Updated PM Augmentation Procedures for the 2002 Point Source NEI

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With special thanks to Anne Pope, US EPA

Why Inventory PM?

- $PM_{2.5}$ NAAQS
- PM_{10} NAAQS
- Regional Haze Rule
- Consolidated Emission Reporting Rule

Particulate Matter Definitions

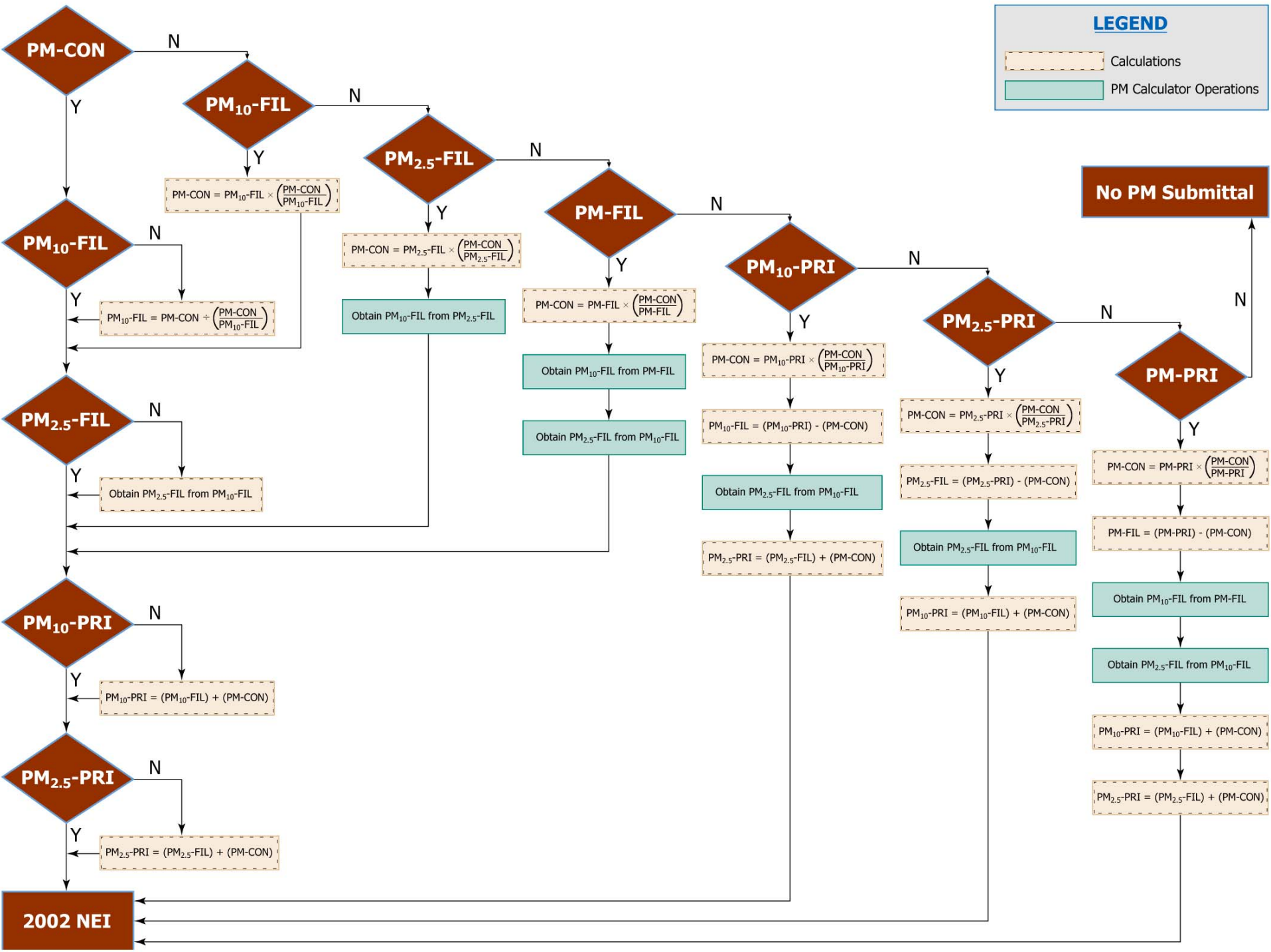
- PM-Filterable: Released as solid or liquid
  - PM_{10}-FIL
  - $PM_{2.5}$-FIL
- PM-Condensible: Released as a vapor
  - PM-CON
- PM-Primary:PM Filterable + Condensible
  - PM_{10}-PRI
  - $PM_{2.5}$-PRI

Relationship between PM Species

PM-PRI	= PM-FIL + PM-CON
PM_{10}-PRI	= PM_{10}-FIL + PM-CON
$PM_{2.5}$-PRI	= $PM_{2.5}$-FIL + PM-CON
PM-FIL	= PM-PRI - PM-CON
PM_{10}-FIL	= PM_{10}-PRI - PM-CON
$PM_{2.5}$-FIL	= $PM_{2.5}$-PRI - PM-CON
PM-CON	= PM-PRI – PM-FIL

Need to Create Other “Relationships”

- PM-CON/PM-FIL
- PM-CON/PM-PRI
- PM-FIL/PM-CON
- PM-PRI/PM-CON
- $PM_{2.5}$-FIL/PM_{10}-FIL
- PM_{10}-FIL/$PM_{2.5}$-FIL
- $PM_{2.5}$-PRI/PM_{10}-PRI
- PM_{10}-PRI/$PM_{2.5}$-PRI


LEGEND
Calculations
PM Calculator Operations
PM-CON
N
Y
PM10-FIL
N
Y
PM-CON = PM10-FIL × (PM-CON / PM10-FIL)
PM2.5-FIL
N
Y
PM-CON = PM2.5-FIL × (PM-CON / PM2.5-FIL)
Obtain PM10-FIL from PM2.5-FIL
PM-FIL
N
Y
PM-CON = PM-FIL × (PM-CON / PM-FIL)
Obtain PM10-FIL from PM-FIL
Obtain PM2.5-FIL from PM10-FIL
PM10-PRI
N
Y
PM-CON = PM10-PRI × (PM-CON / PM10-PRI)
PM10-FIL = (PM10-PRI) - (PM-CON)
Obtain PM2.5-FIL from PM10-FIL
PM2.5-PRI = (PM2.5-FIL) + (PM-CON)
PM2.5-PRI
N
Y
PM-CON = PM2.5-PRI × (PM-CON / PM2.5-PRI)
PM2.5-FIL = (PM2.5-PRI) - (PM-CON)
Obtain PM2.5-FIL from PM10-FIL
PM10-PRI = (PM10-FIL) + (PM-CON)
PM-PRI
N
Y
PM-CON = PM-PRI × (PM-CON / PM-PRI)
PM-FIL = (PM-PRI) - (PM-CON)
Obtain PM10-FIL from PM-FIL
Obtain PM2.5-FIL from PM10-FIL
PM10-PRI = (PM10-FIL) + (PM-CON)
PM2.5-PRI = (PM2.5-FIL) + (PM-CON)
No PM Submittal
PM10-FIL
N
Y
PM10-FIL = PM-CON ÷ (PM-CON / PM10-FIL)
PM2.5-FIL
N
Y
Obtain PM2.5-FIL from PM10-FIL
PM10-PRI
N
Y
PM10-PRI = (PM10-FIL) + (PM-CON)
PM2.5-PRI
N
Y
PM2.5-PRI = (PM2.5-FIL) + (PM-CON)
2002 NEI

Development of PM Augmentation Ratios

- Electric Generating Unit (EGU) emissions data
- PM Calculator
- AP-42
  - Emission factors
  - Particle size distribution
- Stand alone tables with ratios (for your review) posted at

http://www.epa.gov/ttn/chief/net/2002inventory.html

Example Ratio Table

SCC	Primary Control Device Code	Ratio PM10-PRI to PM-CON	Ratio PM10-FIL to PM-CON	Ratio PM25-PRI to PM-CON	Ratio PM25-FIL to PM-CON
10100401	000	0.17	0.22	0.22	0.30
10100404	000	0.20	0.26	0.25	0.35
10100501	000	0.56	1.35	0.84	5.37
10100601	000	0.75	6.34	0.75	6.34

Ratios Developed for EGUs

- SCCs = 101* and 201*
- Control device specific
- Emission estimates developed by EIG using PM Calculator and AP-42 emission factors
- Details on the development of the emission estimates can be found at

http://www.epa.gov/ttn/chief/net/2002inventory.html#point

Ratios Developed Using PM Calculator

- SCC and control device specific
- Only for filterable
- Ratios developed using the program, compiled in external files

Ratios Developed Using AP-42

- SCC specific, sometimes control device specific
- Primary, filterable and condensible
- Emission factors vs particle size distribution
- Assumed sulfur content and ash content
- Worst case: 1st digit SCC

AP-42 Emission Factor Surrogates

- Industrial processes and surface coating operations
  - Surrogate ratios applied to fuel-fired equipment, process heaters, incinerators, and coating ovens
  - Based on emission factors for industrial external combustion boilers
- Solid waste disposal
  - Based on average emission factors for external and internal combustion sources

AP-42 Cumulative Particle Size Distribution

- 6- and 8-digit SCC level
- Worst case: 1st digit SCC Assumptions
  - PM-CON ≤ 1 micron
  - $PM_{2.5}$-PRI ≤ 2.5 micron
  - PM_{10}-PRI ≤ 10 micron
  - PM-FIL calculated from primary and condensible
  - PM-PRI always 100%

Example Calculations

Uncontrolled PM_{10}-FIL provided

- Calculate PM-CON

PM_{10}-FIL * [PM-CON/PM_{10}-FIL] = PM-CON

- Calculate PM_{10}-PRI

PM_{10}-FIL + PM-CON = PM_{10}-PRI

- Calculate $PM_{2.5}$-FIL

PM_{10}-FIL * [$PM_{2.5}$-FIL/PM_{10}-FIL] = $PM_{2.5}$-FIL

- Calculate $PM_{2.5}$-PRI

$PM_{2.5}$-FIL + PM-CON = $PM_{2.5}$-PRI

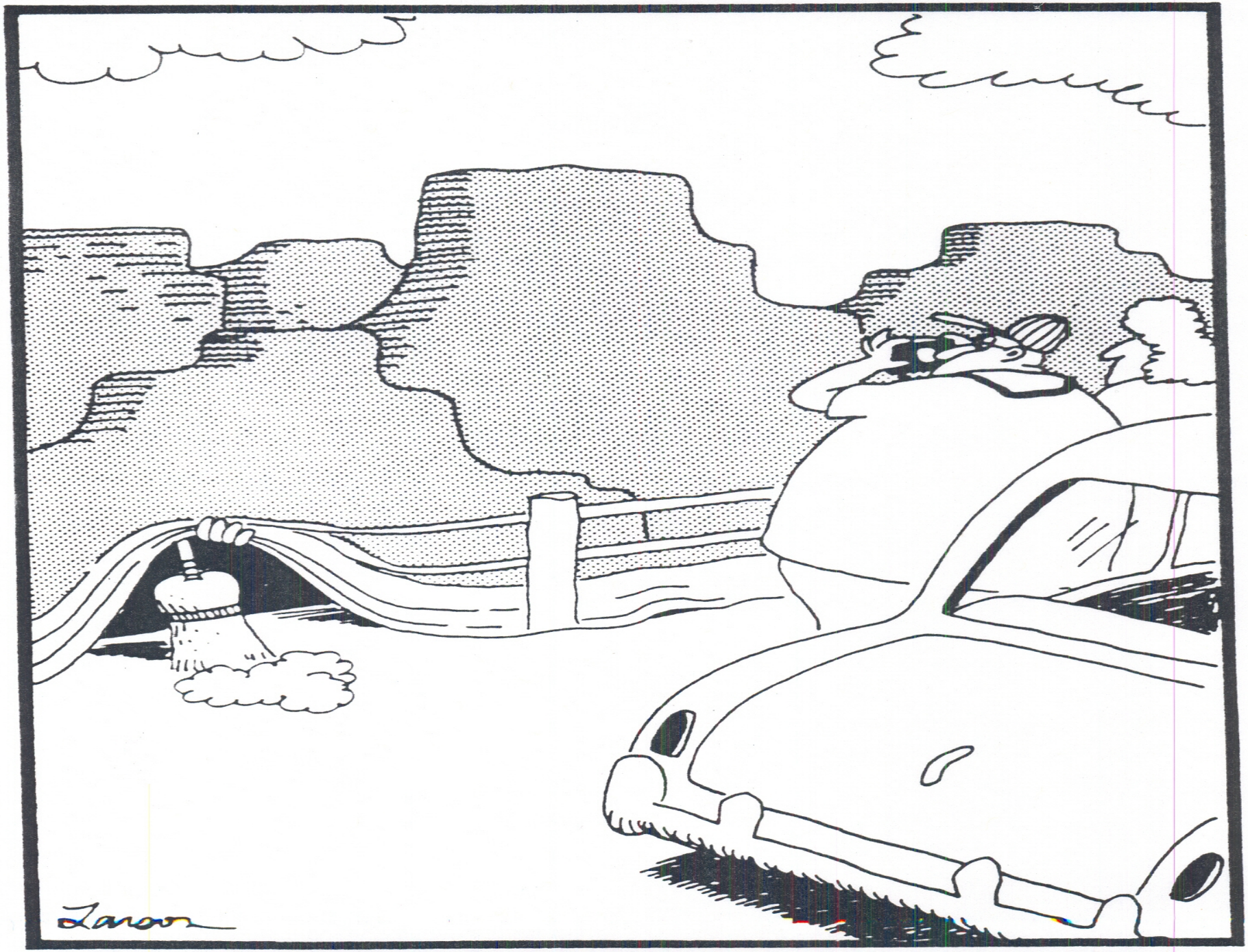
Quality Assurance/Quality Control Checks

- PM-PRI ≥PM-FIL and PM-CON
  - PM_{10}-PRI ≥PM_{10}-FIL and PM-CON
  - $PM_{2.5}$-PRI ≥$PM_{2.5}$-FIL and PM-CON
- PM_{10} ≥ $PM_{2.5}$
  - PM_{10}-FIL ≥ $PM_{2.5}$–FIL
  - PM_{10}-PRI ≥ $PM_{2.5}$-PRI
- PM-PRI =PM-FIL + PM-CON
  - PM_{10}-PRI =PM_{10}-FIL + PM-CON
  - $PM_{2.5}$-PRI =$PM_{2.5}$-FIL + PM-CON

Conclusions

- Goals:
  - Augment PM in the NEI for completeness
  - Make augmentation method as transparent as possible
  - Provide tools for review, use, adjustments

- We are VERY interested in your input on this approach!
  - Darcy Wilson, ERG
  - Anne Pope, EIG


Larson