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# Setting Standards: The 'Best Available Technology' Option

**January, 1991**

A working paper prepared under the auspices of the Environmental Law Institute's Law Drafting Assistance Project for Central and Eastern Europe.

## Acknowledgements

*Setting Standards: The 'Best Available Technology' Option* is one of a series of Working Papers being prepared under the auspices of the Environmental Law Institute's Law Drafting Assistance Project for Central and Eastern Europe. This Working Paper is an outgrowth of an Environmental Law Institute (ELI) law-drafting assistance visit to Poland and the Czech and Slovak Federal Republic, from October 1-10, 1990.

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Funding for ELI's Law Drafting Assistance Project for Central and Eastern Europe is being provided by the World Environment Center, under an agreement with the U.S. Agency for International Development. ELI's Environmental Program for Central and Eastern Europe is supported by grants from the German Marshall Fund of the United States, the Andrew W. Mellon Foundation, the Rockefeller Brothers Fund, and the United States Information Agency.

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## INTRODUCTION

Pollution emission standards can be based on a variety of factors including technology constraints, economic impacts on the sources, or health risks from the pollutant. The draft Polish law for the Protection of Nature and the Natural Environment relies on the "available technology" option[1] to control industrial air pollution. The law requires the Minister for Environmental Protection to determine "the most contemporary technology as well as the most technically advanced pollution control equipment" for sources of air pollution. This approach of using technology-based standards has been an essential part of the U.S. Clean Air Act, the major air pollution statute in the United States.[2] Although this paper describes the workings of technology-based standards, these standards may not be directly transferrable to Poland due to the great differences in economic and political structures in the two countries. A great challenge for Polish policymakers and law drafters in the next few years will be to assess the many approaches to air pollution control, and then decide which approach or combination of approaches would be most effective for their country.

What follows is a description of the Clean Air Act and the technology-based standards employed under the Act for stationary sources. In particular, this paper will focus on Best Available

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[1] Chapter 3, Article 47.

[2] 42 USC Sec. 7401-7626.

Control Technology (BACT), which is a standard applied to certain new or modified major stationary sources of air pollution in "clean" or "attainment" areas of the United States. BACT is a particularly interesting standard because of its flexibility; BACT is determined by weighing a wide variety of factors in order to choose the technology that is best for each particular source. It is a good example of the workings of technology-based standards in the Clean Air Act and the many issues that are involved in setting those standards.

It is important to note that this paper does not attempt to describe the full range of approaches to standard setting or draw any conclusions as to the merits of technology-based standards relative to other types of pollution control standards.

## HISTORY OF THE CLEAN AIR ACT

The Clean Air Act was passed in 1970 in order to protect areas with relatively clean air ("attainment areas") and improve areas with unhealthy air ("nonattainment areas"). By setting different standards for these two designated categories, the Clean Air Act works to raise the level of air quality in nonattainment areas and to prevent deterioration of air quality in attainment areas. At the time of its passage, the Act was a revolution in the field of environmental protection since it resulted in the regulation of almost every large industry in the country, including the powerful steel and utilities industries.

It is likely that U.S. industries did not realize how powerful the Clean Air Act would become in regulating their everyday activities. Since the passage of the Act in 1970, the law has been amended twice. Complex regulations have been developed to implement the law, and controversy between industry and the U.S. Environmental Protection Agency (which implements the law) over various provisions has become very common.[3]

The Clean Air Act is one of the most complex pieces of legislation in the United States. The most recent amendments, enacted into law in November 1990, are about 700 pages long, and the regulations following the new amendments will likely be much longer.[4] While some argue that a simpler law would be more efficient, the Clean Air Act is the result of many compromises among many different interests. Most of the details in the Act are the result of two decades of arguing, experimenting and revising.

The Clean Air Act is based on National Ambient Air Quality Standards (NAAQS), which are goals for atmospheric levels of

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[3] In most cases, the Clean Air Act relies primarily upon individual state governments, rather than the federal Environmental Protection Agency (EPA), to implement and enforce its provisions. The EPA is charged with overseeing state performance, has concurrent enforcement powers along with the states, and has ultimate responsibility to Congress for implementation of the Act. In this paper, the term "EPA" is sometimes used to refer both to the federal EPA and to state regulatory agencies acting under the authority of the Clean Air Act.

[4] It is important to note that while many programs were substantially revised, the BACT program was left relatively untouched by the most recent amendments.

certain pollutants. The NAAQS are determined as the level in the ambient air of each pollutant that is considered safe for human health.[5] Before the Act, standards were set individually by the 50 states leading to great variations across the country. While there are many additional standards for facilities and industries in the Act, none can allow pollution in excess of the NAAQS. According to one legal scholar, the NAAQS "are not goals, they are commands. They are the engine that directly drives much of the complex regulatory machinery" in the Clean Air Act.[6]

In order to achieve the NAAQS goal, states set emissions standards for particular types of facilities through permits. New sources must generally meet tougher standards than old sources since retrofitting old sources can be expensive.[7]

## WHAT IS A TECHNOLOGY-BASED STANDARD?

In the Clean Air Act, there are many standards based on use of a particular pollution control device. These standards, generally called "technology-based performance standards," do not usually require a facility to install a certain technology. Rather, technology-based standards are expressed as numerical

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[5] Novick, 11-4.

[6] Novick, 11-14.

[7] For a detailed discussion of the way NAAQS is used as a basis for setting emissions standards, see Appendix V: Jones, Michael. "Developing and Updating Our National Ambient Air Quality Standards." Ambient Standards Branch, Office of Air Quality Planning and Standards, U.S. Environmental Protection Agency (1988).

emissions limits based on what is achievable through the technology. Once an emission limit has been set, industry is free to choose its own means of complying with the standard. This allows industry to innovate, which is a central feature of the Clean Air Act.

In setting a technology-based standard, several considerations need to be kept in mind: What types of technology are available? What level of emissions reductions are expected? How should economic impacts of the technology be assessed? How can increasingly efficient industrial processes reduce emissions without requiring "end-of-pipe" control technology? There are many technology-based standards in the Act and more have been added in the 1990 amendments. Each was developed at a different time in response to different circumstances. The following are some of the technology-based standards in the Clean Air Act and related regulations:

**Best Available Control Technology (BACT)** requires the best technology for new sources and for major modifications of existing plants in attainment areas. Economic, environmental and energy factors can be considered on a case-by-case basis in the implementation of this standard.

**Best Available Retrofit Technology (BART)** requires the best technology to be installed on existing sources in areas where visibility is important, such as wilderness areas or national parks.

**Lowest Achievable Emissions Rate (LAER)** requires the best technology for new sources and for major modifications of existing plants in nonattainment areas. Economic, environmental and energy impacts are not considered. In order to expand a plant, a company much show that its other existing plants are in compliance. There is also a requirement that pollution produced by a new plant must be offset by emissions reductions in an existing plant.

**New Source Performance Standards (NSPS)** require that new sources in about 60 categories (such as municipal incinerators and petroleum refineries) install the best demonstrated technology. Unlike the other technology-based standards, NSPS are not set on a facility-specific basis; rather, they are industry-wide standards. Thus, the NSPS tend to be less resource-intensive for EPA and the states to implement.

**Reasonably Available Control Technology (RACT)** requires that retrofit improvements be made on existing sources in nonattainment areas using technology commonly found in the industry.

**Maximum Achievable Control Technology (MACT)** requires major sources of any of 189 toxic air pollutants to make the greatest reduction in emissions possible while considering economic and environmental impacts. For new sources, MACT must not exceed the limits achieved by the least polluting similar source. For existing sources, MACT must be at least as stringent as the average emissions of the best-controlled 12% of similar sources. Any source that achieves voluntary reductions of 90% (from current emissions) gets a 6 year extension on compliance with MACT.

**Generally Available Control Technology (GACT)** is a less stringent alternative to MACT for area sources of air toxics, including gas stations, wood stoves and dry cleaners.

These brief descriptions reflect the many different types of technology-based standards now in use. The goal of most of these standards is to force companies to perform as well as the best of their peers. For this paper, the BACT standard for new or modified major stationary sources in attainment areas will be used as an example of the workings of a technology-based performance standard.

In 1979, a federal court ruled that EPA and the states could require BACT for a wide variety of pollutants regulated under the Clean Air Act, not just SO2 and particulate matter. This greatly increased the scope of BACT to include NOx, photochemical oxidants and a variety of other air pollutants. With this ruling, many new sources were more carefully regulated. As a result, the administrative burden on the agencies grew substantially.

## THE DEVELOPMENT OF THE BACT STANDARD IN THE CLEAN AIR ACT

In 1977, the U.S. Congress passed major amendments to the Clean Air Act establishing BACT as part of the Prevention of Significant Deterioration Program (PSD)[8]. The goal of PSD is to prevent areas with clean air from being polluted. All new or modified major stationary sources of regulated pollutants that are emitted at levels exceeding established "significant levels" are required to get a PSD permit and conform to BACT standards.[9] Most PSD permits cover about 25 types of sources including electric utilities, chemical plants, petroleum refineries, pulp and paper mills, gas and oil pumping stations, natural gas processing plants, and food processing plants.

Sources may be able to avoid this limit if they agree to keep their emissions at current levels through a process called "offsetting." For example, a company may add a new wing to a factory without triggering BACT if, at the same time, it shuts down a production line in another facility. BACT is applied only when there is a net significant increase in the amount of

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8 Part C, 42 USC Sec. 7470-9.

9 See 40 CFR 51.169 (b) and 40 CFR 52.21.

pollution produced by an individual company.[10] In "nonattainment" areas (where ambient concentration goals are not being met), offsetting is not allowed and new or modified facilities must use the best technology available regardless of reductions at existing plants.

## HOW IS BACT INCORPORATED INTO AN ENVIRONMENTAL PERMIT?

A PSD permit containing BACT standards is required for major sources of air pollution in attainment ("clean") areas in one of two categories:

(1) Those that are new and have the potential to emit 100 tons or more per year of a regulated pollutant, or

(2) Those that are undergoing modifications that would increase net emissions of a regulated pollutant beyond certain "significant levels" set by EPA.

[See table 1 for a list of the significant levels of pollutant emissions that trigger PSD review for modifications.]

After receiving an application for a PSD permit, EPA looks at other similar facilities to determine the best control technology currently in use.[11] EPA can require technology that is used in a different industry; however, EPA must do a careful

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[10] This applies only to major modifications of old sources. Most new sources in attainment areas must get a permit and follow BACT standards.

[11] For a discussion of the roles of industry and EPA in BACT determinations, see "Who is Responsible for Considering These Factors?" p. 14.

## TABLE 1. SIGNIFICANT EMISSION RATES[a]

| Pollutant | Emissions Rate (tons/year) | |
|---|---|---|
| Carbon monoxide | 100 | Pollutants Regulated by the Clean Air Act as of 8/7/80 |
| Nitrogen oxides | 40 | |
| Sulfur dioxide | 40 | |
| Particulate matter ($PM/PM_{10}$) | 25/15 | |
| Ozone (VOC) | 40 (of VOCs) | |
| Lead | 0.6 | |
| Asbestos | 0.007 | |
| Beryllium | 0.0004 | |
| Mercury | 0.1 | |
| Vinyl chloride | 1 | |
| Fluorides | 3 | |
| Sulfuric acid mist | 7 | |
| Hydrogen sulfide ($H_2S$) | 10 | |
| Total reduced sulfur (including $H_2S$) | 10 | |
| Reduced sulfur compounds (including $H_2S$) | 10 | |
| Other pollutants regulated by the Clean Air Act such as: • Benzene • Arsenic • Polonium-210 • Radionuclides • Radon-222 • Chlorofluorocarbons (CFC's) | Any emission rate | Pollutants Regulated by the Clean Air Act since 8/7/80 |
| Each regulated pollutant | Emission rate that causes an air quality impact of 1 ug/m³ or greater (24-hour basis) in any Class I area located within 10 km of the source | |

[a]Based on 40 CFR 52.21(b)(23) plus subsequent CAA rulemaking.

From Hayes, Leigh C. "Prevention of Significant Deterioration for the 1990's -- Renewed Uncertainty," presented at Inside EPA Clean Air Conference, Arlington, VA, September 27-28, 1989: page 4.

review of the effects (economic, environmental and energy) of transferring technology from one industry to another. For example, a control device that works well in one industry may emit certain air toxics or be very expensive in another industry. However, there have been many successful technology transfers, and other industries are often good sources of ideas for more effective control technologies.

Based on EPA's determination of the best available control technology, the Agency sets an emissions standard for the facility in a written permit. While the permit applicant has the right to contest the terms of the permit and argue that EPA's determination of a control technology was not appropriate, most permits are not challenged. The work of analyzing the technology is generally paid for by the company and carried out by consultants. Once a permit is granted, the emissions limit is in force for the life of the permit, regardless of whether new technology is developed after the permit is issued.[12]

**WHAT KINDS OF CONTROL TECHNOLOGY ARE CONSIDERED BACT?**

There are two major limitations on the kind of technology that EPA may require as BACT. The first is that EPA cannot redefine the source through a BACT determination. For example, the Agency cannot require a proposed coal-fired power plant to

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[12] The permit application process generally takes several months.

use natural gas because it will be less polluting.[13] However, EPA can require process changes short of redefining the source; and, in many cases, a more efficient process or a different design may produce less pollution.[14] As public concerns increase over energy use, EPA may consider changes in industrial processes more often in determining BACT.

The second major limitation on EPA's choice of BACT is that the emissions limit determined must be achievable by existing technology. In implementing some sections of the Clean Air Act where BACT standards are <u>not</u> applied, EPA has set emissions limits that are unachievable by available technology -- this

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[13] 43 FR 26397 (1978).

[14] Design or process standards are used now primarily in cases in which it is impossible to set a numerical performance standard due to difficulty in monitoring emissions. Controlling air emissions from certain storage tanks is one instance in which the EPA has required a design standard. Because leakage can occur at any point along a tank's seal, the EPA has required the use of double mechanical seals rather than imposing difficult-to-monitor numerical limits on emissions. Requiring a higher grade of fuel oil is a process change that EPA has imposed in some situations where the monitoring of emissions has been impractical.

The EPA has increased its attention to pollution prevention over the past few years. An Office of Pollution Prevention has been established within the Agency to coordinate efforts to reduce the amount of pollution generated. In addition, there are explicit provisions in the 1990 Clean Air Act Amendments calling for EPA to consider pollution prevention in determining standards for air toxics.

It is important to note that some companies claim that EPA does not have the authority under the Clean Air Act to require these design or process changes in determining BACT. Like many issues in the Clean Air Act, this point is still being litigated in the courts.

process is called "technology-forcing."[15] While technology-forcing has been used successfully by EPA, particularly in the mobile source program, EPA cannot set an unreachable emissions limit under BACT. BACT is based on pollution controls that are already in use.

**WHAT FACTORS ARE CONSIDERED IN CHOOSING BACT?**

EPA and the regulated industries have wrestled over how strong the BACT provisions should be and what technologies should be considered. As discussed above, current federal regulations issued under the Clean Air Act allow facilities to argue that the best available technology in general may not be the best for a particular facility. The statute requires that facilities must achieve:

> an emissions limitation... based on the maximum degree of reduction for each pollutant subject to regulation under the Act which would be emitted from any proposed major stationary source or major modification which the [EPA] Administrator, on a case-by-case basis, taking into account energy, environmental, and economic impacts, and other costs, determines is achievable through application of production processes or available methods, systems and techniques. [emphasis added] [42 USC 7479 (3)]

The weight given to each factor has a tremendous impact on what technology will be required.

Currently, the draft Polish Law for the Preservation of Nature and the Environment allows a Voivoda to adjust emissions

[15] For a more complete discussion of "technology-forcing," see p. 17.

standards "for certain economic activities which are deemed socially important."[16] In the United States, economic impacts must always be considered but will only justify a less stringent technology where the effects are "unique and substantial," such as increasing unemployment in a town that already has a high number of people without jobs. The words "unique and substantial" are subject to many different interpretations, and throughout the history of the Clean Air Act, the decision about how to incorporate economic factors has been a constant source of controversy between industry, citizens groups and EPA.

The major issue in this controversy is whether a BACT requirement will cause economic hardship. Several industry groups have argued that EPA has required them to use certain technologies that have achieved very small reductions in emissions levels.[17] In California, for example, furniture manufacturers are required to use expensive water-based coating processes to reduce emissions of volatile organic compounds (VOCs). Claiming that compliance with these requirements made it impossible to operate economically in the United States, a number of smaller furniture manufacturers have relocated to Mexico, where environmental regulations are seen as less stringent. However, few, if any, new major sources (as opposed to modifications) have failed to open because of BACT requirements,

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[16] Chapter 3, Article 50.

[17] Environmental Research and Technology, 1981, 8.

and the effect on smaller industries is still unclear.

The debate over the economic effects of compliance with BACT still rages today. While all involved -- EPA, state agencies, consulting groups, law firms, companies, etc. -- have gained expertise in the BACT process over the past two decades, practically every new amendment, regulation or technology produces a new flurry of activity. This controversy will likely continue as long as new technologies are being developed and EPA requires industries to use them.

Environmental factors must also be considered in determining BACT. EPA will not require a source to install a control device that itself creates large amounts of pollution.[18] For example, a control device may produce hazardous or solid waste, water pollution, cause reduced visibility or generate unregulated air pollutants. On the other hand, some control technologies produce environmental benefits beyond the reduction in specifically targeted pollutants. A control device, for example, may reduce certain unregulated air toxics or improve visibility in addition to controlling regulated pollutants. An EPA consultant who has studied the PSD program has argued that the Agency should give more weight to these environmental factors in determining BACT.[19]

The level of control technology required by EPA has varied

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[18] The levels of additional pollution that will be tolerated from a control technology are called "significant impact levels," and are set by EPA.

[19] Hayes, "The BACT Decisionmaking Process," p. 6.

over the last twenty years as the Agency's view on the importance of economic and environmental factors has varied. Some people feel that in the 1980's particularly, EPA increased its attention to economic impacts, resulting in less stringent technology requirements in permits. Currently, the trend seems to be that economic impacts are becoming less important while environmental effects are being considered more seriously. The degree to which environmental, economic or energy factors are considered will have a tremendous impact on the stringency of the BACT standard.

**WHO IS RESPONSIBLE FOR CONSIDERING THESE FACTORS?**

The EPA's biggest change in making BACT determinations took place in 1987 with the issuance of the so-called "top down" policy. Previously, a "bottom up" approach[20] was followed, whereby the proposed pollution source was responsible for analyzing various control technology options and presenting a proposal to EPA of the best available control technology. Based on this analysis, EPA would decide what emissions levels to require the applicant to meet.[21]

In 1987, an EPA Task Force found that the Agency was almost always accepting the BACT proposed by the company.[22] In

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[20] EPA PSD Workshop Manual, 1980.

[21] See Appendix IV -- "Draft Top Down BACT Guidance Document." Office of Air Quality Planning and Standards, U.S. Environmental Protection Agency (March 15, 1990).

[22] Hayes, 1989, 1.

addition, the Task Force found that sources were not analyzing (in their permit applications) options that were more stringent than the one they proposed to use. This process provided "too little incentive [on the part of the company] to select the very best available technology."[23] It also placed the burden of proof on EPA to find and analyze tougher BACT options, which added greatly to EPA's workload and made BACT a weaker standard. On the theory that permit applicants should bear the burden of showing that they deserve the permit, EPA decided that a change was needed in the way BACT was determined.

This change came in a memo from EPA outlining the "top down" policy.[24] Under this policy, EPA makes the first move by suggesting a particular technology to the company based on the best technology currently in use.[25] Then the burden of proof for

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[23] Wilson, 10070.

[24] The memo reads as follows: "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 infeasible... then the next most stringent level of control is determined and similarly evaluated. This process continues until the BACT level under consideration cannot be eliminated by any substantial or unique technical, environmental or economic objection. Thus, the "top down" approach shifts the burden of proof to the applicant to justify that 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 technique only if the applicant opposes that level of control."

[25] See Table 2 -- "Key Steps in the 'Top-Down' BACT Process" for an overview of EPA's BACT decisionmaking process as described in an Agency guidance document.

showing that a control technology is not feasible (or will have adverse economic or environmental impacts) shifts to the company.

The EPA memo has been the basis for BACT determinations since 1987 and may have had the effect of making BACT determinations more stringent. Many regard the "top down" policy as reducing the importance of economic considerations in BACT determinations.

## EVALUATION OF BACT STANDARDS

Although the effects of the passage of the most recent Clean Air Act Amendments, enacted in November 1990, are still not clear, it is possible to make general observations about BACT standards as they have been applied over the past fifteen years. Overall, BACT has grown into a complex regulatory system that has led to relatively strict control on certain types of major stationary sources of air pollution. Over time, EPA and industry have each refined their roles and developed greater expertise in the process of BACT determination.

**Effects of BACT on Emission Levels:** The most recent study on the effectiveness of BACT standards in reducing air pollution was commissioned by EPA in 1986.[26] The study compared emissions from

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[26] Sugiyama, George, Leigh Hayes, and Mary Ann Baviello. "New Source Review Permitting Experience," presented at the 79th Annual Meeting of the Air Pollution Control Association. (Minneapolis, MN, June 22-27, 1986.)

Table 2

# KEY STEPS IN THE "TOP-DOWN" BACT PROCESS

**From EPA BACT Guidance Document**

*March 15, 1990*

STEP 1: IDENTIFY ALL CONTROL TECHNOLOGIES.

- LIST is comprehensive (LAER included).

STEP 2: ELIMINATE TECHNICALLY INFEASIBLE OPTIONS.

- A demonstration of technical infeasibility should be clearly documented and should show, based on physical, chemical, and engineering principles, that technical difficulties would preclude the successful use of the control option on the emissions unit under review.

STEP 3: RANK REMAINING CONTROL TECHNOLOGIES BY CONTROL EFFECTIVENESS.

Should include:

- control effectiveness (percent pollutant removed);
- expected emission rate (tons per year);
- expected emission reduction (tons per year);
- energy impacts (BTU, kWh);
- environmental impacts (other media and the emissions of toxic and hazardous air emissions); and
- economic impacts (total cost effectiveness, incremental cost effectiveness).

STEP 4: EVALUATE MOST EFFECTIVE CONTROLS AND DOCUMENT RESULTS.

- Case-by-case consideration of energy, environmental, and economic impacts.
- If top option is not selected as BACT, evaluate next most effective control option.

STEP 5: SELECT BACT

- Most effective option not rejected is BACT.

plants that use BACT to those from plants that use the uniform national "New Source Performance Standards" for three pollutants -- sulfur dioxide (SO2), particulate matter (PM), and nitrogen oxides (NOx).

The study found that almost half of sources using BACT were emitting significantly less SO2 and PM than the NSPS sources. However, only about 13% of BACT sources outperformed NSPS sources for NOx. The difference is primarily that the best available technology for NOx control, selective catalytic reduction, is new and extremely expensive. Many states have been reluctant to require facilities to use this technology because of the cost.[27] As a result, BACT has been less effective in encouraging the use of the very best technology for NOx. However, overall, the study concludes that BACT standards have significantly reduced the levels of air pollution in new sources by the application of stringent control technology.[28]

Another way in which BACT can be evaluated is the degree to which it encourages the development of new control technologies. The most effective "technology-forcing" standards were applied to mobile sources in the early 1970's. These were technology-based standards like BACT, but they required an emissions limit that

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[27] The state of California has been a leader among states in requiring stringent BACT for many air pollutants and has mandated the use of selective catalytic reduction in most cases. Since much of the implementation and enforcement of the Clean Air Act is done by individual states, it is possible for BACT to be applied in different ways around the country.

[28] Hayes, 1989, 5.

was not achievable by available technology. Car manufacturers were required to reduce vehicle emissions of hydrocarbons and carbon monoxide by 90%, which at the time was not technologically feasible.[29] Although the industry complained that this was unfair, the catalytic converter was developed and brought on line, and the standards were met.[30]

The success of mobile source technology-forcing is not achievable under BACT because BACT can only be based on existing technology.[31] However, because each new source is required to adopt the best technology used in any existing similar source, BACT provides a stimulus to the pollution control industry to invent new technologies. If a pollution control equipment manufacturer or designer is able to get even one existing facility to use a new technology, then potentially EPA will require all similar new sources to use that technology.

The degree to which BACT is technology-forcing is a matter of great debate. While some feel that it slowly and effectively encourages the development of new technologies, others feel that it freezes technology at current levels. Permit terms in the

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[29] Clean Air Act Sec. 202 (1970).

[30] Novick, 11-162 and 11-179.

[31] In some cases, regulatory agencies are developing programs that may help to broaden the realm of "existing" technology. In the state of California, for example, regulators are considering a plan to use government funds to bring experimental technology into general use. The goal of the plan is to encourage research and development companies to produce new, economical control technologies, especially for use in small businesses.

1990 Clean Air Act Amendments are five years in duration, and the level of control technology must be re-evaluated by EPA before a new permit is issued.[32] By setting relatively short permit terms, EPA can continue to require better control devices as new technologies are developed.

One argument against the Clean Air Act in general, and the Act's BACT provisions in particular, is that they focus on new or modified sources while old sources continue to produce the bulk of the country's air pollution. For example, one study shows that electric power plants built before 1971, which are exempt from the PSD program, emit 88% of the SO2 and 79% of the NOx released from all electric power plants.[33] Although there are many ways of reducing emissions in older sources -- including improving the efficiency of the industrial process or retrofitting with end-of-the-pipe control technology -- several types of industries have received exemptions for older facilities.

BACT standards, while not reaching all major sources of air pollution, are designed to reduce continually the amount of air pollution by requiring all new sources to use better and better technology. Thus, as older plants are gradually decommissioned,

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[32] EPA or a state can change the emissions levels in a permit before the permit expires if the facility is creating a substantial health risk.

[33] Electricity Supply: Older Plants' Impact on Reliability and Air Quality. U.S. General Accounting Office, GAO/RCED-90-200 (1990): 2, 20-24.

BACT standards will eventually control pollution from all facilities. In the case of nonattainment areas, the Clean Air Act has tried to speed up the process by applying Reasonably Achievable Control Technology (RACT), a less stringent version of BACT, to existing sources.

**Effects of BACT on the Regulated Industry:** The most common complaint from industry about the BACT standard refers to the lack of certainty as to emissions limits. Since each BACT determination is made on a case-by-case basis, it is very difficult for industries to predict what types of control will be required of them. This makes the planning of new facilities much more difficult than under a regime that relies on uniform emission limits.

EPA has tried to bring consistency to the process by establishing the BACT/LAER Clearinghouse which keeps track of the technologies used at regulated facilities. The Clearinghouse is continually being updated with information from EPA's Regional Offices and includes most large and some small facilities.[34] Most industries make their decisions by hiring consultants who are familiar with the BACT process, and there is considerable discussion with EPA and the state during this process. Although many companies complain that the BACT determination process is

[34] The 1990 Clean Air Act Amendments, requiring that the Clearinghouse be substantially improved, authorized additional federal funds for this task.

confusing and difficult to follow, there is no question that as time goes on, industry has learned more and more about the process and has become better able to anticipate the EPA's requirements under this standard.

## CONCLUSION

BACT has become an important part of the regulation of many large industries in the United States. In some cases, BACT has made a clear, significant impact on entire industries. For example, many coal-fired power plants now use scrubbers -- expensive but effective in reducing SO2 emissions -- as a result of BACT requirements. In addition, BACT is starting to make a dent in NOx emissions, which are considered one of the most difficult pollutants to regulate economically.

BACT standards are applied on a case-by-case basis so that technology, economics, environment and energy can be carefully considered for each facility. The level of control technology required also has the potential to become more stringent as time goes on; since technology is continually improving, the best available technology for an industry will tend to become stronger over time. Once one source adopts an effective new technology, future sources in the same industry will likely be required to use that technology.

The main disadvantage of BACT as currently applied is that it is very resource-intensive for both the government and industry. The government must not only keep track of what control technologies are used around the country, but must also evaluate each facility and its particular situation. The implementation of BACT standards has required compromises between EPA's desire to review carefully each permit application and the Agency's resource limitations. Industry, in turn, bears the costs of analyzing different technologies, filing a permit application, and installing new control devices.

In the United States, various types of standards have been chosen for different circumstances or goals. In many cases, the use of different standards has allowed EPA to target its limited resources toward areas and facilities of greatest concern. Careful study and consideration of the situation in Poland will help to determine the areas in which a technology-based standard system might be most appropriate.

Technology-based standards first took effect with the passage of the Clean Air Act of 1970. The statute was enacted at a time when there was great optimism about the problem-solving potential of American technology. As a result, technology-based solutions to environmental problems were a natural choice for Congress.

Over the past two decades, Congress has expanded the role of technology-based standards in the Clean Air Act. In the 1990 Amendments to the Clean Air Act, Congress has strengthened BACT provisions and has added two new technology-based standards for air toxics and area sources of volatile organic compounds (VOCs). These developments indicate that technology-based standards have ongoing support in the Congress and have become a key feature of the American environmental regulatory system.

Poland in 1991 faces awesome challenges of political transformation, economic restructuring, and environmental repair. Policymakers must carefully evaluate these factors as they weigh the advantages and disadvantages of different pollution control options. Technology-based standards are an option that must be carefully considered in light of Poland's current needs and constraints.

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# APPENDICES

**I -- List of Abbreviations**

**II -- Technology-Based Standards in the Clean Water Act** [33 U.S.C. Sec. 1131 (b)(1)(A) and (B)] based on Water Pollution Control in the United States: Lessons for Other Countries by Jeffrey G. Miller. (Unpublished Manuscript, 1990).

**III -- Clean Air Act** [42 U.S.C. Sec. 7401-7626]

A. Statutory Outline

B. Prevention of Significant Deterioration Program [Part C, Subpart I, Sec. 7470-9], including Sec. 7475 (a)(4) which sets the Best Available Technology Standard.

**IV -- Draft "Top-Down BACT Guidance Document"** Environmental Protection Agency Office of Air Quality Planning and Standards, March 15, 1990.

**V -- "Developing and Updating our National Ambient Air Quality Standards"** by Michael H. Jones, Ambient Standards Branch, Office of Air Quality Planning and Standards, US Environmental Protection Agency. (1988)

**VI -- "A Critical Review of the Environmental Protection Agency's Standards for 'Best Available Technology' under the Clean Air Act,"** by Michael L. Wilson, Lisa Marie Martin and David M. Friedland in Environmental Law Reporter 20 (February, 1990): 10067-10076.

# APPENDIX I

## List of Abbreviations

## APPENDIX I -- ABBREVIATIONS

| | | |
|---|---|---|
| BACT | -- | Best Available Control Technology |
| BART | -- | Best Available Retrofit Technology |
| EPA | -- | Environmental Protection Agency |
| GACT | -- | Generally Available Control Technology |
| LAER | -- | Lowest Achievable Emissions Reduction |
| MACT | -- | Maximum Achievable Control Technology |
| NAAQS | -- | National Ambient Air Quality Standards |
| NSPS | -- | New Source Performance Standard |
| NOx | -- | Oxides of Nitrogen |
| PM | -- | Particulate Matter |
| PSD | -- | Prevention of Significant Deterioration |
| RACT | -- | Reasonably Achievable Control Technology |
| SCR | -- | Selective Catalytic Reduction |
| SO2 | -- | sulfur dioxide |

## APPENDIX II

## Technology-based Standards in the Clean Water Act

## APPENDIX II

### TECHNOLOGY-BASED STANDARDS IN THE CLEAN WATER ACT 33 U.S.C. Sec. 1311(b)(1)(A) and (B)[35]

The Clean Water Act establishes a series of technology based standards for sewage treatment works (POTWs) and industries. Like the standards in the Clean Air Act, these standards are water quality standards based on the use of a certain technology. POTWs must meet treatment standards which are based on primary treatment (settling), followed by secondary treatment (biological), followed by chlorination. Primary treatment removes the majority of solids, secondary treatment removes the majority of oxygen demanding organic material, and chlorination kills pathogens. The secondary treatment standards specify the concentration of pollutants expected to remain in the effluent after treatment by primary and secondary systems with chlorination.

Industries discharging directly to surface water are subject to two stages of technology based standards. The first, best practicable technology (BPT), is analogous to secondary treatment, requiring about 85% removal of BOD, suspended solids and singular pollutants. The second, best available technology (BAT), requires additional removal for certain other toxic and non-toxic pollutants. Most major industries met the national

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[35] Based on Water Pollution Control in the United States: Lessons for Other Countries by Jeffrey G. Miller. (Unpublished Manuscript, 1990).

goal of achieving BPT between 1972 and 1977, and most have achieved BAT since then.

## APPENDIX III

A. Summary of Clean Air Act

42 U.S.C. Sec. 7401-7626

B. Prevention of Significant Deterioration Provisions of the Clean Air Act

42 U.S.C. Sec. 7470-7479

# AIR QUALITY

## Clean Air Act*
## 42 U.S.C. §§7401-7626

**National ambient air quality standards and state implementation plans**

• Each state has primary responsibility for assuring air quality within its borders by submitting a **state implementation plan (SIP)** specifying the manner in which **primary and secondary national ambient air quality standards (NAAQSs)** will be achieved and maintained.

• The Administrator of EPA must establish **primary NAAQSs** to protect the public health with an adequate margin of safety and **secondary NAAQSs** to protect the public welfare.

• The statute provides for the procedure by which states shall adopt and submit SIPs for primary and secondary NAAQSs, the requirements of such plans, and the procedure by which the Administrator shall approve, disapprove, or revise such plans.

**New source performance standards**

• The Administrator shall promulgate regulations establishing federal performance standards for **new stationary sources of pollution** (new source performance standards, or NSPSs). The standards must reflect the degree of emission limitation and the percentage reduction achievable through the application of the best technological system of continuous emission reduction that has been demonstrated. The Administrator is to consider the cost of achieving such emission reduction.

• Each state may develop its own procedure for implementing and enforcing NSPSs, and the Administrator, upon finding that a state's procedure is adequate, shall **delegate** his implementation authority to the state.

• Each state shall submit to the Administrator a plan that establishes standards of performance for existing stationary sources of pollution and provides for their implementation. In applying performance standards to existing sources, states may take into consideration the remaining useful life of the source.

**Hazardous air pollutants**

• The Administrator shall establish **national emission standards for hazardous air pollutants (NESHAPs).** NESHAPs shall provide an ample margin of safety to protect the public health.

• Each state may develop a procedure for implementing and enforcing NESHAPs, and the Administrator, upon finding that a state's procedure is adequate, shall delegate to the state his implementation authority.

**Enforcement and monitoring provisions**

• The statute provides for **federal enforcement mechanisms** for air quality and emission limitation requirements, including **administrative orders, civil actions, and criminal prosecution.**

• **Interim orders** may be issued to allow noncomplying stationary sources to continue operating.

• The Administrator or state may require operators of emission sources to keep **records**, make reports, and provide other information, and may enter the premises of sources at reasonable times to inspect **monitoring** methods and sample emissions.

**State authority**

• Air pollution measures by state and local governments are generally not **preempted** unless they are less stringent than existing federal or SIP requirements.

**Federal facilities**

• **Federal facilities** shall comply with all federal, state, interstate, and local requirements respecting the control and abatement of air pollution, although the President may grant exemptions.

**Noncompliance penalties**

• The Administrator or state shall assess **noncompliance penalties** against sources that are in violation of applicable limitations or standards. The penalty must be at least equal to the **violator's economic benefit** from noncompliance.

**Stack heights**

• Required emission limitations are not affected by **stack heights** over good engineering practice or by any other **dispersion technique.**

**Interstate pollution**

• SIPs shall require that certain sources, including major new or modified sources that will significantly contribute to air pollution in excess of NAAQSs outside the sources' states, must notify nearby states

***The full text of the Clean Air Act, including a table of sections, is published in this binder at ELR Stat. CAA 001.**

prior to commencing construction. Affected states may petition the Administrator for a finding that the proposed emissions would violate prohibitions on certain interstate pollution.

**Prevention of significant deterioration**

- Each SIP shall contain emission limitations and any other necessary requirements to **prevent significant deterioration** of air quality (PSD requirements).
- The statute establishes a three-tiered classification system (PSD classifications) for certain public lands, as well as regions with air quality levels for sulfur oxides or particulate matter better than the NAAQSs, and limits allowable increases of sulfur dioxide and particulate matter pollution for each classification. In no event shall allowable concentrations of any pollutant exceed the NAAQSs.
- The statute provides for the procedures and requirements that must be followed prior to the construction of new major emitting facilities in areas covered by PSD classifications. Such new facilities must be subject to the best available control technology.
- The Administrator shall promulgate regulations to prevent the significant deterioration of air quality with respect to hydrocarbons, carbon monoxide, photochemical oxidants, and nitrogen oxides.
- The Administrator shall promulgate regulations to address the impairment of **visibility** in national parks and wilderness areas resulting from man-made air pollution. The regulations shall provide that SIPs require certain major stationary sources to install the **best available retrofit technology.**

**Nonattainment**

- SIPs must provide that **nonattainment areas** achieve compliance with NAAQSs by December 31, 1982. Certain areas may be granted an extension until December 31, 1987, for compliance with primary NAAQSs for photochemical oxidants and carbon monoxide. (**Sanctions** for violation of the December 31, 1987, deadline cannot be implemented until August 31, 1988. Pub. L. No. 100-202, 101 Stat. 1329 (1987).)
- SIPs must include provisions relating to the management of nonattainment areas, including a requirement that a permit be obtained for the construction and operation of a new or modified stationary source in such areas.
- These permits will be granted only if, when the new source goes into operation, the total allowable emissions from existing sources and the proposed new source will be less than the total emissions from existing sources before the permit application (the offset requirement). Another condition is that the proposed source comply with the lowest achievable emission rate (LAER).

**Emission standards for moving sources**

- The Administrator shall prescribe standards applicable to the emission of any air pollutant from **new motor vehicles** that may reasonably be anticipated to endanger public health or welfare. Such regulations shall take effect after such period that the Administrator finds necessary for development and application of the requisite technology, giving consideration to the cost of compliance.
- The statute specifies certain requirements concerning regulations to be promulgated for particular pollutants (carbon monoxide, hydrocarbons, and nitrogen) or kinds of vehicle.
- The statute provides for **civil penalties** for the commission of certain prohibited acts, including the sale of new vehicles without certificates of conformity and the removal by sellers or repair persons of any device or design element used to reduce emissions in compliance with motor vehicle emission standards.
- Manufacturers are required to obtain **certificates of conformity** for new vehicles. The statute provides the procedures by which certificates may be issued, suspended, and revoked, and by which permit decisions may be reviewed.
- The Administrator is authorized to conduct **audits** at manufacturers' plants to ensure compliance with auto emission standards.
- A manufacturer of each new motor vehicle shall warrant to purchasers that the vehicle conforms with auto emission regulations.
- State motor vehicle emission standards and regulations are generally **preempted.**

**General**

- Where the Administrator receives notice that a pollution source is presenting an **imminent and substantial endangerment** to human health and that state or local authorities have not acted to abate the danger, he may sue for the immediate restraint of anyone causing or contributing to the pollution, or take any other action necesssary.
- Any person may bring a **citizen suit** against alleged violators, the Administrator, or any person who proposes to construct a major emitting facility without a permit.
- The statute establishes certain procedural and jurisdictional rules pertaining to administrative proceedings and **judicial review**.

Clean Air Act Prevention of Significant Deterioration Program
(42 USC Sec. 7470-9)

<u>Note</u>: Best Available Control Technology provision is at 42 USC Sec. 7475 (a)(4).

# PART C—PREVENTION OF SIGNIFICANT DETERIORATION OF AIR QUALITY

## *Subpart I—Clean Air*

### §7470. [CAA §160]
**Purposes**

Sec. 160. [7470] The purposes of this part are as follows:

(1) to protect public health and welfare from any actual or potential adverse effect which in the Administrator's judgment may reasonably be anticipate [2] to occur from air pollution or from exposures to pollutants in other media, which pollutants originate as emissions to the ambient air),[3] notwithstanding attainment and maintenance of all national ambient air quality standards;

(2) to preserve, protect, and enhance the air quality in national parks, national wilderness areas, national monuments, national seashores, and other areas of special national or regional natural, recreational, scenic, or historic value;

(3) to insure that economic growth will occur in a manner consistent with the preservation of existing clean air resources;

(4) to assure that emissions from any source in any State will not interfere with any portion of the applicable implementation plan to prevent significant deterioration of air quality for any other State; and

(5) to assure that any decision to permit increased air pollution in any area to which this section applies is made only after careful evaluation of all the consequences of such a decision and after adequate procedural opportunities for informed public participation in the decisionmaking process.

(July 14, 1955, ch. 360, tit. I, §160, as added Aug. 7, 1977, Pub.L. 95-95, tit. I, §127(a), 91 Stat. 731.)

### §7471. [CAA §161]
**Plan requirements**

Sec. 161. [7471] In accordance with the policy of section 101(b)(1), each applicable implementation plan shall contain emission limitations and such other measures as may be necessary, as determined under regulations promulgated under this part, to prevent significant deterioration of air quality in each region (or portion thereof) identified pursuant to section 107(d)(1) (D) or (E).

(July 14, 1955, ch. 360, tit. I, §161, as added Aug. 7, 1977, Pub.L. 95-95, tit. I, §127(a), 91 Stat. 731.)

### §7472. [CAA §162]
**Initial classifications**

Sec. 162. [7472] (a) Upon the enactment of this part, all—

(1) international parks,

(2) national wilderness areas which exceed 5,000 acres in size,

(3) national memorial parks which exceed 5,000 acres in size, and

(4) national parks which exceed six thousand acres in size,

and which are in existence on the date of enactment of the Clean Air Act Amendments of 1977 shall be class I areas and may not be redesignated. All areas which were redesignated as class I under

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[2] So in original public law. Probably should be "anticipated".
[3] So in original. Section enacted without opening parenthesis.

regulations promulgated before such date of enactment shall be class I areas which may be redesignated as provided in this part.

(b) All areas in such State identified pursuant to section 107(d)(1)(D) or (E) which are not established as class I under subsection (a) shall be class II areas unless redesignated under section 164.

(July 14, 1955, ch. 360, tit. I, §162, as added Aug. 7, 1977, Pub.L. 95-95, tit. I, §127(a), 91 Stat. 731, and amended Nov. 16, 1977, Pub.L. 95-190, §14(a)(40), 91 Stat. 1401.)

## §7473. [CAA §163]

### Increments and ceilings

Sec. 163. [7473] (a) In the case of sulfur oxide and particulate matter, each applicable implementation plan shall contain measures assuring that maximum allowable increases over baseline concentrations of, and maximum allowable concentrations of, such pollutant shall not be exceeded. In the case of any maximum allowable increase (except an allowable increase specified under section 165(d)(2)(C)(iv)) for a pollutant based on concentrations permitted under national ambient air quality standards for any period other than an annual period, such regulations shall permit such maximum allowable increase to be exceeded during one such period per year.

(b)(1) For any class I area, the maximum allowable increase in concentrations of sulfur dioxide and particulate matter over the baseline concentration of such pollutants shall not exceed the following amounts:

*Maximum allowable increase*

[Micrograms per cubic meter]

| Pollutant | |
|---|---|
| Particulate matter: | |
| Annual geometric mean | 5 |
| Twenty-four-hour maximum | 10 |
| Sulfur dioxide: | |
| Annual arithmetic mean | 2 |
| Twenty-four-hour maximum | 5 |
| Three-hour maximum | 25 |

(2) For any class II area, the maximum allowable increase in concentrations of sulfur dioxide and particulate matter over the baseline concentration of such pollutants shall not exceed the following amounts:

*Maximum allowable increase*

[Micrograms per cubic meter]

| Pollutant | |
|---|---|
| Particulate matter: | |
| Annual geometric mean | 19 |
| Twenty-four-hour maximum | 37 |
| Sulfur dioxide: | |
| Annual arithmetic mean | 20 |
| Twenty-four-hour maximum | 91 |
| Three-hour maximum | 512 |

(3) For any class III area, the maximum allowable increase in concentrations of sulfur dioxide and particulate matter over the baseline concentration of such pollutants shall not exceed the following amounts:

*Maximum allowable increase*

[Micrograms per cubic meter]

| Pollutant | |
|---|---|
| Particulate matter: | |
| Annual geometric mean | 37 |
| Twenty-four-hour maximum | 75 |
| Sulfur dioxide: | |
| Annual arithmetic mean | 40 |
| Twenty-four-hour maximum | 182 |
| Three-hour maximum | 700 |

(4) The maximum allowable concentration of any air pollutant in any area to which this part applies shall not exceed a concentration for such pollutant for each period of exposure equal to—

(A) the concentration permitted under the national secondary ambient air quality standard, or

(B) the concentration permitted under the national primary ambient air quality standard,

whichever concentration is lowest for such pollutant for such period of exposure.

(c)(1) In the case of any State which has a plan approved by the Administrator for purposes of carrying out this part, the Governor of such State may, after notice and opportunity for public hearing, issue orders or promulgate rules providing that for purposes of determining compliance with the maximum allowable increases in ambient concentrations of an air pollutant, the following concentrations of such pollutant shall not be taken into account:

(A) concentrations of such pollutant attributable to the increase in emissions from stationary sources which have converted from the use of petroleum products, or natural gas, or both, by reason of an order which is in effect under the provisions of sections 2 (a) and (b) of the Energy Supply and Environmental Coordination Act of 1974 (or any subsequent legislation which supersedes such provisions) over the emissions from such sources before the effective date of such order.[1]

(B) the concentrations of such pollutant attributable to the increase in emissions from stationary sources which have converted from using natural gas by reason of a natural gas curtailment pursuant to a natural gas curtailment plan in effect pursuant to the Federal Power Act over the emissions from such sources before the effective date of such plan,

(C) concentrations of particulate matter attributable to the increase in emissions from construction or other temporary emission-related activities, and

(D) the increase in concentrations attributable to new sources outside the United States over the concentrations attributable to existing sources which are included in the baseline concentration determined in accordance with section 169(4).

(2) No action taken with respect to a source under paragraph (1)(A) or (1)(B) shall apply more than five years after the effective date of the order referred to in paragraph (1)(A) or the plan referred to in paragraph (1)(B), whichever is applicable. If both such order and plan are applicable, no such action shall apply more than five years after the later of such effective dates.

(3) No action under this subsection shall take effect unless the Governor submits the order or rule providing for such exclusion to the Administrator and the Administrator determines that such order or rule is in compliance with the provisions of this subsection.

(July 14, 1955, ch. 360, tit. I, §163, as added Aug. 7, 1977, Pub.L. 95-95, tit. I, §127(a), 91 Stat. 732, and amended Nov. 16, 1977, Pub.L. 95-190, §14(a)(41), 91 Stat. 1401.)

## §7474. [CAA §164]

### Area redesignation

Sec. 164. [7474] (a) Except as otherwise provided under subsection (c), a State may redesignate such areas as it deems appropriate as class I areas. The following areas may be redesignated only as class I or II:

(1) an area which exceeds ten thousand acres in size and is a national monument, a national primitive area, a national preserve, a national recreation area, a national wild and scenic river, a national wildlife refuge, a national lakeshore or seashore, and

(2) a national park or national wilderness area established after the date of enactment of this Act which exceeds ten thousand acres in size.

Any area (other than an area referred to in paragraph (1) or (2) or an area established as class I under the first sentence of section 162(a)) may be redesignated by the State as class III if—

(A) such redesignation has been specifically approved by the Governor of the State, after consultation with the appropriate Committees of the legislature if it is in session or with the leadership of the legislature if it is not in session (unless State law provides that such redesignation must be specifically approved by State legislation) and if general purpose units of local government representing a majority of the residents of the area so redesignated enact legislation (including for such units of local government resolutions where appropriate) concurring in the State's redesignation;

(B) such redesignation will not cause, or contribute to, concentrations of any air pollutant which exceed any maximum allowable increase or maximum allowable concentration permitted under the classification of any other area; and

(C) such redesignation otherwise meets the requirements of this part.

Subparagraph (A) of this paragraph shall not apply to area redesignations by Indian tribes.

(b)(1)(A) Prior to redesignation of any area under this part, notice shall be afforded and public hearings shall be conducted in areas proposed to be redesignated and in areas which may be affected by the proposed redesignation. Prior to any such public hearing a satisfactory description and analysis of the health, environmental, economic, social, and energy effects of the proposed redesignation shall be prepared and made available for public inspection and prior to any such redesignation, the description and analysis of such effects shall be reviewed and examined by the redesignating authorities.

(B) Prior to the issuance of notice under subparagraph (A) respecting the redesignation of any area under this subsection, if such area includes any Federal lands, the State shall provide written notice to the appropriate Federal land manager and afford adequate opportunity (but not in excess of 60 days) to confer with the State respecting the intended notice of redesignation and to submit written comments and recommendations with respect to such intended notice of redesignation. In redesignating any area under this section with respect to which any Federal land manager has submitted written comments and recommendations, the State shall publish a list of any inconsistency between such redesignation and such recommendations and an explanation of such inconsistency (together with the reasons for making such redesignation against the recommendation of the Federal land manager).

(C) The Administrator shall promulgate regulations not later than six months after date of enactment of this part, to assure, insofar as practicable, that prior to any public hearing on redesignation of any area, there shall be available for public inspection any

[1] So in original public law. The period probably should be a comma.

specific plans for any new or modified major emitting facility which may be permitted to be constructed and operated only if the area in question is designated or redesignated as class III.

(2) The Administrator may disapprove the redesignation of any area only if he finds, after notice and opportunity for public hearing, that such redesignation does not meet the procedural requirements of this section or is inconsistent with the requirements of section 162(a) or of subsection (a) of this section. If any such disapproval occurs, the classification of the area shall be that which was in effect prior to the redesignation which was disapproved.

(c) Lands within the exterior boundaries of reservations of federally recognized Indian tribes may be redesignated only by the appropriate Indian governing body. Such Indian governing body shall be subject in all respect to the provisions of subsection (e).

(d) The Federal Land Manager shall review all national monuments, primitive areas, and national preserves, and shall recommend any appropriate areas for redesignation as class I where air quality related values are important attributes of the area. The Federal Land Manager shall report such recommendations, within[1] supporting analysis, to the Congress and the affected States within one year after enactment of this section. The Federal Land Manager shall consult with the appropriate States before making such recommendations.

(e) If any State affected by the redesignation of any area by an Indian tribe or any Indian tribe affected by the redesignation of an area by a State disagrees with such redesignation of any area, or if a permit is proposed to be issued for any new major emitting facility proposed for construction in any State which the Governor of an affected State or governing body of an affected Indian tribe determines will cause or contribute to a cumulative change in air quality in excess of that allowed in this part within the affected State or tribal reservation, the Governor or Indian ruling body may request the Administrator to enter into negotiations with the parties involved to resolve such dispute. If requested by any State or Indian tribe involved, the Administrator shall make a recommendation to resolve the dispute and protect the air quality related values of the lands involved. If the parties involved do not reach agreement, the Administrator shall resolve the dispute and his determination, or the results of agreements reached through other means, shall become part of the applicable plan and shall be enforceable as part of such plan. In resolving such disputes relating to area redesignation, the Administrator shall consider the extent to which the lands involved are of sufficient size to allow effective air quality management or have air quality related values of such an area.

(July 14, 1955, ch. 360, tit. I, §164, as added Aug. 7, 1977, Pub.L. 95-95, tit. I, §127(a), 91 Stat. 733, and amended Nov. 16, 1977, Pub.L. 95-190, §14(a)(42), (43), 91 Stat. 1402.)

## §7475. [CAA §165]
### Preconstruction requirements

Sec. 165. [7475] (a) No major emitting facility on which construction is commenced after the date of the enactment of this part, may be constructed in any area to which this part applies unless—

(1) a permit has been issued for such proposed facility in accordance with this part setting forth emission limitations for such facility which conform to the requirements of this part;

(2) the proposed permit has been subject to a review in accordance with this section, the required analysis has been conducted in accordance with regulations promulgated by the Administrator, and a public hearing has been held with opportunity for interested persons including representatives of the Administrator to appear and submit written or oral presentations on the air quality impact of such source, alternatives thereto, control technology requirements, and other appropriate considerations;

(3) the owner or operator of such facility demonstrates, as required pursuant to section 110(j), that emissions from construction or operation of such facility will not cause, or contribute to, air pollution in excess of any (A) maximum allowable increase or maximum allowable concentration for any pollutant in any area to which this part applies more than one time per year, (B) national ambient air quality standard in any air quality control region, or (C) any other applicable emission standard or standard of performance under this Act;

(4) the proposed facility is subject to the best available control technology for each pollutant subject to regulation under this Act emitted from, or which results from, such facility;

(5) the provisions of subsection (d) with respect to protection of class I areas have been complied with for such facility;

(6) there has been an analysis of any air quality impacts projected for the area as a result of growth associated with such facility;

(7) the person who owns or operates, or proposes to own or operate, a major emitting facility for which a permit is required under this part agrees to conduct such monitoring as may be necessary to determine the effect which emissions from any such facility may have, or is having, on air quality in any area which may be affected by emissions from such source; and

(8) in the case of a source which proposes to construct in a class III area, emissions from which would cause or contribute to exceeding the maximum allowable increments applicable in a class II area and where no standard under section 111 of this Act has been promulgated subsequent to enactment of the Clean Air Act Amendments of 1977, for such source category, the Administrator has approved the determination of best available technology as set forth in the permit.

(b) The demonstration pertaining to maximum allowable increases required under subsection (a)(3) shall not apply to maximum allowable increases for class II areas in the case of an expansion or modification of a major emitting facility which is in existence on the date of enactment of the Clean Air Act Amendments of 1977, whose allowable emissions of air pollutants, after compliance with subsection (a)(4), will be less than fifty tons per year and for which the owner or operator of such facility demonstrates that emissions of particulate matter and sulfur oxides will not cause or contribute to ambient air quality levels in excess of the national secondary ambient air quality standard for either of such pollutants.

(c) Any completed permit application under section 110 for a major emitting facility in any area to which this part applies shall be granted or denied not later than one year after the date of filing of such completed application.

(d)(1) Each State shall transmit to the Administrator a copy of each permit application relating to a major emitting facility received by such State and provide notice to the Administrator of every action related to the consideration of such permit.

(2)(A) The Administrator shall provide notice of the permit application to the Federal Land Manager and the Federal official charged with direct responsibility for management of any lands within a class I area which may be affected by emissions from the proposed facility.

(B) The Federal Land Manager and the Federal official charged with direct responsibility for management of such lands shall have an affirmative responsibility to protect the air quality related values (including visibility) of any such lands within a class I area and to consider, in consultation with the Administrator, whether a proposed major emitting facility will have an adverse impact on such values.

(C)(i) In any case where the Federal official charged with direct responsibility for management of any lands within a class I area or the Federal Land Manager of such lands, or the Administrator, or the Governor of an adjacent State containing such a class I area files a notice alleging that emissions from a proposed major emitting facility may cause or contribute to a change in the air quality in such area and identifying the potential adverse impact of such change, a permit shall not be issued unless the owner or operator of such facility demonstrates that emissions of particulate matter and sulfur dioxide will not cause or contribute to concentrations which exceed the maximum allowable increases for a class I area.

(ii) In any case where the Federal Land Manager demonstrates to the satisfaction of the State that the emissions from such facility will have an adverse impact on the air quality-related values (including visibility) of such lands, notwithstanding the fact that the change in air quality resulting from emissions from such facility will not cause or contribute to concentrations which exceed the maximum allowable increases for a class I area, a permit shall not be issued.

(iii) In any case where the owner or operator of such facility demonstrates to the satisfaction of the Federal Land Manager, and the Federal Land Manager so certifies, that the emissions from such facility will have no adverse impact on the air quality-related values of such lands (including visibility) notwithstanding the fact that the change in air quality resulting from emissions from such facility will cause or contribute to concentrations which exceed the maximum allowable increases for class I areas, the State may issue a permit.

(iv) In the case of a permit issued pursuant to clause (iii), such facility shall comply with such emission limitations under such permit as may be necessary to assure that emissions of sulfur oxides and particulates from such facility, will not cause or contribute to concentrations of such pollutant which exceed the following maximum allowable increases over the baseline concentration for such pollutants:

*Maximum allowable increase*

*(Micrograms per cubic meter)*

| | |
|---|---|
| Particulate matter: | |
| Annual geometric mean | 19 |
| Twenty-four-hour maximum | 37 |
| Sulfur dioxide: | |
| Annual arithmetic mean | 20 |
| Twenty-four-hour maximum | 91 |
| Three-hour maximum | 325 |

(D)(i) In any case where the owner or operator of a proposed major emitting facility who has been denied a certification under subparagraph (C)(iii) demonstrates to the satisfaction of the Governor, after notice and public hearing, and the Governor finds, that

[1] So in original public law. Probably should be "with".

the facility cannot be constructed by reason of any maximum allowable increase for sulfur dioxide for periods of twenty-four hours or less applicable to any class I area and, in the case of Federal mandatory class I areas, that a variance under this clause will not adversely affect the air quality related values of the area (including visibility), the Governor, after consideration of the Federal Land Manager's recommendation (if any) and subject to his concurrence, may grant a variance from such maximum allowable increase. If such variance is granted, a permit may be issued to such source pursuant to the requirements of this subparagraph.

(ii) In any case in which the Governor recommends a variance under this subparagraph in which the Federal Land Manager does not concur, the recommendations of the Governor and the Federal Land Manager shall be transmitted to the President. The President may approve the Governor's recommendation if he finds that such variance is in the national interest. No Presidential finding shall be reviewable in any court. The variance shall take effect if the President approves the Governor's recommendations. The President shall approve or disapprove such recommendation within ninety days after his receipt of the recommendations of the Governor and the Federal Land Manager.

(iii) In the case of a permit issued pursuant to this subparagraph, such facility shall comply with such emission limitations under such permit as may be necessary to assure that emissions of sulfur oxides from such facility will not (during any day on which the otherwise applicable maximum allowable increases are exceeded) cause or contribute to concentrations which exceed the following maximum allowable increases for such areas over the baseline concentration for such pollutant and to assure that such emissions will not cause or contribute to concentrations which exceed the otherwise applicable maximum allowable increases for periods of exposure of 24 hours or less on more than 18 days during any annual period:

*Maximum allowable increase*

*[Micrograms per cubic meter]*

| | |
|---|---|
| Period of exposure: | |
| Low terrain areas: | |
| 24-hr maximum | 36 |
| 3-hr maximum | 130 |
| High terrain areas: | |
| 24-hr maximum | 62 |
| 3-hr maximum | 221 |

(iv) For purposes of clause (iii), the term "high terrain area" means with respect to any facility, any area having an elevation of 900 feet or more above the base of the stack of such facility, and the term "low terrain area" means any area other than a high terrain area.

(e)(1) The review provided for in subsection (a) shall be preceded by an analysis in accordance with regulations of the Administrator, promulgated under this subsection, which may be conducted by the State (or any general purpose unit of local government) or by the major emitting facility applying for such permit, of the ambient air quality at the proposed site and in areas which may be affected by emissions from such facility for each pollutant subject to regulation under this Act which will be emitted from such facility.

(2) Effective one year after date of enactment of this part, the analysis required by this subsection shall include continuous air quality monitoring data gathered for purposes of determining whether emissions from such facility will exceed the maximum allowable increases or the maximum allowable concentration permitted under this part. Such data shall be gathered over a period of one calendar year preceding the date of application for a permit under this part unless the State, in accordance with regulations promulgated by the Administrator, determines that a complete and adequate analysis for such purposes may be accomplished in a shorter period. The results of such analysis shall be available at the time of the public hearing on the application for such permit.

(3) The Administrator shall within six months after the date of enactment of this part promulgate regulations respecting the analysis required under this subsection which regulations—

(A) shall not require the use of any automatic or uniform buffer zone or zones,

(B) shall require an analysis of the ambient air quality, climate and meteorology, terrain, soils and vegetation, and visibility at the site of the proposed major emitting facility and in the area potentially affected by the emissions from such facility for each pollutant regulated under this Act which will be emitted from, or which results from the construction or operation of, such facility, the size and nature of the proposed facility, the degree of continuous emission reduction which could be achieved by such facility, and such other factors as may be relevant in determining the effect of emissions from a proposed facility on any air quality control region,

(C) shall require the results of such analysis shall be[1] available at the time of the public hearing on the application for such permit, and

(D) shall specify with reasonable particularity each air quality model or models to be used under specified sets of conditions for purposes of this part.

Any model or models designated under such regulations may be adjusted upon a determination, after notice and opportunity for public hearing, by the Administrator that such adjustment is necessary to take into account unique terrain or meteorological characteristics of an area potentially affected by emissions from a source applying for a permit required under this part.

(July 14, 1955, ch. 360, tit. I, §165, as added Aug. 7, 1977, Pub.L. 95-95, tit. I, §127(a), 91 Stat. 735, and amended Nov. 16, 1977, Pub.L. 95-190, §14(a)(44)-(51), 91 Stat. 1402.)

## §7476. [CAA §166]
### Other pollutants

Sec. 166. [7476] (a) In the case of the pollutants hydrocarbons, carbon monoxide, photochemical oxidants, and nitrogen oxides, the Administrator shall conduct a study and not later than two years after the date of enactment of this part, promulgate regulations to prevent the significant deterioration of air quality which would result from the emissions of such pollutants. In the case of pollutants for which national ambient air quality standards are promulgated after the date of the enactment of this part, he shall promulgate such regulations not more than 2 years after the date of promulgation of such standards.

(b) Regulations referred to in subsection (a) shall become effective one year after the date of promulgation. Within 21 months after such date of promulgation such plan revision shall be submitted to the Administrator who shall approve or disapprove the plan within 25 months after such date or promulgation in the same manner as required under section 110.

(c) Such regulations shall provide specific numerical measures against which permit applications may be evaluated, a framework for stimulating improved control technology, protection of air quality values, and fulfill the goals and purposes set forth in section 101 and section 160.

(d) The regulations of the Administrator under subsection (a) shall provide specific measures at least as effective as the increments established in section 163 to fulfill such goals and purposes, and may contain air quality increments, emission density requirements, or other measures.

(e) With respect to any air pollutant for which a national ambient air quality standard is established other than sulfur oxides or particulate matter, an area classification plan shall not be required under this section if the implementation plan adopted by the State and submitted for the Administrator's approval or promulgated by the Administrator under section 110(c) contains other provisions which when considered as a whole, the Administrator finds will carry out the purposes in section 160 at least as effectively as an area classification plan for such pollutant. Such other provisions referred to in the preceding sentence need not require the establishment of maximum allowable increases with respect to such pollutant for any area to which this section applies.

(July 14, 1955, ch. 360, tit. I, §166, as added Aug. 7, 1977, Pub.L. 95-95, tit. I, §127(a), 91 Stat. 739.)

## §7477. [CAA §167]
### Enforcement

Sec. 167. [7477] The Administrator shall, and a State may, take such measures, including issuance of an order, or seeking injunctive relief, as necessary to prevent the construction of a major emitting facility which does not conform to the requirements of this part, or which is proposed to be constructed in any area included in the list promulgated pursuant to paragraph (1) (D) or (E) of subsection (d) of section 107 of this Act and which is not subject to an implementation plan which meets the requirements of this part.

(July 14, 1955, ch. 360, tit. I, §167, as added Aug. 7, 1977, Pub.L. 95-95, tit. I, §127(a), 91 Stat. 740.)

## §7478. [CAA §168]
### Period before plan approval

Sec. 168. [7478] (a) Until such time as an applicable implementation plan is in effect for any area, which plan meets the requirements of this part to prevent significant deterioration of air quality with respect to any air pollutant, applicable regulations under this Act prior to enactment of this part shall remain in effect to prevent significant deterioration of air quality in any such area for any such pollutant except as otherwise provided in subsection (b).

(b) If any regulation in effect prior to enactment of this part to prevent significant deterioration of air quality would be inconsistent with the requirements of section 162(a), section 163(b) or section 164(a), then such regulations shall be deemed amended so as to conform with such requirements. In the case of a facility on which construction was commenced (in accordance with the definition of "commenced" in section 169(2)) after June 1, 1975, and prior to the enactment of the Clean Air Act Amendments of 1977, the review and permitting of such facility shall be in accordance with the regulations for the prevention of significant deterioration in effect prior to the enactment of the Clean Air Act Amendments of 1977.

[1] So in original. Probably should be "to be".

(July 14, 1955, ch. 360, tit. I, §168, as added Aug. 7, 1977, Pub.L. 95-95, tit. I, §127(a), 91 Stat. 740, and amended Nov. 16, 1977, Pub.L. 95-190, §14(a)(52), 91 Stat. 1402.)

## §7479. [CAA §169]

**Definitions**

Sec. 169. [7479] For purposes of this part—

(1) The term "major emitting facility" means any of the following stationary sources of air pollutants which emit, or have the potential to emit, one hundred tons per year or more of any air pollutant from the following types of stationary sources: fossil-fuel fired steam electric plants of more than two hundred and fifty million British thermal units per hour heat input, coal cleaning plants (thermal dryers), kraft pulp mills, Portland Cement plants, primary zinc smelters, iron and steel mill plants, primary aluminum ore reduction plants, primary copper smelters, municipal incinerators capable of charging more than two hundred and fifty tons of refuse per day, hydrofluoric, sulfuric, and nitric acid plants, petroleum refineries, lime plants, phosphate rock processing plants, coke oven batteries, sulfur recovery plants, carbon black plants (furnace process) primary lead smelters, fuel conversion plants, sintering plants, secondary metal production facilities, chemical process plants, fossil-fuel boilers of more than two hundred and fifty million British thermal units per hour heat input, petroleum storage and transfer facilities with a capacity exceeding three hundred thousand barrels, taconite ore processing facilities, glass fiber processing plants, charcoal production facilities. Such term also includes any other source with the potential to emit two hundred and fifty tons per year or more of any air pollutant. This term shall not include new or modified facilities which are nonprofit health or education institutions which have been exempted by the State.

(2)(A) The term "commenced" as applied to construction of a major emitting facility means that the owner or operator has obtained all necessary preconstruction approvals or permits required by Federal, State, or local air pollution emissions and air quality laws or regulations and either has (i) begun, or caused to begin, a continuous program of physical on-site construction of the facility or (ii) entered into binding agreements or contractual obligations, which cannot be canceled or modified without substantial loss to the owner or operator, to undertake a program of construction of the facility to be completed within a reasonable time.

(B) The term "necessary preconstruction approvals or permits" means those permits or approvals required by the permitting authority as a precondition to undertaking any activity under clauses (i) or (ii) of subparagraph (A) of this paragraph.

(C) The term "construction" when used in connection with any source or facility, includes the modification (as defined in section 111(a)) of any source or facility.

(3) The term "best available control technology" means an emission limitation based on the maximum degree of reduction of each pollutant subject to regulation under this Act emitted from or which results from any major emitting facility, which the permitting authority, on a case-by-case basis, taking into account energy, environmental, and economic impacts and other costs, determines is achievable for such facility through application of production processes and available methods, systems, and techniques, including fuel cleaning or treatment or innovative fuel combustion techniques for control of each such pollutant. In no event shall application of "best available control technology" result in emissions of any pollutants which will exceed the emissions allowed by any applicable standard established pursuant to section 111 or 112 of this Act.

(4) The term "baseline concentration" means, with respect to a pollutant, the ambient concentration levels which exist at the time of the first application for a permit in an area subject to this part, based on air quality data available in the Environmental Protection Agency or a State air pollution control agency and on such monitoring data as the permit applicant is required to submit. Such ambient concentration levels shall take into account all projected emissions in, or which may affect, such area from any major emitting facility on which construction commenced prior to January 6, 1975, but which has not begun operation by the date of the baseline air quality concentration determination. Emissions of sulfur oxides and particulate matter from any major emitting facility on which construction commenced after January 6, 1975, shall not be included in the baseline and shall be counted against the maximum allowable increases in pollutant concentrations established under this part.

(July 14, 1955, ch. 360, tit. I, §169, as added Aug. 7, 1977, Pub.L. 95-95, tit. I, §127(a), 91 Stat. 740, and amended Nov. 16, 1977, Pub.L. 95-190, §14(a)(54), 91 Stat. 1402.)

**APPENDIX IV**

**Draft EPA Top-Down BACT Guidance Document**

* * * D R A F T * * *

# "TOP-DOWN" BEST AVAILABLE CONTROL TECHNOLOGY

# GUIDANCE DOCUMENT


Environmental Protection Agency
Office of Air Quality Planning and Standards
Air Quality Management Division
Noncriteria Pollutants Program Branch
Source Review Section


March 15, 1990

- D R A F T -
March 15, 1990

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# I. PURPOSE

This document describes the U.S. Environmental Protection Agency (EPA) guidance for performing analyses leading to determinations of best available control technology (BACT) under the prevention of significant air quality deterioration (PSD) program. This document supersedes prior EPA guidance documents, policies, and interpretations in this subject area which are inconsistent with its terms.

The BACT requirement is defined as:

> "an emissions limitation (including a visible emission standard) based on the maximum degree of reduction for each pollutant subject to regulation under the Clean Air Act which would be emitted from any proposed major stationary source or major modification which the Administrator, on a case-by-case basis, taking into account energy, environmental, and economic impacts and other costs, determines is achievable for such source or modification through application of production processes or available methods, systems, and techniques, including fuel cleaning or treatment or innovative fuel combustion techniques for control of such pollutant. In no event shall application of best available control technology result in emissions of any pollutant which would exceed the emissions allowed by any applicable standard under 40 CFR Parts 60 and 61. If the Administrator determines that technological or economic limitations on the application of measurement methodology to a particular emissions unit would make the imposition of an emissions standard infeasible, a design, equipment, work practice, operational standard, or combination thereof, may be prescribed instead to satisfy the requirement for the application of best available control technology. Such standard shall, to the degree possible, set forth the emissions reduction achievable by implementation of such design, equipment, work practice or operation, and shall provide for compliance by means which achieve equivalent results."

The requirement to conduct a BACT analysis and determination is set forth in section 165(a)(4) of the Clean Air Act, in federal regulations at 40 CFR 52.21(j), in regulations setting forth the requirements for State implementation plan approval of a State prevention of significant deterioration (PSD) program at 40 CFR 51.166(j), and in the SIP's of the various States at 40 CFR Part 52, Subpart A - Subpart FFF. Neither this guidance document in particular nor EPA's policies regarding BACT in general establish binding regulatory requirements; such requirements are contained in the regulations and implementation plans referred to above. Rather, this document is intended to guide permitting officials in those areas subject to the federal PSD regulations 40 CFR 52.21. The EPA strongly recommends that this guidance also be followed in areas where a PSD program has received SIP approval under 40 CFR 51.166. In any event, both EPA and the States must continue to adhere to the binding regulatory requirements governing BACT determinations. In this regard, EPA notes that it has consistently interpreted the statutory and regulatory BACT definitions as containing two core requirements which EPA believes must be met by any BACT determination, irrespective of whether it is conducted in a "top-down" manner. First, the BACT analysis must include consideration of the most stringent available technologies, i.e., those which provide the "maximum degree of emissions reduction." Second, any decision to require a lesser degree of emissions reduction must be justified by an objective analysis of "energy, environmental, and economic impacts" contained in the record of the permit decision.

A number of terms and acronyms used in this document have specific meanings within the context of new source review (NSR). Since this document is intended for use by permit engineers and others generally familiar with NSR, these terms are used throughout this document, often without definition. To aid users of the guidance document who are unfamiliar with these terms, general definitions of these terms can be found in Appendix A. The specific regulatory definitions for most of the terms can be found in 40 CFR 52.21. Should there be any inconsistency between the definitions contained in Appendix A and the regulatory definitions or other requirements found in Part 40 of the Code of Federal Regulations, including any policies or interpretations issued pursuant to those regulations following the issuance of this document, the regulations and policies, or interpretations shall govern.

## II. INTRODUCTION

On December 1, 1987, the EPA Assistant Administrator for Air and Radiation issued a memorandum that implemented certain program initiatives designed to improve the effectiveness of the new source review (NSR) programs within the confines of existing regulations and state implementation plans. Among these was the "top-down" method for determining best available control technology (BACT). The purpose of this document is to provide a detailed description of the top-down method in order to assist permitting authorities and prevention of significant deterioration (PSD) applicants in conducting BACT analyses.

In brief, the top-down process provides that all available control technologies be ranked in descending order of control effectiveness. The PSD applicant first examines the most stringent -- or "top" -- alternative. That alternative is established as BACT unless the applicant demonstrates, and the permitting authority in its informed judgment agrees, that technical considerations, or energy, environmental, or economic impacts justify a conclusion that the most stringent technology is not "achievable" in that case. If the most stringent technology is eliminated in this fashion, then the next most stringent alternative is considered, and so on.

There are two key criteria that must be satisfied in any BACT analysis under the Clean Air Act. First, the permit applicant must consider the most stringent control technologies available. Second, if the applicant proposes less stringent controls, it must demonstrate, using objective data, that the most stringent controls are not achievable due to source-specific energy, environmental, or economic impacts, and the permitting authority must exercise its informed judgment before accepting that determination. The EPA's adoption of a top-down approach reflects concern that the implementation of other prior approaches to determining BACT was deficient in fulfilling these key BACT requirements. The EPA expects that the top-down approach will be more effective than other approaches in assuring that BACT analyses comply with the requirements of the Clean Air Act.

## III. BACT 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 level is bases on potential emissions.

The BACT requirement applies to each individual new or modified affected emissions unit and pollutant emitting activity. Also, individual BACT determinations are performed for each pollutant emitted from the same emission unit. Consequently, the BACT determination must separately address, for each regulated pollutant with a significant emissions increase at the source, air pollution controls for each emissions unit or pollutant emitting activity subject to review.

# IV. A STEP BY STEP SUMMARY OF THE TOP-DOWN PROCESS

Table IV-1 shows the five basic steps of the top-down procedure, including some of the key elements associated with each of the individual steps. A brief description of each step follows.

## IV.A. STEP 1--IDENTIFY ALL CONTROL TECHNOLOGIES.

The first step in a "top-down" analysis is to identify, for the emissions unit in question (the term "emissions unit" should be read to mean emissions unit, process or activity), all "available" control options. Available control options are those air pollution control technologies or techniques with a practical potential for application to the emissions unit and the regulated pollutant under evaluation. Air pollution control technologies and techniques include the application of production process or available methods, systems, and techniques, including fuel cleaning or treatment or innovative fuel combustion techniques for control of the affected pollutant. This includes technologies employed outside of the United States. In some circumstances inherently lower-polluting processes are appropriate for consideration as available control alternatives. The control alternatives should include not only existing controls for the source category in question, but also (through technology transfer) controls applied to similar source categories and gas streams, and innovative control technologies. Technologies required under lowest achievable emission rate (LAER) determinations are available for BACT purposes and must also be included as control alternatives and usually represent the top alternative.

In the course of the BACT analysis, one or more of the options may be eliminated from consideration because they are demonstrated to be technically infeasible or have unacceptable energy, economic, and environmental impacts on a case-by-case (or site-specific) basis. However, at the outset, applicants

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TABLE IV-1. - KEY STEPS IN THE "TOP-DOWN" BACT PROCESS

STEP 1: *IDENTIFY ALL CONTROL TECHNOLOGIES.*

- LIST is comprehensive (LAER included).

STEP 2: *ELIMINATE TECHNICALLY INFEASIBLE OPTIONS.*

- A demonstration of technical infeasibility should be clearly documented and should show, based on physical, chemical, and engineering principles, that technical difficulties would preclude the successful use of the control option on the emissions unit under review.

STEP 3: *RANK REMAINING CONTROL TECHNOLOGIES BY CONTROL EFFECTIVENESS.*

Should include:

- control effectiveness (percent pollutant removed);
- expected emission rate (tons per year);
- expected emission reduction (tons per year);
- energy impacts (BTU, kWh);
- environmental impacts (other media and the emissions of toxic and hazardous air emissions); and
- economic impacts (total cost effectiveness, incremental cost effeciveness).

STEP 4: *EVALUATE MOST EFFECTIVE CONTROLS AND DOCUMENT RESULTS.*

- Case-by-case consideration of energy, environmental, and economic impacts.
- If top option is not selected as BACT, evaluate next most effective control option.

STEP 5: *SELECT BACT*

- Most effective option not rejected is BACT.

should initially identify all control options with potential application to the emissions unit under review.

## IV.B. STEP 2--ELIMINATE TECHNICALLY INFEASIBLE OPTIONS.

In the second step, the technical feasibility of the control options identified in step one is evaluated with respect to the source-specific (or emissions unit-specific) factors. In general, a demonstration of technical infeasibility should be clearly documented and should show, based on physical, chemical, and engineering principles, that technical difficulties would preclude the successful use of the control option on the emissions unit under review. Technically infeasible control options are then eliminated from further consideration in the BACT analysis.

For example, in cases where the level of control in a permit is not expected to be achieved in practice (e.g., a source has received a permit but the project was cancelled, or every operating source at that permitted level has been physically unable to achieve compliance with the limit), and supporting documentation showing why such limits are not technically feasible is provided, the level of control (but not necessarily the technology) may be eliminated from further consideration. However, a permit requiring the application of a certain technology or emission limit to be achieved for such technology usually is sufficient justification to assume the technical feasibility of that technology or emission limit.

## IV.C. STEP 3--RANK REMAINING CONTROL TECHNOLOGIES BY CONTROL EFFECTIVENESS.

In step 3, all remaining control alternatives not eliminated in step 2 are ranked and then listed in order of over all control effectiveness for the pollutant under review, with the most effective control alternative at the top. A list should be prepared for each pollutant and for each emissions unit (or grouping of similar units) subject to a BACT analysis. The list should present the array of control technology alternatives and should include the following types of information:

- control efficiencies (percent pollutant removed);
- expected emission rate (tons per year, pounds per hour);
- expected emissions reduction (tons per year);
- economic impacts (cost effectiveness);
- environmental impacts (includes any significant or unusual other media impacts (e.g., water or solid waste), and, at a minimum, the impact of each control alternative on emissions of toxic or hazardous air contaminants);
- energy impacts.

However, an applicant proposing the top control alternative need not provide cost and other detailed information in regard to other control options. In such cases the applicant should document that the control option chosen is, indeed, the top, and review for collateral environmental impacts.

## IV.D. STEP 4--EVALUATE MOST EFFECTIVE CONTROLS AND DOCUMENT RESULTS.

After the identification of available and technically feasible control technology options, the energy, environmental, and economic impacts are considered to arrive at the final level of control. At this point the analysis presents the associated impacts of the control option in the listing. For each option the applicant is responsible for presenting an objective evaluation of each impact. Both beneficial and adverse impacts should be discussed and, where possible, quantified. In general, the BACT analysis should focus on the direct impact of the control alternative.

If the applicant accepts the top alternative in the listing as BACT from an economic and energy standpoint, the applicant proceeds to consider whether impacts of unregulated air pollutants or impacts in other media would justify selection of an alternative control option. If there are no outstanding issues regarding collateral environmental impacts, the analysis is ended and the results proposed as BACT. In the event that the top candidate is shown to be inappropriate, due to energy, environmental, or economic impacts, the rationale for this finding should be fully documented for the public record. Then the next most stringent alternative in the listing becomes the new control candidate and is similarly evaluated. This process continues until the technology under consideration cannot be eliminated by any source-specific environmental, energy, or economic impacts which demonstrate that alternative to be inappropriate as BACT.

## IV.E. STEP 5--SELECT BACT

The most effective control option not eliminated in step 4 is proposed as BACT for the pollutant and emission unit under review.

# V. TOP-DOWN ANALYSIS DETAILED PROCEDURE

## V.A. IDENTIFY ALTERNATIVE EMISSION CONTROL TECHNIQUES (STEP 1)

The objective in step 1 is to identify all control options with potential application to the source and pollutant under evaluation. Later, one or more of these options may be eliminated from consideration because they are determined to be technically infeasible or to have unacceptable energy, environmental or economic impacts.

Each new or modified emission unit (or logical grouping of new or modified emission units) subject to PSD is required to undergo BACT review. BACT decisions will generally be made on the information presented in the BACT analysis, including the degree to which effective control alternatives were identified and evaluated. Potentially applicable control alternatives can be categorized in three ways.

- *Inherently Lower-Emitting Processes/Practices*, including the use of materials and production processes and work practices that *prevent* emissions and result in lower "production-specific" emissions; and

- *Add-on Controls*, such as scrubbers, fabric filters, thermal oxidizers and other devices that *control* and *reduce* emissions after they are produced.

- *Combinations of Inherently Lower Emitting Processes and Add-on Controls*. For example, the application of combustion and post-combustion controls to reduce $NO_x$ emissions at a gas-fired turbine.

The top-down BACT analysis should consider potentially applicable control techniques from all three categories. Lower-polluting processes should be considered based on demonstrations made on the basis of manufacturing identical or similar products from identical or similar raw materials or fuels. Add-on controls, on the other hand, should be considered based on the physical and chemical characteristics of the pollutant-bearing emission stream. Thus, candidate add-on controls may have been applied to a broad range of emission unit types that are similar, insofar as emissions characteristics, to the emissions unit undergoing BACT review.

### V.A.1. DEMONSTRATED AND TRANSFERABLE TECHNOLOGIES

Applicants are expected to identify all demonstrated and potentially applicable control alternatives. Information sources to consider include:

- o EPA's BACT/LAER Clearinghouse and Control Technology Center;
- o Best Available Control Technology Guideline - South Coast Air Quality Management District;
- o control technology vendors;
- o Federal/State/Local new source review permits and associated inspection/performance test reports;
- o environmental consultants;
- o technical journals, reports and newsletters (e.g., JAPCA and the McIvaine reports), air pollution control seminars; and
- o EPA's New Source Review (NSR) bulletin board.

The applicant should make a good faith effort to compile appropriate information from available information sources, including any sources specified as necessary by the permit agency. The permit agency should review the background search and resulting list of control alternatives presented by the applicant to check that it is complete and comprehensive.

In identifying control technologies, the applicant needs to survey the range of potentially available options without regard to where and how the technologies have been applied previously. This includes technologies in application outside the United States to the extent that the technologies have been successfully demonstrated in practice on full scale operations. Usually, technologies which have not yet been applied to (or permitted for) full scale operations are not considered available; an applicant should be able to purchase or construct a process or control device that has already been demonstrated in practice.

While EPA's intent is to ensure broad consideration in determining alternative control techniques for consideration as BACT, the focus is on the technologies with a demonstrated potential to achieve the highest levels of control. It is not necessary to consider unreasonably large numbers of options. For example, control options incapable of meeting an applicable New Source Performance Standard (NSPS) or State Implementation Plan (SIP) limit would not meet the definition of BACT under any circumstances and need not be considered in the BACT analysis and are not to be considered in step 1.

The fact that a NSPS for a source category does not require a certain level of control or particular control technology does not preclude its consideration in the top-down BACT analysis. For example, the fact that $SO_2$ scrubbing is not required under the Subpart Db of the NSPS for Industrial-Commercial-Institutional Steam Generating Units does not preclude the inclusion of scrubbing from the list of available technologies or the BACT selection process. In the BACT analysis, an NSPS simply defines the minimal level of control. The fact that a more stringent technology was not selected for the NSPS (or that a pollutant is not regulated by an NSPS) does not exclude that control alternative or technology as a BACT candidate. When developing a list of possible BACT alternatives, the only reason for comparing control options to an NSPS is to determine whether the control option would result in an emissions level less stringent than the NSPS. If so, the option is unacceptable.

## V.A.2. INNOVATIVE TECHNOLOGIES

Although not required in step 1, innovative technologies may also be evaluated and proposed as BACT. To be considered innovative, a control technique must meet the provisions of 40 CFR 52.21(b)(19) or, where appropriate, the applicable SIP definition. In essence, if a developing technology has the potential to achieve a more stringent emissions level than otherwise would constitute BACT or the same level at a lower cost, it may be proposed as an innovative control technology. Innovative technologies are distinguished from technology transfer BACT candidates in that an innovative technology is still under development and has not been demonstrated in a commercial application on identical or similar emission units. In certain instances, the distinction between innovative and transferable technology may not be straightforward. In these cases, it is recommended that the permit agency consult with EPA prior to proceeding with the issuance of an innovative control technology waiver.

Applicants should note that EPA has in the past approved only a limited number of innovative control technology waivers for a specific control technology; if a waiver has been applied for or granted to a similar source for the same technology, granting of additional waivers to similar sources is highly unlikely.

**V.A.3. CONSIDERATION OF INHERENTLY LOWER POLLUTING PROCESSES/PRACTICES**

Historically, EPA has not considered the BACT requirement as a means to redefine the design of the source when considering available control alternatives. For example, applicants proposing to construct a coal-fired electric generator, have not been required by EPA as part of a BACT analysis to consider building a natural gas-fired electric turbine although the turbine may be inherently less polluting per unit product (in this case electricity). However, this is an aspect of the PSD permitting process in which states have the discretion to engage in a broader analysis if they so desire. Thus, although the gas turbine normally would not be included in the list of control alternatives for a coal-fired boiler. However, there may be instances where, in the permit authority's judgment, the consideration of alternative production processes is warranted and appropriate for consideration in the

BACT analysis. A production process is defined in terms of its physical and chemical unit operations used to produce the desired product from a specified set of raw materials. In such cases, the permit agency should require the applicant to include the inherently lower-polluting process in the list of BACT candidates.

In many cases, a given production process or emissions unit can be made to be inherently less polluting (e.g; the use of water-based versus solvent based paints in a coating operation or a coal-fired boiler designed to have a low emission factor for $NO_x$). In such cases the ability of design considerations to make the process inherently less polluting must be considered as a control alternative for the source. Inherently lower-polluting processes/practice are usually more environmentally effective because of lower amounts of solid wastes and waste water than are generated with add-on controls. These factors are considered in the cost, energy and environmental impacts analyses in step 4 to determine the appropriateness of the additional add-on option.

Combinations of inherently lower-polluting processes/practices (or a process made to be inherently less polluting) and add-on controls are likely to yield more effective means of emissions control than either approach alone. Therefore, the option to utilize a inherently lower-polluting process does not, in and of itself, mean that no additional add-on controls need be included in the BACT analysis. These combinations should be identified in step 1 of the top down process for evaluation in subsequent steps.

## V.A.4. EXAMPLE

The process of identifying control technology alternatives (step 1 in the top-down BACT process) is illustrated in the following hypothetical example.

Description of Source

A PSD applicant proposes to install automated surface coating process equipment consisting of a dip-tank priming stage followed by a two-step spray application and bake-on enamel finish coat. The product is a specialized electronics component (resistor) with strict resistance property specifications that restrict the types of coatings that may be employed.

List of Control Options

The source is not covered by an applicable NSPS. A review of the BACT/LAER Clearinghouse and other appropriate references indicates the following control options may be applicable:

Option #1: water-based primer and finish coat;

*[The water-based coatings have never been used in applications similar to this.]*

Option #2: low-VOC solvent/high solids coating for primer and finish coat;

*[The high solids/low VOC solvent coatings have recently been applied with success with similar products (e.g., other types of electrical components).]*

Option #3: electrostatic spray application to enhance coating transfer efficiency; and

*[Electrostatically enhanced coating application has been applied elsewhere on a clearly similar operation.]*

Option #4: emissions capture with add-on control via incineration or carbon adsorber equipment.

*[The VOC capture and control option (incineration or carbon adsorber) has been used in many cases involving the coating of different products and the emission stream characteristics are similar to the proposed resistor coating process and is identified as an option available through technology transfer.]*

Since the low-solvent coating, electrostatically enhanced application, and ventilation with add-on control options may reasonably be considered for use in combination to achieve greater emissions reduction efficiency, a total of eight control options are eligible for further consideration. The options include each of the four options listed above and the following four combinations of techniques:

<u>Option #5:</u> low-solvent coating with electrostatic applications without ventilation and add-on controls;

<u>Option #6:</u> low-solvent coating without electrostatic applications with ventilation and add-on controls;

<u>Option #7:</u> electrostatic application with add-on control; and

<u>Option #8</u>: a combination of all three technologies.

A "no control" option also was identified but eliminated because the applicant's State regulations require at least a 75 percent reduction in VOC emissions for a source of this size. Because "no control" would not meet the State regulations it could not be BACT and, therefore, was not listed for consideration in the BACT analysis.

<u>Summary of Key Points</u>

The example illustrates several key guidelines for identifying control options. These include:

- All available control techniques must be considered in the BACT analysis.

- Technology transfer must be considered in identifying control options. The fact that a control option has never been applied to process emission units similar or identical to that proposed does not mean it can be ignored in the BACT analysis if the potential for its application exists.

- 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.

V.B. TECHNICAL FEASIBILITY ANALYSIS (STEP 2)

In step 2, the technical feasibility of the control options identified in step 1 is evaluated. This step is straightforward and simple for control technologies that are demonstrated--if the control technology has been installed and operated successfully on the type of source under review, it is demonstrated and it is technically feasible. For control technologies that are not demonstrated in the sense indicated above, the analysis is somewhat more involved.

Two key concepts are important in determining whether an undemonstrated technology is feasible: "availability" and "applicability." A technology is considered "available" if it can be obtained by the applicant through commercial channels or is otherwise available within the common sense meaning of the term. An available technology is "applicable" if it can reasonably be installed and operated on the source type under consideration. A technology that is available and applicable is technically feasible.

Availability in this context is further explained using the following process commonly used for bringing a control technology concept to reality as a commercial product:

- o concept;
- o research and patenting;
- o bench scale or laboratory testing;
- o pilot scale testing;
- o licensing and commercial demonstration; and
- o commercial sales.

A control technique is considered available, within the context presented above, if it has reached the licensing and commercial sales stage of development. A source would not be required to experience extended time delays or resource penalties to allow research to be conducted on a new technique. Neither is it expected that an applicant would be required to experience extended trials to learn how to apply a technology on a totally new and dissimilar source type. Consequently, technologies in the pilot scale testing stages of development would not be considered available for BACT review. An exception would be if the technology were proposed and permitted under the qualifications of an innovative control device consistent with the provisions of 40 CFR 52.21(v) or, where appropriate, the applicable SIP.

In general, if a control option is commercially available, it falls within the options to be identified in step 1. Commercial availability by itself, however, is not necessarily sufficient basis for concluding a technology to be applicable and therefore technically feasible. Technical feasibility, as determined in Step 2, also means a control option may reasonably be deployed on or "applicable" to the source type under consideration.

Technical judgment on the part of the applicant and the review authority is to be exercised in determining whether a control alternative is applicable to the source type under consideration. In general, a commercially available control option will be presumed applicable if it has been or is soon to be deployed (e.g., is specified in a permit) on the same or a similar source type. Absent a showing of this type, technical feasibility would be based on examination of the physical and chemical characteristics of the pollutant-bearing gas stream and comparison to the gas stream characteristics of the source types to which the technology had been applied previously. Deployment of the control technology on an existing source with similar gas stream characteristics is generally sufficient basis for concluding technical feasibility barring a demonstration to the contrary.

Alternately, for process-type control alternatives, more general criteria must be considered in determining whether or not it is applicable to the source in question. The decision would have to be based on an assessment of the similarities and differences between the proposed source and other sources to which the process technique had been applied previously. Absent an explanation of unusual circumstances by the applicant showing why a particular process cannot be used on the proposed source the review authority may presume it is technically feasible.

In practice, decisions about technical feasibility are the purview of the review authority. Further, a presumption of technical feasibility may be made by the review authority based solely on technology transfer. Decisions of this type would be made in the case of add-on controls by comparing the physical and chemical characteristics of the exhaust gas stream from the unit under review to those of the unit from which the technology is to be transferred. Unless significant differences between source types exist that are pertinent to the successful operation of the control device, the control option is presumed to be technically feasible.

Within the context of the top-down procedure, an applicant becomes involved with the issue of technical feasibility in asserting that a control option identified in Step 1 is technically infeasible. In this instance, the applicant should make a practical, factual demonstration of infeasibility based on commercial unavailability and/or unusual circumstances which exist with application of the control to the applicant's emission units. Generally, such a demonstration would involve an evaluation of the pollutant-bearing gas stream characteristics and the capabilities of the technology. Also a showing of unresolvable technical difficulty with applying the control would constitute a showing of technical infeasibility (e.g., size of the unit, location of the proposed site, and operating problems related to specific circumstances of the source). Where the resolution of technical difficulties is a matter of cost, the applicant should consider the technology as technically feasible. The economic feasibility of a control alternative is reviewed in the economic impacts portion of the BACT selection process.

A demonstration of technical infeasibility is based on a technical assessment considering physical, chemical and engineering principles and/or empirical data showing that the technology would not work on the emissions unit under review, or that unresolvable technical difficulties would preclude the successful deployment of the technique. Physical modifications needed to resolve technical obstacles do not in and of themselves provide a justification for eliminating the control technique on the basis of technical infeasibility. However, the cost of such modifications can be considered in estimating cost and economic impacts which, in turn, may form the basis for eliminating a control technology.

Vendor guarantees may provide an indication of commercial availability and the technical feasibility of a control technique and could contribute to a determination of technical feasibility or technical infeasibility, depending on circumstances. However, EPA does not consider a vendor guarantee alone to be sufficient justification that a control option will work. Conversely, lack of a vendor guarantee by itself does not present sufficient justification that a control option or an emissions limit is technically infeasible. Generally, decisions about technical feasibility will be based on chemical, and engineering analyses (as discussed above) in conjunction with information about vendor guarantees.

A possible outcome of the top-down BACT procedures discussed in this document is the evaluation of multiple control technology alternatives which result in essentially equivalent emissions. It is not EPA's intent to encourage evaluation of unnecessarily large numbers of control alternatives for every emissions unit. Consequently, judgment should be used in deciding what alternatives will be evaluated in detail in the impacts analysis (Step 4) of the top-down procedure discussed in a later section. For example, if two or more control techniques result in control levels that are essentially identical considering the uncertainties of emissions factors and other parameters pertinent to estimating performance, the source may wish to point this out and make a case for evaluation and use only of the less costly of these options. The scope of the BACT analysis should be narrowed in this way only if there is a negligible difference in emissions and collateral environmental impacts between control alternatives. Such cases should be discussed with the reviewing agency before a control alternative is dismissed at this point in the BACT analysis due to such considerations.

It is encouraged that judgments of this type be discussed during a preapplication meeting between the applicant and the review authority. In this way, the applicant can be better assured that the analysis to be conducted will meet BACT requirements. The appropriate time to hold such a meeting during the analysis is following the completion of the control hierarchy discussed in the next section.

Summary of Key Points

In summary, important points to remember in assessing technical feasibility of control alternatives include:

- A control technology that is "demonstrated" for a given type or class of sources is technically feasible unless source-specific factors exist and are documented to justify technical infeasibility.
- Technical feasibility of technology transfer control candidates generally is assessed based on an evaluation of pollutant-bearing gas stream characteristics for the proposed source and other source types to which the control had been applied previously.
- Innovative controls that have not been demonstrated on any source type similar to the proposed source need not be considered in the BACT analysis.
- The applicant is responsible for providing a basis for assessing technical feasibility or infeasibility and the review authority is

responsible for the decision on what is and is not technically feasible.

## V.C. RANKING THE TECHNICALLY FEASIBLE ALTERNATIVES TO ESTABLISH A CONTROL HIERARCHY (STEP 3)

Step 3 involves ranking all the technically feasible control alternatives which have been previously identified in Step 2. For the regulated pollutant and emissions unit under review, the control alternatives are ranked-ordered from the most to the least effective in terms of emission reduction potential. The primary focus in the ranking at this time is the overall capabilities of the control technology options. Later, once the control technology is determined, the focus shifts to the specific limits to be met by the source.

Two key issues that must often be addressed in this process include:

- o What common units should be used to compare emissions performance levels among options?
- o How should control techniques that can operate over a wide range of emission performance levels (e.g., scrubbers, etc.) be considered in the analysis?

### V.C.1. CHOICE OF UNITS OF EMISSIONS PERFORMANCE TO COMPARE LEVELS AMONGST CONTROL OPTIONS

In general, this issue arises when comparing inherently lower-polluting processes to one another or to add-on controls. For example, direct comparison of powdered (and low-VOC) coatings and vapor recovery and control systems at a metal furniture finishing operation is difficult because of the different units of measure for their effectiveness. In such cases, it is probably most effective to express emissions performance as an average steady state emissions level per unit of product or process. Other examples are:

- o pounds VOC emission per gallons of solids applied,
- o pounds PM emission per ton of cement produced,

- pounds $SO_2$ emissions per million Btu heat input, and
- pounds $SO_2$ emission per kilowatt of electric power produced,

Calculating annual emissions levels (tons/yr) using these units becomes straightforward once the projected annual production or processing rates are known. The result is an estimate of the annual pollutant emissions that the source or emissions unit will emit. Annual "potential" emission projections are calculated using the source's maximum design capacity and full year round operation (8760 hours), unless the final permit is to include federally enforceable conditions restricting the source's capacity or hours of operation. However, emissions estimates used for the purpose of calculating and comparing the cost effectiveness of a control option are based on a different approach (see section V.D.2.b. COST EFFECTIVENESS).

V.C.2. CONTROL TECHNIQUES WITH A WIDE RANGE OF EMISSIONS PERFORMANCE LEVELS

The objective of the top-down BACT analysis is to not only identify the best control technology, but also a corresponding performance level (or in some cases performance range) for that technology considering source-specific factors. Many control techniques, including both add-on controls and inherently lower polluting processes can perform at a wide range of levels. Scrubbers, high and low efficiency electrostatic precipitators (ESPs), low-VOC coatings are examples of just a few. It is not the EPA's intention to require analysis of each possible level of efficiency for a control technique, as such an analysis would result in a large number of options. Rather, the applicant should use the most recent regulatory decisions and performance data for identifying the emissions performance level(s) to be evaluated in all cases.

The EPA does not expect an applicant to necessarily accept an emission limit as BACT solely because it was required previously of a similar source type. While the most effective level of control must be considered in the BACT analysis, different levels of control for a given control alternative can be considered. This may occur, for example, the consideration of a lower level of control for a given technology may be warranted in cases where past decisions involved different source types. The evaluation of an alternative control level can also be considered where the applicant can to the satisfaction of the permit agency demonstrate that other considerations demonstrate the need to also evaluate the control alternative at a lower level of effectiveness.

Manufacturer's data, engineering estimates and the experience of other sources provide the basis for determining achievable limits. Consequently, in the evaluation, latitude exists to consider any special circumstances pertinent to the specific source under review, or regarding the prior application of the control alternative, in assessing the capability of the control alternative. However, the basis for choosing the alternate level (or range) of control in the BACT analysis must be well documented in the application. In the absence of a showing of differences between the proposed source and previously permitted sources achieving lower emissions limits, the permit agency should conclude that the lower emissions limit is representative for that control alternative.

The permit agency should require an applicant to consider a control technology alternative otherwise eliminated by the applicant, if the operation of that control technology at a lower level of control (but still higher than the next control technology alternative) could no longer warrant the elimination of the alternative. For example, while a scrubber operating at 98% efficiency may be eliminated as BACT by the applicant due to source specific economic considerations, the scrubber operating in the 90% to 95% efficiency range may not have an adverse economic impact.

In summary, when reviewing a control technology with a wide range of emission performance levels, it is presumed that the source can achieve the same emission reduction level as another source unless the applicant demonstrates that there are source-specific factors or other relevant information that provide a technical, economic, energy or environmental justification to do otherwise. Also, a control technology that has been eliminated as having an adverse economic impact at its highest level of performance, may be acceptable at a lesser level of performance. For example, this can occur when the cost effectiveness of a control technology at its highest level of performance greatly exceeds the cost of that control technology at a somewhat lower level (or range) of performance.

## V.C.3. ESTABLISHMENT OF THE CONTROL OPTIONS HIERARCHY

After determining the emissions performance levels (in common units) of each control technology option identified in Step 2, a hierarchy is established that places at the "top" the control technology option that achieves the lowest emissions level. Each other control option is then placed after the "top" in the hierarchy by its respective emissions performance level, ranked from lowest emissions to highest emissions (most effective to least stringent effective emissions control alternative).

From the hierarchy of control alternatives the applicant should develop a chart (or charts) displaying the control hierarchy and, where applicable,:

- o **expected emission rate (tons per year, pounds per hour);**
- o **emissions performance level (e.g., percent pollutant removed, emissions per unit product, lb/MMbtu, ppm);**
- o **expected emissions reduction (tons per year);**
- o **economic impacts (total costs, cost effectiveness, incremental cost effectiveness);**
- o **environmental impacts (includes any significant or unusual other media impacts (e.g., water or solid waste), and the relative ability of each control alternative to control emissions of toxic or hazardous air contaminants);**
- o **energy impacts (indicate any significant energy benefits or disadvantages).**

This should be done for each pollutant and for each emissions unit (or grouping of similar units) subject to a BACT analysis. The chart is used in comparing the control alternatives during step 4 of the BACT selection process. Some sample charts are displayed in Table V-1 and Table V-2. Completed sample charts accompany the example BACT analyses provided in section VII.

At this point, it is recommended that the applicant contact the reviewing agency to determine whether the agency feels that any other applicable control alternative should be evaluated or if any issues require special attention in the BACT selection process.

## V.D. THE BACT SELECTION PROCESS (STEP 4)

After identification of available control options is the consideration of energy, environmental, and economic impacts and the selection of the final level of control. The applicant is responsible for presenting an objective evaluation of each impact. Consequently, both beneficial and adverse impacts should be discussed and, where possible, quantified. In general, the BACT analysis should focus on the direct impact of the control alternative.

TABLE V-1. SAMPLE BACT CONTROL HIERARCHY

| Pollutant | Technology | Range of control (%) | Control level for BACT analysis (%) | Emissions limit |
|---|---|---|---|---|
| $SO_2$ | First Alternative | 80-95 | 95 | 15 ppm |
| | Second Alternative | 80-95 | 90 | 30 ppm |
| | Third Alternative | 70-85 | 85 | 45 ppm |
| | Fourth Alternative | 40-80 | 75 | 75 ppm |
| | Fifth Alternative | 50-85 | 70 | 90 ppm |
| | Baseline Alternative | - | - | - |

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TABLE V-2. SAMPLE SUMMARY OF TOP-DOWN BACT IMPACT ANALYSIS RESULTS

| | | | | Economic Impacts | | | Environmental Impacts | | Energy Impacts |
|---|---|---|---|---|---|---|---|---|---|
| Pollutant/ Emissions Unit | Control alternative | Emissions (lb/hr, tpy) | Emissions reduction(a) (tpy) | Total annualized cost(b) ($/yr) | Total Cost effectiveness(c) ($/ton) | Incremental cost effectiveness(d) ($/ton) | Toxics impact(e) (Yes/No) | Adverse environmental impacts(f) (Yes/No) | Incremental increase over baseline(g) (MMBtu/yr) |
| NOx/Unit A | Top Alternative<br>Other Alternative(s)<br>Baseline Alternative | | | | | | | | |
| NOx/Unit B | Top Alternative<br>Other Alternative(s)<br>Baseline Alternative | | | | | | | | |
| SO2/Unit A | Top Alternative<br>Other Alternative(s)<br>Baseline Alternative | | | | | | | | |
| SO2/Unit B | Top Alternative<br>Other Alternative(s)<br>Baseline Alternative | | | | | | | | |

(a) Emissions reduction over baseline level.
(b) Total annualized cost (capital, direct, and indirect) of purchasing, installing, and operating the proposed control alternative. A capital recovery factor approach using a real interest rate (i.e., absent inflation) is used to express capital costs in present-day annual costs.
(c) Cost Effectiveness is total annualized cost for the control option divided by the emissions reductions resulting from the option.
(d) The incremental cost effectiveness is the difference in annualized cost for the control option and the next most effective control option divided by the difference in emissions reduction resulting from the respective alternatives.
(e) Toxics impact means there is a toxics impact consideration for the control alternative.
(f) Adverse environmental impact means there is an adverse environmental impact consideration with the control alternative.
(g) Energy impacts are the difference in total project energy requirements with the control alternative and the baseline control alternative expressed in equivalent millions of Btus per year.

Step 4 validates the suitability of the top control option in the listing for selection as BACT, or provides clear justification why the top candidate is inappropriate as BACT. 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 (e.g., emissions of unregulated air pollutants or impacts in other media) would justify selection of an alternative control option. If there are no outstanding issues regarding collateral environmental impacts, the analysis is ended and the results proposed as BACT. In the event that the top candidate is shown to be inappropriate, due to energy, environmental, or economic impacts, the rationale for this finding needs to be fully documented for the public record. Then, the next most effective alternative in the listing becomes the new control candidate and is similarly evaluated. This process continues until the control technology under consideration cannot be eliminated by any source-specific environmental, energy, or economic impacts which demonstrate that the alternative is inappropriate as BACT.

Determining a control alternative to be inappropriate involves a demonstration that circumstances exist at the source under review which distinguish it from other sources where the control alternative may have been required previously, or that argue against the transfer of technology or application of new technology. Alternately, where a control technique has been applied to only one or a very limited number of sources, the applicant can identify those characteristic(s) unique to those sources that may have made the application of the control appropriate in those case(s) but not for the source under consideration. In showing unusual circumstances, objective factors dealing with the control technology and its application should be the focus of the consideration. The specifics of the situation will determine to what extent an appropriate demonstration has been made regarding the elimination of the more effective alternative(s) as BACT. In the absence of unusual circumstance, the presumption is that sources within the same category are similar in nature, and that cost and other impacts that have been borne by one source of a given source category may be borne by another source of the same source category.

### V.D.1. ENERGY IMPACTS ANALYSIS

Applicants should examine the energy requirements of the control technology and determine whether the use of that technology results in any significant or unusual energy penalties or benefits. A source may, for example, benefit from the combustion of a concentrated gas stream rich in volatile organic compounds; on the other hand, more often extra fuel or electricity is required to power a control device or incinerate a dilute gas stream. If such benefits or penalties exist, they should be quantified. Because energy penalties or benefits can usually be quantified in terms of additional cost or income to the source, the energy impacts analysis can, in most cases, simply be factored into the economic impacts analysis. However, certain types of control technologies have inherent energy penalties associated with their use. While these penalties should be quantified, so long as they are within the normal range for the technology in question, such penalties should not, in general, be considered adequate justification for nonuse of that technology.

Energy impacts should consider only direct energy consumption and not indirect energy impacts. For example, the applicant could estimate the direct energy impacts of the control alternative in units of energy consumption at the source ( e.g., Btu, kWh, barrels of oil, tons of coal). The energy requirements of the control options should be shown in terms of total (and in certain cases also incremental) energy costs per ton of pollutant removed. These units can then be converted into dollar costs and, where appropriate, factored into the economic analysis.

As noted earlier, indirect energy impacts (such as energy to produce raw materials for construction of control equipment) generally are not considered. However, if the permit authority determines, either independently or based on a showing by the applicant, that the indirect energy impact is unusual or significant and that the impact can be well quantified, the indirect impact may be considered. The energy impact should still focus on the application of the control alternative and <u>not</u> a concern over general energy impacts associated with the project under review as compared to alternative projects for which a permit is not being sought, or as compared to a pollution source which the project under review would replace (e.g., it would be inappropriate to argue that a cogeneration project is more efficient in the production of electricity than the powerplant production capacity it would displace and, therefore, should not be required to spend equivalent costs for the control of the same pollutant).

The energy impact analysis may also address concerns over the use of locally scarce fuels. The designation of a scarce fuel may vary from region to region, but in general a scarce fuel is one which is in short supply locally and can be better used for alternative purposes, or one which may not be reasonably available to the source either at the present time or in the near future.

## V.D.2. COST/ECONOMIC IMPACTS ANALYSIS

Cost effectiveness, in terms of dollars per ton of pollutant emissions reduction, is one of the key criteria to be used in assessing the economic feasibility of a control alternative. Incremental cost effectiveness may also be considered in conjunction with total cost effectiveness. In the economic impacts analysis, primary consideration should be given to quantifying the cost of control and not the economic situation of the individual source. Consequently, applicants generally should not propose elimination of control alternatives on the basis of economic parameters that provide an indication of the affordability of a control alternative relative to the source. BACT is required by law. Its costs are integral to the overall cost of doing business and are not to be considered an afterthought. Consequently, for control alternatives that have been effectively employed in the same source category, the economic impact of such alternatives on the particular source under review should be not nearly as pertinent to the BACT decision making process as the total and, where appropriate, incremental cost effectiveness of the control alternative. Thus, where a control technology has been successfully applied to similar sources in a source category, an applicant should concentrate on documenting significant cost differences, if any, between the application of the control technology on those other sources and the particular source under review.

Cost effectiveness values above the levels experienced by other sources of the same type and pollutant, are taken as an indication that unusual and persuasive differences exist with respect to the source under review. In addition, where the cost of a control alternative for the specific source reviewed is within the range of normal costs for that control alternative, the alternative, in certain limited circumstances, may still be eligible for elimination. To justify elimination of an alternative on these grounds, the applicant should demonstrate to the satisfaction of the permitting agency that costs of pollutant removal for the control alternative are disproportionately high when compared to the cost of control for that particular pollutant and source in recent BACT determinations. If the circumstances of the differences are adequately documented and explained in the application and are acceptable to the reviewing agency they may provide a basis for eliminating the control alternative.

In all cases, economic impacts need to be considered in conjunction with energy and environmental impacts (e.g., toxics and hazardous pollutant considerations) in selecting BACT. It is possible that the environmental impacts analysis or other considerations (as described elsewhere) would override the economic elimination criteria as described in this section. However, absent overriding environmental impacts concerns or other considerations, an acceptable demonstration of a adverse economic impact can be adequate basis for eliminating the control alternative.

### V.D.2.a. ESTIMATING CONTROL COST

Once the control technology alternatives and achievable emissions performance levels have been identified, capital and annual costs are developed. This is an important step because these costs will form the basis of the cost and economic impacts used to determine and document if a control alternative should be eliminated on grounds of its economic impacts.

Consistency in the approach to decision-making is a primary objective of the top-down BACT approach. In order to maintain and improve the consistency of BACT decisions made on the basis of cost and economic considerations, procedures for estimating control equipment costs are based on EPA's OAQPS Control Cost Manual and are set forth in Appendix B of this document. Applicants should closely follow the procedures in the appendix and any deviations should be clearly presented and justified in the documentation of the BACT analysis.

Normally the submittal of very detailed and comprehensive project cost data is not necessary. However, where initial control cost projections on the part of the applicant appear excessive or unreasonable (in light of recent cost data) more detailed and comprehensive cost data may be necessary to document the applicant's projections. An applicant proposing the top alternative usually does not need to provide cost data on the other possible control alternatives.

Control technology total cost estimates developed for BACT analyses should be on the order of plus or minus 30 percent accuracy. If more accurate cost data are available (such as specific bid estimates), these should be used. However, these types of costs may not be available at the time permit applications are being prepared. Costs should also be site specific. Some site specific factors are costs of raw materials (fuel, water, chemicals) and labor. For example, in some remote areas costs can be unusually high. For example, remote locations in Alaska may experience a 40 - 50 percent premium on installation costs. The applicant should document any unusual costing assumptions used in the analysis.

Before costs can be estimated, the control system design parameters must be specified. The most important item here is to ensure that the design parameters used in costing are consistent with emissions estimates used in other portions of the PSD application (e.g., dispersion modeling inputs and permit emission limits). In general, the BACT analysis should present vendor-supplied design parameters. Potential sources of other data on design parameters are BID documents used to support NSPS development, control technique guidelines documents, and cost manuals developed by EPA, or control data in trade publications. Table V-3 presents some example design parameters which are important in determining system costs.

To begin, the limits of the area or process segment to be costed is specified. This well defined area or process segment is referred to as the control system battery limits. The second step is to list and cost each major piece of equipment within the battery limits. The top-down BACT analysis should provide this list of costed equipment. The basis for equipment cost estimates also should be documented, either with data supplied by an equipment vendor (i.e., budget estimates or bids) or by a referenced source (such as the OAQPS Control Cost Manual (Fourth Edition), EPA 450/3-90-006, January 1990). Inadequate documentation of battery limits is one of the most common reasons for confusion in comparison of costs of the same controls applied to similar sources. For control options that are defined as inherently lower-polluting processes (and not add-on controls), the battery limits may be the entire process or project.

TABLE V-3. EXAMPLE CONTROL SYSTEM DESIGN PARAMETERS

| Control | Design parameter |
|---|---|
| Wet Scrubbers | Scrubber liquor (water, chemicals, etc.)<br>Gas pressure drop<br>Liquid/gas ratio |
| Carbon Absorbers | Specific chemical species<br>Gas pressure drop<br>lbs carbon/lbs pollutant |
| Condensers | Condenser type<br>Outlet temperature |
| Incineration | Residence time<br>Temperature |
| Electrostatic Precipitator | Specific collection area (ft2/acfm)<br>Voltage density |
| Fabric Filter | Air to cloth ratio<br>Pressure drop |
| Selective Catalytic Reduction | Space velocity<br>Ammonia to NOx molar ratio<br>Pressure drop<br>Catalyst life |

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Design parameters should correspond to the specified emission level. The equipment vendors will usually supply the design parameters to the applicant, who in turn should provide them to the reviewing agency. In order to determine if the design is reasonable, the design parameters can be compared with those shown in documents such as the OAQPS Control Cost Manual, Control Technology for Hazardous Air Pollutants (HAPS) Manual (EPA 625/6-86-014, September 1986), and background information documents for NSPS and NESHAP regulations. If the design specified does not appear reasonable, then the applicant should be requested to supply performance test data for the control technology in question applied to the same source, or a similar source.

V.D.2.b. COST EFFECTIVENESS

Cost effectiveness, or dollars per ton of pollutant reduction, is one of the key economic criterion used to determine if a control option presents adverse economic impacts. By expressing costs in terms of the amount of emission reduction achieved, comparisons can more readily be performed among different locations and types of sources.

Cost effectiveness is calculated as the annualized cost of the control option being considered divided by the baseline emissions minus the control option emissions rate, as shown by the following formula:

$$\text{Cost Effectiveness (dollars per ton removed)} = \frac{\text{Control option annualized cost}}{\text{Baseline emissions rate} - \text{Control option emissions rate}}$$

Costs are calculated in (annualized) dollars per year (\$/yr) and emissions rates are calculated in tons per year (tons/yr). The result is a cost effectiveness number in (annualized) dollars per ton (\$/ton) of pollutant removed.

The baseline emissions rate represents a realistic scenario of upper boundary uncontrolled emissions for the source. The NSPS/NESHAP requirements or the application of controls, including other controls necessary to comply with State or local air pollution regulations, are not considered in calculating the baseline emissions. In other words, baseline emissions are essentially uncontrolled emissions, calculated using realistic upper boundary operating assumptions.

A realistic upper-bound case scenario does not mean that the source operates in an absolute worst case manner all the time. For example, in developing a realistic upper boundary case, baseline emissions calculations can also consider inherent physical or operational constraints on the source. Such constraints should accurately reflect the true upper boundary of the source's ability to physically operate and the applicant should submit documentation to verify these constraints. If the applicant does not adequately verify these constraints, then the reviewing agency should consider the application incomplete in cases where the constraints would substantively affect the outcome of the BACT determination. In addition, the reviewing agency may require the applicant to calculate the cost effectiveness based on values exceeding the upper boundary assumptions to determine whether or not the assumptions have a deciding role in the BACT determination. If the assumptions have a deciding role in the BACT determination, the reviewing agency should include enforceable conditions in the permit. For example, VOC emissions from a storage tank might vary significantly with temperature, volatility of liquid stored, and throughput. In this case, it would not be realistic to calculate annual VOC emissions by extrapolating over the course of a year VOC emissions based solely on the hottest summer day. Instead, the range of expected temperatures should be acknowledged in determining baseline emissions. Likewise, it would be unreasonable to assume that gasoline would be stored in a storage tank being build to feed an oil-fired power boiler or that such a tank will be continually filled and emptied. However, on the other hand, an upper boundary case for a storage tank being constructed to store and transfer liquid fuels at a marine terminal would consider emissions based on the most volatile liquids at a high annual through put level since it would not be unrealistic for the tank to operate in such a manner.

In addition, historic upper boundary operating data, typical for the source or industry, may be used in defining baseline emissions in evaluating the cost effectiveness of a control option for a specific source. For example, if for a source or industry, historical upper boundary operations call for two shifts a day, it is not necessary to assume full time (8760 hours) operation on an annual basis in calculating baseline emissions. For comparing cost effectiveness, the same realistic upper boundary assumptions must, however, be used for both the source in question and other sources (or source categories) that will later be compared during the BACT analysis. For example, suppose (based on verified historic data regarding the industry in question) a given source can be expected to utilize numerous colored inks over the course of a year. Each color ink has a different VOC content ranging from a high VOC content to a relatively low VOC content. The source verifies that its operation will indeed call for the application of numerous color inks. In this case, it is more realistic for the baseline emission calculation for the source (and other similar sources) to be based on the expected mix of inks that would be expected to result in an upper boundary case annual VOC emissions rather than an assumption that only one color (i.e, the ink with the highest VOC content) will be applied exclusively during the whole year.

In another example, suppose sources in a particular industry historically operate at most at 85 percent capacity. For BACT cost effectiveness purposes (but not for applicability), an applicant may calculate cost effectiveness using 85 percent capacity. However, in comparing costs with similar sources, the applicant must consistently use an 85 percent capacity factor for the cost effectiveness of controls on those other sources.

Although permit conditions are normally used to make operating assumptions enforceable, the use of "standard industry practice" parameters for cost effectiveness calculations (but not applicability determinations) is acceptable without permit conditions. However, when a source projects operating parameters (e.g., limited hours of operation or capacity utilization, type of fuel, raw materials or product mix or type) that are lower than standard industry practice or which have a deciding role in the BACT determination, then these parameters or assumptions must be made enforceable with permit conditions. If the applicant will not accept enforceable permit conditions, then the reviewing agency should use the absolute worst case uncontrolled emissions. This is necessary to ensure that the source operates within the upper boundary of those parameters used in defining baseline emissions. For example, the baseline emissions calculation for an emergency standby generator may consider the fact that the source does not intend to operate more than 2 weeks a year. On the other hand, baseline emissions associated with a base-loaded turbine would not consider limited hours of operation. This produces a significantly higher level of baseline emissions than in the case of the emergency/standby unit and results in more cost effective controls. As a consequence of the dissimilar baseline emissions, BACT for the two cases could be very different. Therefore, it is important that the applicant confirm that the operational assumptions used to define the source's baseline emissions (and BACT) are genuine. As previously mentioned, this is usually done through enforceable permit conditions which reflect limits on the source's operation which were used to calculate baseline emissions. In certain cases, as discussed above, such explicit permit conditions may not be necessary. For example, a source for which continuous operation would be a physical impossibility (by virtue of its design) may consider this limitation in estimating baseline emissions, without a direct permit limit on operations. However, the permit agency has the responsibility to verify that the source is constructed and operated consistent with the information and design specifications contained in the permit application.

For some sources it may be more difficult to define what emissions level actually represents uncontrolled emissions in calculating baseline emissions. For example, uncontrolled emissions could theoretically be defined for a spray coating operation as the maximum VOC content coating at the highest possible rate of application that the spray equipment could physically process, even though use of such a coating or application rate is unrealistic for the source. Assuming use of a coating with a VOC content and application rate greater than expected is unrealistic and would overestimate the emissions reductions achievable by various control options. The cost effectiveness of the options could also be greatly underestimated. In this case, uncontrolled emission factors should be represented by the highest realistic VOC content of the types of coatings and highest realistic application rates that would be used by the source, rather than by highest VOC based coating materials or rate of application in general.

Conversely, if uncontrolled emissions are underestimated, emissions reductions to be achieved by the various control options would also be underestimated and their cost effectiveness overestimated. For example, this type of situation occurs in the previous example if the baseline for the above coating operation was based on a VOC content coating or application rate that is too low [when the source had the ability and intent to utilize (even infrequently) a higher VOC content coating or application rate].

In addition to the cost effectiveness of a control option, incremental cost effectiveness between control options may also be calculated where the control option is not selected. The incremental cost effectiveness should be examined in combination with the total cost effectiveness in order to justify elimination of a control option. For the reasons discussed below, the incremental cost , by itself, generally is not an appropriate basis on which to eliminate a control option. The incremental cost effectiveness calculation compares the costs and emissions performance level of a control option to those of the next most stringent option, as shown in the following formula:

$$\text{Incremental Cost (dollars per incremental ton removed)} = \frac{\text{Control option annualized cost - Annualized cost of next control option}}{\text{Next control option emission rate - Control option emissions rate}}$$

Caution should be exercised in deriving incremental costs of candidate control options. For example, assume that eight technically available control options for analysis are listed in the BACT hierarchy. These are represented as A through H in Figure V-1. In calculating incremental costs, the analysis should only be conducted for control options that are dominant among all possible options. In Figure V-1, the dominant set of control options, A, B, D, F, G, and H, represent the least-cost envelope depicted by the curvilinear line connecting them. Points C and E are inferior options and should not be considered in the derivation of incremental cost effectiveness. Points C and E represent inferior controls because D will buy more emissions reduction for less money than C; and similarly, F will by more reductions for less money than E.

Consequently, care should be taken in selecting the dominant set of controls when calculating incremental costs. First, the control options need to be rank ordered in ascending order of higher costs. Then, as Figure V-1 illustrates, the most reasonable smooth curve of the control options is plotted in such a way that incremental cost effectiveness should be ever-increasing for increasing levels of stringency. The incremental cost effectiveness is then determined by the difference in total annual costs between two contiguous options divided by the difference in emissions reduction. An example is illustrated in Figure V-1 for the incremental cost effectiveness for control option F. The vertical distance, "delta" Total Annual Costs, divided by the horizontal distance, "delta" Emissions Reduction, would be the measure of the incremental cost effectiveness for option F.

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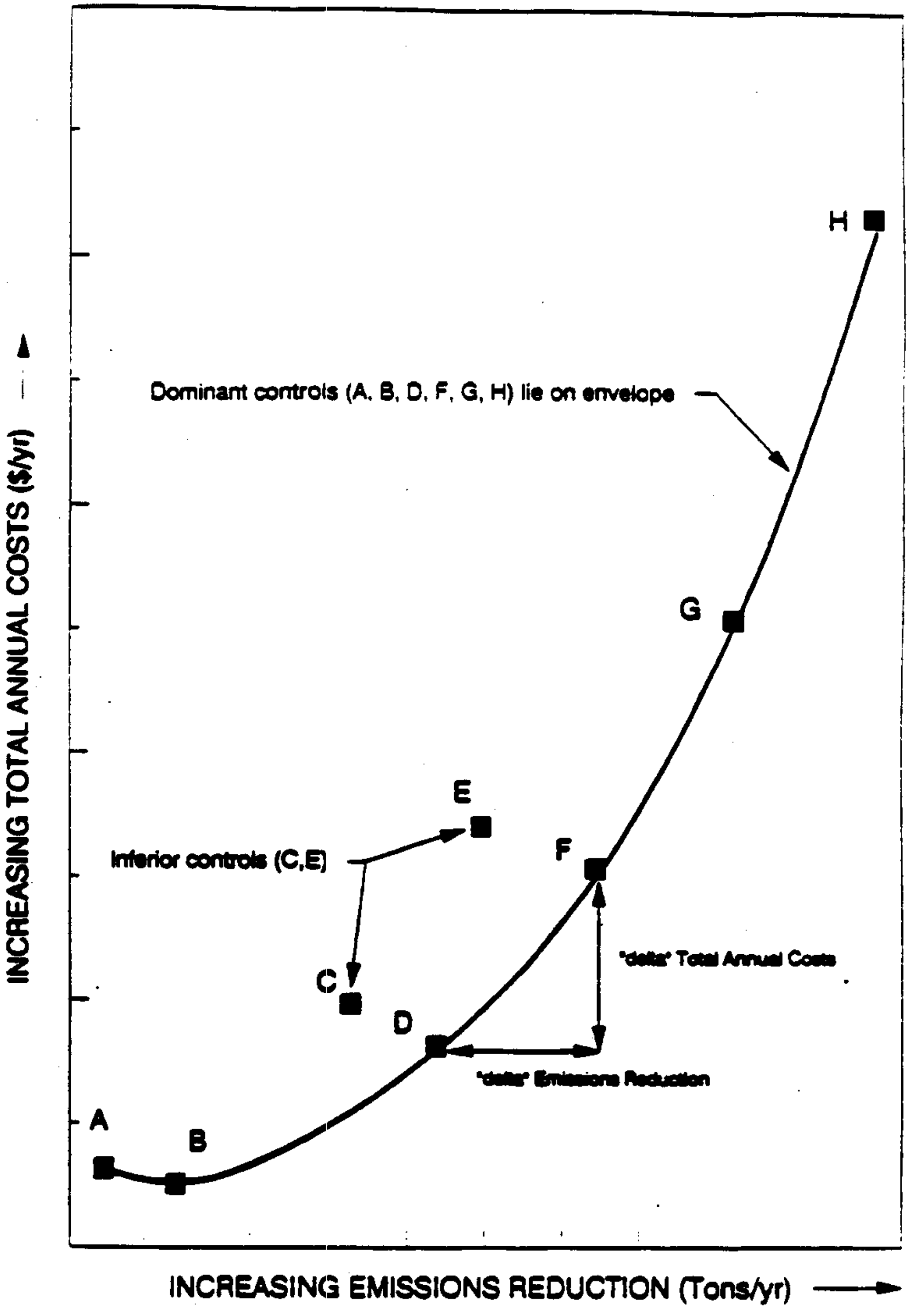
# Figure V-1. LEAST-COST ENVELOPE



A comparison of incremental costs can also be useful in evaluating the economic viability of a specific control option over a range of efficiencies. For example, depending on the capital and operational cost of a control device, total and incremental cost may vary significantly (either increasing or decreasing) over the operation range of a control device.

In addition, when evaluating the total or incremental cost effectiveness of a control alternative, reasonable and supportable assumptions regarding control efficiencies should be made. An unrealistically low assessment of the emission reduction potential of a certain technology could result in inflated cost effectiveness figures.

The final decision regarding the reasonableness of calculated cost effectiveness values will be made by the review authority considering previous regulatory decisions. Study cost estimates used in BACT are typically accurate to ± 20 to 30 percent. Therefore, control cost options which are within ± 20 to 30 percent of each other should generally be considered to be indistinguishable when comparing options.

### V.D.2.c. DETERMINING AN ADVERSE ECONOMIC IMPACT

It is important to keep in mind that BACT is primarily a technology-based standard. In essence, if the cost of reducing emissions with the top control alternative, expressed in dollars per ton, is on the same order as the cost previously borne by other sources of the same type in applying that control alternative, the alternative should initially be considered economically achievable, and therefore acceptable as BACT. However, unusual circumstances may greatly affect the cost of controls in a specific application. If so they should be documented. An example of an unusual circumstance might be the unavailability in an arid region of the large amounts of water needed for a scrubbing system. Acquiring water from a distant location might add unreasonable costs to the alternative, thereby justifying its elimination on economic grounds. Consequently, where unusual factors exist that result in cost/economic impacts beyond the range normally incurred by other sources in that category, the technology can be eliminated provided the applicant has adequately identified the circumstances, including the cost or other analyses, that show what is significantly different about the proposed source.

Where the cost of a control alternative for the specific source being reviewed is within the range of normal costs for that control alternative, the alternative may also be eligible for elimination in limited circumstances. This may occur, for example, where a control alternative has not been required as BACT (or its application as BACT has been extremely limited) and there is a clear demarcation between recent BACT control costs in that source category and the control costs for sources in that source category which have been driven by other constraining factors (e.g., need to meet a PSD increment or a NAAQS). To justify elimination of an alternative on these grounds, the applicant should demonstrate to the satisfaction of the permitting agency that costs of pollutant removal (e.g., dollars per total ton removed) for the control alternative are disproportionately high when compared to the cost of control for the pollutant in recent BACT determinations. Specifically, the applicant should document that the cost to the applicant of the control alternative is significantly beyond the range of recent costs normally associated with BACT for the type of facility (or BACT control costs in general) for the pollutant. This type of analysis should demonstrate that a technically and economically feasible control option is nevertheless, by virtue of the magnitude of its associated costs and limited application, unreasonable or otherwise not "achievable" as BACT in the particular case. Total and incremental cost effectiveness numbers are factored into this type of analysis. However, such economic information should be coupled with a comprehensive demonstration, based on objective factors, that the technology is inappropriate in the specific circumstance.

The economic impact portion of the BACT analysis should not focus on inappropriate factors or exclude pertinent factors, as the results may be misleading. For example, the capital cost of a control option may appear excessive when presented by itself or as a percentage of the total project cost. However, this type of information can be misleading. If a large emissions reduction is projected, low or reasonable cost effectiveness numbers may validate the option as an appropriate BACT alternative irrespective of the apparent high capital costs. In another example, undue focus on incremental cost effectiveness can give an impression that the cost of a control alternative is unreasonably high, when, in fact, the total cost effectiveness is well within the normal range of acceptable BACT costs.

### V.D.3. ENVIRONMENTAL IMPACTS ANALYSIS

The environmental impacts analysis is not to be confused with the air quality impact analysis, which is an independent statutory and regulatory requirement and is conducted separately from the BACT analysis. The purpose of the air quality analysis is to demonstrate that the source (using the level of control ultimately determined to be BACT) will not cause or contribute to a violation of any applicable national ambient air quality standard or PSD increment. Thus, regardless of the level of control proposed as BACT, a permit cannot be issued to a source that would cause or contribute to such a violation. In contrast, the environmental impacts portion of the BACT analysis concentrates on impacts other than impacts on air quality (i.e., ambient concentrations) due to emissions of the regulated pollutant in question, such as solid or hazardous waste generation, discharges of polluted water from a control device, visibility impacts, or emissions of unregulated pollutants.

Thus, the fact that a given control alternative would result in only a slight decrease in ambient concentrations of the pollutant in question when compared to a less stringent control alternative should not be viewed as an adverse <u>environmental</u> impact justifying rejection of the more stringent control alternative. However, if the cost effectiveness of the more stringent alternative is exceptionally high, it may (as provided in section V.D.2.) be considered in determining the existence of an adverse economic impact that would justify rejection of the more stringent alternative.

The applicant should identify any significant or unusual environmental impacts associated with a control alternative that have the potential to affect the selection or elimination of a control alternative. Some control technologies may have potentially significant secondary (i.e., collateral) environmental impacts. Scrubber effluent, for example, may affect water quality and land use. Similarly, emissions of water vapor from technologies using cooling towers may affect local visibility. Other examples of secondary environmental impacts could include hazardous waste discharges, such as spent catalysts or contaminated carbon. Generally, these types of environmental concerns become important when sensitive site-specific receptors exist or when the incremental emissions reduction potential of the top control is only marginally greater than the next most effective option. However, the fact that a control device creates liquid and solid waste that must be disposed of does not necessarily argue against selection of that technology as BACT, particularly if the control device has been applied to similar facilities elsewhere and the solid or liquid waste problem under review is not significantly greater than in those other applications. On the other hand, where the applicant can show that unusual circumstances at the proposed facility create greater problems than experienced elsewhere, this may provide a basis for the elimination of that control alternative as BACT.

The procedure for conducting an analysis of environmental impacts should be made based on a consideration of site-specific circumstances. In general, however, the analysis of environmental impacts starts with the identification and quantification of the solid, liquid, and gaseous discharges from the control device or devices under review. This analysis of environmental impacts should be performed for the entire hierarchy of technologies even if the applicant proposes to adopt the "top", or most stringent, alternative). However, the analysis need only address those control alternatives with any significant or unusual environmental impacts that have the potential to affect the selection or elimination of a control alternative. Thus, the relative environmental impacts (both positive and negative) of the various alternatives can be compared with each other and the "top" alternative.

Initially, a qualitative or semi-quantitative screening is performed to narrow the analysis to discharges with potential for causing adverse environmental effects. Next, the mass and composition of any such discharges should be assessed and quantified to the extent possible, based on readily available information. Pertinent information about the public or environmental consequences of releasing these materials should also be assembled.

V.D.3.a. EXAMPLES (Environmental Impacts)

The following paragraphs discuss some possible factors for considerations in evaluating the potential for an adverse other media impact.

o *Water Impact*

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

o *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 a result of the application of each alternative emission control system would be compared with the quality and quantity of wastes created with the "top" emission control system. 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 would be appropriate for consideration.

o *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).

o *Other Environmental Impacts*

Significant differences in noise levels, radiant heat, or dissipated static electrical energy may be considered.

One environmental impact that could be examined is the trade-off between emissions of the various pollutants resulting from the application of a specific control technology. The use of certain control technologies may lead to increases in emissions of pollutants other than those the technology was designed to control. For example, the use of certain volatile organic compound (VOC) control technologies can increase nitrogen oxides ($NO_x$) emissions. In this instance, the reviewing authority may want to give consideration to any relevant local air quality concern relative to the secondary pollutant (in this case $NO_x$) in the region of the proposed source. For example, if the region in the example were nonattainment for $NO_x$, a premium could be placed on the potential $NO_x$ impact. This could lead to elimination of the most stringent VOC technology (assuming it generated high quantities of $NO_x$) in favor of one having less of an impact on ambient $NO_x$ concentrations. Another example is the potential for higher emissions of toxic and hazardous pollutants from a municipal waste combustor operating at a low flame temperature to reduce the formation of $NO_x$. In this case the real concern to mitigate the emissions of toxic and hazardous emissions (via high combustion temperatures) may well take precedent over mitigating $NO_x$ emissions through the use of a low flame temperature. However, in most cases (unless an overriding concern over the formation and impact of the secondary pollutant is clearly present as in the examples given), it is not expected that this type impact would affect the outcome of the decision.

Other examples of collateral environmental impacts would include hazardous waste discharges such as spent catalysts or contaminated carbon. Generally these types of environmental concerns become important when site-specific sensitive receptors exist or when the incremental emissions reduction potential of the top control option is only marginally greater than the next most effective option.

### V.D.3.b. CONSIDERATION OF EMISSIONS OF TOXIC AND HAZARDOUS AIR POLLUTANTS

The generation or reduction of toxic and hazardous emissions, including compounds not regulated under the Clean Air Act, are considered as part of the environmental impacts analysis. Pursuant to the EPA Administrator's decision in North County Resource Recovery Associates, PSD Appeal No. 85-2 (Remand Order, June 3, 1986), a PSD permitting authority should consider the effects of a given control alternative on emissions of toxics or hazardous pollutants not regulated under the Clean Air Act. The ability of a given control alternative to control releases of unregulated toxic or hazardous emissions must be evaluated and may, as appropriate, affect the BACT decision. Conversely, hazardous or toxic emissions resulting from a given control technology should also be considered and may, as appropriate, also affect the BACT decision.

Because of the variety of sources and pollutants that may be considered in this assessment, it is not feasible for the EPA to provide highly detailed national guidance on performing an evaluation of the toxic impacts as part of the BACT determination. Also, detailed information with respect to the type and magnitude of emissions of unregulated pollutants for many source categories is currently limited. For example, a combustion source emits hundreds of substances, but knowledge of the magnitude of some of these emissions or the hazards they produce is sparse. While the EPA is pursuing a variety of projects that will help permitting authorities to determine pollutants of concern, EPA believes it is appropriate for agencies to proceed on a case-by-case basis using the best information available. Thus, the determination of whether the pollutants would be emitted in amounts sufficient to be of concern is one that the permitting authority has considerable discretion in making. However, reasonable efforts should be made to address these issues. For example, such efforts might include consultation with the:

- o EPA Regional Office;
- o Control Technology Center (CTC);
- o National Air Toxics Information Clearinghouse;
- o Air Risk Information Support Center in the Office of Air Quality Planning and Standards (OAQPS); and
- o review of the literature, such as: EPA-prepared compilations of emission factors.

Source-specific information supplied by the permit applicant is often the best source of information, and it is important that the applicant be made aware of its responsibility to provide for a reasonable accounting of air toxics emissions.

Similarly, once the pollutants of concern are identified, the permitting authority has flexibility in determining the methods by which it factors air toxics considerations into the BACT determination, subject to the obligation to make reasonable efforts to consider air toxics. Consultation by the review authority with EPA's implementation centers, particularly the CTC, is again advised.

It is important to note that several acceptable methods, including risk assessment, exist to incorporate air toxics concerns into the BACT decision. The depth of the toxics assessment will vary with the circumstances of the particular source under review, the nature and magnitude of the toxic pollutants, and the locality. Emissions of toxic or hazardous pollutant of concern to the permit agency should be identified and, to the extent possible, quantified. In addition, the effectiveness of the various control alternatives in the hierarchy at controlling the toxic pollutant should be estimated and summarized to assist in making judgements about how potential emissions of toxic or hazardous pollutants may be mitigated through the selection of one control option over another.

Under a top-down BACT analysis, the control alternative selected as BACT will most likely reduce toxic emissions as well as the regulated pollutant. An example is the emissions of heavy metals typically associated with coal combustion. The metals generally are a portion of, or adsorbed on, the fine particulate in the exhaust gas stream. Collection of the particulate in a high efficiency fabric filter rather than a low efficiency electrostatic precipitator reduces criteria pollutant particulate matter emissions and toxic heavy metals emissions. Because in most instances the interests of reducing toxics coincide with the interests of reducing the pollutants subject to BACT, consideration of toxics in the BACT analysis generally amounts to quantifying toxic emission levels for the various control options.

In limited other instances, though, control of regulated pollutant emissions may compete with control of toxic compounds, as in the case of certain selective catalytic reduction (SCR) $NO_x$ control technologies. The SCR technology itself results in emissions of ammonia, which increase, generally speaking, with increasing levels of $NO_x$ control. It is the intent of the toxics screening in the BACT procedure to identify and quantify this type of toxic effect. Generally, toxic effects of this type will not necessarily be overriding concerns and will likely not to affect BACT decisions. Rather, the intent is to require a screening of toxics emissions effects to ensure that a possible overriding toxics issue does not escape notice.

On occasion, consideration of toxics emissions may support the selection of a control technology that yields less than the maximum degree of reduction in emissions of the regulated pollutant in question. An example is the municipal solid waste combustor and resource recovery facility that was the subject of the North County remand. Briefly, BACT for $SO_2$ and PM was selected to be a lime slurry spray drier followed by a fabric filter. The combination yields good $SO_2$ control (approximately 83 percent), good PM control (approximately 99.5 percent) and also removes acid gases (approximately 95 percent), metals, dioxins, and other unregulated pollutants. In this instance, the permitting authority determined that good balanced control of regulated and unregulated pollutants took priority over achieving the maximum degree of emissions reduction for one or more regulated pollutants. Specifically, higher levels (up to 95 percent) of $SO_2$ control could have been obtained by a wet scrubber.

## V.E. SELECTING BACT (STEP 5)

The most effective control alternative not eliminated in Step 4 is selected as BACT.

It is important to note that, regardless of the control level proposed by the applicant as BACT, the ultimate BACT decision is made by the permit issuing agency after public review. The applicant's role is primarily to provide information on the various control options and, when it proposes a less stringent control option, provide a detailed rationale and supporting documentation for eliminating the more stringent options. It is the responsibility of the permit agency to review the documentation and rationale presented and; (1) ensure that the applicant has addressed all of the most effective control options that could be applied and; (2) determine that the applicant has adequately demonstrated that energy, environmental, or economic impacts justify any proposal to eliminate the more effective control options. Where the permit agency does not accept the basis for the proposed elimination of a control option, the agency may inform the applicant of the need for more information regarding the control option. However, the BACT selection essentially should default to the highest level of control for which the applicant could not adequately justify its elimination based on energy, environmental and economic impacts. If the applicant is unable to provide to the permit agency's satisfaction an adequate demonstration for one or more control alternatives, the permit agency should proceed to establish BACT and prepare a draft permit based on the most effective control option for which an adequate justification for rejection was not provided.

## V.F. OTHER CONSIDERATIONS

Once energy, environmental, and economic impacts have been considered, BACT can only be made more stringent by other considerations outside the normal scope of the BACT analysis as discussed under the above steps. Examples include cases where BACT does not produce a degree of control stringent enough to prevent exceedences of a national ambient air quality standard or PSD increment, or where the State or local agency will not accept the level of control selected as BACT and requires more stringent controls to preserve a greater amount of the available increment. A permit cannot be issued to a source that would cause or contribute to such a violation, regardless of the outcome of the BACT analysis. Also, States which have set ambient air quality standards at levels tighter than the federal standards may demand a more stringent level of control at a source to demonstrate compliance with the State standards. Another consideration which could override the selected BACT are legal constraints outside of the Clean Air Act requiring the application of a more stringent technology (e.g., a consent decree requiring a greater degree of control). In all cases, regardless of the rationale for the permit requiring a more stringent emissions limit than would have otherwise been chosen as a result of the BACT selection process, the emission limit in the final permit (and corresponding control alternative) represents BACT for the permitted source on a case-by-case basis.

The BACT emission limit in a new source permit is not set until the final permit is issued. The final permit is not issued until a draft permit has gone through public comment and the permitting agency has had an opportunity to consider any new information that may have come to light during the comment period. Consequently, in setting a proposed or final BACT limit, the permit agency can consider new information it learns, including recent permit decisions, subsequent to the submittal of a complete application. This emphasizes the importance of ensuring that prior to the selection of a proposed BACT, all potential sources of information have been reviewed to ensure that the list of potentially applicable control alternatives is complete (most importantly as it relates to any more effective control options than the one chosen) and that all considerations relating to economic, energy and environmental impacts have been addressed. These responsibilities reside with the applicant.

## VI. ENFORCEABILITY OF BACT

To complete the BACT process, the reviewing agency must establish an enforceable emission limit for each emission unit at the source and for each pollutant subject to review that is emitted from the source. If technological or economic limitations in the application of a measurement methodology to a particular emission unit would make an emissions limit infeasible, a design, equipment, work practice, operation standard, or combination thereof, may be prescribed. Also, the technology upon which the BACT emissions limit is based should be specified in the permit. These requirements should be written in the permit so that they are specific to the individual emission unit(s) subject to PSD review.

The emissions limits must be included in the proposed permit submitted for public comment, as well as the final permit. BACT emission limits or conditions must be met on a continual basis at all levels of operation (e.g., limits written in pounds/MMbtu or percent reduction achieved), demonstrate protection of short term ambient standards (limits written in pounds/hour) and be enforceable as a practical matter (contain appropriate averaging times, compliance verification procedures and recordkeeping requirements). Consequently, the permit must:

- be able to show compliance or noncompliance (i.e., through monitoring times of operation, fuel input, or other indices of operating conditions and practices); and
- specify a reasonable averaging time consistent with established reference methods, contain reference methods for determining compliance, and provide for adequate reporting and recordkeeping so that the permitting agency can determine the compliance status of the source.

## VII. EXAMPLE BACT ANALYSES FOR GAS TURBINES

*Note: The following example provided is for illustration only. The example source is fictitious and has been created to highlight many of the aspects of the top-down process. Finally, it must be noted that the cost data and other numbers presented in the example are used only to demonstrate the BACT decision making process. Cost data are used in a relative sense to compare control costs among sources in a source category or for a pollutant. No absolute cost guidelines have been established above which costs are assumed to be too high or below which they are assumed reasonable. Determination of appropriate costs is made on a case-by-case basis.*

In this section a BACT analysis for a stationary gas turbine project is presented and discussed under three alternative operating scenarios:

- Example 1--Simple Cycle Gas Turbines Firing Natural Gas
- Example 2--Combined Cycle Gas Turbines Firing Natural Gas
- Example 3--Combined Cycle Gas Turbines Firing Distillate Oil

The purpose of the examples are to illustrate points to be considered in developing BACT decision criteria for the source under review and selecting BACT. They are intended to illustrate the <u>process</u> rather than provide universal guidance on what constitutes BACT for any particular source category. BACT must be determined on a case-by-case basis.

These examples are not based on any actual analyses performed for the purposes of obtaining a PSD permit. Consequently, the actual emission rates, costs, and design parameters used are neither representative of any actual case nor do they apply to any particular facility.

## VII.A. EXAMPLE 1--SIMPLE CYCLE GAS TURBINES FIRING NATURAL GAS

### VII.A.1 PROJECT SUMMARY

Table VII-1 presents project data, stationary gas design parameters, and uncontrolled emission estimates for the new source in example 1. The gas turbine is designed to provide peaking service to an electric utility. The planned operating hours are less than 1000 hours per year. Natural gas fuel will be fired. The source will be limited through enforceable conditions to the specified hours of operation and fuel type. The area where the source is to be located is in compliance for all criteria pollutants. No other changes are proposed at this facility, and therefore the net emissions change will be equal to the emissions shown on Table VII-1. Only $NO_x$ emissions are significant (i.e., greater than the 40 tpy significance level for $NO_x$) and a BACT analysis is required for $NO_x$ emissions only.

### VII.A.2. BACT ANALYSIS SUMMARY

#### VII.A.2.a. CONTROL TECHNOLOGY OPTIONS

The first step in evaluating BACT is identifying all candidate control technology options for the emissions unit under review. Table VII-2 presents the list of control technologies selected as potential BACT candidates. The first three control technologies, wet injection and selective catalytic reduction, were identified by a review of existing gas turbine facilities in operation. Wet injection can mean either water or steam injection. Selective noncatalytic reduction was identified as a potential type of control technology because it is an add-on $NO_x$ control which has been applied to other types of combustion sources.

In this example, the control technologies were identified by the applicant based on a review of the BACT/LAER Clearinghouse, and discussions with State agencies with experience permitting gas turbines in $NO_x$ nonattainment areas. A preliminary meeting with the State permit issuing agency was held to determine whether the permitting agency felt that any other

TABLE VII-1. EXAMPLE 1--COMBUSTION TURBINE DESIGN PARAMETERS

| Characteristics | |
|---|---|
| Number of emissions units | 1 |
| Unit Type | Gas Turbines |
| Cycle Type | Simple-cycle |
| Output | 75 MW |
| Exhaust temperature, | 1,000 $^{o}F$ |
| Fuel(s) | Natural Gas |
| Heat rate, Btu/kw hr | 11,000 |
| Fuel flow, Btu/hr | 1,650 million |
| Fuel flow, lb/hr | 83,300 |
| Service Type | Peaking |
| Operating Hours (per year) | 1,000 |
| Uncontrolled Emissions, tpy(a) | |
| $NO_x$ | 564 (169 ppm) |
| $SO_2$ | <1 |
| CO | 4.6 (6 ppm) |
| VOC | 1 |
| PM | 5 (0.0097 gr/dscf) |

(a) Based on 1000 hours per year of operation at full load.

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## TABLE VII-2. EXAMPLE 1--SUMMARY OF POTENTIAL NOx CONTROL TECHNOLOGY OPTIONS

| Control technology(a) | Typical control efficiency range (% reduction) | In Service On: Simple cycle turbines | Combined cycle gas turbines | Other combustion sources(c) | Technically feasible on simple cycle turbines |
|---|---|---|---|---|---|
| Selective Catalytic Reductions | 40-90 | No | Yes | Yes | Yes(b) |
| Water Injection | 30-70 | Yes | Yes | Yes | Yes |
| Steam Injection | 30-70 | No | Yes | Yes | No |
| Low NOx Burner | 30-70 | Yes | Yes | Yes | Yes |
| Selective Noncatalytic Reduction | 20-50 | No | Yes | Yes | No |

(a) Ranked in order of highest to lowest stringency.
(b) Exhaust must be diluted with air to reduce its temperature to 600-750°F.
(c) Boiler incinerators, etc.

applicable control technologies should be evaluated and they agreed on the proposed control hierarchy.

### VII.A.2.b. TECHNICAL FEASIBILITY CONSIDERATIONS

Once potential control technologies have been identified, each technology is evaluated for its technical feasibility based on the characteristics of the source. Because the gas turbines in this example are intended to be used for peaking service, a heat recovery steam generator (HRSG) will not be included. A HRSG recovers heat from the gas turbine exhaust to make steam and increase overall energy efficiency. A portion of the steam produced can be used for steam injection for $NO_x$ control, sometimes increasing the effectiveness of the net injection control system. However, the electrical demands of the grid dictate that the turbine will be brought on line only for short periods of time to meet peak demands. Due to the lag time required to bring a heat recovery steam generator on line, it is not technically feasible to use a HRSG at the facility. Use of an HRSG in this instance was shown to interfere with the performance of the unit for peaking service, which requires immediate response times for the turbine. Although it was shown that a HRSG was not feasible, water and steam are readily available for $NO_x$ control since the turbine will be located near an existing steam generating powerplant.

The turbine type and, therefore, the turbine model selection process, affects the achievability of $NO_x$ emissions limits. Factors which the customer considered in selecting the proposed turbine model were outlined in the application as: the peak demand which must be met, efficiency of the gas turbine, reliability requirements, and the experience of the utility with the operation and maintenance service of the particular manufacturer and turbine design. In this example, the proposed turbine is equipped with a combustor designed to achieve an emission level, at 15 percent $O_2$, of 25 ppm $NO_x$ with steam injection or 42 ppm with water injection.[1]

Selective noncatalytic reduction (SNCR) was eliminated as technically infeasible because this technology requires a flue gas temperature of 1300 to 2100°F. The exhaust from the gas turbines will be approximately 1000°F, which is below the required temperature range.

Selective catalytic reduction (SCR) was evaluated and no basis was found to eliminate this technology as technically infeasible. However, there are no known examples where SCR technology has been applied to a simple-cycle gas turbine or to a gas turbine in peaking service. In all cases where SCR has been applied, there was an HRSG which served to reduce the exhaust temperature to the optimum range of 600-750°F and the gas turbine was operated continuously. Consequently, application of SCR to a simple cycle turbine involves special circumstances. For this example, it is assumed that dilution air can be added to the gas turbine exhaust to reduce its temperature. However, the dilution air will make the system more costly due to higher gas flows, and may reduce the removal efficiency because the $NO_x$ concentration at the inlet will be reduced. Cost considerations are considered later in the analysis.

### VII.A.2.c. CONTROL TECHNOLOGY HIERARCHY

After determining technical feasibility, the applicant selected the control levels for evaluation shown in Table VII-3. Although the applicant reported that some sites in California have achieved levels as low as 9 ppm, at this facility a 13 ppm level was determined to be the feasible limit with SCR. This decision is based on the lowest achievable level with steam injection of 25 ppm and an SCR removal efficiency of 50 percent. Even though

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[1] For some gas turbine models, 25 ppm is not achievable with either water or steam injection.

TABLE VII-3. EXAMPLE 1--CONTROL TECHNOLOGY HIERARCHY

| Control Technology | Emissions Limits ppm(a) | TPY |
|---|---|---|
| Steam Injection plus SCR | 13 | 44 |
| Steam Injection at maximum(b) design rate | 25 | 84 |
| Water Injection at maximum(b) design rate | 42 | 140 |
| Steam Injection to meet NSPS | 93 | 312 |

(a) Corrected to 15 percent oxygen.

(b) Water to fuel ratio.

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the reported removal efficiencies for SCR are up to 90 percent at some facilities, at this facility the actual $NO_x$ concentration at the inlet to the SCR system will only be approximately 17 ppm (at actual conditions) due to the dilution air required. Also the inlet concentrations, flowrates, and temperatures will vary due to the high frequency of startups. These factors make achieving the optimum 90 percent $NO_x$ removal efficiency unrealistic. Based on discussions with SCR vendors, the applicant has established a 50 percent removal efficiency as the highest level achievable, thereby resulting in a 13 ppm level (i.e., 50 percent of 25 ppm).

The next most stringent level achievable would be steam injection at the maximum water-to-fuel ratio achievable by the unit within its design operating range. For this particular gas turbine model, that level is 25 ppm as supported by vendor $NO_x$ emissions guarantees and unit test data. The applicant provided documentation obtained from the gas turbine manufacturer[2] verifying ability to achieve this range.

After steam injection the next most stringent level of control would be water injection at the maximum water-to-fuel ratio achievable by the unit within its design operating range. For this particular gas turbine model, that level is 42 ppm as supported by vendor $NO_x$ emissions guarantees and actual unit test data. The applicant provided documentation obtained from the gas turbine manufacturer verifying ability to achieve this range.

The least stringent level evaluated by the applicant was the current NSPS for utility gas turbines. For this model, that level is 93 ppm at 15 percent $O_2$. By definition, BACT can be no less stringent than NSPS. Therefore, less stringent levels are not evaluated.

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[2] It should be noted that achievability of the $NO_x$ limits is dependent on the turbine model, fuel, type of wet injection (water or steam), and system design. Not all gas turbine models or fuels can necessarily achieve these levels.

### VII.A.2.d. IMPACTS ANALYSIS SUMMARY

The next steps completed by the applicant were the development of the cost, economic, environmental and energy impacts of the different control alternatives. Although the top-down process would allow for the selection of the top alternative without a cost analysis, the applicant felt cost/economic impacts were excessive and that appropriate documentation may justify the elimination of SCR as BACT and therefore chose to quantify cost and economic impacts. Because the technologies in this case are applied in combination, it was necessary to quantify impacts for each of the alternatives. The impact estimates are shown in Table VII-4. Adequate documentation of the basis for the impacts was determined to be included in the PSD permit application.

The incremental cost impacts shown are the cost of the alternative compared to the next most stringent control alternative. Figure VII-1 is a plot of the least-cost envelope defined by the list of control options.

### VII.A.2.e. TOXICS ASSESSMENT

Potential toxic emissions which could occur as a result of this facility would be ammonia if SCR were applied. Ammonia emissions resulting from application of SCR could be as large as 20 tons per year. Application of SCR would reduce $NO_x$ by an additional 20 tpy over steam injection alone (25 ppm)(not including ammonia emissions).

Another environmental impact considered was the spent catalyst which would have to be disposed of at certain operating intervals. The catalyst contains vanadium pentoxide, which is listed as a hazardous waste under RCRA regulations (40 CFR 261.3). Disposal of this waste creates an additional

TABLE VII-4. EXAMPLE 1--SUMMARY OF TOP-DOWN BACT IMPACT ANALYSIS RESULTS FOR $NO_x$

| Control alternative | Emissions per Turbine | | | Economic Impacts | | | | Energy Impacts | Environmental Impacts | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Emissions (lb/hr) | (tpy) | Emissions reduction(a) (tpy) | Installed capital cost(b) ($) | Total annualized cost(c) ($/yr) | Cost effectiveness over baseline(d) ($/ton) | Incremental cost effectiveness(e) ($/ton) | Incremental increase over baseline(f) (MMBtu/yr) | Toxics impact (Yes/No) | Adverse environmental impact (Yes/No) |
| 13 ppm Alternative | 44 | 22 | 260 | 11,470,000 | 1,717,000(g) | 6,600 | 56,200 | 464,000 | Yes | No |
| 25 ppm Alternative | 84 | 42 | 240 | 1,790,000 | 593,000 | 2,470 | 8,460 | 30,000 | No | No |
| 42 ppm Alternative | 140 | 70 | 212 | 1,304,000 | 356,000 | 1,680 | 800 | 15,300 | No | No |
| NSPS Alternative | 312 | 156 | 126 | 927,000 | 288,000 | 2,285 | | 8,000 | No | No |
| Uncontrolled Baseline | 564 | 282 | - | - | - | - | - | - | - | - |

(a) Emissions reduction over baseline control level.
(b) Installed capital cost relative to baseline.
(c) Total annualized cost (capital, direct, and indirect) of purchasing, installing, and operating the proposed control alternative. A capital recovery factor approach using a real interest rate (i.e., absent inflation) is used to express capital costs in present-day annual costs.
(d) Cost Effectiveness over baseline is equal to total annualized cost for the control option divided by the emissions reductions resulting from the uncontrolled baseline.
(e) The optional incremental cost effectiveness criteria is the same as the total cost effectiveness criteria except that the control alternative is considered relative to the next most stringent alternative rather than the baseline control alternative.
(f) Energy impacts are the difference in total project energy requirements with the control alternative and the baseline control alternative expressed in equivalent millions of Btus per year.
(g) Assued 10 year catalyst life since this turbine operates only 1000 hours per year. Assumptions made on catalyst life may have a profound affect upon cost effectiveness.



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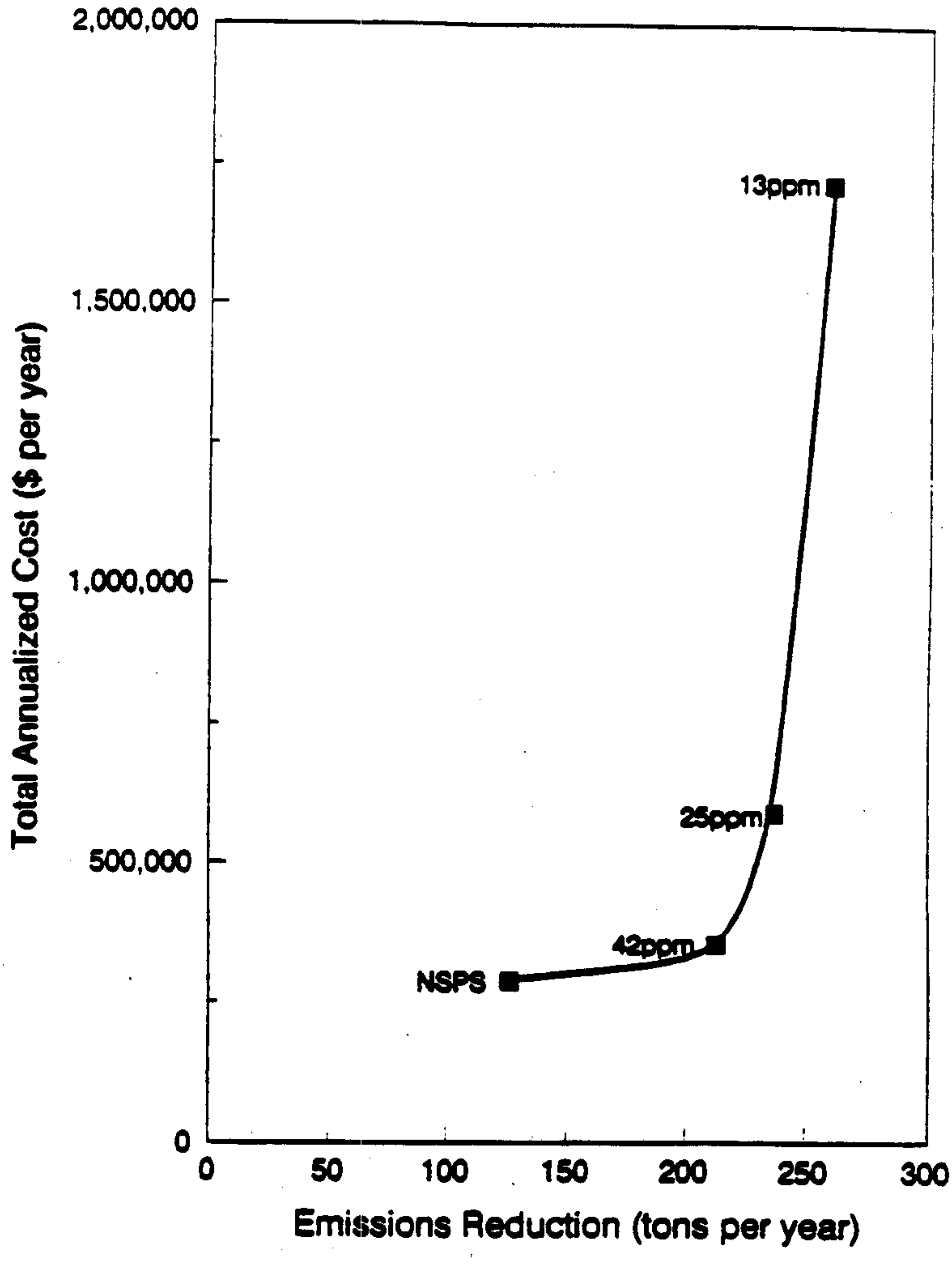
Figure VII-1. Least-Cost Envelope for Example 1



economic and environmental burden. This was considered in the applicant's proposed BACT determination.

### VII.A.2.f. RATIONALE FOR PROPOSED BACT

Based on these impacts, the applicant proposed eliminating the 13 ppm alternative as economically infeasible. The applicant documented that the cost effectiveness is high at 6,600 $/ton, and well out of the range of recent BACT $NO_x$ control costs for similar sources. The incremental cost effectiveness of $56,200 also is high compared to the incremental cost effectiveness of the next option.

The applicant documented that the other combustion turbine sources which have applied SCR have much higher operating hours (i.e., all were permitted as base-loaded units). Also, these sources had heat recovery steam generators so that the cost effectiveness of the application of SCR was lower. For this source, dilution air must be added to cool the flue gas to the proper temperature. This increases the cost of the SCR system relative to the same gas turbine with a HRSG. Therefore, the other sources had much lower cost impacts for SCR relative to steam injection alone, and much lower cost effectiveness numbers. Application of SCR would also result in emission of ammonia, a toxic chemical, of possibly 20 tons per year while reducing $NO_x$ emissions by 20 tons per year. The applicant asserted that, based on these circumstances, to apply SCR in this case would be an unreasonable burden compared to what has been done at other similar sources.

Consequently, the applicant proposed eliminating the SCR plus steam injection alternative. The applicant then accepted the next control alternative, steam injection to 25 ppmv. The review authority concurred with the proposed elimination of SCR and the selection of a 25 ppmv limit as BACT.

## VII.B. EXAMPLE 2--COMBINED CYCLE GAS TURBINES FIRING NATURAL GAS

Table VII-5 presents the design parameters for an alternative set of circumstances. In this example, two gas turbines are being installed. Also, the operating hours are 5000 per year and the new turbines are being added to meet intermediate loads demands. The source will be limited through enforceable conditions to the specified hours of operation and fuel type. In this case, HRSG units are installed. The applicable control technologies and control technology hierarchy are the same as the previous example except that no dilution is required for the gas turbine exhaust because the HRSG serves to reduce the exhaust temperature to the optimum level for SCR operation. Also, since there is no dilution required and fewer startups, the most stringent control option proposed is 9 ppm based on performance limits for several other natural gas fired baseload combustion turbine facilities.

Table VII-6 presents the results of the cost and economic impact analysis for the example and Figure VII-2 is a plot of the least-cost envelope defined by the list of control options. The incremental cost impacts shown are the cost of the alternative compared to the next most stringent control alternative. Due to the increased operating hours and design changes, the economic impacts of SCR are much lower for this case. There does not appear to be a persuasive argument for stating that SCR is economically infeasible. Cost effectiveness numbers are within the range typically required of this and other similar source types.

In this case, there would also be emissions of ammonia. However, now the magnitude of ammonia emissions, approximately 40 tons per year, is much lower than the additional $NO_x$ reduction achieved, which is 270 tons per year.

Under these alternative circumstances, PM emissions are also now above the significance level (i.e., greater than 25 tpy). The gas turbine

TABLE VII-6. EXAMPLE 2--SUMMARY OF TOP-DOWN BACT IMPACT ANALYSIS RESULTS FOR $NO_x$

| Control alternative | Emissions per Turbine: Emissions (lb/hr) | Emissions per Turbine: Emissions (tpy) | Emissions per Turbine: Emissions reduction(a,h) (tpy) | Economic Impacts: Installed capital cost(b) ($) | Economic Impacts: Total annualized cost(c) ($/yr) | Economic Impacts: Cost effectiveness over baseline(d) ($/ton) | Economic Impacts: Incremental cost effectiveness(e) ($/ton) | Energy Impacts: Incremental increase over baseline(f) (MMBtu/yr) | Environmental Impacts: Toxics impact (Yes/No) | Environmental Impacts: Adverse environmental impact (Yes/No) |
|---|---|---|---|---|---|---|---|---|---|---|
| 9 ppm Alternative | 30 | 75 | 1,335 | 10,900,000 | 3,380,000(g) | 2,531 | 12,200 | 160,000 | Yes | No |
| 25 ppm Alternative | 84 | 210 | 1,200 | 1,791,000 | 1,730,000 | 1,440 | 6,050 | 105,000 | No | No |
| 42 ppm Alternative | 140 | 350 | 1,060 | 1,304,000 | 883,000 | 833 | 181 | 57,200 | No | No |
| NSPS Alternative | 312 | 780 | 630 | 927,000 | 805,000 | 1,280 | | 27,000 | No | No |
| Uncontrolled Baseline | 564 | 1,410 | - | - | - | - | - | - | - | - |

(a) Emissions reduction over baseline control level.
(b) Installed capital cost relative to baseline.
(c) Total annualized cost (capital, direct, and indirect) of purchasing, installing, and operating the proposed control alternative. A capital recovery factor approach using a real interest rate (i.e., absent inflation) is used to express capital costs in present-day annual costs.
(d) Cost Effectiveness over baseline is equal to total annualized cost for the control option divided by the emissions reductions resulting from the uncontrolled baseline.
(e) The optional incremental cost effectiveness criteria is the same as the total cost effectiveness criteria except that the control alternative is considered relative to the next most stringent alternative rather than the baseline control alternative.
(f) Energy impacts are the difference in total project energy requirements with the control alternative and the baseline control alternative expressed in equivalent millions of Btus per year.
(g) Assumes a 2 year catalyst life. Assumptions made on catalyst life may have a profound affect upon cost effectiveness.
(h) Since the project calls for two turbines, actual project wide emissions reductions for an alternative will be equal to two times the reduction listed.

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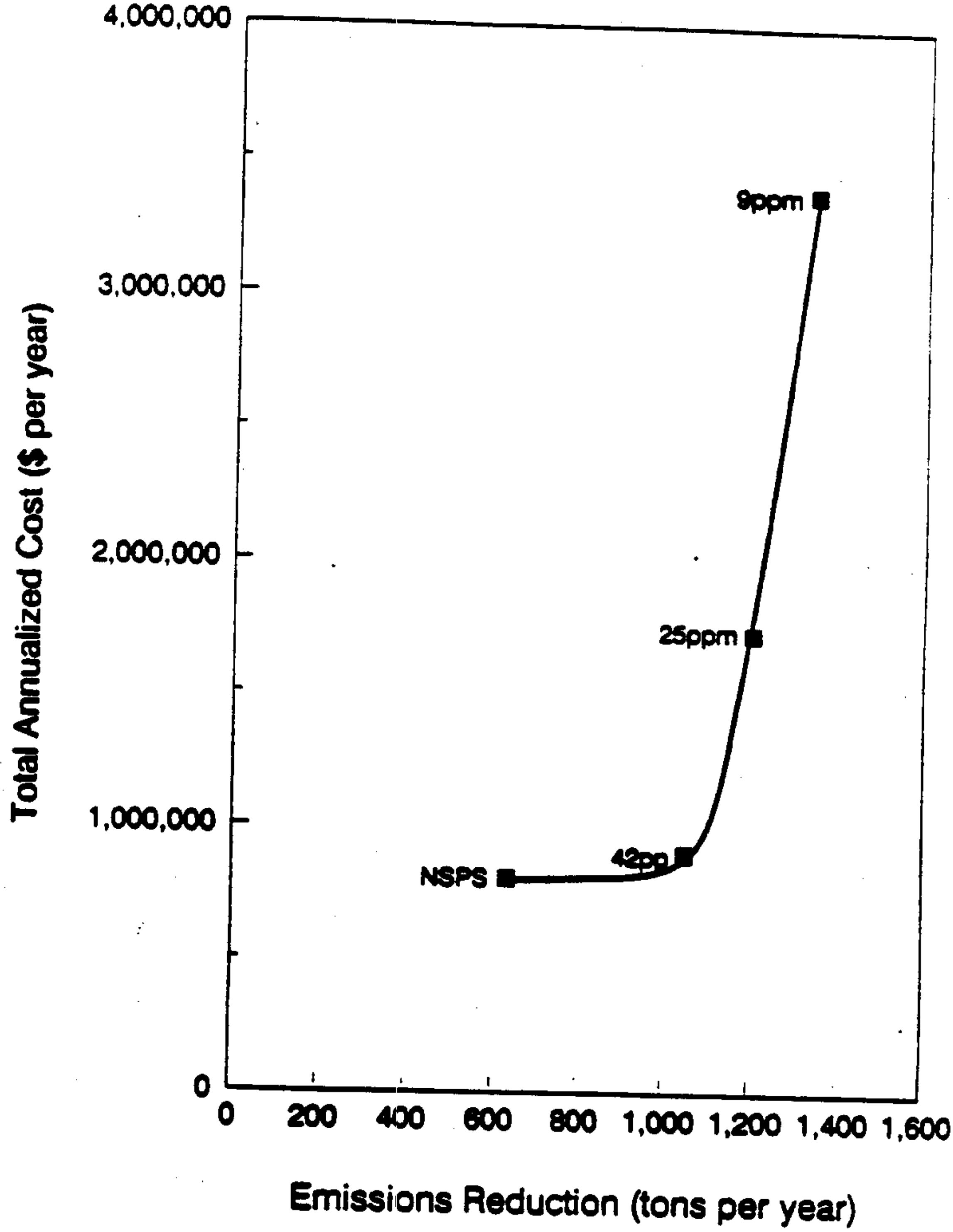
Figure VII-2. Least-Cost Envelope for Example 2



combustors are designed to combust the fuel as completely as possible and therefore reduce PM to the lowest possible level. Natural gas contains no solids and solids are removed from the injected water. The PM emission rate without add-on controls is on the same order (0.009 gr/dscf) as that for other particulate matter sources controlled with stringent add-on controls (e.g., fabric filter). Since the applicant documented that precombustion or add-on controls for PM have never been required for natural gas fired turbines, the reviewing agency accepted the applicants analysis that natural gas firing was BACT for PM emissions and that no additional analysis of PM controls was required.

## VII.C. EXAMPLE 3--COMBINED CYCLE GAS TURBINE FIRING DISTILLATE OIL

In this example, the same combined cycle gas turbines are proposed except that distillate oil is fired rather than natural gas. The reason is that natural gas is not available on site and there is no pipeline within a reasonable distance. The fuel change raises two issues; the technical feasibility of SCR in gas turbines firing sulfur bearing fuel, and $NO_x$ levels achievable with water injection while firing fuel oil.

In this case the applicant proposed to eliminate SCR as technically infeasible because sulfur present in the fuel, even at low levels, will poison the catalyst and quickly render it ineffective. The applicant also noted that there are no cases in the U.S. where SCR has been applied to a gas turbine firing distillate oil as the primary fuel.[3]

A second issue would be the most stringent $NO_x$ control level achievable with wet injection. For oil firing the applicant has proposed 42 ppm at 15 percent oxygen. Due to flame characteristics inherent with oil firing, and limits on the amount of water or steam that can be injected, 42 ppm is the

[3] Though this argument was considered persuasive in this case, advances in catalyst technology have now made SCR with oil firing technically feasible.

lowest $NO_x$ emission level achievable with distillate oil firing. Since natural gas is not available and SCR is technically infeasible, 42 ppm is the most stringent alternative considered. Based on the cost effectiveness of wet injection, approximately 833 $/ton, there is no economic basis to eliminate the 42 ppm option since this cost is well within the range of BACT costs for $NO_x$ control. Therefore, this option is proposed as BACT.

The switch to oil from gas would also result in $SO_2$, CO, PM, and beryllium emissions above significance levels. Therefore, BACT analyses would also be required for these pollutants. These analyses are not shown in this example, but would be performed in the same manner as the BACT analysis for $NO_x$.

## VII.D. OTHER CONSIDERATIONS

The previous judgements concerning economic feasibility were in an area meeting NAAQS for both $NO_x$ and ozone. If the natural gas fired simple cycle gas turbine example previously presented were sited adjacent to a Class I area, or where air quality improvement poses a major challenge, such as next to a nonattainment area, the results may differ. In this case, even though the region of the actual site location is achieving the NAAQS, adherence to a local or regional $NO_x$ or ozone attainment strategy might result in the determination that higher costs than usual are appropriate. In such situations, higher costs (e.g., 6,600 $/ton) may not necessarily be persuasive in eliminating SCR as BACT.

While it is not the intention of BACT to prevent construction, it is possible that local or regional air quality management concerns regarding the need to minimize the air quality impacts of new sources would lead the permitting authority to require a source to either achieve stringent emission control levels or, at a minimum, that control cost expenditures meet certain cost levels without consideration of the resultant economic impact to the source.

Besides local or regional air quality concerns, other site constraints may significantly impact costs of particular control technologies. For the examples previously presented, two factors of concern are land and water availability.

The cost of the raw water is usually a small part of the cost of wet controls. However, gas turbines are sometimes located in remote locations. Though water can obviously be trucked to any location, the costs may be very high.

Land availability constraints may occur where a new source is being located at an existing plant. In these cases, unusual design and additional structural requirements could make the costs of control technologies which are commonly affordable prohibitively expensive. Such considerations may be pertinent to the calculations of impacts and ultimately the selection of BACT.

# APPENDIX A

# DEFINITION OF SELECTED TERMS

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# APPENDIX A - DEFINITION OF SELECTED NSR TERMS

**BACT** — Best Available Control Technology is the control level required for sources subject to PSD. From the regulation (reference 40 CFR 52.21(b)) BACT means "an emissions limitation (including a visible emission standard) based on the maximum degree of reduction for each pollutant subject to regulation under the Clean Air Act which would be emitted from any proposed major stationary source or major modification which the Administrator, on a case-by-case basis, taking into account energy, environmental, and economic impacts and other costs, determines is achievable for such source or modification through application of production processes or available methods, systems, and techniques, including fuel cleaning or treatment or innovative fuel combustion techniques for control of such pollutant. In no event shall application of best available control technology result in emissions of any pollutant which would exceed the emissions allowed by any applicable standard under 40 CFR Parts 60 and 61. If the Administrator determines that technological or economic limitations on the application of measurement methodology to a particular emissions unit would make the imposition of an emissions standard infeasible, a design, equipment, work practice, operational standard, or combination thereof, may be prescribed instead to satisfy the requirement for the application of best available control technology. Such standard shall, to the degree possible, set forth the emissions reduction achievable by implementation of such design, equipment, work practice or operation, and shall provide for compliance by means which achieve equivalent results."

**Emission Units** — The individual emitting facilities at a location that together make up the source. From the regulation (reference 40 CFR 52.21(b)), it means "any part of a stationary source which emits or would have the potential to emit any pollutant subject to regulation under the Act."

**Increments** — The maximum permissible level of air quality deterioration that may occur beyond the baseline air quality level. Increments were defined statutorily by Congress for $SO_2$ and PM. Recently EPA also has promulgated increments for $NO_x$. Increment is consumed or expanded by actual emissions changes occurring after the baseline date and by construction related actual emissions changes occurring after January 6, 1975, and February 8, 1988 for PM/$SO_2$ and $NO_x$, respectively.

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**Innovative Control Technology**

From the regulation (reference 40 CFR 52.21(b)(19)) "Innovative control technology" means any system of air pollution control that has not been adequately demonstrated in practice, but would have a substantial likelihood of achieving greater continuous emissions reduction than any control system in current practice or of achieving at least comparable reductions at lower cost in terms of energy, economics, or nonair quality environmental impacts. Special delayed compliance provisions exist that may be applied when applicants propose innovative control techniques.

**LAER**

Lowest Achievable Emissions Rate is the control level required of a source subject to nonattainment review. From the regulations (reference 40 CFR 51.165(a)), it means for any source "the more stringent rate of emissions based on the following:

(a) The most stringent emissions limitation which is contained in the implementation plan of any State for such class or category of stationary source, unless the owner or operator of the proposed stationary source demonstrates that such limitations are not achievable; or

(b) The most stringent emissions limitation which is achieved in practice by such class or category of stationary sources. This limitation, when applied to a modification, means the lowest achievable emissions rate of the new or modified emissions units within a stationary source. In no event shall the application of the term permit a proposed new or modified stationary source to emit any pollutant in excess of the amount allowable under an applicable new source standard of performance."

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| Major Modification | A major modification is a modification to an existing major stationary source resulting in a significant net emissions increase (defined elsewhere in this table) that, therefore, is subject to PSD review. From the regulation (reference 40 CFR 52.21(b)(2)):<br><br>"(i) 'Major modification' means any physical change in or change in the method of operation of a major stationary source that would result in a significant net emissions increase of any pollutant subject to regulation under the Act.<br><br>(ii) Any net emissions increase that is significant for volatile organic compounds shall be considered significant for ozone.<br><br>(iii) A physical change or change in the method of operation shall not include:<br><br>(a) routine maintenance, repair and replacement;<br><br>(c) use of an alternative fuel by reason of an order or rule under Section 125 of the Act;<br><br>(d) Use of an alternative fuel at a steam generating unit to the extent that the fuel is generated from municipal solid waste;<br><br>(e) Use of an alternative fuel or raw material by a stationary source which:<br><br>(1) The source was capable of accommodating before January 6, 1975, unless such change would be prohibited under any Federally enforceable permit condition which was established after January 6, 1975, pursuant to 40 CFR 52.21 or under regulations approved pursuant to 40 CFR Subpart I or 40 CFR 51.166; or<br><br>(2) The source is approved to use under any permit issued under 40 CFR 52.21 or under regulations approved pursuant to 40 CFR 51.166;<br><br>(f) an increase in the hours of operation or in the production rate, unless such change would be prohibited under any federally enforceable permit condition which was established after January 6, 1975, pursuant to 40 CFR 52.21 or under regulations approved pursuant to 40 CFR Subpart I or 40 CFR 51.166; or<br><br>(g) any change in ownership at a stationary source." |

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**Major Stationary Source**

A major stationary source is an emissions source of sufficient size to warrant PSD review. Major modification to major stationary sources are also subject to PSD review. From the regulation (reference 40 CFR 52.21(b)(1)), (i) "Major stationary source" means:

"(a) Any of the following stationary sources of air pollutant which emits, or has the potential to emit, 100 tons per year or more of any pollutant subject to regulation under the Act: Fossil fuel-fired steam electric plants of more than 250 million British thermal units per hour heat input, coal cleaning plants (with thermal dryers), Kraft pulp mills, Portland cement plants, primary zinc smelters, iron and steel mill plants, primary aluminum ore reduction plants, primary aluminum ore reduction plants, primary copper smelters, municipal incinerators capable of charging more than 250 tons of refuse per day, hydrofluoric, sulfuric, and nitric acid plants, petroleum refineries, lime plants, phosphate rock processing plants, coke oven batteries, sulfur recovery plants, carbon black plants (furnace process), primary lead smelters, fuel conversion plants, sintering plants, secondary metal production plants, chemical process plants, fossil fuel boilers (or combinations thereof) totaling more than 250 million British thermal units per hour heat input, petroleum storage and transfer units with a total storage capacity exceeding 300,000 barrels, taconite ore processing plants, glass fiber processing plants, and charcoal production plants;

(b) Notwithstanding the stationary source size specified in paragraph (b)(1)(i) of this section, any stationary source which emits, or has the potential to emit, 250 tons per year or more of any air pollutant subject to regulation under the Act; or

(c) Any physical change that would occur at a stationary source not otherwise qualifying under paragraph (b)(1) as a major stationary source not otherwise qualifying under paragraph (b)(1) as a major stationary source, if the changes would constitute a major stationary source by itself.

(ii) A major stationary source that is major for volatile organic compounds shall be considered major for ozone."

**NAAQS**

National Ambient Air Quality Standards are Federal standards for the minimum ambient air quality needed to protect public health and welfare. They have been set for six criteria pollutants including $SO_2$, $PM/PM_{10}$, $NO_x$, CO, $O_3$ (VOC), and Pb.

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| NESHAP | NESHAP, or National Emission Standard for Hazardous Air Pollutants, is a technology-based standard of performance prescribed for hazardous air pollutants from certain stationary source categories under Section 112 of the Clean Air Act. Where they apply, NESHAP represent absolute minimum requirements for BACT. |
| NSPS | NSPS, or New Source Performance Standard, is an emission standard prescribed for criteria pollutants from certain stationary source categories under Section 111 of the Clean Air Act. Where they apply, NSPS represent absolute minimum requirements for BACT. |
| PSD | Prevention of significant deterioration is a construction air pollution permitting program designed to ensure air quality does not degrade beyond the NAAQS levels or beyond specified incremental amounts above a prescribed baseline level. PSD also ensures application of BACT to major stationary sources and major modifications for regulated pollutants and consideration of soils, vegetation, and visibility impacts in the permitting process. |
| Regulated Pollutants[1] | Refers to pollutants that have been regulated under the authority of the Clean Air Act (NAAQS, NSPS, NESHAP): |

$O_3$ (VOC) - Ozone, regulated through volatile organic compounds as precursors
$NO_x$ - Nitrogen oxides
$SO_2$ - Sulfur dioxide
PM (TSP) - Total suspended particulate matter
PM ($PM_{10}$) - Particulate matter with ≤10 micron aerometric diameter
CO - Carbon monoxide

| | |
|---|---|
| Pb - Lead | TRS - Total reduced sulfur (including $H_2S$) |
| As - Asbestos | RSC - Reduced Sulfur Compounds (including $H_2S$) |
| Be - Beryllium | Bz - Benzene |
| Hg - Mercury | Rd - Radionuclides |
| VC - Vinyl chloride | As - Arsenic |
| F - Fluorides | CFC's - Chlorofluorocarbons |
| $H_2SO_4$ - Sulfuric acid mist | Rn-222 - Radon-222 |
| $H_2S$ - Hydrogen sulfide | Halons |

[1] The referenced list of regulated pollutants is current as of November 1989. Presently, additional pollutants may also be subject to regulation under the Clean Air Act.

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| Significant Emissions Increase | For new major stationary sources and major modifications, a significant emissions increase triggers PSD review. Review requirements must be met for each pollutant undergoing a significant net emissions increase. From the regulation (reference 40 CFR 52.21(b)(23)). |

(i) "Significant" means, in reference to a net emissions increase from a modified major source or the potential of a new major source to emit any of the following pollutants, a rate of emissions that would equal or exceed any of the following rates:

Carbon monoxide: 100 tons per year (tpy)
Nitrogen oxides: 40 tpy
Sulfur dioxide: 40 tpy
Particulate matter: 25 tpy
PM10: 15 tpy
Ozone: 40 tpy of volatile organic compounds
Lead: 0.6 tpy
Asbestos: 0.007 tpy
Beryllium: 0.0004 tpy
Mercury: 0.1 tpy
Vinyl chloride: 1 tpy
Fluorides: 3 tpy
Sulfuric acid mist: 7 tpy
Hydrogen Sulfide ($H_2S$): 10 tpy
Total reduced sulfur (including $H_2S$): 10 tpy
Reduced sulfur compounds (including $H_2S$): 10 tpy

(ii) "Significant" means, in reference to a net emissions increase or the potential of a source to emit a pollutant subject to regulation under the Act, that (i) above does not list, any emissions rate.

(For example, benzene and radionuclides are pollutants falling into the "any emissions rate" category.)

(iii) Notwithstanding, paragraph (b)(23)(i) of this section, "significant means any emissions rate or any net emissions increase associated with a major stationary source or major modification which would construct within 10 kilometers of a Class I area, and have an impact on such an area equal to or greater than 1 $ug/m^3$, (24-hour average).

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| SIP | State Implementation Plan is the federally approved State (or local) air quality management authority's statutory plan for attaining and maintaining the NAAQS. Generally, this refers to the State/local air quality rules and permitting requirements that have been accepted by EPA as evidence of an acceptable control strategy. |
| Stationary Source | For PSD purposes, refers to all emissions units at one location under common ownership or control. From the regulation (reference 40 CFR 52.21(b)(5) and 51.166(b)(5)), it means "any building, structure, facility, or installation which emits or may emit any air pollutant subject to regulation under the Act."<br><br>"Building, structure, facility, or installation" means all of the pollutant-emitting activities which belong to the same industrial grouping, are located on one or more contiguous or adjacent properties, and are under the control of the same person (or person under common control). Pollutant-emitting activities shall be considered as part of the same industrial grouping if they belong to the same "Major Group" (i.e., which have the same first two digit code) as described in the Standard Industrial Classification Manual, 1972, as amended by the 1977 Supplement (U.S. Government Printing Office stock numbers 4101-0066 and 003-005-00176-0, respectively). |

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March 15, 1990

# APPENDIX B
# ESTIMATING CONTROL COSTS

# APPENDIX B - ESTIMATING CONTROL COSTS

## I. CAPITAL COSTS

Capital costs include equipment costs, installation costs, indirect costs, and working capital (if appropriate). Figure B-1 presents the elements of total capital cost and represents a building block approach that focuses on the control device as the basic unit of analysis for estimating total capital investment. The total capital investment has a role in the determination of total annual costs and cost effectiveness.

One of the most common problems which occurs when comparing costs at different facilities is that the battery limits are different. For example, the battery limit of the cost of a electrostatic precipitation might be the precipitator itself (housing, plates, voltage regulators, transformers, etc.), ducting from the source to the precipitator, and the solids handling system. The stack would not be included because a stack will be required regardless of whether or not controls are applied. Therefore, it should be outside the battery limits of the control system.

Direct installation costs are the costs for the labor and materials to install the equipment and includes site preparation, foundations, supports, erection and handling of equipment, electrical work, piping, insulation and painting. The equipment vendor can usually supply direct installation costs.

The equipment vendor should be able to supply direct installation costs estimates or general installation costs factors. In addition, typical installation cost factors for various types of equipment are available in the following references.

- OAQPS Control Cost Manual (Fourth Edition), January 1990, EPA 450/3-90-006
- Control Technology for Hazardous Air Pollutants (HAPS) Manual, September 1986, EPA 625/6-86-014

FIGURE B-1. Elements of Total Capital Costs

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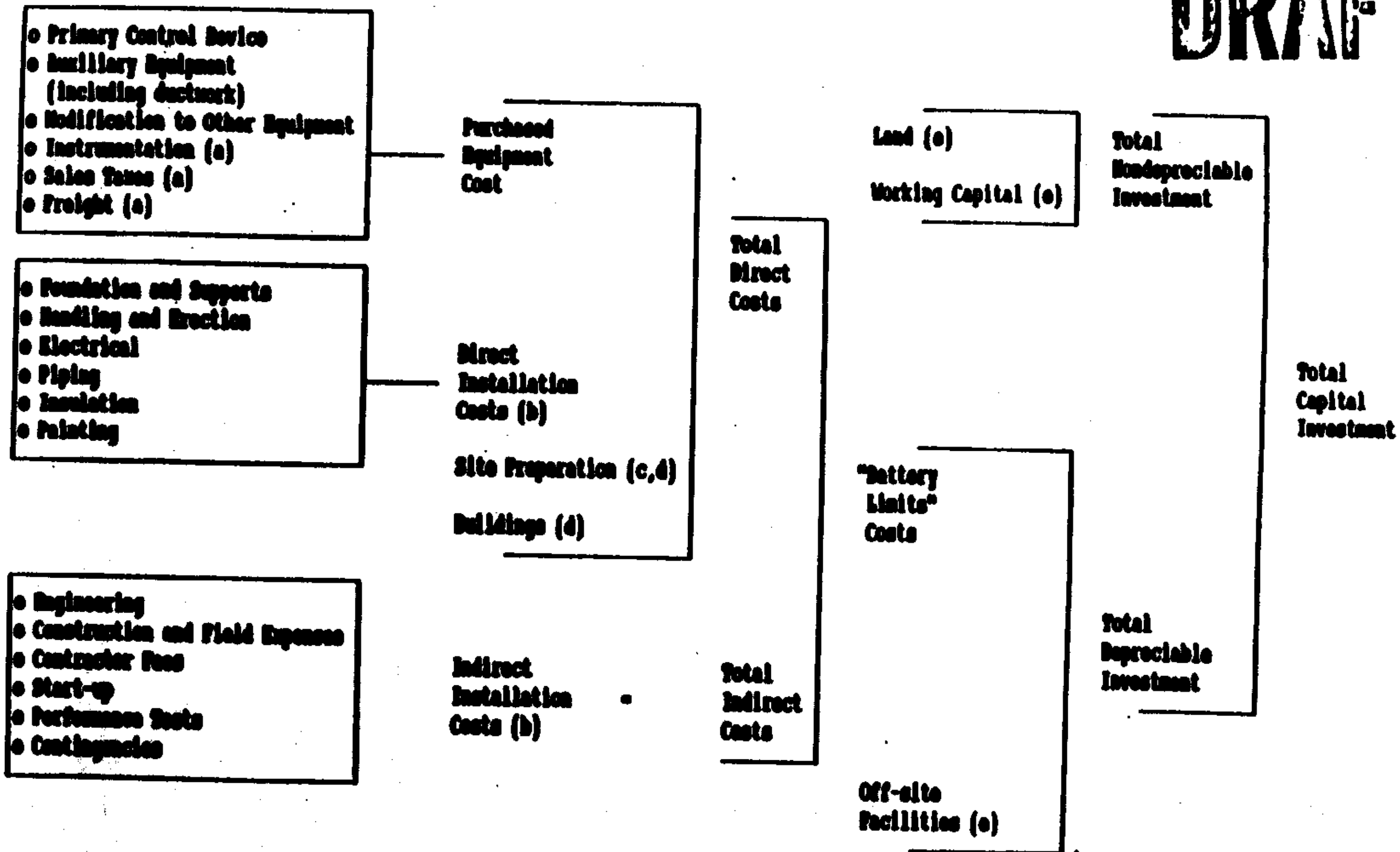


(a) These costs are factored from the sum of the control device and auxiliary equipment costs.
(b) These costs are factored from the purchased control equipment.
(c) Usually required only at "grass roots" installations.
(d) Unlike the other direct and indirect costs, costs for these items are not factored from the purchased equipment cost. Rather, they are sized and costed separately.
(e) Normally not required with add-on control systems.

- o Standards Support Documents
  - Background Information Documents
  - Control Techniques Guidelines Documents
- o Other EPA sponsored costing studies
- o Engineering Cost and Economics Textbooks
- o Other engineering cost publications

These references should also be used to validate any installation cost factors supplied from equipment vendors.

If standard costing factors are used, they may need to be adjusted due to site specific conditions. For example, in Alaska installation costs are on the order of 40 - 50 percent higher than in the contiguous 48 states due to higher labor prices, shipping costs, and climate.

Indirect installation costs include (but are not limited to) engineering, construction, start-up, performance tests, and contingency. Estimates of these costs may be developed by the applicant for the specific project under evaluation. However, if site-specific values are not available, typical estimates for these costs or cost factors are available in:

- o OAQPS Control Cost Manual (Fourth Edition), EPA 450/3-90-006
- o Cost Analysis Manual for Standards Support Documents, April 1979

These references can be used by applicants if they do not have site-specific estimates already prepared, and should also be used by the reviewing agency to determine if the applicant's estimates are reasonable. Where an applicant uses different procedures or assumptions for estimating control costs than contained in the referenced material or outlined in this document, the nature and reason for the differences are to be documented in the BACT analysis.

Working capital is a fund set aside to cover initial costs of fuel, chemicals, and other materials and other contingencies. Working capital costs for add on control systems are usually relatively small and, therefore, are usually not included in cost estimates.

Table B-1 presents an illustrative example of a capital cost estimate developed for an ESP applied to a spreader-stoker coal-fired boiler. This estimate shows the minimum level of detail required for these types of estimates. If bid costs are available, these can be used rather than study cost estimates.

II. TOTAL ANNUAL COST.

The permit applicant should use the levelized annual cost approach for consistency in BACT cost analysis. This approach is also called the "Equivalent Uniform Annual Cost" method, or simply "Total Annual Cost" (TAC). The components of total annual costs are their relationships are shown in Figure B-2. The total annual costs for control systems is comprised of three elements: "direct" costs (DC), "indirect costs" (IC), and "recovery credit" (RC), which are related by the following equation:

$$TAC = DC + IC - RC$$

Direct costs are those which tend to be proportional or partially proportional to the quantity of exhaust gas processed by the control system or, in the case of inherently lower polluting processes, the amount of material processed or product manufactured per unit time. These include costs for raw materials, utilities (steam, electricity, process and cooling water, etc.), and waste treatment and disposal. Semivariable direct costs are only partly dependent upon the exhaust or material flowrate. These include all associated labor, maintenance materials, and replacement parts. Although these costs are a function of the operating rate, they are not linear

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TABLE B-1. EXAMPLE OF A CAPITAL COST ESTIMATE FOR AN ELECTROSTATIC PRECIPITATOR

| | Capital cost ($) |
|---|---|
| Direct Investment | |
| Equipment cost | |
| ESP unit | 175,800 |
| Ducting | 64,100 |
| Ash handling system | 97,200 |
| Total equipment cost | 337,100 |
| Installation costs | |
| ESP unit | 175,800 |
| Ducting | 102,600 |
| Ash handling system | 97,200 |
| Total installation costs | 375,600 |
| Total direct investment (TDI) (equipment + installation) | 712,700 |
| Indirect Investment | 71,300 |
| Engineering (10% of TDI) | 71,300 |
| Construction and field expenses (10% of TDI) | 71,300 |
| Construction fees (10% of TDI) | 71,300 |
| Start-up (2% of TDI) | 14,300 |
| Performance tests (minimum $2000) | 3,000 |
| Total indirect investment (TII) | 231,200 |
| Contingencies (20% of TDI + TII) | 188,800 |
| TOTAL TURNKEY COSTS (TDI + TII) | 1,132,700 |
| Working Capital (25% of total direct operating costs)a | 21,100 |
| GRAND TOTAL | 1,153,800 |

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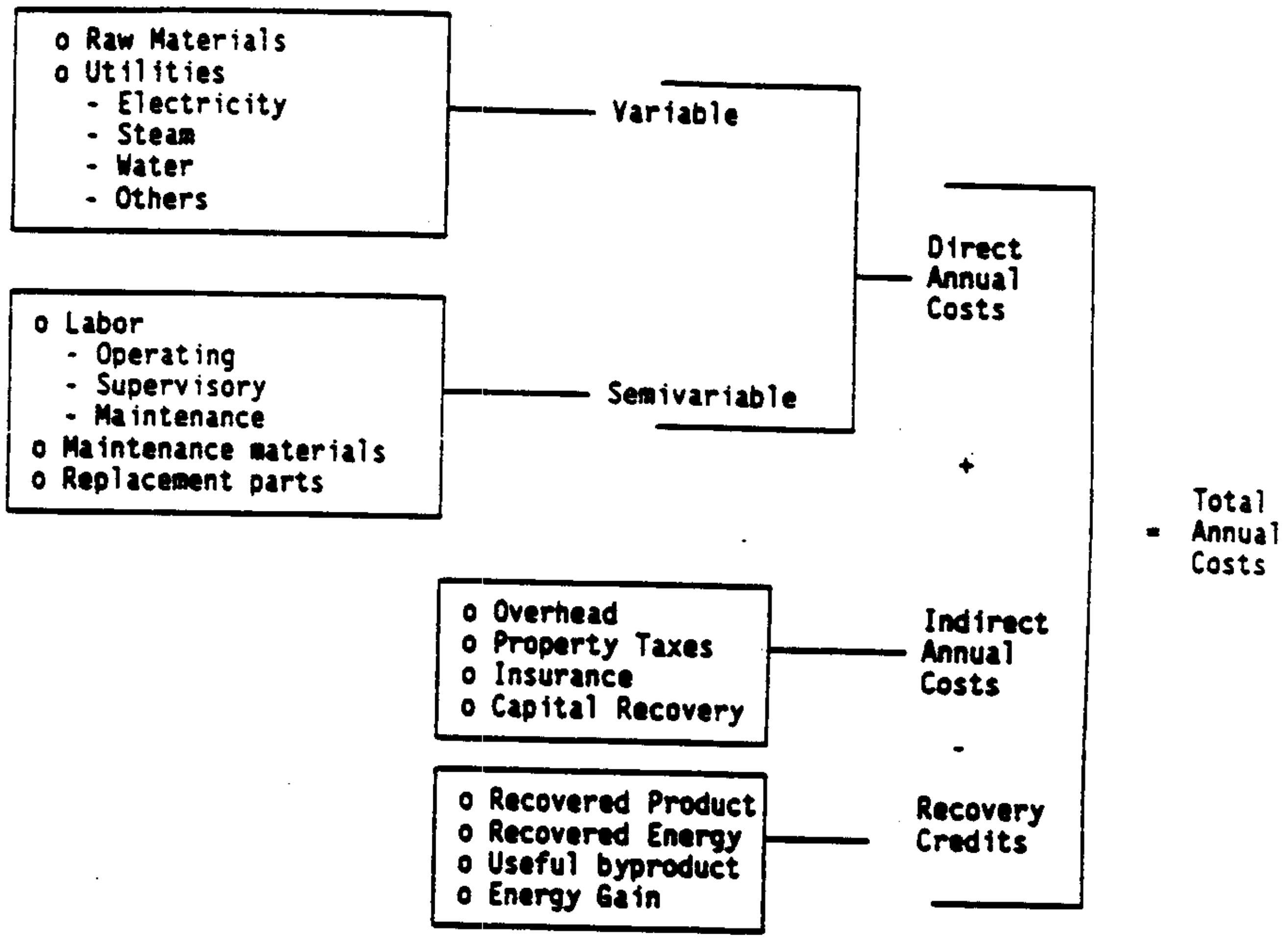
FIGURE B-2. Elements of Total Annual Costs



functions. Even while the control system is not operating, some of the semivariable costs continue to be incurred.

Indirect, or "fixed", annual costs are those whose values are relatively independent of the exhaust or material flowrate and, in fact, would be incurred even if the control system were shut down. They include such categories as overhead, property taxes, insurance, and capital recovery.

Direct and indirect annual costs are offset by recovery credits, taken for materials or energy recovered by the control system, which may be sold, recycled to the process, or reused elsewhere at the site. These credits, in turn, may be offset by the costs necessary for their purification, storage, transportation, and any associated costs required to make then reusable or resalable. For example, in auto refinishing, a source through the use of certain control technologies can save on raw materials (i.e., paint) in addition to recovered solvents. A common oversight in BACT analyses is the omission of recovery credits where the pollutant itself has some product or process value. Examples of control techniques which may produce recovery credits are equipment leak detection and repair programs, carbon absorption systems, baghouse and electrostatic precipitators for recovery of reusable or saleable solids and many inherently lower polluting processes.

Table B-2 presents an example of total annual costs for the control system previously discussed. Direct annual costs are estimated based on system design power requirements, energy balances, labor requirements, etc., and raw materials and fuel costs. Raw materials and other consumable costs should be carefully reviewed. The applicant generally should have documented delivered costs for most consumables or will be able to provide documented estimates. The direct costs should be checked to be sure they are based on the same number of hours as the emission estimates and the proposed operating schedule.

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TABLE 8-2. EXAMPLE OF A ANNUAL COST ESTIMATE FOR AN ELECTROSTATIC PRECIPITATOR APPLIED TO A COAL-FIRED BOILER

| | Annual costs ($/yr) |
|---|---|
| **Direct Costs** | |
| Direct labor at $12.02/man-hour | 26,300 |
| Supervision at $15.63/man-hour | 0 |
| Maintenance labor at $14.63/man-hour | 16,000 |
| Replacement parts | 5,200 |
| Electricity at $0.0258/kWh | 3,700 |
| Water at $0.18/1000 gal | 300 |
| Waste disposal at $15/ton (dry basis) | 33,000 |
| Total direct costs | 84,500 |
| **Indirect Costs** | |
| Overhead | |
| Payroll (30% of direct labor) | 7,900 |
| Plant (26% of all labor and replacement parts) | 12,400 |
| Total overhead costs | 20,300 |
| **Capital charges** | |
| G&A taxes and insurance (4% of total turnkey costs) | 45,300 |
| Capital recovery factor (11.75% of total turnkey costs) | 133,100 |
| Interest on working capital (10% of working capital) | 2,100 |
| Total capital charges | 180,500 |
| **TOTAL ANNUALIZED COSTS** | **285,300** |

Maintenance costs in some cases are estimated as a percentage of the total capital investment. Maintenance costs include actual costs to repai equipment and also other costs potentially incurred due to any increased system downtime which occurs as a result of pollution control system maintenance.

Fixed annual costs include plant overhead, taxes, insurance, and capit. recovery charges. In the example shown, total plant overhead is calculated a the sum of 30 percent of direct labor plus 26 percent of all labor and maintenance materials. The OAQPS Control Cost Manual combines payroll and plant overhead into a single indirect cost. Consequently, for "study" estimates, it is sufficiently accurate to combine payroll and plant overhead into a single indirect cost. Total overhead is then calculated as 60 percent of the sum of all labor (operating, supervisory, and maintenance) plus maintenance materials.

Property taxes are a percentage of the fixed capital investment. Note that some jurisdictions exempt pollution control systems from property taxes. Ad valorem tax data are available from local governments. Annual insurance charges can be calculated by multiplying the insurance rate for the facility by the total capital costs. The typical values used to calculate taxes and insurance is four percent of the total capital investment if specific facility data are not readily available.

The annual costs previously discussed do not account for recovery of the capital cost incurred. The capital cost shown in Table B-2 is annualized using a capital recovery factor of 11.75 percent. When the capital recovery factor is multiplied by the total capital investment the resulting product represents the uniform end of year payment necessary to repay the investment in "n" years with an interest rate "i".

The formula for the capital recovery factor is:

$$CRF = \frac{i\,(1+i)^n}{(1+i)^n - 1}$$

where:

CPF = capital recovery factor

n = economic life of equipment

i = real interest rate

The economic life of a control system typically varies between 10 to 20 years and longer and should be determined consistent with data from EPA cost support documents and the IRS Class Life Asset Depreciation Range System.

From the example shown in Table 8-2 the interest rate is 10 percent and the equipment life is 20 years. The resulting capital recovery factor is 11.75 percent. Also shown is interest on working capital, calculated as the product of interest rate and the working capital.

It is important to insure that the labor and materials costs of parts of the control system (such as catalyst beds, etc.) that must be replaced before the end of the useful life are subtracted from the total capital investment before it is multiplied by the capital recovery factor. Costs of these parts should be accounted for in the maintenance costs. To include the cost of those parts in the capital charges would be double counting. The interest rate used is a real interest rate (i.e., it does not consider inflation). The value used in most control costs analyses is 10 percent in keeping with current EPA guidelines and Office of Management and Budget recommendations for regulatory analyses.

It is also recommended that income tax considerations be excluded from cost analyses. This simplifies the analysis. Income taxes generally represent transfer payments from one segment of society to another and as such are not properly part of economic costs.

III. OTHER COST ITEMS.

Lost production costs are not included in the cost estimate for a new or modified source. Other economic parameters (equipment life, cost of capital, etc.) should be consistent with estimates for other parts of the project.

# APPENDIX V

"Developing and Updating our National Ambient Air Quality Standards"
(U.S. EPA Document, 1988)

# DEVELOPING AND UPDATING OUR NATIONAL AMBIENT AIR QUALITY STANDARDS

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This paper describes the process for review of national ambient air quality standards (NAAQS). Special attention is given to the role NAAOS play in the nation's air quality management system. The legal requirements based on the Clean Air Act Amendments of 1977 are discussed as they apply to this review and to the decision process in making a choice on the standards. The paper describes not only the importance of the scientific basis for selecting a standard but also the role of the policymaker and the judicial process. Criteria document development, scientific review process, preliminary staff decision paper and public review process are all described. Highlights include discussion of the problem of making decisions with imperfect information and the requirement to exclude economic/cost criteria in selecting standards.

## Introduction

On February 19, 1987, Environmental Protection Agency (EPA) Administrator Lee Thomas testified[1] before the United States House Subcommittee on Health and the Environment and characterized the national ambient air quality standards (NAAQS) and their attainment as a major environmental priority. Attainment and maintenance of the NAAQS is a multi-billion dollar effort and probably the most resource-intensive of any environmental regulatory program in the United States. Because these standards are the markers that drive NAAQS control programs, the process for developing and updating these standards is of extreme importance. Indicative of national importance of this process, the United States Congress signaled its resolve to be informed on the need for evolution or change in the way standards are developed and reviewed, by commissioning the General Accounting Office (GAO) to assess the standard development process[2].

EPA's charter for conducting NAAQS development and reviews is defined in the Clean Air Act[3] and related amendments passed by the United States Congress. The standard development and review process includes the following: (a) the assessment of scientific information, (b) generation of a consensus within the scientific community on the veracity of this asessment, (c) an exchange of views and information with the public sector following proposal of a standard, and (d) if necessary, promulgation of a final rule.

## Background

Six NAAQS have been established under the provision of the Clean Air Act Amendments. Substances for which these standards have been set include carbon monoxide (CO), lead (Pb), nitrogen dioxide ($NO_2$), sulfur oxides ($SO_x$), particulate matter (TSP), and ozone ($O_3$). All of these standards with the exception of $O_3$ and Pb were originally set in 1971. The 0.12 ppm ozone standard is the result of the 1978-79 review and revision[4] from the old 0.08 ppm oxidant standard. The lead standard was promulgated[5] in October 1978 after litigation brought against the Agency by the Natural Resources Defense Council. The $NO_2$ and CO standards were reaffirmed in 1985.[6,7] A hydrocarbon standard set in 1971 was rescinded in 1983.[8]

## Legislative Requirements

The goal of the Clean Air Act is to protect the public health and welfare and enhance the quality of the nation's air. Under the Act, the Federal government is responsible for establishing, on a nationwide basis, ambient air quality standards that are set at a level adequate to protect the public health and welfare. In order to provide for attainment of these standards, the States are responsible for specifying emission limitations and other programs for individual sources through State implementation plans (SIP's). Two categories of standards are called for in the Clean Air Act: (1) primary or health based standards and (2) secondary or welfare based standards which address environmental damage not included in the public health category.

The first step in establishing an ambient air quality standard is a finding by the Administrator of the EPA that a particular pollutant causes or contributes to air pollution which, in the words of the Act, "may reasonably be anticipated to endanger the public health or welfare" and that are emitted from "numerous or diverse mobile or stationary sources." Within 12 months after the listing of a pollutant under section 108(a) of the Clean Air Act, the Administrator must publish an air quality criteria document which will form the scientific basis for the ambient air quality standard. The criteria document must contain the "latest scientific knowledge useful in indicating the kind and extent of all identifiable effects on public health or welfare."[3]

Simultaneously with publication of the criteria document, the Administrator must propose primary and/or secondary national ambient air quality standard, as appropriate. A primary standard is one that, in the Administrator's judgment, is required to protect the public health with an adequate margin of safety. Costs of attainment are not a germane consideration in setting the primary standard, although such costs may be considered in the development of SIP's. A secondary standard is one that adequately protects the public welfare. Public welfare is defined as including, but not limited to, effects on soils, water, crops, vegetation, man-made materials, animals, wildlife, weather, visibility, climate, damage to and deterioration of property, and hazards to transportation, as well as effects on economic values and on personal comfort and well-being. After providing a public comment period, the Administrator is required to promulgate final standards within 6 months of his initial proposal.

Section 109(d) of the 1977 Act directed the Administrator to complete reviews of all existing standards and criteria before the end of 1980 and at 5-year intervals thereafter, and to revise the criteria and standards, as appropriate, based on those reviews. The 1977 Amendments also require that the revised criteria documents be reviewed by a Clean Air Scientific Advisory Committee (CASAC) of EPA's Science Advisory Board (SAB). An independent body made up of scientists and engineers with substantial scientific and technical expertise, the SAB is chartered by the Administrator to provide critical review and advice on scientific matters. (The SAB's authority to comment on draft criteria documents was statutorily established by the Environmental Research Development and Demonstration Authorization Act of 1978.)

Once an ambient standard is promulgated, responsibility under the Clean Air Act shifts from the Federal government to the States. Within 9 months after promulgation, each State is required to prepare and submit a State implementation plan (SIP) to EPA for approval. These SIP's must contain emission limitations and must describe measures necessary to attain the primary standard "as expeditiously as practicable" but not later than 3 years after EPA approval and to attain the secondary standard within a reasonable time.

Considerations In Establishing Air Quality Standards

When the Agency undertakes either to establish or revise a standard, questions often arise concerning what the Administrator must consider in establishing a primary standard. Section 109(d) of the Clean Air Act requires that primary NAAQS be set at a level allowing for an adequate margin of safety, which the Administrator judges is adequate to protect the public health. The statute and legislative history[9] make clear that the standards are to be solely health-based, designed to protect the most sensitive group of citizens (but not necessarily the most sensitive members of that group) against adverse health effects. The task of deciding which health effects are adverse is a difficult one, and to accomplish it the Administrator must exercise his judgment as allowed by the Act in the investigation of the range of health effects of a pollutant and in the consideration of the risks disclosed by the investigation. In addition, the requirement of a margin of safety and the precautionary nature of the Act indicate that the standards must protect against uncertain, as well as certain, effects.

In the process of setting the primary standards, the Administrator must typically deal with two different kinds of issues: (a) which effects on a continuum of known effects should be regarded as adverse? and (b) what degree of additional protection is required to protect against uncertain harms--those not yet identified by research, or identified but not yet fully understood?

Any attempt to determine that level of pollutant exposure at which the effects are adverse to the sensitive population faces an immediate problem: investigation of the effects typically reveals that while there are levels above which "adverse effects" clearly exist, it is not generally possible to identify sharp "thresholds" for such effects. Rather, expanding scientific knowledge and better analytical techniques have made it clear that pollutant effects typically exist as a continuum, ranging from clearly serious health effects at high pollutant concentrations, to physiologically detectable effects of uncertain significance, to effects which are too subtle to measure.

Even though Congress was aware that there is no sharp "breakpoint" between a "no-effect" level and a level where the effect is clearly adverse, it still required that standards be set and that the standards be set at the point where there is no adverse effect for the sensitive population. The fact that health effects exist on a continuum creates a difficulty in identifying that level. In addition, the term "adverse" itself is difficult to define in the abstract. At different points in the continuum are levels of pollutants at which the effects will be conceded to be "adverse" by any given person. That point will vary, however, since medical judgments about what is "adverse" will vary with the information available to the person and his or her viewpoint. In a given case, determination of what health effects are adverse may be as much an exercise of informed judgment as a factual injury.

In recognition of this, Congress in section 109(b)(1) of the Clean Air Act explicitly provided that the Administrator is to exercise judgment in setting the standard. Though relying heavily on scientific advisors for technical evaluation of data and for those judgments that are essentially scientific in nature, the Administrator alone is responsible for considering risks and determining at what pollutant concentration the health effects on the sensitive population should be regarded as adverse. Medical experts may differ as to which particular health effects are adverse, but the statute gives the Administrator the responsibility of making that judgment.

Support For EPA's Approach To Standard Setting

On June 17, 1980, the United States Court of Appeals, upheld the principal elements of EPA's standard-setting philosophy in its decision on the lead standard.10 The court specifically supported EPA's contention that: (1) costs cannot be considered in selecting primary standards and, (2) the Administrator has the authority and responsibility for making reasoned judgments in protecting public health in the face of incomplete or uncertain evidence. Two cites from the Court decision verify these judgments.

> Furthermore, we agree with the Administrator that requiring EPA to wait until it can conclusively demonstrate that a particular effect is adverse to health before it acts is inconsistent with both the Act's precautionary and preventive orientation and the nature of the Administrator's statutory responsibilities. Congress provided that the Administrator is to use his judgment in setting air quality standards precisely to permit him to act in the face of uncertainty. As we read the statutory provisions and the legislative history, Congress directed the Administrator to err on the side of caution in making the necessary decisions. We see no reason why this court should put a gloss on Congress' scheme by requiring the Administrator to show that there is a medical consensus that the effects on which the lead standards were based are "clearly harmful to health." All that is required by the statutory scheme is evidence in the record which substantiates his conclusions about the health effects on which the standards were based. Accordingly, we reject the Lead Industry Association's (LIA) claim that the Administrator exceeded his statutory authority and turn to LIA's challenge to the evidentiary basis for the Administrator's decisions.

Cost and Economics Role in Standard-Setting

A second cite from this court decision addresses the issue of the relevance of economic factors in setting air quality standards.

> ...According to petitioners, Congress only authorized the Administrator to set primary air quality standards that are aimed at protecting the public against health effects which are known to be clearly harmful. They argue that Congress so limited the Administrator's authority because it was concerned that excessively stringent air quality standards could cause massive economic dislocation.
>
> In developing this argument, St. Joe contends that EPA erred by refusing to consider the issues of economic and technological feasibility in setting the air quality standards for lead. St. Joe's claim that the Administrator should have considered these issues is based on the statutory provision directing him to allow an "adequate margin of safety" in setting primary air quality standards. In St. Joe's view, the Administrator must consider the economic impact of the proposed standard on industry and the technological feasibility of compliance by emission sources in determining the appropriate allowance for a margin of safety. St. Joe argues that the Administrator abused his discretion by refusing to consider these factors in determining the appropriate margin of safety for the lead standards, and maintains that the lead air quality standards will have a disastrous economic impact on industrial sources of lead emissions. This argument is totally without merit. St. Joe is unable to point to anything in either the language of the Act or its legislative history that offers any support for its claim that Congress, by specifying that the Administrator is to allow an adequate margin of safety in setting primary air quality standards, thereby required the Administrator to

consider economic or technological feasibility. To the contrary, the statute and its legislative history make clear that economic considerations play no part in the promulgation of ambient air quality standards under Section 109.

In addition, the Court made clear that its views applied to both health and welfare standards.

> Most important, this Court has recently held that in considering the public health and welfare under the Clean Air Act, the Administrator of EPA is bound not to consider the cost to regulated industries of the pollution control equipment required to meet health and welfare standards.

This Court decision would appear to lay to rest arguments questioning the role of economics in setting both health and welfare standards and the Administrator's responsibility in making choices under uncertainty.

## Standard Development Process

### Criteria Document

Figure 1 illustrates the various steps in the standard development process. The first step in the process is to review criteria, and develop a revised criteria document where appropriate. Main responsibility for production of the document rests with the Environmental Criteria and Assessment Office (ECAO/RTP) in EPA's Office of Research and Development (ORD). The first phase of the documentation process is to plan and initiate document preparation procedures. This phase includes assembling an internal EPA task force and recruiting outside experts as consultants to aid in writing the document. Together, these groups develop a work plan and define a schedule for production of the document.

The next step includes accumulating and analyzing literature and writing initial rough drafts of document chapters. Hard copies of every article cited are obtained and keep on file for public inspection at ECAO facilities. The actual writing of the drafts is carried out by ECAO staff, other EPA research scientists, or non-Agency consultants, depending upon the availability of authors with the required expertise. These activities result in the production of an initial working draft of the document.

Following this phase, a workshop is held, where non-Agency experts meet with the document preparation team, which includes authors of the draft chapters, to provide preliminary peer review of the document contents and to assist in its revision. Post-workshop revisions lead to the production of a first external review draft of the document. This draft is circulated to the public and CASAC for review and comment. The document is reviewed by CASAC at a public meeting.

Following the public review meeting, ECAO staff members undertake indepth cataloging of public and CASAC comments on the first external review draft. All comments from CASAC, the public, and other reviewers are passed on to the appropriate authors and are given consideration in revising the document. Each comment and its disposition is considered and entered into a docket, which is available for public inspection. Consideration of comments and appropriate revision of the document text result in a second external review draft.

The revised reprinted draft is normally submitted to the public and the CASAC again for external review, and an effort is made to achieve final closure on the document with the CASAC. If no substantive criticisms are received as a result of this cycle of review then the CASAC/SAB indicates, in a written report to the Administrator, that such is the case, confirming the CASAC's evaluation of the document as being of appropriate quality for use as the scientific basis for the related air standard.

## Staff Paper

Once the criteria document has been reviewed by the public and the CASAC and the document is nearing its final form, the Agency staff prepares a paper which evaluates the key studies in the criteria document and identifies critical elements to be considered in the review of the standard. The staff paper identifies those studies that the staff believes should be used in making the best scientific judgment on the level at which adverse effects signal a danger to public health in the sensitive population. The paper also provides a discussion of the uncertainties in the medical evidence and of other factors that the staff believes should be considered in selecting an adequate margin of safety and a final standard level. In addition, the paper evaluates studies that the staff believes should be used in making the necessary scientific judgments on the level at which adverse effects signal a danger to public welfare. Important emerging topics treated in the staff paper are analytic efforts to assess such areas as exposure, risk, and air quality. While the paper does not present a judgment on what concentration level should be established for the standard, the staff paper will normally present staff recommendations on the range of standards that appear reasonable given the existing science. The paper helps bridge the gap between the science contained in the criteria documents and the judgment required of the Administrator in setting ambient standards.

The staff paper is reviewed externally by the public and the CASAC. A public meeting is held with the CASAC to receive their comments and the comments of the public. Once the paper has been reviewed by the CASAC, the scientific judgments made in the paper form the basis for the staff's recommendation to the Administrator on any revisions to the standard.

Assessing and interpreting the scientific evidence is a very complex undertaking involving hundreds of studies. Reviewing these studies, determining which are the most relevant to standard setting, and finally interpreting the scientific evidence from the relevant studies are very difficult and challenging tasks which the Agency must undertake each time a standard is reviewed. This task is also made is even more difficult because there is often considerable disagreement in the scientific community over how the studies should be interpreted. The preparation of the staff paper and its review by the public and the scientific community is the staffs way of ensuring that the interpretation of the scientific evidence is sound and that the Administrator has available to him a properly interpreted data base for his decision making on air standards.

## Regulation Development

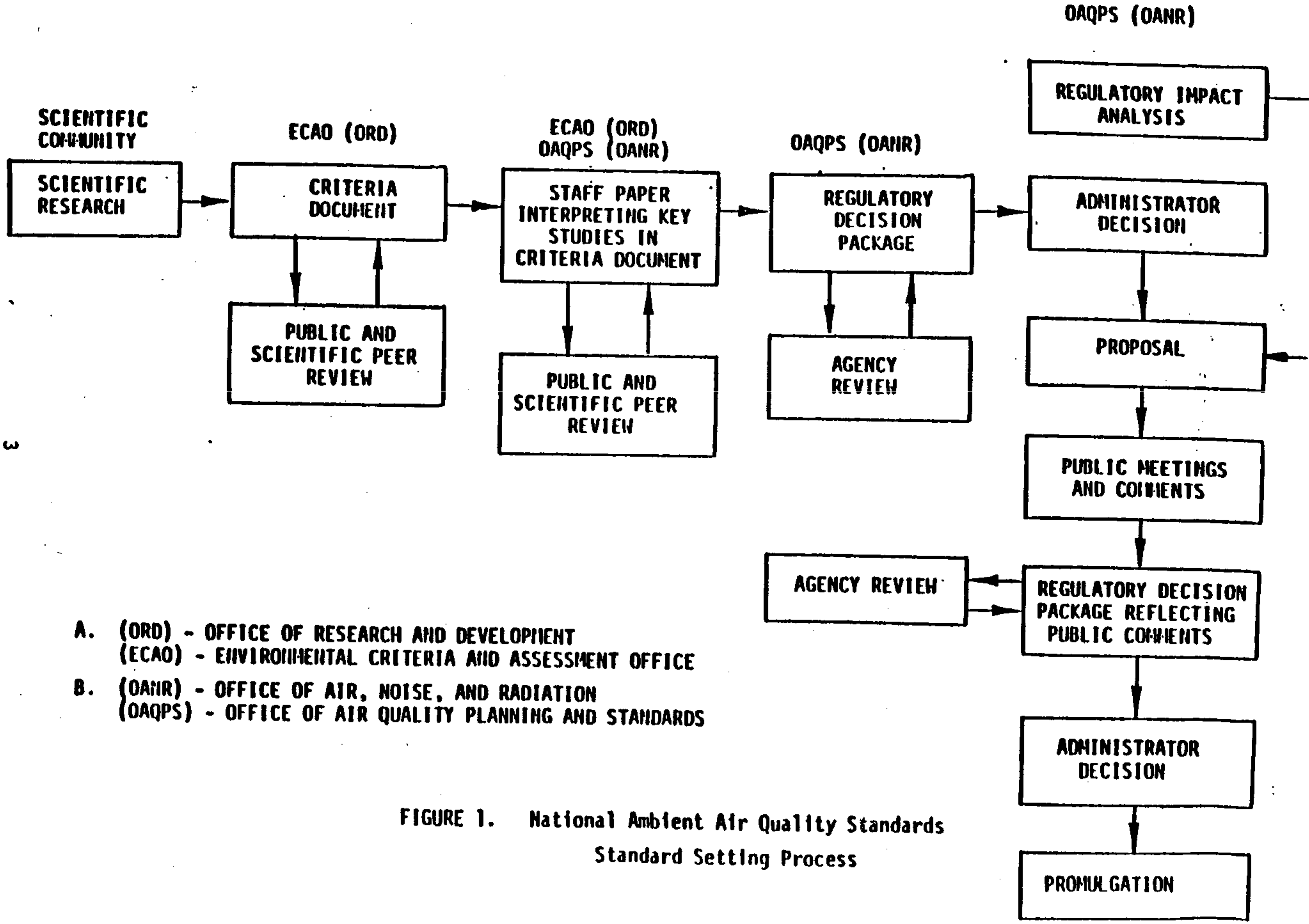
The first general principle of the regulatory development process is the extensive and continuous participation by various EPA offices. Participatory decision making continues to be important at EPA because systematic review by offices other than the office with primary responsibility provides several types of valuable input. Scientists and engineers check data and analyses; lawyers check procedures, clarity, and consistency with the law; and other program managers evaluate how proposed regulations would affect their programs. This process starts when the lead office, which has the responsibility for the standard, invites Assistant Administrators, the General Counsel, Regional Offices, and Staff Offices to send representatives to participate in a work group in developing a regulation.

The work group advises and assists the lead office in preparing a proposed regulation. The initial review of the regulation is by the Steering Committee. This committee is a continuing group representing the six Assistant Administrators' staff. Following Steering Committee reviews, proposed regulations are reviewed by all Assistant Administrators, General Counsel, and chief Staff Office directors.

Consensus is not reached at a particular level, the disagreement is spelled out, and the matter is taken to a higher level for review. When consensus is reached on major issues at lower management levels, the lead office identifies for senior management the nature of the issue and the consensus that has been reached. As a result, final decisions remain with publicly responsible appointed officials at the top of the Agency.

The Agency also places a high priority on public participation in our standard review process. EPA has provided for public and scientific review of criteria documents and staff papers. Ample public review is provided for during rulemaking under section 307(d) of the Clean Air Act, as added by the 1977 Amendments, including establishment of a public docket, providing interested persons an opportunity for oral presentation of data, views, or arguments, and an opportunity to submit written comments. The final regulation includes the Agency's response to the public comments.

The Agency process has worked extremely well in practice. The process ensures both outside public review and top Agency management review during the standard development process. The result has been an open and objective decision-making process that gives consideration to opposing viewpoints.




A. (ORD) - OFFICE OF RESEARCH AND DEVELOPMENT
(ECAO) - ENVIRONMENTAL CRITERIA AND ASSESSMENT OFFICE

B. (OANR) - OFFICE OF AIR, NOISE, AND RADIATION
(OAQPS) - OFFICE OF AIR QUALITY PLANNING AND STANDARDS

FIGURE 1. National Ambient Air Quality Standards Standard Setting Process

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**APPENDIX VI**

"A Critical Review of the Environmental Protection Agency's Standards for Best Available Technology under the Clean Air Act"

(Environmental Law Reporter, February 1990)

# A Critical Review of the Environmental Protection Agency's Standards for "Best Available Control Technology" Under the Clean Air Act

by Michael L. Wilson, Lisa Marie Martin, and David M. Friedland

*Editors' Summary: One of Congress' goals in enacting the Clean Air Act was to prevent clean air from becoming dirty. Accordingly, the Clean Air Act established a "prevention of significant deterioration" (PSD) program, requiring that specified new facilities use the "best available control technology" (BACT). However, Congress left the task of defining BACT to EPA.*

*Over time, EPA has fleshed out the parameters of BACT in guidance documents and administrative appeals of PSD permits. Currently, EPA applies a "top-down" analysis to the BACT determination, placing the burden on a permit applicant to show substantial or unique technical, environmental, or economic objections why the most stringent control available should not be used. This policy has proven controversial and has been challenged in court. In this Article, the authors explore the history of BACT analysis and the current substantive and procedural issues raised by EPA's current BACT policies.*

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**Glossary of Terms**

BACT—best available control technology
de-$NO_x$—nitrogen oxides control technology
LAER—lowest achievable emission rate
NAAQS—national ambient air quality standard
NSPS—new source performance standard
OAQPS—Office of Air Quality Planning and Standards
PM—particulate matter
PSD—prevention of significant deterioration
$SO_2$—sulfur dioxide

Congress enacted the Clean Air Act[1] in the face of two separate problems: how to clean the air in regions where it is dirty, and how to keep the air clean in regions where it is already clean. The Clean Air Act addresses the latter problem by providing a "prevention of significant deterioration" (PSD) program, intended to prevent clean air from significantly deteriorating into dirty air.[2] New facilities constructed in areas covered by PSD classifications must incorporate the "best available control technology" (BACT).[3] What BACT means, however, is not immediately obvious.

The Environmental Protection Agency (EPA) has, over time, elaborated on what BACT means in practical terms. Through regulations, opinions of the Administrator in PSD appeals, and guidance documents, BACT analysis has evolved into a substantial body of administrative law. This Article analyzes EPA guidelines on BACT, how they differ from earlier EPA interpretations, and the practical implications of BACT as now implemented by EPA.

**Background: Origins of PSD and BACT Regulation**

In 1972, the district court for the District of Columbia issued an injunction ordering EPA to require the prevention of significant deterioration of air quality in "clean air" or attainment areas and to promulgate the necessary regulations to achieve such a goal.[4] In 1974, EPA first promulgated regulations to prevent the significant deterioration of air quality in attainment areas from emissions of sulfur dioxide ($SO_2$) and particulate matter (PM).[5] Specifically, each state implementation plan (SIP) was required to prohibit the construction of sources in any of 19 specified source categories unless the state or other reviewing authority verified that the source would meet an emission limit evidencing application of the BACT for $SO_2$ and PM emissions. These regulations were ultimately upheld by the District of Columbia Circuit Court of Appeals.[6]

The 1977 Amendments to the Clean Air Act added Part C, significantly expanding the requirements for PSD and BACT for attainment and unclassifiable areas.[7] The requirements of BACT were extended to all pollutants subject to regulation under the Act. The 1977 Amendments further established threshold emission levels for "major emitting facilities," including 28 stationary source categories that emit at least 100 tons per year of any air pollutant subject to regulation and any other sources with the potential to emit 250 tons per year or more of any air pollutant.[8] PSD review requirements were also triggered by a "major modification" to an existing facility, defined in subsequent EPA regulations as all changes causing emission increases above specified "significant" levels.[9]

On June 19, 1978, EPA amended its regulations to implement the additional PSD statutory requirements. The Agency promulgated two substantially similar sets of regulations: Part 51, laying out the requirements for state PSD programs,[10] and Part 52, the federal PSD regulations that apply in the absence of an approved state program.[11] A subsequent petition for review of the 1978 PSD regulations was brought in the D.C. Circuit in *Alabama Power Co. v. Costle*,[12] which challenged EPA's application of PSD and BACT requirements for pollutants other than $SO_2$ and PM. The court affirmed EPA's requirement for the application of PSD and BACT review to all pollutants regulated under the Clean Air Act.[13] In response to other parts of the *Alabama Power* challenge not relevant here, EPA once again amended the PSD regulations in 1980.[14]

The current regulatory definition of BACT closely tracks the statutory definition found in §169(3)[15] of the Clean Air Act. BACT means

> an emissions limitation . . . based on the maximum degree of reduction for each pollutant subject to regulation under [the] Act which would be emitted from any proposed major stationary source or major modification which the Administrator, on a case-by-case basis, taking into account energy, environmental, and economic impacts and other costs, determines is achievable for such source or modification through application of production processes or available methods, systems, and techniques, including fuel cleaning or treatment or innovative fuel combustion techniques for control of such pollutant. . . . [16]

The Clean Air Act and implementing regulations specify broad parameters for a reviewing agency to follow in exercising its discretion to determine BACT. For example, the Act states that BACT shall be no less stringent than the uniform standards applicable to new sources under §111 or §112 of the Act.[17] BACT is often more stringent in practice. A reviewing agency may impose a design, work practice, or operational standard instead of a numerical emission limitation as BACT but "only when technological or economic limitations on the application of measurement methodology to a particular class of sources would make the imposition of an emission standard infeasible."[18]

By definition, the Act limits the consideration to available control technologies. "Available," however, does not

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1. *See* Clean Air Act §§101-403, 42 U.S.C. §§7401-7642, ELR Stat. CAA 004-052.
2. *Id.* at §§160-169, 42 U.S.C. §§7470-7479, ELR Stat. CAA 024-028.
3. *Id.* at §165(a)(4), 42 U.S.C. §7475(a)(4), ELR Stat. CAA 026.
4. Sierra Club v. Ruckelshaus, 344 F. Supp. 253, 2 ELR 20262 (D.D.C.), *aff'd*, 2 ELR 20656 (D.C. Cir. 1972), *aff'd sub nom.* Fri v. Sierra Club, 412 U.S. 541, 3 ELR 20684 (1973).
5. 39 Fed. Reg. 42510 (1974); 40 C.F.R. pt. 52 (1974).
6. Sierra Club v. EPA, 540 F.2d 1114, 6 ELR 20669 (D.C. Cir. 1976).
7. Pub. L. No. 95-95, 91 Stat. 685 (1977) (codified at 42 U.S.C. §§7470-7479 (Part C), ELR Stat. CAA 024-28).
8. 42 U.S.C. §§7475(a)(1), 7479(1), ELR Stat. CAA 026, 028.
9. 40 C.F.R. §52.21(b)(2), .21(j)(3).
10. 40 C.F.R. §51.166 (1978).
11. 40 C.F.R. §52.21 (1978).
12. 636 F.2d 323, 10 ELR 20001 (D.C. Cir. 1979).
13. *Id.*
14. 45 Fed. Reg. 52676 (1980) (codified at 40 C.F.R. pts. 51, 52, 124).
15. 42 U.S.C. §7479(3), ELR Stat. CAA 028.
16. 40 C.F.R. §§52.21(b)(12), 51.166(b)(12).
17. 42 U.S.C. §§7411, 7412, ELR Stat. CAA 011, 013.
18. 43 Fed. Reg. 26397 (1978); *see* 40 C.F.R. §§52.21(b)(12), 51.166(b)(12).

necessarily mean that the technology must have been previously applied to the type of emissions unit undergoing review. The reviewing agency is not precluded from considering the "transfer" of a technology demonstrated for another source. However, the 1978 PSD regulations make clear that due consideration of factors, such as economic costs and energy, must also be given before requiring such technology transfer in order to comply with the BACT requirement.[19]

EPA published guidelines in December 1978 designed to provide a consistent approach to BACT and provided further BACT guidance as part of its PSD Workshop Manual published in 1980.[20] These documents generally required a new source applicant to propose an emission limitation as BACT for each pollutant subject to regulation under the Clean Air Act that the source had the potential to emit in significant amounts. The applicant was also required to evaluate available control alternatives that would provide a greater level of emission control than that proposed as BACT.[21] As part of this evaluation, the applicant was required to defend its selection of a less stringent alternative in terms of adverse economic, energy, or environmental impacts for the particular facility in question.[22]

The guidelines recommended that each state decide the relative importance to be given to energy, environmental, economic, and other factors in the BACT decision. For instance, where the environmental benefits of more stringent controls did not make economic sense in terms of the costs per unit of pollution removed, the 1978 Guidelines and 1980 PSD Workshop Manual did not require application of the most stringent control systems available. These guidance documents cautioned that the BACT determination should not force new projects to the brink of cancellation, but must be based on sound judgment and balancing environmental benefits with energy, economic, and other impacts.[23]

**Substantive Issues**

Recent PSD permit appeals and EPA guidelines have substantially altered how EPA and state or local permitting agencies must evaluate and analyze the impacts of control technology options. In particular, the standards for evaluating control alternatives have been altered to reflect a strong bias in favor of applying the most stringent control technology available unless the applicant can demonstrate "unique" and "substantial" environmental or cost impacts.

Some limitations on EPA's interpretation of BACT still remain. For instance, a technology's availability, at least in the form of actual operating data, must be shown. In addition, BACT requirements cannot redefine the source.

19. 43 Fed. Reg. 26397 (1978).

20. EPA, Office of Air Quality Planning and Standards (OAQPS), *Guidelines for Determining Best Available Control Technology (BACT)* (1978) [hereinafter *1978 Guidelines*]; EPA, OAQPS, *Prevention of Significant Deterioration Workshop Manual* (1980) [hereinafter *PSD Workshop Manual*].

21. *1978 Guidelines, supra* note 20, at 5.

22. *Id.* at 6.

23. *Id.* at 15.

*EPA's "Top Down" Review Process*

*In re Honolulu Resource Recovery Facility* (*H-Power*),[24] a 1987 PSD appeal out of Hawaii, demonstrates how EPA interprets its scope of authority to consider new information in reviewing an applicant's BACT choice. In *H-Power*, a final decision to issue a PSD permit had been made by the Hawaii Department of Health (HDOH). EPA Region IX, pursuant to a delegation agreement with the state of Hawaii, concurred in the issuance of the permit at that time. On appeal, petitioners argued that the applicant had not applied BACT for $SO_2$. The Administrator agreed that the BACT analysis for $SO_2$ was inadequate based on a reevaluation of the record and new information submitted by Region IX on the use of scrubbers to control emissions of $SO_2$. The new information cited by Region IX included presentations at three conferences, two of which occurred after the issuance of the permit. HDOH argued that new information not part of the administrative record could not be considered in evaluating the adequacy of the BACT review. The Administrator did not analyze whether the new information, or some part of it, was actually "available" for the applicant to evaluate, but rather decided that the Region and the Administrator could consider the new information once an appeal of the permit had been filed.[25]

The Administrator held that the permitting agency or the Region, which by the terms of its delegation agreement with Hawaii had to concur with the permitting agency, had the authority to consider the new information. In the *H-Power* remand, the Administrator specifically directed Region IX to reconsider ". . . whether the applicant has met its burden of demonstrating that significant technical defects, or substantial local economic, energy, or environmental factors or other costs warrant a control technology less efficient than scrubbers . . . ."[26] The initial PSD permit incorporated "up-front" removal of high sulfur bearing materials rather than "back-end" scrubbers, which would have provided for greater $SO_2$ removal as well as more efficient control of unregulated pollutants.

The Administrator found that most of the resource recovery facilities in the region would employ scrubbers.[27] While this did not, as a matter of law, compel the conclusion that H-Power had to use scrubbers, it did demonstrate that the technology was available. Accordingly, the Administrator found that H-Power had to demonstrate "substantial and unique local factors" to justify a less efficient control technology and that H-Power failed to make such a showing.[28]

The *H-Power* remand redefined the standards for evaluating when an applicant for a PSD permit may use anything other than the most stringent control technology available. Prior to *H-Power*, EPA adopted a more flexible approach to the determination of BACT. In the *1978 Guidelines*, EPA noted that the relative weight to be assigned to energy, environmental, and economic impacts was a critical element in the review process, and an ele-

24. PSD Appeal No. 86-8 (June 22, 1987) [hereinafter *H-Power* Appeal].

25. *Id.* at 8-9 n.12.

26. *H-Power* Appeal at 7.

27. *Id.* at 6 n.9.

28. *Id.*

ment to be evaluated by the state, "thus allowing some flexibility in emission control requirements depending on local energy, environmental, and economic conditions and local preferences."[29]

The *1978 Guidelines* illustrated how this type of discretion might be exercised:

> 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.[30]

The *1978 Guidelines* required the applicant to start with a "base-line case" control system as BACT and to present control alternatives that were more stringent than the system proposed. The applicant would have to defend the system selected as BACT by demonstrating that control alternatives representing a more stringent level of control "would cause unreasonably adverse energy, environmental or economic impacts."[31]

In the recent appeal *In re Spokane Regional Waste-to-Energy Facility,*[32] the Administrator characterized this pre-*H-Power* BACT analysis as the "bottom-up" approach in which an applicant could select virtually any technology it deemed appropriate (baseline case) and then the applicant would be required to present a full and fair analysis of alternative technologies, including alternatives potentially more stringent.[33]

The Administrator argued that this approach presented too many opportunities for abuse, since it provided little incentive for the applicant to select the most effective technology, especially where that technology was also the most expensive.[34] *H-Power*, by contrast, imposed a significantly greater burden on the applicant by mandating that the applicant choose the most stringent control technology unless it could demonstrate that unique local factors justified a less efficient control technology.

EPA subsequently confirmed the top-down approach of *H-Power* in guidance issued in December 1987.[35] EPA described the top-down approach as follows:

> 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 infeasible for the source in question, then the next most stringent level of control is determined and similarly evaluated. 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 to 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. . . .[36]

There is significant disagreement in the regulated community concerning the legality of the top-down policy. The paper and forest products industries recently challenged the policy in court on both procedural and substantive grounds, arguing that the policy is inconsistent with the Clean Air Act because it illegally equates BACT with the lowest achievable emission rate (LAER). In addition, the industry petitioners argue that the policy represents such a change from EPA's *1978 Guidelines* and 1980 *PSD Workshop Manual* that it should be subject to notice and comment rulemaking.[37] EPA has responded by issuing a background statement discussing the origins of and rationale for the top-down approach. In its statement, the Agency argues that the policy is consistent with current statutory and regulatory requirements.[38] EPA is also currently preparing a new top-down guidance document, drafts of which have been circulated to the regions and to industry.[39]

*Environmental Impacts of the Technology Chosen as BACT*

As noted above, the BACT analysis must take into account the environmental impacts of the choice of a particular technology.[40] The new guidelines emphasize that this analysis should not be confused with the air quality impact analysis that is conducted to determine whether the source will violate any applicable national ambient air quality standards (NAAQS) or PSD increments, in which case the facility may not be constructed as proposed.[41] Indeed, the Administrator recently held that the relative air quality impacts for the regulated pollutant cannot be considered in the BACT decision.[42] The Administrator rejected as clearly erroneous the permitting authority's use of negligible air quality impacts for the regulated pollutant as justification for not imposing the most stringent control technology available as BACT.[43]

According to EPA's new guidance, the environmental impacts analysis must concentrate on "impacts other than impacts on air quality (i.e., ambient concentrations) due to emissions of the regulated pollutant in question, such

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29. *1978 Guidelines, supra* note 20, at 4.
30. *Id.*
31. *Id.* at 6.
32. PSD Appeal No. 88-12 (June 9, 1989) [hereinafter *Spokane* Appeal].
33. *Id.* at 9-10 n.13.
34. *Id.*
35. Memorandum from Craig Potter, Assistant Administrator, Office of Air and Radiation, to Regional Administrators (Regions I-X) (Dec. 1, 1987) [hereinafter Dec. 1, 1987 Memorandum]; *see also* Memorandum from Gerald Emison, Director, OAQPS, to EPA Regional Air Office Directors (June 26, 1987) (enclosing Operational Guidance on Control Technology for New and Modified Municipal Waste Combustors).
36. Dec. 1, 1987 Memorandum, *supra* note 35, at 3-4.
37. American Paper Institute v. EPA, No. 89-2030 (D.D.C. filed July 18, 1989); American Paper Institute v. EPA, No. 89-1428 (D.C. Cir. filed July 10, 1989).
38. Memorandum from John Calcagni, Director, Air Quality Management Division, OAQPS, to regional air offices (June 13, 1989) (transmittal of Background Statement on "Top-Down" Best Available Control Technology (BACT)) [hereinafter June 1989 Background Statement].
39. OAQPS, "Top-Down" Best Available Control Technology: A Summary (Draft, May 25, 1989) [hereinafter Draft May 1989 Guidance].
40. 42 U.S.C. §7479(3), ELR STAT. CAA 028.
41. *See* Draft May 1989 Guidance, *supra* note 39, at 7; Memorandum from Gary McCutchen, Chief, New Source Review Section, OAPQS, to Bruce P. Miller, Chief, Air Programs Branch, Region IV at 3 (Apr. 22, 1987) (Huntsville Incinerator-Determining Best Available Control Technology (BACT)) [hereinafter Huntsville Memorandum] (BACT determination made independent of amount of increment or air resources available).
42. In re Columbia Gulf Transmission Co., PSD Appeal No. 88-11 (June 21, 1989).
43. *Id.*

as solid or hazardous waste generation or discharges of polluted water from a control device, visibility impacts or emissions of unregulated pollutants."[44] An example of a secondary environmental impact referred to in the draft guidance is the disposal of scrubber effluent and other hazardous waste discharges, such as spent catalysts or contaminated carbon.[45] The guidance warns, however, that the fact that a control technology creates liquid or solid waste does not necessarily justify rejection of that technology as BACT "if the control device has been applied to similar facilities elsewhere and the solid or liquid waste problem under review is not significantly greater than in those other applications."[46]

EPA has also found that consideration of environmental impacts may justify the imposition of a more stringent BACT alternative even though there is no direct reduction in emissions of the regulated pollutant. In *In re North County Resource Recovery Associates,*[47] petitioners challenged Region IX's granting of a PSD permit because the Region failed to consider the effect of the control technology on pollutants not currently regulated under the Clean Air Act, that is, "unregulated pollutants." Region IX asserted that it lacked authority under the PSD regulations to consider impacts of unregulated pollutants in the selection of BACT.

The Administrator disagreed and found the Region's interpretation "overly broad . . . if it is meant as a limitation on EPA's authority to evaluate, for example, the environmental impact of unregulated pollutants in the course of making a BACT determination for the regulated pollutants."[48] In fact, such consideration may result in an even more stringent BACT determination than would have otherwise been imposed if only the impact on the regulated pollutant were considered. The Administrator held that if EPA finds that setting a more stringent emission limit on regulated pollutants would incidentally restrict a hazardous but not yet regulated pollutant, it may do so.[49] The effect of the *North County* remand is to regulate indirectly all pollutants from PSD sources through BACT determinations. *North County* does not, however, permit EPA to prescribe an emission limit for unregulated pollutants.

### *Economic Impacts and Other Costs*

The Clean Air Act provides that the permitting authority must take into account the "economic impacts and other costs" of a particular control technology on a case-by-case basis.[50] *H-Power* and the Dec. 1, 1987 Memorandum make it clear, however, that the economic impacts must be "unique" and "substantial" to make imposition of the most stringent control technology available "infeasible" for a particular facility. In the *Huntsville* Memorandum, EPA indicated that economic impacts were "substantial" if the BACT determination so greatly exceeded normal cost estimates as to preclude a typical facility from being built.[51]

Similarly, in another PSD appeal, *In re Pennsauken County; New Jersey Resource Recovery Facility,*[52] the Administrator rejected the applicant's claim that "thermal de-$NO_X$" technology was not an available technology. The Administrator claimed that the applicant failed to show that thermal de-$NO_X$ technology was technically or economically unachievable for the source and failed to present any evidence that the costs for thermal de-$NO_X$ were unusually high.[53] However, the Administrator did not clarify what might constitute "unusually high" costs.

An applicant in Pasco County, Florida, argued that the costs for de-$NO_X$ technology were unacceptable because they were greater than the cost/benefit ratio that EPA used in setting applicable new source performance standards (NSPS). EPA Region IV rejected these arguments as irrelevant.[54]

EPA Region II recently confirmed this approach when it demanded that de-$NO_X$ technology be imposed as BACT on a facility similar to the Pennsauken and Pasco County facilities. Region II found that an emission limit based on de-$NO_X$ is BACT unless the applicant demonstrates overwhelming reasons why it should not be applied in a particular case.[55]

Finally, in its Draft May 1989 Guidance, EPA described yet again how costs should be factored into the BACT analysis. Cost factors may make a technically feasible BACT alternative economically infeasible only when the applicant demonstrates that the control costs of the most stringent option are "disproportionately high when compared to the cost of control for the pollutant in recent acceptable BACT determinations."[56]

It is not clear what "costs significantly beyond the range of costs normally associated with BACT," or any of the other formulations of the standard set forth in other guidance documents and PSD permit appeals, mean. However, it is clear that it will be very difficult for a source to establish that economic impacts dictate imposition of less than the most stringent control technology.

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44. Draft May 1989 Guidance, *supra* note 39, at 7.

45. *Id.* at 8.

46. *Id.*

47. PSD Appeal No. 85-2 (Sept. 4, 1986) [hereinafter *North County* Appeal].

48. *Id.* at 2.

49. *Id.* at 3-4.

50. 42 U.S.C. §7479(3), ELR STAT. CAA 028.

51. *Huntsville* Memorandum, *supra* note 41, at 4. Examples might include requirements for a series of two or more baghouses or a control system whose cost greatly exceeds that of the base facility.

52. PSD Appeal No. 88-8 (Nov. 10, 1988) [hereinafter *Pennsauken* Appeal].

53. *Id.* at 9.

54. Letter from Bruce P. Miller, Air Program Branch, Air, Pesticides, and Toxic Management Division, EPA Region IV, to C.H. Fancy, Bureau of Air Quality Management, Florida Department of Environmental Regulation (Nov. 4, 1988).

55. Letter from Conrad Simon, Director, Air and Waste Management Division, U.S. EPA Region II, to T.M. Allen, Acting Director, Division of Air Resources, New York State Department of Environmental Conservation (Apr. 4, 1989). ("This argument should be based on significant technical defects in the system, or substantial local, economic, energy or environmental factors or other costs that warrant a control technology less efficient than the most stringent available technology." *Id.*))

56. Draft May 1989 Guidance, *supra* note 39, at 10-11. The Agency also discussed the type of "unusual circumstances" that might justify rejection of a particular technology on economic grounds:

> Specifically the applicant must document that the cost to the applicant of the control alternative is significantly beyond the range of costs normally associated with BACT for the type of facility (or BACT control costs in general) for the pollutant.
>
> An example of an unusual circumstance might be the unavailability in an arid region of the large amounts of water needed for a scrubbing system. Shipping water from a distant location might add unreasonable costs to the alternative, thereby justifying its rejection on economic grounds.

*Id.* at 10.

*LAER Determinations as the Starting Point for BACT*

As the foregoing discussion illustrates, EPA has interpreted BACT as the most stringent available control option unless the applicant demonstrates that some unique economic or environmental impact precludes its application. This interpretation means BACT will, in many instances, be equivalent to the lowest achievable emission rate (LAER). The Clean Air Act requires LAER for new sources locating in nonattainment areas.[57] LAER determinations force the most stringent technologically feasible control option on a new source regardless of the cost or other environmental impacts.

Both EPA Region IX and the Northeast States for Coordinated Air Use Management (NESCAUM) have published guidelines that require LAER to be the starting point in all BACT analyses. Under these guidelines, BACT is presumed equal to LAER absent an adequate showing that circumstances unique to a proposed project are provided for and justified.[58]

In their suit challenging the top-down policy, the paper and forest products industries argue that equating BACT with LAER is inconsistent with the Clean Air Act, which makes a clear distinction between standards applicable in attainment areas (BACT) and standards applicable in nonattainment areas (LAER).[59] In its June 1989 Background Statement, EPA responded by arguing that the top-down approach maintains the statutory distinctions between BACT and LAER.

> The LAER requirement provides that all affected sources must comply with either the most stringent limit contained in a State implementation plan, or the most stringent emission limitation achieved in practice, whichever is more stringent. In contrast, under BACT, consideration of energy, environmental, or economic impacts may justify a lesser degree of control in the particular case. The EPA's policy regarding the top-down process does not alter this sharp statutory distinction.[60]

Whether the courts uphold the Agency's view that the distinction between BACT and LAER is maintained by the top-down approach remains to be seen.

*A Technology Must Be Available to Be BACT*

A control technology must be available to be considered BACT for a particular source. EPA has construed "availability" to mean "technically feasible." In the *Pennsauken* Appeal, for example, the Administrator concluded that the permit applicant need not consider technology that is not available in BACT analysis. Availability, in BACT analysis, is a "practical, factual determination, using conventional notions of whether the technology can be put into use."[61] The Administrator in the *Pennsauken* Appeal found that a nearly identical source was "in existence and operating" with a more stringent $NO_X$ control technology [de-$NO_X$] than initially proposed as BACT by the Pennsauken facility. The applicant failed to show that this technology was technically infeasible for application to the Pennsauken facility. It was therefore an available technology within the meaning of BACT.[62]

The Administrator further interpreted what it means for a technology to be available in the *Spokane* Appeal. Two environmental groups challenged the granting of a permit to the Spokane facility on the grounds that the permitting authority had failed to consider recycling and source separation as BACT for the facility. The Administrator rejected this claim, finding that petitioners had not established that recycling and source separation, when used in conjunction with conventional, state-of-the-art pollution control equipment, were "available" control technologies for control of regulated pollutants.[63]

The Administrator also clarified the degree to which an applicant must do research to determine whether a technology is available. If knowledge about a technology's effect on emissions is not unusable in the particular configuration planned, that technology is not available.[64] After the *Spokane* decision, a BACT alternative must not only be available in the sense that it "can be put into use" on a given application, but its "effect on emissions" must also be quantifiable and there must be a data base sufficient to establish the environmental, energy, and cost impacts of the technology.

*BACT Requirements Cannot Redefine the Source*

BACT alternatives cannot include a material redefinition of the type of facility proposed by the applicant. In the *Pennsauken* Appeal, one of the petitioners objected not to the control technology, but to the resource recovery facility itself. The petitioner urged rejection of the facility in favor of burning a mixture of 20 percent refuse-derived fuel (RDF) and 80 percent coal at existing power plants.[65] EPA rejected the petitioner's attempt to redefine the source, concluding that permit conditions ensure that the proposed source of pollutant emissions uses emission control systems that represent BACT, resulting in reduced emissions to the maximum degree possible.[66]

57. 42 U.S.C. §7501(3), ELR STAT. CAA 028. The Act defines LAER as:

    (A) the most stringent emission limitation which is contained in the implementation plan of any state for such class or category of source, unless the owner or operator of the proposed source demonstrates that such limitations are not achievable, or

    (B) the most stringent emission limitation which is achieved in practice by such class or category of source, whichever is more stringent.

58. EPA Region IX, *Guidelines for Determining Best Available Control Technology (BACT)* at 15 (Apr. 1987); *see NESCAUM BACT Guidelines* at 3-4 (Oct. 1988). NESCAUM is comprised of the air offices of Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island, and Vermont.

59. *Compare* 42 U.S.C. §7475(a)(4), ELR STAT. CAA 026, *with* 42 U.S.C. §7503(2), ELR STAT. CAA 030.

60. June 1989 Background Statement, *supra* note 38, at 6 (emphasis in original).

61. *Pennsauken* Appeal, *supra* note 52, at 7-8.

62. *Id.*

63. *Spokane* Appeal, *supra* note 32, at 6 n.9.

64. *Id.* at 17-18 ("Perhaps more importantly, without the requisite knowledge about the technology's effects on emissions, the technology also cannot be regarded as the 'best' technology."). The PSD regulations do provide that an applicant may propose an "innovative technology" for emissions reduction in lieu of BACT. 40 C.F.R. §52.21(v). Innovative technology is technology that "has not been adequately demonstrated in practice, but would have a substantial likelihood of achieving greater continuous emission reductions." *Id.*

65. *Pennsauken* Appeal, *supra* note 52, at 10.

66. *Id.* at 10-11. These control systems, as stated in the definition of BACT, may require application of

Similarly, in the *Spokane* Appeal, petitioners argued that the resource recovery facility should use RDF. The Administrator rejected this argument because "RDF facilities are usually associated with a different combustor design and feed mechanism than the designs employed in mass-burn incinerators such as the one proposed for Spokane."[67] The Administrator noted that the change from a mass-burn to an RDF facility would constitute a redefinition of the project beyond the scope of the BACT program.[68] Therefore, BACT review cannot properly include alternatives to the source proposed by the applicant even though there may be less polluting alternatives. For example, an applicant proposing a coal-fired boiler will not be ordered to build a gas-fired turbine, although the latter is inherently less polluting.[69]

*EPA's Authority to Prescribe Design or Work Practice Standards as BACT in Lieu of Emission Limitations*

EPA's PSD regulations provide that BACT must consist of a numerical emission standard unless such an emission limitation is infeasible.[70] Although the language of the regulatory definition of BACT appears to prohibit production and process requirements in the absence of a finding that imposition of an emission limitation is infeasible, EPA found to the contrary.[71] CertainTeed Corporation (CertainTeed) requested review of certain terms of a PSD permit issued to it by Region IX for its fiberglass insulation manufacturing plant. In addition to prescribing an emission level as BACT for $NO_x$, the Region also prescribed production and process requirements that CertainTeed would have to adopt and follow to meet the emission level.[72]

CertainTeed argued that EPA lacked the authority to prescribe process and production requirements where it was feasible to measure emissions and therefore to set an emission level. Congress wanted EPA to set emission levels, CertainTeed argued, but not to tell industry how to meet those levels, at least where, as here, emissions could be monitored. EPA disagreed and found that it had the authority to prescribe production and process requirements. Accordingly, the Agency upheld the Region's BACT determination.

The Agency reasoned that the very language "best available control technology" emphasizes the predominant role of control technologies in the PSD process.[73] Moreover, BACT is "an emission limitation . . . which the permitting authority . . . determines is achievable for such facility through application of production processes and available methods, systems, and techniques" for control of the pollutants in question.[74] "Emission limitation," in turn, is "a requirement . . . which limits the quantity, rate, or concentration of emissions of air pollutants . . . including any requirement relating to the operation or maintenance of a source to assure continuous emission reduction."[75] Therefore, EPA argued that "emission limitation" embraces operational controls such as those required by Region IX.[76]

EPA also noted that because the BACT determination is "inextricably tied to a specific set of assumptions" regarding the type of control technology in use at each facility, any change in technology will require a reevaluation of associated environmental, economic, and energy impacts. Therefore, the control technology must be specified for a BACT determination to make any sense.[77]

EPA's interpretation of BACT in this case raises significant questions. First, as noted earlier, EPA's own PSD regulations provide that BACT must consist of a numerical emission standard unless such an emission limitation is infeasible.[78] The Agency confirmed this interpretation of its regulations in its 1978 preamble to the PSD regulations. The preamble provided that the Administrator will prescribe work practice standards only when technological or economic limitations on the use of a particular measurement method makes the imposition of an emission standard infeasible.[79]

The BACT regulations are also consistent with §§111 and 112 of the Act, which provide that EPA may require specific work practices or operational standards when it is "not feasible" to prescribe specific numerical limitations.[80] In both instances, "not feasible" is "any situation . . . [where the pollutant] cannot be emitted through a conveyance designed and constructed to emit or capture such pollutant . . . [or] the application of measurement methodology . . . is not practicable due to technological or economic limitations."[81] Also, under both §§111 and 112, work practice standards must be promulgated as specific numerical limits "whenever it becomes feasible to promulgate and enforce such standard in such terms."[82]

The rationale for the limitation on the promulgation of operational standards is that Congress wanted to encourage the development of innovative pollution control technologies and recognized that such new technologies would not be developed if EPA imposed existing technologies. Congress' strong preference for emission limitations (which in-

production processes and available methods, systems, and techniques, including fuel cleaning as treatment or innovative fuel combustion techniques to control the emissions. 42 U.S.C. §7479(3). The permit conditions that define these systems are imposed on the source as the applicant has defined it. Although imposition of the conditions may, among other things, have a profound effect on the viability of the proposed facility as conceived by the applicant, the conditions themselves are not intended to redefine the source . . . . In other words, the source itself is not a condition of the permit.

66. *Id.*

67. *Spokane* Appeal, *supra* note 32, at 20 n.25.

68. *Id.*; *see also Spokane* Appeal at 5 n.7.

69. *Id.*, at 20 n.25.

70. 40 C.F.R. §52.21(b)(12).

71. In re CertainTeed Corp., PSD Appeal No. 81-2 (Dec. 22, 1982) [hereinafter *CertainTeed* Appeal].

72. *Id.* at 2 n.3. The production requirement limited glass production to no more than 220 metric tons per day. The process requirement was installation of excess oxygen control equipment and "electric boosting" at certain production levels.

73. *Id.* at 3-4.

74. *Id.* at 4 (citing 42 U.S.C. §7479(3), ELR STAT. CAA 028)).

75. *Id.* at 4-5 (citing 42 U.S.C. §7602(k), ELR STAT. CAA 043)).

76. *Id.* at 5.

77. *Id.* at 5.

78. 40 C.F.R. §52.21(b)(12).

79. 43 Fed. Reg. 26397 (1978).

80. *See* 42 U.S.C. §§7411(h)(1), 7412(e)(1), ELR STAT. CAA 012, 013.

81. 42 U.S.C. §§7411(h)(2), 7412(e)(2), ELR STAT. CAA 012, 013.

82. 42 U.S.C. §§7411(h)(4), 7412(e)(4), ELR STAT. CAA 012, 013.

dustry can meet by any combination of technologies it desires) over work practice or operational standards (which specify particular technologies) reflects its desire to encourage such technological innovation.[83]

One reason that EPA may have reached the conclusion it did in the *CertainTeed* Appeal is that the company did not claim that it knew of any presently available techniques, other than the prescribed production and process requirements, to meet the $NO_X$ emission level. CertainTeed claimed only that it was developing alternative control techniques.[84] It remains to be seen whether EPA will offer the same interpretation where an applicant can demonstrate that there are several available technologies to meet an emission limitation.

**Procedural Issues**

The advent of top down review has created disagreements over what exactly constitutes BACT. These uncertainties have in turn resulted in various attempts by EPA to impose its interpretation of BACT on applicants and local permitting authorities, not only in PSD appeals where an Agency decision is affirmatively sought, but also in connection with delegate, and even approved, state programs. Applicants therefore need to be aware of the types of challenges to which their BACT choices may be subject depending on certain procedural issues, such as the nature of the reviewing authority as a delegate or approved state, and the availability of an appeal or other potential avenue for EPA intervention in the permit proceedings.

Other critical procedural issues concern the temporal scope of PSD review. These issues include when an applicant may permissibly terminate his search for an available technology, the Agency's obligation to grant or deny a permit within one year of application, and the Agency's claimed authority to extend the temporal scope of BACT review once a PSD appeal has been filed by considering new information not available during initial permit review. Although these and other procedural issues raise questions yet to be definitively answered, recent EPA guidance memoranda, PSD appeals orders, and case law provide guidance for permit applicants.

*Appeal Procedures for Permits Issued by EPA and Delegate States*

PSD permit decisions may be made by one of three reviewing authorities: (1) an EPA Regional Administrator;[85] (2) a state or local permitting authority that has been delegated by EPA to administer a PSD program;[86] or (3) a state or local permitting agency that has exclusive authority to administer a PSD program by virtue of a PSD implementation plan approved by EPA.[87]

The distinctions among permits issued by EPA, a delegate authority, or an approved authority can be critical. Depending on the scope of local permit appeal procedures, permits issued by an approved authority are the least vulnerable to EPA intervention. These permits are not subject to appeals to the EPA Administrator.[88] In delegate states, on the other hand, the Agency may have an opportunity to intervene at various stages of the permit process and, in certain cases, EPA interprets its authority to extend to revocation of the delegation.[89]

Recently, in *United States v. Solar Turbines, Inc.*,[90] a Pennsylvania district court decided the first case to consider the issue of whether EPA can permissibly bring an enforcement action under §§113 and 167 of the Clean Air Act when a source has properly obtained a final PSD permit from an approved state.

In *Solar Turbines*, EPA brought an action against the Solar Turbines Company under both §§113 and 167 of the Clean Air Act because the final permit issued by Pennsylvania did not require water or steam technology as BACT for nitrogen oxides.[91] In granting summary judgment for Solar Turbines, the court found that EPA could not bring an enforcement action against an owner/operator who was in compliance with a permit issued by an authorized permit-issuing authority.[92] The court reasoned that Congress could not have intended such a result:

> It is unreasonable to take the position that Congress would have so nonchalantly and vaguely provided for a drastic expansion of EPA enforcement action without explicitly setting forth this expansion and defining its scope. It is furthermore unreasonable to take the position that a source can be held directly liable for a decision which was not in its control to make.[93]

The *Solar Turbines* court concluded that an enforcement action against the owner/operator is not authorized by the Clean Air Act in situations where an approved state has not, in EPA's view, complied with the Clean Air Act. However, the court held that EPA does have the option of proceeding against the state under §167 and possibly §113 as well. EPA had not pursued that option in the *Solar Turbines* case based on an expressed "need to maintain harmonious state-federal relations."[94]

Permits issued directly by EPA under 40 C.F.R. §52.21 and those issued by delegate state or local authorities may be appealed to the Administrator within 30 days of issuance.[95] Petitions to the Administrator to review any condition of a PSD permit decision must demonstrate that the decision involved either: (1) a finding of fact or conclusion of law which is clearly erroneous or (2) an exercise of discretion or an important policy consideration which the Administrator in his discretion should review.[96] The Administrator may also review any condition of the per-

83. S. Rep. No. 1196, 91st Cong., 2d Sess. 17 (1970) (The Administrator "should not make a technical judgment as to how [standards of performance] should be implemented. He should determine the achievable limits and let the owner or operator determine the most economic, acceptable technique to apply.").

84. *CertainTeed* Appeal, *supra* note 71, at 3.

85. Under EPA's own 40 C.F.R. §52.21 regulations.

86. 40 C.F.R. §52.21(u).

87. 40 C.F.R. §51.166.

88. 40 C.F.R. §124.1(e).

89. Memorandum from Gerald A. Emison, Director, OAQPS, to EPA Regional Air Office Directors (Sept. 22, 1987) at 5 [hereinafter Sept. 22, 1987 Memorandum] (implementation of North County Resource Recovery PSD Remand).

90. No. 88-0924 (M.D. Pa. Nov. 28, 1989).

91. *Id.*, slip op. at 6-7.

92. *Id.* at 7.

93. *Id.* at 9-10.

94. *Id.* at 11.

95. Under the procedures outlined in 40 C.F.R. §124.19.

96. 40 C.F.R. §124.19(a)(1)-(2).

mit on his own initiative, provided he acts within 30 days of service of the reviewing authority's action.[97] The preamble to the regulations provides that the power of review should be sparingly exercised and that final determination of most permit conditions should be made at the regional level.[98]

The Part 124 regulations state that within a reasonable time following the filing of a petition for review, the Administrator shall issue an order granting or denying the petition for review. If denied, the preexisting conditions of the permit become final agency action. If the petition is granted, final agency action occurs either when a decision on the merits is reached without remand or upon completion of the remand proceedings if the Administrator's remand order allows for a further appeal from the remand proceedings.[99]

EPA regions can initiate the PSD appeal process from decisions made by delegate agencies, as long as the region satisfies the prerequisite of participation in the public comment and/or public hearing process.[100] In practice, even when a party other than an EPA region initiates a petition for review, the Administrator consults the appropriate region for its input on the appeal.

EPA has also tentatively interpreted its jurisdiction to extend to revoking a reviewing body's delegation agreement in appropriate circumstances, if the appeal procedures of Part 124 are unavailable.[101]

The court in *Greater Detroit Resource Recovery Authority v. Adamus,*[102] however, has held that depending on the scope of the particular delegation agreement, revocation may not be an available option for the Agency. In *Greater Detroit,* the court granted the Authority's motion for summary judgment on the issue of EPA's revocation of Michigan's PSD delegation with respect to the Authority's permit. The court held that there was no basis for revoking Michigan's PSD delegation where: (1) the delegation agreement itself provided that revocation could only be accomplished if the state enforced its provisions in a manner inconsistent with the terms of the delegation;[103] (2) the Authority's permit itself had been issued without any adverse comments or other steps taken by EPA to prevent its issuance;[104] and (3) EPA had previously audited five permits, including the one at issue, and found no problems.[105]

Thus, despite EPA's belief that revocation of a permitting authority's delegation remains an enforcement tool to challenge an individual permit, unless the delegation agreement leaves room for individual permits to be challenged in this manner, such a revocation may not withstand legal challenge. Indeed, EPA has recently expressed some doubt about the ability of EPA regions to challenge PSD permits issued by delegate states in ways other than submitting comments during the public comment period and subsequently participating in a PSD appeal.[106]

*Timing Issues*

Since the "available" component of BACT review is to be determined during permit review, BACT determinations are by definition temporal in scope.[107] That is, available technologies for a current new source may differ from those technologies deemed to be available at a prior date. The Act imposes a further temporal limitation on BACT review by mandating that any completed PSD permit application be granted or denied not later than one year after the date of the filing of a completed application.[108] These limits on the temporal scope of BACT review serve both to build some finality into the permit process and to implement PSD provisions so that economic growth will occur in a manner consistent with the preservation of existing clean air resources.[109]

In several previously mentioned orders issued as part of PSD Part 124 appeals, the Administrator has considered both the issue of when the applicant's search for relevant BACT information can legitimately come to an end and the issue of whether a permitting authority and the Administrator, on appeal, may consider new information in determining the adequacy of the applicant's BACT evaluation. The Administrator, as noted earlier in the *Pennsauken* Appeal, remanded a BACT evaluation for reconsideration because the permitting authority had not considered in detail a control option that had been treated as available to sources of the applicant's type in EPA guidance predating the issuance of the permit. The Administrator found that previously issued Agency guidance, coupled with the fact that one facility was actually in operation using the particular pollution control technology, raised a strong presumption that the technology was available for the purposes of BACT review.[110]

More recently, in reaching his decision in the *Spokane* Appeal that there were no studies or actual operating data

97. 40 C.F.R. §124.19(b).

98. 45 Fed. Reg. 33412 (1980).

99. 40 C.F.R. §124.19(c), (f).

100. 40 C.F.R. §124.19, 124.41.

101. Sept. 22, 1987, Memorandum, *supra* note 89.

> EPA has the authority, depending upon the facts of the case, to withdraw the delegation with respect to an individual permit that is being or has been issued inconsistently with the terms of that delegation. . . . This withdrawal of delegation is not the preferred course of action but it may be available if needed.

*Id.*

102. No. 86-CV-72910-DT, slip op. (E.D. Mich. Oct. 21, 1986).

103. *Id.* at 3.

104. *Id.* at 5.

105. *Id.* at 7.

106. Memorandum from J. Craig Potter, Assistant Administrator, EPA Office of Air and Radiation to all Regional Administrators (Dec. 1, 1987) at 3 (Improving New Source Review (NSR) Implementation).

> By uniformly reviewing all major source permit actions during the comment period, EPA is able to address deficient reviews or permits before the final permit is issued. This not only promotes more consistency in the permitting process among the states, but also provides the highest degree of certainty to the applicant that the permit will not be challenged by EPA at a later date. Moreover, if the permit is not reviewed and commented on prior to issuance, the possibility of successfully challenging the action is greatly diminished.

*Id.*

107. "As a practical matter, BACT determinations will ordinarily be made at some time prior to actual issuance of the permit, for there is always a lag between closure of the administrative record (usually the close of the public comment period) and the time when the permit determination is announced." *Pennsauken* Appeal at 7, n.11.

108. 42 U.S.C. §7475(c), ELR STAT. CAA 026.

109. 42 U.S.C. §7470(3), ELR STAT. CAA 024.

110. *Pennsauken* Appeal *supra* note 52, at 7-8.

that supported source separation or recycling in combination with a conventional pollution control technology as BACT, the Administrator[111] made specific reference to the Clean Air Act's one-year deadline to grant or deny PSD permits as an indication that an applicant's burden to identify the best available control technology must be terminated at some point.[112]

The *Pennsauken* and *Spokane* decisions, taken together, indicate that if operating data, studies, or Agency guidance demonstrate actual use of a particular technology on the source type (or on a similar source that can be appropriately transferred to the source type under review) any time prior to permit issuance, that technology must be investigated as part of the BACT review.

In the *H-Power* Appeal, the Administrator held that the permitting agency or the region, which by the terms of its delegation agreement with Hawaii had to concur with the permitting agency, had the authority to consider new information. In addition, the Administrator found that his own broad discretionary review powers[113] gave him the authority to direct the Regional Administrator or the local permitting authority on remand to consider new information and seek further evidence on relevant points.[114] Thus, *H-Power* stands for the proposition that the Administrator or the permitting agency has broad authority to consider new information in a Part 124 appeal proceeding.

This is precisely the administrative precedent that EPA Region IX cited in an appeal of a delegate agency's issuance of a PSD Permit for Signal Energy System's Cottonwood Power Plant. In this Part 124 remand proceeding, the delegate agency (in this case, the Shasta County Air Pollution Control District) assumed that BACT review should be limited to information on control technology alternatives available prior to the reviewing agency's decision to issue the PSD permit. The Control District argued that the Administrator could not find the initial BACT determination defective on the ground that the applicant failed to consider new data that had not even been available prior to the initial permit decision. If the Administrator has the authority under Part 124 to consider new data, the BACT review on remand would be de novo and not simply a reconsideration of the initial BACT determination, as the Part 124 regulations seem to require. Region IX rejected these arguments, citing *H-Power* for the proposition that the Administrator has full authority on remand to review all information relevant to the matter, including new or additional information.[115]

Thus, under the administrative precedent of *H-Power*, it is EPA's position that if an administrative appeal under Part 124 is filed, information regarding BACT alternatives outside the administrative record and data that may not have been available to an applicant during the permit review can be used to decide the adequacy of the reviewing agency's initial BACT decision. Read literally, it appears that the Administrator, under *H-Power*, could hold that an applicant must consider new information all the way through remand proceedings if the applicant's permit is appealed and review is granted or a remand ordered.

The *H-Power* doctrine has never been subjected to judicial review. Until it has, applicants in states without approved PSD programs need to be aware of the possibility that new information could be taken into account in a Part 124 appeal proceeding.

**Conclusion**

BACT determinations are key discretionary findings of the PSD preconstruction review process and the primary mechanism for incorporating the most current technologically feasible and cost-effective air pollution control techniques. EPA has interpreted the scope of what constitutes BACT primarily through guidance documents and administrative appeals of PSD permits. Facilities that propose to locate in attainment areas must become intimately familiar with these documents as well as the PSD requirements of the applicable local permitting authority, if any. The Agency's top-down analysis of BACT alternatives will undoubtedly continue to remain controversial. Whether the courts will ultimately hold that the top-down procedure is consistent with the Clean Air Act is unclear. Until then, the practical impact of the approach will likely continue to be the requirement of the most stringent technologically feasible control alternative in the absence of some very significant and substantial environmental or cost impacts.

111. *Spokane* Appeal *supra* note 32, at 2, 17.

112. *Id.* at 17-18.

> Given the Clean Air Act's emphasis on granting or denying completed PSD permit applications within one year of filing, it would be unreasonable to read the term "available" as imposing a duty on the permit applicant to conduct time-consuming original research by generating new data for the purpose of discovering whether a potential, but unproven, technology might possibly prove successful.

*Id.* (footnote omitted).

113. Under 40 C.F.R. §124.19.

114. *H-Power* Appeal at 8 n.12.

115. Memorandum from David P. Howekamp, Director, Air Management Division, Region IX to, Ronald L. McCallum, Chief Judicial Officer, U.S. EPA (Oct. 9, 1987) at 2 (PSD Appeal No. 87-6) (Signal Energy Systems Cottonwood Power Plant).