❶

ELECDAN Converter

Principle of a solar installation off-grid and low voltage

operating directly (Solar Direct Drive)

5116
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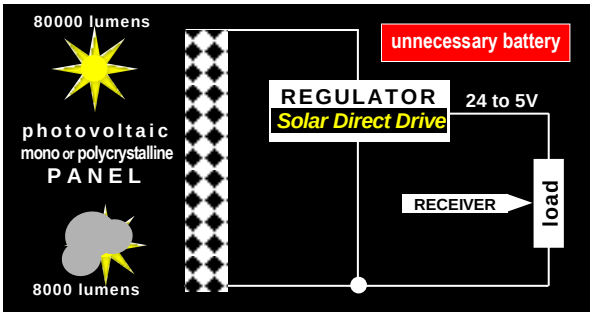
Presentation :

A photovoltaic panel is the first element in an off-grid, low-voltage solar power system. The panel converts the luminous flux into electricity. This electricity is supplied directly to the input of a *"Solar Direct Drive"* regulator that is controlled by a *MPPT (Maximum Power Point Tracking)*, without add-on battery. After conversion, this regulator delivers optimized electrical energy to the final receiver, usually a motor (e.g.: a helical pump powering a raised pond). With even a very low input of electrical energy, this motor can operate virtually from morning to evening, "as the sun shines", at variable speed.



Classic photovoltaic panel

- Mono or polycrystalline with 60 cells (≈ 33V peak)
- Solar efficiency ≤ 20% (photovoltaïc panel at 25°C)
- Power ≈ 300W for a surface of 1.5 x 1 m
- Weight: ≈ 20kg for the regular rigid version, or 5 kg for the flexible version (more costly).

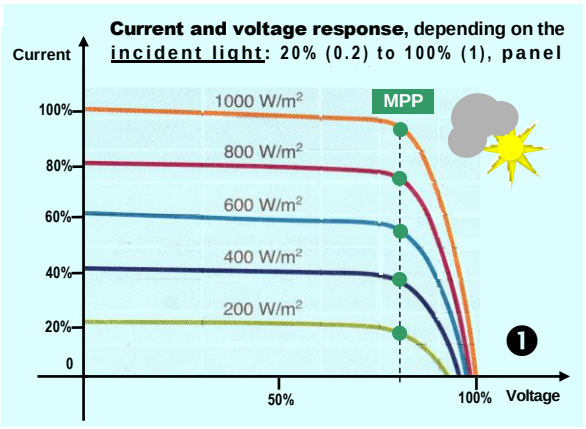
This fundamental element of the solar installation cannot permanently provide its full power (300W for a sunshine of 1kW / m2) because it depends, in order of importance:

① on a random sunlight or a more or less subdued (see curves ❶)
② on the panel orientation, preferably perpendicular to the sun
③ on the adaptation of the load depending on the level of sunlight.

nominal power	example of sunlight levels	Available power (simplified calculations)	
		without regulator	with regulator + MPPT
300W	0.5	300 x 0.5^2 = 75W	300 x 0.5 = 150W
	0.2	300 x 0.2^2 = 12W	300 x 0.2 = 60W

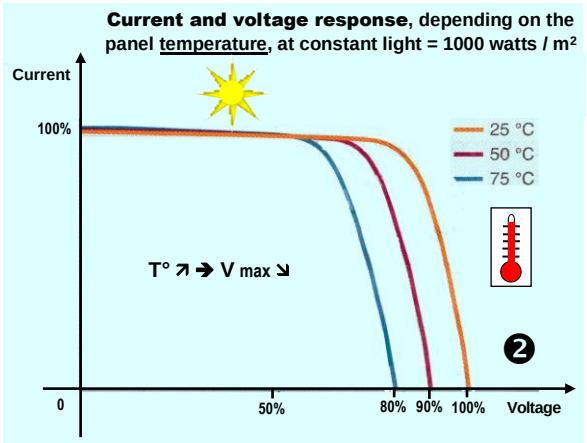
④ on its temperature : if T° ↗ then efficiency ↘ (see curves ❷)
⑤ on the variable precision of its constituent cells
⑥ on its obsolescence (decreasing power over the years)

As a complex result of all the 6 variables mentioned above, the representative curve "Current / Voltage" of the photovoltaic panel has a preferential operating point MPP (= Maximum Power Point) such that the product of its coordinates (Current x Voltage) is maximum. This essential characteristic is judiciously exploited by a SDD MPPT Regulator (see "white on black" box at bottom).



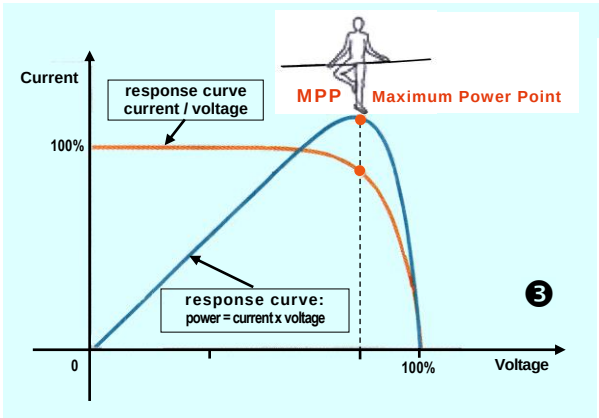
Solar Direct Drive regulator

It is a MPPT controlled DC-DC regulator, with very high efficiency, directly connected to the photovoltaic panel. The output of this regulator directly powers the load, but in a modulated way, so that, on the response curve "current / voltage" of the photovoltaic panel, the operating point coincides with the MPP. This coincidence is obtained by a permanent control that reduces or increases the current absorbed by the load. For this purpose, the variable voltage applied to the terminals of the load is controlled by a fast electronic tracking system.



MPPT Maximum Power Point Tracking (curves ❸ and history)

Most charge controllers on the market are based on the work of NASA, which, around 1968, used calculators to optimize the operation of its photovoltaic panels for space research. Currently, MPP tracking requires a current sensor, a microprocessor, its power supply and specific algorithms to control a DC-DC regulator, generally using one of two methods: "Incremental Conductance" (complex) or "Perturb and Observe"; cyclic load disturbance doesn't have only advantages!



ELECDAN CONVERTER radically simplifies photovoltaic energy optimization. Instead of using complex NASA-type digital sequences to automatically find the Maximum Power Point, ELECDAN CONVERTER determines the MPP using permanent, self-powered analog tracking.
Advantages: disappearance of the usual battery and chemical capacitors; uselessness of a current sensor and switches; deletion of memory, microprocessor or customizable algorithms. Controlling the DC-DC regulator associated with the mono or polycrystalline panel, this innovative analog MPPT allows extreme miniaturization and tenfold reliability, while increasing thermal insensitivity and electromagnetic protection.