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CARB Advanced Clean Transit

Electric Utility and Transit Fleets Electrification Workgroup

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Tackling emerging issues in transit electrification

- The increased interest around electric transit is exciting and has brought many issues forward that need to be resolved for the market to flourish
- Utilities, transit agencies and third-party providers can better address industry issues by
  - Reducing infrastructure and operating costs by utilizing low carbon fuel standard credits, real time energy pricing, and innovative rate design
  - Looking at new or expanded roles for utilities to provide assistance including charging infrastructure
  - Exploring technical solutions including range extenders, storage and on-site generation
  - Remaining neutral to technology type and business model in order to allow choices for the transit agency
  - Creating new codes and standards for charging infrastructure

Reducing total cost of ownership

Several cost reduction activities are available now for transit agencies

	Cost reduction action	Value to Transit Agency	Implementation	Description
Upfront	**Initiate IOU infrastructure program**	High	In development	SCE is developing a new transport-focused application modeled on Charge Ready
	Reduce Rule 15/16 Cost	Low	Available now	Allowances generally cover cost of distribution /service extensions (Additional costs would be covered under infrastructure program)
On-going	**Redesign demand charges**	Med-High	Available now	SCE has one EV rate without a demand charges (Schedule EV-4*) and is considering an additional rate option
	Explore innovative rate offerings	Med-high	In development but challenging	e.g., Locational demand charges, real-time energy pricing
	Utilize LCFS proceeds	High	Available now	Approx. 100 credits/bus/year (up to $20,000 per year)
Non-Utility	**Vehicle purchase rebate**	High	Available now	Up to $100,000 per bus under HVIP
	Operational Savings	Med	Available now	Fuel, maintenance, labor
	Technical Solutions	Med	Available now	Charging software enhancements, alternative vehicle technologies (range extenders, larger batteries, charging alternatives), energy management systems

* If EV demand is less than primary account demand

Background on Pilot

- EV-charging customers today generally have low load factor usage profiles, which inspires strategies to account for the unique characteristics of EV load
- In November 2012, the CPUC adopted Resolution E-4514:
  - Required SCE to extend the eligibility of Schedule TOU-GS-1* – with no demand charge – for a pilot period of three years. Available only to government agencies that have purchased or obtained zero emissions electric buses.
  - The pilot period was limited to 3 years to "strike[ ] a balance between ensuring electric bus demonstration projects move forward, but not unduly providing an advantage to any particular electric transit battery technology and energy storage strategy."
- EV customers with demand less than 500 kW can currently avail themselves of TOU-EV-3 and TOU-EV-4**. SCE is exploring a new option for commercial EV chargers, Schedule TOU-EV-6, but has not formally filed a rate proposal at the CPUC.
- Prior to Commission approval of a new proposed rate for commercial EVs, SCE will transition existing EV rate customers with demands above 500 kW to Schedule TOU-8 Option-A.

* Schedule TOU-GS-1 is intended for small commercial accounts with a monthly maximum demand of 20 kilowatts (kW) or less
** Schedule TOU-EV-3 is applicable to customers whose monthly maximum demand is 20 kW or less; Schedule TOU-EV-4 is applicable to customers whose monthly maximum demand is above 20 kW but not exceed 500 kW

LCFS Value Proposition

LCFS has the potential to lower the lifecycle costs of owning and operating electric buses and other EVs

40-foot transit bus example

- 40,000 miles/year at 2.2 kWh/mile will generate roughly 100 LCFS credits/year

Credit Price	$/bus/year	$/mile savings	$/kWh savings
$50	$4,984	$0.12	$0.06
$100	$9,969	$0.25	$0.11
$150	$14,953	$0.37	$0.17
$200	**$19,938**	**$0.50**	**$0.23**

Foothill example[1]:

- LCFS credits forecast electricity to be 14% less expensive than CNG net per mile in Q1 2016 (at $100/MT)
- Break even with CNG estimated at ~$85/MT
- Credit prices have stabilized due to regulatory certainty and could increase to the $200/MT cost-containment ceiling[2]

[1] March 29, 2016 presentation to CalSTART
[2] http://www.des.ucdavis.edu/faculty/Lin/California_LCFS.pdf

What SCE is doing

- **Rate Design**: EV Rates
  - SCE has three TOU rates specifically designed for EV customers available now (EV-1, EV-3A/B, and EV-4)
  - Additionally, SCE is developing a new EV rate proposal (EV-6) intended for high-demand customers (e.g., transit agencies)
  - SCE's existing EV rates do not have demand charges if the EV-metered account's demand is less than that of the primary adjacent account
  - SCE also has a rate not specific to EV customers, Schedule TOU-8-A, which could be favorable in some cases
- **Proposed Investment**: SCE is in development of an infrastructure program similar in design to Charge Ready ("make-readies") but focused on Transport vehicles
- **Programs**: SCE is active internally and externally in support of transportation electrification
  - Advisory Services / Trusted Energy Advisor to business customers
  - Codes and Standards effort by EPRI and SAE

Backup

Rule 15/16 info

- Rule 15 - distribution service extensions that **can serve multiple customers**
- Rule 16 - distribution service extensions that **serve only one customer**
- Both are in place to ensure that
  - distribution and service extension costs are appropriately allocated (individual customer vs. all customers)
  - limit system overbuild and unnecessary cost
- Allowance used to pay for utility costs for planning, designing, and engineering, installing cables, switches, transformers, distribution lines

$$Allowance = \frac{Net\ Revenue}{Annual\ Cost\ of\ Ownership}$$

(Demand and energy distribution components of customer rate paid in one year)

(SCE=15.72%)

- Overwhelmingly, that allowance fully covers customer costs
- Customer is responsible for any excess service costs
- All materials are owned, operated & maintained by utility

Rate Structure Components

Rate Structure Component	Typically Expressed in…	Rate Design Concepts
Energy Rate	¢/kWh	Designed to recover a portion of costs for delivery service and generation.
Customer Charge	$/day or $/month	Designed to recover all or a portion of marginal customer-related distribution costs, such as customer hookup facilities (cost of final line transformer, service drop) and revenue cycle services (metering, billing), which do not vary with energy usage.
Demand Charge (Facilities - FRD) (Time Related - TRD)	$/kW FRD: Applied to the greatest amount of registered demand. TRD: Applied to the greatest amount of registered demand in the on-peak and mid-peak seasonal periods	FRD: Designed to recover costs for the installed transmission and distribution facilities (i.e., transformers, circuits, substations, etc.) required to serve the customer's highest demand. TRD: Designed to recover part of higher costs of providing Generation Capacity during the high-demand summer season
Time-of-Use (TOU)	$/kWh (Energy Rate)	Rate charged for energy is variable throughout the day in accordance with demand. As a result, energy is cheapest at night (when there is low demand) and typically most expensive during the day (when there is high demand).