Multi-unit Dwellings (MuD) Challenges and Successes

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Multi-unit Dwelling Vehicle Charging Support
Co-chair Multi-unit/Workplace Working Group - California Plug-In Electric Vehicle Collaborative

- Public/private organization - accelerating the adoption of plug-in electric vehicles to meet California’s economic, energy and environmental goals
- More than 40 PEV stakeholders - automakers, utilities, charging equipment/network providers, government, research & education
Charging at Multi-unit Dwellings

- Many cities have increasing populations living in Multi-units
- Tenants requests will only increase for charging access
- Multi-units have unique challenges that require creative spectrum of solutions
WHAT IS A PEV?

A PEV is a Plug-in Electric Vehicle that runs at least partially on battery power and is recharged from the electricity grid.

**Pure Battery Electric Vehicles (BEVs)** run on electricity stored in batteries and have an electric motor rather than a gasoline engine.

**Plug-in Hybrid Electric Vehicles (PHEVs)** combine two propulsion modes in one vehicle – an electric motor (that is battery-powered and can be plugged in and recharged) and a gasoline engine (that can be refueled with gasoline).

BEVs and PHEVs – What’s the difference?

<table>
<thead>
<tr>
<th></th>
<th>BEV</th>
<th>PHEV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emissions</td>
<td>Zero emissions from vehicle; only emissions are from utility electricity generation mix</td>
<td>Zero emissions when driving on electricity. Emissions when driving on gasoline depend on engine emissions certification</td>
</tr>
<tr>
<td>Range</td>
<td>Generally 70 to 100 miles (proportional to battery size); some models are higher</td>
<td>All electric range varies from 15 to 35 miles (proportional to battery size); gasoline range is about 300+ miles</td>
</tr>
<tr>
<td>Propulsion</td>
<td>Electric motor / battery only</td>
<td>Electric motor / battery plus gasoline engine</td>
</tr>
<tr>
<td>Re-fueling</td>
<td>Recharge with electricity</td>
<td>Recharge with electricity and/or refuel with gasoline</td>
</tr>
</tbody>
</table>

Source: California PEV Collaborative (CG2-2).
Note: Approximation assumes CA sales are 45% of national sales.
Reference: www.hybridcars.com
BEV Models Available.... More Coming

NISSAN
LEAF
Focus Electric

TESLA
Model S
Spark

HONDA
Fit EV
Rav 4

FIAT
500e
iMiEV

TOYOTA

GM
BEV Models Available…. More Coming

- BMW Group: i3, i8
- KIA: Soul EV
- TOYOTA: Scion iQ EV
- NISSAN: e-NV200, Model X
- smart: Fourtwo
- Mercedes-Benz: B-Class Electric
- TESLA: Model X
PHEV Models Available.... More Coming

- Prius Plug-in
- Accord Plug-in
- Volt
- Panamera
- C-Max Energi
- Fusion Energi
- Outlander
- ELR

Brands: Toyota, Ford, Honda, GM, Porsche, Subaru
Why Install Charging at Your Multi-unit?

• Amenity that attracts tenants
• “Greener” image for marketing
• Property a leader in sustainable practices (LEED points)
• PEV sales are growing – more tenants will be asking for it
Residential Charging Equipment

- Uses a standard 110/120-volt alternating current (VAC) three-pronged wall plug.

- Uses 208/240 VAC and can be hardwired or connected with a plug*, but typically requires a contractor.

Images: www.pluginamerica.org & leviton.com

* 12 inch cord requirement for wall hung units
## How Quickly Will it Charge?

### Residential Charging

<table>
<thead>
<tr>
<th>Type of Charging</th>
<th>Power Levels (installed circuit rating)</th>
<th>Miles of Range per Hour of Charging*</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>AC Level 1</strong></td>
<td>110/120VAC at 15 or 20 Amps</td>
<td>~4-6 miles/hr.</td>
</tr>
<tr>
<td><strong>AC Level 2</strong></td>
<td><strong>3.3 kW (low)</strong> 208/240VAC at 30 Amps</td>
<td>8-12 miles/hr.</td>
</tr>
<tr>
<td></td>
<td><strong>6.6 kW (medium)</strong> 208/240VAC at 40 Amps</td>
<td>16-24 miles/hr.</td>
</tr>
<tr>
<td></td>
<td><strong>9.6 kW (high)</strong> 208/240VAC at 50 Amps</td>
<td>32-48 miles/hr.</td>
</tr>
<tr>
<td></td>
<td><strong>19.2 kW (highest)</strong> 208/240VAC at 100 Amps</td>
<td>&gt; 60 miles/hr.</td>
</tr>
</tbody>
</table>

* Refer to vehicle specifications for exact ratings.
Charging Equipment Installation Process

- Conduct a survey of residents
- Consider different approaches/options for installing chargers
- Contact electrical contractor
- Contact local utility to discuss rate options
- Contractor will coordinate planning with local utility and municipal government for permitting and inspections
Costs

**Lower Costs**
- Level 1 (120V)

**EVSE Purchase**
- Non-communicating Level 2 (208/240V)

**Higher Costs**
- Communicating/reporting Level 2

**Installation**
- Near existing meter(s)/wiring
- Greenscape trenching (outdoor)
- Surface-mounted (garage)

- Distant runs of wiring to EVSE
- Hardscape trenching (outdoor)
- Structural drilling/flush mount

**Metering**
- Add EVSE to existing common area meters
- Individually assigned EVSE meters

- Combined EVSE on a separate meter

- Individually assigned EVSE meters

**Operation and Maintenance**
- EV TOU rates (usually residential)
- No communication report costs

- Small business commercial rates (below 20 kW loads)

- Commercial rates (with demand charges)
- Monthly communication and/or transaction fees
Considerations for Multi-unit PEV Charging
Key Considerations

• Building architecture and physical electrical design
  – Proximity of electrical service room to desired charging location
  – Wiring needed to accommodate charging stations
• Commercial electricity rates for common-area meters
• Cost of installation
• Parking ownership models
Different Approaches

• Hire turnkey operator to handle all charging services and payments

• Install individually assigned charging units
  – Residents can individually select and own their charging units
  – Residents can pay directly for their energy use

• Install chargers as shared community resource (often valet services)

• Arrange for use of nearby business chargers during “off” evening hours
Example of Challenge
California PEVC Case Studies

- Case studies provide examples of the spectrum of MuD charging installations
- Case studies are available online and will be added to as developed

www.PEV Collaborative.org/MuD
California PEVC Case Studies

- Case studies provide examples of the spectrum of MuD charging installations
- Case studies are available online and will be added to as developed (evolving solutions)

www.PEVCollaborative.org/MuD
Case Study

CityFront Terrace
San Diego

- 320 residents/417 parking spaces
- 20 AC Level 2 metered make ready (wired to spot)
- Drivers pay directly for their electricity use and choose their own charger
- Cost $80,000 total or $4,000 per space
Case Study

Millenium Tower
San Francisco

- 419 residents/340 parking spaces
- AC Level 1 (3), AC Level 2 (3)
- Program is revenue neutral
- Drivers pay ChargePoint for electricity (membership)
- $0.76 per kWh on-peak*
- $0.54 per kWh off-peak*
- Drivers share (3) Level 2 chargers using valet to manage use
- Some costs covered by CEC grants

* Cost determined by HOA
Case Study

Towers at Costa Verde

San Diego

- Over 590 residents
- Level 2 (10) with pre-wiring for 10 more
- Billing managed by NRG eVgo
- Install costs approx. $21,000 under NRG eVgo settlement
Case Study

The Elysian
Los Angeles

- 96 units
- Motivated to be sustainable company
- AC Level 2 (10) with dual ports – 20 connections
- 5 in garage, 5 in outside parking lot
- Purchased ChargePoint chargers
- Installed by on-site electrician
- Residents free, guests pay by kWh based on time-of-day
Shelter Creek Condos
San Bruno, CA

• 1,296 units
• Level 2 (4) with dual ports = 8
• Drivers pay ChargePoint for electricity at a price determined by HOA and property manager
  • $1.25/kWh
  • High to cover service fees
  • Hope to reduce fee once there are more users
• Installation cost ~$20,000 covered by CEC grants
Case Study

Sofia Lofts
San Diego

- No. of Units - 17
- Level 1 (1)
  Level 2 (2)
- Prewired garage for more chargers
- On-site Car2Go PEV car sharing program
- AeroVironment chargers for Car2Go cars linked to PEV system
- Installation costs - ~$10,000 covered by CEC grant
## Infrastructure Proposals

<table>
<thead>
<tr>
<th></th>
<th>SDG&amp;E</th>
<th>SCE</th>
<th>PG&amp;E</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong># of sites</strong></td>
<td>550</td>
<td>3,000</td>
<td>25,000¹</td>
</tr>
<tr>
<td><strong>Cost</strong></td>
<td>$103M</td>
<td>$346.1M</td>
<td>$653.8M</td>
</tr>
<tr>
<td><strong>Market Segments</strong></td>
<td>Apartments and Workplaces</td>
<td>Apartment, Workplaces, and public interest sites</td>
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</tr>
<tr>
<td><strong>Who Owns Make-Ready?</strong></td>
<td>Utility</td>
<td>Utility</td>
<td>Utility</td>
</tr>
<tr>
<td><strong>Who Owns Charger?</strong></td>
<td>Utility</td>
<td>Host site</td>
<td>Utility</td>
</tr>
<tr>
<td><strong>User Pricing</strong></td>
<td>Utility Tariff Direct to the User</td>
<td>Determined by Host/EVSP</td>
<td>Utility Tariff Direct to the User</td>
</tr>
</tbody>
</table>

¹PG&E’s proposal also includes funding for 100 DC Fast Charging stations, not included in site total

Slide courtesy of CPUC
Resources – Multi-unit Guideline

Includes information on:
• Charging a PEV
• Charging equipment installation flow
• Community considerations for charging station installation
• Operating/Maint. costs
• Financial recovery models and technology solutions
• Case Studies
Resources – Decision Guides

Guide 1: Great primer on electric vehicle charging for multi-unit dwellings

Guide 2: Information for property owners, managers, and homeowner associations

Guide 3: Information for residents of MUDs

www.PEVCollaborative/MuD
Resources - Resident Survey

- Find out tenants’ and homeowners’ current and future interest in PEVs
- Available in hardcopy or electronic formats

www.PEVCollaborative/MuD
For More Information

www.PEVCollaborative.org

www.DriveClean.ca.gov/pev
Resources

• CA Energy Commission – Small Bus. Financing Program
  http://www.treasurer.ca.gov/cpcfa/calcap/evcs/index.asp

Loans enrolled in the Electric Vehicle Charging Station Financing Program can be used for the design, development, purchase, and installation of electric vehicle charging stations at small business locations in California. CalCAP may provide up to 100% coverage to lenders on certain loan defaults. Borrowers may be eligible to receive a rebate of 10-15% of the enrolled loan amount.

• CA Air Res. Board (ARB) -
  http://www.arb.ca.gov/newsrel/newsrelease.php?id=730

Possible for a family that meets income guidelines to receive as much as $12,000 toward the purchase of an electric car.
• Up to $2,000 for a charging unit at your single residence or multi-unit dwelling for the purchase of battery electric cars; and
• An additional $1,500 and $2,500, respectively, for the purchase or lease of a new plug-in hybrid or electric car from a separate program known as the Clean Vehicle Rebate Project.

www.DriveClean.ca.gov/pev
Questions?

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