TABLE 2a
BAAQMD Mariposa Energy Project

CO Catalyst Control Costs Base Case to 4 PPMVD to 2 PPMVD
CAPITAL COST SUMMARY

Average/Total Cost Effectiveness analysis

DIRECT CAPITAL COSTS (2009 $)		Explanation of Cost Estimates per Turbine
1. Purchased Equipment:		Base Cost
A) Pollution Control Equipment	$400,000	EIT Proposal C10-109 (difference between 4 ppm and 2 ppm)
B) Instrumentation & Controls(No CEMS)	$0	EPA1998 10% of Base Cost (assumed $0 for incremental assessment)
C) Freight & Taxes	$52,000	8% Taxes; 5% Freight; on 1A & 1B
Total Purchased Equip. Costs (TEC):	$452,000	Sum 1A,1B,1C
2. Installation Costs:		
A) Foundation & Supports	$0	EPA1998 8% of TEC
B) Erection and Handling	$0	EPA1998 14% of TEC (assumed $0 for incremental assessment)
C) Electrical	$0	EPA1998 4% of TEC
D) Piping	$0	EPA1998 2% of TEC
E) Insulation	$0	1% of TEC
F) Painting	$0	EPA1998 1% of TEC
G) Site Preparation	$0	0% of TEC
Total Installation Costs (TINC):	$0	Sum 2A,2B,2C,2D,2E,2F,2G
Total Direct Capital Costs (TDCC):	$452,000	Sum TEC,TINC
INDIRECT CAPITAL COSTS		
1. Engineering & Supervision	$45,200	EPA1998 10% of TEC
2. Construction and Field Exp.	$22,600	OAQPS 5% of TEC
3. Contractor Fees	$45,200	OAQPS 10% of TEC
4. Start-up	$9,040	OAQPS 2% of TEC
5. Performance Testing	$4,520	OAQPS 1% of TEC
Total Indirect Capital Costs (TICC):	$126,560	Sum 1,2,3,4,5
Total Direct & Indirect Capital Costs (TDICC):	$578,560	Sum TDCC,TICC
Contingency (@12%):	$69,427	12% TDICC (std engineering accuracy)
TOTAL CAPITAL COSTS (TCC):	$647,987	Sum TDICC,Contingency

TABLE 2a
ANNUAL OPERATING COST SUMMARY

DIRECT OPERATING COSTS (2003 $)		Explanation of Cost Estimates per Turbine
1. Operating Labor	$45,443	EPA1998 3 hr/day, @41.50 hr
2. Supervisory Labor	$6,816	OAQPS 15% Operating Labor
3. Maintenance Labor & Materials	$30,295	2 hr/day, $41.50/hr, + 100% materials (estimated at $0)
4. Electricity Expense ($0.0527/kWh)	$0	
5. Catalyst Cost (replace)	$0	NA
6. Fuel Penalty ($0.0041/scf gas)	$11,215	.15% fuel increse/inch wc (EIT Proposal - 1.0" bp)
7. Annual Catalyst Cost	$0	Initial Catalyst will last 15 year period
Total Direct Operating Costs (TDOC):	$93,769	Sum 1 through 7
INDIRECT OPERATING COSTS		
1. Overhead	$27,266	OAQPS 60% Total Labor
Total Indirect Operating Costs (TIOC):	$27,266	Sum 1
CAPITAL CHARGES COSTS		
1. Property Tax	$6,480	OAQPS 1% TCC
2. Insurance	$6,480	OAQPS 1% TCC
3. General Administrative	$12,960	OAQPS 2% TCC
4. Capital Recovery Cost (7%, 15 years)	$71,149	10.98%, TCC
Total Capital Charges Costs (TCCC):	$97,068	Sum 1,2,3,4
TOTAL ANNUALIZED OPERATING COSTS:	$218,103	Sum TDOC,TIOC,TCCC

		Per Turbine
Base Uncontrolled Case	4.0	in ppmvd
Annual Emission Rate	8.3	tpy (99.9 TPY * 4 ppmvd CO/48 ppmvd CO)

Controlled Case Emissions

CO Concentration	2.0	ppm (3-hour)
Annual Emission Rate:	4.2	tpy (100.8 TPY @ 48 ppm * 2/48) Startup/Shutdown Excluded.
CO Reduction from Uncontrolled Case:	4.2	tpy
Control Cost Effectiveness:	**$52,387**	per ton CO

References:
OAQPS - OAQPS Cost Control Manual, 5th ED., February 1996.
EPA1998 - Cost Effectiveness fo Oxidation Catalyst Control of HAP Emissions from Stationary Combustion Turbines, EPA, 1998.
* EPA memo dated 12-30-99, Emissions Stds Division, Docket A-95-51, and May 14, 1999 memo on Stationary CT control cost

TABLE 2b
BAAQMD Mariposa Energy Project

CO Catalyst Control Costs Base Case to 2 PPMVD (3-Hour) to 2 PPMVD (1-Hour)*
CAPITAL COST SUMMARY

DIRECT CAPITAL COSTS (2009 $)		Explanation of Cost Estimates
		Per Turbine
1. Purchased Equipment:		Base Cost
A) Pollution Control Equipment	$100,000	EIT Proposal C10-109 (cost difference between 2 ppm and 1.5 ppm CO emission levels)
B) Instrumentation & Controls (No CEMS)	$0	EPA1998 10% of Base Cost (assumed $0 for incremental assessment)
C) Freight & Taxes	$13,000	8% Taxes; 5% Freight; on 1A & 1B
Total Purchased Equip. Costs (TEC):	$113,000	Sum 1A,1B,1C
2. Installation Costs:		
A) Foundation & Supports	$0	EPA1998 8% of TEC
B) Erection and Handling	$0	EPA1998 14% of TEC (assumed $0 for incremental assessment)
C) Electrical	$0	EPA1998 4% of TEC
D) Piping	$0	EPA1998 2% of TEC
E) Insulation	$0	1% of TEC
F) Painting	$0	EPA1998 1% of TEC
G) Site Preparation	$0	0% of TEC
Total Installation Costs (TINC):	$0	Sum 2A,2B,2C,2D,2E,2F,2G
Total Direct Capital Costs (TDCC):	$113,000	Sum TEC,TINC
INDIRECT CAPITAL COSTS		
1. Engineering & Supervision	$11,300	EPA1998 10% of TEC
2. Construction and Field Exp.	$5,650	OAQPS 5% of TEC
3. Contractor Fees	$11,300	OAQPS 10% of TEC
4. Start-up	$2,260	OAQPS 2% of TEC
5. Performance Testing	$1,130	OAQPS 1% of TEC
Total Indirect Capital Costs (TICC):	$31,640	Sum 1,2,3,4,5,6
Total Direct & Indirect Capital Costs (TDICC):	$144,640	Sum TDCC,TICC
Contingency (@12%):	$17,357	20% TDICC (std engineering accuracy)
TOTAL CAPITAL COSTS (TCC):	$161,997	Sum TDICC,Contingency

TABLE 2b
ANNUAL OPERATING COST SUMMARY

DIRECT OPERATING COSTS (2003 $)		Explanation of Cost Estimates
		per Turbine
1. Operating Labor	$0	EPA1998 3 hr/day, @41.50 hr
2. Supervisory Labor	$0	OAQPS 15% Operating Labor
3. Maintenance Labor & Materials	$7,574	0.5 hr/day, $41.50/hr, + 100% materials (estimated at $0)
4. Electricity Expense ($0.0527/kWh)	$0	
5. Catalyst Cost (replace)	$0	
6. Fuel Penalty ($0.0041/scf gas)	$7,850	.15% fuel increse/inch wc (0.7" per EIT Proposal)
7. Annual Catalyst Cost	$0	Initial Catalyst will last 15 years
Total Direct Operating Costs (TDOC):	$15,424	Sum 1 through 7 Annualized Costs Only
INDIRECT OPERATING COSTS		
1. Overhead	$4,544	OAQPS 60% Total Labor
Total Indirect Operating Costs (TIOC):	$4,544	Sum 1
CAPITAL CHARGES COSTS		
1. Property Tax	$1,620	OAQPS 1% TCC
2. Insurance	$1,620	OAQPS 1% TCC
3. General Administrative	$3,240	OAQPS 2% TCC
4. Capital Recovery Cost (7%, 15 years)	$17,787	10.98%, TCC
Total Capital Charges Costs (TCCC):	$24,267	Sum 1,2,3,4
TOTAL ANNUALIZED OPERATING COSTS:	$44,235	Sum TDOC,TIOC,TCCC

Controlled Case Emissions		per Turbine
Base Concentration-Controlled	2.0	ppm - 3 hour - assumed CO concentration of 2 ppm
Annual Emission Rate	4.2	tpy (100.8 TPY @ 48 ppm * 2/48) Startup/Shutdown Excluded.
Incremental Controlled Emissions Case		
CO Concentration	1.5	ppm - 1 hour - assumed CO concentration of 1.5 ppm
Annual Emission Rate:	3.1	tpy (4.2 TPY @ 2 ppm * 1.5/2) Startup/Shutdown Excluded.
CO Reduction from Uncontrolled Case:	1.0	tpy
Control Cost Effectiveness:	**$42,500**	per ton CO

References:
OAQPS - OAQPS Cost Control Manual, 5th ED., February 1996.
EPA1998 - Cost Effectiveness fo Oxidation Catalyst Control of HAP Emissions from Stationary Combustion Turbines, EPA, 1998.

* Vendor assumed that CO emission concentration would need to be 1.5 ppm to achieve a 2 ppm CO 1-hour limit.
* EPA memo dated 12-30-99, Emissions Stds Division, Docket A-95-51, and May 14, 1999 memo on Stationary CT control cost options.