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## **A Utility Roadmap for Expanding Customer Adoption of Electric Vehicles**

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### **Summary**

Portland General Electric (PGE) is one of only a few electric utilities in the United States actively conducting evaluations of their pilots in support of transportation electrification. Research presented in this paper will examine how PGE customers and employees are responding to incentives, outreach, and educational activities. Findings will illuminate the utility experience after two years of effort and provide concrete guidance for other utilities that seek to expand customer adoption of EVs and PHEVs.

*Keywords: Electric Vehicle (EV), Utility, Consumers, Charging, Infrastructure*

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### **1 Introduction**

Consumer adoption of electric vehicles (EVs) and plug-in hybrid electric vehicles (PHEVs) is a critical component of decreasing transportation sector emissions and addressing global climate change. Efforts in the United States over the last decade have resulted in minimal success at increasing EV and PHEV adoption. In 2018, EV sales accounted for just 2% of all light-duty vehicle sales [1]. Barriers to adoption center around familiarity (due to limited production and promotion from vehicle manufactures), vehicle price, driving range, and perceived lack of charging infrastructure. Eleven U.S. states currently have Zero Emission Vehicle (ZEV) regulations in place to help accelerate EV adoption. Support at a local level, however, is needed to meet these state ZEV goals. Electric utilities are in a unique position to help address these barriers by providing their customers with information and education to encourage EV adoption and provide customers with accessible and reliable charging infrastructure.

Portland General Electric (PGE) has long been involved in encouraging EV adoption in and around Portland, Oregon. In 2011, PGE in partnership with the City of Portland and Portland State University (PSU) launched the first “Electric Avenue” on the PSU campus, which provided EV owners with free public charging (subsidized by PSU) included in the cost of parking. In 2016, PGE moved and expanded the PSU Electric Avenue location to outside its headquarters in downtown Portland. At the same time, PGE launched an Employee EV Research Program, where eligible PGE staff were given financial incentives to assist with purchasing an EV or PHEV. In return, participant staff took monthly and quarterly surveys regarding their EV driving and charging experiences and completed a one-time survey on their EV purchase experience. Participants also completed a 14-day logbook, documenting their daily EV and charging use.

Building off its experience with the first Electric Avenue locations and the Employee Research Program, PGE launched a coordinated set of three five-year pilot programs in late 2018 that encourage greater electrification of the transportation sector in its service territory (the Portland and Salem metro areas). While each pilot program has its specific activities and immediate targets, the pilots work together to bring about several overlapping near-term outcomes including increasing customer awareness and use of EVs, transit buses, and public charging stations and to lower barriers to adoption of EVs for all customers, including those in disadvantaged and underserved communities. This paper discusses evaluation research conducted for two of the three transportation electrification pilots:

- **Outreach, Education, and Technical Assistance Pilot:** To increase adoption of EVs, PGE provides EV technical assistance to organizations that are considering fleet electrification, workplace charging, or procurement of EVs. PGE is working with auto dealers to install educational kiosks (developed by Chargeway) at dealerships and to educate auto dealer staff on a proprietary EV charger labeling system for consumers. In addition to general consumer marketing, PGE is also partnering with Original Equipment Manufacturers (OEMs) to offer combined PGE and OEM EV incentives to PGE customers. PGE is also sponsoring ride-and-drive events to allow customers to test drive EVs.
- **Community Charging Infrastructure Pilot:** PGE has installed six Electric Avenue charging locations throughout its service territory. Locations include areas with limited existing fast charging and high proportions of multifamily properties. In addition to the six Electric Avenue locations, PGE is also installing utility pole-mounted Level 2 chargers in its service territory, that it hopes will provide a quick and efficient way to expand charging access to customers. The pilot aims to test pricing signals to encourage off-peak charging and examine the impact of community charging on increasing adoption of EVs by customers and transportation network company (TNC) drivers. Future research will involve analyzing charger utilization and conducting intercept surveys with Electric Avenue users to better understand user experience and impacts on multifamily residents.

## 2 Methods

In 2018, the authors of this paper conducted an evaluation of PGE's Employee Research Program. Evaluation findings largely drew on survey and logbook data compiled by PGE staff. PGE asked pilot participants to complete monthly and quarterly surveys, which asked about EV charging locations used, types of chargers used at home, and EV ownership experience. The survey data included 1,409 responses from 2016 to 2018. Data were anonymized and lacked information to link responses to specific individuals. PGE also asked pilot participants to fill out logbooks that detailed 14 days of EV usage, including trips taken, charging locations, charging times, charging amounts and odometer readings. The authors transcribed and cleaned logbook data, resulting in a dataset of 106 respondents.

The authors are also conducting a five-year evaluation of PGE's Transportation Electrification Pilot. During the first year of the evaluation, the authors compiled data through various sources, including ride-and-drive intercept surveys, and pre- and post-pilot launch general population surveys.

In 2019, the authors conducted in-person intercept surveys at two PGE-sponsored ride-and-drive events. One event in April 2019 targeted general public drivers and the other event in November 2019 targeted TNC drivers. The key objectives of the surveys were to understand reasons for attending the events, participant satisfaction, understand consideration and intention to purchase or lease an EV in the near future, and attendee exposure to other PGE outreach and education campaigns or resources. In total, 39 surveys were completed with ride-and-drive participants. In addition to the two ride-and-drive surveys conducted by the authors, PGE staff conducted a brief survey at the National Drive Electric Week event in September 2019. Seventy-nine event attendees who participated in a ride-and-drive completed the brief survey. Additional ride-and-drive surveys will be conducted at larger events similar to the National Drive Electric Week event in the future and results will be combined to enable more robust analyses.

In 2018, PGE conducted a baseline survey with the general population of residential customers that indicated they were considering purchasing a vehicle in the next five years. The survey explored EV awareness and perceptions in the PGE territory. The authors adapted the 2018 Baseline survey to create a post-pilot launch survey that was fielded in 2019. For the 2018 ("Baseline") and 2019 ("Wave 1") surveys, a random sample

of PGE residential customers with email addresses was invited to take the web-based survey via email invitation.

Both the Baseline and Wave 1 surveys 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 PGE customers are familiar with any pilot campaigns. 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.

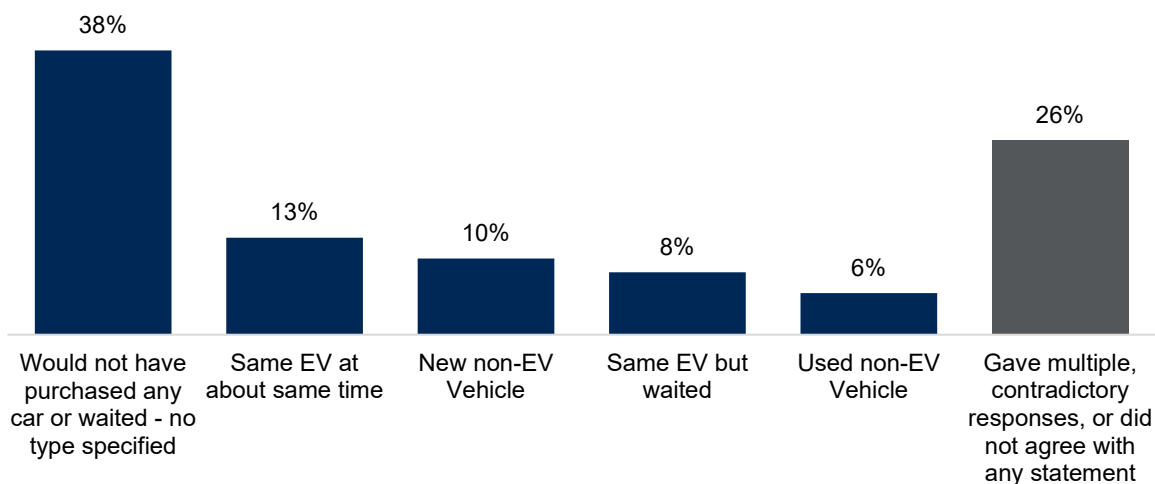
### 3 Results

The following sections present results from the Employee Research Program, ride-and-drive intercept surveys, and general population surveys.

#### 3.1 Employee Research Program

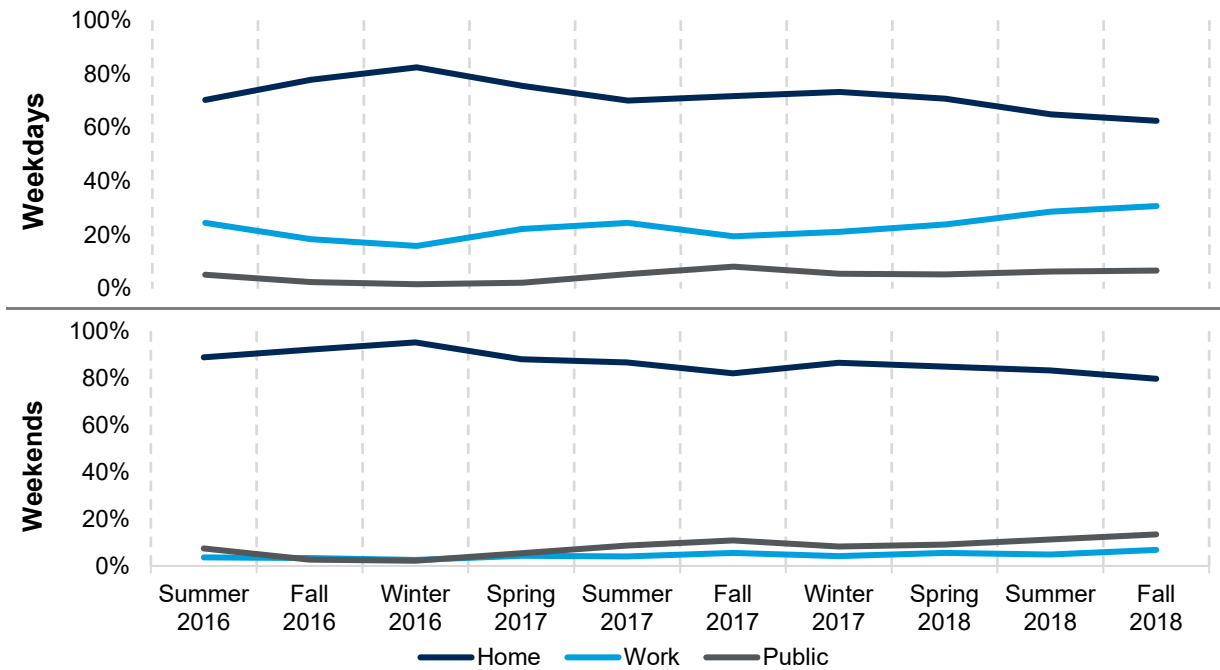
The PGE incentive motivated over half of the employee participants to purchase an EV or purchase one sooner than they would have otherwise. Without the PGE incentive, 38% of survey respondents (i.e., pilot participants who completed a one-time survey on EV purchase experience) reported they likely would have waited or not purchased any type of car, 10% would have bought a new non-EV vehicle, and 8% would have purchased an EV at a later date (Fig. 1). A minority of respondents indicated they would have purchased the same EV and would not have waited without the PGE incentive (13%).

Figure 1: How the PGE EV Incentive Affected EV Purchase – Without the Incentive Participants Would Have Purchased... (EV Purchase Experience Survey; n = 109)



As other studies have shown, the quarterly and monthly PGE employee surveys show that EV charging occurred primarily at home, particularly during weekends (Fig. 2). This is true, even with ample workplace charging available. The average reported percentage of workplace charger use was higher during weekdays compared to weekends. The reported use of EV charging at public locations was generally low compared to other locations, but public charging did slightly increase on weekends.

Figure 2: Average Percentage of EV Charging by Location, Season and Year <sup>a</sup>



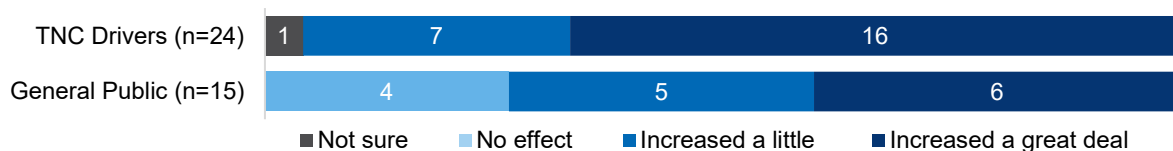
<sup>a</sup> Sample size (or the number of survey respondents) varies from 27 to 191, depending on the season.

### 3.2 Ride-and-Drive Intercept Surveys

Findings from the ride-and-drive surveys show that vehicle battery range and charging needs vary between the general public and TNC drivers. Intercept survey findings show about three-quarters (12 of 15) of general public 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 TNC driver respondents reported driving over 400 miles each week for their TNC rides, suggesting TNC drivers 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.

Consistent with expectations, the ride-and-drive events appear to increase attendees' likelihood of purchasing or leasing an EV in the next five years, especially among TNC drivers. Most general public (14 of 15) and TNC driver respondents (20 of 24) 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) of the general public and two-thirds (16 of 24) of TNC driver survey respondents indicated that the ride-and-drive event increased their likelihood of purchasing or leasing an EV "a great deal" (Fig. 3). Similarly at a larger ride-and-drive event, nearly all (99%) of 79 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 3: Event Effect on Likelihood of Purchasing EV in Next Five Years, by Survey Wave



Even after the test drive, respondents mentioned a variety of concerns they had about purchasing or leasing an EV. Both general public and TNC driver survey respondents were primarily concerned about the purchase price of the vehicle (7 of 15 and 14 of 24, respectively) and the vehicle driving range (7 of 15 and 14 of 24, respectively).

### 3.3 General Population Surveys

This section presents key findings from Wave 1 of the general population survey fielded to PGE residential customers in November 2019 and with comparisons to the Baseline survey fielded in 2018 where questions are comparable. The surveys 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 PGE 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 1 for definitions of each segment).

The number of respondents 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 1). 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. The authors found that the proportion of PGE customers who are considering purchasing an EV or PHEV is higher than what was found in a 2019 survey on American attitudes toward EVs (36% reporting at least considering an EV for their next vehicle) [2].


























Table 1: General Population Customer Survey Analysis Segments<sup>a</sup>

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 when asked which one type they are most likely to acquire the next time they purchase or lease a vehicle.	276	30%	253	25% <sup>a</sup>
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% <sup>a</sup>

<sup>a</sup> Indicates a statistically significant difference between Baseline and Wave 1 survey all likely vehicle purchasers (z-test for proportions,  $p < 0.05$ ).

Respondents 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%; Fig. 4). 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 4: 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<0.05).

\* Indicates a statistically significant difference between Baseline and Wave 1 survey all likely vehicle purchasers (z-test for proportions, p<0.05).

Survey respondents report finding EVs and PHEVs to be the most environmentally friendly vehicle types, unchanged since the Baseline survey. Respondents in the non-considerer segment are least likely to report EVs and PHEVs are very environmentally friendly (reporting an 8-10 on an scale from “0” to “10”), however, all respondents are generally in agreement that gasoline and diesel vehicles are the least environmentally friendly vehicles.

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 (Fig. 5). 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).

Figure 5: Unprompted Reasons Mentioned for Purchasing or Leasing an EV or PHEV, by Survey Wave and Segment (Multiple Responses Allowed)

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%
Don't know	19%	25%*	31%	26%	9%

Note: Letters A - C indicate statistically significant differences between likely vehicle purchaser segments (z-test for proportions, p<0.05).

\* Indicates a statistically significant difference between Baseline and Wave 1 survey all likely vehicle purchasers (z-test for proportions, p<0.05).

Survey results show that vehicle range has become less of a barrier to purchasing or leasing an EV or PHEV with the affordability of EVs remaining the greatest 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 (Fig. 6). There was a notable decrease, however, in the number of mentions related to vehicle range and charging availability compared to the Baseline survey. Interestingly, respondents in the considerer and intender segments were significantly more likely to report cost or affordability as barriers compared to non-considerers, likely because respondents in these segments have spent more time researching these vehicle types and understand the costs compared to conventional vehicles.

Figure 6: Unprompted Barriers Mentioned to Purchasing or Leasing an EV or PHEV, by Survey Wave and Segment (Multiple Responses Allowed)<sup>a</sup>

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
Don't know	13%	17%  *	18%  C	24%  C	10%  A B

<sup>a</sup> Only top five items mentioned displayed in figure.

Note: Letters A - C indicate statistically significant differences between likely vehicle purchaser segments (z-test for proportions, p<0.05).

\* Indicates a statistically significant difference between Baseline and Wave 1 survey all likely vehicle purchasers (z-test for proportions, p<0.05).

Similarly, when provided with a list of potential concerns to purchasing or leasing an EV or PHEV, a large majority of respondents reported that the purchase price of the vehicle was a major concern, followed closely by vehicle range (Fig. 7). Concern about vehicle purchase price has increased significantly since the 2018 Baseline survey (84%, up from 79%). Concern with vehicle range and availability of public charging within PGE’s service territory and outside its territory, 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 7: 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
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

Note: Letters A - C indicate statistically significant differences between likely vehicle purchaser segments (z-test for proportions,  $p < 0.05$ ).

\* Indicates a statistically significant difference between Baseline and Wave 1 survey all likely vehicle purchasers (z-test for proportions,  $p < 0.05$ ).

Home charging is most important to respondents, and its availability may factor into decisions to purchase or lease an EV or PHEV. Overall, about three-quarters (73%) of survey 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, 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 mentioned by respondents (7% and 5% of respondents who reported seeing signage, respectively).

Respondents report having received information about EVs from a variety of sources, with their electric utility being an important source of information (Fig. 8). About half (48%) of respondents reported primarily receiving information about EVs from friends and colleagues, unchanged since the Baseline survey. 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 8: 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	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% A
Social media	26%	26%	23% B	32% A	28% A
Automobile reviews and consumer advice information	28%	25%	19% B C	28% A	37% A
Portland General Electric (Electric Utility)	32%	23% *	20% B C	25% A	26% A
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% B C	10% C	4% B

Note: Letters A - C indicate statistically significant differences between likely vehicle purchaser segments (z-test for proportions,  $p < 0.05$ ).

\* Indicates a statistically significant difference between Baseline and Wave 1 survey all likely vehicle purchasers (z-test for proportions,  $p < 0.05$ ).

## 4 Conclusions and Findings

Increasing consumer adoption of EVs in the United States will require a coordinated effort, in which electric utilities can play an important role. Findings from the Employee Research Program show that incentives can lead to increased adoption of EVs, as they address financial barriers associated with purchasing EVs. Findings also show that although battery range is becoming less of a concern to consumers, vehicle cost continues to be a primary barrier to adoption. Vehicle purchasing incentives can be offered to utility customers (as PGE has done as part of the pilot program), or employers can be encouraged to offer their employees incentives to purchase an EV as a fringe benefit. As most consumers lack first-hand experience with EVs, utility-sponsored ride-and-drive events can provide consumers with a low-pressure test-driving experience, which has been shown to increase the likelihood of purchasing an EV. Further, utilities can work with TNCs to provide drivers with subsidized charging to encourage adoption among TNC drivers. Increased adoption of EVs among TNC drivers not only decreases the cost burden on drivers who are often from disadvantaged communities, but also provides riders with experience with being in an EV.

Electric utilities are also in a unique position to increase access to fast and reliable public charging infrastructure. Although employee and customer survey findings show home charging is where most consumers would likely charge, there is a significant and growing proportion of consumers in urban areas who are unable to charge at home because they live in homes without a driveway or live in multifamily buildings. Having utility provided or sponsored charging locations provides an affordable and reliable public charging option to those who do not have the option to charge at home or work. Additionally, consumer recognition of their electric utility is generally high and having utility-branded charging infrastructure draws customer attention to where charging is located, which can help to decrease the perception of limited public charging availability.

Electric utilities face several challenges, however, with increasing adoption of EVs in their service territory. There is concern among state utility regulators that utilities are marketing electricity as a fuel to consumers, which is not traditionally a role of an electric utility. As shown above, while PGE ranked higher among sources of EV information, consumers are also less likely to think of an electric utility as a source of EV information compared to friends, colleagues, internet searching, and the automotive industry sources. Further, electric utilities have geographic boundaries and thus each utility has different issues. For example, rural utilities will face the prospect of large infrastructure upgrades, which may largely be used by non-customers who are passing through its service territory rather than customers. Conversely, electric utilities in urban area face large infrastructure upgrade requirements to meet the growing charging needs of their residential and commercial customers, TNC drivers, and transit agencies.

Taken together, the findings in this paper illustrate how electric utilities can play an important role in encouraging EV adoption. Since 2018, there has been considerable change in consumer consideration and intention to purchase an EV in PGE's service territory. The ongoing pilot and evaluation activities are providing an opportunity for PGE to test and learn how best to serve their customers as transportation electrification accelerates. These lessons learned will be useful for other utilities and regulators and in the coming years should provide important conclusions on the most effective solutions.

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