



Utility Programs and Transit Electrification

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Outline

- Commercial electric rates
 - Rate selection
 - Long-term price signals
 - Demand charges and per-mile operating costs
- Transit Agency A1 Pilot experience
- Utility support for transit agencies



Rates and Demand Charges

- Rates recover costs to maintain the safety and reliability of the electric grid and to support all customers and end-uses
 - Rates are comprised of energy charges (kWh) and demand charges (kW)
- Demand charges reflect charges for generation and T&D capacity in accordance with the demand a customer places on the grid
 - Demand charges are calculated as average demand over a 15-minute interval
 - Short, high-power charging sessions may incur lower demand charges than the actual instantaneous demand
 - Rates include the ability to measure demand on 5-minute intervals for customers with highly intermittent use, but this is not done currently and is unlikely in the near-term



- Support for transit agencies must be transparent – not hidden in rates
 - Long-term operating expenses must be accounted for in cost projections



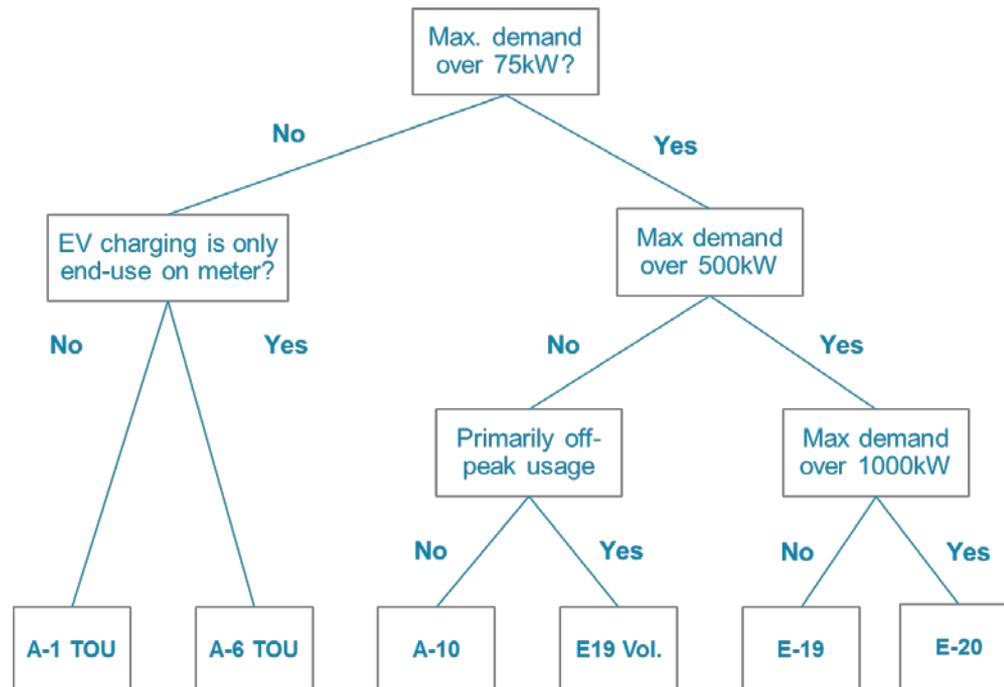
Selecting the Right Rate

- Commercial electric rates have two main components
 - time-of-use energy charges (kWh)
 - demand charges (kW)
- Rate options are generally determined based on maximum demand

Charging can be installed on existing facility service, or with new service (separately metered)

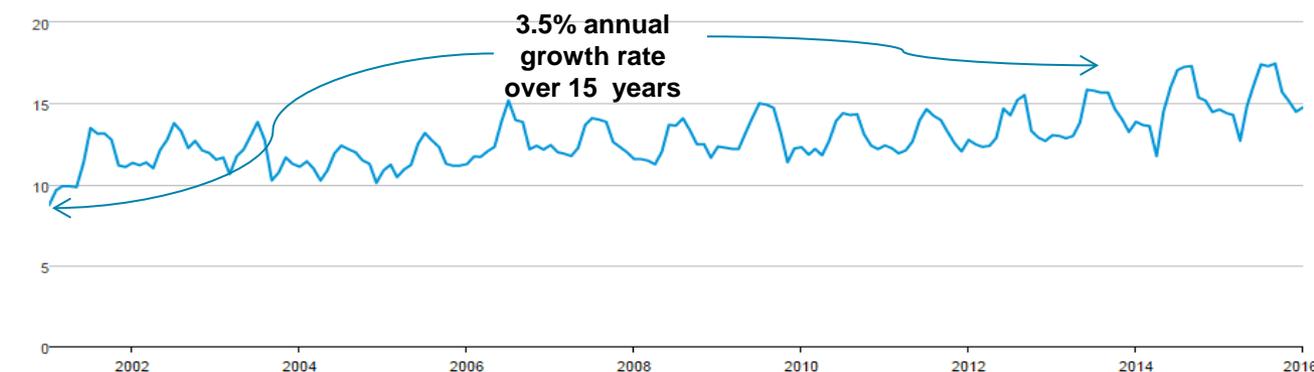
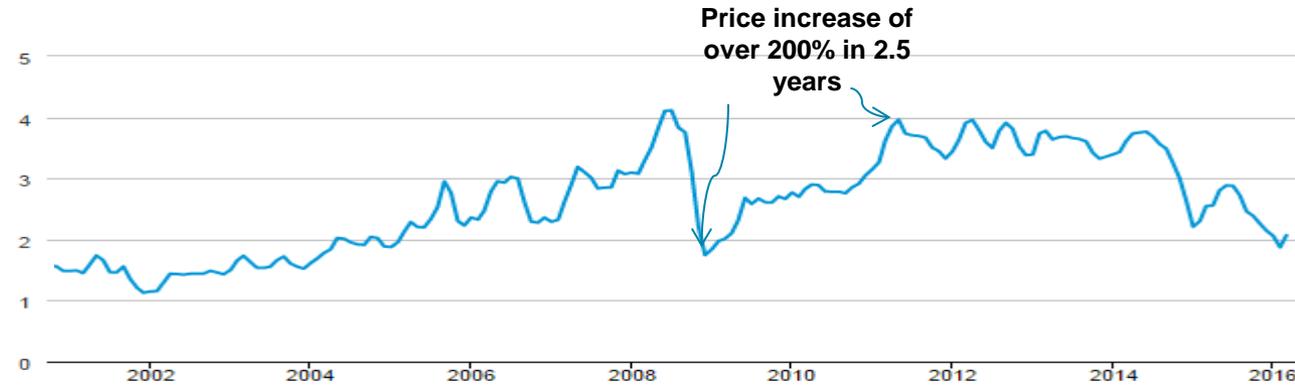
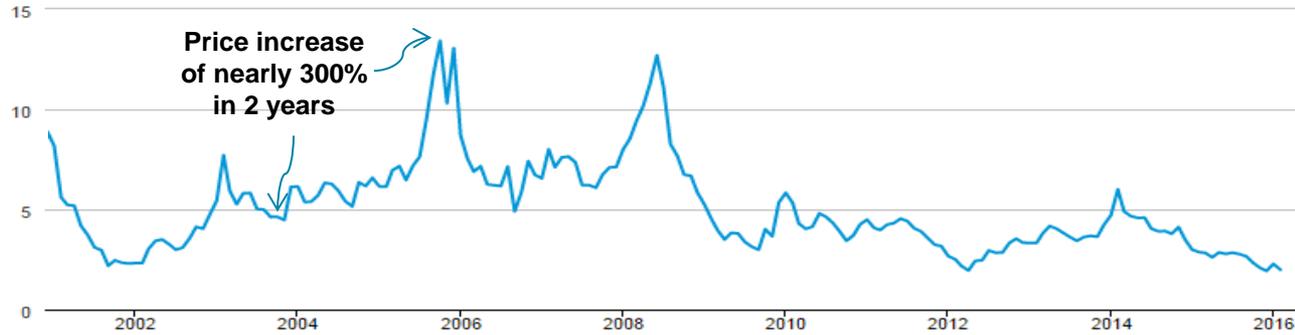
- Same meter with existing facility load: charging load and facility usage are considered together to avoid increased demand charges
- Separate meter: existing load will not affect rates, but new service may add to installation costs

Commercial rate applicability





Electricity Prices are Relatively Stable



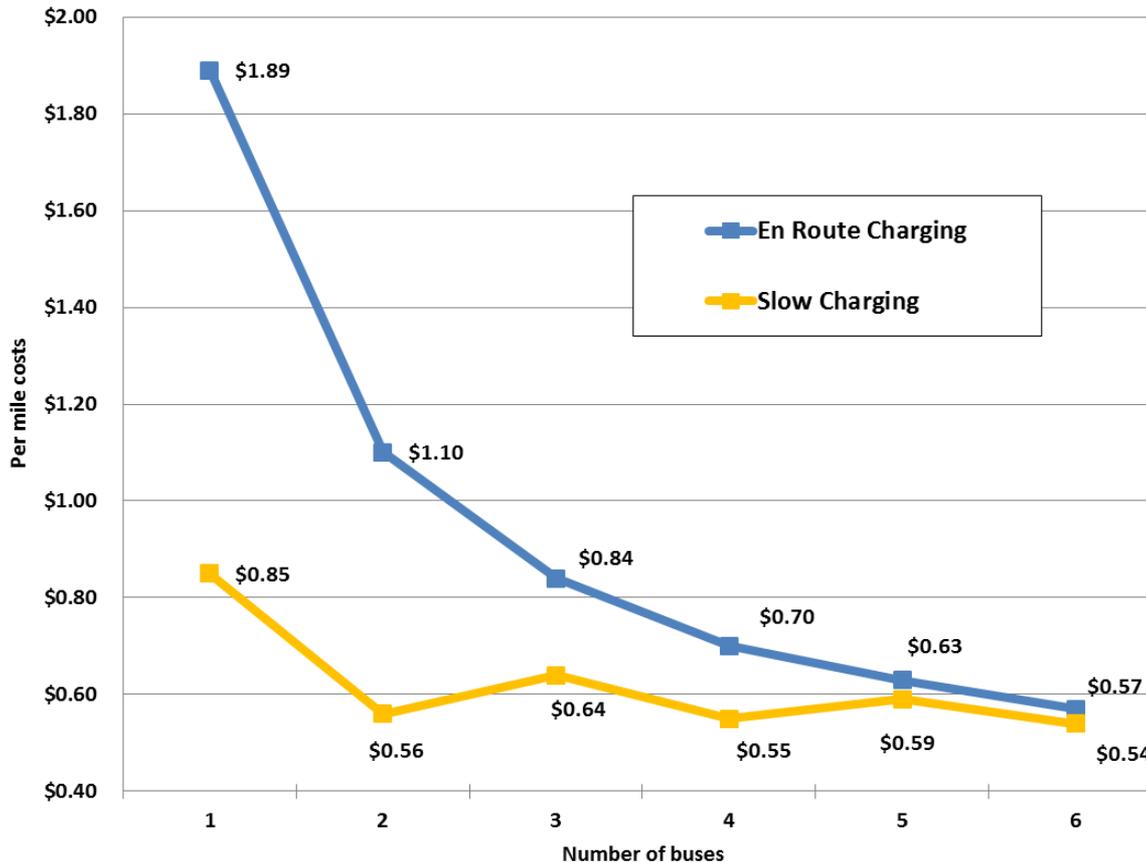


Demand charges are site/application specific

Per mile costs associated with demand charges will be dependent a variety of factors:

- Type of charger (fast vs slow)
- Charge sequencing
- Applicable rate
- Time of charging (on- vs off- peak , seasonal)
- Number of buses per charger

Modeled Charging Costs for A-10 Rate



For en route charging, the model assumes:

- 2,200 miles/month/bus, 2.1kWh/mile, and 1 fast-charger
- Charging is 36% on peak, 33% partial peak, 31% off peak
- Demand based on 235kW avg over 15-min interval (est. based on 500kW charger)
- Demand and usages charges are avg of summer and winter for A-10B (TOU) rate

For slow charging, the model assumes:

- 2,200 miles/month/bus, 2.1kWh/mile, and a shared 80kW-charger for every 2 buses (managed charging)
- Charging is 10% on peak, 10% partial peak, 80% off peak
- Demand based on 80kW avg over 15-min interval
- Demand and usages charges are avg of summer and winter for A-10B (TOU) rate



San Joaquin Regional Transit District: A1 rate pilot

- San Joaquin RTD is the only transit district served by PG&E that has applied for a pilot for electric buses
- The pilot has successfully reduced electric fuel costs allowing for testing of electric buses and the 500kW fast-charge technology
- This is leading to the uptake of more buses, across which demand charges will be spread, reducing the per-mile cost of electric fuel
 - RTD acquired 2 Proterra buses in 2013 and plans to procure 13 more buses over the next two years
- The agency's experience using 500kW fast charge technology during the pilot does not reflect real long term costs. When the 3-year pilot concludes, per-mile operating costs will increase.



Utility Support for Electric Transit

- Rate analysis and consultation
 - Metering and charging options and their impact on bills
- Education and outreach
- Logistics (e.g. charging schedules)
- Technology solutions (e.g. storage, solar)
- Cost reduction opportunities
 - Facility energy audits
 - Energy efficiency incentives to reduce overall consumption (e.g. lighting retrofits and retro-commissioning for air compressors)
 - Demand response (e.g. watch maintenance equipment (e.g. compressors, welders) that can also generate big loads.)
 - Distributed generation (solar) and storage
 - On-bill financing and repayment can be used for many of these solutions



Appendix

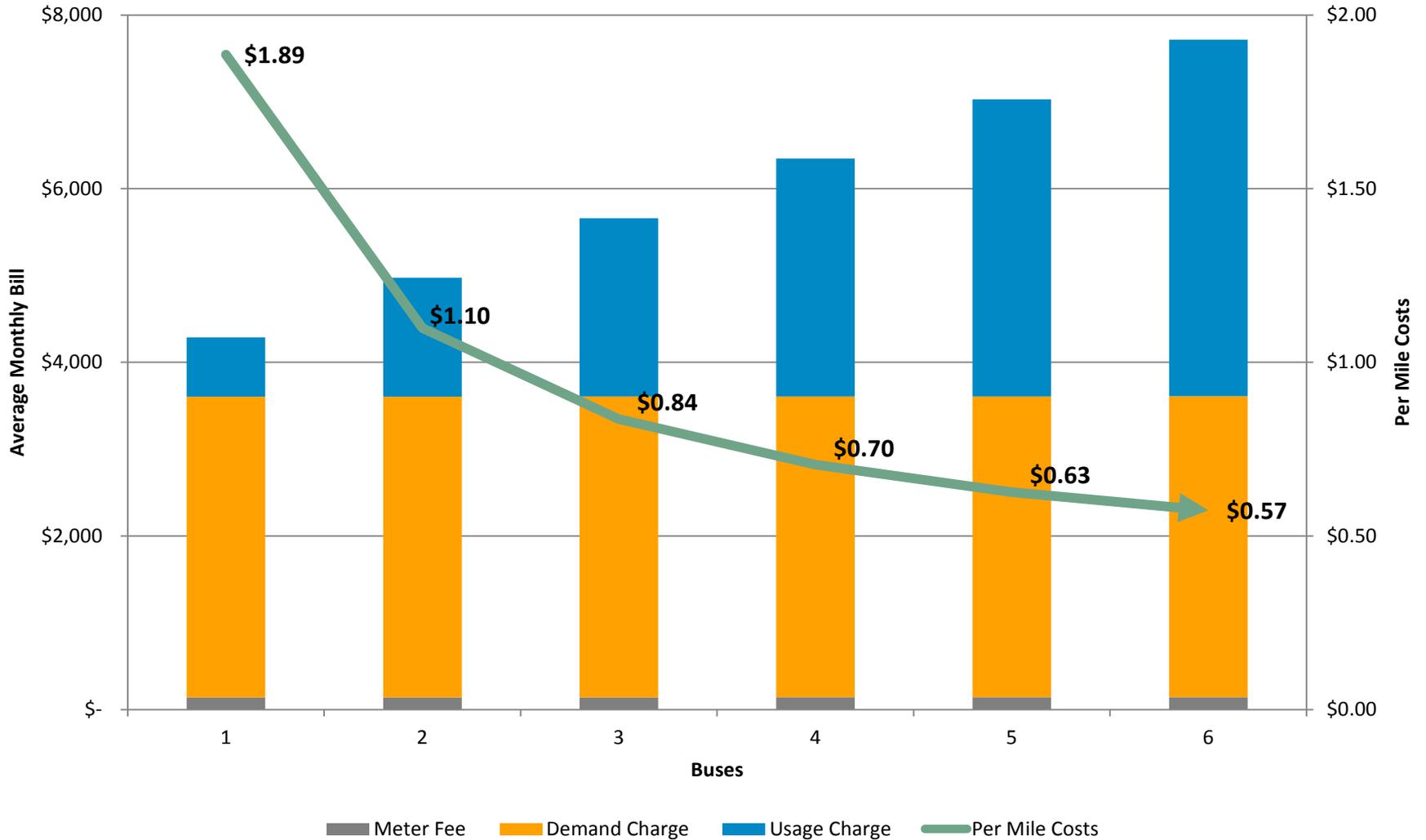


Commercial Rates

	A1 Small general service	A6 Small general TOU service	A10 Medium general demand- metered service	E19 Medium general demand- metered service	E20 Service to customers with 1000kW+
Applicability	Less than 75kW peak demand Less than 150,000 kWh annual usage Cannot be used solely for EV charging	Less than 75kW peak demand Less than 150,000 kWh annual usage	Less than 500 kW peak demand	Between 500 and 1000 kW peak demand	Over 1000 kW peak demand
Demand charges	None	None	Maximum Demand (No TOU component)	[Peak demand] + [Part peak demand] + [Max Demand]	[Peak demand] + [Part peak demand] + [Max Demand]
Energy charges (\$)	Summer Peak: 12-6pm Peak - \$0.258 Part - \$0.215 Off - \$0.194	Summer Peak: 12-6pm Peak - \$0.549 Part - \$0.252 Off - \$0.181	Summer Peak: 12-6pm Peak - \$0.215 Part - \$0.160 Off - \$0.132	Summer Peak: 12-6pm Peak - \$0.147 Part - \$0.107 Off - \$0.081	Summer Peak: 12-6pm Peak - \$0.138 Part - \$0.101 Off - \$0.076
Notes	This is the rate that agencies are put on when they receive the "demand charge waiver"				



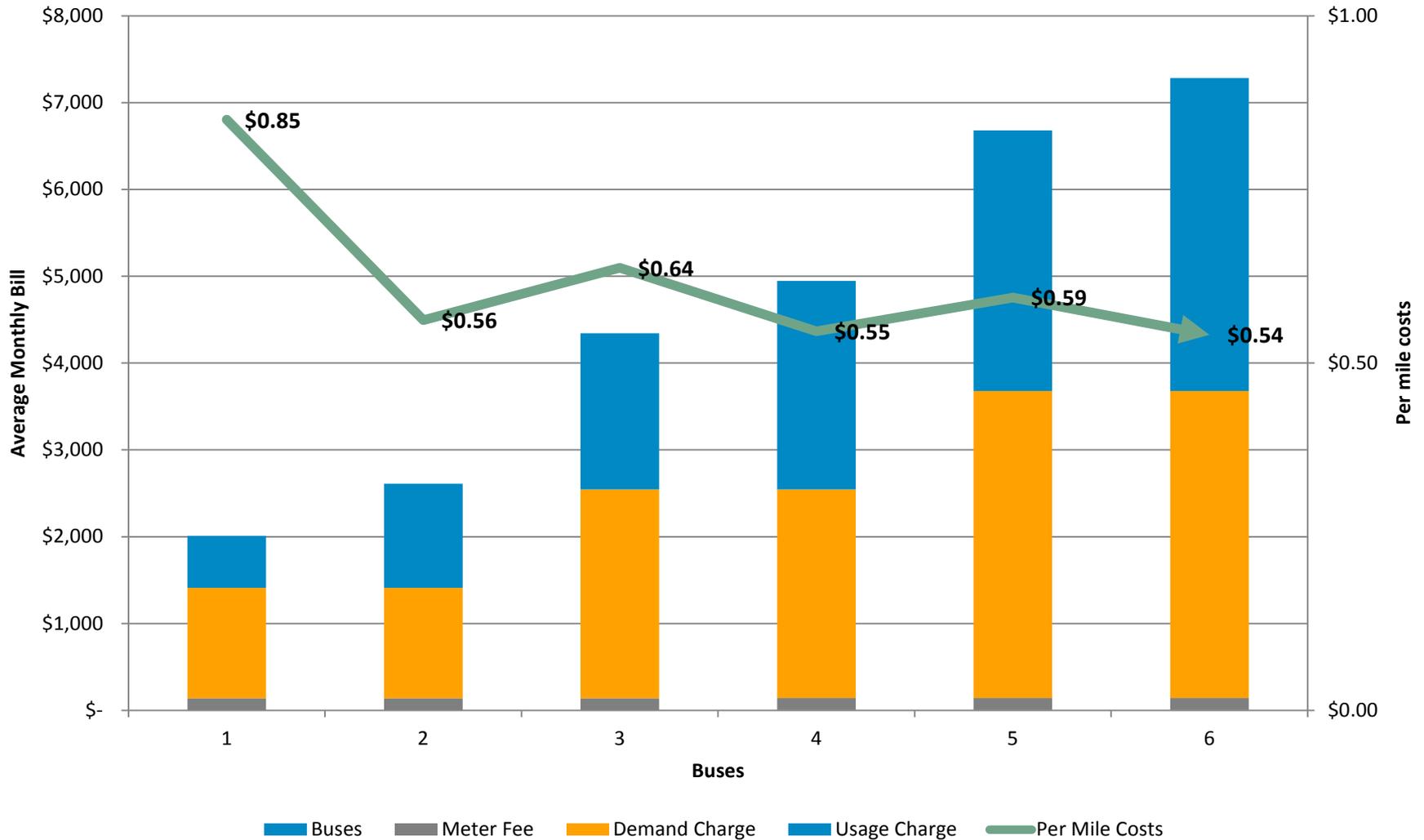
Modeled En Route Charging Costs for A-10 Rate



Models assumes: 2,200 miles/month/bus, 2.1kWh/mile, and 1 fast-charger
Charging is 36% on peak, 33% partial peak, 31% off peak
Demand is based on 235kW average over 15 minute interval (Estimated based on 500kW charger)
Demand and Usages Charges are average of summer and winter rates for A-10B (TOU) rate



Modeled Slow Charging Costs for A-10 Rate



Models assumes: 2,200 miles/month/bus, 2.1kWh/mile, and an 80kW-charger shared for every 2 buses (managed charging)
Charging is 10% on peak, 10% partial peak, 80% off peak
Demand is based on 80W average over 15 minute interval
Demand and Usages Charges are average of summer and winter rates for A-10B (TOU) rate