Cost Effectiveness for
Rules 1146, 1146.1 Boilers and Heaters
and for
Rule 1109 Boilers & Heaters > 110 mmBtu/hr

Attached is the Rule 1109, 1146, 1146.1 boiler/heater control cost data and analysis. Please note the following:

1. Cost effectiveness analysis is provided for Rule 1109 boilers and heaters that have a rating greater than 110 mmBtu/hr.

2. Emission Data:
   Emission reductions were based on emission factors in units of lbs/mmBtu. Emission reductions were calculated using throughput rates and uncontrolled minus controlled emission factors for 75 Rule 1109 boilers and heaters at the 6 large refineries and for 687 Rule 1146 and 1146.1 boilers and heaters. The average uncontrolled emissions per boiler/heater for each of these categories are 0.063 tons/day and 0.006 tons/day respectively.

3. Equipment Costs:
   The EPA Office of Air Quality Planning and Standards (OAQPS), Air Pollution Control Cost Manual (January 2002) assumptions were used in the cost effectiveness calculations. The OAQPS factor for retrofits includes costs for auxiliary equipment, handling and erection, piping, insulation, painting, site preparation, off-site facilities, engineering, designing, and lost production. These items are addressed in the notes and within the analysis on the attached spreadsheets. For more information on the OAQPS cost model, please refer to http://www.epa.gov/ttn/catc/products.html#cccinfo.

4. Operating Costs:
   These items are addressed in the notes and within the analysis on the attached spreadsheets. Annual costs include raw and maintenance materials, labor, utilities, waste treatment and disposal, replacement materials, overhead, property taxes, insurance, and administrative charges.

5. Financial Costs:
   The analysis was applied to a 10, 15 and 25 year project life for Rule 1109 equipment and to a 10 and 15 year project life for Rule 1146 and 1146.1 equipment. A 4% interest rate and the Discounted Cash Flow method was used.