

IEA International Energy Agency
CO-OPERATIVE PROGRAMME ON PHOTOVOLTAIC POWER SYSTEMS

TASK 1

Exchange and dissemination of information on PV power systems

**NATIONAL SURVEY REPORT
ON PV POWER APPLICATIONS
IN ITALY**

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I FOREWORD

The International Energy Agency (IEA), founded in November 1974, is an autonomous body within the framework of the organisation for Economic Co-operation and Development (OECD), which carries out a comprehensive programme of energy co-operation among its 23 member countries. The European Commission also participates in the work of the Agency.

The IEA Photovoltaic Power Systems Programme (IEA-PVPS) is one of the collaborative R & D agreements established within the IEA and, since 1993, its participants have been conducting a variety of joint projects in the applications of photovoltaic conversion of solar energy into electricity.

The twenty participating countries are Australia (AUS), Austria (AUT), Canada (CAN), Denmark (DNK), Finland (FIN), France (FRA), Germany (DEU), Israel (ISR), Italy (ITA), Japan (JPN), Korea (KOR), Mexico (MEX), The Netherlands (NLD), Norway (NOR), Portugal (PRT), Spain (ESP), Sweden (SWE), Switzerland (CHE), The United Kingdom (GBR) and The United States of America (USA). The European Commission is also a member.

The overall programme is headed by an Executive Committee composed of one representative from each participating country, while the management of individual research projects (Tasks) is the responsibility of Operating Agents. Eight Tasks have been established, and currently seven are active.

The objective of Task 1 is to promote and facilitate the exchange and dissemination of information on the technical, economic, environmental and social aspects of photovoltaic power systems.

This report is related to the status of PV power applications in Italy in 2002 and is intended for the use of IEA Photovoltaic Power System Programme experts. It has been prepared by:

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The authors are greatly indebted with several experts from ENEA, CESI, ENEL and PV Industries, who have supplied information on PV systems and components installed in Italy.

II INTRODUCTION

The objective of Task 1 of the IEA Photovoltaic Power Systems Programme is to promote and facilitate the exchange and dissemination of information on the technical, economic and environmental aspects of photovoltaic power systems for application by utilities and other users.

An important deliverable of Task 1 is the annual International Survey Report on PV power applications. This report gives information on trends in PV power applications in the twenty member countries, and is based on the information provided in the National Survey Reports which are produced annually by each Task 1 participant.

As the International Survey Report is based on the National Survey Reports, they have been prepared by national experts following guidelines adopted by Task 1 participants. The International Survey Report is an external publication of the IEA-PVPS Implementing Agreement so it must not contain confidential information. In contrast the National Survey Reports are classified as internal reports and are not published within the IEA-PVPS Implementing Agreement. When preparing National Survey Reports, experts have made their own arrangements with their sources on how to treat confidential information (e.g. by restricting circulation or ensuring anonymity of the data).

In Annex A an explanation is given about the method used in our country to gather the information and on the accuracy of data.

III DEFINITIONS, SYMBOLS AND ABBREVIATIONS

For the purposes of the National Survey Reports, the following definitions apply:

PV power system market: The market for all nationally installed (terrestrial) PV applications with a PV power capacity of 40 Wp or more.

Installed PV power: Power delivered by a PV module or a PV array under standard test conditions (STC) – irradiance of 1 000 W/m², cell junction temperature of 25°C, AM 1,5 solar spectrum – (also see ‘Peak power’).

Peak power: Amount of power produced by a PV module or array under STC, written as Wp.

PV system: Set of interconnected elements such as PV modules, inverters that convert d.c. current of the modules into a.c. current, storage batteries and all installation and control components with a PV power capacity of 40 Wp or more.

Module manufacturer: An organisation carrying out the encapsulation in the process of the production of PV modules.

Off-grid domestic PV power system: System installed in households and villages that are not connected to the utility grid. Usually a means to store electricity is used (most commonly lead-acid batteries). Also referred to as 'stand-alone PV power system'.

Off-grid non-domestic PV power system: System used for a variety of applications such as water pumping, remote communications, telecommunication relays, safety and protection devices, etc. that are not connected to the utility grid. Usually a means to store electricity is used. Also referred to as 'stand-alone PV power system'.

Grid-connected distributed PV power system: System installed on consumers' premises usually on the demand side of the electricity meter. This includes grid-connected domestic PV systems and other grid-connected PV systems on commercial buildings, motorway sound barriers, etc. These may be used for support of the utility distribution grid.

Grid-connected centralized PV power system: Power production system performing the function of a centralized power station.

Turnkey price: Price of an installed PV system excluding VAT/TVA/sales taxes, operation and maintenance costs but including installation costs. For an off-grid PV system, the prices associated with storage battery maintenance/replacement are excluded. If additional costs are incurred for reasons not directly related to the PV system, these should be excluded. (E.g. If extra costs are incurred fitting PV modules to a factory roof because special precautions are required to avoid disrupting production, these extra costs should not be included. Equally the additional transport costs of installing a telecommunication systems in a remote area are excluded).

Field Test Programme: A programme to test the performance of PV systems/components in real conditions.

Demonstration Programme: A programme to demonstrate the operation of PV systems and their application to potential users/owners.

Market deployment initiative: Initiatives to encourage the market deployment of PV through the use of market instruments such as green pricing, rate based incentives etc. These may be implemented by government, the finance industry, utilities etc.

NC: National Currency

Final annual yield: Total PV energy delivered to the load during the year per kW of power installed.

Performance ratio: Ratio of the final annual (monthly, daily) yield to the reference annual (monthly, daily) yield, where the reference annual (monthly, daily) yield is the theoretical annual (monthly, daily) available energy per kW of installed PV power.

1 EXECUTIVE SUMMARY

In Italy, the last years have been characterized, on one side, by a thick budget for dissemination programme implementation as well as very high public demand and, on the other side, by rather slow market growth due to bureaucratic issues essentially related to the incentive mechanism. Only at the end of 2003 the approval of a decree concerning the implementation of the European Directive 2001/77/CE which include also the feed-in tariff, has provided a strong expectation in the Italian PV market.

- Installed PV power

In this situation, during the year 2003 the cumulative installed PV power increased only by 20% reaching a total of about 26 MW. Besides, most of this increase has been due to the expansion of the grid-connected market, in response to the incentives committed by the Government and the Regions. Small grid connected systems now account for 30% of PV installed in Italy, with respect to 16% at the end of 2002.

- Costs & prices

The average module prices has slightly decreased in 2003, reaching lowest values of 3.1 €/W for reasonable volume orders while for small orders prices reach typical values of about 3.9 €/W. A similar drop has been recorded for system prices. In particular, small (2 - 3 kWp) grid connected systems of roof mounted PV plants have been installed at 7300 €/kWp without VAT while for larger plants (10 – 20 kWp) a system price of approximately 6800 €/kWp has been achieved.

- PV production

By the end of 2003, the production of photovoltaic modules applying both single and multi crystal technologies amounted to 4.3 MW, decreasing from 5.1 MW in 2002. Reasons for the reduced production were uncertainties about the future support of PV and the weak situation of the Italian PV firm with respect to the foreign ones. In the same year about 60% of the installed modules have been imported, as a consequence a rough estimation of the exported modules lead to a figure of about 2.7 MW still decreasing with respect to 2002.

- Budget for PV

The total budget for photovoltaics has reached, during the last year, the sum of about 25 millions of Euro. Of this amount, expenditure on PV research and demonstration, mainly supported by ENEA (the Italian Agency for New Technology, Energy and Environment) and CESI (the Institute for Research and Certification of electric components and system) have been about 5 million of Euro, remaining essentially flat with respect to the previous years. The other 20 million of Euro, aimed at market stimulation, have been provided by both the Ministry of Environment and the Italian Regions in the framework of the National roof-top Programme.

2 THE IMPLEMENTATION OF PV SYSTEMS

The PV power system market is defined as the market of all nationally installed (terrestrial) PV applications with a PV capacity of 40 Wp or more. A PV system consists of modules, inverters, batteries and all installation and control components for modules, inverters and batteries.

2.1 Applications for photovoltaics

Four different primary applications for PV power systems can be identified in Italy:

- Off-grid domestic systems. This kind of application has been mainly promoted in the early phase (1983 – 1990) of the Italian photovoltaic programme through 80% incentive in order to provide electricity to 5000 isolated households in rural remote areas especially diffused in Southern Italy.
- Off-grid economic industrial applications. These applications still represent a consistent share (about 25%) of Italy's cumulative installed capacity.
- On-grid centralized systems, sharply increasing at the beginning of 1990's but after few years with declining annual growth rate, since 1999 around 0%. The basic scope was the identification and validation of satisfactory solutions for power generation by means of medium and large size grid connected plants, for utility applications, ranging from 100 kW to 3.3 MW. In this context during the period 1991-1998, the most relevant results have been:
 - o the development of six standard 100 kW plants for small grid support such island and weak feeder (by ENEA);
 - o the realization of the 3.3 MW Serre power station (by ENEL);
 - o the construction of 3 modular plants (total power 2,2 MW) suitable for multi megawatt power generation (by ANIT PV company);
- On-grid distributed PV systems, enjoying strong growth (110%) over the last year as benefiting incentives in the framework of the Italian roof-top Programme and now dominating with a share of about 30% Italy's cumulative installed power.

Up to now, the Italian PV market has been showing a behaviour variable from year to year and strongly dependent on subsidized projects. In particular, the sector of PV plants for power generation has been boosted by the financial support coming from the European Community, ENEA and ENEL projects while the one of distributed generation by the governmental incentives in the frame of the Italian Roof-top Programme.

2.2 Total photovoltaic power installed

The total PV power installed in Italy at the end of 2003 was about 26 MWp, 4 MWp being installed in 2003.

In table 1 is presented the total cumulative installed PV power for each submarket on the 31 December from the year 1992 onwards.

Table 1: The cumulative installed PV power in 4 sub-markets.

Sub-market/ application	31/12/ 92 kWp	31/12/ 93 kWp	31/12/ 94 kWp	31/12/ 95 kWp	31/12/ 96 kWp	31/12/ 97 kWp	31/12/ 98 kWp	31/12/ 99 kWp	31/12/ 00 kWp	31/12/ 01 kWp	31/12/ 02 kWp	31/12/ 03 kWp
off-grid domestic	3 950	4 350	4 700	4 830	4 962	5 052	5 210	5 220	5 240	5 300	5 300	5 300
off-grid non- domestic	3 750	4 150	4 650	4 780	4 792	4 814	5 100	5 640	5 890	6 350	6 365	6 400
on-grid distributed	100	100	150	335	404	677	780	905	1 155	1 635	3 620	7 600
on-grid centralised	680	3 480	4 590	5 850	5 850	6 166	6 590	6 715	6 715	6 715	6 715	6 700
TOTAL	8 480	12 080	14 090	15 795	16 008	16 709	17 680	18 480	19 000	20 000	22 000	26 000

During the year 2003 the cumulative installed PV power increased by 20% reaching a total of about 26 MW. Moreover, most of this increase has been due to the expansion of on-grid distributed systems market that now account for 30% of PV installed in Italy.

It is worth mentioning that the accuracy of the assignment to this year is related to the actual date of the start of plant operation. Inadequate statistics of these information coming from regional programmes makes assessment accuracy around 10%.

2.3 Major projects, demonstration and field test programmes

In the following are described the major programmes and projects operating in Italy

National Roof-top Programme

This Programme was aimed at tune programme procedures, check people consensus and encouraging the development of small grid connected systems installed on building structures. Since the starting of the programme on March 2001, 146 plants ranging from 1 kW to 20 kW, amounting to 1,8 MW have been installed funded by about 10.3 M€ committed by the Ministry of Environment and Land Protection (MATT). In general, have been provided contribution up to 75% of the eligible investment cost that has been fixed from 7 €/W to 8 €/W, depending on plant size

Following the great demand, more than three times the offer, further funds amounting to about

20 M€ have been made available on March 2003 by MATT and Regions to finance (fifty-fifty) other 314 applications already positively evaluated and amounting to 3,6 MW

On the whole, with the National Programme, the MATT incentives are making active an investment amount of about 40 M€ to install a total capacity around 5.4 MW.

Out of this capacity, at the end of the year 2003, over 1.8 MW financed with the initial funds, have been completed the first plants admitted in the framework of the additional funds, amounting to about 200 kW.

Regional Roof-top Programmes

These Programmes are completely managed by all the 19 Italian Regions and the 2 Autonomous Provinces. The purpose is to promote a wide diffusion of building integrated photovoltaic applications all over Italy and to create a sure and lasting market, in order to allow companies for long term investment planning. In addition, some long term benefits are expected concerning a decrease of photovoltaic costs, the creation of job opportunities and the local development in unfavourable Regions.

The initial budget, provided by the MATT (i.e. 20.7 M€), constitute the 70% of the total incentives, while the remaining 30% (in total 9.3 M€) has been provided by the Regions and Autonomous Provinces.

Since August 2001 a great amount of applications has been submitted, amounting to about 6680, well beyond the objective to realize a total capacity around 5.5 MW, roughly corresponding to 2000 projects. For this reason an additional commitment of about 55 M€ has been approved in August 2002 by the MATT and Regions. In this contest, priority has been given to fully integrated roof-top applications while a decrease of the economic incentive and of the maximum cost allowed has been recorded.

On the whole, MATT and Regions incentives are making active an investment amount of about 135 M€ to install a total capacity around 17,5 MW. Nevertheless, it is worth mentioning that despite very high public demand, the Regional Programmes are experiencing rather slow growth due to ongoing bureaucratic issues. As a consequence, at the end of 2003 only about 4 MW out of the anticipated 17.5 MW have so far been installed.

Demonstration Programme

Since 1991 the Italian Demonstration Programme has been increasingly focused on power generation by means of medium and large size grid connected plants, for utility applications, ranging from 100 kW to 3.3 MW. The basic scope was identification and validation of satisfactory solutions. The activities currently performed in this contest regard the analysis, tests, long term performance evaluations as well as operation and maintenance procedures carried out by ENEA on its own PLUG plants at Delphos test facility and Casaccia Research Center. Furthermore performance evaluation of photovoltaic components and plants are carried out by CESI, in order to assess long term behaviour of PV technology in different climatic conditions and in different electric configurations.

BIPV project

The project is carried out in the framework of preliminary actions foreseen by the Italian Roof-top Program with the aim of experimenting the integration of the photovoltaic generator

into the architectural design of roofs, facades and shelters, to test new grid interface mode adopting simplified protection devices, to evaluate plant performance as well as to verify the effectiveness of the technical solutions adopted. The activities are mainly focused on 25 small grid-connected pilot plants, as prototypes of roof mounted systems and are carried out by ENEA and CESI in Manfredonia test facility, in Portici Center and on public building of Municipalities and Universities in some important Italian cities. Data collection and performances of these plants are analyzed since the year 2000.

Table 2 summarizes the major programmes and projects in Italy.

Table 2: Summary of main demonstration and field test programmes

Project Date plant start up	Technical data Economic data	Objectives	Main accomplishments until the end of 2003 Problems and lessons learned	Funding	Project management	Remarks
National Roof-top Programme 2001	30 M€ are made available from MATT and Regions to install 5,4 MW of small on-grid systems	- to tune programme procedures - to check people consensus - to encouraging the development of small grid connected systems	2 MW installed Slow growth due to ongoing bureaucratic issues	MATT: 20 M€ Regions: 10 M€	MATT	Great amount of applications submitted
Regional roof-top Programmes 2001	85 M€ are made available from MATT and Regions to install 17,5 MW of small on-grid systems	- to promote a wide diffusion of BIPV applications all over Italy long term aims: - to create a sure and lasting market - to decrease photovoltaic costs - to creation of job opportunities and the local development in unfavourite Regions.	MW installed Slow growth due to ongoing bureaucratic issues	MATT: 48 M€ Regions: 37 M€	Regions	Strong involvement of Local Authorities Wide interest of PV operators Stronger and stonger popular acceptance for PV technology
Buildings integrated PV plants 1999	25 PV systems for a total power of about 60 kWp, installed on the public buildings of Municipalities and Universities in some important Italian cities	- to assess the architectural integration of PV array on roofs and facades - to evaluate plant performance - to verify the effectiveness of the technical solutions adopted.	The operation data of these systems are regularly collected Performance evaluation in progress	ENEA	ENEA	The plants have been installed in the framework of demonstration activities foreseen by the Italian rooftops programme
Medium and large size PV plants for utility applications 1991	10 grid connected plants, for utility applications, ranging from 100 kW to 3.3 MW	- to identify and to validate satisfactory solutions - to evaluate long term performance	Data collection, long term performance evaluation and maintenance experience in progress	ENEA - CESI	ENEA - CESI	The plant have been installed in the framework of the Italian Demonstration programme

2.4 Highlights of R&D

R&D are mainly focused on new materials, devices and system components and are conducted by ENEA, CESI with the support, in some cases, of Universities, Industries and the National Council for Scientific Research (CNR).

ENEA is the main Research organization operating in Italy. Its most significant R&D activities concern laser assisted processes, buried contact and selective emitter technology, advanced screen-printing, and the setup and optimization of fabrication processes of several kinds of innovative cells.

For the next future, a-Si based multi-junction thin film devices are still a main line of activity with the aim of improving the stabilized efficiency of integrated large area modules. A new cluster tool was recently installed to begin a new investigation on poly-Si thin films. ENEA is also involved in the a-SiNET and PV-EC-NET European. Moreover, in the field of a-Si/c-Si heterojunction, a cooperation between Enitecnologie (formerly Eurosolare), ENEA and some other European operators, is currently carried out in the framework of the "MOPHET" Program promoted by the European Community. Activities on poly-Si thin film cells on foreign substrates are also carried out, in the framework of the V FP "Subaro" while developments on high efficiency crystal silicon cells are studied in the framework of INDI project that coordinate at European level.

Last, but not least, ENEA is working, since 2002 on the PhoCUS (Photovoltaic Concentrators to Utility Scale) Project, aimed at investigate concentrators technologies and to assess the technical and economical feasibility of this application in Italy for centralised generation of electricity. It is expected that 5 standard units (5kW each) will be installed in 2004.

CESI is an institute for R&D and services in the electric sector, which belongs to some Italian electrical operators (institutions, utilities and electromechanical manufacturers). In the field of photovoltaics CESI is carrying out activities in the development and industrial manufacturing of high efficiency solar cells for space and terrestrial applications, based on GaAs compounds and in the analysis and testing of PV modules based on advanced solar cells (thin films, amorphous silicon, etc.) and innovative components (e.g. inverters).

In particular in the frame of GaAs space solar cells, CESI is one of the leader companies in Europe having supplied bare solar cells for 24 small and medium size satellites, world-wide. The R&D activities of CESI in the field of space solar cells have been funded both by the Italian Space Agency (ASI) and the European one (ESA). Besides, triple junction solar cells (InGaP/GaAs/Ge) are under development and qualification and will be commercially available from next year. GaAs single junction and multijunction concentrator solar cells are also manufactured for terrestrial application. This development activity is aimed to investigate the expected costs using advanced high efficiency solar cells derived from the space technology and suitable to convert the sunlight with an efficiency close to 30% at concentrator values above 300 suns. Several concentrator PV test modules are in manufacturing using composite Fresnel lenses.

2.5 Public budgets for market stimulation, demonstration/field test programmes and R&D

In the year 2003 the public budget for R&D amounted to about 5 M€ with a further 20 M€ for market incentives.

Table 3 gives figures, for the year 2003, on budgets in National Currency from the authorities for R&D, demonstration and market incentives (public subsidies, fiscal incentives, and amounts collected) on the national/federal level, and on the state/regional level.

Table 3 Budgets for R&D, demonstration programmes and market incentives in Italy for the year 2003.

	R & D	Demo	Market
National/federal	4.8 M€	0.2 M€	10 M€
State/regional			10 M€
Total	4.8 M€	0.2 M€	20 M€

3 INDUSTRY AND GROWTH

3.1 Production of feedstocks and wafers

Enitecnologie (formerly Eurosolare) has transferred to a 50% Chinese-Italian joint venture based in Ningbo, China, the technology for multicrystalline wafers production. As a consequence during 2003 have not been produced feedstocks and wafers in Italy

3.2 Production of photovoltaic cells and modules

In Italy can be identified two major manufacturers of PV modules and some small assembling companies.

A major PV module manufacturer is Enitecnologie. Its manufacturing facilities have a production capability of about 3 MWp/year per shift. Both single-crystal and multicrystalline silicon cells are currently produced from wafers bought on the international market. Moreover the Enitecnologie production includes also specially designed modules for roof-tops and facades. On the overall, in the last year the Enitecnologie module production has been of 1.4 MWp. Concerning production quality, cell efficiency distribution is peaked at about 15% in the case of monocrystalline silicon and at about 13% in the case of polycrystalline wafers. Modules are manufactured to meet the international

standards via IEC and ESTI 503 testing. In the framework of cost efficient solar cell processing a highly automated totally screen printed process has been developed and patented by Enitecnologie which enables high automation in the whole cell to module manufacturing, and the use of very thin wafers

Moreover, Enitecnologie has developed a buried contact solar cell process tailored on multicrystalline Si wafers, with the aim of incorporating some screen printing steps in the sequence. Finally, Enitecnologie in the field of polycrystalline silicon thin films on glass is carrying out feasibility study of the industrial phase.

Another important Italian module manufacturer is Helios Technology. Its manufacturing facilities have a production capability of 4.5 MWp/year. In the last year Helios Technology module production has been of 2.9 MWp. Helios Technology module manufacturing process comprehends the fabrication of cells and modules from mono-crystalline silicon wafers. Modules produced range from 20 Wp to 90 Wp and meet the international standards via IEC and ESTI 503 testing meet the IEC norms.

Further small companies assembling and encapsulating tailor-made and especially designed modules such as windows integrated cells or using coloured cells can be found in Italy.

Table 5: Production and production capacity information for the year 2003 for each module manufacturer

Module manufacturer	Technology (sc-Si, mc-Si, a-Si, CdTe)	Total Production (MWp)		Maximum production capacity (MWp)
		Cell	Module	
Eurosolare	sc-Si	0.3	0.3	8.5
	mc-Si	1.1	1.1	
Helios technology	sc-Si	2.9	2.9	4.5
TOTALS (where applicable)		4.3	4.3	13

The average module prices has slightly decreased in 2003, reaching lowest values of 3.1 €/W for reasonable volume orders. For small orders, prices reach typical values of about 3.9 €/W.

Table 5a: Module prices for a number of years

Year	1993	1997	2000	2001	2002	2003
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Module price(s) – €/W	4.65	4.13	4.13	3.85 - 4.65	3.5 – 4.3	3.1 – 3.9
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3.3 Manufacturers and suppliers of other components

In the field of BOS components, about 15 companies manufacture inverters for on-grid and off-grid applications. Some of these have experience in inverters for large PV power plants, while others have produced 1.5-10 kVA inverters under Electric Utilities specifications. In Table 5, further information on the inverters sold for PV applications is given.

Table 6: Price of inverters for grid-connected PV applications.

Size of Inverter	1-10 kVA	10-100 kVA
Average Price per kVA (€)	650 – 1100	650

Four battery manufacturers with a specific experience in the PV sector can be found in Italy. All produce stationary lead-acid batteries with a low content of antimony, in order to reduce the self-discharge. The rated capacity range from few Ah to about 3000 Ah.

The price paid for batteries is strongly dependent on the size of shipment or other specific situations.

An estimation of the number of companies that install PV systems in Italy reach 100 units. These are specialist PV companies offering consultancy, installation services and component delivery, including the ENEL Group, CESI and some electric municipalities. The most important operators in this field are associated in the Italian PV firms Group (GIFI).

3.4 System prices

Table 6 gives the prices (excluding VAT/TVA/sales tax) in €/Wp for specific shipments of typical PV plants in the 4 categories of installation.

Prices do not include recurring charges after installation such as battery replacement or operation and maintenance. Additional costs, incurred due to the remoteness of the site or special installation requirements, are also not included.

Table 7: Prices of typical applications

Category/Size	Typical applications and brief details	Price per Wp in €
OFF-GRID Up to 1 kWp	Street lighting Rural electrification	12 - 15
OFF-GRID >1 kWp	Rural electrification Industrial application	12 - 14
GRID CONNECTED Up to 10 kWp	Distributed generation	7 – 7.6
GRID CONNECTED From 10 kWp to 100 kWp	Distributed generation	6.6 – 7

Table 7a: National trends in system prices for small grid connected systems (up to 10 kWp)

YEAR	1998	1999	2000	2001	2002	2003
Price €/Wp	9.3	8.8	7.75	7.4	7.5	7.3

3.5 Labour places

Full time labour places in the following activities during the year 2003 are:

- a) Research and development (not including companies): 80
- b) Manufacturing of PV system components, including company R&D: 60
- c) All other, including within electricity companies, installation companies etc.: 420

In the year 2003 the total number of labour places reported an increase in the installation company and a decrease in the sectors of research and manufacturing.

3.6 Business value

In the year 2003 approximately 4 MW of on-grid applications have been supplied into the Italian market. At an average price of 7 €/Wp, the local market of these applications has been around 28 M€. Of this capacity about 60% of the installed modules (2.4 MW) have been imported, as a consequence a rough estimation of the exported modules during the year 2003 lead to a figure of about 2.7 MW, being produced by the Italian PV industry about 4.3 MW. At an average price of 3.7 €/Wp the total value of the exported modules has been

approximately 10 M€. Therefore, in Italy the overall net value of PV manufacture and sale has been in 2003 around 38 M€

On the other hand, in the year 2003 have been imported:

- about 1200 inverters (average power 3 kW), corresponding to 3.1 M€;
- 2.4 MW of modules (8.9 M€);
- 4.3 MW of wafers (3 M€):

As a consequence, in Italy the net value of the products has been reduced to about 23 M€.

4 FRAMEWORK FOR DEPLOYMENT (NON-TECHNICAL FACTORS)

4.1 New initiatives

At the end of 2003 with the approval of a decree law (387/03), Italy has put into effect in the Italian legislation the European directive 77/2001/CE for the promotion of electrical energy produced from renewable sources in the domestic electricity market.

In particular, this law forecasts:

- an annual increase of 0.35% in “green sources” share obligation, from current 2%;
- dedicated support measures for photovoltaics which include fixed feed-in tariffs, decreasing over time, for different installations and a purchase obligation for the grid companies;
- procedure simplification for plant installation and grid connection;
- advertising campaigns;
- facilitations for small renewable source plants up to 20 kW

Utility perception of PV

Both ENEL and Local Utilities have demonstrated their strong consensus to the Italian roof-top Program co-operating with ENEA to overcome some technical barriers, such as grid interface devices, grid connection requirements and plant maintenance.

Changes in public perceptions of PV

During this year is sharply increased the popular acceptance for this technology as well as the general environmental awareness. In particular, a wide interest to the Italian Roof-top Programme of both private and public end-users has been recorded.

A valuable source of information is provided by ENEA and ISES, through Conference, Exhibitions, Handbooks and training courses and web sites. In particular in the year 2003 about 8 courses have been activated in different Italian cities and the participation of over 350 among installers, designers and architects has been recorded.

Major new projects or initiatives

Following the real success recorded by the National and the Regional Programmes additional funds of about 20 M€ have been made available by the Ministry of Environment and the regions to finance a second phase of the Programme

4.2 Indirect policy issues

Both the Italian Ministry for Productive Activities and the Ministry of Environment are convinced that the development and the diffusion of renewable technologies constitute a significant opportunity perfectly in agreement with the European directive 77/2001/CE.

Today, in Italy, Renewables contribute to the primary energy supply with a share of about 6%. A doubling of the contribution of renewable energies to the Italian total energy demand is foreseen in the next ten years.

4.3 Standards and codes

During this year has been almost completed a new edition of the technical rules for the connection of electric power producers to low-voltage and medium-voltage grid. Besides at the end of 2003 is started, in the framework of the Technical Committee CT82 the preparation of a guide for the design, construction and the test of PV plants. The elaboration of all other standards and codes for PV is performed on CENELEC and IEC level.

5 HIGHLIGHTS AND PROSPECTS

In Italy, the last years have been characterized, on one side, by a thick budget for dissemination programme implementation as well as very high public demand and, on the other side, by rather slow market growth due to bureaucratic issues essentially related to the incentive mechanism. Only at the end of 2003 the approval of a decree concerning the implementation of the European Directive 2001/77/CE which include also the feed-in tariff, has provided a strong expectation in the Italian PV market.

ANNEX A METHOD AND ACCURACY OF DATA

The value of the PV power installed in 2003 has been obtained collecting data from installers and Regions. The accuracy of these data is related to the actual date of the start of plant operation. Inadequate statistics of these information coming from regional programmes makes assessment accuracy around 10%. Major uncertainty (20%) is associated to the real quantity of installed *off-grid domestic* PV plants, whose installation often is arranged directly by the user.

Prices of PV systems and components are strongly dependent on the number of units per shipments and on their technical characteristics. Values are supplied only for specific shipments.