MOVES2014 Development & Testing

Sensitivity Test Results

MOVES2010a vs MOVES2014

Based on the 2014 CLRP & FY2015-2020 TIP Conformity

Analysis Year: 2015

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Select New Features of MOVES2014

- **Federal Programs:**
  - ✓ Tier 3 in 2017 for cars and light/medium/heavy duty vehicles
  - ✓ Heavy duty vehicle GHG regulation for MY 2014-2018
  - ✓ Phase 2 light duty vehicle GHG regulation for MY 2017-2025

- **New Science** based on new test programs & studies:
  - ✓ Improved emission rates for all fuels
  - ✓ Improved temperature effects on emissions
  - ✓ Improved Evaporative & PM emissions calculations methods

- **Methodological Changes (examples but not limited to)**:
  - ✓ E85 inclusion in fuel data
  - ✓ Combination long-haul truck hoteling
  - ✓ Combination long-haul truck start emissions

Sensitivity Testing Framework

Purpose: To evaluate the impacts of technical updates to MOVES model on mobile emissions

- **Models:** MOVES2010a & MOVES2014 (October Release)
- **Inputs:** Travel and non-travel input data from the 2014 CLRP and FY2015-20 TIP Air Quality Conformity
- **Geographical Coverage**: Non-attainment areas (vary by pollutant)
- **Analysis Year:** 2015(1)

(1) Analysis year 2015 was chosen for this first stage of sensitivity tests to identify the impacts of all the changes in the MOVES 2014 model independent of OR seperate from the federal control programs

Regional Total Emissions

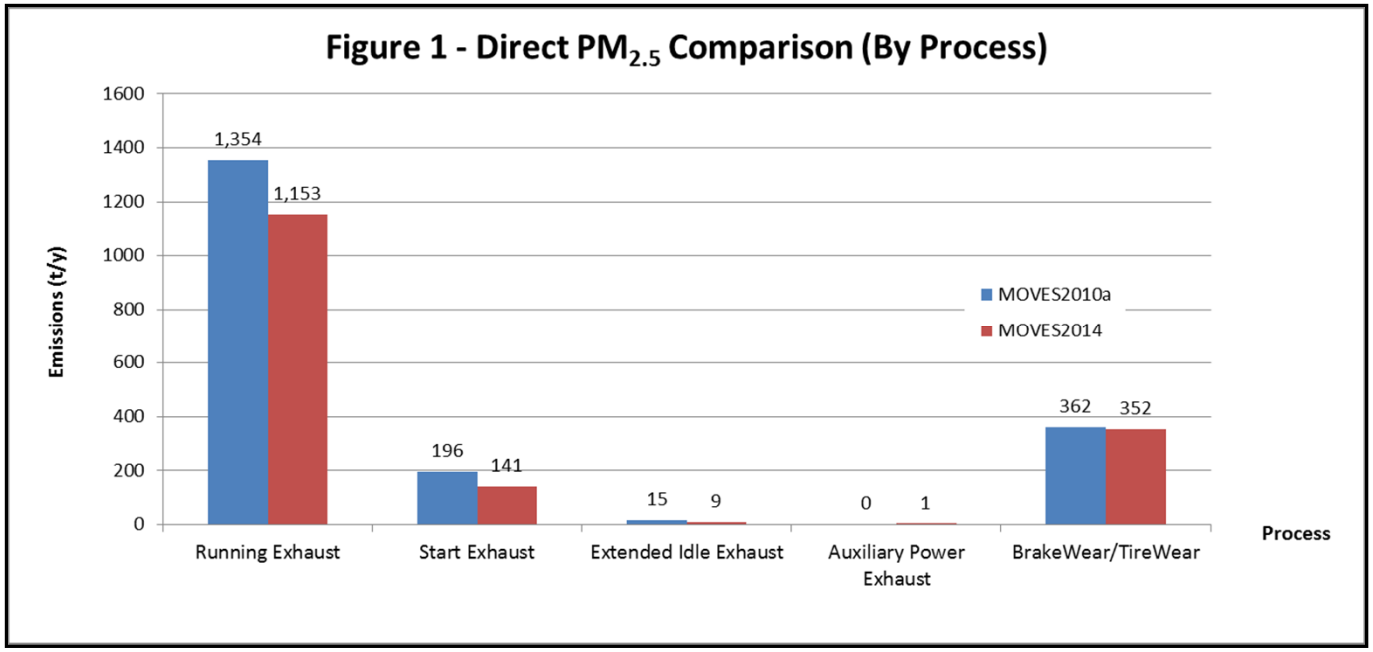
Analysis Year: 2015

Year 2015 Emissions Comparison: MOVES2010a Vs. MOVES2014 Based on the 2014 CLRP & FY2015-2020 TIP Air Quality Conformity					
Season	**Pollutant**	**MOVES2010a**	**MOVES2014**	Δ	%Δ
ANNUAL (t/y)	PM2.5	1,926	1,656	-271	**-14%**
	NOX	46,115	41,226	-4,889	**-11%**
OZONE (t/d)	VOC	58.5	56.1	-2.4	**-4%**
	NOX	131.9	114.5	-17.4	**-13%**
WINTER (t/d)	CO	494	351	-143	**-29%**
GHG (t/y)	CO2 Equivalent	25,476,533	24,914,703	-561,831	**-2%**

Emissions Components: Fine Particles (Direct $PM_{2.5}$)

Table 1 - Direct $PM_{2.5}$ Comparison (By Process) ton/year

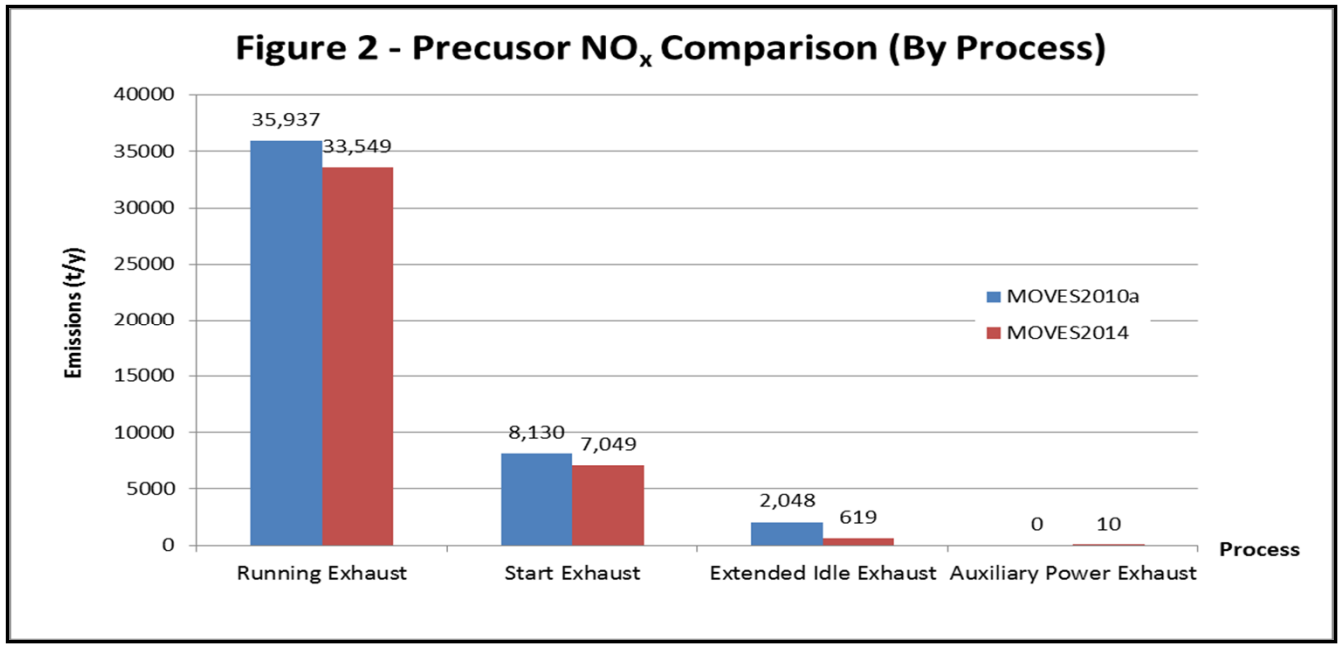
Process	MOVES2010a	MOVES2014	Δ	%Δ
Running Exhaust	1,354	1,153	-201	-15%
Start Exhaust	196	141	-56	-28%
Extended Idle Exhaust	15	9	-6	-41%
Auxiliary Power Exhaust	ND	1	1	ND
BrakeWear/TireWear	362	352	-9	-3%
Total	**1,926**	**1,656**	**-271**	**-14%**



Emissions Components: Fine Particles (Precursor NO_x)

Table 2 - Precursor NO_X Comparison (By Process) ton/year

Process	MOVES2010a	MOVES2014	Δ	%Δ
Running Exhaust	35,937	33,549	-2,388	-7%
Start Exhaust	8,130	7,049	-1,081	-13%
Extended Idle Exhaust	2,048	619	-1,429	-70%
Auxiliary Power Exhaust	ND	10	10	ND
Total	**46,115**	**41,226**	**-4,889**	**-11%**

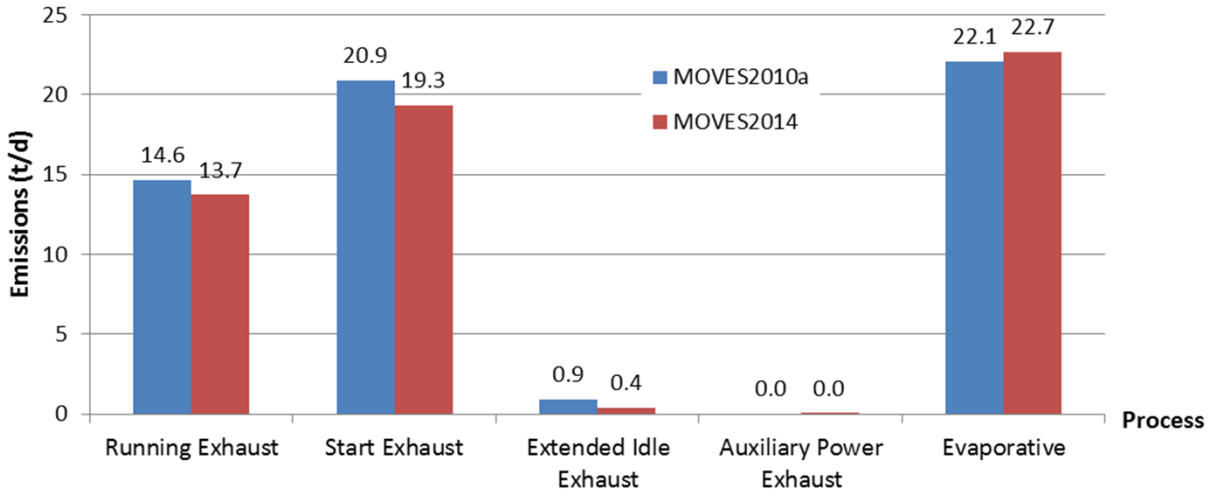


Emissions Components: Ozone (VOC)

Table 3 - Ozone VOC Comparison (By Process) ton/day

Process	MOVES2010a	MOVES2014	Δ	%Δ
Running Exhaust	14.6	13.7	-0.9	-6%
Start Exhaust	20.9	19.3	-1.5	-7%
Extended Idle Exhaust	0.9	0.4	-0.5	-59%
Auxiliary Power Exhaust	ND	0.0	0.0	ND
Evaporative	22.1	22.7	0.6	3%
Total	**58.5**	**56.1**	**-2.4**	**-4%**

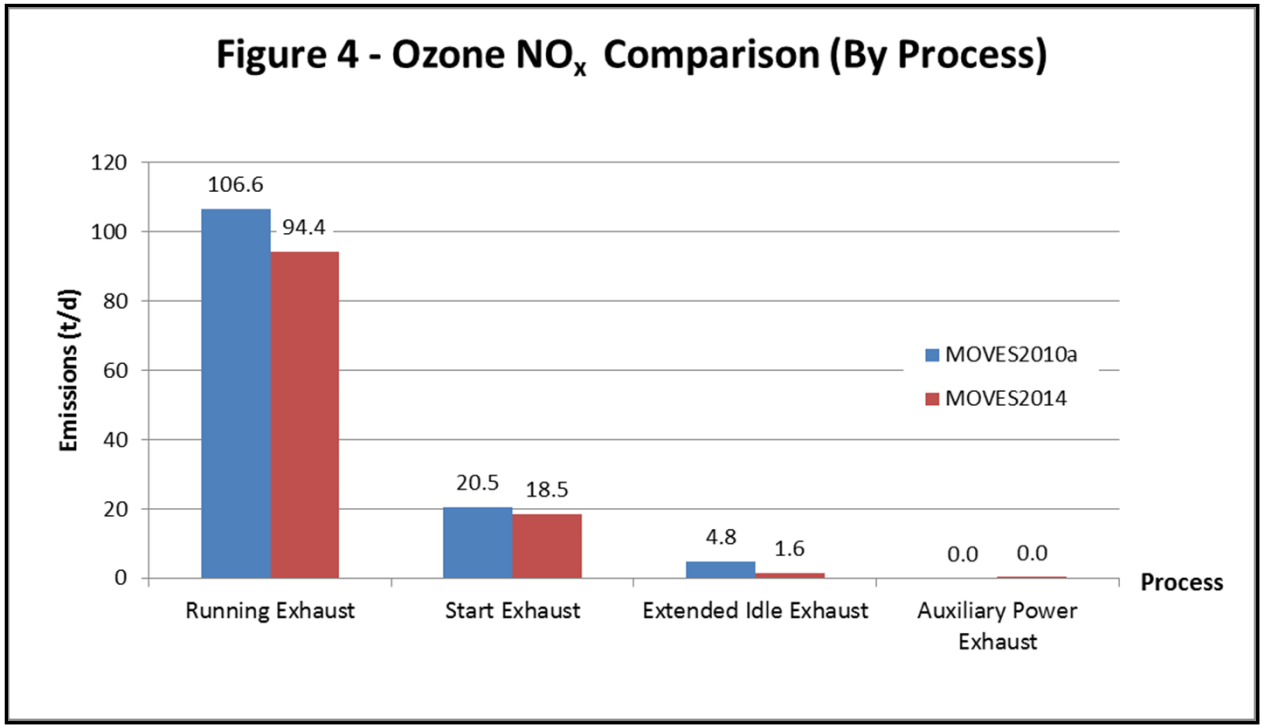
Figure 3 - Ozone VOC Comparison (By Process)



Emissions Components: Ozone (NO_x)

Table 4 - Ozone NO_x Comparison (By Process) ton/day

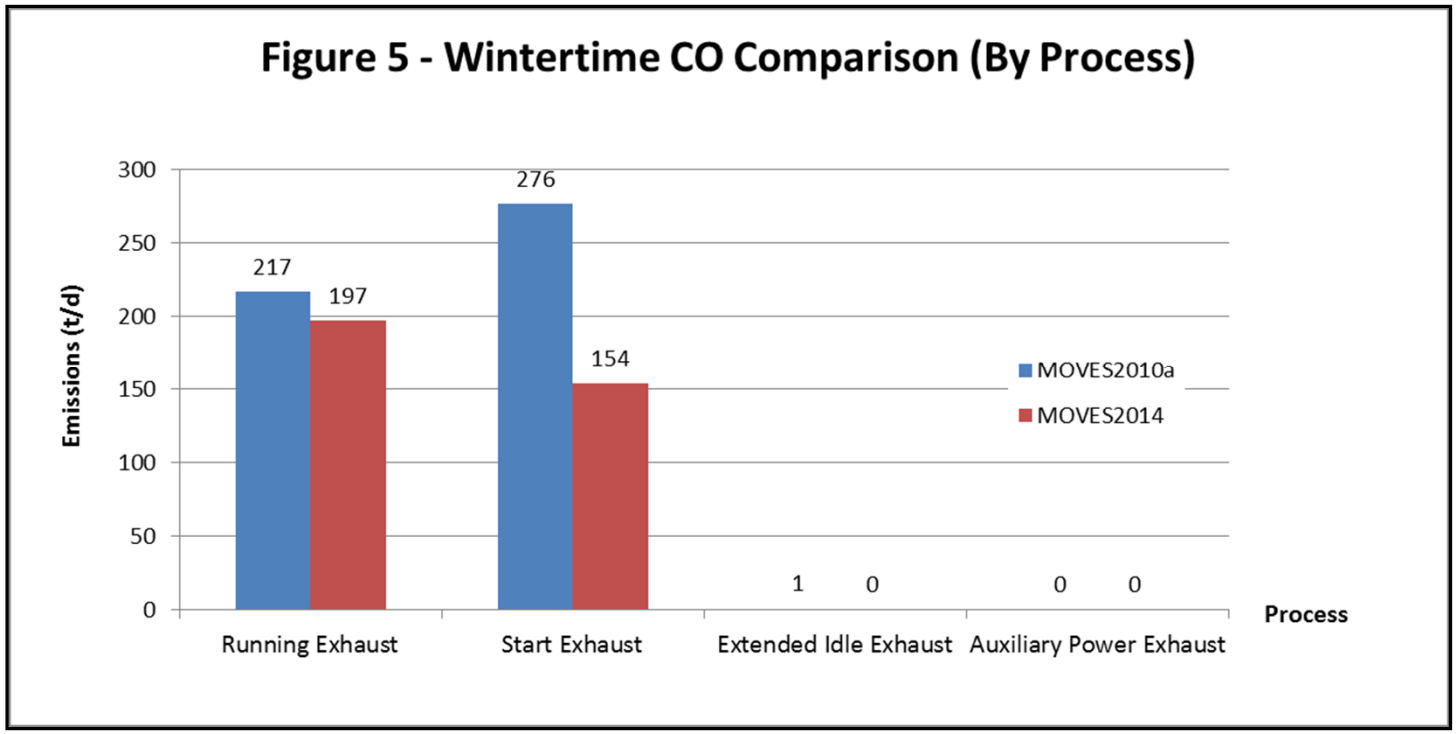
Process	MOVES2010a	MOVES2014	Δ	%Δ
Running Exhaust	106.6	94.4	-12.2	-11%
Start Exhaust	20.5	18.5	-2.0	-10%
Extended Idle Exhaust	4.8	1.6	-3.2	-66%
Auxiliary Power Exhaust	ND	0.0	0.0	ND
Total	**131.9**	**114.5**	**-17.4**	**-13%**



Emissions Components: Winter CO

Table 5 - Wintertime CO Comparison (By Process) ton/day

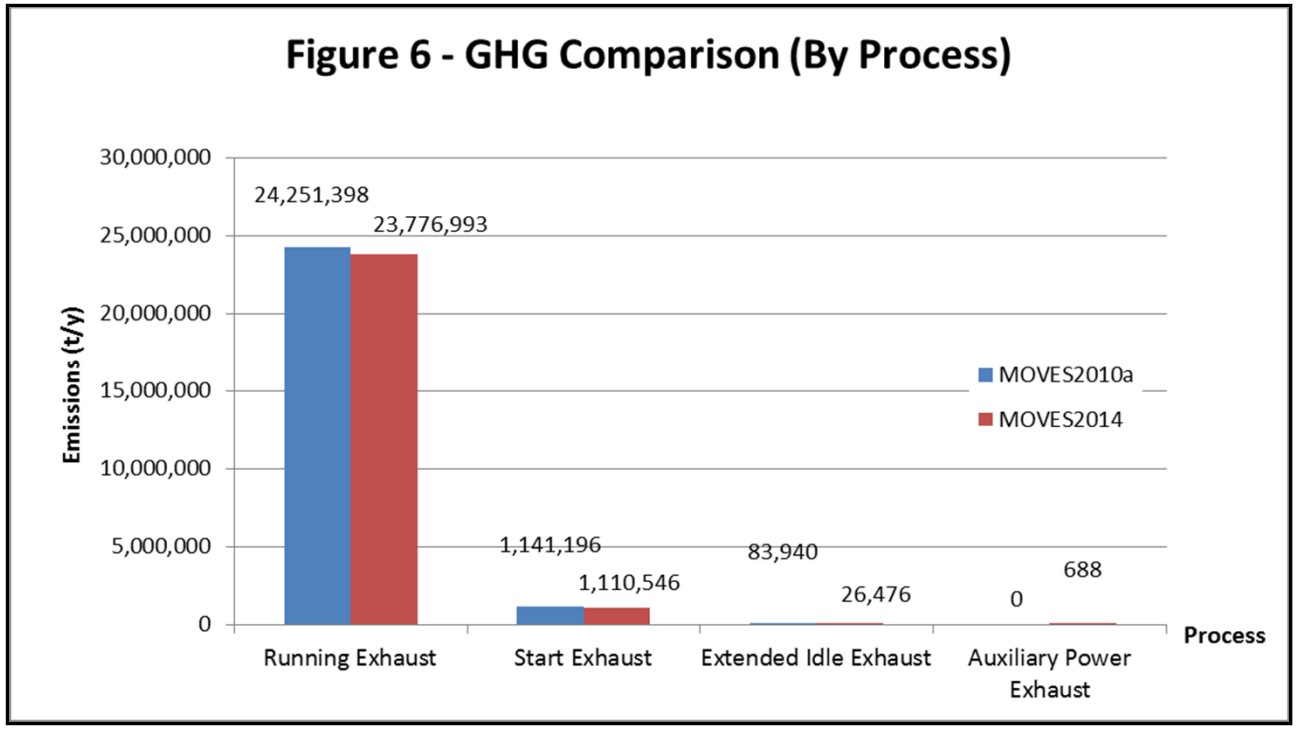
Process	MOVES2010a	MOVES2014	Δ	%Δ
Running Exhaust	217	197	-20	-9%
Start Exhaust	276	154	-122	-44%
Extended Idle Exhaust	1	0	-1	-89%
Auxiliary Power Exhaust	ND	0	0	ND
Total	**494**	**351**	**-143**	**-29%**



Emissions Components: GHG (CO_2 Equivalent)

Table 6 - GHG (CO_2 Equivalent) Comparison (By Process) ton/year

Process	MOVES2010a	MOVES2014	Δ	%Δ
Running Exhaust	24,251,398	23,776,993	-474,405	-2%
Start Exhaust	1,141,196	1,110,546	-30,650	-3%
Extended Idle Exhaust	83,940	26,476	-57,464	-68%
Auxiliary Power Exhaust	ND	688	688	ND
Total	**25,476,534**	**24,914,703**	**-561,831**	**-2%**



Conclusions

- MOVES2014 yields lower mobile emissions across all pollutants tested for analysis year 2015 in 2014 CLRP
- The greatest reduction was in Winter CO, a reduction of 29% across the region
- The lowest reduction was in GHG (CO2 equivalent), a reduction of 2% across the region
- A NO_x reduction in the order of 11-13% was estimated (depending on daily or annual estimation)
- Most of the overall emissions reductions by pollutant (with the exception of Winter CO) were attributed to the Running Exhaust emissions reductions
- Most of the overall reductions of Winter CO were attributed to the Start Exhaust emissions reductions

Thank You

For questions: please contact

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