

Best Available Control Technology for Greenhouse Gas Emissions Sources

Clean Air: Law, Policy, and Practice
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What I Will Cover in this Presentation

- ▶ A little background: what did we expect?
- ▶ General comments
- ▶ Specific permits—EPA letters
- ▶ Specific comments from the EPA letters
- ▶ Important points
- ▶ What can we expect going forward?

A Little Background

- ▶ April 2, 2007 Supreme Court Decision
- ▶ December 7, 2009 EPA Endangerment Finding
- ▶ March 29, 2010 Johnson Memorandum
- ▶ April 1, 2010 LDV Emissions Rule
- ▶ June 3, 2010 EPA Tailoring Rule
- ▶ All of the Above added up to Large Emitters of GHGs being subject to PSD and Title V as of January 1, 2011

A Little Background

- ▶ CAAAC Workgroup Convened with Reports available at:
<http://www.epa.gov/air/caaac/climatechangewg.html>
- ▶ EPA GHG Permitting Guidance available at:
<http://www.epa.gov/nsr/ghgpermitting.html>
- ▶ EPA Slide Presentation on Guidance at:
http://epa.gov/air/oaqps/eog/video/pdfs/GHGP_ermitttingGuidance_Nov18&19Webinars.pdf
- ▶ Greenhouse Gas Permit Training, December, 2010 at:
<http://www.epa.gov/apti/broadcast2010.html#GHGTraining1210>

What did we Expect?

- ▶ Top-Down BACT process or equivalent
- ▶ Energy Efficiency would be the key to BACT for GHGs
- ▶ Terms and conditions in permits that expressed the energy efficiency as BACT would have to be worked out
- ▶ Trade offs between GHG emissions and criteria pollutants would be examined
- ▶ Challenges to permits and decisions would go forward

Important Points

Going into the year of permit reviews

- ▶ Follow the Process
 - Top-Down BACT
 - Concentrate your BACT analysis for GHGs on energy efficiency
- ▶ Document Your Decisions
 - Consideration of Alternative Processes
 - Consideration of Carbon Capture and Storage
- ▶ Formally Respond to Comments on the Record

Five-Step Top-Down BACT Process

- ▶ Identify all available control technologies
- ▶ Eliminate technically infeasible options
- ▶ Rank remaining technologies
- ▶ Evaluate most effective controls
 - Economic, Energy, Environmental effects
- ▶ Select BACT

Alternate Boilers/Processes or Fuels

- ▶ Should be identified and evaluated
- ▶ The source choice should be carefully documented, especially when there are cleaner, more efficient alternatives
- ▶ Source re-definition is not required (fuel switches are re-definition)
- ▶ Efficiency analysis can be on a equipment, process, or facility level

Carbon Capture and Storage

- ▶ Should be evaluated for most very large sources, certainly for any new Coal-fired EGU
- ▶ Likely can be eliminated from BACT in step 4, considering economics
- ▶ Documentation is key

So, What has been our Experience?

- ▶ Implementing GHG Permitting – Questions and Answers at:

<http://www.epa.gov/nsr/ghgqa.html>

- ▶ EPA Comment Letters on Proposed GHG Permitting Actions at:

<http://www.epa.gov/nsr/ghgcomment.html>

EPA Comment Letters on GHG Permitting Actions

Date	Comment Letter
▶ 01 / 07 / 2011	<u>Nucor Iron</u>
▶ 03 / 04 / 2011	<u>Pacificorp-Lakeside</u>
▶ 03 / 04 / 2011	<u>WE Rothschild</u>
▶ 04 / 01 / 2011	<u>Hyperion Refinery</u>
▶ 04 / 01 / 2011	<u>Abengoa Bioenergy</u>
▶ 05 / 06 / 2011	<u>MidAmerican Energy – George Neal South</u>

EPA Comment Letters on GHG Permitting Actions

Date	Comment Letter
▶ 05/19/2011	<u>Wolverine Power – Rogers City</u>
▶ 06/22/2011	<u>Effingham County Power</u>
▶ 06/30/2011	<u>US Steel Keetac</u>
▶ 07/29/2011	<u>Cricket Valley Energy</u>
▶ 08/08/2011	<u>U.S. Nitrogen</u>
▶ 08/10/2011	<u>Crawford Renewable Energy</u>
▶ 08/16/2011	<u>Showa Denko</u>
▶ 09/12/2011	<u>Abengoa Bioenergy</u>
▶ 09/15/2011	<u>Elizabethtown Energy and Lumberton Energy</u>
▶ 09/16/2011	<u>MyPower Lakeside Energy</u>

EPA Comment Letters on GHG Permitting Actions

- | Date | Comment Letter |
|--------------|--|
| ▶ 10/17/2011 | <u>Beaver Wood Energy – Fair Haven</u> |
| ▶ 10/19/2011 | <u>Hoosier Energy – Merom</u> |
| ▶ 10/27/2011 | <u>Kennecott Repowering Project</u> |
- ▶ Plus, there is now an EPA draft permit at:
http://www.epa.gov/earth1r6/6pd/air/pd-r/ghg/lcra_draftpermit.pdf

From the Letters

- ▶ Summary of important points
- ▶ Issues identified
- ▶ Typical comment language from the letters
- ▶ Suggested language when available

Summary of Important Points

- ▶ Establish BACT numerical limits for CO_{2e}
- ▶ Include all the GHG emissions sources in the BACT determination
- ▶ Include all the GHG emissions in the limits
- ▶ Include startup and shutdown emissions in the BACT limit
- ▶ Document all your decisions, emissions calculations, compliance methods, etc.

BACT Numerical Limit

Early Lesson Learned

- ▶ EPA encourages permitting authorities to consider establishing an output-based BACT emissions limit, or a combination of output- and input-based limits, wherever feasible and appropriate to ensure that BACT is complied with at all levels of operation
- ▶ Averaging time for limit should be consistent with the compliance assurance method
- ▶ CO₂ continuous emission monitors should be considered, but remember the other GHGs
- ▶ Address emissions during startup and shutdown

CO_{2e} Limit

- ▶ CO_{2e} limits should be specified in numerical terms and should be accompanied with appropriate compliance monitoring requirements
- ▶ CEMS for CO₂ emissions from large combustion sources appears to be a common requirement

CO_{2e} Limit

- ▶ “As stipulated by the definition of BACT, the permit should contain ‘an emissions limitation ...based on the maximum degree of reduction for each pollutant subject to regulation under the CAA which would be emitted...’”
- ▶ “...a permit may contain an operational standard, in lieu of a numerical BACT emissions limit, if the permit record demonstrates that a numerical limit is infeasible, and the operational standard is practically enforceable.”

CO_{2e} Limit

Permit Language

- ▶ “Total annual CO_{2e} emissions from the three combined-cycle units shall not exceed 3,576,943 tons per rolling 12-month period. Each combustion turbine shall install CO₂ CEMS, or alternative method as specified under 40 CFR 75, to demonstrate compliance with this combined limit.”

Other GHG Emissions

- ▶ Don't neglect BACT limits for other GHG emission points (other than the main source of CO₂ emissions)
- ▶ “The BACT analysis does not appear to consider GHG emissions from the fire pump and emergency generators. Please revise the BACT analysis to address the emissions from these additional combustion units.”

Other GHG Emissions

- ▶ “CO₂ CEMS do not monitor some of the GHG pollutants that contribute to the total CO_{2e}. The permit needs to specify how to determine the quantity of other GHG pollutants to add to the CO₂ to get the total CO_{2e}, or alternatively, provide a methodology or analysis for using CO₂ emissions as a basis for determining the CO_{2e} emissions.”

Other GHG Emissions

- ▶ “Sections ... briefly describe the CO₂ emissions from the auxiliary boiler and fuel gas heater, respectively. However, BACT is required on all emission units, and these sections do not include a BACT analysis or limit for either unit. While we do not expect the applicant to look at add-on control technologies (such as CCS) for these smaller units, the applicant should perform a BACT analysis to assess the efficiency of both ... and establish a BACT limit ...”

CO₂ Limit Permit Language

- ▶ “Total CO_{2e} emissions from the four black-start generators shall not exceed 4,822 tons per year rolling 12-month period. The CO₂ emissions from these units shall be monitored through fuel usage.”

Startup and Shutdown Emissions

- ▶ Startup and shutdown emissions must be addressed in the BACT analysis
- ▶ PSD analysis must include these emissions

Startup and Shutdown Emissions

- ▶ “Please affirm that the CO_{2e} emissions during startup and shutdown must be included in the compliance calculation for the CO_{2e} BACT limits.”
- ▶ “Where MPCA determines that the startup and shutdown emissions cannot meet the BACT limit, secondary BACT limits or work practices for those specific periods should be established.”

Startup and Shutdown Emissions

Cautionary Note

- ▶ The EPA recommends that such secondary limits or work practices (for SSM BACT) be justified as BACT and that all PSD requirements, including compliance with NAAQS and PSD increments, are met.

Documentation

- ▶ BACT determinations are made at the State/Local agency level. As long as the approved process (Top-Down BACT) is followed and the decisions carefully documented, the BACT determination should withstand challenge
- ▶ Documentation is vital to a defensible permit

Documentation

- ▶ “Please clarify why oxidation catalyst is technically infeasible due to the potential of catalyst poisoning.”
- ▶ “Please provide an explanation of the GHG BACT decision-making process, and how these emission units and control devices were chosen...”
- ▶ “We suggest Appendix B be expanded to clearly explain all the emission calculations.”

Documentation

- ▶ “...it remains EPA’s position that the derivation of costs for the BACT analysis should be fully documented in the permit record.”
- ▶ “DENR’s statement of basis should explain, for each refinery system, how the potential CO_{2e} emissions and the proposed BACT emission limit were calculated, or cross-reference where this information can be found in the applicant’s analysis.”

Documentation

- ▶ “The cost analyses in table 4-4 through 4-7 do not appear to be consistent with the EPA cost manual. While variation from the cost manual is allowed, the basis for the variation needs to be documented.”
- ▶ “Please clarify what control options are being evaluated (e.g. nonselective catalytic reduction (NSCR), catalytic decomposition, etc.).”

Miscellaneous Issues

- ▶ The emission limits specified in permit terms and conditions do not match the limits expressed in tables or modeling appendices
- ▶ BACT is expressed as a workpractice but parametric monitoring is not specified
- ▶ Recordkeeping requirements are not specified
- ▶ The possibility of increased emissions due to debottlenecking is not addressed

Miscellaneous Issues

- ▶ More stringent limits are found in existing permits and are not addressed in the BACT analysis
- ▶ Control options are dismissed without proper analysis (carbon capture and storage should always be considered)

In Conclusion

- ▶ The BACT process appears to be working
- ▶ Energy efficiency is the standard BACT determination, but must be expressed in a limit
- ▶ CO_{2e} limits should be expressed in numerical terms and should:
 - Include compliance monitoring (CO₂ CEMS on large combustion sources) and test methods
 - Address emissions during startup and shutdown
 - Include all emission sources and all GHGs

In Conclusion

- ▶ Follow the SIP approved process (usually Top-Down BACT process)
- ▶ Document all decisions
- ▶ Include all emissions calculations and assumptions
- ▶ Address public comments in the record

What can we expect Going Forward?

- ▶ Of course there will be legal challenges and court decisions
- ▶ Compliance issues will arise (what happens when a source exceeds its 12-month rolling limit?)
- ▶ Limits will be compared and challenged
- ▶ GHG control equipment will be developed and applied