

Mobile Sources Technical Review Subcommittee MOVES Work Group: Meeting Summary

November 27, 2012
U.S. EPA Office of Transportation & Air Quality
2000 Traverwood Drive
Ann Arbor, MI 48105

Welcome and Introductions

Megan Beardsley welcomed the participants. A full list of participants is provided as an attachment to this summary. Prior to the meeting, a full set of presentations and a summary of comments from the September MOVES Work Group meeting were distributed to the members.

Ms. Beardsley briefly summarized the comments received after the September MOVES Work Group meeting. Written comments were received from Matt Barth of UC Riverside regarding the use of test data in the continuing development of MOVES and from Chengfeng Wang of the California Air Resources Board (CARB) regarding several aspects of the MOVES data and assumptions. Ms. Beardsley stated that the EPA will develop written responses to the California comments and distribute them to the Work Group. Ms. Beardsley also noted that there will be a MSTRS meeting in December, at which the Work Group has an opportunity to present recommendations. Since the Work Group has not discussed recommendations yet, she suggested that the workgroup instead prepare recommendations for the next MSTRS meeting, scheduled for May 2013.

Presentation: MOVES – NONROAD Model Development – Ed Glover, EPA/OTAQ

The MOVES2013 model will include an option to model emissions from non-road mobile vehicles, which currently is not available in the MOVES model. The current model for non-road mobile emissions, NONROAD, has been used to build emission inventories from most non-road mobile equipment types, except locomotives, commercial marine vessels and aircraft. The NONROAD model includes most major pollutants and processes, with the exception of HAP emissions, covers calendar years 1970 through 2050, and has a geographical scale ranging from the county level to the national level. This model was first released in 1998 and was based largely on population and activity inputs provided by Power Systems Research. Although the model data has been updated several times, the software platform is now outdated, is difficult to modify, and does not work with the current versions of Windows or Linux. By adding the NONROAD model to MOVES, mobile source emissions inventories can be developed using the same user-friendly interface for both on-road and non-road emissions, data will be easier to input into MOVES compared with the current data input for NONROAD, and the output of results will have more aggregation options than the current NONROAD. The insertion of NONROAD into MOVES is mostly complete with final debugging and testing currently in process. The release of

NONROAD2008a in MOVES2013 will be as “draft.” More work on the NONROAD portion of MOVES is planned to occur after the release of MOVES2013.

Discussion

Tom Darlington asked whether the EPA had performed a top-down validation for the NONROAD model. Jim Warila explained that some had been done using diesel fuel estimates from the Department of Energy (DOE), and he noted that more validation would also be done.

Roy Mann inquired about how the EPA allocated agricultural and construction equipment to counties. In response, Mr. Glover explained that the surrogates used are detailed in the model documentation. Housing starts is one surrogate that was used for construction equipment.

Susan Collet asked whether the EPA planned to design the outputs from MOVES2013 to flow into the SMOKE model. It was explained, in response, that the EPA did hope to have the outputs in a format that would allow them to be an input to the SMOKE model.

David Lax asked whether the EPA planned to add locomotive, commercial marine and aircraft to the NONROAD model in MOVES. Mr. Glover responded that those equipment types will not be included in MOVES2013. The EPA hopes to include locomotives in the next MOVES update, but the other equipment types have complicated models that would be difficult, to incorporate into MOVES.

Mike Sheehan asked how long the EPA would continue to support older versions of NONROAD after it is incorporated into MOVES. Ms. Beardsley responded that the EPA would continue to support older versions of NONROAD for some time, but eventually, the EPA would not continue to support legacy code.

Mr. Sheehan recommended that the MOVES output be in a format that would be acceptable for use as an NEI input.

Mr. Darlington asked whether the draft model could be used for State Implementation Plans (SIPS). Gary Dolce responded that using a draft model is not appropriate for regulatory purposes, but modelers can use the draft version to learn how to use the interface and to understand the model’s capabilities. For regulatory purposes, the current version of NONROAD should continue to be used.

Presentation: NONROAD Population and Activity Update – Darrell Sonntag, EPA/OTAQ

While the initial release of MOVES2013 with NONROAD will include data for non-road equipment consistent with NONROAD2008a, updated population and activity data for non-road equipment is being developed and will be included in MOVES after a period for public comment on the updated data. The data that the EPA intends to include for population is based on data purchased from Power Products Marketing (PPM) and from the Census of Agriculture. Along with the population data, county allocation estimates are included with the PPM data, and the

EPA will be reviewing the county allocation surrogates and revisiting past and future emissions estimates considering the new population and allocation data. The EPA has also purchased equipment activity data from ENVIRON, which is based on 11 state and local area activity surveys. Also, the EPA will be developing new load factors based on another new data source, the EPA Midwest Construction Study. Initial comparisons between the current NONROAD data and the data from PPM show that non-road equipment populations are larger in the PPM data due to less aggressive scrappage rates in the PPM data compared to the NONROAD assumptions. Because the equipment type categories are different in the PPM data and the current NONROAD categories, work is needed to harmonize the categories. The PPM data for county allocation is based primarily on the Uniform Commercial Code, which is collected for financed equipment. This allocation data provides intuitive allocation for many sources, but it may bias sales areas over use areas and may not reflect the population for long-lived equipment. Compared with the Census of Agriculture data, NONROAD also appears to underestimate the tractor population, but fuel consumption compares well with the Energy Information Administration data. This indicates that engine size, load factors, and activity need to be revisited if tractor population is updated in NONROAD. For the activity data, comparisons between the new survey data and NONROAD show that NONROAD appears to under-predict use of commercial lawn and garden equipment and over-predict diesel construction equipment use. The EPA plans to supplement the activity data for categories with small sample sizes in the survey data. The next steps in the population and activity data update are to continue reviewing and assessing the new data and work toward incorporating it into the model.

Discussion

Tom Darlington asked whether activity would be expected to decline with age. Mr. Glover responded that activity and the load factor could be expected to decline with age.

Roy Mann asked whether the data sources separated spark from compression ignition tractors. He noted that it may be important to know where the older spark ignition tractors are, as they may not be used very often. Mr. Sonntag believed the two types of tractors were not currently separated and were allocated to counties in the same way. There was speculation about whether the census questionnaires separated spark from compression ignition tractors.

Mr. Darlington asked how boats were allocated to the Great Lakes. Mr. Sonntag responded that the allocation was made out to a certain distance from the shore, which he believed was two miles.

Karin Landsberg asked whether the purchased data included Alaska and Hawaii, as the maps presented only showed the Continental U.S. Mr. Sonntag replied that it did, but the maps included in his presentation did not show those areas.

Mr. Mann asked whether the activity curves presented were representative for all equipment ages or just new equipment. Mr. Sonntag responded that the curves were generated based on all ages, but could be displayed separately by age as well.

Matt Barth asked what the remaining data gaps were. Mr. Sonntag replied that the EPA was still sorting out the data they have gotten, and at this point, they are not sure what the major gaps remaining are. Mr. Sonntag stated that one of the EPA's next steps will be to determine data gaps.

Susan Collet asked whether it would be possible for the EPA to survey equipment manufacturers to get population data, rather than relying on dealer data. Mr. Warila responded that the EPA has done this indirectly through consultants and trade groups. Mr. Darlington added that he knows other data sources that he could suggest to the EPA also.

Mr. Darlington asked about the timeframe for incorporating the new data into NONROAD. Ms. Beardsley replied that the data will not be ready for incorporation in the next release with MOVES, but they hoped to have it available in the model in 2014.

Phil Heirigs commented that the tractor data from the Agricultural Census should be looked at carefully, noting that not all tractors owned may be used very often. He also suggested that when the EPA allocates agriculture equipment by state, the EPA should look at harvested acreage by crop type, as there would be differences in emissions based on the type of crop the equipment was used for. He further suggested that the EPA review the Agricultural Census data questions in order to fully understand the resulting data.

Mr. Mann noted that there is United States Department of Agriculture (USDA) data for gallons of diesel fuel needed to produce certain crops, and he offered to provide that data to the EPA. He also suggested that the EPA should understand and consider minimum tillage practices.

Ms. Collet asked whether the EPA could use its own data collected from certifications and standards development data for certain types of equipment, like snowblowers. Mr. Glover indicated that this data was not adequate for the purposes of the model.

Presentation: Modeling Evaporative Emissions in MOVES2010b – David Brzezinski EPA/OTAQ

Evaporative emissions include emissions from vapor losses, fuel permeation, liquid leaks, refueling spillage and refueling vapor. About 37% of total hydrocarbon (HC) emissions from gasoline vehicles in the summer come from non-exhaust processes. Vapor loss is vaporized fuel that finds its way out of the system and can be divided into three modes, including cold soak, running loss, and hot soak. Vapor leaks account for much of the vapor losses from modern vehicles. In MOVES2010b, hot soak and running losses are not adjusted for fuel properties or temperature, and vapor leak rates are not applied, whereas these variables are applied to cold soak emissions. Because vapor leak rates are only applied to cold soak losses, inspection and maintenance programs (I/M) only affect cold soak emissions in the model. Fuel permeation results from gasoline permeating through the tank or hoses and then evaporating. Increases in temperature and ethanol content increase these losses. Liquid leaks (i.e., dripping fuel) are not common, but result in very high emissions when they occur. Permeation and liquid leaks are not affected by I/M programs. Refueling losses can be split into spillage and vapor losses. Fuel consumption, as well as temperature, fuel volatility, whether the vehicle has onboard refueling

vapor recovery (ORVR) systems, and whether fueling vapor recovery programs are in place, impact the emissions from refueling losses. Fuel tank temperature, which increases during trips and falls to ambient temperature when parked, is the main driver for permeation and cold soak vapor losses. To estimate operating hours, number of trips, time spent in hot soak and cold soak, data was obtained from a sample of instrumented vehicles for MOVES2010b.

Discussion

Matt Barth requested more information on the sample vehicles used for the MOVES2010b activity database. Ms. Beardsley explained that there were several hundred light-duty vehicles included all together, with data from several different studies, and much less data for heavy duty vehicles

Presentation: Evaporative Emissions Research Overview – Connie Hart, EPA/OTAQ

The EPA has or is undertaking several testing programs to further understand evaporative emissions. These programs include Coordinating Research Council (CRC) E-77 test programs, high evaporative emissions field studies, multiday diurnal testing and running loss testing. The E-77 program objectives were to understand the effects on evaporative emissions from fuel ethanol content, fuel Reid vapor pressure (RVP), and leaks in various vehicle locations. These studies found that leaks located at the top of the tank and canister inlet have greater emissions than those in the gas cap, which is controlled by ORVR technology, and that increased RVP and perhaps ethanol content affect emissions. The high evaporative emissions field studies objectives were to investigate the magnitude, frequency and location of leaks in the real world. From these studies, it was found that the most common areas for leaks included the tank, fill pipe, and canister, and that some areas, such as the injector and purge solenoid, tended to have larger leaks when they did occur in those areas. Also, these studies found that older vehicles (pre-1996) had much higher rates of leaks than newer vehicles. The objectives for the multiday diurnal testing were to understand the effects of fuel RVP on evaporative emissions, when newer technology vehicles experience canister breakthrough, and what the backpurge rate over an extended parked period is. They found greater emissions with higher RVP fuels and canister breakthrough occurring after three or four days. For running losses, the testing objectives were to understand these emissions for newer technology vehicles and for vehicles with leaks. The studies showed that the location of the leak and the fuel RVP affect running losses from leaks. Other running loss studies are currently in progress. Future research includes a canister degradation study, the development of a real-world evaporative emissions test procedure and an activity study.

Discussion

Susan Collet asked whether the EPA planned to study the effects of E15 on evaporative emissions. Ms. Hart replied that the EPA did not have plans to investigate E15, as it appears that fuel RVP has a larger effect on evaporative emissions. Ms. Collet noted that Toyota thinks E15 will have a large effect on evaporative emissions.

Matt Barth asked when the results from these tests would be incorporated into MOVES. Ms. Hart responded that the results from the E-77 studies, high evaporative emissions field studies and the multi-day diurnal studies would be incorporated in to MOVES2013, but that the running loss data would not be in this next version.

Mr. Barth asked how the EPA planned to incorporate the data from the E-77 studies that had large error bars in the graphic presentation. Ms. Hart replied that the EPA had done statistical analysis on the study data, which will be presented at the next meeting.

General Discussion

Syeda Haque asked when the EPA planned to release MOVES2013. Ms. Beardsley responded that the plan was for mid-2013, which may be late summer or early fall of next year.

Ms. Haque also asked whether there would be a grace period for conformity in using the newest version of the model. Gary Dolce responded that there would be a grace period, which would be anywhere from two months to three years, but that has not been decided yet. It will depend on the complexity of the changes to the model and how much time the EPA thinks it will take users to learn how to use the new version.

Ms. Haque inquired whether the EPA had completed any sensitivity studies comparing the results to MOVES2010b. Ms. Beardsley replied that MOVES2013 is not put together yet, so it is not possible to do comparisons at this point. Ms. Beardsley indicated that comparisons would be made available a few months before the model is released.

Ms. Haque asked whether MOVES2013 will have the CAFÉ standards incorporated into it. Ms. Beardsley answered that the first round of CAFÉ standards are in MOVES2010a and those that were finalized last summer will be incorporated into MOVES2013.

Phil Heirigs inquired whether the EPA will have another review group for the evaporative emissions updates to the model and how comments from the Work Group will be incorporated. Ms. Beardsley responded that there will be more discussion of evaporative emissions in the next Work Group meeting scheduled for January. She further explained that the EPA aims to allow for an adequate period of time for Work Group comments and for incorporation of those comments regarding evaporative emissions following the next meeting. Mr. Heirigs further stressed the importance of allowing adequate time for stakeholder comments and for EPA review of stakeholder comments, which may not be possible if the review process is started too late (i.e., too close to the model release date).

Karin Landsberg was curious to know how evaporative emissions that have been tested at higher temperatures would map to areas of the country with colder temperatures, such as Alaska. Ms. Hart explained that the EPA used a model to derive emissions estimates for colder areas, and she hoped to present this information at the next meeting. Mr. Brzezinski added that at temperatures under 75 °F, the EPA expects there to be a dramatic drop in evaporative emissions. The main concerns regarding evaporative emissions are the emissions that occur at higher temperatures and outside design conditions.

Susan Collet asked whether evaporative emissions are included in the NONROAD model. Mr. Glover replied that there are evaporative emissions included in the current model, and the EPA is not planning to make any major changes to that portion of the model at this time.

WRAP-Up

Ms. Beardsley noted that the tentative date for the next Work Group meeting is January 28, 2013, which is a Monday. Ms. Beardsley asked the participants to provide comments to Lesley Stobert, with copies sent to William Aikman (aikman.william@epa.gov), on the information presented today by January 11, 2013, so that the comments could be compiled and distributed prior to the next meeting. The topics for discussion at the next meeting will primarily be about fuels, activity, and temperature effects on emissions. Ms. Beardsley also noted that meetings may be needed beyond March 2013, and she asked for input on the format of any such meetings, such as having more shorter meetings or longer in-person meetings. Matt Barth commented that the best format for the meetings would depend on the goal of the meetings. If a lot of discussion is needed, longer in-person meetings would be better, but presentations could be handled with shorter webinar-type meetings.

Attachment - Work Group Meeting Attendance List

Name	Organization	Attendance
Giedrius Ambrozaitis	Alliance of Automotive Manufacturers	Webinar/teleconference
Matthew Barth	UC Riverside	X
Megan Beardsley	EPA/OTAQ	X
Marc Bennett	Massachusetts DEP	Webinar/teleconference
Susan Collet	Toyota	X
Tom Darlington	AEM and EMA	X
Rich Denbow	AMPO	Webinar/teleconference
Chuck Gebhardt	Illinois EPA	Webinar/teleconference
Phil Heirigs	Chevron	Webinar/teleconference
Joe Kubsh	MECA	Webinar/teleconference
Karin Landsberg	Alaska DEC	Webinar/teleconference
David Lax	API	Webinar/teleconference
Bob Maxwell	Global Automakers	Webinar/teleconference
Chengfeng Wang	California Air Resources Board (CARB)	Webinar/teleconference
Other		
Denise Cornier		Webinar/teleconference
Scott Fincher	Eastern Research Group	Webinar/teleconference
Syeda Haque	North Central Texas Council of Governments	Webinar/teleconference
Hang Liu		Webinar/teleconference
Kathy Jaw	CARB	Webinar/teleconference
Jeff Long	CARB	Webinar/teleconference
Eulalie Lucas	Metropolitan Washington Council of Governments	Webinar/teleconference
Roy Mann	CNH Global	X
Sam Pournazeri	California Air Resources Board	Webinar/teleconference
Mike Rodgers	Georgia Tech	Webinar/teleconference
Mike Sheehan	NY	Webinar/teleconference
Jenny Sigelko	Chrysler	Webinar/teleconference
Gyo Shyu		Webinar/teleconference
Craig Woleander	Massachusetts DEP	Webinar/teleconference
EPA Observers and Presenters		
William Aikman	EPA/OTAQ	X
David Brzezinski	EPA/OTAQ	X
David Choi	EPA/OTAQ	X
Gary Dolce	EPA/OTAQ	X
Chris Dresser	EPA/OTAQ	X
Ed Glover	EPA/OTAQ	X
Connie Hart	EPA/OTAQ	X
Dave Hawkins	EPA/OTAQ	X
Ari Kahan	EPA/OTAQ	X
Harvey Michaels	EPA/OTAQ	X
Darrel Sonntag	EPA/OTAQ	X
Jim Warila	EPA/OTAQ	X

EPA Contractor Support		
Lesley Stobert	EC/R Incorporated	X
Alden West	EC/R Incorporated	Webinar/teleconference