

**Commonwealth of Pennsylvania  
Department of Environmental Protection**

**Evaluation of Total Particulate Matter Emissions  
From Coal-Fired Electric Generation Units  
Final Report  
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## **Introduction**

*Particulate matter* is described in 40 CFR §51.15 (a) (2) as a complex mixture of solid or liquid matter. Smaller particles (PM<sub>10</sub> and PM<sub>2.5</sub>) can penetrate deep into the lungs and become trapped to aggravate or cause respiratory illnesses. They can also transport toxic or carcinogenic chemicals into the lungs, causing greater health risks. Particulate matter also soils and damages materials. "Particulate matter," also known as particle pollution or PM, is a complex mixture of extremely small particles and liquid droplets. Particle pollution is made up of a number of components, including acids (such as nitrates and sulfates), organic chemicals, metals, and soil or dust particles.

The size of particles is directly linked to their potential for causing health problems. EPA is concerned about particles that are 10 micrometers in diameter or smaller because those are the particles that generally pass through the throat and nose and enter the lungs. Once inhaled, these particles can affect the heart and lungs and cause serious health effects. A primary source of particulate emissions is coal fired EGUs.

In November 2008, the Pennsylvania Department of Environmental Protection (PADEP or Department) initiated a source testing project to evaluate particulate matter emitted from coal-fired electric generating units (EGUs) in Pennsylvania. The study was designed to determine the quality and accuracy of total particulate matter (TPM) emission testing available to the Department for this source category which includes all coal-fired and waste coal-fired electric utility steam generating units. As defined in 25 Pa. Code § 121.1 (relating to definitions) for purposes of new source review requirements in Chapter 127, Subchapter E, a electric utility steam generating unit means a steam electric generating unit that is constructed to produce steam to provide electricity for the purpose of supplying more than one third of its potential electric output capacity and more than 25 MW electric output to a utility power distribution system for sale. Steam supplied to a steam distribution system for the purpose of providing steam to a steam-electric generator that would produce electrical energy for sale is also considered in determining the electrical energy output capacity of the affected facility.

The evaluation also focused on EGUs combusting waste coal and pulverized coal as fuel including circulating fluidized bed (CFB) boiler units and pulverized coal-fired (PCF) boiler units that fall within this source category.

Electric generating stations in Pennsylvania under the Department's jurisdiction are located in all six PADEP Regions. A total of 73 EGUs were identified at 35 facilities throughout the Commonwealth including one facility in Allegheny County under the jurisdiction of the Allegheny County Health Department. The distribution of these facilities and units by Region is provided as follows:

Regions/Locality	Facilities	Units
Southwest Region	14	34
Northeast Region	9	12
Northcentral Region	4	11
Northwest Region	3	6
Southcentral Region	2	6
Southeast Region	2	3
Allegheny County	1	1

### **Project Goals**

1. Evaluate EGU particulate matter source testing data on file to determine frequency of testing and quality of source test data. If the frequency of testing is not adequate, recommend the minimum time period between test events.
2. Identify sources tested for total particulate matter emissions that include condensable and filterable particulate emissions based on the most current acceptable test methods.
3. Require total particulate matter testing of coal-fired and waste coal-fired EGUs in 2009 to provide a comprehensive estimate of total matter particulate emissions.
4. Define test requirements and methods that will provide comparative results for all sources.
5. Evaluate test data collected during this test program for the purpose of determining the compliance status of each source and providing a baseline evaluation of PM<sub>2.5</sub> emissions based on condensable particulate matter results.

### **Availability of EGU Test Data:**

A review of the Bureau of Air Quality source test records identified the latest test dates and results of particulate matter testing for the targeted source category. Condensable particulate matter test data was available but limited to less than half of the sources in this category because the PADEP repealed emissions testing requirements for insoluble particulate matter in December 1997 under the Regulatory Basics Initiative. Since the effective date of the amendments to 25 Pa. Code § 139.12 (relating to emissions of particulate matter), the PADEP has not required a compliance demonstration for both filterable and condensable particulate matter unless expressly required as a condition of a federally enforceable plan approvable or operating permit. A record of all test reports received by the Division of Source Testing and Monitoring (DSTM) is maintained in a local electronic data base that has been in existence since 1999. The data base is limited to dates of test reports and test report reviews, not the results of the test. Test results are maintained in the Central Office (CO) paper files and a microfiche copy dating back 25 years. Filterable (in-stack) Particulate Matter (FPM) and Condensable Particulate Matter (CPM) results were recovered by researching the DSTM data base and matching test dates with results found in the Central Office paper files.

Test results on file for 29 EGU facilities were not adequate to evaluate the current status of total particulate matter (TPM) emissions from the EGU source category. Some sources in this category appeared to have no source test data on file. Generally, operating permits for this category did not require a measurement of condensable particulate matter to demonstrate

compliance with particulate matter emission standards. Following amendments to 25 Pa. Code Section 139.12 on December 27, 1997 source testing for these sources was only for filterable particulate matter. However, source test data for 14 of the 29 facilities on file included CPM results using the current EPA Method 202. This data also demonstrated that condensable particulate matter results added to the filterable particulate matter results for 13 of 14 of those facilities would not increase the results above the permit limit of those sources. The Hatfield's Ferry Power Station owned by Allegheny Energy Supply Company, LLC, is the only facility that would exceed their operating permit limit if condensable particulate matter is combined with the filterable particulate matter. The installation of flue gas desulphurization units or "scrubbers" on the Hatfield's Ferry units to reduce SO<sub>2</sub> emissions has resulted in co-benefit reductions of particulate matter (including the condensable particulate fraction) and mercury emissions.

Emissions data on file in the Department was not adequate to make any conclusive estimate of total particulate emissions that included the condensable particulate portion due to inadequacies in Method 202. Therefore, the goal of this evaluation was modified to require additional source testing at coal-fired EGUs to determine total particulate emissions based on the combination of filterable and condensable particulate matter measured by an improved method developed by EPA.

#### **Total Particulate Matter Source Test initiative for the EGU Sector:**

On January 30, 2009, the owners/operators of 35 coal-fired electric generating units and waste coal-fired power plants were notified in writing that source testing for condensable and filterable particulate matter should be completed by June 30, 2009 (see Attachment 1.). Under the authority of Section 4(6) of the Pennsylvania Air Pollution Control Act, (APCA), 35 P.S. § 4004(6), the Department requested the owners and operators of the affected facilities to conduct total particulate emissions testing of controlled emissions from coal fired and waste coal fired EGUs. The testing of total particulate matter (TPM) emissions must include filterable particulate matter (FPM) and condensable particulate matter (CPM) as PM<sub>2.5</sub> based on a test method approved by the Department.

The study was designed to collect accurate total particulate test data under optimal operating conditions using similar test methods that provide the most accurate emission results. This initiative included the following minimum requirements:

1. Require the owners and operators of all coal-fired and waste coal-fired EGUs to conduct total particulate testing in 2009 by notifying 35 EGU facilities in writing that testing will be completed by June 30, 2009.
2. Conduct testing in accordance with the U.S. Environmental Protection Agency's (EPA) Reference Method 5 (for FPM) and Other Test Method 028 (for CPM) methodology.
3. Submit a test protocol to the Department within 30 days of notification with a proposed a test date.
4. Test all EGUs at the facility. Any unit not operational during the test period will be scheduled for testing within 60 days of continuous operation after start up.

5. Maintain standardize operating conditions for coal and waste coal fired EGUs during testing. Testing will be conducted at the normal maximum operating conditions at peak operating periods.
6. Develop model permit conditions which establish requires total particulate matter testing at least every two years.

**Test Methods for Measuring Particulate Matter Emissions:**

Test methods for measuring filterable particulate matter (FPM) are EPA Methods 5, 5A-5H and 17 where particulate is captured in the front-half of the sampling train and on a filter. Analysis is gravimetric. The EPA reference method for condensable particulate matter is Method 202 (discussed below). Condensable particulate matter (CPM) is combined with FPM to achieve total particulate matter (TPM). Currently, Method 202 is acceptable even though results have proven to be biased high based on inherent flaws in Method 202.<sup>1</sup>

Condensable particulate matter consists of material that is in a vapor phase at stack conditions which condense and/or react upon cooling and dilution in the ambient air to form solid or liquid particulate immediately after discharge from the stack. Both the organic and inorganic fractions of condensable particulate matter must be determined by Method 202. EPA Reference Method 202 is currently under revision by EPA to provide a more accurate representation of CPM. In measuring CPM from sources combusting fuels containing sulfur, it has been shown by EPA using Method 202 that SO<sub>2</sub> collected in the impingers can be oxidized into sulfates to produce a variable sulfate artifact resulting in an overestimation of condensable particulate emissions. A nitrogen purge defined in Method 202 is an optional requirement that will reduce some of the artifacts but is rarely used by contract testers. If the impinger system is not purged with nitrogen gas, errors associated with the sulfate artifact remaining in the sample may inflate the final result. CPM data from prior Department test results were achieved using EPA Method 202. However, results may be biased high because there is no assurance that the nitrogen purge for removing sulfur-based artifacts was conducted.

Primary PM<sub>2.5</sub> or Filterable PM<sub>2.5</sub> and CPM (all CPM is assumed to be in the PM<sub>2.5</sub> size fraction) are considered particulate matter with an aerodynamic diameter equal to or less than 2.5 microns. Determining PM<sub>2.5</sub> emissions from stationary sources was not available using an EPA Referenced Method that was subject to rulemaking. EPA has developed two Other Test Methods (OTM 027 and OTM 028) with the capability to measure PM<sub>10</sub> and PM<sub>2.5</sub> (Constant Sampling Rate Procedure). The U.S. Environmental Protection Agency Emissions Measurement Center developed these methods to describe the procedures that the stack tester must follow to measure particulate matter emissions equal to or less than a nominal aerodynamic diameter of 10 microns (PM<sub>10</sub>) and 2.5 microns (PM<sub>2.5</sub>). According to the

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<sup>1</sup> On December 21, 2010, the EPA's final rule concerning "Methods for Measurement of Filterable PM<sub>10</sub> and PM<sub>2.5</sub> and Measurement of Condensable PM Emissions from Stationary Sources" was published in the Federal Register (75 FR 80118). Effective January 1, 2011, State New Source Review programs must address condensable particulate matter emissions.

Emissions Measurement Center, OTM 027 and OTM 028 could be used to measure CPM, pending the issuance of the revised Method 201A (OTM 027) and Method 202 (OTM 028) as Referenced Methods.

### **Particulate Matter Testing of Coal-Fired EGUs:**

Particulate testing for stationary emission sources such as coal fired EGUs is accomplished in accordance with Department guidance established in the Source Testing Manual (Revision 3.3) Document Number 274-0300-002 dated November 11, 2000 authorized under 25 Pa. Code § 139.3(b). The Source Testing Manual provides guidance on how to conduct stationary source testing and report results. However, it does not define specific parameters to be tested at the source. For example; if the operating permit requires testing for Filterable Particulate Matter, the Manual provides guidance on the sampling method for measuring FPM (EPA RM5 or RM17). If the permit specifies testing for “Total Particulate”, the Manual provides guidance for measuring both FPM (EPA RM5 or RM17) plus CPM (EPA RM 202). Particulate matter testing as defined in the Source Testing Manual includes Total Particulate (TPM), Filterable (in-stack) Particulate Matter (FPM) and Condensable Particulate Matter (CPM), Filterable (In-Stack) PM<sub>10</sub> and Condensable PM<sub>10</sub>. Total particulate matter is a combination of filterable particulate matter and condensable particulate matter. For the purposes of the Department’s EGU source testing initiative, source owners and operators were instructed to perform testing that would identify total particulate matter including the filterable and condensable fractions. Testing was performed using EPA Reference Method 5 for the filterable portion and EPA Other Test Method (OTM) 028 for the condensable portion.

### **EGU Test Reporting and Data Validation Procedures:**

- **Source Testing Notification.** In January 2009, the owners and operators of all facilities in the EGU source category were notified, in writing, by personnel in the PADEP Regional Office where the source was located that TPM testing should be completed by June 30, 2009. The notification included information concerning the emission parameters to be tested, operating conditions to be maintained at the time of testing, and instructions for reporting the date of testing and how the results were to be reported to the Department. The notification also provided an option to use test results of total particulate matter testing that was completed and approved by the Department no later than six months prior to the date of the notification letter. This option was only exercised by Orion Power Midwest LP, Cheswick, which is located in Allegheny County; the facility is permitted by the Allegheny County Health Department (ACHD) which required source testing at least every two years. On October 8, 2008, Orion Power tested the Cheswick unit for total particulate matter. For purposes of this evaluation, the PADEP used Cheswick’s TPM source test data including filterable and condensable particulate emissions.
- **Test Procedures.** Facility Operators were required to submit a pretest protocol, consistent with the format listed in the Source Testing Manual to PADEP within 30 days of receipt of the notification letter. Following review of the protocols submitted to the Department, each pretest protocol was approved, in writing, with additional instructions for completing the test. The owners and operators of all facilities in the

EGU source category submitted a test protocol that was subsequently approved by the PADEP's Source Testing Section. When a test date was established, the facility operator was instructed to notify the Department's Division of Source Testing and Monitoring and appropriate PADEP Regional Office 15 days prior to the test in order to provide the opportunity to observe testing. Except for five facilities granted an extension for particulate matter testing due to scheduled outages for the construction of control technology systems or planned maintenance outages, all testing was completed on June 30, 2009. Source testing was completed by February 25, 2010 for the remaining facilities undergoing modifications or outages. Test dates were established based on the predicted date of construction completion and achieving normal operating conditions after startup.

- **Test Report Reviews.** The owners or operators of the electric generating facilities were required to submit a test report to the Department within 60 days of test completion. A rigorous technical review of each test report was completed by the PADEP Source Testing staff. A typical review was accomplished within 30 days of receipt. As part of the review, a determination of compliance was made and the PADEP Regional Office Air Quality Program staff responsible for the facility was notified in the form of a report review memorandum. If the completed test review validated compliance, the reported source test data was captured in a data base for future reference. If the source was out of compliance with the established emission standard, the Regional Office issued a written Notice of Violation and required retesting to demonstrate compliance. In a few cases, the filterable particulate matter results were close to the permit limit but did not exceed the limit. However, when the condensable particulate matter was added, the limit was exceeded. In those cases, the Department required the facility operator to repeat the testing for total particulate matter.

### **Discussion of Test Results:**

Facilities identified for the Department's particulate matter source testing initiative included pulverized coal-fired (PCF) and waste coal-fired units as defined in 25 Pa. Code §121.1 (relating to definitions), which defines an electric steam generating unit (EGU) as "a unit that that is constructed for the purpose of supplying more than one-third of its potential electric output capacity and more than 25 MW electric output to a utility power distribution system for sale."

The source test results in this report include a summary of the total particulate matter data for all EGUs tested under this initiative. The emissions data listed in this report are particulate matter test results of the last test performed for a unit during the test period even if there were numerous retests. Retests were conducted where the results either exceeded the permit limit, were very close to the permit limit or where questionable test procedures or abnormal operational conditions existed.

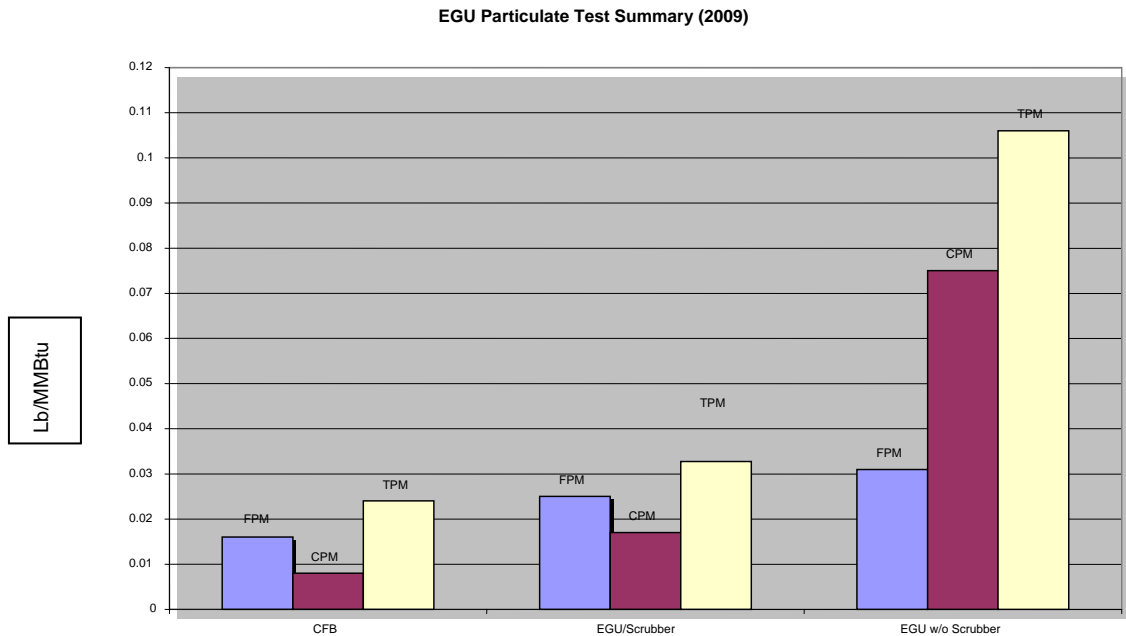
Thirty-four coal and waste coal-fired facilities in the EGU source category are permitted by the Department; the Cheswick facility is permitted by the Allegheny County Health Department. The 35 electric generating facilities subject to the PADEP particulate matter testing initiative include a total of 73 EGUs with 66 stacks (sources). In most cases, one

stack serviced one unit but some facilities used one stack for multiple units. In those cases, the unit emissions were combined as described in the facility operating permit.

Facilities were separated into the following groups: (1) Circulating Fluidized Bed (CFB) boilers fueled with waste coal; (2) pulverized coal fired (PCF) units with wet scrubbers for SO<sub>2</sub> and particulate control; and (3) PCF units controlled by other technologies including electro-static precipitators or baghouses.

Circulating Fluidized Bed (CFB) boilers that are fueled by waste coal have a nominal net electric output somewhat lower than the pulverized coal fired units. All 19 CFBs at 14 facilities have limestone injection for the control of SO<sub>2</sub>, ammonia injection for the control of NO<sub>x</sub> and a baghouse to control particulate emissions. The second group includes 31 pulverized coal fired (PCF) units with wet scrubbers for SO<sub>2</sub> and particulate control. There are 13 facilities with 31 units in this category including one unit at the Homer City Power Station (Unit #3). These units are unique in that most include Flue Gas Desulphurization (FGD) SO<sub>2</sub> removal systems that would expect to see lower particulate matter emission levels. The third group of EGUs includes PCF units at nine facilities with 23 units including two units at Homer City Power Station (Units #1 and #2) that do not have wet scrubbers but use other technologies such as electro-static precipitators or baghouse filtration for particulate control.

The chart below lists the source groups as CFB, EGU/Scrubber and EGU w/o Scrubber. These groups are broken down to illustrate the average filterable portion (FPM) and condensable portion (CPM) of total particulate matter (TPM) for the units tested in that group.



**Test Results for Circulating Fluidized Bed Boilers:**

As expected, the average CFB emission results were very low compared to the particulate matter emissions from PCF units. Permitted limits for CFBs are generally based only on

FPM results calculated in accordance with the requirements of 25 Pa. Code § 123.11(a) (2) for units under 600 MMBtu/heat input. With two exceptions, total particulate matter emissions for all CFBs subject to the limits in Section 123.11(a)(2) may not exceed 0.03 lbs/MMBtu/hour heat input. As demonstrated in the test summary chart, the average FPM for all CFBs did not exceed the 0.03 lb/MMBtu/hour heat input. Due to the effective SO<sub>2</sub> and NO<sub>x</sub> controls, PADEP found very low CPM emissions during source testing of CFBs.

The table below provides source test results for all CFBs tested during the Department’s PM source test program. None of the 17 sources tested exceeded the 0.03 lb/MMBtu/hour heat input particulate matter emission standard for FPM. Five of 17 sources exceeded 0.03 lb/MMBtu/hour heat input for TPM when CPM is added to the FPM results.

**CFB TEST RESULTS**

Company/Facility Name	Region	County	Test Date	TPM lb/MMBtu	FPM lbs/MMBtu	CPM lbs/MMBtu
Cambria CoGen Co.#1	5	Cambria	3/21/09	0.015	0.007	0.007
#2			4/2/09	0.005	0.004	0.0007
Ebensburg Power Co.	5	Cambria	5/28/09	0.037	0.02	0.017
Inter-Power of Pa., Inc.	5	Cambria	5/7/09	0.056	0.023	0.032
Reliant Energy (RRI) #1Seward	5	Indiana	1/28/10	0.016	0.011	0.005
#2 Seward			1/28/10	0.013	0.008	0.005
Gilberton Power Co.(COGENTREX) #1+#2	2	Schuylkill	4/23/09	0.039	0.03	0.009
Northampton Generating Co. LP	2	Northampton	5/6/09	0.013	0.005	0.008
Northeastern Power Co.	2	Schuylkill	6/25/09	0.033	0.029	0.004
Panther Creek Partners #1	2	Carbon	6/16/09	0.014	0.012	0.002
#2			6/17/09	0.01	0.009	0.0003
Schuylkill Energy Resources	2	Schuylkill	6/3/09	0.028	0.024	0.004
Wheelabrator Frackville Energy	2	Schuylkill	8/6/09	0.010	0.0035	0.0075
WPS Westwood Generation LLC	2	Schuylkill	5/20/09	0.031	0.023	0.01
Mt. Carmel Cogen, Inc.	4	Northumberland	6/10/09	0.013	0.009	0.004
Piney Creek Limited Partnership	6	Clarion	3/11/09	0.019	0.015	0.004
Scrubgrass Generating Co.#1+#2	6	Venango	6/17/09	0.023	0.018	0.005
Average CFB				0.022	0.015	0.007
% of Total					68%	32%

**PCF EGU Test results with scrubber controls and without scrubber controls:**

A comparison of the PCF EGUs demonstrates the dramatic difference in not only the TPM variation between scrubbed units and unscrubbed units, but also the obvious difference in the CPM portion of TPM between these two groups. The particulate matter emission standards noted in the operating permits for these facilities are defined in 25 Pa. Code § 123.11(a) (3) as 0.1 lb/MMBtu/hour heat input for FPM. As identified in the test summary chart above, average FPM emissions for all EGUs were well below that standard.

The following table (relating to EGUs with scrubber control test results) provides source test results for 27 units at 13 EGU facilities controlled by wet scrubbers. Source test results for

facilities with scrubber controls averaged 0.024 lb/MMBtu/hour heat input for FPM with none of the test results exceeding the 0.1 lb/MMBtu/hour heat input particulate matter emission standard. If the CPM is added to FPM, the TPM averages 0.033 lb/MMBtu/hour heat input and none of the individual TPM test results exceed the emission standard.

**EGU TEST RESULTS (with scrubber controls)**

Company Name	Facility	Region	County	Unit	Test Date	Total PM lb/MMBtu	FPM lbs/MMBtu	CPM lb/MMBtu
Allegheny Energy Supply Co. LLC	Hatfield	5	Greene	1	11/6/2009	0.034	0.029	0.0047
				2	2/25/2010	0.066	0.061	0.005
				3	2/24/2010	0.073	0.071	0.002
Allegheny Energy Supply Co. LLC	Mitchell	5	Washington	1	6/30/2009	0.036	0.026	0.01
EME	Homer City		Indiana	Unit 3	1/8/2009	0.01	0.005	0.003
Pennsylvania Power Co.	Bruce	5	Beaver	1a/b	6/30/2009	0.04	0.029	0.011
				1b	6/30/2009	0.041	0.03	0.011
	Mansfield			2a/b	6/30/2009	0.055	0.043	0.012
				2b	6/30/2009	0.054	0.041	0.013
				3a/b	6/30/2009	0.016	0.008	0.007
Reliant Energy (RRI)	Conemaugh	5	Indiana	1	3/20/2009	0.017	0.007	0.01
				2	2/20/2009	0.025	0.01	0.015
Reliant Energy (RRI)	Keystone	5	Armstrong	1	1/19/2010	0.015	0.010	0.006
				2	1/20/2010	0.012	0.009	0.003
AES-BV Partners	Potter Twp.	5	Beaver	Boiler 2	4/21/2009	0.039	0.036	0.003
				Boiler 3	4/21/2009	0.047	0.041	0.006
				Boiler 4	4/20/2009	0.041	0.038	0.004
				Boiler 5	4/29/2009	0.035	0.027	0.007
PPL Montour LLC	Montour SES	4	Montour	Unit 1	5/20/2009	0.011	0.004	0.006
				Unit 2	4/22/2009	0.02	0.013	0.007
PPL Brunner Island LLC	Brunner Island	3	York	Unit 1,2	11/19/2009	0.013	0.003	0.0094
				Unit 3	5/27/2009	0.037	0.013	0.0238
Orion Power Midwest	Elrama	5	Washington	1,2,3,4	6/4/2009	0.048	0.04	0.008
Exelon Generation Co. LLC	Cromby	1	Chester	Unit 1	6/16/2009	0.02	0.013	0.007
Exelon Generation Co. LLC	Eddystone	1	Delaware	Unit 1	6/2/2009	0.025	0.0129	0.0119
				Unit 2	6/2/2009	0.028	0.0118	0.0164
Orion Power Midwest LP	Cheswick	A	Allegheny	1	10/20/2008	0.048	0.022	0.026
Average EGU w/scrubber						0.033	0.024	0.009
% of total							73%	27%

The EGU Test Results table below provides the individual test results for those sources not controlled with wet scrubbers. Of the 20 sources tested, none exceeded the 0.1 lb/MMBtu/hour heat input particulate matter emission standard for FPM with an average of 0.031 lb/MMBtu/hour heat input. When the CPM test results are added to FPM, 10 of the 20 source test emission results expressed as TPM exceed the 0.1 lb/MMBtu/hour heat input particulate matter standard. The average TPM emissions rate is 0.106 lb/MMBtu/hour heat input for all units tested in this group.

**EGU TEST RESULTS (without scrubber controls)**

Company Name	Facility	Region	County	Unit	Test Date	TPM	FPM	CPM
						lb/MMBtu	lb/MMBtu	lb/MMBtu
Allegheny Energy	Armstrong	5	Armstrong	1	6/9/2009	0.124	0.084	0.04
Supply Co. LLC				2	6/9/2009	0.038	0.026	0.012
EME	Homer City	5	Indiana	Unit 1	1/22/2010	0.088	0.074	0.0147
				Unit 2	1/22/2010	0.083	0.057	0.0269
Horsehead Corp.	Monaca	5	Beaver	Unit 2	4/28/2009	0.004	0.002	0.0024
				Unit 1	5/29/2009	0.011	0.004	0.0063
Reliant Energy (RRI)	Titus	3	Berks	Units 1,2,3	12/17/2009	0.061	0.046	0.015
Reliant Energy (RRI)	Portland	2	Northampton	Unit 1	2/11/2009	0.179	0.015	0.165
				Unit 2	2/12/2009	0.122	0.036	0.085
UGI Corp.	Hunlock Creek	2	Luzerne	B6	6/22/2009	0.1	0.09	0.01
Reliant Energy	Shawville	4	Clearfield	Unit 1	7/24/2009	0.057	0.006	0.051
				Unit 2	4/9/2009	0.203	0.061	0.142
				Unit 3/4	2/26/2009	0.183	0.022	0.161
Sunbury Generation, LLC	Shamokin Dam	4	Snyder	Unit 1	2/24/2009	0.089	0.015	0.073
				Unit 2A	1/27/2009	0.08	0.016	0.0628
				Unit 3	2/24/2009	0.13	0.037	0.0924
				Unit 4	2/24/2009	0.109	0.02	0.0883
Orion Power Midwest	New Castle	6	Lawrence	Unit 3	3/4/2009	0.17	0.002	0.16
				Unit 4	3/5/2009	0.15	0.001	0.147
				Unit 5	3/12/2009	0.116	0.006	0.11
Average EGU w/o Scrubber						0.106	0.031	0.075
% of total							30%	70%

**Conclusions:**

The owners and operators of all 35 electric generating facilities including 73 units completed source testing for total particulate matter in accordance with protocol approved by PADEP for each facility. The Department validated the accuracy and acceptance of the results to

determine compliance with the particulate matter emission standard for FPM. The source test results also provide accurate data for the assessment, planning and evaluation of total particulate emissions from the coal-fired and waste coal-fired EGU source sector. In addition, the data provides an assessment of control technology efficiencies for reducing particulate emissions based on a profile that establishes not only the filterable particulate portion but also condensable particulate matter. The total particulate matter data clearly demonstrates that wet scrubbers on PCF EGUs provide better control fine particulate matter emissions; 27% of total particulate matter emissions are fine particulates. However, when PCF EGUs are controlled by other types of technologies including electro-static precipitators or baghouses, fine particulate matter represents 70% of total particulate matter emissions. Additional information collected during testing breaks down the organic and inorganic condensable fraction that can be used to further characterize fine particulate results.

The EGU source sector evaluation for total particulate matter also established a testing standard for this sector that will be enforceable in operating permits subsequently issued by the Department. By increasing the source test frequency from once every five years to once every two years, the Department will be able to determine compliance earlier during the five-year permit term. The increased source test frequency for EGUs will also provide additional data that will improve the accuracy of baseline results collected with this project. Total particulate matter source test data collected during this evaluation are available for use by other agencies including EPA for establishing or improving current emission factors for similar sources. This is especially true for validating the effectiveness of the revised Method 202 to measure CPM.

During the notification phase of the project there were instances where the facility operator stated that units with traditionally low emission rates or compliance monitoring systems in place would not need to be tested more frequently than once every five years. The results of this study demonstrated that that was not necessarily the case. During the course of this project, five retests were conducted for high TPM results due to poor unit operating conditions or poor control equipment maintenance. For four of the EGUs with Compliance Assurance Monitoring (CAM) systems installed as PM emission predictors, higher than expected PM emissions were discovered. Based on this finding, those CAM systems should be revalidated as particulate emission indicator.

This study was an effective tool for evaluating the status of an emission source sector for a targeted pollutant. The process used in this project can be used as a model for the assessment of other source sectors.

## Attachment 1. Sample EGU Testing Notification Letter

**Rachel Carson State Office Building  
P.O. Box 2063  
Harrisburg, PA 17105-2063  
(12/23/08DRAFT)**

Bureau of Air Quality

XXX-XXX-XXXX

[Name]  
[Title]  
[Company Name]  
P.O. Box XXX  
Anytown, PA 16003-0832

Dear Mr. [Last NAME]:

Pursuant to Section 4(6) of the Pennsylvania Air Pollution Control Act, (APCA), 35 P.S. § 4004(6), the Pennsylvania Department of Environmental Protection (Department) is requesting [Company Name and location] to conduct total particulate emissions testing of controlled emissions from [source description] at [Company name] [Source location and units], owned or operated by [company name] by June 30, 2009. The Department requests particulate testing of total particulate emissions to include Filterable Particulate Matter (FPM) and Condensable Particulate Matter (CPM) as  $PM_{2.5}$  based on a test method approved by the Department.

Testing must be performed in accordance with 25 Pa. Code Chapter 139, the Source Testing Manual Revision 3.3, a Department-approved test protocol utilizing EPA Referenced Method 5 and EPA OTM (Other Test Method) 0028 or equivalent test method used to determine total particulates to include  $PM_{2.5}$ . Within 30 days of receipt of this letter, the test protocol and test schedule should be submitted to Gregory D. Parrish, Chief of the Division of Source Testing and Monitoring, Bureau of Air Quality, Rachel Carson State Office Building, P.O. Box 8468, Harrisburg, PA 17105-8468. If the specified testing was performed within six months of receipt of this letter, that test data should be submitted to the Department within 15 working days of receipt of this letter. The Department will notify you in writing if the data may be used to satisfy the previously mention particulate testing requirement.

[Company Name] may claim that certain information is confidential. However, any claim of confidentiality must be supported by a written demonstration that the information would divulge production or sales figures or methods, processes or production unique to your facility or would otherwise adversely affect your competitive position by revealing trade

secrets, including intellectual property rights. See § 13.2 of the APCA, 35 P.S. § 4013.2. Emissions data is never considered confidential information.

Please note that Department is requesting testing from other sources within this sector. If you have any questions or comments regarding the above, my telephone number is xxx-xxx-xxxx or contact Greg Parrish, Chief, Division of Source Testing and Monitoring at 717-783-9479.

Sincerely,

[Program manager Name]  
[Regional Office]

Cc: