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PLUG-IN HYBRID & ELECTRIC VEHICLE RESEARCH CENTER
of the Institute of Transportation Studies

PEV Market, Incentives and Usage 2011-2018

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The Plug-in Hybrid & Electric Vehicle (PH&EV) Research Center

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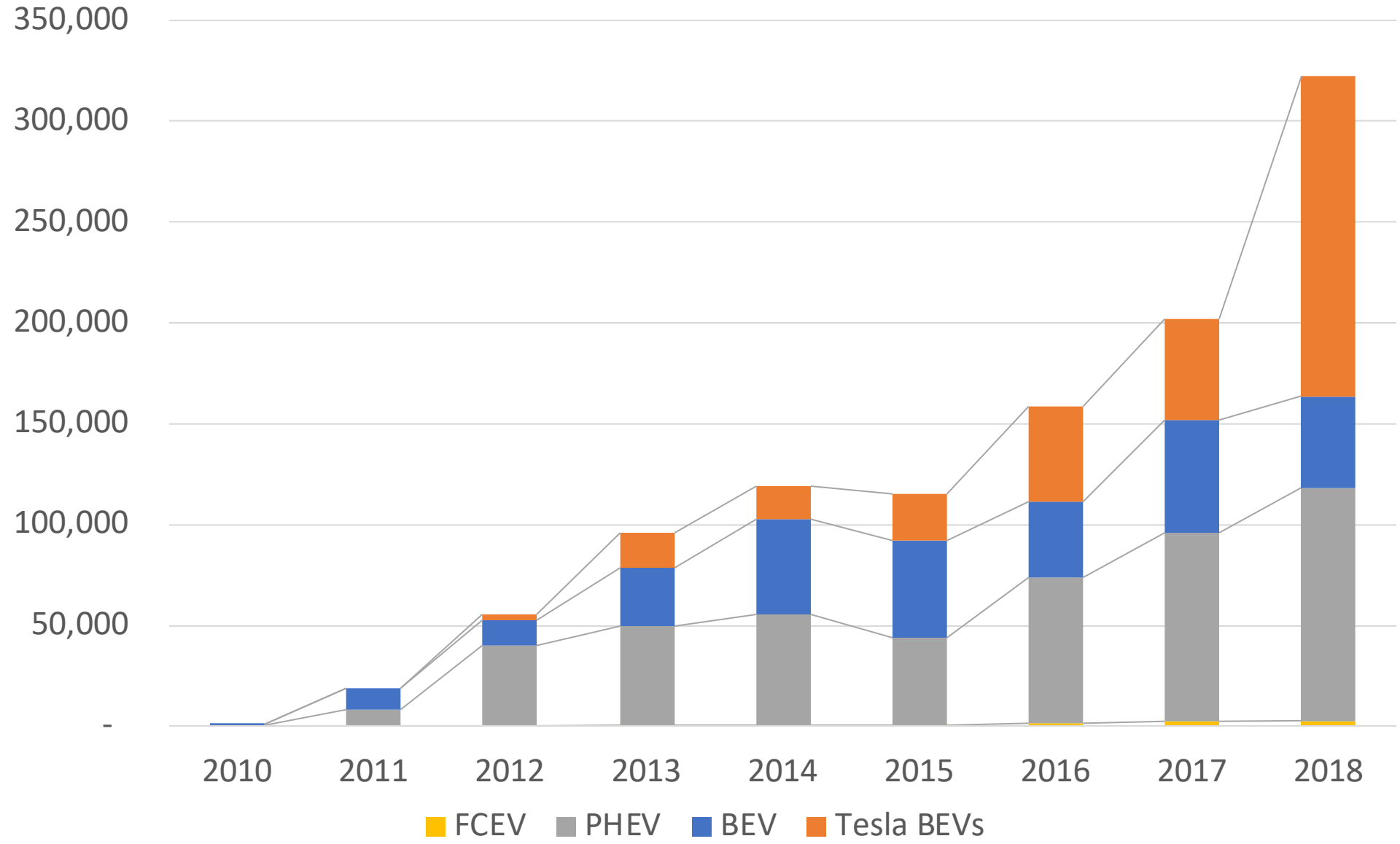
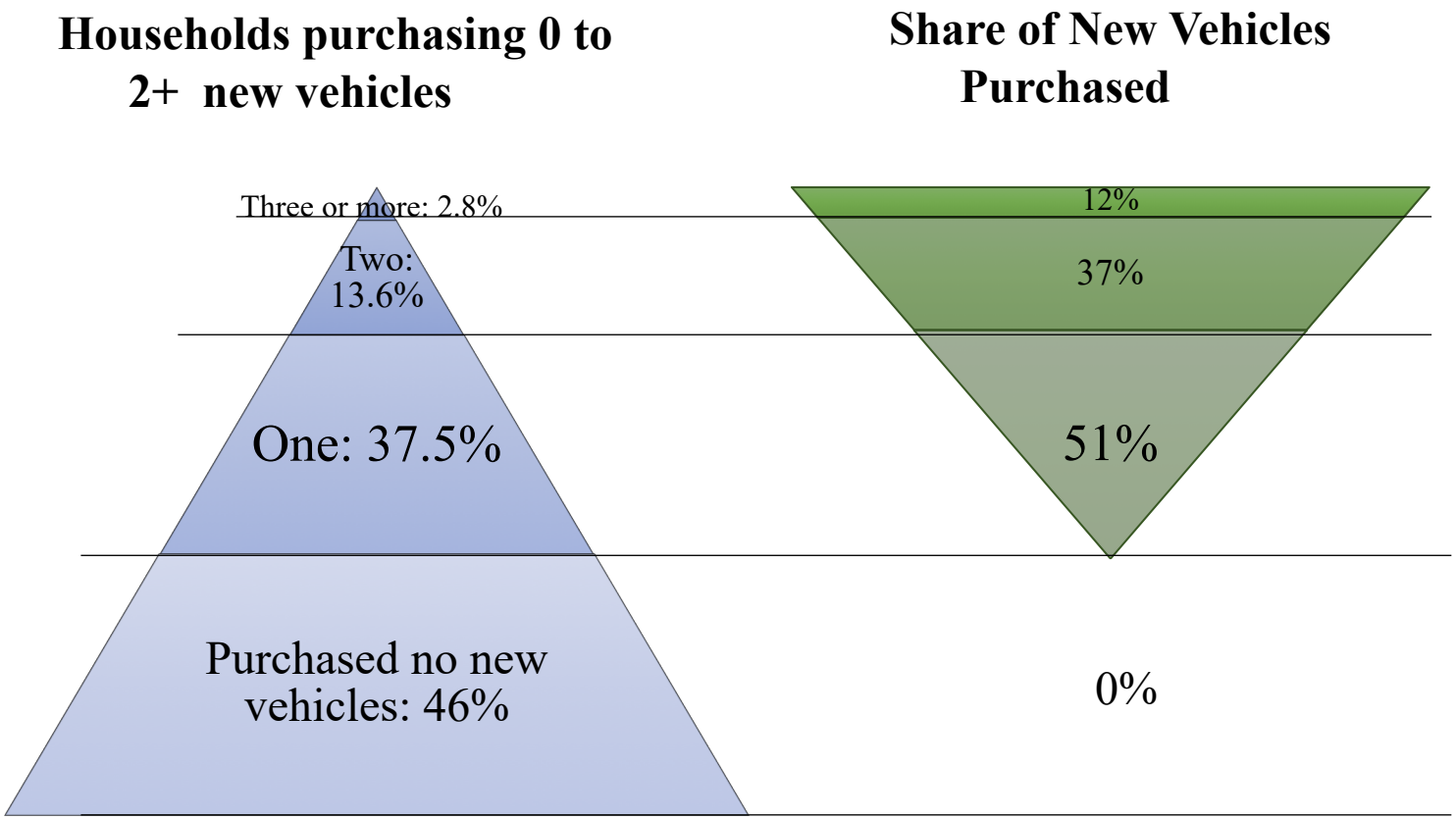
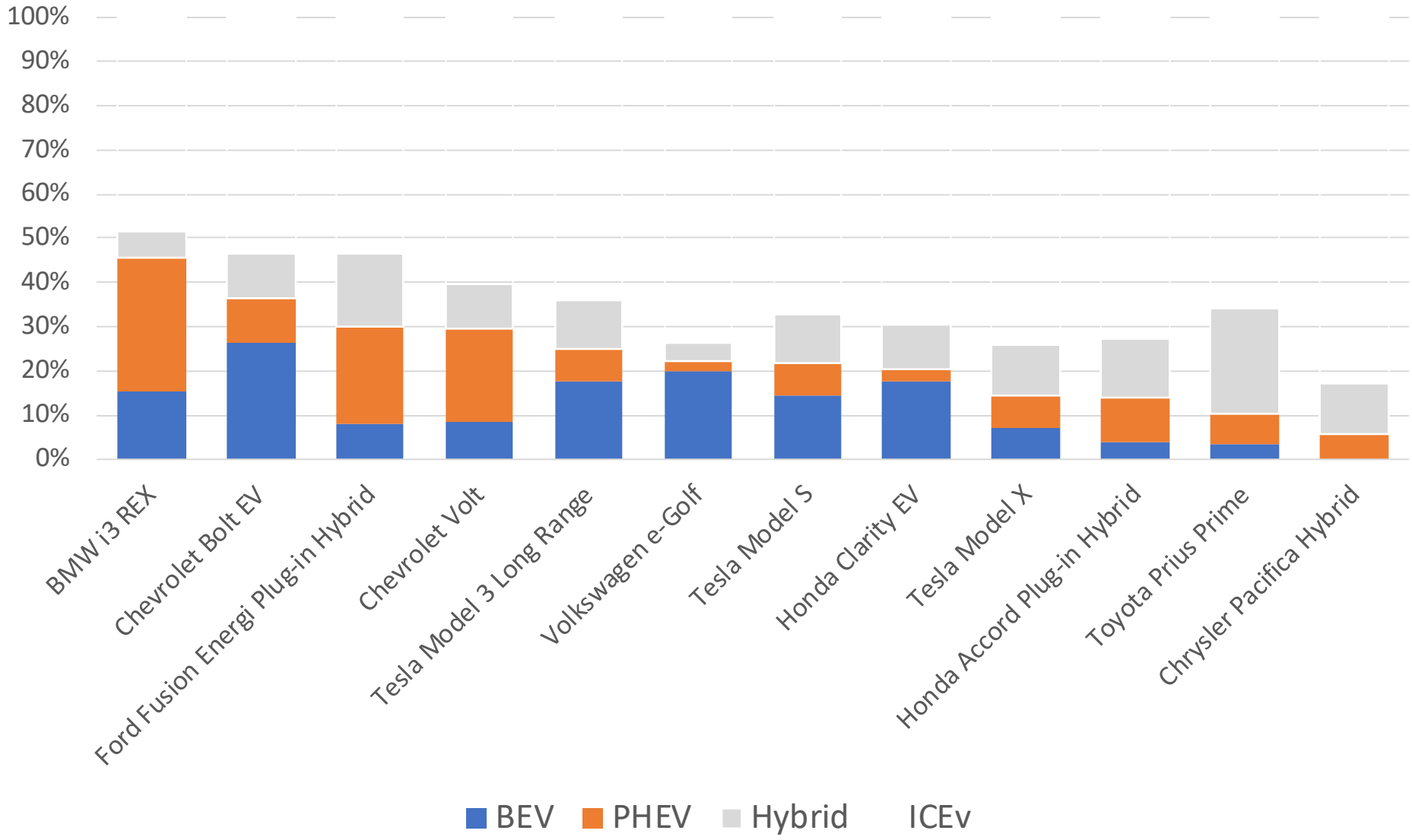
USA PEV sales were growing slower than rest of world until 2018, but the Model 3 changed the picture



Who Bought New Vehicles in California (2010 to 2017)?



Vehicle Replacement by new PEV, 2018



A plausible California scenario

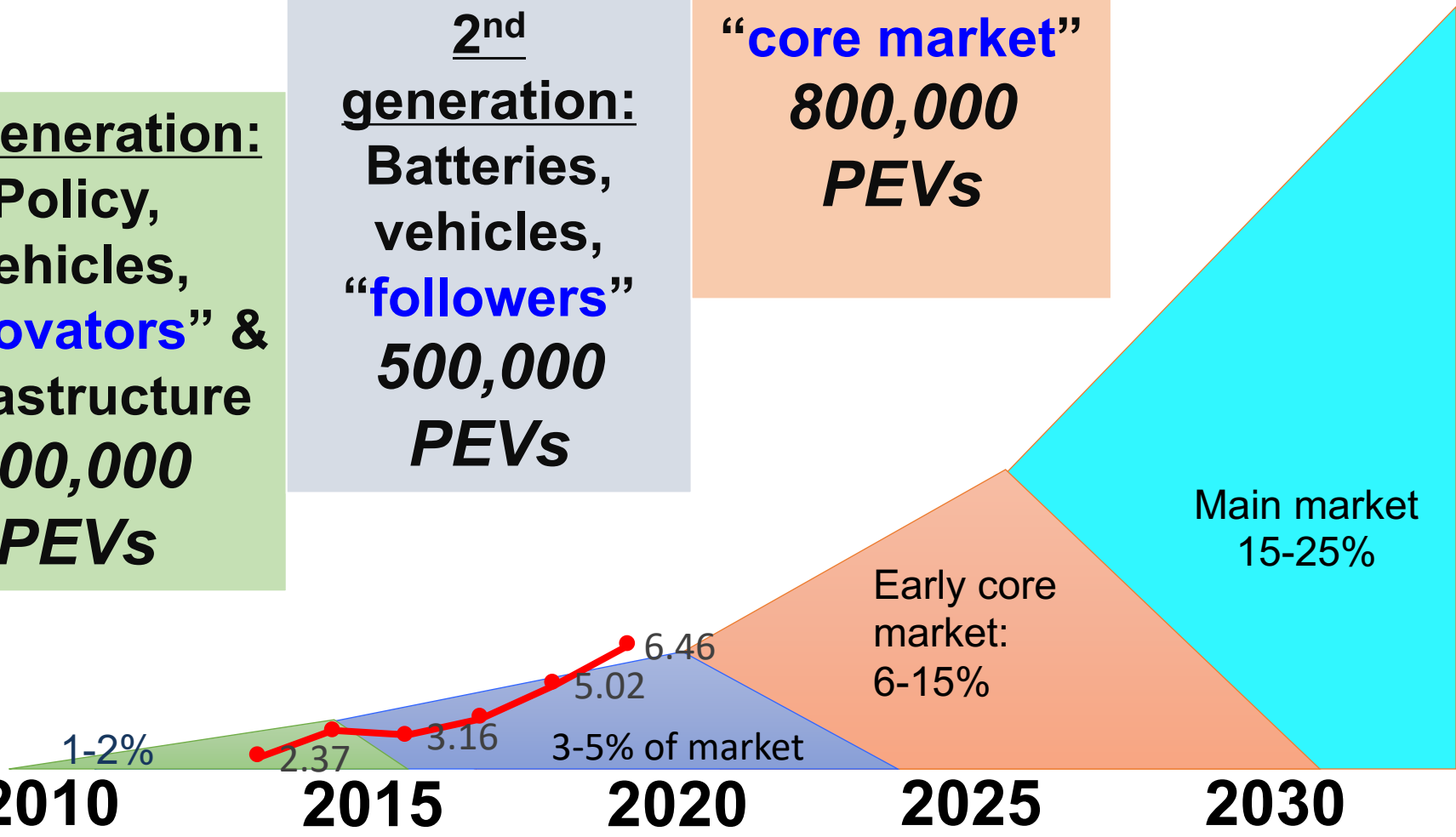
Curve based on rollout of HEVs in Japan & California 1997-2015

1st generation: Policy, vehicles, "innovators" & infrastructure ***200,000 PEVs***

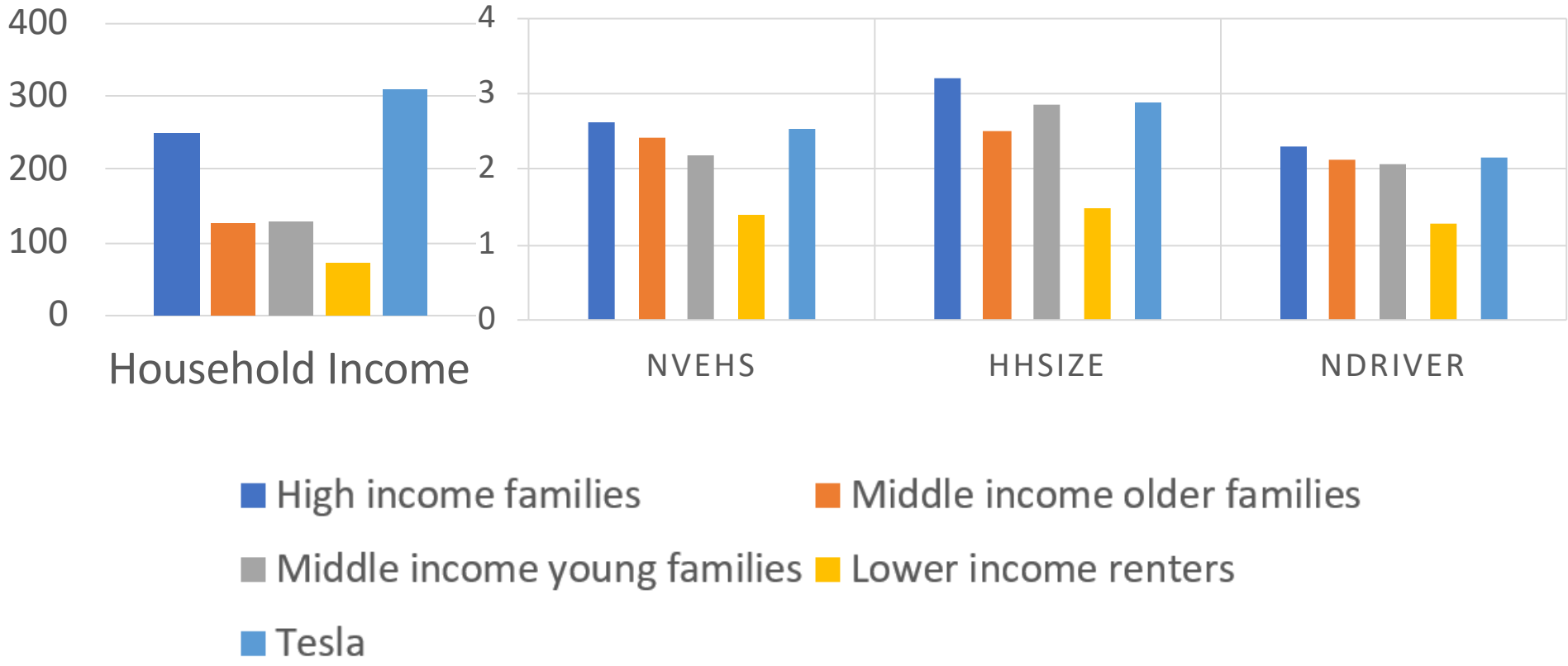
2nd generation: Batteries, vehicles, "followers" ***500,000 PEVs***

3rd generation: Batteries, vehicles, "core market" ***800,000 PEVs***

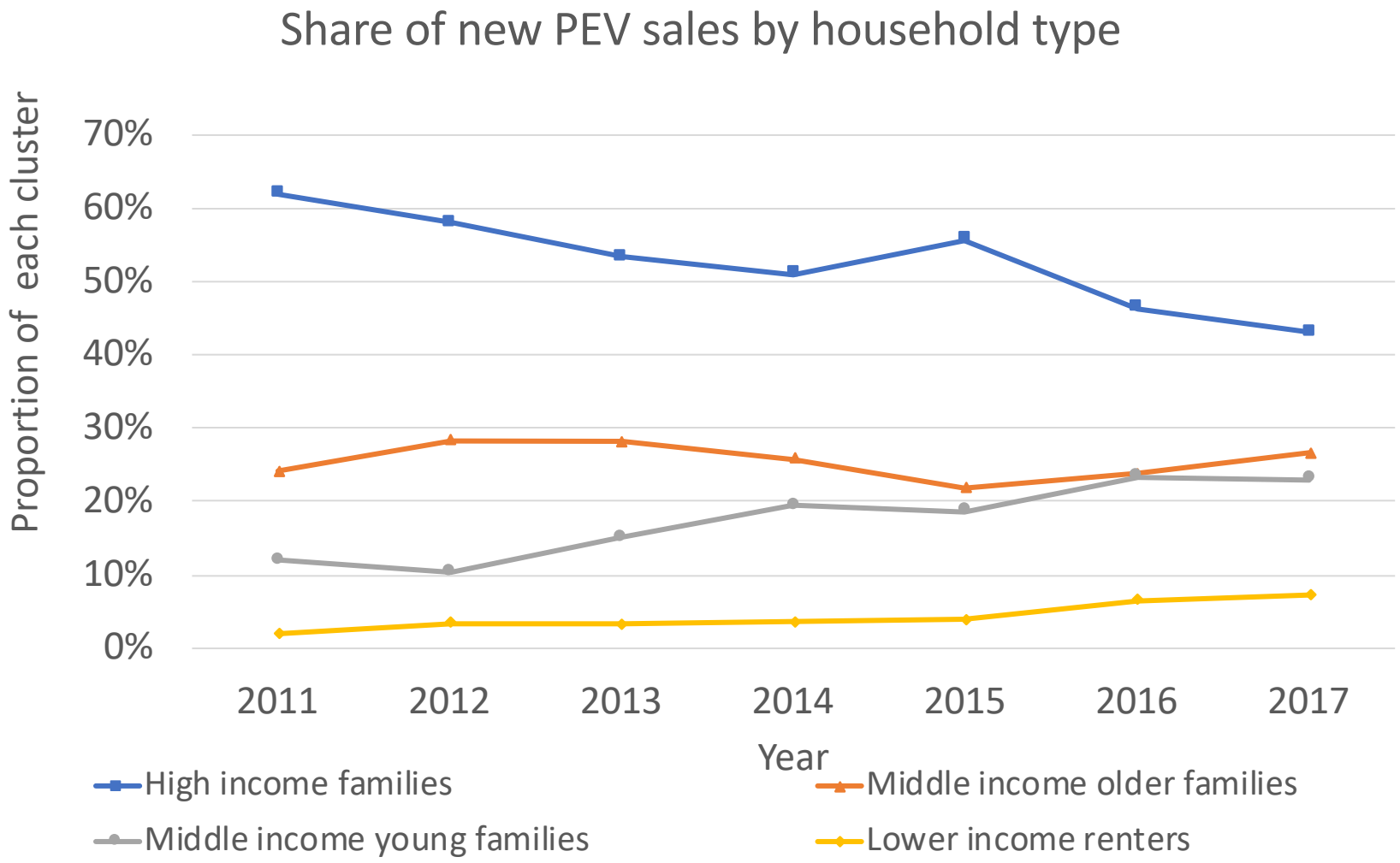
4th generation: ***3 - 5 million?***



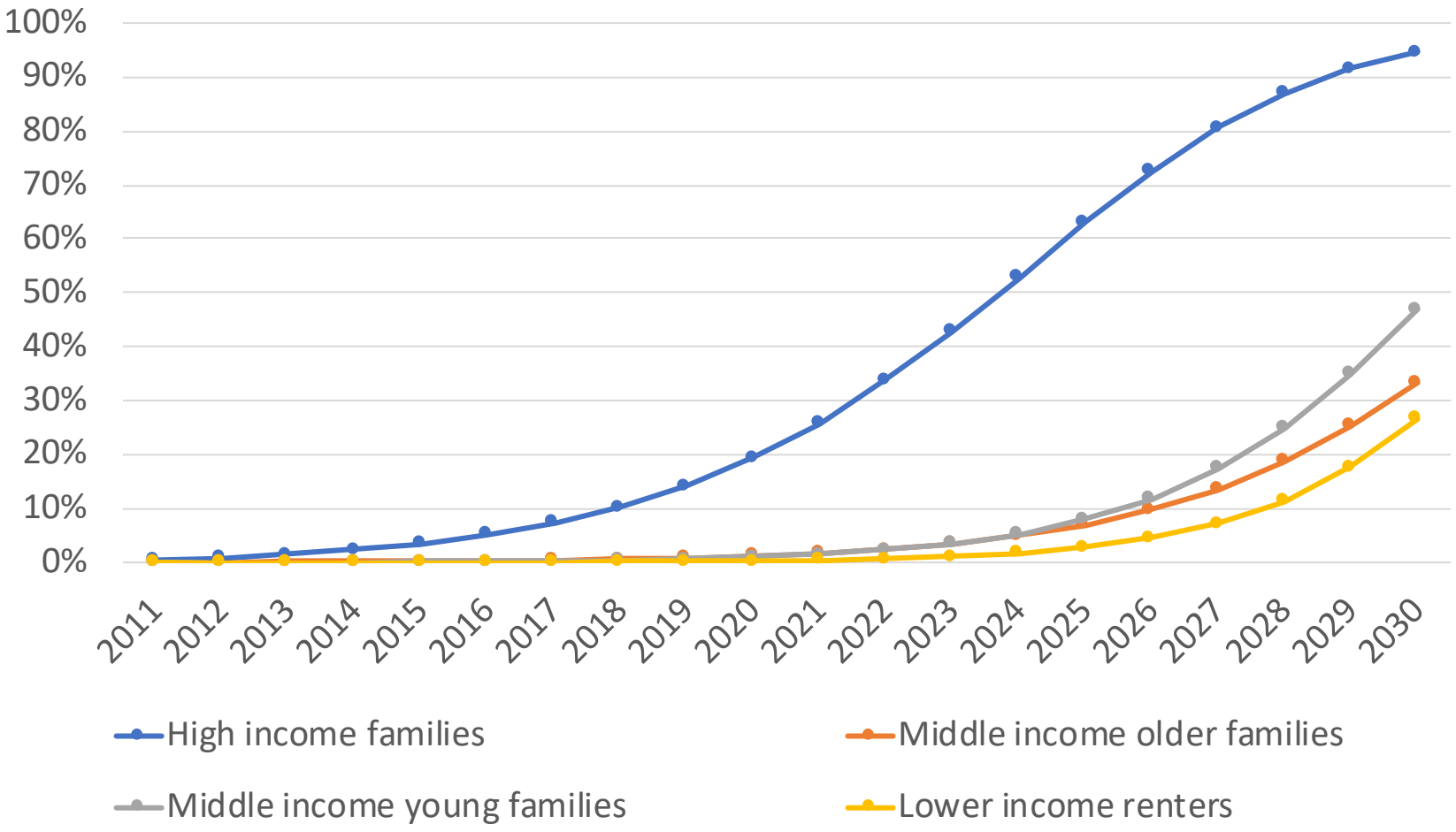
Clustering new PEV sales by household type



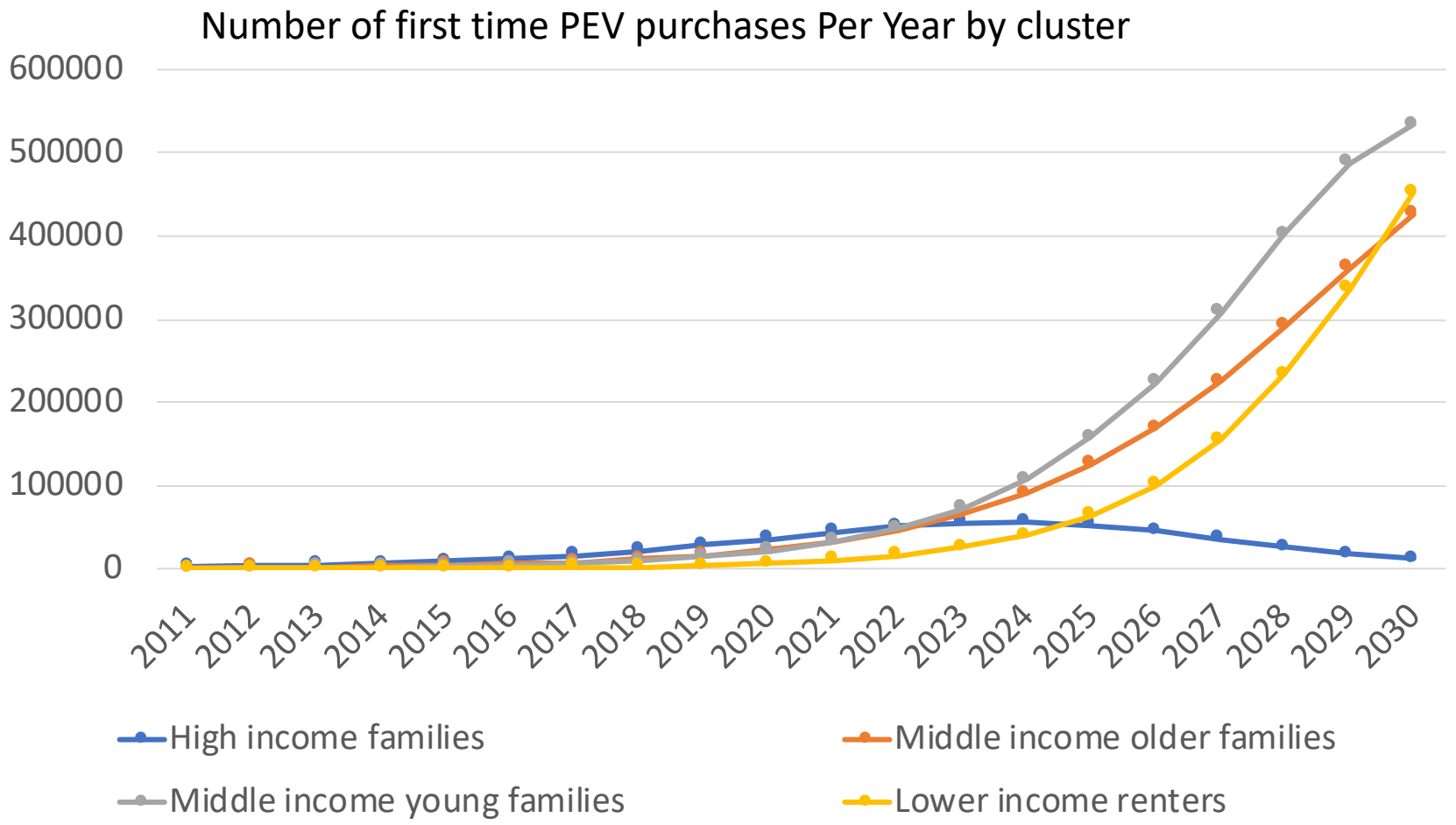
Low and Middle income families are now buying a larger share of PEVs



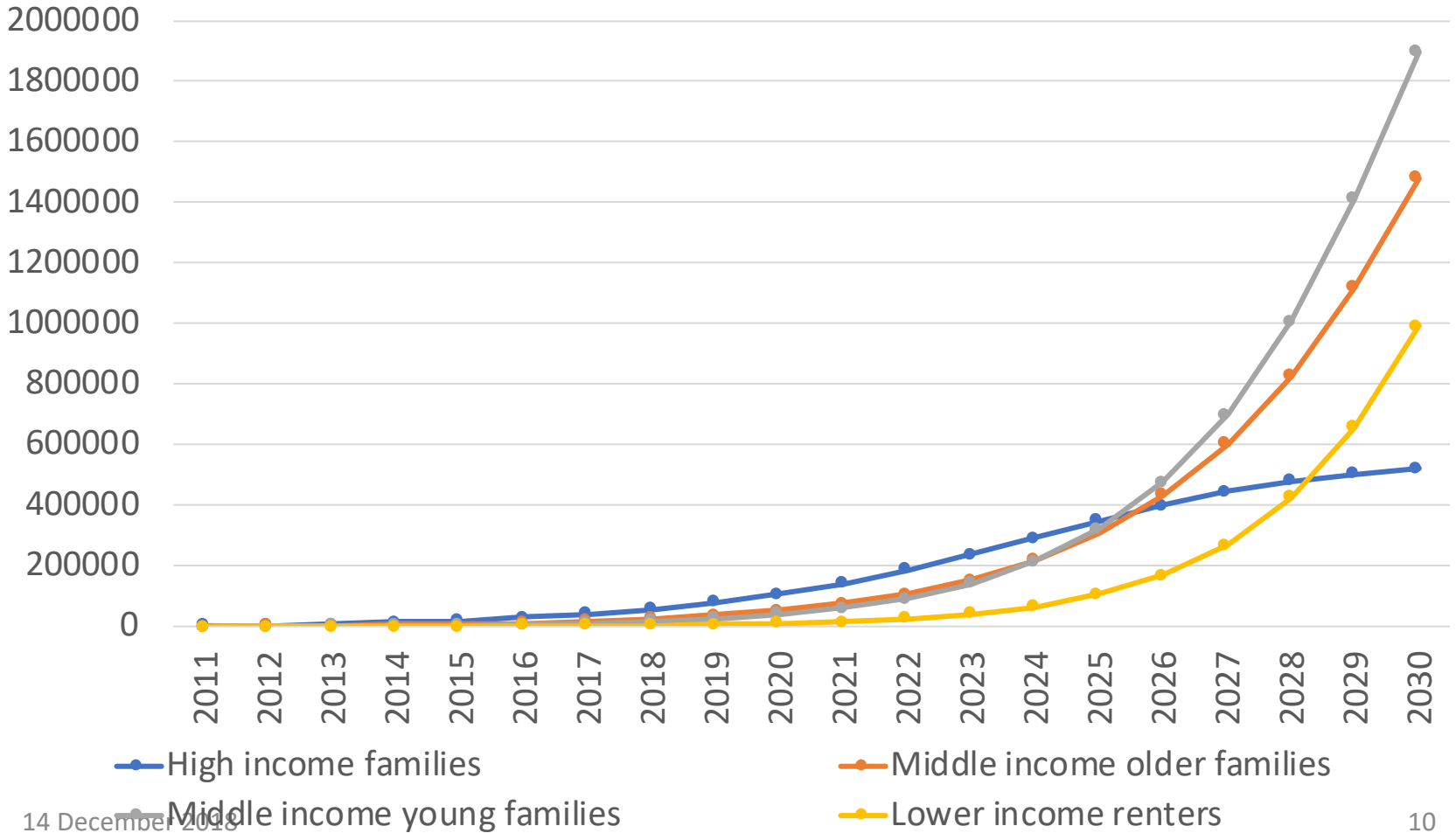
Market saturation by cluster



High Income PEV buyers likely to be repeat buyers
Low and middle income are still first-time PEV buyers

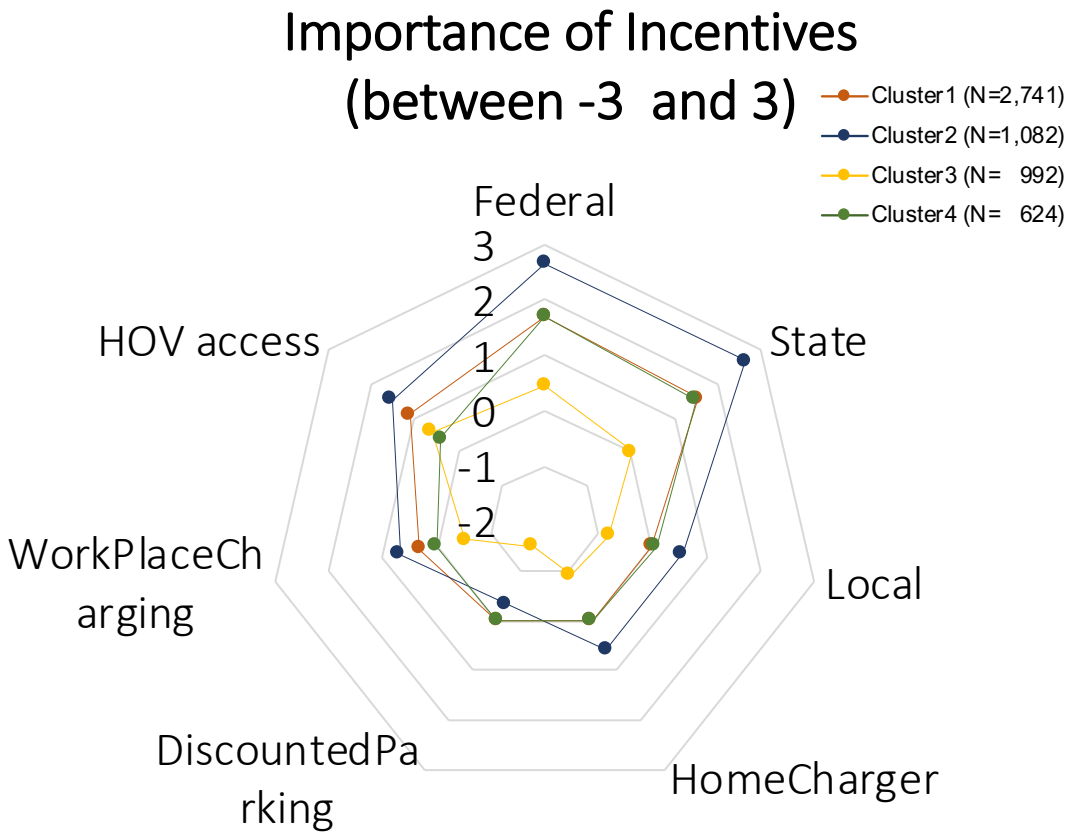


If 80% of the low income and 20% of the middle income will buy used PEVs we need 1.5 million used cars (and second time buyers) to achieve 5M target

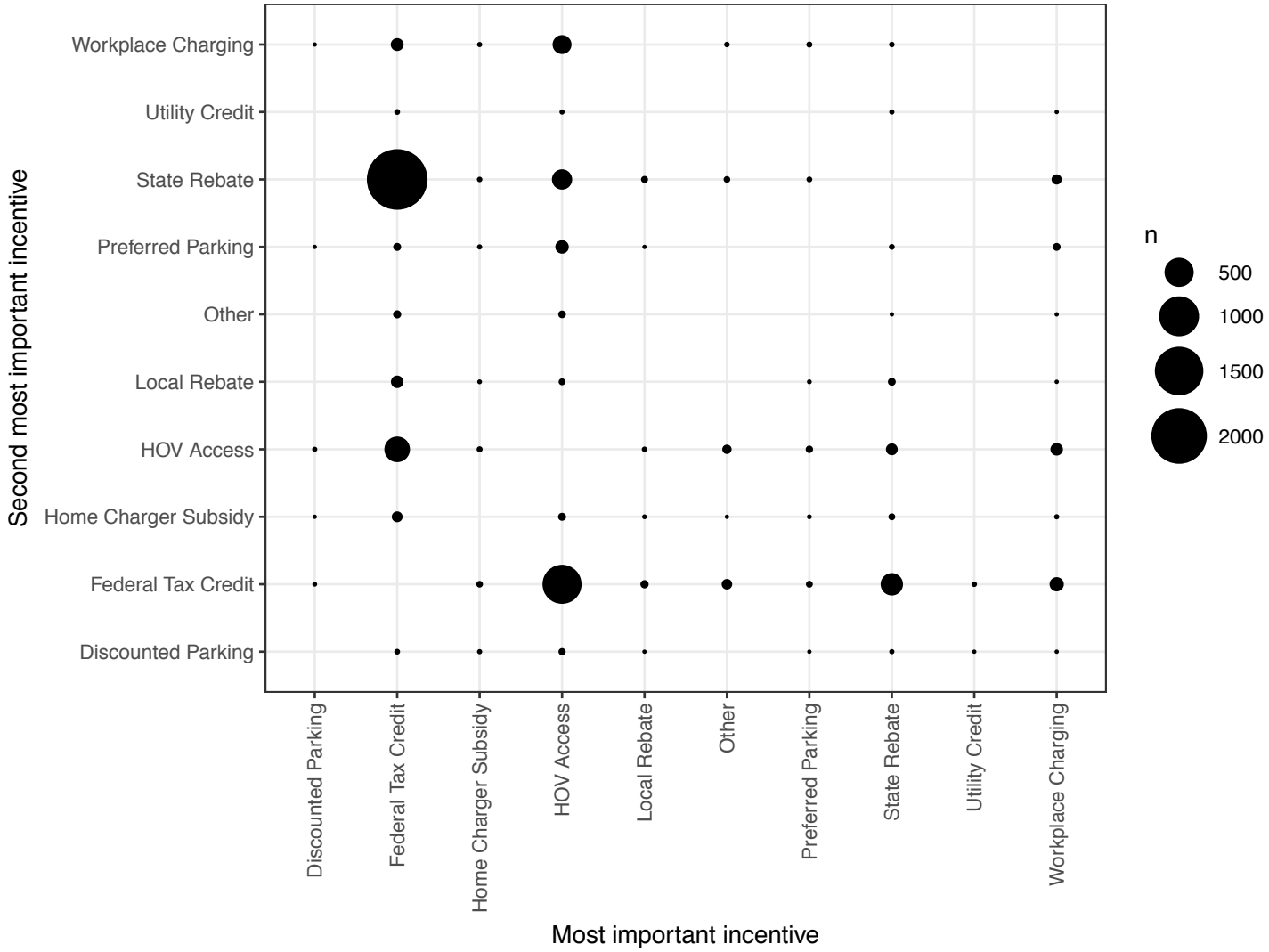


Consumer clusters: Importance of Incentives

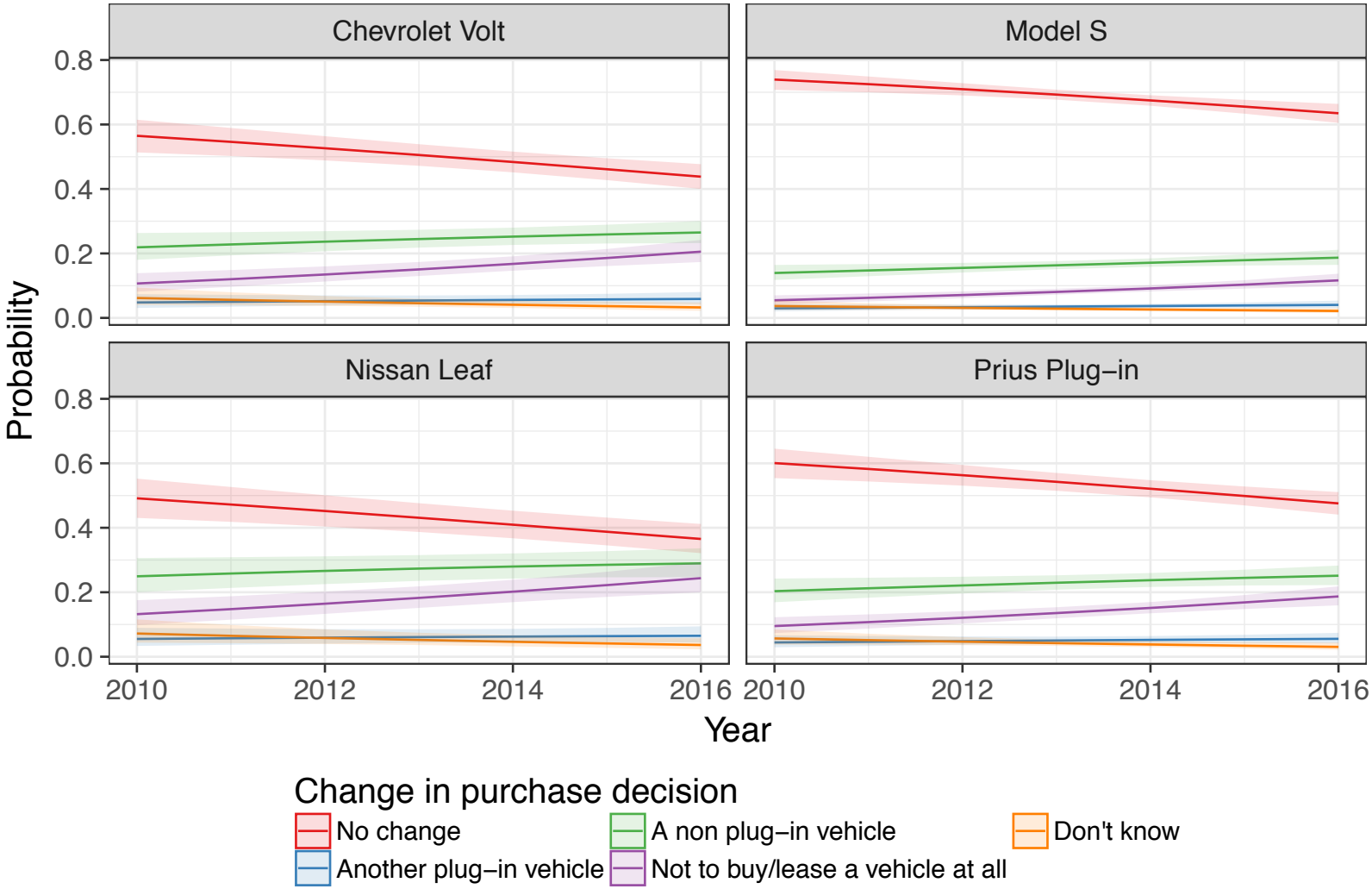
- Cluster 1: younger, high income, all incentives important, likely Tesla owners
- Cluster 2: younger, lower income, males; non-Teslas
- Cluster 3: neutral to non-monetary incentives, Tesla owners, older, high-income
- Cluster 4: older females, more vehicles in household



Importance of incentives



Incentives are increasingly important over time



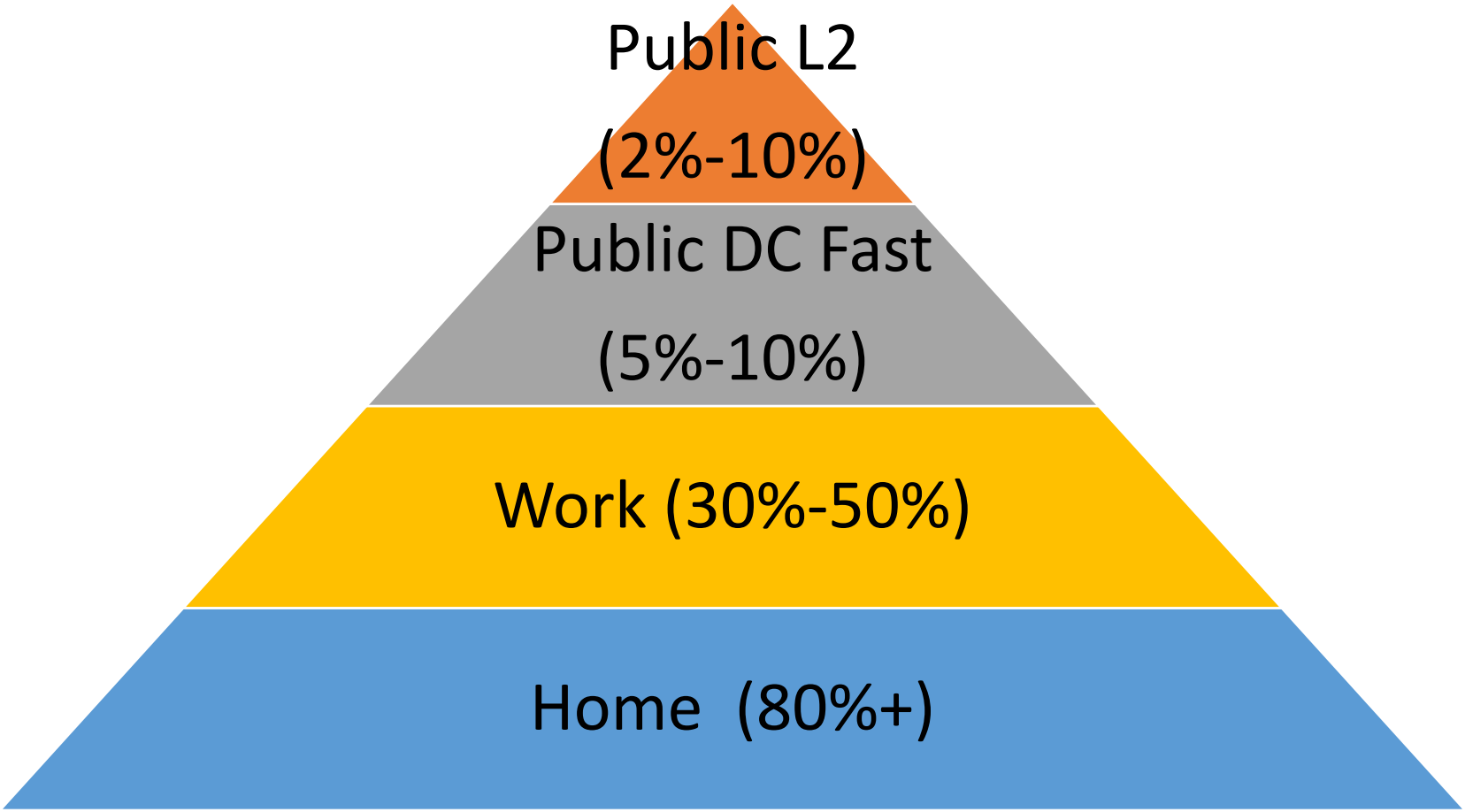
Incentives today are more important than in the past

- Current consumers are more price sensitive than early market buyers
- Without incentives, PEV sales would likely decrease by about half
- Reaching ZEV goals will require a strong secondary market

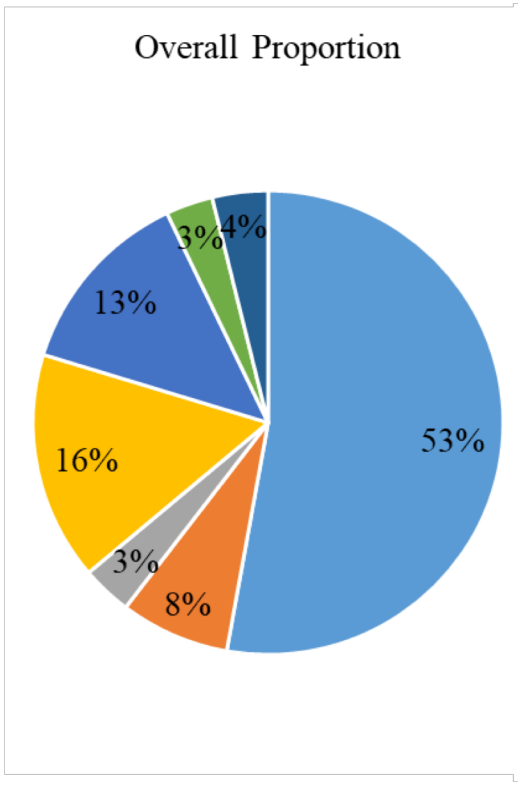
Charging

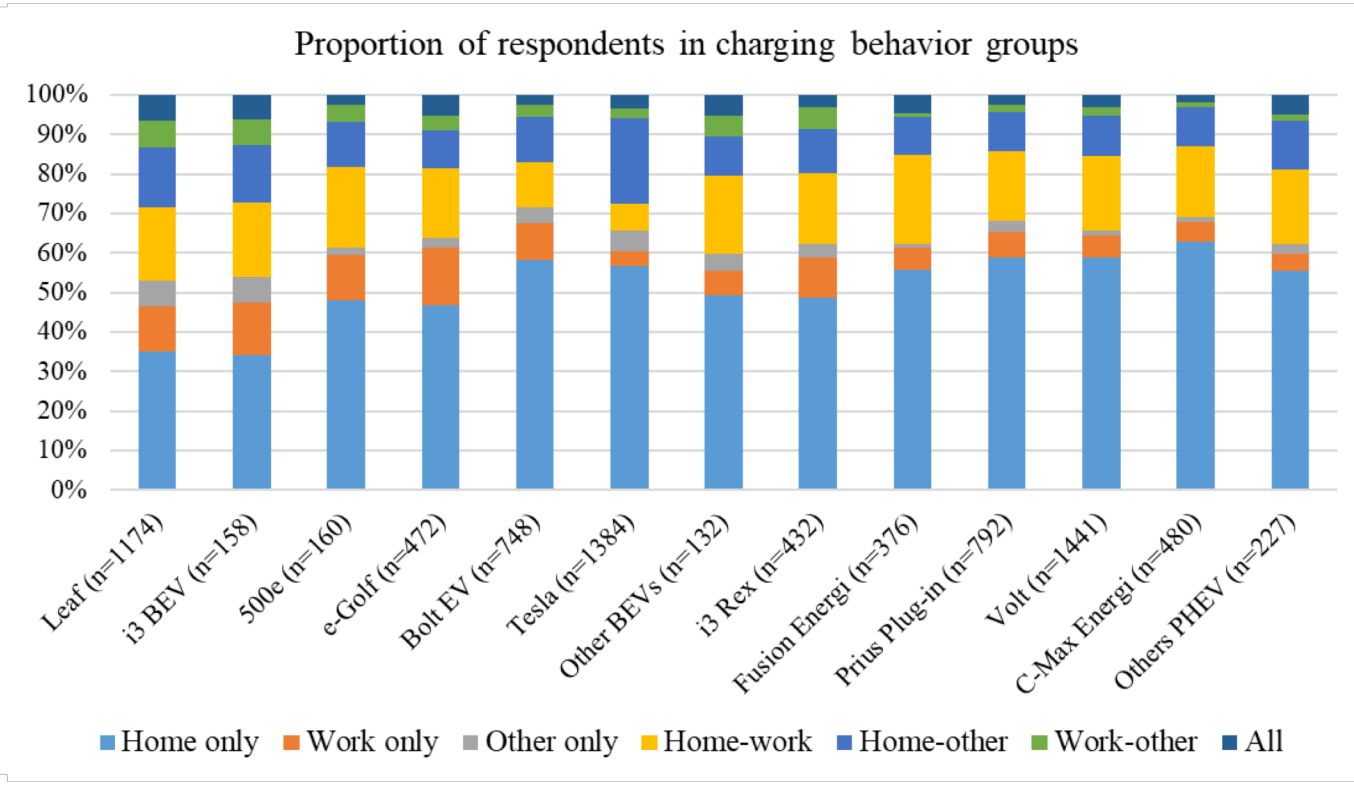
Electric Vehicle Charging needs

Charging Location of Individual Use

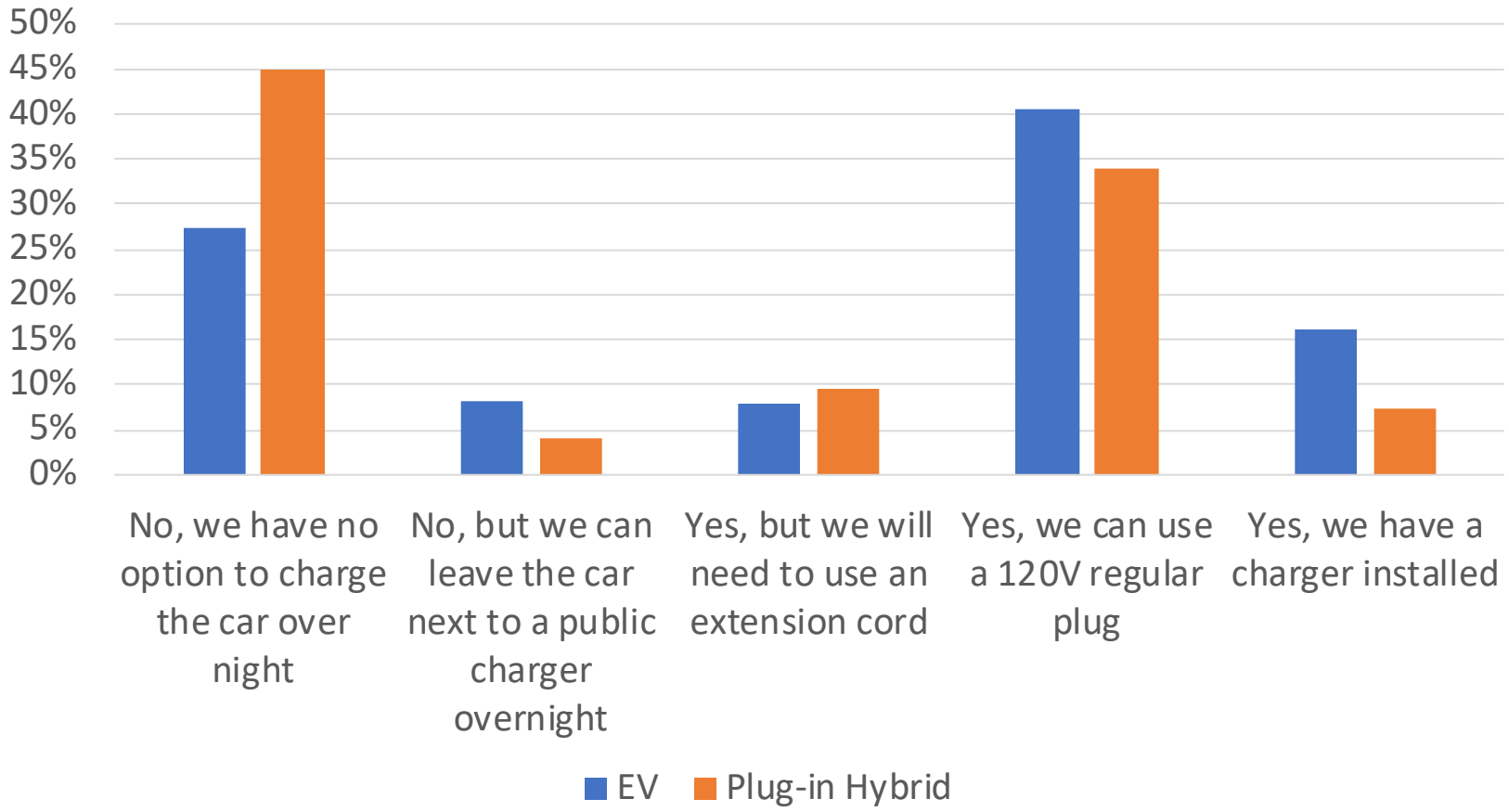


Where and When PEVs Charge in a Week?

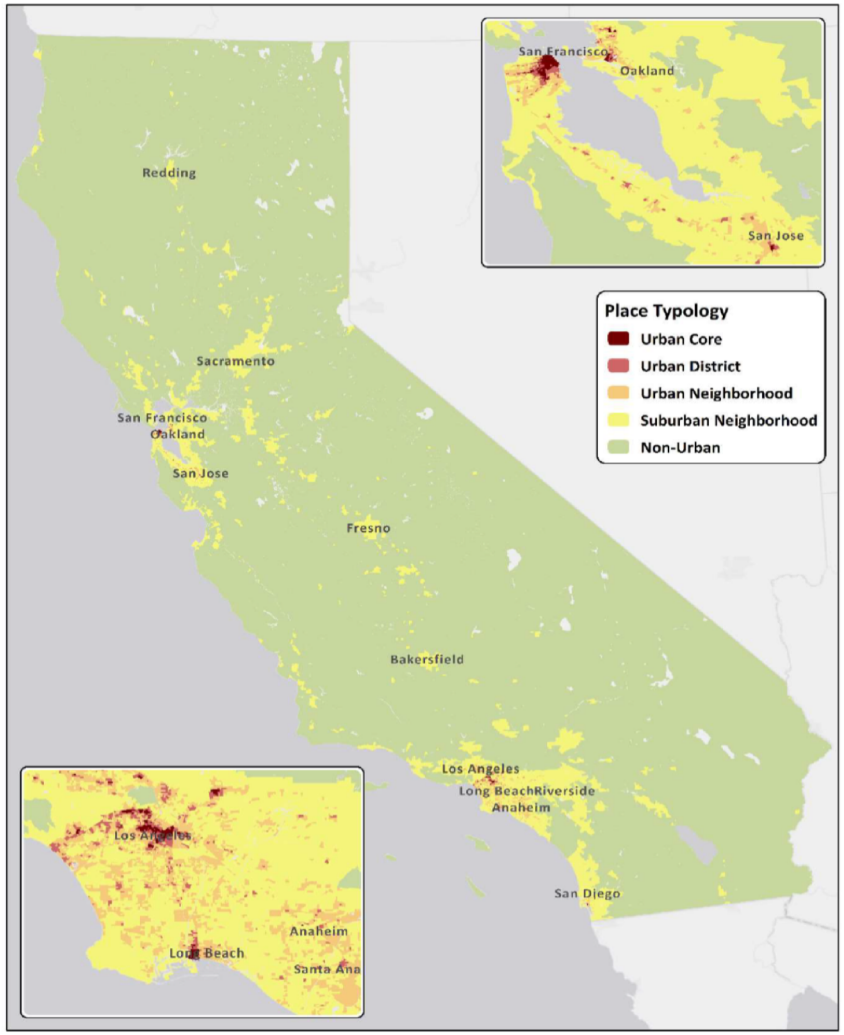


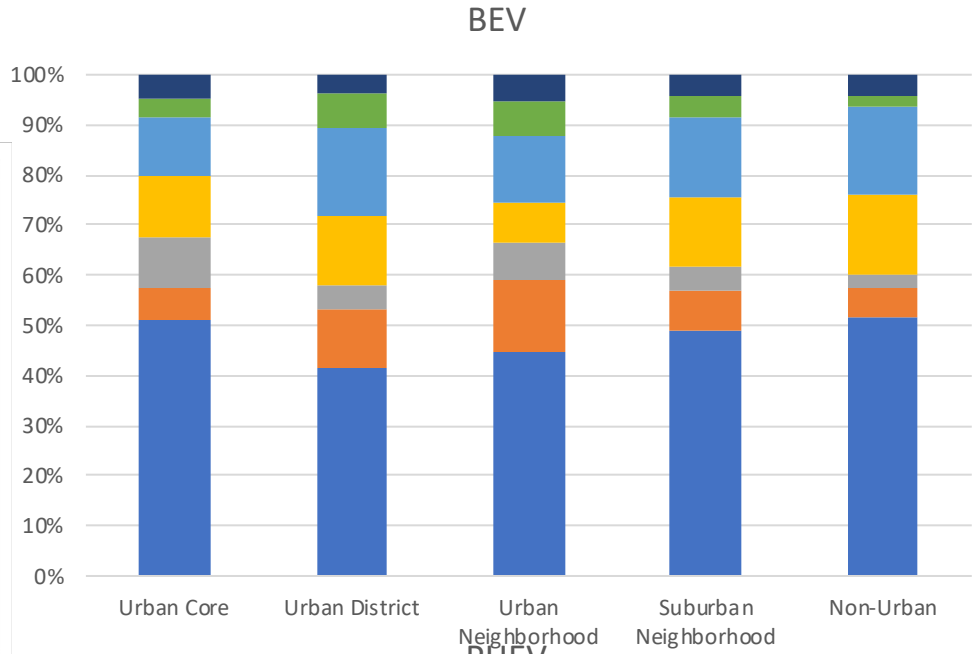


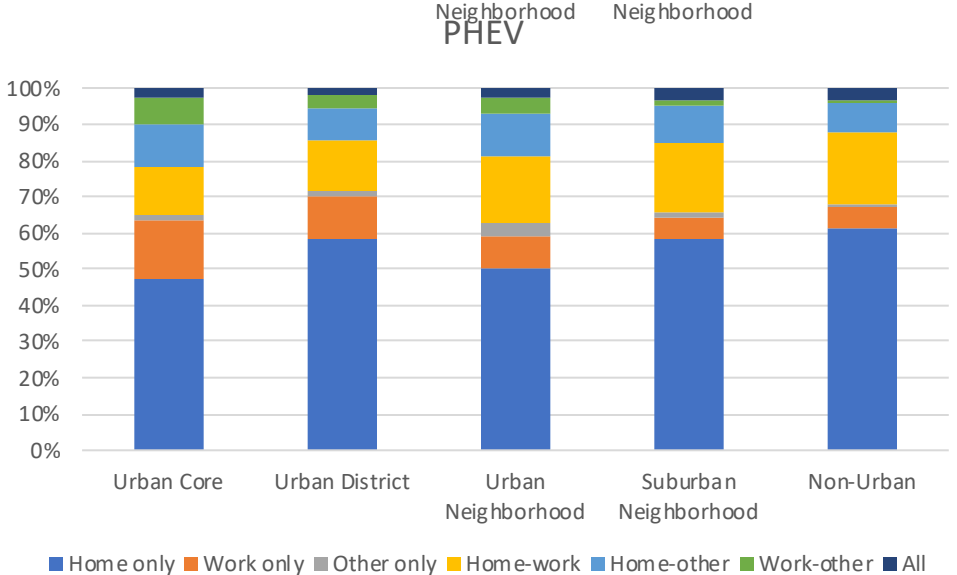
Can you plug in at home? (2018)



Urban residents and mixed charging behavior

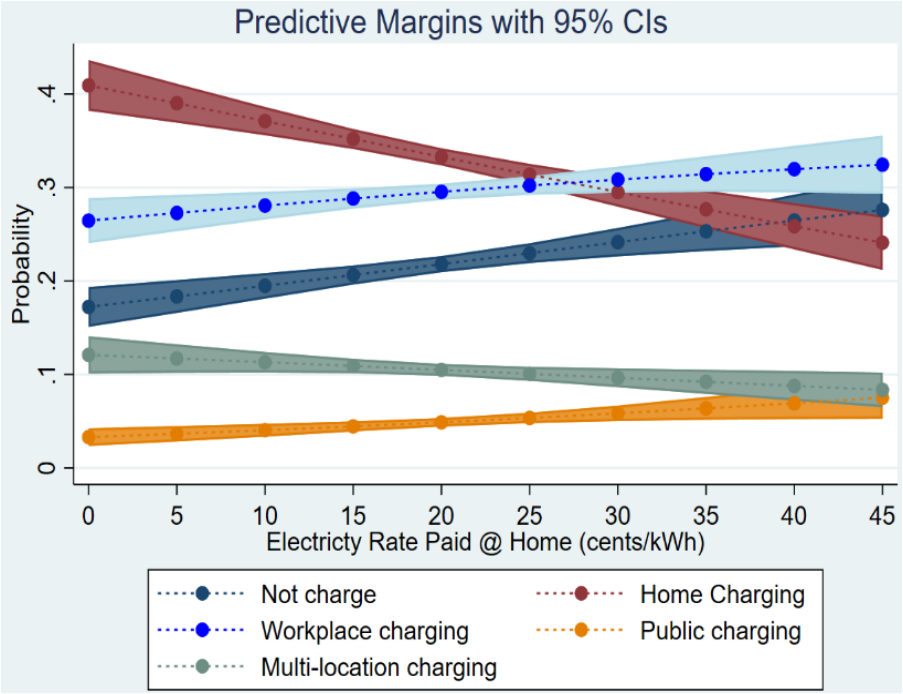




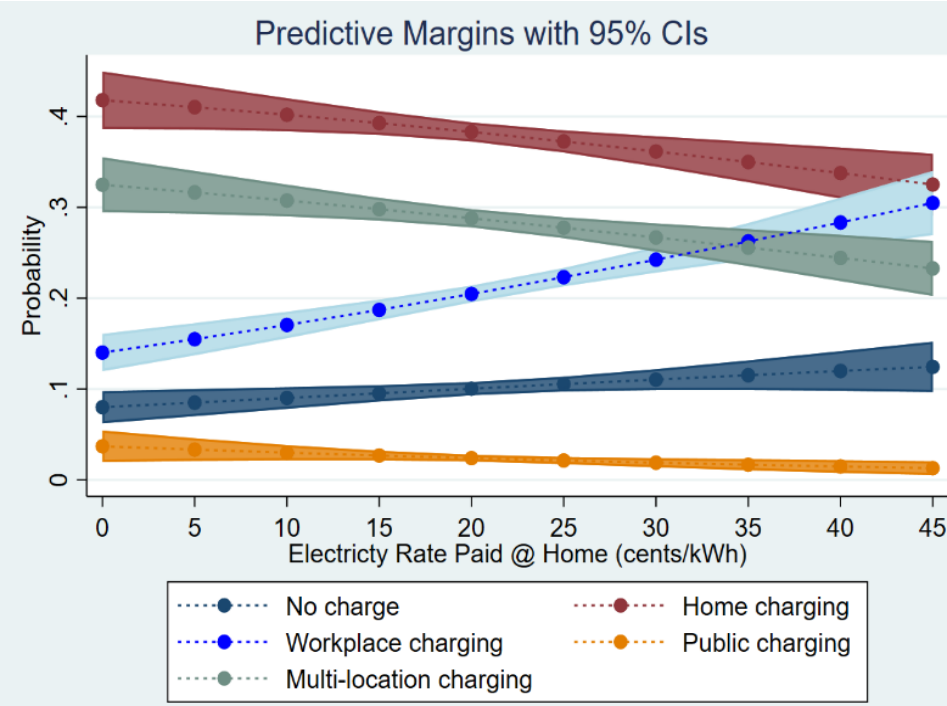


Predicted probability of Choice of Charging Location by Electricity Rate paid at Home

BEV

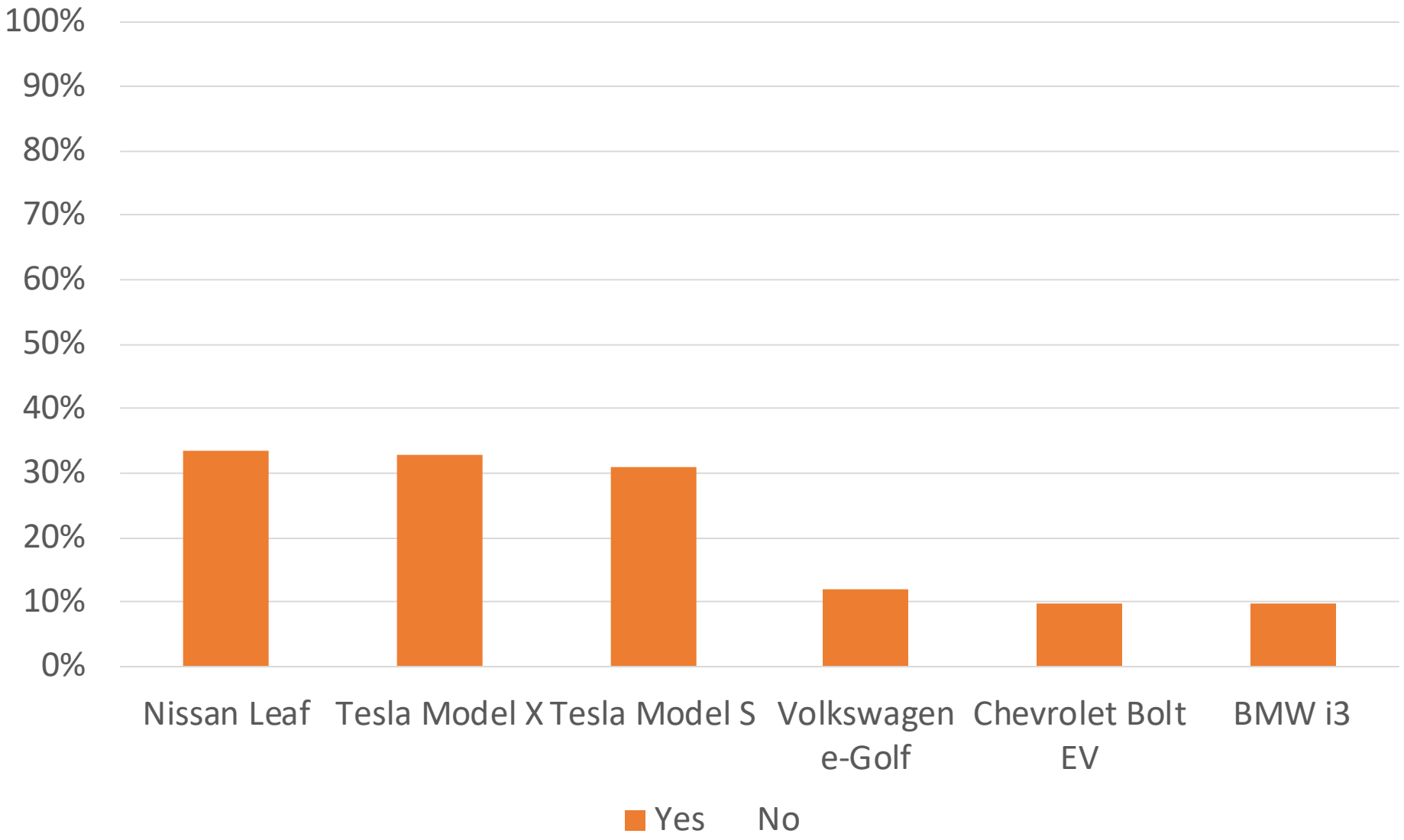


PHEV

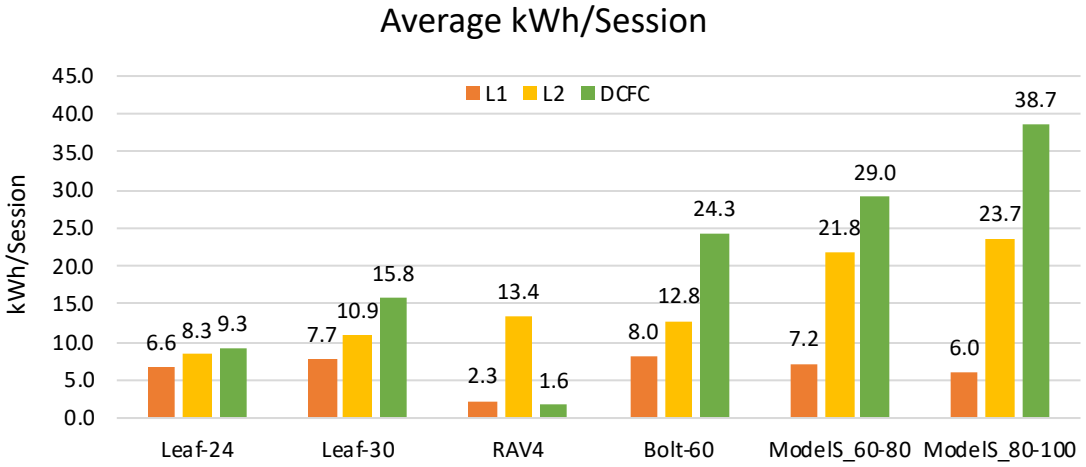


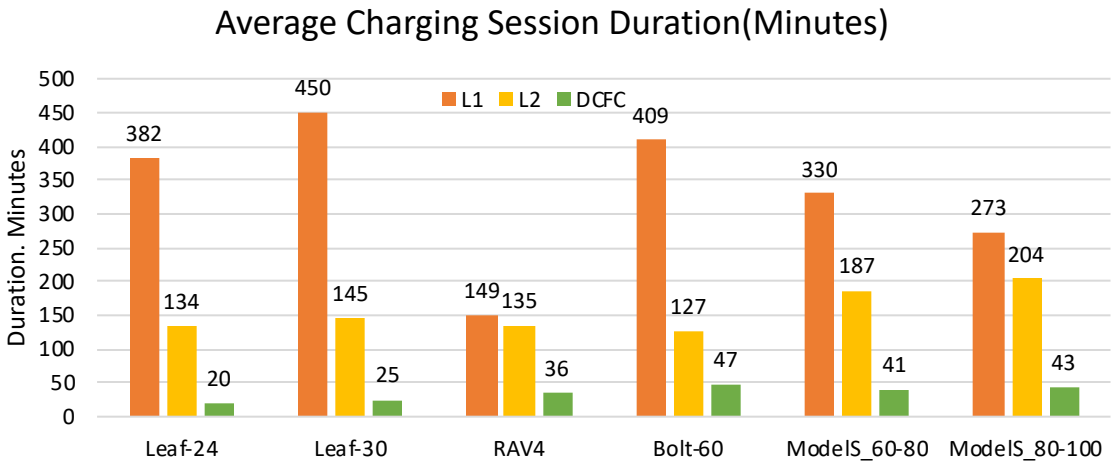
Free workplace charging will have two times more events than paid. The shift is mostly from home charging.

Who is using DC Fast Chargers? (once or more in the last 30 days)



Average kWh/Session and Charging Duration(minutes)



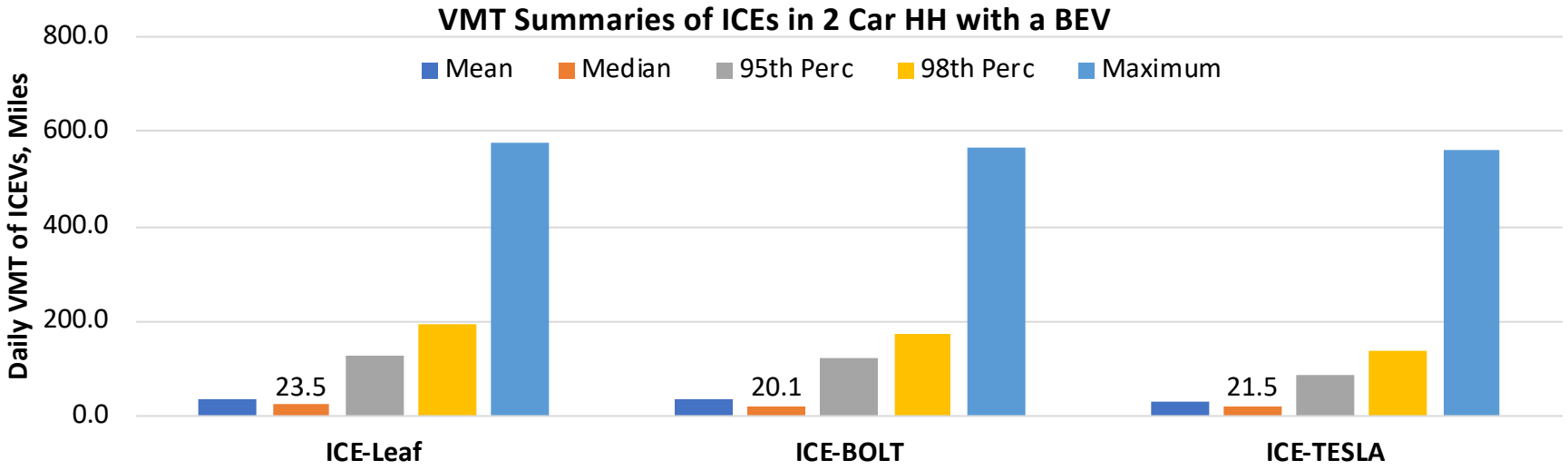


- Bolts having longer DCFC sessions compared to Teslas
- On board power electronics limits on rated kW between BEVs

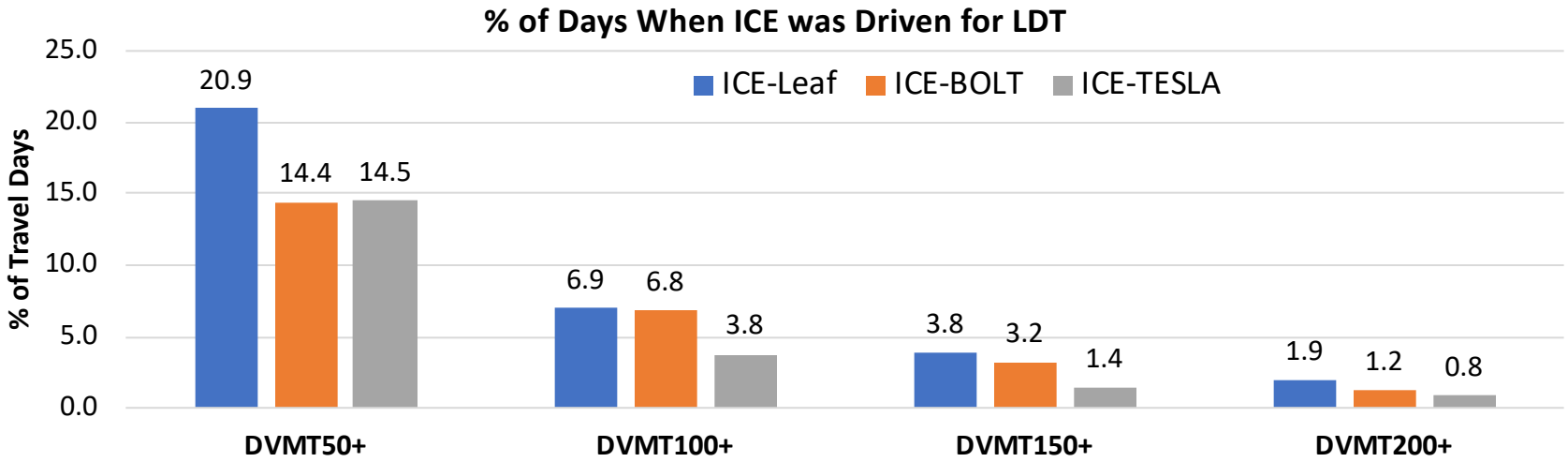
Some Caveats:

- *Difference between logged duration and actual charging event duration*
- *Need precise information on the maximum charging power*
- ***PH&EV Center raw data deep dive will address these***

ICEV Driving Metrics by type of PEV in Household



Median ICEV daily VMT is similar to all BEVs



Tesla S and X household use ICEVs less often for long trips

Home charging remains the most important part of the charging infrastructure system

- Most people who don't use home charging, could
- Free workplace charging is often congested and therefore not dependable
- Fast chargers are rarely used for long trips

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Thank You!

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