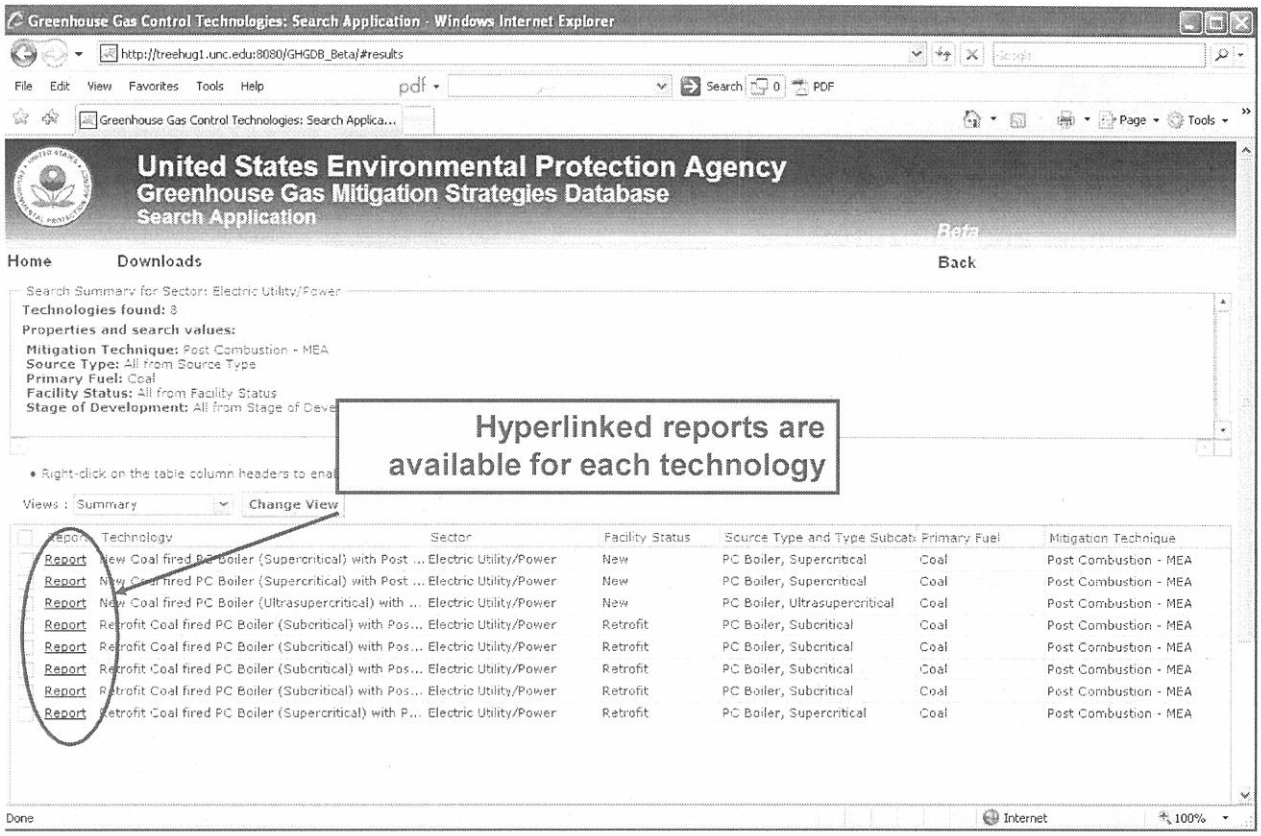
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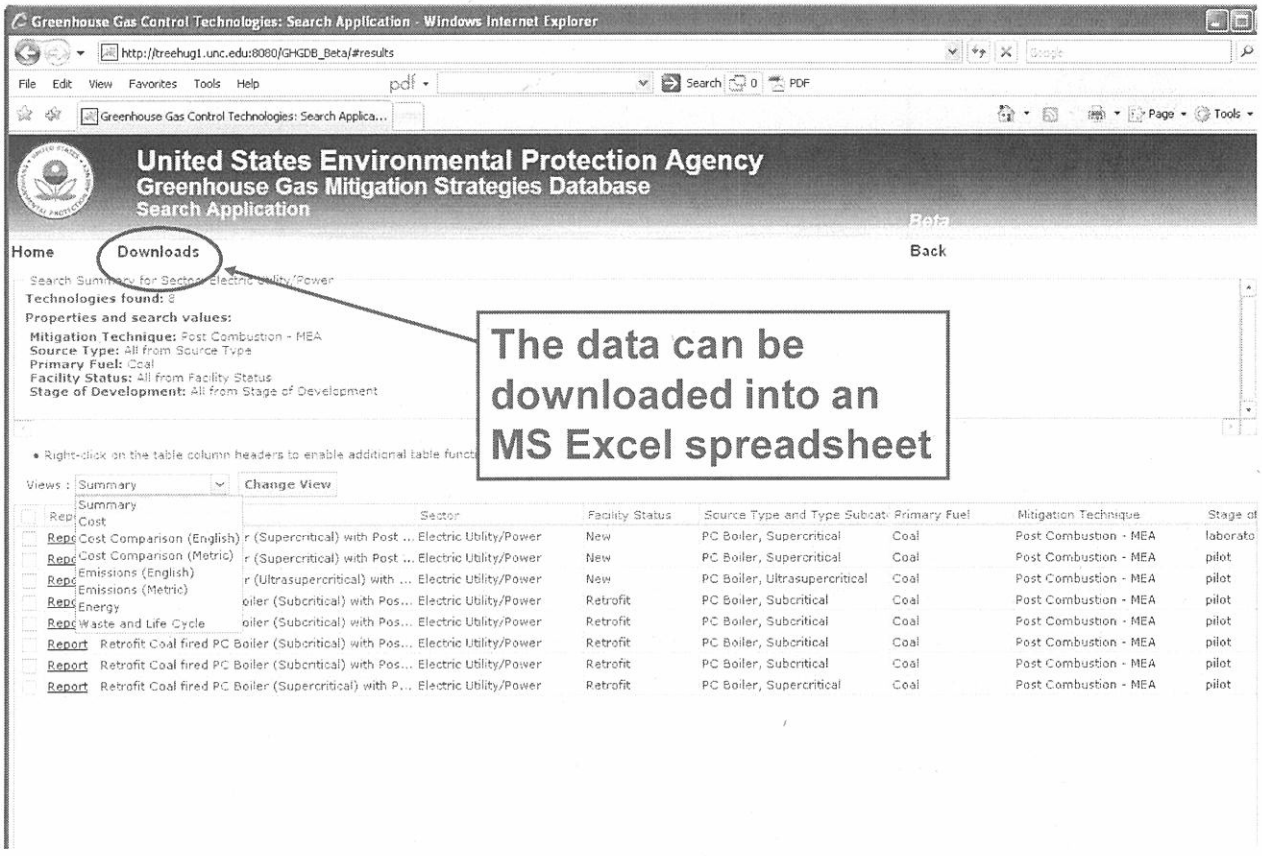
http://treehug1.unc.edu:8080/GHGDB_Beta/#results
United States Environmental Protection Agency
Greenhouse Gas Mitigation Strategies Database
Search Application
Beta
Home
Downloads
Back
Technologies found: 8
Properties and search values:
Mitigation Technique: Post Combustion - MEA
Source Type: All from Source Type
Primary Fuel: Coal
Facility Status: All from Facility Status
Hyperlinked reports are available for each technology
Views : Summary
Change View
Technology
Sector
Facility Status
Source Type and Type Subcat
Primary Fuel
Mitigation Technique
Report
Electric Utility/Power
New
PC Boiler, Supercritical
Coal
Post Combustion - MEA
Retrofit
PC Boiler, Subcritical
PC Boiler, Ultrasupercritical
Done
Internet
100%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http://treehug1.unc.edu:8080/GHGDB_Beta/#results
United States Environmental Protection Agency
Greenhouse Gas Mitigation Strategies Database
Search Application
Beta
Home
Downloads
Back
Technologies found: 8
Properties and search values:
Mitigation Technique: Post Combustion - MEA
Source Type: All from Source Type
Primary Fuel: Coal
Facility Status: All from Facility Status
Stage of Development: All from Stage of Development
The data can be downloaded into an MS Excel spreadsheet
Views : Summary
Change View
Summary
Cost
Cost Comparison (English)
Cost Comparison (Metric)
Emissions (English)
Emissions (Metric)
Energy
Waste and Life Cycle
Sector
Facility Status
Source Type and Type Subcat
Primary Fuel
Mitigation Technique
Stage of
Electric Utility/Power
New
PC Boiler, Supercritical
Coal
Post Combustion - MEA
laborato
Retrofit
PC Boiler, Subcritical
PC Boiler, Ultrasupercritical
pilot

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PSD GHG Technical Information and Guidance

- **Summer and Fall 2010:**
  - Develop guidance on emphasizing energy efficiency when selecting BACT for criteria pollutants which would likely also minimize GHGs.
  - Initial technical data and information concerning available and emerging GHG control measures
    - **GHG Mitigation Strategies Database**
    - RACT/BACT/LAER Clearinghouse enhancements
    - GHG technical white papers that will provide information on control techniques and measures for the largest GHG emitting industrial sectors (e.g., power plants, industrial boilers, cement plants, refineries, iron and steel, pulp and paper and nitric acid plants)

- **Before end of 2010:** General guidance for applying the PSD requirements, including BACT, for GHGs and training work shops with example BACT analyses for EPA Regions and States

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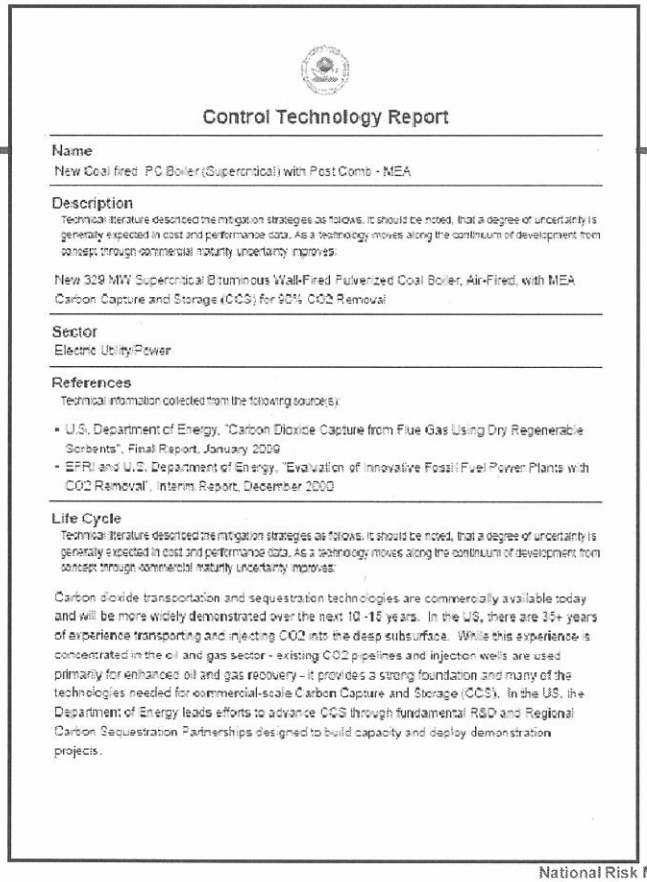

Control Technology Report

Name
New Coal fired PC Boiler (Supercritical) with Post Comb - MEA

Description
Technical literature described the mitigation strategies as follows. It should be noted, that a degree of uncertainty is generally expected in cost and performance data. As a technology moves along the continuum of development from concept through commercial maturity uncertainty improves.

New 329 MW Supercritical Bituminous Wall-Fired Pulverized Coal Boiler, Air-Fired, with MEA Carbon Capture and Storage (CCS) for 90% CO2 Removal

Sector
Electric Utility/Power

References
Technical information collected from the following source(s):

- U.S. Department of Energy, "Carbon Dioxide Capture from Flue Gas Using Dry Regenerable Sorbents", Final Report, January 2009
- EPRI and U.S. Department of Energy, "Evaluation of Innovative Fossil Fuel Power Plants with CO2 Removal", Interim Report, December 2000

Life Cycle
Technical literature described the mitigation strategies as follows. It should be noted, that a degree of uncertainty is generally expected in cost and performance data. As a technology moves along the continuum of development from concept through commercial maturity uncertainty improves.

Carbon dioxide transportation and sequestration technologies are commercially available today and will be more widely demonstrated over the next 10 -15 years. In the US, there are 35+ years of experience transporting and injecting CO2 into the deep subsurface. While this experience is concentrated in the oil and gas sector - existing CO2 pipelines and injection wells are used primarily for enhanced oil and gas recovery - it provides a strong foundation and many of the technologies needed for commercial-scale Carbon Capture and Storage (CCS). In the US, the Department of Energy leads efforts to advance CCS through fundamental R&D and Regional Carbon Sequestration Partnerships designed to build capacity and deploy demonstration projects.

National Risk Management Research Laboratory
Office of Research and Development

EPA
United States
Environmental Protection
Agency

Contact Information

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919 541 2968

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CAVEAT on DATA

- APPCD/NRMRL/ORD Management has indicated that the final report from these studies will be subjected to both internal and external peer review.
- Until that review is completed, these results and any conclusions drawn from them must be considered to be PRELIMINARY.

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Hazardous Air Pollutant (HAP) Emissions Testing in the EPA Pilot-Scale Combustion Research Facility

Nick Hutson

35th Annual EPA-A&WMA Information Exchange

EPA Campus, Research Triangle Park, NC

EPA United States Environmental Protection Agency

Multipollutant Control Research Facility (MPCRF)

- 4 MMBtu/hr (1.2 MW_t)
  - Flue gas velocity and temperature profiles approximate those in commercial utility systems (approx 1000 cfm total flow)
  - Capable of firing all ranks of coal, natural gas and No. 2 fuel oil
- Design facilitates ease of modification for evaluation of various control technologies – individually or in combination.
- Multiple sampling ports throughout the flow path
- Continuous Emissions Monitors (CEMs) for O_2, CO_2, NO_x, SO_2, CO, Hg, total hydrocarbon (THC), HCl, HBr, NH_3 ... other.

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Testing Objective

- Pilot-scale testing in EPA's Multipollutant Control Research Facility (MPCRF) located at the RTP, NC campus.
- Multiple tests using a variety of coal ranks and air pollution technology configurations.
- The primary objective of the testing was to collect data for evaluation of surrogate relationships for inferred control of selected HAPs.
- Data will NOT be used to establish emission limits – i.e., it is not a substitute for the UTILITY ICR data.

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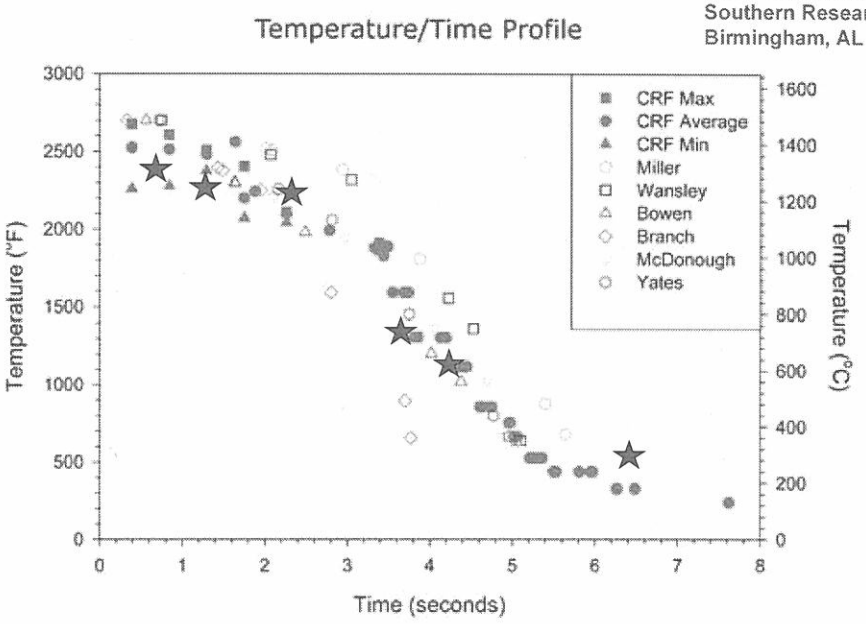
Time-Temperature Profile

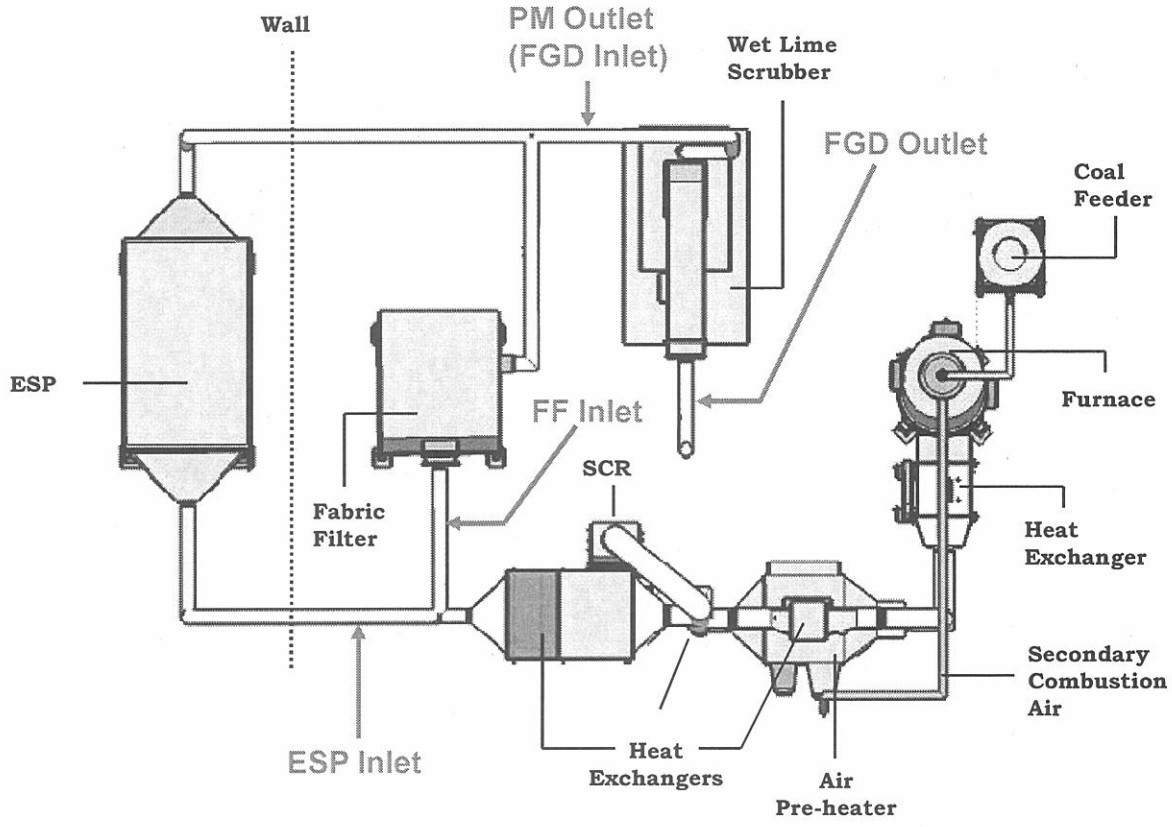
Run #1 (2/16/2010)

Note: Original plot comes from Southern Research Institute (SRI), Birmingham, AL



5

★ MPCRF Time-Temperature Profile during Test #1 (2/16/10)



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HAP Categories

- [X] **(1) Mercury**
- [X] **(2) Dioxin/Furan Organic HAP**
- [√] **(3) Non-Hg Metal HAP** (Sb, As, Be, Cd, Cr, Co, Pb, Mn, Ni, Se)
- [√] **(4) Acid Gas HAP** (HCl, HF, Cl_2)
- [√] **(5) Organic HAP** (Non-Dioxin/Furan Organics)

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HAP Categories

(1) Mercury

(2) Dioxin/Furan Organic HAP

(3) Non-Hg Metal HAP (Sb, As, Be, Cd, Cr, Co, Pb, Mn, Ni, Se)

(4) Acid Gas HAP (HCl, HF, Cl_2)

(5) Organic HAP (Non-Dioxin/Furan Organics)

Class	Sample Method	PM inlet	PM outlet	FGD outlet
SVOC	EPA M0010	X	X	
Aldehydes	EPA M0011		X	
VOC	EPA M31	X		
CH_4	EPA M40		X	
Particulate	Method 5/29	X	X	
Metals	Method 5/29	X	X	
OC/EC	NIOSH 5040 (mod)		X	
TGA LOI	EPA M17 (mod)	X		
Halogens	EPA M26A		X	X
O_2, CO_2	Method 3A	X	X	
SO_2	Method 6C	X		
NO_x	Method 7E	X		
CO	Method 10	X	X	
CH_4	Method 18		X	
TOC	Method 25A	X	X	
SO_2, HCl	ECOChem		X	X

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Test Program

Test #	Date	PM Control	Coal Type	LOI, %
1	2/16/2010	ESP	course bit	22.0
2	2/23/2010	ESP	course bit	12.4
3*	4/7/2010	ESP	bit	- NM -
4	4/21/2010	ESP	bit	7.7
5	4/28/2010	FF	bit	19.6
6	5/20/2010	FF	sub-bit	1.2
7	5/25/2010	FF	sub-bit	2.6
8	6/02/2010	ESP	sub-bit	1.1
9*	6/15/2010	ESP	bit	- NM -
10	7/21/2010	ESP	lignite	1.0
11	7/28/2010	FF	lignite	1.0

*** Runs 3 and 9 were only for acid gas measurements around the FGD scrubber**

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Results

Non-Hg Metal HAPs

(Sb, As, Be, Cd, Cr, Co, Pb, Mn, Ni, Se)

Q: Does the control of bulk PM indicate similar or predictable control of the non-mercury metal HAPs?

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Coal

Bituminous	Sub-bituminous	Lignite
Eastern PA medium-sulfur	PRB, WY low-sulfur	Texas lignite
Coal Analysis * dry basis	**Coal Analysis** * dry basis	**Coal Analysis** * dry basis
moisture = 3.4 %	moisture = 19.8 %	moisture = 27.2 %
Ash* = 7.85 %	Ash* = 7.97 %	Ash* = 15.5 %
Sulfur* = 1.93 %	Sulfur* = 0.92 %	Sulfur* = 1.15 %
Chlorine* = 0.13 % (1300 ppm)	Chlorine* = 0.03 % (326 ppm)	Chlorine* = 0.02 % (197 ppm)
HHV = 13,769 Btu/lb	HHV = 9,599 Btu/lb	HHV = 7,925 Btu/lb

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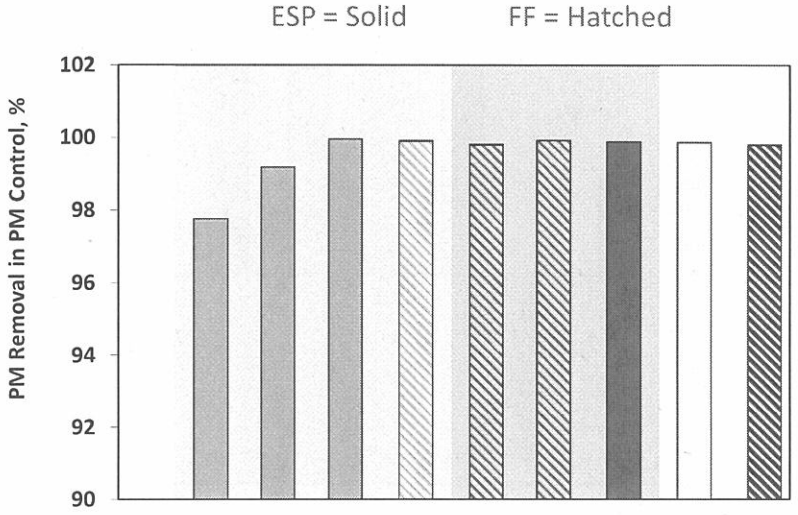
Capture Efficiency



PM Removal (Avg)

overall = 99.57 %

ESP = 99.33 %

FF = 99.86 %

EPA Method 5/29

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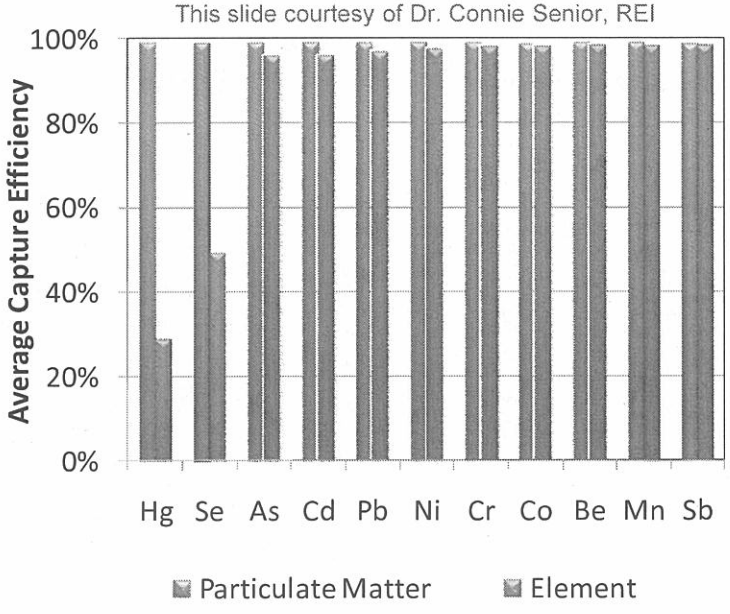
Capture Efficiency in ESPs

(PISCES/DOE field data)

This slide courtesy of Dr. Connie Senior, REI



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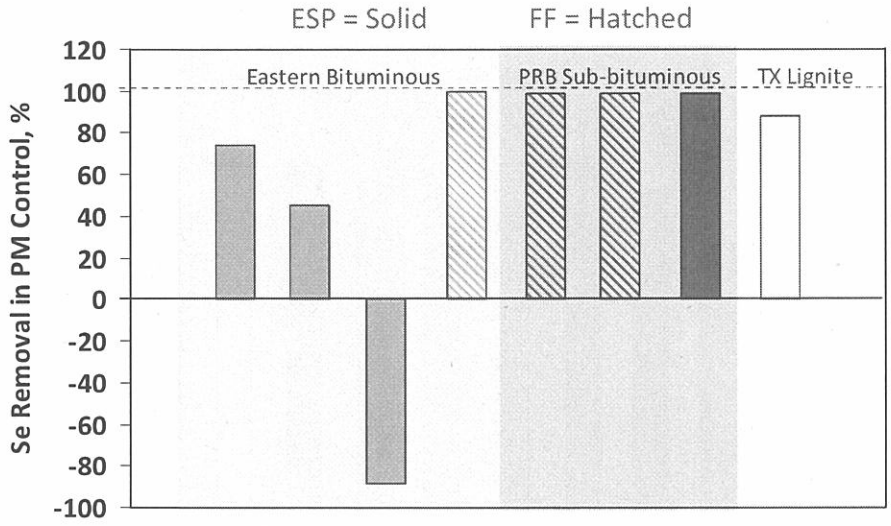
Selenium



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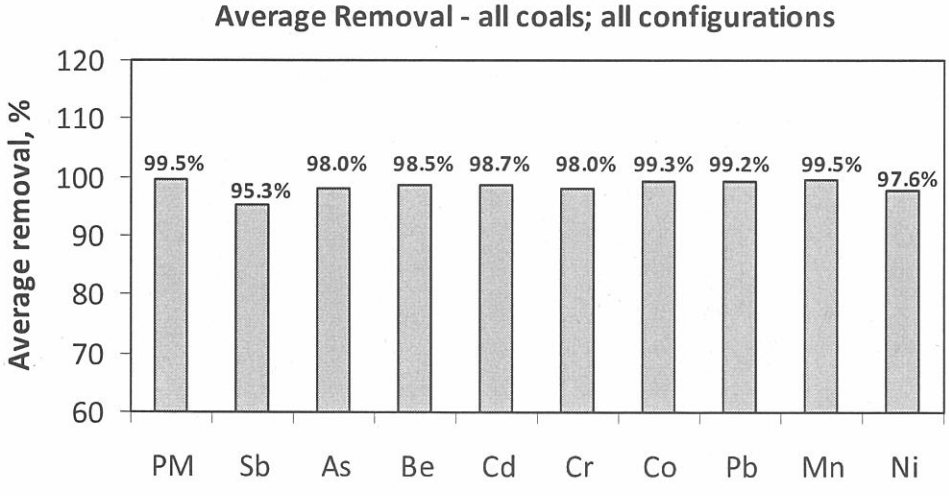
Capture Efficiency



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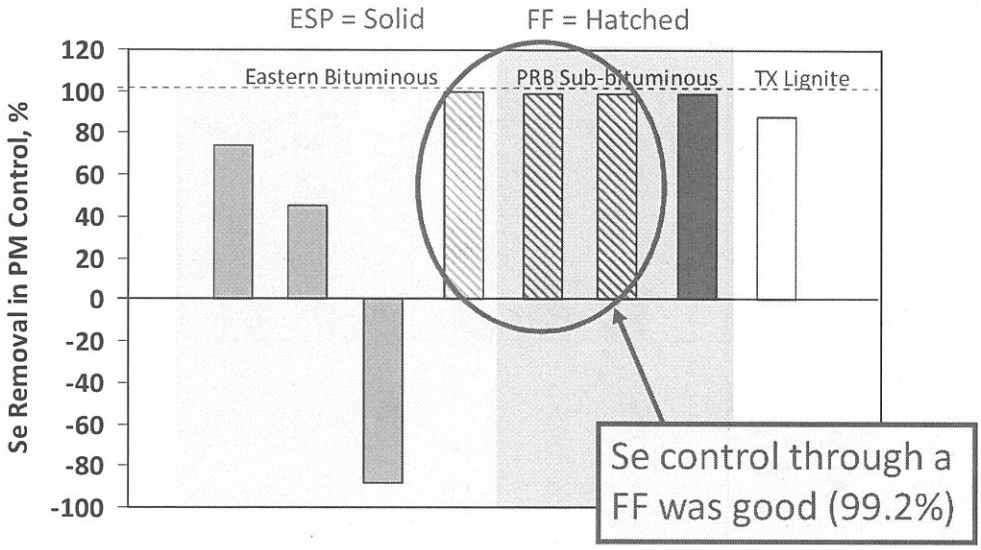
Selenium



EPA Method 5/29

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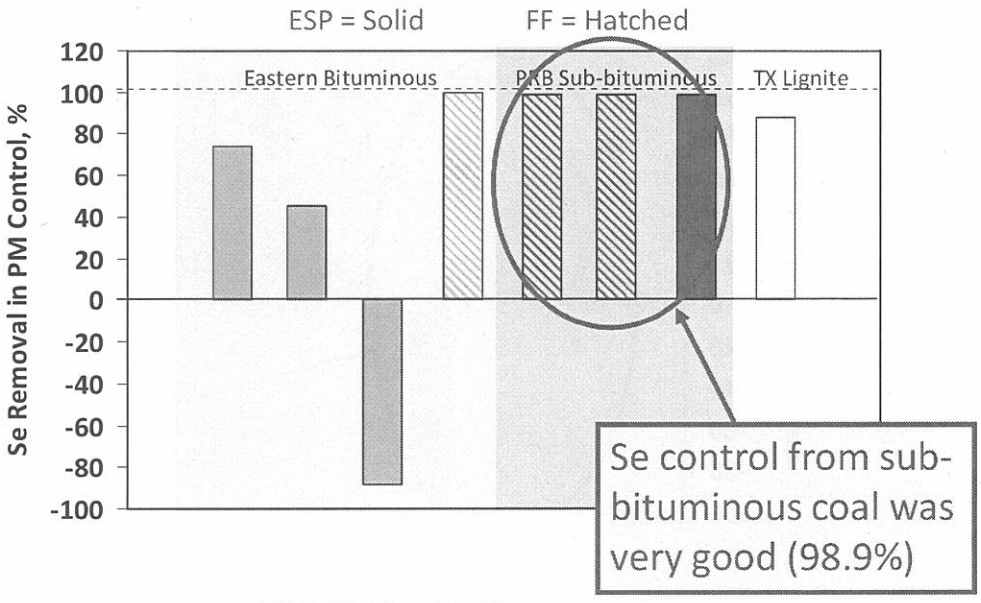
Selenium



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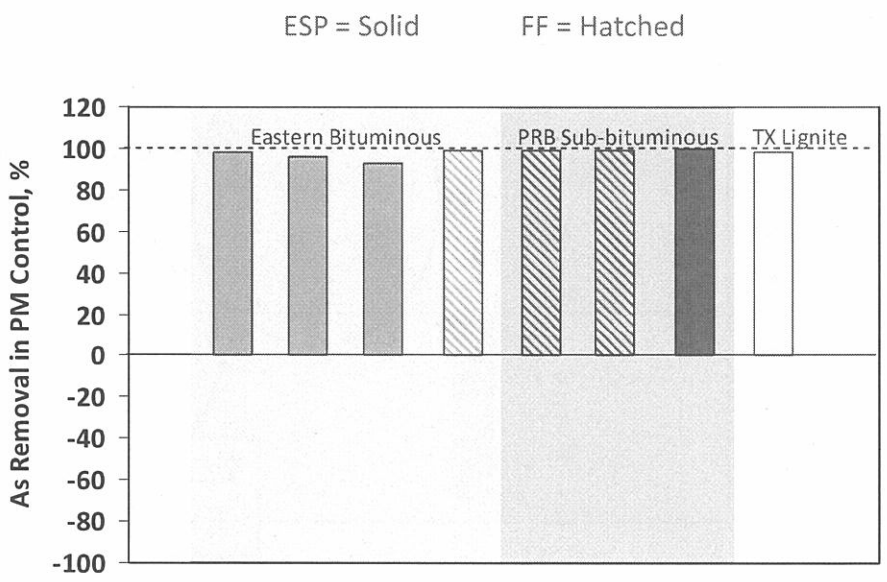
Arsenic



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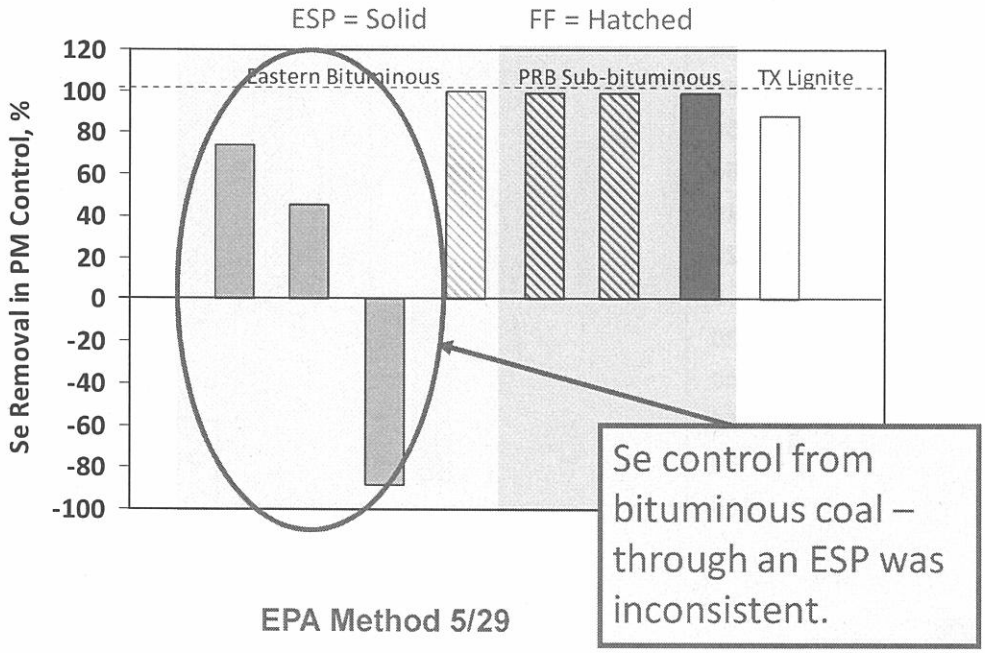
Selenium



EPA Method 5/29

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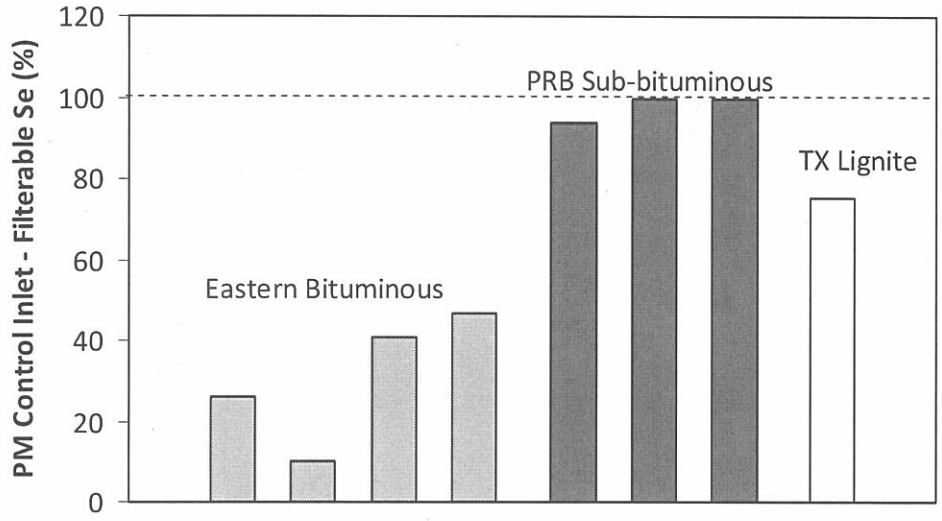
Filterable Se at PM inlet



EPA Method 5/29

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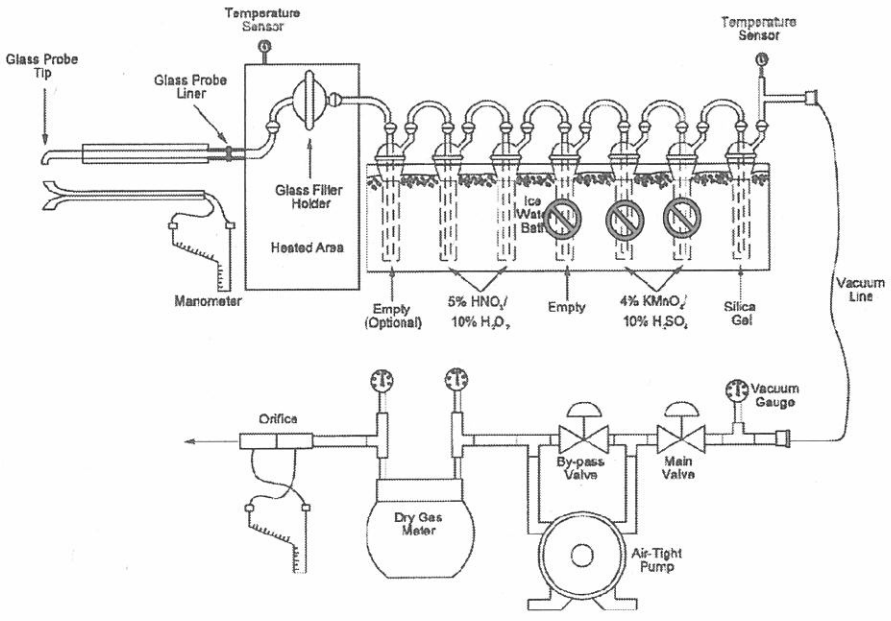
EPA Method 29



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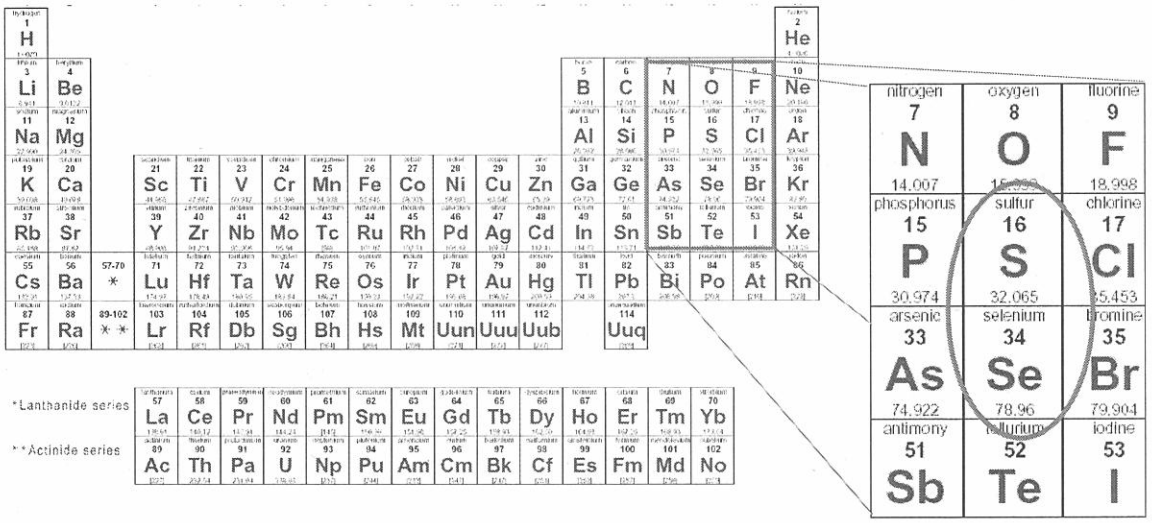
Selenium



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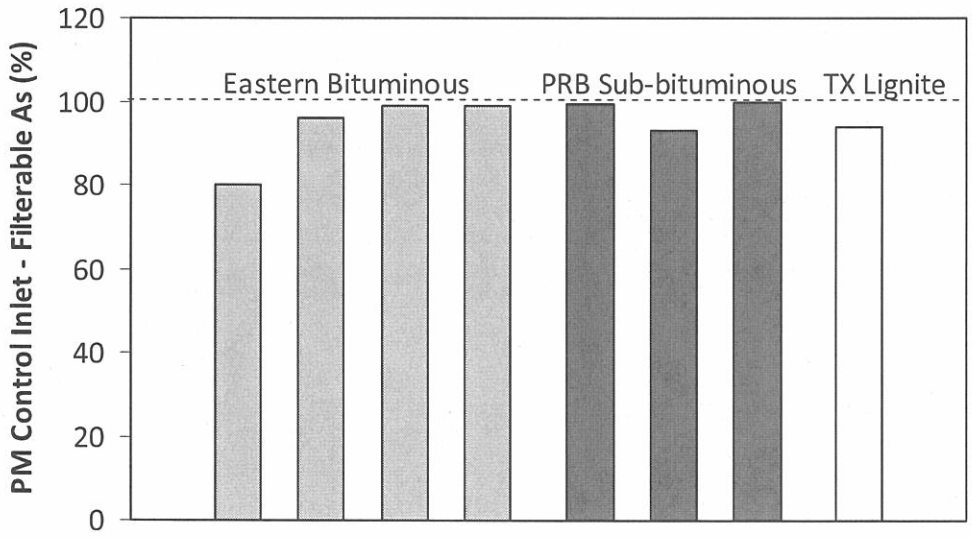
Filterable As at PM inlet



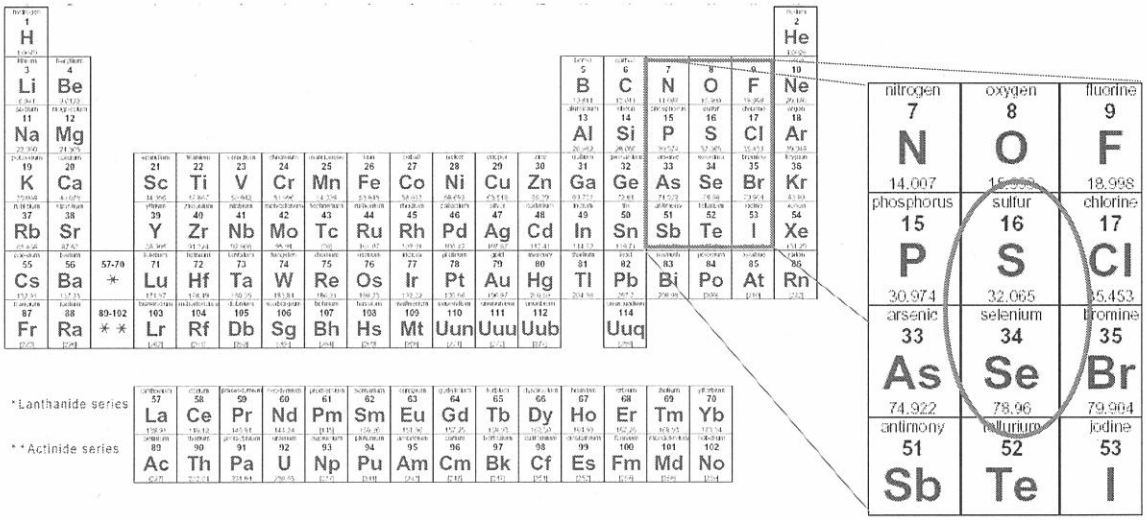
EPA Method 5/29

Acid Gas HAP

(HCl, HF, Cl_2)

Q: Are acid gas HAPs controlled in a typical flue gas desulfurization (FGD) systems and is the level of control for HCl (or SO_2?) a predictor of the level of control for the other acid gas HAPs?

Q: What levels of Cl_2 (relative to HCl) are present in the coal combustion flue gas?



Interaction with Calcium ??

Ca (bit)	= 1.40 %	
Ca (sub-bit)	= 9.98 %	← ash basis
Ca (TX lignite)	= 8.98 %	

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Results

EPA pilot data – lime based wet-FGD scrubber

Typical SO_2 control = 98 – 99%
HCl control = 99.8+%
HCl:Cl_2 at FGD inlet = 200:1

Other non-ICR data (full-scale bit plants w/ wet-FGD)

HCl control = 97+%
HF control = 96+%
Cl_2 control = 76+%

HCl:Cl_2 at FGD inlet = 250:1 to 60:1
HCl:Cl_2 at stack = 45:1 to 5:1

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Acid Gases (Method 26A)

	Inlet	Outlet	Control	Outlet Emission
	(ppmv,d)	(ppmv,d)	(%)	(lb/MMBtu)
HCl				
Run 3	52.6	0.075	99.86	0.000136
Run 9	50	0.031	99.94	0.000051
HF				
Run 3	1.63	<0.134	> 91.8	-
Run 9	0.53	< DL	-	-
Cl_2				
Run 3	-	<0.020	-	-
Run 9	0.25	< DL	-	-

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Organic HAP (non-dioxin)

EPA Median Emission Factors

(1998 HAP Study Report to Congress – Table A-4)

Organic HAPs	Number of emission factors (2010)	Median emission factor: lb/trillion Btu (2010)
Methylene chloride	5	13.0
Methyl ethyl ketone	6	8.0
Acetaldehyde	12	6.8
Phenol	10	6.1
Carbon disulfide	8	4.3
Bis(2-ethylhexyl) phthalate	9	4.1
Formaldehyde	15	4.0
Toluene	17	3.6
Acrolein	6	3.3
Styrene	7	3.1
Tetrachloroethylene	5	3.1
Dibutyl phthalate	5	2.8
Benzene	20	2.5
m,p-xylenes	8	1.5
Methyl bromide	6	0.9
o-xylenes	5	0.8
Naphthalene	11	0.8
Acetophenone	7	0.7
Ethyl benzene	5	0.4

EPRI Mean Emission Factors (2009)

Organic	Number of detections	Number of sites	Mean Emission Factor (lb/TBtu)
Benzoic acid	5	11	22
bis(2-ethlyhexyl)phthalat	7	11	3.6
Benzene	24	28	3.5
Phenol	7	13	3.3
Methylene chloride	6	11	3.1
Acetaldehyde	12	21	2.6
Formaldehyde	13	30	2.4
Acrolein	5	12	1.9
Propionaldehyde	5	8	1.9
Chloromethane	5	12	1.8
Toluene	18	26	1.7
Acetophenone	8	14	1.2
Carbon disulfide	8	15	1
Acetone	5	15	1
Naphthalene	13	25	0.9
Trichlorofluoromethane	5	14	0.72
m/p-Xylene	8	15	0.7
Phenanthrene	14	25	0.4
Biphenyl	6	9	0.16

Updated Hazardous Air Pollutants (HAPs) Emissions Estimates and Inhalation Human Health Risk Assessment for U.S. Coal-Fired Electric Generating Units. EPRI, Palo Alto, CA: 2009. Report # 1017980.

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Results

Organic HAP

(Non-Dioxin/Furan Organics)

Q: Is there a relationship between combustion conditions and production of non-dioxin/furan organic HAPs?
[CO]? [THC]?

Q: Is there an organic surrogate that indicates the presence or absence of the other non-dioxin/furan organic HAPs?
[formaldehyde]? [benzene]? [other?]

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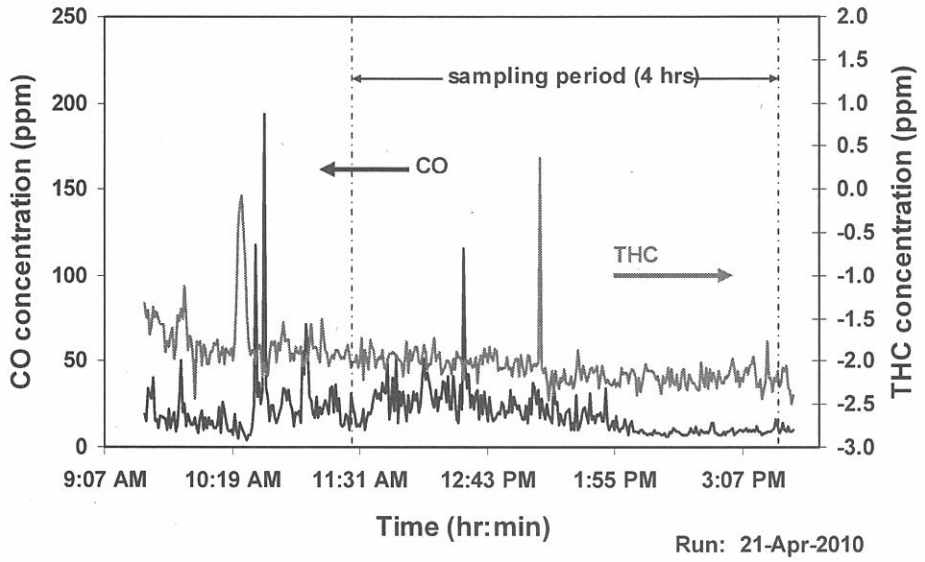
Test #4



Run: 21-Apr-2010

Note: Measurements are upstream of the ESP.

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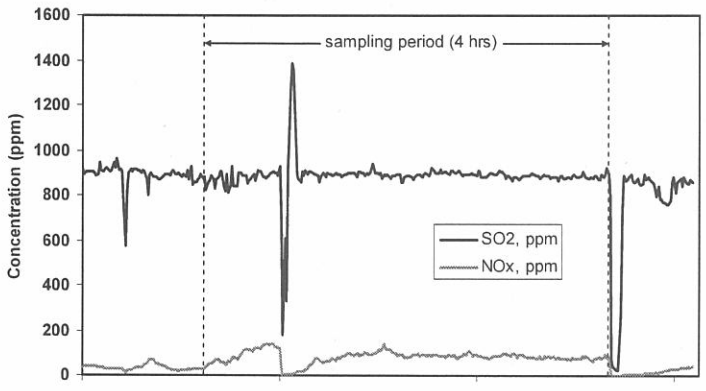
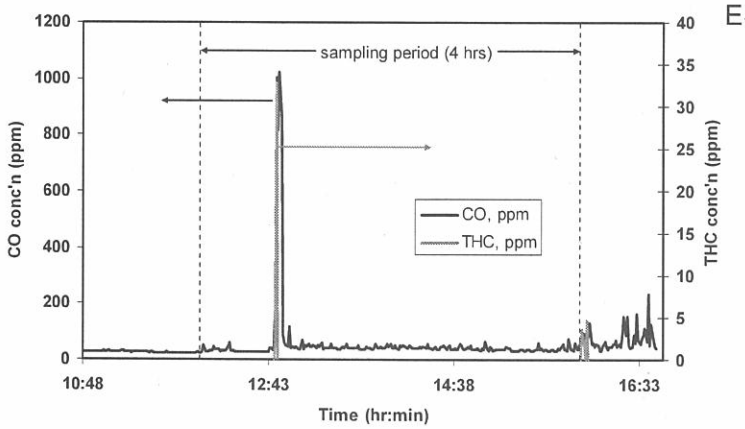
Test #1





Note: Measurements are upstream of the ESP.

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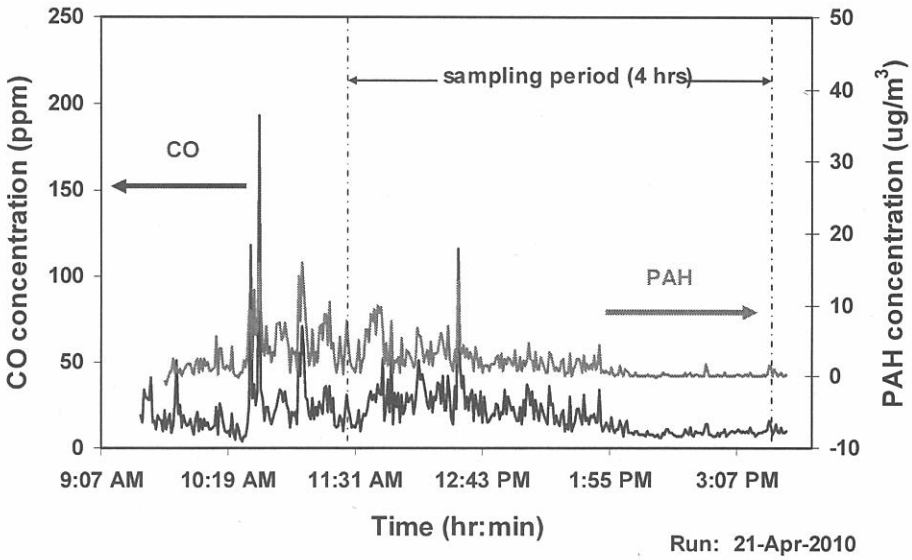

Note: Measurements are upstream of the ESP.

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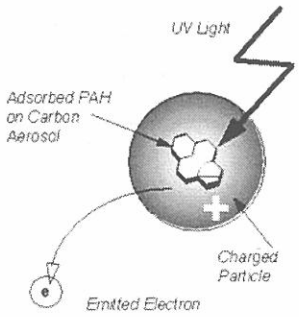
Polycyclic Aromatic Hydrocarbon (PAH) monitor

EcoChem PAS 2000
Photoelectric Aerosol Sensor (PAS)
for real-time measurement of
particle-bound PAH



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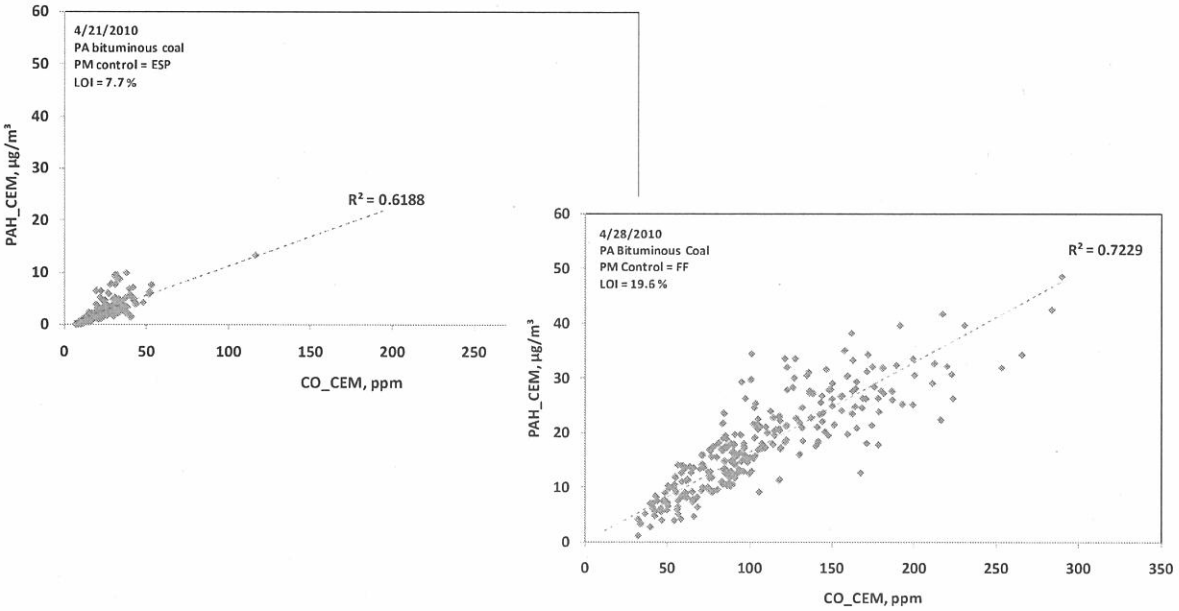
CO vs PAH, Runs #4 and #5



Note: Measurements are upstream of the ESP.

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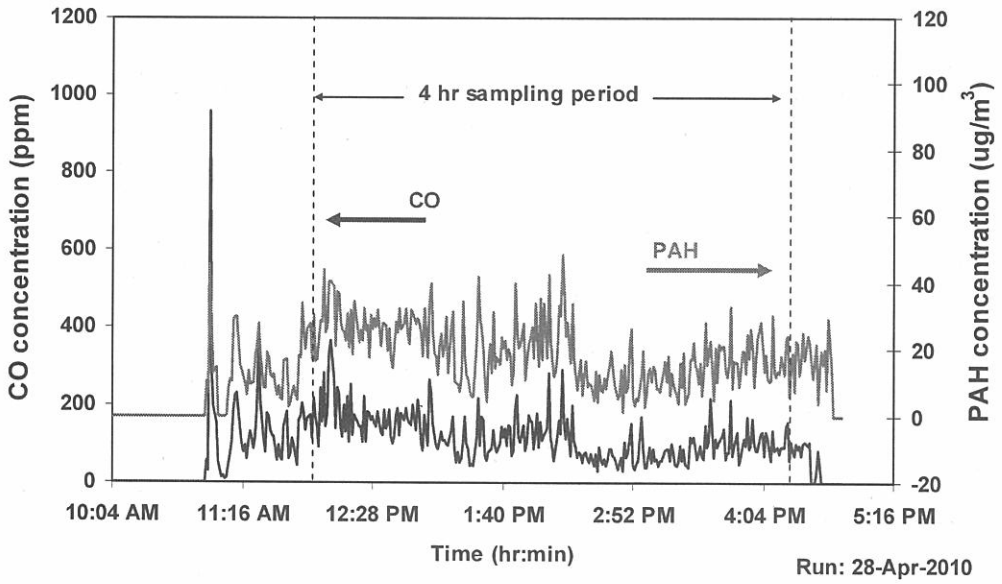
Test #5



Run: 28-Apr-2010

Note: Measurements are upstream of the ESP.

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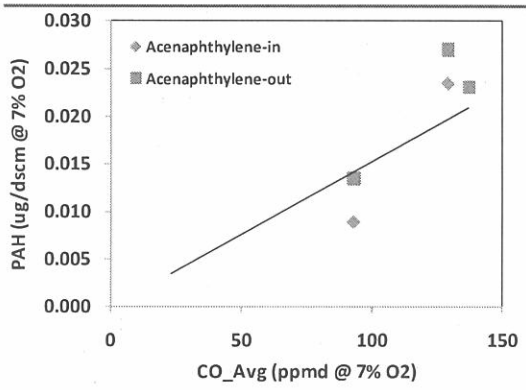
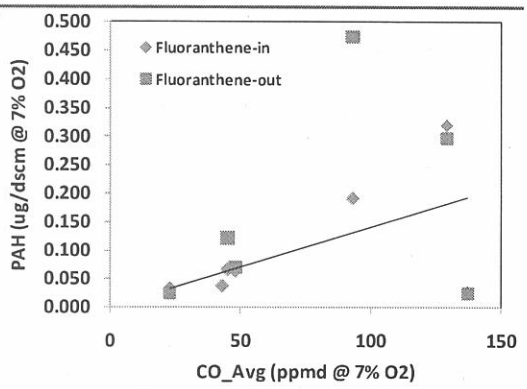
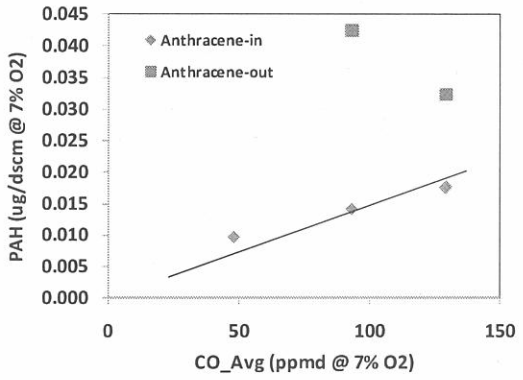
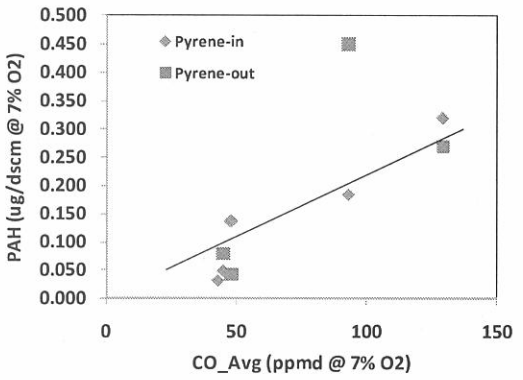
PAH vs CO_Avg









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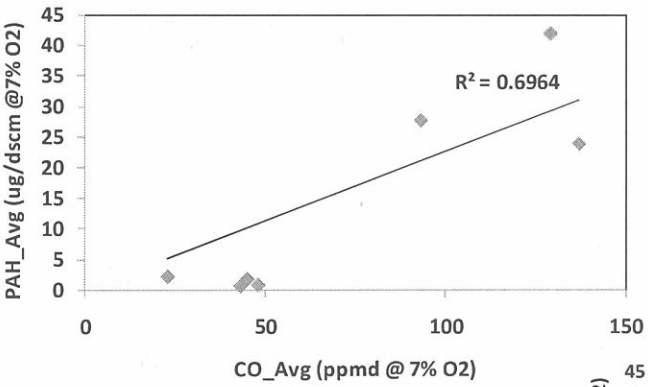
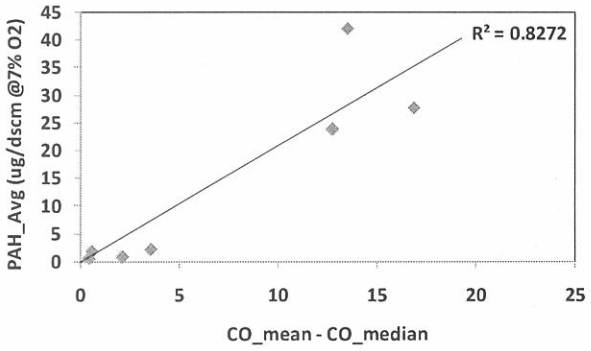
CO_Avg vs PAH_Avg





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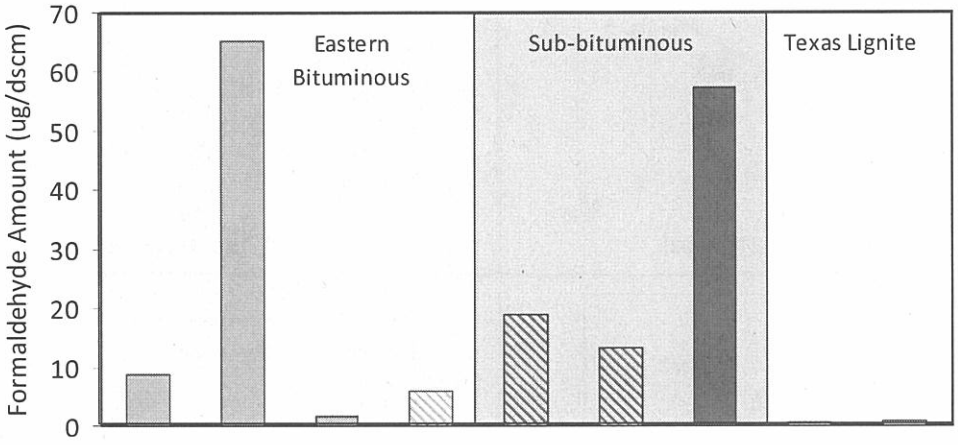
Formaldehyde



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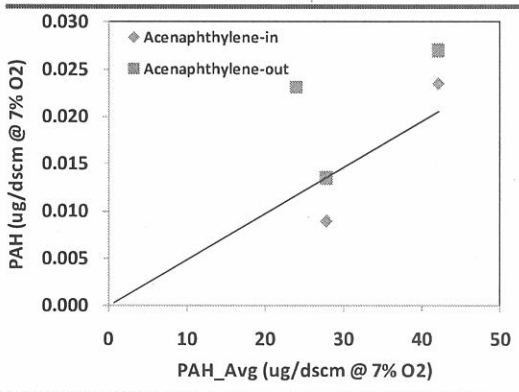
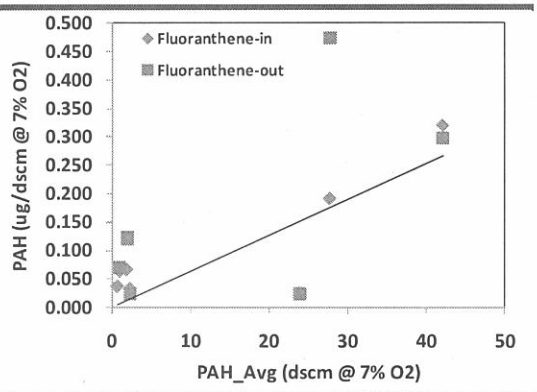
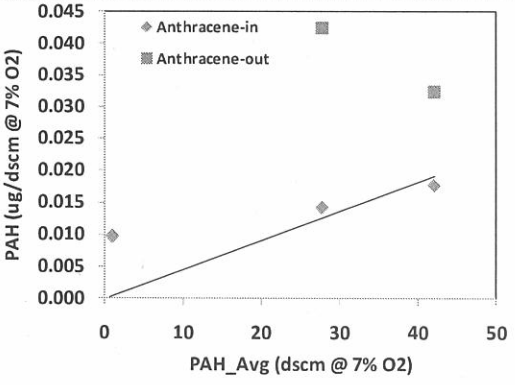
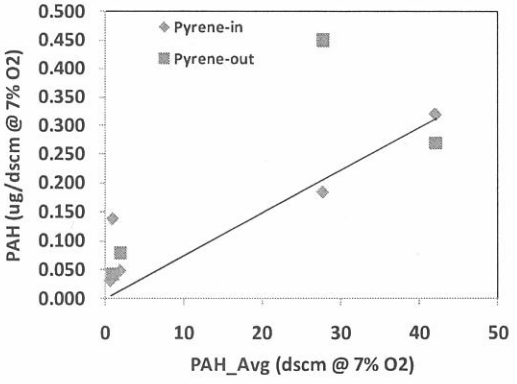
PAH vs PAH_Avg









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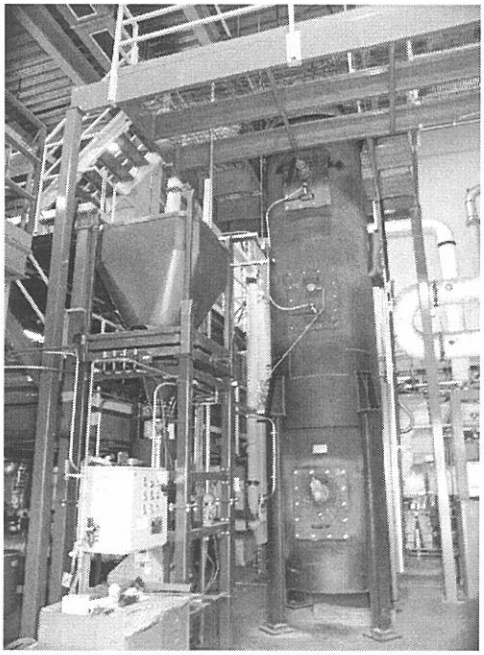
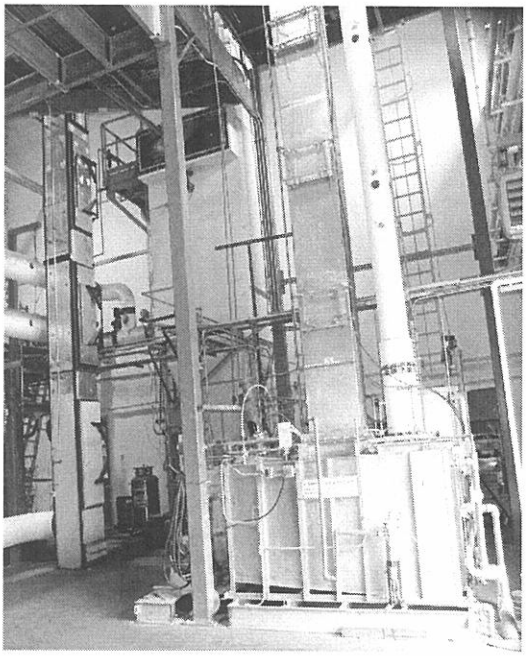
Questions?





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Path Forward

- We are still going through lots of data
  - Final report for peer review soon .
- Additional testing using on-line monitors for real-time measurements of combustion gases and organic products.
  - CO, CO_2, etc.
  - aldehydes using FTIR
  - more PAH using the ECOChem 2000 PAS
  - benzene, etc. using the jet-REMPI
- What is the effect of [CO] spikes/excursions?
- Effect of SCR?

Key Elements of the Rule

- Annual reporting of GHG data by March 31st, 2011:
  - 29 source categories
  - 5 types of suppliers of fuel and industrial GHG
- 25,000 metric tons CO_2e per year reporting threshold for most sources; capacity-based thresholds where feasible
- Direct reporting to EPA electronically
- EPA verification of emissions data

Greenhouse Gas Reporting Program- Update

December 7, 2010
35th Annual EPA-A&WMA Information Exchange

Other 2010 Updates

- Technical Amendment Package
- Revisions Package
- Additional Reporting Requirements- Corporate Parent, NAICS, co-generation use
- Final determination not to include Suppliers of Coal, or distinct source categories for Ethanol Production and Food Processing.

Subparts Added in 2010

- Magnesium Production (T)
- Underground Coal Mines (FF)
- Industrial Wastewater (II)
- Industrial Landfills (TT)
- Geologic Sequestration/CO_2 injection (RR/UU)
- Oil and natural gas systems (W)
- Electronics manufacturing (I)
- Fluorinated GHG production (L)
- Use of Electrical T&D equipment (DD)
- Import/export of pre-changed equip and closed cell foams (QQ)
- Electrical equipment manufacture and refurbishment (SS)

Begin data collection January 1, 2011; report to EPA by March 31, 2012.

Overview of Added Subparts

Status Update: Electronic Reporting System

- All reporting under the GHG Reporting Program will be electronic.

- Web-based system for facility/supplier to EPA reporting
  - Web-forms will guide reporters through data entry and submission.
  - Will include a mechanism to submit file directly using Extensible Markup Language (XML) format.
  - Draft XML schema is available on the EPA website.

e-GRET
Electronic Greenhouse Gas Reporting Tool

Subpart II – Industrial Wastewater

- Reporters
  - On-site industrial treatment systems at pulp and paper mills, food processing plants, ethanol production plants, and petroleum refineries
- Data reported
  - CH4 emissions generated, recovered, and emitted from anaerobic processes (lagoons, reactors, sludge digesters)
- Estimating/Monitoring Methods
  - Weekly measuring of flow rate and weekly sampling of COD/BOD5 concentration of influent wastewater
  - Continuous monitoring of volumetric flow of biogas and either continuous or weekly monitoring of CH4 concentration of biogas recovered

Subpart T – Magnesium Production

- Reporters
  - Magnesium metal producers (primary and secondary) and processing (e.g. casting) facilities
- Data Reported
  - Emissions of GHGs used as protective cover gases in magnesium operations (i.e. SF_6, HFC-134a, FK 5-1-12 and CO_2)
- Estimating Methods
  - Consumption = emissions
  - Three measurement options:
    - Weighing gas cylinders as they are brought into and out of service
    - Using a mass flow meter to continuously measure the mass of GHGs used
    - Performing a facility-level mass balance for all GHGs used at least once annually
- No changes from proposal to final rule

Subpart FF – Underground Coal Mines

- **Underground coal mines**
  - Definition in 40 CFR 98.6:
  - "Mine at which coal is produced by tunneling into the earth to the coalbed, which is then mined with underground mining equipment such as cutting machines and continuous, longwall, and shortwall mining machines, and transported to the surface."
- **Mine must be active**
  (1) Mine development is underway;
  (2) Coal has been produced within the last 90 days;
  (3) Mine personnel are present in the mine workings;
  (4) Mine ventilation fans are operative; **or**
  (5) The mine is designated as an "intermittent" mine by MSHA.
- **Mine is subject to quarterly or more frequent sampling of ventilation systems by Mine Safety and Health Administration (MSHA)**
  (1) MSHA samples CH4 emissions for mines liberating more than 100,000 cubic feet of CH4 per day from ventilation systems
  (2) This amount is equivalent to about 15,000 metric tons CO_2e per year

Subpart TT – Industrial Waste Landfills*

- Reporters
  - Open or closed landfills (LFs) that accepted waste after 1/1/1980 with a design capacity of 300,000 metric tons or more
  - No hazardous waste LFs or dedicated construction and demolition waste LFs
  - Excludes those that receive only inert or "inorganic" wastes
- Data reported
  - CH4 generation and CH4 emissions from LFs
  - CH4 emissions from LF gas destruction
- Estimating/monitoring methods
  - CH4 generation based on first order decay model
  - CH4 emissions monitoring and calculations identical to municipal solid waste LFs for landfills with gas recovery

*At proposal subpart HH included both Municipal Solid Waste and Industrial Landfills. Landfill reporting is now separated into two subparts: subpart HH for MSW Landfills (published Oct 30, 2009) and subpart TT for industrial landfills.

Subpart RR and UU

- EPA has finalized greenhouse gas (GHG) reporting mechanisms for facilities that conduct geologic sequestration (subpart RR) and all other facilities that inject carbon dioxide (CO_2) underground for enhanced oil and gas recovery or any other purpose (subpart UU).
- The information obtained through this rule will inform Agency decisions under the Clean Air Act (CAA) related to the use of CCS for mitigating GHG emissions.
- This rule is complementary to and builds on EPA's Underground Injection Control (UIC) requirements.
- EPA has designed this rule so that facilities can comply with the reporting requirements without disrupting or delaying normal operations.

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Subpart FF: GHGs to be reported

- Mines subject to Subpart FF must report 4 sources of greenhouse gases:

1. CH4 *liberated** from mine ventilation and degasification systems
2. CH4 destruction from systems where gas is sold, used onsite, or otherwise destroyed (including by flaring)
3. Net CH4 emissions from ventilation and degasification systems (CH4 liberated less CH4 destroyed)
4. CO2 emissions from coal mine CH4 destruction occurring at the facility, where the gas is not a fuel input for energy generation or use. (This applies primarily to CH4 that is flared.)
5. Emissions from other sources on site, such as stationary combustion

**Liberated* means released from coal and surrounding rock strata during the mining process. This includes both methane released from the ventilation system and methane drained from degasification systems.

Geologic Sequestration of Carbon Dioxide (Subpart RR)

- Facilities that inject CO_2 for enhanced oil and gas recovery and do not hold a UIC Class VI permit are not required to report geologic sequestration under subpart RR, but may choose to opt-in to these requirements.
- Geologic sequestration research and development (R&D) projects will be granted an exemption from subpart RR.
- All facilities subject to subpart RR are required to submit annual reports to EPA by March 31, 2012 reporting basic information on CO_2 received in 2011.
  - These facilities will add data to their annual reports on the amount of CO_2 that is geologically sequestered and annual monitoring activities once their EPA-approved MRV plans are implemented.

Geologic Sequestration of Carbon Dioxide (Subpart RR)

- Facilities that conduct geologic sequestration by injecting CO_2 for long-term containment in subsurface geologic formations are required to:
  - Report basic information on CO_2 received for injection.
  - Develop and implement an EPA-approved site-specific monitoring, reporting, and verification (MRV) plan.
  - Report the amount of CO_2 geologically sequestered using a mass balance approach and annual monitoring activities.
- All facilities that hold a UIC Class VI permit must report under subpart RR.

Subpart W: Petroleum and Natural Gas

Requires reporting by facilities in specific segments of the petroleum and natural gas industry that emit GHGs ≥ 25,000 metric tons carbon dioxide equivalent (CO2e) per year:

- Onshore petroleum and gas production facilities (including EOR CO2 surface emissions), basin level reporting*
- Offshore petroleum and gas production platforms
- Natural gas processing plants
- Natural gas transmission compression
- Underground natural gas storage
- Liquefied natural gas (LNG) storage
- LNG import and export
- Natural gas distribution facilities, owned or operated by Local Distribution Companies (LDCs)*

* Due to their unique characteristics, the facility definition for onshore petroleum and natural gas production and natural gas distribution differs from the definition of facility applied in the remainder of 40 CFR part 98.

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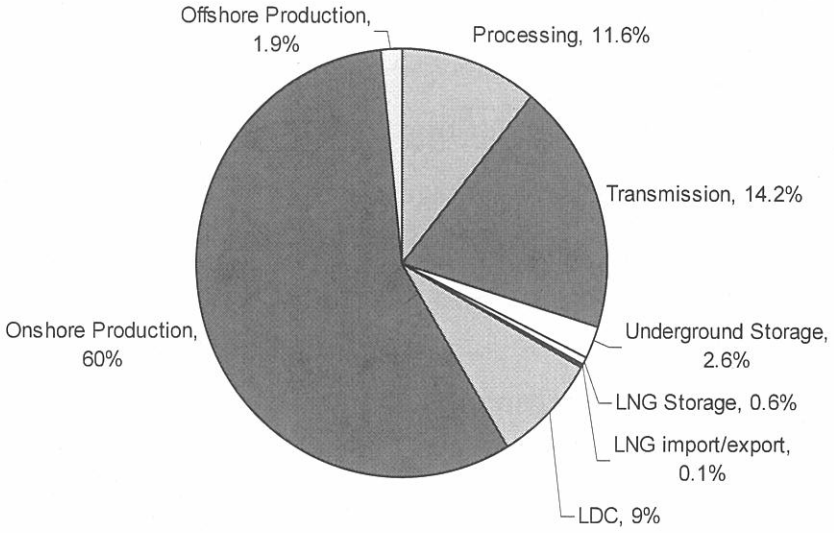
Injection of Carbon Dioxide (Subpart UU)

- All facilities that inject CO_2 underground for purposes besides geologic sequestration (subpart UU), such as for enhanced oil and gas recovery or any other purpose, are required to report basic information on CO_2 received for injection.
- Geologic sequestration R&D projects that receive an exemption from subpart RR are required to report under subpart UU.
- All facilities subject to subpart UU are required to submit annual reports to EPA by March 31, 2012 reporting basic information on CO_2 received in 2011.

Subpart W: Petroleum and Natural Gas

- Approximately 254 million tons CO2e (MMTCO2e) per year of CO_2 and CH_4 equipment leaks and vented emissions are covered

Equipment Leaks and Vented Emissions Breakdown by Industry Segment



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Subpart W: Petroleum and Natural Gas

- Requires annual reporting of:
  - Equipment leaks and vented carbon dioxide (CO_2) and methane (CH_4) emissions;
  - CO_2, CH_4 and nitrous oxide (N_2O) emissions from flares; and
  - CO_2, CH4, and N2O combustion emissions from portable and stationary equipment in onshore petroleum and natural gas production and combustion emissions from stationary equipment involved in natural gas distribution

- Reporting is at the facility level; data collection begins on January 1, 2011
  - Reports will be submitted annually with the first report due to EPA by March 31, 2012, covering 2011 emissions.
  - For specified time periods during the 2011 data collection year, dependent on criteria outlined in the rule, reporters may use best available monitoring methods for certain emissions sources

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Subparts I, L, QQ, DD and SS: Fluorinated Gases

- Requires reporting of fluorinated GHGs from the source categories:
  - Electronics manufacturing including manufacture of semiconductors (which include light-emitting diodes), photovoltaic cells, liquid crystal displays, and micro-electro-mechanical systems (Subpart I)
  - Fluorinated gas production (Subpart L)
  - Imports and exports of pre-charged equipment or closed-cell foams containing fluorinated GHGs (Subpart QQ)
  - Use of electric transmission and distribution equipment (Subpart DD)
  - Manufacture of electric transmission and distribution equipment (Subpart SS).

Subparts I, L, QQ, DD and SS: Fluorinated Gases

- Final Rule for mandatory reporting of GHGs from large sources of fluorinated GHGs (e.g., HFCs, NF_3, PFCs, and SF_6) signed by the EPA Administrator on November 8, 2010; 75 FR 74774; 12/1/10.
- Rule estimated to cover more than 95 percent of the total GHG emissions from these sources, with approximately 385 facilities reporting. Most small businesses fall below the reporting threshold and are not required to report.

Further Information

- Additional documents are available at:
  www.epa.gov/climatechange/emissions/ghgrulemaking.html
  www.epa.gov/climatechange/emissions/subpart.html

- Information on this rulemaking and supporting background material is available at www.regulations.gov

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Hazardous Air Pollutant Metals

- CAA Section 112 specifies Hazardous Air Pollutants (HAPs), including metals:

- Antimony Compounds
- Arsenic Compounds (inorganic including arsine)
- Beryllium Compounds
- Cadmium Compounds
- Chromium Compounds
- Cobalt Compounds
- Lead Compounds
- Manganese Compounds
- Mercury Compounds
- Nickel Compounds
- Radionuclides (including radon)
- Selenium Compounds

Behavior of Selenium in Coal-Fired Combustion Systems

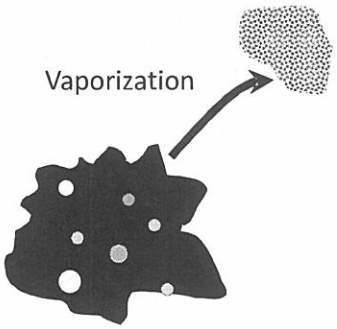
Connie Senior

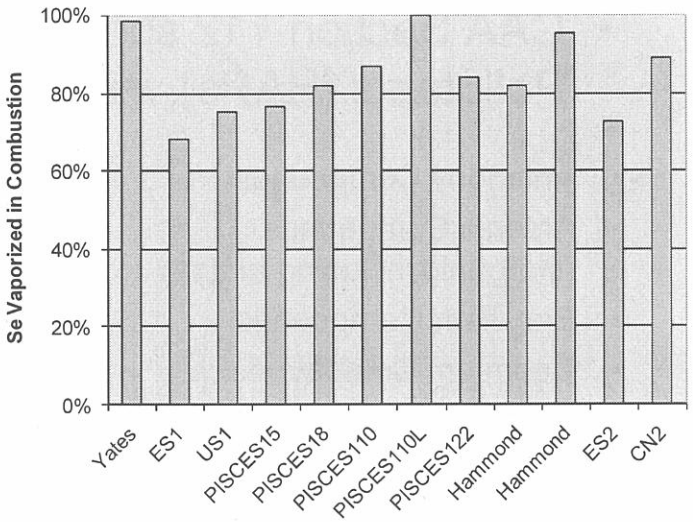
35th EPA-AWMA Information Exchange
December 7-8, 2010
Research Triangle Park, North Carolina

REACTION ENGINEERING INTERNATIONAL

Behavior of Se in Coal-Fired Boilers

- Data from full-scale campaigns used to calculate vaporization in the combustion zone
- Se vaporization: 70%-100%





Selenium Emissions from Power Plants

- US EPA currently reconsidering regulation of HAPs under **Clean Air Act**, including Selenium (Se), from coal-fired power plants
  - Rule to be proposed in 2011
- US EPA under **Clean Water Act** working on rulemaking for steam electric effluent guidelines, which will apply to coal-fired power plants
  - Rule to be proposed in 2012