SmartWay Transport Partnership Truck Tool Peer Review
Response to Comments and Final Report

EPA SmartWay is in the process of enhancing its assessment and tracking tools for SmartWay partners to calculate annual fuel usage and emissions. Tools are being developed for trucking carriers and shippers to use to calculate the emissions of their shipping operations overall. In the future, EPA could develop carrier tools for other modes.

These enhanced tools will replace the Freight Logistics Emissions and Efficiency Tool (FLEET) that carrier partners have used since SmartWay's inception. The FLEET tools provided an index of the partners' operating efficiencies based upon adopting technical and behavioral measures to save fuel and improve efficiency. As with the FLEET tool, the enhanced tool will assist carriers in understanding environmental and fuel consumption performance. Unlike the FLEET tool, which assigned carriers a non-dimensional rating of relative performance, the enhanced tools enable carriers to express performance as an emission metric rather than an indexed factor. These new tools address the evolving needs of SmartWay partners for environmental and carbon accounting. This includes the needs of carriers to respond to multiple shipper customer requests for carbon accounting, and the need for shipper partners to do such accounting across their entire supply chains. The enhanced tools will allow shippers and carriers to use a single, consistent, integrated assessment and tracking reporting approach.

The peer review process helps EPA ensure that the Agency's scientific and technical products are of the highest quality. SmartWay is submitting the enhanced tools to panels of independent experts on supply chain management and on operations. This peer review is part of a broader process in developing the tools, which included informal discussions with stakeholders, and beta testing.

The Truck Carrier Tool was the first of the tools submitted for peer review. This report summarizes the results of that review and EPA's response to the reviewers' comments. The SmartWay 2.0 Truck Carrier Tool was sent out for peer review on October 15, 2010, to the following individuals:

- H. Donald Ratliff, Georgia Technical University,
- Jason Mathers, Environmental Defense Fund (EDF)
- Paul Dittmann, The University of Tennessee
- Rolf Schmitt, Federal Highway Administration (FHWA)
- Therese Langer, American Council for an Energy-Efficient Economy (ACEEE)
- Cristiano Facanha, The International Council on Clean Transportation (ICCT)
- Dan Murray, American Transportation Research Institute (ATRI)
- John Koupal, EPA

Reviewers were invited to comment on all aspects of the model, but in particular, their charge asked them to address the following specific questions:

- Does the tool collect sufficient data to develop robust CO_2, PM, and NO_x emission inventories for SmartWay truck carriers? Does the tool provide sufficient outputs to help SmartWay truck carriers track their emissions performance over time? Are there other data, or ways of organizing the data, you believe would help carriers better manage their fuel economy, GHG, or air quality performance?
- Are the default activity data assumptions reasonable (e.g. average payload by truck class, average cube utilization by truck)?
- Are the default emissions factors reasonable (i.e., g/gallon, g/bhp-hr, etc.)?
- Is it clear exactly what is required for each field? Are there any additional definitions we could add or clarifications we could make to improve user-friendliness?
- Are the underlying equations in the tools reasonable?
- Are the data validation ranges and logic checks described in the Technical Documentation reasonable? Do you have any other suggestions on ways to flag potential errors in data inputs/outputs?
- Are the lists of data sources in the look-up tables sufficiently comprehensive? Are there other sources that are more robust?
- Are the descriptions of data sources well characterized? Please offer any suggestions for additional data sources that carriers might use, along with your suggested ranking of the data sources in terms of the quality of the data.
- The primary outputs of these tools are estimates of the carriers' efficiencies stated in grams per mile, grams per ton-mile, grams per volume-mile, and grams per utilized volume-mile, recognizing that different metrics are appropriate for different operating modes and types of cargo. Please comment on the quality of available data and the best ways to obtain the best available data for each of these metrics. In particular, do you have recommendations or suggestions on how verifiable tonnage and cubic payload and cube utilization data might be obtained?
- Currently, the tool doesn't have default assumptions regarding percent cube utilization. Can you suggest data sources we could use to develop distributions and ranges similar to those the tool offers for payload?
- Assuming sufficient robustness of data, please comment on the best overall metric to evaluate the emissions performance of truck carriers (e.g., gram-per-mile vs. gram-per-ton-mile). Please also comment on whether different metrics would be more appropriate to evaluate the emissions performance of trucking fleets with different truck technologies and operating modes (e.g., Truckload (TL), Less-than-truckload (LTL), Dry Van Reefer, Flatbed, etc.).
- Consider whether outputs from this carrier model can assist companies - including SmartWay shippers that use the services of SmartWay freight providers - in determining their carbon and/or emissions footprint for use in complementary carbon and emissions accounting protocols such as the Greenhouse Gas Protocol developed by the World Resources Institute and the World Business Council for Sustainable Development. Do you have recommendations for metrics or data organization that might facilitate in this use of the data for our partners?
- Does the technical manual effectively communicate the assumptions and background calculations underlying the tool?
- Is the User Guide appropriate and useful for helping truck carriers complete the tool and

understand the outputs?
- Is the graphical user interface clear? How could it be improved?
- What additional features would be useful to include in the tool?
- Please evaluate the tool itself for usability. Please suggest any modifications that could make it more accessible to different types of trucking companies (e.g., independent owner-operators).

Summary of Comments and Responses

Overall comments on the tool were positive. A reviewer said, "Overall, it's a great tool. The flow is user friendly, the data requirements seem very reasonable and the metrics in the summary are spot on." Another stated, "The tool appears to be one of the most, if not the most, detailed models available for tracking over-the-road fleet emissions." Another said, "You guys have done a fantastic job. I was very familiar with the old FLEET model, and this version is very organized and user-friendly." Another said, "The spreadsheet tool is generally clear on what needs to be entered and appears to be fairly comprehensive from both the spreadsheet and supporting documentation." And another said, "The basic concept of the tool, namely to permit fleets to estimate and compare actual emissions over time, is sound and represents a major step forward."

The following is a summary of responses to the charge questions, focusing on those responses that posed questions or suggested areas for further development.

- *Does the tool collect sufficient data to develop robust CO_2, PM, and NO_x emission inventories for SmartWay truck carriers? Does the tool provide sufficient outputs to help SmartWay truck carriers track their emissions performance over time? Are there other data, or ways of organizing the data, you believe would help carriers better manage their fuel economy, GHG, or air quality performance?*

Comment: Linkages to other entity-specific quantification tools (like the GHG Protocol) are desirable in the future.

EPA Response: EPA is open to considering whether and how best to coordinate with other carbon tools such as the GHG Protocol. Within the scope of the activities it covers, SmartWay is widely seen as the best truck freight carbon calculator tool currently available.

Comment: Not all carriers capture the required data; hopefully SmartWay will encourage them to.

EPA Response: Based on our work with stakeholders we believe the data required to fill out the tool are reasonably available to carriers. As more carriers join SmartWay, this could encourage the rest of the industry to improve the robustness of its data.

Comment: There is no operational category for dedicated fleet multi stop trucks like Coke and Pepsi.

EPA Response: In this version of the tool, SmartWay attempted to capture the most widely used operational and equipment types. Beverage stop-and-go carriers can be considered a subset of less-than-truckload carriers. In the future, EPA, with input from its stakeholders, can consider further refinements to the tool's operational categories and equipment types.

Comment: CNG and LNG vehicle emissions may not be identical due to leakage from LNG vehicles based on anecdotal evidence. GHG impacts of leaking HFCs are not captured and could be significant.

EPA Response: Our current assumptions are based on the best data presently available. As data become available to characterize this phenomenon they can be incorporated into the tool.

Comment: One reviewer asked whether the tool had been validated under laboratory controlled conditions, and whether a rigorous experimental design analysis had been done to determine which variables most influence emissions. This reviewer also asked if two urban drive cycles provide enough granularities.

EPA Response: Emission factors in the tool are based on EPA's MOVES model, utilizing the vehicle class and model year as primary determinants of emission rates for NOx and PM. These emission rates, in turn, are based upon EPA emissions testing.

- *Are the default activity data assumptions reasonable (e.g. average payload by truck class, average cube utilization by truck)?*

All reviewers thought the assumptions are reasonable. One reviewer noted the use of averages and assumptions used in some data inputs, but stated also that this is probably the best approach possible today, given the available data.

- *Are the default emissions factors reasonable (i.e., g/gallon, g/bhp-h, etc.)?*

Most reviewers thought these factors are reasonable.

Comment: A reviewer questioned whether PM and NOx are overestimated.

EPA Response: Coordination with the ASD MOVES team confirmed the emission estimates are accurate.

Comment: A reviewer questioned whether the idle emission factors should be further refined, e.g., to capture model year and accessory load.

EPA Response: The idle emission factors in the tool are based on the best data and assumptions currently in MOVES, which do capture model year. The research by Khan et. al. (cited in the comment) is recent and of interest, and EPA is interested in studying its implications for further refinements of this tool in the future.

- *Is it clear exactly what is required for each field? Are there any additional definitions we could add or clarifications we could make to improve user-friendliness?*

Requirements were clear. Two reviewers reported initial difficulty understanding how to use the tool. EPA is revising its user guide and technical support document to improve useability.

- *Are the underlying equations in the tools reasonable?*

Most reviewers thought the equations appeared reasonable.

Comments: A reviewer stated that the PERE model has problems with an excessive amount of assumptions and non real world data and questioned the application of the factor of 1.2 to mpg.

EPA Response: We recognize the limitations of the PERE Model. The Technical document states that "The values developed using the PERE model should be considered preliminary estimates. Upper bound efficiency estimates should be revised based on improved engine modeling tools currently under development by the EPA in support of the upcoming heavy-duty vehicle Notice of Proposed Rule Making." The factor of 1.2 is added to allow for the uncertainty. EPA plans to refine its tools in the future, as new Agency data becomes available.

Comments: A reviewer requested clarifications: "In the first equation on p.17, it looks like either F-B should be replaced by F, or F should be defined as total fuel. In the second equation, for what collection of trucks are NOx emissions being calculated (e.g. all, Class C, Class C and year Y)? The factor T_{CY}/T_T suggests a weighted sum over all classes and years, but there's no summation. The second term suggests that E_{NOx} is the total for all Class C trucks. Please clarify." They also stated that more description of MOVES drive cycles in the Technical Document would be appropriate, and they questioned two speed assumptions in the urban drive cycles, specifically, "15-mph average for low-speed urban operation is too high, considering that the average transit bus speed in the USA is approximately 13.7 mph and most of the bus cycles developed from city transit operations point to less than 10-mph average speed. (See e.g. CARB heavy-duty truck cycle, in particular the creep segment.) Lower speeds would be more representative of pickup and delivery vans, which mostly operate in urban areas with congested traffic. Also, an average speed in excess of 30 mph for the bus cycle representing arterial operation also seems too high, considering the majority of the transit bus cycles have average speed less than 20-mph."

EPA Response: We will add the requested clarifications to the Technical Document. Average urban speeds are based on truck operation, not the bus operation the reviewer cited.

Comments: A reviewer asked if the effects of terrain and driver training were taken into account.

EPA Response: MOVES, and therefore the tool also, do not currently take these factors into account. However, these factors are an inherent part of a truck carrier's fuel consumption, and thus are included in the fuel consumption data provided by partners.

- *Are the data validation ranges and logic checks described in the Technical Documentation reasonable? Do you have any other suggestions on ways to flag potential errors in data inputs/outputs?*

Ranges were found to be reasonable and good. A reviewer questioned what occurs if input is outside the range but is actually true. In that case, the user may input the value but must also describe in a pop-up text box the reason why data is outside the expected range.

- *Are the lists of data sources in the look-up tables sufficiently comprehensive? Are there other sources that are more robust?*

All reviewers thought the lists were good and had no further suggestions.

- *Are the descriptions of data sources well characterized? Please offer any suggestions for additional data sources that carriers might use, along with your suggested ranking of the data sources in terms of the quality of the data.*

Comment: A reviewer suggested adding inputs to account for use of CARB and TxLED diesels, verified retrofits for PM and NOx and fuel purchased in states with biofuels mandates or incentives.

EPA Response: Users already input the amount of bio-fuel use. Purchases in states with mandates or incentives would presumably result in greater biofuels use than would occur otherwise, but this is already reflected in the tool's inputs. EPA does not yet have emission factors for CARB or TxLED diesels. We could potentially include them in future releases of the tool as they become available. The tool does already provide inputs for NOx and PM retrofit devices. EPA will seek more information from ATRI on the nature of this comment.

Comment: A reviewer recommended that average payload calculations using VIUS be updated by comparison with 2002 weigh –in-motion (WIM) data, and between 2002 WIM and the most recent WIM. They also stated that the use of truck silhouettes may lead users to make errors, that Census has stopped using silhouettes in the VIUS for this reason.

EPA Response: We thank the commenter for the suggestion on updating payload calculations and will pursue it, resources permitting. SmartWay partners have found the silhouettes very helpful. We will re-evaluate the use of silhouettes in consultation with our SmartWay partners.

- *The primary outputs of these tools are estimates of the carriers' efficiencies stated in grams per mile, grams per ton-mile, grams per volume-mile, and grams per utilized volume-mile, recognizing that different metrics are appropriate for different operating modes and types of cargo. Please comment on the quality of available data and the best ways to obtain the best available data for each of these metrics. In particular, do you have recommendations or suggestions on how verifiable tonnage and cubic payload and cube utilization data might be obtained?*

Comment: A reviewer stated that trailer width and height dimensions may be slightly

understated in the tool.

EPA Response: We will consider incorporating information that reflects evolving changes to truck equipment into future releases of the tool.

Comment: A reviewer said that cube utilization could be estimated by multiplying commodity payload from VIUS by average shipment density.

EPA Response: Current cube utilization estimates are provided by partners and incorporate weigh-out and cube-out scenarios. It would add greatly to the complexity of the tool to track type of commodity shipped by truck and VMT. However, EPA will continue to revisit appropriate metrics in future modifications to the tool.

Comment: One reviewer thought reported cube utilization may be understated. Another suggested that partners be subject to mandatory rigorous auditing.

EPA Response: EPA is aware that truck carriers have historically collected data using their own individual systems and approaches. This could lead to some diversity in how information is reported. The enhanced tools require carriers to specify sources used for key data inputs; this enhancement will lead to greater uniformity of the data, and can also highlight the need for a carrier to improve its data management system. In this way, the new tools can help industry to better understand the importance of robust data management, and encourage best practices in data collection and management. Additionally, EPA is exploring a number of options that could accelerate data improvements in the industry, including an auditing program. EPA is currently not proposing an audit requirement for SmartWay, but is receptive to any suggested designs.

- *Currently, the tool doesn't have default assumptions regarding percent cube utilization. Can you suggest data sources we could use to develop distributions and ranges similar to those the tool offers for payload?*

Comment: A reviewer suggested that Page 74 of the proposed federal greenhouse gas regulation for medium and heavy duty vehicles mentions an analysis by MJ Bradley that might be useful.

EPA Response: After the proposed regulation is finalized, likely later this year, EPA SmartWay can explore incorporating updated data from the regulation into future refinements of the tool.

- *Assuming sufficient robustness of data, please comment on the best overall metric to evaluate the emissions performance of truck carriers (e.g., gram-per-mile vs. gram-per-ton-mile). Please also comment on whether different metrics would be more appropriate to evaluate the emissions performance of trucking fleets with different truck technologies and operating modes (e.g., Truckload (TL), Less-than-truckload (LTL), Dry Van Reefer, Flatbed, etc.).*

Comment: One reviewer thought grams per ton mile to be the best metric for all modes other than LTL. No other reviewer took a position.

EPA Response: In general, we would like to use the gram per ton-mile metric wherever possible. We are continuing to explore this and other metrics with our stakeholders.

- *Consider whether outputs from this carrier model can assist companies - including SmartWay shippers that use the services of SmartWay freight providers - in determining their carbon and/or emissions footprint for use in complementary carbon and emissions accounting protocols such as the Greenhouse Gas Protocol developed by the World Resources Institute and the World Business Council for Sustainable Development. Do you have recommendations for metrics or data organization that might facilitate in this use of the data for our partners?*

Comment: One reviewer recommended that CO2 outputs be in metric tons to be consistent with the GHG Protocol. Another noted the lack of methane and NO2 outputs. Otherwise the reviewers stated that the tool is well suited to this purpose.

EPA Response: We hope to add outputs for other greenhouse gases, such as methane and N2O in future releases, and are considering refinements to future versions of the tool that would state results in metric tons.

- *Does the technical manual effectively communicate the assumptions and background calculations underlying the tool?*

Two reviewers found it difficult to read, but all thought it was effective.

EPA Response: We are revising both the technical documentation and user's guide to be more user-friendly.

- *Is the User Guide appropriate and useful for helping truck carriers complete the tool and understand the outputs?*

All thought the User Guide was well done. One suggested a web link to it, and another suggested a shorter quick start version.

EPA Response: When the documents and tools are finalized, they will be posted to the web site. We appreciate the "quick start" version idea and will consider how this could be implemented.

- *Is the graphical user interface clear? How could it be improved?*

All thought the user interface was easy to use. One stated that a data privacy statement should be added to the Partnership Agreement page. A few minor tweaks were suggested.

- *What additional features would be useful to include in the tool?*

One reviewer stated that all GHGs should be estimated. Another suggested adding "what if" capability so that users could model hypothetical scenarios.

- *Please evaluate the tool itself for usability. Please suggest any modifications that could make it more accessible to different types of trucking companies (e.g., independent owner-operators).*

All reviewers gave the tool high marks for usability.

Summary

EPA appreciated the comprehensive evaluation of the carrier tool by peer reviewers. As noted, EPA intends that the SmartWay partner calculator tools be updated periodically to reflect the most up-to-date data, methodologies, and assumptions. The peer review panel has provided a number of suggestions that we will work to incorporate into future releases. We note with pleasure that no reviewer noted major deficiencies in the tool and that all felt it is ready for use as is.