EMFAC2011

Overview

California Environmental Protection Agency

Air Resources Board

September 19, 2011

(Updated January 2013)

<u>Summary</u>

EMFAC2011 represents the next step in the ongoing improvement of the EMFAC series of emissions estimation models. The EMFAC2011 release is needed to support the Air Resources Board's (ARB) regulatory and air quality planning efforts and to meet the Federal Highway Administration's transportation planning requirements. EMFAC2011 includes the latest data on California's car and truck fleets and travel activity. The model also reflects the emissions benefits of ARB's recent rulemakings including on-road diesel fleet rules, Pavley Clean Car Standards, and the Low Carbon Fuel standard.

In order to incorporate the new detailed data and methods to estimate emissions from diesel trucks and buses and future improvements, staff used a modular emissions modeling approach for EMFAC2011 that departs from past EMFAC versions. The first module, named EMFAC-LDV, estimates passenger vehicles emissions. A second module, called EMFAC-HD, estimates emissions from diesel trucks and buses. A third module integrates the output of EMFAC-LDV and EMFAC-HD and provides users with the ability to conduct scenario assessments for air quality and transportation planning. The third module is called EMFAC-SG. Together the three modules comprise EMFAC2011.

The sections below describe and summarize the major updates to this version of the model. The reader is directed to the Technical Support Document for a complete discussion of all the updates, revisions, and additions to EMFAC2011, and to new ARB on-line data tools. Most importantly, the on-line tools are designed to cover most data needs for both summarized and detailed emissions and emission rates. The vast majority of EMFAC users will no longer have to download, learn, and run the model to get the data they need. Much simple data queries across the internet will suffice.

In early 2013 EMFAC2011 was re-released to highlight new web-database tools that provided improved capabilities for project level assessment. In addition EMFAC2011-LDV and EMFAC2011-SG were updated to correct the number of starts in Santa Clara County for several small categories of gasoline vehicle classes which led to an overestimate of emissions in Santa Clara County. No other counties were affected, and no model algorithms were changed in the update.

New Data

The most important improvement in EMFAC2011 is the integration of the new data and methods to estimate emissions from diesel trucks and buses. EMFAC2011 uses the same diesel truck and bus vehicle populations, miles traveled and other emissions-related factors developed for the Truck and Bus Rule approved by the Air Resources Board in 2010. EMFAC2011 still provides the same traditional emissions rate detail for these vehicles that user are familiar with in previous EMFAC versions. The model includes the emissions benefits of the truck and bus rule and the previously adopted rules for other on-road diesel equipment. Finally, the impacts of the recession on emissions that were quantified as part of the truck and bus rulemaking are included.

Light-duty motor vehicle fleet age, vehicle type, and vehicle population in EMFAC2011 is based on 2009 California Department of Motor Vehicles data. These data along with the new diesel truck and bus data, satisfies guidance issued by the U.S. Department of Transportation, Federal Highway Administration that requires that vehicle fleet data used in transportation conformity analyses be no older than 5 years.

As in previous releases of EMFAC, travel activity data (which includes vehicle miles traveled, trips, and distributions of vehicle miles traveled by speed and time period) are provided by metropolitan planning organizations (MPOs) that conduct travel demand modeling for the transportation planning process. For EMFAC2011, updated travel activity data was provided by the Southern California Association of Governments (SCAG) for the greater Los Angeles region, by the San Diego Association of Governments (SANDAG) for San Diego County, by the eight San Joaquin Valley MPOs, by the Metropolitan Transportation Commission (MTC) for the Bay Area, and by the Sacramento Area Council of Governments (SACOG) for the greater Sacramento region.

New Modular Model Structure

The new EMFAC2011 comprises a suite of three modules that estimates emissions from diesel trucks, buses, and gasoline powered vehicles. Staff has moved to a modular model structure to accommodate more detailed information about the truck and bus fleet than has been in prior EMFAC versions. The modular structure will also more easily accommodate future model enhancements that are necessary to support on-going program development associated with criteria and greenhouse gas emissions.

The first module, named EMFAC-LDV, is used as the basis for estimating emissions from gasoline powered on-road vehicles, diesel vehicles below 14,000 pounds gross vehicle weight rating, and urban transit buses. The algorithms used in EMFAC-LDV for passenger cars are the same as used in EMFAC2007

The second module, called EMFAC-HD, is the basis for emissions estimates for diesel trucks and buses with a gross vehicle weight rating greater than 14,000 pounds operating in California. This model is based upon the Statewide Truck and Bus Rule emissions inventory that was developed between 2007 and 2010 and approved by the Air Resources Board in December 2010. The truck and bus population and vehicle miles traveled estimates in EMFAC2011-HD are identical to those presented to the Board. Emission factors in the Statewide Truck and Bus Rule inventory were based on statewide, annual average emission factors and adjusted for improvements to fuel economy, medium-heavy duty truck emission factors, and other new information. EMFAC-HD emissions estimates include all of the improvements made as part of the Statewide Truck and Bus Rule inventory and then add the traditional detailed EMFAC methods that provide emission rates for annual, summer, and winter seasons on a regional basis.

Finally, EMFAC2011 contains a new simplified tool, called EMFAC-SG, that provides air quality planners, transportation planners, and other EMFAC users a tool for assessing emissions under different future growth scenarios. This includes conformity analyses of transportation plans and programs with the State Implementation Plans required by federal law, State Implementation Plan inventories, alternative growth scenarios associated with regional transportation planning for greenhouse gas reductions (SB375), and the like.

EMFAC-SG takes the output from EMFAC-LDV and EMFAC-HD and applies scaling factors to estimate emissions consistent with user-defined vehicle miles of travel (VMT) and speeds. The EMFAC-SG module also estimates the benefits of Pavley and Low Carbon Fuel Standard regulations.

EMFAC2011's enhanced modular structure and computation requirements can make running the model more resource-intensive than the previous EMFAC release. Therefore, ARB is enhancing data availability by providing a new database through the ARB mobile source emissions inventory web site that provides regional population, activity, emissions, and emission rates at varying levels of detail. Most current EMFAC users will find the new database sufficient for obtaining emissions data to support California Environmental Quality Act (CEQA) assessments and other types of analyses for which the EMFAC model is currently used and will not need to run the model. In July 2012 these tools were updated based on user comments provided to our web site. The model executable files will also remain publicly available on our website. Figure 1 provides a schematic that describes how the modules fit together.

Figure 1: EMFAC2011 Schematic
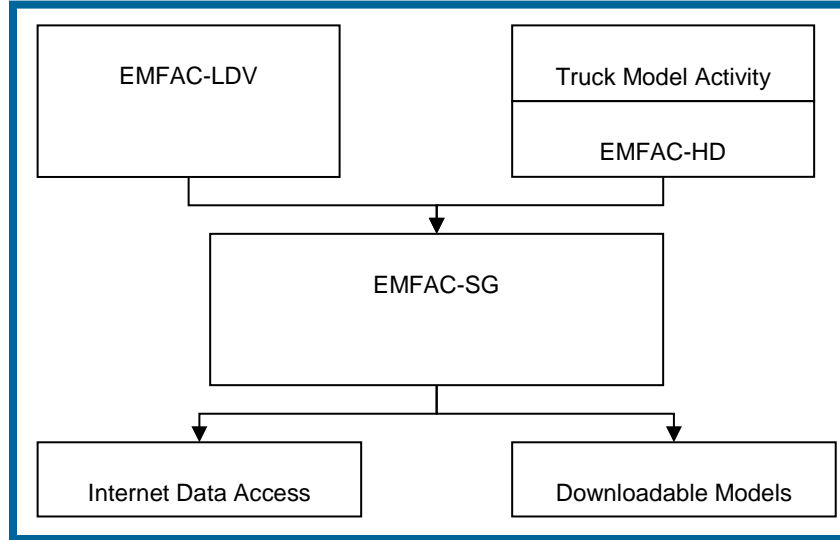
Beyond EMFAC2011

EMFAC2011 is a transition step to a future EMFAC emissions modeling system under development to meet the increasingly demanding needs for data in both the regulatory and planning arenas. Some of the areas of focus for the future EMFAC system that staff is developing over the next two to three years include:

Population, activity, and forecasting:

- Improved capture of recession and fuel price spikes.
- Reflect planned GHG emissions standards and their impact on future year fleet mix.

New Smog Check Algorithms

- Reflect the new Smog Check mandated by State law starting in 2013.

Flexibility for air quality planning better support for long-term scenario assessment

- Scenario development support for tighter National Ambient Air Quality Standards.
- SB375 –Model structure to better support for smart growth planning.
- Better conformity methods to support MPO conformity determinations.

Improved documentation and public availability of model output:

Future model output will be available in raw and processed form over the internet in ways that require minimal processing to understand.