

WA 0-14: Peer Review of “Update of Speciation & Toxic Emissions, and Particulate Matter Emissions from Gasoline LDVs”

Peer Review Charge

1. Purpose

Over 125 million Americans experience unhealthy levels of air pollution. Motor vehicle exhaust is a particularly important source of exposure to air pollutants, with more than 50 million people living, working, or going to school in close proximity to high-traffic roadways. The U.S. Environmental Protection Agency’s (EPA) Office of Transportation and Air Quality (OTAQ) is tasked with identifying policy options to reduce ozone, particulate matter (PM), and nitrogen dioxide emissions, among other pollutants, from light-duty vehicles (LDVs) in the U.S. As new policy options are brought forth, there is a need to evaluate their soundness and utility.

Models can be used to help address questions that may be too large to study directly but may yield to approximations from smaller sets of real data. These models can provide insights into how drivers will change their vehicle operating patterns in response to, for example, a required increase in fuel economy across the LDV fleet. Tools, like EPA’s MOtor Vehicle Emission Simulator (MOVES), describe the result of various inquiries into the nature of fuel and vehicle emission interactions. Specifically, the MOVES model estimates the impact of LDV, heavy-duty vehicle, and nonroad equipment exhaust and/or evaporative emissions on air quality in the U.S.

EPA is updating the MOVES model to include information from four documents referred to collectively as, “Update of Speciation & Toxic Emissions, and Particulate Matter Emissions from Gasoline LDVs,” and thereby refine the model’s ability to estimate accurately the emissions impacts of motor vehicles. The four documents describe proposed updates to MOVES data and methods.

ICF, which is under contract with OTAQ to facilitate a peer review of the aforementioned documents, has selected you as a reviewer. This charge letter provides you with a detailed scope of services for this review. It includes:

- A description of the materials for review;
- A list of general questions for your review, with instructions;
- The review schedule;
- Drafts of the four documents for review; and
- A list of materials, including a Conflict of Interest (COI) form, to be submitted to ICF at the conclusion of the review.

2. Description of Peer Review Materials

EPA is seeking your review of and comments on the following four documents:

1. **Speciation of Total Organic Gas and Particulate Matter Emissions from Onroad Vehicles in MOVES201X**
 - Chapter 3 (Organic Gas Aggregations);
 - Chapter 4 (Chemical Mechanism (CM) Speciation) (Pages 21 and 24); and
 - Section 5.1 (PM_{2.5} Speciation Calculations) - Step 8 (Page 33).
2. **Air Toxic Emissions from Onroad Vehicles in MOVES201X¹**

¹ Please ignore any inaccuracies in the document’s Table of Contents; these will be corrected later.

- Updates made for 2007+ diesel engine emission rates within the following sections:
 - Section 3.1.2 (Volatile Organic Compounds);
 - Section 3.2.2 (Polycyclic Aromatic Hydrocarbons); and
 - Section 3.3 (Metals).
- 3. Exhaust Emission Rates for Light-Duty On-road Vehicles in MOVES201X**
 - Section 1.4 (Exhaust Emissions for Start Operation); and
 - Section 2.2 (Particulate-Matter Emission Rates for Model Year 2004 and Later Vehicles).
- 4. Emission Adjustments for Temperature, Humidity, Air Conditioning, and Inspection and Maintenance for On-road Vehicles in MOVES201X**
 - Section 2.3.2 (PM Running-Exhaust Temperature Effects).

Specifically, within the first report, *Speciation of Total Organic Gas and Particulate Matter Emissions from Onroad Vehicles in MOVES201X*, EPA has updated the data and methods in Chapter 3, and requests a full review of that chapter. The methods and data in Chapters 4 and 5 are unchanged from MOVES2014, and were peer-reviewed for MOVES2014, with two exceptions. In Chapter 4, EPA has incorporated a new profile (profile ID 95335) used to speciate 2010+ diesel exhaust on page 21. EPA has also incorporated a new chemical mechanism, SAPRC07T, which is mentioned on page 24. In Section 5.1, Step 8, EPA has added on page 33 the rationale for not incorporating the ACES Phase 2 PM speciation profile into MOVES201X, however, the methods and PM speciation profiles described in the rest of Chapter 5 have not changed from MOVES2014. In addition to Chapter 3, EPA requests your review of the updates it has made (pp. 21 and 24), and its rationale for not updating the PM speciation profiles for MOVES201X (p. 33).

Within the second report, *Air Toxic Emissions from Onroad Vehicles in MOVES201X*, EPA has updated the toxic emission factors within three sections (3.1.2 (2007+ Diesel Engines), 3.2.2 (2007+ Diesel Engines), and 3.3 (Metals)) to incorporate emissions data collected from the ACES Phase 2 Emission test program. No data updates were made to other sections of the report. (Please note that in the MOVES2014a November 2016 Patch, the dioxin emission rates were updated to be reported in units of grams, rather than toxicity equivalency factors. The current version of the report reflects this particular update.)

Within the third report, *Exhaust Emission Rates for Light-Duty On-road Vehicles in MOVES201X*, you are only charged with reviewing Section 1.4 (pp. 91-122) and Section 2.2 (pp. 173-93), which includes updated analysis and new test data for estimating light-duty vehicle emission rates.

Finally, within the fourth report, *Emission Adjustments for Temperature, Humidity, Air Conditioning, and Inspection and Maintenance for On-road Vehicles in MOVES201X*, you are charged with reviewing Section 2.3.2 (pp. 23-25). EPA has updated the temperature adjustments for PM emission rates from gasoline-fueled vehicles. This short section has been included in this peer review because it is pertinent to the updates EPA made to the light-duty gasoline PM emission rates.

3. Charge Questions

EPA is seeking your review of and comments on selected methods and underlying assumptions, their consistency with the current science as you understand it, and the clarity and completeness of the presentation. For this review, no independent data analysis is required. Rather, EPA asks that you assess whether the information provided is representative of the

state of current understanding, and whether incorporating the information into the MOVES model will result in appropriate predictions and conclusions.

Although the peer review charge is limited to the chapter/sections specified above, we have provided you with the full draft reports for context. Comments made on the other chapters in the draft reports are outside the scope of the peer review, and any comments made outside of the charge will be addressed at EPA's discretion. The draft reports reference other MOVES201X draft reports. We will provide these to you at your request, but we do not anticipate they will be needed for this work.

EPA has provided the following charge questions to define the scope of your review. EPA does not expect individual responses to these questions, but would like the questions to help guide your comments. Please note that you are welcome to identify additional topics or depart from the questions as necessary to best apply your particular area(s) of expertise. You may also include any additional comments that are not specific to the charge questions using the table provided. Your written comments should address, sequentially, all sections of the material that you are charged with reviewing. Comments on organization, formatting, and other minor issues are welcome, but should be provided separately.

In your written comments, you should distinguish between recommendations for clearly defined improvements that can be readily made based on data or literature reasonably available to EPA, and improvements that are more exploratory or dependent on information not readily available to EPA. Your comments should be sufficiently clear and detailed to allow readers to understand thoroughly their relevance to the subject report.

EPA requests that you treat all materials as confidential. Do not release or discuss with others the peer review materials or your comments. Your comments will be listed as an appendix to EPA's final published report, along with EPA's responses to them.

If you are unclear about what is required to complete this review or need additional background material, please contact Ira Dassa at ICF by telephone (443-573-0551) or email (Ira.Dassa@icf.com).

Charge Questions

1. Does the presentation describe the selected data sources sufficiently to allow the reader to form a general view of the quantity, quality, and representativeness of data used in the analysis? Are you able to recommend alternate data sources that might better allow the model to estimate national or regional default values?
2. Is the description of analytic methods and procedures clear and detailed enough to allow the reader to develop an adequate understanding of the steps taken and assumptions made by EPA while developing the model inputs? Are examples selected for tables and figures well-chosen and effective in improving the reader's understanding of approaches and methods?
3. Are the methods and procedures employed technically appropriate and reasonable, with respect to the relevant disciplines, including physics, chemistry, engineering, mathematics, and statistics? Are you able to suggest or recommend alternate approaches that might better achieve the goal of developing accurate and representative model inputs? In making recommendations, please distinguish between instances involving reasonable disagreement in adoption of methods as opposed to instances where you conclude that current methods involve specific technical errors.

4. Where EPA has concluded that applicable data is meager or unavailable, and consequently has made assumptions to frame approaches and arrive at solutions, do you agree that the assumptions are appropriate and reasonable? If not, and you are able to do so, please suggest alternative assumptions that might lead to more reasonable or accurate model inputs.
5. Are the resulting model inputs appropriate and, to the best of your knowledge and experience, reasonably consistent with physical and chemical processes involved in mobile source emissions, formation, and control? Are the resulting model inputs empirically consistent with the body of data and literature with which you are familiar?

ADDITIONAL OVERALL COMMENTS PROVIDED (NOT CHARGE QUESTION-SPECIFIC):
ADDITIONAL COMMENTS BY SPECIFIC REPORT CHAPTER:

4. Schedule

The schedule for this peer review is as follows:

- September 5, 2017 (tentative): Conference call with EPA, ICF, and all reviewers to address any preliminary questions.
- September 25, 2017: Comments/review due to ICF via email (send to Ira.Dassa@icf.com, with a cc to Lindsay.Kirschner@icf.com).

ICF will arrange the teleconference between the reviewers, relevant EPA staff, and ICF. The purpose of this teleconference will be to answer any questions you and the other reviewer may have regarding the EPA peer review process and the particular material you are reviewing. ICF will contact you in advance to assess the best time for you and the other reviewer to participate in the conference call.

Any questions that you have after this teleconference should be directed to ICF, which will then seek resolution from EPA. Any answer provided and the question to which it refers will be shared with the other reviewer.

5. Materials to Submit

Upon completion of your review, please submit the following to ICF:

1. A cover letter that states:
 - Your name; and

- The name and address of your organization.
- 2. A completed COI form (attached).
- 3. Your written comments.

6. Material for Review

The following files are appended for your review:

- *Peer-review - Speciation of Total Organic Gas and Particulate Matter Emi....docx*
- *Peer-review - Air Toxic Emissions from Onroad Vehicles in MOVES201X.docx*
- *Peer-review - Exhaust Emission Rates for Light-Duty Onroad Vehicles in MOVES201X.docx*
- *Peer-review - Emission Adjustments for MOVES201X.docx*

Additional attachment:

- *COI Form* (please complete this and submit it with your review)

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Peer Review Charge Addendum

Specific Charge Question

1. As discussed in the *Speciation* and *Air Toxic Emissions* reports, EPA developed a TOG speciation profile from ACES Phase II, using the data collected on the 16-hour transient cycle, and an average of the data collected from the three tested engines. The TOG speciation profile from ACES Phase II has a 0 methane, as opposed to 58% methane in the ACES Phase I profile used to represent 2007-2009 heavy-duty trucks. Other anomalies were also noted in the speciation profile. For example, benzene was not detected (ND) (from which we then assumed benzene=0), while ethanol comprises over 3% of the TOG emissions, due to one of the 3 engines in ACES Phase II reporting over 8% ethanol in the VOC emissions.

We are proposing to use the ACES Phase II profile as the source of toxics and for developing a speciation profile for developing chemical mechanism species for air quality modeling. Do you have any recommendations regarding the use of the ACES Phase II TOG Profile in MOVES? Do you think it should be corrected/updated based on engineering judgment or test data collected from other 2010+ diesel engines? How should we consider correcting the profile data to accurately represent 2010+ diesel exhaust?

For your reference, we have attached the speciation profile (*speciate_95355_2011_diesel_TOG.xlsx*) obtained from the EPA SPECIATE database (<https://cfpub.epa.gov/speciate/>), an OTAQ spreadsheet (*HD 2010+ Toxics Speciation Factors_rev.xlsx*) used to derive toxic fractions for MOVES from the ACES Phase II data, and detailed data reported from the ACES Phase II study, obtained from the CRC webpage (*Detailed Chemistry-FTP-Site.xlsx*).

Additional attachments:

- *speciate_95355_2011_diesel_TOG.xlsx*
- *HD 2010+ Toxics Speciation Factors_rev.xlsx*
- *Detailed Chemistry-FTP-Site.xlsx*