Who we are

BMSolar was founded as a spin-off of Epik, a Tuscany-based company in the sectors of planning and installation, hardware and software solutions for civil and industrial automation, as well as being and being active in the energy sector.

In 2006, Blackmagic technology for photovoltaic installation was born, giving life to a new state of the art, optimizing energy production and introducing advanced functionalities such as fire-resistance, anti-theft and monitoring panels.

Thanks to the first round of investments by the Pisa Chamber of Commerce, partner of BMSolar, and the technological support of Epik, BMSolar is the first European enterprise specialized in resolving problems which are inherent in photovoltaic systems, solving energy production limitations and adding functionalities, which have made PV installations intelligent for the first time. BMSolar has progressively become the market and technology leader in the optimizing, testing and safe-proofing of both new and existing solar installations.

The creativity and problem solving skills of Italian engineers and computer scientists have enabled the development of cutting edge BlackMagic technology, the first and only of its kind, designed and produced solely in Italy.

The all Italian quality of the service and products are available not only to technicians, panel manufacturers, but also to designers and private clients wanting to reap all the benefits of the photovoltaic technology.

BMSolar is part of the Centre for Innovation of Green Tech in Tuscany and of the Pontedera Centre of Technology.

Acknowledgements

- Award ‘Inventors of Italy’ we represented Italia in the Shanghai Expo 2010
- USA - Toscana Bilateral Cooperation for a Cleaner Tomorrow named as an innovative green-tech technology
- Nominated by the European Commission as one of the innovations in Cleantech at Ecomondo Fair
- TechConnectWorld Boston USA selected by ICE to represent Italian innovation
- Innovation Exhibition Hangzhou RPC selected by the region of Tuscany to represent Italian and Tuscan innovation excellence.
- Intersolar Innovation Award named as an innovative technology
- At the Genoa Boat Show represented innovation excellence Italy and Tuscany at StartToBusiness
- guest of the Quinn University Concorse, UCINA and CDI Manager
- Smau Innovation Paths selected as a successful case study
- Present in over 80 articles in photovoltaic magazines that identify BMSolar as the leader of innovation.

FOUNDER and CEO

Alessandro Caraglio, Engineer with twenty five years of experience in the electronics, industrial automation, process control software and renewable energy sectors. Winner of various innovation awards, he has worked for large industrial and service groups in positions of responsibility. He writes about science and technology on his blog www.caraglio.com and Twitter @alexcaraglio
BlackMagic optimizes all photovoltaic systems, increasing the energy production from +5% to +80%. It prevents system deterioration, protects against the interference on the pv-string and safe-proofs panels in case of fire or other events such as electric arcs.

Only 10-12% of the solar energy is converted into electrical energy that is fed into the grid: this theoretical figure decreases due to environmental and meteorological factors and / or to the inherent system problems (design and / or installation errors, the decline of panel efficiency, mismatching and other problems). These problems increase the investment payback time (BEP break-even period) and decrease the return on the investment (ROI return of investment).

BlackMagic technology was the first in Europe to confront and resolve these problems which are typical in the photovoltaic sector. BlackMagic has been in the market since 2006 and:

- increases the efficiency of the photovoltaic panels and system
- reduces the payback time (minor BEP)
- maximizes the return on photovoltaic investment (higher ROI)
- prevents panel from deteriorating
- safe-proofs panels in case of fire or electric arcs.
- prevents theft
- prevents damage

BlackMagic technology can be applied to new and existing systems.

BlackMagic can also be integrated with photovoltaic panel junction boxes, it works with all varieties of panels and inverters on the market, it can be installed on any type of residential, commercial or ground-based photovoltaic system.

BlackMagic is “the intelligence in the photovoltaic field” because it is able to manage and reduce the technical issues of photovoltaic systems and develops each system to its full potential. It also offers guaranteed results on investment return in terms of the duration of the system and the increased energy production.

The state of the art photovoltaic installation is basic and unsupervised, a traditional installation is nothing more than a series of batteries.

Intrinsic Critical Photovoltaic Systems

There are some phenomena that reduce the efficiency and the lifespan of the installation due to external and internal factors. **External factors:** shadows, dirt, fog, rain, snow, sand, sea wind, smoke, birds excrement continuous AC disturbances on DC string that stress the panels promoting premature wearing or damage, electric arcs which, following stress, may also occur at cell level.

**Internal factors:** mismatching panels, panel decay over time, installation, wiring, connectors.

Photovoltaic System Security

**Fire:** in case of fire, the string voltage does not allow safe intervention. **Theft:** the traditional anti-theft systems are inefficient and generate false alarms.
BlackMagic Technology:

**EnergyQuadCore**
Four functions which increase energy production and intervene separately or simultaneously according to the immediate condition of the system. This is the competitive advantage of BlackMagic technology that addresses all the critical issues with more specific answers.
With Blackmagic the best panels help the others that are experiencing difficulties.

**SmartCoolByPass**
The logic of intelligent exclusion of a panel from the circuit I_sc<1bp

**EnergySpring**
It solves mismatching across all panels on a string for internal factors (eg. installation and design issues) and mild external factors which do not vary quickly (eg. Small shadows, a small amount of dirt, a few clouds, ...)

**BMFireSafety**
Safety measures in case of fire through intrinsic safety controls which intervene without protocols or electronic controls. Control of the temperature gradient: activating automatic safety controls. Possible to integrate with all fire protection systems.

**BMTheftSafety**
Anti-theft day and night 24 hours / 365 days a year based on measuring changes in warning signs. Can be integrated with all alarm systems

**BMPanelMonitor**
Monitoring panel (advanced version)

**DuoInput**
BlackMagic is powered by two panels, the output is equal to a panel with twice its power and half its tolerance.

**NeuralMPPT**
DC/DC convertor with cooperative MPPT. Solves external factors when they have a more significant impact, manifesting with a high frequency (eg. Frequently varying shadows, a lot of dirt, highly variable industrial fumes.)
Problems inherent photovoltaic systems

In the series of panels (string) the current is equal to the panel that is producing least of all Is, the other panels dispel part of their production in heat, the extra current Iq runs on the dissipation resistance. This phenomenon is called Mismatching, below I/V curves Irradiance and Temperature function

**Endogenous Mismatching**

- **Machine Flash Tolerance**: The tolerance of flash tests goes from 5% to 2%
- **Panel Tolerance**: Panels have a tolerance p.es. ± 2% or positive 0-4%, with mismatching the important thing is the absolute interval for which ± 2% equals 0-4%
- **Guaranteed Peak**: the production of panels is guaranteed for 90% of the peak for the first 10 years then to 80%. This results in a maximum misalignment of 10% and of 20% after 10 years

**Exogenous Mismatching**

- Rain
- Dust
- Snow
- Birds excrement
- Clouds
- Dirt
- Industrial fumes
- Mismatching panels/cells
- Panel wearing
- Design problems

**The new state of the art in photovoltaic systems**
BM-AN Fire-Protection System

BM-AN ensures security in case of fire, electric arcs, maintenance of photovoltaic systems. The real danger is the circuit voltage that can be up to 1000 Vdc. With the BM-AN, the circuit voltage goes to ZERO Vdc.

- **Intrinsic Security**
  the safety system is based on an electrotechnical consensus, thanks to a low voltage external power supply, rather than running via protocols or wireless connections

- **Temperature Control**
  An internal sensor commands the cutting of each single panel when they go over the temperature threshold.

- **Can be integrated with all sensors and anti-fire units.**
  The safety can be manually or automatically eg. by smoke detector or with the consent of fire control units

- **Reduces the need for compartmentalization**
  The roofs do not need to be separated from the building with expensive insulation with fire resistance of at least 90 minutes

BM-AF Theft-Protection System

The manager BM-MA is a multi-function alarm system for both photovoltaic panels and parallel boxes which is active 24 hours a day, 365 days a year. It is based on the measurement of the DC line continuity, thanks to the measurement of the line’s impedance variation.

It can be installed either downstream (for anti-theft panels) and upstream of the string box (for anti-theft cables).

The alarms use digital output and Modbus RTU making it compatible with all SCADA and central alarm systems.

HDRweb

BMSolar provides subscription-based access to its own data collection portal that gives details of the records from the photovoltaic field where they are managed.

- Graphs and daily production data grouped by month
- Graphs and monthly production data grouped by year
- Comparison with the Business Plan
- Data and graphics progression of daily power Inverter comparison between them
- PDF reports which can be downloaded from the website
- Multi-PVInstallation Management

The BMSolar portal can be installed "in house" from client’s Web-Provider or Datacenter, making it autonomous in the management of its own system data or of its own customers, in addition to being able to offer a monitoring and reporting service.
HDR - Monitoring and Control Software

BMSOLAR’s HDR software allows data acquisition and information processing from all parts of the system, as well as the management and control of any added components, is a true industrial SCADA.

Extremely versatile, it collects all the data from the field and displays them in real-time with scenarios, managing alarms and when required, manipulating them through the use of its internal mathematical software package.

The main features are:

- Acquisition, recording, processing, presentation of variables including temperature, weather readings (outdoor temperature, solar radiation, humidity and wind), electricity produced, thermal energy produced
- Scenarios and videographic presentation
- Alarm management
- Remote Control
- Key inverter protocol management (SMA, Fronius, PowerOne, Elettronica Santerno, SIEL, AROS, Sunways and many others)
- Key "building automation" protocol and industrial management
- Remote control via point-to-point connections or via the Internet
- On request data records from our Datacenter accessed via web browser

BM-MeterForSun

A monitoring system for photovoltaic systems composed of

- WiFi Monitoring Device to be connected downstream from the AC meter
- Tablet and SmartPhone Apps

Managed information

- Power Production
- Power Usage
- Extra-power production measurement from optimization with BlackMagic
- Real-time display on tablets and smartphones thanks to Android and iOS Apps
- Power Production Forecast
- Interfaces with Intelligent Storage systems
Enter into the new world of Efficiency and Security with the Blackmagic StarterKit