CIBO Estimated Capital Costs For Air Pollution Control Equipment For Gas 2-Fired Industrial Boilers and Process Heaters

Pollutant	Particulate Matter (PM) or Total Selected Metals (TSM)	Hydrogen Chloride (HCl)	Carbon Monoxide (CO)	Mercury (Hg)
Likely Additional Control	Fabric Filter (FF)	Scrubber (e.g., spray dryer or wet scrubber)	Catalytic Oxidation (CATOX)	Carbon Injection (CI)
# of Gas 2-Fired Boilers and Process Heaters	0 of the 78 gas 2-fired units will need a new FF	2 of the 78 gas 2-fired units will need scrubbers	71 of the 78 gas 2-fired units need CATOX	1 of the 78 gas 2-fired units need CI
Comments/ Assumptions	• If there was information that indicated the unit cannot meet the limit, we assumed a new FF. [i] • If the unit already had a FF or ESP and there was information that indicated the unit cannot meet the limit we assumed an upgrade to the existing FF or ESP. • FF base capital cost $7 MM[ii]; FF/ESP base upgrade capital cost $4 MM. [iii]	• If there was information that indicated the unit cannot meet the limit, we assumed either a scrubber upgrade or new scrubber depending on whether the unit currently had a scrubber. [i] • Scrubber base capital cost $8 MM; scrubber base upgrade capital cost $4 MM.[iii]	• If there was information that indicated the unit cannot meet the limit, then we assumed that capital would be necessary to install a CO catalyst. [i] • Base capital cost of $3 million was assumed for CO controls (either projects to improve combustion or fuel feed or installation of a CO catalyst).[iii]	• If there was information in the EPA database that indicated the unit cannot meet the limits, we added carbon injection. [i] • A fixed cost of $1 million was assumed for installation of a carbon injection system for Hg control, as these systems do not vary much in cost by boiler size.
Total Capital Cost to Gas 2-Fired Units: $237 million	$0	$28.4 MM	$208 MM	$1 MM
Capital Cost Per Unit	• Range of Costs Per Unit: $0 to 0MM • Average Per Unit Cost: $0MM[iv]	• Range of Costs Per Unit: $14.2MM • Average Per Unit Cost: $14.2MM	• Range of Costs Per Unit: $435k to 5.9MM • Average Per Unit Cost: $2.9MM	• $1 MM per unit

[i] Where no emissions data were available in the EPA database for a particular type of unit, EPA's baseline emission factors identified in the memorandum "Revised Development of Baseline Emission Factors for Boilers and Process Heaters at Commercial, Industrial, and Institutional Facilities," January 2012, Appendix D were used to determine if typical emissions from the type of unit (fuel/design/control device) would meet the MACT limits

[ii] MM stands for million.

[iii] The base cost assumes a size of 250 MMBtu/hr, the boiler specific cost was calculated using a 0.6 power function and the actual boiler size in MMBtu (e.g., for a 100 MMBtu/hr boiler or process heater, the cost is the base cost times $(100/250)^{0.6}$)

[iv] Average cost was calculated by adding up the per unit cost for every unit requiring controls to get the total cost for all units and then dividing the total cost by the number of units requiring controls.