POLICY AND IMPLEMENTATION PROCEDURE

Interpretation of BACT

For ease in permit application review, the above definition of BACT can be broken down to two general categories: 1) "technologically feasible and cost-effective" and 2) "achieved in practice." The first category is a more stringent level of BACT control and is technology forcing; it generally refers to advanced control devices or techniques. The control equipment or technology must be commercially available, and demonstrated effective and reliable on a full scale unit and shown to be cost-effective on a dollars per ton of pollutant removed basis. The actual cost analysis methodology will be discussed later in this section. Note that the District BACT definition, developed under CARB guidelines, does not explicitly require that the control be demonstrated for any specific length of time. However, District staff in reviewing BACT performance data must make the engineering determination that the control would reasonably be expected to perform for a sufficient duration to make the control option cost-effective. Often, control techniques under the technologically feasible/cost-effective category are technology transfers from successful applications on similar types of equipment or emission streams. In that case, the control has been "achieved in practice" (the second BACT category) on a similar source or equipment category, but has not been used for the particular source or equipment in question. A feasibility and cost-effectiveness analysis would then be necessary.

In general, cost effectiveness analysis is done on a source by source basis. However, if a group of sources, each of which triggers a BACT review on its own, emits a common pollutant(s) with similar wastestream characteristics, and the sources are configured in such a manner that they could share a common abatement device, then the control costs can be shared proportionately and the cost-effectiveness determination made accordingly.

The second BACT category, "achieved in practice", applies to the most effective emission control device already in use or the most stringent emission limit achieved in the field for the type and capacity of equipment comprising the source under review and operating under similar conditions, e.g., process throughput and material usage, hours of operation, site-specific limitations or opportunities, etc.. For example, the control device performance or emission limit has already been verified by source tests or other appropriate documentation approved by this District or another California air district.

A user of the BACT/TBACT Workbook would go to the appropriate source or equipment category listing in Sections 2 through 11, and review the BACT 1 entry "Technologically Feasible/Cost Effective" as the candidate required BACT. Only if proven not technologically feasible and cost effective for the particular application under permit review would the BACT requirement default to BACT 2 "Achieved in Practice" for which case a cost analysis is not necessary. In some cases, an intermediate level of control between BACT 1 and BACT 2 may prove to be cost effective and appropriate.

Where no BACT determination has been made to date in this workbook or if a determination needs to be updated or reviewed, potential sources of BACT and TBACT determination information include the CAPCOA/CARB BACT Clearinghouse, the EPA BACT/LAER Clearinghouse, the South Coast Air Quality Management District BACT Guideline, determinations made by other air districts, and published, independently verified equipment performance and operating data. It is important to note that a listing in, for example, the CAPCOA/CARB BACT Clearinghouse does not necessarily mean that that particular determination is BACT or TBACT for the Bay Area Air Quality Management District; the listing may merely be a candidate BACT or TBACT for this District. Recall that BACT is the most effective emission control or the most stringent emission limitation and for the "achieved in practice" category, does not require a cost-effectiveness justification. The calculation procedure is shown below in the Cost Effectiveness Determination for BACT section for cost-effectiveness for the "technologically feasible/cost-effective" BACT category.

Interpretation of TBACT

For the majority of applications, TBACT is the same as BACT, and the BACT/TBACT Workbook determinations presented in Sections 2 through 11 identify TBACT as such. In most cases, the use of TBACT will result in residual health risks that are within acceptable levels. In some cases, however, additional risk reduction measures may be needed for a project to be approved. The need for risk reduction measures is generally related to a source's proximity to residential receptors or other areas where the public exposure may occur. For example, additional risk reduction measures are generally required to mitigate fugitive emissions from a perchloroethylene dry cleaning facility located in an apartment building. The need for, and extent of, additional risk reduction measures is determined on a case-by-case basis through site-specific health risk assessment.

While TBACT is driven by risk reduction and there are no specific cost effectiveness triggers, the economic impact of achieving the toxic emission reductions must be taken into consideration, as discussed in Introduction. The fact that TBACT is generally the same as BACT demonstrates these implicit cost considerations. Similarly, the criteria of commercial availability, reliability, and demonstrated full scale operation and performance apply to TBACT as well as BACT.

In addition to the data sources cited in Interpretation of BACT above, EPA's MACT Database and CARB's Air Toxic Control Measures (ATCMS) guidance documents can be searched. Specific TBACT determinations that have been made by the Bay Area Air Quality Management District for commonly permitted source categories and equipment are identified in Sections 2 through 11.

Cost Effectiveness Determination for BACT

For the purpose of calculating emission control cost-effectiveness for BACT, the Bay Area Air Quality Management District has adopted the "levelized cash flow method", otherwise commonly referred to as the annualized cost method. The annualized method is simple to use and appropriate for the kinds of abatement projects proposed in the great majority of the District's permit applications. It has been approved for use by the California Air Resources Board's Office of Air Quality Planning and Liaison and the U. S. Environmental Protection Agency's Office of Air Planning and Standards.

The cost-effectiveness of an abatement system or strategy is defined as the ratio of the annualized cost of that abatement system over the reduction in annual pollutant emissions achieved by the system for the pollutant in question. Cost-effectiveness can be estimated as follows:

Cost-effectiveness =
(Annualized Cost of Abatement System ($/yr)) / (Reduction in Annual Pollutant Emissions (ton/yr))

The reduction in annual pollutant emissions is the expected decrease in the source's pollutant emissions from its baseline uncontrolled level, achieved by the installation of the abatement system under review. This annual reduction can be calculated as the difference in emissions with and without the abatement system, using District-approved standard emission factors or source test data and the permitted annual usage or throughput limits expected in the operating permit. Simply put,

Reduction in Annual Pollutant Emissions (ton/yr) =
Baseline Uncontrolled Emissions - Control Option Emissions

As noted above, the emissions reductions are calculated using realistic upper boundary operating assumptions (permit limit conditions).

The annualized cost of the abatement system can be estimated from the installed cost of the control and its expected annual operating and maintenance costs.

Annualized cost = Direct Costs + Indirect Costs

where Direct Costs (Sum of the Following):
Labor
Raw Materials
Replacement Parts
Utilities

and Indirect Costs (Sum of the Following):
Overhead (80% of Labor Costs)
Property Tax (1% of Total Capital Cost)
Insurance (1% of Total Capital Cost)
General & Administrative (2% of Total Capital Cost)
Capital Recovery (CRF x Total Capital Cost)

where Total Capital Cost = Installed Equipment Cost

The capital recovery factor (CRF) recognizes the time value of money and converts the up front capital cost (the installed equipment cost) to an annualized cost.

The capital recovery factor (CRF) is given by:

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

where i = interest rate (assume i = 0.06, as determined below)

and n = lifetime of abatement system (assume n = 10 years unless shown to be different).

For example, when i = 0.06 (6 percent interest rate) and n = 10, the capital recovery factor CRF = 0.136.

The current District policy regarding the interest rate (to be used in cost-effectiveness calculations) is similar to the guidelines used by the California Air Resources Board. First, take as a benchmark the interest rate on United States Treasury Securities with a maturity that most closely approximates the project horizon (typically 10 years), add 2 percentage points for incremental risk, and then round the total up to the next higher integer. Use of the 10-Year Treasury Note interest rate (yield) averaged over the previous 6 months will dampen the daily fluctuations of that index. And the addition of two percentage points and rounding up to the next higher integer rate will reflect more closely market conditions while adding further assurance that the project can be financed near or below that final calculated interest rate.

For example, the benchmark average 10-Year Treasury note interest rate for the first six months of 2003 was 3.77%. Adding 2 percentage points and rounding up results in the currently recommended 6% interest rate for cost-effectiveness calculations. This methodology for determining the interest rate can be easily followed; the relevant Treasury note data are readily available from financial publications or the Internet. The interest rates resulting from this methodology are more reflective of market conditions rather than the single fixed number originally used by the *BACT/TBACT Workbook*. Furthermore, use of this interest rate methodology would have generally followed the interest rates used by CARB and U.S. EPA since the initial publication of this *BACT/TBACT Workbook* on June 30, 1995. Looking back, the 10-Year Treasury Note averaged over the first half of 1995 was 7.05%. Had the current District methodology been followed at that time, the calculated interest rate would have been 7.05 + 2.0 = 9.05 → rounded up to 10%, which was exactly the interest rate recommended by the *BACT/TBACT Workbook* at initial publication.

For simple cases of cost-effectiveness determinations where the details of operating and maintenance costs, etc. are not readily available, a rough estimate of cost-effectiveness can be obtained as follows:

Annualized Cost =
Installed Equipment Cost x

[Capital Recovery Factor + Tax Factor + Insur. Factor + G & A Factor + Annual Operating/Maintenance Factor]

where:
CFR = 0.136
Tax = 0.01
Insur. = 0.01
G&A = 0.02
O&M = 0.05

It should be reiterated that this estimation method is to be used as a first cut projection when case or site specific information is not available and not necessarily as a final cost-effectiveness determination. However, it can be useful for eliminating extreme control options or identifying control strategies worthy of further consideration.

Finally, is clear that cost-effectiveness needs to be determined or reviewed on a case-by-case basis. Inherent physical constraints on the source or at the site can significantly increase the cost of the abatement system under review. Similarly, operational constraints can affect the cost-effectiveness figure by increasing or decreasing the potential annual emissions reduction. However, these operational constraints should be reflected in enforceable conditions in the permit to operate (e.g., throughput or usage limits).

Examples of cost-effectiveness calculations are given in Appendix C1 and Appendix C2.

Maximum Cost Guidelines for BACT

As noted above, for BACT determinations based on the "achieved in practice" category, no cost analysis is necessary. For the "technologically feasible/cost-effective" BACT determinations, the District has adopted guidelines for the maximum cost per ton of air pollutants controlled that would be considered cost-effective. These guideline cost maximums are consistent with the broad guidelines provided by the California Air Resources Board's Office of Air Quality Planning and Liaison. The Bay Area Air Quality Management District's guideline cost limits are as follows:

Pollutant Maximum Cost ($/ton)
POC = 17,500
NOx = 17,500
SO2 = 18,300
CO n/d
PM10 = 5,300
NPOC = 17,500

Note that the cost-effectiveness trigger for NOx has been lowered to 17,500 dollars per ton, down from the 24,500 figure of an earlier BACT Workbook draft. This brings the cost-effectiveness trigger for NOx in line with that for precursor organic emissions, and consistent with Regulation 2, Rule 2, Section 302, which allows the interchangeability of NOx and POC emission offsets.

For spray booth coating operations, the following cost limits apply for controlling POC or NPOC emissions:

A. Maximum cost of 17,500 $/ton for the following spray booth coating operations:
i) Aerospace parts coating operations complying with Regulation 8, Rule 29.
ii) Motor vehicle, rework/body shop coating operations complying with Regulation 8, Rule 45.
iii) Motor vehicle, assembly plant coating operations complying with Regulation 8, Rule 13.
iv) Coating operations which have reduced VOC emissions by < 35% through the use of low VOC coatings and/or high transfer efficiency methods.
B. Maximum cost of 13,750 $/ton for the following spray booth coating operations:
i) Wood products coating operations complying with Regulation 8, Rule 32.
ii) Coating operations which have reduced VOC emissions by > 35% to < 80% through the use of low VOC coatings and/or high transfer efficiency methods.
C. Maximum cost of 10,000 $/ton for the following spray booth coating operations:
i) Flat wood coating operations complying with Regulation 8, Rule 23.
ii) Metal coating operations complying with Regulation 8, Rule 19.
iii) Plastic coating operations complying with Regulation 8, Rule 31.
iv) Coating operations which have reduced VOC emissions by > 80% through the use of low VOC coatings and/or high transfer efficiency methods.

The lower maximum cost allowed for specific spray booth coating operations is a recognition that these specific operations have already significantly reduced their VOC emissions through the use of lower VOC coatings and/or higher transfer efficiency methods. These emission reductions are reflected in the more stringent requirements required under their applicable Regulation 8 rules. The high costs of add-on BACT controls such as afterburners and carbon adsorption units, relative to the costs of spray booths, was also taken into consideration in setting the above cost limits.

The maximum cost of 17,500 $/ton will apply to any coating operation not listed above. Spray booth coating operations proposing to use lower VOC content coatings and/or higher transfer efficiency methods than those required by the existing applicable rules may be allowed to use a lower maximum control cost, down to a minimum of 10,000 $/ton.

If the cost-effectiveness number for a specific pollutant, calculated according to the procedures of this Workbook, is less than the corresponding limit listed above, then the emission control or emission limitation in question would be considered to be cost-effective for the source under review operating under typical representative conditions.