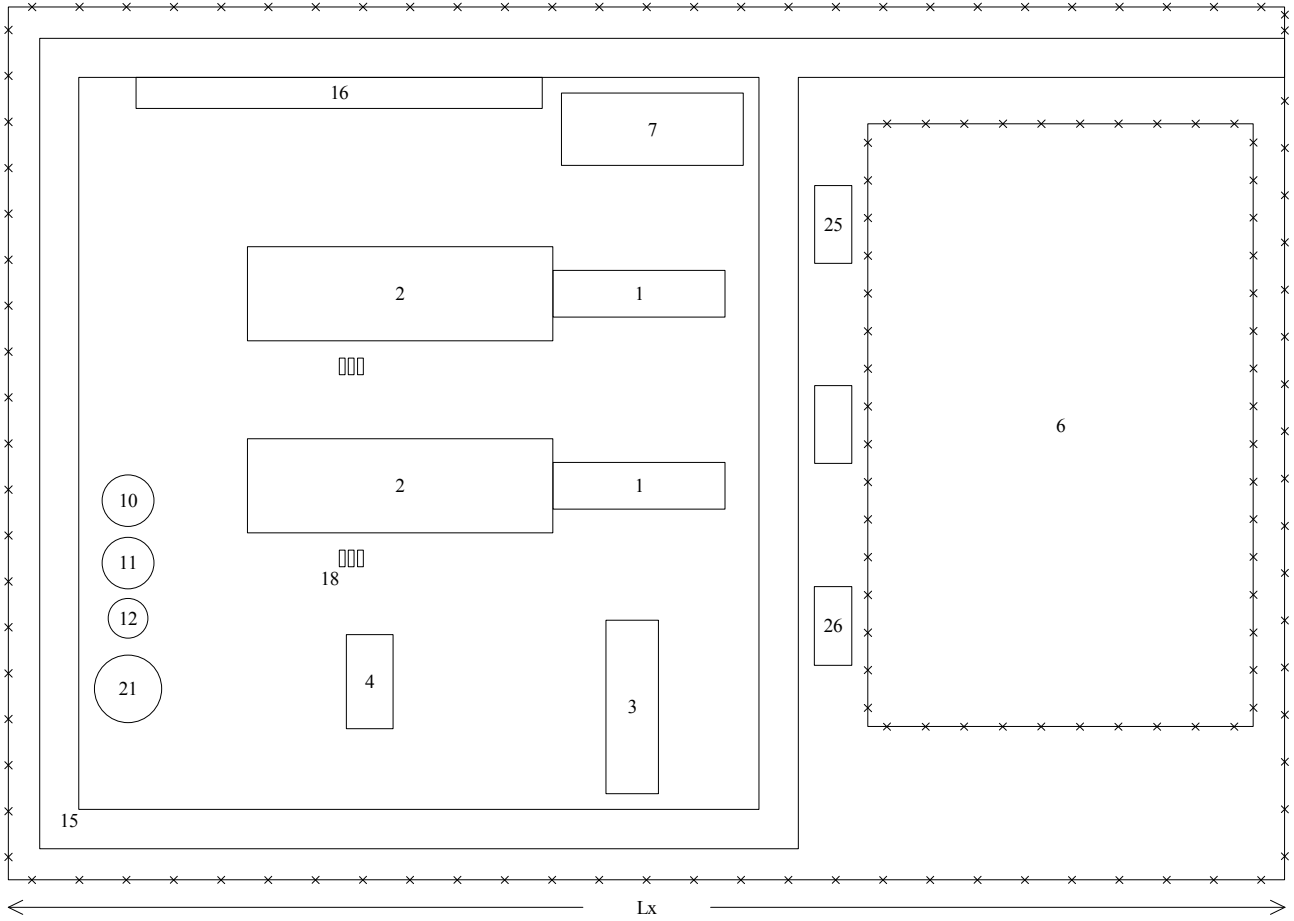
FOR QUALITATIVE INDICATION ONLY

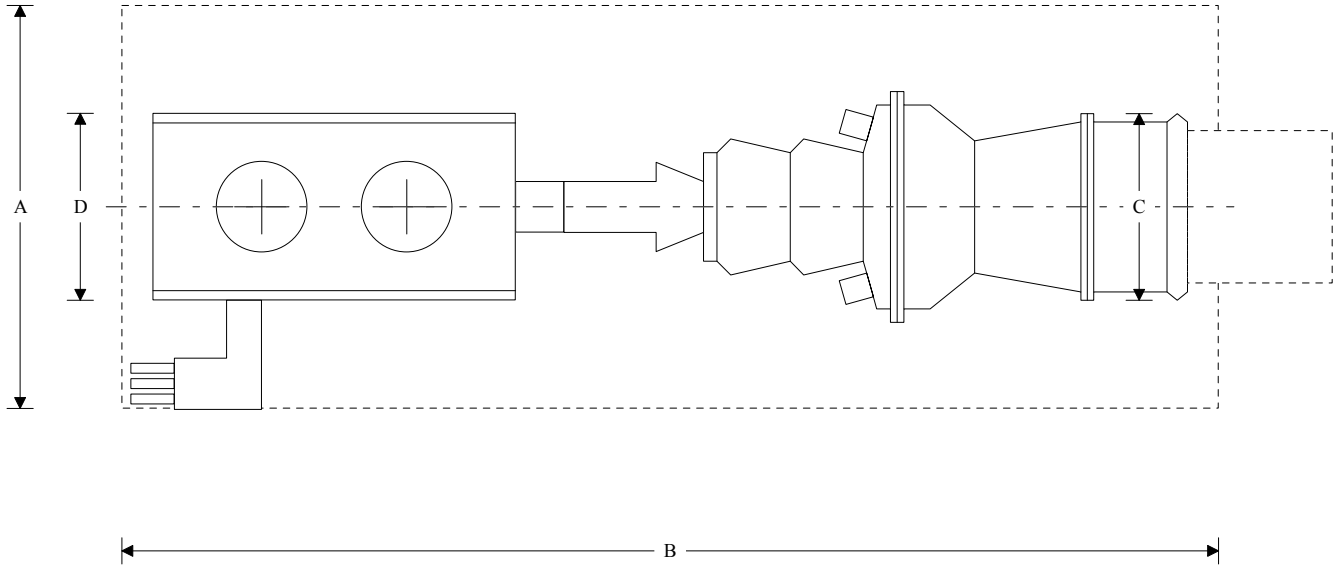


Area 4.2 hectare
Lx 249 m
Ly 170 m

1 - Gas Turbine Package
2 - Heat Recovery Steam Generator
3 - Steam Turbine Package
4 - Water Treatment
6 - Switchyard
7 - Administration, Shop & Warehouse
10 - Demineralized Water Tank
11 - Raw Water Tank
12 - Neutralized Water Tank
15 - Road
16 - Parking
18 - Feed Pumps
21 - Fire Protection Tank
25 - GT Transformer
26 - ST Transformer

Thermoflow, Inc.	Company: Energy International
	User: Jose A. Benitez
	SITE PLAN
Date: 11/14/09	
Drawing No:	

FOR QUALITATIVE INDICATION ONLY



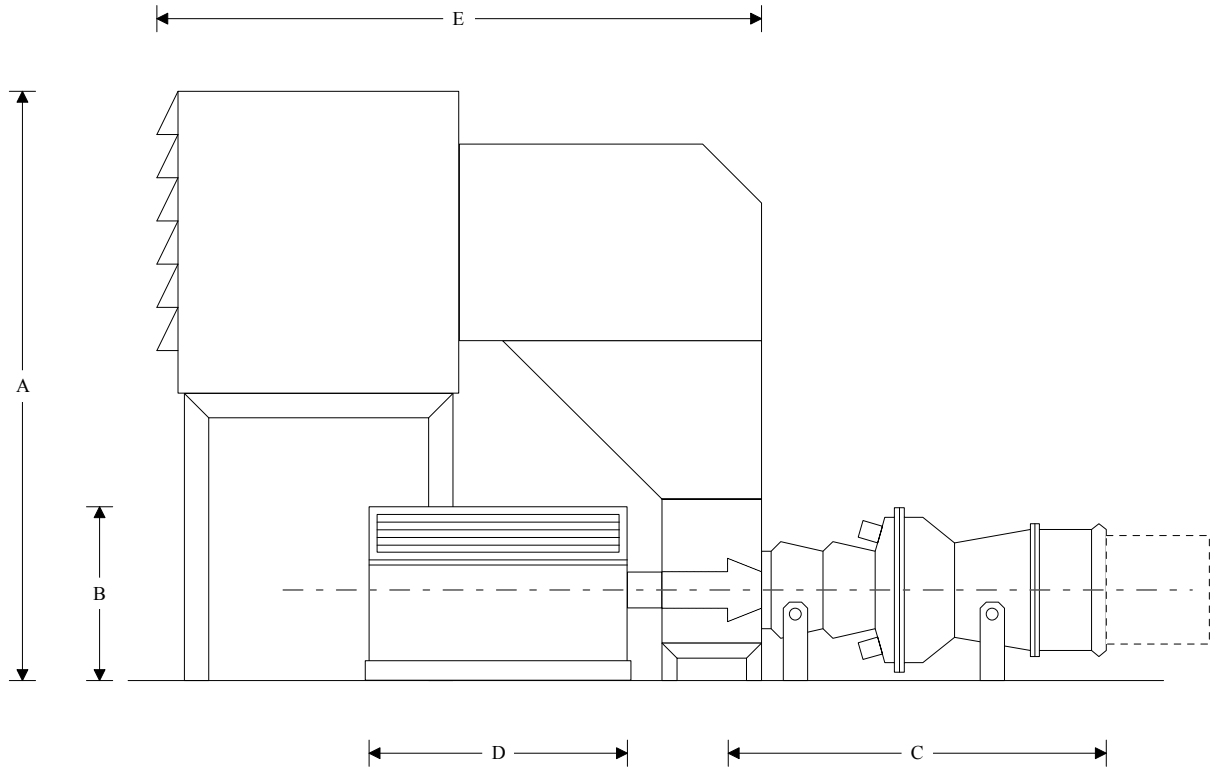
SHAPE, DIMENSIONS & SCALE ARE APPROXIMATE

A	B	C	D	E	F	G	H	I	J
9.144 m	35.05 m	4.237 m	4.237 m	-	-	-	-	-	-

Thermoflow, Inc.	Company: Energy International
	User: Jose A. Benitez
	GAS TURBINE PACKAGE
	PLAN
Date: 11/14/09	GE 9351FA 313
Drawing No:	

PEACE/GT PRO 19.0.1 Jose A. Benitez
File = C:\TFLOW19\00_Projects\Pakistan\Karachi 1 x GE 209FA\Karachi_1 x GE 209FA.gtp

FOR QUALITATIVE INDICATION ONLY



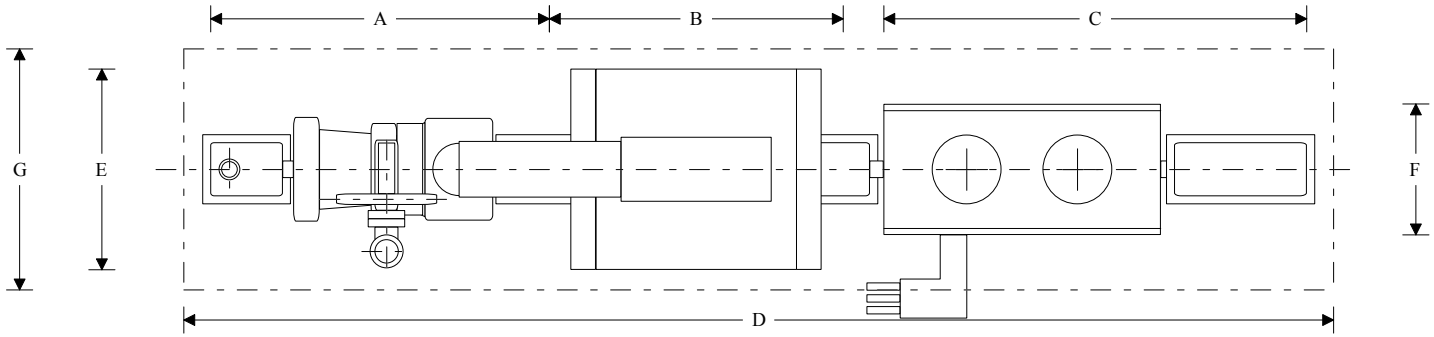
SHAPE, DIMENSIONS & SCALE ARE APPROXIMATE

A	B	C	D	E	F	G	H	I	J
18.78 m	5.534 m	12.04 m	8.23 m	19.26 m	-	-	-	-	-

Thermoflow, Inc.	Company: Energy International
	User: Jose A. Benitez
	GAS TURBINE PACKAGE
	PLAN
Date: 11/14/09	GE 9351FA 313
Drawing No:	

PEACE/GT PRO 19.0.1 Jose A. Benitez
File = C:\TFLOW19\00_Projects\Pakistan\Karachi 1 x GE 209FA\Karachi_1 x GE 209FA.gtp

FOR QUALITATIVE INDICATION ONLY



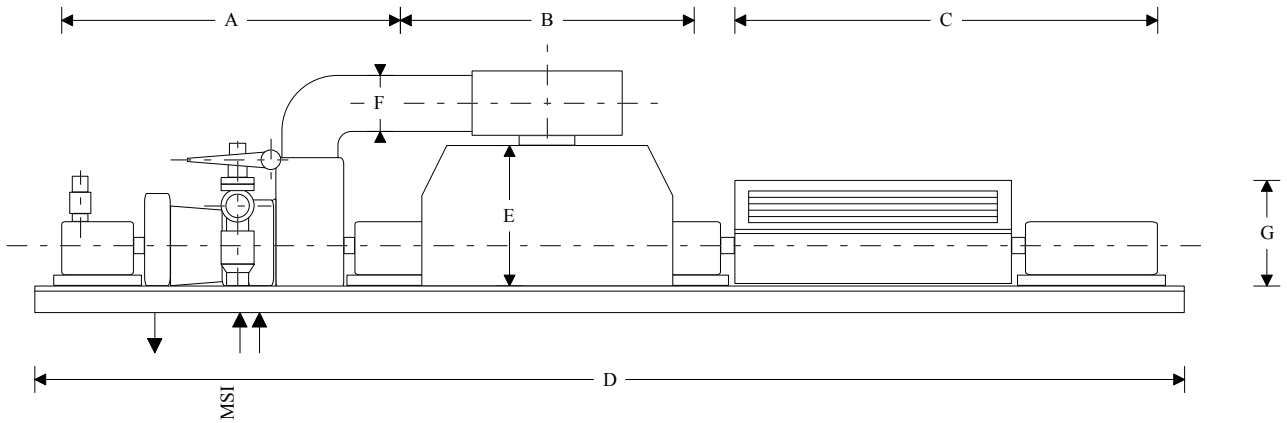
STEAM TURBINE - CONDENSING, REHEAT, 2 LPT PATHS
SHAPE, DIMENSIONS & SCALE ARE APPROXIMATE

A	B	C	D	E	F	G	H	I	J
10.23 m	8.87 m	12.77 m	34.77 m	6.058 m	3.949 m	7.27 m	-	-	-

Thermoflow, Inc.	Company: Energy International
	User: Jose A. Benitez
	STEAM TURBINE PACKAGE
	PLAN
Date: 11/14/09	
Drawing No:	

PEACE/GT PRO 19.0.1 Jose A. Benitez
File = C:\TFLOW19\00_Projects\Pakistan\Karachi 1 x GE 209FA\Karachi_1 x GE 209FA.gtp

FOR QUALITATIVE INDICATION ONLY



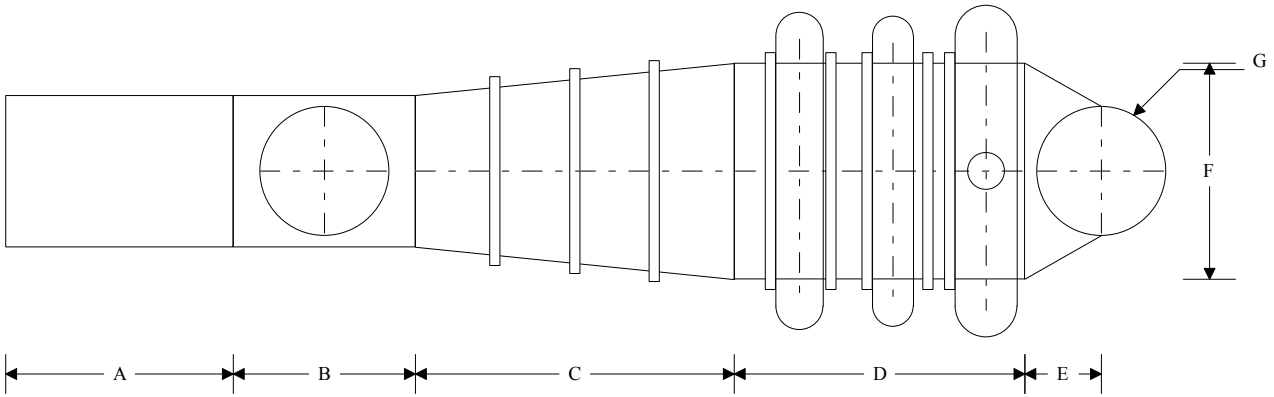
STEAM TURBINE - CONDENSING, REHEAT, 2 LPT PATHS
SHAPE, DIMENSIONS & SCALE ARE APPROXIMATE

A	B	C	D	E	F	G	H	I	J
10.23 m	8.87 m	12.77 m	34.77 m	4.241 m	1.696 m	3.186 m	-	-	-

Thermoflow, Inc.	Company: Energy International
	User: Jose A. Benitez
	STEAM TURBINE PACKAGE
	ELEVATION
Date: 11/14/09	
Drawing No:	

PEACE/GT PRO 19.0.1 Jose A. Benitez
File = C:\TFLOW19\00_Projects\Pakistan\Karachi 1 x GE 209FA\Karachi_1 x GE 209FA.gtp

FOR QUALITATIVE INDICATION ONLY

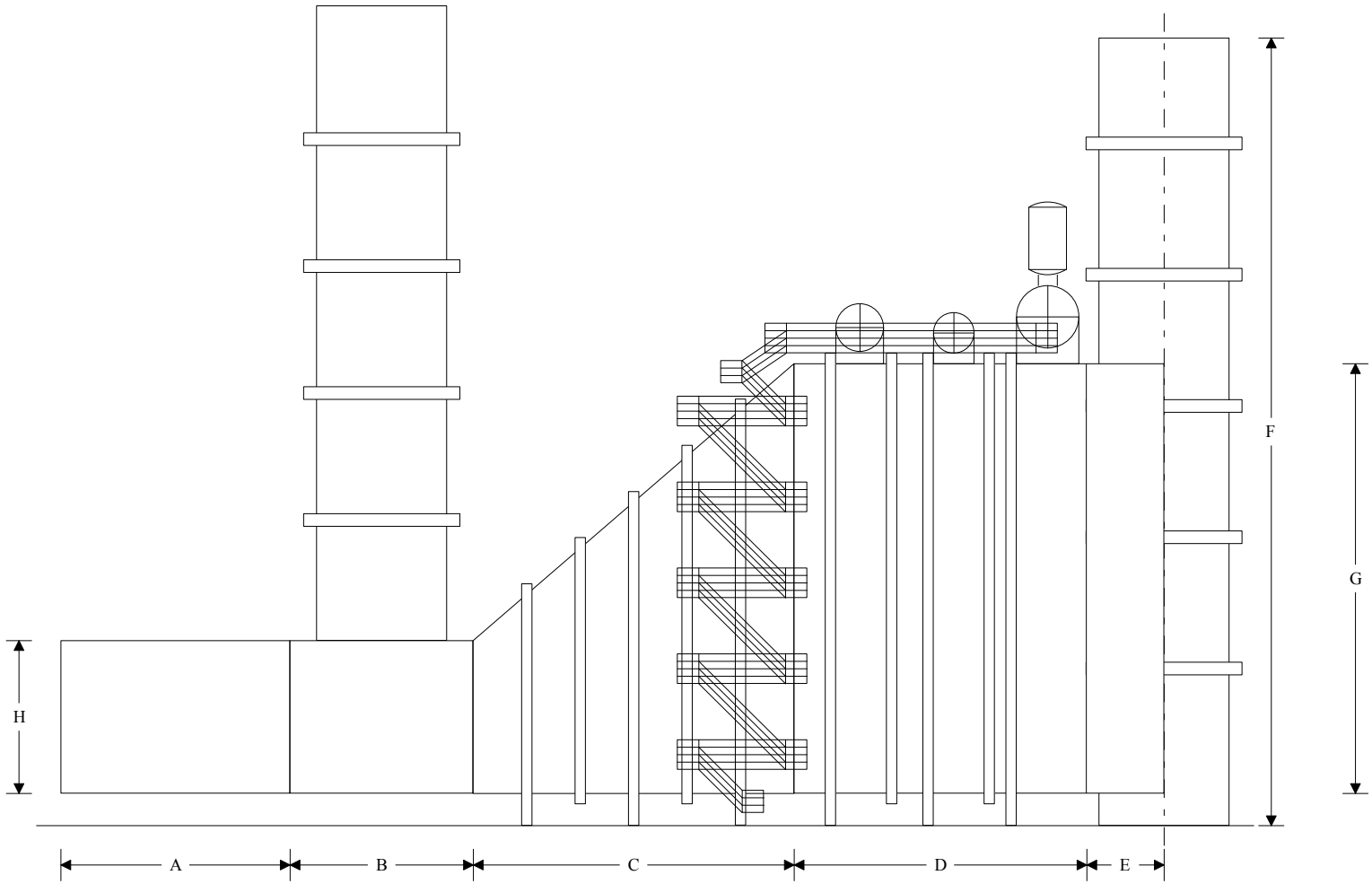


A	B	C	D	E	F	G	H	I	J
11.69 m	9.353 m	16.37 m	14.92 m	3.933 m	11.09 m	6.646 m	-	-	-

Thermoflow, Inc.	Company: Energy International
	User: Jose A. Benitez
	HEAT RECOVERY STEAM GENERATOR
	PLAN
Date: 11/14/09	
Drawing No:	

PEACE/GT PRO 19.0.1 Jose A. Benitez
File = C:\TFLOW19\00_Projects\Pakistan\Karachi 1 x GE 209FA\Karachi_1 x GE 209FA.gtp

FOR QUALITATIVE INDICATION ONLY

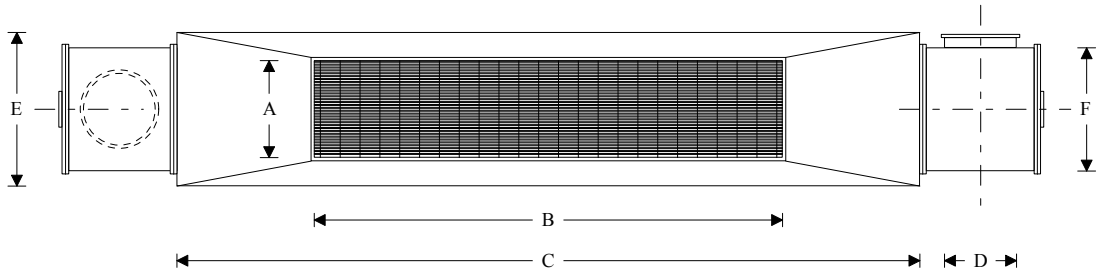


A	B	C	D	E	F	G	H	I	J
11.69 m	9.353 m	16.37 m	14.92 m	3.933 m	40.17 m	21.91 m	7.794 m	-	-

Thermoflow, Inc.	Company: Energy International
	User: Jose A. Benitez
	HEAT RECOVERY STEAM GENERATOR
	ELEVATION
Date: 11/14/09	
Drawing No:	

PEACE/GT PRO 19.0.1 Jose A. Benitez
File = C:\TFLOW19\00_Projects\Pakistan\Karachi 1 x GE 209FA\Karachi_1 x GE 209FA.gtp

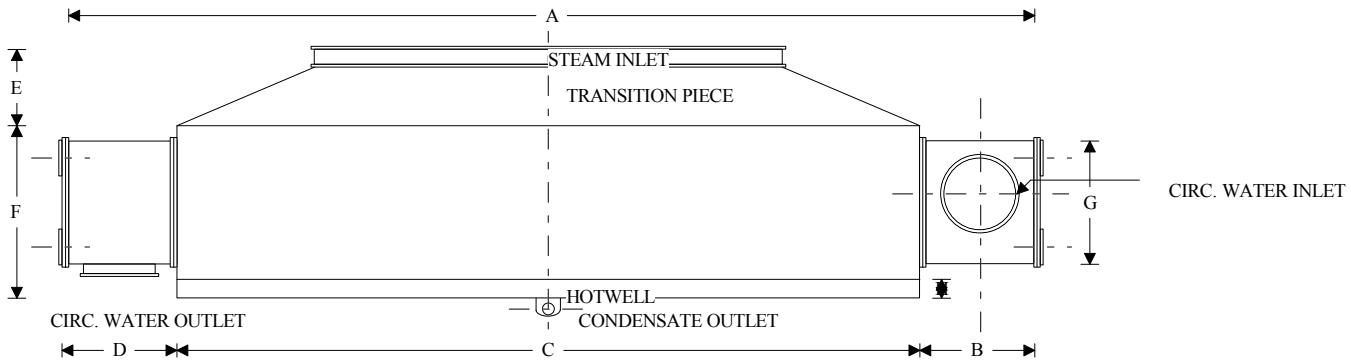
FOR QUALITATIVE INDICATION ONLY



A	B	C	D	E	F	G	H	I	J
2.955 m	14.28 m	22.65 m	2.196 m	4.688 m	3.753 m	-	-	-	-

Thermoflow, Inc.	Company: Energy International
	User: Jose A. Benitez
	WATER-COOLED CONDENSER
	PLAN
Date: 11/14/09	
Drawing No:	

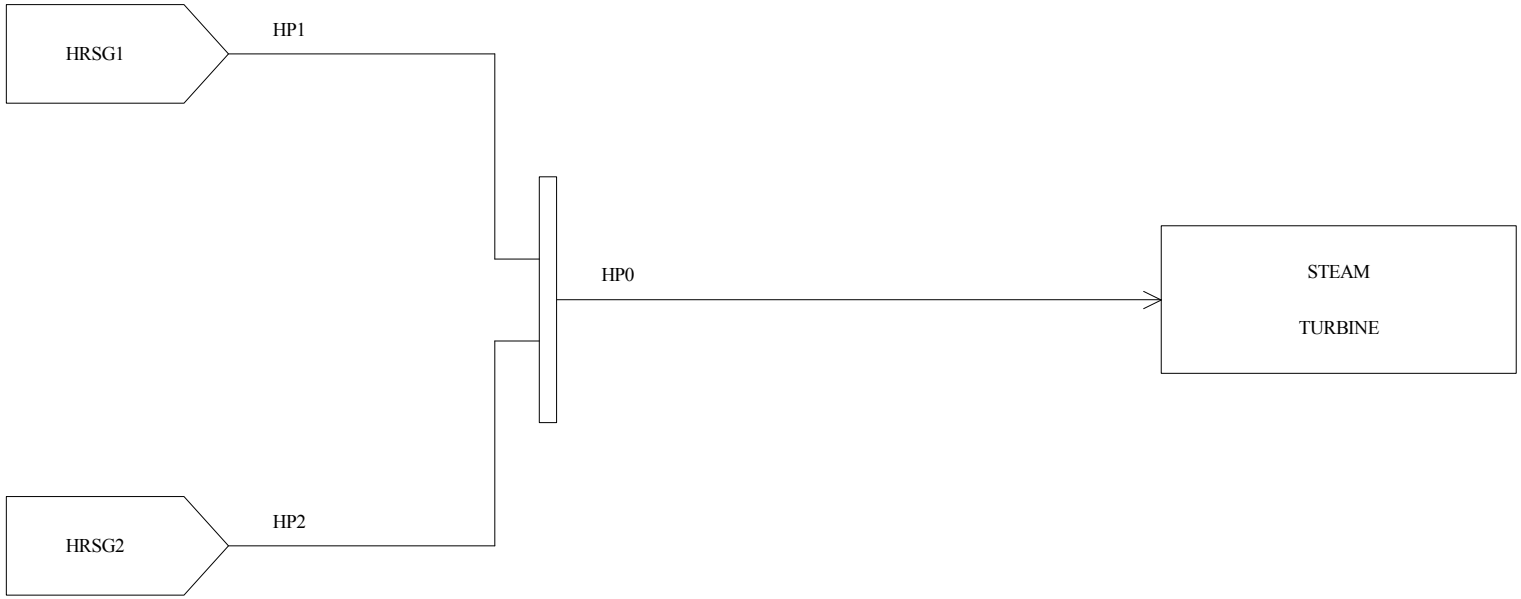
FOR QUALITATIVE INDICATION ONLY



A	B	C	D	E	F	G	H	I	J
29.24 m	3.294 m	22.65 m	3.294 m	2.327 m	5.26 m	3.753 m	0.5726 m	-	-

Thermoflow, Inc.	Company: Energy International
	User: Jose A. Benitez
	WATER-COOLED CONDENSER
	SIDE ELEVATION
Date: 11/14/09	
Drawing No:	

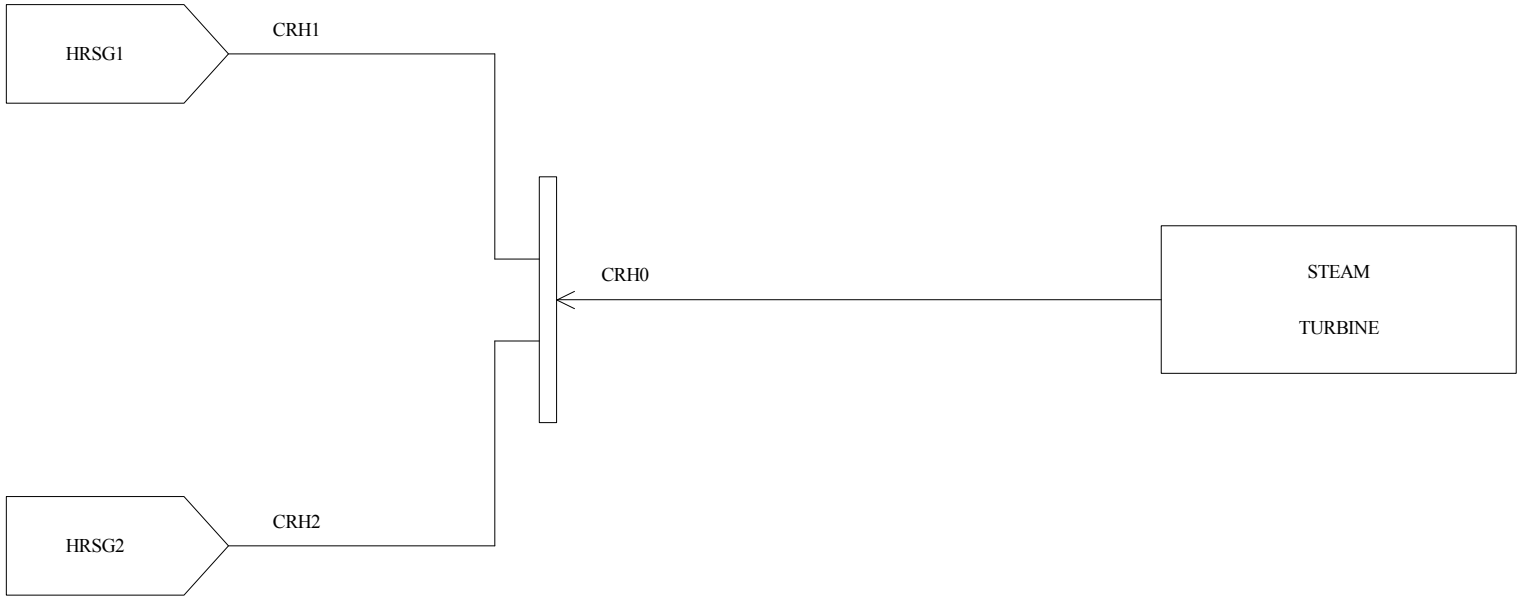
FOR QUALITATIVE INDICATION ONLY



ID & # OFF	DIAMETER	LENGTH	SCHEDULE	MATERIAL	DESIGN P	DESIGN T	DESIGN M
HP1 x 1	406.4	168.3	160	P-91	125.9	568	277.3
HP2 x 1	406.4	168.3	160	P-91	125.9	568	277.3
HP0 x 1	609.6	21.95	160	P-91	125.9	568	554.7
	mm	m			bar	C	t/h

Thermoflow, Inc.	Company: Energy International
	User: Jose A. Benitez
	HP PIPING
	DIAGRAM
Date: 11/14/09	
Drawing No:	

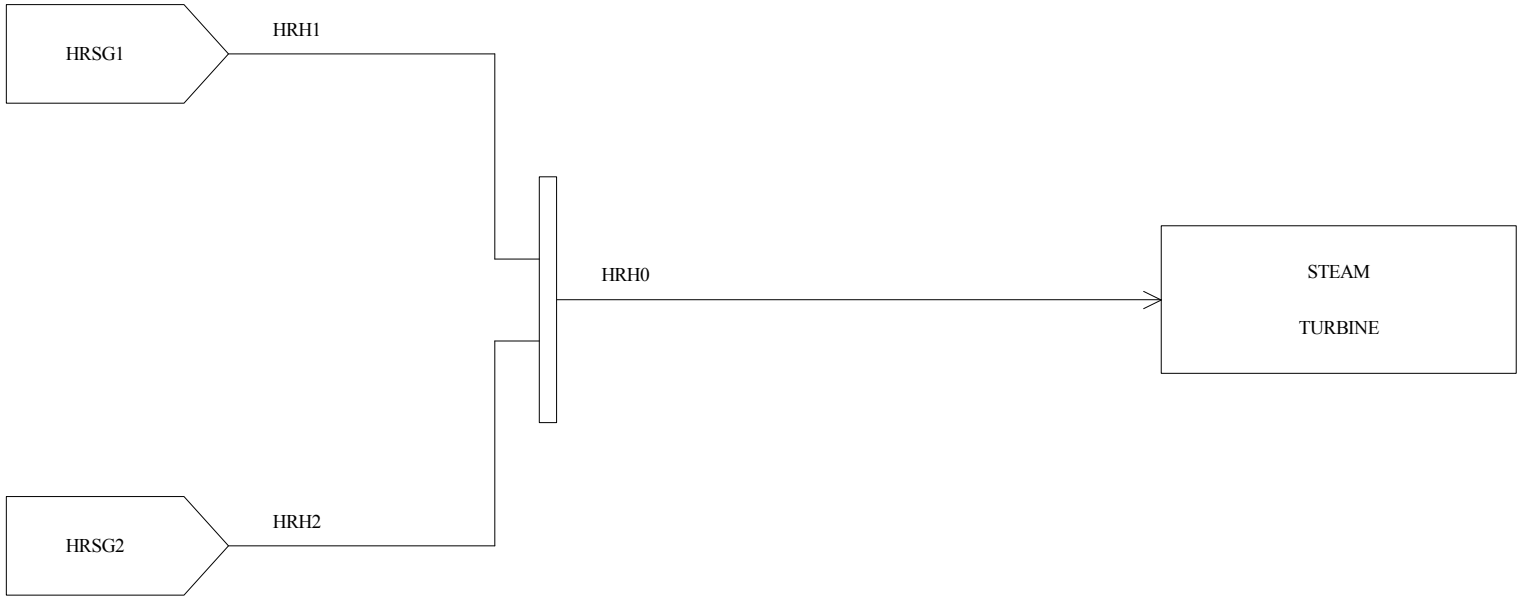
FOR QUALITATIVE INDICATION ONLY



ID & # OFF	DIAMETER	LENGTH	SCHEDULE	MATERIAL	DESIGN P	DESIGN T	DESIGN M
CRH1 x 1	457.2	175.6	40	A-106	31.94	362	270.4
CRH2 x 1	457.2	175.6	40	A-106	31.94	362	270.4
CRH0 x 1	762	21.95	30	A-106	31.94	362	540.8
	mm	m			bar	C	t/h

Thermoflow, Inc.	Company: Energy International
	User: Jose A. Benitez
	COLD REHEAT PIPING
	DIAGRAM
Date: 11/14/09	
Drawing No:	

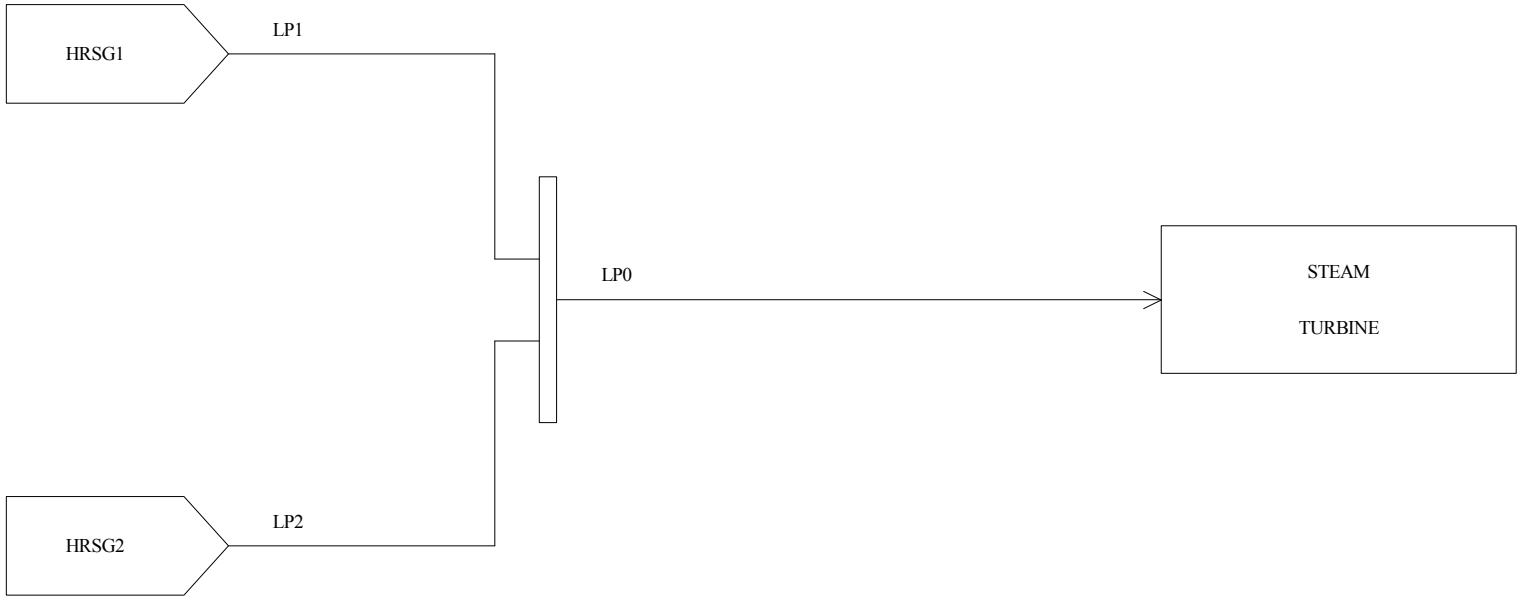
FOR QUALITATIVE INDICATION ONLY



ID & # OFF	DIAMETER	LENGTH	SCHEDULE	MATERIAL	DESIGN P	DESIGN T	DESIGN M
HRH1 x 1	508	168.3	40	P-91	28.7	568	316.4
HRH2 x 1	508	168.3	40	P-91	28.7	568	316.4
HRH0 x 1	914.4	21.95	40	P-91	28.7	568	632.9
	mm	m			bar	C	t/h

Thermoflow, Inc.	Company: Energy International
	User: Jose A. Benitez
	HOT REHEAT PIPING
	DIAGRAM
Date: 11/14/09	
Drawing No:	

FOR QUALITATIVE INDICATION ONLY

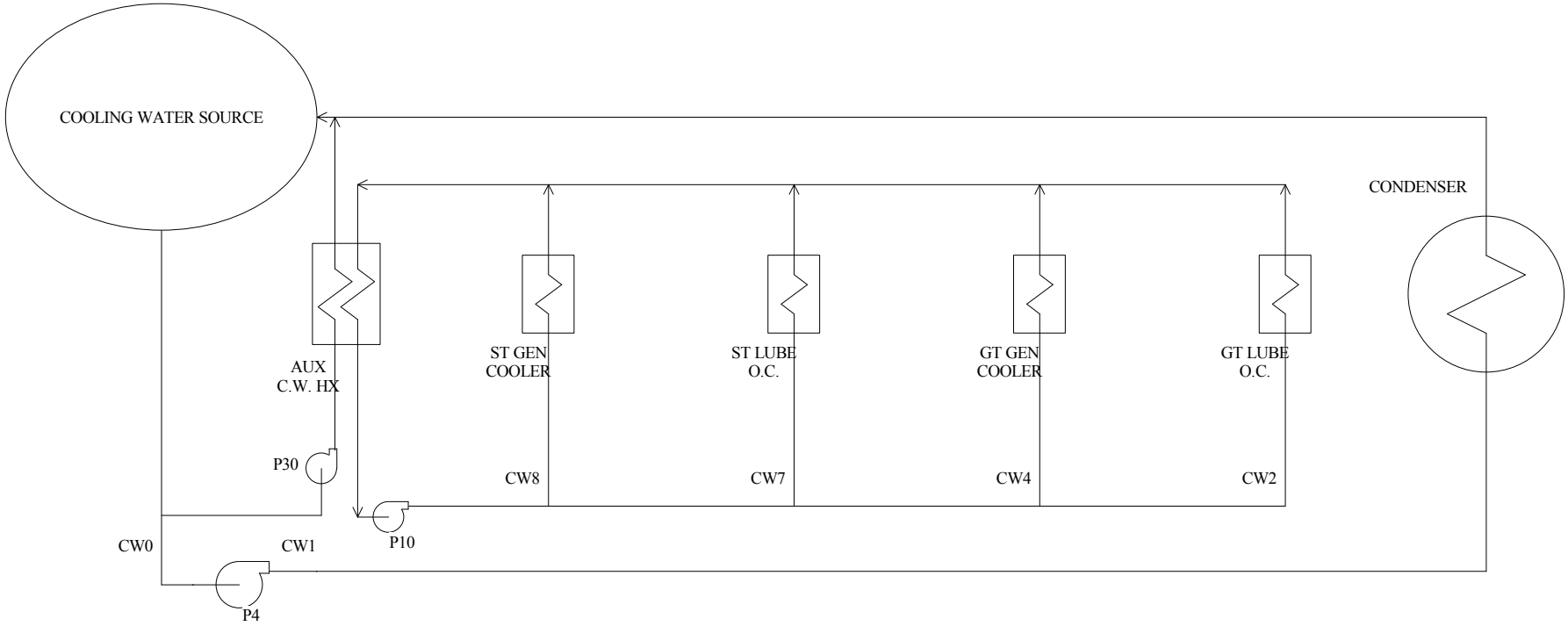


ID & # OFF	DIAMETER	LENGTH	SCHEDULE	MATERIAL	DESIGN P	DESIGN T	DESIGN M
LP1 x 1	457.2	189.9	40	A-106	3.619	290	43.56
LP2 x 1	457.2	189.9	40	A-106	3.619	290	43.56
LP0 x 1	762	21.95	10	A-106	3.619	290	87.1
	mm	m			bar	C	t/h

Thermoflow, Inc.	Company: Energy International
	User: Jose A. Benitez
	LP PIPING
	DIAGRAM
Date: 11/14/09	
Drawing No:	

PEACE/GT PRO 19.0.1 Jose A. Benitez
File = C:\TFLOW19\00_Projects\Pakistan\Karachi 1 x GE 209FA\Karachi_1 x GE 209FA.gtp

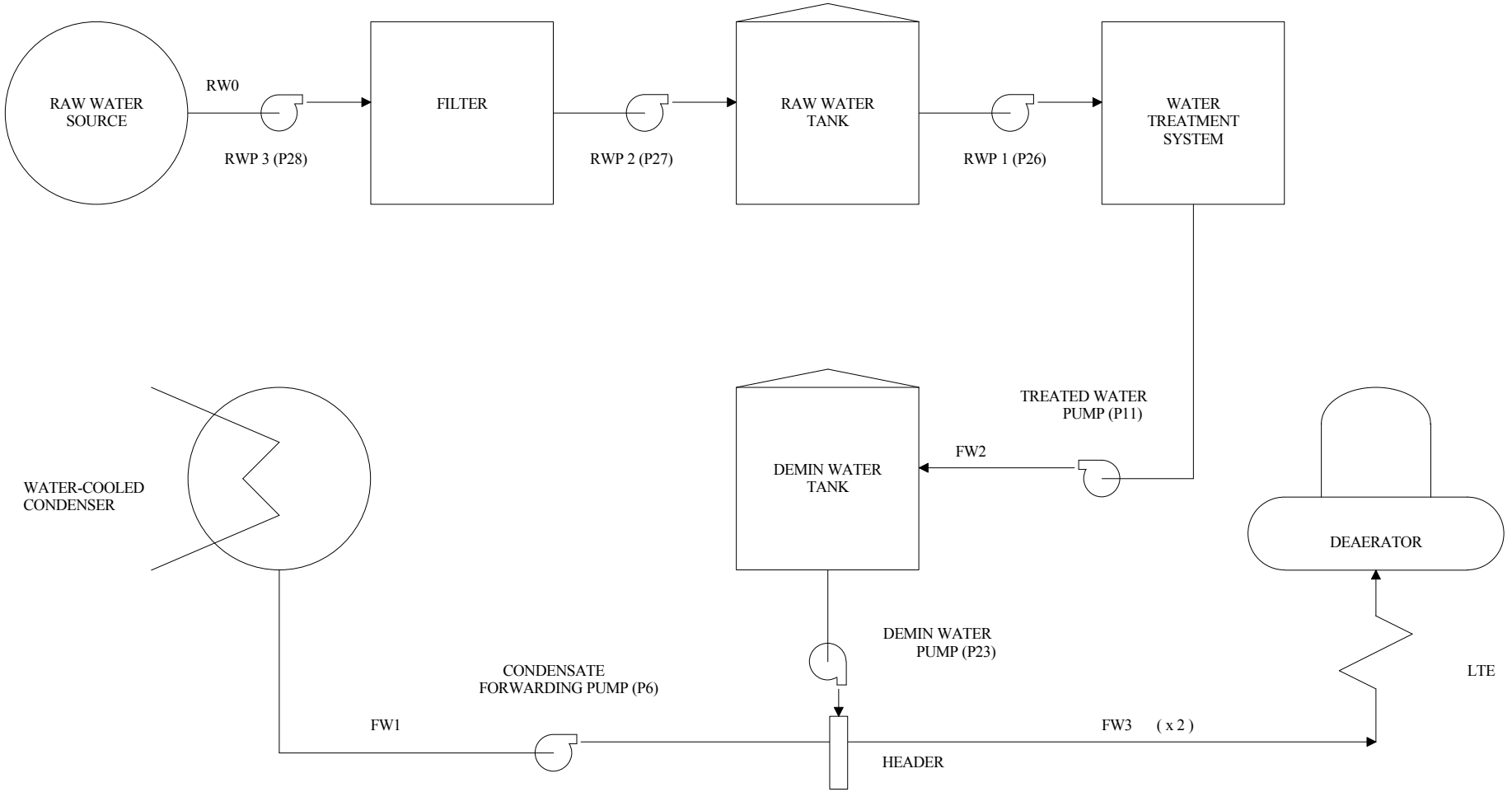
FOR QUALITATIVE INDICATION ONLY



ID & # OFF	DIAMETER	LENGTH	SCHEDULE	MATERIAL	DESIGN P	DESIGN T	DESIGN M	DESIGN Q
CW0 x 1	2133.6	600	50psi	Fiberglass	3.85	36	41818	701242
CW1 x 1	304.8	304.2	40	A-106	6.895	21	966.2	16130
CW2 x 2	203.2	396.2	40	A-106	6.895	21	153.3	2559.8
CW4 x 2	203.2	396.2	40	A-106	6.895	21	169.5	2829.3
CW7 x 1	127	43.59	40	A-106	6.895	21	75.93	1267.6
CW8 x 1	203.2	43.59	40	A-106	6.895	21	244.6	4084
	mm	m			bar	C	t/h	lpm

Thermoflow, Inc.	Company: Energy International
	User: Jose A. Benitez
	COOLING WATER PIPING DIAGRAM
Date: 11/14/09	
Drawing No:	

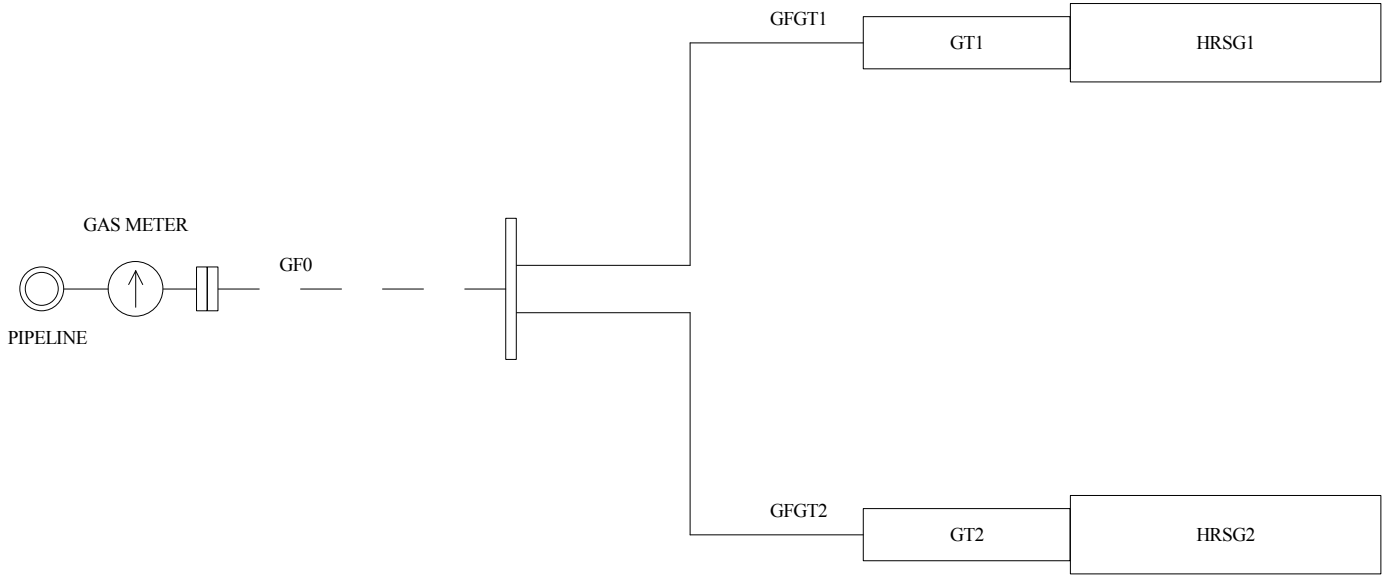
FOR QUALITATIVE INDICATION ONLY



ID & # OFF	DIAMETER	LENGTH	SCHEDULE	MATERIAL	DESIGN P	DESIGN T	DESIGN M	DESIGN Q
RW0 x 1	88.9	502.8	40	A-106	12.07	21	41.68	695.7
FW1 x 1	355.6	221.3	20	A-106	8.278	39	724.3	12157
FW2 x 1	88.9	157.6	40	TP316	8.278	21	41.68	695.8
FW3 x 2	254	192	40	TP316	6.895	132	366.2	6539
	mm	m			bar	C	t/h	lpm

Thermoflow, Inc.	Company: Energy International
	User: Jose A. Benitez
	FEEDWATER PIPING DIAGRAM
Date: 11/14/09	
Drawing No:	

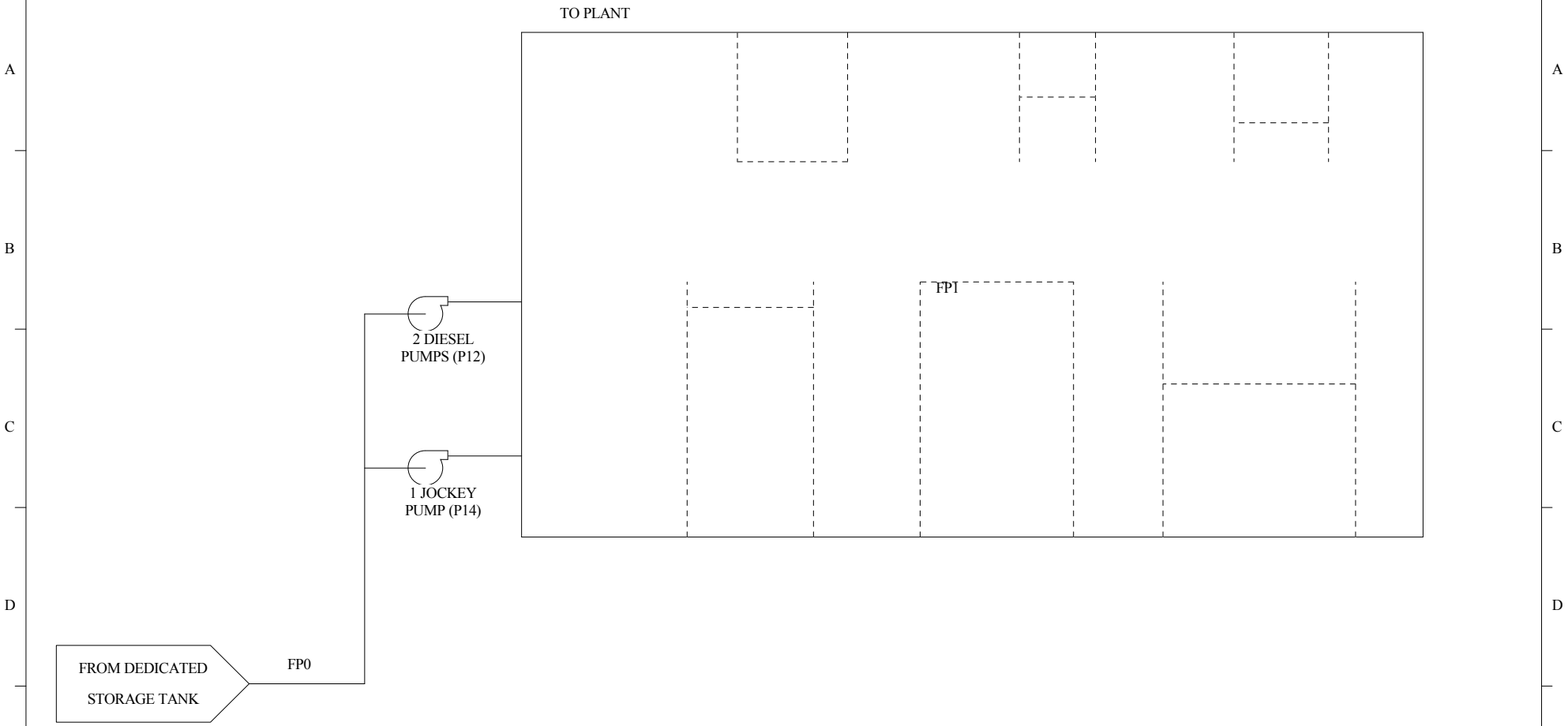
FOR QUALITATIVE INDICATION ONLY



ID & # OFF	DIAMETER	LENGTH	SCHEDULE	MATERIAL	DESIGN P	DESIGN T	DESIGN M	DESIGN Q
GF0 x 1	304.8	304.2	40	A-106	26.42	25	94.37	143909
GFGT1 x 1	203.2	143.3	40	TP316	29.06	25	47.18	71955
GFGT2 x 1	203.2	143.3	40	TP316	29.06	25	47.18	71955
	mm	m			bar	C	t/h	m³/hr

Thermoflow, Inc.	Company: Energy International
	User: Jose A. Benitez
	GAS FUEL PIPING
	DIAGRAM
Date: 11/14/09	
Drawing No:	

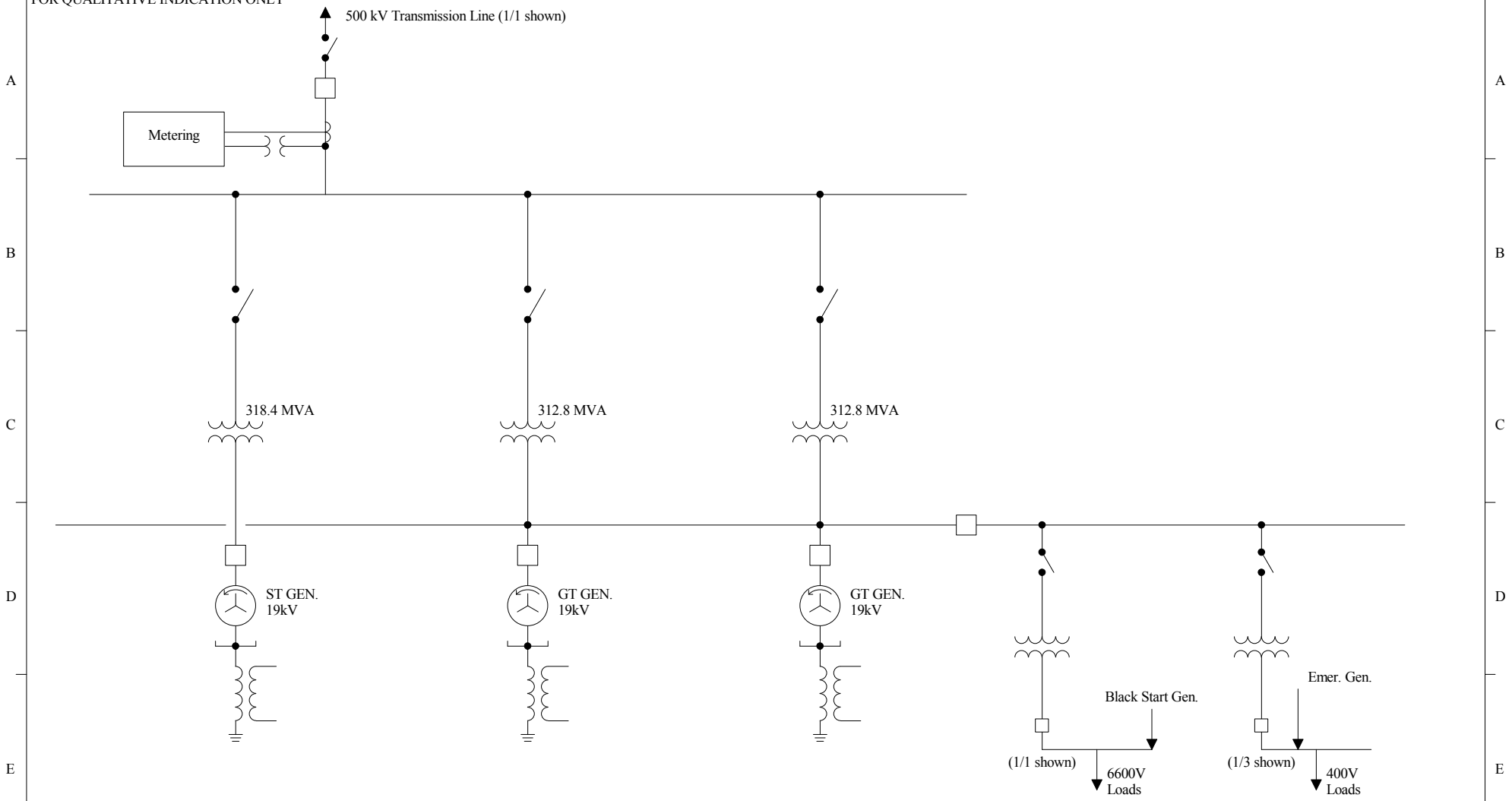
FOR QUALITATIVE INDICATION ONLY



ID & # OFF	DIAMETER	LENGTH	SCHEDULE	MATERIAL	DESIGN P	DESIGN T	DESIGN M	DESIGN Q
FP0 x 1	152.4	532.5	350psi	Ductile iron	6.895	15	681.1	11356
FP1 x 1	152.4	532.5	350psi	Ductile iron	6.895	15	340.5	5678
	mm	m			bar	C	t/h	lpm

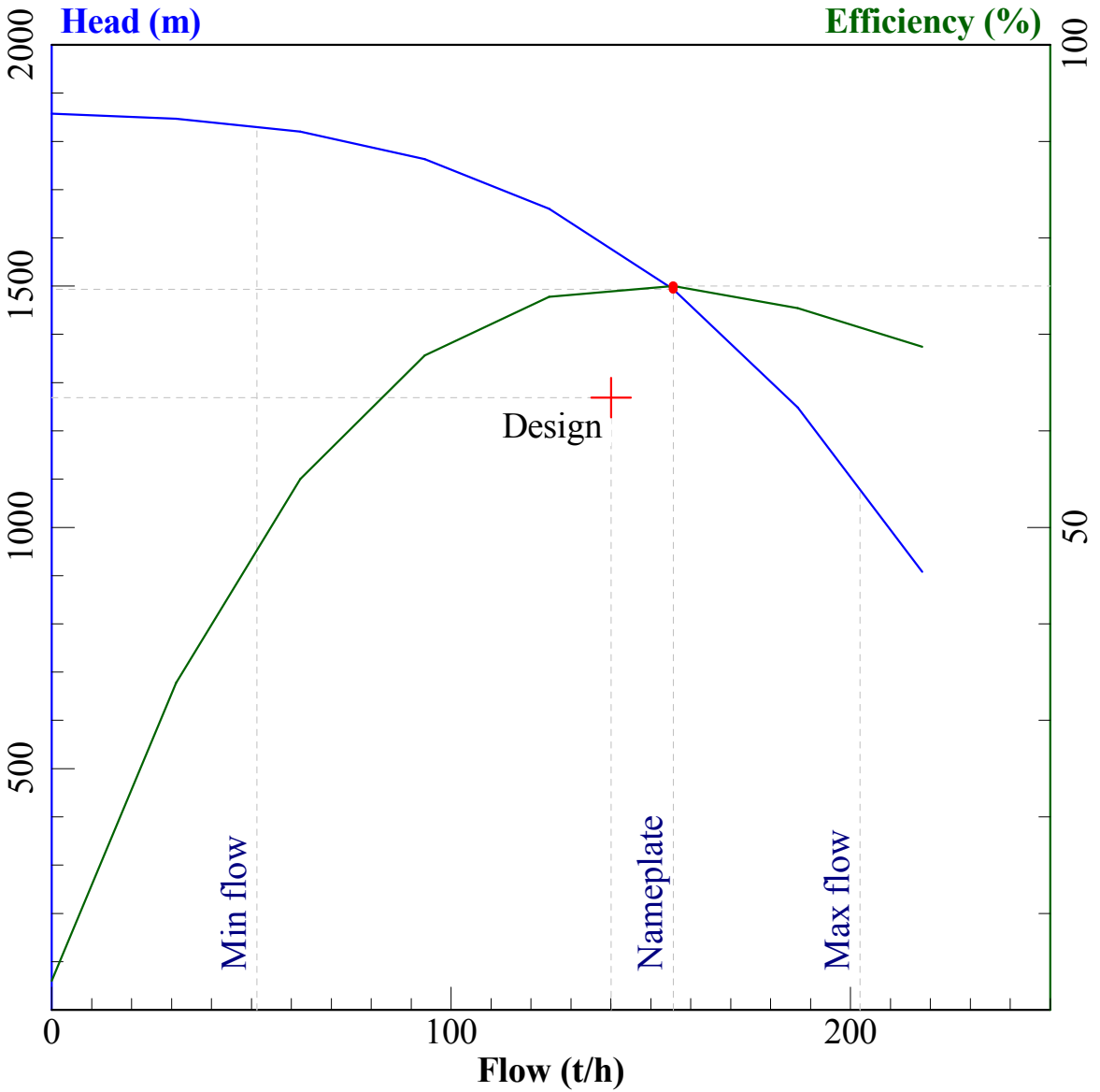
Thermoflow, Inc.	Company: Energy International
	User: Jose A. Benitez
	FIRE PROTECTION PIPING
	DIAGRAM
Date: 11/14/09	
Drawing No:	

FOR QUALITATIVE INDICATION ONLY



Thermoflow, Inc.	Company: Energy International
	User: Jose A. Benitez
	ELECTRICAL ONE-LINE DIAGRAM
Date: 11/14/09	
Drawing No:	

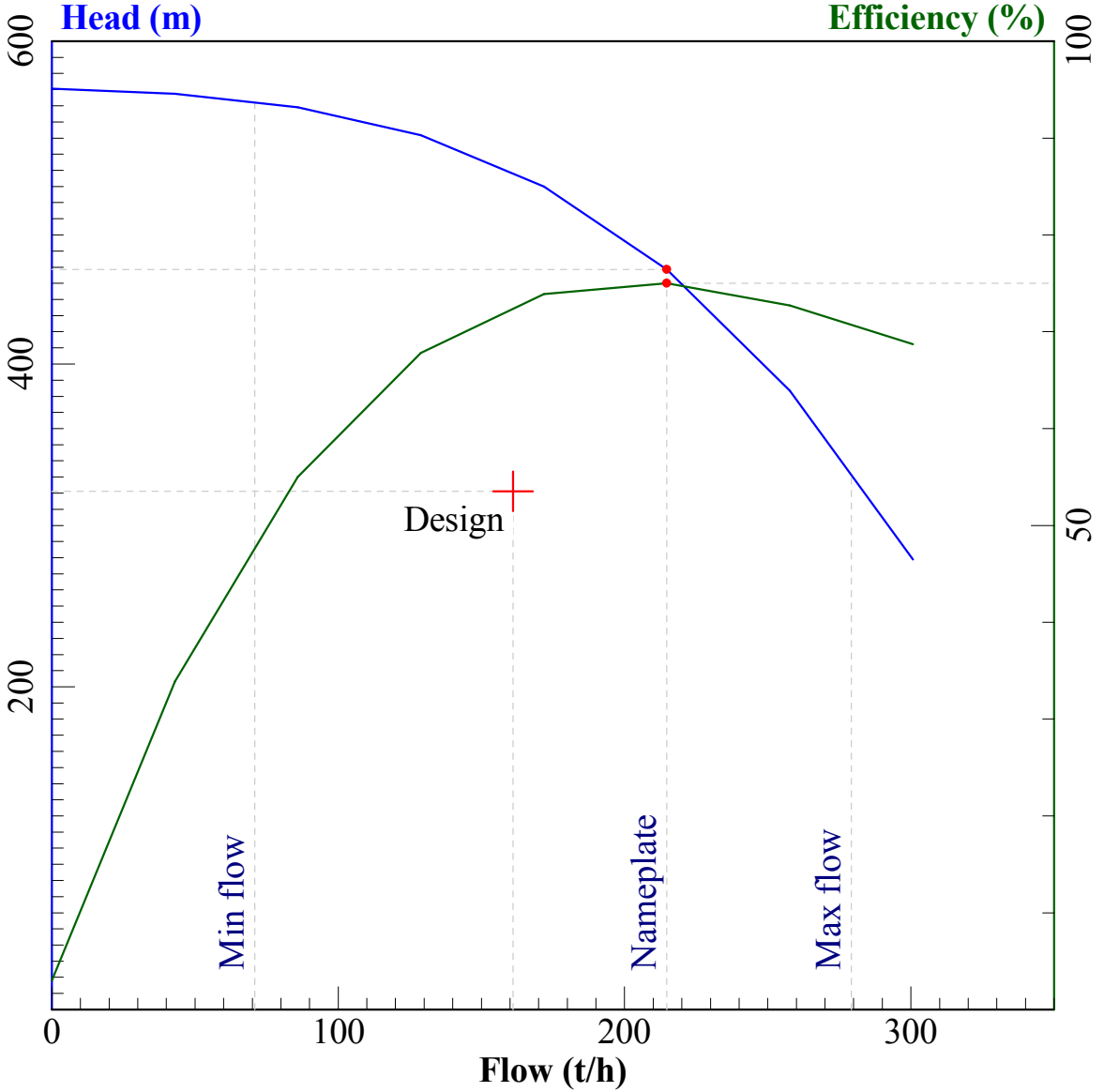
HP Feedwater Pump (P1)



No. per HRSG	3
No. operating per HRSG	2
Nameplate flow	155.7 t/h
Nameplate head	1493 m
Nameplate flow (nominal)	3407 lpm
Nameplate head (nominal)	1524 m
Nameplate RPM	3000
Design flow	140.1 t/h
Design head	1269.1 m
Design RPM	3000
Minimum continuous flow	51.37 t/h
Maximum continuous flow	202.3 t/h

Thermoflow, Inc.	Company: Energy International
	User: Jose A. Benitez
	HP Feedwater Pump (P1)
Date: 11/14/09	
Drawing No:	

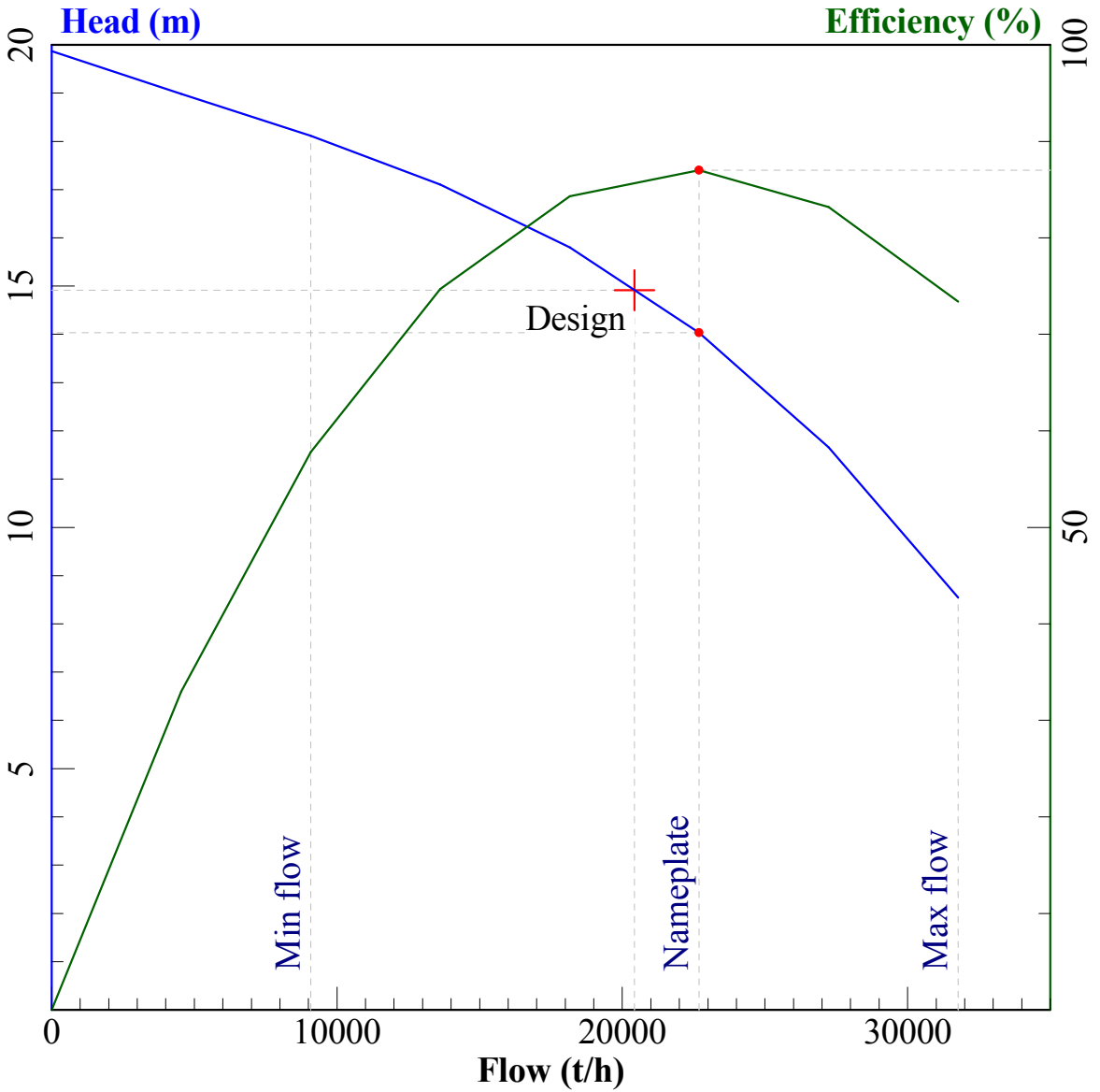
IP Feedwater Pump (P2)



No. per HRSG	3
No. operating per HRSG	2
Nameplate flow	214.8 t/h
Nameplate head	458.7 m
Nameplate flow (nominal)	4164 lpm
Nameplate head (nominal)	487.7 m
Nameplate RPM	3000
Design flow	161.1 t/h
Design head	321.1 m
Design RPM	3000
Minimum continuous flow	70.87 t/h
Maximum continuous flow	279.2 t/h

Thermoflow, Inc.	Company: Energy International
	User: Jose A. Benitez
	IP Feedwater Pump (P2)
Date: 11/14/09	
Drawing No:	

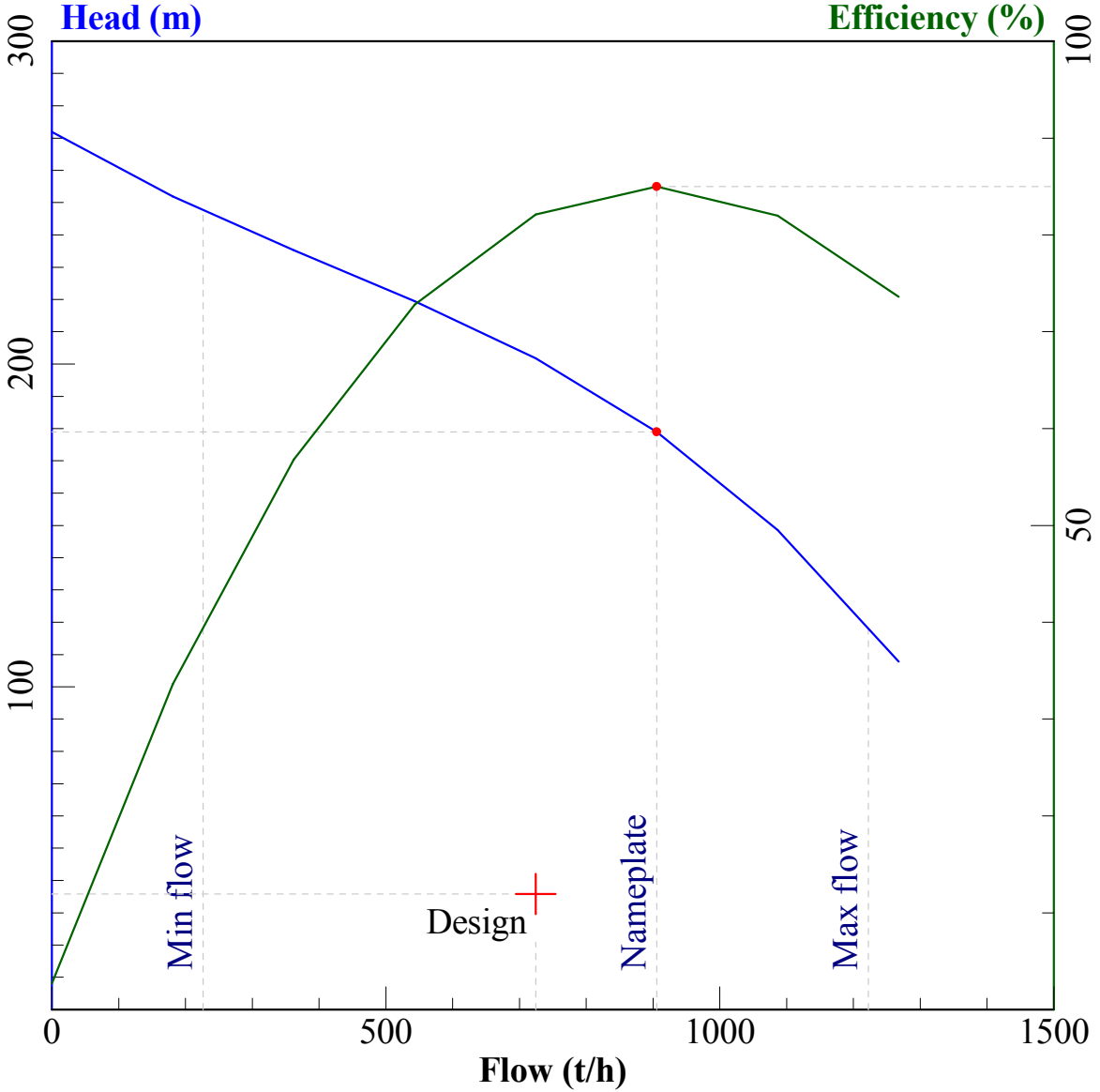
Condenser C.W. Pump (P4)



No. per Condenser	2
No. operating per Condenser	2
Nameplate flow	22695 t/h
Nameplate head	14.03 m
Nameplate flow (nominal)	382327 lpm
Nameplate head (nominal)	15.24 m
Nameplate RPM	500
Design flow	20426 t/h
Design head	14.92 m
Design RPM	500
Minimum continuous flow	9078 t/h
Maximum continuous flow	31774 t/h

Thermoflow, Inc.	Company: Energy International
	User: Jose A. Benitez
	Condenser C.W. Pump (P4)
Date: 11/14/09	
Drawing No:	

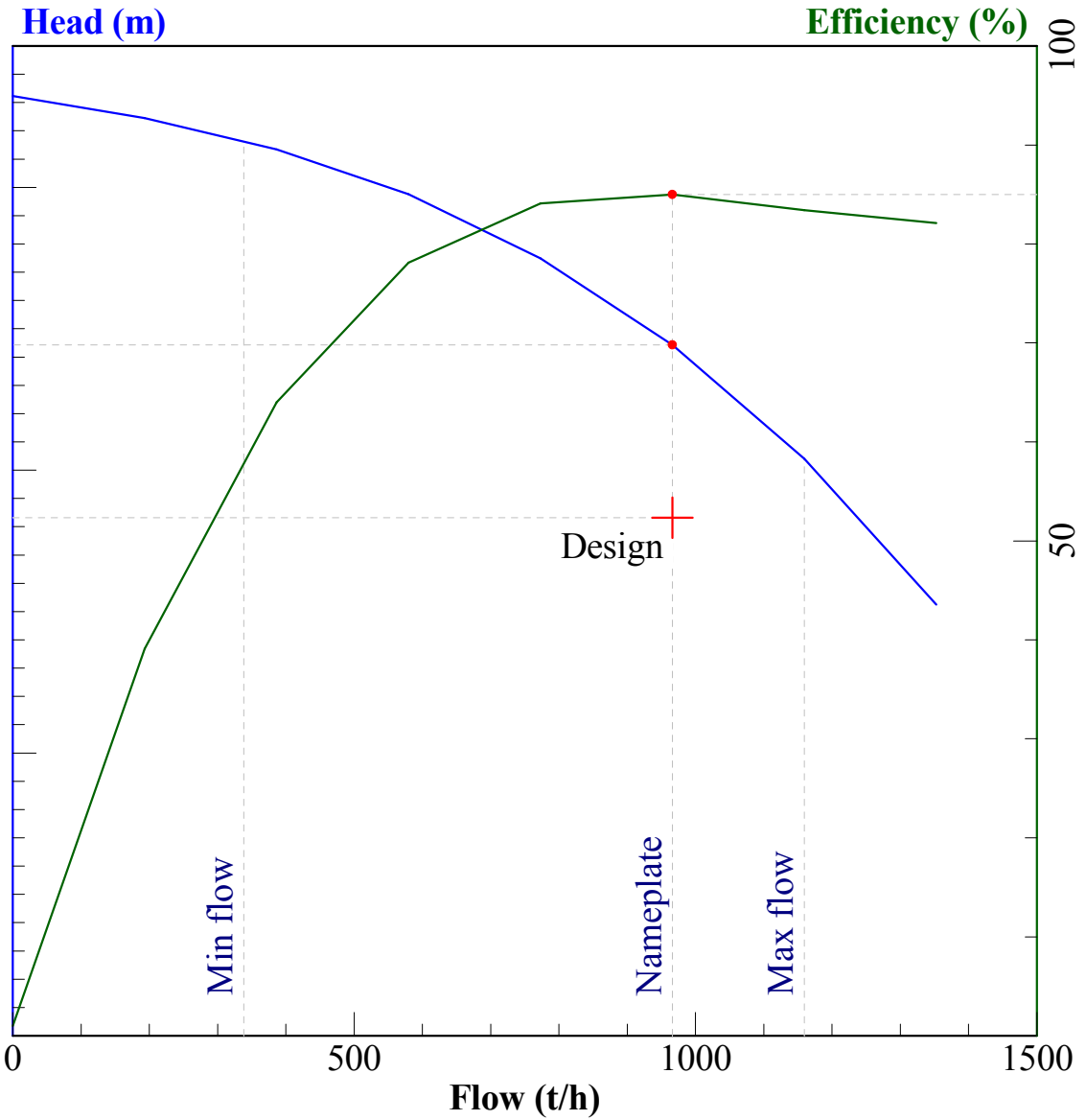
Condensate Forwarding Pump (P6)



No. per Condenser	2
No. operating per Condenser	1
Nameplate flow	905.3 t/h
Nameplate head	179 m
Nameplate flow (nominal)	15142 lpm
Nameplate head (nominal)	182.9 m
Nameplate RPM	1500
Design flow	724.3 t/h
Design head	35.8 m
Design RPM	1500
Minimum continuous flow	226.3 t/h
Maximum continuous flow	1222.2 t/h

Thermoflow, Inc.	Company: Energy International
	User: Jose A. Benitez
	Condensate Forwarding Pump (P6)
Date: 11/14/09	
Drawing No:	

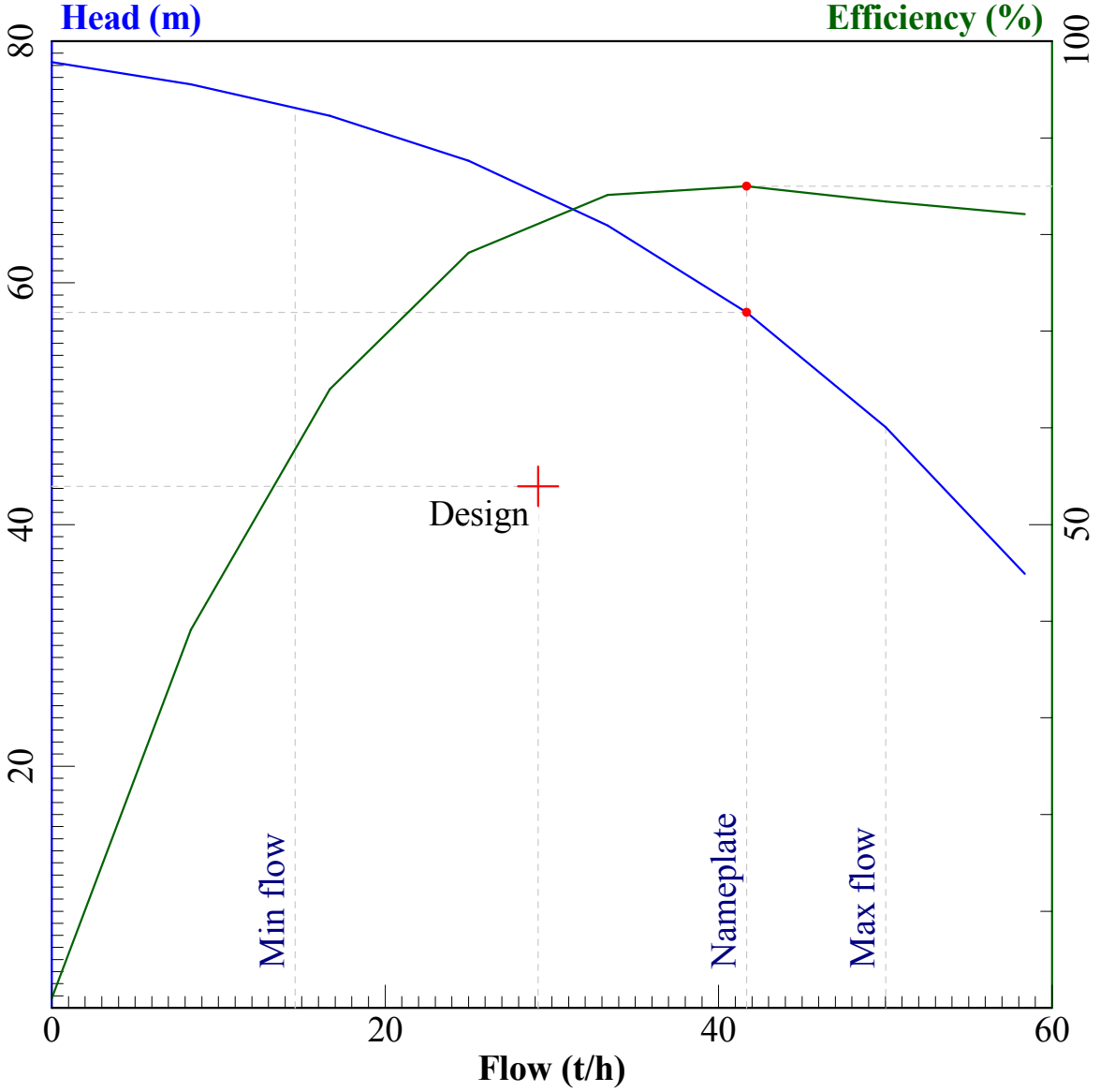
Aux Cooling Water Pump (closed loop) (P10)



No. per Plant	2
No. operating per Plant	1
Nameplate flow	966.2 t/h
Nameplate head	24.43 m
Nameplate flow (nominal)	17034 lpm
Nameplate head (nominal)	27.43 m
Nameplate RPM	1000
Design flow	966.2 t/h
Design head	18.32 m
Design RPM	1000
Minimum continuous flow	338.2 t/h
Maximum continuous flow	1159.4 t/h

Thermoflow, Inc.	Company: Energy International
	User: Jose A. Benitez
	Aux Cooling Water Pump (closed loop) (P10)
Date: 11/14/09	
Drawing No:	

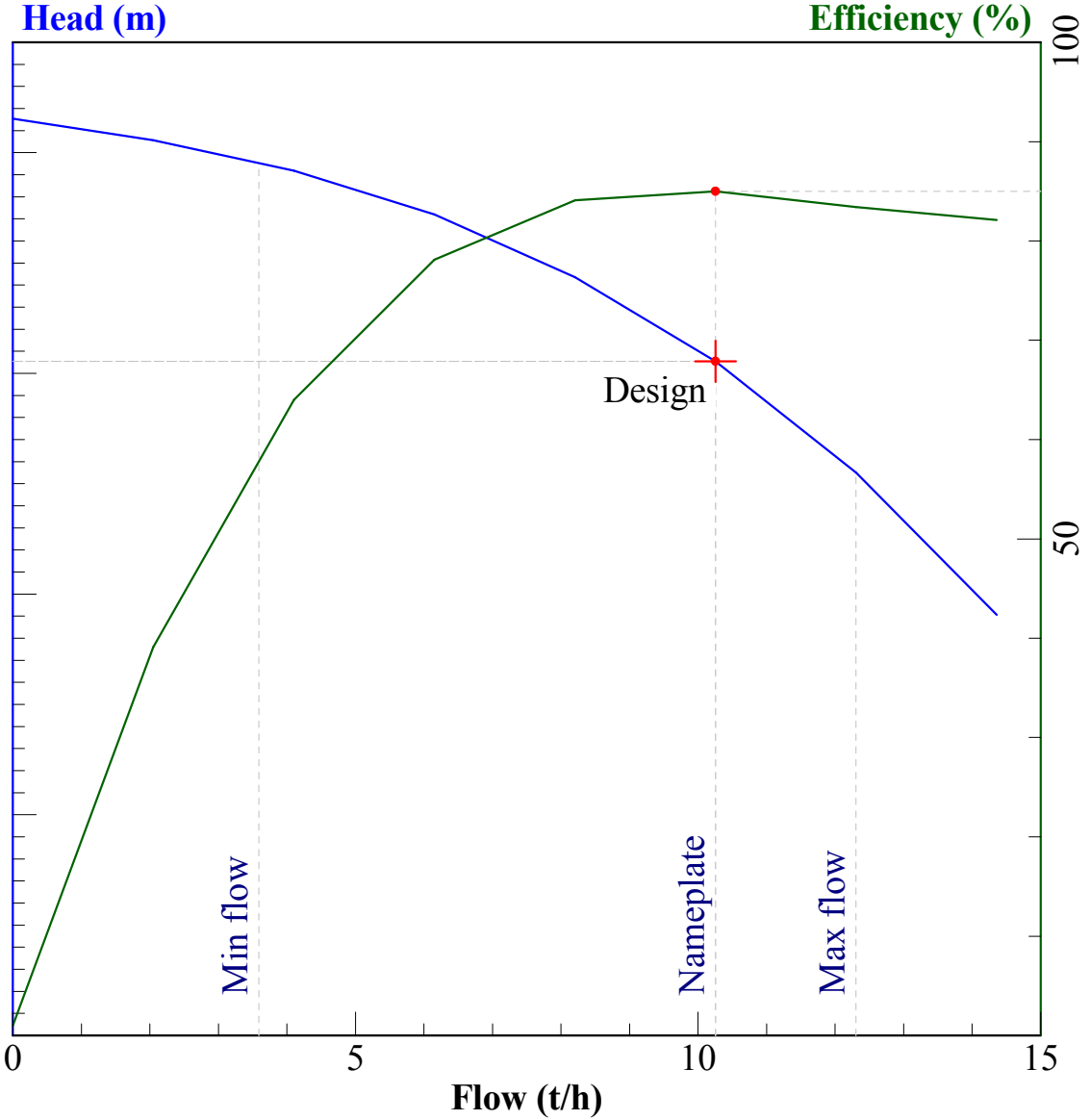
Treated Water Pump (P11)



No. per Plant	1
No. operating per Plant	1
Nameplate flow	41.68 t/h
Nameplate head	57.55 m
Nameplate flow (nominal)	757.1 lpm
Nameplate head (nominal)	60.96 m
Nameplate RPM	3000
Design flow	29.18 t/h
Design head	43.16 m
Design RPM	3000
Minimum continuous flow	14.59 t/h
Maximum continuous flow	50.02 t/h

Thermoflow, Inc.	Company: Energy International
	User: Jose A. Benitez
	Treated Water Pump (P11)
Date: 11/14/09	
Drawing No:	

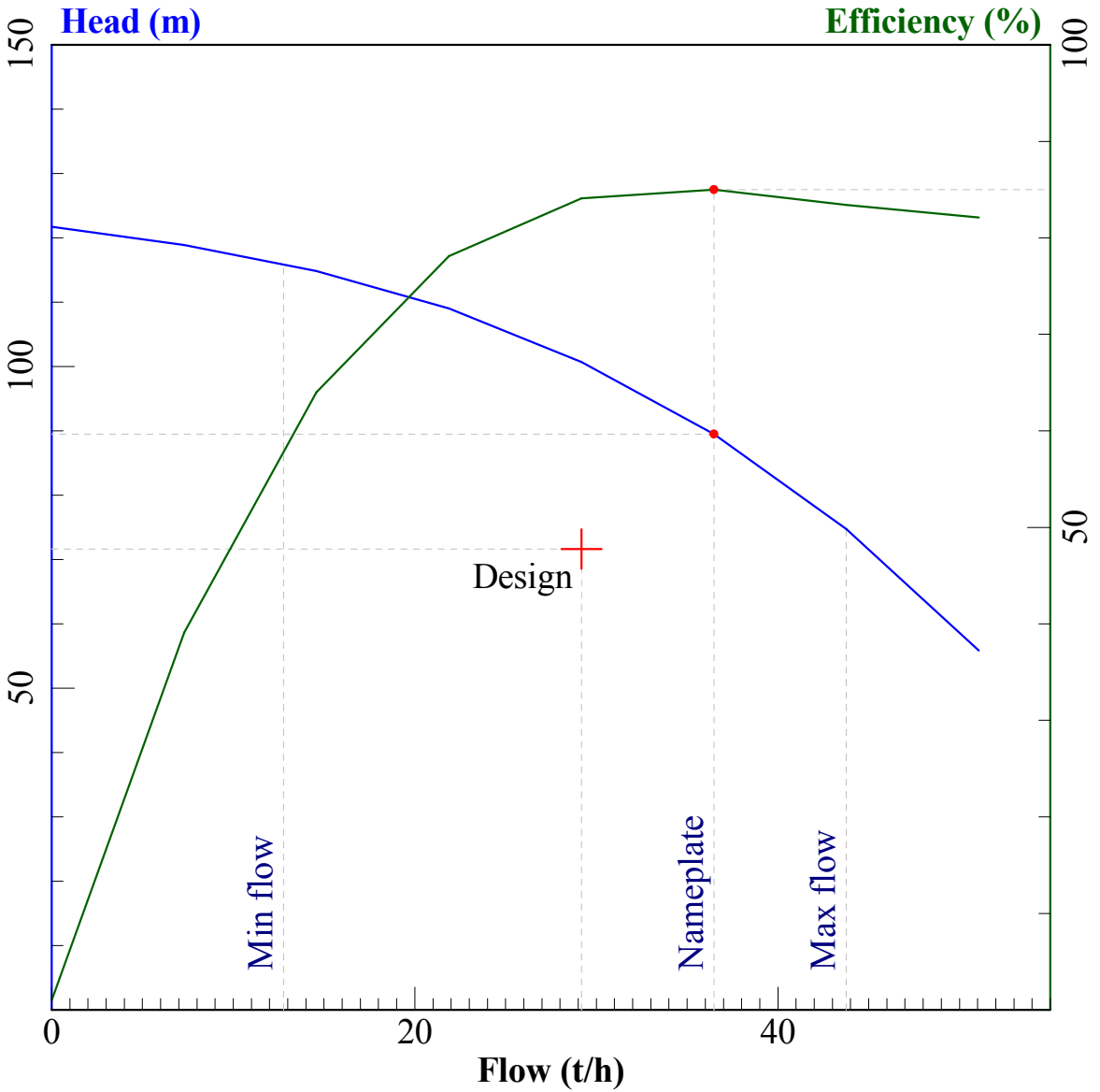
Jockey Fire Pump (P14)



No. per Plant	1
No. operating per Plant	1
Nameplate flow	10.25 t/h
Nameplate head	30.54 m
Nameplate flow (nominal)	170.3 lpm
Nameplate head (nominal)	38.1 m
Nameplate RPM	3000
Design flow	10.25 t/h
Design head	30.54 m
Design RPM	3000
Minimum continuous flow	3.589 t/h
Maximum continuous flow	12.31 t/h

Thermoflow, Inc.	Company: Energy International
	User: Jose A. Benitez
	Jockey Fire Pump (P14)
Date: 11/14/09	
Drawing No:	

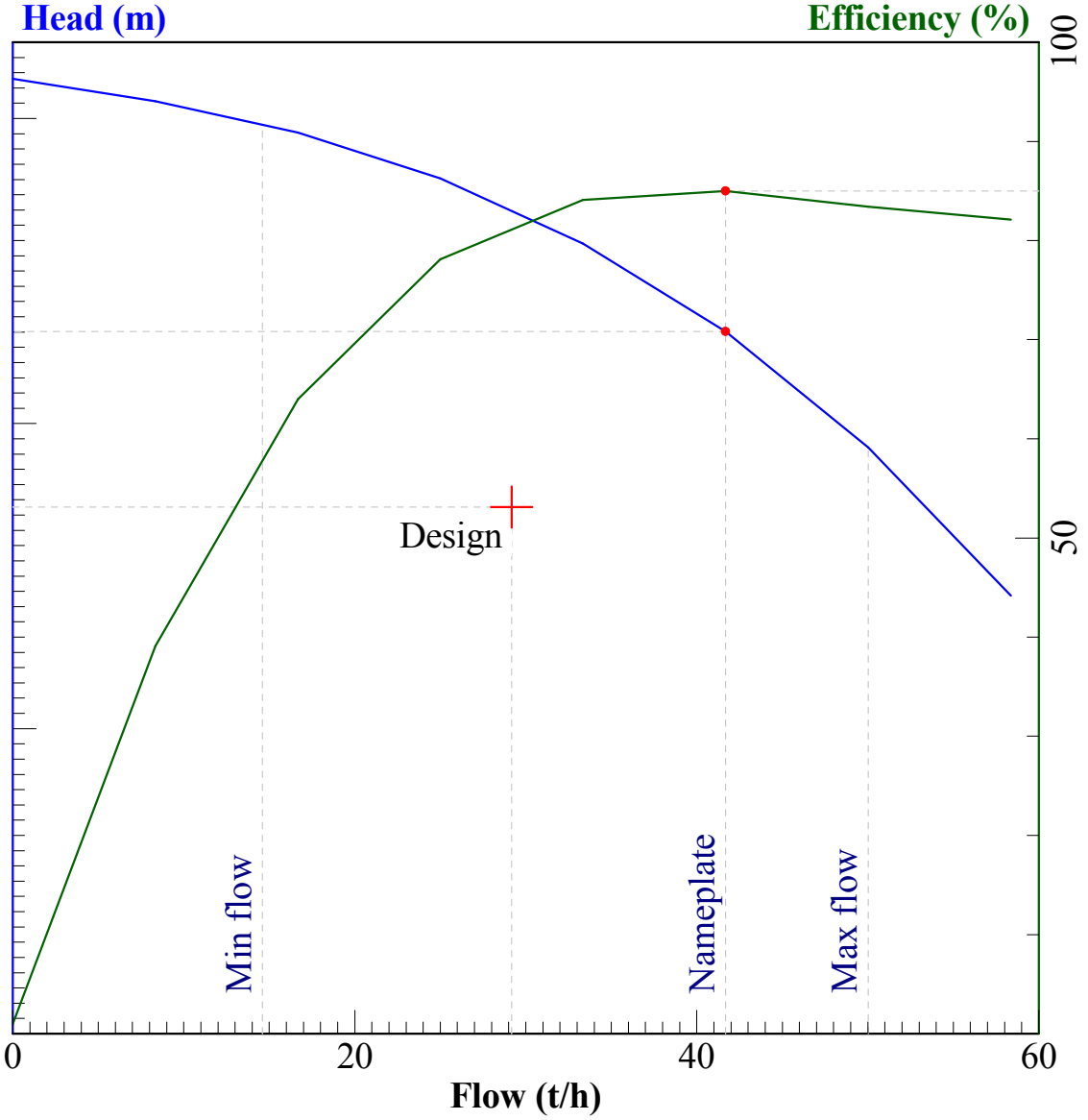
Demin Water Pump (P23)



No. per Plant	2
No. operating per Plant	1
Nameplate flow	36.47 t/h
Nameplate head	89.51 m
Nameplate flow (nominal)	662.4 lpm
Nameplate head (nominal)	91.44 m
Nameplate RPM	3000
Design flow	29.18 t/h
Design head	71.61 m
Design RPM	3000
Minimum continuous flow	12.77 t/h
Maximum continuous flow	43.77 t/h

Thermoflow, Inc.	Company: Energy International
	User: Jose A. Benitez
	Demin Water Pump (P23)
Date: 11/14/09	
Drawing No:	

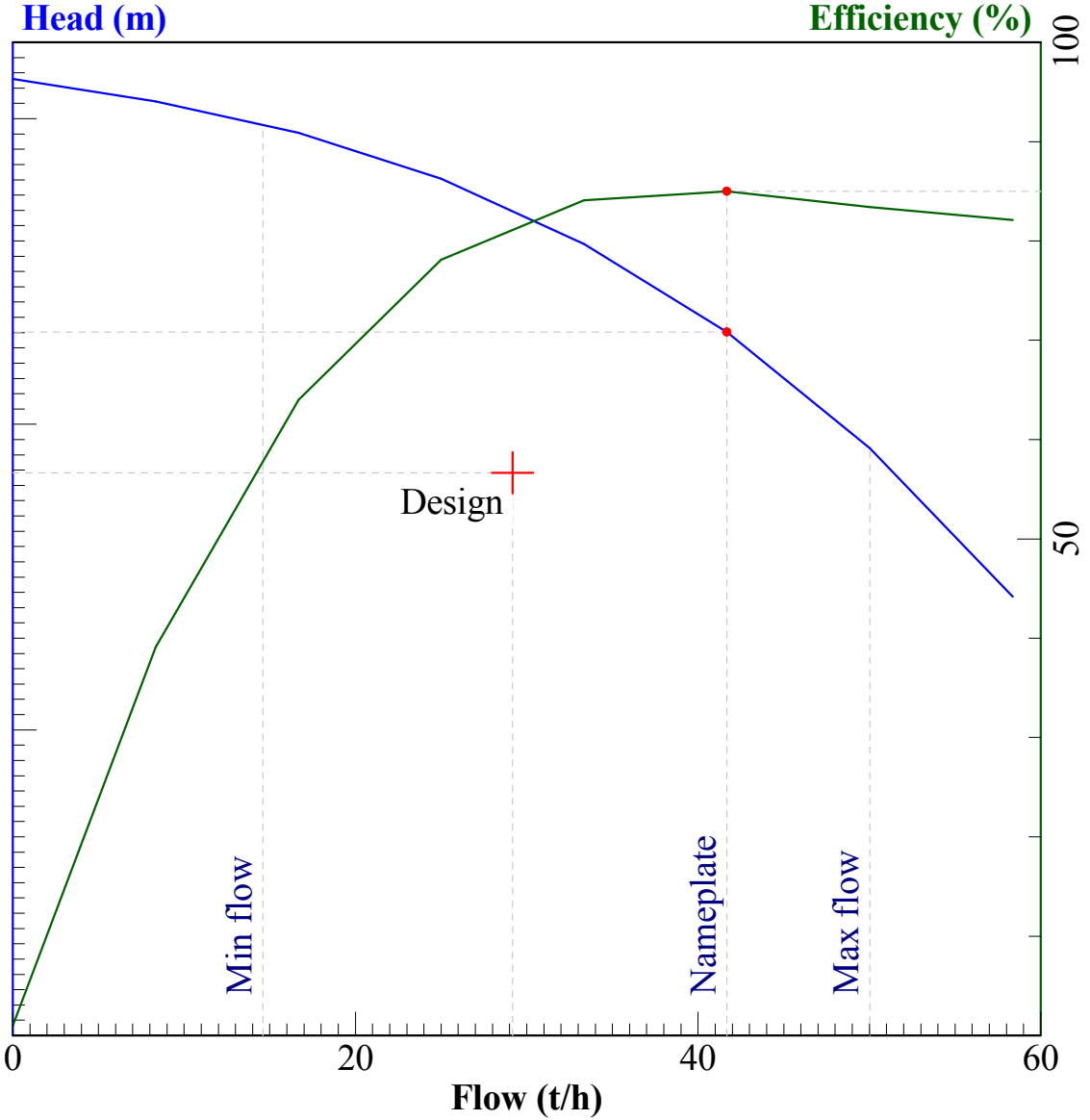
Raw Water Pump 1 (P26)



No. per Plant	1
No. operating per Plant	1
Nameplate flow	41.68 t/h
Nameplate head	46.04 m
Nameplate flow (nominal)	757.1 lpm
Nameplate head (nominal)	53.34 m
Nameplate RPM	3000
Design flow	29.18 t/h
Design head	34.53 m
Design RPM	3000
Minimum continuous flow	14.59 t/h
Maximum continuous flow	50.02 t/h

Thermoflow, Inc.	Company: Energy International
	User: Jose A. Benitez
	Raw Water Pump 1 (P26)
Date: 11/14/09	
Drawing No:	

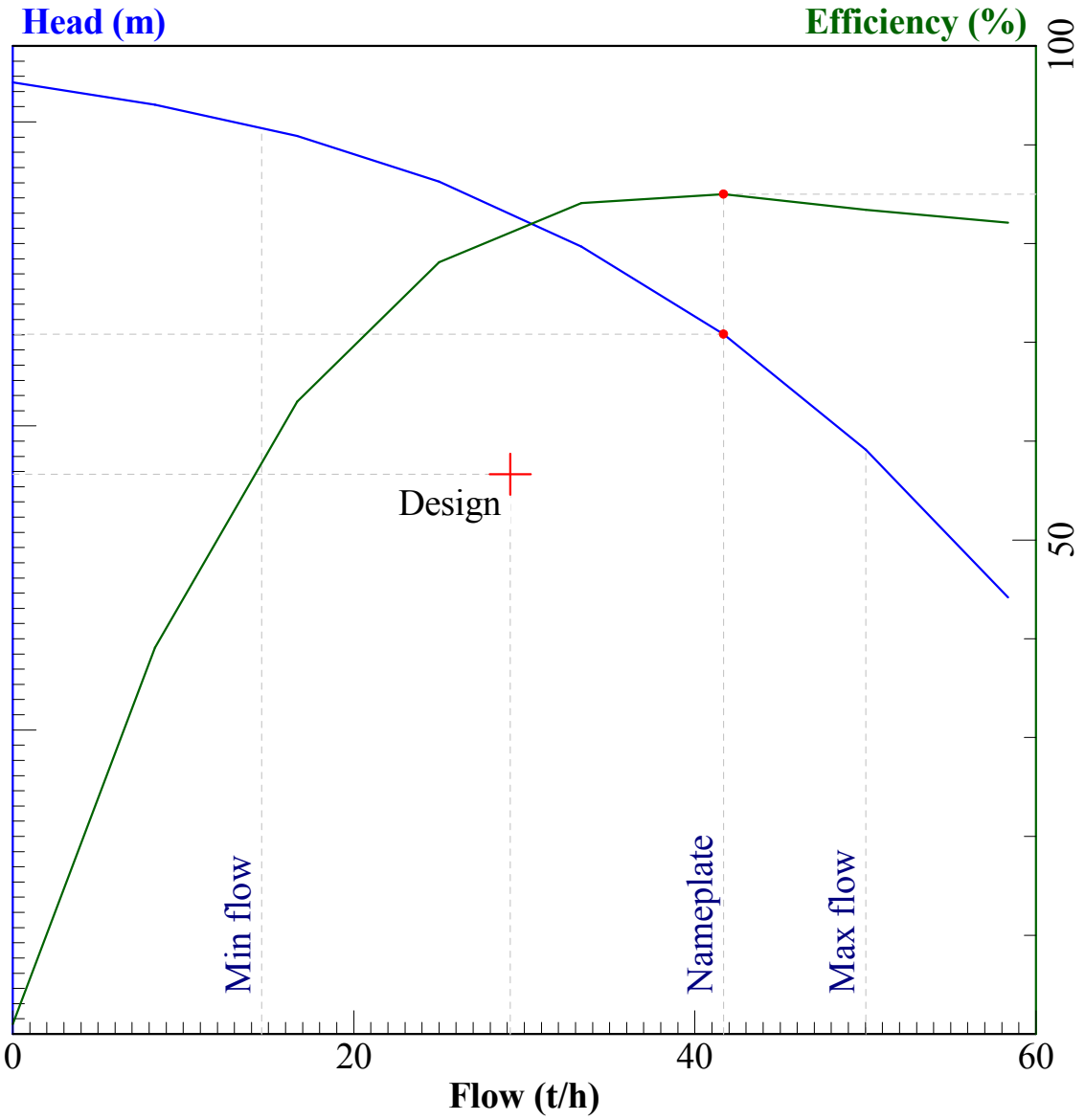
Raw Water Pump 2 (P27)



No. per Plant	1
No. operating per Plant	1
Nameplate flow	41.68 t/h
Nameplate head	46.04 m
Nameplate flow (nominal)	757.1 lpm
Nameplate head (nominal)	53.34 m
Nameplate RPM	3000
Design flow	29.18 t/h
Design head	36.83 m
Design RPM	3000
Minimum continuous flow	14.59 t/h
Maximum continuous flow	50.02 t/h

Thermoflow, Inc.	Company: Energy International
	User: Jose A. Benitez
	Raw Water Pump 2 (P27)
Date: 11/14/09	
Drawing No:	

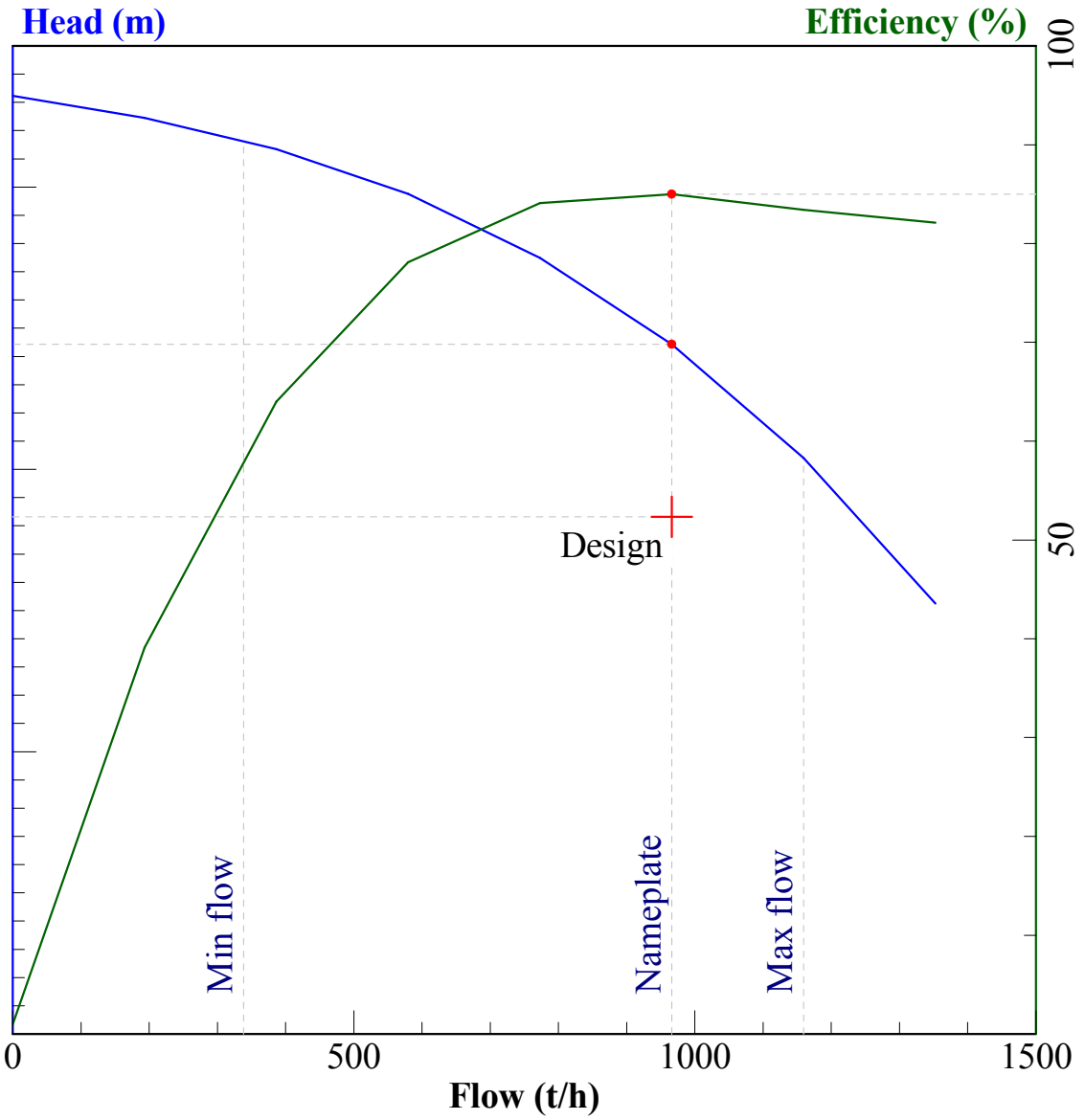
Raw Water Pump 3 (P28)



No. per Plant	1
No. operating per Plant	1
Nameplate flow	41.68 t/h
Nameplate head	46.04 m
Nameplate flow (nominal)	757.1 lpm
Nameplate head (nominal)	53.34 m
Nameplate RPM	3000
Design flow	29.18 t/h
Design head	36.83 m
Design RPM	3000
Minimum continuous flow	14.59 t/h
Maximum continuous flow	50.02 t/h

Thermoflow, Inc.	Company: Energy International
	User: Jose A. Benitez
	Raw Water Pump 3 (P28)
Date: 11/14/09	
Drawing No:	

Aux Cooling Water Pump (open loop) (P30)



No. per Plant	2
No. operating per Plant	1
Nameplate flow	966.2 t/h
Nameplate head	24.43 m
Nameplate flow (nominal)	17034 lpm
Nameplate head (nominal)	27.43 m
Nameplate RPM	1000
Design flow	966.2 t/h
Design head	18.32 m
Design RPM	1000
Minimum continuous flow	338.2 t/h
Maximum continuous flow	1159.4 t/h

Thermoflow, Inc.	Company: Energy International
	User: Jose A. Benitez
	Aux Cooling Water Pump (open loop) (P30)
Date: 11/14/09	
Drawing No:	

Estimated Gas Turbine Data

Estimated Gas Turbine Data		
Number of units	2	
All quantities displayed on a per unit basis		
1. Nominal Gas Turbine Description & Performance Data (per unit)		
Model	GE 9351FA	
Dry Low NOx Combustion System is Available	Yes	
Engine Specification is Currently Offered New from Manufacturer	Yes	
Generator Output	260700	kW
LHV Heat Rate @ Generator Terminals	9674	kJ/kWh
LHV Efficiency @ Generator Terminals	37.21	%
Compressor Inlet Airflow	2354.7	t/h
Exhaust Temperature	600	C
Firing Temperature	1326.7	C
Compressor Pressure Ratio	15.8	
Number of Shafts	1	
Engine Output Shaft Speed	3,000	RPM
Engine Output Shaft Drives Through a Gear Box	No	
Generator Efficiency	98.6	%
Gas Turbine Package Price, Reference basis	71,542,000	USD
2. Site Specific Gas Turbine Performance Data (per unit)		
Generator Output	237332	kW
LHV Heat Rate @ Generator Terminals	9909	kJ/kWh
LHV Efficiency @ Generator Terminals	36.33	%
Compressor Inlet Airflow	2208.8	t/h
Exhaust Temperature	617	C
Estimated Firing Temperature	1325.4	C
Compressor Pressure Ratio	15.01	
Site Performance Data Computed Burning	Gas Fuel	
Site Performance Data Computed with Inlet Loss	10	millibar
Site Performance Data Computed with Exhaust Loss	31.97	millibar
3. Estimated Gas Turbine System Weights & Dimensions (per unit)		
Engine Weight	243,150	kg
Generator Weight	276,250	kg
Inlet Filter Housing & Ductwork Weight	87,100	kg
Genset Foundation Length	35.05	m
Genset Foundation Width	9.144	m

Estimated HRSG Data

Estimated HRSG Data		
Number of Units	2	
Displayed quantities in this table are on a per unit basis		
1. HRSG System Summary		
Overall Length	59.6	m
Overall Width	11.1	m
Overall Height	21.9	m
Overall Weight:		
- Round to Square	64,200	kg
- Bypass Duct, Stack, and Damper	317,050	kg
- Inlet Transition Duct	166,700	kg
- Main HRSG Section	2,063,000	kg
Total Weight (dry)	2,611,000	kg
Total Weight (wet)	2,786,000	kg
Overall heat transfer surface area	195096	m^2
- Economiser	89222	m^2
- Evaporator	76158	m^2
- Superheater	29717	m^2
Total number of tubes	9,080	
Total HRSG Cost, Reference Basis	27,460,000	USD
Includes:		
- Main Stack	1,142,000	USD
- Bypass Stack & Damper	4,227,000	USD
- Deaerator		
2. GT-to-Ductwork Transition		
Length	11.7	m
Weight	64,200	kg
Height	7.8	m
3. Bypass Duct, Stack, and Damper		
Duct Length	9.4	m
Duct Width	7.8	m
Duct Height	7.8	m
Weight	317,050	kg
- Bypass Stack & Damper	259,500	kg
- Duct Structure & Skin	57,550	kg
Bypass Stack & Damper:		
- Diameter	6.6	m
- Height	40.2	m
- Thickness	9.525	mm
- Weight	259,500	kg
4. Ductwork-to-HRSG Transition		
Length	16.4	m
Inlet Width	7.8	m
Inlet Height	7.8	m
Outlet Width	11.1	m
Outlet Height	21.9	m
Weight	166,700	kg
5. Main HRSG Section		
Length	22.2	m
Width	11.1	m
Height	21.9	m

Estimated HRSG Data

Estimated HRSG Data		
Weight:		
- Heat Transfer Tubing	995,700	kg
- Headers, Tube sheets	149,350	kg
- Drums	328,900	kg
- Interconnecting Piping & Support	106,800	kg
- Skin & Structure	195,300	kg
- Liner & Insulation	61,900	kg
- Main Stack	87,700	kg
- Platforms, Walkways, and Ladders	48,480	kg
- Miscellaneous	89,000	kg
Total	2,063,000	kg
Main Stack:		
- Diameter	6.6	m
- Height	40.2	m
- Thickness	9.525	mm
- Weight	87,700	kg
6. HP Drum		
Length	16.8	m
Outer Diameter	2.917	m
Drum Thickness	232	mm
Weight (dry)	228,600	kg
Weight (wet)	260,900	kg
7. IP Drum		
Length	16.1	m
Outer Diameter	2.224	m
Drum Thickness	70.36	mm
Weight (dry)	57,550	kg
Weight (wet)	80,450	kg
8. LP Drum		
Length	17.1	m
Outer Diameter	3.254	m
Drum Thickness	31.9	mm
Weight (dry)	42,740	kg
Weight (wet)	99,000	kg

Estimated Steam Turbine Data

Estimated Steam Turbine Data		
Number of Units	1	
1. Steam Turbine Description		
Nameplate Capacity	318.4	MVA
Power Factor	0.9	
Steam Turbine Type	Condensing, Reheat	
Nameplate Throttle Pressure	130.2	bar
Nameplate Throttle Temperature	566	C
Nameplate Throttle Massflow	554.7	t/h
Exhaust End Type	Down Draft	
Number of LPT Exhaust Annuli	2	
Last Stage Bucket Length	990	mm
Last Stage Pitch Diameter	2796.3	mm
Number of Ports	0	
Number of Auto-Extraction Ports	0	
2. Estimated Weights, Dimensions & Cost		
Steam Turbine Length	19.1	m
Steam Turbine Width	6.1	m
Steam Turbine Weight	423,500	kg
Generator Length (Including Exciter)	12.8	m
Generator Width	3.9	m
Generator Weight	324,650	kg
Overall ST and Generator Length	31.9	m
Overall ST and Generator Width	6.1	m
Overall ST and Generator Weight	748,100	kg
Equipment Cost per Unit, Reference Basis	37,561,000	USD
Foundation Length	34.8	m
Foundation Width	10.3	m
Foundation Concrete per Unit	1086.7	m^3

Estimated Condenser Data

Estimated Condenser Data		
Number of Units	1	
Condenser Type	Shell & Tube	
Condenser Cost (per unit), Reference Basis	3,719,000	USD
1. Condenser Tube Description (per unit)		
Effective Surface Area	17,800	m^2
Number of Condenser Passes	1	
Tube Material	Titanium	
Number of Tubes	9848	
Tube Length	22.7	m
Tube Outside Diameter (O.D.)	25.4	mm
Tube Inside Diameter (I.D.)	24.28	mm
Tube Wall Thickness	0.5588	mm
Tube Weight, dry	45,770	kg
Tube Pitch	40.64	mm
2. Condenser Shell Description (per unit)		
Shell Material	Carbon Steel	
Nominal Shell Thickness	15.88	mm
Number Tube Support Plates	36	
Tube Support Plate Spacing	0.61	m
Hotwell Depth	0.57	m
Total Dry Weight	266,650	kg
Overall Footprint Area	137	m^2
Overall Length	29.2	m
Overall Width	4.7	m
Overall Height	7.6	m
3. Condenser Operating Parameters (per unit)		
Non-Condensible Removal System	Vacuum Pump	
Water Depth in Hotwell	0.57	m
Volume Water Stored in Hotwell	60,800	l
Total Operating (Wet) Weight (Excluding Vacuum Forces)	430,700	kg

Estimated Pump Data

Estimated Pump Data		
1. Integral Feedwater Pump (P29)		
Number of Pumps per HRSG	None	
2. HP Feedwater Pump (P1)		
Number of Pumps per HRSG	3 - 50%	
Nameplate Flow (each) (nominal)	3407	lpm
Nameplate Head (nominal)	1524.018	m
Nameplate Speed	3,000	RPM
Baseplate Length (each)	3.3	m
Baseplate Width (each)	1.2	m
Pump Weight (each)	3,180	kg
Motor Weight (each)	2,850	kg
Motor Nameplate Shaft Power (each) (nominal)	894.8	kW
Mechanical Installation Labor (each)	319	Labor Hours
Pump Cost, Reference Basis (each)	209,750	USD
Motor Cost, Reference Basis (each)	73,400	USD
3. IP Feedwater Pump (P2)		
Number of Pumps per HRSG	3 - 50%	
Nameplate Flow (each) (nominal)	4164	lpm
Nameplate Head (nominal)	487.6859	m
Nameplate Speed	3,000	RPM
Baseplate Length (each)	2.7	m
Baseplate Width (each)	0.98	m
Pump Weight (each)	1,360	kg
Motor Weight (each)	1,470	kg
Motor Nameplate Shaft Power (each) (nominal)	410.1	kW
Mechanical Installation Labor (each)	210	Labor Hours
Pump Cost, Reference Basis (each)	117,400	USD
Motor Cost, Reference Basis (each)	32,640	USD
4. LP Feedwater Pump (P3)		
Number of Pumps per HRSG	None	
5. Condensate Forwarding Pump (P6)		
Number of Pumps per Condenser	2 - 100%	
Nameplate Flow (each) (nominal)	15142	lpm
Nameplate Head (nominal)	182.8822	m
Nameplate Speed	1,500	RPM
Baseplate Length (each)	1.8	m
Baseplate Width (each)	1.8	m
Pump Weight (each)	1,950	kg
Motor Weight (each)	1,960	kg
Motor Nameplate Shaft Power (each) (nominal)	596.6	kW
Mechanical Installation Labor (each)	254	Labor Hours
Pump Cost, Reference Basis (each)	69,900	USD
Motor Cost, Reference Basis (each)	44,270	USD
6. Condenser C.W. Pump (P4)		
Number of Pumps per Condenser	2 - 50%	
Nameplate Flow (each) (nominal)	382327	lpm
Nameplate Head (nominal)	15.24018	m
Nameplate Speed	500	RPM
Baseplate Length (each)	2.1	m
Baseplate Width (each)	2.1	m
Pump Weight (each)	3,750	kg
Motor Weight (each)	3,260	kg

Estimated Pump Data

Estimated Pump Data		
Motor Nameplate Shaft Power (each) (nominal)	1118.6	kW
Mechanical Installation Labor (each)	350	Labor Hours
Pump Cost, Reference Basis (each)	401,300	USD
Motor Cost, Reference Basis (each)	120,100	USD
7. Condenser Vacuum Pump (P7)		
Number of Pumps per Condenser	2 - 50%	
Nameplate Suction Pressure	52.43	mmHg
Baseplate Length (each)	2.4	m
Baseplate Width (each)	1.7	m
Pump Unit Weight (each)	4,110	kg
Motor Nameplate Shaft Power (each) (nominal)	33.56	kW
Mechanical Installation Labor (each)	107	Labor Hours
Pump Cost, Reference Basis (each)	77,750	USD
Motor Cost, Reference Basis (each)	0	USD
8. Treated Water Pump (P11)		
Number of Pumps per Plant	1 - 100%	
Nameplate Flow (each) (nominal)	757.1	lpm
Nameplate Head (nominal)	60.96074	m
Nameplate Speed	3,000	RPM
Baseplate Length (each)	1.2	m
Baseplate Width (each)	0.41	m
Pump Weight (each)	163	kg
Motor Weight (each)	65.46	kg
Motor Nameplate Shaft Power (each) (nominal)	7.084	kW
Mechanical Installation Labor (each)	61	Labor Hours
Pump Cost, Reference Basis (each)	4,490	USD
Motor Cost, Reference Basis (each)	963	USD
9. Demin Water Pump (P23)		
Number of Pumps per Plant	2 - 100%	
Nameplate Flow (each) (nominal)	662.4	lpm
Nameplate Head (nominal)	91.44111	m
Nameplate Speed	3,000	RPM
Baseplate Length (each)	1.3	m
Baseplate Width (each)	0.44	m
Pump Weight (each)	193	kg
Motor Weight (each)	86.69	kg
Motor Nameplate Shaft Power (each) (nominal)	10.44	kW
Mechanical Installation Labor (each)	66	Labor Hours
Pump Cost, Reference Basis (each)	4,940	USD
Motor Cost, Reference Basis (each)	1,290	USD
10. Raw Water Pump 1 (P26)		
Number of Pumps per Plant	1 - 100%	
Nameplate Flow (each) (nominal)	757.1	lpm
Nameplate Head (nominal)	53.34065	m
Nameplate Speed	3,000	RPM
Baseplate Length (each)	1.1	m
Baseplate Width (each)	0.39	m
Pump Weight (each)	144	kg
Motor Weight (each)	55.08	kg
Motor Nameplate Shaft Power (each) (nominal)	5.593	kW
Mechanical Installation Labor (each)	58	Labor Hours
Pump Cost (Incl. Motor), Reference Basis (each)	4,330	USD
11. Raw Water Pump 2 (P27)		

Estimated Pump Data

Estimated Pump Data		
Number of Pumps per Plant	1 - 100%	
Nameplate Flow (each) (nominal)	757.1	lpm
Nameplate Head (nominal)	53.34065	m
Nameplate Speed	3,000	RPM
Baseplate Length (each)	1.1	m
Baseplate Width (each)	0.39	m
Pump Weight (each)	144	kg
Motor Weight (each)	55.08	kg
Motor Nameplate Shaft Power (each) (nominal)	5.593	kW
Mechanical Installation Labor (each)	58	Labor Hours
Pump Cost (Incl. Motor), Reference Basis (each)	4,330	USD
12. Raw Water Pump 3 (P28)		
Number of Pumps per Plant	1 - 100%	
Nameplate Flow (each) (nominal)	757.1	lpm
Nameplate Head (nominal)	53.34065	m
Nameplate Speed	3,000	RPM
Baseplate Length (each)	1.1	m
Baseplate Width (each)	0.39	m
Pump Weight (each)	144	kg
Motor Weight (each)	55.08	kg
Motor Nameplate Shaft Power (each) (nominal)	5.593	kW
Mechanical Installation Labor (each)	58	Labor Hours
Pump Cost (Incl. Motor), Reference Basis (each)	4,330	USD
13. Auxiliary Boiler Feedwater Pump (P5)		
Number of Pumps per Auxiliary Boiler	None	
14. Fuel Oil Unloading Pump (P8)		
Number of Pumps per Plant	None	
15. Fuel Oil Forwarding Pump (P9)		
Number of Pumps per Plant	None	
16. Aux Cooling Water Pump (closed loop) (P10)		
Number of Pumps per Plant	2 - 100%	
Nameplate Flow (each) (nominal)	17034	lpm
Nameplate Head (nominal)	27.43233	m
Nameplate Speed	1,000	RPM
Baseplate Length (each)	1.9	m
Baseplate Width (each)	0.69	m
Pump Weight (each)	576	kg
Motor Weight (each)	430	kg
Motor Nameplate Shaft Power (each) (nominal)	82.03	kW
Mechanical Installation Labor (each)	118	Labor Hours
Pump Cost, Reference Basis (each)	21,550	USD
Motor Cost, Reference Basis (each)	9,390	USD
17. Diesel Fire Pump (P12)		
Number of Pumps per Plant	2 - 100%	
Nameplate Flow (each) (nominal)	5678	lpm
Nameplate Head (nominal)	76.20093	m
Baseplate Length (each)	1.9	m
Baseplate Width (each)	0.69	m
Pump Unit Weight (each)	1,440	kg
Engine Nameplate Shaft Power (each)	82.03	kW
Mechanical Installation Labor (each)	43	Labor Hours
Pump Cost (Incl. Engine), Reference Basis (each)	59,700	USD

Estimated Pump Data

Estimated Pump Data		
18. Electric Fire Pump (P13)		
Number of Pumps per Plant	None	
19. Jockey Fire Pump (P14)		
Number of Pumps per Plant	1 - 100%	
Nameplate Flow (each) (nominal)	170.3	lpm
Nameplate Head (nominal)	38.10046	m
Nameplate Speed	3,000	RPM
Baseplate Length (each)	0.75	m
Baseplate Width (each)	0.26	m
Pump Weight (each)	52.71	kg
Motor Weight (each)	15.19	kg
Motor Nameplate Shaft Power (each) (nominal)	1.119	kW
Mechanical Installation Labor (each)	42	Labor Hours
Pump Cost (Incl. Motor), Reference Basis (each)	3,340	USD
20. GT Inlet Air Chiller/Heater Water Pump (P15)		
Number of Pumps per GT	None	
21. GT+Generator Lube Oil Coolant Pump (P16)		
Number of Pumps per GT+Generator Lube Oil	None	
22. GT Generator Lube Oil Coolant Pump (P17)		
Number of Pumps per GT Generator Lube Oil	None	
23. GT Generator Cooling Pump (P18)		
Number of Pumps per GT Generator	None	
24. GT Chiller Coolant Pump (P19)		
Number of Pumps per GT Chiller	None	
25. Fuel Compressor Coolant Pump (P20)		
Number of Pumps per Fuel Compressor	None	
26. ST+Generator Lube Oil Coolant Pump (P21)		
Number of Pumps per ST+Generator Lube Oil	None	
27. ST Generator Cooling Pump (P22)		
Number of Pumps per ST Generator	None	
28. Aux Cooling Water Pump (open loop) (P30)		
Number of Pumps per Plant	2 - 100%	
Nameplate Flow (each) (nominal)	17034	lpm
Nameplate Head (nominal)	27.43233	m
Nameplate Speed	1,000	RPM
Baseplate Length (each)	1.9	m
Baseplate Width (each)	0.69	m
Pump Weight (each)	576	kg
Motor Weight (each)	430	kg
Motor Nameplate Shaft Power (each) (nominal)	82.03	kW
Mechanical Installation Labor (each)	118	Labor Hours
Pump Cost, Reference Basis (each)	21,550	USD
Motor Cost, Reference Basis (each)	9,390	USD

Estimated Tank Data

Estimated Tank Data	Number	Volume [l]	Diameter [m]	Height [m]
Demineralized Water	1	718,800	10.1	8.9
Raw Water	1	718,800	10.1	8.9
Neutralized Water	1	359,400	7.8	7.4
Acid	2	22,710	2.4	5.1
Caustic	2	22,710	2.4	5.1
Fire Protection	1	1,363,000	13.2	10.0

Estimated Piping Data

Estimated Piping Data	ID & No.	Nom. D [mm]	Length [m]	Schedule	Material	Fittings	M [t/h]	Nom. Flow
1. High Pressure Steam Piping								
HPB1 to Header	HP1 x 1	406.4	168.3	160	P-91	6	277.3	
HPB2 to Header	HP2 x 1	406.4	168.3	160	P-91	6	277.3	
Header to HPT	HP0 x 1	609.6	21.95	160	P-91	5	554.7	
2. Cold Reheat Steam Piping								
Cold Reheat Header to HRSG1	CRH1 x 1	457.2	175.6	40	A-106	6	270.4	
Cold Reheat Header to HRSG2	CRH2 x 1	457.2	175.6	40	A-106	6	270.4	
HPT to Cold Reheat Header	CRH0 x 1	762	21.95	30	A-106	5	540.8	
3. Hot Reheat Steam Piping								
Hot Reheat from HRSG1 to Header	HRH1 x 1	508	168.3	40	P-91	6	316.4	
Hot Reheat from HRSG2 to Header	HRH2 x 1	508	168.3	40	P-91	6	316.4	
Hot Reheat Header to HPT	HRH0 x 1	914.4	21.95	40	P-91	5	632.9	
4. Low Pressure Steam Piping								
LPB1 to Header	LP1 x 1	457.2	189.9	40	A-106	6	43.56	
LPB2 to Header	LP2 x 1	457.2	189.9	40	A-106	6	43.56	
Header to LPT admission	LP0 x 1	762	21.95	10	A-106	5	87.1	
5. Circulating Water Piping								
Main Circulating Water	CW0 x 1	2133.6	600	50psi	Fiberglass	8	41818	701242 lpm
6. Auxiliary Cooling Water Piping								
Main Auxiliary CW	CW1 x 1	304.8	304.2	40	A-106	23	966.2	16130 lpm
CW for GT+Generator Lube Oil Cooler	CW2 x 2	203.2	396.2	40	A-106	30	153.3	2559.8 lpm
CW for GT Generator	CW4 x 2	203.2	396.2	40	A-106	30	169.5	2829.3 lpm
CW for ST+Generator Lube Oil Cooler	CW7 x 1	127	43.59	40	A-106	20	75.93	1267.6 lpm
CW for ST Generator	CW8 x 1	203.2	43.59	40	A-106	20	244.6	4084 lpm
7. Feedwater Piping								
Condensate	FW1 x 1	355.6	221.3	20	A-106	14	724.3	12157 lpm
Makeup from Water Treatment System	FW2 x 1	88.9	157.6	40	TP316	14	41.68	695.8 lpm
Feedwater to Boiler	FW3 x 2	254	192	40	TP316	14	366.2	6539 lpm
8. Raw Water Piping								
Raw Water	RW0 x 1	88.9	502.8	40	A-106	83	41.68	695.7 lpm
9. Service Water Piping								
Service Water	SW0 x 1	50.8	1216.8	40	A-106	300	NA	NA
10. Fuel Gas Piping								
Gas Pipe from Metering Station	GF0 x 1	304.8	304.2	40	A-106	6	94.37	143909 std.m³/hr
Gas Pipe to GT1	GFGT1 x 1	203.2	143.3	40	TP316	10	47.18	71955 std.m³/hr
Gas Pipe to GT2	GFGT2 x 1	203.2	143.3	40	TP316	10	47.18	71955 std.m³/hr
11. Lube Oil Piping								
GT+Generator Lube Oil	OIL1 x 2	254	34.44	40	TP316	16	170.4	3235 lpm
ST+Generator Lube Oil	OIL3 x 1	203.2	130.5	40	TP316	16	84.36	1602 lpm
12. Service Air Piping								
Service Air	SERVA x 1	38.1	912.6	80	A-106	225	0.9054	12.74 std.m³/min
13. Vacuum Air Piping								
Condenser Air Removal	CAR0 x 1	203.2	57	80	A-106	16	NA	NA
14. Boiler & Equipment Drain Piping								

Estimated Piping Data

Estimated Piping Data	Nom. Vel. [m/s]
1. High Pressure Steam Piping	
HPB1 to Header	26.48
HPB2 to Header	26.48
Header to HPT	23.31
2. Cold Reheat Steam Piping	
Cold Reheat Header to HRSG1	45.14
Cold Reheat Header to HRSG2	45.14
HPT to Cold Reheat Header	31.1
3. Hot Reheat Steam Piping	
Hot Reheat from HRSG1 to Header	65.16
Hot Reheat from HRSG2 to Header	65.16
Hot Reheat Header to HPT	38.76
4. Low Pressure Steam Piping	
LPB1 to Header	59.68
LPB2 to Header	59.68
Header to LPT admission	39.38
5. Circulating Water Piping	
Main Circulating Water	3.269
6. Auxiliary Cooling Water Piping	
Main Auxiliary CW	4.572
CW for GT+Generator Lube Oil Cooler	2.286
CW for GT Generator	2.286
CW for ST+Generator Lube Oil Cooler	2.286
CW for ST Generator	2.286
7. Feedwater Piping	
Condensate	2.286
Makeup from Water Treatment System	2.286
Feedwater to Boiler	2.286
8. Raw Water Piping	
Raw Water	2.286
9. Service Water Piping	
Service Water	NA
10. Fuel Gas Piping	
Gas Pipe from Metering Station	24.38
Gas Pipe to GT1	24.38
Gas Pipe to GT2	24.38
11. Lube Oil Piping	
GT+Generator Lube Oil	1.219
ST+Generator Lube Oil	1.219
12. Service Air Piping	
Service Air	45.72
13. Vacuum Air Piping	
Condenser Air Removal	NA
14. Boiler & Equipment Drain Piping	

Estimated Piping Data

Estimated Piping Data	ID & No.	Nom. D [mm]	Length [m]	Schedule	Material	Fittings	M [t/h]	Nom. Flow
Boiler & Equipment Drain Piping	BEDR x 2	152.4	152.1	350psi	Ductile iron	16	NA	NA
15. Boiler Blowdown Piping								
Boiler Blowdown Piping	BLDN x 2	152.4	152.1	40	A-106	16	NA	NA
16. Steam Blowoff Piping								
Steam Blow Piping from HRSG & ST	STBL x 3	304.8	41.15	40	A-106	20	NA	
17. Fire Protection Piping								
Main Fire Protection	FP0 x 1	152.4	532.5	350psi	Ductile iron	45	681.1	11356 lpm
Miscellaneous Fire Protection	FP1 x 1	152.4	532.5	350psi	Ductile iron	45	340.5	5678 lpm

Estimated Piping Data

Estimated Piping Data	Nom. Vel. [m/s]
Boiler & Equipment Drain Piping	NA
15. Boiler Blowdown Piping	
Boiler Blowdown Piping	NA
16. Steam Blowoff Piping	
Steam Blow Piping from HRSG & ST	NA
17. Fire Protection Piping	
Main Fire Protection	9.144
Miscellaneous Fire Protection	9.144

Estimated Miscellaneous Equipment Data

Estimated Miscellaneous Equipment Data		
1. Air Compressor		
Number of Air Compressors	2 - 100%	
Capacity (each)	765	m³/h
Motor Power (each)	104	kW
Weight	4,530	kg
Installation Labor (each)	234	Labor Hours
Equipment Cost, Reference Basis, (each)	79,600	USD
Foundation Concrete (each)	9.547	m^3
Foundation Labor (each)	532	Labor Hours
2. Auxiliary Boiler & Stack	None	
3. Emergency Generator		
Number of Generators	1	
Generator Set Type	Medium Speed	
Capacity (each)	2,000	kW
Length	10.1	m
Width	2.4	m
Height	3.4	m
Weight	37,300	kg
Installation Labor (each)	195	Labor Hours
Equipment Cost, Reference Basis, (each)	782,200	USD
Foundation Concrete (each)	77.49	m^3
Foundation Labor (each)	1,710	Labor Hours
4. Black Start Generator		
Number of Generators	2	
Generator Set Type	Medium Speed	
Capacity (each)	5,500	kW
Length	12.5	m
Width	2.5	m
Height	3.9	m
Weight	73,050	kg
Installation Labor (each)	195	Labor Hours
Equipment Cost, Reference Basis, (each)	2,151,000	USD
Foundation Concrete (each)	151	m^3
Foundation Labor (each)	3,220	Labor Hours
5. Feedwater Heater	None	
6. Inlet Chilling System	None	
7. Auxiliary Heat Exchanger		
Number of Cells	1	
Capacity (each)	15,610	kW
Installation Labor (each)	251	Labor Hours
Equipment Cost, Reference Basis, (each)	224,800	USD
8. Bridge Crane (for GT)		
Number of Cranes	1	
Span	13.7	m
Capacity	49.11	Ton
Crane Weight	36,110	kg
Hoist Motor Power	44.74	kW
Bridge Motors	2 - 3.169	kW
Trolley Motor Power	2.983	kW
Installation Labor	572	Labor Hours

Estimated Miscellaneous Equipment Data

Estimated Miscellaneous Equipment Data		
Crane & Support Cost, Reference Basis, (each)	303,800	USD
9. Bridge Crane (for ST)		
Number of Cranes	1	
Span	19.8	m
Capacity	62.5	Ton
Crane Weight	63,950	kg
Hoist Motor Power	52.2	kW
Bridge Motors	2 - 3.729	kW
Trolley Motor Power	3.542	kW
Installation Labor	775	Labor Hours
Crane & Support Cost, Reference Basis, (each)	423,950	USD

Estimated Site Plan Data

Estimated Site Plan Data		
1. Site Plot Plan		
Length	249	m
Width	170	m
Area	4.236	hectare
2. Turbine Hall		
Area	9,240	m^2
3. Switchyard		
Length	118	m
Width	75.2	m
Area	8,840	m^2
4. Water Treatment Facility		
Length	18.4	m
Width	9.2	m
Area	169	m^2
5. Administration, Shop & Warehouse Building		
Length	35.5	m
Width	14.2	m
Area	1,510	m^2
Number of Floors	3	
6. Road		
Length	740	m
Width	7.6	m
Area	5,640	m^2
7. Parking Lot		
Number of Parking Spaces	26	
Total Width	79.2	m
Depth of Parking Space	6.1	m
Total Area	483	m^2
8. Walkways		
Area	2,120	m^2
9. Guard House		
Area	18.58	m^2

Estimated Electric Load Data

Estimated Electric Load Data	Number in plant	Nameplate kW (each)	Nominal kW Operating	Nominal kW Standby	Nominal kWe Operating	Nominal kWe Standby	Voltage
1. Pump Motors							
HP Feedwater Pump	6	895	3580	1790	3600	1800	6600 V
IP Feedwater Pump	6	410	1640	820	1600	800	6600 V
Condensate Forwarding Pump	2	597	597	597	600	600	6600 V
Condenser C.W. Pump	2	1,120	2240	0	2200	0	6600 V
Condenser Vacuum Pump	2	33.56	67.12	0	70	0	400 V
Treated Water Pump	1	7.084	7.084	0	9	0	400 V
Demin Water Pump	2	10.44	10.44	10.44	12	12	400 V
Raw Water Pump 1	1	5.593	5.593	0	7.5	0	400 V
Raw Water Pump 2	1	5.593	5.593	0	7.5	0	400 V
Raw Water Pump 3	1	5.593	5.593	0	7.5	0	400 V
Aux Cooling Water Pump (closed loop)	2	82.03	82.03	82.03	90	90	400 V
Jockey Fire Pump	1	1.119	1.119	0	1.25	0	400 V
Aux Cooling Water Pump (open loop)	2	82.03	82.03	82.03	90	90	400 V
2. Auxiliary Cooling Fan Motors							
3. Air Compressor Motors							
Station Air Compressor	2	104	104	104	110	110	400 V
4. Water Treatment System Motors							
Reverse Osmosis System	6	11.19	67.14	0	78	0	400 V
Misc. Makeup Water Auxiliary Loads	18	17.15	102.9	205.8	108	216	400 V
5. Bridge Crane Motors							
GT bridge crane hoist motor	1	44.74	0	44.74	0	50	400 V
GT bridge crane bridge motor	2	3.169	0	6.338	0	8	400 V
GT bridge crane trolley motor	2	2.983	0	5.966	0	7.5	400 V
ST bridge crane hoist motor	1	52.2	0	52.2	0	55	400 V
ST bridge crane bridge motor	2	3.729	0	7.458	0	9	400 V
ST bridge crane trolley motor	2	3.542	0	7.084	0	8.5	400 V
6. GT Auxiliary Loads							
GT Frame Blower Motor	4	104	416	0	440	0	400 V
GT Lube Oil Pumps	4	186	372	372	400	400	6600 V
GT HVAC	12	8.948	71.584	35.792	80	40	400 V
Misc. GT Aux Loads	36	29.83	1073.88	0	1042.92	0	400 V
7. ST Auxiliary Loads							
ST Lube Oil Pumps	2	410	410	410	450	450	6600 V
Misc. SC Aux Loads	18	33.56	604.08	0	582.48	0	400 V
8. Miscellaneous Plant Loads							
HVAC Loads	1	112	112	0	120	0	400 V
Lighting Loads	1	224	224	0	225	0	6600 V
Misc. Plant Aux Loads	25	15.66	391.5	0	404	0	400 V
Total Plant Motors & Loads	168		16,460	6,210	12,340	4,750	
Total 6600V Motors & Loads					9,080	4,050	
Total 400V Motors & Loads					3,260	696	

Estimated Electric Load Data

Estimated Electric Load Data	Heat Balance
	Aux. kWe
1. Pump Motors	
HP Feedwater Pump	3462
IP Feedwater Pump	1356.9
Condensate Forwarding Pump	521.2
Condenser C.W. Pump	2071.5
Condenser Vacuum Pump	70
Treated Water Pump	9
Demin Water Pump	12
Raw Water Pump 1	7.5
Raw Water Pump 2	7.5
Raw Water Pump 3	7.5
Aux Cooling Water Pump (closed loop)	90
Jockey Fire Pump	1.25
Aux Cooling Water Pump (open loop)	90
2. Auxiliary Cooling Fan Motors	
3. Air Compressor Motors	
Station Air Compressor	110
4. Water Treatment System Motors	
Reverse Osmosis System	78
Misc. Makeup Water Auxiliary Loads	108
5. Bridge Crane Motors	
GT bridge crane hoist motor	0
GT bridge crane bridge motor	0
GT bridge crane trolley motor	0
ST bridge crane hoist motor	0
ST bridge crane bridge motor	0
ST bridge crane trolley motor	0
6. GT Auxiliary Loads	
GT Frame Blower Motor	440
GT Lube Oil Pumps	400
GT HVAC	80
Misc. GT Aux Loads	1042.8
7. ST Auxiliary Loads	
ST Lube Oil Pumps	450
Misc. SC Aux Loads	582.4
8. Miscellaneous Plant Loads	
HVAC Loads	120
Lighting Loads	225
Misc. Plant Aux Loads	373.8
Total Plant Motors & Loads	11716
Total 6600V Motors & Loads	
Total 400V Motors & Loads	

Estimated Water Treatment System Data

Estimated Water Treatment System Data		
1. Clarifier-Reactivator	None	
2. Pressure Filter	1 Unit	
Diameter (each)	0.9144	m
Weight (each)	2,480	kg
Cost (each), Reference Basis	55,550	USD
3. Softener	1 Twin Unit	
Design Flow (8 hr continuous operation running one unit)	488	lpm
Exchange Capacity (each)	240,000	ppm per min.
Weight (twin unit)	61,450	kg
Cost (twin unit), Reference Basis	649,100	USD
4. Reverse Osmosis System	6 Units	
Design Flow (each)	94.64	lpm
Weight (each)	680	kg
Cost (each), Reference Basis	118,400	USD
5. Two-Bed Demineralizer	2 Trains	
Design Flow (each)	379	lpm
Weight (each)	2,950	kg
Cost (each), Reference Basis	424,650	USD

Estimated Main Electrical Data

Estimated Main Electrical Data		
1. Gas Turbine Step-up Transformer		
Count	2	
Nominal Rating	313	MVA
Cooling	OA/FA/FA	
Configuration	Circuit Breaker Connected	
High-side Voltage	500	kV
Low-side Voltage	19	kV
Length	15.23	m
Width	7.329	m
Weight	300,950	kg
Unit Mechanical Installation hours	3,500	hours
Unit Electrical Installation hours	3,500	hours
Unit Reference Cost	3,965,000	USD
2. Steam Turbine Step-up Transformer		
Count	1	
Nominal Rating	318	MVA
Cooling	OA/FA/FA	
Configuration	Circuit Breaker Connected	
High-side Voltage	500	kV
Low-side Voltage	19	kV
Length	15.41	m
Width	7.357	m
Weight	305,050	kg
Unit Mechanical Installation hours	3,530	hours
Unit Electrical Installation hours	3,530	hours
Unit Reference Cost	4,017,000	USD
3. Medium Voltage Step-down Transformer		
Count	1	
Nominal Rating	14.58	MVA
High-side Voltage	19	kV
Low-side Voltage	6.6	kV
Length	2.386	m
Width	1.909	m
Weight	11,110	kg
Unit Mechanical Installation hours	279	hours
Unit Electrical Installation hours	279	hours
Unit Reference Cost	211,400	USD
4. Low Voltage Step-down Transformer		
Count	3	
Nominal Rating	1.465	MVA
High-side Voltage	19	kV
Low-side Voltage	0.4	kV
Length	2.18	m
Width	1.744	m
Weight	5,350	kg
Unit Mechanical Installation hours	134	hours
Unit Electrical Installation hours	134	hours
Unit Reference Cost	95,400	USD
5. Gas Turbine Generator Circuit Breaker		
Count	2	
Voltage	19	kV
Amperage	9,510	Amps
Unit Mechanical Installation hours	256	hours

Estimated Main Electrical Data

Estimated Main Electrical Data		
Unit Electrical Installation hours	513	hours
Unit Reference Cost	946,000	USD
6. Steam Turbine Generator Circuit Breaker		
Count	1	
Voltage	19	kV
Amperage	9,670	Amps
Unit Mechanical Installation hours	257	hours
Unit Electrical Installation hours	515	hours
Unit Reference Cost	966,200	USD
7. Utility Interconnect Circuit Breaker		
Count	1	
Voltage	500	kV
Amperage	1,070	Amps
Unit Mechanical Installation hours	182	hours
Unit Electrical Installation hours	364	hours
Unit Reference Cost	844,100	USD
8. Auxiliary Bus Feeder Circuit Breaker		
Count	1	
Voltage	19	kV
Amperage	577	Amps
Unit Mechanical Installation hours	127	hours
Unit Electrical Installation hours	254	hours
Unit Reference Cost	13,370	USD
9. Medium Voltage Circuit Breaker		
Count	1	
Voltage	6.6	kV
Amperage	1,280	Amps
Unit Mechanical Installation hours	155	hours
Unit Electrical Installation hours	310	hours
Unit Reference Cost	29,580	USD
10. Low Voltage Circuit Breaker		
Count	3	
Voltage	0.4	kV
Amperage	2,110	Amps
Unit Mechanical Installation hours	176	hours
Unit Electrical Installation hours	352	hours
Unit Reference Cost	60,150	USD
11. Generator to Step-up Transformer Bus		
Gas Turbine Bus Type	Isolated phase bus	
Number generators	2	
Length (per generator)	93.52	m
Mechanical installation hours (per generator)	1,650	hours
Electrical installation hours (per generator)	824	hours
Reference Cost (per generator)	2,822,000	USD
Steam Turbine Bus Type	Isolated phase bus	
Number generators	1	
Length (per generator)	131	m
Mechanical installation hours (per generator)	2,240	hours
Electrical installation hours (per generator)	1,120	hours
Reference Cost (per generator)	3,876,000	USD
12. Plant Buswork		

Estimated Main Electrical Data

Estimated Main Electrical Data		
Low Voltage		
Total length (all runs)	7,770	m
Total Electrical Installation hours	9,820	hours
Total Reference Equipment Cost	426,250	USD
Medium Voltage		
Total length (all runs)	3,890	m
Total Electrical Installation hours	1,970	hours
Total Reference Equipment Cost	96,600	USD
13. Switch Gear		
Low Voltage		
Number sections in plant	0	
Medium Voltage		
Number sections in plant	2	
Total weight	3,500	kg
Total Mechanical Installation hours	271	hours
Total Electrical Installation hours	902	hours
Total Reference Equipment Cost	393,250	USD
14. Motor Control Centers		
Low Voltage		
Number sections in plant	25	
Total number of starters	75	
Total load on all starters	1,650	kW
Total weight	11,340	kg
Total Mechanical Installation hours	336	hours
Total Electrical Installation hours	1,120	hours
Total Reference Equipment cost	116,450	USD
Medium Voltage		
Number sections in plant	9	
Total number of starters	17	
Total load on all starters	11,480	kW
Total weight	12,630	kg
Total Mechanical Installation hours	208	hours
Total Electrical Installation hours	692	hours
Total Reference Equipment cost	606,400	USD
15. Motor & Load Feeders		
Low Voltage		
Number runs in plant	75	
Total length (all runs)	15,210	m
Total Electrical Installation hours	15,730	hours
Total Reference Equipment Cost	316,800	USD
Medium Voltage		
Number runs in plant	17	
Total length (all runs)	3,450	m
Total Electrical Installation hours	5,600	hours
Total Reference Equipment Cost	166,250	USD
16. Cable Tray		
Total length (all runs)	4,260	m
Total Mechanical Installation hours	22,780	hours
Total Electrical Installation hours	7,970	hours
Total Reference Equipment Cost	277,550	USD
17. General Plant Instrumentation		
Instrument Count	112	

Estimated Main Electrical Data

Estimated Main Electrical Data		
Total Electrical Installation hours	2,910	hours
Total Reference Equipment Cost	512,100	USD

Estimated Chiller System Data

Estimated Chiller System Data		
1. GT Inlet Chilling System	None	

Estimated Gasifier Data

Estimated Gasifier Data		
1. Gasifier	None	

Estimated Desalination Plant Data

Estimated Desalination Plant Data		
1. Desalination Plant	None	

Estimated Air Separation Unit Data

Estimated Air Separation Unit Data		
1. Air Separation System	None	

Estimated Gas Cleanup System Data

Estimated Gas Cleanup System Data		
1. Gas Cleanup System	None	

Estimated CO2 Capture Data

Estimated CO2 Capture Data		
1. CO2 Capture Plant	None	