**Off-Road Diesel Vehicle PM Profiles**

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- **Objective:**

  Use the available on-road HDDV speciation profiles to create speciation profiles for off-road diesel vehicle categories

- **Background:**
  1. PM speciation profiles for off-road diesel vehicles need to be updated, but no source testing data are available at this point.

  2. New PM speciation profiles have been created for on-road diesel vehicles. Profiles are available for eight MY/AT(model year/aftertreatment) groups:

| Engine Model Year (MY) | Exhaust Aftertreatment (AT) | |
|---|---|---|
| | without | with |
| pre-1994 | G1 | G2 |
| 1994-2002 | G3 | G4 |
| 2003-2006 | G5 | G6 |
| 2007-2009 | / | G7 |
| 2010+ | / | G8 |

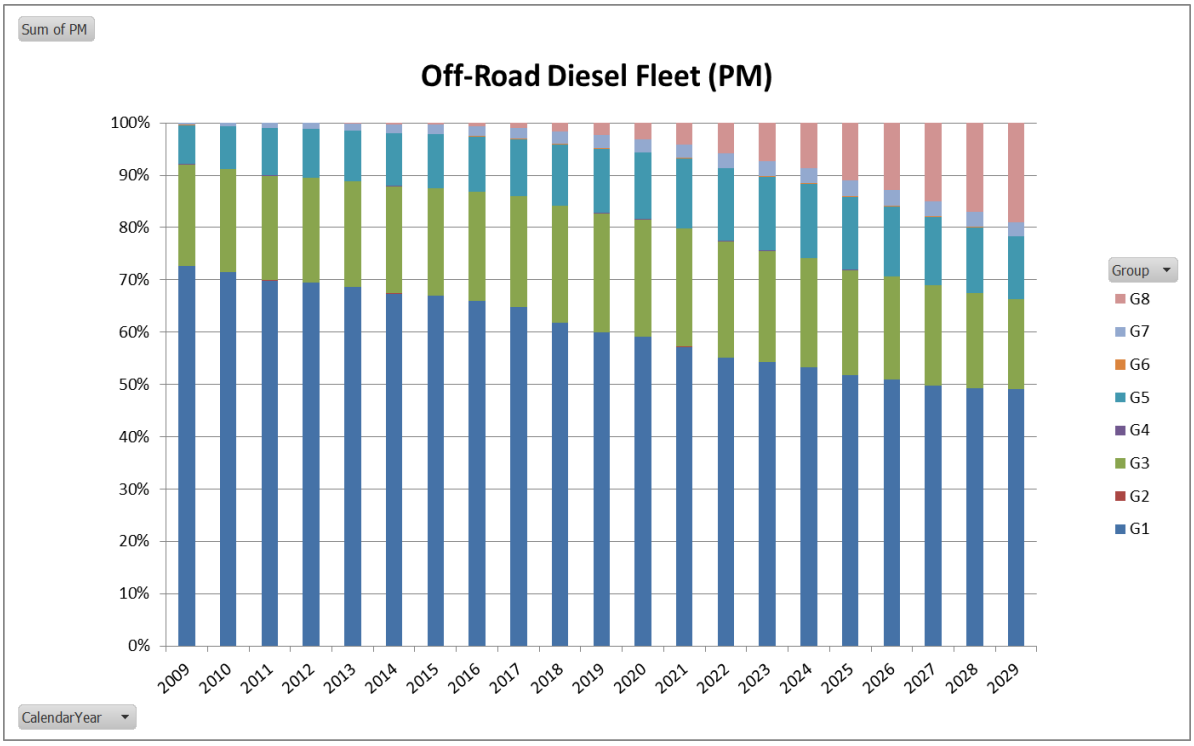
- **Methodology:**
  1. Obtain the fleet composition by Tier for the with rule scenario (Provided by Andrew Willey--PTSD).

| Calendar Year | ScenTier | Retrofit/Non-Retrofit |
|---|---|---|
| 2009 | T0 | |
| 2010 | T1 | Non-Retrofit |
| . | T2 | |
| . | T3 | |
| . | T4I | Retrofit |
| 2029 | T4Z | |

  2. Match up the off-road Tier with on-road MY/AT (model year/aftertreatment) groups based on the engine standards described in the rules (i.e., Nox and PM) (Consulted with Michael Baker—MSCD).

| off road groups | on road MY/AT |
|---|---|
| (T0+T1)Non-Retrofit | G1 |
| (T0+T1)Retrofit | G2 |
| (T2)Non-Retrofit | G3 |
| (T2)Retrofit | G4 |
| (T3)Non-Retrofit | G5 |
| (T3)Retrofit | G6 |
| T4I | G7 |
| T4Z | G8 |

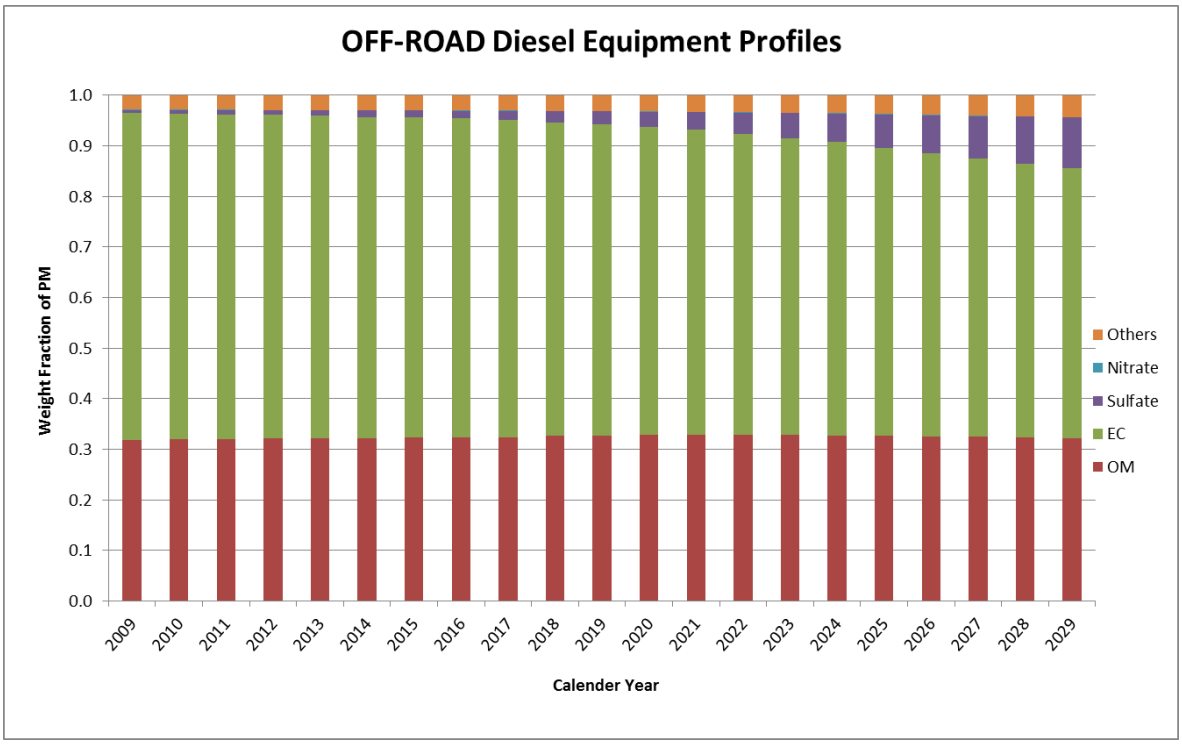
3. Get the off-road fleet by combine the information provided in the above two steps as follows:




4. Assume that transient mode is the typical driving activity for off-road diesel vehicles. For each calendar year, the composite off-road profile is the average of all G1 to G8 on-road transient profiles weighted by PM emissions of off-road fleet.

- **Profiles:**

The final composite profiles are demonstrated in the following figure with five model-need species (i.e., OM-organic compound, EC-elemental carbon, sulfate, nitrate and all other species).


OFF-ROAD Diesel Equipment Profiles
Weight Fraction of PM
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
2026
2027
2028
2029
Calender Year
Others
Nitrate
Sulfate
EC
OM