

2015 NATIONAL AMBIENT AIR QUALITY STANDARDS FOR OZONE: REDESIGNATION REQUEST AND MAINTENANCE PLAN INVENTORY

Alternate Vehicle Fuel and Technologies (AVFT) Inputs

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Redesignation Request/Maintenance Plan

- A Redesignation Request (RR) is a formal request to the EPA to designate an area as attaining the Ozone NAAQS, placing the region in “Maintenance” status.
- A Maintenance Plan (MP) outlines how the local air district will maintain its attainment of a federal air quality standard for 10 years into the future.
- MWAQC, in consultation with TPB, develops both the RR and MP. These are then provided to the state air agencies for finalization and submission to the EPA for approval.
- In an Ozone MP, precursor pollutants, Volatile Organic Compounds (VOC) and Nitrogen Oxides (NO_x), are evaluated instead of Ozone directly.



Elements of Redesignation Request and Maintenance Plan

Air Quality Data

- Monitor data to show compliance with the 2015 ozone standard (3-year average: 2021-2023)

Emissions Inventories (Point, Area, Non-road, On-road Mobile Sources)

- 2017 Base Year
- 2022 Attainment Year
- 2032 Intermediate Year
- 2038 Final Maintenance Year (must be at least 10 years beyond EPA's official date of redesignation for an area – likely in 2027)



On-Road Emissions Inventory

- Developed using:
 - Regional travel demand model: Gen2/Ver. 2.4.6
 - EPA MOVES Model: MOVES5



On-Road Emissions Inventory Inputs to MOVES

Travel-Related Data

- Based on the travel demand model and vehicle registration data, such as vehicle miles traveled, vehicle age distribution, and speed data

Non-Travel Data

- Meteorological data, fuel supply and formulation data, and inspection and maintenance program data



Alternate Vehicle Fuel and Technologies (AVFT) Data

- Part of the “Non-Travel Data” inputs
- Allows users to modify the fraction of vehicles capable of using different fuels and technologies for each source type and vehicle model year:
 - Gasoline
 - Diesel
 - Ethanol (E-85)
 - Compressed Natural Gas (CNG)
 - Battery electric (BEV)
 - Fuel cell electric (FCEV)
- Recent rapid growth of electric vehicles and how it is reflected in AVFT dataset can impact a region's ability to pass conformity



AVFT Data Sensitivity Tests

- In consultation with MWAQC-TAC members, TPB staff have estimated emissions in 2038 using the following sets of assumptions for AVFT data:
 - Local AVFT: Inputs provided by the state air agencies, developed using MOVES5 tools and guidance for both historic and future data
 - MOVES5 defaults
 - Fixed 2022 AVFT: 2022 AVFT inputs (or shares), supplied by the states, are “fixed” and applied in the future years (e.g., in 2038)
 - Fixed 2025 AVFT: 2025 AVFT shares of vehicles from MOVES5 defaults are “fixed” and applied in the future years (e.g., in 2038); MOVES5 defaults are applied to each corresponding year prior to 2025 – **NEW, PER NOVEMBER 12, 2025 MWAQC-TAC SUGGESTION**



Fixed 2025 AVFT Approach - Assumptions

- At MWAQC-TAC meeting in November 2025, members inquired about modeling an additional scenario, interpreted as following:
 - Assume 2025 AVFT MOVES default data shares for every year after 2025 (“freezing today’s conditions” approach).
 - Assume MOVES default data shares for each respective year up to and including 2025.
- These assumptions seem reasonable:
 - All the data come from a single source – MOVES5 defaults.
 - Applying estimated 2025 vehicle fuel type shares to future years (rather than applying the 2022 shares) would account for the more recent vehicle fleet electrification between 2022 and 2025.



AVFT Data Input Assumptions: Passenger Cars

Table 1. Vehicle Shares by Fuel Type for Model Year 2038: Passenger Cars

Fuel Type	Local AVFT (2038)			MOVES5 Default (2038)	Fixed 2022 AVFT (Local)			Fixed 2025 Default AVFT
	DC	MD	VA		DC	MD	VA	
Gasoline	38%	43%	48%	41%	86%	91%	89%	76%
Diesel	0%	0%	0%	0%	0%	0%	0%	0%
E-85	0%	0%	0%	1%	0%	0%	0%	1%
Electricity	62%	56%	52%	59%	14%	9%	11%	23%
Total	100%	100%	100%	100%	100%	100%	100%	100%



AVFT Data Input Assumptions: Passenger Trucks

Table 2. Vehicle Shares by Fuel Type for Model Year 2038: Passenger Trucks

Fuel Type	Local AVFT (2038)			MOVES5 Default (2038) DC/MD/VA	Fixed 2022 AVFT (Local)			Fixed 2025 Default AVFT DC/MD/VA
	DC	MD	VA		DC	MD	VA	
Gasoline	33%	41%	33%	48%	91%	93%	90%	81%
Diesel	0%	0%	0%	1%	0%	1%	1%	2%
E-85	1%	1%	1%	3%	0%	1%	2%	5%
Electricity	66%	57%	65%	48%	9%	6%	7%	13%
Total	100%	100%	100%	100%	100%	100%	100%	100%



AVFT Data Input Assumptions: Light Commercial Trucks

Table 3. Vehicle Shares by Fuel Type for Model Year 2038: Light Commercial Trucks

Fuel Type	Local AVFT (2038)			MOVES5 Default (2038) DC/MD/VA	Fixed 2022 AVFT (Local)			Fixed 2025 Default AVFT DC/MD/VA
	DC	MD	VA		DC	MD	VA	
Gasoline	20%	35%	30%	44%	46%	85%	90%	78%
Diesel	2%	1%	1%	3%	7%	2%	1%	7%
E-85	3%	2%	1%	2%	9%	10%	2%	4%
Electricity	75%	62%	68%	51%	39%	4%	7%	11%
Total	100%	100%	100%	100%	100%	100%	100%	100%



AVFT Data Input Assumptions: Combination Short-Haul Trucks

Table 4. Vehicle Shares by Fuel Type for Model Year 2038: Combination Short-Haul Trucks

Fuel Type	Local AVFT (2038)			MOVES5 Default (2038) DC/MD/VA	Fixed 2022 AVFT (Local)			Fixed 2025 Default AVFT DC/MD/VA
	DC	MD	VA		DC	MD	VA	
Gasoline	0%	0%	0%		0%	0%	0%	0%
Diesel	56%	56%	70%		56%	99%	99%	98%
E-85	0%	0%	1%		0%	1%	1%	1%
Electricity	44%	44%	29%		44%	0%	0%	1%
Total	100%	100%	100%		100%	100%	100%	100%



AVFT Data Input Assumptions: Summary

- Using MOVES5 local projections means that between 52% and 62% of model year 2038 light-duty passenger cars are assumed to be electric (similar to 2038 MOVES5 defaults); 2025 MOVES5 defaults show that 23% of vehicles in this category are estimated to be electric (Table 1).
- Using MOVES5 local projections means that between 57% and 66% of model year 2038 light-duty passenger trucks are assumed to be electric (slightly higher than 2038 MOVES5 defaults at 48%); According to 2025 MOVES5 default data, 13% of vehicles in this category are estimated to be electric (Table 2).
- Using MOVES5 2038 local input projections means that between 29% and 44% of model year 2038 combination short-haul trucks (“tractor trailers”) are assumed to be electric (similar to MOVES defaults); 2025 MOVES5 defaults estimate this percentage at 1% (Table 4).



AVFT Data Sensitivity Test Findings: Nitrogen Oxides (NOx)

Table 5. 2038 NOx Emissions: AVFT Tests Compared to 2038 Local AVFT/State Air Agency Inputs (in short tons per day)

Vehicle Category	Local AVFT	MOVES5 Defaults	Fixed 2022 Local AVFT	Fixed 2025 Default AVFT	MOVES5 Defaults (vs. Local AVFT)		Fixed 2022 AVFT (vs. Local AVFT)		Fixed 2025 AVFT (vs. Local AVFT)	
					Δ	%Δ	Δ	%Δ	Δ	%Δ
Light-duty Vehicles	3.389	3.902	4.336	4.961	0.513	15%	0.946	28%	1.572	46%
Heavy-duty Vehicles	7.931	7.992	8.696	8.944	0.062	1%	0.766	10%	1.013	13%
Buses	1.855	1.794	1.934	1.949	-0.061	-3%	0.078	4%	0.094	5%
Total	13.175	13.689	14.965	15.854	0.514	4%	1.790	14%	2.679	20%

Note:

Light-duty Vehicles = Motorcycles + Passenger Cars + Passenger Trucks + Light Commercial Trucks

Heavy-duty Vehicles = Refuse Trucks + Single Unit Short- and Long-Haul Trucks + Motorhomes + Combination Short- and Long-Haul Trucks

Buses = Other Buses + Transit Buses + School Buses



AVFT Data Sensitivity Test Findings: Volatile Organic Compounds (VOC)

Table 6. 2038 VOC Emissions: AVFT Tests Compared to 2038 Local AVFT/State Air Agency Inputs (in short tons per day)

Vehicle Category	Local AVFT	MOVES5 Defaults	Fixed 2022 Local AVFT	Fixed 2025 Default AVFT	MOVES5 Defaults (vs. Local AVFT)		Fixed 2022 AVFT (vs. Local AVFT)		Fixed 2025 AVFT (vs. Local AVFT)	
					Δ	%Δ	Δ	%Δ	Δ	%Δ
Light-duty Vehicles	14.427	14.844	17.629	16.826	0.417	3%	3.201	22%	2.399	17%
Heavy-duty Vehicles	0.587	0.520	0.614	0.596	-0.067	-11%	0.027	5%	0.009	2%
Buses	0.195	0.298	0.165	0.369	0.104	53%	-0.030	-15%	0.175	90%
Total	15.208	15.662	18.407	17.791	0.454	3%	3.199	21%	2.583	17%

Note:

Light-duty Vehicles = Motorcycles + Passenger Cars + Passenger Trucks + Light Commercial Trucks

Heavy-duty Vehicles = Refuse Trucks + Single Unit Short- and Long-Haul Trucks + Motorhomes + Combination Short- and Long-Haul Trucks

Buses = Other Buses + Transit Buses + School Buses



AVFT Data Sensitivity Test Findings

- Using MOVES5 AVFT defaults resulted in increases in estimated NOx emissions by 4% and VOC emissions by 3% percent relative to the local AVFT inputs in 2038.
- However, using “Fixed 2025 AVFT” inputs that maintain the current distribution of various vehicle categories resulted in greater estimated increases in NOx emissions (20%) and VOC emissions by (17%) relative to the local AVFT inputs in 2038.
- Data in Table 5 show that the heavy-duty vehicles (or trucks) account for about 60% of NOx emissions.



Considerations for Moving Forward

- Main concern: using locally developed data or MOVES5 defaults for corresponding years, motor vehicle emissions budgets (MVEBs) may be set using relatively optimistic vehicle electrification assumptions that could become outdated if the EPA were to repeal some of the recent regulations embedded in MOVES5 assumptions, such as the recently proposed rulemaking that rolls back some of the fuel economy standards:
 - The Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule III for Model Years 2022 to 2031 Passenger Cars
 - If these and other regulations were to be repealed, a new MOVES model, presumably assuming both lower shares of electric vehicles (AVFT inputs) and higher emissions rates in the future (embedded in the model itself), would be released (with state air agency local data also reflecting these trends).



Considerations for Moving Forward (Cont.)

- It may be challenging to pass conformity using a future model if MVEBs were set using the current MOVES5 model and assumptions, which assume a cleaner vehicle fleet.
 - If NOx and VOC emissions were to increase by 17-20% only due to a new model and one input (per these tests), the region may need to update the MVEBs and Maintenance Plan to maintain consistency between the MVEB setting process and conformity assumptions.
 - Future MOVES model would presumably not only assume different shares of vehicles by fuel type as specified in AVFT inputs, but it would likely include other updates that would impact emissions rates that are embedded in the model itself, rather than being input by users (e.g., new CAFE Standards).
 - Emissions differences (17% for VOC and 20% for NOx) would not account for all potential differences between the models.

Considerations for Moving Forward (Cont.)

- In addition to the assumptions related to the region's vehicle fleet, other tools/inputs periodically change, which include, but are not limited to, demographic data and the travel demand model.
 - For example, TPB's Gen3 travel demand model, which is an activity-based model recently released for beta testing, may be used for the next air quality conformity analysis.



Fixed 2025 AVFT Approach - Summary

- Fixed 2025 AVFT assumptions show that, as expected:
 - NOx emissions in 2038 increase by 20% relative to the approach that relied on the local data that relied on more rapid vehicle electrification and cleaner fleet assumptions.
 - VOC emissions in 2038 increase by 17% relative to the approach that relied on local data that relied on more rapid vehicle electrification and cleaner fleet assumptions.
- TPB staff tests have shown that local data and MOVES default data produced similar results for 2017 and 2022 - within 1% for NOx and VOC (tables not included for brevity).
- This approach and results seem reasonable.



Next Steps

- Using the agreed-upon assumptions, develop on-road mobile emissions inventories.



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