

**Summary of FACA Modeling Workgroup Meeting
November 6, 2002
Ann Arbor, Michigan**

Attendees

Susan Collet, Toyota
Dilip Patel, California ARB
Tom Darlington, AIR
Bob Maxwell, Consultant (representing AIAM)
Mark Janssen, LADCO
John German, Honda
Michael Reale, DaimlerChrysler
Mary McGarry Barber, Texas CEQ
Chris Kite, Texas CEQ
Karl Pepple, Houston-Galveston Area Council
Martin Boardman, Texas Transportation Institute
Priyanka Painuly, Iowa DNR
Behshad Norowzi, North Carolina DOT
Peter McClintock, Applied Analysis
Rick Barrett, Colorado Department of Health
Jim Sidebottom, Colorado Department of Health
David Lax, API
Alison Pollack, ENVIRON
Chris Frey, NC State University
Kevin Black, FHWA
John Zamurs, New York DOT
Sue Kimbrough, EPA/ORD
Harvey Michaels, EPA/OTAQ
Connie Hart, EPA/OTAQ
Chad Bailey, EPA/OTAQ
Gene Tierney, EPA/OTAQ
John Koupal, EPA/OTAQ

By Conference Phone:

Mike Rodgers, Georgia Tech
Tom Wenzel, Lawrence Berkeley Laboratory

Summary of Meeting Proceedings

The workgroup meeting was held following the MOVES day of EPA's Mobile Source Present and Future Models Workshop. Presentations and a transcript for this day will be posted on <http://www.epa.gov/otaq/models.htm>

An agenda for the meeting is attached. John Koupal of EPA presented the material in three documents, included at the end of this document and summarized below.

The first attachment after the agenda is a summary of documents which EPA plans to distribute via email or post on <http://www.epa.gov/otaq/ngm.htm> before the end of 2002. The two primary reports which will be disseminated for public review are the “Draft Design and Implementation Plan for MOVES”, and the “Draft Emission Analysis Plan for MOVES GHG”. The additional documents to be distributed serve as background for the latter report.

The next attachment is a summary of EPA proposals regarding emission and fuel consumption rates used in MOVES, as discussed during the workshop and documented in the “Draft Emission Analysis Plan for MOVES GHG”.

The final attachment is the “issue list” compiled by EPA in the summer of 2002 to keep track of workgroup comments and how they were being addressed. The issue list includes specific issues raised by the workgroup in earlier meetings (primarily the February and June 2002 meetings), EPA’s initial responses to these issues and an issues status as judged by EPA. The latter category lays out whether a specific issue has been addressed (as determined by the workgroup) or if specific next steps have been identified.

The remainder of the meeting focused on workgroup member comments on the elements presented in these three documents, and other aspects of EPA’s MOVES proposals presented during the workshop. Specific comments from attendees are as follow.

- Tom Darlington suggested that using temperature rise as an operating mode for diurnal emissions might be preferable to using tank pressure, an approach which ARB uses in EMFAC
- Mark Janssen provided input on scope issues related to air quality modeling, to highlight the importance of good computing performance. LADCO performs modeling work with a domain stretching from Mexico to Canada, requires grid specific temperatures and uses a link-based approach in the Lake Michigan region with 250,000 links. This modeling run takes several hours.
- Peter McClintock asked if EPA would reevaluate some of the proposals, i.e. the binning approach, when the time comes to perform data analysis. John Koupal answered that while some issues have been left open for the data analysis, the core proposals would not be revisited.
- Behshad Norowzi asked if tire pressure differences would be accounted for in MOVES. John Koupal answered that in theory they could through manipulation of the rolling resistance term in the VSP equation, but at the default level these differences would not be accounted for.

- John German commented that air conditioning should be considered in the physical model framework, to allow a more complete comparison than what was done in MOBILE6. He also advocated incorporating cold temperature effects for fuel consumption, which could be evaluated by looking at the difference between certification tests at 20 degrees and 75 degrees. EPA agreed to consider this.
- John Zamurs requested guidance on how to understand the uncertainty output of the model, expressing a general concern that decision makers will face difficulty when faced with the additional uncertainty information.

A general discussion also ensued on the issue of how IM240 data should be used in the model, and how the high emitters should be characterized.

Attachments

Agenda

Summary of MOVES Documents

MOVES GHG Proposal Summary

Workgroup Issue List

**FACA Modeling Workgroup Meeting
Ann Arbor, MI
November 6, 2002
4:00 - 6:00 pm**

**Conference Line:
(202) 260-7280, Access Code: 5575#**

Agenda

- 1) MOVES Document Overview (15 minutes)
- 2) Discussion of MOVES GHG Design and Implementation Plan (30 minutes)
- 3) Discussion of MOVES GHG Emission Proposals (1 hour)
- 4) Updating the Issue List (15 minutes)

Summary of MOVES Documents – 11/5/02

Document	FACA Distribution	Web Posting	Review Process
Draft Design and Implementation Plan for EPA’s Multi-Scale Motor Vehicle and Equipment Emission System (MOVES)	10/17	10/17	Submit comments to newgen@epa.gov by December 20 th
Draft Emission Analysis Plan for MOVES GHG	11/30	11/30	Submit comments to newgen@epa.gov by January 31 st
<i>Emission Analysis Plan Background Documents:</i>			As necessary for review of MOVES GHG emission analysis plan
Determination of Important Parameters for CO ₂ and CH ₄ Emission Factor Modeling (ERG)	11/7	11/30	
Shootout Test Program Report (Sensors, Inc)	11/30	11/30	
Shootout Analysis Reports (NC State, Environ, UC Riverside)	-	10/1	
EPA’s On-Board Emission Shootout: Overview and Results	11/1	11/30	
Methodology for Developing Modal Emission Rates for EPA’s Multi-Scale Motor Vehicle & Equipment Emission System (NC State)	11/1	11/30	
Proof of Concept Investigation for the Physical Emission Rate Estimator (PERE) for MOVES (Ed Nam, Ford Motor Company)	11/30 (pending Ford review)	11/30 (pending Ford review)	
Mobile Source Observation Database (MSOD) Database Update (ERG)	11/7	11/30	

Summary of MOVES GHG Emission Proposals – Draft 11/5/02

This table contains preliminary proposals from the forthcoming EPA report “Draft Emission Analysis Plan for MOVES GHG”.

	Proposals
Emission Processes	
<i>Fuel Consumption/CO₂</i>	Running
<i>N₂O</i>	Running, Start
<i>CH₄</i>	Running, Start
Operating Modes	
<i>Fuel Consumption/CO₂</i>	- 14 VSP bins & average speed bins (bins TBD from analysis) - Will evaluate PERE fuel rate equation with VSP bins only
<i>N₂O</i>	None
<i>CH₄</i>	Average speed bins (bins TBD from analysis)
Source Bin Parameters	
<i>Fuel Consumption/CO₂</i>	Weight (bins TBD from analysis), fuel
<i>N₂O</i>	Standard, technology
<i>CH₄</i>	Standard, technology
Method for populating emission rate database	Hybrid approach – apply empirical analysis when adequate data, apply physical model where data is lacking (including future standards/technology)
Physical model calibration	Physical model parameters will be varied to match cumulative emissions and (where second-by-second data is available) minimize variability across VSP bins
Emission Adjustments	- Fuel/CO ₂ only - A/C, Well-To-Pump, I/M
Uncertainty	- Propagation of error - Adjustments would have uncertainty as well
Data	
<i>Second-by-second</i>	- Currently in EPA’s database (MSOD) - Studies identified by ERG for inclusion in MSOD
<i>Bag</i>	- Bag data currently in MSOD
<i>Using Bag Data</i>	Use to calibrate physical model
High Emitter Characterization	Not proposed for MOVES GHG. For full implementation of MOVES would use parametric distributions. Two approaches for this: single distribution, or emitter categories (three options for categories: high/normal categories, malfunction categories, represented/unrepresented categories)

FACA Modeling Workgroup Issue List
November 5, 2002

Reflects “Next Step” issues from July 15, 2002 conference call

“Issue Status” Categorization:

- **Addressed:** EPA has sufficiently addressed issue
- **Next Steps:** EPA and workgroup members agree on next steps to address the issue (list specific steps)
- **Lack of Agreement:** EPA and workgroup members do not agree on issue and/or next steps
- **Lack of Consensus:** Non-EPA workgroup members do not agree on issue and/or next steps

Issue List:

Areas	Specific Issues Raised By Workgroup	EPA Response (July 2002)	Issue Status
Emission Analysis Approach	Shootout results don't provide convincing argument that modal binning is “best” approach; should assess individual pollutant results	<p>Shootout report presents individual pollutant results, with estimated uncertainty bounds.</p> <p>Shootout approaches predicted within uncertainty bounds of validation data for nearly all cases; all approaches could likely be refined to produce a reasonable accurate model</p> <p>Moving ahead with modal binning is determine more by feasibility criteria: it can apply to all scales, can use data from many sources, is easily updated;and can be implemented efficiently</p> <p>Phase 2 analysis incorporates aspects of 3 shootout approaches: VSP Binning, Modal Bins/OLS, Microtrips</p>	<p>Next Steps:</p> <p>Evaluate Phase 2 Analysis Results</p> <p>Explore Physical Model Approach</p>
	Concern with accuracy of aggregating modal results	<p>Shootout approaches demonstrate adequate accuracy of aggregating modal emission rates</p> <p>Phase 2 analysis will further refine the modal approach and test accuracy</p>	<p>Next Steps:</p> <p>Evaluate Phase 2 Analysis Results</p>

Areas	Specific Issues Raised By Workgroup	EPA Response (July 2002)	Issue Status
	<p>What is model acceptability criteria? e.g. Shootout NOx results for modal binning approaches off by 30% - is this good enough?</p>	<p>No validation dataset represents “the truth”; all contain uncertainties.</p> <p>A reasonable criteria for model acceptability is that the uncertainty bounds of model predictions are within the uncertainty bounds of the validation dataset. The shootout NOx results for the modal binning approaches meet this criteria.</p> <p>Motor vehicle emissions are tremendously variable, and there is a great deal of uncertainty in modeling emissions over all conditions. MOVES is taking a big step by attempting to quantify this uncertainty.</p> <p>Model development should focus on reducing model uncertainty through refining model formulation and using large, representative dataset</p>	<p>Next Steps:</p> <p>Evaluate Phase 2 Analysis Results</p>
	<p>Modal binning approach may be incorrect model formulation for HC and NOx at the microscopic level</p>	<p>Our assessment of use cases indicates that MOVES will not need to predict second-by-second emissions, even at microscale level.</p> <p>Modal binning approaches in shootout showed promise for HC and NOx. Phase 2 analysis will assess viability of approach on all pollutants</p> <p>Physical model investigation will provide an alternate method of evaluating this</p>	<p>Next Steps:</p> <p>Evaluate Phase 2 Analysis Results</p>
	<p>How will bag data be used?</p>	<p>NCSU shootout paper presents method for deriving modal emissions from bag data. Phase 2 analysis will investigate this approach further.</p>	<p>Next Steps:</p> <p>Evaluate Phase 2 Analysis Results</p>

Areas	Specific Issues Raised By Workgroup	EPA Response (July 2002)	Issue Status
PEMS Accuracy	Accuracy of on-board measurement not proven in the field	<p>In response to workgroup comments, dyno correlation results were presented at 6/12 MWG meeting. These results showed excellent correlation between on-board and bag data.</p> <p>How would on-road accuracy be proven in the field? Is this a realistic suggestion?</p>	<p>Next Steps:</p> <p>Convene subgroup to address</p>
Model Extrapolation	How will model deal with areas with little or no data, such as future standards?	<p>Methods will likely be similar to MOBILE6; i.e. using past performance relative to the standards and applying this to future standards.</p> <p>An advantage of physical model approach is that it would allow modeling of future vehicles based on projected changes in vehicle technology.</p> <p>Assumptions are unavoidable when modeling the future. Assumptions will be documented and will undergo public review</p>	<p>Next Steps:</p> <p>Elaborate how new analysis method would approach, when further developed</p>