Advanced EV Charging in the United States

Electric Advanced Recharging Corridor - eARC

June 16, 2016
Topics

1. Introduction to EVgo
2. United States EV Charging Industry Context
3. Current Data on U.S. EV Charging Behavior
4. eARC Project Overview
5. Project Objectives and Research Questions
EVgo leads America’s electric vehicle revolution.

OUR MISSION:

Build the nation’s largest EV charging network while improving the planet and boosting the economy. At home, work, and on the road, we put the right chargers in the right places. Together, we unite the EV movement for all, making it unstoppable.
# Electric Vehicle Value Chain

<table>
<thead>
<tr>
<th>Sector</th>
<th>Products Produced</th>
<th>Industry Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>EV OEMs</strong></td>
<td></td>
<td><strong>Plus 17 others</strong></td>
</tr>
<tr>
<td>Vehicles</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>EV Battery OEMs</strong></td>
<td></td>
<td><strong>Plus 7 others</strong></td>
</tr>
<tr>
<td>Batteries</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>EV Charger OEMs</strong></td>
<td></td>
<td><strong>Plus 7 others</strong></td>
</tr>
<tr>
<td>Chargers</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>EV Infrastructure Owners and Operators</strong></td>
<td><strong>EVgo Target Market</strong></td>
<td></td>
</tr>
<tr>
<td>Networks</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The Right Chargers In The Right Places

Over 700 chargers in over 50 major U.S. markets

Total EV Sales since 2011:
- United States: 453,069
- California: 209,054

May, 2016:
- United States: 12,145
- California: 6,315

EVgo Network Areas
The Right Chargers In The Right Places

- Highway Access
- Well-Lit
- Retail Engagement
- Dedicated EV Parking
- Accessible
## Sector Differentiation

<table>
<thead>
<tr>
<th>Feature</th>
<th>EVgo</th>
<th>Tesla</th>
<th>ChargePoint</th>
<th>Blink</th>
</tr>
</thead>
<tbody>
<tr>
<td>Owner/Operator</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Pricing Control</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Some</td>
</tr>
<tr>
<td>Service control</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Location control</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Location strategy</td>
<td>Planned</td>
<td>Planned</td>
<td>Ad-hoc</td>
<td>Ad-hoc</td>
</tr>
<tr>
<td>Multiple fast charging standards</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Subscription or pay-per-use (PPU)</td>
<td>Both</td>
<td>Private</td>
<td>PPU</td>
<td>PPU</td>
</tr>
<tr>
<td>OEM Embedded</td>
<td>Yes</td>
<td>Self</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Coverage</td>
<td>Metro</td>
<td>Inter-City</td>
<td>Host Decision</td>
<td>Metro</td>
</tr>
<tr>
<td>Expansion prospects?</td>
<td>Rapid</td>
<td>Rapid</td>
<td>Rapid</td>
<td>None</td>
</tr>
</tbody>
</table>

*Denotes Industry Leader*
Networking and Management Types are Diverse

Total Fast Chargers

- EVgo: 33%
- Tesla: 38%
- Chargepoint: 10%
- Blink: 5%
- Greenlots: 10%
- AeroVironment: 4%
- Non-networked: 0%
Controlling User Experience is Key

User Ratings

- Tesla: 9.9
- EVgo: 8.9
- Blink: 7.7
- ChargePoint: 7.6
Ownership of the Driver Experience

Non-networked station
“Charging at a Thursday night at 9:30, a homeless man set up his camp for the night here, was saying something to us. If I wasn't here with my husband, I would have probably passed charging here given the circumstance.”

EVgo
“Nice spot with several chain upscale fast food and a placed called "The Stand" which has dogs, burgers, BBQ, local tap beer and wine.”
Average California fast charger utilization increased from 6.5 daily sessions per site in Dec-14 to 10.7 daily sessions per station in Dec-15.

### Charging Sessions per Day per Station, by Month

<table>
<thead>
<tr>
<th>Month</th>
<th>Average Sessions per Day per Station</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dec-14</td>
<td>6.5</td>
</tr>
<tr>
<td>Jan-15</td>
<td>6.5</td>
</tr>
<tr>
<td>Feb-15</td>
<td>6.6</td>
</tr>
<tr>
<td>Mar-15</td>
<td>6.4</td>
</tr>
<tr>
<td>Apr-15</td>
<td>6.7</td>
</tr>
<tr>
<td>May-15</td>
<td>7.9</td>
</tr>
<tr>
<td>Jun-15</td>
<td>8.1</td>
</tr>
<tr>
<td>Jul-15</td>
<td>8.9</td>
</tr>
<tr>
<td>Aug-15</td>
<td>8.8</td>
</tr>
<tr>
<td>Sep-15</td>
<td>9.8</td>
</tr>
<tr>
<td>Oct-15</td>
<td>9.5</td>
</tr>
<tr>
<td>Nov-15</td>
<td>9.6</td>
</tr>
<tr>
<td>Dec-15</td>
<td>10.7</td>
</tr>
</tbody>
</table>
Existing Charging Is Metro-Focused, Not Corridors

Sacramento & Lake Tahoe

SF Bay Area & Monterey
Utilization Varies by Location Type

Daily Charging Sessions per Day per Location (Nov 2015)

Corridor Examples (sessions/day):
Livermore – 9
Tracy – 8
Pleasant Hill – 9

Metro Examples (sessions/day):
San Francisco – 16
Daly City – 16
San Mateo – 20
Fremont – 52

Legend
- low (4-8 / day) (27)
- very low (<4 / day) (20)
- medium (8-16 / day) (33)
- high (16-32 / day) (15)
- very high (>32 / day) (2)
Utilization Varies by Time of Day

The most popular time to use EVgo fast chargers is between 4-8pm.

29% of weekday charging occurs between 4-8pm
Fast Charging Energy Costs

Average electricity cost $0.43/kWh*

Largest component is a fixed cost: electricity demand charges $1,400 - $3,100 per month per site ($15-$33 / peak kW)

**Actual Station Load Profile (Jan-16)**

Peak Demand = 95kW

*Average electricity cost in Pacific Gas & Electric in November 2015

**Peak Times of SDG&E Tariff; PG&E Tariff for <200 kW have no demand charges
eARC
Electric
Advanced
Recharging Corridor

Up to 25 sites
- At least 2 chargers per site
- Grocery and retail locations
- Enables popular routes for day-travelers
- High-visibility corridors
- Real-time information service through mobile phone

![Map of eARC Electric Advanced Recharging Corridor](image-url)
NEDO Partners

- **NEDO Partners**
- **Nissan Motors**
  - Project Lead
  - Data integration & analysis
- **Nissan North America**
  - Market Support
  - Customer Voice
- **Kanematsu Corporation**
  - Information Service
  - User Experience
  - Customer Research
- **EVgo**
  - Station development and operation
- **California Government**
  - Promotion
  - Local Support
We are targeting to complete Equipment installation within FY16.

- Verification of Hypothesis (for driving behavior expansion) in FY17~FY18.
- Business Case Assessment (of inter-city charging service) in FY19~FY20.
- Plan to be reviewed periodically in accordance with external environment.
User Experience and Pricing

Current EVgo pricing plans
- On-the-Go:
  - $15/month + $0.10/minute
- Flex:
  - $5/session + $0.20/minute

eARC pricing
- FREE with QR code / smartphone app
Research Questions and Additional Context

Questions
• Do high quality, high demand stations increase vehicle miles traveled?
• How does pricing affect utilization and charging behavior?
• Can pricing and station design affect peak charging behavior and energy costs?
• What charging business models increase electric vehicle utility and sales?

Additional Market Context
• High power charging (150kW and greater) expected in U.S. market
• New vehicle models will enter the market during the project time frame
• Government and utilities are building more charging infrastructure
• Multifamily charging may be better provided by high speed chargers for long-range EVs
Multifamily Housing is Critical to EV Market

Data Source: California Center for a Sustainable Economy, California Vehicle Rebate Program

<table>
<thead>
<tr>
<th>Zip code</th>
<th>% Renters</th>
</tr>
</thead>
<tbody>
<tr>
<td>90401</td>
<td>95%</td>
</tr>
<tr>
<td>90404</td>
<td>80%</td>
</tr>
<tr>
<td>90292</td>
<td>68%</td>
</tr>
</tbody>
</table>

West Los Angeles

Map Legend (Vehicle Rebates):
- 0
- 1 - 5
- 6 - 13
- 14 - 23
- 24 - 34
- 35 - 48
- 49 - 65
- 66 - 80
- 87 - 127
- 128 - 200
- 201 - 10000

Data Source: California Center for a Sustainable Economy, California Vehicle Rebate Program
Multifamily Housing is Critical to EV Market

Multi-Family Neighborhoods

<table>
<thead>
<tr>
<th>Zip code</th>
<th>% Renters</th>
</tr>
</thead>
<tbody>
<tr>
<td>94041</td>
<td>62%</td>
</tr>
<tr>
<td>94085</td>
<td>66%</td>
</tr>
</tbody>
</table>

Data Source: California Center for a Sustainable Economy, California Vehicle Rebate Program