



# RENEWABLE energy applications

- Solar-Photovoltaic
- Hybrid Power Supplies
- Electricity Production

 **SUNLIGHT**  
creating energy



# Renewable energy applications general information

SUNLIGHT SYSTEMS S.A. operates in the field of Engineering, Production, Distribution and Construction of Integrated Renewable Energy Systems and Special Specification Battery Cells. Our aim is to provide our customers with reliable and cost effective energy solutions, covering challenging power requirements under adverse weather conditions.

Renewable energy sources are environmentally friendly, maintenance-free and highly efficient, with long-life operation and incomparably low operating expenses. Taking into consideration these competitive advantages, we design and construct cost effective and robust energy solutions to the benefit of our clients.

The dedicated team of experienced engineers at SUNLIGHT SYSTEMS S.A. offers fully customized products utilizing renewable energy sources, including in most cases solar photovoltaics. In special cases we design and offer energy systems that include more than one power source, in order to minimize system cost and increase reliability.

In addition, we provide the following services:

- Turn key solutions
- Project development and management
- Design and engineering
- Installation, commissioning and training
- After Sales Support



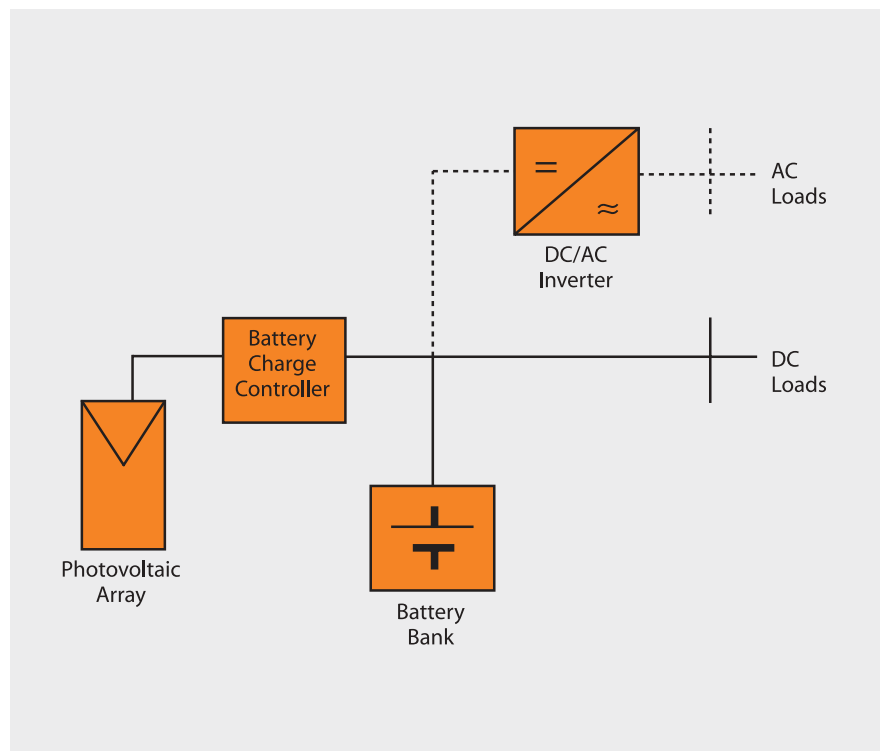
# Autonomous solar photovoltaic

Autonomous solar photovoltaic systems are easy to install and are the preferred solution for remote sites where no electricity grid is available. These systems are almost maintenance free and with minimal operation expenses. Photovoltaic panels carry a warranty for electrical performance up to 25 years and can supply loads ranging from few Watts up to several kilo Watts (kW). These characteristics imply a competitive advantage for photovoltaics when compared to diesel generators which are characterized by their expensive maintenance and operation.

The operation of the autonomous solar photovoltaic systems, known also as stand alone solar power systems, is simple. During the day the photovoltaic modules (panels) will convert solar energy into electrical energy. The produced energy is then used to supply the load as well as to charge the batteries. The energy stored in the batteries will supply the load during night hours or when the solar radiation is low.

Autonomous solar photovoltaic systems are mainly used for:

- Remote house electrification.
- Water pumping (no need for battery storage).
- Refrigeration and health services.
- Telecommunication applications (mainly links, repeaters and micro-BTS).
- Information technology (IT) applications.
- Military applications.
- Gas - oil industry applications (mainly cathodic protection).



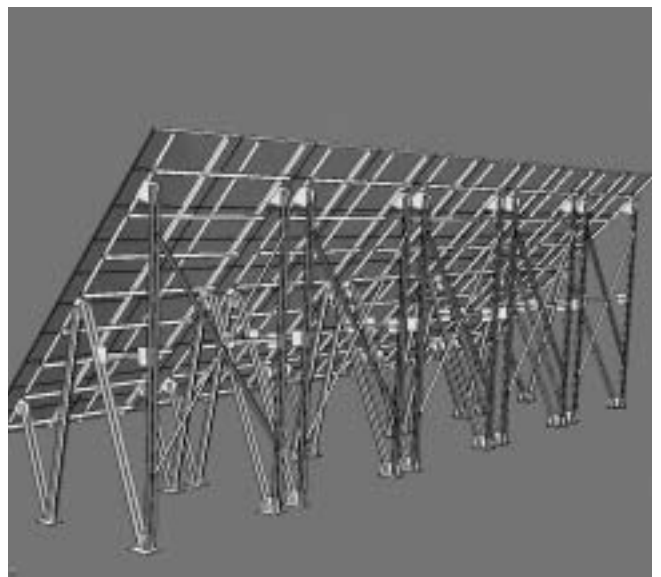
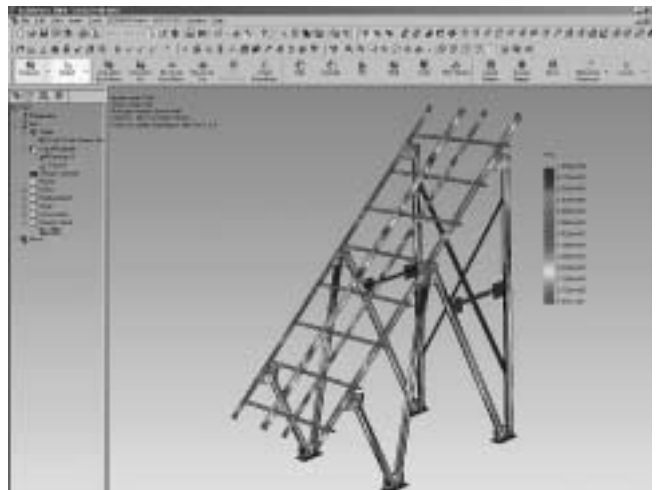
# Sizing and Component Selection

The implementation of solar photovoltaic systems starts with a thorough analysis of meteorological data at the site of installation. The results are important for the sizing and customization of the photovoltaic system.

Selection of a proper size for the photovoltaic array is crucial so that load requirements are covered during the worst solar radiation period. Appropriate battery sizing and type selection implies long battery life time, increased system reliability but also minimization of system cost and maintenance requirements. Our long experience along with the application of suitable software tools will meet these requirements to the benefit of the end-user.

Photovoltaic panels mounting structures are also very important for the system design. The structures are manufactured according to EUROCODE standard (or any other standard required by our customers) and therefore, are enduring to adverse weather and wind conditions. The design is a fully customized process and allows us to meet tailored specifications without compromising safety.

The systems' autonomy requirements can be supported by SUNLIGHT VRLA, OPzS and OPzV battery range, depending on the application. SUNLIGHT SYSTEMS S.A. supplies **charge regulators, inverters, AC and DC distribution boards, lighting protection devices** or any other electronic device required in customized solutions. **Customized alarm boards and remote monitoring control facilities** are integrated in our turn key solutions according to customer needs.



# Hybrid power supplies

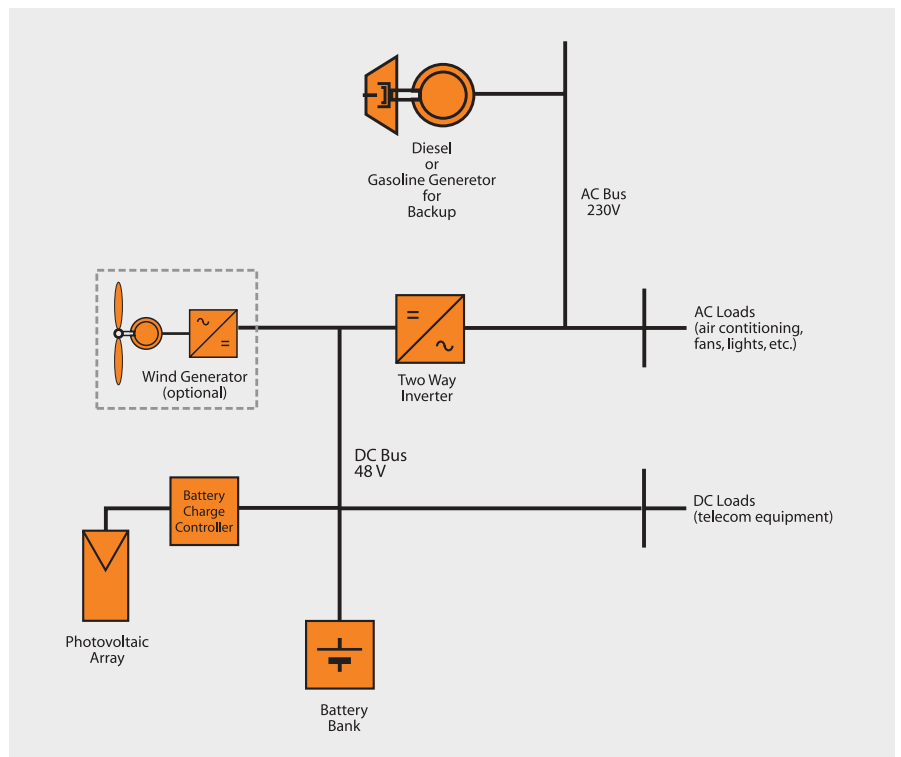
The combination of a solar photovoltaic array with a diesel generating set offers supreme power system flexibility at greatly reduced cost. This solution offers the following main advantages:

- Can accommodate load increase without system redesign.
- Does not require very high capacity battery.
- Does not require PV array over sizing and utilizes it to a full extent.
- Has excellent performance in adverse climatic conditions.

**SUNLIGHT SYSTEMS S.A. has developed integrated hybrid solar solution early on and is currently one of the market leaders.** SUNLIGHT Autonomous Power Supply (APS) System is a fully customized hybrid product consisting mainly of photovoltaic panels, batteries and a diesel generator. The batteries are kept separately from the generator and both are kept inside a thermally insulated shelter. Optionally a wind generator can be provided.

The fundamental difference regarding the operation of the APS and the solar photovoltaic system is the presence of a diesel generator. When there is lack of solar and electrochemical energy, the generator turns on automatically in order to supply the load and charge the batteries.

Through continuous testing and data analysis, our engineers have succeeded in designing an APS that **keeps operating expenditure (OPEX) very low**. This was accomplished by minimizing the use of the electric generator, on yearly basis.



The following table is a typical configuration of an APS corresponding to the photo below:

■ <b>PV array</b>	5.760 Wp	72 PV modules 80 Wp
■ <b>Battery Bank</b>	2.500 Ah /-48 Vdc	2 parallel strings of 24 series cells 120PzV1250 (1250Ah / 2 Volt)
■ <b>Inverter / charger</b>	9 kVA inverting-6 kVA charging	Two inverters in parallel
■ <b>Diesel genset</b>	11 kVA one phase	

Apart from the incomparable low OPEX, the advantages of using the APS, can be summarized as follows:

- Easy installation.
- Durable operation.
- Low maintenance cost.
- Ideal for rural areas.
- Alternative shelter use (telecom cabinets).
- Efficient energy supply and generator operation (nominal rate).

In order to achieve even more efficient operation, the APS is equipped with an advanced telemetry management information system. This system is especially developed to monitor APS operation as well as to perform preventive maintenance remotely. The telemetry system also provides pre selected or customized APS operation reports, in real time. In addition, it can be handled by multiple users.



# Electricity production

SUNLIGHT SYSTEMS S.A. is the first company in Greece, that has implemented photovoltaic technologies on a large scale, both for autonomous and grid connected systems. Since the early eighties we have been designing, supplying and installing photovoltaic systems on the ground, building rooftops and facades. In 1999, we installed the largest grid connected photovoltaic system in Greece in order to benefit from the sales of electricity to utility grid.

Furthermore, we have provided solutions for demanding applications in regions with harsh climatic conditions, such as the Middle East, Europe and Africa.

Our valuable experience in electricity production secures maximum profits to potential investors and minimizes their risks. These systems can be also financially supported by institutional funds or governmental subsidies. For example, European countries such as Germany, Spain, Italy and Greece have currently favorable economic conditions for the installation of grid connected photovoltaic systems.



The largest grid connected photovoltaic system in Greece was installed in Crete in 1999.



Building integrated solar photovoltaic systems installed in National Technical University of Athens (NTUA) in 2002.

During the past decade, thousands of companies, investors or homeowners, have installed photovoltaic systems of various sizes and profit from sales of electricity to the utility grid. Favorable installation surfaces are flat or hilly lands, factory and house roofs as well as building facades. The system design layout is simple, with just a photovoltaic array and an inverter to supply the produced electricity to the grid.

Photovoltaic systems vary from 1 kWp up to several MWp and can be installed in areas with ample sunshine.

# Quality services

## **Turn key solutions**

Our long-lasting and valuable experience in renewable energy applications field, enables us to provide our customers with the optimum solution that maximizes their profit.

Our turn key solutions are easily comprehensible even by users or investors that are not well acquainted with renewable sources applications and technology.

## **Project development and management**

Our specialized team provides full project development and management. As an extra service we can process all needed procedures regarding licensing and financing.

## **Design and engineering**

Our experienced engineers have the capability to design customized solutions in order to satisfy our customer's needs. We provide innovative engineering and balance of system components for grid connected systems, telecom applications and demanding building integrations.

Engineering services can be offered either as a part of a turn key solution or as a separate package.





## **Installation, commissioning and training**

We provide installation and commissioning services that is optimized and adapted to our customer's needs. Training of local installation and service teams is offered in countries around the world.

## **After Sales Support**

Our integrated customer service does not end upon sale, a philosophy that is reflected in the operation of a qualified Technical and After Sales Support Department.

Technical coverage offered by SUNLIGHT's network exceeds the boundaries of Greece. We provide technical support with the same high standards in every country we operate either through autonomous local presence or qualified local partners.



[www.sunlight.gr](http://www.sunlight.gr)

## SUNLIGHT MANUFACTURING PLANT

SUNLIGHT Manufacturing Plant is headquartered in Northern Greece. Since 1991, there has been a systematic investment in the development of one of the most modern industrial units of Europe in accordance with the strictest international standards.

In a total area of 142,000 m<sup>2</sup>, with indoor areas of more than 40,000 m<sup>2</sup>, the SUNLIGHT Manufacturing Plant has six high-end production units that are recognized for their high specialization.

Aiming at the production of high added value and quality products, the production and assembly lines of the SUNLIGHT Industrial Unit are used for:

- Cylindrical Zinc-Chloride cells such as R6HD (AA), R14HD (C) and R20HD (D) sizes.
- Advanced Lead-Acid batteries for submarine propulsion.
- Silver-Zinc batteries for combat and exercise torpedoes.
- Stationary and traction Lead-Acid batteries (vented type).
- Sealed Lead-Acid Batteries (VRLA).
- Autonomous Photovoltaic Hybrid Power Supply Systems.
- Battery packs for military and commercial applications.
- Assembly of Power Supply Systems for telecommunication applications.
- Assembly of Uninterruptible Power Systems (UPS).
- Assembly of Industrial Rectifiers.
- Assembly of Generating Sets ranging from 5 to 3,000 KVA.

## MANAGEMENT SYSTEMS for QUALITY, ENVIRONMENTAL CONTROL, OCCUPATIONAL HEALTH & SAFETY

SUNLIGHT Manufacturing Plant has established and maintains management systems for Quality (ISO 9001), Environmental Control (ISO 14001) and Occupational Health and Safety (OHSAS 18001).



### • SUNLIGHT SYSTEMS S.A. Headquarters

23rd Km. N.R. Athens - Lamia, 145 65 Agios Stefanos - Attica, Greece  
Tel.: +30 210 624 2000, Fax: +30 210 621 6911

### • SUNLIGHT SYSTEMS S.A. Manufacturing Plant

Neo Olvio 67 200 Xanthi, Greece  
Tel.: +30 25410 48100, Fax: +30 25410 95446

### • SUNLIGHT INDUSTRIAL S.R.L. (Romania)

1/II Pipera-Tunari Highway, 3rd Floor (Room no.1 and no.2), Voluntari Ilfov County, Romania  
Tel.: +4021 4077330-31-32, Fax: +4021 4077333

### • SUNLIGHT INDUSTRIAL EOOD (Bulgaria)

P.O. 1715 "MIADOST" 4 - 1 Business Park Sofia Str., Block 3-Floor 3-Bulgaria  
Tel.: +359 2 9769371-8, Fax: +359 2 9769377

### • GERMANOS POLSKA Sp.oz.o

Szyszkowa 34 str., 02-285 Warsaw, Poland  
Tel.: +48 225 758227, Fax: +48 225 758201

### • SUNLIGHT UKRAINE S.R.L.

9, Moskovsky Prospect, "Forum Park Plaza", Kiev 04073 - Ukraine  
Tel.: +380 44 4635735, Fax: +380 44 4635735

### • SUNLIGHT TRADING doo SRBIJA

Ustanicka 127c, Hotel "Srbija", 11000 Beograd, Serbia & Montenegro  
Tel.: +381 11 3476782, 11 2891671, Fax: +381 11 2891671

### • SUNLIGHT SYSTEMS FRANCE S.R.L.

Hyde Park - Le Westminster, 12 Allée Rosa Luxembourg  
BP 80286 95610 Eragny Sur Oise, France  
Tel.: +33 1 34401634, Fax: +33 1 34401639

### • SUNLIGHT GERMANY

Elbestrasse 10 (TechnoMarl) D-45768 Marl, Germany  
Tel.: +49 2365 91 51 75, Fax: +49 2365 20 59 10

### • SUNLIGHT SPAIN

Avenida Del Mediterraneo 9-2o D 28007 Madrid - Spain  
Tel.: +34 3 91 4343890, Fax: +34 3 91 4344070

### • SUNLIGHT MIDDLE EAST - AFRICA

15 El - Hassan Str. Dokki Giza, Egypt  
Tel.: +20 2 33 800 59, Fax: +20 2 33 652 93

