Gainesville Renewable Energy Center

CEMS QA/QC Plan

for 40 CFR Parts 60 and 75

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Quality Assurance/Quality Control Manual

Revision History

Revision Number	Date of Revision	Revised Pages	Reason(s) for Revision
0	Aug 2013	N/A	Original
1	Apr 2015	Major Revision	Delete O_{2wet} CEMS and H_2O calculation; Update Procedure 3 COMS QA requirements to reflect final rule; Delete HCl/HF CEMS provisions; miscellaneous changes as needed due to DAHS replacement; Extensive changes to Chapters 6, 7 and 8; Correct errors and omissions.

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Glossary of Abbreviations and Acronyms

AETB	Air Emission Testing Body
CD	Calibration Drift
CE	Calibration Error
CEMS	Continuous Emissions Monitoring System
CFR	Code of Federal Regulations
CGA	Cylinder Gas Audit
CO	Carbon Monoxide
COMS	Continuous Opacity Monitoring System
DAHS	Data Acquisition and Handling System
DAR	Data Assessment Report
ECMPS	Emissions Collection and Monitoring Plan System
EDR	Electronic data report
CAMD	U.S. Environmental Protection Agency, Clean Air Markets Division
FDEP	Florida Department of Environmental Protection
GHR	Gross Heat Rate
NIST	National Institute of Standards and Technology
NO_X	Oxides of Nitrogen
O_2	Oxygen
PGVP	Protocol Gas Verification Program
PLC	Programmable Logic Controller
PM	Preventive Maintenance
PS	Performance Specification
QI	Qualified Individual
RA	Relative Accuracy
RATA	Relative Accuracy Test Audit
SCR	Selective Catalytic Reduction
SO_2	Sulfur Dioxide
SOP	Standard Operating Procedure

Glossary of Abbreviations and Acronyms

US EPA	U.S. Environmental Protection Agency
UV	Ultraviolet

1. QUALITY ASSURANCE PLAN OVERVIEW

1.1 Introduction

This document describes the Quality Assurance/Quality Control (QA/QC) Plan that has been developed for CEMS and COMS installed at the Gainesville Renewable Energy Center (GREC). The GREC QA/QC Plan meets the requirements set forth by the US EPA in Title 40 of Code of Federal Regulations (CFR) Parts 60 and 75 as well as the *Part 75 CEMS Program Policy Manual*. In addition, this QA/QC Plan addresses CEMS operations, activities, and performance requirements implemented by GREC.

1.2 Quality Assurance Policy

GREC operates and maintains this facility in strict adherence to all applicable environmental rules, regulations, and policies. With respect to emissions monitoring, GREC strives to adhere to all applicable rules and regulations as set forth in 40 CFR Part 60 and 40 CFR Part 75, applicable state regulations, and the facility air permit. All necessary air emission data will be obtained in order to demonstrate compliance with data quality objectives. This QA/QC Plan establishes operational procedures that will ensure data and measurements are accurate and precise. At no time will non-quality assured data be reported as valid data.

1.3 Definition of Quality Assurance and Quality Control

This QA/QC Plan establishes procedures for both quality control and quality assurance. Quality assurance and quality control have been defined, used, and interpreted in many ways. The two terms are commonly distinguished as follows:

- **Quality Control (QC)** consists of the procedures, policies, and corrective actions necessary to ensure product quality. QC procedures are routine activities. These activities include but are not limited to daily calibrations and routine preventive maintenance activities as defined by manufacturers of the various hardware components of the CEM system and/or by regulatory agencies.
- **Quality Assurance (QA)** is a series of checks performed to ensure the QC procedures are functioning properly. QA activities are often performed less frequently than QC activities and include but are not limited to required periodic quarterly and annual audits.

This QA/QC Plan covers both quality assurance activities and quality control activities. Within this document, those activities that are clearly quality control-related are called “QC activities.”

Likewise, activities specified in this QAP that are quality assurance-related are termed “QA activities.”

1.4 Objective of Quality Assurance Plan

The objective of the QA/QC Plan is to establish a series of QA and QC activities that will provide a high level of confidence in the data reported by the CEMS. The QA/QC Plan provides guidelines for implementing QA and QC activities needed to ensure that emission-monitoring data are complete, representative, and of known precision and accuracy.

1.5 Scope of the Quality Assurance Plan

This QA/QC Plan covers the operation and maintenance of the CEMS and COMS installed at GREC. It also includes descriptions of all necessary support services and support activities, such as missing data substitution procedures consistent with US EPA regulations, data reduction, and report preparation.

The QA/QC Plan identifies only the type and frequency of QA/QC activities. Additional details concerning operation and maintenance activities for each CEMS component are contained in the vendor-specific manuals as well as plant specific procedures that have been developed by GREC. The O&M manuals for each CEMS are on file at GREC and are updated periodically when required and are available for review and inspection by regulatory agencies upon request. Plant-specific operating procedures are found in Appendix A of this Plan.

1.6 Document Control

This QA/QC Plan should be reviewed on an annual basis and updated when needed to reflect changes in regulatory requirements or the CEMS components. It should also be updated if any changes in scheduled maintenance routines are indicated after experience in operating the system for a prolonged period of time. Maintenance schedules can vary depending upon site-specific conditions (i.e., filters may need to be changed more often in a “dirty” environments or less often under “clean” conditions).

When modifications to the QA/QC Plan become necessary, responsible facility personnel will be designated to ensure that any required revisions are made to the document, providing a copy of any revisions to all individuals or groups that need to be aware of such changes. Plant operating procedures, equipment O&M manuals, and other documents that may be referenced in this QA/QC Plan are not controlled documents and therefore are not subject to these document revision procedures.

2. ORGANIZATION AND RESPONSIBLE INDIVIDUALS

2.1 Organization

The organizational chart for GREC in Figure 1 shows the personnel responsible for QA and QC activities. All identified plant personnel have a shared responsibility for the day-to-day operation, maintenance and quality assurance of the CEMS and COMS. The responsibilities for QA/QC activities can be summarized as follows. Please note, while not stated explicitly, all references to CEMS in these sections also include the COMS.

2.1.1 Asset Manager

- Serve as 40 CFR Part 75 Designated Representative
- Review and approve the reports sent out under company letter head to the appropriate regulatory agencies.
- Handles permitting and enforcement activities at the facility.

2.1.2 Plant Manager

- Designates and manages manpower and other resources needed to properly maintain and operate the CEMS
- Reviews and approves all plant-specific CEM plans and procedures. Reviews and comments on reports sent out under company letter head to the appropriate regulatory agencies

2.1.3 Plant Engineer

- Oversees the CEMS QA/QC program and ensures that all required CEMS accuracy audits are performed as required by applicable regulations.
- Reviews all plans and reports for accuracy
- Prepares certification/recertification applications and notifications
- Stays abreast of EPA regulation updates that may affect the CEM programs and interprets as required
- Coordinates and schedules CEMS audits, diagnostic tests and recertification tests as required
- Reviews the quarterly CEMS reports from each plant prior to review and approval by the DR or ADR
- Submits quarterly reports and certification/recertification test results to the EPA
- Maintains long-term storage of EDR emissions databases for all plants
- Revises monitoring plans, as necessary
- Supports and provides training in the administration and maintenance of the DAHS

- Assures that the CEMS QA/QC Plan is reviewed at least annually and updated as necessary to reflect changing regulations and plant practices
- Reviews CEMS data for validity and makes any necessary corrections so the proper data will be entered in the quarterly reports
- Ensures records are maintained for out-of-control conditions
- Notifies the Plant Manager of any abnormal conditions that cannot be resolved within existing CEMS procedures in a reasonable amount of time
- Prepares quarterly reports for approval and submittal in a timely manner at the end of the reporting periods to allow review prior to the DR's approval and submittal to the EPA
- Maintains files of all plant CEMS data (hard copy and electronic), reports, calibration gas certificates, etc. for three years as required by the EPA
- Notifies appropriate plant personnel of scheduled CEMS audits and certification/recertification tests
- Arranges for support needed by contractors for RATAs and certification/recertification tests
- Provides plant resources to assist contractors during RATAs and certification or recertification testing
- Responsible for the overall program including maintaining complete files of CEMS data, including records, reports, alarm printouts, QA forms, etc.
- Ensure that all required CEMS accuracy audits, including linearity checks, CGAs and RATAs are performed as required by applicable regulations. This may include retaining the services of an outside stack testing company or initiating corrective maintenance in the event of a QA test failure.

2.1.4 Maintenance Manager

- Schedules daily, weekly, monthly, quarterly, and annual maintenance
- Notifies the Plant Manager and Plant Engineer of any abnormal conditions so immediate action can be taken to return the system to normal operating conditions
- Notifies the Environmental Manager and Instrument Technicians of CEMS malfunctions
- Ensures that an adequate spare parts inventory is maintained based on manufacturers' recommendations and plant operating experience with the CEMS
- Ensures that an adequate inventory of EPA Protocol calibration gases is maintained
- Maintains a permanent file of all cylinder gas certification documentation from the cylinder gas supplier
- Develops and maintains CEMS Standard Operating Procedure (SOP) documents

- Ensures that work requests for preventive maintenance and priority jobs on the CEMS are scheduled and completed in a timely manner
- Oversee the work of outside firms that are contracted to perform maintenance tasks.

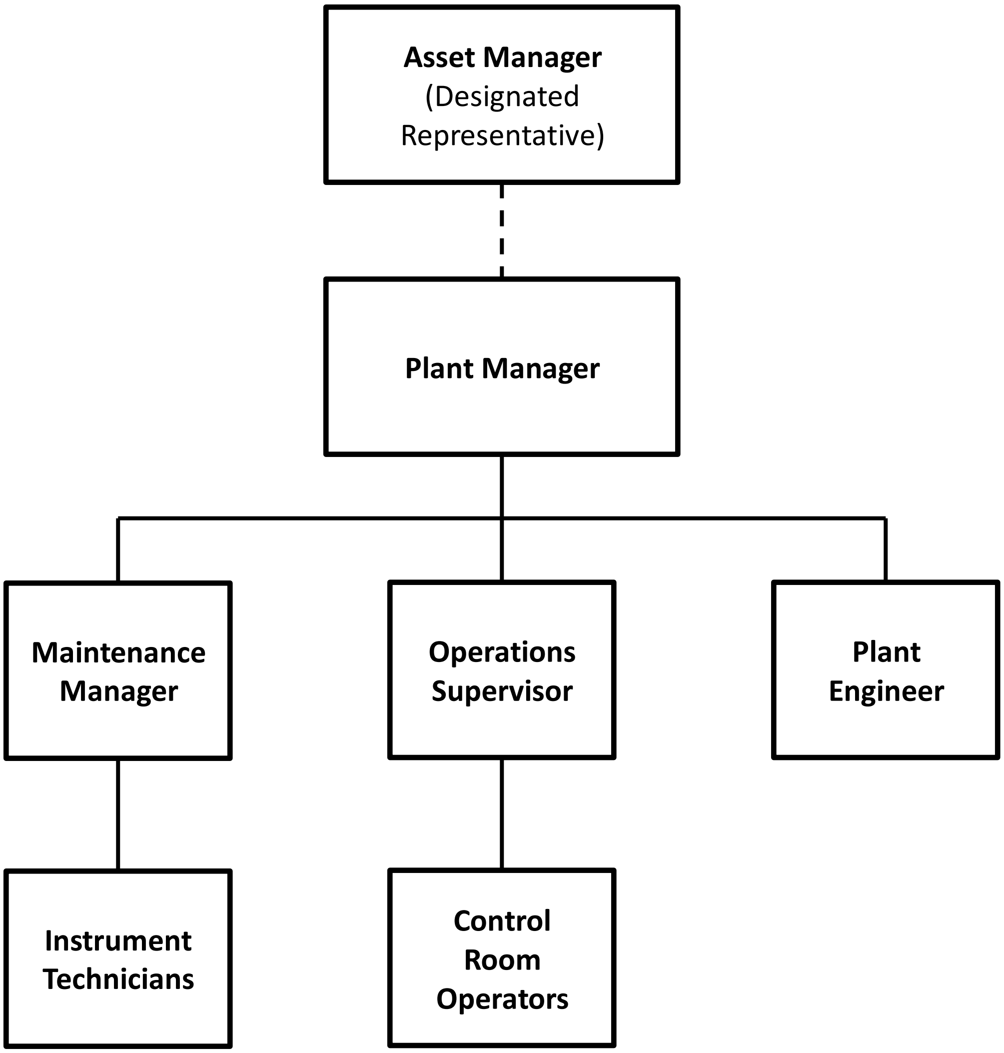
2.1.5 Instrument Technicians

- Verifies that the unit is operated in compliance with the monitoring plan
- Performs all maintenance (routine and corrective) to keep the CEMS running according to specifications
- Reviews CEMS calibration reports on a daily basis and responds to CEMS alarms
- Maintains a complete CEMS maintenance log
- Assists contractors during audits and certification/recertification testing
- Checks the conditions of all analyzer shelters
- Informs responsible managers/supervisors of the CEMS status on at least a weekly basis
- Performs daily, weekly, monthly, quarterly, and annual maintenance.
- Perform all required corrective actions needed to keep the CEMS operating within specifications, including service to correct out-of-control conditions, service required as a result of preventative maintenance checks, service due to CEMS alarm conditions, and service due to malfunctioning components.

2.1.6 Control Room Operators

- Notifies Instrument Technicians and Plant Engineer of CEMS alarms.

Figure 1 GREC Organization Chart of CEMS QA Responsibilities



3. FACILITY AND CEMS DESCRIPTIONS

3.1 Facility Description

The Gainesville Renewable Energy Center (GREC) is a 102.5-MW_{net} electric generating station located approximately eight miles northwest of downtown Gainesville, Florida. The facility is situated on approximately 131 acres at the Gainesville Regional Utility Deerhaven Generation Station. UTM coordinates of the main stack are Zone 17R; 365.01 kilometers East and 3,293.83 kilometers North. The facility is within the jurisdiction of US EPA Region 4 and the Florida Department of Environmental Protection.

The primary source of air emissions at GREC is a bubbling fluidized bed (BFB) boiler that is fired by clean woody biomass fuel and that also utilizes natural gas as a startup fuel and for flame stabilization. The following major equipment and systems are associated with the BFB boiler: a fluidizing bed air supply, natural gas startup burners, overfire air ports, steam drum, superheater, economizer, air heater, ash hoppers, ducts, steam turbine generator, fuel feeding equipment, mechanical draft cooling tower, and air pollution control equipment.

The facility incorporates the following pollution control strategies and equipment:

- Efficient combustion of clean woody biomass in the BFB boiler to minimize formation of PM, NO_X, CO and volatile organic compounds;
- Limitation of biomass to woody untreated biomass to minimize formation of SO_2 and other acid gases, including HCl and HF;
- Use of an inherently clean natural gas as the startup fuel for the BFB boiler;
- Ammonia injection into an SCR reactor to destroy NO_X;
- The alkaline properties of the fly ash and an in-duct sorbent injection system (IDSIS) to control SO_2, HCI, and HF; and
- A fabric filter baghouse to further control particulate matter and to remove injected sorbents.

Figure 2 contains a simplified diagram illustrating the entire flue gas handling system, including add-on pollution controls and the CEMS.

3.2 CEMS Description

GREC installed a CEMS on Unit 1 to comply with the environmental requirements in the facility permit as well as 40 CFR Parts 60 and 75. The CEMS is designed to monitor sulfur dioxide (SO_2), nitrogen oxides (NO_X), carbon monoxide (CO), and oxygen (O_2) as a diluent gas on a dry basis. In addition, the monitoring system includes a stack flow monitor and a COMS.

The CEMS is comprised of the following principal sub-systems and components:

- Sample train
- Sample conditioning system
- Monitoring equipment (analyzers)
- Calibration gas system
- System controller
- The data acquisition and handling system

Additional detail regarding each of the principal CEMS components is provided in the subsequent sub-sections. Comprehensive descriptions of these components are contained in the vendor O&M manuals that are maintained on file at the facility.

3.2.1 Sample Train

The function of the sample train is to extract the sample from the required sample location and transport that sample to a location where it will be delivered to the various analyzers. The sample train consists of the following major components: 1) a sample probe, 2) an umbilical bundle, and 3) a sample pump.

The sample probe is designed to extract a representative sample from the flue gas stream within the exhaust stack. For a sample to be representative, the installation location of the probe must conform to requirements in Section 1 of 40 CFR Part 75, Appendix A. As shown in Figure 2, the sample probe is located in the exhaust stack following all control devices. Figure 3 denotes the CEMS sampling and stack test locations. It also lists the relevant dimensions such as upstream and downstream distances to the nearest flow disturbances.

The probe body is constructed of corrosion-resistant 316 stainless steel and contains a 2 micron ceramic filter to remove coarse particulate from the sample prior to transport. The probe enclosure is heated to prevent moisture condensation and contains valves to allow probe purge and calibrations.

The sample is transported from the sample probe to the CEMS shelter via a sample line imbedded inside of an umbilical bundle. This bundle is heated in order to prevent premature condensation or degradation of the sample. The temperature of the umbilical is thermostatically controlled and maintains a temperature slightly higher than normal temperature of the sample at the sample point. In addition to the sample line, the umbilical bundle contains tubes for transporting instrument air (for blow back of the probe filter, if needed) and calibration gases to the sample probe. All tubing inside the umbilical bundle is made of Teflon®, a chemically inert material. There are also several conductors in the bundle. These conductors are used for supplying stack equipment with 110VAC power, connecting thermocouples to temperature controllers, and (if needed) signal wires between stack equipment and I/O devices at the instrument panel in the CEMS shelter.

The sample is drawn through the sample train using a diaphragm pump. This pump is located between the sample conditioner and the gas analyzers. The conditioned sample gas is fed to a flow panel, which contains the flow meters required to route the sample to each of the analyzers at the flow rate required by the specific analyzer. The pressure generated by the sample pump is also controlled by a pressure regulator to insure a consistent pressure/flow going to each analyzer.

3.2.2 Sample Conditioning System

The function of the sample conditioning system is to efficiently condition the raw sample to a state suitable for analysis by each analyzer. The sample conditioning system consists of the following components:

- heated filter assembly (0.1 micron)
- heated ammonia scrubber
- sample cooler
- sample condensate monitor

The heated filter assembly is located upstream of the FTIR analyzer while the remaining components are located downstream from the FTIR analyzer and upstream of the dry-basis extractive gas analyzers.

The heated 0.1 micron filter assembly is required to protect the downstream gas analyzers. It is designed to remove fine particulate that is not removed by the 2 micron filter installed in the sample probe.

The ammonia scrubber removes trace NH_3 from the sample in order to prevent the formation of ammonia compounds that can plug the downstream gas analyzers. It is heated and utilizes a chemical absorbent.

The sample cooler removes moisture prior to introduction into the dry-basis measurement analyzers, which can be damaged by the presence of water in the sample. Moisture removal is accomplished by chilling the sample to below its dew point in two stages. First, the sample is routed through a heat exchanger (impinger) that is cooled by direct contact with a heat sink that is in turn cooled by a blower. The sample subsequently passes through a second impinger that is cooled by the use of thermoelectric cooling elements at a controlled temperature (nominally 41 deg. F). The impingers are designed to minimize the gas/condensate area and contact time in order to minimize the loss of water-soluble components such as SO_2. The sample cooler is equipped with a peristaltic pump used to evacuate condensate from the bottom of the chiller chambers. A sample condensate monitor will trigger an alarm when moisture is detected in the tubing following the cooler.

3.2.3 Analyzers

The purpose of the analyzers is to accurately measure the parameters of interest: gas concentrations, opacity, and stack flow rates. Table 3-1 below summarizes information pertaining to the CEMS analyzers. Additional detail regarding each measurement is provided in the subsequent subsections.

Table 3-1 CEMS Analyzer Information

Analyzer	Range(s)	Measurement Principle	Manufacturer & Model No.	Serial No.
SO_2	0-40 ppm	UltravioletFluorescence	California Analytical Instruments (CAI) Model 600	Z01006
NO_X	0-120 ppm	Chemiluminescent	California Analytical Instruments (CAI) Model 600	Y08012
CO	0-200 ppm	Non-dispersive Infrared	California Analytical Instruments (CAI) Model 601	Z01007
O_2	0-25%	Paramagnetic	California Analytical Instruments (CAI) Model 601	Z01007-M
Flow	6,000 to 25,000 Kscf/hr	Differential Pressure	Trace Model 500	11131-1
Opacity	0-100%	Photo-reflective	Durag Model D-R 290	1220055

3.2.3.1 Sulfur Dioxide

SO_2 concentration of the exhaust gases are measured on a dry, undiluted-basis following the removal of moisture by the sample conditioning system. The CAI Model 600 SO_2 analyzer measures gas concentration based on the principle that SO_2 will fluoresce when exposed to ultra-violet light. The instrument consists of a UV light source and an optical filter, a measuring cell, a second optical filter, and a detector. In addition, there are lenses and baffles to focus the light. The light source emits UV light in the direction of the measurement cell. The light is focused and the wavelength filtered as it enters the measurement cell. The optical filter blocks UV at wavelengths longer than 230nm. The UV is absorbed by the SO_2 in the measurement cell. The SO_2 absorbs UV at wavelengths between 190nm and 230nm, and then emits the energy as UV at wavelengths between 230 and 420nm. At a right angle to the incoming beam of UV light is the port for the detector. The detector is a photomultiplier tube that is very sensitive. The detector port has a filter that blocks UV shorter than 230nm, as well as a focusing lens. The filters keep the detector from sensing the UV light from the lamp, so only UV light emitted by SO_2 is measured. The amount of energy picked up by the sensor is directly proportional to the concentration of the SO_2 in the measurement cell.

3.2.3.2 Nitrogen Oxides

NO_X concentration of the exhaust gases are measured on a dry, undiluted-basis following the removal of moisture by the sample conditioning system. The CAI Model 600 NO_X analyzer utilizes the principle of chemiluminescence, which is preferred to other methods because of its high sensitivity and lack of interference. The chemiluminescent NO_X analyzer operates by combining nitric oxide (NO) contained in the sample with ozone (O_3) generated by the analyzer from dry air. As these two gases are mixed, a chemical reaction occurs and forms NO_2. The light produced during this chemical reaction is directly proportional to the NO concentration in the sample. NO_2 will not participate in the chemiluminescent reaction, so to measure NO_X ($NO+NO_2$) a converter unit installed in the analyzer upstream of the detector catalytically reduces any NO_2 present in the sample to NO prior to measurement.

3.2.3.3 Carbon Monoxide

CO concentration of the exhaust gases are measured on a dry, undiluted-basis following the removal of moisture by the sample conditioning system. The CAI Model 601 CO analyzer utilizes the non-dispersive infrared measurement method, which is based on the infrared absorption characteristics of gases. Using a single infrared beam to measure gas concentrations, this analyzer produces highly stable and reliable results. A single infrared light beam is modulated by a chopper system and passed through a sample cell of predetermined length containing the gas sample to be analyzed. As the beam passes through the cell, the sample gas absorbs some of its energy. The attenuated beam (transmittance) emerges from the cell and is introduced to the front chamber of a two-chamber infrared microflow detector. The detector is filled with the gas component of interest and consequently the beam experiences further energy absorption. This absorption process increases the pressure in both of the chambers. The differential pressure between the front and rear chambers of the detector causes a slight gas flow between the two chambers. This flow is detected by a mass-flow sensor and is converted into an output signal that can be related to the sample CO_2 concentration.

3.2.3.4 Oxygen

O_2 concentration of the exhaust gases will be measured on a dry, undiluted-basis following the removal of moisture by the sample conditioning system. The CAI Model 601 O_2 analyzer utilizes the principle of paramagnetism, which is a property of O_2 that causes it to be attracted to magnetic fields. This analyzer incorporates a magnetopneumatic detector that compares the magnetic properties of O_2 in a reference gas (usually ambient air) to that in the sample. The reference and sample gases are introduced into opposite sides of the detector, which is surrounded by a magnetic field. As the difference between the O_2 concentrations of the two gases change, the difference in magnetic field strength is detected, providing a measure of O_2 concentration in the sample.

3.2.3.5 Stack Flow

The stack flow monitor is an in situ sensor consisting of a stack-mounted S-type pitot. It utilizes the same basic measurement method as EPA Method 2. The pitot consists of two tubes, one facing the direction of flow of the gas, to measure the impact or stagnation pressure, and the other tube either perpendicular to the flow or in the direction opposite of flow, to measure the static or wake pressure. Pressure transducers are used to measure the differential pressure between the stagnation pressure and wake pressure. The stack flow monitor also measures stack temperature, stack pressure and ambient pressure just outside the sample point. These measured values are used to calculate the flue gas velocity. The flow monitor is designed to avoid plugging of the sample lines via periodic back-purging.

3.2.3.6 Opacity

A Durag Model D-R 290 opacity monitor is used to determine stack/flue opacity. This instrument is a double-pass system that operates by passing light through the boiler effluent (across the stack and back). The reduction of light transmitted through the effluent represents the effluent opacity. A transceiver and retroreflector are mounted on opposite walls of the stack. The opacity is measured by comparing a measurement beam of light passed through the flue gas to a reference beam. The transceiver assembly splits the beam and sends half of it across the diameter of the stack to the reflector unit where it is then reflected back to the transceiver assembly. This represents the “double-pass” opacity of the flue gas. Once the measurement beam returns to the transceiver, a single photocell compares it to the reference beam. The windows of the transceiver and reflector units are kept clean with a purge blower system. This system blows outside air across the window(s) to keep particulate from collecting (fouling) the window components.

3.2.4 Calibration Gas System

The calibration gas system is designed to permit dynamic calibration of the entire monitoring system. It consists of calibration gas cylinders, regulators, low pressure switches, and activation solenoids.

Active calibration gas cylinders are maintained in a storage area located on an exterior wall of the CEMS shelter. The gases in these cylinders are under high pressure, so appropriate safety precautions must be observed when handling them. Calibration gas cylinder saddles or other retaining devices are installed to guarantee safe, secure storage of gas cylinders in accordance with OSHA requirements. Information pertaining to calibration gases may be found in Section 4.2 of this Plan.

A dual stage regulator with dual gauges is provided for each active calibration gas cylinder. The primary pressure gauge can be read to anticipate when a cylinder needs to be replaced.

A low pressure switch is provided for each active calibration gas cylinder. The low pressure switches are run in series so if one or more calibration gas bottle pressure is low, the “low pressure” indication will be activated. These switches are set to alarm when the gas pressure drops below preset value.

Activation solenoids are installed downstream from each active gas cylinder for the purpose of starting and ending the flow of calibration gas to the probe. The solenoids are activated by the system controller, which is described in the following section.

3.2.5 System Controller

The system controller consists of an Allen-Bradley ControlLogix programmable logic controller (PLC) with multiple modules providing analog and digital I/O capabilities. The PLC is a critical component of the CEMS that performs multiple functions:

- Controls automatic and manually initiated calibration of the gas analyzers and sample probe purging
- Holds the last valid gas concentration value for output to the DCS when the analyzer is in calibration.
- Provide probe, sample conditioning system, and analyzer alarming functions
- Shuts off sample flow to the analyzers when a failure of the sample conditioning system is detected
- Assigns status to the raw analyzer data (valid, invalid, zero check, span check, system malfunction, etc.)

- Perform first-level calculations and format analyzer data packets for retrieval by the DAHS
- Upon DAHS failure, buffer a minimum of 7 days of monitoring and supporting quality assurance data and, upon recovery of the DAHS, automatically log this data to the DAHS.

3.2.6 Data Acquisition and Handling System

The facility utilizes a VIM Technologies, Inc., CEMLink™6 data acquisition and handling system. The DAHS reads and records the entire range of pollutant concentrations and volumetric flow from zero through full-scale and provides a continuous, permanent record of all measurements and required information in an electronic format. The DAHS also performs emission calculations and handles substitution of missing data in accordance with Part 75 requirements.

Figure 2 Flue Gas Handling System Diagram

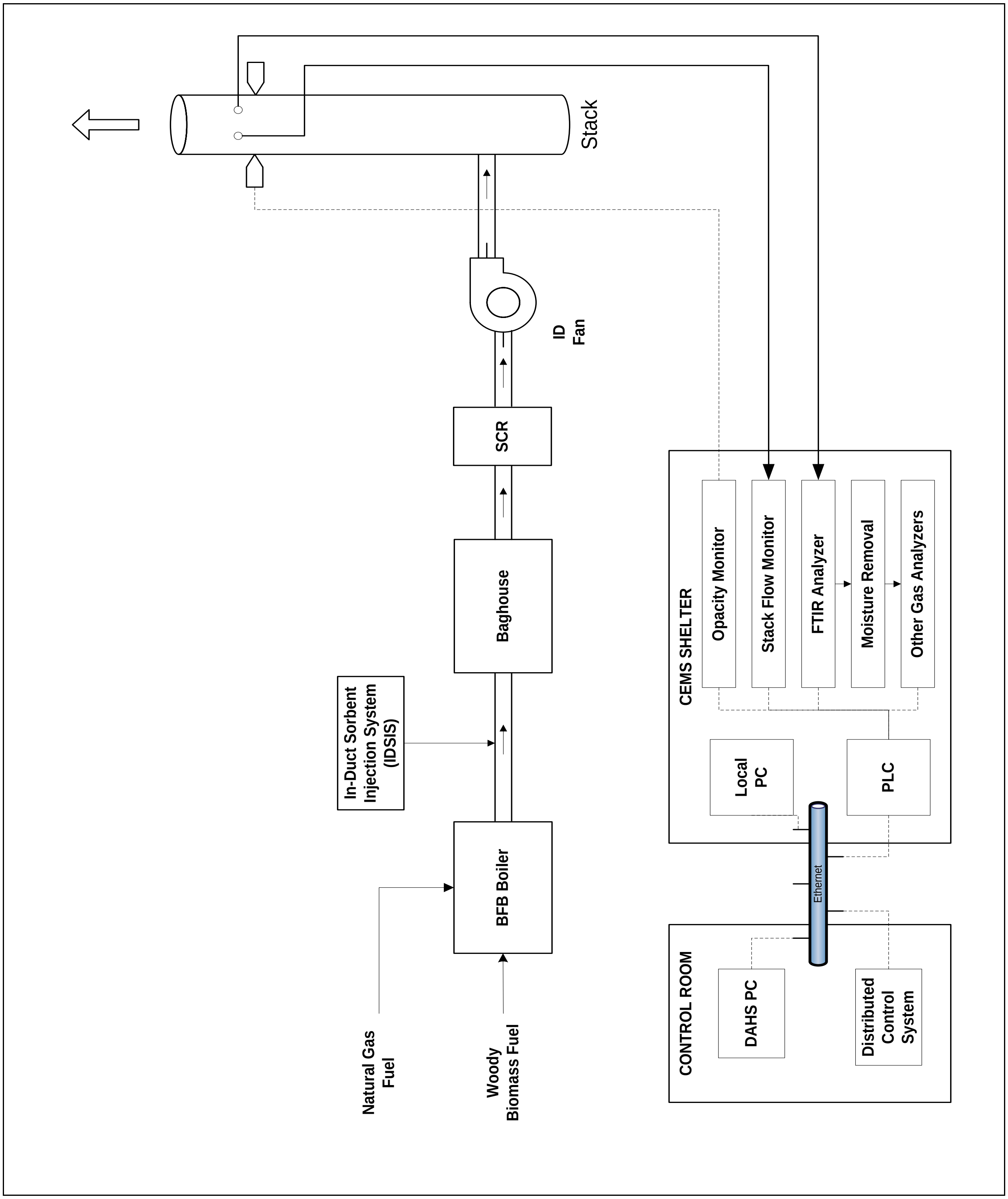


Figure 3 Sampling Locations

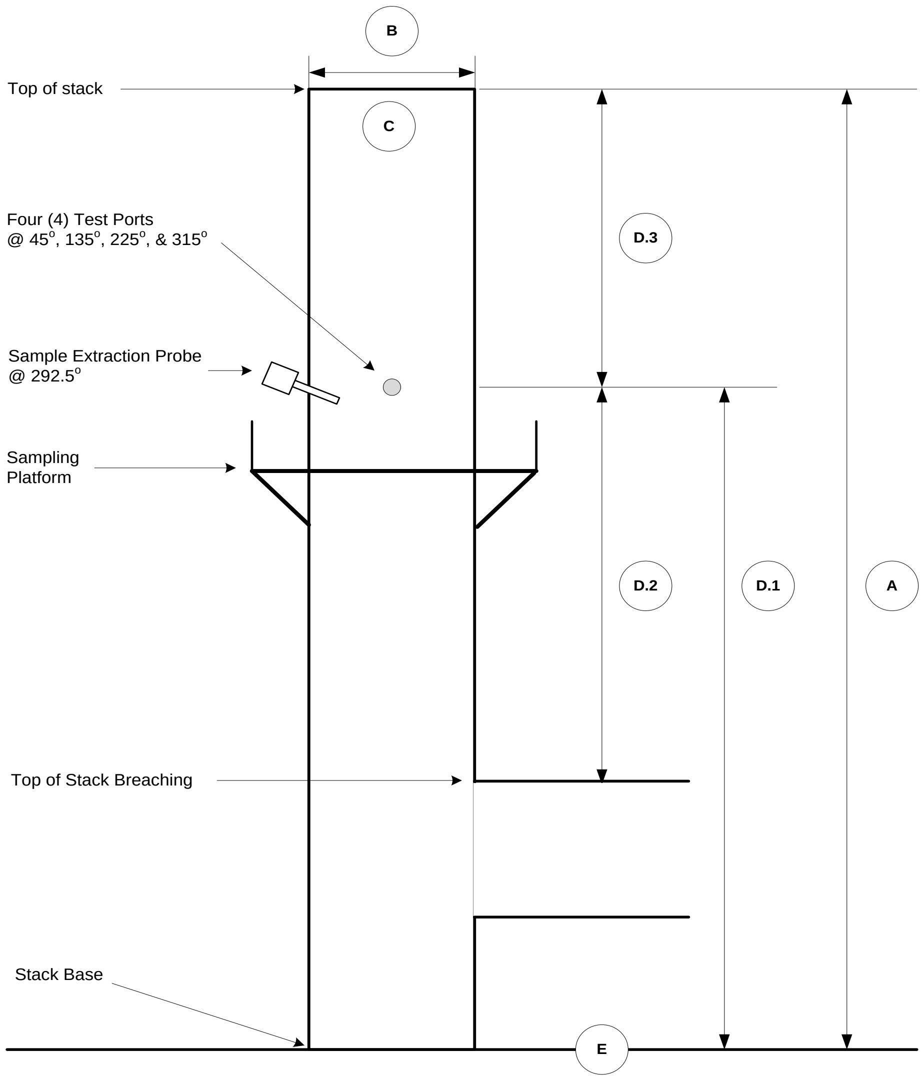


Figure 2 Dimensions	Feet – Inches	Stack Diameters[1]
A. Stack height above grade	230’ – 0”	
B. Stack inside diameter at test port	11’ – 11.5”	
C. Inside cross sectional area at test port and flue exit	112.3 ft^2	
D. CEMS sample probe and test port elevation:		
1. Above grade	160’ – 10.5”	
2. Above last disturbance	108’ – 2"	9.0
3. Prior to stack exit	69’ – 1.5”	5.8
E. Stack base elevation above mean sea level	187’ – 1.5”	

[1] The measurement location must be at least two stack diameters downstream from the nearest flow disturbance (D.2) and at least a half diameter upstream from the effluent exhaust (D.3).

4. QUALITY CONTROL ACTIVITIES

4.1 Introduction

As defined in Section 1.3, quality control consists of the procedures, policies, and corrective actions necessary to ensure product quality. QC procedures are routine activities. These activities include but are not limited to daily calibrations, operational checks, and routine maintenance. Table 4-1 below summarizes QA activities for the CEMS and COMS.

Table 4-1 Summary of QC Activities

Perform this QC Check	At this Frequency	On these Monitors
Calibration Error Test	Daily	SO_2, NO_X, O_2, Flow
Interference Check	Daily	Flow
Calibration Drift Check	Daily	CO, Opacity
Status Indicator Check	Daily	Opacity
Leak Check	Quarterly	Flow

Daily QC activities like calibration checks are performed automatically by the DAHS. The Maintenance Department is responsible for performing corrective actions and follow-up “hands-off” calibrations whenever a QC test is failed.

4.2 Calibration and Audit Gases

Calibration gases are used to verify the accuracy of the gas analyzers. Daily calibration gases are used to verify that the instruments are within the allowable error limits for a two-point (zero, mid span, or high span) on a daily basis. Audit gases are used to verify that the instruments are within the allowable limits for a three-point calibration (low, mid, and high) on a quarterly basis for Part 75 Appendix A; two point calibration (low and mid) for Part 60 Appendix F.

Because of their role in assessing CEMS performance, it is important that the quality of calibration gases be verified. The following subsections discuss quality control measures that GREC will implement to maintain the quality of these gases.

4.2.1.1 Certification Requirements

The type of certification required for the calibration differs depending on the regulatory requirements that apply to the monitoring system. The CEMS at GREC is subject to two different regulations: 40 CFR Part 60 and 40 CFR Part 75. Each of these requirements is discussed below:

Zero Level Calibration Gas

GREC will use Zero Air Material for performing zero-level calibrations. The requirement to use Zero Air Material comes from Part 75, but GREC will use this product for performing all zero level calibrations. Zero Air Material is defined in 40 CFR §72.2 as one of the following:

- A calibration gas certified by the gas vendor not to contain concentrations of SO_2 , NO_X , or total hydrocarbons above 0.1 parts per million (ppm), a concentration of CO above 1 ppm, or a concentration of CO_2 above 400 ppm;

- Ambient air conditioned and purified by a CEMS for which the CEMS manufacturer or vendor certifies that the particular CEMS model produces conditioned gas that does not contain concentrations of SO_2, NO_X, or total hydrocarbons above 0.1 ppm, a concentration of CO above 1 ppm, or a concentration of CO_2 above 400 ppm;

- For dilution-type CEMS, conditioned and purified ambient air provided by a conditioning system concurrently supplying dilution air to the CEMS (does not apply to GREC); or

- A multi-component mixture certified by the supplier of the mixture that the concentration of the component being zeroed is less than or equal to the applicable concentration specified in paragraph (1) of this definition, and that the mixture's other components do not interfere with the CEM readings.

[Regulatory Citations: 40 CFR Part 75, Appendix A, Sections 5.1.6 and 5.2.1]

SO_2, NO_X, and O_2 Calibration Gas

The SO_2, NO_X, and O_2 analyzers are subject to 40 CFR Part 75 and hence the associated calibration gases must meet the requirements of Part 75, Appendix A. Section 5.1 of Appendix A identifies the following categories of calibration gases that may be used for Part 75 purposes:

- Standard Reference Materials (SRM)
- SRM-Equivalent Compressed Gas Primary Reference Material (PRM)
- NIST Traceable Reference Materials
- EPA Protocol Gases
- Research Gas Mixtures
- NIST/EPA-Approved Certified Reference Materials
- Gas Manufacturer's Intermediate Standards

GREC will use EPA Protocol Gases for performing upscale (i.e., non-zero) calibrations of the SO_2, NO_X, and O_2 analyzers. An EPA Protocol gas is a calibration gas mixture prepared and analyzed according to Section 2 of the "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards". The current version of this document is dated May 2012 (EPA/600/R-12/531). EPA Protocol gas concentrations must be certified by an EPA Protocol gas production site to have an analytical uncertainty (95-percent confidence interval) to be not more than plus or minus 2.0 percent (inclusive) of the certified concentration (tag value) of the gas mixture.

[Regulatory Citation: 40 CFR Part 75, Appendix A, Section 5.1]

CO Calibration Gas

The CO analyzer is subject to 40 CFR Part 60 and hence the calibration gas must meet the requirements of Part 60, Appendix F. The following categories of audit gases that may be used for Part 60 purposes:

- Certified Reference Materials (CRM's) - audit gases that have been certified by comparison to National Institute of Standards and Technology (NIST); or

- EPA Traceability Protocol Materials (ETPM's) – audit gases that have been certified following the most recent edition of EPA's Traceability Protocol No. 1; or

- As an alternative to CRM's or ETPM gases, Method 205 for calibration gas dilution may be used.

As is the case for the Part 75 gases, GREC will use EPA Protocol gases for performing upscale (i.e., non-zero) calibrations of the CO analyzer.

[Regulatory Citation: 40 CFR Part 60, Appendix F, Section 5.1.2]

4.2.1.2 Cylinder Pressure

The gas cylinders are initially charged to 2000 psig and must be changed at 150 psig to maintain correct gas concentrations (Note that there is no minimum cylinder pressure specification for zero air materials.) Cylinder regulators are set to a pressure of between 20 and 25 psig while the gas is flowing. The flow rate during calibration should be approximately 6-7 liters/minute set using the calibration gas flow meter. Replacement calibration gases should be ordered when the bottle pressure drops to 1000 psig.

Check gas cylinder pressures on a daily basis. There must be sufficient gas in each cylinder to complete the calibration. The instrument could fail the calibration if the gas runs out during the calibration cycle. Calibration gas can be lost if the cylinder pressure is set too high (lifting the seat on the normally closed solenoid valve that controls gas flow), through leaking fittings, and through a leaking solenoid valve.

[Regulatory Citation: 40 CFR Part 75, Appendix B, Section 6.5.10]

4.2.1.3 Gas Concentrations

The cylinders will contain a known concentration of a single gas or blended gases such as O_2, CO, NO_X, and SO_2, with the balance typically consisting of N_2. Refer to the manufacturer's certification sheet provided with each cylinder for the gas concentration, cylinder certification number, and Protocol statement. Even though the cylinders usually have a tag or label listing the gas concentrations, always use the values on the certification sheet for entry into the DAHS. Also, record cylinder changes, gas concentrations, expiration dates, and certification numbers in the CEM maintenance log. Keep a copy of the certification sheet as part of the site records.

IMPORTANT!

The certification sheets for NO_X calibration gas often list the concentration of both NO and NO_X, leading to confusion over which value to enter in the DAHS. When both the NO and NO_X concentrations of an EPA Protocol gas cylinder are certified NIST-traceable, either value may be entered in the DAHS although it is recommended that the NO_X concentration be used. On the other hand, if only the NO concentration is NIST-traceable but the NO_X concentration is not, then only the NO concentration may be entered. For additional information, refer to Question 9.34 in the EPA Part 75 Emissions Monitoring Policy Manual.

The actual concentration of any calibration gas can be outside of the tolerances listed on the certification sheet. If an analyzer shows excessive drift after changing a cylinder, check the analyzer with the cylinder that was replaced, or another cylinder that is known to be accurate. Ensure the new gas values were entered correctly in the DAHS. If a cylinder is suspect, return it to the supplier or have it re-certified. For cylinders containing SO_2, NO_X, or O_2, recertification must be performed by an EPA Protocol gas production site that is participating in the EPA Protocol Gas Verification Program (see Section 4.2.1.5).

[Regulatory Citation: 40 CFR §75.59(a)]

4.2.1.4 Shelf Life

The maximum certification shelf life for calibration and audit gases depends on a number of factors including the type of gas, its concentration. For combined concentrations of gases (such as NO_X and CO in the same bottle) the maximum certification shelf life is equal to that of its most briefly certifiable component. If a certified gas is to be used after the certification period has ended, it must be re-certified. A gas standard may be re-certified if the gas pressure remaining in the cylinder is greater than 500 psig. Re-certification must be approved by the Plant Engineer and Maintenance Manager. For cylinders containing O_2, SO_2, or NO_X, recertification must be performed by an EPA Protocol gas production site that is participating in the EPA Protocol Gas Verification Program (see Section 4.2.1.5, below). Facility personnel will maintain calibration gas bottle certificate records for a minimum of three years.

[Citation: Question 9.32 in the Draft EPA Part 75 Emissions Monitoring Policy Manual, May 2012]

4.2.1.5 Protocol Gas Verification Program

Starting in 2011, EPA established a national Protocol Gas Verification Program (PGVP) in order to ensure the accuracy of calibration gases used for 40 CFR Part 75 reporting purposes. Under this program EPA, in cooperation with the National Institute of Standards and Technology (NIST), conducts an annual blind audit of EPA Protocol gases that are used to calibrate CEMS and the instruments used in certain EPA reference methods. The purpose of this program is to:

- Ensure that EPA Protocol gases meet the accuracy requirements of 40 CFR Part 75;
- Assist calibration gas consumers in their purchasing decisions;
- Provide an incentive for gas vendors that perform well in the audits to continue to use good practices; and
- Encourage gas vendors that perform poorly in the audits to make improvements.

At GREC, the PGVP regulations apply to CEMS gases purchased for Part 75 components of the CEMS: namely, O_2, SO_2, and NO_X.

Each year, protocol gas companies participating in the PGVP are required to provide EPA certain production site information such as address and contacts. EPA issues vendor ID numbers and posts this information on the Clean Air Markets Division (CAMD) website. EPA conducts a vendor-funded blind audit program for all participating production sites. NIST will analyze gas bottles randomly selected annually, and then submit draft and final audit reports to EPA. EPA will post final results to assist Part 75 facilities in selecting their protocol gas vendors. The list of participating production sites and audit results may be accessed from the CAMD website at the following address: *http://www.epa.gov/airmarkets/emissions/pgvp.html*.

All Part 75 facilities, including GREC, must obtain their calibration and audit gases from an EPA Protocol gas production company that participates in the national PGVP, or from a reseller providing unaltered gases from a PGVP production company. Alternately, cylinders can be analyzed by an independent laboratory to verify 2% accuracy per the 1997 EPA Traceability Protocol.

Prior to ordering O_2, SO_2, or NO_X calibration gases, the Maintenance Manager will verify that the supplier's production site is included on the list of PGVP participants. In the event that an EPA Protocol gas production site is removed from the list of PGVP participants on the same date as or after the date on which a particular cylinder has been certified or ordered, that gas cylinder may continue to be used for the purposes of Part 75 until the earlier of the cylinder's expiration date or the date on which the cylinder gas pressure reaches 150 psig.

The PGVP requirements are mandatory. If the facility uses a cylinder gas bottle that is not from a currently participating/listed gas vendor, all Part 75 daily calibrations and linearity audits utilizing that bottle will be invalid and may result in the CEMS being deemed out-of-control. If the applicable grace periods have expired, monitor availability and emissions allowances will be negatively impacted. Similarly, if a relative accuracy test audit (RATA) is performed on the O_2, SO_2, or NO_X CEMS and the stack tester uses non-PGVP calibration gases during the performance of EPA reference methods 3A, 6C, or 7E, emissions data subsequent to the RATA will be invalid.

Compliance with the PGVP requirements is verified through recordkeeping and reporting. PGVP elements to be reported electronically through ECMPS and in hardcopy certification/recertification reports are:

- Level Code for low, mid, high
- Code for type of protocol gas (from a lengthy table in the Reporting Instructions)
- Vendor ID (obtained from the EPA website)
- Expiration Date
- Cylinder Number

Participation in the PGVP does not guarantee that a supplier is producing accurate gases. Individuals responsible for ordering calibration gases should periodically review the most recent PGVP audit results on the CAMD website for the supplier being utilized by the facility. This information should also be reviewed prior to changing calibration gas suppliers. If a pattern of failures is noted for the supplier of interest, the supplier should be contacted to determine the cause of the failures and what corrective actions have been taken to address the problem. This information can also be used to avoid suppliers with a history of producing poor quality gases.

[Regulatory Citations: 40 CFR §§75.21(g) and 75.59(a)(9)(x); 40 CFR Part 75 Appendix A Section 6.5.10; and 40 CFR Part 75 Appendix B Sections 2.1.4(c), 2.2.3(i), and 2.3.2(k).]

4.3 Quality Control Requirements for CEMS

4.3.1 Daily Calibration Error Test (40 CFR Part 75)

Subsection 3-B, Condition 13 of the GREC air permit states that the SO_2, NO_X, and O_2 CEMS must be certified, operated, and maintained in accordance with the requirements of 40 CFR Part 75. Therefore, these components are subject to Part 75 requirements for daily calibration error testing. The CO monitor is subject to 40 CFR Part 60 QA/QC requirements as discussed elsewhere in this Plan.

The calibration of each CEMS is automatically checked daily at approximately 24-hour intervals while the unit is on-line. These tests are controlled by the DAHS and are sometimes referred to as “hands-off” calibrations. Analyzer response is tested at two calibration levels: (1) zero-level (0.0 to 20.0% of span) and (2) high-level (80.0 to 100.0% of span). Alternatively, a mid-level calibration gas (50.0 to 60.0% of span) may be used in lieu of the high-level gas provided that it is more representative of the actual stack gas concentrations. Allowable concentration ranges for daily calibrations of the O_2, SO_2, and NO_X monitors are provided in Table 4-2 below. Gases used for daily calibrations must either be EPA protocol gases or must meet one of the other applicable certifications listed in Section 4.2.1.1 of this Plan.

Table 4-2 Daily Calibration Gas Concentration Ranges for O_2, SO_2, and NO_X

Component	Instrument Span	Low-Level Concentration (0 to 20% of span)	High-Level Concentration (80 to 100% of span)
O_2	25%	0 – 5%	20 – 25%
SO_2	40 ppm	0 – 8 ppm	32 – 40 ppm
NO_X	120 ppm	0 – 24 ppm	96 – 120 ppm

IMPORTANT!

The instrument “span” is not necessarily the same as its full-scale range. Full-scale range is the highest value that can be measured by the instrument. For Part 75 parameters such as O_2, SO_2, and NO_X, the span value is determined in accordance with Section 2 of Appendix A to Part 75 and may equal to or lower than the full-scale range.

During a calibration, calibration gas is injected at the sample extraction probe so that the gas traverses the entire sampling system from the probe to the analyzers. The analyzers are challenged once with each level of the calibration gas. Gas must flow for a length of time sufficient to allow the monitor reading to stabilize. The duration of zero and span gas flows is typically established by the CEMS supplier during the initial installation, but can be adjusted if necessary. Once an automatic calibration is initiated, the complete sequence of a zero check followed by a span check must be allowed to complete without making manual adjustments. The analyzer response is recorded by the DAHS at a preset time following the commencement of calibration gas flow. The calibration error is subsequently computed by the DAHS from the test results for each concentration level using Equation A-5 from 40 CFR 75 Appendix A as follows:

Equation A-5: Calibration Error Calculation	
$$CE = \frac{\lvert R - A \rvert}{S} \times 100$$ Alternately, if the instrument span is less than 200 ppm then the following formula may be used: $$CE = \lvert R - A \rvert$$	CE = Calibration error as a percentage of instrument span R = Zero or high-level calibration gas value in ppm A = Actual monitor response to calibration gas in ppm S = Span of the instrument

A passed daily calibration error test *prospectively* validates data from a continuous monitor for 26 clock hours (24 hours plus a two-hour grace period), unless another calibration error test is failed during that period or a maintenance event is conducted within that 26 hour period necessitating the completion of a calibration test to validate data following that event. Once a 26-hour data validation window has expired, data from the monitor are considered invalid until a subsequent calibration error test is passed. The only exception to this general rule is a grace period allowed for startup events under the Part 75 regulations (refer to Section 4.3.1.1).

A routine adjustment should be performed on any analyzer whenever the calibration error (CE) exceeds the recommended recalibation limits in Table 4-3 below. The analyzers are considered out-of-control and must be recalibrated whenever the CE at either the zero- or high-level checkpoint exceeds the out-of-control limits listed in Table 4-3. The NO_X CEMS is considered out-of-control whenever either the NO_x or O_2 monitor component exceeds the applicable limits.

Corrective maintenance is performed any time a calibration error out-of-control limit is exceeded. Corrective maintenance is conducted in accordance with the relevant CEMS component manufacturer's standard operation and maintenance procedures or troubleshooting procedures. Often this involves performing a manual calibration in accordance with Standard Operating Procedure CEMS-01 (see Appendix A) to adjust the analyzer response. Results of the corrective maintenance procedures are documented in the maintenance log. The calibration error test procedure is then repeated to demonstrate that the corrective maintenance procedures were successful.

Table 4-3 Daily Calibration Specifications for Part 75

Component	Span	Performance Specification	Recalibration Recommended	Out-of-Control Criteria
O_2	25% O_2	0.5% absolute difference	> 0.5% O_2	> 1.0% O_2
SO_2	40 ppm	2.5% of span value	> 1 ppm	> 2 ppm or > 5 ppm[1]
NO_X	120 ppm	2.5% of span value	> 3 ppm	> 6 ppm or > 10 ppm[2]

[1] Alternate performance specification for SO_2 or NO_X analyzers with span values ≤ 50 ppm. Applies whenever the primary performance specification of 5.0% of span (2 ppm) cannot be met.

[2] Alternate performance specification for SO_2 or NO_X analyzers with span values >50 ppm, but ≤200 ppm. Applies whenever the primary performance specification of 5.0% of span (6 ppm) cannot be met.

[Regulatory Citations: Part 75, Appendix A, Sections 3.1, 6.3.1, and 7.2.1; Part 75, Appendix B, Sections 2.1.1 and 2.1.4]

4.3.1.1 Additional Calibration Error Tests and Adjustments (40 CFR Part 75)

An additional "hands-off" calibration error test must be conducted whenever:

- A calibration error test is failed,
- A monitor is returned to service following repair or corrective maintenance, or
- After making routine or non-routine calibration adjustments.

A routine adjustment is a manual analyzer adjustment intended to bring the readings as close as possible to the known calibration gas tag value(s). The procedure for performing a routine adjustment is provided in Standard Operating Procedure CEMS-01 (see Appendix A of this Plan). Routine calibration adjustments are permitted after any successful calibration error test. EPA recommends but does not require that such adjustments be made whenever the daily calibration error exceeds the applicable performance specifications (i.e., 2.5% of span for SO_2 and NO_X; 0.5% absolute difference for O_2). A hands-off calibration error test is required following routine calibration adjustments when the monitor's calibration has been physically adjusted (e.g., by means of a potentiometer) to verify that the adjustments have been done correctly. After a routine adjustment, the calibration error must not exceed twice the applicable performance specification (i.e., 5.0% of span for SO_2 and NO_X; 1.0% absolute difference for O_2). An additional calibration error test is not required if the routine calibration adjustments are made by means of a mathematical algorithm programmed into the data acquisition system.

A non-routine adjustment is a manual adjustment to bring the readings away from the calibration gas tag value. Non-routine calibration adjustments of a monitor are permitted prior to (but not during) linearity checks and RATAs and at other times, provided that an appropriate technical justification is included in this QA/QC Plan. Question 9.28 of the *EPA Part 75 Emissions Monitoring Policy Manual* discusses this issue in greater detail. As is the case for routine adjustments, an additional hands-off calibration error test must be conducted after each non-routine adjustment; however, the pass criteria are more stringent. After a non-routine adjustment, the calibration error must not exceed the applicable performance specification (i.e., 2.5% of span for SO_2 and NO_X; 0.5% absolute difference for O_2).

[Regulatory Citation: Part 75, Appendix B, Section 2.1.3]

4.3.1.2 Grace Periods for Daily Calibrations (40 CFR Part 75)

A start-up grace period of up to eight (8) clock hours is allowed for an affected unit before an on-line calibration error test must be performed, provided that the following requirements are met:

(1) Following an outage of one or more hours, the unit is in a start-up condition and a start-up event must have begun, as evidenced in the <HourlyOperatingData> record by a change in unit operating time from zero in one clock hour to a positive unit operating time in the next clock hour.
(2) The last on-line calibration error test must have been completed and passed within 26 clock hours before the hour in which the unit last operated.

During the startup grace period, data generated by the CEMS are considered valid. A startup grace period ends when either: (A) an on-line calibration error test of the monitor is completed; or (B) eight clock hours have elapsed from the beginning of the startup event, whichever occurs first.

If a unit shuts down during an eight hour grace period, when that unit resumes operations it does not qualify for a new eight hour grace period. Hours following the resumption of operations are considered invalid unless those hours are within the eight *clock* hour window following the initial startup after shutdown for which conditions (1) and (2) above are met.

In certain instances, one or more clock hours within the eight hour window of a start-up grace period may coincide (overlap) with clock hours that are within a 26-hour window associated with a previous on-line calibration error test. In such instances, CEM data validation is governed by whichever window (i.e., the eight hour grace period or the 26-hour calibration window) expires *last*.

IMPORTANT!

The DAHS can be configured to automatically perform a "start-up" calibration beginning at a preset time following receipt of a startup signal from the DCS. The time delay should be chosen, to the extent possible, such that periods of high pollutant concentrations typically associated with startups are avoided, but in no case can the delay be greater than eight hours.

[Regulatory Citation: Part 75, Appendix A, Section 2.1.5]

4.3.1.3 Part 75 Data Validation for Daily Calibrations (40 CFR Part 75)

For the Part 75 parameters (O_2, SO_2, and NO_X) an out-of-control period occurs when the calibration error exceeds twice the recalibration criteria (i.e., CE = 5.0% for SO_2 or NO_X and 1.0% difference for O_2). The recalibration and out-of-control criteria are summarized in Table 4-3.

The out-of-control period begins with the hour of the failed calibration error test and ends with the hour of the next satisfactory calibration error test after corrective action. If the failed calibration error test, corrective action, and satisfactory calibration error test occur within the same hour, the hour is not considered out-of-control if two or more valid readings are obtained during the hour. A NO_X monitoring system is considered out-of-control if either component (i.e. NO_X or O_2 components) exceeds twice the application specification.

The DAHS records the calibration error test results and "flags" the calibration report if the recalibration (or out-of-control) criteria are exceeded. A recalibration or other corrective action is taken when the failure is identified.

During the period the CEMS is out-of-control, the CEMS data may not be used in calculating emission compliance nor be counted towards meeting minimum data availability. The data must be substituted per the procedures in Part 75 Subpart D.

[Regulatory Citation: Part 75, Appendix A, Sections 2.1.4]

4.3.2 Daily Calibration Drift Check (40 CFR Part 60)

Part 60 calibration rules apply to the CO CEMS. The calibration is automatically checked daily at 24-hour intervals. The BFB boiler need not be online for a valid calibration to occur. The tests are controlled by the DAHS and performed automatically so they are sometimes referred to as "hands-off" calibrations. Analyzer response is tested at two calibration levels: (1) zero-level (0.0 to 20.0% of span) and (2) high-level (50.0 to 100.0% of span). Allowable concentration ranges for daily calibrations of the CO monitor are provided in Table 4-4 below. Gases used for daily calibrations must either be EPA protocol gases or must meet one of the other applicable certifications listed in Section 4.2.1.1 of this Plan.

Table 4-4 Daily Calibration Gas Ranges for Part 60

Component	Instrument Span	Zero-Level Concentration (0 to 20% of span)	High-Level Concentration (50 to 100% of span)
CO	200 ppm	0 – 40 ppm	100 – 200 ppm

During a calibration, calibration gas is injected at the sample extraction probe so that the gas traverses the entire sampling system from the probe to the analyzers. The analyzer is challenged once with each level of the calibration gas. Gas must flow for a length of time sufficient to allow the monitor reading to stabilize. The duration of zero and span gas flows is typically established by the CEMS supplier during the initial installation, but can be adjusted if necessary. Once an automatic calibration is initiated, the complete sequence of a zero check followed by a span check must be allowed to complete without making manual adjustments. The analyzer response is recorded by the DAHS at a preset time following the commencement of calibration gas flow. The calibration drift is subsequently computed by the DAHS from the test results for each concentration level using Equation A-5 from 40 CFR 75 Appendix A (refer to Section 4.3.1 of this Plan).

For the CO CEMS, if either the zero or high-level calibration drift (CD) result exceeds twice the performance specification in Table 4-5 below for five, consecutive, daily periods, the CEMS is out-of-control. If either the zero or high-level CD result exceeds four times the applicable drift specification during any CD check, the CEMS is out-of-control. The out-of-control period begins at either:

- the time corresponding to the completion of the daily calibration drift check preceding the daily check that results in a CD in excess of four times the allowable limit, or
- the time corresponding to the completion of the fifth, consecutive, daily calibration drift check with a CD in excess of two times the allowable limit.

In either case, the end of the out-of-control period is the time corresponding to the completion of the calibration drift check following corrective action that results in the CD's at both the zero (or low-level) and high-level measurement points being within the allowable limits.

IMPORTANT!

When the CO calibration drift exceeds four times the performance specification, data must normally be invalidated retroactively back to the previous daily calibration. In these cases, the DAHS will not automatically flag the invalid one-minute average data retroactively, but the Instrument Technician must manually re-poll the database in order to properly invalidate the data. However, if the failure is not due to the monitor or monitoring system, then it is not necessary to perform retroactive validation provided that no monitor adjustments are made prior to the subsequent successful calibration drift test. Calibration failure due to lack of sufficient calibration gas is one example of a failure that would not require data to be invalidated retroactively.

Table 4-5 Daily Calibration Specifications for Part 60

Component	Span	Performance Specification	Recalibration Recommended	Out-of-Control Criteria	
				2 x PS[1]	4 x PS[2]
CO	200 ppm	5.0% of span	> 10 ppm	> 20 ppm	> 40 ppm

[1] Data are invalid beginning with the hour of the fifth consecutive calibration that exceeds two times the performance applicable specification.

[2] Data are invalidated retroactively back to the previous successful daily calibration.

Whenever a failed calibration, corrective action, and a successful re-calibration occur in the same hour, the system will not be considered to be out-of-control if two or more valid data points from that hour were recorded.

During the period the CEMS is out-of-control, the CEMS data may not be used in calculating emission compliance nor be counted toward meeting minimum data availability.

[Regulatory Citation: 40 CFR §60.13(d) and Appendix F, Procedure 1, Section 4]

4.4 Quality Control Requirements for Flow Monitors

QC activities for the flow monitor comply with the requirements detailed in Appendices A and B to 40 CFR Part 75.

4.4.1 Daily Calibration Error Test

A two-point calibration error test is performed daily at 24 hour intervals while the unit is on-line. The low calibration point must be between 0-20 percent of span and the upper point must be between 50-70 percent of span. Instead of a calibration gas, a pitot type flow monitor uses two precise differential pressure points. The two calibration pressure points must be specified to be within the following ranges:

Table 4-6 Daily Calibration Levels for Flow

Reference Values	Allowable Range *(percent of span)*	Target Value *(percent of span)*
Zero	0 – 20%	10%
High	50 – 70%	65%

Calibration error tests may also be required as diagnostic tests following CEMS component repairs or modifications. Section 7 of this QA/QC Plan provides information concerning diagnostic test requirements specified by US EPA.

[Regulatory Citations: Part 75, Appendix A, Section 6.3.2 and Appendix B, Section 2.1.1]

4.4.1.1 Grace Period for Daily Calibrations

As is the case for CEMS, data from flow monitor are prospectively considered valid for 26 clock hours (i.e., 24 hours plus a 2-hour grace period) following a "passed" calibration error test unless another calibration error test is failed during that period.

[Regulatory Citation: Part 75, Appendix B, Section 2.1.4]

4.4.1.2 Data Validation for Daily Calibrations

An out-of-control period occurs when the calibration error of a flow monitor exceeds 6.0 percent of the span value, which is twice the applicable specification of Appendix A to Part 75. Even if the calibration error exceeds 6.0 percent of the span value, the flow monitor is not considered out-of-control if |R-A|, the absolute value of the difference between the monitor response and the reference value in Equation A-6 of Appendix A is < 0.02 inches of water.

The out-of-control period begins with the hour of the failed calibration error test and ends with the hour of the next satisfactory calibration error test after corrective action. If the failed calibration error test, corrective action, and satisfactory calibration error test occur within the same hour, the hour is not considered out-of-control if two or more valid readings are obtained during the hour.

[Regulatory Citation: Part 75, Appendix B, Section 2.1.4]

4.4.2 Daily Flow Interference Check

Each flow monitor must be designed and equipped with a means to ensure that the moisture expected to occur at the monitoring location does not interfere with the proper functioning of the flow monitoring system. This is accomplished through automatic, periodic back purging (simultaneously on both sides of the probe) to keep the probe and lines sufficiently free of obstructions. To verify the absence of interference, daily flow monitor interference checks must be performed as specified in Section 2.2.2.2 of Part 75 Appendix A while the unit is on-line.

An out-of-control period occurs whenever interference of a flow monitor is identified. The out-of-control period begins with the hour of completion of the failed interference check and ends with the hour of completion of an interference check that is passed.

The grace period for performing flow monitor interference checks is the same as that for daily calibrations as described in Section 4.4.1.1 of this Plan.

[Regulatory Citations: Part 75, Appendix A, Section 2.2.2.2 and Appendix B, Sections 2.1.2 & 2.1.4]

4.4.3 Quarterly Leak Check

For differential pressure flow monitors, a leak check must be performed of all sample lines (a manual check is acceptable) at least once during each QA operating quarter. The BFB boiler does not have to be operating during this test. Conduct the leak checks no less than 30 days apart, to the extent practicable. The procedures for performing a leak check may be found in Standard Operating Procedure CEMS-02 (refer to Appendix A of this Plan).

The flow monitor is out-of-control when a sample line leak is detected. The out-of-control period begins with the hour of the failed leak check and ends with the hour of a satisfactory leak check following corrective action.

The grace period for performing leak checks is the same as that for linearity tests as described in Section 5.2.1.4 of this Plan.

[Regulatory Citation: Part 75, Appendix B, Section 2.2.2]

4.5 Quality Control Requirements for COMS

QC activities for the COMS comply with the requirements detailed in the following provisions of 40 CFR Part 60: Appendix B, Performance Specification 1 and Appendix F Procedure 3.

4.5.1 Daily Calibration Drift Test

Zero and upscale calibration drift checks of the COMS are performed automatically at 24-hour intervals. Zero drift is checked through the use a simulated zero device, which is an automated mechanism within the transmissometer that produces a simulated clear path condition or low-level opacity condition. Upscale drift is checked using an upscale calibration device, which is an automated mechanism (employing a filter or reduced reflectance device) within the transmissometer that produces an upscale opacity value. The calibrations provide a system check of the analyzer internal optical surfaces and all active electronic circuitry including the lamp and photodetector assembly used in the measurement mode.

The span value of the COMS is 100 percent opacity. Table 4-7 below summarizes allowable ranges for the zero and upscale calibration values:

Table 4-7 Daily Calibration Levels for Opacity

Calibration Level	Allowable Range *(percent opacity)*	Target Value *(percent opacity)*
Zero	[1]	0.0
Upscale	10 – 40%[2]	40.0%

[1] The energy reaching the detector must be between 90 and 190% of the energy reaching the detector under actual clear path conditions.

[2] The energy level reaching the detector must be between the energy levels corresponding to 10% opacity and the highest level filter used to determine calibration error. ASTM D 6216–98 specifies that the high-level calibration filter can be no greater than 40% opacity when the applicable opacity standard is 10%.

COMS output during the daily CD checks is processed by the DAHS, which computes and records the drift values, and determines whether or not the CD limit is exceeded at either the zero or upscale check point. Table 4-8 below summarizes calibration specifications for the COMS:

Table 4-8 Daily Calibration Specifications for COMS

Component	Span	Performance Specification	Recalibration and/or Cleaning Recommended	Out-of-Control Criteria
Opacity	100% Opacity	2.0% Opacity	> 2.0% Opacity	> 4.0% Opacity

The COMS is considered out-of-control when the calibration drift exceeds 4.0%. The COMS is manually recalibrated or the optical surfaces are cleaned whenever the daily CD (after adjustment) at either the low- or high-level checkpoint differs from the checkpoint value by more than ± 2.0% opacity. COMS calibration and corrective action procedures are contained in the vendor operation and maintenance manuals.

The beginning of the out-of-control period is the time corresponding to the completion of the failed daily calibration drift check. The end of the out-of-control period is the time corresponding to the completion of appropriate adjustment and subsequent successful CD assessment. During a period that the COMS is out-of-control the COMS data cannot be used to calculate emission compliance or to meet minimum data capture requirements in the applicable regulation.

4.5.2 Daily Status Indicator Check

In addition to the daily calibration checks, the Instrument Technician will check the status indicators, data acquisition system error messages, and other system self-diagnostic indicators. Appropriate corrective action will be taken based on the manufacturer's recommendations when the COMS is operating outside preset limits.

[Regulatory Citations: 40 CFR §60.13(d); Part 60, Appendix B, Performance Specification 1; Part 60, Appendix F, Procedure 3]

5. QUALITY ASSURANCE ACTIVITIES

5.1 Introduction

As discussed in Section 1.3, quality assurance activities consist of a series of checks performed to ensure that the QC procedures are effective in maintaining an acceptable level of CEMS and COMS data quality. QA activities are often performed less frequently than QC activities and include but are not limited to required periodic quarterly and annual audits. Table 5-1 summarizes QA activities for the CEMS.

Table 5-1 Summary of QA Activities

Perform this Audit	At this Frequency	On these Monitors
Linearity Check	Quarterly	SO_2, NO_X, O_2
Cylinder Gas Audit	Quarterly[1]	CO
Flow-to-Load Ratio Test	Quarterly	Flow
Optical Alignment Assessment	Quarterly	Opacity
Zero Compensation Check	Quarterly	Opacity
Calibration Error Test	Quarterly	Opacity
Relative Accuracy Test Audit	Semiannually or Annually[2]	SO_2, NO_X, O_2, CO, Flow
Zero Alignment Audit	Annually	Opacity
Span Evaluation	Annually	SO_2, NO_X, Flow

[1] Except during calendar quarters when a RATA is performed.

[2] For SO_2, NO_X, O_2, and Flow, frequency depends on RA achieved during previous RATA.

With the exception of the RATA, QA activities may be performed by either plant personnel or independent contractors. RATA's are always performed by a qualified air emission testing body (AETB) as discussed in Section 5.2.3.6 of this Plan.

5.2 Quality Assurance Activities for CEMS

Quality assurance assessments for the CEMS consist of quarterly multi-point gas audits and annual relative accuracy test audits. The test procedures, performance specifications, and other requirements vary depending on whether the monitor is subject to 40 CFR Part 60 or Part 75. The following sub-sections describe these requirements.

5.2.1 Linearity Check (40 CFR Part 75)

The linearity check is performed for each SO_2, and NO_X and O_2 monitor at least once during each QA operating quarter. A *QA operating quarter* means a calendar quarter in which there are at least 168 unit operating hours, where a unit operating hour is any hour or partial hour that a unit combusts fuel. Conduct the linearity checks no less than 30 days apart, to the extent practicable. For dual range analyzers, a linearity check is required only on the range(s) used to record and report emission data during the QA operating quarter.

[Regulatory Citation: Part 75, Appendix B, Section 2.2.1]

IMPORTANT!

If the SO_2 or NO_X analyzer span value is $\leq$30 ppm, that range of the analyzer is exempt from the Part 75 linearity test requirements. This exemption did not apply to the GREC SO_2 and NO_X analyzers as of the date Revision 1 of this QA/QC plan was finalized because neither of the analyzer ranges was less than 30 ppm. However, the plan will need to be modified if the SO_2 span is reduced to $\leq$ 30 ppm. If this occurs, be aware that the state regulatory agency may require a two-point 40 CFR 60, Appendix F cylinder gas audit (CGA) test in place of the 40 CFR 75 linearity test. Not all agencies will allow the 40 CFR 75 linearity exemption to be carried over to include the 40 CFR 60 CGA requirement. Check with the local regulatory agency on this matter. If a CGA is required in lieu of the linearity test, follow the test procedures in Section 5.2.2 below for CO monitors.

5.2.1.1 Linearity Check Procedure

Before initiating a linearity check, routine and non-routine calibration adjustments can be made to the analyzers. Refer to Section 4.3.1.1 of this Plan for information concerning routine and non-routine adjustments.

Trial gas injections are allowable prior to commencing a linearity check for the purpose of checking the accuracy of the CEMS. The results of the trial injections do not affect the status of the quality assured or conditionally valid data provided that the specifications listed below are met:

(1) The stable, ending monitor response is within ±5 percent or within 5 ppm of the tag value of the reference gas;
(2) No adjustments to the calibration of the CEMS are made following the trial injection(s), other than the adjustments permitted under Section 2.1.3 of Appendix B to Part 75; and
(3) The CEMS is not repaired, re-linearized, or reprogrammed after the trial injection(s).

If the results of a trial injection exceed the limits in (1) above or if the CEMS is repaired, re-linearized or reprogrammed after the injection, then it must be counted as a failed linearity check and reported via the ECMPS Client Tool. If this occurs, follow the procedures pertaining to failed and aborted recertification tests in paragraphs (b)(3)(vii)(A) and (b)(3)(vii)(B) of 40 CFR §75.20.

The general procedure for conducting a linearity test is as follows:

(1) Conduct linearity tests while the unit is combusting fuel at conditions of typical stack temperature and pressure; it is not necessary for the unit to be generating electricity during this test.
(2) Operate each monitor at its normal operating temperature and conditions. Introduce the calibration gas at the gas injection port and allow it to pass through all filters, scrubbers, conditioners, and other monitor components used during normal sampling and through as much of the sampling probe as is practical.
(3) Challenge the CEMS with an audit gas of known concentration at each of three calibration levels (low, mid, and high). The allowable range of concentration for each of these calibration levels is provided in Table 5-2 below.
(4) Use EPA Protocol or NIST certified gases. The gases must be vendor-certified to be within 2.0% of the concentration specified on the cylinder label (tag value). Verify that each audit gas cylinder has not passed its expiration date and has a minimum pressure of 200 pounds per square inch.
(5) Challenge the CEMS three times at each audit point. Do not use the same gas twice in succession. Instead, alternate between low-, mid- and high-level values. Note that the DAHS is capable of performing the linearity injections automatically provided that proper procedures are followed as identified in the CEMLink™6 Operator's Guide.
(6) The monitor should be challenged at each audit point for a sufficient time to assure that any sample gas in the lines is flushed out and the calibration gas flow has stabilized. The injection time should also take into account the response time of the analyzers and sample system.
(7) To the extent practicable, the duration of each linearity test from the hour of the first injection to the hour of the last injection, shall not exceed 24 unit operating hours.

Table 5-2 Calibration Gas Concentration Ranges for Linearity Checks

Component	Instrument Span	Gas Concentration		
		Low-Level (20 – 30% of span)	Mid-Level (50 – 60% of span)	High-Level (80 – 100% of span)
O_2	25%	5.0 – 7.5% O_2	12.5 – 15.0% O_2	20 – 25%
SO_2	40 ppm	8 – 12 ppm	20 – 24 ppm	32 – 40 ppm
NO_X	120 ppm	24 – 36 ppm	60 – 72 ppm	96 – 120 ppm

[Regulatory Citation: Part 75, Appendix A, Section 6.2]

5.2.1.2 Linearity Check Calculations

Linearity error is computed by the DAHS from the average of the three responses for each audit gas concentration level using Equation A-4 from 40 CFR 75 Appendix A as listed below. Note that the DAHS is capable of performing the linearity calculations provided that proper procedures are followed as identified in the CEMLink™6 Operator's Guide.

Equation A-4: Linearity Error Calculation

$$LE = \frac{|R - A|}{R} \times 100$$

Alternately, if linearity error is based on the absolute value of the difference then the following formula is used:

$$LE = |R - A|$$

LE = Percent linearity error
R = Calibration gas reference value
A = Average of monitor response

[Regulatory Citation: Part 75, Appendix A, Section 7.1]

5.2.1.3 Linearity Performance Specifications

For SO_2 and NO_X pollutant concentration monitors, results of the linearity test are acceptable if:

- The error in linearity for each calibration gas concentration (low-, mid-, and high-levels) does not exceed or deviate from the reference value by more than 5.0 percent as calculated using Equation A-4 above; or
- The absolute value of the difference between the average of the monitor response values and the average of the reference values, |R - A| in Equation A-4 above, is less than or equal to 5 ppm.

For the O_2 monitor, results of the linearity test are acceptable if:

- The error in linearity for each calibration gas concentration (low-, mid-, and high-levels) does not exceed or deviate from the reference value by more than 5.0 percent as calculated using Equation A-4 above; or
- The absolute value of the difference between the average of the monitor response values and the average of the reference values, |R - A| in Equation A-4 above, is less than or equal to 0.5 percent O_2, whichever is less restrictive.

[Regulatory Citation: Part 75, Appendix A, Section 3.2]

5.2.1.4 Linearity Check Grace Periods

When a required linearity test has not been completed by the end of the QA operating calendar quarter it is due, or because of infrequent operation of a unit, infrequent use of a required high range monitor or monitoring system, or four successive calendar quarters have elapsed after the quarter a linearity was last performed, the owner/operator has a grace period of 168 consecutive operating hours to perform the linearity test. The grace period starts with the first unit operating hour following the calendar quarter that the linearity test was due.

If at the end of this 168-unit operating hour grace period, the required tests have not been performed, data from the monitoring system will be considered invalid beginning with the hour of the missed 168-hour grace period. Data from the monitoring system will remain invalid until the hour of completion of a subsequent successful hands-off linearity test. A linearity test performed within a grace period satisfies the QA requirements for the missed quarter but not for the quarter that the grace period linearity test was completed.

[Regulatory Citation: Part 75, Appendix B, Section 2.2.4]

5.2.1.5 Data Validation for Linearity Checks

An out-of-control period occurs when the error in linearity at any of the three concentrations exceeds the applicable specifications summarized in Section 5.2.1.3 of this Plan. The NO_X-diluent CEMS is considered out-of-control whenever either monitor component (NO_X or O_2) exceeds the applicable linearity error limits.

An out-of-control period also occurs when a linearity test is aborted due to a problem with the monitor or monitoring system. However, a monitor is not considered out-of-control when a linearity test is aborted for a reason unrelated to the monitor's performance (e.g., a forced unit outage).

The out-of-control period begins with the hour of the failed or aborted linearity check and ends with the hour of completion of a satisfactory linearity check following corrective action, unless the conditional data validation procedures specified in 40 CFR §75.20 (b)(3) are followed. In that case, the beginning and end of the out-of-control period shall be determined in accordance with §§ 75.20(b)(3)(vii)(A) and (B).

During the time the CEMS is out-of-control the CEMS data may not be used in calculating emission compliance nor be counted towards meeting minimum data availability.

[Regulatory Citation: Part 75, Appendix B, Section 2.2.3]

5.2.2 Cylinder Gas Audits (40 CFR Part 60)

A CGA is similar to a linearity test and is performed for the CO monitor in accordance with Procedure 1 in 40 CFR 60, Appendix F.

CGAs are conducted in three consecutive quarters. During the fourth quarter, the accuracy of the CO monitor is evaluated by conducting a RATA. Conduct successive quarterly CGAs no less than two months apart.

[Regulatory Citation: Part 60, Appendix F, Section 5]

5.2.2.1 Cylinder Gas Audit Procedure

The general procedure for conducting a CGA is as follows:

(1) Unlike linearity tests, a CGA may be conducted while the unit is not operating.
(2) Operate each monitor in its normal sampling mode, i.e., pass the audit gas through all filters, scrubbers, conditioners, and other monitor components used during normal sampling, and as much of the sampling probe as is practical.
(3) Challenge the CEMS with an audit gas of known concentration at two points within the following concentration ranges:

Table 5-3 Calibration Gas Concentration Ranges for CGAs

Component	Instrument Span	Gas Concentration	
		Audit Point 1 (20 – 30% of span)	Audit Point 2 (50 – 60% of span)
CO	200 ppm	40 – 60 ppm	100 – 120 ppm

(4) Use only EPA Protocol Gases or Certified Reference Materials (CRMs) per Part 60, Appendix F, Section 5.1.2(3). Verify that each audit gas cylinder has not passed its expiration date and has a minimum pressure of 200 pounds per square inch.
(5) Use separate audit gas cylinders for audit points 1 and 2. Do not dilute gas from audit cylinder when challenging the CEMS.
(6) Challenge the CEMS three times at each audit point. Do not use the same gas twice in succession. Instead, alternate between low- and mid-level values and use the average of the three responses in determining accuracy.
(7) The monitor should be challenged at each audit point for a sufficient period of time to assure adsorption-desorption of the CEMS sample transport surfaces has stabilized. The injection time should also take into account the response time of the analyzers and sample system.

[Regulatory Citation: Part 60, Appendix F, Section 5.1.2]

5.2.2.2 Cylinder Gas Audit Calculations

CGA accuracy is computed using the average of the two responses for each audit gas concentration level using Equation 1-1 from 40 CFR 60 Appendix F as listed below. Note that the DAHS is capable of performing the CGA calculations provided that proper procedures are followed as identified in the CEMLink™6 Operator's Guide.

Equation 1-1: CGA Accuracy Calculation	
$$A = \frac{C_m - C_a}{C_a} x 100$$	A = Percent accuracy of the CEMS C_m = The average monitor response to the specific audit gas (high or low) in units of concentration C_a = Certified value of CGA audit gas in units of concentration

[Regulatory Citation: Part 60, Appendix F, Section 6.3]

5.2.2.3 CGA Accuracy Specifications

For the CO pollutant monitor, results of the CGA are acceptable if the CEMS accuracy does not exceed:

- ±15 percent at each of the two calibration levels (Audit Points 1 and 2) as calculated using Equation 1-1 above; or

- ±5 ppm absolute difference between the average monitor response and reference value at each of the two calibration levels (Audit Points 1 and 2)

[Regulatory Citation: Part 60, Appendix F, Section 5.2.3]

5.2.2.4 Data Validation for CGA Tests

An out-of-control period occurs when the CGA at either of the two concentrations exceeds the applicable specifications (>15% error or 5 ppm difference) summarized in Section 5.2.2.3 of this Plan. The out-of-control period begins with the time of completion of the failed CGA and ends with the time of completion of a satisfactory CGA following the corrective action. Please note that the conditional data validation procedures specified in 40 CFR §75.20 (b)(3) do not apply to CEMS components such as CO that are subject to Part 60 monitoring requirements.

During the time the CEMS is out-of-control the CEMS data may not be used in calculating emission compliance nor be counted toward meeting minimum data availability.

If the CEMS is out-of-control, take necessary corrective action to eliminate the problem. Following corrective action, another CGA must be completed to determine if the CEMS is operating within the specifications. If audit results show the CEMS to be out-of-control, the CEMS operator shall report both the audit showing the CEMS to be out-of-control and the results of the audit following corrective action showing the CEMS to be operating within specifications.

[Regulatory Citation: Part 60, Appendix F, Section 5.2]

5.2.3 Relative Accuracy Test Audits (40 CFR Part 75)

The O_2, SO_2, and NO_X CEMS are addressed separately in this section because they are subject to similar requirements under 40 CFR Part 75. RATA requirements for other CEMS analyzers are addressed in this Plan as follows:

- CO monitor: Section 5.2.4
- Flow monitor: Section 5.3.2

Note that 40 CFR §75.21(a)(6) provides an exemption from the requirement to conduct an SO_2 RATA if the designated representative certifies that a unit with an SO_2 monitoring system burns only very low sulfur fuel

GREC qualifies for this exemption because samples of biomass fuel taken prior to startup of the facility demonstrated that it qualifies as a very low sulfur fuel. In addition, the pipeline natural gas utilized during startups qualifies as a very low sulfur fuel by definition. A certification to this effect has been provided in the Part 75 electronic monitoring plan. While this section discusses SO_2 RATA requirements, these requirements will not apply to GREC provided that the biomass fuel continues to meet this qualification.

IMPORTANT!

The facility should sample and analyze the biomass fuel for sulfur content at least annually in order to demonstrate that it continues to meet the definition of very low sulfur fuel(s) as defined in 40 CFR §72.2. The biomass fuel must have a total sulfur content no greater than 0.05 percent sulfur by weight in order to qualify. If the sulfur content is in excess of this value, an SO_2 RATA must be performed no later than the calendar quarter following the one in which the exceedance occurred.

5.2.3.1 RATA Deadlines

A relative accuracy test audit (RATA) must be performed either semiannually (i.e., once every two successive operating quarters) or annually (i.e., once every four successive operating quarters) depending on the accuracy achieved during the previous RATA. Exclude calendar quarters with fewer than 168 operating hours in determining the RATA deadline. Regardless of the number of non-operating quarters excluded, the deadline for the next RATA cannot be more than 8 calendar quarters after the quarter a RATA was last performed. If a RATA has not been completed by the end of the eighth calendar quarter since the quarter of the last RATA, then the RATA must be completed within a 720 unit operating hour grace period (refer to Section 5.2.3.7 of this Plan) following the end of the eighth successive elapsed calendar quarter, or data from the CEMS will become invalid.

For RATAs, there is an incentive system that rewards good monitor performance. RATAs may be performed annually rather than semiannually if a certain level of relative accuracy is achieved. The ability to perform less frequent RATAs is provided by the "Relative Accuracy Test Frequency Incentive System" described in 40 CFR 75, Appendix B. The criteria for determining RATA frequency are summarized in Table 5-4 below.

Table 5-4 Relative Accuracy Test Frequency Incentive System

RATA	Semiannual	Annual
SO_2	7.5% < RA ≤ 10% or ±15.0 ppm[1]	RA ≤ 7.5% or ±12.0 ppm[1]
NO_X/diluent	7.5% < RA ≤ 10% or ±0.020 lb/mmBtu [2]	RA ≤ 7.5% or ±0.015 lb/mmBtu[2]
Flow	.5% < RA ≤ 10.0% or ±2.0 fps	RA ≤ 7.5% or ±1.5 fps
O_2	7.5% < RA ≤ 10.0% or ±1.0% O_2	RA ≤ 7.5% or ±0.7% O_2

[1] If the average of the SO_2 reference method measurements during the RATA is ≤250 ppm, then use the alternate pass criteria of ±15.0 ppm (semiannual) and ±12 ppm (annual).

[2] If the average of the NO_X reference method measurements during the RATA is ≤0.20 lb/mmBtu, then use the alternate pass criteria of ±0.02 lb/mmBtu (semiannual) and ±0.015 lb/mmBtu (annual).

There is no limit to the number of RATAs that can be conducted in an effort to achieve the results required to qualify for the annual test frequency as long as all applicable data validation procedures are followed.

[Regulatory Citation: Part 75, Appendix A, Section 3.3 and Appendix B, Section 2.3.1.2]

5.2.3.2 RATA Notifications and Reporting

Please note that the all RATAs require agency notifications. The EPA regional office requires a 21-day notification of the RATA test schedule (or 45-day notice required if RATA is part of a total recertification event). Notification requirements are summarized in Table 5-5 below:

Table 5-5 Periodic Quality Assurance RATA Notification and Reporting Requirements

If you are submitting...	Then it is due...	In this form...	To this office...
Notice of semiannual or annual RATA	21 days prior to beginning of test, or	Written (mail or fax) (or e-mail with agency's consent)	US EPA Regional Office, State/local agency. CAMD has waived this requirement. Check with the other agencies.
Notice of rescheduled RATA	24 hours prior to beginning of rescheduled test	Same as above, plus by telephone or any other means acceptable to applicable agency	
Periodic QA RATA results (electronic)	30 days following the end of the calendar quarter in which the RATA was completed	Electronic report in extensible-markup language (XML) format	US EPA CAMD via the ECMPS Client Tool
Periodic QA RATA results (hardcopy)	Later of 45 days after completing tests or 15 days after receiving request from US EPA Regional Office or state/local agency	Written hardcopy report	US EPA Regional Office or state/local agency that made the request

There is no regulatory requirement to submit hardcopy RATA reports to either the US EPA Regional Office or state/local agency unless they are specifically requested either in writing or by electronic mail. However, these agencies should be contacted to determine whether they wish to receive complete hard copies of the reports.

A summary of the RATA results is provided as necessary in the quarterly Data Assessment Report that that is submitted to FDEP in accordance with 40 CFR Part 60 requirements. In addition, CO RATA reports must be submitted to the US EPA's WebFIRE database in order to comply with "Boiler MACT" reporting requirements in 40 CFR Part 63. Refer to Section 5.2.4.2 of this Plan for a discussion of RATA notification and reporting requirements under Parts 60 and 63.

[Regulatory Citation: 40 CFR §75.60(b)(6) and 40 CFR §75.61(a)(5)]

5.2.3.3 RATA Test Procedures

Prior to conducting a RATA, all routine quarterly and annual maintenance should be completed on the monitoring systems. This is not a requirement, but is highly recommended as it reduces the likelihood of problems developing with the CEMS during the RATA. If problems should develop, the amount of time required for troubleshooting may be reduced if some potential causes have been eliminated from consideration because they were previously addressed by the annual maintenance. Therefore, it is beneficial to synchronize the preventive maintenance schedule with the RATA schedule.

Do not commence a RATA if the CEMS is out-of-control due to prior failure of either a daily calibration or quarterly linearity test, or if it is out-of-control with respect to the additional calibration error test requirements in Section 2.1.3 of Appendix B to Part 75.

RATA tests must be done at the load level designated as "normal." A load evaluation is required to determine the normal load per the procedures described in Section 5.5 of this Plan. If two load levels are designated as normal, the required RATA(s) may be done at either load level. Each single-load RATA must be completed within a period of 168 consecutive unit operating hours while the BFB boiler is combusting biomass, its primary fuel.

All Part 75 RATAs must be performed by an independent emission test firm that meets EPA criteria as an AETB as discussed in Section 5.2.3.6 of this Plan. The AETB must perform the RATA following the procedures in 40 CFR 75, Appendix A, Section 6.5, which includes utilizing the appropriate EPA reference methods listed in Table 5-6 below. EPA Protocol gases utilized by the AETB for performing a RATA must be obtained from gas production sites participating in the Protocol Gas Verification Program (PGVP) as discussed in Section 4.2.1.5 of this Plan. Test methods will be conducted according to the corresponding Performance Specifications of 40 CFR 60, Appendix B as follows:

Table 5-6 RATA Performance Specifications

Parameter	40 CFR 60, Appendix A Test Method	40 CFR 60, Appendix B Performance Specification
Flow	2[1]	6
O_2	3A	3
SO_2	6C	2
NO_X	7E	2
CO	10	4/4A

[1] Allowed alternatives: Methods 2A, 2C, 2D, 2F, 2G, or 2H.

Prior to conducting each RATA, the response time of the reference CEMS and that of the GREC CEMS will be determined. Based on these response times, the timing of the data will be adjusted to ensure proper correlation between the two measurement systems.

Reference method measurements must be made at a location within the stack that is (1) accessible; (2) in the same proximity as the monitor or monitoring system location; and (3) meets the requirements of the following performance specifications in Appendix B of 40 CFR Part 60: PS-2 for SO_2 and NO_X monitors, and PS-3 for O_2 monitors. One of the following options may be used for traverse point selection.

- At any location (including locations with expected stratification), use a minimum of six traverse points along a diameter, in the direction of any expected stratification. The points will be located according to 40 CFR 60, Appendix A, Method 1.
- At locations where PS-2, Section 3.2 allows use of a short reference method measurement line (with three points located at 0.4, 1.0 and 2.0 meters from the stack wall), an alternative 3-point measurement line, locating the three points at 4.4, 14.6, and 29.6 percent of the way across the stack may be used.
- At locations where stratification is expected, the short measurement line from PS-2, Section 3.2 (or the alternative line described previously), may be used in lieu of the "long" measurement line in PS-2, Section 3.2, if the 12-point stratification test described in 40 CFR 75, Appendix A, Section 6.5.6.1 is performed and passed one time at the location (using the acceptance criteria of Section 6.5.6.3(a)) and provided that either the 12-point stratification test or the alternate (abbreviated) stratification test in Section 6.5.6.2 is performed and passed prior to each subsequent RATA at the location.
- A single reference method measurement point, located no less than 1.0 meter from the stack wall and situated along one of the measurement lines used for the stratification test, may be used at any sampling location if the 12-point stratification test described in 40 CFR 75, Appendix A, Section 6.5.6.1 is performed and passed prior to each RATA according to the acceptance criteria of Section 6.5.6.3 (b).

Trial RATA runs are allowable prior to commencing a RATA for the purpose of optimizing the performance of the CEMS. The results of the trial runs do not affect the status of the quality-assured or conditionally valid data provided that the specifications listed below are met:

(1) the average reference method reading and the average CEMS reading for the run differ by no more than ±10% of the average reference method value or ±15 ppm, or ±1.5% H_2O, or ±0.02 lb/mmBtu from the average reference method value, as applicable;
(2) No adjustments to the calibration of the CEMS are made following the trial run(s), other than the adjustments permitted under Section 2.1.3 of Appendix B to Part 75; and
(3) The CEMS is not repaired, re-linearized, or reprogrammed after the trial run(s).

If the results of any trial RATA run(s) exceed the limits in (1) above or if the CEMS is repaired, re-linearized or reprogrammed after the run(s), then it must be counted as a failed RATA attempt and reported via the ECMPS Client Tool. If this occurs, follow the procedures pertaining to failed and aborted recertification tests in paragraphs (b)(3)(vii)(A) and (b)(3)(vii)(B) of 40 CFR §75.20.

If a routine daily calibration error test is performed and passed just prior to a RATA (or during a RATA test period) and a mathematical correction factor is automatically applied by the DAHS, the correction factor shall be applied to all subsequent data recorded by the monitor, including the RATA test data.

Once a RATA is commenced, the test must be done “hands-off.” No adjustment of the monitor's calibration is permitted during the RATA test period, other than the routine calibration adjustments following daily calibration error tests, as described in Section 4.3.1.1 of this Plan. If a daily calibration error test failed during a RATA test period, prior to completing the test, the RATA must be repeated. Data from the monitor are invalidated from the hour of the failed calibration error test until the hour of completion of a subsequent successful calibration error test. The RATA cannot be re-started until the monitor has successfully passed a calibration error test.

A minimum of nine 21-minute test runs are performed per audit. Additional runs may be performed but only a maximum of three test runs may be rejected and the total number of test results used to determine the relative accuracy or bias must be greater than or equal to nine. All data, including the rejected runs, are reported in the quarterly EDR.

For each monitoring system, report the results of all completed and partial RATAs that affect data validation (i.e., all completed, passed RATAs; all completed, failed RATAs; and all RATAs aborted due to a problem with the CEMS, including trial RATA runs counted as failed tests) in the quarterly report. Note that RATA attempts that are aborted or invalidated due to problems with the reference method or due to operational problems with the affected unit need not be reported. Such runs do not affect the validation status of emission data recorded by the CEMS. However, a record of all RATAs, trial RATA runs and RATA attempts (whether reported or not) must be kept on-site as part of the official test log for each monitoring system.

Whenever a passing RATA of a gas monitor is performed (irrespective of the reason for performing the test), the required frequency for the subsequent RATA (semi-annual or annual) is established based upon the date and time of completion of the RATA and the relative accuracy percentage obtained.

[Regulatory Citations: Part 75 Appendix A, Section 6.5 and 40 CFR §75.20(b)(3)(vii)(E) & (F)]

5.2.3.4 RATA Calculations

Normally, the AETB is responsible for performing all calculations associated with the RATA. The Plant Engineer should verify the accuracy of these calculations during the testing, if possible, or prior to submittal of the RATA results.

First, calculate the mean of the monitor or monitoring system measurement values. Then calculate the mean of the reference method values. Using data from the automated data acquisition and handling system, calculate the arithmetic differences between the reference method and monitor measurement data sets. Then calculate the arithmetic mean of the difference, the standard deviation, the confidence coefficient, and the monitor or monitoring system relative accuracy using the following equations:

40 CFR Part 75, Appendix A, Equation A-7	
$\bar{d} = \frac{1}{n}\sum_{i=1}^{n} d_i$	$\bar{d}$ = Arithmetic mean n = Number of data points (test runs) d_i = The difference between a reference method value and the corresponding CEMS value for a given data point $\sum_{i=1}^{n} d_i$ = Algebraic sum of the individual differences, d_i

40 CFR Part 75, Appendix A, Equation A-8	
$S_d = \sqrt{\frac{\sum_{i=1}^{n} d_i^2 - \frac{\left(\sum_{i=1}^{n} d_i\right)^2}{n}}{n-1}}$	S_d = Standard deviation n = Number of data points (test runs) d_i = The difference between a reference method value and the corresponding CEMS value for a given data point $\sum_{i=1}^{n} d_i$ = Algebraic sum of the individual differences, d_i $(\sum_{i=1}^{n} d_i)^2$ = Algebraic sum of differences squared

40 CFR Part 75, Appendix A, Equation A-9	
$$cc = t_{0.025} \frac{S_d}{\sqrt{n}}$$	cc = Confidence coefficient S_d = Standard deviation n = Number of data points (test runs) $t_{0.025}$ = t value from Table 7-1 in Part 75, Appendix A

40 CFR Part 75, Appendix A, Equation A-10	
$$RA = \frac{\lvert \bar{d} \rvert + \lvert cc \rvert}{\overline{RM}} x100$$	RA = Relative accuracy $\overline{RM}$ = Arithmetic mean of the reference method values $\lvert \bar{d} \rvert$ = The absolute value of the mean difference between the reference method values and the corresponding CEMS values |cc| = Absolute value of the confidence coefficient

[Regulatory Citation: Part 75, Appendix A, Section 7.3]

5.2.3.5 Bias Test

RATA results for the flow monitor as well as the SO_2 pollutant concentration, NO_X pollutant concentration, and NO_X-diluent continuous emission monitoring systems must be analyzed for bias. The purpose of the bias test is to determine whether a monitoring system is biased low with respect to the reference method, based on the RATA results. If a low bias is found, a bias adjustment factor (BAF) must be calculated and applied to the subsequent hourly emissions data.

If, for the relative accuracy test audit data set being tested, the mean difference, $\bar{d}$ (calculated per Equation A-7), is less than or equal to the absolute value of the confidence coefficient, |cc| (calculated per Equation A-9), the monitor or monitoring system has passed the bias test. If the mean difference, $\bar{d}$, is greater than the absolute value of the confidence coefficient, |cc|, the monitor or monitoring system has failed to meet the bias test requirement.

If the monitor or monitoring system fails to meet the bias test requirement, adjust the value obtained from the monitor using the following equations:

Reference: 40 CFR 75, Appendix A, Equation A-11 & A-12	
$CEM_i^{Adjusted} = CEM_i^{Monitor} \times BAF$	$CEM_i^{Adjusted}$ = Data value, adjusted for bias, at time i $CEM_i^{Monitor}$ = Data (measurements) provided by the monitor at time i BAF = Bias adjustment factor
$BAF = 1 + \frac{\lvert \bar{d} \rvert}{\overline{CEM}_{avg}}$	$\bar{d}$ = Arithmetic mean of the difference obtained during the failed bias test from the arithmetic mean calculation of the relative accuracy test audit (Equation A-7) $\overline{CEM}_{avg}$ = Mean of the data values provided by the monitor during the failed bias test

IMPORTANT!

Following each RATA, bias adjustment factors in the DAHS must be reviewed and revised if necessary by the Instrument Technician. Failure to do so may result in penalties.

[Regulatory Citations: Part 75, Appendix A, Sections 3.4, 6.5(g), and 7.6]

5.2.3.6 Air Emission Testing Body (AETB) Program

All RATAs at Part 75 sources, including GREC, must be performed by an AETB that certifies conformance with ASTM D7036-04, *"Standard Practice for Competence of Air Emission Testing Bodies"*. Testing must be conducted or supervised by at least one Qualified Individual (QI). A QI is defined in 40 CFR §72.2 as an individual who is identified by an AETB as meeting the requirements described in ASTM D 7036-04 as of the date of testing. Only those portions of a test conducted or supervised by a QI may be used under Part 75.

It is expected that if a QI is conducting a test, that a QI will actively conduct the test for its duration. However, allowance may be made for normal activities of a QI who is overseeing or conducting a test, *e.g.,* bathroom breaks, food breaks, etc., and emergencies that may arise during a test.

The AETB must provide Plant Engineer with the following information which is submitted electronically to EPA:

- The AETB name, phone number, and email address
- Name of each RATA on-site Qualified Individual
- For each reference method performed, the date(s) that each QI passed that method's qualification exam

- Name and email address of each qualification exam provider

The Plant Engineer must obtain a certificate of accreditation from the AETB for the relevant test methods. The certification does not require electronic reporting. The Plant Engineer should also request the AETB quality manual, internal audit results, performance data, and QI training records.

[Regulatory Citations: 40 CFR §§75.21(f), 75.59(a)(9)(xi), and Appendix A 6.1.2]

5.2.3.7 RATA Grace Periods

The owner/operator has a grace period of 720 unit operating hours to complete the required RATA whenever:

- The RATA has not been performed by the end of the QA operating quarter it is due; or
- A required 3-load flow RATA has not been performed by the end of the calendar quarter in which it is due; or
- Eight (8) successive calendar quarters have elapsed following the quarter a RATA was last performed due to infrequent operation of the unit(s).

Except for SO_2 monitoring system RATAs, the grace period begins with the first unit operating hour following the calendar quarter in which the required RATA was due. For SO_2 monitor RATAs, the grace period begins with the first unit operating hour in which biomass is burned in the BFB boiler, following the quarter in which the required RATA is due. Data validation during a RATA grace period shall be done in accordance with the applicable provisions in Section 2.3.2 of 40 CFR Part 75, Appendix B.

If at the end of the 720 unit operating hour grace period the RATA has not been completed, data from the monitoring system is invalid beginning with the first unit operating hour following the expiration of the grace period. Data from the CEMS remain invalid until the hour of completion of a subsequent hands-off RATA. The deadline for the next test is either two QA operating quarters (if a semiannual RATA frequency is obtained) or four QA operating quarters (if an annual RATA frequency is obtained) after the quarter in which the RATA is completed, not to exceed eight calendar quarters.

When a RATA is done during a grace period in order to satisfy a RATA requirement from a previous quarter, the deadline for the next RATA is determined as follows:

- If the grace period RATA qualifies for a reduced, (i.e., annual), RATA frequency the deadline for the next RATA is set at three QA operating quarters after the quarter in which the grace period test is completed.

- If the grace period RATA qualifies for the standard, (i.e., semiannual), RATA frequency the deadline for the next RATA is set at two QA operating quarters after the quarter in which the grace period test is completed.

Notwithstanding these requirements, no more than eight successive calendar quarters can elapse after the quarter in which the grace period test is completed without a subsequent RATA having been conducted.

[Regulatory Citation: Part 75, Appendix B, Section 2.3.3]

5.2.3.8 Performance Specifications

Results of the SO_2 RATA are acceptable if the RA does not exceed 10.0 percent. Alternatively, if the average of the reference method measurements of SO_2 concentration during RATA is less than or equal to 250.0 ppm, RATA are results are acceptable if the difference between the mean value of the monitor measurements and the reference method mean value does not exceed ±15.0 ppm, wherever the relative accuracy specification of 10.0 percent is not achieved.

Results of the NO_X RATA are acceptable if the RA does not exceed 10.0 percent. Alternatively, if the average of the reference method measurements of NO_X emission rate during the RATA is less than or equal to 0.200 lb/mmBtu, RATA results are acceptable if the difference between the mean value of the continuous emission monitoring system measurements and the reference method mean value does not exceed ±0.020 lb/mmBtu, wherever the relative accuracy specification of 10.0 percent is not achieved.

Results of the O_2 RATA are acceptable if the RA does not exceed 10.0 percent. The relative accuracy test results are also acceptable if the difference between the mean value of the O_2 monitor measurements and the corresponding reference method measurement mean value does not exceed ±1.0 percent O_2.

[Regulatory Citation: Part 75, Appendix A, Section 3.3]

5.2.3.9 Data Validation

If a calibration error test is failed before completing the RATA, the RATA must be repeated. Data from the monitor system are invalidated prospectively from the hour of the failed calibration error test until the hour of successfully completing a subsequent calibration error test.

Provided that the RATA is done "cold" (i.e., no corrective maintenance, repair, calibration adjustments, and re-linearization or reprogramming of the monitoring system is performed prior to the RATA), or if only routine or non-routine calibration adjustments at the zero and/or upscale calibration gas levels are performed, then apply one of the following data validation procedures in the event that the RATA is failed or aborted due to problems with the CEMS:

- The CEMS is out-of-control and all emission data from the CEMS are invalidated prospectively from the hour in which the RATA is failed or aborted. Data from the CEMS remain invalid until the hour of completion of a subsequent successful RATA.
- Alternatively, if the conditional data validation procedures of 40 CFR §75.20(b)(3) are used, data from the CEMS are invalidated prospectively from the hour of the failed or aborted RATA until the completion of a probationary calibration error test which initiates a conditionally valid data period. The data remain valid provided all required QA/QC tests are passed.

If the RATA is being performed as part of the conditional data validation procedures of 40 CFR §75.20(b)(3), and the RATA is failed or aborted due to problems with the CEMS, then all conditionally valid emission data recorded by the CEMS are invalidated from the hour of commencement of the test period (i.e., hour in which the probationary calibration was performed) until the completion of a probationary calibration test which initiates a new conditionally valid data period. The data remain valid provided all required QA/QC tests are passed. If a probationary calibration error test is not performed, data are invalid from the hour of the failed or aborted RATA until the hour of completing a successful RATA.

If the diluent monitor used as a component in a NO_X-diluent monitoring system fails, then both components of the system are considered out-of-control from the hour of completion of the failed diluent monitor RATA until the hour of completion of a subsequent successful hands-off RATA demonstrates that both system components have passed the applicable specifications.

RATA attempts that are aborted or invalidated due to problems with the reference method do not affect the validation status of emission data recorded by the CEMS. In addition, failure of the bias test does not result in the system or monitor being out-of-control.

For additional details concerning the status of emission data from the CEMS prior to and during the RATA test period, refer to the following regulations:

- For routine quality assurance RATAs, use the data validation procedures in Section 2.3.2 of Appendix B to Part 75.
- For recertification RATAs, use the data validation procedures in 40 CFR §75.20(b)(3).
- For RATAs performed during and after the expiration of a grace period, use the data validation procedures in Sections 2.3.2 and 2.3.3, respectively, of Appendix B to Part 75.

- For all other RATAs, use the data validation procedures in Section 2.3.2 of Appendix B to Part 75.

During the period the CEMS is out-of-control the CEMS data may not be used in calculating emission compliance nor be counted towards meeting minimum data availability.

[Regulatory Citations: Part 75, Appendix B, Sections 2.3.2 & 2.3.3 and 40 CFR §75.20(b)(3)]

5.2.4 Relative Accuracy Test Audit (40 CFR Part 60)

In general, procedures for performing a CO RATA are similar to those described in the preceding section for a Part 75 RATA. However, there are a number of notable differences due to the fact that the CO CEMS is subject to 40 CFR Part 60 rather than Part 75. These differences include:

- Part 60 does not have an incentive provision that rewards good monitor performance with less frequent RATAs;
- The required intervals for performing RATAs are based on calendar quarters rather than QA operating quarters as they are under Part 75; and
- The AETB (refer to Section 5.2.3.6) and PGVP (refer to Section 4.2.1.5 provisions of Part 75 do not apply.
- There are no RATA grace periods allowed for not performing the RATA on time.
- There is no requirement to perform a bias test.

5.2.4.1 RATA Deadlines (40 CFR Part 60)

A RATA must be performed on the CO monitor at least once every four calendar quarters, except in the case where the BFB boiler is off-line (does not operate) in the fourth calendar quarter since the quarter of the previous RATA. In that case, the RATA must be performed in the quarter in which the unit recommences operation. Generally, the CO RATA will be scheduled to coincide with RATAs for the Part 75-affected monitoring systems (i.e., O_2, SO_2, NO_X, and flow).

[Regulatory Citation: 40 CFR Part 60, Appendix F, Section 5.1]

5.2.4.2 RATA Notifications and Reporting (40 CFR Part 60)

40 CFR Part 60 does not contain advance notification deadlines applicable to the CO RATA. GREC should utilize the Part 75 RATA notification deadlines as summarized in Table 5-5.

Results of the RATA are provided in a Data Assessment Report (DAR) that is submitted to FDEP with the quarterly emissions report covering the calendar quarter in which the RATA was performed. In addition, the RATA results for CO must be submitted to the US EPA's WebFIRE database by using the Compliance and Emissions Data Reporting Interface (CEDRI) that is accessed through the US EPA's Central Data Exchange (CDX). This is an electronic submittal that is mandated by requirements in the "Boiler MACT" rule [refer to 40 CFR Part 63, Subpart DDDDD].

[Regulatory Citations: Section 3 Condition 13.c of Permit Number PSD-FL-411/0010131-001-AC; 40 CFR §60.Part 60, Appendix F, Section 7]

5.2.4.3 RATA Test Procedures (40 CFR Part 60)

Prior to conducting a RATA, all routine quarterly and annual maintenance should be completed on the monitoring systems. This is not a requirement, but is highly recommended as it reduces the likelihood of problems developing with the CEMS during the RATA. If problems should develop, the amount of time required for troubleshooting may be reduced if some potential causes have been eliminated from consideration because they were previously addressed by the annual maintenance. Therefore, it is beneficial to synchronize the preventive maintenance schedule with the RATA schedule.

Conduct the CO RATA while the BFB boiler is operating at more than 50 percent of normal load. CO RATA tests must be performed according to Performance Specification 4 or 4A (PS-4 or PS-4A) of 40 CFR 60, Appendix B. The reference method for the RATA is EPA Method 10 utilizing a continuous sampling train. The sampling strategy for reference method testing, the number of test runs, and the correlation of reference method and CEMS data are the same as PS-2, Sections 8.4.3, 8.4.4, and 8.4.5, respectively. CO calibration gases used for instrumental reference method procedures will be selected in accordance with Section 7.1 of EPA Test Method 7E.

The difference between the reference method sample and the CO monitor's reading will be evaluated from a minimum of nine sets of paired monitor and reference method test data. More than nine sets of RM tests may be performed. If this option is chosen, a maximum of three sets of the test results may be rejected so long as the total number of test results used to determine the RA is greater than or equal to nine. However, all data must be reported, including the rejected data.

[Regulatory Citation: 40 CFR Part 60, Appendix B, PS-2 and 4/4A; Section 4 Appendix CEMS of Permit Number PSD-FL-411/0010131-001-AC;]

5.2.4.4 RATA Calculations (40 CFR Part 60)

Normally, the emission test firm is responsible for performing all calculations associated with the RATA. The Plant Engineer should verify the accuracy of these calculations during the testing, if possible, or prior to submittal of the RATA results. The RATA calculations are found in Section 12 of PS-2, but they are generally the same calculations that are performed for a Part

75 RATA as listed in Section 5.2.3.4 of this Plan, with the notable exception that relative accuracy for CO may be determined by substituting the emission standard for the term "RM" in the denominator of Equation A-10 of Part 75 Appendix A (the equivalent Part 60 equation is Eq 2-6). This option is allowed whenever average emissions measured during the CO RATA are less than 50 percent of the applicable standard. Refer to Section 12.5 of PS-2 for details.

5.2.4.5 Performance Specifications (40 CFR Part 60)

The CO relative accuracy test results are acceptable if the CO relative accuracy does not exceed:

- 10.0% of the mean value of the RM test data in terms of units of the emission standard; or
- 5% when the applicable emission standard is used to calculate relative accuracy; or
- 5 ppmv when the RA is calculated as the absolute average difference between the RM and CEMS plus the 2.5 percent confidence coefficient.

If the RA exceeds the above criteria, the CEMS is out-of-control and corrective action must be taken to eliminate the problem. Following corrective action, audit the CEMS with a RATA to determine if the CEMS is operating within the specifications. A RATA must always be used following an out-of-control period resulting from a RATA. If audit results show the CEMS to be out-of-control, both the audit showing the CEMS to be out-of-control and the results of the audit following corrective action showing the CEMS to be operating within specifications must be reported to FDEP.

[Regulatory Citation: 40 CFR Part 60, Appendix B, PS-4A, Section 13.2 and Appendix F, Section 5.2]

5.2.4.6 Data Validation (40 CFR Part 60)

<u>The beginning of the out-of-control period is the time corresponding to the completion of the sampling for the failed RATA. The end of the out-of-control period is the time corresponding to the completion of the sampling of the subsequent successful audit.</u>

During the period the monitor is out-of-control, the CEMS data may not be used in calculating emission compliance nor be counted towards meeting minimum data availability.

[Regulatory Citation: Part 60, Appendix F, Procedure 1, Section 5.2]

5.3 Quality Assurance Activities for Flow Monitors

5.3.1 Flow-to-Load Ratio Test

A flow-to-load ratio test must be performed on the flow monitoring system once every unit QA operating quarter. A QA operating quarter is defined as any quarter in which a unit operates for at least 168 cumulative operating hours; where a unit operating hour is any hour or partial hour that a unit combusts fuel.

IMPORTANT!

The flow-to-load ratio test should always be completed within one week following the end of each QA operating calendar quarter. In the event of a failed test, this will allow time for identifying and correcting the root cause of the failure within the two week window discussed in Section 5.3.1.2 below and will minimize the possibility that an unscheduled flow RATA will be required as part of the corrective actions.

The DAHS at GREC has the capability to perform a flow-to-load ratio test. Follow the instructions in the VIM CEMLink™6 Operator's Guide to perform this test. The steps involved in performing a flow-to-load ratio test are described below.

First, equation B-1 below is used to calculate the flow-to-load ratio (R_h) for every hour during the quarter in which: (1) the unit operated within ±10.0 percent of the average load during the most recent normal-load flow RATA (L_{avg}) and (2) quality-assured volumetric flow rate data was obtained with a certified flow rate monitor.

40 CFR Part 75, Appendix B, Equation B-1	
$R_h = \frac{Q_h}{L_h} \times 10^{-5}$	R_h = Hourly value of the flow-to-load ratio, scfh/megawatts, scfh/1000 lb/hr of steam, or scfh/(mmBtu/hr thermal output) Q_h = Hourly stack gas volumetric flow rate, as measured by the flow rate monitor, scfh[1] L_h = Hourly unit load, megawatts, 1000 lb/hr of steam, or mmBtu/hr thermal output[2]

[1] Either bias-adjusted flow rates or unadjusted flow rates may be used, provided that all of the ratios are calculated the same way.

[2] Must be within + 10.0 percent of L_{avg} during the most recent normal-load flow RATA

Alternatively, GREC may calculate the hourly gross heat rates, $(GHR)_h$, in lieu of the hourly flow-to-load ratios. The hourly GHR shall be determined only for those hours in which quality-assured flow rate data and diluent gas (O_2) concentration data are both available from a certified monitor or monitoring system or reference method. If this option is selected, calculate each hourly GHR using Equation B-1a of Appendix B to 40 CFR Part 75.

Each analysis must be based on a minimum of 168 acceptable recorded hourly average flow rates (i.e., at loads within ±10 percent of L_{avg}). When two RATA load levels are designated as normal, the analysis must be performed at the higher load level, unless there are fewer than 168 acceptable data points available at that load level, in which case the analysis is performed at the lower load level. If, for a particular flow monitor fewer than 168 acceptable hourly flow-to-load ratios are available at any of the load levels designated as normal, a flow-to-load evaluation is not required for that monitor for that calendar quarter.

The second step in the evaluation is to calculate E_h, which is the absolute percentage difference between each hourly flow-to-load ratio (or hourly GHR) and the reference flow-to-load ratio, R_{ref} (or reference GHR). E_h is calculated using Equation B-2 below from Appendix B to Part 75. Refer to Section 5.3.2.3 of this Plan for information on calculating R_{ref}. R_{ref} is determined based on results of the most recent normal-load flow RATA, even if that RATA was conducted during the calendar quarter being evaluated.

40 CFR Part 75, Appendix B, Equation B-2	
$E_h = \frac{R_{ref} - R_h}{R_{ref}} \times 100$	E_h = Absolute percentage difference between the hourly average flow-to-load ratio and the reference value of the flow-to-load ratio at normal load R_h = The hourly average flow-to-load ratio, for each flow rate recorded at a load level within ±10.0 percent of L_{avg} R_{ref} = The reference value of the flow-to-load ratio from the most recent normal-load flow RATA

Equation B-2 must be used in a consistent manner. That is, use R_{ref} and R_h if the flow-to-load ratio is being evaluated, and use $(GHR)_{ref}$ and $(GHR)_h$ if the gross heat rate is being evaluated.

Finally, calculate E_f , the arithmetic average of all of the hourly E_h values. Report the results of each quarterly flow-to-load (or GHR) evaluation, as determined from Equation B-2, in the electronic quarterly report.

The flow-to-load evaluation results are acceptable and no further action is required if the arithmetic average (E_f) of all the E_h values is less than or equal to:

- 15.0% if L_{avg} for the most recent normal load RATA is ≥ 60 megawatts and unadjusted flow rates were used in the equation

- 10.0% if L_{avg} for the most recent normal load RATA is ≥ 60 megawatts and if bias adjusted flow rates were used in the equation
- 20.0% if L_{avg} for the most recent normal load RATA is < 60 megawatts and unadjusted flow rates were used in the equation
- 15.0% if L_{avg} for the most recent normal load RATA is < 60 megawatts and if bias adjusted flow rates were used in the equation

[Regulatory Citation: 40 CFR Part 75, Appendix B, Section 2.2.5]

5.3.1.1 Recalculation of E_f

If the flow-to-load evaluation results do not meet the above criteria and the original analysis did not exclude any hours within ±10 percent of L_{avg}, then the facility may recalculate E_f after excluding any non-representative flow data. The following hours are considered non-representative and may be excluded from the data analysis:

- Any hour in which the unit combusted a different fuel than the fuel combusted during the most recent normal load RATA;
- For a unit that is equipped with an SO_2 scrubber and which always discharges its flue gases to the atmosphere through a single stack, any hour in which the SO_2 scrubber was bypassed;
- Any hour in which "ramping" occurred, i.e., the hourly load differed by more than ±15.0 percent from the load during the preceding hour or the subsequent hour;
- If a normal load RATA was conducted and passed during the quarter being analyzed, exclude any data for any hour prior to the completion of this RATA; and
- If a problem with the flow monitor accuracy was discovered during the quarter and was corrected, any hour prior to the completion of the required abbreviated flow-to-load test.

After eliminating these data, the data may be analyzed a second time. A minimum of 168 representative data points must be available to conduct the evaluation, or the evaluation is not required for that particular quarter. If the recalculation meets the acceptance criteria, then no further action is required.

<u>If the recalculated E_f exceeds the acceptance criteria then the flow monitor is out-of-control, beginning with the first hour of the quarter following the quarter in which E_f exceeded the applicable limit.</u> If a probationary calibration error test is performed and passed (refer to Section 7.8 of this Plan), data from the monitor may be declared conditionally valid following the quarter in which E_f exceeded the applicable limit. The facility must then implement Option 1 or Option 2 described below.

[Regulatory Citation: 40 CFR Part 75, Appendix B, Section 2.2.5]

5.3.1.2 Option 1

For Option 1, within two weeks after the end of the calendar quarter for which a flow-to-load ratio evaluation failed to meet the applicable acceptance criteria, the cause of the flow monitor problems will be investigated. If corrective maintenance fails to uncover a problem with the flow monitor, then a single load RATA at normal load must be conducted.

If troubleshooting uncovers a problem with the flow monitor then all repairs, corrective actions, etc. must be documented in the maintenance log. If corrective action required re-linearization of the flow monitor, then a 3-level RATA is required. Data from the flow monitor is invalid until a probationary calibration error test is successfully completed following corrective action. Data are then conditionally valid until all remaining diagnostic tests are completed (refer to Section 7 of this Plan). Following the probationary calibration error test, either an abbreviated flow-to-load ratio test, a single load RATA or a 3-level RATA will be performed.

[Regulatory Citation: 40 CFR Part 75, Appendix B, Section 2.2.5.1]

5.3.1.3 Option 2

If the flow-to-load ratio evaluation exceeds the applicable limits, the facility may opt to perform a RATA at normal load. Data from the monitor is considered invalid until a normal load RATA is successfully completed.

[Regulatory Citation: 40 CFR Part 75, Appendix B, Section 2.2.5.2]

5.3.1.4 Abbreviated Flow-to-Load Test

An abbreviated flow-to-load test may be performed after any documented repair, component replacement, or other corrective maintenance to a flow monitor to demonstrate that the repair, replacement, or other maintenance has not significantly affected the monitor's ability to accurately measure the stack gas volumetric flow rate. This test may not be used following changes affecting the linearity of the flow monitor, such as adjusting the flow monitor coefficients or K factor(s).

A probationary calibration error test must be performed immediately following completion of the maintenance activity in order to maintain valid data until an abbreviated flow-to-load test can be performed. The abbreviated test must be completed within 168 unit operating hours of the probationary calibration error test.

During the test, operate the BFB boiler in such a way as to reproduce, as closely as practicable, the exact conditions at the time of the most recent normal-load flow RATA. To achieve this, Part 75 regulations recommend that the load be held constant to within ±10.0 percent of the average load during the RATA and that the diluent concentration be maintained within ±0.5 percent O_2 of the average diluent concentration during the RATA. When the process parameters have been set, record a minimum of six and a maximum of 12 consecutive hourly average flow rates, using the flow monitor(s) for which E_f was outside the applicable limit.

Results of the abbreviated flow-to-load test are considered acceptable and no further action is required if the value of E_f does not exceed the applicable limit listed in Section 5.3.1.1 of this Plan. All conditionally valid data recorded by the flow monitor shall be considered quality-assured, beginning with the hour of the probationary calibration error test that preceded the abbreviated flow-to-load test.

If the test results are unacceptable then all conditionally valid data recorded by the flow monitor is considered invalid back to the hour of the probationary calibration error test, and a single-load RATA is required (or a 3-load RATA if the monitor must be re-linearized). In that case, another probationary calibration error test should be performed to initiate a new conditionally valid data period until the required RATA can be completed.

[Regulatory Citation: 40 CFR Part 75, Appendix B, Section 2.2.5.3]

5.3.2 Relative Accuracy Test Audit

The procedures for performing a RATA of the flow monitor are similar to those discussed in Section 5.2.3 of this Plan for conducting a RATA of the gas analyzers. The following sections focus on those aspects of the procedures that are specific to conducting a flow monitor RATA.

5.3.2.1 RATA Deadlines

Flow monitor RATAs are performed either semiannually (*i.e.,* once every two successive QA operating quarters) or annually (*i.e.,* once every four successive QA operating quarters) based on the previous RATA results for the flow monitors as discussed in Section 5.2.3.1 of this Plan. There is no limit to the number of RATAs that can be conducted in an effort to achieve the results required to qualify for the annual test frequency.

Regardless of the number of QA operating quarters that have elapsed, a RATA must be performed within eight successive calendar quarters since the last RATA.

[Regulatory Citations: 40 CFR Part 75, Appendix A, Sections 2.3.1.1, 2.3.1.2, & 2.3.1.4]

5.3.2.2 RATA Test Procedures

Refer to Section 5.2.3.3 of this Plan for the procedures applicable to all RATAs. This section addresses test procedures that are specific to performing flow RATAs.

If the flow monitor is on an annual RATA frequency, then a 2-load flow RATA must be performed at the two most frequently used load levels as determined by a historical load analysis (refer to Section 5.5 of this Plan). If the flow monitor is on a semiannual RATA frequency, 2-load flow RATAs and single-load flow RATAs at the normal load level may be performed alternately. In addition, a 3-level RATA at the low, mid, and high load levels must be performed on the flow monitor at least once every twenty consecutive calendar quarters.

Regardless of the required RATA frequency, a single-load annual flow RATA may be performed in lieu of the 2-load RATA if the results of an historical load data analysis show that:

- In the time period extending from the ending date of the last annual flow RATA to a date that is no more than 21 days prior to the date of the current annual flow RATA, the unit has operated at a single load level (low, mid, or high), for ≥ 85.0 percent of the time; or
- The 85.0 percent criterion is met in the time period extending from the beginning of the quarter in which the last annual flow RATA was performed through the end of the calendar quarter preceding the quarter of current annual flow RATA.

For all multi-level flow audits, the audit points at adjacent load levels or at adjacent operating levels (*e.g.,* mid and high) must be separated by no less than 25.0 percent of the "range of operation" (refer to Section 5.5 of this Plan). Each single-load flow RATA must be completed within a period of 168 consecutive unit operating hours. For multi-level flow RATAs, all testing at each of the required operating levels must be completed within 720 consecutive unit operating hours.

For multiple-load flow RATAs, each load level is treated as a separate RATA. If a RATA is failed or aborted at a particular load level due to a failed calibration during the RATA or a problem with the flow monitor, only the RATA at that load level must be repeated following corrective action. Flow RATA(s) that were previously passed at the other load level(s) do not have to be repeated unless the flow monitor must be re-linearized (i.e., the monitor's polynomial coefficients or K-factor(s) are changed) following the failed or aborted test. If the flow monitor is re-linearized, a subsequent 3-load RATA is required.

Whenever a passing RATA of a flow monitor is performed (irrespective of the reason for performing the test), the required frequency for the subsequent RATA (semi-annual or annual) is established based upon the date and time of completion of the RATA and the relative accuracy percentage obtained. For multiple-load flow RATAs, the RATA frequency is based on the highest percentage relative accuracy at any of the tested loads. The results of a single-load flow RATA may be used to establish the RATA frequency only when the single-load RATA is allowed per the 85 percent criteria described previously in this section. No other single-load flow RATA may be used to establish an annual RATA frequency.

[Regulatory Citations: 40 CFR Part 75, Appendix A, Section 6.5 and Appendix B, Sections 2.3.1.3 & 2.4]

5.3.2.3 RATA Calculations

Normally, the emission test firm is responsible for performing all calculations associated with the RATA. The Plant Engineer should verify the accuracy of these calculations during the testing, if possible, or as soon as possible following completion of the testing. With the exception of the reference flow-to-load calculation, all RATA calculations are listed in Section 5.2.3.4 of this Plan.

The reference value of the ratio of flow rate to unit load (R_{ref}) must be determined each time that a passing flow RATA is performed at a load level designated as normal. This reference value is used in performing the flow-to-load ratio test described in Section 5.3.1 of this Plan. Report the current value of R_{ref} as well as the completion date of the associated RATA in the electronic quarterly report. If two load levels have been designated as normal, determine a separate R_{ref} value for each of the normal load levels. The reference flow-to-load ratio is calculated as follows:

40 CFR Part 75, Appendix A, Equation A-13	
$R_{ref} = \frac{Q_{ref}}{L_{ref}} \times 10^{-5}$	R_{ref} = Reference value of the flow-to-load ratio, from the most recent normal-load flow RATA, scfh/megawatts. Q_{ref} = Average stack gas volumetric flow rate measured by the reference method during the normal-load RATA, scfh. L_{avg} = Average unit load during the normal-load flow RATA, megawatts

In addition to determining R_{ref} or as an alternative to determining R_{ref}, a reference value of the gross heat rate (GHR) may be determined. In order to use this option, quality-assured diluent gas (O_2) must be available for each hour of the most recent normal-load flow RATA. The reference value of the GHR, $(GHR)_{ref}$, is calculated using Equation A-13a located in Appendix A to 40 CFR Part 75.

[Regulatory Citations: 40 CFR Part 75, Appendix A, Section 7.7]

5.3.2.4 Performance Specifications

The flow RATA results are acceptable if the RA is less than or equal to 10.0%. The RATA will be performed on an annual basis only if the RA for the preceding RATA was 7.5% or less for each operating load tested.

[Regulatory Citations: 40 CFR Part 75, Appendix A, Section 3.3.4 and Appendix B

5.3.2.5 Bias Test

Procedures for performing the bias test are found in Section 5.2.3.5 of this Plan.

5.3.2.6 RATA Grace Periods

RATA grace period provisions for flow monitors are addressed in Section 5.2.3.7 of this Plan.

5.3.2.7 Data Validation

Data validation for a flow RATA is the same as described in Section 5.2.3.9 for pollutant concentration monitors.

5.4 Quality Assurance Activities for COMS

The BFB boiler is an affected source under the “Boiler MACT” rules in 40 CFR Part 63, Subpart DDDDD. The facility has elected to utilize a COMS in order to demonstrate continuous compliance with the Boiler MACT particulate matter standard. The COMS is subject to the following periodic QC and QA testing:

- a daily calibration drift assessment
- a quarterly performance audit, and
- an annual zero alignment audit

The procedure for conducting daily calibration drift assessments is discussed in Section 4.5 of this Plan. Quarterly performance audits and annual zero alignment audits are discussed in the following sections.

[Regulatory Citation: 40 CFR §63.7525(c)(5)]

5.4.1 Quarterly Performance Audit

Perform a performance audit on the COMS once each QA operating quarter in accordance with Section 10.2 of Procedure 3 in 40 CFR Part 60 Appendix F. A QA operating quarter is a calendar quarter in which a unit operates at least 168 hours. If GREC achieves quality assured COMS data (i.e., all Performance Audits passed) for four consecutive quarters the auditing frequency may be reduced to semi-annual. If a performance audit is failed, GREC must resume quarterly testing for that audit requirement until it again demonstrates successful performance over four consecutive quarters.

IMPORTANT!

Since the Procedure 3 requirements do not provide a grace period for the COMS Quarterly Performance Audit, it is recommended that this audit be performed every calendar quarter (or every two calendar quarters if GREC qualifies for semi-annual testing) regardless of whether the unit has operated. However, it should be noted that the unit must be operating in order to perform an Optical Alignment Assessment [refer to Section 5.4.1.1], which is part of the overall Quarterly Performance Audit.

The performance audit consists of an optical alignment assessment, a zero compensation check, and a three-point calibration error test. Descriptions of each of these quarterly tests and associated performance specifications are provided in the following sub-sections.

The COMS is out-of-control if it fails to meet any of the applicable performance standards. The beginning of the out-of-control period is the time corresponding to the completion of the performance audit indicating unacceptable performance. The end of the out-of-control period is the time corresponding to the completion of appropriate corrective actions and subsequent successful audit (or partial audit, if applicable). During the out-of-control period the data generated by the COMS may not be used for compliance purposes nor be counted toward meeting minimum data availability.

[Regulatory Citations: 40 CFR Part 60, Appendix F, Procedure 3, Sections 3.1, 10.2, and 10.8]

5.4.1.1 Optical Alignment Assessment

The purpose of the optical alignment assessment is to verify that the transceiver and receiver are aligned properly. Temperature changes, vibration, or poor maintenance procedures may cause the alignment of these two components to shift over time. As a result, not all of the projected light will hit the reflector. Less light will be returned to the detector, and the opacity will read higher than it actually is in the stack.

Complete the optical alignment assessment prior to starting the calibration error test. If the optical alignment varies with stack temperature, perform the alignment when the unit is operating. Follow the procedure provided in Section 5.4.1 of the Durag Model D-R 290 Service and Operation Manual for step-by-step instruction on how to perform the assessment. Verify that the reflector image is centered in the “bulls eye” of the alignment sight. Adjust the alignment if necessary in accordance with the manufacturer’s instructions. Document the results of the assessment in the CEMS log book and note any alignment adjustments that were made.

[Regulatory Citation: 40 CFR Part 60, Appendix B, Performance Specification 1, Section 8.1(3) and Appendix F, Procedure 3]

5.4.1.2 Zero Compensation Check

The purpose of the zero compensation check is to assess the cleanliness of the exposed optical surfaces of the opacity monitor. The COMS is designed to automatically check the amount of particulate matter buildup on these surfaces and then electronically compensate for it by applying a correction to the stack opacity readings. U.S. EPA design specifications allow the COMS to compensate for dust up to a maximum of 4 percent opacity. The COMS is out-of-control if the zero compensation exceeds this threshold.

The instrument will alarm above a preset value of 3.5 percent opacity to warn that the optical surfaces must be cleaned. The preset alarm value can be lowered to 3.0 percent, if necessary, to provide additional lead time before the 4 percent limit is exceeded. Refer to Section 6.1.1.9 of the Durag Model D-R 290 Service and Operation Manual for instructions on how to modify the alarm setpoint.

The zero compensation check should be performed prior to starting the calibration error test. The value of the zero compensation applied at the time of the audit must be calculated as equivalent opacity and corrected to stack exit conditions according to the procedures specified by the manufacturer. Follow the procedure for performing a "window check" provided in Section 6.1.1.14 of the Durag Model D-R 290 Service and Operation Manual. Note the compensation value and clean the optics if necessary. Document the compensation value in the CEMS log book and note any cleaning that was performed. The COMS is out-of control if the zero compensation exceeds 4 percent opacity,

[Regulatory Citation: 40 CFR Part 60 Appendix F, Procedure 3]

5.4.1.3 Calibration Error Test

The purpose of the calibration error test is to demonstrate that the opacity monitor is properly calibrated and can provide accurate and precise measurements. This test is sometimes referred to as a "filter audit" because it involves placing neutral density filters (also known as calibration attenuators) into the light path so that the instrument is no longer measuring stack opacity. The filters are calibrated to produce a known response by the opacity monitor.

Details concerning performance of the calibration error test are found in Section 6.1.1.12 of the Durag Model D-R 290 Service and Operation Manual. Conduct the calibration error test using three calibration attenuators that produce outlet path length-corrected, single-pass opacity values falling within the allowable ranges shown in Table 5-7 below. The attenuators must be calibrated periodically as discussed in Section 5.4.1.4 of this Plan.

Table 5-7 Calibration Attenuator Opacity Values

Calibration Level	Opacity
Low Level	5 – 10 %
Mid Level	10 – 20 %
High Level	20 – 40 %

Prior to starting the calibration error test, the optics should be clean and a calibration cycle should be completed so that the zero compensation value will be updated. Then initiate the test by inserting each of the calibration attenuators (low, mid, and high-level) into the external audit device. While inserting each attenuator:

- ensure that the entire light beam passes through the attenuator,
- minimize interference from reflected light, and
- leave the attenuator in place for at least two times the shortest recording interval on the COMS data recorder.

Make a total of three non-consecutive readings for each attenuator. At the end of the test, correlate each attenuator insertion to the corresponding COMS response obtained from the DAHS and record both sets of values. Then subtract the single-pass calibration attenuator values corrected to the stack exit conditions from the COMS responses.

Calculate the arithmetic mean difference, standard deviation, and confidence coefficient of the five measurements using equations 1–3, 1–4, and 1–5 in Section 12.0 of Performance Specification 1, which are shown below. Calculate the calibration error as the sum of the absolute value of the mean difference and the 95 percent confidence coefficient for each of the three test attenuators using Equation 1–6. Note that the DAHS is capable of performing these calculations but the test data must be manually entered. Refer to the VIM CEMLink™6 Operator's Guide for details.

Following completion of the calibration error test, record the test results for each of the three attenuators. The COMS is out-of-control if the calibration error exceeds 3 percent opacity at any of the three levels tested.

Equation 1-3: Arithmetic Mean of the Difference	
$\bar{x} = \frac{1}{n}\sum_{i=1}^{n} x_i$	$\bar{x}$ = Arithmetic mean n = Number of data points $\sum_{i=1}^{n} x_i$ = Algebraic sum of the individual measurements

Equation 1-4: Standard Deviation	
$S_d = \sqrt{\frac{\sum_{i=1}^{n} x_i^2 - \frac{\left(\sum_{i=1}^{n} x_i\right)^2}{n}}{n-1}}$	S_d = Standard deviation of a data set n = Number of data points $\sum_{i=1}^{n} {x_i}^2$ = Algebraic sum of the square of the individual measurements $\left(\sum_{i=1}^{n} x_i\right)^2$ = Algebraic sum of differences squared

Equation 1-5: Confidence Coefficient	
$cc = \frac{t_{0.975} S_d}{\sqrt{n}}$	cc = Confidence coefficient S_d = Standard deviation of the data set n = Number of data points (test runs) $t_{0.975}$ = t value from Table 1–2 in Performance Specification 1

Equation 1-6: Calibration Error	
$Er = \lvert\bar{x}\rvert + \lvert\overline{CC}\rvert$	Er = Error $\lvert\bar{x}\rvert$ = Absolute value of the arithmetic mean $\lvert\overline{CC}\rvert$ = Absolute value of the confidence coefficient

[Regulatory Citations: 40 CFR Part 60, Appendix B, Performance Specification 1, Sections 7.1, 8.1(3)(ii), and 12; 40 CFR Part 60, Appendix F, Procedure 3, Section 10.2]

5.4.1.4 Calibration Attenuator Certification

Calibration attenuators utilized for quarterly calibration error tests must be calibrated annually by a qualified laboratory following procedures in Section 7.1 of Performance Specification 1. If two annual calibrations agree within 0.5 percent opacity, the attenuators may then be calibrated once every five years. Keep a copy of the attenuator certification results as part of the site records.

When not in use, the calibration attenuators are stored in a protective case that is maintained in a secured location either within the instrument shop or in the custody of the CEMS service firm that is contracted to perform the quarterly COMS calibration error tests.

5.4.2 Annual Zero Alignment Audit

Daily assessments of the COMS calibration are based on the simulated, rather than the actual clear-path zero. The COMS simulated zero device produces a simulated clear path condition or low-level opacity condition, where the energy reaching the detector is between 90 and 110 percent of the energy reaching the detector under actual clear path conditions. The purpose of a zero alignment audit is to confirm that the difference between the simulated and clear path zero values is maintained below 2 percent opacity.

The zero alignment audit must be conducted annually under clear path conditions. Annually is defined as a period wherein the unit is operating at least 28 days in a calendar year. In order to obtain clear path conditions, the COMS must be removed from its installed location and set up in a clean, opacity-free room. Care must be taken not to damage the instrument while moving it.

Refer to Section 10.3 of Procedure 3 in 40 CFR Part 60 Appendix F for a complete description of the regulatory requirements associated with the annual zero alignment audit. Specific instructions for performing a zero alignment may be found in the Durag Model D-R 290 Service Manual as well as the Installation and Operation Manual. There must be no adjustments to the monitor during a zero alignment audit other than the establishment of the proper monitor path length and correct optical alignment of the COMS components. In addition, either disable the automatic zero compensation mechanism prior to testing or record the amount of correction applied to the simulated zero condition.

Record the COMS response to a clear condition and to the COMS's simulated zero condition as percent opacity corrected to stack exit conditions. The difference in response to the clear path and simulated zero conditions must be recorded as the zero alignment error. The COMS is out-of-control if the zero alignment error exceeds 2 percent opacity. The beginning of the out-of-control period is the time corresponding to the completion of the zero alignment audit indicating unacceptable performance. The end of the out-of-control period is the time corresponding to the completion of appropriate corrective actions and subsequent successful audit. During the out-of-control period the data generated by the COMS may not be used for compliance purposes nor be counted toward meeting minimum data availability.

Following determination of the zero alignment error, adjust the COMS's simulated zero device to provide the same response as the clear path condition. Restore the COMS to its operating mode once the audit is complete.

As an alternative to removing the opacity monitor from the stack, the annual alignment audit may be performed on the stack provided that the monitor is capable of allowing the installation of an external audit device. Refer to Section 10.3(2) of Procedure 3 for further information concerning the restrictions placed on the use of this option. If an external audit device is utilized, the facility must perform zero alignment audits with the COMS off the stack at least every three years.

[Regulatory Citation: 40 CFR Part 60, Appendix F, Procedure 3, Section 10.3]

5.5 Historical Load Analysis

GREC will determine the upper and lower boundaries of the range of operation for the BFB boiler in accordance with 40 CFR 75, Appendix A, Section 6.5.2.1. The lower boundary of the range of operation will be the minimum safe, stable load. The upper boundary of the range of operation will be the maximum sustainable load. The maximum sustainable load is the higher of either the nameplate or rated capacity of the unit, less any physical or regulatory limitations or other de-ratings; or the highest sustainable unit load, based on at least four quarters of representative historical operating data.

The load levels for relative accuracy test audits will be as follows:

- Low- The first 30% of the range of operation
- Mid- The middle portion of the range of operation (>30% to 60%)
- High The upper end of the range of operation (>60% to 100%)

The RATA operating levels (in megawatts) are summarized in Table 5-8 below based on the current range of operation identified in the GREC monitoring plan. It is very important that the values in this table be updated whenever the upper and/or lower boundary of the range of operation is modified.

Table 5-8 RATA Operating Levels

Range of Operation		Low Operating Level[1]	Mid Operating Level[1]	High Operating Level[1]
Lower/Upper Boundary	Total Range			
81/116 MW	35 MW	81 - 91.5 MW	91.5 - 102 MW[2]	102 - 116[2]

[1] For all multi-load flow RATAs, each load level tested (e.g., mid and high) shall be separated by at least 9MW, which represents 25% of the range of operation.

[2] High-load is the designated normal load for the BFB boiler; mid-load is the secondary load level.

Identify the "normal" and optional "second normal" load level based on the operating history of the unit(s). To identify the normal load levels, determine the relative number of operating hours at each of the three load levels over the past four representative operating quarters. Determine to the nearest 0.1 percent, the percentage of the time that each load level has been used during that time-period. The DAHS has the capability to perform this analysis and generate a report of the results. Refer to the VIM CEMLink™6 Operator's Guide for details. A summary of the data used for this determination and calculated results must be kept on-site in a format suitable for inspection.

The initial load analysis for GREC was established prior to initial startup of the BFB boiler and was based on the expected or projected manner of operating the unit because no historical load data was available at the time. The historical load analysis must be repeated once four quarters of representative data become available. Thereafter, the load analysis must be repeated if the manner of operation of the unit changes significantly, such that the designated normal load(s) or the two most frequently used load levels change. A minimum of two representative quarters of historical load data are required to document that a change in the manner of unit operation has occurred.

IMPORTANT!

While not required, the load analysis should be conducted annually prior to the scheduled RATA regardless of whether a change in operation is suspected in order to assure that testing is conducted at the proper load(s).

The upper and lower boundaries of the range of operation for the BFB boiler, in units of megawatts or thousands of lb/hr of steam production, must be reported to EPA in the Part 75 electronic monitoring plan using the ECMPS Client Tool. Except for peaking units, the monitoring plan must also indicate the load level(s) designated as normal as well as the two most frequently used load levels. The monitoring plan must be updated and re-submitted as needed to reflect any changes to this information.

[Regulatory Citation: 40 CFR Part 75, Appendix A, Section 6.5.2.1]

5.6 Annual Span and Range Evaluation

The CEMS equipment specifications in Section 2.1 of Appendix A to Part 75 directs that the measurement range for each parameter (SO_2 , NO_X , O_2 , or flow rate) be set high enough to prevent full-scale exceedances from occurring, yet low enough to ensure good measurement accuracy and to maintain a high signal-to-noise ratio. To meet these objectives, the measurement range should be selected such that the majority of the readings obtained during typical unit operation are kept, to the extent practicable, between 20.0 and 80.0 percent of the full-scale range of the instrument.

To confirm that the "20-80" goal is met, a span and range evaluation must be conducted at least annually for each Part 75-affected CEMS analyzer. The span and range evaluation is performed by the Plant Engineer using the functionality inherent in the DAHS. Refer to the VIM CEMLink™6 Operator's Guide for instructions on running this evaluation. Evaluate the maximum potential concentration (MPC), maximum expected concentration (MEC), maximum potential velocity (MPV), maximum potential gas flow rates (MPF), span and range, as applicable for each monitor, in accordance with the relevant requirements in Section 2.1 of Appendix A to Part 75. The evaluation will include, at a minimum, data collected during the previous four calendar quarters. Data collected during short-term, non-representative unit operating conditions (e.g., trial burn of different fuel) can be ignored when performing the annual evaluation.

GREC will adjust the span and range setting as necessary based on the evaluation results to assure continued accuracy of the monitoring system. Span and range adjustments may be required as a result of changes in the fuel supply, changes in the manner of operation of the unit, or installation or removal of emission controls. In addition, facility management should evaluate whether any planned changes in operation of the unit may affect the concentration of emissions being emitted from the unit or stack and should plan any necessary span and range changes needed to account for these changes so that they are made in as timely a manner as practicable to coordinate with the operational changes.

If the evaluation results indicate a need to change the span or range of an analyzer, this change must be made no later than 45 days after the end of the calendar quarter when the need to adjust the span was identified. However, if the change in span renders the current calibration gases unsuitable for conducting daily calibration error tests and quarterly linearity checks, then up to 90 days after the end of the calendar quarter may be taken to make the required adjustment.

Whenever an analyzer span adjustment is made, a calibration error test is conducted. Whenever a span adjustment requires an accompanying change to calibration gas concentrations, a probationary calibration error test and a linearity check are conducted. Both the hardcopy and electronic versions of the Part 75 monitoring plan will be updated with any changes in span values. Results of the annual span and range evaluation must be maintained on-site in a form suitable for inspection.

[Regulatory Citation: 40 CFR Part 75, Appendix A, Section 2.1.1.5]

6. PREVENTIVE MAINTENANCE AND CORRECTIVE ACTIONS

6.1 Preventive Maintenance

Preventive or routine maintenance is defined by the US EPA[1] as the following: *"an orderly program of positive actions (equipment cleaning, adjustments and/or testing, lubricating, reconditioning) for preventing failure of monitoring parts and systems during their use."* The primary objective of preventive maintenance is to maintain acceptable levels of data accuracy and availability.

According to 40 CFR 60, Appendix F, the facility must develop and implement written procedures needed to maintain the CEMS in proper operating condition. This sub-section describes the preventive maintenance (PM) program being implemented at GREC to ensure reliable operation of the CEMS and COMS.

IMPORTANT!

Note that a "hands-off" calibration drift check must be performed following the completion of any maintenance. If the post-maintenance zero or calibration drift test shows excessive drift, corrective action and recalibration must be conducted to bring the CEMS and its components within specifications.

[Regulatory Citation: 40 CFR Part 75, Appendix B, Section 1.1]

6.1.1 Overview

The PM program at GREC is based on the CEMS manufacturers' recommendations as well as operating experience. The program is comprised of a list of routine maintenance tasks and a schedule for accomplishing those tasks. It also includes maintenance procedures that are intended to assure that certain tasks are performed correctly and in a consistent manner. Maintenance of an adequate spare parts inventory is addressed in order to minimize the duration of planned and un-planned CEMS maintenance outages. Lastly, recordkeeping requirements are incorporated in order to provide documentation that required tasks were completed properly.

For a new monitoring system, the PM program primarily reflects the CEMS manufacturers' recommendations. Once operational experience is gained with the system, the PM program must be periodically updated in response to equipment malfunctions, test results, and

[1] Environmental Protection Agency, 1977, (6/1/86 update). Continuous Emission Monitoring (CEM) Systems Good Operating Practices. **Section 3.0.9. Quality Assurance Handbook for Air Pollution Measurement Systems, Volume III --- Stationary Source Specific Methods.** EPA 600/4-77-027b.

observations made during scheduled operational checks. Procedures may need to be modified, new PM tasks added or existing ones eliminated, and the frequency adjusted in order to accomplishing the goals of the PM program while at the same time utilizing resources efficiently. For example, filters may need to be changed more often in a "dirty" environment or less often under "clean" conditions. Adjustment to the PM program should be made within a reasonable amount of time once the need for change is identified, but in no case later than the annual QA/QC plan review.

6.1.2 Preventive Maintenance Procedures

Preventive maintenance procedures generally fall into two categories: standard operating procedures (SOPs) and manufacturer's instructions. SOPs are developed in-house by plant personnel to cover certain critical preventive maintenance activities and are specific to the CEMS/COMS installed at GREC. In addition to step-by-step instructions for performing the task(s) of interest, an SOP also addresses safety precautions, equipment and supplies needed to perform the task, and references to external documents that may be relevant to the SOP. SOPs developed by GREC are included in Appendix A of this Plan.

SOPs need not be written to address every PM task. Many tasks are adequately addressed through the use of manufacturer's instruction manuals or other technical documents. In such cases, the technicians should be directed to utilize these procedures by referencing them in the QA/QC Plan or the relevant SOP.

6.1.3 Maintenance Schedules

The PM schedule being implemented at GREC is summarized in Appendix C of this Plan. This schedule contains lists of PM tasks to be completed on a daily, weekly, and quarterly basis. Whenever possible, quarterly maintenance tasks should be completed immediately prior to conducting scheduled quarterly QA audits (i.e., CGA's, linearity tests, and RATA's).

Frequency of maintenance depends on many variables such as geographic location (humidity and seasonal temperature fluctuations), fuel type, stack temperature and moisture content, etc. Consequently, scheduled maintenance intervals may vary from the general guidelines given in the CEMS Operation and Maintenance (O&M) manual and the individual component equipment manuals.

Some items, such as filter checks, may not exhibit a failure condition until damage has occurred to other components. Initially, these items will require careful and frequent checking to determine replacement frequency specific to individual applications. Any changes of the operating characteristics of the system should trigger a maintenance response to prevent loss of data and/or equipment damage. This includes paying attention to any shift (sudden or prolonged) in one direction and close observation of the visual indicators in the system.

6.1.4 Spare Parts

GREC maintains an inventory of recommended repair parts for the CEM and COM systems to adequately meet the normal operating requirements and to maintain a functional system in sound operation at least 95% of the time. The existing inventory allows sufficient time for re-ordering and receiving replacement parts. The inventory of spare parts should be reviewed semi-annually to ensure an adequate supply. Appendix D contains a complete list of recommended spare parts that should be maintained to the extent possible by either GREC or the CEMS service contractor.

6.2 Corrective Actions

Corrective maintenance (also termed corrective action or non-routine maintenance) is required when the system or part of the system fails. The failure may be discovered during normal operation, during a daily operation check, while conducting scheduled preventive maintenance, or it may be discovered during a performance audit. Appendix CEMS of the facility air permit states that failure to take corrective actions to remedy CEMS malfunctions are considered violations of the permit.

According to 40 CFR 60, Appendix F, the facility must develop and implement written procedures that establish a program of corrective action for malfunctioning CEMS. This sub-section describes the corrective action program being implemented at GREC for the purpose of minimizing equipment downtime.

6.2.1 Corrective Action Procedures

CEMS troubleshooting and corrective maintenance are performed as needed by the Instrument Technicians based on observations made during daily operational checks, the results of QC testing, QA audits, or monitoring system malfunctions. In the event of a monitoring system malfunction, the Instrument Technicians assess the nature of the malfunction and initiate troubleshooting and/or corrective action. In performing corrective maintenance, Instrument Technicians follow established procedures/guidelines contained in the CEMS O&M manuals and other available references. Corrective actions are followed by a “hands off” calibration error test of the affected monitor as a minimum. Additional tests may be required depending on the nature of the corrective actions. Refer to Section 7 of this Plan for information concerning the diagnostic or recertification testing that may be required.

If the Instrument Technician is unable to diagnose the malfunction or repair the component, a manufacturer's service representative or CEMS service contractor is contacted to assist in resolving the issue. If an analyzer must be returned to the manufacturer for repair, a "like-kind" replacement analyzer may be used in its place for up to 720 operating hours. Refer to Section 6.4 of this Plan for information concerning like kind replacement analyzers.

6.2.2 Response to Alarms

Monitoring system malfunctions are often identified through alarms generated by the DAHS. Control Room Operators are responsible for monitoring CEMS and COMS alarms and notifying Instrument Technicians and the Plant Engineer if necessary. While CEMS alarms indicate that service is required, they do not necessarily indicate that the collected data is invalid. The alarms do indicate that the system is operating outside of design tolerance and incorrect data and/or equipment damage may occur if the system continues operation without corrective action. For this reason, the alarms themselves should be tested on a regular basis to assure that they are operating as designed. All alarm conditions require prompt attention and resolution.

6.2.3 Recordkeeping and Reporting

Corrective action is generally associated with system breakdown or instrument failure. In these situations, data from the CEM/COM system is often invalidated and considered "downtime" for reporting purposes. In addition to providing a log book entry (refer to Section 8.3.1 of this Plan), Instrument Technicians must enter a reason for all system downtime into the DAHS along with a brief description of the corrective action(s) taken to repair the system. These reason and action "codes" are included in the quarterly emission reports that are submitted to the FDEP and US EPA. All reason codes must correspond to one of the standard reasons listed in the summary report shown in Figure 1 from 40 CFR 60.7(d). Guidance for proper selection of reason codes has been provided by the US EPA[2]. There are no restrictions on entering actions other than that they should be brief while adequately describing the corrective action that was taken.

Note that if CEMS or COMS data is excluded from a compliance determination due to a malfunction, the quarterly excess emission reports discussed in Sections 8.3.3 and 8.3.4 of this Plan must include (1) a description of the malfunction, (2) the actual emissions recorded, and (3) the actions taken to correct the malfunction. Proper entry of reason and action codes as discussed in the previous paragraph will meet requirements (1) and (3).

6.3 Minimizing Downtime

It is important to minimize monitor downtime during maintenance activities because excessive downtime has a negative effect on system availability. Appendix CEMS of the facility air permit

[2] Environmental Protection Agency, 1986. Handbook for the Review of Excess Emission Reports, Pgs. 52-56. EPA 340/1-86-011

requires a minimum CEMS monitor availability of 95 percent or greater be achieved during any calendar quarter in which the unit operates for more than 760 hours. In the event the applicable availability is not achieved, GREC must provide the FDEP with a report identifying the problems in achieving the required availability and a plan of corrective actions that will be taken to achieve 95 percent availability. Continued failure to achieve the minimum monitor availability is considered a violation of the permit.

The most effective way to minimize monitor downtime is through implementation of an effective preventive maintenance program (see Section 6.1 of this Plan). Inevitably, even well-maintained systems will periodically require emergency or breakdown repairs. However, there are a number of strategies that can be followed to minimize the duration of both routine and non-routine maintenance:

- All necessary spare parts, tools, and equipment should be available to the persons responsible for the upkeep of this system at all times. Spare parts are addressed in Section 6.1.4 of this Plan, while the SOPs in Appendix A of this Plan contain lists of equipment and supplies needed to complete the specific tasks addressed in those procedures. For other tasks, consult the individual component equipment manuals for guidance concerning necessary tools and equipment and supplies.

- Much of the CEMS servicing requires placing the system in maintenance mode to perform the work. Leave the system in maintenance mode for only as long as needed to perform the necessary maintenance or repair activity. Return the system to normal sampling mode as soon as possible.

- Some maintenance can be performed while the CEMS is operating without affecting data integrity or system availability. This is often the case for simple tasks like filter replacements that can be accomplished in a short period of time (i.e., less than 30 minutes). In these cases, be aware of the relevant data validation requirements [40 CFR §75.10(d) and §60.13(h)] and try to time the maintenance activity such that there is at least one valid data point in each quadrant of the hour. Starting the maintenance one or two minutes following the beginning of a quadrant (i.e., 1, 16, 31, or 46 minutes after the hour) will increase the likelihood of achieving this goal.

- For more extensive routine maintenance, a good way to minimize downtime is to take advantage of planned or unplanned source shutdowns, such as trips or maintenance outages.

- Infrequently, the only option available to repair an analyzer is to return it to the manufacturer. This could take several days and result in excessive downtime that would require a report to the FDEP. The facility may consider use of a “like kind” replacement analyzer in these situations. Refer to Section 6.4 below for additional information concerning like-kind analyzers.

- When corrective actions trigger a requirement to re-certify a Part 75 monitoring system, utilize the Part 75 conditional data validation provisions in §75.20(b)(3) to avoid an extended period of missing data. Refer to Section 7.8 of this Plan for additional details.

- Maintain the DAHS in operational status at all times.

6.4 Like-Kind Analyzers

6.4.1 Temporary CEMS Analyzers

Part 75 regulations allow the use of “like-kind” analyzers on a temporary basis without requiring such analyzers to undergo recertification testing. This is useful when the primary analyzer must be returned to the CEMS integrator or manufacturer for repairs. For GREC, the like-kind analyzer provision applies only to the Part 75 analyzers: SO_2, NO_X, O_2, and flow. Use of a like-kind analyzer for CO will require prior approval from FDEP.

A like-kind replacement analyzer is one that uses the same method of sample collection (dilution-extractive, dry extractive, or in-situ) and analysis (for example, pulsed fluorescence, UV fluorescence, chemiluminescence) as the analyzer that it replaced. A temporary like-kind replacement analyzer must also use the same probe and interface as the primary system and have the same span value. The full-scale range need not be identical, but must meet the guidelines in Section 2.1 of Appendix A to Part 75.

In general, a linearity check must be passed each time a temporary like-kind replacement analyzer is brought into service. Data from the monitoring system or analyzer are considered invalid until the linearity test is passed, unless a probationary calibration error test is performed and passed when the system or analyzer is brought into service. In that case, data from the system or analyzer may be considered "conditionally valid" for up to 168 unit operating hours (beginning at the hour of the probationary calibration error test), provided that a successful linearity test is completed within the 168 operating hour window. If the analyzer fails the linearity check, then the data is invalid until the completion of a successful linearity check. For flow monitors replaced with like-kind analyzers, the replacement analyzer need only pass a calibration check prior to use for recording and reporting emissions.

In each quarter that a temporary like-kind replacement analyzer is used for data reporting, it must be represented in the electronic monitoring plan as a component of the primary monitoring system, and must be assigned a component ID that begins with the letters "LK" (e.g., "LK3"). Hourly data from the like-kind replacement analyzer are reported under the primary monitoring system ID number, and a method of determination code (MODC) of "17" must be reported. Any time a like-kind replacement analyzer is in service, the data must reflect the bias adjustment factor determined during the most recent RATA for the primary monitoring system.

A like-kind replacement analyzer can monitor a parameter for up to 720 cumulative operating hours per unit in any calendar year. To use a temporary like-kind replacement analyzer more than 720 hours per year at a particular unit or stack location, the monitoring plan must be updated, re-designating the analyzer as a component of a regular non-redundant backup system, and a RATA must be passed at that unit or stack location.

Refer to §75.20(d)(2)(ii) and Question 7.13 in the Part 75 Emissions Monitoring Policy Manual for additional details regarding like-kind replacement analyzers.

[Regulatory Citation: 40 CFR §75.20(d)(2)]

6.4.2 Temporary Opacity Monitors

In the event that the certified opacity monitor has to be removed for extended service, a temporary replacement monitor may be installed to obtain required opacity emissions data. Use of the temporary monitor is limited to no more than 1080 hours (45 days) of operation per year. After that time, the analyzer must complete a full certification according to PS–1 prior to further use as a temporary replacement monitor. Once a temporary replacement monitor has been installed and required testing and adjustments have been successfully completed, it cannot be replaced by another temporary replacement monitor to avoid the full PS–1 certification testing that is required after 1080 hours (45 days) of use.

Prior to use, the temporary monitor must have be certified according to ASTM D6216–12 and a Manufacturer's Certificate of Conformance (MCOC) must be provided. In addition, Procedure 3 of 40 CFR Part 60 Appendix F requires that the following actions be taken before data generated by the temporary monitor is considered valid:

- Successfully complete an optical alignment assessment and status indicator assessment following installation;
- Successfully complete an off-stack clear path zero assessment and zero calibration value adjustment procedure;

- Successfully complete an abbreviated zero and upscale drift check consisting of seven zero and upscale calibration value drift checks which may be conducted within a 24-hour period with not more than one calibration drift check every three hours and not less than one calibration drift check every 25 hours;
- Successfully complete a three-point calibration error test;
- Update the upscale reference calibration check value of the new monitor in the associated data recording equipment;
- Verify the overall calibration of the monitor and data recording equipment; and
- Documented all of the above required actions in the maintenance log.

[Regulatory Citation: 40 CFR Part 60, Appendix F, Procedure 3, Section 10.6]

7. RECERTIFICATION AND DIAGNOSTIC TESTING

Whenever a replacement, modification, or other change is made to a monitoring system that may affect the ability of the system to accurately measure emissions, the system must be recertified. Also, changes to the flue gas handling system or manner of unit operation that affect the flow profile or the concentration profile in the stack may trigger recertification. Examples of situations that require recertification of Part 75 monitoring systems include:

- Replacement of an analyzer.
- Replacement of an entire CEMS.
- Change in the location or orientation of a sampling probe

Changes resulting from routine or normal corrective maintenance or QA activities do not require recertification. Similarly, software modifications in the automated DAHS do not require recertification when the modifications do not affect missing data substitution or calculation formulas.

Section 75.20(b)(1) of 40 CFR 75 specifies that for recertification, the same series of tests that were performed during the initial certification test program must be repeated unless otherwise approved by the local Administrator. Note that in some instances, the EPA may require less than the full battery of tests in a recertification event.

Not all changes made to a certified monitoring system require recertification. In many cases, only diagnostic testing is required to ensure that the system continues to provide accurate data. Diagnostic tests are those tests required to verify that a CEMS is operating accurately following certain preventive or corrective maintenance procedures.

For a more thorough discussion of recertification and diagnostic testing requirements applicable to Part 75 CEMS, see §75.20(b) and EPA's *Part 75 Emissions Monitoring Policy Manual*. Please note that Part 60 regulations are largely silent concerning this topic, and consequently it may be difficult to determine the appropriate course of action whenever a replacement, modification, or other change is made to the CO CEMS. In these cases the Instrument Technician should contact the Plant Engineer for clarification. Possible alternatives include following the relevant recommendations in the Part 75 Policy Manual guidance and/or contacting FDEP for guidance.

[Regulatory Citation: 40 CFR §75.20(b)]

7.1 Recertification and Diagnostic Test Policy

EPA has developed a policy that clarifies the types of changes to a monitoring system that may "significantly affect the ability of the system to accurately measure or record" emissions or flow rate and therefore require recertification testing or less stringent diagnostic testing. This policy is summarized in series of tables presented in Question 12.10 of EPA's *Part 75 Emissions Monitoring Policy Manual.* These tables are reproduced in Appendix E of this Manual. They list common CEMS maintenance and repair activities that trigger either diagnostic tests or full recertification and outline the appropriate tests to be performed for each event.

IMPORTANT!

The Recertification and Diagnostic Test Policy tables in Question 12.10 do not address every situation that may arise. Contact the EPA Clean Air Markets Division concerning maintenance or repair activities that are not listed in the tables.

[Citation: Question 12.10 in EPA Part 75 Emissions Monitoring Policy Manual (2013)]

7.2 Conditional Data Validation

When a significant change is made to a CEMS (e.g., replacement of an analyzer) and the system must be recertified, the CEMS must pass a series of recertification tests before it can be used to report quality-assured data. In most cases, recertification takes at least 7 days (since a 7-day calibration error test is usually one of the required tests). While the recertification tests are in progress the requirement to report emissions data for every unit operating hour remains in effect. Without regulatory relief, this could result in an extended period of missing data substitution, and possible loss of allowance credits.

To alleviate this situation, Part 75 allows conditional data validation to be used for recertification events. Conditional data validation provides a means of minimizing the use of substitute data while a CEMS is being recertified. To take advantage of this rule provision, a calibration error test must be performed as soon as the monitoring system is ready to be tested. This is called a "probationary calibration". If the probationary calibration is passed, data from the CEMS are assigned a conditionally valid status from that point on, pending the results of the recertification tests. The period of time beginning with the probationary calibration error test and ending with successful completion of all required recertification tests is known as the recertification test period.

If the required recertification tests are then performed and passed within a certain time frame, with no test failures, all of the conditionally valid data recorded by the CEMS from the date and hour of the probationary calibration to the date and hour of completion of the required tests may be reported as quality-assured. If one of the major recertification tests (such as a linearity check or RATA) is failed, then all of the conditionally valid data are invalidated and missing data substitution must be used until all of the required tests have been successfully completed, or until corrective actions are taken and a new period of conditional data validation is initiated. The tests required in the new recertification test period include any tests required for the initial recertification test period that were not successfully completed as well as any recertification or diagnostic tests that are required as a result of changes made to the CEMS to correct the problems that caused the failed recertification test(s). Data validation procedures associated with use of condition data validation is described in Section 7.8 of this Plan.

As is the case for initial certifications, all recertification and diagnostic tests must be performed "hands-off." In addition, routine daily calibration error tests must be performed throughout the recertification test period.

Part 75 extends the use of conditional data validation beyond recertification events. Conditional data validation is also useful when:

- Monitor repair or maintenance activities are performed that trigger diagnostic test requirements; or
- A routine QA test, such as a linearity check or RATA is failed or aborted due to a problem with the monitoring system and the test must be repeated.

In these instances if a probationary calibration is done following corrective actions, conditional data validation may be used until the required diagnostic or QA test has been completed.

[Regulatory Citation: 40 CFR §75.20(b)(3)]

7.3 Notifications and Reporting

GREC will notify EPA and FDEQ no later than the second business day after the need for recertification has been determined. The Owner's Representative, as the Designated Representative for the unit, will submit a notice of the recertification testing dates to CAMD at least 45 days prior to the testing dates. If adjustments are made to the reported test schedule, the Designated Representative will notify EPA of the changes by telephone at least seven (7) days prior to the first scheduled day of testing. However, under emergency conditions when testing is required following an uncontrollable equipment failure that results in lost data, notification is sufficient if provided within two business days following the date when testing is scheduled. Whenever a CEMS or system component fails the certification or recertification test, the test may be repeated immediately without advance notification.

Within 45 days of completing recertification tests, the Designated Representative, or alternate, will submit a recertification application to EPA CAMD using the ECMPS Client Tool. The application will be electronically formatted and will include the following information:

- Any changes to the previous Monitoring Plan for the applicable unit (consistent with the requirements of 40 CFR Part 75).
- Recertification test results, including the type of tests performed, test dates, and test results (including failed tests).
- If applicable, test results for verifying the accuracy of the emission calculations conducted by the DAHS.

In addition to the electronic submittal, a hardcopy recertification application must be submitted to the EPA Regional Office and FDEP unless a waiver has been issued by either or both entities. The hardcopy application is also due within 45 days of completing all recertification tests and must contain the information specified in §75.63(b)(2).

The CEMS, DAHS, or other system component is deemed provisionally certified by EPA for 120 days beginning with the completion date of the recertification audits. During this time, EPA reviews the application and notifies the Designated Representative if the application is rejected. If the recertification application is disapproved by the Administrator, the data are invalidated from the hour in which the probationary calibration error test was completed until a subsequent probationary calibration error test is passed, thereby initiating a new recertification period. All recertification test and other requirements specified in the notice of disapproval must be completed no later than 30 unit operating days after the disapproval issuance date. The Designated Representative is required to provide notification of the new recertification test dates and to submit a new recertification application.

Note that diagnostic tests are not subject to the notification requirements described above for recertification testing. The results of diagnostic tests are reported electronically using the ECMPS Client Tool, but a hardcopy report is not required for Part 75 purposes. However, remember to submit the results of any tests along with the quarterly excess emissions report if required.

[Regulatory Citations: 40 CFR §§75.20 and 75.63]

7.4 Recertification and Diagnostic Procedures for CEMS

This section provides a brief description of the tests that may be required for recertification or diagnostic test events for the SO_2, NO_X, and CO_2 CEMS. A more detailed description of these tests can be found in 40 CFR Part 75, Appendix A, Section 6. Consult Appendix E of this Plan to determine which tests are required for a specific maintenance activity.

Note that some of these tests (linearity, RATA, and bias tests) are familiar because they are performed regularly to satisfy Part 75 QA requirements, while others (7-day calibration error and cycle time tests) are performed infrequently and may not have been done at all since initial certification.

[Regulatory Citations: 40 CFR §§75.20(c)(1) and (4)]

7.4.1 Linearity Check

The purpose of this test is to verify that the response of a gas monitor is linear across its range. The procedure for performing a linearity check, when required for recertification, can be found in Section 6.2 of Appendix A to Part 75. Linearity checks are also discussed in Section 5.2.1 of this Plan.

Note that an abbreviated linearity check may be allowed in place of the equivalent full test in some situations. The Addendum to Question 12.10 in EPA's *Part 75 Emissions Monitoring Policy Manual* describes the procedure for performing an abbreviated linearity check.

[Regulatory Citation: 40 CFR Part 75, Appendix A, Section 6.2]

7.4.2 7-Day Calibration Error Test

The purpose of this test is to evaluate the accuracy and stability of a gas monitor's calibration over an extended period of unit operation.

The 7-day calibration error test procedure involves challenging the CEMS once at each of two gas concentration levels (normally zero and high-level) while the unit is combusting fuel. The test is performed once per day at 24-hour intervals for seven consecutive unit operating days. The nominal concentrations of audit gases for the 7-day calibration error test are the same as those normally used for routine daily calibration error testing.

For the SO_2 and NO_X analyzers, results of this test are acceptable if the calibration error does not deviate from the reference value of either the zero or upscale calibration gas by more than 2.5 percent of the span of the instrument. For instrument spans below 200 ppm, then calibration error test results are also acceptable if the absolute value of the difference between the monitor response value and the reference value does not exceed 5 ppm.

For the O_2 monitors (including O_2 monitors used to measure CO_2 emissions or percent moisture) results of this test are acceptable if the calibration error does not deviate from the reference value of the zero or upscale calibration gas by >0.5 percent O_2 as calculated using the term |R−A| in the numerator of Equation A-5 of 40 CFR Part 75 Appendix A.

[Regulatory Citation: 40 CFR Part 75, Appendix A, Section 6.3]

7.4.3 Cycle Time Test

The purpose of this test is to determine whether a gas monitoring system is capable of completing at least one cycle of sampling, analyzing, and data recording every 15 minutes.

The cycle time test procedure involves determining both the downscale and upscale cycle times. With the analyzer measuring flue gas at a stable emission value, a zero-level calibration gas is injected at the sampling probe. The time it takes for 95.0 percent of the step change to be achieved between the stable stack emissions value and the stable ending zero gas reading is recorded as the downscale cycle time. This process is repeated, starting with stable stack emissions and injecting the high-level calibration gas, to determine the upscale cycle time. Section 6.4 of Appendix A defines how stable starting and ending values are determined. For dual-range analyzes, a cycle time test must be completed on both ranges.

The cycle time test results are acceptable if none of the response times exceed 15 minutes.

[Regulatory Citation: 40 CFR Part 75, Appendix A, Section 6.4]

7.4.4 RATA

This test compares emissions data recorded by a CEMS gas monitor to data collected concurrently with an EPA emission test method. The procedure for performing a RATA, when required for recertification, can be found in Section 6.5 of Appendix A to Part 75. RATAs are also discussed in Section 5.2.3 of this Plan.

[Regulatory Citation: 40 CFR Part 75, Appendix A, Section 6.5]

7.4.5 Bias Test

The SO_2 concentration and NO_X-diluent RATA results will be analyzed for bias and the appropriate bias adjustment factor will be determined in accordance with the procedures specified by Section 7.6 of Part 75 Appendix A. The purpose of this test is to determine whether a monitoring system is biased low with respect to the reference method, based on the RATA results. Section 7.6 also specifies the pass criteria for the bias test. If a low bias is found, a bias adjustment factor (BAF) must be calculated and applied to the subsequent hourly emissions data.

[Regulatory Citation: 40 CFR Part 75, Appendix A, Section 7.6]

7.5 Recertification and Diagnostic Procedures for Flow Monitors

This section provides a brief description of the tests that may be required for recertification or diagnostic test events for the flow monitor. Detailed descriptions of the test procedures can be found in 40 Section 6 of Appendix A to Part 75. Consult Appendix E of this Manual to determine which tests are required for a specific maintenance activity.

Note that most of these tests are familiar because they are performed regularly to satisfy Part 75 QA requirements, while the 7-day calibration error test is performed infrequently and may not have been done at all since initial certification.

[Regulatory Citation: 40 CFR §75.20(c)(2)]

7.5.1 Flow RATA

This test compares emissions data recorded by the CEMS flow monitor to data collected concurrently with an EPA emission test method. The procedure for performing a flow monitor RATA, when required for recertification, can be found in Section 6.5 of Appendix A to Part 75. Flow RATAs are also discussed in Section 5.3.2 of this Plan.

[Regulatory Citation: 40 CFR Part 75, Appendix A, Section 6.5]

7.5.2 Bias Test

RATA results for the flow monitor must be analyzed for bias in accordance with the procedures specified by Section 7.6 of Appendix A to Part 75. The purpose of the bias test is to determine whether a monitoring system is biased low with respect to the reference method, based on the RATA results. Section 7.6 of Appendix A also specifies the pass criteria for the bias test. If a low bias is found, a bias adjustment factor (BAF) must be calculated and applied to the subsequent hourly flow data.

[Regulatory Citation: 40 CFR Part 75, Appendix A, Section 7.6]

7.5.3 Abbreviated Flow-to-Load Test

An abbreviated flow-to-load ratio test may be conducted following any documented repair, component replacement, or other corrective maintenance to a flow monitor to demonstrate that the repairs have not significantly affected the monitor's ability to measure volumetric flow. This test may not be used following changes affecting the linearity of the flow monitor, such as adjusting the K factor(s).

A probationary calibration error test must be performed before starting an abbreviated flow-to-load ratio test, thereby initiating a conditionally valid data period. The abbreviated test must be completed within 168 cumulative operating hours of the probationary calibration error test.

During the test, operate the unit such that operating conditions during the most recent normal load RATA are duplicated to the extent possible. To accomplish this, 40 CFR Part 75 recommends that:

- the operating load should be held constant to within ±10.0% of the average load during the most recent RATA; and
- The diluent gas concentration should be maintained within ±0.5% O_2 of the average diluent concentration during the most recent normal load RATA.

After setting the process parameters, record a minimum of six and a maximum of twelve consecutive hourly average flow rates. Record the corresponding hourly load values and, if applicable, the hourly diluent gas concentrations. Calculate the flow-to-load ratio for each hour in the test hour period, using Equation B-1 of 40 CFR Part 75, Appendix A. Determine E_h for each hourly flow-to-load ratio (or GHR), using Equation B-2 of Appendix A and then calculate E_f, the arithmetic average of the E_h values. Refer to Section 5.3.1 of this Plan for detailed instructions on how to perform these calculations.

The results of the abbreviated test are acceptable and no further action is required if the test results meet the applicable limits. All conditionally valid data will be considered quality-assured beginning with the hour of completion of the probationary calibration error test. If, however, the abbreviated flow-to-load test results are unacceptable then a normal load RATA is required and the flow monitor data are considered invalid back to the hour of completion of the probationary calibration error test. Another probationary calibration error test may be conducted to initiate another conditionally valid data period until completion of the required RATA.

[Regulatory Citation: 40 CFR Part 75, Appendix B, Section 2.2.5.3]

7.5.4 Leak Check

The procedures for performing a leak check may be found in Standard Operating Procedure CEMS-02 in Appendix A of this Plan.

7.5.5 7-Day Calibration Error Test

The procedure for performing a 7-day calibration error test of a flow monitor, when required for certification, recertification, or diagnostic testing, can be found in Section 6.3.2 of Appendix A to Part 75. The test is conducted while the unit is operating once each unit operating day. The interval between each daily test should be as close to 24 hours as practicable. In the event that unit outages occur after the commencement of the test, the 7 consecutive operating days need not be 7 consecutive calendar days.

Introduce two reference signals to the probe tip (or equivalent), or to the transducer corresponding to the following values: (1) 0.0 to 20.0% of span and (2) 50.0 to 70.0% of span. Record flow monitor responses to the reference signals using the DAHS. Calculate the calibration error using Equation A-6 of 40 CFR Part 75, Appendix A. Do not perform any corrective maintenance, repair, or replacement upon the flow monitor during the 7-day test period. Do not make adjustments between the zero and high reference level measurements on any day during the 7-day test.

For the flow monitor, results of this test are acceptable if the calibration error does not exceed 3.0 percent of the calibration span value of the instrument, as calculated using Equation A-6 of Appendix A. The calibration error test results are also acceptable if $|R-A|$, the absolute value of the difference between the monitor response and the reference value in Equation A-6 of Appendix A, does not exceed 0.01 inches of water.

Record all maintenance activities and the magnitude of any adjustments. Record output readings from the data acquisition and handling system before and after all adjustments. Record and report all calibration error test results using the unadjusted flow rate measured in the calibration error test prior to resetting the calibration. Record all adjustments made during the 7-day period at the time the adjustment is made and report them in the certification or recertification application.

[Regulatory Citation: 40 CFR Part 75, Appendix A, Section 6.3.2]

7.6 Recertification and Diagnostic Testing for COMS

The EPA Recertification and Diagnostic Test Policy previously described in Section 7.1 of this Plan does not address the COMS. However, Procedure 3 of 40 CFR Part 60 Appendix F requires that the COMS corrective action program establish what diagnostic testing must be performed after each type of maintenance or repair activity to ensure that the COMS is collecting valid, quality-assured data. Although Procedure 3 doesn’t mandate a specific set of COMS diagnostic tests, EPA has developed a separate guidance document that lists suggested diagnostic test(s) for each type of activity. GREC will follow these recommendations, which are included in Appendix F of this Manual. Procedures for performing COMS diagnostic tests that are mentioned in the EPA guidance may be found in the following locations:

- Sections 4.5 and 5.4 of this Manual
- Performance Specification 1 in Appendix B to 40 CFR Part 60, “*Specifications and Test Procedures for Continuous Opacity Monitoring Systems in Stationary Sources*”

- ASTM D 6216–98, "*Standard Practice for Opacity Monitor Manufacturers to Certify Conformance with Design and Performance Specifications*"

The EPA guidance document discussed above addresses only diagnostic testing, not recertification testing. However, 40 CFR §75.20(b) states that "the owner or operator shall recertify a continuous opacity monitoring system whenever the monitor path length changes or as required by an applicable State or local regulation or permit." EPA Performance Specification 1 lists all of the QA tests that the COMS must successfully complete as part of a full recertification.

[Regulatory Citations: Part 60, Appendix B, Performance Specification 1; Part 60, Appendix F, Procedure 3, Section 10.5 and 40 CFR §75.20(b)]

7.7 Data Acquisition and Handling System Verification

The purpose of the DAHS verification is to ensure that all emissions calculations are being performed correctly and that the missing data routines are being applied properly.

Two tests are required as part of the DAHS verification:

- Formula Verification Test – verifies proper computation of hourly averages for pollutant concentrations, pollutant emission rates, and pollutant mass emissions.

- Missing Data Substitution Test – verifies proper computation and application of the Part 75 missing data substitution procedures.

Results of the formula verification test are considered acceptable if all Part 75 emission calculations are performed accurately for a single hour of operating data. The missing data substitution test requirement will be satisfied by installing a standard software package which has been thoroughly tested by the developer for conformance with the Part 75 missing data algorithms. The developer will provide an official statement (e.g., a certificate or a letter from the appropriate corporate official) certifying that the missing data software meets the requirements of Part 75. This statement will be included with the initial certification application.

[Regulatory Citation: 40 CFR 40 CFR §75.20(c)(10)]

7.8 Data Validation for Diagnostic and Recertification Testing

The requirement to monitor and report emissions data for every unit operating hour remains in effect while diagnostic or recertification testing is in progress. In these circumstances, the facility should utilize the Part 75 conditional data validation provisions in §75.20(b)(3) to avoid an extended period of missing data and possible loss of allowance credits.

To take advantage of the conditional data validation provisions a "probationary" calibration error test must be performed after completing all required corrective maintenance as soon as the monitoring system is ready to be tested. If the probationary calibration is passed, data from the CEMS are assigned a conditionally valid status from that point on, pending the results of the diagnostic or recertification tests. Provided that all required diagnostic or recertification tests are successfully completed within the specified time periods, all the conditionally valid data collected by the CEMS is considered to be quality-assured data. Each required test must be completed no later than the following number of unit operating hours (or unit operating days) after the probationary calibration error test that initiates the test period:

- 168 consecutive unit operating hours for linearity tests and/or cycle time test,
- 720 consecutive unit operating hours for RATAs, and
- 21 consecutive unit operating days for a 7-day calibration error test.

If a recertification test (with the exception of a 7-Day calibration error test) is failed or aborted due to a problem with the CEMS, then all the conditionally valid data recorded by the CEMS is invalidated from the hour of completing the probationary calibration error test until the hour in which a subsequent probationary calibration error test is passed after performing corrective action. The failure of a 7-Day calibration error test during a recertification test period does not invalidate conditionally valid data unless the test results exceed twice the applicable performance specification.

A daily calibration error test shall be performed during the recertification test period. If a routine daily calibration error test is failed (i.e., calibration exceeds twice the applicable performance standard) during the recertification test period, then the applicable CEMS is out-of-control. The conditionally valid data are prospectively invalidated from the hour of the failed calibration error test until the hour in which a calibration error test is passed, thereby resuming the conditionally valid status. If a daily calibration error test is failed or missed during a recertification period, then no further recertification test can be conducted until a subsequent calibration error test is performed. The subsequent calibration error test re-establishes the conditionally valid data status. If a calibration error test is failed during the performance of a linearity check or RATA, these tests must be restarted.

Following are the data validation requirements for recertification tests that are not completed within the specified time period.

- For a late 7-day calibration error test, the CEMS data are invalidated from the hour of expiration of the recertification period until the hour of completion of the late test, regardless if it is passed on the first attempt or not.

- If a late linearity test, cycle time test, or RATA is successfully completed on the first attempt, then the CEMS data are invalidated from the hour of expiration of the recertification test period until the hour of completion of the late test.

- If a late linearity test, cycle time test, or RATA is failed on the first attempt, then the CEMS data are invalidated from the hour of the original probationary calibration error test. Under these circumstances, the CEMS data remains invalid until the successful completion of any late recertification test(s).

Results of each required diagnostic or recertification test will be entered into the CEMS Maintenance Log. Entries in the Maintenance Log will be reviewed by responsible facility managers and supervisors to ensure that the entries are complete and that all required tests have been completed. Additionally, the review serves to ensure that data is properly validated during diagnostic or recertification test periods.

[Regulatory Citation: 40 CFR 40 CFR §75.20(b)(3)]

8. DATA RECORDING, CALCULATIONS, AND REPORTING

8.1 Data Recording

The CEMS is provided with a data acquisition and handling system (DAHS) to provide automated data monitoring and management capabilities to the CEMS. The DAHS consists of two primary hardware components: a system controller, which provides timing and control of the sampling system in addition to performing limited data processing and short term data storage; and a personal computer (PC), which does more complete data processing and long term data storage as well as report generation. A data flow diagram is displayed in Figure 4 that shows the overall design of the DAHS. A description of the DAHS is provided in the following paragraphs.

CEMS system control functions are provided by a programmable logic controller (PLC). The PLC, which is housed in the CEMS shelter, performs the minimum functions described in Section 3.2.5 of this Plan.

The digital outputs of the CEMS instruments and certain plant process data from the plant distributed control system (DCS) are initially transmitted to the PLC in real time every 10 seconds- and converted to one-minute averages. Following initial storage and processing by the PLC this data is communicated to the DAHS PC via an Ethernet connection. One-minute averages are the basic unit used by the DAHS to build 15-minute and 1-hour block averages in accordance with Appendix CEMS, Condition 14 of the AC Permit.

The DAHS utilizes software developed by VIM Technologies, Inc. running on a Windows™ platform. The VIM software, called CEMLink™6, is utilized for operator interface, data entry/storage, report generation, and data display. The DAHS will indicate any occurrence of specification limit exceedances or CEMS operational problems. Reports are generated as necessary in the required format for submittal to the applicable regulatory agencies. These reports may be produced in either hard copy or electronic format.

8.2 Emission Calculations

The following sub-sections list most of the equations used to calculate emissions. Equations used to calculate CEMS accuracy and bias in association with QA/QC testing are listed in Sections 4 and 5 of this Plan.

8.2.1 CO_2 Concentration

The following equation is used to calculate the hourly average dry-basis CO_2 concentration of flue gases (in percent by volume):

40 CFR Part 75, Appendix F, Equation F-14a	
$$CO_{2d} = 100 \times \frac{F_c}{F} \times \frac{20.9 - O_{2d}}{20.9}$$	CO_{2d} = Hourly average CO_2 concentration during unit operation, percent by volume, dry basis F, F_c = F-factor and carbon-based F_c -factor 20.9 = Percentage of O_2 in ambient air O_{2d} = Hourly average O_2 concentration during unit operation, percent by volume, dry basis

8.2.2 Pollutant Emission Rate – Input Basis

The following equations are used to calculate the SO_2, NO_X, and CO emission rate in units of pounds per million British Thermal Units:

40 CFR 75, Appendix A, Equation F-5 and 40 CFR 60, Appendix A, Method 19, Equation 19-1	
$$E = K \times C_h \times F \frac{20.9}{20.9 - \%O_2}$$	E = Pollutant emissions in lb/mmBtu K = See below for calculation C_h = Hourly average pollutant concentration in ppm-dry $\%O_2$ = Oxygen concentration in percent (%) volume F[1] = 9,240 dscf/mmBtu for wood residue 8,710 dscf/mmBtu for natural gas
$$K = \frac{MW}{385.35 \times 10^6}$$	K = 1.661×10^{-7} (lb/dscf)/ppm SO_2 1.194×10^{-7} (lb/dscf)/ppm NO_X 7.266×10^{-8} (lb/dscf)/ppm CO MW = Molecular weight of pollutant 64 lb/lb-mol for SO_2 46 lb/lb-mol for NO_X 28 lb/lb-mol for CO 385.35×10^6 = Conversion factor (lb-mol/scf)

[1] "F" is a factor representing a ratio of the volume of dry flue gases generated to the calorific value of the fuel combusted. F-factors for wood residue and natural gas obtained from Table 1 in Part 75 Appendix A. Whenever both fuels are fired in the BFB boiler simultaneously, the F-factor for wood residue is used in the emission rate calculation.

8.2.3 Pollutant Emission Rate – Output Basis

The following equation is used to calculate the pollutant emission rate of SO_2 and NO_X in units of pounds per megawatt-hour:

40 CFR Part 60, Subpart Da, §§60.48Da(i) and (m)	
$$E = \frac{E_h}{O_{sg}}$$	E = SO_2 or NO_X emission rate, lb/MWh E_h = SO_2 or NO_X emission rate calculated per Equation F-2[1], lb/hr O_{sg} = Average hourly gross energy output from steam generating unit, MW

[1] See Section 8.2.4 below for equation to calculate E_h.

8.2.4 30-Day Rolling Averages

The following equation is used to calculate the 30-day rolling average SO_2, NO_X, and CO emission rate in units of pounds per million British Thermal Units.

40 CFR 60, Appendix A, Method 19, Equation 19-19	
$$E_a = \frac{1}{H}\sum_{j=1}^{n} E_{hj}$$	E_a = Average pollutant rate for the specified 30-day period, lb/million Btu H = Total number of operating hours for which valid CEMS data is available during the 30-day period E_{hj} = Hourly arithmetic average pollutant rate for hour "j," lb/million Btu n = Number of hourly rates for which E_{hj} is available within the 30-day period

8.2.5 Mass Emission Rate – SO_2, NO_X, and CO_2

The following equation is used to calculate the mass emission rate of SO_2, NO_X, and CO_2 in units of pounds per hour:

40 CFR Part 75, Appendix F, Equation F-2	
$$E_h = K \times C_{hd} \times Q_h \frac{(100 - \%H_2 0)}{100}$$	E_h = Hourly pollutant mass emission rate during unit operation, lb/hr (tons/hr for CO_2) K = 1.660×10^{-7} (lb/dscf)/ppm SO_2 1.194×10^{-7} (lb/dscf)/ppm NO_X 5.7×10^{-7} (tons/scf)/percent CO_2 C_{hd} = Hourly average pollutant concentration during unit operation, ppm (dry) Q_h = Hourly average volumetric flow rate during unit operation, scfh as measured (wet) $\%H_2O$ = Hourly average stack moisture content during unit operation, percent by volume

8.2.6 Correction of Pollutant Concentration to O_2 Standard

The following equation is used to correct measured CO concentrations to 3 percent oxygen:

40 CFR Part 60, Appendix A, Method 20 (2006 version), Equation F-20-4	
$$C_{adj} = C_d \times \frac{20.9 - STD}{20.9 - \%O_2}$$	C_{adj} = Pollutant concentration corrected to standard O_2 value C_d = Pollutant concentration measured, dry basis, ppm $\%O_2$ = Measured O_2 concentration, dry basis, percent 20.9 = Ambient O_2 concentration, percent STD = Standard O_2 concentration (i.e., 3%)

8.2.7 12-Month Rolling Total Mass Emissions

The following equation is used to calculate 12-month rolling total pollutant mass emissions in units of tons per year (tpy):

40 CFR Part 75, Appendix F, Equation F-3	
$$E_q = \sum_{h=1}^{n} E_h \times t_h / 2000$$	E_q = Total pollutant mass emissions for the previous 12 calendar months, tons E_h = Hourly pollutant mass emission rate, lb/hr t_h = Unit operating time, hour or fraction of an hour n = Number of hourly pollutant emissions values during the previous 12 calendar months 2000 = Conversion of 2000 lb per ton

8.2.8 Heat Input

The following equation is used to calculate the heat input rate for the BFB boiler:

40 CFR Part 75, Appendix F, Equation F-18	
$$HI = Q_W \left[\frac{100 - \%H_2O}{100\ F}\right]\left[\frac{20.9 - \%O_{2d}}{20.9}\right]$$	HI = Hourly heat input rate during unit operation, mmBtu/hr Q_W = Hourly average volumetric flow during unit operation, wet basis, scfh F[1] = 9,240 dscf/mmBtu for wood residue 8,710 dscf/mmBtu for natural gas $\%H_2O$ = Moisture content of the stack gas, percent $\%O_{2d}$ = Hourly concentration of O_2 during unit operation, percent O_2 dry basis

[1] "F" is a factor representing a ratio of the volume of dry flue gases generated to the calorific value of the fuel combusted. F-factors for wood residue and natural gas obtained from Table 1 in Part 75 Appendix A. Whenever both fuels are fired in the BFB boiler simultaneously, the F-factor for wood residue is used in the emission rate calculation.

8.3 Recordkeeping and Reporting

8.3.1 Log Book

A log book will be kept and maintained to document all testing, maintenance, or repair activities performed on any monitoring system or component. The logbook will be maintained in a location and format (either hardcopy or electronic) suitable for inspection.

The log book will include entries for:

- Any testing, adjustment, repair, replacement, or preventive maintenance action performed on any monitoring system;
- Corrective actions associated with a monitor's outage period,
- Any adjustment that re-characterizes a system's ability to record and report emissions data must be recorded (e.g., changing of temperature and pressure coefficients),
- The procedures used to make the adjustment(s).

Each entry should specify the date, time, name of the technician, a description of the preventive maintenance or corrective action performed, and the results of the post-maintenance compliance checks, if required. Additional relevant information should be included at the discretion of the individual making the entry.

8.3.2 QA/QC Plan Record Retention

As per 62-4.160(14)(b), F.A.C., the owner or operator of any affected unit must maintain for each affected unit a file of all measurements, data, reports and other information required by permit and/or guidance manual at the source in a form suitable for inspection for at least three years from the date of each record. This will allow an inspector to confirm emission calculations and that any data manually entered into the system is correct and that its value is based on sound scientific principles.

GREC will retain all records of measurements, data, reports and other information associated with the CEMS and COMS for at least five years from the date of each record. The purpose of the longer retention time is to assure compliance with records retention requirements of other applicable regulations such as those under Title V of the federal Clean Air Act. DAHS printed reports with a software back-up copy are archived. Any forms or documents which are not computer generated will be stored in the environmental library.

8.3.3 QA/QC Reporting

GREC is required to report the results of QA/QC testing reported to state and federal agencies. For purposes of compliance with Section 7 of 40 CFR Part 60 Appendix F, this information is provided in a Data Assessment Report (DAR) that is included with the quarterly Excess Emissions Report. Subpart G of 40 CFR Part 75 requires that the results of QA/QC testing be submitted to the EPA as part of the quarterly Electronic Data Report (EDR).

The quarterly EER and DAR must be submitted to [Insert] no later than the 30th day following the end of each calendar quarter. As a minimum, the DAR must contain the following information, although FDEP may require additional information to be included:

- Source owner or operator name and address.
- Identification and location of monitors in the CEMS.
- Manufacturer and model number of each monitor in the CEMS
- CEMS data accuracy assessment results and the date of each assessment
- Results from EPA performance audit samples and the applicable reference methods
- Summary of all corrective actions taken when CEMS was out-of-control

IMPORTANT!

If an accuracy audit results show the CEMS to be out-of-control, the facility must report both the audit results showing the CEMS to be out-of-control and the results of the audit following corrective action showing the CEMS to be operating within specifications.

Additional detail concerning DAR requirements can be found in Section 7 of Procedure 1 in Appendix F of 40 CFR Part 60. Figure 1 in Procedure 1 shows an example format for a DAR.

As with the EER/DAR, the Part 75 EDR must be submitted to EPA no later than the 30th day following the end of each calendar quarter. There are multiple files that comprise an EDR. QC test data such as daily calibration error and stack flow interference check results are included in the emissions data file while QA test data including RATA and linearity results are submitted in the quality assurance data file. The content and format of EDRs is defined by the Part 75 regulations. The DAHS is capable of generating these electronic reports with the proper content and format.

All regulatory reports that contain monitoring or quality assurance data, including EERs, DARs, and EDRs, are reviewed for accuracy by the Environmental Specialist prior to final approval. If an EDR problem is discovered, the Environmental Specialist should review support information (e.g., log books) and contact the Engineering Manager or other knowledgeable individuals if necessary in order to resolve the reporting issues. Final approval and signoff of the EER/DAR is performed by the Title V Responsible Official prior to being submitted to the WVDEP. Although the EDR is electronic and hence does not require a wet ink signature, the Designated Representative (or alternate) must certify the accuracy and completeness of each EDR submitted to EPA.

[Regulatory Citations: 40 CFR Part 60, Appendix F, Procedure 1, Section 7; 40 CFR Part 75, Subpart G]

8.3.4 Downtime and Monitor Availability

Each quarterly emissions report discussed in Section 8.3.3 above will contain a summary of CEMS and COMS monitoring availability. The facility will strive to maintain a minimum monitor availability of 95 percent for each calendar quarter in which the unit operated for more than 760 hours. In the event the applicable availability is not achieved, GREC will provide the FDEP with a report identifying the problems in achieving the required availability and a plan of corrective actions that will be taken to achieve 95% availability. GREC will implement the corrective actions within the next calendar quarter. Monitor availability for each calendar quarter will be calculated in accordance with 40 CFR 60.7(d) as follows:

40 CFR Part 60, Subpart A, §60.7(d)	
$Availability = \frac{TSOT - CMS}{TSOT} \times 100\%$	Availability = Percentage of time monitor was functioning properly, percent TSOT = Total Source Operating Time, whole hours CMS = CEMS Downtime, whole hours

For purposes of the above calculation, periods of time where the monitor is functioning properly but is unable to collect data while performing required maintenance or a mandated QA/QC activity will not be counted as CEMS downtime provided that the hours in question meet the data validation criteria of 40 CFR §60.13(h)(2)(iii).

IMPORTANT!

Note that for Part 75 reporting purposes, percent monitor data availability is calculated on the basis of a rolling 8,760 unit operating period rather than calendar quarters. Details concerning this calculation are found in 40 CFR §75.32. The differing calculation methods are likely to result in different monitor availability statistics being reported in the quarterly EER and EDR.

Upon the occurrence of 24 consecutive hours of continuous monitoring system downtime, GREC must notify the FDEP district office by facsimile or electronic mail by 5:00 p.m. on the agency's next business day. The notification must be dated and include the name, title and signature of the party notifying the FDEP. It must also include the following information as required by Rule 62-4.160(8), F.A.C.:

- A description of and cause of noncompliance; and
- The period of noncompliance, including dates and times; or, if not corrected, the anticipated time the noncompliance is expected to continue, and steps being taken to reduce, eliminate, and prevent recurrence of the noncompliance.

The following examples illustrate the notification requirements upon the occurrence of 24 consecutive hours of continuous monitor system downtime:

- If the monitor has been down for 24 hours as of 1:00 a.m. on Monday, GREC has until 5:00 p.m. on Tuesday to notify the FDEP;
- If the monitor has been down for 24 hours as of 3:00 p.m. on Friday, GREC has until 5:00 p.m. on Monday to notify the FDEP; and
- If the monitor has been down for 24 hours as of 11:00 a.m. on Wednesday, November 10, GREC has until 5:00 p.m. on Friday, November 12 (the day after Veterans Day), to notify the FDEP.

Periods of continuous monitoring system downtime that do not reach 24 consecutive hours should be included in all applicable records and reports, but these periods do not require immediate notification as described above.

[Regulatory Citations: 40 CFR §§60.7(d) and 60.13(h)(2)(iii); 40 CFR §75.32]

8.3.5 Emission Control Device Operating Parameters

The BFB boiler at GREC utilizes an SCR reactor to control NO_X as well as an in-duct sorbent injection system (lDSIS) to control SO_2. For units with add-on SO_2 or NO_X emission controls, the missing data substitution requirements in 40 CFR Part 75 differ depending on whether applicable emission control devices are operating properly during missing data periods. GREC must comply with the following recordkeeping requirements that are intended to verify proper operation of control devices:

- Maintain a list of operating parameters for the add-on emission controls as well as the range of each parameter in the list that indicates the emission controls are properly operating. This information is provided in Table 8-1 below.
- Monitor and record each of the operating parameters listed in Table 8-1. This data may be recorded by either the Plant Historian or the DAHS.

For any missing data hour in which the parametric data are either not provided or, if provided, do not demonstrate that proper operation of the SO_2 or NO_X add-on emission controls has been maintained, GREC will substitute the maximum potential NO_X emission rate or the maximum potential concentration for SO_2, as applicable.

Table 8-1 Control Device Operating Parameters

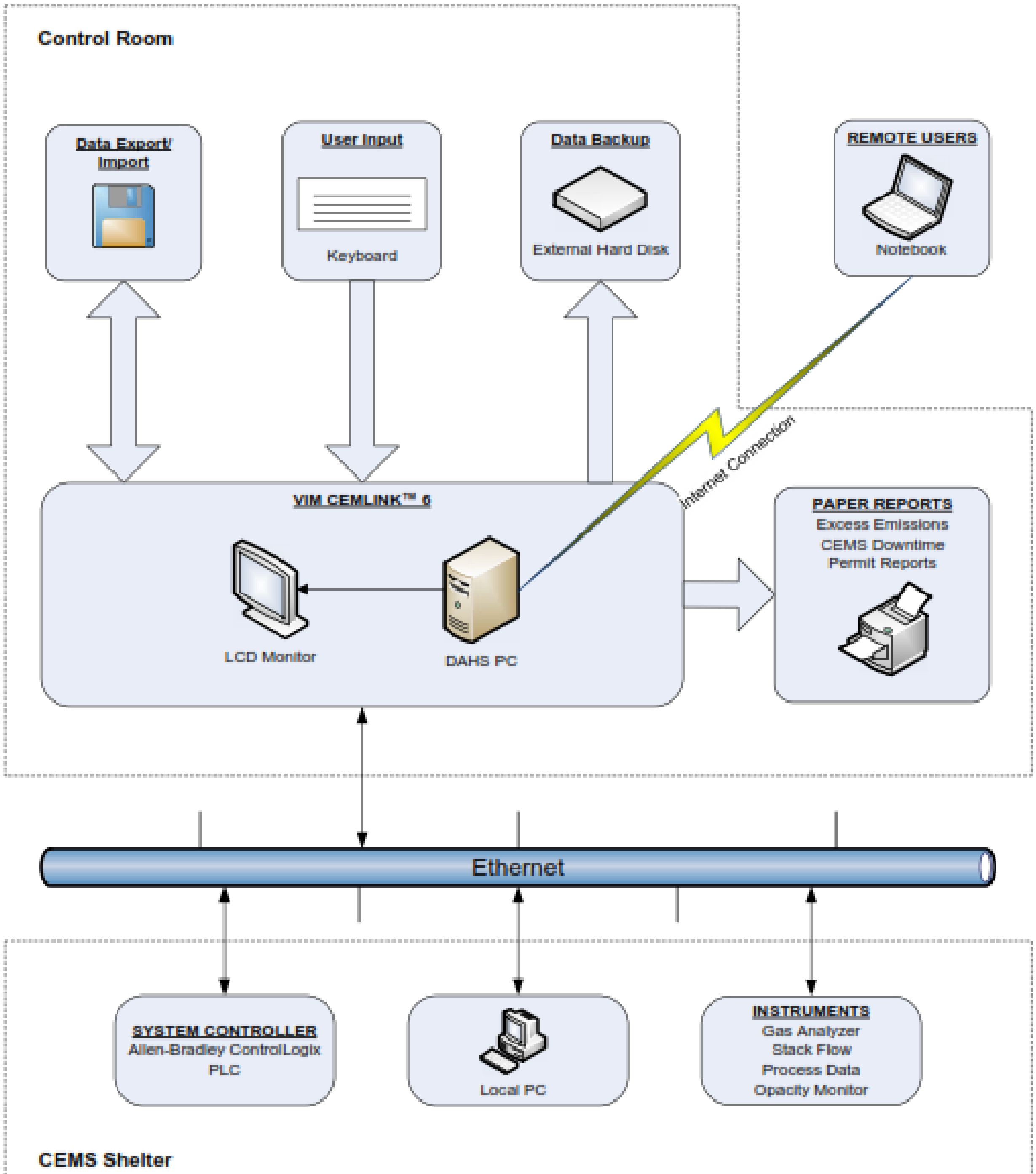
Pollutant	Control Device	Operating Parameter(s)[1]	Range Indicating Proper Operation of Control Device
NO_X	SCR	Inlet Temperature	≥ 375 degrees Fahrenheit
		Aqueous NH3 Flow Rate	≥ 120 pounds per hour
SO_2	IDSIS	Sorbent Injection Rate[2]	≥ 60 pounds per hour

[1] When two or more parameters are listed for a single control device, both parameters must be within the indicated ranges in order to demonstrate proper operation of the device.

[2] This operating parameter is only applicable when sorbent injection is required in order to achieve the SO_2 emission limit.

[Regulatory Citation: 40 CFR §§ 75.34(a), 75.58(b), and 75.59(c)]

Figure 4 DAHS Data Flow Diagram



APPENDIX A
Standard Operating Procedures

Gainesville Renewable Energy Center

STANDARD OPERATING PROCEDURE

SOP Title: **Manual calibration of gas analyzers**

SOP Number: CEMS-01

Revision	Reason	Author	Approved by/Date	Effective Date
0.0	Initial Release			

PURPOSE AND SCOPE	The purpose of this SOP is to assure that manual calibrations are performed in accordance with the manufacturer's instructions as well as all applicable regulations and guidance. Manual calibrations should be performed whenever the daily calibration error exceeds the applicable performance specification value in the regulations (see references), and must be performed whenever a CEMS gas analyzer fails a daily calibration. This SOP does not apply to the COMS or flow monitor.
RESPONSIBILITY	The instrument technicians are responsible for following the proper procedure for performing and documenting all manual calibrations as described in this SOP.
DEFINITIONS	N/A
MATERIAL AND EQUIPMENT	1. Calibration gas cylinders containing appropriate zero- and span-level concentrations and having valid manufacturer's certification. 2. Manufacturer user manual(s) for specific analyzer(s) being calibrated.
PROCEDURE	1. Place the CEMS Unit into "Maintenance Mode". 2. Insure the analyzer "zero calibration" value is set to zero. 3. Insure the analyzer "span calibration" value is set to the value on the span gas cylinder certificate. 4. Turn on the zero calibration gas. 5. Allow this gas to flow long enough for it to propagate through the sample train and allow the analyzer reading to stabilize. 6. Perform the analyzer specific instructions for adjusting the zero reading.

	7. Turn off the zero calibration gas. 8. Turn on the span calibration gas. 9. Allow this gas to flow long enough for it to propagate through the sample train and allow the analyzer reading to stabilize. 10. Perform the analyzer specific instructions for adjusting the span reading. 11. Turn off the span gas. 12. Wait until the calibration gas has been purged and the stack gas reading has stabilized. 13. Take the system out of Maintenance Mode. 14. Initiate a CEMS auto calibration check. 15. Review the results of the calibration check to evaluate the effectiveness of the manual calibration. 16. Record the following information in the maintenance log: a. Beginning and end time of the calibration b. Reason for the calibration c. Any other information that may be pertinent
REFERENCES	40 CFR Part 60, Appendix B, Performance Specification 4A, *"Specifications and Test Procedures for Carbon Monoxide Continuous Emission Monitoring Systems in Stationary Sources*" 40 CFR Part 75, Appendix A, *"Specifications and Test Procedures"*

Gainesville Renewable Energy Center

STANDARD OPERATING PROCEDURE

SOP Title: **Flow Monitor Leak Checks**

SOP Number: CEMS-02

Revision	Reason	Author	Approved by/Date	Effective Date
0.0	Initial Release			

PURPOSE AND SCOPE	The purpose of this SOP is to assure that leak checks of the stack flow monitor are performed in accordance with the manufacturer's instructions as well as all applicable regulations and guidance. Leak checks are required to be performed quarterly in accordance with Section 2.2.2 of 40 CFR Part 75, Appendix B.
RESPONSIBILITY	The instrument technicians are responsible for following the proper procedure for performing and documenting all manual calibrations as described in this SOP.
DEFINITIONS	N/A
MATERIAL AND EQUIPMENT	1. Pneumatic tester with a shutoff valve and pressure gauge 2. Manufacturer user manual(s) for stack flow monitor
PROCEDURE	1. Turn the reference manometer control valves to the closed position. 2. Connect the "HIGH PRESSURE" and "LOW PRESSURE" Pitot tubes together, preferably at the Pitot tube, otherwise connect the bulkhead fittings on the Air Flow Monitor Control Cabinet. 3. Using a pneumatic tester with a shutoff valve and pressure gauge, pressurize the Air Flow Monitor to 90 percent of the differential pressure gauges maximum and close the pneumatic testers shutoff valve. Observe the readout from the differential pressure sensor for 5 minutes. The value should not change more than 6% of full scale. 4. Any noticeable pressure drop indicates a possible leak and should be investigated, located and repaired. 5. If a sample line leak is detected, the flow monitor is out-of-control and the data must be manually invalidated. The out-of-control period begins

	with the hour of the failed leak check and ends with the hour of a satisfactory leak check following corrective action. 6. Record the following information in the maintenance log for each leak check: a. Beginning and end time of the leak check b. Starting and ending readings from the differential pressure sensor c. Percent of full scale change in pressure d. Corrective actions taken in the event that a leak is identified 7. All leak checks must be reported to U.S. EPA in the quarterly electronic data report via the ECMPS Client Tool.
REFERENCES	40 CFR Part 75, Appendix B, *"Quality Assurance and Quality Control Procedures"*

APPENDIX B
Sample Forms

Example Form 6-1: Corrective Action Report Sheet

Date: ______________________ Initials: ______________________

Time: ______________________ Reviewed By: ______________________

Locations: ______________________ Unit: ______________________

Analyzer/Monitor/Component Being Serviced: ______________________

Problem (Describe the problem that initiated the corrective action, including active alarms, out-of-control conditions etc.):

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Corrective Action (Describe the procedures, checks, tests, etc. performed to correct the problem. Include a list of parts used.):

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As Corrected Condition: (Describe the state of the analyzer/monitor/component/system following corrective action. Include alarms cleared, calibration results, analyzer readings, etc.):

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APPENDIX C

Routine Preventive Maintenance Summary

Daily Scheduled Maintenance

Component	Maintenance Task	SOP Reference
Instrument Air Pressure Regulator	Verify that pressure = 80 psi	None
ZAG Pressure Regulator	Verify that pressure = 25 psi	None
Sample Back Pressure Regulator	Verify that pressure = 2.5 psi	None
Sample Line Vacuum Gauge	Verify that vacuum = 5-9 inches of mercury	None
FTIR Bypass (purge) flow	Verify that flow = 1.5 lpm	None
CO/O_2 Monitor flow	Verify that flow = 1.0 lpm	None
NO_X Monitor flow (self-regulated)	Verify that flow 0.85 lpm (typical)	None
SO_2 Monitor flow (self-regulated)	Verify that flow 0.65 lpm (typical)	None
Sample Bypass (purge)	Verify that flow is at least 0.5 lpm	None
Sample Probe	Verify that temperature setting = 285° F	None
Sample Line	Verify that temperature setting = 285° F	None
Heated Filter Assembly	Verify the temperature setting ≈ 300° F (self-regulated)	None
Heated Ammonia Scrubber	Verify that temperature = 285° F (fixed wattage, typical temperature)	None
Daily Calibration Gas Cylinders	Verify that all cylinder valves are open	None
Daily Calibration Gas Cylinders	Verify that cylinder primary pressure is greater than 200 psi. Replace cylinder if primary pressure is low.	None
Daily Calibration Gas Cylinders	Set calibration gas regulator pressure (during or shortly after flow) to 25 psi.	None
CGA Calibration Gas Cylinders	Verify that all cylinder valves are closed	None
All Monitors	Review calibration drift report. Perform routine adjustment if the drift exceeds 1 x Performance Specification. Follow up with “hands-off” automatic calibration.	None

Weekly Scheduled Maintenance

Component	Maintenance Task	SOP Reference
Shelter HVAC Unit	The Shelter HVAC unit has a filter protecting the heat exchanger. This filter should be inspected. Should the flow be restricted due to particulate matter, the filter should be cleaned or replaced.	None
Opacity Monitor	The Durag DR290 opacity monitor has an alignment view port, located on the right side of the transmitter unit. When the unit is in operation, a technician can look into the view port and verify the “light spot” is centered.	None

Quarterly Scheduled Maintenance

Component	Maintenance Task	SOP Reference
Sample Probe	Replace the sample probe filter	None
Sample Pump	Replace the diaphragms in the sample pump	None
Heated Filter Assembly	Replace the filter in the heated filter assembly	None
Ammonia Scubber	Depending on the actual levels of ammonia in the sample, you will need to determine the life cycle of the media in the ammonia scrubber. Replace as needed or quarterly, whichever comes first	None
Each Gas Analyzer	For each analyzer, refer to the OEM manual for cleaning recommendations. Depending on the expertise in-house, the analyzers should be disassembled and inspected for any internal damage, corrosion, or the need to cleaning the measurement bench.	None

APPENDIX D

Recommended Spare Parts List

To be added

APPENDIX E

Recertification and Diagnostic Test Policy Summary Tables

Recertification and Diagnostic Test Policy for Dry-Extractive CEMS(1)

Description of Event	Event Status (2)	RATA	7 Day Cal Error (3)	Cycle Time Test	Linearity Check	Calibration	Submit an Event Record	Comments
Permanently replace NO_X, SO_2, O_2, or CO_2 analyzer with like-kind analyzer as defined in Question 7.1.3.	R	X	X		X	X	X	The rule indicates that the permanent replacement of an analyzer is a recertification event. EPA does not require the cycle time test in this case, since the analyzer is like- kind and the rest of the system is the same.
Permanently replace NO_X, SO_2, O_2, or CO_2 analyzer with a new analyzer that does not qualify as a like-kind analyzer	R	X	X	X	X	X	X	Modify the Monitoring Plan as necessary. The rule indicates that the permanent replacement of an analyzer is a recertification event. Thus, all tests are required.
Replace or repair any of the following components:								EPA will conditionally allow the abbreviated linearity check and the alternative system response check (see footnotes (5) and (6)). For repair or replacement of other major components that are not listed here (e.g., major components of new monitoring technologies or monitoring technology not addressed in this policy), contact EPA for a case-by case ruling.
Photomultiplier	D				(5)	X	A	
Lamp	D				(5)	X	A	
Internal analyzer particulate filter	D			(6)		X	A	
Analyzer vacuum pump	D			(6)	(5)	X	A	
Capillary tube	D			(6)	(5)	X	A	
Ozone generator	D				(5)	X	A	
Reaction chamber	D				(5)	X	A	
NO_2 converter	D				(5)	X	A	
Ozonator dryer	D				(5)	X	A	
Sample Cell	D				(5)	X	A	
Optical filters	D				(5)	X	A	
Replace or repair circuit board	D				(5)	X	A	EPA will conditionally allow the abbreviated linearity check (see footnote (5)).
Replace, repair or perform routine maintenance (as specified in the QA/QC plan) on a minor analyzer component, including, but not limited to:								For repair or replacement of other minor components that are not listed here perform a diagnostic calibration error test. EPA recommends that each facility develop its own list of major and minor components and document this list within their QA/QC plan. If there is uncertainty whether a component is major or minor, contact EPA for a case-by-case ruling.
PMT base	D					X		
O-rings	D					X		
Optical windows	D					X		
High voltage power supply	D					X		
Zero air scrubber	D					X		
Thermistor	D					X		
Reaction chamber heater	D					X		

Description of Event	Event Status (2)	RATA	7 Day Cal Error (3)	Cycle Time Test	Linearity Check	Calibration	Submit an Event Record	Comments
Photomultiplier cooler	D					X		
Photomultiplier cooler fins	D					X		
DC power supply	D					X		
Valve	D					X		
Display	D					X		
Replace or repair signal wiring in CEMS shelter	D					X		
Replace or repair sample tubing in CEMS shelter	D					X		EPA recommends performing both a pressure and vacuum leak check. The term "sample tubing" includes any sample or calibration tubing, the sample or calibration manifold, and the solenoid valve.
Replace or repair vacuum pump or pressure pump (not the analyzer pumps)	D					X		EPA recommends that a leak check be performed, also.
Replace or repair moisture removal system (chiller)	D					X		EPA recommends performing both a pressure and vacuum leak check.
Replace CEMS probe (same probe length and location)	D					X		EPA recommends performing both a pressure and vacuum leak check.
Change probe length and/or location	R	X		(6)		X	X	The rule indicates that a probe location change is a recertification event.
Routine probe filter maintenance (<u>e.g</u>., clean or replace coarse filter)	D					X		
Permanently replace umbilical line	D	X		(6)		X	X	EPA recommends performing both a pressure and vacuum leak check.
Replace probe heater or sample line heaters	D							
Change from extractive CEMS to in-situ CEMS	R	X	X	X	X	X	X	The rule indicates that the permanent replacement of a system is a recertification event. Thus, all tests are required.
Change from extractive CEMS to dilution CEMS	R	X	X	X	X	X	X	The rule indicates that the permanent replacement of a system is a recertification event. Thus, all tests are required.

(1) The relevant tests for CEMS are listed in § 75.20 (c)(1).

(2) "R" means a recertification event, and "D" means diagnostic test event.

(3) The 7-day calibration error test is not required for a "regular" non-redundant backup system (§ 75.20(d)(2)(i)).

(4) A calibration error is required after every repair or corrective maintenance event that may affect system accuracy (Part 75, Appendix B, Section 2.1.3 (a)). If conditional data validation is used, a probationary calibration error test is required (§ 75.20(b)(3)(ii)).

(5) A full, "hands-off" linearity check is recommended. However, an abbreviated linearity check is conditionally allowed (see Appendix, below). If the abbreviated test is not passed, consider it to be an aborted linearity check and perform a full linearity check. <u>Note</u>: SO_2 and NO_X monitors with span values ≤ 30 ppm are exempted from linearity checks.

(6) A full cycle time test is recommended. However, the alternative system response check is conditionally allowed. If the system response check is not passed, perform a full cycle time test.

(X) "X" means that this test is required or that a <QACertificationEventData> record must be reported.

(A) Report a <QACertificationEventData> record only if the full linearity check or cycle time test is performed. Keep the results of all successful alternative diagnostic tests on-site and do not report them to EPA.

Recertification and Diagnostic Policy for Flow Monitors[1]

Description of Event	Event Status [2]	RATA	Abbreviated Flow to Load	Leak	7 Day Cal Error [3]	Calibration	Report an Event Record	Comments
Permanently replace flow monitor (includes like- kind monitor)	R	X		X	X	X	X	Edit the Monitoring Plan as needed.
Replace or repair major component of flow monitor, such as:								Perform abbreviated flow to load ratio test. Perform a RATA if abbreviated flow to load test is failed. (Part 75, App. B, Section 2.2.5.3). Note that there are no appropriate QA/Certification records for reporting the abbreviated flow-to-load ratio diagnostic test.Therefore, only the <QACertificationEventData> record is required when this diagnostic test is performed. Keep the test data and calculated results on-site, in a format suitable for inspection.
Ultrasonic transducer	D		X			X	X	
Ultrasonic transducer interface (electronics)	D		X			X	X	
Differential Pressure Probe	D		X	X		X	X	
Differential Pressure Transducer/transmitter electronics	D		X	X		X	X	
Thermal Probe	D		X			X	X	
Thermal Electronics to condition/convert probe signal to	D		X			X	X	
Replace or repair minor component of flow monitor, such as:								Perform any diagnostic testing as recommended by the manufacturer.
Ultrasonic Purge system components, such as filters or fans	D					X		
Differential Pressure Back-purge probe cleaning system components	D			X		X		
Thermal Probe cleaning system components	D					X		
Change polynomial coefficients or K factors used to compute flow	D	X				X	X	3-load RATA required, except for monitors installed on peaking units and bypass stacks, which require only a normal-load RATA. (§ 75.20(c)(2)(ii)(A)).

(1) The relevant tests for FLOW CEMS are listed in § 75.20 (c)(2) and Part 75, Appendix B, Sections 2.2.2 and 2.2.5.3.

(2) "R" means a recertification event, and "D" means diagnostic test event.

(3) For differential pressure flow monitor only.

(4) The 7-day calibration error test is not required for a "regular" non-redundant backup system (see § 75.20 (d)(2)(i)).

(5) A calibration error is required after every maintenance event that may affect system accuracy (Appendix B, Section 2.1.3 (a)). If conditional data validation is used, a probationary calibration error test is required (§ 75.20 (b)(3)(ii)).

(X) "X" means that this test is required or that a <QACertificationEventData> record must be reported.

Diagnostic Test Policy for DAHS

Description of Event	Event Status (2)	Formula Verification	Missing Data Verification	RATA	Linearity Check	Calibration Error Test	Submit an Event Record	Comments
Replace entire DAHS (i.e., different vendor)	D	X	X			X	X	Modify the Monitoring Plan as necessary.
Upgrade DAHS to support a new EDR version using existing hardware, same equations, and algorithms to calculate emissions data	D	X	X				X	See Question 13.22.
Change or insert new temperature, pressure or molecular weight correction algorithms(3) in DAHS, for dilution systems	D			X	X	X	X	EPA recommends these types of changes be made immediately prior to the RATAs for affected systems.
Change or insert mathematical algorithm(3) in DAHS, for correcting measured NO concentration to total NO_X	D			X		X	X	EPA recommends this type of change be made immediately prior to the RATA for affected system.
Change missing data algorithm in DAHS	D		X				X	

(1) The relevant tests are listed in §§ 75.20 (c)(1) and (c)(9).

(2) "R" means a recertification event, and "D" means diagnostic test event.

(3) Contact EPA to discuss the appropriate diagnostic tests if other types of mathematical algorithms are changed or inserted in the DAHS.

(X) "X" means that this test is required or that a <QACertificationEventData> record must be reported.

APPENDIX F
EPA Suggested COMS Diagnostic Tests

Suggested Continuous Opacity Monitoring Systems (COMS) Diagnostic Tests

Suggested maintenance and repair procedures are described below. These procedures may be performed at the manufacturer's facility, a service provider's facility, the user's instrument laboratory, or at the stack/duct at the discretion of the owner/operator and within the recommendation of the manufacturer. They should be performed by persons either skilled and/or trained in the operation and maintenance of the analyzer.
Table 1 (attached) outlines suggested tests.

- Routine/Preventative Maintenance. Routine/preventative maintenance includes the routine replacement of consumables, cleaning of optical surfaces, and adjustment of monitor operating parameters as needed to maintain normal operation. Replacement of consumables that have the possibility of adversely affecting the performance of an analyzer may cause the nature of the maintenance procedure to fall within one of the classifications described below.

- Measurement Non-Critical Repairs. Measurement non-critical repairs include repair and/or replacement of standard non- critical components, the unique characteristics of which do not materially affect the performance of the monitor. These components include, but are not limited to, resistors, capacitors, inductors, transformers, semiconductors, such as discrete components and integrated circuits, brackets and machined parts (not associated with internal optical components), cabling and connectors, electro mechanical components, such as relays, solenoids, motors, switches, blowers, pressure/flow indicators, tubing, indicator lights, software with the same version and/or revision level, glass windows (uncoated or anti-reflection coated, but with no curvature), lenses with mounts where such mounts are not adjustable as installed, circuit boards where such boards are interchangeable and without unique adjustments (except offset and gain adjustments) for the specific analyzer of the same model, with such repairs to include the maintenance procedures required to ensure that the analyzer is appropriately setup.

- Primary Measurement Light Source. Repair or replace the primary measurement light source.

- Measurement Critical Repairs. Measurement critical repairs include repair and/or replacement of measurement sensitive components, the unique characteristics of which may materially affect the performance of the monitor. These components include, but are not limited to, optical detectors associated with the opacity measurement/ reference beam(s), spectrally selective optical filters, beam splitters, internal zero and/or upscale reference reflective or transmissive materials, electro optical light switches, retro reflectors, adjustable apertures used on external zero devices or reflectors, lenses which have an adjustable mount, circuit boards which are not completely interchangeable and/or require unique adjustments for the specific analyzer, with such repairs to include the maintenance procedures required to ensure that the analyzer is appropriately setup.

- Rebuilt or Refurbished Analyzers. Rebuilt or refurbished analyzers include analyzers for which a major sub-assembly has been replaced or multiple lesser sub-assemblies with different revision levels from the original have been replaced and/or modified. This also includes major changes to the analyzer measurement detection and processing hardware or software.

TABLE 1—SUGGESTED COMS DIAGNOSTIC TESTS AFTER VARIOUS REPAIRS

Description of event	Optical align-ment	Optical alignment indicator assess-ment (Note 1)	Zero cali-bration check	Clear path (off- stack) zero as-sessment (Note 3)	Upscale calibra-tion check	Calibra-tion error check	Fault sta-tus indi-cator check	Averaging period calcula-tion and recording	7-Day zero and up-scale drift check (Note 2)	Recertify per PS–1	New MCOC per ASTM D 6216–98, 07	Comments
(1) Replace or repair components described as routine and/or preventative maintenance..	X	—	X	—	X	—	X	—	—	—	—	Includes replacement of blower, cleaning optical surfaces, resetting adjustable parameters to maintain normal per-
(2) Replace or repair primary measurement light..	X	X	X	X	X	X	X	—	—	—	—	Light source uniformity and position are key source to many performance parameters.
(3) Replace or repair components which are measurement noncritical..	X	—	X	—	X	....	X	—	—	—	—	See text description.
(4) Replace or repair components which are measurement critical..	X	X	X	X	X	X	X	—	X	—	—	See test description.
(5) Replace or repair components which are measurement critical but do not involve optical or electro-optical components..	—	—	X	—	X	X	X	X	—	—	—	Includes changes of components involving data acquisition and recording.
(6) Rebuild or substantially refurbish the analyzer..	—	—	—	—	—	—	—	—	—	X	—	See text description.
(7) Change to, or addition of, analyzer components which may affect MCOC-specified performance parameters..	—	—	—	—	—	—	—	—	—	X	X	Significant changes which are not part of the MCOC-designated configuration.

Notes: (1) Optical alignment indicator assessment requires the operator to verify during an off the stack clear path zero assessment that the beam is centered on the reflector/retro reflector when the alignment indicator indicates on-axis centered alignment. If not, the analyzer optical train must be adjusted until this condition is met.

(2) 7-Day zero and upscale drift assessment. Opacity measurement data recorded prior to completion of the 7-day drift test will be considered as valid provided that the first 7-day drift test is successful, that it is completed within 14 days of completion of the repair, and that other QA requirements are met during this time period.

(3) Requires verification of the external zero device response, or recalibration of the same, after the off-stack clear path zero has been re-established.