

SolarBeam™ Concentrator Thermal Efficiency Review

Thermal Comparison with Parabolic
Solar Trough Technology

Solartron Energy White Paper



SolarBeam Concentrator™ Technology

The SolarBeam Concentrator is the world's first parabolic solar dish to achieve SRCC certification ([SRCC 600 Standard](#)) and achieve high thermal efficiencies compared with other concentrated solar parabolic technologies. The SolarBeam Concentrator achieves peak 11.5 kW of thermal heat per hour by collecting the sun's radiation from a 15.8 m² (160 sq.ft) surface area and focusing the energy on a 25x25cm (10x10") absorber.

The SolarBeam Concentrator was designed as a low maintenance hybrid system capable of providing temperatures up to 93 degrees Celsius* for the following application:

- Process Heating
- Cooling with Adsorption / Absorption chillers
- Future electricity production with CPV cell technology

The SolarBeam can be installed as a single system or in a solar array for large energy production.

The SolarBeam has been tested in the harsh, cold Canadian winters with minimal performance loss. The SolarBeam was engineered with state-of-the-art components and electronics to handle any weather condition including high ambient temperature, snow load and easy snow removal.

In the following section you will find the performance review of the SolarBeam and two other systems based strictly on SRCC data for operating delta temperature of: 0, 10, 30, 50, and 80 degree Celsius.

**Although the SolarBeam is capable of achieving temperatures above 100 degrees celsius, the Solar Beam would require having an onsite stationary engineer to manage the system and the SolarBeam would not be able to be used with adsorption / absorption chillers or CPV technology.*

Comparison Data

The comparison was based on data for the SolarBeam Concentrator and SRCC reports for Cogenera and ChromaSun.

- Cogenera is a hybrid thermal & PV parabolic trough concentrator.
- ChromaSun is a micro-concentrator solar thermal collector

The performance analysis was based on the following SRCC data and the energy kW was measured by changing the delta T : 0, 10, 30, 50, 80 degrees celsius.

SolarBeam	
Solar Collector Area	15.8
G Solar Radiation	1000
F Collector Efficiency	0.73
Kθb(θ)	1
K1 Factor	1
C1	0.733
C2	0.0204
C3	0
C4	0
C5	512
C6	0.085

ChromaSun	
Solar Collector Area	15.8
G Solar Radiation	1000
F Collector Efficiency	0.565
Kθb(θ)	1
K1 Factor	1
C1	0.54
C2	0.0032
C3	0
C4	0
C5	590.46
C6	0

Cogenera	
Solar Collector Area	15.8
G Solar Radiation	1000
F Collector Efficiency	0.64
Kθb(θ)	1
K1 Factor	1
C1	0
C2	0.08519
C3	0
C4	0
C5	304.0425
C6	0.00524

The following equation was used for the thermal performance results as per SRCC requirements:

$$Q / A = F'(\tau\alpha)en K\theta b(\theta) G_b + F'(\tau\alpha)en K\theta d G_d - c_6 u G^* - c_1 (t_m - t_a) - c_2 (t_m - t_a)^2 - c_5 dtm/dt$$

SolarBeam Concentrator™ Performance Curve

The performance curve for the SolarBeam Concentrator shows overall high energy performance within the temperature ranges.

