CMAQ Emissions Calculator Toolkit

Documentation of Emissions Data for the Construction & Intermodal Equipment Engine Retrofit and Replacement Tool

This document supplements the User Guide for the Construction & Intermodal Equipment Engine Retrofit and Replacement Tool in the Congestion Mitigation and Air Quality Improvement Program Emissions Calculator Toolkit (CMAQ Toolkit). It discusses the primary data sources and how the emissions datasets for this tool were derived. Emissions estimates from the CMAQ Toolkit are not intended to meet specific requirements for State Implementation Plans (SIPs) or transportation conformity analyses.

MOVES METHODOLOGY

Emissions rates for the Construction & Intermodal Equipment Engine Retrofit and Replacement Tool were acquired from national-scale runs of the Environmental Protection Agency's (EPA) MOtor Vehicle Emissions Simulator (MOVES) NONROAD model.[1] Table 1 lists the national-scale run parameters used in MOVES3. In March 2021, a new version of MOVES was released, MOVES3. In MOVES3, diesel fuel sulfur levels were lowered to be more consistent with the latest available data from refineries.[2] As a result, national results for sulfur dioxide and particulate matter emissions in MOVES3 are typically lower compared to those in MOVES2014b. However, other NONROAD results are largely unaffected by the recent MOVES update.[3]

Table 1. National-Scale Run Parameters

Categories	Variable	Input
Description	-----	<blank>
Scale	Model	Nonroad
	Domain/Scale	National
	Calculation Type	Inventory
Time Spans	Time Aggregation Level	Year
	Years	[2018, 2019, 2020, 2021, 2022, 2023, 2024, 2025, 2026, 2027, 2028, 2029, 2030, 2031, 2032, 2033, 2034, 2035, 2036, 2037, 2039, 2040]
	Weekend/Weekdays	All Selected
Geographic Bounds	-----	Nation
Vehicles/Equipment	Fuels	Compressed Natural Gas (CNG), Gasoline, Liquefied Petroleum Gas (LPG), Nonroad Diesel Fuel
	Sectors	Construction, Industrial, Airport Support
Road Type	Road Type	Nonroad
Pollutants and Processes	Total Gaseous Hydrocarbons	Running Exhaust
	Non-methane Hydrocarbons	Running Exhaust
	Volatile Organic Compounds	Running Exhaust
	Methane (CH4)	Running Exhaust
	Carbon Monoxide (CO)	Running Exhaust
	Oxides of Nitrogen (NOx)	Running Exhaust
	Primary Exhaust PM2.5 – Total	Running Exhaust
	Primary Exhaust PM10 – Total	Running Exhaust

[1] U.S. Environmental Protection Agency. 2021. MOVES3. Available at https://www.epa.gov/moves/latest-version-motor-vehicle-emission-simulator-moves.

[2] U.S. Environmental Protection Agency. 2020. Fuel Supply Defaults: Regional Fuels and the Fuel Wizard in MOVES3. Available at https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P1010MA7.pdf.

[3] Choi, David. 2020. MOVES3 Introduction & Overview. Presentation at the Clean Air Act Advisory Committee Meeting. Available at https://www.epa.gov/sites/production/files/2020-12/documents/moves3_presentation_for_caaac_12.08.2020.pdf.

Categories	Variable	Input
	Brake Specific Fuel Consumption (BSFC)	Running Exhaust
	Atmospheric CO2	Running Exhaust
Manage Input Data Series	-----	<blank>
Strategies	Rate of Progress	<blank>
General Output	Units	Mass: kilograms Energy: million BTU Distance: miles
Output Emissions Detail	Always	24-Hour Day, Nation
	On Road/Off Road	On Road/Off Road
	On and Off Road	SCC
	Off Road	Sector, Engine Tech., HP Class
	For All Vehicle/Equipment Combinations	Model Year, Fuel Type, Emission Process, Fuel Subtype
Advanced Performance Features	-----	<blank>

Post-MOVES Run Data Processing

Results from the national-scale MOVES run were used to obtain emissions rates for use in the tool. The output emissions rates were aggregated by evaluation year, pollutant, sector, fuel type, model year, and horsepower. Aggregating by source classification code (SCC) (i.e., equipment type) produces a high volume of data due to the large number of nonroad equipment types. As a result, only sector-level emissions rates are used within this tool.

The output MOVES emissions rates include default load factors. To allow users to input their own load factor values, each output emission rate, ER_{LF}, was divided by the average default load factor across all equipment types in a given sector, LF_{avg}, to obtain emissions rates without embedded load factors, ER (Equation 1). See the User Guide for tabulated default load factors by fuel type and equipment type and a list of equipment types within each sector.

$$ER = \frac{ER_{LF}}{LF_{avg}} \quad (1)$$