

Lee County Energy Recovery Facility
SCR Search Summary Spreadsheet

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Estimate of Selective Catalytic Reduction Costs
for Lee County Energy Recovery Facility
With Flue Gas Reheat Using Natural Gas Combustion

Cost Component	Costs	Basis of Cost Component
Direct Capital Costs		
SCR Associated Equipment	\$6,300,000	Vendor Estimate
Ammonia Storage Tanks	Included	Two Storage Tanks for Ammonia
Flue Gas Ductwork	\$386,000	Vatavuk, OAQPS Control Cost Manual, 1990
Instrumentation	Included	In-situ NOx Analyzer
Taxes	\$504,000	8% of Associated Equip.; OAQPS Control Cost Manual
Freight	\$315,000	5% of Associated Equip.; OAQPS Control Cost Manual
System Integration	\$100,000	Engineering Estimate
Firewater Booster Pump	\$23,000	Vendor Neutral Estimate
Increase ID Fan Size	\$343,000	Vendor Neutral Estimate; Increased size due to pressure drop across SCR System
Total Direct Capital Costs (TDCC)	\$7,971,000	
Direct Installation Costs		
Foundation and Supports	\$5,675,000	Vendor Estimate
Handling and Erection	Included	Included in Vendor Quote for Installation of SCR System
Electrical	Included	Included in Vendor Quote for Installation of SCR System
Piping	Included	Included in Vendor Quote for Installation of SCR System
Insulation for Ductwork	Included	Included in Vendor Quote for Installation of SCR System
Painting	\$30,000	SCR Structural Steel, Piping and Exposed Metals
Site Preparation	\$29,000	Existing Roads, Demolition & Restoration, SCR Footprint
Buildings	\$25,000	Engineering Estimate
Concrete	\$40,000	ID Fan Foundation, Aqueous Ammonia Spill Containment
Structural Steel	\$200,000	Windload Requirements for Hurricanes
Miscellaneous Steel	\$11,000	Platforms, Ladders, etc.
SCR Building Enclosure	\$330,000	Vendor Neutral Estimate
Electrical Systems	\$56,000	Grounding, Lightning Protection, Lighting, etc.
Instrumentation Systems	\$8,000	Piping Systems Monitoring
Piping Systems	\$216,000	Fire Protection Standpipe/Sprinklers, Steam, Service Air, relocate propane, potable water, anhydrous ammonia
Add. Contractor Costs for Above Work	\$100,000	10% of Additional Costs Not Included in Vendor Estimate
Total Direct Installation Costs (TDIC)	\$6,720,000	
Total Capital Costs (TCC)	\$14,691,000	Sum of TDCC and TDIC
Indirect Costs		
Engineering	Included	Included in Vendor Quote for SCR System
Construction and Field Expenses	Included	Included in Vendor Quote for SCR System
Contractor Fees	\$1,469,100	10% of TCC; OAQPS Control Cost Manual, Chapter 3
Project Management & Oversight	\$123,000	Vendor Neutral Estimate
Start-Up	\$293,820	2% of TCC; OAQPS Control Cost Manual, Chapter 3
Performance Tests	\$146,910	1% of TCC; OAQPS Control Cost Manual, Chapter 3
Contingencies	\$1,175,280	8% of TCC;
Total Indirect Capital Costs (TInCC)	\$3,208,110	
Total Direct, Indirect and Capital Costs (TDICC)	\$17,899,110	

Estimate of Selective Catalytic Reduction Costs
for Lee County Energy Recovery Facility
With Flue Gas Reheat Using Natural Gas Combustion

Cost Component	Costs	Basis of Cost Component
Direct Annual Costs		
Operating Personnel	\$56,160	24 hours/week at \$45/hour
Supervision	\$8,500	15% of Operating Personnel
Ammonia to control 260 ppm inlet NOx	\$380,000	\$300 per ton for Aqueous NH ₃
Catalyst Disposal Costs	\$15,000	Engineering Estimate
Catalyst Cost	\$90,000	1/3 Catalyst-3 year catalyst life
Contingency	\$62,466	10% of Direct Annual Costs
Regulatory Compliance Costs	\$25,000	Engineering Estimate
Miscellaneous Spare Parts	\$50,000	Vendor Neutral Estimate
Total Direct Annual Costs (TDAC)	\$687,126	
Annual Energy Costs		
Annual Electrical Energy Usage	\$191,876	476 kWh X 8,062 hours per year at \$0.05 per kWh
Annual Natural Gas Usage	\$932,940	186,588 Mcf at \$5.00 per 1000 cf of Natural Gas Based on Vendor Estimate
Total Energy Costs (TEC)	\$1,124,816	
Indirect Annual Costs		
Overhead	\$266,796	60% of Operating/Supervision Labor and Ammonia
Property Taxes	\$146,910	1% of Total Capital Costs
Insurance	\$146,910	1% of Total Capital Costs
Miscellaneous Painting	\$10,000	Vendor Neutral Estimate
Miscellaneous Equipment Rebuild	\$30,000	Vendor Neutral Estimate
Annualized Total Direct Capital	\$2,912,185	0.1627 Capital Recovery Factor of 10% over 10 years multiplied by sum of TDACC
Total Indirect Annual Costs (TIAC)	\$3,512,801	
Total Annualized Costs	\$5,324,743	Sum of TDAC, TEC and TIAC (for 260 ppm)
Cost Effectiveness of SCR System	\$17,690	Cost Per Ton NOx Removed 301 Tons NOx Removed (260 ppm inlet; 100 ppm outlet; 62% Removal)

Note: 'Included' denotes item is assumed to be included in vendor budgetary estimate for SCR Associated Equipment and Installation. [See letter from Dennis Malone (Babcock Borsig Power) to Michael Hober (RTP Environmental) dated October 19, 2001]

The above cost does not include revenue lost due to system shutdown. Based on a cost of \$56 per ton of waste at 600 tons of waste per day and over an annual shutdown of 10 days, this cost is estimated to be approximately \$336,000 due to lost tipping fees. In addition to this, the amount of revenue lost due to not producing steam during these 10 days is estimated to be approximately \$177,000; bringing the Total Annualized costs to \$5,837,743. Factoring these items into the Total Annualized Costs above, the cost effectiveness of the SCR system is estimated to be \$19,394 per ton of NOx removed.

Estimate of Selective Catalytic Reduction Costs
for Lee County Energy Recovery Facility
With Flue Gas Reheat Using Steam Diverted from Header

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Direct Capital Costs		
SCR Associated Equipment	\$6,363,000	Vendor Estimate With 1% for Steam Coil System
Ammonia Storage Tanks	Included	Two Storage Tanks for Ammonia
Flue Gas Ductwork	\$386,000	Vatavuk, OAQPS Control Cost Manual, 1990
Instrumentation	Included	In-situ NOx Analyzer
Taxes	\$509,040	8% of Associated Equip.; OAQPS Control Cost Manual
Freight	\$318,150	5% of Associated Equip.; OAQPS Control Cost Manual
System Integration	\$100,000	Engineering Estimate
Firewater Booster Pump	\$23,000	Vendor Neutral Estimate
Increase ID Fan Size	\$343,000	Vendor Neutral Estimate; Increased size due to pressure drop across SCR System
Total Direct Capital Costs (TDCC)	\$8,042,190	
Direct Installation Costs		
Foundation and Supports	\$5,731,750	Vendor Estimate With 1% for Steam Coil System
Handling and Erection	Included	Included in Vendor Quote for Installation of SCR System
Electrical	Included	Included in Vendor Quote for Installation of SCR System
Piping	Included	Included in Vendor Quote for Installation of SCR System
Insulation for Ductwork	Included	Included in Vendor Quote for Installation of SCR System
Painting	\$30,000	SCR Structural Steel Piping and Exposed Metals
Site Preparation	\$29,000	Existing Roads, Demolition & Restoration, SCR Footprint
Buildings	\$25,000	Engineering Estimate
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Structural Steel	\$200,000	Windload Requirements for Hurricanes
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SCR Building Enclosure	\$330,000	Vendor Neutral Estimate
Electrical Systems	\$56,000	Grounding, Lightning Protection, Lighting, etc.
Instrumentation Systems	\$8,000	Piping Systems Monitoring
Insulation Systems	\$29,000	Insulating Steam Line to SCR Building
Piping Systems	\$216,000	Fire Protection Standpipe/Sprinklers, Steam, Service Air, relocate propane, potable water, anhydrous ammonia
Add. Contractor Costs for Above Work	\$100,000	10% of Additional Costs Not Included in Vendor Estimate
Total Direct Installation Costs (TDIC)	\$6,805,750	
Total Capital Costs (TCC)	\$14,847,940	Sum of TDCC and TDIC
Indirect Costs		
Engineering	Included	Included in Vendor Quote for SCR System
Construction and Field Expenses	Included	Included in Vendor Quote for SCR System
Contractor Fees	\$1,484,794	10% of TCC; OAQPS Control Cost Manual, Chapter 3
Project Management & Oversight	\$123,000	Vendor Neutral Estimate
Start-Up	\$296,959	2% of TCC; OAQPS Control Cost Manual, Chapter 3
Performance Tests	\$148,479	1% of TCC; OAQPS Control Cost Manual, Chapter 3
Contingencies	\$1,187,835	8% of TCC;
Total Indirect Capital Costs (TInCC)	\$3,241,067	
Total Direct, Indirect and Capital Costs (TDICC)	\$18,089,007	

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for Lee County Energy Recovery Facility
With Flue Gas Reheat Using Steam Diverted from Header

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Direct Annual Costs		
Operating Personnel	\$56,160	24 hours/week at \$45/hour
Supervision	\$8,500	15% of Operating Personnel
Ammonia to control 260 ppm inlet NOx	\$380,000	\$300 per ton for Aqueous NH ₃
Catalyst Disposal Costs	\$15,000	Engineering Estimate
Catalyst Cost	\$90,000	1/3 Catalyst-3 year catalyst life
Contingency	\$62,466	10% of Direct Annual Costs
Regulatory Compliance Costs	\$25,000	Engineering Estimate
Miscellaneous Spare Parts	\$50,000	Vendor Neutral Estimate
Total Direct Annual Costs (TDAC)	\$687,126	
Annual Energy Costs		
Annual Electrical Needs	\$191,876	476 kWh X 8,062 hours per year at \$0.05 per kWh
Annual Lost Electrical Revenue	\$273,000	Engineering Estimate (Steam Reheat)
Total Energy Costs (TEC)	\$464,876	
Indirect Annual Costs		
Overhead	\$266,796	60% of Operating/Supervision Labor and Ammonia
Property Taxes	\$148,479	1% of Total Capital Costs
Insurance	\$148,479	1% of Total Capital Costs
Miscellaneous Painting	\$10,000	Vendor Neutral Estimate
Miscellaneous Equipment Rebuild	\$30,000	Vendor Neutral Estimate
Annualized Total Direct Capital	\$2,943,082	0.1627 Capital Recovery Factor of 10% over 10 years multiplied by sum of TDACC
Total Indirect Annual Costs (TIAC)	\$3,546,836	
Total Annualized Costs	\$4,698,838	Sum of TDAC, TEC and TIAC (for 260 ppm)
Cost Effectiveness of SCR System	\$15,611	Cost Per Ton NOx Removed 301 Tons NOx Removed (260 ppm inlet; 100 ppm outlet; 62% Removal)

Note: 'Included' denotes item is assumed to be included in vendor budgetary estimate for SCR Associated Equipment and Installation. [See letter from Dennis Malone (Babcock Borsig Power) to Michael Hober (RTP Environmental) dated October 19, 2001]

The above cost does not include revenue lost due to system shutdown. Based on a cost of \$56 per ton of waste at 600 tons of waste per day and over an annual shutdown of 10 days, this cost is estimated to be approximately \$336,000 due to lost tipping fees. In addition to this, the amount of revenue lost due to not producing steam during these 10 days is estimated to be approximately \$177,000; bringing the Total Annualized costs to \$5,211,838. Factoring these items into the Total Annualized Costs above, the cost effectiveness of the SCR system is estimated to be \$17,315 per ton of NOx removed.