NORTHEAST STATES FOR COORDINATED AIR USE MANAGEMENT (NESCAUM)

NESCAUM BACT GUIDELINE

June 1991

I. INTRODUCTION

The Northeast States for Coordinated Air Use Management (NESCAUM) is an interstate association of the air quality divisions in the Northeast states: Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island, and Vermont. NESCAUM's purpose is to exchange technical information and to promote cooperation and coordination of air pollution control issues among its member states. To accomplish this, NESCAUM sponsors frequent air quality training programs, participates in national debates, and promotes a variety of research initiatives.

Each of the NESCAUM states administers programs for the preconstruction review of new sources and modifications of existing sources. Some states administer a delegated version of the Federal Prevention of Significant Deterioration (PSD) regulations while others have developed their own regulations which, upon approval by the U.S. Environmental Protection Agency (EPA), provide the state the authority to issue federally enforceable permits. The minimum size of sources subject to review varies from state to state, but all states require that sources review available control technologies and that the source select the Best Available Control Technology (BACT). For new major sources or major modifications in nonattainment areas, the control technology required is Lowest Achievable Emission Rate (LAER).

The original policy was adopted by the NESCAUM Board of Directors at their meeting on October 11, 1988. Revisions to the policy were reviewed and approved by the Directors on June 11, 1991. This policy does not change regulations in any state or any existing PSD requirement for a top-down BACT analysis. Rather, it is intended to promote consistency between member states in methods of determining BACT and to provide prospective applicants with guidance on the level of analysis appropriate to support a proposed control technology. This policy defines a top-down analysis which starts by identifying the most stringent control available for a similar or identical source or source category. Working from that "top" case, the applicant must justify that the proposed emission levels represent BACT.

II. BACKGROUND

In the 1977 Amendments to the Clean Air Act, Congress adopted the Federal Prevention of Significant Deterioration Program. The program was designed to prevent air quality from deteriorating in areas where it was already better than the national ambient air

MICHAEL J. BRADLEY, EXECUTIVE DIRECTOR
85 MERRIMAC STREET
BOSTON, MASSACHUSETTS 02114
TEL. (617) 367-8540 FAX (617) 742-9162

quality standards. This objective was approached in two ways. First, the program established increments to limit the amount of additional sulfur dioxide and particulate matter allowed to be emitted above the baseline (which is existing air quality). Second, the program required that, regardless of existing air quality, new emission sources subject to PSD would be controlled to a level that represents BACT. This requirement not only precludes potential applicants from shopping for areas with less stringent emission limitations, but also promotes the research and development of more efficient and more economic alternative technologies.

EPA adopted regulations to implement the requirements of the 1977 Clean Air Act Amendments. These regulations were challenged by both industry and environmental organizations. In December 1979, in the case of Alabama Power et al., vs. Costle (13 ERC 1225), the Washington, D.C. Circuit Court upheld some provisions while overturning others. Subsequently, EPA promulgated changes to the regulatory requirements for new source review in amendments to Title 40 of the Code of Federal Regulations on August 7, 1980. On October 17, 1988, EPA promulgated a final rule which adopted PSD increments for nitrogen oxides. As of March 1991, these provisions constitute the regulatory requirements for the review of new sources and major modifications of existing sources in attainment areas that all programs must meet. These provisions may be changed as a result of the Clean Air Act Amendments of 1990.

III. PURPOSE

The purpose of this document is to promote consistent analysis of proposed control technologies and consistent procedures for reviewing BACT determinations from state to state. Establishing a uniform set of procedures will not only ensure equitable treatment for prospective applicants, but will also reduce pressure on reviewing agencies resulting from the argument that a similar source located elsewhere would not be subjected to the same requirements. It is also intended to provide prospective applicants with guidance on the BACT analysis process. Additional guidance may be obtained from EPA's draft New Source Review Workshop Manual (October 1990).

Each NESCAUM state has decided to use a top-down BACT analysis. This approach is based on identifying the best technology solution, allowing for environmental, energy, and economic considerations.

This guideline focuses on the type of data required in a preconstruction permitting application and how the data should be used in order to determine BACT. The guideline addresses how the emission control system proposed in the permitting application is determined to be BACT or why a more stringent level of emission control might be appropriate, considering available technology and economic, energy, and environmental factors.

The Clean Air Act places the responsibility for proposing BACT with the applicant and the responsibility of confirming BACT with the permitting agency. The top-down approach places the additional responsibility on the source to present and defend its proposal.

The level of analysis (or documentation) to support a BACT determination should be consistent from area to area. Since BACT is a case-by-case process, consistency does not necessarily mean that a new facility in one area will have an emission limit identical to that of the same type of facility in another area. Using a consistent approach to determine

BACT should ensure that the impacts of alternative emission control systems are measured by the same set of parameters.

IV. APPLICABILITY

The applicability criteria for imposition of the BACT requirement vary from state to state. In general, BACT is required of those new sources and modifications to existing sources which exceed some specified trigger level. The trigger is based on emission rates or source categories. States will have differing guidelines on calculating emissions. Therefore, the appropriate state permitting officials (see Appendix I) must be consulted at this stage in the process.

V. DEFINITIONS

This guideline uses "permit" to refer to what different states call permits, licenses, approvals, and plant approvals. The specific definitions of terms may vary from state to state. The applicant must work with each states' definitions. Therefore, the state permitting officials listed in Appendix I should be consulted.

VI. IDENTIFICATION OF CONTROL ALTERNATIVES

In carrying out a top-down BACT analysis, the applicant must first identify the most stringent control possible (usually referred to as Lowest Achievable Emission Rate, or LAER) and then quantify emissions. Since other alternatives will be compared against this top case, applicants should confer with the appropriate state contacts on what represents the most stringent control case. At this step of the BACT review process, no technically feasible alternative should be ruled out as a possible BACT candidate. Identifying control alternatives should not be limited to simply reviewing existing controls for the source category in question. The review must be broad enough to take into account controls applied to similar source categories and new control technologies. Finally, the alternatives identified should include the control alternatives representative of LAER for the source or category of source.

The starting assumption for the top-down approach is that the most stringent control possible is BACT. The burden of proof for applying a less stringent control rests in the applicant's case specific evaluation of the control alternatives. If the most stringent control for a specific pollutant is selected, the BACT evaluation for that pollutant is stopped. However, further evaluation of that control option's effectiveness on other pollutants may be required.

Failing to address the top case in an attempt to avoid stringent controls will result in the process being delayed while the applicant is required to reassess alternatives against the control option the permitting authority determines to be the top case.

When searching the record to identify the top case, the applicant must seek information on control technologies used throughout the United States, as well as applicable foreign control technologies. For example, Scandinavian pulping facility controls, German boiler and incinerator technology and operation controls, and Japanese controls for flue gas desulfurization have traditionally met very stringent emission control limits. Also, emission testing information on these technologies may be available to help establish the level of performance achievable with the specific technology.

A. Types of Controls

When identifying the top case and alternative control technologies, the following types of controls should be considered.

1. Existing Control Technology: a control technology which has been proven in practice for the source category. This should include both emission limitations imposed by other jurisdictions and test results which reflect what was actually achieved in performance.

2. Technically Feasible Alternatives: a control technology which has been demonstrated in practice on other source categories, but has not been demonstrated in practice on the class or category of source under review. Applying a control technology to a source category in which it has not been demonstrated is called control technology transfer.

3. Innovative Control Technology: a control technology that has never been applied to any source on a full scale, continuously operating basis. This technology may be chosen on the basis of pilot scale or short-term testing. In selecting an innovative control technology, there must be some reasonable level of expectation that the innovative options will out-perform the demonstrated control. Innovative control is not mandated but may be approved if submitted by the applicant.

4. Using Production Processes, Fuels, and Coatings That Are Inherently Lower Polluting
These options should be evaluated alone and in combination with add-on pollution control devices. Examples include adjusting raw material feed to reduce emissions, using methanol for low NO_X applications, and using powder coatings instead of solvent borne coatings where technically feasible. In considering these options, it is especially important to work closely with the appropriate state permitting officials who may allow some information to be treated as confidential or proprietary.

5. Specific Design or Operational Parameters: These options may include such factors as combustion zone temperature, combustion zone residence time, automatic combustion controls, pressure drop across control equipment, etc.

Both the source applicant and the reviewing agency should consider the use of clean processes, fuels, and solvents that are inherently lower polluting than what has been historically employed by a particular industry. The analyses for these alternatives should be conducted in the same manner as the analyses for more conventional BACT alternatives (described in later sections). A reviewing agency should seriously consider requiring the use of such alternatives if the BACT analysis justifies their use based on environmental, economic, and energy factors. Examples include the use of a dry process cement plant vs. a wet design; powder coatings vs. solvent-borne coatings; gas vs. fuel oil; electric boost or all-electric glass furnaces vs. fossil fuel fired; fluidized bed coal combustion vs. conventional firing, low sulfur residual oil, etc.

B. Sources of Information on Control Alternatives

There are numerous sources of information on control alternatives for various source categories. The following sources of information will be checked by the permitting authority. Hence they must be considered by the applicant preparing a BACT analysis.

1. BACT/LAER Clearinghouse

All applicants should check EPA's BACT/LAER Clearinghouse (telephone number: 919/ 541-5534) prior to submitting an application. The relevant information contained in the Clearinghouse should be summarized in the application. Reviewing agencies should verify that this information is correct and up-to-date.

2. EPA/State/Local Air Quality Permits

Applicants should be aware of permits issued for their industry. An effort must be made to obtain current information on BACT for these sources. Permitting agencies should maintain documentation of recent BACT determinations.

3. Federal/State/Local Permitting Engineers

Permitting engineers and engineering managers can provide information on projects under review for which BACT information may be available. BACT analyses under consideration will be available from these individuals before it appears in the Clearinghouse manual.

4. Control Equipment Vendors

Vendors have information on the most recent control technology, cost information, emission guarantees, and test results.

5. Trade Associations

Associations serving one sector often maintain permitting and emission test reports. Examples include the National Council for Air and Stream Improvement (NCASI) for pulp and paper industry, Electric Power Research Institute (EPRI) for electric generators and American Gas Cleaning Institute (AGCI) for information on air pollution control equipment.

6. Agencies or Companies Outside the United States

Where there is reason to believe that better controls are being used outside the United States, these groups should be consulted for information on the most recent advances in control technologies, control costs, test results, etc.

7. Inspection/Performance Test Reports

Recent test data may be useful in establishing emission limitations for sources. Inspection and performance test data may also reveal potential problems with a control technology or specific equipment.

8. Technical Papers and Journals

VII. EFFECTIVENESS RANKING OF CONTROL ALTERNATIVES

Once the applicant has identified the appropriate control alternatives, the applicant should rank them in order of control effectiveness, with the most effective control alternative at the top. This list should present an array of control alternatives, showing control efficiencies, expected emissions, economic costs, environmental benefits, energy costs, and other costs. The applicant should prepare a chart for each pollutant and for each emissions unit, or small group of units in the BACT analysis. These charts should be used to compare the control alternatives and to focus the selection of a control option as BACT.

VIII. EVALUATION OF CONTROL ALTERNATIVES

Three criteria are to be used if the applicant proposes using a control technology less effective than the top case. These three criteria are:

1. energy impacts

2. environmental impacts
3. economic impacts

Since the permitting agency will consider these criteria in its decision making process, it is important that applicants provide fully documented estimates of the emissions using alternative control as well as quantitative and qualitative environmental, energy, and economic impacts as described in Section IX. The evaluation process should be conducted in an incremental manner, from the top-down. The first step in this approach is to determine, for the emission source in question, the most stringent control available for a similar or identical source or source category. If it can be shown that this level of control is technically or economically inappropriate for the source in question, then the applicant should determine the next most stringent level of control and evaluate it similarly. This process continues until the BACT level under consideration cannot be eliminated by any substantial or unique technical, environmental, or economic objections. Thus, the top-down approach shifts the burden of proof to the applicant who must justify why the proposed source is unable to apply the best technology available. It also differs from other processes in that it requires the applicant to analyze a control technology only if the applicant opposes that level of control; other processes require a full analysis of all possible types and levels of control above the baseline case. If the applicant accepts the top alternative in the listing as BACT from an economic and energy standpoint, the applicant proceeds to consider whether collateral environmental impacts may justify selection of an alternative control option.

IX. IMPACT ANALYSIS OF CONTROL ALTERNATIVES

There are three main impacts to be examined in a BACT analysis. These are:

a. environmental impacts
b. energy impacts
c. economic impacts

Although the impact analyses are the important part of the selection process, the effectiveness of the control alternatives is usually the decisive factor affecting BACT selection.

A. Environmental Impacts

The first analysis is for environmental impacts. The applicant should estimate the net environmental impact associated with each control alternative. Both beneficial impacts and adverse impacts should be discussed and quantified, where possible. The analyses should be presented in the form of the incremental impact of each control alternative relative to the most stringent system identified as a control alternative.

The BACT determination, however, is totally independent of the amount or increment of air quality resources available. Insignificant air quality impact cannot provide a basis for accepting a less stringent control technology. The only case where the modeled impact of the proposed emissions should influence the emission limitation is when that modeling shows exceedances of the air quality standards or increments. In this case, the applicant must choose between using a control more stringent than BACT or changing the stack parameters or site location.

When weighing environmental impacts, the applicant should consider all air pollutants and the impact on other environmental media affected by the control alternative. This includes air pollutants which are not currently regulated under the Clean Air Act, but which may have a significant environmental impact. On June 3, 1986, the Administrator of the EPA remanded a PSD permitting to Region 9, instructing the Region to consider the effects of unregulated air pollutants when making a BACT determination for regulated pollutants. The analysis of unregulated air pollutants should be directed at developing an inventory of potential pollutants from a proposed source and evaluating the impact of each control alternative being considered for BACT on those pollutants.

The following is a brief outline of some of the environmental categories that should be considered during an analysis of environmental impacts.

1. Impacts on air quality
    - visible emissions
    - odor
    - visibility impairment
    - toxic air pollutants
    - noncriteria air pollutants
    - dioxin/furans
    - heavy metals
    - acid gases
    - non-photochemically reactive or toxic solvents
    - etc.
2. Impacts on water quality
3. Solid waste disposal impacts
4. Other environmental impacts
5. Noise
6. Steam plumes from cooling towers
7. Potential for accidental releases
8. Reliability (or the potential for malfunction and downtime)

Where approximately the same degree of emission reduction can be achieved by different technologies, preference should be given to the technology that achieves the reduction with the greatest degree of pollution prevention. For example, use of either low VOC coatings or utilizing carbon adsorption with reuse of the solvent are generally preferable to utilizing a thermal or catalytic incinerator.

<u>B. Energy Impacts</u>

The second analysis is for energy impacts. In analyzing energy impacts, the applicant should estimate the direct energy impacts of the control alternatives in units of energy consumption (Btus, kWh, barrels of oil, tons of coal, etc.). The energy requirements of the control options should be shown in terms of total and incremental (units of energy per ton of reduction) energy costs.

The analysis of energy impacts should also identify the type and amount of scarce fuels in the region that would be required. The analysis should also recognize the perils of relying on inherently low polluting fuels in lieu of controls since such decisions could result in greater emissions in the future due to unforeseen national energy policies or availability.

<u>C. Economic Impacts</u>

The third analysis is for economic impacts. In evaluating the economics of various BACT control options, primary consideration should be given to the cost effectiveness of an option and not to the economic situation of the source applicant. For control technologies that have been proven for the source category under review, the economic impact of requiring this technology on a source under review is less important than the cost effectiveness. There are two measures of cost effectiveness. These include: average cost effectiveness (total annualized costs of control divided by annual emissions reduction, or the difference between the baseline emission rate and the controlled emission rate), and incremental cost effectiveness (dollars per incremental ton removed). Baseline emissions used to determine the degree of pollution reduction must be based on a realistic scenario of the upper bound of uncontrolled emissions from the source, and must be derived in a manner consistent with the procedures specified in EPA's Draft New Source Review Workshop Manual (October 1990). Emission reduction credit can be taken for using inherently lower polluting processes.

When comparing two control devices with a similar level of control for the same pollutants, incremental cost may be used in conjunction with the average cost effectiveness to justify the elimination of the more stringent control level. However, incremental costs alone should not be used as a basis for justifying the elimination of a control option.

In the analysis of economic impacts, the applicant should estimate the approximate costs of the different emission control alternatives. The analysis should include a complete explanation of procedures used for assessing the economic impacts, any supporting data, and an itemization and explanation of all costs. Credit for tax incentives should be included, along with credits for product recovery savings and by-product sales generated from the use of the control system.

In evaluating the relative cost effectiveness of alternatives, calculations should be based on allowable emissions at maximum design capacity for 8,760 hours per year. If permit condition(s) limit operation to less than 8,760 hours per year, the analysis may also include data based on the allowed operation.

Annual costs should include the operation and maintenance cost plus the annualized cost for capital and design engineering. The capitalization should be based on the average useful life of equipment. The economic life of a control system typically varies between 10 and 20 years and should be determined consistent with data from EPA cost support documents and IRS Class Life Asset Depreciation Range System (publication, #534). This publication is referenced in EPA's October 1990 New Source Review Workshop Manual.

Applicants are responsible for fully documenting all relevant cost information. Vendor quotations or other reliable means should be the primary basis for estimates. Cost estimates can also be derived using the most recent methods included in OAQPS Control Cost Manual, 4th edition (EPA 450/3-9-006, January 1990), and Appendix B (Estimating Control Costs) of EPA's Draft New Source Review Workshop Manual (October 1990), and any subsequent revisions to these manuals. Whenever the cost estimates are outside the range contained in these documents, the applicant is responsible for substantiating the estimates. The applicant must note the year used in cost estimates and adjust all calculations to reflect costs for that year. The limits of the process segment to be costed (or control system battery limits) should be specified in the BACT analysis and should have design parameters consistent with those that would achieve the emission estimates used in other portions of the application (i.e., dispersion modeling inputs, permit emission limits). Table 1 below summarizes some design parameters that are important in determining system costs.

Table 1 Control System Design Parameters Examples

Control	Design Parameter Example
Wet Scrubbers	Scrubber liquor (water, chemicals, etc.) Gas pressure drop Liquid/ gas ratio

Carbon Adsorbers	Specific chemical species Gas pressure drop lbs. carbon/ lbs. pollutant
Condensers	Condenser type Outlet temperature
Incineration	Residence time Temperature
Electrostatic Precipitator	Specific collection area (ft^2, acfm) Voltage density
Fabric Filter	Air to cloth ratio Pressure drop
Selective Catalytic Reduction	Space velocity Ammonia to NOx molar ratio Pressure drop Catalyst life

SOURCE: EPA Draft New Source Review Workshop Manual (October 1990).

A complete economic analysis should compare costs of controls both within the specific source category under review and, as a comparison of costs, for other industries, on the basis of dollars per ton of pollutant removed. The analysis should also represent the control option costs in terms of operations at full capacity (8,760 hours per year) and the control cost as a percent of the total project cost. If permit condition(s) limit operation to less than 8,760 hours per year, the analysis may also include data based on the allowed operation.

The analysis must be source specific, but should also be general enough to consider normal costs for doing business in a given field. A demonstration by an applicant that it cannot afford to construct a facility using the most stringent technology does not allow the more stringent technology to be rejected as BACT. Rather it is a statement of whether the applicant is financially capable of conducting business in that field.

X. ENFORCEABILITY

The BACT determination for each pollutant must result in a federally enforceable permit. BACT must be specified not only in terms of a control technology, but also in terms of emission limits and/or design, equipment, work practice, or operational standards (temperature, pressure drop, flow rates, pH control, etc.) that are federally enforceable. The BACT limits must be point specific and must include appropriate averaging times, reference test methods, and a method for ensuring continuous compliance.

This guideline was adopted by the NESCAUM Board of Directors on June 11, 1991.

APPENDIX I

STATE BACT CONTACTS

CONNECTICUT
S. Amarello, E. Bouffard, S. Peplau 203/ 566-8230
Connecticut Department of Environmental Protection
Bureau of Air Management
165 Capitol Avenue
Hartford, CT 06106

MAINE
M. Cone, E. Kennedy 207/ 289-2437
Maine Department of Environmental Protection
Bureau of Air Quality Control
State House Station 17
Augusta, ME 04330

MASSACHUSETTS
J. Belsky, T. Cussons, C. Goff, D. Squires, V. Steeves 617/ 292-5630
Massachusetts Department of Environmental Protection
Division of Air Quality Control
One Winter Street, 8th Floor
Boston, MA 02108

NEW HAMPSHIRE
A. Bodnarik, D. Davis 603/ 271-1370
New Hampshire Department of Environmental Services
Air Resources Division
64 North Main Street, Caller Box 2033
Concord, NH 03302-2033

NEW JERSEY

Minor Source Air Pollution Control Permits
L. Mikolajczyk 609/ 633-8220
Chief, Bureau of New Source Review
New Jersey Department of Environmental Protection
Division of Environmental Quality
401 East State Street, CN 027
Trenton, NJ 08625

Major Source Air Pollution Control Permits
I. Atay 609/ 984-3023
Chief, Bureau of Engineering and Regulatory Development
New Jersey Department of Environmental Protection
Division of Environmental Quality
401 East State Street, CN 027
Trenton, NJ 08625

NEW YORK
J. Davis, R. Parker 518/ 457-2044
New York Department of Environmental Conservation
Division of Air
50 Wolf Road
Albany, NY 12233

RHODE ISLAND
D. McVay 401/ 277-2808
Rhode Island Department of Environmental Management
Division of Air and Hazardous Materials
291 Promenade Street
Providence, RI 02908

VERMONT
D. Elliott, B. Fitzgerald, J. Perreault 802/ 244-8731
Vermont Department of Environmental Conservation
Air Pollution Control Division
Building 3 South
103 South Main Street
Waterbury, VT 05676

OTHER CONTACTS

NESCAUM
M. Bradley, N. Seidman 617/ 367-8540
85 Merrimac Street
Boston, MA 02114

EPA Region I
J. Courcier 617/ 565-3260
L. Hamjian 617/ 565-3250
JFK Federal Building, Room 2311
Boston, MA 02203

EPA Region II
W. Baker, K. Mangels 212/ 264-2517
26 Federal Plaza
New York, NY 10278

EPA Office of Air Quality Planning and Standards
BACT/LAER Clearinghouse 919/ 541-5534

BACT gdln-rev 7/91;7/25/91