

A decorative graphic on the left side of the slide, consisting of a network of light blue lines and circles that resemble a circuit board or a neural network. The lines are vertical and horizontal, with small circles at various points, creating a grid-like structure.

EV EXPLORER: GIVING EMPLOYERS AND EMPLOYEES BETTER INFORMATION ON THE BENEFITS OF PEVS

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PUT IN YOUR HOME AND WORK AND CALCULATE YOUR ENERGY SAVINGS

UCDAVIS ELECTRIC VEHICLE EXPLORER Start/Home Travel/Commute Car Manager

STEP 2
Where do you travel/commute to?

Winters Street & Interstate 80
Sacramento, CA 95838

Travel/Commute Settings ?

How **often** do you commute here? times per

Charger at Destination

Enter a destination or drag the marker

Destination address

Annual Vehicle Energy Costs
These data were calculated using information from www.fueleconomy.gov.

Optional Survey

| Vehicle | Annual Cost | Gas Cost | Electric Cost |
|--------------------------|-------------|----------|---------------|
| Honda Civic, 2014 | \$1340 | \$1340 | \$0 |
| Honda Accord Plug-in ... | \$850 | \$712 | \$138 |
| Chevrolet Volt, 2014 | \$789 | \$304 | \$485 |
| Nissan Leaf, 2014 | \$546 | \$0 | \$546 |

Gas Electric

Roundtrip Miles: 50 miles ?

0 10 20 30 40 50 60 70 80 90 100

ADD WORKPLACE CHARGING

UCDAVIS ELECTRIC VEHICLE EXPLORER Start/Home Travel/Commute Car Manager

STEP 2
Where do you travel/commute to?

Winters Street & Interstate 80
Sacramento, CA 95838

Travel/Commute Settings

How often do you commute here? times per

Charger at Destination

Type

Hours Parked

Price to Charge \$/hr

Enter a destination or drag the marker

Destination address

Annual Vehicle Energy Costs
These data were calculated using information from www.fueleconomy.gov

Optional Survey

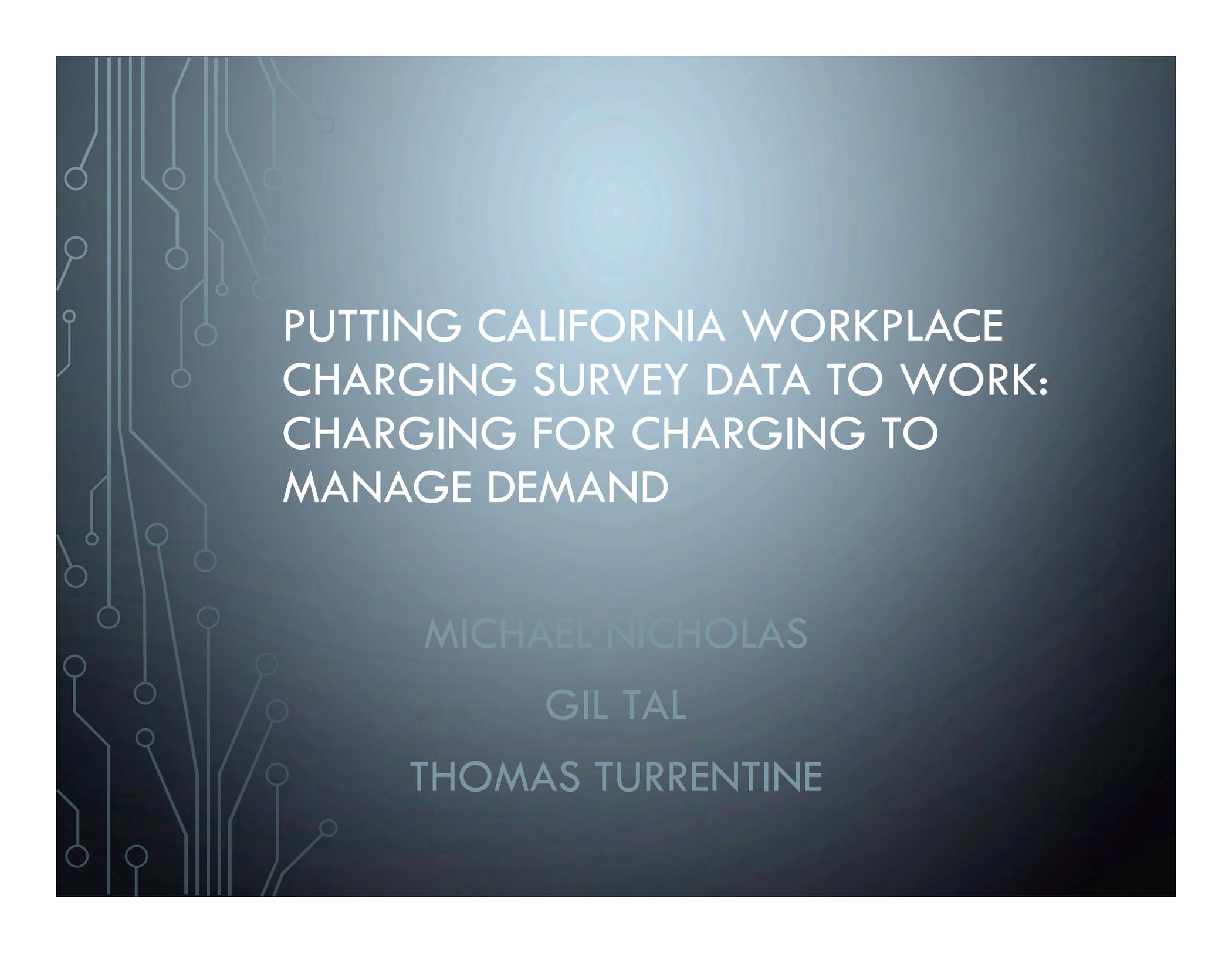
| Vehicle | Gas Cost | Electric Cost | Total Cost |
|--------------------------|----------|---------------|------------|
| Honda Civic, 2014 | \$1340 | \$0 | \$1340 |
| Honda Accord Plug-in ... | \$462 | \$138 | \$600 |
| Chevrolet Volt, 2014 | \$0 | \$319 | \$319 |
| Nissan Leaf, 2014 | \$0 | \$273 | \$273 |

Gas

Roundtrip Miles: 50 miles

CUSTOMIZE YOUR PARAMETERS

- Change number of commute days
- Change energy prices
- Change car in the “car manager” to any of 34,000 cars in fuelconomy.gov
- Change your destination
- Find it at <http://gis.its.ucdavis.edu/evexplorer> or search for “EV Explorer” in Google
- Funded by the California Energy Commission



PUTTING CALIFORNIA WORKPLACE
CHARGING SURVEY DATA TO WORK:
CHARGING FOR CHARGING TO
MANAGE DEMAND

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ANSWERS FIRST

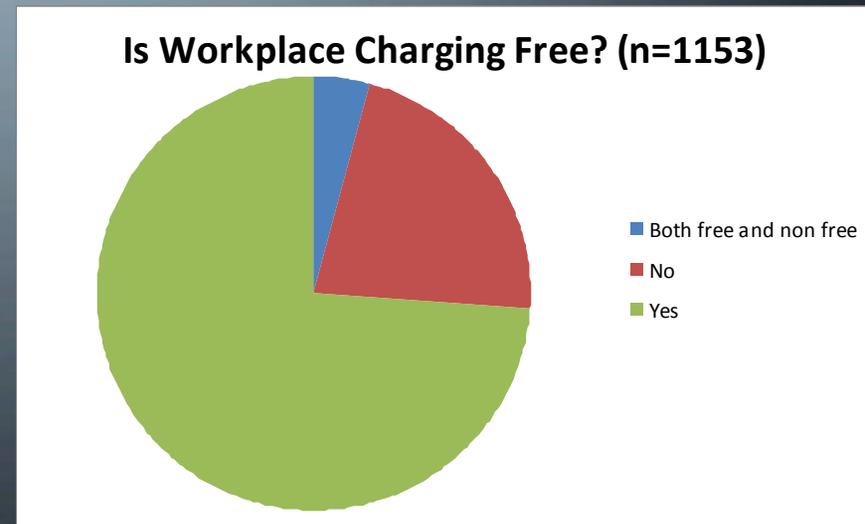
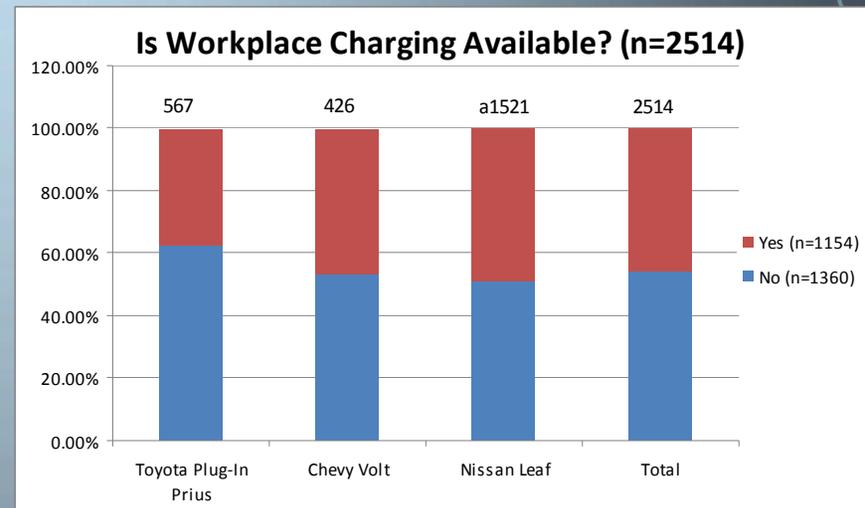
- Congestion is happening in California at chargers necessitating more chargers or better charger management
- Free charging will be used approximately 4X more than paid charging
- There is little hope of return on investment for paid chargers
- Paid charging results in shorter sessions and more throughput
- Charging by hour encourages BEVs and discourages PHEVs
- Charging by kWh is fair to BEVs and PHEVs but wastes capacity (a 6kW charger charges a 2kW Prius)

WHY PROVIDE CHARGING AT WORK?

- Common reasons
 - Corporate responsibility
 - Employee retention
 - Get employees to and from work faster (HOV lane access)
 - Get drivers to and from work
 - Encourage vehicle sales
- Often missed reason
 - Provide marginal electric miles. i.e. Plug in at home as much as possible and workplace charging provides the miles that home cannot

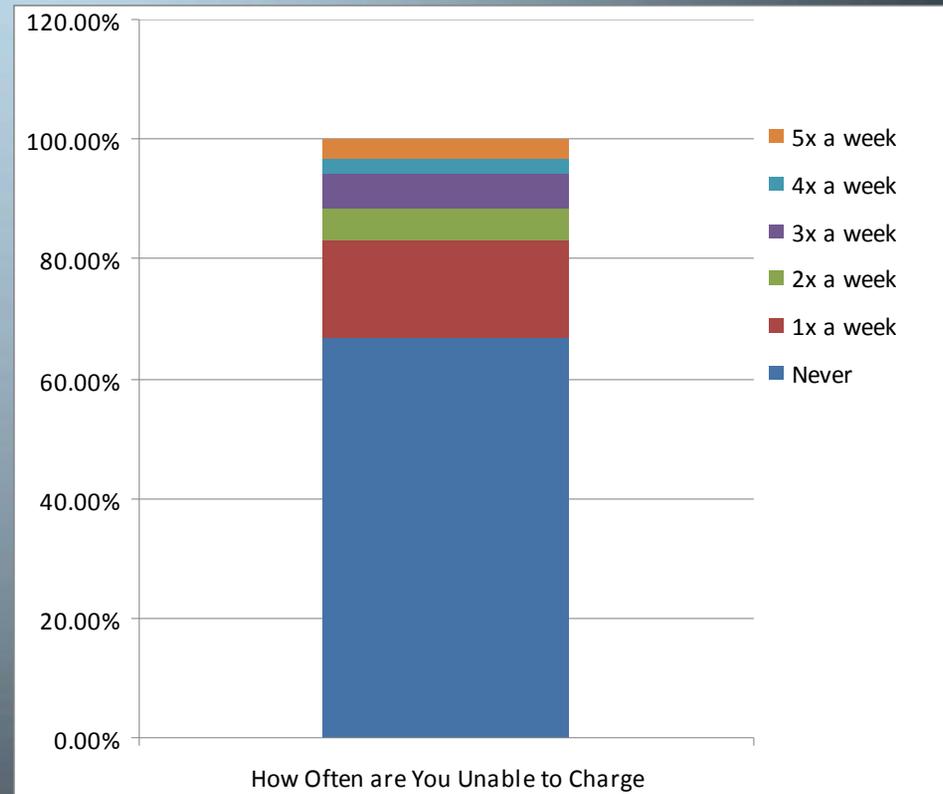
MOST WP CHARGING IS FREE (CALIFORNIA 2013)

- 46% have WP charging (California 2013)
- 48% Nationally (Nov 2014 12-state survey)
- 74% of that 46% have free charging (California 2013)



HOWEVER, THERE IS CONGESTION HAPPENING ALREADY

- Over 30% of drivers have congestion at work
- Pay systems exist in congested areas. Nevertheless paid chargers are 1.7 times less likely to experience congestion
- At least 53% of people who don't need charging charged anyway with free uncongested charging.



'Charge rage': Too many electric cars, not enough workplace chargers

By Dana Hull | dhull@mercurynews.com

POSTED: 01/19/2014 07:04:21 PM PST | UPDATED: 10 MONTHS AGO

196 COMMENTS



Source: Mercury News http://www.mercurynews.com/business/ci_24947237/charge-rage-too-many-electric-cars-not-enough-workplace-chargers

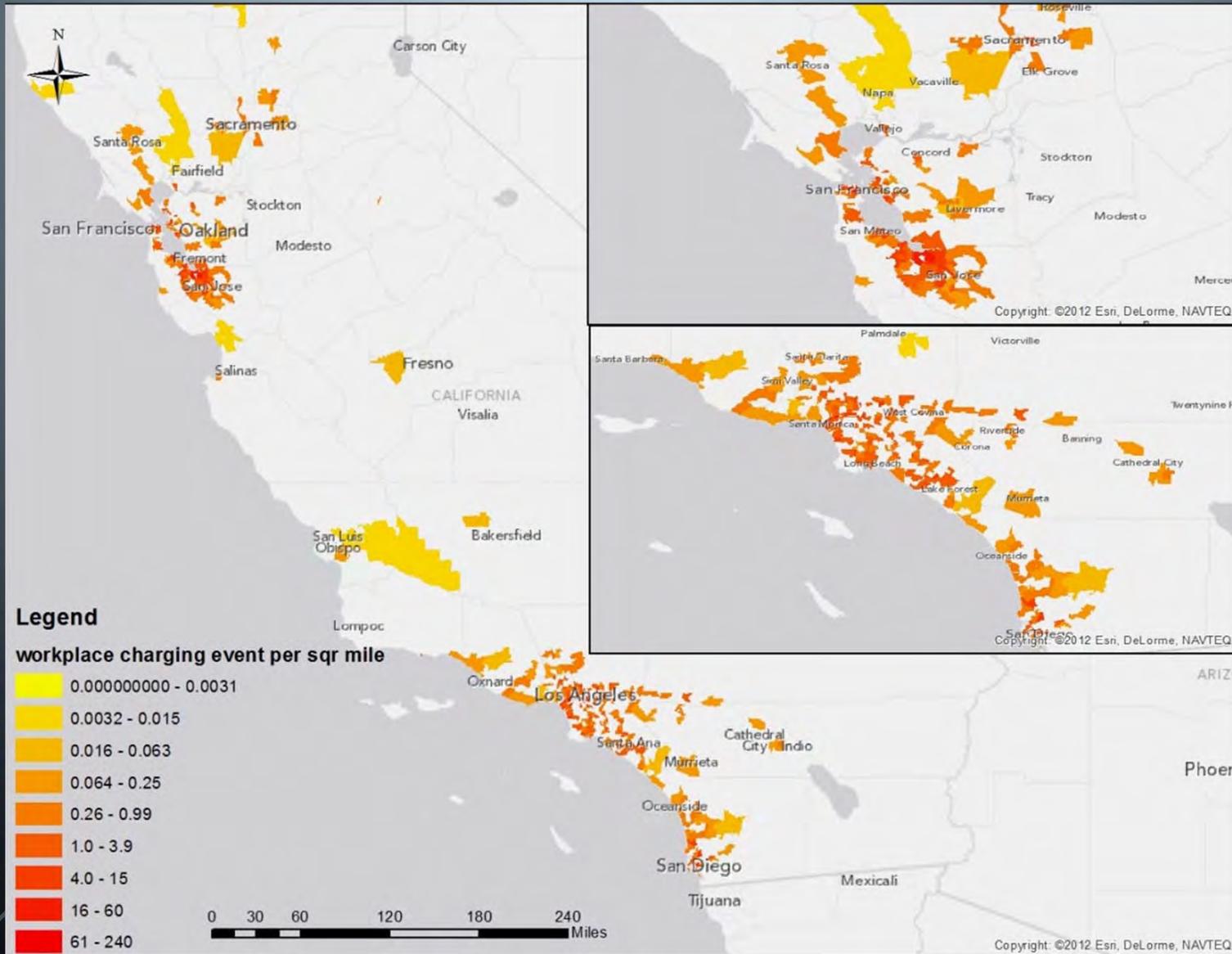
CONGESTION HAS NEGATIVE EFFECTS

- Congestion increases uncertainty. The only people using charging in this situation are those who don't really need it.
- Creates a hassle for companies to manage. Do we need a new position?

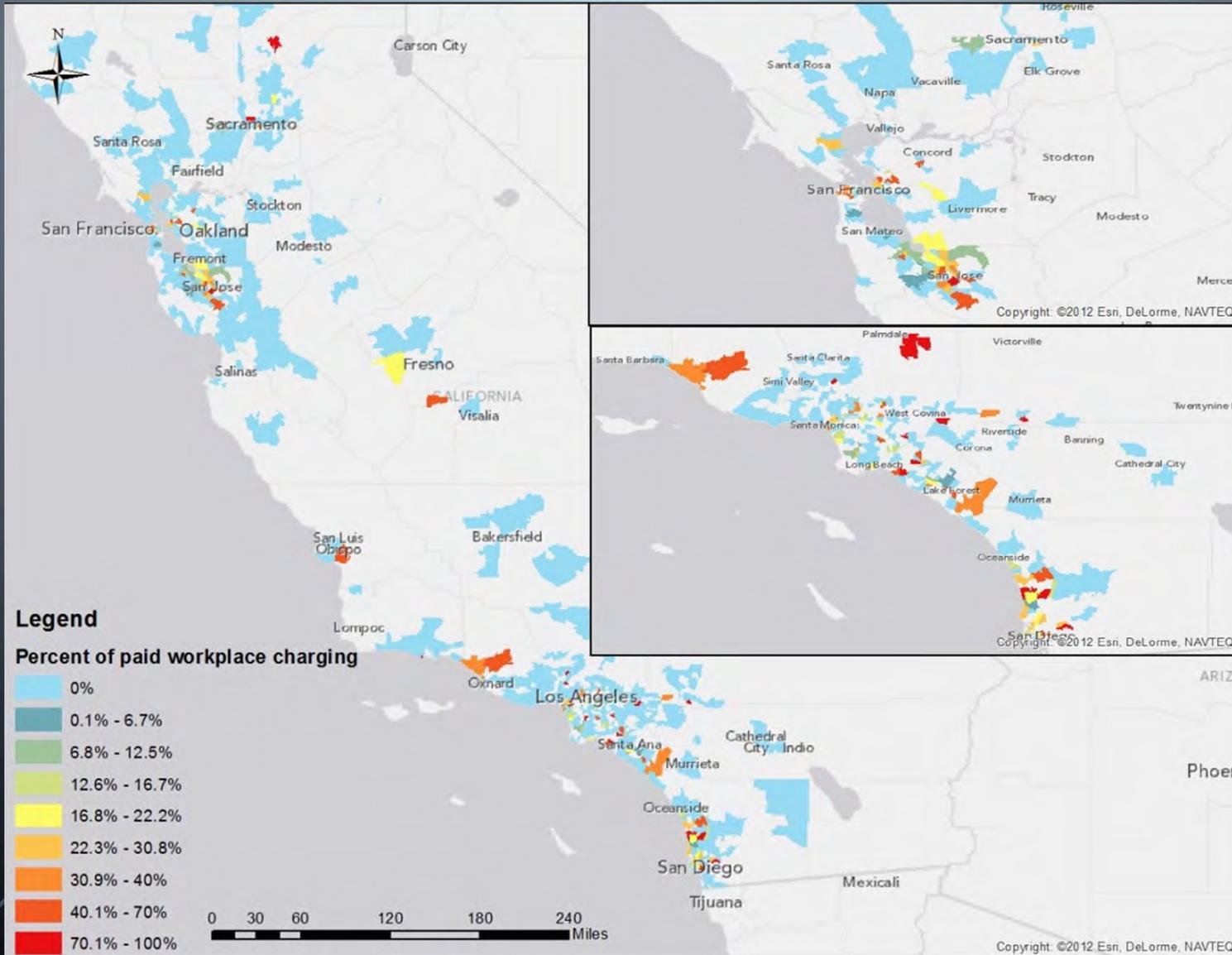
OPTIONS TO MANAGE CONGESTION

- Install more chargers
- Time limits
- Parking rotation
- Charging list/serves
- Valet parking
- Better charger placement in lots
- Charging for Charging

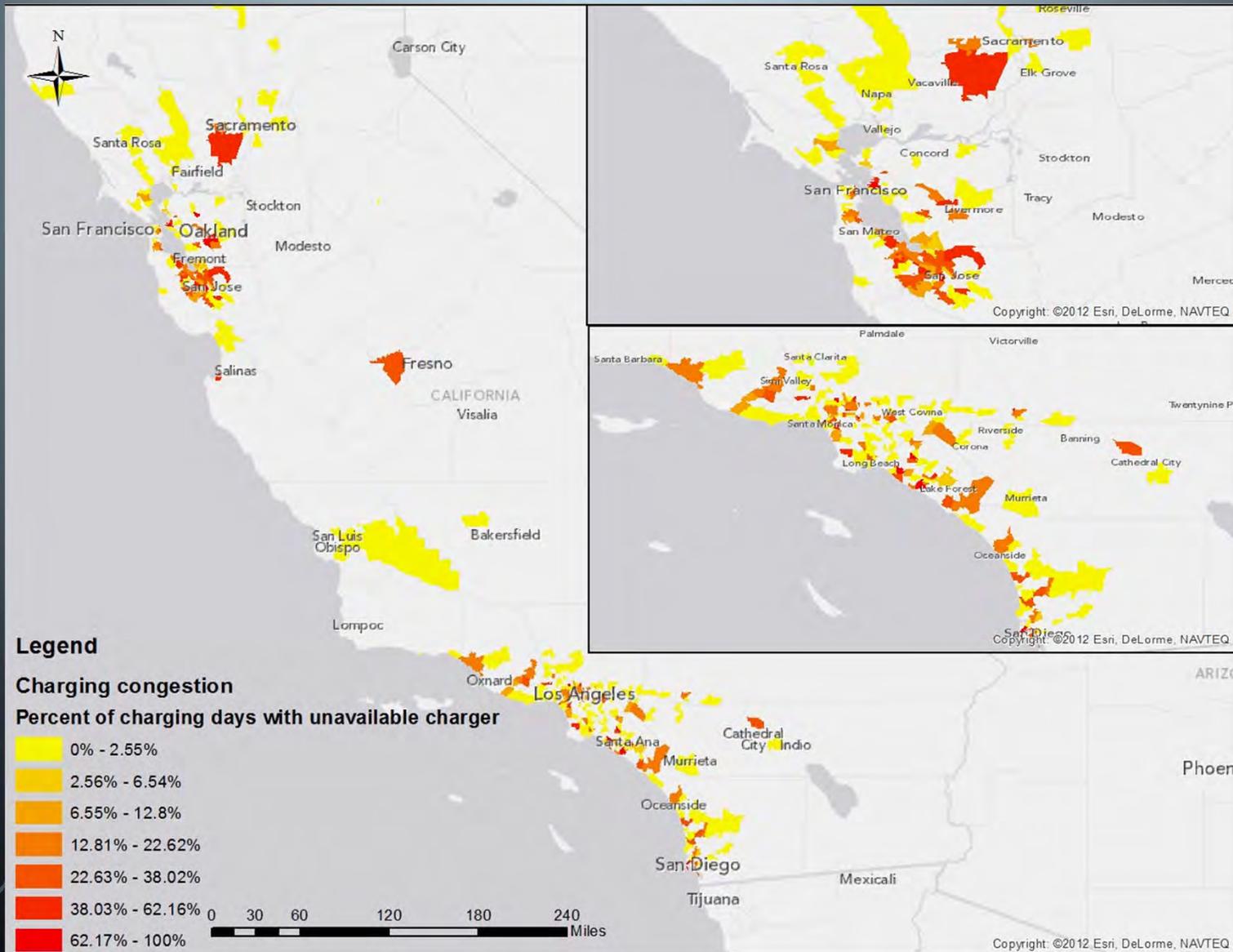
WORKPLACE CHARGING



FREE CHARGING

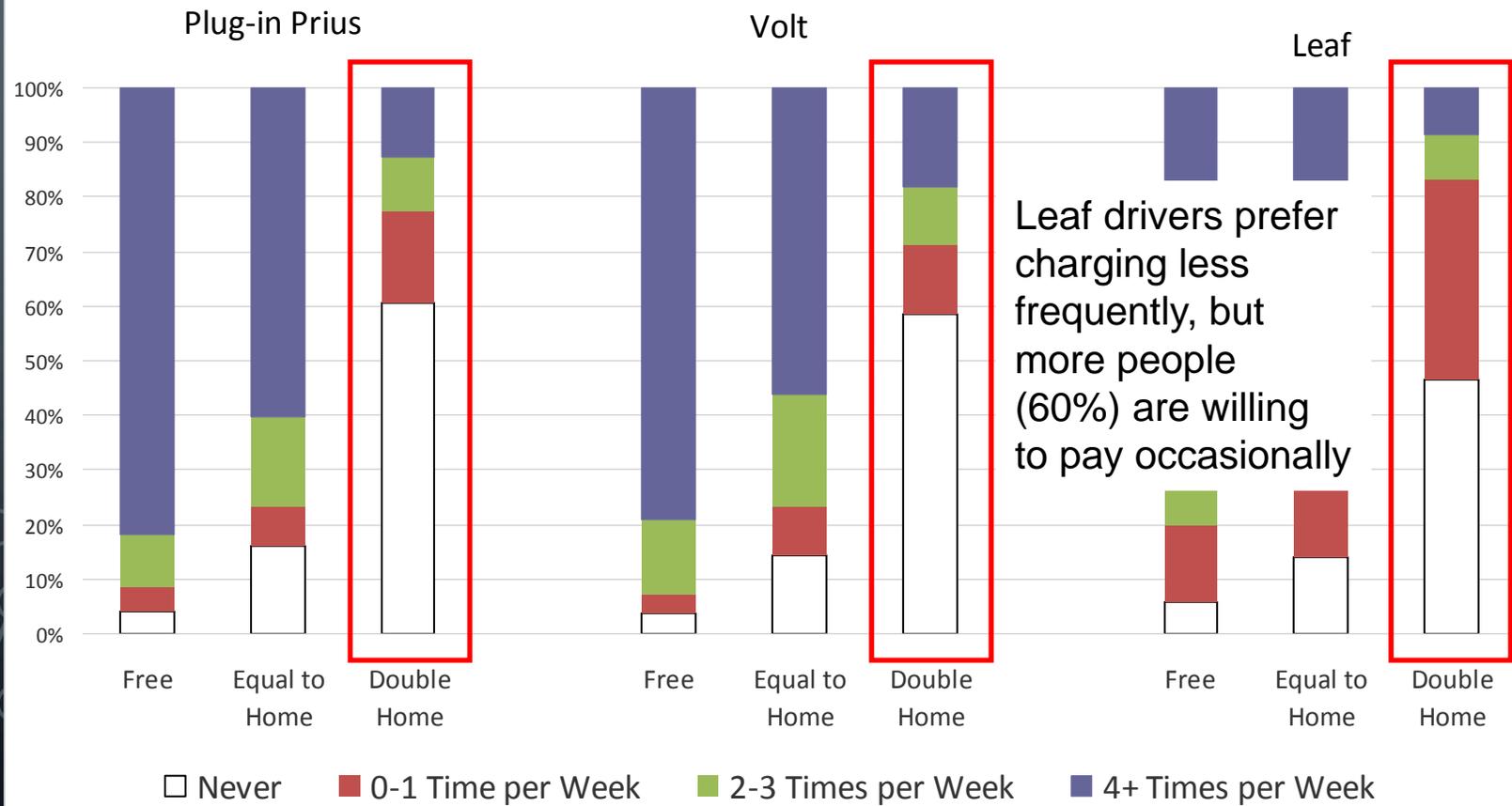


CONGESTION



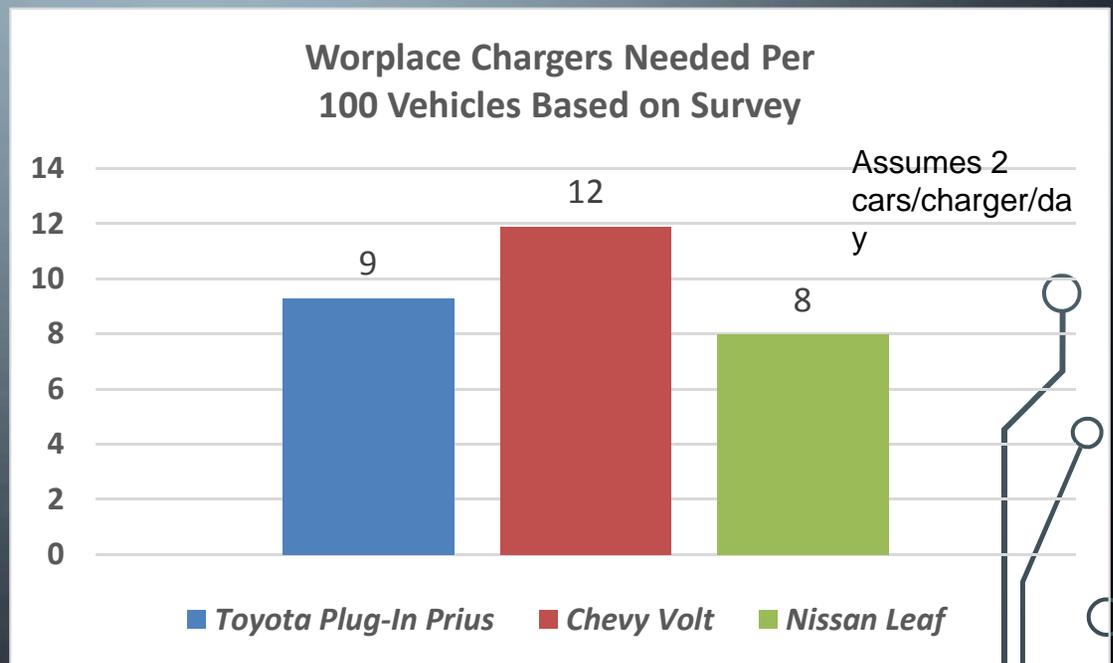
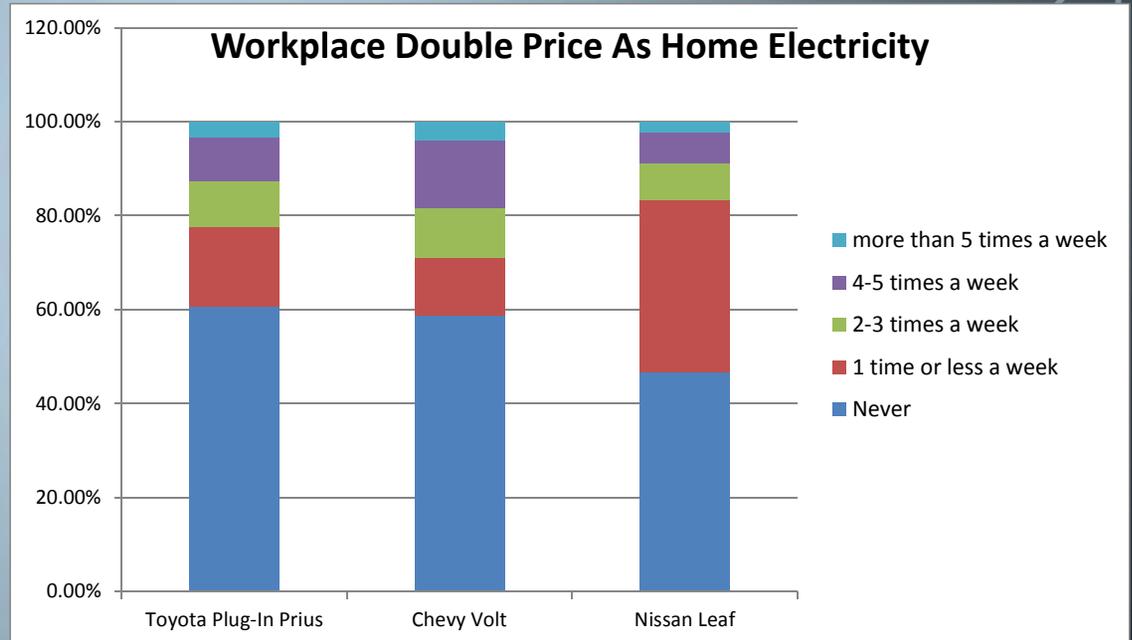
FREE CHARGING REPRESENTS A FOUR-FOLD INCREASE IN CHARGER DEMAND

Usage Frequency by Price and Vehicle Type

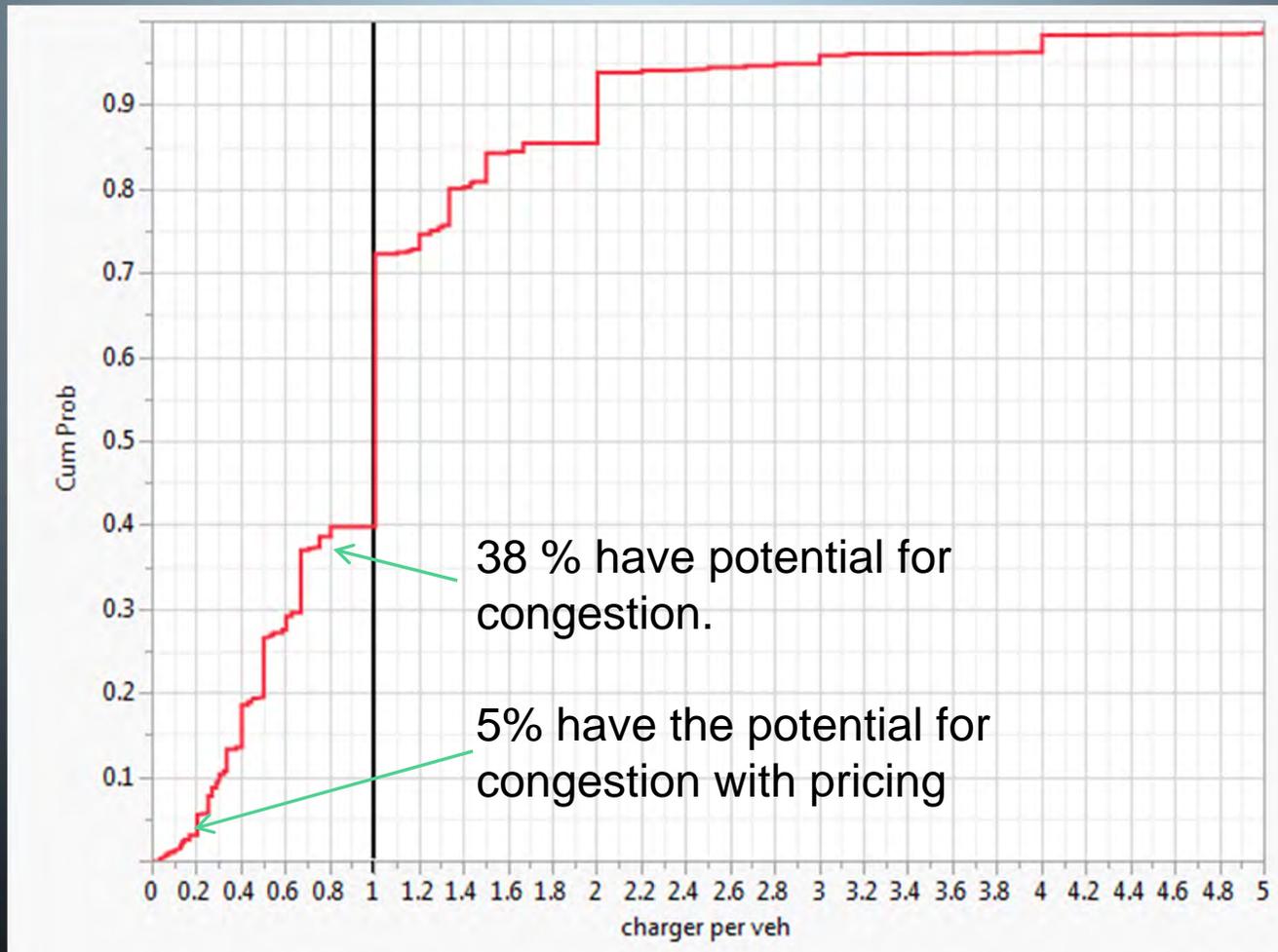


CHARGING FOR CHARGING

- More chargers needed per vehicle
- Too small = no benefit
- Medium size = more chargers
- Large BEV = lower frequency, more access needed



CHARGERS PER CAR EXCLUDING CA NOV 2014

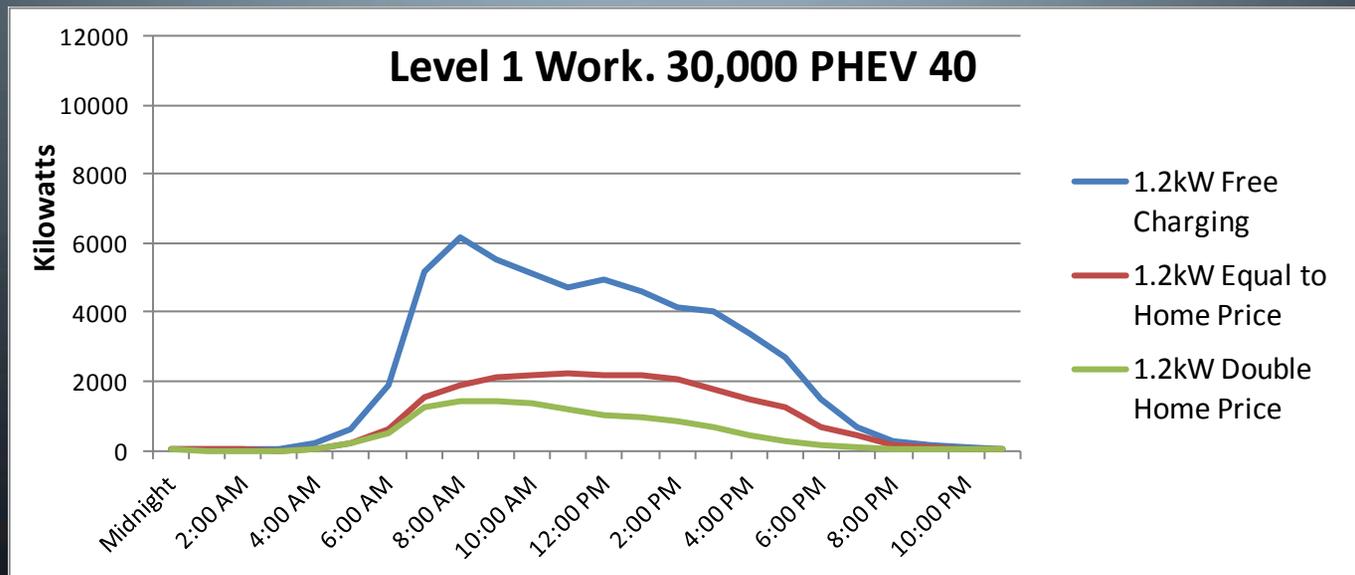


38 % have potential for congestion.

5% have the potential for congestion with pricing

MODELING SUGGESTS FREE CHARGING MAY NOT INCREASE EVMT

- Little difference in marginal eVMT may exist between free and priced scenarios
- Value of time may alter this somewhat (eg Plug in Prius)
- 53% of people surveyed who had free charging who did not need charging to get home charged anyway

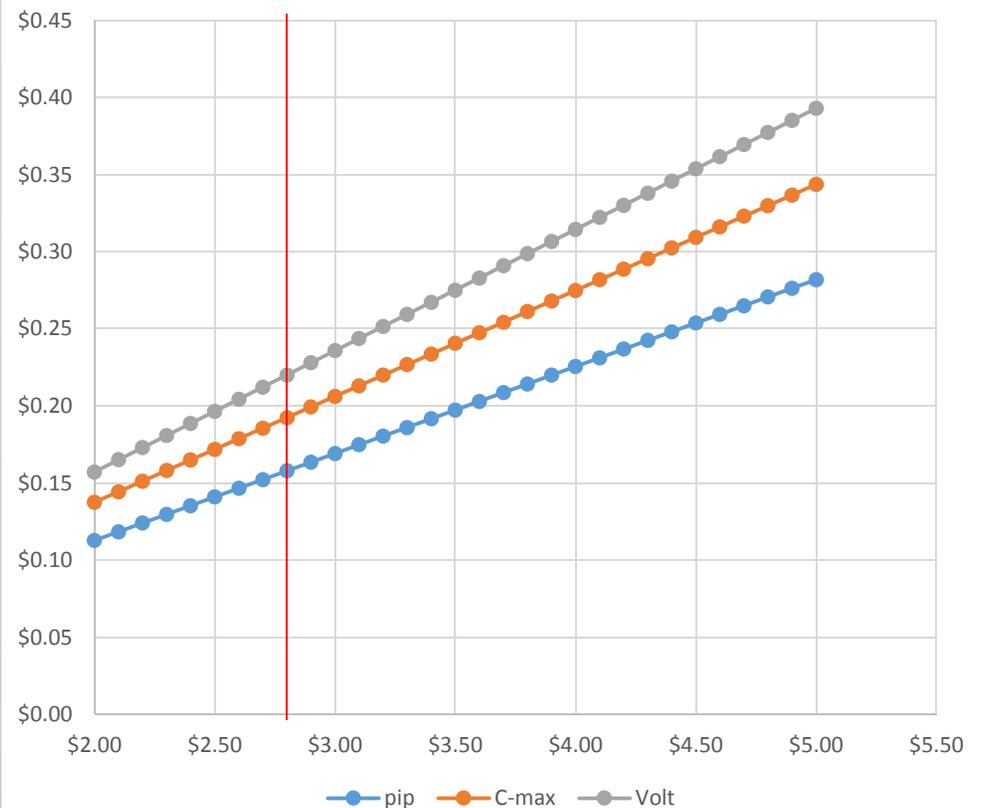


CHANGING CONTEXT OVER TIME

HOW MUCH TO CHARGE?

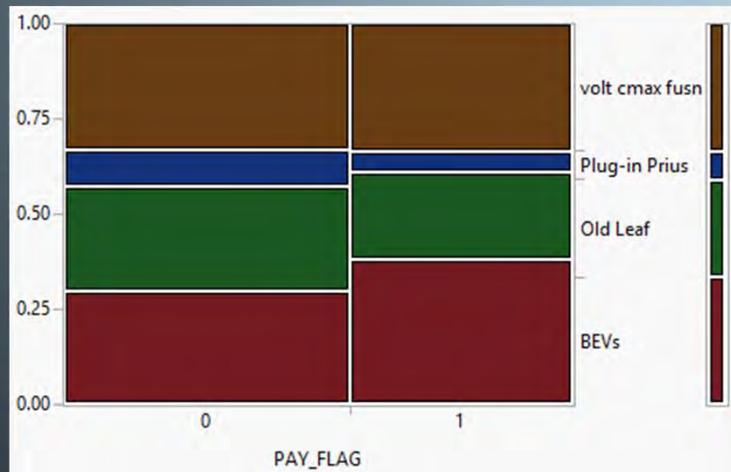
- If Gas is \$2.80, Break-even cost for:
 - Plug-in Prius is 16¢/kWh
 - C-Max is 19¢/kWh
 - Volt is 22¢/kWh
- Home electricity is 15¢/kWh
 - PIP “fill” = 3¢ savings
 - C-Max “fill” = 32¢ savings
 - Volt “fill” = 92¢ savings

Break even Cost of Electricity at Various Gasoline Prices

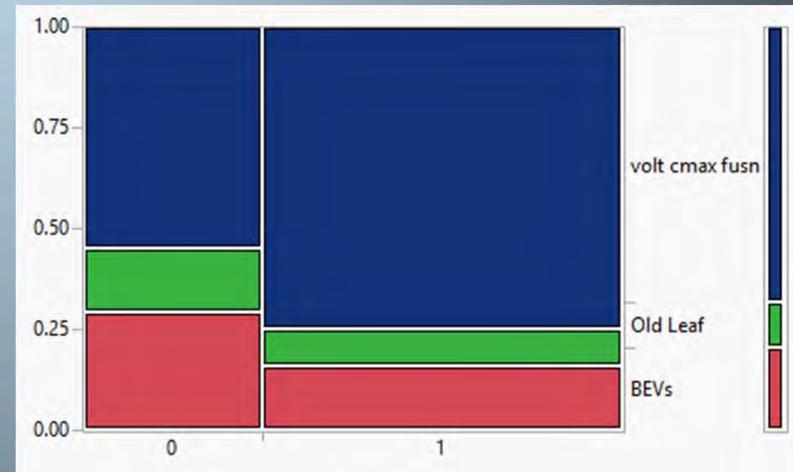


HOW TO CHARGE?

By Hour?



By kWh?



- Encourages BEVs with faster onboard chargers. Better value
- Values need to be validated and market composition controlled for
- Encourages PHEVs who don't have the range to return

CONCLUSIONS

- Pricing is one of many tools to manage the demand for charging
- Not all chargers need to be the same power and price
- Pricing is an effective tool to reduce the number of chargers companies need to install
- Pricing ensures that electricity dispensed creates “extra” electric miles
- Pricing by hour discourages PHEVs
- Pricing by kWh encourages PHEVs
- However, pricing may discourage Plug-in sales in general particularly for PHEV 20s

THANK YOU

For more information see: “Charging for Charging” on
pubs.its.ucdavis.edu

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