MOVES Review Work Group Update

May 31, 2017

Dr. Matthew Barth
Work Group Co-Chair
Director, Center of Environmental Research and Technology
Yeager Families Professor, University of California-Riverside

MOVES
Motor Vehicle Emission Simulator

EPA MOVES Model

- U.S. EPA's **Mo**tor **V**ehicle **E**mission **S**imulator estimates emissions and energy use from
  - Onroad vehicles: passenger cars, light- and heavy-duty trucks, buses, motorcycles
  - Nonroad equipment: construction, agricultural, industrial, lawn & garden, commercial, logging, airport support, oil & gas, mining, railroad service, recreational vehicles and boats
- MOVES accounts for national emission standards, vehicle populations and activity, local rules, fuels, and meteorology
- EPA uses MOVES to estimate emission impacts of mobile source emissions regulations and policies and to generate national inventories of air pollutants
- State and local agencies use MOVES to prepare emission inventories in State Implementation Plans and transportation conformity
- MOVES is also used in academic research and to model effects of policy choices

MOVES
Motor Vehicle Emission Simulator

MOVES Review Work Group

- Created by MSTRS to provide input on the development of the Motor Vehicle Emission Simulator (MOVES)
- Members have expertise in modeling emissions from highway and nonroad vehicles and represent a spectrum of stakeholders, including vehicle and engine manufacturers, fuel producers, state and local emission modelers, academic researchers, environmental advocates, and affected federal agencies
- From Fall 2016 – Winter 2018, EPA is presenting proposed updates to MOVES, including underlying data and analyses
- Work group members coordinate within their organizations and with their constituents to solicit specific comments on EPA's proposals
- The work group develops recommendations to the MSTRS based on the proceedings of work group meetings

MOVES
Motor Vehicle Emission Simulator

Work Group Discussion Topics

- September 14, 2016 Meeting:
  - MOVES2014 Overview and Plans for the Future
  - Options for Simplifying MOVES Onroad Source Types and Ramps
  - MOVES-NONROAD Model Plans and Data Updates
  - Heavy-Duty Greenhouse Gas Phase 2 in MOVES
- December 7, 2016 Meeting:
  - Update to Running Exhaust Criteria Pollutant Emission Rates for Model Year 2010+ Heavy-Duty Diesel Vehicles
  - Updated Emission Rates for Extended Idle and Auxiliary Power Units
  - MOVES Onroad Population and Activity Update
  - Updating Hotelling Hours in MOVES
- March 1, 2017 Meeting:
  - Vehicle Idle Activity in MOVES
  - Model Evaluation
  - Light-Duty Particulate Matter Emission Rates Update
- Future Meeting Topics:
  - Telematics and MOVES
  - Start Emission Rates for Model Year 2010+ Heavy-Duty Trucks
  - Soak Time Impact on Start Emissions
  - Expanding Modeling Capabilities for Heavy-Duty Natural Gas Vehicles
  - Updated Speciation Profiles and Total Organic Gaseous Calculations
  - Updated NONROAD Equipment Population Growth Rates
  - MOVES Performance Improvements
  - Updates to MOVES Default Fuel Supply

MOVES
Motor Vehicle Emission Simulator

Recommendations to MSTRS

- Short-Term Recommendations: *(decisions that need to be made now to start coding for the next public version of MOVES)*
  - Update MOVES-NONROAD portion of the model with better data and better documentation
  - Simplify Ramps in MOVES
  - Update MOVES Onroad Population and Activity
  - Update Hotelling Hours in MOVES
  - Update Running Exhaust Criteria Pollutant Emission Rates for Model Year 2010+ Heavy-Duty Diesel Vehicles
  - Update Emission Rates for Extended Idle and Auxiliary Power Units
  - Update Light-Duty Particulate Matter Emission Rates
  - Incorporate Heavy-Duty Greenhouse Gas Phase 2 in MOVES

MOVES
Motor Vehicle Emission Simulator

Recommendations to MSTRS

- Long-Term Recommendations (part 1): *(general direction of future development and role of MOVES)*
  - Consider addressing the incorporation of a true modal emissions model to better address impacts of project-level analyses
  - Prioritize needs for project-level analyses pertinent to state DOTs (e.g., improve linkages with traffic models, limit modeling of road grades to realistic levels)
  - Invest in a robust data collection program to gather information on how vehicles are actually used in-use and associated emissions and emission control technology
  - Improved handling of alternative fuels and technology (ethanol, natural gas, electric vehicles, hybrid electric vehicle), for both tailpipe and evaporative emissions
  - Consider re-vamping modeling of Heavy Duty Diesel vehicles in MOVES:
    - Activity – incorporate latest heavy-duty vehicle project data sets, modify operating modes, and add road grade
    - Emissions – update with latest real-world data, including tampering, malfunction, and mal-maintenance
  - Improved handling of road dust and brake and tire wear

MOVES
Motor Vehicle Emission Simulator

Recommendations to MSTRS

- Long-Term Recommendations (part 2):
  - Simplify MOVES Onroad Source Types: e.g., combine some source types, converge with FHWA vehicle types
  - Evaluate MOVES estimates with comparisons to real-world data
  - Consider different interfaces for different uses (multiple graphical user interfaces)
  - Incorporate new options for improving processing time: e.g., consider pre-calculating look-up tables for cities or regions
  - Create a “Scenario Manager” to allow users to better manage modeling multiple runs, compare incremental results, and automate post-processing
  - Establish better methods of interfacing MOVES to other models (SMOKE, etc.)
  - Provide documentation on how MOVES can be used for Life-Cycle Emissions Analysis
  - Make use of huge vehicle activity datasets that are becoming available (connected vehicle data)
  - More detailed handling of air conditioning usage
  - Improve software installation and update processes

MOVES
Motor Vehicle Emission Simulator

Additional Resources

- For more information on MOVES, please see the MOVES web page:

  https://www.epa.gov/moves

- Questions: Contact the MOVES Team at mobile@epa.gov

MOVES
Motor Vehicle Emission Simulator