The PV Trends in developing countries

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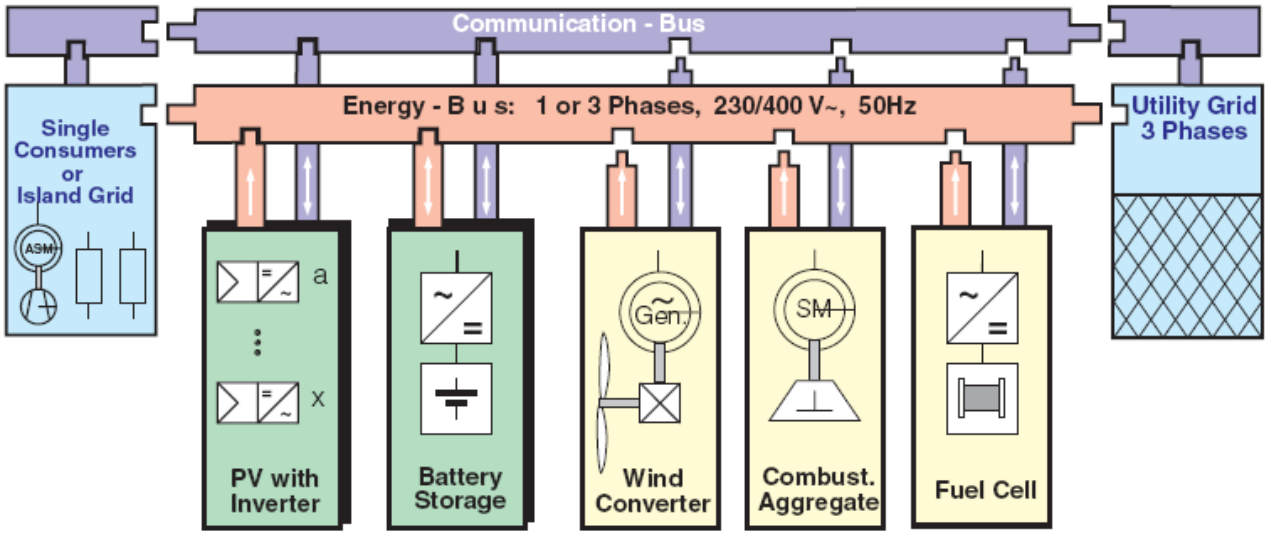
Some Facts about PV Rural Electrification

- Over the last decades PV has shown its potential as a technology for decentralized rural electrification in developing countries.
- PV systems are now being integrated in large rural electrification programs in different parts of the world.
- Programmes and studies now address the issues related to large-scale market development in rural areas:
  - Access to affordable credit,
  - local market infrastructure for installing and servicing PV systems, and
  - mechanisms for conductive local policy-making.
- the impact of the application of solar PV for rural electrification is more substantial than generally recognized
- In many countries, the growth rate of solar rural electrification exceeds that of conventional electrification with diesel microgrids or extension of the main grid.
- Lack of statistics on PV rural electrification

Trends in PV off-grid system technology

- Charge regulator with Maximum Power Point Tracking
- Bidirectional inverter: Battery charger and inverter
- PV modules designed for grid connected installations
- PV Hybrid systems



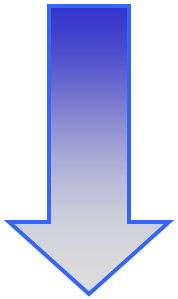
TECHNICAL STATUS OF PV RURAL ELECTRIFICATION

High growth rate of PV installations

Development of PV components poorly coordinated

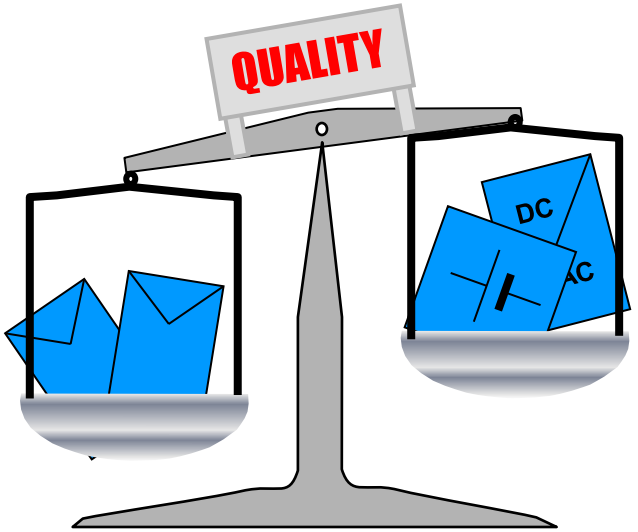
Balance of System complexity underestimated

Mediocre Installations



QUALITY CONTROL

- Standardisation
- Certification:
  - System
  - PV Components
  - Installation



Main Faults observed

Shadows on the modules

PV components bad placed

Low initial state of charge in the batteries

Charge regulators:

- Lack of protections
- inadequacy with the battery

Wiring

- insufficient cross section
- no polarity identification

Lamps

- Premature fade-out of the tube
- insulation faults

Electromagnetic interferences

PV Rural Electrification project evaluation

- ✓ Finished this year
- ✓ Investment: 10 millions €
- ✓ Total Power Installed: 440 kWp
- ✓ Number of PV systems: 430
- ✓ Peak Power per system: 800 – 1200 Wp
- ✓ Use: Electricity for Schools and Health Centers

PV Modules and Structures 1

PV Modules and Structures 2

Shadows

Easy to steal

Batteries

Paralell configuration

Connections not well tight

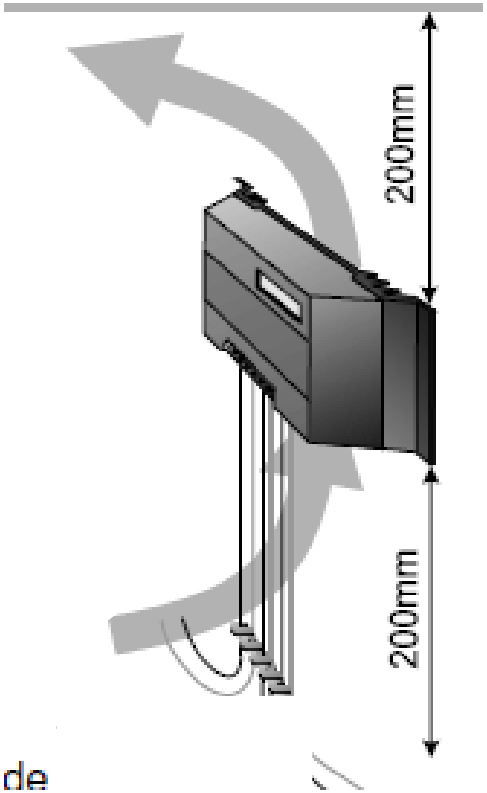
Charge controller 1

12 V subsystems

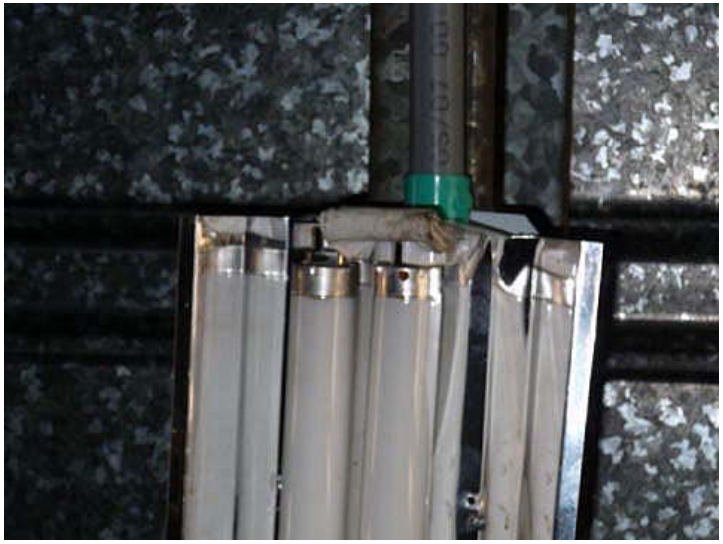
Two charge controllers and inverter per subsystem

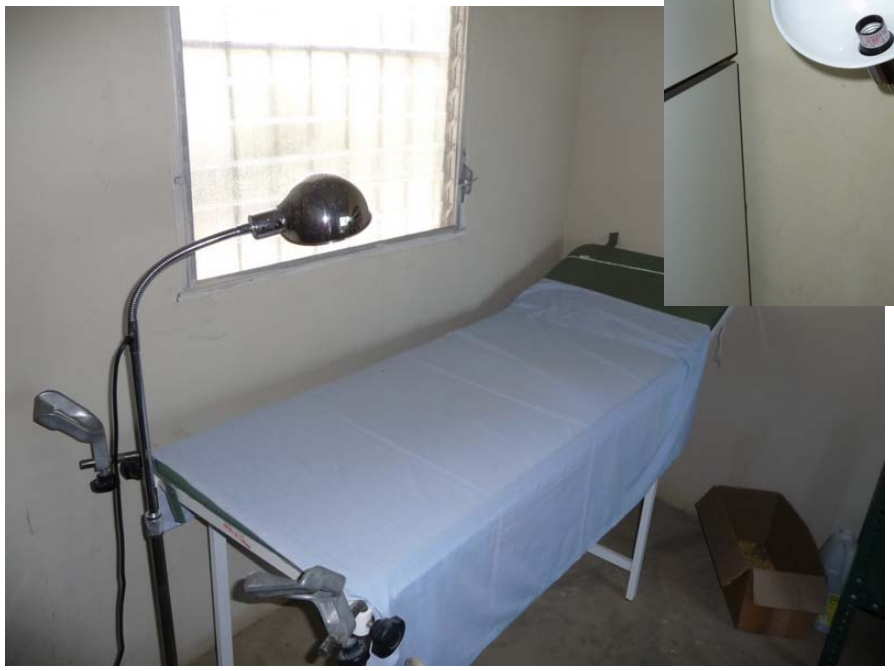
Charge controller 2

Manufacturer's manual



Lamps and wiring





Social acceptance of PV technology

Lessons learnt from this project

- ✓ Good quality in B.O.S. components and acceptable PV modules
- ✓ Mistakes on systems design
- ✓ Lack of knowledge in quality control procedures
- ✓ Defective commissioning procedure
- ✓ Lack of users training

Our Quality Control approach

Certification process accessible to local markets

- Main end-users
- technical sophistication is not a synonym of quality improvement
- Installation and maintenance are local activities

Standardisation: ***Universal Technical Standard for Solar Home System***

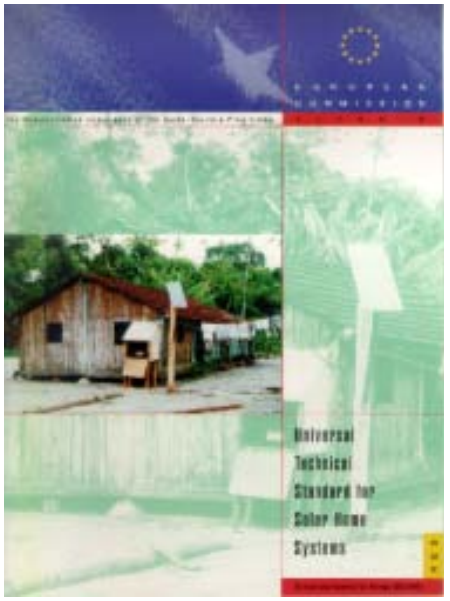
- Prescriptions for:
  - PV components
  - Installation
  - PV system

Certification: ***Solar Home System Test Procedures***

- Standard Compliance Certificate
- Test for DC/AC Stand-Alone converters

Commissioning: ***Guidelines***

O&M and evaluation: ***Guidelines***



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Some examples of aplication

- PVMTI: Morocco, India and Kenya
- ADEME: Burkina Fasso and Mauritania
- Filipinas: National Power Corporation
- DANIDA: Malawi, Ghana, Mozambique and Nepal
- Perú: GEF project (4600 SHS)
- Bolivia: Technical specification NB 1056

General conclusions

Taquile Island – Titicaca Lake (Peru)

✓ PV Stand Alone Systems Technology is not fully reliable yet

✓ Certification process must be accesible to local markets

- Norms with low flexibility can be detrimental for the local markets development
- increase of the technological dependence

✓ Sustainability of PV rural electrification projects is improved when the technical quality is reinforced

- reliability of PV systems would be enhanced
- availability, safety and maintainability are strongly dependents of non-technical factors.

✓ Improving quality means improving electricity service for final users

Thank you for your attention