Innovation for Solar Energy: # Maximum Power Point Tracking

An unexpected innovation for the **optimization of photovoltaic energy**: the **first** **high-performance**, **very economical** and **miniature** **MPPT** (Maximum Power Point Tracking).

A breakthrough innovation avoiding modern-day digital technologies that are efficient but constraining.
*This analog MPPT concerns **off-grid photovoltaic systems** as well as **grid-connected** ones, the MPPT being included in the **solar charge controller** (standalone or within a **solar inverter**).*

Problem/needs identification

An efficient MPPT is a crucial factor in optimizing any photovoltaic installation: up to 30% extra power in the conventional case where the load is a battery, and much more for a load of resistive type (heating element, etc).
It takes into account the variations in sunshine and temperature, as well as the aging of the photovoltaic module.

Since 1968, market-leading MPPTs have been following in the footsteps of NASA, with microcontrollers and other digital converters, along with their various constraining algorithms, and predictive measures by disturbing (distortive) currents.

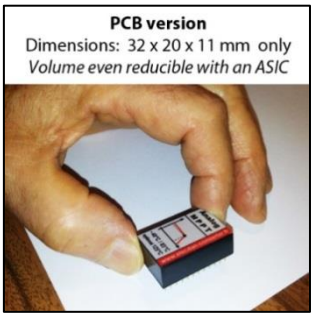
Currently, due to its high cost, the use of an efficient solar MPPT charge controller (within a solar inverter or standalone) is unfortunately not widespread, especially for small off-grid installations around the world.

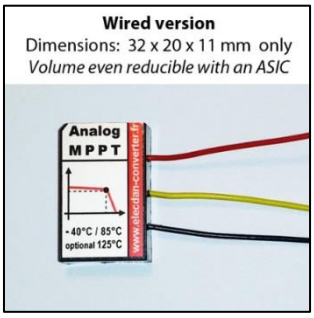
Efficacy of the solution

Our analog MPPT (Maximum Power Point Tracking) **reliably** and **economically** optimizes the production of photovoltaic energy.
This tracking device systematically and accurately determines the **ideal operating** **"voltage/current"** **point** (maximum power point) of photovoltaic modules, even at low light levels.
This high-performance MPPT is a breakthrough innovation because it not only eliminates microcontrollers but also current sensors, thus drastically reducing the cost price.

Thanks to its effective analog technology, our MPPT has many advantages over the best MPPTs presently on the market:

- efficiency even at low light levels,
- extreme eco-design,
- drastically reduced volume and weight (less than 6 cm^3, even reducible to only an electronic microchip),
- exceptional resistance to extreme hygrometries and temperatures (from -40°C/-40°F to 125°C/257°F), as well as to electromagnetic disturbances,
- possible pioneering direct integration **into** photovoltaic solar panels (for their own upgradation),
- automatic adaptation, allowing the parallel installation of additional and identical photovoltaic modules, thus allowing scalable installations,
- current sensor removed (no disturbing currents for prediction and correction),
- super-economic (very low cost of all the electronic components of the MPPT),
- increased reliability, with an exceptional MTBF: over 2.10^6 hours (at 70°C).





Sustainability of the solution

1 - Time saving:

- fast and easy **manufacturing**: only a reduced number of regular components to be wired/assembled,
- particularly simple and rapid **final controls**, as checking of settings is not required.

2 - Gain of photovoltaic energy:

- no shutdown of the operated photovoltaic system in case of overheating (up to 125°C),
- no loss of information in the event of a thunderstorm (because of no memory requirement),
- no loss of energy due to "perturb and observe" calculations,
- improbable failure

3 - Adoption by the industry facilitated by:

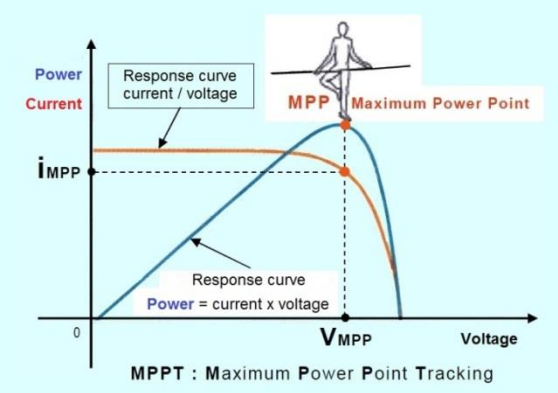
- its multiple performances and benefits already listed,
- attractive licensing (patent application already filed).

Degree of innovation

1 - A breakthrough technology eliminating current sensors and microcontrollers, our MPPT **ingeniously** maintains the "Maximum Power Point", not with successively predictive and corrective (and disturbing!) algorithms governing "voltage x current" calculations, but with a control resulting from an instantaneous **analog analysis** of the **voltage** of the "current / voltage" curve in the vicinity of Vmpp.

2 - Our solution was developed by eliminating traditional methods (started by NASA) while improving climatic performances, reliability, integration possibilities, and money savings.

3 - Example of improvement of a standard practice: **direct** and yet reliable integration of our MPPT in photovoltaic modules (by their manufacturers), the modules being generally superheated.



Economic impact

Our analog MPPT drastically reduces cost prices for components and labor during the whole process of manufacturing.

Our MPPT being inexpensive, miniaturized, climatically insensitive, we target the **immense global market** of photovoltaic installations, off-grid or grid-connected. Examples:

- more than 100 million domestic installations to be renovated, **economically**,
- 1.2 billion people with limited budgets, deprived of electricity (EDF, for example, will distribute 3 million off-grid photovoltaic systems in Africa),
- average growth of the photovoltaic market, up to 2050: 19 gigawatts per year, or about 200 million m² of photovoltaic panels per year.

This MPPT can also serve **innovative projects** involving **new technologies or new applications in photovoltaics**, whenever increasing reliability/efficiency and saving space/money really matter: intelligent solar panels, microgrids, etc.

We are looking for partnerships, for commercial and industrial acceleration.

Please visit our website: www.elecdan-converter.com