Attachment 4

Construction Schedule and Cost Assessment

Section 1: **Construction Schedule**

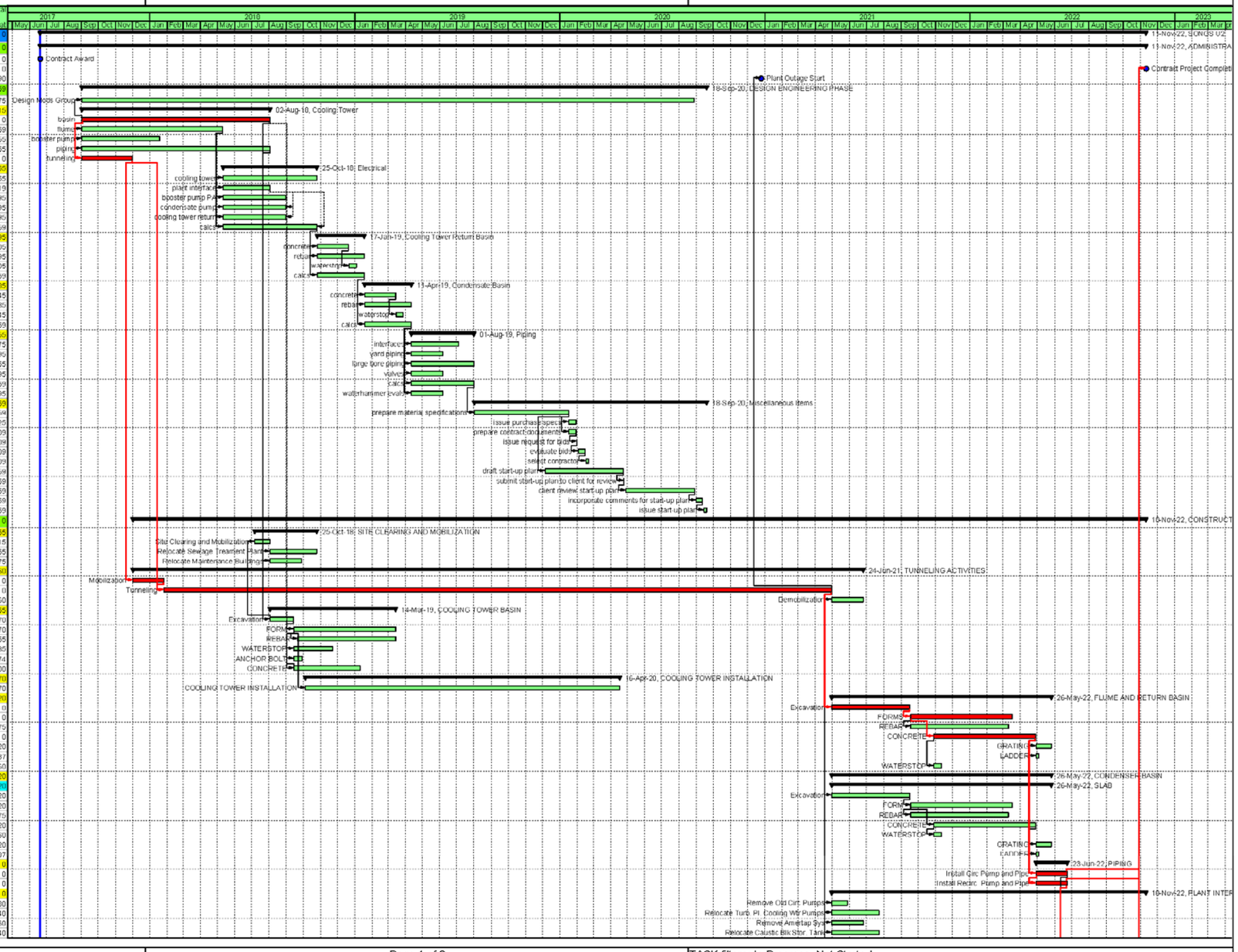
Section 2: **Capital Cost Assessment**

Section 3: **Operations and Maintenance Cost Assessment**

Section 4: **Summary of Engineering Scope**

SONGS U2 | Classic WBS Layout | 21-Sep-09 10:14

Activity ID	Activity Name	Physical % Complete	Original Duration	Start	Finish	Total Float
SONGS U2			1408	19-Jun-17	11-Nov-22	0
ADMINISTRATION			1409	19-Jun-17	11-Nov-22	0
002	Contract Award	0%	0	19-Jun-17*		0
008	Contract Project Completion	0%	0	11-Nov-22		0
004	Plant Outage Start	0%	0	25-Dec-20		490
DESIGN ENGINEERING PHASE			796	01-Sep-17	18-Sep-20	559
006	Design Mods Group	0%	780	01-Sep-17	27-Aug-20	575
Cooling Tower			240	01-Sep-17	02-Aug-18	1110
0008	basin	0%	240	01-Sep-17*	02-Aug-18	0
0009	flume	0%	100	01-Sep-17	10-May-18	559
0010	booster pump	0%	100	01-Sep-17	18-Jan-18	1255
0011	piping	0%	240	01-Sep-17	02-Aug-18	1055
0012	tunnelling	0%	65	01-Sep-17	30-Nov-17	0
Electrical			120	11-May-18	25-Oct-18	1055
0014	cooling tower	0%	120	11-May-18	25-Oct-18	1055
0015	plant interface	0%	60	11-May-18	02-Aug-18	619
0016	booster pump PA	0%	80	11-May-18	30-Aug-18	1095
0017	condensate pump	0%	80	11-May-18	30-Aug-18	1095
0018	cooling tower return	0%	80	11-May-18	30-Aug-18	1095
0019	calcs	0%	120	11-May-18	25-Oct-18	559
Cooling Tower Return Basin			60	26-Oct-18	17-Jan-19	995
0021	concrete	0%	40	26-Oct-18	20-Dec-18	1005
0022	rebar	0%	60	26-Oct-18	17-Jan-19	995
0023	waterstop	0%	10	21-Dec-18	03-Jan-19	1005
0024	calcs	0%	60	26-Oct-18	17-Jan-19	559
Condensate Basin			60	18-Jan-19	11-Apr-19	935
0026	concrete	0%	40	18-Jan-19	14-Mar-19	945
0027	rebar	0%	60	18-Jan-19	11-Apr-19	935
0028	waterstop	0%	10	15-Mar-19	28-Mar-19	945
0029	calcs	0%	60	18-Jan-19	11-Apr-19	559
Piping			80	12-Apr-19	01-Aug-19	855
0031	interfaces	0%	60	12-Apr-19	04-Jul-19	675
0032	yard piping	0%	40	12-Apr-19	06-Jun-19	895
0033	large bore piping	0%	80	12-Apr-19	01-Aug-19	855
0034	valves	0%	40	12-Apr-19	06-Jun-19	895
0035	calcs	0%	80	12-Apr-19	01-Aug-19	559
0036	waterhammer evals	0%	40	12-Apr-19	06-Jun-19	895
Miscellaneous Items			296	02-Aug-19	18-Sep-20	559
0038	prepare material specifications	0%	170	02-Aug-19	16-Jan-20	559
0039	issue purchase specs	0%	10	17-Jan-20	30-Jan-20	725
0040	prepare contract documents	0%	10	17-Jan-20	30-Jan-20	709
0041	issue request for bids	0%	1	31-Jan-20	31-Jan-20	709
0042	evaluate bids	0%	10	03-Feb-20	14-Feb-20	709
0043	select contractor	0%	5	17-Feb-20	21-Feb-20	709
0044	draft start-up plan	0%	100	06-Dec-19	23-Apr-20	559
0045	submit start-up plan to client for review	0%	1	24-Apr-20	24-Apr-20	559
0046	client review start-up plan	0%	90	27-Apr-20	28-Aug-20	559
0047	incorporate comments for start-up plan	0%	10	31-Aug-20	11-Sep-20	559
0048	issue start-up plan	0%	5	14-Sep-20	18-Sep-20	559
CONSTRUCTION PHASE			1290	01-Dec-17	10-Nov-22	0
SITE CLEARING AND MOBILIZATION			80	06-Jul-18	25-Oct-18	1055
0057	Site Clearing and Mobilization	0%	20	06-Jul-18	02-Aug-18	1115
0081	Relocate Sewage Treament Plant	0%	60	03-Aug-18	25-Oct-18	1055
0082	Relocate Maintenance Buildings	0%	40	03-Aug-18	27-Sep-18	1075
TUNNELING ACTIVITIES			930	01-Dec-17	24-Jun-21	360
0065	Mobilization	0%	40	01-Dec-17	25-Jun-18	0
0066	Tunneling	0%	850	26-Jan-18	29-Apr-21	0
0067	Demobilization	0%	40	30-Apr-21	24-Jun-21	360
COOLING TOWER BASIN			160	03-Aug-18	14-Mar-19	955
0051	Excavation	0%	30	03-Aug-18	13-Sep-18	670
0052	FORM	0%	130	14-Sep-18	14-Mar-19	670
0053	REBAR	0%	125	21-Sep-18	14-Mar-19	955
0054	WATERSTOP	0%	50	14-Sep-18	22-Nov-18	1035
0055	ANCHOR BOLT	0%	11	14-Sep-18	28-Sep-18	1074
0056	CONCRETE	0%	85	14-Sep-18	10-Jan-19	1000
COOLING TOWER INSTALLATION			400	05-Oct-18	16-Apr-20	670
0058	COOLING TOWER INSTALLATION	0%	400	05-Oct-18	16-Apr-20	670
FLUME AND RETURN BASIN			280	30-Apr-21	26-May-22	120
0059	Excavation	0%	100	30-Apr-21	16-Sep-21	0
0060	FORMS	0%	130	17-Sep-21	17-Mar-22	0
0060R	REBAR	0%	125	17-Sep-21	10-Mar-22	175
0061	CONCRETE	0%	130	29-Oct-21	28-Apr-22	0
0062	GRATING	0%	20	29-Apr-22	26-May-22	120
0063	LADDER	0%	3	29-Apr-22	03-May-22	137
0064	WATERSTOP	0%	10	29-Oct-21	11-Nov-21	260
CONDENSER BASIN			280	30-Apr-21	26-May-22	120
SLAB			280	30-Apr-21	26-May-22	120
0069	Excavation	0%	100	30-Apr-21	16-Sep-21	120
0070	FORM	0%	130	17-Sep-21	17-Mar-22	120
0071	REBAR	0%	125	17-Sep-21	10-Mar-22	175
0072	CONCRETE	0%	130	29-Oct-21	28-Apr-22	120
0073	WATERSTOP	0%	10	29-Oct-21	11-Nov-21	260
0074	GRATING	0%	20	29-Apr-22	26-May-22	120
0075	LADDER	0%	3	29-Apr-22	03-May-22	137
PIPING			40	29-Apr-22	23-Jun-22	0
0076	Install Circ Pump and Pipe	0%	40	29-Apr-22	23-Jun-22	0
0077	Install Recirc. Pump and Pipe	0%	40	29-Apr-22	23-Jun-22	0
PLANT INTERFACE			400	30-Apr-21	10-Nov-22	0
0080	Remove Old Circ Pumps	0%	20	30-Apr-21	27-May-21	380
0083	Relocate Turb. Pl. Cooling Wtr Pumps	0%	60	30-Apr-21	22-Jul-21	340
0084	Remove Amertap Sys	0%	40	30-Apr-21	24-Jun-21	360
0085	Relocate Caustic Blk Stor. Tank	0%	60	30-Apr-21	22-Jul-21	340



Actual Work
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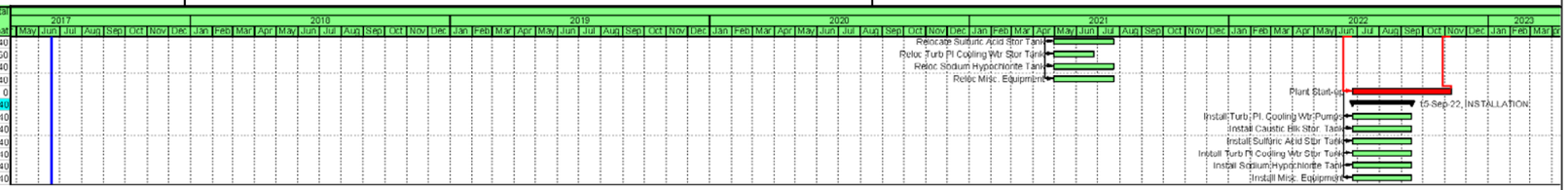
TASK filters: In Progress, Not Started.

SONGS U2 | Classic WBS Layout | 21-Sep-09 10:14

Activity ID	Activity Name	Physical % Complete	Remaining Duration	Start	Finish	Total Float
0086	Relocate Sulfuric Acid Stor Tank	0%	60	30-Apr-21	22-Jul-21	340
0087	Reloc Turb Pl Cooling Wtr Stor Tank	0%	40	30-Apr-21	24-Jun-21	360
0088	Reloc Sodium Hypochlorite Tank	0%	60	30-Apr-21	22-Jul-21	340
0089	Reloc Misc. Equipment	0%	60	30-Apr-21	22-Jul-21	340
0090	Plant Start-up	0%	100	24-Jun-22	10-Nov-22	0
INSTALLATION			60	24-Jun-22	15-Sep-22	40
0093	Install Turb. Pl. Cooling Wtr Pumps	0%	60	24-Jun-22	15-Sep-22	40
0095	Install Caustic Blk Stor. Tank	0%	60	24-Jun-22	15-Sep-22	40
0096	Install Sulfuric Acid Stor Tank	0%	60	24-Jun-22	15-Sep-22	40
0097	Install Turb Pl Cooling Wtr Stor Tank	0%	60	24-Jun-22	15-Sep-22	40
0098	Install Sodium Hypochlorite Tank	0%	60	24-Jun-22	15-Sep-22	40
0099	Install Misc. Equipment	0%	60	24-Jun-22	15-Sep-22	40



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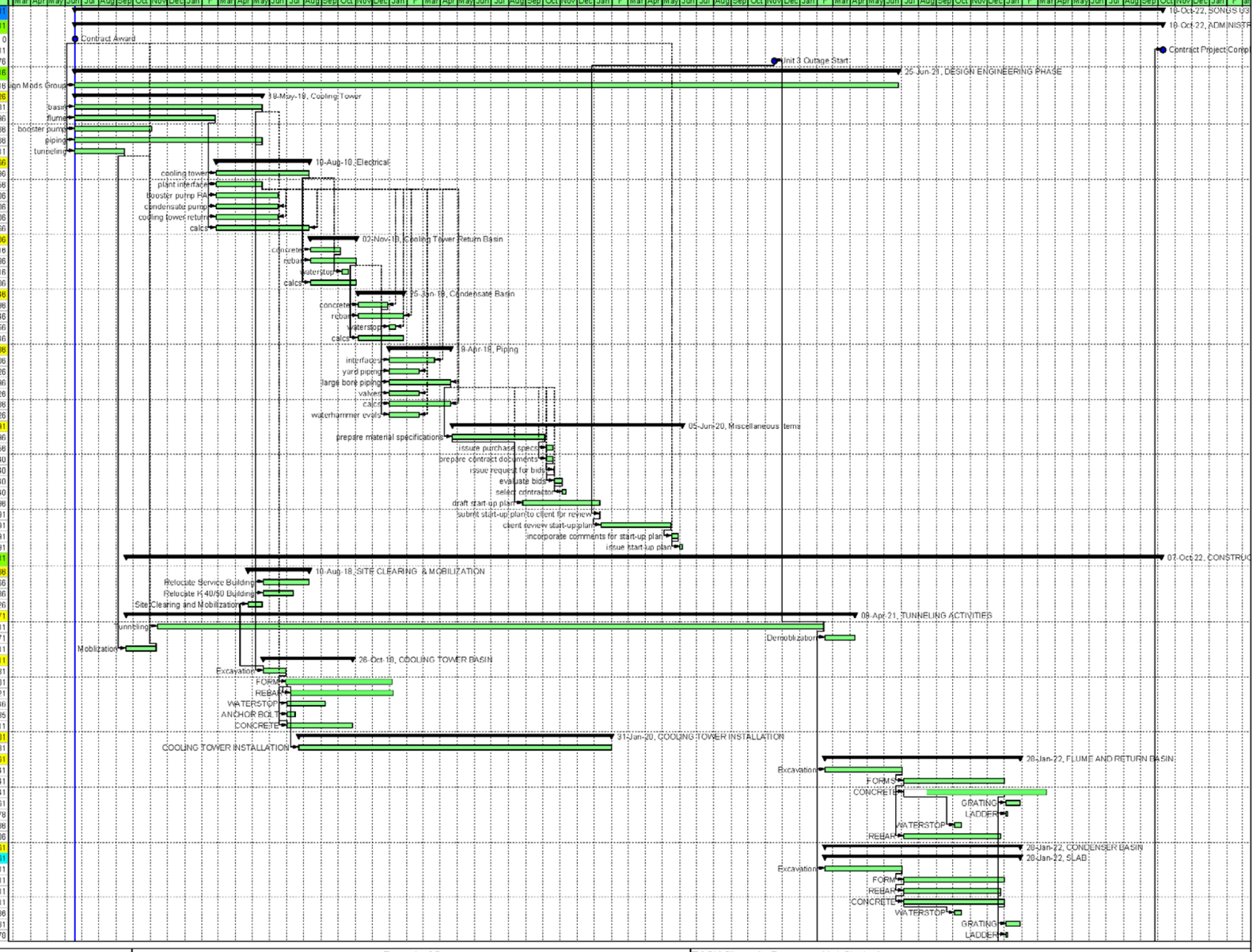
TASK filters: In Progress, Not Started.

SONGS U3 | Classic WBS Layout | 10-Sep-09 14:59

Activity ID	Activity Name	Physical % mplete	Remaining Duration	Start	Finish	Total Float
SONGS U3			1385	19-Jun-17	10-Oct-22	81
ADMINISTRATION			1385	19-Jun-17	10-Oct-22	81
002	Contract Award	0%	0	19-Jun-17*		0
003	Contract Project Completion	0%	0	10-Oct-22		81
004	Unit 3 Outage Start	0%	0	16-Nov-20		576
DESIGN ENGINEERING PHASE			1050	19-Jun-17	25-Jun-21	416
006	Design Mods Group	0%	1050	19-Jun-17	25-Jun-21	416
Cooling Tower			240	19-Jun-17	18-May-18	1226
008	basin	0%	240	19-Jun-17	18-May-18	781
009	flume	0%	180	19-Jun-17	23-Feb-18	796
010	booster pump	0%	100	19-Jun-17	03-Nov-17	1386
011	piping	0%	240	19-Jun-17	18-May-18	1186
012	tunneling	0%	65	19-Jun-17	15-Sep-17	81
Electrical			120	26-Feb-18	10-Aug-18	1166
014	cooling tower	0%	120	26-Feb-18	10-Aug-18	796
015	plant interface	0%	60	26-Feb-18	18-May-18	956
016	booster pump PA	0%	80	26-Feb-18	15-Jun-18	1206
017	condensate pump	0%	80	26-Feb-18	15-Jun-18	1206
018	cooling tower return	0%	80	26-Feb-18	15-Jun-18	1206
019	calcs	0%	120	26-Feb-18	10-Aug-18	1166
Cooling Tower Return Basin			60	13-Aug-18	02-Nov-18	1106
021	concrete	0%	40	13-Aug-18	05-Oct-18	1116
022	rebar	0%	60	13-Aug-18	02-Nov-18	796
023	waterstop	0%	10	08-Oct-18	19-Oct-18	1116
024	calcs	0%	60	13-Aug-18	02-Nov-18	1106
Condensate Basin			80	05-Nov-18	25-Jan-19	1046
026	concrete	0%	40	05-Nov-18	28-Dec-18	796
027	rebar	0%	60	05-Nov-18	25-Jan-19	1046
028	waterstop	0%	10	31-Dec-18	11-Jan-19	1056
029	calcs	0%	60	05-Nov-18	25-Jan-19	1046
Piping			80	31-Dec-18	19-Apr-19	986
031	interfaces	0%	60	31-Dec-18	22-Mar-19	1006
032	yard piping	0%	40	31-Dec-18	22-Feb-19	1026
033	large bore piping	0%	80	31-Dec-18	19-Apr-19	786
034	valves	0%	40	31-Dec-18	22-Feb-19	1026
035	calcs	0%	80	31-Dec-18	19-Apr-19	986
036	waterhammer evals	0%	40	31-Dec-18	22-Feb-19	1026
Miscellaneous Items			285	22-Apr-19	05-Jun-20	691
038	prepare material specifications	0%	120	22-Apr-19	04-Oct-19	786
039	issure purchase specs	0%	10	07-Oct-19	18-Oct-19	856
040	prepare contract documents	0%	10	07-Oct-19	18-Oct-19	840
041	issue request for bids	0%	1	21-Oct-19	21-Oct-19	840
042	evaluate bids	0%	10	22-Oct-19	04-Nov-19	840
043	select contractor	0%	5	05-Nov-19	11-Nov-19	840
044	draft start-up plan	0%	100	28-Aug-19	10-Jan-20	796
045	submit start-up plan to client for rev...	0%	1	10-Jan-20	10-Jan-20	691
046	client review start-up plan	0%	90	13-Jan-20	15-May-20	691
047	incorporate comments for start-up	0%	10	18-May-20	29-May-20	691
048	issue start-up plan	0%	5	01-Jun-20	05-Jun-20	691
CONSTRUCTION PHASE			1320	18-Sep-17	07-Oct-22	81
SITE CLEARING & MOBILIZATION			80	23-Apr-18	10-Aug-18	1166
001	Relocate Service Building	0%	60	21-May-18	10-Aug-18	1166
002	Relocate K 40/50 Building	0%	40	21-May-18	13-Jul-18	1186
049A	Site Clearing and Mobilization	0%	20	23-Apr-18	18-May-18	1226
TUNNELING ACTIVITIES			930	18-Sep-17	09-Apr-21	471
057	Tunneling	0%	650	13-Nov-17	12-Feb-21	81
050	Demobilization	0%	40	15-Feb-21	09-Apr-21	471
050	Mobilization	0%	40	18-Sep-17	10-Nov-17	81
COOLING TOWER BASIN			160	21-May-18	02-Jan-19	1111
051	Excavation	0%	90	21-May-18	29-Jun-18	781
052	FORM	0%	130	02-Jul-18	02-Jan-19	701
053	REBAR	0%	125	09-Jul-18	02-Jan-19	1121
054	WATERSTOP	0%	50	02-Jul-18	07-Sep-18	1146
055	ANCHOR BOLT	0%	11	02-Jul-18	16-Jul-18	1185
056	CONCRETE	0%	85	02-Jul-18	26-Oct-18	1111
COOLING TOWER INSTALLATION			400	23-Jul-18	31-Jan-20	701
049B	COOLING TOWER INSTALLATION	0%	400	23-Jul-18	31-Jan-20	781
FLUME AND RETURN BASIN			280	15-Feb-21	14-Mar-22	261
059	Excavation	0%	100	15-Feb-21	02-Jul-21	241
060	FORMS	0%	130	05-Jul-21	31-Dec-21	241
061	CONCRETE	0%	130	-Aug-21	14-Mar-22	241
062	GRATING	0%	20	03-Jan-22	28-Jan-22	261
063	LADDER	0%	3	03-Jan-22	05-Jan-22	278
064	WATERSTOP	0%	10	04-Oct-21	15-Oct-21	336
060R	REBAR	0%	125	05-Jul-21	24-Dec-21	206
CONDENSER BASIN			280	15-Feb-21	14-Mar-22	261
SLAB			250	15-Feb-21	14-Mar-22	261
069	Excavation	0%	100	15-Feb-21	02-Jul-21	81
070	FORM	0%	130	05-Jul-21	31-Dec-21	81
071	REBAR	0%	125	05-Jul-21	24-Dec-21	81
072	CONCRETE	0%	130	-Aug-21	31-Dec-21	81
073	WATERSTOP	0%	10	04-Oct-21	15-Oct-21	336
093	GRATING	0%	20	03-Jan-22	28-Jan-22	281
103	LADDER	0%	3	03-Jan-22	05-Jan-22	278



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TASK filters: In Progress, Not Started.

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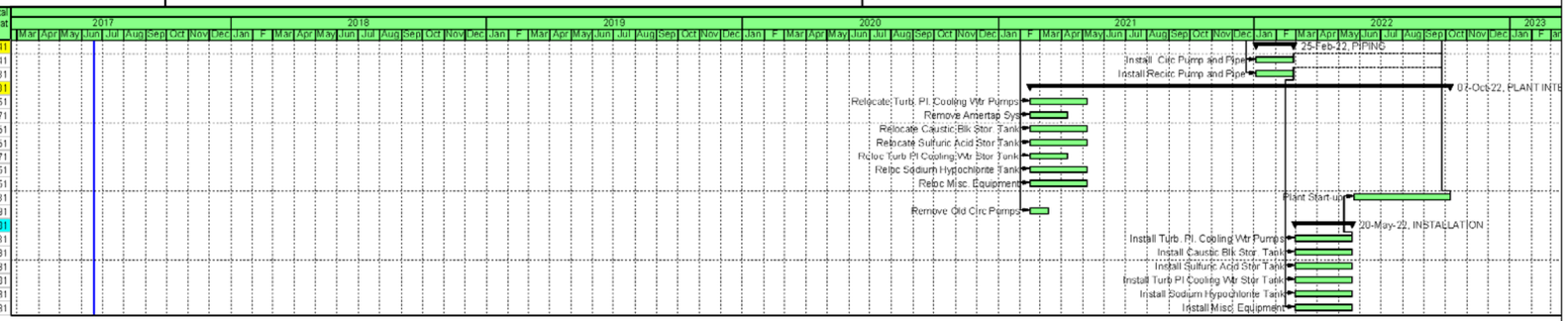
SONGS U3 | Classic WBS Layout | 10-Sep-09 14:59

Activity ID	Activity Name	Physical % Complete	Remaining Duration	Start	Finish	Total Float
PIPING			40	03-Jan-22	25-Feb-22	241
076	Install Circ Pump and Pipe	0%	40	03-Jan-22	25-Feb-22	241
077	Install Recirc Pump and Pipe	0%	40	03-Jan-22	25-Feb-22	81
PLANT INTERFACE			430	15-Feb-21	07-Oct-22	01
083	Relocate Turb. Pl. Cooling Wtr Pu	0%	60	15-Feb-21	07-May-21	451
084	Remove Amertap Sys	0%	40	15-Feb-21	09-Apr-21	471
085	Relocate Caustic Blk Stor. Tank	0%	80	15-Feb-21	07-May-21	451
086	Relocate Sulfuric Acid Stor Tank	0%	80	15-Feb-21	07-May-21	451
087	Reloc Turb Pl Cooling Wtr Stor Tank	0%	40	15-Feb-21	09-Apr-21	471
088	Reloc Sodium Hypochlorite Tank	0%	60	15-Feb-21	07-May-21	451
089	Reloc Misc. Equipment	0%	60	15-Feb-21	07-May-21	451
090	Plant Start-up	0%	100	23-May-22	07-Oct-22	81
080	Remove Old Circ Pumps	0%	20	15-Feb-21	12-Mar-21	491
INSTALLATION			60	28-Feb-22	20-May-22	101
113	Install Turb. Pl. Cooling Wtr Pumps	0%	60	28-Feb-22	20-May-22	81
095	Install Caustic Blk Stor. Tank	0%	60	28-Feb-22	20-May-22	181
096	Install Sulfuric Acid Stor Tank	0%	80	28-Feb-22	20-May-22	181
097	Install Turb Pl Cooling Wtr Stor Tank	0%	60	28-Feb-22	20-May-22	101
098	Install Sodium Hypochlorite Tank	0%	60	28-Feb-22	20-May-22	181
099	Install Misc. Equipment	0%	60	28-Feb-22	20-May-22	181



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TASK filters: In Progress, Not Started.

Capital Cost Assessment

Engineering and Construction Costs

The cost estimate in this Attachment (Table 4-1) includes a DOE recommended contingency of 25%. The conceptual stage of the closed-loop cooling design provides a sound basis for estimating the overall design, procurement, and construction costs. Estimated design costs were based on a DOE recommended percentage (15%) of the total procurement and construction costs (less the cooling tower and tunneling turn-key costs), procurement costs were based on vendor budgetary estimates and construction costs were derived utilizing established construction cost estimating tools. While these individual costs are accurately estimated, the overall cost contains a good deal of uncertainty that would not be resolved until the final detailed design was completed (i.e., all associated bill of materials developed, vendor quotes obtained for all components/material, and estimates for contractor bonding, financing costs, and the escalation of costs over time included). For this reason, a DOE recommended contingency of 25% was added to the cost estimate provided in Table 4-1.

Outage Costs

Both SONGS Units 2 and 3 would require a construction outage of approximately 22.6 months. Since Unit 2 and Unit 3 generate a net electrical output of approximately 1070 MWe and 1080, respectively, a 21.1 month non-planned forced construction outage would result in approximately 16,481,000 MWhr and 16,635,000 MWhr of lost electrical generation, respectively. Assuming a projected cost of electricity of $73.30 per MWhr, the aggregate outage cost for conversion of SONGS to closed-loop cooling would be approximately $2.4 billion. The projected cost of electricity is based on SCE projected costs of $72.50 per MWhr in 2019 and $74.10 per MWhr in 2020, giving an average projected cost of $73.30 per MWhr.

Total One-Time Costs

The estimated capital costs associated with conversion of SONGS to closed-loop cooling include both the engineering and construction costs (Table 4-1) and the non-planned forced outage costs. The total one-time capital cost of conversion is obtained by combining both of these costs to yield a cost of approximately $3 billion in 2009 dollars.

Table 4-1 Engineering and Construction Costs Associated with Conversion to Closed-Loop Cooling at SONGS

The following summarizes the engineering and construction capital cost estimate in 2009 dollars for the implementation of closed-loop cooling at SONGS.

Conversion to Closed-Loop Cooling		
Work Scope	**Estimated Cost**	**Notes:**
Design Engineering and Modification Packages	$ 19,508,000	15% of non-turn-key estimates[1]
Procurement Costs		
Unit 1		
Linear Hybrid Cooling Towers (3)	$ 81,200,000	Attachment 1, Section 1
Noise Abatement	$ 28,420,000	Attachment 1, Section 1
Circulating Water Pumps (3)	$ 6,480,000	Attachment 1, Section 3
Recirculating Water Pumps (3)	$ 13,200,000	Attachment 1, Section 3
Startup Pump (1)	$ 2,160,000	Attachment 1, Section 3
Unit 2		
Linear Hybrid Cooling Towers (3)	$ 81,200,000	Attachment 1, Section 1
Noise Abatement	$ 28,420,000	Attachment 1, Section 1
Circulating Water Pumps (3)	$ 6,480,000	Attachment 1, Section 3
Recirculating Water Pumps (3)	$ 13,200,000	Attachment 1, Section 3
Startup Pump (1)	$ 2,160,000	Attachment 1, Section 3
Subtotal	$ 262,920,000	
Tasks for Closed-Loop Cooling Implementation		
Tunneling	$ 113,935,000	Attachment 2, Section 1 (without spoils removal)
Spoils Removal	$ 8,916,000	Attachment 2, Section 1
Construction / Installation		ENERCON Estimates Below
Civil Costs	$ 18,455,000	(See Below)
Mechanical Costs	$ 26,820,000	(See Below)
Electrical Costs	$ 39,938,000	(See Below)
Power and Control Building	$ 154,000	(See Below)
Field Service Testing, Commissioning, Startup and Training	$ 1,000,000	ENERCON Estimate
Subtotal	$ 209,218,000	
Total Work Scope		
Subtotal	$ 491,646,000	
Recommended Contingency (25%)	$ 122,911,500	DOE Planning Contingency (20-30%)[1]
Recommended Engineering and Construction Budget	**$ 614,558,000**	

1. United States Department of Energy. March 28, 1997. *Cost Estimating Guide.* Publication No. DOE G 430.1-1

Construction / Installation Costs – Civil Estimate

Construction Estimate
File Name: civil.est Page: 1

Qty	Craft	Hours	Unit	Material	Labor	Equipment	Total
Cooling tower basins and footings							
Form work							
2 uses							
37296.00	ax@ 7533.		SF	63,530.01	346,852.80	6,027.03	416,409.84
Reinforcing bar							
Grade 60 bars, #3 to #6 bars							
566.84	p6@ 7255.		Ton	797,883.98	414,416.72	2,713.69	1,215,014.40
PVC schedule 40 pipe							
3/4" (2.5cm) pipe							
1509.00	w3@ 45.27		LF	677.24	1,614.63	45.72	2,337.59
Polyvinyl chloride water stop							
Center bulb, 3/8" thick x 9" wide							
2769.00	al@ 213.2		LF	20,533.24	10,632.96	111.87	31,278.07
Polyvinyl chloride water stop							
3/8" thick x 6" wide							
16788.00	al@ 1158.		LF	74,488.36	57,750.72	678.24	132,917.31
J-type anchor bolts							
3/4" diameter x 18" (46cm) long							
1176.00	am@ 588.0		Ea	16,553.38	29,341.20	344.45	46,239.03
Miscellanous Materials							
300.00	ee@ 15.00		Ea	1,500.00	501.00	0.00	2,001.00
Placing concrete with a crane and bucket							
Slabs on grade 6" (15 cm) or more							
34816.40	bs@ 17547		CY	3,622,298.26	746,463.62	204,306.12	4,573,067.99
Placing concrete with a crane and bucket							
Add for 4,000 PSI concrete							
34816.40	--@ .0000		CY	296,176.15	0.00	0.00	296,176.15
**Subtotal: Cooling Tower Basin							
		34356.7		4,893,640.61	1,607,573.65	214,227.12	6,715,441.38
Flume and catch basin							
Placing concrete with a crane and bucket							
Slabs on grade 6" (15 cm) or more							
558.50	bs@ 281.4		CY	58,106.34	11,974.24	3,277.33	73,357.91
Placing concrete with a crane and bucket							
Add for 4,000 PSI concrete							
558.50	--@ .0000		CY	4,751.05	0.00	0.00	4,751.05
Slab-on-grade edge forms							
7" to 12" (18cm to 31cm) high							
990.00	av@ 73.26		LF	1,262.25	3,484.80	59.99	4,807.04

Construction Estimate
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Qty	Craft	Hours	Unit	Material	Labor	Equipment	Total
Placing concrete with a crane and bucket 12" (31cm) thick building walls							
50.00	bs@ 40.90		CY	5,202.00	1,739.50	476.22	7,417.72
Placing concrete with a crane and bucket Add for 4,000 PSI concrete							
608.00	--@ .0000		CY	5,172.13	0.00	0.00	5,172.13
Polyvinyl chloride water stop Plain, 3/8" thick x 9" wide							
990.00	al@ 76.23		LF	5,331.74	3,801.60	40.00	9,173.34
Combination section, W shapes and channels 30 to 65 lbs. per LF							
10.40	qm@ 73.94		Ton	25,034.88	4,034.16	927.50	29,996.54
Galvanized steel grating 1-1/4" x 3/16", 9.1 lbs. per SF							
5026.50	qc@ 266.4		SF	47,681.38	15,531.89	812.28	64,025.55
Steel vertical ladder, primed 20" (51cm)wide, caged							
25.00	qc@ 15.95		VLF	2,086.00	928.75	50.00	3,064.75
**Subtotal: Flume and Catch Basin							
		828.2		154,627.78	41,494.94	5,643.32	201,766.03
Plant pump basins							
Condenser basin							
12” thick slab, placed with crane and bucket, wood shores Formwork							
9381.00	BV@ 1022.		SF	16,840.77	39,400.20	757.98	56,998.96
12” thick slab, placed with crane and bucket, wood shores, 12' floor-to-floor height Concrete							
9381.00	T7@ 469.0		SF	41,910.56	16,135.32	5,116.40	63,162.27
Footing and slab reinforcing Grade 60 bars, #3 to #6 bars							
56.29	p6@ 720.5		Ton	79,233.80	41,153.62	269.48	120,656.91
Placing concrete with a crane and bucket Add for 4,000 PSI concrete							
347.44	--@ .0000		CY	2,955.60	0.00	0.00	2,955.60
Polyvinyl chloride water stop Plain, 3/8" thick x 9" wide							
396.00	al@ 30.49		LF	2,132.70	1,520.64	16.00	3,669.34
Polyvinyl chloride water stop Plain, 3/8" thick x 9" wide							
200.00	al@ 15.40		LF	1,077.12	768.00	8.08	1,853.20
12" concrete walls with two mats of No. 6's at 8" on center, each way, 40’ high Reinforcing steel							
792.00	RI@ 2344.		LF	88,054.56	93,614.40	4,055.59	185,724.55

Construction Estimate
File Name: civil.est Page: 3

Qty	Craft	Hours	Unit	Material	Labor	Equipment	Total
12" concrete walls with two mats of No. 6's at 8" on center, each way, 40’ high							
Forms							
792.00	B2@	3421.	LF	33,363.79	133,531.20	5,919.41	172,814.40
12" concrete walls with two mats of No. 6's at 8" on center, each way, 40’ high							
Concrete							
792.00	B3@	2090.	LF	81,591.84	76,404.24	15,918.41	173,914.49
Cooling tower return basin							
12” thick slab, placed with crane and bucket, wood shores							
Formwork							
8242.50	BV@	898.4	SF	14,796.94	34,618.50	665.99	50,081.43
12” thick slab, placed with crane and bucket, wood shores, 12' floor-to-floor height							
Concrete							
8242.50	T7@	412.1	SF	36,824.19	14,177.10	4,495.46	55,496.75
Footing and slab reinforcing							
Grade 60 bars, #3 to #6 bars							
49.46	p6@	633.0	Ton	69,619.90	36,160.21	236.78	106,016.89
Placing concrete with a crane and bucket							
Add for 4,000 PSI concrete							
305.28	--@	.0000	CY	2,596.96	0.00	0.00	2,596.96
Polyvinyl chloride water stop							
Plain, 3/8" thick x 9" wide							
420.00	al@	32.34	LF	2,261.95	1,612.80	16.97	3,891.72
Polyvinyl chloride water stop							
Plain, 3/8" thick x 9" wide							
100.00	al@	7.700	LF	538.56	384.00	4.04	926.60
12" concrete walls with two mats of No. 6's at 8" on center, each way, 25’ high							
Reinforcing steel							
430.00	RI@	1272.	LF	47,807.40	50,826.00	2,201.90	100,835.30
12" concrete walls with two mats of No. 6's at 8" on center, each way, 25’ high							
Forms							
430.00	B2@	1857.	LF	18,114.18	72,498.00	3,213.82	93,826.00
12" concrete walls with two mats of No. 6's at 8" on center, each way, 25’ high							
Concrete							
430.00	B3@	1135.	LF	44,298.60	41,482.10	8,642.57	94,423.27
Combination section, W shapes and channels							
100 to 500 lbs. per LF							
351.25	qm@	375.8	Ton	512,333.25	20,505.98	4,718.34	537,557.57
Galvanized steel grating							
1-3/4" x 3/16", 12.5 lbs. per SF							
17623.50	qc@	1251.	SF	222,902.03	72,785.06	3,915.94	299,603.02
Misc. components							
5000.00	--@	.0000	Ea	8,750.00	0.00	0.00	8,750.00

Construction Estimate
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Qty	Craft	Hours	Unit	Material	Labor	Equipment	Total
**Subtotal: Plant basins							
17991.0				1,328,004.69	747,577.36	60,173.17	2,135,755.22
Plume abatement booster pump							
Placing concrete with a crane and bucket							
Slabs on grade 6" (15 cm) or more							
74.00	bs@ 37.29		CY	7,698.96	1,586.56	434.24	9,719.76
Pre-engineered metal buildings - 14’ eave height							
40 x 100, 4,000 SF (372m2)							
1.00	qi@ 280.0		Ea	9,159.60	15,340.00	2,403.80	26,903.40
Valve Pit							
12" concrete walls with two mats of No. 6's at 8" on center, each way, 30’ high							
Reinforcing steel							
3600.00	RI@ 532.8		SF	20,049.12	21,276.00	909.00	42,234.12
12" concrete walls with two mats of No. 6's at 8" on center, each way, 30’ high							
Forms							
3600.00	B2@ 777.6		SF	7,564.32	30,348.00	1,345.32	39,257.64
12" concrete walls with two mats of No. 6's at 8" on center, each way, 30’ high							
Concrete							
3600.00	B3@ 475.2		SF	18,470.16	17,352.00	3,636.00	39,458.16
Placing concrete with a crane and bucket							
Add for 4,000 PSI concrete							
133.33	--@ .0000		CY	1,134.21	0.00	0.00	1,134.21
Placing concrete with a crane and bucket							
Slabs on grade 6" (15 cm) or more							
32.00	bs@ 16.12		CY	3,329.28	686.08	187.78	4,203.14
Placing concrete with a crane and bucket							
Add for 4,000 PSI concrete							
32.00	--@ .0000		CY	272.22	0.00	0.00	272.22
Footing and slab reinforcing							
Grade 60 bars, #3 to #6 bars							
5.10	p6@ 65.28		Ton	7,178.76	3,728.61	24.42	10,931.79
Total Manhours, Material, Labor, and Equipment:							
55360.2				6,451,129.71	2,486,963.19	288,984.17	9,227,077.07

Construction Estimate
File Name: civil.est Page: 8

Qty	Craft	Hours	Unit	Material	Labor	Equipment	Total
Subtotal:							9,227,077.07
Estimate Total:							9,227,077.07

Construction / Installation Costs – Mechanical Estimate

Construction Estimate
File Name: mechanical.est Page: 1

Qty	Craft	Hours	Unit		Material	Labor	Equipment	Total
Cooling Tower and Pump basin piping								
Piping cost includes cost for miscellanous ells and tees								
Seamless welded steel pipe 144" (366cm)								
1814.00	xw@ 26121		LF		3,904,090.80	1,199,961.00	555,138.42	5,659,190.22
Coal tar epoxy coating for pipe 144" (366cm) wrap								
1842.00	--@ .0000		LF		177,926.15	0.00	0.00	177,926.15
Cement coating (1" to 2") for pipe 144" (366cm) coating								
1842.00	--@ .0000		LF		283,704.84	0.00	0.00	283,704.84
Seamless welded steel pipe 120" (305cm),								
910.00	xw@ 8008.		LF		1,633,632.00	367,913.00	170,033.50	2,171,578.50
Coal tar epoxy coating for pipe 120" (305cm) wrap								
910.00	--@ .0000		LF		73,234.98	0.00	0.00	73,234.98
Cement coating (1" to 2") for pipe 120" (305cm) coating								
910.00	--@ .0000		LF		116,953.20	0.00	0.00	116,953.20
Seamless welded steel pipe 96" (244cm)								
336.00	xx@ 1612.		LF		479,808.00	74,222.40	31,865.90	585,896.30
Coal tar epoxy coating for pipe 96" (244cm) wrap								
336.00	--@ .0000		LF		21,625.63	0.00	0.00	21,625.63
Cement coating (1" to 2") for pipe 96" (244cm) coating								
336.00	--@ .0000		LF		34,614.72	0.00	0.00	34,614.72
Seamless welded steel pipe 84" (213cm)								
224.00	xw@ 985.6		LF		281,030.40	45,270.40	20,972.45	347,273.25
Coal tar epoxy coating for pipe 84" (213cm) wrap								
224.00	--@ .0000		LF		12,612.10	0.00	0.00	12,612.10

Construction Estimate
File Name: mechanical.est Page: 2

Qty	Craft	Hours	Unit	Material	Labor	Equipment	Total
Cement coating (1" to 2") for pipe 84" (213cm) coating							
224.00	--@	.0000	LF	20,106.24	0.00	0.00	20,106.24
Seamless welded steel pipe 72" (183cm)							
224.00	xw@	492.8	LF	154,452.48	22,646.40	10,474.91	187,573.79
Coal tar epoxy coating for pipe 72" (183cm) wrap							
224.00	--@	.0000	LF	10,807.10	0.00	0.00	10,807.10
Cement coating (1" to 2") for pipe 72" (183cm) coating							
224.00	--@	.0000	LF	17,227.39	0.00	0.00	17,227.39
Seamless welded steel pipe 54" (137cm)							
336.00	xv@	846.7	LF	124,064.64	38,908.80	15,135.46	178,108.90
Coal tar epoxy coating for pipe 54" (137cm) wrap							
336.00	--@	.0000	LF	12,166.56	0.00	0.00	12,166.56
Cement coating (1" to 2") for pipe 54" (137cm) coating							
336.00	--@	.0000	LF	19,397.95	0.00	0.00	19,397.95
Seamless welded steel pipe 30" (76cm)							
2000.00	xv@	2940.	LF	238,680.00	135,060.00	52,520.00	426,260.00
Coal tar epoxy coating for pipe 30" (76cm) wrap							
2000.00	--@	.0000	LF	16,524.00	0.00	0.00	16,524.00
Cement coating (1" to 2") for pipe 30" (76cm) coating							
2000.00	--@	.0000	LF	64,056.00	0.00	0.00	64,056.00
30" Butterfly							
45.00	nn@	1215.	Ea	562,500.00	61,110.00	5,090.40	628,700.40
Expansion joints 30" riser including rod restraints							
45.00	pp@	90.00	Ea	232,380.00	3,658.50	0.00	236,038.50
30" flanges							
180.00	pp@	720.0	Ea	135,000.00	29,268.00	7,804.80	172,072.80

Construction Estimate
File Name: mechanical.est Page: 3

Qty	Craft	Hours	Unit	Material	Labor	Equipment	Total
144" flanges							
10.00	pp@	160.0	Ea	75,000.00	6,504.00	1,740.00	83,244.00
144" expansion joint, includes retaining rings and control assemblies							
2.00	pp@	32.00	Ea	37,490.00	1,300.80	112.00	38,902.80
144" Butterfly Valves							
2.00	pp@	24.00	Ea	450,000.00	975.60	200.00	451,175.60
84" Check Valves							
3.00	pp@	36.00	Ea	255,000.00	1,463.40	300.00	256,763.40
48" Butterfly							
1.00	nn@	27.00	Ea	15,500.00	1,358.00	113.12	16,971.12
Make-up Water Pump							
Vertical Turbine Pump							
38,000 GPM @ 6 ft-head							
1.00	pb@	15.00	Ea	178,400.00	643.40	130.00	179,173.40
Plume Abatement Booster Pump							
Electric motors, AC, three phase, 460 volt							
200 HP motor							
12.00	lk@	60.00	Ea	94,860.00	3,374.40	12.12	98,246.52
200 HP pump							
24,000 GPM @ 26 ft-head							
12.00	pj@	288.0	Ea	458,400.00	11,851.20	808.44	471,059.64
Steel AWWA standard weight water distribution pipe, cement lined, 20' lengths							
36" (91cm), 3/8" wall							
50.00	tq@	55.00	LF	12,393.00	2,215.50	423.19	15,031.69
60" flange							
6.00	pp@	144.0	Ea	90,000.00	5,853.60	300.00	96,153.60
Seamless welded steel pipe - 5/16" to 1/2" wall thickness							
60" (152cm), 1/2" wall pipe							
300.00	xv@	882.0	LF	137,700.00	40,530.00	15,786.30	194,016.30
Vertical turbine pumps, stainless steel							
277,000 GPM 38' head							
4.00	pj@	480.0	Ea	-	19,752.00	482.32	20,234.30
Vertical turbine pumps, stainless steel							
277,000 GPM 120' head							
3.00	pj@	360.0	Ea	-	14,814.00	361.74	15,175.70

Construction Estimate
File Name: mechanical.est Page: 4

Qty	Craft	Hours	Unit	Material	Labor	Equipment	Total

Total Manhours, Material, Labor, and Equipment:

44755.5	10,431,338.18	2,088,654.40	889,805.07	13,409,797.65

Subtotal: 13,409,797.65

Estimate Total: 13,409,797.65

Construction / Installation Costs – Electrical Estimate

Construction Estimate
File Name: electrical.est Page: 1

Qty	Craft	Hours	Unit	Material	Labor	Equipment	Total
Switchyard to Cooling Tower Distribution Building							
15,000 volt cable, on poles 500 MCM							
78.40	lu@	3136.	MLF	1,319,472.00	173,185.60	22,804.99	1,515,462.59
Cooling Tower Power and Control							
Outdoor Circuit Breaker							
2.00	ll@	10.00	Ea	30,000.00	382.60	0.00	30,382.60
13.8kv/480v Transformer							
2.00	ln@	48.00	Ea	1,500,000.00	2,216.00	100.00	1,502,316.00
600 volt THW copper feeder wire 500 MCM, type THW							
2.10	lp@	54.60	MLF	28,274.40	3,013.50	11.58	31,299.48
480 volt load center							
1.00	ln@	24.00	Ea	40,000.00	1,108.00	0.00	41,108.00
600 volt THW copper feeder wire 500 MCM, type THW							
0.75	lp@	19.50	MLF	10,098.00	1,076.25	4.14	11,178.39
Unassembled panelboards - Main breaker, 3 phase, 480 volt 400 amp, 42 breaker spaces							
2.00	lk@	8.000	Ea	4,182.00	449.80	1.62	4,633.42
Panel mounted molded case breakers - Type WRI, 600 volt, 3 pole 125 to 400 amp, type LBB							
50.00	lk@	87.50	Ea	85,680.00	4,920.00	17.68	90,617.68
Branch circuit cable 300 MCM							
127.10	lp@	2923.	MLF	1,073,435.76	161,417.00	620.03	1,235,472.79
Louver bottom straight cable tray 30" (76cm)							
3294.00	lk@	658.8	LF	77,949.22	37,057.50	133.08	115,139.79
Bailey INFI-90 Controller Cooling Tower and Pump control							
2.00	lr@	120.0	Ea	110,000.00	5,570.00	200.00	115,770.00
Louver bottom cable tray fittings - Horizontal elbow, 90 degree 30" (76cm)							
6.00	lk@	6.000	Ea	1,046.52	337.38	1.21	1,385.11

Construction Estimate
File Name: electrical.est Page: 2

Qty	Craft	Hours	Unit	Material	Labor	Equipment	Total
Louver bottom cable tray fittings - Inside vertical riser, 90 degree 30" (76cm)							
6.00	lk@	6.000	Ea	1,107.72	337.38	1.21	1,446.31
Louver bottom cable tray fittings - Outside vertical riser, 90 degree 30" (76cm)							
6.00	lk@	6.000	Ea	1,107.72	337.38	1.21	1,446.31
Structural tubing, square 8" x 8", 20 to 60 lbs. per LF							
2.40	qm@	19.20	Ton	5,654.88	1,047.60	240.95	6,943.43
Structural tubing, square 4" x 4", 10 to 22 lbs. per LF							
0.66	qm@	6.600	Ton	1,501.24	360.10	82.66	1,943.99
600 volt copper wire - Single stranded conductor #12 AWG, type THW							
127.00	lp@	889.0	MLF	26,814.78	49,085.50	188.56	76,088.84
Louver bottom straight cable tray 24" (61cm)							
6588.00	lk@	1152.	LF	142,458.91	64,825.92	266.16	207,550.99
Plume Abatement Booster Pump							
Pouring concrete directly from a chute Continuous duct							
125.00	bq@	50.00	CY	13,005.00	2,076.25	71.96	15,153.21
Rigid galvanized steel conduit 6" RSC							
5952.00	lp@	1785.	LF	415,866.24	98,565.12	360.69	514,792.05
Electrical handholes, listed by interior dimensions, precast 36" x 36" x 48"							
3.00	bz@	4.500	Ea	1,848.24	205.92	71.51	2,125.67
Rigid galvanized steel conduit - RSC including supports 3-1/2" RSC							
200.00	lp@	32.00	LF	4,120.80	1,766.00	6.06	5,892.86
Louver bottom straight cable tray 24" (61cm)							
100.00	lk@	17.50	LF	2,162.40	984.00	4.04	3,150.44
Round tapered aluminum light poles with square mounting base 15' high, heavy duty							
4.00	L2@	3.600	Ea	4,720.00	132.40	0.00	4,852.40

Construction Estimate
File Name: electrical.est Page: 3

Qty	Craft	Hours	Unit	Material	Labor	Equipment	Total
HID pole-mounted floodlights with lamp base horizontal without poles 1000W Hi pres sodium							
4.00	L1@	2.800	Ea	4,000.00	103.00	0.00	4,103.00
Power cable, stranded, single conductor, copper # 12 AWG, XLP (XHHW)							
13.10	lp@	91.70	MLF	3,901.70	5,063.15	19.45	8,984.30
Type USE underground feeder and branch circuit cable 350 MCM, type USE							
52.40	lp@	1257.	MLF	513,635.28	69,430.00	266.74	583,332.02
Power Transformer							
1.00	ll@	48.00	Ea	650,000.00	1,836.00	100.00	651,936.00
Shielded 15,000 volt cable, on poles 350 MCM							
20.00	lu@	720.0	MLF	259,080.00	39,760.00	5,231.80	304,071.80
Shielded 5,000 volt cable #1/0 AWG							
0.10	lp@	2.200	MLF	448.80	121.50	0.47	570.77
13.8kv/480v Transformer							
2.00	ln@	48.00	Ea	1,500,000.00	2,216.00	100.00	1,502,316.00
600 volt THHN copper feeder wire #500 MCM, type THHN							
24.00	lp@	624.0	MLF	328,032.00	34,440.00	132.35	362,604.35
Unassembled panelboards - Main breaker, 3 phase, 480 volt 500 amp, 42 breaker spaces							
2.00	lk@	8.000	Ea	5,182.00	449.80	1.62	5,633.42
Panel mounted molded case breakers - Type WRI, 600 volt, 3 pole 300 to 600 amp, type LC							
12.00	lk@	24.00	Ea	23,011.20	1,350.00	4.85	24,366.05
Transformer 480v to 208/120v							
1.00	ll@	12.00	Ea	10,000.00	459.00	0.00	10,459.00
Unassembled panelboards - 3-wire main lugs only, 1 phase, 120/240 volt 400 amp, 42 circuits							
1.00	lk@	4.000	Ea	486.54	224.90	0.81	712.25
Cooling Tower Return Pump							
Shielded 15,000 volt cable, on poles 500 MCM							
300.00	lu@	12000	MLF	5,049,000.00	662,700.00	87,264.00	5,798,964.00

Construction Estimate
File Name: electrical.est Page: 4

Qty	Craft	Hours	Unit	Material	Labor	Equipment	Total
Transformer							
1.00	ll@	100.0	Ea	3,000,000.00	3,825.00	1,000.00	3,004,825.00
Pouring concrete directly from a chute Continuous duct							
264.00	bq@	105.6	CY	27,466.56	4,385.04	151.98	32,003.58
Rigid galvanized steel conduit 6" RSC							
16800.00	lp@	5040.	LF	1,173,816.00	278,208.00	1,018.08	1,453,042.08
13.8kv Switchgear							
3.00	ll@	144.0	Ea	450,000.00	5,508.00	300.00	455,808.00
Rigid galvanized steel conduit - RSC including supports 3-1/2" RSC							
1000.00	lp@	160.0	LF	20,604.00	8,830.00	30.30	29,464.30
Pouring concrete directly from a chute Continuous duct							
125.00	bq@	50.00	CY	13,005.00	2,076.25	71.96	15,153.21
Electrical handholes, listed by interior dimensions, precast 24" x 24" x 30"							
3.00	bz@	3.750	Ea	853.74	171.60	59.69	1,085.03
Circulating Water Pumps							
Branch circuit cable 500 MCM							
6.00	lp@	156.0	MLF	79,560.00	8,610.00	33.09	88,203.09
Rigid galvanized steel conduit - RSC including supports 3-1/2" RSC							
600.00	lp@	96.00	LF	12,362.40	5,298.00	18.18	17,678.58
Pouring concrete directly from a chute Continuous duct							
600.00	bq@	240.0	CY	62,424.00	9,966.00	345.42	72,735.42
Electrical handholes, listed by interior dimensions, precast 24" x 24" x 30"							
6.00	bz@	7.500	Ea	1,707.48	343.20	119.38	2,170.06
NEMA class 1 surface or flush mounted screw cover pull boxes 12 x 12 x 6							
24.00	L1@	14.40	Ea	1,464.00	529.68	0.00	1,993.68

Construction Estimate
File Name: electrical.est Page: 5

Qty	Craft	Hours	Unit	Material	Labor	Equipment	Total
Panels only for JIC enclosures 10.87 x 10.87							
12.00	L1@ .7200		Ea	134.40	26.52	0.00	160.92
Weatherproof switches, 120 volt, 20 amp 3 way, exposed installation							
12.00	lk@ 4.200		Ea	91.31	236.16	0.85	328.32
Total Manhours, Material, Labor, and Equipment:							
		32033.1		18,090,772.24	1,756,624.00	121,460.34	19,968,856.58
					Subtotal:		19,968,856.58
					Estimate Total:		19,968,856.58

Construction / Installation Costs – Power and Control Building Estimate

Construction Estimate
File Name: Power and Control.est

Qty	Craft	Hours	Unit	Material	Labor	Equipment	Total
Power and Control Building							
Placing concrete with a crane and bucket Stairs on grade							
148.00	bs@	541.6	CY	15,397.92	23,043.60	6,308.06	44,749.58
Footing and slab reinforcing Grade 60 bars, #3 to #6 bars							
12.00	p6@	153.6	Ton	16,891.20	8,630.40	57.45	25,579.05
Pre-engineered metal buildings - 14’ eave height 80 x 100, 8,000 SF (744m2)							
1.00	qi@	519.0	Ea	16,932.00	28,440.00	4,454.10	49,826.10
Power roof ventilators - Belt driven 21,600 CFM, 40" x 40" damper							
2.00	nz@	25.00	Ea	6,650.40	1,295.00	15.17	7,960.57
Fluorescent fixtures - Drop opal lens, 2’ x 4’ Four 40 watt lamps							
50.00	lp@	100.0	Ea	9,996.00	5,520.00	21.21	15,537.21
600 volt copper wire - Single solid conductor # 12 AWG, type THW							
7.50	lp@	52.50	MLF	1,377.00	2,898.75	11.14	4,286.89
Electric metallic tube (EMT) conduit 1/2" with couplings							
500.00	lp@	16.50	LF	249.90	910.00	5.05	1,164.95
Rigid steel conduit installed in slabs and masonry 1/2" conduit with couplings							
100.00	lp@	4.000	LF	167.28	221.00	1.01	389.29
Rigid steel conduit installed in slabs and masonry 3/4" conduit with couplings							
100.00	lp@	5.000	LF	212.16	276.00	1.01	489.17
PVC thin wall conduit in a concrete encased duct bank 4" schedule 40-EB with coupling							
600.00	ll@	24.00	LF	1,689.12	1,110.00	0.00	2,799.12
Switches in 1-1/2" deep handy boxes with handy box covers 2-pole 15 amp ivory							
5.00	L1@	2.400	Ea	37.45	88.25	0.00	125.70
Switches in 1-1/2" deep handy boxes with handy box covers 4-way 15 amp ivory							
4.00	L1@	2.320	Ea	44.80	85.32	0.00	130.12

Construction Estimate
File Name: Power and Control.est

Qty	Craft	Hours	Unit	Material	Labor	Equipment	Total
3" octagon boxes, 1-1/2" deep except pancake box 3-0 1/2" KO							
10.00	L1@	1.500	Ea	32.50	55.20	0.00	87.70
Switch boxes, square corners, non-gangable, for MC 2" deep with ears							
25.00	L1@	3.750	Ea	112.75	138.00	0.00	250.75
Total Manhours, Material, Labor, and Equipment:							
		1451.3		69,790.48	72,711.52	10,874.19	153,376.19
				Subtotal:			153,376.19
				Estimate Total:			153,376.19

Table 4-2 Annual Operations Activities and Cost Estimate

	Activity Description	Group	Est. Cost
Daily	Check fans, motors, driveshafts, gear reducers Check gear reducer oil level Check electrical substation, transformers, switchgear Monitor local control panel and alarm displays Check water level in cold water basin and hot water distribution system Check booster pumps and associated instrumentation Sample water quality	Operations	
Cost Basis	Labor - 8 hrs/day X 365 days		$176,000
Weekly	Inspect hot water distribution system Inspect fill for fouling Check gear reducer for leakage Adjust water quality	Operations	
Cost Basis	Labor - 40 hrs/week X 52 weeks		$125,000
Annual Operations Cost Estimate			**$301,000**

Notes:

Labor cost based on 2009 estimate of $60/hr; includes wages and benefits.

Table 4-3 Annual Maintenance Activities and Cost Estimate

	Activity Description	Group	Est. Cost
Monthly	Inspect drift eliminators and fill for clogging Check gear reducer oil seals, oil level, and oil condition	Maintenance	
Periodic (Quarterly estimated)	Clean and repaint fans and drivers, drift eliminators, fill, hot water distribution system Rebalance fans and driveshafts Lighting inspection or replacement	Maintenance	
Semi-annual Inspection	Inspect keys, keyways, set screws & tighten bolts for fans and drivers Change oil and check vent condition for gear reducers Check fan blade clearances Check for leakage in fill, basin and hot water distribution system Inspect general condition and repair as necessary all tower components including cranes and hoists	Maintenance	
Annual Inspection and Corrective Maintenance	Inspect general condition of basin, suction screen and tower casing Inspect/repair fans and drivers, and tower access components, including stairs, ladders, walkways, doors, handrails Transformer Inspection Starting at year 16, replacement of fan blades, fan motors, fan gearbox, fill, drift eliminators	Maintenance	
Cost Basis	Labor - 2 Additional Workers X 40 hrs/week X 52 weeks		$500,000
Cost Basis	Material - Equipment Replacement (Years 1 - 5) Material - Equipment Replacement (Years 6 - 15) Material - Equipment Replacement (Years 16 - 20)		$250,000 $750,000 $1,750,000
Annual Maintenance Cost Estimate (Years 1 - 5)			**$750,000**
Annual Maintenance Cost Estimate (Years 6 - 15)			**$1,250,000**
Annual Maintenance Cost Estimate (Years 16 - 20)			**$2,250,000**

Notes:

Labor cost based on 2009 estimate of $60/hr; includes wages and benefits.

Based on vendor (SPX) estimates/historical data

Summary of Engineering Scope for Conversion to Closed-Loop Cooling

Phase 1: Initial Analyses and Studies Required for Issue of Design and Contract Specifications

- Intake flow analysis
- Electrical distribution analysis
- Circulating water flow analysis
- Engineering support for permit applications
- Heat load and cooling selection analysis

Phase 2: Prepare and Issue Contract Specifications and Preliminary Design Drawings for Procurement

- Tunneling specification
- Circulating water piping and foundations specification
- Circulating water reservoir (hot and cold water basin) specification
- Motor control centers and substation specification
- Cooling tower and control system specification
- Electrical distribution specification
- Booster pump and motor specification
- Circulating water pump and motor specification
- Recirculating water pump and motor specification
- Cooling tower makeup and blowdown design
- Relocation of security fence design
- Miscellaneous specifications and designs

Phase 3: Complete and Issue Design Modification Packages, Calculations, Drawings, and Construction Work Packages

- Site preparation and excavation packages
- Temporary utilities package
- Pumping station packages
- Cooling tower electrical packages
- Cooling tower erection package
- Piping installation packages
- Security relocation package

Phase 4: Support Construction, As-Built Drawings, and Design Closeout

- Construction support and problem resolution
- Construction walkdown and as-built drawings
- Package closure and facility turnover
- Vendor interface