Identifying Plug-in Electric Vehicle Consumers and the Role of Incentives

Gil Tal
Michael Nicholas

Public Workshop on Development of a Long-term Plan for the Clean Vehicle Rebate Project and Light-Duty Vehicle Incentives

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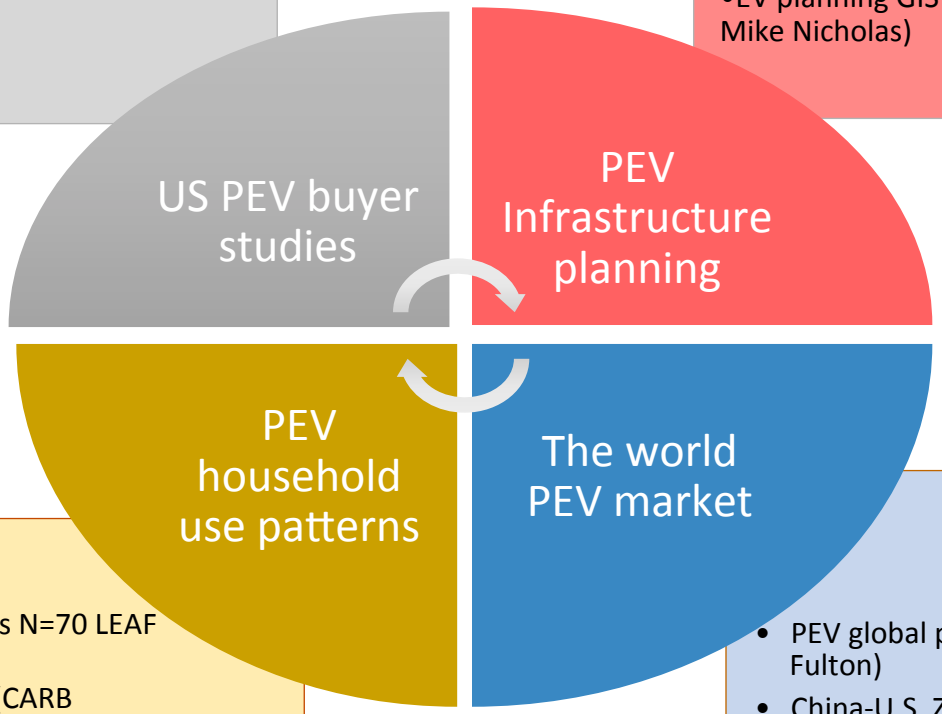
- 11 states plus DC survey N=4,000 (EPRI 2014)
- California PEV owners N=5000 (ARB 2015)
- California used PEV buyers (ARB 2015)

- Neighborhood charging, EV infrastructure plan city of Davis (CEC 2014-2016)
- Street charging, MUDs infrastructure plan city of San –Francisco (CEC 2015-2017)
- EV planning GIS Toolbox (CEC 2011-2015, Lead Mike Nicholas)

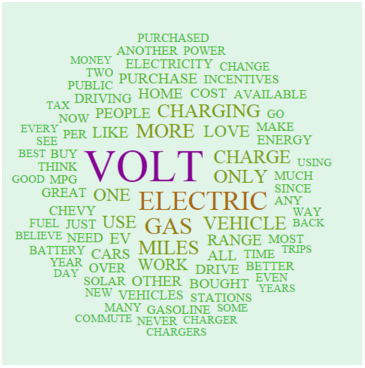


- BEV Households usage patterns N=70 LEAF HH (CEC, 2013)
- PEV Household Usage Project (CARB 2014-2016 Lead Mike Nicholas)
- Cellular data -long trips (STEPS 2015)

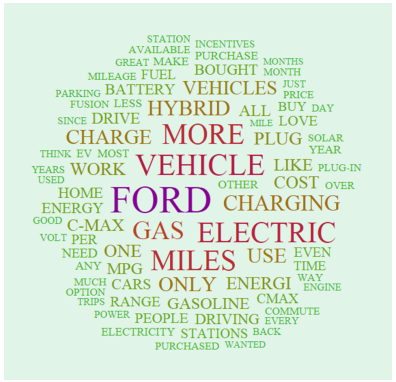
- PEV global projections (STEPS 2015 with Lew Fulton)
- China-U.S. ZEV Policy Lab (CATARC 2015-2016 Lead Yunshi Wang)

Plug in Electric Vehicle (PEV) Purchase Motivations

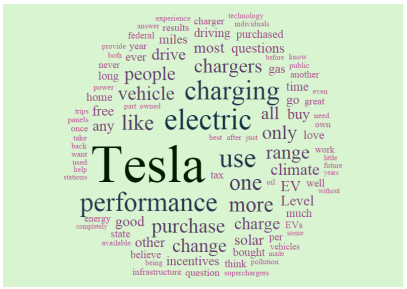
Not using gas



MPG



Performance



Range
Electric experience

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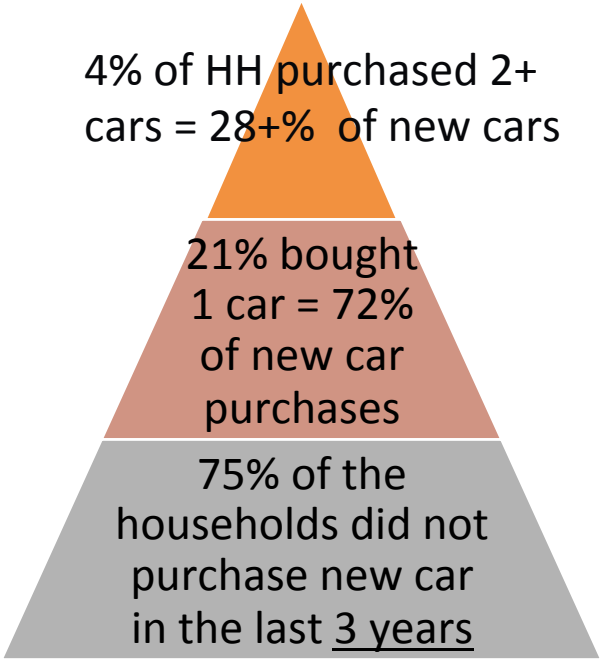
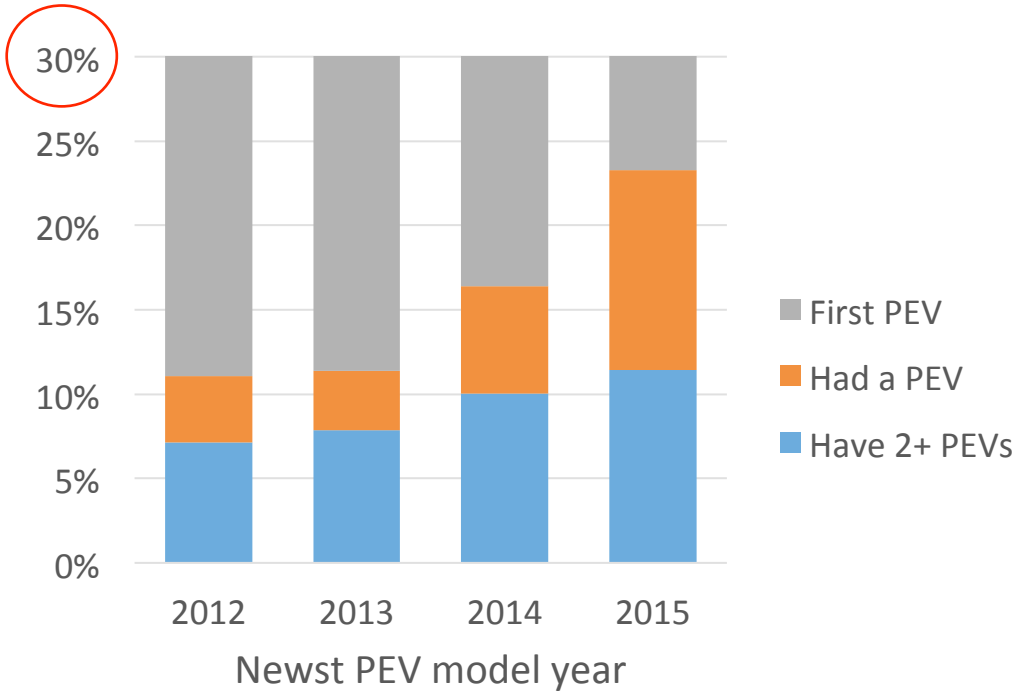
NEW CAR BUYERS AND PEV BUYERS: PEV BUYERS ARE COMING BACK FOR SECONDS

ICE Buyers



PEV Buyers



- 4% of the households are responsible for almost one third of the market over the last 3 years 2010-2012
- Up to 15% of PEV buyers are on their second PEV

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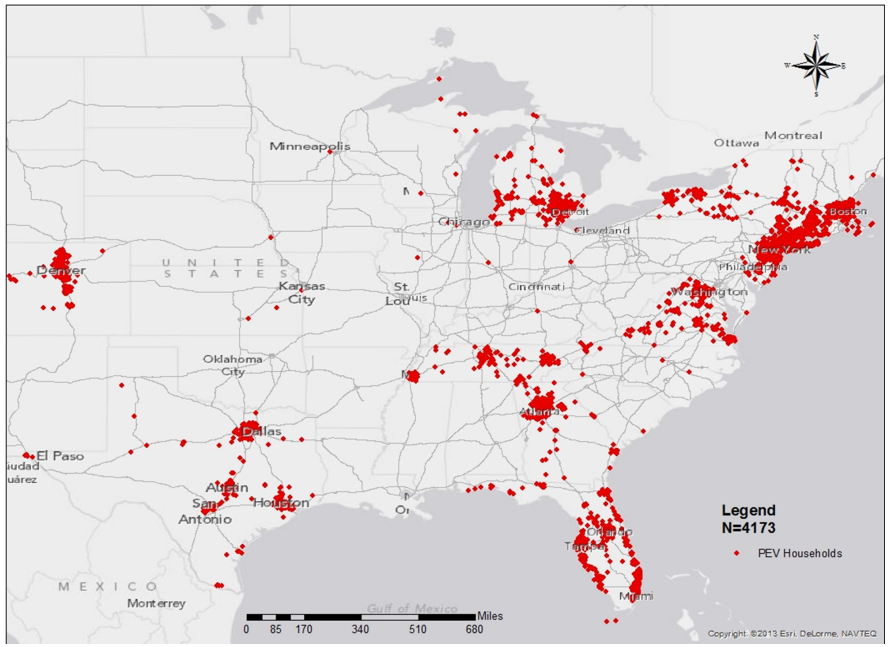
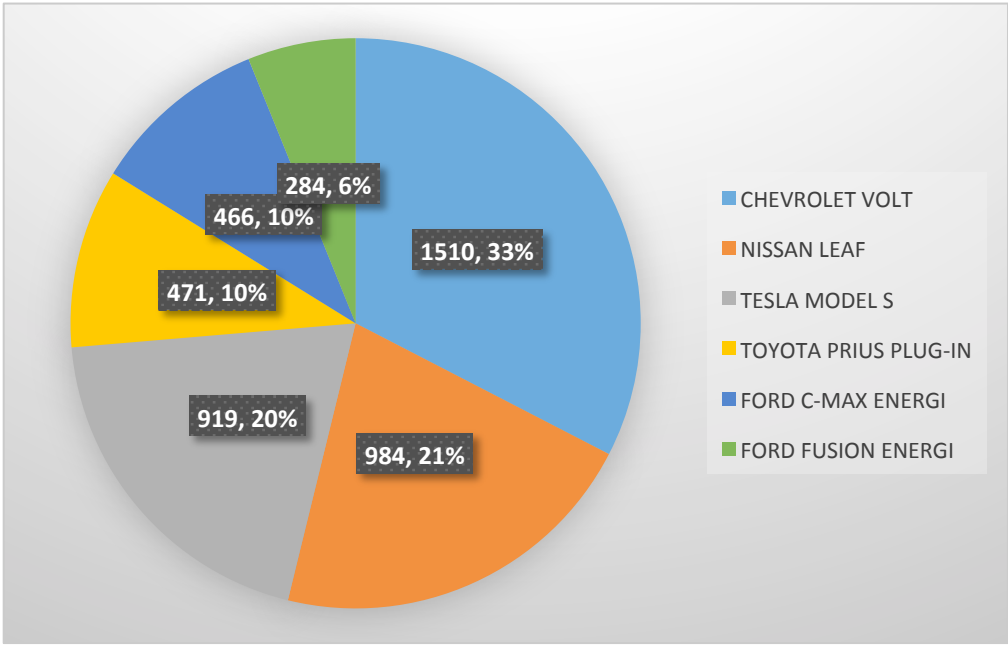
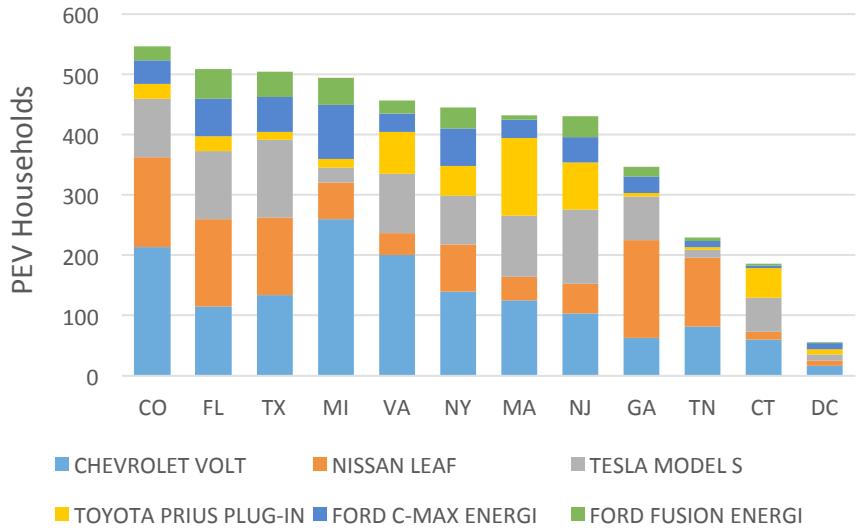
Federal Tax Credit

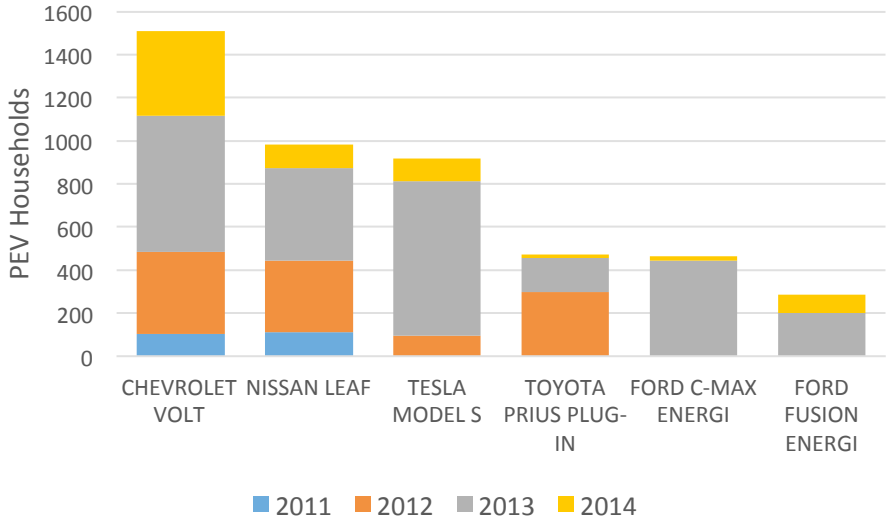
The credit is equal to $2,500 plus, for at least 5 kilowatt hours of capacity, plus an additional $417 for each kilowatt hour. The total amount of the credit allowed for a vehicle is limited to $7,500.

PEV Owner Survey (N=~4600, December 2014)









How Important was the Federal Tax Credit in the Decision to Buy a PEV?

In the next set of questions we will ask about the decision you made when buying/leasing your car. Please try to answer the following questions based on the knowledge you had when making your car purchase.

Plug-in cars are eligible for different local, state, and federal incentives. How important were those incentives in your decision to buy the TESLA MODEL S? (If the incentive was not available for you please move the slider bar to "Not Applicable")

Federal Tax Credit

Not Important | Important | Not Applicable | No answer

What is the dollar value of this incentive for your household? $ 7500

State Rebate

Not Important | Important | Not Applicable | No answer

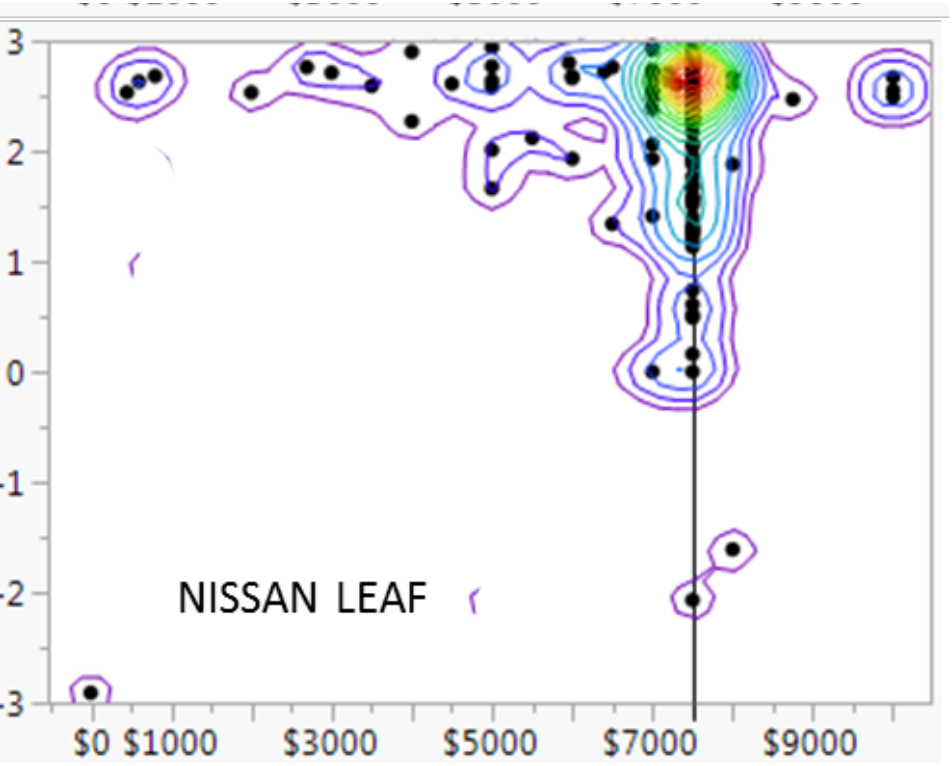
What is the dollar value of this incentive for your household? $ 1000

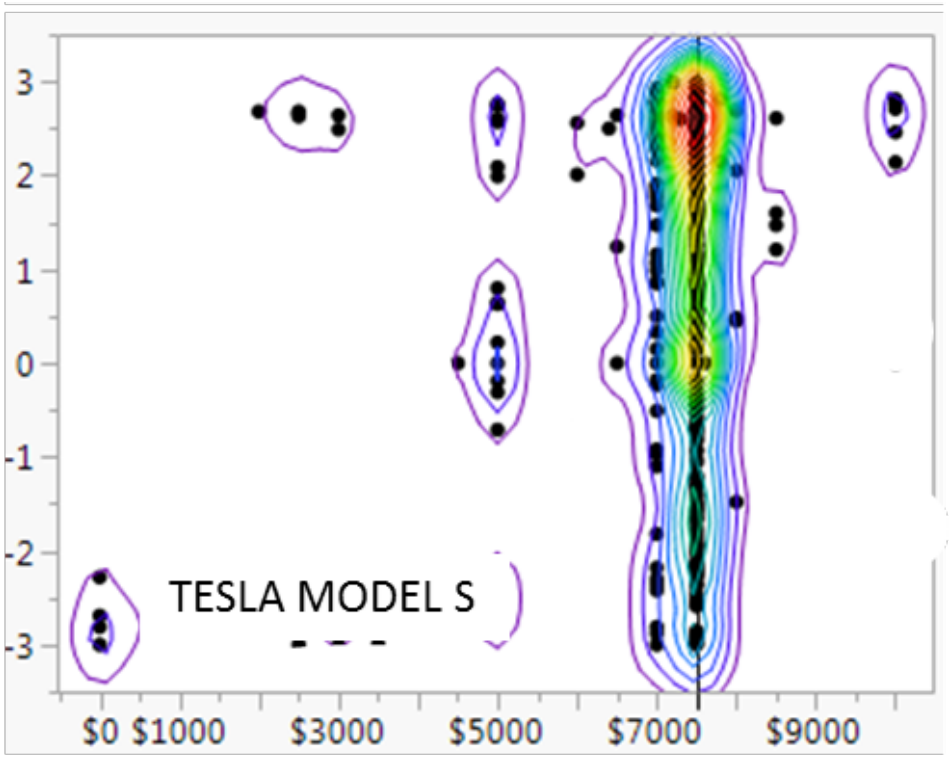
Local Rebate

Not Important | Important | **Not Applicable** | No answer

What is the dollar value of this incentive for your household? $ XXX.XX

BEVs Importance vs Value





Will They Buy the Same Car Without the Federal Incentive?

*

Please mark your decision assuming that your most important incentive is not available.

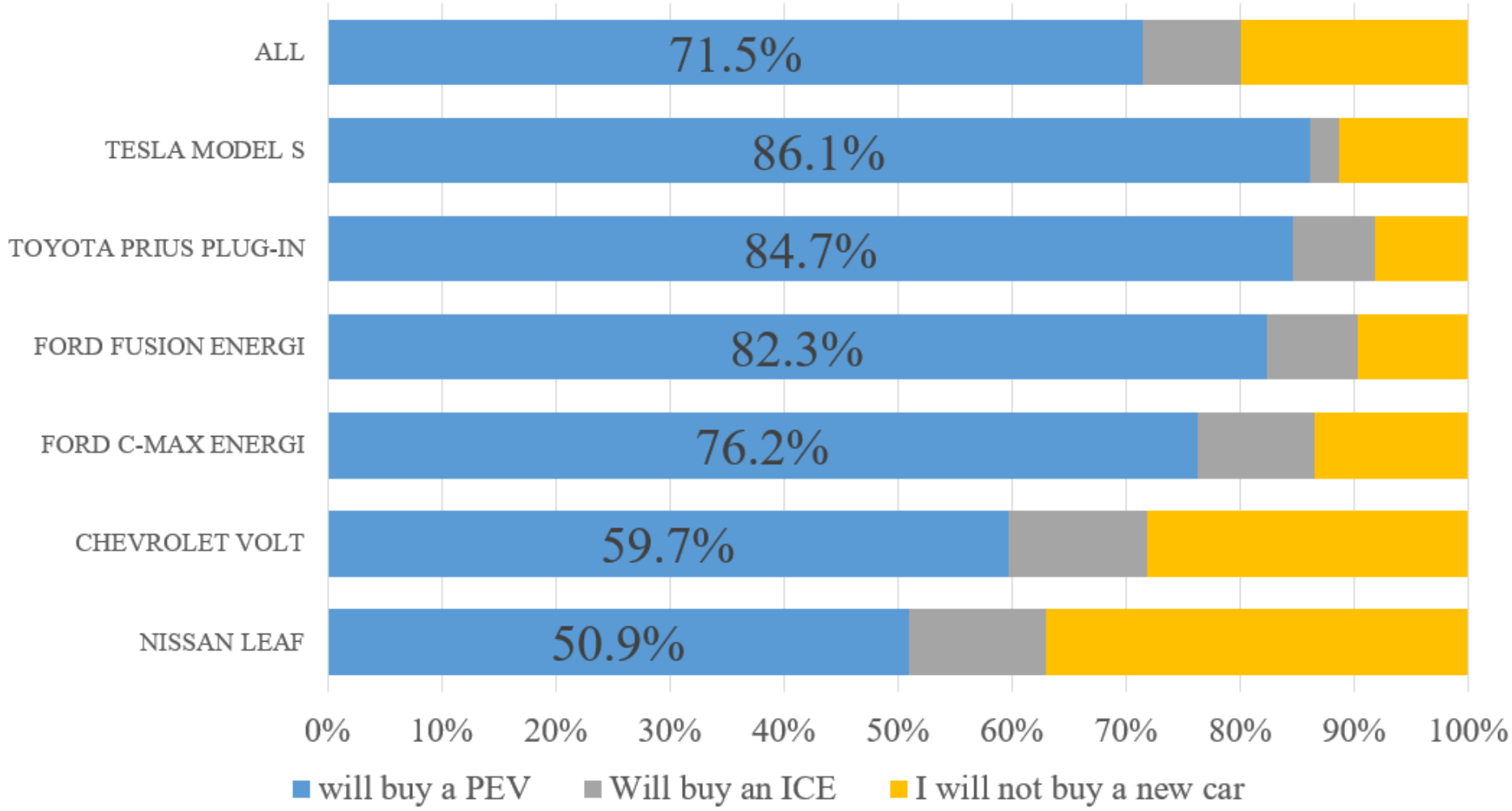
~~Federal Tax Credit: $7500.00~~
Workplace Charging
Dedicated Parking
State Rebate: $1000.00
Subsidy for Installing Home Charger: $250.00
High Occupancy Vehicle (HOV) Lane Access

I would like to go back to the vehicle selection page

Choose one of the following answers

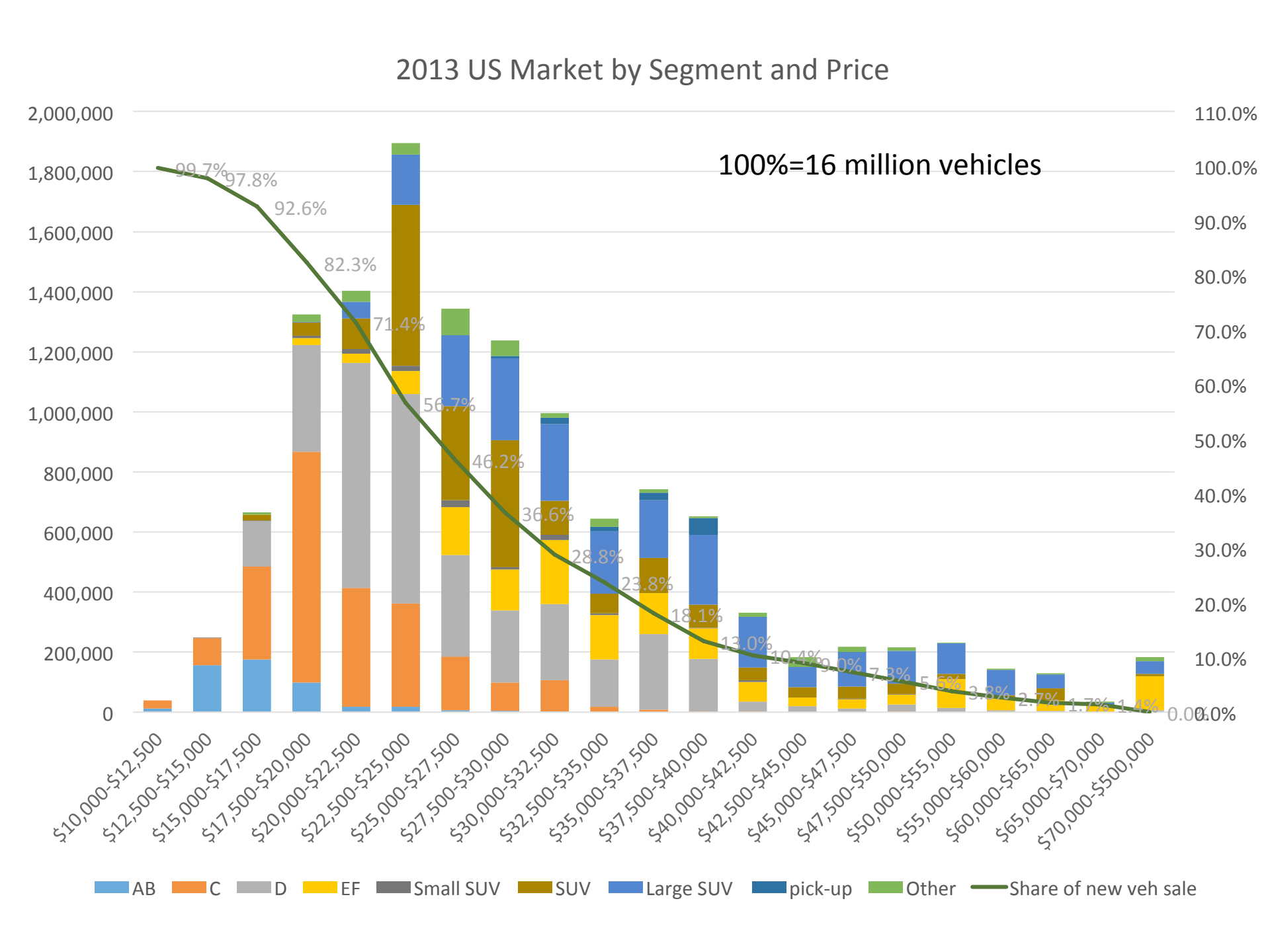
TESLA MODEL S: I will buy this car	2014 Sedan (4-door): I will buy this car	BMW 650i xDrive Gran Coupe: I will buy this car	Nissan Leaf: I will buy this car	I will not buy a new car

Vehicle Choice Without the Federal Tax Credit

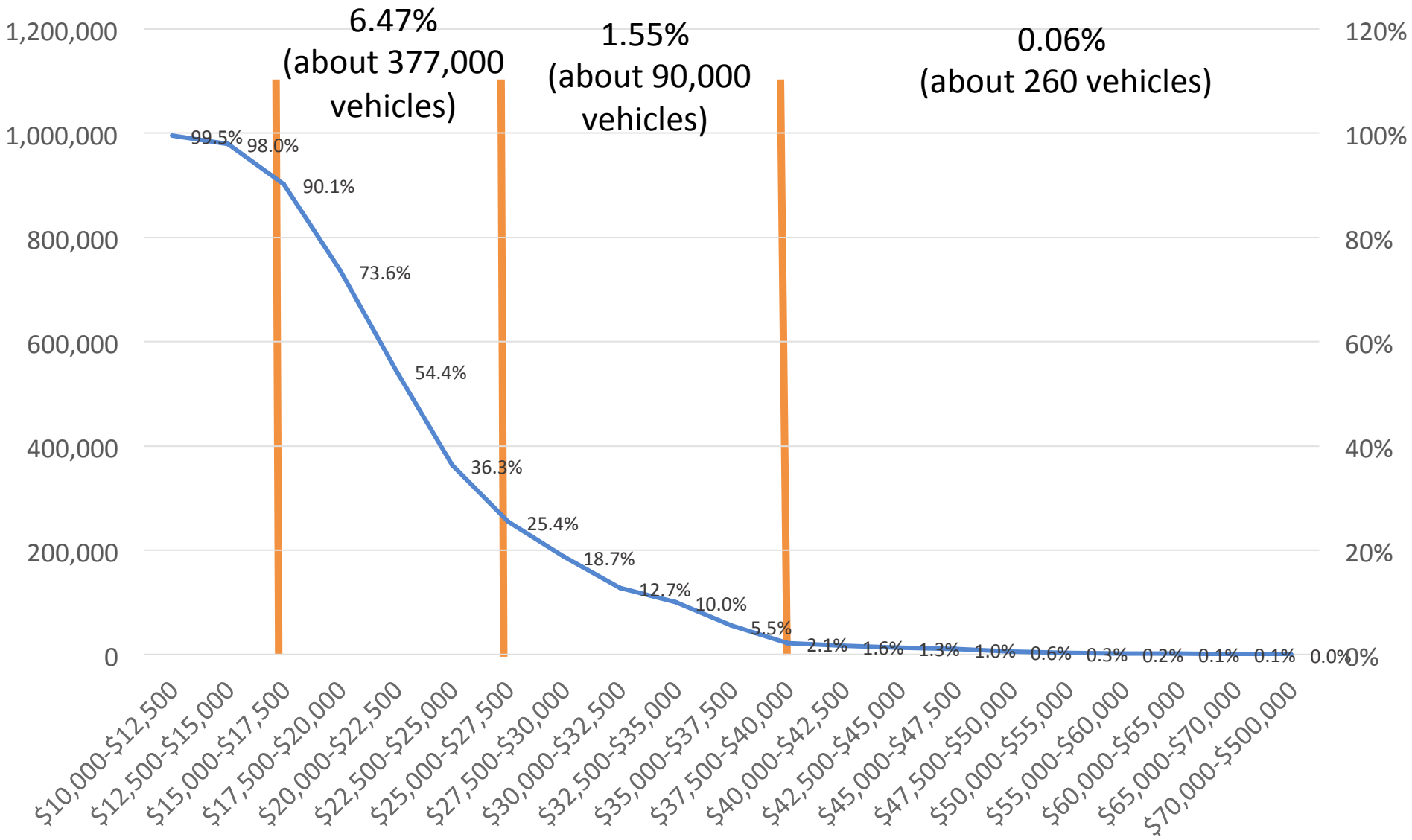


The Impact of $1000 per vehicle Federal Tax Credit (Actual Incentive $2,500-$7,500)

	What is the Impact of $1000 per vehicle Federal Incentive?		
	Additional PEV sales	Battery Capacity (kWh)	eVMT per year (miles)
NISSAN LEAF	0.068	1.6	658
FORD C-MAX ENERGI	0.062	0.5	252
TOYOTA PRIUS PLUG-IN	0.061	0.3	152
CHEVROLET VOLT	0.057	1.0	517
FORD FUSION ENERGI	0.047	0.4	204
TESLA MODEL S	0.019	1.6	240


2013 US Market by Segment and Price
100%=16 million vehicles
2,000,000
1,800,000
1,600,000
1,400,000
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
110.0%
100.0%
90.0%
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
99.7%
97.8%
92.6%
82.3%
71.4%
56.7%
46.2%
36.6%
28.8%
23.8%
18.1%
13.0%
10.4%
9.0%
7.3%
5.6%
3.8%
2.7%
1.7%
1.4%
0.0%
$10,000-$12,500
$12,500-$15,000
$15,000-$17,500
$17,500-$20,000
$20,000-$22,500
$22,500-$25,000
$25,000-$27,500
$27,500-$30,000
$30,000-$32,500
$32,500-$35,000
$35,000-$37,500
$37,500-$40,000
$40,000-$42,500
$42,500-$45,000
$45,000-$47,500
$47,500-$50,000
$50,000-$55,000
$55,000-$60,000
$60,000-$65,000
$65,000-$70,000
$70,000-$500,000
AB
C
D
EF
Small SUV
SUV
Large SUV
pick-up
Other
Share of new veh sale

The Impact of $1000 price Change on the Potential Market



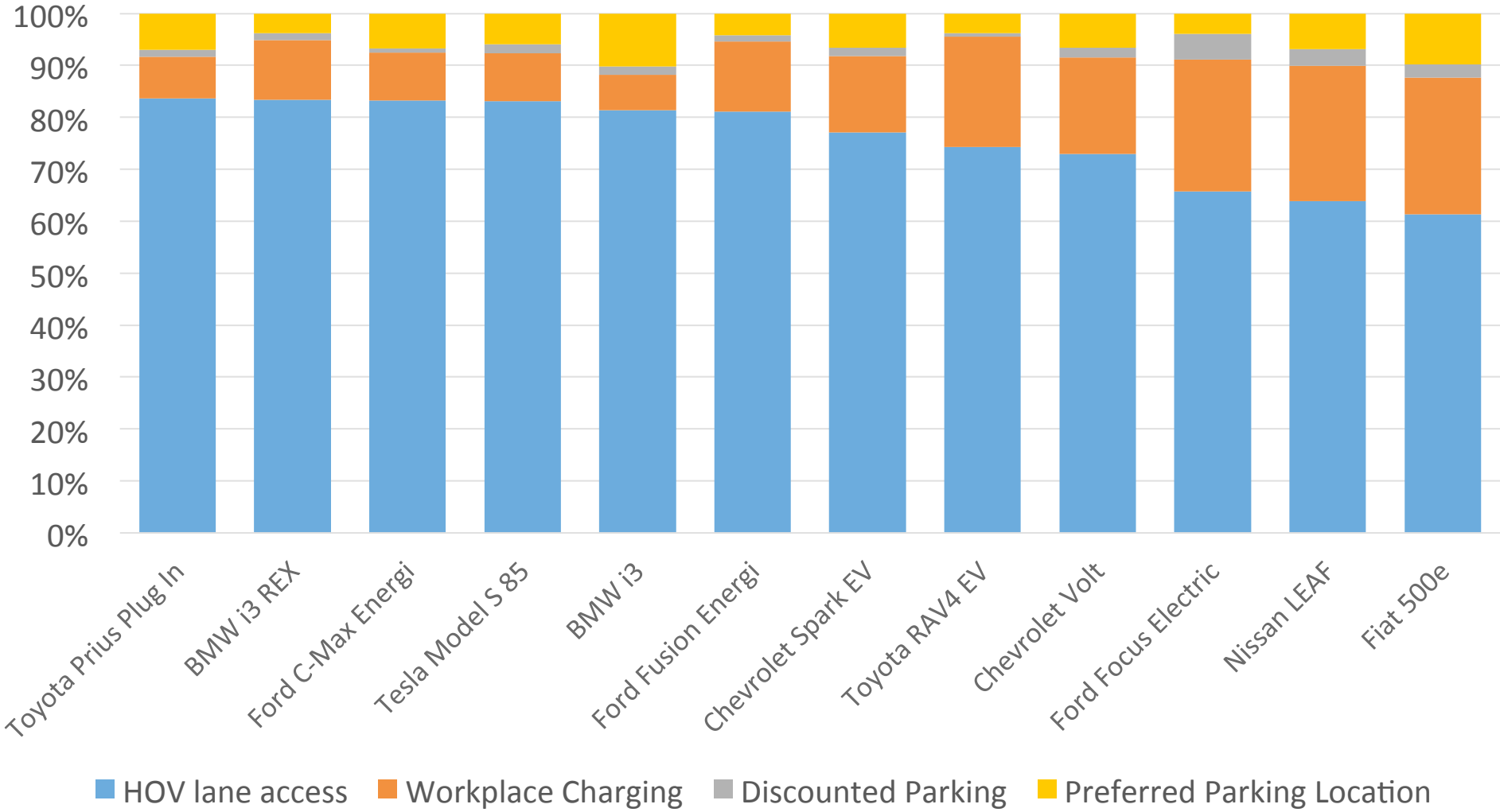
Interim Conclusions

- Almost half of the BEV 80 vehicle sales in the US can be attributed to the federal tax credit.
- The credit has a higher impact when applied at the maximum rate for both the Volt PHEV and the LEAF BEV (both in term of sales and in terms of additional eVMT).
- The impact on Tesla Model S sales is relatively low reflecting the share of the incentive of both the vehicle cost and the buyer's income.

Non Monetary Incentives

The Case of HOV access in California

Most Important Non Monetary Incentives in California



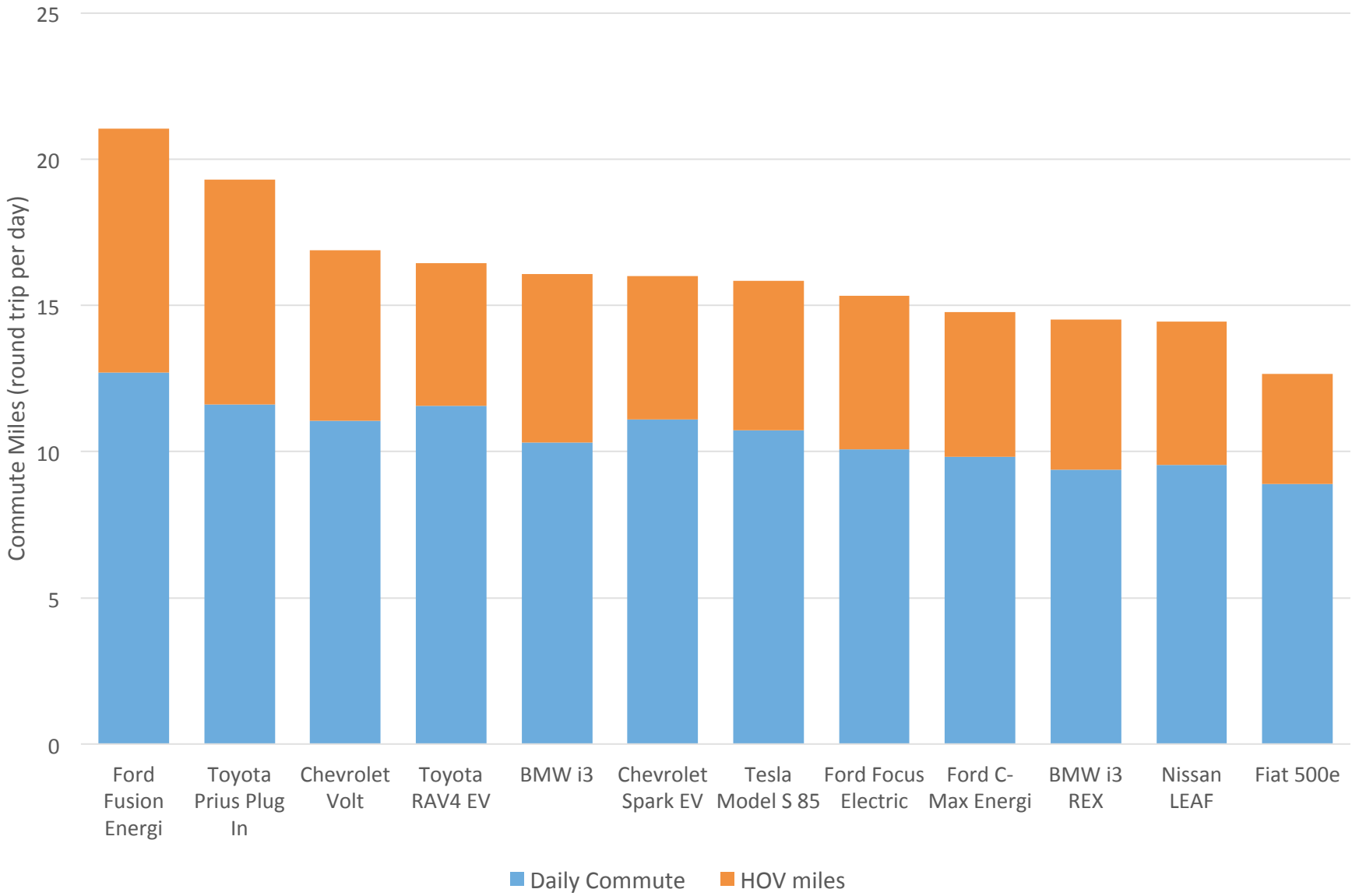
Single Occupancy Vehicle HOV Access Permits in California

1. White stickers , available to an unlimited number of qualifying federal inherently-low-emission vehicles, which are mostly 100% battery electric vehicles (BEVs) and compressed natural gas vehicles and

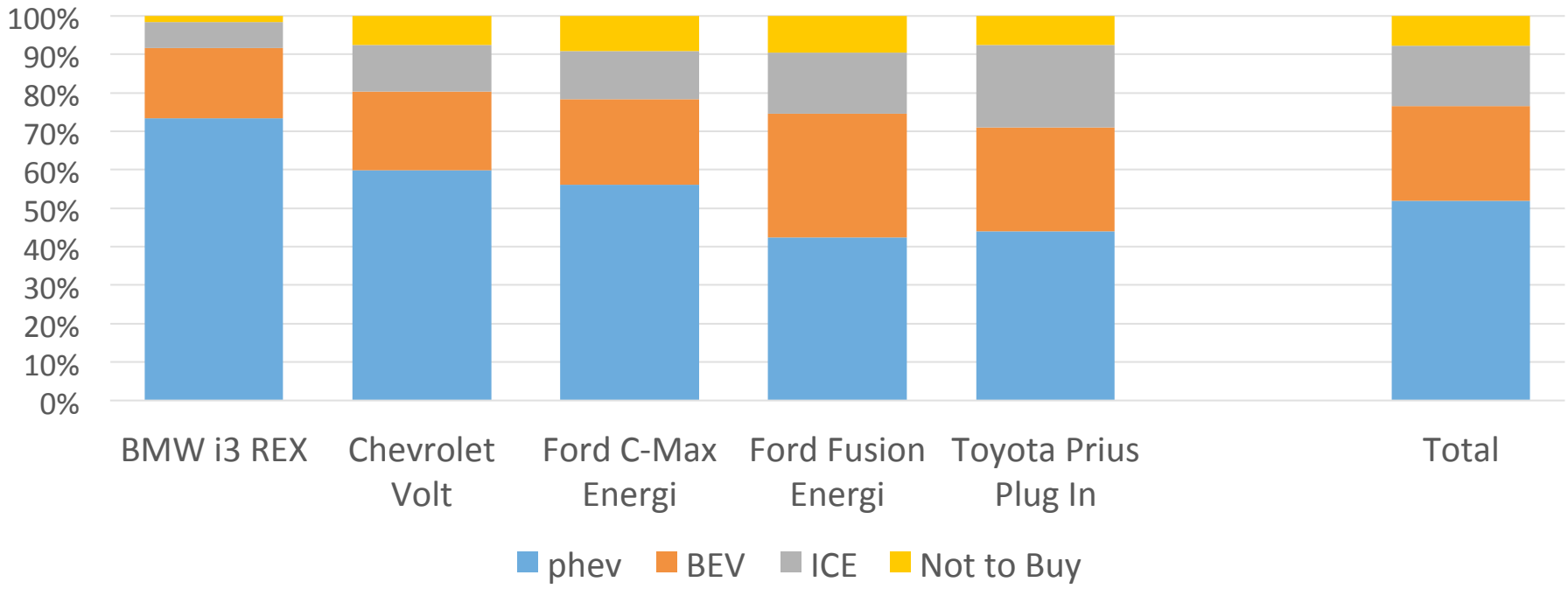
2. Green stickers , available to the first 75,000 applicants that purchase or lease cars meeting California's transitional zero emission vehicle (TZEV) requirement, which are mostly plug-in hybrid electric vehicles (PHEVs).

- The expiration date for both the green and white stickers is 2019.
- HOV stickers save time and money (On bridge tolls, access tolls and HOT lanes)

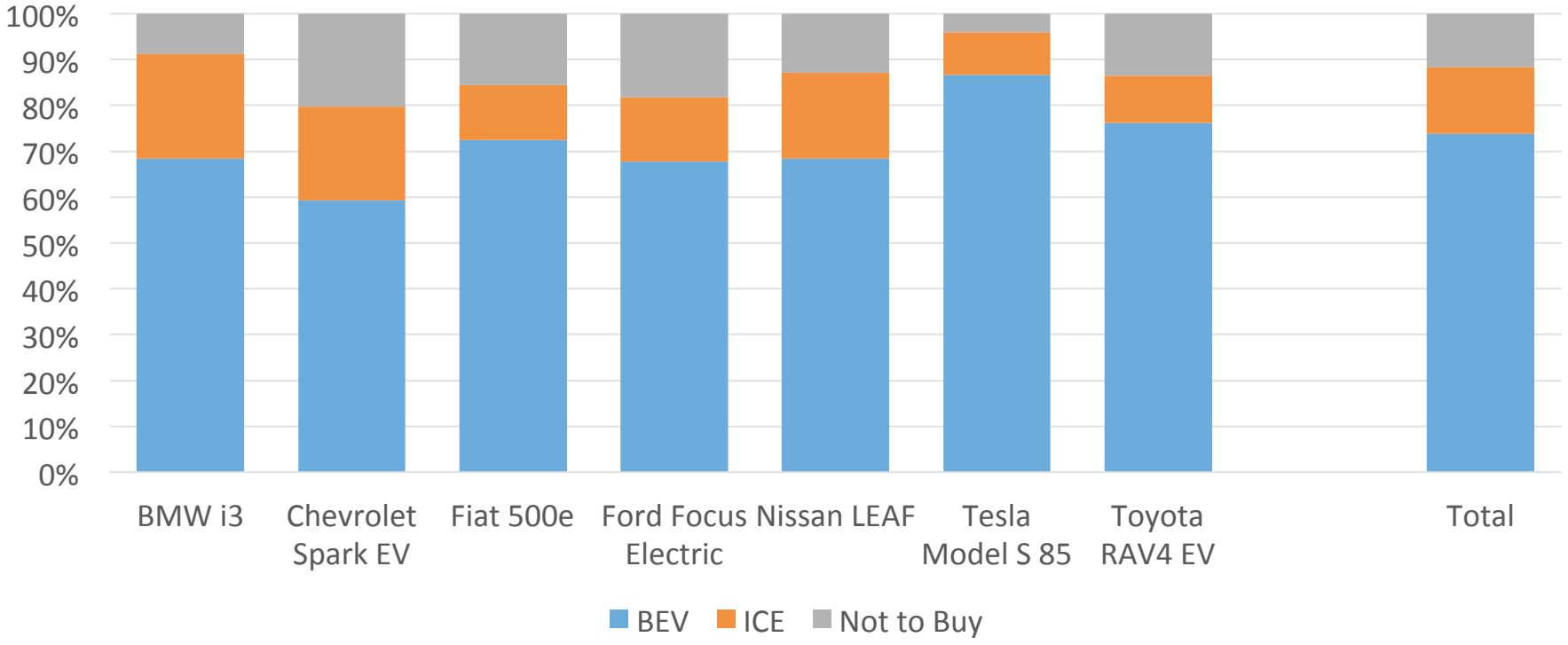
HOV Usage for Commute



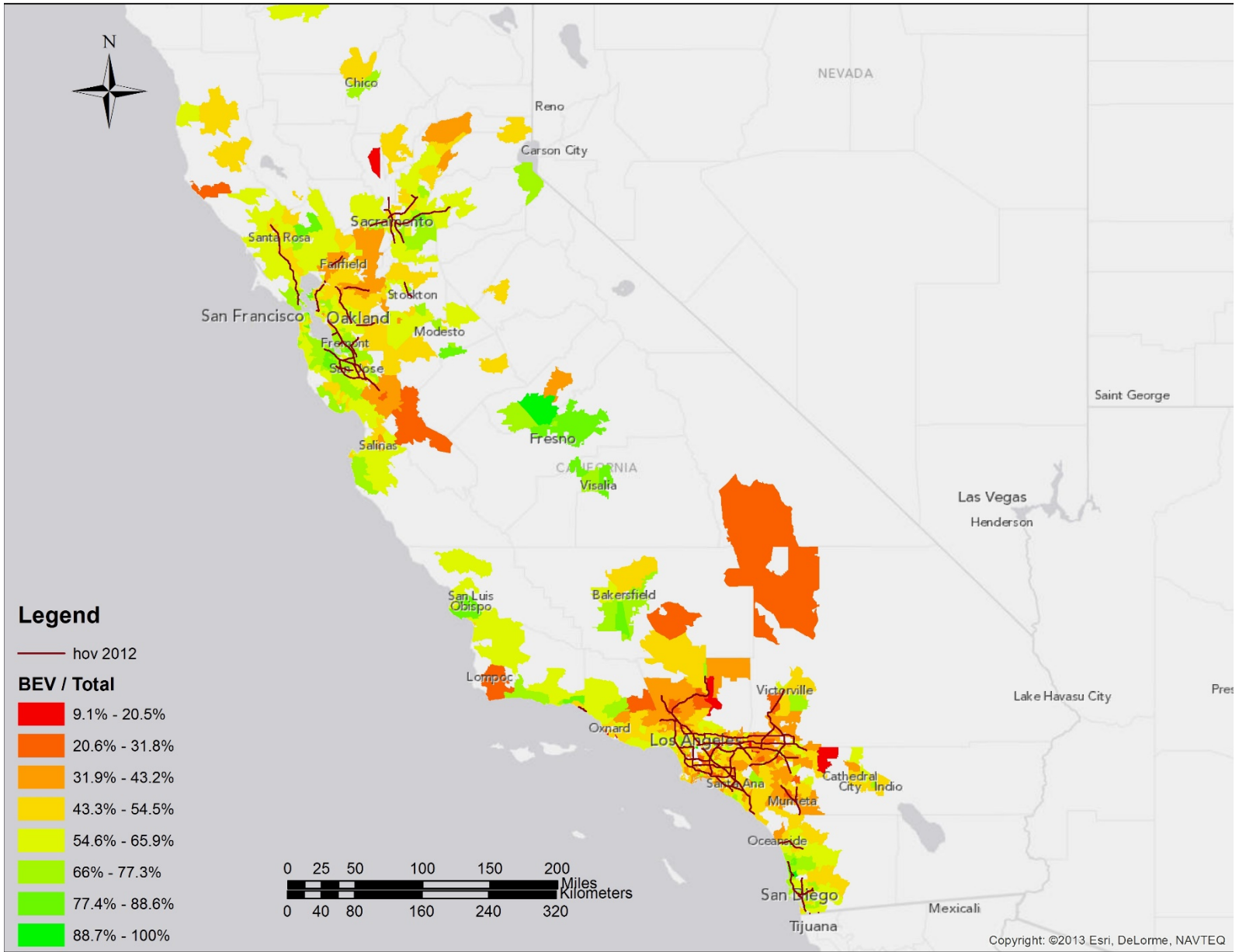
What Will a PHEV Driver Buy Without the Green Sticker?



What a BEV Driver Buy Without HOV Access?



BEV to PEV Ratio (N=100,211)



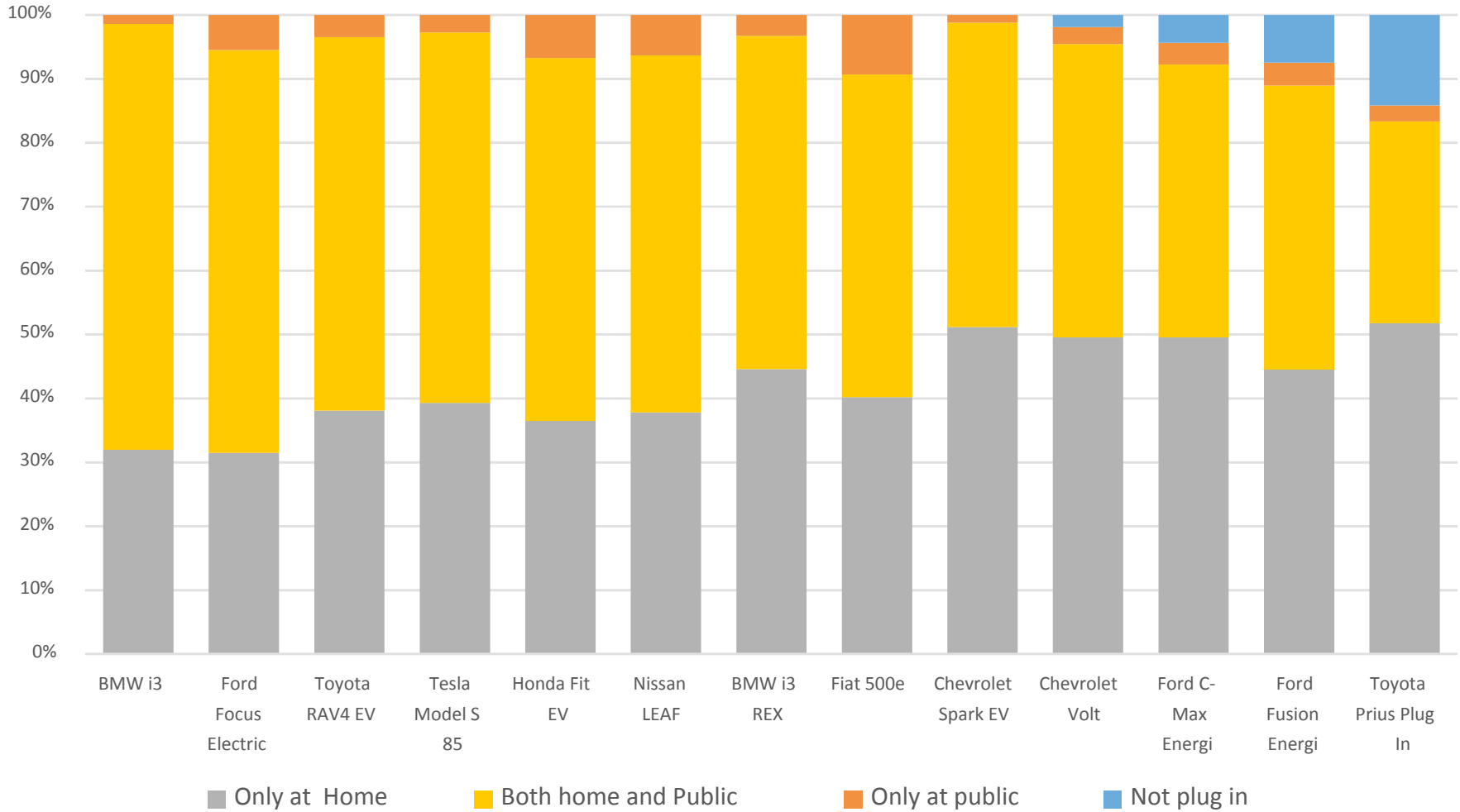
Policy Options

- Limit the stickers to vehicles with longer EV range or BEVs only
    - Up to 50% of the potential "sticker buyers" will go for a BEV (or a long range PHEV?)
    - Will they plug in more?
- Limit the sticker to three years instead of a fixed sunset date
    - Open question:
        - What is the cost of enforcing this system?
        - How it will influence the incentive?
        - What about two sunset terms instead of one?
- Reduce or Cancel monetary rebate (state rebate) for sticker takers

Non-Monetary Incentives

The Case of Commute Charging

Where/do they Charge?



Focus Groups: The Role of Public Infrastructure

- Group 1
  - 12 participants
- Group 2
  - 15 participants
- Vehicles
  - Tesla Model S, Honda Fit, Toyota RAV4, Nissan Leaf, Ford C-Max, Toyota Prius Plug-in, Fiat 500e, Chevy Volt, Mercedes B-Class, Ford Fusion, Chevy Spark

Topics

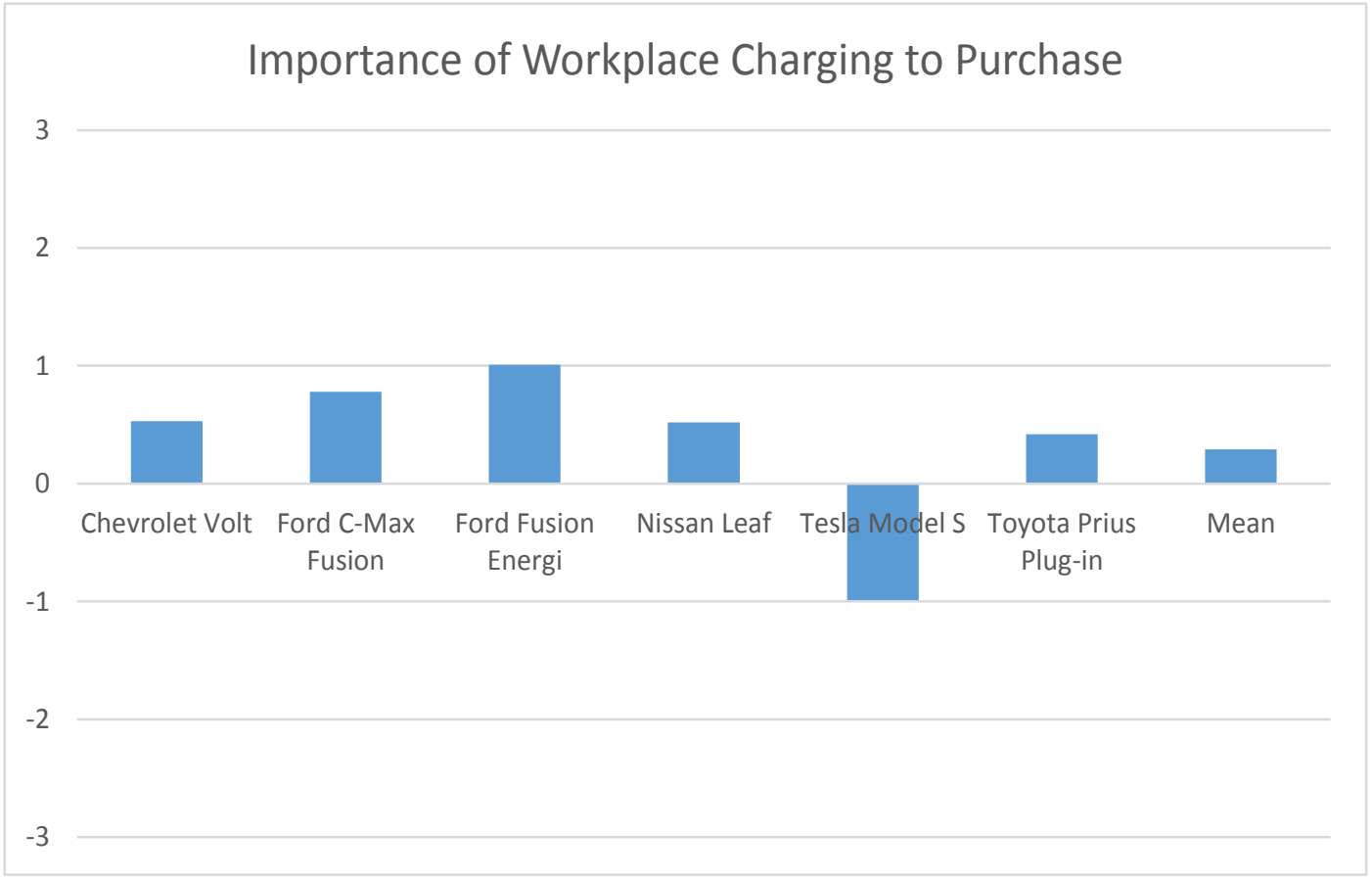
- **What was the role of public infrastructure in the decision to buy the PEV?**
- How does public infrastructure impact purchase and will it change PEV usage?
  - Location
  - Type
  - Willingness to pay for public charging
- Etiquette
- Future Vehicles

The Role of Chargers in Buying PEV Focus Group Results:

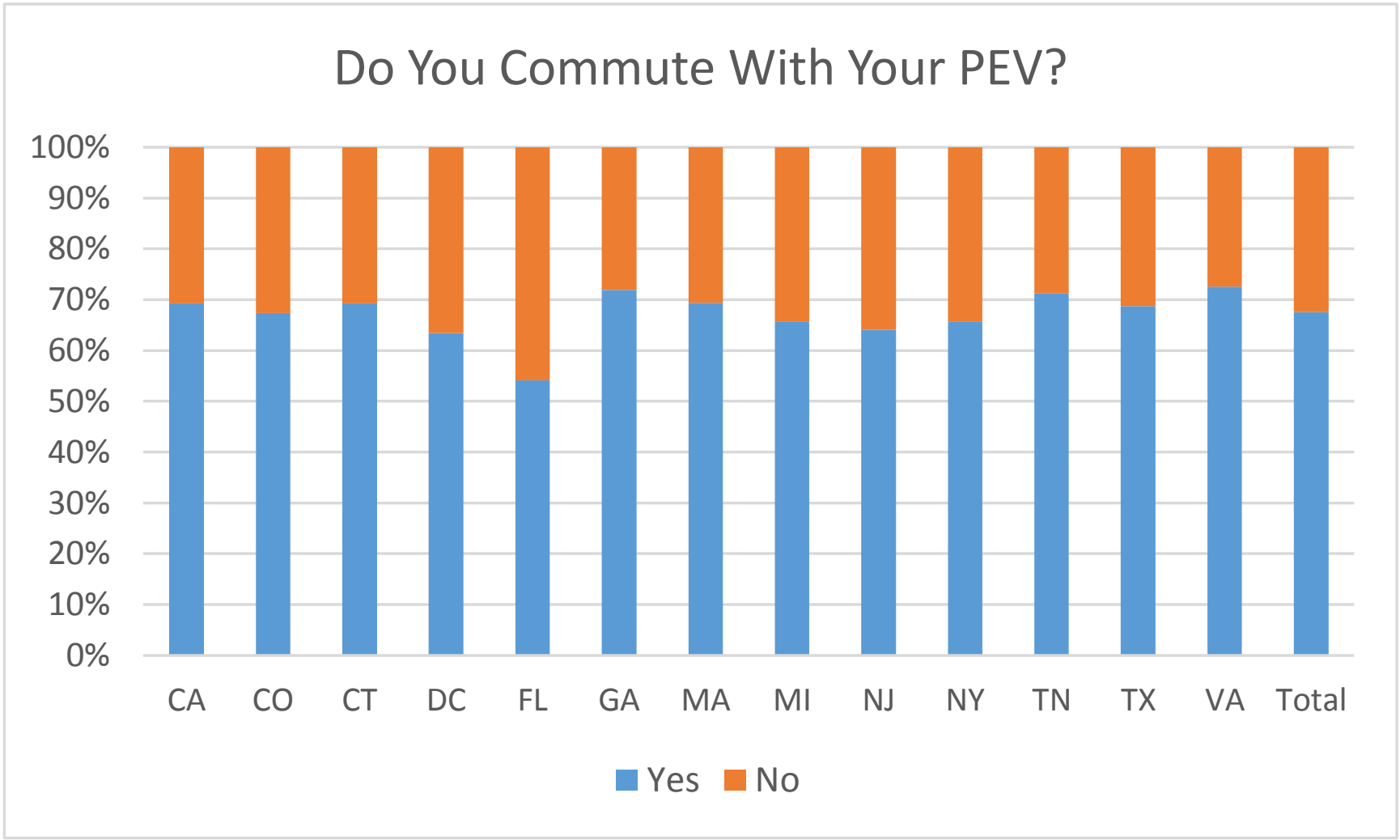
- Nissan LEAF leased household:
  - *The free workplace charging balanced out the lease cost, we would have stay with one car without it.*
- Ford Fusion downtown household:
  - *I couldn't charge at home, the free chargers a block from home are my main option, but now they are occupied even at night.*
- Fiat 500 household:
  - *We just stopped at the dealer to kick tires, we had no idea where we will plug it in when we drove it home.*
- Nissan LEAF household:
  - *There are no public chargers that I can use, the few available are always in use.*
- Toyota Prius household:
  - *I planed on using 120v at home and all the public chargers in Berkeley, but I'm not using it anymore.*
- Toyota Prius household:
  - *My next car will be a BEV, but I'm waiting for the electric highway to be finished.*

How Important is it for Purchase?

3 = Extremely Important. -3 = Not at All Important

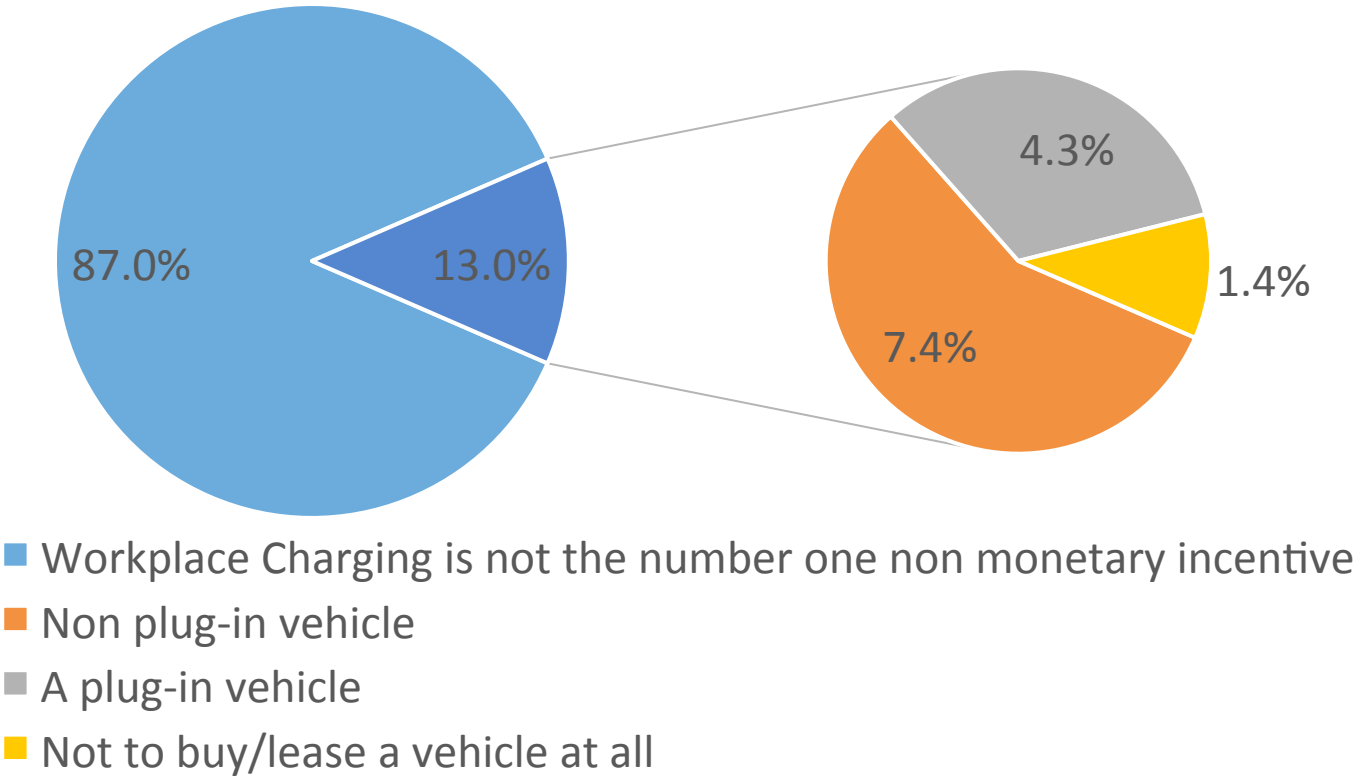


65%-70% of Households Commute with PEV



How Many PEVs Can Be Directly Attributed to Workplace Charging?

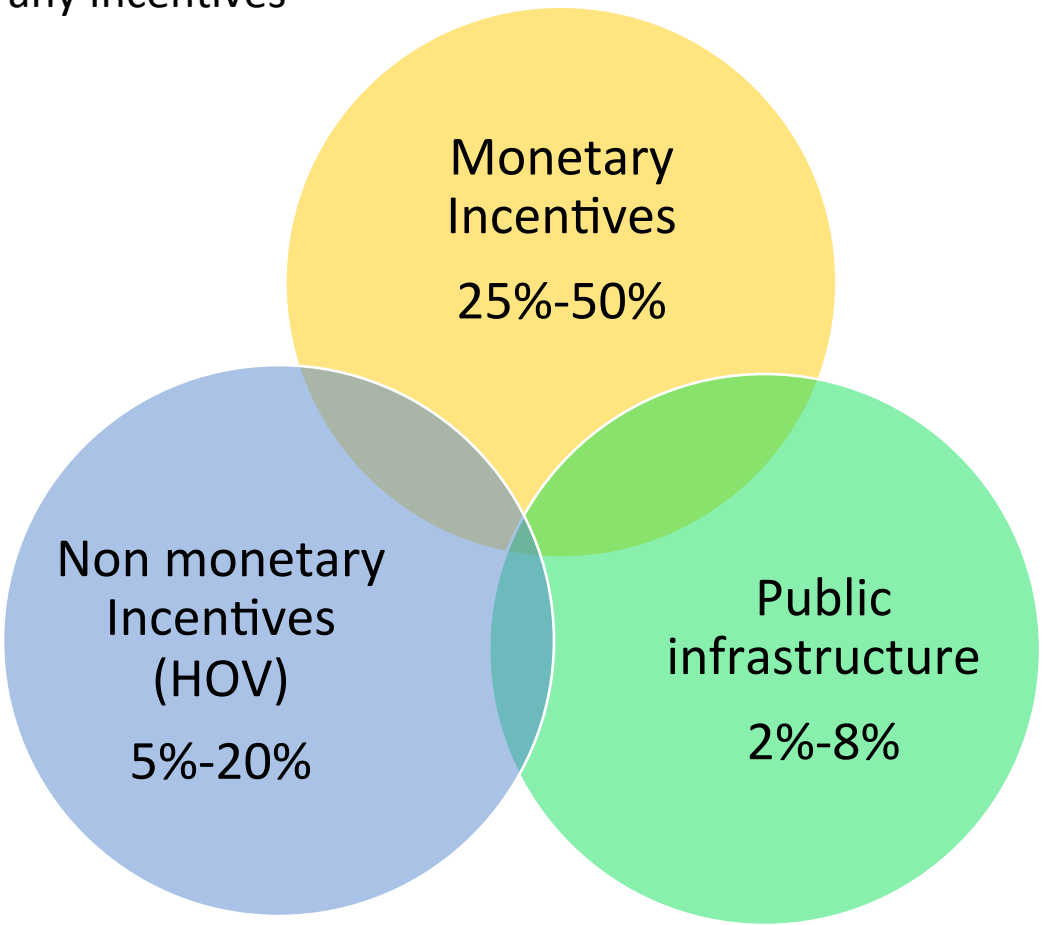
- If workplace charging were not available when buying my PEV (or any other plug-in vehicle) I would choose:



Only about third of the respondents report a non-monetary incentive i.e. total sales that can be directly attributed to workplace chargers may be lower than 6.0%

Overlapping Incentives

No Need of any Incentives
22%-50%



Conclusions

- Monetary incentives work, but can be optimized based on sales price
- Non-monetary incentives work but may be correlated with less desired eVMT results.
- What is the measure for success? Green HOV stickers sell more PHEVs but white stickers may create more EVMT.
- Not all buyers need all incentives. Allow a selection of one incentives over the other (HOV access or CVRP for example) may reduce public cost with very low impact on sales.

Thank You

Questions?