

RATE DESIGN FOR EV CHARGERS

Chris Nelder

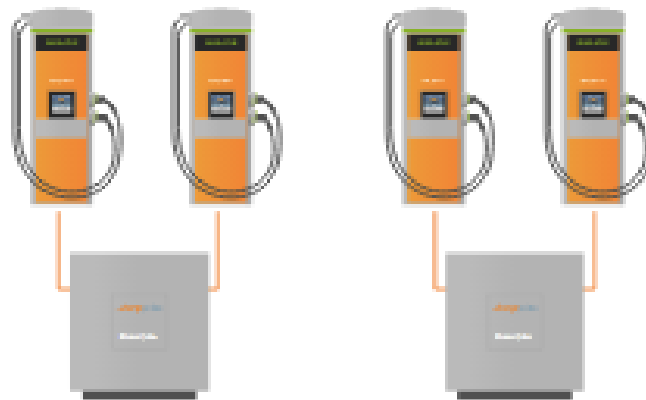
Manager, Vehicle-Grid Integration

Rocky Mountain Institute

DIFFERENT RATES FOR DIFFERENT USE-CASES



For Level 2 chargers (typically 7-19 kW), which are mainly used for residential and workplace charging over 8 hours or more, a conventional Time of Use (ToU) rate design to encourage **managed charging is appropriate.**

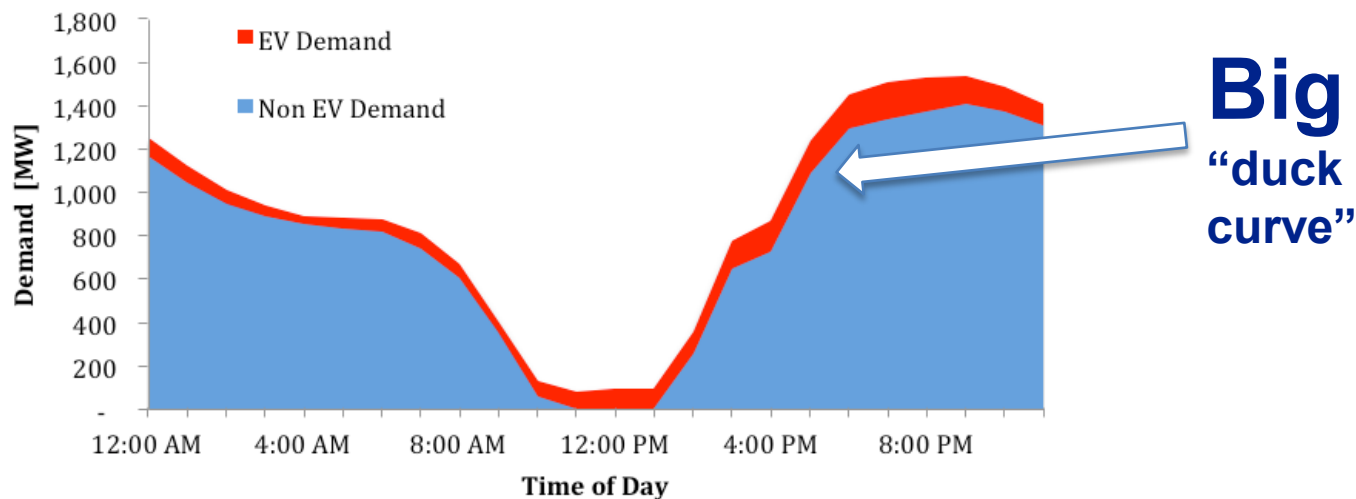


For DCFC (50-350+ kW), which are used briefly (< 1 hour) at random times, a more sophisticated rate design is needed, which minimizes the role of demand charges until the market matures.

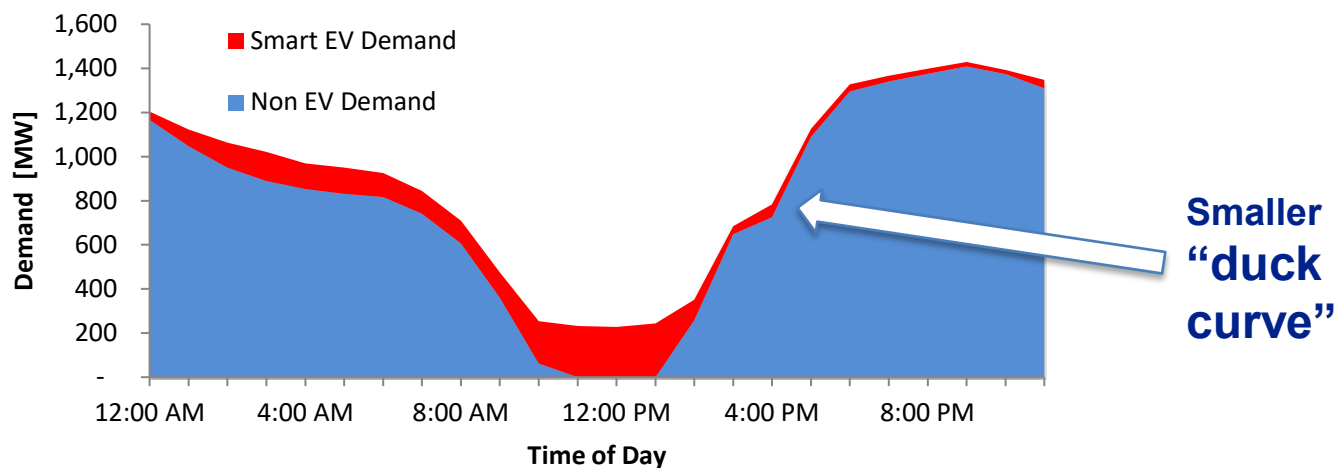
- The load is “spiky” and unpredictable.
- The DCFC use-case is **not conducive to managed charging.**

MANAGED CHARGING: PRESSED DUCK

Projected HECO demand with 23% EV penetration with **uncontrolled** EV charging



Projected HECO demand with 23% EV penetration with **managed** EV charging



KEY ISSUES WITH DCFC RATE DESIGN

1. **DC fast charging is mostly a market failure.**
2. Public **DCFC are critical** parts of the network. We cannot achieve our transportation electrification aims without widespread public DCFC.
3. Conventional utility rates with **demand charges can kill the business case** and are not suitable. On public DCFC with low utilization rates, demand charges can be as much as **80-90%** of a monthly bill.
4. New, **DCFC-specific rates are needed** while the market is young and charger utilization rates are low.
5. **Charging depot loads will be significant.** In addition to today's 50-150 kW DCFC loads, let's have a view toward funding & recovering costs for 2 MW loads at public charging depots and 20 MW loads at truck stops.



RATE DESIGN OBJECTIVES

We see transportation electrification as a public good.

In order to ensure that EV adoption is robust and affordable, we put forth these design objectives for utility tariffs applied to EV charging:

- Charging should be **profitable** so that it is sustainable.
- Charging should always be **cheaper than gasoline** (typically **\$0.29/kWh, or ~\$0.09/mile, or less**).
- Level 2 charging should be considerably **cheaper than DC fast charging**.
- EV chargers should be on **dedicated tariffs** and on **separate meters**, preferably the meter built into the charging station.
- Tariffs should offer an opportunity to **earn credit for providing grid services** through **managed charging**.

RATE DESIGN PRINCIPLES FOR EV CHARGERS

- Tariffs for Level 2 chargers should be **time-varying**, and preferably dynamic, while recovering most utility costs. Time-varying rates are typically not appropriate for DCFC.
- Tariffs should have **low fixed charges** which primarily reflect routine costs for things like maintenance and billing.
- Demand charges should be minimized, but the “demand charge holiday” approach is guesswork.
- If demand charges are necessary, they should:
 - reflect the *demonstrated* added cost of providing service
 - be peak-coincident
 - scale with utilization rates
 - recover **only location-specific costs of connection to the grid, not upstream costs**, so that customers sharing capacity share costs, and **continuous-capacity customers are not subsidized by short, infrequent loads.**

DCFC RATE DESIGNS COMPARED



DCFC Rate Design Study (Sept 2019)

We compared:

- **Three tariffs:**

- Xcel Energy's S-EV
- PG&E's EV-Large S
- RMI's DCFC

- **Three load profiles:**

- Public DCFC charging depot with two dual-port 50 kW chargers
- Public DCFC charging depot with two dual-port 150 kW chargers
- Transit bus depot with 25, 100-kW chargers

- **Three utilization rates** on public DCFCs: 5%, 10%, and 30%

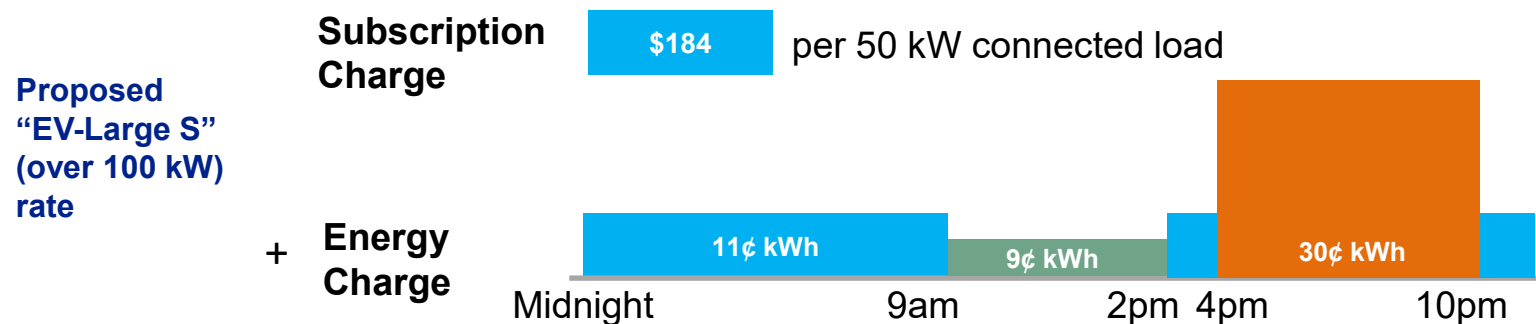
Goal: Meet or beat gasoline parity at \$0.09/mile.



DCFC RATE DESIGNS COMPARED XCEL COLORADO'S S-EV TARIFF

- Fixed monthly charge: \$34.40/mo.
- Two-tier ToU rate:
 - \$0.054/kWh on-peak (9 am – 9 pm)
 - \$0.027/kWh off-peak (9 pm – 9 am)
- CPP adder: \$1.50/kWh
- Low (distribution) demand charge: \$5.63/kW

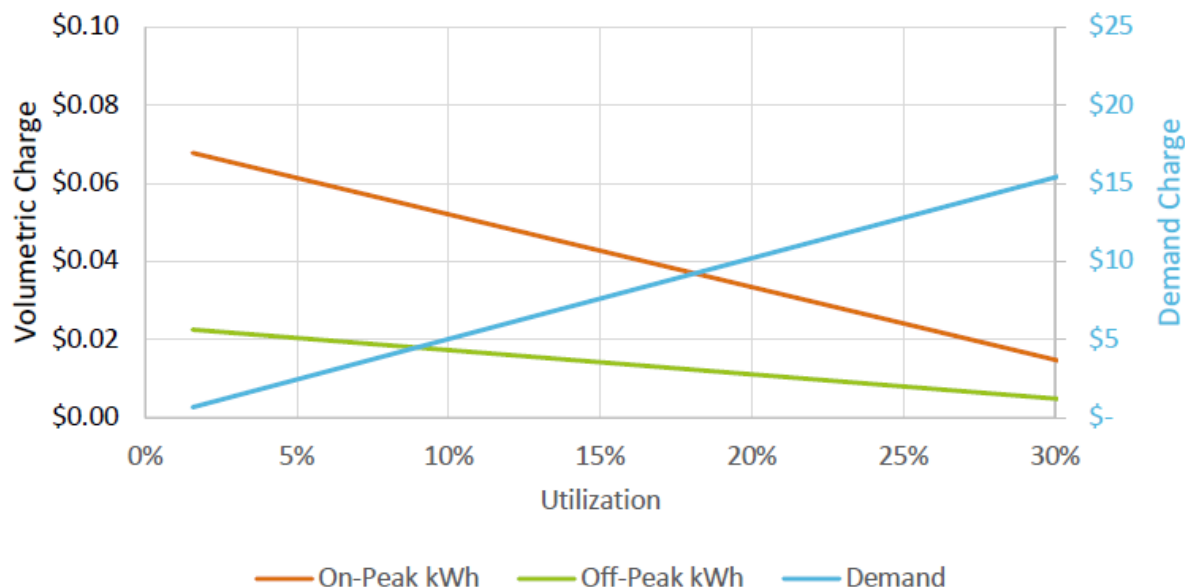
DCFC RATE DESIGNS COMPARED PG&E'S PROPOSAL



- No demand charges
- Three-part ToU rate matched to system peaks for appropriate cost recovery
- Rates are stable year-round, sending charging networks and drivers reliable and appropriate price signals
- Allows profitable DCFC operation across a wide variety of load shapes and charging scenarios

DCFC RATE DESIGNS COMPARED RMI'S PROPOSAL

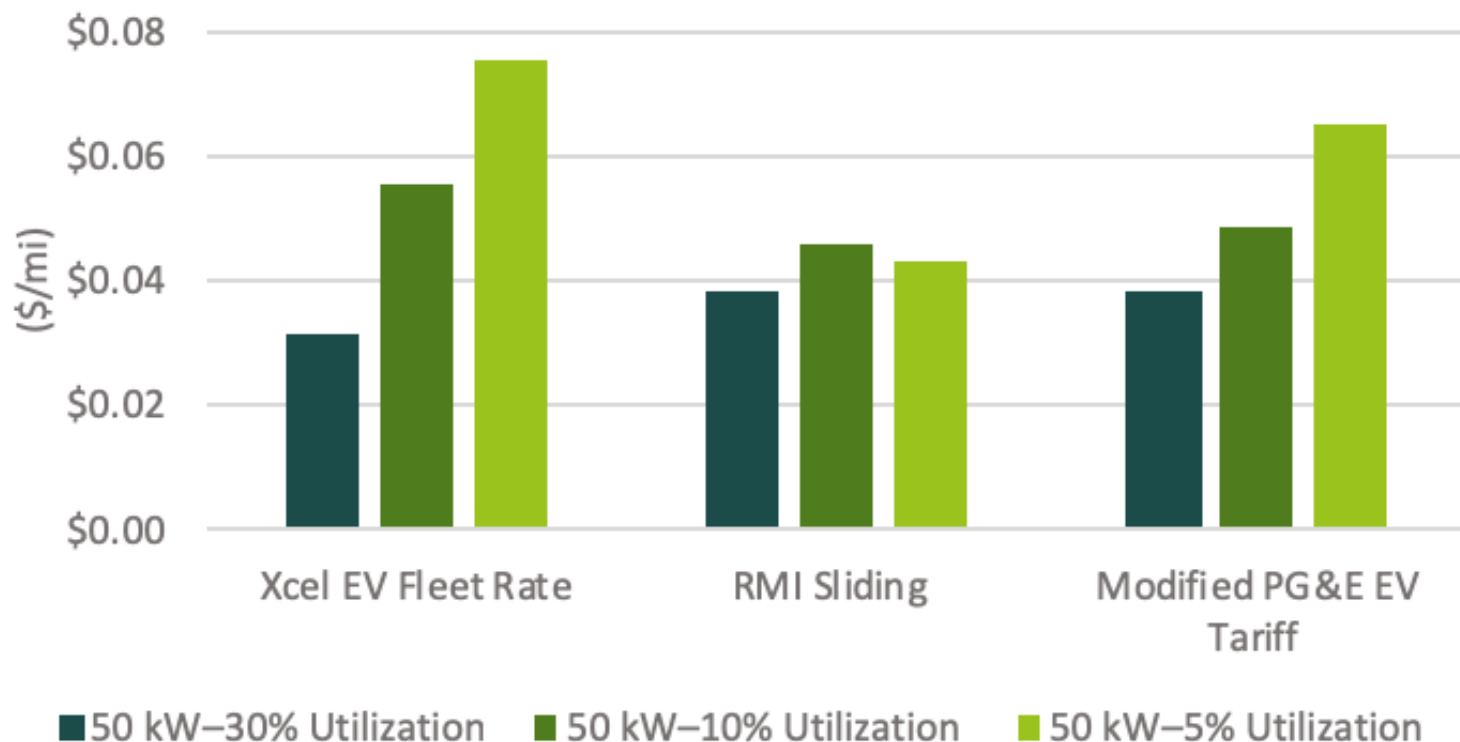
- Charges scale *as a function of utilization rates*.
- Recovers the same revenue over 10 years as Xcel's own rate.
- Fixed monthly charge: \$34.40/mo.
- Two-tier ToU rate:
 - On-peak (9 am – 9 pm) Decreases from \$0.068 to \$0.007
 - Off-peak (9 pm – 9 am) Decreases from \$0.022 to \$0.002
- Demand charge: Increases from \$0.677 to \$17.622/kW



DCFC RATE DESIGNS COMPARED

PUBLIC 50 KW DCFC

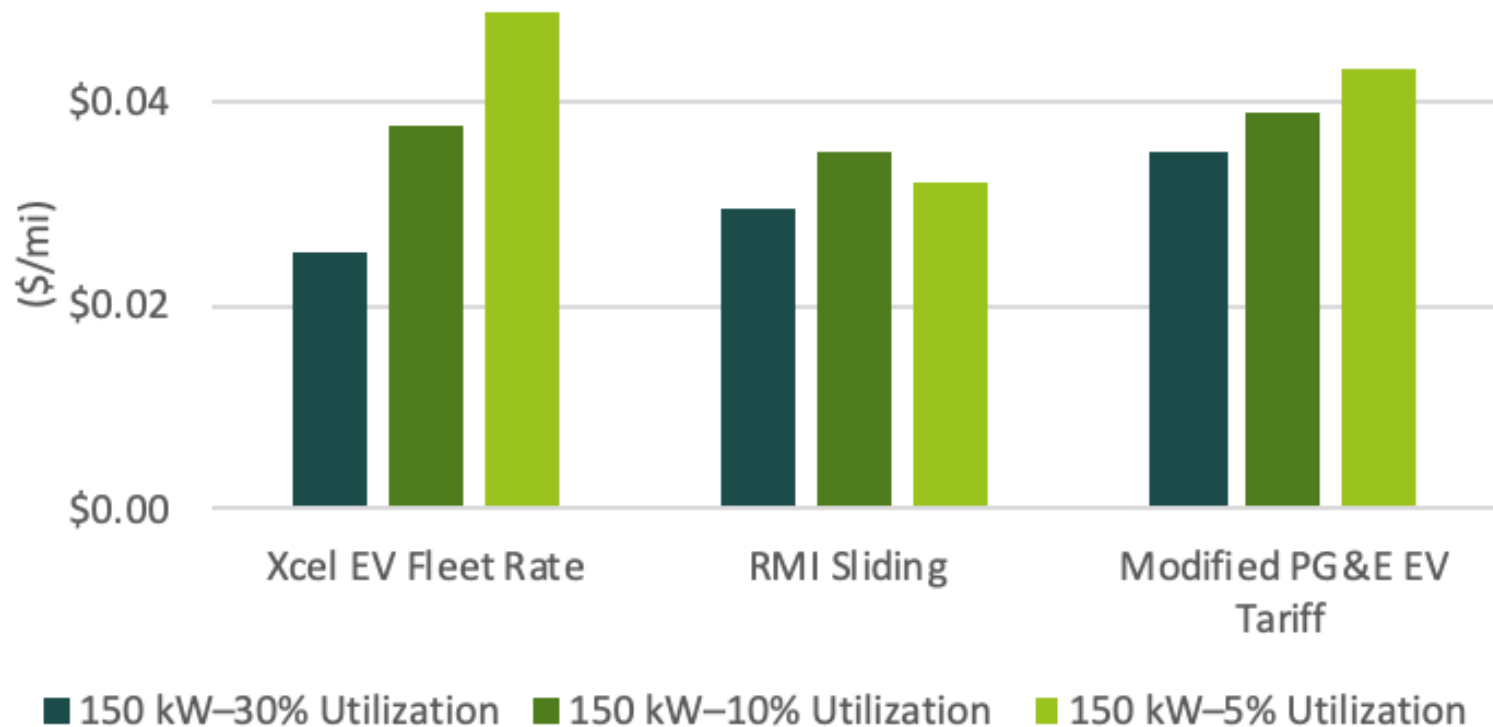
RMI tariff produces *the lowest cost at low utilization* and the highest cost at high utilization



DCFC RATE DESIGNS COMPARED

PUBLIC 150 KW DCFC

RMI tariff produces the *most consistent cost per mile* and the cheapest cost at 5% and 10% utilizations



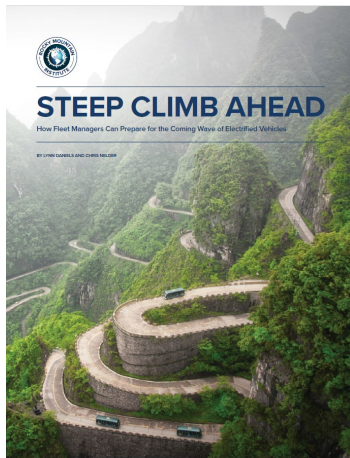


REGULATING EV CHARGING LIKE UTILITIES HAS A CHILLING EFFECT

In our report, *From Gas to Grid*, we found that regulating EV charging networks as if they were utilities has a chilling effect on the deployment of charging stations. When states lifted those requirements, more charging stations were built and more EVs were purchased.

- In Colorado & Hawaii, charging networks are exempted from regulation as a public utility. This favors private ownership and deployment of charging stations, and those states offer significant rebates for charging station deployments, and have significant rates of EV adoption.
- In Texas, the Public Utility Regulatory Act regulates charging networks like they do utilities, which has barred competitive private charging networks from owning or operating EV charging stations.
- Some state regulators just decline to regulate the sector. Others treat it the same way they do vending machines.

RMI EV-GRID REPORTS



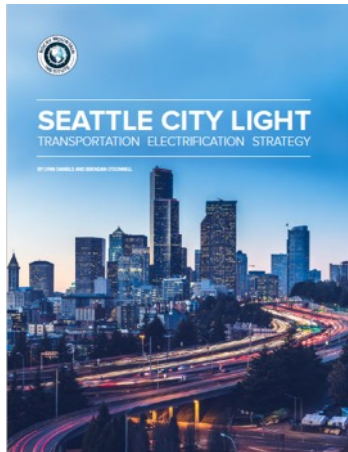
Steep Climb Ahead
(January 2021)



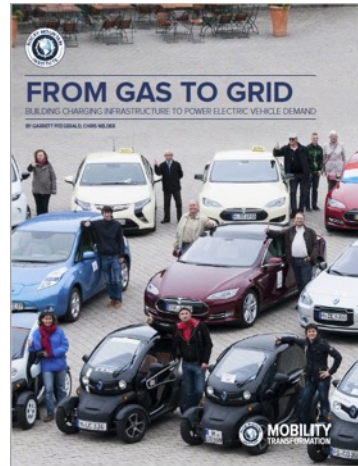
Reducing EV Charging Infrastructure Costs
(January 2020)



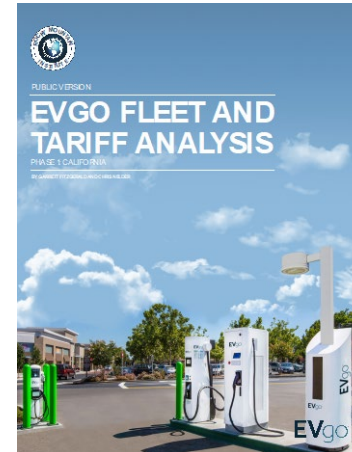
DCFC Rate Design Study
(Sept 2019)



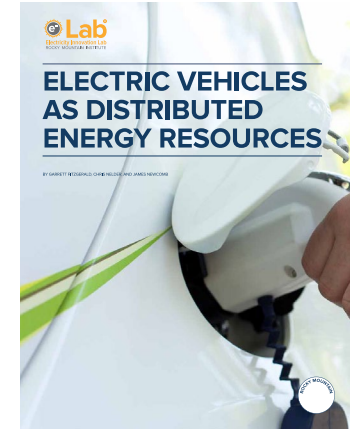
Seattle City Light TE Strategy
(Aug 2019)



From Gas to Grid
(October 2017)



EVgo Fleet and Tariff Analysis
(March 2017)



Electric Vehicles as Distributed Energy Resources
(June 2016)



Thank you!

