

Status of Inventories

PM_{2.5} Maintenance Plan

(Washington DC-MD-VA PM_{2.5} Nonattainment Area)

Sunil Kumar

MWAQC-TAC Meeting, COG

July 12, 2011

Milestone Years

PM_{2.5} Maintenance Plan

- **Milestone Years**
 - 2002 : Nonattainment Year (BY 1997 Annual PM_{2.5} Std SIP)
 - 2007 : PM_{2.5} MP Base Year (Attainment Year - 1997 Annual PM_{2.5} Std)
 - 2017 : PM_{2.5} MP Interim Year
 - 2025 : PM_{2.5} MP Future Year

Inventory Requirements PM2.5 Maintenance Plan

- **Inventories needed**

- Point Source
- Area Source
- Nonroad Source
- Onroad Source

3

Summary of Inventories PM2.5 Maintenance Plan

- **Point Source (EGU & NEGU)**

- EGU = Electric generating unit (Power plants)
- NEGU = Non-Electric generating unit (Cement & steel manufacturing)

Annual Inventory (tpy) - Point (EGU & NEGU)

Jurisdiction	NOx				SO2				PM2.5			
	2002	2007	2017	2025	2002	2007	2017	2025	2002	2007	2017	2025
DC	1,317.46	788.64			2,467.55	612.42			126.53	52.80		
MD	45,829.43	30,365.29			164,784.06	176,880.07			3,497.31	5,047.65		
VA	14,195.67	6,694.88			37,400.23	5,956.12			545.71	446.30		
Washington, DC-MD-VA												
PM2.5 NAA	61,342.56	37,848.81			204,651.84	183,448.61			4,169.55	5,546.75		

- 2002 emissions are taken from PM2.5 submitted in March 2008.
- 2017 & 2025 EGU emissions currently being developed.
- Final 2017 & draft 2025 NEGU emissions are ready.

4

Summary of Inventories PM2.5 Maintenance Plan

- **Area Source**
 - **Application of Transport Fraction to PM2.5 emissions**
- **Transport Fraction**
 - Fugitive dust particles (part of total PM2.5 emission) measured at PM2.5 monitors are lower than the calculated emission estimates.
 - Fugitive dust - dust from unpaved & paved roads, highways, commercial & residential construction and agricultural tilling
 - This is because a fraction of these particles is removed by vegetation, buildings, etc. before they reach the monitors
 - Transport Fraction - Fraction of fugitive dust particles remaining airborne and available for transport away from the vicinity of the source, after localized removal has occurred
 - Application of TF is necessary as current photochemical models (CMAQ, CAMx) are unable to correctly model fugitive dust particles processes, which occur at scales smaller than even 4 x 4 km grid sizes (typical model grid scale).

5

Summary of Inventories PM2.5 Maintenance Plan

- **Area Source (Without PM2.5 Transport Fraction)**

Annual Inventory (tpy) - Area

Jurisdiction	NOx				SO2				PM2.5			
	2002	2007	2017	2025	2002	2007	2017	2025	2002	2007	2017	2025
DC	1,694.70	1476.97	1490.70		463.44	1231.51	985.59		495.07	758.46	773.87	
MD	5,167.94	3222.22	3431.26		2,375.52	1077.80	1208.69		7479.48	6313.33	6628.81	
VA	7,091.38	4652.10	4490.24		9,496.59	5411.60	4911.70		5692.32	4813.48	4801.35	
Washington, DC-MD-VA												
PM2.5 NAA	13954.02	9351.29	9412.19		12335.55	7720.91	7105.97		13666.87	11885.27	12204.03	

•2002 emissions are taken from PM2.5 submitted in March 2008 and need to be revised for a few sources.

•2007 PM2.5 emissions for DC, MD, and VA (highlighted in yellow) were revised since TAC meeting in 06.13.11 to fix a spread-sheet error. Total emissions for the region did not change.

6

Summary of Inventories PM2.5 Maintenance Plan

- **Area Source (With PM2.5 Transport Fraction)**

Annual Inventory (tpy) - Area (With PM2.5 TF)

Jurisdiction	NOx				SO2				PM2.5			
	2002	2007	2017	2025	2002	2007	2017	2025	2002	2007	2017	2025
DC	1,694.70	1476.97	1490.70	1560.82	463.44	1231.51	985.59	891.13	409.71	423.79	437.17	
MD	5,167.94	3222.22	3431.26	3518.61	2,375.52	1077.80	205.17	208.46	4352.64	4497.84	4581.55	
VA	7,091.38	4652.10	4490.24	4536.56	9,496.59	5411.60	4911.70	4720.76	3849.34	3751.05	3667.72	
Washington, DC-MD-VA PM2.5 NAA	13954.02	9351.29	9412.19	9615.99	12335.55	7720.91	6102.46	5820.35	8611.69	8672.67	8686.44	

•2002 emissions are taken from PM2.5 submitted in March 2008 and need to be revised for a few sources and PM2.5 transport fraction needs to be applied.

•2007 PM2.5 emissions for DC, MD, and VA (highlighted in yellow) were revised since TAC meeting in 06.13.11 to fix a spread-sheet error. Total emissions for the region did not change.

7 •2017 and 2025 emissions (highlighted in yellow above) in two different MARAMA data files differ and need to be verified.

Summary of Inventories PM2.5 Maintenance Plan

- **Nonroad Model (NMIM) Source**

Annual Inventory (tpy) - Nonroad Model (NMIM)

Jurisdiction	NOx				SO2				PM2.5			
	2002	2007	2017	2025	2002	2007	2017	2025	2002	2007	2017	2025
DC		2,757.72	1,510.57	957.91		192.90	2.67	2.84		236.10	132.14	71.37
MD		8,211.07	4,656.08	3,407.43		478.71	11.01	12.04		837.97	610.07	492.85
VA		9,115.30				560.65				932.41		
Washington, DC-MD-VA PM2.5 NAA		20,084.09				1,232.26				2,006.48		

8

Summary of Inventories PM2.5 Maintenance Plan

- **Non-Nonroad Model Source**
 - **(Marine, Airport, Rail)**

Annual Inventory (tpy) - Nonroad Source (MAR)

Jurisdiction	NOx				SO2				PM2.5			
	2002	2007	2017	2025	2002	2007	2017	2025	2002	2007	2017	2025
DC	469.44	511.77	357.27	265.57	33.35	37.97	0.26	0.18	10.73	11.86	6.63	4.65
MD	1054.46	2184.94	1444.27	1098.08	93.09	71.41	39.28	39.65	53.39	66.87	32.21	20.31
VA	2737.00	4003.06	4511.68	5346.89	571.05	306.35	366.36	447.69	223.23	122.12	119.77	135.42
Washington, DC-MD-VA												
PM2.5 NAA	4260.91	6699.77	6313.23	6710.54	697.50	415.69	405.90	487.52	287.35	200.84	158.62	160.38

•2002 emissions are taken from PM2.5 submitted in March 2008 and need to be revised.

9

Summary of Inventories PM2.5 Maintenance Plan

- **Onroad Source (MOVES2010a) - MARAMA**

Annual Inventory (tpy) - Onroad

Jurisdiction	NOx				SO2				PM2.5			
	2002	2007	2017	2025	2002	2007	2017	2025	2002	2007	2017	2025
DC		7698.26		1615.55		79.25		24.77		543.29		144.08
MD		35272.28		12451.36		307.63		321.76		2085.38		1026.22
VA												
Washington, DC-MD-VA												
PM2.5 NAA												

•Draft 2007 & 2025 emissions here are provided by MARAMA and will be replaced by COG developed inventories.

10

Status of Inventories PM2.5 Maintenance Plan

Source	2002	2007	2017	2025
Point	Final	Final		
Area	Draft	Draft	Draft	Draft
NMIM		Draft	Draft (DC,MD)	Draft (DC,MD)
MAR	Draft	Final	Final	Draft
Onroad		Draft (DC,MD)		Draft (DC,MD)

• Draft MOVES emissions for DC and MD above are available from MARAMA and will be updated with COG's MOVES emissions.

11

Summary of Inventories PM2.5 Maintenance Plan

- **Conclusion**
 - A number of inventories are still draft or in the process of being developed
 - Point Source – Overall SO₂ emission increased between 2002 and 2007
 - Area Source – Overall NO_x and PM_{2.5} emissions increased between 2007 and 2025
 - Nonroad Source (NMIM) – Minor increase in SO₂ emission between 2017 and 2025 for DC and MD. VA emissions need to be developed
 - Nonroad Source (MAR) – Increase in NO_x, SO₂, and PM_{2.5} emissions for DC, MD, and VA between 2017 and 2025
 - Onroad Mobile Source - Minor increase in SO₂ emission between 2007 and 2025 for DC and MD. VA emissions need to be developed

12