C. Issues Related to PV Installations and Introduction to the Case Studies

by Arch. Lucia Ceccherini Nelli - ABITA, Eng. Rolf Oldach IT Power

1. Issues Relating to the Use of PV on Buildings

The development of the PV industry in Italy lags behind other countries in certain areas. While there is now good design assistance material in the form of design guidelines and computer-based optimisation tools, as well as guidance for project commissioning, testing and monitoring, the procurement stage is not well served with material to help organisations in the process of implementing a PV system.

There is a need for the standards covering performance of modules and related equipment to be incorporated into Italian standards documentation. In areas where no standards exist, such as manufacturing defects and appearance, these need to be formulated.

There are many issues relating to the integration of PV on a building, which arise throughout the course of a project. These include the following:

Planning Legislation
Grid Connection and Surplus Power
Optimising PV Systems
Standards
Maintenance
PV Building Products Costs

Each of the above listed issues is briefly described on the following two pages.

1 Planning legislation
Local authorities generally support projects directed toward environmental strategies and PV Publish projects are all integrated in public buildings to be realised with funding from public administration.

Goals for sustainability are increasing part of local Plans and reflect the Government‘s commitment to environmental measures through Local Agenda 21.

2 Grid Connection and surplus power
The PV systems detailed in the case studies of this brochure do not produce energy surplus to the building‘s requirements for export to the grid, as happens in many European countries.
At the moment it is not possible to sell surplus electricity produced by a PV system on a building to the national grid. The Italian Government may follow other European countries for the privatisation of ENEL (the Italian national electricity producer) in 2004 so that PV buildings will be able to satisfy not only their individual needs, but will also be able to export surplus electricity thus making a useful contribution to the country‘s electricity demand.

3 Optimising PV systems
This was briefly mentioned in an earlier section of this brochure. Optimisation involves optimisation of tilt and azimuth angles. It is also necessary to prevent over-heating of the modules and to keep the modules clean and free from dust etc.


Residential buildings

4 Standards

Designers need simple standards and codes of practice to to cover component manufacture and installation. Current Italian standards relate to:

§Module appearance, including bubbles in the resin in glass/glass modules, alignment of cells, acceptability of faulty cells and alignment and positioning of conducting wire;

§Non-electrical safety issues including handling, durability and hazards arising from fire;

§Support systems such as PV-integrated curtain walls, roof lights etc.

5 Maintenance

Maintenance requirement of PV systems is very low. However, providing safe access for maintenance to a PV array is very important and has frequently been overlooked until too late in the design process.

6 PV Building Products Costs

Recently, most photovoltaic elements for building-integration are moderately more costly than their conventional building material counterparts. The electricity generated from BIPV systems cannot in the near term compete on cost-basis with that supplied by conventional means. However, BIPV costs are expected to decrease over the next 10-15 years to the point where the additional cost of PV building component is offset by the value of the electricity supplied over its operating period. A significant portion of the cost decrease will be attributed to the expected increases in market size.

When considering the cost of a general PV system, it is common to quote the cost in relation to rated power output. This is not the case for a BIPV system where comparisons with conventional building material expressed as per unit are, are considered. This is often done without factoring in the cost savings from the energy the BIPV system provides. Earlier results of five case studies undertaken in the UK in 1997, comparing BIPV product costs to conventional building materials, approximate costs listed in the table below:

	Installed cost in Euro/m^2
PV curtain walling, glass/glass crystalline modules	1,200
PV curtain walling, glass/glass thin-film amorphous modules	450
PV rainscreen cladding	900
PV roofing tiles	800
PV modules on a pitched roof	1,100

Heliotrop, solar House, Freiburg

7. Introduction to the Case Studies

The case studies were selected for their suitability of the building for PV integration in terms of its use, size and structure, and the availability of relevant information, both in terms of the PV system which could be used and the building's replication potential within Italy.

The PV systems are all grid-connected. Most systems use polycrystalline silicon technology for the PV cells and one uses amorphous silicon. A number of case studies feature two PV arrays, each using a different method of integration. The largest system included was 30 kWp. The smallest individual system included was 10 kWp.

The projects show a wide variety of projects meeting the needs of a number of building sectors. Most of them set out to be ideal" solutions. All the projects are for systems on public buildings and illustrate the vast range of methods of PV integration.

Of the 13 projects, 9 will be realised with the financial support of the Minister of the Environment.

8. Information contained in the case studies

Most of the case studies each contain the following project specific information:

•Site description and short background information about the project.
•Integration details.
•System size: in terms of rated power and surface area.
•Electrical configuration details.
•Technical specifications of the hardware to be used.
•Simulation details and results: A simulation programme (PV Syst) was used to estimate the electrical energy the system would produce over a year. For this irradiation data was taken from weather files for Pisa. This site was selected on the basis of it having a "typical' weather pattern for Italy.