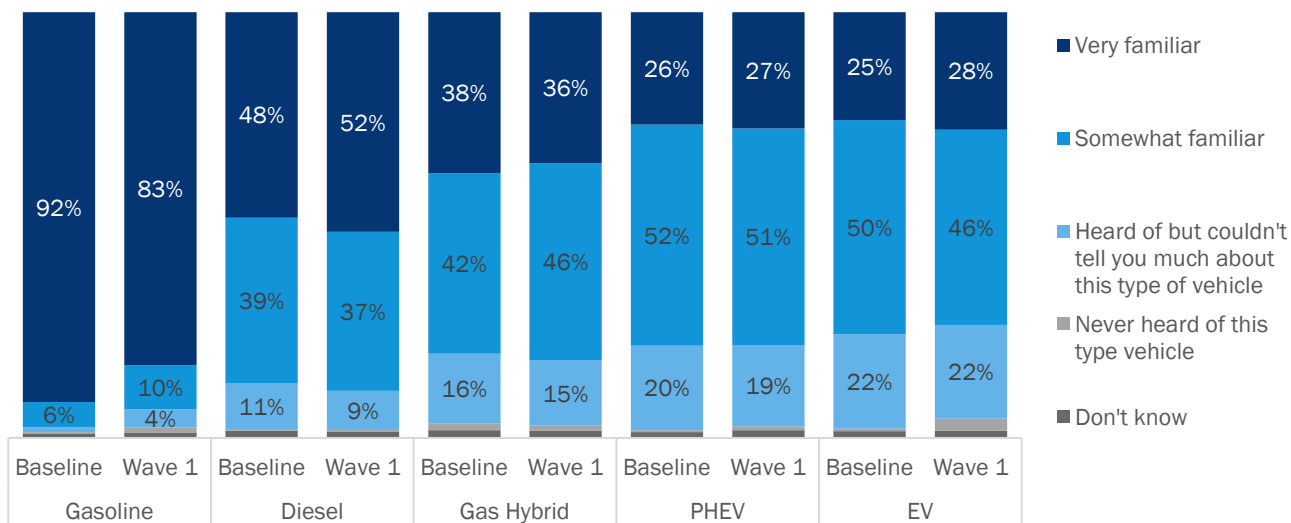
Vehicle Fuel Type Familiarity (% Reporting Somewhat or Very Familiar)	All Likely Vehicle Purchasers		Wave 1 - All Likely Vehicle Purchasers		
	Baseline (n= 929)	Wave 1 (n=1026)	EV/PHEV Non-Considerers (n=526) (A)	EV/PHEV Considerers (n=253) (B)	EV/PHEV Intenders (n=247) (C)
Gasoline	97%	93%	94%	93%	93%
Diesel	87%	89%	85% B C	92% A	93% A
Gas Hybrid	80%	82%	74% B C	87% A C	94% A B
PHEV	78%	78%	70% B C	84% A C	92% A B
EV	76%	73%	63% B C	81% A C	90% A B

Note: Letters A - C indicate statistically significant differences between likely vehicle purchaser segments (z-test for proportions, p<.05).

* Indicates a statistically significant difference between Baseline and Wave 1 survey all likely vehicle purchasers (z-test for proportions, p<.05).

Although customers are generally aware of EVs and PHEVs, high familiarity levels for EVs and PHEVs currently lag behind gasoline and diesel vehicles. As shown in Figure 9, respondents were significantly less likely to report being "very familiar" with EVs and PHEVs compared to gasoline and diesel vehicles. Additionally, about one-fifth of respondents indicated they have heard about EVs and PHEVs but do not know much about these vehicle types. These findings suggest that although customers are aware of EVs and PHEVs, they continue to lack first-hand experience with these vehicle types that would likely lead to increased familiarity.

Figure 9. Respondent Level of Familiarity with Vehicle Fuel Types, by Survey Wave (Baseline n=929; Wave 1 n=1026)



Customers report finding EVs and PHEVs to be the most environmentally friendly vehicle types, unchanged since the Baseline survey. Customers in the non-considerer segment are least likely to report EVs and PHEVs are very environmentally friendly (reporting an 8-10 on a scale from “0” to “10”), however, all customers are generally in agreement that gasoline and diesel vehicles are the least environmentally friendly vehicles. See Appendix G for a detailed response breakout.

When asked why respondents would consider purchasing or leasing an EV or PHEV, the environmental impact and operations cost savings were the most cited considerations (Figure 10). Respondents in the intender segment were most likely to report considering the environmental impact. Respondents in the non-considerer segment were most likely to indicate fuel and operating costs as a consideration, significantly more so than considerers. Similarly, most respondents who were considering or intending to purchase or lease an EV or PHEV in the next five years reported that protecting the environment and lower fuel costs were major factors in their consideration (82% and 70%, respectively). See Appendix G for a detailed response breakout.

Figure 10. Unprompted Reasons Mentioned for Purchasing or Leasing an EV or PHEV, by Survey Wave and Segment (Multiple Responses Allowed) ^a

Main Reason for Purchasing or Leasing an EV/PHEV (Unprompted)	All Likely Vehicle Purchasers		Wave 1 - All Likely Vehicle Purchasers		
	Baseline (n= 929)	Wave 1 (n=1026)	EV/PHEV Non-Considerers (n=526) (A)	EV/PHEV Considerers (n=253) (B)	EV/PHEV Intenders (n=247) (C)
Environmental impact	42%	40%	26% B C	45% A C	64% A B
Fuel/operating cost	33%	26% *	29% B	20% A	25% A
Cost (unspecified)	9%	8%	7%	9%	10%
No/less gas used	5%	8% *	10%	5%	8%
Efficiency/fuel economy	7%	5%	3% B C	8% A	7% A
Maintenance costs	6%	5%	4%	3%	7%
Don't know	19%	25% *	31% C	26% C	9% A B

^a Those who indicated they were intending to purchase an EV or PHEV were asked “What are the main reasons you would consider an EV PHEV for your next vehicle purchase or lease?” All other respondents were asked “If in the future you were to consider purchasing or leasing an EV /PHEV, what would you expect to be the main benefits of having an electric vehicle?”

Note: Letters A - C indicate statistically significant differences between likely vehicle purchaser segments (z-test for proportions, p<.05).

* Indicates a statistically significant difference between Baseline and Wave 1 survey all likely vehicle purchasers (z-test for proportions, p<.05).

8.2 Sources of Information about EV Acquisition, Ownership, and Charging

Customers report receiving information about EVs from a variety of sources, with PGE being an important source of information. Respondents reported primarily receiving information about EVs from friends and colleagues (48%), unchanged since the Baseline survey (Figure 11). About one-quarter (23%) of respondents reported receiving information about EVs from PGE, down from 32% in the Baseline survey.

When asked which source of information respondents find most useful, PGE was ranked fifth (9%) among all sources of information, with friends and colleagues (33%), general internet searching (29%), automobile reviews (24%), and automobile manufacturers (13%) rounding out the top five most useful information sources.

Figure 11. Sources of Information Respondents Recalled Reading, Hearing, or Seeing Information about EVs, by Survey Wave and Segment (Multiple Responses Allowed).

Sources from which Respondents Recall Reading, Hearing, or Seeing Information about EVs	All Likely Vehicle Purchasers		Wave 1 - All Likely Vehicle Purchasers		
	Baseline (n=929)	Wave 1 (n=1026)	EV/PHEV Non-Considerers (n=526) (A)	EV/PHEV Considerers (n=253) (B)	EV/PHEV Intenders (n=247) (C)
Friends and colleagues	48%	48%	43% C	51% A C	56% A
General internet search	30%	30%	23% B C	33% A C	45% A B
Automobile manufacturers	31%	29%	25% B	35% A	32%
Social media	26%	26%	23% B	32% A	28%
Automobile reviews and consumer advice information	28%	25%	19% B C	28% A	37% A
PGE	32%	23% *	20%	25%	26%
Automobile dealerships	22%	20%	15% B C	24% A	26% A
None	8%	10%	14% B C	5% A	3% A
Don't know	10%	8% *	8%	10% C	4% B

Note: Letters A - C indicate statistically significant differences between likely vehicle purchaser segments (z-test for proportions, p<.05).

* Indicates a statistically significant difference between Baseline and Wave 1 survey all likely vehicle purchasers (z-test for proportions, p<.05).

About one-fifth (20%) of respondents reported seeing at least one PGE EV resource, campaign, or discount (Figure 12). Customers were most familiar with emails from PGE on EV services or charging, followed by PGE's EAs. The small number of respondents for any single PGE activity suggests that customers are yet to be substantially influenced by the OE&TA efforts.¹⁶

Figure 12. PGE EV Resources, Campaigns, or Discounts Seen by Respondents, by Survey Wave and Segment (Multiple Responses Allowed)^a

PGE EV Resources, Campaigns, or Discounts	Total (n=1026)	All Likely Vehicle Purchasers		
		EV/PHEV Non-Considerers (n=526) (A)	EV/PHEV Considerers (n=253) (B)	EV/PHEV Intenders (n=247) (C)
Emails from PGE on EV services or charging	6%	5%	7%	7%
PGE's Electric Avenue in downtown Portland	4%	2% C	4%	8% A
PGE website information on EVs	4%	4%	4%	4%
PGE's and Nissan's combined \$3,500 Nissan Leaf discount	2%	1%	3%	4%
PGE's Electric Avenue in Hillsboro	2%	2%	2%	1%
PGE's Electric Avenue in Milwaukie	2%	1% C	1% C	6% A B
PGE's sponsored ride-and-drive events	2%	2%	1%	1%
Social media	2%	1% B	4% A	3%
Didn't see any of these	63%	66% C	63%	54% A
Don't know	17%	17%	17%	18%

Note: Letters A - C indicate statistically significant differences between likely vehicle purchaser segments (z-test for proportions, p<.05).

^a Question only asked of Wave 1 survey respondents.

¹⁶ Note that reported customer awareness of Electric Avenues was considerably lower in this question compared to when asked directly about what Electric Avenue locations they had seen (2-4% vs 33%) (see Figure 18 below). Since this question was essentially an unaided request, asking about a variety of resources, campaigns, or discounts (17 in total), it is possible that customers overlooked the Electric Avenue options.

Twenty percent of customers report having experience with driving an EV. Among those that said they had experience driving an EV at a Ride-and-Drive event, about 5 % indicated the event was sponsored by PGE – all of whom were customers in the intender segment.

Figure 13. Respondent Experience with Driving an EV, By Survey Wave and Segment (Multiple Responses Allowed)

Respondent Experience Driving EV	Total (n=1026)	EV/PHEV Non-Considerers (n=526) (A)	EV/PHEV Considerers (n=253) (B)	EV/PHEV Intenders (n=247) (C)
A friend's, family member's, or colleague's	14%	10% B C	21% A	18% A
At a dealership	3%	2% C	3%	6% A
At some other (non-Forth) ride-and-drive event	2%	1% B	4% A	2%
My own EV or PHEV	1%	0%	0%	3%
No experience	80%	87% B C	71% A	71% A
Don't know	2%	1% B	3% A	3%

Note: Letters A - C indicate statistically significant differences between likely vehicle purchaser segments (z-test for proportions, p<.05).

^a Question only asked of Wave 1 survey respondents.

8.3 Customer Motivations and Barriers to Purchasing or Leasing an EV or PHEV

Vehicle range has become less of a barrier to purchasing or leasing an EV or PHEV with the affordability of EVs remaining the primary barrier. In an open-ended response, one-third (30%) of respondents mentioned that cost or affordability were barriers to purchasing or leasing an EV or PHEV, unchanged since the Baseline survey (Figure 14). There was a notable decrease, however, in the number of mentions related to vehicle range and charging availability compared to the Baseline survey. Interestingly, customers in the considerer and intender segments were significantly more likely to report cost or affordability as barriers compared to non-considerers, likely because customers in these segments have spent more time researching these vehicle types and understand the costs compared to conventional vehicles.


















































Figure 14. Unprompted Barriers Mentioned to Purchasing or Leasing an EV or PHEV, by Survey Wave and Segment (Multiple Responses Allowed)

Main Barrier to Purchasing or Leasing an EV/PHEV (Unprompted)	All Likely Vehicle Purchasers		Wave 1 - All Likely Vehicle Purchasers		
	Baseline (n= 929)	Wave 1 (n=1026)	EV/PHEV Non-Considerers (n=526) (A)	EV/PHEV Considerers (n=253) (B)	EV/PHEV Intenders (n=247) (C)
Cost/affordability (unspecified)	28%	30%	19% B C	33% A C	51% A B
Range/battery life	23%	14% *	18% B C	10% A	10% A
Recharge stations/infrastructure	22%	13% *	16% C	11%	10% A
Cost of vehicle	11%	10%	8%	10%	12%
Convenience/ease of use	7%	7%	10% B C	3% A	3% A
Cost of electricity/cost to use	5%	4%	6%	3%	2%
Cost of repairs/maintenance	6%	4% *	5% C	2%	2% A
Power/able to pull and tow	4%	4%	5% C	3%	1% A
Don't know	13%	17% *	18% C	24% C	10% A B

Note: Letters A - C indicate statistically significant differences between likely vehicle purchaser segments (z-test for proportions, p<.05).
 * Indicates a statistically significant difference between Baseline and Wave 1 survey all likely vehicle purchasers (z-test for proportions, p<.05).

Similarly, when provided with a list of potential concerns to purchasing or leasing an EV or PHEV, a large majority of customers reported that the purchase price of the vehicle was a major concern, followed closely by vehicle range (Figure 15). Concern about vehicle purchase price has increased significantly since the Baseline survey (84%, up from 79%). Concern with vehicle range and availability of public charging within and outside the Portland and Salem metro areas, however, has decreased significantly since the Baseline survey. Among those respondents who reported vehicle range was a concern, about two-thirds (62%) indicated that the range would need to be over 200 miles to alleviate concerns.

Figure 15. Prompted Barriers Mentioned to Purchasing or Leasing an EV or PHEV, by Survey Wave and Segment (Multiple Responses Allowed)

Barriers to Purchasing or Leasing an EV/PHEV (% Reporting a Major Concern)	All Likely Vehicle Purchasers		Wave 1 - All Likely Vehicle Purchasers		
	Baseline (n=929)	Wave 1 (n=1026)	EV/PHEV Non-Considerers (n=526) (A)	EV/PHEV Considerers (n=253) (B)	EV/PHEV Intenders (n=247) (C)
Purchase price of vehicle	79% 	84%  *	80%  C	86% 	88%  A
Number of miles vehicle will go on a single charge	86% 	78%  *	81%  C	80% 	73%  A
Vehicle reliability	N/A ^a	77% 	75% 	79% 	80% 
Vehicle safety	69% 	66% 	60%  C	68% 	76%  A
Ability to charge at home	66% 	65% 	66% 	61% 	66% 
Amount of time required to charge battery	66% 	62%  *	68%  B C	56%  A	53%  A
Availability of public charging stations outside of the Portland/Salem metro areas	69% 	61%  *	73%  B C	51%  A	42%  A
Maintenance costs	65% 	61% 	65%  C	62% 	52%  A
Vehicle's performance and handling	64% 	58%  *	57% 	60% 	60% 
Availability of public charging stations in the Portland/Salem metro areas	61% 	50%  *	57%  B C	45%  A	41%  A

^a Item not displayed to Baseline survey respondents.

Note: Letters A - C indicate statistically significant differences between likely vehicle purchaser segments (z-test for proportions, p<.05).

* Indicates a statistically significant difference between Baseline and Wave 1 survey all likely vehicle purchasers (z-test for proportions, p<.05).

Among customers who indicated they were not considering an EV or PHEV for their next vehicle, about one-third (30%) reported there were no changes to vehicle specifications or charging infrastructure that would encourage them to purchase or lease an EV or PHEV in the future (Figure 16).¹⁷ Among those that offered suggestions, additional charging infrastructure, changes in range or battery life, and cost/affordability were most cited.

Figure 16. Reported Changes Necessary to Consider EV or PHEV for Next Vehicle among Non-Considerers, by Survey Year (Multiple Responses Allowed)^a

Changes Necessary to Consider EV or PHEV for Next Purchase/Lease	EV or PHEV Non-Considerers	
	Baseline (n=494)	Wave 1 (n=526)
Additional charging infrastructure	32%	25%*
Range/battery life	23%	17%*
Cost/affordability (unspecified)	14%	10%*
Cost of vehicle	8%	7%
Style/model of car	8%	7%
Time it takes to charge	7%	6%
Size of vehicle	7%	6%
Nothing	3%	30%*
Don't know	8%	5%*

^a Only asked of respondents in the EV/PHEV Non-Considerer segment.

* Indicates a statistically significant difference between Baseline and Wave 1 survey all likely vehicle purchasers (z-test for proportions, $p < .05$).

8.4 Knowledge of EV Charging Options and Logistics

Customer knowledge of the cost of charging compared to the cost of fueling a gasoline-powered vehicle and knowledge of DC fast charging appears to increase the likelihood of considering an EV or PHEV for their next vehicle purchase. One-fifth (20%) of respondents reported being aware of the cost per mile comparison between electricity and gasoline (3 cents vs. 13 cents per mile, on average), unchanged since the Baseline

¹⁷ Note that although there was a significant increase in “nothing” responses from the Baseline survey, interpret this result with caution due to changes to survey format. The format of the Baseline survey allowed respondents to input an open-ended response with the choice of not leaving a response and skipping the question. Only respondents who typed in a response that indicated there were no additional changes needed were coded at “nothing.” The Wave 1 survey provided the same open-ended space to input a response but also provided a “no changes needed” options for respondents to select. It is likely that a portion of respondents in the Baseline survey left this question blank when they had no suggestions for changes.

survey (21%). When asked how knowing the cost comparisons affected their likelihood to purchase or lease an EV or PHEV, about half (54%) of respondents indicated they were somewhat or much more likely to purchase or lease an EV or PHEV (Figure 17).

Figure 17. Impact of EV and PHEV Operating Knowledge on Likelihood to Purchase or Lease, by Survey Wave and Segment

Knowledge Factor (% Reporting Much or Somewhat More Likely)	All Likely Vehicle Purchasers		Wave 1 - All Likely Vehicle Purchasers		
	Baseline (n=929)	Wave 1 (n=1026)	EV/PHEV Non-Considerers (n=526) (A)	EV/PHEV Considerers (n=253) (B)	EV/PHEV Intenders (n=247) (C)
Cost to charge in comparison to gasoline (3 cents per mile vs 13 cents per mile)	58%	54%	41% B C	68% A	71% A
Availability of Level 1 Charging (Standard home outlet used to charge an EV in 10-15 hours or PHEV in 5-10 hours)	21%	26% *	20% B C	33% A	33% A
Availability of Level 2 Charging (\$1,000 installed home charger used to charge an EV in 5-10 hours or PHEV in 1-5 hours)	26%	27%	17% B C	32% A C	43% A B
Availability of DC Fast Charging (Public charging used to charge an EV to 80% in 30 minutes to 1 hour)	38%	41%	30% B C	48% A	58% A

Note: Letters A - C indicate statistically significant differences between likely vehicle purchaser segments (z-test for proportions, p<.05).

* Indicates a statistically significant difference between Baseline and Wave 1 survey all likely vehicle purchasers (z-test for proportions, p<.05).

Home charging is most important to customers, and its availability may factor into decisions to purchase or lease an EV or PHEV. Overall, about three-quarters (73%) of respondents indicated that having charging available at home is most important to them. Respondents in the intender segment were significantly more likely to report home charging being most important to them than other segments (87%, compared to 67% of non-considerers and 73% of considerers). When asked if respondents had access to an electrical service outlet where they park their vehicle, only about two-fifths (39%) reported having one, with intenders being most likely to report having one (47%, compared to 35% of non-considerers and 40% of considerers).

Fewer than one-fifth (14%) of respondents indicated that public charging is the most important location to have charging available. However, a large majority (87%) reported having noticed public charging locations in Oregon. Among those respondents who reported noticing public charging locations, about two-fifths (40%) reported they noticed signs or other information at these stations – a similar proportion was seen in the Baseline survey (35%). About two-thirds of respondents who reported seeing signage could not identify the company who owned the charging equipment, a significant increase from the Baseline survey (65%, up from 56%). Tesla and PGE were the two companies most commonly mentioned by respondents (7% and 5% of customers who reported seeing signage, respectively).

Customer awareness of EA locations has doubled since the Baseline survey. One-third (33%) of Wave 1 survey respondents reported having seen an EA location, a significant increase from Baseline (13%; Figure 18). Customers were most aware of the Downtown Portland location (18%), followed by the recently opened Eastport Plaza location. Respondents in the considerer and intender segments were significantly more likely to report seeing an EA location compared to non-considerers.

Figure 18. Electric Avenue Locations Seen by Respondents, by Survey Wave and Segment (Multiple Responses Allowed)

Electric Avenues Seen	All Likely Vehicle Purchasers		Wave 1 - All Likely Vehicle Purchasers		
	Baseline (n=929)	Wave 1 (n=1026)	EV/PHEV Non-Considerers (n=526) (A)	EV/PHEV Considerers (n=253) (B)	EV/PHEV Intenders (n=247) (C)
Has seen any Electric Avenue	13%	33%*	26% B C	37% A	44% A
Downtown Portland	N/A ^a	18%	10% B C	24% A	31% A
Eastport Plaza	N/A ^a	8%	7%	10%	8%
Hillsboro	N/A ^a	7%	7%	6%	7%
Milwaukie	N/A ^a	7%	7%	6%	9%

^a Only the Downtown Portland Electric Avenue location was the only operating at the time of the Baseline survey thus respondents were not asked about specific Electric Avenue locations.

Note: Letters A - C indicate statistically significant differences between likely vehicle purchaser segments (z-test for proportions, p<.05).

* Indicates a statistically significant difference between Baseline and Wave 1 survey all likely vehicle purchasers (z-test for proportions, p<.05).

8.5 Expectations for PGE supporting EV Adoption and Developing EV Charging Infrastructure

Customers are supportive of PGE’s efforts to ensure convenient EV charging is available in the community but are less supportive of PGE efforts to help EVs and PHEVs gain more market acceptance. Respondents were most in agreement that they support PGE investing to ensure that the existing electrical system supports convenient recharging and that PGE should help to make owning an EV more convenient and feasible by installing and maintaining public charging stations (Figure 19). Respondents were in less agreement that PGE should be helping EVs and PHEVs gain market acceptance and that they should electrify its fleet. Overall, customers in the non-considerer segment were least likely to report agreeing with the below statements and those in the considerer and intender segments were in most agreement.

Figure 19. Respondent Agreement with Statements About PGE’s Role in Supporting EVs, by Survey Wave and Segment (Multiple Responses Allowed)

Respondent Agreement with Statements about PGE's Role in Supporting EVs (% Responding 8-10 - Strong Agreement)	All Likely Vehicle Purchasers		Wave 1 - All Likely Vehicle Purchasers		
	Baseline (n=929)	Wave 1 (n=1026)	EV/PHEV Non-Considerers (n=526) (A)	EV/PHEV Considerers (n=253) (B)	EV/PHEV Intenders (n=247) (C)
Support PGE working and investing now to ensure that the existing electric system is able to support convenient recharging	81%	80%	72%	88%	91%
PGE should make owning an EV more convenient and feasible by installing and maintaining public charging stations	75%	77%	68%	86%	89%
PGE is a credible source of information about EVs	73%	74%	68%	81%	80%
PGE should take an active role in educating people about EVs	75%	74%	65%	82%	88%
PGE should work with the local and state government to encourage EV market growth	74%	73%	62%	84%	88%
PGE should help EVs and PHEVs gain market acceptance	71%	71%	60%	82%	87%
PGE should convert its own vehicle fleet to electric power as soon as possible	67%	67%	55%	78%	83%

Note: Letters A - C indicate statistically significant differences between likely vehicle purchaser segments (z-test for proportions, p<.05).

Customers expressed moderate levels of agreement that PGE supports the expansion of EV adoption in the region, offers innovative energy solutions, and helps to protect the environment (Figure 20).

Figure 20. Respondent Level of Agreement with Statements About PGE’s Support of EVs, Offering of Innovative Energy Solutions, and Protecting the Environment, by Survey Wave and Segment ^a













Agreement with Statements about PGE (% Responding 6 or 7 - Strong Agreement)	All Likely Vehicle Purchasers		Wave 1 - All Likely Vehicle Purchasers		
	Baseline (n=929)	Wave 1 (n=1026)	EV/PHEV Non-Considerers (n=526) (A)	EV/PHEV Considerers (n=253) (B)	EV/PHEV Intenders (n=247) (C)
PGE supports the expansion of EV adoption in the region	47%	48%	44%	51%	56%
PGE offers innovative energy solutions	46%	45%	43%	50%	44%
PGE helps protect the environment	43%	40%	38%	45%	38%

^a Percent reporting 6 or 7 on a 7-point scale, from 1 meaning “strongly disagree” to 7 meaning “strongly agree”.

Note: Letters A - C indicate statistically significant differences between likely vehicle purchaser segments (z-test for proportions, p<.05).

Customers show moderate interest in PGE EV pricing plans currently under consideration. Over three-quarters (79%) of respondents who were at least considering purchasing or leasing an EV or PHEV indicated that PGE pricing plans for EVs would increase their consideration of these vehicle types, similar to the Baseline survey (83%). When asked to rate their level of consideration on four pricing plans about one-third to two-fifths of respondents indicated they would probably or definitely consider a plan that would offer them free or discounted home and public charging for a flat monthly charge (Figure 21). Customer interest did not vary greatly by plan type – respondents reported being most interested in the \$40 per month plan and least interested in the \$80 per month plan.

Figure 21. Customer Interest in Potential PGE Charging Plans, by Segment (Multiple Responses Allowed) ^a

Interest in Charging Plans (% Reporting Would Probably or Definitely Consider)	Wave 1 - All Likely Vehicle Purchasers		
	Total (n=500)	EV/PHEV Considerers (n=253) (B)	EV/PHEV Intenders (n=247) (C)
\$80 a month: free home charging at night, free PGE public charging, a discounted Level 2 home charging station, discounted non-PGE public charging, and renewable power	34% 	36% 	32% 
\$60 a month: free home charging at night, free PGE public charging, discounted non-public public charging, and renewable power	38% 	34% 	42% 
\$40 a month: discounted home charging at night, free PGE public charging, and renewable power	41% 	41% 	41% 
\$20 a month: free PGE public charging	37% 	37% 	37% 

^a Note that a similar question was asked in the Baseline survey but was revised slightly for the Wave 1 survey. Thus, the team did not include results in the above figure due to a lack of comparability. Results, however, were similar between the two surveys with 36% of customers reporting they would probably or definitely consider the \$80 a month plan, 47% would consider the \$60 a month plan, 53% would consider the \$40 a month plan, and 34% would consider the \$20 a month plan. Also, note that only those who were considering or intending to purchase or lease an EV or PHEV were asked this question.

Appendix A. Future Evaluation Activities

The evaluation of the pilots will continue through 2023. The following is a summary of planned evaluation activities by year. Note that some scheduled 2020 evaluation activities may be moved to 2021 due to COVID-19.

■ Planned 2020 Evaluation Activities:

- Round two of PGE staff and partner interviews
- Wave 2 of the general population survey
- Wave 1 of the EV owner/lessee survey
- Wave 2 of the Business technical assistance and builder education survey
- Wave 1 and Wave 2 of the follow-up technical assistance survey
- Round 3 of ride-and-drive intercept surveys
- Round 1 of the Electric Avenue intercept surveys
- Round 1 of focus groups with TNC drivers
- First pilot impact analysis, including analysis of equity impacts

■ Planned 2021 Evaluation Activities:

- Wave 3 of the follow-up technical assistance survey
- Round 2 and 3 of the Electric Avenue intercept surveys
- Multifamily building owner and manager in-depth interviews

■ Planned 2022 Evaluation Activities

- Wave 3 of the general population survey
- Round 2 of focus groups with TNC drivers

■ Planned 2023 Evaluation Activities

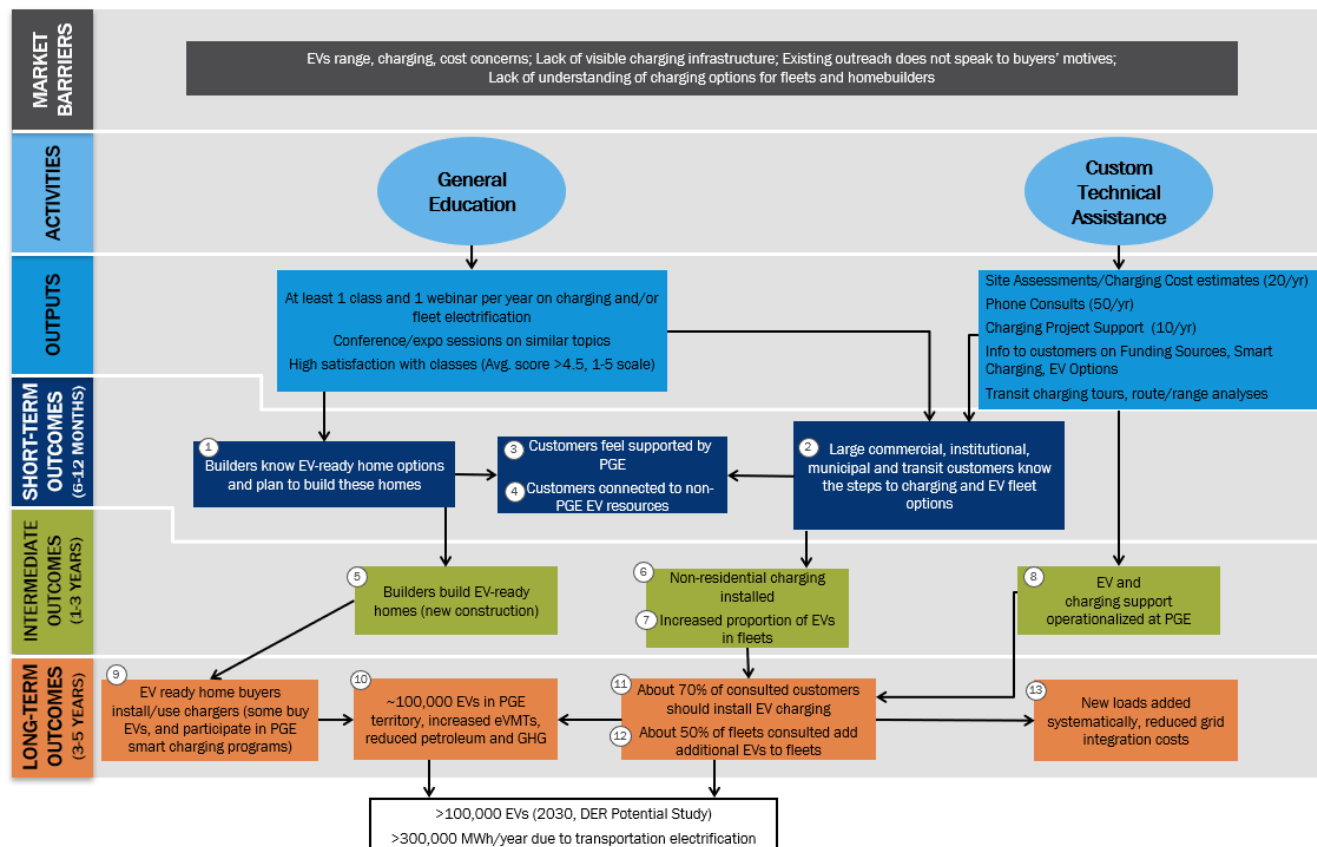
- Wave 2 of the EV owner/lessee survey
- Second pilot impact analysis, including analysis of equity impacts

Appendix B. Logic Models and Key Performance Indicators

This section provides the final program theory and logic model diagram and associated key performance indicators (KPIs) for the pilots.

Outreach, Education, and Technical Assistance Pilot

Figure 22. Outreach, Education, and Technical Assistance Pilot Program Non-Residential Logic Model



Note: EV=Electric Vehicles; TA=Technical Assistance; HBA=Home Builders Association, EV-ready=the necessary conduit and wiring for a dedicated circuit to serve a future-installed EV charger has been installed (and the electrical panel is labeled to indicate this). The circles with numbers in the logic model diagram indicate the KPIs, which measure the program outcomes (see table below). If more than one KPI per outcome, label the KPIs with the number noted in the circle in the logic model and “a”, “b”, “c”, etc. to denote the outcome has multiple KPIs.

Table 16. Outreach, Education, and Technical Assistance Pilot Program Non-Residential Key Performance Indicators

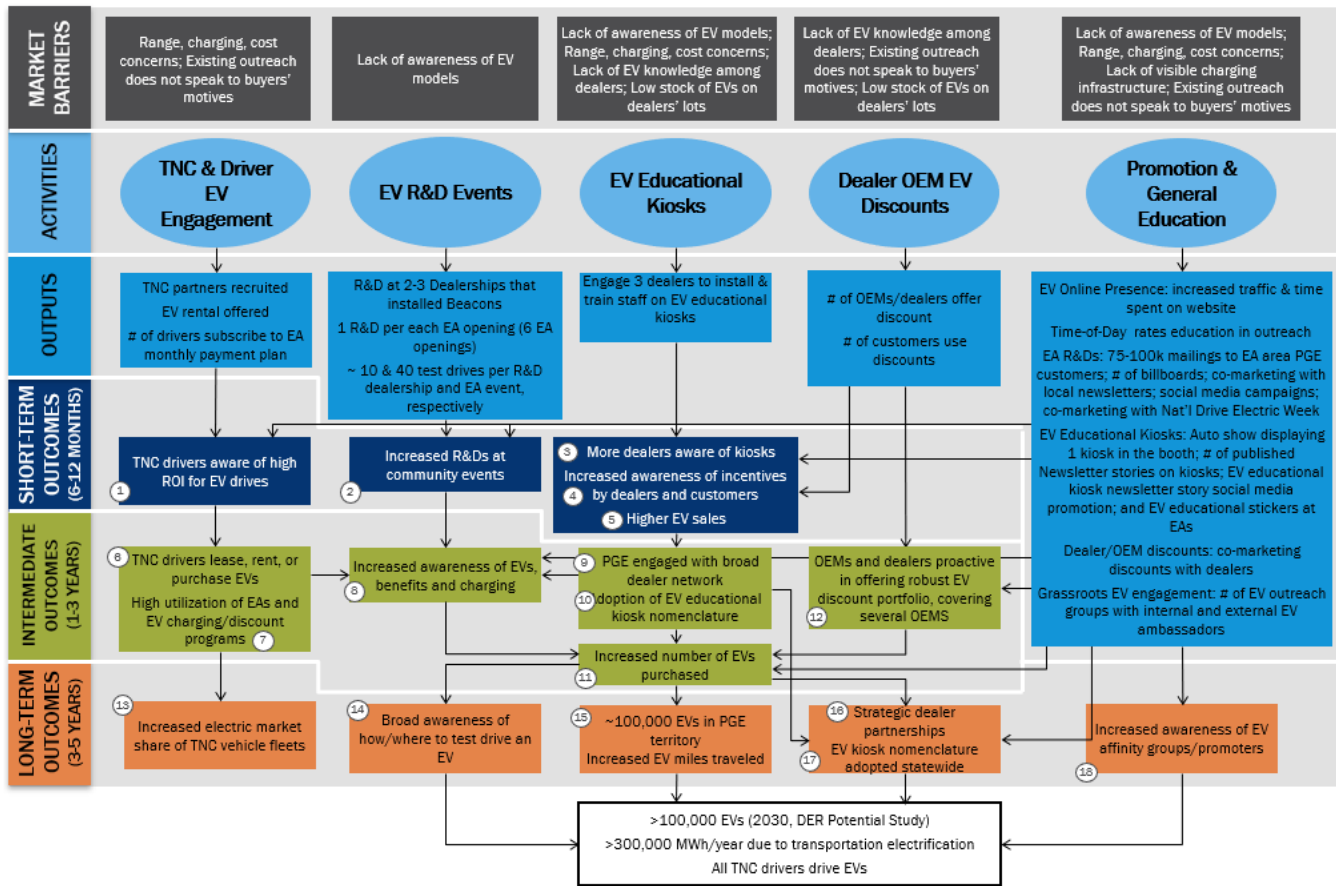
KPI Name		Description	Goal	Data Source	Staff Responsible for Goal
1a	Builder knowledge gained	Builders are able to describe/define how to make a home EV-ready (Note: class, workshop attendees get EV-ready definition and example construction specifications)	>75%	Interviews, surveys by Evaluation contractor	PGE Marketing

KPI Name		Description	Goal	Data Source	Staff Responsible for Goal
1b	Builder knowledge gained	Builders agree with “I’m more likely to build EV-ready homes as a result of this class.”	>50% agreement	Interviews, surveys by Evaluator	PGE Marketing
2a	Knowledge gained (non-builders)	Class attendees attain satisfactory test score on knowledge of EVs/charging concepts	>75% out of 100	In class test by PGE	PGE Marketing
2b	Knowledge gained (non-builders)	Classes or consults: Respondents agree with “I am more knowledgeable about: <ul style="list-style-type: none"> ▪ how to evaluate EVs for my fleet ▪ how to evaluate charging for my fleet, and/or ▪ how to install workplace charging as a result of my class attendance/EV consultations.”	>75% agreement, for each relevant interest area	Interviews, surveys by Evaluator	PGE Marketing/ Grid Edge Solutions Staff
2c	Knowledge gained (non-builders)	Classes or consults: Respondents agree with “I feel well prepared to....” <ul style="list-style-type: none"> ▪ purchase EVs for my fleet ▪ install charging for my fleet, and/or ▪ install workplace charging as a result of my class attendance/EV consultations.”	>75% agreement, for each relevant interest area	Interview, surveys by Evaluator	PGE Marketing/ Grid Edge Solutions Staff
2d	Knowledge gained (non-builders)	Classes or consults: Respondents agree with “I’m more likely to: <ul style="list-style-type: none"> ▪ purchase EVs for my fleet ▪ install charging for my fleet, and/or ▪ install workplace charging as a result of my class attendance/EV consultations.”	>50% agreement, for each relevant interest area	Interview, surveys by Evaluator	PGE Marketing/ Grid Edge Solutions Staff
3a	Customers feel supported by PGE	Classes or consults: Respondents agree with “I can rely on PGE to give me ongoing support as I build EV-ready homes/install workplace charging/expand my EV fleet.”	80% agreement	Interviews, surveys by Evaluator	PGE Marketing/ Grid Edge Solutions Staff
3b	Customers feel supported by PGE	Class attendees agree with “I would recommend this training to others.”	80% agreement	In class evaluation survey by PGE	PGE Marketing
3c	Customers feel supported by PGE	Consultees agree with “I would recommend PGE’s EV consultation services to others.”	80% agreement	Interviews, surveys by Evaluator	Grid Edge Solutions Staff
4	Connections to non-PGE EV resources	Class attendees, consultees indicate that they have new connections to experienced fleet managers, EV auto/bus/truck manufacturers, and/or EV charging companies/installers.	No firm goal	Interviews, surveys by Evaluator	PGE Marketing/ Grid Edge Solutions Staff
5	Builders construct new EV-ready homes	Builders are building more EV-ready homes than previously, and/or have actual plans/designs to build these new homes	No firm goal	Trained builder interviews, surveys by Evaluator	PGE Marketing

KPI Name		Description	Goal	Data Source	Staff Responsible for Goal
6a	EV Charging – Evaluated charging needs and created a plan	Commercial, institutional, municipal and transit customers are developing EV charging plans (estimated: 3-6 months after PGE assistance)	80% of consultees	Interviews, surveys by Evaluator	Grid Edge Solutions Staff
6b	EV Charging – Got bids from electrical contractors	Commercial, institutional, municipal and transit customers are obtaining bids and signing contracts with electrical contractors (estimated: 3-6 months after PGE assistance)	60% of consultees	Interviews, surveys by Evaluator	Grid Edge Solutions Staff
6c	EV Charging – Installed EV chargers	Commercial, institutional, municipal and transit customers are installing chargers (estimated: 6-12 months after PGE assistance)	40% of consultees	Interviews, surveys by Evaluator	Grid Edge Solutions Staff
7a	Fleet EVs – Conducted vehicle/fleets research	Commercial, institutional, municipal and transit customers are contacting resources <u>as needed</u> (estimated: 3-6 months after PGE assistance)	No firm goals (PGE helps with this research)	Interviews, surveys by Evaluator	Grid Edge Solutions Staff
7b	Fleet EVs – Purchased EVs	Commercial, institutional, municipal and transit customers have purchased fleet EVs (estimated: 12-18 months after PGE assistance)	50% of consultees	Interviews, surveys by Evaluator	Grid Edge Solutions Staff
7c	Fleet EVs – Created a fleet electrification plan	Commercial, institutional, municipal and transit customers have created fleet electrification plans (estimated: 12-24 months after PGE assistance)	25% of consultees, incl. 3 largest transit agencies in PGE territory	Interviews, surveys by Evaluator	Grid Edge Solutions Staff
8a	EVs and Charging Support Operationalized at PGE	PGE call center staff trained to answer general EVs and charging FAQs (not specific to PGE programs, rebates)	# trained TBD by call center manager	PGE records/org chart	Grid Edge Solutions Staff, Call Center Manager
8b	EVs and Charging Support Operationalized at PGE	New PGE EV fleet planning program established	New program established	PGE records/org chart	Grid Edge Solutions Staff
9	EV-ready home buyers install chargers, increased home charging	Home buyers install/use EV chargers because the home is EV-ready (other influences include future building codes and charger rebate incentives)	No firm goals - dependent on # of homes built (KPI #5)	Surveys of new home buyers by PGE or Evaluator	PGE Marketing, PGE New Homes Product Manager
		Some homebuyers may be inspired to buy EVs, and participate in PGE smart charging programs			

KPI Name		Description	Goal	Data Source	Staff Responsible for Goal
10	~100,000 EVs by 2023	~100,000 EVs by 2023, leading to increased eVMTs, and reduced petroleum and GHG	~ 100,000 EVs by 2023	EV Registration Data: DMV/DEQ	PGE Program Manager
			(~40,000 EVs by 2020 - Governor's executive order)	Survey	
11	Consulted customers installing EV charging	Commercial, institutional, municipal and transit customers have installed EV charging as a direct result of receiving PGE assistance	70% of consulted customers	Interviews, surveys by Evaluator	Grid Edge Solutions Staff
12	Consulted EV fleets adding EVs to fleets	Commercial, institutional, municipal and transit customers with EV fleets have expanded their fleets as a direct result of receiving PGE assistance	50% of EV fleets consulted add more EVs	Interviews, surveys by Evaluator	Grid Edge Solutions Staff
13	Charging loads added systematically, cost-effectively	New non-residential charging loads added systematically due to enhanced PGE expertise; reduced grid integration costs over time	Evidence of declining grid integration costs for installed EV charging loads	Interviews with PGE Grid Operations and Distribution Planning Staff by Evaluator	Grid Edge Solutions Staff

Figure 23. Outreach, Education, and Technical Assistance Pilot Program Residential Logic Model



Note: EV=Electric Vehicles; R&D=Ride-and-Drive; EA=Electric Avenues; TNC=Transportation Network Co.; OEM=Original Eq. Mfr.; ROI=Return On Investment. The circles with numbers in the logic model diagram indicate the KPIs, which measure the program outcomes (see table below). If more than one KPI per outcome, label the KPIs with the number noted in the circle in the logic model and "a", "b", "c", etc. to denote the outcome has multiple KPIs.

Table 17. Outreach, Education, and Technical Assistance Pilot Program Residential Key Performance Indicators

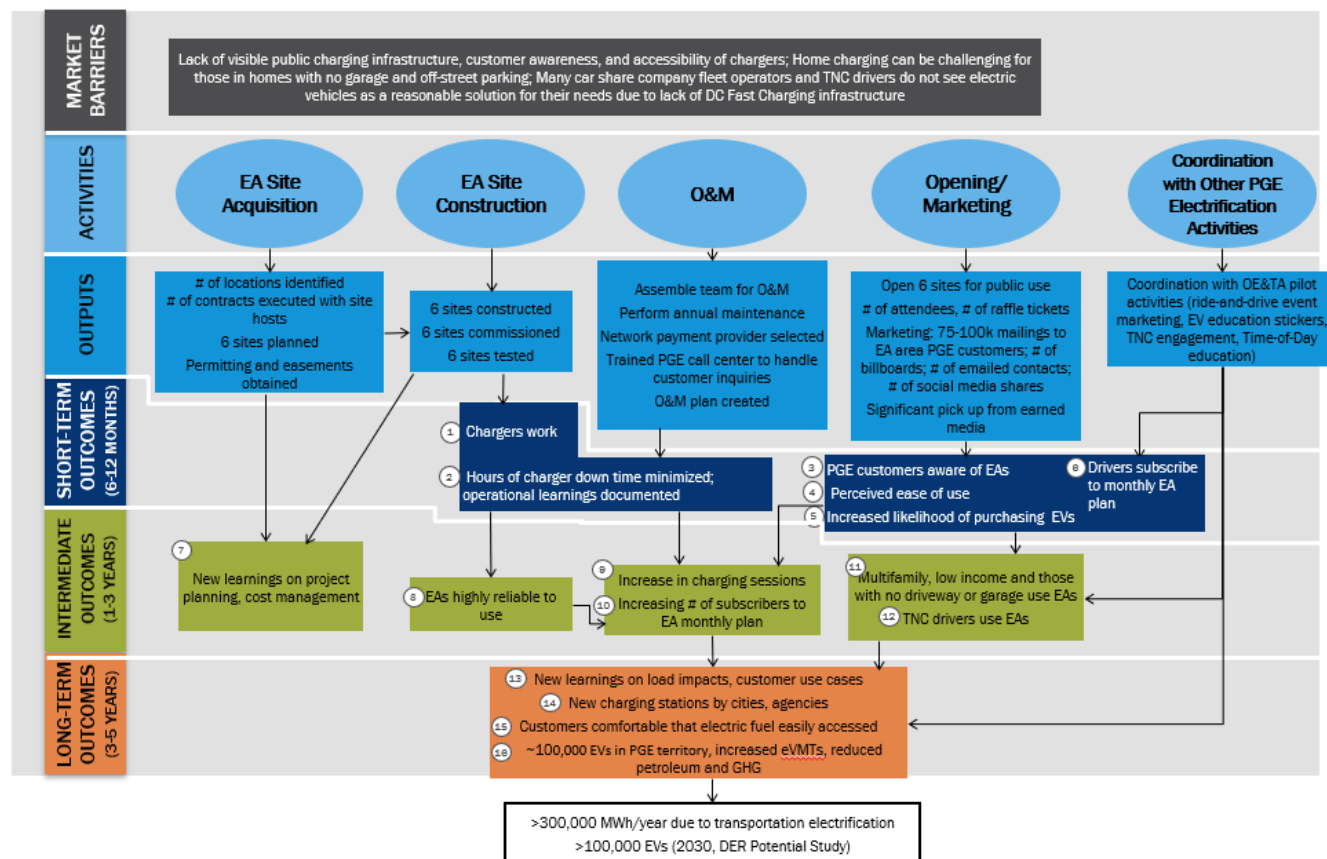
KPI Name	Description	Goal	Data Source	Staff Responsible for Goal
1 TNC drivers know EV benefits	TNC drivers indicate awareness of financial/ROI benefits of driving an EV (via EA subscriptions education)	25% of TNC drivers aware	TNC surveys, interviews by PGE or Evaluation contractor	PGE Marketing Staff, Program Manager
2 Increased Ride-and-Drives	Communities/organizations/companies request Ride-and-Drives at their own events	3 additional Ride-and-Drives (cars or med/heavy trucks)	The ride-and-drive implementer	Ride-and-drive implementer, PGE Marketing Staff
3 More auto dealers aware of EV	Auto dealer's awareness of EV educational kiosks expands beyond initial installation group	20% of dealers surveyed aware of kiosks	Surveys, interviews by PGE or Evaluator	PGE Marketing Staff

KPI Name		Description	Goal	Data Source	Staff Responsible for Goal
	educational kiosks				
4a	Increased Awareness of Incentives	Customers have increased awareness of multiple incentives available (Federal/State/PGE/OEMs) via EV educational kiosks	100 emails submitted by customers via kiosks; PGE provides incentives info	PGE, PGE's dealer engagement implementer	PGE Marketing Staff
4b	Increased Awareness of Incentives	Dealer staff have increased awareness of multiple incentives available (Federal/State/PGE/OEMs) via Beacons	No firm goal	Surveys, interviews with staff by Evaluator	PGE Marketing Staff
5	Higher EV sales	Higher EV sales at dealerships with EV Educational kiosks	50% increased EV sales annually @ dealerships with EV educational kiosks	PGE's dealer engagement implementer, via dealers	PGE Marketing Staff
6	TNC drivers in EVs	TNC drivers are leasing, renting or buying EVs through TNC EV rental program	No firm EV sales/rental/lease goals	TNCs (if NDA), or driver surveys by PGE or Evaluator	PGE Marketing Staff, Program Manager
7	TNC drivers have high usage of EAs and subscriptions	Growth in driver monthly subscriptions and high Electric Avenue utilization by TNC drivers	100% increase in EA monthly subscriptions - compared to initial purchase by TNC (Note: Currently difficult to ID individual TNC driver sessions)	PGE/TNCs	PGE Marketing Staff, PGE Program Manager
8	Increased awareness of EVs, benefits and charging	PGE customers have increased awareness of EVs, their benefits and Electric Avenues	50% increase of those surveyed - compared to 2018 baseline survey	Customer Surveys by Evaluator	PGE Marketing Staff
9	PGE engaged with broad dealer network	PGE is working with a broad network of dealers in PGE territory to promote EVs and EV educational kiosks	PGE engaged with approx. 10 dealerships May include additional kiosks in dealerships	Evaluator interviews with PGE staff, PGE's dealer engagement implementer	PGE Marketing Staff
10	EV educational kiosk nomenclature adopted	EV educational kiosk nomenclature/labeling implemented on all PGE chargers and some other chargers	Evidence that EV educational kiosks nomenclature adoption is growing	PGE's dealer engagement implementer and PGE	PGE's dealer engagement implementer, PGE Marketing Staff
11	More EVs purchased	EV's purchased statewide grows annually	2020= ~50k EVs	ODOT/DEQ	PGE Marketing Staff, PGE
			2021= ~75k EVs		
			2022= ~100k EVs		

KPI Name		Description	Goal	Data Source	Staff Responsible for Goal
					Program Manager
12	OEMs, dealers regularly offering EV discounts	OEMs and dealers are proactive in offering robust EV discount portfolio, covering several OEMs	Evidence of regular (e.g., seasonal), coordinated discount offerings with PGE and partners (e.g., PacifiCorp)	PGE	PGE Marketing Staff
13	Increased electric market share of TNC vehicle fleets	The share of EVs (owned, leased or rented) among TNC fleets has increased over time	Evidence that the share of EVs has increased among TNC fleets/drivers – no firm goal	TNCs data (if NDAs) or interviews, or driver surveys by Evaluator	PGE Marketing Staff, Program Manager
14	Broad awareness of where to test drive EVs	Customers know where to test drive an EV (e.g., at ride-and-drive implementer or other venues – auto shows, community events)	Evidence of regular Ride-and- Drive events at auto shows, community events, other events, etc.	Customer surveys, interviews by Evaluator	PGE Marketing Staff
15	~100,000 EVs by 2023	~100,000 EVs are in PGE territory by 2023 leading to increased eVMTs	~100,000 EVs by 2023	EV Registration Data: DMV/DEQ	PGE Program Management
			(40,000 EVs by 2020 - Governor's executive order)	Survey	
16	Strategic dealer partnerships	PGE is actively engaged with a group of dealerships to plan and regularly promote EVs via marketing, ride-and-drives, discounts, or other methods.	Evidence that PGE is actively and regularly coordinating with a core group of dealers	Evaluator interviews with PGE and dealers	PGE Marketing Staff
17	EV educational kiosk nomenclature adopted statewide	EV educational kiosk nomenclature/labeling is implemented at all public and workplace charging in Oregon	All public and workplace charging incorporates EV educational kiosk nomenclature (e.g., Electrify America, private companies, all utilities)	PGE's dealer engagement implementer	PGE's dealer engagement implementer, PGE Marketing Staff
18	Awareness of EV affinity groups	Customers aware of non-PGE outreach groups promoting EVs (i.e., potential information sources)	Customers aware of new grassroots, community based EV advocacy groups	Customer surveys by Evaluator	PGE Marketing Staff

Electric Avenue Pilot

Figure 24. Electric Avenue Pilot Program Logic Model



Note: EA=Electric Avenue; O&M=Operations & Maintenance; eVMT=electric vehicle mile traveled; WTC=World Trade Center; TNC=Transportation Network Co. The circles with numbers in the logic model diagram indicate the KPIs, which measure the program outcomes (see table below).

Table 18. Electric Avenue Pilot Program Key Performance Indicators

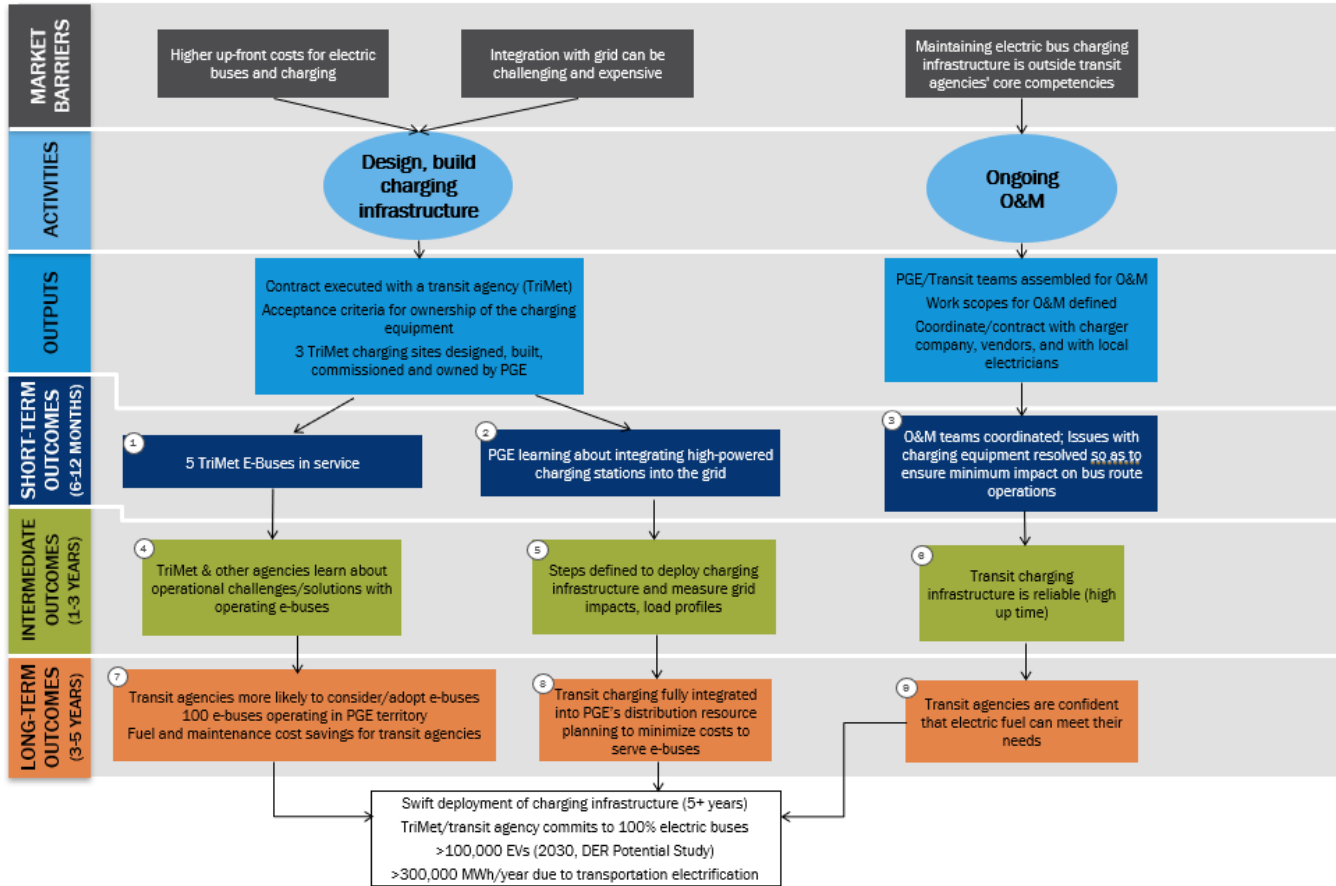
KPI Name	Description	Goal	Data Source	Staff Responsible for Goal	
1	Chargers Work	At Opening, chargers are fully tested and operating and continue to work.	100% functioning during first year	The EVSP via PGE O&M	PGE O&M team
2	Down time minimized	Hours of charger down time minimized across all stations; PGE documents operations learnings	7% maximum downtime in charger vendor agreement (vendor is subcontractor to EVSP)	The EVSP via PGE O&M	PGE O&M team
3	PGE Customers aware of EA stations generally	Customer awareness was 5% in baseline	7-8% customer awareness of EA stations	Surveys by Evaluation contractor	PGE Marketing team

KPI Name		Description	Goal	Data Source	Staff Responsible for Goal
4	Perceived ease of use	Do drivers know where chargers are and how to use chargers?	EV drivers know where chargers are or how to locate, Limited calls for charging help to the EVSP, few observed charging difficulties	EVSP via PGE O&M, Surveys and charging time observations by Evaluation	PGE O&M and Marketing teams
5	Increased likelihood of EV purchases	More customers will consider/purchase EVs due to convenience of new Electric Avenues	Some customers note positive influence of stations on consideration/purchase	Surveys by Evaluation	PGE Marketing team
6	Drivers subscribe to EA monthly plan	EA monthly plan purchases go up as more charging stations are available for use	Additional 54 subscription payments per month (@ \$31.25/mo.) in 2020 across 6 new stations. Excludes WTC	The EVSP via PGE O&M	PGE Marketing team
7	New learnings on project planning	PGE identifies best ways to plan, develop, commission, test and operate new EAs	PGE obtains and documents learnings on EA project planning and cost management that can be utilized at other sites and shared with others	Interviews with PGE staff; documents review by Evaluator	PGE O&M team
8	EAs highly reliable	Limited down time	EAs are rated an "8" in PlugShare, PGE maintenance logs show limited issues, few complaints	Review PlugShare, the EVSP, PGE O&M logs	PGE O&M team
9	Increase in charging sessions	Increase in charging sessions	Total sessions increase at 44% per year through 2023, then increase 4.5% per year after that.	The EVSP charging data via PGE O&M	PGE Marketing team and Program Management
10	Increasing Subscribers to EA plan	EA monthly plan purchases go up as more charging stations are available for use	See #6. Subscription revenue goal for 2020 is \$20,250.	The EVSP via PGE O&M	PGE Marketing team
11	MF and those w/out driveways use EAs	Multifamily dwellers, low income customers and those who do not have driveways use EA chargers	No firm target set	Surveys, MF interviews, focus groups by evaluator	PGE Marketing team and Program Management
12	TNC Drivers use EA s	TNC drivers use EA chargers during time they are working	No firm goal – evidence of more TNC EVs, charging session and eVMT	TNC company interviews, driver focus groups by evaluator	PGE Marketing team and Program Management

KPI Name		Description	Goal	Data Source	Staff Responsible for Goal
13	New learnings on load impacts, customer use cases	PGE obtains learnings on load impacts for different pricing plans and customer use cases as EA utilization increases	Load impact learnings are integrated into PGE Grid Management Plan	Loads analyses by Evaluator, interviews with PGE staff, plan reviews	Program management, PGE O&M team and Distribution Planning
14	New fast charging stations by cities, agencies	Cities and agencies learn from PGE's EA construction and operations experience and build new charging to serve their constituents	Cities and agencies develop their own charging stations in PGE territory to grow the market	Public charging data, Evaluator interviews with PGE and cities/agencies	PGE marketing and O&M
15	Customer have convenient access to electric fuel	Customers comfortable that electric fuel can be easily accessed at fast charging stations	Surveyed customers indicate that that electric fuel can be easily accessed at fast charging stations	Surveys by Evaluator	Program management, PGE O&M team
16	~100,000 EVs by 2023	~100,000 EVs are in PGE territory by 2023 leading to increased eVMTs, and reduced petroleum and GHG	~100,000 EVs by 2023 (40,000 EVs by 2020 - Governor's executive order)	EV Registration Data: DMV/DEQ, Survey	Program management

Electric Mass Transit 2.0 (TriMet) Pilot

Figure 25. Electric Mass Transit 2.0 (TriMet) Pilot Logic Model



Note: E-Bus=Electric Bus; O&M=Operation & Maintenance. The circles with numbers in the logic model diagram indicate the KPIs, which measure the program outcomes (see table below).

Table 19. Electric Mass Transit 2.0 (TriMet) Pilot Key Performance Indicators

KPI Name		Description	Goal	Data Source	Staff Responsible for Goal
1	TriMet buses in service	New operational chargers allow TriMet to put five new TriMet electric buses in revenue service	Buses in revenue service by 9/1/2019	TriMet Staff	TriMet/PGE O&M/Charging Vendor
2	Initial PGE learnings about grid integration	PGE learns challenges and best practices for integrating high-powered charging stations into the grid and initial load impacts	See Description	Evaluator interviews with PGE/ TriMet; load analysis by PGE and Evaluator	PGE Grid Edge Solutions/ Distribution Resource Planning

KPI Name		Description	Goal	Data Source	Staff Responsible for Goal
3	O&M teams working together; charger issues resolved	O&M teams coordinated and working together effectively; Issues with charging equipment resolved so as to ensure minimum impact on bus route operations	O&M program created by 7/1/2019 Evidence that PGE staff, transit staff, and charging vendors following established procedures efficiently	Evaluator interviews with PGE, TriMet, vendors	TriMet/PGE O&M/Charging Vendor
4	Learnings about e-bus operations	TriMet and other agencies learn about operational challenges and solutions with operating e-buses	Evidence that e-bus operational challenges are documented and shared with relevant stakeholders	Transit operations reports; Evaluator interviews with PGE, TriMet, other transit	PGE Grid Edge Solutions/Transit Agencies
5	Steps created to deploy chargers & assess impacts	PGE has formal, defined processes to deploy transit charging infrastructure, develop load profiles, assess grid impacts and transit operations	See Description	Processes and metrics are established	TriMet Staff, PGE Staff, supported by Evaluation contractor
6	Reliable charging equipment	O&M staffs are able to keep transit charging equipment highly reliable across broad portfolio of chargers	98% charger uptime PGE has competent and effective O&M team to support multiple agencies and chargers	Evaluator interviews with PGE, transit O&M staffs; charger data	PGE O&M/Transit O&M/Charging Vendors
7a	Transit agencies considering e-buses	Transit agencies are more likely to consider and adopt e-buses after learning about initial implementation challenges and solutions	Surveyed, interviewed agencies indicate increasing consideration and future planning for e-buses	Evaluator surveys, interviews with transit agencies	PGE O&M, Grid Edge Solutions Team and Key Customer Managers
7b	100 e-buses in service	TriMet and other transit agencies have increased # of e-buses in service	100 e-buses in PGE service territory by 2023	Data from transit agencies and PGE	Transit agencies/multiple PGE groups (Key Customer Managers, Grid Edge Solutions, O&M)

KPI Name		Description	Goal	Data Source	Staff Responsible for Goal
7c	Transit cost savings	Transit agencies document cost savings for fuel and maintenance	TriMet: Fuel Savings = \$400K per bus over 12 years; Maintenance Savings = \$125K per bus over 12 years (Source: TriMet/PGE/Electric Bus Manufacturer) Others: no firm goal-dependent on specific transit agencies	Transit agencies/ PGE staff	Transit agencies/ Multiple PGE groups (customer managers, tech assistance, O&M)
8	Transit charging is planned cost-effectively	Current and planned transit charging is fully integrated into PGE's distribution resource planning with best practices to minimize costs to serve e-buses	See Description	PGE plans and documents, Evaluator interviews with PGE staff	PGE O&M, Distribution Resource Planning, Key Customer Managers
9	Transit agencies confident in electric fuel	Transit agencies are confident that electric fuel can meet their future fleet/operational needs	Surveyed, interviewed transit agencies indicate that e-bus charging can be sufficiently reliable to justify expanding their e-bus fleets, and that distribution upgrades are not cost prohibitive	Transit agency surveys, interviews by evaluator	PGE O&M, Grid Edge Solutions Team and Key Customer Managers

Appendix C. Milwaukie Ride-and-Drive Memo

This memo summarizes the results of the first round of Ride-and-Drive intercept surveys fielded at the opening of PGE's Electric Avenue in Milwaukie. The team will conduct two additional rounds of Ride-and-Drive intercept surveys over the next year and will combine results for the 2019 Annual Memo and the second-year Interim Report.

The key objectives of the Ride-and-Drive intercept surveys are to understand:

- How attendees heard of the Ride-and-Drive event and reasons for attending;
- Satisfaction with the event and the EV they test drove;
- Consideration and intention to purchase or lease an EV in the near future;
- Attendee exposure to other PGE outreach and education campaigns or resources; and
- Characteristics of those attending (income, location, and experience with an EV).

Analyses of the first round of Ride-and Drive intercept surveys revealed the following preliminary¹⁸ findings:

- The source of event awareness among attendees is consistent with PGE's outreach and marketing activities. Most attendees heard of the event through channels PGE used to promote the event (social media, emails, City of Milwaukie newsletter, Oregon Electric Vehicle Association, and ride-and-drive implementer promotions).
- Most attendees came to the event to test drive an EV and to learn more about EVs and the availability of public charging. A notable minority (about one-third) wanted additional information on: 1) all-wheel drive, 2) auto-driving, 3) towing capacity, 4) Tesla models, 5) the purchase price of EVs, 6) future EV models, and 6) the benefits of leasing versus buying an EV.
 - At the next event, consider providing spec sheets that provide the additional information noted above sought by attendees.
- Satisfaction with the Ride-and-Drive event was high, although some attendees reported lower satisfaction levels with the availability of EVs they could test drive.
 - If feasible, offer more EV models to test drive at the next event.
- The Ride-and-Drive event increased the desire to buy or lease an EV for most Ride-and-Drive attendees.
- About half of attendees were aware of other PGE outreach and education campaigns or EV resources.
- Attendees represented a range of income levels, most of whom were males who had never driven an EV prior to the event. Most attendees reported living near the Ride-and-Drive event in single family detached homes.

Methodology and Survey Disposition

On April 6, 2019, the research team conducted an intercept survey during an EV Ride-and-Drive event at the opening of the PGE Milwaukie Electric Avenue. The research team attempted to survey all individuals who test drove an EV at the event. In total, the team completed 15 surveys at the event (Table 3). Although the sample is small, it does account for most individuals who test drove vehicles at the event and is thus reflective of the Milwaukie Electric Avenue Ride-and-Drive population.

¹⁸ Given the small sample size, it is not possible to draw definitive conclusions from this data. The team will combine this data with the data from the upcoming Ride-and-Drive intercept surveys to confirm the findings and thus provide definitive conclusions.

Table 20. Summary of Ride-and-Drive Participants and Dispositions

Disposition	Count
Approximant number of attendees ^a	100
Number of individuals who test drove a vehicle ^b	18
Screen-outs ^c	2
PGE employee	1
City of Milwaukee employee	1
Refusals	1
Completed surveys with those who test drove a vehicle	15

^a Number of attendees is a rough estimate provided by PGE staff. the ride-and-drive implementer used a counter during the event and ended the day with count of 62 attendees (including ride-and-drive participants). However, the ride-and-drive implementer mentioned they had missed counting some attendees. PGE staff mentioned that the count of all event attendees was closer to 100 based on the attendance at the Hillsboro Electric Avenue opening.

^b Individuals were able to test drive multiple vehicles. The 18 individuals completed 24 test drives during the event. These numbers were provided by the ride-and-drive implementer.

^c The team, in collaboration with PGE EM&V staff, decided to screen out any PGE or City employees. The team assumed PGE or City event attendees were likely involved with the opening of the Electric Avenue. For the next ride-and-drive intercept survey, the team will re-assess the screening criteria since it could be possible that some PGE or City employees were not involved with the EA Pilot.

Respondent Characteristics

Nearly two-thirds (9 of 15) of respondents who completed the survey were males. About three-quarters reported being PGE customers (11 of 15). Respondents also represented a range of annual household income levels. Among those who reported income (9 of 15), about half (5 of 9) reported household income levels below \$50,000 (Table 21).

Table 21. Respondents' 2018 Annual Household Income, before Taxes (n = 9)

Household Income	Count
Less than \$25,000	3
\$25,000 to \$49,000	2
\$50,000 to \$74,000	1
\$100,000 to \$149,000	2
\$150,000 or more	1
Refusals	6
Total	15

^a Note that 6 of the 15 respondents refused to provide their household income level. Two-thirds of respondents (10 of 15) reported residing in a single-family detached house with a driveway, with the remaining respondents residing in an apartment, condo, or attached housing. Respondents were split between homeowners (8 of 15) and renters (7 of 15). When looking at zip-codes provided by respondents, over half (8 of 15) reported living either in Milwaukee or the nearby Sellwood/Westmoreland area, and 8 of 15 respondents reported working at least five miles from the location event.

Over three-quarters (12 of 15) of respondents reported driving 200 miles or less each week, which suggests that EVs with 100-miles-per-charge range can likely fulfill the driving needs of these respondents (Table 10). Table 10 provides a summary of the number of vehicles leased or owned by respondents' households and the number of miles driven per week.

Table 22. Respondents' Vehicle Use (n = 15)

Respondent Vehicle Characteristics	Count
Number of vehicles leased or owned by household	
1	7
2	4
3 or more	4
Miles driven per week	
50 or less	3
51 to 100	3
101 to 200	6
201 to 400	2
Over 400	1

The Ride-and-Drive event appears to be targeting the right audience. About two-thirds (9 of 15) of respondents reported they had never driven an EV prior to the event. Among the six respondents that had experience driving an EV before the event, most (4) reported driving a friend's or family member's EV. There were two respondents who reported owning their own EV, which they noted was used as their primary vehicle.

Awareness of Event and Other PGE EV Campaigns

Respondents reported hearing about the event primarily through social media or word-of-mouth from friends or colleagues (Table 23). A few mentioned specifically hearing about the event through posts on Facebook.¹⁹

Table 23. How Respondents Learned about the Event (n = 15; Multiple Responses Allowed)

Source of Awareness	Count
Social media (e.g., Facebook, Instagram, Twitter)	7
Friend, family, or colleague	4
Email	3
Newsletter (from City of Milwaukie and PGE)	3
Oregon Electric Vehicle Association	2
The ride-and-drive implementer (website, social media, membership)	1
Another source	2

Less than half of respondents (6 of 15) reported being aware of any PGE EV resources, campaigns, or combined OEM-PGE discounts before attending the event. Of respondents who reported being aware, most reported being aware of social media information from PGE (Table 11).

Table 24. PGE EV Resources, Campaigns, or Discounts Seen Before Attending the Event (n = 15; Multiple Responses Allowed)

PGE Resource, Campaign, or Discount	Count
Social media information from PGE on EVs	5
PGE's Electric Avenues	3
PGE website information on EVs	1

¹⁹ Respondents mentioned this unsolicited to the research team as they were taking the survey.

PGE Resource, Campaign, or Discount	Count
PGE's and Nissan's combined \$3,500 discount for the Nissan Leaf	1
National Drive Electric Week advertising (in 2018)	1
Did not see any of these resources	9

Reasons for Attending

Eleven of 15 respondents reported attending the event to test drive an EV. Six also noted wanting to learn more about EVs and the availability of public charging.

Event Feedback

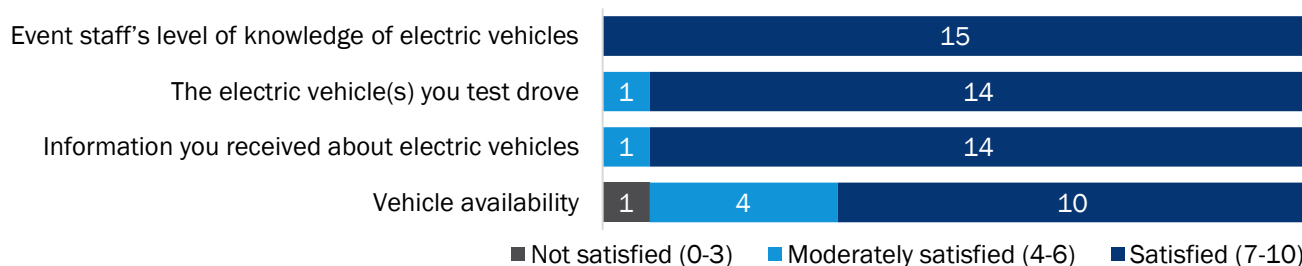
The Ride-and-Drive event had six EVs and PHEVs for attendees to test drive: two Nissan Leaf models, a BMW i3, a Prius Prime, a Chevy Volt, and a VW eGolf. Table 25 summarizes the vehicles that survey respondents test drove. Most respondents drove a Nissan Leaf because there were two available to drive at the event, though interest in the BMW i3 was just as high among attendees, as observed by the team.

Table 25. EVs Driven by Survey Respondents (n = 15; multiple responses allowed)

Vehicle Tested	Count
Nissan Leaf	9
BMW i3	6
Prius Prime	4
VW E-Golf	2
Chevy Volt	1

Survey respondents reported being generally satisfied with the event (Figure 1). All respondents reported high satisfaction with event staff's level of knowledge of EVs and nearly all were highly satisfied with both the EV they test drove and the information they received about EVs. Respondents reported lower satisfaction with the availability of EVs they could test drive. The research team observed some attendees being disappointed that there was not a Tesla model available to test drive. The research team also observed some attendees having to wait to test drive their preferred EV model. At least one attendee chose not to test drive because their preferred vehicle was not immediately available.

Figure 26. Respondent Satisfaction with the Event (n = 15)



Nearly all respondents (14 of 15) reported they would be "somewhat" or "very" likely to purchase or lease an EV or PHEV within the next five years. About one-third (6 of 15) indicated that the Ride-and-Drive event increased their likelihood of purchasing or leasing an EV within the next five years "a great deal". Another third (5 of 15) noted the event had increased their likelihood by "a little" (i.e., was somewhat influential). The remaining respondents reported that the event had no effect on their likelihood to purchase an EV.

Even after the test drive, respondents mentioned a variety of concerns they had about purchasing or leasing an EV or PHEV (Table 12). Respondents were primarily concerned about the driving range and purchase price of the vehicle (7 mentions each).

**Table 26. Potential Barriers Preventing Respondents from Purchasing or Leasing an EV or PHEV
 (n = 15; Multiple Responses Allowed)**

Purchasing or Leasing Barrier	Count
Driving range (number of miles on a single charge)	7
Purchase price of vehicle	7
Ability to charge at home	4
Availability of public charging stations	3
Performance and handling	3
Time required to charge battery	2
Vehicle safety	2
Body types and sizes available	2
Ability to charge at work	1
Cost of charging the vehicle	1
Something else	2
Not applicable – already own or lease an EV	2

About two-thirds of respondents reported not needing additional information about EVs (6 of 15) or they were unsure (4 of 15). Among the five respondents who wanted more information, three wanted more information about specific features of EVs, such as all-wheel drive information, auto-driving, and towing capacity. The remaining respondents wanted additional information about Tesla models, the purchase price of EVs, future EV models, and the benefits of leasing versus buying an EV.

Appendix D. TNC Ride-and-Drive Memo

This memo summarizes the results of the second round of Ride-and-Drive intercept surveys. The research team fielded the surveys at a rideshare community event and information session in Downtown Portland. The event targeted rideshare drivers with cooperation from a TNC company. Opinion Dynamics will conduct one additional round of Ride-and-Drive intercept surveys in 2020.

The key objectives of the Ride-and-Drive intercept surveys are to understand:

- How attendees heard of the Ride-and-Drive event and reasons for attending;
- Satisfaction with the event and the EV they test drove;
- Consideration and intention to purchase or lease an EV in the near future;
- Attendee exposure to other PGE outreach and education campaigns or resources; and
- Characteristics of those attending (income, location, ridesharing vehicle use, and experience with an EV).

Analyses of the second Ride-and Drive intercept survey revealed the following key findings:

- Most attendees reported learning about the event via TNC communications and most reported attending the event to test drive an EV or to learn more about EVs.
- Attendees reported high satisfaction with all aspects of the Ride-and-Drive, and most indicated that the event had increased their desire to buy or lease an EV.
- Although few attendees reported being aware of PGE EV resources, nearly half reported that the availability of fast charging at PGE’s Electric Avenues as influential in their consideration of EVs.
- Attendees represented a range of income levels, most of whom were males who had never driven an EV prior to the event. Most attendees reported driving over 400 miles per week for Transportation Network Company (TNC) rides, with about half noting they use their vehicle for both TNC rides and for personal use.

Methodology and Survey Disposition

On November 12, 2019, the research team conducted an intercept survey during an EV Ride-and-Drive event at a rideshare community event and information session in Downtown Portland. The research team attempted to survey all TNC drivers who test drove an EV at the event. In total, the team completed 24 surveys at the event (Table 3).

Table 27. Summary of Ride-and-Drive Participants and Dispositions

Disposition	Count
Approximant number of attendees ^a	47
Number of individuals who test drove a vehicle ^b	30
Refusals	2
Completed surveys with those who test drove a vehicle	24

^a Number of attendees is a rough estimate provided by the ride-and-drive implementer. Of the 47 who attended, 37 signed in and approximately ten did not sign in but came in for lunch and to listen to presentations.

^b Individuals were able to test drive multiple vehicles. Out of the 30 individuals who completed a test drive, nine test drove more than one vehicle. These numbers were provided by the ride-and-drive implementer.

Respondent Characteristics

Nearly two-thirds (14 of 24) of respondents who completed the survey were males. About half reported being PGE customers (11 of 24). Respondents also represented a range of annual household income levels. Among those who reported income (23 of 24), about half (12 of 23) reported household income levels below \$75,000 (Table 21).

Table 28. Respondents' 2018 Annual Household Income, before Taxes (n = 24)

Household Income	Count
Less than \$25,000	3
\$25,000 to \$49,000	4
\$50,000 to \$74,000	5
\$75,000 to \$99,000	7
\$100,000 to \$149,000	3
\$150,000 or more	1
Refusals	1
Total	24

Over half of respondents (13 of 24) reported residing in a single-family detached house with a driveway, with the remaining respondents residing in an apartment, condo, or attached housing. Respondents were split between homeowners (12 of 24) and renters (11 of 24), with one respondent refusing to specify. Based on the zip-codes provided by respondents, about one half (10 of 24) reported living in the Portland metropolitan area, one-third (8 of 24) reported living in Washington, and about one-fifth (5 of 24) reported living outside of the Portland metropolitan area (e.g., Salem, Boring, Scappoose). One respondent refused to specify their zip-code.

Over half (13 of 24) of respondents reported driving over 400 miles each week, which suggests that long-range EVs coupled with easily accessible public charging is needed for these respondents (Table 10). Over half of respondents (17 of 24) reported that they lease or own two or more vehicles. Over half (14 of 24) of respondents indicated that the vehicle they use for TNC rides is also used for personal use, with the remaining ten respondents reporting that they have a vehicle that is solely used for TNC rides.

Table 29 provides a summary of the number of vehicles leased or owned by respondents' households, the number of miles driven per week for TNC rides, and the number of miles driven per week for personal reasons.

Table 29. Respondents' Vehicle Use (n = 24)

Respondent Vehicle Characteristics	Count
Number of vehicles leased or owned by household	
1	6
2	10
3 or more	7
None	1
Miles driven per week for TNC rides	
100 or less	2
101 to 400	4
401 to 700	3
701 to 1,000	7

Respondent Vehicle Characteristics	Count
Over 1,000	3
Don't know	5
Miles driven per week for personal reasons	
50 or less	7
51 to 100	7
101 to 200	3
201 to 400	2
Over 400	0
Don't know	5

The Ride-and-Drive event appears to be targeting the right audience. Over three-quarters (20 of 24) of respondents reported they had never driven an EV prior to the event. Among the four respondents that had experience driving an EV before the event, two reported driving a friend's or family member's EV and one reported test driving at a dealership. There was one respondent who reported owning an EV, which they noted they no longer owned.

Awareness of Event and Other PGE EV Campaigns

Over two-thirds (17 of 24) of respondents reported hearing about the event from an email, social media post, blog, or email from a TNC company (Table 23).

Table 30. How Respondents Learned about the Event (n = 24; Multiple Responses Allowed)

Source of Awareness	Count
TNC (website, social media, blogs, email)	17
Email	4
Friend, family, or colleague	3
The ride-and-drive implementer (website, social media, membership)	1
Uber (website, social media, blogs, email)	1

About one-fifth of respondents (5 of 24) reported being aware of PGE EV resources, campaigns, combined OEM-PGE discounts, or free charging subscriptions for TNC EV drivers before attending the event (Table 11). Opinion Dynamics did not find notable differences in awareness of PGE EV resources among those attendees who reported being PGE customers versus those who were not PGE customers.

Table 31. PGE EV Resources, Campaigns, or Discounts Seen Before Attending the Event (n = 24; Multiple Responses Allowed)

PGE Resource, Campaign, or Discount	Count
PGE's Electric Avenues	3
PGE's and Nissan's combined \$3,500 discount for the Nissan Leaf	2
Social media information from PGE on EVs	2
Free charging subscriptions for TNC EV drivers at PGE's Electric Avenues	1
PGE website information on EVs	1
Didn't see any of these resources or don't know	19

Reasons for Attending

Twenty of 24 respondents reported attending the event to test drive an EV. A similar amount (19 of 24) also noted wanting to learn more about EVs. Respondents also reporting attending the event to learn about public charging availability (10 of 24) and learning about charging costs (10 of 24).

Event Feedback

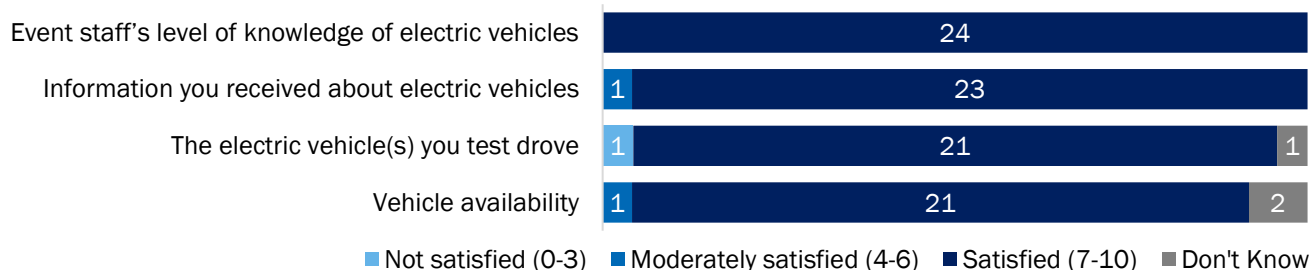
The Ride-and-Drive event had four EVs and PHEVs for attendees to test drive: A Tesla Model 3, a Chevy Bolt, a Prius Prime, and a Nissan Leaf. Table 25 summarizes the vehicles that survey respondents test drove. Most respondents drove the Tesla Model 3, followed closely by the Chevy Bolt.

Table 32. EVs Driven by Survey Respondents (n = 24; multiple responses allowed)

Vehicle Tested	Count
Tesla Model 3	10
Chevy Bolt	8
Prius Prime	6
Nissan Leaf	5

Survey respondents reported being generally satisfied with the event (Figure 1). All respondents reported high satisfaction with event staff's level of knowledge of EVs and nearly all were highly satisfied with other aspects of the event.

Figure 27. Respondent Satisfaction with the Event (n = 24)



Twenty of the 24 respondents reported they would be "somewhat" or "very" likely to purchase or lease an EV or PHEV within the next five years, and 16 drivers (two-thirds) indicated that the Ride-and-Drive event increased their likelihood of purchasing or leasing an EV "a great deal". Another third (7 of 24) noted the event had increased their likelihood by "a little" (i.e., was somewhat influential). The remaining respondent did not have an opinion.

Nearly half (11 of 24) of respondents reported the availability of the new Electric Avenue fast charging in Milwaukie, Hillsboro, and East Portland have influenced their consideration of EVs. About two-fifths (9 of 24) of respondents indicated not being aware of PGE's Electric Avenues, and four reported being aware of the Electric Avenues, but indicated they were not influential in their consideration of EVs.

Even after the test drive, respondents mentioned a variety of concerns they had about purchasing or leasing an EV or PHEV (Table 12). Respondents were primarily concerned about purchase price of the vehicle (14 of 24) and vehicle driving range (12 of 24).

**Table 33. Potential Barriers Preventing Respondents from Purchasing or Leasing an EV or PHEV
 (n = 24; Multiple Responses Allowed)**

Purchasing or Leasing Barrier	Count
Purchase price of vehicle	14
Driving range (number of miles on a single charge)	12
Ability to charge at home	5
Time required to charge battery	4
Availability of public charging stations	3
Body types and sizes available	3
Reliability	2
Maintenance costs	1
Ability to charge at work	1
Vehicle safety	1
Financing with bad credit	1
Recently purchased a vehicle	1
Don't know	1

Two-thirds of respondents reported not needing additional information about EVs (16 of 24). Among the seven respondents who indicated wanting additional information, three had questions about vehicle affordability, including current and upcoming rebates. Another three respondents reported having questions about charging (availability, costs, and connector types) and one respondent had questions about the interior size of other EVs. One respondent was not sure if they had any unanswered questions.

Appendix E. General Population Residential Customer Survey Detailed Methodology

This section describes the general population residential customer survey methodology. The team followed the methodology used for 2018 Baseline survey to ensure comparability of results.

Survey Sampling Fielding

PGE provided the team with a random sample of 16,000 residential customer with an email address on record. The team assumed a 5% response rate based on the response rate from the Baseline survey. The team invited all 16,000 customers to take the survey via email invitation on November 11, 2019. To mitigate response bias, the team used neutral language in the invitation and to did not specifically mention the survey topic, EVs. The invitation informed respondents that upon completion of the survey they would be entered into a drawing for one of six gift cards (one \$500 and five \$100). The team sent one reminder email to nonresponders midway through fielding and closed the survey on November 30, 2019. A total of 1,780 customers completed the Wave 1 survey for an 11% response rate.

The team reviewed survey responses and removed any surveys with a survey duration significantly below the average survey duration time or had responses that suggested the respondent was not engaged with the survey. This process resulted in the removal of 28 surveys, with a final completed survey count of 1,752.

The survey included a series of screening questions at the beginning of the survey. Respondents who reported being under the age of 18 or working in the automotive, environmental, energy, utility, or market research industry were terminated from the survey. Respondents who indicated they were not involved in the decision to purchase or lease a vehicle (n=67) or who indicated they would not be purchasing or leasing a new or used vehicle in the next five years and did not own an EV or PHEV (n=581) were shown demographic questions and exited from the survey. A total 1,026 respondents indicated they were likely to purchase or lease a vehicle within the next five years and completed the survey.

A total of 78 survey respondents indicated they owned an EV or PHEV and completed the EV-related survey questions. These respondents, however, are excluded from this analysis due to small sample sizes. The team will combine these respondents with the 2020 EV owner survey oversample of respondents. The team will also look to see how responses between each survey wave change over time.

Weighting

Survey results of likely vehicle purchasers are weighted to correct for sampling and non-response bias present in the survey data. Specifically, the team used “raked weights”²⁰ to adjust the sample to reflect known population proportions of age, income, county, and PGE residential segment. Population estimates of age and income are based on Acxiom data, and county and segment are based on PGE records. Sample estimates of age and income are based on survey responses, county and segment were appended from PGE records to each respondent.

Prior to calculating the raked weights, the team imputed age and income for any interested EV buyers that refused to provide their age (3%) or income (20%) in the survey. Since age and income were highly correlated ($r=.075$; $p<.05$), the team used age to inform income imputations: the team randomly assigned income values to respondents that declined to answer the income question relative to the income distribution of those in their age group that provided their income (for example, 3% of those between 55-64 years old reported

²⁰ Kolenikov, Stanislav. 2014. “Calibrating survey data using iterative proportional fitting (raking).” *The Stata Journal* 14(1):22-59.

incomes less than \$15,000, 4% of 55-64 year-olds reported incomes between \$15,000 and \$19,999, and so on. Of the 55-64 year-olds that declined to provide their income, a random selection of 3% of those were assigned incomes less than \$15,000, 4% were assigned incomes between \$15,000 and \$19,999, and so on).

A similar imputation process was used for those that refused to provide their age *and* income (100% of those that declined to provide their age also declined to provide their income). Since the team were unable to use age to inform income imputation for these respondents, the team simply used the overall sample distributions of income and age (without applying any of the aforementioned age-based income imputations during this step) to establish the proportional random assignment imputation algorithms for cases missing both age and income.

These imputations resulted in the requisite survey data to execute the raked weighting procedure for all respondents, without altering the sample's distribution of age and income.²¹ The team then calculated and assigned raked weights to all surveyed interested EV buyers; resulting raked weight values were not allowed to exceed 3.0.²² All interested EV buyer results presented in this report are weighted.

²¹ Note that the team only used imputed age and income data to create the weights. For analysis of the data, refused income and age answers are treated as missing values.

²² The raked weighting procedure resulted in weights greater than 3.0 (but less than 4.0) for two respondents. These respondents were reassigned a weight of 3.0.

Appendix F. Business Technical Assistance and Builder Education Survey Detailed Findings

The following section provides detailed findings from the Business Technical Assistance and Builder Education Survey. Findings are presented separately for EV-ready home builder education participants (n=9) and business and governmental organizations who received technical assistance from PGE staff (n=14) or who attended a workplace charging or fleet electrification event (n=2).

Builder Education

Source of Awareness and Reasons for Attending

Over three-quarters (7 of 9) of respondents indicated that they heard of the PGE-sponsored training through a builder training implementor, one respondent learned through an email sent to them from PGE, and one learned through a colleague or someone in their industry.

Over three quarters (8 of 9) of respondents indicated they attended the training to learn about how EV-ready homes, followed by learning about smart home technologies (5 mentions), EVs (2 mentions), and installing EV chargers on their premises (1 mention, multiple mentions allowed). One respondent also reported attending to receive a continuing education credit.

Regarding where respondents were in the process of deciding about EV options or investment(s) in charging, over three-quarters (7 of 9) indicated that at the time they attended PGE's event, they were in the process of considering or planning an investment (4 respondents) or seeking additional information (3 respondents). One respondent indicated actively evaluating their plan and another was in the design or purchase process.

Business Technical Assistance and Classes

Source of Awareness and Topics Discussed

About three-quarters (10 of 14) of surveyed technical assistance recipients indicated learning about PGE's consultation services through someone from the PGE Key Customer Manager Team (KCMs; 3 mentions) or someone else at PGE (9 mentions; multiple responses allowed). Other sources of awareness included colleagues (6 mentions), Forth (4 mentions), PGE's website (2 mentions), emails from PGE, a class or webinar where a PGE speaker presented, PGE's dealer engagement implementer, Oregon Applied Research, and ongoing business with Puget Sound Energy (PSE; 1 mention each, multiple mentions allowed).

About three-quarters (11 of 14) of surveyed technical assistance recipients reported receiving technical assistance for charging infrastructure, 6 reported receiving technical assistance for fleet electrification, and 6 reported receiving assistance for both. During their consultations, respondents discussed a range of topics with PGE staff, most of which covered costs associated with charging infrastructure and technical resources available for charging infrastructure (Table 34).

Table 34. Topics Discussed During Consultations (Multiple Responses Allowed; n=14)

Topics Discussed	Count
Charging Infrastructure (14 total respondents)	
Associated costs	11
Benefits to your business or organization	6

Topics Discussed	Count
Technical resources available	12
Financial resources available	10
PGE distribution systems upgrades required	8
Fleet Electrification (6 total respondents)	
Associated costs	5
Benefits to your business or organization	3
Technical resources available	6
Financial resources available	4

Two respondents indicated that they would have liked additional information during their consultations. One respondent wanted to know about opportunities to “share information Daimler Trucks North America (DTNA) is gathering such as power metering of high-power chargers for trucks.” Another reported wanting to see more active involvement from PGE in planning EV charging locations and help in developing long-term business models for charging infrastructure, and a financial plan to fund charging installations and to maintain charging installations in the long term.

Event Attendee Feedback on Fleet Electrification and Workplace Charging Information

Of the two respondents who received information about fleet electrification and workplace charging from the Electrifying School Transportation conference session and the Making the Business Case for Workplace Charging Webinar, one learned about the event from the ride-and-drive implementer and the other learned at a conference where PGE presented. In terms of their reasons for attending, one reported attending to learn fleet electrification and the other to learn about installing workplace charging. Both provided high satisfaction ratings with the events and indicated they would be highly very likely to recommend the events to others. The conference session attendee suggested that having a demonstration bus would have improved the event.

The conference session attendee indicated that they were moderately prepared to purchase the appropriate EVs for their fleet after attended the event. Both respondents indicated that they were either very or moderately prepared to select the appropriate charging equipment, and both indicated they were moderately prepared to install or find someone to install charging equipment. Finally, both respondents who attended the conference session and webinar indicated that they were in the initial, information-gathering stage of their respective projects.

Workplace Charger Installations

Eight respondents (of 13 who reported their organization had a parking garage or lot for their employees or customers) indicated their organization has installed charging equipment. One respondent reported installing more than five DC fast chargers, some of which were installed after November 2018. Eight respondents reported installing Level 2 chargers (four of whom installed more than five Level 2 chargers), some of which were installed after November 2018. Three respondents installed more than five standard 120V outlets for charging, none of which were installed after November 2018.

Among those who received financial assistance to install charging, most found the assistance to be an important influence in their decision process. Half (4 of 8) respondents who reported installing charging indicated they received financial assistance to procure or install charging equipment, including grants (3 mentions), rebates (2 mentions), and a tax credit (1 mention). All but one respondent who received financial assistance indicated that the assistance they received came from a source other than PGE. The three grant

recipients indicated the grants were “extremely important” in influencing their organization to install the chargers. Among the two rebate recipients (one of whom also received a grant), one rated the rebate as “extremely important” and one rated it as “not at all important” in their decision to installing charging. The respondent who indicated receiving a tax incentive reported being unsure of its importance.

Six of the eight respondents who installed workplace charging indicated encountering challenges with purchasing, installing, or permitting their charger(s). Challenges included it taking more time to complete the installation than expected (4 mentions), stations not working as intended (3 mentions), the project going over budget (2 mentions), permitting taking longer than expected (2 mentions), and that the stations still do not function properly (1 mention, multiple mentions allowed).

Five respondents who reported providing off-street parking for their employees and who did not install workplace charging, noted several factors preventing them from installing chargers. Challenges included chargers being cost-prohibitive (2 mentions), concerns about maintenance (2 mentions), concerns with reliability, insufficient space, and being unsure of how to find a contractor (1 mention each, multiple mentions allowed).

Of the five respondents who reported providing off-street parking for their employees and who did not install workplace charging four indicated that they are very likely to install a charging infrastructure in their parking areas within the next three years. Of those, one respondent who received a consultation indicated that their consultation made them “very likely” to install a charging infrastructure in their parking area(s) within the next three years, one respondent said it made them somewhat more likely, and the remaining respondent provided a “neutral” response.

Fleet Electrification

About half of all respondents (12 of 25) indicated that their organizations owns forklifts and lift trucks (6 mentions), passenger vehicles (9 mentions), vans (5 mentions), school buses (1 mention), public transit buses (1 mention), trucks, including a delivery refrigeration truck (4 mentions), and fire engines, police cars, and street equipment (1 mention; multiple responses allowed). About two-thirds of respondents (5 of 8), including three municipal representatives and two businesses, and all of whom received technical assistance, indicated that after working or interacting with PGE, they purchased electric passenger cars, ranging from one to six additional vehicles.

Surveyed technical assistance recipients indicated that the financial assistance they received was somewhat influential in their organizations’ decision to purchase an EV for their fleet. Financial assistance included grants (2), tax credit(s) (2), rebates (2; 1 rebate from PGE); one other respondent indicated they are currently seeking assistance from Drive Fund and three said they did not receive assistance. Two respondents (of 5) indicated that rebates were extremely influential in their organizations’ decision to purchase an EV for their fleet, two (of 5) indicated that tax credits were extremely influential and one respondent (of 5) rated grants as highly influential. Despite indicating that financial and technical assistance were influential, respondents indicated that if their organization had not received financial assistance, their organization would have bought the exact same number of vehicles (4 respondents) or postponed buying EVs for 2-3 years (2 respondents).

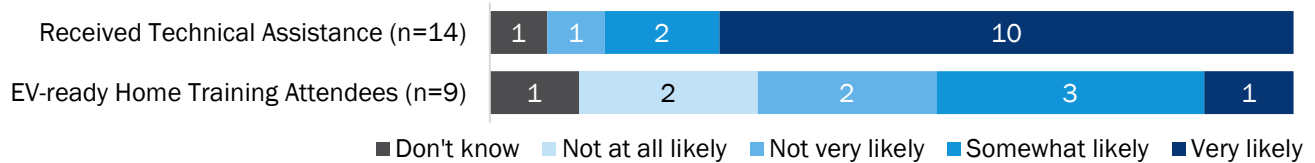
Among those whose organizations received financial assistance to purchase an EV for their fleet, PGE’s technical assistance was the most important influence in their decision process. PGE’s technical assistance was ranked as having the greatest influence on the decision to buy an EV by three respondents. Grants, tax credit(s), and rebates were ranked as most influential by one other respondent each.

All of the 12 respondents whose organizations purchased an EV for their fleet indicated several factors that keep their organizations from purchasing electric or additional EVs for their fleet. Barriers included not being aware that there is an electric version for certain fleets (6), and concerns about where to charge (6), vehicle

range (5), and longevity of the battery (5). Despite several barriers, respondents indicated they are likely to purchase or lease an EV for commercial or business use within the next three years.

Those who received technical assistance were more likely to report considering fleet electrification than those who received training. Almost three-quarters (10 of 14) of surveyed technical assistance recipients indicated that they are very likely to purchase or lease an EV in the next three years compared to one EV-ready home training attendee (Figure 28).

Figure 28. Likelihood of Purchasing or Leasing an EV within the Next Three Years



EV-Ready Homes

Respondents involved in building trades vary in whether they include a 240V outlet for EV charging in new construction and existing homes. Three respondents (of 11) indicated that their organization includes 240V for EV charging outlets in their new construction homes. The remaining eight respondents indicated that they do not include any (5 mentions), that they are not involved in new construction (2 mentions), or that they did not know (1 mention).

For existing homes, about two-thirds of respondents (7 of 11 total; 5 who attended EV-ready home training and two who received a consultation) sell, recommend, or include 240V outlets or charging options when bidding on electric or remodeling jobs. Three respondents reported they have installed a 240V outlet or EV charging options in existing homes they have worked on - one installed in six existing homes, one installed in five, and the remaining respondent reported installing in one. Four respondents said they had not installed in any.

Respondents were of mixed opinion on the influence of the information presented at the EV-ready home training by PGE staff in their decision to offer EV-ready home options. Over half of respondents (3 of 5) reported finding the information moderately influential in their decision to offer EV-ready home options and one (of 5) reported it was very influential. One respondent (of 5) reported that the information was not influential in their decision. Four respondents (of 5) indicated that if they had not received information from PGE at an EV-ready home training, their organization would most likely have still considered offering EV-ready home options. One respondent (of 5) indicated they do not know what their organization would have done.

Three respondents noted factors that prevent them from selling EV-ready homes or charging plus options(s), including added cost (1), clients not asking for it (1), and clients not having an EV at the time of design (1).

Respondents were of mixed opinion as to the effect that information from PGE increased their future likelihood of offering a 240V EV plug when bidding on a project or building/designing a home. Half of respondents (3 of 6; two EV-ready home training attendees and one who received technical assistance) indicated that PGE-information increased their future likelihood a little, one respondent (of 6; an EV-ready home training attendee) indicated it increased their likelihood a great deal, and two (EV-ready home attendees) indicated it did not change their likelihood.

About two thirds of respondents (4 of 6; one who attended an EV-ready home training and one who received a consultation) indicated that in the next three years, it is very likely that they will always offer a 240V EV charging plug when bidding on a project or building/designing a home. One other indicated “somewhat likely” and another indicated they didn’t know.

Appendix G. General Population Customer Survey Detailed Findings

This section presents detailed findings from the general population customer survey by survey wave (when questions are comparable) and likely vehicle purchaser segment.

Vehicle Purchasing and Ownership

Figure 29. Respondent Involvement in Decision to Purchase or Lease Vehicles, by Survey Wave and Segment

Vehicle Purchase Decision Making	All Likely Vehicle Purchasers		Wave 1 - All Likely Vehicle Purchasers		
	Baseline (n=929)	Wave 1 (n=1026)	EV/PHEV Non-Considerers (n=526) (A)	EV/PHEV Considerers (n=253) (B)	EV/PHEV Intenders (n=247) (C)
I am the primary decision maker	46%	55% *	54%	61% C	52% B
I share the decision with someone else in my household	54%	45% *	46%	39% C	48% B

S3. How involved would you be in a decision to purchase or lease a new or used vehicle for your household?

Note: Letters A - C indicate statistically significant differences between likely vehicle purchaser segments (z-test for proportions, p<.05).

* Indicates a statistically significant difference between Baseline and Wave 1 survey all likely vehicle purchasers (z-test for proportions, p<.05).

Figure 30. Number of Vehicles Owned or Leased, by Survey Wave and Segment

Number of Vehicles	All Likely Vehicle Purchasers		Wave 1 - All Likely Vehicle Purchasers		
	Baseline (n=929)	Wave 1 (n=1026)	EV/PHEV Non-Considerers (n=526) (A)	EV/PHEV Considerers (n=253) (B)	EV/PHEV Intenders (n=247) (C)
None	0%	3%	3%	5%	3%
One	28%	32%	31%	31%	35%
Two	44%	39% *	42%	38%	35%
Three	17%	17%	15%	17%	20%
Four or more	10%	9%	9%	8%	7%

S4r. How many vehicles does your household currently own or lease?

Note: Letters A - C indicate statistically significant differences between likely vehicle purchaser segments (z-test for proportions, p<.05).

* Indicates a statistically significant difference between Baseline and Wave 1 survey all likely vehicle purchasers (z-test for proportions, p<.05).

Figure 31. Timeframe for Next Vehicle Purchase, by Survey Wave and Segment

Next Vehicle Purchase Timeframe	All Likely Vehicle Purchasers		Wave 1 - All Likely Vehicle Purchasers		
	Baseline (n= 929)	Wave 1 (n=1026)	EV/PHEV Non-Considerers (n=526) (A)	EV/PHEV Considerers (n=253) (B)	EV/PHEV Intenders (n=247) (C)
During the next 12 months	25%	26%	29% C	27% C	19% A B
More than 1 year to 2 years from now	30%	31%	31%	28%	34%
More than 2 years to 3 years from now	21%	20%	17% C	22%	24% A
More than 3 years to 5 years from now	24%	24%	24%	23%	23%

S6. How soon do you expect to purchase or lease a new or used vehicle for your household? For the purposes of this survey "vehicle" refers to cars, crossovers-SUVs, trucks, and vans. This would not include electric motorcycles, bikes, scooters, etc.

Note: Letters A - C indicate statistically significant differences between likely vehicle purchaser segments (z-test for proportions, p<.05).

Familiarity with EVs and Awareness of EV Benefits

Figure 32. Vehicle Fuel Type Familiarity, by Survey Wave and Segment (Multiple Responses Allowed)

Vehicle Fuel Type Familiarity (% Reporting Somewhat or Very Familiar)	All Likely Vehicle Purchasers		Wave 1 - All Likely Vehicle Purchasers		
	Baseline (n=929)	Wave 1 (n=1026)	EV/PHEV Non-Considerers (n=526) (A)	EV/PHEV Considerers (n=253) (B)	EV/PHEV Intenders (n=247) (C)
Gasoline	97%	93% *	94%	93%	93%
Diesel	87%	89%	85% B C	92% A	93% A
Gas Hybrid	80%	82%	74% B C	87% A C	94% A B
PHEV	78%	78%	70% B C	84% A C	92% A B
EV	76%	73%	63% B C	81% A C	90% A B
Biodiesel	57%	62% *	55% B C	68% A	70% A
Natural Gas	38%	39%	34% B	46% A	42%

Q1. In addition to vehicles using traditional gasoline internal combustion engines, some automobile manufacturers offer vehicles with powertrains that use other fuel types including diesel, biodiesel, natural gas and electricity. Please indicate how familiar you are with each vehicle type below.

Note: Letters A - C indicate statistically significant differences between likely vehicle purchaser segments (z-test for proportions, p<.05).

* Indicates a statistically significant difference between Baseline and Wave 1 survey all likely vehicle purchasers (z-test for proportions, p<.05).

Figure 33. Vehicle Fuel Type Environmental Friendliness, by Survey Wave and Segment (Multiple Responses Allowed)

Vehicle Fuel Type Environmental Friendliness (% Reporting 8-10)	All Likely Vehicle Purchasers		Wave 1 - All Likely Vehicle Purchasers		
	Baseline (n=929)	Wave 1 (n=1026)	EV/PHEV Non-Considerers (n=526) (A)	EV/PHEV Considerers (n=253) (B)	EV/PHEV Intenders (n=247) (C)
EV	68%	69%	60%	74%	84%
PHEV	43%	45%	41%	46%	53%
Gas Hybrid	29%	28%	27%	31%	29%
Natural Gas	23%	22%	23%	23%	20%
Biodiesel	17%	19%	19%	24%	15%
Diesel	3%	4%	5%	5%	2%
Gasoline	3%	3%	5%	2%	0%

Q2. Now, please indicate how environmentally friendly do you think each type of vehicle type below is.

Note: Letters A - C indicate statistically significant differences between likely vehicle purchaser segments (z-test for proportions, p<.05).

Figure 34. Vehicle Fuel Type with Lowest Fuel Costs, by Survey Wave and Segment

Vehicle Type with Lowest Fuel Costs	All Likely Vehicle Purchasers		Wave 1 - All Likely Vehicle Purchasers		
	Baseline (n=929)	Wave 1 (n=1026)	EV/PHEV Non-Considerers (n=526) (A)	EV/PHEV Considerers (n=253) (B)	EV/PHEV Intenders (n=247) (C)
Electric	58%	54%	50%	54%	64%
Plug-in hybrid	15%	15%	15%	15%	16%
Hybrid (non-plug-in)	5%	6%	8%	6%	4%
Natural gas	7%	6%	7%	5%	5%
Biodiesel	3%	4%	4%	5%	2%
Diesel	2%	3%	3%	4%	1%
Gasoline	2%	3%	3%	3%	3%
Don't know	7%	8%	10%	7%	4%

Q3. Which one of these vehicle types would you expect to have the lowest fuel costs?

Note: Letters A - C indicate statistically significant differences between likely vehicle purchaser segments (z-test for proportions, p<.05).

Figure 35. Vehicle Fuel Type with Lowest Maintenance Costs, by Survey Wave and Segment

Vehicle Type with Lowest Maintenance Costs	All Likely Vehicle Purchasers		Wave 1 - All Likely Vehicle Purchasers		
	Baseline (n=929)	Wave 1 (n=1026)	EV/PHEV Non-Considerers (n=526) (A)	EV/PHEV Considerers (n=253) (B)	EV/PHEV Intenders (n=247) (C)
Electric	29%	32%	20% B C	37% A C	52% A B
Gasoline	25%	21% *	27% B C	17% A	10% A
Diesel	6%	8%	8%	9%	6%
Plug-in hybrid	5%	6%	5%	5%	9%
Hybrid (non-plug-in)	2%	4%	4%	4%	1%
Natural gas	3%	3%	4%	2%	1%
Biodiesel	1%	1%	1%	1%	1%
Don't know	28%	26%	30% C	25%	19% A

Q4. Which one of these vehicle types would you expect to have the lowest maintenance costs?

Note: Letters A - C indicate statistically significant differences between likely vehicle purchaser segments (z-test for proportions, p<.05).

* Indicates a statistically significant difference between Baseline and Wave 1 survey all likely vehicle purchasers (z-test for proportions, p<.05).

Importance of Factors Considered During Vehicle Purchase / Lease Decision Process

Figure 36. Respondent Fuel Type Consideration for Next Vehicle, by Survey Wave and Segment (Multiple Responses Allowed)

Vehicle Fuel Type Consideration (% Reporting will Definitely Consider)	All Likely Vehicle Purchasers		Wave 1 - All Likely Vehicle Purchasers		
	Baseline (n= 929)	Wave 1 (n=1026)	EV/PHEV Non-Considerers (n=526) (A)	EV/PHEV Considerers (n=253) (B)	EV/PHEV Intenders (n=247) (C)
Gasoline	79%	74%*	85% B C	77% A C	47% A B
EV	38%	39%	0% †	78% C	89% B
Gas Hybrid	42%	37%*	20% B C	60% A	52% A
PHEV	39%	33%*	0% †	69% C	72% A B
Diesel	15%	13%	15% C	14% C	7% A B

Q9. Thinking about the next vehicle your household might purchase or lease, how likely are you to consider a vehicle powered by...?

Note: Letters A - C indicate statistically significant differences between likely vehicle purchaser segments (z-test for proportions, p<.05).

* Indicates a statistically significant difference between Baseline and Wave 1 survey all likely vehicle purchasers (z-test for proportions, p<.05).

† Significant testing was not performed on these fuel types because responses were used in defining the EV/PHEV Non-Considerers segment.

Figure 37. Vehicle Fuel Type Respondents are Most Likely to Consider for their Next Vehicle Purchase or Lease, by Survey Wave and Segment

Vehicle Type Respondents are Most Likely to Acquire for Next Purchase/Lease	All Likely Vehicle Purchasers		Wave 1 - All Likely Vehicle Purchasers		
	Baseline (n=921)	Wave 1 (n=1016)	EV/PHEV Non-Considerers (n=516) (A)	EV/PHEV Considerers (n=253) (B)	EV/PHEV Intenders (n=247) (C)
Gasoline	56%	46%*	70% B	37% A	0%
Electric	7%	14%*	1% C	0% †	57% A
Hybrid (non-plug-in)	15%	14%	13% A	29% B	0%
Plug-in hybrid	11%	10%	1% C	0% †	43% A
Diesel	3%	3%	4%	4%	0%
Don't know	7%	12%*	10% B	26% A	0%

Q10. Considering everything you currently know, which one type of vehicle listed below are you most likely to acquire the next time your household purchases or leases a vehicle?

Note: Letters A - C indicate statistically significant differences between likely vehicle purchaser segments (z-test for proportions, p<.05).

* Indicates a statistically significant difference between Baseline and Wave 1 survey all likely vehicle purchasers (z-test for proportions, p<.05).

† Significant testing was not performed on these fuel types because responses were used in defining the EV/PHEV Considerers and Intenders segments.

Figure 38. Vehicle Body Type Respondents are Most Likely to Consider for Next Purchase or Lease, by Survey Wave and Segment

Vehicle Body Type Respondents are Most Likely to Consider for Next Purchase/Lease	All Likely Vehicle Purchasers		Wave 1 - All Likely Vehicle Purchasers		
	Baseline (n=929)	Wave 1 (n=1026)	EV/PHEV Non-Considerers (n=526) (A)	EV/PHEV Considerers (n=253) (B)	EV/PHEV Intenders (n=247) (C)
Crossover or sports utility vehicle (CUV/SUV)	49%	49%	56% B C	44% A	40% A
Sedan	18%	19%	15% B C	22% A	26% A
Coupe	4%	11%	8%	12%	3%
Hatchback	10%	11%	8% C	12%	18% A
Truck	10%	9%	12% C	7%	3% A
Minivan	3%	3%	2%	5%	3%
Wagon	3%	2%	2%	2%	3%
Convertible	0%	1%	0%	0%	1%
Another type of vehicle	1%	1%	1%	0%	0%
Don't know	3%	2%	2%	3%	4%

Q11. Based on everything you currently know, which one vehicle body type listed below are you most likely to consider the next time your household purchases/leases a vehicle?

Note: Letters A - C indicate statistically significant differences between likely vehicle purchaser segments (z-test for proportions, p<.05).

Awareness and Consideration of EV and PHEV Makes and Models

Figure 39. Model of EV Respondents Would Consider for Next Vehicle Purchase, by Segment (Multiple Responses Allowed)

EV Respondents Would Consider for Next Vehicle Purchase	All Likely Vehicle Purchasers		
	Total (n=423)	EV/PHEV Considerers (n=196) (B)	EV/PHEV Intenders (n=224) (C)
Tesla Model 3	37%	31% C	43% B
Nissan LEAF	29%	24%	34%
Honda Clarity Electric	25%	24%	26%
Tesla Model S	24%	19% C	29% B
Tesla Model X	21%	16% C	25% B
Chevrolet Bolt EV	18%	13% C	24% B
Audi e-tron	16%	12%	19%
Volkswagen e-Golf	16%	16%	15%
Ford Focus Electric	15%	17%	14%
Hyundai Kona EV	15%	13%	18%
BMW i3	14%	13%	15%
Kia Soul EV	12%	10%	14%
Hyundai Ioniq Electric	11%	10%	12%
Chevrolet Spark EV	8%	7%	10%
Jaguar i-Pace	6%	9%	4%
Mercedes B250e	5%	6%	4%
Fiat 500e	4%	4%	4%
Smart ED	1%	0%	2%
Other EV model(s)	5%	3%	6%
Not considering any of these models	17%	26% C	9% B

Q14. Below is a list of all-electric vehicles available for purchase or lease in Oregon. Please select those that you are likely to consider for your next vehicle purchase or lease.

^a Baseline response not displayed as different PHEV models have been introduced to the market since 2018. Only asked of respondents in the EV/PHEV Considerer and Intender segments.

Note: Letters B - C indicate statistically significant differences between likely vehicle purchaser segments (z-test for proportions, p<.05).

Figure 40. Model of PHEV Respondents Would Consider for Next Vehicle Purchase, By Segment (Multiple Responses Allowed) ^a

PHEV Respondents Would Consider for Next Vehicle Purchase	All Likely Vehicle Purchasers		
	Total (n=353)	EV/PHEV Considerers (n=175) (B)	EV/PHEV Intenders (n=178) (C)
Toyota Prius Prime	41%	36% C	46% B
Honda Clarity Plug-In Hybrid	25%	22%	27%
Chevrolet Volt	18%	15%	22%
Audi A3	14%	10% C	19% B
Ford Fusion Energi	14%	14%	15%
Hyundai Ioniq PHEV	12%	7% C	18% B
Hyundai Sonata PHEV	12%	9%	14%
Kia Optima PHEV	12%	10%	14%
Kia Niro PHEV	10%	10%	11%
Volvo S90 T8	9%	7%	12%
Volvo XC60 T8	9%	7%	11%
Mitsubishi Outlander PHEV	8%	8%	7%
Volvo XC90 T8	8%	7%	8%
Ford C-MAX Energi	7%	8%	6%
Chrysler Pacifica Hybrid	7%	6%	7%
BMW 330e iPerformance	6%	9%	4%
MINI Cooper SE Countryman ALL4	6%	5%	7%
Cadillac CT6 PHV	5%	5%	4%
Mercedes C350e	5%	5%	5%
Porsche Cayenne S E-Hybrid	4%	6%	3%
I am not considering any of these models	23%	29% C	17% B

Q15. The next list (below) is a list of plug-in hybrid electric vehicles available for purchase or lease in Oregon. Please select those that you are likely to consider for your next vehicle purchase or lease.

^a Baseline response not displayed as different PHEV models have been introduced to the market since 2018. Only asked of respondents in the EV/PHEV Considerer and Intender segments.

Note: Letters B - C indicate statistically significant differences between likely vehicle purchaser segments (z-test for proportions, p<.05).

Motivations/Barriers for EV/PHEV Acquisition

Figure 41. Main Reasons Respondents Would Consider an EV/PHEV, by Survey Wave and Segment

Main Reason for Purchasing or Leasing an EV/PHEV (Unprompted)	All Likely Vehicle Purchasers		Wave 1 - All Likely Vehicle Purchasers		
	Baseline (n=929)	Wave 1 (n=1026)	EV/PHEV Non-Considerers (n=526) (A)	EV/PHEV Considerers (n=253) (B)	EV/PHEV Intenders (n=247) (C)
Environmental impact	42%	40%	26%	45%	64%
Fuel/operating cost	33%	26%*	29%	20%	25%
Cost (unspecified)	9%	8%	7%	9%	10%
No/less gas used	5%	8%*	10%	5%	8%
Efficiency/fuel economy	7%	5%	3%	8%	7%
Maintenance costs	6%	5%	4%	3%	7%
Ease/availability charge	7%	3%*	2%	3%	3%
Less maintenance	3%	3%	3%	3%	5%
Quiet ride	4%	3%	4%	2%	1%
Commuter car/used for short trips	2%	2%	1%	2%	4%
Range	4%	2%*	1%	3%	3%
Fun to drive	0%	1%	0%	0%	2%
Performance	5%	1%*	0%	2%	2%
Reliable	1%	1%	0%	1%	1%
Safe	1%	1%	1%	1%	0%
Style/model of car	3%	1%*	0%	1%	1%
Vehicle cost	2%	1%	0%	2%	1%
Other	5%	6%	5%	5%	7%
No/None/Not any/Nothing	2%	2%	3%	0%	0%
Don't know	19%	25%*	31%	26%	9%

Q16. What are the main reasons you purchased or leased an all-electric vehicle / plug-in hybrid electric vehicle? What are the main reasons you would consider an all-electric vehicle / plug-in hybrid electric vehicle for your next vehicle purchase or lease? If in the future you were to consider purchasing or leasing an all-electric vehicle / plug-in hybrid electric vehicle, what would you expect to be the main benefits of having an electric vehicle?

Note: Letters A - C indicate statistically significant differences between likely vehicle purchaser segments (z-test for proportions, p<.05).

* Indicates a statistically significant difference between Baseline and Wave 1 survey all likely vehicle purchasers (z-test for proportions, p<.05).

Figure 42. Reasons for Considering an EV/PHEV for Next Purchase or Lease, by Survey Wave and Segment ^a

Reason for Purchasing or Leasing an EV/PHEV (% Reporting a Major Reason)	All Likely Vehicle Purchasers		Wave 1 - All Likely Vehicle Purchasers	
	Baseline (n=435)	Wave 1 (n=500)	EV/PHEV Considerers (n=253) (B)	EV/PHEV Intenders (n=247) (C)
Protecting the environment	78%	82%	76% C	88% B
Lower fuel cost	82%	70% *	69%	71%
Vehicle safety	68%	64%	65%	63%
Less vehicle maintenance	63%	58%	56%	60%
Vehicle's performance and handling	61%	55%	58%	52%
The convenience of charging vehicle at home	68%	49% *	41% C	59% B
Tax incentives and rebates	41%	32% *	32%	32%
Availability of public charging stations in the Portland/Salem metro areas	56%	31% *	32%	30%
Availability of public charging stations outside of the Portland/Salem metro areas	55%	30% *	31%	28%
The convenience of charging vehicle at work	26%	17% *	15%	18%
Priority parking at some locations	10%	9%	11% C	6% B
How I look driving and owning this vehicle	5%	6%	8%	4%

Q17. For each of the factors below, please indicate whether that factor is a major reason, a minor reason, or not a reason you are considering an all-electric vehicle / plug-in hybrid electric vehicle for your next purchase / lease. For each of the factors below, please indicate whether that factor was a major reason, a minor reason, or not a reason you decided to purchase or lease an all-electric vehicle / plug-in hybrid electric vehicle.

^a Only asked of respondents in the EV/PHEV Considerer and Intender segments.

Note: Letters B - C indicate statistically significant differences between likely vehicle purchaser segments (z-test for proportions, p<.05).

* Indicates a statistically significant difference between Baseline and Wave 1 survey all likely vehicle purchasers (z-test for proportions, p<.05).

Figure 43. Unprompted Barriers to Purchasing or Leasing and EV Mentioned by Respondents, by Survey Wave and Segment

Main Barrier to Purchasing or Leasing an EV/PHEV (Unprompted)	All Likely Vehicle Purchasers		Wave 1 - All Likely Vehicle Purchasers		
	Baseline (n=929)	Wave 1 (n=1026)	EV/PHEV Non-Considerers (n=526) (A)	EV/PHEV Considerers (n=253) (B)	EV/PHEV Intenders (n=247) (C)
Cost/affordability (unspecified)	28%	30%	19%	33%	51%
Range/battery life	23%	14%	18%	10%	10%
Recharge stations/infrastructure	22%	13%	16%	11%	10%
Cost of vehicle	11%	10%	8%	10%	12%
Convenience/ease of use	7%	7%	10%	3%	3%
Cost of electricity/cost to use	5%	4%	6%	3%	2%
Cost of repairs/maintenance	6%	4%	5%	2%	2%
Power/able to pull and tow	4%	4%	5%	3%	1%
Don't know	13%	17%	18%	24%	10%

Q18. What are the main factors that might hold you back from purchasing or leasing an electric vehicle?

Note: Letters A - C indicate statistically significant differences between likely vehicle purchaser segments (z-test for proportions, p<.05).

* Indicates a statistically significant difference between Baseline and Wave 1 survey all likely vehicle purchasers (z-test for proportions, p<.05).

Figure 44. Prompted Barriers to Purchasing or Leasing and EV Mentioned by Respondents, by Survey Wave and Segment

Barriers to Purchasing or Leasing an EV/PHEV (% Reporting a Major Concern)	All Likely Vehicle Purchasers		Wave 1 - All Likely Vehicle Purchasers		
	Baseline (n=929)	Wave 1 (n=1026)	EV/PHEV Non-Considerers (n=526) (A)	EV/PHEV Considerers (n=253) (B)	EV/PHEV Intenders (n=247) (C)
Purchase price of vehicle	79%	84%*	80% C	86%	88% A
Number of miles vehicle will go on a single charge	86%	78%*	81% C	80%	73% A
Vehicle reliability	N/A ^a	77%	75%	79%	80%
Vehicle safety	69%	66%	60% C	68%	76% A
Ability to charge at home	66%	65%	66%	61%	66%
Amount of time required to charge battery	66%	62%*	68% B C	56% A	53% A
Availability of public charging stations outside of the Portland/Salem metro areas	69%	61%*	73% B C	51% A	42% A
Maintenance costs	65%	61%	65% C	62%	52% A
Vehicle's performance and handling	64%	58%*	57%	60%	60%
Availability of public charging stations in the Portland/Salem metro areas	61%	50%*	57% B C	45% A	41% A
Cost of charging the vehicle	54%	45%*	47% C	49% C	35% A B
EV body types	45%	42%	46%	38%	36%
Availability of body type and sizes	N/A ^b	39%	39%	39%	39%
Ability to charge at work	38%	33%*	12% B C	23% A	16% A
EV appearance	20%	25%*	28% C	26%	18% A

Q19. For each item, please indicate whether the issue described is a major concern, a minor concern, or not a concern to you at all when considering whether or not to purchase or lease an electric vehicle.

Note: Letters A - C indicate statistically significant differences between likely vehicle purchaser segments (z-test for proportions, p<.05).

* Indicates a statistically significant difference between Baseline and Wave 1 survey all likely vehicle purchasers (z-test for proportions, p<.05).

^{a, b} These two items were not asked in Baseline survey.

Figure 45. Unprompted EV/PHEV Changes needed for Non-Considerers to Consider an EV/PHEV, by Survey Wave (Multiple Responses Allowed) ^a

Changes Necessary to Consider EV or PHEV for Next Purchase/Lease	All Likely Vehicle Purchasers	
	Baseline (n=494)	Wave 1 (n=526)
Additional charging infrastructure	32%	25%
Range/battery life	23%	17%
Cost/affordability (unspecified)	14%	10%
Cost of vehicle	8%	7%
Style/model of car	8%	7%
Time it takes to charge	7%	6%
Size of vehicle	7%	6%
Power/able to pull and tow	5%	4%
Reliability	1%	3%
Need more information	8%	3%
Availability	4%	2%
Convenience/ease of use	7%	2%
Cost of electricity/cost to use	5%	3%
Cost of batteries	2%	2%
Maintenance/repairs	2%	2%
Safety	3%	3%
Cost of repairs/maintenance	3%	2%
Environmental impact	4%	3%
Comparative to traditional vehicle in quality	4%	2%
Quality of batteries/batteries need to be improved	2%	2%
Not in the market for a car	6%	0%
Other	3%	3%
Nothing	3%	30%
Don't know	8%	5%

Q20. What changes would need to occur in terms of vehicle features and specifications and/or electric vehicle charging infrastructure in order for you to consider an all-electric vehicle or plug-in hybrid electric vehicle for your next vehicle purchase / lease?

^a Only asked of respondents in the non-consider segment.

* Indicates a statistically significant difference between Baseline and Wave 1 survey all likely vehicle purchasers (z-test for proportions, p<.05).

Figure 46. How Many Miles EV Needs to Go on Single Charge to Reduce Range Concerns, by Survey Wave and Segment

Miles Needed on a Single Charge to Reduce Vehicle Range Concerns	All Likely Vehicle Purchasers		Wave 1 - All Likely Vehicle Purchasers		
	Baseline (n=888)	Wave 1 (n=971)	EV/PHEV Non-Considerers (n=494) (A)	EV/PHEV Considerers (n=241) (B)	EV/PHEV Intenders (n=232) (C)
100 miles or less	8%	11% *	9%	12%	15%
101 to 200 miles	22%	23%	20% A	28% B	25%
201 to 250 miles	15%	15%	10% B C	17% A	24% A
251 to 300 miles	22%	19%	20%	17%	20%
More than 300 miles	29%	28%	36% B C	23% C	14%
Not sure	5%	4%	5%	2%	2%

Q21. How many miles would an electric vehicle need to be able to go on a single charge to reduce your concerns about vehicle range?
 Note: Letters A - C indicate statistically significant differences between likely vehicle purchaser segments (z-test for proportions, p<.05).
 * Indicates a statistically significant difference between Baseline and Wave 1 survey all likely vehicle purchasers (z-test for proportions, p<.05).

Figure 47. How Respondents Would Use an Electric or Plug-In Hybrid Vehicle if it Were Purchased or Leased, by Segment

How Respondents Would Use an EV or PHEV	All Likely Vehicle Purchasers		
	Total (n=500)	EV/PHEV Considerers (n=253) (B)	EV/PHEV Intenders (n=247) (C)
For all or most auto trips and would not use another vehicle	63%	55% C	72% B
Primarily for short distance trips (30 miles or less) and use another vehicle	26%	31% C	21% B
Would use a non-electric vehicle instead of an EV or PHEV for most trips	4%	5%	3%
Something else	1%	0%	2%
Don't know	6%	9% C	3% B

Q22. Which of the following best described how you would use an electric or plug-in hybrid vehicle were you to purchase or lease one?
 a Only asked of Wave 1 survey respondents in the EV/PHEV Considerer and Intender segments.
 Note: Letters B - C indicate statistically significant differences between likely vehicle purchaser segments (z-test for proportions, p<.05).

Knowledge of EV Charging Options and Logistics

Figure 48. Where Respondents Typically Park their Primary Vehicle, by Segment ^a

Typical Parking Location at Home	Total (n=993)	All Likely Vehicle Purchasers		
		EV/PHEV Non-Considerers (n=513) (A)	EV/PHEV Considerers (n=242) (B)	EV/PHEV Intenders (n=241) (C)
Garage	36%	34%	36%	39%
Driveway	46%	48%	42%	43%
On the street	7%	5% B	11% A	8%
In a shared parking garage or lot	10%	12%	10%	8%
Don't know	1%	0%	2%	1%

Q23. When at home, where do you typically park the vehicle you primarily use?

^a This question was not asked of Baseline survey respondents.

Note: Letters A - C indicate statistically significant differences between likely vehicle purchaser segments (z-test for proportions, p<.05).

















Figure 49. Parking Space Availability to Respondent's Home, by Segment ^a

Parking Space Available Close to Home	Total (n=78)	All Likely Vehicle Purchasers		
		EV/PHEV Non-Considerers (n=30) (A)	EV/PHEV Considerers (n=28) (B)	EV/PHEV Intenders (n=20) (C)
Has parking space available	76%	72%	83% A	74%
Does not have parking space available	22%	24%	17%	26%
Don't know	2%	4%	0%	0%

Q24. Is there usually a parking space available close to your home?

^a This question was not asked of Baseline survey respondents.

Figure 50. Level of Concern with Current Parking Situation on Respondent’s Decision to Purchase or Lease an EV/PHEV in the Future, by Segment ^a

















Level of Concern with Parking	Total (n=996)	All Likely Vehicle Purchasers		
		EV/PHEV Non-Considerers (n=513) (A)	EV/PHEV Considerers (n=242) (B)	EV/PHEV Intenders (n=241) (C)
Not a concern at all	47% 	44%  C	45% 	56%  A
A minor concern	27% 	25% 	30% 	27% 
A major concern	24% 	28%  C	23% 	16%  A
Don't know	3% 	3% 	2% 	2% 

Q25. How much of a concern is your current parking situation in your decision on whether to purchase an electric or plug-in hybrid vehicle in the future?

^a This question was not asked of Baseline survey respondents.

Note: Letters A - C indicate statistically significant differences between likely vehicle purchaser segments (z-test for proportions, p<.05).

Figure 51. Most Important Location to Have Charging Available, by Segment ^a

Most Important Location to Have Charging Available	Total (n=1026)	All Likely Vehicle Purchasers		
		EV/PHEV Non-Considerers (n=526) (A)	EV/PHEV Considerers (n=253) (B)	EV/PHEV Intenders (n=247) (C)
At home	73% 	67%  C	73%  C	87%  AB
At work	7% 	8% 	8% 	4% 
At public locations (e.g., grocery stores, coffee shops, malls)	14% 	17%  C	14% 	8%  A
Don't know	5% 	7%  C	5% 	1%  A

Q26. Which location would be most important to you to have charging available if you were to purchase an all-electric or plug-in hybrid vehicle?

^a This question was not asked of Baseline survey respondents.

Note: Letters A - C indicate statistically significant differences between likely vehicle purchaser segments (z-test for proportions, p<.05).

Figure 52. Availability of Electric Service Outlet Available Where Respondents Park at Home, by Survey Wave and Segment

Electric Service Outlet Available at Home	All Likely Vehicle Purchasers		Wave 1 - All Likely Vehicle Purchasers		
	Baseline (n=929)	Wave 1 (n=1026)	EV/PHEV Non-Considerers (n=526) (A)	EV/PHEV Considerers (n=253) (B)	EV/PHEV Intenders (n=247) (C)
Has outlet available	29%	39% *	35% C	40%	47% A
Does not have outlet available	58%	50% *	55% C	49%	41% A
Don't know	13%	11%	10%	11%	12%

Q27. Do you have an electric service outlet available where you park your car at home?

Note: Letters A - C indicate statistically significant differences between likely vehicle purchaser segments (z-test for proportions, p<.05).

* Indicates a statistically significant difference between Baseline and Wave 1 survey all likely vehicle purchasers (z-test for proportions, p<.05).

Figure 53. Availability of Electric Service Outlet Available Where Respondents Park at Work, by Survey Wave and Segment

Electric Service Outlet Available at Workplace	All Likely Vehicle Purchasers		Wave 1 - All Likely Vehicle Purchasers		
	Baseline (n=929)	Wave 1 (n=1026)	EV/PHEV Non-Considerers (n=526) (A)	EV/PHEV Considerers (n=253) (B)	EV/PHEV Intenders (n=247) (C)
Has outlet available	14%	16%	15%	19%	16%
Does not have outlet available	47%	45%	48% C	47% C	36% AB
Not applicable	27%	29%	28%	24% C	36% B
Don't know	12%	10%	9%	10%	11%

Q28. Do you have an electric service outlet available where you park your car at your workplace?

Note: Letters A - C indicate statistically significant differences between likely vehicle purchaser segments (z-test for proportions, p<.05).

Figure 54. Effect of Having an EV Charging Station at Workplace on Respondent’s Decision to Purchase or Lease an EV/PHEV, by Survey Wave and Segment

Effect of EV Charging Stations at Workplace	All Likely Vehicle Purchasers		Wave 1 - All Likely Vehicle Purchasers		
	Baseline (n=664)	Wave 1 (n=776)	EV/PHEV Non-Considerers (n=405) (A)	EV/PHEV Considerers (n=201) (B)	EV/PHEV Intenders (n=173) (C)
Much more likely to purchase or lease an electric vehicle	15%	18%	11% B C	21% A C	34% A B
Somewhat more likely to purchase or lease an electric vehicle	42%	39%	35% B	48% A	40% A B
Have no effect on your decision to purchase or lease an electric vehicle	37%	36%	47% BC	24% A	23% A
Don't know	6%	7%	7%	8%	3%

Q29. Would having electric vehicle charging stations at your workplace make you...?

Note: Letters A - C indicate statistically significant differences between likely vehicle purchaser segments (z-test for proportions, p<.05).

* Indicates a statistically significant difference between Baseline and Wave 1 survey all likely vehicle purchasers (z-test for proportions, p<.05).

Figure 55. Awareness of Federal and State Tax Incentives for EVs, by Survey Wave and Segment

Awareness of State and Federal Tax Incentives	All Likely Vehicle Purchasers		Wave 1 - All Likely Vehicle Purchasers		
	Baseline (n=929)	Wave 1 (n=1026)	EV/PHEV Non-Considerers (n=526) (A)	EV/PHEV Considerers (n=253) (B)	EV/PHEV Intenders (n=247) (C)
Aware of federal or Oregon tax incentives	47%	43% *	37% C	44% A	55% A
Both federal and Oregon	N/A ^a	29%	25% C	29% A	38% A
Federal only	N/A ^a	9%	7%	11% A	12% A
Oregon only	N/A ^a	5%	5%	5%	5%
Not aware of either	N/A ^a	54%	61% C	52% A	42% A
Don't know	N/A ^a	3%	3%	3%	3%

Q30. The federal government and state of Oregon offer financial incentives including tax credits to help offset the up-front costs of plug-in electric vehicles. Prior to this survey, were you aware of these incentives?

Note: Letters A - C indicate statistically significant differences between likely vehicle purchaser segments (z-test for proportions, p<.05).

* Indicates a statistically significant difference between Baseline and Wave 1 survey all likely vehicle purchasers (z-test for proportions, p<.05).

Figure 56. Expected Tax Incentive Amount to Offset Cost of EV, by Survey Wave and Segment

Expectation of Tax Credits and Incentives to Offset Cost of E or PHEV	All Likely Vehicle Purchasers		Wave 1 - All Likely Vehicle Purchasers		
	Baseline (n=929)	Wave 1 (n=1026)	EV/PHEV Non-Considerers (n=526) (A)	EV/PHEV Considerers (n=253) (B)	EV/PHEV Intenders (n=247) (C)
Less than \$2K	16%	15%	15%	14%	17%
\$2K to less than \$5k	18%	11% *	10%	13%	14%
\$5K to less than \$7K	18%	11% *	8% C	12%	17% A
\$7K or more	14%	11%	12%	9%	13%
Not sure	33%	51% *	56% C	53% C	39% AB

Q31. Approximately how much would you expect tax credits and incentives to offset the cost of a plug-in electric vehicle?

Note: Letters A - C indicate statistically significant differences between likely vehicle purchaser segments (z-test for proportions, p<.05).

* Indicates a statistically significant difference between Baseline and Wave 1 survey all likely vehicle purchasers (z-test for proportions, p<.05).

Figure 57. Awareness of Electricity Versus Fuel Cost for Operating an EV, by Survey Wave and Segment

Awareness of Electricity Versus Fuel Cost	All Likely Vehicle Purchasers		Wave 1 - All Likely Vehicle Purchasers		
	Baseline (n=929)	Wave 1 (n=1026)	EV/PHEV Non-Considerers (n=526) (A)	EV/PHEV Considerers (n=253) (B)	EV/PHEV Intenders (n=247) (C)
Yes	21%	20%	18%	17%	26%
No	79%	80%	82%	83%	74%

Q32. On average, a typical electric vehicle / plug-in hybrid electric vehicle driver would spend approximately 3 cents per mile for the electricity to drive compared to approximately 13 cents per mile based on current fuel costs for a typical gasoline-powered vehicle averaging 25 miles per gallon. Prior to this survey were you aware of this?

Figure 58. Impact of EV Fuel Cost on Respondent Likelihood to Purchase or Lease an EV/PHEV, by Survey Wave and Segment

Impact of EV/PHEV Fuel Cost on Future Vehicle Purchase	All Likely Vehicle Purchasers		Wave 1 - All Likely Vehicle Purchasers		
	Baseline (n=929)	Wave 1 (n=1026)	EV/PHEV Non-Considerers (n=526) (A)	EV/PHEV Considerers (n=253) (B)	EV/PHEV Intenders (n=247) (C)
Much less likely	2%	3%	4% C	1%	1% A
Somewhat less likely	1%	3%	3%	3%	2%
Neither more or less likely	37%	35%	45%	22% C	23% B
Somewhat more likely	43%	40%	35%	48%	40%
Much more likely	14%	15%	5%	20%	31%
Don't know	2%	6%	7%	6%	2%

Q33. Does knowing this information make you more or less likely to consider an electric vehicle / plug-in hybrid electric vehicle for a future vehicle purchase?

Note: Letters A - C indicate statistically significant differences between likely vehicle purchaser segments (z-test for proportions, p<.05).

Figure 59. Effect of Level 1 Charger Understanding on Respondent Likelihood to Purchase or Lease an EV/PHEV, by Survey Wave and Segment

Effect of L1 Charger on Likelihood to Purchase EV/PHEV	All Likely Vehicle Purchasers		Wave 1 - All Likely Vehicle Purchasers		
	Baseline (n=929)	Wave 1 (n=1026)	EV/PHEV Non-Considerers (n=526) (A)	EV/PHEV Considerers (n=253) (B)	EV/PHEV Intenders (n=247) (C)
Much less likely	9%	8%	13% C	4%	1% A
Somewhat less likely	19%	17%	21%	15%	10%
Neither more or less likely	46%	43%	41%	42% C	51% B
Somewhat more likely	16%	21%	18%	26%	23%
Much more likely	5%	5%	2%	6%	9%
Don't know	5%	6%	6%	6%	5%

Q34. Each electric vehicle comes with a Level One (120-volt) charger which can be used in almost any standard wall socket in a home. With this type of charger, it will take about 10-15 hours to fully charge an all-electric vehicle, and about 5-10 hours to fully charge a plug-in hybrid electric vehicle. Does knowing this information make you more or less likely to consider an electric vehicle / plug-in hybrid electric vehicle for a future vehicle purchase?

Note: Letters A - C indicate statistically significant differences between likely vehicle purchaser segments (z-test for proportions, p<.05).

Figure 60. Effect of Level 2 Charger Understanding on Respondent Likelihood to Purchase or Lease an EV/PHEV, by Survey Wave and Segment

Effect of L2 Charger on Likelihood to Purchase EV/PHEV	All Likely Vehicle Purchasers		Wave 1 - All Likely Vehicle Purchasers		
	Baseline (n=929)	Wave 1 (n=1026)	EV/PHEV Non-Considerers (n=526) (A)	EV/PHEV Considerers (n=253) (B)	EV/PHEV Intenders (n=247) (C)
Much less likely	8%	8%	13% c	3%	2% A
Somewhat less likely	15%	15%	19%	14%	7%
Neither more or less likely	46%	45%	45%	46% c	44% B
Somewhat more likely	22%	22%	16%	26% c	31% B
Much more likely	4%	5%	1%	5%	12%
Don't know	6%	6%	6%	5%	4%

Q35. Electric vehicle owners have the option to have a second type of charger installed. A Level Two charger charges at 240 volts and can fully charge an all-electric vehicle in about 5-10 hours, and a plug-in hybrid electric vehicle in about 1-5 hours. The cost to purchase and have a 240-volt charger installed is roughly \$1,000. Does knowing this information make you more or less likely to consider an electric vehicle / plug-in hybrid electric vehicle for a future vehicle purchase?

Note: Letters A - C indicate statistically significant differences between likely vehicle purchaser segments (z-test for proportions, p<.05).

Figure 61. Effect of DC Fast Charger Understanding on Respondent Likelihood to Purchase or Lease an EV/PHEV, by Survey Wave and Segment

Effect of DC Fast Charger on Likelihood to Purchase EV/PHEV	All Likely Vehicle Purchasers		Wave 1 - All Likely Vehicle Purchasers		
	Baseline (n=929)	Wave 1 (n=1026)	EV/PHEV Non-Considerers (n=526) (A)	EV/PHEV Considerers (n=253) (B)	EV/PHEV Intenders (n=247) (C)
Much less likely	4%	4%	7% c	0%	0% A
Somewhat less likely	5%	7%	10%	5%	2%
Neither more or less likely	46%	42%	47%	39% c	35% B
Somewhat more likely	30%	32%	27%	36% c	37% B
Much more likely	8%	9%	3%	11%	21%
Don't know	6%	6%	6%	8%	4%

Q36. More than 125 DC fast chargers have been installed in public locations in Oregon, allowing drivers to charge on the go and extend their driving range. A DC fast charger will charge most electric vehicles to 80 percent in 30 minutes to 1 hour. Does knowing this information make you more or less likely to consider an electric vehicle / plug-in hybrid electric vehicle for a future vehicle purchase?

Note: Letters A - C indicate statistically significant differences between likely vehicle purchaser segments (z-test for proportions, p<.05).

Figure 62. Whether Respondent has Noticed Public EV Charging Stations in Public Areas in Oregon, by Survey Wave and Segment

	All Likely Vehicle Purchasers		Wave 1 - All Likely Vehicle Purchasers		
	Baseline (n=929)	Wave 1 (n=1026)	EV/PHEV Non-Considerers (n=526) (A)	EV/PHEV Considerers (n=253) (B)	EV/PHEV Intenders (n=247) (C)
Yes	90%	87% *	87%	86%	88%
No or not sure	10%	13% *	13%	14%	12%

Q37. Have you noticed any public electric vehicle charging stations in public areas and parking lots around Oregon?

* Indicates a statistically significant difference between Baseline and Wave 1 survey all likely vehicle purchasers (z-test for proportions, $p < .05$).

Figure 63. Whether Respondent has Noticed Signs or Other Information at Public EV Charging Stations Identifying Company Providing the Station, by Survey Wave and Segment

	All Likely Vehicle Purchasers		Wave 1 - All Likely Vehicle Purchasers		
	Baseline (n=838)	Wave 1 (n=896)	EV/PHEV Non-Considerers (n=461) (A)	EV/PHEV Considerers (n=218) (B)	EV/PHEV Intenders (n=217) (C)
Yes	35%	40%	36%	43%	46%
No or not sure	65%	60%	64%	57%	54%

Q38. Have you noticed signs or other information at these public electric vehicle charging stations identifying the company that is providing the charging station?

Figure 64. Companies Respondents Recall Identified as an EV Charging Station Provider, by Survey Wave and Segment (Multiple Responses Allowed)

Companies Respondents Recalled Seeing as EV Charging Station Provider	All Likely Vehicle Purchasers		Wave 1 - All Likely Vehicle Purchasers		
	Baseline (n=294)	Wave 1 (n=370)	EV/PHEV Non-Considerers (n=170) (A)	EV/PHEV Considerers (n=97) (B)	EV/PHEV Intenders (n=103) (C)
Tesla	10%	7%	4%	9%	9%
PGE	7%	5%	7%	2%	7%
Chargepoint	1%	3%	5%	1%	2%
Fred Meyer	7%	2%	1%	1%	5%
Volta	0%	2%	5%	0%	0%
Intel	3%	1%	0%	0%	1%
Blink	3%	1%	1%	0%	2%
Other	15%	10%	10%	3%	17%
No/None/Not any/Nothing	1%	8%	8%	11%	7%
Don't know	56%	65%	66%	75%	55%

Q39. What company (or companies) do recall seeing identified as an electric vehicle charging station provider?

Note: Letters A - C indicate statistically significant differences between likely vehicle purchaser segments (z-test for proportions, p<.05).

* Indicates a statistically significant difference between Baseline and Wave 1 survey all likely vehicle purchasers (z-test for proportions, p<.05).

Figure 65. PGE Electric Avenues Respondents Have Seen, by Survey Wave and Segment (Multiple Responses Allowed)

Electric Avenues Seen	All Likely Vehicle Purchasers		Wave 1 - All Likely Vehicle Purchasers		
	Baseline (n=929)	Wave 1 (n=1026)	EV/PHEV Non-Considerers (n=526) (A)	EV/PHEV Considerers (n=253) (B)	EV/PHEV Intenders (n=247) (C)
Has seen any Electric Avenue	13%	33%*	26% B C	37% A	44% A
Downtown Portland	N/A ^a	18%	10% B C	24% A	31% A
Eastport Plaza	N/A ^a	8%	7%	10%	8%
Hillsboro	N/A ^a	7%	7%	6%	7%
Milwaukie	N/A ^a	7%	7%	6%	9%

Q40. Which of the following PGE “Electric Avenue” electric vehicle charging stations have you seen?

Note: Letters A - C indicate statistically significant differences between likely vehicle purchaser segments (z-test for proportions, p<.05).

* Indicates a statistically significant difference between Baseline and Wave 1 survey all likely vehicle purchasers (z-test for proportions, p<.05).









Figure 66. Customer Interest in Potential PGE Charging Plans, by Segment (Multiple Responses Allowed) ^a

Interest in Charging Plans (% Reporting Would Probably or Definitely Consider)	Wave 1 - All Likely Vehicle Purchasers		
	Total (n=500)	EV/PHEV Considerers (n=253) (B)	EV/PHEV Intenders (n=247) (C)
\$80 a month: free home charging at night, free PGE public charging, a discounted Level 2 home charging station, discounted non-PGE public charging, and renewable power	34%	36%	32%
\$60 a month: free home charging at night, free PGE public charging, discounted non-public public charging, and renewable power	38%	34%	42%
\$40 a month: discounted home charging at night, free PGE public charging, and renewable power	41%	41%	41%
\$20 a month: free PGE public charging	37%	37%	37%

Q41. PGE may offer special electric vehicle pricing plans in the future which could include several benefits for a monthly fee. Please review the plans below and rate your level of interest.

^a Note that a similar question was asked in the Baseline survey but was revised slightly for the Wave 1 survey. Thus, the team did not include results in the above figure due to lack of comparability. Results, however, were similar between the two surveys with 36% of customers reporting they would probably or definitely consider the \$80 a month plan, 47% would consider the \$60 a month plan, 53% would consider the \$40 a month plan, and 34% would consider the \$20 a month plan. Also note that only those who were considering or intending to purchase or lease an EV or PHEV were asked this question.



















Figure 67. Respondent Likelihood to Purchase EV if PGE Offered EV Pricing Plans, by Survey Wave and Segment ^a

Likely to Purchase EV if PGE Offered Special EV Pricing Plans	All Likely Vehicle Purchasers		Wave 1 - All Likely Vehicle Purchasers	
	Baseline (n=399)	Wave 1 (n=500)	EV/PHEV Considerers (n=253) (B)	EV/PHEV Intenders (n=247) (C)
Yes	83% 	79% 	77% 	81% 
No	17% 	21% 	23% 	19% 

Q42. Would PGE offering special electric vehicle pricing plans make you more likely to consider purchasing an electric vehicle?

^a Only asked of respondents in the EV/PHEV Considerer and Intender segments.

Figure 68. Preferred Method for Charging Station Payment, by Segment ^a

Respondent Preferred Method for Charging Station Payment	Wave 1 - All Likely Vehicle Purchasers		
	Total (n=500)	EV/PHEV Considerers (n=253) (B)	EV/PHEV Intenders (n=247) (C)
Charging PGE account and appearing on bill	37% 	38% 	35% 
Credit or debit card reader	27% 	25% 	28% 
A charging station mobile app	11% 	11% 	12% 
Mobile payment (e.g., Apple Pay, Google Pay, Samsung Pay)	11% 	11% 	11% 
Contactless payment (using key fob, smart card, or other devices with RFID)	5% 	4% 	5% 
Don't know	9% 	9% 	9% 

Q43. Which of the following would be your preferred method for charging station payment?

^a Only asked of Wave 1 survey respondents in the EV/PHEV Considerer and Intender segments.

Sources of Information about EV/PHEV Acquisition, Ownership and Charging

Figure 69. Sources from which Respondents Recall Reading, Hearing, or Seeing Information about EVs, by Survey Wave and Segment (Multiple Responses Allowed)

Sources from which Respondents Recall Reading, Hearing, or Seeing Information about EVs	All Likely Vehicle Purchasers		Wave 1 - All Likely Vehicle Purchasers		
	Baseline (n=929)	Wave 1 (n=1026)	EV/PHEV Non-Considerers (n=526) (A)	EV/PHEV Considerers (n=253) (B)	EV/PHEV Intenders (n=247) (C)
Friends and colleagues	48%	48%	43%	51%	56%
General internet search	30%	30%	23%	33%	45%
Automobile manufacturers	31%	29%	25%	35%	32%
Social media	26%	26%	23%	32%	28%
Automobile reviews and consumer advice information	28%	25%	19%	28%	37%
PGE	32%	23%*	20%	25%	26%
Automobile dealerships	22%	20%	15%	24%	26%
Automobile websites	16%	16%	11%	22%	19%
Automobile magazines	19%	15%*	15%	13%	20%
Environmental organizations	20%	15%*	10%	20%	20%
U.S. Environmental Protection Agency (EPA)	9%	6%*	3%	8%	8%
Reddit	4%	5%	2%	6%	11%
U.S. Department of Energy (DOE)	8%	5%*	4%	5%	8%
Forth	2%	2%	1%	2%	5%
Electrical contractors	1%	1%	1%	0%	1%
Some other source	1%	5%*	6%	4%	3%
None	8%	10%	14%	5%	3%
Don't know	10%	8%*	8%	10%	4%

Q60. From which sources, if any, do you recall reading, hearing or seeing information about electric vehicles?

Note: Letters A - C indicate statistically significant differences between likely vehicle purchaser segments (z-test for proportions, p<.05).

* Indicates a statistically significant difference between Baseline and Wave 1 survey all likely vehicle purchasers (z-test for proportions, p<.05).

Figure 70. Most Useful Sources of EV Information Reported by Respondents, by Survey Wave and Segment (Multiple Responses Allowed) ^a

Most Useful Sources When Looking for EV Information	All Likely Vehicle Purchasers		Wave 1 - All Likely Vehicle Purchasers	
	Baseline (n=385)	Wave 1 (n=450)	EV/PHEV Considerers (n=220) (B)	EV/PHEV Intenders (n=230) (C)
Friends and colleagues	32%	33%	32%	35%
General internet search	23%	29%	26%	31%
Automobile reviews and consumer advice information	30%	24%*	22%	25%
Automobile manufacturers	17%	13%	16%	10%
PGE	12%	9%	10%	9%
Automobile websites	7%	8%	9%	8%
Social media	4%	8%*	7%	9%
Environmental organizations	11%	7%*	7%	6%
Automobile dealerships	11%	6%*	6%	6%
Automobile magazines	12%	5%*	5%	6%
Reddit	2%	5%*	4%	6%
U.S. Environmental Protection Agency (EPA)	5%	4%	3%	4%
U.S. Department of Energy (DOE)	3%	3%	1% C	5% B
Forth	1%	2%	1%	3%
Some other source	2%	3%	3%	3%

Q61. Which of these sources did you find most useful when looking for information about electric vehicles?

^a Only asked of respondents in the EV/PHEV Considerer and Intender segments.

Note: Letters B - C indicate statistically significant differences between likely vehicle purchaser segments (z-test for proportions, p<.05).

* Indicates a statistically significant difference between Baseline and Wave 1 survey all likely vehicle purchasers (z-test for proportions, p<.05).

Figure 71. PGE EV Resources, Campaigns, or Discounts Seen by Respondents, by Survey Wave and Segment (Multiple Responses Allowed) ^a

PGE EV Resources, Campaigns, or Discounts Respondents Have Seen	Total (n=1026)	All Likely Vehicle Purchasers		
		EV/PHEV Non-Considerers (n=526) (A)	EV/PHEV Considerers (n=253) (B)	EV/PHEV Intenders (n=247) (C)
Emails from PGE on EV services or charging	6%	5%	7%	7%
PGE's Electric Avenue in downtown Portland	4%	2%	4%	8%
PGE website information on EVs	4%	4%	4%	4%
PGE's and Nissan's combined \$3,500 Nissan Leaf discount	2%	1%	3%	4%
PGE's Electric Avenue in Hillsboro	2%	2%	2%	1%
PGE's Electric Avenue in Milwaukie	2%	1%	1%	6%
PGE's sponsored ride-and-drive events	2%	2%	1%	1%
Social media	2%	1%	4%	3%
Electric Car Insider's Electric Car Guest Drive in Milwaukie	1%	0%	1%	1%
National Drive Electric Week advertising	1%	0%	2%	1%
Interactive Chargeway kiosks/displays at dealership	1%	1%	1%	1%
PGE and Chevy's \$500 discount for EVs or a free Level 2 charger	1%	0%	3%	1%
PGE's Drive Change Fund	1%	0%	1%	1%
PGE's Electric Avenue at Eastport Plaza	1%	1%	0%	1%
PGE's Electric Avenue at Portland International Autoshow	1%	1%	1%	1%
PGE's Electric Avenue opening events	1%	0%	1%	1%
Didn't see any of these	63%	66%	63%	54%
Don't know	17%	17%	17%	18%

Q62. Which of the following PGE electric vehicle resources, campaigns, or discounts have you seen?

^a This question was not asked of Baseline survey respondents.

Note: Letters A - C indicate statistically significant differences between likely vehicle purchaser segments (z-test for proportions, p<.05).

Figure 72. Respondent Experience with Driving an EV, by Segment (Multiple Responses Allowed) ^a

Respondent Experience Driving EV	Total (n=1026)	All Likely Vehicle Purchasers		
		EV/PHEV Non-Considerers (n=526) (A)	EV/PHEV Considerers (n=253) (B)	EV/PHEV Intenders (n=247) (C)
A friend's, family member's, or colleague's	14%	10%	21%	18%
At a dealership	3%	2%	3%	6%
At some other ride-and-drive event	2%	1%	4%	2%
My own EV or PHEV	1%	0%	0%	3%
No experience	80%	87%	71%	71%
Don't know	2%	1%	3%	3%

Q63. Have you driven a plug-in 100% electric or a plug-in hybrid vehicle before today?

^a This question was not asked of Baseline survey respondents.

Note: Letters A - C indicate statistically significant differences between likely vehicle purchaser segments (z-test for proportions, p<.05).

Figure 73. Respondent Recollection of Sponsor of Ride-and-Drive Event Attended, by Segment (Multiple Responses Allowed) ^a
















Sponsor of Ride-and-Drive Event	Wave 1 (n=18)	All Likely Vehicle Purchasers		
		EV/PHEV Non-Considerers (n=3) (A)	EV/PHEV Considerers (n=9) (B)	EV/PHEV Intenders (n=6) (C)
PGE	5%	0%	0%	17%
Someone else	52%	48%	37%	83%
Don't know	43%	52%	63%	0%

Q64. Do you recall who sponsored the ride-and-drive event?

^a This question was not asked of Baseline survey respondents.

Customer Perceptions of PGE

Figure 74. Respondent Level of Agreement with Statements About PGE’s Support of EVs, Offering of Innovative Energy Solutions, and Protecting the Environment, by Survey Wave and Segment ^a

Agreement with Statements about PGE (% Responding 6 or 7 - Strong Agreement)	All Likely Vehicle Purchasers		Wave 1 - All Likely Vehicle Purchasers		
	Baseline (n=929)	Wave 1 (n=1026)	EV/PHEV Non-Considerers (n=526) (A)	EV/PHEV Considerers (n=253) (B)	EV/PHEV Intenders (n=247) (C)
PGE supports the expansion of EV adoption in the region	47% 	48% 	44%  C	51% 	56%  A
PGE offers innovative energy solutions	46% 	45% 	43% 	50% 	44% 
PGE helps protect the environment	43% 	40% 	38% 	45% 	38% 

Q65. Please rate how well each statement reflects your opinion of PGE...

^a Percent reporting 6 or 7 on a 7-point scale, from 1 meaning “strongly disagree” to 7 meaning “strongly agree”.

Note: Letters A - C indicate statistically significant differences between likely vehicle purchaser segments (z-test for proportions, p<.05).

Expectations of PGE Supporting EV / PHEV Adoption and Developing the EV Charging Infrastructure

Figure 75. Respondent Agreement with Statements About PGE’s Role in Supporting EVs, by Survey Wave and Segment (Multiple Responses Allowed)

Respondent Agreement with Statements about PGE's Role in Supporting EVs (% Responding 8-10 - Strong Agreement)	All Likely Vehicle Purchasers		Wave 1 - All Likely Vehicle Purchasers		
	Baseline (n=929)	Wave 1 (n=1026)	EV/PHEV Non-Considerers (n=526) (A)	EV/PHEV Considerers (n=253) (B)	EV/PHEV Intenders (n=247) (C)
Support PGE working and investing now to ensure that the existing electric system is able to support convenient recharging	81%	80%	72%	88%	91%
PGE should make owning an EV more convenient and feasible by installing and maintaining public charging stations	75%	77%	68%	86%	89%
PGE is a credible source of information about EVs	73%	74%	68%	81%	80%
PGE should take an active role in educating people about EVs	75%	74%	65%	82%	88%
PGE should work with the local and state government to encourage EV market growth	74%	73%	62%	84%	88%
PGE should help EVs and PHEVs gain market acceptance	71%	71%	60%	82%	87%
PGE should convert its own vehicle fleet to electric power as soon as possible	67%	67%	55%	78%	83%

Q66. Please indicate how much you agree or disagree with the following statements...?

Note: Letters A - C indicate statistically significant differences between likely vehicle purchaser segments (z-test for proportions, p<.05).

Figure 76. Suggestions for PGE to Support Expansion of EV Use, by Survey Wave and Segment

Suggestions for PGE to Support Expansion of EV Use	All Likely Vehicle Purchasers		Wave 1 - All Likely Vehicle Purchasers		
	Baseline (n=929)	Wave 1 (n=1026)	EV/PHEV Non-Considerers (n=526) (A)	EV/PHEV Considerers (n=253) (B)	EV/PHEV Intenders (n=247) (C)
More charging stations/provide infrastructure	4%	3%	2%	4%	3%
Provide discounts/incentives/rebates	3%	2%	1% C	2%	6% A
Increase promotion/education	11%	2% *	2%	1%	3%
Decrease cost of vehicles/batteries	2%	1%	1%	1%	1%
Increase use of renewable energy	2%	1%	1%	1%	1%
Provide more information/detail on value	4%	1% *	2%	0%	1%
Assist/subsidize installation of home charging stations	1%	1%	1%	1%	1%
Provide information/negate environmental impacts	2%	1%	1%	1%	1%
Increase awareness/affordability of charging stations	0%	<1%	1%	0%	1%
Partner with manufacturers/dealerships	0%	<1%	0%	0%	1%
Other	5%	3% *	3%	3%	2%
No/none/not any/nothing	56%	86% *	87%	86%	82%

Q67. Do you have any other suggestions for ways PGE could help support the expansion of electric vehicle use in our region?

Note: Letters A - C indicate statistically significant differences between likely vehicle purchaser segments (z-test for proportions, p<.05).

* Indicates a statistically significant difference between Baseline and Wave 1 survey all likely vehicle purchasers (z-test for proportions, p<.05).

Ridesharing Services

Figure 77. Respondent Enrollment as Rideshare Driver, by Survey Wave and Segment

Rideshare Driver	All Likely Vehicle Purchasers		Wave 1 - All Likely Vehicle Purchasers		
	Baseline (n=929)	Wave 1 (n=1026)	EV/PHEV Non-Considerers (n=526) (A)	EV/PHEV Considerers (n=253) (B)	EV/PHEV Intenders (n=247) (C)
Yes	4%	5%	3%	6%	8%
No	96%	94%*	96%	93%	90%
Prefer not to say	0%	1%*	1%	1%	2%

Q79. Are you a current rideshare driver?

Note: Letters A - C indicate statistically significant differences between likely vehicle purchaser segments (z-test for proportions, p<.05).

* Indicates a statistically significant difference between Baseline and Wave 1 survey all likely vehicle purchasers (z-test for proportions, p<.05).

Figure 78. Respondent Use of EV/PHEV for Rideshare Driving, by Survey Wave and Segment

Use EV or PHEV for Rideshare	All Likely Vehicle Purchasers		Wave 1 - All Likely Vehicle Purchasers		
	Baseline (n=34)	Wave 1 (n=51)	EV/PHEV Non-Considerers (n=15) (A)	EV/PHEV Considerers (n=15) (B)	EV/PHEV Intenders (n=20) (C)
Yes	3%	3%	0%	0%	8%
No	64%	81%	78%	84%	80%
Don't know	34%	16%	22%	16%	11%

Q80. Do you currently use an electric vehicle / plug-in hybrid electric vehicle for your rideshare service?

Figure 79. Likelihood to Use Rideshare Services that Use EV/PHEVs, by Survey Wave and Segment

Likelihood to Use Rideshare Services that Use EV/PHEVs	All Likely Vehicle Purchasers		Wave 1 - All Likely Vehicle Purchasers		
	Baseline (n=929)	Wave 1 (n=1026)	EV/PHEV Non-Considerers (n=526) (A)	EV/PHEV Considerers (n=253) (B)	EV/PHEV Intenders (n=247) (C)
Much less likely	4%	4%	6%	3%	3%
Somewhat less likely	1%	2%	2%	3%	2%
Neither more likely nor less likely	58%	56%	65% B C	50% A	44% A
Somewhat more likely	19%	16%	9% B C	22% A	26% A
Much more likely	7%	7%	3% B C	9% A	14% A
Don't know	11%	14%	15%	14%	11%

Q81. Would you be more or less likely to use rideshare services that use electric vehicles / plug-in hybrid electric vehicles?

Note: Letters A - C indicate statistically significant differences between likely vehicle purchaser segments (z-test for proportions, p<.05).

Demographics

Figure 80. Respondent Education Level, by Survey Wave and Segment



















Respondent Educational Level	All Likely Vehicle Purchasers		Wave 1 - All Likely Vehicle Purchasers		
	Baseline (n=929)	Wave 1 (n=1026)	EV/PHEV Non-Considerers (n=526) (A)	EV/PHEV Considerers (n=253) (B)	EV/PHEV Intenders (n=247) (C)
Some high school	0%	1% *	2%	1%	0%
Graduated high school	5%	9% *	11% C	8%	3% A
Trade or technical school	4%	5%	6%	6%	3%
Some college	20%	23%	27% B	16% A	22%
Graduated college	41%	37% *	35%	37% A	40%
Graduate/professional school	27%	23% *	17% BC	29% A	31% A
Refused	2%	2%	2%	2%	1%

Q82. What is the highest level of education you've attained to date?

Note: Letters A - C indicate statistically significant differences between likely vehicle purchaser segments (z-test for proportions, p<.05).

* Indicates a statistically significant difference between Baseline and Wave 1 survey all likely vehicle purchasers (z-test for proportions, p<.05).

Figure 81. Respondent Housing Tenure, by Survey Wave and Segment
































Housing Tenure	All Likely Vehicle Purchasers		Wave 1 - All Likely Vehicle Purchasers		
	Baseline (n=929)	Wave 1 (n=1026)	EV/PHEV Non-Considerers (n=526) (A)	EV/PHEV Considerers (n=253) (B)	EV/PHEV Intenders (n=247) (C)
Own	76% 	67%  *	66%  C	64%  C	73%  A B
Rent	21% 	30%  *	31% 	31% 	25% 
Other	0%	1%  *	1% 	2% 	0%
Refused	2% 	2% 	2% 	2% 	1% 

Q83. Do you own or rent your home?

Note: Letters A - C indicate statistically significant differences between likely vehicle purchaser segments (z-test for proportions, p<.05).

* Indicates a statistically significant difference between Baseline and Wave 1 survey all likely vehicle purchasers (z-test for proportions, p<.05).

Figure 82. Respondent Housing Type, by Survey Wave and Segment ^a

Housing Type	Total (n=1026)	All Likely Vehicle Purchasers		
		EV/PHEV Non-Considerers (n=526) (A)	EV/PHEV Considerers (n=253) (B)	EV/PHEV Intenders (n=247) (C)
Single-family detached house with a driveway	64% 	67% 	58% 	65% 
Single-family detached house with no driveway	2% 	1%  B	4%  A	2% 
Single-family attached home (such as a townhouse)	6% 	4% 	6% 	7% 
Duplex, triplex, or four-plex	5% 	6% 	4% 	5% 
Apartment or condominium with 5 units or more	17% 	16% 	22% 	15% 
Manufactured or mobile home	4% 	4% 	2% 	3% 
Other	1% 	1% 	0%	1% 
Refused	1% 	1% 	3% 	1% 

Q84. What type of home do you live in?

^a This question was not asked of Baseline survey respondents.

Note: Letters A - C indicate statistically significant differences between likely vehicle purchaser segments (z-test for proportions, p<.05).

Figure 83. Age of Respondent, by Segment ^a

Age	Wave 1 (n=1026)	All Likely Vehicle Purchasers		
		EV/PHEV Non-Considerers (n=526) (A)	EV/PHEV Considerers (n=253) (B)	EV/PHEV Intenders (n=247) (C)
18-34	1%	1%	2%	2%
35-54	49%	46% B	57% A	47%
55-64	21%	21%	18%	22%
65 or older	26%	28%	21%	28%
Refused	3%	4%	3%	2%

Q86. What is your age?

^a This question was not asked of Baseline survey respondents.

Note: Letters A - C indicate statistically significant differences between likely vehicle purchaser segments (z-test for proportions, p<.05).

Figure 84. Whether Respondent is of Latino or Hispanic Descent, by Survey Wave and Segment

Latino/Hispanic	All Likely Vehicle Purchasers		Wave 1 - All Likely Vehicle Purchasers		
	Baseline (n=929)	Wave 1 (n=1026)	EV/PHEV Non-Considerers (n=526) (A)	EV/PHEV Considerers (n=253) (B)	EV/PHEV Intenders (n=247) (C)
No, not Latino/Hispanic	86%	84%	85%	83%	82%
Yes, Latino/Hispanic	5%	6%	5%	6%	8%
Refused	9%	10%	11%	11%	9%

Q87. Are you of Latino or Hispanic descent – for example Mexican, Puerto Rican, Cuban, or some other Hispanic background?

Figure 85. Respondent Race or Ethnicity, by Survey Wave and Segment

Respondent Race or Ethnicity	All Likely Vehicle Purchasers		Wave 1 - All Likely Vehicle Purchasers		
	Baseline (n=929)	Wave 1 (n=1026)	EV/PHEV Non-Considerers (n=526) (A)	EV/PHEV Considerers (n=253) (B)	EV/PHEV Intenders (n=247) (C)
White	80%	79%	82%	76%	77%
Black or African American	1%	1%	2%	1%	1%
Asian (Japanese, Korean, Pacific Islander, etc.)	4%	5%	3%	6%	7%
American Indian/Native American	1%	1%	1%	0%	1%
Other, please specify:	1%	2%	1%	3%	3%
Not applicable	0%	5%	5%	6%	4%
Don't know	0%	0%	0%	1%	0%
Refused	13%	6%	6%	8%	7%

Q88. Is your racial or ethnic background white, black or African American, Asian, or something else?

Note: Letters A - C indicate statistically significant differences between likely vehicle purchaser segments (z-test for proportions, p<.05).

Figure 86. Respondent Employment Status, by Segment

Respondent Employment Status	All Likely Vehicle Purchasers		Wave 1 - All Likely Vehicle Purchasers		
	Baseline (n=929)	Total (n=1026)	EV/PHEV Non-Considerers (n=526) (A)	EV/PHEV Considerers (n=253) (B)	EV/PHEV Intenders (n=247) (C)
Employed full time	54%	51%	48% B	61% A	51%
Employed part time	6%	7%	9%	7%	5%
Homemaker	4%	3%	3%	3%	1%
Self-employed	8%	7%	7%	6%	7%
Retired	24%	28% *	29% B	19% AC	33% B
Student	1%	1%	1%	1%	2%
Unemployed	1%	1%	1%	2%	1%
Don't know	1%	1%	1%	1%	0%
Prefer not to say	1%	0%	0%	0%	0%

Q89. Please select the option that best describes your employment status.

Note: Letters A - C indicate statistically significant differences between likely vehicle purchaser segments (z-test for proportions, p<.05).

Figure 87. Respondent Household Income, by Segment


















Respondent Income	All Likely Vehicle Purchasers				
	Baseline (n=929)	Total (n=1026)	EV/PHEV Non-Considerers (n=526) (A)	EV/PHEV Considerers (n=253) (B)	EV/PHEV Intenders (n=247) (C)
Less than \$50K	17%	24% *	22% B	30% A C	19% B
\$50K to less than \$75K	18%	22% *	23%	19%	25%
\$75K to less than \$100K	17%	14% *	14%	12%	15%
Over \$100K	30%	20% *	19%	20%	21%
Refused	18%	21%	22%	19%	20%

Q90. What was your household's total annual income before taxes in 2018? Please include the income of all people living in your home in this figure.

Note: Letters A - C indicate statistically significant differences between likely vehicle purchaser segments (z-test for proportions, p<.05).

* Indicates a statistically significant difference between Baseline and Wave 1 survey all likely vehicle purchasers (z-test for proportions, p<.05).

Figure 88. Respondent Gender, by Survey Wave and Segment

Respondent Gender	All Likely Vehicle Purchasers		Wave 1 - All Likely Vehicle Purchasers		
	Baseline (n=929)	Wave 1 (n=1026)	EV/PHEV Non-Considerers (n=526) (A)	EV/PHEV Considerers (n=253) (B)	EV/PHEV Intenders (n=247) (C)
Male	43% 	42% 	35%  BC	47%  A	54%  A
Female	53% 	53% 	60%  BC	48%  A	43%  A
Other	0%	1% 	1% 	0%	0%
Refused	4% 	4% 	4% 	4% 	3% 

Q91. Are you male, female, or something else?

Note: Letters A - C indicate statistically significant differences between likely vehicle purchaser segments (z-test for proportions, p<.05).

Appendix H. General Population Customer Survey Instrument

Screening

[ASK ALL]

S1. [BL – S1] Are you age 18 or older with a valid driver's license?

[SINGLE RESPONSE]

1. Yes
2. No [SKIP TO END OF SURVEY]

[ASK ALL]

S2. [BL – S2] Do you, or do any members of your household work in any of the following industries?

[MULTIPLE RESPONSE 1 THROUGH 6 ONLY]

1. Environmental Protection
2. Market research/Advertising/Public Relations
3. Media
4. Electric or Gas Utility
5. Energy
6. Automotive
7. No, none of these
98. Don't know
99. Prefer not to answer

[IF S2 <> 7, THANK AND TERMINATE: "No further responses are needed at this time. Thank you very much!"]

[ASK IF S2 = 7]

S3. [BL – S3] How involved would you be in a decision to purchase or lease a new or used vehicle for your household?

[SINGLE RESPONSE]

1. I am the primary decision maker
2. I share the decision with someone else in my household
3. I'm not involved in the decision to purchase or lease a new vehicle [SKIP TO Q82 (DEMOGRAPHICS SECTION)]
98. Don't know [SKIP TO Q82 (DEMOGRAPHICS SECTION)]

[ASK ALL]

S4. [BL – S4 – ADJUSTED] How many vehicles does your household currently own or lease?

[SINGLE RESPONSE]

1. 0
2. 1
3. 2
4. 3
5. 4
6. 5
7. 6

- 8. 7
- 9. 8
- 10. 9
- 11. 10 or more vehicles (Please specify): [OPEN-ENDED RESPONSE]
- 98. Don't know

[IF S4 >0 AND ≠ 98 (HAS AT LEAST ONE VEHICLE)]

- S5. [BL-S4a] Does your household own or lease an electric vehicle or plug-in electric hybrid (electric + gas, can plug in to charge battery)?

[SINGLE RESPONSE]

- 1. Yes
- 2. No

[IF S5 = 2 (NO)]

- S5a. [NEW] Did you or others in your household own or lease an electric or plug-in electric hybrid vehicle in the past?

[SINGLE RESPONSE]

- 1. Yes
- 2. No
- 98. Don't know

[IF S5A = 1 (YES)]

- S5b. [NEW] What happened to the electric or plug-in electric hybrid?

[SINGLE RESPONSE]

- 1. Sold to private party
- 2. Traded in / sold to dealership
- 3. Crashed / totaled
- 4. Given away
- 5. Stolen
- 96. Other, please specify: [OPEN-ENDED RESPONSE]
- 98. Don't know

[IF S5B = 1 OR 4 (SOLD TO PRIVATE PARTY OR GIVEN AWAY)]

- S5c. [NEW] Was the vehicle [IF S5b = 1 "sold" IF S5b = 4 "given away"] to someone living in Oregon?

[SINGLE RESPONSE]

- 1. Yes
- 2. No
- 98. Don't know

[ASK ALL]

- S6. [BL - S5] How soon do you expect to purchase or lease a new or used vehicle for your household?

For the purposes of this survey "vehicle" refers to cars, crossovers-SUVs, trucks, and vans. This would not include electric motorcycles, bikes, scooters, etc.

[SINGLE RESPONSE]

- 1. During the next 12 months

2. More than 1 year to 2 years from now
3. More than 2 years to 3 years from now
4. More than 3 years to 5 years from now
5. More than 5 years to 10 years from now
6. More than 10 years from now
7. Never – I do not plan on purchasing or leasing a new or used vehicle
98. Don't know

[SKIP TO Q82 IN DEMOGRAPHICS SECTION IF NON-EV/PHEV DRIVER AND MORE THAN 5 YEARS FOR THEIR NEXT VEHICLE PURCHASE (S5=2 AND S6=5-7, DK)]

[ALL EV/PHEV DRIVERS OR CUSTOMERS WHO WILL BUY A VEHICLE IN THE NEXT FIVE YEARS SHOULD QUALIFY AND CONTINUE (S5=1 OR S6=1-4)]

Familiarity with EVs and Awareness of EV Benefits

[ASK ALL]

- Q1. [BL - FAM] In addition to vehicles using traditional gasoline internal combustion engines, some automobile manufacturers offer vehicles with powertrains that use other fuel types including diesel, biodiesel, natural gas and electricity. Please indicate how familiar you are with each vehicle type below.

(For each vehicle type below, select the response that best describes your level of familiarity.)

[SINGLE RESPONSE]

I've never heard of this type vehicle	I've heard the term but couldn't tell you much more about this type of vehicle	Somewhat familiar	Very familiar	Don't know
1	2	3	4	98

1. Gasoline (internal combustion engine)
2. Diesel
3. Biodiesel
4. Natural gas (compressed natural gas / CNG)
5. Hybrid (electric+gas, cannot plug in to charge battery)
6. Plug-in hybrid (electric+gas, can plug in to charge battery)
7. Electric (all-electric powertrain)

[ASK ALL]

- Q2. [BL – ENV 1-7] Now, please indicate how ENVIRONMENTALLY FRIENDLY you think each type of vehicle type below is.

(Select the rating scale point that best describes how you feel. Your best guess is fine.)

[SINGLE RESPONSE]

Not at all environmentally friendly										Very environmentally friendly
0	1	2	3	4	5	6	7	8	9	10

- 11 No Opinion
98. Not sure

[RANDOMIZE]

1. Gasoline (internal combustion engine)
2. Diesel
3. Biodiesel
4. Natural gas (compressed natural gas / CNG)
5. Hybrid (electric+gas, cannot plug in to charge battery)
6. Plug-in hybrid (electric+gas, can plug in to charge battery)
7. Electric (all-electric)

[ASK ALL]

Q3. [BL - LOWFUEL] Which one of these vehicle types would you expect to have the lowest fuel costs?

[SINGLE RESPONSE] [RANDOMIZE]

1. Gasoline
2. Diesel
3. Biodiesel
4. Natural gas
5. Hybrid (non-plug-in)
6. Plug-in hybrid
7. Electric
8. Something else
98. Don't know

[ASK ALL]

Q4. [BL - LOWMAINT] Which one of these vehicle types would you expect to have the lowest maintenance costs?

[SINGLE RESPONSE] [RANDOMIZE]

1. Gasoline
2. Diesel
3. Biodiesel
4. Natural gas
5. Hybrid (non-plug-in)
6. Plug-in hybrid
7. Electric
8. Something else
98. Don't know

EV Purchase Details

[ASK IF EV/PHEV DRIVER (S5=1)]

Q5. [BL - FTYPE and Year_ACQ - ADJUSTED] For each electric vehicle your household currently owns or leases, please indicate whether the vehicle is plug-in electric hybrid or 100% Electric, the year the vehicle was purchased or leased, and the make & model of the car. If your household has more than one electric vehicle, please provide this information for all your electric vehicles up to four.

[DISPLAY FOUR ROWS. EACH ROW SHOULD HAVE A DROP-DOWN FOR FUEL TYPE AND YEAR ACQUIRED.]

(Please select the vehicle type and year purchased from the dropdown lists below and also tell us make and model of the car.)

	Vehicle Fuel [DROP-DOWN LIST]	Year Purchased/Leased [DROP-DOWN LIST]	Make (e.g., Nissan) & Model (e.g., Leaf) [OPEN-END]
VEHICLE #1			
VEHICLE #2			
VEHICLE #3			
VEHICLE #4			

Vehicle Fuel drop-down list	Year drop-down list
1. Plug-in hybrid	1. Before 2010
2. Electric	2. 2010-2015
3. Don't Know	3. 2016
	4. 2017
	5. 2018
	6. 2019
	7. Don't Know

[ASK IF ANY VEHICLE IN Q5 WAS BOUGHT OR LEASED IN 2018 OR 2019 (IF ANY VEHICLE #1-4 = 5 OR 6)]

Q6. [NEW] When in 2018 or 2019 did you purchase or lease an electric or plug-in hybrid vehicle(s)?

(If more than one, please select the option(s) below to indicate when you acquired your most recent electric or plug-in hybrid electric vehicle and the second most recent if applicable.)

Most Recent Electric Vehicle (EV)	[ASK IF MORE THAN ONE VEHICLE IN Q5 WAS BOUGHT/LEASED IN 2018 OR 2019]
	Second Most Recent EV (if applicable)
1. Before July, 2018	1. Before July, 2018
2. July - August, 2018	2. July - August, 2018
3. September - October, 2018	3. September - October, 2018
4. November - December, 2018	4. November - December, 2018
5. January - February, 2019	5. January - February, 2019
6. March - April, 2019	6. March - April, 2019
7. May - June, 2019	7. May - June, 2019
8. July - August, 2019	8. July - August, 2019
9. September - October, 2019	9. September - October, 2019
10. November - December, 2019	10. November - December, 2019
98. Don't Know	98. Don't Know

[ASK IF EV/PHEV DRIVER (S5=1)]

Q7. [NEW] Which of the following best describes how you use your electric or plug-in hybrid vehicle(s)?
 (If more than one, please select the option below for the electric or plug-in hybrid electric vehicle that you or others in your household drive the most.)

[SINGLE RESPONSE]

1. I use my electric or plug-in hybrid for all or most of my auto trips and do not own or lease another vehicle
2. I use my electric or plug-in hybrid primarily for short distance trips (30 miles or less) and own or lease another vehicle for longer trips
3. I own or lease a non-electric vehicle and drive that vehicle instead of my electric or plug-in hybrid for most of my trips
4. Something else, please specify: [OPEN-ENDED RESPONSE]
98. Don't know

[ASK IF EV/PHEV DRIVER (S5=1)]

Q8. [BL - EV_LOC] Did you purchase or lease your electric or plug-in hybrid vehicle in Oregon or in another state?
 (If your household has more than one, please indicate where your most recently acquired electric or plug-in hybrid electric vehicle was purchased.)

[SINGLE RESPONSE]

1. Purchased in Oregon
2. Leased in Oregon
3. Purchased in another state
4. Leased in another state
98. Don't know

Importance of Factors Considered During Vehicle Purchase / Lease Decision Process

[ASK IF LIKELY TO PURCHASE/LEASE IN NEXT 5 YEARS (S6=1-4)]

Q9. [BL - FT1] Thinking about the next vehicle your household might purchase or lease, how likely are you to consider a vehicle powered by...?
 (For each fuel type below, select the response that best describes your opinion.)

[MATRIX QUESTION: SCALE]

[RANDOMIZE]	1 Will definitely not consider	2 Will probably not consider	3 Might or might not consider	4 Will probably consider	5 Will definitely consider	98 Don't know
Q9_1. Gasoline						
Q9_2. Diesel						
Q9_3. Biodiesel						

[RANDOMIZE]	1 Will definitely not consider	2 Will probably not consider	3 Might or might not consider	4 Will probably consider	5 Will definitely consider	98 Don't know
Q9_4. Natural gas						
Q9_5. Hybrid (non-plug-in)						
Q9_6. Plug-in hybrid						
Q9_7. Electric						

[ASK IF CONSIDERING (Q9_1 - Q9_7=3-5)]

Q10. [BL - FT2] Considering everything you currently know, which one type of vehicle listed below are you most likely to acquire the next time your household purchases or leases a vehicle?

[SINGLE RESPONSE]

1. [Show if Q9_1=3-5:] Gasoline
2. [Show if Q9_2=3-5:] Diesel
3. [Show if Q9_3=3-5:] Biodiesel
4. [Show if Q9_4=3-5:] Natural gas
5. [Show if Q9_5=3-5:] Hybrid (non-plug-in)
6. [Show if Q9_6=3-5:] Plug-in hybrid
7. [Show if Q9_7=3-5:] Electric
98. Don't know

[ASK IF LIKELY TO PURCHASE/LEASE IN NEXT 5 YEARS (S6=1-4)]

Q11. [BL - BT1] Based on everything you currently know, which one vehicle body type listed below are you most likely to consider the next time your household purchases/leases a vehicle?

[SINGLE RESPONSE]

1. Sedan
2. Coupe
3. Hatchback
4. Crossover or sports utility vehicle (CUV/SUV)
5. Truck
6. Minivan
7. Convertible
8. Wagon
9. Motorcycle
96. Another type of vehicle [OPEN-ENDED RESPONSE]
98. Don't know

[THESE ARE COMPUTED VARIABLES NOT SEEN BY RESPONDENTS]

EVINT. EV / PHEV intenders / non-intenders.

Set if (Q9_6=4-5 OR Q9_7=4-5) AND (S5 ≠ 1): EVINT = 1 (EV / PHEV intenders)

Else set: EVINT = 0 (EV / PHEV non-intenders)

SEG. Owner / Intender / Considerer / Non-Considerer

Set if (S5 = 1): SEG = 1 (Owner)

Set if (EVINT = 1 AND (Q10 = 6 OR Q10 = 7)): SEG = 2 (Intender)

Set if (EVINT = 1 AND (Q10 ≠ 6 OR Q10 ≠ 7)): SEG = 3 (Considerer)

Set if (EVINT = 0): SEG = 4 (Non-Considerer)

Awareness/Consideration of EV and PHEV Makes/Models

[SHOW IF EV OR PHEV INTENDER (Q9_6 OR Q9_7=4 OR 5)]

[BL – SHOW PRIOR TO Q12] Several automobile companies have introduced electric cars and trucks over the past several years.

- Some of these are all-electric vehicles (EVs), which only run on electricity from a battery.
- Other vehicles using electric motors are plug-in hybrid electric vehicles (PHEVs), which run on electricity for 10-20 miles then switch to gasoline or diesel for ranges up to 400 miles.

[ASK IF ALL-ELECTRIC VEHICLE INTENDER (Q9_7 =4-5)]

Q12. [BL – ECON] Considering your next vehicle purchase, please list the make and model of the all-electric vehicles you are most strongly considering for your household.

(Enter the all-electric vehicles that you're considering in the boxes below—one make and model per box. Be as specific as possible.)

1. [OPEN-ENDED RESPONSE]
2. [OPEN-ENDED RESPONSE]
3. [OPEN-ENDED RESPONSE]
4. [OPEN-ENDED RESPONSE]
5. [OPEN-ENDED RESPONSE]
98. Not sure
99. Prefer not to say

[ASK IF PHEV INTENDER (Q9_6=4-5)]

Q13. [BL – PCON] Considering your next vehicle purchase, please list the make and model of the plug-in hybrid electric vehicles you are most strongly considering for your household.

(Enter the plug-in hybrid electric vehicles that you're considering in the boxes below—one make and model per box. Be as specific as possible.)

1. [OPEN-ENDED RESPONSE]
2. [OPEN-ENDED RESPONSE]
3. [OPEN-ENDED RESPONSE]
4. [OPEN-ENDED RESPONSE]
5. [OPEN-ENDED RESPONSE]
98. Not sure
99. Prefer not to say

[ASK IF ALL-ELECTRIC VEHICLE INTENDER (Q9_7=4-5)]

Q14. [BL – EV_CON] Below is a list of all-electric vehicles available for purchase or lease in Oregon. Please select those that you are likely to consider for you next vehicle purchase or lease.

Note: The list below only contains all-electric vehicles. Plug-in hybrid vehicles will be shown in a separate question.

Select all vehicles below that you would consider for purchase or lease.

[MULTIPLE RESPONSE]

1. Audi e-tron
2. BMW i3
3. Chevrolet Bolt EV
4. Chevrolet Spark EV
5. Fiat 500e
6. Ford Focus Electric
7. Honda Clarity Electric
8. Hyundai Ioniq Electric
9. Hyundai Kona EV
10. Jaguar i-Pace
11. Kia Soul EV
12. Mercedes B250e
13. Nissan LEAF
14. Smart ED
15. Tesla Model 3
16. Tesla Model S
17. Tesla Model X
18. Volkswagen e-Golf
96. Other electric vehicle model(s), please specify: [OPEN-ENDED RESPONSE]
97. I am not considering any of these models [MAKE EXCLUSIVE RESPONSE]

[ASK IF PHEV INTENDER (Q9_6=4-5)]

Q15. [BL - PHEV_CON] The next list (below) is a list of plug-in hybrid electric vehicles available for purchase or lease in Oregon.

Please select those that you are likely to consider for your next vehicle purchase or lease.

[MULTIPLE RESPONSE]

1. Audi A3
2. BMW 330e iPerformance
3. BMW 530e iPerformance
4. BMW 740e xDrive iPerformance
5. BMW i8
6. BMW X5 xDrive40e iPerformance
7. Cadillac CT6 PHV
8. Chevrolet Volt
9. Chrysler Pacifica Hybrid
10. Ford C-MAX Energi
11. Ford Fusion Energi
12. Honda Clarity Plug-In Hybrid
13. Hyundai Ioniq Plug-In Hybrid
14. Hyundai Sonata Plug-In Hybrid
15. Kia Niro Plug-In Hybrid
16. Kia Optima Plug-In Hybrid Electric Vehicle
17. Mercedes C350e

- 18. Mercedes GLE550e
- 19. Mercedes S550e
- 20. MINI Cooper SE Countryman ALL4
- 21. Mitsubishi Outlander Plug-In Hybrid Electric Vehicle
- 22. Porsche Cayenne S E-Hybrid
- 23. Porsche Panamera S E-Hybrid
- 24. Toyota Prius Prime
- 25. Volvo S90 T8
- 26. Volvo XC60 T8
- 27. Volvo XC90 T8
- 96. Other plug-in hybrid electric vehicle model(s), please specify: [OPEN-ENDED RESPONSE]
- 97. I am not considering any of these models [MAKE EXCLUSIVE RESPONSE]

Motivations/Barriers for EV/PHEV Acquisition

[ASK ALL]

- Q16. [BL – MOTIV_P] Show if EV driver (S5=1): What are the main reasons you purchased or leased an all-electric vehicle / plug-in hybrid electric vehicle?

Show if intender (EVINT=1): What are the main reasons you would consider an all-electric vehicle / plug-in hybrid electric vehicle for your next vehicle purchase or lease?

Show if non-intender (EVINT=0): If in the future you were to consider purchasing or leasing an all-electric vehicle / plug-in hybrid electric vehicle, what would you expect to be the main benefits of having an electric vehicle?

(Enter your response in the box below. Be as specific as possible.)

- 1. [OPEN-ENDED RESPONSE]
- 98. Don't know

[ASK IF EV/PHEV INTENDER (EVINT=1) OR EV DRIVER (S5=1)]

- Q17. [BL – EVFAC] Show if intender (EVINT=1) but not an EV driver (S5=2): For each of the factors below, please indicate whether that factor is a major reason, a minor reason, or not a reason you are considering an all-electric vehicle / plug-in hybrid electric vehicle for your next purchase / lease.

Show if EV driver (S5=1): For each of the factors below, please indicate whether that factor was a major reason, a minor reason, or not a reason you decided to purchase or lease an all-electric vehicle / plug-in hybrid electric vehicle.

(For each factor below, select the response that best describes your opinion.)

[MATRIX QUESTION: SCALE]

Factors	1 Not a reason	2 A minor reason	3 A major reason	98 Not sure
Q17_1. Lower fuel cost				
Q17_2. Less vehicle maintenance required				
Q17_3. Protecting the environment				

Factors	1 Not a reason	2 A minor reason	3 A major reason	98 Not sure
Q17_4. Priority parking at some locations				
Q17_5. Tax incentives and rebates				
Q17_6. The convenience of charging my vehicle at home				
Q17_7. The convenience of charging my vehicle at work				
Q17_8. Availability of public charging stations in the Portland/Salem metro areas				
Q17_9. Availability of public charging stations outside of the Portland/Salem metro areas				
Q17_10. How I look driving and owning this vehicle				
Q17_11. Vehicle's performance and handling				
Q17_12. Vehicle safety				

[ASK ALL]

Q18. [BL – BAR_P] What are the main factors that might hold you back from purchasing or leasing an electric vehicle?

(Enter your response in the box below. Be as specific as possible.)

- 1. [OPEN-ENDED RESPONSE]
- 98. Don't know

[ASK ALL]

Q19. [BL – BAR] For each item, please indicate whether the issue described is a major concern, a minor concern, or not a concern to you at all when considering whether or not to purchase or lease an electric vehicle.

(For each factor below, select the response that best describes your level of concern.)

[Matrix Question: Scale]

Issue	1 Not a concern at all	2 A minor concern	3 A major concern	98 Don't know
Q19_1. Number of miles vehicle will go on a single charge				
Q19_2. Purchase price of vehicle				
Q19_3. Maintenance costs				
Q19_4. Cost of charging the vehicle				
Q19_5. Electric vehicle body types and sizes available				
Q19_6. Electric vehicle appearance				
Q19_7. Ability to charge at work				
Q19_8. Ability to charge at home				
Q19_9. Availability of public charging stations in the Portland/Salem metro areas				

Issue	1 Not a concern at all	2 A minor concern	3 A major concern	98 Don't know
Q19_10. Availability of public charging stations outside of the Portland/Salem metro areas				
Q19_11. Amount of time required to charge battery				
Q19_12. Vehicle's performance and handling				
Q19_13. Vehicle safety				
Q19_14. Vehicle Reliability				
Q19_15. Availability of body type and sizes				

[ASK IF NON-INTENDER (EVINT=0)]

Q20. [BL – BAR_14] What changes would need to occur in terms of vehicle features and specifications and/or electric vehicle charging infrastructure in order for you to consider an all-electric vehicle or plug-in hybrid electric vehicle for your next vehicle purchase / lease?

Enter your response in the box below. Be as specific as possible.

1. [OPEN-ENDED RESPONSE]
97. No Changes needed

[ASK IF RANGE IS A CONCERN (Q19_1 = 2 or 3)]

Q21. [BL – BAR_15] How many miles would an electric vehicle need to be able to go on a single charge to reduce your concerns about vehicle range?

[SINGLE RESPONSE]

1. At least 50 miles
2. 51 to 100 miles
3. 101 to 150 miles
4. 151 to 200 miles
5. 201 to 250 miles
6. 251 to 300 miles
7. More than 300 miles
8. None of the above
98. Don't know

[ASK IF EV/PHEV INTENDER (EVINT=1)]

Q22. [NEW] Which of the following best describes how you would use an electric or plug-in hybrid vehicle were you to purchase or lease one?

[SINGLE RESPONSE]

1. I would use an electric or plug-in hybrid for all or most of my auto trips and would not use another vehicle
2. I would use an electric or plug-in hybrid primarily for short distance trips (30 miles or less) and use another vehicle for longer trips
3. I would use a non-electric vehicle instead of an electric or plug-in hybrid for most of my trips
96. Something else, please specify: [OPEN-ENDED RESPONSE]
98. Don't know

Knowledge of EV Charging Options and Logistics

[ASK IF S4 > 0 AND ≠ 98 (OWNS OR LEASES AT LEAST ONE VEHICLE)]

Q23. [NEW] When at home, where do you typically park the vehicle you primarily use?

[SINGLE RESPONSE]

1. My garage
2. My driveway
3. On the street
4. In a shared parking garage
96. Something else, please specify: [OPEN-ENDED RESPONSE]
98. Don't know

[ASK IF Q23 = 3 (ON STREET PARKING)]

Q24. [NEW] Is there usually a parking space available close to your home?

[SINGLE RESPONSE]

1. Yes
2. No
98. Don't know

[ASK IF S4 > 0 AND ≠ 98 (OWNS OR LEASES AT LEAST ONE VEHICLE) AND S5 = 2 (DOES NOT OWN OR LEASE EV OR PHEV)]

Q25. [NEW] How much of a concern is your current parking situation in your decision on whether to purchase an electric or plug-in hybrid vehicle in the future?

[SINGLE RESPONSE]

1. Not a concern at all
2. A minor concern
3. A major concern
98. Don't know

[ASK ALL]

Q26. Which location would be most important to you to have charging available if you were to purchase an all-electric or plug-in hybrid vehicle?

[SINGLE RESPONSE]

1. At home
2. At work
3. At public locations (e.g., grocery stores, coffee shops, malls)
98. Don't know

[ROTATE Q27-Q28. SHOW ON SAME SCREEN]

[ASK ALL]

Q27. [BL - CHRГ_1] Do you have an electric service outlet available where you park your car at home?

[SINGLE RESPONSE]

1. Yes
2. No

98. Don't know

[ASK ALL]

Q28. [BL – CHRГ_2] Do you have an electric service outlet available where you park your car at your workplace?

[SINGLE RESPONSE]

1. Yes
2. No
97. Not applicable
98. Don't know

[ASK IF PARK OUTSIDE OF HH FOR WORK (Q28 ≠ 97)]

Q29. [BL – CHRГ_3] Would having electric vehicle charging stations at your workplace make you...?

[SINGLE RESPONSE]

1. Much more likely to purchase or lease an electric vehicle
2. Somewhat more likely to purchase or lease an electric vehicle, or
3. Have no effect on your decision to purchase or lease an electric vehicle
98. Don't know

[ASK ALL]

Q30. [BL – CHRГ_5 - ADJUSTED] The federal government and state of Oregon offer financial incentives including tax credits to help offset the up-front costs of plug-in electric vehicles. Prior to this survey, were you aware of these incentives?

[SINGLE RESPONSE]

1. Yes, federal only
2. Yes, Oregon only
3. Yes, aware of both federal and Oregon
4. No, not aware of either
98. Don't know

[ASK ALL]

Q31. [BL – CHRГ_6] Approximately how much would you expect tax credits and incentives to offset the cost of a plug-in electric vehicle?

(Enter your response as a dollar amount below. Your best guess is fine.)

[ACCEPT RESPONSES BETWEEN 0 & 50,000]

1. \$ Amount: [OPEN-ENDED RESPONSE]
98. Don't know

[SHOW Q32 & Q33 ON SAME SCREEN]

[ASK ALL]

Q32. [BL – CHRГ_7] On average, a typical electric vehicle / plug-in hybrid electric vehicle driver would spend approximately 3 cents per mile for the electricity to drive compared to approximately 13 cents per mile based on current fuel costs for a typical gasoline-powered vehicle averaging 25 miles per gallon.

Prior to this survey were you aware of this?

[SINGLE RESPONSE]

1. Yes
2. No

[ASK ALL]

Q33. [BL – CHR8_8] Does knowing this information make you more or less likely to consider an electric vehicle / plug-in hybrid electric vehicle for a future vehicle purchase?

(Select the response that best describes how you feel.)

Much less likely	Somewhat less likely	Neither more or less likely	Somewhat more likely	Much more likely
1	2	3	4	5

98. Don't know

[BL – SHOW PRIOR TO Q27] The three most common types of electric vehicle chargers currently available are:

Level One Charger (120 Volts) - Level 1 charging uses the same 120-volt current found in standard household outlets and can be performed using the power cord and equipment that most EVs come with. Many residents can charge in their garage without any electrical upgrades.

Level Two Charger (240 Volts) - Level 2 charging uses 240 volt power to enable faster regeneration of an EV's battery system. Providing this type of charging requires installation of an EVSE unit and electrical wiring capable of handling higher voltage power. Homeowners interested in Level 2 chargers should have a qualified electrician install the charging equipment.

DC Fast Charger (3 phase) - DC fast charging provides compatible vehicles with an even faster charge by converting high voltage AC power to DC power for direct storage in EV batteries. This type of charger is generally not available for home use and would be found in public charging locations.

[ASK ALL]

Q34. [BL – CHR8_10] Each electric vehicle comes with a Level One (120-volt) charger which can be used in almost any standard wall socket in a home. With this type of charger, it will take about 10-15 hours to fully charge an all-electric vehicle, and about 5-10 hours to fully charge a plug-in hybrid electric vehicle.

Does knowing this information make you more or less likely to consider an electric vehicle / plug-in hybrid electric vehicle for a future vehicle purchase?

(Select the response that best describes how you feel.)

Much less likely	Somewhat less likely	Neither more or less likely	Somewhat more likely	Much more likely
1	2	3	4	5

98. Don't know

[ASK ALL]

Q35. [BL – CHR8_11] Electric vehicle owners have the option to have a second type of charger installed. A Level Two charger charges at 240 volts and can fully charge an all-electric vehicle in about 5-10 hours, and a plug-in hybrid electric vehicle in about 1-5 hours. The cost to purchase and have a 240-volt charger installed is roughly \$1,000.

Does knowing this information make you more or less likely to consider an electric vehicle / plug-in hybrid electric vehicle for a future vehicle purchase?

(Select the response that best describes how you feel.)

Much less likely	Somewhat less likely	Neither more or less likely	Somewhat more likely	Much more likely
1	2	3	4	5

98. Don't know

[ASK ALL]

Q36. [BL - CHRГ_12] More than 125 DC Fast Chargers have been installed in public locations in Oregon, allowing drivers to charge on the go and extend their driving range. A DC Fast Charger will charge most electric vehicles to 80 percent in 30 minutes to 1 hour.

Does knowing this information make you more or less likely to consider an electric vehicle / plug-in hybrid electric vehicle for a future vehicle purchase?

(Select the response that best describes how you feel.)

[SINGLE RESPONSE]

Much less likely	Somewhat less likely	Neither more or less likely	Somewhat more likely	Much more likely
1	2	3	4	5

98. Don't know

[ASK ALL]

Q37. [BL - CHRГ_13A] Have you noticed any public electric vehicle charging stations in public areas and parking lots around Oregon?

[SINGLE RESPONSE]

- 1. Yes
- 2. No
- 98. Don't know

[ASK IF NOTICED STATIONS (Q37=1)]

Q38. [BL - CHRГ_13B] Have you noticed signs or other information at these public electric vehicle charging stations identifying the company that is providing the charging station?

[SINGLE RESPONSE]

- 1. Yes
- 2. No
- 98. Don't know

[ASK IF RECALL COMPANY NAMES AT CHARGING STATIONS (Q38=1)]

Q39. [BL - CHRГ_14] What company (or companies) do recall seeing identified as an electric vehicle charging station provider?

(Enter your response in the box below. Be as specific as possible)

- 1. [OPEN-ENDED RESPONSE]
- 98. Don't recall specific company names

[ASK ALL]

Q40. [BL – CHRГ_15 – ADJUSTED] Which of the following Portland General Electric (PGE) “Electric Avenue” electric vehicle charging stations have you seen?

[MULTIPLE RESPONSE]

1. Downtown Portland (SW Salmon between SW 1st and 2nd Ave)
2. Milwaukie (intersection of SE McLoughlin Blvd and SE Jackson St)
3. Hillsboro (2105-2643 SE Tualatin Valley Hwy)
4. Eastport Plaza (4140 SE 82nd Ave)
5. None of these [MAKE EXCLUSIVE RESPONSE]

[ASK IF EV/PHEV OWNER/INTENDER (EVINT=1 OR S5=1)]

Q41. [BL – CHRГ_18 - ADJUSTED] PGE may offer special electric vehicle pricing plans in the future which could include several benefits for a monthly fee. Please review the plans below and rate your level of interest.

(For each factor below, select the response that best describes your opinion.)

[MATRIX QUESTION: SCALE]

[LOGIC] Item [ROTATE ORDER OF ITEMS]	1 I would never consider this plan	2 I probably wouldn't consider this plan	3 May or may not consider	4 I probably would consider this plan	5 I definitely would consider this plan
Q41_1. \$80 a month: free electric vehicle home charging at night (11 p.m. – 5 a.m.), free PGE public charging, a discounted Level 2 home charging station, discounted non-PGE public charging, and renewable power					
Q41_2. \$60 a month: free electric vehicle home charging at night (11 p.m. – 5 a.m.), free PGE public charging, discounted non-public public charging, and renewable power					
Q41_3. \$40 a month: discounted electric vehicle home charging at night (11 p.m. – 5 a.m.), free PGE public charging, and renewable power					
Q41_4. \$20 a month: free PGE public charging					

98. Don't know

[ASK IF EV/PHEV OWNER/INTENDER (EVINT=1 OR S5 = 1)]

Q42. [BL – CHRГ_19] Would PGE offering special electric vehicle pricing plans make you more likely to consider purchasing an electric vehicle?

1. Yes
2. No

[ASK IF EV/PHEV OWNER/INTENDER (EVINT=1 OR S5 = 1)]

Q43. Which of the following would be your preferred method for charging station payment?

[SINGLE RESPONSE – RANDOMIZE OPTIONS EXCEPT DON'T KNOW]

1. A charging station mobile app

2. Contactless payment (using key fob, smart card, or other devices with RFID)
3. Credit or debit card reader
4. Mobile payment (e.g., Apple Pay, Google Pay, Samsung Pay)
5. Charging my PGE account and appearing on PGE bill
96. Other, please specify: [OPEN-ENDED RESPONSE]
98. Don't know

Current EV/PHEV Owner Details

[ASK IF EV/PHEV OWNER (S5 = 1)]

Q44. [OWN_1] How many years have you owned an electric vehicle / plug-in hybrid electric vehicle (including any previous electric vehicles you have owned)?

(Enter your response in the box below. Your best guess is fine.)

[Accept responses between 1 & 50]

98. Don't know

[ASK IF EV/PHEV DRIVER (S5=1)]

Q45. [BL - OWN_2] Where do you typically charge your electric vehicle / plug-in hybrid electric vehicle?
Select all that apply.

[MULTIPLE RESPONSE]

1. Home
2. A charging station at your workplace
3. Public charging station(s)
4. Other place, please specify: [OPEN-ENDED RESPONSE]
5. None of the above [MAKE EXCLUSIVE RESPONSE]
99. Prefer not to say

[ASK IF EV/PHEV DRIVER (S5=1)]

Q46. [BL - OWN_3] How often do you use a public charging station to charge your electric vehicle / plug-in hybrid electric vehicle?

[SINGLE RESPONSE]

FLIP CODE DISPLAY; anchor 99

1. Never
2. Rarely (a few times per year or less)
3. About once per month
4. 2 to 3 times per month
5. About once per week
6. Several times per week
99. Prefer not to say

[ASK IF EV/PHEV DRIVER (S5=1) AND USE PUBLIC CHARGING STATIONS (Q46=2-6)]

Q47. [BL - OWN_4] How do you go about locating a public charging station when needed? Select all that apply.

[MULTIPLE RESPONSE]

1. Charging stations identified on my electric vehicle's navigation system
2. Vehicle app on my mobile phone
3. Charging networks App such as Blink, Chargepoint, Greenlots, etc.
4. Third Party App such as Chargeway or PlugShare
5. Internet search
6. Some other way, please specify: [OPEN-ENDED RESPONSE]
7. None of the above [MAKE EXCLUSIVE RESPONSE]
99. Prefer not to say

[ASK IF EV/PHEV DRIVER (S5=1) AND USE PUBLIC CHARGING STATIONS (Q46=2-6)]

Q48. [BL - OWN_6] Would you say that locating an available public electric vehicle charging station when needed is typically...?

[SINGLE RESPONSE]

FLIP CODE DISPLAY [ANCHOR 99]

1. Very difficult
2. Somewhat difficult
3. Somewhat easy
4. Very easy
99. Prefer not to say

[ASK IF EV/PHEV DRIVER (S5=1) AND HAVE SEEN ELECTRIC AVENUE (Q40 = 1, 2, 3, OR 4)]

Q49. [BL - OWN_7 - ADJUSTED] How often do you use the Electric Avenue location(s) to charge your electric vehicle / plug-in hybrid electric vehicle?

[MATRIX QUESTION]

[DISPLAY ONLY LOCATIONS SELECTED IN Q40]	1 I have not charged at this location	2 Rarely (a few times per year or less)	3 About once per month	4 2 to 3 times per month	5 About once per week	6 Several times per week	98 Don't know
Downtown Portland (SW Salmon between SW 1st and 2nd Ave)							
Milwaukie (intersection of SE McLoughlin Blvd and SE Jackson St)							
Hillsboro (2105-2643 SE Tualatin Valley Hwy)							
Eastport Plaza (4140 SE 82nd Ave)							

[ASK IF EV/PHEV DRIVER (S5=1)]

Q50. [BL - OWN_8] How many miles do you typically drive per day in your electric vehicle / plug-in hybrid electric vehicle?

(Enter your response in the box below. Your best guess is fine.)

[ACCEPT RESPONSES BETWEEN 1 & 997]

1. [OPEN-ENDED RESPONSE]
98. Don't know

[ASK IF EV/PHEV DRIVER (S5=1)]

Q51. [BL - OWN_9] Which type of home electric vehicle charging system do you have? Select all that apply.

[MULTIPLE RESPONSE]

1. Level One (120v - standard electric outlet)
2. Level Two (240v - large 3-prong outlet such as for an electric clothes dryer)
3. Separate panel for an Electric Vehicle
4. Other type; please specify here: [OPEN-ENDED RESPONSE]
5. None of the above [MAKE EXCLUSIVE RESPONSE]

[ASK IF EV/PHEV OWNER (S5=1) AND Q51 ≠ 2 (DOES NOT HAVE L2 CHARGER AT HOME)]

Q52. What is your level of interest in participating in a new PGE program where you would receive a rebate of up to \$500 for a level two home charger, in return for allowing PGE to control the times your electric or plug-in hybrid vehicle can charge (generally during evening and weekend hours)?

[SINGLE RESPONSE]

1. I would never consider this program
2. I probably wouldn't consider this program
3. I may or may not consider
4. I probably would consider this program
5. I definitely would consider this program
97. Not applicable - I'm unable to charge at home

[ASK IF EV/PHEV DRIVER (S5=1)]

Q53. [NEW] What dealer(s) did you go to when you purchased or leased your electric or plug-in hybrid vehicle?

[MULTIPLE RESPONSE]

1. Beaverton Honda
2. Beaverton Hyundai
3. Carr Chevrolet
4. Carr Nissan
5. Courtesy Ford
6. Dick Hannah Honda
7. Dick Hannah Nissan
8. Dick Hannah Volkswagen
9. Gresham Toyota
10. Herzog-Meier Volkswagen
11. Kia of Portland
12. Kuni BMW

- 13. Landmark Ford
- 14. Platt Auto
- 15. Ron Tonkin Chevrolet
- 16. Ron Tonkin Honda
- 17. Ron Tonkin Hyundai
- 18. Ron Tonkin Toyota
- 19. Toyota of Portland
- 20. Wentworth's Wilsonville Chevrolet
- 21. Weston Kia
- 22. Wilsonville Nissan
- 23. Wilsonville Toyota
- 24. Other, please specify: [OPEN-ENDED RESPONSE]
- 97. Not applicable – did not interact with dealer
- 98. Don't know

[ASK IF ANY IN Q51 SELECTED AND Q11 ≠ 98 – INPUT ALL DEALERS SELECTED IN Q53]

Q54. [BL – OWN_11 – ADJUSTED] How informative was the dealer(s) when you purchased or leased your electric vehicle / plug-in hybrid electric vehicle?

(Select the rating scale point that best describes how you feel.)

(If your household has more than one electric or plug in hybrid vehicle, please answer for your most recently acquired electric or plug-in hybrid electric vehicle.)[SINGLE RESPONSE]

[DISPLAY ONLY DEALERS SELECTED IN Q53] Item	0 Not at all informative	1	2	3	4	5	6	7	8	9	10 Very informative	98 Don't know
[INPUT DEALER 1]												
[INPUT DEALER 2]												
[INPUT DEALER 3]												
[INPUT DEALER 4]												
[INPUT DEALER 5]												
[INPUT REMAINING DEALERS FROM Q53 IF MORE THAN 5 ARE SELECTED]												

[ASK IF Q53 = [PGE PARTNER DEALERSHIPS]]

Q55. [NEW] When you went to [RESPONSE(S) FROM Q53], were you shown the [EV EDUCATIONAL KIOSK]?

(This is an interactive display that shows a map of charging stations, charging times, and a trip planning tool.)

[SINGLE RESPONSE]

- 1. Yes
- 2. No
- 98. Don't know

[ASK Q55 = 1 (RECALL EV EDUCATIONAL KIOSK)]

Q56. [NEW] How helpful was the [EV EDUCATIONAL KIOSK] in helping you understand EV charger availability and EV charging times?

[SINGLE RESPONSE]

- 1. 0 – Not at all helpful
- 2. 1
- 3. 2
- 4. 3
- 5. 4
- 6. 5
- 7. 6
- 8. 7
- 9. 8
- 10. 9
- 11. 10 – Extremely helpful
- 98. Don't know

[ASK IF EV/PHEV DRIVER (S5=1) AND Q53 ≠ NA]

Q57. [BL – OWN_12] Did the dealer you purchased or leased your electric vehicle / plug-in hybrid electric vehicle from recommend contacting PGE?

[SINGLE RESPONSE]

- 1. Yes
- 2. No
- 98. Not sure

[ASK IF EV/PHEV DRIVER (S5=1)]

Q58. [BL – OWN_13] At what point did you contact PGE regarding your electric vehicle / plug-in hybrid electric vehicle purchase and home charging set-up? Select all that apply.

[MULTIPLE RESPONSE]

- 1. Before deciding to acquire an electric vehicle / plug-in hybrid electric vehicle
- 2. During the purchase/lease process
- 3. After acquiring the vehicle
- 4. I did not contact PGE [MAKE EXCLUSIVE RESPONSE]
- 98. Not sure [MAKE EXCLUSIVE RESPONSE]

[ASK IF EV/PHEV DRIVER (S5=1)]

Q59. [BL – OWN_14 – ADJUSTED] How likely is it that you would recommend an all-electric vehicle / plug-in hybrid electric vehicle to your friends or family?

[SINGLE RESPONSE]

1 Not likely at all											Extremely likely
0	1	2	3	4	5	6	7	8	9	10	

- 98. Not sure

Sources of Information about EV/PHEV Acquisition, Ownership and Charging

[ASK ALL]

Q60. [BL – INFO_1] From which sources, if any, do you recall reading, hearing or seeing information about electric vehicles? Select all that apply.

[MULTIPLE RESPONSE] [RANDOMIZE]

1. Automobile dealerships
2. Automobile manufacturers
3. U.S. Department of Energy (DOE)
4. U.S. Environmental Protection Agency (EPA)
5. Portland General Electric (PGE)
6. Environmental organizations
7. Automobile reviews and information in consumer advice publications / websites such as Consumer Reports
8. Automobile magazines (e.g., Car and Driver)
9. Automobile websites (e.g., jalopnik.com)
10. Electrical contractors
11. Friends and colleagues
12. Social media (e.g., Facebook, LinkedIn, Twitter)
13. Reddit
14. Forth (electric vehicle website or showroom)
15. General internet search
16. Some other source: [OPEN ENDED RESPONSE]
17. None of the above / Do not recall information about electric vehicles [MAKE EXCLUSIVE RESPONSE]
98. Don't know

[ASK IF EV INTENDERS SELECTED MORE THAN ONE SOURCE IN Q60 (EVINT=1 AND Q60=1-16 (2-17 ITEMS SELECTED))]

Q61. [BL – INFO_2] Which of these sources did you find most useful when looking for information about electric vehicles? Select all that apply.

[MULTIPLE RESPONSE]

1. RESTORE ITEMS 1-16 selected in Q60. [Set as selected item in Q60 if only one response selected]

[ASK ALL]

Q62. [BL – EXP_8 – ADJUSTED] Which of the following PGE electric vehicle resources, campaigns, or discounts have you seen? Select all that apply.

[MULTIPLE RESPONSE – RANDOMIZE OPTIONS 1 – 17; GROUP OPTIONS 11-16]

1. Social media information from PGE on electric vehicles (on Instagram, Facebook, Twitter, or LinkedIn)
2. Emails from PGE on electric vehicle services or charging
3. PGE website information on electric vehicles
4. PGE's and Nissan's combined \$3,500 discount for the Nissan Leaf
5. PGE and Chevy's \$500 discount for electric vehicles or a free Level 2 charger

6. Interactive [EV EDUCATIONAL KIOSKS] at dealerships with vehicle charging information (PGE sponsors those)
7. [PGE'S DEALER ENGAGEMENT IMPLEMENTER] App
8. National Drive Electric Week advertising (in 2018 or 2019)
9. Electric Car Insider's Electric Car Guest Drive in Milwaukie (PGE sponsored)
10. PGE's sponsored ride-and-drive events
11. PGE's Electric Avenue in downtown Portland (public charging station)
12. PGE's Electric Avenue in Milwaukie (public charging station)
13. PGE's Electric Avenue in Hillsboro (public charging station)
14. PGE's Electric Avenue at Eastport Plaza (public charging station)
15. PGE's Electric Avenue opening events
16. PGE's Electric Avenue at Portland International Autoshow
17. PGE's Drive Change Fund
97. Didn't see any of these [MAKE EXCLUSIVE RESPONSE]
98. Don't know

[ASK ALL]

Q63. [BL - DRV_3] Have you driven a plug-in 100% electric or a plug-in hybrid vehicle before today? Select all that apply.

[MULTIPLE RESPONSE]

1. Yes, a friend's, family member's, or colleague's
2. Yes, my own electric or plug-in hybrid vehicle
3. Yes, at a dealership
4. Yes, at Forth's electric vehicle showroom in downtown
5. Yes, at some other ride-and-drive event
6. No [MAKE EXCLUSIVE RESPONSE]
98. Don't know

[ASK IF Q63=5]

Q64. [NEW] Do you recall who sponsored the ride-and-drive event? Select all that apply.

[MULTIPLE RESPONSE]

1. Portland General Electric (PGE)
2. Forth
96. Someone else, please specify: [OPEN-ENDED RESPONSE]
98. Don't Know

Perceptions of PGE

[DISPLAY SENTENCE BELOW ON SAME PAGE AS Q65]

[BL – SHOW PRIOR TO NEXT QUESTION] Now, we have some questions about Portland General Electric...

[ASK ALL]

Q65. [BL – Q4] Please rate how well each statement **reflects your opinion of PGE...**

(For each statement below, select the response that best describes how you feel.)

Strongly Disagree							Strongly Agree
1	2	3	4	5	6	7	

98. Don't know

Randomize

Q65_1. PGE helps protect the environment

Q65_2. PGE supports the expansion of electric vehicle adoption in the region

Q65_3. PGE offers innovative energy solutions

Expectations of PGE Supporting EV / PHEV Adoption and Developing the EV Charging Infrastructure

[ASK ALL]

Q66. [BL – EXP_1 – EXP_6] Please indicate how much you agree or disagree with the following statements...?

(For each statement below, select the response that best describes how you feel.)

Completely Disagree										Completely Agree
0	1	2	3	4	5	6	7	8	9	10

98. Don't know

Randomize

Q66_1. I would like to see PGE take a leadership role in helping electric vehicles and plug-in hybrid electric vehicles gain market acceptance as manufacturers introduce these new vehicles.

Q66_2. I support the idea that PGE should be working and investing now to ensure that the existing electric system is able to support convenient recharging of electric cars and trucks.

Q66_3. PGE should take an active role in educating people about electric vehicles.

Q66_4. I believe that PGE is a credible source of information about electric vehicles.

Q66_5. PGE should convert its own vehicle fleet to electric power as soon as possible.

Q66_6. PGE should make owning an electric vehicle more convenient and feasible by installing and maintaining public charging stations.

Q66_7. PGE should work with the local and state government to encourage electric vehicle market growth.

[ASK ALL]

Q67. [BL – EXP_OE] Do you have any other suggestions for ways PGE could help support the expansion of electric vehicle use in our region?

(Enter your response in the box below. Be as specific as possible.)

1. [OPEN-ENDED RESPONSE]
97. No other suggestions

Attribution

[ASK EV/PHEV DRIVERS WHO BOUGHT THEIR EV(S) AFTER THE PGE'S PILOTS LAUNCHED AND WHO REPORTED RECEIVING OR SEEING RESOURCES, INFORMATION, OR DISCOUNTS FROM PGE]

[ASK EV/PHEV DRIVER (S5=1) AND IN Q6 THEY SAY THEY BOUGHT THEIR EV AFTER NOVEMBER 2018 AND (Q58=1, 2, 3 OR Q60=5 OR Q62=1 THROUGH 17)]

Q68. [NEW] You recalled receiving or seeing information on electric vehicles, charging, discounts, or other electric vehicle resources from PGE. Please indicate how influential that information was in your decision to purchase or lease your electric or plug in hybrid vehicle.

(If your household has more than one electric or plug in hybrid vehicle, please answer for the electric or plug-in hybrid electric vehicle purchased closest to December 2018.)

[INSERT 0-10 SCALE WHERE 0=Not at all influential AND 10=Extremely influential WITH DON'T KNOW OPTION (98); LABEL ONLY THE END POINTS]

[ASK EV/PHEV DRIVER (S5=1) AND (Q62=9,10 OR Q53 ≠ 97 NA OR Q63=1,3,4,5 (MOST LIKELY TEST DROVE A VEHICLE))]

Q69. [NEW] You recalled driving an electric or plug in hybrid vehicle at a dealership, ride-and-drive event, or at some other place. Please indicate how influential the electric or plug in hybrid vehicle test ride was in your decision to purchase or lease your electric or plug in hybrid vehicle.

(If your household has more than one electric or plug in hybrid vehicle, please answer for the electric or plug-in hybrid electric vehicle purchased closest to December 2018.)

[INSERT 0-10 SCALE WHERE 0=Not at all influential AND 10=Extremely influential WITH DON'T KNOW OPTION (98) AND NA OPTION (97); LABEL ONLY THE END POINTS]

[ASK EV/PHEV DRIVER (S5=1) AND Q53 = [PGE PARTNER DEALERSHIPS]

Q70. [NEW] You recalled that you went to [RESPONSE(S) FROM Q53]. Please indicate how influential the dealership [IF MORE THAN ONE DEALERSHIP MENTIONED: "visits were"; IF ONLY ONE DEALERSHIP MENTIONED: "visit was"] in your decision to purchase or lease your electric or plug in hybrid vehicle.

(If your household has more than one electric or plug in hybrid vehicle, please answer for the electric or plug-in hybrid electric vehicle purchased closest to December 2018. [IF MORE THAN ONE DEALERSHIP MENTIONED: "Please think of all visits"])

[INSERT 0-10 SCALE WHERE 0=Not at all influential AND 10=Extremely influential; LABEL ONLY THE END POINTS]

[ASK EV/PHEV DRIVER (S5=1)]

Q71. [NEW] When you purchased or leased your electric or plug in hybrid vehicle(s), did you receive financial assistance from any of these sources? Select all that apply

1. Loan(s)
2. Federal Tax Credit
3. State Tax Credit
4. Rebate(s)
5. Discount(s) from car manufacturer(s) (GM, Tesla, Nissan, others)
6. Discount(s) from car dealership(s)
96. Other, please specify: [OPEN-ENDED RESPONSE]
97. None of these [EXCLUSIVE]

[ASK IF Q71 = 4,5,6,OR 96]

Q71A. Did you receive this financial assistance from PGE or other sources?

	Source	
	PGE	non-PGE
Q71A_4. [DISPLAY IF Q71 = 4] Rebate(s)	<input type="checkbox"/>	<input type="checkbox"/>
Q71A_5. [DISPLAY IF Q71 = 5] Discount(s) from car manufacturer(s) (GM, Tesla, Nissan, others)	<input type="checkbox"/>	<input type="checkbox"/>
Q71A_6. [DISPLAY IF Q71 = 6] Discount(s) from car dealership(s)	<input type="checkbox"/>	<input type="checkbox"/>
Q71A_96. [DISPLAY IF Q71 = 96] [PIPE IN RESPONSE FROM Q71_96]	<input type="checkbox"/>	<input type="checkbox"/>

[ASK EV/PHEV DRIVER (S5=1)]

Q72. [NEW] The following is a list of items that could have influenced you to purchase or lease an electric or plug in hybrid vehicle. For each one, please indicate how important the item was in the decision to purchase or lease.

[INSERT 0-10 SCALE FOR EACH ITEM WHERE 0=Not at all important AND 10=Extremely important WITH DON'T KNOW OPTION (98); LABEL ONLY THE END POINTS]

[DISPLAY ONLY OPTIONS THAT THEY SELECTED IN Q71]

1. Loan(s) you said you received
2. Federal Tax credit you said you received
3. State Tax credit you said you received
4. Rebate(s) you said you received
5. Car manufacturer discount(s) you said you received
6. Dealership discount(s) you said you received
96. Anything else – if so, please specify: [OPEN-ENDED RESPONSE]

[ASK EV/PHEV DRIVER (S5=1)]

Q73. [NEW] Please use #1, #2, and so forth to rank which factors had the greatest influence (#1), next-greatest influence (#2), and so forth on the decision to purchase or lease.

DISPLAY ONLY THOSE ITEMS THEY RATED IN Q72 AS 1 OR ABOVE AND RANDOMIZE OPTIONS	RANK
1. [DISPLAY IF THEY ANSWER Q68] PGE's information or resources you received	
2. Loan(s) you said you received	
3. Tax credit you said you received	
4. Rebate(s) you said you received	
5. Car Manufacturer discount(s) you said you received	
6. Dealership discount(s) you said you received	
8. Other factor(s) you mentioned	

[ASK EV/PHEV DRIVER (S5=1) **AND** IN Q6 THEY SAY THEY BOUGHT THEIR EV AFTER NOVEMBER 2018 AND (Q58=1, 2, 3 OR Q60=5 OR Q62=1 THROUGH 17)]

Q74. [NEW] If you had not received information on electric vehicles, charging, discounts, or other electric vehicle resources from PGE, which of the following is most likely: You would have...

[SINGLE RESPONSE]

1. ...postponed buying or leasing an electric or plug in hybrid vehicle for 2-3 years
2. ...bought or leased a vehicle, but a different one
3. ...done the exact same purchase or lease
96. ...done something else. If so, what: [OPEN-ENDED RESPONSE]
98. Don't Know

[ASK EV/PHEV DRIVER (S5=1) AND (Q62=9 OR 10 OR Q63=1,3,4,5 (MOST LIKELY TEST DROVE A VEHICLE))]

Q75. [NEW] If you had not driven an electric or plug in vehicle at a dealership, ride-and-drive event, or at some other place, which of the following is most likely: You would have...

[SINGLE RESPONSE]

1. ...postponed buying or leasing an electric or plug in hybrid vehicle for 2-3 years
2. ...bought or leased a vehicle, but a different one
3. ...done the exact same purchase or lease
96. ...done something else. If so, what: [OPEN-ENDED RESPONSE]
97. ...I/we did not test drive electric or plug in hybrid vehicle before buying ours
98. ...Don't Know

[ASK EV/PHEV DRIVER (S5=1) **AND** Q71, = 2,3,4,5,6 (RECEIVED A DISCOUNT/SUBSIDY)]

Q76. [NEW] If you had not received a discount (tax credit, rebate, and/or discount from car dealer or manufacturer), which of the following is most likely: You would have...

[SINGLE RESPONSE]

1. ...postponed buying or leasing an electric or plug in hybrid vehicle for 2-3 years
2. ...bought or leased a vehicle, but a different one
3. ...done the exact same purchase or lease
96. ...done something else. If so, what: [OPEN-ENDED RESPONSE]
98. ...Don't Know

[ASK EV/PHEV DRIVER (S5=1) AND Q71 = 1 (RECEIVED A LOAN)]

Q77. [NEW] If you had not received a loan, which of the following is most likely: You would have...

[SINGLE RESPONSE]

1. ...postponed buying or leasing an electric or plug in hybrid vehicle for 2-3 years
2. ...bought or leased a vehicle, but a different one
3. ...done the exact same purchase or lease
96. ...done something else. If so, what: [OPEN-ENDED RESPONSE]
98. ...Don't Know

[ASK IF Q74= 2 OR Q75=2 OR Q76=2 OR Q77=2]

Q78. [NEW] You said you would have bought or leased a vehicle but a different one in the previous question(s) if you had not [INPUT "received info from PGE" if Q74= 2, "test driven an electric or plug in vehicle" if Q75=2, "received a discount" Q76=2, "or received a loan" Q77=2]. Which type of vehicle listed below would you have most likely acquired?

[SINGLE RESPONSE]

1. Gasoline
2. Diesel
3. Biodiesel
4. Natural gas
5. Hybrid (non-plug-in)
6. Plug-in hybrid
7. Electric
98. Don't know

Ridesharing Services

[ASK ALL]

Q79. [BL – RID_1] Are you a current rideshare driver?

[SINGLE RESPONSE]

1. Yes
2. No
99. Prefer not to say

[ASK IF CURRENT RIDESHARE DRIVER (Q79=1)]

Q80. [BL – RID_2] Do you currently use an electric vehicle / plug-in hybrid electric vehicle for your rideshare service?

[SINGLE RESPONSE]

1. Yes
2. No
98. Don't know

[ASK ALL]

Q81. [RID_5] Would you be more or less likely to use rideshare services that use electric vehicles / plug-in hybrid electric vehicles?

(Select the response that best describes how you feel.)

Much less likely	Somewhat less likely	Neither more likely nor less likely	Somewhat more likely	Much more likely
1	2	3	4	5

98. Don't know

Demographics

[ASK ALL]

Q82. [BL – EDUC] What is the highest level of education you've attained to date?

[SINGLE RESPONSE]

1. Elementary school
2. Some high school

3. Graduated high school
4. Trade or technical school
5. Some college
6. Graduated college
7. Graduate/professional school
99. Prefer not to say

[ASK ALL]

Q83. [BL – OWNR] Do you own or rent your home?

[SINGLE RESPONSE]

1. Own
2. Rent
96. Other
98. Don't know
99. Prefer not to say

[ASK ALL]

Q84. [R&D Survey – Q16] What type of home do you live in?

[SINGLE RESPONSE]

1. Single-family detached house with a driveway
2. Single-family detached house with no driveway
3. Single-family attached home (such as a townhouse)
4. Duplex, triplex, or four-plex
5. Apartment or condominium with 5 units or more
6. Manufactured or mobile home
96. Other, please specify: [OPEN-ENDED RESPONSE]
99. Prefer not to answer

[ASK ALL]

Q85. [BL – LIVH] How many people live in your home?

[Accept responses between 0 & 996]

1. [OPEN-ENDED RESPONSE]
99. Prefer not to say

[ASK ALL]

Q86. [NEW] What is your age?

1. 18-24 years
2. 25-34
3. 35-44
4. 45-54
5. 55-64
6. 65-74
7. 75 years or older
99. Prefer not to say

[ASK ALL]

Q87. [BL – LATIN] Are you of Latino or Hispanic descent – for example Mexican, Puerto Rican, Cuban, or some other Hispanic background?

[SINGLE RESPONSE]

1. Yes, Latino/Hispanic
2. No, not Latino/Hispanic
99. Prefer not to say

[ASK ALL]

Q88. [BL – RACE] Is your racial or ethnic background white, black or African American, Asian, or something else?

[SINGLE RESPONSE]

1. White
2. Black or African American
3. Asian (Japanese, Korean, Pacific Islander, etc.)
4. American Indian/Native American
96. Other, please specify: [OPEN-ENDED RESPONSE]
97. Not applicable
98. Don't know
99. Refused

[ASK ALL]

Q89. [BL – EMPL] Please select the option that best describes your employment status.

[SINGLE RESPONSE]

1. Employed full time
2. Employed part time
3. Homemaker
4. Self-employed
5. Retired
6. Student
7. Unemployed
96. Something else: [OPEN-ENDED RESPONSE]
98. Don't know

[ASK ALL]

Q90. [BL – INCOME] What was your household's total annual income before taxes in 2018? Please include the income of all people living in your home in this figure.

[SINGLE RESPONSE]

1. Less than \$15,000
2. \$15,000 TO \$19,999
3. \$20,000 to \$29,999
4. \$30,000 to \$39,999
5. \$40,000 to \$49,999
6. \$50,000 to \$74,999
7. \$75,000 to \$99,999
8. \$100,000 to \$124,999
9. \$125,000 or more

99. Prefer not to answer

[ASK ALL]

Q91. [BL – GENDER] Are you...

[SINGLE RESPONSE]

- 1. Male
- 2. Female
- 96. Other
- 99. Prefer not to say

Thank you for your participation in this survey! Those are all the questions we have for you. Your responses have been saved, and you are eligible to enter a drawing for one \$500 grand prize and five \$100 prizes for your participation.

If you would like to enter the drawing, please enter your name and email address below.

[RESPONSE NOT REQUIRED]

Name: _____

Email Address: _____

You may now close your browser.

Appendix I. Ride-and-Drive Event Survey Instrument – Electric Avenue Grand Opening



Ride and Drive Survey

Interviewer Notes		
Time: _____	M / F	GC: <input type="checkbox"/>

1. How did you hear about this event? *Select all that apply.*

- Billboard
- Car dealership
- Email
- Friend, family, or colleague
- Social media (e.g., Facebook, Instagram, Twitter)
- Newsletter (from City of Milwaukie and PGE)
- Newspaper, magazine, or other print material
- PGE's website
- Forth Mobility (website, social media, membership)
- Another source, please specify: _____

Don't know

2. What brought you to the event today?

Select all that apply.

- To test drive electric vehicles
- To learn more about electric vehicles
- To learn about public charging availability
- To learn about electric vehicle rebates or discounts
- Another reason, please specify: _____

Don't know

3. Which vehicle(s) did you test drive today?

Select all that apply.

- BMW i3
- Nissan Leaf
- Prius Prime
- Tesla Model 3
- Other, please specify: _____

Don't know

4. Have you driven a plug-in 100% electric or a plug-in hybrid vehicle before today? *Select all that apply.*

- Yes, a friend's, family member's, or colleague's
- Yes, at a dealership
- Yes, at some other ride-and-drive event
- Yes, my own electric or plug-in hybrid vehicle
- No, this is my first time
- Don't know

5. Which of the following best describes how you use your electric or plug-in hybrid vehicle?

- I use my electric or plug-in hybrid for all or most of my auto trips and do not own or lease another vehicle
- I use my electric or plug-in hybrid primarily for short distance trips (30 miles or less) and own or lease another vehicle for longer trips
- I own or lease a non-electric vehicle and drive that vehicle instead of my electric or plug-in hybrid for most of my trips
- I no longer own or lease the electric or plug-in hybrid
- Something else, please specify: _____

Don't know

6. Which of the following PGE electric vehicle resources, campaigns, or discounts have you seen before attending this event? *Select all that apply.*

- Social media information from PGE on electric vehicles
- PGE website information on electric vehicles
- PGE's and Nissan's combined \$3,500 discount for the Nissan Leaf
- PGE and Chevy's \$500 discount for electric vehicles or a free Level 2 charger
- Interactive displays at dealerships with vehicle charging information (PGE sponsors those)
- National Drive Electric Week advertising (in 2018)
- PGE's Electric Avenues
- Didn't see any of these
- Don't know

7. How satisfied are you with the following aspects of this event?

	Not at all satisfied										Extremely Satisfied		
	0	1	2	3	4	5	6	7	8	9	10	DK	N/A
Information you received about electric vehicles	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Event staff's level of knowledge of electric vehicles	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The electric vehicle(s) you test drove	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Vehicle availability (number of vehicles and/or vehicle models to test drive)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

8. What is your likelihood of purchasing or leasing a plug-in vehicle (100% electric or plug-in hybrid) within the next five years?

- Not at all likely
- Not very likely
- Neutral
- Somewhat likely
- Very likely
- Don't know

9. What effect did this event have on your likelihood of purchasing or leasing a plug-in vehicle (100% electric or plug-in hybrid) within the next five years?

- Decreased it a great deal
- Decreased it a little
- No change
- Increased it a little
- Increased it a great deal
- Don't know

10. Now that you have attended this event, what might keep you from purchasing or leasing a plug-in vehicle (100% Electric or plug-in hybrid)?

Select all that apply.

- Driving range (number of miles on a single charge)
- Purchase price of vehicle
- Maintenance costs
- Availability of public charging stations
- Reliability
- Ability to charge at work
- Time required to charge battery
- Ability to charge at home
- Performance and handling
- Vehicle safety
- Cost of charging the vehicle
- Body types and sizes available
- Not applicable – already own or lease an electric vehicle
- Something else, please specify:

Don't know

11. What, if anything, would you like to know more about electric or plug-in hybrid vehicles?

- Nothing Don't know

12. Are you a Portland General Electric customer?

- Yes
- No
- Not applicable – Don't pay for Electricity bill
- Don't know

13. Approximately how far do you live from here?

- Less than a mile
- 1 mile to less than 5 miles
- 5 miles or more
- Don't know
- Prefer not to answer

14. And approximately how far do you work from here?

- Less than a mile
- 1 mile to less than 5 miles
- 5 miles or more
- Not applicable – not employed
- Don't know
- Prefer not to answer

15. How many vehicles does your household own or lease?

_____ Vehicles None

16. Approximately how many miles do you drive per week?

_____ miles per week Don't know N/A

17. What type of home do you live in?

- Single-family detached house with a driveway
- Single-family detached house with no driveway
- Single-family attached home (such as townhouse)
- Duplex, triplex or four-plex
- Apartment or condominium with 5 units or more
- Manufactured or mobile home
- Other, please specify:

Prefer not to answer

18. What is your zip-code? _____

19. Do you or members of your household own or rent your home?

- Own
- Rent

20. What was your approximate total household income in 2018, before taxes?

- Less than \$25,000
- \$25,000 to \$49,999
- \$50,000 to \$74,999
- \$75,000 to \$99,999
- \$100,000 to \$149,999
- \$150,000 or more
- Prefer not to answer

21. Would you like to receive additional information from PGE about electric or plug-in hybrid vehicles?

- Yes (Please provide your email address):

No thank you

Thank you for completing the survey!

Appendix J. Ride-and-Drive Event Survey Instrument – TNC Driver Event



Ride and Drive Survey

1. **How did you hear about this event?** Select all that apply.

- Email
- Friend, family, or colleague
- TNC (website, social media, blogs, email)
- Social media (e.g., Facebook, Instagram, Twitter)
- Newspaper, magazine, or other print material
- PGE's website
- Forth Mobility (website, social media, membership)
- Other rideshare resources (websites, blogs, emails)
- Another source, please specify: _____

Don't know

2. **What brought you to the event today?**

Select all that apply.

- To test drive electric vehicles
- To learn more about electric vehicles
- To learn about public charging availability
- To learn about public charging costs
- To learn about electric vehicle rebates or discounts
- Another reason, please specify: _____

Don't know

3. **Which vehicle(s) did you test drive today?**

Select all that apply.

- Prius Prime
- Nissan Leaf
- Tesla Model 3
- Other, please specify: _____

Don't know

4. **Have you driven a plug-in 100% electric or a plug-in hybrid vehicle before today?** Select all that apply.

- Yes, a friend's, family member's, or colleague's
- Yes, at a dealership
- Yes, at some other ride-and-drive event
- Yes, my own electric or plug-in hybrid vehicle
- No, this is my first time
- Don't know

5. **Which of the following best describes how you use your electric or plug-in hybrid vehicle?**

- I use my electric or plug-in hybrid for all or most of my Lyft or Uber rides and do not own or lease another vehicle
- I own or lease a non-electric vehicle and use that vehicle instead of my electric or plug-in hybrid for most of my Lyft or Uber rides
- I use both my electric or plug-in hybrid and non-electric vehicle equally for my Lyft or Uber rides
- I no longer own or lease the electric or plug-in hybrid
- Something else, please specify: _____

Don't know

6. **Which of the following PGE electric vehicle resources, campaigns, or discounts have you seen before attending this event?** Select all that apply.

- Social media information from PGE on electric vehicles
- PGE website information on electric vehicles
- PGE's and Nissan's combined \$3,500 discount for the Nissan Leaf
- PGE and Chevrolet's \$500 discount for electric vehicles or a free Level 2 charger
- Free charging subscriptions for TNC EV drivers at PGE's Electric Avenues
- Interactive displays at dealerships with vehicle charging information (PGE sponsors those)
- National Drive Electric Week advertising
- PGE's Electric Avenues
- Didn't see any of these
- Don't know

7. **How satisfied are you with the following aspects of this event?**

	Not at all satisfied										Extremely Satisfied		
	0	1	2	3	4	5	6	7	8	9	10	DK	N/A
Information you received about electric vehicles	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Event staff's level of knowledge of electric vehicles	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The electric vehicle(s) you test drove	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Vehicle availability (number of vehicles and/or vehicle models to test drive)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

8. **What is your likelihood of purchasing or leasing a plug-in vehicle (100% electric or plug-in hybrid) within the next five years?**

- Not at all likely
- Not very likely
- Neutral
- Somewhat likely
- Very likely
- Don't know

9. **What effect did this event have on your likelihood of purchasing or leasing a plug-in vehicle (100% electric or plug-in hybrid) within the next five years?**

- Decreased it a great deal
- Decreased it a little
- No change
- Increased it a little
- Increased it a great deal
- Don't know

Interviewer Notes
Time: _____ M / F GC: <input type="checkbox"/>

10. Has the availability of new PGE Electric Avenue fast charging in Milwaukee, Hillsboro, or East Portland influenced your consideration of EVs?

- Yes
- No
- N/A – Not aware of PGE Electric Avenue fast charging

11. Now that you have attended this event, what might keep you from purchasing or leasing a plug-in vehicle (100% Electric or plug-in hybrid)?

Select all that apply.

- Driving range (number of miles on a single charge)
- Purchase price of vehicle
- Maintenance costs
- Availability of public charging stations
- Reliability
- Ability to charge at work
- Time required to charge battery
- Ability to charge at home
- Performance and handling
- Vehicle safety
- Cost of charging the vehicle
- Body types and sizes available
- Not applicable – already own or lease an electric vehicle
- Something else, please specify:

Don't know

12. What, if anything, would you like to know more about electric or plug-in hybrid vehicles?

- Nothing Don't know

13. Are you a Portland General Electric customer?

- Yes
- No
- Not applicable – Don't pay for Electricity bill
- Don't know

13. How many vehicles does your household own or lease?

_____ Vehicles None

14. Thinking about the vehicle you use for your Lyft or Uber rides, is that vehicle...

- Primarily used for Lyft or Uber rides
- Used for both Lyft or Uber rides and for personal use
- Or, something else, please specify:

15. Approximately how many miles do you drive per week for Lyft or Uber rides?

_____ miles per week Don't know N/A

16. Approximately how many miles do you drive per week for personal reasons?

_____ miles per week Don't know N/A

17. What type of home do you live in?

- Single-family detached house with a driveway
- Single-family detached house with no driveway
- Single-family attached home (such as townhouse)
- Duplex, triplex or four-plex
- Apartment or condominium with 5 units or more
- Manufactured or mobile home
- Other, please specify:

Prefer not to answer

18. What is your zip code? _____

19. Do you or members of your household own or rent your home?

- Own Rent

20. What was your approximate total household income in 2018, before taxes?

- Less than \$25,000
- \$25,000 to \$49,999
- \$50,000 to \$74,999
- \$75,000 to \$99,999
- \$100,000 to \$149,999
- \$150,000 or more
- Prefer not to answer

21. Would you like to receive additional information from PGE about electric or plug-in hybrid vehicles?

- Yes (Please provide your email address):

No thank you

**Thank you for completing
the survey!**

Appendix K. Business Technical Assistance and Training Survey Instrument

Screening

[PIPE IN THOSE WHO RECEIVED A CONSULTATION FROM PGE]

- S1. Did you, or someone in your organization consult with PGE about electric vehicles and/or charging in 2018 or 2019?

[SINGLE RESPONSE]

1. Yes
2. No

[IF S1=No, ASK]

- S2. Do you know who at your organization spoke with PGE staff about charging, electric vehicles, or fleet electrification?

Name: [OPEN-ENDED RESPONSE]

Email: [OPEN-ENDED RESPONSE]

[TERMINATE THOSE WHO SAID THEY DID NOT RECEIVE CONSULTATION FROM PGE UNLESS THEY ATTENDED PGE-FUNDED EV CLASS, WEBINAR, OR INDUSTRY EVENT. IF ATTENDED PGE-FUNDED EV CLASS, WEBINAR, OR INDUSTRY EVENT, PROCEED TO S3]

[PIPE IN THOSE WHO ATTENDED THE PGE-FUNDED EV CLASS, WEBINAR, OR INDUSTRY EVENT]

- S3. Did you attend the following PGE-funded EV webinar, class, or an industry presentation event: [LIST THE EVENT(S)]?

1. Yes
2. No

[TERMINATE IF THEY SAY THEY DID NOT ATTEND PGE-FUNDED EV CLASS, WEBINAR, OR INDUSTRY EVENT]

EV Education: Classes, Webinars, and Industry Events

[ASK THOSE WHO ATTENDED PGE EV CLASS, WEBINAR, OR INDUSTRY PRESENTATION EVENT]

- Q1. How did you hear about PGE'S [INPUT CLASS, WEBINAR, OR INDUSTRY PRESENTATION EVENT THEY ATTENDED]? *Select all that apply.*

[MULTIPLE RESPONSE- RANDOMIZE OPTIONS]

1. PGE emailed me
2. A colleague or someone in my industry told me
3. From PGE's website
4. [EV TRAINING IMPLEMENTER]
5. [SHOW IF ATTENDED PGE'S PRESENTATION AT A CONFERENCE] At a conference PGE speaker presented at
6. [SHOW IF ATTENDED PGE/TRAINING IMPLEMENTER EVENT] From [BUILDIER TRAINING IMPLEMENTER]
96. Another source, please specify: [OPEN-ENDED RESPONSE]

98. Don't know

[ASK THOSE WHO ATTENDED PGE EV CLASS, WEBINAR, OR INDUSTRY PRESENTATION EVENT]

Q2. Why did you attend PGE's class or presentation on charging or fleet electrification? *Select all that apply.*

[MULTIPLE RESPONSE- RANDOMIZE OPTIONS]

1. To learn about smart home technologies
2. To learn about electric vehicles (EVs)
3. To learn about installing EV chargers on your premises
4. To learn about making new homes EV ready
96. Another reason, please specify: [OPEN-ENDED RESPONSE]
98. Don't know

[ASK THOSE WHO ATTENDED PGE EV CLASS, WEBINAR, OR INDUSTRY PRESENTATION EVENT]

Q3. Thinking about how PGE staff or PGE-sponsored speakers explained the EV or charging concepts, would you say that the explanation was:

[SINGLE RESPONSE]

1. Far too advanced
2. Somewhat too advanced
3. About right
4. Somewhat too basic
5. Far too basic
96. Other, please specify: [OPEN-ENDED RESPONSE]
98. Don't know

[ASK IF Q3 = 1 OR 2]

Q4. What about the explanation was too advanced?

1. [OPEN-ENDED RESPONSE]

[ASK THOSE WHO ATTENDED PGE EV CLASS, WEBINAR, OR INDUSTRY PRESENTATION EVENT]

Q5. What concepts were not covered that should have been covered? If no additional concepts should have been covered, please select "none".

1. [OPEN-ENDED RESPONSE]

[ASK THOSE WHO ATTENDED PGE EV CLASS, WEBINAR, OR INDUSTRY PRESENTATION EVENT]

Q6. How likely are you to recommend PGE's [INPUT CLASS, WEBINAR, OR INDUSTRY PRESENTATION EVENT THEY ATTENDED] to a colleague or other industry professional?

[SINGLE RESPONSE]

1. 0 - Not at all likely
2. 1
3. 2
4. 3
5. 4
6. 5
7. 6
8. 7

- 9. 8
- 10. 9
- 11. 10 – Extremely likely
- 98. Don't Know

[ASK THOSE WHO ATTENDED PGE EV CLASS, WEBINAR, OR INDUSTRY PRESENTATION EVENT]

Q7. Please rate your overall satisfaction with PGE's [INPUT CLASS, WEBINAR, OR INDUSTRY PRESENTATION EVENT THEY ATTENDED] on the following scale.

[SINGLE RESPONSE; INSERT 0-10 SCALE WHERE 0=Not at all satisfied AND 10=Completely satisfied WITH DON'T KNOW OPTION; LABEL ONLY THE END POINTS]

[ASK THOSE WHO ATTENDED PGE EV CLASS, WEBINAR, OR INDUSTRY PRESENTATION EVENT EXCEPT FOR THOSE WHO ATTENDED TRAININGS]

Q8. After attending PGE's [INPUT CLASS, WEBINAR, OR INDUSTRY PRESENTATION EVENT THEY ATTENDED], how well were you prepared to:

- a. Purchase the appropriate EVs for your fleet or business if you chose to do it
- b. Select the appropriate charging equipment if you chose to do it
- c. Install or find someone to install charging equipment if you chose to do it

[FOR EACH ITEM ABOVE, INSERT 0-10 SCALE WHERE 0=Not at all prepared AND 10=Extremely well prepared WITH DON'T KNOW OPTION; LABEL ONLY THE END POINTS)

[ASK THOSE WHO ATTENDED PGE PRESENTATION AT TRAINING]

Q9. After attending PGE's and [BUILDER TRAINING IMPLEMENTER] on EV-ready homes in [INSERT DATE], how well are you prepared to make a new home "EV-ready"?

[INSERT 0-10 SCALE WHERE 0=Not at all prepared AND 10=Extremely well prepared WITH DON'T KNOW OPTION; LABEL ONLY THE END POINTS)

[ASK THOSE WHO ATTENDED PGE EV CLASS, WEBINAR, OR INDUSTRY PRESENTATION EVENT]

Q10. At the time you attended PGE's [INPUT CLASS, WEBINAR, OR INDUSTRY PRESENTATION EVENT THEY ATTENDED], where were you in your process of deciding about electric vehicle options or investment(s) in charging?

[MULTIPLE RESPONSE]

- 1. Seeking initial information
- 2. Considering or planning an investment
- 3. Actively evaluating your plan
- 4. In the design or purchase process
- 5. Had already designed or purchased but looking for additional advice
- 96. Other, please specify: [OPEN-ENDED RESPONSE]
- 97. Not applicable – please explain: [OPEN-ENDED RESPONSE]
- 98. Don't know
- 99. Refused

PGE EV Consultations

[ASK THOSE WHO RECEIVED A CONSULT]

Q11. How did you hear about PGE's business electric vehicle consultation services? Select all that apply.

[MULTIPLE RESPONSE- RANDOMIZE OPTIONS]

1. PGE emailed me
2. PGE sent a letter or postcard about it
3. A colleague or someone in my industry told me
4. From PGE's website
5. At a conference a PGE speaker presented at
6. A class or webinar a PGE speaker presented at
7. Someone from the PGE Key Customer Manager team
8. Someone else at PGE
9. From [BUILDER TRAINING IMPLEMENTER]
10. From [EV TRAINING IMPLEMENTER]
96. Another source, please specify: [OPEN-ENDED RESPONSE]
98. Don't know

[ASK THOSE WHO RECEIVED A CONSULT]

Q12. Where were you in your process of deciding about electric vehicle options or investment in charging?
Were you...

[MULTIPLE RESPONSE]

1. Seeking initial information
2. Considering or planning investment
3. Actively evaluating your plan
4. In the design or purchase process
5. Had already designed or purchased but looking for additional advice
96. Other, please specify: [OPEN-ENDED RESPONSE]
97. Not applicable
98. Don't know
99. Refused

[ASK THOSE WHO RECEIVED A CONSULT]

Q13. Why did you decide to have a consultation from PGE? Select all that apply.

[MULTIPLE RESPONSE- RANDOMIZE OPTIONS]

1. Wanted to know the benefits of electric vehicles for my business or organization
2. Wanted to understand the costs associated with chargers
3. Wanted to understand where the best location to place chargers
4. Wanted to learn about required or potential PGE distribution system upgrades
5. Needed help selecting the right chargers for my business or organization
6. Learn about technical expertise and resources available
7. Learn about electric vehicle incentives available
96. Another reason, please specify: [OPEN-ENDED RESPONSE]
98. Don't know

[ASK THOSE WHO RECEIVED A CONSULT]

Q14. What topics were covered during your consultation(s)?

[MULTIPLE RESPONSE]

1. Fleet electrification – associated costs
2. Fleet electrification – benefits to your business or organization
3. Fleet electrification – technical resources available
4. Fleet electrification – financial resources available
5. Charging infrastructure – associated costs
6. Charging infrastructure – benefits to your business or organization
7. Charging infrastructure – technical resources available
8. Charging infrastructure – financial resources available
9. Charging infrastructure – PGE distribution systems upgrades required
96. Something else, please specify: [OPEN-ENDED RESPONSE]
98. Don't know

[ASK THOSE WHO RECEIVED A CONSULT]

Q15. What, if any, additional information would you have liked from the consultation you received?

1. [OPEN-ENDED RESPONSE]
97. No additional information
98. Don't know

[ASK THOSE WHO RECEIVED A CONSULT]

Q16. How likely are you to recommend the PGE's consultation you received to a colleague or other industry professional?

[SINGLE RESPONSE]

1. 0 - Not at all likely
2. 1
3. 2
4. 3
5. 4
6. 5
7. 6
8. 7
9. 8
10. 9
11. 10 – Extremely likely
98. Don't Know

[ASK THOSE WHO RECEIVED A CONSULT]

Q17. Please rate your overall satisfaction with the consultation you received using a scale from 0 to 10, with 0 meaning “not at all satisfied” and 10 meaning “completely satisfied” on the following scale.

[SINGLE RESPONSE; INSERT 0-10 SCALE WHERE 0=Not at all satisfied AND 10=Completely satisfied WITH DON'T KNOW OPTION; LABEL ONLY THE END POINTS]

[ASK THOSE WHO THOSE WHO RECEIVED A CONSULT]

Q18. After receiving a consultation from PGE, how well prepared were you to:

- a. Purchase the appropriate EVs for your fleet or business if you chose to do it
- b. Select the appropriate charging equipment if you chose to do it
- c. Install or find someone to install charging equipment if you chose to do it

[FOR EACH ITEM ABOVE, INSERT 0-10 SCALE WHERE 0=Not at all prepared AND 10=Extremely well prepared WITH DON'T KNOW OPTION; LABEL ONLY THE END POINTS)

Awareness of Other PGE EV Pilot Efforts

[ASK ALL]

Q19. Which of these PGE electric vehicle resources, campaigns, or discounts have you seen or heard of?
Select all that apply.

[MULTIPLE RESPONSE – RANDOMIZE OPTIONS]

1. Social media information from PGE on electric vehicles
2. Emails from PGE on electric vehicle services or classes
3. PGE website information on electric vehicles
4. PGE's and Nissan's combined \$3,500 discount for the Nissan Leaf
5. PGE and Chevy's \$500 discount for electric vehicles or a free Level 2 charger
6. Interactive displays (EV educational kiosks) at dealerships with vehicle charging information (PGE sponsors those)
7. National Drive Electric Week advertising (in 2018 or 2019)
8. PGE's Electric Avenues in downtown Portland
9. PGE's Electric Avenues in Milwaukee
10. PGE's Electric Avenues in Hillsboro
11. PGE's Drive Change Fund
97. Did not see any of these
98. Don't know

Charging Installations, Fleet Purchases, or Building EV Ready Homes

Charging Installations

[ASK ALL]

Q20. Does your organization provide a parking garage or lot for your employees or customers? *This does not include on-street parking.*

[SINGLE RESPONSE]

1. Yes
2. No
98. Don't know

[ASK IF Q20= 1 (YES)]

Q21. Has your organization installed any electric vehicle charging equipment in your parking garage or lot?

[SINGLE RESPONSE]

- 1. Yes
- 2. No
- 98. Don't know

[ASK IF Q21= 1 (YES)]

Q22. How many chargers did you install? Select appropriate quantity for each type. If zero, select "none".

DC FAST CHARGERS	LEVEL 2 (240 V)	STANDARD OUTLETS (120 V)
None	None	None
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
More than 5	More than 5	More than 5
98. Don't Know	98. Don't Know	98. Don't Know

[ASK IF Q21= 1 (YES) AND (Q22_DC FAST CHARGERS >0 OR DON'T KNOW)]

Q23. When were the DC Fast charger(s) installed? *If at multiple dates, please select all dates that apply.*

Year 2018 [MULTIPLE RESPONSE]	Year 2019 [MULTIPLE RESPONSE]
<input type="checkbox"/> Before May 2018	<input type="checkbox"/> January 2019
<input type="checkbox"/> May 2018	<input type="checkbox"/> February 2019
<input type="checkbox"/> June 2018	<input type="checkbox"/> March 2019
<input type="checkbox"/> July 2018	<input type="checkbox"/> April 2019
<input type="checkbox"/> August 2018	<input type="checkbox"/> May 2019
<input type="checkbox"/> September 2018	<input type="checkbox"/> June 2019
<input type="checkbox"/> October 2018	<input type="checkbox"/> July 2019
<input type="checkbox"/> November 2018	<input type="checkbox"/> August 2019
<input type="checkbox"/> December 2018	<input type="checkbox"/> Don't know

[ASK IF Q21= 1 (YES) AND (Q22_LEVEL 2 >0 OR DON'T KNOW)]

Q24. When were the Level 2 charger(s) installed? *If at multiple dates, please select all dates that apply.*

Year 2018 [MULTIPLE RESPONSE]	Year 2019 [MULTIPLE RESPONSE]
<input type="checkbox"/> Before May 2018	<input type="checkbox"/> January 2019
<input type="checkbox"/> May 2018	<input type="checkbox"/> February 2019
<input type="checkbox"/> June 2018	<input type="checkbox"/> March 2019
<input type="checkbox"/> July 2018	<input type="checkbox"/> April 2019
<input type="checkbox"/> August 2018	<input type="checkbox"/> May 2019
<input type="checkbox"/> September 2018	<input type="checkbox"/> June 2019
<input type="checkbox"/> October 2018	<input type="checkbox"/> July 2019

Year 2018 [MULTIPLE RESPONSE]	Year 2019 [MULTIPLE RESPONSE]
<input type="checkbox"/> November 2018	<input type="checkbox"/> August 2019
<input type="checkbox"/> December 2018	<input type="checkbox"/> Don't know

[ASK IF Q21= 1 (YES) AND (Q22_STANDARD >0 OR DON'T KNOW)]

Q25. When were the standard outlets installed? If at multiple dates, please select all dates that apply.

Year 2018 [MULTIPLE RESPONSE]	Year 2019 [MULTIPLE RESPONSE]
<input type="checkbox"/> Before May 2018	<input type="checkbox"/> January 2019
<input type="checkbox"/> May 2018	<input type="checkbox"/> February 2019
<input type="checkbox"/> June 2018	<input type="checkbox"/> March 2019
<input type="checkbox"/> July 2018	<input type="checkbox"/> April 2019
<input type="checkbox"/> August 2018	<input type="checkbox"/> May 2019
<input type="checkbox"/> September 2018	<input type="checkbox"/> June 2019
<input type="checkbox"/> October 2018	<input type="checkbox"/> July 2019
<input type="checkbox"/> November 2018	<input type="checkbox"/> August 2019
<input type="checkbox"/> December 2018	<input type="checkbox"/> Don't know

[ASK IF Q22 <> 0 (NONE) OR 98 (DON'T KNOW) ELSE SKIP TO Q36]

Q26. Did you receive financial assistance for any of your installed chargers? Please select all that apply.
 [MULTIPLE RESPONSE]

1. Grant(s)
2. Loan(s)
3. Tax Credit
4. Rebate(s)
5. Discount(s) from manufacturer(s) or vendor(s)
96. Other, please specify: [OPEN-ENDED RESPONSE]
97. No – I did not receive any financial assistance
98. Don't know

[ASK IF Q26 = 1 - 96]

Q26a. Did you receive this financial assistance from PGE or other sources?

	Source	
	PGE	non-PGE
[IF Q26 = 1] Grant(s)	<input type="checkbox"/>	<input type="checkbox"/>
[IF Q26 = 2] Loan(s)	<input type="checkbox"/>	<input type="checkbox"/>
[IF Q26 = 3] Tax Credit	<input type="checkbox"/>	<input type="checkbox"/>
[IF Q26 = 4] Rebate(s)	<input type="checkbox"/>	<input type="checkbox"/>
[IF Q26 = 5] Discount(s) from manufacturer(s) or vendor(s)	<input type="checkbox"/>	<input type="checkbox"/>
[IF Q26 = 96] [pipe in response from Q26_other] [OPEN-ENDED RESPONSE]	<input type="checkbox"/>	<input type="checkbox"/>

[ASK IF Q21= 1(YES) AND THEY RECEIVED A CONSULT]

Q27. Please indicate how influential the consultation from PGE was in the decision to install any of your charger(s).

[INSERT 0-10 SCALE FOR EACH ITEM WHERE 0=Not at all influential AND 10=Extremely influential WITH DON'T KNOW OPTION; LABEL ONLY THE END POINTS]

[ASK IF Q21= 1(YES) AND THEY ATTENDED A PGE-FUNDED CLASS, WEBINAR, OR INDUSTRY EVENT]

Q28. Please indicate how influential the information you received when you attended PGE class, webinar, or presentation was in the decision to install any of your charger(s).

[INSERT 0-10 SCALE FOR EACH ITEM WHERE 0=Not at all influential AND 10=Extremely influential WITH DON'T KNOW OPTION; LABEL ONLY THE END POINTS]

[ASK IF Q21= 1(YES) AND Q26 (AT LEAST ONE ITEM SELECTED)]

Q29. The following is a list of additional items that could have influenced your organization to install the charger(s). For each one, please indicate how important the item was in the decision to install the charger(s).

[INSERT 0-10 SCALE FOR EACH ITEM WHERE 0=Not at all important AND 10=Extremely important WITH DON'T KNOW OPTION; LABEL ONLY THE END POINTS]

[DISPLAY ONLY OPTIONS THAT THEY SELECTED IN Q26]

1. Grant(s) you said you received
2. Loan(s) you said you received
3. Tax credit you said you received
4. Rebate(s) you said you received
5. Manufacturer/vendor discount(s) you said you received
6. Anything else – if so, please specify: [OPEN-ENDED RESPONSE]

[ASK IF Q21= 1(YES) AND ANY ITEM IN Q27 TO Q29 WAS RATED 1 AND ABOVE]

Q30. Please use #1, #2, and so forth to rank which factors had the greatest influence (#1), next-greatest influence (#2), and so forth on the decision to install charger(s)

If there is only one item on the list below, please enter "1" and click on the arrow button to proceed.

DISPLAY ONLY THOSE ITEMS THEY RATED IN Q27 TO Q29 AS 1 OR ABOVE AND RANDOMIZE OPTIONS	RANK
1. PGE's technical assistance/ consultation you received	
2. Information from PGE's class, webinar or presentation	
3. Grant(s) you said you received	
4. Loan(s) you said you received	
5. Tax credit you said you received	
6. Rebate(s) you said you received	
7. Manufacturer/vendor discount(s) you said you received	
8. Other factor(s) you mentioned	

[ASK IF Q21= 1]

Q31. If your organization had not received [INPUT “a consultation from PGE” if they received a consultation or INPUT “information from PGE” if they attended PGE-funded class, webinar, or industry event], which of the following is most likely: Your organization would have...

[SINGLE RESPONSE]

1. ...postponed installing charging equipment for 2-3 years
2. ...done the installation, but would have scaled the project down
3. ...done the exact same installation(s)
4. ...done something else. If so, what: [OPEN-ENDED RESPONSE]
98. Don't Know

[ASK IF Q31= 2]

Q32. You said your organization would have scaled the project down. How would the scope have changed?

1. [OPEN-ENDED RESPONSE]
98. Don't know

[ASK IF Q21= 1 (YES)]

Q33. Is/are your charging station(s) open to the public?

[SINGLE RESPONSE]

1. No – it is intended for private-use, company electric vehicles only
2. Yes, but only employees, customers, or guests who drive an EV can use it/them
3. Yes, anyone with an EV can use it/them
4. Other, please specify: [OPEN-ENDED RESPONSE]
98. Don't know

[ASK IF Q21= 1 (YES) AND Q33=2, 3, OR 4]

Q34. On the following scale, did these interactions with PGE influence you to open your charging station(s) to others outside of your organization?

[INSERT 0-10 SCALE FOR EACH ITEM WHERE 0=No at all influential AND 10=Extremely influential WITH DK; LABEL ONLY THE END POINTS]

[DISPLAY ONLY OPTIONS THAT APPLY TO EACH RESPONDENT]

1. PGE's technical assistance/ consultation you received
2. Information from PGE's class, webinar, or presentation(s)

[ASK IF Q21= 1 (YES)]

Q35. What challenges, if any, did you have with purchasing, installing, or permitting your charging station(s)?

[MULTIPLE RESPONSE; RANDOMIZE OPTIONS]

1. Contractor took more time than expected to complete the installation
2. The installation went over budget
3. Permitting took extra time
4. Stations did not work as intended initially
5. Stations still do not function properly
6. Other, please specify: [OPEN-ENDED RESPONSE]
7. NO CHALLENGES
98. Don't know

[ASK IF Q21 = 2 OR 98]

Q36. What is stopping you from installing charging infrastructure in your parking area(s)?

[MULTIPLE RESPONSE – RANDOMIZE OPTIONS]

1. Too expensive (high up-front cost even after the incentives)
2. Concerns with maintenance
3. Concerns about reliability or uptime
4. Concerns about staff and customers sharing access over the course of the day
5. Not sure how to find a vendor that does these installations
6. Not sure how to start the process
7. Benefits of adding charging not clear to me
8. Lack of staff resources to devote to the project
9. Insufficient space for chargers
10. Other, please describe: [OPEN-ENDED RESPONSE]
98. Don't know

[ASK IF Q21 = 2 OR 98]

Q37. What is your likelihood of installing a charging infrastructure in your parking area(s) within the next three years?

[SINGLE RESPONSE]

1. Not at all likely
2. Not very likely
3. Neutral
4. Somewhat likely
5. Very likely
98. Don't know

[ASK IF Q21 = 2 OR 981]

Q38. What effect did [INPUT “a consultation from PGE” if they received a consultation or INPUT “information from PGE” if they attended PGE-funded class, webinar, or industry event] have on your likelihood of installing a charging infrastructure in your parking area(s) within the next three years?

[SINGLE RESPONSE]

1. Decreased it a great deal
2. Decreased it a little
3. No change
4. Increased it a little
5. Increased it a great deal
98. Don't know

EV Purchases

[ASK ALL]

Q39. What types of commercial fleets, if any, does your organization own?

[MULTIPLE RESPONSE]

1. Forklifts/Lift Trucks
2. Passenger cars

3. Vans
4. School buses
5. Public transit buses
6. Tour buses
7. Delivery refrigeration trucks
8. Other, please specify: [OPEN-ENDED RESPONSE]
9. None
98. Don't know

[ASK IF ANY OF THE 1-8 OPTIONS ARE SELECTED IN Q39]

Q40. Please indicate the number of electric vehicles in your fleet today, by type.

[DISPLAY ONLY OPTIONS THEY SELECTED IN Q39]

1. Forklifts/Lift Trucks: [OPEN-ENDED RESPONSE]
2. Passenger cars: [OPEN-ENDED RESPONSE]
3. Vans: [OPEN-ENDED RESPONSE]
4. Buses: [OPEN-ENDED RESPONSE]
5. Delivery refrigeration trucks: [OPEN-ENDED RESPONSE]
6. Other [PIPE IN FROM Q39_OTHER]: [OPEN-ENDED RESPONSE]

[ASK IF ANY EVS IN Q40]

Q41. And please indicate the number of electric vehicles in your fleet that you purchased **after working or interacting with PGE**.

[DISPLAY ONLY OPTIONS THEY SELECTED IN Q40]

1. Forklifts/Lift Trucks: [OPEN-ENDED RESPONSE]
2. Passenger cars: [OPEN-ENDED RESPONSE]
3. Vans: [OPEN-ENDED RESPONSE]
4. Buses: [OPEN-ENDED RESPONSE]
5. Delivery refrigeration trucks: [OPEN-ENDED RESPONSE]
6. Other [PIPE IN FROM Q39_OTHER]: [OPEN-ENDED RESPONSE]

[ASK IF ANY 1-6 OPTIONS IN Q40 > 0]

Q42. Did you receive any financial assistance when you bought your electric vehicle(s)? Please select all that apply. [MULTIPLE RESPONSE]

1. Grant(s)
2. Loan(s)
3. Tax Credit
4. Rebate(s)
5. Discount(s) from manufacturer(s) or vendor(s)
96. Other, please specify: [OPEN-ENDED RESPONSE]
97. No – I did not receive any financial assistance
98. Don't know

[ASK IF Q42 = 1 - 96]

Q42a. Did you receive this financial assistance from PGE or other sources?

	Source	
	PGE	non-PGE
[IF Q42 = 1] Grant(s)	<input type="checkbox"/>	<input type="checkbox"/>
[IF Q42 = 2] Loan(s)	<input type="checkbox"/>	<input type="checkbox"/>
[IF Q42 = 3] Tax Credit	<input type="checkbox"/>	<input type="checkbox"/>
[IF Q42 = 4] Rebate(s)	<input type="checkbox"/>	<input type="checkbox"/>
[IF Q42 = 5] Discount(s) from manufacturer(s) or vendor(s)	<input type="checkbox"/>	<input type="checkbox"/>
[IF Q42 = 96] [pipe in response from Q42_other] [OPEN-ENDED RESPONSE]	<input type="checkbox"/>	<input type="checkbox"/>

[ASK IF ANY 1-6 OPTIONS IN Q41 > 0 AND THEY RECEIVED A CONSULT]

Q43. Please indicate how influential the consultation from PGE was in the decision to buy any of your electric vehicles.

[INSERT 0-10 SCALE FOR EACH ITEM WHERE 0=No at all influential AND 10=Extremely influential WITH DON'T KNOW OPTION; LABEL ONLY THE END POINTS]

[ASK IF ANY 1-6 OPTIONS IN Q41 > 0 AND THEY ATTENDED A PGE-FUNDED CLASS, WEBINAR, OR INDUSTRY EVENT]

Q44. Please indicate how influential the information you received when you attended PGE class, webinar, or presentation was in the decision to buy any of your electric vehicles.

[INSERT 0-10 SCALE FOR EACH ITEM WHERE 0=Not at all influential AND 10=Extremely influential WITH DON'T KNOW OPTION; LABEL ONLY THE END POINTS]

[ASK IF ANY 1-6 OPTIONS IN Q41 > 0]

Q45. The following is a list of additional items that could have influenced your organization to buy an electric vehicle(s). For each one, please indicate how influential it was the decision to purchase an electric vehicle(s) for your fleet(s).

[INSERT 0-10 SCALE FOR EACH ITEM WHERE 0=Not at all influential AND 10=Extremely influential WITH DK; LABEL ONLY THE END POINTS] [DISPLAY ONLY OPTIONS THAT APPLY TO EACH RESPONDENT]

1. Grant(s) you said you received
2. Loan(s) you said you received
3. Tax credit you said you received
4. Rebate(s) you said you received
5. Manufacturer or dealer discount(s) you said you received
6. Anything else – if so please, specify: [OPEN-ENDED RESPONSE]

[ASK IF ANY 1-6 OPTIONS IN Q41 > 0 AND ANY ITEM IN Q43 - Q45 WAS RATED 1 AND ABOVE]

Q46. Please use #1, #2, and so forth to rank which factors had the greatest influence (#1), next-greatest influence (#2), and so forth on the decision to buy an electric vehicle(s)

If there is only one item on the list below, please enter "1" and click on the arrow button to proceed.

DISPLAY ONLY THOSE ITEMS THEY RATED IN Q43 - Q45 AS 1 OR ABOVE	RANK
1. PGE's technical assistance/ consultation you received	

DISPLAY ONLY THOSE ITEMS THEY RATED IN Q43 - Q45 AS 1 OR ABOVE	RANK
2. Information from PGE's class, webinar or presentation	
3. Grant(s) you said you received	
4. Loan(s) you said you received	
5. Tax credit you said you received	
6. Rebate(s) you said you received	
7. Manufacturer/dealer discount(s) you said you received	
8. Other factor(s) you mentioned	

[ASK IF ANY 1-6 OPTIONS IN Q40 > 0]

Q47. If your organization had not received [INPUT "a consultation from PGE" if they received a consultation or INPUT "information from PGE" if they attended PGE-funded class, webinar, or industry event], which of the following is most likely: Your organization would have...

[SINGLE RESPONSE]

1. ...postponed buying electric vehicles for 2-3 years
2. ...bought the electric vehicles, but not as many
3. ...bought the exact same and number of vehicles
4. ...done something else. If so, what: [OPEN-ENDED RESPONSE]
98. Don't Know

[ASK IF ANY OF THE 1-8 OPTIONS ARE SELECTED IN Q39]

Q48. What keeps your organization from purchasing an electric or additional electric vehicle(s) for your fleet]?

[MULTIPLE RESPONSE]

1. Not aware that there is an electric version for certain fleets
2. Concerns about vehicle range
3. Concerns about where to charge (chargers owned by others)
4. Unable to install chargers on my property
5. Cost is too high compared to the gasoline or diesel model(s)
6. Concerns about longevity of the battery
7. My entire fleet is now electrified
8. Other, please describe: [OPEN-ENDED RESPONSE]
98. Don't know

[ASK ALL]

Q49. What is your likelihood of purchasing or leasing a plug-in vehicle(s) (100% electric or plug-in hybrid) for commercial or business use within the next three years?

[SINGLE RESPONSE]

1. Not at all likely
2. Not very likely
3. Neutral
4. Somewhat likely
5. Very likely
98. Don't know

[ASK ALL]

Q50. What effect did [INPUT “a consultation from PGE” if they received a consultation or INPUT “information from PGE” if they attended PGE-funded class, webinar, or industry event] have on your likelihood of purchasing or leasing a plug-in vehicle(s) (100% electric or plug-in hybrid) within the next three years?

[SINGLE RESPONSE]

1. Decreased it a great deal
2. Decreased it a little
3. No change
4. Increased it a little
5. Increased it a great deal
98. Don't know

[ASK ALL]

Q51. What is your organization’s primary business or activity?

[SINGLE RESPONSE]

1. Local government
2. Architecture or design
3. Property development or property management
4. Building or construction
5. Electrical subcontractor
6. Other, please describe: [OPEN-ENDED RESPONSE]
98. Don't know

EV-ready Homes

[ASK IF Q51=2,3,4,5 (BUILDING TRADE)]

Q52. In how many new construction homes or buildings has your organization included a 240V electric vehicle charging plug(s)?

[SINGLE RESPONSE]

1. None
2. 1
3. 2
4. 3
5. 4
6. 5
7. 6
8. 7
9. 8
10. 9
11. 10
12. More than 10 – please specify: [OPEN-ENDED RESPONSE]
97. Not Applicable – not involved in new construction
98. Don't know

[ASK IF Q52=2 THROUGH 12 (INDICATED THEY INCLUDED A 240V PLUG)]

Q53. When did you decide to include a 240V electric vehicle option in new construction?

1. Please provide an approximate date – month and year: [OPEN-ENDED RESPONSE]
98. Don't know

[ASK IF Q51=2,3,4,5 (BUILDING TRADE)]

Q54. Do you sell, recommend or include EV-plug or charging options when bidding on electrical or remodeling jobs in existing homes or buildings?

[SINGLE RESPONSE]

1. Yes
2. No
99. Not Applicable – not involved in remodeling existing homes or buildings
98. Don't know

[ASK IF Q54=1 (YES)]

Q55. When did you decide to include EV-plug or charging options when bidding on electrical or remodeling jobs in existing homes or buildings?

1. Please provide an approximate date – month and year: [OPEN-ENDED RESPONSE]
98. Don't know

[ASK IF Q54=1 (YES)]

Q56. In how many **existing** homes or buildings have you installed an EV-plug or charging option?

1. None
2. 1
3. 2
4. 3
5. 4
6. 5
7. 6
8. 7
9. 8
10. 9
11. 10
12. More than 10 – please specify: [OPEN-ENDED RESPONSE]
98. Don't know

[ASK IF Q52=2-12 (YES) OR Q54=1 (YES) AND TRAINING IMPLEMENTER = 1]

Q57. If you had not received information from PGE when you attended their presentation at [BUILDER TRAINING IMPLEMENTER] event on [INSERT DATE], which of the following is most likely: Your organization...

[SINGLE RESPONSE]

1. ... would have not considered offering EV-ready home options
2. ... would have considered offering EV-ready home options
3. ...done something else. If so, what: [OPEN-ENDED RESPONSE]
98. Don't Know

[ASK IF Q52=2-12 OR Q54=1 (YES) AND BUILDER TRAINING = 1]

Q58. Please indicate how influential the information you received when you attended PGE presentation at [BUILDER TRAINING IMPLEMENTER] event was in the decision to offer EV-ready home options.

[INSERT 0-10 SCALE FOR EACH ITEM WHERE 0=Not at all influential AND 10=Extremely influential WITH DON'T KNOW OPTION; LABEL ONLY THE END POINTS]

[ASK IF Q52=1 (NONE) OR Q54=2 (NO)]

Q59. What keeps your organization from selling EV-ready homes or charging plug option(s)?

[MULTIPLE RESPONSE]

1. Added cost
2. Clients are not asking for it
3. Not sure what an EV-ready home is
4. Other, please describe: [OPEN-ENDED RESPONSE]
98. Don't know

[ASK IF Q52=1 (NONE) OR Q54=2 (NO)]

Q60. In the next three years, how likely is it that you will always offer a 240V electric vehicle charging plug when bidding on a project or building/designing a home?

[SINGLE RESPONSE]

1. Not at all likely
2. Not very likely
3. Neutral
4. Somewhat likely
5. Very likely
98. Don't know

[ASK IF Q52=1 (NONE) OR Q54=2 (NO)]

Q61. What effect did information from PGE have on your likelihood to offer a 240V electric vehicle plug when bidding on a project or building/designing a home?

[SINGLE RESPONSE]

1. Decreased it a great deal
2. Decreased it a little
3. No change
4. Increased it a little
5. Increased it a great deal
98. Don't know

Firmographics

[ASK ALL]

Q62. How many employees work for you organization in Oregon?

[SINGLE RESPONSE]

1. Less than 10
2. 11-50

- 3. 51-100
- 4. 101-500
- 5. 501-1,000
- 6. Over 1,000
- 98. Don't know

Thank you for your time and feedback. You will receive an email with information about choosing your \$20 gift card.

Termination Script:

[IF RESPONDENTS DO NOT PASS SCREENING QUESTIONS AT THE BEGINNING OF THE SURVEY]

Thank you for being willing to take our survey. We are looking for those who received a consultation from PGE or attended a PGE-funded class, webinar, or presentation at an industry event.

We don't have any additional questions for you now but we may reach out in the future.

For more information, please contact:

Zac Hathaway
Managing Consultant

503-943-2371 tel
zhathaway@opiniondynamics.com

3934 NE Martin Luther King Jr. Blvd., Suite 300
Portland, OR 97212



Opinion **Dynamics**

Boston | Headquarters

617 492 1400 tel
617 492 7944 fax
800 966 1254 toll free

1000 Winter Street
Waltham, MA 02451

San Francisco Bay

510 444 5050 tel
510 444 5222 fax

1 Kaiser Plaza
Suite 445
Oakland, CA 94612

San Diego

858 270 5010 tel
858 270 5211 fax

7590 Fay Avenue
Suite 406
La Jolla, CA 92037

Portland

503 287 9136 tel
503-281-7375 fax

3934 NE MLK Jr. Blvd.
Suite 300
Portland, OR 97212