Plug-in Electric Vehicles and Charging Infrastructure: Multi-Unit Dwellings

Nick Nigro and Dan Welch

Quarterly Webinar for the U.S. Department of Energy Clean Cities Program

C2ES.ORG
On behalf of U.S. Department of Energy Clean Cities, C2ES is working with Argonne National Laboratory to present a quarterly State of Play on plug-in electric vehicles (EVs)

EV Market and Technology State of Play

• EV market growth mostly flat in 2015
• Continued increase in charging stations
• State and local policies and actions are key driver for market growth
• Focus: Actions to Address Multi-Unit Dwelling Challenges

Spotlight on Community Readiness Grant Recipients

• Updating lessons learned from DOE’s 2012 Clean Cities Community Readiness and Planning for Plug-In Electric Vehicles and Charging Infrastructure awardees
• Residents of buildings will drive the installation of the stations at MUDs
**Plug-in electric vehicle (EV)**

- Battery Electric Vehicle (BEV): all-electric car only powered by batteries
- Plug-in Hybrid Electric Vehicle (PHEV): vehicle that can be powered by either batteries, a gasoline engine, or both

**Charging Levels**

<table>
<thead>
<tr>
<th>Low – AC 120V</th>
<th>Medium – AC 240V</th>
<th>High – DC Fast Charge</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;AC&quot; LEVEL 1</td>
<td>“AC” LEVEL 2</td>
<td>“DC” LEVEL 2</td>
</tr>
<tr>
<td>Uses standard outlet</td>
<td>Requires high-voltage circuit</td>
<td>Power requirements are up to max power for 15 homes</td>
</tr>
<tr>
<td>Power requirements similar to a toaster</td>
<td>Power requirements similar to an electric clothes dryer</td>
<td>Up to 90 kilowatts</td>
</tr>
<tr>
<td>Up to 1.4 kilowatts</td>
<td>Up to 19.2 kilowatts</td>
<td>Currently, three systems used (CHAdeMO, SAE Combo, Tesla)</td>
</tr>
<tr>
<td>Can use existing power outlets resulting in no cost installation</td>
<td>Equipment &amp; installation costs vary widely (~$6,500 in public and ~$2,000 at home)</td>
<td>Can have very high equipment &amp; installation costs (up to $90,000)</td>
</tr>
<tr>
<td>Charging rate: 3-5 miles per hour</td>
<td>Charging rate: 12-75 miles per hour</td>
<td>Charging rate: 100-300 miles per hour</td>
</tr>
</tbody>
</table>
EV Market Share (Monthly Average Through May)

Not shown: Tesla (100%), Smart (18%)
Bubbles size represents total number of light-duty vehicles sold
- 80% or more sales are all-electrics
- 80% or more sales are plug-in hybrids
- Plug-in hybrid & all-electric mix

Source: hybridcars.com, wsj.com

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June 22, 2015
EV Sales Trend Declined in Last 12 Months

Difference of 1,300 EVs in May

BEV Rolling 12-Month Average
PHEV Rolling 12-Month Average
Trend (5/2014)
Trend (5/2015)
Charging Infrastructure Continues its Expansion Nationwide

• Public charging locations increased significantly in the last quarter

• Level 2 locations grew by 6%, DC fast charging locations grew by 11%

<table>
<thead>
<tr>
<th>Date</th>
<th>Level 2 Locations</th>
<th>Level 2 Ports</th>
<th>DC Fast Charging Locations</th>
<th>DC Fast Charging Ports*</th>
</tr>
</thead>
<tbody>
<tr>
<td>February 2015</td>
<td>8,473</td>
<td>17,679</td>
<td>795</td>
<td>1,850</td>
</tr>
<tr>
<td>June 2015</td>
<td>8,982</td>
<td>19,486</td>
<td>883</td>
<td>2,107</td>
</tr>
</tbody>
</table>

* At some multi-port locations, only one DC fast charging port can be used at a time.

Source: U.S. Department of Energy Alternative Fuel Data Center
State and Local Policy Activity Since March 2015

- **Connecticut enacted new rebate for EVs**
  - Rebate ranges from $750 - $3,000 depending on battery size

- **Tennessee restarted rebate program EVs**
  - $2,500 for all-electrics and $1,500 for plug-in hybrids

- **Massachusetts replenished fund for EV rebates with $2m**
  - Rebate up to $2,500 depending on battery size

- **Washington enacted law encouraging investor-owned utilities to use ratepayer funds for charging infrastructure**

- **Georgia enacted law to sunset valuable $5,000 BEV tax credit on July 1, 2015**
  - Credit was a key driver in making state an EV leader
  - Market response uncertain

- **Illinois ended its EV rebate program**

- **EV public fleet program in Indianapolis under scrutiny**
  - Innovative business model aimed at saving city money on vehicle fleet operations
  - City council voted to sue Mayor in attempt to stop deal
EVs and Multi-Unit Dwellings (MUDs)

• Convenient home charging is very important, but when provided in the EV Project, public charging was used (Idaho National Laboratory [INL] or GM)
  
  • 65% of Nissan Leaf charging in the EV Project takes place at home [INL, always level 2 EVSE in study, public charging provided]
  
  • 57% of Chevy Volt charging in the EV Project takes place at home [INL, always level 2 EVSE in study, public charging provided]
  
  • 70% of Chevy Volt customers use the 120V cordset that comes with vehicle; 30% opt to purchase/install a 240V charge station (incentives drive influence) (GM, national sales)

• 25 percent of total households live in multi-unit dwellings (U.S. Census Bureau)

  • The percentage of MUDs is considerably higher in cities with dense population
    – 50 percent of Miami-Dade County residents live in MUDs
    – 61 percent of Washington, DC residents live in MUDs

  • 60 percent of total renter households live in multi-unit dwellings (National Multifamily Housing Council)

• Residents of MUDs are a potentially large, but difficult to tap market for EV ownership

  • EV owners would likely need to charge while parked at home
  
  • Without home charging, BEV owners would need convenient DC fast charging nearby
Policies and Actions to Improve Charging Access for MUDs

• Four states and several cities have taken steps to establish MUD charging station ownership rights and regulations, to streamline charging station permitting, and to set requirements for charging station availability.

• Three California utilities have proposed charging projects that would expand MUD charging access.

• Illinois is considering legislation that would set guidelines for utilities to provide charging access to residents of MUDs.
Framing Multi-Unit Dwelling Considerations

Key Questions

• Finance
  • Who should pay for stations, installation, metering, and operating costs?

• Infrastructure
  • What charging station type is optimal? How should a site be designed?

• Legal Considerations
  • Who may own or install a charging station? How are ownership and installation processes considered?

Key Recommendations

• Finance
  • Clarifying ownership roles and charging structures; agreement among stakeholders (i.e. tenants, building owners, utilities, etc.)

• Infrastructure
  • Innovative design solutions; updated building codes; incorporation of new technologies.

• Legal Considerations
  • Legislation and ordinances to establish equipment ownership; definitions of stakeholder roles; streamlining of permitting process.
## Finance

- **PowerTree** is a startup that installs solar panels and EV chargers in MUDs and leases equipment at a set rate

- California Utilities (e.g., SDG&E) are proposing projects that would install EV charging stations at MUDs and offer building owners and managers a choice of equipment and rate options

- **ChargePoint** offers special EV charging stations for MUDs and establishes wiring and electricity prices with property managers

## Infrastructure

- **Blue Indy** is an EV car-sharing program that could reduce car ownership in Indianapolis

- **New York City** requires new, large garages & parking lots to install EV-ready electrical capacity & conduit for 20% of spots

- **HEVO Power & WiTriCity** have developed wireless EV charging systems for use in lots or at dedicated curbside spaces

- **Philadelphia** allows EV owners to apply for curbside charging stations

## Legal Considerations

- **California Renter Laws** establish a tenant’s right to purchase and install EV charging stations at MUDs

- **Illinois** legislature is considering guidelines for utilities to provide charging access for MUDs

- **Palo Alto** established requirements for MUDs and other buildings to be wired for EV charging installation

- **Los Angeles** established guidelines to reduce the cost and timeframe of permitting for EV charging at MUDs
• Consumer demand may drive MUD charging deployment

• New construction should account for future charging needs

• Workplace charging complements residential MUD charging

Source: C2ES Map
Mission Electric: Supporting Greater New York City’s EV Community

• 2,921 EVs

• 181 public Level 2 ports

• 4 DC public fast charging locations

• Mission Electric empowers the community to pave the way for EVs and for a future of clean and efficient city transportation

• State agencies, such as the New York State Energy Research and Development Authority and the New York Power Authority, are funding charging initiatives through the governor’s ChargeNY initiative

• Mayor de Blasio has prioritized community safety and social justice issues more than the previous mayor, Bloomberg, who emphasized climate change mitigation and resiliency

• State still emphasizes EVs through Reforming the Energy Vision (REV) initiative and Greener, Clean Communities

• Consumers will drive demand for public EV charging and for charging installations at MUDs
Mission Electric: Supporting Greater New York City’s EV Community

• **Current Activities**
  - Developing a study on residual value of batteries that identifies potential secondary markets, including renewable energy storage
  - Reaching out to taxi fleets and bike share companies about solutions for curbside and building-side EV charging installation
  - Looking for opportunities to revamp Mission Electric website to incorporate heavy-duty EVs

• **Looking down the Road**
  - The next generation of long-range all-electric vehicles may increase demand for MUD charging
  - Planning for a pilot project to install curbside charging for food trucks has begun at a private campus in Brooklyn
  - Utilities have expressed interest in EV deployment as distributed generation resources to improve resiliency
Drive Electric Florida: Supporting South Florida’s EV Community

- 4,544 EVs (11,000 EVs statewide)
- 203 public Level 2 charging ports
- 16 public DC fast charging locations

Mission is to prepare communities in Southeast Florida for widespread EV adoption and to assist other regions in Florida with readiness planning

- Expanded statewide from initial 7-county region covered by grant
- Electric utilities can be valuable and effective partners in growing EV demand
- Service region has highest percentage of MUD in Florida

Other Notable Activities

- Partnering with National Parks to promote and site public charging stations
- Broward County was first government entity to join DOE’s Workplace Charging Challenge
Drive Electric Florida: Florida Power & Light is a Key Partner

- **Readiness plan provided theory, now ready to share real-world lessons**
  - Leveraging a building’s existing valet services offers good short term solution (~1-3 months versus 6-12+ months project length), serving many vehicles with less infrastructure
  - Third party solutions now available, but still new. Need time to assess suitability
  - Upcoming factsheet from Florida Power & Light on regional best practices and contacts for MUD installations

- **Communication with building managers is key**
  - Host workshops with managers at regional meetings for building management companies
  - Host booths and present at condominium expos – reaches thousands of building managers
  - Be available for phone calls to answer ad hoc questions (4-6 new buildings per week)

- **Challenges of addressing MUD concerns**
  - Difficult to track ongoing activity statewide
  - Conference calls and one-on-one assistance is very time consuming
• 130 public Level 2 charging ports

• 4 public DC fast charging locations

• Providing a comprehensive, regionally coordinated approach to the introduction of EVs and charging equipment in the five counties of Southeastern Pennsylvania

• Local and state government beginning to consider EVs for resilience and adaptation

• MUDs may make charging conduit available to prepare for EV charging

• Level 1 charging is an inexpensive way to expand charging access to MUDs
• Current Activities

• Counseling municipalities on building codes and strategies to prepare new MUD developments for the expansion of EV charging

• Sharing transportation and EV insights as a member of the Pennsylvania Climate Change Advisory Committee

• Providing planning information to local EV stakeholders, including transit authorities and government agencies

• Looking down the Road

• Received a grant from the Federal Highway Administration to analyze local fleet greenhouse gas emissions and target opportunities for improvement

• Local electric utilities have been receptive to EVs and are researching how best to incorporate future EV load
Lessons Learned from DOE PEV Community Readiness Grant Recipients

• Consumer demand may drive MUD charging deployment
  • Building managers may install charging units if they have a business case
  • Making new buildings ready for charging is an inexpensive, forward-looking action that may not commit specific spaces or equipment to EV charging
  • Utilities are valuable partners for readying their service areas for EV deployment and MUD charging
  • Consumer demand for MUD charging may increase as EV deployment moves beyond early adopters

• Workplace charging complements residential MUD charging
  • Most EVs can meet local commute needs
  • Workplace charging can supplement or replace residential charging

• EV batteries may have alternative uses in urban areas
  • Utilities and governments are looking at the role of EVs in distributed generation and resiliency
  • Batteries could have residual value as renewable energy storage systems