DRAFT 3/1/10

San Joaquin Valley
Air Pollution Control District

Best Available Control Technology Policy

Approved By: ____________________ David Warner Director of Permit Services	**Date Revised:** ___________

I. Purpose

The purpose of this policy is to ensure that Best Available Control Technology (BACT) determinations are made in a uniform manner and in accordance with District Rule 2201 (New and Modified Stationary Source Review Rule).

II. Applicability

This policy applies to all emission units that are subject to the BACT requirements of District Rule 2201. Units utilized solely as emission control devices are not considered emission units and are not subject to BACT.

III. BACT Guideline Updates

The District's BACT clearinghouse contains numerous BACT guidelines that specify BACT requirements for various classes and categories of sources.

BACT guidelines that have not been updated during the five year period immediately preceding the date the subject application was deemed complete shall be updated prior to use. The update may be waived by the Director of Permit Services.

Updates to the BACT Clearinghouse shall be made as new or updated guidelines are approved by the District.

The District shall take a proactive approach in updating the BACT Clearinghouse. Updates to the clearinghouse may occur when evaluating applications for new and modified sources or when the District is made aware of, and sufficiently documents, using engineering and scientific principles, any of the following:

1. A new control technology or method has become Achieved in Practice for a class or category of source under consideration.

2. A new control technology or method is required as a part of a State Implementation Plan approved by the EPA for the class or category of source under consideration.

3. A new technology is found to be Technologically Feasible for the class or category of source under consideration.

For new or revised BACT guidelines that represent a significant change in technology and/or may potentially impact a large source category, the District will may hold public workshops prior to finalizing the new or revised BACT guidelines.

As Authorities to Construct (ATCs) requiring Technologically Feasible BACT are implemented or as Technologically Feasible controls become utilized, the District BACT Coordinator shall determine whether such controls meet the definition of Achieved in Practice. If the controls are determined to meet the definition of Achieved in Practice, they shall be shifted to the Achieved in Practice category.

Additionally, interested parties can provide information to the District and request that a particular BACT guideline be updated. Such requests should include detailed information on the control technology and a justification detailing if the control technology is achieved in practice or technologically feasible for a particular class and category of source.

IV. Definitions

Achieved in Practice:

An emission level or an emission control technology or technique that is has been identified by the District, CARB, EPA, or any other air pollution control District as having been achieved in practice for the same class and category of source provided:

- The rating and capacity for the unit where the control was achieved must be approximately the same as that for the proposed unit.

- The type of business (i.e. class of source) where the emissions units are utilized must be the same.

- The availability of resources (i.e. fuel, water) necessary for the control technology must be approximately the same.

In addition to the criteria above, an emission control technology or technique is considered to be achieved in practice provided all of the following are satisfied:

- At least one vendor must offer this equipment for regular or full-scale operation. A performance guarantee should be (but is not required to be) available with the purchase of the control technology.
- The control technology must have been installed and operated reliably at least one commercial facility for at least 180 days.
- The control technology must be verified to perform effectively over the range of operation expected for that class and category of source. The verification shall be based on a performance test or tests, when possible, or other performance data.

Alternate Basic Equipment or Process:

Equivalent basic equipment or process with less Target Pollutant emissions (e.g. NO_x for combustion equipment and VOC for operations whose emissions include evaporative VOC losses) that does not redefine the basic design of the equipment or fundamentally change the scope of the project.

Alternate Basic Equipment or Processes shall be considered only for applications for new equipment.

Best Available Control Technology (BACT):

The most stringent emission limitation or control technique of the following:

1. Achieved in Practice for such a class or category of source.

2. Contained in a State Implementation Plan approved by the United States Environmental Protection Agency for such a class or category of source. A specific limitation or control technique shall not apply if the owner of the proposed emission unit demonstrates to the satisfaction of the Air Pollution Control Officer (APCO) that such a limitation or control technique is not presently achievable.

3. Contained in an applicable Federal New Source Performance Standard.

4. Any other emission limitation or control technique, including changes to the process and/or changes to process or control equipment, found by the Air Pollution Control Officer (APCO) to be cost effective (as defined in this policy) and technologically feasible for such a class or category of source or for a specific source.

Collateral Pollutants:

Air contaminants emitted by a control device that controls Target Pollutants.

Cost Effective Control:

The threshold, above which, a control alternative is not cost effective.

These thresholds do not directly apply to analyses for control options that would control multiple pollutants. For options that would control more than one pollutant, a Multi Pollutant Cost Effectiveness Threshold (MCET) shall be calculated as shown in attachment 2 of this document:

Pollutant	Cost Threshold ($/ton of reductions)
NO_x	$24,500
CO	$ 300
VOC	$17,500
SO_x	$18,300
PM_{10}	$11,400

If there is not a cost threshold for a pollutant for which BACT is required, the threshold for the most similar pollutant shall be utilized. For example, since ammonia is a PM_{10} precursor, the PM_{10} cost threshold would be utilized to determined the cost effectiveness of an ammonia control option.

District Standard Emissions:

For new emission units, District Standard Emissions are equal to the emissions level allowed the by the applicable San Joaquin Valley Air Pollution Control District (SJVAPCD) rule once the final compliance date for the rule has passed. The emission limits in the applicable SJVAPCD prohibitory rule shall be those that the particular emission unit would be subject to. If the applicable rule has both standard and enhanced compliance options, the standard compliance option date and emission standard shall be used.

For currently permitted emission units, District Standard Emissions are equal to the emissions level allowed by the current PTO. If the rule level that the unit is currently subject to is lower than the permitted limit, the applicable rule level shall be used.

If there is no SJVAPCD prohibitory rule limit that applies to the new emission unit or if the existing emission unit does not have permitted emission limits, District Standard Emissions shall be set equal to commercially available emissions levels (as determined by an industry survey) for similar units. If insufficient information is available to make a determination regarding commercially available emissions levels, District Standard Emissions shall be estimated based on EPA's Compilation of Air Pollutant Emission Factors (AP-42), or other references determined by the SJVAPCD to be appropriate.

Environmental Benefit Index (EBI) Ranking Method:

The method of ranking a technologically feasible control device or alternate basic equipment based on its Target Pollutant and Non-Target Pollutant reductions and its Collateral Pollutant increases. Achieved in practice control technologies and control technologies required by an EPA approved SIP shall not be ranked using the EBI ranking method. A higher EBI indicates a more environmentally beneficial control option.

Environmental Benefit Index (EBI) is calculated as follows:

$$\begin{aligned} \text{EBI} = {} & \sum(\text{Target Pollutant Reduction})(\text{Pollutant Significance Factor}) \\ & + \sum(\text{Non-Target Pollutant Reduction})(\text{Pollutant Significance Factor}) \\ & - \sum(\text{Collateral Pollutant Increase})(\text{Pollutant Significance Factor}) \end{aligned}$$

Significance factors for NOx, VOC, and $PM_{10/2.5}$, based information contained in the 2007 8 hour attainment plan and the 2008 $PM_{2.5}$ attainment plans, are as follows:

NOx: 7
VOC: 1
$PM_{10/2.5}$: 1
SOx: 1

These significance factors take into account the relationship between ozone precursors NOx and VOC and between $PM_{2.5}$ precursors NOx, and SOx and the relative emission reductions needed of each pollutant needed to attain the ozone and $PM_{2.5}$ ambient air quality standards.

Please note because CO is an attainment pollutant the significance factors for CO is 0. As such it is not necessary to calculate CO collateral emissions.

Multi-Pollutant Cost Effectiveness Threshold (MCET):

A cost threshold calculated to determine whether an emission control alternative that would control more than one Target Pollutant would be cost effective. Only pollutants for which BACT is triggered shall be included in the calculation. Refer to attachment 2 of this document for a sample MCET calculation.

Non-Target Pollutants:

For an emissions unit, the affected pollutants for which BACT is not required.

Small Emitter:

A Stationary Source with post-project potential emission of less than 10,000 pounds per year of NOx, VOC, SOx, and PM10/PM2.5. CO emissions are not considered. A Stationary Source that is not a small emitter for one pollutant shall not be a Small Emitter for any pollutant.

Target Pollutants:

The pollutant(s) for which BACT is required.

Technologically Feasible:

A practically applicable emission control technology or technique that, based on physical, chemical, and engineering principles, could be applied to the specific class and category of source in a commercial setting. Technologically feasible control options have not been achieved in practice.

V. BACT Determination Cutoff Date

BACT determinations shall be based on the applicable guideline in the District BACT Clearinghouse at the time the application is deemed complete provided the BACT guideline has been updated within the past 5 years. If the BACT guideline was last updated more than 5 years from when the subject application is deemed complete, the BACT determination shall be based on an updated BACT guideline which will consider, at a minimum, control technologies or techniques that have been achieved in practice or are technologically feasible for such class and category of source. If the District BACT Clearinghouse does not include an applicable guideline, one shall be prepared.

Notwithstanding the above, if written public comments subsequent to the District's preliminary decision on an application identify control technologies or methods not previously considered by the District in determining BACT requirements for the specific application, such technologies or methods must be considered in determining BACT requirements prior to taking final action on the application.

Additionally, subsequent to deeming an application complete, if the District determines that an existing BACT guidelines does not identify the most stringent level of emissions that has been achieved in practice or is technologically feasible, such levels of emissions must be considered in determining BACT requirements prior to taking final action on such an application.

For emission units that were subject to Authorities to Construct at the time they were installed but were installed without them, BACT shall be based on the policy, cost thresholds and the guideline that applied at the time the unit was installed. If the unit did not meet BACT at the time it was installed, it shall be subjected to current BACT. If an applicable guideline did not exist at the time the unit was installed then current BACT shall be required. If the date of installation cannot be determined to the District's satisfaction then current BACT shall be required.

VI. BACT Analyses During the Preliminary Review of Applications

Although the top-down BACT analysis need not be completed as part of the preliminary review, all of the information necessary to conduct the required BACT analysis, including control equipment cost information is required prior to the application being deemed complete.

If it is obvious BACT is not being proposed, the application shall remain incomplete until it appears that BACT is being proposed.

VII. Top-Down BACT Analysis

A top-down BACT analysis shall be conducted as a part of the Application Review for each emission unit subject to the BACT requirements of District Rule 2201. The top-down procedure shall be repeated separately for each pollutant for which BACT is required. If the BACT Clearinghouse includes a guideline that was originally prepared, or last revised, less than or equal to 5 years prior to the subject application being deemed complete, information from that guideline shall be cited without further analysis. If the applicable guideline was originally prepared, or last revised, more than five years prior to the application being deemed complete, the guideline shall be revised prior to use. The following steps shall be documented in the top-down BACT analysis.

Step 1: Identify All Control Technologies

Identify and list all practically applicable control alternatives including Alternate Basic Equipment or Processes. The list must include at least the controls currently in use for the source category under consideration and controls available through technology transfer.

All Achieved in Practice options that would emit Collateral Pollutants shall be listed. For Achieved in Practice options that will not emit Collateral Pollutants, only the one that would be most effective in Target Pollutant control shall be listed.

Step 2: Eliminate Technologically Infeasible Control Technologies

For classes or categories of sources covered in the District's BACT Clearinghouse, all controls listed as technologically feasible must be considered in the final BACT selection and must not be eliminated in this step.

Except as provided above, remove all technologically infeasible control options listed in step 1. To exclude a control option, a demonstration of technical infeasibility must be clearly documented and must show, based on physical, chemical, and engineering principles, the technical difficulties would preclude the successful use of the control option for the emissions unit under review. Include a full written justification for each option removed in this step.

Additionally, technologically feasible control options that will result in a greater than de minimus increase in health risk, as determined by the APCO, shall be eliminated from further consideration.

Step 3: Rank All Remaining Control Technologies Utilizing the Environmental Benefit Index (EBI) Method

List all remaining control options, including Alternate Basic Equipment or Processes, in the order of descending EBI's. See attachment 1 for examples of the EBI ranking method. Please note that the numeric ranking of technologically feasible control options listed in some BACT guidelines shall not be utilized.

Control technologies that have a negative EBI are not included in the ranking. A negative EBI indicates that the specific control technology does not have an environmental benefit and as such can not be required as BACT.

Notwithstanding the above, control technologies that have been achieved in practice or are included in an EPA approved SIP shall not be given an EBI rank.

Step 4: Cost Effectiveness Analysis

Except as stated below, a cost effectiveness analysis shall be conducted for each control option classified as Technologically Feasible or as Alternate Basic Equipment. The analyses shall commence with the highest ranking control option listed in Step 3 and shall conclude at the time an Achieved in Practice option is reached or at the time an option classified as Technologically Feasible or Alternate Basic Equipment is determined to be cost effective. That option is required as BACT. See Attachment 2 for cost effectiveness calculation examples.

A cost effectiveness analysis for Alternate Basic Equipment that controls multiple target pollutants shall be conducted using a Multiple Pollutant Cost Effectiveness Threshold (MCET).

The annualized cost of control shall be based on a 10% interest rate and a 10 year amortization period unless a different interest rate or amortization period is determined by the District to be more appropriate.

A cost effectiveness analysis is not required if the highest ranked control option from Step 3 is proposed.

The highest ranking Achieved in Practice control option is the minimum control that will be required, therefore, a cost effectiveness analysis is not required for Achieved in Practice options.

Cost data from similar applications finalized within 12 months prior to the date the subject application was deemed complete may be used in the cost effectiveness analysis. Cost data from similar applications finalized more than 12 months prior to the date the subject application was deemed complete may be used if it can be demonstrated the cost of such controls has not decreased during the intervening time period.

For facilities that are Small Emitters as defined in this policy, the cost effectiveness analysis shall be conducted utilizing data previously collected by the District if available. If the required cost data has not yet been collected by the District then it shall be provided by the applicant. For Small Emitters, cost data up to 5 years old (and adjusted for inflation) may be utilized.

For proposals that include more than one similar emission unit that requires BACT, the cost effectiveness analysis shall be performed for the group of emission units, and not for each one individually, as practical.

Step 5: Select BACT

The most effective control option not eliminated in Step 4 shall be selected as BACT.

Alternative control options that have an EBI equal to or greater than the EBI for the control option chosen in step 5 above may be installed to satisfy BACT.

Attachment A
EBI Examples

Procedure for Ranking Control Options Using the Environmental Benefit Index (EBI) Method:

The following equation shall be used to calculate the EBI. An EBI shall be calculated separately for each control option to be ranked in Step 3 of the Top-Down BACT analysis.

EBI = ∑(Target Pollutant Reduction)(Pollutant Significance Factor)
+ ∑(Non-Target Pollutant Reduction)(Pollutant Significance Factor)
- ∑(Collateral Pollutant Increase)(Pollutant Significance Factor)

The significance factors are as follows:

NOx: 7
VOC: 1
$PM_{10/2.5}$: 1
SOx: 1

<u>**Example 1**</u>**:**
Consider an emission unit that triggers BACT for VOC emissions, and has an industry standard VOC emission rate of 25,000 lb/yr. Assume the following VOC emission control technologies are technologically feasible for use with the proposed operation.

- 10 MMBtu/hr Standard Thermal Oxidizer with 99% VOC reduction
- 10 MMBtu/hr Flare with 95% VOC reduction
- Carbon Adsorption with 80% VOC reduction

EBI Ranking Method:
The EBI method establishes a numerical rank based on not only the target pollutant reductions but also the collateral pollutant increases associated with each emission control technology. The EBI for each emission control technology is calculated as follows:

10 MMBtu/hr Standard Thermal Oxidizer with 99% VOC reduction

Target Pollutant Reductions:
12.4 tons-VOC-reduced/yr

Collateral Pollutant Increases (AP-42 EFs):
0.1 lb-NO_x/MMBtu = 4.4 tons-NO_x-added/yr
0.0076 lb-PM_{10}/MMBtu = 0.3 tons-PM_{10}-added/yr
0.00285 lb –SOx/MMBtu = 0.1 ton = SOx added/yr

EBI = (12.4 tons-VOC-reduced/yr)(1) - (4.4 tons-NO_x-added/yr)(7)
- (0.3 tons-PM_{10}-added/yr)(1) - (0.1 tons–SOx added/yr)(1)
= -18.80
(EBI < 1, NOT REQUIRED – NOT ENVIRONMENTALLY BENEFICIAL)

10 MMBtu/hr Flare with 95% VOC reduction

Target Pollutant Reductions:
11.9 tons-VOC-reduced/yr

Collateral Pollutant Increases (FYI-83 EFs):
0.068 lb-NO_x/MMBtu = 3.0 tons-NO_x-added/yr
0.026 lb-PM_{10}/MMBtu = 1.1 tons-PM_{10}-added/yr
0.00285 lb –Sox/MMBtu = 0.1 ton = SOx added/yr

EBI = (11.9 tons-VOC-reduced/yr)(1) - (3.0 tons-NO_x-added/yr)(7)
- (1.1 tons-PM_{10}-added/yr)(1) - (0.1 tons–SOx added/yr)(1)
= -10.3
(EBI < 1, NOT REQUIRED – NOT ENVIRONMENTALLY BENEFICIAL)

Carbon Adsorption with 80% VOC reduction

Target Pollutant Reductions:
10 tons-VOC-reduced/yr

No collateral pollutants are emitted.

EBI = (10 tons-VOC-reduced/yr)(1)
– (0 tons-NO_x-added/yr)(7)
– (0 tons-PM_{10}-added/yr)(1)
– (0.0 tons–SOx added/yr)(7)
= 10.0

The control technologies have the following ranking:

1: Carbon Adsorption (EBI: 10.0)

Please note that the thermal oxidizer and flare options have EBIs < 0, so they are not considered.

Thus, even though it has the lowest target pollutant control efficiency, the carbon adsorption system is more environmentally beneficial than either the thermal incinerator or the flare due to the collateral pollutant emissions associated with the latter two control technologies. If the carbon adsorption system were determined to be cost effective, it would be required as BACT over the thermal incinerator and the flare.

Example 2:

Consider a 50 MMBtu/hr boiler that, due to unique operational requirements, must undergo large turndown ratios and very rapid response rates, which are outside the operating parameters for which an ultra low NO_x burner system is feasible. The boiler triggers BACT for NO_x emissions, and has the following industry standard emission rates:

NO_x: 15,768 lb/yr
VOC: 2,409 lb/yr

Assume the following NO_x emission control technologies are technologically feasible for use with the proposed operation.

- Selective Catalytic Reduction (SCR) System with 95% NO_x reduction

- SCONOx System with 95% NO_x reduction

Proposed EBI Ranking Method:

The proposed EBI method establishes a numerical rank based on not only the target pollutant reductions but also the collateral pollutant increases associated with each emission control technology. The EBI for each emission control technology is calculated as follows:

Selective Catalytic Reduction (SCR) System with 95% NO_x reduction

Target Pollutant Reductions:
7.5 tons-NO_x-reduced/yr

No collateral pollutants are emitted (ignoring NH_3 as there is no significance factor for it).

EBI = (7.5 tons-NO_x-reduced/yr)(7) - (0 tons-VOC-added/yr)(1)
- (0 tons-PM_{10}-added/yr)(1) - (0 tons–SOx added/yr)(1)
= 52.5

SCONOx System with 95% NO_x reduction

Target Pollutant Reductions:
7.5 tons-NO_x-reduced/yr

No collateral pollutants are emitted. However, according to the manufacturer, SCONOx technology also controls 90% of the VOC emissions. Therefore, SCONOx has the following non-target pollutant reductions:

Non-target pollutant Reductions:
1.1 tons-VOC-reduced/yr

EBI = (7.5 tons-NO_x-reduced/yr)(7) + (1.1 tons-VOC-reduced/yr)(1)
- (0 tons-PM_{10}-added/yr)(1) - (0 tons–SOx added/yr)(1)
= 53.6

The ranking of these control technologies in Step 3 of the Top Down BACT Analysis is as follows::

1: SCONOx System (EBI: 53.6)
2: SCR System (EBI: 52.5)

Thus, even though it has the same target pollutant control efficiency, the SCONOx system is more environmentally beneficial than the SCR system because it also reduces non-target pollutant emissions. If the SCONOx system were determined to be cost effective, it would be required as BACT over the SCR system.

Attachment B
Cost Effectiveness Calculation Examples

Procedures for Conducting a Cost Effectiveness analysis:

A. Technologically Feasible Options

1. Calculate the equivalent annual cost using the capital recovery factor show below:

   $$A = P\frac{i(1+i)^n}{(1+i)^n - 1}$$ Where;

   A = Equivalent Annual Control Equipment Capital Cost

   P = Present value of the control equipment, including installation costs

   i = interest rate (use 10% unless an alternate rate is more appropriate)

   n = equipment life (use 10 years unless an alternate equipment life is more appropriate)

2. Determine the annual costs associated with the operation of the control device under consideration (utilities, labor, maintenance, etc.)

3. Calculate the total annual cost by summing the equivalent annual cost and the annual operating costs (steps 1 and 2 above)

4. If a control device controls only one pollutant, calculate the control cost per ton of reductions by dividing the total annual cost from step 3 by the annual reduction in emissions of that pollutant. If the control cost per ton of reductions exceeds the cost effectiveness threshold, the control option is not required.

   Example:

   If a the highest ranking control strategy listed in Step 3 of the Top-Down BACT procedure would reduce NO_x emissions by 2 tons per year compared to the District Standard Emissions, and the cost of those reductions, as calculated in step 3, would be $16,900/yr, the cost of control would be:

   Cost of Control = ($16,900/yr) ÷ (2 tons NO_x/yr) = $8,450/ton

Since the calculated cost of emission control would be less than the cost effectiveness threshold for NO_x, this control strategy would be required as BACT and no further cost analyses are required.

5. If the control option under consideration would control more than one pollutant, calculate a Multi Pollutant Cost Effectiveness Threshold (MCET) as shown below. The calculation shall include only the pollutants for which BACT is required.

   Example:

   If BACT is triggered for NO_x and VOC and the control strategy under consideration would control 2 tons per year of NO_x and 4 tons per year of VOC the MCET would be:

$$MCET = \left(\frac{2\ tons\ NOx}{yr}\right)\left(\frac{\$24{,}500}{ton\ NOx}\right) + \left(\frac{4\ tons\ VOC}{yr}\right)\left(\frac{\$17{,}500}{ton\ VOC}\right) = \$119{,}000 \big/ yr$$

   If the total annual cost as calculated in Step A.3 above exceeds this MCET, the control device under consideration is not cost effective and shall be removed from consideration.

6. When multiple control strategies are available, each BACT scenario shall be evaluated as a package instead of evaluating the individual components separately. For example, if BACT is triggered for both NO_x and VOC and both SCR and oxidation catalysts will be considered, both devices shall be considered as a package, with duplicate costs being eliminated.

7. If the control technology is not cost effective, perform a cost effectiveness analysis for the next control technology listed in Step 3 of the Top-Down BACT analysis.

B. Alternate Basic Equipment or Process

1. Calculate the cost effectiveness of Alternate Basic Equipment or Process using the following formula:

$$CE_{ALT} = \frac{Cost_{ALT} - Cost_{Basic}}{Emissions_{Basic} - Emissions_{ALT}}$$ Where;

CE_{ALT}: the cost effectiveness of alternate basic equipment or process expressed as dollars per ton of emissions reduced

$Cost_{ALT}$: the equivalent annual capital cost of the alternate basic equipment plus its annual operating cost

$Cost_{Basic}$: the equivalent annual capital cost of the proposed basic equipment with District Standard Emissions, plus its annual operating cost

$Emissions_{Basic}$: the District Standard Emissions from the proposed basic equipment

$Emissions_{ALT}$: the emissions from the Alternate Basic Equipment or Process

Please note that a cost effectiveness analysis for Alternate Basic Equipment that controls multiple target pollutants shall be conducted using a Multiple Pollutant Cost Effectiveness Threshold (MCET).