EPA Releases MOVES2010a Mobile Source Emissions Model Update: Questions and Answers

What is MOVES2010a?

MOVES2010a, released in August 2010, is a minor update to MOVES2010. MOVES2010, released in December 2009, is EPA's state-of-the-art tool for estimating emissions from highway vehicles. The model is based on analysis of millions of emission test results and considerable advances in the Agency's understanding of vehicle emissions. As EPA has stated in the past, the advanced software used for MOVES allows EPA to easily incorporate new information. EPA is now releasing MOVES2010a to allow MOVES users to easily account for emissions under new car and light truck energy and greenhouse gas standards and to benefit from several improvements to MOVES general performance.

What has changed from MOVES2010 to MOVES2010a?

MOVES2010a incorporates new car and light truck greenhouse gas emissions standards affecting model years 2012-and-later (published May 7, 2010[1]) and updates effects of corporate average fuel economy standards affecting model years 2008-2011.[2] MOVES2010a includes reductions in greenhouse gases associated with those standards in future calendar years, and small reductions in refueling and sulfur-related emissions associated with the reductions in vehicle fuel consumption.

MOVES2010a also includes a number of other improvements. These are listed in Appendix A. The net impact of these changes on criteria pollutant emissions is small, with decreases of one percent or less in NOx, PM2.5, and CO emissions for regional inventory runs using example local inputs. Compared to MOVES2010, most regional inventory runs should see an increase in methane emissions and a small decrease (less than five percent using example local inputs) in the associated Volatile Organic Compound (VOC) and air toxics emissions. However, comparisons for runs that focus on a particular project or sourcetype may vary.

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[1] www.regulations.gov/search/Regs/home.html#documentDetail?R=0900006480ae8a38
[2] www.regulations.gov/search/Regs/home.html#documentDetail?R=09000064802cefcd and
     www.regulations.gov/search/Regs/home.html#documentDetail?R=09000064809375ea

When should MOVES2010a be used for state implementation plans and transportation conformity analyses?

Because the impact of the changes in MOVES2010 on criteria pollutant emissions are small, we are not considering MOVES2010a a new emissions model for state implementation plan (SIP) and transportation conformity purposes under 40 CFR 93.111, and there will be no new grace period for regional conformity analyses using MOVES2010a. The MOVES2010 grace period for regional conformity analyses will apply to the use of MOVES2010a as well. It is important to note that EPA has not yet approved any version of MOVES for use in project-level conformity analyses, and will do so in the future when applicable conformity guidance is completed.

All states other than California should use MOVES2010a for future SIPs in order to take full advantage of the improvements incorporated in this version. However, state and local agencies that have already completed significant work on a SIP with MOVES2010 can continue to use it. To determine when to use MOVES2010a in transportation conformity determinations, refer to the March 2, 2010 Federal Register notice which announced the grace period for MOVES2010 (75 FR 9411) and the EPA's policy guidance on the use of MOVES2010 for SIP development and transportation conformity (www.epa.gov/otaq/models/moves/420b09046.pdf). EPA's existing guidance on the use of MOVES2010 for SIPs and conformity applies to MOVES2010a as well. We will work with state and local agencies to resolve any questions that come up regarding differences in MOVES2010 and MOVES2010a.

What needs to be done to switch from using MOVES2010 to MOVES2010a?

Instructions for downloading and installing MOVES2010a are available on the MOVES web page www.epa.gov/otaq/models/moves/ . Users will find that runspecs and input databases developed with MOVES2010 may need modification to be able to run with MOVES2010a. Users should regenerate fuelFormulation input files and Alternate Vehicle Fuels & Technologies (AVFT) strategy files. Output databases will need to be recreated with a new name since several new tables have been added. Users should always specify what version of MOVES was used to create emissions results.

What other resources are available that apply to MOVES2010a?

The latest version of EPA's existing Technical Guidance for MOVES2010 (available at www.epa.gov/otaq/models/moves/420b10023.pdf) also applies to MOVES2010a. The MOVES2010 User Guide has been updated to reflect changes in MOVES2010a. The document "EPA Releases MOVES2010 Mobile Source Emissions Model: Questions and Answers" (available at: www.epa.gov/otaq/models/moves/420f09073.pdf) contains general information about the release of MOVES2010 that also applies to MOVES2010a.

If you have technical questions about MOVES2010a, please contact the MOVES team at mobile@epa.gov. If you have SIP or conformity policy questions, please contact Rudy Kapichak (kapichak.rudolph@epa.gov) or Meg Patulski (patulski.meg@epa.gov).

Appendix A

Changes from MOVES2010 to MOVES2010a

Change from MOVES2010 to MOVES2010a	Implication
1) Updated light duty energy and carbon dioxide rates and algorithm to account for new fuel economy/CO2 regulations.	Reduced energy consumption and carbon dioxide emissions for light duty gasoline vehicles; reduced hydrocarbon emissions from refueling and sulfate emissions from fuel consumption.
2) Incorporated all data corrections distributed in May 15, 2010 version of the MOVES database (i.e. data in MOVESDB20100515). See MOVES2010 Errata/Information Sheet (May 15, 2010) for additional information.	For users who have switched to the May 15, 2010 database, these changes will have no impact. Compared to MOVES2010 as released in December 2009, MOVES2010a will change NO and NO2 emissions (no change in NOx), decrease hydrocarbon evaporative emissions slightly, change diesel vehicle volatile organic compound (VOC) and air toxics emissions for calendar years 1999-2006, change hydrocarbon emissions for vehicles running on gasoline containing ethanol in calendar years 1999-2004, and reduce particulate matter emissions for 2021-and-later light-duty diesel emissions.
3) Improved algorithm for brakewear and tirewear so emissions are always zero at idle.	Reduced brakewear and tirewear emissions. Change is very small for regional inventories, but larger for projects with substantial idling on steep grades.
4) Improved MOVES algorithm for calculating emissions on ramps.	Negligible changes for regional emissions calculated using Inventory mode (emissions inventory output). Increase in emissions on highways (restricted access roadtypes) for those using Emission Rate mode (rate-per-distance emissions).
5) Improved methane algorithm and updated methane rates. Better accounts for methane variation with temperature, driving activity, etc. Adds methane emissions for some processes where it was not calculated.	Methane emissions increased substantially. VOC and other non-methane hydrocarbons are reduced by about 3 to 5 percent. "Carbon Dioxide Equivalent" emissions are increased less than 1 percent by this change and when combined with the impact of the new regulations (see above), total greenhouse gas emissions decline. When methane output is desired, users now must calculate total hydrocarbons also.

Change from MOVES2010 to MOVES2010a	Implication
6) Fixed error that reduced temperature correction for temperatures greater than 100F.	Increases hydrocarbon, CO, and NOx emissions for temperatures greater than 100F. Users who have modeled days with temperatures over 100F should evaluate emission changes that result from this revision.
7) Fixed error in pre-aggregation by month that occurred in some HD runs.	Some runs will see an increase in emissions for medium and heavy duty trucks and buses for VOC and other hydrocarbons.
8) Repaired an error in the ammonia emissions calculations.	Increases ammonia emissions for passenger and light commercial trucks.
9) Improved calculation of air toxics emissions, particularly for diesel vehicles.	Increases air toxic emissions from diesel vehicles.
10) Updated default national heavy truck and bus sales-growth and VMT-growth factors to account for more recent data and updated projections.	Increased default population, sales and emissions for buses and heavy trucks. This does not affect emissions in runs using local inputs for bus and truck populations.
11) Fixed errors in motorcycle scrappage, migration and sales growth defaults.	Increases default population of motorcycles. This does not affect emissions in runs using local inputs for motorcycle populations.
12) Fixed error that increased emissions when users selected "placeholder" fuel.	Reduces emissions, sometimes substantially, in runs where "Placeholder fuel" was selected. Even with MOVES2010a, use of "Placeholder" fuel is not recommended.
13) Added a new output option -- emission rates by SCC.	Eliminates some users' need to calculate SCC rates in post-processing. Adds an additional column to emission rate output tables.
14) Changed units for project-level start & extended idle rates (see Users Guide).	Users may need to modify post-processing to apply rates properly.
15) Improved MOVES user interface, including run spec editor, importers, summary reporter and "Multiple Run Spec Creator."	Many small changes that should make MOVES easier to use.
16) Improved error checking in MOVES importers.	A number of changes that should make MOVES easier to use.
17) Allow the batch creation of import databases.	Makes it easier for users to create a group of similar import databases.

Change from MOVES2010 to MOVES2010a	Implication
18) Allow user to add new fuel formulations rather than just editing existing formulations.	Provide more flexibility for users changing default fuel characteristics.
19) Made MOVES more compatible with UNIX/Linux.	Makes it easier to adapt MOVES to run with UNIX/Linux systems. While EPA does not have the resources to provide or fully support such adaptations, we encourage Linux/UNIX users to contact us to share information.
20) Updated the "Example" files distributed with MOVES.	Example file runs correctly with MOVES2010a.
21) Improved MOVES run time and added tools to better monitor MOVES performance.	MOVES runs slightly faster and users can better diagnose performance problems.
22) Improved MOVES robustness by adding additional error checking.	Improved code that sometimes led to MOVES crashes.
23) Improved Custom Domain functioning.	Allow users to calculate Custom Domain emissions for "off-network" roadtype without requesting output for other roadtypes.
24) Corrected a problem in which evaporative permeation emissions were not always aggregated correctly. Previous output sometimes had rows with duplicate key fields. Depending on the post-processing method used, totals could have been miscalculated.	More accurate post-processing.
25) Made the "DecodeMOVESOutput" script compatible with new version of MOVES.	Decode script should run without error.
26) Corrected several other minor errors in the MOVES program.	Negligible impact on emissions.