UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

September 6, 2006

OFFICE OF
AIR AND RADIATION

Mr. Phillip Polyak
Alternate Designated Representative
Dearborn Industrial Generation
2400 Miller Road
Dearborn, MI 48121

Re: Approval of the Predictive Emission Monitoring System Installed on Unit BL2100 at Dearborn Industrial Generation (Facility ID (ORISPL) 55088)

Dear Mr. Polyak:

This letter approves the May 15, 2005 petition submitted by Dearborn Industrial Generation (DIG) under '75.66(d) and 40 CFR Part 75, Subpart E. In that petition, DIG requested approval of a predictive emission monitoring system (PEMS) to continuously monitor nitrogen oxides (NO_x) emissions from Unit BL2100 at its Dearborn, MI generating plant.

On July 13, 2005, in accordance with '75.20(f), EPA published a notice in the Federal Register concerning DIG=s request for approval of an alternative monitoring system (see 70 FR 40330, July 13, 2005). The 60-day public comment period closed on September 12, 2005. No comments were received.

Background

On May 15, 2005, DIG petitioned for approval of a NO_x PEMS installed on Unit BL2100 at its Dearborn, Michigan generating plant. The SmartCEM^{TM}-75 PEMS on Unit BL2100 is a neural-network computer software system supplied by CMC Solutions, L.L.C. that utilizes boiler sensor inputs to produce NO_x outputs. The petition documented the methods used to establish the relationship between sensor inputs and NO_x emissions, and provided data to demonstrate the precision and reliability of the predictive measurements.

Unit BL2100 is a 500-MW boiler that is capable of firing either a mixture of natural gas (NG) and blast furnace gas (BFG), or NG only. The boiler generates steam and electricity for local contract customers. The unit is nominally rated at an output capacity of 500,000 lbs/hr of superheated steam at a minimum pressure of 1,350 psig and a temperature of 960 degrees Fahrenheit. The unit has a maximum heat input of 746 mmBtu/hr when firing NG and BFG. Low NO_x burners are used to control NO_x emissions.

Unit BL2100 is subject to the NO_x Budget Trading Program under Michigan Department of Environmental Quality (MDEQ) regulations R336.1801-R336.1818. These regulations require DIG to continuously monitor and report NO_x mass emissions and heat input for Unit

BL2100, in accordance with Subpart H of 40 CFR Part 75. Unit BL2100 is not subject to the Acid Rain Program and the MDEQ NO_x Budget Program regulations do not require year-round reporting for the unit. Therefore, DIG has elected to report NO_x mass emissions and heat input data for Unit BL2100 on an ozone season-only basis (i.e., from May through September).

To meet the NO_x Budget Program monitoring requirements, DIG installed and certified a NO_x emission rate continuous emission monitoring system (CEMS). However, in the May 15, 2005 petition, DIG proposed to replace the NO_x CEMS with an alternative monitoring system, i.e., CMC Solutions' SmartCEM™-75 PEMS. To demonstrate that the PEMS provides NO_x emission measurements of comparable precision and reliability to measurements made with a CEMS, DIG followed the alternative monitoring system procedures stipulated in 40 Subpart E of Part 75. DIG contracted with CMC Solutions to collect data for the required 720 operating hour demonstration required by Subpart E.

The certified NO_x emission rate CEMS on Unit BL2100 was used to provide the hourly reference data during the PEMS training and test periods. The SmartCEM™-75 PEMS was installed on the unit in the first quarter of 2004. Relative accuracy test audits (RATAs) of the CEMS were conducted on March 15, 2004 at three operating loads, using EPA Methods 7E and 3A. Following the RATAs, the initial training data for the PEMS were collected. Next, the predictive capabilities of the PEMS were activated, and the training dataset was imported into a database. The PEMS and CEMS were then operated concurrently during the 3rd quarter of 2004, for the Subpart E demonstration.

Upon completion of the Subpart E demonstration, DIG prepared a certification application for the PEMS, in accordance with §75.48(a) and submitted it to EPA.

<u>EPA=s Determination</u>

Under Subpart E, the owner or operator of a unit applying to the Administrator for approval of an alternative monitoring system (AMS) must demonstrate that the AMS has the same or better precision, reliability, accessibility, and timeliness (PRAT) as provided by a CEMS. The demonstration must be made by comparing the AMS to a contemporaneously operating, fully certified CEMS or a contemporaneously operating reference method. DIG opted to use the existing CEMS installed on the unit to obtain the hourly reference data. Sections 75.41 through 75.46 discuss the criteria for evaluating PRAT, daily quality assurance, and missing data substitution for the AMS. Section 75.48 details the information that must be included in the application in order to demonstrate that the criteria in ''75.41 – 46 are met.

EPA reviewed the certification application and petition for approval of the Unit BL2100 PEMS. The Agency finds that DIG has satisfactorily demonstrated the precision, reliability, accessibility and timeliness of the PEMS data. Therefore, EPA approves the petition. EPA=s approval applies to baseload and non-baseload (startup/shutdown) NO_x emission rate outputs from the PEMS (in units of lb NO_x/mmBtu) when Unit BL2100 is firing either a combination of NG and BFG (the primary fuel supply) or NG only. The results of the Agency's review and the terms and conditions of approval are presented in the following paragraphs.

1. Precision

Under '75.41, for the normal unit operating level, the owner or operator must provide paired AMS and fully-certified CEMS hourly data for at least 90 percent of the hours during 720 unit operating hours for the primary fuel supply, and for at least 24 successive unit operating hours for all alternative fuel supplies that have significantly different sulfur content. Missing data substitution procedures must not be used to provide sample data. The data may be adjusted to account for any lognormality and/or time dependency autocorrelation. Three statistical tests must be passed, i.e., a linear correlation coefficient (r) $\geq$ 0.8, an F-test, and a one-tailed t-test for bias described in Appendix A to Part 75. Further, the owner or operator must provide two separate time series plots for the AMS and CEMS data. Each data plot must have a horizontal axis representing the calendar dates and clock hours of the readings, and there must be a separate data point for every hour of the test period. One data plot must show CEMS and AMS readings vs. time, and the other data plot must show the percentage difference between the AMS and CEMS readings vs. time. Finally, a plot of the paired AMS concentrations (on the vertical axis) and CEMS concentrations (on the horizontal axis) must be provided.

DIG provided 720 unit operating hours of paired PEMS and CEMS data that were collected from July 1, 2004 through August 12, 200 while co-firing NG and BFG in Unit BL2100 (the primary operating configuration). In addition, 24 hours of paired data were collected from July 3, 2004 through September 5, 2004 while combusting NG only (the alternative operating configuration).

Included in the 720-hour data set for co-fired operation are 71 hours of "non-baseload" operation (i.e., periods of unit startup and shutdown). DIG performed a Subpart E statistical analysis of the 720 hours of paired PEMS and CEMS data and performed the same statistics on the non-baseload subset of these data, to demonstrate PEMS performance during unit startup and shutdown.

The table below shows the results of the statistical tests for the DIG Unit BL2100 SmartCEM™-75 PEMS output.[1]

DIG Unit BL2100 SmartCEM™-75 PEMS			
All Data NG and BFG combination fuel (lbs NO_x/mmBtu)	**Non-baseload Data NG and BFG combination fuel (lbs NO_x/mmBtu)**	**NG-only Data (lbs NO_x/mmBtu)**	**Non-baseload Data NG-only (lbs NO_x/mmBtu)**
n = 720	**n = 82**	**n = 24**	**n = 11**

[1] Under '75.41(b), in preparation for conducting the required statistical tests, the data were screened for lognormality and time dependency autocorrelation. If either is detected, certain calculation adjustments are required. DIG detected neither lognormality nor autocorrelation. Therefore, consistent with 75.41(b), no calculation adjustments were made to the data.

t-test: mean difference, d = 0.000027 abs. value of confidence coefficient, cc = 0.000028 **Evaluation:** Since |cc| $\geq$ d, the model passed.	**t-test:** mean difference, d = 0.00002 abs. value of confidence coefficient, cc = 0.00010 **Evaluation:** Since |cc| $\geq$ d, the model passed.	**t-test:** mean difference, d = 0.00022 abs. value of confidence coefficient, cc = 0.00067 **Evaluation:** Since |cc| $\geq$ d, the model passed.	**t-test:** mean difference, d = -0.00005 abs. value of confidence coefficient, cc = 0.00119 **Evaluation:** Since |cc| $\geq$ d, the model passed.
r-coefficient correlation: r = 0.9987 **Evaluation:** Since r $\geq$ 0.8, the model passed.	**r-coefficient correlation:** r = 0.9991 **Evaluation:** Since r $\geq$ 0.8, the model passed.	**r-coefficient correlation:** r = 0.9966 **Evaluation:** Since r $\geq$ 0.8, the model passed.	**r-coefficient correlation:** r = 0.9979 **Evaluation:** Since r $\geq$ 0.8, the model passed.
F-test: variance of PEMS = 5.447E-05 variance of CEMS = 5.471E-05 F = 0.9957 $F_{critical}$ = 1.130 **Evaluation:** Since $F_{critical} \geq F$, the model passed.	**F-test:** variance of PEMS = 6.014E-05 variance of CEMS = 6.471E-05 F = 0.9294 $F_{critical}$ = 1.44 **Evaluation:** Since $F_{critical} \geq F$, the model passed.	**F-test:** variance of PEMS = 3.400E-04 variance of CEMS = 3.547E-04 F = 0.9587 $F_{critical}$ = 2.01 **Evaluation:** Since $F_{critical} \geq F$, the model passed.	**F-test:** variance of PEMS = 7.300E-04 variance of CEMS = 7.435E-04 F = 0.9817 $F_{critical}$ = 2.978 **Evaluation:** Since $F_{critical} \geq F$, the model passed.

The PEMS NO_x lb/mmBtu output passed each of the three statistical tests for all unit operations. Further, DIG supplied the appropriate data plots concerning the paired PEMS and CEMS data under ''75.41(a)(9) and (c)(2)(i).

2. Reliability

According to '75.42, the owner or operator must demonstrate that the PEMS is capable of providing valid 1-hr averages for 95.0 percent or more of unit operating hours over a 1-year period and that the system meets the applicable CEMS quality assurance requirements of Part 75. Valid PEMS data were collected by the data acquisition and handling system (DAHS) for more than 95.0 percent of the operating hours in the Subpart E test period, indicating that the PEMS is capable of meeting the long-term data availability requirements of '75.42. By meeting the quality assurance/quality control (QA/QC) requirements described in this petition response, EPA has determined that DIG will also meet the applicable Part 75 QA/QC requirements.

3. Accessibility and Timeliness

According to ''75.43 and 75.44, the owner or operator must demonstrate that the PEMS meets the recordkeeping and reporting requirements of Subparts F and G of Part 75. In the May 15, 2005 petition, DIG states that the PEMS meets these requirements. The DAHS records all parameters needed to calculate the NO_x emission rate on an hourly basis and is equipped to issue a data record for the previous day within 24 hours. The DAHS provides the operator with a continuous display of real-time emission data, including raw NO_x and O_2 concentration data, calculated NO_x emission data, process operating parameters, and the status of the process as it relates to the PEMS. Data are evaluated for compliance within the model's range of training data. The data are then available to generate reports, e.g., Part 60 compliance reports, Part 75 electronic data reports (EDRs), or custom reports configurable by the end user.

4. Quality Assurance

Under '75.45, the owner or operator must demonstrate either that daily tests equivalent to those in Part 75 can be performed on the PEMS or that such tests are unnecessary for providing quality-assured data. Sections 75.48(a)(8) – (11) require the following information to be submitted: (i) a detailed description of the process used to collect data, including location and method of ensuring an accurate assessment of operating hourly conditions on a real-time basis; (ii) a detailed description of the operation, maintenance, and quality assurance procedures for the AMS as required in Part 75; (iii) a description of methods used to calculate diluent gas concentration; and (iv) results of tests and measurements necessary to substantiate the equivalency of the AMS to a fully certified CEMS or reference method.

EPA has determined that the PEMS installed on Unit BL2100 PEMS will satisfy these requirements if the following QA procedures are implemented:

(a) The PEMS shall use the input parameters shown in the table immediately below. Each parameter minimum and maximum value is a one minute average. The PEMS input parameters must stay within the minimum and maximum values (inclusive) in the table below (referred to as "the PEMS operating envelope"), unless the PEMS is retrained according to paragraph (g), in which case, the new training values will supersede the values in the below table. If any PEMS input parameter value goes below the minimum or above the maximum table value by 5 percent or more[2], and if there is any[3] fifteen-minute quadrant of an hour in which the unit operates without at least one valid set of inputs, the PEMS shall be considered out-of-control, and the maximum potential NO_x emission rate (MER) specified in paragraph (h) shall be reported, starting with the out-of-control hour and ending with the next valid hour. For at least three years, data from each PEMS input parameter shall be maintained on site in a form suitable for inspection.

DIG Unit BL2100
SmartCEM™-75 PEMS Operating Envelope

Input	PEMS Input Parameter	Min	Max
Input 16**	Excess air (%)	0.3	20.9
Input 21**	Boiler feedwater flow (kpph)	0.0	581.70

[2] The PEMS Analyzer component additionally scans the historical training dataset to determine if the critical parameters contained in the current process vector correspond to any of the data previously collected (using a configurable tolerance or threshold that is maintained at 5% of the parameter range or less). Thus, a combination of critical input parameters that is not represented in the historical training dataset will invalidate the current minute record even if each of the individual critical parameters are within 5% of the minimum and maximum values established by the model envelope.

[3] However, an hourly average may be computed from at least two valid sets of inputs separated by a minimum of 15 minutes (where the unit operates for more than one quadrant of an hour) if data are unavailable as a result of the performance of calibration, quality assurance, or preventive maintenance activities pursuant to section 4 of this response, or backups of data from the data acquisition and handling system, or recertification, pursuant to paragraph (g).

Input 23*	Boiler steam flow (kpph)	0.0	552.10
Input 24	Combustion air flow raw signal (unitless)	0.0	93499.4
Input 25**	Combustion air flow (kpph)	0.0	434.00
Input 27*	Natural gas fuel flow (kpph)	0.0	111.24
Input 29	#1 Burner BFG fuel flow (kcfh)	0.0	2089.632
Input 31	#2 Burner BFG fuel flow (kcfh)	0.0	1984.662
Input 33	#3 Burner BFG fuel flow (kcfh)	0.0	1907.778
Input 35	#4 Burner BFG fuel flow (kcfh)	0.0	1987.476
Input 37	Furnace pressure (in. H2O)	-5.1	4.9
Input 42	Stack temperature (deg F)	204.9	373.7
Input 44	BFG temperature (deg F)	77.1	158.7
Input 50**	Furnace temperature (deg F)	310.7	1923.6
Input 51**	Economizer temperature (deg F)	528.8	908.1
Input 52	Superheater temperature (deg F)	430.7	1475.1
Input 54	Boiler oxygen A (%)	0.9	20.2
Input 55	Boiler oxygen B (%)	0.5	21.8
Input 56	Boiler oxygen C (%)	1.0	21.5
Input 99	BFG heat divided by total heat (%)	0.0	74.2

* Primary or critical parameters
** Secondary or non-critical but significant parameters

(b) Ongoing QA/QC tests of the PEMS shall be performed according to the following table:

PEMS Ongoing QA/QC Tests

Test	Performance Specification	Frequency
Daily QA/QC	PEMS output - PEMS output = 0.002 lb NO_X/mmBtu [see paragraph (e)]	Daily
3-run RAA	• Accuracy ≤ 10.0% <u>or</u> • For a low emitting source,[1] results are acceptable if the mean value for the PEMS is within ± 0.020 lb/mmBtu of the reference mean value	Monthly during ozone season and possibly in quarters 1 and 4 [see paragraph (f)].

PEMS Ongoing QA/QC Tests

Test	Performance Specification	Frequency
RATA	For semiannual RATA frequency: • RA > 7.5% and ≤ 10.0% or • For a low emitting source,[1] results are acceptable if the mean value for the PEMS is within ± 0.020 lb/mmBtu of the reference method mean value. For annual RATA frequency: • RA ≤ 7.5% or • For a low emitting source,[1] results are acceptable if the mean value for the PEMS is within ± 0.015 lb/mmBtu of the reference method mean value	Semiannual or annual (depending on the RATA results) for routine QA (see §75.74(c)(2)(ii)) Recertification RATA is required when a RAA or a RATA is failed or when operating conditions change. ≥ 9 test runs are required at normal operating level for annual or semiannual QA. ≥ 30 test runs are required at each of 3 operating levels for recertification. [see paragraphs (f) and (g)].
Sensor validation system (minimum data capture)	Check for production of at least 1 valid data point per 15 minutes [see paragraph (c)]	Before each RATA [see paragraphs (f) and (g)].
Sensor validation system (failed sensor alert)	Alert operator of any failed sensors [see paragraphs (c) and (d)]	Hourly
Bias adjustment factor	If $d_{avg} \leq |cc|$, bias test is passed	After each RATA. Perform bias test at the normal operating level [see paragraphs (f) and (g)].
PEMS training (Linear correlation and F-test)	$r \geq 0.8$, and $F_{critical} \geq F$	According to paragraph (g)
Sensor validation system (alarm system set-up)	[see paragraphs (c) and (d)]	After each PEMS training [see paragraph (g)]

[1] The unit is a low-emitting source if the mean reference value during the RATA or RAA is ≤ 0.200 lb/mmBtu NO_x.

The sensor alarm system validation procedure is described in paragraphs (c) and (d). The daily QA/QC test is described in paragraph (e). The RATAs, 3-run RAAs, and bias adjustment factor are discussed in paragraphs (f) and (g). Recertification, including training, of the PEMS is discussed in paragraph (g).

(c) The sensors for the PEMS= input parameters must be maintained in accordance with the manufacturer=s recommendations. A sensor validation system is required to identify sensor failures hourly to the operator and to reconcile failed sensors by: comparing each sensor to several other sensors, determining, based on the comparison, if a sensor has failed, and calculating a reasonable substitute value for the parameter measured by the failed sensor. DIG must ensure that the sensor validation system validates sensor data in this way every minute of PEMS operation. To comply with '75.10(d)(1), hourly averages must be computed using at least one valid set of inputs in each[4] fifteen-minute quadrant of an hour in

[4] However, an hourly average may be computed from at least two valid sets of inputs separated by a minimum of 15 minutes (where the unit operates for more than one quadrant of an hour) if data are unavailable as a result of the performance of calibration, quality assurance, or preventive maintenance activities pursuant to section 4 of this

which the unit operates. All valid data input to the PEMS during the hour must be used to calculate the hourly averages. All data points collected during an hour shall be, to the extent practicable, evenly spaced over the hour. If the provisions of this paragraph are not met, the PEMS is out-of-control, and Subpart D missing data procedures shall be followed.

(d) The sensor validation system shall include an alarm to inform the operator when sensors need repair and to indicate that the PEMS is out-of-control. In setting up the alarm system, a demonstration shall be performed at a minimum of four different PEMS training conditions, which must be representative of the entire range of expected boiler operations. For each of the four or more training conditions, the demonstration shall consist of the following:

(1) For all of the sensors used in the PEMS model, input a set of reference sensor values that were recorded either during the training of the PEMS or during a RATA of the PEMS (these values will all be within the PEMS operating envelope). Verify that these reference inputs produce the expected PEMS output, i.e., the expected NO_x emission rate;

(2) Perform one-sensor failure analysis, as follows. Artificially fail one of the sensors and then, using the calculated replacement value for that sensor [see paragraph (c), above], assess the effect on the accuracy of the PEMS. Calculate the percent difference between the reference NO_x emission rate from step (1) and the PEMS output. Repeat this procedure for each sensor, individually;

(3) Identify the sensor failure in step (2) that results in the worst accuracy. If the highest percent deviation exceeds $\pm$ 10.0 percent, then set up the PEMS to alarm when any single sensor fails. If none of the percent difference values exceeds 10.0 percent, proceed to step (4);

(4) Perform two-sensor failure analysis, as follows: Artificially fail the sensor from step (3) that produced the worst accuracy and also fail one of the other sensors. Then, using the calculated replacement values for both sensors, assess the accuracy of the PEMS hourly average output, as in step (2). Repeat this procedure, evaluating each sensor in turn with the sensor from step (3);

(5) Identify the combination of dual sensor failures that results in the worst accuracy. If the highest percent deviation exceeds $\pm$ 10.0 percent, then set up the PEMS to alarm when any two sensors fail. If none of the percent difference values exceeds 10.0 percent, then set up the PEMS to alarm with three sensor failures.

The results of this demonstration shall be maintained on site in a form suitable for inspection. For every hour of PEMS operation, the PEMS shall check for failed sensors and provide an alarm to alert the operator of

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response, or backups of data from the data acquisition and handling system, or recertification, pursuant to paragraph (g).

any sensors needing repair. When the PEMS alarms, the PEMS is out-of-control, and DIG shall report the NO_x MER, specified in paragraph (h), starting with the hour after the sensor validation alarm system alarms and ending with the hour after the sensor value is back within the expected range.

(e) A daily QA/QC test must be performed whenever the unit operates for any portion of the day. DIG shall input to the PEMS a set of boiler operating parameters used by the PEMS during a passed PEMS RATA or the most recent PEMS training. (**Note:** It is important that the same number of decimal places for the PEMS inputs be used here as was used in the passed PEMS RATA or most recent PEMS training.) The resulting PEMS NO_x lb/mmBtu output, if bias-adjusted, shall be divided by the bias adjustment factor (BAF) currently in use (this removes the BAF by resetting it to 1.000, as it was during the passed PEMS RATA or most recent PEMS training). Then, the unbiased PEMS output shall be compared to the corresponding PEMS NO_x lb/mmBtu output produced at the time of the RATA or PEMS training. If the difference between the two PEMS NO_x outputs is within ∀ 0.002 lb NO_x/mmBtu, the daily QA/QC test is passed. If a daily QA/QC test is failed or not performed, the PEMS is out-of-control. Subpart D missing data procedures shall be followed starting with the hour of the failed test or, if the test was not performed, the hour after the test due date, and ending with the hour in which a daily QA/QC test is passed. No grace periods are allowed. The results of this check (pass/fail) shall be reported in record type (RT) 624 in EDR version 2.2. (**Note:** Use code "04" in start column 53 of RT 624 (QA test code) for the daily QA/QC check.)

(f) Ongoing semi-annual or annual RATAs shall be performed at the normal operating level according to the procedures in §75.74(c)(2)(ii), and shall be calculated on a lb/mmBtu basis. If, as of the date of this approval, no RATA of the PEMS has yet been done, a RATA shall be performed no later than December 31, 2006. The reference method traverse point selection shall be consistent with Part 75, Appendix A, section 6.5.6. Notification of ongoing RATAs shall be provided according to '75.61(a)(5). Immediately prior to a RATA, the BAF shall be set to 1.000. Before each RATA, DIG shall ensure that the sensor validation system is set to provide at least one valid data point per 15 minute period, as discussed in paragraph (c). After the RATA, DIG shall calculate and apply a bias adjustment factor at the normal operating level according to Part 75, Appendix A, section 7.6. Report the RATA data and results in EDR RTs 610 and 611 and report the bias test results in RT 611.

Ozone season, monthly, 3-run (minimum) relative accuracy audits (RAAs), described below, shall be performed in every calendar month of the ozone season (May through September) in which the unit operates for at least 56 hours, except for a month in which a full 9-run RATA or PEMS recertification is performed. Justification for these ozone season RAAs is provided in Attachment C.

If Unit BL2100 becomes subject to the Clean Air Interstate Rule (CAIR), and if year-round reporting of NO_x mass emissions is required, two additional RAAs shall be performed to provide year-round QA for the PEMS. These RAAs (if required) shall be performed in the first and fourth calendar quarters of each year, except for quarters in which: (i) the unit operates for less than 168 hours; or (ii) a full 9-run RATA is performed; or (iii) the PEMS is recertified. Further justification for these two quarterly RAAs is provided in Attachment C.

All required RAAs shall be done on a lb NO_x/mmBtu basis, and shall be performed using either EPA Reference Methods 7E and 3A in Part 60, Appendix A-4 or portable analyzers. To the extent practicable, each RAA shall be done at different operating conditions from the previous one. Follow the portable analyzer manufacturer=s recommended maintenance procedures.

The minimum time per RAA run shall be 20 minutes. The reference method traverse point selection shall be consistent with Part 75, Appendix A, section 6.5.6. Alternatively, a single measurement point located at least 1.0 meter from the stack or duct wall may be used without performing a stratification test.

Results of the RAA shall be calculated using Equation 1-1 in Appendix F to Part 60. Bias-adjusted data from the PEMS (using the bias adjustment factor from the most-recent RATA) shall be used in the calculations. The results of the RAA are acceptable if the performance specifications in the "PEMS Ongoing QA/QC Tests" table in paragraph (b) are met. If the RAA is failed, follow the provisions in paragraph (g). No grace periods are allowed.

Report the results of all RAAs in the appropriate quarterly electronic data report. Use EDR RT 624, and report the results of each test as either "pass" or "fail". Report the QA test code in column 53 of RT 624 as "05".

If a portable chemiluminescent NO_x analyzer is used to perform the required RAAs, the procedures of Method 7E in Part 60, Appendix A-4 shall be followed. The analyzer performance specifications in Method 7E for calibration error, system bias, and calibration drift shall be met.

If a portable electrochemical analyzer is used to perform the required RAAs, ASTM Method D6522-00[5], as modified below, shall be followed.
ASTM D6522-00 applies to the measurement of NO_x (NO and NO_2), CO, and O_2 concentrations in emissions from natural gas-fired combustion systems using electrochemical analyzers. The method was developed based on studies sponsored by the Gas Research Institute (GRI)[6]. It has also been peer-reviewed, approved by ASTM Committees D22.03 and D22, and accepted by EPA as a conditional test method (CTM-030). ASTM D6522-00 prescribes analyzer design specifications, test procedures, and instrument performance requirements that are similar to the checks in EPA=s instrumental test methods (e.g., Methods 7E and

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5 ASTM D6522-00, "Standard Test Method for Determination of Nitrogen Oxides, Carbon Monoxide, and Oxygen Concentrations in Emissions from Natural Gas-Fired Reciprocating Engines, Combustion Turbines, Boilers, and Process Heaters Using Portable Analyzers."

6 GRI (Gas Research Institute), "Topical Report, Development of an Electrochemical Cell Emission Analyzer Test Method," July, 1997.

20). These checks include linearity, interference, stability, pre-test calibration error, and post-test calibration error.

Based on the results of EPA=s portable analyzer study[7], the following modifications to ASTM D6522-00 are required to make the method more practical without sacrificing accuracy: (i) NO_x analyzers must provide readings to 0.1 ppm to improve the likelihood of passing the performance specifications for sources with low NO_x levels; (ii) an alternative performance specification (e.g., ± 1 ppm difference from reference value) will be applied to take account of sources with low concentrations of NO_x; and (iii) the measurement system must be purged with ambient air between gas injections during the stability check, to reduce degradation of electrochemical cell performance (see the footnote in the table below).

The measurement system performance specifications as modified by the EPA portable analyzer study are shown in the following table.

ASTM Method D6522-00 Measurement System Performance Specifications (as Modified by EPA Portable Analyzer Study)

Performance Check	Gas	Acceptance Criteria
Zero Calibration Error	NO, NO_2	≤ 3 percent of span gas value or ± 1.0 ppm difference, whichever is less restrictive
	O_2	≤ 0.3 percent O_2
Span Calibration Error	NO, NO_2	≤ 5 percent of span gas value or ± 1.0 ppm difference, whichever is less restrictive
	O_2	≤ 0.5 percent O_2
Interference	NO, NO_2, O_2	≤ 5 percent of average stack NO concentration for each test run (using span gas checks)
Linearity	NO, O_2	≤ 2.5 percent of span gas concentration or ± 1.0 ppm difference, whichever is less restrictive
	NO_2	≤ 3.0 percent of span gas concentration or ± 1.0 ppm difference, whichever is less restrictive
Stability[1]	NO, NO_2 O_2	≤ 2.0 percent of span gas concentration or ± 1.0 ppm max-min difference, whichever is less restrictive, for 30-minute period ≤ 1.0 percent of span gas concentration or ± 1.0 ppm max-min difference, whichever is less restrictive, for 15-minute period
Cell Temperature		± 5 °F from initial temperature

[1] When conducting this check for three cells in an analyzer, the system must be purged with ambient air between gas injections to minimize the possibility of problems with the electrochemical cells. Otherwise, the cells will be exposed to high NO and NO_2 concentrations for prolonged periods of time, which can cause degradation in the cells performance (i.e., the so-called "O_2-starved exposure").

(g) If a RAA or a RATA is failed due to a problem with the PEMS, or if changes occur that result in a significant change in NO_x emission rate relative to the previous PEMS training conditions (e.g., process modification, new process

[7] "Evaluation of Portable Analyzers for Use in Quality Assuring Predictive Emission Monitoring Systems for NO_x," The Cadmus Group, Inc., September 8, 2004.

operating modes, or changes to emission controls), the following recertification tests and procedures shall be performed, in this order, *for both natural gas combustion and for the normal fuel combination of natural gas and BFG*:

(1) Ensure that the Sensor Validation System meets the requirements of paragraph (c).

(2) If required, re-train the PEMS according to the manufacturer=s recommendations.[8]

(3) Ensure that the requirements in paragraph (d) are met.

The following recertification tests and procedures shall be performed *while combusting the normal fuel combination of natural gas and BFG*:

(4) Perform a RATA, following the procedures in Part 75, Appendix A, section 6.5, except use three different operating levels (low, mid, and high) as defined in section 6.5.2.1 of Part 75, Appendix A. Use paired PEMS and reference method data to calculate the results on a lb NO_x/mmBtu basis. Calculations shall be based on a minimum of 30 runs at each operating level. DIG shall apply to each operating level the RATA performance specifications contained in the "PEMS Ongoing QA/QC Tests" table in paragraph (b). Report the RATA data and results of only the normal operating level in EDR RTs 610 and 611 and keep the data and results for the other two operating levels on-site, available for inspection. The RATA result for the normal operating level determines when the next RATA is due.

(5) Ensure that requirements in paragraph (e) are met.

(6) Conduct an F-test, and a correlation analysis (r-test) using Part 75, Subpart E equations at low, mid, and high operating levels.[9] The r-test shall be performed using all data collected at the three operating levels combined. When the mean value of the reference method NO_x data is less than 5 ppm, data from that operating level may be removed before applying the r-test. The F-test is to be applied to data at each operating

[8] If a reference method is used to provide training data for the PEMS, the training data may be used to calculate the relative accuracy at each operating level and the normal level bias, and to set up the alarm system.

[9] EPA performed a Subpart E statistical analysis of 720 hours of matched pairs of PEMS and CEMS data for one participating combustion turbine and 830 matched data pairs for another, and then performed the same statistics on 30-point subsets of these data. [see "Evaluation and Field Testing of Nitrogen Oxide (NO_x) Predictive Emission Monitoring Systems (PEMS) for Gas-fired Combustion Turbines - Synthesis Report," The Cadmus Group, Inc., December 29, 2004.] The results of these analyses showed that most of the 30-point subsets passed the same combination of statistical tests as the full data set. The field test data also illustrated the importance of testing the PEMS over the full operating range of the unit because of the strong correlation between NO_x emissions to certain unit operating parameters. Based on this evaluation, EPA believes that whenever the PEMS is recertified, a three load RATA (with a minimum of 30 paired data points at each load level) should be required in conjunction with input sensor failure checks and certain abbreviated Subpart E statistical tests; in particular, the F-test, the correlation analysis, and the t-test.

level separately. If the standard deviation of the reference method NO_x data at any operating level is less than either 3 percent of the span or 5 ppm, a reference method standard deviation of either 3 percent of span or 5 ppm may be used at that operating level when applying the F-test. Report the F-test and r-test results in RT 641.

(7) Perform a bias test (one-tailed t-test) at the normal operating level according to Part 75, Appendix A, section 7.6. If a bias test is failed, calculate and apply a bias adjustment factor (BAF) to the subsequent NO_x emission rate data. Report the bias test results in RT 611.

The following recertification tests shall be performed *for only: (i) non-baseload operation while combusting the normal fuel combination of NG and BFG; (ii) normal operation while combusting NG only; and (iii) non-baseload operation while combusting NG only*:

(8) For each operating condition described in (i) – (iii) above, collect at least 24 successive unit operating hours of paired hourly PEMS and reference method data and conduct an F-test, correlation analysis (r-test) and bias test. If a bias test is failed, calculate and apply an operating condition-specific bias adjustment factor (BAF) to the subsequent NO_x emission rate data. Report the F-test and r-test results in RT 641. Bias test results shall be maintained on site in a form suitable for inspection, active for at least three (3) years.

The tests and procedures in this paragraph (g) shall be completed by the earlier of 60 unit operating days (as defined in '72.2) or 180 calendar days after the failed RAA or failed RATA or after the change that caused a significant change in NO_x emission rate. For a failed RAA or RATA, DIG shall use the appropriate Part 75 missing data procedures (see section 5 below), starting from the hour of the failed RAA or RATA and ending with the hour of successful passage or completion of the tests and procedures, as required above. For a change that caused a significant change in NO_x emission rate, DIG shall report the NO_x MER from paragraph (h) and shall use a Method of Determination Code of “55” (i.e., “Other substitute data approved through petition by EPA”) in RT 320 for reporting lb NO_x/mmBtu emission rate, starting with the hour after the change that caused a significant change in NO_x emission rate and ending with the hour of successful passage or completion of the tests and procedures in steps (1) through (8) above. Notification of recertification of the PEMS shall be provided according to '75.61.

(h) For the purposes of this approval, the NO_x MER shall be 0.150 lb/mmBtu when the unit is firing a mixture of NG and BFG, or NG only. A Method of Determination Code A55” (i.e., “Other substitute data approved through petition by EPA”) shall be used in RT 320 when reporting the MER, except when the standard missing data routines in '75.33 require the MER to be reported.

5. Missing Data Substitution

Under '75.46, the owner or operator must demonstrate that all missing data can be accounted for in a manner consistent with the applicable missing data procedures in Subpart D (except where alternate procedures are required in this approval). The Subpart D missing data substitution requirements for NO_x emission rate include, but are not limited to: the initial missing data procedures in §75.31; determination of the percent monitor data availability; and the standard missing data procedures in §75.33. The missing data substitution requirements for fuel flow rate are found in Part 75, Appendix D, section 2.4. In the May 15, 2005 petition, DIG states that the data acquisition and handling system (DAHS) for Unit BL2100 has already been programmed to meet these missing data substitution requirements under the NO_x Budget Program.

6. Reporting Requirements

DIG shall submit the operating envelope for the DIG Unit BL2100 PEMS to Michigan DEQ and EPA Region 5 for inclusion in the hardcopy monitoring plan. Any time changes are made to the PEMS operating envelope, the complete, revised PEMS operating envelope shall be submitted in a hardcopy monitoring plan by the applicable deadline in '75.62(a)(2). More information on monitoring plan submittals, revisions and other submittals can be found at: http://www.epa.gov/airmarkets/monitoring/submissions/ monplan.html.

To report emissions data from the PEMS, DIG shall follow the EDR version 2.2 Reporting Instructions, found at: http://www.epa.gov/airmarkets/reporting/edr21/, in conjunction with the supplementary, PEMS-specific reporting instructions attached to this petition response (see Attachments A and B). Monitoring Data Checking (MDC) software that can be used to quality assure the electronic reports prior to submission is found at: http://www.epa.gov/airmarkets/reporting/index.html.

DIG may report quality-assured data from the PEMS in the 2006 ozone season for any month(s) in which all of the provisions of this petition response are followed.

This approval relies on the accuracy of the information provided by DIG in the May 15, 2005 petition and is appealable under Part 78. If there are any further questions or concerns about this matter, please contact John Schakenbach of my staff at (202) 343-9158 or at (schakenbach.john@epa.gov).

Thank you for your continued cooperation.

Sincerely,

/s/
Sam Napolitano, Director
Clean Air Markets Division

cc: John Schakenbach, EPA, CAMD
Louis Nichols, EPA, CAMD
Constantine Blathras, EPA Region V
Karen Kajiya-Mills, Michigan DEQ

Attachments

Attachment A

BASIC EDR REPORTING FOR PREDICTIVE EMISSIONS MONITORING SYSTEMS (PEMS)

I. Introduction

Table A-15, below includes the essential EDR record types for units that have received approval under Subpart E of Part 75 to use PEMS to report NO_x emissions. The scope of Table A-15 is limited to affected oil and gas-fired units (i.e., boilers and combustion turbines) that:

- X Have a single unit-single stack exhaust configuration; and
- X Use Part 75, Appendix D methodology to quantify unit heat input; and
- X Use Part 75, Appendices D and G to account for SO_2 and CO_2 mass emissions (if the units are in the Acid Rain Program).

For hourly NO_x emission rate reporting, RT 320 is used. Hourly 200-level records are not reported for either NO_x concentration or diluent gas (O_2 or CO_2) concentration.

II. Interpreting Table A-15

In Table A-15, the first column identifies the record type. The second column gives a brief description of the record type. The third, fourth, and fifth columns indicate whether the record type must be reported for a particular type of submittal. The third column header, "MP," refers to monitoring plan submittals. The fourth column header, "CT," stands for certification or recertification applications. The fifth column header, "QT," refers to electronic data report submittals. The letter codes in columns 3 through 5 are defined as follows:

Y This record type is required for this type of submittal (monitoring plan, certification/recertification application or electronic data report).

N This record type is not appropriate for this type of submittal.

O This record type is appropriate, but optional for this type of submittal.

A This record type may be required for this submittal. If any doubt exists as to the need to submit this record type, consult the appropriate EDR instructions.

T This record type is required each time a quality assurance test (e.g., a RATA) is performed.

Column 6 identifies the units covered by the record type as units subject to the Acid Rain Program ("ARP") or units subject to Part 75, Subpart H ("Subpart H").

Table A-15
EDR RECORD TYPES FOR UNITS WITH PEMS

Record Type	Description	MP	CT	QT	Program Applicability and Comments
100	Facility Identification	Y	Y	Y	ARP, Subpart H
101	Record Types Submitted	O	O	O	ARP, Subpart H
102	Facility Location and Identification Information	Y	Y	Y	ARP, Subpart H
300	Operating Data	N	N	Y	ARP, Subpart H $ Report one RT 300 for each hour in the quarter, except when a unit does not operate during the entire quarter. $ For each operating hour, report the fuel combusted in column 64.
301	Quarterly Cumulative Emissions	N	N	Y	ARP $ Quarterly NO_x emission rate is the arithmetic average of the RT 320, col 42 values.
302	Oil Fuel Flow	N	N	Y	ARP, Subpart H $ For ARP units, must be paired with RT 313 when reporting SO_2 mass emissions.
303	Gas Fuel Flow	N	N	Y	ARP, Subpart H $ For ARP units, must be paired with RT 314 when reporting SO_2 mass emissions.
307	Cumulative NO_x Mass Emissions	N	N	Y	Subpart H
313	SO_2 Mass Emissions (Oil)	N	N	Y	ARP
314	SO_2 Mass Emissions (Gas)	N	N	Y	ARP
320	NO_x Emission Rate Estimation	N	N	Y	ARP, Subpart H $ See supplementary reporting instructions.
328	NO_x Mass Emissions	N	N	Y	Subpart H $ See supplementary reporting instructions.
330	CO_2 Mass Emissions Data	N	N	A	ARP $ Report RT 330 for hours in which Equation G-4 is used to determine hourly CO_2 mass emissions for gas or oil-fired units.
331	CO_2 Mass Emissions Estimation Parameters	N	N	A	ARP $ Report RT 331 if you estimate CO_2 mass emissions using fuel sampling and Equation G-1.
504	Unit Information	Y	Y	Y	ARP, Subpart H
505	Program Indicator for Report	Y	Y	Y	ARP, Subpart H
506	EIA Cross Reference Information	Y	Y	Y	ARP, Subpart H
507	Peaking Unit or ARP Gas-Fired Unit Qualification Data	A	A	A	ARP
508	Subpart H Reporting Frequency Change	N	N	A	Subpart H
510	Monitoring Systems/Analytical Components Table	Y	Y	Y	ARP, Subpart H $ See supplementary reporting instructions.
520	Formula Table	Y	Y	Y	ARP, Subpart H $ Report formulas for SO_2 and CO_2 mass emissions

Record Type	Description	MP	CT	QT	Program Applicability and Comments
					(ARP units, only), NO_x mass emissions (Subpart H units), and unit heat input rate.
531	Defaults and Constants	Y	Y	Y	ARP, Subpart H $ See supplementary reporting instructions.
535	Unit and Stack Operating Load Data	Y	Y	Y	ARP, Subpart H Required for any unit using load-based missing data procedures for NO_x or fuel flow rate.
536	Range of Operation, Normal Load, and Load Usage	Y	Y	Y	ARP, Subpart H $ Report RT 536 to define operating range and normal load for RATA testing.
540	Fuel Flowmeter Data	Y	Y	Y	ARP, Subpart H
550	Reasons for Monitoring System Downtime or Missing Parameter	N	N	A	ARP, Subpart H $ See supplementary reporting instructions.
556	Monitoring System Recertification, Maintenance, or Other Events	N	Y	A	ARP, Subpart H $ Report RT 556 for recertification of the PEMS or fuel flowmeters. $ See supplementary reporting instructions.
585	Monitoring Methodology Information	Y	Y	Y	ARP, Subpart H $ See supplementary reporting instructions.
586	Control Equipment Information	A	A	A	ARP, Subpart H
587	Unit Fuel Type	Y	Y	Y	ARP, Subpart H
610	RATA and Bias Test Data	N	Y	T	ARP, Subpart H $ Report RT 610 each time a RATA is performed for certification, recertification or for on-going QA/QC. $ See supplementary reporting instructions.
611	RATA and Bias Test Results	N	Y	T	ARP, Subpart H $ Report RT 611 each time a RATA is performed for certification, recertification or for on-going QA/QC. $ See supplementary reporting instructions.
624	Other QA Activities	N	N	Y	ARP, Subpart H $ Report RT 624 for PEMS daily QA/QC and for PEMS periodic accuracy checks using a reference method, or a portable analyzer. $ See supplementary reporting instructions.
627	Fuel Flowmeter Accuracy Test	N	A	T	ARP, Subpart H $ Report only for fuel flowmeters that are certified and quality assured by periodic accuracy tests according to Part 75, Appendix D, section 2.1.5.1 or 2.1.5.2.
628	Fuel Flowmeter Accuracy Test for Orifice, Nozzle and Venturi Flowmeter	N	A	T	ARP, Subpart H $ Report only for orifice, nozzle and venturi-type flowmeters that are quality assured by periodic transmitter/transducer calibrations.
629	Fuel Flow-to-load Ratio Test Baseline Data	N	N	A	ARP, Subpart H $ Report if quarterly fuel flow-to-load ratio test in Part 75, Appendix D, section 2.1.7 is used to extend fuel flowmeter accuracy test deadlines.
630	Quarterly Fuel Flow-to-load Ratio Test Results	N	N	A	ARP, Subpart H $ Report if quarterly fuel flow-to-load ratio test in Part 75, Appendix D, section 2.1.7 is used to extend fuel flowmeter accuracy test deadlines.
640	Alternative Monitoring System	N	Y	A	ARP, Subpart H

Record Type	Description	MP	CT	QT	Program Applicability and Comments
	Approval Petition Data				$ Report when certifying a PEMS.
641	Alternative Monitoring System Approval Petition Results and Statistics	N	Y	A	ARP, Subpart H $ Report when certifying or recertifying a PEMS.
696	Fuel Flowmeter Accuracy Test Extension	N	N	A	ARP, Subpart H $ Use RT 696 to claim allowable extensions of fuel flowmeter accuracy test deadlines.
697	RATA Deadline Extension or Exemption	N	N	A	ARP, Subpart H $ Report when claiming a RATA deadline extension under Part 75, Appendix B, section 2.3.3.
699	QA Test Extension Based on Grace Period	N	N	A	ARP, Subpart H $ Report when claiming a QA test deadline extension under Part 75, Appendix B, section 2.2.4.
900	Certifications	Y	Y	Y	ARP
901	Certifications	Y	Y	Y	ARP
910	Comments	Y	Y	Y	ARP, Subpart H $ See supplementary reporting instructions.
920	Comments	O	O	O	ARP, Subpart H
940	Certifications	Y	Y	Y	Subpart H
941	Certifications	Y	Y	Y	Subpart H
999	Contact Information	O	O	O	ARP, Subpart H

Attachment B

SUPPLEMENTARY EDR REPORTING INSTRUCTIONS FOR PEMS

For a unit with an approved petition to use a predictive emissions monitoring system (PEMS), use the following supplementary instructions, in conjunction with the EDR version 2.2 Reporting Instructions document, to prepare the required EDR submittals.

RT 320

Monitoring System ID (10). Report the monitoring system ID (from RT 510, column 13) of the PEMS used to determine the NO_x emission rate during the hour.

F-Factor (26). Leave this field blank.

Average NO_x Emission Rate for the Hour (36). Report the average unadjusted NO_x emission rate for the hour (lb/mmBtu), rounded to three decimal places, as determined by the PEMS. For hours in which you use missing data procedures, leave this field blank.

Adjusted Average NO_x Emission Rate for the Hour (42). For each hour in which you report NO_x emission rate in column 36, apply the appropriate adjustment factor (1.000 or the BAF) to the unadjusted average emission rate, and report the result rounded to three decimal places. For each hour in which you use missing data procedures, report the appropriate substitute value.

Formula ID (50). Leave this field blank.

Method of Determination Code (53). Report “03” when you use the PEMS to determine the NO_x emissions rate. Report “55” when you report the fuel-specific maximum NO_x emission rate. During hours when you use other missing data procedures, report the appropriate MODC listed in the EDR instructions.

RT 328

NO_x Methodology for the Hour (45). Report “NOXR-PEMS”.

RT 510

The PEMS monitoring system consists of either one or two data acquisition and handling system (DAHS) components. For single-component PEMS systems or for systems where the PEMS software and standard DAHS software have the same manufacturer/provider, model or version number, report one RT 510 for the PEMS system. If the PEMS software and the standard DAHS software have different manufacturer/providers, model or version numbers, report each as a separate RT 510 with the same PEMS monitoring system ID.

Component ID (10). Report the three-character alphanumeric ID for each DAHS component.

Monitoring System ID (13). Create a unique three-character alphanumeric ID for each PEMS monitoring system. For sources switching from NO_x CEMS or Part 75, Appendix E to PEMS, do not re-use the CEMS or Appendix E system ID numbers.

System Parameter Monitored (17). If your PEMS is approved for NO_x emission rate (lb/mmBtu) and if you use the NO_x emission rate to calculate NO_x mass emissions, report "NOx" for the system parameter monitored. If your PEMS is approved for NO_x concentration (ppm) and if you calculate NO_x mass emissions as the product of NO_x concentration times flow rate, report "NOXC" for the system parameter monitored.

Primary/Backup Designation (21). Report "PE" to indicate that this is a predictive emissions monitoring system.

Component Type Code (23). Report "DAHS" as the component type code.

Sample Acquisition Method (27). Leave this field blank.

Manufacturer (30). Report the name of the manufacturer or developer of the software component.

Model/Version (55). Report the model/version of the software component.

Serial Number (70). Report the serial number, if applicableCotherwise leave blank.

RT 531

Parameter (10). Report "NORX" as the parameter monitored. (You should report one 531 record for each fuel type.)

Default Value (14). Report the fuel-specific maximum potential NO_x emission rate (MER), in units of lb/mmBtu.

Units of Measure (27). Report "LBMMBTU".

Purpose or Intended Use (34). Report "MD" for missing data.

Type of Fuel (37). Report the fuel type code for the fuel. (See the EDR Instructions for RT 531 for the list of available codes.)

Indicator of Use (40). Report "A" for any hour.

Source of Value (41). Report "DEF" for default value.

RT 550

Parameter (10). Report "NOX".

Monitoring System ID (14). Report the monitoring system ID, from RT 510, of the NO_x PEMS system.

<u>RT 556</u>

Component ID (10). Report the PEMS component ID subject to recertification/diagnostic testing, if a specific component is involved. If the event is system, not component, specific, leave this field blank.

Monitoring System ID (13). Report the monitoring system ID, from RT 510, of the NO_x PEMS system.

Event Code (16). Report code "99" (i.e., "Other").

Code for Required Test (19). Codes for PEMS systems are:

80 PEMS sensor validation system (minimum data capture check), train or retrain (if manufacturer recommends), sensor validation system (alarm system set-up and failed sensor alert check), daily QA/QC, 3 operating level RATA, statistical tests, and normal operating level bias test;

81 PEMS daily QA/QC, and PEMS check with reference method or portable analyzer;

Beginning of Conditionally Valid Period (31, 39). If conditional data validation is used, report the date and hour that the probationary PEMS daily QA/QC test was successfully completed according to the provisions of '75.20(b)(3)(ii).

<u>Note</u>: For PEMS, you may only use conditional data validation if the "event" in column 16 requires RATA testing. If you elect to use conditional data validation, you must complete the RATA within the allotted time in '75.20(b)(3)(iv).

<u>RT 585</u>

Parameter (10). If your PEMS is approved for NO_x emission rate (lb/mmBtu) and if you use the NO_x emission rate to calculate NO_x mass emissions, report "NOXR" as the parameter code associated with the PEMS. If your PEMS is approved for NO_x concentration (ppm) and if you calculate NO_x mass emissions as the product of NO_x concentration times flow rate, report "NOXM" as the parameter code associated with the PEMS.

Monitoring Methodology (14). Report "PEMS" as the monitoring methodology for the PEMS.

<u>RT 610</u>

Units of Measure (33). Report "2" (lb/mmBtu) as the units of measure.

Value from CEM System Being Tested (34). Report the average value recorded by the PEMS, for each RATA run.

<u>RT 611</u>

Units of Measure (34). Report "2" (lb/mmBtu) as the units of measure.

Arithmetic Mean of CEM Values (35). Report the arithmetic mean of all the RTs 610 PEMS values associated with the RATA.

Number of Load Levels Comprising Test (133). Report "1" or "3" (if certification or recert).

BAF for a Multiple-Load RATA (134). Leave this field blank.

<u>RT 624</u>

Component ID (10). Report the PEMS software component ID from RT 510.

Monitoring System ID (13). Report the NO_x monitoring system ID from RT 510.

Parameter (16). Report "NOX".

QA Test Activity Description (30). Fill in appropriately.

Reason for Test (51). Report "Q".

QA Test Code (53). Report one of the following codes, as appropriate:

04 PEMS daily QA/QC
05 Periodic check of PEMS accuracy with a portable analyzer, or reference method

<u>RT 640</u>

Submit RT 640 <u>only</u> with the Subpart E application for initial certification of the PEMS. Do <u>not</u> submit RT 640 for PEMS recertification.

Component ID (10). Report the PEMS software component ID from RT 510.

Monitoring System ID (13). Report the NO_x monitoring system ID from RT 510.

<u>RT 641</u>

Submit RT 641 with the Part 75, Subpart E application for initial certification of the PEMS and for all recertifications of the PEMS. For initial certification, fill in all applicable data fields in RT 641. For PEMS recertification, report only the data elements in start columns 1 through13, column 95 (the F-statistic), column 108 (Critical value of F at 95% confidence level for sample size), and column 121 [Coefficient of correlation (Pearson=s r) of CEM and AMS data].

Component ID (10). Report the PEMS software component ID from RT 510.

Monitoring System ID (13). Report the NO_x monitoring system ID from RT 510.

RT 910

Text (4). Briefly describe the PEMS.

Attachment C

JUSTIFICATION FOR RAA TESTING OF THE PEMS

A. Background

A NO_x PEMS is a piece of software that provides an indirect determination of NO_x emissions. It can provide an accurate indication of NO_x levels if it is properly developed, trained, and quality-assured. Normally, a PEMS is trained over a one week (or longer) time period and over a wide range of source operating conditions. However, even the best training regimen cannot include all possible operating conditions, e.g., upsets, sticky valves, or other unforeseen events, that can affect emissions but are not reflected in the PEMS output.

One safeguard against this is to implement a PEMS algorithm that identifies potentially failed sensors and PEMS input parameters that are outside of the expected range of values, by comparing the readings from each sensor to several other sensors and determining expected sensor values based on the historical sensor relationships developed during PEMS training. When unacceptable sensor values are identified, an alarm is activated, the PEMS is considered out-of-control, and the maximum potential NO_x emission rate must be reported until the sensor is fixed or the PEMS is retrained. Reporting standard missing data values or allowing a substitute sensor value calculated by the PEMS is not a complete solution because the PEMS cannot determine whether the abnormal input parameter value is caused by a failed sensor or by some new region of operation not represented in the PEMS training data.

An even better safeguard against unforeseen events that can affect NO_x emissions but may not be reflected in the PEMS output is to periodically compare the PEMS output to a quality assured, direct measurement of stack emissions, e.g., by performing a RATA. However, RATAs are costly and are generally performed only once or twice a year. Therefore, other, less-expensive accuracy checks should be done in-between the RATAs, to provide ongoing assurance of data quality. For continuous emission monitoring systems (CEMS), the RATAs are supplemented by daily calibration error checks and quarterly linearity checks, which use calibration gases. However, these tests cannot be done on a PEMS, because calibration gas cannot be injected into a PEMS. Therefore, some other type of periodic accuracy check suitable for a PEMS is needed to supplement the RATAs, in order to adequately quality assure the PEMS data for use in a cap and trade program.

EPA has completed a field study of portable NO_x monitors, analyzed the results, and performed a cost assessment[10]. For the two natural gas-fired combustion turbines tested, the accuracy of the portable analyzers at NO_x concentration levels of 3 ppm and higher was found to be comparable to that of a certified Part 75 CEMS and to EPA Reference Method 7E. Thus, portable analyzers are suitable for periodic accuracy tests of a PEMS.

[10] "Evaluation of Portable Analyzers for Use in Quality Assuring Predictive Emission Monitoring Systems for NO_x," The Cadmus Group, Inc., September 8, 2004.

B. Monthly 3-Run Relative Accuracy Audits in the Ozone Season

EPA believes that monthly 3-run relative accuracy audits (RAAs) performed during the ozone season using a portable analyzer will provide the necessary additional QA for the PEMS installed on DIG BL2100 under the NO_x Budget Trading Program. The monthly frequency was chosen by EPA as a compromise between a daily and a quarterly check of the PEMS against a direct emission measurement. Because the NO_x Budget Trading Program is concerned with controlling ozone, EPA decided that performing monthly RAAs on the PEMS during the ozone season (May through September) is an appropriate level of quality assurance.

C. Quarterly 3-Run RAAs in First and Fourth Quarters

DIG Unit BL2100 may become subject to the emission monitoring requirements of the Clean Air Interstate Rule (CAIR). Under CAIR, certain sources in Michigan are controlled out of concern for both ozone and fine particulate concentrations. The previously discussed monthly RAAs in the ozone season cover the second and third quarters only. However, fine particulate is a year round problem. Therefore, if DIG BL2100 becomes an affected unit under CAIR, and if year-round reporting of NO_x mass emissions is required, two additional RAAs are required to provide year round QA for the PEMS. One of these RAAs is required in the first quarter and the other in the fourth quarter. For the first and fourth quarters, EPA has decided to provide the greater flexibility of quarterly rather than monthly RAAs out of safety concerns of performing stack tests during winter months.

D. Cost Analysis

EPA has assessed the potential cost associated with an RAA requirement. The Agency estimates that performing the additional five monthly RAAs during the ozone season and two RAAs during the non-ozone season using a portable analyzer with trained in-house staff would bring the total annual cost of operating, maintaining and quality-assuring a PEMS such as the one on DIG BL2100 to approximately $29,850. (If outside contractors are used, instead of in-house staff, the total annual cost would be $49,750). This cost includes $6,000 annualized equipment cost for a portable analyzer plus $7,750 operation and maintenance (O&M) costs associated with QA testing (including an annual 9-run RATA performed by an outside test contractor, and seven 3-run RAAs performed by in-house staff using a portable analyzer), and $15,000 for PEMS O&M. This represents an annualized increase of about $9,850 above the cost without the seven RAAs.

EPA believes that the cost of the additional RAAs is reasonable. According to EPA=s CEM Cost Model, the next least costly option for DIG BL2100 to comply with Subpart H of Part 75 would be NO_x-diluent CEMS. The total annual cost of operating and maintaining a CEMS is estimated at $62,700. This cost includes $15,000 annualized equipment cost plus $47,700 O&M costs (including an annual RATA). Thus, even with the additional RAA requirement, the estimated annual cost of operating and maintaining a PEMS at DIG BL2100 using trained in-house staff and a portable analyzer would be less than half the cost associated with CEMS. Even if outside contractors are used instead of in-house staff, the annual PEMS cost would be significantly less ($12,950 less) than the annual cost associated with a CEMS.