

Question 16.5

Topic: NO_x Monitoring -- Multiple Stack Configurations

Question: If I must measure the NO_x emission rate from all of the multiple stacks or ducts associated with a single unit, or if I choose to do so, how do I determine the NO_x emission rate for the unit?

Answer: If you have a unit with a multiple stack (or duct) configuration, and the unit does not qualify for single-stack (or duct) monitoring under Question 16.4, you must monitor the NO_x emission rate in each of the multiple stacks or ducts separately. If you are required to monitor all of the stacks or ducts, or if you voluntarily choose to do so, use the following guidelines.

Guidelines for Boilers

For boilers you may either:

(1) Identify separate NO_x emission rate monitoring systems with unique system IDs for each stack or duct and test and certify each system separately. Apply missing data procedures for each stack or duct separately. Calculate and report the NO_x emission rates separately for each duct or stack (which has been identified in the monitoring plan with a multiple stack ("MS") prefix). Assign formula IDs to support the calculation of hourly NO_x emission rate and include these formulas in the monitoring plan.

Calculate and report the quarterly and cumulative arithmetic average NO_x emission rate for each stack or duct. Also calculate and report the quarterly and cumulative heat input-weighted NO_x emission rates for the unit. See Section 2.1 of the ECMPS Emissions Reporting Instructions ("Summary Value Data") for a discussion of these calculations; or

(2) If the unit uses Appendices D and G for SO₂ and CO₂ emissions accounting, monitor the NO_x emission rate separately at each stack or duct and, in lieu of installing a flow monitor on each stack or duct, you may report all hourly, quarterly and cumulative NO_x emission data at the unit level; provided that:

(a) For any hour in which flue gases exhaust through only one of the stacks, the NO_x emission rate measured at that stack is reported (or, if the monitoring system is out-of-control, the appropriate missing data value is reported); and

(b) For any hour in which flue gases exhaust through all of the stacks, report the highest NO_x emission rate measured by any of the installed monitoring systems. If any of the monitoring systems is out-of-control during a particular operating hour, report the higher of the appropriate missing data value for that hour or the highest measured value from any of the in-control systems.

If you use this option, designate each NO_x-diluent CEMS as a primary monitoring system in the monitoring plan. Perform missing data substitution for NO_x at the unit level. The reported quarterly and cumulative NO_x emission rates for the unit will be arithmetic averages of the reported hourly NO_x emission rate values.

Guidelines for Combined-Cycle Combustion Turbines

For combined-cycle turbines, monitor the NO_x emission rate at both the main HRSG stack and at the bypass stack. Report all hourly, quarterly, and cumulative NO_x emission data and heat input data at the unit level. Also perform missing data substitution at the unit level. In the monitoring plan, designate the NO_x monitoring system on the HRSG stack as the “primary” (P) system and the bypass stack system as the “primary bypass” (PB) system, consistent with the ECMPS reporting instructions.¹

Depending on the control status of the monitoring systems and the way that the exhaust gases are routed, the reported NO_x emission rate for a given unit operating hour will either be:

- (1) A quality-assured value from the primary monitoring system;
- (2) A quality-assured value from the primary bypass system; or
- (3) Some form of substitute data.

For unit-level reporting, most DAHS vendors program their systems to draw substitute data values from a single “pool” of historical quality-assured data when the standard Part 75 missing data routines require “lookbacks”².

However, for combined-cycle turbines, EPA allows sources to create two separate data pools, one consisting of the quality-assured NO_x emission rate data recorded by the primary monitoring system at the HRSG stack and the other consisting of the quality-assured data recorded by the primary bypass monitoring system at the bypass stack.³ Table 1, below, outlines twelve possible combinations of unit operation and control status of the primary and primary backup monitoring systems for a combined-cycle turbine. For each combination, the appropriate way to report NO_x emission rate is specified.

The Table also shows the effect that each way of reporting NO_x emission rate has on the unit-level percent monitor data availability (PMA).

**TABLE 1: Reporting of Hourly NO_x Emission Rate Data for Combined-Cycle Turbines
with HRSG and Bypass Stack Monitoring Systems**

Monitoring System Control Status	All Emissions for the Hour Pass Through the HRSG Stack	All Emissions for the Hour Pass Through the Bypass Stack	Both Stacks are Used in the Hour
P & PB both IC	Report reading from the HRSG stack (P) Monitoring System [+ PMA]	Report reading from bypass stack (PB) Monitoring System [+ PMA]	Report the higher of: the value recorded by the HRSG stack (P) monitoring system or the value recorded by the bypass stack (PB) monitoring system. [+ PMA]
P is IC; PB is OOC	Report reading from the HRSG stack (P) Monitoring System [+ PMA]	Report substitute data. Either: (1) The maximum potential NO _x emission rate (MER)** , if a single missing data pool is used [- PMA]; <u>or</u> (2) The standard missing data value for the PB location, if two separate missing data pools are used [- PMA]	(1) If a single missing data pool is used, report the greater of the reading from the HRSG stack (P) monitoring system [+ PMA] or the MER** [- PMA] <u>or</u> (2) If two separate missing data pools are used, report the greater of the reading from the HRSG stack (P) monitoring system [+ PMA] or the standard missing data for the PB location [- PMA]
P is OOC; PB is IC	Report substitute data. Either: (1) The standard unit-level missing data value, if a single missing data pool is used [- PMA]; <u>or</u> (2) The standard missing data value for the P location, if two separate missing data pools are used [- PMA]	Report reading from bypass stack (PB) Monitoring System [+ PMA]	(1) If a single missing data pool is used, report the greater of the reading from the bypass stack (PB) monitoring system [+ PMA] or the standard unit-level missing data value [- PMA] (2) If two separate missing data pools are used, report the greater of the reading from the bypass stack (PB) monitoring system [+ PMA] or the standard missing data value for the P location [- PMA]

<p>P & PB both OOC</p>	<p>Report substitute data. Either:</p> <p>(1) The standard unit-level missing data value, if a single missing data pool is used [- PMA];</p> <p style="text-align: center;"><u>or</u></p> <p>(2) The standard missing data value for the P location, if two separate missing data pools are used [- PMA]</p>	<p>Report substitute data. Either:</p> <p>(1) The maximum potential NO_x emission rate (MER)**, if a single missing data pool is used [- PMA];</p> <p style="text-align: center;"><u>or</u></p> <p>(2) The standard missing data value for the PB location, if two separate missing data pools are used [- PMA]</p>	<p>Report substitute data. Either:</p> <p>(1) The maximum potential NO_x emission rate (MER)**, if a single missing data pool is used [- PMA];</p> <p style="text-align: center;"><u>or</u></p> <p>(2) The standard missing data value from either the P or the PB location (whichever is greater), if two separate missing data pools are used [- PMA]</p>
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** This is similar to the unmonitored bypass stack reporting option allowed by the rule. For the single missing data pool option, reporting the MER ensures that emissions are not underreported. In these situations, unit-level missing data lookbacks could result in unrepresentatively low substitute data values (i.e., controlled values recorded at the HRSG stack) being reported.

Key to the Table

P = Primary Monitoring System, installed on the HRSG stack

PB = Primary Bypass Monitoring System, installed on the bypass stack

IC = Monitoring system is in control and providing quality-assured measurements

OOC = Monitoring system is out-of-control or otherwise not providing quality-assured measurements

PMA = Percent monitor data availability (see §75.32)

[+ PMA] = The reported hourly NO_x emission rate is quality-assured and increases the PMA

[- PMA] = The reported hourly NO_x emission rate is not quality-assured and decreases the PMA

References: §§ 75.17(c) and (d), ECMPS Emissions Reporting Instructions, Sections 2.1 and 2.5.2

History: First published in August 1994, Update #3; revised in October 1999 Revised Manual; revised in December 2000, Update #13; revised in October 2003 Revised Manual; revised in 2013 Manual