

Steam Electric Detailed Study: Summary Paper for the Preliminary 2008 Effluent Guidelines Plan



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LIST OF ACRONYMS

BOD ₅	Biochemical oxygen demand
CFR	Code of Federal Regulations
CWA	Clean Water Act
DCN	Document control number
ELGs	Effluent limitations guidelines and standards
EPA	Environmental Protection Agency
EPRI	Electric Power Research Institute
FGD	Flue gas desulfurization
HEM	Hexane extractable material
IGCC	Integrated Gasification Combined Cycle
NO _x	Nitrogen oxides
NPDES	National Pollutant Discharge Elimination System
O&M	Operating and maintenance
PCS	Permit Compliance System
QC	Quality control
SCR	Selective catalytic reduction
SGT-HEM	Silica gel treated hexane extractable material
SNCR	Selective non-catalytic reduction
TDS	Total dissolved solids
TKN	Total Kjeldahl nitrogen
TRI	Toxics Release Inventory
TSS	Total suspended solids
UWAG	Utility Water Act Group
WWT	Wastewater treatment

1.0 BACKGROUND

The Environmental Protection Agency (EPA) is conducting a review of discharges from the steam electric power generating industry as part of its broader review of effluent limitations guidelines and standards (ELGs) for the 2008 Effluent Guidelines Plan. Section 304(m) of the Clean Water Act (CWA) requires EPA to develop and publish a biennial plan that establishes a schedule for the annual review and revision of ELGs required by Section 304(b).

The 2007/2008 study is concentrating primarily on characterizing pollutant sources believed to contribute the majority of the toxic-weighted pollutant loadings from steam electric facilities. The study will also evaluate available pollution control technologies/practices for the pollutants present in these wastestreams. Building upon the results of a prior study EPA conducted for the 2005/2006 review of ELGs, the current effort is primarily focused on wastewater discharges from air pollution controls and ash handling operations at coal-fired power plants. Certain other discharges from steam electric power plants will also be reviewed during the study. EPA is collecting data using a variety of means, including facility inspections, wastewater sampling, industry and vendor contacts, and a data request instrument (i.e., questionnaire) sent to selected power plant operators.

EPA's Office of Water is coordinating its efforts with ongoing research and activities being undertaken by other EPA offices, including the Office of Research and Development, the Office of Solid Waste, and the Office of Air and Radiation (Office of Air Quality Planning and Standards and the Office of Atmospheric Programs). EPA is also coordinating certain activities with the Utility Water Act Group (UWAG), an industry trade association, and has held technical information discussions with the Electric Power Research Institute (EPRI) and treatment equipment vendors.

1.1 Background of the Study

During EPA's 2005/2006 review of ELGs, EPA determined that the Steam Electric Power Generating Point Source Category (40 CFR Part 423) discharges relatively high amounts of toxic-weighted pollutants, in comparison to other industry sectors. In conducting the detailed study that ended in 2006, EPA initially investigated whether pollutant discharges reported to the Permit Compliance System (PCS) and Toxics Release Inventory (TRI) for 2002 accurately reflected the current discharges of the industry. EPA also performed an in-depth analysis of the reported pollutant discharges, and reviewed technology innovation and process changes. Additionally, EPA evaluated certain electric power and steam generating activities that are similar to the processes regulated for the Steam Electric Power Generating Point Source Category, but that are not currently subject to ELGs.

EPA's efforts for the 2006 study focused on the following objectives:

- Identify the key pollutants and sources of those pollutants discharged by the regulated steam electric industry.
- Identify available pollution control technologies and best management practices within the industry to address significant pollutant discharges.

- Evaluate wastewaters from certain activities not currently regulated by ELGs, but which may be similar in nature to the waste streams regulated by 40 CFR Part 423. EPA examined information for wastewaters from the following types of activities:
 - The combustion/gas turbine portion of combined cycle systems.
 - Steam electric facilities where the energy/heat source used to produce the steam is not a fossil or nuclear fuel.
 - Steam supply facilities that generate steam for distribution and sale, but that do not primarily use that steam to drive a turbine and produce electric power.
 - Facilities providing a combination of electric power (generated by steam) and other utility services.
 - Industrial non-utilities (i.e., steam electric power plants located at industrial/manufacturing facilities such as paper mills).

EPA determined that the currently available data provide an incomplete picture of the wastewaters generated by the regulated steam electric industry; however, they do suggest that several process waste streams are primarily driving the pollutant loads discharged by these facilities and that control technologies and management practices capable of achieving significant pollutant reductions are technologically feasible. Therefore, EPA determined that further review of these discharges during the 2007/2008 ELG planning cycle was warranted. For more information on the 2005/2006 study, see *Interim Detailed Study Report for the Steam Electric Power Generating Point Source Category* (EPA-821-R-06-015; November 2006).

2.0 DATA COLLECTION ACTIVITIES

EPA is focusing efforts for the 2007/2008 Study on certain discharges from coal-fired power plants. Since EPA's past study efforts indicate that the toxic-weighted loadings are predominantly driven by the metals present in wastewater discharges, and that the waste streams contributing the majority of the metals are associated with air pollution controls,¹ EPA is collecting and analyzing data characterizing wastewater pollutants and potential control options for wet flue gas desulfurization (FGD) wastes and ash handling wastes. EPA is collecting data through facility inspections, wastewater sampling, a limited survey of selected facilities, and various secondary data sources. Figure 1 shows the locations of plants where EPA has visited, collected samples of wastewater, or obtained information via the data request.

¹ Other potential sources of metals include coal pile runoff, metal/chemical cleaning wastes, coal washing, and certain low volume wastes.

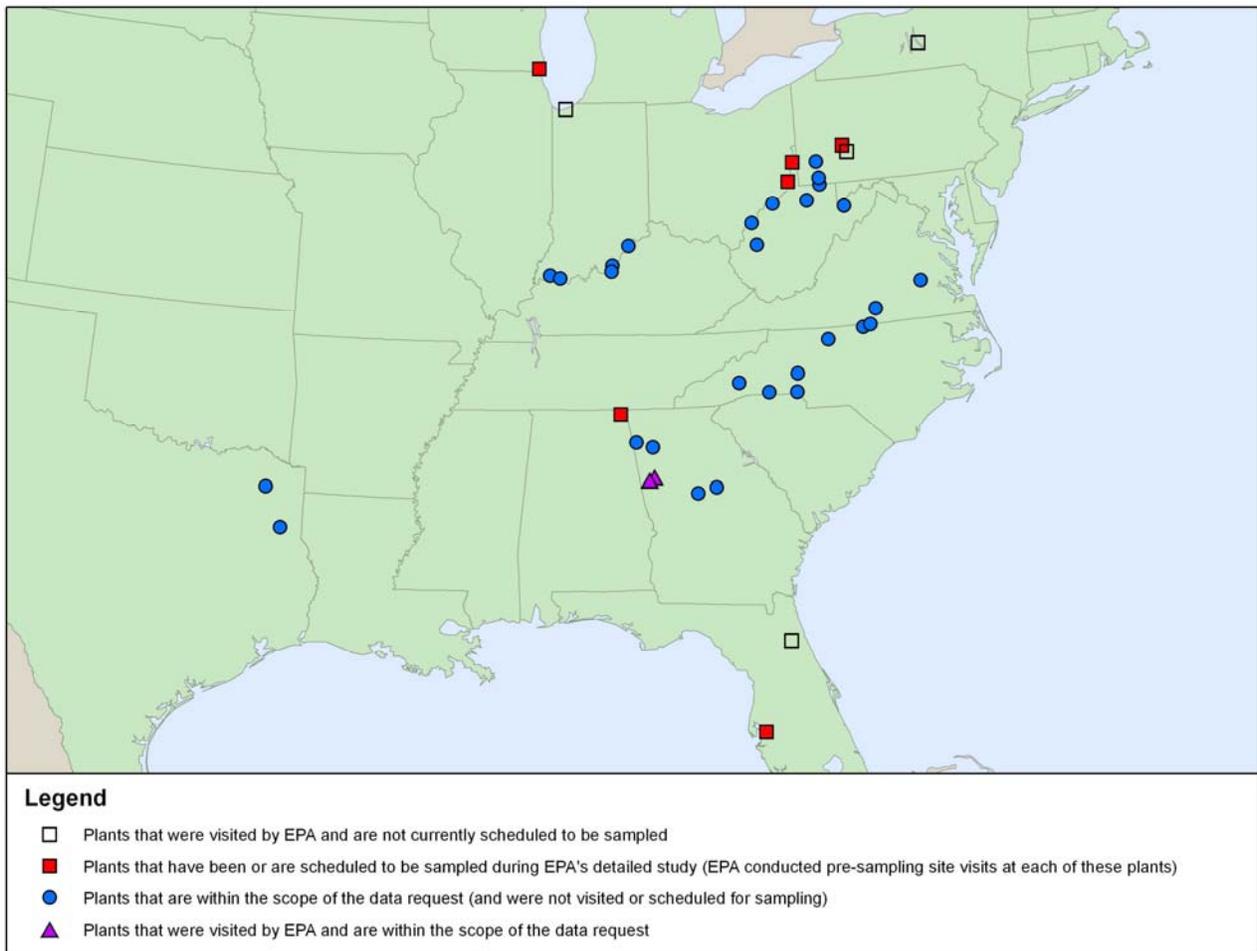


Figure 1. Geographic Distribution of Coal-fired Steam Electric Plants Included in EPA Data Collection Activities for Steam Electric Detailed Study

2.1 Facility Inspections

EPA is currently conducting a site visit program to gather information on the types of wastewaters generated by coal-fired steam electric power plants, as well as the methods of managing these wastewaters to allow for recycle, reuse, or discharge. In particular, EPA has focused data gathering activities on coal-fired power plants, with particular interest in FGD wastewater treatment, the management of ash sluice water, and water reuse opportunities.

EPA initially constructed a list of 96 coal-fired steam electric plants believed to operate wet FGD systems, based on information received from EPA's Office of Air and Radiation. EPA received and reviewed data from UWAG on approximately 80 of these coal-fired steam electric plants with wet FGD systems and two additional plants not previously identified by EPA. The data provided by UWAG included information on air pollution controls in place, process configurations, and other characteristics of the plants (see Section 2.4 for more information). In addition, EPA gathered data on another 4 coal-fired steam electric power plants.

The compiled facility data are believed to represent approximately 80-85 percent of the total population of coal-fired plants currently operating wet FGD systems.² The UWAG data were used in conjunction with information from other sources, including publicly available plant-specific information and contacts with state and regional permitting authorities, to preliminarily identify candidate plants for site visits. EPA considered the following characteristics to select plants for site visits (not listed in any priority order):

- Coal-fired boilers;
- Wet FGD scrubber system, including:
 - Type of scrubber,
 - Sorbent used,
 - Year operation began,
 - Chemical additives used,
 - Forced oxidation process,
 - Water cycling, and
 - Solids removal process;
- Type of coal;
- Selective Catalytic Reduction (SCR) and/or Selective Non-Catalytic Reduction (SNCR) NOx controls;
- Ash handling systems;
- FGD wastewater treatment system;
- Ash treatment system; and
- Advanced mercury air controls.

Using these characteristics, EPA identified plants to contact and obtain more detailed information about the plants' operations. From the information obtained during these contacts, EPA selected 12 plants for site visits. Plant conditions, such as type of FGD and whether target waste streams are segregated or commingled with other wastes, influenced the plant selection process. See Table 1 for information on the characteristics of plants visited prior to September 2007. Figure 2 shows the geographic distribution of the plants that were visited.

² As of early 2007, EPA had identified 98 plants operating one or more wet FGD systems. The total number of plants operating wet FGD systems is dynamic; additional plants have started operating FGD systems since the beginning of the year, or are currently in the process of installing FGD systems. Therefore, the data provided by UWAG are believed to represent about 80-85 percent of the total population of coal-fired plants currently operating wet FGD systems.

Table 1. Summary of Steam Electric Detailed Study Site Visits

Site	Coal Type	FGD Type	Year FGD Began Operation	SCR/SNCR NO _x Control	Type of FGD Wastewater Treatment System	Fly Ash Handling (wet/dry)
A	Eastern Bituminous	Chiyoda Jet-Bubbling Reactor, limestone forced oxidation. No additives. (1 unit)	1992	No SCR or SNCR	Settling pond	Wet
B	Eastern Bituminous	Currently being installed	NA	SCRs on 2 units	Currently installing a settling pond	Wet
C	Eastern Bituminous	Spray tower, limestone forced oxidation. ^a No additives. (2 units)	1977 and 1981	SCRs on both units with FGD	Settling Pond	Wet
D	Eastern Bituminous	Spray tower, limestone forced oxidation. Dibasic acid additive. (2 units)	1994 and 1995	No SCR or SNCR	Chemical precipitation (lime addition to pH 8.6, ferric chloride, sodium sulfide, polymer), followed by biological reactor	Dry
E	Eastern Bituminous	Spray tower, limestone forced oxidation. Formic acid additive. (1 unit)	2001	SCRs on 3 units	Chemical precipitation (lime addition to pH 8.1, ferric chloride, polymer), followed by biological reactor	Dry
F	Subbituminous (Powder River Basin)	Spray tower, limestone forced oxidation. No additives. (2 units)	2006 and 2007	SCRs on both units with FGD	Chemical precipitation (lime addition to pH 8.9, organosulfide, ferric chloride, polymer)	Dry
G	Bituminous (75%), Eastern Bituminous (25%)	Spray tower, limestone forced oxidation. No additives. (2 units)	1992	SCR on one of the units with FGD	Polymer addition only; no pH adjustment	Dry
H	Eastern bituminous, additionally burns petroleum coke as a small percentage (up to 30%)	Spray tower, limestone forced oxidation. Dibasic acid additive. (2 units)	1984	No SCR or SNCR	Chemical precipitation (lime addition to pH 8, ferrous chloride, polymer)	Dry
I	Eastern Bituminous, additionally burns petroleum coke as a small percentage (typically 1-2%; 5% maximum)	Two scrubbers for 4 units (2 units per scrubber): (1) spray tower, limestone forced oxidation, and (2) double loop spray tower, limestone forced oxidation. Dibasic acid additive.	1985 (double loop) and 2000 (spray tower)	SCR on one unit. Will be installing SCR's on the other units over the next three years.	Chemical precipitation (lime addition to pH 9.0, ferric chloride, polymer)	Dry
J	Eastern Bituminous	Spray tower, limestone forced oxidation. Formic acid additive. (2 units)	1995	SCR on 1 unit	Chemical precipitation (lime addition to pH 10.7, ferric chloride, polymer)	Dry
K	Eastern Bituminous	Spray tower, limestone forced oxidation. No additives. (2 units)	NA	SCRs on both units with FGD	Chemical precipitation (lime addition to pH 8.5, ferric chloride, polymer)	Dry
L	Subbituminous	In the process of being installed.	NA	SCRs on 3 units	In process of being installed	Wet

^aThe FGD scrubber is a once-through system in which, the gypsum slurry in the scrubber reaction tank is not recycled back through the scrubber, but rather, is continuously discharged.
 NA – Not available.

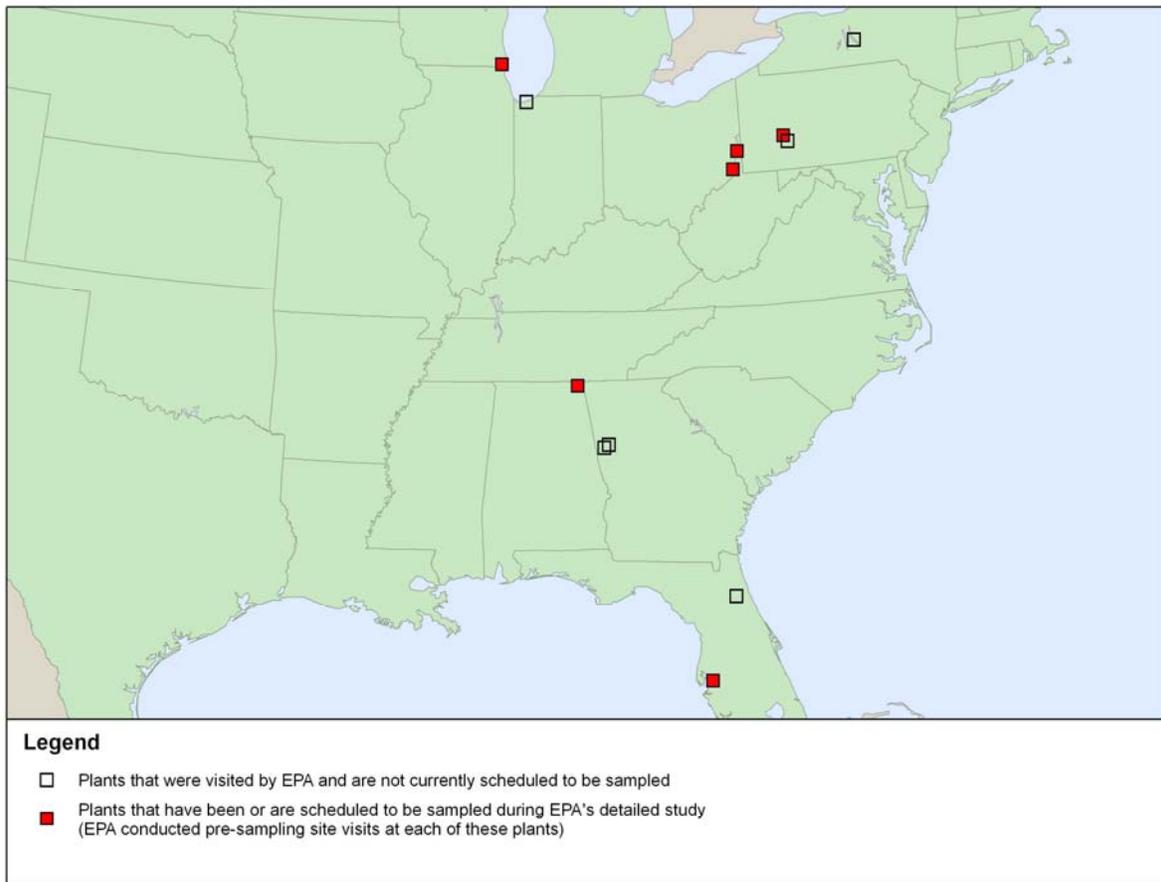


Figure 2. Geographic Distribution of Coal-fired Steam Electric Plants Part of EPA Site Visit and Sampling Program for the Steam Electric Detailed Study

During the site visits, EPA collected information on plant operations and types of wastewater management techniques. EPA also used these visits to assess whether the site was appropriate for sampling. The objectives of these site visits were to:

- Gather general information about the plant's operations;
- Gather process-specific information;
- Gather information on pollution prevention and wastewater treatment/operations;
- Gather plant-specific information to develop sampling plans; and
- Select and evaluate potential sampling points.

From these visits, EPA selected six facilities as candidates for wastewater sampling episodes.

2.2 Wastewater Sampling

EPA is currently conducting a sampling program to characterize raw wastewaters generated by coal-fired steam electric power plants, as well as evaluate treatment technologies and best management practices used to reduce pollutant discharges. EPA developed a “generic” sampling plan³ to provide general sampling procedures and methods EPA and its contractors will follow when conducting sampling activities. This document, in combination with plant-specific sampling plans, serves as a guide to the field sampling crew, and provides a source of procedural information for plant personnel.

EPA is in the process of collecting and analyzing samples to characterize wastewater streams generated at six coal-fired steam electric power plants. Specifically, EPA is characterizing wastewater streams associated with wet FGD systems and ash handling operations, and evaluating the capability of various types of treatment systems to remove metals prior to discharge. See Table 2 for information on the plants selected as part of the sampling program and Figure 2 for the geographic distribution of coal-fired steam electric plants that were sampled.

Table 2. Summary of Steam Electric Detailed Study Sampling Program

Site	Episode No.	Date of Sample Episode	Samples Planned for Collection				
			FGD			Ash Pond	
			Influent	In-Process	Effluent	Influent	Effluent
I	6547	July 2007	X		X		
E	6548	August 2007	X	X	X		X (bottom ash)
C	6549	September 2007	X		X	X (fly + bottom)	X (fly + bottom)
K	6550	Episode has not yet occurred	X	X	X		X (fly ash + other)
L	6551	Episode has not yet occurred				X (fly ash)	X (fly ash)
F	6546	Episode has not yet occurred	X	X	X		

Data from the sampling program will be used to support the following study objectives:

- Determine the pollutants present in wastewater streams generated by or associated with air pollution controls (e.g., wet scrubber FGD units, SCR/SNCR NOx controls, wet ash handling systems);
- Characterize the treatment performance of steam electric wastewater treatment systems;

³ *Generic Sampling and Analysis Plan for Coal-Fired Steam Electric Power Plants* (DCN 04296), dated 6/1/2007.

- Evaluate the effectiveness of treatment systems at reducing discharges of metals;
- Characterize the pollutants ultimately discharged to surface water from steam electric plants; and
- Depending on available information, determine the contribution of the pollutants from FGD wastewaters and ash handling to the overall pollutant load discharged from steam electric plants.

The steam electric sampling and analysis program consists of one- to two-day sampling at selected plants. The sampling activities will characterize the FGD and ash handling wastewaters, and the performance of the systems used to treat these wastes. EPA has prepared or is preparing site-specific sampling plans for each location, including discussions of the specific sample points, the sample collection methods to be used, and the field quality control (QC) samples to be collected (consisting of bottle blanks, field blanks, equipment blanks, duplicate samples, and laboratory QC samples used for matrix spike/matrix spike duplicate analyses and serial dilutions).

Table 3 presents the analytes identified by EPA as analytes of interest for the wastewater sampling program. The analytes selected for analysis reflect the current understanding of coal-fired power plant wastewaters, including contributions from coal, scrubber sorbents, treatment chemicals, and other sources. EPA is also collecting samples that will be analyzed by EPA's Office of Research and Development for arsenic and selenium speciation.

EPA's sampling program will provide data to perform an engineering assessment of the design, operation, and performance of treatment systems at steam electric plants. Specifically, EPA will collect information regarding system design and day-to-day operation. The sampling will focus on influent, effluent, and in-process streams for FGD and ash handling wastewater treatment systems.

During each sampling episode, engineering information will be collected with regard to design and operation of the plant being sampled. For example, information such as coal usage, plant capacity, wastewater flow rates, sludge generation rates (if applicable), and retention times in wastewater treatment process stages. Engineering data collection sheets will be completed for each plant. This information will be used to determine if the specific design or operational criteria of the steam electric operations affect the wastewater characteristics.

Table 3. Summary of Analytes of Interest for Sampling Program

Parameter	Method Number
Classicals	
Biochemical Oxygen Demand (BOD5)	SM 5210 B
Total Suspended Solids (TSS)	SM 2540 D
Total Dissolved Solids (TDS)	SM 2540 C
Sulfate	ASTM D516-90
Chloride	SM 4500—Cl—C
Ammonia as Nitrogen	SM 4500—NH3 B, F (18th ed.)
Nitrate/Nitrite as Nitrogen	SM 4500—NO3 -H
Total Kjeldahl Nitrogen (TKN)	SM 4500—NH3 B or C, F (18th ed.)
Total phosphorus	EPA 365.3 (Rev 1978)
Hexane Extractable Material (HEM)	EPA 1664A
Silica Gel Treated Hexane Extractable Material (SGT-HEM)	EPA 1664A
Metals	
Total metals (27 metals: aluminum, antimony, arsenic, barium, beryllium, boron, cadmium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, mercury, molybdenum, nickel, selenium, silver, sodium, thallium, tin, titanium, vanadium, yttrium, and zinc)	EPA 200.7, 200.8, 200.9, 245.2
Dissolved metals (27 metals)	EPA 200.7, 200.8, 200.9, 245.2
Low-level total metals (11 metals: antimony, arsenic cadmium, chromium, copper, lead, nickel, selenium, silver, thallium, zinc)	EPA 1638
Low-level dissolved metals (11 metals)	EPA 1638
Low-level total mercury	EPA 1631
Low-level dissolved mercury	EPA 1631
Hexavalent chromium	ASTM D1687-92
Low-level hexavalent chromium	EPA 1636

2.3 Data Request

EPA collected information about coal-fired steam electric plants by means of the *Data Request for the Steam Electric Power Generating Industry*⁴ (“data request”), issued under authority of Section 308 of the Clean Water Act.

EPA selected nine companies to receive the data request based on specific characteristics of plants they operate. Each company operates one or more coal-fired power plants that were in operation in 2006 and have one or more of the following characteristics: wet FGD systems (either operating or planned installations) or wet fly ash handling systems. EPA distributed the data request to these nine power companies in May 2007 and received data request responses in August and October 2007.

⁴ *Data Request for the Steam Electric Power Generating Industry* (DCN 04322), dated 05/07/2007.

The data requests were divided into two parts: Part A, General Power Company Information; and Part B, Power Plant Technical Information. Part A requested the following: company contact information; corporate structure information; and profile information for the coal-fired steam electric plants that the companies currently operate and that were in operation during 2006.

EPA requested that the power companies complete Part B of the data request for each coal-fired steam electric plant they operate that meets the following criteria: was in operation in calendar year 2006; and operates at least one wet scrubber and/or is currently constructing/installing (or plans to begin constructing prior to December 31, 2010) at least one wet scrubber. Part B contains the following seven sections:

- Section 1: General Plant Information;
- Section 2: Steam Electric Power Production;
- Section 3: Fuels Used;
- Section 4: Process Wastewater Generation from Coal-fired Steam Electric Units;
- Section 5: Wastewater Discharge and Treatment Operations;
- Section 6: Wastewater Treatment Costs; and
- Section 7: Monitoring Data.

Section 1 (General Plant Information) requested plant address and contact information. Sections 2 and 3 (Steam Electric Power Production; Fuels Used) requested steam electric power production information and fuels used for each steam electric unit that the plant operated in 2006.

Section 4 (Process Wastewater Generation from Coal-fired Steam Electric Units) requested wastewater generation information, including flow rate data, for the following wastewaters: coal pile runoff; coal pulverizer waste streams; wastewaters from ash handling and air pollution control systems (FGD, SCR/SNCR, and enhanced mercury air controls); and cooling water.

Section 5 (Wastewater Discharge and Treatment Operations) requested information on the operations of each wastewater treatment system at each plant and the associated wastewater flow rates; flow rates for untreated wastewaters; and a diagram for each plant including all coal-fired steam electric process operations, wastewater treatment systems, and treated and untreated flows. Section 6 (Wastewater Treatment Costs) requested operation and maintenance (O&M) cost data for each wastewater treatment system operated in 2006; and capital cost data for each FGD wastewater treatment system constructed between January 01, 1997 and December 31, 2006.

Section 7 (Monitoring Data) requested monitoring data for coal-fired steam electric wastewater streams that the plant collected for any reason during 2006 that meets certain sample location and analyte criteria.

In developing the data request, EPA worked with industry trade associations and other EPA program offices to develop questions that addressed the needs of the detailed study, while minimizing respondent burden.

Table 4 contains preliminary information about the coal-fired steam electric plants operated by the data request recipient companies. EPA obtained this information either from the data request recipients directly (prior to data request completion), or from the plant information provided by UWAG. As shown in Table 4, EPA received data request information for 30 coal-fired steam electric plants, all of which are either operating a wet FGD system or are constructing or planning to begin constructing a wet FGD system by December 31, 2010. Of these plants, 20 plants operate wet fly ash handling systems and 7 plants operate segregated FGD wastewater treatment systems. Figure 3 presents the geographic distribution of coal-fired steam electric plants for which the data request recipients provided information.

Table 4. Preliminary Profile Data of Data Request Recipients

Company Number	Coal-fired Steam Electric Plants Operated by Company/Subsidiary			Plants Covered by the Data Request		
	Total ^a	Number Currently Operating Wet FGD Systems ^a	Number Not Currently Operating Wet FGD Systems, But Planning to Begin Constructing by 12/31/2010 ^a	Total	Number with Segregated FGD WWT System (Operating) ^b	Number with Wet Fly Ash Systems ^a
1	10	3	2	5	1	0
2	6	1	1	2	1	1
3	16	2	1	3	1	1
4	8	1	3	4	1	4
5	10	1	5	6	1	6
6	3	3	0	3	0	3
7	8	2	1	3	0	3
8	4	2	0	2	2	0
9	2	2	0	2	0 ^c	2
Total	67	17	13	30	7	20

^aData from companies receiving data request.

^bData from UWAG plant information; not yet confirmed by review of response to data request.

^cData from initial plant contacts; not yet confirmed by review of response to data request.

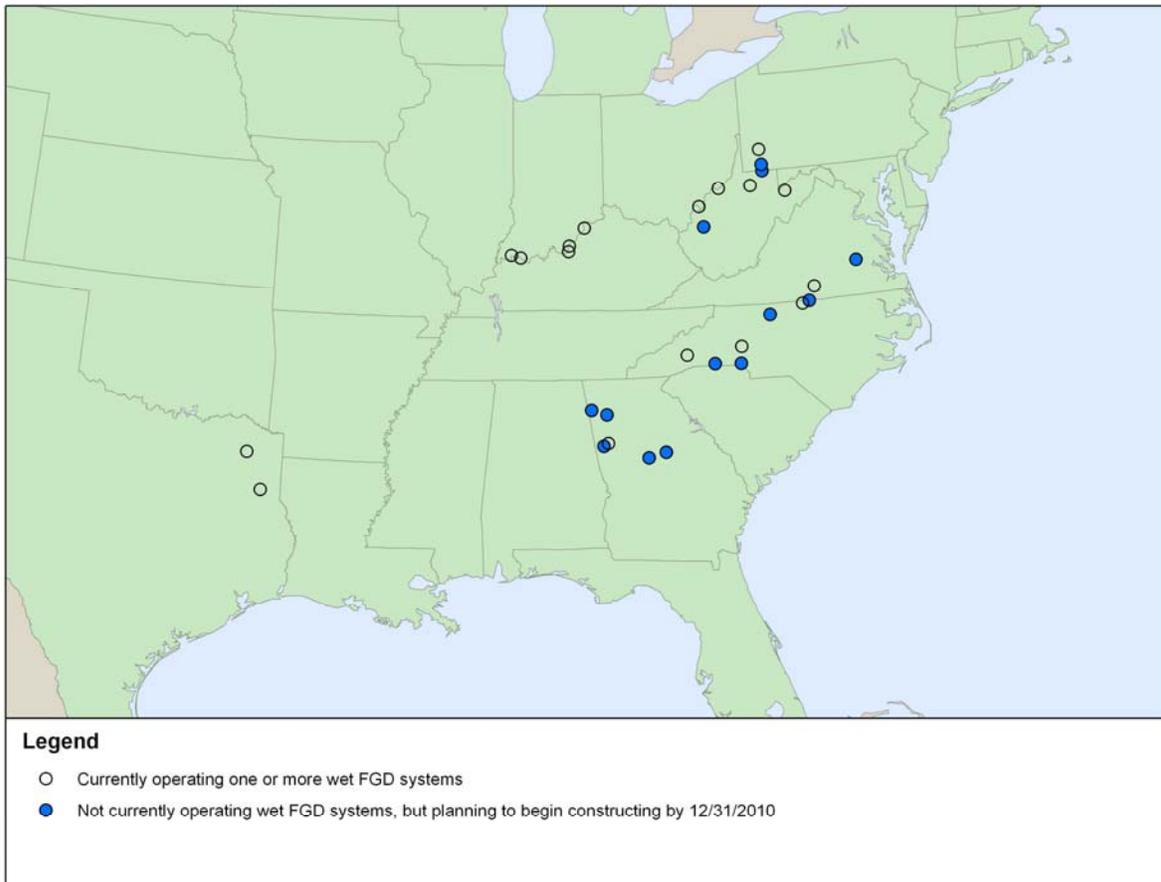


Figure 3. Geographic Distribution of Coal-fired Steam Electric Plants That Received the Data Request for Steam Electric Detailed Study

2.4 EPA Interactions with the Utility Water Act Group (UWAG)

The Utility Water Act Group (UWAG) is an association of over 200 individual electric utilities and four national trade associations of electric utilities: the Edison Electric Institute, the National Rural Electric Cooperative Association, the American Public Power Association, and the Nuclear Energy Institute. The individual utility companies operate power plants and other facilities that generate, transmit, and distribute electricity to residential, commercial, industrial, and institutional customers. The Edison Electric Institute is the association of U.S. shareholder-owned electric companies, international affiliates, and industry associates. The National Rural Electric Cooperative Association is the association of nonprofit electric cooperatives supplying central station service through generation, transmission, and distribution of electricity to rural areas of the United States. The American Public Power Association is the national trade association that represents publicly owned (municipal and state) electric utilities in 49 states. The Nuclear Energy Institute establishes industry policy on legislative, regulatory, operational, and technical issues affecting the nuclear energy industry on behalf of its member companies, which include the companies that own and operate commercial nuclear power plants in the United States, as well as nuclear plant designers and other

organizations involved in the nuclear energy industry. UWAG's purpose is to participate on behalf of its members in EPA's rulemakings under the CWA.

UWAG previously commented on EPA's selection of the steam electric power generation industry for a detailed study as part of the 2006 Effluent Guidelines Program Plan. UWAG also provided data during a review of PCS and TRI data to assess national discharge loadings associated with this industry, as summarized in the *Interim Detailed Study Report for the Steam Electric Power Generating Point Source Category (EPA/821-R-06-015, November 2006)*. As EPA continued with the detailed study and began formulating approaches to data collection, EPA held a series of discussions with UWAG to streamline and facilitate the data collection process. Specifically, EPA communicated with UWAG to collect information on power plant characteristics to support site visit selection, discuss wastewater sampling approaches and recommendations, review the data request for clarity, and coordinate data collection for existing permit data.

2.4.1 Database of Power Plant Information

In preparing for the selection of site visit candidates, EPA assembled available power plant information from the Department of Energy and EPA's Office of Air and Radiation. Specifically, EPA was interested in coal-fired power plants that operate wet FGD systems and have wet ash handling operations. EPA provided UWAG with a list of 96 potential candidates, which UWAG reviewed and provided information as described in Section 2.1.

In reviewing the information provided by UWAG, EPA determined slightly more than half of the plants use eastern bituminous coal as the primary source of fuel. Eastern bituminous coal is generally considered to contribute more pollutants (i.e., metals) to wastewater streams than other types of coal. Approximately 10 percent of the plants use Powder River Basin coal, another approximately 10 percent use lignite coal, and still another approximately 10 percent use subbituminous coal. Almost 60 percent of the FGD systems in the dataset use limestone as the FGD sorbent and approximately half of the plants are using forced oxidation systems to produce a calcium sulfate byproduct (gypsum), while the other half are producing a calcium sulfite byproduct. However, a number of relatively old FGD systems are included in the UWAG data and, based on communications with industry, EPA believes that the majority of newly-installed FGD systems will be limestone forced oxidation systems that produce a commercial-grade gypsum byproduct. No plants were identified as using advanced mercury air controls.

According to the UWAG data, most of the plants (75 percent) do not treat FGD wastewater prior to commingling it with other waste streams at the plant. Therefore, the most reported treatment operation was settling, such as a pond system, to treat the FGD wastewater prior to discharge from the plant. EPA did identify seven plants in the UWAG dataset that operate a segregated chemical precipitation system for treating FGD wastewater.

2.4.2 Wastewater Sampling

As discussed in Section 2.2, EPA is conducting a wastewater sampling program to characterize wastewaters generated by coal-fired power plants, and to evaluate treatment technologies and best management practices available to reduce pollutant discharges. EPA held

several meetings with UWAG to discuss various approaches to the sampling program, including identifying representative sample points, providing comment on the generic sampling and analysis plan, and providing recommendations on laboratory analyses and potential interferences (particularly with handling high solids influent samples). UWAG participated in the facility pre-sampling site visits and provided review and comment on site-specific sampling plans. At the invitation of the plants being sampled, UWAG also collected split samples during EPA's sampling episodes.

2.4.3 Data Request

As discussed in Section 2.3, EPA developed a data request to collect information on coal-fired steam electric plants. EPA provided UWAG an opportunity to review the data request and to recommend changes to improve the clarity of the questions involved. For example, UWAG provided input on the industry's definitions of scrubber terminology to ensure that the respondents would understand the questions that EPA included in the request. A copy of UWAG's comments on the data request are included in the docket.⁵

2.4.4 NPDES Form 2C

UWAG and EPA are coordinating efforts to compile selected NPDES Form 2C data from UWAG's member companies. The NPDES Form 2C is an application for a permit to discharge wastewater that must be completed by existing industrial facilities (including manufacturing, commercial, mining and silvicultural operations). This form includes facility information, data on facility outfalls, process flow diagrams, treatment information, and intake and effluent characteristics. During EPA's development of the "*Data Request for the Steam Electric Power Generating Industry*," UWAG proposed, as an alternative to the Data Request including a requirement for plants to collect wastewater samples, to gather current Form 2Cs from its members and summarize relevant data contained on the forms. While this compilation of Form 2C data will provide less information than could have been collected for any individual plant if a sampling requirement had been included as part of the Data Request, EPA believes it is a reasonable alternative that will provide wastewater characteristics for a broader population of plants than EPA had contemplated, encompassing a greater variety of plant operations and characteristics and possibly resulting in a better characterization of the waste streams of interest. In addition, this approach eases the burden that a sampling requirement would have imposed on plants responding to the Data Request.

The database will focus on the outfalls of coal-fired facilities that receive either FGD, ash handling, or coal pile runoff waste streams. Other outfalls – such as separate outfalls for sanitary sewerage, cooling water, landfill runoff, and other miscellaneous purposes – will not be included in the database. The database will not include Form 2C information for plants that do not have either a wet FGD or wet fly ash. For example, if a plant has no wet FGD and it is known that the only wet ash handling at the plant is for bottom ash sluicing, its information will not be included in the database.

⁵ *Comments of the Utility Water Act Group (UWAG) on EPA's Draft Data Request for the Steam Electric Generating Industry* (DCN 04998), dated 03/23/2007.

2.5 EPA Interactions with the Electric Power Research Institute (EPRI)

EPRI is a research-oriented trade association for the steam electric industry that focuses on determining solutions to industry issues or problems. EPRI has extensively studied wastewater discharges from FGD systems, and provided EPA with reports that summarize the data collected during several of these studies. EPRI provided EPA with the following reports:

- Flue Gas Desulfurization (FGD) Wastewater Characterization: Screening Study (DCN 04539);
- EPRI Technical Manual: Guidance for Assessing Wastewater Impacts of FGD Scrubbers (DCN 04537);
- The Fate of Mercury Absorbed in Flue Gas Desulfurization (FGD) Systems (DCN 04538);
- Update on Enhanced Mercury Capture by Wet FGD: Technical Update (DCN 04536); and
- PISCES Water Characterization Field Study, Sites A-G (DCNs 05060-05065).

The EPRI reports have provided EPA with background information regarding the characteristics of FGD wastewaters and the sampling techniques used to collect the samples.

In addition, EPRI participated in meetings with EPA and provided comments on EPA's planned data collection activities, including the data request and the sampling program. EPRI specifically commented on the sample collection techniques, as well as considerations for the laboratory analysis of FGD and ash handling wastewaters. EPRI also provided comments on EPA's Generic Sampling and Analysis Plan for Coal-Fired Steam Electric Power Plants.

2.6 Other Data Collection Activities

EPA is also in the process of contacting vendors and conducting literature searches to collect additional information on wastewater treatment technology options and wastewater reuse options for particular waste streams. In addition, EPA is collecting general information on the cost for coal-fired power plants to install FGD systems, wastewaters associated with Integrated Gasification Combined Cycle (IGCC) power plants, and is continuing to investigate the source of boron in wastewaters discharged from nuclear facilities.