

# **How Can Electric Power Companies Respond to the SIPs Being Developed to Attain the 8-Hour Ozone and Annual Average PM2.5 NAAQS: Reactive or Proactive Strategies?**

**Presentation at the Electric Utilities Environmental Conference**

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**January, 2006**

# Introduction

- On July 18, 1997, EPA issued new National Ambient Air Quality Standards (NAAQS) for PM<sub>2.5</sub>:
  - **15 ug/m<sup>3</sup>** annual average based on a 3-year average
  - **65 ug/m<sup>3</sup>** based on 3-year average of the 98<sup>th</sup> percentile of the daily 24-hour concentrations

# Introduction

On July 18, 1997 EPA also issued a new NAAQS for the 8-hour ozone standard of **84 ppb** fourth highest daily rolling 8-hour concentration per year averaged over the most recent three years

# Introduction

- In April 2004, U.S. EPA issued its attainment designations for the 8-hour ozone NAAQS
- In January 2005, U.S. EPA issued its attainment designations for the PM<sub>2.5</sub> NAAQS

# Introduction

- Each state must submit its State Implementation Plan (SIP) for attaining the 8- hour ozone NAAQS by June 2007 and its SIP for attaining the PM<sub>2.5</sub> NAAQS by April 2008.

# Introduction

- These SIP revisions may impose **large new capital and operating costs on the electric power industry** beyond the costs of complying with the Clean Air Interstate Rule (CAIR)

# Introduction

- One approach an electric power company can take is the “**Reactive**” one of waiting until the draft proposed SIP is developed and then submitting comments for the state to consider in finalizing its SIP

# Introduction

- The other approach an electric power company can take is the “**Proactive**” one where the company works along side the state and Regional Planning Organization in SIP development.



# Introduction

- **Purpose of this presentation:**

Discuss ideas on what an electric power company can do to be **Proactive** in influencing SIP development for the 8-hour ozone and annual average PM<sub>2.5</sub> NAAQS

# Introduction

Following ideas are based on Enviroplan Consulting's ongoing work on SIP development for the 8-hour ozone and annual PM2.5 NAAQS for electric power companies with more than 65 coal and gas-fired electric generating units in several states.

# Introduction

Remainder of this presentation is divided into the two parts:

- **What Must States Do in SIP Development?**
- **What Can Electric Power Companies Do to Work Proactively in Influencing the SIP Development Process?**

# What Must States Do?

# What Must States Do?

- In October 2005, EPA issued its final guidance and regulations for states to use in developing their 8-hour ozone SIPs

# What Must States Do?

- States with their Regional Planning Organizations are developing and implementing their own Modeling Protocols based on the above U.S. EPA guidance to make the required Model Attainment Demonstrations in their SIPs

# What Must States Do?

## What is a Model Attainment Demonstration?

An air quality modeling analysis that demonstrates attainment of the NAAQS due to specified air pollution emission control scenarios to be included in the SIP

# **What Must States Do?**

## **What is a Modeling Protocol?**

The detailed air quality modeling procedures and data to be used to conduct the Model Attainment Demonstration



# What Must States Do?

## Tasks in a typical Modeling Protocol:

1. Develop the Base Year (2002) and Control Year (2009) emissions inventories covering most of U.S. for over 20 air pollutants affecting ozone and PM<sub>2.5</sub> concentrations
  - Large point sources (EGUs)
  - Several other categories of area and point sources

# What Must States Do?

- Base Year (2002) inventory is the actual 2002 emissions inventory
- Control Year emissions inventory begins with on-the-books controls including projections of how EGUs will comply with CAIR

# What Must States Do?

2. Develop multilayered (MM5) meteorological data for the analysis
3. Conduct a performance evaluation of the air quality model to obtain a validated model

# What Must States Do?

4. Apply the validated model in Sensitivity Analyses to evaluate the impact of changes in emissions by pollutant, area source category and point source category on changes in ambient concentrations

# What Must States Do?

## Examples of Sensitivity Analyses:

- Zero out EGU emissions in one or more Consolidated Metropolitan Statistical Areas (CMSAs)
- 50% reduction in NO<sub>x</sub> emissions from designated categories of area and point sources in designated areas

# What Must States Do?

## Examples of Sensitivity Analyses:

- 50% reduction in VOC emissions from designated categories of area and point sources in designated areas

# What Must States Do?

5. Select control scenarios to model with different mixes of regional and local emission reductions/controls for different pollutants, point and area source categories, and source types within each category

# What Must States Do?

6. Predict the Design Concentration resulting from each control scenario for the Base Year and the Control Year at receptors about each *existing air quality monitor site*



# What Must States Do?

Note: Design Concentration is the one to compare with the NAAQS to determine attainment status = 4<sup>th</sup> highest rolling 8-hour concentration per day averaged over three years

# What Must States Do?

7. For each monitor site, calculate the Relative Reduction Factor:

$$\text{RRF} = \frac{\text{Control Year predicted Design Concentration}}{\text{Base Year predicted Design Concentration}}$$

# What Must States Do?

8. Calculate the *Monitored Design Concentration* to use for SIP development as follows:

- Calculate the 4<sup>th</sup> highest daily rolling 8-hour concentration per year averaged over the 3-year period 2000-2002

# What Must States Do?

- Repeat the above step for the 3-year periods 2001-2003 and 2002-2004
- *Monitored Design Concentration* equals the average of the above three 3-year averages

# What Must States Do?

9. Predicted 2009 Design Concentration =

$RRF \times \textit{Monitored Design Concentration}$

# What Must States Do?

10. Conduct supplementary air quality data analyses using monitoring data as part of a “weight-of-evidence” approach

# What Must States Do?

11. In collaboration with the other states in the Regional Planning Organization, decide on what control strategies to adopt in the SIP for attainment of the NAAQS

# **WHAT CAN ELECTRIC POWER COMPANIES DO?**



# What Can Electric Power Companies Do?

The Regional Planning Organizations are :

- Developing the input data to the air quality model -- emissions, meteorology, receptors
- Conducting the model validation
- Running Sensitivity Analyses
- Developing Control Scenario options for the states

# What Can Electric Power Companies Do?

Each state must:

- Decide what control scenarios to actually consider
- Conduct the detailed modeling in each CMSA that is nonattainment
- Decide what local controls to adopt to demonstrate attainment

# What Can Electric Power Companies Do?

Electric power companies are taking one or both of the following two approaches to this SIP development work

# What Can Electric Power Companies Do?

## 1. **Reactive Approach**

Working individually or in *regional* electric utility groups with the Regional Planning Organization and State(s) to review and comment on their work

# What Can Electric Power Companies Do?

## 2. Proactive Approach

- Working along side the Regional Planning Organization and State(s) in SIP development
- Conducting the tasks in the Modeling Protocol in parallel to develop cost effective attainment strategies

# What Can Electric Power Companies Do?

Following are some of the Proactive Approaches an electric power company should consider undertaking

# What Can Electric Power Companies Do?

## **Task 1: EGU Emissions Evaluation for 2002**

1. Evaluate the accuracy of the Base Year 2002 emissions inventory for your company's EGUs using the:
  - Annual emissions from your 2002 Annual Emission Statement and hourly NO<sub>x</sub> and SO<sub>2</sub> emissions from your Electronic Data Reports
  - Actual 2002 BTU use by hour

# What Can Electric Power Companies Do?

## Task 1: EGU Emissions Evaluation for 2002

2. Compare the model input data and the actual 2002:
  - Annual emissions
  - Ozone season emissions
  - Hourly variation in emissions used by day of week and by month



# What Can Electric Power Companies Do?

## Task 1: EGU Emissions Evaluation for 2002

3. Obtain the actual stack height, inside diameter, exit temperature, exit velocity and (x,y,z) coordinate parameters and compare to the model input data

# What Can Electric Power Companies Do?

## Task 1: EGU Emissions Evaluation for 2002

Note: It is critical to examine the *actual input data files used in the modeling* in gram-moles per hour for gases, gram-moles for particulates and the stack gas exit parameters

# What Can Electric Power Companies Do?

## Task 2: EGU Emissions Evaluation for 2009

1. Develop your company projected 2009 emission rates by EGU using:
  - Projected 2009 SO<sub>2</sub> and NO<sub>x</sub> emission rates based on CAIR
  - Annual average 2002 or more recent year emission rates for other air pollutants with on the books controls in 2009

# What Can Electric Power Companies Do?

## Task 2: EGU Emissions Evaluation for 2009

2. Provide your internal projections of BTU use by hour by EGU in 2009
3. Apply the hourly BTU use to the average emission rates to determine the hourly emission rates

# What Can Electric Power Companies Do?

## Task 2: EGU Emissions Evaluation for 2009

- Compare the model input data and the actual 2009:
  - Annual emissions
  - Ozone season emissions
  - Hourly variation in emissions used by day of week and by month

# What Can Electric Power Companies Do?

## Task 2: EGU Emissions Evaluation for 2009

5. Obtain the actual stack gas exit parameters and compare to the model input data

# **What Can Electric Power Companies Do?**

**Task 3: Evaluate the Emissions for Other  
Source Categories for 2002 and 2009**

# What Can Electric Power Companies Do?

## Task 4: Conduct Sensitivity Analyses

There are an **extremely large number** of combinations of possible control scenarios by:

- Individual EGU
- Other source categories
- Geographic region (grid cells) for emission reductions
- Percent emission reductions by pollutant



# What Can Electric Power Companies Do?

## Task 4: Conduct Sensitivity Analyses

- Run a carefully selected set of Sensitivity Analyses to determine the gradient in Design Concentration with emission reductions for various source categories in various geographic area

# What Can Electric Power Companies Do?

## Task 4: Conduct Sensitivity Analyses

Review Sensitivity Analysis results to develop Control Scenarios with the potential for attaining the NAAQS in a cost effective way

# What Can Electric Power Companies Do?

**Task 5:** Conduct the complete set of air quality modeling analyses required to make a Model Attainment Demonstration for the SIP using the Control Scenarios identified in Task 4

# What Can Electric Power Companies Do?

**Task 6:** Conduct supplementary air quality data analyses using monitoring data as part of a “Weight-Of-Evidence” approach

# What Can Electric Power Companies Do?

**Task 7:** Work *collaboratively* with your state(s) to corroborate the cost effective control scenario(s) developed in Task 5 and adopt them in the SIP

# Conclusions

Electric power companies have only **17 months** until the SIPs for the 8-hour ozone NAAQS are to be completed and submitted to EPA

# Conclusions

Electric power companies have only **27 months** until the SIPs for the annual average PM<sub>2.5</sub> NAAQS are to be completed and submitted to EPA

# Conclusions

If you want to take a **Proactive** approach to developing a cost effective SIP for your EGUs, you must start working with your Regional Planning Organization and State(s) as soon as possible to carry out the tasks discussed in this presentation