PACIFIC POWER
A DIVISION OF PACIFICORP

825 NE Multnomah, Suite 2000
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March 29, 2019

VIA ELECTRONIC FILING

Public Utility Commission of Oregon
201 High Street SE, Suite 100
Salem, OR 97301-3398

Attn: Filing Center

RE: UM 1810 – PacifiCorp's Transportation Electrification Pilot Update

In accordance with Order No. 18-075, PacifiCorp d/b/a Pacific Power encloses for filing in the above-referenced docket its transportation electrification pilot update. Included in the update is PacifiCorp's study of potential system impacts of residential electric vehicle adoption in the company's Oregon service territory as Appendix A, Potential System Impact Study.

It is respectfully requested that all formal data requests to the company regarding this filing be addressed to the following:

By e-mail (preferred): datarequest@pacificorp.com

By regular mail: Data Request Response Center
PacifiCorp
825 NE Multnomah Street, Suite 2000
Portland, OR 97232

Please direct any informal inquiries to Cathie Allen, Manager, Regulatory Affairs, at (503) 813-5934.

Sincerely,

Etta Lockey
Vice President, Regulation

Enclosure

TRANSPORTATION ELECTRIFICATION PILOT UPDATE

MARCH 27, 2019

This document provides a progress update on PacifiCorp's Transportation Electrification Pilot Programs.[1]

Background

In accordance with Senate Bill 1547, PacifiCorp filed its initial transportation electrification applications on December 27, 2016, proposing three pilot programs anticipated to accelerate transportation electrification in the company's Oregon service territory. In February 2017, Public Utility Commission of Oregon (Commission) staff requested additional information to expedite the review process. In response, PacifiCorp filed a supplemental application on April 12, 2017. On May 31, 2017, PacifiCorp hosted a settlement conference where intervening parties expressed support for, concerns with, and suggestions for improvement of various aspects of PacifiCorp's proposed pilot programs. This resulted in a stipulation that was filed on August 11, 2017, that resolved all matters in the proceeding (Stipulation). All but one intervening party agreed to the terms of the Stipulation. The Commission modified, adopted, and approved the Stipulation on February 27, 2018.

The lengthy proceeding resulted in the stipulation and order naming specific dates that did not align with the proposed three-year period of implementation. To align timing expectations, PacifiCorp filed a motion to amend Order No. 18-075 on February 25, 2019. On March 14, 2019, the Commission amended the order to modify the dates included in the Stipulation. The amended language also modified the Stipulation to require progress updates to the Commission by March 31, 2019, and March 31, 2020, with a report on pilot activities due by June 30, 2021.

The company began staffing and procurement for these programs after program approval. At this point, competitive requests for proposal (RFP) processes have been completed and vendors have been selected for all program elements, but most pilot elements remain in early implementation stages. There are three programs approved by the commission and summarized in this update. The three programs include:

- Public Charging Pilot
- Outreach and Education Pilot
- Demonstration and Development Pilot

[1] In the stipulation, Pacific Power agreed to "…provide a progress update on all transportation electrification pilot programs and pilots to the Commission by March 31, 2019."

Public Charging Pilot

Through the Public Charging Pilot, PacifiCorp is authorized to construct, own, and operate public electric vehicle charging stations at up to seven locations in its Oregon service territory. To support this effort, the company selected two vendors through competitive RFP processes:

- Tower Engineering Professionals was selected to perform design, engineering and construction services.
- ChargePoint was selected to provide electric vehicle charging equipment, network services, and operations and maintenance.

Based on final pricing from these RFPs, PacifiCorp anticipates it will develop five locations and the company further expects to begin construction of all sites as early as the end of 2019, however, it's likely that construction at one or more sites may extend into 2020.

The company began looking for potential locations in March of 2018, paying particular attention to areas currently underserved by existing charging infrastructure. An initial list of nine potential sites was shared in June of 2018 with Commission staff based on the criteria of convenience and anticipated use, visibility, availability of necessary electrical service, future-proofing, and permitting. Communities were engaged through PacifiCorp's Regional Business Managers to identify suitable locations to site charging stations. Potential sites were identified within seven communities. Currently the company is working with local governments and property owners in five of the identified communities to finalize locations and property agreements. On September 10, 2018, PacifiCorp announced that its first public charging station would be at a newly constructed public park in Klamath Falls. However, the city no longer considers that site viable and the company is currently working with the city to identify a new location for the charging station.

Table 1. Planned Construction Schedule

Location	Estimated Construction Start
Mill City	Q2 2019
Madras	Q2/Q3 2019
Otis	Q3 2019
Bend	Q3/Q4 2019
Klamath Falls	Q4 2019

Note: While the current schedule is to start construction at each of the sites in 2019, it is possible that construction at one or more sites will be extended into 2020 based on changing and/or unanticipated site conditions.

In accordance with the stipulation and order, on April 19, 2018, the company held a workshop with intervening parties to discuss the objectives of the Public Charging Pilot, including the use of time-varying pricing at company-operated electric vehicle charging stations. Participating parties expressed support of time-varying pricing and the beneficial integration of electric vehicle charging load onto the company's system. On July 19, 2018, PacifiCorp proposed rate Schedule 60 for company operated electric vehicle charging station service. The rate was designed to align with market funding and encourage efficient equipment and electric grid use. Schedule 60 became effective for service on September 1, 2018.

Table 2. Schedule 60- Company Operated Electric Vehicle Charging Stations

Schedule 60- Company Operated Electric Vehicle Charging Stations		
Level 2 Charging Stations	On-Peak, per minute	1.4 ¢
	Off-Peak, per minute	0.6 ¢
DC Fast Charging Stations	On-Peak, per minute	28.3 ¢
	Off-Peak, per minute	17.7 ¢

Outreach and Education Pilot

The Outreach and Education Pilot primarily consists of four components: customer communications, self-service resources, community events, and technical assistance. Progress updates on each component are provided below.

Customer Communications

As agreed to in the stipulation, "Pacific Power will focus Customer Communications expenses, to the extent practical, on promoting and supporting the success of the company's transportation electrification pilot programs that are approved by the Commission in this docket." To date the majority of communications have focused on publicizing and soliciting applicants for the demonstration and development grants. As the other components of the pilot programs are just ramping up, there has been minimal activity in this area.

Self Service Resources

Through a competitive RFP process, the company selected Clean Power Research's WattPlan tool. WattPlan performs detailed electric vehicle and home load modeling, electric utility bill, vehicle total cost of ownership and environmental impact estimates. This tool will assist customers interested in electric vehicles in better understanding total lifecycle costs through comprehensive vehicle options, utility bill impacts, and incentive calculations. WattPlan is expected to go live on PacifiCorp's website in the second quarter of 2019. PacifiCorp is also exploring additional self-service tools but has not yet made additional commitments.

Community Events

Through a competitive RFP process, PacifiCorp selected Forth to coordinate community events, primarily electric vehicle ride-and-drive events. Planning is underway for an estimated four ride-and-drive events throughout Oregon through 2020 along with additional event participation as budget and resources allow.

Technical Assistance

Through a competitive RFP process, PacifiCorp selected C2 Group to provide on-site technical assistance to non-residential customers interested in installing charging infrastructure. This service is offered at no cost to customers. Eligible customers will request custom analysis by submitting an online application, linked to PacifiCorp's

Website. The buildout of online application and processing is underway with a launch of this service planned for second quarter of 2019.

Demonstration and Development Pilot

The Demonstration and Development Pilot provides grant funding to non-residential customers to help offset the upfront costs of installing electric vehicle charging infrastructure. To make the program more easily understood by customers, PacifiCorp has branded the Demonstration and Development Pilot program as the *Electric Vehicle Charging Station Grant Program*. Through a competitive RFP process, PacifiCorp selected Nexant as the independent grant evaluator

Promotion of the Grant program began in August 2018 and is ongoing. Interested customers can sign up to receive notifications about the grant cycles via the website. The company's Regional Business Managers have been essential in promoting this program to communities and organizations around the state and building awareness about the availability of grant funding. Other organizations including the Oregon Department of Energy, Forth, and Travel Oregon have been helpful in publicizing this grant opportunity.

One full grant cycle has been completed. The first quarterly grant cycle opened to non-residential customers on October 15, 2018, with applications due November 15, 2018. The company received eight applications and awarded grants to six of the applicants based on the criteria established in the company's applications and as modified by the stipulation. Awardees are located in Bend, Coos Bay, Roseburg, and Medford. All grant recipients plan to install Level 2 charging stations representing an estimated total 28 charging ports with a total PacifiCorp contribution of $262,547. As required by the stipulation, up to 25 % of funds in the grant cycle were available to projects focused on fleet or workplace charging. Two of the six applications met the requirements of workplace or fleet charging. Of the $290,000 available in the first grant cycle $72,000, or 17%, was awarded to these two applicants. Up to 25% of funding in each grant cycle will continue to be reserved for these fleet and workplace electrification projects.

The second quarterly cycle opened on January 15, 2019, with applications due on February 15, 2019. A total of 13 applications were received, but two did not meet the eligibility requirements. Eleven applications are currently under review by the independent evaluator.

Table 3. Remaining 2019 Grant Cycles

Remaining 2019 Cycles	Cycle Opens	Applications Due
Q2	April 15	May 15
Q3	July 15	August. 15
Q4	October 15	November 15

Potential System Impact Study

As agreed to in the stipulation, PacifiCorp developed an initial pilot study of potential impacts of residential electric vehicle adoption. The study proposal was shared with parties in September 2018 and feedback was incorporated into the study design. The study is complete and can be found as Appendix A to this document.

Third Party Evaluation

Through a competitive RFP, PacifiCorp selected Navigant Consulting to evaluation the pilot programs. Navigant will prepare an evaluation report at the end of the pilot period and results of the evaluation will be used to inform potential program continuation.

Attribution Model and Cost-effectiveness Framework

As agreed to in the stipulation, PacifiCorp is supporting and funding an attribution model and cost-effectiveness framework to inform program evaluation efforts and potential future transportation electrification program development. Since that time, PacifiCorp has worked closely with Portland General Electric to develop a consistent framework for these analyses. On October 17, 2018, PacifiCorp and Portland General Electric staff led a workshop, attended by Commission staff and interested stakeholders, to review background and industry techniques and discuss options for assessing cost-effectiveness and attribution of Oregon transportation electrification programs. Results of those discussions will be incorporated into PacifiCorp's third-party program evaluations and future transportation electrification program proposals.

Appendix A
Potential System Impact Study

Potential System Impact Study

Executive Summary:

In Order 18-075, the Public Utility Commission of Oregon approved PacifiCorp's initial transportation electrification pilot programs, as modified by a stipulation supported by parties in Docket UM 1810. The stipulation includes the following provision:

> PacifiCorp will develop and conduct an initial pilot study of potential system impacts of residential electric vehicle adoption in a selected portion of the Company's Oregon service territory. Before beginning the study, PacifiCorp will share its proposed pilot study objectives, timeline and expected cost with the Stipulating Parties.[2]

In September 2018, the company shared its proposed pilot study objectives, timeline, and expected cost with UM 1810 parties and incorporated feedback received into the design of this study. Through this study, the company sought to understand the potential system impacts of residential electric vehicle adoption on the primary distribution system. The study accounts for variations in the company's Oregon service territory such as seasonality, geography, demographics, and electric vehicle adoption through 2025. The system impacts studied are equipment thermal loading, voltage range, and imbalance.

This study utilized a state-level vehicle adoption forecast provided by the Oregon Department of Transportation (ODOT), which considers the market share of new electric vehicles growing to 10% by 2025. The study analyzed sensitivities of 20% and 40% higher than the state- level adoption forecast (i.e., 12% and 14% market share by 2025, respectively) with random and clustered electric vehicle adoption. Each scenario was also studied with an additional 30% penetration of private solar generation to understand potential interactions between high levels of electric vehicle and private generation adoption. It is also assumed that customers installing electric vehicle charging will contact PacifiCorp regarding load additions.

The results of this study predict that in some locations, normal load growth will cause isolated system component overloading issues, which will be compounded by additional electric vehicle load. However, PacifiCorp's traditional distribution planning study process is designed to predict overload conditions that require system changes to mitigate. Barring a large increase in the installation of electric vehicle chargers in a short time period, this process will account for and prepare the system for the installation of residential electric vehicle charging.

Most overload conditions created by the installation of residential electric vehicle charging are capable of being mitigated by balancing the feeder load across all three phases. At some single-phase locations, the solution to mitigate the overload condition will require the evaluation and modification of the feeder configuration and protection scheme. The addition of private solar generation equal to 30% of the existing load is not projected to significantly impact the conductor overload conditions present due to residential electric vehicle adoption.

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[2] Order 18-075 modified this requirement to include all parties, not only those that supported the stipulation.

Study Scope:

The study assessed three distribution substation transformers and their associated distribution circuits where the substation is categorized as primarily serving urban, suburban, or rural areas. The study starts with the expected loading in 2025 and then is adjusted with the additional increase from the electric vehicle loading sensitivities. The substation distribution transformers and associated distribution circuits are:

Portland (urban)
    Vernon substation, T3747
    5P394 (96% residential), 5P395 (97% residential)
Bend (suburban)
    Shevlin Park substation, T365701
    5D238 (91% residential), 5D241 (91% residential), 5D243 (79% residential)
Klamath Falls (rural)
    Texum substation, T338712
    5L112 (76% residential), 5L113 (12% residential), 5L116 (79% residential)

Methodology:

The study was performed using measured feeder loads and estimated load growth rates through 2025 as a baseline to evaluate the impacts of the ODOT projection of plausible electric vehicle increase to a 10% market share. To study potential impacts of higher levels of residential electric vehicle adoption, sensitivities representing electric vehicle market share of 12% and 14% by 2025 were analyzed. After adjusting the baseline to reflect the impacts of potential new electric vehicle adoption, power flow analysis was performed using time series analysis and peak feeder loading to evaluate the impacts of increased adoption on existing equipment, devices, and voltage delivery. The time series analysis included four one-week periods: the weeks of summer peak load, winter peak load, spring minimum daytime load, and fall minimum daytime load.

Electric vehicle penetration was studied using two different scenarios. The first scenario assumed that the electric vehicle distribution was evenly spread across the entire feeder. The second scenario assumed clusters of electric vehicles in specific areas of the feeders. The randomly spread scenario was modeled as a general load increase equal to the increase in load due to the assumed number of electric vehicle chargers. The clustered scenario was modeled as blocks of load added to feeder taps with a sufficient number of existing customers capable of sustaining the increase of electric vehicle charging. Each clustered scenario was also studied with the addition of private solar generation equal to 30% of the peak load on each feeder.

The study assumed that residents with plug-in hybrid electric vehicles (PHEVs) would use Level 1 chargers with an average peak demand of 3.5 kilowatts (kW) and that residents with battery electric vehicles (BEVs) would use Level 2 chargers with an assumed average peak demand of 8 kW.

The assumed registered electric vehicle penetration was based on statewide penetration of electric vehicles and adjusted by individual feeder population. The assumed registered electric vehicle penetration is shown below.

Substation	Feeder	12%		14%	
		BEV	PHEV	BEV	PHEV
Portland- Vernon- Urban	5P394	79	41	95	50
	5P395	53	28	64	34
Bend- Shevlin Park- Suburban	5D238	48	37	58	42
	5D241	52	40	63	45
	5D243	28	21	34	25
Klamath Falls- Texum- Rural	5L112	1	2	2	3
	5L113	0	0	0	0
	5L116	1	3	2	4

Results

Urban:
Summary: The urban Vernon feeders are projected to experience overloaded conductors in all scenarios during normal load growth, random electric vehicle adoption ramping up to 12% market share, clustered electric vehicle adoption at 12% market share, and clustered electric vehicle adoption at 14% market share by 2025.

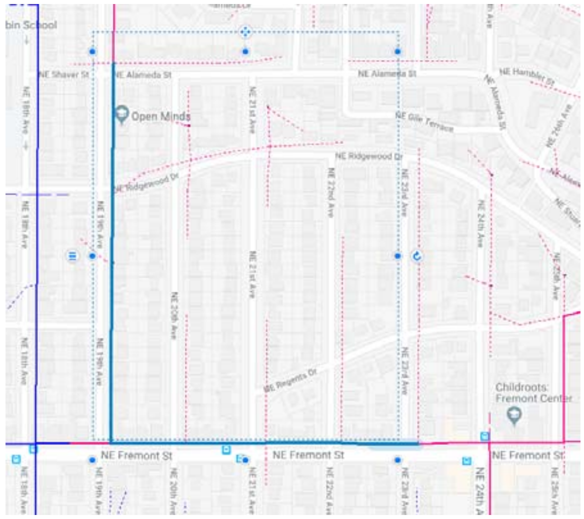
Normal Load Growth: The urban Vernon feeders are projected to experience normal load growth of up to 2.0% over the period ending in 2025. This normal growth rate is modeled to cause conductor overload of up to 118.5% on feeder 5P395 during summer loading conditions at multiple locations. There are no modeled overload conditions due to normal load growth during winter, spring, or fall loading conditions.

12% Electric Vehicle Market Share: The addition of electric vehicle charging to this feeder is modeled to increase this overload to 124.7% by 2025. Random electric vehicle adoption is modeled to overload one section of conductor on 5P395 to 100.5% during summer loading conditions. Clustered electric vehicle adoption in this scenario is modeled to overload one section of conductor on 5P395. All sections of overloaded conductor can be brought into tolerances with targeted phase balancing to move the load to under-loaded phases.

Random electric vehicle adoption in this scenario is modeled to overload the conductor between facility points 01101001.0236009 and 01101001.0236001 on feeder 5P395 to 100.5% during summer loading conditions.

Clustered electric vehicle adoption in this scenario is modeled to overload the section of #2/0 copper on feeder 5P395 beginning at facility point 01101001.0237203 and extending to facility point 01101001.0237003 to 111.3% during winter loading conditions. The addition of private solar generation is expected to decrease the overload to 109.1% in the case of 12% electric vehicle registration and 118.6% in the case of 14% electric vehicle registration. This section of conductor is shown in Figure 1.

Figure 1. Potentially Overloaded Conductor, FP 01101001.0237203 to 01101001.0237003



14% Electric Vehicle Market Share: Clustered electric vehicle adoption ramping up to 14% market share by 2025 is modeled to overload four additional sections of conductors on 5P394 and 5P395.

- The span of 336 ACSR conductor on feeder 5P395 beginning at 0101001.0236009 to 01101001.0236001 is modeled to be overloaded to 108.2% during winter loading conditions. The addition of private solar generation may reduce this overload to 106.4%. This span of conductor is shown in Figure 2.
- The section of 336 AAC conductor on feeder 5P395 beginning at facility point 01101001.0237305 to 01101001.0237202 is modeled to be overloaded to 107.1% during winter loading conditions. The addition of private solar generation may reduce this overload to 105.2%. This section of conductor is shown in Figure 3.
- The 5P394 feeder getaway of 1000 kcm aluminum is modeled to be overloaded to 102.6% during winter loading conditions. The addition of private solar generation may reduce this overload to 101%.
- The section of 4/0 copper conductor on feeder 5P394 beginning at 01101001.0236309 to 01101001.0236310 is modeled to be overloaded to 107.2% during winter loading conditions. The addition of private solar generation may reduce this overload to 105.4%. This section of conductor is shown in Figure 4.

Figure 2. Potentially Overloaded Conductor, FP 01101001.0236009 to 01101001.0236001

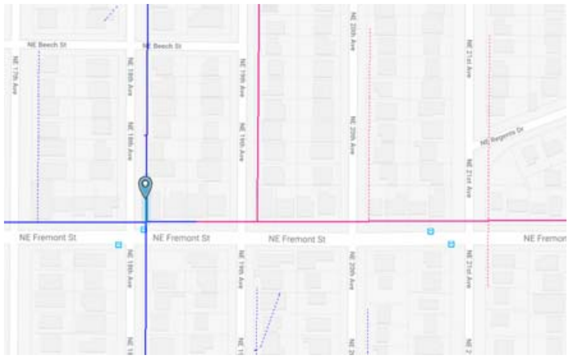
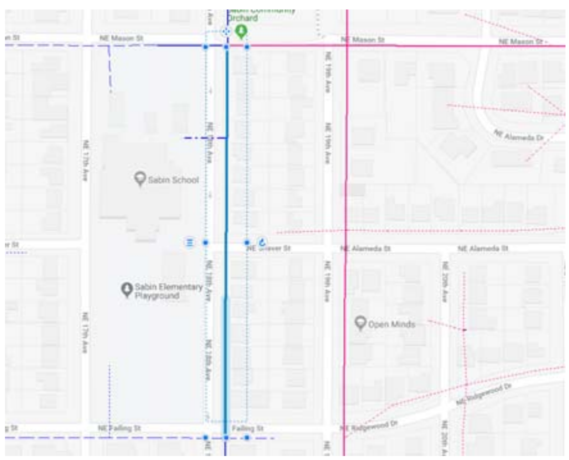


Figure 3. Potentially Overloaded Conductor, FP 01101001.0237305 to 01101001.023720

Figure 4. Potentially Overloaded Conductor, FP 01101001.0236309 to 01101001.0236310



Suburban:

Summary: The suburban Shevlin Park feeders are projected to experience overloaded fuse conditions during normal load growth, clustered electric vehicle adoption ramping up to 12% market share, random electric vehicle adoption ramping up to 14% market share, and clustered electric vehicle adoption at 14% market share. Overloaded elbow conditions are also projected on feeder 5D241 during clustered electric vehicle adoption of 14% market share.

Normal Load Growth: The suburban Shevlin Park substation is expected to experience normal load growth of up to 5.0% on feeder 5D243 while experiencing lower growth rates of 0.5% on feeders 5D238 and 5D241 over the period ending in 2025. The normal load growth on 5D243 is not expected to lead to overloading issues by 2025. This normal load growth is expected to lower the peak load voltage to 94.8%, which is outside of ANSI Range A. Normal load growth is modeled to cause overloading up to 128.7% at three fuse locations on 5D238 and 5D241 during summer and winter loading conditions.

12% Electric Vehicle Market Share: The random and clustered electric vehicle charging scenarios were shown to cause single-phase overloading at various additional fuse and elbow locations on feeders on 5D238 and 5D241. Extreme clustered electric vehicle charging on feeder 5D238 was shown to increase load up to 150% of the rated capacity of some devices during winter loading conditions. 5D243 was not shown to have any overload issues that are the result of electric vehicle charging.

When random electric vehicle is modeled, it is shown to cause the single-phase overload of the 200A elbows to 100.3% at facility point 01418012.0063782 during summer loading conditions. This is modeled to increase to 102.1% with the random electric vehicle adoption of 14% of registered vehicles. This location is shown in Fig 5.

Clustered electric vehicle adoption in this scenario is modeled to cause the single-phase overload at three fuse locations.

- The 100T fuse at 01417011.0252800 on feeder 5D238 is expected to be overloaded to 118% during winter loading conditions and 130.5% with the clustered electric vehicle adoption of 14% of registered vehicles. This overload is modeled to be 109.3% during summer loading conditions with electric vehicle adoption if 12% of registered vehicles and 120.1% with electric vehicle adoption of 14% of registered vehicles. The addition of private solar generation may reduce the overload by 1.1% for each scenario. This fuse feeds a three-phase tap and the overload condition can be mitigated by balancing the load beyond the fuse. This fuse location is shown in Figure 6.

- The 80E fuse at facility point 01417011.0247281 on feeder 5D238 is modeled to be overloaded to 134.4% during winter loading conditions. The addition of private solar generation may reduce the overload by 1.4% for this scenario. This fuse feeds a single-phase tap that would not benefit from load balancing. An evaluation of the fuse coordination and normal open point beyond this fuse would need to be performed to determine the ideal solution to this overload condition. This location is shown in Figure 7.

- The 100T fuse at 01417012.0317502 on feeder 5D241 is modeled to be overloaded during summer loading conditions to 106.3% in this scenario. The addition of private solar generation is expected to decrease this overload by 1.8%. This fuse feeds a single-phase tap that would not benefit from load balancing. An evaluation of the fuse coordination and normal open point beyond this fuse would need to be performed to determine the ideal solution to this overload condition. This fuse location is shown in Figure 8.

Figure 5. Potentially Overloaded Elbow, FP 01418012.0063782

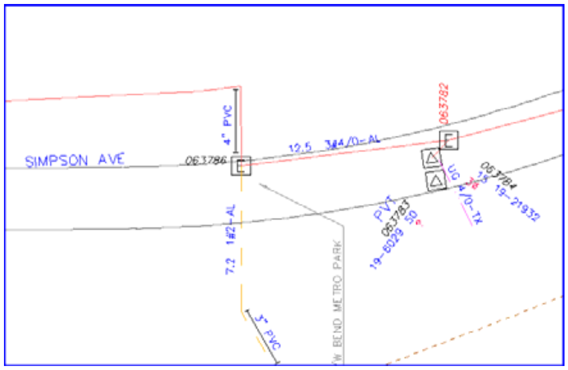


Figure 6. Potentially Overloaded Fuse, FP 01417011.0252800

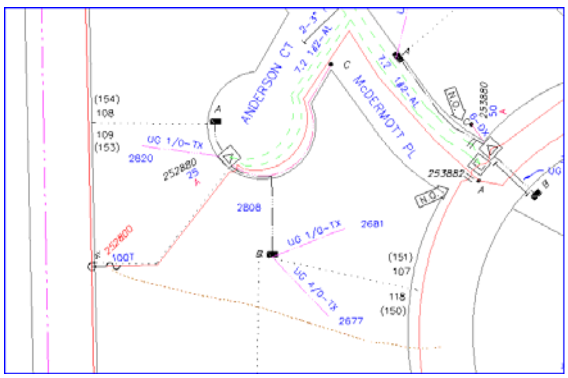


Figure 7. Potentially Overloaded Fuse, FP 01417011.0247281

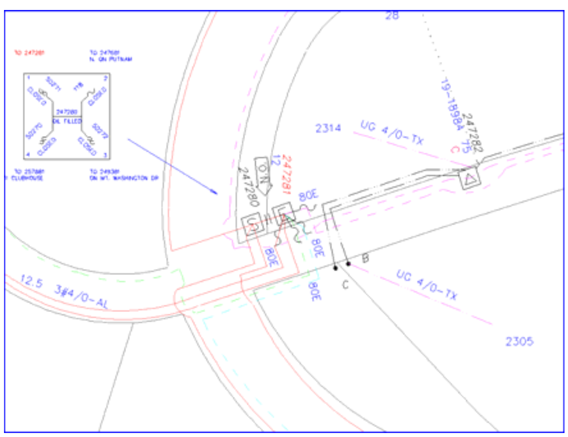
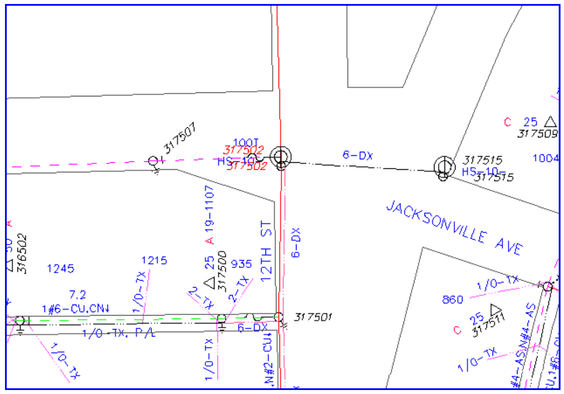
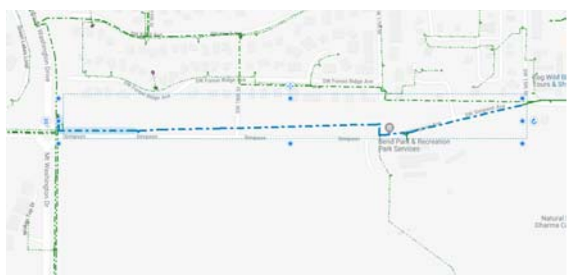


Figure 8. Potentially Overloaded Fuse, FP 01417012.0317502



14% Electric Vehicle Adoption: Clustered electric vehicle adoption ramping up to 14% market share is modeled to cause an overload condition of up to 102.1% on 200 A elbows between facility points 01418012.0063782 and 01418011.0019782 during summer loading conditions on B phase. This overload condition would be able to be corrected by balancing the load beyond the elbows. The addition of private solar generation may reduce this overload condition to less than 100%. This section of line is shown in Figure 9.

Figure 9. Potentially Overloaded Elbows, FP 01418012.0063782 to 01418011.0019782



Rural:

The rural Texum substation load examined in this study does not expect any load growth over the period ending in 2025. The assumption of between seven and 11 residential electric vehicle chargers connected to these feeders is not expected to cause any loading or voltage issues by 2025.