Emissions Factors Uncertainty Primer

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What are Emissions Factors?

- Emissions Factors (EFs) are low cost, low burden means to estimate emissions
  - EFs are average values gleaned from few emissions tests at a subset of sources
    - Typical EF units are lbs of pollutant per fuel input
  - EFs developed for use in the national emissions inventory

$$Emissions = EF\left(\frac{pounds}{mmBTU}\right) \times Consumption\left(\frac{mmBTU}{year}\right)$$

What's wrong with EFs?

- Nothing when used in proper context
  - Developing annual, national inventory
- However, EFs are used out of context
  - Individual sites use EFs rather than direct measurements
    - To determine program applicability
    - To establish permit limits
    - To demonstrate compliance
    - To calculate fees
    - As basis for TRI reporting

What's wrong with EFs?

- Such out of context use often ignores potential consequences
  - Half of sources' emissions exceed values determined by using EFs
- Moreover, Inspector General and other stakeholders found
  - Few high quality EFs
  - Difficult process for generating new EFs
  - No accounting for EF uncertainty
  - No guidance for using EFs out of context

How Has MPG Responded?

- Convened stakeholders
- Created streamlined EF development process
  - Captures emissions test data electronically, assigns quality rating automatically, and will post results online
- Drafted peer-reviewed EF Uncertainty Assessment and seeks comments on it
  - Comment period extended 3 times – 10/31 is new deadline

What did we learn from the Uncertainty Assessment?

- Uncertainty is the lack of knowledge regarding the true value
  - Includes variability, systematic error, and random error
  - Can be expressed as a probability distribution
  - Depends on
    - Type of pollutant (gaseous criteria, PM, or HAP)
    - Use of controls (controlled or uncontrolled)
    - Number of emissions tests performed
    - Number of similar units nearby
    - Decision level (percentile appropriate for program)

What did we learn from the Uncertainty Assessment?

- Probability distributions for HAP, PM, and gaseous criteria pollutant EFs
  - Are based on 42 A-rated and 1 B-rated EFs
  - Were generated from Monte Carlo simulation and repeated sampling
  - Exhibit lognormal or Weibull characteristics (no negative values and long tail to the right)
  - Allow calculation of expected range of EF values

What did we learn from the Uncertainty Assessment?

- Expected EF values range

Pollutant	Less than 3 emissions tests		25 or more emissions tests	
	10th percentile	95th percentile	10th percentile	95th percentile
HAP	0.2 * EF	13.4 * EF	0.1 * EF	3.9 * EF
PM condensable	0.2 * EF	6.9 * EF	0.1 * EF	3.6 * EF
PM filterable, controlled	0.4 * EF	3.9 * EF	0.3 * EF	2.7 * EF
PM filterable, uncontrolled	0.5 * EF	2.7 * EF	0.4 * EF	2.2 * EF
Gaseous criteria pollutants	0.3 * EF	5.4 * EF	0.3 * EF	2.8 * EF

What did we learn from the Uncertainty Assessment?

- In general, median of existing EFs is around 65th percentile
- Uncertainty reduced with more supporting data (additional emissions tests)
  - Effects diminish after 10 tests
- Assessment includes procedure to calculate effect of uncertainty on more than one similar unit nearby

How Has MPG Responded?

- No action on guidance until uncertainty method finalized
  - Commenters overly concerned about perceived impact of potential guidance instead of focusing on draft method

Next Steps

- Continue to refine revised EF development process
  - Add new pollutants and seek new partners to pilot program
- Prepare and improve WebFIRE, the interactive EF website
  - Put more hard copy records into electronic format

Next Steps

- Respond to comments and finalize uncertainty method
- Begin internal Agency discussions with programs concerning EF use
- Continue updating stakeholders of program progress