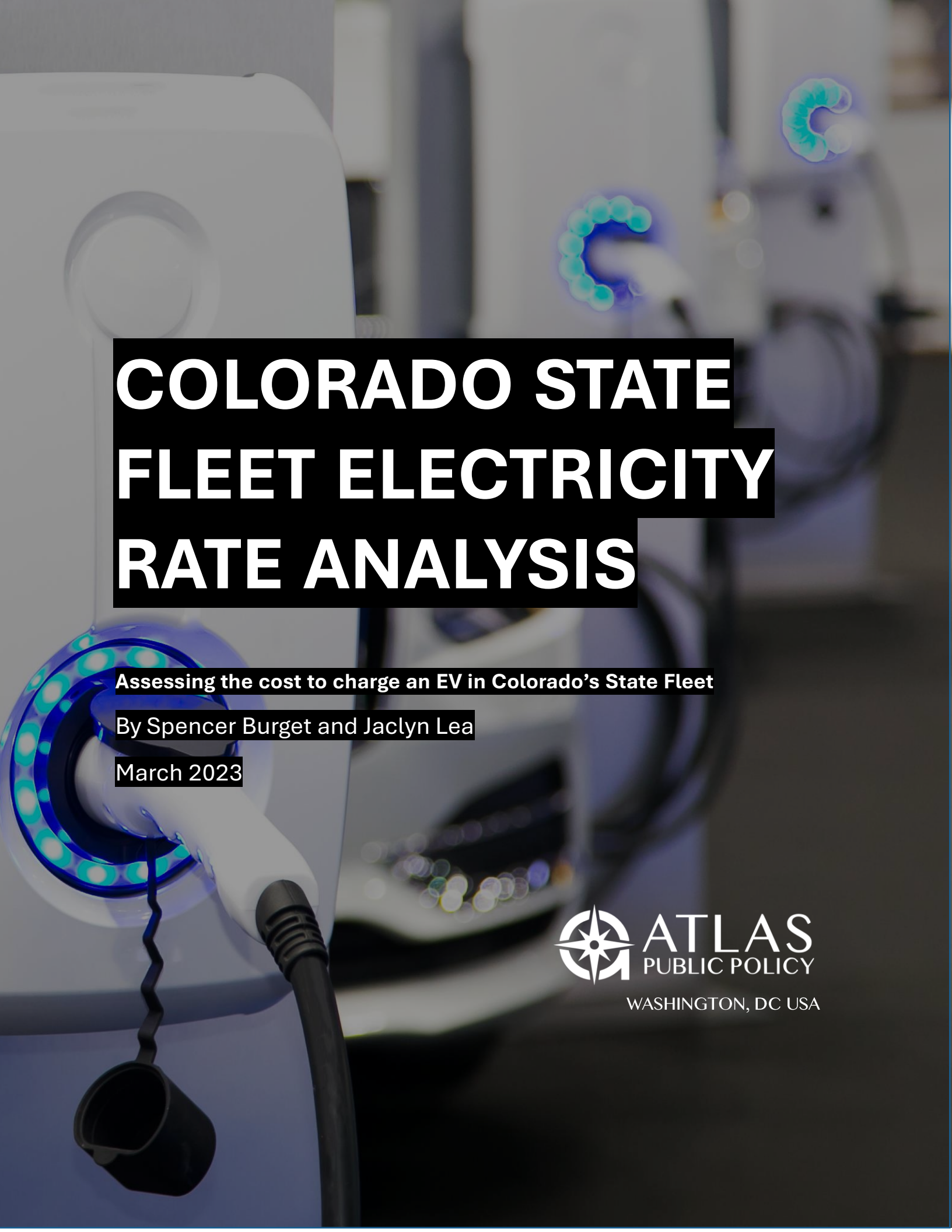

COLORADO STATE FLEET ELECTRICITY RATE ANALYSIS

Assessing the cost to charge an EV in Colorado's State Fleet

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Executive Summary

The Colorado Energy Office tasked Atlas Public Policy (Atlas) to conduct an analysis to inform the cost of electricity used in total cost of ownership calculations for the State fleet's assessment of electric vehicles (EVs). Further, Atlas was tasked with assessing the potential benefits of dedicated EV-specific rates in Xcel Energy and Black Hills Energy's territories for the subset of charging stations that are served by a dedicated meter.

Atlas found that the current cost to charge an EV on a non-dedicated meter ranged from $0.09 per kilowatt-hour (kWh) to $0.15/kWh, representing one quarter to one third the cost per mile to fuel an equivalent gasoline vehicle at $3.50 per gallon. On average, an EV in the state fleet could produce fuel cost savings of over $800 per year.[1]

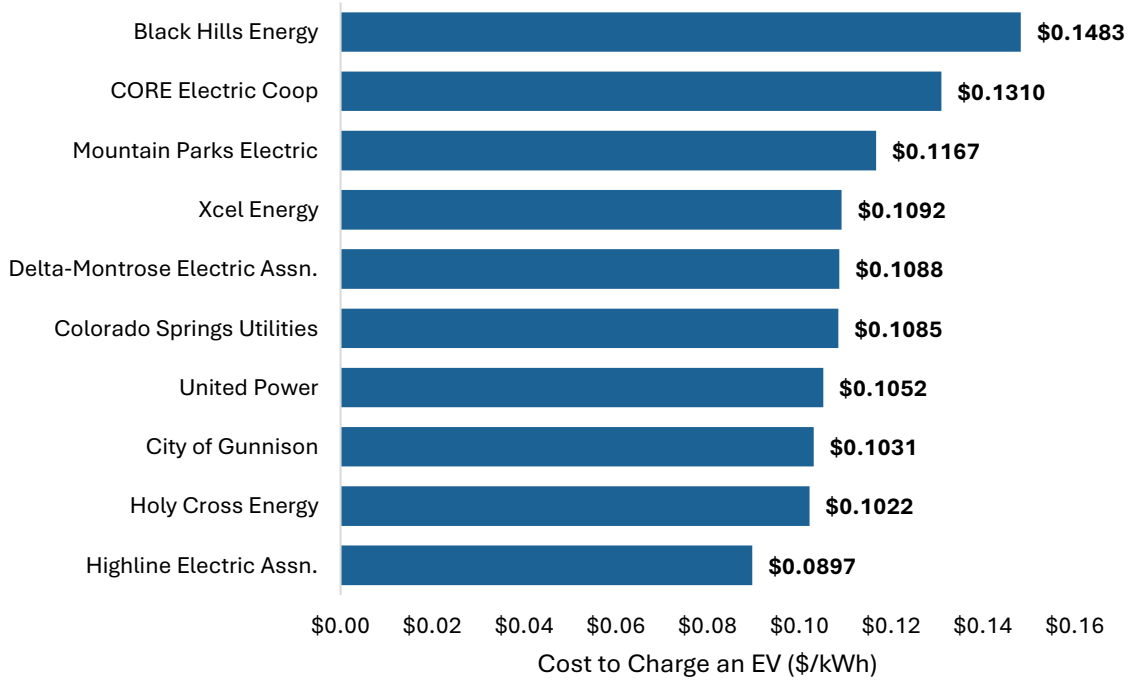
Highline Electric had the lowest cost to charge at $0.09/kWh and Black Hills Energy had the highest cost to charge at $0.15/kWh. Xcel Energy, representing 62 percent of State fleet vehicles, had a cost to charge of $0.11/kWh. The Statewide average, weighted by the share of State fleet vehicles registered in each utility service territory, was $0.12/kWh, equivalent to $0.03 per mile.[2]

This report recommends a cost per kilowatt-hour for each utility service territory for use in total cost of ownership calculations based on the cost to charge on non-dedicated meters. The rates represent the cost to charge considering current charging behavior, seasonal variations, time-of-use pricing, and demand charges as well as all applicable taxes, riders, and fees. The results are shown in Figure 1.

[1] The calculation assumed an average vehicle efficiency of 3.75 miles per kWh for EVs and 30 miles per gallon for gasoline-powered vehicles. It also assumed a State fleet average vehicle miles traveled of 9,912 miles per year.

[2] Based on fuel economy of 3.75 miles per kWh.

Figure 1: Cost to Charge an EV by Utility Service Territory



This figure shows the average cost to charge in each utility service territory including all applicable riders, taxes, and fees for charging stations served by non-dedicated meters.

In addition, Atlas compared the cost to charge an EV on an EV-specific rate, which for this analysis includes three different rates offered by Xcel Energy and Black Hills Energy, compared to a conventional rate for charging stations served by a dedicated meter. Under current charging behavior where drivers tend to charge at all hours, only one out of three EV-specific rates offer cost savings. However, if charging can be shifted overnight, two out of three EV-specific rates offer cost savings.

This report recommends that all stations served by a dedicated meter in Xcel Energy territory be placed on the S-EV rate while stations in Black Hills Energy service territory should only be placed on an EV-specific rate if the facility is eligible for the SGS-EV rate and if charging can be managed to avoid use during the on-peak period.

Methodology

This section describes Atlas's process for determining the cost to charge an EV across each utility service territory. Atlas used two distinct methodologies: one for charging stations

served by a non-dedicated meter, and one for those served by a dedicated meter. Due to these methodological differences, the cost to charge across both methodologies should not be compared.

Atlas first identified relevant utilities in Colorado based on where State-owned light-duty vehicles are located. Then, Atlas identified the specific rates available from those utilities in which state facilities are located as well as EV-specific rates available in Xcel Energy's and Black Hills Energy's territories. Next, Atlas analyzed real-world charging use data from the State fleet to construct two charging scenarios, one representing current charging use in which drivers tend to charge at all hours and one representing overnight charging.

Atlas then calculated the energy cost component by using the charging scenarios to determine the share of on- and off-peak charging. This calculation was the same for both dedicated meters that serve only EV charging stations and non-dedicated meters that serve other loads such as buildings and site lighting.

Next, Atlas calculated the demand charge cost component. For non-dedicated meters, Atlas calculated the per-kWh demand charge based on the likelihood that EV charging would coincide with existing building demand. For dedicated meters, Atlas calculated the per-kWh demand charge based on the expected demand charge per station and the total energy charged each month.

For dedicated meters, Atlas also included any fixed monthly charges.

Finally, Atlas assessed all applicable riders, taxes, and fees to yield the total cost to charge.

Selecting Utilities to Evaluate

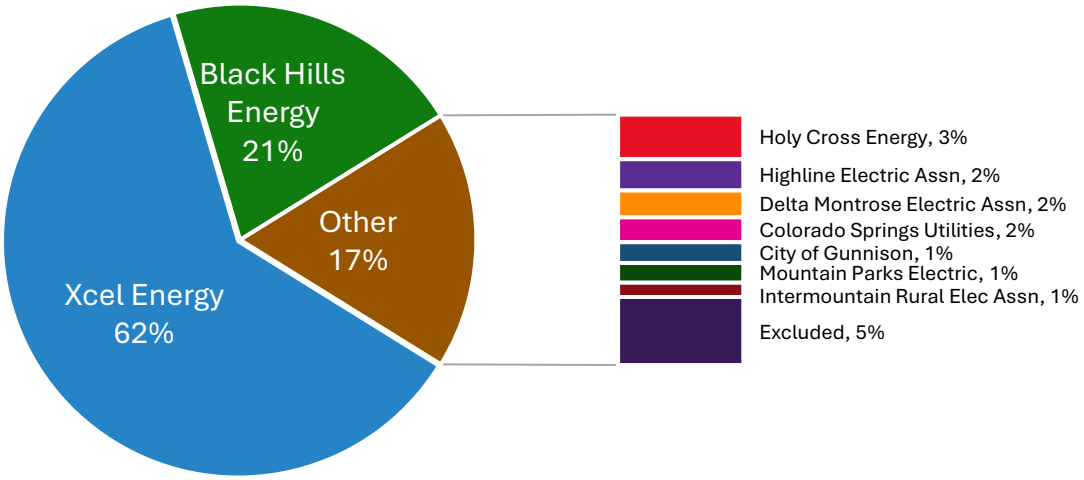
Atlas used the Colorado State Fleet Vehicle Inventory provided by State Fleet Management to identify the number of the State's light-duty vehicles registered in each utility service territory. While some vehicles may charge in a different utility service territory from where they are registered, the registration location provides an appropriate proxy of where vehicles are located.

Nine utilities cover over 95 percent of the State's light-duty fleet, while the remaining five percent of vehicles are registered in 18 different utility service territories. Atlas focused on the nine utilities that had at least one percent of the nearly 1,900 state-owned light-duty vehicle registrations. Atlas omitted any utility that represented less than one percent of the fleet to focus on the utilities that currently have the largest share of state vehicles registered in their service territories. However, Atlas and the Colorado Energy Office added United Power to the analysis due to known State-owned EV chargers in their service territory.

For the purposes of this analysis, Atlas included the State's investor-owned utilities (IOUs), Black Hills Energy and Xcel Energy, as well as the following cooperative and municipal utilities:

- City of Gunnison
- Colorado Springs Utilities
- Delta-Montrose Electric Association
- Highline Electric Association
- Holy Cross Energy
- Intermountain Rural Electric Association
- Mountain Parks Electric
- United Power[3]

Figure 2: Colorado's Light-Duty State Fleet by Utility Service Territory



This figure shows the breakdown of State-owned vehicles in Colorado by electric utility.

Identifying Utility Rates

Atlas identified relevant rates for the ten analyzed utilities based on utility bills provided by Colorado State Agencies as well as utility tariffs if bills were not available from an analyzed utility.

[3] While United Power does not meet the vehicle registrations threshold, there are known state-owned EV chargers in this service territory.

Atlas identified 19 conventional electricity rates and three EV-specific rates. The rates analyzed spanned small commercial and general service rates to large industrial and primary service rates. The rates had a wide variety of pricing mechanisms including time-of-use pricing and demand charge components. Atlas did not analyze Xcel Energy's S-EV-CPP rate because the rate was comparable to the S-EV rate and modeling a critical peak pricing structure was outside the scope of this analysis.

Nearly three-quarters of rates analyzed used a flat energy charge with no tiered, seasonal, or time-of-use component. Three rates had tiered energy charges, whereby one cost per kWh is charged up to a set allowance each month and a different cost is charged for each additional kWh used above that allowance. One rate had a seasonal variation, whereby one cost per kWh is assessed in the summer and a different cost is used the rest of the year. Four rates, including all three EV-specific rates, used a seasonal time-of-use (TOU) rate whereby electricity used during periods of peak demand cost more than electricity used during the rest of the day, and where the cost of on-peak energy is higher in the summer than in the rest of the year.

Nearly half of rates analyzed included a demand charge in addition to an energy charge. A demand charge is imposed based on the highest amount of electricity consumed during a specific period, usually measured in 15-minute increments.

Eight rates had a flat demand charge with no seasonal or TOU variation. Two rates had a seasonal TOU demand charge whereby the demand charge depends on the hour when the period of peak demand occurs and is higher in summer months. One rate had a seasonal demand charge that is higher in summer months. In addition, Colorado Springs Utility's ETL demand charge was assessed on a daily basis rather than a monthly basis meaning that the customer pays a cost per kW for the peak demand used each day.

Table 1 lists the 22 rates analyzed and the types of energy and demand charges assessed. A complete breakdown of the energy and demand charges, as well as riders, taxes, and fees, is available in Appendix A.

Table 1: Analyzed Rates by Utility

Utility	Rate	Energy Charge	Demand Charge
Black Hills Energy	Large General Service, Secondary: LGS-S	Tiered	Flat
	Small General Service, Non-Demand: SGS-N	Flat	None

Utility	Rate	Energy Charge	Demand Charge
	Large General Service, Primary: LGS-P	Tiered	Flat
	Small General Service, Electric Vehicle Time of Day: SGS-EV*	Seasonal TOU	None
	Large General Service, Secondary Electric Vehicle Time of Day: LGS-SEV*	Seasonal TOU	Flat
City of Gunnison	Commercial*	Flat	None
Colorado Springs Utilities	Industrial Service - Time of Day - ETL	Seasonal TOU	Seasonal TOU[4]
	Commercial Service - General (E2C)	Flat	None
	Small Commercial- Rate E1C	Flat	None
CORE Electric Cooperative	Small Commercial Service - Single Phase (E1)	Flat	None
Delta-Montrose Electric Association	Industrial-Distribution Voltage 12kV	Flat	Flat
	Small Commercial Single-Phase	Flat	None
Highline Electric Association	Small Commercial Rates (Single Phase)	Tiered	None
Holy Cross Energy	General Services – Small*	Flat	None
	General Services – Large*	Flat	Flat
Mountain Parks Electric	General Service Small (Residential)	Flat	None
Xcel Energy	Secondary General Service (Schedule SG)	Flat	Seasonal

[4] Colorado Springs Utility's ETL demand charge is assessed daily. All other demand charges are assessed monthly.

Utility	Rate	Energy Charge	Demand Charge
	Primary General Service (Schedule PG)	Flat	Seasonal TOU
	Commercial Service (Schedule C)	Seasonal	None
	Secondary Voltage Time-of-Use Electric Vehicle Service (S-EV)*	Seasonal TOU	Flat
United Power	Small Commercial Secondary Service*	Flat	Flat
	Large Commercial Secondary Service*	Flat	Flat

* Represents a rate that was identified directly from a utility tariff rather than a utility bill from a state agency.

For each EV-specific rate, Atlas identified an equivalent non-EV rate. In general, EV-specific rates tend to have lower demand charges but higher energy charges than their equivalent non-EV rate. In addition, all EV-specific rates analyzed utilize time-of-use energy pricing whereas their equivalent non-EV rates do not. All EV-specific rates analyzed have the same fixed monthly charge as their non-EV equivalent.

Table 2 shows the energy, demand, and fixed charges for EV-specific rates and their non-EV equivalents.

Table 2: Comparison of Base Charges on EV-Specific Rates and non-EV Equivalents

Utility	Rate	Energy Charge		Demand Charge	Fixed Charge
		On-Peak	Off-Peak		
Black Hills Energy (<50 kW)	SGS-EV	$0.1636*	$0.0694	$0.00	$11.39
	SGS-N	$0.0903		$0.00	$11.39
Black Hills Energy (>50 kW)	LGS-EV	$0.3036*	$0.1301	$6.35	$64.00
	LGS-S	$0.0110		$23.33	$64.00
Xcel Energy	S-EV	$0.0868*	$0.0174*	$3.01	$41.13

Utility	Rate	Energy Charge		Demand Charge	Fixed Charge
		On-Peak	Off-Peak		
	SG	$0.0079		$17.28	$41.13

* Represents a weighted average of summer and winter rates. This table does not include any riders, taxes, or fees.

Constructing Charging Curves

To assess the cost of demand charges and time-of-use rates, Atlas constructed two potential charging curves based on real-world charging use data from EVs in the State fleet.

State Fleet Management provided Atlas with charging use data from EVs in the state fleet from July 1, 2021, through June 30, 2022. Atlas cleaned the data, removing any session where no energy was charged and any session with an average load greater than 20 kW to isolate successful sessions and remove any direct current fast charging (DCFC) sessions.[5] State Fleet Management provided the charging start date and time, charging end date and time, and total energy charged.

Atlas first converted the charging sessions into interval data. Each charging session was divided into 15-minute intervals and with the total energy split evenly amongst each interval and proportionally for partial intervals. Atlas then added up the energy needed across all charging sessions to determine the total energy charged during each 15-minute interval. Atlas then calculated the percent of charging that occurred during each hour of the day.

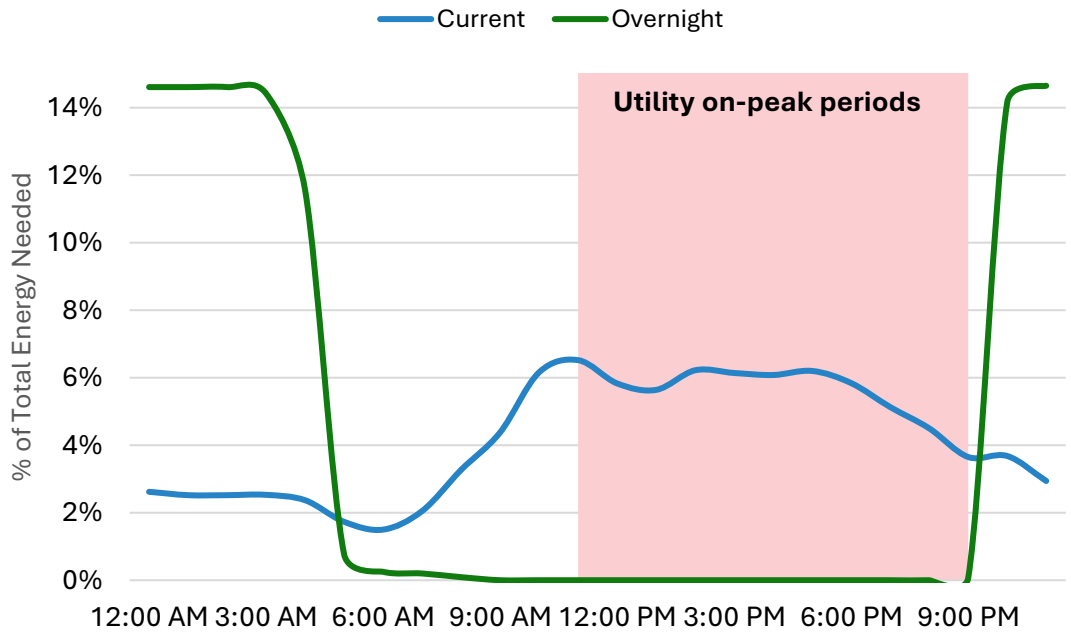
Atlas constructed two distinct charging scenarios based on these data. The "Current Charging Scenario" included all EVs in the State fleet while the "Overnight Charging Scenario" included only a subset of vehicles that exhibited overnight charging patterns.

In total, 170 EVs in Colorado's state fleet charged nearly 45,000 kWh from July 2021 to July 2022 across 8,309 unique charging sessions and 255 distinct locations. In aggregate, EV charging tends to occur between 10am and 6pm, representing 49 percent of all energy needed. The hour between 11am and 12pm is the period with the most EV charging, accounting for 6.5 percent of the total. That hour is followed closely by 2 to 3pm and 5 to 6pm each with 6.2 percent. Alternatively, under the "Overnight Charging Scenario" over 98 percent of charging occurred between 10pm and 5am with peak charging between 11pm and

[5] This analysis assumed that all charging occurred at state-owned level 2 charging stations. DCFC sessions were considered outliers and excluded from the charging curve.

midnight. Figure 3 presents the percentage of energy needed by the state fleet in each hour along with utility on-peak periods.

Figure 3: Colorado State Fleet Charging Use by Hour



This figure depicts the percentage of energy charged by EVs in the Colorado State Fleet from 7/1/2021 through 6/30/2022. "Current" includes all EVs in the State fleet while "Overnight" includes only a subset of vehicles that exhibit overnight charging patterns. Utility on-peak periods highlights hours which at least one of the ten utilities analyzed classifies as on peak.

The Current Charging Scenario closely resembles a charging pattern typical of commuter charging. The curve has a significant ramp up from 8am to 10am when commuters would be arriving at work, a slight dip at 1pm when commuters may be on their lunch break, and ramps down at the end of the workday. In total, 61 percent of charging occurs during hours which at least one of the utilities classifies as on-peak. Charging during these hours may incur additional costs on time-of-use rates.

Assessing the Cost to Charge

Atlas calculated the cost to charge an EV on each utility rate and charging scenario inclusive of energy charges, demand charges, fixed charges (where applicable), and all applica-

ble riders, taxes, and fees. The cost to charge considered seasonal and time-of-use variations using the charging curve constructed based on charging use data from the Colorado State Fleet.

Atlas used two different demand charge methodologies: one for charging stations served by an existing meter, and one for those served by a dedicated meter. Fixed charges are only included for stations served by a dedicated meter. Due to these methodological differences, the cost to charge should not be compared.

Energy Charges

Atlas identified the per-kWh energy cost for each rate analyzed. For tiered rates, Atlas assumed that the incremental load of EV charging fell into the highest usage tier. For seasonal rates, Atlas took a weighted average of the cost to charge based on the percentage of the calendar year covered by each seasonal period. For time-of-use rates, Atlas calculated the percentage of energy charged during each period and then took a weighted average of the on- and off-peak rates.

Demand Charges (Non-Dedicated Meter)

Atlas calculated the demand charge associated with the marginal kWh of EV charging. The demand cost component represents the expected value of the demand charge incurred by one kWh of EV charging. The expected value was calculated by multiplying the chance that a given kWh of charging occurred during the peak period by the demand charge incurred by one kWh of incremental load spread over the 15-minute peak period.

Calculating the Likelihood of Incurring a Demand Charge

Atlas assumed that in the near term, the load from EV charging would not be large enough to shift peak load, and so the peak period was determined by existing building load. Atlas identified the hour of each month that peak demand was likely to occur based on the National Renewable Energy Laboratory (NREL)'s Commercial Building Stock Energy Model for large and medium offices in Colorado.[6]

Next, based on monthly charging use data provided by State Fleet Management, Atlas determined the likelihood that EV charging occurred during the peak period of each month. Atlas took the share of monthly energy needed during the peak hour and divided it by the number of workdays in the month, and then by the number of 15-minute periods in the

[6] National Renewable Energy Laboratory, "ComStock," October, 2021. [Online]. Available: https://comstock.nrel.gov/. [Accessed 19 1 2023].

hour (4). This calculation yielded the likelihood that an EV charging event occurred during the peak period and incurred a demand charge.

Calculating the Cost of a Demand Charge

Atlas identified the per-kW demand charge for each rate analyzed. Atlas then multiplied the cost per kW by the marginal incremental load of one kWh spread over a 15-minute period (4 kW) to yield the cost incurred by each kWh charged during the peak period. Finally, Atlas multiplied the cost of demand incident by the chance of demand incident to yield the expected value of the demand charge associated with a marginal kWh of EV charging.

$$Demand\ Charge\ (\$/kWh) = Probability\ of\ Demand\ Incident \times Cost\ of\ Demand\ Incident$$

Box 1. Example Demand Charge Calculation – Xcel SG

The following example explores our per-kWh methodology in the context of an example charging station on the Xcel SG Rate. The Xcel SG demand charge is $27.65/kW in summer months and $20.31/kW in all other months, inclusive of all riders, taxes, and fees.

1. Starting with January as an example, peak demand is expected to occur during a 15-minute interval between 9am and 10am.
2. The Xcel SG demand charge in January between 9am and 10am is $20.31/kW.
3. One kWh of EV charging spread over the 15-minute peak period would add 4 kW of incremental load, incurring a demand charge of $81.24.
4. In January, 4.62 percent of State fleet charging occurs between 9am and 10am, and we can assume that 1/4th of that occurs during the 15-minute peak period. There are 22 workdays in January, so the likelihood that a kWh charged in January occurred during the 15-minute peak period is: 4.62% * 1/4 * 1/21 = 0.0525%
5. Therefore, the expected value of the demand charge for a kWh charged on Xcel SG in January is: 0.0525% * $81.24 = $0.0426/kWh
6. January has a lower demand charge than summer months and a relatively lower chance of demand incident compared to other months. Averaged across all months, the demand charge component for EVs charged on Xcel's SG rate is $0.0499/kWh.

Demand Charges (Dedicated Meters)

Atlas used an alternative methodology to calculate demand charges for stations served by a dedicated meter. Since these meters exclusively serve charging stations, the monthly demand charge can be entirely attributed to EV charging.

Atlas estimated the demand charge by assuming that each charging station charges at a maximum power level of 7.2 kW and dispenses an average of 1,200 kWh per month.[7] Further, for each meter, Atlas assumed all charging stations charged simultaneously for at least 15-minutes each month, representing the worst-case scenario. This allowed Atlas to calculate the demand charge on a per-station basis, independent of how many stations may be served by the same meter.

Atlas calculated the per-kWh demand charge by multiplying the maximum power level (7.2 kW) by the demand charge inclusive of all applicable taxes, riders, and fees, and dividing by the number of kWh dispensed each month (1,200).

$$Demand\ Charge\ (\$/kWh)\ = \frac{(Max\ Power\ Level\ \times Demand\ Charge\ (\$/kW)}{Monthly\ kWh}$$

Fixed Charges

For charging stations served by dedicated meters, Atlas included fixed monthly costs in the cost to charge an EV. Atlas calculated the per-kWh fixed cost by dividing the monthly cost by the assumed average number of kWh dispensed each month (1,200) times the number of stations per meter. Atlas assumed six stations (or ports) per meter, the median number of State fleet vehicles registered per location.[8]

$$Fixed\ Charge\ (\$/kWh)\ = \frac{Monthly\ Charge}{Monthly\ kWh\ x\ Stations\ per\ Meter}$$

For charging stations served by non-dedicated meters, Atlas did not include a fixed cost because the fixed cost would be incurred regardless of EV charging.

[7] This assumption was based on real-world station-level data provided by Colorado State Agencies.

[8] Excludes locations with only one vehicle registered as these locations would not likely be served by a dedicated meter.

Riders, Taxes, and Fees

Atlas assessed all applicable riders, taxes, and fees for each rate. Atlas identified applicable rate riders based on utility tariffs. Riders include per-kWh adjustments, per-kW adjustments, percentage adjustments applied to base energy costs, and percentage adjustments applied to total costs. In addition, Atlas assessed a franchise fee of three percent, based on the fee of several populous areas of the state, including Denver.[9] Lastly, Atlas assessed an average tax rate of 3.956 percent, representing a weighted average of municipal and county taxes based on the number of State light-duty vehicles registered in each municipality or county.

Atlas applied the applicable riders, taxes, and fees to yield the total energy and demand costs using the following formula:

$$\begin{aligned} &Total\ Energy, Demand, or\ Fixed\ Cost \\ &\quad = (Base\ Cost \times Base\ Energy\ Cost\ Adjustment \\ &\quad + Per\ kWh\ or\ Per\ kW Adjustment) \times (1 + Total\ Cost\ Adjustment) \\ &\quad \times (1 + Franchise\ Fee) \times (1 + Tax\ Rate) \end{aligned}$$

Finally, Atlas calculated the final cost to charge an EV for each rate, charging scenario, and meter type by summing the total per-kWh energy, demand, and fixed costs.

$$Final\ Cost = Total\ Energy\ Cost + Total\ Demand\ Cost + Total\ Fixed\ Cost$$

Rate Analysis Results

This section presents the results of the analysis and ultimately proposes a per-kWh rate for each utility service territory for use in total cost of ownership calculations. This section includes the following:

1. **Estimate of Current Cost to Charge an EV**: Estimate of current cost to charge an EV by utility assuming non-dedicated meter and current charging use.
2. **Potential Savings from EV-Specific Rates for Stations on Dedicated Meters:** a comparison of EV-specific rates and their conventional alternatives for charging stations served by a dedicated meter.

[9] Franchise fees vary throughout the state, with some ratepayers not paying any fee and others paying up to four percent. In assuming a franchise fee of three percent, the rates outlined in this analysis may be lower, higher, or the actual price that customers pay.

Estimate of Current Cost to Charge an EV

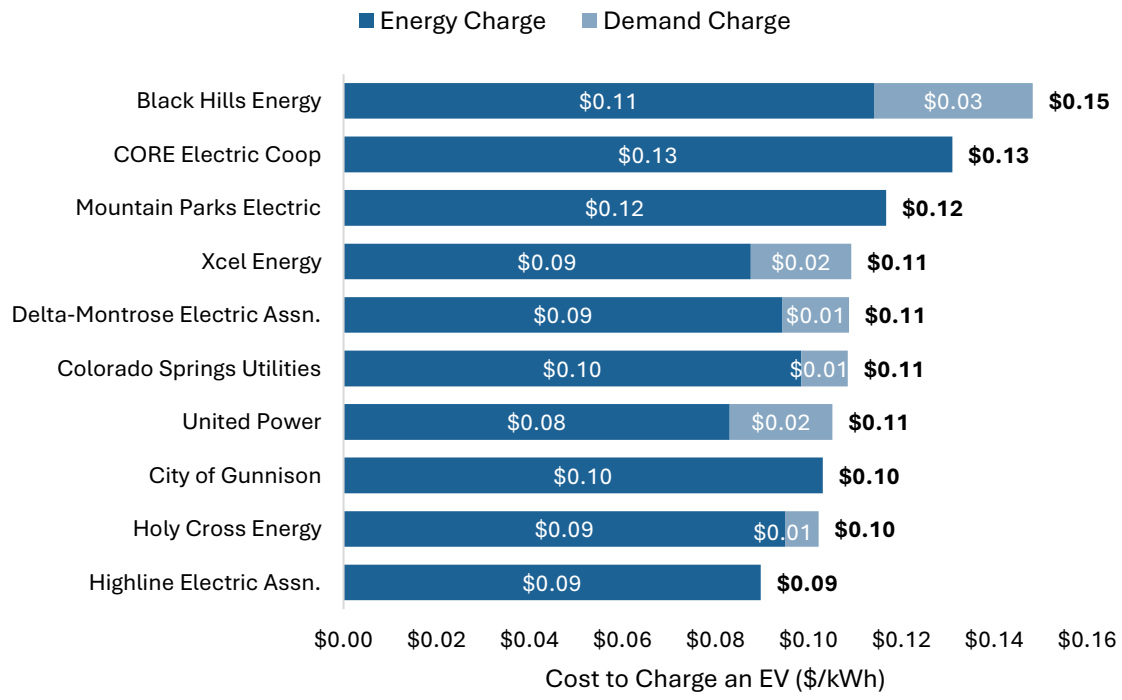
Atlas estimated the current cost to charge in each utility service territory for use in the State's total cost of ownership calculations. Atlas used the Current Charging Scenario to reflect current costs. Further, at the direction of the Colorado Energy Office, Atlas based the current cost to charge on non-dedicated meters, reflecting the majority of the State's charging stations. The cost to charge for each utility represented an average of the utility's rates, excluding EV-specific rates.

The average cost to charge an EV across the State, weighted based on the share of State fleet vehicles in each service territory, was $0.1175/kWh. The cost to charge ranged from $0.0897/kWh for Highline Electric to $0.1483/kWh for Black Hills Energy. In Xcel Energy's service territory, which accounts for 62 percent of light-duty State vehicles, it cost $0.1092/kWh to charge an EV.

For utilities with demand charges, the demand charge made up seven to 23 percent of the total current cost to charge. Colorado can reduce these costs by managing charging to ensure that EV charging does not coincide with existing peak load. For example, if the building primarily uses energy during the day, EVs could be encouraged to charge overnight.

Figure 4 shows the cost to charge an EV in each utility service territory and Table 3. provides additional detail.

Figure 4: Estimated Current Cost to Charge an EV by Utility Service Territory



This figure shows the estimated current cost to charge in each utility service territory including all applicable riders, taxes, and fees. The cost is based on the Current Charging Scenario and assumed non-dedicated meters. The cost for each utility represented an average of that utility's rates, excluding EV-specific rates. The per-kWh demand charge cost component is estimated based on the probability that a marginal kWh of EV charging coincides with the peak demand of the existing building load.

Table 3: Cost to Charge an EV by Utility Service Territory

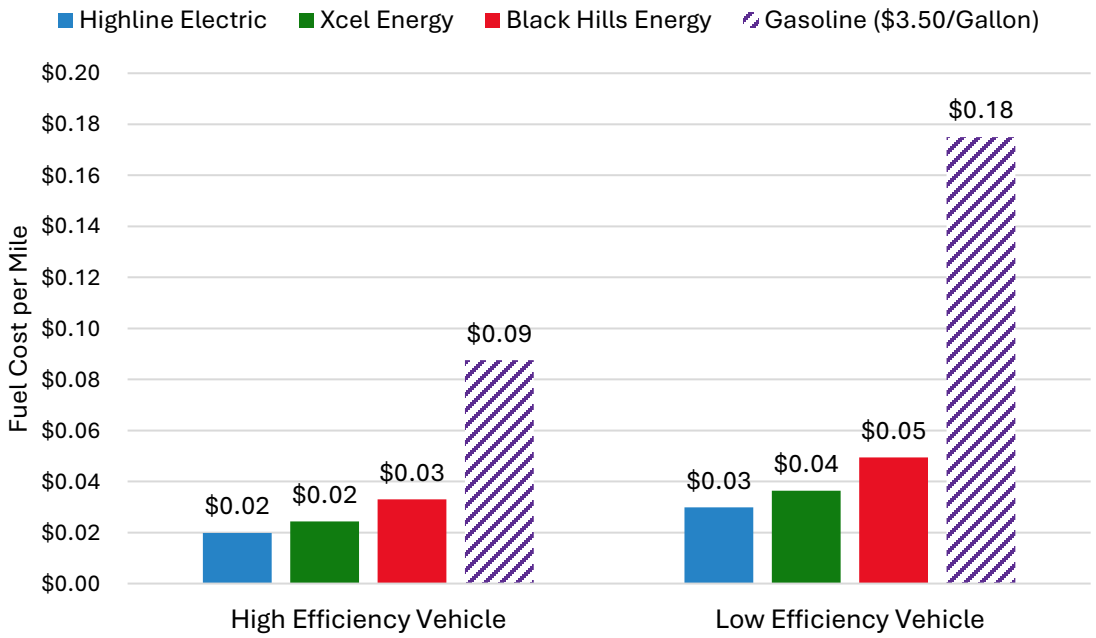
Utility	Percent of State Fleet	Energy Cost ($/kWh)	Demand Cost ($/kWh)	Total Cost ($/kWh)
Black Hills Energy	21%	$0.1141	$0.0342	$0.1483
CORE Electric Co-operative	1%	$0.1310	$0.0000	$0.1310
Mountain Parks Electric	1%	$0.1167	$0.0000	$0.1167
Xcel Energy	62%	$0.0876	$0.0216	$0.1092

Utility	Percent of State Fleet	Energy Cost ($/kWh)	Demand Cost ($/kWh)	Total Cost ($/kWh)
Delta-Montrose Electric Association	2%	$0.0945	$0.0143	$0.1088
Colorado Springs Utilities	2%	$0.0985	$0.0100	$0.1085
United Power	0%	$0.0831	$0.0221	$0.1052
City of Gunnison	1%	$0.1031	$0.0000	$0.1031
Holy Cross Energy	3%	$0.0950	$0.0072	$0.1022
Highline Electric Association	2%	$0.0897	$0.0000	$0.0897
Weighted Average		**$0.0951**	**$0.0224**	**$0.1175**

Across all utility service territories, it was far more cost effective to fuel an EV than an equivalent gas-powered vehicle. The cost to fuel a gasoline vehicle at $3.50 per gallon comes out to $0.09/mile for a high-efficiency vehicle (40 miles per gallon) and $0.18/mile for a low-efficiency vehicle (20 miles per gallon). Even for Black Hills Energy, the utility with the highest cost to charge, the fuel cost for an EV was $0.03/mile for a high-efficiency vehicle (4.5 m/kWh) and $0.05/mile for a low-efficiency vehicle (3 m/kWh), both less than one third of the cost to fuel an equivalent gasoline vehicle.

Figure 5 compares the fuel cost per mile for Highline Electric, Xcel Energy, and Black Hills Energy to the cost to fuel an equivalent gasoline vehicle.

Figure 5: Fuel Cost per Mile Compared to Gasoline-Powered Vehicle at $3.50 per Gallon



This chart shows the fuel cost per mile for an EV compared to an equivalent gasoline-powered vehicle at $3,50 per gallon. High efficiency assumed 4.5 m/kWh for EVs and 40 mpg for conventional vehicles. Low efficiency assumed 3 m/kWh and 20 mpg.

Potential Savings from EV-Specific Rates for Stations on Dedicated Meters

This section presents a comparison of the cost to charge an EV on an EV-specific rate compared to the cost to charge on a conventional rate for stations on a dedicated meter. All three EV-specific rates analyzed require EV chargers to be served by a dedicated electric meter, so this section does not consider charging stations on non-dedicated meters. A charging station may be served by a dedicated meter if its location does not have an existing connection, or if it cannot be added to the existing building load. Stations will most likely be served by a dedicated meter when new service is required, such as installation of DCFC or participation in a program like Xcel Energy's EV Supply Infrastructure program.

Importantly, the results from this section should not be compared to the results of *Estimate of Current Cost to Charge an EV.* Because comparing stations served by existing meters to those served by dedicated meters in this way does not yield an apples-to-apples

comparison. The decision to serve charging stations on an existing meter versus a dedicated meter should instead be made on a case-by-case basis taking into account site-specific considerations such as the number of stations served, the cost of adding additional electric service, and as noted above, participation in a utility program.

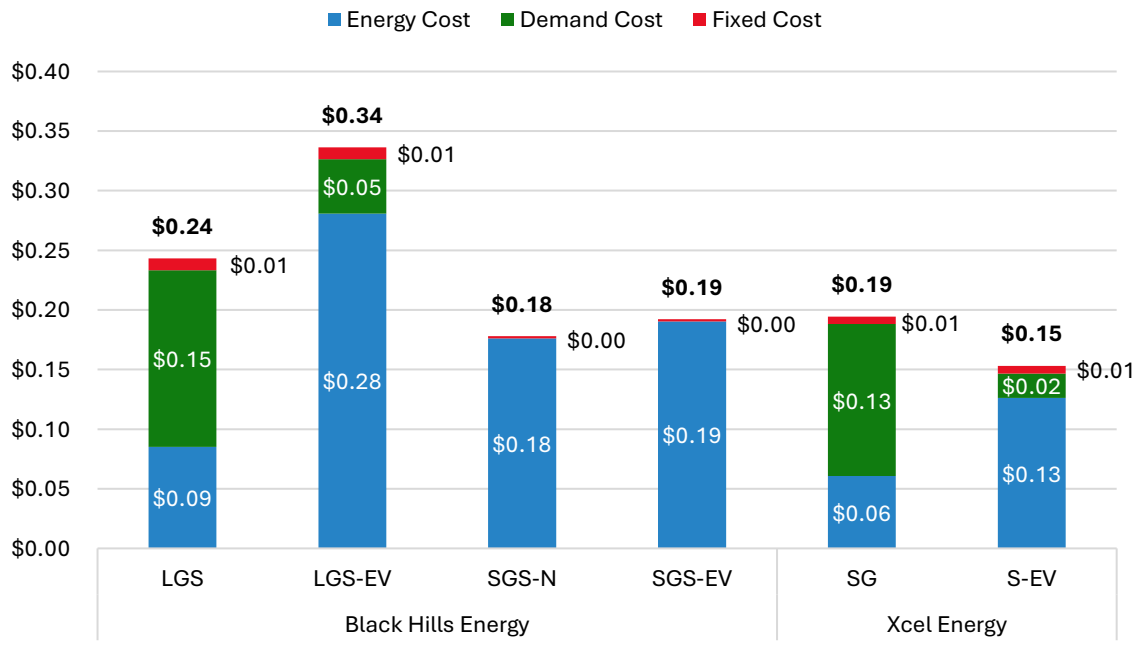
Atlas compared the cost to charge under both the Current and Overnight Charging Scenario. One out of three EV-specific rates offered savings under current charging use and two out of three EV-specific rates offered savings with overnight charging.

Based on the Current Charging Scenario, Xcel Energy's S-EV rate offers cost savings of $0.04/kWh compared to the conventional Xcel-SG rate while the Black Hills Energy SGS-EV rate comes at a cost premium of $0.01 per kWh and the Black Hills Energy LGS-EV rate comes at a cost premium of $0.10 per kWh.

Under the Overnight Charging Scenario, nearly all charging occurred during the utilities' off-peak periods, which significantly reduced the energy costs incurred on EV-specific rates. The savings offered by the Xcel Energy S-EV rate increased from $0.04 to $0.07 per kWh. The Black Hills SGS-EV rate flipped from a cost premium of $0.01 to cost savings of $0.02 per kWh, and the cost premium of the LGS-EV rate fell from $0.10 to $0.03 per kWh.

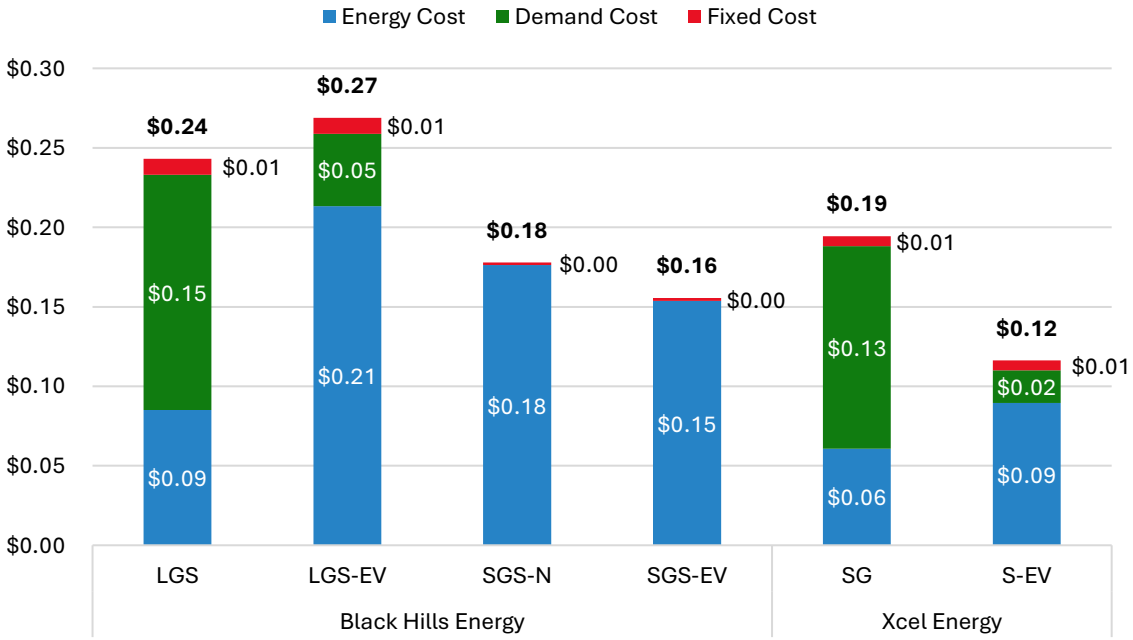
Figure 6 shows the comparative cost to charge on a dedicated meter under current charging use and Figure 7 shows the comparative cost to charge with overnight charging.

Figure 6: Comparative Cost to Charge an EV on Dedicated Meter under Current Charging Scenario



This figure shows the cost to charge an EV on EV-specific rates compared to conventional alternatives under the Current Charging Scenario. The analysis assumes that in either case EVs are charged on a dedicated meter and a monthly demand charge is incurred. Costs are based on a maximum station power level of 7.2 kW and average monthly usage of 1,200 kWh.

Figure 7: Comparative Cost to Charge an EV on Dedicated Meter under Overnight Charging Scenario



This figure shows the cost to charge an EV on EV-specific rates compared to conventional alternatives under the Overnight Charging Scenario. The analysis assumes that in either case EVs are charged on a dedicated meter. Costs are based on a maximum station power level of 7.2 kW and average monthly usage of 1,200 kWh.

Atlas recommends that all stations served by a dedicated meter in Xcel Energy territory be placed on the S-EV rate. Stations in Black Hills Energy service territory should only be placed on an EV-specific rate if the facility is eligible for the SGS-EV rate and if charging can be managed to avoid use during the on-peak period.

Appendix A: Electricity Rates

Table 4: Base Energy Charges

Utility	Rate	Seasonal Period	TOU Period	Energy Charge ($/kWh)
Black Hills Energy	Large General Service, Primary: LGS-P	Year-Round	Standard	$0.0071
	Large General Service, Secondary Electric Vehicle Time of Day: LGS-SEV	Non-Summer	On Peak	$0.2610
			Off Peak	$0.1301
		Summer	On Peak	$0.3888
			Off Peak	$0.1301
	Large General Service, Secondary: LGS-S	Year-Round	Standard	$0.0110
	Small General Service, Electric Vehicle Time of Day: SGS-EV	Non-Summer	On Peak	$0.1410
			Off Peak	$0.0694
		Summer	On Peak	$0.2090
			Off Peak	$0.0694
	Small General Service, Non-Demand: SGS-N	Year-Round	Standard	$0.0903
CORE Electric Cooperative	Small Commercial Service - Single Phase (E1)	Year-Round	Standard	$0.1163
City of Gunnison	Commercial	Year-Round	Standard	$0.0963
Colorado Springs Utilities	Commercial Service - General (E2C)	Year-Round	Standard	$0.0662
	Industrial Service - Time of Day - ETL	Non-Summer	On Peak	$0.0000
			Off Peak	$0.0000
		Summer	Off Peak	$0.0000
			On Peak	$0.0000

Utility	Rate	Seasonal Period	TOU Period	Energy Charge ($/kWh)
	Small Commercial- Rate E1C	Year-Round	Standard	$0.0777
Delta-Montrose Electric Association	Industrial-Distribution Voltage 12kV	Year-Round	Standard	$0.0654
	Small Commercial Single-Phase	Year-Round	Standard	$0.1110
Highline Electric Association	Small Commercial Rates (Single Phase)	Year-Round	Standard	$0.0838
Holy Cross Energy	General Services - Large	Year-Round	Standard	$0.0730
	General Services - Small	Year-Round	Standard	$0.0950
Mountain Parks Electric	General Service Small (Residential)	Year-Round	Standard	$0.1090
United Power	Large Commercial Secondary Service	Year-Round	Standard	$0.0521
	Small Commercial Secondary Service	Year-Round	Standard	$0.1031
Xcel Energy	Commercial Service (Schedule C)	Non-Summer	Standard	$0.0531
	Commercial Service (Schedule C)	Summer	Standard	$0.0885
	Primary General Service (Schedule PG)	Year-Round	Off Peak	$0.0078
		Year-Round	On Peak	$0.0078
	Secondary General Service (Schedule SG)	Year-Round	Standard	$0.0079
	Secondary Voltage Time-of-Use Electric Vehicle Service (S-EV)	Non-Summer	On Peak	$0.0651
			Off Peak	$0.0130
		Summer	On Peak	$0.1302
			Off Peak	$0.0261

Table 5: Base Demand Charges

Utility	Rate	Seasonal Period	TOU Period	Demand Charge ($/kW)
Black Hills Energy	Large General Service, Primary: LGS-P	Year-Round	Standard	$18.14
	Large General Service, Secondary Electric Vehicle Time of Day: LGS-SEV	Year-Round	Standard	$6.35
	Large General Service, Secondary: LGS-S	Year-Round	Standard	$23.33
Colorado Springs Utilities	Industrial Service - Time of Day - ETL	Non-Summer	On Peak	$0.77*
			Off Peak	$0.50*
		Summer	On Peak	$0.77*
			Off Peak	$0.50*
Delta-Montrose Electric Association	Industrial-Distribution Voltage 12kV	Year-Round	Standard	$12.29
Holy Cross Energy	General Services - Large	Year-Round	Standard	$6.11
United Power	Large Commercial Secondary Service	Year-Round	Standard	$17.50
	Small Commercial Secondary Service	Year-Round	Standard	$1.50
Xcel Energy	Primary General Service (Schedule PG)	Non-Summer	On Peak	$14.26
			Off Peak	$4.23
		Summer	On Peak	$19.20
			Off Peak	$4.23
	Secondary General Service (Schedule SG)	Non-Summer	Standard	$15.26
		Summer	Standard	$21.32

	Secondary Voltage Time-of-Use Electric Vehicle Service (S-EV)	Year-Round	Standard	$3.01

* Colorado Springs Utility's ETL demand charge is assessed daily. All other demand charges are assessed monthly.

Table 6: Adjustments, Taxes, and Fees

Utility	Adjustment Name	Applicable Rates	Applicable Periods	Adjustment
All	Franchise Fee	All	All	3.000%
	Sales Tax	All	All	3.965%
Black Hills Energy	Clean Air-Clean Jobs Act Adjustment (CACJA)	LGS-S, LGS-P, LGS-SEV	All	$0.780/kW
		SGS-N, SGS-EV	All	$0.004/kWh
	Demand Side Management Cost Adjustment	LGS-S, SGS-N, LGS-P, SGS-EV, LGS-SEV	All	2.5% Final Cost
	Energy Cost Adjustment	LGS-S, SGS-N, LGS-P, SGS-EV, LGS-SEV	All	0.060/kWh
	General Rate Schedule Adjustment (GRSA)	LGS-S, SGS-N, LGS-P, SGS-EV, LGS-SEV	All	-3.8% Base Energy
	Purchase Capacity Cost Adjustment	LGS-S, LGS-P, LGS-SEV	All	$0.370/kW
		SGS-N, SGS-EV	All	0.001/kWh
	Renewable Energy Standard Adjustment (RESA)	LGS-S, SGS-N, LGS-P, SGS-EV, LGS-SEV	All	2% Final Cost
	Transmission Cost Adjustment	LGS-S, SGS-N, LGS-P, SGS-EV, LGS-SEV	All	$0.005/kWh

Utility	Adjustment Name	Applicable Rates	Applicable Periods	Adjustment
Colorado Springs Utilities	Electric Capacity Charge	E1C	All	$0.004/kWh
		E2C	All	$0.004/kWh
		ETL	All	$0.004/kWh
	Electric Cost Adjustment (ECA)	ETL	On Peak	$0.059/kWh
		ETL	Off Peak	$0.034/kWh
		E2C, E1C	All	$0.039/kWh
CORE Electric Cooperative	Power Cost Adjustment	E1	All	$0.006/kWh
Holy Cross Energy	Electric Cost Adjustment (ECA)	GS-S, GS-L	All	$0.003/kWh
	We CARE Rate Rider	GS-S, GS-L	All	2% Final Cost
Xcel Energy	Colorado Energy Plan Adjustment (CEPA)	C, SG, S-EV, PG	All	1% Final Cost
	Demand Side Management Cost Adjustment	PG	All	$0.440/kW
		SG	All	$0.420/kW
		S-EV	All	$0.004/kWh
		C	All	$0.001/kWh
	Electric Commodity Adjustment (ECA)	PG	On Peak	$0.048/kWh
			Off Peak	$0.032/kWh
		C	All	$0.039/kWh
		SG, S-EV	All	$0.039/kWh
	Extraordinary Gas Cost Recovery Rider	C, SG, S-EV, PG	All	$0.005/kWh
	General Rate Schedule Adjustment (GRSA)	SG, PG, S-EV	All	10.9% Base Energy
	GRSA-Energy	C	All	$0.012/kWh
		SG, S-EV	All	$0.003/kWh

Utility	Adjustment Name	Applicable Rates	Applicable Periods	Adjustment
		PG	All	$0.003/kWh
	Purchased Capacity Cost Adjustment	SG	All	$1.000/kW
		PG	All	$0.910/kW
		S-EV	All	$0.009/kWh
		C	All	$0.003/kWh
	Renewable Energy Standard Adjustment (RESA)	C, SG, S-EV, PG	All	1% Final Cost
	Transmission Cost Adjustment	SG	All	$0.250/kW
		PG	All	$0.230/kW
		S-EV	All	$0.002/kWh
		C	All	$0.001/kWh

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