BEFORE THE PUBLIC UTILITY COMMISSION

OF OREGON

UM 2033

In the Matter of PGE TRANSPORTATION ELECTRIFICATION PLAN	STAFF'S COMMENTS

Staff appreciates the work Portland General Electric (PGE or the Company) put into this inaugural transportation electrification plan (the Plan). In these comments, Staff will identify what additional information is needed for us to recommend the Commission accept this Plan. Broadly, the rules[1] for a transportation electrification plan call for the utility to present all of the electric company's near-term and long-term transportation electrification activities. The Plan should identify a portfolio of actions designed to achieve the Legislature's goals.[2] The Plan should also address areas most affected by market barriers in the electric company's service territory and provide benefits for traditionally underserved communities.

Specifically, Order No. 19-134 from Docket No. AR 609 established the following required elements of transportation electrification plans (TE Plans):[3]

a) Current condition of the transportation electrification market in the electric company's Oregon service territory, including, but not limited to:

   A) A discussion of existing state policies and programs;
   B) Market barriers that the electric company can address and the barriers that are beyond the electric company's control, including any identified emerging challenges to transportation electrification;
   C) Existing data on the availability and usage patterns of charging stations;
   D) Number of electric vehicles of various sizes in the utility service territory and projected number of vehicles in the next five years;
   E) Other transportation electrification infrastructure, if applicable;

[1] *See* OAR 860-087-0020(1).
[2] ORS 757.357.
[3] *See* OAR 860-087-0020 (3).

F) Charging and vehicle technology updates; and
G) Distribution system impacts and opportunities for efficient grid management.

b) A summary of the electric company's transportation electrification program(s) and future transportation electrification concepts and actions in its Oregon service territory. The TE Plan must incorporate project learnings and any other relevant information gathered from other transportation electrification infrastructure investments, programs, and actions to ensure that lessons learned are carried forward;

c) A discussion of how the electric company's investments, programs, and actions are expected to accelerate transportation electrification, address barriers to adoption, and extend access to traditionally underserved communities;

d) Supporting data and analysis used to develop the TE Plan, which may be derived from elements such as review of costs and benefits; rate design, energy use and consumption, overlap with other electric company programs, and customer and electric vehicle user engagement;

e) A discussion of the electric company's potential impact on the competitive electric vehicle supply equipment market, including consideration of alternative infrastructure ownership and business models, and identification of a sustainable role for the electric company in the transportation electrification market;

f) A discussion of the current and anticipated electric company system impacts resulting from increased transportation electrification and the electric company's portfolio of actions, how transportation electrification can support the efficient integration of renewable energy, and how the TE Plan is designed to address these system impacts; and

g) A discussion of how programs and concepts in the TE Plan relate to carbon reduction goals, requirements and other state programs, including expected greenhouse gas emission reductions based on publicly available metrics.

Staff appreciates how the Company organized its plan to match the structure of the administrative rules, and we will follow the same order. The primary theme of Staff's comments is to ask for more analysis of the tradeoffs that the public and policymakers can expect between costs and benefits.

Staff's comments and exploration of cost-benefits echo those of Chair Decker at the November 21, 2019 Public Meeting.[4] Staff sees the transportation electrification plan docket as a place for stakeholders to have a conversation about on-going development and many decisions ahead.

4 OPUC Public Meeting, November 21, 2019 (timestamp 1:06), *available at* https://oregonpuc.granicus.com/MediaPlayer.php?view_id=2&clip_id=438 (comments of Chair Megan Decker).

Existing State Policies and Programs

In this section, PGE provides a broad overview of the policies and programs driving transportation electrification in the Company's territory. PGE details a number of drivers from local climate action plans and lawsuit settlements to statewide mandates. Staff found this context helpful.

Staff notes that HB2020, Oregon's proposed cap and invest bill, was included on PGE's list of existing policies and programs.[5] This bill was not passed by the legislature or adopted as law in 2019. Regardless, it would have devoted a substantial level of policy effort toward transportation decarbonization. Staff seeks clarification as to the purpose of including HB 2020 on this list, if any; Staff believes it could be worthwhile to describe the effect HB 2020 would have had on transportation electrification efforts by PGE in contrast to existing policy, as lawmakers may revisit this legislation or some variation of it. Would HB2020 have made the Company's transportation electrification efforts less costly?

Market Barriers

Staff would like more analysis on the degree to which the Company can alter the cost of EV ownership. Table 8 on page 27 of the 2019 PGE TE Plan lists customer considerations in buying light duty vehicles (LDV). The table's third column presents the utility's ability to impact its customers' decisions. In the row for total cost of ownership (TCO), PGE ranks its impact as high for this category, using a one-to-five scale where five is the highest:

Total Cost of Ownership (TCO)	The TCO of an EV includes first cost/lease cost, fuel cost, cost of installing charging infrastructure, incentives, and maintenance. In some cases, the TCO can be lower for EVs, largely due to low cost fuel and maintenance savings. Electric utilities can impact this through charging infrastructure, smart charging programs, and innovative rate designs.	5 Rating: PGE can simplify rates and make them easier to understand. PGE can develop rates that allow customers to reduce charging costs by charging intelligently.

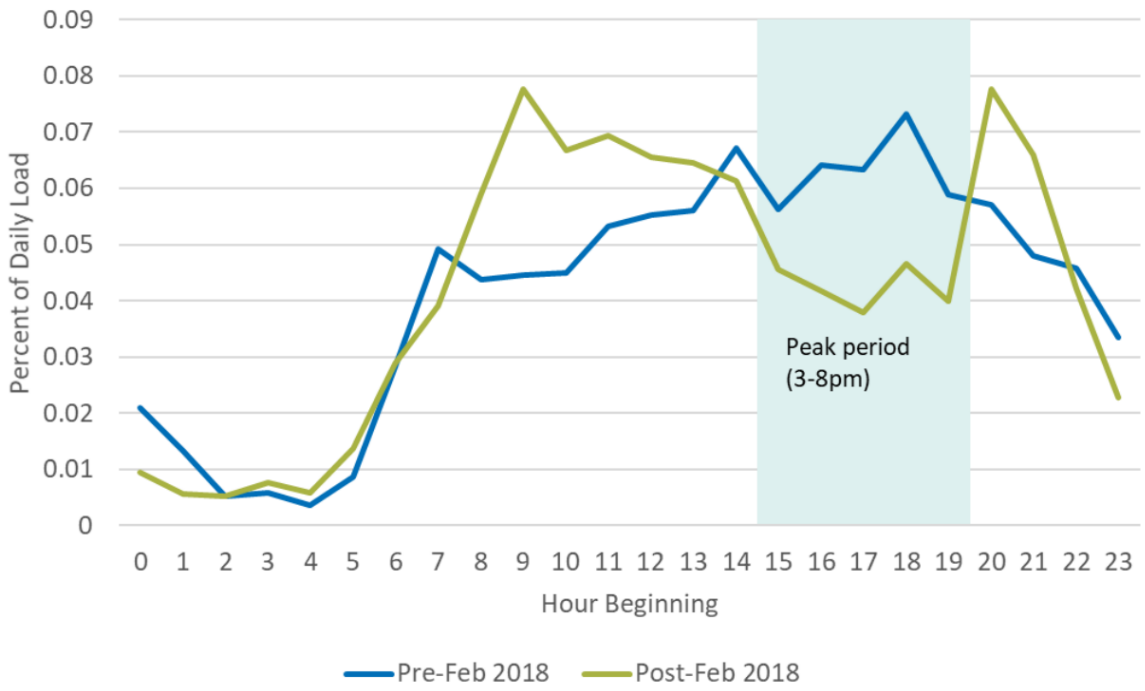
This is an important point. Staff would like to see the math behind how the fuel cost of LDV EV ownership affects TCO now, reflecting where the break-even point *currently* is, in contrast with Bloomberg New Energy Finance's general forecast of a convergence of costs between EVs and internal combustion engines.[6]

Charging Station Availability and Usage Patterns

Understanding how malleable EV charging demand actually is stands prominently as one of the most important insights the Company's planning must grapple with. Staff finds Figure 14 on page 42 of the 2019 PGE TE Plan helpful evidence on the potential to shape Electric Avenue's load shape:

[5] PGE. *Transportation Electrification Plan* September 30, 2019, page 16, Table 1.
[6] Ibid. page 64.

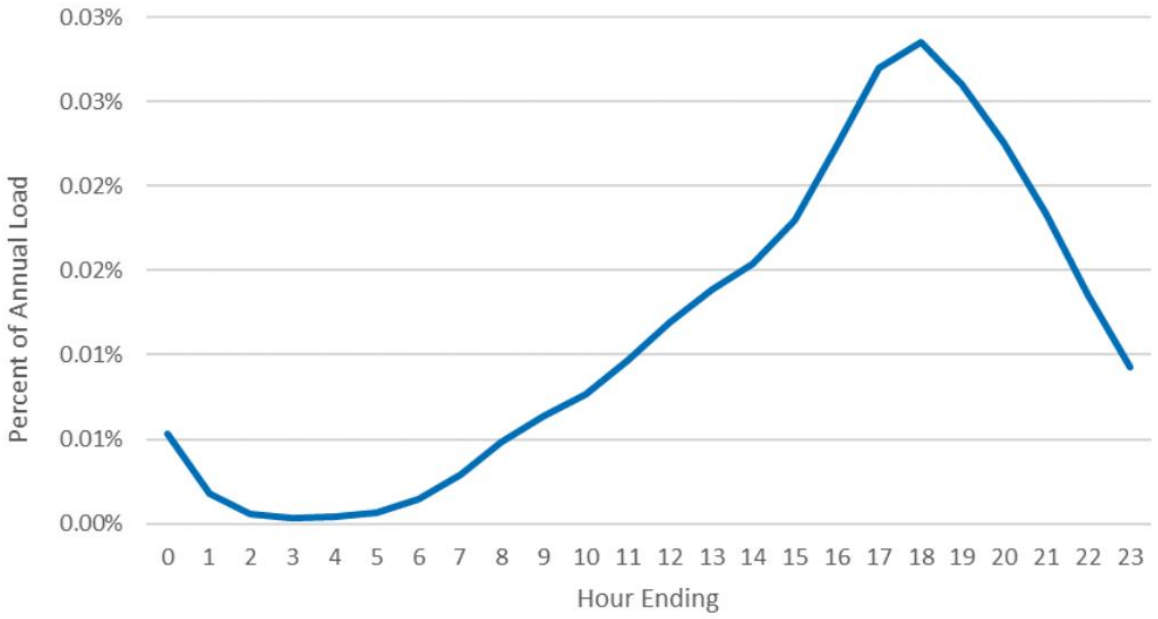
Figure 14 – Electric Ave 2.0 Hourly Weekday Load Profile Before/After Peak Pricing



This graph also raises a question. Given that PGE is a dual peaking utility, Staff would like to better understand how the Company plans to avoid EV charging at other system critical hours outside 3pm to 8pm, especially in the winter.

Stakeholders need to know if the Company's estimated residential EV load shape is merely a picture of the status quo that PGE wants to mitigate against or an expected outcome the Company foresees as a result of its planning. With regards to this load shape's depiction in Figure 8 on page 35 of the 2019 PGE TE Plan, it looks to Staff to be what the Company should be working to avoid:

Figure 8 – Estimated Residential EV Load Shape



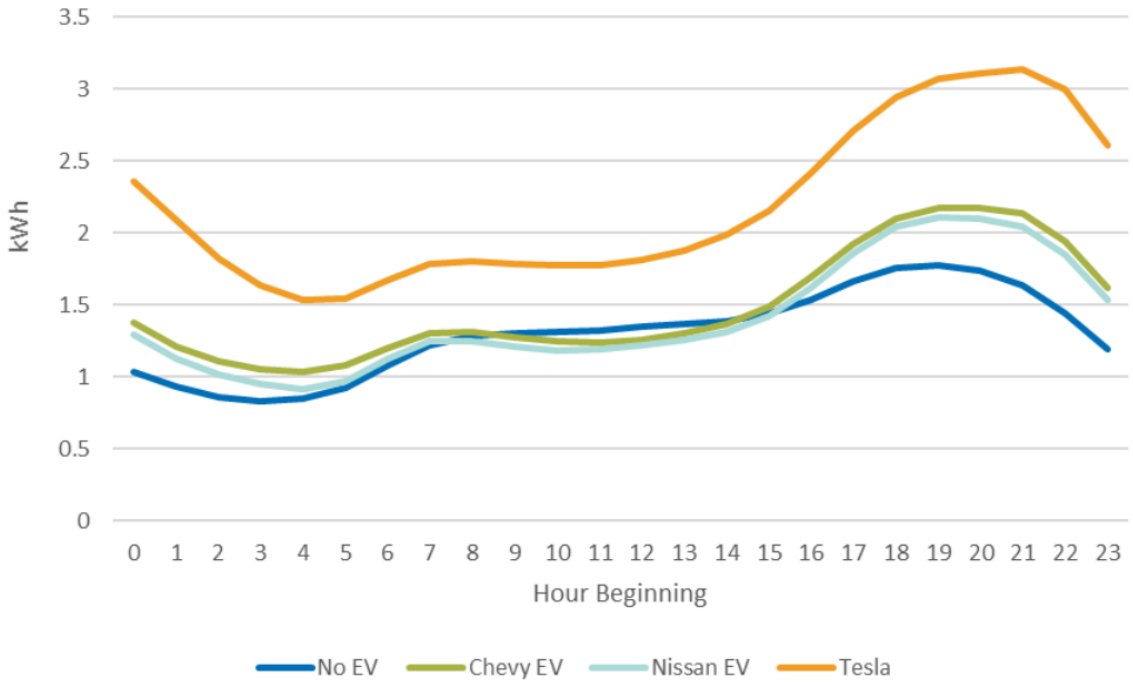
That load peaks precisely at the time PGE's *2019 Integrated Resource Plan* (IRP) identifies as a key reliability stress point.[7]

The text of PGE's 2019 TE Plan explains an estimate was used because: "Without a current residential EV charging program, PGE does not have a clear line of sight into how customers are actually charging at home."[8] Staff finds PGE's statement very problematic, given PGE's investment in advanced meter infrastructure (AMI), a large data analytics group and capabilities, and a readily available database of EV ownership in its territory. Staff believes PGE should be doing much more in this regard, as understanding the impacts to system operation is a critical aspect of this Plan. Requiring this data collection in PGE's next transportation electrification plan is an action item Staff recommends for the Commission.

Since the estimated residential EV charging load shape comes from capacity planning for the future, Staff would like clarification on several things. Is Figure 8 in the 2019 PGE TE Plan the Company's expectation of residential EV load shape *without* participation in the time of use (TOU) and demand response (DR) programs described later in this Plan? Or is this the EV load shape the Company is expecting to result *from* its EV planning? PGE should clarify in its reply comments what immediate steps it will take between now and the filing of its next TE Plan to reduce the peak impact of EVs, especially as part of the Company's soon-to-be-launched residential charging pilot. As seen in the graphic below, from page 36 of the 2019 PGE TE Plan, there is some clear evidence of residential EV charging impact on peak demand with the data the Company does have:

[7] PGE. 2019 Integrated Resource Plan July 2019, page 668.
[8] PGE. *Transportation Electrification Plan* September 30, 2019, page 35.

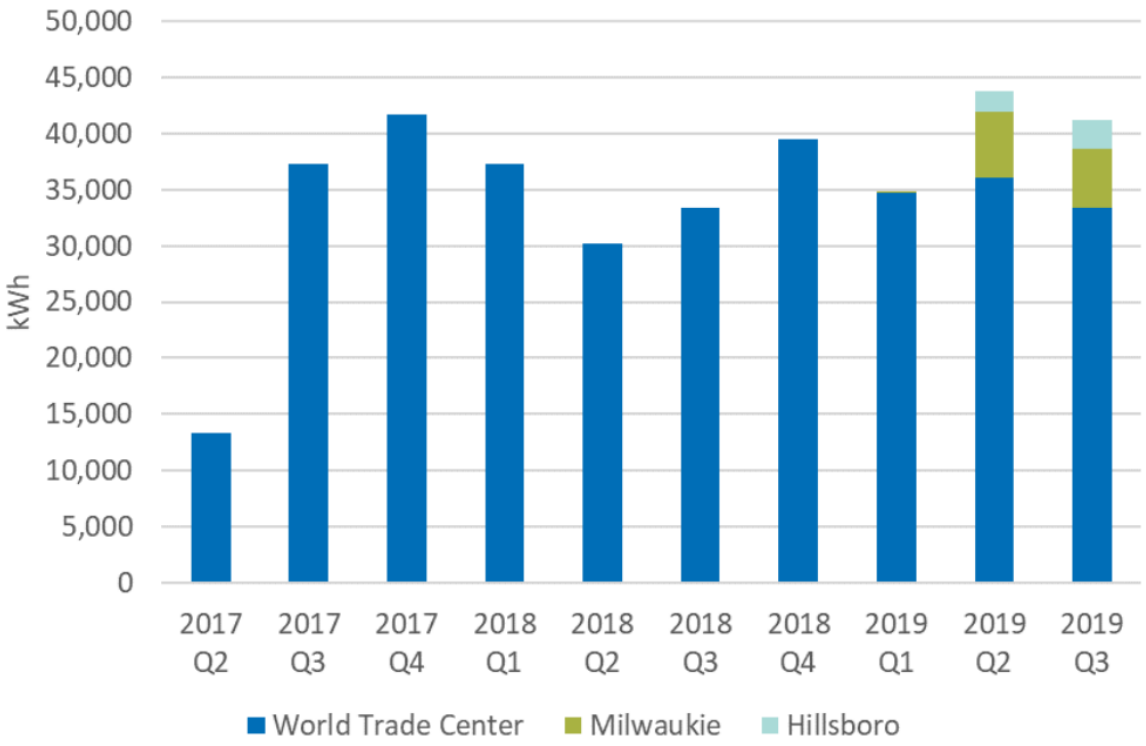
Figure 9 – Residential Annual Average EV Load Shape by OEM, PGE Service Area



The way owners of Chevy and Nissan EVs converge midday with customers that do not own EVs might show significantly higher load during peak capacity hours. Staff agrees with the Company's intuition that the spread in load shapes between customers that own Teslas and customers that own other EV brands is likely due to a difference in income.

Staff finds the Company's data on the quarterly energy deliveries at Electric Avenue, PGE's utility-owned charging station program, very helpful. The flatness of these deliveries across time in Figure 10 on page 37 of the 2019 PGE TE Plan needs to be better understood:

Figure 10 – Quarterly Energy Deliveries at Electric Avenues, by Site



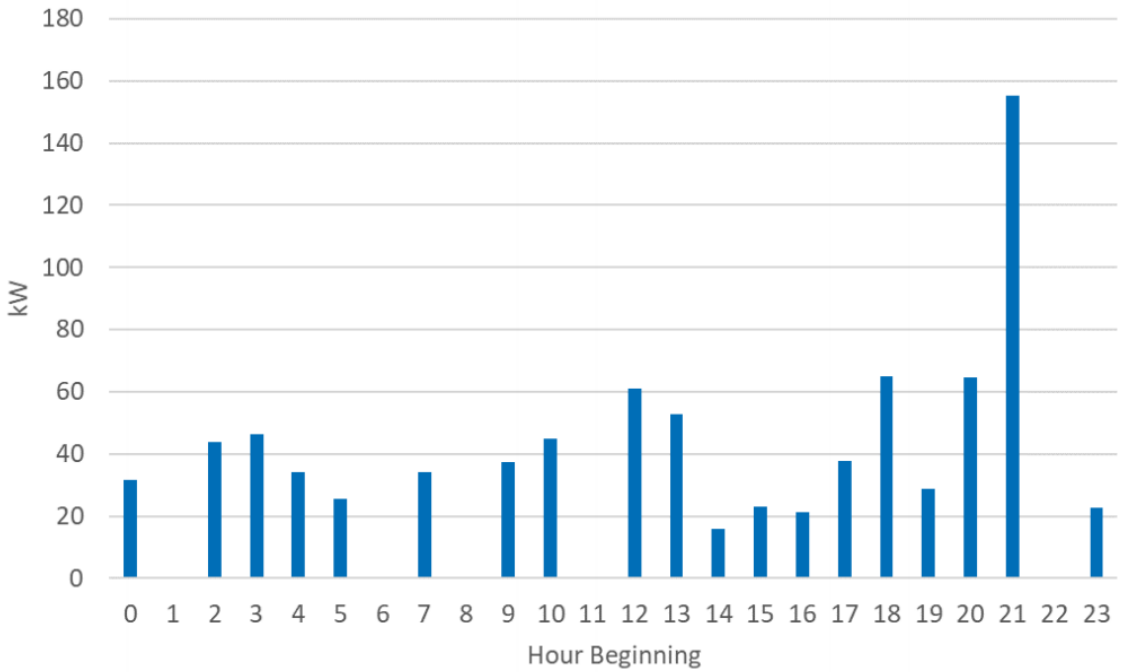
By separating each location by color, PGE visually displays what a retail analyst calls "same-store sales." When a retailer's sales are growing, it's important to understand how much of that growth comes from building more stores and how much comes from increased traffic to the stores themselves.

A same-store sales look at Electric Avenue shows remarkably flat deliveries given the growth of EV ownership in PGE's service territory during the same time period. Only the World Trade Center (WTC) site has been open more than a year; so this may be more about constraints on that location's growth rather than demand for public charging in the Portland Metro area in general, but Staff finds this an important metric to watch.

PGE explains the dip in 2018Q2 as coincident with "the introduction of pricing structures to the Electric Avenue 2.0 site." It would also be helpful to understand what might have been a dip in 2017Q2. Does PGE have no data on the kWh deliveries to Electric Avenue before the second quarter of 2017?

After seeing Electric Avenue's load shapes presented in Figure 11 on page 38 of the 2019 PGE TE Plan and the WTC site in Figure 12 on the next page, Staff was surprised to see as low a load factor as .23 for the WTC site's 2019 peak demand day in Figure 13 on page 40, because the prior graphs seemed more spread out across the day:

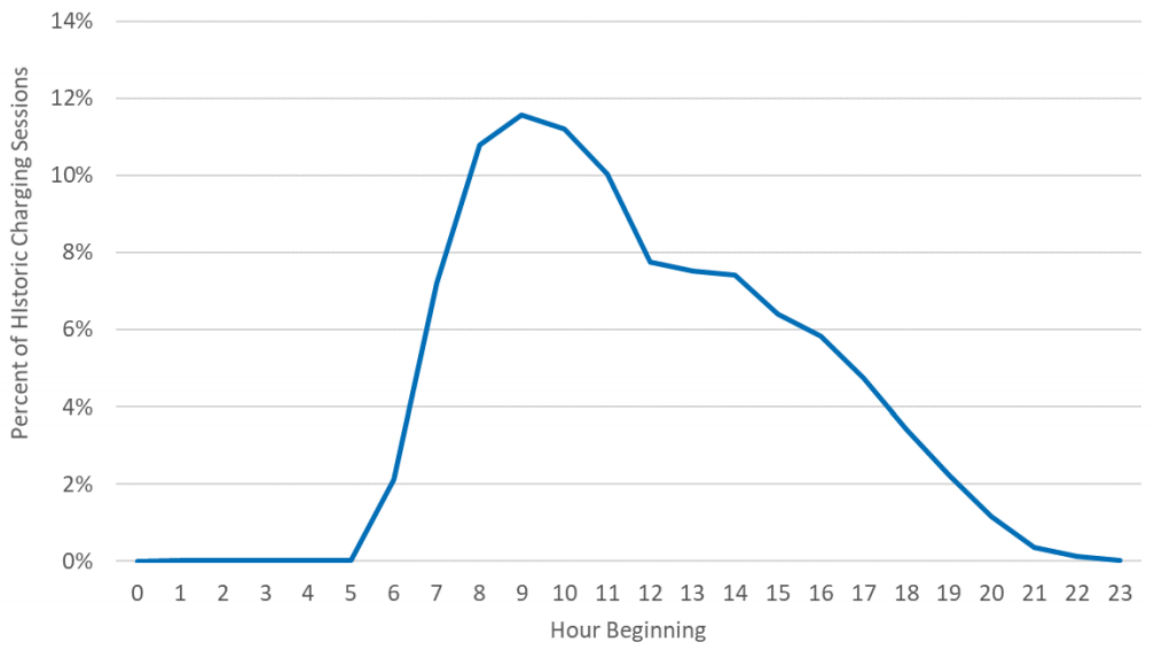
Figure 13 – Hourly Demand from Electric Ave 2.0 on Peak EV Demand Day (June 15, 2019)



Is there any special explanation for this day? Staff requests that the Company provide in its reply comments separate peak EV demand day profiles by month and site for Electric Avenue, using kW as the vertical axis of the graph.

It's not certain how representative PGE's Tualatin Contact Center and its 14 EVs are of the future of workplace charging, but Figure 16 on page 44 of the 2019 PGE TE Plan shows a strong preference for the key hours of morning system peak:

Figure 16 – Charger Utilization Since Install of PGE Workplace Charging, (Tualatin Contact Center)

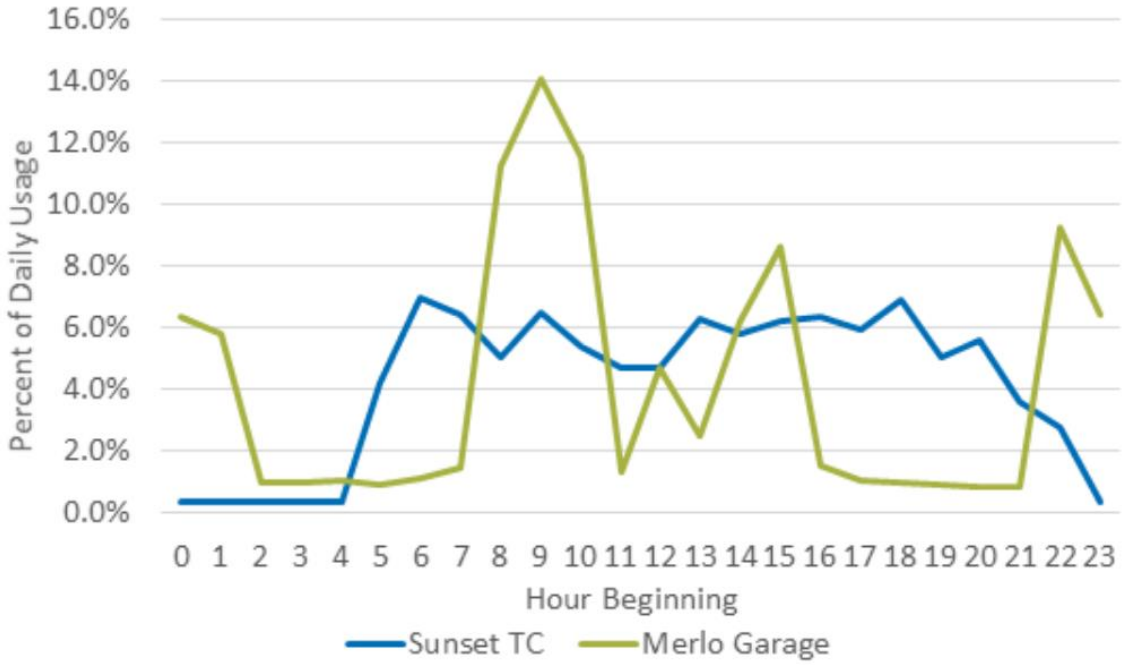


If Figure 16 is indicative of workplace charging patterns, PGE could see winter peak capacity concerns exacerbated as EV penetration grows and if price signals for charging in the AM in winter remain muted as they currently are in PGE's rates.

Further, the capacity requirement of charging just one electric bus is around 400 kW. On page 47, the Plan reports only 3 percent of electric bus charging in the Company's pilot project with TriMet is during peak hours, but this peak time is narrowly defined as 3pm to 8pm. The highest point of peak demand for TriMet bus charging is shown in Figure 18 on page 47 of the 2019 PGE TE Plan to be 9am, an hour PGE's 2019 IRP identifies as critical for the Company's system.[9]

[9] PGE. 2019 Integrated Resource Plan July 2019, page 668.

Figure 18 – Hourly Load Shape of Electric Mass Transit Pilot



Staff would like to better understand the potential scope of this problem. Staff requests that PGE calculate aggregated capacity impacts, for both summer and winter peak, by charging location (e.g., home, workplace, mass transit) for the base case and high case through 2030 in its reply comments.

Number of EVs in PGE's Service Territory

One way of detecting the likelihood of a forecast's overestimation is to find a sudden step-up from real data to the forecast's first estimated number. We appear to have that in Navigant's forecast of EVs in PGE's service territory in 2020. Table 19 on page 48 of the 2019 PGE TE Plan shows 16,131 total EVs were in PGE's territory around the time its 2019 IRP was filed. Navigant's EV forecast for that IRP predicted 28,030 EVs in 2020, an increase that stands as a significant outlier over prior observed years' growth.[10]

The full 2019 EV numbers for PGE's territory will not be available when the Company files its reply comments. However, PGE should share the latest numbers for 2019 that are available to help stakeholders assess the accuracy of the Navigant forecast.

Vehicle Technology

It's important for stakeholders to understand local expectations of national trends. Table 23 on page 60 of the 2019 PGE TE Plan displays a list of announced EV fleet commitments in the United States:

[10] PGE. *Transportation Electrification Plan* September 30, 2019, page 49.

Table 23 – Public Corporate Commitments on Fleet Electrification

Company	U.S. EV Fleet commitments
FedEx	Acquired 1,000 EV delivery vehicles in 2019; committed to buy 20 e-HDVs
UPS	Committed to buy 125 e-HDVs and developing a proprietary EV delivery truck
DHL	Purchased 63 EV cargo vans; committed to zero fleet emissions by 2050
Sysco	Committed to convert 20% of fleet to alternative fuels by 2025
Albertsons	Committed to buy 10 e-HDVs
Anheuser Busch	Committed to buy 40 e-HDVs; aims to convert entire fleet to renewables by 2025
PepsiCo	Committed to buy 100 e-HDVs
Amazon	100,00 electric trucks by 2030
City of Portland	Plan to add 60 EVs to sedan fleet by the end of 2020

Beyond the City of Portland's sedan fleet, what distribution of these deployments in Table 23 does PGE expect in its territory?

Staff would like to know how far down the road the Company sees vehicle to grid (V2G) programs in its own territory. On page 70, the 2019 PGE TE Plan cites a National Renewable Energy Laboratory study on the economics of V2G, but Staff notes the absence of a V2G pilot in either its transportation or storage pilot dockets. At what stage is PGE's V2G planning?

Distribution System Impacts

Staff has several important system planning details we would like to see the Company elaborate on in more detail in its reply comments. On page 75 of the 2019 PGE TE Plan, PGE states: "This section is not intended to present a thorough distribution planning exercise for EVs." Supporting this section with a more rigorous appendix would be adequate, but the transportation electrification plan needs to present the Company's most thorough distribution planning for EVs.

PGE should explain why the Company, "…did not conduct power flow analyses to determine EV hosting capacity or estimate locational value,"[11] given potential peak load impacts and the fact that locational data is available. In the reply comments, PGE should identify how it could use the existing ratepayer investments such as its AMI meters and customer analytics software along with other data, including the data PGE has made available on OASIS to develop estimates of customer EV load impacts in its territory. Staff is hopeful that UM 2005 quickly develops a comprehensive reporting standard for PGE's distribution system, but does not expect the Company's critical operational planning for EVs to be put on hold until that docket's completion.

[11] PGE. *Transportation Electrification Plan* September 30, 2019, page 75.

MWa should not be focused on to the exclusion of MW. Table 26 on page 76 of the 2019 PGE TE Plan displays forecasted load in MWa, an energy metric:

Table 26 – Forecasted EV Load (Reference Case), PGE Service Area, MWa

Vehicle Type	2020	2025	2030	2035	2040	2045	2050
Light Duty	10	35	79	131	190	255	316
Medium Duty	~ 0	2	9	22	41	65	95
Heavy Duty	~ 0	3	20	55	104	169	247
Total	**10**	**39**	**108**	**207**	**335**	**489**	**657**

Staff would like to see the same table in MW of expected peak demand. There is a possibility that focusing on load in terms of energy may cause stakeholders to underestimate the capacity requirements.

Of the EVs in this forecast, by count and by load, what percentage does PGE expect to charge their batteries without system optimizing incentives? How does the Company see that percentage changing over time?

On page 78 of the 2019 PGE TE Plan, PGE states: "We estimate that 3% of the EV drivers will require a transformer replacement when they start charging at home." How does the Company plan to recover these costs? What possibilities does PGE see in using the assessment method that forecasted this rate of transformer replacement also being used for distributed energy resource planning more broadly?

A Summary of the Electric Company's Transportation Electrification Programs and Future Transportation Electrification Concepts

Staff is not certain this section covers an exhaustive list of the Company's TE programs. In reply comments, PGE should present a full list of every PGE TE program, including all planned programs PGE in the coming two years.

Lessons Learned

On page 93 of the 2019 PGE TE Plan, PGE refers to challenges in the reliability of bus charging infrastructure. In reply comments, PGE should list those issues and identify which ones have been resolved.

On page 106 of the 2019 PGE TE Plan, the Company states, of the challenges Electric Avenue has faced, that: "PGE selected state-of-the-art equipment that had not been widely deployed." This led to "a variety of reliability issues that vendors had to remedy." In reply comments, PGE should list those issues and identify which ones have been resolved.

On page 133, the 2019 PGE TE Plan quotes the fourth principal from OPUC Order No. 18-376, that the utility's Clean Fuels Program is "designed to be independent from ratepayer funds." On the next page, the Company states: "Though we do not anticipate any changes in the near term, it is possible that our utility programs and Clean Fuels Programs may begin to converge at some point in the future, if such convergence supports a more efficient or effective path towards realizing the State's decarbonization and electrification goals." In reply comments, PGE should describe in more detail how PGE foresees these plans converging.

Acceleration of Transportation Electrification

Staff finds PGE's summary of its investments, programs, and actions meets this requirement on a qualitative level, but this is the appropriate section of the Plan to itemize the cost of these investments. In the Company's reply comments, PGE should show stakeholders a table with expenditures, by year by program. Also, the Company should include a forecast of EV costs.

In future years, Staff will want to see more data on the individual impact of each program. Staff recognizes in 2019 many of these investments are at too early a stage to assess their effectiveness, but we can still understand their budget size and growth trajectory.

Supporting Data

Data in this section can offer some of the most important insight to stakeholders on the tough choices ahead. Table 60 on page 144 of the 2019 PGE TE Plan has an important asterisk. The forecasted revenue from EV owners assumes current tariffs:

Table 60 – Annual Benefits Accrued to Customers – Passenger EVs

Benefits	NPV	2020	2025	2030	2035	2040	2045	2050
Tariff Revenue* ($M/yr.)	$1,440	$9	$36	$90	$162	$257	$377	$506

*Assumes current tariff rate escalated at inflation

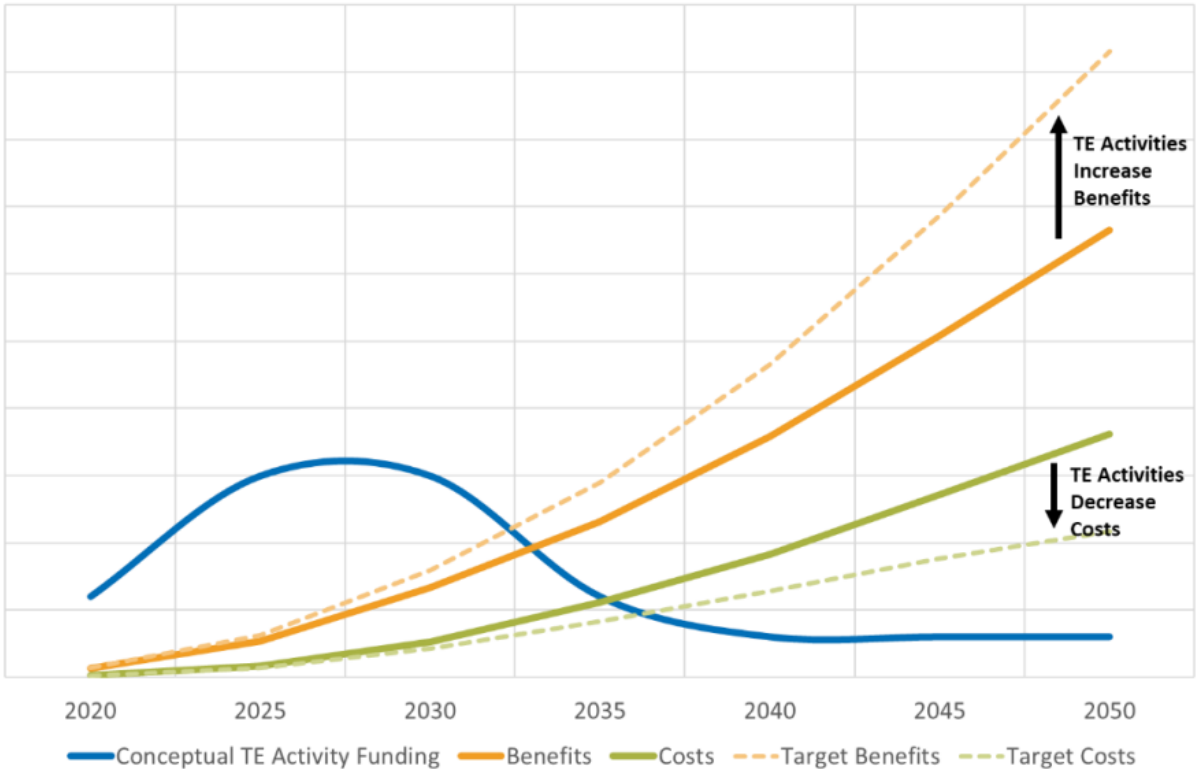
Staff would like to see this same forecast with demand charge relief, particularly raising Schedule 38's 200 kW capacity limit.[12] Also, the Company should clarify whether this revenue forecast assumes TOU was optional or mandatory. A contrast between the expected revenue from mandatory TOU tariffs and a system without them is an important revenue impact for stakeholders to consider. If the system impacts of EV penetration are not mitigated by tariff design, socializing the costs of EV-driven feeder upgrades and new generation capacity, this might violate clear tenants of cost-causation in rate design.

[12] PGE. *Transportation Electrification Plan* September 30, 2019, page 122.

Review of Costs and Benefits

Figure 65 on page 145 of the 2019 PGE TE Plan shows a conceptual framework for understanding the costs and benefits of transportation electrification, which sheds some light on how the Company views the distribution of costs and net benefit:

Figure 65 – Conceptualization of TE Costs, Benefits, and Activity Funding



Using the terminology for cost/benefit analysis PGE cites on page 142 of the 2019 PGE TE Plan, California's *Standard Practice for Cost-Benefit Analysis of Conservation and Load Management Programs*, it appears PGE expects its expenditures on transportation electrification will not meet the "total resource test." Figure 65 may imply the Company expects ratepayers' net costs to go up. Staff gets this impression because the area between the green lines appears, visually, to be smaller than the area under the blue line.

Does PGE only expect transportation electrification to be net beneficial under California's "societal cost test?" When the Plan describes future rate design, it needs to be clearer which intended benefit the rate modification is targeting: societal or ratepayers' cost.

Impact on the Competitive Electric Vehicle Supply Equipment Market

On page 157 of the 2019 PGE TE Plan, PGE states it "has an inherent role to support and stimulate innovation, competition, and choice regardless of who owns the charging infrastructure." Later on that page, the Company only goes into more detail in terms of fostering vender completion in its procurement process.

Staff sees this requirement of OAR 860-087-0020 as the place for PGE to communicate its understanding of where it's appropriate to grow its charging station business with ratepayer funds and where it's not appropriate to use those funds to crowd out a competitive market of independent suppliers of public charging stations. Staff requests an explanation of the Company's understanding of when it's inappropriate to use ratepayer funds for investments in charging stations.

In her questions during PGE's November 21, 2019 presentation of this Plan, Commissioner Tawney inquired about a need for national or regional charging networks and how PGE's investments are being made in a way that ensures "there is enough breathing space [for] other players that can span multiple boundaries."[13] The Company replied by acknowledging customers don't know where the utility's boundaries are and that PGE works with other charging service providers. Staff invites the Company to use its reply comments to more thoroughly answer Commissioner Tawney's question. What criteria does PGE expect to use to evaluate when it is encroaching upon that breathing space?

Demand Response

Table 64 on page 160 of the 2019 PGE TE Plan shows the Company expects to have 3 MW of direct load control from EVs in winter of next year:

Table 64 – EV DLC Achievable Potential in PGE service area (MW)[150]

Season	2020	2025	2030	2035	2040	2045	2050
Summer	4	17	39	66	98	134	168
Winter	3	14	32	54	80	109	137

Source: PGE's 2019 IRP: DER Potential Study

[13] OPUC Public Meeting, November 21, 2019 (timestamp 53:30), *available at* https://oregonpuc.granicus.com/MediaPlayer.php?view_id=2&clip_id=438 (comments of Commissioner Letha Tawney).

That is the equivalent of PGE's winter capacity from the Energy Partners program in 2017.[14] What is the estimated cost per MW behind each year of that forecast? Please provide more details on this DR program, including its cost, how it operates, and if it has been identified as part of the portfolio of DR pilots and programs run by PGE.

Carbon Reduction

Staff finds the Company's Plan meets this requirement. Table 66 on page 166 of the 2019 PGE TE Plan is particularly helpful in quantifying the expected impact of transportation electrification in PGE's service territory:

Table 66 – Est. Annual GHG Reductions from Transportation Electrification in PGE Service Area (million metric tons CO_2-equivalent)[156]

2020	2025	2030	2035	2040	2045	2050
0.13	0.51	1.26	2.47	3.91	5.48	7.15

System Impacts

Staff is unclear how and when PGE's portfolio of actions will create 100 MW of distributed flexibility. The Company should provide the numbers behind its expectation of when and how this can be achieved.

OAR 860-087-0020(3)(f) requires that anticipated impacts of increased electrification of transportation be included in TE Plans. To fulfill this requirement, the Company should explain the cost risk associated with peak load impact in MW calculations, ranging from the Navigant Study's 99,216 LDV base case and 236,427 LDV high case of expected adoption in PGE's service territory by 2025, with and without mandatory TOU.

Conclusion

Reviewing this Plan made evident to Staff that the Company put considerable thought and effort into Oregon's inaugural utility transportation electrification plan. The additional information Staff has requested from PGE in these comments will offer a clearer roadmap to the public and policymakers about what tradeoffs the Company will be asking ratepayers to make, and will give Staff adequate information to recommend the Commission accept this Plan.

[14] PGE. *2019 Smart Grid Report* May 31, 2019, page 43.

This concludes Staff's comments.

Dated at Salem, Oregon, this 6th of December, 2019

Eric Shierman
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