UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
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OFFICE OF
AIR AND WASTE MANAGEMENT

SUBJECT: Guidance for Determining BACT Under PSD

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TO: Regional Administrators, I-X

The 1977 Clean Air Act amendments pertaining to the Prevention of Significant Deterioration (PSD) require that the determination of best available control technology (BACT) be performed on a case-by-case basis considering energy, environmental, and economic impacts and other costs. The enclosed document provides guidance to assist you in determining BACT in the PSD review. This document has been circulated in draft form and reviewed by your staff.

The purpose of the guideline is to provide the framework for a consistent approach in determining BACT. The guidance is rather general, focusing on the parameters which should be considered in the analysis supporting the proposed control system. Unfortunately, no specific criteria can be developed a priori, nor can quantitative factors relating to the weighting and evaluation of energy, environmental, and economic consideration be prescribed. However, consideration of the same set of parameters should contribute to more consistent decisions among the Regions.

I recognize that the case-by-case BACT determination is a difficult task and one which may be resource intensive. To minimize the resource requirements, the primary responsibility for defending the proposed control system must be placed on the source. The guidelines suggest a significant effort by the source to provide data and analysis to support a permit application. My office will continue to provide assistance for the engineering aspects of control technology selection through operation of the OAQPS new source review clearinghouse.

Enclosure

cc: Assistant Administrators and Office Directors
Director, Air and Hazardous Materials Division, Regions I - X
Director, Facilities Technology Division, Region II
Director, Enforcement Division, Regions I-X

GUIDELINES FOR DETERMINING BEST AVAILABLE CONTROL TECHNOLOGY (BACT)

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Office Of Air, Noise, and Radiation
Office of Air Quality Planning and Standards
U. S. Environmental Protection Agency

GUIDELINES FOR DETERMINING BEST AVAILABLE CONTROL TECHNOLOGY (BACT)

INTRODUCTION

The 1977 Clean Air Act Amendments establish more restrictive conditions for the approval of pre-construction permit applications under the Prevention Of Significant Deterioration (PSD) program. One of the new requirements is for best available control technology (BACT) to be installed for all pollutants regulated under the Act. [SEE FOOTNOTE * BELOW] Under the revised Act, BACT is to be determined on a case-by-case basis rather than automatically applying an applicable Federal New Source Performance Standard (NSPS), as was the case under the previous regulation. Concern has been expressed that these determinations should be consistent from area to area. In the context of case-by-case BACT, consistency does not necessarily mean that a new facility In one area will have an identical emission limit as the same type of facility in another area. Consistency means that a consistent approach is used in determining BACT and that the impacts of alternative emission control systems are measured by the same set of parameters, although evaluation of specific parameters is done on a case-by-case basis.

PURPOSE

This guideline is intended for use by (1) EPA Regional Offices in determining BACT during the interim period before the States adopt

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[FOOTNOTE *] Pollutants subject to National Ambient Air Quality Standards, Standards of Performance for New Stationary Sources, National Emission Standards for Hazardous Air Pollutants, and Emission Standards for Moving Sources.

State Implementation Plan (SIP) provisions for implementing the PSD program, (2) by States in writing PSD regulations or determining BACT and (3) by individual sources in preparing PSD permit applications. The purpose of the guideline is to provide the framework for a consistent approach to determining BACT. The emphasis is on the types of data which should be required in a pre-construction permit application and how the data should be used in order to determine BACT. The guideline addresses the technological question of whether the emission control system proposed in the permit application represents BACT or whether a more stringent level of emission control is appropriate considering available technology and economic, energy, and environmental impacts. The guideline assumes accomplishment of all other air quality review requirements including, for example, the requirement that air quality standards and appropriate PSD increments are met, stack heights are appropriate, and siting is acceptable.

In accomplishing this purpose, the guideline lists a number of factors which can be considered in assessing energy, environmental, and economic impacts. While the full list represents the magnitude of the analysis that could be required for a very large and complex source, many of these factors will not be relevant to the typical BACT review. The inclusion of any factor should be based on Its relative merit considering such influences as source size, nature of the process and control options, and local conditions. It is the clear intent of EPA not to require an analysis of the full proportion described herein for small sources or for the use of conventional control equipment whose impacts

are well established. In short, the BACT analysis should be held to a minimum with the depth of analysis being dependent on the difficulty of the decision.

PHILOSOPHY OF BACT

The primary purpose of BACT is to optimize consumption of PSD air quality increments thereby enlarging the potential for future economic growth without significantly degrading air quality. The Act places the responsibility of determining BACT with the State once a PSD SIP revision is approved. The BACT decision is to take into account energy, environmental,

and economic impacts and other costs associated with application of alternative control systems. This case-by-case approach allows adoption of improvements in emission control technology to become widespread more rapidly than would occur through the uniform Federal new source or hazardous emission standards. In setting the NSPS, for example, emission limits are selected which can reasonably be met by all new or modified sources in an industrial category, even though some individual sources are capable of lower emissions. Additionally, because of resource limitations In EPA, revision of new source standards must lag somewhat behind the evolution of new or improved technology. Accordingly, new or modified facilities in some source categories may be capable of achieving lower emission levels that NSPS without substantial economic impacts. The case-by-case BACT approach provides a mechanism for determining and applying the best technology in each individual situation. Hence, NSPS and NESHAPS are Federal guidelines for BACT determinations and establish minimum acceptable control requirements for a BACT determination.

Where Federal standards do not exist, guidance on well-controlled sources is available through the OAQPS clearinghouse (discussed later).

A critical decision in the BACT analysis is the relative weight assigned to the energy, environmental, and economic impacts. Congress implied that this decision should be made by the State, thus allowing some flexibility in emission control requirements depending on local energy, environmental, and economic conditions and local preferences. For example, in an area with unusually high unemployment, the economic impacts may be weighted more heavily if the application of a strict BACT emission requirement would reduce production or jobs. On the other hand, if visibility protection is a major value of the area, then environmental impacts could be weighted more heavily. This flexible approach allows the permitting authority to consider a number of local factors (for example the size of the plant, the amount of the air quality increment that would be consumed, and desired economic growth in the area) in deciding on a weighting scheme. State judgment and the Federal emission standards are the foundations for the BACT determination. Accordingly, EPA does not consider it appropriate to assign nationally applicable weighting factors in this guideline.

GENERAL GUIDELINES

The recommended approach to determining BACT is to place on the applicant the responsibility for presenting and defending the technology selection.[SEE FOOTNOTE *] This approach recognizes that the applicant is best suited for assessing the costs, environmental residuals, and energy

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[FOOTNOTE *] Preliminary meetings between the applicant and the permitting authority are encouraged as a means of promoting efficiency in the review process.

penalties associated with alternative control options as they apply to his processes. The permit application should contain the following elements relative to BACT:

(1) Proposal of a control system representing BACT. BACT should address control of each emission point at a facility, including fugitive process, fugitive dust, and stack emissions. Technology selection should consider application of flue gas treatment, fuel treatment, and processes or techniques which are inherently low-polluting. In no circumstance should a system be proposed for any emission point unless it is at least as stringent as the applicable SIP or Federal emission requirement (whichever is more stringent). In cases where technological or economic limitations on the application of measurement techniques would make the imposition of an emission standard infeasible, a design, operating, or equipment standard may be established.

(2) Presentation of alternative systems that could achieve a higher degree of emission control. For each pollutant, the BACT permit application should present control alternatives which have greater control capabilities than the system proposed as BACT and which have been used or proposed for

the same or similar applications. In some cases, the BACT decision may require a trade-off of control among pollutants. That is, a technology may do slightly worse in controlling one pollutant, but do significantly better in controlling another air, water, or solid waste residual. Such alternatives should not be excluded from consideration, but in justifying BACT for a given pollutant only those alternatives which have greater control capabilities for that pollutant need be presented in the permit application.

If no better control technology is available for an emission point, then such finding should be stated and supported, and no further analysis is required. Other equipment with similar control capabilities need not be presented (e.g., a baghouse versus an equivalent ESP at a particulate emitter). Unrealistic alternatives need not be presented such as placing in series control equipment which is normally used alone (e.g., an ESP followed by a baghouse). In some cases, a better control technology may be available for a general type of operation, but unique processing equipment or procedures may create a valid technical reason which would preclude its selection as BACT. Such situations should be full, supported.

(3) Defense of the BACT selection. The BACT selection for a particular pollutant is defended by demonstrating that each alternative control system (representing a more stringent level of control for that pollutant) would cause unreasonable adverse energy, environmental, or economic impacts. The rationale for rejecting each alternative should be presented in the form of an incremental analysis of the impacts of each alternative system relative to the proposed BACT system. Relevant energy, environmental and economic impacts are described below.

IMPACT ANALYSIS

This section outlines the types of impacts that should be recognized by the permitting authority as relevant issues in assessing the energy, environmental, and economic impacts of alternative control systems. For instance, if an applicant wishes to reject an alternative control system, he would do so by demonstrating the adverse impacts which would result from the selection of that alternative system. This section lists

specific energy, environmental, and economic impacts which may be addressed in this impact analysis and explains the data requirements for documenting an adverse impact. Each of the factors discussed below need not be addressed in every permit application. Rather this guideline presents a set of potential impacts any number of which may be addressed in a permit application depending on the individual situation. For example, even though a control system may produce solid waste by-products, such impacts need not be presented in the PSD permit application unless the applicant wishes to use solid waste impact as an argument against selection of a particular control alternative as BACT.

In general, the BACT analysis should focus on the direct (on-site) impacts of alternative control systems. Indirect energy or environmental impacts are not required but may be considered where such impacts are found to be significant and well quantified. Indirect energy impacts include such impacts as energy to produce raw materials for construction of control equipment, increased use of foreign oil, or increased oil use in the utility grid. Indirect environmental impacts include such considerations as pollution at an off-site manufacturing facility which produces materials needed to construct or operate a proposed control system. Indirect impacts will generally not be considered, in the BACT review, since the complexity of consumption patterns in the economy makes those impacts difficult to quantify. For example, since manufacturers purchase capital equipment and supplies from many suppliers, who in turn purchase goods from the other suppliers, accurate tracing of indirect impacts may not

be possible. Raw materials may be needed to operate control equipment, and suppliers of these resources may change over time. Similarly, it generally will not be possible to determine specific power stations and fuel sources which would be used to satisfy electrical demand over the lifetime of a

control device.

Duplicative analyses will not be required in preparing the BACT permit application. Any studies previously performed for Environmental Impact Statements, water pollution permits, State New Source Review, or other programs may be used when appropriate to demonstrate an adverse energy, environmental, or economic impact.

These guidelines are applicable to both new and modified sources. Where appropriate, however, the review may consider any special economic or physical constraints which might limit the application of certain control techniques to a modification project. That is, the level of control required for a process undergoing modification or reconstruction may not be as stringent as that which would be required if the same process were being constructed at a grass-roots facility. Such findings, however, must be made on a case-by-case basis by the permitting authority considering the relevant economic and environmental impacts.

The following discussion, under each of three headings of energy, environmental, and economic impacts, lists and briefly describes a number of factors which may be addressed in the respective impact analyses. These factors are guidelines only and are not intended as an exclusive list of considerations for BACT. Some of these factors may not be appropriate

in all cases, while, in other instances, factors which are not included here may be relevant to the BACT determination. The guideline does not address the evaluation of each factor nor the weighting of any factor relative to another. Such determinations should be made on a case-by-case basis by the permitting authority. For purposes of this discussion, terms such as "emission control system" or "BACT system" refer to design, equipment, or operating standards and non-polluting processes as well as flue gas control equipment.

I. Energy Impact

Energy impacts should address energy use associated with a control system and the direct effects of such energy use on the facility and the community. As noted earlier, indirect energy impacts (such as energy to produce raw materials for construction of control equipment) are not required but may be considered if the permitting authority determines, based on a showing by the applicant, that the impact is significant and that the impact can be well quantified. Some specific considerations for energy impacts are presented below.

A. Energy Consumption

The amount, type (e. g., electric, coal, natural gas), and source of energy required by each alternative emission control system should be identified and compared to the quantities and types of energy required by the proposed BACT system. In analyzing for energy consumption, various alternatives can be compared in terms of a) energy consumption per unit of pollution removed (for example, Btu/ton hydrocarbon removed)

and b) energy consumption versus the portion of the remaining PSD increment which is preserved for future growth. If such comparisons are made, they should be computed on both an overall and an incremental basis.

B. Impact on Scarce Fuels

The type and amount of scarce fuels (e.g., natural gas, distillate oil) which are required to comply with each alternative control requirement should be identified and compared with the BACT requirement. The designation of a scarce fuel may vary from area to area, but in general a scarce fuel is one which is in short supply locally and can better be used for alternative purposes, or one which may not be reasonably available to the source either at present or in the future.

C. Impact on Locally Available Coal

Alternatives which require the use of a fuel other than locally or regionally available coal should be discouraged if such a requirement causes significant local economic disruption or unemployment.

D. Energy Production Impacts (electric utilities)

The 1977 Act Amendments imposed more stringent BACT requirements, and may affect electric utility units that were well along in the planning process prior to adoption of EPA regulations in June 1978. Where the start-up of the more stringent PSD program would result in construction delays for these units, the BACT determination may consider such impacts. The impact of delay plant operation should be assessed in terms of reserve capacities, system reliability, and additional costs implied by such delays.

II. Environmental Impact

The net environmental impact associated with each alternative emission control system should be determined. Both beneficial impacts (e.g., reduced emissions attributed to a control system) and adverse impacts (e.g., exacerbation of another pollution problem through use of a control system) should be discussed and quantified. As pointed out above, indirect environmental impacts (such as pollution impacts at an off-site plant which manufacturers chemicals for use in pollution control equipment) normally need not be considered. The analysis should be presented in the form of the incremental impact of alternative control systems relative to the system proposed as BACT in the permit application. Some specific considerations are presented below:

A. Air Pollution Impact

The impact of air pollutants emitted from a gas stream or a fugitive emission source can be assessed terms of either quantity of emissions, modeled effects on air quality, or both. If application of a control system directly removes or releases other air pollutants (or precursors to other air pollutants), then the pollutants affected and the impact of these emission changes should be identified. The analysis can consider any pollutant affecting local air quality including pollutants which are not currently regulated under the Act, but which may be of special concern locally.

In the absence of a more systematic technique (e.g., market-type systems, etc.) for allocating PSD increments, BACT determinations are important for executing such allocations. PSD programs which depend on BACT determinations to implement the allocation of increments should project

desired levels of growth in an area so that BACT determinations for each source will serve to insure that the total air impacts of future growth are no greater than the available increments. Since in the first years of the PSD program many areas may have neither a functioning market system for allocating increments no accurate projects of desired growth, it is important that such areas use the BACT determinations during this initial period to conserve the remaining increments as much as possible until more systematic allocation mechanisms are put in place.

B. Water Impact

Relative quantities of water used and water pollutants produced and discharged as a result of use of each alternative emission control system should be identified. Where possible, the analysis should assess their effect on such local surface water quality parameters as pH, turbidity, dissolved oxygen, salinity, toxic chemical levels and any other important considerations, as well as on groundwater. The analysis should consider whether applicable water quality standards are met and the availability and effectiveness of various techniques to reduce potential adverse effects.

C. Solid Waste Disposal impact

The quality and quantity of solid waste (e.g., sludges, solids) that must be stored and disposed of or recycled as the result of the application

of each alternative emission control system should be compared with the quality and quantity of wastes created if the emission control system proposed as BACT is used. The composition and various other characteristics of the solid waste (such as permeability, water retention, rewatering of dried material, compression strength, leachability of dissolved ions, bulk density, ability to support vegetation growth and

hazardous characteristics) which are significant with regard to potential surface water pollution or transport into and contamination of subsurface waters or aquifers should be considered. The relative effectiveness, hazard and opportunity for solid waste management options, such as sanitary landfill, incineration, and recycling, should be identified and discussed.

D. Irreversible or Irretrievable Commitment of Resources

The BACT decision may consider the extent to which the alternative emission control systems may involve a trade-off between short-term environmental gains at the expense of long-term environmental losses and the extent to which the alternative systems may result in irreversible or irretrievable commitment of resources (for example, use of scarce water resources).

E. Other Environmental Impacts

Incremental differences in noise levels, radiant heat, or dissipated static electrical energy should be considered where appropriate.

III. Economic Impact

This analysis should address the economic impacts associated with the incremental costs of installing and operating alternative control systems above the economic impact associated with the system proposed as BACT. The review should include a complete explanation of procedures for assessing economic impacts and any supporting data. As outlined below, economic considerations can address direct economic impacts on the firm and impacts on local economic growth.

A. Direct Economic Impacts on the Plant

Direct economic impacts on the plant should be examined through evaluation of the following:

1. Direct Costs

The direct cost for each control alternative should be presented both on an incremental and on an overall basis. Investment costs, operations and maintenance costs and annualized costs should be presented separately. Annualized costs are operations and maintenance costs plus depreciation and interest charges on the investment. Costs should be itemized and explained. Credit for tax incentives should be included along with credits for product recovery costs and by-product sales generated from the use of control systems. The lifetime of the investment should be stated. Where possible, costs should be broken down into process change costs (costs of less polluting production process) and direct pollution abatement costs (cost of pollution control equipment). The costs of air treatment, water treatment and solid waste disposal should be presented separately. The analysis should also include the total investment cost of the new facility.

As a guide in determining when control costs become excessive, alternative control systems can be compared in terms of certain cost effectiveness ratios. Such ratios may include the following:

* ratio of total control costs to total investment costs.
* cost per unit of pollution removed (for example, dollars/ton).
* cost versus additional portion of remaining PSD increment preserved for future growth.
* unit production costs (for example, mill/kw-hr, dollars/ton of steel).

In some cases, the unit of production output may be difficult to determine,

as in the case of a plant producing many different products. In such cases, unit production costs can be expressed as cost per dollar of total sales.

2. Capital Availability

Capital availability addresses the difficulty that some sources may face in financing alternative control systems. Proof of such claims should be fully documented.

B. Local Economic Impacts

Local economic impacts address the economic feasibility of alternative BACT requirements and the impact of the production decisions of the firm in response to alternative levels of control. For example, a BACT alternative may alter the economics of a project to the point where the decision would be made to cancel the construction or expansion of a facility, to relocate a plant, to reduce the scale of operation, or to change the production mix. The local economic impacts of such decisions should be assessed in terms of local employment effects including number of jobs, dollars paid in salaries, and changes in employee skill levels required. The guideline does not imply that the BACT decision should force new projects to the brink of cancellation. The BACT decision must be based on sound judgment, balancing environment benefits with energy, economic, and other impacts.

Local economic impacts also can address the effect of various BACT alternatives on air quality increment consumption and the subsequent impact on future growth potential in the surrounding area. The BACT decision should reflect policy decisions to conserve the available air quality increment for future growth.

IV. Other Costs

Other costs associated with alternative emission control systems may be considered where appropriate.

ASSISTANCE IN DETERMINING BACT

Assistance to the states and Regional Offices in evaluating control technology will continue to be provided through the OAQPS new source review clearinghouse (August 1, 1977 memo, Walter C. Barber to Regional Offices, "OAQPS Assistance for BACT/RACT/LAER Determinations"). Through its repository of information on past BACT/RACT/LAER decisions, the clearinghouse provides a communication link for advising reviewing authorities of each other's determinations, thereby promoting consistency in BACT determinations. The degree to which the clearinghouse will be effective as a consistency-improving tool will depend on the degree to which the BACT determinations are reported to OAQPS. All Regional Offices are requested to submit BACT findings to the clearinghouse. In addition to the repository, the clearinghouse system also provides a focal point for answering questions related to policy issues and control technology. With respect to control technology, OAQPS can assist in establishing the range of alternative controls for a particular process, but cannot evaluate case-by-case energy, environmental, and economic impacts or select BACT emission levels. In short, the clearinghouse can be an important input to the reviewing authority's decision, but it cannot substitute for the case-by-case analysis required to select the appropriate control technology.