| **DOCKETED** |
|------------------|------------------|
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| **Project Title:** | Implementation of AB 2127 Electric Vehicle Charging Infrastructure Assessments |
| **TN #:** | 244226 |
| **Document Title:** | Presentation - CPUC - CalFUSE VGI Rates and ELRP |
| **Description:** | ***Document supersedes TN 244215*** |
| **Filer:** | Spencer Kelley |
| **Organization:** | California Energy Commission |
| **Submitter Role:** | Commission Staff |
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| **Docketed Date:** | 7/28/2022 |
EV Specific Rates and CPUC Energy Division CalFUSE Staff Proposal

Achintya Madduri, PhD
Retail Rates Section | Energy Division
July 26, 2022
Summary

- Multiple options to support Vehicle-Grid Integration
  
  I. Optional EV TOU rates with reduced demand charges or demand charge “subscriptions”.
  
  II. EV RTP rate options and V2G Export compensation pilots
  
  III. Emergency Load Reduction Program (ELRP)
  
  IV. Submetering protocols
  
  V. “CalFUSE” CPUC Energy Division Staff proposal
I. EV TOU Rates

• SCE Charge Ready Program (TOU-EV-7/8/9)
  – No monthly demand charges till 2023, 5-year phase in afterwards
  – E.g., TOU-EV-8 off-peak = $0.176/kWh (summer), $0.108/kWh (winter)

• PG&E Schedule BEV
  – Super off-peak (9am-2pm) = $0.1485/kWh
  – Discounted “Subscription”-based demand charges: e.g., $62/mo for 50-kW

• SDG&E EVHP
  – Super off-peak (12am-6am) = $0.10/kWh
  – “Subscription”-demand charge: e.g., $190/mo for 50-kW
II. EV Dynamic Rate Pilots

• PG&E Commercial EV Day Ahead RTP (CEV DAHRTP) rate (D.21-11-017) – October 2023
  – Optional day-ahead, hourly RTP rate for Commercial EV customers.
  – Includes a dynamic MGCC Adder and a time-differentiated Revenue Neutral Adder
  – Distribution rate includes demand charge—“Subscription”
  – Cost-based export rate-rider (in proceeding: A.20-10-011)

• SDG&E GRC Phase 2 RTP rate & High-Power EV (HPEV) RTP Rate (A.21-12.006/A.21-12.008)
  – Applications for C&I RTP pilot and RTP export rate-rider for HPEV customers have been consolidated into a single proceeding.
  – Rate design includes day-ahead hourly market prices, CPP adders for MGCC.
  – SDG&E to revise its applications in supplemental testimony based on ED staff guidelines.

Note: Both the above pilots offer dynamic generation rates and do not include dynamic distribution rates.

• SB 676 PG&E VGI Pilots (CPUC Resolution E-5192 regarding PG&E AL 6259-E)
  – 3 VGI pilots (residential, commercial fleet, and microgrid)
  – Address V2X barriers and demonstrate capabilities of bidirectional EV chargers
### III. ELRP Option A.5: VGI Aggregation

**ELRP established in D.21-03-056**
**VGI-specific program modifications established in D.21-12-015**

<table>
<thead>
<tr>
<th>Program availability:</th>
<th>May-October</th>
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<tbody>
<tr>
<td></td>
<td>Seven days a week; 4-9pm</td>
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<table>
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<tr>
<th>Event duration:</th>
<th>1 hour min; 5 hour max</th>
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<tbody>
<tr>
<td>Annual dispatch limit:</td>
<td>Up to 60 hrs</td>
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</tbody>
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<table>
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<tr>
<th>IOU minimum VGI aggregation dispatch:</th>
<th>30 hours per season</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consecutive day dispatches:</td>
<td>No constraints</td>
</tr>
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</table>

| Compensation rate:                   | $2/kW of Incremental Load Reduction (ILR) |
VGI Event Triggers

• **CAISO-Declared System Events**
  – Alert (day-ahead)
  – Warning (day-of, several hours ahead)
  – Emergency (day-of, 30-60 min ahead)

• **IOU Discretion**
  – High Location Marginal Prices (CAISO energy market)
  – Forecasted grid stress conditions
  – To meet 30-hour minimum VGI aggregation dispatch per season
VGI Aggregation (ELRP A.5) Eligibility

• An eligible aggregator can manage a portfolio that combines any numbers of EVs and charging stations
  – Both V1G and V2G (export with bi-directional charger) is allowed

• Eligibility Requirements:
  – A customer site within an aggregation cannot be simultaneous enrolled in a supply-side (CAISO market-integrated) DR program.
  – All sites within the VGI aggregation must be located within the distribution service area of a single IOU.
  – A VGI aggregation should contribute ILR > 25kW for a minimum of one hour during an ELRP event
  – NOTE: NEM customers with EVs meeting the above requirements are eligible

• An EVSE meter or EVSE sub-meter may be used to determine the ILR
IV. Submetering Protocols

• PD adopting EV submetering protocol and EVSE communication protocols issued (June 20th) in R.18-12-006

• Goals:
  – Reduce cost of EV charging
  – Consumers can avoid having to install a separate utility meter
  – Can use a submeter to have EV charging measured and billed separately
  – Customers can enroll in EV-specific rate independently
V. The “CalFUSE” Staff Proposal
Executive Summary

Staff Proposal
Pursue joint reforms of DR programs and Rate structures to Promote *Unified Strategies* for Demand Management and Grid Optimization to **Achieve widespread adoption** of demand flexibility solutions.

**Policy Objective:** Improve demand-side resource management...
- Through more effective demand response (DR) and retail rate structures,
- That leverage opportunities enabled by long term electrification and DER deployment,
- To better address grid issues associated with the growth of renewables, electrification, and DER adoption, and support California’s clean energy goals.
Present

Basket of Rates
(cost recovery / allocation, equity)

Basket of Supply-Side Programs
(market integrated)

Distribution Level DR

- Complex, inefficient, expensive, confusing
- Difficult to scale, Limited adoption
- High cost of controls, automation

Future

Demand Side: Flexible Unified Signal for Energy in California (CalFUSE)

- Reduced complexity, Single point focus
- Highly scalable, widespread adoption
- Reduced cost of controls, automation
The “CalFUSE” Vision

- Widespread adoption of demand flexibility solutions
- Reduced peak loads, energy prices, infrastructure needs
- Reduced cost of service

...leading to a reduction in peak loads, energy prices, and required infrastructure...

PEAK LOADS

Lower peak load means less infrastructure cost...

...and customers buy more electricity when it is cheaper

Wholesale Electricity Cost

Image Source: PNNL “DSO+T Study”, January 2022
The CalFUSE “Framework”

Three Pillars

- Price Presentation
- Rate Reform (Three-prong strategy)
- Customer Options for Energy Optimization

Six Elements

- Element 1: Standardized price access
- Element 2: Real-time energy prices
- Element 3: Real-time capacity prices
- Element 4: Bidirectional prices
- Element 5: Subscription option
- Element 6: Transactive option
Role of Third Parties

Third parties expected to play a major role in the implementation of CalFUSE.

The CalFUSE “ecosystem” could include:

• **Application developers** focused on making the CalFUSE price signal accessible to customers and devices,

• **Device manufacturers** integrating the necessary functionality to enable the devices to interact with the CalFUSE signal,

• **Automation service providers** layering intelligent algorithms or artificial intelligence to optimize device behavior in response to the CalFUSE signal,

• **Energy management service providers** offering services to customers for managing multiple smart devices and optimize customer’s bills, and

• **DER operators or aggregators** pooling together and leveraging multiple customers and their devices as a resource and offering services to LSEs or UDCs, etc.
Locational, Dynamic Energy and Capacity Prices

https://MyElectricityPrice.com

John Doe
Address
Account #

Real-time Grid Utilization
\[ x = \text{UDC Circuit Load} \]
\[ y = \text{LSE Net Load} \]
\[ z = \text{LSE Net Load Ramp} \]

Input at set up
Real-time

UDC
\[ P_{\text{Distribution}} = f(x) \]
LSE
\[ P_{\text{RA Capacity}} = g(y) \]
LSE
\[ P_{\text{Flex RA}} = h(z) \]

LMP

Third Party Service Providers (TSPs)

California Public Utilities Commission
Example – SCE/TeMix “RATES” Pilot

Composite Hourly Prices based on Hourly Capacity Utilization & CAISO LMP

Hourly Stacked Prices for a Winter Day

- Flex FCR Price
- Gen FCR Price
- LMP Price
- Delivery Price
- Bundled Price

Hourly Stacked Prices for a Summer Day

Source: SCE / TeMix “RATES” Pilot funded by CEC (EPIC)
Customer-Specific Baseline Subscriptions
Historic Load Shape & Energy Quantity at OAT Price

- Stabilizing Element (Hedge) for Both Customers and Utilities

- Options for subscriptions shape include:
  - Customer-specific,
  - class-averaged,
  - climate-zone weighted.
Transactive Platform

California Public Utilities Commission

Price Machine (Cloud Platform) $\sum$

Real-time Grid Conditions
- $x = \text{Circuit Aggregate Load}$
- $y = \text{LSE Aggregate Load}$
- $z = \text{LSE Net Load Ramp}$

UDC $P_{\text{Distribution}} = f(x)$
LSE $P_{\text{Flex RA}} = h(z)$

https://MyElectricityPrice.com

John Doe
Address
Account #
- Hourly, [15 min, 5 min]
- Next day, 24 x hourly

1. Import / Export @ Current Price
2. Fixed Price Subscriptions

Third Party Service Providers (TSPs)

LSE $P_{\text{RA Capacity}} = g(y)$

Transactive Platform

California ISO

LMP

Input at set up

Real-time
Transactive Platform

Real-time Grid Conditions
- $x =$ Circuit Aggregate Load
- $y =$ LSE Aggregate Load
- $z =$ LSE Net Load Ramp

Input at set up
- Real-time

UDC
$P_{Distribution} = f(x)$

LSE
$P_{RA \, \text{Capacity}} = g(y)$

LSE
$P_{Flex \, RA} = h(z)$

California ISO

LMP

1. Import / Export @ Current Price
2. Fixed Price Subscriptions
3. [Forward Buy/Sell Contracts]

https://MyElectricityPrice.com

John Doe
Address
Account #

- Hourly, [15 min, 5 min]
- Next day, 24 x hourly
- [Week-ahead, 7x24 x hourly]
- [Additional forward prices...]

Third Party Service Providers (TSPs)

Transactive System

Price Machine (Cloud Platform)

Transactive Platform

California Public Utilities Commission
Upcoming CalFUSE Pilots

- CalFUSE Pilots authorized by Summer Reliability OIR Phase 2 (D.21.12.05) to launch on May 1

- VCE/PG&E “AgFIT” agricultural pumping dynamic rate pilot
  - Jointly implemented by Polaris, TeMix, VCE, and PG&E
  - Authorized for 5MW (~1MW enrolled)
  - Provides farmers week-ahead prices which they can use to pre-schedule irrigation cycles using TeMix Transactive Layer

- SCE “RATES Phase 2” dynamic rate pilot
  - Open to all C&I and residential SCE customers
  - Will be available across SCE service territory
California Public Utilities Commission

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