



SOLARBEAM™

HYBRID PARABOLIC SOLAR CONCENTRATOR
STATE OF THE ART TECHNOLOGY FOR
ELECTRICITY | WATER DESALINATION

9M



ABOUT SOLARTRON

The global market was missing a scalable, cost effective & reliable solar power technology. The LCOE such as trough, tower, and HCPV Fresnel were not competitive with existing coal & natural gas power generation plants.

Since 2010 Solartron Energy Systems Inc. has achieved the first ever globally certified 4.5 meter dish (2011), increased efficiency with the 7.5 meter dish (2013), and now in 2016 set the record for the most affordable utility-scale HCPV system yet - SolarBeam™ 9M.

Solartron has a proven track record and has deployed over 60 systems world wide and sold its technology under license.

GLOBAL CERTIFICATION

In 2011, the 4.5 Meter SolarBeam™ was the first parabolic dish in the world to be tested to global thermal standards and the new SolarBeam™ 9M continues to set new records in performance and reliability.

- USA: SRCC 600
- Europe: EN – 12975-2 Standard (KeyMark)
- Australia & New Zealand: AS NZS 2712
- Canada: CSA

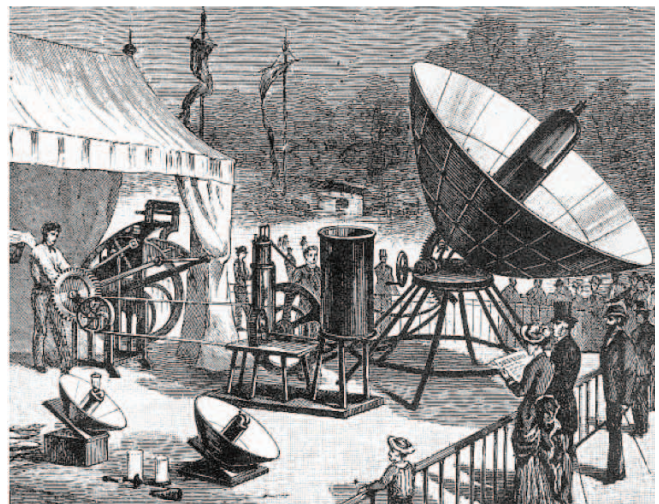


HISTORY OF CONCENTRATED SOLAR POWER (CSP)

The concept of harnessing the sun's energy dates back as far as 1774 when Antoine Lavoisier created a large device that had a glass lens that focused the sunlight onto a focal point over material for combustion.

Later in 1878 a parabolic collector was showcased and reflected the sun's energy onto a steam boiler, which operated a small engine that ran a printing press.

Recently, the development of sophisticated CSP & HCPV technology increased but had yet to meet the affordability of conventional PV panels or provide confidence in the reliability. Solartron saw a need to manufacturer the world's most advanced parabolic concentrator.





TECHNOLOGY

The SolarBeam™ 9M Concentrator achieves peak 45 kW (153,500 BTU/hour) of thermal heat per hour by tracking the sun with flawless precision and collects the sun's radiation from a 63 m² (678 sq.ft) surface area and beams the energy onto a 25x25cm (10x10") receiver.

Instead of using traditional sun light sensors or inclinometers to determine the sun's position, the SolarBeam™ uses a sophisticated celestial tracking system. The result: the dish does not hunt for the sun, consistent sun-lock throughout the year, and seamless movement.

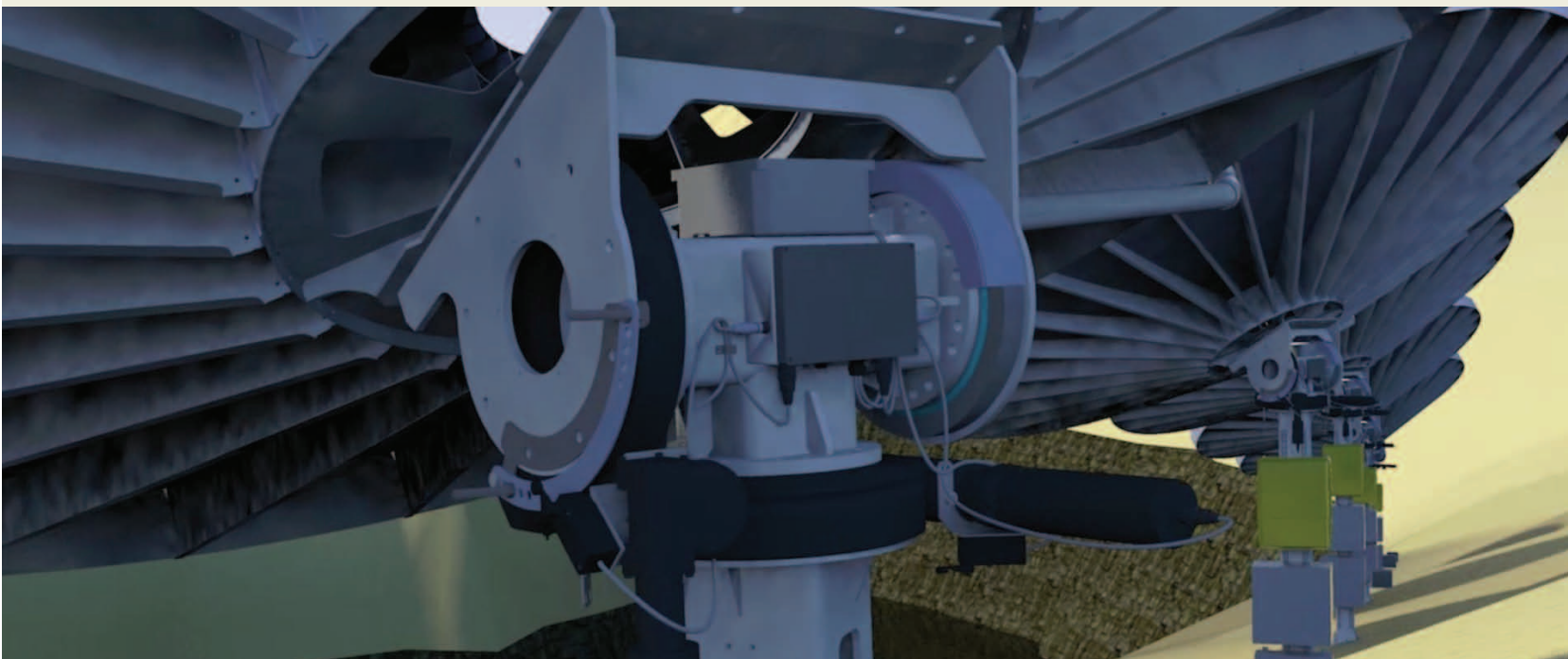
APPLICATIONS

The SolarBeam™ 9M Hybrid Concentrator was designed as a low maintenance system capable of providing hybrid technology for:

- HCPV: High Concentration Photovoltaic Power
- Stirling Engine Electricity Generation
- Solar Water Desalination
- Process Heating
- Solar Air Conditioning

DESIGN

The design of the SolarBeam™ 9M blends art with functionality. With many engineers and architects designing buildings of the future, the SolarBeam™ 9M seamlessly integrates with their vision. The SolarBeam™ 9M makes more than a statement - it is a land mark.



Meticulous attention to detail starts from the mechanical design stage. Stress point simulation is performed to ensure maximum strength and durability in different weather conditions. The patented manufacturing dish stamping process provides a reliable and cost effective parabolic dish system.

The reflective petal is made of a special reflective material specifically engineered for maximum solar reflectance and superior corrosion resistance to wind storms and hail.

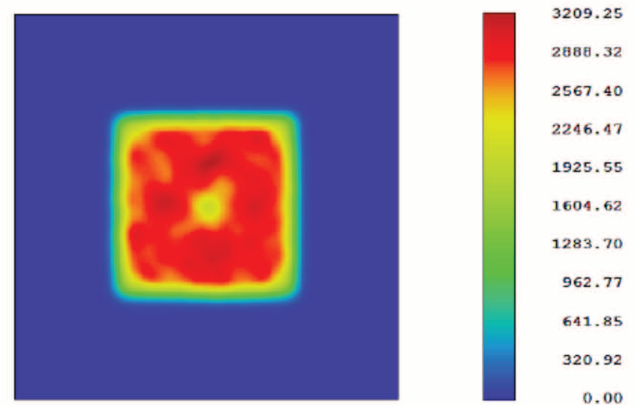
Our engineers designed the drivetrain with dual slew drive motors for virtually maintenance free operation and outstanding performance. The system was designed to allow easy attachment of accessories such as cooling system, control module, and inverter directly on the post.

TECHNOLOGICAL BREAKTHROUGH

The patent pending engineered Optical Light Lens (OLL) has been designed to achieve a uniform square light distribution on a single 200mm x 200mm HCPV dense array module (20 KW).

OLL technology compensates for imperfections of manufacturing the reflective dish and assembly and creates a uniform light pattern on the HCPV module.

Standard HCPV Fresnel systems use multiple Fresnel lenses and optical devices for each HCPV cell which adds to cost, complexity, and reliability issues. OLL technology solves the problem by using only one device per dish.



INSTALLATION

Complicated? No. When designing the system for field installations, our engineers were motivated to keep it simple. The whole SolarBeam™ 9M assembly is designed to be assembled in a fast and easy manner. One system can be assembled in one day.

The dish is pre-assembled on the ground and the 3 major components are put in place in 3 easy steps:

- Step 1: Pole
- Step 2: Drivetrain
- Step 3: Dish

The SolarBeam 9M can be installed on sloped terrain and is designed for scalability.

SAFETY

To ensure a reliable system, the SolarBeam™ 9M was engineered with various safety features. Below are a few of the many features provided in the system:

WIND CONDITIONS

The SolarBeam™ 9M tracks the sun in winds up to 55 km/hour (34 mph). For winds that have a consistency above 65 km/hour (40 mph) the SolarBeam™ 9M tilts to its “safety stow” position.

POWER OUTAGE

In an event of a power outage, a UPS (Uninterruptable Power Supply) moves the dish to the “safety stow” position. When the power resumes, a 1 hour lock-out ensures that the UPS is charged before it resumes auto tracking.

PRESSURE LOSS

If the pressure in the primary loop drops below 7 PSI, the SolarBeam™ 9M automatically moves the dish to the “safety stow” position.

ELECTRICITY GENERATION

HCPV multi junction cell technology is at 44% efficiency and innovations in HCPV technologies are pushing the efficiency to 50%. The SolarBeam 9M has maximized these advancements effortlessly.

The cost can per watt can be as low as \$1 per watt installed.

The SolarBeam™ 9M with integrated HCPV dense array module is 4 times more affordable than existing Tower, HCPV Fresnel, or trough technology (4 year payback vs 20 years for a 25 Megawatt power plant). The LCOE is at 4.4 cents per kWh.



ROI FOR ELECTRICITY & THERMAL GENERATION

Electricity Production: 20kW CPV

Yearly kWh: 53500

Annual Electricity Savings: \$ 5295.00

SOLAR HEATING: 80 deg. C

Annual Energy Savings*: \$ 3,614.00

Total Yearly Savings: \$ 8,909.00

Payback: 2.4 years



MICRO WATER DESALINATION

Over 97.5 percent of the earth's water contains salt, and desalination is the process of removing salt from water. The SolarBeam™ 9M can be used to distill brackish water and sea water for land irrigation and potable water. The SolarBeam™ 9M works with:

Multiple Stage Flash Distillation: is a water desalination process that distills sea water by flashing a portion of the water into steam in multiple stages of what are essentially countercurrent heat exchangers.

Multiple-effect Distillation (MED) is a distillation process often used for sea water desalination. It consists of multiple stages or "effects". In each stage the feed water is heated by steam in tubes.



ROI FOR MICRO WATER DESALINATION

SOLAR HEATING: 80 deg. C

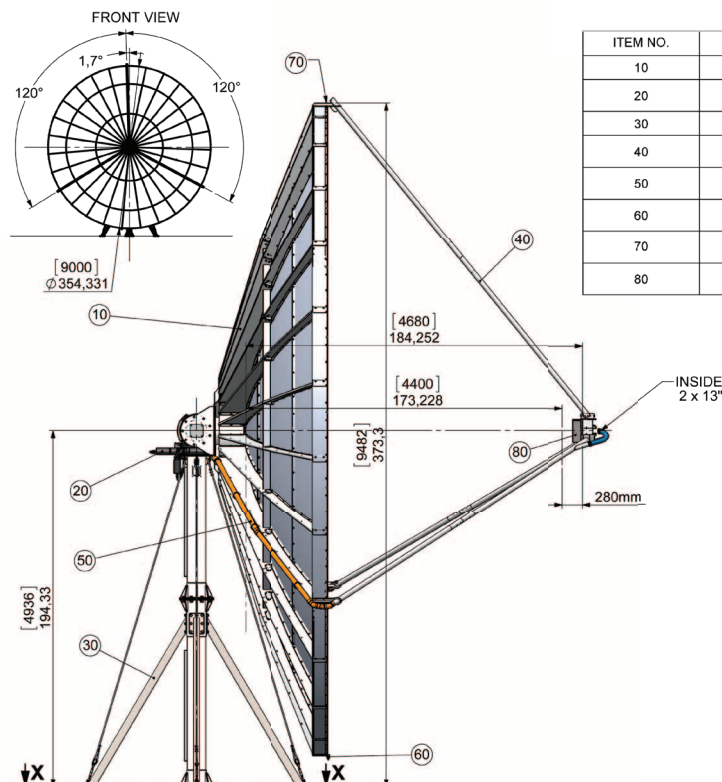
Number of Dishes: 12 X \$ 16,500.00
Desalinator/Purifier: 1 X \$ 92,000.00
Total Cost: \$315,000.00

Water Purification Cost per Litre: \$0.0018
Yearly Water Production: 8,760,000L

Yearly Revenue: \$ 87,600
Payback: 3.6 years

Energy Production @ 1000 W/m ² Radiation	
Thermal Power	45 kW
Thermal Efficiency	73%
Third Party HCPV Module Power	20 kW
CPV Module Efficiency	37%
Dimension and Area	
Reflector Diameter	9 m (29.5 ft)
Gross Area of Collector	63 m ² (678 ft ²)
Absorber Size	25.4cm X 25.4cm (10" X 10")
Gross Area of Absorber	0.0645 m ² (99.72 in ²)
Focal Point Distance	444 mm (173")
Mounting Post	4.4 m (14.4 ft)
SolarBeam 9M Parameters	
Reflective Material Efficiency	86%
Tracking	Dual Axis
Volume of Fluid in Absorber	550 mL
Max Operating Pressure	25 PSI (1.72 Bar)
Stagnation Temp 1000W/m ² at 30° C	93° C (199° F)
Flow Rate	30 (Litres/Min) / 7.9 Gal/min
Collector Weight	292 kg (643 lbs)
Total Weight	1150 kg (2,535 lbs)
Passed to Frost Level 2	- 25° C (- 13° F)
Maximum Absorber Temperature	145 C (293 F)
Maximum Fluid Temperature of Primary & Secondary Loop	93° C (199° F)
Mechanical & Structural Rating	CE
AC Power Interruption Protection	Automatic Solar Concentrator Shut-down to Survival Position (105 Degree Vertical Axis)
Heat Transfer Fluid	Propylene Glycol/Water Solution (50%/50% to -30° C)

Power Consumption	
Input Voltage	24 VDC
Vertical Axis Motor	48W, 2A
Horizontal Axis Motor	24W, 1A
Power Back Up	UPS Battery
Enclosure Ratings	
Cable Assembly	IP66
Controller Interface	IP66 and NEMA 4
Paint	
Color	Stone Grey
Environment	ISO 12944-C5I
Protection Features	
Power Outage	Safety stow
Over Temperature Protection	Safety stow
Wind Speed Protection	Safety stow
Horizontal Monitor Axis	Home Position
Vertical Monitor Axis	Home Position
Pressure Loss	Safety stow
SolarBeam Controller	
Voltage	120 /220 V
Current	5A
Analog Inputs	4x / 0-10VDC
Pulse Inputs	6x
Output Voltage	24 VDC
Frequency	50/60 Hz
Communication	Ethernet
Dimension	51 cm x 40.64 cm x 17.78 cm (20"X16"X7")
Enclosure Rating	NEMA 4X
Electrical Rating	CE & QPS (UL/CSA Equivalent)



ITEM NO.	PART NUMBER	DESCRIPTION	0 degree/QTY.
10	9MA-100-000	9m PARABOLIC REFLECTIVE DISH ASSEMBLY	1
20	7MA-13-30300	7m DRIVE ASSEMBLY	1
30	9MA-300-000	9m POST ASSEMBLY SQ10/0.5" x 181.1" (4600mm)	1
40	9MA-400-000	9m STRUT ASSEMBLY - Tube 2.5/0.065"	1
50	9MA-500-000	9m COOL PIPING ASSEMBLY, 2" diameter	1+1
60	9MA-000-010	LIGHT SENSOR ASSEMBLY	1
70	Skirting Set Screws	Flange Bolt 5/16-18x0.875"lg., Washer,Nut, Grade 5, zinc	3
80	9MA-600-000	ABSORBER BOX BRACKET ASSEMBLY (0 to 280mm)	1



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