Case Studies in Air Dispersion Modeling

Power Generation Projects

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Introduction

Air dispersion modeling is critical to power project siting

Modeling Overview

1. Emissions vs. impacts & the health standards
2. Modeling Inputs – what do you need?

Case studies

1. Distributed Generation Projects – Engine Projects
2. Screening vs. Refined Modeling – Three Mtn Power
3. PM10 Modeling -- Wildflower Larkspur Peaker

Air Dispersion Modeling

- Dispersion models are computer TOOLS
- Emissions vs. impacts – what counts?
- Air quality impacts from:
  - ✓ Criteria pollutant emissions
  - ✓ Air toxics -- health risk assessment
- Inputs and outputs
- "Screening" vs. "Refined" modeling

Model Inputs

- Emissions data
- Meteorological data
- Source release parameters (stack ht, etc.)
- Building downwash & terrain
- “Receptor” location information
- Model options

CASE STUDY #1

Distributed Generation -- Engines

Permitting Engines and Health Risk Assessment

- Gas engines with NSCR – small emissions, big problems
- Diesel engines – risky business?

Issues:

- Lack of air toxic emissions data
- Heavily populated areas
- Low stack heights
- Multiple engine projects
- Conservative risk assessments

Engines – Project Examples

Gas Engine Project – 1000 MW (5 units)

- Prime power and peak shaving
- Tale of two air districts – emissions and methods
- To pass or not to pass – need to test?

Diesel Engine Project – 1500 hp

- Peak shaving / PM controls after 10 hours

CASE STUDY #2

Screening vs. Refined Modeling

SCREENING MODELING: WHEN USED?

- **EPA Guidelines: Use screening modeling to demonstrate compliance**
- **If a source meets air quality standards, no refined modeling is required**
- **Refined modeling requires meteorological data**

Example: Three Mountain Power, Burney, CA

- ✓ **Local agency approved refined modeling**
- ✓ **Meteorological data was challenged**
- ✓ **CEC & local AQMD verified refined modeling results w/ screening modeling**

Default Meteorological Data

- Based on Turner's meteorological classification scheme
- Covers all possible combinations of wind speed & stability class
- May contain unlikely or unmeasured results

Example: D stability, 20 meters/second

- ✓ High downwash predicted from source/building relationship
- ✓ Intervenors argued existing data not conservative;
  Not enough calms and low wind speeds
- ✓ Maximum impacts predicted for high wind speeds
- ✓ D stability, 20 m/s never observed in existing data set

Scaling Factors

- **Recommended by U.S. EPA.**
- **Data below created from 1 hr average, screening Metdata results.**

3 Hour	**0.9**
8 Hour	**0.7**
24 Hour	**0.4**
Annual	**0.08**

- **Factors recognized as conservative by U.S. EPA**
- **Scaling factors may overestimate impacts by 2 to 10 times.**

Case Study Conclusions

- Screening modeling useful where no met. data is available.
- Three Mountain Power meets air quality requirements with both screening and refined modeling.
- Predicted impacts are highly conservative.

Case Study #3

PM10 Modeling

PM10 Standards

- **California has more stringent PM10 standards than U.S. EPA**

  Annual: 30 µg/m^3 vs. 50 µg/m^3

  24-Hour: 50 µg/m^3 vs. 150 µg/m^3

- **All California air basins/counties (except Lake County) are non-attainment for the CAAQS for PM10**
- **Most California air basins are in-attainment for the NAAQS for PM10**

Local Regulatory Agency Example
(Wildflower Larkspur Facility)

- Otay Mesa area is in attainment for the NAAQS for PM10, nonattainment for the CAAQS for PM10
- Evaluate: Will project cause a <u>new</u> exceedance of the CAAQS?

Local Regulatory Agency Example

(Wildflower Larkspur Facility)

- Identify maximum 24-hour impacts
- Eliminate days that standard already exceeded
- Maximum impacts typically do not occur during same conditions as maximum background

Conclusions

- Siting projects – must calculate impacts
- Air dispersion models are TOOLs
- Screening modeling fast way to assess impacts
- Modeling “difficulties” may arise
- Feasibility studies important – know your problems before you have them!