ISSUE GROUP 2 (Technical Feasibility)

Issue Group 2 addressed technical feasibility considerations of potential greenhouse gas (GHG) control technologies in context with performing a BACT analysis. The deliberations focused on three questions and some examples of specific technologies. There were three over-arching consensus recommendations developed. Consensus and non-consensus areas were also developed by the Issue Group and through deliberations with the balance of the Work Group.

Recommendations

1. EPA should expand the RACT-BACT-LAER Clearinghouse (RBLC) to include information on greenhouse gases (GHGs) regarding construction status, controls installed, performance data, and compliance test results, including data on operating conditions during testing. The EPA Office of Research & Development (ORD) GHG mitigation database should be similarly expanded and should include information on foreign sources. EPA should convert data where necessary to ensure a consistent format.

2. EPA should explore ways to encourage the use of innovative GHG control technologies.

3. EPA should provide guidance regarding evaluating energy efficiency in a BACT analysis on a sector by sector basis.

Issue Group Questions

I. What are the general criteria for determining whether or not a potential control technology is technically feasible for consideration as BACT?

a. Areas of Consensus:

Current EPA policy is set forth in the 1990 Draft NSR Workshop Manual. Although that is a draft guidance document, it represents longstanding Agency policy and provides useful guidelines for evaluating the technical feasibility of GHG control technologies. For example, at page B.17, the manual states, "if the technology *has been installed and operated successfully on the type of source under review*, then it is demonstrated, and it is technically feasible." (Emphasis added).[1] The current EPA RBLC provides a starting point for the identification of candidate control technologies. The RBLC contains only permitting information and should be updated with verifiable control technology performance data. EPA should expand the RBLC to include details regarding construction status, controls installed, performance data, and compliance test results, including data on operating conditions during testing. This additional information would be useful in determining whether specific controls have in fact been installed and whether they have successfully demonstrated compliance with specific emission limitations identified as BACT.

EPA policy also recommends that the list of potential control techniques identified at Step 1 of the BACT analysis include LAER controls, and that the applicant should go beyond the RBLC, investigating innovative control technologies and technology transfer

[1] See also pages B.7, B.10, and B.17-B.22.

opportunities, from both foreign and domestic sources. The RBLC currently contains detailed information only on domestic sources. Both the RBLC and the ORD GHG Mitigation Measures Database being developed by EPA should include information on domestic and international technology development. Information for international sources sometimes is difficult to obtain, can be challenging to verify, and may not be directly comparable to information for U.S. sources. EPA should obtain such information and convert it to a consistent and comparable basis for optimum use with the RBLC. When evaluating control technology information for either domestic or international sources, it is important to consider the full picture: whether a technology is only in the development stage, whether it has been applied commercially, on how many sources it has been installed, and what level of performance has been achieved and for what period of time. The scope of the technical evaluation should be manageable and focus on measures that could result in significant GHG reductions. Where alternative production processes have been identified that could potentially fulfill the stated business purpose, those processes can be included in the BACT analysis.

Current EPA policy included in the Draft Manual states that technical feasibility is evaluated at Step 2 of the top-down BACT process, and that at that step the applicant must demonstrate that a Step 1 list technology (or other technique, system, process, or combination of all of these) is infeasible, in order to eliminate it from further consideration. Among the factors that play into that analysis is the question of whether a technology is demonstrated on the source type under review. If it is not, then questions regarding availability (commercially available) and applicability (can it reasonably be installed and operated or used at the source) should be considered. A technology is feasible if it has been demonstrated in practice or is available and applicable. A technology is applicable if it can reasonably be installed and operated on the source type under consideration. This analysis is to be fact-based – empirical data should be evaluated concerning these questions – the "determination" must be made on the basis of actual information. A source should not be required to perform new stack tests to determine the feasibility of a technology, but should be able to prove the infeasibility of its application with available information. Based on current EPA policy, technologies must be available within the time frame of permit issuance in order to be evaluated as BACT. The permitting authority may require the applicant to address the availability and applicability of a new or emerging technology based on information that becomes available during the consideration of the permit. Physical changes needed to resolve the technical difficulties do not in and of themselves provide justification for finding technical infeasibility. The cost of such modifications (or other economic impacts associated with the application of the technology) are cost and economic factors which are considered at Step 4 and after that analysis is done may form the basis for eliminating a control technology as the basis for BACT at that step.

Consistent with the 1990 Draft NSR Manual, a control technology should remain under consideration if it has been applied to a similar chemical and physical exhaust gas stream. The applicant is responsible for demonstrating that a potential control measure is technically infeasible and the permit issuing authority is responsible for the decision on what is and is not technically feasible on a case-by-case basis.

b. Areas of Non-Consensus:

1. Consensus could not be reached on the role and value of commercial guarantees in determining whether production processes and control technologies are technically feasible. Some members view that a commercial guarantee (or lack thereof), alone, is not sufficient evidence of the technical feasibility or infeasibility of a control technology or production process.

   Applicants view the commercial availability of a process or control as a minimum threshold for including those candidates in the pool of potential technologies at Step 1 of the BACT process. An applicant generally is not in the control technology development business, and must be able to provide its investors and lenders with reasonable assurances that the proposed facility will reliably perform its intended function and consistently meet the proposed permit limits. For developing technologies or those that have not been applied to the type of source the applicant proposes to build, the lack of commercial guarantees may be evidence that the technology is not yet "demonstrated in practice" and can be eliminated at Step 1 or Step 2 of the BACT process.

   For demonstrated technologies, the role of commercial guarantees may be evidence of the level of performance that can be achieved, and the circumstances under which that level of performance has been demonstrated. Assurances of specified levels of performance may come in the form of commercial performance guarantees from equipment vendors. These guarantees can take a number of different forms, and provide varying degrees of assurance. For example, certain equipment vendors will provide only a performance testing guarantee, one that is based on a single carefully controlled test of the newly installed equipment at optimum operating conditions. Some guarantees are backed only by the payment of a limited amount of money as "liquidated damages," while others are backed by a commitment to make alterations and repairs necessary to achieve the promised level of performance. All of these factors are typically considered by the permit applicant when proposing a specified emission limit or level of performance for the controls. This information, as well as BACT emission rates for other recently permitted sources and other information, should be considered at Step 5 of the BACT analysis, but is not specifically relevant to the question of technical feasibility.

II. What is meant by "demonstrated in practice" and how does this factor into the determination of technical feasibility?

a. Areas of Consensus:

The 1990 Draft NSR Workshop Manual provides guidance on determining when a technology has been demonstrated in practice and the implications of that for the BACT analysis. For example, page B.17 of the manual notes "if the technology has been installed and operated successfully on the type of source under review, then it is demonstrated, and it is technically feasible." Demonstrated in practice generally means that an available process or control technology has been used in a production situation, and has been demonstrated to be successful at achieving the claimed performance. In such a case, the control option is technically feasible for consideration in the BACT analysis. Bench scale and pilot plant trials alone are generally not sufficient, but may supplement other experience. Use on a smaller or larger sized similar process can be -- but are not always -- a demonstration in practice.

Where a technology is not "demonstrated in practice" it is technically feasible if it is "applicable" and "available" according to the NSR Manual. Demonstrated in practice implies that a proposed technology is an available technology that has successfully been demonstrated on a commercial scale to be feasible across a range of reasonably expected operating scenarios. More difficult issues are presented for developing technologies and technology transfer opportunities. Innovative controls not demonstrated on any similar source type or flue gas to that proposed may or may not be "applicable" or "available" and may or may not be eliminated on feasibility grounds at Step 2, after a case-specific inquiry. On these issues, see the varying positions presented in response to Question I above.

b. Areas of Non-Consensus: None

III. With respect to technology transfer, what factors should be considered in determining if a control technology is potentially feasible for another process?

a. Areas of Consensus:

A number of factors need to be addressed when considering whether a control technology used on a different process is a candidate for consideration in the BACT analysis. The 1990 Draft NSR Workshop Manual represents longstanding agency policy and provides guidelines for issues related to technology transfer among process applications. On a case-by-case basis, the primary factors to be considered are the characteristics of the gas stream to be controlled, the comparability of the production processes (including but not limited to batch versus continuous operation, frequency of process interruptions, special product quality concerns), and the potential impacts of the candidate technology on other emissions from the source. If a control technology has been demonstrated in practice on a range of exhaust gases with similar physical and chemical characteristics and does not unacceptably affect process operations, product quality, or the control of other emissions, it may generally be considered as potentially feasible for application to another process with similar exhaust gas characteristics.

Detailed information is required to effectively evaluate technology transfer opportunities on a case-by-case basis for a specific source. Data and information detailing the function of the proposed control equipment or process, preferably under the full range of operating scenarios and conditions that are applicable to the proposed source, are extremely useful, and EPA's source category background documents can be a valuable resource in this area. This type of information would enhance engineering evaluations of the similarity of the equipment, run cycles, and processes in which the technology is currently used and where it may be potentially used. Such information is not generally available directly from the RBLC. Steps to include data of this type, for both domestic and foreign sources, in the RBLC and/or GHG Mitigation Measures database will be useful in this regard.

b. Areas of Non-Consensus: None

IV. Innovative Control Technologies

a. Areas of Consensus:

With respect to emerging technologies or systems, there may be merit in permit issuers (state agency, local agency, or EPA) encouraging applicants to avail themselves of the regulatory path for employing such technologies or systems found in the PSD regulations (40 CFR 52.21(v) and 40 CFR 51.166(s). This path offers an applicant who wants to use "innovative control technology" a longer timeframe in which to meet the BACT emissions limit(s) associated with that innovative technology than would be the case if a "demonstrated" technology were the basis for BACT. Under the rule, the applicant can seek and EPA or the permit authority (with the approval of the governor of the state where the facility is to be located) can grant, a permit containing a *future* emissions limit that is more protective, or that achieves the same level of control at a lower cost, than would a BACT emissions limit, based on a "demonstrated" system of control.

"Innovative control technology" is defined as a system that has not been adequately demonstrated in practice, but that would have a substantial likelihood of greater continuous emissions reduction than any demonstrated control system, or achieving comparable reductions at lower cost in terms of energy, economics, or non-air quality environmental impacts. The lower BACT limit associated with the innovative control technology must be achieved no later than 4 years after startup or 7 years after permitting, and during the interim, the facility must not emit so as to cause or contribute to a NAAQS or increment violation, and all Class I area requirements must be met. The innovative control technology provision contained in the PSD rules and discussed in the Draft NSR Workshop Manual has been rarely used, but EPA should evaluate whether it has greater application to GHG emissions. In addition to the innovative control technology provision, other ways to promote new and innovative control technology should be considered and encouraged if they are likely to promote the use of potentially lower emitting technologies.

An approach that has been utilized by one state to implement relatively new technology as BACT may be instructive as EPA considers how to encourage the expanded use of the innovative control technology provision. This experience involved providing a range for the BACT emissions limit, including a goal limit at the low (greater control) end of the range and a limit not to be exceeded at the upper end of the range. The permit included a process by which the final BACT limit within the range was to be selected, based on sufficient experience using the technology (for example 1 to 2 years). The time period to gain experience was also used to optimize the technology in order to minimize emissions. This approach gave more certainty to the applicant and project financers that the technology would comply with emission requirements, while allowing for the orderly introduction of a new control technology. This example was negotiated under the existing case-by-case BACT process, not the innovative technology provisions; but could be instructive as well in considering the innovative technology provisions of the PSD rules.

b. Areas of Non-Consensus: None

V. In context of carbon capture and sequestration (CCS) processes, what general milestones need to be achieved in order for CCS to be considered a technically feasible option for consideration?

a. Areas of Consensus:

The technical feasibility of a CCS system for consideration in a BACT analysis is dependent on the feasibility of both the capture and sequestration systems. In determining the feasibility of capture options on a case-by-case basis, technical information and specific evaluations of the effectiveness of the process for separation of CO_2 from the operation of similar units and controls must be evaluated, including any associated effects on other pollution control systems. The technological feasibility of sequestration systems is impacted by the ability to transport and deliver captured CO_2 to the sequestration site. In determining the feasibility of sequestration options on a case-by-case basis, the determination is potentially two-fold: (1) general technical feasibility and (2) site-specific technical feasibility. To determine general technical feasibility, control of CO_2 from the operation of similar units, and different units with similar flue gases, should be evaluated for feasibility, considering the relative sizes of the existing facilities and proposed facility. With respect to site-specific feasibility, the physical and legal availability of sequestration capacity (pore space) onsite is relevant to determining feasibility of CCS for a specific site, as is the extent of availability of opportunities to pipe the capture CO_2 offsite for sequestration.

The burden for showing legal and technical infeasibility of using the underground pore space for carbon sequestration onsite is on the applicant. The lack of final agreements at the time of permit application for using underground pore space is insufficient to exclude CCS as BACT if obtaining such agreements is feasible. Lack of sequestration potential in formations on or near the proposed site is insufficient justification for not considering CCS in the BACT analysis if CCS is generally available, via offsite pipeline to a sequestration site, for example. In that case, determining the reasonableness of piping the CO_2 to another site where sequestration is feasible should be part of the BACT evaluation. For example, if a CO_2 pipeline to a sequestration site is being constructed concurrently with the project, and will be available for public use at the time the project is scheduled to be completed, use of that CO_2 pipeline should be considered in the BACT evaluation. These facts should be evaluated to determine feasibility on a case-by-case basis as for any other control technology considered.

b. Areas of Non-Consensus:

1. Location: While the group agrees that the availability of pore space for sequestration, as a legal and technical matter, is relevant, there are varying opinions regarding the application of this factor in a BACT evaluation. There is consensus on the evaluation of nearby and available CO_2 pipelines. There is not consensus on using the BACT process to consider changing the location of the source where there is no reasonable sequestration opportunity at or near the proposed site. Some have the view that for CO_2 sequestration purposes, EPA could provide guidance that the BACT process could include evaluation of the site selection. Others have the view that this is beyond the scope of a BACT review, and that EPA would need to adopt rules, such as NSPS, if it intended to mandate CCS for certain new sources regardless of location.

2. Degree of Use: While the group agrees that the degree of availability of CCS systems is relevant to setting BACT emissions limits, the group did not attempt to agree on how many CCS systems must be in use, or whether there must be commercial orders (and how many), before CCS is considered demonstrated or available.

3. Similarity: While the group agrees that the flue gas characteristics and volumes are relevant, the group did not agree on how similar an existing source with CCS must be to the proposed source for the CCS technology to be transferable. These factors will likely evolve over time as CCS is applied to more sources and as case by case CO_2 BACT evaluations and determinations are done.

VI. In the context of energy efficiency, what general factors need to be considered in determining whether an energy efficiency threshold is technically feasible for a process?

a. Areas of Consensus (applying to those units subject to BACT:

Current EPA policy on this issue is somewhat ill-defined, although energy impacts are expressly considered in Step 4 of the BACT process for the top control options. In general, for GHGs, the group agrees that EPA should consider how its past practice can or should be modified to capture cost-effective GHG reductions/avoidance through energy efficiency measures. In addition, different members have varying concerns about how energy efficiency might be used to impose requirements on non-emitting units and/or units that are not the subject of a modification, whether energy efficiency considerations could affect the fundamental design of the source, about how efficiency-based limits could be enforced, and other issues that are addressed or could be more effectively addressed in other segments of the BACT analysis.

For an emission unit subject to BACT, improving its energy and process efficiency could be very effective in securing GHG and other emission reductions and should be included in a BACT analysis. Energy efficiency at the unit subject to BACT can be considered in two ways: as a factor in evaluating BACT alternatives; and, in setting emission limits. The most efficient options to meet the desired production output should be evaluated. EPA should provide guidance regarding evaluating energy efficiency in a BACT analysis on a sector by sector basis.

The Subgroup decided to address Question VI as two separate questions:

VI.A. How is or could energy efficiency be considered in the BACT process? And
VI.B. How might energy efficiency be considered in setting limits?

With respect to VI.A., the Subgroup agreed that where energy efficiency directly reduces GHG emissions from the source, such considerations generally form part of the fundamental design criteria for a new or modified source. There is a direct incentive to maximize efficiency in the original design as a result of the opportunity to lower operating expenses over the life of the source.

With respect to VI.B., specific energy efficiency limits may be difficult to quantify into an invariable emission limit. Certain requirements need to be considered, for example: the full range of operating scenarios experienced over the life of the unit, that is, the source must meet the BACT emissions limits, once set, over its operational life; project site variability; the deterioration of efficiency as systems age; maintenance cycles; and, whether a threshold requirement for energy efficiency is available for the source category. Much discussion centered on the necessity for and feasibility of developing regulatory mechanisms such that efficiency gains could be enforceable. For electricity generators, a metric of tons of GHGs per MWh of electrical output is often discussed. A threshold for energy efficiency may not be available as a singular number or value for many large source categories. Instead, energy efficiency may need to be expressed as a range of values for facilities of similar type and function, as an equipment specification (e.g., a condensing furnace), or as a monitoring/maintenance procedure to provide continuing indications of efficiency (e.g., a carbon monoxide emissions monitor and regular cleaning/tuning schedule for a boiler).

Efficiency standards may vary on a case-by-case basis to account for site variability (e.g., altitude) and other factors that could impact process efficiency. In addition, any system will "age" over time and achievable efficiencies may deteriorate. Section 169 contains multiple statutory factors that must be evaluated in determining the "maximum degree of reduction" on which BACT is based. Efficiency improvements in combination with some other control option could be listed as the maximum control, in which case the standard process limits would likely incorporate the effects of the more efficient design and a separate "efficiency" standard would not be necessary. Page B.16 of the 1990 Draft NSR Workshop Manual notes that "combinations of techniques should be considered to the extent they result in more effective means of achieving stringent emissions levels represented by the "top" alternative, particularly if the "top" alternative is eliminated."

b. Areas of Non-Consensus:

1. Energy efficiency can be considered narrowly or broadly depending on the scope of the project being permitted. A consensus could not be reached on how narrow or broad the scope of energy efficiency considerations should be.

   Consideration of energy efficiency becomes more difficult as the scope of the evaluation is expanded. Permit agencies should have flexibility on where to draw the line based on case by case evaluation of the project. Evaluation of more than the minimum required is prudent to ensure that the BACT evaluation is sufficiently comprehensive and avoid procedural challenges from failure to evaluate a reasonable alternative. The following includes the type of processes that might be included in an evaluation of energy efficiency ranging from the more obvious that must be included to those that are more broadly defined and may or may not be included.

   vi. Energy efficiency of a new combustion device.
   vii. Energy efficiency of new processes being provided steam by a new boiler.
   viii. Energy efficiency of an existing combustion device being modified.
   ix. Energy efficiency of existing processes being provided steam by a new boiler.
   x. Energy efficiency of existing processes being provided steam by a modified boiler.
   xi. Energy efficiency of non-process or combustion related activities (i.e., de minimis activities such as the office building designs, lighting plans, landscaping, etc.).
   xii. Off site processes (i.e., demand side management at other locations, etc.).

   Opinions vary regarding if, when and how any of these areas should be evaluated in the BACT analysis. Currently, permitting agencies may request an applicant evaluate any of these with good reason, given the case-by-case nature of BACT evaluations. When making the BACT emissions limit setting extend beyond the emitting equipment, agencies should avoid burdening the BACT process with too broad an investigation that diverts attention and resources away from investment in on-site measures that produce meaningful reductions or that otherwise would discourage beneficial modifications to sources.

VII. Clean Fuels Discussion

a. Areas of Consensus

The Work Group recognizes that clean fuels is included in the Act as well as other factors and that EPA should provide guidance on how clean fuels should be considered in the BACT determination process for GHGs.

b. Areas of Non-Consensus:

There are different views on how clean fuels should be considered in the BACT determination process. One view is that fuel alternatives should be considered broadly in the BACT process. The other view is that the consideration of fuel alternatives is limited by considerations of redefining the source.