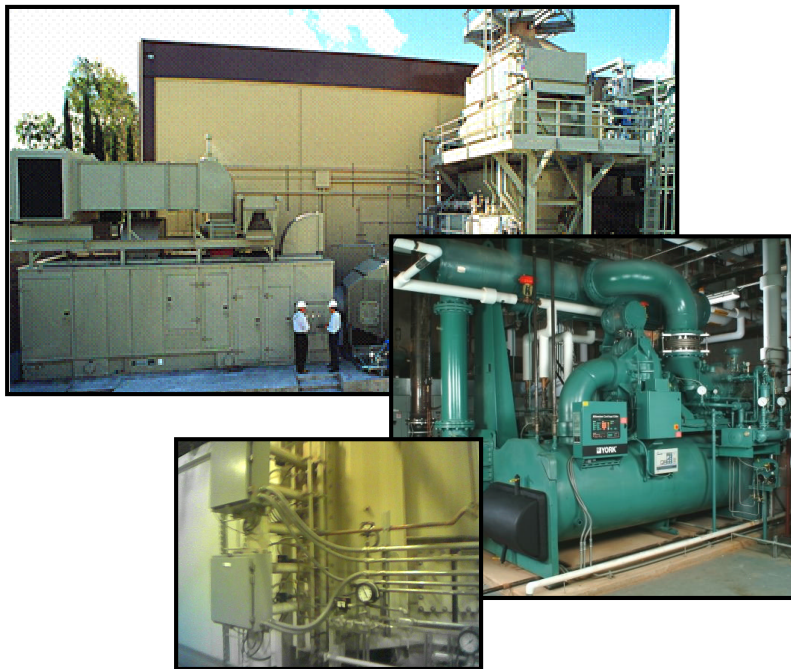


Solar[®] Turbines

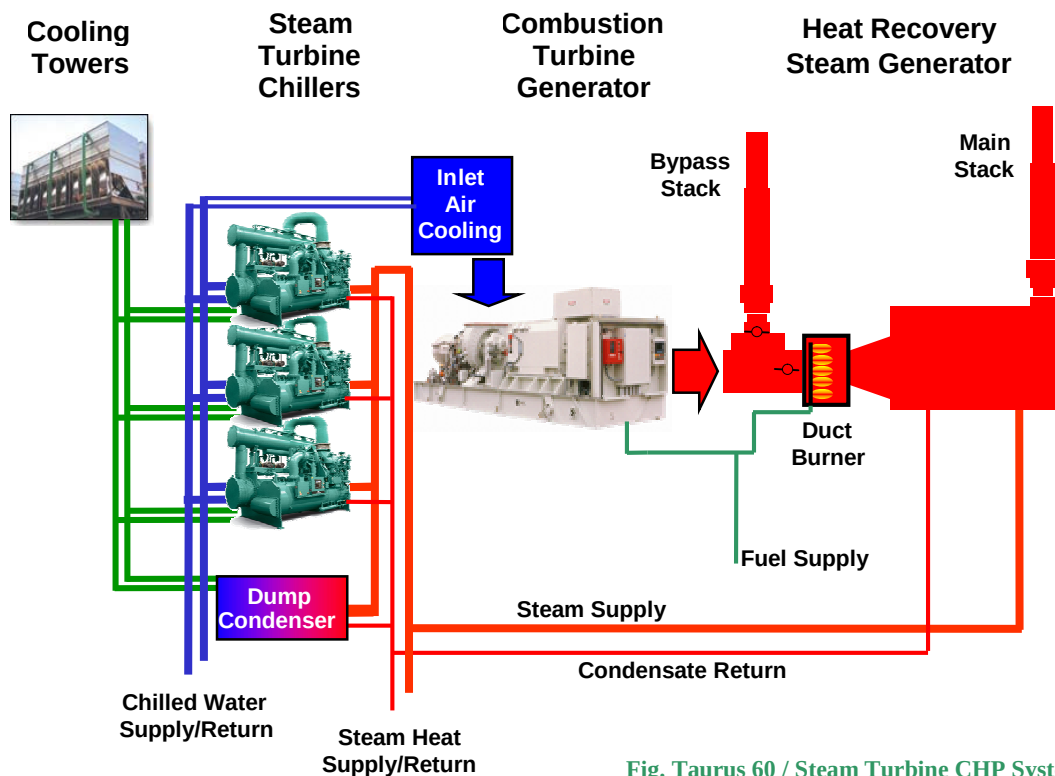
Taurus 60 Integrated CHP System

LT Steam	5 MW / 1,750 Tons / 30 MMBH
MT Steam	5 MW / 3,000 Tons / 25 MMBH
HT Steam	5 MW / 6,000 Tons / 60 MMBH

Over 90% Output Cooling Efficiency



Simultaneous Cooling, Heating and Power



The ‘high-output’ Taurus 60 Integrated CHP System comprises of a Solar Taurus 60 Combustion Turbine Generator with a Heat Recovery Steam Generator and up to three (3) YST 2J2000 York Steam Turbine Chiller Modules. Adding a Duct Burner to the CHP System doubles the thermal output, increases the overall efficiency and provides maximum reliability for a low cost premium. All systems are designed to optimize year round efficiency and increase reliability.

- **Highest Efficiency CHP System Available**

Air Inlet Cooling maintains combustion air temperature to the generator at or below ISO conditions for maximum capacity and efficiency. The Steam Turbine Chillers operate at optimum conditions in a cooling based CHP application. The typically high load factor at varying ambient conditions produces average operating COP’s of over 1.5. Cooling Towers are rated for 80 F leaving tower water in a 73 F wet bulb climate.

- **Environmentally Friendly**

Clean combustion technology combined with offset gas for thermal needs make CHP an environmentally friendly technology. The US Environmental Protection Agency supports the deployment of CHP due to its reduced environmental impact versus grid based systems. CHP is also recognized by LEEDS as part of sustainable building practice as well as by many state programs based on efficiency.

Performance

SOLAR CHP SYSTEMS

Generator

Model	
Generator Nominal Output	kW
Generator Parasitics	kW
Fuel Input LHV	MBH
Net Output	kW
Heat Rate LHV	Btu/kW
Nominal Electric Efficiency	%
Exhaust Flow	Mlb/hr
Exhaust Temperature	F

Taurus 60

5,329
266
59,300
5,063
11,128
28%
167.6
954

HRSG

Duct Burner	
Duct Burner Input	MBH
Temp after Duct Burner	F
Exhaust Temp	F
Heat Recovered as Steam	MBH
Feedwater Temp	F
Steam Output @ 125/15 psig	lb/hr
Steam Temp	F
Steam Pressure	psig
Superheat	F

No	No	Yes
-	-	30,226
954	954	1,600
350	275	350
27,696	31,135	57,317
200	200	200
27,020	31,260	55,919
352.9	249.7	352.9
150	15	150
0	0	0

Cooling Tower

Design WB Temp	F
Approach	F
Heat Rejection	MBH
Total Fan Power	kW

73	73	73
7	7	7
64,292	52,570	133,054

Chiller

Total Output	tons
Steam Turbine Model	#
Tons/kW (nom)	#
Unit Capacity	tons
FL Steam Flow per Unit	lb/hr
# Units	#
Total Steam Consumption	lb/hr
Full Load COP	#
Chiller Parasitics	kW

B	C
3,050	1,786
JGJDJ3KD7	Single Stage
0.57	0.34
1,600	908
14,811	15,770
2	2
27,020	31,260
1.32	0.69
91	27

Efficiencies (LHV)

Thermal/Electric Ratio	#
Electric Efficiency	%
Heating Efficiency	%
Cooling Efficiency	%
Heat Recovery Efficiency	%

0.57	0.34	1.18
28%	28%	28%
77%	83%	84%
91%	65%	104%
67%	76%	80%

Rating Conditions: 59 F Inlet Air, 0' Ell, 150 psig Dry & Saturated Steam, 44 F Chilled W & 80 F Condenser W, Natural Gas Fuel, 100% Load, Air Inlet Press Loss 3", Exhaust Pressure Loss = 7", HRSG Feedwater 200 F

Major Components

Solar Taurus 60 Generator

Industrial Gas Turbine

- High Availability
- Long Life
- Low Maintenance

Main Gearbox

60 Hz Generator

Auto Start (Black Start Optional)

Enclosure - Outdoor/Sound Attenuated

Base Frame

Dims: 32' x 8' x 10' high

Oper Wt: 73,000 lbs

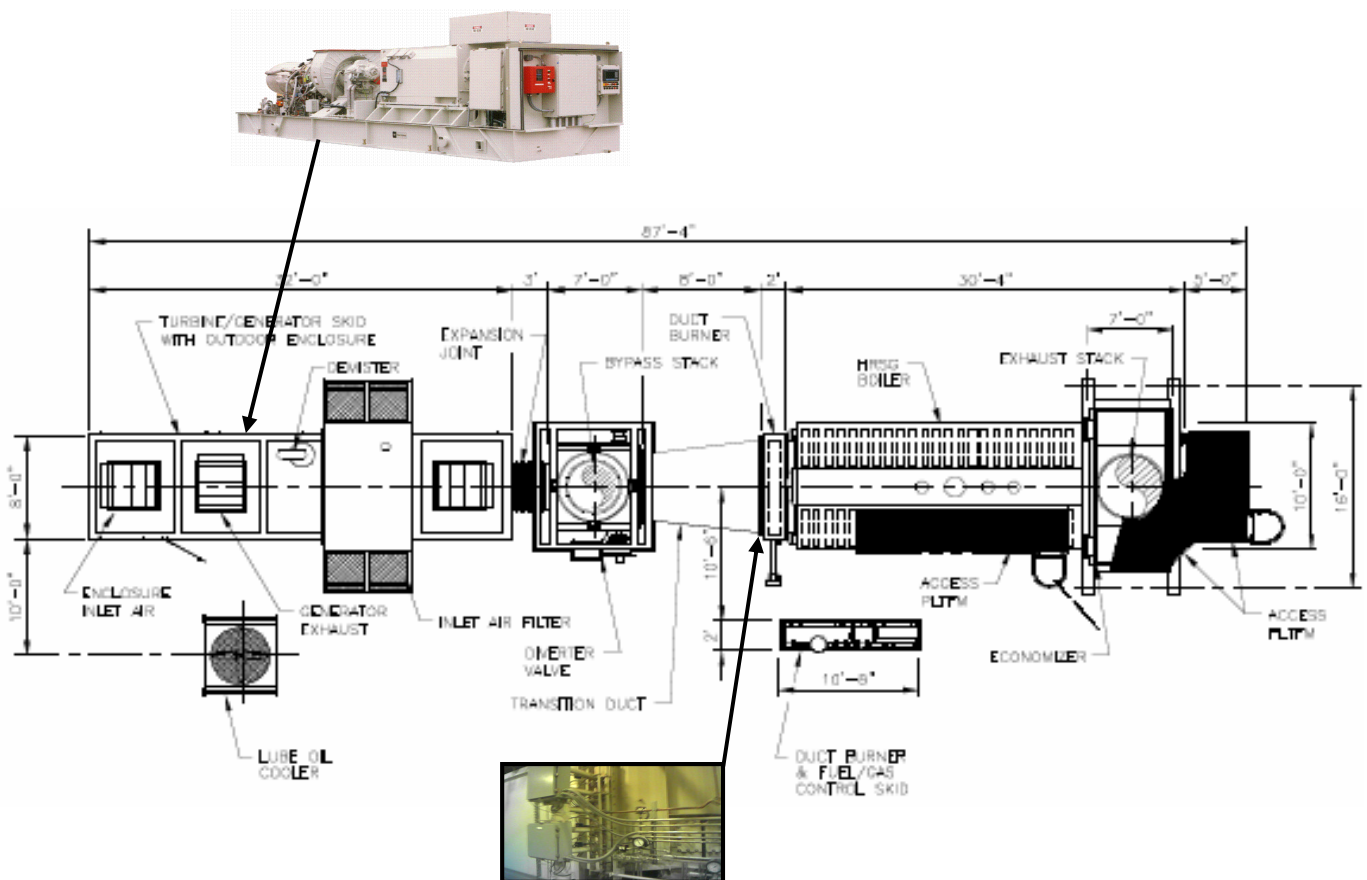
Heat Recovery Steam Generator

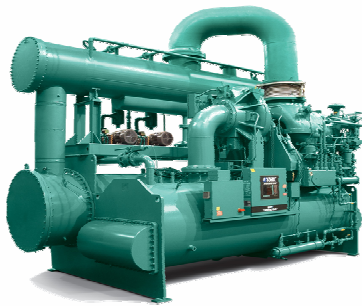
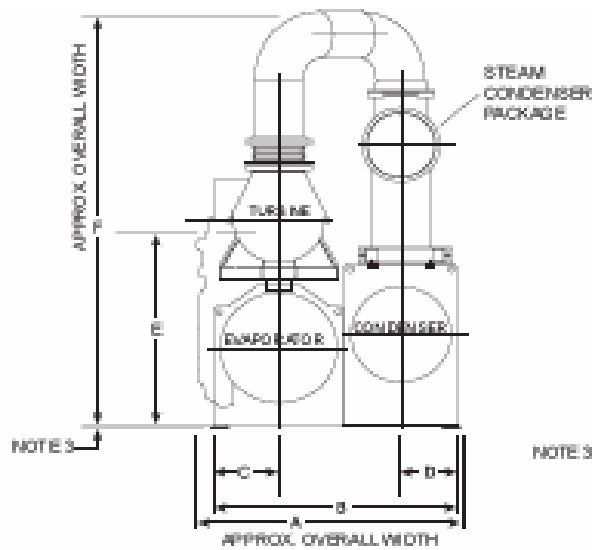
Double Pass Boiler

Duct Burner (Optional)

Dims:

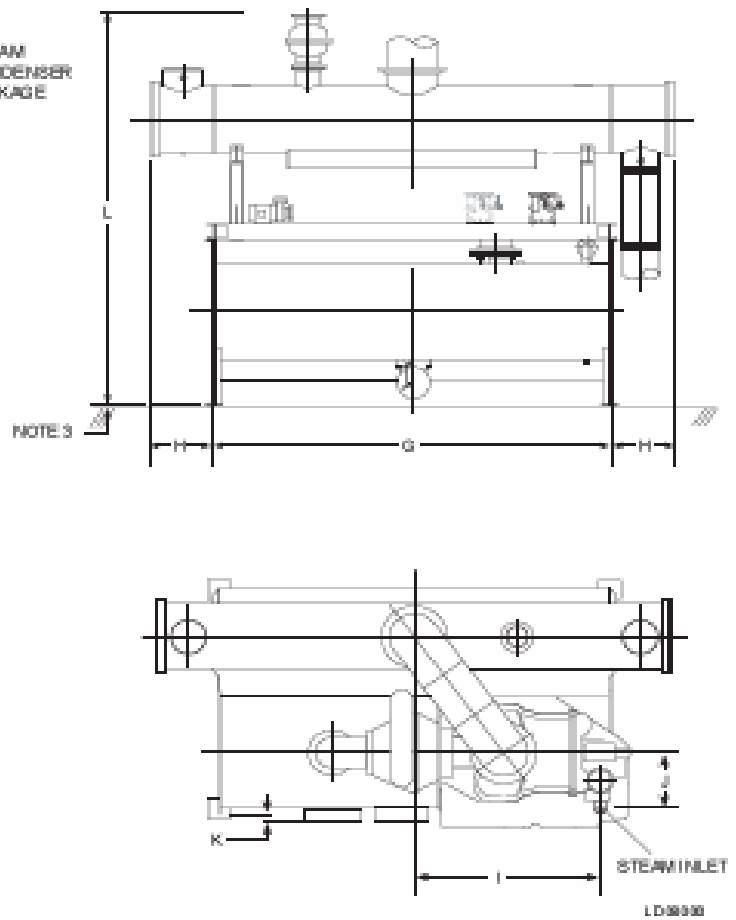
Oper Wt:





York YST Steam Turbine Chiller

Steam Condenser
Indoor – Enclosure Optional
Base Frame



Cooling Tower

Rated according to local WB
VFD

Accessories

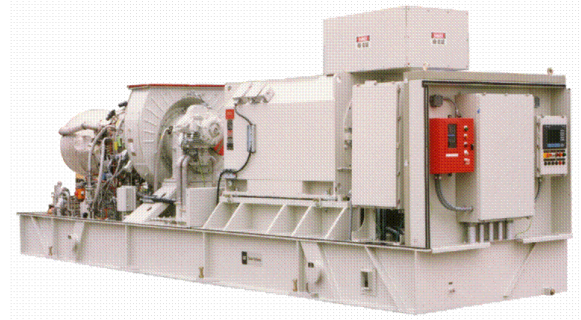
Compressor
Inlet Air Cooling
Dump Condenser

Design Considerations

Ambient Air Temperature:

Inlet Air Conditioning stabilizes the inlet air temperature at ISO conditions of 59 F during the summer so there is no loss of performance due to ambient temperature.

Elevation:



Steam Pressure:

Dry saturated steam with no superheat is the basis of design. Standard operating pressure is 150 psig while higher pressures can be accommodated.

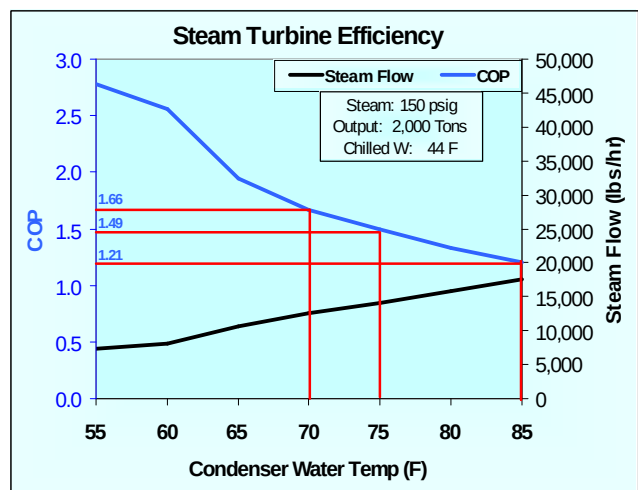
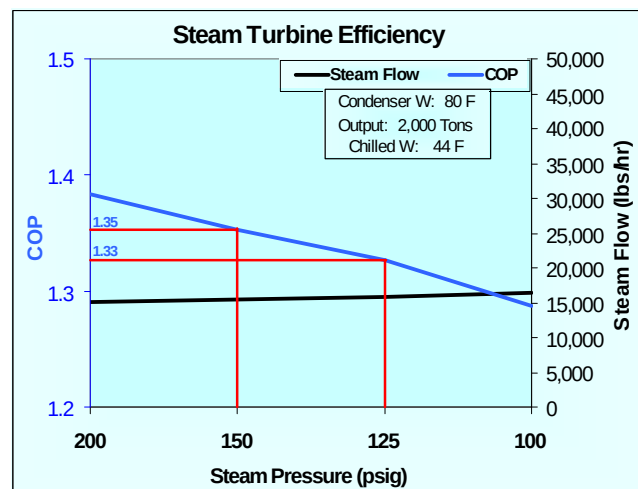


Chilled Water Temperature:

Steam Turbine Chillers can provide low temperature chilled water without sacrificing efficiency. Modern designs can utilize higher temperature differentials for reduced equipment costs.

Condenser Water Temperature:

The long run hours at off design day conditions combined with a high load factor due to base loading promotes higher chiller efficiency. A steam turbine chiller at 68 F ambient wet bulb has a full load COP of 1.5 (or an efficiency of 150%). As the ambient temperature drops the chiller COP can rise to over 2.5 providing high efficiency in shoulder seasons. The availability of high quality simultaneous heat maximizes annual load factor.



Applications

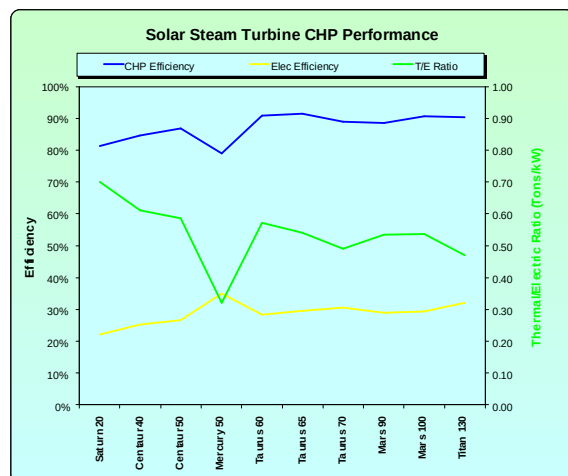
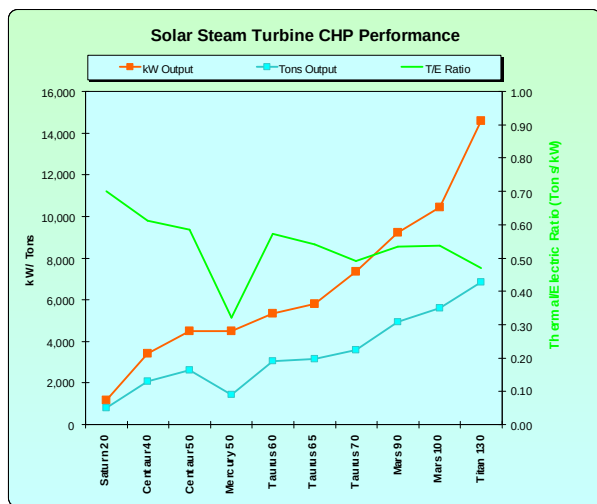
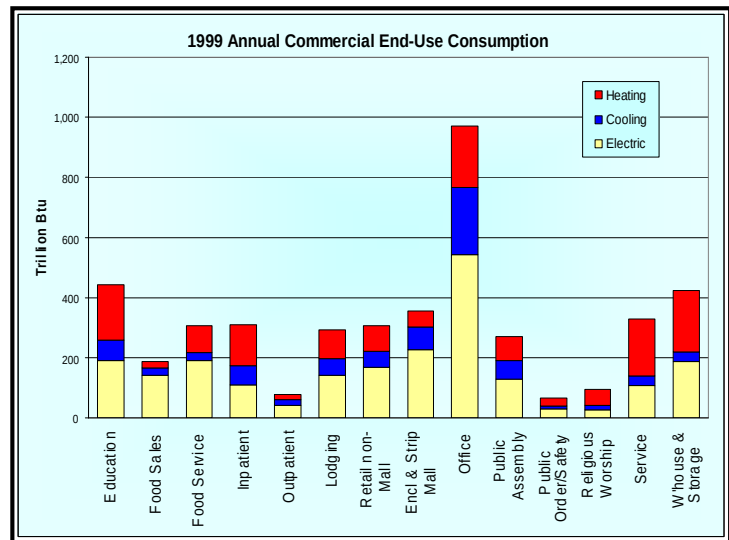
Solar based CHP systems with Steam and Chilled Water have applications in the Industrial and Commercial Sectors as well as in Multi-Family Residential buildings and district energy loops.

High Cooling, Heating and Power Loads

1 to 3 MW Electric Load Minimum
High operating hours
Central Thermal System

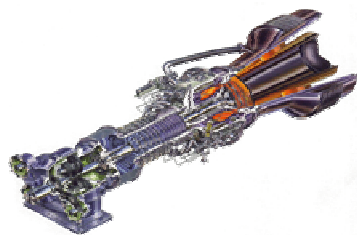
Energy Information Agency statistics for Commercial Building Sectors show large cooling loads in the following sectors:

Colleges & Universities
Hospitals
Hotels & Retirement Homes
Large Office Buildings



Widest Range of Products and Experience

Solar Turbines CHP Systems are driven by the industries number one combustion turbine generator and the number one steam turbine chiller.



Contact your nearest Solar dealer for further information.

SOLAR CHP SYSTEMS

Generator			Saturn 20	Centaur 40	Centaur 50	Mercury 50	Taurus 60
Model							
Generator Nominal Output	kW		1,174	3,419	4,483	4,506	5,329
Fuel Input LHV	MBH		16,800	42,700	53,100	40,300	59,300
Heat Rate LHV	Btu/kW		14,310	12,489	11,784	8,990	11,128
Exhaust Flow	Mlb/hr		51.5	146.6	150.3	140.4	167.6
Exhaust Temp	F		952	826	956	707	954
HRSG							
Exhaust Temp	F		350	350	350	350	350
Heat Recovered as Steam	MBH		8,482	19,092	24,919	13,713	27,696
Feedwater Temp	F		200	200	200	200	200
Steam Output @ 125/15 psig	lb/hr		8,275	18,626	24,311	13,379	27,020
Steam Temp	F		352.9	352.9	352.9	352.9	352.9
Steam Pressure	psig		150	150	150	150	150
Superheat	F		0	0	0	0	0
Cooling Tower							
Design WB Temp	F		73	73	73	73	73
Approach	F		7	7	7	7	7
Heat Rejection	MBH		18,343	44,177	56,424	31,050	64,292
Total Fan Power	kW						
Chiller			A	D	B	B	B
Total Output	tons		822	2,090	2,625	1,445	3,050
Steam Turbine Model	#		HFG8BH7K2G7	XHXB5J5KD7	JGJD3JKD7	JGJD3JKD7	JGJD3JKD7
# Units	#		1	1	2	1	2
Full Load COP	#		1.16	1.31	1.26	1.26	1.32
Chiller Parasitics	kW		25	63	79	43	91
Efficiencies (LHV)							
Thermal/Electric Ratio	#		0.70	0.61	0.59	0.32	0.57
Electric Efficiency	%		22%	25%	27%	35%	28%
Heating Efficiency	%		74%	1	76%	72%	77%
Cooling Efficiency	%		81%	85%	87%	79%	91%
Heat Recovery Efficiency	%		66%	62%	66%	55%	67%

SOLAR CHP SYSTEMS

Generator			Taurus 65	Taurus 70	Mars 90	Mars 100	Titan 130
Model							
Generator Nominal Output	kW		5,815	7,352	9,216	10,439	14,583
Fuel Input LHV	MBH		61,800	75,400	100,500	111,500	143,100
Heat Rate LHV	Btu/kW		10,628	10,256	10,905	10,681	9,813
Exhaust Flow	Mlb/hr		154.5	212.3	316.4	329.1	392.2
Exhaust Temp	F		1,025	913	875	915	932
HRSG							
Exhaust Temp	F		350	350	350	350	350
Heat Recovered as Steam	MBH		28,532	32,701	45,446	50,872	62,450
Feedwater Temp	F		200	200	200	200	200
Steam Output @ 125/15 psig	lb/hr		27,836	31,903	44,338	49,631	60,927
Steam Temp	F		352.9	352.9	352.9	352.9	352.9
Steam Pressure	psig		150	150	150	150	150
Superheat	F			0		0	0
Cooling Tower							
Design WB Temp	F		73	73	73	73	73
Approach	F		7	7	7	7	7
Heat Rejection	MBH		66,233	75,911	102,903	118,092	144,506
Total Fan Power	kW						
Chiller			B	C	B	C	D
Total Output	tons		3,142	3,601	4,788	5,602	6,838
Steam Turbine Model	#		JGJD3JKD7	WHVDJ4KD7	JGJD3JKD7	WHVDJ4KD7	XHXB5J5KD7
# Units	#		2	2	3	3	3
Full Load COP	#		1.32	1.32	1.26	1.32	1.31
Chiller Parasitics	kW		94	108	144	168	205
Efficiencies (LHV)							
Thermal/Electric Ratio	#		0.54	0.49	0.52	0.54	0.47
Electric Efficiency	%		30%	31%	29%	29%	32%
Heating Efficiency	%		78%	77%	77%	78%	78%
Cooling Efficiency	%		92%	89%	87%	91%	90%
Heat Recovery Efficiency	%		68%	65%	66%	67%	67%