Federal Advisory Committee Act
Clean Air Act Advisory Committee

Mobile Sources Technical Review Subcommittee
MOVES Work Group: Meeting Summary

September 25, 2012
U.S. EPA Office of Transportation & Air Quality
2000 Traverwood Drive
Ann Arbor, MI 48105

Welcome and Introductions

John Koupal 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 July MOVES Work Group meeting were distributed to the members.

John summarized the comments received after the July MOVES Work Group meeting. Written comments were received from Chris Frey regarding validation of MOVES emission rates considering temperature effects and cold starts. Mr. Koupal stated that in addition to other validations, EPA will validate emission rates versus temperature. EPA is planning to test cold temperature effects versus particulate matter emissions. This testing is not being conducted just to support the MOVES program but to understand very cold temperature effects on particulate emissions and will also be used to validate MOVES. EPA is collecting Tier II PEMS data for about 100 vehicles to analyze in use driving under cold temperatures. These data will not be available in time for the 2013 data for the development of MOVES. Some large scale start data may be available in time and if it is available, EPA will review the data.

Comments were also received from the Engine Manufacturers Association (EMA) requesting that discussion of non-road emissions be held earlier in the Work Group cycle of meetings. EPA has adjusted the schedule of meetings to include a part 1 and 2 discussion of the non-road component of MOVES. EPA will start sharing these data for preliminary discussion at the next meeting, but definitive MOVES changes will not be ready at that time. Tim French of EMA thanked Mr. Koupal for this change to the schedule, as he was hoping to discuss non-road emissions before the previously scheduled discussion in March.

Steve Potter of the Connecticut Department of Environmental Protection submitted comments about MOVES inputs transparency and emission factor apportionment. Megan Beardsley of EPA stated that there is documentation of the mapping of source type to source bins. She acknowledged that this information is hard to find, hard for MOVES users to change and will provide Mr. Potter with the documentation he is interested in. The EPA will also consider how to make this information clearer and more readily changeable to MOVES users. With regard to fleet data, the “Vehicle Activity Report” (census on trucks) has been discontinued and has not been replaced. Providing these data to the model was viewed as a burden (most users do not have access to these data).The uncertainty of these data is included in the model outputs.

Tom Darlington asked whether the EPA was running two different cold emissions test programs. Mr. Koupal confirmed that there are two programs. The first involves the use of a prescribed route in Detroit and a combination of remote sensing data, portable emissions measurement systems (PEMS), and activity monitors. These cars (approximately 100 Tier II) will have a prescribed route designed to populate a range of operations and should provide real-world cold start data and hopefully a long-term emission factor test. The second study is a program with Mercedes Benz to collect data from 10-20 vehicles driving in cold conditions by the actual vehicle owners.

Presentation: Analysis of Recent Heavy-Duty Vehicle Emission Test Programs – David Choi, EPA/OTAQ

In this presentation, NOx emissions from heavy-duty diesel trucks estimated by MOVES was compared to emissions measured in two studies by PEMS. The data MOVES is based on includes EPA PEMS data from 124 trucks and West Virginia University PEMS data from 188 trucks. The MOVES data was compared to in-use compliance data from truck manufacturers and data from a Houston port drayage study. To compare MOVES to the in-use compliance data, the compliance data needed to be extrapolated to model years (MY) before 1991 and after 2006 and were also put into MOVES operating mode bins based on scaled tractive power (STP). MOVES compared to the truck manufacturer in-use compliance data showed:

- For heavy heavy-duty (HHD) trucks
    - MOVES slightly underpredicts NOx emissions for MY 2003-2006
    - MOVES underpredicts NOx emissions from MY 2007-2009
    - MOVES predicts NOx emissions within the variability of the data for MY 2010+, but there was only compliance data for one vehicle for these MY
- For medium heavy-duty (MHD) trucks, MOVES compares well with compliance data for MY 2003-2009 NOx emissions
- For light heavy-duty (LHD) trucks
    - MOVES overpredicts NOx emissions for MY 2003-2006 at low STP and well at high STP
    - MOVES compares well with compliance data for MY 2007-2009 for NOx emissions.

To compare MOVES to the Houston port drayage data, the drayage data were separated into classes based on remote sensing data (RSD) NOx emissions and then weighted to correct for sample imperfections. MOVES compared to the Houston port drayage data showed:

- MOVES compares well with the data for MY 1991-2002 for NOx emissions
- MOVES underpredicts NOx emissions for MY 2003-2006, but is within the variability of the data.

Based on the drayage data, MOVES compares well for pre-2003 MY, and no updates for MOVES2013 are proposed. For MYs 2003-2006, MOVES underpredicts compliance data and unweighted drayage data but compares fairly well with weighted population data. Issues to resolve, if updates are to be made for MOVES2013, include the use of population weights and determining which data sources are most representative for the HHD fleet. Based on compliance data, EPA proposes to update MOVES for MY 2007-2009. Depending on timing, updates may be warranted based on analysis of 2011 compliance data. No updates are proposed for MHD or LHD trucks. For next steps, the EPA plans to analyze 2011 compliance data when it becomes

available in December 2012. The EPA also plans to continue analyzing the Houston drayage data.

Discussion

Tom Darlington asked if there were any peer-reviewed or non-peer reviewed reports on the compliance data on tractive power. In response, it was explained that there is a heavy-duty emission rate report that was just posted that has the methodology for the scaled tractive power.

Mridal Gautam commented that it is important to remember that integrating data of separate modes will give a different result than looking at data from continuous operation. The data collection could affect the results and may not be representative of true conditions. Mr. Gautam also noted that there is some new drayage data available for Long Beach, California.

Presentation: Proposed Exhaust Emission Rates for Compressed Natural Gas Transit Buses in MOVES2013 – Ari Kahan, EPA/OTAQ

Buses using compressed natural gas (CNG) are an increasing proportion of the bus fleet, with 14% of the share in mileage in 2010. From 2003 to 2010 the number of CNG buses doubled, and these buses use about 75% of the CNG used in transportation. MOVES2010b uses the gasoline MHD emission rates for total hydrocarbons (THC), CO, NOx, and PM for CNG buses. However, data obtained from a literature search on measured CNG bus emissions compared to those predicted by MOVES2010b shows that MOVES underpredicts CNG bus emissions of methane, THC, NOx and PM, and overpredicts CO emissions. There were no modal data available from the literature search, but some may be available from some authors. The EPA proposes to categorize CNG buses into 3 MY groups: 1994-2001, 2002-2006, and 2007+. For MY 1994-2001 and 2002-2006, the EPA proposes to use the emission rates from the literature and scale the 2002-2006 data for the 2007+ group by ratio to sales-weighted certification data. These changes would result in significant increases in methane and THC and smaller increases in NOx and CO emissions predicted for CNG buses with MOVES2013 over that predicted by MOVES2010b.

Discussion

Matt Barth commented that some local testing was being conducted, and it may be possible to share modal data from that study.

A question was asked about the percentage of methane that was assumed to be from other operations, such as refueling or evaporation. The EPA responded that they did not have breakouts of the data to different operations. Mr. Gautam said that WVU will be starting a study soon to look at these sources of emissions.

Presentation: Heavy-Duty GHG Rule – Don Kopinski, EPA/OTAQ

Of the U.S. total transportation greenhouse gas (GHG) emissions, 35% is from passenger cars, 30% is from light-duty trucks 20% is from medium- and heavy-duty trucks and 15% is from other sources. Of the heavy-duty sector, 39% of GHG is from sleeper cab tractors, 27% is from day cab tractors, 22% is from vocational vehicles and 12% is from pickups and vans. The heavy-duty (HD) GHG rule is a joint EPA/National Highway Traffic Safety Administration program that begins to apply to HD vehicles with model year 2014 and increases in stringency through 2018. The rule breaks the heavy-duty truck sector into three categories: line haul tractors, heavy-duty trucks and vans, and vocational trucks and sets separate standards for engines and vehicles. There are also separate standards for fuel consumption, methane, carbon dioxide, nitrogen oxides, and hydrofluorocarbons. The rule provides incentives for advanced technologies and allows for manufacturer flexibilities, such as averaging, banking and trading. For day cab and sleeper cab tractors, the standards are based on the gross vehicle weight rating (GVWR) and the roof height of the tractor, and the engines for these tractors are regulated separately. For vocational vehicles, the standards apply to the manufacturers of chassis, not bodies, and are based on the GVWR of the total vehicle. These vehicles also have separate engine standards. For heavy-duty pickups and vans, compliance is assessed on a corporate average basis. The rule does not regulate non-GHG pollutants, but the EPA expects reductions in NOx, SO2, VOC, CO and PM to also result from the rule due to anticipated improvements in road load, the use of auxiliary power units and reduced fuel consumption to meet the GHG standards.

Discussion

The workgroup was asked to hold their questions until after the next presentation.

Presentation: Heavy-Duty GHG Rule Implementation in MOVES – Ed Glover, EPA/OTAQ

To address the effects of the Heavy-Duty GHG Rule, the key changes to MOVES include the addition of APUs, the addition of new aerodynamic coefficients and weights, and revised running emission rates for total energy. The revised running emission rates were drawn from the modeling done for the Heavy-Duty GHG rulemaking, which affects gasoline and diesel vehicles, applies to running, start, and extended idle modes, and applies to MY 2014+. The results of these changes are that total energy emissions predicted by the model are generally lower by a few percent. The new aerodynamic coefficients and weights are based on a 1997 paper by SAE, which include revised rolling, rotating, drag, and inertia terms in the basic vehicle-specific power (VSP) calculation. The result of these changes is a small decrease in all pollutants, with the largest effect of a few percent on total energy emissions. For heavy-duty trucks only, APUs were added to MOVES, with 30% penetration assumed for 2010-2014 MY and 100% penetration assumed for MY 2014+. The emissions from these units are consistent with the Heavy-Duty GHG rulemaking and were drawn from the NONROAD model.

Discussion

Roy Mann asked whether APU emissions were treated as on-road or non-road emissions in MOVES. It was explained that MOVES treats these emissions as on-road emissions, but in emissions standards they are non-road emissions.

Tom Darlington asked about the assumptions MOVES makes for truckstop hotelling. Dave Brezinski explained that the off-road hours for long haul trucks are calculated as a percentage of the on-road hours. For MOVES2013, the EPA would like to develop fractions of the off-road time to assign to idling, APUs and truckstop electrification. MOVES does not currently have a default value for truckstop electrification. The EPA will need data to develop appropriate default values for these variables. It was suggested that the company Cascade Sierra Solutions may have data they would be willing to share on this.

Chris Frey asked whether the assumptions for APU fuel use were appropriate. He mentioned that the assumption of 0.2 gallons/hour was low and that the 1 gallon/hour for idle trucks was high, based on studies he has seen. The benefits of APUs could be overstated if the difference between the two is lower than currently assumed. Mr. Frey said he would send EPA the research studies he referred to.

Tom Darlington asked why the ratio of the compliance data is higher than the ratios of the standards. The response was that averaging, banking and trading (ABT) is the most likely reason, as MOVES assumes no ABT is occurring. Mr. Darlington indicated that it seemed important to understand why emissions estimated in MOVES would be higher than the standards, noting that it could be related to deterioration assumptions.

WRAP–Up

John Koupal reminded the Work Group that the next meeting would be November 27, 2012. John asked the participants to provide comments to Becky Battye, with copies sent to John Koupal and William Aikman, on the information presented today by November 12, 2012, so that the comments could be compiled and distributed prior to the next meeting. Mr. Koupal noted that the biggest uncertainty related to the information presented today is in how to use the Houston drayage data in MOVES. The topics for discussion at the next meeting will primarily be about evaporative and non-road emissions. Mr. Koupal also noted that the EPA will be reporting to the FACA on MOVES fuel updates. There will also be work done to update the vehicle miles traveled variable in MOVES by day and by hour. He welcomed comments from Work Group members on these topics.

Gary Dolce noted that the EPA is revising training materials for MOVES2010b, and he hopes they will be posted online in the next month. There is also going to be a 3-day training course coming up in Madison, Wisconsin.

In response to a question from Tom Darlington about what will be presented regarding non-road emissions at the next meeting, John Koupal summarized three work assignments EPA has with different contractors regarding non-road emissions that may have data ready to share at the next meeting. One is with Environ to do a growth activity survey study and to review data of sales and populations for all non-road sectors, which also includes county allocation factors. Another work assignment is with ERG to develop load factors, emission rates and fuel consumption rates from a pilot study of non-road equipment in Kansas City. A third assignment is to integrate the existing non-road application into MOVES.

Attachment - Work Group Meeting Attendance List

Name	Organization	Attendance
John Koupal	EPA/OTAQ	X
Matthew Barth	UC Riverside	Webinar/teleconference
Giedrius Ambrozaitis	Alliance of Automotive Manufacturers	X
Bob Maxwell	Global Automakers	Webinar/teleconference
Tom Darlington	AEM and EMA	Webinar/teleconference
Rich Denbow	AMPO	Webinar/teleconference
Joe Kubsh	MECA	Webinar/teleconference
Karin Landsberg	Alaska DEC	Webinar/teleconference
Chuck Gebhardt	Illinois EPA	Webinar/teleconference
Marc Bennett	Massachusetts DEP	Webinar/teleconference
Mike Sheehan for Steven Flint	New York State DEC	Webinar/teleconference
Mridul Gautam	West Virginia University	Webinar/teleconference
Tim Sexton	Washington State DOT	Webinar/teleconference
Chengfeng Wang	CARB	Webinar/teleconference
Robert Sawyer	University of California - Berkeley	Webinar/teleconference
Chris Frey	North Carolina State University	Webinar/teleconference
Will Ollison for David Lax	API	Webinar/teleconference
Other		
Jeff Long		Webinar/teleconference
Kathy Jaw	CARB	Webinar/teleconference
Mike Claggett		Webinar/teleconference
Roy Mann	CNH Global	Webinar/teleconference
Wesley Risher	Oregon DEQ	Webinar/teleconference
Gary Beyer	Oregon DEQ	Webinar/teleconference
Scott Craford	Isuzu	Webinar/teleconference
Suriya Vallamsunder		Webinar/teleconference
Takahiro Koseki		Webinar/teleconference
EPA Observers and Presenters		
Priscilla Chang	ORISE Intern	X
Jim Warila		X
Ed Glover		X
David Brezinski		X
David Choi		X
William Aikman		X
Gary Dolce		X
Ari Kahan		X
Mike Olechiv		X
Darrel Sonntag		X
Megan Beardsley		X
EPA Contractor Support		
Rebecca Battye	EC/R Incorporated	X
Lesley Stobert	EC/R Incorporated	Teleconference