

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

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



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- **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

Low – AC 120V

"AC" LEVEL 1

- Uses standard outlet
- Power requirements similar to a toaster
- Up to 1.4 kilowatts
- Can use existing power outlets resulting in no cost installation
- Charging rate: 3-5 miles per hour

Medium – AC 240V

"AC" LEVEL 2

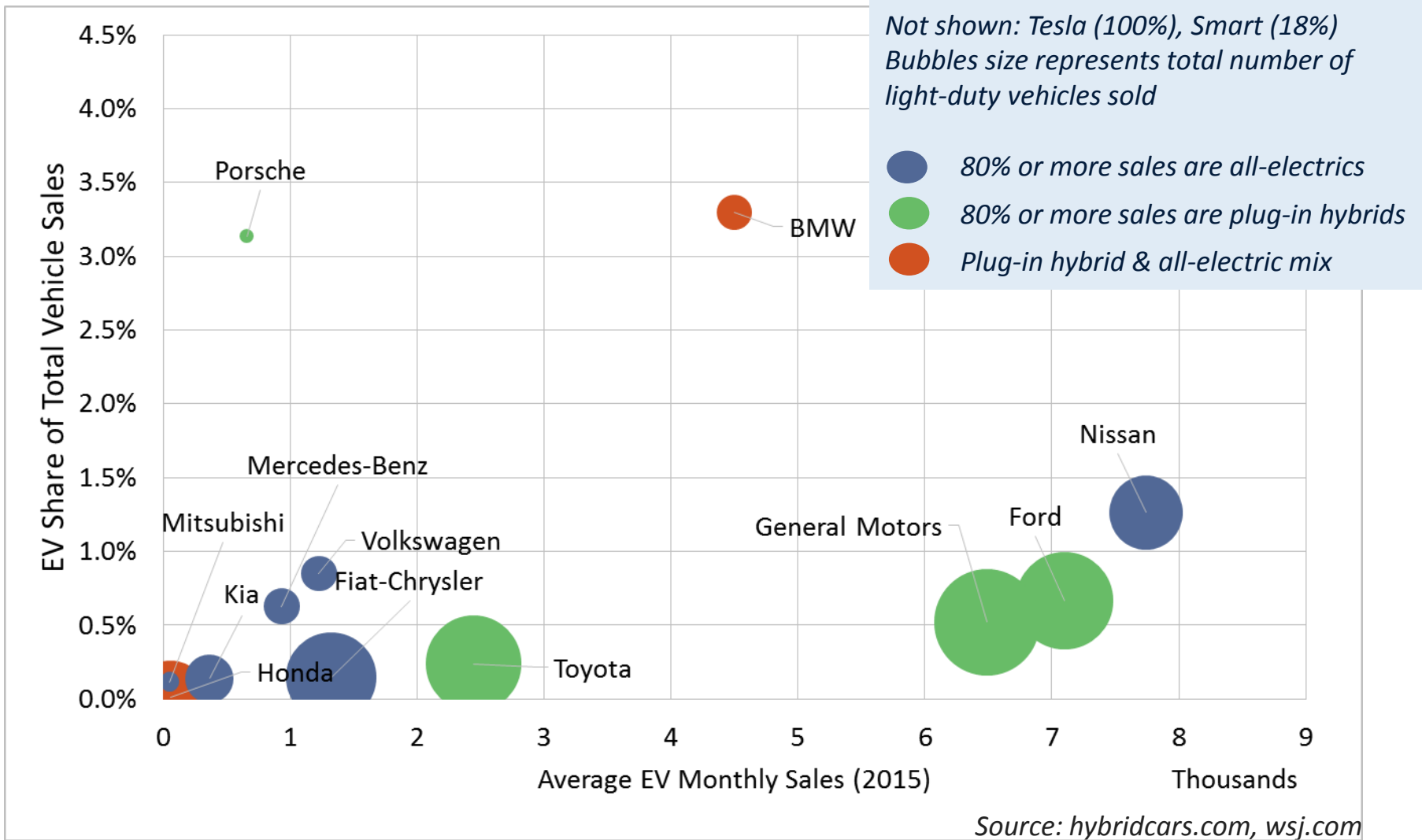
- Requires high-voltage circuit
- Power requirements similar to an electric clothes dryer
- Up to 19.2 kilowatts
- Equipment & installation costs vary widely (~\$6,500 in public and ~\$2,000 at home)
- Charging rate: 12-75 miles per hour

High – DC Fast Charge

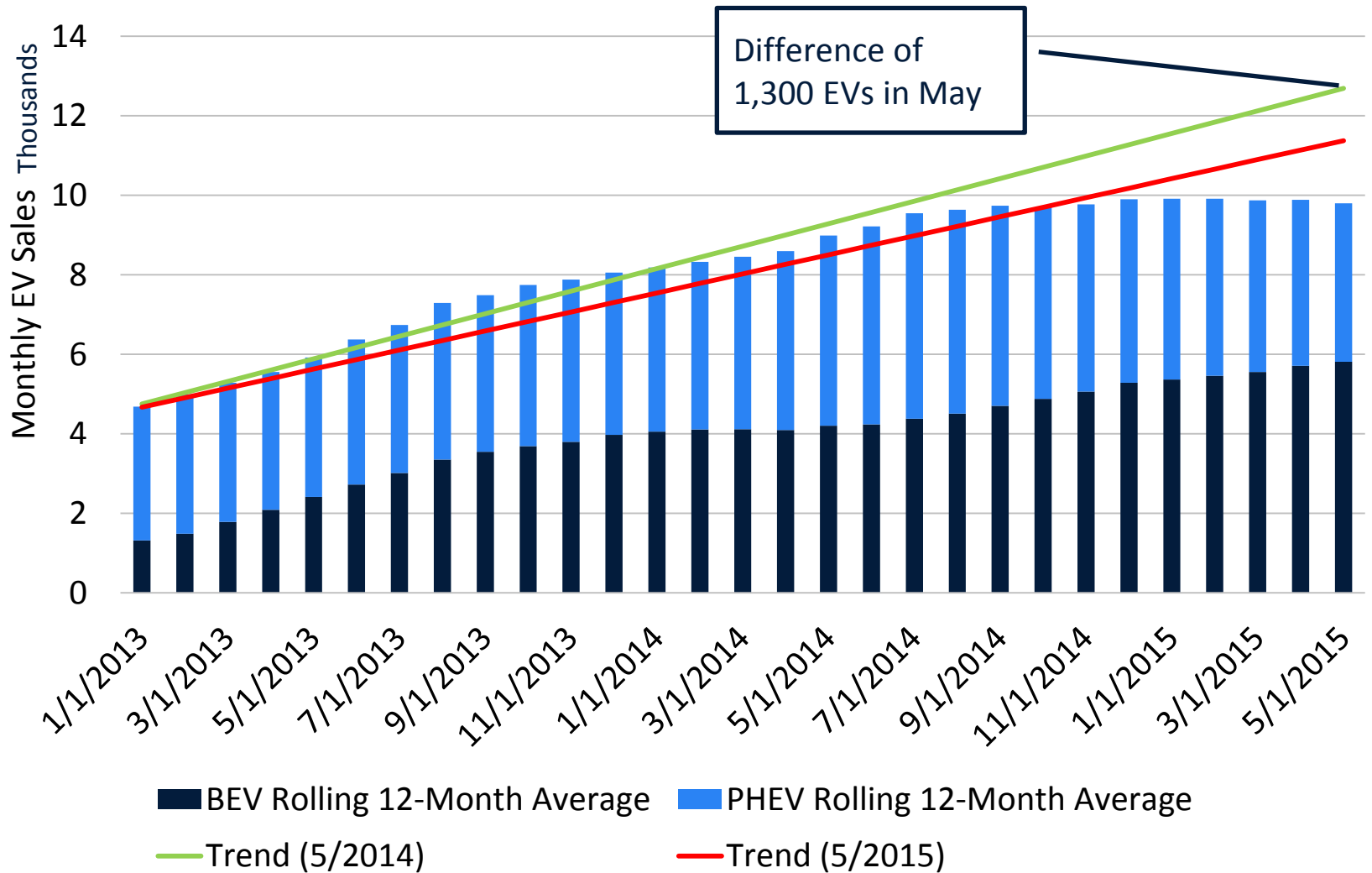
"DC" LEVEL 2

- Power requirements are up to max power for 15 homes
- Up to 90 kilowatts
- Currently, three systems used (CHAdeMO, SAE Combo, Tesla)
- Can have very high equipment & installation costs (up to \$90,000)
- Charging rate: 100-300 miles per hour

EV Market Share (Monthly Average Through May)



EV Sales Trend Declined in Last 12 Months



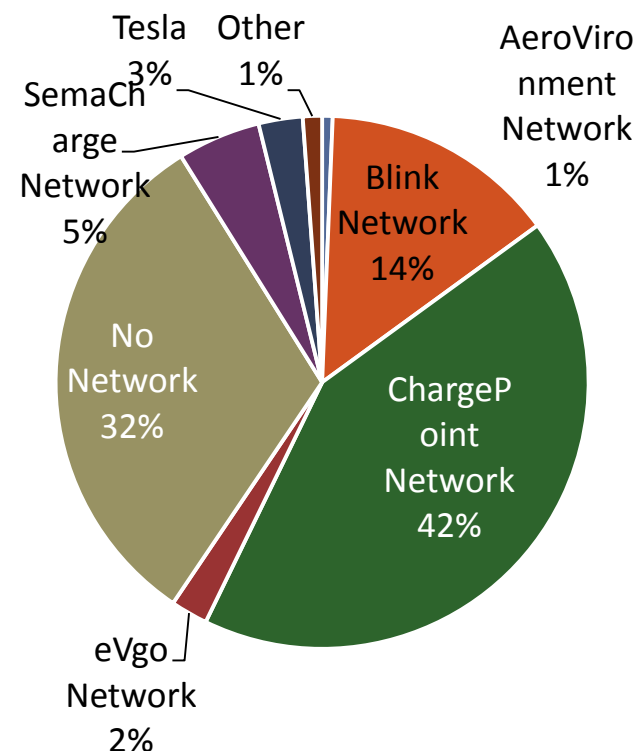
Charging Infrastructure Continues its Expansion Nationwide



- Public charging locations increased significantly in the last quarter
- Level 2 locations grew by 6%, DC fast charging locations grew by 11%

Date	Level 2 Locations	Level 2 Ports	DC Fast Charging Locations	DC Fast Charging Ports*
February 2015	8,473	17,679	795	1,850
June 2015	8,982	19,486	883	2,107

* 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

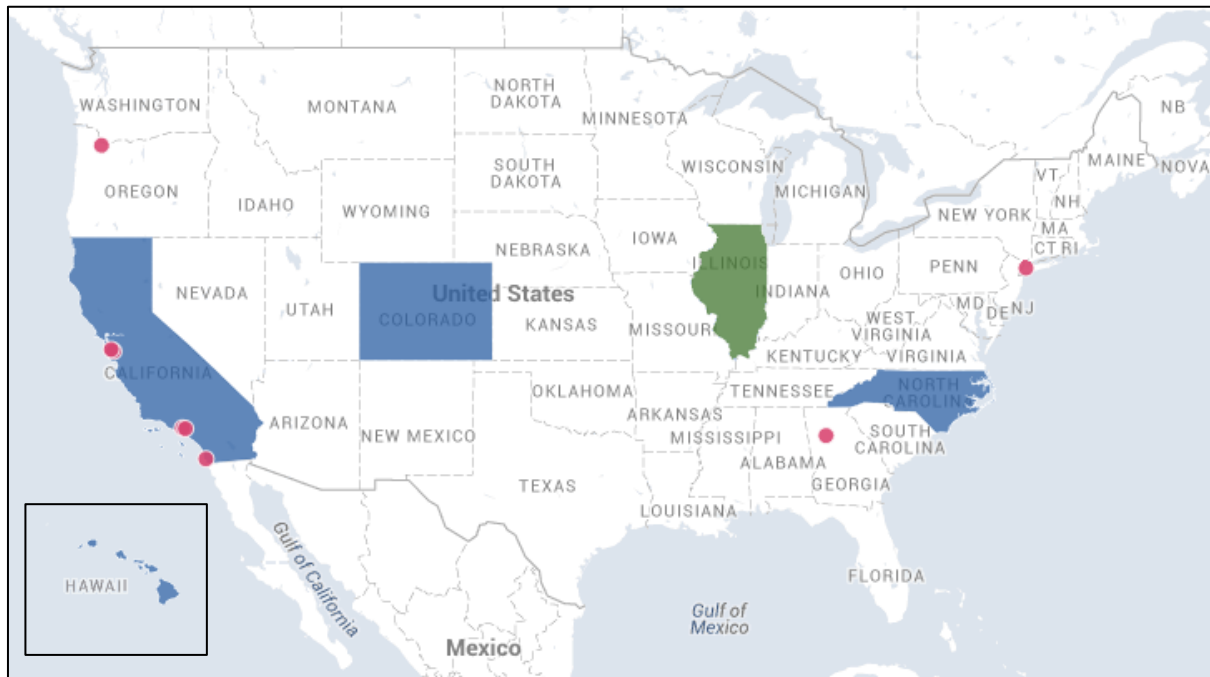
- **Connecticut enacted new rebate for EVs**
 - Rebate ranges from \$750 - \$3,000 depending on battery size
- **Tennessee restarted rebate program EVs**
 - \$2,500 for all-electrics and \$1,500 for plug-in hybrids
- **Massachusetts replenished fund for EV rebates with \$2m**
 - Rebate up to \$2,500 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

- **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



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

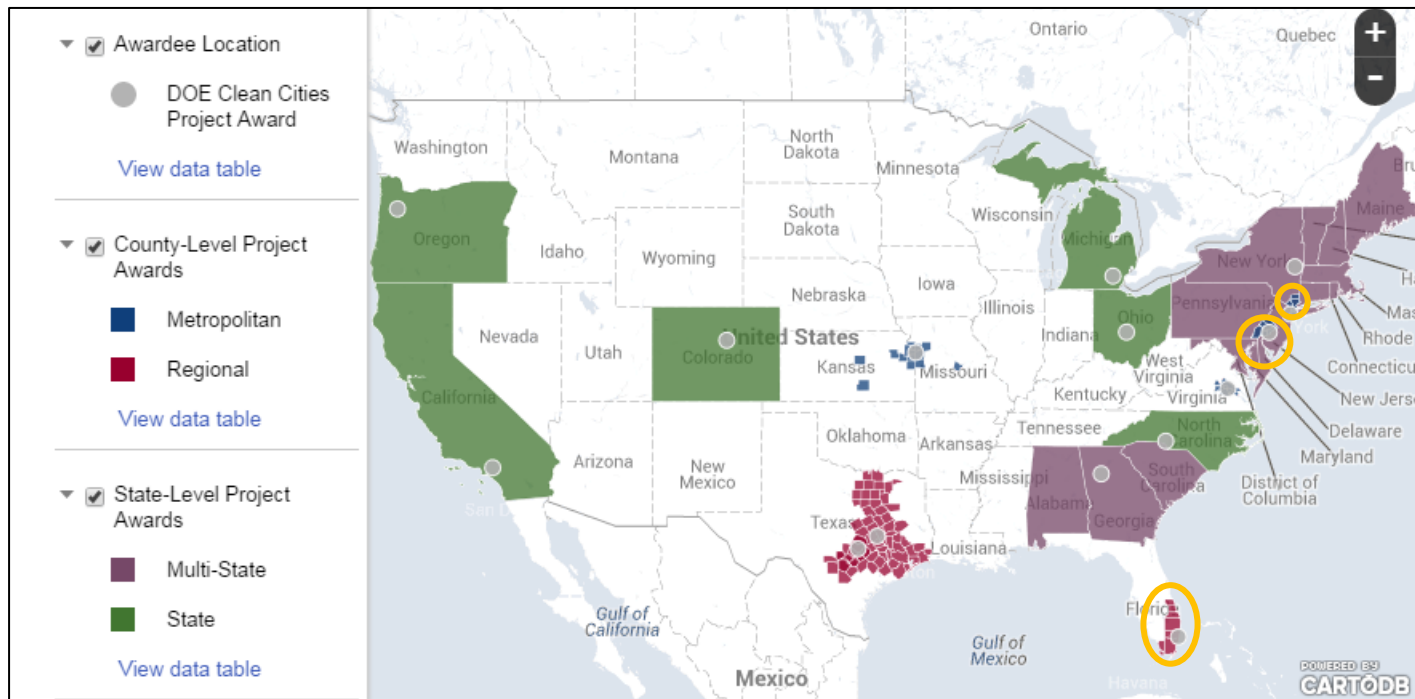
Legal Considerations

- [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

Lessons Learned from DOE PEV Community Readiness Grant Recipients



- 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

- **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**

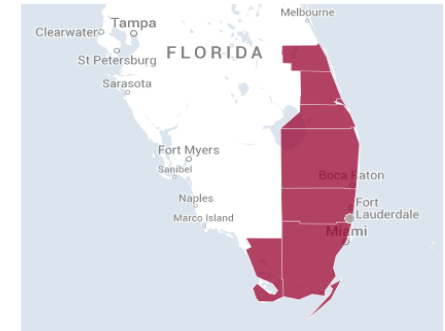
- The next generation of long-range all-electric vehicles may increase demand for MUD charging
- Planning for a pilot project to install curbside charging for food trucks has begun at a private campus in Brooklyn
- Utilities have expressed interest in EV deployment as distributed generation resources 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

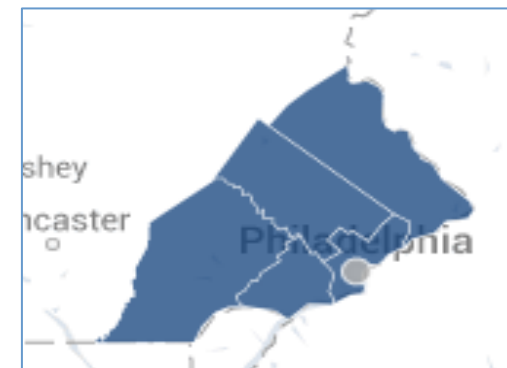




- **Readiness plan provided theory, now ready to share real-world lessons**
 - Leveraging a building's existing valet services offers good short term solution (~1-3 months versus 6-12+ months project length), serving many vehicles with less infrastructure
 - Third party solutions now available, but still 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



Ready to Roll!: Supporting Southeastern Pennsylvania's Regional EV Community



- **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



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