Hg TAG: Presentation to CAC 3/6/2002

- MACT Hammer
- Mercury Control
- Mass Cap Source Emissions and Control Equipment
- Major Utility Source Emissions and Control Equipment

Hg TAG: MACT

- MACT Implementation

  Compliance Date = Due Date + 3 years

- MACT Hammer

  Compliance Date = Due Date + 7 / 9 years (+4/6)

  + 18 months (application part 1)

  + 6, 12 or 24 months (application part 2)

  + 2 months (completeness review)

  + 6 months (resubmit)

  + 18 months for permit issuance

  + 3 years

Hg TAG: MACT

- Utility Compliance Date

  Dec. 2004 + 7 = **Dec. 2011**

  Dec. 2004 + 9 = **Dec. 2013**

- Industrial Boiler Compliance Date

  Summer 2003 + 7 = **Summer 2010**

  Summer 2003 + 9 = **Summer 2012**

- *If EPA sets MACT anytime during the "Hammer" period then clock starts + 3 years to compliance.*

Hg TAG: Hg Control Background

- Hg Speciation
  - Hg elemental ==> non-reactive, non-soluble
  - Hg ionic (2+) ==> attaches to particulate, soluable
  - Hg part ==> solid form or compound of Hg

Hg TAG: Hg Control Background

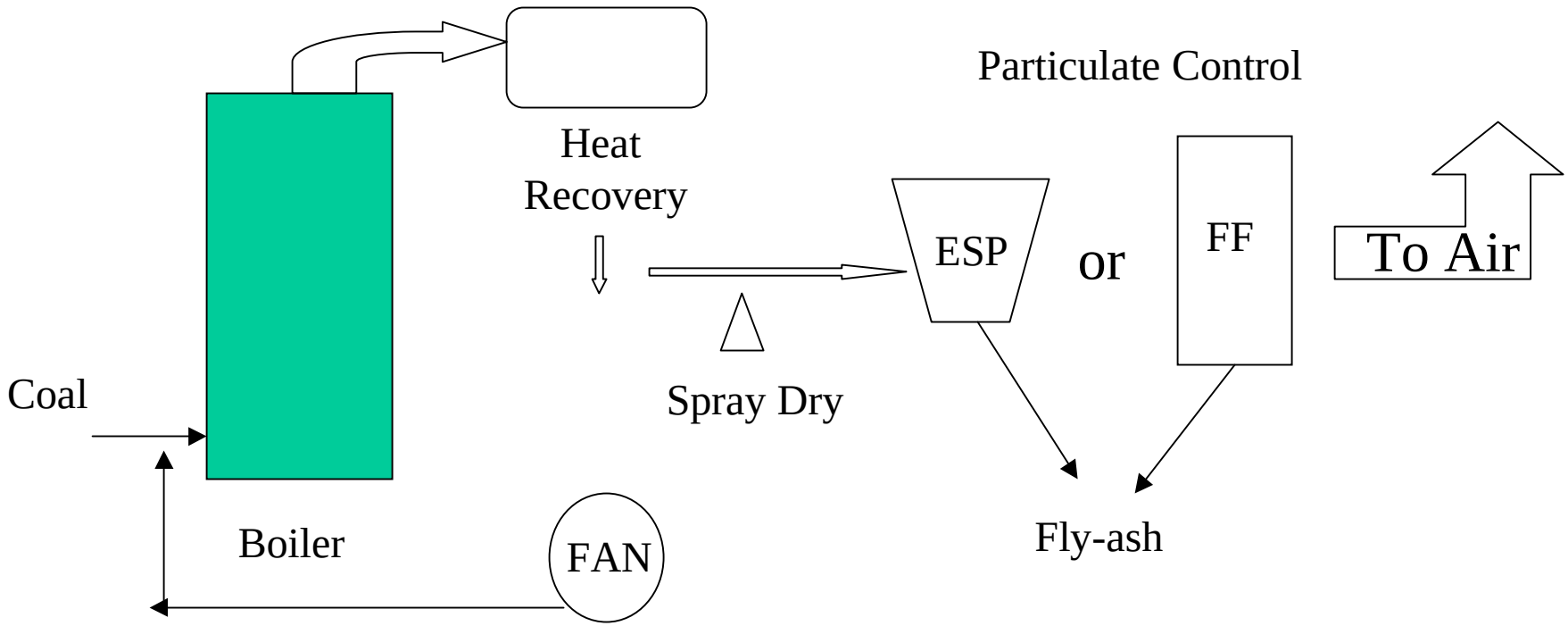
- Basic Control Pathway
  - Attach Hg to particulate and remove in Particulate Control Device: ESP, FF
    - Hg2+ ==> relatively easy
    - Hg elemental ==> need help - active adsorbent, change Hg to Hg2+, lower temperature to condense.
  - Absorb Hg2+ in solution in Wet Scrubber
    - Oxidize Hg elemental ==> Hg2+

Hg TAG: Hg Control Background

- Speciation dependent on
  - Characteristics of fuel (Cl ==> Hg2+)
  - Flue Gas Temperature - Hg is very volative
  - Other Fuel components ?
- Fuel Content and Flue Gas Speciation
  - Bituminous - 8.7 lbs/Tbtu, High %Hg2+
  - Sub-bituminous - 5.8 lbs/Tbtu, Lower %Hg2+

Hg TAG: Hg Control Background

- Existing Boiler and Control Equipment



Hg TAG: Hg Control Background

- Electrostatic Precipitator
  - Coldside: after heat recovery => lower temp
  - Hotside: before heat recovery => higher temp
  - Residence Time relates to particulate contact => more Hg removal
- Fabric Filter
  - More positive contact with particulate ==> increases removal

Hg TAG: ICR Existing Control Levels

Unit Configuration	Average Percent Mercury Removal by Coal Type			
	Bituminous	**Subbituminous**	**Lignite**	**Waste Coal**
PC w/ particulate control				
ESP-coldside	29	3	3	
ESP-hotside	11	**0**		
Fabric Filter	**89**	73		
Mechanical	12	**0**	33	
PC w/ particulate + SO_2 control				
SDA + ESP	45	**0**		
SDA + Fabric Filter	**93+**	23	17+	
ESP-coldside + Wet Scrubber (FGD)	78	16	42	
ESP-hotside + Wet Scrubber (FGD)	39	8		
Fabric Filter + Wet Scrubber (FGD)	**97**			
FBB w/ particulate control				
ESP-coldside			40	
Fabric Filter			57	99

Hg TAG: Stationary Source Hg Emissions

- Initial Estimate

	Hg lbs	No of Facilities
Major Utilities	2,100	15
Mass Cap Facilities	1,954	19
Non-NR 446	82	28

- Revised Estimate

	Hg lbs	No of Facilities
Major Utilities	2,100	15
Mass Cap Facilities	1,534	15
Non-NR 446	82	28

Hg TAG: Mass Cap Hg Emissions

Source Type	No of Units	Hg (lbs)	No of Units	Hg (lbs)
Chlor-Alkali Process	1	1085	1	1085
Waste Incinerator	2	214	2	214
Boilers	15	527	7 (13)	105 (326)
Kiln	1	13	1	13
Process	2	59	2	59
Salvage Process	1	33	1	33
WWTP	1	23	1	23
Facilities => 10 lbs/yr	**23**	**1954**	**15 (21)**	**1,532 (1753)**
Facilities < 10 lbs/yr		**82**		**125 (91)**

Hg TAG: Mass Cap Hg Emissions

Facility	Source Type	Control Equip	Hg Emissions (lbs)		
			Initial Estimate - 3 yr Avg (97-99)	Updated - Fuel (99)	Updated - Controlled (99)
Vulcan Materials	Chlor-Alkali Process	Best Practices	1,085		
Barron Co. Waste Inc.	Waste Incinerator	Activated Carbon	190		
EXCEL - French Island (b)	Waste Incinerator	Activated Carbon	24		
Appleton Papers Inc. Mills Lock	Boiler	Particulate	140	16	8
Nicolet Paper Co.	Boiler	Particulate	98	12	6
Weyerhauser Co.	Boiler	Particulate	65	0	0
Consolidated Papers - Kraft	Boiler	Particulate	48	17	4
Fort James Co.	Boiler	Particulate	47	97	19
Repap Wisconsin	Boiler	Particulate	34	16	9
WDOA UW-Madison Charter St	Boiler	Particulate	31	9	1
Mosinee Paper Corp.	Boiler	Particulate	21	13	10
Rhinelander Paper Co.	Boiler	Particulate	19	11	6
Consolidated - Niagra	Boiler	Particulate	14	17	9
Manitowoc Public Utility	Boiler	Particulate	11	11	11
Consolidated Papers - Biron	Boiler	Particulate		27	19
Domtar	Boiler	Particulate		30	18
Packaging Corp of America	Boiler	Particulate		20	13
International Paper	Boiler	Particulate		26	15
Rockwell Lime Co.	Kiln		13		
Delta Group Inc.	Process		41		
Chilton Products	Process		18		
Superior Services	Salvage Process		33		
MMSD-Jones WWTP	WWTP		23		

Hg TAG: Mass Cap Boilers

PLANT	Fuel	APCD	Fuel Hg (lbs)	APCD Efficiency	Hg Emissions lbs	+/- lbs	Hg Fuel Capacity Utilization
APPLETON PAPERS INC LOCKS MILL	Bitum/Sludge	ESP	16	46%	8	0.09	73%
NICOLET PAPER COMPANY	Bitum	ESP	12	46%	6	0.06	72%
WEYERHAEUSER COMPANY	Wood		-		neg	-	
FORT HOWARD CORPORATION	Bitum/Coke	FF	97	80%	19	0.32	70%
CONSOLIDATED PAPERS INC-KRAFT I	Subbitum	multi-cyclone / ESP	17	79%	4	0.22	45%
WIS DOA / UW MADISON--CHARTER S	Bitum	cyclone-single / FF	9	91%	1	0.04	55%
RHINELANDER PAPER CO	Bitum	ESP/multi-cyclone	11	44%	6	0.06	21%
REPAP WISCONSIN INC	Bitum	ESP	16	46%	9	0.08	72%
MOSINEE PAPER CORP	Bitum	ESP	13	25%	10	0.07	50%
NIAGARA OF WISCONSIN PAPER CORI	Bitum	ESP	17	49%	9	0.09	57%
CONSOL PAPERS INC BIRON DIV	Bitum/Sub	ESP	27	31%	19	0.24	63%
NEKOOSA PAPERS INC NEKOOSA MIL	Bitum	ESP	30	39%	18	0.15	63%
TENNECO PACKAGING INC.	Bitum	ESP	20	36%	13	0.12	59%
THILMANY PULP & PAPER COMPANY		multi-cyclone / ESP	26	43%	15	0.11	52%
Total			**311**		**137**	**1.65**	
Total @ 100 Capacity Utilization w/ Hg Fuels			**538**		**243**	**2.95**	**100%**

Hg TAG: Mass Cap Hg Emissions

- Boiler Units - Working Items
  - Apply ICR Fuel and Control data
  - Control Level & Affected Units Uncertain
    - Fuel Hg = 311
    - Controlled = 137
  - Overall Emission Decrease: most closer to 10 lbs Range

Hg TAG: Mass Cap Hg Emissions

- Mass Cap
  - No additional control => capacity limitation
  - Controls => no capacity limitation?
  - At 100% Capacity for Hg Fuel Utilization
    - Fuel Hg = 538 lbs
    - Controlled = 243 lbs

Hg TAG: Major Utility Hg Emissions

GenUnit	Gen Capacity (MW)	Fuel	Control Device	HG Fuel (lbs)	Flue Gas Speciation			HG Control Efficiency (ICR/EPRI)	Total HG Emissions (lbs/yr - 3yr)
					% Particulate (HGp)	% Elemental (HGo)	% Oxidized (HG+)		
Col 1	512	Sub	ESPh	165	1%	91%	8%	0%	165
Col 2	511	Sub	ESPc	178	2%	72%	26%	12%	156
NED 1	100	Sub	ESPh	36	1%	56%	42%	15%	31
NED 2	100	Sub	ESPh	37	1%	56%	42%	15%	32
ROR 1	75	Sub	ESPc	14	2%	48%	51%	30%	10
ROR 2	75	Sub	ESPc	21	2%	48%	51%	30%	15
Edge 3	60	Sub	ESPc	18	2%	70%	29%	14%	15
Edge 4	330	Sub	ESPc	80	2%	70%	29%	14%	69
Edge 5	380	Sub	ESPc	114	2%	70%	29%	14%	98
Alma 4	59	Sub/Bitum	ESPc	11	2%	28%	70%	50%	5
Alma 5	85	Sub/Bitum	ESPc	14	2%	28%	70%	50%	7
JP Madget	374	Sub	ESPh	110	1%	91%	8%	0%	110
Genoa 3	376	Sub/Bitum	ESPc	90	2%	22%	77%	55%	40
PP 1	580	Sub	ESPc	409	2%	85%	14%	0%	409
PP 2	580	Sub	ESPc	406	2%	85%	14%	0%	406
OC 5	258	Sub/Bitum	ESPc	63	2%	48%	51%	30%	44
OC 6	260	Sub/Bitum	ESPc	63	2%	52%	47%	28%	45
OC 7	280	Sub/Bitum	ESPc	88	2%	49%	50%	30%	61
OC 8	305	Sub/Bitum	ESPc	85	2%	50%	32%	21%	68
Val 1	64	Bitum	FF	14	1%	13%	86%	72%	4
Val 1	62	Bitum	FF	14	1%	13%	86%	72%	4
Val 2	70	Bitum	FF	15	1%	13%	86%	72%	4
Val 2	70	Bitum	FF	15	1%	13%	86%	72%	4
PW 1	80	Bitum	ESPc	22	2%	73%	26%	20%	17
PW 2	80	Bitum	ESPc	25	2%	31%	67%	40%	15
PW 3	82	Bitum	ESPc	26	2%	31%	67%	40%	15
PW 4	80	Bitum	ESPc	19	2%	73%	26%	20%	15
Pul 3	26	Sub	ESPc	3	2%	69%	29%	22%	2
Pul 4	27	Sub	ESPc	4	2%	69%	29%	22%	3
Pul 5	52	Sub	ESPc	11	2%	69%	29%	22%	8
Pul 6	67	Sub	ESPc	15	2%	69%	29%	22%	12
Pul 7	88	Sub	ESPc	17	2%	69%	29%	22%	13
Pul 8	135	Sub	ESPc	29	2%	69%	29%	22%	23
Weston 1	68	Sub	ESPc	21	2%	58%	41%	28%	15
Weston 2	92	Sub	ESPc	28	2%	58%	41%	28%	20
Weston 3	337	Sub	ESPh	121	1%	72%	27%	7%	113
				2,451		**85%**	**27%**	**14%**	**2,105**

Hg TAG: Major Utility Hg Emissions

Fuel	Control	Units	Avg MW	% of Fossil Gen	Hg (lbs)	% of Hg
Sub	ESPc	16	197	47%	1,273	61%
Sub	ESPh	5	285	20%	450	21%
Sub/Bitum	ESPc	7	232	22%	271	13%
Bitum	ESPc	12	53	4%	77	4%
Bitum	FF	4	67	3%	16	1%
Bitum	Mech	3	39	1%	10	0%
Sub/Bitum/Wood	Mech	3	73	2%	6	0%
Total					2,100	

Hg TAG: Major Utility Hg Emissions

Fuel	Control Device	Fuel Hg (lbs)	Flue Gas		% Red from Fuel	Hg Emitted
			% HGo	% HG+		
Sub	ESPc	1,368	78%	21%	7%	1,273
Sub	ESPh	470	81%	18%	4%	450
Sub/Bitum	ESPc	413	42%	53%	34%	271
Bitum	ESPc	111	48%	51%	31%	77
Bitum	FF	58	13%	86%	72%	16
Bitum	Mech	20	29%	70%	51%	10
Sub/Bitum/Wood	Mech	8	36%	63%	22%	6
Total		2,448	69%	29%	14%	2,100

Hg TAG: Hg Emission Inventory

Fuel	PM Control	No of Units	Avg MW	% of Fossil Generation
Sub	ESPc	16	196.63	47%
Sub	ESPh	5	284.60	20%
Sub/Bitum	ESPc	7	232	22%
Bitum	ESPc	12	53	4%
Bitum	FF	4	67	3%
Bitum	Mech	3	39	1%
Sub/Bitum/Wo	Mech	3	73	2%
Coke/Bitum	SDA / FF	1	53	1%

Hg TAG: Major Utility Hg Emissions

- Background
  - Some Control Already Achieved from Fuel
    - Utility Average 14% from Fuel
  - Control from Emissions vs Fuel
  - 30% = 40%, 50% = 57%, 90% = 91%
  - Fuel & Control in Baseline Emissions
    - Sub / ESP: 80 - 85% (20% Hotside)
    - Bit / ESP: < 20%
    - Bit / FF: small units

Hg TAG: Schedule for CAC Information

- March 6 - Control Technology and Options: Background and overview
- *End of March - Schedule TAG meeting for major conclusions*
- *April 1 - Target Date for Control Issue Briefs. Provide as available*
- April 10 - Final TAG conclusions / recommendations for control levels and timing / major rule components.
- *April 23 - TAG Responses to CAC issues and questions.*
- April 30 - **CAC Retreat**