

# Transportation Conformity Update

What has changed for the current conformity.

What does this mean.

What are some of the next steps.

# Transportation Conformity Update

For the current conformity there have been 3 main changes that impacted emission:

1. We switched to MOVES 4
2. We reconfigured/recalculated how vehicles are assigned to various vehicle classifications.
3. We accounted for Electric Vehicles (EV) for the first time.

# Model Update

## MOVES 4:

Incorporates several important updates, including the most important of which are some EPA rule makings, specifically:

- Heavy-duty (HD) low NOx rule for model years 2027 and later (HD2027 rule)
- Light-duty (LD) greenhouse gas rule for model years 2023 and later (LD GHG 2023 rule)
- The ability to model HD battery electric (BEV) and fuel cell vehicles (FCEV), as well as compressed natural gas (CNG) long-haul combination trucks.

# Model Update

## MOVES 4:

What does this mean:

- Future year NO<sub>x</sub> and PM emissions are notably lower due to the HD2027 rule.
- Future year GHG estimates are lower due to the LD GHG 2023 rule and electric vehicles expected with the Inflation Reduction Act.
- Evaporative hydrocarbon emissions from refueling increase in the near-term due to algorithm improvements and new data. HD gasoline vehicle refueling emissions decrease in later years because of HD2027 rule requirements.

# Model Update

Table 2-1: Algorithm and Data Updates for MOVES4 and Emission Implications

Area	Description of Change and Emission Implications
Heavy-duty diesel emissions for MY 2027 and later	Reduced emissions from heavy-duty diesel vehicles due to HD2027 rule. In particular, there are notable reductions in running, start and extended idle NO <sub>x</sub> . There are also reductions in running PM <sub>2.5</sub> , THC, and CO and reductions in crankcase emissions of all pollutants.
Heavy-duty gasoline emissions for MY 2027 and later.	Slight reductions in NO <sub>x</sub> , THC, CO and PM <sub>2.5</sub> emission rates for running processes due to the HD2027 rule.
Heavy-duty energy consumption for MY 2018 and later	Slight increases in energy consumption due to updated modeling of HDGHG2 rule.
Light-duty gasoline PM emissions for MY 2017 and later	Slight decreases in PM due to updated data and projections of prevalence of gasoline direct injection engines.
Light-duty vehicle energy consumption and NO <sub>x</sub> and THC emissions for internal combustion engine vehicles of MY 2017 and later	Adjusted to account for manufacturer “averaging, banking and trading” with electric vehicles. Compared to MOVES3, this increases per-vehicle emissions from gasoline, diesel and E-85 light-duty vehicles.
Light heavy-duty diesel emissions	Reduced emission deterioration rates for THC, CO & NO <sub>x</sub> emissions from light heavy-duty vehicles based on corrected warranty period.
Heavy-duty diesel extended idle elemental carbon (EC) and non-EC emissions for MY 2007 and earlier.	Corrected database for speciation of diesel extended idle PM <sub>2.5</sub> emissions, increasing EC fraction of PM emissions and decreasing non-EC fraction.
Light- and heavy-duty ammonia emissions for gasoline vehicles of MY 1981 and later, and diesel vehicles of MY 1960 and later.	Increased NH <sub>3</sub> emissions based on new data.
Heavy-duty diesel vehicle N <sub>2</sub> O for MY 2004+	Increased N <sub>2</sub> O emissions based on new data.
Diesel vehicle NO <sub>2</sub> and NO for all model years	Updated NO <sub>2</sub> :NO <sub>x</sub> and NO:NO <sub>x</sub> ratios such that NO fraction increases and NO <sub>2</sub> fraction decreases.

Area	Description of Change and Emission Implications
Crankcase emissions for HD diesel vehicles	Updated algorithm that calculates crankcase emissions by regulatory class. Net emission impacts are small and vary by pollutant.
Speciation for air quality modeling	Removed chemical mechanisms and updated rocspeciation and nrrocspeciation tables. No impact on total emissions of hydrocarbons, NonHAPTOG, or any PM species.
Refueling vapor emissions from gasoline and E-85 vehicles	New data and improved algorithm generally increase refueling vapor emissions. HD gasoline vehicle refueling emissions decrease in later years because of HD2027 rule requirements. We also updated default information on the location of Stage II vapor recovery programs.
I/M Coverage	Updated the default list of counties with I/M programs to account for corrections, program changes, and program terminations.
Updated NO <sub>x</sub> humidity adjustments	NO <sub>x</sub> emissions are slightly more sensitive to ambient humidity due to improved algorithms for all fuel types.
Default national VMT, default national vehicle populations, and default vehicle age distributions	Updated historical data and forecasts.
Default vehicle fuel type and regulatory class mix	Updated historical mix and forecasts. Moved engine-certified Class 3 trucks from regulatory class 41 to 42 to better match emissions. Reduced population of heavy-duty “glider” trucks. Unlike MOVES3, MOVES4 includes non-zero EV fractions.
Relative Mileage Accumulation	Updated LD mileage accumulation based on DOT analysis of odometer data from a random national sample of one million light-duty vehicles. The new analysis shows that cars and light trucks/SUVs are driven more similarly. It also shifts the distribution of VMT from newer to older vehicles
U.S. Counties	Accounted for split in Alaska county equivalent by removing one county and adding two more.
Gasoline properties	Updated gasoline properties for calendar years 2018 and later.
Fuel energy and carbon content	Updated fuel density, energy density, and carbon content for diesel and gasoline fuels. Declines in energy density and increased carbon content led to very small increases in CO <sub>2</sub> and SO <sub>2</sub> emissions. We also updated the fuel densities used in nonroad calculations.

# Vehicle Registration Update

MOVES 4 gives us the ability to account for Electric Vehicles.

- We had to develop a methodology to do this and apply it to the data we currently have (2022 vehicle data).
- As part of this process, we reviewed the methodology we had and determined it needed to be revised.

# Vehicle Registration Update

The revised methodology resulted in a number of vehicles being reclassified among the MOVES Source Type ID's.

- We reviewed this internally and did some testing (emissions changes were <5%).
- We used the revised vehicle population and corresponding age distribution files in the current conformity modeling as it was necessary to be able to use MOVES 4.

## Mapping Changes Between the Current and Updated VIN Decoder:

This comparison was conducted in an Inspection and Maintenance (IM) area, indicating that the data is from a region where vehicles undergo regular inspections and maintenance. The dataset includes 6,217,589 vehicles, with 968,493 vehicles changing their types using the updated method.

### 1. Passenger Car to Passenger Truck:

- **Original:** 386,442 passenger cars (MOVESID 21)
- **Updated:** Passenger trucks (MOVESID 31)
- **Details:** All weight types of Sport Utility Vehicle (SUV)/Multi-Purpose Vehicle (MPV), Crossover Utility Vehicle (CUV), Minivan, and Class 1 Pickup are now considered Passenger Trucks.

### 2. Passenger Truck to Light Commercial Truck:

- **Original:** 375,129 passenger trucks (MOVESID 31)
- **Updated:** Light Commercial Trucks (MOVESID 32)
- **Details:** Class 2 Pickup, Van, Cargo Van, and Class 1 and Class 2 Incomplete vehicles (non-bus) are now considered Light Commercial Trucks.

### 3. Passenger Truck to Passenger Car:

- **Original:** 65,363 passenger trucks (MOVESID 31)
- **Updated:** Passenger cars (MOVESID 21)
- **Details:** Coupe, Convertible/Cabriolet, Hatchback/Liftback/Notchback, Roadster, Sedan/Saloon, and Wagon body classes from NHTSA are now considered Passenger Cars.

# Vehicle Registration Update (Continued)

## 4. Single Unit Short-haul Truck to Light Commercial Truck:

- **Original:** 23,607 Single Unit Short-haul Trucks (MOVESID 52)
- **Updated:** Light Commercial Trucks (MOVESID 32)
- **Details:** Class 2 Pickup, Van, Cargo Van, and Class 1 and Class 2 Incomplete vehicles (non-bus) are now considered Light Commercial Trucks.

## 5. Passenger Truck to Single Unit Short-haul Truck:

- **Original:** 21,199 passenger trucks (MOVESID 31)
- **Updated:** Single Unit Short-haul Trucks (MOVESID 52)
- **Details:** Class 3 and above Pickup, Truck, Van, Cargo Van, and Incomplete vehicles (non-bus) are now considered Single Unit Short-haul Trucks.

## 6. Single Unit Long-haul Truck to Single Unit Short-haul Truck:

- **Original:** 12,381 Single Unit Long-haul Trucks (MOVESID 53)
- **Updated:** Single Unit Short-haul Trucks (MOVESID 52)
- **Details:** Class 3 and above Pickup, Truck, Van, Cargo Van, and Incomplete vehicles (non-bus) are now considered Single Unit Short-haul Trucks.

## 7. Light Commercial Truck to Single Unit Short-haul Truck:

- **Original:** 11,539 Light Commercial Trucks (MOVESID 32)
- **Updated:** Single Unit Short-haul Trucks (MOVESID 52)
- **Details:** Class 3 and above Pickup, Truck, Van, Cargo Van, and Incomplete vehicles (non-bus) are now considered Single Unit Short-haul Trucks.

## 7. Light Commercial Truck to Single Unit Short-haul Truck:

- **Original:** 11,539 Light Commercial Trucks (MOVESID 32)
- **Updated:** Single Unit Short-haul Trucks (MOVESID 52)
- **Details:** Class 3 and above Pickup, Truck, Van, Cargo Van, and Incomplete vehicles (non-bus) are now considered Single Unit Short-haul Trucks.

## 8. Single Unit Long-haul Truck to Combination Short-haul Truck:

- **Original:** 10,388 Single Unit Long-haul Trucks (MOVESID 53)
- **Updated:** Combination Short-haul Trucks (MOVESID 61)
- **Details:** Class 6 and Class 7 Trucks are now considered Combination Short-haul Trucks.

## 9. Passenger Car to Light Commercial Truck:

- **Original:** 8,472 passenger cars (MOVESID 21)
- **Updated:** Light Commercial Trucks (MOVESID 32)
- **Details:** Class 2 Pickup, Van, Cargo Van, and Class 2 Incomplete vehicles (non-bus) are now considered Light Commercial Trucks.

## 10. Passenger Truck to Non-MOVES Vehicle:

- **Original:** 7,644 passenger trucks (MOVESID 31)
- **Updated:** Non-MOVES vehicles (MOVESID 0)
- **Details:** Low Speed Vehicle (LSV) / Neighborhood Electric Vehicle (NEV), Off-road Vehicle, and Trailer are now considered non-MOVES vehicles.

# EV Modeling

MOVES 4 updated the fuels inputs: Specifically, the Alternate Vehicle Fuel and Technologies (AVFT) input to enable EV's to be projected into the future.

## **Alternate Vehicle Fuel and Technologies (AVFT):**

- The AVFT input enables the fraction of vehicles capable of using different fuels and technologies to be modified.
- Specifically, for each source type and model year, the AVFT table allows users to define the fraction of vehicles that are designed to run on:  
*Gasoline, diesel, E-85, CNG, battery electric (BEV), and fuel cell electric (FCEV).*

## **MOVES4 also has an AVFT tool:**

- The tool can be used to project future fuel type distributions based on the combination of local historic data and projected national trends.
- It can also help with gap-filling local historic fuel type distribution data if necessary. For example, if you are modeling calendar year 2030, MOVES would require a fuel type distribution for every model year between 2000-2030.
- CMAP's data is from 2022, and we model 2025 thus we need to be able to go back to 1995.

# EV Modeling (Continued)

## AVFT tool assumptions and methodology CMAP used:

- Last Complete model year = 2022 (Nov. of 2022)
- Gap filling method (default settings)
- Projection Method: Proportional

This method projects future fuel type distributions based on proportional differences between the local and the national distributions in the last complete model year in the input data.

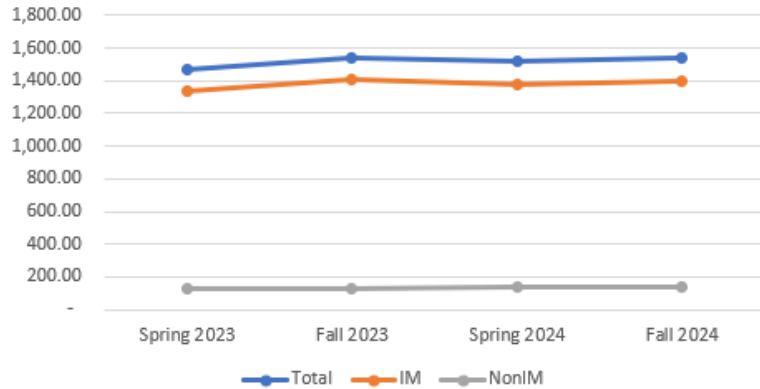
This preserves differences between local conditions and the national average, while still accounting for expected changes in national fuel type distribution trends.

The screenshot shows the AVFT Tool interface with the following sections:

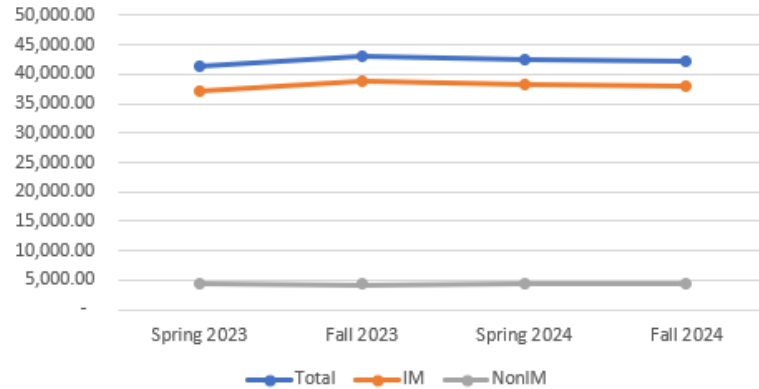
- Tool Input Selections:**
  - Last complete model year in input data: [Dropdown]
  - Analysis year: [Dropdown]
  - Open Help button
  - Projection Method: [Dropdown]
- Gap-filling Method:**
  - Passenger Cars (21): Fill with 0s
  - Passenger Trucks (31): Fill with 0s
  - LD Commercial Trucks (32): Fill with 0s
  - Other Buses (41): Fill with 0s
  - Transit Buses (42): Fill with 0s
  - School Buses (43): Fill with 0s
  - Refuse Trucks (51): Fill with 0s
  - Single Unit Short-haul Trucks (52): Fill with 0s
  - Single Unit Long-haul Trucks (53): Use defaults and renormalize
  - Motor Homes (54): Fill with 0s
  - Combination Short-haul Trucks (61): Fill with 0s
  - Combination Long-haul Trucks (62): Use defaults and renormalize
- Input/Output Files:**
  - Input AVFT File: Browse for the input AVFT file... [Browse...] [Create Template...]
  - Known Fractions: Browse for the known fractions input file... [Browse...] [Create Template...]
  - Output AVFT File: Specify the output file name and location... [Browse...]
- Messages:** [Empty text area]
- Buttons:** Run AVFT Tool, Save Messages, Done

# Transportation Conformity Results 2025

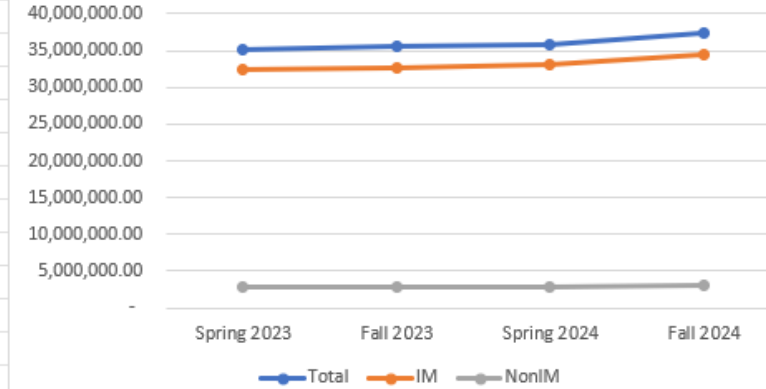
2025 Direct PM



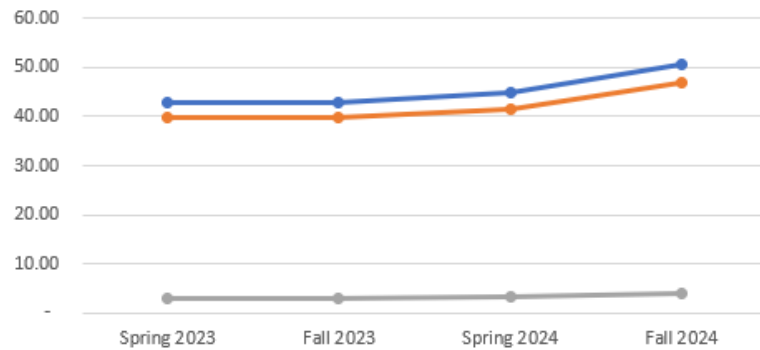
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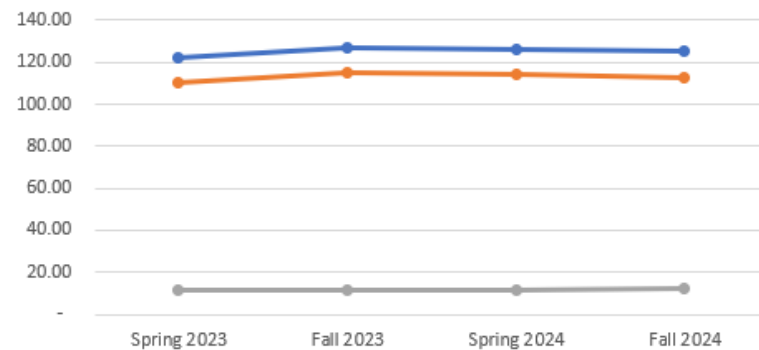
2025 CO2 Equivalent



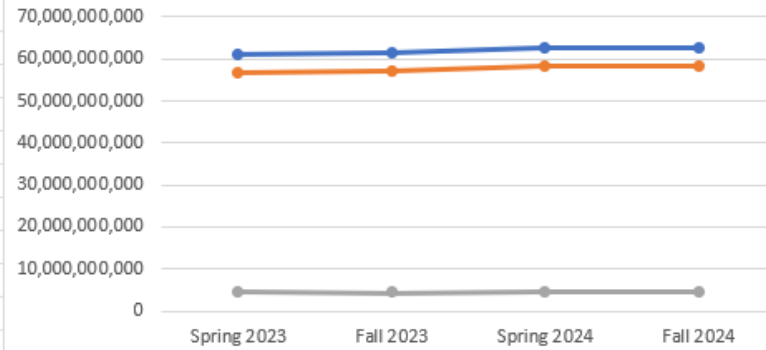
2025 VOC



2025 NOx

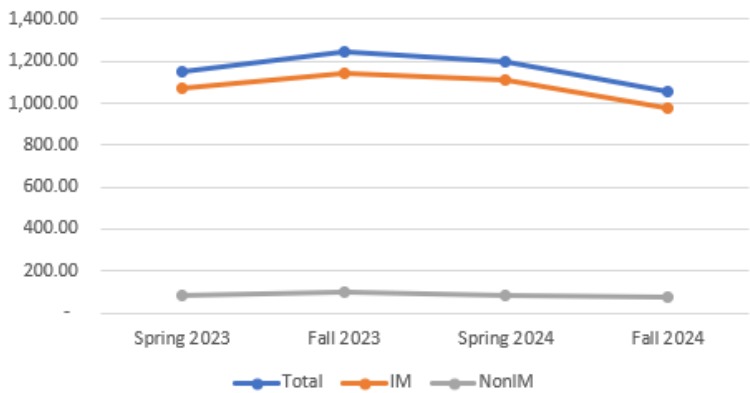


2025 HPMSYearly VMT

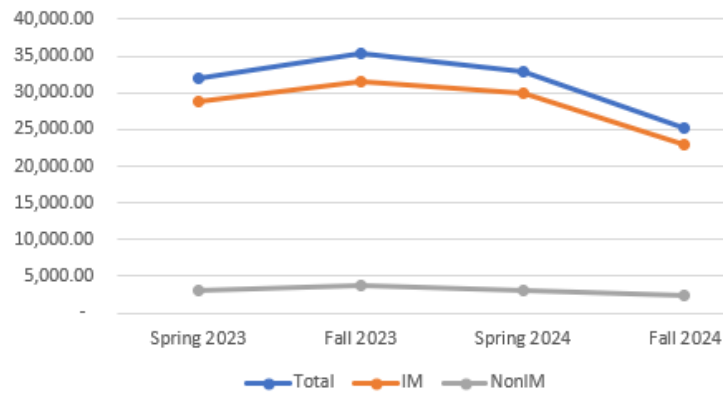


# Transportation Conformity Results 2030

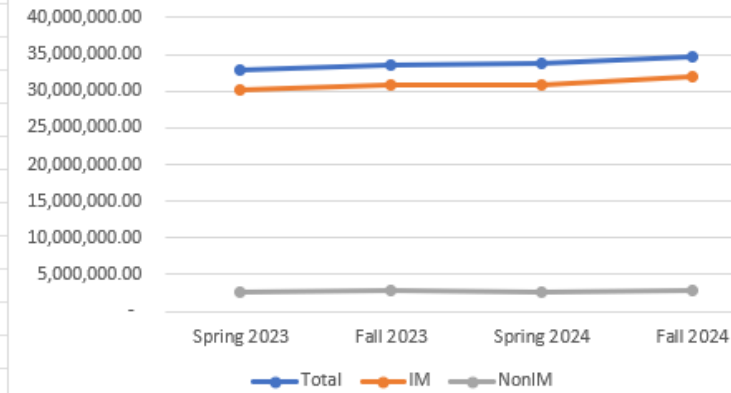
### 2030 Direct PM



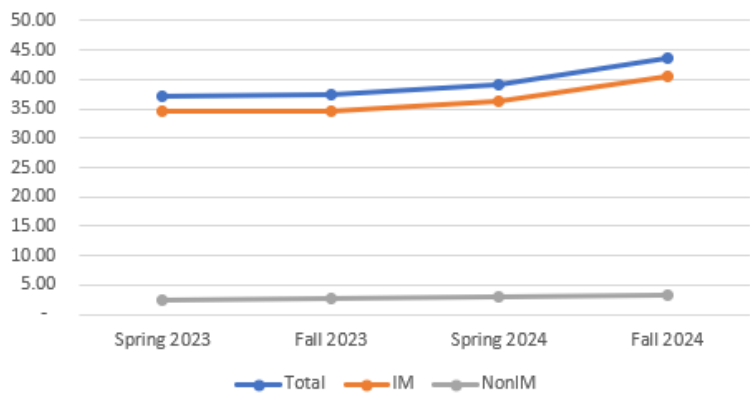
### 2030 NOx



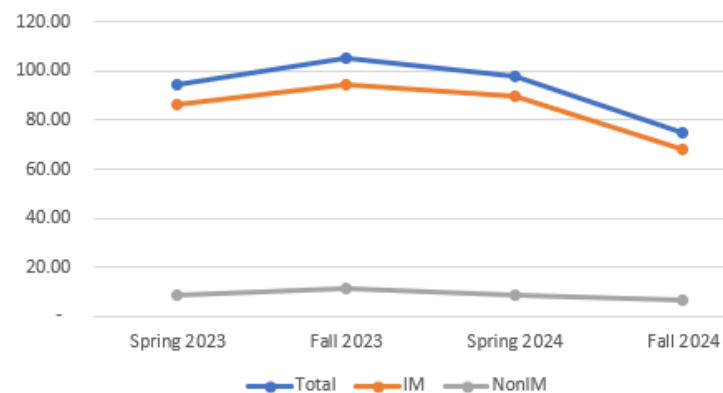
### 2030 CO2 Equivalent



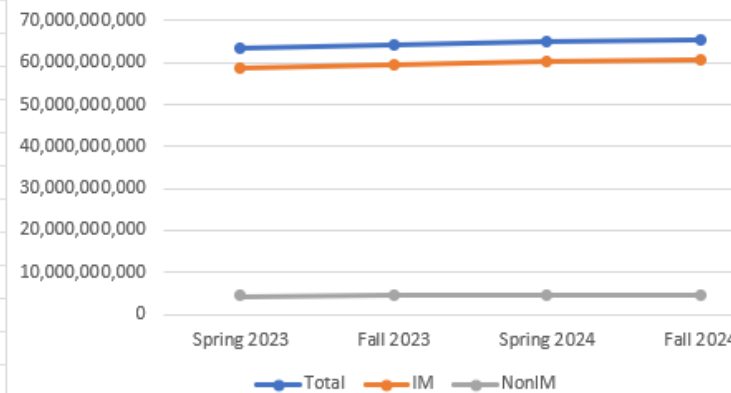
### 2030 VOC



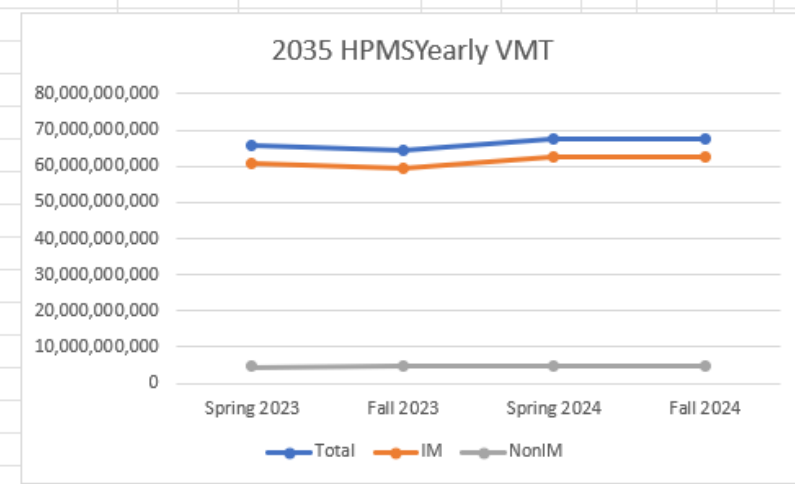
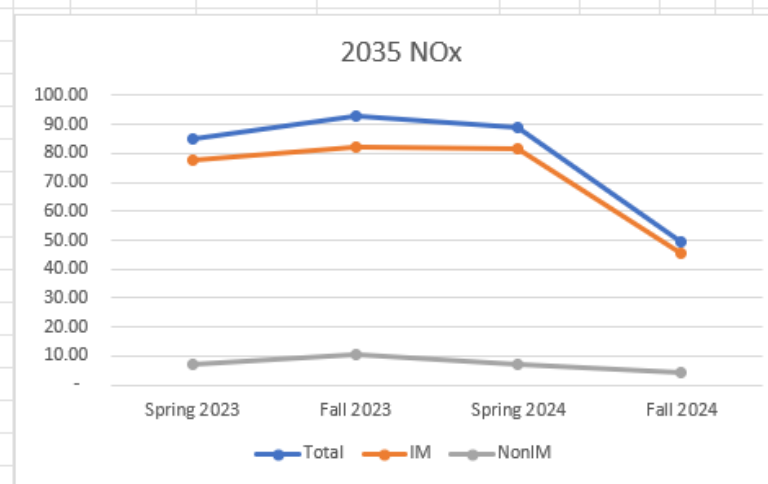
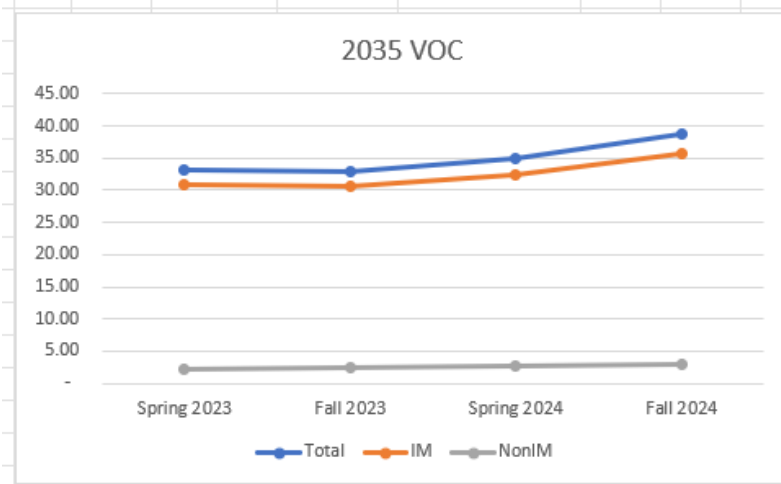
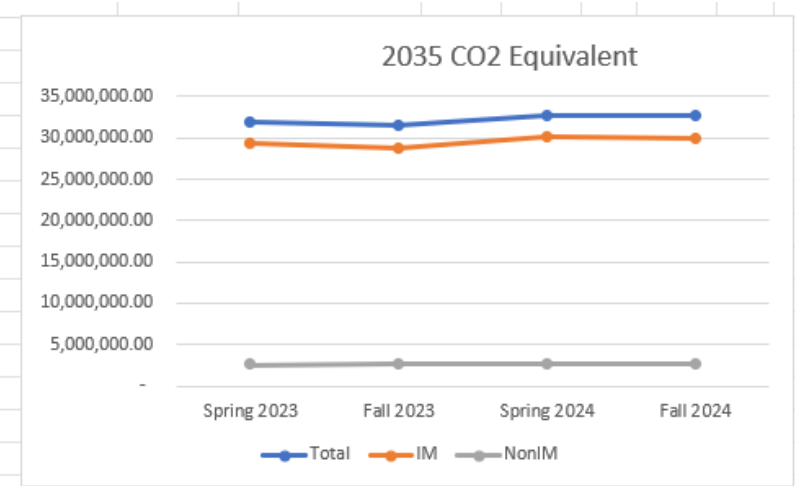
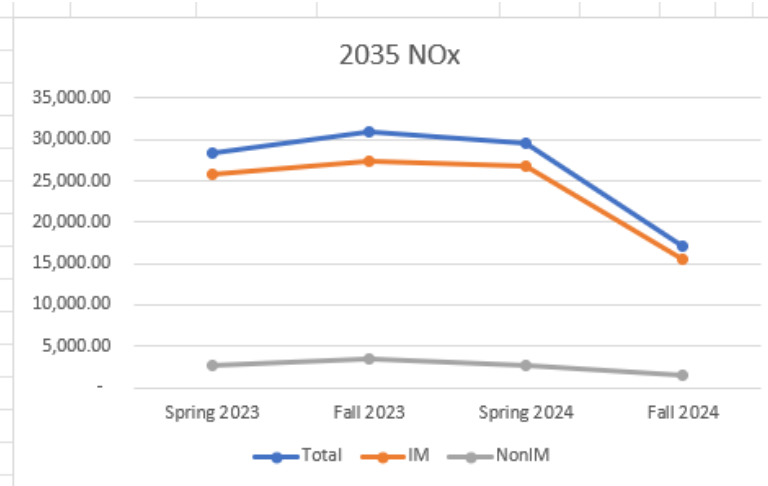
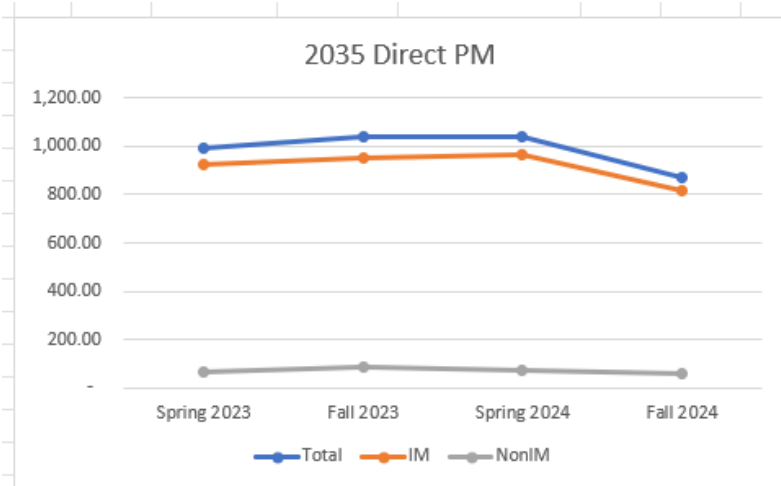
### 2030 NOx



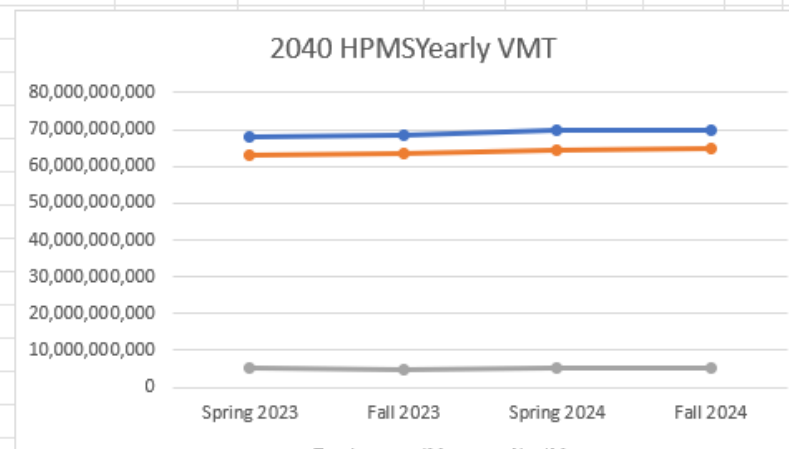
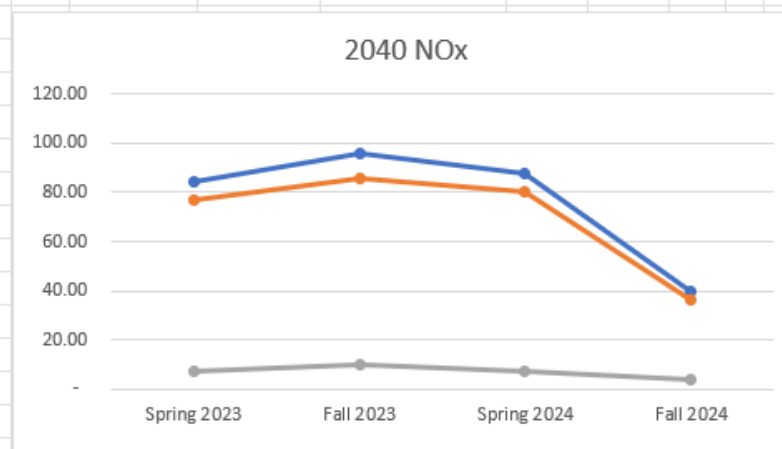
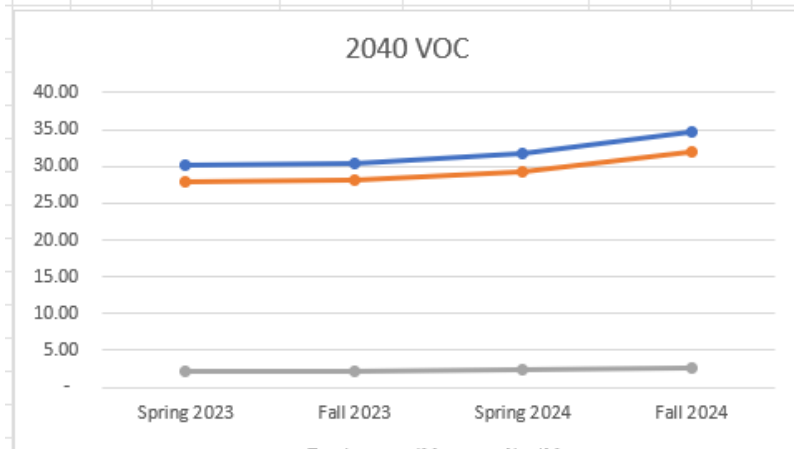
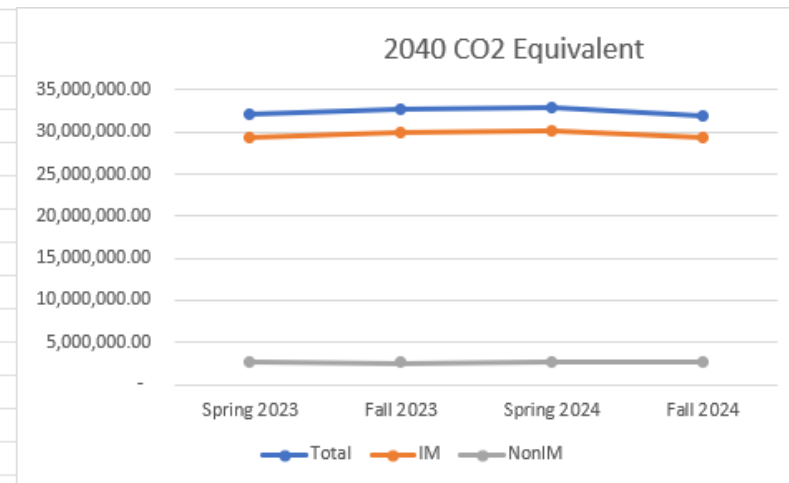
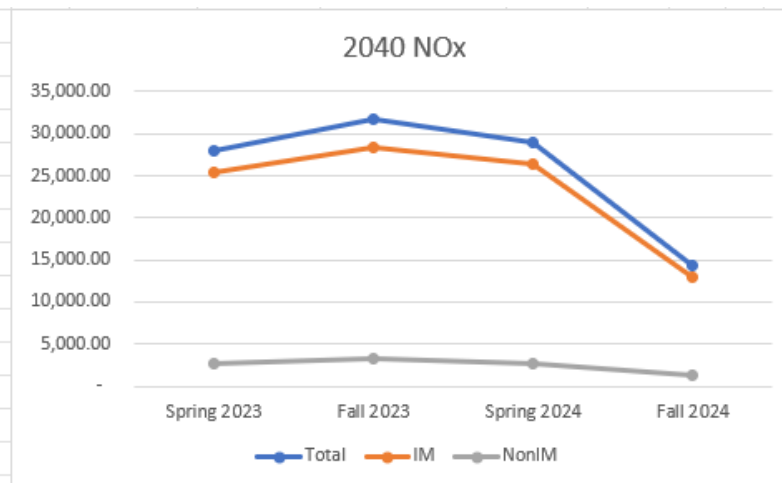
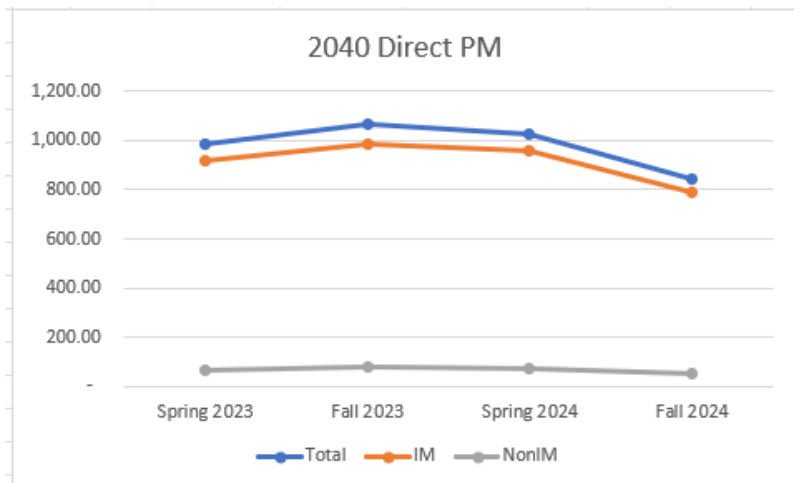
### 2030 HPMSYearly VMT



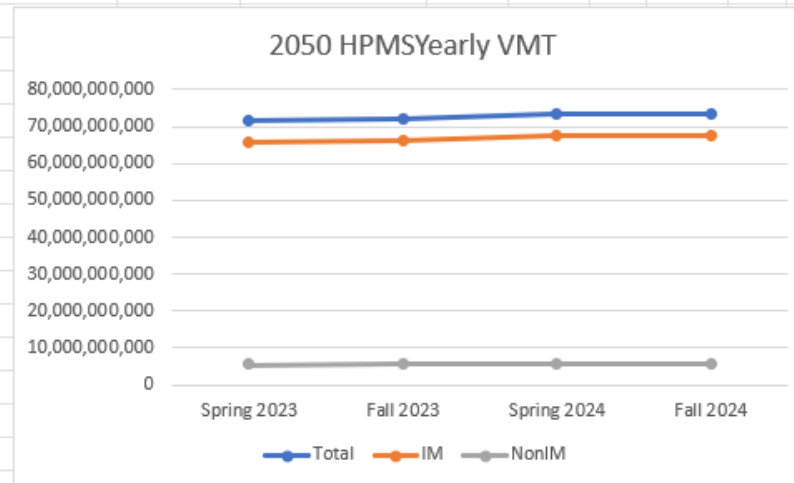
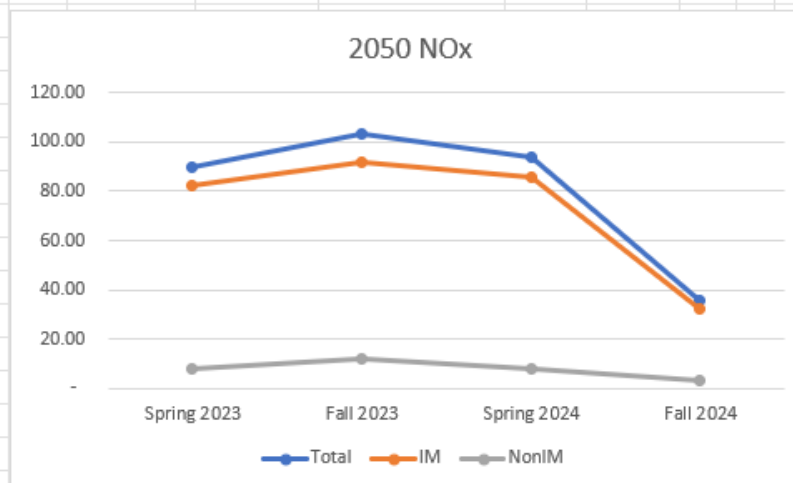
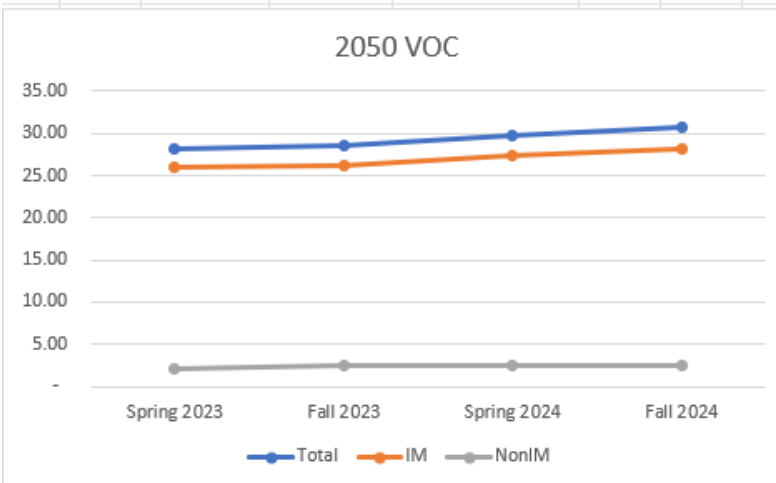
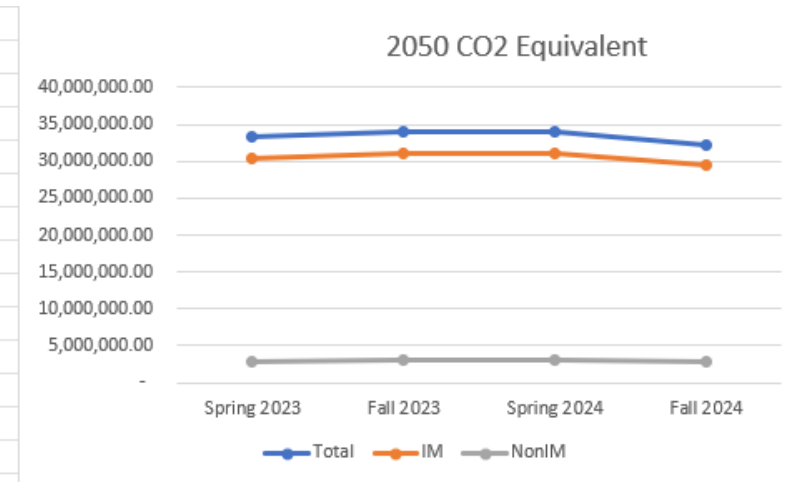
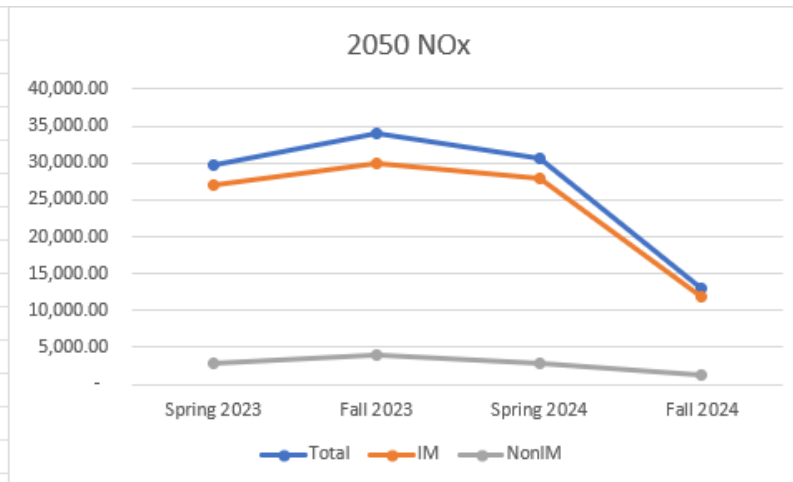
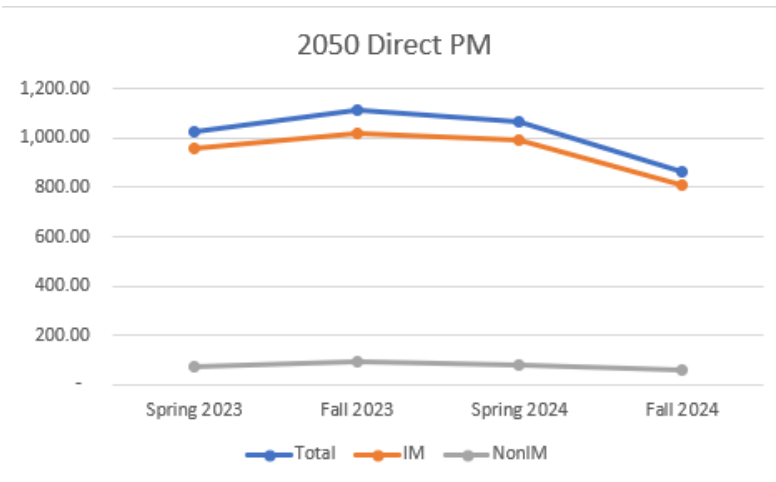
# Transportation Conformity Results 2035



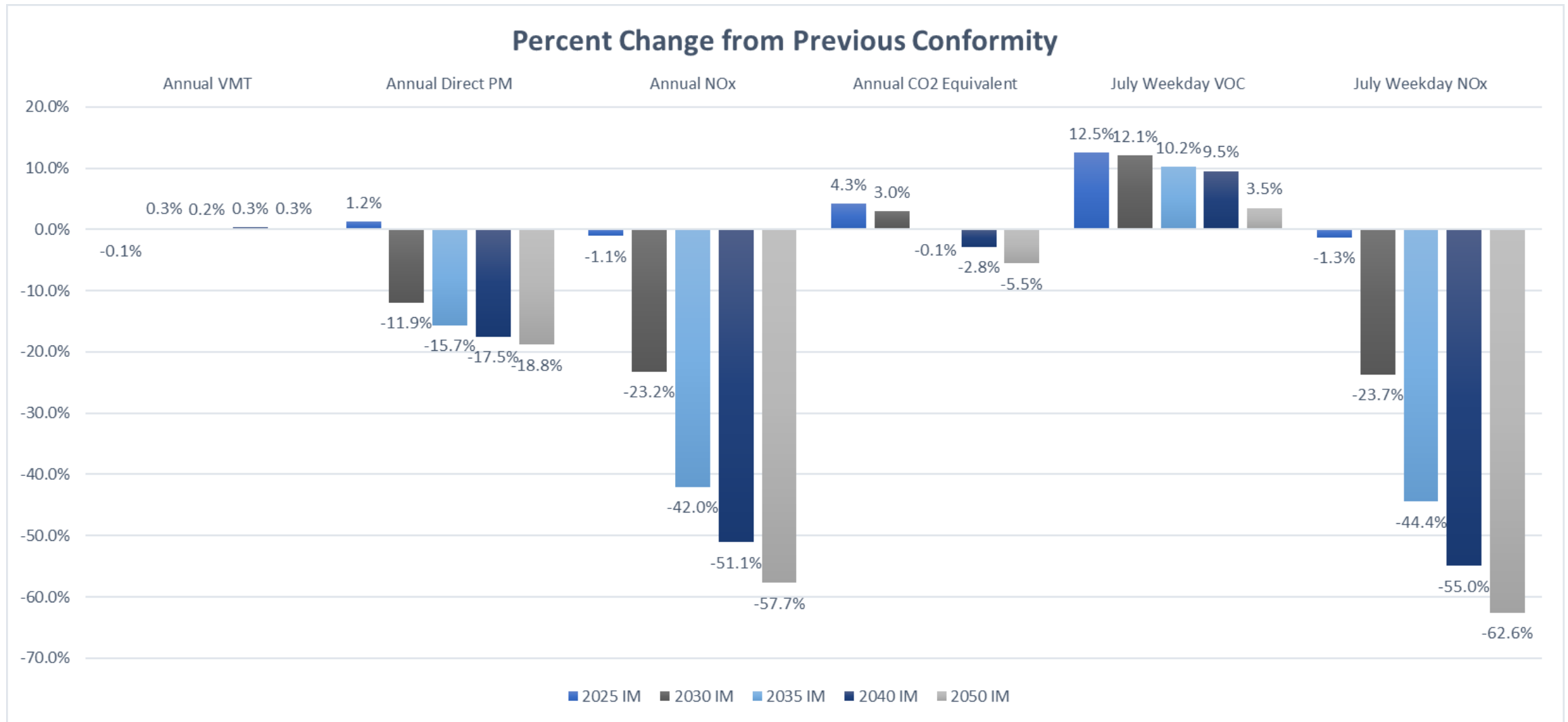
# Transportation Conformity Results 2040



# Transportation Conformity Results 2050



# Transportation Conformity



# Transportation Conformity Update

## Next Steps:

- Review our methodology and update data inputs and process
- Begin testing to switch to MOVES 5 over the summer (released last week)
- Get new vehicle data