

information including, but not limited to, the following: (1) a copy of all data and results from the initial NO<sub>x</sub> emission rate testing, including the values of quality assurance parameters specified in section 2.3 of this appendix; (2) a copy of all data and results from the most recent NO<sub>x</sub> emission rate load correlation testing; (3) a copy of the recommended range of quality assurance- and quality control-related operating parameters.

4.1 Submit a copy of the recommended range of operating parameter values, and the range of operating parameter values recorded during the previous NO<sub>x</sub> emission rate test that determined the unit's NO<sub>x</sub> emission rate, along with the unit's revised monitoring plan submitted with the certification application.

4.2 Keep records of these operating parameters for each hour of operation in order to demonstrate that a unit is remaining within the recommended operating range.

[58 FR 3701, Jan. 11, 1993, as amended at 60 FR 26551-26553, May 17, 1995; 64 FR 28665, May 26, 1999; 67 FR 40473, 40474, June 12, 2002; 67 FR 53505, Aug. 16, 2002; 73 FR 4372, Jan. 24, 2008; 76 FR 17325, Mar. 28, 2011]

#### APPENDIX F TO PART 75—CONVERSION PROCEDURES

##### 1. APPLICABILITY

Use the procedures in this appendix to convert measured data from a monitor or con-

tinuous emission monitoring system into the appropriate units of the standard.

##### 2. PROCEDURES FOR SO<sub>2</sub> EMISSIONS

Use the following procedures to compute hourly SO<sub>2</sub> mass emission rate (in lb/hr) and quarterly and annual SO<sub>2</sub> total mass emissions (in tons).

2.1 When measurements of SO<sub>2</sub> concentration and flow rate are on a wet basis, use the following equation to compute hourly SO<sub>2</sub> mass emission rate (in lb/hr):

$$E_h = KC_h Q_h \quad (\text{Eq. F-1})$$

Where:

$E_h$  = Hourly SO<sub>2</sub> mass emission rate during unit operation, lb/hr.

$K = 1.660 \times 10^{-7}$  for SO<sub>2</sub>, (lb/scf)/ppm.

$C_h$  = Hourly average SO<sub>2</sub> concentration during unit operation, stack moisture basis, ppm.

$Q_h$  = Hourly average volumetric flow rate during unit operation, stack moisture basis, scfh.

2.2 When measurements by the SO<sub>2</sub> pollutant concentration monitor are on a dry basis and the flow rate monitor measurements are on a wet basis, use the following equation to compute hourly SO<sub>2</sub> mass emission rate (in lb/hr):

$$E_h = K C_{hp} Q_{hs} \frac{(100 - \%H_2O)}{100} \quad (\text{Eq. F-2})$$

where:

$E_h$  = Hourly SO<sub>2</sub> mass emission rate during unit operation, lb/hr.

$K = 1.660 \times 10^{-7}$  for SO<sub>2</sub>, (lb/scf)/ppm.

$C_{hp}$  = Hourly average SO<sub>2</sub> concentration during unit operation, ppm (dry).

$Q_{hs}$  = Hourly average volumetric flow rate during unit operation, scfh as measured (wet).

$\%H_2O$  = Hourly average stack moisture content during unit operation, percent by volume.

2.3 Use the following equations to calculate total SO<sub>2</sub> mass emissions for each calendar quarter (Equation F-3) and for each calendar year (Equation F-4), in tons:

$$E_q = \frac{\sum_{h=1}^n E_h t_h}{2000}$$

(Eq. F-3)

Where:

$E_q$  = Quarterly total SO<sub>2</sub> mass emissions, tons.

$E_h$  = Hourly SO<sub>2</sub> mass emission rate, lb/hr.

$t_h$  = Unit operating time, hour or fraction of an hour (in equal increments that can range from one hundredth to one quarter of an hour, at the option of the owner or operator).

$n$  = Number of hourly SO<sub>2</sub> emissions values during calendar quarter.

2000 = Conversion of 2000 lb per ton.

$$E_a = \sum_{q=1}^4 E_q \quad (\text{Eq. F-4})$$

Where:

$E_a$  = Annual total SO<sub>2</sub> mass emissions, tons.

$E_q$  = Quarterly SO<sub>2</sub> mass emissions, tons.

$q$  = Quarters for which  $E_q$  are available during calendar year.

2.4 Round all SO<sub>2</sub> mass emission rates and totals to the nearest tenth.

### 3. PROCEDURES FOR NO<sub>x</sub> EMISSION RATE

Use the following procedures to convert continuous emission monitoring system measurements of NO<sub>x</sub> concentration (ppm) and diluent concentration (percentage) into NO<sub>x</sub> emission rates (in lb/mmBtu). Perform measurements of NO<sub>x</sub> and diluent (O<sub>2</sub> or CO<sub>2</sub>) concentrations on the same moisture (wet or dry) basis.

3.1 When the NO<sub>x</sub> continuous emission monitoring system uses O<sub>2</sub> as the diluent, and measurements are performed on a dry basis, use the following conversion procedure:

$$E = K C_h F \frac{20.9}{20.9 - \%O_2}$$

(Eq. F-5)

where,

$K$ ,  $E$ ,  $C_h$ ,  $F$ , and  $\%O_2$  are defined in section 3.3 of this appendix. When measurements are performed on a wet basis, use the equations in Method 19 in appendix A-7 to part 60 of this chapter.

3.2 When the NO<sub>x</sub> continuous emission monitoring system uses CO<sub>2</sub> as the diluent, use the following conversion procedure:

$$E = K C_h F_c \frac{100}{\%CO_2}$$

(Eq. F-6)

where:

$K$ ,  $E$ ,  $C_h$ ,  $F_c$ , and  $\%CO_2$  are defined in section 3.3 of this appendix.

When CO<sub>2</sub> and NO<sub>x</sub> measurements are performed on a different moisture basis, use the equations in Method 19 in appendix A-7 to part 60 of this chapter.

3.3 Use the definitions listed below to derive values for the parameters in equations F-5 and F-6 of this appendix, or (if applicable) in the equations in Method 19 in appendix A-7 to part 60 of this chapter.

3.3.1  $K=1.194 \times 10^{-7}$  (lb/dscf)/ppm NO<sub>x</sub>.

3.3.2  $E$  = Pollutant emissions during unit operation, lb/mmBtu.

3.3.3  $C_h$  = Hourly average pollutant concentration during unit operation, ppm.

3.3.4  $\%O_2$ ,  $\%CO_2$  = Oxygen or carbon dioxide volume during unit operation (expressed as percent O<sub>2</sub> or CO<sub>2</sub>).

3.3.4.1 For boilers, a minimum concentration of 5.0 percent CO<sub>2</sub> or a maximum concentration of 14.0 percent O<sub>2</sub> may be substituted for the measured diluent gas concentration value for any operating hour in which the hourly average CO<sub>2</sub> concentration is < 5.0 percent CO<sub>2</sub> or the hourly average O<sub>2</sub> concentration is > 14.0 percent O<sub>2</sub>. For stationary gas turbines, a minimum concentration of 1.0 percent CO<sub>2</sub> or a maximum concentration of 19.0 percent O<sub>2</sub> may be substituted for measured diluent gas concentration values for any operating hour in which the hourly average CO<sub>2</sub> concentration is < 1.0 percent CO<sub>2</sub> or the hourly average O<sub>2</sub> concentration is > 19.0 percent O<sub>2</sub>.

3.3.4.2 If NO<sub>x</sub> emission rate is calculated using either Equation 19-3 or 19-5 in Method 19 in appendix A-7 to part 60 of this chapter, a variant of the equation shall be used whenever the diluent cap is applied. The modified equations shall be designated as Equations 19-3D and 19-5D, respectively. Equation 19-3D is structurally the same as Equation 19-3, except that the term “ $\%O_{2w}$ ” in the denominator is replaced with the term “ $\%O_{2dc} \times [(100 - \%H_2O)/100]$ ”, where  $\%O_{2dc}$  is the diluent cap value. The numerator of Equation 19-5D is the same as Equation 19-5; however, the denominator of Equation 19-5D is simply “ $20.9 - \%O_{2dc}$ ”, where  $\%O_{2dc}$  is the diluent cap value.

3.3.5  $F$ ,  $F_c$  = a factor representing a ratio of the volume of dry flue gases generated to the caloric value of the fuel combusted ( $F$ ), and a factor representing a ratio of the volume of CO<sub>2</sub> generated to the caloric value of the fuel combusted ( $F_c$ ), respectively. Table 1 lists the values of  $F$  and  $F_c$  for different fuels.

TABLE 1—F- AND F<sub>c</sub>-FACTORS<sup>1</sup>

Fuel	F-factor (dscf/mmBtu)	F <sub>c</sub> -factor (scf CO <sub>2</sub> /mmBtu)
Coal (as defined by ASTM D388-99 <sup>2</sup> ):		
Anthracite .....	10,100	1,970
Bituminous .....	9,780	1,800
Subbituminous .....	9,820	1,840
Lignite .....	9,860	1,910
Petroleum Coke .....	9,830	1,850
Tire Derived Fuel .....	10,260	1,800
Oil .....	9,190	1,420
Gas:		
Natural gas .....	8,710	1,040
Propane .....	8,710	1,190
Butane .....	8,710	1,250
Wood:		
Bark .....	9,600	1,920
Wood residue .....	9,240	1,830

<sup>1</sup>Determined at standard conditions: 20 °C (68 °F) and 29.92 inches of mercury.

<sup>2</sup>Incorporated by reference under § 75.6 of this part.

3.3.6 Equations F-7a and F-7b may be used in lieu of the F or F<sub>c</sub> factors specified in Section 3.3.5 of this appendix to calculate a site-specific dry-basis F factor (dscf/mmBtu) or a site-specific F<sub>c</sub> factor (scf CO<sub>2</sub>/mmBtu), on either a dry or wet basis. At a minimum, the site-specific F or F<sub>c</sub> factor must be based on 9 samples of the fuel. Fuel samples taken during each run of a RATA are acceptable for this purpose. The site-specific F or F<sub>c</sub> fac-

tor must be re-determined at least annually, and the value from the most recent determination must be used in the emission calculations. Alternatively, the previous F or F<sub>c</sub> value may continue to be used if it is higher than the value obtained in the most recent determination. The owner or operator shall keep records of all site-specific F or F<sub>c</sub> determinations, active for at least 3 years. (Calculate all F- and F<sub>c</sub> factors at standard conditions of 20 °C (68 °F) and 29.92 inches of mercury).

$$F = \frac{3.64 (\%H) + 1.53 (\%C) + 0.57 (\%S) + 0.14 (\%N) - 0.46 (\%O)}{GCV} \times 10^6$$

(Eq. F-7a)

$$F_c = \frac{321 \times 10^3 (\%C)}{GCV}$$

(Eq. F-7b)

3.3.6.1 H, C, S, N, and O are content by weight of hydrogen, carbon, sulfur, nitrogen, and oxygen (expressed as percent), respectively, as determined on the same basis as the gross calorific value (GCV) by ultimate analysis of the fuel combusted using ASTM D3176-89 (Reapproved 2002), Standard Practice for Ultimate Analysis of Coal and Coke, (solid fuels), ASTM D5291-02, Standard Test Methods for Instrumental Determination of Carbon, Hydrogen, and Nitrogen in Petroleum Products and Lubricants, (liquid fuels) or computed from results using ASTM D1945-96 (Reapproved 2001), Standard Test Method for Analysis of Natural Gas by Gas Chromatography, or ASTM D1946-90 (Reapproved 2006), Standard Practice for Analysis of Reformed Gas by Gas Chromatography, (gas-

eous fuels) as applicable. (All of these methods are incorporated by reference under § 75.6 of this part.)

3.3.6.2 GCV is the gross calorific value (Btu/lb) of the fuel combusted determined by ASTM D5865-01a or ASTM D5865-10, ASTM D240-00 or ASTM D4809-00, and ASTM D3588-98, ASTM D4891-89 (Reapproved 2006), GPA Standard 2172-96, GPA Standard 2261-00, or ASTM D1826-94 (Reapproved 1998), as applicable. (All of these methods are incorporated by reference under § 75.6.)

3.3.6.3 For affected units that combust a combination of a fuel (or fuels) listed in Table 1 in section 3.3.5 of this appendix with any fuel(s) not listed in Table 1, the F or F<sub>c</sub> value is subject to the Administrator's approval under § 75.66.

3.3.6.4 For affected units that combust combinations of fuels listed in Table 1 in section 3.3.5 of this appendix, prorate the F or F<sub>c</sub> factors determined by section 3.3.5 or 3.3.6 of this appendix in accordance with the applicable formula as follows:

$$F = \sum_{i=1}^n X_i F_i \quad F_c = \sum_{i=1}^n X_i (F_c)_i \quad (\text{Eq. F-8})$$

Where,

X<sub>i</sub> = Fraction of total heat input derived from each type of fuel (*e.g.*, natural gas, bituminous coal, wood). Each X<sub>i</sub> value shall be determined from the best available information on the quantity of fuel combusted and the GCV value, over a specified time period. The owner or operator shall explain the method used to calculate X<sub>i</sub> in the hardcopy portion of the monitoring plan for the unit. The X<sub>i</sub> values may be determined and updated either hourly, daily, weekly, or monthly. In all cases, the pro-

rated F-factor used in the emission calculations shall be determined using the X<sub>i</sub> values from the most recent update.

F<sub>i</sub> or (F<sub>c</sub>)<sub>i</sub> = Applicable F or F<sub>c</sub> factor for each fuel type determined in accordance with Section 3.3.5 or 3.3.6 of this appendix.  
n = Number of fuels being combusted in combination.

3.3.6.5 As an alternative to prorating the F or F<sub>c</sub> factor as described in section 3.3.6.4 of this appendix, a "worst-case" F or F<sub>c</sub> factor may be reported for any unit operating hour. The worst-case F or F<sub>c</sub> factor shall be

## Environmental Protection Agency

## Pt. 75, App. F

the highest F or F<sub>c</sub> value for any of the fuels combusted in the unit.

3.4 Use the following equations to calculate the average NO<sub>x</sub> emission rate for each calendar quarter (Equation F-9) and the average emission rate for the calendar year (Equation F-10), in lb/mmBtu:

$$E_q = \sum_{i=1}^n \frac{E_i}{n} \quad (\text{Eq. F-9})$$

Where:

E<sub>q</sub> = Quarterly average NO<sub>x</sub> emission rate, lb/mmBtu.

E<sub>i</sub> = Hourly average NO<sub>x</sub> emission rate during unit operation, lb/mmBtu.

n = Number of hourly rates during calendar quarter.

$$E_a = \sum_{i=1}^m \frac{E_i}{m} \quad (\text{Eq. F-10})$$

Where:

E<sub>a</sub> = Average NO<sub>x</sub> emission rate for the calendar year, lb/mmBtu.

E<sub>i</sub> = Hourly average NO<sub>x</sub> emission rate during unit operation, lb/mmBtu.

m = Number of hourly rates for which E<sub>i</sub> is available in the calendar year.

3.5 Round all NO<sub>x</sub> emission rates to the nearest 0.001 lb/mmBtu.

### 4. PROCEDURES FOR CO<sub>2</sub> MASS EMISSIONS

Use the following procedures to convert continuous emission monitoring system measurements of CO<sub>2</sub> concentration (percentage) and volumetric flow rate (scfh) into CO<sub>2</sub> mass emissions (in tons/day) when the owner or operator uses a CO<sub>2</sub> continuous emission monitoring system (consisting of a CO<sub>2</sub> or O<sub>2</sub> pollutant monitor) and a flow monitoring system to monitor CO<sub>2</sub> emissions from an affected unit.

4.1 When CO<sub>2</sub> concentration is measured on a wet basis, use the following equation to calculate hourly CO<sub>2</sub> mass emissions rates (in tons/hr):

$$E_h = K C_h Q_h \quad (\text{Eq. F-11})$$

Where:

E<sub>h</sub> = Hourly CO<sub>2</sub> mass emission rate during unit operation, tons/hr.

K = 5.7×10<sup>-7</sup> for CO<sub>2</sub>, (tons/scf) / %CO<sub>2</sub>.

C<sub>h</sub> = Hourly average CO<sub>2</sub> concentration during unit operation, wet basis, either measured directly with a CO<sub>2</sub> monitor or calculated from wet-basis O<sub>2</sub> data using Equation F-14b, percent CO<sub>2</sub>.

Q<sub>h</sub> = Hourly average volumetric flow rate during unit operation, wet basis, scfh.

4.2 When CO<sub>2</sub> concentration is measured on a dry basis, use Equation F-2 to calculate the hourly CO<sub>2</sub> mass emission rate (in tons/hr) with a K-value of 5.7×10<sup>-7</sup> (tons/scf) percent CO<sub>2</sub>, where E<sub>h</sub> = hourly CO<sub>2</sub> mass emission rate, tons/hr and C<sub>hp</sub> = hourly average CO<sub>2</sub> concentration in flue, dry basis, percent CO<sub>2</sub>.

4.3 Use the following equations to calculate total CO<sub>2</sub> mass emissions for each calendar quarter (Equation F-12) and for each calendar year (Equation F-13):

$$E_{CO_2q} = \sum_{h=1}^{H_R} E_h t_h \quad (\text{Eq. F-12})$$

Where:

E<sub>CO<sub>2</sub>q</sub> = Quarterly total CO<sub>2</sub> mass emissions, tons.

E<sub>h</sub> = Hourly CO<sub>2</sub> mass emission rate, tons/hr.

t<sub>h</sub> = Unit operating time, in hours or fraction of an hour (in equal increments that can range from one hundredth to one quarter of an hour, at the option of the owner or operator).

H<sub>R</sub> = Number of hourly CO<sub>2</sub> mass emission rates available during calendar quarter.

$$E_{CO_2a} = \sum_{q=1}^4 E_{CO_2q} \quad (\text{Eq. F-13})$$

Where:

E<sub>CO<sub>2</sub>a</sub> = Annual total CO<sub>2</sub> mass emissions, tons.

E<sub>CO<sub>2</sub>q</sub> = Quarterly total CO<sub>2</sub> mass emissions, tons.

q = Quarters for which E<sub>CO<sub>2</sub>q</sub> are available during calendar year.

4.4 For an affected unit, when the owner or operator is continuously monitoring O<sub>2</sub> concentration (in percent by volume) of flue gases using an O<sub>2</sub> monitor, use the equations and procedures in section 4.4.1 and 4.4.2 of this appendix to determine hourly CO<sub>2</sub> mass emissions (in tons).

4.4.1 If the owner or operator elects to use data from an O<sub>2</sub> monitor to calculate CO<sub>2</sub> concentration, the appropriate F and F<sub>c</sub> factors from section 3.3.5 of this appendix shall be used in one of the following equations (as applicable) to determine hourly average CO<sub>2</sub> concentration of flue gases (in percent by volume) from the measured hourly average O<sub>2</sub> concentration:

$$\text{CO}_{2d} = 100 \frac{F_c}{F} \frac{20.9 - O_{2d}}{20.9} \quad (\text{Eq. F-14a})$$

Where:

$\text{CO}_{2d}$  = Hourly average  $\text{CO}_2$  concentration during unit operation, percent by volume, dry basis.

$F, F_c$  = F-factor or carbon-based  $F_c$ -factor from section 3.3.5 of this appendix.  
 20.9 = Percentage of  $\text{O}_2$  in ambient air.  
 $O_{2d}$  = Hourly average  $\text{O}_2$  concentration during unit operation, percent by volume, dry basis.

$$\text{CO}_{2w} = \frac{100}{20.9} \frac{F_c}{F} \left[ 20.9 \left( \frac{100 - \% \text{H}_2\text{O}}{100} \right) - O_{2w} \right] \quad (\text{Eq. F-14b})$$

Where:

$\text{CO}_{2w}$  = Hourly average  $\text{CO}_2$  concentration during unit operation, percent by volume, wet basis.

$O_{2w}$  = Hourly average  $\text{O}_2$  concentration during unit operation, percent by volume, wet basis.

$F, F_c$  = F-factor or carbon-based  $F_c$ -factor from section 3.3.5 of this appendix.

20.9 = Percentage of  $\text{O}_2$  in ambient air.

$\% \text{H}_2\text{O}$  = Moisture content of gas in the stack, percent.

For any hour where Equation F-14a or F-14b results in a negative hourly average  $\text{CO}_2$  value, 0.0%  $\text{CO}_{2w}$  shall be recorded as the average  $\text{CO}_2$  value for that hour.

4.4.2 Determine  $\text{CO}_2$  mass emissions (in tons) from hourly average  $\text{CO}_2$  concentration (percent by volume) using equation F-11 and the procedure in section 4.1, where  $\text{O}_2$  measurements are on a wet basis, or using the procedures in section 4.2 of this appendix, where  $\text{O}_2$  measurements are on a dry basis.

#### 5. PROCEDURES FOR HEAT INPUT

Use the following procedures to compute heat input rate to an affected unit (in mmBtu/hr or mmBtu/day):

5.1 Calculate and record heat input rate to an affected unit on an hourly basis, except as provided in sections 5.5 through 5.5.7. The owner or operator may choose to use the provisions specified in §75.16(e) or in section

2.1.2 of appendix D to this part in conjunction with the procedures provided in sections 5.6 through 5.6.2 to apportion heat input among each unit using the common stack or common pipe header.

5.2 For an affected unit that has a flow monitor (or approved alternate monitoring system under subpart E of this part for measuring volumetric flow rate) and a diluent gas ( $\text{O}_2$  or  $\text{CO}_2$ ) monitor, use the recorded data from these monitors and one of the following equations to calculate hourly heat input rate (in mmBtu/hr).

5.2.1 When measurements of  $\text{CO}_2$  concentration are on a wet basis, use the following equation:

$$\text{HI} = Q_w \frac{1}{F_c} \frac{\% \text{CO}_{2w}}{100} \quad (\text{Eq. F-15})$$

Where:

$\text{HI}$  = Hourly heat input rate during unit operation, mmBtu/hr.

$Q_w$  = Hourly average volumetric flow rate during unit operation, wet basis, scfh.

$F_c$  = Carbon-based F-factor, listed in section 3.3.5 of this appendix for each fuel, scf/mmBtu.

$\% \text{CO}_{2w}$  = Hourly concentration of  $\text{CO}_2$  during unit operation, percent  $\text{CO}_2$  wet basis.

5.2.2 When measurements of  $\text{CO}_2$  concentration are on a dry basis, use the following equation:

$$\text{HI} = Q_h \left[ \frac{(100 - \% \text{H}_2\text{O})}{100 F_c} \right] \left( \frac{\% \text{CO}_{2d}}{100} \right) \quad (\text{Eq. F-16})$$

## Environmental Protection Agency

## Pt. 75, App. F

Where:

HI = Hourly heat input rate during unit operation, mmBtu/hr.

$Q_w$  = Hourly average volumetric flow rate during unit operation, wet basis, scfh.

$F_c$  = Carbon-based F-Factor, listed in section 3.3.5 of this appendix for each fuel, scf/mmBtu.

$\%CO_{2d}$  = Hourly concentration of  $CO_2$  during unit operation, percent  $CO_2$  dry basis.

$\%H_2O$  = Moisture content of gas in the stack, percent.

5.2.3 When measurements of  $O_2$  concentration are on a wet basis, use the following equation:

$$HI = Q_w \frac{1}{F} \left[ \frac{(20.9/100)(100 - \%H_2O) - \%O_{2w}}{20.9} \right] \quad (\text{Eq. F-17})$$

Where:

HI = Hourly heat input rate during unit operation, mmBtu/hr.

$Q_w$  = Hourly average volumetric flow rate during unit operation, wet basis, scfh.

$F$  = Dry basis F-factor, listed in section 3.3.5 of this appendix for each fuel, dscf/mmBtu.

$\%O_{2w}$  = Hourly concentration of  $O_2$  during unit operation, percent  $O_2$  wet basis. For any operating hour where Equation F-17

results in an hourly heat input rate that is  $\leq 0.0$  mmBtu/hr, 1.0 mmBtu/hr shall be recorded and reported as the heat input rate for that hour.

$\%H_2O$  = Hourly average stack moisture content, percent by volume.

5.2.4 When measurements of  $O_2$  concentration are on a dry basis, use the following equation:

$$HI = Q_w \left[ \frac{(100 - \%H_2O)}{100 F} \right] \left[ \frac{(20.9 - \%O_{2d})}{20.9} \right] \quad (\text{Eq. F-18})$$

Where:

HI = Hourly heat input rate during unit operation, mmBtu/hr.

$Q_w$  = Hourly average volumetric flow during unit operation, wet basis, scfh.

$F$  = Dry basis F-factor, listed in section 3.3.5 of this appendix for each fuel, dscf/mmBtu.

$\%H_2O$  = Moisture content of the stack gas, percent.

$\%O_{2d}$  = Hourly concentration of  $O_2$  during unit operation, percent  $O_2$  dry basis.

5.3 *Heat Input Summation (for Heat Input Determined Using a Flow Monitor and Diluent Monitor)*

5.3.1 Calculate total quarterly heat input for a unit or common stack using a flow monitor and diluent monitor to calculate heat input, using the following equation:

$$HI_q = \sum_{\text{hour}=1}^n HI_i t_i \quad (\text{Eq. F-18a})$$

Where:

$HI_q$  = Total heat input for the quarter, mmBtu.

$HI_i$  = Hourly heat input rate during unit operation, using Equation F-15, F-16, F-17, or F-18, mmBtu/hr.

$t_i$  = Hourly operating time for the unit or common stack, hour or fraction of an hour (in equal increments that can range from one hundredth to one quarter of an hour, at the option of the owner or operator).

5.3.2 Calculate total cumulative heat input for a unit or common stack using a flow monitor and diluent monitor to calculate heat input, using the following equation:

$$HI_c = \sum_{q=1}^{\text{the current quarter}} HI_q \quad (\text{Eq. F-18b})$$

Where:

$HI_c$  = Total heat input for the year to date, mmBtu.

$HI_q$  = Total heat input for the quarter, mmBtu.

5.4 [Reserved]

5.5 For a gas-fired or oil-fired unit that does not have a flow monitor and is using the procedures specified in appendix D to this part to monitor  $SO_2$  emissions or for any unit using a common stack for which the owner or operator chooses to determine heat input by fuel sampling and analysis, use the

following procedures to calculate hourly heat input rate in mmBtu/hr. The procedures of section 5.5.3 of this appendix shall not be used to determine heat input from a coal unit that is required to comply with the provisions of this part for monitoring, recording, and reporting NO<sub>x</sub> mass emissions under a State or federal NO<sub>x</sub> mass emission reduction program.

5.5.1 (a) When the unit is combusting oil, use the following equation to calculate hourly heat input rate:

$$HI_o = M_o \frac{GCV_o}{10^6} \quad (\text{Eq. F-19})$$

Where:

HI<sub>o</sub> = Hourly heat input rate from oil, mmBtu/hr.

M<sub>o</sub> = Mass rate of oil consumed per hour, as determined using procedures in appendix D to this part, in lb/hr, tons/hr, or kg/hr.

GCV<sub>o</sub> = Gross calorific value of oil, as measured by ASTM D240–00, ASTM D5865–01a, ASTM D5865–10, or ASTM D4809–00 for each oil sample under section 2.2 of appendix D to this part, Btu/unit mass (all incorporated by reference under § 75.6).

10<sup>6</sup> = Conversion of Btu to mmBtu.

(b) When performing oil sampling and analysis solely for the purpose of the missing data procedures in § 75.36, oil samples for measuring GCV may be taken weekly, and the procedures specified in appendix D to this part for determining the mass rate of oil consumed per hour are optional.

5.5.2 When the unit is combusting gaseous fuels, use the following equation to calculate heat input rate from gaseous fuels for each hour:

$$HI_g = \frac{(Q_g \times GCV_g)}{10^6} \quad (\text{Eq. F-20})$$

Where:

HI<sub>g</sub> = Hourly heat input rate from gaseous fuel, mmBtu/hour.

Q<sub>g</sub> = Metered flow rate of gaseous fuel combusted during unit operation, hundred standard cubic feet per hour.

GCV<sub>g</sub> = Gross calorific value of gaseous fuel, as determined by sampling (for each delivery for gaseous fuel in lots, for each daily gas sample for gaseous fuel delivered by pipeline, for each hourly average for gas measured hourly with a gas chromatograph, or for each monthly sample of pipeline natural gas, or as verified by the contractual supplier at least once every month pipeline natural gas is combusted, as specified in section 2.3 of appendix D to this part) using ASTM D1826–94 (Reapproved 1998), ASTM D3588–98, ASTM D4891–89 (Reapproved 2006), GPA Standard 2172–96 Calculation of Gross Heating Value,

Relative Density and Compressibility Factor for Natural Gas Mixtures from Compositional Analysis, or GPA Standard 2261–00 Analysis for Natural Gas and Similar Gaseous Mixtures by Gas Chromatography, Btu/100 scf (all incorporated by reference under § 75.6 of this part).

10<sup>6</sup> = Conversion of Btu to mmBtu.

5.5.3 When the unit is combusting coal, use the procedures, methods, and equations in sections 5.5.3.1–5.5.3.3 of this appendix to determine the heat input from coal for each 24-hour period. (All ASTM methods are incorporated by reference under § 75.6 of this part.)

5.5.3.1 Perform coal sampling daily according to section 5.3.2.2 in Method 19 in appendix A to part 60 of this chapter and use ASTM D2234–00, Standard Practice for Collection of a Gross Sample of Coal, (incorporated by reference under § 75.6 of this part) Type I, Conditions A, B, or C and systematic spacing for sampling. (When performing coal sampling solely for the purposes of the missing data procedures in § 75.36, use of ASTM D2234–00 is optional, and coal samples may be taken weekly.)

5.5.3.2 All ASTM methods are incorporated by reference under § 75.6. Use ASTM D2013–01 for preparation of a daily coal sample and analyze each daily coal sample for gross calorific value using ASTM D5865–01a or ASTM D5865–10. On-line coal analysis may also be used if the on-line analytical instrument has been demonstrated to be equivalent to the applicable ASTM methods under §§ 75.23 and 75.66.

5.5.3.3 Calculate the heat input from coal using the following equation:

$$HI_c = M_c \frac{GCV_c}{500} \quad (\text{Eq. F-21})$$

(Eq. F-21)

where:

HI<sub>c</sub> = Daily heat input from coal, mmBtu/day.

M<sub>c</sub> = Mass of coal consumed per day, as measured and recorded in company records, tons.

GCV<sub>c</sub> = Gross calorific value of coal sample, as measured by ASTM D3176–89 (Reapproved 2002), ASTM D5865–01a, or ASTM D5865–10, Btu/lb (incorporated by reference under § 75.6).

500 = Conversion of Btu/lb to mmBtu/ton.

5.5.4 For units obtaining heat input values daily instead of hourly, apportion the daily heat input using the fraction of the daily steam load or daily unit operating load used each hour in order to obtain HI<sub>i</sub> for use in the above equations. Alternatively, use the hourly mass of coal consumed in equation F-21.

## Environmental Protection Agency

## Pt. 75, App. F

5.5.5 If a daily fuel sampling value for gross calorific value is not available, substitute the maximum gross calorific value measured from the previous 30 daily samples. If a monthly fuel sampling value for gross calorific value is not available, substitute the maximum gross calorific value measured from the previous 3 monthly samples.

5.5.6 If a fuel flow value is not available, use the fuel flowmeter missing data procedures in section 2.4 of appendix D of this part. If a daily coal consumption value is not available, substitute the maximum fuel feed rate during the previous thirty days when the unit burned coal.

5.5.7 Results for samples must be available no later than thirty calendar days after the sample is composited or taken. However, during an audit, the Administrator may require that the results be available in five business days, or sooner if practicable.

### 5.6 Heat Input Rate Apportionment for Units Sharing a Common Stack or Pipe

5.6.1 Where applicable, the owner or operator of an affected unit that determines heat input rate at the unit level by apportioning the heat input monitored at a common stack or common pipe using megawatts shall apportion the heat input rate using the following equation:

$$HI_i = HI_{CS} \left( \frac{t_{CS}}{t_i} \right) \left[ \frac{MW_i t_i}{\sum_{i=1}^n MW_i t_i} \right] \quad (\text{Eq. F-21a})$$

Where:

$HI_i$  = Heat input rate for a unit, mmBtu/hr.

$HI_{CS}$  = Heat input rate at the common stack or pipe, mmBtu/hr.

$MW_i$  = Gross electrical output, MWe.

$t_i$  = Unit operating time, hour or fraction of an hour (in equal increments that can range from one hundredth to one quarter of an hour, at the option of the owner or operator).

$t_{CS}$  = Common stack or common pipe operating time, hour or fraction of an hour (in equal increments that can range from one

hundredth to one quarter of an hour, at the option of the owner or operator).

$n$  = Total number of units using the common stack or pipe.

$i$  = Designation of a particular unit.

5.6.2 Where applicable, the owner or operator of an affected unit that determines the heat input rate at the unit level by apportioning the heat input rate monitored at a common stack or common pipe using steam load shall apportion the heat input rate using the following equation:

$$HI_i = HI_{CS} \left( \frac{t_{CS}}{t_i} \right) \left[ \frac{SF_i t_i}{\sum_{i=1}^n SF_i t_i} \right] \quad (\text{Eq. F-21b})$$

Where:

$HI_i$  = Heat input rate for a unit, mmBtu/hr.

$HI_{CS}$  = Heat input rate at the common stack or pipe, mmBtu/hr.

$SF$  = Gross steam load, lb/hr, or mmBtu/hr.

$t_i$  = Unit operating time, hour or fraction of an hour (in equal increments that can range from one hundredth to one quarter of an hour, at the option of the owner or operator).

$t_{CS}$  = Common stack or common pipe operating time, hour or fraction of an hour (in equal increments that can range from one hundredth to one quarter of an hour, at the option of the owner or operator).

$n$  = Total number of units using the common stack or pipe.

$i$  = Designation of a particular unit.



### 5.7 Heat Input Rate Summation for Units with Multiple Stacks or Pipes

The owner or operator of an affected unit that determines the heat input rate at the unit level by summing the heat input rates monitored at multiple stacks or multiple pipes shall sum the heat input rates using the following equation:

$$HI_{Unit} = \frac{\sum_{s=1}^n HI_s t_s}{t_{Unit}} \quad (\text{Eq. F-21c})$$

Where:

$HI_{Unit}$  = Heat input rate for a unit, mmBtu/hr.

$HI_s$  = Heat input rate for the individual stack, duct, or pipe, mmBtu/hr.

$t_{Unit}$  = Unit operating time, hour or fraction of the hour (in equal increments that can range from one hundredth to one quarter of an hour, at the option of the owner or operator).

$t_s$  = Operating time for the individual stack or pipe, hour or fraction of the hour (in equal increments that can range from one hundredth to one quarter of an hour, at the option of the owner or operator).

$s$  = Designation for a particular stack, duct, or pipe.

### 5.8 Alternate Heat Input Apportionment for Common Pipes

As an alternative to using Equation F-21a or F-21b in section 5.6 of this appendix, the owner or operator may apportion the heat input rate at a common pipe to the individual units served by the common pipe based on the fuel flow rate to the individual units, as measured by uncertified fuel flowmeters. This option may only be used if a fuel flowmeter system that meets the requirements of appendix D to this part is installed on the common pipe. If this option is used, determine the unit heat input rates using the following equation:

$$HI_i = HI_{CP} \left( \frac{t_{CP}}{t_i} \right) \left[ \frac{FF_i t_i}{\sum_{i=1}^n FF_i t_i} \right] \quad (\text{Eq. F-21d})$$

Where:

$HI_i$  = Heat input rate for a unit, mmBtu/hr.

$HI_{CP}$  = Heat input rate at the common pipe, mmBtu/hr.

$FF_i$  = Fuel flow rate to a unit, gal/min, 100 scfh, or other appropriate units.

$t_i$  = Unit operating time, hour or fraction of an hour (in equal increments that can range from one hundredth to one quarter of an hour, at the option of the owner or operator).

$t_{CP}$  = Common pipe operating time, hour or fraction of an hour (in equal increments that can range from one hundredth to one quarter of an hour, at the option of the owner or operator).

$n$  = Total number of units using the common pipe.

$i$  = Designation of a particular unit.

### 6. PROCEDURE FOR CONVERTING VOLUMETRIC FLOW TO STP

Use the following equation to convert volumetric flow at actual temperature and pressure to standard temperature and pressure.

$$F_{STP} = F_{Actual} (T_{Std}/T_{Stack}) (P_{Stack}/P_{Std})$$

where:

$F_{STP}$  = Flue gas volumetric flow rate at standard temperature and pressure, scfh.

$F_{Actual}$  = Flue gas volumetric flow rate at actual temperature and pressure, acfh.

$T_{Std}$  = Standard temperature=528 °R.

$T_{Stack}$  = Flue gas temperature at flow monitor location, °R, where °R=460+ °F.

$P_{Stack}$  = The absolute flue gas pressure=barometric pressure at the flow monitor location + flue gas static pressure, inches of mercury.

$P_{Std}$  = Standard pressure = 29.92 inches of mercury.

### 7. PROCEDURES FOR SO<sub>2</sub> MASS EMISSIONS, USING DEFAULT SO<sub>2</sub> EMISSION RATES AND HEAT INPUT MEASURED BY CEMS

The owner or operator shall use Equation F-23 to calculate hourly SO<sub>2</sub> mass emissions in accordance with §75.11(e)(1) during the combustion of gaseous fuel, for a unit that uses a flow monitor and a diluent gas monitor to measure heat input, and that qualifies to use a default SO<sub>2</sub> emission rate under section 2.3.1.1, 2.3.2.1.1, or 2.3.6(b) of appendix D to this part. Equation F-23 may also be applied to the combustion of solid or liquid fuel that meets the definition of very low sulfur fuel in §72.2 of this chapter, combinations of

such fuels, or mixtures of such fuels with gaseous fuel, if the owner or operator has received approval from the Administrator under §75.66 to use a site-specific default SO<sub>2</sub> emission rate for the fuel or mixture of fuels.

$$E_h = (ER)(HI) \quad (\text{Eq. F-23})$$

Where:

$E_h$  = Hourly SO<sub>2</sub> mass emission rate, lb/hr.

ER = Applicable SO<sub>2</sub> default emission rate for gaseous fuel combustion, from section 2.3.1.1, 2.3.2.1.1, or 2.3.6(b) of appendix D to this part, or other default SO<sub>2</sub> emission rate for the combustion of very low sulfur liquid or solid fuel, combinations of such fuels, or mixtures of such fuels with gaseous fuel, as approved by the Administrator under §75.66, lb/mmBtu.

HI = Hourly heat input rate, determined using the procedures in section 5.2 of this appendix, mmBtu/hr.

#### 8. PROCEDURES FOR NO<sub>x</sub> MASS EMISSIONS

The owner or operator of a unit that is required to monitor, record, and report NO<sub>x</sub> mass emissions under a State or federal NO<sub>x</sub> mass emission reduction program must use the procedures in section 8.1, 8.2, or 8.3 of this appendix, as applicable, to account for hourly NO<sub>x</sub> mass emissions, and the procedures in section 8.4 of this appendix to account for quarterly, seasonal, and annual NO<sub>x</sub> mass emissions to the extent that the provisions of subpart H of this part are adopted as requirements under such a program.

8.1 The owner or operator may use the hourly NO<sub>x</sub> emission rate and the hourly heat input rate to calculate the NO<sub>x</sub> mass emissions in pounds or the NO<sub>x</sub> mass emission rate in pounds per hour, (as required by the applicable reporting format), for each unit or stack operating hour, as follows:

8.1.1 If both NO<sub>x</sub> emission rate and heat input rate are monitored at the same unit or stack level (e.g., the NO<sub>x</sub> emission rate value and the heat input rate value both represent all of the units exhausting to the common stack), then (as required by the applicable reporting format) either:

(a) Use Equation F-24 to calculate the hourly NO<sub>x</sub> mass emissions (lb).

$$M_{(NO_x)_h} = ER_{(NO_x)_h} HI_h t_h \quad (\text{Eq. F-24})$$

Where:

$M_{(NO_x)_h}$  = NO<sub>x</sub> mass emissions in lbs for the hour.

$ER_{(NO_x)_h}$  = Hourly average NO<sub>x</sub> emission rate for hour h, lb/mmBtu, from section 3 of this appendix, from Method 19 in appendix A-7 to part 60 of this chapter, or from section 3.3 of appendix E to this part. (Include bias-adjusted NO<sub>x</sub> emission rate values, where the bias-test procedures in appendix

A to this part shows a bias-adjustment factor is necessary.)

$HI_h$  = Hourly average heat input rate for hour h, mmBtu/hr. (Include bias-adjusted flow rate values, where the bias-test procedures in appendix A to this part shows a bias-adjustment factor is necessary.)

$t_h$  = Monitoring location operating time for hour h, in hours or fraction of an hour (in equal increments that can range from one hundredth to one quarter of an hour, at the option of the owner or operator). If the combined NO<sub>x</sub> emission rate and heat input are monitored for all of the units in a common stack, the monitoring location operating time is equal to the total time when any of those units was exhausting through the common stack; or

(b) Use Equation F-24a to calculate the hourly NO<sub>x</sub> mass emission rate (lb/hr).

$$E_{(NO_x)_h} = ER_{(NO_x)_h} HI_h \quad (\text{Eq. F-24a})$$

Where:

$E_{(NO_x)_h}$  = NO<sub>x</sub> mass emissions rate in lbs/hr for the hour.

$ER_{(NO_x)_h}$  = Hourly average NO<sub>x</sub> emission rate for hour h, lb/mmBtu, from section 3 of this appendix, from Method 19 in appendix A-7 to part 60 of this chapter, or from section 3.3 of appendix E to this part. (Include bias-adjusted NO<sub>x</sub> emission rate values, where the bias-test procedures in appendix A to this part shows a bias-adjustment factor is necessary.)

$HI_h$  = Hourly average heat input rate for hour h, mmBtu/hr. (Include bias-adjusted flow rate values, where the bias-test procedures in appendix A to this part shows a bias-adjustment factor is necessary.)

8.1.2 If NO<sub>x</sub> emission rate is measured at a common stack and heat input is measured at the unit level, sum the hourly heat inputs at the unit level according to the following formula:

$$HI_{CS} = \frac{\sum_{u=1}^p HI_u t_u}{t_{CS}} \quad (\text{Eq. F-25})$$

where:

$HI_{CS}$  = Hourly average heat input rate for hour h for the units at the common stack, mmBtu/hr.

$t_{CS}$  = Common stack operating time for hour h, in hours or fraction of an hour (in equal increments that can range from one hundredth to one quarter of an hour, at the option of the owner or operator). (For each hour,  $t_{CS}$  is the total time during which one or more of the units which exhaust through the common stack operate.)

$HI_u$  = Hourly average heat input rate for hour h for the unit, mmBtu/hr.

$t_u$  = Unit operating time for hour  $h$ , in hours or fraction of an hour (in equal increments that can range from one hundredth to one quarter of an hour, at the option of the owner or operator).

$p$  = Number of units that exhaust through the common stack.

$u$  = Designation of a particular unit.

Use the hourly heat input rate at the common stack level and the hourly average  $\text{NO}_x$  emission rate at the common stack level and the procedures in section 8.1.1 of this appendix to determine the hourly  $\text{NO}_x$  mass emissions at the common stack.

8.1.3 If a unit has multiple ducts and  $\text{NO}_x$  emission rate is only measured at one duct, use the  $\text{NO}_x$  emission rate measured at the duct, the heat input measured for the unit, and the procedures in section 8.1.1 of this appendix to determine  $\text{NO}_x$  mass emissions.

8.1.4 If a unit has multiple ducts and  $\text{NO}_x$  emission rate is measured in each duct, heat input shall also be measured in each duct and the procedures in section 8.1.1 of this appendix shall be used to determine  $\text{NO}_x$  mass emissions.

8.2 Alternatively, the owner or operator may use the hourly  $\text{NO}_x$  concentration (as measured by a  $\text{NO}_x$  concentration monitoring system) and the hourly stack gas volumetric flow rate to calculate the  $\text{NO}_x$  mass emission rate (lb/hr) for each unit or stack operating hour, in accordance with section 8.2.1 or 8.2.2 of this appendix (as applicable). If the hourly  $\text{NO}_x$  mass emissions are to be

reported in lb, Equation F-26c in section 8.3 of this appendix shall be used to convert the hourly  $\text{NO}_x$  mass emission rates to hourly  $\text{NO}_x$  mass emissions (lb).

8.2.1 When the  $\text{NO}_x$  concentration monitoring system measures on a wet basis, first calculate the hourly  $\text{NO}_x$  mass emission rate (in lb/hr) during unit (or stack) operation, using Equation F-26a. (Include bias-adjusted flow rate or  $\text{NO}_x$  concentration values, where the bias-test procedures in appendix A to this part shows a bias-adjustment factor is necessary.)

$$E_{(\text{NO}_x)_h} = K C_{hw} Q_h \quad (\text{Eq. F-26a})$$

Where:

$E_{(\text{NO}_x)_h}$  =  $\text{NO}_x$  mass emissions rate in lb/hr.

$K = 1.194 \times 10^{-7}$  for  $\text{NO}_x$ , (lb/scf)/ppm.

$C_{hw}$  = Hourly average  $\text{NO}_x$  concentration during unit operation, wet basis, ppm.

$Q_h$  = Hourly average volumetric flow rate during unit operation, wet basis, scfh.

8.2.2 When  $\text{NO}_x$  mass emissions are determined using a dry basis  $\text{NO}_x$  concentration monitoring system and a wet basis flow monitoring system, first calculate hourly  $\text{NO}_x$  mass emission rate (in lb/hr) during unit (or stack) operation, using Equation F-26b. (Include bias-adjusted flow rate or  $\text{NO}_x$  concentration values, where the bias-test procedures in appendix A to this part shows a bias-adjustment factor is necessary.)

$$E_{(\text{NO}_x)_h} = K C_{hd} Q_h \frac{(100 - \%H_2O)}{(100)} \quad (\text{Eq. F-26b})$$

Where:

$E_{(\text{NO}_x)_h}$  =  $\text{NO}_x$  mass emissions rate, lb/hr.

$K = 1.194 \times 10^{-7}$  for  $\text{NO}_x$ , (lb/scf)/ppm.

$C_{hd}$  = Hourly average  $\text{NO}_x$  concentration during unit operation, dry basis, ppm.

$Q_h$  = Hourly average volumetric flow rate during unit operation, wet basis, scfh.

$\%H_2O$  = Hourly average stack moisture content during unit operation, percent by volume.

8.3 When hourly  $\text{NO}_x$  mass emissions are reported in pounds and are determined using a  $\text{NO}_x$  concentration monitoring system and a flow monitoring system, calculate  $\text{NO}_x$  mass emissions (lb) for each unit or stack operating hour by multiplying the hourly  $\text{NO}_x$  mass emission rate (lb/hr) by the unit operating time for the hour, as follows:

$$M_{(\text{NO}_x)_h} = E_h t_h \quad (\text{Eq. F-26c})$$

Where:

$M_{(\text{NO}_x)_h}$  =  $\text{NO}_x$  mass emissions for the hour, lb.

$E_h$  = Hourly  $\text{NO}_x$  mass emission rate during unit (or stack) operation from Equation F-26a in section 8.2.1 of this appendix or Equation F-26b in section 8.2.2 of this appendix (as applicable), lb/hr.

$t_h$  = Unit operating time or stack operating time (as defined in §72.2 of this chapter) for hour “h”, in hours or fraction of an hour (in equal increments that can range from one hundredth to one quarter of an hour, at the option of the owner or operator).

8.4 Use the following procedures to calculate quarterly, cumulative ozone season, and cumulative yearly  $\text{NO}_x$  mass emissions, in tons:

(a) When hourly  $\text{NO}_x$  mass emissions are reported in lb., use Eq. F-27.

$$M_{(\text{NO}_x) \text{ time period}} = \frac{\sum_{h=1}^p M(\text{NO}_x)_h}{2000} \quad (\text{Eq. F-27})$$

Where:

$M_{(\text{NO}_x) \text{ time period}}$  =  $\text{NO}_x$  mass emissions in tons for the given time period (quarter, cumulative ozone season, cumulative year-to-date).

$M_{(\text{NO}_x)_h}$  =  $\text{NO}_x$  mass emissions in lb for the hour.

$p$  = The number of hours in the given time period (quarter, cumulative ozone season, cumulative year-to-date).

(b) When hourly  $\text{NO}_x$  mass emission rate is reported in lb/hr, use Eq. F-27a.

$$M_{(\text{NO}_x) \text{ time period}} = \frac{\sum_{h=1}^p E_{(\text{NO}_x)_h} t_h}{2000} \quad (\text{Eq. F-27a})$$

Where:

$M_{(\text{NO}_x) \text{ time period}}$  =  $\text{NO}_x$  mass emissions in tons for the given time period (quarter, cumulative ozone season, cumulative year-to-date).

$E_{(\text{NO}_x)_h}$  =  $\text{NO}_x$  mass emission rate in lb/hr for the hour.

$p$  = The number of hours in the given time period (quarter, cumulative ozone season, cumulative year-to-date).

$t_h$  = Monitoring location operating time for hour  $h$ , in hours or fraction of an hour (in equal increments that can range from one hundredth to one quarter of an hour, at the option of the owner or operator).

8.5 Specific provisions for monitoring  $\text{NO}_x$  mass emissions from common stacks. The owner or operator of a unit utilizing a common stack may account for  $\text{NO}_x$  mass emissions using either of the following methodologies, if the provisions of subpart H are adopted as requirements of a State or federal  $\text{NO}_x$  mass reduction program:

8.5.1 The owner or operator may determine both  $\text{NO}_x$  emission rate and heat input at the common stack and use the procedures

in section 8.1.1 of this appendix to determine hourly  $\text{NO}_x$  mass emissions at the common stack.

8.5.2 The owner or operator may determine the  $\text{NO}_x$  emission rate at the common stack and the heat input at each of the units and use the procedures in section 8.1.2 of this appendix to determine the hourly  $\text{NO}_x$  mass emissions at each unit.

#### 9. [RESERVED]

#### 10. MOISTURE DETERMINATION FROM WET AND DRY $\text{O}_2$ READINGS

If a correction for the stack gas moisture content is required in any of the emissions or heat input calculations described in this appendix, and if the hourly moisture content is determined from wet- and dry-basis  $\text{O}_2$  readings, use Equation F-31 to calculate the percent moisture, unless a "K" factor or other mathematical algorithm is developed as described in section 6.5.7(a) of appendix A to this part:

$$\% \text{H}_2\text{O} = \frac{(\text{O}_{2d} - \text{O}_{2w})}{\text{O}_{2d}} \times 100 \quad (\text{Eq. F-31})$$

Where:

% H<sub>2</sub>O = Hourly average stack gas moisture content, percent H<sub>2</sub>O

O<sub>2d</sub> = Dry-basis hourly average oxygen concentration, percent O<sub>2</sub>

O<sub>2w</sub> = Wet-basis hourly average oxygen concentration, percent O<sub>2</sub>

[58 FR 3701, Jan. 11, 1993; Redesignated and amended at 60 FR 26553-26556, 26571, May 17, 1995; 61 FR 25585, May 22, 1996; 61 FR 59166, Nov. 20, 1996; 63 FR 57513, Oct. 27, 1998; 64 FR 28666-28671, May 26, 1999; 64 FR 37582, July 12, 1999; 67 FR 40474, 40475, June 12, 2002; 67 FR 53505, Aug. 16, 2002; 70 FR 28695, May 18, 2005; 73 FR 4372, Jan. 24, 2008; 76 FR 17325, Mar. 28, 2011; 77 FR 2460, Jan. 18, 2012]

#### APPENDIX G TO PART 75— DETERMINATION OF CO<sub>2</sub> EMISSIONS

##### 1. APPLICABILITY

The procedures in this appendix may be used to estimate CO<sub>2</sub> mass emissions discharged to the atmosphere (in tons/day) as the sum of CO<sub>2</sub> emissions from combustion and, if applicable, CO<sub>2</sub> emissions from sorbent used in a wet flue gas desulfurization control system, fluidized bed boiler, or other emission controls.

##### 2. PROCEDURES FOR ESTIMATING CO<sub>2</sub> EMISSIONS FROM COMBUSTION

Use the following procedures to estimate daily CO<sub>2</sub> mass emissions from the combustion of fossil fuels. The optional procedure in section 2.3 of this appendix may also be used for an affected gas-fired unit. For an affected unit that combusts any nonfossil fuels (e.g., bark, wood, residue, or refuse), either use a CO<sub>2</sub> continuous emission monitoring system or apply to the Administrator for approval of a unit-specific method for determining CO<sub>2</sub> emissions.

2.1 Use the following equation to calculate daily CO<sub>2</sub> mass emissions (in tons/day) from the combustion of fossil fuels. Where fuel flow is measured in a common pipe header (i.e., a pipe carrying fuel for multiple units), the owner or operator may use the procedures in section 2.1.2 of appendix D of this part for combining or apportioning emissions, except that the term “SO<sub>2</sub> mass emissions” is replaced with the term “CO<sub>2</sub> mass emissions.”

$$W_{CO_2} = \frac{(MW_C + MW_{O_2}) \times W_C}{2,000 MW_C} \text{ (Eq. G-1)}$$

Where:

W<sub>co2</sub>=CO<sub>2</sub> emitted from combustion, tons/day.

MW<sub>c</sub>=Molecular weight of carbon (12.0).

MW<sub>o2</sub>=Molecular weight of oxygen (32.0)

W<sub>c</sub> = Carbon burned, lb/day, determined using fuel sampling and analysis and fuel feed rates.

2.1.1 Collect at least one fuel sample during each week that the unit combusts coal, one sample per each shipment or delivery for oil and diesel fuel, one fuel sample for each delivery for gaseous fuel in lots, one sample per day or per hour (as applicable) for each gaseous fuel that is required to be sampled daily or hourly for gross calorific value under section 2.3.5.6 of appendix D to this part, and one sample per month for each gaseous fuel that is required to be sampled monthly for gross calorific value under section 2.3.4.1 or 2.3.4.2 of appendix D to this part. Collect coal samples from a location in the fuel handling system that provides a sample representative of the fuel bunkered or consumed during the week.

2.1.2 Determine the carbon content of each fuel sample using one of the following methods: ASTM D3178–89 (Reapproved 2002) or ASTM D5373–02 (Reapproved 2007) for coal; ASTM D5291–02, Standard Test Methods for Instrumental Determination of Carbon, Hydrogen, and Nitrogen in Petroleum Products and Lubricants, ultimate analysis of oil, or computations based upon ASTM D3238–95 (Reapproved 2000) and either ASTM D2502–92 (Reapproved 1996) or ASTM D2503–92 (Reapproved 1997) for oil; and computations based on ASTM D1945–96 (Reapproved 2001) or ASTM D1946–90 (Reapproved 2006) for gas (all incorporated by reference under §75.6 of this part).

2.1.3 Use daily fuel feed rates from company records for all fuels and the carbon content of the most recent fuel sample under this section to determine tons of carbon per day from combustion of each fuel. (All ASTM methods are incorporated by reference under §75.6.) Where more than one fuel is combusted during a calendar day, calculate total tons of carbon for the day from all fuels.

2.2 For an affected coal-fired unit, the estimate of daily CO<sub>2</sub> mass emissions given by equation G–1 may be adjusted to account for carbon retained in the ash using the procedures in either section 2.2.1 through 2.2.3 or section 2.2.4 of this appendix.

2.2.1 Determine the ash content of the weekly sample of coal using ASTM D3174–00, “Standard Test Method for Ash in the Analysis Sample of Coal and Coke from Coal” (incorporated by reference under §75.6 of this part).

2.2.2 Sample and analyze the carbon content of the fly-ash according to ASTM D5373–02 (Reapproved 2007), Standard Test Methods for Instrumental Determination of Carbon, Hydrogen, and Nitrogen in Laboratory Samples of Coal and Coke” (incorporated by reference under §75.6 of this part).

2.2.3 Discount the estimate of daily CO<sub>2</sub> mass emissions from the combustion of coal given by equation G–1 by the percent carbon