

Standards Pave the Way for Next Generation Workplace Charging Technology Opportunities/Decisions

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Overview: Many EVSE Manufacturers Exist with Many Variables on Installation Complexities/Costs as Well as Opportunities to Manage Access and Energy Flow

Note: Different grades of EVSEs (residential/commercial, Smart, Networked, NRTL/non-NRTL)
 Each EVSE manufacturer makes several models of AC charging EVSE, as well as some DC

#	Brand/Mfg	Key	#	Brand/Mfg	Key	#	Brand/Mfg	Key
1	ABB	E1	16	BTC Power	E2	31	Green Garage	O2
2	Delphi	E1	17	CMI-EVSE LLC	E2	32	Gridbot CA/US	O2
3	Delta Products	E1	18	Keba	E2	33	Legrand (Lear)	O2
4	Eaton	E1	19	Telefonix	E2	34	MeritCharge	O2
5	General Electric	E1	20	Tesla Motors-Adapter	E2	35	OP Connect	O2
6	Leviton	E1	21	Chargepoint	O1	36	ParkPod	O2
7	Liteon	E1	22	ClipperCreek	O1	37	PEP Stations	O2
8	Panasonic	E1	23	DBT	O1	38	Poulsen Power	O2
9	Phoenix Contact	E1	24	SemaConnect	O1	39	Shorepower	O2
10	Schneider	E1	25	Signet Systems	O1	40	Volta	O2
11	Shanghai Viasystems	E1	26	Add Energie	O2	41	Voltec-Bosch	O2
12	Siemens	E1	27	CCG-Blink/Rousch	O2	42	Electric Motor Werks	DIY
13	Walther Electric	E1	28	EV Charge America	O2	43	Open EVSE	DIY
14	Aerovironment	E2	29	EVI_Elec. Vehicle Inst.	O2	44	Tucson EV	DIY
15	Bosch	E2	30	EvoCharge	O2	45	University of Delaware	DIY



ANL 'Smart Energy Plaza' is a Best Practices WPC Site- EVSEs with Cord Handling Systems (ADA concerns), Managed Energy Network; Solar/Battery Peak Shaving, Nearly all 'Flavors' of Charging: L1/L2/L3 AC, L1/L2 DC, Bi-directional DC, Wireless; (7 spots plus Motorcycle)



First spot has 'flush mount' wireless EVSE
fiberglass grating covered trench

Seven parking spots; **Four EVSE caissons** with dual outputs on some. Left to Right: Juice Bar (w/L3 Clipper Creek, IES-DC CCS), Telefonix, BTCP, ChargePoint, EvoReel



'What Lies Beneath' is Often the Most Expensive Part

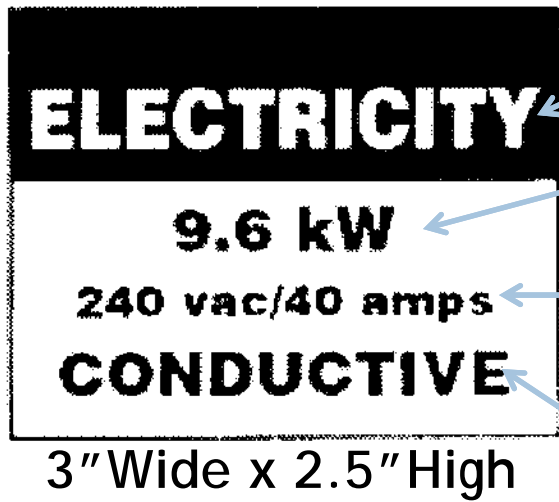
Fiberglass Edging on Wireless Charging 'Trench'



Power Conduit from Building to Panel Board/Metering;
Multiple Power Conduits to Each EVSE for Each Output
Data Wire Conduits Separate Paths from Power Conduits



User/Employee Charging Options: (L1/L2 AC, DC, Wireless) and Signage Challenges {16CFR309.18}



Fuel Type (electricity)

Power Delivered ($40A \times 240V = 9600W$)

Type of Supply (possibly non-fixed current)
(Voltage, Current, AC, or DC)

Type of coupling; wireless,
or conductive



Takeaway: Even though 16CFR309 Non-Liquid Alternative Fuel Placarding is not currently enforced, in light of upcoming changes to NIST HB130/HB44 method of sale of electricity as a fuel, **placard requirements will be enforced.**

(3) **Electric vehicle fuel dispensing system labels.** The label is 3" (7.62 cm) wide \times 2 1/2" (6.35 cm) long. "Helvetica black" type is used throughout. All type is centered. The band at the top of the label contains the common identifier of the fuel. This band should measure 1" (2.54 cm) deep. Spacing of the common identifier is 1/4" (.64 cm) from the top of the label and 3/16" (.48 cm) from the bottom of the black band, centered horizontally within the black band. The first line of type beneath the black band is 3/16" (.48 cm) from the bottom of the black band. All type below the black band is centered horizontally, with 1/8" (.32 cm) between lines. The bottom line of type is 1/4" (.64 cm) from the bottom of the label. All type should fall no closer than 3/16" (.48 cm) from the side edges of the label.



ANL Workplace Charging Pilot/Policy

20 EVSEs for ANL Fleet Vehicles at Night, Employee Vehicles Allowed to Charge During Day

DOE provided guidance in July, 2013 regarding employees charging their personal vehicles onsite, which stipulated the following:

- 1) Argonne fleet and research vehicles must have priority at all times for charging;
- 2) Charging stations cannot be installed for the express use of employees; and
- 3) Employees using onsite charging stations must reimburse Argonne for electricity, charging station maintenance, and administrative costs.

ANL Workplace Charging Highlights:

- 1) Post-Tax deduction of \$7.75/month for electricity, maintenance, admin. Costs (\$7.75=\$6 + \$.25 + \$1.50/month respective cost for three categories above)
- 2) Energy based session charging possible on Chargepoint Stations for non-participants
- 3) Sessions limited to 4hrs/day per user
- 4) Permit needs to be displayed while vehicles are charging with contact information
- 5) EVSE spots are reserved via ANL Charging Group Outlook Calendar (RFID on user ID badge is planned to enable station in future if reservation matches user)



NEC 2014 Article 625.14 Rating Definition- WPC

Opportunities to Leverage Existing EVSE Installations

- **625.14 Rating**
 - Modified per TIA 70-11-2 - Electric vehicle supply equipment shall have sufficient rating to supply the load served. Electric vehicle charging loads shall be considered to be continuous loads for the purposes of this article. Where an automatic load management system is used, the **maximum** electric vehicle supply equipment **load on a service** and feeder shall be the **maximum load permitted by the automatic load management system.**
- **Translation:** Formerly EVSE load to the branch circuit was fixed by the EVSE rating (continuous). Now it is determined by load management system.
- This means that MANY EVSE modules can be connected to a single branch circuit. I.e. 10 EVSEs on a single 40A branch circuit, as long as only 32A max is drawn by any/all EVSEs.



ANL Hosted SAE-ISO/IEC International PEV-DC EVSE AC/DC Charging Protocol Testing Event (Nov 13-14)

5 PEVs-5 DCFC EVSEs; 4 EVCC-6 SECC module OEMs

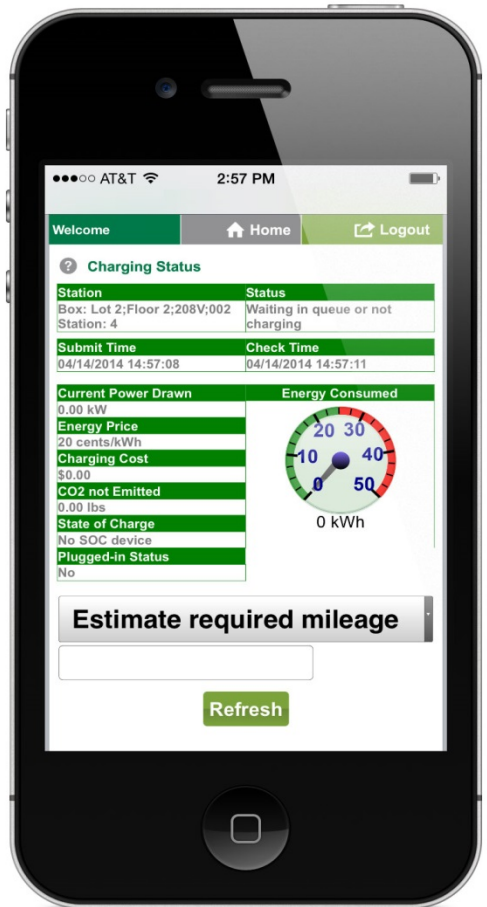
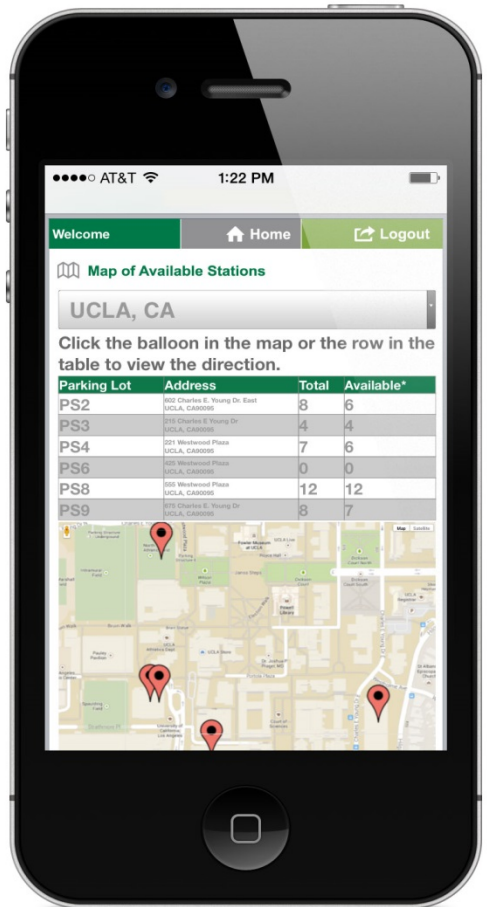
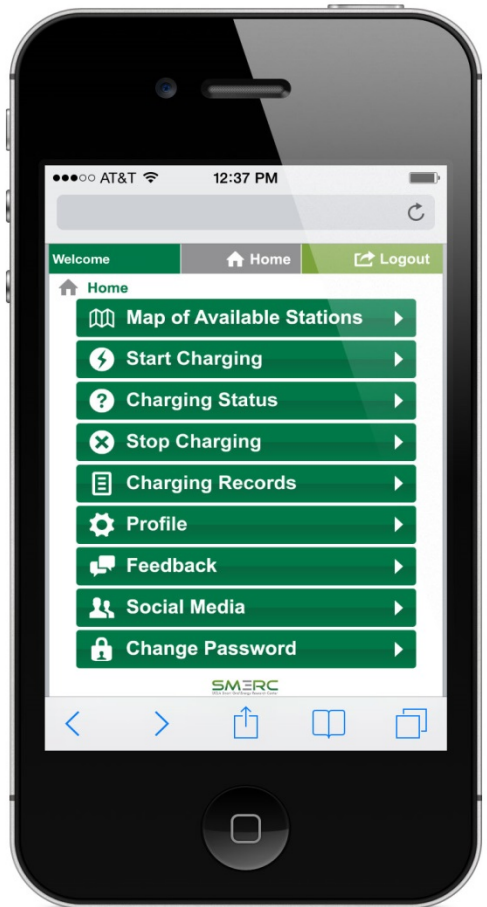
- 5 CCS PEVs, 6 DC CCS EVSEs and 18 controller modules on test benches



Examples of Locally/Cloud Managed EVSE Arrays (Several EVSE Manufacturers offer theirs as well)

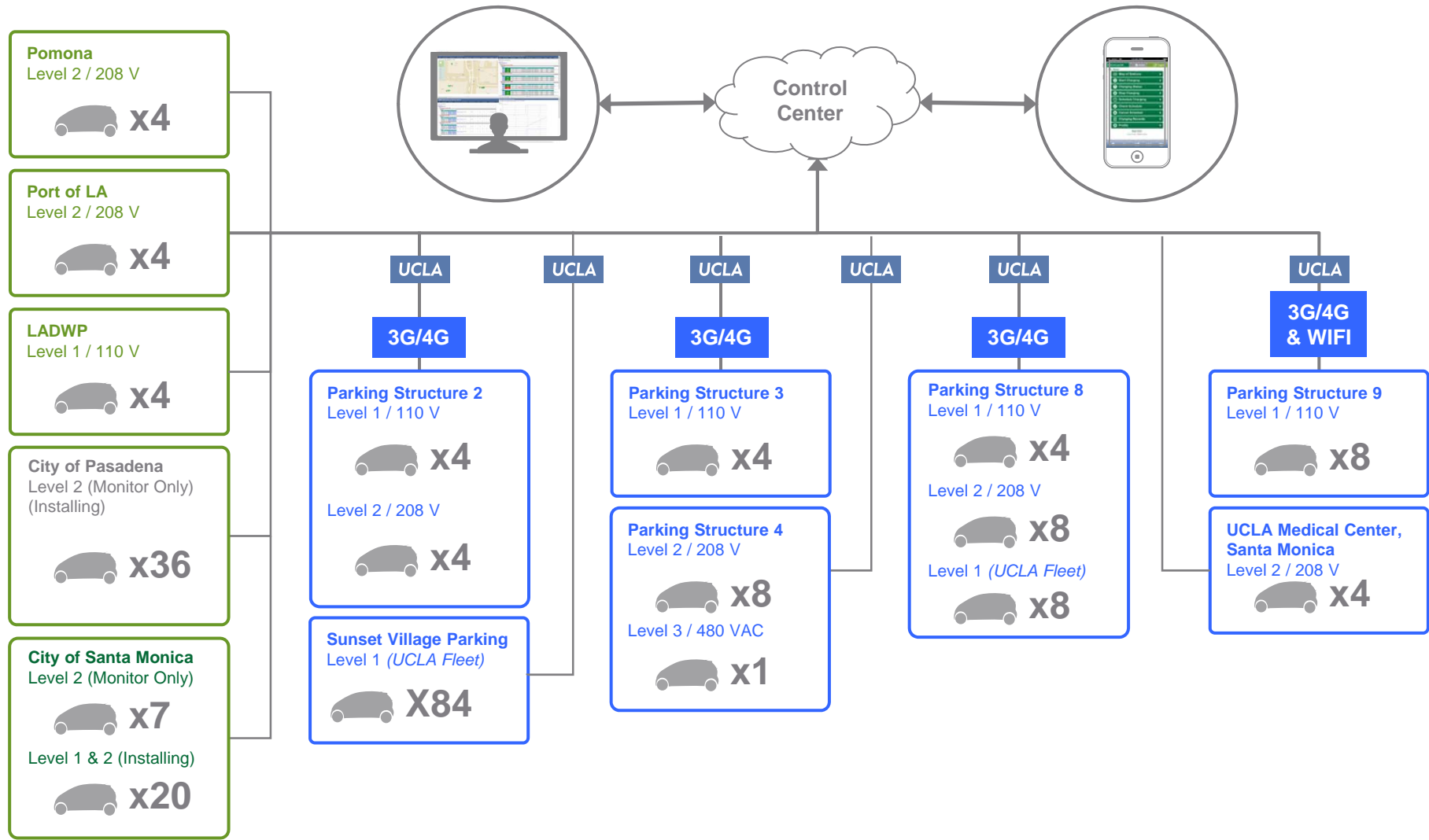


UCLA SMERC User Interface to Control and Monitor EV Charging, Adjust and Track Charge Rate

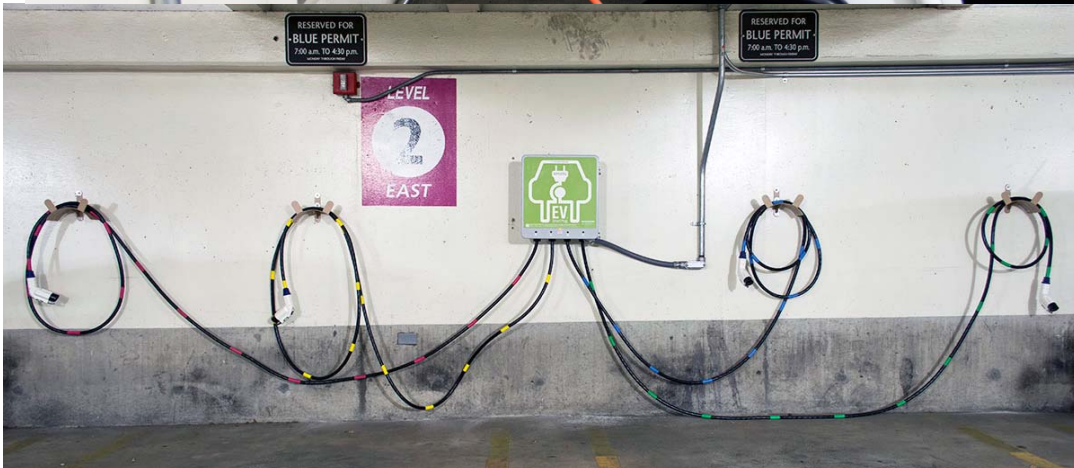


WINSmartEV™ Infrastructure

The current WINSmartEV™ infrastructure at UCLA, LADWP, Port of LA, City of Santa Monica, and City of Pasadena consists of **212** EVSmartPlug™s.



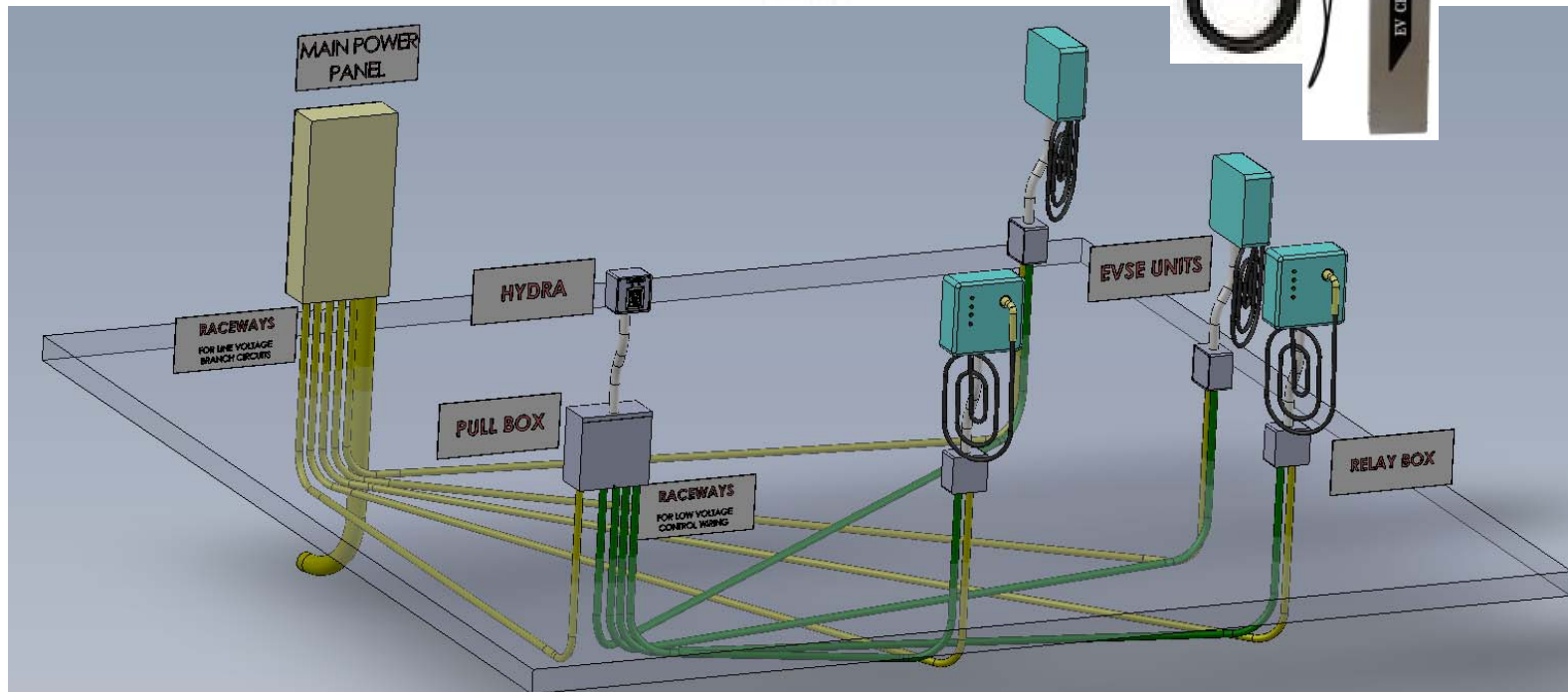
WINSmartEV™: Level 2 Multiplexor





HYDRA-R™

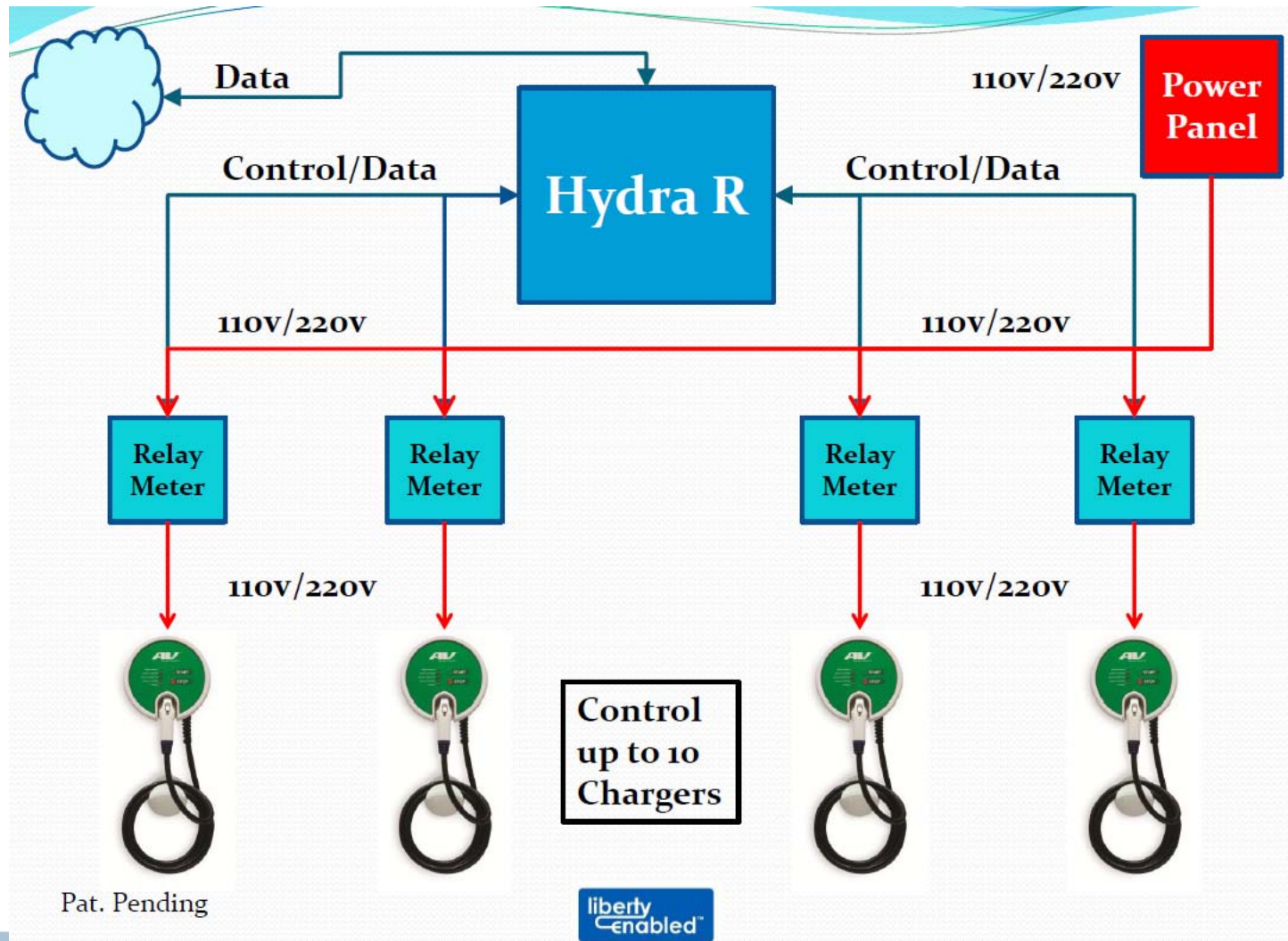
Access control, metering, reporting, billing, demand response... From your choice of chargers



Each Liberty Access Technologies HYDRA-R controls up to ten low cost, non-networked charging units



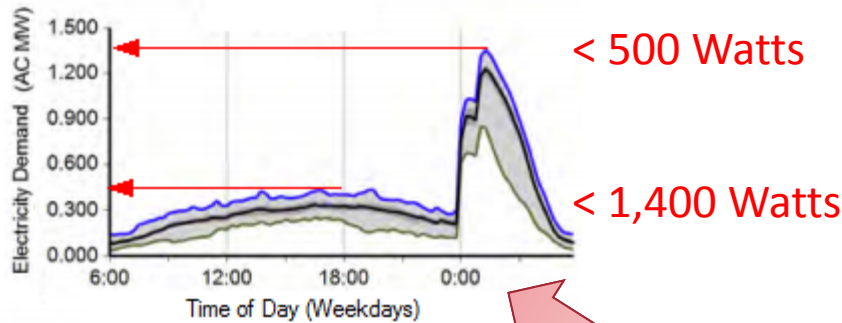
Liberty Access Technology Hydra R Works with Existing EVSE Installations to Monitor and Control Charging Rates, Sequence, Limit Demand Charge, etc



On average, EV Project vehicles added the equivalent of a toaster or hairdryer to total utility system load... and pricing helped move that load to "off peak" hours

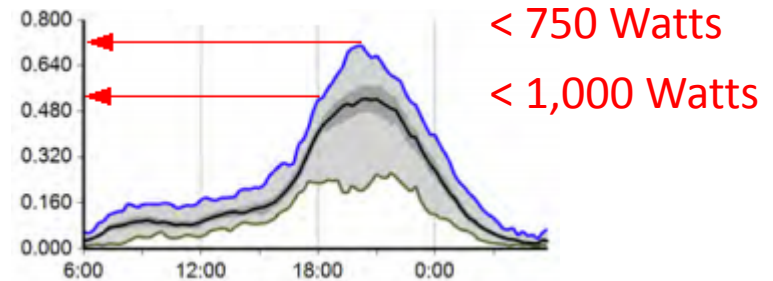
Aggregate Demand (EV Project)

Time-of-Use (TOU) Pricing
San Diego, CA



677 Nissan LEAFs, 275 Chevy Volts
(333 Smart EDs not included)

Flat Pricing
Nashville, TN

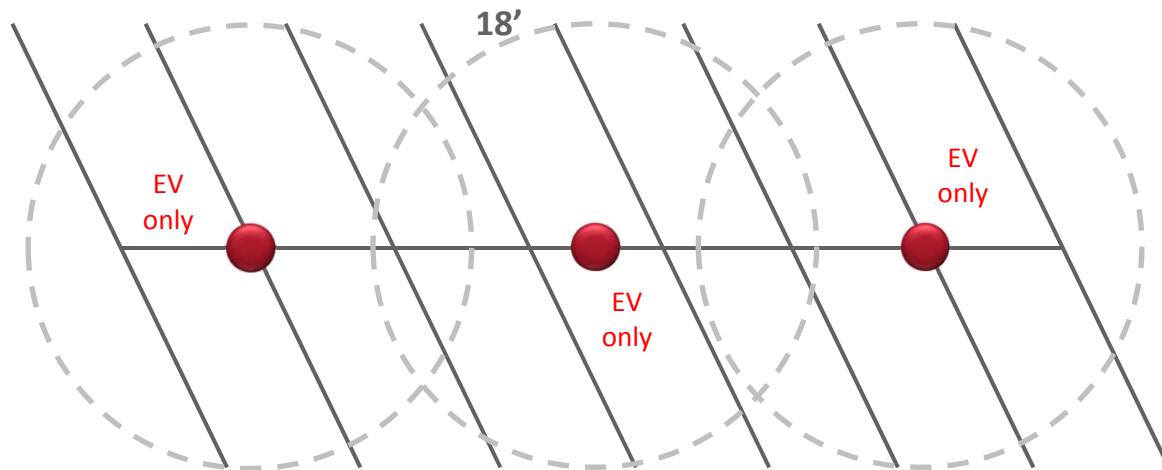


654 Nissan LEAFs, 54 Chevy Volts



And TOU pricing doesn't require capital expenditure, which helps keep rates low

Smart... making each charger accessible to many parking spaces



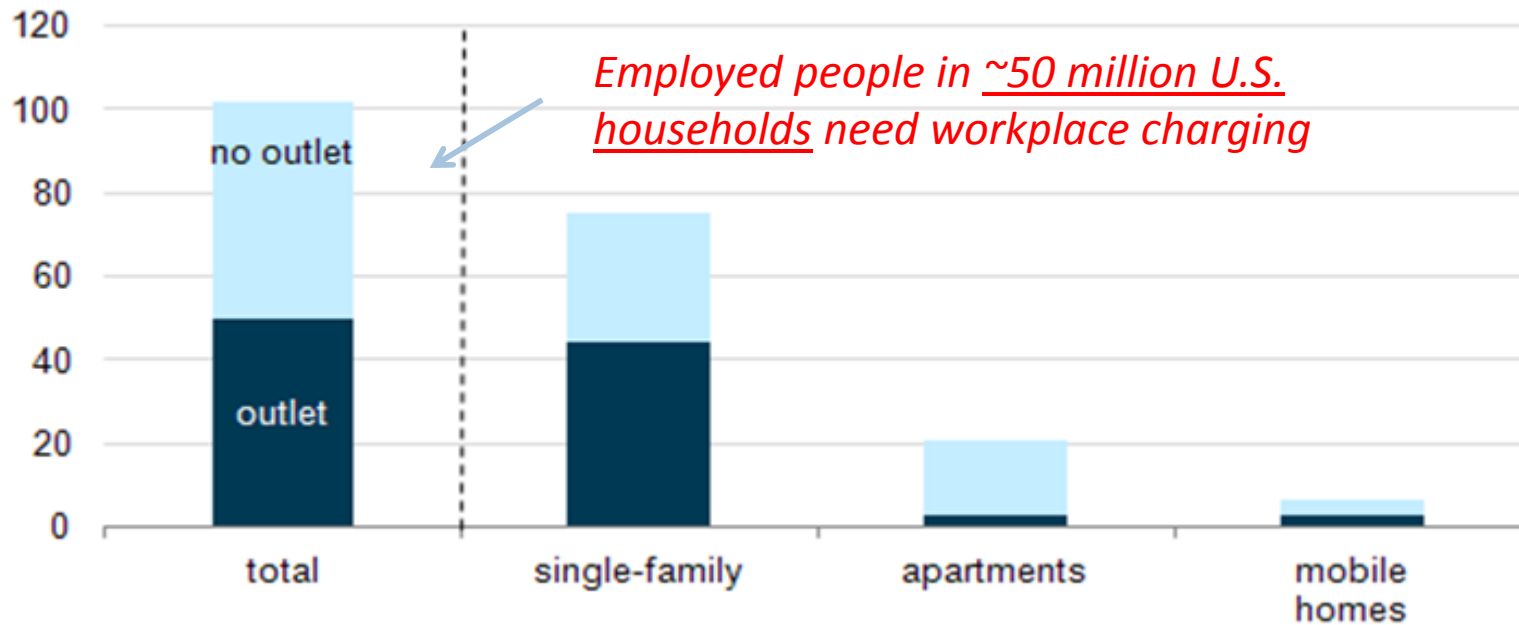
Better accessibility helps minimize the need for “EV Only” parking spots too

Move cords... not cars...



Who needs workplace charging?

Number of homes with electric outlet access for vehicles by housing type
million housing units



Source: U.S. Energy Information Administration, Residential Energy Consumption Survey.

Note: Excludes the 11.2 million households without a vehicle.

Of households that own at least one car, an estimated 49% (49.6 million housing units) park within 20 feet of an electrical outlet. 60% of respondents in single-family detached houses park within 20 feet of an outlet, as opposed to only 14% of respondents in apartments. In the Northeast Census region, less than 40% of all respondents in single-family houses park their car within 20 feet of an electrical outlet. In contrast, for single-family houses in the Midwest region, more than 60% of respondents park their car within 20 feet of an electrical outlet.

Only 47% of respondents from urban areas have access compared to 55% from rural areas, reflecting the prevalence of apartments in the urban housing stock.