

Motor Vehicle Emission Simulator (MOVES) Model for Transportation Conformity, State Implementation Plans, and Project-Level Analysis



The U. S. Environmental Protection Agency (EPA) released a new and improved on-road emissions model, *Motor Vehicle Emission Simulator (MOVES)*, in December of 2009, and followed with subsequent versions, MOVES2010b being the latest.

The MOVES model is used in the process of meeting a variety of different federal and state requirements for air quality compliance, including the demonstration of conformity in air quality plans developed by metropolitan planning organizations (MPOs), state air agencies working on state implementation plans (SIPs), and project sponsors working on project-level analyses.

Rules and Guidance

On March 2, 2010, the EPA approved use of the MOVES2010 emissions model for SIPs and regional emissions analyses for transportation conformity. This approval also started a two-year transportation conformity grace period that ended on March 2, 2012, after which MOVES2010b was required to be used for new regional emissions analyses for transportation conformity [FR Doc No: 2010-4312].

On December 20, 2010, the EPA approved the latest version of the MOVES model for official use in quantitative carbon monoxide (CO), PM_{2.5}, and PM₁₀ hot-spot analyses outside of California (California uses the EMFAC model instead of MOVES and MOBILE6.2). This notice also announced a two-year grace period before the MOVES model was required to be used in quantitative CO and particulate matter hot-spot analyses for project-level conformity determinations outside California [FRL-9241-3].

On February 27, 2012, the EPA took final action to extend the grace period before the MOVES model is required for regional emissions analyses for transportation conformity determinations. This final rule adds an additional year to the previously established two-year conformity grace period. As a result, MOVES must be used for new regional conformity analyses that begin after March 2, 2013. This action does not affect the EPA's previous approval of the use of MOVES in SIP submissions, or the existing grace period before MOVES is required for CO and particulate matter hot-spot analyses at the project-level [EPA-HQ-OAR-2011-0393; FRL-9636-5].

On December 6, 2012, the Federal Highway Administration (FHWA) updated the September 2009 interim guidance that advised how to conduct a Mobile Source Air Toxics (MSAT) analysis under the National Environmental Policy Act (NEPA) review process for highway projects. The EPA provided a two-year grace period for CO, PM_{2.5}, and PM₁₀ hot-spot analyses beginning December 20, 2012. After the grace period, project sponsors should use the MOVES model to conduct emissions analyses for NEPA purposes. To prepare for this transition, the FHWA updated the 2009 Interim Guidance on incorporating analyses using the MOVES model.



Why did EPA propose these revisions?

As required by the Clean Air Act (CAA), the EPA regularly updates its mobile source emission models. As a result, MOVES2010b is the EPA's state-of-the-art model for estimating emissions from highway vehicles based on analyses of millions of emission test results and considerable advances in the Agency's understanding of vehicle emissions. The MOVES2010b model further incorporates several changes to the EPA's approach for mobile source emission modeling based on recommendations made by the National Academy of Sciences. The MOVES2010b improves the quality of results and overall functionality as compared to its predecessor, MOBILE6.2.

What are the implications of these revisions?

When compared to MOBILE6.2, MOVES is a significant leap forward in terms of data and model capabilities. Although the EPA and FHWA have conducted numerous training sessions throughout the country, the number of end users utilizing MOVES is small, but is expected to increase over time, as was seen during the release of MOBILE6.2. In the near future, end users utilizing MOVES may encounter issues and generate unexpected results, as in the following scenarios:



Transportation Conformity

Transportation conformity is required under CAA section 176(c) (42 U.S.C. 7506(c)) to ensure that federally funded highway and transit project activities conform to air quality goals established in SIPs. Transportation conformity analysis is driven by modifications to the Metropolitan Transportation Plan (MTP) and Transportation Improvement Program (TIP), and is updated frequently when compared to SIPs. While regional transportation conformity must be based on the updated software, MOVES2010b, SIPs can maintain emissions estimates derived from MOBILE6.2. This mismatch can impact transportation conformity results and have implications on a region's ability to implement a long-range multi-modal transportation plan. Sensitivity tests conducted by the EPA and other agencies, comparing MOBILE6.2 to MOVES, indicate that MOVES produces higher emission estimates for oxides of nitrogen (NO_x) and PM_{2.5}.

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Hot Spot Analysis

A hot-spot analysis is defined in 40 CFR 93.101 as an estimation of likely future localized pollutant concentrations and a comparison of those concentrations to the relevant NAAQS. A hot-spot analysis assesses air quality impacts on a scale smaller than an entire nonattainment or maintenance area. Starting December 20, 2012, MOVES2010b (outside of California) is required to be used for new quantitative CO, PM₁₀, and PM_{2.5} hot-spot analyses. The analysis also requires using the AERMOD or CAL3QHCR dispersion models, depending on project type. Conducting a hot-spot analysis for a project requires skills on using the MOVES model due to numerous runs and data inputs. The EPA recommends employing local inputs such as vehicle fleet age distribution, meteorology, fuel, inspection and maintenance, ramp fraction, road type distribution, source type population, vehicle miles of travel mix, etc. Gathering local inputs for emissions estimating is a time-consuming task. Errors in inputs can result in MOVES predicting new or worsened PM/CO NAAQS violations, which in turn can delay a region's ability to implement a project.

Mobile Source Air Toxics (MSAT) Analysis

NEPA requires all federal agencies to prepare an environmental impact statement that should include a qualitative or quantitative MSAT analysis for approval of highway projects. The FHWA has developed interim guidance as to when and how to analyze MSATs in the NEPA process for such projects. As per FHWA interim guidance, an MSAT analysis should be conducted for every project that has an



annual average daily traffic (AADT) volume greater than or equal to 140,000. Quantitative MSAT analysis involves estimating emission factors, identifying roadway links that have changed ± 5 percent in volume between a build and a no-build (affected transportation network), and calculating emissions for roadway links identified in the process for different analysis years. The EPA encourages using the MOVES model for all project-level air quality analyses under NEPA after December 2012. To estimate MSAT emissions for project-level analysis, the EPA recommends employing local inputs where available. Gathering local inputs and conducting a quantitative MSAT analysis can be a time consuming process that delays a project and escalates costs. A four percent per year inflation cost added to a delayed project means less funding for other projects, causing more delays and continuance of compounding financial impacts.

What resources are available for regions/states to utilize MOVES in their planning process?

The EPA and FHWA conducted numerous training sessions throughout the country and the following links are provided here for accessing rules, regulations and guidance documents.

- The [MOVES User Guide](http://www.epa.gov/otaq/models/moves/) provides detailed instructions for using MOVES and has been updated for MOVES2010b. (www.epa.gov/otaq/models/moves/, or in the MOVES Help Menu)
- ["Policy Guidance on the Use of MOVES2010 \(and Subsequent Minor Revisions\) for State Implementation Plan Development, Transportation Conformity, and Other Purposes: Revision to April 2012 EPA Guidance"](http://www.epa.gov/otaq/stateresources/transconf/policy.htm#models) describes how and when to use MOVES2010b for SIP development, transportation conformity, general conformity, and other purposes. (www.epa.gov/otaq/stateresources/transconf/policy.htm#models)
- ["Using MOVES to Prepare Emission Inventories in State Implementation Plans and Transportation Conformity: Technical Guidance for MOVES2010, MOVES2010a and MOVES2010b"](http://www.epa.gov/otaq/stateresources/transconf/policy.htm#models) provides guidance on creating a RunSpec and adding local data using the County Data Manager for SIPs and regional transportation conformity analyses. (www.epa.gov/otaq/stateresources/transconf/policy.htm#models)
- ["Transportation Conformity Guidance for Quantitative Hot-Spot Analyses in PM_{2.5} and PM₁₀ Nonattainment and Maintenance Areas"](http://www.epa.gov/otaq/stateresources/transconf/policy.htm) provides guidance on using MOVES for quantitative PM₁₀ and PM_{2.5} hot-spot analysis for transportation projects. (www.epa.gov/otaq/stateresources/transconf/policy.htm)
- ["Using MOVES in Project-Level Carbon Monoxide Analysis"](http://www.epa.gov/otaq/stateresources/transconf/policy.htm) describes how to use MOVES to model CO emissions from transportation projects. (www.epa.gov/otaq/stateresources/transconf/policy.htm)
- ["Using MOVES for Estimating State and Local Inventories of On-Road Greenhouse Gas Emissions and Energy Consumption – Final"](http://www.epa.gov/otaq/stateresources/ghgtravel.htm) describes how to use MOVES to estimate GHG emissions and/or energy consumption from on-road vehicles in a state or metropolitan area. (www.epa.gov/otaq/stateresources/ghgtravel.htm)



For further questions concerning this and other air quality issues, please contact us at:

WWW.PROVIDENCEENG.COM

Madhusudhan (Madhu) Venugopal, PE
Air Quality Specialist
mvenugopal@providenceeng.com
(972) 550-9326

Carley Williams
Director of Business Development
carleywilliams@providenceeng.com
(225) 766-7400

Providence Headquarters: 1201 Main Street | Baton Rouge, Louisiana 70802 | Phone: (225) 766-7400 | Fax: (225) 766-7440

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