

Call for Projects Congestion Mitigation and Air Quality (CMAQ) Emissions Formulas

Technical Advisory Committee



July 18, 2018

CMAQ Emissions Formulas

Formula Coordination



DRCOG – under review, considering FHWA toolkit

RAQC – Argonne National Laboratory's AFLEET

CEO – no restricted alternative fuel facility awards

UFR – FHU formulas

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CMAQ Emissions Formulas

Formulas



Michigan DOT Forms

- Used in 2014 and 2016 Calls
- Supports seven project types
- Michigan emission factors can be replaced with CO factors
- Out year is 2035

EPA Diesel Emissions Quantifier (DEQ)

- Used in 2014 and 2016 Calls for alternative fuel vehicles
- No estimate for VOC
- No CNG-specific factors
- Out year is 2023

FHWA CMAQ Emissions Calculator Toolkit

- Supports nine project types
- Developed in 2016-2017
- Three modules to be released in 2018
- Out year is 2020 or 2021

AFLEET

- Alt fuel vehicle calculator
- Developed for US DOE
- State-level emissions factors
- Out year is 2022

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CMAQ Emissions Formulas

Eligible Projects



- | | |
|--|--|
| <ul style="list-style-type: none"> ▪ Diesel engine retrofits* ▪ Diesel vehicle repower* ▪ Idle reduction strategies* ▪ Park and ride* ▪ Incident management* ▪ Alternative fuel vehicle/bus ▪ Alternative fuel stations ▪ Transit service expansion ▪ Transit amenity improvements ▪ Extreme-temperature cold start technologies ▪ Bicycle and pedestrian facilities and programs ▪ Employee transit benefits ▪ Intermodal freight ▪ Intersection improvements ▪ Traffic signal synchronization | <ul style="list-style-type: none"> ▪ Roundabouts ▪ Intelligent Transportation Systems (ITS) ▪ Congestion pricing ▪ Carpooling / vanpooling ▪ Carsharing ▪ Ridesharing ▪ Bikesharing ▪ Subsidized transit fares ▪ Travel Demand Management (TDM) strategies and outreach |
|--|--|
- *Most cost effective projects

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CMAQ Emissions Formulas

Example Projects for Formula Testing



- CNG vehicle replacement
- Clean diesel vehicle replacement
- Transit CNG bus replacement
- Diesel engine retrofit
- Traffic signal synchronization
- Bicycle/pedestrian trail
- Auxiliary lane



Example projects tested as 2020 upgrades from 2010

Example projects are based on previous applications or formula defaults

CNG Vehicle Replacement



Inputs

- Old Fuel Type – Diesel
- New Fuel Type – CNG
- Old Model Year – 2010
- New Model Year – 2020
- VMT – 14,962
- Cost – \$50,000
- Annual Fuel Gallons – 1,463
- Annual Idling Hours – 30
- Vehicle Class – Single unit short-haul class 4-5

Measure	Emission	EPA DEQ	FHWA Toolkit	AFLEET
Total Emissions Reduced (KG)	NOx	36	43	83
	VOC	N/A	1	1
Cost Effectiveness (Cost per KG)	NOx	\$1,378	\$1,168	\$600
	VOC	N/A	\$53,769	\$37,540

Clean Diesel Vehicle Replacement



Inputs

- Old Fuel Type – Diesel
- New Fuel Type – Diesel
- Old Model Year – 2010
- New Model Year – 2020
- VMT – 14,962
- Cost – \$50,000
- Annual Fuel Gallons – 1,463
- Annual Idling Hours – 30
- Vehicle Class – Single unit short-haul class 4-5

Measure	Emission	EPA DEQ	FHWA Toolkit	AFLEET
Total Emissions Reduced (KG)	NOx	36	102	39
	VOC	N/A	2	1
Cost Effectiveness (Cost per KG)	NOx	\$1,378	\$489	\$1,288
	VOC	N/A	\$25,929	\$37,540

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CMAQ Emissions Formulas

Transit CNG Bus Replacement



Inputs

- Old Fuel Type – Diesel
- New Fuel Type – CNG
- Old Model Year – 2010
- New Model Year – 2020
- VMT – 26,250
- Cost – \$600,000
- Annual Fuel Gallons – 3,269
- Annual Idling Hours – 600

Measure	Emission	EPA DEQ	FHWA Toolkit	AFLEET
Total Emissions Reduced (KG)	NOx	113	27	170
	VOC	N/A	-1	1
Cost Effectiveness (Cost per KG)	NOx	\$5,291	\$21,877	\$3,510
	VOC	N/A	N/A	\$433,448

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CMAQ Emissions Formulas

Diesel Engine Retrofit



Inputs

- Retrofit Type – Diesel Particulate Filter
- Old Model Year – 2010
- New Model Year – 2020
- VMT – 14,962
- Cost – \$9,000
- Annual Fuel Gallons – 14,962
- Annual Idling Hours – 30

Measure	Emission	EPA DEQ	FHWA Toolkit
Total Emissions Reduced (KG)	NOx	0	0
	VOC	N/A	143
Cost Effectiveness (Cost per KG)	NOx	N/A	N/A
	VOC	N/A	\$63

Traffic Signal Synchronization



Inputs

- Area Type – Urban
- Corridor Length – 4 miles
- Number of signalized intersections – 12
- Number of Lanes – 3
- Speed Limit – 50 mph
- Average Speed – 31 mph
- Expected Increase in Speed – 5 mph
- Average Cycle Length – 110 seconds
- Truck Percentage – 6%
- AADT – 55,000
- Peak-Hour Volume – 6,000
- Existing Corridor Travel Time – 10 minutes

Measure	Emission	MDOT	FHWA Toolkit
Total Emissions Reduced (KG)	NOx	660	1,801
	VOC	3,564	1,069
Cost Effectiveness (Cost per KG)	NOx	\$1,212	\$444
	VOC	\$224	\$748

Bicycle/Pedestrian Trail



Inputs

- Length – 0.75 miles
- ADT – 58,000
- Percentage of bike/ped – 3%
- Average speed on road – 43 mph
- Cost – \$1,000,000

Measure	Emission	MDOT
Total Emissions Reduced (KG)	NOx	317
	VOC	113
Cost Effectiveness (Cost per KG)	NOx	\$3,148
	VOC	\$8,818

Auxiliary Lane



Inputs	Road 1	Road 2
AADT (both directions)	55,000	6,400
Peak Hour Volume (both directions)	4,500	600
Number of Lanes (one direction)	3	1
Truck Percentage	4%	1%
Existing Delay per Vehicle (sec/vehicle)	8	60
Existing Left-turn Phase	Yes	Yes
Existing Right-turn Phase	No	No
Number of Left-Turn Lanes to Add	1	1
Planned Left-turn Phase	Yes	Yes
Planned Right-turn Phase	No	No
Ratio of Green Time per Cycle Time	.7	.3

Measure	Emission	FHWA
Total Emissions Reduced (KG)	NOx	75
	VOC	31
Cost Effectiveness (Cost per KG)	NOx	\$13,697
	VOC	\$32,578

Project Type	MDOT/DEQ	FHWA	AFLEET
Alternative Fuel Vehicles and Buses	Available	Available	Recommended
Engine Retrofit	Recommended	-	-
Idle Reduction	Recommended	-	-
Alt Fuel Infrastructure	-	Recommended	-
Carpool/Vanpool	-	Recommended	-
Park and Ride	Recommended	-	-
Non-Motorized Pathway	Recommended	-	-
ITS	Recommended	-	-
TDM	Recommended	-	-
ATMS	Recommended	-	-
Intersection Improvements	-	Recommended	-
Traffic Signal Synchronization	-	Recommended	-
Roundabouts	-	Recommended	-
New Public Transportation Service	Recommended	-	-

Call Policies



- Determine Call policies for CMAQ, STBG, and TA
 - CMAQ Emissions formulas
 - Project scoring system
 - Pool structure
 - Request limit
 - Transportation Alternatives (TA) project types

National Performance Measures



Performance Area	Coverage
Highway Safety	All Public Roads
Pavement Condition	NHS
Bridge Condition	NHS
Truck Travel Time Reliability	Interstate
CMAQ Emissions	Non-attainment areas
Transit Asset Management	System-wide

Proposed Call for Projects Schedule



Event	Timeframe
Open Call	August
Project Application Workshop	September
CMAQ Project Description Due	September
CMAQ Emissions Data Due	September
Applications Due	September
Scoring Meeting	October
TAC Discussion	October
Council Presentations	November
TAC Action	December
Council Action	January (2019)

Draft Federal Funding Available



Program	FY2022	FY2023
CMAQ	\$4,917,303	\$4,921,755
STBG	\$4,183,184	\$4,186,972
TA	\$330,470	\$330,816

Contact Us



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