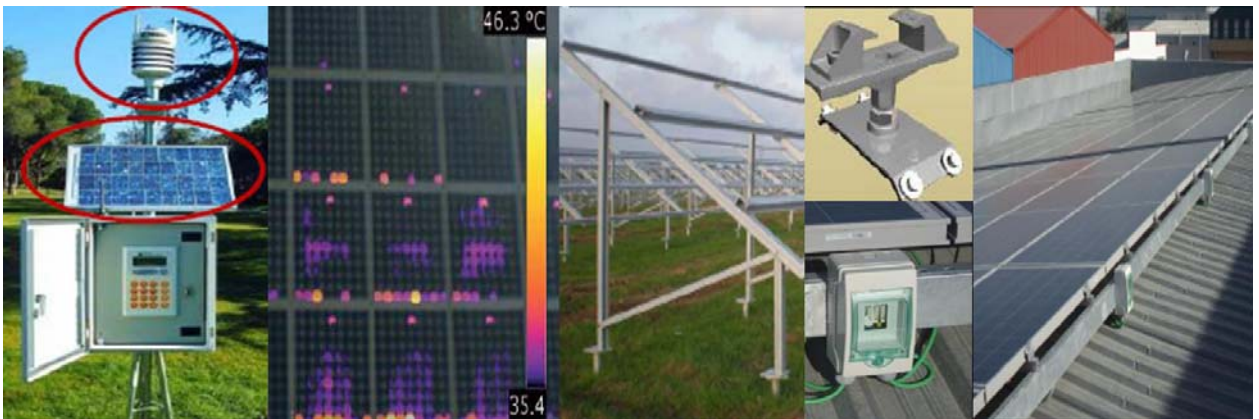


## PV TRAINING – DESIGN, CONSTRUCTION, OPERATION AND MAINTENANCE

September – October 2010

<http://www.leonardo-energy.org/node/5948>



### 1- DESIGN

- Solar resource assessment
- Determination of profitability of PV plant based on design data
- Selection and optimization of the site.
- Selection of components
  - Inverters. Decentralized or centralized. New Trends.
  - Installation with crystalline or thin film module
  - Protection and wiring.
  - Grounding circuit.

- Centers of transformation. Technologies. Efficiencies. Facilities without transformer.
- Metering equipment.
- Supplier Quality Control.
- The point of connection.
- Advanced calculations
  - Estimated losses.
  - Shading study. Plot Optimization versus shading losses.
  - Towards a Definition of Performance Ratio.
  - Annual production of the PV installation.
  - System Configuration.
  - Electrical calculations. Considerations for voltage drop and wiring heating.
  - AC and DC wire.
  - Lightning strike. Direct and indirect effects.
  - Importance of the point of connection.
- Electrical diagrams

## **2- IMPLEMENTATION AND PV SYSTEM START UP**

- Civil works. Preparation of infrastructure.
- Mechanical assembly.
- Electrical Installation
  - Ground-mounted PV facilities
  - Rooftop installations.
  - Wiring.
  - Cabinets.
  - Ground net.
- Environmental aspects and waste management.
- Quality. Critical aspects in the development of the installation.
- Testing. Key issues.

- Inverter tests.
- Maximum power of the PV generator .
- Evaluation of the Performance Ratio real.

### 3. PLANT OPERATION

- Control systems and telecommunications.
- Components and infrastructure needed to control systems
- Monitoring and troubleshooting
- Management of information obtained by the control system
  - Management and alarms.
  - Sending information for maintenance purposes.
- Security of the Installation.
  - Fundamental characteristics required in a surveillance system.
- Protection systems against theft.
  - Anti-intrusion systems.
  - CCTV and video surveillance.
  - e-Rounds.
  - Remote control systems.
  - Security in PV roofs.

### 4. MAINTENANCE

- Importance of good maintenance procedure in the plant operation.
- Components to be maintained.
  - PV Panel.
  - Inverter.
  - Transformer.
  - Solar tracker.
  - Cabinet.
- Types of maintenance

- Corrective maintenance.
- Preventive Maintenance.
- Supplies.
  - Critical elements.
  - Guarantees.
- Management of spare parts and stock.
- Types of inspections and reach
  - Visual inspections.
  - Deep inspections.
  - Frequency of revisions.

## 5. PERFORMANCE STUDY OF A PHOTOVOLTAIC INSTALLATION

- Operating expenses.
- Project Cash-flow.
- Calculation of the IRR. Internal Rate of Return

## 6. CONSIDERATIONS ON ISOLATED INSTALLATIONS

- Criteria of higher winter production versus annual production maximization
- Hybrid systems.
- Storage Systems.
- Types of Batteries.
- The importance of energy efficiency in consumption in the isolated systems.
- Maintenance.

**Dates** (time is [16h00 Brussels time](#))

1. 14 September 2010 – Design

2. 16 September 2010 – Implementation and start-up
3. 21 September 2010 – Plant operation
4. 28 September 2010 – Maintenance
5. 30 September 2010 – Economic and financial analysis
6. 6 October 2010 – Considerations for isolated installations

Delivered by [GENERALIA](#), a PV engineering and construction company with several installed MW. Generalia Group management team has more than 20 years experience with energy and water projects.