Electric Vehicle Charging Infrastructure

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Outline

- California Government
- SAE J1772
- Need for public charging infrstructure?
- Automaker needs
- Other challenges
- EVSE Wish List
- Provocative Questions

California Government & EVs

- Air Resources Board (ARB) &
  California Energy Commission (CEC)
  - Where objectives overlap, similar roles
  - Both fund alt fuel & EV related research, vehicle incentives, infrastructure deployment
- Air Resources Board
  - Vehicle emission regulations
  - **SAE J1772 vehicle connection requirement**

- Public Utilities Commission (PUC)
  - Regulation of (some) Electric Utilities

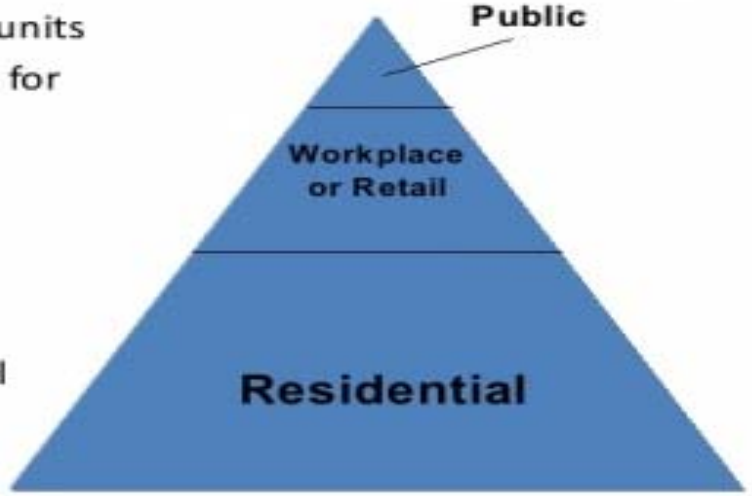
SAE J1772

- Good news:
  - Soon, all LD-MD EVs and PHEVs will be equipped with industry-standard SAE J1772 “inlets”
    - Safer, & makes public infrastructure more effective
- Not so good news:
  - NEV and e-motorcycle advocates arguing for dual public standards (120 VAC & SAE)
  - “Single” SAE connection standard is actually 3 inter-connectable power types (15, 32, & 80 amp)
    - Higher current version not available (for Tesla)
  - Probably not going to be a worldwide standard (Europe wants 3 phase AC)

Need for Public EV Infrastructure?

Charging Infrastructure

- Residential – majority of units
  - Seamless installations for homeowners
  - Permits, electricians, inspections
  - Rates and
- Workplace or Retail
  - Commercial/Industrial customers
- Public Charging
  - Support municipalities



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Need for Public Charging Infrastructure?

- Opinions vary:
  - Some automakers believe public chargers are needed to make early customers feel more secure- to help address “range anxiety”
    - “Placebo stations”
  - Others believe that fast-charge stations might be useful along major inter-city corridors
  - Ultimately, public stations are needed to address customers who park on-street overnight

Automakers are asking for help:

"Complimentary Policies" needed:

- Vehicle incentives
- Time and convenience issues for home EVSE installations
  - Address building permit challenges & opportunities
- Electricity price needs to be very low to offset higher vehicle cost
  - Without this, EV economics are even more challenging
- …and more!

Other Challenges

- EVSE's currently cost $3,000-$4,000 w/o electrician installation labor
  - With labor, installations for BEVs may presently cost as much as $5,000
  - This cost must be reduced
    - Fed & State incentives
    - Outlet VS hard-wired EVSE installation
      - Make a part of new construction requirements
    - EVSE's made in high volumes

Other Challenges:

- How to manage combined charger loads: other electrical load types do not need to assume 100% simultaneous load
  - Multi-car or networked EVSE's needed for fleet, workplace, & apartment applications
- Building codes
  - inconsistent EVSE installation treatment
  - Needs EVSE outlet requirement for new constructions (and remodels)
- SAE J1772 hardware availability in the higher-power versions

“Basic” EVSE Wish List

- Customer able to buy their home EVSE from whereever they want, and install it themselves like any other appliance
- SAE compliant, UL approved “Basic” unit retail price $<200-400 (6.6 kW version)
  - Now at $3,000- $4,000+
- Future EV buyer picks one up at local store & self-installs it
- To repair or upgrade EVSE: Owner removes from wall, unplugs & ships it!

Alternative EVSEs

- Multi-car EVSE
  - Manages peak load by rotating charge amongst several EVs
  - Limits max load that parking lot or facility "service" experiences
  - More complex than shutting down some while powering others
    - reduces power instead to cooling system lower limits

California Public Charging Station Infrastructure Retrofit

Makes sense to examine existing California public charging infrastructure to see if selective retrofit is worthwhile

- …but, retrofit will be very owner-dependant
  - retrofit is ultimately up to the current owner
- Some resistance to subscriber service retrofits
- Not all locations suitable for 6kW stations
  - Best if otherwise used for >= 90 minute parking
- Some legacy station types still in use for a few more years

- Some retrofit programs underway (PG & E presentation will cover some)

Questions

- Should the CA PUC regulate subscription service or other entities that sell electrictiy into EVs?
  - PUC Rulemaking should be interesting: Matthew from PUC will present later
- There are near-term challenges to metering home electricity going into EVs (prior to Smart Grid implementation)
  - Could a temporary or alternative “estimate” based billing system be put in place?

Questions

- How will we meter home electrictiy going into EVs in the long term?
  - Where will the utility grade networked meter go?
- Should public funds be used for subscription-service public charger installations?
  - If yes, should we demand “universal access” and cap the price charged?

Agenda topics

- Past experience
- EVSE products
- PUC Rulemaking
- Current Projects

Extra Slides

EV Wish List

- ALL EVs SAE compliant!
  - Note: Not a requirement everywhere (other states)
- BEVs capable of 6.6 kW charging
  - Utilities seem to prefer this power standard- not too much, not too little!
- Multi-current 120VAC settings for convenience chargers
- All EVs should (might?) implement a double-pump “charge me know” feature
  - = inserting plug twice within 5 seconds
  - Needed to override other on-vehicle or utility preference settings and indicate a desire to charge NOW
  - Also tells multi-car EVSE that you are in a hurry
- EV should tell you when it’s charging