However, this table is a photograph and the amendments could not be incorporated.

APPENDIX E TO PART 75—OPTIONAL NO\textsubscript{X} EMISSIONS ESTIMATION PROTOCOL FOR GAS-FIRED PEAKING UNITS AND OIL-FIRED PEAKING UNITS

1. APPLICABILITY

1.1 Unit Operation Requirements

This NO\textsubscript{X} emissions estimation procedure may be used in lieu of a continuous NO\textsubscript{X} emission monitoring system (CEMS) for determining the average NO\textsubscript{X} emission rate and hourly NO\textsubscript{X} rate from gas-fired peaking units and oil-fired peaking units as defined in §72.2 of this chapter. If a unit’s operations exceed the levels required to be a peaking unit, the owner or operator shall install and certify a NO\textsubscript{X}-diluent continuous emission monitoring system no later than December 31 of the following calendar year. If the required CEMS has not been installed and certified by that date, the owner or operator shall report the maximum potential NO\textsubscript{X} emission rate (MER) (as defined in §72.2 of this chapter) for each unit operating hour, starting with the first unit operating hour after the deadline and continuing until the CEMS has been provisionally certified. The provision of §75.12 apply to excepted monitoring systems under this appendix.

1.2 Certification

1.2.1 Pursuant to the procedures in §75.20, complete all testing requirements to certify use of this procedure in lieu of a NO\textsubscript{X} continuous emission monitoring system no later than the applicable deadline specified in §75.4. Apply to the Administrator for certification to use this method no later than 45 days after the completion of all certification testing. Whenever the monitoring method is to be changed, reapply to the Administrator for certification of the new monitoring method.

1.2.2 [Reserved]

2. PROCEDURE

2.1 Initial Performance Testing

Use the following procedures for: measuring NO\textsubscript{X} emission rates at heat input rate levels corresponding to different load levels; measuring heat input rate; and plotting the correlation between heat input rate and NO\textsubscript{X} emission rate, in order to determine the emission rate of the unit(s). The requirements in section 6.1.2 of appendix A to this part shall apply to any stack testing performed to obtain O\textsubscript{2} and NO\textsubscript{X} concentration measurements under this appendix, either for units using the excepted methodology in this appendix or for units using the low mass emissions excepted methodology in §75.19.
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point using methods 7E and 3A in appendices A–4 and A–2 to part 60 of this chapter. For diesel or dual fuel reciprocating engines, select the sampling site to be as close as practicable to the exhaust of the engine.

2.1.2.3 Allow the unit to stabilize for a minimum of 15 minutes (or longer if needed for the NOX and O2 readings to stabilize) prior to commencing NOX, O2, and heat input measurements. Determine the measurement system response time according to sections 8.2.5 and 8.2.6 of method 7E in appendix A–4 to part 60 of this chapter. When inserting the probe into the flue gas for the first sampling point in each traverse, sample for at least one minute plus twice the measurement system response time (or longer, if necessary to obtain a stable reading). For all other sampling points in each traverse, sample for at least one minute plus the measurement system response time (or longer, if necessary to obtain a stable reading). Perform three test runs at each load condition and obtain an arithmetic average of the runs for each load condition. During each test run on a boiler, record the boiler excess oxygen level at 5 minute intervals.

2.1.3 Heat Input

Measure the total heat input (mmBtu) and heat input rate during testing (mmBtu/hr) as follows:

2.1.3.1 When the unit is combusting fuel, measure and record the flow of fuel consumed. Measure the flow of fuel with an in-line flowmeter(s) and automatically record the data. If a portion of the flow is diverted from the unit without being burned, and that diversion occurs downstream of the fuel flowmeter, an in-line flowmeter is required to account for the unburned fuel. Install and calibrate in-line flow meters using the procedures and specifications contained in sections 2.1.2, 2.1.3, 2.1.4, and 2.1.5 of appendix D of this part. Correct any gaseous fuel flow rate measured at actual temperature and pressure to standard conditions of 68 °F and 29.92 inches of mercury.

2.1.3.2 For liquid fuels, analyze fuel samples taken according to the requirements of section 2.2 of appendix D of this part to determine the heat content of liquid or gaseous fuel in accordance with the procedures in appendix F of this part. Calculate the heat input rate during testing (mmBtu/hr) associated with each load condition in accordance with equations F–19 or F–20 in appendix F of this part. Calculate the heat content of the fuel to emergencies only. When emergency fuel is combusted, report the emergency fuel with the primary fuel to emergencies only. When emergency fuel is combusted, report the emergency fuel with the primary fuel.

2.1.3.3 For liquid fuels, analyze fuel samples taken according to the requirements of section 2.2 of appendix D of this part to determine the heat content of liquid or gaseous fuel in accordance with the procedures in appendix F of this part. Calculate the heat input rate during testing (mmBtu/hr) associated with each load condition in accordance with equations F–19 or F–20 in appendix F of this part and total heat input using equation E–1 of this appendix. Record the heat input rate at each heat input/load point.

2.1.4 Emergency Fuel

The designated representative of a unit that is restricted by its federal, State or local permit to combusting a particular fuel only during emergencies where the primary fuel is not available may claim an exemption from the requirements of this appendix for testing the NOX emission rate during combustion of the emergency fuel. To claim this exemption, the designated representative shall include in the monitoring plan for the unit documentation that the permit restricts use of the fuel to emergencies only. When emergency fuel is combusted, report the emergency fuel with the primary fuel.

2.1.5 Tabulation of Results

Tabulate the results of each baseline correlation test for each fuel or, as applicable, combination of fuels, listing: time of test, duration, operating loads, heat input rate (mmBtu/hr), F-factors, excess oxygen levels, and NOX concentrations (ppm) on a dry basis (at actual excess oxygen level). Convert the NOX concentrations (ppm) to NOX emission rates (to the nearest 0.001 lb/mmBtu) according to equation F–5 of appendix F of this part or 19–3 in method 19 of appendix A of part 60 of this chapter, as appropriate. Calculate the NOX emission rate in lb/mmBtu for each sampling point and determine the arithmetic average NOX emission rate of each test run. Calculate the arithmetic average of the boiler excess oxygen readings for each test run. Record the arithmetic average of the three test runs as the NOX emission rate and the boiler excess oxygen level for the heat input/load condition.

2.1.6 Plotting of Results

Plot the tabulated results as an x-y graph for each fuel and (as applicable) combination of fuels combusted according to the following procedures.

2.1.6.1 Plot the heat input rate (mmBtu/hr) as the independent (or x) variable and the NOX emission rates (lb/mmBtu) as the dependent (or y) variable for each load point. Construct the graph by drawing straight line segments between each load point. Draw a horizontal line to the y-axis from the minimum heat input (load) point.

2.1.6.2 Units that co-fire gas and oil may be tested while firing gas only and oil only instead of testing with each combination of fuels. In this case, construct a graph for each fuel.

2.2 Periodic NOX Emission Rate Testing

Retest the NOX emission rate of the gas-fired peaking unit or the oil-fired peaking unit while combusting each type of fuel (or fuel mixture) for which a NOX emission rate versus heat input rate correlation curve was determined.
derived, at least once every 20 calendar quarters. If a required retest is not completed by the end of the 20th calendar quarter following the quarter of the last test, use the missing data substitution procedures in section 2.5 of this appendix, beginning with the first unit operating hour after the end of the 20th calendar quarter. Continue using the missing data procedures until the required retest has been passed. Note that missing data substitution is fuel-specific (i.e., the use of substitute data is required only when combusting a fuel (or fuel mixture) for which the retesting deadline has not been met). Each time that a new fuel-specific correlation curve is derived from retesting, the new curve shall be used to report NOx emission rate, beginning with the first operating hour in which the fuel is combusted, following the completion of the retest. Notwithstanding this requirement, for stationary gas turbines the units that report NOx mass emissions and heat input data only during the ozone season under §75.74(c), if the NOx emission rate testing is performed outside the ozone season, the new correlation curve may be used beginning with the first unit operating hour in the ozone season immediately following the testing.

2.3 Other Quality Assurance/Quality Control-Related NOx Emission Rate Testing

When the operating levels of certain parameters exceed the limits specified below, or where the Administrator issues a notice requesting retesting because the NOx emission rate data availability for when the unit operates within all quality assurance/quality control parameters in this section since the last test is less than 90.0 percent, as calculated by the Administrator, complete retesting of the NOx emission rate by the earlier of: (1) 30 unit operating days (as defined in §72.2 of this chapter) or (2) 180 calendar days after exceeding the limits or after the date of issuance of a notice from the Administrator to re-verify the unit’s NOx emission rate. Submit test results in accordance with §75.60 within 45 days of completing the retesting.

2.3.1 For a stationary gas turbine, select at least four operating parameters indicative of the turbine’s NOx formation characteristics, and define in the QA plan for the unit the acceptable ranges for these parameters at each tested load-heat input point. The acceptable parametric ranges should be based upon the turbine manufacturer’s recommendations. Alternatively, the owner or operator may use sound engineering judgment and operating experience with the unit to establish the acceptable parametric ranges, provided that the rationale for selecting these ranges is included as part of the quality-assurance plan for the unit. Any operating parameter critical for NOx control shall be included. During the NOx heat-input correlation tests, record the average value of each parameter for each load-heat input to ensure that the parameters are within the acceptable range. Redetermine the NOx emission rate-heat input correlation for each fuel and (optional) combination of fuels after continuously exceeding the acceptable range of any of these parameters for one or more successive operating periods totaling more than 16 unit operating hours.

2.3.2 For a diesel or dual-fuel recirculating engine, select at least four operating parameters indicative of the engine’s NOx formation characteristics, and define in the QA plan for the unit the acceptable ranges for these parameters at each tested load-heat input point. The acceptable parametric ranges should be based upon the manufacturer’s recommendations. Alternatively, the owner or operator may use sound engineering judgment and operating experience with the unit to establish the acceptable parametric ranges, provided that the rationale for selecting these ranges is included as part of the quality-assurance plan for the unit. Any operating parameter critical for NOx control shall be included. During the NOx heat-input correlation tests, record the average value of each parameter for each load-heat input to ensure that the parameters are within the acceptable range. Redetermine the NOx emission rate-heat input correlation for each fuel and (optional) combination of fuels after continuously exceeding the acceptable range of any of these parameters for one or more successive operating periods totaling more than 16 unit operating hours.

2.3.3 For boilers using the procedures in this appendix, the NOx emission rate heat input correlation for each fuel and (optional) combination of fuels shall be redetermined if the excess oxygen level at any heat input rate (or unit operating load) continuously exceeds by more than 2 percentage points O2 from the boiler excess oxygen level recorded at the same operating heat input rate during the previous NOx emission rate test for one or more successive operating periods totaling more than 16 unit operating hours.

2.4 Procedures for Determining Hourly NOx Emission Rate

2.4.1 Record the time (hr. and min.), load (MWge or steam load in 1000 lb/hr. or mmBtu/hr thermal output), fuel flow rate and heat input rate (using the procedures in section 2.1.3 of this appendix) for each hour during which the unit combusts fuel. Calculate the total hourly heat input using equation E–1 of this appendix. Record the heat input rate for each fuel to the nearest 0.1 mmBtu/hr. During partial unit operating hours or during
hours where more than one fuel is combusted, heat input must be represented as an hourly rate in mmBtu/hr, as if the fuel were combusted for the entire hour at that rate (e.g., total heat input during that partial hour or hour) in order to ensure proper correlation with the NOx emission rate graph.

2.4.2 Use the graph of the baseline correlation results (appropriate for the fuel or fuel combination) to determine the NOx emissions rate (lb/mmBtu) corresponding to the heat input rate (mmBtu/hr). Input this correlation into the data acquisition and handling system for the unit. Linearly interpolate to 0.1 mmBtu/hr heat input rate and 0.001 lb/mmBtu NOx. For each type of fuel, calculate NOx emission rate using the baseline correlation results from the most recent test with that fuel, beginning with the date and hour of the completion of the most recent test.

2.4.3 To determine the NOx emission rate for a unit co-firing fuels that has not been tested for that combination of fuels, interpolate between the NOx emission rate for each fuel as if that fuel were combusted for the entire hour at that rate. (For fuel mixtures, substitute the highest NOx emission rate from the baseline correlation tests, the NOx emission rate for the hour is considered to be missing. Provide substitute data for each such hour, according to section 2.5.2.1 or 2.5.2.1.2 of this appendix, as applicable. Either: 2.5.2.1.1 Substitute the higher of: the NOx emission rate obtained by linear extrapolation of the correlation curve, or the maximum potential NOx emission rate (MER) (as defined in §72.2 of this chapter), specific to the type of fuel being combusted. (For fuel mixtures, substitute the highest NOx MER value for any fuel in the mixture.) For units with NOx emission controls, the extrapolated NOx emission rate may only be used if the controls are documented (e.g., by parametric data) to be operating properly during the missing data period (see section 2.5.2.2 of this appendix); or

2.5.2.1.2 Substitute 1.25 times the highest NOx emission rate from the baseline correlation tests for the fuel (or fuel mixture) being combusted in the unit, not to exceed the MER for that fuel (or mixture). For units with NOx emission controls, the option to report 1.25 times the highest emission rate from the correlation curve may only be used if the controls are documented (e.g., by parametric data) to be operating properly during the missing data period (see section 2.5.2.2 of this appendix).

2.5.2 If the measured heat input rate during any unit operating hour is higher than the highest heat input rate from the baseline correlation tests, the NOx emission rate for the hour is considered to be missing. Provide substitute data for each such hour, according to section 2.5.2.1 or 2.5.2.1.2 of this appendix.

2.5.2.3 Whenever 20 full calendar quarters have elapsed following the quarter of the last baseline correlation test for a particular type of fuel (or fuel mixture), without a subsequent baseline correlation test being done for that type of fuel (or fuel mixture), substitute the fuel-specific NOx MER (as defined in §72.2 of this chapter) for each such hour.

2.5.2.4 Whenever 20 full calendar quarters have elapsed following the quarter of the last baseline correlation test for a particular type of fuel (or fuel mixture), without a subsequent baseline correlation test being done for that type of fuel (or fuel mixture), substitute the fuel-specific NOx MER (as defined in §72.2 of this chapter) for each such hour.

2.5 Missing Data Procedures

Provide substitute data for each unit electing to use this alternative procedure whenever a valid quality-assured hour of NOx emission rate data has not been obtained according to the procedures and specifications of this appendix. For the purpose of providing substitute data, calculate the maximum potential NOx emission rate (as defined in §72.2 of this chapter) for each type of fuel combusted in the unit.

2.5.1 Use the procedures of this section whenever any of the quality assurance/quality control parameters exceed the limits in section 2.3 of this appendix or whenever any of the quality assurance/quality control parameters are not available.

2.5.2 Substitute missing NOx emission rate data using the highest NOx emission rate tabulated during the most recent set of baseline correlation tests for the same fuel or, if applicable, combination of fuels, except as provided in sections 2.5.2.1, 2.5.2.2, 2.5.2.3, and 2.5.2.4 of this appendix.

2.5.2.1 If the measured heat input rate during any unit operating hour is higher than the highest heat input rate from the baseline correlation tests, the NOx emission rate for the hour is considered to be missing. Provide substitute data for each such hour, according to section 2.5.2.1.1 or 2.5.2.1.2 of this appendix, as applicable. Either:

2.5.2.1.1 Substitute the higher of: the NOx emission rate obtained by linear extrapolation of the correlation curve, or the maximum potential NOx emission rate (MER) (as defined in §72.2 of this chapter), specific to the type of fuel being combusted. (For fuel mixtures, substitute the highest NOx MER value for any fuel in the mixture.) For units with NOx emission controls, the extrapolated NOx emission rate may only be used if the controls are documented (e.g., by parametric data) to be operating properly during the missing data period (see section 2.5.2.2 of this appendix); or

2.5.2.1.2 Substitute 1.25 times the highest NOx emission rate from the baseline correlation tests for the fuel (or fuel mixture) being combusted in the unit, not to exceed the MER for that fuel (or mixture). For units with NOx emission controls, the option to report 1.25 times the highest emission rate from the correlation curve may only be used if the controls are documented (e.g., by parametric data) to be operating properly during the missing data period (see section 2.5.2.2 of this appendix).

2.5.2.2 For a unit with add-on NOx emission controls (e.g., steam or water injection, selective catalytic reduction), if, for any unit operating hour, the emission controls are either not in operation or if appropriate parametric data are unavailable to ensure proper operation of the controls, the NOx emission rate for the hour is considered to be missing. Substitute the fuel-specific MER (as defined in §72.2 of this chapter) for each such hour.

2.5.2.3 When emergency fuel (as defined in §72.2) is combusted in the unit, report the fuel-specific NOx MER for each hour that the fuel is combusted, unless a NOx correlation curve has been derived for the fuel.

2.5.2.4 Whenever 20 full calendar quarters have elapsed following the quarter of the last baseline correlation test for a particular type of fuel (or fuel mixture), without a subsequent baseline correlation test being done for that type of fuel (or fuel mixture), substitute the fuel-specific NOx MER (as defined in §72.2 of this chapter) for each such hour.
2.5.3 Maintain a record indicating which data are substitute data and the reasons for the failure to provide a valid quality-assured hour of NO\textsubscript{X} emission rate data according to the procedures and specifications of this appendix.

2.5.4 Substitute missing data from a fuel flowmeter using the procedures in section 2.4.2 of appendix D to this part.

2.5.5 Substitute missing data for gross calorific value of fuel using the procedures in sections 2.4.1 of appendix D to this part.

3. C\textsc{alculations}

3.1 Heat Input

Calculate the total heat input by summing the product of heat input rate and fuel usage time of each fuel, as in the following equation:

\[ H_T = H_{\text{fuel}1} t_1 + H_{\text{fuel}2} t_2 + H_{\text{fuel}3} t_3 + \ldots + H_{\text{last fuel}} t_{\text{last}} \]  \hspace{1cm} (Eq. E-1)

Where:

- \( H_T \) = Total heat input of fuel flow or a combination of fuel flows to a unit, mmBtu.
- \( H_{\text{fuel}1,2,3,\ldots,\text{last}} \) = Heat input rate from each fuel, in mmBtu/hr as determined using Equation F–19 or F–20 in section 5.5 of appendix F to this part, mmBtu/hr.
- \( t_{1,2,3,\ldots,\text{last}} \) = Fuel usage time for each fuel (rounded up to the nearest 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)).

3.2 \( F \)-factors

Determine the \( F \)-factors for each fuel or combination of fuels to be combusted according to section 3.3 of appendix F of this part.

3.3 \textsc{N}\textsc{o}_\textsc{x} Emission Rate

3.3.1 Conversion from Concentration to Emission Rate

Convert the \( \textsc{N}\textsc{o}_\textsc{x} \) concentrations (ppm) and \( \text{O}_2 \) concentrations to \( \textsc{N}\textsc{o}_\textsc{x} \) emission rates (to the nearest 0.01 lb/mmBtu for tests performed prior to April 1, 2000, or to the nearest 0.001 lb/mmBtu for tests performed on and after April 1, 2000), according to the appropriate one of the following equations: F–5 in appendix F to this part for dry basis concentration measurements or 19–3 in Method 19 of appendix A to part 60 of this chapter for wet basis concentration measurements.

3.3.2 Quarterly Average \textsc{N}\textsc{o}_\textsc{x} Emission Rate

Report the quarterly average emission rate (lb/mmBtu) as required in subpart G of this part. Calculate the average \( \textsc{N}\textsc{o}_\textsc{x} \) emission rate according to equation F–9 in appendix F of this part.

3.3.3 Annual Average \textsc{N}\textsc{o}_\textsc{x} Emission Rate

Report the average emission rate (lb/mmBtu) for the calendar year as required in subpart G of this part. Calculate the average \( \textsc{N}\textsc{o}_\textsc{x} \) emission rate according to equation F–10 in appendix F of this part.

3.3.4 Average \textsc{N}\textsc{o}_\textsc{x} Emission Rate During Co-firing of Fuels

\[ E_h = \frac{\sum_{\text{all fuels}} (E_f \times HI_f t_f)}{H_T} \]  \hspace{1cm} (Eq. E-2)

Where:

- \( E_h \) = \( \textsc{N}\textsc{o}_\textsc{x} \) emission rate for the unit for the hour, lb/mmBtu.
- \( E_f \) = \( \textsc{N}\textsc{o}_\textsc{x} \) emission rate for the unit for a given fuel at heat input rate \( HI_f \), lb/mmBtu.
- \( HI_f \) = Heat input rate for the hour for a given fuel, during the fuel usage time, as determined using Equation F–19 or F–20 in section 5.5 of appendix F to this part, mmBtu/hr.
- \( H_T \) = Total heat input for all fuels for the hour from Equation E–1.
- \( t_f \) = Fuel usage time for each fuel (rounded up to the nearest 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)).

NOTE: For hours where a fuel is combusted for only part of the hour, use the fuel flow rate during the fuel usage time, instead of the total fuel flow during the hour, when calculating heat input rate using Equation F–19 or F–20.
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oil-fired peaking unit. In this section present information including, but not limited to, the following: (1) a copy of all data and results from the initial NO\textsubscript{X} 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\textsubscript{X} 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\textsubscript{X} emission rate test that determined the unit’s NO\textsubscript{X} 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.

APPENDIX F TO PART 75—CONVERSION PROCEDURES

1. APPLICABILITY

Use the procedures in this appendix to convert measured data from a monitor or continuous emission monitoring system into the appropriate units of the standard.

2. PROCEDURES FOR SO\textsubscript{2} EMISSIONS

Use the following procedures to compute hourly SO\textsubscript{2} mass emission rate (in lb/hr) and quarterly and annual SO\textsubscript{2} total mass emissions (in tons).

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

\[
E_h = KC_hQ_h \quad \text{(Eq. F-1)}
\]

Where:

- \(E_h\) = Hourly SO\textsubscript{2} mass emission rate during unit operation, lb/hr.
- \(K = 1.660 \times 10^{-7}\) for SO\textsubscript{2}, (lb/scf)/ppm.
- \(C_h\) = Hourly average SO\textsubscript{2} concentration during unit operation, ppm.
- \(Q_h\) = Hourly average volumetric flow rate during unit operation, scfh.

2.2 When measurements by the SO\textsubscript{2} 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\textsubscript{2} mass emission rate (in lb/hr):

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

where:

- \(E_h\) = Hourly SO\textsubscript{2} mass emission rate during unit operation, lb/hr.
- \(K = 1.660 \times 10^{-7}\) for SO\textsubscript{2}, (lb/scf)/ppm.
- \(C_{hp}\) = Hourly average SO\textsubscript{2} concentration during unit operation, ppm (dry).
- \(Q_{hs}\) = Hourly average volumetric flow rate during unit operation, scfh as measured (wet).
- \%H\textsubscript{2}O = Hourly average stack moisture content during unit operation, percent by volume.

2.3 Use the following equations to calculate total SO\textsubscript{2} mass emissions for each calendar quarter (Equation F-3) and for each calendar year (Equation F-4), in tons:

\[
E_q = \sum_{h=1}^{n} E_h t_h \quad \text{(Eq. F-3)}
\]

Where:

- \(E_q\) = Quarterly total SO\textsubscript{2} mass emissions, tons.
- \(E_h\) = Hourly SO\textsubscript{2} 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\textsubscript{2} emissions values during calendar quarter.