Combined Cycle Plant Performance — Report

DOCUMENT

Plant / project	**Example Plant**
Equipment tag / system	**CC-01**
Calculation / document no.	**CALC-PE-100**
Revision	**0**
Prepared by	**Your name**
Checked by	**—**
Date	**07-Nov-2026**
Calculation basis	Basis: LHV · Steam turbine output: measured · Fuel input: flow and LHV · Exhaust flow: entered · Auxiliary load: kW · Aligned with the publicly documented ASME PTC 46 overall-plant method; IAPWS-IF97 steam; ISO correction with generic coefficients
Status	**✓ Inputs OK · ℹ️ 9 default value(s) in use: HHV / LHV ratio of the fuel, gas turbine generator efficiency, steam turbine generator efficiency, gas turbine casing and lube-oil loss, HRSG casing loss, output change per K of ambient temperature, heat-rate change per K of ambient temperature, output change per g/kg of specific humidity, heat-rate change per g/kg of specific humidity**

KEY INPUTS (values used; Proposed shows the Actual value where it was left blank)

Input	Unit	Design	Actual	Proposed
Ambient air temperature	°C	15.0	32.0	32.0
Ambient pressure	bar a	1.013	1.006	1.006
Relative humidity	%	60.0	55.0	55.0
Fuel mass flow to the gas turbines	kg/h	50,000	45,900	45,900
Fuel lower heating value (LHV)	kJ/kg	47,500	47,500	47,500
Gas turbine gross output (all units)	MW	242.00	213.50	213.50
Gas turbine exhaust temperature (HRSG inlet)	°C	545.0	556.0	556.0
Gas turbine exhaust mass flow (all units)	t/h	2,520.0	2,380.0	2,380.0
Stack temperature (HRSG exit)	°C	98.0	104.0	104.0
Steam turbine gross output	MW	113.00	104.00	109.50
HP steam flow to the steam turbine	t/h	318.0	302.5	307.0
HP steam pressure at turbine inlet	bar a	70.00	69.00	69.00
HP steam temperature at turbine inlet	°C	515.0	512.0	512.0
LP steam admission flow	t/h	74.0	70.5	71.5
LP steam admission pressure	bar a	6.00	6.00	6.00
LP admission temperature (blank = sat.)	°C	200.0	200.0	200.0
Condenser pressure	bar a	0.0700	0.0850	0.0700
Steam turbine section isentropic efficiency	%	86.0	85.0	86.0
Feedwater temperature at the HRSG inlet	°C	45.0	48.0	48.0
Plant auxiliary load	MW	8.00	7.80	7.80

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RESULTS

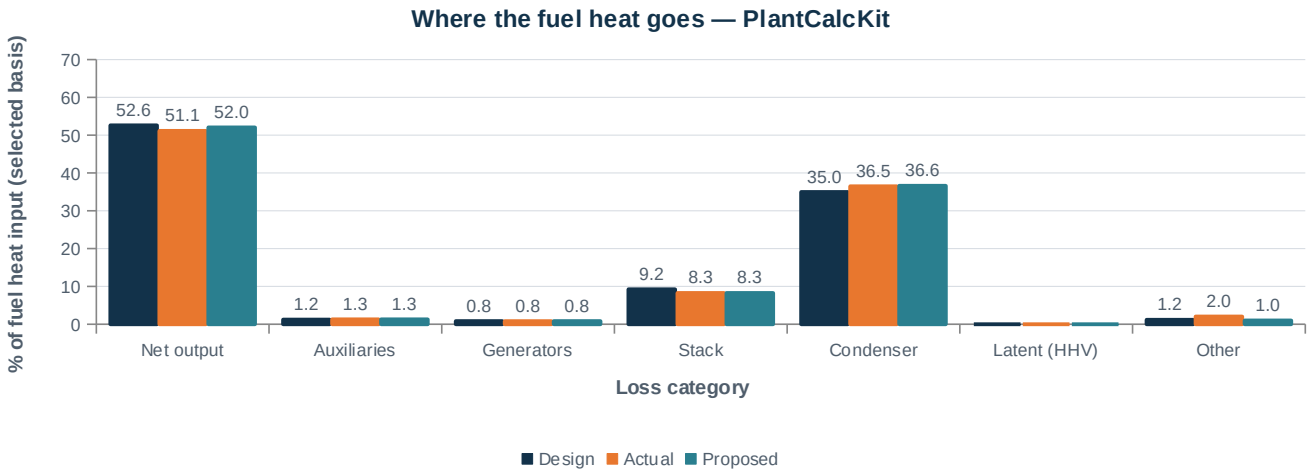
Result	Unit	Design	Actual	Proposed	Actual − Design	Proposed − Actual
Gas turbine gross output	MW	242.00	213.50	213.50	-28.50	0.00
Steam turbine gross output (selected method)	MW	113.00	104.00	109.50	-9.00	5.50
Plant gross output	MW	355.00	317.50	323.00	-37.50	5.50
Auxiliary load	MW	8.00	7.80	7.80	-0.20	0.00
Net electrical output	MW	347.00	309.70	315.20	-37.30	5.50
Steam cycle share of gross output	%	31.8	32.8	33.9	0.9	1.1
Fuel heat input, LHV (incl. duct burners)	MW	659.72	605.63	605.63	-54.10	0.00
Fuel heat input, HHV	MW	731.63	671.64	671.64	-59.99	0.00
Net electrical efficiency, LHV	%	52.60	51.14	52.05	-1.46	0.91
Net electrical efficiency, HHV	%	47.43	46.11	46.93	-1.32	0.82
Net heat rate, LHV	kJ/kWh	6,844.38	7,039.88	6,917.04	195.50	-122.84
Net heat rate, HHV	kJ/kWh	7,590.42	7,807.22	7,670.99	216.81	-136.23
Gas turbine gross efficiency (selected basis)	%	36.68	35.25	35.25	-1.43	0.00
Humidity ratio of the inlet air	g/kg	6.35	16.62	16.62	10.27	0.00
Output correction factor	-	1.0000	0.9100	0.9100	-0.0900	0.0000
Heat-rate correction factor	-	1.0000	1.0046	1.0046	0.0046	0.0000
Net output at ISO conditions	MW	347.00	340.32	346.36	-6.68	6.04
Net heat rate at ISO (selected basis)	kJ/kWh	6,844.38	7,007.58	6,885.30	163.20	-122.28
Net efficiency at ISO (selected basis)	%	52.60	51.37	52.29	-1.22	0.91
Net electrical output	%	52.60	51.14	52.05	-1.46	0.91
Auxiliary load	%	1.21	1.29	1.29	0.08	0.00
Generator losses (GT and ST)	%	0.82	0.80	0.81	-0.02	0.01
Stack (exhaust) loss	%	9.24	8.26	8.26	-0.98	0.00
Condenser heat rejection	%	34.96	36.48	36.62	1.52	0.14
Latent heat of fuel-gas water (HHV basis)	%	0.00	0.00	0.00	0.00	0.00
Other and unaccounted losses	%	1.17	2.04	0.98	0.87	-1.06
Gas turbine exhaust mass flow used	t/h	2,520.0	2,380.0	2,380.0	-140.0	0.0
Exhaust heat above ambient temperature	MW	407.14	381.26	381.26	-25.88	0.00
Stack loss	MW	60.95	50.01	50.01	-10.94	0.00
Heat to water and steam — exhaust side	MW	344.46	329.59	329.59	-14.87	0.00
Heat absorbed by the steam — steam side	MW	342.06	323.67	328.44	-18.40	4.78
HRSG balance closure (steam − exhaust side)	%	-0.70	-1.80	-0.35	-1.10	1.45
Steam turbine output estimated from steam	MW	113.13	104.07	108.79	-9.06	4.72
Estimated − measured steam turbine output	%	0.11	0.07	-0.65	-0.04	-0.71
Condenser heat rejection	MW	230.62	220.90	221.75	-9.72	0.85
Steam cycle efficiency	%	33.54	32.62	33.85	-0.92	1.23

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FINDINGS AND RECOMMENDATIONS

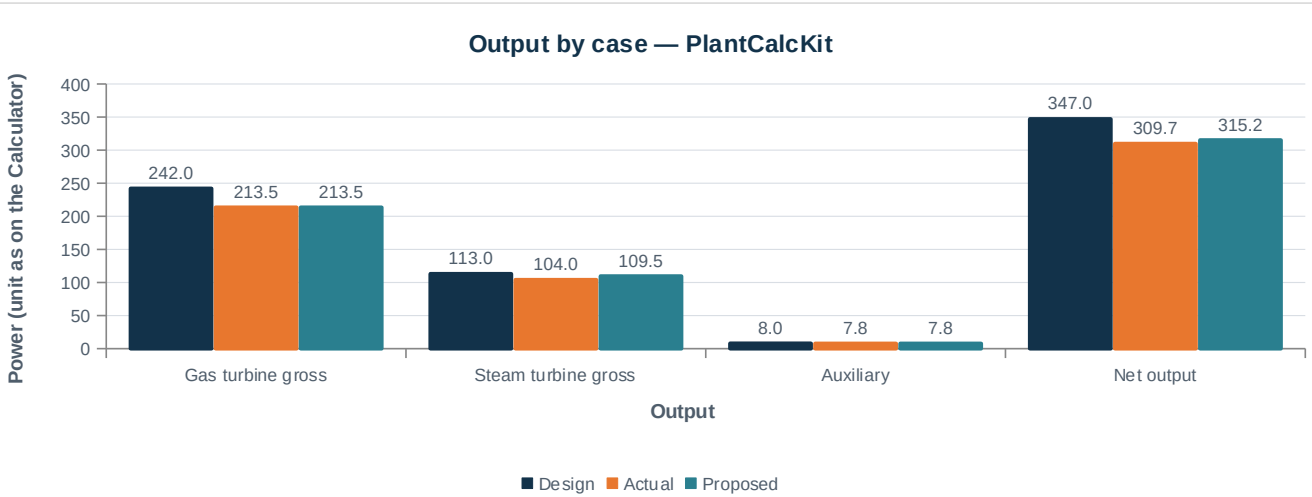
⚠ **Correct soon**	The actual net efficiency at ISO conditions is 1.2 points below the design value.
◆ **Opportunity**	The condenser pressure is 1.5 kPa above the design value: the steam turbine loses output. Check the cooling water temperature and flow, the air removal and the tube cleanliness.
◆ **Opportunity**	The proposed case changes the net output by 5,500 kW (1.78 %) and the net efficiency by +0.91 points against the actual case.

CHARTS



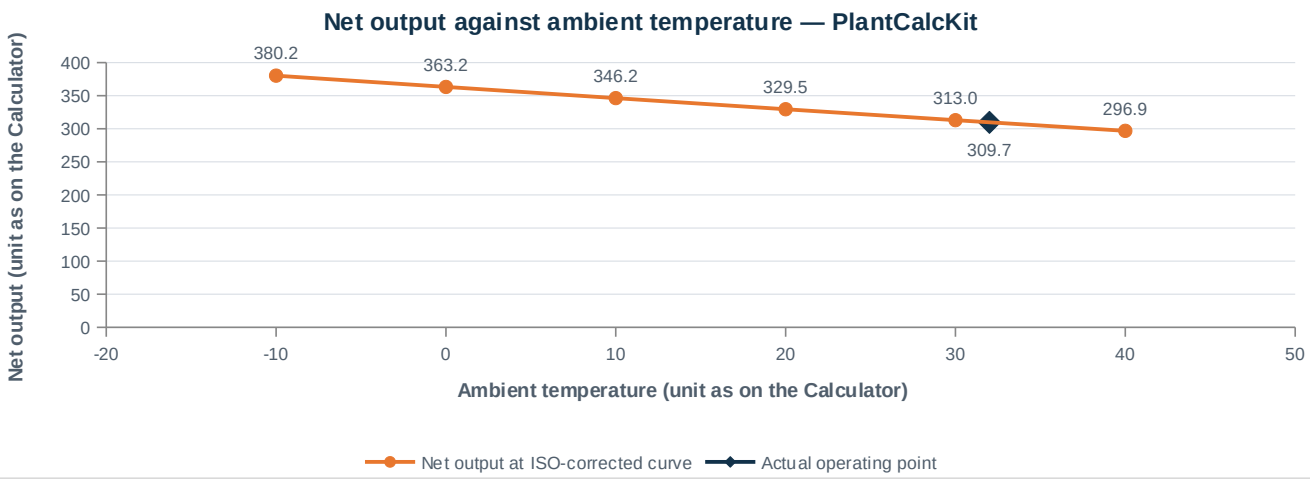
Observations — loss breakdown

[Write your observations here]



Observations — output by case

[Write your observations here]



Observations — ambient influence

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