A Recent Profile of Motor Vehicle Characteristics in the Washington, D.C. Region

Analysis of December 2016 vehicle registration data

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Presentation purpose – Why now?

- TPB staff periodically obtains vehicle registration data from departments of motor vehicles through the state air agencies to ensure that MOVES inputs are current for the purposes of emissions forecasting
- Vehicle registration data are used to create key inputs for the mobile emissions (MOVES) model
- Recently obtained 2016 vehicle registration data will be used in Visualize 2045 air quality conformity analysis for ozone-season pollutants

Presentation outline

Background

- Why are vehicle characteristics important?
- What are vehicle registration data?
- History of vehicle registration data analysis
- Study area

Analysis of December 2016 Data

Key Findings

Next Steps

Background

Why are vehicle characteristics important?

The **size, composition** and **age** of the vehicle fleet are important determinants of mobile source emissions calculations

The current mobile emissions (MOVES2014a) model requires two key vehicle-related inputs to be specified by jurisdiction, obtained from **vehicle registration data**:

- The number of vehicles by 13 vehicle classes; and
- The age distribution by vehicle class

What are vehicle registration data?

- A complete inventory of private, public and commercial registered vehicles maintained by departments of motor vehicles (DMVs) at a specific point in time
- Data are obtained for specific jurisdictions that comprise the non-attainment area
- Registration data can be viewed as a list of Vehicle Identification Numbers (or “VINs”)

What are Vehicle Identification Numbers (VINs)?

- Can be viewed as the "fingerprint" of each vehicle
- A standardized 17-character code that indicates the characteristics of each vehicle including manufacturer, model year, engine type, weight, vehicle type and fuel type
- VINs were standardized in 1981 by the National Highway Traffic Safety Administration (NHTSA)

VIN data analysis requires substantial staff effort:

- *data cleaning;*
- *decoding; and*
- *software and technical analysis.*

History of TPB staff's vehicle registration data analysis

- Vehicle registration data have been collected and analyzed on a **three-year** cycle
- **Previous** registration data collections corresponded to:
  - July 1, 2008
  - July 1, 2011
  - July 1, 2014
- **Current** data presented today:
  - December 31, 2016

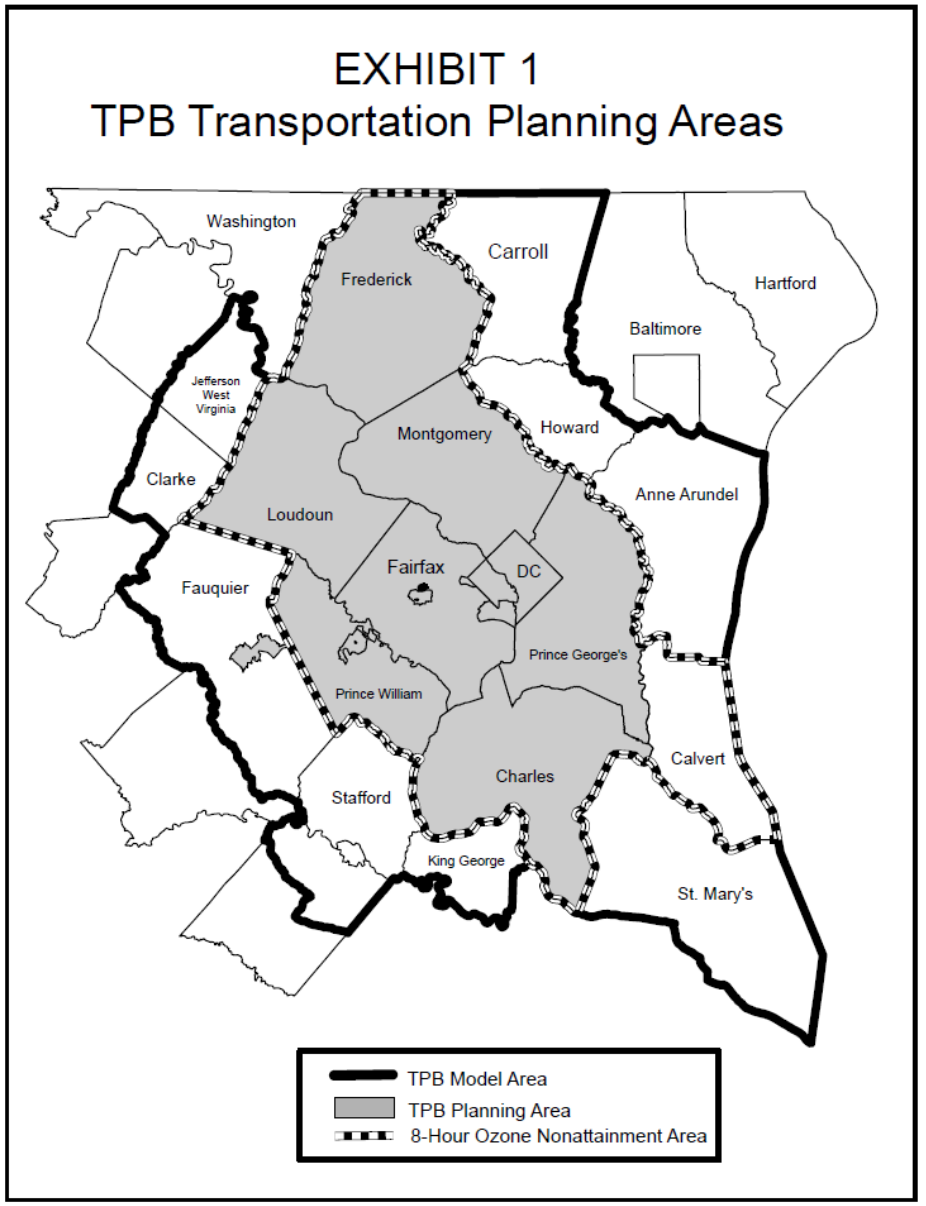
Some of the state air agencies have recently adopted a year-end data collection cycle as opposed to a July 1 data collection cycle that was used in prior years

The analysis of December data may introduce some bias when comparing to prior July data

Study area

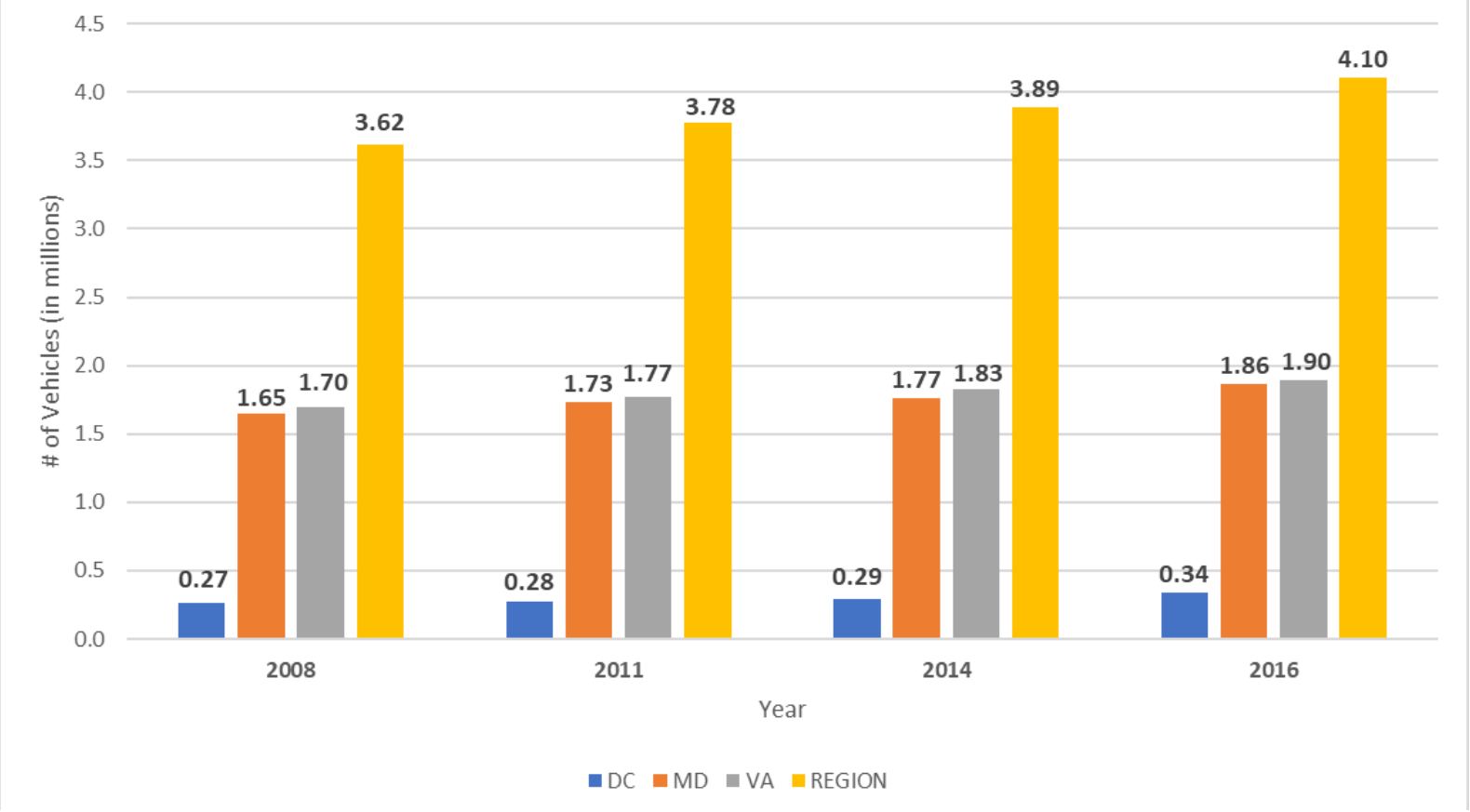
VIN data are collected for **Ozone Non-Attainment area**, including:

- District of Columbia
- Maryland:
  - Calvert County
  - Charles County
  - Frederick County
  - Montgomery County
  - Prince George's County
- Virginia:
  - Arlington County
  - City of Alexandria
  - Fairfax County and Cities
  - Loudoun County
  - Prince William County and Cities



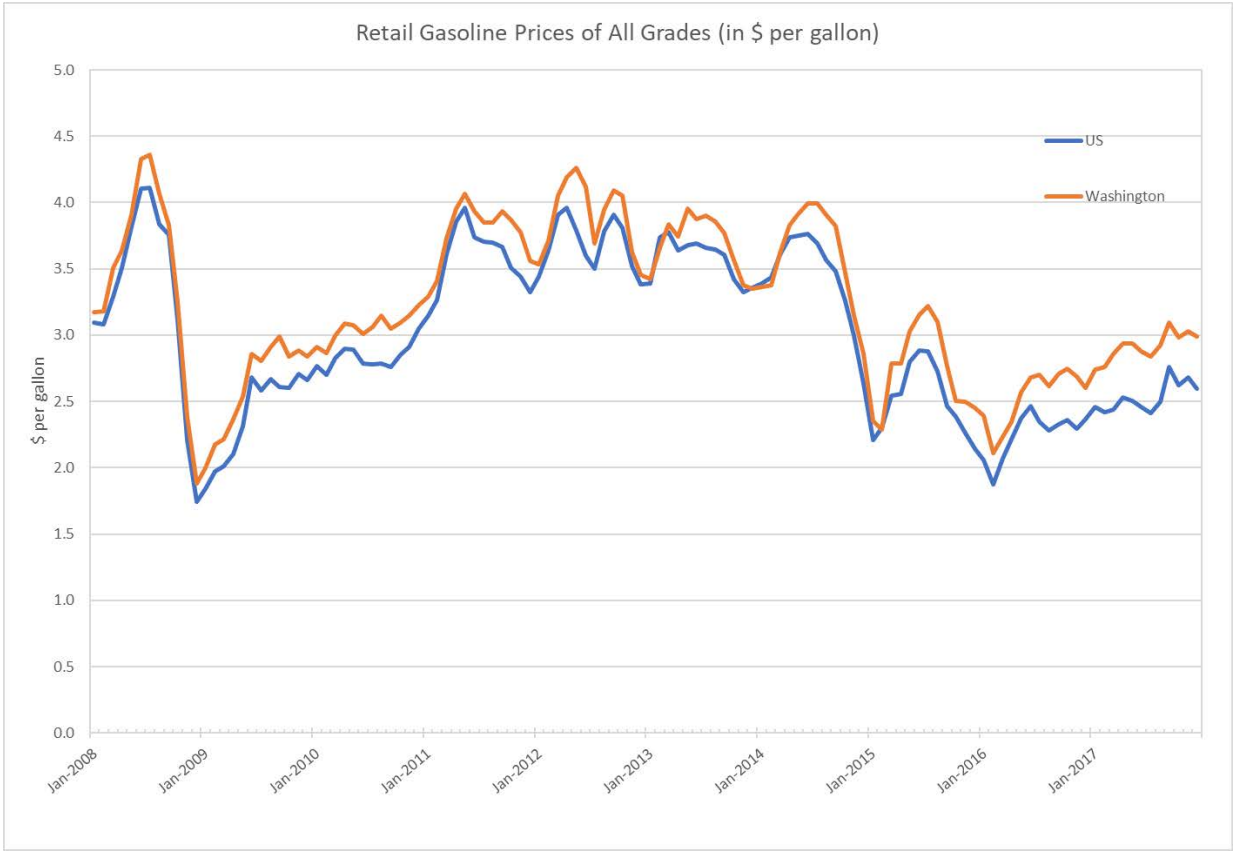
Analysis of December 2016 Data

Vehicle growth over time by state



* Based on Total DMV Records

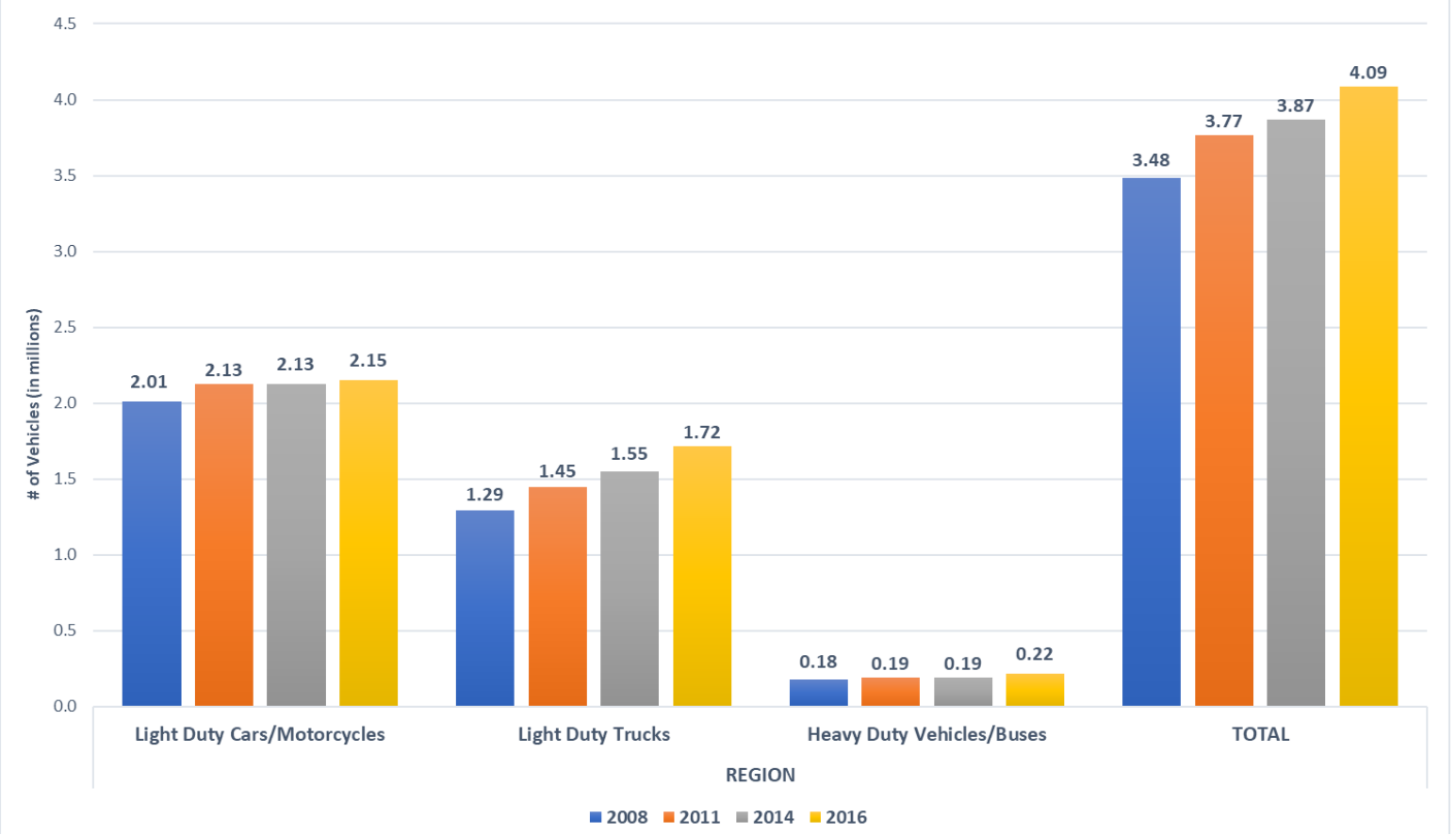
Historical retail gas prices by year



Source: US Energy Information Administration, https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=pet&s=emm_epm0_pte_nus_dpg&f=m

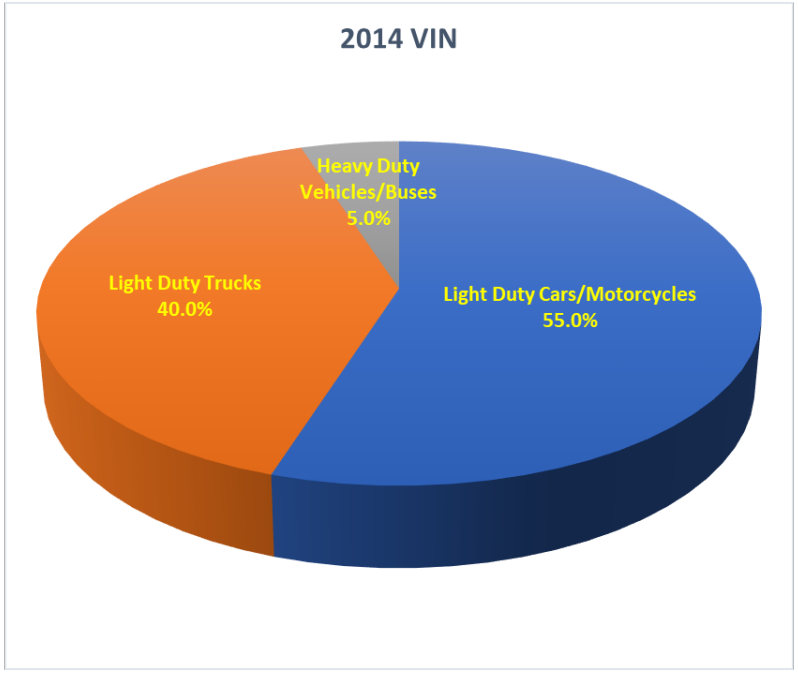
- Washington area gasoline prices have been relatively low in recent years
- Could be a factor in vehicle purchase decisions

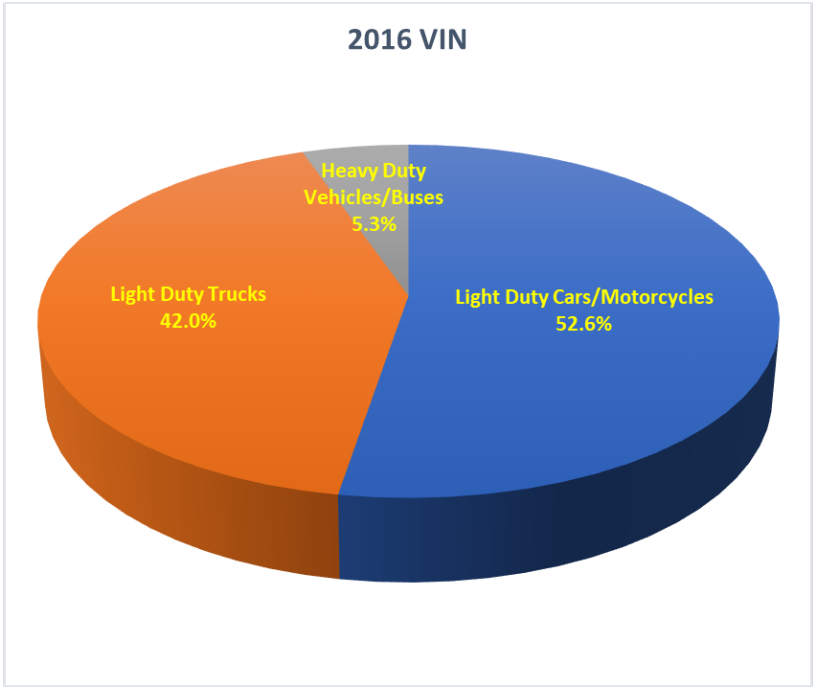
Historical growth in vehicles by type



* Based on Decoded Records

Changes in regional vehicle composition: 2014 vs. 2016





Between 2014 and 2016:

- Share of light duty trucks (including SUVs) increased by 2%; share of heavy duty vehicles increased by 0.3%
- Share of light duty cars decreased by 2.4%

Historical changes in average vehicle age

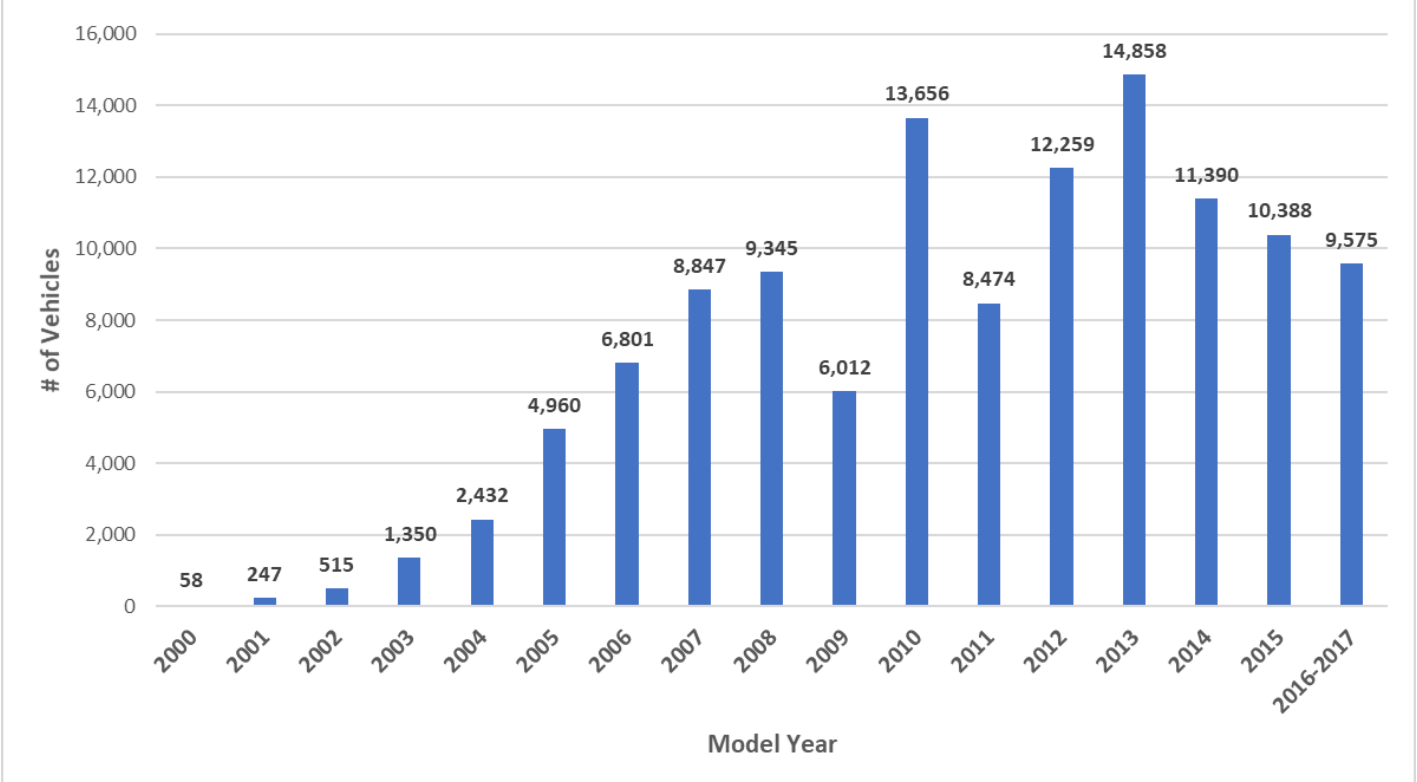
- Between 2008 and 2014, vehicle age increased across all vehicle types
- Between 2014 and 2016, vehicle age decreased for all vehicle types

Average Age of Regional Vehicle Fleet by Year

Year	Light Duty Cars* (LDC)	Light Duty Trucks (LDT)	Heavy Duty Vehicles (HDV)	All Vehicle Types
2008	8.51	7.53	9.21	8.18
2011	9.25	8.55	10.56	9.05
2014	9.62	9.09	11.30	9.49
2016	**9.33**	**8.69**	**11.29**	**9.17**

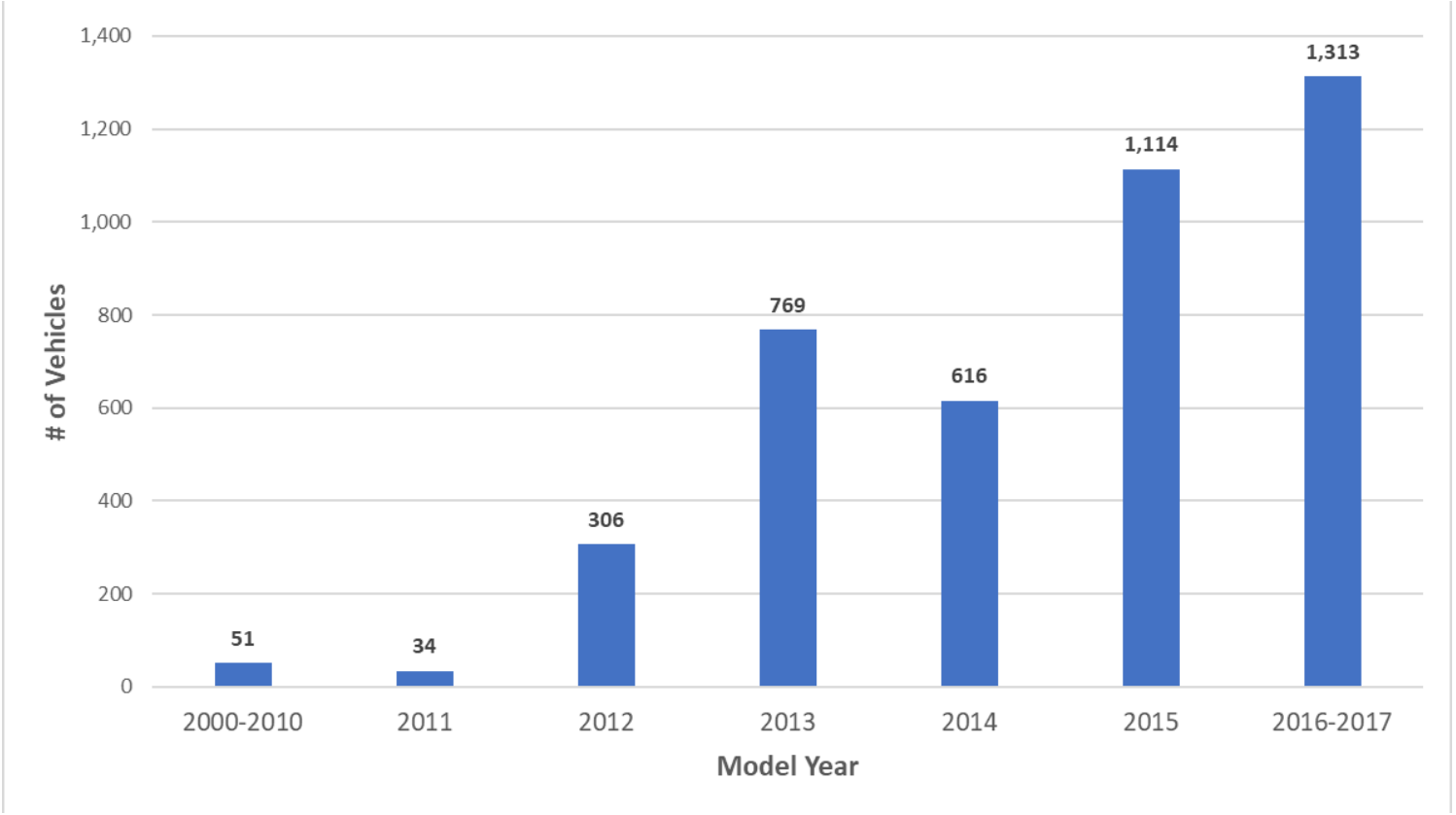
*Motorcycles are included

Current distribution of hybrid vehicles by model year



- Hybrid vehicles include: hybrid electric and plug-in hybrid vehicles
- Regional total = 121k hybrid vehicles, 3.13% out of LDC/LDT total

Current distribution of electric vehicles by model year



- Regional total = 4.2k electric vehicles, or 0.1% out of LDC/LDT total

Key findings

- The regional vehicle fleet has grown from 3.6M in 2008 to 4.1M in 2016

- The vehicle composition is changing: Between 2014 and 2016:
  - The share of LD trucks (SUVs) increased by 2%
  - The share of LD cars decreased by 2.4%
  - The share of HDV/Buses increased by 0.3%

Key findings (cont.)

- Average age of the vehicle fleet has decreased from 9.49 years in 2014 to 9.17 in 2016; a decrease in fleet age has not been observed in prior analysis years
- Hybrid vehicles account for 3.1% of the vehicle fleet
- Electric vehicles account for 0.1% of the vehicle fleet, but the size of EV fleet is steadily increasing over time

Next Steps:

- Assemble vehicle population, vehicle composition and vehicle age distribution inputs to the MOVES model based on the 2016 dataset
- Apply in air quality conformity analysis of the constrained element of Visualize 2045

Appreciation

- The state air agencies and COG DEP for granting access to the December 2016 vehicle registration data
- Daniel Son for data cleaning, VIN decoding and conducting detailed analysis of the data

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