Yellow Pine Energy
BACT Cost Analysis

Analysis Workbook sheets include:

Equipment	Pollutant	Control System
Boiler	NO_X	Selective Non-Catalytic Reduction
Boiler	SO_2	Dry FGD
Boiler	SO_2	Wet FGD
Boiler	PM-10	Baghouse

Yellow Pine Energy BFB Boiler
Selective Noncatalytic Reduction
Cost Estimate

Capital Cost Factors

DIRECT COSTS	**Cost Factors**					
(1) Purchased Equipment						
(a) Basic Equipment and auxiliaries						
Capital Cost of SNCR System				=	$	7,415,000
Total Capital Cost				=	$	7,415,000
(b) Instruments and controls				=	$	80,000
(c) Taxes [0.07(a)]	0.07	*	(a)	=	$	-
Total Equipment Cost (TEC)				=	$	7,495,000
(2) Construction Costs						
(a) Foundations and supports	(Included in Total Construction Costs)					
(b) Handling and Erection	(Included in Total Construction Costs)					
(c) Electrical	(Included in Total Construction Costs)					
(d) Piping	(Included in Total Construction Costs)					
(e) Insulation	(Included in Total Construction Costs)					
(f) Painting	(Included in Total Construction Costs)					
Total Construction Costs				=	$	433,000
TOTAL DIRECT COSTS (TDC)	(TEC)	+	(TCC)	=	$	7,928,000
INDIRECT COSTS						
(3) Engineering and supervision [0.1(TEC)]	0.1	*	(TEC)	=	$	749,500
(4) Construction and field expenses [0.05(TEC)]	0.05	*	(TEC)	=	$	374,750
(5) Construction fee [0.1(TEC)]	0.1	*	(TEC)	=	$	749,500
(6) Contingencies [0.03(TEC)]	0.03	*	(TEC)	=	$	224,850
(7) Start-up [0.02(TEC)]	0.02	*	(TEC)	=	$	149,900
(8) Performance test [0.01(TEC)]	0.01	*	(TEC)	=	$	74,950
(9) Simple Interest During Construction	TEC * 7% * 0.5 YEARS			=	$	262,325
TOTAL INDIRECT COSTS (TIC)				=	$	2,585,775
TOTAL DIRECT AND INDIRECT COSTS (TDIC)	(TDC)	+	(TIC)	=	$	10,513,775
(10) Contingency	(Included in Total Indirect Costs)					
TOTAL INSTALLED CAPITAL COSTS (TICC)				=	$	10,513,775

Yellow Pine Energy BFB Boiler
Selective Noncatalytic Reduction
Cost Estimate (continued)

Annualized Cost Factors

DIRECT COSTS	**Cost Factors**					
Fixed O&M Costs						
(1) Operating Labor					$	56,319
(2) Supervisory Labor	15% of Operating Labor				$	8,448
(3) Maintenance Labor					$	94,805
(4) Parts and Materials					$	-
Total Fixed O&M Costs				=	$	159,572
Variable O&M Costs						
(5) Ammonia Reagent Cost:				=	$	164,688
(6) Catalyst Replacement Cost:				=	$	-
(7) Auxiliary Power Cost:[4]				=	$	172,400
(8) Natural Gas Cost:				=		
					$	-
Total Variable O&M Costs					$	337,088
TOTAL DIRECT COSTS (TDAC)				=	$	496,660
INDIRECT COSTS						
(9) Overhead	60%	of	Fixed O&M Costs	=	$	95,743
(10) Property Tax	1%	of	(TICC)	=	$	105,138
(11) Insurance	1%	of	(TICC)	=	$	105,138
(12) G&A Charges	2%	of	(TICC)	=	$	210,276
(13) Capital Recovery	0.1424	*	(TICC)	=	$	1,496,925
TOTAL INDIRECT COSTS (TIAC)				=	$	2,013,219
TOTAL ANNUALIZED COSTS	TDAC + TIAC			=	$	2,509,879
TOTAL TONS REMOVED PER YEAR (NO_x)	1482 tons uncontrolled - 669.7 tons with SNCR			=		812
COST EFFECTIVENESS ($ per ton of pollutant removed)				=	$	3,090

Notes:

1) Cost factors - from OAQPS Control Cost Manual, Chapter 3

2) Capital Recovery Factor for System - Based on a 10-year equipment life and 7% interest rate.

3) Air Techniques, Inc. provided SNCR purchased equipment cost.

4) The auxiliary power cost are associated with pumps and blowers for the SNCR system.

Yellow Pine Energy BFB Boiler
Dry Lime Flue Gas Desulfurization System
Cost Estimate

Capital Cost Factors

DIRECT COSTS	**Cost Factors**					
(1) Installed Capital Cost of one Lime Spray Dryer Absorber, Reagent Feed System, ID Fans, Waste/Byproduct Handling System, and Support Equipment				=	$	8,350,000
TOTAL DIRECT COSTS (TDC)				=	$	8,350,000
INDIRECT COSTS						
(2) General Facilities	0.1	*	(TDC)	=	$	835,000
(3) Engineering Fees	0.08	*	(TDC)	=	$	668,000
(4) Construction fee	0.03	*	(TDC)	=	$	250,500
(5) Preproduction Costs				=	$	1,136,644
(6) Lime Inventory Cost				=	$	91,522
TOTAL INDIRECT COSTS (TIC)				=	$	2,981,666
TOTAL DIRECT AND INDIRECT COSTS (TDIC)	(TDC)	+	(TIC)	=	$	11,331,666
(7) Contingency	0.1	*	(TDIC)	=	$	1,133,167
TOTAL INSTALLED CAPITAL COSTS (TICC)				=	$	12,464,833
				($/kW)	$	113

Yellow Pine Energy BFB Boiler
Dry Lime Flue Gas Desulfurization System
Cost Estimate (continued)

Annualized Cost Factors

DIRECT COSTS	**Cost Factors**					
Fixed O&M Costs						
(1) Operating Labor					$	262,500
(2) Administrative and Support Labor					$	85,000
(3) Maintenance Labor and Materials					$	245,000
(4) Parts and Materials[4]	Included in (3)				$	-
Total Fixed O&M Costs				=	$	592,500
Variable O&M Costs						
(5) Lime Reagent Cost:	$57.00/ton delivered			=	$	2,115,221
(6) FDG Waste Disposal Cost:				=	$	92,773
(7) Makeup Water Cost:				=	$	5,848
(8) Auxiliary Power Cost:				=	$	485,654
Total Variable O&M Costs					$	2,699,496
TOTAL DIRECT COSTS (TDAC)				=	$	3,291,996
INDIRECT COSTS						
	Included in Fixed O&M Costs					
(9) Overhead				=	$	-
(10) Property Tax				=	$	-
(11) Insurance	1%	of	(TICC)	=	$	124,648
(12) G&A Charges	2%	of	(TICC)	=	$	249,297
(13) Capital Recovery	0.110	*	TICC	=	$	1,371,132
TOTAL INDIRECT COSTS (TIAC)				=	$	1,745,077
TOTAL ANNUALIZED COSTS	TDAC + TIAC			=	$	5,037,073
TOTAL TONS REMOVED PER YEAR (SO_2)	6052 tons in exit stream from BFB Boiler - 670 tons with FGD			=		5,382
COST EFFECTIVENESS ($ per ton of pollutant removed)				=	$	936

Notes:

1) Cost factors - from OAQPS Control Cost Manual, Chapter 3

2) Capital Recovery Factor for System - Based on a 15-year equipment life and 7% interest rate.

3) Dry Lime FGD total direct costs, total indirect costs and annual fixed and variable O&M costs are based on data from Babcock & Wilcox for a similar project.

Yellow Pine Energy BFB Boiler
Wet Lime Flue Gas Desulfurization System
Cost Estimate

Capital Cost Factors

DIRECT COSTS	**Cost Factors**					
(1) Installed Capital Cost of one Lime Spray Dryer Absorber, Reagent Feed System, ID Fans, Waste/Byproduct Handling System, and Support Equipment				=	$	28,219,660
TOTAL DIRECT COSTS (TDC)				=	$	28,219,660
INDIRECT COSTS						
(2) General Facilities	0.1	*	(TDC)	=	$	2,821,966
(3) Engineering Fees	0.08	*	(TDC)	=	$	2,257,573
(4) Construction fee	0.03	*	(TDC)	=	$	846,590
(5) Preproduction Costs				=	$	1,160,804
(6) Lime Inventory Cost				=	$	41,000
TOTAL INDIRECT COSTS (TIC)				=	$	7,127,933
TOTAL DIRECT AND INDIRECT COSTS (TDIC)	(TDC)	+	(TIC)	=	$	35,347,593
(7) Contingency	0.1	*	(TDIC)	=	$	3,534,759
TOTAL INSTALLED CAPITAL COSTS (TICC)				=	$	38,882,352
				($/kW)	$	353

Yellow Pine Energy BFB Boiler
Wet Lime Flue Gas Desulfurization System
Cost Estimate (continued)

Annualized Cost Factors

DIRECT COSTS	**Cost Factors**					
Fixed O&M Costs						
(1) Operating Labor					$	589,667
(2) Administrative and Support Labor					$	405,805
(3) Maintenance Labor and Materials					$	1,907,542
(4) Parts and Materials[4]	Included in (3)				$	-
Total Fixed O&M Costs				=	$	2,903,014
Variable O&M Costs						
(5) Lime Reagent Cost:				=	$	498,848
(6) FDG Waste Disposal Cost:				=	$	396,095
(7) Makeup Water Cost:				=	$	11,800
(8) Auxiliary Power Cost:				=	$	700,800
Total Variable O&M Costs					$	1,607,543
TOTAL DIRECT COSTS (TDAC)				=	$	4,510,557
INDIRECT COSTS						
	Included in Fixed O&M Costs					
(9) Overhead				=	$	-
(10) Property Tax				=	$	-
(11) Insurance	1%	of	(TICC)	=	$	388,824
(12) G&A Charges	2%	of	(TICC)	=	$	777,647
(13) Capital Recovery	0.110	*	TICC	=	$	4,277,059
TOTAL INDIRECT COSTS (TIAC)				=	$	5,443,529
TOTAL ANNUALIZED COSTS	TDAC + TIAC			=	$	9,954,086
TOTAL TONS REMOVED PER YEAR (SO_2)	670 tons with Dry FGD - 303 tons with Wet FGD			=		367
COST EFFECTIVENESS ($ per ton of pollutant removed)				=	$	27,123

Notes:

1) Cost factors - from OAQPS Control Cost Manual, Chapter 3

2) Capital Recovery Factor for System - Based on a 15-year equipment life and 7% interest rate.

3) Dry Lime FGD total direct costs, total indirect costs and annual fixed and variable O&M costs are based on data from Babcock & Wilcox for a similar project.

Yellow Pine Energy BFB Boiler
Baghouse
Cost Estimate

Capital Cost Factors

DIRECT COSTS	**Cost Factors**					
(1) Installed Capital Cost						
(a) Basic Equipment and auxiliaries						
Baghouse, Quenching Air System, Ducting, and Controls				=	$	7,723,048
TOTAL DIRECT COSTS (TDC)	(TEC)	+	(TCC)	=	$	7,723,048
INDIRECT COSTS						
(3) Engineering and supervision [0.1(TEC)]	0.1	*	(TDC)	=	$	772,305
(4) Construction and field expenses [0.05(TEC)]	0.05	*	(TDC)	=	$	386,152
(5) Construction fee [0.1(TEC)]	0.1	*	(TDC)	=	$	772,305
(6) Contingencies [0.03(TEC)]	0.03	*	(TDC)	=	$	231,691
(7) Start-up [0.02(TEC)]	0.02	*	(TDC)	=	$	154,461
(8) Performance test [0.01(TEC)]	0.01	*	(TDC)	=	$	77,230
(9) Simple Interest During Construction	TDC * 7% * 0.5 YEARS			=	$	270,307
TOTAL INDIRECT COSTS (TIC)				=	$	2,664,452
TOTAL DIRECT AND INDIRECT COSTS (TDIC)	(TDC)	+	(TIC)	=	$	10,387,500
(10) Contingency	0.1	*	(TDIC)	=	$	1,038,750
TOTAL INSTALLED CAPITAL COSTS (TICC)				=	$	11,426,250

Yellow Pine Energy BFB Boiler
Baghouse
Cost Estimate (continued)

Annualized Cost Factors

DIRECT COSTS	**Cost Factors**					
Fixed O&M Costs						
(1) Operating Labor					$	-
(2) Supervisory Labor					$	-
(3) Maintenance Labor Materials					$	564,136
(4) Parts and Materials[4]	Included in (3)				$	-
Total Fixed O&M Costs				=	$	564,136
Variable O&M Costs						
(5) Auxiliary Power Cost:				=	$	257,029
(6) Bag Replacemen and Associated Support Systems:				=	$	286,667
Total Variable O&M Costs					$	543,696
TOTAL DIRECT COSTS (TDAC)				=	$	1,107,832
INDIRECT COSTS						
(8) Overhead	Included in Fixed O&M Costs			=	$	-
(10) Property Tax	1%	of	(TICC)	=	$	114,262
(11) Insurance	1%	of	(TICC)	=	$	114,262
(12) G&A Charges	2%	of	(TICC)	=	$	228,525
(13) Capital Recovery	0.110	*	(TICC)	=	$	1,254,541
TOTAL INDIRECT COSTS (TIAC)				=	$	1,711,591
TOTAL ANNUALIZED COSTS	TDAC + TIAC			=	$	2,819,423
TOTAL TONS REMOVED PER YEAR (PM-10)	22,100 tons uncontrolled - 221 tons with a Baghouse			=		21,879
COST EFFECTIVENESS ($ per ton of pollutant removed)				=	$	129

Notes:

1) Cost factors - from OAQPS Control Cost Manual, Chapter 3

2) Capital Recovery Factor for System - Based on a 15-year equipment life and 7% interest rate.