BEFORE THE PUBLIC UTILITY COMMISSION

OF OREGON

UM 2033

In the Matter of	)
	)
PORTLAND GENERAL ELECTRIC COMPANY,	)
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2019 Transportation Electrification Plan.	)
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COMMENTS OF THE

OREGON CITIZENS' UTILITY BOARD

December 6, 2019

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I. INTRODUCTION

The Oregon Citizens' Utility Board (CUB) files these Comments on Portland General Electric's (PGE or the Company) 2019 Transportation Electrification Plan (TE Plan or Plan) filed on September 30, 2019. PGE produced this Plan in compliance with the Oregon Public Utility Commission (PUC) Order No. 19-134.[1]

CUB appreciates PGE's efforts to address the goals for advancing transportation electrification in the state as formulated in various bills and measures of Oregon's Governor, the Oregon Legislature, and local communities. The need for transportation electrification was articulated in the state's decarbonization goals and the fact that the transportation sector accounts for about 40% of the state's greenhouse gas (GHG) emissions.

CUB's Comments are organized in two main sections. Section II represents CUB's Comments on various aspects of PGE's 2019 TE Plan. Section III describes an alternative, innovative method for evaluating whether electric vehicle (EV) investments are cost effective. EVs are well established in PGE's service territory. CUB believes this requires a paradigm shift in the way PGE, regulators, and stakeholders consider the cost effectiveness of EV investments in order to maximize the benefits EVs can bring to PGE's system.

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[1] *In re Rulemaking Regarding Transportation Electrification Plans,* OPUC Docket No. AR 609, Order No. 19-134 (Apr. 16, 2019).

II. COMMENTS on PGE's 2019 TE PLAN

This section is organized as follows:

1. *PGE's focus on accelerating EV adoption in its service territory;*
2. *PGE's EV estimates for the purpose of cost-benefit analysis of its TE programs;*
3. *PGE's role in describing current EV market conditions in its territory, identifying and removing market barriers; and*
4. *Charging infrastructure.*

1. *PGE's focus on accelerating EV adoption in its service territory.*

Current state policies require the electric utilities to design transportation electrification plans with a goal towards increasing the number of EVs in Oregon. For example, Executive Order 17-21[2] establishes a "statewide goal of 50,000 or more registered and operating electric vehicles by 2020." The State of Oregon has also established a target to have 250,000 EVs registered by 2025 and while having EVs make up 90% of new vehicle sales by 2035. The Oregon Legislature promulgated SB 1547 and SB 1044, both of which establish goals to promote zero-emission vehicles. Oregon's state and local GHG emissions reduction targets also put transport electrification at the center of the state's decarbonization goals. CUB appreciates that PGE has addressed the state goals for reducing carbon emissions and accelerating EV adoption in its TE Plan. PGE's TE Plan reflects the Company's commitment towards building a clean energy future. However, CUB is concerned that PGE's TE Plan is much too focused on meeting these EV adoption targets, rather than strategies to manage the new load that would be on the utility's system as a result of an increase in transportation electrification.

The Company's primary role as a utility is to provide reliable service to its customers at affordable rates. CUB represents residential customers irrespective of whether these customers own EVs or not. PGE should have a plan to manage the new load that is brought into the system by existing and new EV owners regardless of whether that plan accelerates adoption of additional EVs. Doing so fits squarely within the Company's responsibility as a regulated utility and would enable the benefits of EVs to flow to all customers.

2. *PGE's EV estimates for the purpose of cost-benefit analysis of its TE programs*

The Commission requires the utilities' TE programs to be prudent for it to be approved. A net benefit analysis determines if investments in TE infrastructure and programs is prudent and, therefore, in customers' interest. PGE's cost benefit calculations are based on their estimate of new EVs that would be brought to their system as a result of the utility's programs.

Currently there are 25,000 EVs on PGE's system. The Company estimates that number to go up to 99,000 by 2025 as a baseline before counting EVs that are attributable to PGE programs. There are several problems with the approach of using the forecast as a baseline which utility programs will build on. First, PGE is ignoring the possibility of an increase in the number of EV

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[2] Office of the Governor, State of Oregon, Executive Order No. 17-212 at 3, *available at* https://www.oregon.gov/gov/Documents/executive_orders/eo_17-21.pdf.

adoptions without any intervention of either utilities or regulators in the EV market. As CUB has earlier argued in its UM 1811 Testimony:

> it should be recognized that EVs have established a presence in PGE's service territory and, with or without PGE's investment, they will likely make up an increasing share of the transportation market. As prices of EVs fall and the vehicle range increases, more consumers who are concerned about climate change will be able to purchase them.[3]

Second, it is extremely difficult to parse out EVs that would have resulted from PGE's programs from those that would be on the system anyway. There is not an established methodology to identify which EVs in PGE's service territory are attributed to PGE's programs. Nor does CUB think such a methodology would be a worthwhile exercise.

Lastly, we note that in its 2016 Transportation Electrification Plan, PGE forecasted 113,265 EVs in its service territory by 2025 as a baseline. The fact that this baseline 2025 forecast is falling even though the utility is offering EV programs suggests that there are either: (1) limitations on the utility's ability to accelerate TE, or (2) our ability to accurately forecast future EV sales is limited.

3. *PGE's role in describing current EV market conditions in its territory, identifying, and removing market barriers.*

In the Plan, PGE describes the current EV market condition in its service area and identifies several barriers within or beyond the utility's control, that hinder the growth of EV adoption in its service territory.

CUB has the following comments on PGE's depiction of the EV adoption market in its service area and its analysis of market barriers.

a. **The EV Market Condition in PGE's Service Territory**: PGE conducted a survey of 1,700 of its residential customers to understand their EV purchasing strategies or plans. The survey revealed that 2.5% of its customers currently own EV, and about 29% considered buying an EV for their next vehicle. Figure 5 on page 25 of PGE's TE Plan shows that the 2.5% current adoption rate among PGE's existing residential customers puts the EV market at the junction of "Innovators" and "Early Adopters." In other words, the EV market in PGE's service area is expanding but still relatively small. PGE states in its plan that "Given that national EV adoption rate has grown steadily between 2013-2018 and is expected to continue to accelerate, we appear at an inflection point in EV market where PGE and our partner across the state must be ready to act."[4]

   CUB is unsure why PGE is referring to the trend in "national EV adoption rate" as opposed to the trend in its "service area adoption rate" as the rationale for a need to act fast. For the last two years, Oregon has been the third leading state in terms of percentage of new car sales that are EVs. In 2017, 2.36% of new vehicle sales were EVs,

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[3] UM 1811 – CUB/100/Jenks/5-6.
[4] PGE 2019 TE Plan at 25.

growing to 3.41% in 2018. Whereas the median sales rate for all states was 0.52% in 2017 and 0.96 in 2018.[5] In addition, because 63% of the state's EVs are in PGE's service territory[6] while PGE serves 35% of the state's electric load, EV sales in PGE's service territory should be nearly twice the state's level or about 6% of new car sales in 2018.

Because EV sales are greater in Oregon that most other states, and sales in PGE's service territory are significantly higher that Oregon, CUB believes that the national adoption rate has little relevance and likely understates the need to take action to serve EV load. PGE should focus more on the significant EV adoption rate within its service territory.

b. **Market Barriers Analysis**: PGE identifies eight market barriers that could impede EV adoption mainly by residential customers in PGE's service area. These barriers include 1. First Cost of Vehicle; 2. Model Availability; 3. Model Functionality; 4. Awareness; 5. Total Cost of Ownership; 6. Fueling Infrastructure Availability; 7. Equitable Access to All Segments; and 8. Dealer Sales Process.

CUB appreciates PGE's work on identifying these market barriers, explaining their severity in Oregon markets, and then making a relative ranking analysis to show the extent to which PGE could impact each of these barriers.

CUB would like to point out that PGE's ability to impact each of these market barriers would only partly determine its ability to impact EV adoption as a whole. In order to realize the net impact of PGE's ability we must also have a relative ranking of the barriers themselves. For instance, PGE gives itself a low rating of 2 in impacting the first cost of buying an electric vehicle and a high rating of 5 in influencing fueling infrastructure availability.[7] If it turns out that the first cost is significantly more important to the buyer compared to fueling infrastructure availability, then PGE would not be able to have a strong net impact on EV adoption simply by building more fueling infrastructure.

In this regard it would be useful to point out that Section 20 of SB 1547 states:

> If market barriers unrelated to the investment made by an electric company prevent electric vehicles from adequately utilizing available electric vehicle charging infrastructure, the commission may not permit additional investments in transportation electrification without a reasonable showing that the investments would not result in long-term stranded costs recoverable from the customers of electric companies.

PGE should perform a relative ranking analysis of the barriers along with the impact ranking for a better understanding of its role in removing market barriers for EV adoption.

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[5] https://evadoption.com/ev-market-share/ev-market-share-state/
[6] PGE 2019 TE Plan, page 48.
[7] PGE 2019 TE Plan, pages 27-28.

4. *Charging infrastructure.*

a) **Public Charging:** PGE infers that the current charging infrastructure is insufficient to meet growing customer demand, citing that fewer than 1000 public chargers exist in PGE's service area. However, most EV charging occurs at home. PGE has ranked itself very high in having an impact on the provision of public chargers, which the Company has identified as one of the market barriers in EV adoption. CUB has already pointed out that without quantifying the importance of this barrier to the acceleration of EV adoption, we may not have a justifiable requirement to build more public charging facilities in its service area.

   As has already been discussed in previous CUB UM 1811 Testimony, Oregon leads the country in public charging infrastructure. There, we stated, "[a]ccording to EV Obsession, a website that reports on EV news and sales, citing 2015 data. Portland already has more Level 2 (240 volt) public chargers than any of the other 25 largest US cities."[8] Oregon is also a nationwide leader leading in DC fast-charging infrastructure. It is not clear whether installing more public chargers will have a significant impact on EV adoption.

   Table 12 in PGE's TE plan shows the utilization rates of its existing public charging facilities. As seen from the table, the rates are not substantial. CUB does not believe PGE can justify a need for building more public charging infrastructure in the light of these low utilization rates.[9] Also, as seen in Figure 12, all four DCQC chargers are rarely in use simultaneously at the World Trade Center Electric Avenue. Although PGE points out that this finding suggests that there are instances when EV drivers may not have access to chargers when and where they expect to, the analysis suggests that this is rare. CUB is doubtful of PGE's ability to support plans to invest in public charging based on utilization rates, which are low. In addition, because of the low utilization rates, it is difficult to calculate that the revenues from public charging will offset the costs of public charging.

   This does not mean that CUB opposes utility investment in public charging. Based on its customer survey, PGE reports that while 99% of current EV drivers typically charge at home, 38% of customers use public charging at least once per month.[10] In Section III of this testimony, CUB will discuss how we believe that PGE should focus less on acceleration of TE, and more on serving the thousands of customers who already own EVs. EVs are mobile, while most other load is stationary. This may mean that serving EV load requires a portfolio of investments. Investments to serve home charging may be very cost effective, while public charging may not be individually cost effective, but both may be needed to support EV charging in its service territory. CUB believes that PGE should be able to develop a portfolio of EV charging investments that are cost effective and support the charging needs of its customers.

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[8] UM 1811 – CUB/100/Jenks/4-5.

[9] PGE 2019 TE Plan, page 37.

[10] PGE 2019 TE Plan, page 28.

b) **Home Charging** – Figure 8, page 35 of PGE's TE Plan clearly shows that most home charging occurs during late afternoon to evening. This graph does not capture if this is Level 1 or Level 2 charging. This load shape also highlights the need for PGE to manage this load. Therefore, a residential charging program is warranted and CUB supports PGE in undertaking a pilot.

III. ALTERNATIVE METHOD FOR COST BENEFIT ANALYSIS

In this section, CUB will discuss the need for a new methodology to analyze the cost effectiveness of PGE EV investments and will propose a methodology based off of PGE's Line Extension Allowance which determines how much PGE can spend to cost effectively serve new residential customers.

1. *Controlling Grid Impact Costs of EVs.*

The integration of EVs can provide great system and ratepayer benefits if they are properly managed and planned for. Therefore, creating a sound long term EV plan is paramount to capturing these benefits. Rocky Mountain Institute (RMI) has discussed the need to invest in integrating EVs to the grid to gain the maximum level of benefits that EVs promise. If we ignore EVs and do not proactively manage their loads, there will be costs to the utility system. According to RMI:[11]

If utilities respond to EV loads late and reactively, that could:

- Shorten the life of grid infrastructure components
- Require greater investment in gas-fired peak and flexible capacity
- Make the grid less efficient
- Increase the unit costs of electricity for all consumers
- Inhibit the integration of variable renewables, and increase curtailment of renewable generation when supply exceeds demand
- Increase grid-power emissions
- Make the grid less stable and reliable

However:

If utilities anticipate the load of charging EVs and plan for it proactively, they can not only accommodate the load at low cost, but also reap numerous benefits to the entire system. Shaping and controlling EV charging can:

- Avoid new investment in grid infrastructure
- Optimize existing grid assets and extend their useful life
- Enable greater integration of variable renewables (wind and solar photovoltaics) without needing new natural-gas generation for dispatchable capacity, while reducing curtailment of renewable production
- Reduce electricity and transportation costs

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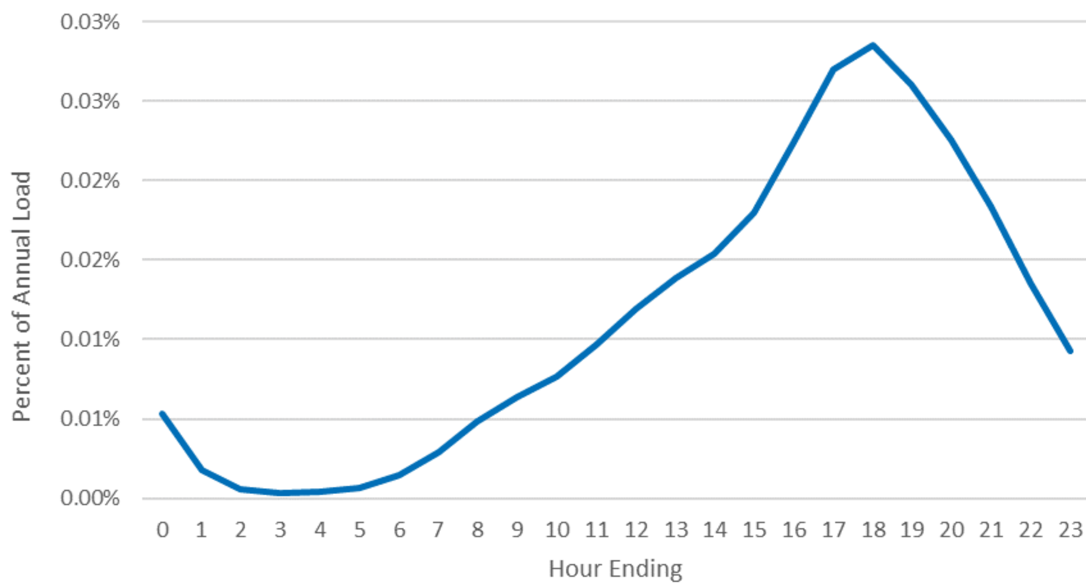
[11] Garrett Fitzgerald, Chris Nelder and James Newcomb. Electric Vehicles as Distributed Energy Resources, Rocky Mountain Institute, 2016 p. 6 and 7
http://www.rmi.org/Content/Files/RMI_Electric_Vehicles_as_DERs_Final_V2.pdf

• Reduce petroleum consumption
• Reduce emissions of CO2 and conventional air pollutants
• Improve energy security
• Provide multiplier benefits from increased money circulating in the community
• Supply ancillary services to the grid, such as frequency regulation and power factor correction[12]

PGE's TE plan shows the problem associated with not proactively planning for expected EV load. The figure below shows the estimated EV light-duty vehicle load profile used in PGE's 2019 IRP to estimate the capacity needs from EV load growth. The expected load shape for EVs on PGE's system should be worrisome.[13]



This load shape shows EV load peaking at hour 18 or 6:00 pm, which coincides with the timing of summer peak usage on PGE's system. If the Company does not address this load shape, EVs have the potential to increase costs on the system by adding load to a system already at its peak. With 85% of charging happening at home,[14] addressing the load shape of home charging is the primary tool to address this problem.

The answers to this problem are known – time-of-use (TOU) charging rates and utility managed charging.

TOU charging raises the cost of charging on peak and lowers the cost of charging off-peak. This creates a price signal to incent EV-driving customers to move their charging off times that would

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[12] Burns & McDonnell, "SPIDERS Delivers First-of-a-Kind Bidirectional Electric Vehicle Charger at Fort Carson, Colorado," August 30, 2013. http://www.burnsmcd.com/ insightsnews/news/releases/2013/08/spiders-deliversfirstofakind-bidirectional-elec__.
[13] PGE 2019 TE Plan, page 35.
[14] PGE 2019 TE Plan, page 144.

create the greatest costs to the system. By moving charging off-peak, the cost of serving that load is reduced and the grid (distribution) impact is minimized because the grid is underutilized off-peak.

However, off-peak charging benefits disappear as more EVs are added to the system. Off-peak charging creates a surge of demand when the off-peak rates begin. This surge is manageable while EV's loads are small, but there is a point where the cost of meeting this ramp outweighs the benefits of moving charging off peak. According to Jim Lazar of the Regulatory Assistance Project, this will happen when EVs make up about 5% of the vehicles on the road.[15] After this, managed charging—giving the utility the ability to directly control a customers' charging—is the best way to control costs. As stated above, CUB estimates that 6% of new vehicle sales in PGE's service territory are currently electric, so PGE will eventually hit this 5% limit for TOU charging.

2. *The Key to Off-Peak and Managed Charging is Grid Integrated Charging.*

There are two barriers to TOU charging. The first is that it requires Level 2 charging, because the off-peak period is not long enough to charge an EV. The second is the need to either place a whole house on TOU or add a second meter, which is cost prohibitive. CUB believes that both can be overcome with a grid connected Level 2 charger. In Minnesota, Xcel Energy has agreed to allow TOU billing utilizing data collected from a single meter, rather than requiring the installation of a second meter.[16] PGE has not agreed to do this in Oregon. CUB believes that this can be accomplished by using data from a grid connected charger. CUB's conversations with PGE suggest that the barriers to this are the need for what the Company refers to as "billing quality data" and the Company billing system's ability to handle the data. CUB believes that these barriers can and should be overcome. First, the entire house, including the EV, is metered by a PGE installed smart meter. The EV charger is downstream and submeters the EV charging. Every single kilowatt hour used by the home and the EV are accounted for by the PGE meter which produces "billing quality data." Even if the charger does not produce perfectly accurate information, every kilowatt hour used by the customer is billed to the customer. As far as the billing system not being able to handle this, PGE just installed a new CIO billing system that is supposed to have the capability to be a platform for a smarter grid and more billing options. If PGE cannot make EV TOU billing an option in that CIO, then there are serious questions about the product PGE purchased and the value of it to customers. CUB continues to believe that PGE can make this work.

The same requirement (a grid connected Level 2 charger) for EV-only TOU rates allows for managed charging. With a grid-connected Level 2 charger, PGE will have the ability through demand response programs to move EV charging around to minimize its impact at peak times, avoid a ramping cost at the start of off-peak pricing, and use EVs to help integrate intermittent resources like wind and solar.

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[15] UM 1811 – CUB/100/Jenks/24.
[16] https://www.utilitydive.com/news/xcel-ev-charging-pilot-would-eliminate-need-for-2nd-meter/511877/

PGE has a residential smart charging pilot that will provide a residential rebate of $500 to install a grid-connected Level 2 charger, but this is limited to 3,600 homes.[17] CUB is concerned that this pilot is too limited. PGE expects 78,000 light duty EVs will be charged at single family homes within its system by 2025.[18] The limitation of this pilot could leave nearly 75,000 EVs on neither TOU nor grid integrate charging. This has the potential to add costs to the system if these EVs are charged during on-peak times as PGE predicts.

PGE estimates that 56% of single-family homes will install Level 2 charging by 2025. Once a customer has installed a Level 2 charger at their home, the customer is unlikely to replace it with a grid-connected charger. This represents a significant lost opportunity. Unless PGE can move beyond a limited pilot program to a program that is available for all home charging, it will end up with a significant amount of load that is not on TOU or managed charging. This is problematic.

3. *Justifying Grid Integrated Charging Based on its Role in Accelerating TE Makes Little Sense*

PGE's TE plan addresses the benefits of PGE's residential smart charging pilot. Two of the primary goals of the pilot are to decrease customers' first cost of adopting an EV and engage dealers in selling EVs and connecting customers to simple charging solutions.

While these are reasonable goals, they grow out of the effort to analyze costs and benefits through the lens of accelerating transportation electrification. While SB 1547 allows utility investments to accelerate TE, making that the focus of programs such as grid connected charging makes little sense.

Despite the Company's efforts to spur EV adoption, most of the grid impacts will come from the vehicles that are purchased completely independently from any action PGE takes. Below is a graph from CUB's Testimony on PGE's 2017 SB 1547 TE programs that highlights the problem with focusing on acceleration transportation electrification.[19] Justifying a program to move EVs to grid connected charging based on PGE's ability to accelerate transportation electrification will fail because the vast majority of EVs will purchased independent of PGE's actions.

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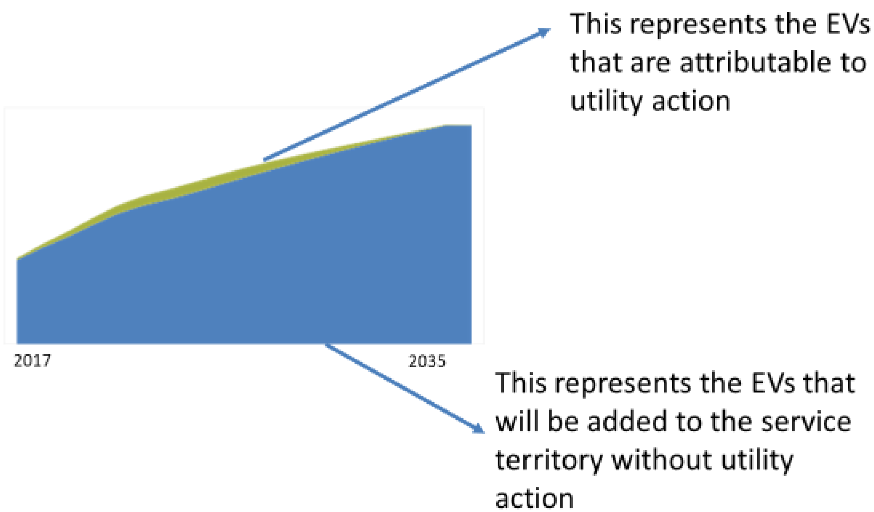
[17] *See* https://edocs.puc.state.or.us/efdocs/HAD/um1811had151943.pdf, CUB notes that some customers with limited income would receive a $1000 rebate.
[18] PGE 2019 Transportation Electrification Plan, page 53
[19] UM 1811 - CUB/100/ Jenks/8.



CUB understands PGE's use of SB 1547 and the pilot programs it has launched. The bill authorizes utility to make investments to accelerate TE, therefore there is clear authority to spend money for this purpose. While CUB believes that SB 1547 creates an allowance for programs that accelerate transportation electrification, CUB disagrees that all EV spending must be examined through a cost effectiveness test associated based on acceleration, as the prior pilot programs have been.

In addition, even SB 1547 does not anticipate using acceleration of transportation as part of a cost effectiveness test. SB 1547 requires the Commission to consider 6 criteria when evaluating utility EV programs for cost recovery:[20]

> (a) Are within the service territory of the electric company;
> (b) Are prudent as determined by the commission;
> (c) Are reasonably expected to be used and useful as determined by the commission;
> (d) Are reasonably expected to enable the electric company to support the electric company's electrical system;
> (e) Are reasonably expected to improve the electric company's electrical system efficiency and operational flexibility, including the ability of the electric company to integrate variable generating resources; and
> (f) Are reasonably expected to stimulate innovation, competition and customer choice in electric vehicle charging and related infrastructure and services.

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[20] SB 1547, page 13.

4. *Light Duty EV load on PGE's system is significant enough that PGE has an obligation to serve it.*

PGE forecasts a base case with 99,000 light duty EVs on its system by 2025 with a load of 35aMW.[21] This is a load that is greater than the load served by each PGE rate schedules: 15, 38, 47, 49, 89-T, 91 and 92. It is greater than the load of streetlighting and is greater than the loads of small and large irrigators combined. To the best of CUB's knowledge there is no special legislative authority authorizing PGE to serve irrigation or streetlighting. Instead, it is PGE's obligation as a utility to serve customers. CUB believes the Company should have a similar obligation to proactively meet the load anticipated in the base case projected by the Company.

PGE expects to have 99,000 light duty EVs in its service territory by 2025, with the bulk of these charged at residential homes. As an advocate for residential customers, CUB represents these PGE customers, as well as the nearly 700,000 residential customers who will not own an EV. EV customers, like all customers, have an expectation that the utility will make the necessary investments to serve their load. The residential customers who do not own EVs should have the expectation that they are not required to unduly subsidize other customers, including EV customers but they should also have the expectation that PGE is making the investments necessary to keep EV charging from adversely impacting the system.

PGE makes investments to serve customers, whether residential or streetlighting or irrigation. CUB does not understand why making investments to serve EV load must require special legislative authority. Investments to serve expected load is a primary responsibility of an electric utility.

5. *All PGE customers are benefiting from EV load.*

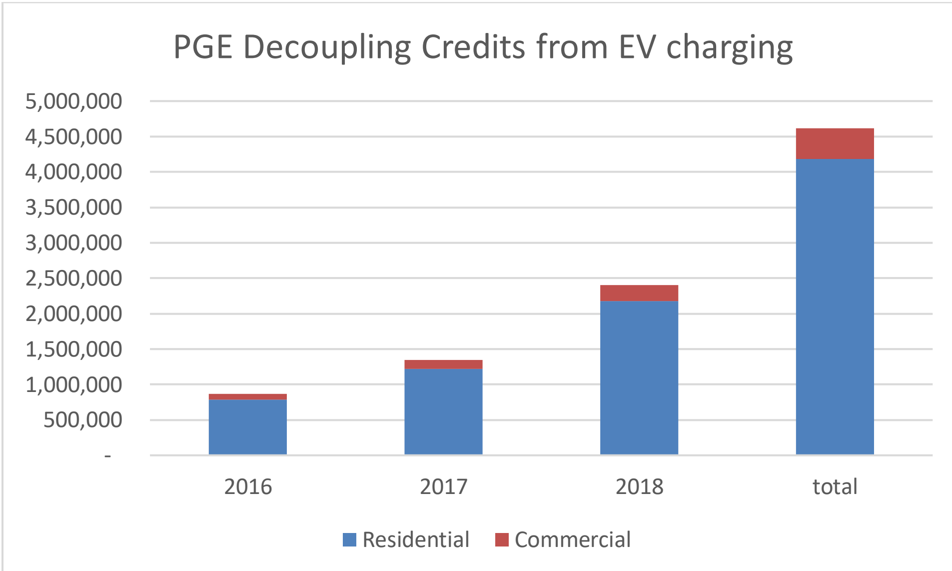
PGE is decoupled. This means that between general rate cases there is a surcharge or surcredit to customers to ensure that PGE does not over or under-recover its fixed costs. Historically, decoupling was established to "decouple" the link between a utility's profit and its volume of sales. Without decoupling a utility has a disincentive to support energy efficiency programs which reduce sales (revenues) but do not reduce fixed costs.

Mathematically, PGE's decoupling tariff charges or credits each customer class for changes in usage from last general rate case forecast multiplied by the fixed costs assigned to that customer class. Activities that reduce usage lead to a surcharge, while activities that add usage will lead to a surcredit. EVs add load, which will contribute to a surcredit.

PGE had rate cases in 2014 and 2018 using a 2015 and 2019 test year forecast. This means that the residential and commercial forecasts included forecasts of 2015 and 2019 EV load. Changes in load between those rate case test years were subject to decoupling adjustments.

[21] PGE 2019 TE Plan, page 76.

Below is a chart that shows from 2016 through 2018 that PGE' residential customers received more than $4 million in decoupling credits associated with EV load being added to the system. Commercial customers saw more than $400,000 in decoupling credits.[22]



6. *Line Extension Allowance (LEA) Rationale Applied to EV load.*

The decoupling mechanism returns revenue to customer classes based on a mathematical formula between rate case that accounts for the fixed costs of distribution, transmission, and energy. It is designed to ensure the utility does not over or under-recover fixed costs. It is not a tool that can appropriately be used as a cost effectiveness test. Utilities have other mechanisms to evaluate both the costs and benefits of serving new load.

The primary tool used to ensure that new load benefits the system is a LEA methodology which focuses on distribution investments to serve new load versus distribution revenues created by that new load. While EVs are not new customers, they are new load and CUB believes that the LEA is a useful tool for determining whether there will be a benefit to new EV load.

It should be noted that the reason it is called a LEA is that most new load is stationary, and the utility needs to extend the grid to serve that load (*i.e.*, extend a line). This extension will include a new line, along with trenching, poles, and any additional investment that is needed to extend service to that load. With EVs, there is less of a need to extend the grid but there is a need to connect the EV to the grid. When applied to EVs, CUB will refer to the LEA as a Grid Integration Allowance (GIA).

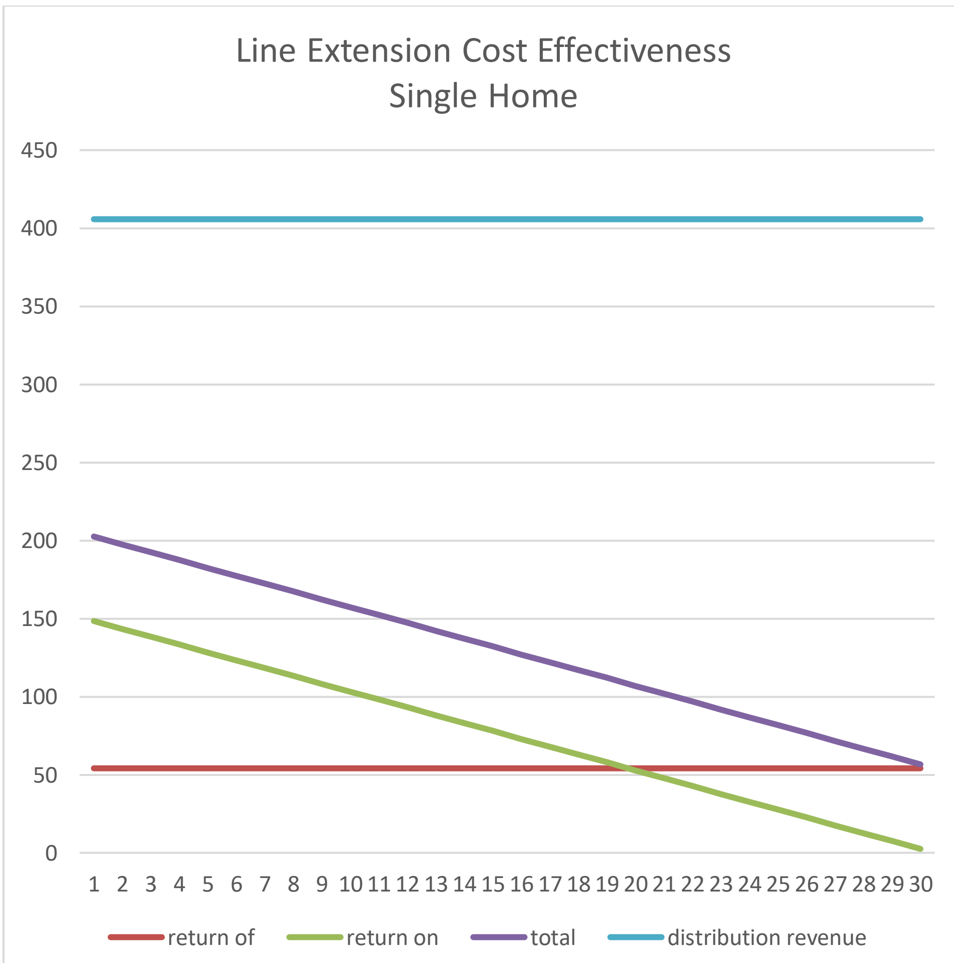
7. *How a LEA works***.**

While LEAs vary from utility to utility, they generally operate in a manner similar to PGE's LEA mechanism. PGE's mechanism forecasts the amount of revenue associated with charges

[22] See CUB Attachment A, EV Decoupling.

for distribution and customer charges that a new home will produce in its first 4 years.[23] PGE is then allowed to invest up to this amount of money in order to serve this load. LEAs are limited to the distribution system, because this is where the investments are needed to serve a new building that would require a LEA.

Because the investments to serve this load are primarily capitalized and spread out over the life of the investments, the revenue contributed by the customer will be greater than the cost of the allowance beginning in the first year of the new load. PGE's residential LEA is $1,623 per home, based on an assumption that a new home will contribute 25% of this ($406) each year in revenue from distribution and customer charges. If we assume that the utility spends the full amount of the allowance on equipment with an average useful life of 30 years, the result would approximate the graph below.



In the first year, the new capital investment to serve that new residential unit add $202.5 to revenue requirement, while the distribution revenue from that customer is $406. The difference between these two figures, $204, represents the benefits to other customers from the new load

[23] PGE Advice Filing 11-13.

contributing to shared distribution costs. This means that PGE can spend $1623 per new home and the entire system benefits from the beginning of cost recovery. Above is a graph that shows the revenue requirement costs associated with a $1623 line extension investment and the expected revenue from that new customer. The area between the blue and yellow lines represents the net distribution benefits that are provided to the system from that new customer's load. The details of this analysis are shown on CUB Attachment B.

8. *Grid Integration Allowance: Applying the LEA concept to EV load.*

EVs are not new individual buildings, so using a LEA may seem misplaced. However, CUB believes that it is a good tool for evaluating the investment needed to meet EV load because it focuses on the cost of integrating that load to the grid, distribution revenues associated with the new load and distribution benefits to the system.

One way to reconcile the two concepts is that if PGE knew every new home would include an EV, then this would automatically raise the projected load of the home and would therefore increase the LEA. This would increase the LEA by four-times the expected EV load multiplied by the distribution charge. The EV would not add additional revenues associated with customer charges, but its load would be multiplied by the distribution charge raising the associated LEA.

Of course, we do not expect that every new residential housing unit will immediately include EV charging load. However, we do have a forecast of new EVs, know their expected residential and commercial loads, and can calculate the distribution revenues. Appling the same concept of an allowance based on four years of distribution revenues would allow a utility to invest in its distribution system to serve that new load.

PGE's GIA for each new EV would be $587.53.[24] Below is a graph of cost and revenue associated with an EV assuming PGE spend the full GIA amount. CUB is assuming a 10-year useful life for EV investments. Again, the difference between the blue and the yellow line represents the contribution toward shared distribution costs that offsets other customers' rates.

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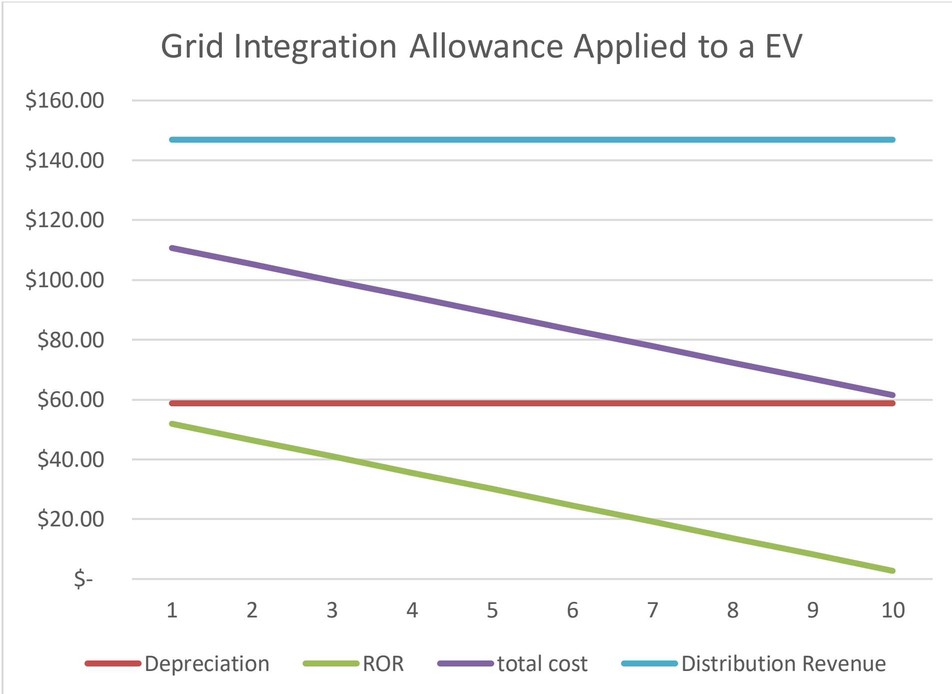
[24] Based on $490.9 for residential and $96.63 for commercial (85% of charging is residential and 10% workplace).



With a forecast of 99,000 EVs by 2015, a GIA would support spending up to a maximum of $58.2 million integrating the EV load to the grid.

These figures represent the upper limit of what PGE could spend under a GIA. CUB is not suggesting that PGE should have a blank check to spend this amount. The GIA analysis says that this amount would be more than offset by the distribution revenues. EVs will require new distribution investment. PGE's TE plans states that 3% of all EVs charged with a Level 2 charger will require line transformer investments of $2500 to $5000. Assuming the high end, this forecast could add more than $10 million in costs, leaving approximately $48 million in potential spending.

9. *Energy Costs*.

LEAs attempt to identify how much a utility could invest in distribution plant to meet new load and still ensure everyone benefits. The benefit is a benefit caused by spreading overall distribution costs over a wider base of revenues. Although it is a real benefit, it only looks at the distribution system. Energy costs and energy revenues are not considered in a LEA.

EVs will also provide significant energy revenues to the utility system. PGE's residential energy charge for the first 1000 kWh at a residence is 6.329 cents/kWh and 7.051 cents/kWh for usage above 1,000 kWh. If the cost of serving the EVs energy and related capacity is less than this then EVs will have an additional energy benefit to the system.

If PGE can manage the EV load in a way as to keep the energy costs below 6.3 cents/kWh, then the system will incur energy benefits in addition to distribution benefits. CUB believes this should be a priority for PGE's EV investments. EVs have some important attributes that should allow the utility to serve it at a relatively low cost:

- EV load is year-round, not limited to peak times of the year. PGE is a dual peaking utility with both a summer and winter peak. EVs, unlike heating and cooling costs, are spread throughout the year, including fall and spring when power prices are low.

- EVs are flexible load which can charge off-peak. While air conditioning needs to be on when temperatures are high, EV charging lends itself to off-peak periods when loads are down. This is one reason CUB believes that PGE should allow TOU billing using grid connected chargers rather than separate meters.

- EVs can be used to reduce power costs. EVs are flexible load. If the utility can harness this flexibility, it can use it to reduce costs. Grid connected EV charging that allows a utility to use the charging flexibility can be used to integrate variable wind at night, can be used to absorb excess solar during the day and would allow a utility to schedule the EV charging to take advantage of the lowest costs available.

PGE's residential grid-integrated charging pilot represents a distribution investment that will help ensure EV power costs are below the embedded power costs and therefore provide additional benefits.

10. *GIA: Applying the Concept to Load that is Mobile Rather than Fixed*

PGE's residential charging pilot offers rebates of $500, while the GIA analysis supports grid connecting investment of $588/vehicle. However, not all new EVs will require a grid connected home charger. PGE is projecting that 44% of residential customers in 2025 will still be using Level 1 charging. Some will charge exclusively at work; others will live in multi-family housing and rely on public charging. Some will use a mixture of home, business, and public charging.

EVs are different than any of the loads that an LEA has traditionally been used to analyze because EVs are not fixed--they are mobile. Public charging, for example, has low utilization and is not cost effective when evaluated from the viewpoint of revenues from public charging versus the cost of the public charging equipment. However, some public charging is necessary because EVs do not have unlimited range and will need to venture further from their home charging than their range allows.

CUB's view is that the GIA represents a methodology to identify a level of spending on connecting EVs to the grid that will be offset by the distribution revenues from the EV load. Because of the mobility and varying charging behavior of EV owners, CUB believes that it makes most sense to apply this GIA to a portfolio of investments that the utility will need to make to ensure that the utility is meeting it responsibility to serve this load while ensuring that there is no subsidy from non-EV load. These investments should be targeted towards maximizing the aforementioned benefits that EVs can provide to a utility's system. That portfolio will include:

- The cost of new line transformers. PGE estimates that 3% of homes with level 2 charging will require a line transformer upgrade. Grid connected charging should reduce this, but the addition of EVs will likely cause some need to upgrade elements of the distribution system.
- Grid connected residential charging.
- Grid connected workplace charging.
- Grid connected public charging.

CUB's analysis shows that PGE could spend more than $50 million by 2050 in supporting grid connection of EVs and the EVs would still benefit *all* customers of the distribution system.

11. *Moving beyond pilots.*

Every EV owner who installs a non-grid connected level 2 charger represents a lost opportunity. These customers will be more likely to add distribution, energy, and capacity costs—rather than benefits—to the system.

The need for EVs to move to TOU and managed charging is well-known and is widely recognized.[25] Because Oregon is one of the top three states for the percentage of new vehicle sales that are electric and the majority of Oregon EVs are in PGE's service territory, PGE is one of the first utilities to deal with significant growing EV load. While pilot programs are important for most utilities as they prepare for EVs, PGE needs to move beyond pilots for a variety of reasons. PGE's residential pilot will help move approximately 4% of EVs to TOU and/or managed charging. The GIA analysis would support moving the residential program out of the pilot stage and making it available to all EVs that are primarily home charged.

12. *CUB's Recommended New Approach*

CUB believes that the current approach to examining EVs through a lens of accelerating transportation electrification and spurring EV adoption within PGE's service territory makes little sense in PGE's case where EV load is already significant, growing, and providing millions of dollars in revenue. The Company should take action now beyond what has been contemplated in its pilot projects to ensure the EVs that are on and coming onto its system can bring benefits with them.

CUB would encourage PGE and the Commission to adopt a GIA methodology approach to light duty EVs. This would require a more granular look at the inputs to the GIA, including the expected load of each EV, and the useful life of investments and expenses. The GIA will identify the level of investment that is cost effective based on current EVs on the system and expected EVs in the next two to five years. PGE's TE Plan should propose a budget for grid integrated charging and other distribution investments that are below the cap established by the GIA. Evaluation of the TE Plan will consider whether the programs are reasonable as a way to

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[25] *See, e.g.,* Smart Electric Power Alliance, *Utilities and Electric Vehicles: The Case for Managed Charging* (Apr. 2017).

integrate electric vehicle load and whether each program should be acknowledged. Importantly, the portfolio of GIA-related investments should be acknowledged by the Commission prior to the Company expending capital to build them and later seeking rate recovery. This would align with traditional utility capital expenditure planning and recovery processes that already exist.

IV. CONCLUSION

A recent *Utility Dive* article pointed out that transportation electrification efforts in Oregon are falling short of what would be required to achieve goals set in Governor Kate Brown's 2017 executive order and also the 50% renewables portfolio target set by SB 1547.[26] In the light of the urgency needed to meet these policy goals, CUB appreciates PGE's efforts in designing a TE Plan largely oriented towards increasing EV adoption in its service area.

At the same time, CUB fears that the traditional role of an electric utility to provide reliable and affordable service to its customers may have been undermined in the utility's pursuit to fulfill the state's EV goals. CUB points out that PGE's TE Plan inadequately addresses the utility's strategies to manage the new load that the EVs would bring to the system. While PGE's cost effectiveness analyses focus on costs and benefits of the "additional" EV load that would result from PGE's program initiatives, CUB argues that the utility should be planning for all EVs that are expected to be in its service territory. Unless the utility accurately plans to manage this new load it would create reliability and affordability concerns for all its customers whether they are EV owners or not.

EV growth in PGE's service territory is significant. It is time to move beyond pilots and instead begin developing programs to serve the load by integrating it to the grid. CUB. CUB strongly supports PGE's plans for residential managed charging, but thinks that this program should not be capped.

Finally, CUB believes that the level of EV penetration in PGE's service territory is significant enough to develop a new methodology for cost effectiveness based on setting a Grid Integration Allowance that identifies a spending level that allows PGE to serve EV load but insures that all customers benefit from EV revenues.

Signed this 6th Day of December, 2019.

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[26] https://www.utilitydive.com/news/as-oregon-lags-behind-on-its-ev-goals-pge-makes-tou-rates-optional-to-expa/567000/

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Grid Integration Analysis For EVs

UM 2033 - Oregon Citizens' Utility Board Attachment A

PGE Light Duty EV forecast	
Year	
2025 forecast	99,000
2030 forecast	225000

Assumptions:	
Annual charging per vehicle	3097 kwh/year
Residential distribution charge	4.662 cents/kWh
Schedule 38 and 83 line extension credit	7.80 cents/kwh

Light Duty EV load kwh	2025	306,603,000
	2030	696,825,000

	2025		2030	
	Residential	Business	Residential	Business
Load By class (85% R, 10% C&I)	260,612,550	30,660,300	592,301,250	69,682,500
Grid Integration Allowance	$ 48,599,028	$ 9,566,014	$ 110,452,337	$ 21,740,940
Line Extension allowanced per EV	$ 490.90	$ 96.63		

sources:

Vehicle Forecast PGE TE Plan

Charging per vehicle: PGE TE Plan 35aMW in 2025

Residential Distribution Charge: PGE Tariffs, Schedule 7, Fourteenth Revision of Sheet No. 7-1

Sch 38 and 83 LEC: PGE Advice filing No. 11-13

Current Line Extension Analysis

UM 2033 - Oregon Citizens' Utility Board Attachment B

Charging per Vehicle	3097 kwh/year
Residential Distribution charge	4.662 cents/kWh
Schedule 38 and 83 line extension credit	7.80 cents/kwh

Residential Line Extension based on 4 years of distribution and customer charge: $1623 per house		
Annual Distribution and Customer Charge revenue:		$ 405.75
Pre-tax ROR	9.30%	
Res EV line extension based on 4 years of distribution:		$490.90
C&I		$96.63
total		$587.53
2025 EV Forecast		99000
Annual EV distribution revenues		$146.88
Maximum EV Spending:		$58,165,113.60
Useful Life	30	

Line Extension 30 Year Max Amount of Spending				
Year	Return of	Return on	Total	·ibution Revenue
1	54.1	148.42	202.52	$ 405.75
2	54.1	143.39	197.49	$ 405.75
3	54.1	138.36	192.46	$ 405.75
4	54.1	133.33	187.43	$ 405.75
5	54.1	128.30	182.40	$ 405.75
6	54.1	123.27	177.37	$ 405.75
7	54.1	118.24	172.34	$ 405.75
8	54.1	113.20	167.30	$ 405.75
9	54.1	108.17	162.27	$ 405.75
10	54.1	103.14	157.24	$ 405.75
11	54.1	98.11	152.21	$ 405.75
12	54.1	93.08	147.18	$ 405.75
13	54.1	88.05	142.15	$ 405.75
14	54.1	83.02	137.12	$ 405.75
15	54.1	77.99	132.09	$ 405.75
16	54.1	72.95	127.05	$ 405.75
17	54.1	67.92	122.02	$ 405.75
18	54.1	62.89	116.99	$ 405.75
19	54.1	57.86	111.96	$ 405.75
20	54.1	52.83	106.93	$ 405.75
21	54.1	47.80	101.90	$ 405.75
22	54.1	42.77	96.87	$ 405.75
23	54.1	37.73	91.83	$ 405.75
24	54.1	32.70	86.80	$ 405.75
25	54.1	27.67	81.77	$ 405.75
26	54.1	22.64	76.74	$ 405.75
27	54.1	17.61	71.71	$ 405.75
28	54.1	12.58	66.68	$ 405.75
29	54.1	7.55	61.65	$ 405.75
30	54.1	2.52	56.62	$ 405.75

EV - 10 Year Max Amount of Spending				
Year	Depreciation	ROR	Total Cost	Distribution Revenue
1	$ 58.76	$ 51.91	$ 110.67	$146.88
2	$ 58.76	46.44978	$ 105.21	$146.88
3	$ 58.76	40.9851	$ 99.75	$146.88
4	$ 58.76	35.52042	$ 94.28	$146.88
5	$ 58.76	30.05574	$ 88.82	$146.88
6	$ 58.76	24.59106	$ 83.35	$146.88
7	$ 58.76	19.12638	$ 77.89	$146.88
8	$ 58.76	13.6617	$ 72.42	$146.88
9	$ 58.76	8.19702	$ 66.96	$146.88
10	$ 58.76	2.73234	$ 61.49	$146.88