

Project Cost Summary

Project Cost Summary	Reference Cost	Estimated Cost	
Power Plant:			
I Specialized Equipment	219.119.000	230.075.000	USD
II Other Equipment	10.025.000	10.526.000	USD
III Civil	25.587.000	29.021.000	USD
IV Mechanical	53.253.000	60.644.000	USD
V Electrical Assembly & Wiring	9.596.000	11.278.000	USD
VI Buildings & Structures	12.955.000	14.899.000	USD
VII Engineering & Plant Startup	20.151.000	20.185.000	USD
Gasification Plant	NA	NA	
Desalination Plant	NA	NA	
CO2 Capture Plant	NA	NA	
Subtotal - Contractor's Internal Cost	350.686.000	376.628.000	USD
VIII Contractor's Soft & Miscellaneous Costs	74.402.000	82.750.000	USD
Contractor's Price	425.088.000	459.379.000	USD
IX Owner's Soft & Miscellaneous Costs	38.258.000	41.344.000	USD
Total - Owner's Cost (1 USD per US Dollar)	463.346.000	500.723.000	USD
Nameplate Net Plant Output	733	733	MW
Price per kW - Contractor's	580,1	626,9	USD per kW
Cost per kW - Owner's	632,3	683,3	USD per kW
* Cost estimates as of August 2017.			
** Land cost, utility connection cost, and spare parts costs are zero.			
The user may want to edit those inputs for better cost estimates.			

Specialized Equipment

	Item Cost	Unit Cost	Quantity	Ref. Cost	Est. Cost
I Specialized Equipment (USD)				219.119.000	230.075.000
1. Gas Turbine Package		36.143.000	2	72.286.000	75.901.000
Combustion Turbine Genset (including multi-unit discount)	33.440.000				
Inlet Filter/Silencer System (w/ elements)	included				
Evaporative Cooling System					
Inlet Fogging System					
Exhaust Stack/Silencer System					
Electrical/Control/Instrumentation Package	included				
Gas Fuel Package	included				
Liquid Fuel Package					
Fuel Heating Package	362.300				
Steam Injection Package					
Water Injection Package					
Starting Package	included				
Lube Oil Package w/ main, auxiliary & emergency pump	included				
Compressor Water Wash System	included				
High Voltage Generator					
OEM supplied technical oversight & services required for warranty	included				
User-defined shipping cost [7%]	2.341.000				
2. Steam Turbine Package		47.054.000	1	47.054.000	49.407.000
Turbine	included				
Generator	included				
Exhaust System	included				
Electrical/Control/Instrumentation Package	included				
Lube Oil Package w/ main, auxiliary & emergency pump	included				
High Voltage Generator					
OEM supplied technical oversight & services required for warranty	included				
User-defined shipping cost [8%]	3.486.000				
3. Heat Recovery Boiler		24.259.000	2	48.517.000	50.943.000
Duct Burner & Burner Management System	893.400				
Gas Turbine Exhaust Transition	included				
Bypass Stack					
Main Stack	1.287.000				
Instrumentation	included				
SCR & Aqueous Ammonia System					
CO catalytic reactor for CO reduction					
Deaerator	included				
Steam Vents & Water Drains	included				
Non-Return Valves	included				
Blowdown Recovery System					
Forced Circulation Pumps					
OEM supplied technical oversight & services required for warranty	included				
User-defined shipping cost [10%]	2.205.000				
4. Water-cooled Condenser		5.847.000	1	5.847.000	6.139.000
Vacuum Pump	elsewhere				
Steam Jet Air Ejector					
User-defined shipping cost [8%]	433.100				
5. Air-cooled Condenser					
Tube Bundles					
Fans, Gears, and Motors					
Steam Duct & Condenser Piping					
Turbine Exhaust Transition					
Steam Jet Air Ejector					
Condensate Receiver Tank					
Support Structures					
User-defined shipping cost [8%]					
6. Inlet Air Chilling / Heating System					

Specialized Equipment

	Item Cost	Unit Cost	Quantity	Ref. Cost	Est. Cost
Main Chiller Unit					
Chilling / Heating Water Coil					
Chiller Cooling System					
Approximate shipping to typical US site					
7. Fuel Gas Compressor					
Fin Fan Cooling System					
Approximate shipping to typical US site					
8. Continuous Emissions Monitoring System		709.300	1	709.300	744.700
Enclosures	included				
Electronics, Display Units, Printers & Sensors	included				
Approximate shipping to typical US site	included				
9. Distributed Control System		2.271.000	1	2.271.000	2.385.000
Enclosures	included				
Electronics, Display Units, Printers & Sensors	included				
Approximate shipping to typical US site	included				
10. Transmission Voltage Equipment		30.168.000	1	30.168.000	31.677.000
Transformers	27.392.000				
Circuit Breakers	1.340.000				
Miscellaneous Equipment	1.437.000				
Approximate shipping to typical US site	included				
11. Generating Voltage Equipment		12.266.000	1	12.266.000	12.879.000
Generator Buswork	6.408.000				
Circuit Breakers	5.274.000				
Current Limiting Reactors					
Miscellaneous Equipment	584.100				
Approximate shipping to typical US site	included				
12. User-defined				0	0

Other Equipment

	Unit Cost	Quantity	Ref. Cost	Est. Cost
II Other Equipment (USD)			10.025.000	10.526.000
1. Pumps			5.326.000	5.592.000
Integral Feedwater Pump	409.350	6	2.456.000	2.579.000
HP Feedwater Pump				
IP Feedwater Pump				
LP Feedwater Pump				
Condensate Forwarding Pump	137.750	2	275.500	289.300
Condenser C.W. Pump	1.041.000	2	2.083.000	2.187.000
Condenser Vacuum Pump	105.650	2	211.250	221.800
Treated Water Pump	5.630	1	5.630	5.910
Demin Water Pump	6.560	2	13.120	13.780
Raw Water Pump 1	5.350	1	5.350	5.620
Raw Water Pump 2	5.350	1	5.350	5.620
Raw Water Pump 3				
GT Water Injection Pump				
GT Evap Cooler Water Pump				
Auxiliary Boiler Feedwater Pump				
Fuel Oil Unloading Pump				
Fuel Oil Forwarding Pump				
Aux Cooling Water Pump (closed loop)	31.230	2	62.450	65.600
Diesel Fire Pump	70.700	2	141.450	148.500
Electric Fire Pump				
Jockey Fire Pump	4.240	1	4.240	4.450
GT Inlet Air Chiller/Heater Water Pump				
GT+Generator Lube Oil Coolant Pump				
GT Generator Lube Oil Coolant Pump				
GT Generator Cooling Pump				
GT Chiller Coolant Pump				
Fuel Compressor Coolant Pump				
ST+Generator Lube Oil Coolant Pump				
ST Generator Cooling Pump				
Aux Cooling Water Pump (open loop)	31.230	2	62.450	65.600
2. Tanks		6	232.100	243.700
Fuel Oil				
Hydrous Ammonia				
Demineralized Water	43.280	1	43.280	45.450
Raw Water	43.280	1	43.280	45.450
Neutralized Water	30.140	1	30.140	31.650
Acid Storage	4.710	1	4.710	4.950
Caustic Storage	4.710	1	4.710	4.950
Waste Water				
Dedicated Fire Protection Water Storage	106.000	1	106.000	111.300
Chilled Water Storage				
Process Water Storage				
District Heating Water Storage				
3. Cooling Tower				
4. Auxiliary Heat Exchangers			211.750	222.300
Auxiliary Cooling Water Heat Exchanger	211.750	1	211.750	222.300
Auxiliary Cooling Tower				
GT+Generator Lube Oil Fin Fan Cooler				
GT Generator Lube Oil Fin Fan Cooler				
GT Generator Fin Fan Cooler				
GT Chiller Fin Fan Cooler				
Fuel Compressor Fin Fan Cooler				
ST+Generator Lube Oil Fin Fan Cooler				
ST Generator Fin Fan Cooler				
Miscellaneous Heat Exchangers				

Other Equipment

	Unit Cost	Quantity	Ref. Cost	Est. Cost
5. Feedwater Heater(s)				
6. Auxiliary Boiler				
7. Makeup Water Treatment System				
8. Waste Water Treatment System				
9. Bridge Crane(s)		2	952.200	999.900
Gas Turbine Crane	263.300	1	263.300	276.450
Steam Turbine Crane	689.000	1	689.000	723.400
10. Station/Instrument Air Compressors	94.300	2	188.550	198.000
11. Recip Engine Genset(s)				
Emergency Generator				
Black Start Generator				
12. General Plant Instrumentation	578.400	1	578.400	607.300
13. Medium Voltage Equipment	1.406.000	1	1.406.000	1.476.000
Transformers	253.200			
Circuit Breakers	57.800			
Switchgear	267.350			
Motor Control Centers	760.800			
Miscellaneous	66.950			
14. Low Voltage Equipment	652.100	1	652.100	684.700
Transformers	330.700			
Circuit Breakers	151.150			
Switchgear				
Motor Control Centers	139.250			
Miscellaneous	31.050			
15. Miscellaneous Equipment	477.350		477.350	501.200
16. User-defined			0	0

Civil

	Material	Labor Hours	Labor Rate	Unit Cost	Quantity	Ref. Cost	Est. Cost
III Civil (USD)						25.587.000	29.021.000
1. Site Work	2.201.000	35.880	36			3.493.000	3.926.000
Site Clearing	included	included					
Demolition	included	included					
Culverts & Drainage	included	included					
Erosion Control	included	included					
Fencing, Controlled Access Gates	included	included					
Finish Grading	included	included					
Finish Landscaping	included	included					
Material (Dirt, Sand, Stone)	included	included					
Waste Material Removal	included	included					
Obstacles R&R	included	included					
Miscellaneous	included	included					
2. Excavation & Backfill	1.933.000	41.820	36	64,59	53.250 m^3	3.438.000	3.911.000
Gas Turbine (2)	103.100	2.270	36	69,1	2.670 m^3	184.850	210.450
Steam Turbine (1)	86.500	1.890	36	66,88	2.310 m^3	154.550	175.850
Heat Recovery Boiler (2)	411.500	8.960	36	65,99	11.130 m^3	734.200	835.500
Water Cooled Condenser (1)	94.350	2.040	36	63,46	2.640 m^3	167.600	190.650
Cooling Tower							
Air Cooled Condenser							
Underground Piping	941.600	20.220	36	62,25	26.820 m^3	1.670.000	1.899.000
Switchyard	5.130	114	36	90,34	102 m^3	9.220	10.500
Other & Miscellaneous	290.700	6.320	36	68,6	7.560 m^3	518.400	589.900
3. Concrete	10.250.000	220.200	36	1.430	12.750 m^3	18.177.000	20.671.000
Gas Turbine (2)	1.681.000	28.080	36	1.490	1.810 m^3	2.692.000	3.029.000
Turbine + Generator Package					1.760 m^3		
Inlet Filter					39,34 m^3		
Steam Turbine (1)	1.400.000	30.050	36	2.130	1.160 m^3	2.482.000	2.822.000
Laydown pads:	65.450	1.870	36		75,35 m^3		
Gas Turbine	30.580	878	36	1.850	33,6 m^3	62.200	71.600
Steam Turbine	34.870	993	36	1.690	41,75 m^3	70.600	81.300
Heat Recovery Boiler (2)	3.445.000	66.000	36	1.190	4.900 m^3	5.821.000	6.587.000
Water Cooled Condenser (1)	525.400	13.920	36	1.490	691 m^3	1.027.000	1.178.000
Cooling Tower							
Air Cooled Condenser							
Underground Piping:	291.650	9.370	36		363 m^3		
CW intake/outfall structures	291.650	9.370	36	1.730	363 m^3	628.800	727.600
Miscellaneous							
Makeup Water Treatment System							
Auxiliary Boiler (0)							
Electrical Power Equipment	1.360.000	35.950	36	1.390	1.910 m^3	2.655.000	3.046.000
Inlet Chilling System (0)							
Fuel Gas Compressor (0)							
Pumps (8)	128.800	3.820	36	2.040	130 m^3	266.450	307.300
Auxiliary Heat Exchangers							
Feedwater Heater(s) (0)							
Station/Instrument Air Compressors (2)	21.680	565	36	2.740	15,35 m^3	42.040	48.210
Bridge Crane(s)							elsewhere
Recip Engine Genset(s) (0)							
Tanks:	139.850	4.520	36		189 m^3		
Fuel Oil							
Hydrous Ammonia							
Demineralized Water	25.540	822	36	1.800	30,64 m^3	55.100	63.800
Raw Water	25.540	822	36	1.800	30,64 m^3	55.100	63.800
Neutralized Water	16.130	533	36	2.280	15,5 m^3	35.320	40.920
Acid Storage	3.750	126	36	2.470	3,353 m^3	8.300	9.620
Caustic Storage	3.750	126	36	2.470	3,353 m^3	8.300	9.620

Civil

	Material	Labor Hours	Labor Rate	Unit Cost	Quantity	Ref. Cost	Est. Cost
Waste Water							
Dedicated Fire Protection Water Storage	65.150	2.100	36	1.330	106 m^3	140.550	162.700
Chilled Water Storage							
Process Water Storage							
District Heating Water Storage							
Switchyard	52.500	1.560	36	1.350	80,7 m^3	108.750	125.450
Miscellaneous	1.139.000	24.460	36	1.430	1.420 m^3	2.020.000	2.297.000
4. Roads, Parking, Walkways	426.950	1.350	38,27			478.650	513.000
Pavement, Curbing, Striping	316.350	840	36	46,93	7.390 m^2	346.600	369.950
Lighting	110.600	512	42	5.740	23	132.100	143.000
5. User-defined						0	0

Mechanical

	Material	Labor Hours	Labor Rate	Unit Cost	Quantity	Ref. Cost	Est. Cost
IV Mechanical (USD)						53.253.000	60.644.000
1. On-Site Transportation & Rigging	4.803.000					4.803.000	5.524.000
2. Equipment Erection & Assembly	2.031.000	277.150	41			13.395.000	16.337.000
Gas Turbine Package	141.150	19.270	41	931.000	2	1.862.000	2.271.000
Steam Turbine Package	235.850	32.190	41	1.556.000	1	1.556.000	1.897.000
HRSG	506.300	69.100	41	3.340.000	2	6.679.000	8.147.000
Condenser	52.650	7.190	41	347.350	1	347.350	423.650
Cooling Tower							
Makeup Water Treatment System							
Auxiliary Boiler							
Electrical Power Equipment	205.500	28.050	41			1.356.000	1.653.000
Inlet Chilling System							
Fuel Gas Compressor							
Pumps	23.440	3.200	41			154.600	188.550
Tanks + Auxiliary Heat Exchangers	22.380	3.050	41			147.600	180.000
Feedwater Heater(s)							
Station/Instrument Air Compressors	2.400	328	41			15.830	19.310
Bridge Crane(s)	8.950	1.220	41			59.000	71.950
Recip Engine Genset(s)							
Miscellaneous	184.600	25.200	41			1.218.000	1.485.000
3. Piping	23.132.000	217.100	41	1.080	9.080	32.033.000	35.415.000
High Pressure Steam	2.949.000	23.900	41	11.480	342 m	3.929.000	4.322.000
Cold Reheat Steam	1.668.000	18.510	41	6.880	353 m	2.427.000	2.700.000
Hot Reheat Steam	6.084.000	44.700	41	23.130	342 m	7.916.000	8.678.000
Intermediate Pressure Steam							
Low Pressure Steam							
Other Steam	557.600	10.510	41	2.700	366 m	988.300	1.124.000
Circulating Water	6.262.000	23.730	41	11.860	610 m	7.235.000	7.792.000
Auxiliary Cooling Water	782.100	22.950	41	957	1.800 m	1.723.000	1.997.000
Feedwater	463.000	9.890	41	1.320	656 m	868.500	993.000
Other Water	415.950	9.000	41	1.080	727 m	785.100	898.200
GT Inlet Chilling/Heating System							
Raw Water	62.350	2.630	41	399	427 m	170.100	200.200
Service Water	69.900	2.650	41	488	366 m	178.600	209.250
Waste Water							
Steam/Water Sampling							
Sanitary Water							
Vents							
Fuel Gas	576.900	12.710	41	1.460	753 m	1.098.000	1.257.000
Fuel Oil							
Lube Oil	662.700	9.500	41	4.780	220 m	1.052.000	1.183.000
Compressed Air							
GT Air Bleed							
Service Air	29.940	1.690	41	362	274 m	99.300	118.150
Vacuum Air	85.150	1.780	41	1.930	81,69 m	157.950	180.400
Trim							
Chemical Feed							
Nitrogen							
Oxygen							
Carbon Dioxide							
Ammonia							
Caustic							
Acid							
Boiler & Equipment Drain	59.900	350	41	406	183 m	74.300	80.850
Boiler Blowdown	112.850	2.140	41	1.100	183 m	200.650	228.250

Mechanical

	Material	Labor Hours	Labor Rate	Unit Cost	Quantity	Ref. Cost	Est. Cost
Air Blowoff							
Steam Blowoff	515.100	4.090	41	5.490	124 m	682.600	750.300
Chemical Cleaning							
Heat Tracing							
Fire Protection	161.800	1.220	41	331	640 m	211.950	232.550
Miscellaneous	1.614.000	15.150	41	3.530	634 m	2.235.000	2.471.000
4. Steel	2.046.000	23.810	41	5.460	554 tonne	3.022.000	3.368.000
Racks, Supports, Ladders, Walkways, Platforms	2.046.000	23.810	41	5.460	554 tonne	3.022.000	3.368.000
5. User-defined						0	0

Electrical Assembly & Wiring

	Material	Labor Hours	Labor Rate	Unit Cost	Quantity	Ref. Cost	Est. Cost
V Electrical (USD)						9,596,000	11,278,000
1. Controls	643,700	67,950	42			3,497,000	4,243,000
Gas Turbine Package	77,450	8,260	42	424.250	2	848,500	1,030,000
Steam Turbine Package	129,400	13,790	42	708.800	1	708,800	860,100
HRSG	162,100	17,280	42	887.700	2	1,775,000	2,154,000
Condenser	11,900	1,270	42	65.150	1	65,150	79,100
Cooling Tower							
Makeup Water Treatment System							
Auxiliary Boiler							
Electrical Power Equipment							
Inlet Chilling System							
Fuel Gas Compressor							
Pumps	12,860	1,370	42			70,450	85,500
Auxiliary Heat Exchangers							
Feedwater Heater(s)							
Station/Instrument Air Compressor	3,290	140	42			9,190	10,830
Bridge Crane(s)	7,160	305	42			19,980	23,540
Recip Engine Genset(s)							
2. Assembly & Wiring	2,941,000	75,150	42			6,099,000	7,035,000
Switchgear	7,160	828	42	41.940	1	41,940	51,000
Motor Control Centers	24,120	1,620	42	3.070	30	92,100	110,300
Feeders	612,500	20,810	42	17.290	86	1,487,000	1,736,000
Medium/Low Voltage Cable Bus	978,200	16,020	42	47.180	35	1,651,000	1,868,000
Cable Tray	183,200	3,860	42	345.500	1	345,500	395,250
General Plant Instrumentation	474,100	8,490	42	1.890	439	830,700	943,500
Generator to Step-up Transformer Bus	73,500	1,310	42	42.780	3	128,350	145,750
Transformers	224,000	11,940	42	103.650	7	725,400	861,900
Circuit Breakers	97,250	3,450	42	30.290	8	242,300	283,450
Miscellaneous	267,400	6,830	42	554.400	1	554,400	639,500
3. User-defined						0	0

Buildings

	Area	Cost/Unit Area	Ref. Cost	Est. Cost
VI Buildings (USD)			12.955.000	14.899.000
1. Turbine Hall	6227,7 m^2	1797,86	11.197.000	12.876.000
2. Administration, Control Room, Machine Shop / Warehouse	1514,4 m^2	1146,78	1.737.000	1.997.000
3. Water Treatment System				
4. Guard House	18,58 m^2	1200,48	22.310	25.650
5. User-defined			0	0

Engineering & Plant Startup

	Material	Labor Hours	Labor Rate	Unit Cost	Quantity	Ref. Cost	Est. Cost
VII Engineering & Startup (USD)						20.151.000	20.185.000
1. Engineering						17.100.000	17.100.000
2. Start-Up	682.700	26.000	91,07	3.050.000		3.050.000	3.085.000
3. User-defined						0	0

Soft & Miscellaneous Costs

	Ref. Cost	Est. Cost
VIII Soft & Miscellaneous Costs (USD)		
1. Contractor's Soft Costs	74,402.000	82,750.000
Contingency:		
Labor supervision, contingency, mobilization, temporary housing, etc.	10,099.000	12,624.000
Specialized Equipment	6,574.000	6,902.000
Other Equipment	401.000	421.050
Commodity	3,065.000	3,219.000
Profit:		
Labor	10,099.000	12,624.000
Specialized Equipment	15,338.000	16,105.000
Other Equipment	701.700	736.800
Commodity	3,576.000	3,755.000
Permits, Licenses, Fees, Miscellaneous	0	0
Bonds and Insurance	7,014.000	7,533.000
Spare Parts & Materials	0	0
Contractor's Fee	17,534.000	18,831.000
2. Owner's Soft Costs	38,258.000	41,344.000
Permits, Licenses, Fees, Miscellaneous	8,502.000	9,188.000
Land Cost	0	0
Utility Connection Cost	0	0
Legal & Financial Costs	8,502.000	9,188.000
Escalation and Interest During Construction	17,004.000	18,375.000
Spare Parts & Materials	0	0
Project Administration & Developer's Fee	4,251.000	4,594.000
3. Total of all user-defined costs displayed on each account	0	0

Gasification Plant

	Item Cost	Unit Cost	Quantity	Ref. Cost	Est. Cost
Gasification Plant (USD)				0	0
1. Gasification					
Gasifier					
Radiant Syngas Cooler					
Convective Syngas Cooler					
Slag & Process Water Handling					
Feedstock Preparation					
Receiving & storage					
Grinding					
Slurry preparation					
Approximate shipping to typical US site					
2. Air Separation Unit					
3. Gas Cleanup System					
Syngas Scrubbers					
COS Hydrolysis System					
Low Temperature Gas Cooling					
Acid Gas Removal					
Sulphur Recovery					
Clean Syngas Moisturization					
Clean Syngas Preheater					
Syngas energy recovery turbine					
Approximate shipping to typical US site					
4. Gasification Plant Water Systems					
5. Gasification Plant General Facilities					
In-Plant Electrical Distribution					
Switchyard					
Buildings					
Miscellaneous Common Utilities					
6. User-defined				0	0

Desalination Plant

	Item Cost	Unit Cost	Quantity	Ref. Cost	Est. Cost
Desalination Plant (USD)				0	0
1. Desalination					
MSF System					
- Evaporators					
- Brine Heater					
- Deaerator					
- Pumps					
- Piping					
- Electrical & Controls					
- Intake System & Distillate Delivery					
- Engineering & Design					
- Platform/ladder/walkway					
- Miscellaneous					
RO System					
- Intake & Outfall					
- Pre-treatment System					
- Pumps					
- Energy Recovery Device					
- RO Membrane Assembly					
- Post-treatment System					
- Miscellaneous					
Approximate shipping to typical US site					
2. User-defined				0	0

CO2 Capture Plant

	Item Cost	Unit Cost	Quantity	Ref. Cost	Est. Cost
CO2 Capture Plant (USD)				0	0
1. CO2 Capture (Physical Type)					
Absorbers					
CO2 Compressors					
CO2 Flash Tanks					
Heat Exchangers & Compressors					
Water & Solvent Pumps					
Piping					
Electrical & Controls					
Engineering & Design					
Miscellaneous					
Approximate shipping to typical US site					
2. User-defined				0	0