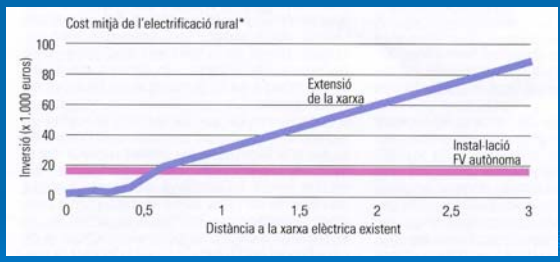
Average cost for a rural electrification



Supposed installed power=5 kWh/day

When autonomous electrification by renewables is interesting.

PHOTOVOLTAIC CONVERTERS FOR SOLAR ENERGY

L'Hostalet de Massivert-Girona-Spain

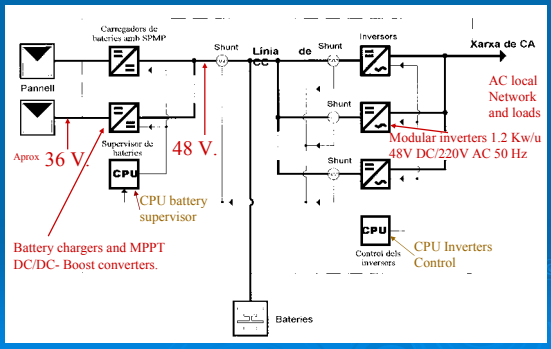
Courtesy of TTA-Trama Tecnoambiental S.L.- Barcelona

Caneto-Huesca-Spain

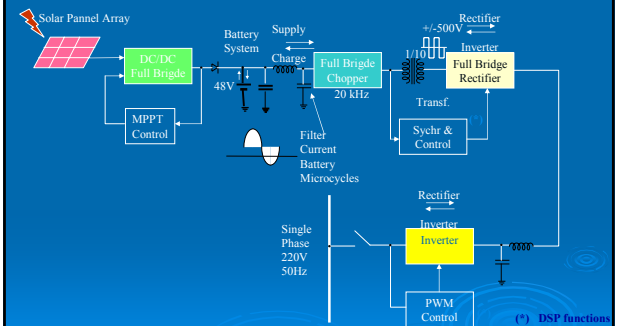
Photovoltaic generation 4kWp Inverter 7.2 kW 220V 50Hz
6 end users possible

Sant Pere de Rodes- Girona-Spain-XI-XII s monument

Stand-alone local grid-connected system

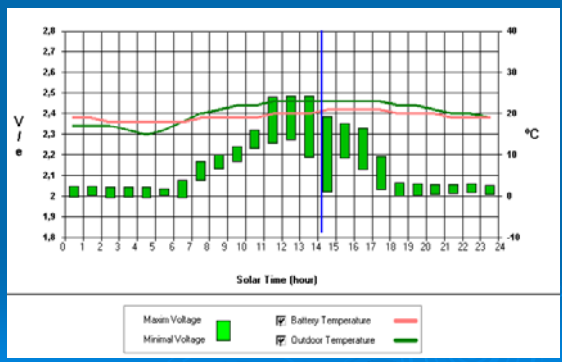


PHOTOVOLTAIC SYSTEM BLOCK DIAGRAM



Practical realisation of a Central Control Station for an autonomous Photovoltaic System.

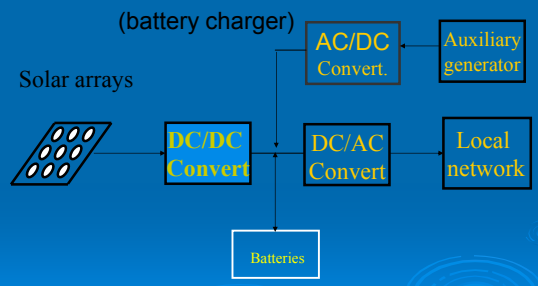
Courtesy of Trama Tecno Ambiental S.A.



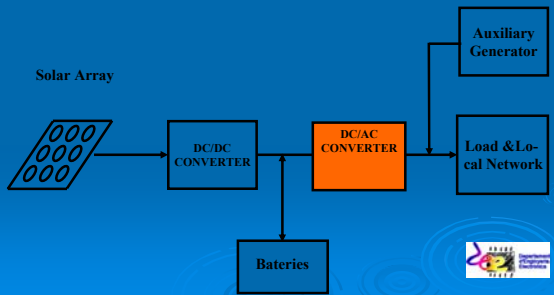
Hybrid Systems

Basic Structure for an Autonomous System

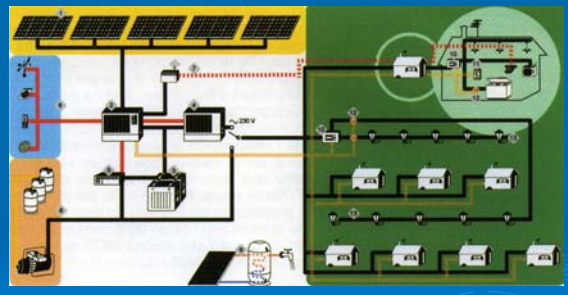
Solar Hybrid generation



PHOTOVOLTAIC CONVERTERS FOR SOLAR ENERGY

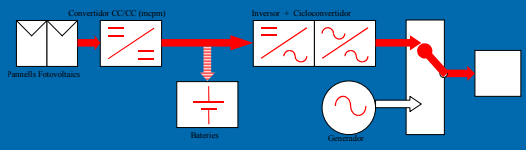


Micro-grids with solar hybrid generation- MGS Project



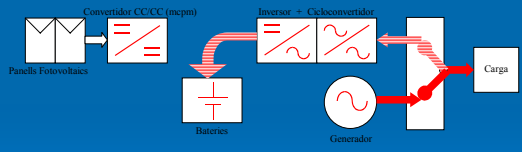
V Frame Program EU Project MGS-Target: Promotion of ***Micro-grid Systems*** up to 120 kWp of Electrical Solar-Hybrid production in Spain and South America

Hybrid Systems with Diesel Generator



Normal Operation-Supply to the batteries and to the external load

Hybrid Systems with Diesel Generator



Error mode operation of the system- discharged batteries and fault in the DC/DC converter.

Spanish Observatory Station Leavingston Island, Antartide

Courtesy of TTA-Trama Tecnoambiental S.L.- Barcelona

Courtesy of TTA-Trama Tecnoambiental S.L.- Barcelona

Going to work

Courtesy of TTA-Trama Tecnoambiental S.L.- Barcelona

Foreana-Galapagos Islands

Photovoltaic generation 18 kWp Inverter 21.6 kW 110V. 60 Hz
for 55 end users

Courtesy of TTA-Trama Tecnoambiental S.L.- Barcelona

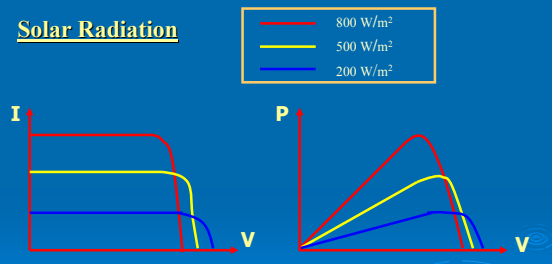
Foreana-Galapagos Islands

Courtesy of TTA-Trama Tecnoambiental S.L.- Barcelona

Maximum Power Point Tracking

Photocell characteristics under different ambient conditions

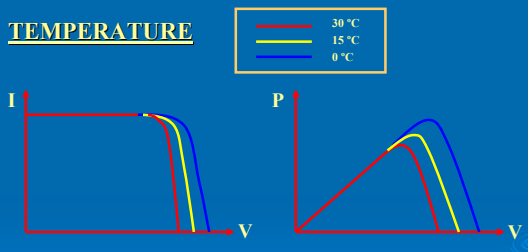
Solar Radiation



- Short circuit current increases with increasing temperature
- Open circuit voltage decreases with increasing radiation
- Maximum power increases with increasing radiation

Ambient factors and photocell characteristics

TEMPERATURE



- Short circuit current doesn't depend on temperature
- Open circuit voltage decreases with increasing temperature
- Maximum power decreses with increasing temperature

Charge variations and working point