

UC DAVIS

PLUG-IN HYBRID & ELECTRIC VEHICLE RESEARCH CENTER

of the Institute of Transportation Studies

Dr. Tom Turrentine, Director

**Dr. Gil Tal, PEV Use Patterns & Infrastructure
Needs, China**

Dr. Ken Kurani, Consumer Studies

Dahlia Garas, Program Director

**Dr. Alan Jenn, PEV Regulations & Incentive
Structures in USA**

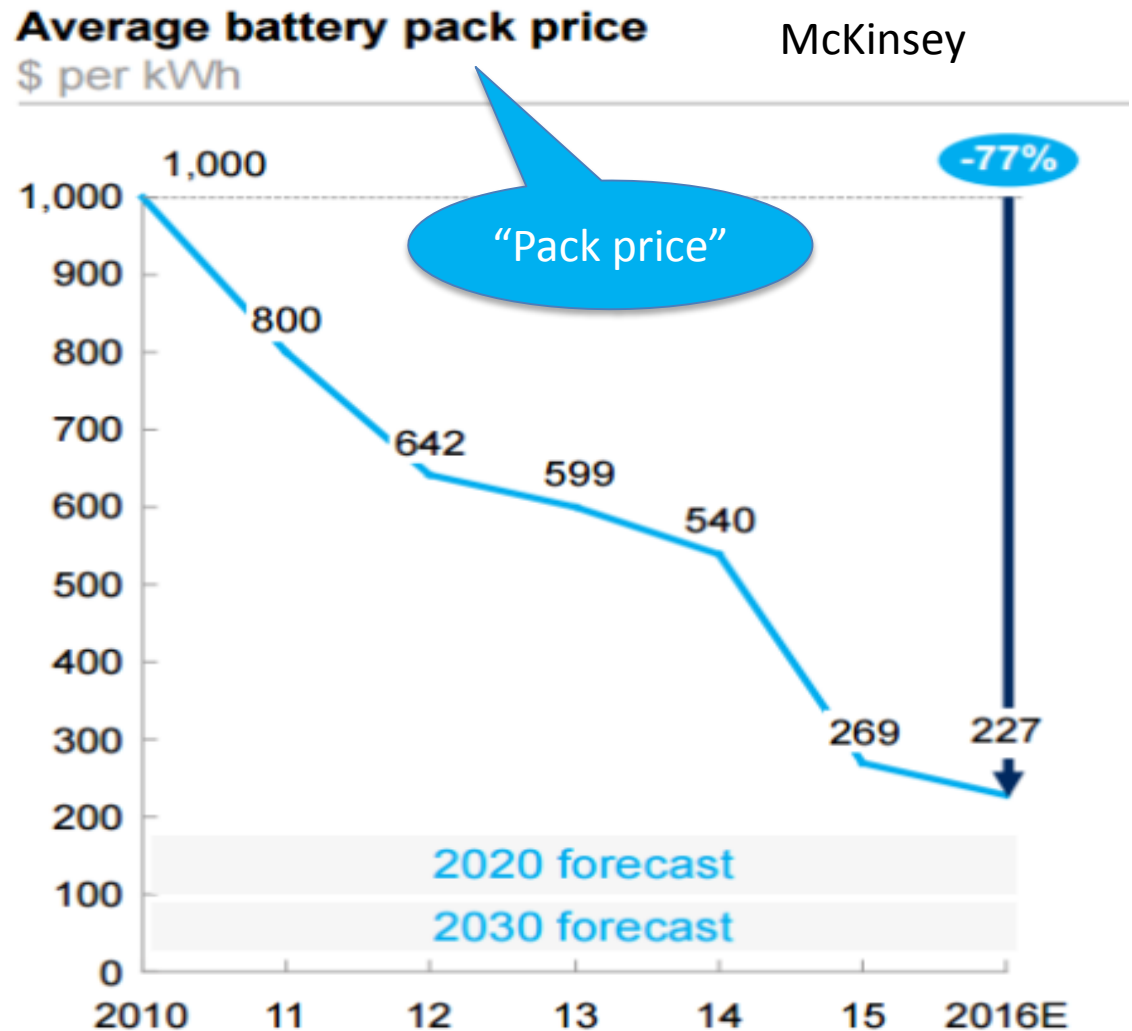
Dr. Scott Hardman, Europe PEV Markets

Dr. Angela Sanguinetti, Energy Feedback



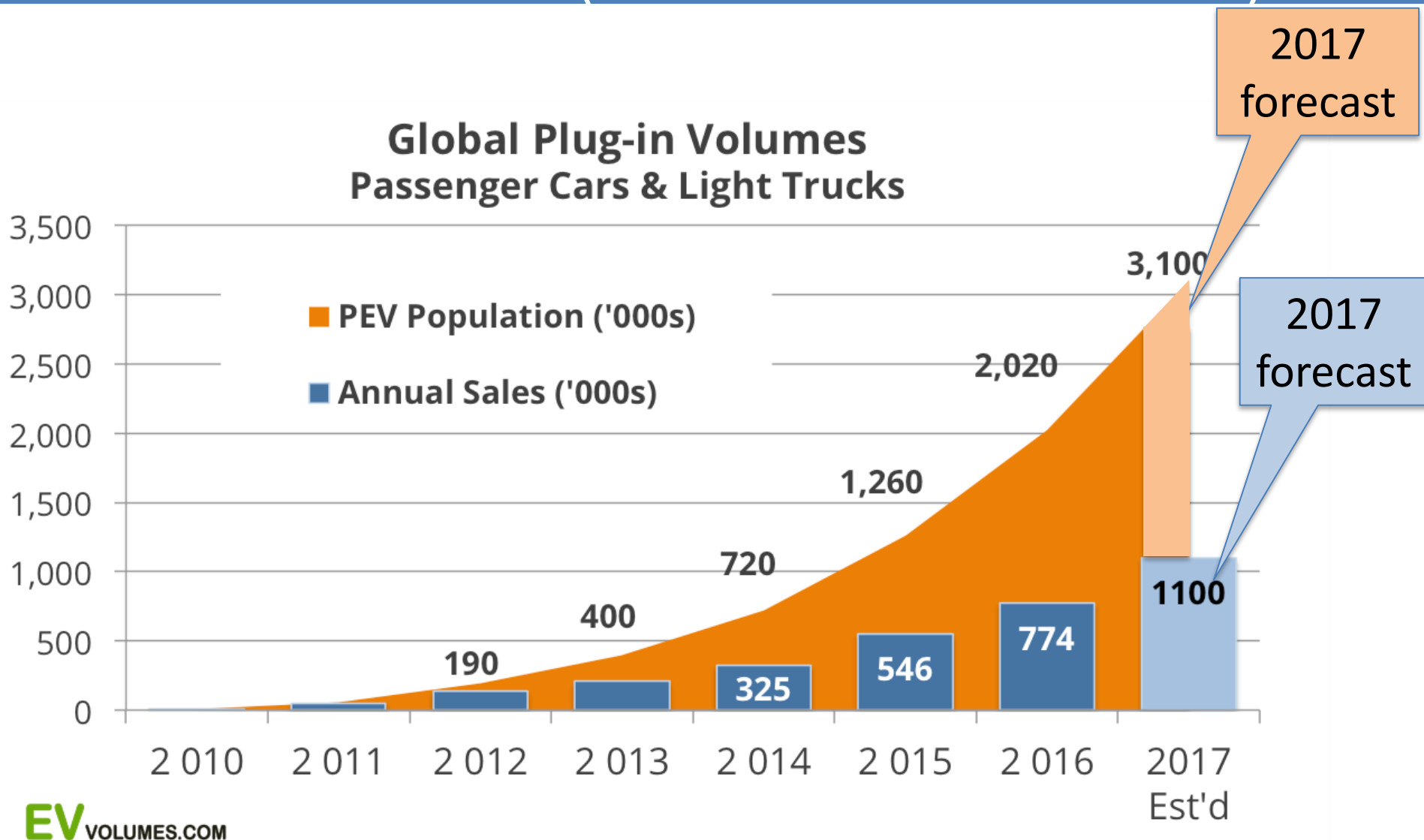
The best news is that battery “cell” and “pack” prices have been dropping & forecast prices for 2020 & 2025 dropping as well

- US Department of Energy predicts \$125 kWh (**pack**) by 2022
- Tesla says \$190 kWh in 2016 and \$100 in 2020 (**cells**)
- GM said it paid \$145 per kWh “**cell**” price for 2017 Bolt
- GM says Bolt will reach price parity in 2022.
- Renault says they will reach price parity 2020.



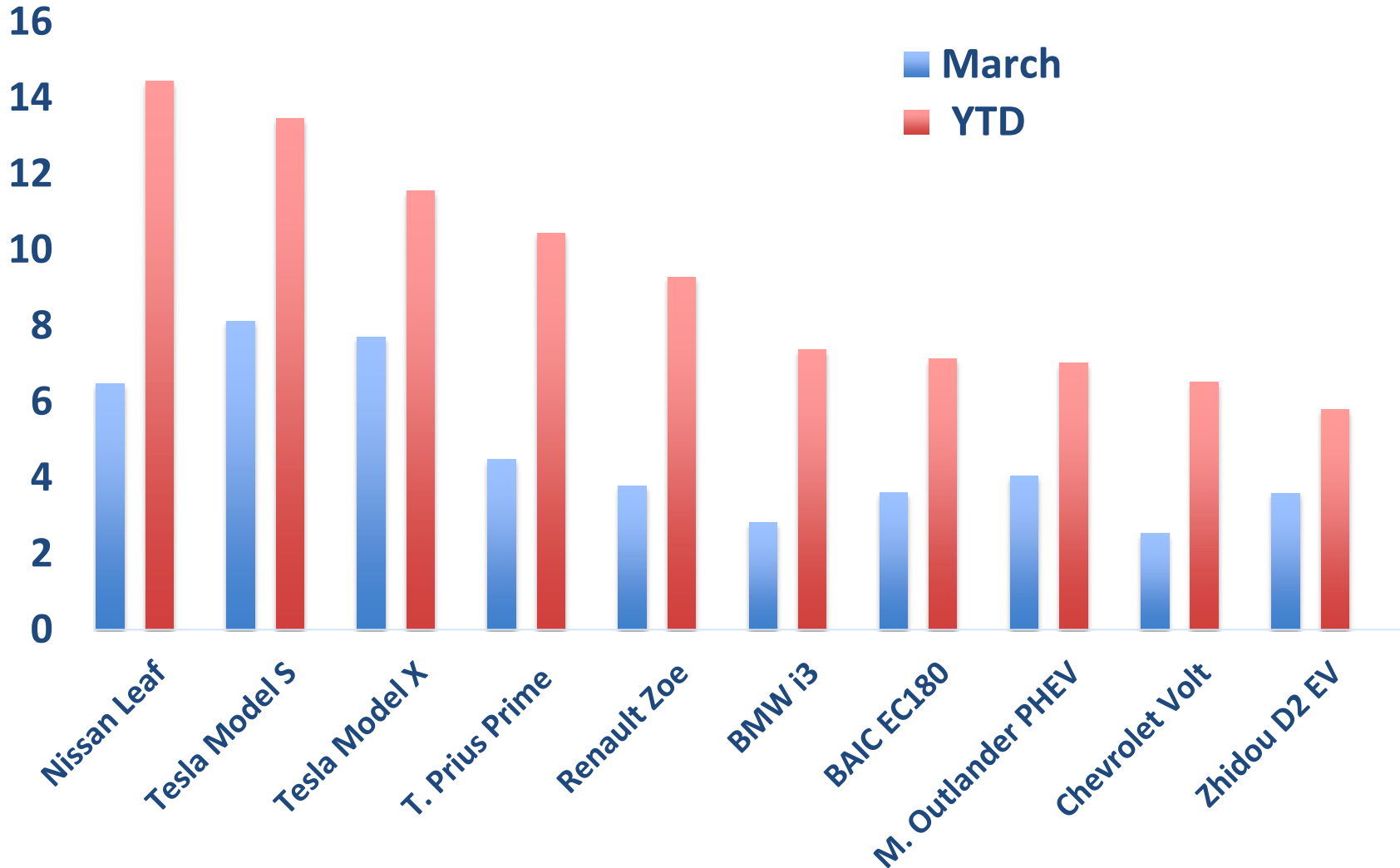
WORLD PEV MARKET

The number of PEVs in the world in 2017 will likely go over 3 million (out of 1 billion vehicles) & over 1 million in sales (out of 90 million vehicles)

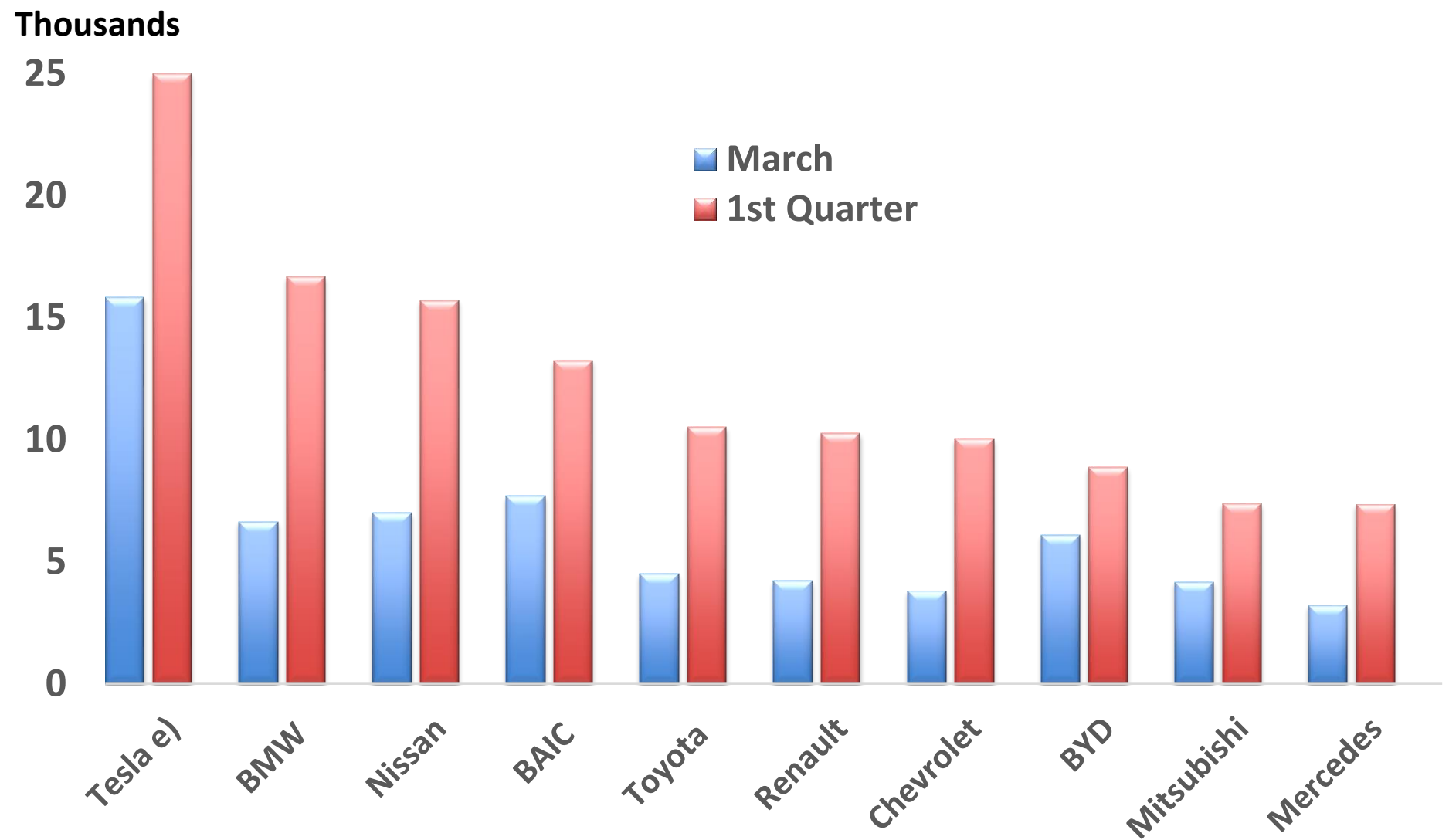


First quarter 2017 global PEV sales by model

Thousands



1st quarter (& March) 2017 global PEV sales by manufacturer



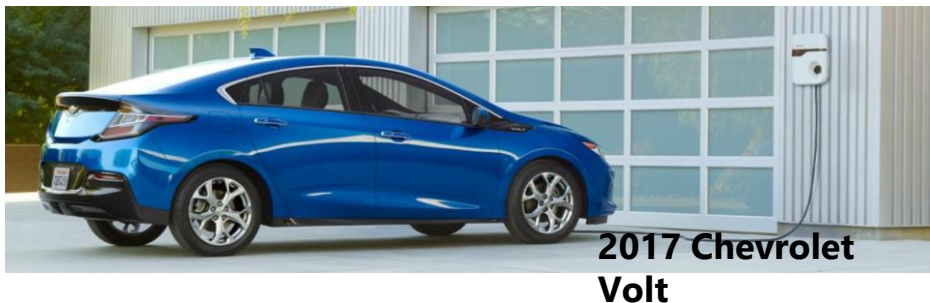
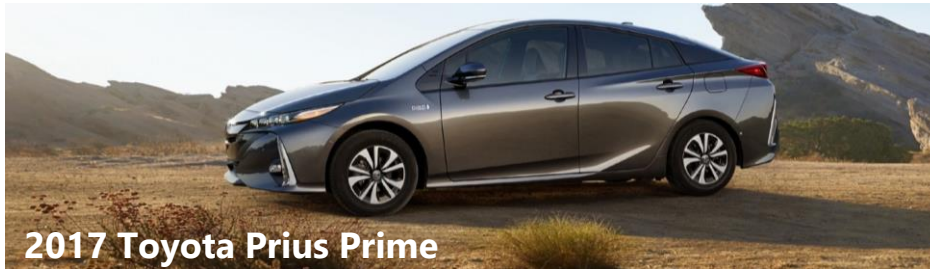
And as a result, car makers are now in competition to make “second generation” BEVs, 130-250 miles of range, Level 1-2 automation, AWD, high power charging



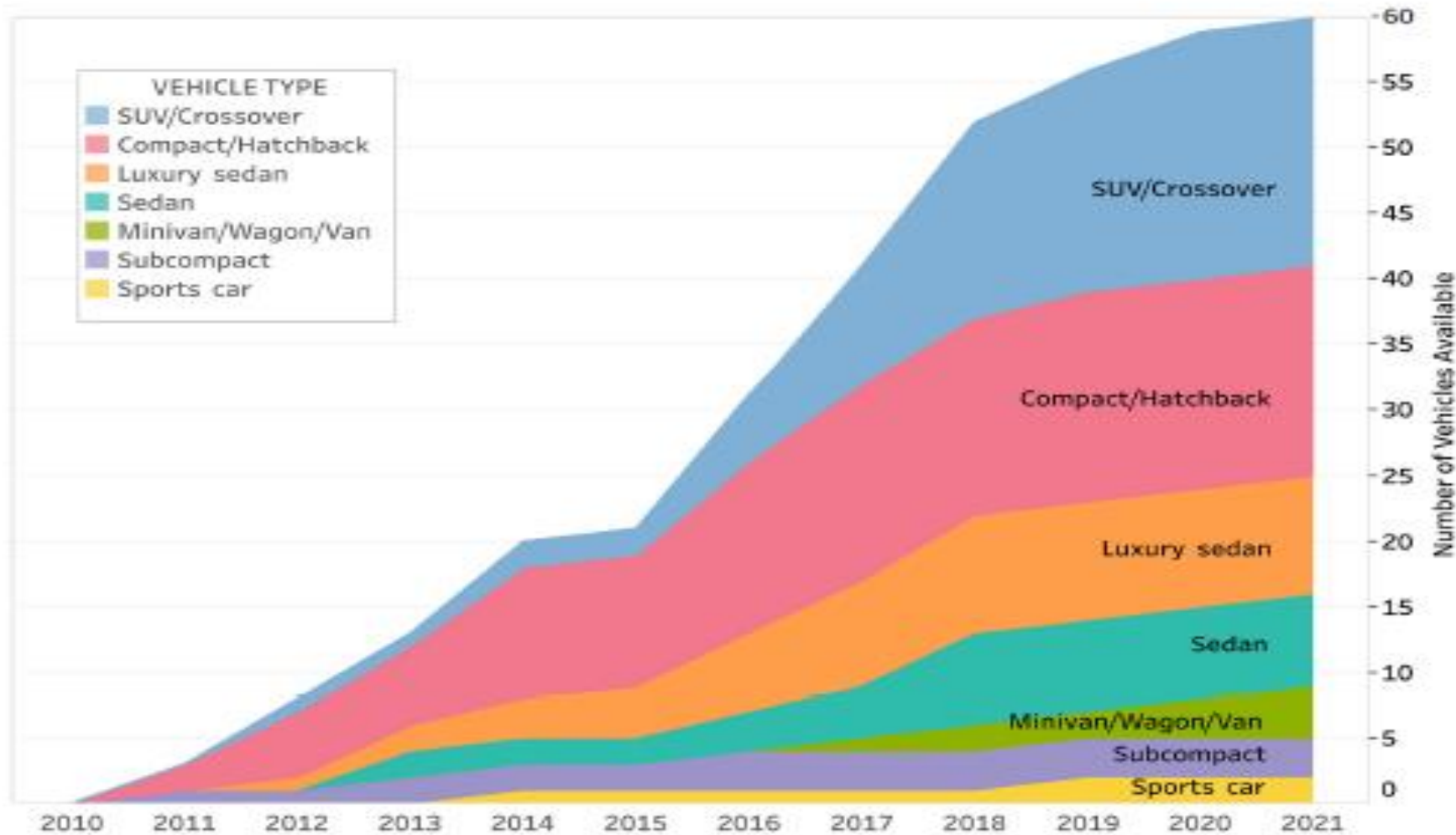
238 miles range, \$29,995 after tax credit



And second generation PHEVs 20-40 miles range, larger, SUV/Crossover type vehicles, more power, AWD, & more automation



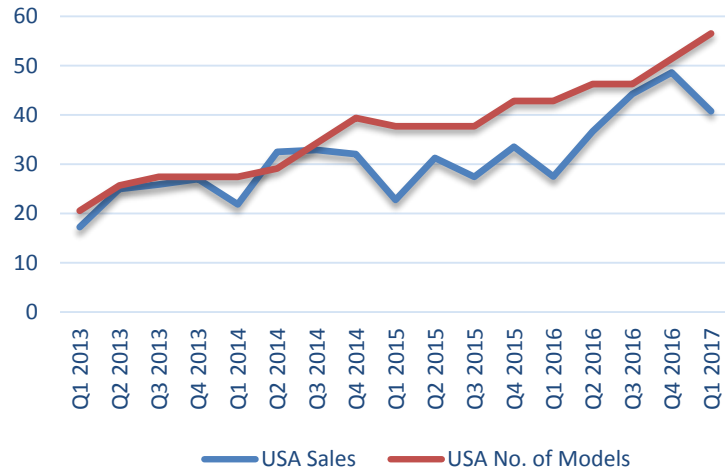
While the current PEV offerings emphasizes small sedans, the shift is to more SUV/Crossover



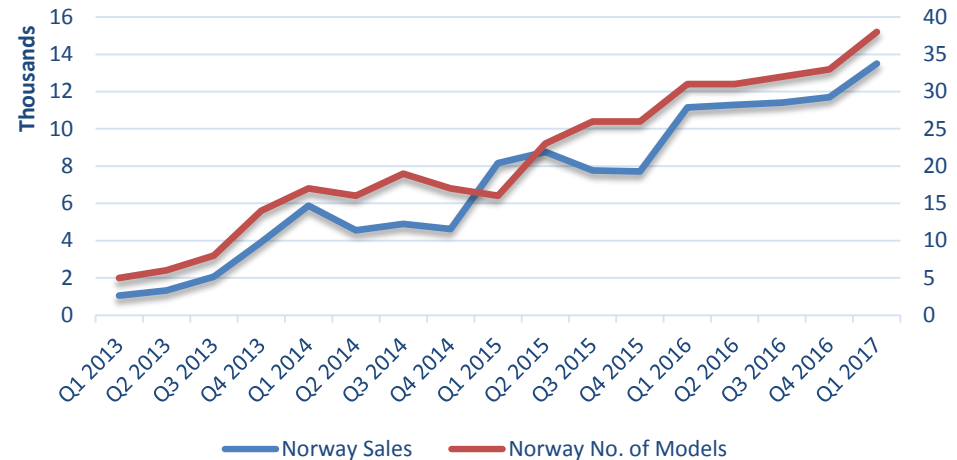
The number and variety of electric vehicle models continues to grow. By the end of 2017, about 40 different models are expected to be available. By 2021, at least 60 models are projected.

Growth in most markets has followed increase in number of models for sale

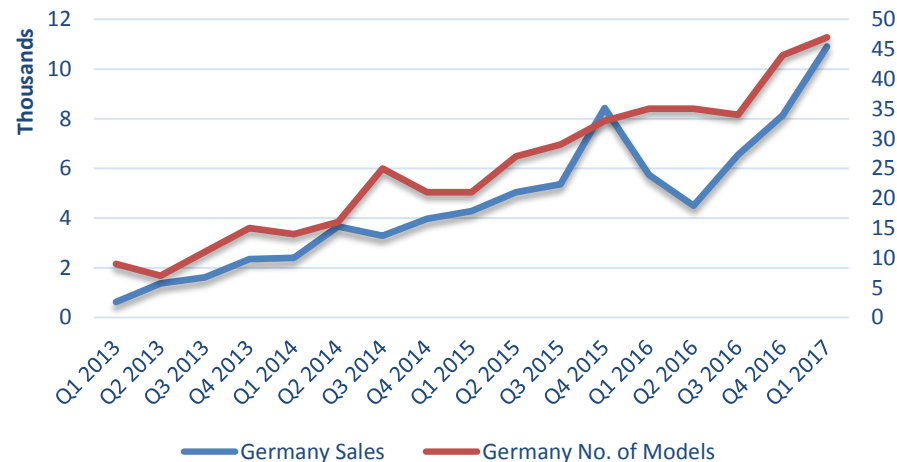
USA



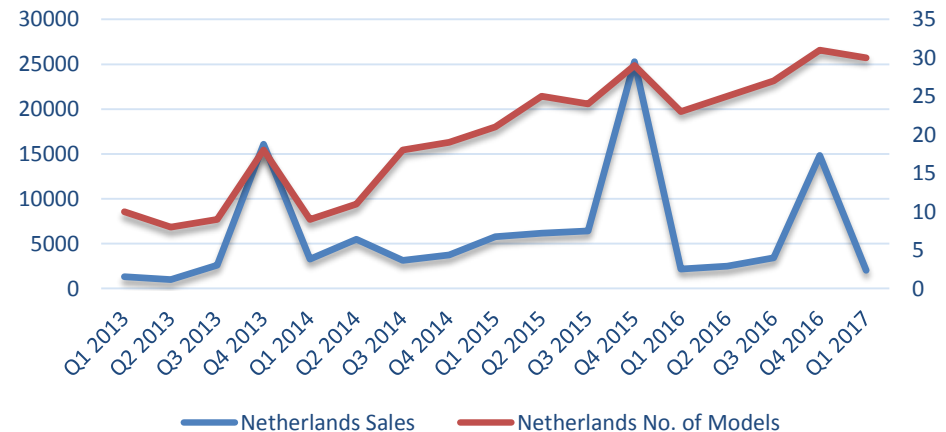
Norway



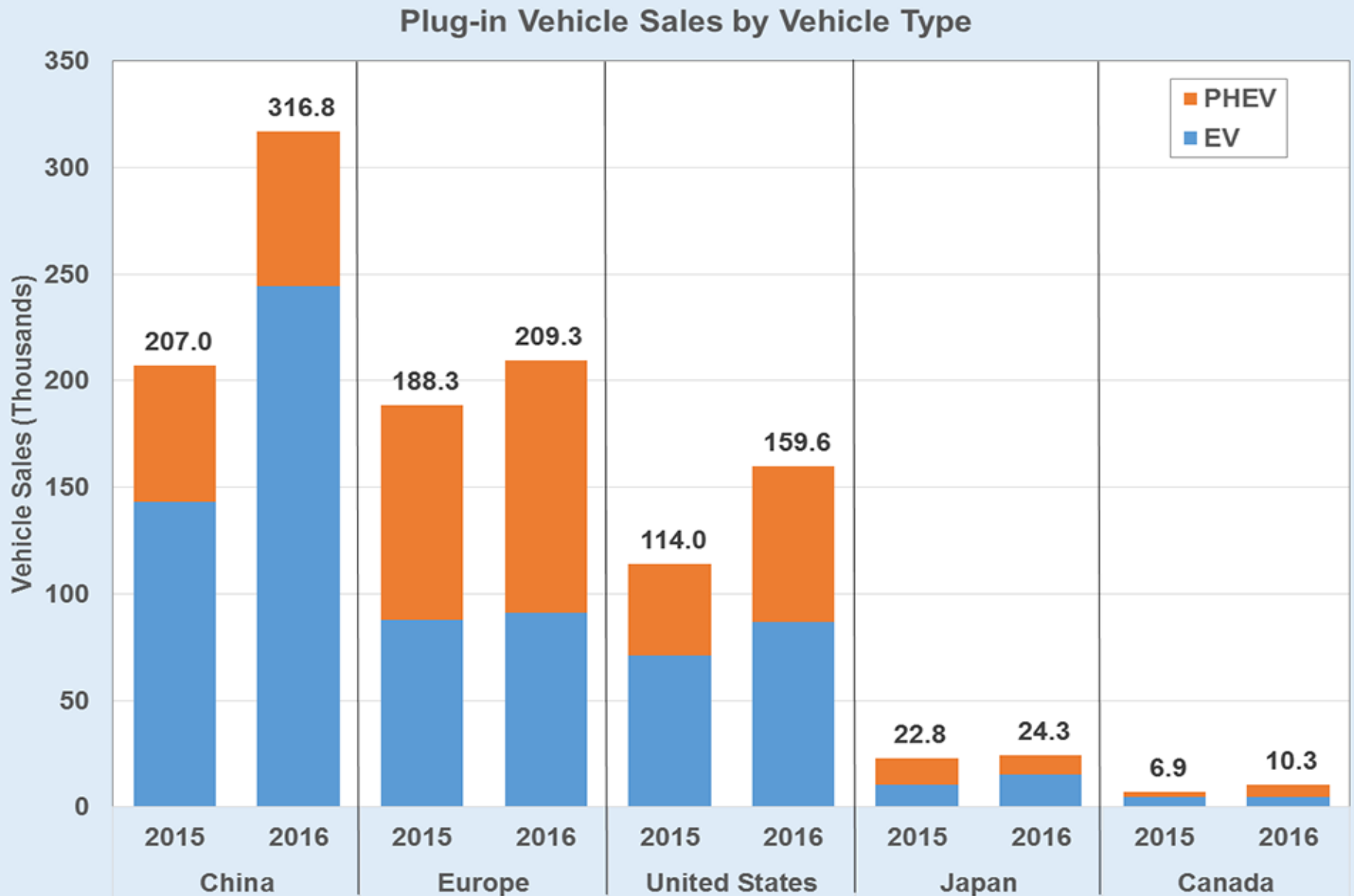
Germany



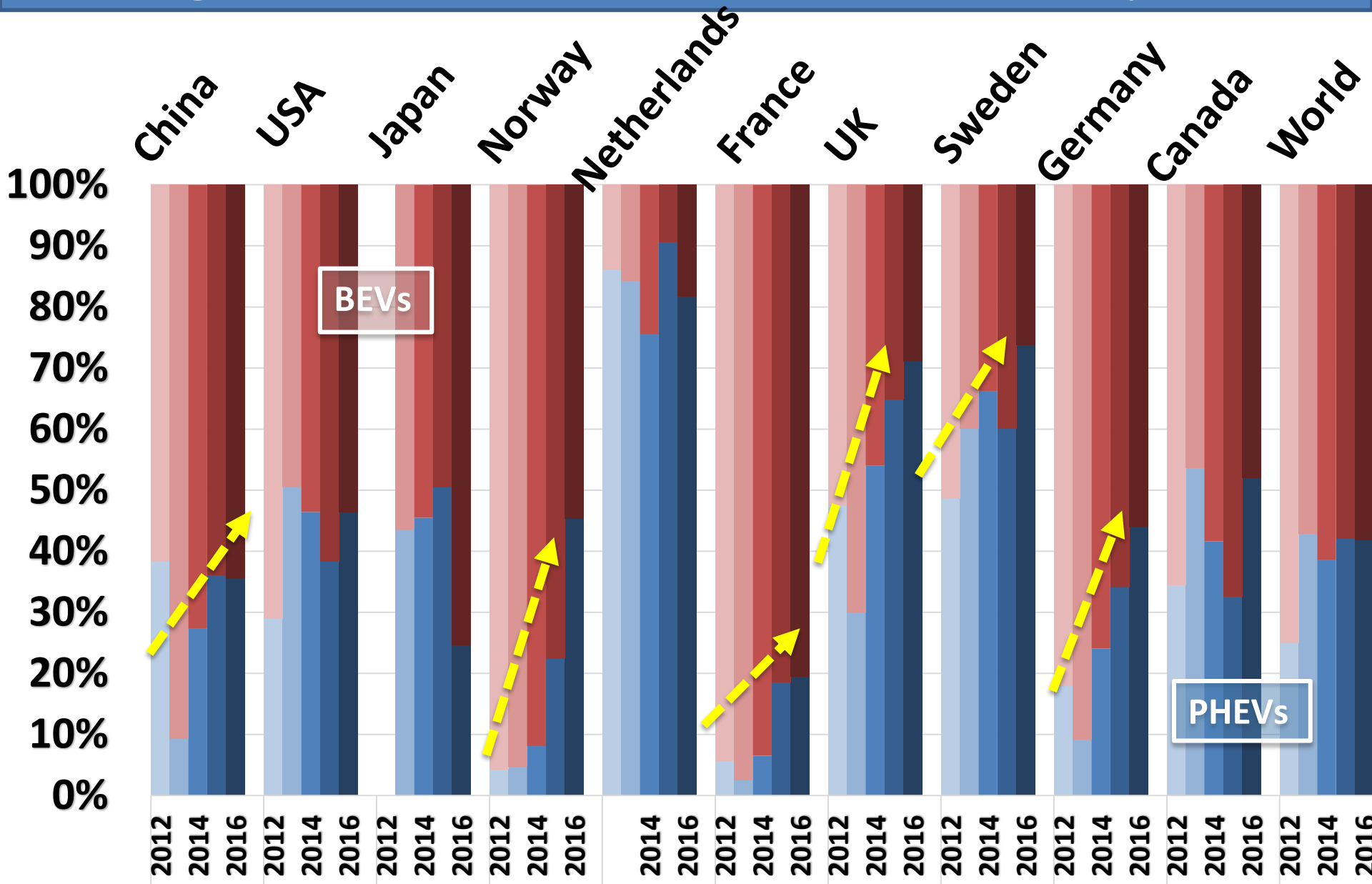
Netherlands



There was 37% growth worldwide in 2016.

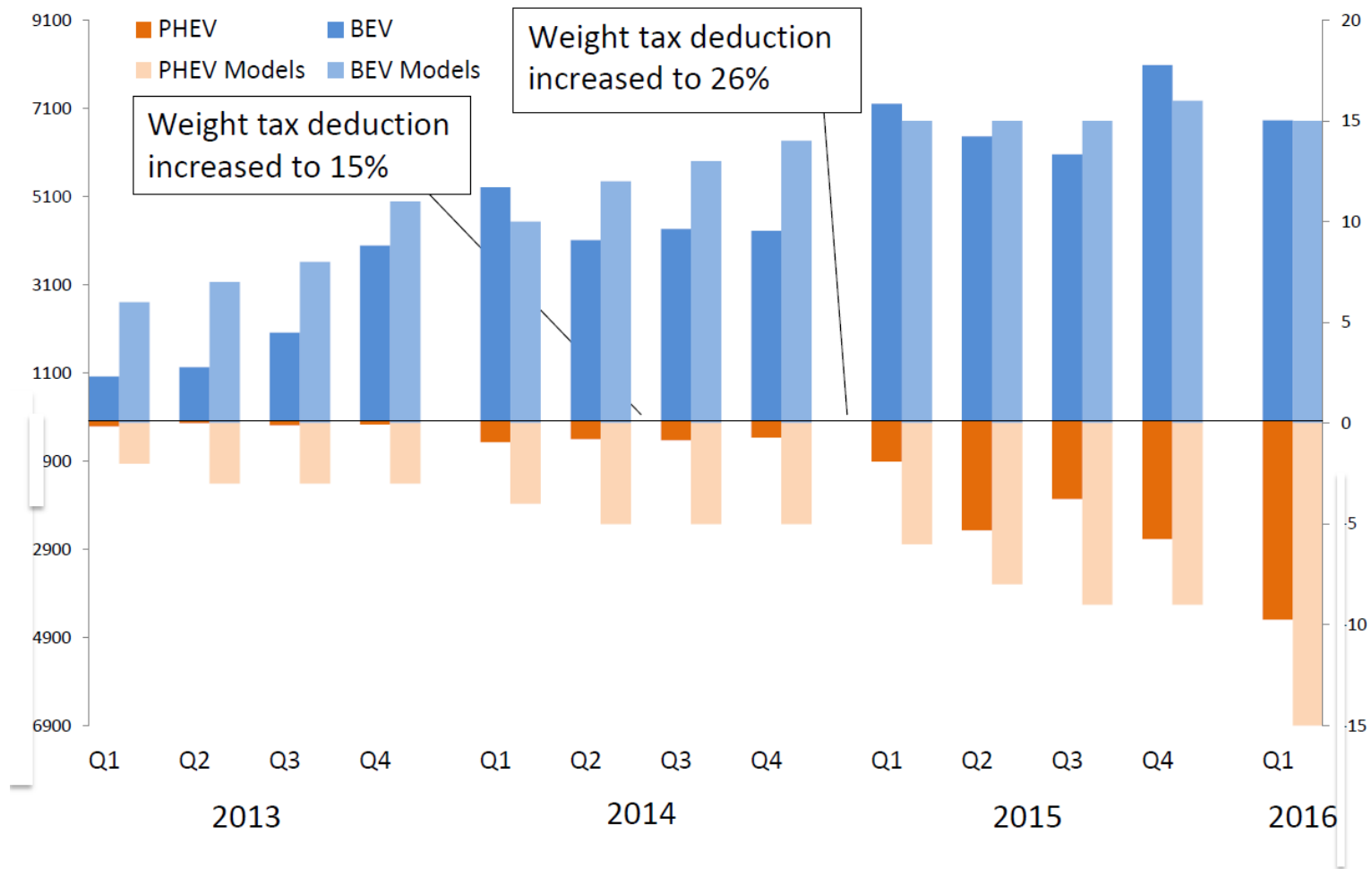


Ratio of BEVs to PHEVs varies, is shaped by policies, trending to PHEVs in several markets, with eVMT problems.

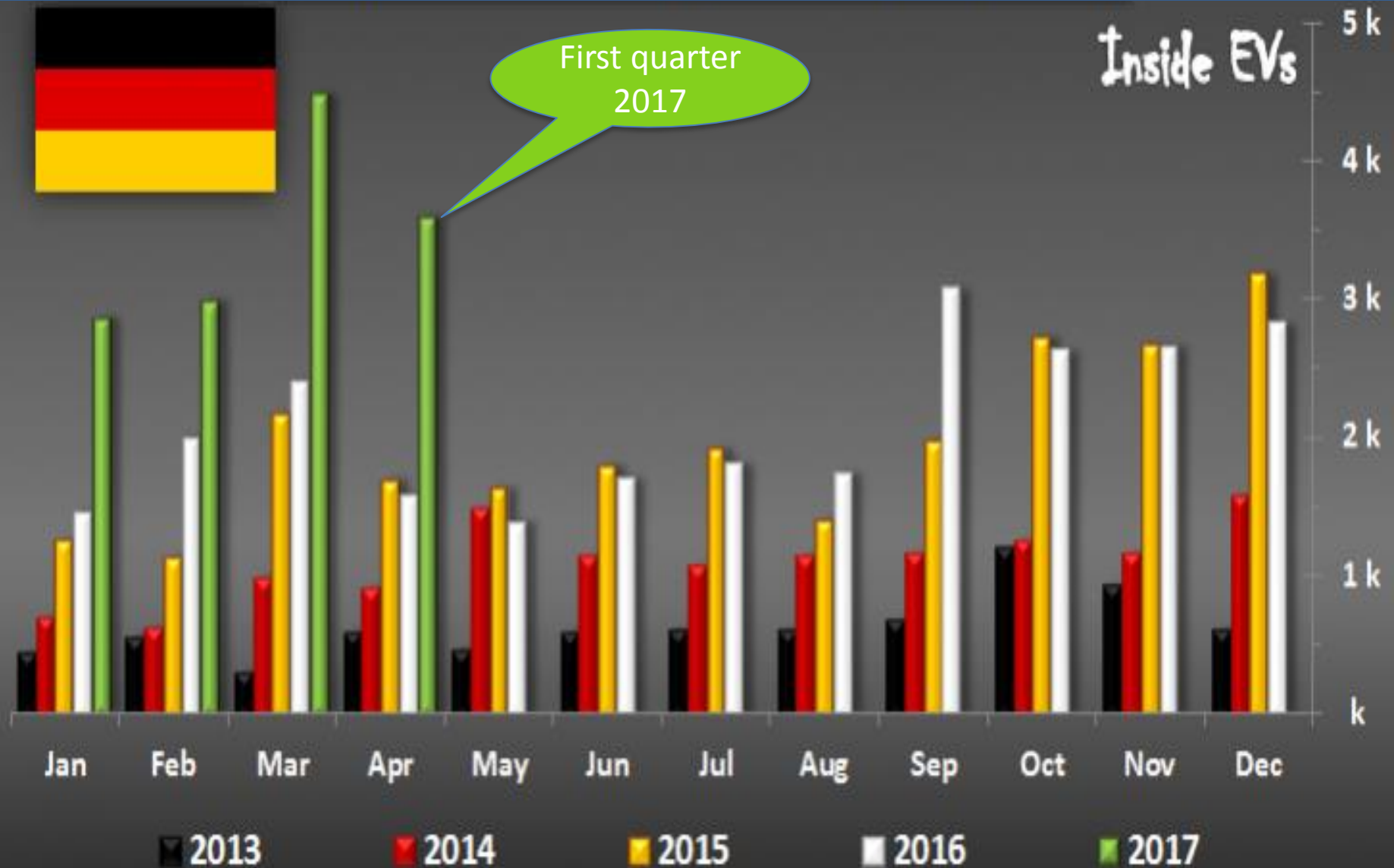


This slide is one year old, but still relevant. Small shifts in PEV policy in Norway made more room for growth around PHEVs in one car & older households

PEV Models in Norway: sales of PEVs that are a bit larger & designed for winter
 挪威PEV车型：销售的PEVs大一些，设计适应冬季低温

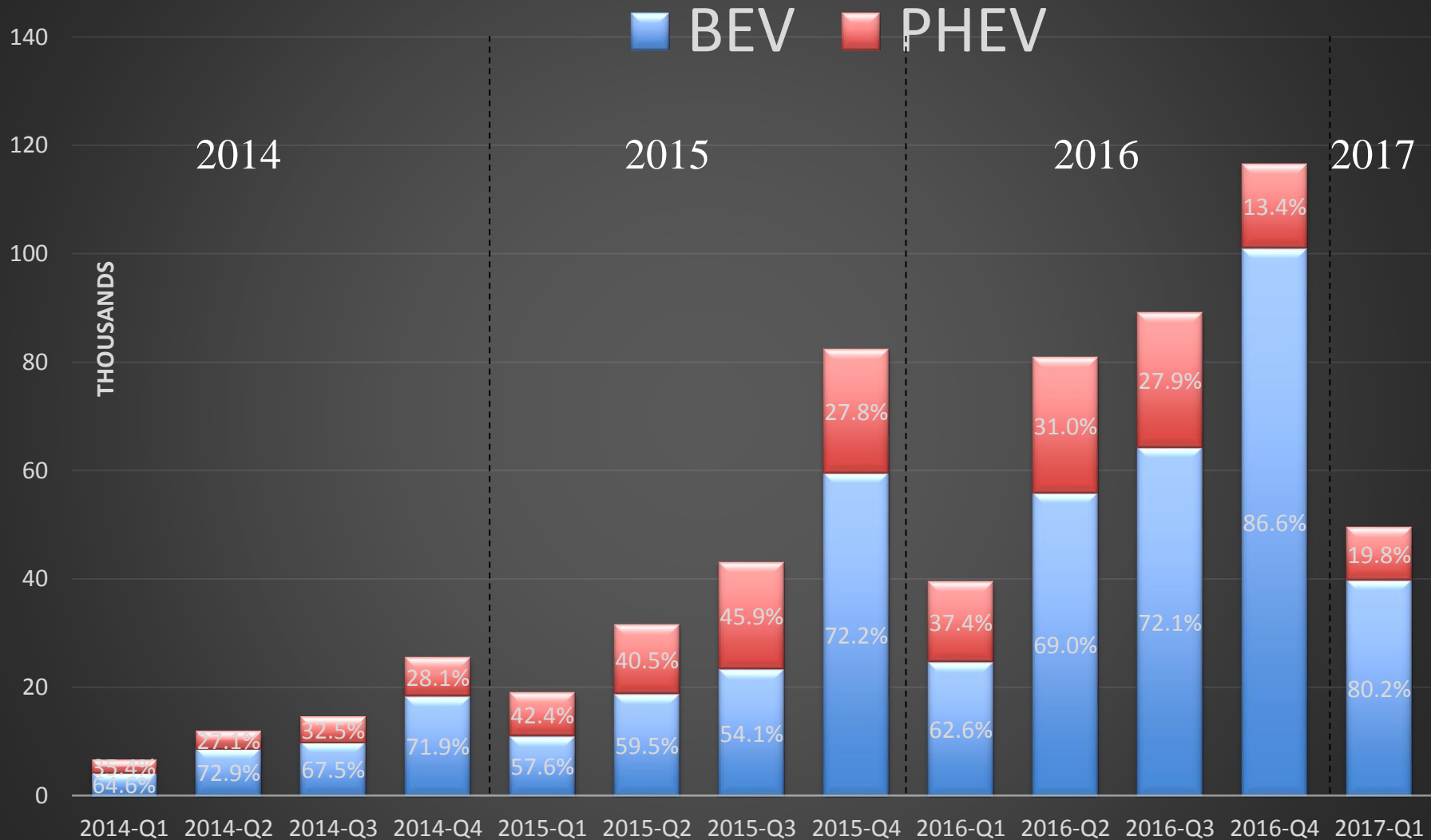


German car market responding to incentives & new PEV models



China is moving further towards BEVs - 80%

China PEV Quarterly Sales

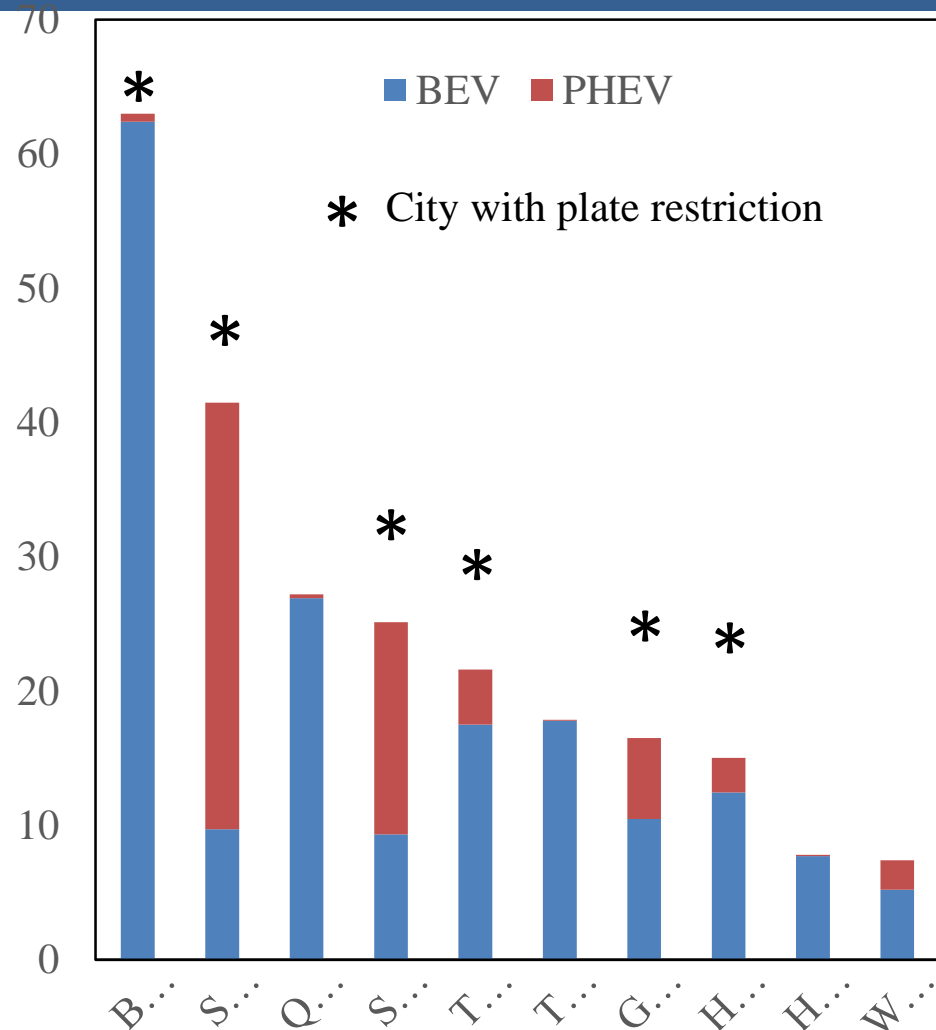


2016 PEV Sales Top 10 Cities in China: BEVs only in Beijing & registration restrictions are important

Data Source: WAYS, 2017 www.way-s.cn

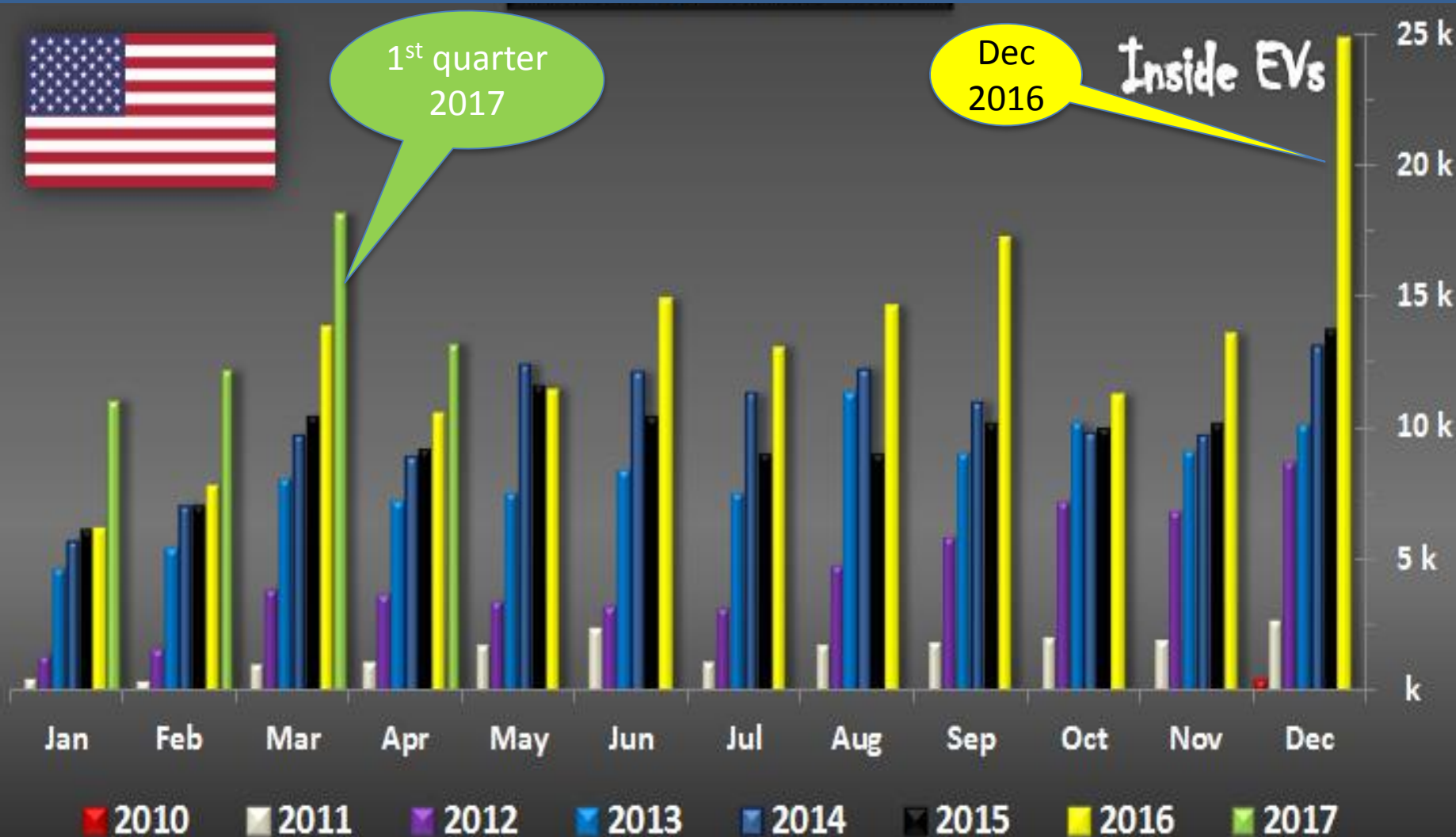
	2016 PEV Sales	BEV Manufacturer	PHEV Manufacturer
--	----------------	------------------	-------------------

Beijing	63000	BAIC	
Shanghai	41483		SAIC
Qingdao	27198		
Shenzhen	25131	BYD	BYD
Tianjin	21611		
Taiyuan	17854		
Guangzhou	16506		GAC
Hangzhou	15033	Geely, Zotye	
Hefei	7805	JAC	
Wuhu	7413	Chery	

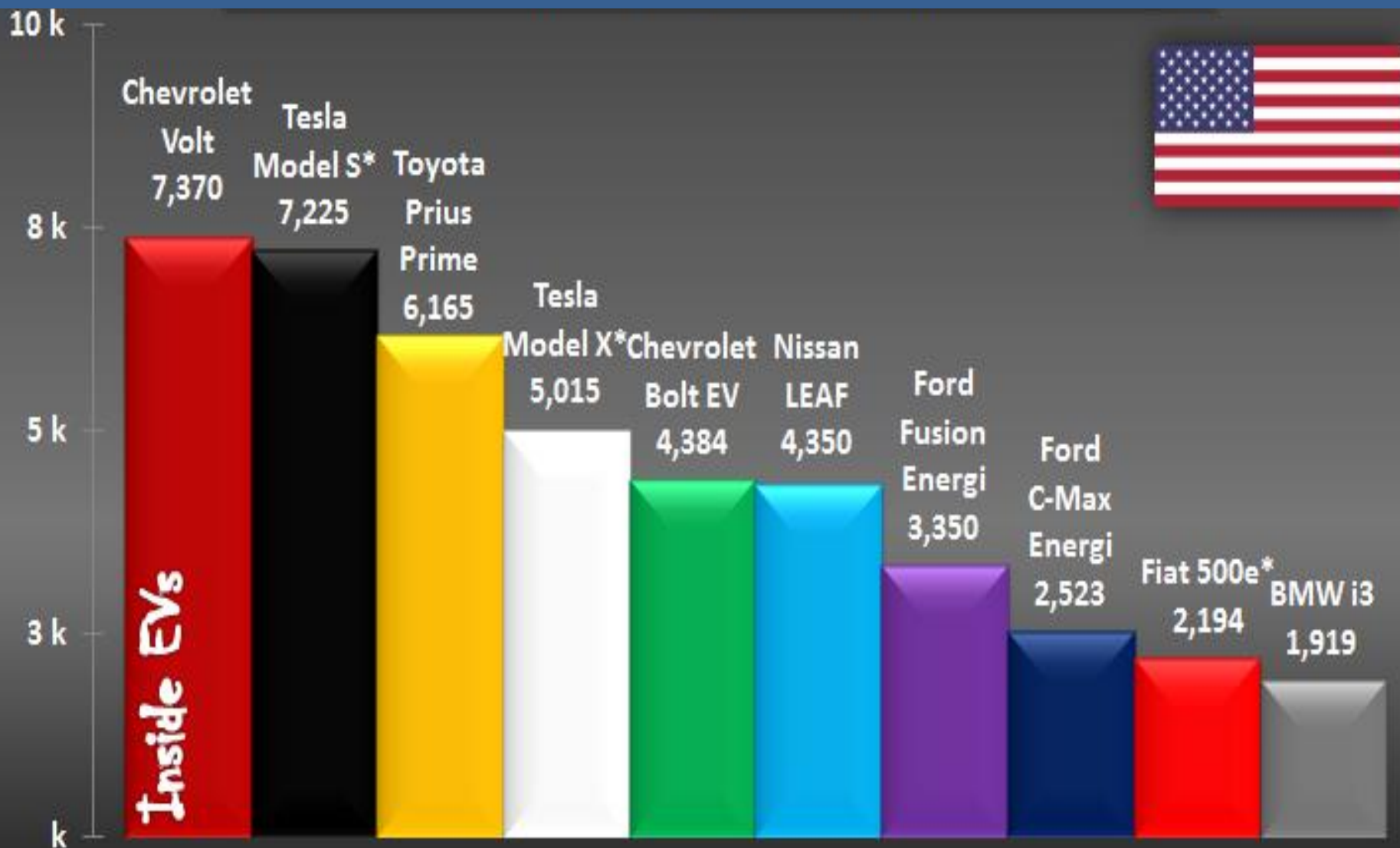


PEV MARKET DEVELOPMENT IN USA & CALIFORNIA

US PEV sales were flat in 2015, but pick up in 2016,
and jumped in Dec. 2016, with steady growth 1st
Quarter 2017

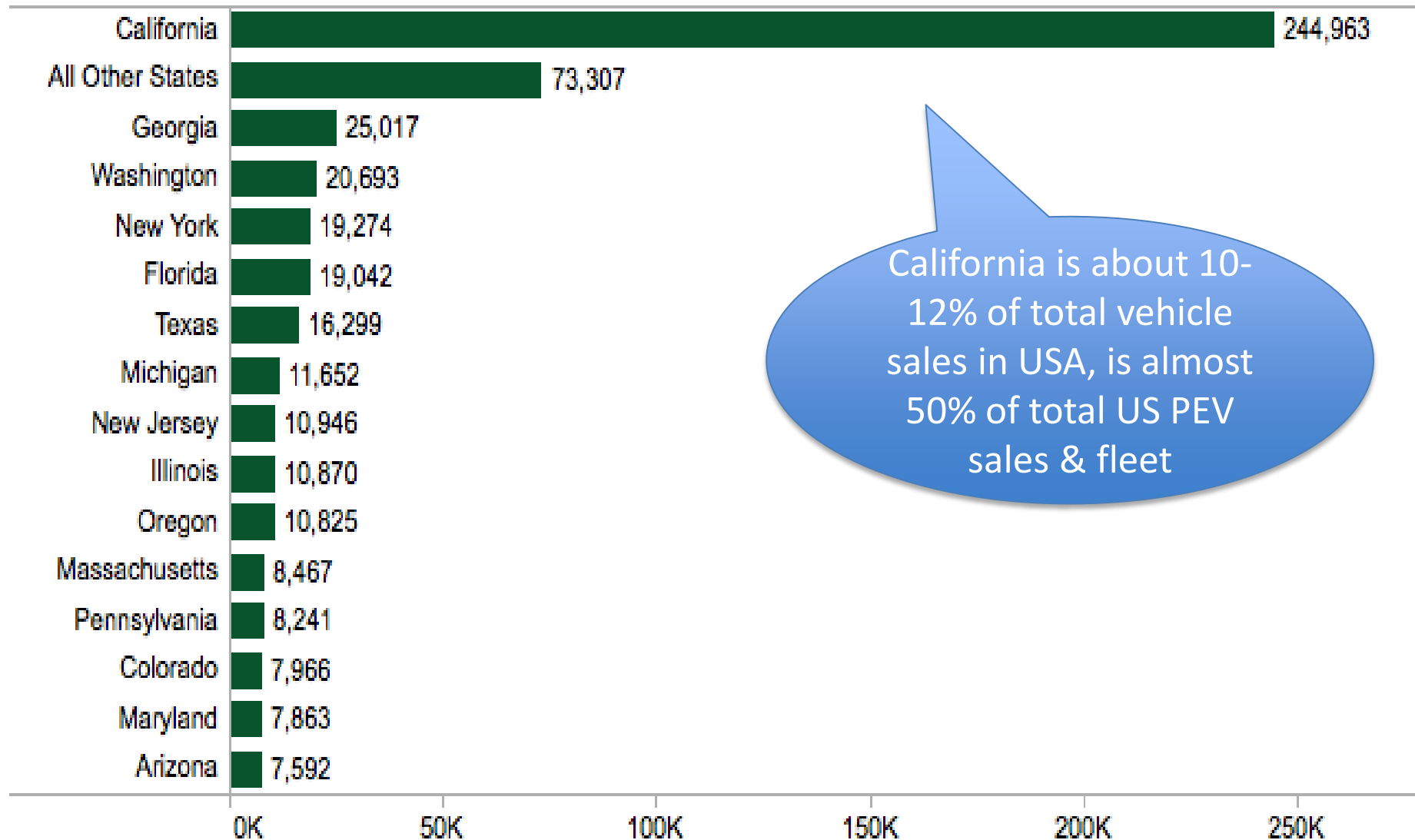


US PEV Sales first four months 2017: solid sales all around, could hit 200,000 this year if Dec strong.

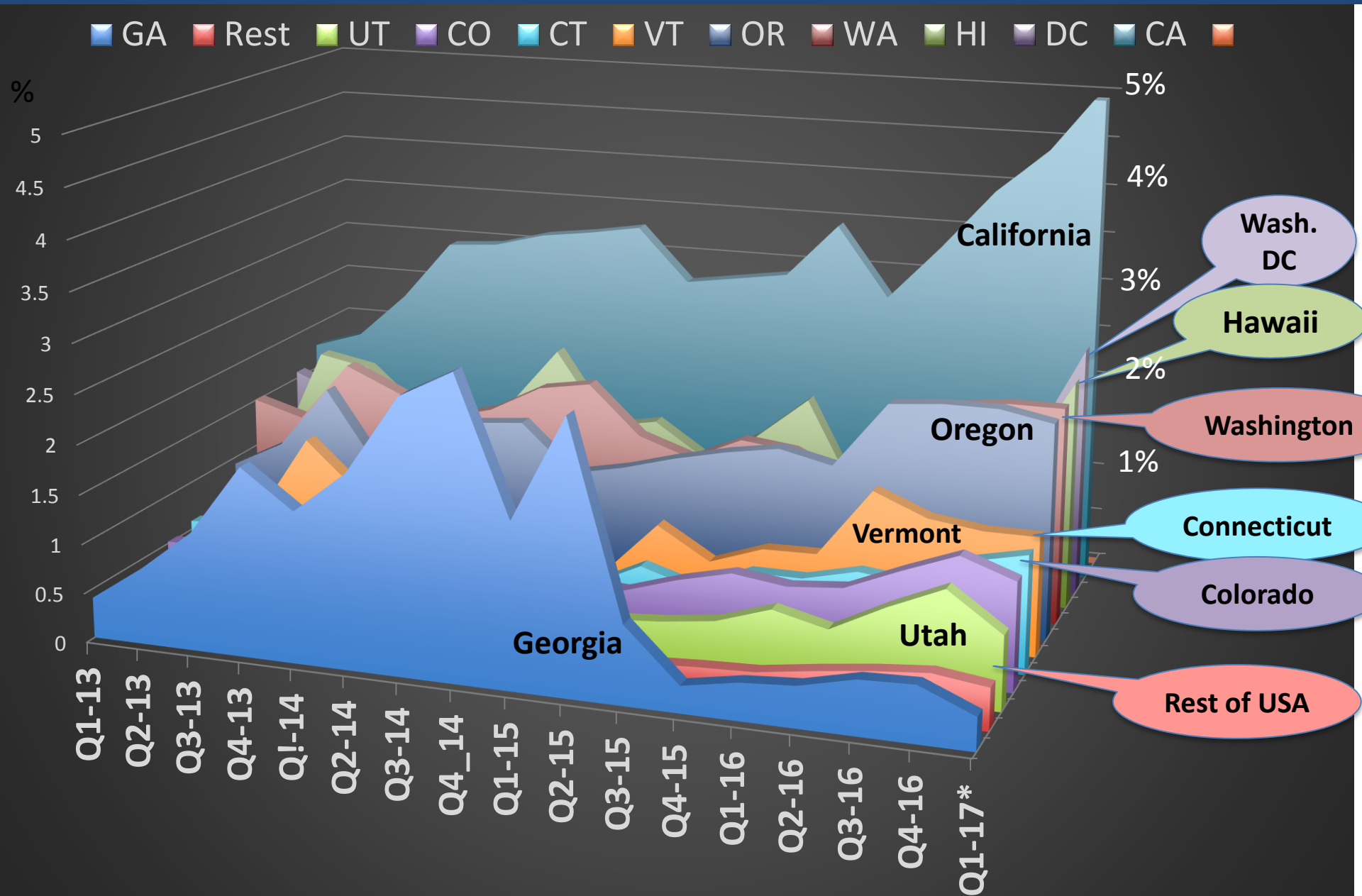


PEVs are almost 1% of registrations; what % of VMT?

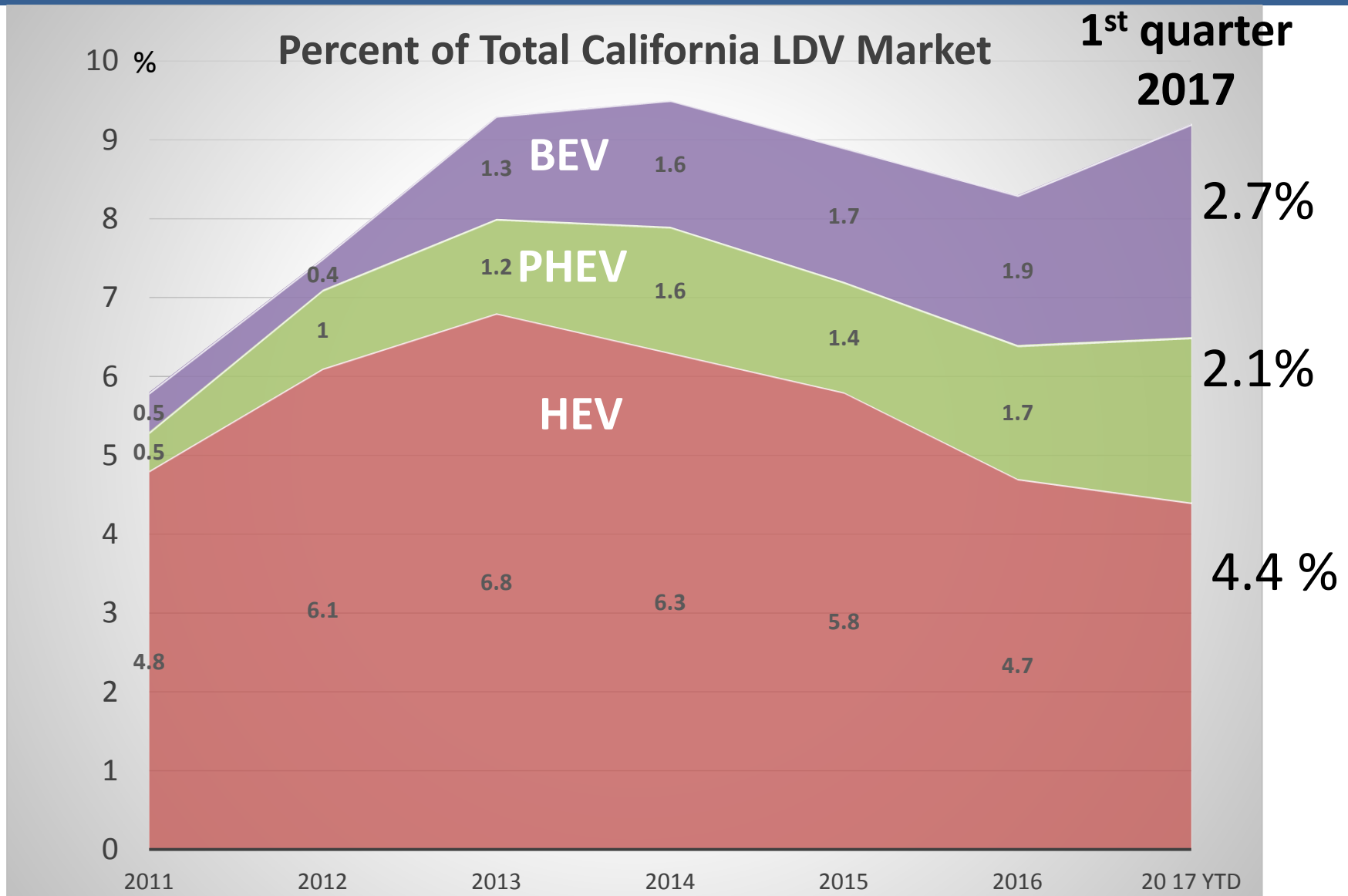
Source: EVvolumes.com



California almost 5% in this quarter, 8 states are at 1-2%, the rest of US at about .5%



PHEV & BEV combined passed HEV 91% increase in 1st quarter 2017 over 1st Quarter 2016 - source CNCDA /



World electric vehicle capitals

