SUMITOMO ELECTRIC

Concentrator Photovoltaic Systems

Ingenious Dynamics

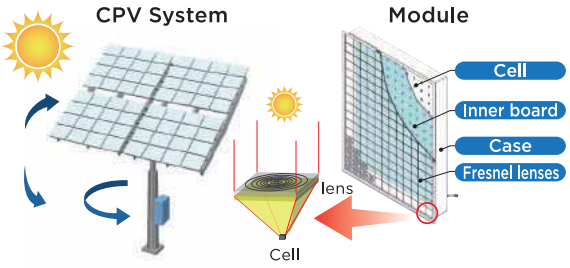
SUMITOMO ELECTRIC GROUP

Concentrator Photovoltaic Technology

Utilizing its solid knowledge of compound semiconductors and long experience in research and development of new energy related technologies, Sumitomo Electric Industries (SEI) has developed a **Concentrator Photovoltaic (CPV)** System as a key component in its environment and energy business division.

High Concentration for High Performance

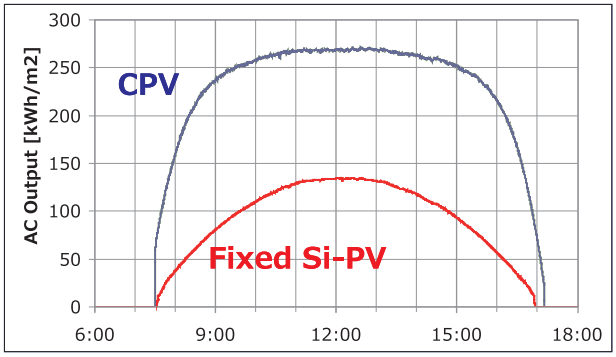
The Sumitomo CPV System uses optical lenses to concentrate sunlight hundreds of times into high-efficiency compound semiconductor cells to convert sunlight to electricity at efficiencies 2 times that of traditional silicon PV systems.
The CPV systems use dual axis trackers, which provide higher energy yield consistently throughout the day.



Consistent Energy Production Throughout the Day

With its precise tracking to the sun, the SEI CPV system is able to generate energy consistently throughout the day. The broad shoulders on the energy curve result in more energy and higher value energy.
The diagram shows the daily power generation of SEI's CPV system installed in Ouarzazate, Morocco.

Location: R&D Site of Moroccan Agency for Solar Energy (MASEN) at Ouarzazate, Morocco

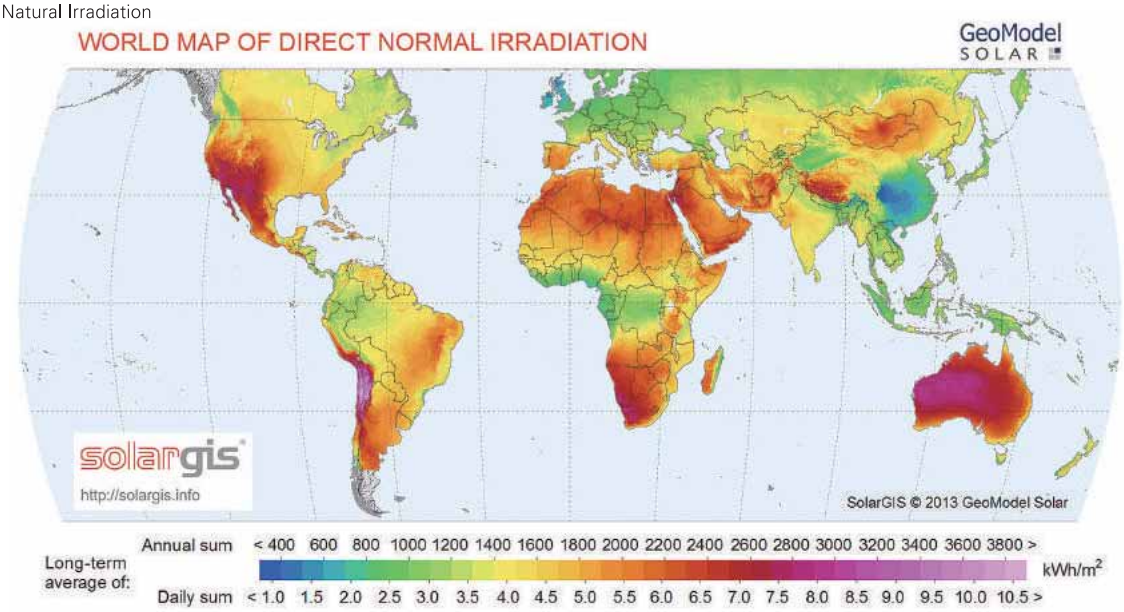


Date : 28 Nov, 2015

High Performance in High DNI*and High Temperature Regions

CPV systems are particularly advantageous in high irradiation areas where the ambient temperatures can be very high. Because of the robust nature of the cells used in the CPV systems, the percentage of rated power loss due to temperature at 40 degrees Celsius for CPV is just 6%, compared to 16% losses for monocrystalline and 18% for polycrystalline silicon systems. Conversion efficiency is minimally impacted by hot temperatures.CPV systems are ideally suited to high DNI regions, where energy generation costs are particularly competitive.

*DNI: Direct Natural Irradiation



Design and Technical Specifications

SEI CPV Goes Beyond Just Energy

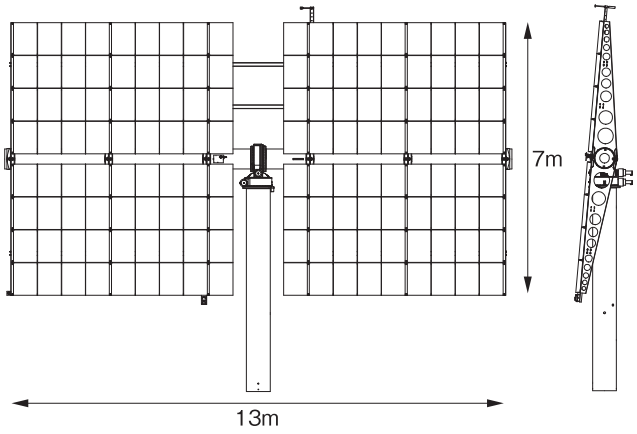
SEI has a patented technology to take its CPV system capabilities beyond production of electricity.
Customization of the systems can be implemented to display a message, corporate identity, or image on the CPV modules without impacting power generation capacity.

University of Miyazaki, Japan, March 2014

Simplified Assembly for Manufacturing and Installation

SEI's CPV modules are designed to allow simplified factory assembly. As a result it is practical to install CPV module assembly lines in regional locations, providing in-region manufacturing close to project deployments.
SEI CPV systems are easy to install, allowing use of local labor and available talent.
The SEI systems are also compact and cost effective for transportation.

System Technical Specifications



Module Technical Specifications

Model #	sCPV01a-HN-NN	sCPV04a-VN-AN
Lens material at front-side	Glass	Glass on AR-coat
Housing	Aluminum	Aluminum
Module size [mm]	842 x 658	840 x 610
Thickness [mm]	101	120
Weight [kg]	9	8.3
Power Rating [watts] @CSTC*	144	152
Certifications	IEC62108 , UL8703 , IEC62688 (Compliant)	IEC62108 , UL8703 , IEC62688 (Compliant)

Maximum Rated System Power	▪ 21.9kWp-d.c./unit@CSTC* w/o Loss ▪ 18.7kWp-d.c./unit@CSOC** w/o Loss Module Model sCPV04a-VN-AN
System Configuration	144 modules per system System size is scalable and the number of modules per system can be increased.

*CSTC: Concentrator Standard Test Condition (IEC62670-1),
Solar Irradiation = DNI 1,000 [W/m^2] , Spectrum = Air Mass 1.5D , Temp.(cell) = 25 [degC] , Wind speed = 0 [m/sec]

**CSOC: Concentrator Standard Operation Condition(IEC62670-1),
Solar Irradiation = DNI 900 [W/m^2] , Spectrum = Air Mass 1.5D , Temp.(ambient) = 20 [degC] , Wind speed = 0 - 2 [m/sec]

Certifications and Installed CPV Plants

IEC and UL Certifications

SEI's CPV modules are certified by TÜV Rheinland for conformity to the following Standards:

- IEC 62108: CPV modules and assemblies
  – Design qualification, and type approval
- IEC 62688: CPV module and assembly safety qualification
- UL Subject 8703 No.3

TÜVRheinland CERTIFIED
IEC 62108
Regular Production Surveillance
Valid until:
July 28, 2019
www.tuv.com
ID 8535004000

TÜVRheinland US

SEI Yokohama Works 100kW CPV Solar Park

In addition to CPV systems, SEI offers both off-grid and on-grid integrated solutions with Redox Flow Battery (RFB) storage and Energy Management System (EMS). An integrated system including 100kW CPV solar park has been operating at SEI's Yokohama Works since 2012.

CPV systems	Max. Output: 100kW
Redox Flow Battery	Max. Output: 1 MW, Capacity: 5 MWh
EMS	Leveling power consumption Balancing fluctuations in solar power Scheduling power generation

EMS

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