

APPENDIX A TO PART 72—METHODOLOGY FOR ANNUALIZATION OF EMISSIONS LIMITS

For the purposes of the Acid Rain Program, 1985 emissions limits must be expressed in pounds of SO₂ per million British Thermal Unit of heat input (lb/mmBtu) and expressed on an annual basis.

Annualization factors are used to develop annual equivalent SO₂ limits as required by section 402(18) of the CAA. Many emission limits are enforced on a shorter term basis (or averaging period) than annually. Because of the variability of sulfur in coal and, in some cases, scrubber performance, meeting a particular limit with an averaging period of less than a year and at a specified statutory emissions level would require a lower annual average SO₂ emission rate (or annual equivalent SO₂ limit) than would the shorter term statutory limit. EPA has selected a compliance level of one exceedance per 10 years. For example, an SO₂ emission limit of 1.2 lbs/MMBtu, enforced for a scrubbed unit over a 7-day averaging period, would result in an annualized SO₂ emission limit of 1.16 lbs/MMBtu. In general, the shorter the averaging period, the lower the annual equivalent would be. Thus, the annualization of limits is established by multiplying each federally enforceable limit by an annualization factor that is determined by the averaging period and whether or not it's a scrubbed unit.

TABLE A-1—SO₂ EMISSION AVERAGING PERIODS AND ANNUALIZATION FACTORS

Definition	Annualization factor	
	Scrubbed Unscrubbed	
	Unit	Unit
Oil/gas unit	1.00	1.00
<=1 day	0.93	0.89
1 week	0.97	0.92
30 days	1.00	0.96
90 days	1.00	1.00
1 year	1.00	1.00
Not specified	0.93	0.89
At all times	0.93	0.89
Coal unit: No Federal limit or limit unknown	1.00	1.00

APPENDIX B TO PART 72—METHODOLOGY FOR CONVERSION OF EMISSIONS LIMITS

For the purposes of the Acid Rain Program, all emissions limits must be expressed in pounds of SO₂ per million British Thermal Unit of heat input (lb/mmBtu).

The factor for converting pounds of sulfur to pounds of SO₂ is based on the molecular weights of sulfur (32) and SO₂ (64). Limits expressed as percentage of sulfur or parts per million (ppm) depend on the energy content of the fuel and thus may vary, depending on several factors such as fuel heat content and atmospheric conditions. Generic conversions for these limits are based on the assumed average energy contents listed in table A-2. In addition, limits in ppm vary with boiler operation (e.g., load and excess air); generic conversions for these limits assume, conservatively, very low excess air. The remaining factors are based on site-specific heat rates and capacities to develop conversions for Btu per hour. Standard conversion factors for residual oil are 42 gal/bbl and 7.88 lbs/gal.

TABLE B-1—CONVERSION FACTORS
[Emission limits converted to lbs SO₂/MMBtu by multiplying as below]

Unit measurement	Plant fuel type			
	Bituminous coal	Subbituminous coal	Lignite coal	Oil
Lbs sulfur/ MMBtu	2.0	2.0	2.0	2.0
% sulfur in fuel	1.66	2.22	2.86	1.07
Ppm SO ₂	0.00287	0.00384	0.00167
Ppm sulfur in fuel	0.00334
Tons SO ₂ /hour	2,000,000/(HEATRATE*SUMNDCAP*capacity factor) ¹			
Lbs SO ₂ /hour	1,000/(HEATRATE*SUMNDCAP*capacity factor) ¹			

¹ In these cases, if the limit was specified as the "site" limit, the summer net dependable capability for the entire plant is used; otherwise, the summer net dependable capability for the unit is used. For units listed in the NADB, "HEATRATE" shall be that listed in the NADB under that field and "SUMNDCAP" shall be that listed in the NADB under that field. For units not listed in the NADB, "HEATRATE" is the generator net full load heat rate reported on Form EIA-860 and "SUMNDCAP" is the summer net dependable capability of the generator (in MWe) as reported on Form EIA-860.

TABLE B-2—ASSUMED AVERAGE ENERGY CONTENTS

Fuel type	Average heat content
Bituminous Coal	24 MMBtu/ton.
Subbituminous Coal	18 MMBtu/ton.
Lignite Coal	14 MMBtu/ton.
Residual Oil	6.2 MMBtu/bbl.

APPENDIX C TO PART 72—ACTUAL 1985 YEARLY SO₂ EMISSIONS CALCULATION

The equation used to calculate the yearly SO₂ emissions (SO₂) is as follows:

$$SO_2 = (\text{coal } SO_2 \text{ emissions}) + (\text{oil } SO_2 \text{ emissions}) \text{ (in tons)}$$

If gas is the only fuel, gas emissions are defaulted to 0.

Each fuel type SO₂ emissions is calculated on a yearly basis, using the equation:

$$\text{fuel } SO_2 \text{ emissions (in tons)} = (\text{yrly wtd. av. fuel sulfur \%}) \times (\text{AP-42 fact.}) \times (1 - \text{scrub. effic. \%}/100) \times (\text{units conver. fact.}) \times (\text{yearly fuel burned})$$

For coal, the yearly fuel burned is in tons/yr and the AP-42 factor (which accounts for the ash retention of sulfur in coal), in lbs SO₂/ton coal, is by coal type:

Coal type	AP-42 factor
Bituminous, anthracite	39 lbs/ton
Subbituminous	35
Lignite	30

For oil, the yearly fuel burned is in gal/yr. If it is in bbl/yr, convert using 42 gal/bbl oil. The AP-42 factor (which accounts for the oil density), in lbs SO₂/thousand gal oil, is by oil type:

Oil type	AP-42 factor
Distillate (light)	142 lbs/1,000 gal
Residual (heavy)	157

For all fuel, the units conversion factor is 1 ton/2000 lbs.

APPENDIX D TO PART 72—CALCULATION OF POTENTIAL ELECTRIC OUTPUT CAPACITY

The potential electrical output capacity is calculated from the maximum design heat input from the boiler by the following equation:

$$\frac{\text{max. design heat input}}{3} \times \frac{\times 1 \text{ kw-hr}}{3413 \text{ Btu}} \times \frac{\times 1 \text{ MWe}}{1000 \text{ Kw}}$$

For example:

(1) Assume a boiler with a maximum design heat input capacity of 340 million Btu/hr.

(2) One-third of the maximum design heat input capacity is 113.3 mmBtu/hr. The one-third factor relates to the thermodynamic efficiency of the boiler.

(3) To express this in MWe, the standards conversion of 3413 Btu to 1 kw-hr is used: 113.3×10⁶ Btu/hr×1 kw-hr / 3413 Btu×1 MWe / 1000 kw=33.2 MWe

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PART 73—SULFUR DIOXIDE ALLOWANCE SYSTEM

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