Preventing Significant Deterioration Under the Clean Air Act: The BACT Determination—Part II

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Summary

PSD permits issued to major emitting facilities must include BACT standards for each pollutant subject to regulation under the CAA. These standards must be determined by permitting authorities on a case-by-case basis, subject to EPA review and approval. Steps 2 through 5 of EPA's preferred "top-down" procedure for making these determinations involve the elimination of technically infeasible options, the ranking of remaining technologies by control effectiveness, the evaluation of energy, environmental, and economic impacts, the selection of BACT technology, and the specification of BACT emission limitations. As old pollution control technologies are continually replaced by newer ones, these steps present daunting burdens for permit applicants and fertile opportunities for their opponents.

V. Top-Down Step 2: Eliminating Technically Infeasible Options

The second step in the top-down analysis is to "eliminate technically infeasible options."[1] The 1990 Workshop Manual explains:

> 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. . . .
>
> 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.[2]

The Manual further provides: "The applicant is responsible for providing a basis for assessing technical feasibility or infeasibility."[3] The cost of a technology is not relevant to the Step 2 determination of feasibility.[4]

A Work Group appointed by the U.S. Environmental Protection Agency (EPA) to examine how best available control technology (BACT) should be determined for greenhouse gases (GHGs) reported that there were no areas of nonconsensus with respect to Step 2, and that its members had reached consensus on the following areas:

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1. *See* U.S. Environmental Protection Agency (EPA), New Source Review Workshop Manual, at B.1 (Oct. 1990) [hereinafter 1990 Workshop Manual], *available at* http://www.epa.gov/ttn/nsr/gen/wkshpman.pdf, at B.4.
2. 1990 Workshop Manual, *supra* note 1, at B.6.
3. 1990 Workshop Manual, *supra* note 1, at B.20.
4. *See* 1990 Workshop Manual, *supra* note 1, at B.18 ("Where the resolution of technical difficulties is a matter of cost, the applicant should consider the technology as technically feasible [because t]he economic feasibility of a control alternative is reviewed in the economic impacts portion of the BACT selection process."). *See also* EPA Office of Air and Radiation, PSD and Title V Permitting Guidance for Greenhouse Gases (Mar. 2011) [hereinafter Permitting Guidance for Greenhouse Gases], at 36 ("As with all top-down BACT analyses, cost considerations should not be included in Step 2 of the analysis, but can be considered in Step 4."); In re Knauf Fiber Glass PSD Permit No. 97-PO-06, PSD Appeal Nos. 98-3 through 98-20, 1999 WL 64235, 8 E.A.D. 121, 1999 EPA App. LEXIS 2 (EAB Feb. 4, 1999), at slip op. 24 ("A control option is not considered infeasible simply based upon the cost of applying that option to the proposed project.").

> On a case-by-case basis, the primary factors considered are the characteristics of the gas stream to be controlled, the comparability of the production processes (e.g. batch versus continuous operation, frequency of process interruptions, special product quality concerns, etc.), and the potential impacts on other emission points within the source.
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> If a control technology has been demonstrated in practice on a range of exhaust gases with similar physical and chemical characteristics and does not unacceptably affect process operations, product quality, or the control of other emissions, it may generally be considered as potentially feasible for application to another process.
>
> Detailed information is required to effectively evaluate technology transfer opportunities on a case-by-case basis for a specific source, such as performance information and test data for potential control technologies across a range of operating scenarios and conditions.[5]

The 1990 Workshop Manual divides the Step 2 analysis into separate components, depending on whether a technology has been demonstrated.[6] On the one hand, if a control technology has been installed and successfully operated on the type of facility proposed by the permit applicant, the technology is demonstrated; every demonstrated technology is, by definition, feasible.[7] For such options, the analysis proceeds to Step 3.

On the other hand, for any undemonstrated technologies on the Step 1 list, the reviewing authority must determine whether the technology is "available" and "applicable."[8] The Manual further explains:

> [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.[9]

Taking these two components together, a technology listed in Step 1 is feasible within the meaning of Step 2 if it is *either* demonstrated, i.e., already used successfully at the same type of facility, *or* available (the applicant can obtain the technology) *and* applicable (the technology can be used successfully at the applicant's facility).[10] Because demonstrated technologies automatically survive the Step 2 winnowing process, the most difficult of the Step 2 decisions involves the issue of technology transfer.

A. *Challenging the Feasibility of Transferable Technologies*

As is true throughout the top-down process, the burden is on the applicant to demonstrate that a Step 1 technology is not feasible.[11] The applicant must "make a 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."[12] At least one case has suggested that, when exploring allegedly transferable technologies, "[a] rule of reason proportionate to the technology's track record necessarily governs how

5. Interim Phase I Report of the Climate Change Work Group of the Permits, New Source Review and Toxics Subcommittee, Clean Air Act Advisory Committee, in Global Warming, Climate Change, and the Law, SR039 ALI-ABA 115 (Feb. 3, 2010), *available at* http://www.epa.gov/oar/caaac/climate/2010_02_InterimPhaseIReport.pdf (last visited Nov. 6, 2011), at 10-11.
6. This analysis builds on the search in Step 1 for demonstrated technologies. *See* John-Mark Stensvaag, *Preventing Significant Deterioration Under the Clean Air Act: The BACT Determination—Part I*, 41 ELR 11101 (Dec. 2011) [hereinafter *BACT Determination Part I*], at text accompanying notes 81-89. *See also* Interim Phase I Report, *supra* note 5, at 10 (reporting consensus that "[d]emonstrated in practice generally means an available technology has been used in a production situation and has been demonstrated to be successful at achieving the claimed performance").
7. *See* 1990 Workshop Manual, *supra* note 1, at B.16. *See also id*. at 20 ("A control technology that is 'demonstrated' for a given type or class of sources is assumed to be technically feasible unless source-specific factors exist and are documented to justify technical infeasibility.").
8. *See* 1990 Workshop Manual, *supra* note 1, at B.16.
9. 1990 Workshop Manual, *supra* note 1, at B.16. *See also id*. at 17 ("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."). *But see* In re Knauf Fiber Glass PSD Permit No. 97-PO-06, PSD Appeal Nos. 98-3 through 98-20, 1999 WL 64235, 8 E.A.D. 121, 1999 EPA App. LEXIS 2 (EAB Feb. 4, 1999), at slip op. 51-52 ("Process technologies that are treated as proprietary and are not commercially available may be considered technically infeasible and eliminated from the BACT consideration process . . . [because] permit applicants and permitting authorities ordinarily should not have to negotiate with owners of proprietary process technologies in order to satisfy BACT requirements."). For a case struggling with the meaning of "available," see *In re Hawaii Electric Light PSD/CSP Permit No. 0007-01-C*, 1998 WL 830633, 8 E.A.D. 66, 1998 EPA App. LEXIS 108 (EPA Admr. Nov. 25, 1998), at slip op. 39-56.
10. "Technologies identified in Step 1 that are neither demonstrated nor found to be available and applicable are eliminated under Step 2." Climate Change Workgroup, Clean Air Act Advisory Committee, Permits, New Source Review, and Toxics Subcommittee, New Source Review BACT Review (PowerPoint illustrations) (Oct. 6, 2009).
11. *See* 1990 Workshop Manual, *supra* note 1, at B.18; *See* Interim Phase I Report, *supra* note 5, at 9 (consensus of Work Group). *But see* In re Steel Dynamics PSD Permit No. CP-183-10097-00030, PSD Appeal Nos. 99-4 & 99-5, 2000 WL 833062, 9 E.A.D. 165, 2000 EPA App. LEXIS 18 (EAB June 22, 2000), at slip op. 50-52 (petitioners, as proponents of a permit provision differing from that adopted by the permit issuer, had burden of demonstrating clear error or abuse of discretion, and failed to produce any evidence supporting their claim of transferable technology).
12. 1990 Workshop Manual, *supra* note 1, at B.18. The Manual explains:
    > 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).

    Id.

much detail and documentation must go into consideration of [the] particular technology."[13]

A Step 2 demonstration by the applicant that use of a given Step 1 technology would be costly—even too costly to permit the enterprise to continue—does not justify the conclusion that the technology is infeasible.[14] Questions of economic costs and other adverse impacts must be addressed in Step 4.[15] Moreover, the physical modifications needed to overcome technical obstacles to implementing a Step 1 technology "do not in and of themselves provide a justification for eliminating the control technique on the basis of technical infeasibility."[16] Such considerations may ultimately justify elimination of a control technology, but not in Step 2. Vendor guarantees—or the lack thereof—are relevant to the feasibility determination, but cannot be dispositive.[17]

B. *Multiple Control Alternatives Resulting in Equivalent Emissions*

The normal rule is that any Step 1 technology found to be feasible in Step 2 cannot be eliminated and must proceed through the subsequent steps in the top-down analysis. The 1990 Workshop Manual describes, however, one narrow exception: "a full analysis is not required where control options are, in effect, redundant (in other words, where there are two or more alternatives with comparable control efficiencies, only one of the alternatives must be fully analyzed)."[18] Even though the Manual describes this as a Step 2 winnowing of options, it seems more likely that such an undertaking must occur as Steps 3 and 4 unfold.[19] Only during those steps will the applicant learn whether the options are essentially equivalent in control efficiencies and in adverse impacts.

In a 2006 case, the reviewing authority had excluded integrated gasification combined cycle (IGCC) technology from further BACT analysis, omitting that technology from the Step 3 ranking and from the detailed cost-effectiveness analysis required by Step 4. The petitioners argued that this exclusion was unlawful, because IGCC had been found in Step 2 to be technically feasible. The EPA Environmental Appeals Board (EAB) rejected their argument, affirming the reviewing authority's conclusion that IGCC was essentially equivalent in control efficiencies and adverse impacts to options that remained under consideration.[20]

VI. Top-Down Step 3: Ranking Remaining Technologies by Control Effectiveness

The third step in the top-down analysis is to rank all alternatives not eliminated in Step 2, and to list them in order of overall control effectiveness, with the most effective control alternative at the top.[21] As with all other portions of the top-down approach, the burden is on the applicant to carry out the procedures in Step 3. The 1990 Workshop Manual explains:

> The list should present the array of control technology alternatives and should include the following types of information:
>
> [1] control efficiencies (percent pollutant removed);
>
> [2] expected emission rate (tons per year, pounds per hour);
>
> [3] expected emissions reduction (tons per year);
>
> [4] economic impacts (cost effectiveness);
>
> [5] 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);
>
> [6] energy impacts.[22]

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13. In re Steel Dynamics PSD Permit No. CP-183-10097-00030, PSD Appeal Nos. 99-4 & 99-5, 2000 WL 833062, 9 E.A.D. 165, 2000 EPA App. LEXIS 18 (EAB June 22, 2000), at slip op. 52.
14. *See* 1990 Workshop Manual, *supra* note 1, at B.18.
15. *See* In re Knauf Fiber Glass PSD Permit No. 97-PO-06, PSD Appeal Nos. 98-3 through 98-20, 1999 WL 64235, 8 E.A.D. 121, 1999 EPA App. LEXIS 2 (EAB Feb. 4, 1999), at slip op. 53.
16. *See* 1990 Workshop Manual, *supra* note 1, at B.19.
17. The 1990 Workshop Manual explains:

    > 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.

    1990 Workshop Manual, *supra* note 1, at B.19. *See also* Interim Phase I Report, *supra* note 5, at 9 ("Consensus could not be reached on the role and value of commercial guarantees in determining whether production processes and control technologies are technically feasible.").
18. In re Prairie State Generating Co., PSD Appeal No. 05-05, 13 E.A.D. 1, 2006 EPA App. LEXIS 38 (EAB Aug. 24, 2006), at slip op. 89-90. The Manual explains:

    > A possible outcome of the top-down BACT procedure . . . 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 . . . Step 4 . . . . 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 of only 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.

    1990 Workshop Manual, *supra* note 1, at B.20-B.21.
19. The effectiveness of the options is ranked in Step 3 and the adverse energy, environmental, and economic impacts are evaluated in Step 4. Each of those steps requires quantification. The Manual's policy on multiple control alternatives resulting in equivalent emissions seems designed to lessen the applicant's burden in those two steps.
20. *See* In re Prairie State Generating Co., PSD Appeal No. 05-05, 13 E.A.D. 1, 2006 EPA App. LEXIS 38 (EAB Aug. 24, 2006), at slip op. 92.
21. *See* 1990 Workshop Manual, *supra* note 1, at B.6.
22. 1990 Workshop Manual, *supra* note 1, at B.6-B.7 (numbering added). If an applicant proposes the top control alternative, it need not provide cost and other detailed information with regard to other control options. In such cases the applicant should document that the chosen control option is, indeed, the most effective, and review it for collateral environmental impacts.

A. *Calculating Pollution Control Effectiveness*

The task of calculating pollution control effectiveness poses two challenges. First, the applicant must select a common unit to compare emissions performance levels among the options. Second, the actor must decide how to address control techniques that can operate over a wide range of performance.

The first issue arises "when comparing inherently low-polluting processes to one another or to add-on controls."[23] Using the example of a metal furniture finishing operation, the 1990 Workshop Manual points to the challenge of comparing inherently low-polluting powdered (and low-volatile organic compound (VOC)) coatings with the add-on technologies of vapor recovery and control systems. Direct comparison between such options is difficult, because different units would ordinarily be used to assess their effectiveness. The Manual advises that "it is generally most effective to express emissions performance as an average steady state emissions level per unit of product produced or processed."[24] Once these values have been derived, the annual emission levels in tons per year for each option can be calculated by factoring in the projected annual production or processing rate.[25] The result is an estimate of the annual pollutant emissions that would occur with implementation of each option.[26] It is these annual emission numbers that are compared to obtain the hierarchical ranking.

The second challenge in calculating pollution control effectiveness is the task of selecting values for control techniques that can vary over a wide range of performance. The 1990 Workshop Manual explains:

> 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, and 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. 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 demonstrate to the satisfaction of the permit agency . . . that other considerations show the need to evaluate the control alternative at a lower level of effectiveness. . . .
>
> Consequently, in assessing the capability of the control alternative, latitude exists to consider any special circumstances pertinent to the specific source under review, or regarding the prior application of the control alternative. However, the basis for choosing the alternate level (or range) of control in the BACT analysis must be documented in the application.[27]

B. *Establishing the Control Options Hierarchy*

Once the applicant has calculated the emissions performance levels (in common units) for each Step 2 control technology, the applicant must prepare a hierarchy of options, placing at the top the option that achieves the lowest emissions level and placing each additional option in sequence below the top technology on the basis of its performance level.[28] The result will be a list progressing from the lowest emissions at the top to the highest emissions at the bottom.

The 1990 Workshop Manual instructs the applicant to present the information in a formal manner:

> From the hierarchy of control alternatives the applicant should develop a chart (or charts) displaying the control hierarchy and, where applicable:
>
> [1] expected emission rate (tons per year, pounds per hour);
>
> [2] emissions performance level (e.g., percent pollutant removed, emissions per unit product, lbs./MMbtu [pounds per thousand British thermal unit], ppm [parts per million]);
>
> [3] expected emissions reduction (tons per year);

See id. at B.7. *See also* In the Matter of Union County Resource Recovery Facility, PSD Appeal No. 90-1, 1990 WL 324096, 3 E.A.D. 455, 1990 EPA App. LEXIS 41 (EPA Admr. Nov. 28, 1990), at slip op. 8.

23. *See* 1990 Workshop Manual, *supra* note 1, at B.21.

24. 1990 Workshop Manual, *supra* note 1, at B.21. The Manual provides examples of such expressions: (1) pounds of VOC emission per gallons of solids applied; (2) pounds particulate matter (PM) emission per ton of cement produced; (3) pounds sulfur dioxide (SO_2) emissions per million British thermal unit (Btu) heat input; and (4) pounds SO_2 emission per kilowatt (kW) of electric power produced. *See id.* at B.21-B.22.

25. Not all facilities operate around the clock or at full capacity. Nevertheless, the Manual declares: "Annual 'potential' emission projections are calculated using the source's maximum design capacity and full year round operation (8,760 hours), unless the final permit is to include federally enforceable conditions restricting the source's capacity or hours of operation." 1990 Workshop Manual, *supra* note 1, at B.22. The Manual cautions, however, that "emissions estimates used for the purpose of calculating and comparing the *cost effectiveness* of a control option are based on a different approach." *Id.* (emphasis added).

26. *See* 1990 Workshop Manual, *supra* note 1, at B.22.

27. 1990 Workshop Manual, *supra* note 1, at B.22-B.23. The Manual goes on to explain:

> [W]hen 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.

Id. at B.23.

28. *See* 1990 Workshop Manual, *supra* note 1, at B.24.

[4] economic impacts (total annualized costs, cost effectiveness, incremental cost effectiveness);

[5] 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);

[6] energy impacts (indicate any significant energy benefits or disadvantages).[29]

The Manual includes some helpful charts illustrating how applicants should display the results of Step 3.[30] We will use portions of the Manual's sample charts concerning economic impacts, environmental impacts, and energy impacts, as we discuss individual subparts of the Step 4 analysis. With respect to the control options hierarchy, we reproduce here Table B.2 from the 1990 Workshop Manual, which illustrates what EPA wishes to see:

TABLE B.2. SAMPLE BACT CONTROL HIERARCHY
Source: 1990 Workshop Manual at B.27

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	—	—	—

As Step 3 comes to an end, "it is initially assumed that the most stringent alternative represents BACT pending the consideration of the source-specific energy, environmental and economic impacts, and other costs associated with each control option."[31]

VII. Top-Down Step 4: Evaluating Collateral Impacts and Selecting the BACT Technology

The fourth step in the top-down approach is to consider the collateral impacts (energy, environmental, and economic) of the top technology identified by the Step 3 hierarchy.[32] These factors have been referred to as "criteria for eliminating technologies,"[33] which is an excellent and appropriate description of their role. "The applicant is responsible for presenting an evaluation of each impact along with appropriate supporting information."[34] Following such consideration, the applicant will either declare the top technology to be suitable for BACT or will provide clear justification for concluding that the technology is inappropriate for BACT.[35]

If the top technology is shown to be unsuitable, the next most stringent option becomes the control candidate and is evaluated in the same manner.[36] "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."[37]

A. *The Paradoxical Nature of Step 4*

Under the top-down approach, Step 4 lies at the very heart of EPA's BACT determination process. Most importantly, it presents a paradox. On the one hand, EPA insists that

29. 1990 Workshop Manual, *supra* note 1, at B.24 (numbering added).
30. *See* 1990 Workshop Manual, *supra* note 1, at B.27 (Table B-2. Sample BACT Control Hierarchy); *id.* at B.66 (Table B-8 Example 1 Summary of Top-Down BACT Impact Analysis Results for NO_x); *id.* at B.71 (Table B-10 Example 2).
31. 61 Fed. Reg. 38250, 38273 (July 23, 1996).
32. It is traditional to refer to the energy, environmental, and economic impacts of BACT candidate technologies as collateral impacts. *See, e.g.*, In re General Motors, PSD Appeal No. 01-30, 10 E.A.D. 360, 2002 WL 373982, 2002 EPA App. LEXIS 2 (EAB Mar. 6, 2002), at slip op. 48 n.16 ("the so-called 'collateral impacts clause' of the CAA . . . requires that BACT determinations take into account a technology's 'energy, environmental and economic impacts or other costs'"); In the Matter of World Color Press, PSD Appeal No. 88-4, 1990 WL 324095, 3 E.A.D. 474, 1990 EPA App. LEXIS 40 (EAB Dec. 13, 1990), at slip op. 8 (the clause "is in the BACT definition to temper the stringency of the technology requirements whenever one or more of the specified "collateral" impacts—energy, environmental or energy—renders use of the most effective technology inappropriate"). We use the phrase "collateral impacts" as well, even though EPA has suggested in a 2010 document that the term may be inappropriate. *See* Permitting Guidance for Greenhouse Gases, *supra* note 4, at 38, *quoted infra* in note 44.
33. *See* Interim Phase I Report, *supra* note 5, at 13.
34. 1990 Workshop Manual, *supra* note 1, at B.25. An earlier 1980 Workshop Manual explained: "After deciding upon a set of alternative control strategies, the applicant then conducts three analyses for each strategy: (1) an economic impacts analysis, (2) an energy impacts analysis, and (3) an environmental impacts analysis. These analyses should identify quantifiable impacts." EPA Office of Air, Noise, and Radiation, Prevention of Significant Deterioration Workshop Manual (Oct. 1980) [hereinafter 1980 Workshop Manual], at I-B-8.
35. *See* 1990 Workshop Manual, *supra* note 1, at B.25. *See also* In re Knauf Fiber Glass PSD Permit No. 97-PO-06, PSD Appeal Nos. 98-3 through 98-20, 1999 WL 64235, 8 E.A.D. 121, 1999 EPA App. LEXIS 2 (EAB Feb. 4, 1999), at slip op. 25 ("consideration of collateral impacts is used to either confirm the top BACT option as appropriate or to demonstrate that it is inappropriate"). The Manual further states:

> The determination that a control alternative [is] inappropriate involves a demonstration that circumstances exist at the source 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. . . . 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.

1990 Workshop Manual, *supra* note 1, at B.27. *See also* In the Matter of Columbia Gulf Transmission Co., PSD Appeal No. 88-11, 1989 WL 266361, 2 E.A.D. 824, 1989 EPA App. LEXIS 26 (EPA Admr. June 21, 1989), at slip op. 7 ("the collateral impacts clause operates primarily as a safety valve whenever unusual circumstances specific to the facility make it appropriate to use less than the most effective technology").
36. *See* 1990 Workshop Manual, *supra* note 1, at B.8. The rationale for the finding of unsuitability must be "documented for the public record." *Id.*
37. 1990 Workshop Manual, *supra* note 1, at B.8. *See also* In re Knauf Fiber Glass PSD Permit No. 97-PO-06, PSD Appeal Nos. 98-3 through 98-20, 1999 WL 64235, 8 E.A.D. 121, 1999 EPA App. LEXIS 2 (EAB Feb. 4, 1999), at slip op. 25 (ultimately, the most effective control alternative not eliminated is selected as BACT).

examination of the collateral impacts must be quantified[38] if at all possible and must be thoroughly documented.[39] We will see this when we look at sample tables in the 1990 Workshop Manual.[40] Indeed, the 1978 Guidelines urged that "[t]he rationale for rejecting each alternative should be presented in the form of an incremental analysis of the impacts of each alternative system relative to the proposed BACT system."[41] On the other hand, EPA concedes that the reviewing authority must be accorded great discretion in balancing the collateral impacts.[42]

With respect to the reviewing authority's freedom to assign its own weights to the collateral impact factors, the 1978 Guidelines explained:

> A critical decision in the BACT analysis is the relative weight assigned to the energy, environmental, and economic impacts. Congress implied that this decision should be made by the State, thus allowing some flexibility in emission control requirements depending on local energy, environmental, and economic conditions and local preferences. For example, in an area with unusually high unemployment, the economic impacts may be weighted more heavily if the application of a strict BACT emission requirement would reduce production or jobs. On the other hand, if visibility protection is a major value of the area, then environmental impacts could be weighted more heavily. This flexible approach allows the permitting authority to consider a number of local factors (for example the size of the plant, the amount of the air quality increment that would be consumed, and desired economic growth in the area) in deciding on a weighting scheme. State judgment and the Federal emission standards are the foundations for the BACT determination. Accordingly, EPA does not consider it appropriate to assign nationally applicable weighting factors in this guideline. . . .
>
> The guideline does not address . . . the weighting of any factor relative to another.[43]

Despite the emphasis of the 1990 Workshop Manual on quantification, it also does not assign specific weights to any factor, leaving this up to the discretion of the reviewing authority.

B. *Indirect Impacts*

With respect both to energy and environmental impacts, the 1990 Workshop Manual recommends that analysis ordinarily be limited to direct impacts:

> Indirect energy or environmental impacts are not required but may be considered where such impacts are found to be significant and well quantified. Indirect energy impacts include such impacts as energy to produce raw materials for construction of control equipment, increased use of foreign oil, or increased oil use in the utility grid. Indirect environmental impacts include such considerations as pollution at an off site manufacturing facility which produces materials needed to construct or operate a proposed control system. Indirect impacts will generally not be considered, in the BACT review, since the complexity of consumption patterns in the economy makes those impacts difficult to quantify. For example, since manufacturers purchase capital equipment and supplies from many suppliers, who in turn purchase goods from the other suppliers, accurate tracing of indirect impacts may not be possible. Raw materials may be needed to operate control equipment, and suppliers of these resources may change over time. Similarly, it generally will not be possible to determine specific power stations and fuel sources which would be used to satisfy electrical demand over the lifetime of a control device.[44]

38. For example, the 1990 Workshop Manual provides: "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." 1990 Workshop Manual, *supra* note 1, at B.7. *See also id*. at B.28 (if energy benefits or penalties exist, "they should be quantified"); *id*. at B.29 (indirect energy may be considered if it can be "well quantified"); *id*. at B.30 (for economic impacts, "primary consideration should be given to quantifying the cost of control").
39. *See, e.g.*, 1990 Workshop Manual, *supra* note 1, at B.25-B.26 (rationale for excluding a technology due to energy, environmental, or economic impacts "needs to be fully documented for the public record"); *id*. at B.31 (elimination of option due to disproportionately high control costs must be "adequately documented and explained"); In re Steel Dynamics PSD Permit No. CP-183-10097-00030, PSD Appeal Nos. 99-4 & 99-5, 2000 WL 833062, 9 E.A.D. 165, 2000 EPA App. LEXIS 18 (EAB June 22, 2000), at slip op. 98 (finding cost-effectiveness analysis to be incomplete because state reviewing agency "has not fully documented, for public review, its economic analysis"); In re Knauf Fiber Glass PSD Permit No. 97-PO-06, PSD Appeal Nos. 98-3 through 98-20, 1999 WL 64235, 8 E.A.D. 121, 1999 EPA App. LEXIS 2 (EAB Feb. 4, 1999), at slip op. 50 (if the top option is rejected, the collateral impacts of each subsequent control option must be documented).
40. *See infra* text accompanying notes 54, 73, and 97.
41. 1978 Guidelines for Determining Best Available Control Technology (BACT), *transmitted by* Memorandum from David G. Hawkins, to Regional Administrators (Jan. 4, 1979), at 6.
42. *See, e.g.*, Background Statement on the EPA's Top-Down Policy (June 13, 1989), *transmitted by* Memorandum of John Calcagni (June 13, 1989), at 5 ("Congress intended PSD permitting authorities to exercise informed discretion to weigh energy, environmental, and economic impacts"); *id*. at 6 (defending the top-down method by stressing that states still weigh the relevant factors); *id*. at 7 (top-down policy "does not prejudge the weight that permitting authorities must give to the relevant statutory factors"). In defending EPA's top-down policy against industry challenge, Air Quality Management Division Director John Calcagni noted:

    > [I]t is not sufficient to reject a control technology by merely asserting that it is "too costly." Rather, claims that economic (or other) factors render a technology or emission limit not achievable must be supported by an analysis utilizing readily available objective indicators of adverse impacts. However, the final weighing of those factors, and the final BACT decision, are made by the permitting authority.

    Id. at 7.
43. 1978 Guidelines, *supra* note 41, at 8-9.
44. 1990 Workshop Manual, *supra* note 1, at B.7-B.8. Oddly, the 2011 Permitting Guidance for Greenhouse Gases suggests that indirect impacts should routinely be considered:

    > In BACT Step 4, the applicant and permitting authority should consider both direct and indirect impacts of the emissions control option or strategy being evaluated. EPA has previously referred to BACT Step 4 as the "collateral impacts analysis," but this term is primarily applicable only to the environmental impact analysis. Overall, the Step 4 analysis is more accurately described as an environmental, economic, and energy impacts analysis that includes both direct and indirect (i.e., collateral) considerations.

    Permitting Guidance for Greenhouse Gases, *supra* note 4, at 38. Perhaps EPA stressed indirect impacts in this context, because the effects of GHGs are almost entirely indirect. *See* 73 Fed. Reg. 44354, 44478 (July 30, 2009)

In several recent administrative proceedings, petitioners have been unsuccessful in asserting that indirect impacts justified the elimination of the top option during the Step 4 analysis.[45] The petitioners' argument in *Prairie State* illustrates one such potential indirect environmental impact:

> Petitioners contend that the Facility will use approximately one million tons of limestone per year in operating the technology designated as BACT. . . . Petitioners contend that Prairie State's purchase of limestone may destroy habitat of the Eastern Narrow Mouth Toad if the limestone seller mines the limestone from an area that is habitat for the toad. . . . Petitioners argue that this potential collateral impact of using locally-mined limestone should have been considered as part of the BACT review . . . .[46]

The EAB rejected their claim:

> Even if the mining of limestone that is subsequently purchased by the Facility constitutes a secondary environmental impact . . . [the reviewing authority] considered this information, relied on [another state agency's] determination that impacts resulting from the proposed action are not likely to jeopardize a listed species or its essential habit, and therefore did not alter its previous conclusion that the proposed most effective control system did not present a significant or unusual environmental impact. . . . We do not find error in [this] conclusion based on these facts.[47]

C. Energy Impacts

The statutory BACT definition declares that BACT is an emission limitation based on the maximum degree of reduction that the permitting authority, on a case-by-case basis, determines to be achievable for the applicant's facility, "taking into account energy . . . impacts."[48] The top-down approach directs applicants to consider this factor during the Step 4 analysis. The applicant must quantify or at least substantiate its reliance on energy impacts to rule out the top technology.[49]

The 1990 Workshop Manual's discussion of the energy impact factor is surprisingly thin.[50] Applicants are told that they should examine the energy requirements for each control technology and determine whether they result in any "significant or unusual energy penalties or benefits."[51] If such unusual energy penalties or benefits exist, "they should be quantified."[52] The Manual then goes on to note that energy benefits and penalties can ordinarily be quantified in terms of additional cost to the facility; accordingly, "the energy impacts analysis can, in most cases, simply be factored into the economic impacts analysis."[53] This language suggests that the analysis of energy impacts may be effectively punted to the analysis of economic impacts.

Finally, the Manual addresses the availability of fuels for the various control options, but suggests no weight for this factor:

> 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.[54]

(describing the effects of GHGs emitted from motor vehicles). In any event, we continue to use the term "collateral impacts" to describe the impact factors enumerated in the statutory BACT definition. *See supra* note 32.

45. *See, e.g.*, In re Power Holdings of Illinois, PSD Appeal No. 09-04, 2010 WL 3258141, 2010 EPA App. LEXIS 35 (EAB Aug. 13, 2010), at slip op. 40 n.17 (petitioner "has not presented evidence demonstrating unusual or significant indirect impacts justifying removal" of the technology); In re Steel Dynamics PSD Permit No. CP-183-10097-00030, PSD Appeal Nos. 99-4 & 99-5, 2000 WL 833062, 9 E.A.D. 165, 2000 EPA App. LEXIS 18 (EAB June 22, 2000), at slip op. 180 (rejecting claims of indirect impacts from truck and commuter traffic as untimely raised).
46. In re Prairie State Generating Co., PSD Appeal No. 05-05, 13 E.A.D. 1, 2006 EPA App. LEXIS 38 (EAB Aug. 24, 2006), at slip op. 117-18.
47. In re Prairie State Generating Co., PSD Appeal No. 05-05, 13 E.A.D. 1, 2006 EPA App. LEXIS 38 (EAB Aug. 24, 2006), at slip op. 122-23.
48. CAA §169(3), 42 U.S.C. §7479(3).
49. Thus, when a reviewing authority rejected the top technology because it would increase fuel consumption by 2.2 %, the EPA Administrator explained:

    > I am less certain about the 2.2 percent increase in energy consumption and what it implies. Nevertheless, it is generally incumbent on the permit issuer and the permit applicant to demonstrate in the record the relevance or significance of any claimed basis for rejecting the most effective technology on energy or other statutory grounds. It is not enough for them to assert, without substantiation, that adoption of the most effective technology will result in an energy penalty. They must provide substantiation and they must show that the penalty is so substantial or unusual as to merit rejection of the most effective technology. They have not done so in this instance, for the record does not disclose any substantial information on the impact of the alleged energy penalty.

    In the Matter of Columbia Gulf Transmission Co., PSD Appeal No. 88-11, 1989 WL 266361, 2 E.A.D. 824, 1989 EPA App. LEXIS 26 (EPA Admr. June 21, 1989), at slip op. 11-12.
50. *See* 1990 Workshop Manual, *supra* note 1, at B.28-B.30. "Energy impacts should consider only direct energy consumption and not indirect energy impacts." *Id*. at B. 29. *See also supra*, text accompanying notes 44-47.
51. 1990 Workshop Manual, *supra* note 1, at B.28. For example, says the Manual, a source may benefit by a control technology involving "combustion of a concentrated gas stream rich in volatile organic compounds," but extra fuel or electricity may be required "to power a control device or incinerate a dilute gas stream." *Id*.
52. 1990 Workshop Manual, *supra* note 1, at B.28. "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)." *Id*. at B.29. If a control technology has inherent energy penalties associated with its use, those penalties should be quantified, but if 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." *Id*.
53. 1990 Workshop Manual, *supra* note 1, at B.28-B.29. The Manual further explains:

    > 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.

    Id. at B.29. *See also* In re General Motors, PSD Appeal No. 01-30, 10 E.A.D. 360, 2002 WL 373982, 2002 EPA App. LEXIS 2 (EAB Mar. 6, 2002), at slip op. 14 ("Typically, any energy implications associated with the use of a control technology should be quantified and factored into the economic impacts analysis.").
54. 1990 Workshop Manual, *supra* note 1, at B.30. The 1978 Guidelines placed considerable emphasis on scarce fuels and locally available coal:

    > [A] scarce fuel is one which is in short supply locally and can better be used for alternative purposes, or one which may not be reason-

The 1990 Workshop Manual suggests in two sample tables that the applicant should calculate and set forth the total project energy demands for each alternative, when compared with a baseline (non-BACT) control alternative, "expressed in equivalent millions of Btus per year."[55] We set forth a fragment of Table B-8 as an illustration.

Perhaps not surprisingly, the Manual makes no attempt to tell the reviewing authority how to weigh the comparative energy consumption demands of the control alternatives when determining whether to eliminate any given option for the next alternative on the list. It is difficult to know how to deal with the information displayed in Table B-8.

TABLE B-8. EXAMPLE 1 — SUMMARY OF ENERGY IMPACT ANALYSIS RESULTS FOR NO_X

Source: Adapted from 1990 Workshop Manual at B.66

	Emissions Per Turbine			Energy Impacts
Control Alternative	lbs/hr	tpy	Emissions reductions over baseline level	Incremental increase over baseline (MMBtu/yr)
13 ppm Alternative	44	22	260	464,000
25 ppm Alternative	84	42	240	30,000
42 ppm Alternative	140	70	212	15,300
NSPS Alternative	312	156	126	8,000
Uncontrolled Baseline	564	282	—	—

The differences in energy consumption demand between the top two alternatives in the table, for example, is dramatically greater than the differences between the second and third alternatives. The top alternative would remove 260 tons per year over the uncontrolled baseline, while using 464,000 MMBtus. The second alternative would remove only 20 tons less per year, while using only 30,000 MMBtus. These differences in energy consumption could be reduced to a difference in economic cost, of course. Because of this, one reviewing authority might decide to give no separate weight to the energy impact factor, choosing instead to include the cost differences in energy demand when considering the economic impact factor. Another reviewing authority might decide, however, that the vast incremental increase in energy consumption—expending 434,000 MMBtus to remove a final 20 tons per year when the first 240 tons per year could be reduced for 30,000 MMBtus—may alone justify the elimination of the first alternative. Presumably, either approach would be appropriate, as long as it was well documented.[56]

D. *Environmental Impacts*

The statutory BACT definition further declares that the permitting authority must take into account environmental impacts when determining BACT on a case-by-case basis.[57] As with the energy impact factor, the top-down approach directs applicants to consider the environmental impact factor during the Step 4 analysis. EPA urges applicants to consider air,[58] water,[59] solid waste,[60] and other[61] environmental impacts, as well as irreversible or irretriev-

> ably available to the source either at present or in the future. . . . Alternatives which require the use of a fuel other than locally or regionally available coal should be discouraged if such a requirement causes significant local economic disruption or unemployment.

1978 Guidelines, *supra* note 41, at 10. *See also* In re General Motors, PSD Appeal No. 01-30, 10 E.A.D. 360, 2002 WL 373982, 2002 EPA App. LEXIS 2 (EAB Mar. 6, 2002), at slip op. 51-52 (reviewing authority "offers no factual support for the claim that natural gas is likely to be a scarce fuel in Michigan").

55. 1990 Workshop Manual, *supra* note 1, at B.66, tbl. B-8 & n.f; *id.* at B.71, tbl. B-10 & n.f.

56. *See, e.g.*, Chipperfield v. Missouri Air Conservation Comm'n, 229 S.W.3d 226 (Mo. App. 2007) (affirming reviewing authority's elimination of the top control technology based in part on its higher energy demand). *Cf.* In re Prairie State Generating Co., PSD Appeal No. 05-05, 13 E.A.D. 1, 2006 EPA App. LEXIS 38 (EAB Aug. 24, 2006), at slip op. 114-16 (finding no clear error in reviewing authority's rejection of dry cooling technology based on energy impacts, even though the impacts were not quantified and the analysis of those impacts was merely narrative).

57. CAA §169(3), 42 U.S.C. §7479(3). As we discuss elsewhere, indirect environmental impacts are ordinarily not considered. *See supra* text accompanying notes 44-47.

58. The 1980 Workshop Manual provided:

> [T]he environmental impacts analysis . . . should consider the maximum ground-level [air quality] impact and ground-level concentrations that would result from the emissions from the proposed new source or modification after each alternative control strategy is applied, as well as the size of the area significantly affected by these increased emissions (i.e., the impact area).

1980 Workshop Manual, *supra* note 34, at I-B-13. Early EPA publications emphasized the role of BACT in protecting the PSD increments. *See, e.g.*, 1978 Guidelines, *supra* note 41, at 11-12 ("In the absence of a more systematic technique (e.g., market-type systems, etc.) for allocating PSD increments, BACT determinations are important for executing such allocations."). *See also* John-Mark Stensvaag, *Preventing Significant Deterioration Under the Clean Air Act: The BACT Requirement and BACT Definition*), 41 ELR 10902 (2011) [hereinafter *BACT Requirement*], at text accompanying notes 11-21.

59. The 1990 Workshop Manual is expansive and demanding:

> 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.

1990 Workshop Manual, *supra* note 1, at B.47.

60. The 1990 Workshop Manual envisions surprisingly detailed analysis:

> 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.

1990 Workshop Manual, *supra* note 1, at B.47-B.48.

61. *See* 1980 Workshop Manual, *supra* note 34, at I-B-14 ("Scrubbers, for example, may affect water quality and land use, whereas strategies using cooling towers may affect visibility."); In re Commonwealth Chesapeake PSD Permit No. 001-00030, PSD Appeal Nos. 96-2, 96-3, 96-4 & 96-5, 1997 WL 94742, 6 E.A.D. 764, 1997 EPA App. LEXIS 3 (EAB Feb. 19, 1997), at slip op. 19-32 (considering but rejecting challenge based on harm to visibility in a National Wildlife Refuge).

able commitments of resources,[62] and to quantify adverse and beneficial effects whenever possible.[63]

As with energy impacts, there are cases in which a less-demanding technology than the one at the top has been selected based on the environmental impact factor.[64]

The 1990 Workshop Manual explains how EPA intends to approach the issue of environmental impacts:

> The environmental impacts analysis is not to be confused with the air quality impact analysis (i.e., ambient concentrations), which is an independent statutory and regulatory requirement and is conducted separately from the BACT analysis. . . . 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. . . .
>
> 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. . . . 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 similar to 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. . . .[65]

It makes sense to consider local conditions when evaluating environmental impacts.[66] Thus, for example, if a source is located in an ozone or nitrogen dioxide (NO_2) nonattainment area, the reviewing authority may decide to eliminate an option that would significantly increase nitrogen oxide (NO_x) emissions.[67]

The 1978 Guidelines (written at a time when the Agency subscribed to a bottom-up approach), provided the following advice:

> The net environmental impact associated with each alternative emission control system should be determined. Both beneficial impacts (e.g., reduced emissions attributed to a control system) and adverse impacts (e.g., exacerbation of another pollution problem through use of a control system) should be discussed and quantified.[68]

It was once said that "BACT can only be made more stringent (not less) by environmental considerations."[69] This statement is no longer correct, however, because it was made when EPA was committed to the bottom-up approach.[70] Under the top-down approach, the applicant is free to argue that the top option should be eliminated because of adverse environmental impacts; if successful, this claim will lead to a less stringent BACT.[71] Moreover, even where the applicant is willing to accept the most

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62. *See* 1990 Workshop Manual, *supra* note 1, at B.48 ("alternative emission control systems may involve a trade-off between short-term environmental gains at the expense of long-term environmental losses and . . . may result in irreversible or irretrievable commitment of resources [such as] scarce water resources"). *See also* In the Matter of Old Dominion Electric Cooperative, PSD Appeal No. 91-39, 1992 WL 92372, 3 E.A.D. 779, 1992 EPA App. LEXIS 37 (EPA Admr. Jan. 29, 1992), at slip op. 29 ("if the most effective technology would impose exceptional demands on local water resources . . . the applicant would have a sound basis for foregoing use of the most effective technology in favor of some less water-intensive technology").
63. "[T]he 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. 1990 Workshop Manual, *supra* note 1, at B.46 (emphasis added). *See also id.* at B.7; In re General Motors, PSD Appeal No. 01-30, 10 E.A.D. 360, 2002 WL 373982, 2002 EPA App. LEXIS 2 (EAB Mar. 6, 2002), at slip op. 50 (rejecting applicant's assertion that an unquantified increase in nitrogen oxide (NO_x) emissions justified elimination of the top technology, because "general unquantified concerns about collateral impacts, without more, do not justify the rejection of a more stringent technology"); In re Three Mountain Power PSD Permit No. 99-PO-01, PSD Appeal No. 01-05, 2001 WL 624778, 2001 EPA App. LEXIS 7 (EAB May 30, 2001), at slip op. 46 (rejecting petitioner's claim that ammonia emissions from the chosen technology would lead to violation of California's PM_{10} standard, because "[t]he Board will not overturn a permit provision based on speculative arguments"). At least one petitioner, who argued that a hypothetical catastrophic failure of the chosen technology was a collateral environmental impact mandating rejecting of the chosen technology, was denied relief because the EAB concluded that the petitioner's claims were too speculative. *See* In re Kawaihae Cogeneration Project PSD/CSP Permit No. 0001-01-C, PSD Appeal Nos. 96-9, 96-10, 96-11, 96-14 & 96-16, 1997 WL 221391, 7 E.A.D. 107 (EAB Apr. 28, 1997), at slip op. 20-30.
64. *See, e.g.*, Chipperfield v. Missouri Air Conservation Comm'n, 229 S.W.3d 226, 240 (Mo. App. 2007) (second-best technology did a better job controlling most hazardous air pollutants and PM and, unlike the top technology, did not produce a wastewater stream that would require disposal).
65. 1990 Workshop Manual, *supra* note 1, at B.45-B.46
66. *See* In the Matter of Columbia Gulf Transmission Co., PSD Appeal No. 88-11, 1989 WL 266361, 2 E.A.D. 824, 1989 EPA App. LEXIS 26 (EPA Admr. June 21, 1989), at slip op. 8 ("the primary purpose of the collateral impacts clause . . . is to focus on local impacts that constrain the source from using the most effective technology").
67. *See* Interim Phase I Report, *supra* note 5, at 16.
68. 1978 Guidelines, *supra* note 41, at 11.
69. Memorandum of Gary McCutchen, to Bruce Miller re Huntsville Incinerator-Determining Best Available Control Technology (Apr. 22, 1987), at 3. *See also* Rolf R. von Oppenfeld et al., *A Primer on New Source Review and Strategies for Success*, 32 ELR 11091, 11100 (Sept. 2002) ("EPA has taken the position that environmental assessments should be used only to make BACT more stringent, not less stringent.").
70. *See BACT Determination Part I*, *supra* note 6, at text accompanying notes 29-37. The statement became obsolete and inaccurate within two months of its issuance. The EPA memorandum setting forth this principle was authored on April 22, 1987. *See* Memorandum of Gary McCutchen, *supra* note 69. The *Honolulu Resource Recovery Facility* decision signaling EPA's switch to the top-down approach was issued on June 22, 1987. *See* Stensvaag, *BACT Determination Part I*, at text accompanying note 36 and note 36.
71. *See, e.g.*, In re Power Holdings of Illinois, PSD Appeal No. 09-04, 2010 WL 3258141, 2010 EPA App. LEXIS 35 (EAB Aug. 13, 2010), at slip op. 31-40 (discussing Sierra Club argument that the concededly top control alternative should have been eliminated on the basis of collateral impacts).

stringent technology, the reviewing authority (sometimes nudged by environmental advocates) may conclude that adverse environmental impacts make that option inappropriate.[72] Accordingly, the 1990 Workshop Manual emphasizes that the applicant's acquiescence in the top technology does not dispense with the requirement to consider environmental impacts:

> If the applicant accepts the top alternative in the listing as BACT, 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. . . .[73]

There is one circumstance in which the environmental impact analysis might be said to lead to a more stringent BACT, although whether it truly does so may be a matter of semantics. Assume that analysis of the economic impacts leads the reviewing authority to conclude initially that the second-best, rather than the top, technology should be chosen as BACT. Analysis of the environmental impacts of the second-best technology might conceivably cause the reviewing authority to reverse its initial conclusion; if the adverse environmental impacts of the second-best technology are unacceptable, the top technology might be selected as BACT, notwithstanding its significant economic impacts.[74]

Although EPA has made much of the idea that collateral impacts must be quantified, the sample tables set forth in the 1990 Workshop Manual provide nothing in the way of hard numbers. We set forth a fragment of Table B-8 as an illustration.

TABLE B-8. EXAMPLE 1 — SUMMARY OF ENVIRONMENTAL IMPACT ANALYSIS RESULTS FOR NO_X

Source: Adapted from 1990 Workshop Manual at B.66

Control Alternative	tpy	Emissions reductions over baseline level	Environmental Impacts: Toxics Impact (Yes/No)	Environmental Impacts: Adverse Environmental Impact (Yes/No)
13 ppm Alternative	22	260	Yes	No
25 ppm Alternative	42	240	No	No
42 ppm Alternative	70	212	No	No
NSPS Alternative	156	126	No	No
Uncontrolled Baseline	282	—	—	—

In fairness to EPA, potential impacts on the environment are so numerous and variable that quantification on the sample table would have been a difficult undertaking. Nevertheless, the Agency could have selected a limited number of potential environmental impacts and displayed them in a quantified manner.

E. Environmental Impacts of Unregulated Pollutants

The Step 4 analysis of environmental impacts must also consider the effects of the alternative control technologies on the emissions of pollutants not regulated under the Clean Air Act (CAA).[75] Analysis of such pollutants may affect the ultimate choice of BACT:

> [C]onsideration 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*[76] remand. . . . 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.[77]

Although the environmental impacts of unregulated pollutants must be considered in the Step 4 analysis, this does not necessarily mean that an emission limitation for an unregulated pollutant may be promulgated as a BACT standard, at least by EPA.[78]

72. *See, e.g.*, Chipperfield v. Missouri Air Conservation Comm'n, 229 S.W.3d 226, 240-43 (Mo. App. 2007) (affirming selection of second-best technology based on environmental factors).
73. 1990 Workshop Manual, *supra* note 1, at B.7. *See also id.* at B.46 ("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).").
74. *See* In the Matter of Columbia Gulf Transmission Co., PSD Appeal No. 88-11, 1989 WL 266361, 2 E.A.D. 824, 1989 EPA App. LEXIS 26 (EPA Admr. June 21, 1989), at slip op. 8 n.5 ("the permitting authority could ultimately conclude that . . . adverse economic impacts are outweighed by adverse collateral environmental impacts associated with the less effective control option").
75. 42 U.S.C. §§7401-7671q, ELR Stat. CAA §§101-618. *See* 1990 Workshop Manual, *supra* note 1 at B.49; 57 Fed. Reg. 18070, 18075 (Apr. 28, 1992) ("the impact on emissions of other pollutants, including unregulated pollutants, must be taken into account in determining BACT for a regulated pollutant"); 54 Fed. Reg. 52823, 52825 (Dec. 22, 1989) (reviewing authority must "consider the environmental impacts of the various control alternatives on emissions of unregulated pollutants"); In re Knauf Fiber Glass PSD Permit No. 97-PO-06, PSD Appeal Nos. 98-3 through 98-20, 1999 WL 64235, 8 E.A.D. 121, 1999 EPA App. LEXIS 2 (EAB Feb. 4, 1999), at slip op. 98 n.56 ("It is legitimate to consider unregulated pollutants as a collateral environmental impact in the context of the BACT determination.").
76. North County Resource Recovery Associates, PSD Appeal No. 85-2, 2 E.A.D. 229, 1986 WL 80843, 1986 EPA App. LEXIS 14 (EPA June 3, 1986).
77. 1990 Workshop Manual, *supra* note 1, at B.52. *See, e.g.*, In the Matter of Texas Industries, PSD Appeal 86-2, 1986 WL 80840, 2 E.A.D. 277, 1986 EPA App. LEXIS 17 (EPA Admr. Sept. 24, 1986) at slip op. 3 n.2 (odor, as a nonregulated pollutant, can be taken into account as an environmental impact when making the BACT determination); In the Matter of Genesee Power Station, PSD Appeal Nos. 93-1 through 93-7, 1993 WL 484880, 4 E.A.D. 832, 1993 EPA App. LEXIS 23 (EAB Oct. 22, 1993), at slip op. 38 (unregulated pollutants must be considered in Step 4 "whenever choosing one control technology over another for a regulated pollutant has the incidental effect of increasing or decreasing emissions of unregulated pollutants").
78. *See* In re Inter-Power of New York, PSD Appeal Nos. 92-8 & 92-9, 1994 WL 114949, 5 E.A.D. 130, 1994 EPA App. LEXIS 33 (EAB Mar. 16, 1994), at slip op. 55 (reviewing authority not required to examine control technologies aimed at controlling unregulated pollutants, and stating "[u]nless the advocated additional control technology is available for the primary purpose of controlling emissions of regulated pollutants, the permit issuer is not required to include that control technology in the BACT analysis"). One trio of authors explains:

F. Economic Impacts

For the last of the three collateral impacts,[79] the statutory BACT definition declares that the permitting authority must take into account economic impacts when determining BACT on a case-by-case basis.[80] As with the energy and environmental impact factors, the top-down approach directs applicants to consider the economic impact factor during the Step 4 analysis and further directs applicants who wish to rely on economic impacts to eliminate one or more technologies to provide concrete, specific information, rather than vague allegations.[81]

G. The Uncertain Purpose and Role of the Economic Impact Analysis

EPA seems conflicted about the purpose and role of the economic impact analysis in determining BACT. On the one hand, EPA, reviewing courts, and others have sometimes acted as if the purpose of the economic impact analysis is to determine whether the applicant can afford to implement the top technology. In its 1978 Guidelines, the Agency discussed capital availability—"the difficulty that some sources may face in financing alternative control systems"—and declared that "[p]roof of such claims should be fully documented."[82] The 1980 Workshop Manual similarly stated: "The ability to secure financing is a critical consideration. If an applicant's plans to expand a plant require outside financing, additional financing required for an alternative control strategy may jeopardize the financing of the entire project."[83] These statements about the applicant's ability to pay were made within the first five years of the prevention of significant deterioration (PSD) program and in the context of the bottom-up approach. As we will see, more recent EPA pronouncements are far less attentive to the applicant's financial status.

Nevertheless, more recent statements by other actors continue to emphasize the applicant's wealth. In 2004, the U.S. Supreme Court sustained EPA's disapproval of a state-determined BACT standard, stressing that the reviewing authority had failed to explain how it could rely on the economic impact analysis to eliminate the top control technology, since the applicant had refused to supply financial information showing the impact of that technology on its operation, profitability, and competitiveness.[84] In 2010, the Climate Change Work Group of the Clean Air Act Advisory Committee reported consensus on the view that "[t]he BACT economic impact assessment considers the ability of the source to bear the cost of air pollution controls."[85] This statement, too, supports the notion that an applicant's financial status is important.[86]

On the other hand, EPA seems to have reversed field in 1990, emphasizing that the profitability of the permit applicant and its ability to bear the costs of the various alternatives has little if any relevance to the BACT determination:

> In the economical 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 average and,

> [I]f 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. 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.

Michael L. Wilson et al., *A Critical Review of the Environmental Protection Agency's Standards for "Best Available Control Technology" Under the Clean Air Act*, 20 ELR 10067, 10071 (Feb. 1990). This seems accurate. States, however, are always free to impose more stringent requirements under CAA §116, 42 U.S.C. §7416. Thus, a state-issued PSD permit could contain an emission limitation for an unregulated pollutant.

79. Technically, the statute directs the reviewing authority to take into account "energy, environmental, and economic impacts *and other costs*." CAA §169(3), 42 U.S.C. §7479(3) (emphasis supplied). We have never seen an instance in which EPA has addressed anything in this ostensible fourth category of collateral impact factors.

80. CAA §169(3), 42 U.S.C. §7479(3).

81. *See* 1990 Workshop Manual, *supra* note 1, at B.30-B.45. EPA has said:

> [I]t is not sufficient to reject a control technology by merely asserting that it is "too costly." Rather, claims that economic (or other) factors render a technology or emission limit not achievable must be supported by an analysis utilizing readily available objective indicators of adverse impacts. . . . Rejection of a control technology by a reviewing agency must have a rationale arrived at after full consideration of data determined in a consistent and sound manner.

Background Statement, *supra* note 42, at 7.

82. 1978 Guidelines, *supra* note 41, at 15. The guidelines distinguished direct cost from local economic impacts. In connection with the latter, the document provides:

> [A] BACT alternative may alter the economics of a project to the point where the decision would be made to cancel the construction or expansion of a facility, to relocate a plant, to reduce the scale of operation, or to change the production mix. The local economic impacts of such decisions should be assessed in terms of local employment effects including number of jobs, dollars paid in salaries, and changes in employee skill levels required. The guideline does not imply that the BACT decision should force new projects to the brink of cancellation.

Id.

83. 1980 Workshop Manual, *supra* note 34, at I-B-12. That Manual also expressed concerns about competitive disadvantage in the marketplace, declaring "if an additional 5 cents per pound of product for emission control creates an intolerable increased product cost, the applicant should include that information." *Id*.

84. *See* Alaska Dept. of Environmental Conservation v. EPA, 540 U.S. 461, 479-80, 34 ELR 20012 (2004). *See also* David M. Driesen, *Distributing the Costs of Environmental, Health, and Safety Protection: The Feasibility Principle, Cost-Benefit Analysis, and Regulatory Reform*, 32 B.C. Envtl. Aff. L. Rev. 1, 12 (2005) (the Court "recognized that consideration of cost in a regulation subject to the feasibility principle requires comparison of the costs of pollution control to the economic capabilities of facilities").

85. Interim Phase I Report, *supra* note 5, at 15.

86. *See also* Wilson et al., *supra* note 78, at 10069 (the 1978 Guidelines and 1980 Workshop Manual "cautioned that the BACT determination should not force new projects to the brink of cancellation").

> 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.[87]

Although the foregoing paragraph contains a few weasel words,[88] its overall language suggests that the economic impact analysis is not designed to ascertain what the permit applicant can afford. Rather, "[t]he principal purpose of the cost analysis is to determine if there are significant cost differences between the applicant and other sources that have adopted the control technology under review."[89] Under this view, the economic impact analysis is designed to "prevent BACT determinations . . . that are so much more expensive than the norm that a *typical source* could not reasonably be built."[90]

The 1990 Workshop Manual places no emphasis that we can find on the financial capabilities of the applicant. Instead, the focus is on whether the use of the top technology at the applicant's facility will cost a great deal more, because of special circumstances, than the use of the same option at similar facilities that have already implemented that technology:

> [W]here 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. . . .
>
> BACT is primarily a technology-based standard. . . . [I]f 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. . . .
>
> To justify elimination of an alternative on these grounds, the applicant should demonstrate . . . 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. . . .[91]

EPA's current position, therefore, seems to be that the applicant's relative wealth or poverty are irrelevant to the BACT determination.[92] This makes sense. Because the law requires conformance to BACT, a permit applicant unable to afford BACT should not receive a PSD permit. What matters instead, when engaging in the economic factor analysis, is whether the costs of the top technology to this applicant are unreasonably out of line with the costs for similar controls at other facilities.

H. Quantifying Economic Impacts

The 1990 Workshop Manual spells out in considerable detail how applicants should quantify the economic impacts of each alternative technology. For consistency in implementing the top-down approach throughout the

87. 1990 Workshop Manual, *supra* note 1, at B.30. As long ago as 1987, in discussing the general irrelevance of the applicant's financial status, Gary McCutchen, then-Chief of the New Source Review Section, dismissed an applicant's argument that it had already made contractual commitments that would make application of the top technology economically infeasible:

> In most cases, this type of argument should be ignored. A reviewing agency is no more bound by an applicant's unfounded assumption regarding what level of control will constitute BACT than a bank is bound by an assumption of a certain interest rate on the applicant's loan or a supplier by an assumption on the applicant's part regarding the costs of materials or equipment. This is one case where it is acceptable for a BACT determination to make it uneconomical for a source to construct.
>
> The EPA has no choice other than to ignore such arguments. If financial agreements like this were taken into account, applicants could simply sign contracts based on meeting the NSPS or even using no control whatsoever, then use those contracts to justify the level of control that they preselected. . . .
>
> Since an applicant can bias the economics of a proposed project towards a less stringent control option, it is best in nearly all cases to evaluate the costs of controls against established norms. . . . These types of approaches help to bring nationwide consistency to the BACT determinations while still allowing for a case-by-case determination. . . .
>
> The demonstration deserves special scrutiny when the applicant claims that an established control option would prevent the source from being constructed. . . . EPA cannot be placed in the position of allowing less stringent (or no) controls simply because an applicant cannot afford what similar sources are required to use. . . .
>
> In most cases, a source simply should not be granted a permit if financing is inadequate for proper controls.

Memorandum of Gary McCutchen, *supra* note 69, at 3-4.

88. Two phrases, in particular, are ambiguous: (1) "applicants generally should not propose elimination . . . on the basis of . . . affordability . . . to the source," and (2) "the economic impact . . . on the particular source . . . should be not nearly as pertinent . . . as . . . average and . . . incremental cost effectiveness." Such language leaves open the argument that a permit applicant's financial situation is germane to the BACT determination.
89. In re General Motors, PSD Appeal No. 01-30, 10 E.A.D. 360, 2002 WL 373982, 2002 EPA App. LEXIS 2 (EAB Mar. 6, 2002), at slip op. 13.
90. Memorandum of Gary McCutchen, *supra* note 69, at 4 (emphasis added).
91. 1990 Workshop Manual, *supra* note 1, at B.30, B.43-B.44.
92. *See* von Oppenfeld et al., *supra* note 69, at 11101 ("the economic impact analysis focuses on quantifying the cost of control and not on the fiscal health of the source").

country, the applicant is urged to follow EPA's Control Cost Manual[93] in calculating the costs of control,[94] the average cost-effectiveness, and the incremental cost-effectiveness.[95] The Manual explains:

> Cost effectiveness is the economic criterion used to assess the potential for achieving an objective at least cost. Effectiveness is measured in terms of tons of pollutant emissions removed. Cost is measured in terms of annualized control costs.[96]
>
> The Cost effectiveness calculations can be conducted on an average, or incremental basis. . . .
>
> Average cost effectiveness [is the] total annualized costs of control divided by annual emission reductions, or the difference between the baseline[97] emission rate and the controlled emission rate . . . .
>
> The incremental cost effectiveness calculation compares the costs and emissions performance level of a control option to those of the next most stringent option . . .
>
> Cost effectiveness (dollars per ton of pollutant reduced) 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. . . .[98]

Perhaps the best way to grasp this quantification approach is to examine one of the sample tables set forth in the 1990 Workshop Manual. We set forth a fragment of Table B-8 as an illustration.

TABLE B-8. EXAMPLE 1 — SUMMARY OF ECONOMIC IMPACT ANALYSIS RESULTS FOR NO_X

Source: Adapted from 1990 Workshop Manual at B.66

			Economic Impacts		
Control Alternative	tpy	Emissions reductions over baseline level	Total annualized cost ($/y)	Average cost effectiveness over baseline ($/ton)	Incremental cost effectiveness ($/ton)
13 ppm Alternative	22	260	1,717,000	6,600	56,200
25 ppm Alternative	42	240	593,000	2,470	8,460
42 ppm Alternative	70	212	356,000	1,680	800
NSPS Alternative	156	126	288,000	2,285	
Uncontrolled Baseline	282	—	—	—	—

The top technology in this sample table removes 260 tons per year from the emissions that would occur from an uncontrolled facility (the baseline emissions), at an average annual cost of $6,600 per ton. The second-best technology removes 240 tons per year from the baseline emissions—only 20 tons less per year than the top technology—at an average annual cost of $2,470 per ton. Moreover, even though the annual *average* cost per ton for the top technology is $6,600, the *incremental* cost to remove the final 20 tons per year—costs that would not be incurred if the second-best technology were chosen—is $56,200 per ton.[99]

I. *When Do Economic Impacts Justify Elimination of a Technology?*

The foregoing illustration is highly clarifying. It is easy to see that removal of 260 tons annually from the baseline emissions (the top technology), rather than 240 tons (the second-best technology), comes at a steep price of $56,200 per ton for removal of the final 20 tons, a number that seems far out of proportion to the average control costs exhibited elsewhere in the table. But what is to be done with this information? The answer, uncomfortable as it may be, is that the reviewing authority has the discretion to determine whether these calculations justify elimination of the top technology. The one thing that EPA will insist on is documentation of the type displayed in the table.[100] The

93. Office of Air Quality Planning and Standards, EPA Air Pollution Control Cost Manual (6th ed. 2002), *available at* http://www.epa.gov/oaqps001/lead/pdfs/2002_01_cost_control_%20manual.pdf.

94. The costs of control for each alternative technology cannot be calculated without first specifying the control system design parameters corresponding to the emission levels. *See* 1990 Workshop Manual, *supra* note 1, at B.31. "[E]quipment vendors will usually supply the design parameters to the applicant." *Id.* at B.32.

95. *See* 1990 Workshop Manual, *supra* note 1, at B.34.

96. One engineer has cautioned applicants to calculate emissions based on the true hours of operation—based on physical restraints or enforceable operating limits—rather than an assumption that the facility will operate around the clock on a year-round basis. *See* 30 Curr. Dev. Env't. Rep. (BNA) 416 (1999). He cited an example in which a technology with an estimated year-round operation cost of $10,156 per ton of pollutant removed had a true per-ton cost of $22,043, once the legal restriction to 2,000 operating hours per year was factored in. *See id.*

97. "[B]aseline emissions are essentially uncontrolled emissions, calculated using realistic upper boundary operating assumptions." 1990 Workshop Manual, *supra* note 1, at B.36.

98. 1990 Workshop Manual, *supra* note 1, at B.30, B.35-B.40. *See also* 61 Fed. Reg. 38250, 38273 n.44 (July 23, 1996) ("incremental cost effectiveness is the difference in cost per ton of emissions reduced at the next most stringent level of control, when comparing two control options").

99. A further complication is that some technologies can be selected to operate with different removal efficiencies. The 1990 Workshop Manual explains:

> [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, 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.

1990 Workshop Manual, *supra* note 1, at B.23. *See also* In re Steel Dynamics PSD Permit No. CP-183-10097-00030, PSD Appeal Nos. 99-4 & 99-5, 2000 WL 833062, 9 E.A.D. 165, 2000 EPA App. LEXIS 18 (EAB June 22, 2000), at slip op. 71 & n.33 (rejecting petitioner's claim that applicant had failed to consider a sufficient variety of removal efficiency levels).

100. *See, e.g.*, 41 [Curr. Dev.] Env't. Rep. (BNA) 33 (2010) (describing EPA order directing reviewing authority to conduct a new cost analysis on the use of low-sulfur fuel at a power plant); In re General Motors, PSD Appeal No. 01-30, 10 E.A.D. 360, 2002 WL 373982, 2002 EPA App. LEXIS 2 (EAB Mar. 6, 2002), at slip op. 45 (the reviewing authority "has simply not provided sufficient data to substantiate its conclusion"); In re Steel Dynamics PSD Permit No. CP-183-10097-00030, PSD Appeal Nos. 99-4 & 99-5,

Agency has also cautioned against reliance on misleading data,[101] and has especially warned against undue reliance on incremental costs.[102]

When it comes to second-guessing the reviewing authority's judgment on the bottom line decision, however, EPA has given us only general guidance.[103] The table does not provide any information on the issue that seems most important to EPA's thinking: whether the costs of the top technology to this applicant are unreasonably out of line with the costs for similar controls at other facilities.[104] To address this question, the reviewing authority must consider data about recently installed control technologies and recently developed BACT standards.[105]

2000 WL 833062, 9 E.A.D. 165, 2000 EPA App. LEXIS 18 (EAB June 22, 2000), at slip op. 98 ("where the top . . . candidate . . . is found to be inappropriate due to economic impacts, the rationale for the finding should be 'fully documented for the public record'").

101. *See, e.g.*, 1990 Workshop Manual, *supra* note 1, at B.44 ("the capital cost of a control option may appear excessive when presented by itself or as a percentage of the total project cost [but] this type of information can be misleading").

102. The 1990 Workshop Manual declares: "[U]ndue focus on incremental cost[-]effectiveness can give an impression that the cost of a control alternative is unreasonably high, when, in fact, the cost-effectiveness, in terms of dollars per total ton removed, is well within the normal range of acceptable BACT costs." 1990 Workshop Manual, *supra* note 1, at B.30, B.35-B.40. The EAB has further explained:

> This caution against allowing incremental cost calculations to unjustifiably inflate the cost component of the BACT analysis is in keeping with the objective of the CAA that less effective control technologies be employed only when the source-specific economic impacts or other costs prevent a source from using a more effective technology. . . .

In re General Motors, PSD Appeal No. 01-30, 10 E.A.D. 360, 2002 WL 373982, 2002 EPA App. LEXIS 2 (EAB Mar. 6, 2002), at slip op. 28-29. The reviewing authority in *General Motors* had rejected the top technology, with an average cost of $5,554 per ton and an incremental cost of $21,349 per ton, as well as the second-best technology, an average cost of $3,604 per ton and an incremental cost of $10,709 per ton, in favor of the third technology, having an average cost-effectiveness of $1,637 per ton. Declaring that "[i]t is inappropriate to eliminate a control option solely on the basis of incremental cost," and concluding that the reviewing authority had done precisely that, the Board found the BACT standard to be inadequate. *Id.* at slip op. 29-37. *But see* In re Commonwealth Chesapeake PSD Permit No. 001-00030, PSD Appeal Nos. 96-2, 96-3, 96-4 & 96-5, 1997 WL 94742, 6 E.A.D. 764, 1997 EPA App. LEXIS 3 (EAB Feb. 19, 1997), at slip op. 31 (sustaining elimination of a technology whose incremental cost "would be nearly four times the incremental per-ton costs incurred by the only other similar source to have utilized the technology").

103. *See* Wilson et al., *supra* note 78, at 10071:

> 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 [but] it will be very difficult for a source to establish that economic impacts dictate imposition of less than the most stringent control technology.

James E. McCarthy, EPA's BACT Guidance for Greenhouse Gases From Stationary Sources, CRS Report for Congress 18 (Nov. 22, 2010) (GHG guidance document "provides no cost thresholds . . . [but] focuses on the discretionary authority that states have in determining BACT"). *Cf.* Interim Phase I Report, *supra* note 5, at 15 (Work Group "could not reach consensus on the issue of establishing cost-effectiveness thresholds" for GHG removal technology).

104. *See* In re Steel Dynamics PSD Permit No. CP-183-10097-00030, PSD Appeal Nos. 99-4 & 99-5, 2000 WL 833062, 9 E.A.D. 165, 2000 EPA App. LEXIS 18 (EAB June 22, 2000), at slip op. 91 ("In most cases, a control option is determined to be economically achievable if its cost-effectiveness is within the range of costs being borne by other sources of the same type to control the pollutant.").

105. *See* von Oppenfeld et al., *supra* note 69, at 11101 ("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").

J. *Step 4 Illustration: Eliminating Transferable Technologies*

In re Steel Dynamics[106] provides an excellent illustration in which a transferable control technology was eliminated by the Step 4 analysis. Petitioners in that case claimed that an electric arc furnace (EAF) at the applicant's proposed steel mill should be required to employ selective catalytic reduction (SCR) technology to reduce NO_x emissions. The EAB agreed with the applicant's claim that SCR would constitute a "technology transfer" situation in the EAF context, because no other EAF that it was aware of used an SCR for NO_x reduction. In sustaining the reviewing authority's elimination of the SCR option, the Board endorsed the following reasoning:

> SCR systems are highly susceptible to catalyst poisoning due to contamination of the catalyst by reactive materials entrained in the EAF gas stream. Other problems with catalysts are their propensity to fouling and masking. . . . The problems with catalyst poisoning, fouling, and masking would, at a minimum, require the placement of the SCR unit downstream of the particulate control device (baghouse). Because SCR catalysts require high gas stream temperatures (500 to 1,100 EF), the gas stream would have to be reheated from approximately 200 EF to the proper operating temperature for the catalyst. This would require substantial energy expenditure (natural gas combustion) and result in additional NO_x emissions, not to mention CO emissions. SCR catalyst suppliers and manufacturers that were contacted confirm the above problems. Therefore, this technology is considered technically infeasible.[107]

Even though the Board used the Step 2 language of infeasibility, the foregoing reasoning seems best characterized as an analysis of the Step 4 factors.[108] The technology seems to have been eliminated based on a finding of adverse energy and environmental impacts unique to the applicant's facility.

VIII. Top-Down Step 5: Specifying the BACT Emission Limitation

Step 5 of the top-down approach is fairly straightforward: "The most effective control alternative not eliminated in Step 4 is selected as BACT."[109] Thus, the initial work of Step 5 is completed by the accomplishment of Step 4. We must remember, however that BACT—as applied to the PSD permit applicant—is not a specified technology, but

106. In re Steel Dynamics PSD Permit No. CP-183-10097-00030, PSD Appeal Nos. 99-4 & 99-5, 2000 WL 833062, 9 E.A.D. 165, 2000 EPA App. LEXIS 18 (EAB June 22, 2000).

107. In re Steel Dynamics PSD Permit No. CP-183-10097-00030, PSD Appeal Nos. 99-4 & 99-5, 2000 WL 833062, 9 E.A.D. 165, 2000 EPA App. LEXIS 18 (EAB June 22, 2000), at slip op. 68-69.

108. This is just one example of the inevitable blurring of the top-down steps. *See BACT Determination Part I*, *supra* note 6, at note 91.

109. 1990 Workshop Manual, *supra* note 1, at B.52.

an emission limitation.[110] Accordingly, what really happens in Step 5 is that "BACT is set as an emissions limit for a specific pollutant that is appropriate for the selected control method."[111]

Specifying the correct emission limitation for the selected technology is not a mechanical, predictable process, but a discretionary one requiring judgment:

> Disputes have arisen in cases where, as here, evidence in the record establishes a range of emissions rates for the most stringent control alternative and the permit issuer has, at step 5 of the top-down analysis, set the permit's BACT limit at a lower rate within the range than the petitioners believed appropriate. . . .
>
> Petitioners argue that [the reviewing authority] improperly used so-called safety factors in explaining why the selected emissions limits are less stringent than the most stringent emissions rates demonstrated at other facilities. . . .
>
> [W]e have approved the use of a safety factor to take into account variability and fluctuation in expected performance of the pollution control methods . . . . [W]here the technology's efficiency at controlling pollutant emissions is known to fluctuate, setting the emissions limitation to reflect the highest control efficiency would make violations of the permit unavoidable. . . .
>
> Thus, we have held that a permit writer is not required to set the emissions limit at the most stringent emissions rate that has been demonstrated by a facility using similar emissions control technology. . . . Instead, permit writers retain discretion to set BACT levels that do not necessarily reflect the highest possible control efficiencies but, rather, will allow permittees to achieve compliance on a consistent basis.[112]

IX. Observations on the Top-Down Approach

Anyone who has attempted to classify analytical steps and develop a perfect flow chart recognizes that some thought processes are difficult to pigeonhole. Reasonable people can make such observations as "this part of the analysis should really be in Step 3 rather than in Step 4." EPA's top-down approach for determining BACT can be criticized on these grounds. Indeed, applicants have sometimes been dinged for incorrectly considering costs, for example, in Step 1 or Step 2, when they should have been addressed only in Step 4.[113]

In truth, however, the top-down approach is an elegantly crafted, thoughtful attempt to construct a practical and predictable methodology for undertaking the challenging multifactored decisionmaking mandated by the statutory BACT definition. A fair-minded person would probably have to concede that the officials who developed the method have made a commendable effort to be faithful to the statutory command that BACT must be developed by considering multiple variables on a case-by-case basis. Perhaps this is why industry seems to have made its peace with a methodology that it initially opposed in court.[114]

X. The BACT Determination Cutoff Date

There remains to be addressed one final, mopping up issue: at what point in time may the applicant and the reviewing authority cease their efforts to locate and evaluate the latest and greatest pollution control technologies? We refer to this as the BACT determination cutoff date.[115]

Two competing values are at stake. On the one hand, permit applicants understandably seek reliable, fixed answers when deciding whether to proceed with proposed construction projects; for them, the prospect of trying to cope with a continually evolving database of potential BACT technologies is discouraging. On the other hand, "[t]he need to base the permit determination on current information is fundamental to any determination of BACT, for old technologies are constantly being replaced by newer and more advanced ones."[116]

In its 1996 proposals for reform of the new source review regulations, EPA proposed to "authorize the permitting authority to cut off consideration of technologies that evolve or appear after the permit application is complete, except under limited circumstances."[117] This proposal

110. *See BACT Requirement*, *supra* note 58, at text accompanying notes 126-31.

111. In re Desert Rock Energy Co., 2009 WL 3126170, 2009 EPA App. LEXIS 28 (EAB Sept. 24, 2009), at slip op. 104. *See also* In re Prairie State Generating Co., PSD Appeal No. 05-05, 13 E.A.D. 1, 2006 EPA App. LEXIS 38 (EAB Aug. 24, 2006), at slip op. 130 ("Because BACT means an emission limitation . . . rather than a particular pollution control technology, the permit issuer sets as BACT an emission limit or limits achievable by the facility using the selected emissions control alternative."); Permitting Guidance for Greenhouse Gases, *supra* note 4, at 18 (Step 5 "includes the development of an emissions limitation that is achievable by the particular source using the selected control strategy").

112. In re Prairie State Generating Co., PSD Appeal No. 05-05, 13 E.A.D. 1, 2006 EPA App. LEXIS 38 (EAB Aug. 24, 2006), at slip op. 131-32, 140-43. *See also* In re Newmont Nevada Energy Investment, TS Power Plant, 2005 WL 3626598, 2005 EPA App. LEXIS 29 (EAB 2005), at slip op. 35; In re Steel Dynamics PSD Permit No. CP-183-10097-00030, PSD Appeal Nos. 99-4 & 99-5, 2000 WL 833062, 9 E.A.D. 165, 2000 EPA App. LEXIS 18 (EAB June 22, 2000), at slip op. 58 ("There is nothing inherently wrong with setting an emission limitation that takes into account a reasonable safety factor.").

113. *See, e.g.*, In re Desert Rock Energy Co., 2009 WL 3126170, 2009 EPA App. LEXIS 28 (EAB Sept. 24, 2009), at slip op. 135 (arguments about technical viability or economics are inapplicable at Step 1); In re Knauf Fiber Glass PSD Permit No. 97-PO-06, PSD Appeal Nos. 98-3 through 98-20, 1999 WL 64235, 8 E.A.D. 121, 1999 EPA App. LEXIS 2 (EAB Feb. 4, 1999), at slip op. 24 (costs cannot render a control option infeasible under Step 2, but must be addressed in Step 4).

114. *See BACT Determination Part I*, *supra* note 6, at text accompanying notes 43-47.

115. Other authors have referred to this as "the temporal scope of PSD review." Wilson et al., *supra* note 78, at 10074 (the issues "include when an applicant may permissibly terminate his search for an available technology . . . 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").

116. In the Matter of Columbia Gulf Transmission, PSD Appeal No. 88-11, 1990 WL 324099, 1990 EPA App. LEXIS 38 (EPA Admr. July 3, 1990), at slip op. 6.

117. 61 Fed. Reg. 38250, 38276 (July 23, 1996). *See also id*. at 38340, *proposing new* 40 C.F.R. §52.21(j)(5)(iii). At one time, EPA spoke as if the BACT determination cutoff date was the date for the close of public comment.

would have provided applicants with some of the certainty they seek. However, the proposal was never adopted.[118]

Instead, the BACT determination cutoff date applied by EPA is much later and far less friendly to permit applicants than the date of the completed permit application:

> The BACT . . . determination . . . is not set until the final permit is issued. We are reaffirming this policy. . . .
>
> [I]t is the responsibility of the source to investigate all available and pending[119] control technologies for consideration as BACT or LAER. Hence, if the source has done a thorough investigation, a change in the permit conditions between the proposed and final permit should have been anticipated by the source. . . .
>
> [E]stablishing a cutoff date at any time prior to the public comment period would limit public participation and the ability of the public to affect changes in the proposed permit.
>
> Furthermore, the . . . policy encourages the source to commence construction as soon as possible and complete such construction within a reasonable time. Establishing a cutoff date prior to the issuance of a final permit would enable a source to maintain a BACT/LAER determination for an extended period of time until the permit is issued; thus, avoiding more stringent controls.[120]

EPA regulations provide unique BACT cutoff dates for each portion of phased construction projects.[121]

The default BACT cutoff date—the date of final permit issuance—is related to a provision in the EPA regulations providing for the expiration of PSD permits under certain conditions:

> Approval to construct shall become invalid if construction is not commenced[122] within 18 months after receipt of such approval, if construction is discontinued for a period of 18 months or more,[123] or if construction is not completed within a reasonable time. The Administrator may extend the 18-month period upon a satisfactory showing that an extension is justified.[124]

Obviously, if the permit becomes invalid, the applicant must start over and faces a new BACT determination. But even where a PSD permit extension is granted, the applicant must encounter a new round of BACT analysis. A 1988 memorandum from then-Chief of EPA's New Source Section unambiguously declares: "A BACT reanalyses is required in all permit extension requests, as in an application for a new PSD permit."[125]

Except for situations in which the applicant fails to commence (and continue) construction under a PSD permit within the 18 month-period, one might think that the danger of encountering increasingly escalating BACT would be obviated by the statutory command that PSD permits must be issued or denied no later than one year from the

See In the Matter of Columbia Gulf Transmission, PSD Appeal No. 88-11, 1990 WL 324099, 1990 EPA App. LEXIS 38 (EPA Admr. July 3, 1990), at slip op. 6 n.5 ("the Agency ordinarily considers the close of the public comment period on the draft permit as tolling the time for consideration of new technologies"); In the Matter of Pennsauken County NJ Resource Recovery Facility, PSD Appeal No. 88-8, 1988 WL 249035, 2 E.A.D. 667, 1988 EPA App. LEXIS 27 (EPA Admr. Nov. 10, 1988), at slip op. 8 n.11 ("Absent unusual delay between the close of the public comment period and the date of permit issuance, or the presence of other extraordinary circumstances, the close of the public comment period can be used as the reference by which the adequacy of the administrative record is judged.").

118. *See BACT Determination Part I*, *supra* note 6, at text accompanying note 86, concerning the discarded proposal to expressly define "demonstrated in practice."

119. *See* von Oppenfeld et al., *supra* note 69, at 11100 ("it is in the source's best interest to thoroughly evaluate the options in an attempt to preclude BACT from changing between the draft permit issuance and the final permit").

120. Memorandum of John Seitz re BACT/LAER Determination Cut-Off Date 1-2 (Jan. 11, 1990). *See also* In re Prairie State Generating Co., PSD Appeal No. 05-05, 13 E.A.D. 1, 2006 EPA App. LEXIS 38 (EAB Aug. 24, 2006), at slip op. 166 ("long-standing EPA policy states that the BACT determination is made on the date that the permit is issued"); In re St. Lawrence County Solid Waste Disposal Auth., PSD Appeal No. 90-9, 1990 EPA App. LEXIS 37 (Adm'r July 27, 1990) (granting review on the grounds that the emissions limits for certain pollutants were less stringent than would be established by a proposed NSPS rule published in after the close of the public comment period); 1990 Workshop Manual, *supra* note 1, at B.53-B.54 (because BACT is not set until the final permit is issued, the reviewing authority "can consider new information it learns, including recent permit decisions, subsequent to the submittal of a complete application"); Gary McCutchen & Colin Campbell, *Retroactive Application of NSR Policy*, 19 No. 6 Air Pollution Consultant 5.1 (2009), at 5.2 ("development of a new technology (or, much more commonly, the issuance of a lower emission rate for the same control technology) can result in a re-evaluation of BACT . . . even if all of the options available at the time of application submittal were properly analyzed"); Interim Phase I Report, *supra* note 5, at 9 (reporting Climate Change Work Group consensus that "[t]he permitting authority may require the applicant to address the availability and applicability of a new or emerging technology based on information that becomes available during the consideration of the permit"). *But see* In re Prairie State Generating Co., PSD Appeal No. 05-05, 13 E.A.D. 1, 2006 EPA App. LEXIS 38 (EAB Aug. 24, 2006), at slip op. 178-180 (notwithstanding new information, updated BACT determination was not needed because BACT standard was stricter than indicated by new information).

121. The language is convoluted, but the basic idea is that BACT will be reassessed as the phases progress:

> For phased construction projects, the determination of best available control technology shall be reviewed and modified as appropriate at the least [sic] reasonable time which occurs no later than 18 months prior to commencement of construction of each independent phase of the project. At such time, the owner or operator of the applicable stationary source may be required to demonstrate the adequacy of any previous determination of best available control technology for the source.

40 C.F.R. §51.166(j)(4). *See also* 43 Fed. Reg. 26388, 26396 (June 19, 1978) (reassessing BACT at the later phases of ongoing projects will "ensure that the most up-to-date control technology will be used").

122. "Commence" is defined in 40 C.F.R. §51.166(b)(9); 40 C.F.R. §52.21(b)(9). *See* Sierra Club v. Franklin County Power of Illinois, 546 F.3d 918, 930-31 (7th Cir. 2008) (excavation work did not constitute commencement of construction sufficient to prevent expiration of PSD permit); Kentucky Mountain Power v. Energy & Environment Cabinet, 2009 WL 6214729 (Ky. Envir. Pub. Prot. Cab. 2009) (PSD permit expired automatically due to non-construction, requiring a new application and an updated BACT determination, notwithstanding permittee's argument that it had entered into a construction contract).

123. *See Sierra Club*, 546 F.3d at 931 (lapse in construction for over 18 months invalidated PSD permit).

124. 40 C.F.R. §52.21(r)(2). *See also id.* ("This provision does not apply to the time period between construction of the approved phases of a phased construction project; each phase must commence construction within 18 months of the projected and approved commencement date."). For a discussion of the criteria for granting a permit extension, see Memorandum of Wayne Blackard, to Region IX States transmitting EPA Region IX Policy on PSD Permit Extensions (July 6, 1988) ("At the heart of these requirements are assurances of current BACT determinations and continued public participation when permits are extended.").

125. Memorandum of Wayne Blackard, *supra* note 124.

date on which the permit application is complete.[126] Nevertheless, disagreements about the completeness[127] of applications may extend the date of final permit issuance long beyond the time frame when the applicant would assume, and lengthy administrative appeals may further postpone the date of final permit issuance for years.[128]

XI. Conclusion

We have seen in this trilogy of Articles[129] that the PSD program's BACT element presents a surprisingly demanding gauntlet for permit applicants—far more daunting, in most cases, than the increment requirement.[130] Through the past 35 years, permit applicants, EPA, and reviewing authorities have struggled to make countless case-by-case BACT determinations while remaining faithful to the BACT requirement and the BACT definition. Although the intelligently crafted top-down approach for making the BACT determination is now well-known and widely applied, the task of reviewing authorities remains a difficult one.

For permit applicants, the process of obtaining the BACT emission limitations that will let them get on with their projects is likely to remain contentious, time-consuming, and sometimes frustrating. For opponents of major emitting facilities, the BACT determination process presents a welcome opportunity to delay permit issuance and to tighten emission limitations. The stakes are heightened now that GHGs have become subject to the BACT requirement. It is unlikely that anyone in Congress foresaw in 1977 the profound roles that the BACT requirement, the BACT definition, and the BACT determination now play in the issuance of PSD permits and in the conduct of major emitting facilities.

126. *See* CAA §165(c), 42 U.S.C. §7475 ("Any completed permit application . . . shall be granted or denied not later than one year after the date of filing of such completed application.").

127. "Complete" is defined in 40 C.F.R. §51.166(b)(22); 40 C.F.R. §52.21(b)(22). *See also* 40 C.F.R. §51.166(q)(1) ("The reviewing authority shall notify all applicants within a specified time period as to the completeness of the application.").

128. For an excellent discussion of new information discovered during the course of administrative appeals, see Wilson et al., *supra* note 78, at 10075-76. These authors conclude: "it is EPA's position that if an administrative appeal . . . 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." *Id*. at 10076.

129. For the first two Articles, see *BACT Requirement*, *supra* note 58; *BACT Determination Part I*, *supra* note 6.

130. *See* John-Mark Stensvaag, *Preventing Significant Deterioration Under the Clean Air Act: Baselines, Increments, and Ceilings—Part I*, 35 ELR 10807, 10808 & nn.1-6 (Dec. 2005); John-Mark Stensvaag, *Preventing Significant Deterioration Under the Clean Air Act: Baselines, Increments, and Ceilings—Part II*, 36 ELR. 10017 (Jan. 2006).