EPA comparison of MOVES light-duty gas NOx emissions to real-world data

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What’s the Issue?

- Recent studies have suggested that AQ models over predict NOx compared to monitored concentrations.
- Staff across EPA investigating various aspects of issue.
- MOVES is just one part of the complex AQ modeling system.
Why Focus on Light Duty Gas Vehicles?

- Researchers have suggested mobile emissions may be over estimated – specifically LD NOx emissions.
- MOVES2014 model is being re-evaluated for next version release.
- Focused on running emissions because little independent data exists for start emissions which are also significant.

2014v1 NEI (CT)
Compare MOVES to External Data

- **Denver I/M Program**
  - Running Emissions for
    - 1,360 Tier 1 cars (‘96-’00)
    - 20,400 Tier 2 cars and trucks (‘10-’16)

- **Caldecott Tunnel Studies in CA**
  - Fleet wide emission rates measured in ‘01, ‘06 and ’10
  - 600K+ measurements

- **Remote Sensing Data (RSD)**
  - 14 Different Cities
  - 670K+ individual vehicle measurements
Denver I/M Results

- Simulated IM240 test cycle in MOVES base rates
- MOVES:
  - over estimates for Tier 1 cars
  - under estimates for Tier 2 cars
  - estimates well Tier 2 light trucks
  - deterioration trends compare well
Tunnel Studies and RSD Results

• MOVES run in project scale with inputs customized to RSD and tunnel sites
  – Local temp/humidity, I&M, vehicle fleet properties, etc.

• National-scale runs also completed
  – Default inputs
  – Does not account for measurement conditions
Tunnel Studies and RSD Results

• MOVES project scale
  – Under estimates on-road RSD measurements
  – Generally MOVES results are within data variability
  – Demonstrates importance of accounting for measurement conditions when evaluating MOVES

• MOVES national scale
  – Clear over estimation of RSD measurements
  – NOT a proper way to compare MOVES to independent data
NEI and MOVES

• **National level** – NEI comparable to MOVES national default emissions

• **State/County level** – emissions vary considerably between the NEI and MOVES national default
  – States submit local inputs that differ from MOVES national defaults
  – When local inputs not provided by states, EPA develops default inputs for NEI that may differ from MOVES national defaults

• EPA working to understand the NEI inputs that lead to these differences
Summary

- Denver I/M suggest that MOVES NOx emission rates are too high for Tier 1 cars and too low for Tier 2 cars.

- RSD and Tunnel studies show:
  - MOVES rates higher when using national defaults.
  - MOVES rates lower when inputs are appropriately adjusted to reflect roadside conditions and trends are within data variability.

- EPA has not concluded that MOVES LD gas NOx rates are too high and does not support adjustments to the mobile source inventory.

- EPA will continue to evaluate why AQ models over predict NOx and DEEP will follow their progress.