RATE DESIGN CONSIDERATIONS FOR EV CHARGING

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**CHARGER TYPES**

Level 2 chargers (4-22 kW) are **inexpensive** and can provide grid services with managed charging.

Level 2 is appropriate anywhere vehicles can stay a few hours:
- residences
- workplaces
- shopping areas
- charging depots

DCFC (50-350+ kW) are **very expensive** and can’t easily provide grid services with managed charging.

DCFC is appropriate for:
- high-traffic urban centers
- commuting corridors
- stops on interstate highways
- charging depots for TNC fleets
- mass transit
KEY ISSUES

1. DC fast charging is mostly a market failure we will have to correct to achieve our transportation electrification aims.

2. This problem almost certainly requires a rate design cure.

3. 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, 5-10+ MW loads at transit bus barns and 20+ MW loads at truck stops.

4. Utility investment is necessary.

5. Fleet electrification entails a steep and treacherous learning curve. Most fleet managers are unfamiliar with charging equipment, operational aspects of managing charging, financial impacts of charging and maintaining electric fleets, etc. Horror stories abound.
PUBLIC DCFC RATE DESIGN ISSUES

• Public DCFC are critical parts of the network.
• Therefore it is critical that tariffs support public DCFC infrastructure. But most existing tariffs are not designed for DCFC operators and are not suitable:
  • Do not accurately reflect the true cost of service
  • Are not consistent across utilities
  • Lack appropriate price signals for effective integration of EVs onto the grid
• DCFC utilization varies by host type, and increasing utilization eases issues with demand charges.

→ We need tariffs that create a better business case for DCFC owners & operators.
LEVEL 2 IS COMPETITIVE WITH GASOLINE; DCFC IS NOT
DEMAND CHARGES: ICE PARITY WITHOUT THEM

<table>
<thead>
<tr>
<th>Year</th>
<th>Scenario 1</th>
<th>Scenario 2</th>
<th>Scenario 3</th>
<th>Scenario 4</th>
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<tr>
<td>2017</td>
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<tr>
<td>2020</td>
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<td>2027</td>
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<td>2027</td>
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Legend: Red = Scenario 1, Blue = Scenario 2, Black = Scenario 3, Orange = Scenario 4.
RATE DESIGN GOALS

• 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.
• Ideally, utilities could leverage distributed energy resource management systems (DERMS) to **promote a more efficient use** of existing grid infrastructure by offering varying rates, or interconnection costs, or levels of cost sharing for make-ready by location.
RATE DESIGN PRINCIPLES FOR EV CHARGERS

- Tariffs should be **time-varying**, and preferably dynamic, while recovering most utility costs.

- Tariffs should have **low fixed charges** which primarily reflect routine costs for things like maintenance and billing.

- Tariffs should reflect the actual cost of providing service, and should charge more for **coincident peak demand**.

- If demand charges are necessary, they should be scale with utilization rates, and 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**.

- **Cost shifts** should be **demonstrated, not assumed**, esp. when utilization is low.

- If a cost shift to low- to moderate-income (LMI) customers is demonstrated, it **should be offset by investments** in mobility services and infrastructure for LMI residents, not avoided altogether.
ADDRESSING THE DEMAND CHARGE PROBLEM
RMI’S PROPOSAL

- While the market is young, there are no demand charges. More cost is shifted to volumetric charges until the market matures.
- As the market matures and utilization rates climb, demand charges scale up and volumetric charges scale down.
- Can be done as a function of utilization rates. Example: (indicative pricing)

<table>
<thead>
<tr>
<th>Utilization rate</th>
<th>Volumetric rate (kWh)</th>
<th>Demand charge (kW)</th>
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</thead>
<tbody>
<tr>
<td>&lt;=10%</td>
<td>$0.20</td>
<td>$0</td>
</tr>
<tr>
<td>15%</td>
<td>$0.18</td>
<td>$1</td>
</tr>
<tr>
<td>20%</td>
<td>$0.16</td>
<td>$2</td>
</tr>
<tr>
<td>30%</td>
<td>$0.15</td>
<td>$3</td>
</tr>
<tr>
<td>40%</td>
<td>$0.14</td>
<td>$4</td>
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<tr>
<td>50%+</td>
<td>$0.11</td>
<td>$5</td>
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</table>
ADDRESSING THE DEMAND CHARGE PROBLEM
PG&E’S PROPOSAL

• No demand charges
• Time of Use rate is 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
ADDRESSING THE DEMAND CHARGE PROBLEM

SCE’S DEMAND CHARGE HOLIDAY PROPOSAL

- SCE has proposed four new rates for EVs
- No demand charges for first 5 years, then demand charges phase in over next 5 years. By Year 11, back to regular rates.
- Time of Use rate is matched to system peaks for appropriate cost recovery
- Rates vary by winter/summer, reflecting system costs and sending charging networks and drivers reliable and appropriate price signals
- Should allow profitable DCFC operation
- Other utilities are proposing similar “demand charge holiday” approaches

Figure III-7
Proposed TOU Weekday Periods for New V Rates (Hour Beginning)
ADDRESSING THE DEMAND CHARGE PROBLEM

XCEL’S “RULE OF 100” APPROACH

Demand calculation

\[ y \text{ kW demand} \times 0.9 \text{ power factor} \times 0.9 = \text{adjusted demand} \]

(\(=\) current demand or 50% of largest adjusted demand over previous 11 months)

\[ \text{If demand charges are } \leq \quad x \text{ kWh} / 100 \text{ hours/mo} \]

- Xcel’s “A14” tariff in Minnesota
- Effectively calculates demand charges as a function of utilization.
- For example, a 50 kW DCFC used once per day would result in a bill that is 70% lower.
- By the time the same charger is used five times per day, the provision no longer has any effect upon the bill
RMI EV-GRID REPORTS

Electric Vehicles as Distributed Energy Resources (June 2016)

EVgo Fleet and Tariff Analysis (March 2017)

From Gas to Grid (October 2017)