OPERATING IN A WORLD OF NONATTAINMENT: NATIONAL AMBIENT AIR QUALITY STANDARDS AND IMPLICATIONS FOR ENERGY DEVELOPMENT

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EPA establishes National Ambient Air Quality Standards ("NAAQS")

- **Primary NAAQS**: standards necessary to protect public health
- **Secondary NAAQS**: standards necessary to protect public welfare

EPA required to review NAAQS at 5-year intervals
States implement measures (i.e., SIPs) to meet NAAQS

Basic SIP Elements:

- Emission limitations; control measures
- Methods to monitor, compile, and analyze ambient air quality data
- Stationary source permitting program
- Enforcement measures
New or revised NAAQS triggers state requirement to recommend areas be designated as either attainment, nonattainment, or unclassifiable (within 1 year).

- Each area designated separately for each criteria pollutant.

EPA must then make final designations “as expeditiously as practicable” (no later than 2 years after new or revised NAAQS)

EPA can modify state recommendations as appropriate
CLEAN AIR ACT OVERVIEW – AREA REDESIGNATIONS

- Areas may be redesignated by one of two ways:
  - (1) By EPA based on “available information”
  - (2) By state recommendation.

- Limitations: Cannot designate area from nonattainment to unclassifiable. To designate area from nonattainment to attainment, EPA must:
  - Determine area has attained NAAQS;
  - Fully approved the applicable SIP for the area;
  - Determine that the improvement in air quality is due to permanent and enforceable reductions in emissions; and
  - Fully approve a maintenance plan for the area.
Nonattainment designation generally triggers requirement to revise SIP (3 years to revise)

Basic Nonattainment SIP Requirements:

- RACM and RACT implementation (i.e., increased state emission control requirements for existing and new stationary sources)
- Emissions inventory
- “Reasonable further progress” requirements
- Nonattainment NSR program
- Contingency measures
### CLEAN AIR ACT OVERVIEW – NONATTAINMENT SIPS (OZONE)

#### OZONE NONATTAINMENT AREA REQUIREMENTS

<table>
<thead>
<tr>
<th>Classification</th>
<th>NA NSR</th>
<th>Major Source Threshold (VOC and NOx)</th>
<th>Major Modification Threshold (VOC and NOx)</th>
<th>Offset Ratio</th>
<th>SIP Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marginal</td>
<td>Yes</td>
<td>100 tpy</td>
<td>40 tpy</td>
<td>1.1:1</td>
<td>Emissions inventory; NSR permit program; Periodic inventories</td>
</tr>
<tr>
<td>Moderate</td>
<td>Yes</td>
<td>100 tpy</td>
<td>40 tpy</td>
<td>1.15:1</td>
<td>Meet all Marginal requirements; 15% VOC reduction in 6 years; RACT catch-up</td>
</tr>
<tr>
<td>Serious</td>
<td>Yes</td>
<td>50 tpy</td>
<td>25 tpy</td>
<td>1.20:1</td>
<td>Meet all Moderate requirements; Reduce VOCs 3% annually for years 7 to 9; Enhanced monitoring requirements</td>
</tr>
<tr>
<td>Severe</td>
<td>Yes</td>
<td>25 tpy</td>
<td>25 tpy</td>
<td>1.30:1</td>
<td>Meet all Serious requirements; Emission fee penalties on sources if area does not meet required reductions</td>
</tr>
</tbody>
</table>

CLEAN AIR ACT OVERVIEW – ATTAINMENT DATES

- Nonattainment areas generally required to come into attainment as expeditiously as practicable (no later than 5 years). Can be extended in limited circumstances.

- Specific deadlines for certain criteria pollutants (e.g., Ozone)
  - Marginal – 3 years
  - Moderate – 6 years
  - Serious – 9 years
  - Severe – 15 years
  - Extreme – 20 years

- Failure to attain standard results in “bump up” to the next ozone classification.
NONATTAINMENT NSR PERMITTING

- Reduced Major Source Thresholds
  - 100 tpy (for nonattainment pollutant)
  - Reduced thresholds for certain NAAQS (e.g., ozone and PM)
  - Reduced “modification” significance thresholds

- Lowest Achievable Emissions Rate
  - Specified as numeric emissions limit and emissions rate
  - Generally, equivalent to the most stringent emissions limitation found in a SIP for the same class or category of source
  - LAER Resources – SIP limits, permits, and BACT/LAER Clearinghouse
  - LAER can never be less stringent than a NSPS control requirement
  - Generally no consideration of economic, energy, or environmental factors.
Emission Offsets

- Surplus, enforceable, permanent, and quantifiable
- Generally must be obtained from same or nearby nonattainment area (area contributing to nonattainment and same or higher classification)
- Generally applicable only to major sources
- Pollutant specific

How?

- Reduce emissions elsewhere at the source or other sources (e.g., emission reductions not required by (or below) federal/state standards; voluntary acceptance of LAER; shutdown/curtailment)
- Use or purchase banked Emission Reduction Credits
OZONE PROSPECTIVE NONATTAINMENT AREAS – OZONE ADVANCE

- Introduced in April 2012.
- Primary purpose to preserve and improve air quality in ozone attainment areas at risk of being designated nonattainment.
- Areas designated unclassifiable/attainment eligible to participate. Areas eventually designated “marginal” can continue to participate.
- Offers states, tribes, and local governments opportunity to work in partnership with EPA to develop emission reductions measures, inventories, modeling and data analysis, and emission control requirements.
OZONE PROSPECTIVE NONATTAINMENT AREAS – OZONE ADVANCE (CONTINUED)

- Participation no guarantee to avoid nonattainment designation
- No exemption from Nonattainment SIP requirements
- Essentially, no special treatment for areas participating in program
- Benefits?
  - Avoid nonattainment designation or higher classification
  - Ensure more timely attainment of standard if designated nonattainment
  - Meet Reasonable Further Progress goals (i.e., lower baseline or show progress toward attainment)
  - EPA may take into consideration in determining whether to redesignate the area as nonattainment
OZONE PROSPECTIVE NONATTAINMENT AREAS – UTAH'S UINTAH BASIN PERMITTING GUIDANCE


- Applicable to state lands in Uintah Basin (Uintah and Duchesne Counties). Currently designated “unclassifiable,” but anticipated to be designated nonattainment in near future.

- Not applicable to permit applications in public comment before February 1st, provided no substantive adverse public comments received.
UDAQ will not issue an approval order under UAC R307-401 for a new or modified stationary source of VOC emissions in Uintah or Duchesne county unless the owner/operator has satisfactorily demonstrated that the source will not contribute to a potential violation of the ozone NAAQS.

How to Demonstrate:

- Pre-approved photochemical ozone modeling;
- VOC Emissions Offsets (ratio – 1:1); or
- Alternate demonstration. Evaluated and approved by UDAQ on a case-by-case basis.
Offset (ERC) Criteria:

- Surplus, permanent, quantifiable, and enforceable.
- ERCs generated in Duchesne or Uintah counties can be used in both.
- ERCs generated in Indian Country will be accepted provided emission reductions are enforceable by EPA.
- Legal review of alternative enforcement mechanisms required. Will likely delay approval order.
- Look-back period to January 1, 2011 to calculate ERCs. Baseline determined when source applies to register ERCs.
- No inter-pollutant trading allowed at this time.
OZONE NAAQS REVIEW – POTENTIAL CONSEQUENCES

- EPA currently reviewing ozone NAAQS. Proposed new standard likely out in late 2013
- New standard? 60 – 70 ppb. EPA final draft in 2011 was 70 ppb. Ultimately withdrawn
- Are designations likely finalized sometime between 2016 and 2018
- 70 ppb 8-Hour Standard – Potential Classifications:
  - Marginal 71 - 81 ppb
  - Moderate 81 to 93 ppb
  - Serious 93 to 105 ppb
  - Severe 105 to 163 ppb
  - Extreme 163 ppb and above
Final Designations
- Unclassifiable / Attainment
- Unclassifiable
- Nonattainment (Partial County)
- Nonattainment (Whole County)

Notes:
EPA has not designated as nonattainment any areas outside the Continental US.
OZONE NAAQS REVIEW – POTENTIAL CONSEQUENCES

North American shale plays
(as of May 2011)

Source: U.S. Energy Information Administration based on data from various published studies. Canada and Mexico plays from ARI. Updated: May 9, 2011
**NAAQS LITIGATION UPDATE**


- **Uintah Basin** – pending challenge in D.C. Circuit to EPA’s decision to classify as “unclassifiable” based on lack of 3 years of regulatory monitoring data.

- **PM₂.₅** – EPA must implement standard under more stringent provisions of Subpart 4 of Part D of Title I of the CAA. *Natural Resources Defense Council v. EPA*, No. 08-1250.
STRATEGIES/CONSIDERATIONS – OPERATING IN A NONATTAINMENT AREA

- Facility design – account for lower major source thresholds
- Application requirements and potential delays (e.g., modeling required?)
- What is LAER? What emission controls required?
- Offsets available?
  - Purchase/bank
  - Other sources at which to reduce emissions? Shutdown/curtail?
  - Accept stricter emission control requirements?
  - Consider voluntary programs or alternative emission control technology?
- Existing operators – be aware of reduced major source threshold
STRATEGIES/CONSIDERATIONS – OPERATING IN A PROSPECTIVE NONATTAINMENT AREA

- Accelerate development plans?
- Offsets? Bank?
- Delay emission reductions (e.g., shutdowns/curtailments; new control measures; new technologies/programs)?
STATUS OF NAAQS REVIEWS

- **Ozone**
  - Current 8-hour standard (75 parts per billion) established in 2008
  - Current review to be finalized in 2013
  - New standard expected in 2014

- **Particulate Matter - PM\(_{10}\) and PM\(_{2.5}\)**
  - Review completed in 2010
  - New annual PM\(_{2.5}\) standard (12 micro-grams/cubic meter) announced December 2012
STATUS OF NAAQS REVIEWS

- Nitrogen Dioxide (NO₂)
  - Review completed in 2010
  - Retained annual standard (53 ppb)
  - Instated new 1-hour standard (100 ppb)
  - New review cycle started in 2012

- Sulfur Dioxide (SO₂)
  - Review completed in 2009
  - Revised primary 1-hour standard to 75 ppb
  - Revoked annual and 24-hour standards
AIR QUALITY MODELS – WHAT ARE THEY?

- Computer algorithms for simulating emissions, transport, dispersion, chemical transformation and deposition of primary and secondary pollutants

- Three major types:
  - Plume model – dispersion estimated using Gaussian equation
  - Puff model – follows air parcels along trajectory
  - Photochemical grid model – uses fixed set of grid cells
Plume models developed in late 1960s to simulate dispersion of single sources – e.g., power plants

Puff models developed in 1970s to simulate dispersion over longer distance/time scales

Photochemical grid models developed in 1970s for ozone planning and mandated by 1990 CAA for State Implementation Plan (SIP) development for ozone nonattainment areas
**AIR QUALITY MODELING BASICS**

- **Plume Models**
  - Simulate plume rise, transport, dispersion and deposition
  - Applied for near-field single- or multi-source assessments
  - Treat sources as point, volume or area sources
  - Simulate criteria pollutants and HAPs
Plume Models

- Limited in treatment of photochemistry & secondary particulate matter/aerosol formation

- Typically used for single-source assessments: permitting, PSD, NSR

- Example - AERMOD
Puff Models

- Can simulate effects of complex terrain, calm winds & land/sea breezes on transport and dispersion
- Limited in treatment of photochemistry & secondary particulate matter/aerosol formation
- Used to simulate toxic releases
- Examples – CALPUFF, MESOPUFF II
Photochemical Grid Models

- Originally included chemical mechanism to simulate photochemistry for ozone production
- Used since 1990s for ozone SIP development throughout U.S. (e.g., Denver, Houston, Atlanta, Memphis, etc.)
- Also used for CO and PM$_{10}$ SIPs
- Current models are “one atmosphere” models designed to simulate ozone and secondary aerosols (PM$_{2.5}$)
- Used recently by RPOs (WRAP) for regional haze SIPs
Photochemical Grid Models (continued)

– Used to support energy resource development EIS’s
  – Regional impacts on criteria pollutants
  – AQRV’s for deposition and visibility

– Examples:
  – CMAQ – Developed by EPA from MODELS3 program
  – CAMx – Similar to original UAM/UAM-V models
  – CALGRID – Developed originally for California ARB
EXAMPLE NATIONAL-SCALE MODELING DOMAIN
EXAMPLE OF GRIDDED EMISSIONS

NOx

CMAQ 36km Grid
2030ec all

Tons

July 15, 2002 0:00:00
Min = 0.000 at (1,1), Max = 407.375 at (43,96)
EXAMPLE OF SIMULATED OZONE

CMAQ 36km Domain
Daily Max 8-Hr Avg Conc (2030 DIA Alt 1)

June 15, 2005 0:00:00
Min = 21 at (24,94), Max = 93 at (128,56)
ENERGY DEVELOPMENT NEPA PROJECTS – AIR QUALITY MODELING

- Continental Divide – Creston
- Moxa Arch Area Infill
- LaBarge
- Hiawatha
- Normally-Pressured Lance (NPL)
- Beaver Creek
- Bird Canyon
- Moneta Divide
- Powder River Basin I and II
- Eagle Prospect/Noble Basin
- Greater Natural Buttes (Utah)
- GasCo (Utah)
Designated a “Marginal” nonattainment area by EPA – April 2012

High wintertime ozone concentrations associated with snow cover, high pressure, calm winds, strong temperature inversion conditions

WDEQ’s 2008 Interim Permit Policy mandated emission offsets for new sources (VOC - 1.5:1; NOx - 1.1:1)

SIP due in 2015

WDEQ examining use of models for wintertime ozone
NEPA EIS for Encana’s NPL project in Sublette County, Wyoming

BLM requires near- and far-field modeling analyses for natural gas development project – 3500 wells
• Objective: To quantify project-specific air quality impacts on criteria pollutants, visibility, and deposition for EIS

• Modeling tools:
  – AERMOD (near-field modeling)
  – CMAQ (far-field modeling)
  – WRF (meteorological inputs)
  – SMOKE (emission inputs)
NEAR-FIELD AIR QUALITY MODELING

- Impacts within ~ 5 km of project area
- Criteria pollutant impact assessment (compliance with NAAQS and WY AAQS for PM$_{10}$, PM$_{2.5}$, NO$_2$, SO$_2$ and CO)
- HAPs assessment (short- and long-term exposures)
- Construction, drilling, and production phases (reasonable maximum emission year impacts)
FAR-FIELD AIR QUALITY MODELING

- Impacts within a broad geographic region, including Class I and sensitive Class II areas (within ~ 500 km of the project area)

- Criteria pollutant impact assessment
  - Compliance with NAAQS and WY AAQS (ozone, PM$_{10}$, PM$_{2.5}$, NO$_2$, SO$_2$ and CO)
  - PSD increment analysis (non-regulatory)

- AQRV assessment
  - Visibility
  - Atmospheric deposition (and lake chemistry)
NPL EIS REGIONAL MODELING STUDY COMPONENTS

- Protocol
- Project-specific emissions inventory
- Meteorological inputs (for 2008)
- Base-year regional emission inventory
- Base-year modeling analysis/performance evaluation
- Future-year regional emission inventory
- Future-year modeling analysis/assessment of alternatives
REGIONAL NESTED MODELING DOMAIN FOR NPL

12-Km grid

4-Km grid
FUTURE-YEAR MODELING CONSIDERATIONS

- Future year (2022) selected to represent maximum project emissions

- Future-year emissions incorporate
  - Net changes in emissions due to RFD, RFFA, retirements/shutdowns, fleet and engine turnover, switch to electrification
  - Project specific emissions (“action” alternatives only)

- Scenarios include
  - Future-year baseline (“no-action” alternative)
  - Proposed action
  - Alternative scenario(s)
AIR QUALITY RELATED CHALLENGES FACING ENERGY DEVELOPMENT IN SUBLETTE COUNTY

- General Conformity
  - Annual assessment of non-permitted sources

- Compatibility with WDEQ’s 2008 Interim Permit Policy and future SIP

- Obtaining emission offsets
  - VOC - 1.5:1
  - NOx - 1.1:1