Level 2 EVSE Charging & Installation Costs
**Level 2 EVSE Installation Costs**

- Installation cost data for analysis is available for 2,479 units
- Average installation cost per EVSE, for publicly accessible Level 2 in EV Project markets, was $3,108
- The five most expensive geographic markets had per unit installation costs over $4,000 ($4,004 to $4,588)
- The five least expensive geographic markets had per unit installation costs under $2,600 ($2,088 to $2,609)
- Similar to residential EVSE and direct current (DC) fast charger installation costs, AC Level 2 EVSE installed in California were the most expensive installations
Public Level 2 EVSE Installation Costs

Percent of Total Installations

- 4.6%
- 7.9%
- 13.8%
- 22.2%
- 40.2%
- 2.0%
- 2.1%
- 2.6%
Level 2 EVSE Installation Costs

- The largest installation site conditions cost drivers were:
  - Distance between EVSE and power distribution panel
  - The nature of the surface needing restoration as a result of the EVSE installation

- Labor cost is primary geographic differentiator of EVSE installation cost
  - Labor costs can be mitigated by wall mount versus pedestal installation
Level 2 EVSE Installation Costs

- The distance and surface condition variations had more impact on installation cost than the number of units installed per site
Level 2 EVSE Installation Cost Drivers

Pedestal EVSE installed on decorative paving; removal and replacement required for underground conduit

Pedestal EVSE installed on concrete pad, with underground boring for conduit

Pedestal EVSE installed on asphalt, with trenching and repaving for underground conduit
Level 2 EVSE Installation Cost Savings

Wall-mounted EVSE installed in parking garage with overhead surface-mounted conduit

Wall-mounted EVSE installed on block divider wall with surface mounted conduit

Wall-mount EVSE installed on building pillar with backing plate and overhead surface mounting for conduit
Utility Demand Charges on AC Level 2 EVSE

• Some electric utilities impose demand charges on the highest power delivered to a customer in a month

• Simultaneously charging plug-in electric vehicles via multiple AC Level 2 EVSE can create significant increases in power demand
  – 4 EVSE x 6.6 kW = 26.4 kW

• Many utilities start demand charges at 20 kW

• Demand charge can exceed $1,000 per month

• The increased charging rate allowed by many newer plug-in-electric vehicles (PEVs) will exacerbate this impact
DCFC Charging & Installation Costs
DC Fast Charger Installation Costs for 111 Units

• By the end of 2013, the EV Project had installed 111 DCFCs
  – Installation costs varied widely from $8,500 to over $50,000
  – Declined $75,000 installation estimate
• The median cost to install the Blink dual-port DCFC in the EV Project was $22,626. Does NOT include DCFC unit cost
• The addition of new electrical service at the site was the single largest differentiator of installation costs
• The surface on or under which the wiring and conduit were installed was second largest cost driver
• Cooperation from the electric utility and/or the local permitting authority is key to minimizing installation costs (both money and time) for DCFCs
• Presenter aware of:
  – British Columbia installation costs of $100,000+ per site
  – New York City $350,000 estimate for one installation
    • Required approval from 29 departments/commissions
Characteristics of Most Expensive DCFC Installations

- Primary characteristic of the more expensive installations can be simply identified as those that had a new electric service installed to accommodate the DCFC
- In some cases, the increased cost for new service was compounded by long underground conduits and surface conditions that were expensive to restore (e.g., concrete or asphalt)
- Another consideration for the DCFC site hosts is installation time:
  - Contractors installing equipment
  - Contractors waiting to start
  - Contractors waiting to finish
- When things went smoothly the installation took from 30 to 60 days from the agreement to proceed
- When there were delays in administration and materials the duration of the installation from start to finish often exceeded 90 days
Characteristics of Least Expensive DCFC Installations

• The very lowest cost installations (Sears) had sufficient power and a simple installation with either short underground conduit runs (i.e., hand-shoveled) or surface-mounted conduit

• Of the three installations that cost less than $9,000, the sites had sufficient existing power at the site and they used surface-mounted electrical conduit
Workplace EVSE Installation Cost Drivers

• Wall-Mounted Installations
  – Greater freedom as to the installation location at a site led to more wall-mounted installations
  – Wall-mounted EVSE were typically less expensive to install, because they did not require underground conduit to supply power, which is typical for a pedestal unit
  – The average cost to install a wall-mount AC Level 2 EVSE was $2,035
  – The average cost to install a pedestal AC Level 2 was $3,209
Installation Cost Drivers
Installation Cost Savings
Signage and To Bollard or Not?
Installation Considerations - Level 2 vs. DCFC

- Installing Level 2 EVSE cost on average 1/7th the cost of DCFC
- Level 2 hardware costs from ~$1,500 to ~$7,000
- DCFC hardware costs from $20,000 to $45,000 (quoted to INL)
  - INL quote for dual DCFC technologies in one box, 2 ports
- For both DCFC and Level 2
  - Data collection intended?
  - Annual back office and maintenance fee costs
    - Level 2 EVSE from $0 to $1,000 annually
    - DCFC about $5,000 (assumes $250 / month demand charge)
General Installation Considerations

• Establishing EV charging infrastructure has unique challenges in that drivers are not used to seeing electric vehicle supply equipment (EVSE) and may be unfamiliar with its purpose and use

• Without specific signage to the contrary, internal combustion engine (ICE) vehicle drivers may park in spaces equipped with an EVSE because they are convenient and vacant

• When a plug-in electric vehicle (PEV) arrives, the driver finds the space occupied and is unable to recharge
ADA Cost Driver Installation Costs

• Another factor that affected installation costs in different markets was implementation of Americans with Disability Act (ADA) requirements as understood by the local permitting authority having jurisdiction
  – In general, for every 25 parking spaces, one parking space should be accessible. For every six parking spaces that are accessible, one parking space should be van accessible
Workplace Cost Savings

• Flexibility of workplace installations gives the ability to install EVSE with fewer accessibility requirements:
  – Typically there were few, if any, parking signage or striping requirements
  – ADA accessibility, including an accessible pathway to the workplace building, was only necessary if an employee was a PEV driver and required this accessibility
  – Units did not need to be in conspicuous locations
Recommendations

• Fleet Charging
  – Support the installation of Level 2 EVSE while mitigating potential demand charges

• DC Fast Chargers
  – Minimize installation costs via site selection
  – Install limited numbers of DC fast chargers in locations with high PEV population densities to support DCFC charge events
  – If possible, choose high PEV density areas with travel corridor access

• Data collection to understand infrastructure use patterns and vehicle missions
  – Requires minimally smart EVSE and DCFC

• Site selection is critical to control installation costs
• Plan EVSE and DCFC for next generation of PEVs with larger batteries
Questions?