

Design Loads

Design loads for the system for wind and gravity are provided below:
All loads are ultimate loads. Moments are provided at the base of the dish mast as defined below:

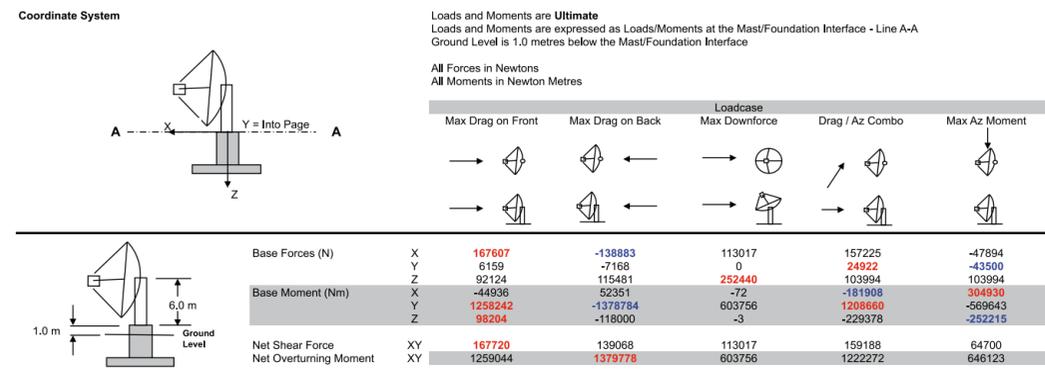


Figure 2: Design loads for the Dish structure system.

System Output in Operation

The CS500-5 output from a receiver is provided below normalized to 1000 W/m² at 25oC showing the output is greater than 35kW from a receiver.

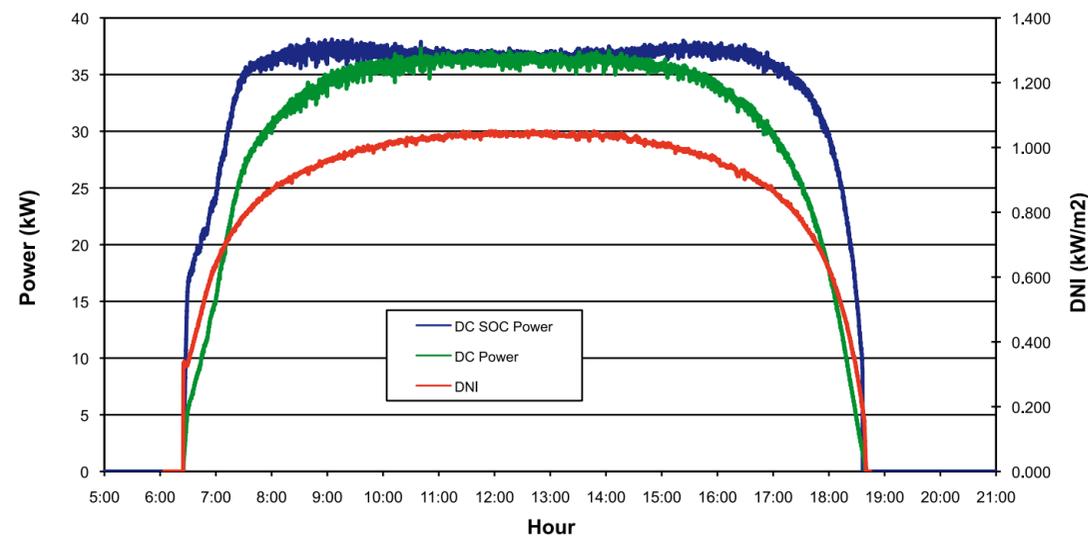
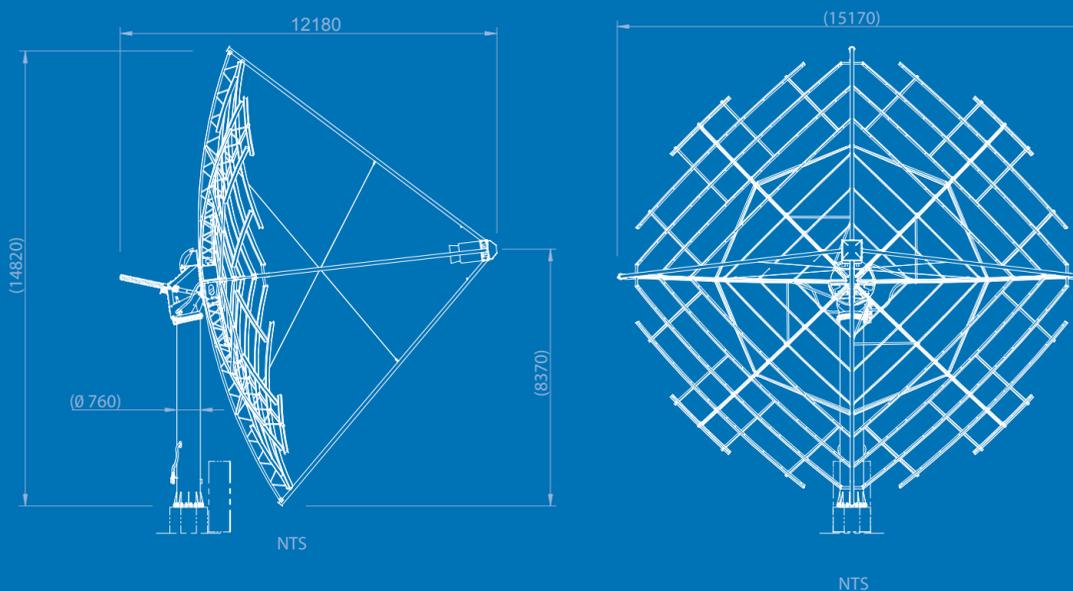


Figure 3: Field data from the Dish structure system.

Product Drawing: CS500-5



Solar Systems CS500-5 Concentrated Solar Dish Generating System

Scalable, high efficiency, utility scale and remote generation

The CS500-5 CPV Dish System delivers world-leading solar energy conversion technology which is unrivalled in solar power generation. This CPV system is a chip design based on the world's most efficient 'multi-junction' photovoltaic conversion cells originally developed for powering space satellites. The low cost balance of system equipment, including a precision dish mirror assembly which collects and focuses sunlight onto a 'dense array' of conversion cells at an intensity of around 500 suns to extract maximum electrical power output.

With over 100 dish years of experience across five power stations operating in Australia, Solar Systems has the technology and experience to deliver both utility scale grid-connected and remote operating solar power generation.

Each CS500-5 CPV Dish System operates autonomously, tracking the sun from sunrise to sunset producing more solar power output per square meter of collected sunlight than any other PV system.

A modular multi-dish installation allows construction projects to deliver increments of solar power that can be increased over time to meet demand.

The key component of Solar Systems' CPV Technology is the unique and proprietary 'Dense Array Receiver', which contains a densely packed array of the ultra-high efficiency multi-junction solar cells. Low cost closed-loop cooling of the Receiver provides the following key advantages over competing CPV technologies:

- lower and more constant operating temperature
- higher conversion efficiency producing higher PV power output
- higher reliability and longer operational lifetime.

The Receiver is designed as a modular sub-assembly, allowing for easy swap-out. This unique feature readily permits quick and cost-effective power upgrades as newer multi-junction cells with higher

conversion efficiencies become available. Multi-junction PV cell technology is still in its infancy. Today's cells are currently rated at 35% efficiency with new cells due to be released in early 2011 running at around 40%. Leading cell manufacturers are already developing next-generation cells expected to operate at 45% to 50%. The technical limit of performance for volume produced multi-junction cells is anticipated to approach 60% in the future.

Solar Systems CPV Technology is relatively compact and utilizes minimal land area compared to other CPV technologies. Current land requirements are approximately 6 acres per MW installed, however this will decrease as higher efficiency cells are introduced.

The control software for the dual-tracking and electrical functions of the CPV Dish system is proprietary to Solar Systems and is fully supported by the company. Solar Systems can provide both operating and maintenance support for installed CPV systems.

Disclaimer

Solar Systems reserves the right to render obsolete, at any time and without notice, any information contained in the CS500-5 data sheet, including device characteristics or specifications. The information provided in this Data Sheet is for reference purposes only.

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Certified Quality Management System



Solar Systems Technology

The Company's proprietary dense array technology utilizes world-leading triple junction cells operating with efficiencies currently up to 40%.

This translates into AC electrical output conversion efficiency of approximately 30% for a complete power plant installation. Higher efficiencies are anticipated as

more advanced cell devices are brought to market in the future.

To maximize the effectiveness of these advanced cells (and to minimize the associated costs), a large mirror collector dish with an area of approximately 500 times the area of the dense cell array, focuses the sunlight onto the cells at an

intensity of around 500 suns. The company has developed several versions of the Dish Concentrator Systems. The current systems installed in Australia are the Mk IV version. A new Mk V version that is lower cost and higher efficiency than previous versions is in the final stages of development and will be released to market in 2011.

CS500-5 Dish System – Key Advantages

- Complete turn-key system for utility grid-connected and remote electricity generation
- Ultra-high efficiency solar cells integrated into a compact dense array Receiver
- Complete control system for operations monitoring and safety
- High accuracy, dual axis tracking system – maximizing sunrise to sunset power output
- Designed to Australian and International standards (IEC)
- Ambient operating temperature: 0°C to 50°C (this range will increase with further development)
- Minimal land requirements – only ~6 acres per MW installed (will decrease with further development)
- Latitude restriction: minimum ±13.5° – suitable for most regions of high solar insolation
- Design life greater than 25 years.



The CS500-5 Technical Specifications

The Solar Systems Pty Ltd CS500-5 product is a complete Solar Electrical generation system that can operate as a single unit or in a modular configuration. The scalable nature of the product allows

development of different size generating plants ranging from ~40kW to 100's of Megawatts.

Optical Concentrator

Solar Systems Pty Ltd optical concentrator system is designed to operate at 500 suns concentration. The concentrator system consists of 112 mirror panels that are focused onto the Solar

System receiver. The steel structure weighs approximately 6 tons and consists of a low cost steel structure designed to operate under typical seismic and wind load conditions.

Electrical Systems

Solar Systems Pty Ltd Electrical system is designed to operate with a range of inverter types.

Dish Power Output	unit	
Power (Typical) @ 1000 W/m ² and 25°C	kW _{DC}	35
Power (Maximum)	kW _{DC}	40
Voltage (mpp)	V _{DC}	380-440
Current (Maximum)	A	92

Solar Systems Pty Ltd can provide specific inverters for the system either as inverter per CS500-5 or grouped into one local inverter. The following inverter specification is typical of the inverters previously supplied by Solar Systems.

Input (DC)	Value
Maximum DC power	45 kW
Maximum power point operating voltage range	350-600 VDC
Maximum input voltage	600 VDC
Input current	100 A
Output (AC)	Value
Rated output	35 kW
Maximum power	40 kW
Efficiency	95.5%
Nominal mains voltage / range	3Ø 400 VAC / 340-460 VAC
Power factor (PF)	>0.97
Nominal mains frequency / range	50/60 Hz / 45-65 Hz
Harmonic distortion	<5%

Cooling System

Solar Systems Pty Ltd CS500-5 system requires active cooling of the solar modules and hence the solar cells. The modules are extensively tested during production and assembly of the receiver.

The liquid to air cooling unit supplied with the system operates over a wide ambient temperature range in a closed loop configuration. The main specifications of the system are highlighted below:

	unit	min	typical	Max
Air Temperature (operating)	oC	-8	25	50
Coolant Flow Rate	LPM	-	140	-
Humidity (operating)	%	0	-	95
Ethylene Glycol content	%	0	0	20
Parasitic AC power consumption	W	0	1400	2700

Control System

Solar Systems Pty Ltd provides a proprietary software control system for management of the CS500-5 Concentrator.

Some key features include:

- Drive and control systems for Azimuth and Elevation, utilize dynamic feedback tracking
- Failsafe system in the event of fault to protect the receiver
- A central controller manages the site and each dish is individually controlled under direction from the SCADA system or a local operator.

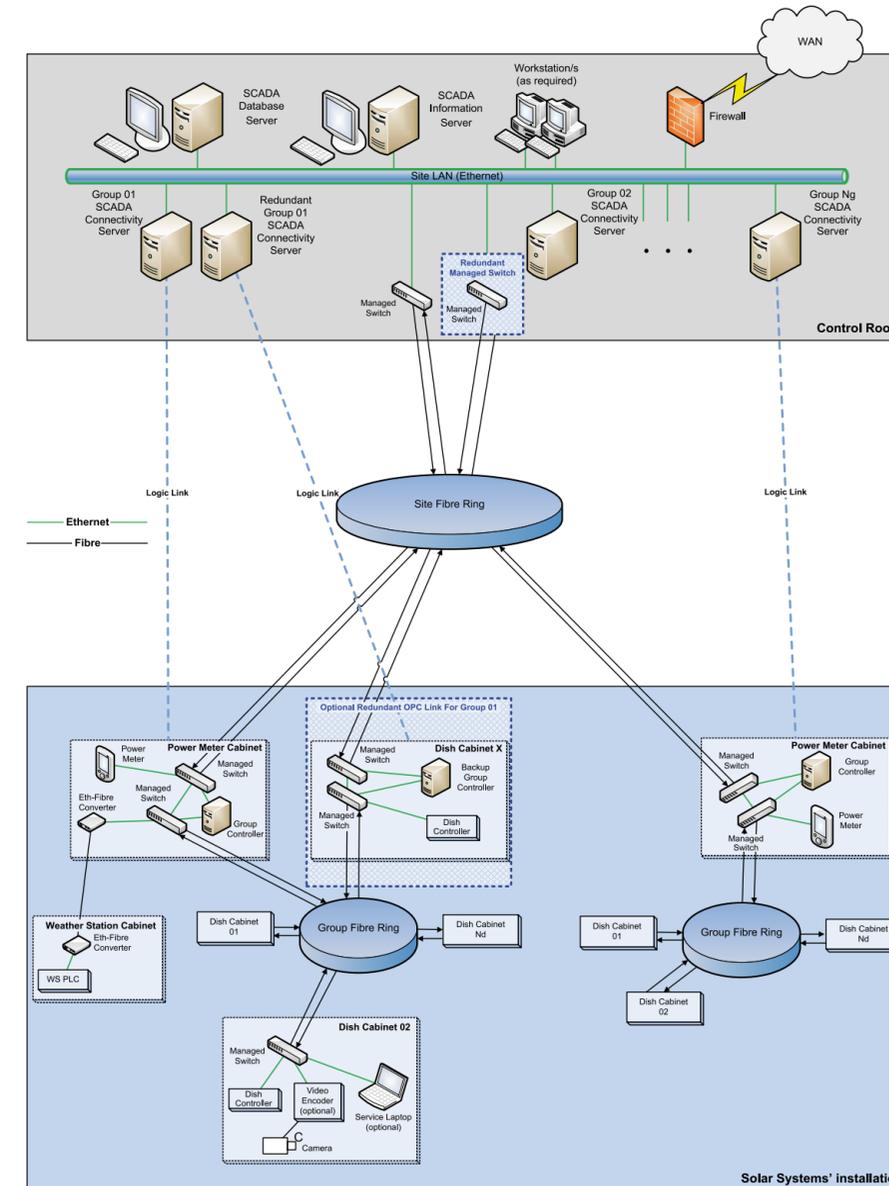


Figure 1: Overview of system control