

PNM SJGS BART Analysis - Cost Analysis (Draft)

Technology: Selective Catalytic Reduction - SJGS Unit 1

Date: 7/11/2007

Cost Item	\$	Remarks/Cost Basis
CAPITAL COST		
Direct Costs		
Purchased equipment costs		
Anhydrous Ammonia Injection System	\$437,000	Scaled from B&V database based on ammonia flow, using 0.6 scale factor
Anhydrous Ammonia Vaporization System	\$436,000	Scaled from B&V database based on ammonia flow, using 0.6 scale factor
Reactor Box, Breeching and Ductwork	\$4,451,000	Scaled from B&V database based on flue gas flow, using 0.6 scale factor
Ductwork Expansion Joints	\$294,000	Scaled from B&V database based on flue gas flow, using 0.6 scale factor
Catalyst	\$2,557,000	Catalyst volume determined based on unit size & Nox removal, \$6500/m3 of catalyst
Sonic Horns	\$188,000	Actual price from similarly sized unit, escalated to 2007 dollars
Elevator	\$1,236,000	Actual price from similarly sized unit, escalated to 2007 dollars
Structural Steel	\$4,881,000	Scaled from B&V database based on flue gas flow, using 0.6 scale factor
SCR Bypass	\$10,000,000	Taken from another B&V project of similar size
NOx Monitoring System	\$440,000	Actual price from similarly sized unit, escalated to 2007 dollars
Electrical System Upgrade	\$378,000	Actual price from similarly sized unit, escalated to 2007 dollars
Instrumentation and Control System	\$279,000	Actual price from similarly sized unit, escalated to 2007 dollars
Subtotal capital cost (CC)	<u>\$25,577,000</u>	
Gross Receipt Tax	\$1,583,000	(CC) X 6.2%
Freight	\$1,279,000	(CC) X 5.0%
Total purchased equipment cost (PEC)	<u>\$28,439,000</u>	
Direct installation costs		
Foundation & supports	\$8,532,000	(PEC) X 30.0%
Handling & erection	\$8,532,000	(PEC) X 30.0%
Electrical	\$4,266,000	(PEC) X 15.0%
Piping	\$711,000	(PEC) X 2.5%
Insulation	\$2,844,000	(PEC) X 10.0%
Painting	\$284,000	(PEC) X 1.0%
Demolition	\$2,844,000	(PEC) X 10.0%
Relocation	\$1,422,000	(PEC) X 5.0%
Total direct installation costs (DIC)	<u>\$29,435,000</u>	
Air preheater modifications	\$1,071,000	Scaled from a B&V project based unit size, using 0.7 scale factor
Balanced draft conversion	\$13,366,000	Adjusted from a B&V balanced draft conversion project based on differences in scope
Site preparation	\$2,000,000	Contingency for site unknowns, such as underground utilities
Buildings & enclosures	\$500,000	Contingency for general site building requirements
Total direct costs (DC) = (PEC) + (DIC)	<u>\$74,811,000</u>	
Indirect Costs		
Engineering	\$5,237,000	(DC) X 7.0%
Owner's cost	\$3,741,000	(DC) X 5.0%
Construction management	\$7,481,000	(DC) X 10.0%
Construction indirect	\$18,344,000	B&V labor market review
Start-up and spare parts	\$2,244,000	(DC) X 3.0%
Performance test	\$200,000	Based on other projects with similar emissions testing scope
Contingencies	\$14,962,000	(DC) X 20.0%
Total indirect costs (IC)	<u>\$52,209,000</u>	
Interest During Construction (IDC)	\$14,118,000	[(DC)+(IC)] X 7.41%
Loss Generation during Outage (GEN)	\$15,667,000	3 years (project time length X 1/2) 5 weeks and 0.06095 \$/kWh 12 weeks required for BDC, 7 weeks major outage available
Total Capital Investment (TCI) = (DC) + (IC) + (IDC) + (GEN)	\$156,805,000	
ANNUAL COST		
Direct Annual Costs		
Fixed annual costs		
Operating labor	\$125,000	1 FTE and 124,862 \$/year Estimated manpower level
Maintenance labor & materials	\$2,244,000	(DC) X 3.0%
Yearly emissions testing	\$25,000	Based on similar other projects with similar emissions testing scope
Catalyst activity testing	\$5,000	Engineering estimate
Fly ash sampling and analysis	\$20,000	Engineering estimate
Total fixed annual costs	<u>\$2,419,000</u>	
Variable annual costs		
Reagent	\$911,000	350 lb/hr and 700 \$/ton B&V Calculated
Auxiliary and ID fan power	\$1,496,000	3,296 kW and 0.06095 \$/kWh B&V Calculated
Catalyst replacement	\$426,000	66 m ³ and 6,500 \$/m ³ 2 yr catalyst replacement rate
Total variable annual costs	<u>\$2,833,000</u>	
Total direct annual costs (DAC)	<u>\$5,252,000</u>	
Indirect Annual Costs		
Cost for capital recovery	\$15,273,000	(TCI) X 9.74%
Total indirect annual costs (IDAC)	<u>\$15,273,000</u>	CRF at 7.41% interest & 20 year life
Total Annual Cost (TAC) = (DAC) + (IDAC)	\$20,525,000	

PNM SJGS BART Analysis - Cost Analysis (Draft)

Technology: Selective Catalytic Reduction - SJGS Unit 2

Date: 7/11/2007

Cost Item	\$	Remarks/Cost Basis
CAPITAL COST		
Direct Costs		
Purchased equipment costs		
Anhydrous Ammonia Injection System	\$429,000	Scaled from B&V database based on ammonia flow, using 0.6 scale factor
Anhydrous Ammonia Vaporization System	\$429,000	Scaled from B&V database based on ammonia flow, using 0.6 scale factor
Reactor Box, Breeching and Ductwork	\$4,444,000	Scaled from B&V database based on flue gas flow, using 0.6 scale factor
Ductwork Expansion Joints	\$294,000	Scaled from B&V database based on flue gas flow, using 0.6 scale factor
Catalyst	\$2,553,000	Catalyst volume determined based on unit size & Nox removal, \$6500/m3 of catalyst
Sonic Horns	\$188,000	Actual price from similarly sized unit, escalated to 2007 dollars
Elevator	\$1,236,000	Actual price from similarly sized unit, escalated to 2007 dollars
Structural Steel	\$5,998,000	Scaled from B&V database based on flue gas flow, using 0.6 scale factor
SCR Bypass	\$10,000,000	Taken from another B&V project of similar size
NOx Monitoring System	\$440,000	Actual price from similarly sized unit, escalated to 2007 dollars
Electrical System Upgrade	\$372,000	Actual price from similarly sized unit, escalated to 2007 dollars
Instrumentation and Control System	\$278,000	Actual price from similarly sized unit, escalated to 2007 dollars
Subtotal capital cost (CC)	<u>\$26,661,000</u>	
Gross Receipt Tax	\$1,650,000	(CC) X 6.2%
Freight	\$1,333,000	(CC) X 5.0%
Total purchased equipment cost (PEC)	<u>\$29,644,000</u>	
Direct installation costs		
Foundation & supports	\$8,893,000	(PEC) X 30.0%
Handling & erection	\$11,858,000	(PEC) X 40.0%
Electrical	\$4,447,000	(PEC) X 15.0%
Piping	\$741,000	(PEC) X 2.5%
Insulation	\$2,964,000	(PEC) X 10.0%
Painting	\$296,000	(PEC) X 1.0%
Demolition	\$2,964,000	(PEC) X 10.0%
Relocation	\$1,482,000	(PEC) X 5.0%
Total direct installation costs (DIC)	<u>\$33,645,000</u>	
Air preheater modifications	\$1,071,000	Scaled from a B&V project based unit size, using 0.7 scale factor
Balanced draft conversion	\$13,366,000	Adjusted from a B&V balanced draft conversion project based on differences in scope
Site preparation	\$2,000,000	Contingency for site unknowns, such as underground utilities
Buildings & enclosures	\$500,000	Contingency for general site building requirements
Total direct costs (DC) = (PEC) + (DIC)	<u>\$80,226,000</u>	
Indirect Costs		
Engineering	\$5,616,000	(DC) X 7.0%
Owner's cost	\$4,011,000	(DC) X 5.0%
Construction management	\$8,023,000	(DC) X 10.0%
Construction indirect	\$22,085,000	B&V labor market review
Start-up and spare parts	\$2,407,000	(DC) X 3.0%
Performance test	\$200,000	Based on other projects with similar emissions testing scope
Contingencies	\$16,045,000	(DC) X 20.0%
Total indirect costs (IC)	<u>\$58,387,000</u>	
Interest During Construction (IDC)	\$15,407,000	[(DC)+(IC)] X 7.41%
Loss Generation during Outage (GEN)	\$15,231,000	3 years (project time length X 1/2) 5 weeks and 0.06095 \$/kWh 12 weeks required for BDC, 7 weeks major outage available
Total Capital Investment (TCI) = (DC) + (IC) + (IDC) + (GEN)	\$169,251,000	
ANNUAL COST		
Direct Annual Costs		
Fixed annual costs		
Operating labor	\$125,000	1 FTE and 124,862 \$/year Estimated manpower level
Maintenance labor & materials	\$2,407,000	(DC) X 3.0%
Yearly emissions testing	\$25,000	Based on other projects with similar emissions testing scope
Catalyst activity testing	\$5,000	Engineering estimate
Fly ash sampling and analysis	\$20,000	Engineering estimate
Total fixed annual costs	<u>\$2,582,000</u>	
Variable annual costs		
Reagent	\$906,000	348 lb/hr and 700 \$/ton B&V Calculated
Auxiliary and ID fan power	\$1,492,000	3,287 kW and 0.06095 \$/kWh B&V Calculated
Catalyst replacement	\$426,000	65 m ³ and 6,500 \$/m ³ 2 yr catalyst replacement rate
Total variable annual costs	<u>\$2,824,000</u>	
Total direct annual costs (DAC)	<u>\$5,406,000</u>	
Indirect Annual Costs		
Cost for capital recovery	\$16,485,000	(TCI) X 9.74% CRF at 7.41% interest & 20 year life
Total indirect annual costs (IDAC)	<u>\$16,485,000</u>	
Total Annual Cost (TAC) = (DAC) + (IDAC)	\$21,891,000	

PNM SJGS BART Analysis - Cost Analysis (Draft)

Technology: Selective Catalytic Reduction - SJGS Unit 3

Date: 7/11/2007

Cost Item	\$	Remarks/Cost Basis
CAPITAL COST		
Direct Costs		
Purchased equipment costs		
Anhydrous Ammonia Injection System	\$559,000	Scaled from B&V database based on ammonia flow, using 0.6 scale factor
Anhydrous Ammonia Vaporization System	\$559,000	Scaled from B&V database based on ammonia flow, using 0.6 scale factor
Reactor Box, Breeching and Ductwork	\$5,613,000	Scaled from B&V database based on flue gas flow, using 0.6 scale factor
Ductwork Expansion Joints	\$371,000	Scaled from B&V database based on flue gas flow, using 0.6 scale factor
Catalyst	\$3,225,000	Catalyst volume determined based on unit size & Nox removal, \$6500/m3 of catalyst
Sonic Horns	\$188,000	Actual price from similarly sized unit, escalated to 2007 dollars
Elevator	\$1,236,000	Actual price from similarly sized unit, escalated to 2007 dollars
SCR Bypass	\$10,000,000	Scaled from B&V database based on flue gas flow, using 0.6 scale factor
Structural Steel	\$7,816,000	Taken from another B&V project of similar size
NOx Monitoring System	\$440,000	Actual price from similarly sized unit, escalated to 2007 dollars
Electrical System Upgrade	\$484,000	Actual price from similarly sized unit, escalated to 2007 dollars
Instrumentation and Control System	\$291,000	Actual price from similarly sized unit, escalated to 2007 dollars
Subtotal capital cost (CC)	<u>\$30,782,000</u>	
Gross Receipt Tax	\$1,905,000	(CC) X 6.2%
Freight	\$1,539,000	(CC) X 5.0%
Total purchased equipment cost (PEC)	<u>\$34,226,000</u>	
Direct installation costs		
Foundation & supports	\$10,268,000	(PEC) X 30.0%
Handling & erection	\$13,690,000	(PEC) X 40.0%
Electrical	\$5,134,000	(PEC) X 15.0%
Piping	\$856,000	(PEC) X 2.5%
Insulation	\$3,423,000	(PEC) X 10.0%
Painting	\$342,000	(PEC) X 1.0%
Demolition	\$3,423,000	(PEC) X 10.0%
Relocation	\$1,711,000	(PEC) X 5.0%
Total direct installation costs (DIC)	<u>\$38,847,000</u>	
Air preheater modifications	\$8,685,000	Based on a budgetary quote received for the project
Balanced draft conversion	\$17,122,000	Adjusted from a B&V balanced draft conversion project based on differences in scope
Site preparation	\$2,000,000	Contingency for site unknowns, such as underground utilities
Buildings & enclosures	\$500,000	Contingency for general site building requirements
Total direct costs (DC) = (PEC) + (DIC)	<u>\$101,380,000</u>	
Indirect Costs		
Engineering	\$7,097,000	(DC) X 7.0%
Owner's cost	\$5,069,000	(DC) X 5.0%
Construction management	\$10,138,000	(DC) X 10.0%
Construction indirect	\$25,498,000	B&V labor market review
Start-up and spare parts	\$3,041,000	(DC) X 3.0%
Performance test	\$200,000	Based on other projects with similar emissions testing scope
Contingencies	\$20,276,000	(DC) X 20.0%
Total indirect costs (IC)	<u>\$71,319,000</u>	
Interest During Construction (IDC)	\$19,195,000	[(DC)+(IC)] X 7.41%
Loss Generation during Outage (GEN)	\$23,674,000	3 years (project time length X 1/2) 5 weeks and 0.06095 \$/kWh 12 weeks required for BDC, 7 weeks major outage available
Total Capital Investment (TCI) = (DC) + (IC) + (IDC) + (GEN)	\$215,568,000	
ANNUAL COST		
Direct Annual Costs		
Fixed annual costs		
Operating labor	\$125,000	1 FTE and 124,862 \$/year Estimated manpower level
Maintenance labor & materials	\$3,041,000	(DC) X 3.0%
Yearly emissions testing	\$25,000	Based on other projects with similar emissions testing scope
Catalyst activity testing	\$5,000	Engineering estimate
Fly ash sampling and analysis	\$20,000	Engineering estimate
Total fixed annual costs	<u>\$3,216,000</u>	
Variable annual costs		
Reagent	\$1,415,000	543 lb/hr and 700 \$/ton B&V Calculated
Auxiliary and ID fan power	\$2,194,000	4,835 kW and 0.06095 \$/kWh B&V Calculated
Catalyst replacement	\$538,000	83 m ³ and 6,500 \$/m ³ 2 yr catalyst replacement rate
Total variable annual costs	<u>\$4,147,000</u>	
Total direct annual costs (DAC)	<u>\$7,363,000</u>	
Indirect Annual Costs		
Cost for capital recovery	\$20,996,000	(TCI) X 9.74%
Total indirect annual costs (IDAC)	<u>\$20,996,000</u>	CRF at 7.41% interest & 20 year life
Total Annual Cost (TAC) = (DAC) + (IDAC)	\$28,359,000	

PNM SJGS BART Analysis - Cost Analysis (Draft)

Technology: Selective Catalytic Reduction - SJGS Unit 4

Date: 7/11/2007

Cost Item	\$	Remarks/Cost Basis
CAPITAL COST		
Direct Costs		
Purchased equipment costs		
Anhydrous Ammonia Injection System	\$559,000	Scaled from B&V database based on ammonia flow, using 0.6 scale factor
Anhydrous Ammonia Vaporization System	\$559,000	Scaled from B&V database based on ammonia flow, using 0.6 scale factor
Reactor Box, Breeching and Ductwork	\$5,648,000	Scaled from B&V database based on flue gas flow, using 0.6 scale factor
Ductwork Expansion Joints	\$373,000	Scaled from B&V database based on flue gas flow, using 0.6 scale factor
Catalyst	\$3,245,000	Catalyst volume determined based on unit size & Nox removal, \$6500/m3 of catalyst
Sonic Horns	\$188,000	Actual price from similarly sized unit, escalated to 2007 dollars
Elevator	\$1,236,000	Actual price from similarly sized unit, escalated to 2007 dollars
Structural Steel	\$6,252,000	Scaled from B&V database based on flue gas flow, using 0.6 scale factor
SCR Bypass	\$10,000,000	Taken from another B&V project of similar size
NOx Monitoring System	\$440,000	Actual price from similarly sized unit, escalated to 2007 dollars
Electrical System Upgrade	\$484,000	Actual price from similarly sized unit, escalated to 2007 dollars
Instrumentation and Control System	\$291,000	Actual price from similarly sized unit, escalated to 2007 dollars
Subtotal capital cost (CC)	<u>\$29,275,000</u>	
Gross Receipt Tax	\$1,811,000	(CC) X 6.2%
Freight	\$1,464,000	(CC) X 5.0%
Total purchased equipment cost (PEC)	<u>\$32,550,000</u>	
Direct installation costs		
Foundation & supports	\$9,765,000	(PEC) X 30.0%
Handling & erection	\$9,765,000	(PEC) X 30.0%
Electrical	\$4,883,000	(PEC) X 15.0%
Piping	\$814,000	(PEC) X 2.5%
Insulation	\$3,255,000	(PEC) X 10.0%
Painting	\$326,000	(PEC) X 1.0%
Demolition	\$3,255,000	(PEC) X 10.0%
Relocation	\$1,628,000	(PEC) X 5.0%
Total direct installation costs (DIC)	<u>\$33,691,000</u>	
Air preheater modifications		
Balanced draft conversion	\$8,685,000	Based on a budgetary quote received for the project
Site preparation	\$17,122,000	Adjusted from a B&V balanced draft conversion project based on differences in scope
Buildings & enclosures	\$2,000,000	Contingency for site unknowns, such as underground utilities
Total direct costs (DC) = (PEC) + (DIC)	<u>\$94,548,000</u>	Contingency for general site building requirements
Indirect Costs		
Engineering	\$6,618,000	(DC) X 7.0%
Owner's cost	\$4,727,000	(DC) X 5.0%
Construction management	\$9,455,000	(DC) X 10.0%
Construction indirect	\$20,996,000	B&V labor market review
Start-up and spare parts	\$2,836,000	(DC) X 3.0%
Performance test	\$200,000	Based on other projects with similar emissions testing scope
Contingencies	\$18,910,000	(DC) X 20.0%
Total indirect costs (IC)	<u>\$63,742,000</u>	
Interest During Construction (IDC)	\$17,594,000	[(DC)+(IC)] X 7.41% 3 years (project time length X 1/2)
Loss Generation during Outage (GEN)	\$23,674,000	5 weeks and 0.06095 \$/kWh 12 weeks required for BDC, 7 weeks major outage available
Total Capital Investment (TCI) = (DC) + (IC) + (IDC) + (GEN)	\$199,558,000	
ANNUAL COST		
Direct Annual Costs		
Fixed annual costs		
Operating labor	\$125,000	1 FTE and 124,862 \$/year Estimated manpower level
Maintenance labor & materials	\$2,836,000	(DC) X 3.0%
Yearly emissions testing	\$25,000	Based on other projects with similar emissions testing scope
Catalyst activity testing	\$5,000	Engineering estimate
Fly ash sampling and analysis	\$20,000	Engineering estimate
Total fixed annual costs	<u>\$3,011,000</u>	
Variable annual costs		
Reagent	\$1,388,000	533 lb/hr and 700 \$/ton B&V Calculated
Auxiliary and ID fan power	\$2,215,000	4,881 kW and 0.06095 \$/kWh B&V Calculated
Catalyst replacement	\$541,000	83 m ³ and 6,500 \$/m ³ 2 yr catalyst replacement rate
Total variable annual costs	<u>\$4,144,000</u>	
Total direct annual costs (DAC)	<u>\$7,155,000</u>	
Indirect Annual Costs		
Cost for capital recovery	\$19,437,000	(TCI) X 9.74% CRF at 7.41% interest & 20 year life
Total indirect annual costs (IDAC)	<u>\$19,437,000</u>	
Total Annual Cost (TAC) = (DAC) + (IDAC)	\$26,592,000	