Western Regional Air Partnership
Regional Haze BART (Trading Program Option)

I. Purpose

The purpose of this document is to provide a consistent methodology for western states that are developing a demonstration that a regional SO_2 trading program will meet the requirement to address best available retrofit technology (BART) for regional haze , as provided in **section 309** of the regional haze rule. The rule allows the western states to meet BART requirement through the establishment of emission milestones, with provisions to implement a backstop emission trading program to ensure that the milestones are met. The states must demonstrate that the milestones will achieve greater reasonable progress than the implementation of case-by-case regional haze BART under section 308 of the rule. This methodology will be used to estimate the emission reductions that would be achieved in the region if case-by-case BART was implemented.

The complete demonstration will be submitted to EPA as part of the Annex to the Grand Canyon Visibility Transport Commission Recommendations in October, 2000. This methodology is being developed by the Western Regional Air Partnership (WRAP) which is the successor organization to the Grand Canyon Visibility Transport Commission. The western states expect that the development of this methodology will be a valuable source of information for the Environmental Protection Agency during the development of national guidance on regional haze BART.

This document does not address reasonably attributable BART, which is a separate requirement under the regional haze rule. Nor does this document address the determination of regional haze BART on a case-by-case basis which is also allowed under section 308 of the regional haze rule. Finally, while this document may be a good starting point, it is not intended to define the methodology for meeting regional haze BART through an emission trading program under section 308 of the rule. Differences in timing of reductions, geographic scope of the program and visibility impacts may lead to significant differences in methodology.

BART requirements for SO_2 must be addressed in the Annex by October, 2000. BART requirements for PM and NO_x must then be included in State Implementation Plans that are due in December 2003 and further clarified by December 2008. This methodology is initially focused on SO_2. The western states intend to re-evaluate this methodology in the future to determine whether it will also be appropriate for PM and NO_x under section 309 of the regional haze rule.

An important aspect of this methodology is that **the western states do not expect that the SO_2 emission controls identified for regional haze BART will actually be required for individual sources in the west**. Instead, greater reasonable progress will occur due to expected declines in emissions from stationary sources, voluntary measures, and if necessary the implementation of a

backstop emission trading program. All of these options provide much greater flexibility than traditional command-and-control programs such as BART. Once the Annex has been completed, the WRAP will examine the feasibility of expanding the backstop trading program to other pollutants and emission sources, including the possibility of addressing regional haze BART for PM and NO_x through the backstop program.

A. Guidance Used

Because regional haze BART is a new requirement, there is no existing guidance for determining greater reasonable progress through the establishment of milestones, and a backstop emission trading program. The most relevant guidance is found in the preamble to the regional haze rule, which was the primary reference used by the western states when developing this methodology.

Federal guidance was developed in 1980 to address BART for source attribution, which is a separate requirement of the visibility rule. The States evaluated the 1980 BART guidance and the Regional Haze Rule and preamble for use during the development of this guidance document. After discussions with State legal counsel the States determined that the 1980 guidance was written specifically to address source attribution BART rather than regional haze BART. Because the regional haze rule and preamble address regional haze BART rather than source attribution BART these sources were chosen as the basis for this methodology.

Guidance documents and case history for PSD and NSR were also used as references for this methodology. There are similar applicability and control technology issues, and the states relied on more than 20 years of experience with these permitting programs to answer some of the relevant questions.

II. List of BART-Eligible Sources

The first step in developing a demonstration that the emission reduction milestones will achieve greater reasonable progress than BART is to develop a list of all BART-eligible sources within the State. The regional haze rule contains the following definitions:

> (hh) **BART-eligible source** means an existing stationary facility as defined in section 51.301(e).
>
> (e) **Existing stationary facility** means any of the following stationary sources of air pollutants, including any reconstructed source, which was not in operation prior to August 7, 1962, and was in existence on August 7, 1977, and has the potential to emit 250 tons per year or more of any air pollutant. In determining potential to emit, fugitive emissions, to the extent quantifiable, must be counted.

(1) Fossil-fuel fired steam electric plants of more than 250 million British thermal units per hour heat input,
(2) Coal cleaning plants (thermal dryers),
(3) Kraft pulp mills,
(4) Portland cement plants,
(5) Primary zinc smelters,
(6) Iron and steel mill plants,
(7) Primary aluminum ore reduction plants,
(8) Primary copper smelters,
(9) Municipal incinerators capable of charging more than 250 tons of refuse per day,
(10) Hydrofluoric, sulfuric, and nitric acid plants,
(11) Petroleum refineries,
(12) Lime plants,
(13) Phosphate rock processing plants,
(14) Coke oven batteries,
(15) Sulfur recovery plants,
(16) Carbon black plants (furnace process),
(17) Primary lead smelters,
(18) Fuel conversion plants,
(19) Sintering plants,
(20) Secondary metal production facilities,
(21) Chemical process plants,
(22) Fossil-fuel boilers of more than 250 million British thermal units per hour heat input,
(23) Petroleum storage and transfer facilities with a capacity exceeding 300,000 barrels,
(24) Taconite ore processing facilities,
(25) Glass fiber processing plants, and
(26) Charcoal production facilities.

The following sections identify the key elements in the definition of existing stationary source that should be considered when determining whether a source is BART-eligible.

A. Unit by Unit Applicability

The source should be reviewed at the unit level rather than the facility level. This means that one facility could have several units that are considered BART-eligible while other units do not meet the BART criteria. Only the BART-eligible units should be reviewed to determine appropriate control technologies. A unit-by-unit applicability determination will focus the BART review and possible control requirements on the large emission units at a facility.

> EXAMPLE: A source consists of 6 boilers. The largest of the boilers has a capacity of 96 MMBtu/hr heat input. The combined capacity of the boilers is 300 MMBtu/hr heat input. One of the applicability tests is that the source must belong to one of the 26 listed categories, one of which is fossil-fuel boilers of more than 250 million British thermal units per hour heat input. Since all of the boilers are below the 250 MMBtu/hr heat input cutoff, none of the units are considered BART-eligible, even though the combined capacity of the plant is over 250 MMBtu/hr heat input.

B. Date of Construction

BART review is limited to units that were constructed during a 15-year window between 1962 and 1977. There are several nuances in the definition that must be considered when determining if a unit falls within this 15-year window. The unit must not have been *in operation* prior to August 7, 1962. As defined in the regional haze rule, "in operation means engaged in activity related to the primary design function of the source." The date that the unit is permitted is not important to meet this test because the focus is on actual operation of the unit.

In addition, the unit must have been *in existence* as of August 7, 1977. As defined in 51.301(k) of the regional haze rule,

> In existence means that the owner or operator has obtained all necessary preconstruction approvals or permits required by Federal, State, or local air pollution emissions and air quality laws or regulations and either has (1) begun, or caused to begin, a continuous program of physical on-site construction of the facility or (2) entered into binding agreements or contractual obligations, which cannot be canceled or modified without substantial loss to the owner or operator, to undertake a program of construction of the facility to be completed in a reasonable time.

The actual date a unit begins operation may not be important to meet this test. For example, a unit that did not begin operation until 1983 may still be considered BART-eligible if the unit was permitted and entered into binding contracts within the relevant timeframe. This information may be difficult to obtain because 20-year old records are often not be complete. The state will need to work closely with the source to determine whether borderline units qualify as BART-eligible units.

In addition to the timing of initial construction, you must also consider whether the unit has been reconstructed. The regional haze rule states, "reconstruction will be presumed to have taken place where the fixed capital cost of the new component exceeds 50 percent of the fixed capital cost of a comparable entirely new source. Any final decision as to whether reconstruction has occurred must be made in accordance with the provisions of Sec. 60.15 (f) (1) through (3) of this title." Reconstruction could affect the applicability of the unit in several ways. If the unit was in operation prior to 1962, but was reconstructed within the 15-year window then it would be

considered BART-eligible. On the other hand, a unit that was originally constructed during the 15-year window but was then reconstructed at a later date would then be exempt.

It is important to note that modifications, as defined for PSD and nonattainment area NSR will not affect the applicability of a unit unless the modification also qualifies as reconstruction of the unit.

C. Listed source categories.

The facility must fall within one of the 26 listed categories in the definition of existing stationary source. These are the same categories that are included in the definition of major source under PSD. PSD guidance documents and case history will be useful to answer any questions related to these categories.

D. Potential Emissions

The unit must have the potential to emit 250 tons/year of SO_2. Applicability for BART is determined on a pollutant-by-pollutant basis. For example, if a unit has the potential to emit 300 tons/year of NO_x and 100 tons/year of SO_2, then the unit would not be considered BART-eligible for SO_2. It is not necessary to determine the unit's PTE at the time of construction. Instead you should focus on the **current PTE** of the unit.

III. Determination of Appropriate Control Technologies to Meet BART

Section 51.308(e)(2)(I)(B) establishes the basic criteria that a state should use for determining regional haze BART for a source category that will then be used to demonstrate that the emission reduction milestones (and backstop trading program) will achieve greater reasonable progress.

> "(B) An analysis of the best system of continuous emission control technology available and associated emission reductions achievable for each source within the State subject to BART. In this analysis, the State must take into consideration the technology available, the costs of compliance, the energy and non-air quality environmental impacts of compliance, any pollution control equipment in use at the source, and the remaining useful life of the source. The best system of continuous emission control technology and the above factors may be determined on a source category basis. The State may elect to consider both source-specific and category-wide information, as appropriate, in conducting its analysis."

There are several key elements to this analysis. The first is that states should identify available control technologies, and then consider additional factors to determine what is BART. The

factors are:

- the costs of compliance
- the energy and non-air quality environmental impacts of compliance
- any pollution control equipment in use at the source
- the remaining useful life of the source

The rule also specifies that the state may consider both source-specific and category-wide information when conducting its analysis.

A. Implications of Category Approach to BART Analysis

The ability to consider category-wide information in addition to source-specific information is a major difference between case-by-case regional haze BART under 51.308(e)(1) and the development of a BART estimate that will be used as justification that the emission reduction milestones (and backstop emission trading program) achieve greater reasonable progress than BART under 51.308(e)(2). The focus of the analysis is shifted from individual sources to the overall regional effect. Averages and other general assumptions that may not be appropriate for an individual source could add up to a very good approximation of the regional emission reductions. This guidance document outlines the methodology for calculating BART for an individual source only as a means for arriving at the regional estimate. The numbers for individual sources are not intended to be used outside of this regional context.

B. Establishment of Emission Reduction Milestones in Lieu of Application of BART to Specific Sources

It is also important to keep in mind that individual sources will not be required to install the BART level controls that are identified through this analysis. Instead, the reductions will be met through changes to increase productivity, voluntary measures, and the possible implementation of a backstop trading program. All of these options will provide a much greater degree of flexibility that the command-and-control application of case-by-case BART. This will have a significant effect on how the factors in the regional haze rule are applied. For example, the availability of water is one of the non-air environmental factors that must be considered. This factor could affect whether a wet scrubber would be an appropriate control for a particular plant. However, there may be roughly equivalent technologies that could be applied to a source where water was scarce. In this example, dry scrubbing would be an option. As long as the market provides the flexibility to use equivalent emission reductions, and category level BART is selected to reflect this flexibility, the effect of the factors will become less significant at the regional level.

C. Timing of Estimated BART Reductions

One significant difference between case-by-case BART and the western states plan to meet regional haze BART through the establishment of emission reduction milestones (along with a backstop trading program) is the timing of reductions. The emission reductions need to occur by the end of the first long range planning period in 2018. This date is almost 20 years in the future which has significant implications on the need to develop a detailed analysis of the costs and feasibilities of different technologies. For example, a source that is required to install a new SO_2 scrubber within 5 years will need to be looking at immediate costs and potential problems, such as siting issues and the availability of water. When looking at controls that would theoretically be installed in 20 years, however, it is very difficult to predict what issues the source would face at that time.

While the timing of the emission reductions makes it difficult to predict factors such as cost, it also provides tremendous flexibility and planning possibilities. For example, a cyclical industry may have difficulty raising the capital that is needed to install new control equipment within the next 5 years. With a 20-year planning cycle, these industries can plan for the upcoming emission reductions requirements that will be required by the regional emission reduction targets. This will reduce the impact of the BART requirements.

D. Process Used to Apply Factors

Rather than going through the factors individually, it is recommended that the factors be applied at each decision point in the development of BART for a source category. In some cases the factors are applied in a qualitative way, and in others they are applied as specific numbers or estimates.

E. Identification of the appropriate range of technologies

For individual source categories there is a wide range of control techniques that could be applied. These range from outdated and ineffective controls to cutting edge, experimental technologies. Rather than identifying all of these possibilities, it is better to focus on the kinds of emission controls that are currently being applied to new and existing sources in the region. Focusing on these known and relatively common controls is one way to address many of the BART factors. The reasonably attributable BART analyses for Navajo, Hayden, Centralia were also used as benchmarks and as proof of feasibility, although the western states recognize that these analyses are not directly applicable to the separate and different requirements for regional haze BART.

> **Cost.** If a control technology is commonly accepted in the region, then this is a good indicator that this type of control is not cost-prohibitive. It is also an indicator that some of the other, more source-specific difficulties can be overcome. Recent RACT, BACT and BART emission controls will be the best indicator of cost because these are applied to existing sources. For example, if wet scrubbers are commonly used on new power plants,

and have also been retrofitted onto existing power plants, this is an indicator that siting problems for the new equipment can often be resolved in a cost effective manner. A rough cost estimate of $3000/ton of SO_2 was used to eliminate the most expensive control options. This is moving into the BACT and LAER level that is applied in most states.

Energy and non-air environmental impacts. Water is scarce in the west. In addition, sources are often located far from urban centers and often do not have access to a wide variety of fuels. For example, natural gas may not be an option as a fuel because there are not any pipelines in the vicinity of the source. On the other hand, other environmental factors such as the release of small quantities of more hazardous pollutants, may not be as big of a factor because many of the sources are located in unpopulated areas. Emission controls that are applied to sources today have, by necessity, accommodated the energy and non-air environmental impacts.

F. How should the range of Technologies be applied?

Sources within a particular source category may be quite variable. Differences will include the age of the source and existing pollution control equipment that has been installed. For this reason, once a range of technologies has been identified for a source category, criteria should then be established to determine where specific sources would fall within that range. For the purpose of this analysis, three types of controls are identified for each source category. These are identified as low BART, medium BART and high BART. The following criteria should be used to determine whether an individual source would fall within this range.

Remaining useful life. When calculating the cost of control, the remaining useful life of a source is a significant factor. A more expensive control may be justified if it will control emissions for 30 years. On the other hand, it may be cost-prohibitive to control a plant that is nearing retirement.

	Remaining useful life
Low BART	less than 5 years
Medium BART	5-10 years
High BART	greater than 10 years

Remaining useful life should be calculated beginning in the year 2013. This date was chosen because this is the date by which BART controls would need to be installed under a case-by-case regional haze BART analysis under section 308 of the regional haze rule. If a state was doing a case-by-case analysis, it would not make sense to require a source to install controls if it was expected to retire within 5 years. The following standard life

expectancies should be used for individual source categories. These were chosen as an average, reasonable estimate that would be applicable on a regional level. Individual sources may retire earlier or later than this regional estimate.

Category	Standard life expectancy
Utility Boilers	60
Other Process Equipment	40
Process heaters and boilers	40
smelters	60
All others	40

Existing pollution controls. There are sources in the region that have existing pollution control equipment that would be considered too inefficient for a brand new source. If the existing controls were replaced with newer, better technologies, you would need to consider some of the indirect costs such as stranded capital costs for the equipment and demolition costs. The cost of maintaining the existing equipment is also a factor because if a source has to replace portions of the equipment regularly, then the cost of a new system may not be as much of an issue.

If the difference in control efficiencies between the existing controls and the current controls is not very significant, this low benefit will not be enough to justify the high cost of replacing the equipment. On the other hand, if the existing control equipment is not very effective, then the expected benefit could outweigh the cost

If the existing pollution control equipment is as good as medium BART, then no additional controls would be calculated

If the existing control equipment is less than medium BART, then high BART would be calculated as the emission control for the unit unless the source the source qualifies for medium or low BART due to the remaining useful life of the unit. In the latter case, low BART would apply to the unit.

G. Visibility Improvement

Once the regional haze BART technology has been identified, after taking into consideration the technology available, the costs of compliance, the energy and nonair quality environmental impacts of compliance, any pollution control equipment in use at the source, and the remaining

useful life of the source, the regional haze rule requires an analysis of visibility improvement due to BART. The rule requires:

> (B) An analysis of the degree of visibility improvement that would be achieved in each mandatory Class I Federal area as a result of the emission reductions achievable from all sources subject to BART located within the region that contribute to visibility impairment in the Class I area, based on the [BART] analysis.

The WRAP modeling forum is already examining methodologies for providing this analysis. In addition, the western states will rely on the underlying strategy of the Grand Canyon Visibility Transport Commission which is to focus on emission reduction strategies rather than specific visibility improvement targets. There is significant variability in visibility impacts during the year due to changing wind speeds, direction, humidity and other important factors. This variability makes it difficult to model the visibility impact of individual emission reduction strategies. For this reason, the GCVTC worked to develop strategies that would provide steady and continuous emission reductions throughout the region, including an overall reduction of SO_2 from stationary sources of 50-70 % by the year 2040.

IV. Application of the Methodology to Individual Source Categories

Various control techniques were examined for each category, including process changes that would reduce the amount of sulfur upstream of the individual processes. These control techniques are summarized in Table 1. The % control efficiency is identified as well as the average cost for installing the controls.

This information was then examined to determine appropriate control efficiencies for low, medium, and high BART. In some cases, the BART control level was assumed to be a mixture of control techniques, recognizing that there is variability in the units throughout the region, and a particular control may not be appropriate for all types. The various BART levels are summarized in Table. 2.

TABLE 1. SULFUR DIOXIDE TECHNOLOGY REVIEW SUMMARY

SOURCE CATEGORY	CONTROL TECHNOLOGY	CONTROL EFFICIENCY	COST/TON [1]	COMMENTS
Coal-Fired Utility Boilers				
	Fuel Switching/Blending	10 to 20%	**moderate to high** depending on coal cost difference and contract termination costs	Coals consumed by AZ utilities have very low sulfur contents. Average coal sulfur content in 1993-1997 ranged from 0.49 to 0.54 wt% sulfur [EIA- Coal Quality Data from the Coal Industry Table 106. Average Quality of Coal Received at Electric Utilities by Census Division and State].
	Dry Sorbent Injection	25 to 90% sodium and calcium based	**moderate to high** Depending on sorbent cost and amount of SO2 removed	Only applicable to units that do not have wet or dry scrubbers. Use of sodium based sorbents can significantly increase waste disposal problems/costs.
	Lime Spray Drying (LSD)	60 to 90%	**Moderate**	Not applicable for units already controlled with wet or dry scrubbers.
	Wet Flue Gas Desulfurization (FGD)	60 to 95%	**moderate to high**	
	Increase Performance of FGD	5 to 50% increase over current levels	**low to moderate** [2]	For wet FGD systems % reduction can be improved through the use of additives and FGD equipment reconfiguration/modifications.
	Increased Performance of LSD	40 to 50% increase over current levels	**moderate** [2]	For LSD systems % reduction can be improved with the addition of scrubber modules and baghouse sections.

SOURCE CATEGORY	CONTROL TECHNOLOGY	CONTROL EFFICIENCY	COST/TON [1]	COMMENTS
Copper Smelter Acid Plants				
	Conversion of Single Contact to Double Contact or addition of Sodium FGD	6% increase in reduction over current levels	**Low** [3]	Assumes going from 93% control to 99% control
Coal-Fired Industrial Boilers				
	Same as Coal-Fired Utility Boilers	Same as Coal-Fired Utility Boilers	Increase Coal-Fired Utility Boiler costs to the next higher category	Smaller size boilers (<100 MW) increases $/ton costs.
	Sodium FGD	90 to 95%	**high**	Lower capitol costs but much higher operating costs relative to L/LS FGD.
Refinery boilers and process heaters				
	Sulfur Recovery Units (SRU) Two-stage Claus unit	74%		Hydrogen sulfide (H2S), a by-product of processing crude oil, is recovered from the process gas by conversion to elemental sulfide. The majority of SRUs are now built with 2-stage Claus units, although some 3-stage units were built to meet more stringent air quality requirements (AP-42 8.13-2)

SOURCE CATEGORY	CONTROL TECHNOLOGY	CONTROL EFFICIENCY	COST/TON [1]	COMMENTS
	SRU Three-stage Claus unit	95%		Refineries that are processing sweet crude may have difficulty running a 3rd stage because there is not enough sulfur to drive the process. The Utah PM10 SIP established a SRU with 95% control efficiency as RACT for refineries.
	SRU Three-stage Claus unit with tail gas unit	99%		A tail gas unit would not be cost-effective on a small refinery or a refinery that is processing sweet crude oil.
Refinery SRU				
	Increase to 2-stage Claus unit	74%		
	Increase to 3-stage Claus unit	95%		
	Increase to 3-stage Claus unit with tail gas unit	99%		
Refinery Catalytic Crackers				
	Low-SOx catalyst			The Utah PM10 SIP required the use of low-SOx catalyst in fluid cat cracking units as RACT.
	Wet alkali scrubber			
Flares				
	No controls typically applied			
Cement Plants				

SOURCE CATEGORY	CONTROL TECHNOLOGY	CONTROL EFFICIENCY	COST/TON [1]	COMMENTS
	No Controls typically applied			The SO_2 emissions are a factor of the sulfur content of the fuel and raw material which can be quite variable. AP-42 indicates that cement absorbs sulfur. Absorption ranges from 70-95% and this occurs during the cement-making process itself. NSPS does not address SO_2. AP-42 does not mention any additional add-on controls. There is a new plant in Colorado that may install a wet scrubber (source has not yet been constructed), but this is very unusual - it may be the only one in the country. Scrubbers are not typically required for BACT.
Lime Plants				
	No control typically applied			The control requirements for lime plants are very similar to cement plants. Quicklime is alkaline and, like cement, naturally absorbs sulfur during the process. AP-42 does not address additional SO_2 add-on controls, and does not provide an emission factor that includes SO_2 controls.
Pulp and Paper Mills - Recovery Furnaces				
	Direct contact evaporator	75%		SO_2 is controlled by removing sulfur earlier in the process by using a direct contact evaporator.

SOURCE CATEGORY	CONTROL TECHNOLOGY	CONTROL EFFICIENCY	COST/TON [1]	COMMENTS
	Direct contact evaporator with the addition of a scrubber	99%		Scrubbing options would be similar to those identified for coal-fired utility boilers.

NOTES:
1. Costs estimated from Assessment of Control Technologies for Reducing Emissions of SO2 and NOx from Existing Coal-Fired Utility Boilers EPA-600/7-90-018. low < $500/ton, moderate $500 to 3000/ton, high $ > $3000/ton
2. Assumed to have lower $/ton costs than new applications.
3. Costs estimated from Cost of Controlling Directly Emitted Acidic Emissions from Major Industrial Sources EPA-600/7-88-012

TABLE 2. BART CONTROL EFFICIENCIES

SOURCE CATEGORY	LOW-BART	MEDIUM-BART	HIGH-BART	COMMENTS
Coal-Fired Utility Boilers	No existing controls 15% FGD or LSD increase existing controls by 25% (for example, 80% control would be increased to 85%)	60%	85%	
Copper Smelters	0%	93%	99%	The control efficiencies should only be applied to the gas stream that goes to the acid plant, not fugitive emission
Coal-Fired Industrial Boilers	0%	No existing controls 15% FGD or LSD increase existing controls by 25% (for example, 80% control would be increased to 85%)	60%	

Refinery Boilers and Process Heaters	Refineries w/o existing SRU 0% Refineries with existing SRU (unit not piped into SRU) 74%	74%	99%	
Refinery Sulfur Recovery Units	0%	74%	99%	
Refinery Catalytic Crackers	?	?	?	Still need to identify control efficiencies for this category
Flares	0%	0%	0%	
Cement Plants	0%	0%	0%	
Lime Plants	0%	0%	0%	
Pulp and Paper Mills - Recovery Furnaces	0%	75%	99%	

V. Method for Calculating Emission Reductions due to BART.

The applicable control level is only one part of the equation that is needed to determine the emission reductions that would occur in the region if regional haze BART was applied to all BART-eligible units. Expected changes in utilization of existing units would also need to be considered. The following equations should be used:

$$\text{Baseline}_{2018} = \text{Emissions}_{unc} \times \text{capacity factor}_{2018} \times \text{control factor}_{current}$$

$$\text{BART}_{2018} = \text{Emissions}_{unc} \times \text{capacity factor}_{2018} \times \text{control factor}_{BART}$$

$$\text{BART Reduction} = \text{Baseline}_{2018} - \text{BART}_{2018}$$

Where:

Emissions_{unc} = Uncontrolled emissions for the unit. The uncontrolled emissions should be calculated using the fuel and material sulfur percentages that the source is currently using.

MMBtu/hr x 8760 hr/yr = total Btu/yr
(Total Btu/yr) / (coal Btu/ton) = tons/yr coal used
Use AP-42 calculation for maximum SO_2

$\text{Capacity factor}_{2018}$ = The expected regional capacity factor for the source category in the year 2018.

Power plants - assume **78%** as a starting point (current capacity for the region). The Western Interstate Energy Board will provide an estimate for regional capacity in the year 2018

****need to determine capacity factors for other categories
Use best estimates of future capacity (if available), otherwise use current capacity as an estimate of what will occur in 2018

$\text{control factor}_{current}$ = Current control efficiency for the unit

$\text{control factor}_{BART}$ = Control efficiency for the unit after BART is applied (low BART, medium BART, or high BART)

A source that is assumed to be shut down by 2018, or a source where BART is considered to be no additional controls, will be calculated as zero emission reductions due to the application of BART. The impact of shut downs will be addressed in the baseline that is used to determine total regional emissions in 2018 with the application of BART-level controls rather than being calculated as a reduction due to BART.

This approach addresses the following issues:

- some sources are currently operating below their capacity. There is an expectation that power plants will be operated at a higher capacity in the future due to restructuring of the power industry.

- sources never operate at their PTE. There is always downtime, and times when the source is not operating at maximum load. For this reason a capacity factor that is less than 100% should be used. 80 - 90% is a good estimate for most categories.

- BART is a technology requirement, not an emission limit. a source could operate at maximum capacity using the BART technology and still be in compliance with BART. However, not all sources in the region will be operating at maximum capacity in 2018. An average expected capacity factor will address this issue.

VI. Example Calculation

****need to develop an example calculation for an individual unit.