AB 2127 Charging Infrastructure: Other Programs to Accelerate EV Adoption

Noel Crisostomo, Fuels and Transportation Division
August 4, 2020
Outline

• AB 2127 Directive on “Other [needed charging infrastructure] Programs”
• Purpose of Transportation Electrification Regulatory Policies Act (TERPA) Concept
• How could TERPA work?
  • A hypothetical process flow using Charging Infrastructure Deployment Strategies to explain the analysis and delivery of one charging use case

• For reference, see prior presentations on this topic in the CPUC’s Transportation Electrification proceedings and CEC’s June IEPR workshop:
  • Benchmarking the Costs of Charging Infrastructure And Services (link)
  • Investor-Owned Utility Roles in Transportation Electrification (link)
  • Lessons Learned from Electricity Policy for Transportation Electrification (link)
...Consider all necessary charging infrastructure, including, but not limited to:

- **Existing Chargers**
  - Counting Chargers
  - Including in Low-income Communities *(SB 1000)*

- **Future Chargers**
  - Electric Vehicle Infrastructure Projections *(EVI-Pro 2)*
  - EVI-Pro
  - RoadTrip
  - Widespread Infrastructure for Ride-hailing EV Deployment *(WIRED)*
  - Medium- & Heavy-Duty EVI-Projections *(HEVI-Pro)*
  - Off-Road, Port and Airport Electrification

- **Charging Hardware and Software** *(Interoperability and Equipment Standards)*

- **Make- Ready Electrical Equipment** *(Building Codes & EVSE Deployment & Grid Evaluation, EDGE)*

- **Other Programs to Accelerate the Adoption of Electric Vehicles** *(Incentives, Investment, others)*
Purpose of TERPA

Accelerate widespread transportation electrification while leveraging limited public funds with private capital.

We could rise to the charging challenge by tuning our efforts:

**Speed**: Increase installation rate

**Scope**: Maximize eMiles enabled

**Scale**: Manage public investments
How could TERPA work?

Assess The Market

1. Assess Regional “Best Fit” Projects
2. Qualify EVSPs & Technology
3. Confirm Charging Demand
4. Assess The Market
5. Business Models

Invest In & Deliver Projects

1. Discover WTP
2. Select Supply Portfolio
3. Budget Public Investment
4. Tailor Awards to EVSPs
5. Alleviate Market Constraints
6. Utilities Serve EVSPs’ Projects
7. Source Funding
   - Ratepayer
   - Taxpayer
   - Feepayer
8. Acquire Sites
9. Reverse Auction
   - Bids → Supply
   - Laws → Demand

Discover WTP × eMiles Enabled (kWh) = Budget Public Investment

How could TERPA work?
A. Assess regional “best fit” projects

- The Port of Long Beach Community Electric Vehicle Blueprint (2019)
  - 100% ZE Drayage Trucks by 2035
  - Regional infrastructure plans for ZE Drayage Trucks to be developed
Integration Capacity: 51 MW
Charging Capacity: 61 MW
Capacity Shortfall: 10 MW

Transformer Upgrade: $40/kW
Utility Cost: $400,000

EDGE Example: PepsiCo, Quaker, and Amazon Distribution Centers, San Bernardino

Prices and quantities illustrative only
B. Qualify eligible suppliers

<table>
<thead>
<tr>
<th>Harmonize to Scale</th>
<th>Grow Partnerships</th>
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<tbody>
<tr>
<td>Interoperable: Convenient, Controllable, and Competitive</td>
<td>Lever Public and Ratepayer Investment with Private Capital</td>
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<tr>
<td>Local &amp; Project Level ↔ Statewide Ecosystem</td>
<td>Project Finance and Innovative Economic Models</td>
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</table>

- CEC qualifies the EVSPs to participate in the RFPs via a two step analysis:
  - Viability to conduct due diligence of company incorporation and model
  - Technical standards to ensure quality

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Diagram:

- OpenADR 2.0b or SEP 2.0b (Demand & Price Signals)
  1. Utility Direct Load Control
  2. Aggregator Managed
  3. Energy Management System

- OCPP 1.6J, 2.0 or others IEC 61851 (Equipment Management)

- ISO/IEC 15118 (Vehicle-To-Grid Communication)
  - ENERG STAR (Efficiency)
  - NIST Handbook 44 (Meter Accuracy)
  - Open Public Payment (Access)
B. Eligible EVSPs prepare bids

Avoided Cost of Charging in year for EVSP \( (ACC_{y, EVSP}) \)

\[
= \frac{Public \; Investment \; (\$)}{Capability \; (kW \times h) \times Stations \; Installed \; Year} \times \text{Station}
\]

eMiles Enabled in year for EVSP \( (E_{y, EVSP}) \)

\[
= \frac{kW \times (h_{measured} + h_{projected})}{Stations \; Installed \; Year} \times \text{Station}
\]

Depth of utilization for current or future technologies and Geographic Breadth of Network
B. Solicit supply (reverse auction)

2020 SCAG Drayage Truck RFP: Responses

<table>
<thead>
<tr>
<th>Bid</th>
<th>ACC ($/kWh)</th>
<th>E (kWh/y)</th>
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Rank-ordered supply curve for the cost of charging energy ($E_{EVSP}$, $ACC_{EVSP}$)

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C. Confirm charging demanded

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Avoided Cost of Charging, $/kWh

- EVSP1 $5
- EVSP2 $10
- EVSP3 $12

Charging Demand by 2020, kWh

- 10k
- 20k
- 30k

e.g. 25,000 kWh of electricity is required by regulation (Advanced Clean Trucks) in the South Coast Air Basin

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### D. Discover willingness to pay

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Cost of sufficiently supplying regulatory demand = $12/kWh

Prices and quantities illustrative only.
E. Analyze sensitivities

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Avoided Cost of Charging, $/kWh

- e.g. Supply
  - Grid controller (n-1) = $17/kWh
  - Cheaper Storage = $9/kWh

Prices and quantities illustrative only

Charging Demand by 2020, kWh

- HEVI-Pro

Statewide Ecosystem

Assess Needs

Expand Electric Vehicle Infrastructure Projections
F. Select sufficient supply portfolio

2020 SCAG Drayage Truck RFP: Selections

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G. Budget the public investment

2020 SCAG Drayage Truck RFP: Investments

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<th>Awards</th>
<th>At Cost</th>
<th>( \Delta = ACC_{MC} - ACC_{EVSP} )</th>
<th>Aggressive</th>
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<td>$70,000</td>
<td>$120,000</td>
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<td>$50,000</td>
<td>$10,000</td>
<td>$60,000</td>
</tr>
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At Cost Public Investment

\[
\text{At Cost Public Investment} = \sum_{1}^{3} ACC_{EVSP} \times E_{EVSP}
\]

Aggressive Public Investment

\[
\text{Aggressive Public Investment} = ACC_{MC} \times D_{HEVI-Pro}
\]

Prices and quantities illustrative only
### 2020 SCAG Drayage Truck RFP: Investments

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Additional $80,000 *could* alleviate market constraints:
- Add Local Permitting Staff
- Train High Voltage Workforce

…and *could be* less expensive than the $400k grid upgrade

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**At Cost Public Investment**

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\text{At Cost Public Investment} = \sum_{1}^{3} \text{ACC}_{EVSP} \times E_{EVSP}
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**Aggressive Public Investment**

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\text{Aggressive Public Investment} = \text{ACC}_{MC} \times D_{HEVI-Pro}
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H. Tailor awards to EVSPs

2020 SCAG Drayage Truck RFP: Investments

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<th>Awards</th>
<th>At Cost</th>
<th>Barrier</th>
<th>Need/Use of Public $</th>
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<td>EVSP1</td>
<td>$50,000</td>
<td>Low initial fleet use</td>
<td>Phase-in $/kW charges</td>
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<tr>
<td>EVSP2</td>
<td>$50,000</td>
<td>Small scale manufacturing</td>
<td>Facility Equipment CapEx</td>
</tr>
<tr>
<td>EVSP3</td>
<td>$120,000</td>
<td>Interconnection cost</td>
<td>Grid Controller CapEx</td>
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Prices and quantities illustrative only
I. Utility supports installations

- Construct needed upgrades
- Energize stations
- Design economic rates
How could TERPA work? (Summary)

**Phase 1: Assess The Market**

A. **Region analyzes needs** and identifies locally-appropriate project types

B. **CEC qualifies EVSPs** upon technical and viability bases. **Program Administrator (PA)** holds a reverse auction, quantifying the cost of charging from EVSPs.

C. **CEC confirms the inelastic demand for charging** consistent with California laws

D. **PA pools funds** and compares supply with demand to discover a **willingness to pay**

E. **PA and CEC analyze supply or demand sensitivities** (e.g. non-EV factors, regulation, innovation, new policy, …) to quantify and mitigate risks or market power

**Phase 2: Invest In & Deliver Projects**

F. **PA selects the cost-beneficial supply portfolio** from EVSPs to meet the electrification objective

G. Consulting with CEC and Agencies, **PA budgets the public investment needed** to deliver the portfolio according to the state of the broader market

H. **PA tailors the investments** in EVSPs according to their barrier(s) to entry

I. **Utilities serve load, energize, and offer economic rates** to the EVSPs’ projects
If further developed, TERPA could:

- **Speed** deployment on multiple fronts by expanding manufacturing & offering policy certainty to the workforce.

- **Broaden scope** of solutions and promote fair competition among them based on the cost to enable e-miles.

- **Scale** funding reach, fronting VGI value of saved upgrade to customers & offering predictable incentives to innovate.

We welcome additional exploration and your feedback!
Thank you! Questions or comments?

Contact:
Noel.Crisostomo@energy.ca.gov

Webpage:
https://www.energy.ca.gov/programs-and-topics/programs/electric-vehicle-charging-infrastructure-assessment-ab-2127