Energy and Light for Africa

Technical solutions and training projects
by
Meridiana Impianti s.n.c. Italy

Meridiana Impianti
Via Quinta Casa, 39 - 90142 Palermo (PA) Italy
Tel +39 091 2524313 - Fax +39 091 7480955
www.meridianaimpianti.it - info@meridianaimpianti.it
meridianaimpianti@pec.it - P.iva 04146490828

June 2013

SUMMARY

1. THE COMPANY

Meridiana impianti has been in business in the national and international market from more than 20 years.

Our Italian headquarters in Palermo (Sicily) provide us with an advantage reference point for the economic and cultural exchanges between Europe and Africa, thanks to the strategic position in the middle of The Mediterranean.

Our technical expertise, the wide experience in technologic plants and the exclusive use of high quality materials are the best warranty for ours costumers.

Thanks to acquired experience and technical Know-how, costantly updated, Meridiana Impianti can offer a full range of products and services related to technologic plants such as:

- Feasibility study
- Executive design
- Construction of power plants
- Training of local staff dedicated to the management and maintenance

Meridiana Impianti is also committed to promoting environmental sustainability through the production of electric and thermal energy from renewable source, thanks to accurate design of modern plants and smart management of available energy resources.

2. PRODUCTS AND SERVICES

In remote areas, in rural villages in areas peripheral cities and everywhere energy supply electricity is not stable or is even absent, level of quality of life decreases.

In these cases, you can not use in a continuous way services such as lighting, the drinking water supply, air conditioning and common household appliances.

In addition, the normal work security services and telecommunications can be dangerously interrupted .

In this case, the integrated use of different energy sources such as solar power, wind power, hydroelectric or thermal power, directly available on the site is a reliable solution to ensure a continuous supply of electricity.

Using the most advanced technologies to produce, store and transfer electricity and thanks to a careful design, developed on the real needs of local communities, Meridiana Impianti provides products and services able to solve all the problems related to the absence of stable and continuous electricity.

Meridiana Impianti offers several valid technical solutions, economically viable, to satisfy the needs listed below.

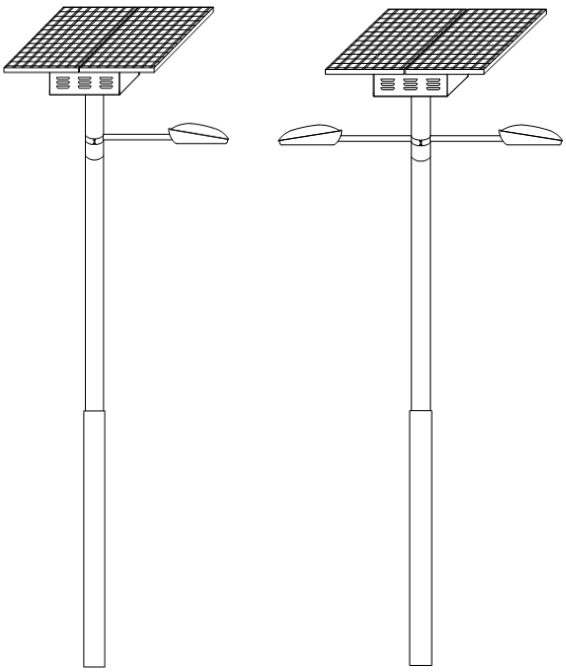
- **Public Lighting**
    - Main and secondary roads
    - Squares
    - Roundabouts
    - Parking lots
    - Other public places

- **Production and distribution of electric energy.**
    - Residential, commercial and administrative buildings
    - Government buildings
    - Factories
    - Schools
    - Hospitals
    - Water pumps
    - Communications
    - Security

2.1 TECHNICAL SOLUTION FOR PUBLIC LIGHTING

Meridiana Impianti offers two technical solutions, called Stand-alone and grid-connected, for public lighting.

Stand-alone solution



The Stand-alone solution involves the installation of individual poles equipped with solar panels, storage batteries, electronic control system and LED lamp.

Each pole is electrically independent from the others and provides illumination of the area below.

There are two types of standard pole as is shown in figure

- Single-arm, equipped with a 52W LED lamp
- Double-arm, equipped with two LED lamps 26 W.

Benefits:

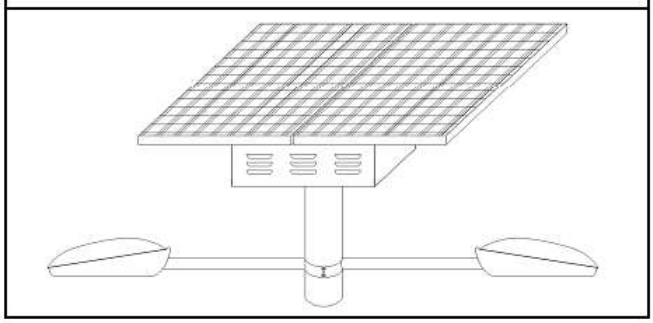
- simplicity and quick installation
- no electrical lines are required to interconnect all poles
- thanks to the independence electricity, a generic fault localized on a pole does not affect the operation of the other poles
- ability to illuminate streets with single and double lane using poles with single and double arm
- The only maintenance required is to clean the panels and control of batteries

Restrictions:

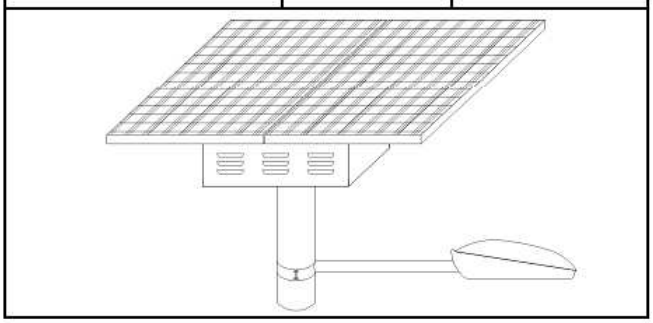
- max led lamp power: 52 W (48 Led) 5800 lumen for single arm version and 26 W (24 Led) 2900 lumen for double arm version
- max height pole : 8 m
- max capacity / max batteries weight: 2x120 Ah / 2x37 kg
- max power / max surface of photovoltaic panel : 260 W / 2 m^2

Main features of stand alone solution

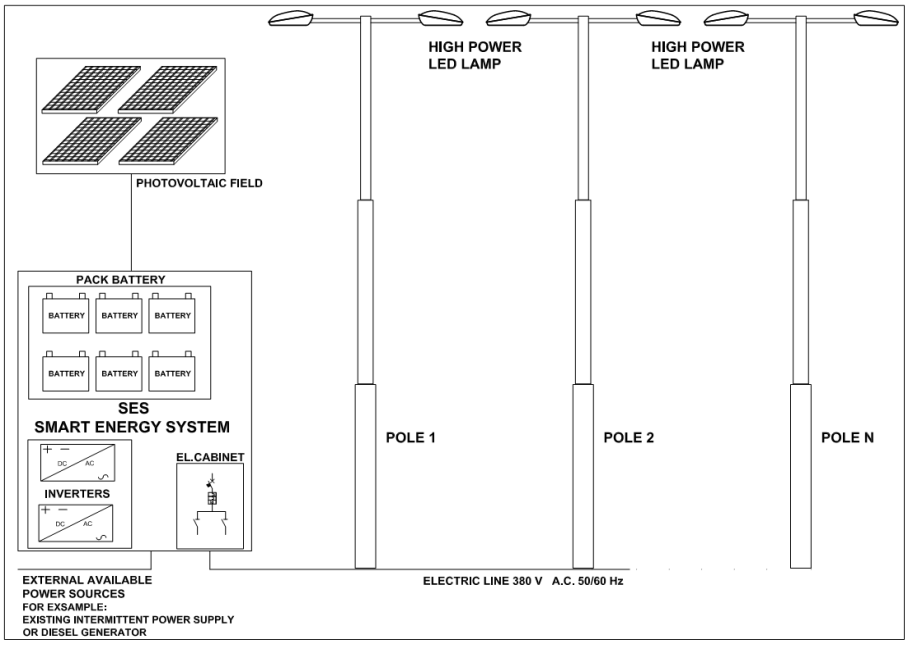
SOLAR STREET LAMP 24 LED - DOUBLE ARMS	
OPTICAL DEVICES	2 x 24 LED LAMP (2x26 W)
LIGHT COLOR	NEUTRAL WHITE CCT 6500 K
LUMINOUS FLUX	2900 lm for each Lamp
ILLUMINATION VALUES	12 lx (max) - 4 lx (min)
PV MODULES	2x120 Wp 12V Polycristalline
BATTERIES	VRLA 12V 2x 120 Ah
BATTERIES AUTONOMY	3 DAYS
OPERATING TIME	8h -12h PROGRAMMABLE
CHARGE REGULATOR	MICROPROCESSOR CONTROLLED
HEAD POLE SHELTER	GALVANIZED STEEL/PVC BOX
SUGGESTED POLE	STEEL POLE - MAX HEIGTH 8 m



SOLAR STREET LAMP 48 LED - SINGLE ARM	
OPTICAL DEVICE	48 LED LAMP (52 W)
LIGHT COLOR	NEUTRAL WHITE CCT 6500 K
LUMINOUS FLUX	5800 lm
ILLUMINATION VALUES	17 lx (max) - 8 lx (min)
PV MODULES	2x120 Wp 12V Polycristalline
BATTERIES	VRLA 12V 2x 120 Ah
BATTERIES AUTONOMY	3 DAYS
OPERATING TIME	8h -12h PROGRAMMABLE
CHARGE REGULATOR	MICROPROCESSOR CONTROLLED
HEAD POLE SHELTER	GALVANIZED STEEL/PVC BOX
SUGGESTED POLE	STEEL POLE - MAX HEIGTH 8 m



Grid-connected Solution



The Grid-connected solution involves the installation of singles poles equipped with LED lamps or, alternatively, using the existing poles in which the traditional lamp is replaced with LED technology.
The poles, with single arm or double-arm, are powered by an electric alternating current line that may already exist there or can be installed.

The electric supply, which feeds all the poles, is stabilized by means of the contribution of a photovoltaic field installed in the vicinity.
The solar energy captured by the PV array is converted, stored and fed into the power line of the poles, integrating the presence of the existing power supply which is often highly discontinuous.
In this way, the entire electric line which feeds an extended stretch of road is powered by a stable source of electric energy.

Benefit

- Ability to efficiently illuminate streets to wide track.
- Possibility to use higher power lamps (60 LED 80 W) required to illuminate wide streets.
- Possibility of installing poles of greater height necessary to obtain a more uniform illumination.
- Reduction of the pack battery size in case of presence of a existing electricity even if discontinuous
- Exploitation of any existing electrical lines reducing the cost and time of installation.
- The electric network, specially designed, is able to be interconnected in the future to a traditional stable power grid.

Restrictions

- A large area, in the vicinity of the road, must be used for the construction of the photovoltaic field needed to produce the electricity demand from the poles.
- All the technical and economic components of the system, can be designed only after a thorough analysis, with related site inspection, of local needs.

The electric generation system is analyzed in next chapters

2.2 PRODUCTION AND DISTRIBUTION OF ELECTRIC ENERGY (SES)

Meridiana Impianti proposes an expandable modular system able to provide electricity in a stable and continuous way.

The electricity generated from renewable sources, directly available on the site, is distributed to various local utilities through an efficient network, specially designed in according to international standards, which is already suitable for a possible future interconnection with the national network.

The main components of the modular system SES (Smart Energy System) are listed below.

- Photovoltaic panels

The photovoltaic panels, used to convert solar radiation into electricity, are manufactured according to strict international standards IEC61215 and IEC61730.

Each panel is able to generate a nominal power up to 260 W with a 25 years of minimum productive life, even in extreme operating conditions (from -40 ° C up to 80 ° C).

- Inverter (DC/AC)

The inverters allow a smart power management of the energy produced, wich can be stored in the battery pack or fed into the grid. It is possible to operate with several values of voltage and frequency, with two kind of distribution (single phase or three phase).

The inverters are manufactured according to to strict international standards IEC61727 and IEC 60529.

- Storage system

The storage system stores the electrical energy in order to be available at night or in the absence of solar radiation.

The storage system is realized by means of VLA OPzS batteries, accorning to international standards IEC61427 and IEC EN60896.

The batteries ensure, more than 2 days of autonomy in case of low solar radiation.

- Electric cabinets

The electric cabinets, needed for management and protection of the generation system and the local power grid, are specially designed and manufactured according to the energy needs of the local community, in compliance with the extreme climatic conditions and international standard CEI EN 61439.

- Electric network

The electric network, required to transport the energy from the generator to the various user, are designed and manufactured employing electrical cables with double insulation, installed in underground pipes or on a appropiate poles depending on the location and type of user.

Benefit

- Stable supply of electricity to any type of user.
- Expandable modular system depending on the energy needed.
- The electric network, specially designed, is able to be interconnected in the future to a traditional stable power grid.
- The technical skills, required for the construction and maintenance of the plant, are transferred to local staff to provide new job opportunities and economic development.

Restrictions

- A large area, in the vicinity of the road, must be used for the construction of the photovoltaic field needed to produce the electricity demand from the poles.
- All the technical and economic components of the system, can be designed only after a thorough analysis, with related site inspection, of local needs.

3. PRODUCT WARRANTY

Meridiana Impianti uses only high quality and reliability products for which it is possible to ensure the no cost replacement for failures (*) or manufacturing defects as shown below .

- Photovoltaic panel : 10 years of Warranty
- Inverter : 5 years of Warranty
- Batteries : 2 years of Warranty
- Lampade Led : 2 years of Warranty
- Other electrical components : 2 years of Warranty

(*) The warranty is void if the fault is caused by tampering, malicious damage, lack of maintenance, natural disasters.

4. TRAINING PROJECT

Meridiana Impianti offers a training project to transfer to local workers the technical skills required to design, implementation and maintenance of lighting systems and power generation.

Staff training has two different levels of skills and is implemented during the construction of the plants according to the mode "LEARNING BY DOING".

The first level is focused on training of technicians for design, construction, plant management and subsequent maintenance.

This level clearly requires knowledge of the basic principles relating to the installation of electrical systems.

The first level training gives the following skill:

- Careful study of local needs and correct choice of plants.
- Use of modern software for accurate design of plants.
- knowledge of the technical characteristics of products.
- Supervision of construction works of the plants.
- Implementation of executive maintenance plan

The second level is focused on training of skilled workers for the construction and maintenance of the plants.

The second level training gives the following skill:

- Principles of plant operation.
- Knowledge of the main technical features of the products.
- Construction of the plant.
- Troubleshooting and problems solving.
- Maintenance operations.