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

SEP – 2 2003

OFFICE OF
AIR AND RADIATION

Mr. Phillip Polyak
Designated Representative
Dearborn Industrial Generation
P.O. Box 126
Dearborn, MI 48121-0126

Re: Request for Approval of a Predictive Emissions Monitoring System for Dearborn Industrial Generation (Facility ID (ORISPL) 55088), Unit GTP1

Dear Mr. Polyak:

This is in response to your October 24, 2002 petition under §75.66 (d) and 40 CFR Part 75, Subpart E in which Dearborn Industrial Generation (DIG) requested approval of a predictive emissions monitoring system (PEMS) at a gas-fired combustion turbine located at its Dearborn, Michigan facility. EPA approves the petition, with conditions, as discussed below.

Background

On October 24, 2002, DIG petitioned for approval of a CMC Solutions' Smart-75$_{©}$ PEMS, which is a hybrid statistical-based computer software system that utilizes turbine sensor inputs to produce outputs of estimated nitrogen oxides (NO_x) and carbon dioxide (CO_2) emissions. The PEMS is installed on a 170 MW GE Frame 7FA, simple cycle combustion turbine (Unit GTP1) at the DIG plant in Dearborn, Michigan. Unit GTP1 was installed in 1999 to generate electricity exclusively for commercial resale. The unit combusts only pipeline natural gas and uses dry low-NO_x combustion technology to control NO_x emissions. Unit GTP1 is subject to the Acid Rain Program regulations, and currently qualifies as a peaking unit (as defined in §72.2). According to the Michigan Department of Environmental Quality, Unit GTP1 is also subject to the NO_x Budget Trading Program, under NO_x Rules 801-818 (also referred to as R336.1801 - R336.1818). NO_x Rules 801-818 require DIG to begin monitoring and reporting NO_x mass emissions for Unit GTP1 by May 1, 2003. The selected NO_x mass monitoring methodology must meet the requirements of Subpart H of Part 75.

To meet the NO_x monitoring requirements of the Acid Rain Program, DIG elected to implement Part 75, Appendix E, which applies exclusively to gas-fired and oil-fired peaking units. The Smart-75$_{©}$ software was installed on the turbine in 1999 and, since that time, has been functioning as a data acquisition and handling system (DAHS) which satisfies Appendix E reporting requirements. However, note that DIG would be required to install a NO_x continuous emissions monitoring system (CEMS) and a more sophisticated DAHS on Unit GTP1 if the unit should ever lose its status as a peaking unit. Faced with this possibility, the October 24, 2002 petition requested approval of the PEMS as an alternative monitoring system (AMS) under Subpart E of Part 75. If

approved as an AMS, the PEMS could be used in lieu of a NO_x CEMS if Unit GTP1's peaking unit status should ever be lost. Approval of the petition would also allow DIG to use the AMS for Part 75 reporting, regardless of Unit GTP1's peaking status.

Under Subpart E of Part 75, the owner or operator of a unit applying to the Administrator for approval of an 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. Sections 75.41 through 75.46 discuss the criteria for evaluating PRAT, and describe the requirements for 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.

In its certification application, DIG submitted Subpart E data for two PEMS models, a simple model and a complete model. Each model was evaluated against quality-assured data recorded by a NO_x- diluent CEMS, which was temporarily installed, certified, maintained and quality-assured according to Part 75 for the purposes of the PEMS demonstration. The two models are identical; only the training data set used for each model was different. For the simple model, the first 40 hours of quality assured data were used to train the model and the remaining 762 hours were used to test the model using Part 75, Subpart E statistics. For the complete model, all 802 hours of quality assured data were used to train and to test the model. Because it is more rigorous to test a PEMS model on a different data set than the one on which it was trained , and because, typically, a PEMS may be trained on as few as 40 hours of data in practice, EPA decided to evaluate compliance with Subpart E based on the simple model.

EPA's Determination

The following paragraphs describe how EPA determined that DIG's application satisfies the requirements of a Subpart E AMS petition, and is therefore approvable. The conditions of EPA's approval are also stated. As discussed in greater detail below, EPA's approval applies only to combustion turbine GTP1 and only to PEMS outputs of NO_x concentration (ppm, dry basis) and NO_x emission rate (lb/mmBtu). Because the complete model was trained on a larger data set, it should be more accurate and robust than the simple model. The complete model also performed better on the Subpart E statistical tests for the same model outputs as the simple model. Therefore, EPA is approving the complete model, subject to the same conditions and requirements as the simple model.

1. Precision

Under §75.41, for the normal unit operating level, the owner or operator must provide concurrently-recorded, paired hourly data from the AMS and from a fully certified CEMS or a reference method for at least 90 percent of the hours during a period of 720 (or more) unit operating hours while the unit is combusting its primary fuel. Missing data substitution procedures must not be used during the 720-hour period. The owner or operator may adjust the data to account for any demonstrated lognormality and/or time dependency autocorrelation. The data must pass three statistical tests, i.e., a linear correlation coefficient test, where "r" must be ≥ 0.8, an F-test, and a one-tailed t-test for bias, as described in §7.6 of Appendix A to Part 75. Further, two separate time-

series plots must be prepared for the AMS and CEMS data. Each data plot must have a horizontal axis representing the clock hour and calendar date of the readings and must contain a separate data point for every hour for the duration of the test period. One data plot must show percentage difference vs. time, and the other data plot must show AMS and CEMS readings vs. time. Finally, a plot of the paired AMS (on the vertical axis) and CEMS (on the horizontal axis) data must be provided.

DIG provided 762 hours of historical, paired CEMS vs. PEMS data while natural gas was being combusted in Unit GTP1. According to DIG, the 762 hours represent more than 90% of the unit operating hours in the three-year data collection period, thereby satisfying the requirement in §75.41(a)(6). According to DIG, all 762 hours of data were quality-assured, i.e., no missing data substitution procedures were applied.

The table below shows the results of the statistical tests for the two conditionally approved PEMS outputs.[1]

PEMS (lbs NO_x/mmBtu)	PEMS (NO_x ppm, dry)
t-test: mean difference d = -0.001 abs. value of confidence coefficient cc = 0.002 **Evaluation:** Since $\|cc\| \geq d$, the model passed.	**t-test:** mean difference d = 0.024 abs. value of confidence coefficient cc = 0.438 **Evaluation:** Since $\|cc\| \geq d$, the model passed.
r-coefficient correlation: r = 0.859 **Evaluation:** Since $r \geq 0.8$, the model passed.	**r-coefficient correlation:** r = 0.837 **Evaluation:** Since $r \geq 0.8$, the model passed.
F-test: variance of PEMS = 0.001328 variance of RM = 0.001900 F = 0.699 $F_{critical} = 1.13$ **Evaluation:** Since $F_{critical} \geq F$, the model passed.	**F-test:** variance of PEMS = 73.216 variance of RM = 124.773 F = 0.587 $F_{critical} = 1.13$ **Evaluation:** Since $F_{critical} \geq F$, the model passed.

The PEMS output of NO_x emission rate in lb/mmBtu passed all three statistical tests, although EPA calculated somewhat different values for the t-test and F-test than were provided in the petition. Because the electronic paired CEMS vs PEMS data provided to EPA were in units of NO_x ppm and $\%CO_2$, EPA recalculated the NO_x lb/mmBtu values using these data before running

[1] Under §75.41(b), in preparation for conducting the required statistical tests, the data may be 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.

the statistics. The NO_x emission rates were calculated using Equation F-6 and an F_c factor of 1,040 for natural gas, from Appendix F of Part 75. Although the petition did not address it, the PEMS output of NO_x ppm (dry basis) passed all three statistics. EPA calculated these statistics because DIG desired this additional output. EPA also calculated the Subpart E statistics for the PEMS output of $\%CO_2$. The $\%CO_2$ output passed the F-test, but failed the "r" correlation and the t-test. Therefore, the % CO_2 PEMS output is not approvable; DIG will continue to use Part 75, Appendix G to report CO_2.

Further, DIG supplied the appropriate data plots concerning the paired AMS 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 hourly averages for 95.0 percent or more of unit operating hours over a one-year period, and that the system meets the applicable quality-assurance requirements of Part 75, Appendix B. The October 24, 2002 petition states that the PEMS provided 98.7% data availability over the three-year data collection period. EPA therefore finds that the PEMS meets the §75.42 requirements for monitoring system data availability. Section 4 below discusses the PEMS' status with respect to the applicable Appendix B quality assurance and quality control (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; can provide "a continuous, quality assured permanent record of certified emissions data on an hourly basis"; and is capable of "issuing a record of data for the previous day within 24 hours". The PEMS has demonstrated the ability to meet Subpart F and G requirements by providing Part 75 quarterly electronic data reports (EDRs) to EPA since 1999. The software also provides a continuous display of real-time emissions data to the operator. In view of these considerations, EPA finds that the PEMS meets the requirements of §§75.43 and 75.44 .

4. Quality Assurance

To quality-assure the data recorded by a PEMS, Subpart E requires the following. First, under §75.45, the owner or operator must demonstrate either that daily tests equivalent to those in Appendix B of Part 75 can be performed on the PEMS or that such tests are unnecessary for providing quality-assured data. Second, §75.48(a)(9) requires the owner or operator to submit as part of the certification application a detailed description of the operation, maintenance, and quality assurance (QA) procedures for the AMS as required in Part 75, Appendix B. Third, §§75.48 (a)(8), (a)(10) and (a)(11) require the owner or operator to provide: 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; a description of methods used to calculate heat input or diluent gas concentration; and results of tests and measurements necessary to substantiate the equivalency of the AMS to a fully certified CEMS.

EPA finds that the quality-assurance plan and the description of the data collection process provided by DIG in the certification application demonstrate a willingness to comply with the requirements of Subpart E. However, these elements of the certification application describe only in general terms how compliance will be achieved and are not sufficiently detailed. Therefore, as conditions of this petition approval, DIG shall ensure that the following quality-assurance criteria and testing requirements are met:

(a) The following PEMS input parameters shall be used, unless the PEMS is retrained according to paragraph (h) below, in which case, any new PEMS input parameters will supercede the parameters in the table immediately below (referred to as the "PEMS operating envelope"): unit load, gas flow, premix 1 (PM1), premix 2 (PM2), premix 3 (PM3), inlet temperature and burner mode[d]. The PEMS input parameters must stay within the minimum and maximum values (inclusive) in the PEMS Operating Envelope Table, unless the PEMS is retrained according to paragraph (h) below, in which case, the new training values will supersede the values in the table. If the burner mode is steady-state[d] (in other words, if dry low-NO_x is operating) and any other PEMS input parameter value goes below the minimum or above the maximum table values, the PEMS shall be considered out-of-control, and the appropriate Part 75 missing data procedures shall be followed (see section 5 below), starting with the hour after the sensor value goes outside of the PEMS operating envelope and ending with the hour after the sensor value is back within the PEMS operating envelope. If the burner mode is not steady-state, DIG shall follow the missing data procedures in paragraph (i).

PEMS Operating Envelope

PEMS Input Parameter	Minimum Value	Maximum Value
Load (MW)	85.5	169.1
Gas flow (hcfh)	10,275.3	15,873.7
PM1 (unitless) [a]	0.064	0.531
PM2 (unitless) [b]	0.071	0.427
PM3 (unitless) [c]	0.162	0.609
Inlet temp (deg F)	43	103
Burner mode [d]	6	6

[a] PM1 or Premix 1 = PM1 nozzle fuel flow / total fuel flow into combustion chamber.
[b] PM2 or Premix 2 = PM2 nozzle fuel flow / total fuel flow into combustion chamber.
[c] PM3 or Premix 3 = PM3 nozzle fuel flow / total fuel flow into combustion chamber.
[d] Six burner modes: (1) Startup (0-26% load with primary gas going in and being fired) or shutdown; (2-5) Lean/Lean (27-67% load with primary and secondary gas going in and both being fired); and (6) Steady state (68-100% load with PM1, PM2, and PM3 all non-zero). Note: Burner mode 6, itself, is not necessarily a PEMS input because load, PM1, PM2, and PM3 inputs are sufficient to define burner mode 6.

(b) The sensors for the PEMS' input parameters must be maintained in accordance with

the manufacturer's recommendations. Further, the PEMS must have a sensor validation system which identifies and reconciles failed sensors, by comparing each sensor to several other sensors and determining, based on the comparison, if a sensor has failed, and then calculating a reasonable substitute data value for the parameter measured by the failed sensor. DIG must check, and demonstrate, that the sensor validation system validates sensor data in this way for every minute of PEMS operation. In accordance with §75.10(d)(1), all valid data recorded by the PEMS must be used to calculate the hourly average NO_x emission rates. To validate an hourly average, for each fifteen-minute quadrant of the hour in which the unit combusts any fuel, there must be at least one valid data point.

(c) DIG shall implement a sensor validation alarm system 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 turbine 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 relative accuracy test audit (RATA) of the PEMS. 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 (b) 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%, then set up the PEMS to alarm when any single sensor fails. If none of the percent difference values exceeds 10.0%, 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%, then set up the PEMS to alarm when any two sensors fail. If none of the percent difference values exceeds 10.0%, proceed to step (6);

(6) Perform three-sensor failure analysis, as follows: Artificially fail the two sensors that resulted in the worst accuracy in step (5) and also fail one of the other sensors. Then, using the calculated replacement values for all three sensors, assess the accuracy of the PEMS hourly average output, as in step (2). Repeat this procedure, evaluating each sensor in turn with the two sensors from step (5);

(7) Identify the combination of three sensor failures that result in the worst PEMS accuracy. If the highest percent deviation exceeds ± 10.0%, then set the PEMS up to alarm with any three sensor failures. If none of the percent difference values exceeds 10.0%, then set up the PEMS to alarm with four sensor failures.

The results of this demonstration shall be reported in the Subpart H certification hardcopy test report and in record type (RT) 910 in the quarterly EDR submittal for the quarter in which the demonstration was performed. When the PEMS alarms, the PEMS is out-of-control. The appropriate Part 75 missing data procedures shall be followed (see section 5 below), starting with the hour after the alarm sounds and ending the hour after the problem is fixed and the alarm no longer sounds.

(d) A daily QA/QC test must be performed. A complete set of reference sensor values that were recorded either during the training of the PEMS or during a RATA of the PEMS shall be input to the PEMS. Verify that these reference inputs produce the expected PEMS output, i.e., the expected NO_x emission rate. If the PEMS NO_x output is within ± 10.0% of the reference method value, the daily QA/QC test is passed. If the daily QA/QC test is failed, the PEMS is out-of-control, and the appropriate Part 75 missing data procedures shall be followed, starting with the hour after the failed test (or, if the test is not conducted in a timely manner, starting with the hour after the test due date) and ending with the hour in which the test is passed. The results of this check (pass/fail) shall be reported in RT 624 (see EDR Reporting, attached).

(e) EPA reserves the right to require DIG to use portable NO_x and CO_2/O_2 analyzers (or, as an option, to use a CEMS, mobile CEMS or reference method) to perform periodic, direct measurement checks against the PEMS, if and when EPA determines that portable NO_x analyzers and the associated measurement methodologies can provide an adequate PEMS accuracy check. EPA will provide the necessary information to DIG on, e.g., performance specifications, sampling frequency, methodology, and reporting, should this become a requirement. Over the next few months, EPA will test several portable chemiluminescence and electrochemical NO_x and CO_2/O_2 analyzers at combustion turbine sites to determine how well these analyzers work. It is anticipated that should this check become a requirement, it would be implemented so that the unit is tested at different load levels from check to check.

(f) DIG shall perform initial certification tests on the PEMS prior to reporting any PEMS data as quality-assured. These certification tests must be performed in the

following order: (1) ensure that the sensor validation system meets the requirements of paragraph (b); (2) train or retrain, as applicable, the PEMS according to the manufacturer's recommendations; (3) ensure that the requirements for an alarm system in paragraph (c) have been met; (4) perform a NO_x RATA at the normal load level according to Part 75, Appendix A, §6.5, using paired PEMS and reference method data, calculating the relative accuracy on a lb/mmBtu basis;[2] and (5) calculate and apply a bias adjustment factor (BAF) at the normal load level according to Part 75, Appendix A, §7.6. Until all tests and procedures in (1), (3), and (4) are passed, and all the procedures in (2) and (5) are completed, the appropriate Part 75 missing data procedures shall be followed (see section 5 below).

(g) Ongoing QA/QC tests shall be performed according to the following table.

Test	Performance Specification	Frequency
Daily QA/QC	$\leq$ 10.0% of reference NO_x emission rate	Daily (paragraph (d))
Direct NO_x/CO_2 measurement with portable analyzer	To be provided	To be provided (paragraph (e))
RATA	RA > 7.5% and $\leq$ 10.0% (semiannual) RA $\leq$ 7.5% for annual frequency	Annual or semiannual and after each PEMS training (paragraphs (f) and (h))
Sensor validation system (minimum data capture)	Check for production of at least 1 valid data point per 15 minutes (paragraph (b))	Before each RATA (paragraphs (f) and (h))
Bias adjustment factor	If $d_{avg} \leq \lvert cc \rvert$, bias test is passed	After each RATA (paragraphs (f) and (h))
PEMS training (Linear correlation and F-test)	$r \geq 0.8$, and $F_{critical} \geq F$	According to paragraphs (f) and (h)
Sensor validation compliance alarm system set-up	(see paragraph (c))	After each PEMS training (paragraphs (f) and (h))

The daily QA/QC test is described in paragraph (d) above. The direct NO_x/CO_2 measurement, if and when it is required by EPA, is discussed in paragraph (e) above. On-going RATAs shall be performed at the normal load level according to the procedures in Part 75, Appendix B, §2.3.1 and, as discussed in paragraphs (f) and (h), shall be calculated on a lb/mmBtu basis. Before each RATA, DIG shall check that the sensor validation system is set to provide one valid data point per 15 minute period, as discussed in paragraph (b). After each RATA, DIG shall calculate and apply a bias adjustment factor at the normal load level according to Part 75, Appendix A, §7.6. DIG shall train or retrain the PEMS according to paragraphs (f) and (h). After each training, DIG shall perform a normal load level RATA and bias test, described in paragraph (f), and the compliance alarm demonstration in paragraph

[2] RATAs must be calculated on a lb NO_x/mmBtu basis because DIG indicated that NO_x mass emissions for GTP1 are calculated using heat input (mmBtu/hr) from a fuel meter and gas heat content times NO_x emission rate (lb/mmBtu).

(c).

(h) After initial certification, if 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 (e.g., turbine aging, process modification, new process operating modes, or changes to emission controls), the tests and procedures in paragraph (f) shall be performed on the PEMS in the order specified in that paragraph. In addition, prior to performance of the RATA (see Step (4) in paragraph (f)), the PEMS must pass a linear correlation "r" and an F-test using the paired PEMS vs. reference method data used in retraining the PEMS (see Step (2) in paragraph (f)). The linear correlation "r", the F-test, and the tests and procedures in (1), (3), and (4) in paragraph (f) shall be passed, and the procedures in (2) and (5) in paragraph (f) shall be completed, by the earlier of 60 unit operating days (as defined in §72.2) or 180 calendar days after the failed RATA or after the change that caused a significant change in NO_x emission rate. DIG shall use the appropriate Part 75 missing data procedures (see section 5), starting from the hour of the failed RATA or the hour after the change that caused a significant change in NO_x emission rate, as applicable, and ending the hour after successful passage or completion of the tests and procedures, as required above.

(i) For any hour or partial hour of startup, shutdown, or lean/lean turbine operation (in other words, if dry low-NO_x is not operating), DIG must report the maximum potential NO_x emission rate (MER), calculated in accordance with §2.1.2.1 (b) of Appendix A to Part 75. A maximum potential NO_x concentration (MPC) of 150 ppm, in accordance with Part 75, Appendix A, Table 2-2, shall be used in the MER calculation.

(j) Over the next few months, EPA will test several statistical procedures at two combustion turbine sites to determine how well these procedures predict PEMS accuracy. Although DIG is currently required to perform a linear correlation (r) and an F-test in paragraph (h), EPA reserves the right, as a condition on today's approval of the PEMS, to add new statistical procedures or to change the ones currently required. EPA will provide the necessary information to DIG should new or changed statistical procedures become a requirement.

5. Missing Data Substitution

Under §75.46, DIG must demonstrate that all missing data can be accounted for in a manner consistent with the applicable missing data procedures in Subpart D. The DIG petition states that Unit GTP1 currently meets Appendix E requirements, including Appendix E missing data procedures. If and when DIG discontinues the use of Appendix E and begins to use the PEMS as an approved Part 75 AMS, Subpart D missing data procedures for NO_x emission rate shall be implemented (except as provided in paragraph (i) above). This includes the initial missing data procedures in § 75.31, determination of monitor data availability (§ 75.32), and the standard missing data procedures in § 75.33.

6. Additional Requirements

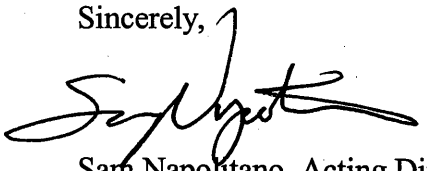
A monitoring plan is due 45 days prior to the initial certification tests (§75.62) described in paragraph (f) above. The PEMS operating envelope shall be included in the hardcopy monitoring

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 and other submittals can be found at: http://www.epa.gov/airmarkets/monitoring/submissions/monplan.html.

DIG shall follow the EDR instructions at: http://www.epa.gov/airmarkets/reporting/edr21/, supplemented by the attached EDR Reporting instructions, to report data from the PEMS in EDR format. 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. EPA is currently revising the MDC software to better accommodate PEMS. Until revised software is issued, MDC may produce some inappropriate error messages.

EPA's approval of DIG's petition under §75.66(d) and Subpart E relies on the accuracy and completeness of the information in DIG's October 24, 2002 petition and is appealable under Part 78 of the Acid Rain regulations. If there are any further questions or concerns about this matter, please contact John Schakenbach of my staff at 202-564-9158 or at (schakenbach.john@epa.gov) .

Sincerely,



Sam Napolitano, Acting Director
Clean Air Markets Division

cc: John Schakenbach, EPA, CAMD
Louis Nichols, EPA, CAMD
Constantine Blathras, EPA Region 5
Karen Kajiya-Mills, MI DEQ

Attachment

EDR REPORTING
[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 predictive emissions monitoring systems (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:

- Have a single unit-single stack exhaust configuration; and
- Use Appendix D methodology to quantify unit heat input; and
- Use Appendices D and G to account for SO_2 and CO_2 mass emissions (if the units are in the Acid Rain Program); and
- Do not co-fire oil and gas.

For PEMS reporting, EDR version 2.2 must be used, since fuel-specific missing data substitution for NO_x emission rate is required. 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.

For units that burn more than one fuel type, separate PEMS are required for each fuel. Each PEMS should be reported as a separate monitoring system with a unique monitoring system ID in RT 510. Each PEMS will require its own set of certification, recertification, and quality assurance tests.

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.

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 (ARP units,only), NO_x mass emissions (Subpart H units), and unit heat input rate.

Record Type	Description	MP	CT	QT	Program Applicability and Comments
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	N	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 RTs 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 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 Section 2.1.5.1 or 2.1.5.2 of Appendix D.
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 Section 2.1.7 of Appendix D is used to extend fuel flowmeter accuracy test deadlines.

Record Type	Description	MP	CT	QT	Program Applicability and Comments
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 Section 2.1.7 of Appendix D is used to extend fuel flowmeter accuracy test deadlines.
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 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 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

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 2.1 or 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 "12" when you report the fuel-specific maximum NO_x emission rate (e.g., during hours of startup or shutdown or when NO_x controls are not functioning properly). During hours when you use other missing data procedures, report the appropriate MODC listed in the EDR instructions.

RT 328

NOx 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, etc., 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, etc., 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. Define a separate NOX PEMS system for each fuel type. For sources

switching from NO_x CEMS or Appendix E to PEMS, do not re-use the CEMS or Appendix E system ID numbers.

System Parameter Monitored (17). Report "NOX" 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 applicable—otherwise 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 NOX PEMS system.

RT 556

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 daily QA/QC, sensor validation system check, train or retrain (if manufacturer recommends), sensor validation compliance alarm check, statistical tests, and normal operating level RATA and bias test;

81 PEMS daily QA/QC, and PEMS check with 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).

Note: 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).

RT 585

Parameter (10). Report "NOXR" as the parameter code associated with the PEMS. Report one RT 585 for each generic fuel type combusted.

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

Missing Data Approach for Methodology (28). Report "FSP75" for the fuel-specific missing data approach for the PEMS methodology.

RT 610

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.

RT 611

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".

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

RT 624

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.

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, CEMS or reference method

RT 910

Text (4). Briefly describe the PEMS.