BASICS OF AIR QUALITY MODELING

Dustin Duhon, P.E.
October 30, 2013
OVERVIEW

- When Do I Need To Model?
- How Do I Model?
- What Can I Do When My Model Fails? (Now The Fun Begins …)
Top 3 Reasons to Model

- Prevention of Significant Deterioration (PSD)
- Major Source of Toxic Air Pollutants (TAP) with increase above Minimum Emission Rate (MER)
- LDEQ said so
HOW DO I MODEL? - PSD

Significance Analysis

NAAQS Analysis

PSD Increment Analysis

Significant Impact Analysis (SIA)

Full Impact Analysis
You will need:
- Meteorological (MET) Data for 5 years preceding the project
- Building dimensions (ALL buildings on site, not just emissions sources)
- Terrain elevations & features within 100 km
- Emission Rates (& Net Emissions Increases for PSD)
How Do I Model? – SIA

- Model Net Emissions Increase

- Compare to Significant Impact Level (SIL)
  - Offsite receptors < SIL? Done!
  - Offsite receptors ≥ SIL? Full Impact Analysis
  - **TIP**: Treat PM$_{2.5}$ as though ≥ SIL (no official SIL)

- Analysis done on a standard-by-standard basis
HOW DO I MODEL? – NAAQS DATA NEEDS

You will need:

– SIA Data Needs

– Receptors within Radius of Impact (ROI)
  • distance to farthest receptor > SIL
  • TIP - round up radial distance to nearest whole kilometer
  • TIP #2 – Add 1 km to radial distance

– Emission sources within Area of Impact (AOI)
  • AOI = ROI + 50 km (not to exceed 100 km)
  • Data Source – Regulatory Agency
  • PTE Emissions – Most Recent Year

– Background monitor data averaged in the form of the standard
Model Potential To Emit from proposed facility
- Annual standard – average lb/hr
- Short term standard – maximum lb/hr

Compare to NAAQS
- Offsite receptors less than NAAQS? Done!
- Offsite receptors greater than NAAQS? Now the fun begins ....

Analysis done on a standard-by-standard basis
You will need:

- SIA Data Needs
- Receptors within ROI
- Emission sources within AOI
- Baseline emissions data
  - Date Source – Regulatory Agency
### How Do I Model? – PSD Increment Analysis

- **Model Potential To Emit** from proposed facility
  - Annual standard – average lb/hr
  - Short term standard – maximum lb/hr

- **Model Baseline** Emissions as negative emissions

- **NAAQS (Ceiling)**
- **PSD Increment (delta)**
- **PSD Baseline**
- **Zero**
How Do I Model? – PSD Increment Analysis

- Compare to PSD Increment
  - Offsite receptors less than Increment? Done!
  - Offsite receptors greater than Increment? Now the fun begins ....

- Analysis done on a increment-by-increment basis

- No increment? Done!
LDEQ TAP Modeling Procedure

1. Source emits TAP > MER
   - Request LDEQ determination
   - LDEQ determination
     - No modeling
       - End
     - Screening analysis (on-site sources only)
       - Result < 7.5% of AAS
         - Yes
           - End
         - Initial refined analysis (all sources in AOI; 1 year)
           - Result < 75% of AAS
             - Yes
               - End
             - Make changes
               - End
           - Result < AAS
             - Yes
               - More refined analysis (all sources in AOI; 5 years)
                 - Result < AAS
                   - Yes
                     - End
                 - Make changes
                   - End
               - End
Now The Fun Begins …
POSSIBLE SOLUTIONS

1. Modeled correctly?
   a) Check your work
   b) Accurate source type? Volume vs. Area vs. Point
      1. **TIP**: Set up model to show contribution source-by-source
   c) Remove receptors within industrial fencelines
   d) TAP Modeling only: Remove receptors from transient areas (roads, rivers, forests)
   e) Accurate stack parameters for outside sources
POSSIBLE SOLUTIONS

2. Appropriate Assumptions?
   a) Representative background data
   b) Accurate operating scenarios
   c) Area & volume source dimensions
3. Receptor Analysis
   a) Seasonal operations averaging
   b) Emergency engines < 100 hr/yr – remove
   c) Receptor exceedances caused by outside sources might be ok
      1. Proposed sources can not be significant contributor
      2. May need to make adjustments and rerun SIL model
      3. Short term standard? If not averaged over multiple years, consider time frame – project’s high concentrations may not occur at same time as exceedance
4. Emissions Source Changes
   a) Vendor guarantees vs. emission factors
   b) More accurate emissions estimation methods
   c) Alter stack parameters
   d) Relocate source
Questions?