Accelerating Electric Vehicle (EV) Adoption

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POWER Post® EVSE
technology by telefonix®

Agenda

I. Why electric cars?

II. Where electric cars?

III. How electric cars?

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Why electric cars?

Inaugural Formula E Beijing Grand Prix
September 13, 2014

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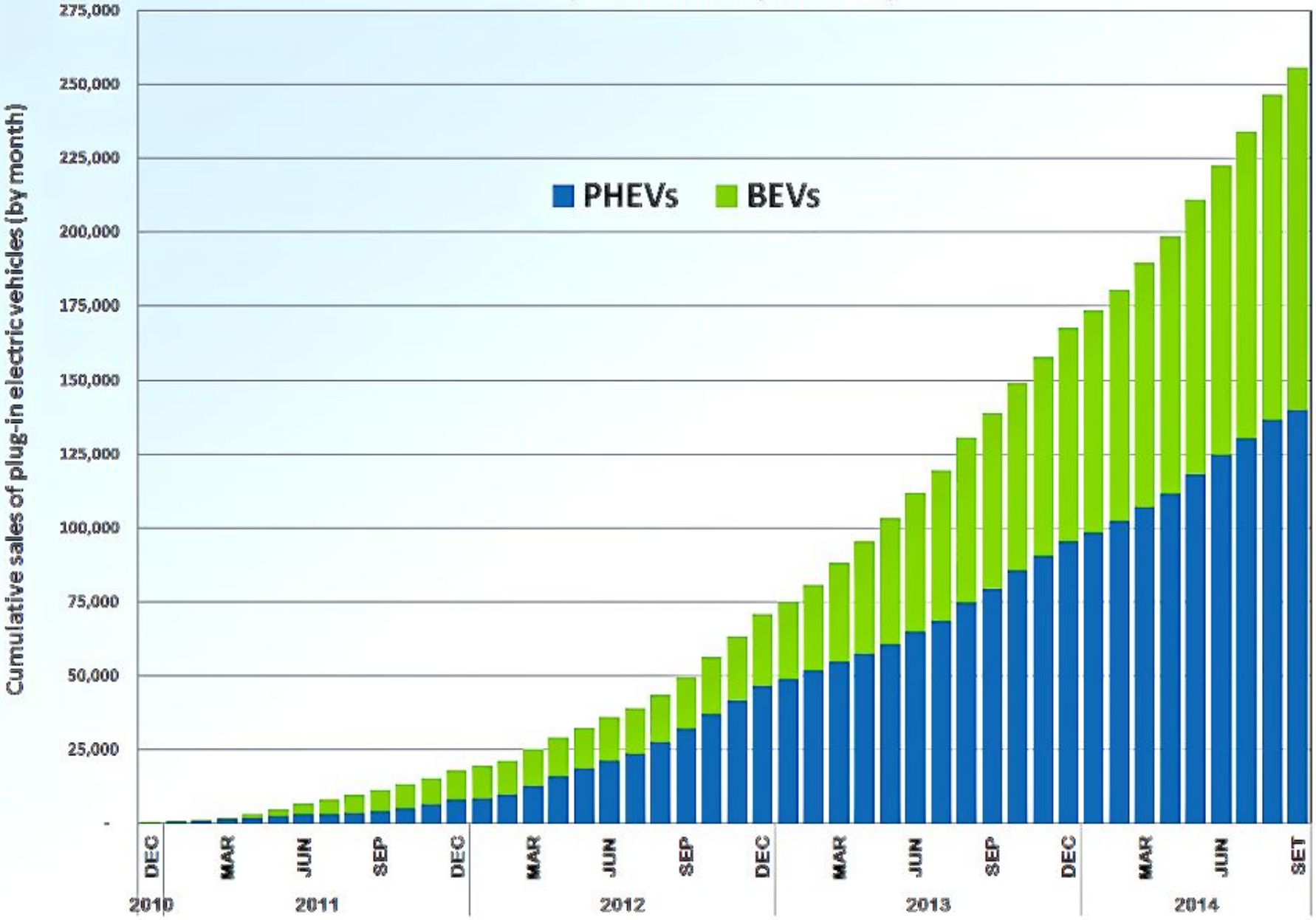
U.S. cumulative sales of plug-in electric vehicles

by monthly sales of all-electric cars (BEVs) and plug-in hybrids (PHEVs)
(December 2010 - September 2014)



Why Electric Cars?

Fun, Fast, Clean & Efficient

- Electric cars are FUN!
- Electric cars are FAST – instant torque
- CLEAN AIR – zero emissions
- Electricity is readily available
- Electricity costs are stable and much lower than gasoline
- Oil independence (national security)
- Save gas = save money
- Low maintenance

Reduced CO_2 Emissions

T / F Electric vehicles just move pollution from the tailpipe to the power plant?

WHAT YOU NEED TO KNOW

- CO_2 is a potent greenhouse gas.
- Using electricity produced with coal, electric vehicles reduce emissions 77% compared to conventional vehicles. Emissions are reduced further with cleaner sources of electricity.
- 2.4 pounds of CO_2 are produced with each gallon of gasoline refined.
- 19 pounds of CO_2 are produced when each refined gallon of gas is burned.
- A total of 21.4 pounds of CO_2 are released into the atmosphere for every gallon of gas consumed.
- Then the gas must be shipped and driven to the pumps everywhere!
- Electricity is already delivered to more places than gasoline.

Increased Efficiency

"You take an average of 5 kilowatt hours to refine gasoline, something like the Model S can go 20 miles on 5 kilowatt hours. You basically have the energy needed to power electric vehicles if you stop refining".

- Elon Musk

WHAT YOU NEED TO KNOW

- A gallon of crude oil contains about 38.6 kWh (132,000 BTU).
- A gallon of gasoline contains about 33.7 kWh (115,000 BTU).
- About 5 kWh are lost in the refining process.
- An average of 4 miles or more per kWh is common among EVs.
- Electric motors are over 90% efficient.
- Internal combustion engines are only 25-30% efficient, the remaining energy is lost mostly to heat.

Where electric cars?

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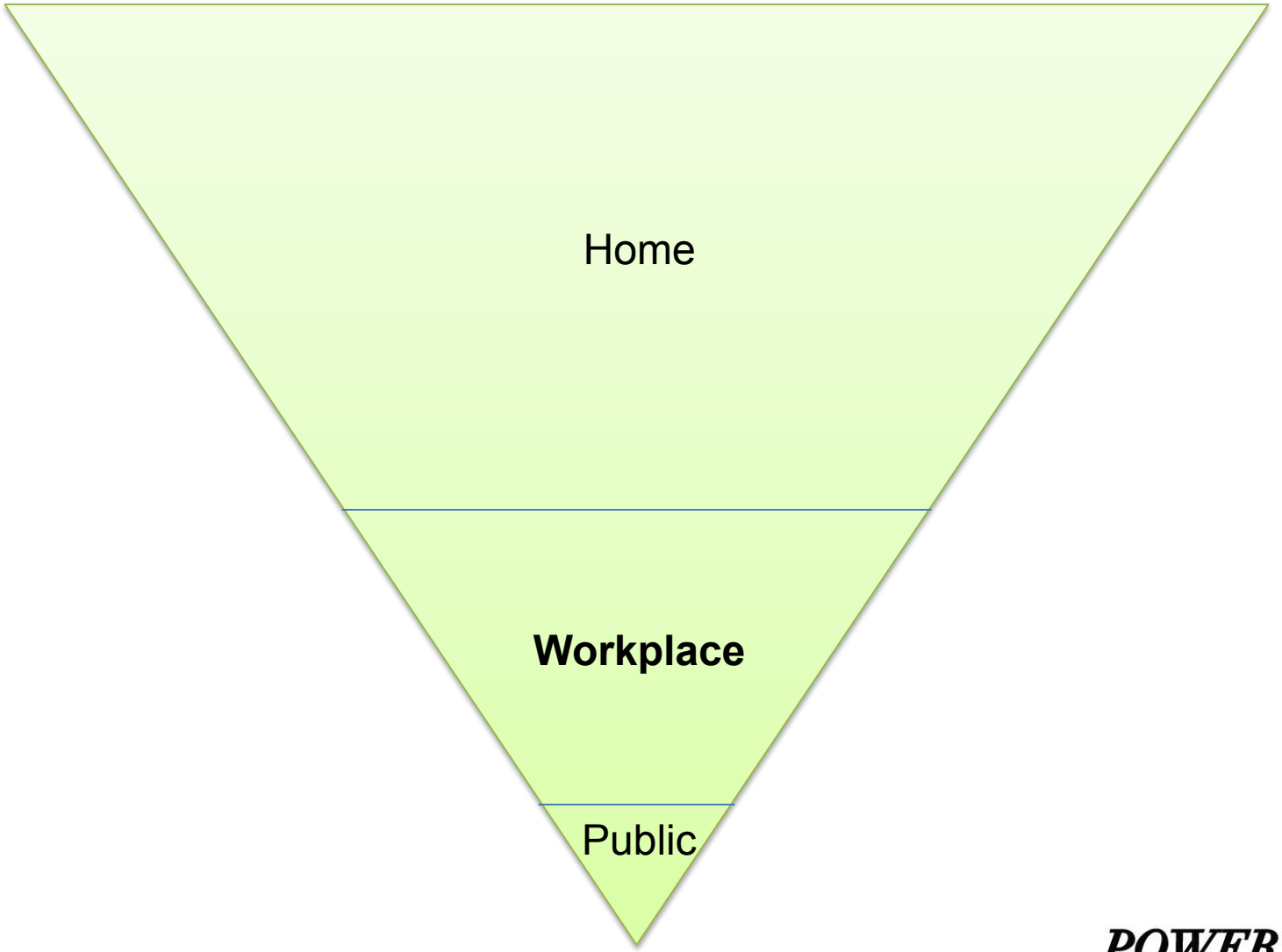
Where Electric Cars?

Work, Play and Most of Our Driving

- Workplace
- Airports
- Schools
- Hotels
- Events, arenas
- Soccer fields
- Golf courses

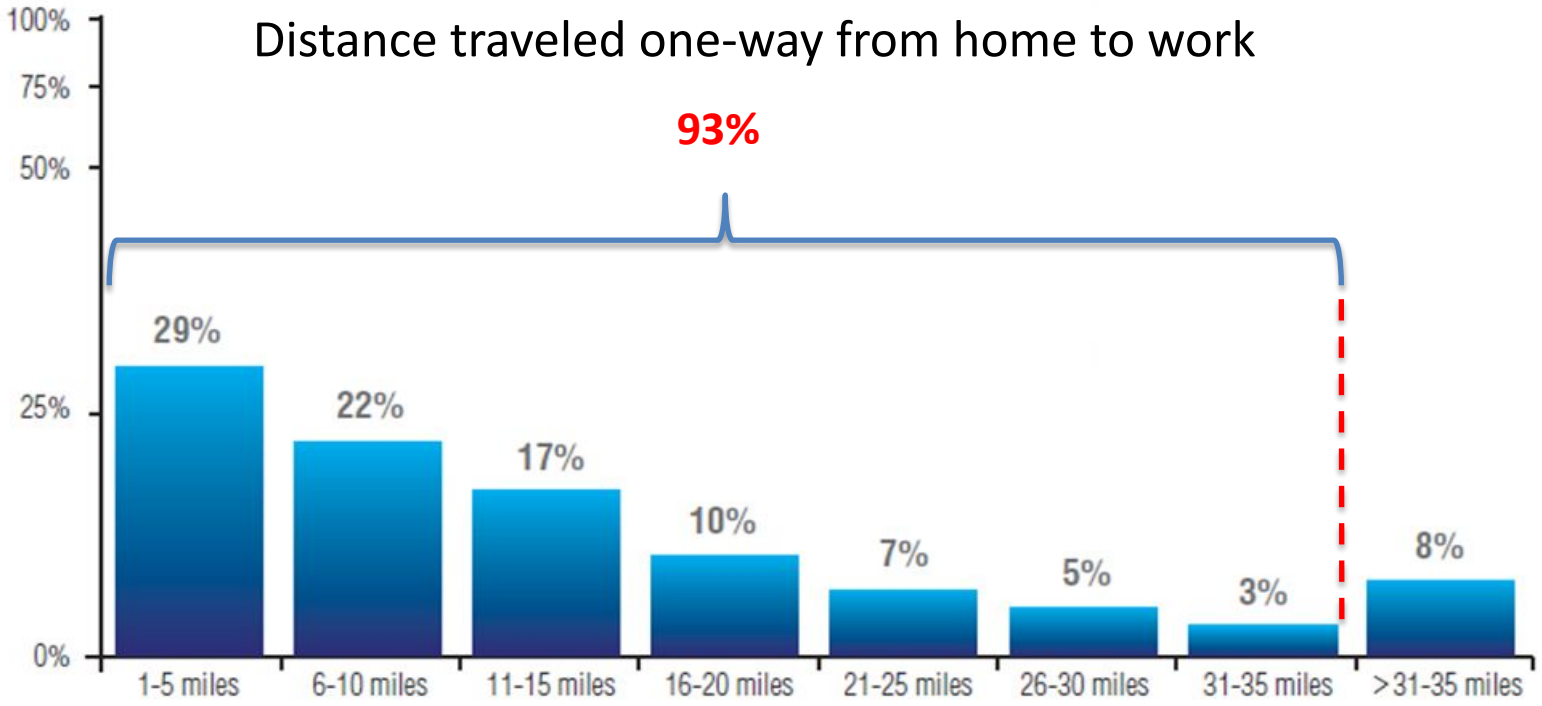
Cars Are Parked Mostly at Home and Work



Daily Commute Distance

WHAT YOU NEED TO KNOW

- 93% of commuters travel less than 35 miles to work!
- 78% of commuters travel less than 20 miles!
- EV drivers typically leave home fully charged.



Source: U.S. Department of Transportation, Bureau of Transportation Statistics, Omnibus Household Survey (2003).

Workplace Charging

- Workplace charging extends the range of an EV.
- The installation of charging stations at work will have a dramatic impact on EV adoption.

Rosalind Franklin University of Medicine and Science
North Chicago, Illinois

Parking Garages

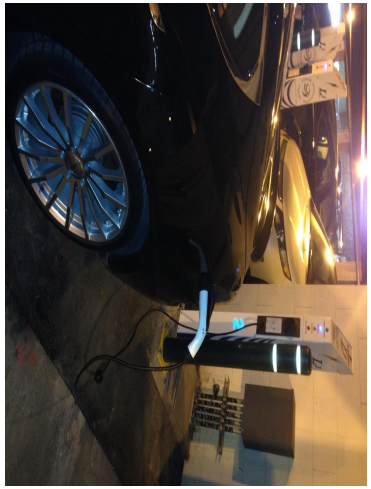
"Parked at work" often means parked in a parking garage.

Where Electric Cars?

Airports

"Parked at work" often means parked at the airport.

Reno-Tahoe International (RNO)



Denver International (DEN)

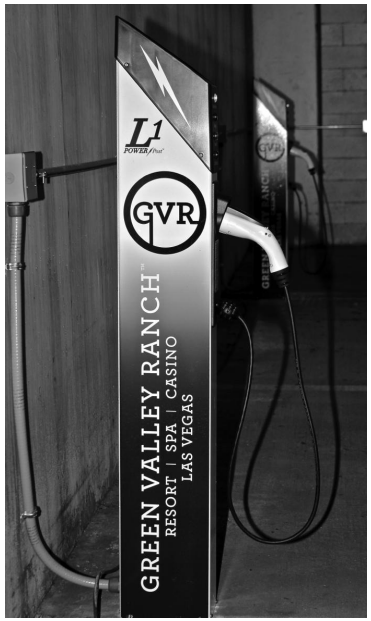
Cincinnati/Northern Kentucky International(CVG)

Piedmont Triad International – Greensboro, NC (GSO)

Hotels

"Parked at work" can also mean parked at a hotel.

Casinos (“Parked for Play”)



How electric cars?

Electric Vehicle Energy Lingo

WHAT YOU NEED TO KNOW

- kWh is “how much” energy, similar to gallons of gas.
- Miles per kWh, similar to miles per gallon.
- kW is “how fast”, similar to gallons per minute.

kWh =
how much energy
is used or strored

kW =
how fast energy is
transferred

Electric Vehicle Cost Lingo

WHAT YOU NEED TO KNOW

- A typical U.S. electricity cost is $0.10/kWh.
- The Nissan Leaf goes about 80 miles with a 24 kWh battery. Therefore, 20 miles uses about 6 kWh.
- The energy cost to recoup 20 miles is about 60 cents:
  6 kWh x $0.10/kWh = $0.60

Example: Nissan Leaf (24 kWh battery)

Q: How long will it take to charge?
A: (kWh) / (kW) = hours



Dead battery: 24 kWh / 6.6 kW = 3.64 hours
1/3 battery on a workplace 3.3 kW charger:
8 kWh / 3.3 kW = 2.42 hours
1/3 battery on a workplace 1.44 kW charger:
8 kWh / 1.44 kW = 5.55 hours

Electric Vehicle Charging Levels

WHAT YOU NEED TO KNOW

- Electric vehicle chargers come in Levels 1, 2 and 3.
- Level 1 = 120 volts AC and Level 2 = 240 volts AC.
- Level 3 is called “DC Fast Charging.

Charging Levels and Ranges

Level 1 = 5-8 miles of range per hour of charging
Level 2 = 10-15 miles of range per hour of charging
Level 3 = 60-70 miles of range per half hour of charging

Plug In Electric Vehicle (PEV) Battery Sizes

Toyota Prius	4.4 kWh Battery	11 miles
C-max Energi	7.6 kWh Battery	21 miles
Chevy Volt	16 kWh Battery	38 miles
BMW i3	22 KWh Battery	80 miles
Ford Focus	23 kWh Battery	76 miles
Nissan Leaf	24 kWh Battery	75 miles
Tesla Model S	60 kWh Battery	208 miles

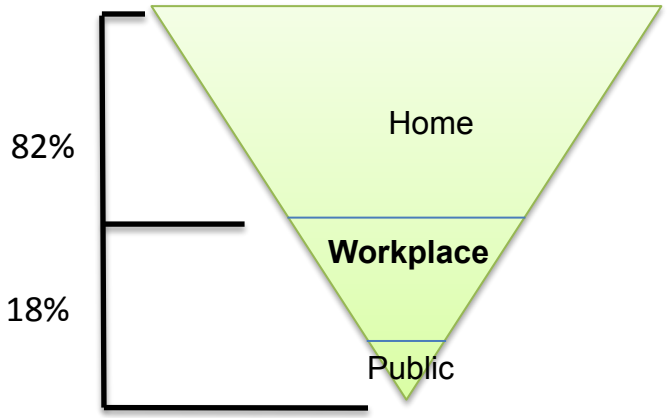
Electric Vehicle Charging Behavior

WHAT YOU NEED TO KNOW

- Most EV owners charge at home (82%).
- Most EV owners charge at least once each day (92%).
- Very few EV owners charge at public locations (18%) and these are mainly work locations.

Charging Behavior

In 2012, SAE International (Smart, 2012) published a report that looked into details of how EV owners charge their EVs. The study found that 92% of EV owners charge a minimum of one time per day and 82% of the charging occurred at the owner's home. Only 18% of the owners charge their EVs at public locations, and these are mainly work locations with extended parking periods.



Understand Charging Options

WHAT YOU NEED TO KNOW

- **Functionality and networking built into electric vehicle chargers (EVSEs) adds cost!**

Credit Card Readers

- Adds approximately $500 per unit
- The single most common cause of EVSE outages

Integrated Electricity Metering

- Energy metering can easily be accomplished outside of the EVSE for a fraction of the cost
- Expected vs. Actual electricity costs can be determined and used to reset employee rates

RFID authorization

Networking and software maintenance

Complimentary Electric Vehicle Charging

Consider "Level Free" Charging

- Less expensive EV charging stations
- No contracts for service fees or revenue sharing
- Energy costs can be recovered using existing programs or new programs at low cost
- "Complimentary" EV charging can be used as a marketing tool

Payments and Electric Vehicle Charging

WHAT YOU NEED TO KNOW

- Based on rates from the leading supplier of EV charging stations, a total cost of ownership (TCO) analysis shows that it is less expensive to provide free charging with two L1 PowerPost® EVSEs than to charge employees for energy using a dual, networked EVSE.

Level 1
Free EV Charging
Costs $5,628
Over 7 Years

Level 2 Networked
EV Charging with
revenue offsets paid
by Employees
Costs $10,993 Over 7 Years

Consider "Level Free" Charging

TCO in both cases does not include installation which varies greatly (site specific)

Novel Approaches to Payments

WHAT YOU NEED TO KNOW

- Donating the cost of EVSE energy to a charity can be an effective image-building tool.

Thank you for driving
A clean Air Vehicle.
Because of your efforts
we can all breathe
a little easier.
The electricity is
compliments of Lowe's.
In return we ask that you
consider supporting the
American Lung Association
by scanning the code here,
or visiting LUNG.ORG

"A Breath of Fresh Air"!

a "Donation Station" approach

AMERICAN LUNG ASSOCIATION®
Fighting for Air

Schools and Clean Air

WHAT YOU NEED TO KNOW

- In June California voters approved nearly $3 billion in bond measures.
- According to a preliminary list from the Coalition for Adequate School Housing, more than $11 billion in additional bond measures is planned for the November 2014 ballot.

- Energy efficiency, improved air quality, LED lighting and other “green” initiatives will be priorities for facilities that are newly built or renovated using bond measure dollars.
- The installation of electric vehicle charging stations at schools may be covered by new bond measures.
- Educational programs focused on the benefit of electric vehicles could be implemented into school curriculums to promote EVs to younger generations

Schools and Clean Air Curriculum

WHAT YOU NEED TO KNOW

- Workplace charging for faculty and staff is a teaching opportunity.
- Students gain valuable knowledge about the world they live in.
- A curriculum of environmental advantages, commute times and distances, energy usage, pollution reduction and gas savings, to name a few!

- Health and Environment
- Real World example of Plug In Vehicle adoption and uses
- Speaking and Presentation from industry leaders
- Contact me for further information.

Summary

Why Electric Cars?

Fun, Fast, clean and efficient

- High performance
- Reduce emissions
- Save gas, save money

Where Electric Cars?

Work, play and most of our driving

- Focus on workplace charging
- Includes airports, hotels, schools, events, etc.

How Electric Cars?

Charging stations installed where needed most

Novel, low-cost approaches to payment

Complementary and “level-free” charging

Educational programs for schools

Lucas di Grassi –
Winner of the first-ever Formula E race

Thank You,

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