**ATTACHMENT M**
SUBMITTED COMPLIANCE ASSURANCE MONITORING (CAM) PLAN
Received June 20, 2005



# CAM Plan Development – Southwest Power Station

**Documentation Revision CP05.0.***

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# Section 1 - Introduction

## About this Plan Guide...

**What's New?**

This plan guide represents significant effort by City Utilities' Southwest Power Station and other responsible personnel to meet or exceed the requirements for the development of an effective Compliance Assurance Monitoring (CAM) Plan pursuant to the provisions of 40 CFR Part 64.

### *How this Plan Guide is Organized...*

This Plan Guide was designed to provide users with clear, easily accessible information for the development, understanding and implementation of the Southwest Power Station CAM Plan. To that end, it has a new look, both in layout and in the way the information is presented. What this means is that you will now have all the information needed to properly identify and ascertain the decision-making process, background information, and robust testing that came together for the development of this CAM Plan. The *CAM* Plan guide is organized into the following sections:

- **Section 1 — Introduction.**
- **Section 2 — Applicability.**
- **Section 3 — Monitoring Approach Description.**
- **Section 4 — Monitoring Approach Justification.**
- **Section 5 — CAM Test Plan.**
- **Section 6 — Test Results Summary.**
- **Section 7 — CAM Test Report.**
- **Tables and Figures.**

### *Definitions and Acronyms*

Terms and acronyms used throughout this document are defined in the table below:

## Definitions

| Term | Definition |
|---|---|
| ***Administrator*** | In this case, the Missouri Department of Natural Resources has a fully delegated Operating Permit Program and will be considered the Administrator in regards to this Plan. The Administrator has the rights to require additional information that it deems necessary for consideration of this Plan and the provisions of the Operating Permit. |
| ***Alarm Trigger Level*** | The level at which corrective measures will begin based on the CAM indicator range determined through the opacity versus particulate matter correlation testing. The Alarm Trigger Level (ATL) will be based on hourly average data in excess of the indicator range. The purpose is to bring the operation of the applicable control device below the trigger (alarm) level. |
| ***Alternative Method*** | Any method of sampling and analyzing for an air pollutant which is not a reference or equivalent method but which has been demonstrated to the Administrator's satisfaction to, in specific cases, produce results adequate for his determination of compliance. |
| ***CAM Trigger Level*** | The level at which a "reasonable assurance" of compliance with the applicable standard is met. Typically, this level is established at a value within 10% of the standard based on the correlation testing or indicator range of the control equipment parameters being monitored and recorded (i.e., opacity %, ESP parametric data). |
| ***Deviation*** | A departure from monitoring requirements established under this part, consistent with monitor downtime events, except for periods of quality assurance activities (visual inspections, calibrations, filter checks, linearity error checks). |
| ***Exceedance*** | A condition that is detected by monitoring that provides data in terms of an emission limitation or standard and that indicates that emissions (or opacity) are greater than the applicable emission limitation or standard (or less than the applicable standard in the case of a percent reduction requirement) consistent with any averaging period specified for averaging the results of the monitoring. |
| ***Excursion*** | A departure from an indicator range established for monitoring under this part, consistent with any averaging period specified for averaging the results of the monitoring. |
| ***Indicator Range*** | Monitoring is used to obtain data for one or more indicators of emission control performance for the control device, which may include "visible emissions or opacity" where an appropriate range(s) or designated condition(s) for the selected indicator(s) such that operation within that range provides a "reasonable assurance" of compliance with the emission limitations or standard. |
| ***Inherent Process Equipment*** | Equipment that is necessary for the proper or safe functioning of the process, or material recovery equipment that the owner or operator documents is installed and operated primarily for purposes other than compliance with air pollution regulations. Equipment that must be operated at an efficiency higher than that achieved during normal process operations in order to comply with the applicable emission limitation or standard is not inherent process equipment. For the purposes of this part, inherent process equipment is not considered a control device. |
| ***Malfunction*** | Any sudden, infrequent, and not reasonably preventable failure of air pollution control equipment, process equipment, or a process to operate in a normal or usual manner. Failures that are caused in part by poor maintenance or careless operation are not malfunctions. |
| ***Opacity*** | The degree to which emissions reduce the transmission of light and obscure the view of an object in the background. |
| ***Particulate Matter*** | Any finely divided solid or liquid material, other than uncombined water, as measured by the reference methods specified under each applicable subpart, or an equivalent or alternative method. |
| ***Potential to emit*** | The maximum capacity of a stationary source to emit any air pollutant under its physical and operational design. Any physical or operational limitation on the capacity of a source to emit an air pollutant, including air pollution control equipment and restrictions on hours of operation or on the type or amount of material combusted, stored, or processed, shall be treated as part of its design if the limitation is enforceable by the Administrator. This term does not alter or affect the use of this term for any other purposes under the Act, or the term "capacity factor" as used in title IV of the Act or the regulations promulgated there under. |
| ***Startup*** | The setting in operation of an affected facility for any purpose. |
| ***Shutdown*** | The cessation of operation of an affected facility for any purpose. |
| ***Valid Hourly Average Data*** | Valid hourly average data will be determined from at least four (4) or more 1-minute average data points in each of the four (4) quadrants of an hour, except for periods of quality assurance. For periods of startup or shutdown, a valid hourly average must consist of 31 or more 1-minute average data points. |
| ***Valid 3-Hour Average Data*** | Valid 3-hour average data will be determined from three (3) consecutive valid hourly average data points. A 3-hour block average will be calculated and maintained for monitoring purposes per the applicable sections of this CAM Plan. |
| ***Valid 6-Minute Average Data*** | Any one of the 10 equal parts of a one-hour period. |

**Acronyms**

| Acronym | Meaning |
|---|---|
| ***APCP*** | Air Pollution Control Program |
| ***CAM*** | Compliance Assurance Monitoring |
| ***EMP*** | Environmental Management Program |
| ***EPA*** | Environmental Protection Agency |
| ***ESP*** | Electrostatic Precipitator |
| ***GEP*** | Good Engineering Practices |
| ***MDNR*** | Missouri Department of Natural Resources |
| ***PM*** | Particulate Matter |
| ***PS*** | Performance Specification |
| ***TEOM*** | Tapered Element Oscillating Microbalance |

***What Does a CAM Excursion Mean...***

Excursion as defined in this plan will not necessarily or automatically indicate a failure to satisfy or comply with the applicable requirements of the regulation(s). In no way, should the MDNR or another regulatory agency or citizen group correlate excursions of the CAM indicator level with violation of the standard. Pursuant to 70.6(c)(5), CAM excursions are reported in the compliance certification statement as "possible exceptions to compliance," not as noncompliance and will not be reported as such. Reporting of excursions will be provided in conjunction with the usual semi-annual reports, submitted under 70.6(a)(3)(iii)(A).

***How is a Deviation Interpreted...***

A deviation will be interpreted as a failure to meet the monitoring requirements pursuant to the applicable regulation. Since percent opacity will be monitored and the COMS will be used as the monitoring device associated with the CAM trigger level, a deviation from the monitoring provisions pursuant to 40 CFR Part 60, Subpart D for Unit 1will be properly reported quarterly as monitor downtime. Deviations from the required reporting and other administrative record keeping requirements will be recorded and reported semi-annually and as part of the annual compliance certification statement.

***What Constitutes an Exceedance...***

An exceedance will be defined as emissions of particulate matter or percent opacity in terms of the applicable emission standard or limit, respectively. The CAM Plan provides a reasonable test that the applicable standard has not been exceeded. However, it is not an absolute measurement of the applicable standard. An exceedance of the particulate matter standard will be based on the average of three (3)-one (1) hour or more (depending on the sampling) test runs that exceed 0.10 lbs/mmBtu for Unit 1. Other credible measurement methods may be used if requested and approved by the MDNR Enforcement Section. The CAM testing conducted for determining the appropriate CAM trigger level was not necessarily a compliance test. However, the tests are credible evidence of compliance and a good indicator for developing the CAM trigger levels and monitoring approach proposed in this plan.

***Start-Up and Shutdown Exclusion from CAM Requirements***

Pursuant to provisions of 10 CSR 10-6.050, *Start-Up, Shutdown and Malfunction Conditions,* the following requirements are applicable to the Southwest Power Station. The requirements define an excused startup or shutdown period. During any event, periods of extended unit startups or shutdowns should be minimized to shorten the duration of excess PM emissions from the unit. Additionally, pursuant to Section 64.7(d), startup and shutdown periods are required to be minimized to the "extent practicable." However, proper unit operation and startup procedures will be maintained in accordance with the plant's Operation and Maintenance Plan. Southwest reserves the right to make any necessary changes to this CAM Plan and its plant O & M Plan or procedures as appropriate.

Startup and shutdown procedures are followed for energizing the ESP during unit startup. These procedures do not allow for immediate energizing of the ESP on fuel oil or other fuel sources until a certain flue gas temperature is reached. For Unit 1, the exit gas temperatures need to be at or above two hundred-fifty (250) degrees Fahrenheit (°F). These procedures are implemented for safety concerns and fouling of the ESP due to premature energization during start-up operations. Typically, startup on pipeline natural gas minimizes opacity exceedances to less than one (1) hour in duration. However, startup and shutdown periods where excess emissions occur will be reported promptly to the MDNR.

Missouri Regulations provide for exclusion of startup and shutdown events, but require proper reporting for periods when the emission limit is exceeded for greater than one (1) hour. Typically, these particular exceedance events are reported next business day. Ten (10) day prior notification is required for startup or shutdown periods that are "expected" to have excess emissions for greater than one (1) hour. The following details the startup and shutdown provisions within Missouri rules. The General Provisions of Subpart A to Part 60 recognizes that startup and shutdown events do occur and were considered during rule promulgation.

**10 CSR 10-6.050 Start Up, Shutdown and Malfunction Conditions** (1) Applicability. This regulation applies to all installations in the state of Missouri. (2) Definitions. Definitions of certain terms in this rule, other than those specified in this rule section, may be found in 10 CSR 10-6.020. (3) General Provisions. (B) The owner or operator shall notify the Missouri Department of Natural Resources' Air Pollution Control Program at least ten (10) days prior to any maintenance, startup or shutdown, which is expected to cause an excess release of emissions that exceeds one (1) hour. If notice cannot be given ten (10) days prior to any maintenance, startup or shutdown, which is expected to cause an excess release of emissions, notice shall be given as soon as practicable prior to the maintenance, startup or shutdown or orally as soon as practical during normal working hours after the release and no later than close of business of the following working day with written notice to follow within ten (10) working days of the release. The owner or operator of such facility shall notify the Missouri Department of Natural Resources' Air Pollution Control Program in the following ways:

A written report including (See Attachment C of the Operating Permit Application):

1. Name and location of installation;
2. Name and telephone number of person responsible for the installation;
3. Name of the person who first discovered the malfunction and precise time and date that the malfunction was discovered;
4. Identity of the equipment causing the excess emissions;
5. Time and duration of the period of excess emissions;

6. Type of activity and the reason for the maintenance, startup or shutdown;
7. Type of air contaminant involved;
8. Estimate of the magnitude of the excess emissions expressed in the units of the applicable emission control regulation and the operating data and calculations used in estimating the magnitude;
9. Measures taken to mitigate the extent and duration of the excess emissions; and
10. Measures taken to remedy the situation, which caused the excess emissions and the measures taken or planned to prevent the recurrence of these situations.

**§60.7 Notification and record keeping**

(c)(2) Specific identification of each period of excess emissions that occurs during startups, shutdowns, and malfunctions of the affected facility. The nature and cause of any malfunction (if known), the corrective action taken or preventative measure adopted.

**§60.8 Performance tests**

(c) ...Operations during periods of startup, shutdown, and malfunction shall not constitute representative conditions for the purpose of a performance test nor shall emissions in excess of the level of the applicable emission limit during periods of startup, shutdown, and malfunction be considered a violation of the applicable emission limit..

**§60.11 Compliance with standards and maintenance requirements**

(c) The opacity standards set forth in this part shall apply at all times except during periods of startup, shutdown, malfunction, and as otherwise provided in the applicable standard.

(d) At all times, including periods of startup, shutdown, and malfunction, owners and operators shall, to the extent practicable, maintain and operate any affected facility including associated air pollution control equipment in a manner consistent with good air pollution control practice for minimizing emissions. Determination of whether acceptable operating and maintenance procedures are being used will be based on information available to the Administrator which may include, but is not limited to, monitoring results, opacity observations, review of operating and maintenance procedures, and inspection of the source.

# Background

### *Source Information*

**Table 1: Unit Description and General Information**

| Required Elements | Source Specific Information |
|---|---|
| Facility Name: | Southwest Power Station |
| Emission Unit(s): | Unit 1 – 1810 mmBTU/hour dry-bottom, opposed-fired, pulverized coal-fired boiler |
| | Nameplate capacity of 194.53 MW |
| Applicable Regulations: | Unit 1 – 40 CFR Part 60, Subpart D, 10 CSR 10-6.070 |
| | Federal New Source Performance Standards (NSPS) regulations |
| Emission Limitations: | Unit 1 – 0.10 lb/mmBTU Particulate Matter (PM) |
| Monitoring Requirements: | Initial source stack testing, Continuous Opacity Monitoring System (COMS) |
| Control Devices: | Electrostatic Precipitators (ESPs) |
| | Stack Flue Sulfur ($SO_3$) Conditioning System (limited use) |
| Pollutants: | Primary: Particulate Matter (PM) |
| | Secondary: Opacity (%) |

### *Objective of the CAM Program*

The objective of the CAM program will require Southwest to: (1) Document continual proper operation of its control devices (i.e., ESPs) required for maintaining compliance with an applicable emission limit or standard. (2) Determined a unit specific performance indicator (e.g., threshold level) that would be selected through a series of stack test runs, designed to provide a "reasonable assurance" of compliance with the emission limitation or standard. (3) Provide a means for defining excursions based on the performance indicator level. (4) Respond appropriately so that excursions are corrected and mitigated (i.e., corrective action measures (mitigation) are defined and properly conducted).

In order to understand how this objective will be achieved, it may be beneficial to briefly discuss the approaches City Utilities researched during its process of selecting the appropriate CAM option for the Southwest Power Station. The best available approach specific to the Southwest Power Station and its affected unit is selected and defined in this plan.

***Description and Discussion of Monitoring Approaches***

**TEOM 7000 series (Alternate Reference Method)**

*Brief Description of Approach*

Rupprecht & Patashnick Co., Inc.'s patented technology, called the TEOM Series 7000 Source Particulate Monitor provides a continuous single-point particulate mass concentration measurement patterned from the filter-based methods (i.e., USEPA Methods 17 and the front end of Method 5). This "EPA-approved" alternate stack reference method approach provides a "real-time" direct mass measurement of stack particulate emissions for process and compliance assessments as well as control device optimization.

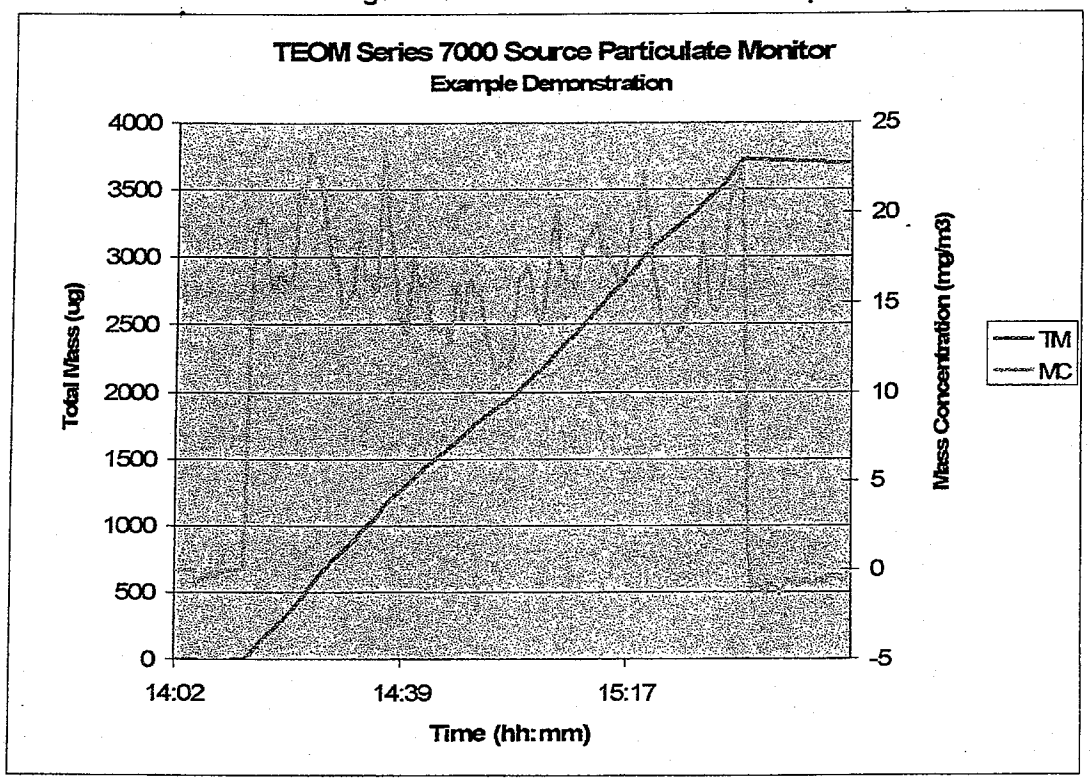
The technology measures particulate matter in the exhaust gas by passing the flue gas through a filter. Particulate matter is collected isokinetically and passed over a filter of a known weight as it oscillates. The exchangeable collection filter is mounted at the end of a tube (tapered element) whose frequency of oscillation changes in direct relation to the mass collected on the filter. Changes in oscillation will determine the weight of the PM sample collected from the weight of the filter. Figure 1, provides an example of the type of data that can be collected electronically and instantaneously when conducting stack testing. Testing can be coordinated with opacity data for a specified time frame and a direct correlation on a continuous basis can be graphed.

The CAM approach to using the TEOM Series 7000 would be to use the results of the instrument method as the primary performance indicator with the use of opacity or COMS data as a secondary indicator of conformance. An opacity trigger level will established when the instrument method would be conducted. Once the opacity percent has exceeded the trigger level, plant personnel would have a defined amount of time to setup and conduct a single-point particulate test run. The results of the test run would determine if an excursion of the particulate mass emission rate has occurred. All excursions would be recorded and then reported on a semi-annual basis.

*Cost of Equipment and Testing*

The initial cost of the TEOM Series 7000 Source Particulate Monitor is relatively expensive compared to other commercially available monitoring devices and typical stack reference method testing. Installed cost estimates range between $65,000 - $70,000 per unit. Testing costs for use of the TEOM equipment without major adjustments to stack ports and support equipment are estimated at $25,000 to $30,000 for a three (3) to five (5) day test period.

**Figure 1: TEOM Demonstration Example**




*Summary and Discussion of Benefits*

The TEOM monitoring approach can provide quality-assured, high-accuracy results on a "real time" basis. Measurements are not affected by changes in personnel or sample handling procedures that are likely to occur with a manual method. The TEOM provides quick, on-site feedback of measurement results. On-site generation of final report (including QA/QC test results) for compliance testing can be made available. The TEOM provides high time resolution, a direct filter-based mass measurement for process assessment and optimization. However, this approach was not selected as the CAM monitoring approach for the Southwest Power Station. The initial costs and general maintenance requirements were the primary reasons this monitoring approach was not considered at this time. Further, access to stack locations during inclement weather was a concern for the use of this methodology or approach. City Utilities does believe this method to be a superior alternative to manual methods that may be employed for future stack compliance determinations. City Utilities reserves the right to consider this approach or any other approach in the future if circumstances arise that would require a more automated method.

**Model Approaches - ESP Computer Models**

*Brief Description of Approach*

The use of an ESP computer-based model approach is considered "presumptively acceptable" by EPA as a CAM monitoring methodology. EPRI has conducted extensive research in the area of the CAM Model approach and has indicated results to be fairly reliable and consistent in predicting PM emissions. ESP models calculate ESP performance from first principles and, therefore, have the capability to account for power variations in the various ESP electrical sections and for sections that are out of service. The models inherently compensate for fuel changes that influence ash resistivity because these changes are reflected in the voltage and current relationships. The models predict the outlet particle size distribution and may enable fine-tuning of the opacity to mass emission relationship for a given ESP.

There are basically three (3) recommended models that are commercially available. They include the following:

1) EPRI's ESPM Model and considered the best;
2) Southern Research Institute Rev. 3 model a windows-based version; and
3) EPA's ESPVI 4.0 a DOS –based version.

The CAM approach to using a computer model would be to use the output of an ESP computer model as the primary performance indicator with the use of opacity or COMS data as a secondary indicator of conformance. An opacity trigger level is used to determine when the model would be required to run. ESP operating parameters (e.g., voltage and current) and other ESP-specific "fitting factors" (rapping) are collected as inputs to the ESP model. Based on these values and results from PM emissions test data, the model can reliably predict a "reasonable assurance of compliance" with the unit's PM emission limit. The model output is compared with a pre-established indicator range (control efficiency), from previous site-specific testing and ESP equipment evaluation that can be directly correlated to the particulate mass emission rate. The output from the model run would determine if an excursion occurred.

*Cost of Equipment and Testing*

CAM model costs are estimated to be $10,000 for both the EPRI (non-member) and Southern Research Institute models. The EPA model can be obtained as freeware and is available to the public for use. Stack testing similar to a Test and Cap approach is required. Test results are used as model input data and correlation to opacity and other ESP and boiler performance data. ESP computer models can be set up to run automatically which would add to the costs of initial installation. Testing costs and purchase of the computer model software and initial setup is estimated at $40,000 to $50,000. Software maintenance and licenses would need to be considered when proceeding with this type of approach and would add to the overall cost associated for full implementation of computer model-based approach.

*Computer-model CAM Approach Considerations at Southwest*

During the recent CAM particulate matter testing conducted at Southwest, a variety of boiler and ESP performance data was collected for consideration of a computer-based model approach. Table 2 provides a list of typical parameters collected as inputs to an ESP computer model. ESP control efficiencies were determined from one (1) run tests at the inlet locations and compared to stack outlet test results. Additional efficiency testing and particle size distribution evaluation would be necessary to adequately setup a computer model at the Southwest Power Station. Coal and ash quality data was collected during testing and will be analyzed as needed for input to a computer-based model approach.

**Table 2: Typical ESP Model Parameters**

| ESP Parameter | ESP Section Parameters | Gas Parameters | Boiler and Coal Parameters |
|---|---|---|---|
| Total specific collector area | Specific collector area | Gas velocity | Megawatts |
| Total plate area | Area | Volumetric flow | Coal grind diameter |
| Number of sections | Length | Temperature | Grind exponent |
| Total length | Wire-plate spacing | Pressure | Heat rate |
| Height | Wire diameter | Viscosity | Coal burning rate |
| Width | Reynolds number | | Coal heating value |
| Stack diameter | | | |
| Resistivity | | | |

*Summary and Discussion of Benefits*

The ESP computer model can be an excellent CAM monitoring approach for specific cases and unique unit variations. An unscientific counting of recent permit renewal applications have not seen computer-based models being used by utilities for their CAM monitoring approach. To City Utilities' knowledge, Ameren and Mid-American (Iowa) are the only two (2) utilities that are considering or had considered using the CAM Model approach. City Utilities believes this monitoring approach needs to mature before it can be fully understood and used as a standard monitoring approach for the utility industry. Facilities that blend fuels or see significant variations in fuel quality may have very extensive and expensive testing requirements in order to quantify particulate matter emissions. The ESP computer model monitoring approach is only as good as the inputs provided and must be carefully considered and calibrated specific to each ESP before its use in a CAM Plan. Based on these concerns and the impact to current operating procedures, this approach was not selected as the CAM monitoring approach for the Southwest Power Plant. Other factors included the additional initial costs and the fact that so few known utility CAM Plans were including this approach made this option less attractive for selection at Southwest. However, Southwest reserves the right to consider this approach in the future if circumstances arise that would require an ESP computer model-based approach.

**Continuous PM Monitors (PS-11 Monitors)**

*Brief Description of Approach*

The current development of Continuous Particulate Matter monitors has seen the employment of different measurement techniques for obtaining particulate matter measurements from unit stacks. Several monitor manufacturers utilize back and forward light scattering optical devices to quantify particulate mass emissions. Other technologies include Beta Gauge technology.

The back or forward scattering devices use similar measurement theories. Both monitors use an optical device with a reliable solid-state light source. Particulate matter in the light stream causes backward or forward (depending on the technology) scattering of light that is detected and converted to an electrical output of a known measurement proportional to the mass concentration for a wide range of particle sizes.

The Beta Gauge technology consists of a sample extraction device, beta source, and beta detector where a sample is extracted isokinetically from the stack in a dilution system. The sample is drawn across a filter tape where particles >0.1 microns are captured. The beta gauge then moves the filter tape between a low energy beta source and a detector to measure the amount of mass capture on the filter tape. The ratio of beta transmissions measured from the original clean spot to the collected sample spot is proportional to the mass on the tape. Beta Gauges have proven to be accurate for various applications (i.e., wet and dry stack, and variations in fuel blends and quality).

*Cost of Equipment and Testing*

The typical costs for either scattering optical monitor are similar to the costs associated with purchasing and installing an opacity or flow monitor. Estimated installed costs provided by Teledyne/Monitor Labs ranged between $25,000 and $30,000. A Beta Gauge monitor would be significantly more, but actual costs were not investigated at this time. Further, stack-testing costs associated with this monitoring approach are unknown. Certification and Periodic Quality Assurance testing requirements for a continuous PM monitor were codified as EPA's Performance Specification (PS-11). PS-11 certification requirements are onerous and would require extensive initial and periodic testing. Annual recertification testing and periodic quality control checks would likely be necessary to maintain conformance with the specification requirements. Initial testing and monitor setup costs may be significantly more than the cost of purchasing the monitor.

*Continuous PM Monitors Considerations at Southwest*

PM monitors would only be used as a performance indicator monitor and would not be intended as an absolute measurement of particulate matter concentration at any given time. Table 3, briefly lists the monitors investigated for use as a surrogate continuous monitoring device.

**Table 3: Continuous PM Monitors**

| Manufacturer | Model | Meets PS-11Criteria | Monitor Type |
|---|---|---|---|
| ESC | Model P-5B | Yes | Particulate |
| Monitor Labs | Model 360 | Yes | Particulate/Dust |
| Monitor Labs | Model 300L | No | Laser Backscatter Particulate |

The ESC Particulate Monitor Model P-5B states that it meets PS-11 criteria. However, significant certification testing and several rigorous field tests at the specific site location would be needed to meet the qualifications for certifying conformance with PS-11. Utilities like Dominion, Kansas City Power & Light, and Aquila have installed or have agreed to install ESC's Model P-5B as part of a Consent Agreement or CAM Plan.

The Monitor Labs Model 360 Particulate/Dust Monitor is due out this year. They have had some success with their Model 300L Laser Backscatter Particulate Monitor. However, the Model 300L does not fully meet the PS-11 certification requirements.

*Summary and Discussion of Benefits*

There still exist many unknowns to the effective use of this monitoring approach for purposes of a CAM Plan. The "reasonable assurance" criterion does not mean absolute or continuous monitoring is required. The courts rejected the concept of enhancement monitoring and thus a "reasonableness" criterion was established pursuant to the applicable requirements of 40 CFR Part 64. City Utilities is still uncertain if the current commercially available monitors could meet the conformance requirements to PS-11. This relatively "new" performance specification stringently defines the certification process and inevitably makes this monitoring approach less attractive. Full understanding of the PS-11 certification requirements would need to be evaluated before choosing this option. After careful consideration, this approach was not selected as the CAM monitoring approach for the Southwest Power Station. At this time, the lack of proven and reliable technology and the ever-changing monitor certification/quality assurance requirements pose too many unknowns. The initial technology development for many monitor manufacturers is still in its infancy. Currently, it is my option that continuous PM monitors are not very accurate and robust enough to serve as a compliance monitoring tool.

## Test and Cap Approach

*Brief Description of Approach*

The Test and Cap approach is based on a concept from the proposed enhanced monitoring rule. This approach requires that a source perform an opacity/mass correlation test on the ESP where the outlet mass loading and opacity are simultaneously at their highest possible condition, yet both still are within their respective permit limits. The testing is conducted under normal boiler operating conditions burning a typical fuel source. The outlet mass loading is adjusted by removing ESP fields or by raising or lowering ESP power input.

Particulate mass emission testing is performed and results compared to a secondary trigger indicator (i.e., opacity or ESP power performance, or ESP efficiency). The test scenarios define the maximum operating condition for the ESP. A cap (or trigger level) is established by which a reasonable assurance of compliance is determined. This trigger level when exceeded would then require enactment of the plant operation procedures. Specified performance or corrective action measure would be implemented within a reasonable period of time to get performance or emissions data below the threshold or within the desired range of operation. The use of percent opacity as a trigger indicator has been a "presumptively acceptable" measurement for use in some of the original CAM Plans proposed by EPA. In fact, the test and cap concept is considered by EPA to be a presumptively acceptable monitoring approach under CAM (see 40CFR64, 64.3(d)(3)(i)) and is the prescribed particulate compliance method under EPA's proposed industrial boiler MACT.

*Cost of Equipment and Testing*

The costs associated with a Test and Cap approach can range between $15,000 - $20,000 per unit. Additional consulting fees may be required for successful setup and oversight of stack testing and ESP performance adjustments. These fees have a wide range depending on the consultant and the type of expertise the affected facility is purchasing.

Typical test methods used for a Test and Cap approach include EPA Methods 5 or 17. Most permit or regulations state Method 5 as the compliance method. However, there are inherent advantages to using Method 17 for CAM testing. Less handling and potential for error exist when using Method 17. Testing typically takes two (2) to three (3) days per unit to perform and obtain accurate and reliable test results. A typical test plan is as follows:

- A minimum of two (2) to three (3) load (opacity) points at or near the opacity threshold for each unit;
- Conduct baseline test;
- Assess additional ESP operating conditions following baseline testing as needed;

- Provide availability for on-site preliminary analysis for each test scenario; and
- Repeat testing as needed.

*Test and Cap Approach at Southwest*

Specific to the implementation of the CAM provisions required pursuant to 40 CFR Part 64 and EPA guidelines, the Test and Cap Approach was considered a viable monitoring approach. Many of the other monitoring approaches would require a minimum level of stack testing. Once initial CAM testing was conducted, a process to evaluate the best monitoring approach could be done from the data collected.

Testing at Southwest followed a rigorous and robust test plan described in more detail in Section 5 (Tab 8). Testing for Southwest Unit 1 spanned three (3) days with a single test crew, and on-site laboratory (used plant facilities) for obtaining preliminary result analyses. Plant personnel were significantly involved in all matters and were engaged in the process. Successful completion of the testing was conducted in a manner consistent with obtaining the best and most accurate results possible.

*Summary and Discussion of Benefits*

The Test and Cap monitoring approach is the most practical approach for the Southwest Power Station. Test results obtained from the CAM testing proved a significant compliance margin exits at reduced ESP performance levels. Opacity percent is considered a good indicator of levels of particulate matter within the stack flue gas. Opacity percent is considered by EPA an appropriate indicator for many CAM Plans and has considered its use in some monitoring approaches as "presumptively acceptable" for determining a reasonable assurance of compliance with the applicable standard. Opacity data is a primary means to track and monitor control device performance. Percent opacity is measured on a continuous basis, so a surrogate continuous monitoring system would be used to determine compliance for particulate matter emissions from the unit stack. The CAM provisions are considered a control device regulation. This approach will maintain all regulatory principles and objectives afforded to a control device rule. Additional scrutiny on effective control practices and improved O&M plans and procedures will evolve because of the requirements set forth in this plan. Based on the results, a careful review of the CAM testing, and taking into consideration current operating procedures and maintenance practices, the Test and Cap monitoring approach was selected for the Southwest Power Station. The details of this approach, the trigger-level indicator, justification for selection, and the actual test results will be discuss thoroughly in subsequent sections.

# Plan Overview

City Utilities of Springfield, Missouri (City Utilities) proposes the following monitoring methodology to serve as CAM. Since the Southwest Power Station is submitting this plan with its operating permit renewal application, City Utilities reserves the right to revise the CAM Plan and provide subsequent submissions, as needed. City Utilities reserves the right to provide the most flexible approach possible within the regulatory obligations of the rule.

The CAM Plan protocol provides guidance for monitoring control device performance and assessing a "reasonable assurance" of compliance with the applicable emission limitation or standard. Southwest's CAM Plan addresses controlling PM emissions from a utility coal-fired boiler. The Southwest Power Station Unit 1 is equipped with electrostatic precipitator (ESP) control technology and has a certified Continuous Opacity Monitoring System (COMS) located on the unit stack. Accurate record keeping of opacity monitor data and enhancement of the facility's Operation and Maintenance procedures will be used to assure continuous compliance at the Southwest Power Station.

# Section 2 - Applicability

# CAM Regulations

***Why Southwest Unit 1 Affected...***

The Southwest Power Station is subject to the applicable requirements pursuant to 40 CFR Part 64, identified below (*Applicability*), and is required to submit a Compliance Assurance Monitoring (CAM) plan as part of its operating permit application. 40 CFR Part 64 requires the Southwest Power Station to maintain and operate its electrostatic precipitator control device to "reasonably" assure compliance with the applicable particulate matter emission limitation for the affected unit.

*§64.2 Applicability*

Pursuant to the provisions of 40 CFR Part 64, the Southwest Power Station is subject to the requirements of this part and applies to each pollutant-specific emissions unit at a major source that is required to obtain a part 70 permit if the unit satisfies "all" of the following criteria:

(1) The unit is subject to an emission limitation or standard for the applicable regulated air pollutant (or a surrogate thereof), other than an emission limitation or standard that is exempt under paragraph (b)(1) of this section listed below;
(2) The unit uses a control device to achieve compliance with any such emission limitation or standard; and
(3) The unit has potential pre-control device emissions of the applicable regulated air pollutant that are equal to or greater than 100 percent of the amount, in tons per year, required for a source to be classified as a major source. For purposes of this paragraph, "potential pre-control device emissions" shall have the same meaning as "potential to emit," as defined in §64.1, except that emission reductions achieved by the applicable control device shall not be taken into account.

Southwest's affected coal-fired boiler satisfies the criteria requirements listed above. The exemptions listed in 64.2(b)(1) are provided below for future reference.

(b) Exemptions:

(1)Exempt emission limitations or standards. The requirements of this part shall not apply to any of the following emission limitations or standards:

(i) Emission limitations or standards proposed by the Administrator after November 15, 1990 pursuant to section 111 or 112 of the Act.
(ii) Stratospheric ozone protection requirements under title VI of the Act.
(iii) Acid Rain Program requirements pursuant to sections 404, 405, 406, 407(a), 407(b), or 410 of the Act.
(iv) Emission limitations or standards or other applicable requirements that apply solely under an emissions trading program approved or promulgated by the Administrator under the Act that allows for trading emissions within a source or between sources.

(v) An emissions cap that meets the requirements specified in §70.4(b)(12) or §71.6(a)(13)(iii) of this chapter.
(vi) Emission limitations or standards for which a part 70 or 71 permit specifies a continuous compliance determination method, as defined in §64.1. The exemption provided in this paragraph (b)(1)(vi) shall not apply if the applicable compliance method includes an assumed control device emission reduction factor that could be affected by the actual operation and maintenance of the control device (such as a surface coating line controlled by an incinerator for which continuous compliance is determined by calculating emissions on the basis of coating records and an assumed control device efficiency factor based on an initial performance test; in this example, this part would apply to the control device and capture system, but not to the remaining elements of the coating line, such as raw material usage).

The exemptions identified above do not apply to the Southwest Power Station at this time.

***The "Reasonable Assurance" of Compliance Criteria***

The CAM program is designed to provide a "reasonable assurance" of compliance with the unit's applicable emission limitation. The CAM program is not intended as an enhanced monitoring approach that provides a direct measure of compliance. However, the program was designed to confirm proper operation and maintenance of control devices and related equipment needed to control emissions on a pollutant-specific basis. "Reasonable assurance" means that evidence of absolute measurement is not needed and that many monitoring approaches can be considered. Further, "reasonable assurance" does not mean that all possible scenarios or endless combination of possibilities need to be explored. It basically means that the weighing of sufficient evidence would lead to the possibility of determining compliance with the appropriate emission limit. EPA recognized this criterion in writing in its preamble language cited at 62 Fed. Reg. at 54921. The monitoring approach set forth in this plan determines a "reasonable assurance" of compliance for Southwest's affected unit and should be approved as the monitoring approach pursuant to the provisions of 40 CFR Part 64.

# Emissions Unit Identification

Southwest Unit 1 is a Riley Stoker Turbo-fired, dry bottom pulverized coal steam boiler that commenced commercial operation in 1976. The turbine generator is a General Electric tandem, compound reheat unit. Unit 1's turbine nameplate base load rating is 194.53 megawatts. The normal operating load range of the unit is 175 – 195 MW.

# State and Federal Applicable Requirements

### *Code of State Regulations*

10 CSR 10-6.070, *New Source Performance Regulations.*

This rule establishes acceptable design and performance criteria for specified new or modified emission sources. The provisions of 40 CFR Part 60, shall apply and are adopted by reference as part of this rule into Missouri regulations. Because of this rule, many Federal New Source Performance Regulations are adoption for inclusion into the Missouri State Implementation Plan and mimic the Federal rule requirements for conformance to the applicable regulatory section. This rule incorporates the provisions of 40 CFR Part 60, Subpart D by reference, specifically for application to Southwest Unit 1. Some exceptions do apply.

### *Code of Federal Regulations*

40 CFR Part 60, Subpart D, *Standards of Performance for Fossil-Fuel-Fired Steam Generators for Which Construction is Commenced After August 17, 1971.*

The New Source Performance Standard (NSPS) emission limit pursuant to 60.42, *Standard for Particulate Matter* for Unit 1 is 0.10 pounds per million Btu of heat input derived from fossil fuel or fossil fuel and wood residue. Unit 1 (EU0040) is subject to the applicable standards and requirements of this Subpart.

# Emission Limitations

Table 4, below, lists the applicable emission limitations established for Unit 1 through regulation or permit requirement. Since opacity will be used as a secondary indicator, the percent opacity limit for Unit 1 has been identified. The CAM plan is designed around a trigger level based on a three (3)-hour block average of percent opacity data and an alarm trigger level based on average hourly opacity data. However, opacity limits for each unit are based on 6-minute average opacity values. The CAM plan does not change Southwest's responsibility to comply with its opacity limitation.

**Table 4: Unit Specific Emission Limits**

| Southwest Unit | Applicable Regulatory Section | | Opacity Limit | Particulate Matter |
|---|---|---|---|---|
| | State Rules | Federal Rules | (Percent) | (Pounds per Million Btu) |
| Unit 1 (1) | 10 CSR 10-6.070 | 40 CFR Part 60, Subpart D | 20% | 0.10 lb/mmBtu |