International Energy Agency

CO-OPERATIVE PROGRAMME ON PHOTOVOLTAIC POWER SYSTEMS

Task 1
Exchange and dissemination of information on PV power systems

National Survey Report of PV Power Applications in Austria 2004

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i Foreword

The International Energy Agency (IEA), founded in November 1974, is an autonomous body within the framework of the organization 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. Nine tasks have been established, and currently six are active. Information about these tasks can be found on the public website www.iea-pvps.org. The new task concerning urban-scale deployment of PV systems is now underway.

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.

ii Introduction

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. The public PVPS website also plays an important role in disseminating information arising from the programme, including national information.

This National Survey Report gives an overview of the achievements in the area of PV power applications in Austria in the year 2004. It is a summary of the market developments, achievements of the PV industry and non technical factors which provide the framework for the deployment of PV in Austria.

iii Definitions, symbols and abbreviations

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

PV power system market: The market for all nationally installed (terrestrial) PV applications with a PV power capacity of 40 W 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/m^2, cell junction temperature of 25 ^{o}C, AM 1,5 solar spectrum – (also see 'Rated power').

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

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 W or more.

Module manufacturer: An organization 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 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

Installed PV power

After the boom in the year before, 2004 marked a turnaround for the Austrian PV market. With the cap in nationwide PV support reached in early 2003, the newly installed capacity dropped from 6,5 MW in 2003 down to 2,3 MW in 2004. For the first time since 1990, a slump in the domestic PV market is to be mentioned.

The overall installed PV capacity in Austria reached 19,2 MW at the end of 2004, with about 2,3 MW installed in 2004. Compared to the year 2003 this represents a decline of the market of 64% compared to the year 2003. On grid applications still dominate the market for PV, with 16,5 MW this sector accounts for about 86 % of the cumulative installed capacity.

In contrast to the decline of the market for grid connected PV, an increase of the market for off-grid systems can be noticed in 2004. The annually installed capacity tripled from 0,17 MW in 2003 to 0,51 MW in 2004. In total approximately 2,7 MW off-grid systems for domestic and non-domestic applications were installed at the end of 2004.

With the decline of the market in 2004, the average growth of the PV market between 1995 and 2004 slightly slowed down to 34% per year.

Costs & prices

After the year 2003 which was characterized by a significant reduction of the turnkey prices for complete PV systems, the trend slowed down in 2004. This development is mainly due to the enormous increase of demand of the German PV market, and a general lack of supply on the world market.

In 2004 turnkey prices for typical on-grid systems varied between 5 EUR/W and 8,5 EUR/W, depending on the used PV-technology, size and type of the installation.

PV production

PV production in Austria 2004 can be characterized by a massive expansion of the production. Especially Austria's inverter industry is one of the beneficiaries of the booming international market for PV and could more than triple its output compared to the year before. In total roughly 60 000 inverters for grid-connected applications with a capacity of approximately 175 MW were produced in Austria during 2004. More than 99% of the production was exported, mainly to Germany. Currently two companies are active in large scale production and R&D.

The world wide leading manufacturer of back sheet laminates used for encapsulation of solar cells likewise reported a tremendous growth of its PV business. In 2004 encapsulation materials for approximately 500 MW were produced.

Also the module sector saw a significant expansion with two new companies entering the market. One company is a spin-off by Europe's largest manufacturer of Solar Thermal Collectors and recently started pilot-production of standard modules. The laminates are based on imported crystalline silicon cells. The second company is a large producer of safety and special glass for windows and façades and has built up a new production line for special modules for building integrated PV.

There is still no traditional cell production in Austria. A spin-off from Vienna's university, is working on the commercialization of new technologies for contacting multi-crystalline silicon cells.

Budgets for PV

The feed-in tariff system for electricity from RES introduced in the national Green Electricity Act is financed by all consumers of electricity via supplements on the electricity price and an obligatory purchase price for Green Electricity which has to be paid by electricity dealers. The feed-in tariffs paid for PV in 2004 amounted to approximately 7,6 MEUR.

With the introduction of the nation wide feed-in tariff system in 2003, almost all other market incentives have ceased. After the cap - up to which the feed in tariffs are granted – had been reached in early 2003, some provinces again reestablished own market incentives. Currently support schemes for new grid connected PV systems are available in three provinces, however only one, namely Upper Austria, granted subsidies in 2004. About 4,5 MEUR were spent for this purpose there.

There is no national R&D programme dedicated to PV, however the programme "Energy systems of Tomorrow" launched in late 2003 by the Ministry of Transport, Innovation and Technology includes PV as a side issue. In the absence of a dedicated programme R&D is mainly funded on a project base via various industrial and governmental initiatives, or European research framework programmes.

Public funding for research, development and demonstration stayed on a relatively constant level during the last years and amounted to 1,6 MEUR in 2004.

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 W 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

As in most of the other IEA countries, Off-grid installations were the first economic alternative for PV systems. Small autonomous systems provide electricity to technical systems or for domestic use in Alpine areas or mountain huts far away from the grid. But not exclusively in remote areas, also on urban sites PV is an option to supply infrastructure like traffic surveillance systems, communication systems, parking meters and a variety of other applications.

With the introduction of favorable support schemes On-grid Distributed Systems have meanwhile become a common place in public's interest. In Austria this sector now stands for more than 86% of the installed capacity.

With most of the support schemes limited to small systems, Grid-Connected Centralized Systems in form of PV Power plants play a minor role, so far approximately 1,2 MW are installed.

2.2 Total photovoltaic power installed

Approximately 19,2 MW of PV power has been installed in Austria by the end of 2004. While until 2003 capacity grew continuously about 37 % each year, the growth dropped down to only 12% in 2004.

On grid applications still dominate the market for PV, with grid-connected systems (GCS) accounting for about 86% of the total installed capacity.

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

Sub-market/ application	31 Dec 1992 kW	31 Dec 1993 kW	31 Dec 1994 kW	31 Dec 1995 kW	31 Dec 1996 kW	31 Dec 1997 kW	31 Dec 1998 kW	31 Dec 1999 kW	31 Dec 2000 kW	31 Dec 2001 kW	31 Dec 2002 kW	31 Dec 2003 kW	31 Dec 2004 kW
total off-grid	338	423	610	722	908	960	1 213	1 413	1 671	1 857	1 984	2 173	2 687
grid-connected distributed	187	346	453	569	761	1 178	1 648	2 119	3 063	4 440	7 857	13 507	15 340
grid-connected centralized	N/A	N/A	N/A	70	70	70	70	140	140	241	476	1 153	1 153
TOTAL	525	769	1 063	1 361	1 739	2 208	2 861	3 672	4 874	6 120	10 341	16 833	19 180

(Data source: BMVIT, G. Faninger, Der Photovoltaikmarkt in Österreich 2004, own inquiries)

2.3 Major projects, demonstration and field test programmes

With the introduction of the nationwide support for electricity from RES (Green Electricity Act) in 2003, the local and regional programmes initiated by communities, federal states or utilities have ceased or were adapted to the national scheme.

A major trend observed in the last years – optimal architectonical integration of BIPV in newly constructed as well as refurbished buildings – also continued during 2003. Several installations with innovative design aesthetically integrated into buildings document this.

In the framework of the European Commission funded project "PV-Enlargement" which aims at demonstrating new approaches for building integrated PV technologies 36 projects are realized in 11 European countries. In Austria, PV enlargement focuses on building integration with highly effective and innovative technologies. The range of applications reaches from PV systems on listed heritage buildings to autonomous electricity supply for alpine huts.

One of the outstanding examples realized in 2004 is a façade integrated PV installation at a refurbished furniture store. The main aim of the project was the visualization of the ecologic attitude of the company and an improvement of the come down façade of the building. With a covered area of 480 m² and an installed capacity of 53 kW the system is the largest PV façade in Austria in 2004. The project costs were funded primarily by the company with support in the framework of the PV enlargement project.

Figure 1 PV façade at a refurbished furniture store (Picture courtesy ATB Becker)

Another national research and demonstration initiative which has an impact on PV development is the “Building of Tomorrow” programme. In the framework of the “solar4alpine” project a prototype of an ecological alpine hut was realized on the "Hochschwab mountain" in the province of Styria at 2 153 m above sea level.

Figure 2 The “Schiestl Haus”, a prototype of an ecologically friendly alpine hut (Picture courtesy ATB Becker)

The new building called “Schiestl Haus” replaced an old, non-restorable building, which did not fulfill today’s requirements for comfort and ecology. The whole building concept is realized in passive house quality with heat recovery and use of solar energy. Besides architectural and building aspects covered by the project, water and energy supply play a further important role. The electricity is produced by a 7,5 kW PV installation integrated in the façade and balustrade and a vegetable oil CHP plant. The whole electricity supply is designed as an AC Hybrid System.

2.4 Highlights of R&D

Austrian PV research activities are mostly focused on national and international project base and are widespread located and decentralized orientated. Some principal descriptions of these projects highlight the general RTD trend of photovoltaics in Austria:

New and improved cell technologies:

- At the University of Vienna academic research focuses on the improvement of photovoltaic solar cells made from multi-crystalline silicon. By adjusting the front contact pattern to the grain boundaries of multi-crystalline solar cells the efficiency is improved. In 2004 research concentrated on further development of characterization techniques for cells with individually designed front contact grids. The work is carried out in cooperation with the spin-off company Powerquant.

- Organic Solar Cells based on thin plastic films have received increased attention due to their unique properties and are promising to become the cheapest solar technology in the future. Academic R&D at the Linz Institute for Organic Solar Cells (LIOS) on this topic focuses on Plastic Solar Cells based on thin films of Conjugated Polymers. A spin-off company founded by the R&D group was meanwhile taken over by the U.S. based Konarka Group and is now working on the commercialization of these organic solar technologies.

BOS components and system aspects:

- Industrial research and development activities carried out by the large manufacturers are focused on optimization of PV inverters and encapsulation materials.

- Grid-interconnection, not exclusively related to PV but more to Distributed Generation from RES in general, is the main focus of R&D projects supported by the European Commission and Austrian Ministries. These projects are jointly carried out by research institutions, industry and utilities.

- Other activities, mainly in the framework of European projects include the development of combined PV-Thermal collectors.

- In the area of system technology, new activities for quality assurance, certification and testing of PV modules were initiated. The activities in this field are focused on lifetime assessment and reliability issues of PV modules. R&D on this issue is centered at the PV laboratory of arsenal research, Vienna.

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

The major institution dealing with research and development policy is the Federal Ministry of Transport, Innovation and Technology (BMVIT). This ministry is the major organizer and facilitator for public R&D activities in Austria. The majority of public R&D programmes operate under the BMVIT and there are several programmes which focus on energy-related fields. Especially the programme “Energy Systems of Tomorrow” initiated in 2004 is to be named in this context. There is no programme specifically dedicated to PV R&D.

Until May 2005, no data on the public spending for Energy R&D in 2004 were available. The following numbers refer to data for the year 2003.

In 2003 renewable energy received 39% of the Austrian R&D energy budget with the majority (54%) spent on biomass R&D. The second-highest priority is laid on solar energy, which comprises solar thermal and PV. Total funding for all solar energy R&D was equal to 34% of the renewable energy R&D budget, PV research accounts for 13% of the total budget.

In 2003 the overall public spending for PV research, development and demonstration was about 1,3 MEUR. This means a slight reduction compared with the year 2002. Not included in this figure is the return from European Community (EC) R&D projects. Since Austria as a member of the European Union contributes to the EC R&D framework programmes (FP) , the return can be ultimately regarded as a part of public spending. In 2003 this figure can be roughly estimated to amount 0,3 MEUR for PV R&D.

There are no specific figures available for the share of Demonstration or Field Test activities but since there is no demonstration or field test programme running now, it can be assumed that the share of these activities is negligible.

The total governmental budget allocated for PV R&D, Demonstration and market incentives is shown in Table 2.

Table 2 Public budgets (in MEUR) for R&D, demonstration/field test programmes and market incentives.

	R & D	Demo/ Field test	Market *)
National/federal	1,30		0,1
State/regional	0,01		4,5
Return from EC FP	0,3		0
Total	1,61		7,6

* Not including feed-in tariffs. See also the comments below.

Since 2003 the support for electricity from RES is governed by the Green Electricity Act. The feed-in tariff system is funded by supplements on the electricity price and an obligatory purchase price for Green Electricity which has to be paid by electricity dealers. Because of the fact that this system is not financed by a public body, but instead by all consumers of electricity the according figures have not been included in Table 2 under “Market”. The total amount of feed-in tariffs paid for PV in 2004 was approximately 7,6 MEUR.

With the commencement of the Green Electricity Act in 2003, almost all further market incentives from regional governments, communities and municipalities, or utilities have ceased. In 2004 solely in the province of Upper Austria a regional support (investment subsidy of 3 000 EUR/kW and installed) was still granted. The figure stated in Table 2 under “regional” represents the total budget spent for this purpose 2004 in Upper Austria.

3 Industry and growth

3.1 Production of feedstock and wafers

No production facilities for silicon feedstock or wafers existed in Austria in 2004.

Table 3: Production and production capacity information for the year for feedstock producers and wafer manufacturers

Manufacturer	Process & technology	Total Production (t or MW)	Maximum production capacity (t/yr or MW/yr)	Product destination
1. -	-	-	-	-

3.2 Production of photovoltaic cells and modules

Despite the difficulties on their home market, Austrian PV industry could expand their production in 2004. Currently, four Austrian companies are involved into the production of PV-modules namely:

PVT AUSTRIA, which started the production in 2002, manufactures standard and tailor-made PV-Modules. The single and multi-crystalline silicon cells are purchased from various manufacturers, mainly Germany, Spain, the U.S. and Taiwan. For glass façades, special semi transparent modules with insulation glass are manufactured. Furthermore the company produces PV-modules made of custom-tailored colored solar cells which can be individually designed according to the customer's requirements.

The second company, SED, focuses on the production of modules specially designed for integration into PV-roof tiles. For this purpose custom designed laminates are directly stuck into standard format tiles made of recycled plastic which can easily replace conventional roofing materials. The used multi crystalline cells are imported from France. New developments in 2004 are roof tiles for the French and UK market.

In mid 2004, Ertl Glas AG, a large manufacturer of safety glass products entered the PV-business. The product range includes tailor made modules for BIPV, especially façade integration. The cells are imported from Germany.

RKG-Photovoltaik Ltd., a subsidiary of Europe's largest manufacturer of Solar Thermal Collectors, GREENoneTEC Solar Industries Ltd. is currently building up a production line for standard modules. The cells are imported from Germany.

In total, Austrian module manufacturers increased their production to more than 2,8 MW in 2004. This figure represents more than a doubling compared to the year before. The largest share of the production is exported to Germany.

Table 4: Production and production capacity information for the year for each manufacturer

Cell/Module manufacturer	Technology (sc-Si, mc-Si, a-Si, CdTe)	Total Production (MW)		Maximum production capacity (MW/yr)	
		Cell	Module	Cell	Module
1 PVT Austria	mc-Si / sc-Si	-	2,5	-	8
2 ERTEX Solar	mc-Si / sc-Si	-	Pilot production	-	No data
3 RKG Photovoltaik	mc-SI / sc-Si	-	Pilot production	-	No data
2 SED	mc-Si	-	0,3	-	1
TOTALS	-	-	2,8	-	0

Currently there is no production of solar cells in Austria. Most of the modules produced include cells imported from various countries, such as Germany, Spain, The U.S., Taiwan or France.

Table 4a indicates the typical module prices for the year 2003 as quoted by the manufacturers. The price range reflects the prices for different module types for typical orders (5 kW). With the ongoing boom in Germany which led to a general shortage on the European and International cell market, manufacturers had to increase their prices slightly compared with 2003.

Table 4a: Typical module prices (EUR per Watt) for a number of years

Year	2002	2003	2004
Module price(s):			
Standard framed laminates	4,50	3,10 – 3,20	3,60 – 3,70

3.3 Manufacturers and suppliers of other components

Austria has a long tradition as one of the largest inverter producing countries in Europe. Thanks to the overall expansion of the European market in 2004, the two large manufacturers could more than triple their output in 2004. In total roughly 60 000 inverters with a capacity of approximately 175 MW were produced. More than 99% were exported, mainly to Germany.

Austria's largest producer of inverters, FRONIUS INTERNATIONAL Ltd. has been engaged in solar-electronics for a long time and is now Europe's second largest manufacturer of inverters for grid connected PV systems. In 2004 about 45 000 inverters with a capacity of 122 MW of were produced. This represents a tripling of production compared with the year before.

The second producer, SIEMENS AG AUSTRIA started large-scale manufacturing and development of string-inverters in the range of 1,5 kW to 4,6 kW for grid connected applications 2 years ago. In 2004 the company significantly expanded its output to a number of more than 15 000 inverters with a capacity of roughly 53 MW.

Besides inverter manufacturing, Austria hosts also one of the largest manufacturers of back sheet laminates for PV modules. ISOVOLTA AG is the world market leader for flexible composite materials used for encapsulation of solar cells. The ICOSOLAR back sheet laminates are available in various colors and are used by many module manufacturers in the world. In 2004 encapsulation materials for about 500 MW of PV modules were produced.

3.4 System prices

After the year 2003 which was characterized by a significant reduction of the turnkey prices for complete PV systems, the trend slowed down in 2004. This development is mainly due to the enormous increase of demand of the German PV market, and a general lack of supply on the world market.

In 2004 turnkey prices for typical on-grid systems varied between 5 EUR/W and 8,5 EUR/W, depending on the used PV-technology, size and type of the installation. The according figures for typical PV applications are shown in Table 5.

Table 5: Turnkey Prices of Typical Applications

Category/Size	Typical applications and brief details	Current prices in EURO/W
OFF-GRID Up to 1 kW	Basic electricity supply for mountain huts.	15 *)
OFF-GRID >1 kW	AC Electricity supply for larger mountain huts. System size between 4 and 8 kW.	10 to 13 *)
GRID-CONNECTED Specific case	2-3 kW roof-mounted system.	5,5
GRID-CONNECTED Up to 10 kW	Typical roof-mounted system for a single or multifamily house.	5,5 to 8,5
GRID-CONNECTED >10 kW	Larger system for commercial / industrial applications. PV-power plants	5 to 8,5

Prices do not include VAT. All figures are estimated based on information provided by installation companies.

*) For off-grid systems prices vary widely depending on the application (DC appliances or AC island grid) and the mounting-site.

Table 5a shows the development of turnkey prices (excluding VAT) for a typical residential, grid-connected roof-mounted system with a power of 2 kW to 3 kW during the last years.

Table 5a: National trends in system prices (EUR/kW) for a typical 2 – 3 kW grid connected system

YEAR	1992		2001	2002	2003	2004
Price /W:			7 500	7 000	6 000	5 500

3.5 Labor places

No precise numbers can be given on the number of labor places in the various sectors. The following figures represent a rough estimation, based on information from the manufacturing companies and R&D institutions:

- Research and development (not including companies): about 40
- Manufacturing of PV system components, including company R&D: about 320
- All other, including within electricity companies, installation companies etc.: about 20

With the expansion of their business Austrian PV manufacturers significantly extended their workforce in 2004. In total roughly 350 to 400 jobs are directly linked to PV R&D, manufacturing and installation in Austria.

3.6 Business value

In 2004 2,3 MW of PV systems were installed in Austria with an estimated value of the national market of 15 MEUR, based on average turnkey prices. While until 2003 modules were almost exclusively imported, the domestic production has become a significant factor in 2004.

The value of exported PV components (mainly inverters and encapsulation materials) more than doubled compared to 2003. For 2004 this figure can be estimated to be approximately 130 MEUR.

Imports of PV products consist mainly of cells used for the module production and complete systems. According to the information provided by the report "Photovoltaikmarkt in Österreich 2004" (see also Annex A), this figure can be estimated to 24 MEUR.

Table 6 provides a detailed overview on the value of PV business in Austria, total Export and Import of PV products as well as the domestic market.

Table 6: Value of PV business

Sub-market	**Capacity installed *in 2004* (MW)**	**Price per W** *(from table 5)*	**Value (MEUR)**	**Totals (MEUR)**
Off-grid	0,51	10	5,1	
Grid-connected distributed	1,83	5,5	10,1	
Grid-connected centralized	0	-	0	
				+15
Export of PV products				+130
Change in stocks held				0
Import of PV products				-10
Value of PV business				**135**

4 Framework for deployment (Non-technical factors)

4.1 New initiatives

Until today public support schemes for PV in Austria have been mainly characterized by discontinuity.

While until 2003 the Austrian framework for renewable energy support had been based on diverse local and regional incentives, the implementation of the nationwide Green Electricity Act (Ökostromgesetz) marked an important turning point. The support in form of preferential feed-in tariffs for electricity from renewable sources together with a purchase obligation for green electricity created a very attractive environment for investment into green electricity in general and PV in detail. For PV systems installed in the framework of this legislation, the feed-in tariff was set to 60 Eurocent per kWh for systems up to 20 kW and 47 Eurocent for larger installations.

Due to the fact that the availability of the PV feed-in tariffs was capped to a national limit of 15 MW, the role of PV in the future electricity scenario was limited from the very beginning. With the limited availability of the support in mind, a run for permissions for the PV-capacity took place in the first weeks of 2003. Already in mid January the limit was reached and until mid 2003 the granted capacity was installed.

To overcome the lack of federal incentives while at the same time avoiding a total collapse of the local market for PV, three provinces again reintroduced own support schemes.

- In Mid 2004 Upper Austria introduced its so called Green Electricity Programme ("Ökostrom Programm Oberösterreich" which aims at increasing the use of renewable energy sources for electricity generation. The main incentive in this programme is a subsidy of 65% of total investment costs up to 3 000 EUR per kW installed. The support is granted for installations with an installed module power between 1 and 3 kW integrated into buildings.

- Further support schemes exist in the provinces of Vienna and Lower Austria in the form of subsidies up to 40% of the total investment and 3 700 EUR per kW respectively. However in both provinces, no grants were awarded to new installations in 2004.

- In the remaining 6 provinces (Burgenland, Kärnten, Salzburg, Steiermark, Tirol and Vorarlberg) no incentives are available at all.

A further initiative which aims at overcoming the lack of public support is the "Solar-Partnership" introduced by an innovative Green Electricity Company. Customers who have an electricity purchase contract with the company are awarded a preferential tariff for the energy produced by their own PV installations on a net metering base. Although this incentive alone does not allow a cost covering operation of a PV-system, it is a very attractive option in combination with other schemes, e.g. the Upper Austrian Green Electricity Programme.

4.2 Indirect policy issues

As in most of the other countries, the reduction of greenhouse gas emissions according to the targets of the Kyoto-Protocol is the major indirect policy issue for the deployment of RES. For Austria the reduction target is 13% from today's 7,6 tons per capita and year towards around 6,6 tons per capita and year in 2010. Appropriate actions and procedures are still in discussion, and it can be doubted if photovoltaics will be a part of the measures to contribute to a sustainable energy supply in the long term.

On the European Union (EU) level, increasing the share of renewable energy for electricity generation has a high priority. In this context, the "Directive on the promotion of electricity produced from RES (RES-E Directive)" was published in September 2001 by the European Commission. The goal set in the directive is to increase the share of RES-E in the European Union to 22,1 % until 2010. For Austria the individual target is to reach a share of 78,1 % of electricity from RES.

4.3 Standards and codes

Generally European PV Standards are likewise applied in Austria. Grid-interconnected PV applications are covered in detail by the national standard ÖNORM/ÖVE E 2750, which defines all safety relevant aspects regarding planning, installation, grid-interconnection, requirements for components and operation of grid connected PV installations.

The new edition of the standard – which had been substantially revised in 2003 and 2004 – was finally published in November 2004. The items revised or adapted include mainly new developments in inverter technology and a general adaptation according to recent developments and findings.

A new Quality Label for PV installers has been developed by the Austrian Photovoltaic Association. Certified planners and installers are obliged to use products and components certified to the relevant standards as well as to have a quality assurance system. However, due to the drop in domestic PV demand, the impact of the scheme will be limited.

5 Highlights and prospects

After the boom in the year before, 2004 marked a turnaround for the Austrian PV market. With the cap in nationwide PV support reached in early 2003, the newly installed capacity dropped from 6,5 MW in 2003 down to 2,3 MW in 2004. For the first time since 1990, a slump in the domestic PV market is to be mentioned.

However, despite the collapse of their home market, Austrian PV manufacturers could significantly expand their business in 2004. Austrian inverter production more than tripled compared to the year before and also module manufacturers substantially increased their production. By far the largest share of the Austrian production is today exported to Germany, where attractive and stable incentives created an enormous boom in PV. It is expected that the overall positive development of the international PV market will provide the basis for an ongoing growth of the Austrian PV manufacturers and helps to strengthen the position of Austria as an important supplier of components for PV systems. New activities in the field of cell development and module production also document this trend.

When looking at the domestic market the situation of PV is currently unclear and unsatisfactory. While waiting for further negotiations concerning the future Green Electricity Act newly installed capacity will remain at a relatively low level relying on few regional incentives. If no significant and stable support mechanisms which can provide long and promising perspective for a national PV development are introduced, the market will remain limited.

Annex A Method and accuracy of data

The market statistics on installed capacity, share of grid-connected and off-grid applications has been collected by Prof. Gerhard Faninger from the University of Klagenfurt by order of the Federal Ministry for Transport, Innovation and Technology (BMVIT). The data is based on a data provided by manufacturers, retailers and importers of PV components as well as network operators and e-control (National authority for the regulation of the liberalized Electricity Market). In the annual report ("Der Photovoltaikmarkt in Österreich 2004") PV applications are divided into

- Off-grid installations (including domestic and non-domestic applications)
- Grid-connected systems

No further breakdown is made in the study between centralized and distributed systems. Therefore the share of grid-connected centralized systems had to be determined by summarizing all large PV-installations which are dedicated as power-plants.

Grid-connected PV-installations have been reported by the grid-operators. Since 2003, the control zone managers (major transmission network operators) are obliged to submit data on grid-connected PV systems to e-control (Company responsible for monitoring, supporting and regulating the liberalization of the Austrian electricity and natural gas market). However, since the stop of the support for new PV installations by special feed-in tariffs which are regulated on the national level many installations were installed outside this framework. Data on these systems, which are supported by regional initiatives or other programs, is not included in the national Energy Statistics. Thus the installations reported by the control zone managers do not provide a complete picture of the situation in Austria.

The uncertainty of the figures presented is estimated to be about ± 20 %.

Data on funding for PV R&D is taken from the report "Energie: Forschung, Entwicklung und Demonstration - Ausgaben des Bundes, der Länder und der Industrie im Jahre 2003" by Gerhard Faninger, University of Klagenfurt. Data for 2004 will be available in June 2005.

Data on actual production, production capacity, prices and other market figures is based on information provided by manufacturers, installers and the Austrian PV association. An estimation of the corresponding accuracy cannot be provided.