Washington University in St. Louis

JAMES MCKELVEY SCHOOL OF ENGINEERING

Spring 2024 MEMS 412 Design of Thermal Systems

Design Homework #2: Brayton Topping Cycle

Course Instructor: Dr. Patricia Weisensee

I hereby certify that the lab report herein is our original academic work, completed in accordance with the McKelvey School of Engineering and Undergraduate Student academic integrity policies, and submitted to fulfill the requirements of this assignment:

Jacob Rapoza

Problem Background

This design homework is analyzing the topping cycle of a combined cycle gas turbine. The cycle it is analyzing is a Brayton Cycle where the system utilizes air from the surrounding environment. One main solution question is what combinations of compressor and turbine efficiencies and compression ratios will result in the highest thermodynamic efficiency. Another solution question is what is the optimal compression ratio for a realistic set of compressor and turbine efficiencies and what number of heliostats would be required to provide the necessary thermal energy for the cycle. Note: I am choosing the solar tower option.

Assumptions and Boundary Conditions

Below are some of the assumptions and boundary conditions already given in the design problem statement as well as some additional assumptions that were drawn through literature search and reason.

Brayton Cycle Given Boundary Conditions/Assumptions.

(1) The Brayton cycle is an open cycle with mass flow into and out of the system.
(2) The working fluid of the open Brayton cycle is air as an ideal gas.
(3) The low-temperature heat exchanger gives off 30 MW of thermal energy.
(4) The temperature of the air entering the compressor from the environment is $T_1 = 300K$.
(5) The temperature of the air leaving the heater and entering the gas turbine is $T_3 = 1200K$.
(6) The temperature of the air leaiving the heat exchanger tied to the bottoming Rankine cycle is $T_5 = 500K$.
(7) The realistic range of compression ratios is $r_p = \frac{p_2}{p_1} = 5 - 30$.
(8) The isentropic efficiencies of the compressor and turbine vary from 70-100%.

Solar Tower Given Boundary Conditions/Assumptions.

(1) The heliostats available for this system are 10m x 10m in size.
(2) Assuming perfect solar-to-thermal conversion.

Solar Tower Additional Boundary Conditions/Assumptions.

(1) The power plant is located in Kailua Kona.
(2) The monthly average direct normal solar irradiation in Kailua, Kona is 3.14 $\frac{kWh}{m^2}$ per day which is 130.83$\frac{W}{m^2}$ [1].
(3) A realistic compressor isentropic efficiency is 88% [2].
(4) A realistic turbine isentropic efficiency is 93% [2].

Schematics and Graphs

Below is a schematic of the Brayton Cycle as well as T-S and P-ν diagrams for the Brayton Cycle.

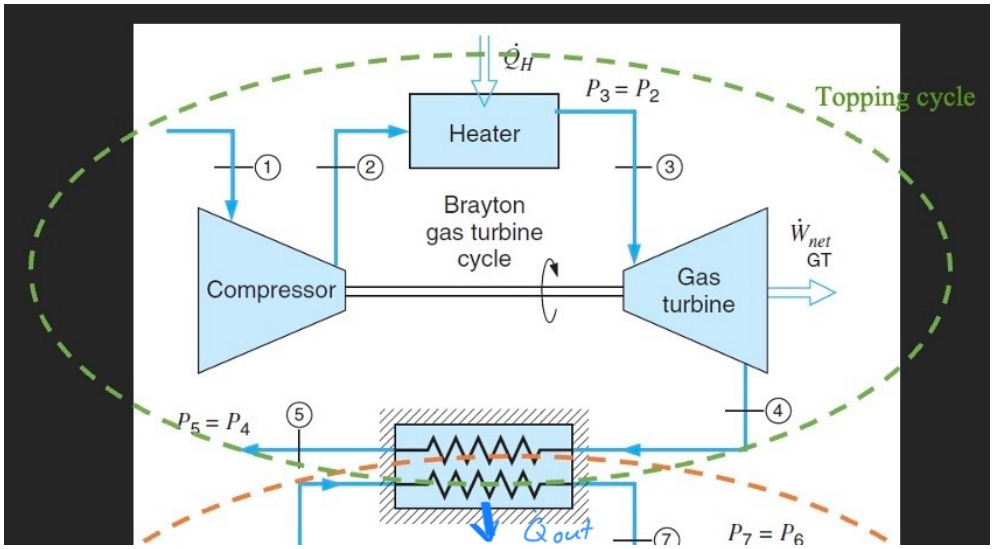


Figure 1 Brayton Cycle schematic.

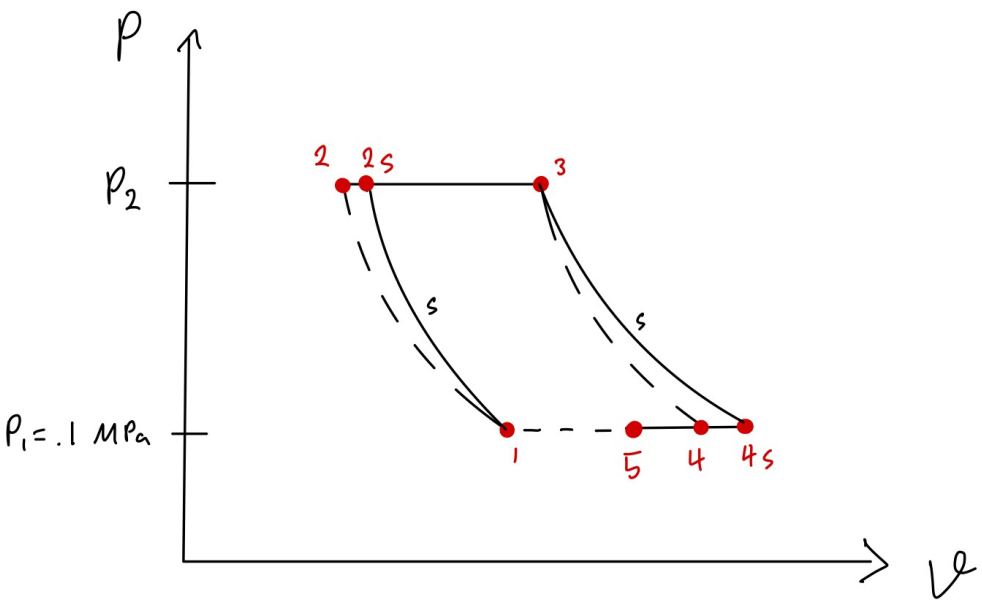


Figure 2 Brayton Cycle P-ν diagram.

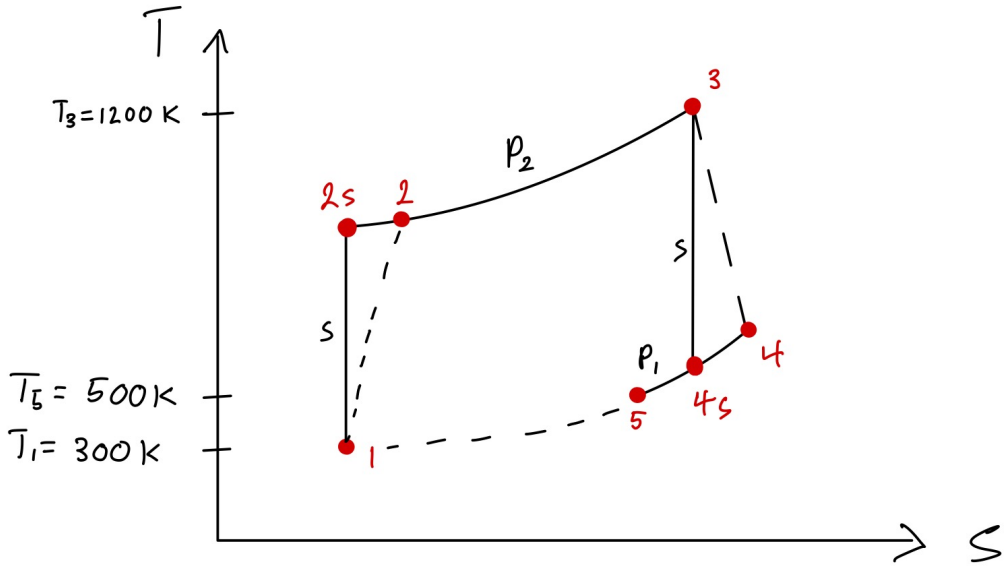


Figure 3 Brayton Cycle T-S diagram.

Equations

Below are the equations that can be used to calculate the efficiency of the open Brayton Cycle and the Solar Tower mirror requirements.

Solving for T_{4s} and T_4 to get $\dot{m}$ for the open Brayton Cycle In order to find T_4 first T_{4s} needs to be found. This can be done using the polytropic relationships seen in Equation 1 below

$$\frac{T_{4s}}{T_3} = (\frac{1}{r_p})^{\frac{k-1}{k}} \tag{1}$$

where T_{4s} is the ideal temperature of the air leaving the turbine [K], T_3 is the temperature of the air entering the turbine [K], r_p is the compression ratio, and k is the heat capacity ratio for air. In this case, because air is treated as an ideal gas k=1.4.

Once T_{4s} has been solved T_4 can be found using the isentropic efficiency relationship as seen in Equation 2 below

$$\eta_T = \frac{T_4 - T_3}{T_{4s} - T_3} \tag{2}$$

where η_T is the isentropic efficiency of the turbine, T_4 is the true temperature of the air leaving the turbine [K], and the rest of the variables are the same as above in Equation 1.

Once T_4 has been found one needs to recognize the energy balance across the heat exchanger that is shared with the Rankine cycle. This energy balance can be used to find $\dot{m}$ which can be seen below in Equation 3

$$\dot{m} = \frac{Q_L}{C_p(T_4 - T_3)} \tag{3}$$

where Q_L is 30 MW given as a boundary assumption, $\dot{m}$ is the mass flow rate found from across the heat exchanger with the Rankine cycle [$\frac{kg}{s}$], C_p is the specific heat of air at 1.004 [$\frac{kJ}{kg-K}$], and the temperatures are the same as above.

Solving for work produced by the turbine W_t In order to find W_t one simply has to recognize the energy balance across the gas turbine which can be seen below in Equation 4

$$W_t = \dot{m} C_p (T_3 - T_4) \tag{4}$$

where W_t is the work of the turbine [kW], T_3 is the temperature of the air entering the gas turbine given as 1200 K, and the rest of the variables are the same as above.

Solving for T_{2s} and T_2 to get W_c for the compressor In order to find T_2 first T_{2s} needs to be found. This can be done using the polytropic relationships seen in Equation 5 below

$$\frac{T_{2s}}{T_1} = (r_p)^{\frac{k-1}{k}} \tag{5}$$

where T_{2s} is the ideal temperature of the air leaving the compressor [K], T_1 is the temperature of the air entering the compressor [K], and the rest of the variables are the same as above.

Once T_{2s} has been solved T_2 can be found using the isentropic efficiency relationship as seen in Equation 6 below

$$\eta_c = \frac{T_{2s} - T_1}{T_2 - T_1} \tag{6}$$

where η_c is the isentropic efficiency of the compressor, T_2 is the true temperature of the air leaving the compressor [K], and the rest of the variables are the same as above.

Once T_2 has been found, to find the work of the compressor, one needs to recognize the energy balance across the compressor which can be seen below in Equation 7

$$W_c = \dot{m} C_p (T_2 - T_1) \tag{7}$$

where W_c is the work into the compressor [kW], and the rest of the variables are the same as above.

Solving for the thermal energy from the heater Q_h In order to find Q_H one simply has to recognize the energy balance across the heater which can be seen below in Equation 8

$$W_t = \dot{m} C_p (T_3 - T_2) \tag{8}$$

where Q_H is the thermal energy from the heater [kW], T_3 is the temperature of the air entering the gas turbine given as 1200 K, and T_2 is the solved value from above [K].

Solving for thermal efficiency of the Brayton Cycle η_{th}

To solve for η_{th} one needs Equation 9 below

$$\eta_{th} = \frac{W_net}{Q_H} = \frac{W_t - W_c}{Q_H} \tag{9}$$

where the variables are the same as above.

Solving for the number of heliostat mirrors required. In order to solve for the number of heliostat mirrors required, first all of the above steps need to be completed with literature values of $\eta_c = .88$ and $\eta_t = .93$.

Once this is done the thermal efficiency of the entire system can be graphed with different compression ratios from 5-30 and the highest efficiency can be found. Then the Q_H for the highest efficiency ratio is known and the number of mirrors required can be calculated using Equation 10 below

$$N = Q_H(\frac{1}{(DNI)})(\frac{1}{A}) \tag{10}$$

where N is the number of mirrors, DNI is the solar irradiance in Kona, HI $[\frac{kW}{m^2}]$, and A is the cross-sectional area of a single mirror $[m^2]$.

Results and Discussion Based on the Excel sheets seen below in the Appendix, the thermal efficiency of the open Brayton cycle as a function of compression ratio can be seen below in Fig. 4 and the net work of the cycle as a function of compression ratio can be seen in Fig. 5. Note not all possible turbine and compressor efficiency combinations were considered and that the legends indicate turbine/compressor efficiencies.

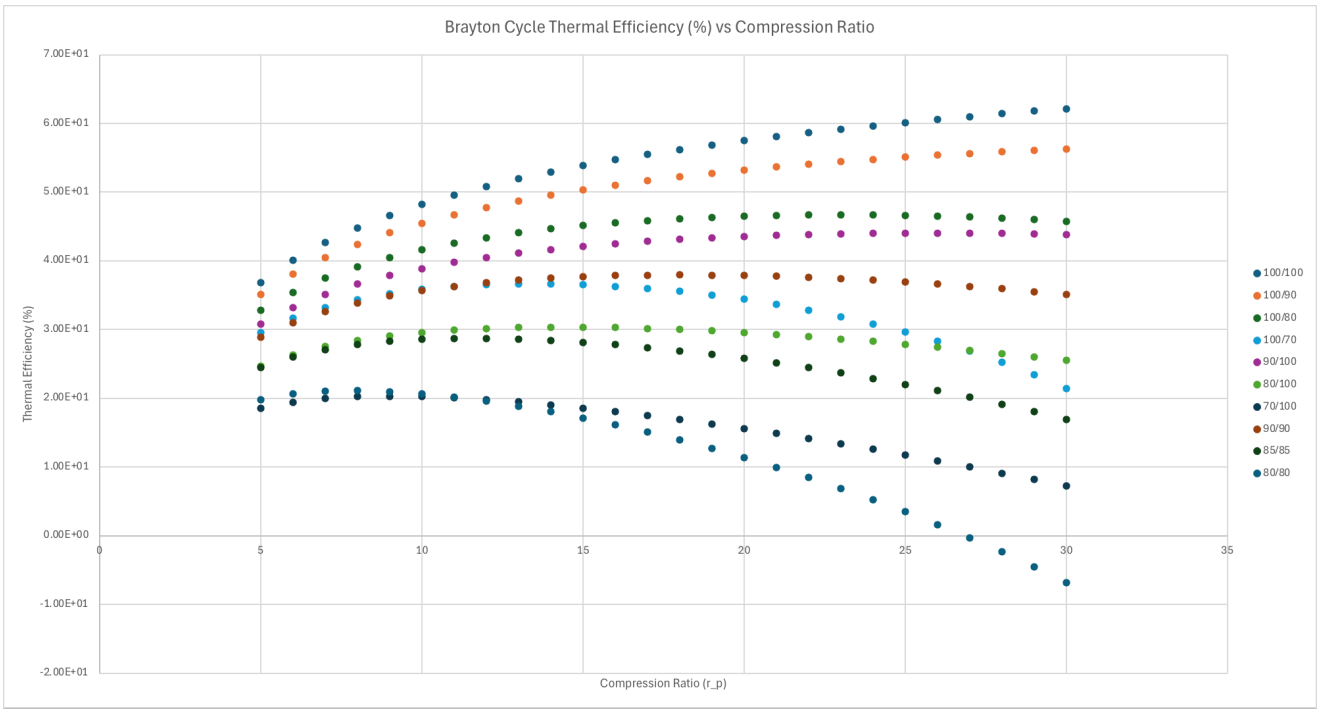


Figure 4 Graph of Brayton cycle efficiency as a function of compression ratio.

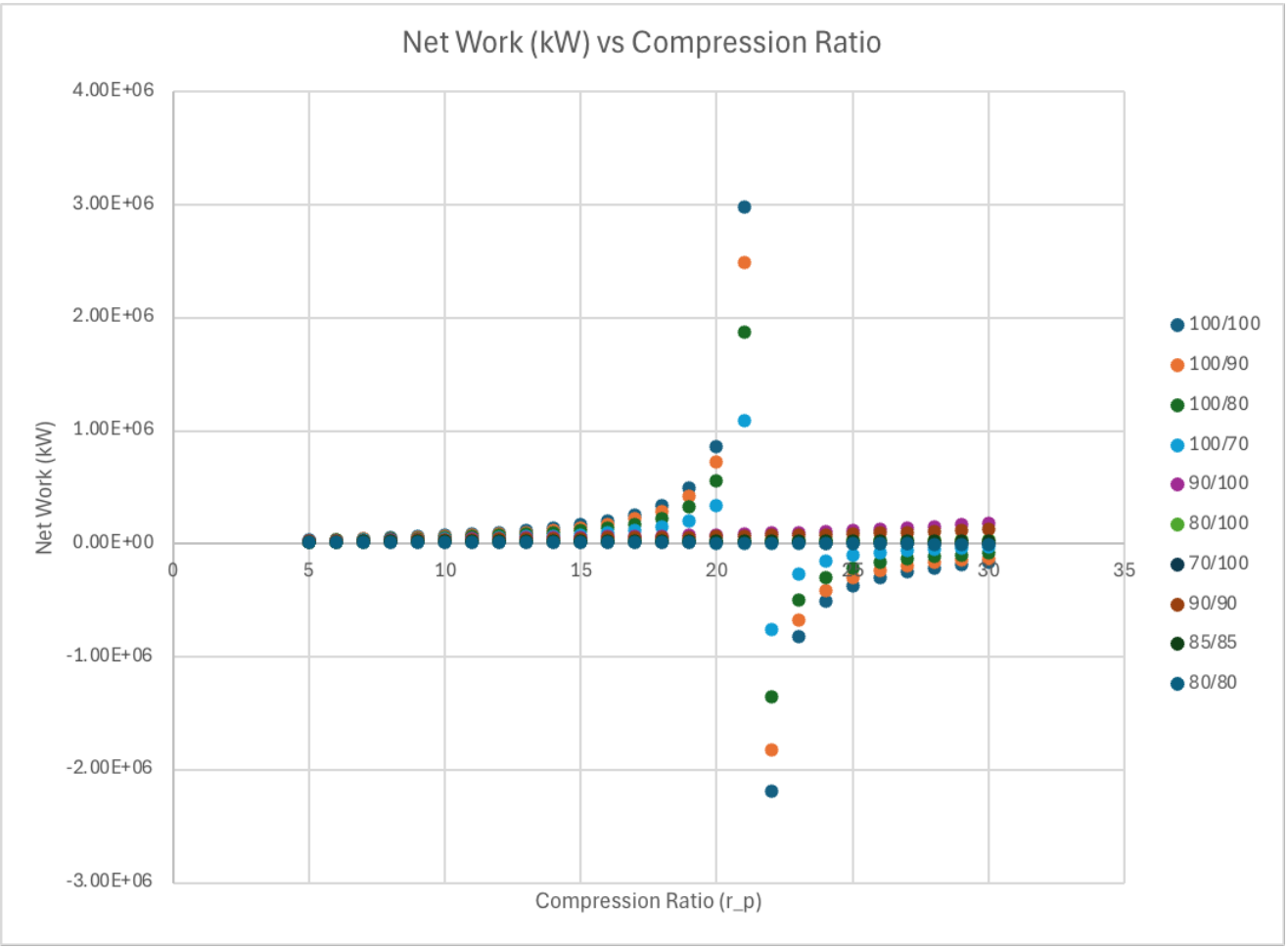


Figure 5 Graph of Brayton cycle net work as a function of compression ratio

Looking at Fig. 4 there is a case where efficiency drops below zero. This case is the 80% turbine efficiency and 80% compressor efficiency. The efficiency dropping below zero, which only happens at the highest compression ratios, simply indicates that the cost to run the compressor became higher than the power output from the turbine. This makes sense because attaining such a high compression ratio would be very expensive, especially with not-as-efficient turbines/compressors.

In terms of Fig. 5 although the majority of the data shows increased net work with an increased compression ratio. It is clear that when the turbine efficiency is 100% there appears a discontinuity in the graph around a compression ratio of 20-22. This happens because with such a high turbine efficiency, T_4 remains the same which in turn leads to a negative $\dot{m}$ when T_4 suddenly becomes higher than the $T_5 = 500K$ given as a boundary. This in turn makes W_t negative which leads to a negative W_net. This implies that there is a cutoff for the optimum compression ratio where the thermal efficiency no longer will increase.

Based on Fig. 5 and 4 improvements in turbine efficiency will have a greater effect on improving the overall thermal efficiency and the net power generation. This makes sense because looking at the graphs combinations with a 100% turbine efficiency showed higher thermal efficiencies than combinations with 100% compressor efficiency. Additionally, the net power for combinations

with 100% turbine efficiency reached exponential gains at lower compression ratios up to their discontinuities.

Based on the calculations above and the Excel sheet seen in the Appendix, the Solar Tower graph of efficiency as a function of compression ratio can be seen below in Fig. 6.

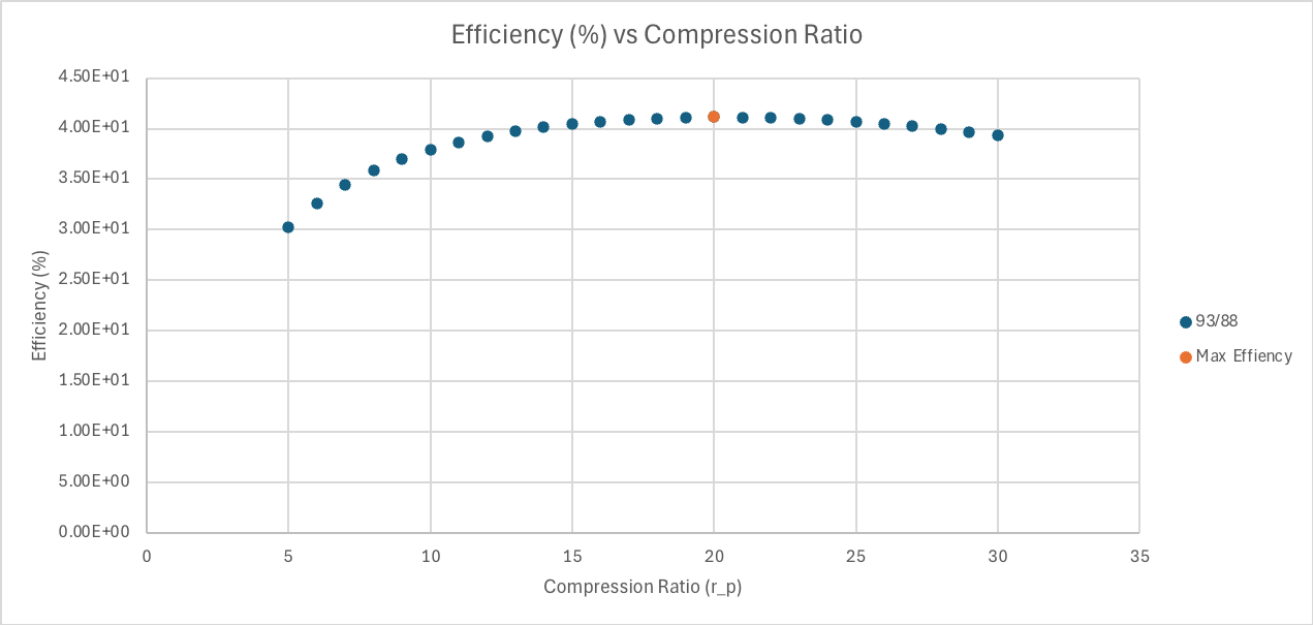


Figure 6 Graph of thermal efficiency as a function of compression ratio.

Using this graph the maximum efficiency for a plant located in Kailua Kona, HI is 41.12% at a compression ratio of 20. Using this efficiency and the Q_H that goes along with it, the number of heliostats required was found to be 17280.

Here is an additional list of final answers garnered from the above work and the Excel file seen in the Appendix.

(1) The compressor and turbine efficiencies for the Solar Tower part were 88% and 93% respectively.
(2) A simple table of results for the various situations can be seen below in Table 1

Table 1 Summary of results.

Combinations	Max Thermal Efficiencies (%)	Compression Ratio	Mass Flow Rate [kg/s]	Net Power Output [kW]	Required Heat Input [kW]	# Heliostats
100/100	62.15	30	-6.51E+02	-1.65E+05	-2.66E+05	-
100/90	56.27	30	-6.51E+02	-1.30E+05	-2.30E+05	-
100/80	46.72	23	-2.97E+03	-4.96E+05	-1.06E+06	-
100/70	36.65	13	3.90E+02	6.26E+04	1.71E+05	-
90/100	44.01	26	6.53E+02	1.27E+05	2.88E+05	-
80/100	30.35	14	1.56E+02	2.67E+04	8.80E+04	-
70/100	20.31	9	9.69E+01	1.26E+04	6.21E+04	-
90/90	37.95	18	3.22E+02	5.78E+04	1.52E+05	-
85/85	28.70	12	1.65E+02	2.54E+04	8.84E+04	-
80/80	21.11	8	1.11E+02	1.40E+04	6.62E+04	-
93/88	41.13	20	5.13E+02	9.30E+04	2.26E+05	17280

As a sanity check to the combination results above, a literature review found that the isentropic efficiency of the turbine has a greater effect than the isentropic efficiency of the compressor on the overall Brayton cycle efficiency [2]. It found this result because the turbine is the "component of higher energy exchange" which means it has " a greater influence on the efficiency (2 times)". In terms of a sanity check for the solar tower calculations, a literature review found that for a solar tower plant with a thermal input of 136 MW, DNI of 850 $\frac{W}{m^2}$, and heliostat efficiency of 57% the square meters of the heliostat field was 302,449 m^2 [3]. In comparison, our example found a 1,727,928 m^2 field would bring in 226 MW with a DNI of 130.8 $\frac{W}{m^2}$ assuming perfect solar to thermal energy conversion. This gives us an area relation of about 5.7 times the literature study area which makes sense when you consider that the DNI is about 6.5 times greater, the thermal output is about 1.7 times greater, and the efficiency is about half. Obviously, this is not a perfect proof but shows that the ranges found in this study at least fall in the ballpark of other studies.

References

[1] 2023, "Solar Energy in 96740 (Kailua Kona, HI)," Solar Energy Local, accessed March 3, 2024, https://www.solarenergylocal.com/states/hawaii/96740/#:~:text=Solar%20Radiation%20Analysis%20for%2096740&text=The%20three%20months%20that%20historically,3.22%20kWh%2Fm2%2Fday.

[2] Sarkar, J., 2010, "Thermodynamic analyses and optimization of a recompression N2O Brayton power cycle," accessed March 3, 2024, https://www.sciencedirect.com/science/article/pii/S0360544210002422?casa_token=Ptvx2O8Qtx4AAAAA:iU9hIPwwJOOzm75uPOiwq0oRGq0ymonk3unELPerhKUqG0wnNOsMKgaBW-3-y10Yc6EF3tb64w

[3] Ferraro, V., Marinelli, V., Settino, J., and Nicoletti, F., 2020, "Techno-Economic Analysis of a Solar Tower Power Plant with an Open Air Brayton Cycle and a Combined Cycle - A Simplified Calculation Method," accessed March 5, 2024, https://www.researchgate.net/profile/Francesco-Nicoletti/publication/346553201_Techno-Economic_Analysis_of_a_Solar_Tower_Power_Plant_with_an_Open_Air_Brayton_Cycle_and_a_Combined_Cycle_-_A_Simplified_Calculation_Method/links/60c344e4299bf1949f4a596a/Techno-Economic-Analysis-of-a-Solar-Tower-Power-Plant-with-an-Open-Air-Brayton-Cycle-and-a-Combined-Cycle-A-Simplified-pdf

Appendix: Excel Sheet

T1	T2	T3	T4	T5	P1=P4=P5	P2=P3
	300		1200		500	100000

Turbine Efficiency	Compressor Efficiency	Pressure Ratio	T2s	T2	T4s	T4	Q_L	Mdot	Q_h	W_c	W_t	Efficiency	W_net
100	100	5	475.1459	475.145883	757.6795	757.679463	3.00E+04	1.16E+02	8.44E+04	2.04E+04	5.15E+04	3.69E+01	3.11E+04
100	100	6	500.5531	500.553132	719.2228	719.2227791	3.00E+04	1.36E+02	9.57E+04	2.74E+04	6.58E+04	4.01E+01	3.83E+04
100	100	7	523.0917	523.09171	688.235	688.2349703	3.00E+04	1.59E+02	1.08E+05	3.56E+04	8.16E+04	4.26E+01	4.60E+04
100	100	8	543.4342	543.434199	662.4734	662.4733876	3.00E+04	1.84E+02	1.21E+05	4.49E+04	9.93E+04	4.48E+01	5.43E+04
100	100	9	562.0332	562.033201	640.5517	640.5516601	3.00E+04	2.13E+02	1.36E+05	5.59E+04	1.19E+05	4.66E+01	6.35E+04
100	100	10	579.2093	579.209319	621.5574	621.5574067	3.00E+04	2.46E+02	1.53E+05	6.89E+04	1.43E+05	4.82E+01	7.38E+04
100	100	11	595.1988	595.198766	604.8607	604.8606835	3.00E+04	2.85E+02	1.73E+05	8.45E+04	1.70E+05	4.96E+01	8.58E+04
100	100	12	610.1811	610.181103	590.0097	590.0097168	3.00E+04	3.32E+02	1.97E+05	1.03E+05	2.03E+05	5.08E+01	9.99E+04
100	100	13	624.2963	624.296333	576.6704	576.6703605	3.00E+04	3.90E+02	2.25E+05	1.27E+05	2.44E+05	5.19E+01	1.17E+05
100	100	14	637.6559	637.655937	564.5891	564.5890699	3.00E+04	4.63E+02	2.61E+05	1.57E+05	2.95E+05	5.29E+01	1.38E+05
100	100	15	650.3503	650.350276	553.5693	553.56927	3.00E+04	5.58E+02	3.08E+05	1.96E+05	3.62E+05	5.39E+01	1.66E+05
100	100	16	662.4537	662.453708	543.4557	543.4557235	3.00E+04	6.88E+02	3.71E+05	2.50E+05	4.53E+05	5.47E+01	2.03E+05
100	100	17	674.0282	674.028235	534.1239	534.1238727	3.00E+04	8.76E+02	4.62E+05	3.29E+05	5.85E+05	5.55E+01	2.57E+05
100	100	18	685.1261	685.126147	525.4724	525.4723774	3.00E+04	1.17E+03	6.06E+05	4.54E+05	7.94E+05	5.62E+01	3.41E+05
100	100	19	695.792	695.791993	517.4178	517.4177728	3.00E+04	1.72E+03	8.68E+05	6.82E+05	1.18E+06	5.69E+01	4.94E+05
100	100	20	706.0641	706.064068	509.8906	509.8905655	3.00E+04	3.02E+03	1.50E+06	1.23E+06	2.09E+06	5.75E+01	8.62E+05
100	100	21	715.9756	715.975557	502.8323	502.8323304	3.00E+04	1.05E+04	5.13E+06	4.41E+06	7.38E+06	5.81E+01	2.98E+06
100	100	22	725.5554	725.555422	496.1935	496.1935175	3.00E+04	-7.85E+03	-3.74E+06	-3.35E+06	-5.55E+06	5.86E+01	-2.19E+06
100	100	23	734.8291	734.829107	489.9318	489.9317709	3.00E+04	-2.97E+03	-1.39E+06	-1.30E+06	-2.12E+06	5.92E+01	-8.20E+05
100	100	24	743.8191	743.819096	484.0106	484.0106238	3.00E+04	-1.87E+03	-8.56E+05	-8.33E+05	-1.34E+06	5.97E+01	-5.11E+05
100	100	25	752.5454	752.545366	478.3985	478.3984739	3.00E+04	-1.38E+03	-6.21E+05	-6.28E+05	-1.00E+06	6.01E+01	-3.74E+05
100	100	26	761.0258	761.025754	473.0678	473.0677698	3.00E+04	-1.11E+03	-4.89E+05	-5.14E+05	-8.10E+05	6.06E+01	-2.96E+05
100	100	27	769.2763	769.27626	467.9944	467.9943593	3.00E+04	-9.34E+02	-4.04E+05	-4.40E+05	-6.86E+05	6.10E+01	-2.46E+05
100	100	28	777.3113	777.311294	463.157	463.1569619	3.00E+04	-8.11E+02	-3.44E+05	-3.89E+05	-6.00E+05	6.14E+01	-2.11E+05
100	100	29	785.1439	785.143888	458.5367	458.536739	3.00E+04	-7.21E+02	-3.00E+05	-3.51E+05	-5.36E+05	6.18E+01	-1.85E+05
100	100	30	792.7859	792.785866	454.1169	454.1169408	3.00E+04	-6.51E+02	-2.66E+05	-3.22E+05	-4.88E+05	6.22E+01	-1.65E+05

Turbine Efficiency	Compressor Efficiency	Pressure Ratio	T2s	T2	T4s	T4	Q_L	Mdot	Q_h	W_c	W_t	Efficiency	W_net
100	90	5	475.1459	494.606536	757.6795	757.679463	3.00E+04	1.16E+02	8.21E+04	2.27E+04	5.15E+04	3.51E+01	2.88E+04
100	90	6	500.5531	522.836814	719.2228	719.2227791	3.00E+04	1.36E+02	9.27E+04	3.05E+04	6.58E+04	3.81E+01	3.53E+04
100	90	7	523.0917	547.879678	688.235	688.2349703	3.00E+04	1.59E+02	1.04E+05	3.95E+04	8.16E+04	4.05E+01	4.21E+04
100	90	8	543.4342	570.482443	662.4734	662.4733876	3.00E+04	1.84E+02	1.16E+05	4.99E+04	9.93E+04	4.24E+01	4.93E+04
100	90	9	562.0332	591.148002	640.5517	640.5516601	3.00E+04	2.13E+02	1.30E+05	6.21E+04	1.19E+05	4.41E+01	5.73E+04
100	90	10	579.2093	610.232576	621.5574	621.5574067	3.00E+04	2.46E+02	1.46E+05	7.66E+04	1.43E+05	4.55E+01	6.62E+04
100	90	11	595.1988	627.998629	604.8607	604.8606835	3.00E+04	2.85E+02	1.64E+05	9.38E+04	1.70E+05	4.67E+01	7.64E+04
100	90	12	610.1811	644.64567	590.0097	590.0097168	3.00E+04	3.32E+02	1.85E+05	1.15E+05	2.03E+05	4.78E+01	8.84E+04
100	90	13	624.2963	660.329259	576.6704	576.6703605	3.00E+04	3.90E+02	2.11E+05	1.41E+05	2.44E+05	4.87E+01	1.03E+05
100	90	14	637.6559	675.173264	564.5891	564.5890699	3.00E+04	4.63E+02	2.44E+05	1.74E+05	2.95E+05	4.96E+01	1.21E+05
100	90	15	650.3503	689.278084	553.5693	553.56927	3.00E+04	5.58E+02	2.86E+05	2.18E+05	3.62E+05	5.04E+01	1.44E+05
100	90	16	662.4537	702.726342	543.4557	543.4557235	3.00E+04	6.88E+02	3.43E+05	2.78E+05	4.53E+05	5.10E+01	1.75E+05
100	90	17	674.0282	715.586928	534.1239	534.1238727	3.00E+04	8.76E+02	4.26E+05	3.65E+05	5.85E+05	5.17E+01	2.20E+05
100	90	18	685.1261	727.917941	525.4724	525.4723774	3.00E+04	1.17E+03	5.56E+05	5.04E+05	7.94E+05	5.22E+01	2.90E+05
100	90	19	695.792	739.768881	517.4178	517.4177728	3.00E+04	1.72E+03	7.93E+05	7.57E+05	1.18E+06	5.28E+01	4.18E+05
100	90	20	706.0641	751.182298	509.8906	509.8905655	3.00E+04	3.02E+03	1.36E+06	1.37E+06	2.09E+06	5.32E+01	7.25E+05
100	90	21	715.9756	762.195063	502.8323	502.8323304	3.00E+04	1.05E+04	4.64E+06	4.90E+06	7.38E+06	5.37E+01	2.49E+06
100	90	22	725.5554	772.839358	496.1935	496.1935175	3.00E+04	-7.85E+03	-3.37E+06	-3.73E+06	-5.55E+06	5.41E+01	-1.82E+06
100	90	23	734.8291	783.143452	489.9318	489.9317709	3.00E+04	-2.97E+03	-1.24E+06	-1.44E+06	-2.12E+06	5.44E+01	-6.76E+05
100	90	24	743.8191	793.132329	484.0106	484.0106238	3.00E+04	-1.87E+03	-7.63E+05	-9.25E+05	-1.34E+06	5.48E+01	-4.18E+05
100	90	25	752.5454	802.828184	478.3985	478.3984739	3.00E+04	-1.38E+03	-5.52E+05	-6.98E+05	-1.00E+06	5.51E+01	-3.04E+05
100	90	26	761.0258	812.250838	473.0678	473.0677698	3.00E+04	-1.11E+03	-4.32E+05	-5.71E+05	-8.10E+05	5.54E+01	-2.39E+05
100	90	27	769.2763	821.418067	467.9944	467.9943593	3.00E+04	-9.34E+02	-3.55E+05	-4.89E+05	-6.86E+05	5.56E+01	-1.97E+05
100	90	28	777.3113	830.345882	463.157	463.1569619	3.00E+04	-8.11E+02	-3.01E+05	-4.32E+05	-6.00E+05	5.59E+01	-1.68E+05
100	90	29	785.1439	839.048764	458.5367	458.536739	3.00E+04	-7.21E+02	-2.61E+05	-3.90E+05	-5.36E+05	5.61E+01	-1.46E+05
100	90	30	792.7859	847.539851	454.1169	454.1169408	3.00E+04	-6.51E+02	-2.30E+05	-3.58E+05	-4.88E+05	5.63E+01	-1.30E+05

Turbine Efficiency	Compressor Efficiency	Pressure Ratio	T2s	T2	T4s	T4	Q_L	Mdot	Q_h	W_c	W_t	Efficiency	W_net
100	80	5	475.1459	518.932353	757.6795	757.679463	3.00E+04	1.16E+02	7.93E+04	2.55E+04	5.15E+04	3.28E+01	2.60E+04
100	80	6	500.5531	550.691415	719.2228	719.2227791	3.00E+04	1.36E+02	8.89E+04	3.43E+04	6.58E+04	3.54E+01	3.15E+04
100	80	7	523.0917	578.864638	688.235	688.2349703	3.00E+04	1.59E+02	9.90E+04	4.44E+04	8.16E+04	3.75E+01	3.71E+04
100	80	8	543.4342	604.292748	662.4734	662.4733876	3.00E+04	1.84E+02	1.10E+05	5.62E+04	9.93E+04	3.92E+01	4.31E+04
100	80	9	562.0332	627.541502	640.5517	640.5516601	3.00E+04	2.13E+02	1.22E+05	6.99E+04	1.19E+05	4.05E+01	4.95E+04
100	80	10	579.2093	649.011648	621.5574	621.5574067	3.00E+04	2.46E+02	1.36E+05	8.61E+04	1.43E+05	4.16E+01	5.66E+04
100	80	11	595.1988	668.998457	604.8607	604.8606835	3.00E+04	2.85E+02	1.52E+05	1.06E+05	1.70E+05	4.26E+01	6.47E+04
100	80	12	610.1811	687.726379	590.0097	590.0097168	3.00E+04	3.32E+02	1.71E+05	1.29E+05	2.03E+05	4.34E+01	7.41E+04
100	80	13	624.2963	705.370416	576.6704	576.6703605	3.00E+04	3.90E+02	1.94E+05	1.59E+05	2.44E+05	4.41E+01	8.53E+04
100	80	14	637.6559	722.069922	564.5891	564.5890699	3.00E+04	4.63E+02	2.22E+05	1.96E+05	2.95E+05	4.46E+01	9.91E+04
100	80	15	650.3503	737.937845	553.5693	553.56927	3.00E+04	5.58E+02	2.59E+05	2.45E+05	3.62E+05	4.51E+01	1.17E+05
100	80	16	662.4537	753.067135	543.4557	543.4557235	3.00E+04	6.88E+02	3.09E+05	3.13E+05	4.53E+05	4.55E+01	1.40E+05
100	80	17	674.0282	767.535294	534.1239	534.1238727	3.00E+04	8.76E+02	3.80E+05	4.11E+05	5.85E+05	4.59E+01	1.74E+05
100	80	18	685.1261	781.407683	525.4724	525.4723774	3.00E+04	1.17E+03	4.93E+05	5.67E+05	7.94E+05	4.61E+01	2.27E+05
100	80	19	695.792	794.739991	517.4178	517.4177728	3.00E+04	1.72E+03	6.98E+05	8.52E+05	1.18E+06	4.64E+01	3.24E+05
100	80	20	706.0641	807.580085	509.8906	509.8905655	3.00E+04	3.02E+03	1.19E+06	1.54E+06	2.09E+06	4.65E+01	5.54E+05
100	80	21	715.9756	819.969446	502.8323	502.8323304	3.00E+04	1.05E+04	4.03E+06	5.51E+06	7.38E+06	4.66E+01	1.88E+06
100	80	22	725.5554	831.944278	496.1935	496.1935175	3.00E+04	-7.85E+03	-2.90E+06	-4.19E+06	-5.55E+06	4.67E+01	-1.35E+06
100	80	23	734.8291	843.536384	489.9318	489.9317709	3.00E+04	-2.97E+03	-1.06E+06	-1.62E+06	-2.12E+06	4.67E+01	-4.96E+05
100	80	24	743.8191	854.77387	484.0106	484.0106238	3.00E+04	-1.87E+03	-6.48E+05	-1.04E+06	-1.34E+06	4.67E+01	-3.02E+05
100	80	25	752.5454	865.681707	478.3985	478.3984739	3.00E+04	-1.38E+03	-4.64E+05	-7.86E+05	-1.00E+06	4.66E+01	-2.17E+05
100	80	26	761.0258	876.282193	473.0678	473.0677698	3.00E+04	-1.11E+03	-3.61E+05	-6.42E+05	-8.10E+05	4.65E+01	-1.68E+05
100	80	27	769.2763	886.595325	467.9944	467.9943593	3.00E+04	-9.34E+02	-2.94E+05	-5.50E+05	-6.86E+05	4.64E+01	-1.36E+05
100	80	28	777.3113	896.639118	463.157	463.1569619	3.00E+04	-8.11E+02	-2.47E+05	-4.86E+05	-6.00E+05	4.62E+01	-1.14E+05
100	80	29	785.1439	906.42986	458.5367	458.536739	3.00E+04	-7.21E+02	-2.12E+05	-4.39E+05	-5.36E+05	4.60E+01	-9.77E+04
100	80	30	792.7859	915.982333	454.1169	454.1169408	3.00E+04	-6.51E+02	-1.86E+05	-4.03E+05	-4.88E+05	4.57E+01	-8.49E+04

Turbine Efficiency	Compressor Efficiency	Pressure Ratio	T2s	T2	T4s	T4	Q_L	Mdot	Q_h	W_c	W_t	Efficiency	W_net
100	70	5	475.1459	550.208404	757.6795	757.679463	3.00E+04	1.16E+02	7.57E+04	2.91E+04	5.15E+04	2.96E+01	2.24E+04
100	70	6	500.5531	586.504475	719.2228	719.2227791	3.00E+04	1.36E+02	8.40E+04	3.92E+04	6.58E+04	3.17E+01	2.66E+04
100	70	7	523.0917	618.702443	688.235	688.2349703	3.00E+04	1.59E+02	9.26E+04	5.08E+04	8.16E+04	3.32E+01	3.08E+04
100	70	8	543.4342	647.763141	662.4734	662.4733876	3.00E+04	1.84E+02	1.02E+05	6.42E+04	9.93E+04	3.44E+01	3.50E+04
100	70	9	562.0332	674.333145	640.5517	640.5516601	3.00E+04	2.13E+02	1.12E+05	7.99E+04	1.19E+05	3.52E+01	3.95E+04
100	70	10	579.2093	698.870455	621.5574	621.5574067	3.00E+04	2.46E+02	1.24E+05	9.84E+04	1.43E+05	3.58E+01	4.43E+04
100	70	11	595.1988	721.712522	604.8607	604.8606835	3.00E+04	2.85E+02	1.37E+05	1.21E+05	1.70E+05	3.63E+01	4.96E+04
100	70	12	610.1811	743.115861	590.0097	590.0097168	3.00E+04	3.32E+02	1.52E+05	1.48E+05	2.03E+05	3.65E+01	5.56E+04
100	70	13	624.2963	763.280476	576.6704	576.6703605	3.00E+04	3.90E+02	1.71E+05	1.81E+05	2.44E+05	3.66E+01	6.26E+04
100	70	14	637.6559	782.365625	564.5891	564.5890699	3.00E+04	4.63E+02	1.94E+05	2.24E+05	2.95E+05	3.66E+01	7.11E+04
100	70	15	650.3503	800.500394	553.5693	553.56927	3.00E+04	5.58E+02	2.24E+05	2.80E+05	3.62E+05	3.65E+01	8.17E+04
100	70	16	662.4537	817.791012	543.4557	543.4557235	3.00E+04	6.88E+02	2.64E+05	3.57E+05	4.53E+05	3.63E+01	9.58E+04

100	70	17	674.0282	834.32605	534.1239	534.1238727	3.00E+04	8.76E+02	3.21E+05	4.70E+05	5.85E+05	3.60E+01	1.16E+05
100	70	18	685.1261	850.180209	525.4724	525.4723774	3.00E+04	1.17E+03	4.12E+05	6.48E+05	7.94E+05	3.55E+01	1.46E+05
100	70	19	695.792	865.417132	517.4178	517.4177728	3.00E+04	1.72E+03	5.76E+05	9.74E+05	1.18E+06	3.50E+01	2.02E+05
100	70	20	706.0641	880.091526	509.8906	509.8905655	3.00E+04	3.02E+03	9.70E+05	1.76E+06	2.09E+06	3.44E+01	3.34E+05
100	70	21	715.9756	894.250796	502.8323	502.8323304	3.00E+04	1.05E+04	3.24E+06	6.29E+06	7.38E+06	3.37E+01	1.09E+06
100	70	22	725.5554	907.936318	496.1935	496.1935175	3.00E+04	-7.85E+03	-2.30E+06	-4.79E+06	-5.55E+06	3.28E+01	-7.56E+05
100	70	23	734.8291	921.184439	489.9318	489.9317709	3.00E+04	-2.97E+03	-8.31E+05	-1.85E+06	-2.12E+06	3.19E+01	-2.65E+05
100	70	24	743.8191	934.02728	484.0106	484.0106238	3.00E+04	-1.87E+03	-4.99E+05	-1.19E+06	-1.34E+06	3.08E+01	-1.54E+05
100	70	25	752.5454	946.49338	478.3985	478.3984739	3.00E+04	-1.38E+03	-3.52E+05	-8.98E+05	-1.00E+06	2.96E+01	-1.04E+05
100	70	26	761.0258	958.60822	473.0678	473.0677698	3.00E+04	-1.11E+03	-2.69E+05	-7.34E+05	-8.10E+05	2.83E+01	-7.61E+04
100	70	27	769.2763	970.394657	467.9944	467.9943593	3.00E+04	-9.34E+02	-2.15E+05	-6.28E+05	-6.86E+05	2.68E+01	-5.78E+04
100	70	28	777.3113	981.873277	463.157	463.1569619	3.00E+04	-8.11E+02	-1.78E+05	-5.55E+05	-6.00E+05	2.52E+01	-4.48E+04
100	70	29	785.1439	993.062697	458.5367	458.536739	3.00E+04	-7.21E+02	-1.50E+05	-5.01E+05	-5.36E+05	2.34E+01	-3.50E+04
100	70	30	792.7859	1003.97981	454.1169	454.1169408	3.00E+04	-6.51E+02	-1.28E+05	-4.60E+05	-4.88E+05	2.14E+01	-2.74E+04

Turbine Efficiency	Compressor Efficiency	Pressure Ratio	T2s	T2	T4s	T4	Q_L	Mdot	Q_h	W_c	W_t	Efficiency	W_net
90	100	5	475.1459	475.145883	757.6795	801.9115167	3.00E+04	9.90E+01	7.20E+04	1.74E+04	3.96E+04	3.08E+01	2.22E+04
90	100	6	500.5531	500.553132	719.2228	767.3005011	3.00E+04	1.12E+02	7.85E+04	2.25E+04	4.86E+04	3.32E+01	2.61E+04
90	100	7	523.0917	523.09171	688.235	739.4114732	3.00E+04	1.25E+02	8.48E+04	2.80E+04	5.77E+04	3.51E+01	2.98E+04
90	100	8	543.4342	543.434199	662.4734	716.2260488	3.00E+04	1.38E+02	9.11E+04	3.38E+04	6.71E+04	3.66E+01	3.33E+04
90	100	9	562.0332	562.033201	640.5517	696.4964941	3.00E+04	1.52E+02	9.74E+04	4.00E+04	7.69E+04	3.78E+01	3.69E+04
90	100	10	579.2093	579.209319	621.5574	679.4016661	3.00E+04	1.67E+02	1.04E+05	4.67E+04	8.71E+04	3.89E+01	4.04E+04
90	100	11	595.1988	595.198766	604.8607	664.3746152	3.00E+04	1.82E+02	1.10E+05	5.39E+04	9.78E+04	3.98E+01	4.39E+04
90	100	12	610.1811	610.181103	590.0097	651.0087451	3.00E+04	1.98E+02	1.17E+05	6.16E+04	1.09E+05	4.05E+01	4.74E+04
90	100	13	624.2963	624.296333	576.6704	639.0033245	3.00E+04	2.15E+02	1.24E+05	7.00E+04	1.21E+05	4.11E+01	5.11E+04
90	100	14	637.6559	637.655937	564.5891	628.130163	3.00E+04	2.33E+02	1.32E+05	7.91E+04	1.34E+05	4.16E+01	5.48E+04
90	100	15	650.3503	650.350276	553.5693	618.212343	3.00E+04	2.53E+02	1.39E+05	8.89E+04	1.48E+05	4.21E+01	5.87E+04
90	100	16	662.4537	662.453708	543.4557	609.1101512	3.00E+04	2.74E+02	1.48E+05	9.97E+04	1.62E+05	4.25E+01	6.28E+04
90	100	17	674.0282	674.028235	534.1239	600.7114854	3.00E+04	2.97E+02	1.57E+05	1.11E+05	1.79E+05	4.28E+01	6.71E+04
90	100	18	685.1261	685.126147	525.4724	592.9251397	3.00E+04	3.22E+02	1.66E+05	1.24E+05	1.96E+05	4.31E+01	7.17E+04
90	100	19	695.792	695.791993	517.4178	585.6759955	3.00E+04	3.49E+02	1.77E+05	1.39E+05	2.15E+05	4.33E+01	7.65E+04
90	100	20	706.0641	706.064068	509.8906	578.9015089	3.00E+04	3.79E+02	1.88E+05	1.54E+05	2.36E+05	4.35E+01	8.18E+04
90	100	21	715.9756	715.975557	502.8323	572.5490973	3.00E+04	4.12E+02	2.00E+05	1.72E+05	2.59E+05	4.37E+01	8.74E+04
90	100	22	725.5554	725.555422	496.1935	566.5741657	3.00E+04	4.49E+02	2.14E+05	1.92E+05	2.85E+05	4.38E+01	9.37E+04
90	100	23	734.8291	734.829107	489.9318	560.9385938	3.00E+04	4.90E+02	2.29E+05	2.14E+05	3.15E+05	4.39E+01	1.01E+05
90	100	24	743.8191	743.819096	484.0106	555.6095614	3.00E+04	5.37E+02	2.46E+05	2.39E+05	3.48E+05	4.40E+01	1.08E+05
90	100	25	752.5454	752.545366	478.3985	550.5586265	3.00E+04	5.91E+02	2.66E+05	2.69E+05	3.85E+05	4.40E+01	1.17E+05
90	100	26	761.0258	761.025754	473.0678	545.7609929	3.00E+04	6.53E+02	2.88E+05	3.02E+05	4.29E+05	4.40E+01	1.27E+05
90	100	27	769.2763	769.27626	467.9944	541.1949234	3.00E+04	7.25E+02	3.14E+05	3.42E+05	4.80E+05	4.40E+01	1.38E+05
90	100	28	777.3113	777.311294	463.157	536.8412657	3.00E+04	8.11E+02	3.44E+05	3.89E+05	5.40E+05	4.40E+01	1.51E+05
90	100	29	785.1439	785.143888	458.5367	532.6830651	3.00E+04	9.14E+02	3.81E+05	4.45E+05	6.13E+05	4.39E+01	1.67E+05
90	100	30	792.7859	792.785866	454.1169	528.7052468	3.00E+04	1.04E+03	4.26E+05	5.15E+05	7.02E+05	4.38E+01	1.87E+05

Turbine Efficiency	Compressor Efficiency	Pressure Ratio	T2s	T2	T4s	T4	Q_L	Mdot	Q_h	W_c	W_t	Efficiency	W_net
80	100	5	475.1459	475.145883	757.6795	846.1435704	3.00E+04	8.63E+01	6.28E+04	1.52E+04	3.07E+04	2.47E+01	1.55E+04
80	100	6	500.5531	500.553132	719.2228	815.3782232	3.00E+04	9.47E+01	6.65E+04	1.91E+04	3.66E+04	2.63E+01	1.75E+04
80	100	7	523.0917	523.09171	688.235	790.5879762	3.00E+04	1.03E+02	6.99E+04	2.30E+04	4.23E+04	2.75E+01	1.92E+04
80	100	8	543.4342	543.434199	662.4734	769.97871	3.00E+04	1.11E+02	7.30E+04	2.71E+04	4.78E+04	2.84E+01	2.07E+04
80	100	9	562.0332	562.033201	640.5517	752.4413281	3.00E+04	1.18E+02	7.58E+04	3.11E+04	5.32E+04	2.91E+01	2.20E+04
80	100	10	579.2093	579.209319	621.5574	737.2459254	3.00E+04	1.26E+02	7.85E+04	3.53E+04	5.85E+04	2.96E+01	2.32E+04
80	100	11	595.1988	595.198766	604.8607	723.8885468	3.00E+04	1.33E+02	8.10E+04	3.96E+04	6.38E+04	2.99E+01	2.42E+04
80	100	12	610.1811	610.181103	590.0097	712.0077734	3.00E+04	1.41E+02	8.35E+04	4.39E+04	6.91E+04	3.01E+01	2.52E+04
80	100	13	624.2963	624.296333	576.6704	701.3362884	3.00E+04	1.48E+02	8.58E+04	4.83E+04	7.43E+04	3.03E+01	2.60E+04
80	100	14	637.6559	637.655937	564.5891	691.671256	3.00E+04	1.56E+02	8.80E+04	5.28E+04	7.96E+04	3.04E+01	2.67E+04
80	100	15	650.3503	650.350276	553.5693	682.855416	3.00E+04	1.63E+02	9.02E+04	5.75E+04	8.48E+04	3.03E+01	2.74E+04
80	100	16	662.4537	662.453708	543.4557	674.7645788	3.00E+04	1.71E+02	9.23E+04	6.22E+04	9.02E+04	3.03E+01	2.79E+04
80	100	17	674.0282	674.028235	534.1239	667.2990981	3.00E+04	1.79E+02	9.43E+04	6.71E+04	9.55E+04	3.02E+01	2.85E+04
80	100	18	685.1261	685.126147	525.4724	660.3779019	3.00E+04	1.86E+02	9.63E+04	7.20E+04	1.01E+05	3.00E+01	2.89E+04
80	100	19	695.792	695.791993	517.4178	653.9342183	3.00E+04	1.94E+02	9.83E+04	7.71E+04	1.06E+05	2.98E+01	2.93E+04
80	100	20	706.0641	706.064068	509.8906	647.9124524	3.00E+04	2.02E+02	1.00E+05	8.24E+04	1.12E+05	2.96E+01	2.96E+04
80	100	21	715.9756	715.975557	502.8323	642.2658643	3.00E+04	2.10E+02	1.02E+05	8.77E+04	1.18E+05	2.93E+01	2.99E+04
80	100	22	725.5554	725.555422	496.1935	636.954814	3.00E+04	2.18E+02	1.04E+05	9.32E+04	1.23E+05	2.90E+01	3.01E+04
80	100	23	734.8291	734.829107	489.9318	631.9454167	3.00E+04	2.26E+02	1.06E+05	9.89E+04	1.29E+05	2.86E+01	3.03E+04
80	100	24	743.8191	743.819096	484.0106	627.208499	3.00E+04	2.35E+02	1.08E+05	1.05E+05	1.35E+05	2.83E+01	3.04E+04
80	100	25	752.5454	752.545366	478.3985	622.7187791	3.00E+04	2.43E+02	1.09E+05	1.11E+05	1.41E+05	2.79E+01	3.05E+04
80	100	26	761.0258	761.025754	473.0678	618.4542159	3.00E+04	2.52E+02	1.11E+05	1.17E+05	1.47E+05	2.75E+01	3.05E+04
80	100	27	769.2763	769.27626	467.9944	614.3954875	3.00E+04	2.61E+02	1.13E+05	1.23E+05	1.54E+05	2.70E+01	3.05E+04
80	100	28	777.3113	777.311294	463.157	610.5255695	3.00E+04	2.70E+02	1.15E+05	1.30E+05	1.60E+05	2.65E+01	3.04E+04
80	100	29	785.1439	785.143888	458.5367	606.8293912	3.00E+04	2.80E+02	1.17E+05	1.36E+05	1.67E+05	2.60E+01	3.03E+04
80	100	30	792.7859	792.785866	454.1169	603.2935527	3.00E+04	2.89E+02	1.18E+05	1.43E+05	1.73E+05	2.55E+01	3.02E+04

Turbine Efficiency	Compressor Efficiency	Pressure Ratio	T2s	T2	T4s	T4	Q_L	Mdot	Q_h	W_c	W_t	Efficiency	W_net
70	100	5	475.1459	475.145883	757.6795	890.3756241	3.00E+04	7.65E+01	5.57E+04	1.35E+04	2.38E+04	1.86E+01	1.03E+04
70	100	6	500.5531	500.553132	719.2228	863.4559453	3.00E+04	8.22E+01	5.77E+04	1.66E+04	2.78E+04	1.94E+01	1.12E+04
70	100	7	523.0917	523.09171	688.235	841.7644792	3.00E+04	8.74E+01	5.94E+04	1.96E+04	3.14E+04	2.00E+01	1.19E+04
70	100	8	543.4342	543.434199	662.4734	823.7313713	3.00E+04	9.23E+01	6.08E+04	2.26E+04	3.49E+04	2.02E+01	1.23E+04
70	100	9	562.0332	562.033201	640.5517	808.3861621	3.00E+04	9.69E+01	6.21E+04	2.55E+04	3.81E+04	2.03E+01	1.26E+04
70	100	10	579.2093	579.209319	621.5574	795.0901847	3.00E+04	1.01E+02	6.31E+04	2.84E+04	4.12E+04	2.02E+01	1.28E+04
70	100	11	595.1988	595.198766	604.8607	783.4024785	3.00E+04	1.05E+02	6.40E+04	3.12E+04	4.41E+04	2.01E+01	1.29E+04
70	100	12	610.1811	610.181103	590.0097	773.0068018	3.00E+04	1.09E+02	6.48E+04	3.41E+04	4.69E+04	1.98E+01	1.28E+04
70	100	13	624.2963	624.296333	576.6704	763.6692524	3.00E+04	1.13E+02	6.55E+04	3.69E+04	4.96E+04	1.95E+01	1.27E+04
70	100	14	637.6559	637.655937	564.5891	755.212349	3.00E+04	1.17E+02	6.61E+04	3.97E+04	5.23E+04	1.91E+01	1.26E+04
70	100	15	650.3503	650.350276	553.5693	747.498489	3.00E+04	1.21E+02	6.66E+04	4.25E+04	5.48E+04	1.86E+01	1.24E+04
70	100	16	662.4537	662.453708	543.4557	740.4190065	3.00E+04	1.24E+02	6.71E+04	4.52E+04	5.73E+04	1.81E+01	1.21E+04
70	100	17	674.0282	674.028235	534.1239	733.8867109	3.00E+04	1.28E+02	6.75E+04	4.80E+04	5.98E+04	1.75E+01	1.18E+04
70	100	18	685.1261	685.126147	525.4724	727.8306642	3.00E+04	1.31E+02	6.78E+04	5.07E+04	6.22E+04	1.69E+01	1.15E+04
70	100	19	695.792	695.791993	517.4178	722.192441	3.00E+04	1.34E+02	6.81E+04	5.34E+04	6.45E+04	1.63E+01	1.11E+04
70	100	20	706.0641	706.064068	509.8906	716.9233958	3.00E+04	1.38E+02	6.83E+04	5.62E+04	6.68E+04	1.56E+01	1.07E+04
70	100	21	715.9756	715.975557	502.8323	711.9826313	3.00E+04	1.41E+02	6.85E+04	5.89E+04	6.91E+04	1.49E+01	1.02E+04
70	100	22	725.5554	725.555422	496.1935	707.3354622	3.00E+04	1.44E+02	6.86E+04	6.16E+04	7.13E+04	1.41E+01	9.71E+03
70	100	23	734.8291	734.829107	489.9318	702.9522396	3.00E+04	1.47E+02	6.88E+04	6.43E+04	7.35E+04	1.34E+01	9.20E+03
70	100	24	743.8191	743.819096	484.0106	698.8074366	3.00E+04	1.50E+02	6.88E+04	6.70E+04	7.56E+04	1.26E+01	8.66E+03
70	100	25	752.5454	752.545366	478.3985	694.8789317	3.00E+04	1.53E+02	6.89E+04	6.97E+04	7.78E+04	1.17E+01	8.09E+03
70	100	26	761.0258	761.025754	473.0678	691.1474389	3.00E+04	1.56E+02	6.89E+04	7.24E+04	7.99E+04	1.09E+01	7.51E+03
70	100	27	769.2763	769.27626	467.9944	687.5960515	3.00E+04	1.59E+02	6.89E+04	7.50E+04	8.19E+04	1.00E+01	6.90E+03
70	100	28	777.3113	777.311294	463.157	684.2098733	3.00E+04	1.62E+02	6.88E+04	7.77E+04	8.40E+04	9.10E+00	6.27E+03
70	100	29	785.1439	785.143888	458.5367	680.9757173	3.00E+04	1.65E+02	6.88E+04	8.04E+04	8.60E+04	8.17E+00	5.62E+03
70	100	30	792.7859	792.785866	454.1169	677.8818586	3.00E+04	1.68E+02	6.87E+04	8.31E+04	8.81E+04	7.20E+00	4.95E+03

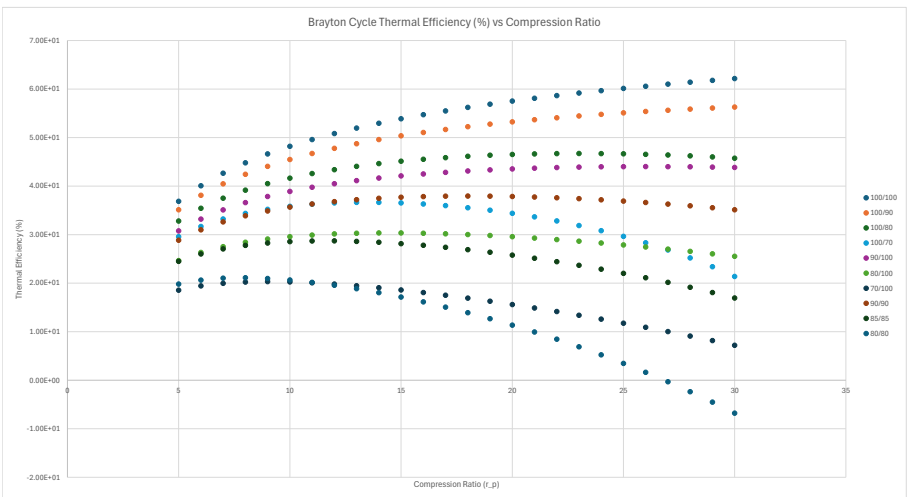
Turbine Efficiency	Compressor Efficiency	Pressure Ratio	T2s	T2	T4s	T4	Q_L	Mdot	Q_h	W_c	W_t	Efficiency	W_net

90	90	5	475.1459	494.606536	757.6795	801.9115167	3.00E+04	9.90E+01	7.01E+04	1.93E+04	3.96E+04	2.88E+01	2.02E+04
90	90	6	500.5531	522.836814	719.2228	767.3005011	3.00E+04	1.12E+02	7.60E+04	2.50E+04	4.86E+04	3.10E+01	2.36E+04
90	90	7	523.0917	547.879678	688.235	739.4114732	3.00E+04	1.25E+02	8.17E+04	3.11E+04	5.77E+04	3.26E+01	2.67E+04
90	90	8	543.4342	570.482443	662.4734	716.2260488	3.00E+04	1.38E+02	8.73E+04	3.75E+04	6.71E+04	3.39E+01	2.96E+04
90	90	9	562.0332	591.148002	640.5517	696.4964941	3.00E+04	1.52E+02	9.30E+04	4.45E+04	7.69E+04	3.49E+01	3.24E+04
90	90	10	579.2093	610.232576	621.5574	679.4016661	3.00E+04	1.67E+02	9.86E+04	5.19E+04	8.71E+04	3.57E+01	3.52E+04
90	90	11	595.1988	627.998629	604.8607	664.3746152	3.00E+04	1.82E+02	1.04E+05	5.99E+04	9.78E+04	3.63E+01	3.79E+04
90	90	12	610.1811	644.64567	590.0097	651.0087451	3.00E+04	1.98E+02	1.10E+05	6.85E+04	1.09E+05	3.68E+01	4.06E+04
90	90	13	624.2963	660.329259	576.6704	639.0033245	3.00E+04	2.15E+02	1.16E+05	7.78E+04	1.21E+05	3.72E+01	4.33E+04
90	90	14	637.6559	675.173264	564.5891	628.130163	3.00E+04	2.33E+02	1.23E+05	8.78E+04	1.34E+05	3.75E+01	4.61E+04
90	90	15	650.3503	689.278084	553.5693	618.212343	3.00E+04	2.53E+02	1.30E+05	9.88E+04	1.48E+05	3.77E+01	4.89E+04
90	90	16	662.4537	702.726342	543.4557	609.1101512	3.00E+04	2.74E+02	1.37E+05	1.11E+05	1.62E+05	3.78E+01	5.17E+04
90	90	17	674.0282	715.586928	534.1239	600.7114854	3.00E+04	2.97E+02	1.44E+05	1.24E+05	1.79E+05	3.79E+01	5.47E+04
90	90	18	685.1261	727.917941	525.4724	592.9251397	3.00E+04	3.22E+02	1.52E+05	1.38E+05	1.96E+05	3.80E+01	5.78E+04
90	90	19	695.792	739.768881	517.4178	585.6759955	3.00E+04	3.49E+02	1.61E+05	1.54E+05	2.15E+05	3.79E+01	6.11E+04
90	90	20	706.0641	751.182298	509.8906	578.9015089	3.00E+04	3.79E+02	1.71E+05	1.72E+05	2.36E+05	3.79E+01	6.46E+04
90	90	21	715.9756	762.195063	502.8323	572.5490973	3.00E+04	4.12E+02	1.81E+05	1.91E+05	2.59E+05	3.77E+01	6.83E+04
90	90	22	725.5554	772.839358	496.1935	566.5741657	3.00E+04	4.49E+02	1.92E+05	2.13E+05	2.85E+05	3.76E+01	7.24E+04
90	90	23	734.8291	783.143452	489.9318	560.9385938	3.00E+04	4.90E+02	2.05E+05	2.38E+05	3.15E+05	3.74E+01	7.68E+04
90	90	24	743.8191	793.132329	484.0106	555.6095614	3.00E+04	5.37E+02	2.19E+05	2.66E+05	3.48E+05	3.72E+01	8.16E+04
90	90	25	752.5454	802.828184	478.3985	550.5586265	3.00E+04	5.91E+02	2.36E+05	2.98E+05	3.85E+05	3.69E+01	8.70E+04
90	90	26	761.0258	812.250838	473.0678	545.7609929	3.00E+04	6.53E+02	2.54E+05	3.36E+05	4.29E+05	3.66E+01	9.31E+04
90	90	27	769.2763	821.418067	467.9944	541.1949234	3.00E+04	7.25E+02	2.76E+05	3.80E+05	4.80E+05	3.63E+01	1.00E+05
90	90	28	777.3113	830.345882	463.157	536.8412657	3.00E+04	8.11E+02	3.01E+05	4.32E+05	5.40E+05	3.59E+01	1.08E+05
90	90	29	785.1439	839.048764	458.5367	532.6830651	3.00E+04	9.14E+02	3.31E+05	4.95E+05	6.13E+05	3.55E+01	1.18E+05
90	90	30	792.7859	847.539851	454.1169	528.7052468	3.00E+04	1.04E+03	3.68E+05	5.72E+05	7.02E+05	3.51E+01	1.29E+05

Turbine Efficiency	Compressor Efficiency	Pressure Ratio	T2s	T2	T4s	T4	Q_L	Mdot	Q_h	W_c	W_t	Efficiency	W_net
85	85	5	475.1459	506.05398	757.6795	824.0275436	3.00E+04	9.22E+01	6.42E+04	1.91E+04	3.48E+04	2.45E+01	1.57E+04
85	85	6	500.5531	535.944862	719.2228	791.3393622	3.00E+04	1.03E+02	6.84E+04	2.43E+04	4.21E+04	2.60E+01	1.78E+04
85	85	7	523.0917	562.460836	688.235	764.9997247	3.00E+04	1.13E+02	7.22E+04	2.97E+04	4.92E+04	2.71E+01	1.95E+04
85	85	8	543.4342	586.393175	662.4734	743.1023794	3.00E+04	1.23E+02	7.57E+04	3.53E+04	5.64E+04	2.78E+01	2.10E+04
85	85	9	562.0332	608.274355	640.5517	724.4689111	3.00E+04	1.33E+02	7.91E+04	4.12E+04	6.36E+04	2.83E+01	2.24E+04
85	85	10	579.2093	628.481551	621.5574	708.3237957	3.00E+04	1.43E+02	8.23E+04	4.73E+04	7.08E+04	2.86E+01	2.35E+04
85	85	11	595.1988	647.292666	604.8607	694.131581	3.00E+04	1.54E+02	8.54E+04	5.37E+04	7.82E+04	2.87E+01	2.45E+04
85	85	12	610.1811	664.918945	590.0097	681.5082593	3.00E+04	1.65E+02	8.84E+04	6.03E+04	8.57E+04	2.87E+01	2.54E+04
85	85	13	624.2963	681.525098	576.6704	670.1698065	3.00E+04	1.76E+02	9.14E+04	6.73E+04	9.34E+04	2.86E+01	2.61E+04
85	85	14	637.6559	697.242279	564.5891	659.9007095	3.00E+04	1.87E+02	9.43E+04	7.45E+04	1.01E+05	2.84E+01	2.68E+04
85	85	15	650.3503	712.176795	553.5693	650.5338795	3.00E+04	1.98E+02	9.72E+04	8.21E+04	1.10E+05	2.81E+01	2.74E+04
85	85	16	662.4537	726.416127	543.4557	641.937365	3.00E+04	2.11E+02	1.00E+05	9.01E+04	1.18E+05	2.78E+01	2.78E+04
85	85	17	674.0282	740.033217	534.1239	634.0052918	3.00E+04	2.23E+02	1.03E+05	9.85E+04	1.27E+05	2.74E+01	2.82E+04
85	85	18	685.1261	753.089584	525.4724	626.6515208	3.00E+04	2.36E+02	1.06E+05	1.07E+05	1.36E+05	2.69E+01	2.85E+04
85	85	19	695.792	765.637638	517.4178	619.8051069	3.00E+04	2.49E+02	1.09E+05	1.17E+05	1.45E+05	2.64E+01	2.87E+04
85	85	20	706.0641	777.722433	509.8906	613.4069807	3.00E+04	2.63E+02	1.12E+05	1.26E+05	1.55E+05	2.58E+01	2.88E+04
85	85	21	715.9756	789.383008	502.8323	607.4074808	3.00E+04	2.78E+02	1.15E+05	1.37E+05	1.66E+05	2.51E+01	2.88E+04
85	85	22	725.5554	800.653438	496.1935	601.7644899	3.00E+04	2.94E+02	1.18E+05	1.48E+05	1.76E+05	2.44E+01	2.88E+04
85	85	23	734.8291	811.563655	489.9318	596.4420052	3.00E+04	3.10E+02	1.21E+05	1.59E+05	1.88E+05	2.37E+01	2.86E+04
85	85	24	743.8191	822.140113	484.0106	591.4090302	3.00E+04	3.27E+02	1.24E+05	1.71E+05	2.00E+05	2.29E+01	2.84E+04
85	85	25	752.5454	832.406313	478.3985	586.6387028	3.00E+04	3.45E+02	1.27E+05	1.84E+05	2.12E+05	2.20E+01	2.80E+04
85	85	26	761.0258	842.38324	473.0678	582.1076044	3.00E+04	3.64E+02	1.31E+05	1.98E+05	2.26E+05	2.11E+01	2.76E+04
85	85	27	769.2763	852.089718	467.9944	577.7952054	3.00E+04	3.84E+02	1.34E+05	2.13E+05	2.40E+05	2.02E+01	2.70E+04
85	85	28	777.3113	861.542699	463.157	573.6834176	3.00E+04	4.06E+02	1.38E+05	2.29E+05	2.55E+05	1.91E+01	2.64E+04
85	85	29	785.1439	870.757515	458.5367	569.7562281	3.00E+04	4.28E+02	1.42E+05	2.45E+05	2.71E+05	1.81E+01	2.56E+04
85	85	30	792.7859	879.748078	454.1169	565.9993997	3.00E+04	4.53E+02	1.46E+05	2.64E+05	2.88E+05	1.69E+01	2.47E+04

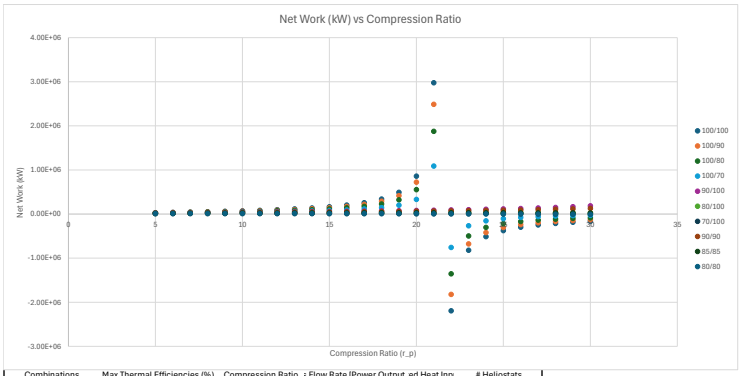
Turbine Efficiency	Compressor Efficiency	Pressure Ratio	T2s	T2	T4s	T4	Q_L	Mdot	Q_h	W_c	W_t	Efficiency	W_net
80	80	5	475.1459	518.932353	757.6795	846.1435704	3.00E+04	8.63E+01	5.90E+04	1.90E+04	3.07E+04	1.98E+01	1.17E+04
80	80	6	500.5531	550.691415	719.2228	815.3782232	3.00E+04	9.47E+01	6.18E+04	2.38E+04	3.66E+04	2.06E+01	1.27E+04
80	80	7	523.0917	578.864638	688.235	790.5879762	3.00E+04	1.03E+02	6.41E+04	2.88E+04	4.23E+04	2.10E+01	1.35E+04
80	80	8	543.4342	604.292748	662.4734	769.97871	3.00E+04	1.11E+02	6.62E+04	3.38E+04	4.78E+04	2.11E+01	1.40E+04
80	80	9	562.0332	627.541502	640.5517	752.4413281	3.00E+04	1.18E+02	6.80E+04	3.89E+04	5.32E+04	2.10E+01	1.43E+04
80	80	10	579.2093	649.011648	621.5574	737.2459254	3.00E+04	1.26E+02	6.97E+04	4.41E+04	5.85E+04	2.06E+01	1.44E+04
80	80	11	595.1988	668.998457	604.8607	723.8885468	3.00E+04	1.33E+02	7.12E+04	4.94E+04	6.38E+04	2.02E+01	1.44E+04
80	80	12	610.1811	687.726379	590.0097	712.0077734	3.00E+04	1.41E+02	7.25E+04	5.49E+04	6.91E+04	1.96E+01	1.42E+04
80	80	13	624.2963	705.370416	576.6704	701.3362884	3.00E+04	1.48E+02	7.37E+04	6.04E+04	7.43E+04	1.89E+01	1.39E+04
80	80	14	637.6559	722.069922	564.5891	691.671256	3.00E+04	1.56E+02	7.48E+04	6.61E+04	7.96E+04	1.80E+01	1.35E+04
80	80	15	650.3503	737.937845	553.5693	682.855416	3.00E+04	1.63E+02	7.58E+04	7.18E+04	8.48E+04	1.71E+01	1.30E+04
80	80	16	662.4537	753.067135	543.4557	674.7645788	3.00E+04	1.71E+02	7.67E+04	7.78E+04	9.02E+04	1.61E+01	1.24E+04
80	80	17	674.0282	767.535294	534.1239	667.2990981	3.00E+04	1.79E+02	7.75E+04	8.38E+04	9.55E+04	1.51E+01	1.17E+04
80	80	18	685.1261	781.407683	525.4724	660.3779019	3.00E+04	1.86E+02	7.83E+04	9.01E+04	1.01E+05	1.39E+01	1.09E+04
80	80	19	695.792	794.739991	517.4178	653.9342183	3.00E+04	1.94E+02	7.90E+04	9.64E+04	1.06E+05	1.27E+01	1.00E+04
80	80	20	706.0641	807.580085	509.8906	647.9124524	3.00E+04	2.02E+02	7.96E+04	1.03E+05	1.12E+05	1.13E+01	9.03E+03
80	80	21	715.9756	819.969446	502.8323	642.2658643	3.00E+04	2.10E+02	8.01E+04	1.10E+05	1.18E+05	9.94E+00	7.96E+03
80	80	22	725.5554	831.944278	496.1935	636.954814	3.00E+04	2.18E+02	8.06E+04	1.17E+05	1.23E+05	8.45E+00	6.81E+03
80	80	23	734.8291	843.536384	489.9318	631.9454167	3.00E+04	2.26E+02	8.10E+04	1.24E+05	1.29E+05	6.88E+00	5.57E+03
80	80	24	743.8191	854.77387	484.0106	627.208499	3.00E+04	2.35E+02	8.14E+04	1.31E+05	1.35E+05	5.22E+00	4.25E+03
80	80	25	752.5454	865.681707	478.3985	622.7187791	3.00E+04	2.43E+02	8.17E+04	1.38E+05	1.41E+05	3.47E+00	2.84E+03
80	80	26	761.0258	876.282193	473.0678	618.4542159	3.00E+04	2.52E+02	8.20E+04	1.46E+05	1.47E+05	1.63E+00	1.33E+03
80	80	27	769.2763	886.595325	467.9944	614.3954875	3.00E+04	2.61E+02	8.22E+04	1.54E+05	1.54E+05	-3.16E-01	-2.60E+02
80	80	28	777.3113	896.639118	463.157	610.5255695	3.00E+04	2.70E+02	8.23E+04	1.62E+05	1.60E+05	-2.36E+00	-1.94E+03
80	80	29	785.1439	906.42986	458.5367	606.8293912	3.00E+04	2.80E+02	8.24E+04	1.70E+05	1.67E+05	-4.52E+00	-3.72E+03
80	80	30	792.7859	915.982333	454.1169	603.2935527	3.00E+04	2.89E+02	8.25E+04	1.79E+05	1.73E+05	-6.79E+00	-5.60E+03

Pressure Ratio	100/100	100/90	100/80	100/70	90/100	80/100	70/100	90/90	85/85	80/80
5	3.69E+01	3.51E+01	3.28E+01	2.96E+01	3.08E+01	2.47E+01	1.86E+01	2.88E+01	2.45E+01	1.98E+01
6	4.01E+01	3.81E+01	3.54E+01	3.17E+01	3.32E+01	2.63E+01	1.94E+01	3.10E+01	2.60E+01	2.06E+01
7	4.26E+01	4.05E+01	3.75E+01	3.32E+01	3.51E+01	2.75E+01	2.00E+01	3.26E+01	2.71E+01	2.10E+01
8	4.48E+01	4.24E+01	3.92E+01	3.44E+01	3.66E+01	2.84E+01	2.02E+01	3.39E+01	2.78E+01	2.11E+01
9	4.66E+01	4.41E+01	4.05E+01	3.52E+01	3.78E+01	2.91E+01	2.03E+01	3.49E+01	2.83E+01	2.10E+01
10	4.82E+01	4.55E+01	4.16E+01	3.58E+01	3.89E+01	2.96E+01	2.02E+01	3.57E+01	2.86E+01	2.06E+01
11	4.96E+01	4.67E+01	4.26E+01	3.63E+01	3.98E+01	2.99E+01	2.01E+01	3.63E+01	2.87E+01	2.02E+01
12	5.08E+01	4.78E+01	4.34E+01	3.65E+01	4.05E+01	3.01E+01	1.98E+01	3.68E+01	2.87E+01	1.96E+01
13	5.19E+01	4.87E+01	4.41E+01	3.66E+01	4.11E+01	3.03E+01	1.95E+01	3.72E+01	2.86E+01	1.89E+01
14	5.29E+01	4.96E+01	4.46E+01	3.66E+01	4.16E+01	3.04E+01	1.91E+01	3.75E+01	2.84E+01	1.80E+01
15	5.39E+01	5.04E+01	4.51E+01	3.65E+01	4.21E+01	3.03E+01	1.86E+01	3.77E+01	2.81E+01	1.71E+01
16	5.47E+01	5.10E+01	4.55E+01	3.63E+01	4.25E+01	3.03E+01	1.81E+01	3.78E+01	2.78E+01	1.61E+01
17	5.55E+01	5.17E+01	4.59E+01	3.60E+01	4.28E+01	3.02E+01	1.75E+01	3.79E+01	2.74E+01	1.51E+01
18	5.62E+01	5.22E+01	4.61E+01	3.55E+01	4.31E+01	3.00E+01	1.69E+01	3.80E+01	2.69E+01	1.39E+01
19	5.69E+01	5.28E+01	4.64E+01	3.50E+01	4.33E+01	2.98E+01	1.63E+01	3.79E+01	2.64E+01	1.27E+01
20	5.75E+01	5.32E+01	4.65E+01	3.44E+01	4.35E+01	2.96E+01	1.56E+01	3.79E+01	2.58E+01	1.13E+01
21	5.81E+01	5.37E+01	4.66E+01	3.37E+01	4.37E+01	2.93E+01	1.49E+01	3.77E+01	2.51E+01	9.94E+00
22	5.86E+01	5.41E+01	4.67E+01	3.28E+01	4.38E+01	2.90E+01	1.41E+01	3.76E+01	2.44E+01	8.45E+00
23	5.92E+01	5.44E+01	4.67E+01	3.19E+01	4.39E+01	2.86E+01	1.34E+01	3.74E+01	2.37E+01	6.88E+00
24	5.97E+01	5.48E+01	4.67E+01	3.08E+01	4.40E+01	2.83E+01	1.26E+01	3.72E+01	2.29E+01	5.22E+00
25	6.01E+01	5.51E+01	4.66E+01	2.96E+01	4.40E+01	2.79E+01	1.17E+01	3.69E+01	2.20E+01	3.47E+00
26	6.06E+01	5.54E+01	4.65E+01	2.83E+01	4.40E+01	2.75E+01	1.09E+01	3.66E+01	2.11E+01	1.63E+00
27	6.10E+01	5.56E+01	4.64E+01	2.68E+01	4.40E+01	2.70E+01	1.00E+01	3.63E+01	2.02E+01	-3.16E-01
28	6.14E+01	5.59E+01	4.62E+01	2.52E+01	4.40E+01	2.65E+01	9.10E+00	3.59E+01	1.91E+01	-2.36E+00
29	6.18E+01	5.61E+01	4.60E+01	2.34E+01	4.39E+01	2.60E+01	8.17E+00	3.55E+01	1.81E+01	-4.52E+00
30	6.22E+01	5.63E+01	4.57E+01	2.14E+01	4.38E+01	2.55E+01	7.20E+00	3.51E+01	1.69E+01	-6.79E+00



Pressure Ratio	100/100	100/90	100/80	100/70	90/100	80/100	70/100	90/90	85/85	80/80
5	3.11E+04	2.88E+04	2.60E+04	2.24E+04	2.22E+04	1.55E+04	1.03E+04	2.02E+04	1.57E+04	1.17E+04
6	3.83E+04	3.53E+04	3.15E+04	2.66E+04	2.61E+04	1.75E+04	1.12E+04	2.36E+04	1.78E+04	1.27E+04
7	4.60E+04	4.21E+04	3.71E+04	3.08E+04	2.98E+04	1.92E+04	1.19E+04	2.67E+04	1.95E+04	1.35E+04
8	5.43E+04	4.93E+04	4.31E+04	3.50E+04	3.33E+04	2.07E+04	1.23E+04	2.96E+04	2.10E+04	1.40E+04
9	6.35E+04	5.73E+04	4.95E+04	3.95E+04	3.69E+04	2.20E+04	1.26E+04	3.24E+04	2.24E+04	1.43E+04
10	7.38E+04	6.62E+04	5.66E+04	4.43E+04	4.04E+04	2.32E+04	1.28E+04	3.52E+04	2.35E+04	1.44E+04
11	8.58E+04	7.64E+04	6.47E+04	4.96E+04	4.39E+04	2.42E+04	1.29E+04	3.79E+04	2.45E+04	1.44E+04
12	9.99E+04	8.84E+04	7.41E+04	5.56E+04	4.74E+04	2.52E+04	1.28E+04	4.06E+04	2.54E+04	1.42E+04
13	1.17E+05	1.03E+05	8.53E+04	6.26E+04	5.11E+04	2.60E+04	1.27E+04	4.33E+04	2.61E+04	1.39E+04
14	1.38E+05	1.21E+05	9.91E+04	7.11E+04	5.48E+04	2.67E+04	1.26E+04	4.61E+04	2.68E+04	1.35E+04
15	1.66E+05	1.44E+05	1.17E+05	8.17E+04	5.87E+04	2.74E+04	1.24E+04	4.89E+04	2.74E+04	1.30E+04
16	2.03E+05	1.75E+05	1.40E+05	9.58E+04	6.28E+04	2.79E+04	1.21E+04	5.17E+04	2.78E+04	1.24E+04
17	2.57E+05	2.20E+05	1.74E+05	1.16E+05	6.71E+04	2.85E+04	1.18E+04	5.47E+04	2.82E+04	1.17E+04
18	3.41E+05	2.90E+05	2.27E+05	1.46E+05	7.17E+04	2.89E+04	1.15E+04	5.78E+04	2.85E+04	1.09E+04
19	4.94E+05	4.18E+05	3.24E+05	2.02E+05	7.65E+04	2.93E+04	1.11E+04	6.11E+04	2.87E+04	1.00E+04
20	8.62E+05	7.25E+05	5.54E+05	3.34E+05	8.18E+04	2.96E+04	1.07E+04	6.46E+04	2.88E+04	9.03E+03
21	2.98E+06	2.49E+06	1.88E+06	1.09E+06	8.74E+04	2.99E+04	1.02E+04	6.83E+04	2.88E+04	7.96E+03
22	-2.19E+06	-1.82E+06	-1.35E+06	-7.56E+05	9.37E+04	3.01E+04	9.71E+03	7.24E+04	2.88E+04	6.81E+03
23	-8.20E+05	-6.76E+05	-4.96E+05	-2.65E+05	1.01E+05	3.03E+04	9.20E+03	7.68E+04	2.86E+04	5.57E+03
24	-5.11E+05	-4.18E+05	-3.02E+05	-1.54E+05	1.08E+05	3.04E+04	8.66E+03	8.16E+04	2.84E+04	4.25E+03
25	-3.74E+05	-3.04E+05	-2.17E+05	-1.04E+05	1.17E+05	3.05E+04	8.09E+03	8.70E+04	2.80E+04	2.84E+03
26	-2.96E+05	-2.39E+05	-1.68E+05	-7.61E+04	1.27E+05	3.05E+04	7.51E+03	9.31E+04	2.76E+04	1.33E+03

27	-2.46E+05	-1.97E+05	-1.36E+05	-5.78E+04	1.38E+05	3.05E+04	6.90E+03	1.00E+05	2.70E+04	-2.60E+02
28	-2.11E+05	-1.68E+05	-1.14E+05	-4.48E+04	1.51E+05	3.04E+04	6.27E+03	1.08E+05	2.64E+04	-1.94E+03
29	-1.85E+05	-1.46E+05	-9.77E+04	-3.50E+04	1.67E+05	3.03E+04	5.62E+03	1.18E+05	2.56E+04	-3.72E+03
30	-1.65E+05	-1.30E+05	-8.49E+04	-2.74E+04	1.87E+05	3.02E+04	4.95E+03	1.29E+05	2.47E+04	-5.60E+03

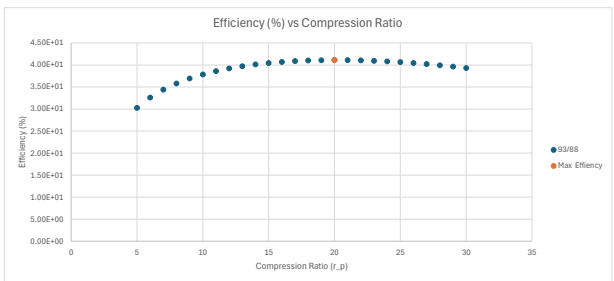


Combinations	Max Thermal Efficiencies (%)	Compression Ratio	s Flow Rate [	Power Output	ed Heat Inp	# Heliostats
100/100	62.15	30	-6.51E+02	-1.65E+05	-2.66E+05	-
100/90	56.27	30	-6.51E+02	-1.30E+05	-2.30E+05	-
100/80	46.72	23	-2.97E+03	-4.96E+05	-1.06E+06	-
100/70	36.65	13	3.90E+02	6.26E+04	1.71E+05	-
90/100	44.01	26	6.53E+02	1.27E+05	2.88E+05	-
80/100	30.35	14	1.56E+02	2.67E+04	8.80E+04	-
70/100	20.31	9	9.69E+01	1.26E+04	6.21E+04	-
90/90	37.95	18	3.22E+02	5.78E+04	1.52E+05	-
85/85	28.70	12	1.65E+02	2.54E+04	8.84E+04	-
80/80	21.11	8	1.11E+02	1.40E+04	6.62E+04	-
93/88	41.13	20	5.13E+02	9.30E+04	2.26E+05	17280

T1	T2	T3	T4	T5	P1=P4=P5	P2=P3
300			1200	500	100000	

Turbine Efficiency	Compressor Efficiency	Pressure Ratio	T2s	T2	T4s	T4	Q_L	Mdot	Q_h	W_c	W_t	Efficiency	W_net
93	88	5	475.1458826	499.0294	757.67946	788.6419006	3.00E+04	1.04E+02	7.29E+04	2.07E+04	4.28E+04	3.03E+01	2.21E+04
93	88	6	500.5531323	527.9013	719.22278	752.8771845	3.00E+04	1.18E+02	7.97E+04	2.70E+04	5.30E+04	3.26E+01	2.60E+04
93	88	7	523.0917103	553.5133	688.23497	724.0585224	3.00E+04	1.33E+02	8.66E+04	3.39E+04	6.37E+04	3.44E+01	2.98E+04
93	88	8	543.4341986	576.6298	662.47339	700.1002504	3.00E+04	1.49E+02	9.35E+04	4.15E+04	7.49E+04	3.58E+01	3.35E+04
93	88	9	562.0332014	597.765	640.55166	679.7130439	3.00E+04	1.66E+02	1.01E+05	4.97E+04	8.69E+04	3.69E+01	3.71E+04
93	88	10	579.2093187	617.2833	621.55741	662.0483883	3.00E+04	1.84E+02	1.08E+05	5.87E+04	9.96E+04	3.79E+01	4.09E+04
93	88	11	595.1987657	635.4531	604.86068	646.5204357	3.00E+04	2.04E+02	1.16E+05	6.87E+04	1.13E+05	3.86E+01	4.46E+04
93	88	12	610.1811029	652.4785	590.00972	632.7090366	3.00E+04	2.25E+02	1.24E+05	7.97E+04	1.28E+05	3.92E+01	4.86E+04
93	88	13	624.296333	668.5186	576.67036	620.3034353	3.00E+04	2.48E+02	1.33E+05	9.19E+04	1.45E+05	3.97E+01	5.27E+04
93	88	14	637.6559372	683.6999	564.58907	609.0678351	3.00E+04	2.74E+02	1.42E+05	1.06E+05	1.63E+05	4.01E+01	5.70E+04
93	88	15	650.3502758	698.1253	553.56927	598.8194211	3.00E+04	3.02E+02	1.52E+05	1.21E+05	1.83E+05	4.05E+01	6.16E+04
93	88	16	662.4537082	711.8792	543.45572	589.4138229	3.00E+04	3.34E+02	1.64E+05	1.38E+05	2.05E+05	4.07E+01	6.67E+04
93	88	17	674.0282349	725.0321	534.12387	580.7352016	3.00E+04	3.70E+02	1.76E+05	1.58E+05	2.30E+05	4.09E+01	7.22E+04
93	88	18	685.1261466	737.6433	525.47238	572.689311	3.00E+04	4.11E+02	1.91E+05	1.81E+05	2.59E+05	4.10E+01	7.83E+04
93	88	19	695.7919926	749.7636	517.41777	565.1985287	3.00E+04	4.58E+02	2.07E+05	2.07E+05	2.92E+05	4.11E+01	8.51E+04
93	88	20	706.0640681	761.4364	509.89057	558.1982259	3.00E+04	5.13E+02	2.26E+05	2.38E+05	3.31E+05	4.11E+01	9.30E+04
93	88	21	715.9755571	772.6995	502.83233	551.6340673	3.00E+04	5.79E+02	2.48E+05	2.75E+05	3.77E+05	4.11E+01	1.02E+05
93	88	22	725.5554223	783.5857	496.19352	545.4599713	3.00E+04	6.57E+02	2.75E+05	3.19E+05	4.32E+05	4.11E+01	1.13E+05
93	88	23	734.8291072	794.124	489.93177	539.6365469	3.00E+04	7.54E+02	3.07E+05	3.74E+05	5.00E+05	4.10E+01	1.26E+05
93	88	24	743.819096	804.3399	484.01062	534.1298801	3.00E+04	8.75E+02	3.48E+05	4.43E+05	5.85E+05	4.08E+01	1.42E+05
93	88	25	752.5453659	814.2561	478.39847	528.9105807	3.00E+04	1.03E+03	4.00E+05	5.34E+05	6.96E+05	4.07E+01	1.63E+05
93	88	26	761.0257542	823.8929	473.06777	523.953026	3.00E+04	1.25E+03	4.71E+05	6.56E+05	8.47E+05	4.05E+01	1.91E+05
93	88	27	769.2762599	833.2685	467.99436	519.2347542	3.00E+04	1.55E+03	5.72E+05	8.32E+05	1.06E+06	4.02E+01	2.30E+05
93	88	28	777.3112942	842.3992	463.15696	514.7359746	3.00E+04	2.03E+03	7.28E+05	1.10E+06	1.40E+06	4.00E+01	2.91E+05
93	88	29	785.1438878	851.2999	458.53674	510.4391673	3.00E+04	2.86E+03	1.00E+06	1.58E+06	1.98E+06	3.97E+01	3.97E+05
93	88	30	792.7858662	859.9839	454.11694	506.328755	3.00E+04	4.72E+03	1.61E+06	2.65E+06	3.29E+06	3.93E+01	6.34E+05

Pressure Ratio	93/88	Max Effiency
5	3.03E+01	
6	3.26E+01	
7	3.44E+01	
8	3.58E+01	
9	3.69E+01	
10	3.79E+01	
11	3.86E+01	
12	3.92E+01	
13	3.97E+01	
14	4.01E+01	
15	4.05E+01	
16	4.07E+01	
17	4.09E+01	
18	4.10E+01	
19	4.11E+01	
20	4.11E+01	41.12638394
21	4.11E+01	
22	4.11E+01	
23	4.10E+01	
24	4.08E+01	
25	4.07E+01	
26	4.05E+01	
27	4.02E+01	
28	4.00E+01	
29	3.97E+01	
30	3.93E+01	



Solar Tower	Optimal Compression Ratio	Q_h(kW)	Efficiency (%)	DNI(kWh/m	DNI(kW/m^; N	M^2	
	20	2.26E+05	4.11E+01	3.14	0.1308333	17279.28	1727928