



# **MOVES MODEL EXPERIENCES, RESULTS, AND OBSERVATIONS**

**2023 INTERNATIONAL EMISSIONS INVENTORY  
CONFERENCE**

**SEPTEMBER 27, 2023**

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**NORTH CENTRAL TEXAS COUNCIL OF  
GOVERNMENTS**

# OUTLINE

EPA On-Road Models and MPO Applications

Emissions Calculation Process

Resource Planning

Primary MOVES Inputs

MOVES3 VS. MOVES4

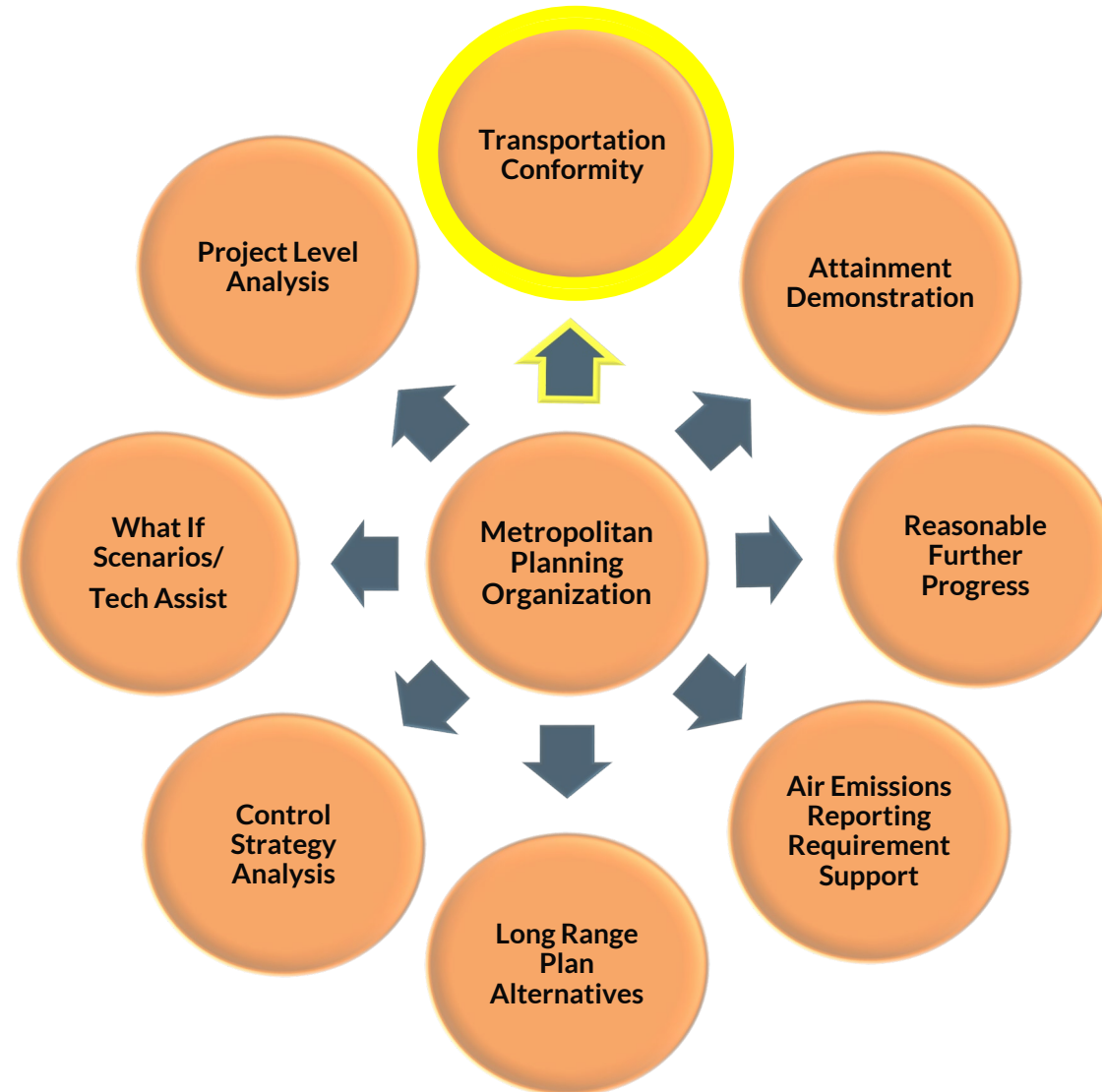
Findings, Observations, and Recommendations

# EPA ON-ROAD MODELS: HISTORY

MOBILE1	1978
MOBILE2	1981
MOBILE3	1984
MOBILE4	1989
MOBILE5	1993
MOBILE6	2002
MOBILE6.2	2004
MOVES2010	2010
MOVES2010a	2010
MOVES2010b	2012
MOVES2014	2014
MOVES2014a	2015
MOVES2014b	2018
MOVES3	2020
<b>MOVES4</b>	<b>2023</b>

(Conformity grace period ends on September 12, 2025)

# EPA ON-ROAD MODELS: NCTCOG APPLICATION



# TRANSPORTATION CONFORMITY AS COMPARED TO THE SUEZ CANAL

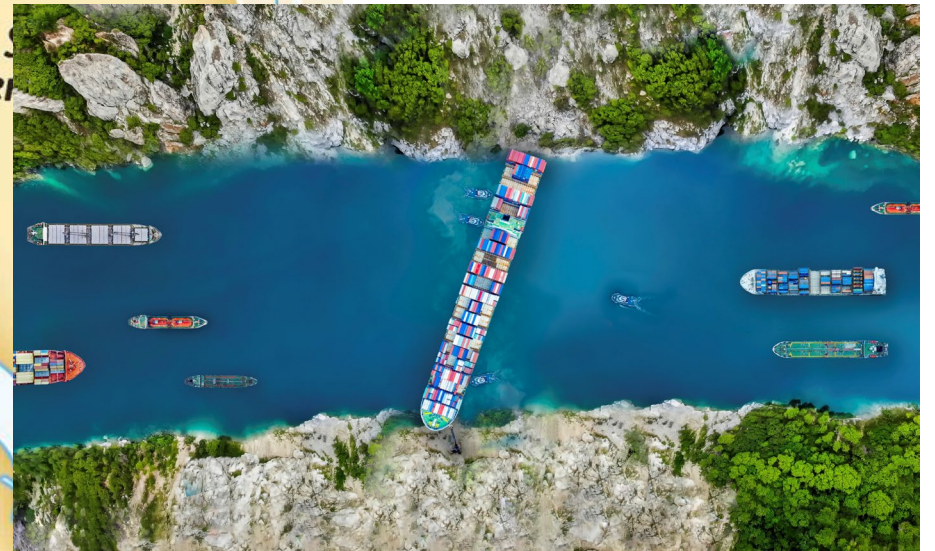
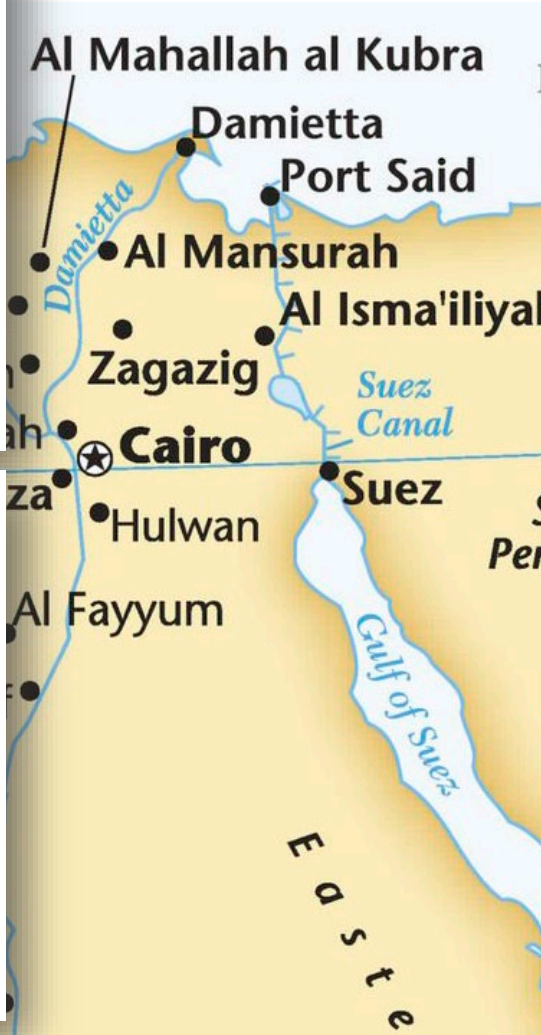
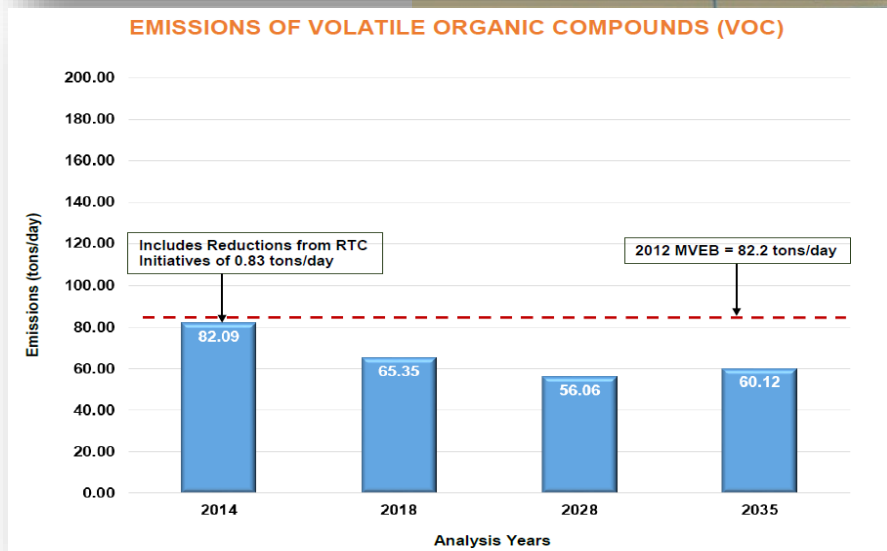
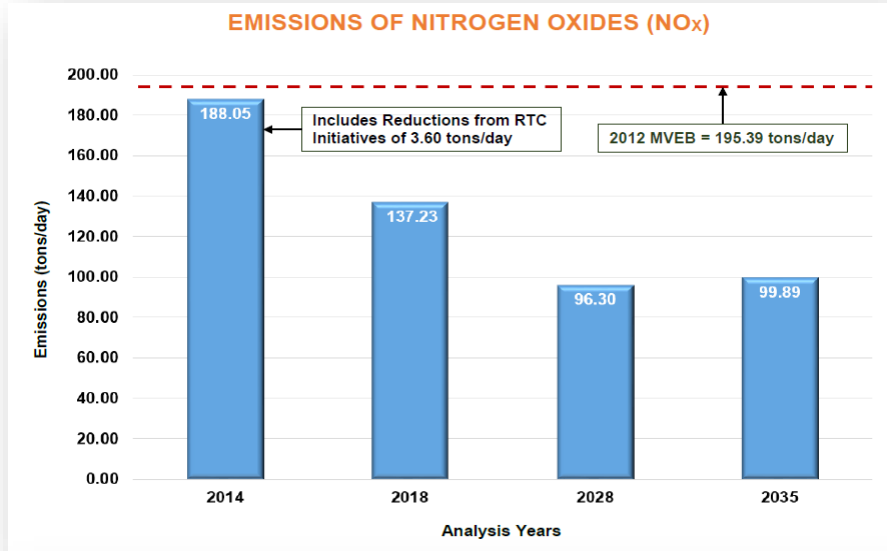
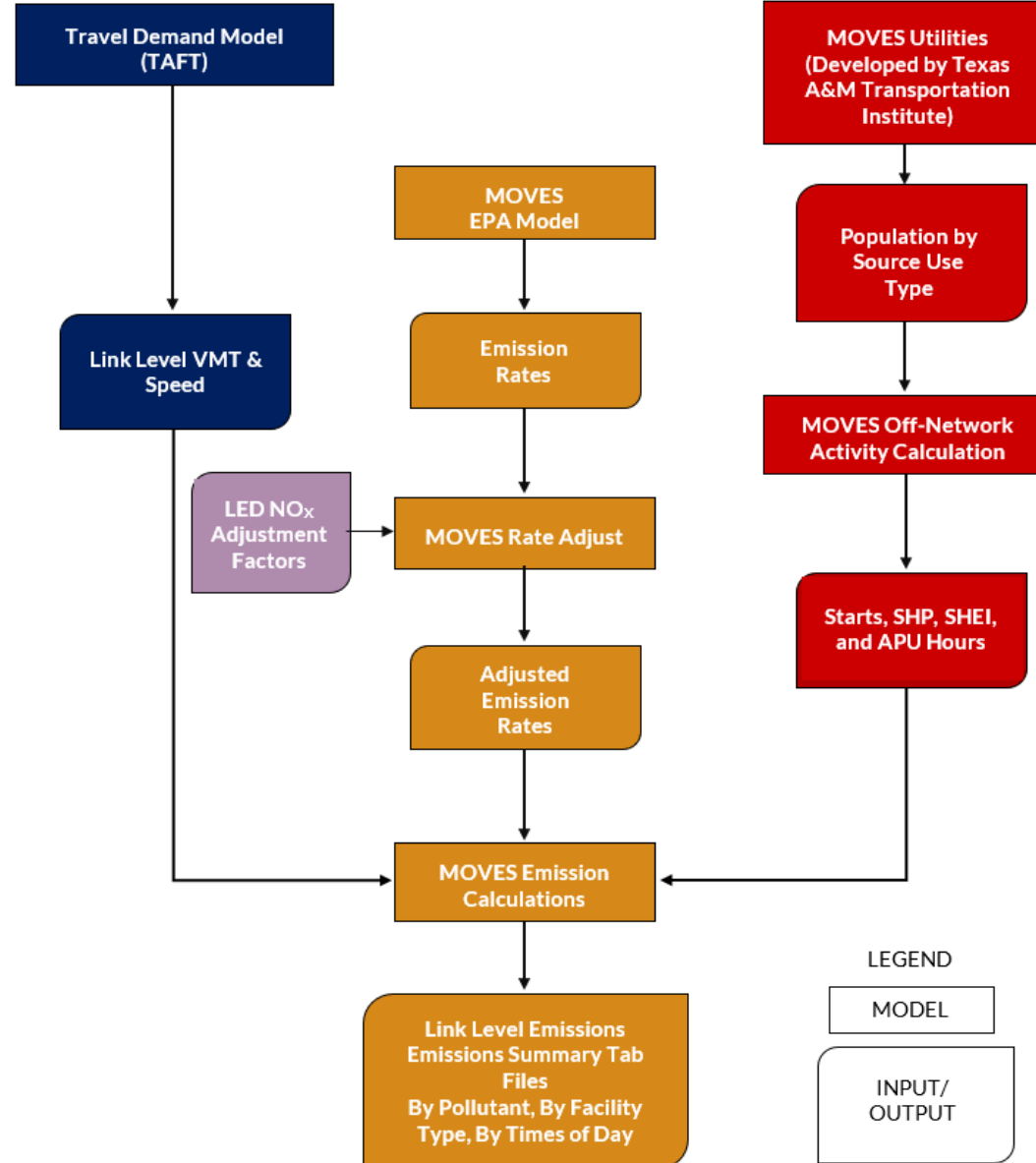


Image Source: Getty

# EMISSIONS CALCULATION PROCESS



# RESOURCE PLANNING

## MOVES and 12-County Dallas-Fort Worth (DFW) Metropolitan Planning Area (MPA)

	Single Analysis Year	Conformity Analysis (4 analysis years)	ADSIP (link-level Emissions and 2 analysis years)	RFPSIP (Control Scenario Emissions and 7 analysis years)
MOVES Input Setup (hours)	12	48	24	84
MOVES Rate Runs (hours)	24	96	48	672
EI Development (days)	4	12	20	40
Hard drive Space (GB)	10	40	1200	800

# PRIMARY MOVES INPUTS

MOVES Inputs	Rate Mode
AVFT	Local
Average Speed Distribution	Local/Default
Day VMT Fraction	Local/Default
Fuel Formulation	Local
Fuel Supply	Local
Fuel Usage Fraction	Local
Hour VMT Fraction	Local/Default
HPMS Vehicle Type Year	Local/Default
I/M Coverage	Local
Month VMT Fraction	Local/Default
Road Type Distribution	Local/Default
Source Type Age Distribution	Local
Source Type Year	Local/Default
County	Local
Zone Month Hour	Local





# PRIMARY MOVES INPUTS

## MOVES Observations when utilizing local data

### Average Speed Distribution

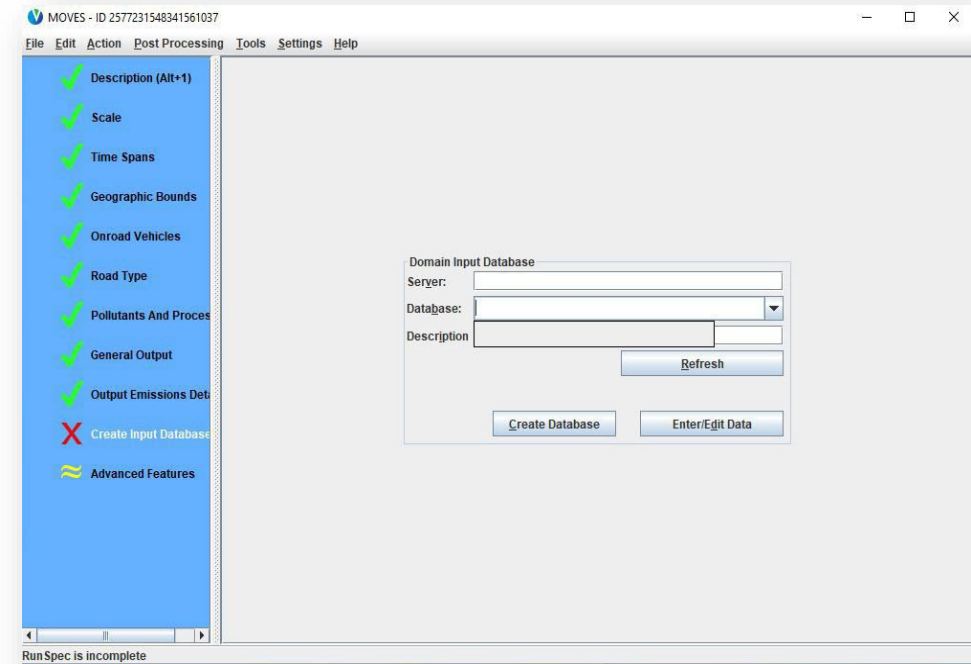
Placeholder non-zero values need to be used if the emission rates for specific speed bins are used for post-processing, and the corresponding speed fractions from the travel model output are 0s.

### Hour VMT Fraction

Placeholder values are needed if local data from the travel model is used and there are 0s for certain roadTypeID, dayID, and hourID combinations. The fractions need to add to one for the 24-hour period.

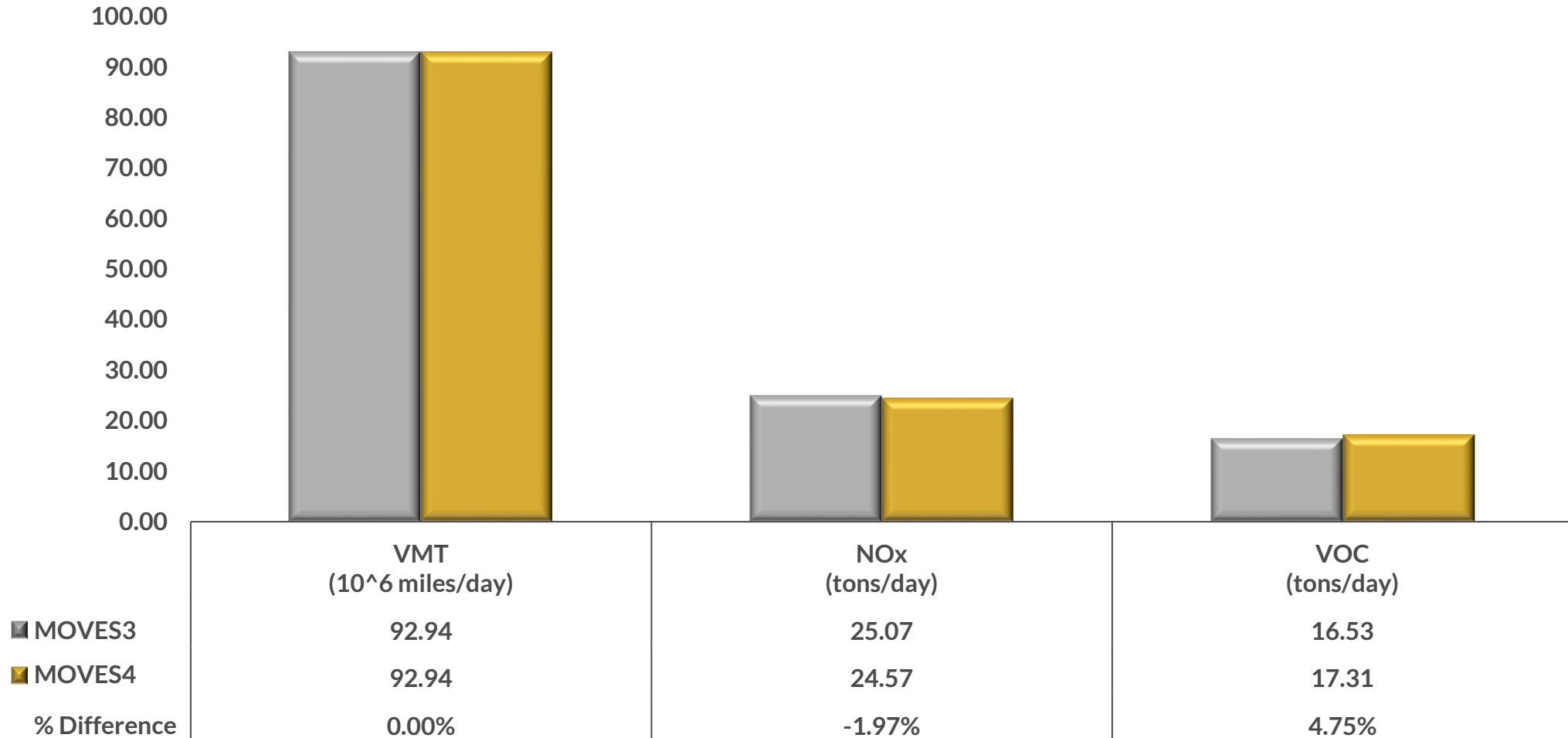
### County

CountyTypeID and MSA are critical and impact the new off-network idle (ONI) emissions rates.



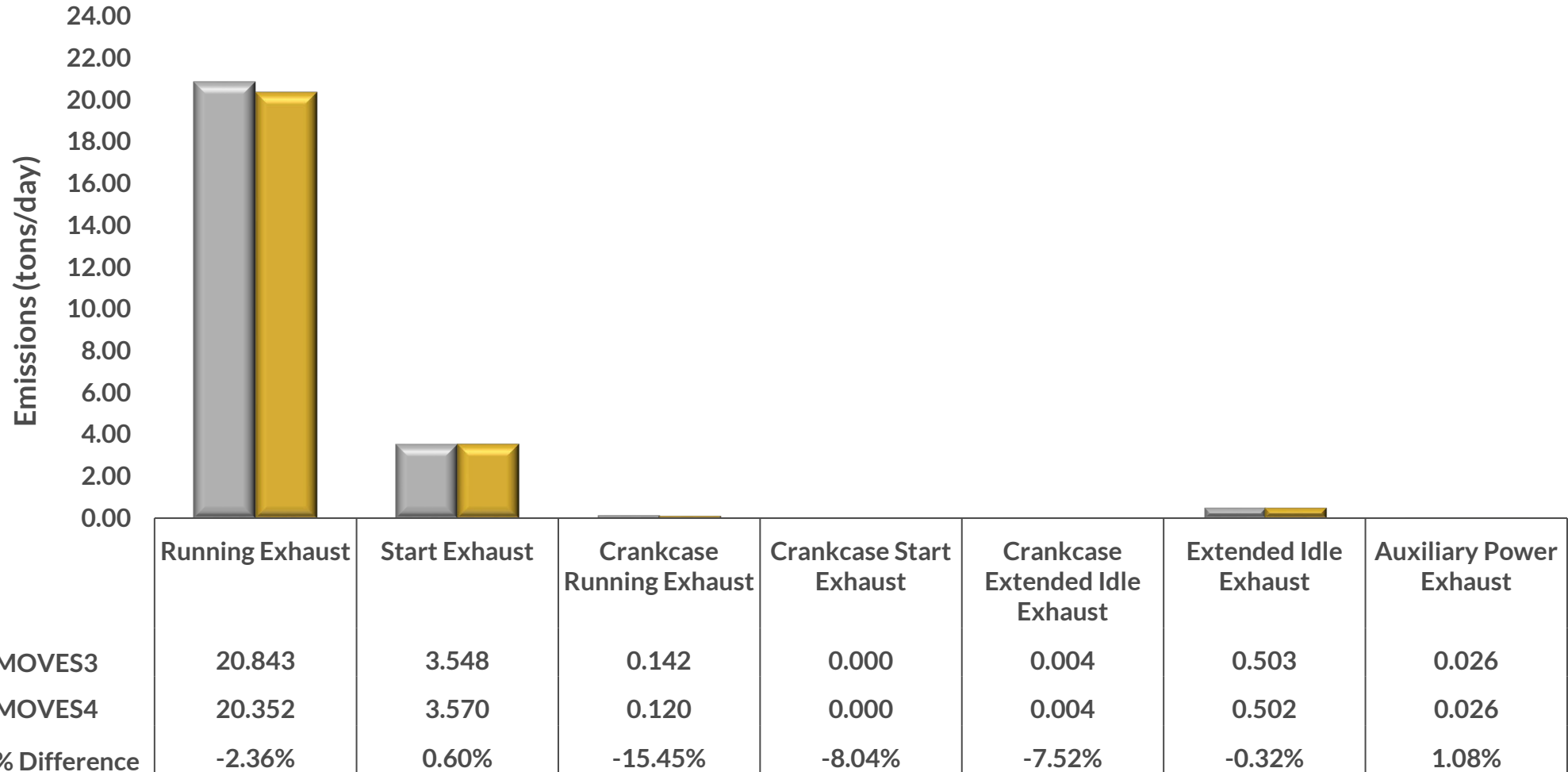
# MOVES<sub>3</sub> VS. MOVES<sub>4</sub>

## Analysis Year 2023, Dallas County



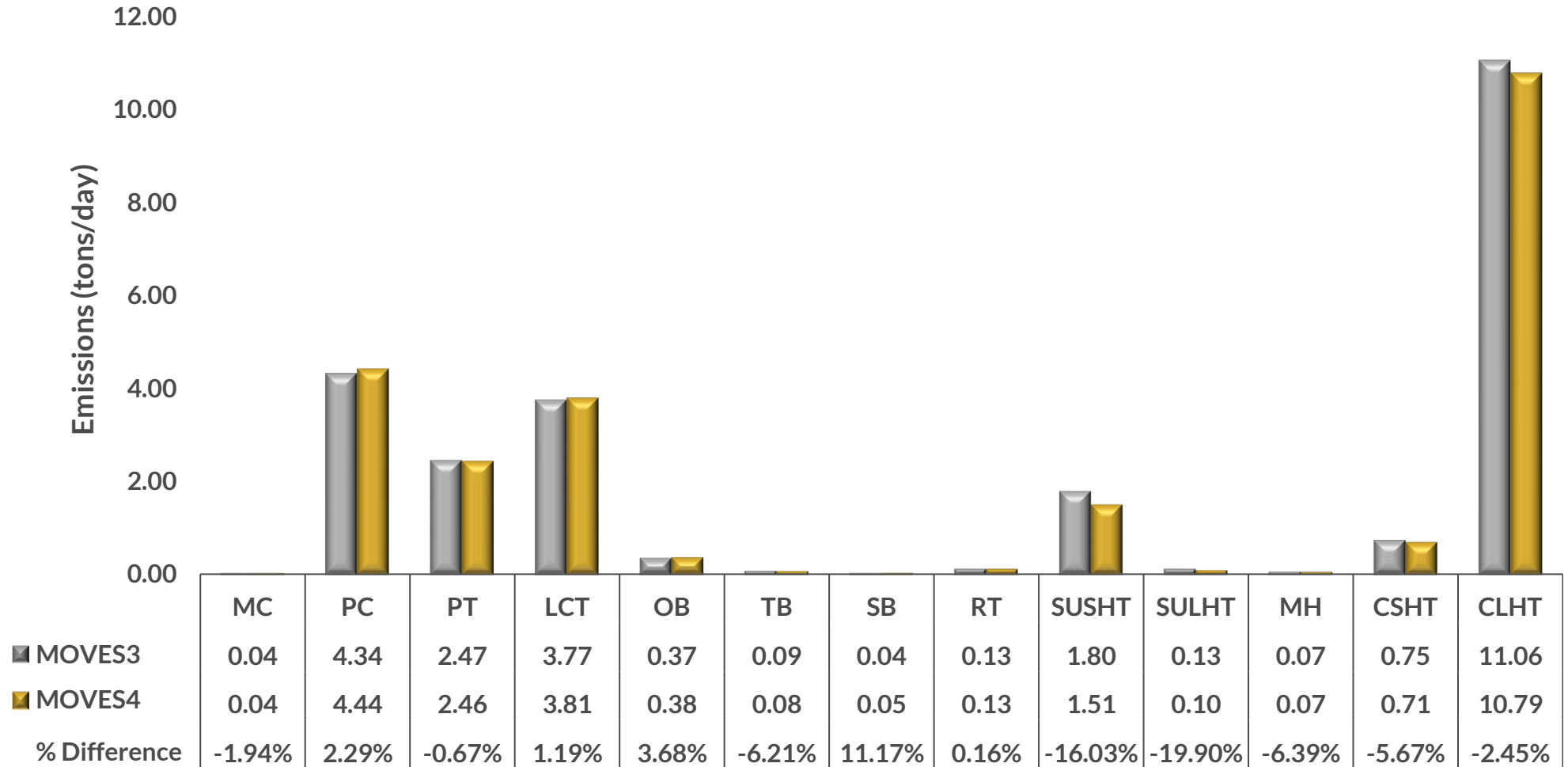
# MOVES<sub>3</sub> VS. MOVES<sub>4</sub>

## Analysis Year 2023, Dallas County, Vehicle Processes, NOx Emissions



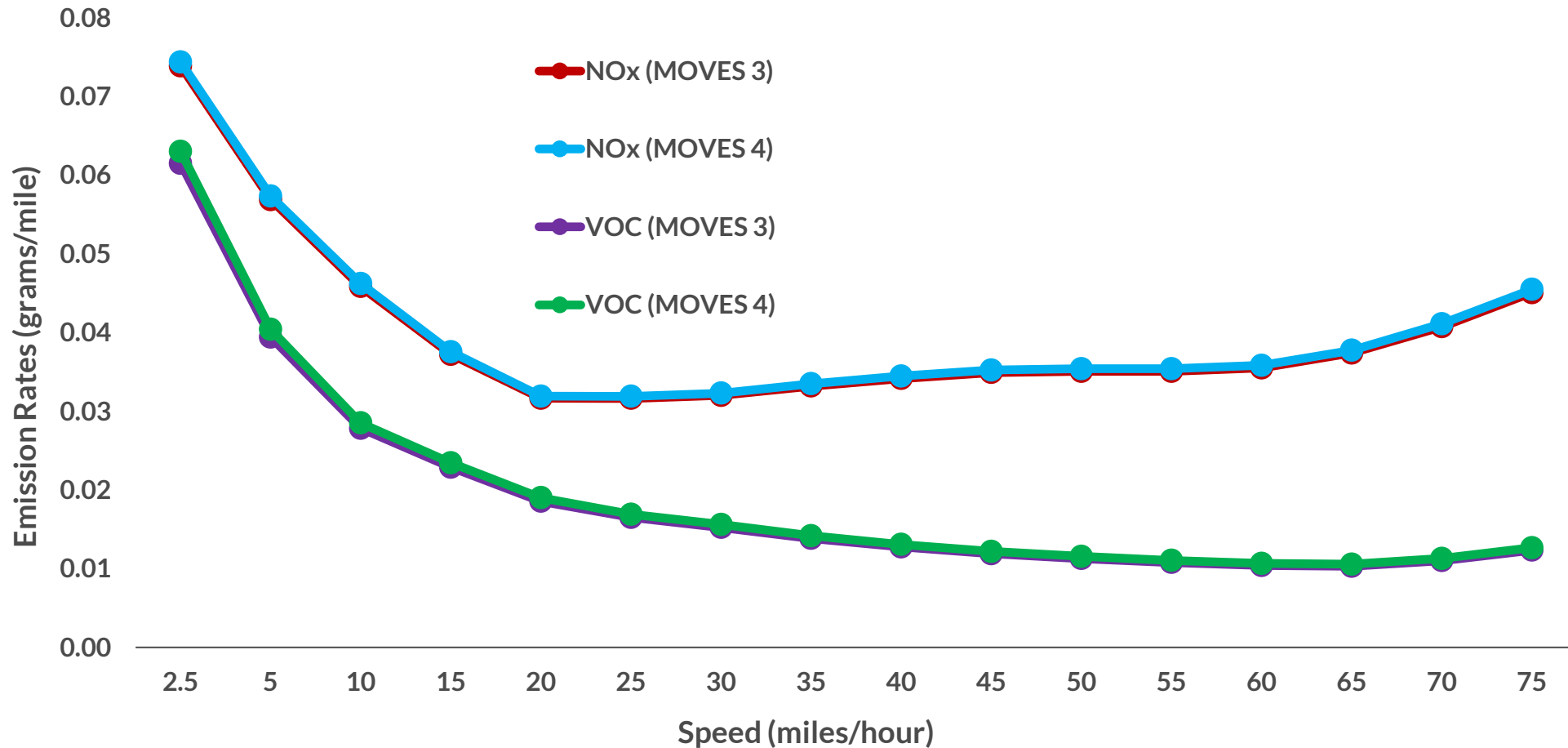
# MOVES<sub>3</sub> VS. MOVES<sub>4</sub>

## Analysis Year 2023, Dallas County, Vehicle Types, NOx Emissions



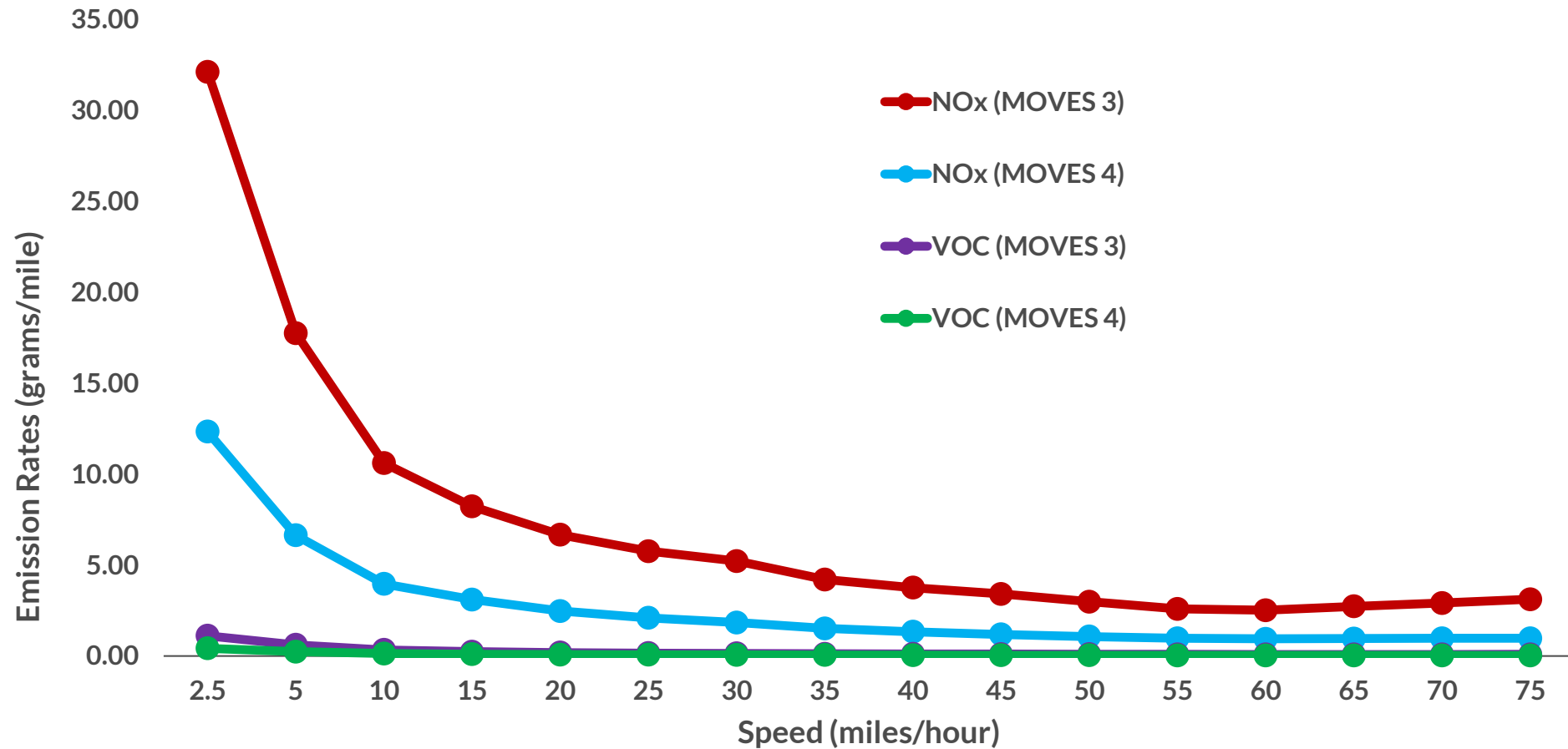
# MOVES<sub>3</sub> VS. MOVES<sub>4</sub>

Analysis Year 2023, Dallas County, Freeway, PC Gas, Running Exhaust Emission Rates



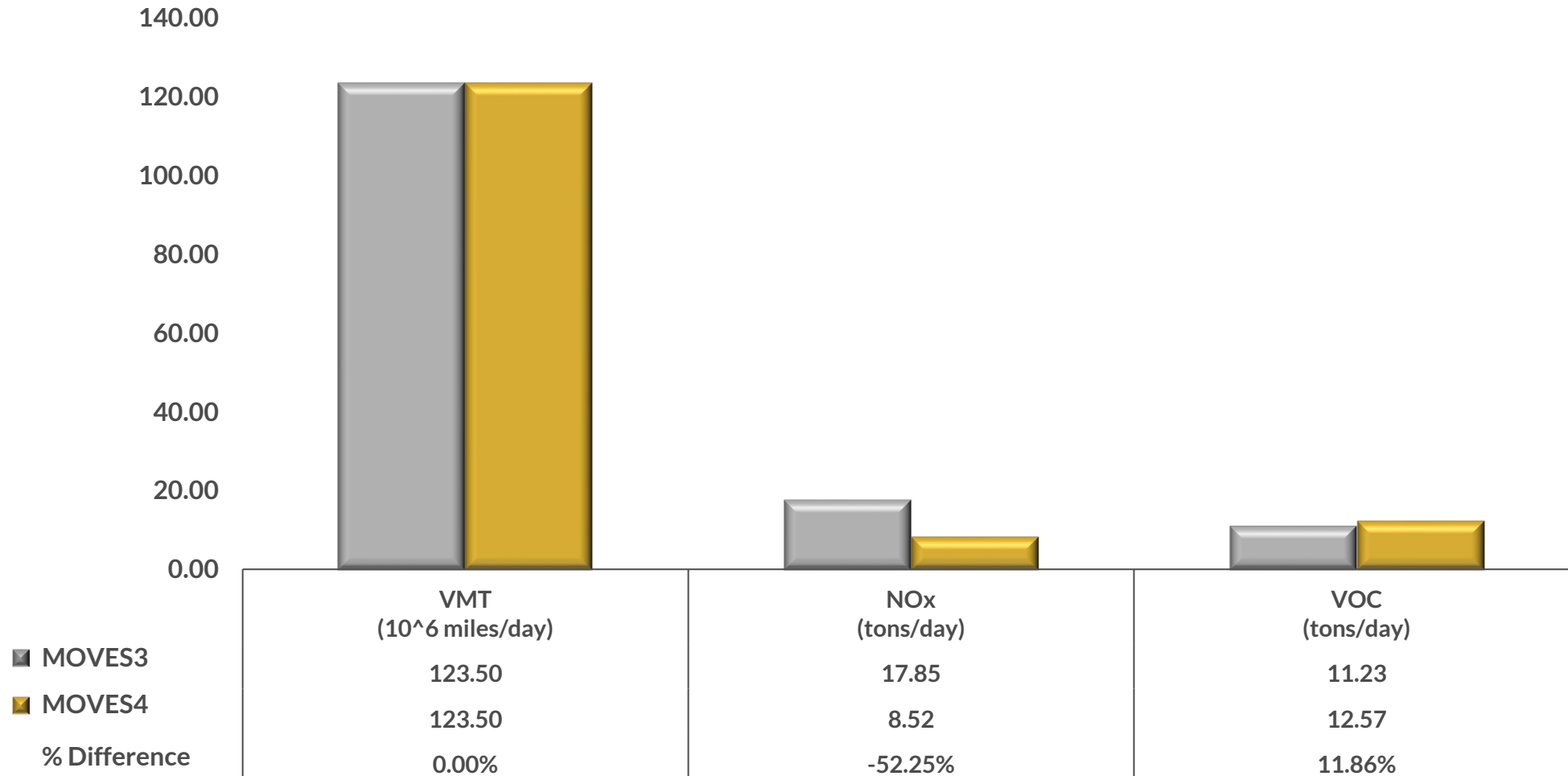
# MOVES<sub>3</sub> VS. MOVES<sub>4</sub>

Analysis Year 2023, Dallas County, Freeway, CLHT (Diesel)  
Running Exhaust Emission Rates



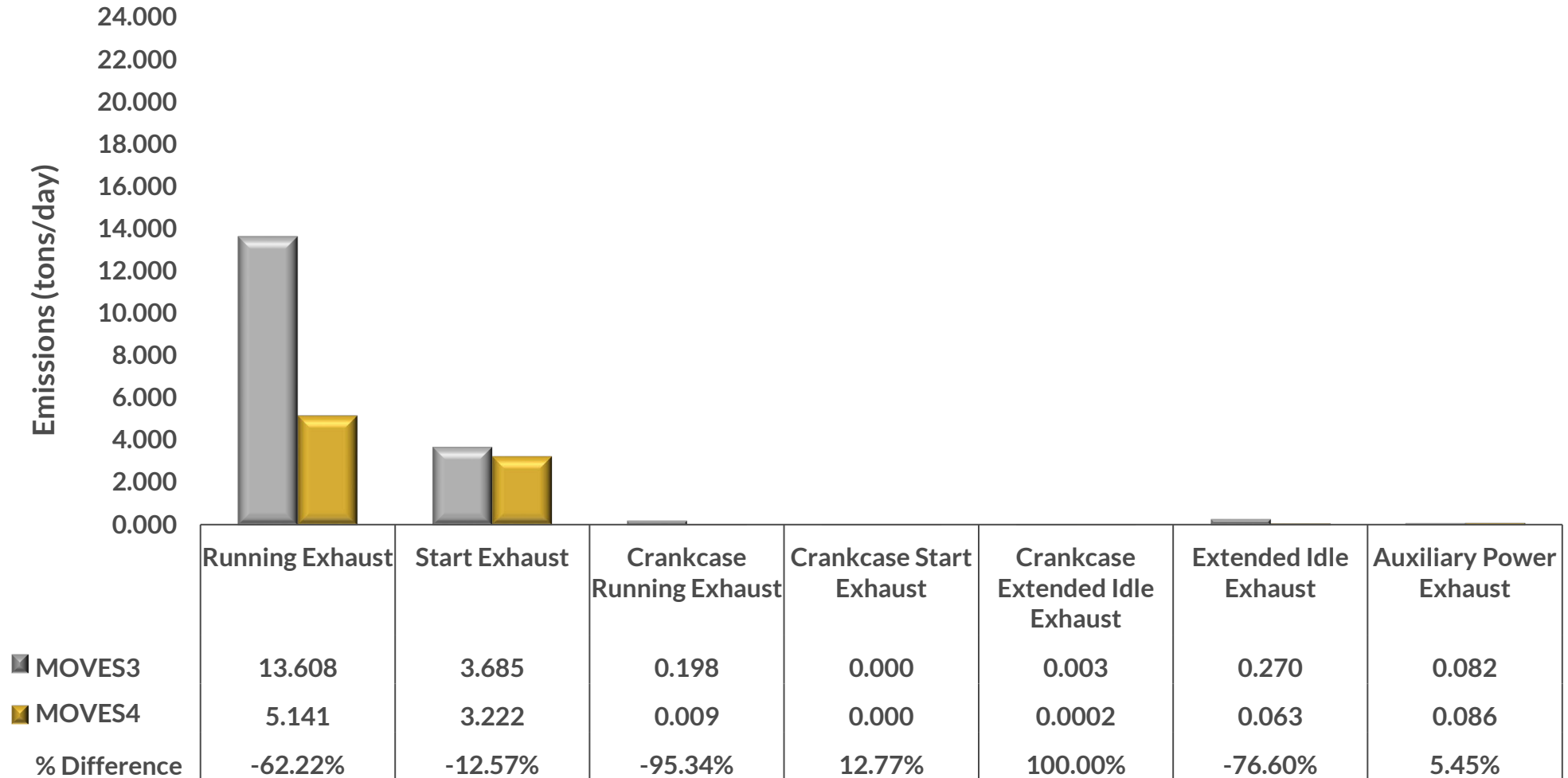
# MOVES<sub>3</sub> VS. MOVES<sub>4</sub>

## Analysis Year 2045, Dallas County



# MOVES<sub>3</sub> VS. MOVES<sub>4</sub>

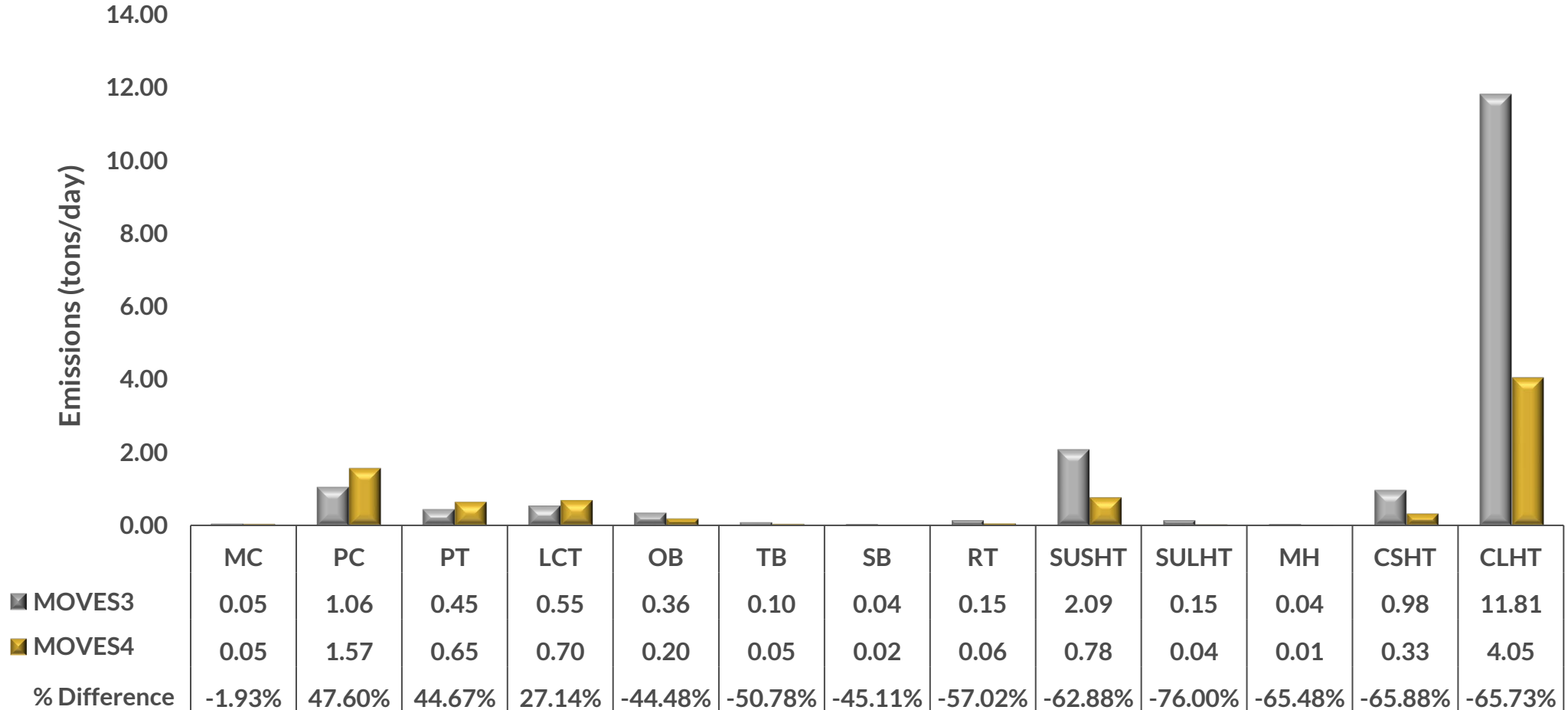
## Analysis Year 2045, Dallas County, Vehicle Processes, NOx Emissions





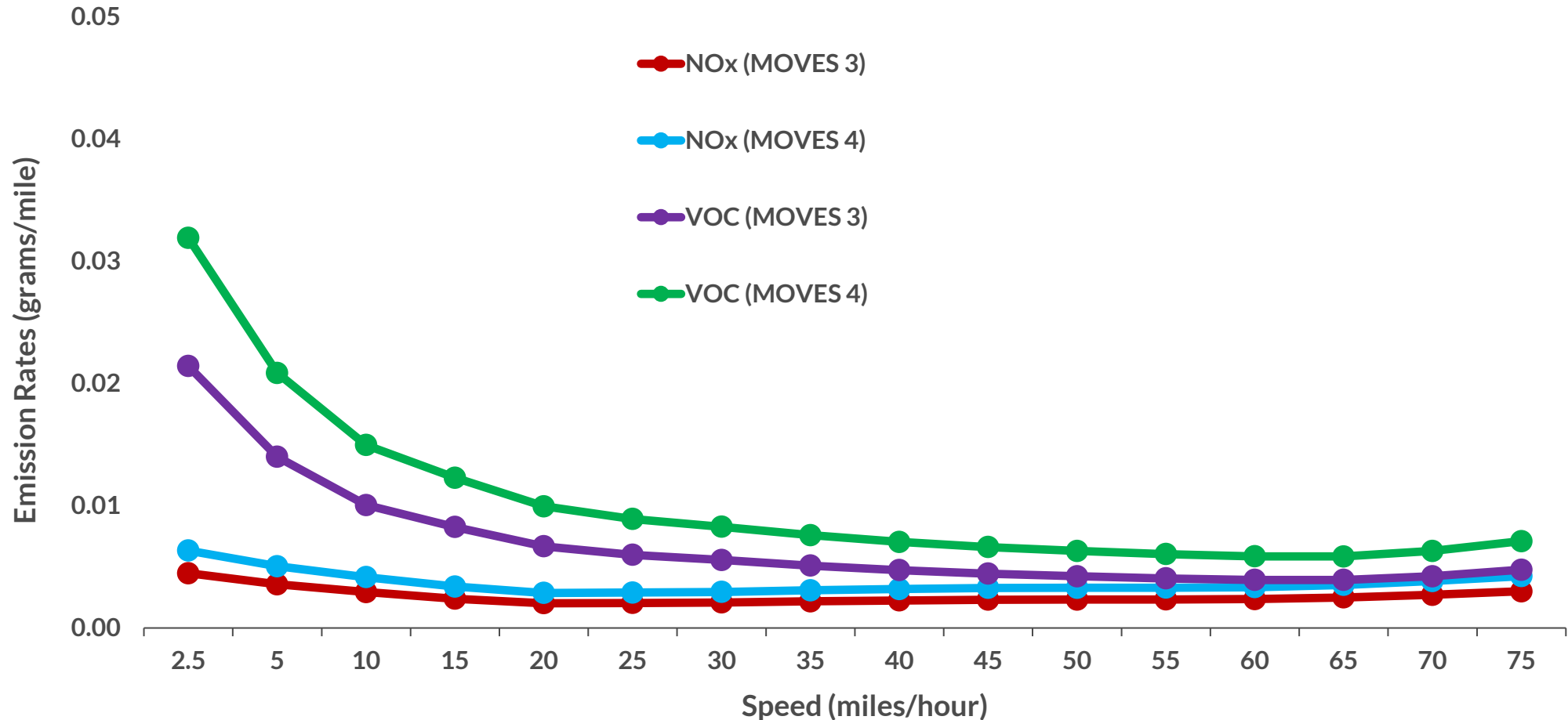
# MOVES<sub>3</sub> VS. MOVES<sub>4</sub>

## Analysis Year 2045, Dallas County, Vehicle Types, NOx Emissions



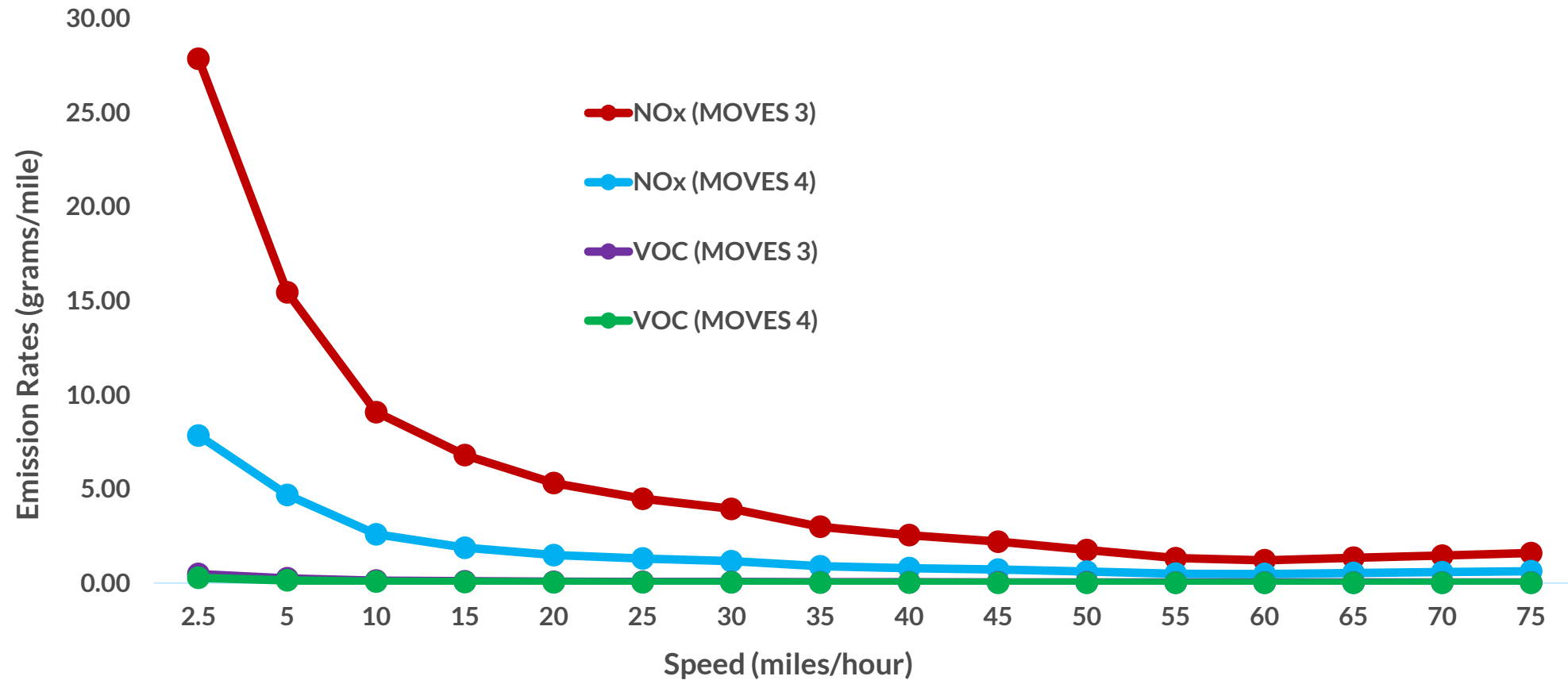
# MOVES<sub>3</sub> VS. MOVES<sub>4</sub>

Analysis Year 2045, Dallas County, Freeway, PC Gas Running Exhaust Emission Rates



# MOVES<sub>3</sub> VS. MOVES<sub>4</sub>

Analysis Year 2045, Dallas County, Freeway, CLHT (Diesel)  
Running Exhaust Emission Rates



# FINDINGS (MOVES<sub>3</sub> VS. MOVES<sub>4</sub>)

## Emissions – Dallas County, Texas

### 2023 Analysis Year

NOx Emissions – a negligible difference with MOVES<sub>4</sub>

VOC Emissions – around 5% higher with MOVES<sub>4</sub>

### 2045 Analysis Year

NOx Emissions – around 50% lower with MOVES<sub>4</sub>

VOC Emissions – around 12% higher with MOVES<sub>4</sub>

## Running Exhaust Emission Rates – Dallas County, Texas (Freeway Road Type)

### 2023 and 2045 Analysis Years with MOVES<sub>4</sub>

Slightly higher NOx rates for passenger cars

Significantly lower NOx rates for combination trucks

# OBSERVATIONS AND RECOMMENDATIONS

## Observations

Model Transition – Newer Inputs and Outputs, Updated Post-Processing Tools

Outer Years/Horizon Year – Lower NOx Emission Results  
Applicable to Conformity Analysis

## Recommendations

Consistent Models and Run Modes for Budget Development and Conformities

Plan for Emission Inventory Development

Streamline Conformity Process

Fast Computers and Sufficient Hard Drive Space

# OTHER THOUGHTS

EPA MOVES Team Very Responsive ([Mobile@epa.gov](mailto:Mobile@epa.gov))

Modeling of Vehicle Engine Tampering and Defeat Devices

**What does it take?**

Data Collection and Analysis

Adjustment Factors

Inclusion in the Model

# FOR MORE INFORMATION



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<https://www.nctcog.org/trans/quality/air/ozone>

# QUESTIONS AND DISCUSSION