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 2009

Final version

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September 1, 2010

Supported by the Austrian Federal Ministry of Transport, Innovation and Technology (BMVIT)

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Definitions, Symbols and Abbreviations

For the purposes of this and all IEA PVPS 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 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 organisation carrying out the encapsulation in the process of the production of PV modules.

Off-grid domestic PV power system: System installed to provide power mainly to a household or village not connected to the (main) utility grid(s). Often a means to store electricity is used (most commonly lead-acid batteries). Also referred to as 'stand-alone PV power system'. Can also provide power to domestic and community users (plus some other applications) via a 'mini-grid', often as a hybrid with another source of power.

Off-grid non-domestic PV power system: System used for a variety of industrial and agricultural 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 to provide power to a grid-connected customer or directly to the electricity grid (specifically where that part of the electricity grid is configured to supply power to a number of customers rather than to provide a bulk transport function). Such systems may be on or integrated into the customer's premises often on the demand side of the electricity meter, on public and commercial buildings, or simply in the built environment on motorway sound barriers etc. They may be specifically designed for support of the utility distribution grid. Size is not a determining feature – while a 1 MW PV system on a rooftop may be large by PV standards, this is not the case for other forms of distributed generation.

Grid-connected centralized PV power system: Power production system performing the function of a centralized power station. The power supplied by such a system is not associated with a particular electricity customer, and the system is not located to specifically perform functions on the electricity grid other than the supply of bulk power. Typically ground mounted and functioning independently of any nearby development.

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.

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.

Currency: The currency unit used throughout this report is EUR

PV support measures:

Enhanced feed-in tariff	an explicit monetary reward is provided for producing PV electricity; paid (usually by the electricity utility) at a rate per kWh somewhat higher than the retail electricity rates being paid by the customer
Capital subsidies	direct financial subsidies aimed at tackling the up-front cost barrier, either for specific equipment or total installed PV system cost
Green electricity schemes	allows customers to purchase green electricity based on renewable energy from the electricity utility, usually at a premium price
PV-specific green electricity schemes	allows customers to purchase green electricity based on PV electricity from the electricity utility, usually at a premium price
Renewable portfolio standards (RPS)	a mandated requirement that the electricity utility (often the electricity retailer) source a portion of their electricity supplies from renewable energies (usually characterized by a broad, least-cost approach favouring hydro, wind and biomass)

PV requirement in RPS	a mandated requirement that a portion of the RPS be met by PV electricity supplies (often called a set-aside)
Investment funds for PV	share offerings in private PV investment funds plus other schemes that focus on wealth creation and business success using PV as a vehicle to achieve these ends
Income tax credits	allows some or all expenses associated with PV installation to be deducted from taxable income streams
Net metering	in effect the system owner receives retail value for any excess electricity fed into the grid, as recorded by a bi-directional electricity meter and netted over the billing period
Net billing	the electricity taken from the grid and the electricity fed into the grid are tracked separately, and the electricity fed into the grid is valued at a given price
Commercial bank activities	includes activities such as preferential home mortgage terms for houses including PV systems and preferential green loans for the installation of PV systems
Electricity utility activities	includes 'green power' schemes allowing customers to purchase green electricity, large-scale utility PV plants, various PV ownership and financing options with select customers and PV electricity power purchase models
Sustainable building requirements	includes requirements on new building developments (residential and commercial) and also in some cases on properties for sale, where the PV may be included as one option for reducing the building's energy foot print or may be specifically mandated as an inclusion in the building development

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 21 participating countries are Australia (AUS), Austria (AUT), Canada (CAN), Denmark (DNK), France (FRA), Germany (DEU), Israel (ISR), Italy (ITA), Japan (JPN), Korea (KOR), Malaysia (MYS), Mexico (MEX), the Netherlands (NLD), Norway (NOR), Portugal (PRT), Spain (ESP), Sweden (SWE), Switzerland (CHE), Turkey (TUR), the United Kingdom (GBR) and the United States of America (USA). The European Commission, the European Photovoltaic Industry Association and the US Solar Electric Power Association are also members.

The overall programme is headed by an Executive Committee composed of one representative from each participating country, while the management of individual Tasks (research projects / activity areas) is the responsibility of Operating Agents. Information about the active and completed tasks can be found on the IEA-PVPS website www.iea-pvps.org

Introduction

The objective of Task 1 of the IEA Photovoltaic Power Systems Programme is to facilitate the exchange and dissemination of information on the technical, economic, environmental and social aspects of photovoltaic power systems. An important deliverable of Task 1 is the annual Trends in photovoltaic applications report. In parallel, National Survey Reports are produced annually by each Task 1 participant. This document is the Austrian National Survey Report for the year 2009. Information from this document will be used as input to the annual Trends in photovoltaic applications report.

The PVPS website www.iea-pvps.org also plays an important role in disseminating information arising from the programme, including national information.

1 EXECUTIVE SUMMARY

Supported by various promotion mechanisms of the federal provinces and the federal government a new strong market diffusion of photovoltaic (PV) systems could be reached in Austria in 2009. As a result grid-connected plants with a total capacity of 19,96 MWp and stand-alone systems with a total capacity of 0,25 MWp were installed during the year.

Hence, in 2009 the total PV market in Austria increased to 20, 21 MWp which led to a cumulated total installed capacity of 52,6 MW. As a consequence the estimated renewable electricity produced by PV amounted to 48.9 GWh in 2009 and lead to a reduction in CO2 - emissions by 21. 121 tons.

The Austrian photovoltaic industry has a broad standing covering production of PV modules, cells, converters and tracking system as well as other PV components and devices. Furthermore, there is a high density of installers of PV systems and significant trade of modules takes place. Finally, specialized institutions and universities play an important role in international photovoltaic research & development (R&D). Within those economic sectors in total 2. 870 people are full-time employed.

1.1 Installed PV power

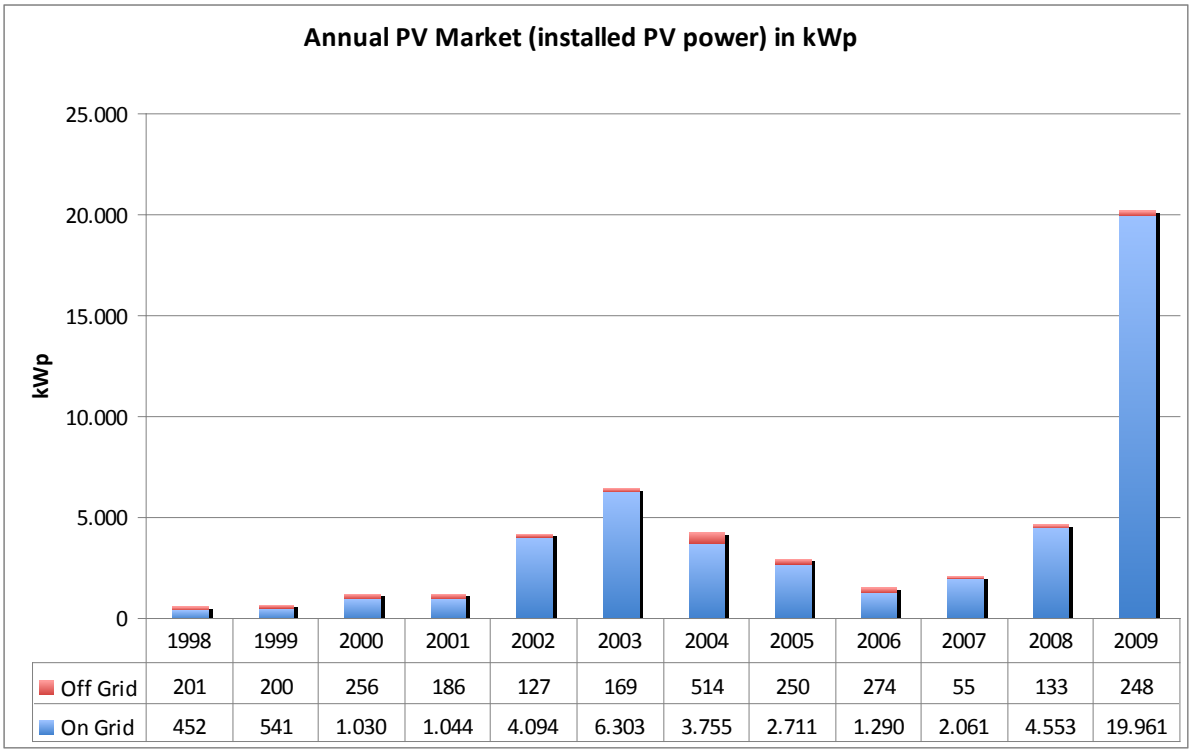
The domestic PV system market in 2009 showed a significant increase compared to 2008. In 2009, off-grid and grid connected PV systems with a total PV power of 20,2 MW have been installed, which represents a 331% growth of the domestic market compared to the year before.

The overall installed PV capacity in Austria showed a growth of 32,4 MW to reach 52,6 MW at the end of 2009. On-grid applications more and more dominate the market for PV, with grid-connected systems (GCS) accounting for about 49 MW of the total installed capacity at the end of 2009.

As during the previous years, the off-grid sector plays a minor role in the Austrian PV market. In 2009 only a cumulated 3,6 MW were installed in this sector for domestic and non-domestic applications.

On a 10 years basis, an average market growth of 32% per year for all PV installations can be reported.

Despite this very positive development, the domestic PV market is still behind the development of other European countries like Germany, with a 20 times higher installed capacity in 2009, the Czech Republic 16 times higher and Italy with a 5 times higher capacity.



	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Off Grid	201	200	256	186	127	169	514	250	274	55	133	248
On Grid	452	541	1.030	1.044	4.094	6.303	3.755	2.711	1.290	2.061	4.553	19.961

Figure 1: Annual PV market development in Austria (on grid / off grid distinction)

1.2 Costs & prices

Compared to the previous years, module prices in Austria dropped again in 2009, following the international trend. The average wholesale price in 2009 was 2,3 EUR/W, the average sales-price of Austrian PV module producers was 2,2 EUR/W.

In 2009, turnkey prices for installed PV systems fell slightly compared to the previous years. However, the reduction was still low, following the continued high demand of the European PV market and the stringent supply of PV modules on the world market. Turnkey prices for typical on-grid systems varied between 3,9 EUR/W and 4,9 EUR/W, depending on the used PV-technology, size and type of the installation, with a typical mean prize of 4,4 EUR/W for grid-connected systems.

1.3 PV production

The most important products manufactured in Austria include PV inverters, PV modules and tracking systems as well as back-sheet laminates for module encapsulation or PV Ribbon Wires.

In 2009, the Austrian PV industry could not further expand their business. Domestic PV module manufacturers reported a slight decline of their output. The overall PV module production in Austria in 2009 amounted to 60,1 MW (2008: 65,4 MW), which represents a decrease of 8% compared to the previous year.

However, Austria's PV inverter industry reported a 100% increase of the production of inverters for grid-connected applications. In 2009, PV inverters with a capacity of approximately 1 000 MW a.c. nominal power (2008: 448 MW) were produced. More than 99% of the production was exported.

The world wide leading manufacturer of back sheet laminates used for encapsulation of solar cells likewise reported ongoing growth of its PV business.

The world market leader of large scale two-axis tracking systems reported a decline of the production to 16 MW in 2008 (2008: 31 MW) and a production capacity of 45 MW.

The industrial scale production of solar cells started in 2008 by several companies has been successfully extended in 2009 marking the next step in the development of Austrian PV industry.

1.4 Budgets for PV

The nationwide 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 2009 decreased to approximately 3,2 MEUR (2008: 10,4 MEUR), this is a reduction of -70%. Accordingly, the share of produced electricity declined from more than 17 GWh to 5,5 GWh. The mean tariffs amounted to 56,86 Cent/kWh which is a decline of -5%.

Besides the feed-in support, also further short-term incentives in form of rebates for new PV installations are provided on the national (National Fund for Climate and Energy) as well as provincial level. The total funds spent for this purpose in 2009 were approx. 6,8 MEUR (compared to 2,4 MEUR in 2008) leading to a installed capacity of 2,290 KWp (2008: 935 KWp).

There is no national R&D programme dedicated to PV, however, two national programmes "New Energy 2020" by the national Fund for Climate and Energy as well as "Buildings of Tomorrow Plus" by the Ministry of Transport, Innovation and Technology were launched in 2009 and explicitly addressed PV in a separate subpart of the programme. In the absence of a dedicated programme, R&D is mainly funded on a project base.

The share of public funding dedicated to PV related RTD can be estimated to 2,2 MEUR in 2008 (2007: 1,6 MEUR).

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.

For the purposes of this report, PV installations are included in the 2009 statistics if the PV modules were installed between 1 January and 31 December 2009, although commissioning may have taken place at a later date.

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 favourable support schemes On-grid Distributed Systems have meanwhile become a common place in public's interest.

With the support schemes limited to small, residential scale systems, Grid-Connected Centralized Systems in form of PV Power plants play a minor role.

2.2 Total photovoltaic power installed

The domestic PV system market in 2009 showed a significant increase compared to 2008. In 2009, off-grid and grid connected PV systems with a total PV power of 20,2 MW have been installed, which represents a 331% growth of the domestic market compared to the year before.

The overall installed PV capacity in Austria showed a growth of 32,4 MW to reach 52,6 MW at the end of 2009. On-grid applications more and more dominate the market for PV, with grid-connected systems (GCS) accounting for about 49 MW of the total installed capacity at the end of 2009.

As during the previous years, the off-grid sector plays a minor role in the Austrian PV market. In 2009 only a cumulated 3,6 MW were installed in this sector for domestic and non-domestic applications.

On a 10 years basis, an average market growth of 32% per year for all PV installations can be reported.

Table 1 shows the PV power installed in 4 sub-markets during 2009.

Table 1: PV power installed during calendar year 2009 in 4 sub-markets.

Sub-market/ application	off-grid domestic	off-grid non-domestic	grid-connected distributed	grid-connected centralized	Total
PV power installed in 2009 (kW)	248	n.a.	19 961	n.a.	20 209

A summary of the cumulative installed PV Power, from 1992-2009, broken down into four sub-markets is shown in Table 2.

Table 2: The cumulative installed PV power in 4 sub-markets.

Sub-market	Until 1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Stand-alone domestic	1 213	1 413	1 671	1 857	1 984	2 173	2 645	2 895	3 169	3 224	3 357	3.605
Stand-alone non-domestic	-	-	-	-	-	-	-	-	-	-	-	-
Grid-connected distributed	1 648	2 119	3 063	4 440	7 857	13 507	17 262	19 973	21 263	23 721	27 274	48.991
Grid-connected centralised	70	140	140	241	476	1 153	1 153	1 153	1 153	1 756	1 756	n.a.
TOTAL (kW)	2 861	3 672	4 874	6 120	10 341	16 833	21 060	24 021	25 585	27 701	32 387	52.596

2.3 PV implementation highlights, major projects, demonstration and field test programmes

PV implementation

In view of the extraordinary growth of the international PV technology market R&D development has become an issue in Austria. However, effective and broad PV implementation programmes are missing in Austria and they will also most probably not be introduced in the upcoming year. The revised Green Electricity Act (GEA) is in operation forming the framework for PV implementation (see section 4 for details).

Besides the federal feed-in tariff scheme, a new initiative was launched by the newly founded national *Fund for Climate and Energy*. The initiative, which provides rebates to newly installed private PV systems up to 5 kW started in August 2008 with a first tender and a total budget of about 10 MEUR. In 2008 2,4 MEUR were brought to account. In 2009 the amount of 19 MEUR was granted under this funding scheme.

However, most Austrian provinces (8 out of 9) are still running regional rebate-programmes, aiming at overcoming the limitations of federal incentives. In most cases the support is subject to limited budgets and is linked to further requirements. Generally, the regional support is only granted in case the installation is not supported by the federal feed-in tariff scheme. In 2009 the regional funding initiatives helped to install a total PV capacity of approx. 13,8 MW.

2.4 Highlights of R&D

Currently Austrian PV research activities are performed on a project basis: The involved research organisations and companies are participating in national and European projects and in different tasks of the IEA PVPS Programme and, concerning grid interconnection, in the IEA ENARD Implementing Agreement. The RTD development and approach is widespread located and decentralised orientated.

In 2009, two calls of the national research programmes "New Energy 2020" funded by the Austrian Climate and Energy fund as well as one call of "Buildings of Tomorrow Plus" funded by the Ministry of Transport, Innovation and Technology were launched again. Both programmes with a total funding volume of 66,5 million Euros in 2009 cover research on energy technologies including a small portion of PV (2,2 MEUR) with a focus on PV building integration. Research in PV systems as well as in distributed generation issues with many aspects relevant to PV have been supported within this well designed activity.

On the European level, the Austrian Ministry of Transport, Innovation and Technology actively supports ongoing initiatives to increase the coherence of European PV RTD programming (PV-ERA-NET).

The trend of involvement of **Austrian electricity companies** investing more and more in renewable power generation has been continued in 2009.

In addition, the following paragraphs highlight some of the specific PV RTD activities and trends in Austria:

The **Christian Doppler Laboratory** at the **University of Salzburg** "Applications of Sulfosalts in Energy Conversion" installed a new method to grow single sulfosalt crystals using melt solution growth and a new photo-acoustic spectroscopy system for semiconductor band gap determination. The improvement of solar cell efficiencies by use of buffer layers was investigated and sulfosalt candidates with high Seebeck coefficients combined with high electrical conductivity for applications in thermoelectrical energy conversion were identified.

The research topics of another Christian Doppler Pilot Laboratory at the **Technical University in Graz** for "Nanocomposite Solar Cells" are focused on the preparation of nano-composite materials with controlled morphology for photovoltaic applications. The basic research program will focus on the formation processes and the investigation of the morphology of nanocomposite layers, consisting of inorganic and organic semiconductor phases.

The **Austrian Institute of Technology, Energy Department** (formerly arsenal research) investigates methods for characterization and analysis of different PV module technologies (Crystalline, thin-film, concentrators) and their performance according to power, energy yield, lifetime and spectral influence. AIT also has a focus on the development of characterization methods for solar cells as well as on the determination of their performance. The research field includes integrating existing and emerging systems to design an intelligent multifunctional façade. The integration of PV into Smart Electricity Networks is the focus of national and EU financed projects which started in 2009. The existing laboratory infrastructure will be extended with the opening of a thin film laboratory in the second half of the year 2010. As the main highlight, the new **IEA-PVPS Task 14**, initiated by international collaboration, will be **coordinated by AIT** for Austria.

Vienna University of Technology, Energy Economics Group (EEG), has the following major topics of teaching and research on Photovoltaics: Diffusion of technology and market penetration on national and international level, non technical obstacles and supporting factors for diffusion of technology (e.g. socio-economic impact parameters), energy policy

design and political economy effects of PV. Further, the PV integration in buildings and the medium and long term diffusion scenarios of PV are analysed.

At the **"Energybase"** in Vienna, the largest passive solar office building in Austria is operational and home of the new Programmes "Renewable Urban Energy" of the **University of Applied Sciences Technikum Vienna**, the Master course starting in September 2009 with a strong focus on PV and other solar technologies.

The **Austria Solar Innovation Center (ASIC)** covers consultation for PV, as well as teaching and training in collaboration with the Upper Austria University of Applied Sciences, degree programme Eco-Energy Engineering (BSc, MSc). Students have lectures and laboratory classes. Students practice with a 17 kWp PV system - 5 different module types, 5 different inverter types, 2 monitoring/data logging system, and a meteorological station.

A group around Prof. Sariciftci from **Linz Institute of Organic Solar Cells (LIOS), Institute of Physical Chemistry of Johannes Kepler University** is working on photoactive materials for organic photovoltaic devices and photovoltaic fiber design.

A PV master study program is being installed at the **Center for Intercultural Studies** in Styria. As a first step a one-year university course on optoelectronics/photovoltaics was started in 2009 addressing technical experts in companies. As a follow-up activity an extra occupational master study program is being introduced addressing graduates of technical bachelor studies, graduation is performed by the **Johannes Kepler University.**

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. There is no programme specifically dedicated to PV R&D, but the topic is mainly funded within the framework of the energy R&D programmes such as "Energy Systems of the Future" (http://www.energiesystemederzukunft.at/english.htm).

Until August 2010, no data on public funding for Energy R&D in 2009 were available. Therefore the following numbers refer to data for the year 2008. The total amount of energy related research funding indicated for the year 2008 was 71,2 MEUR. This was an increase of 123% compared to 2007.

In 2008 renewable energy received about 24,5 MEUR (34,4%) of the Austrian Energy R&D budget (46,5% in 2007). The area of energy efficiency received 33,1% (2007: 24,1%). These two areas clearly show the priority of the publicly financed energy research in Austria. 715 R&D projects and activities were registered and analysed for the year 2008 (2007: 578). In 2008 the overall public spending for PV research and development was about 2,2 MEUR (2007: 1,59 MEUR).

Not included in these figures is the return from European Community (EC) R&D projects. As a member of the European Union, Austria contributes to the EC R&D framework programmes (FP), hence the return can be ultimately regarded as a part of public spending. However, no reliable data was available on these funds in 2008.

There are no specific figures available for the share of Demonstration or Field Test activities but as there was no demonstration or field test programme running in 2009, 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 3.

Table 3: Public budgets for R&D, demonstration/field test programmes and market incentives.

	R & D (2008 figures!) [1]	Demo/Field test	Market incentives
National/federal	2,2 MEUR (2008)	N/A	6,8 MEUR[2]
State/regional	N/A	N/A	20 MEUR (estimate) [3]
Total	2,2 MEUR (2008)	N/A[4]	27 MEUR (estimate)

[1] No 2009 figures available as of August 2010.
[2] Actual rebates paid in 2009 by the federal Fund for Climate and Energy (KliEn)
[3] No financial data provided by 2 of 9 provinces
[4] In 2009, no demo/field test programmes were reported.

Starting in 2003 the support for electricity from RES has been governed by the Green Electricity Act (GEA). 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 3 under “Market”.

The total amount of feed-in tariffs paid for PV in 2009 was approximately 12,1 MEUR (2008: 10,4 MEUR), which represents a 12% increase compared to the previous year. The average feed-in tariff paid for PV in 2009 was 57,02 Eurocent/kWh which represents a 5% reduction compared to the previous year (2008: 60,05 Eurocent/kWh).

Besides the feed-in support, the federal Fund for Climate and Energy (founded in 2007) provided a limited incentive in form of a non-refundable rebate for new installations up to 5 kW. The total funds spent for this purpose in 2009 were 6,8 MEUR.

In addition to the federal incentive governed by the Green Electricity Act, some provinces (Lower Austria, Vienna, Burgenland and Vorarlberg) continued running their regional support in form of rebates on the costs of the PV system (investment subsidies) in 2009. Due to the complex nature of the incentives and the data provided, only a rough estimate for the total funds spent by the provinces can be given.

3 INDUSTRY AND GROWTH

3.1 Production of feedstocks, ingots and wafers

No production facilities for silicon feedstock or wafers existed in Austria in 2008.

3.2 Production of photovoltaic cells and modules

Compared to the important increase of the installed capacity in 2009 the Austrian PV industry could not keep pace in terms of production. In total, Austrian module manufacturers had to register a slight decline of their output compared to the previous year. The total module production in 2009 amounted to 60,1 MW. Compared to 65,4 MW in 2008 this figure represents a decline of -8% (see Figure 2). At the same time, the export rate of Austrian modules declined by -13%.

Looking at the total module production of 2009 a share of 63% consisted of polycrystalline cells, 37% of monocrystalline cells

Currently the following Austrian companies are involved into the production of PV-modules, or inverters, namely:

AT&S photovoltaic modules produced in Austria are based on a novel concept which optimally utilises back contact solar cells in combination with printed circuit board technology. The patented crystalline cells were developed by AT&S co-operation partner Solland Solar. The backsheet foil of the modules is also manufactured by AT&S.

Crystalsol is aiming at developing a new type of flexible photovoltaic module with a significant cost and versatility advantage, compared to currently known photovoltaic technologies. The core innovation is the light absorbing layer made of a patented new crystalline semiconductor powder and the low-cost roll-to-roll production process. For this innovative technology development, Crystalsol received the Austrian State Award “Environmental and Energy Technology 2010”.

Energetica Energietechnik GmbH, located in Klagenfurt, Carinthia, is producing standard framed laminates and glass-glass laminates based on single and multi crystalline silicon cells. The cells are imported from various sources. Several large-scale installations in Spain and innovative building integration projects have been performed.

Ertex-Solar, affiliated to Ertl Glas AG, a large manufacturer of safety glass products, is producing tailor made modules for BIPV, especially façade integration. One of their main products is the VSG, a laminated safety glass which can be also easily assembled to insulating glass. Their market focus in 2009 was in Italy, France, Germany and Portugal.

KIOTO Photovoltaics GmbH, is affiliated to KIOTO Clear Energy AG. Since 2004 the company is manufacturing mono- and multi-crystalline solar modules based on 6“ wafers in St.Veit/Carinthia, mainly for the European market. A new production line based on an innovative soldering method was implemented in 2009. With an annual production of 50 MW KIOTO specializes on the development of large-scale PV plants (> 1MW). The first plants were installed in 2008 in Spain, showing overwhelming performance rates.

Powerquant Photovoltaics is a manufacturer of photovoltaic modules with silicon solar cells. Multicrystalline silicon solar cells with diagonal busbars and optimized finger grid allow unique design for individual solutions of building-integrated photovoltaics. This type of solar cells is uniquely produced for Powerquant by leading European solar cell manufacturers.

Polycrystalline silicon solar cells with optimized rectangular format are used for higher performance modules.

PVT AUSTRIA, the first manufacturer of PV modules in Austria produces standard and tailored modules from imported crystalline silicon cells and solar cells produced by Falconcell. The company successfully increased their output taking profit of the German PV boom. The single and multi-crystalline silicon cells are purchased from various manufacturers, mainly Germany, Spain, the U.S. and Taiwan. Specialised products are tailor-made solar modules with coloured solar cells as well as multicrystalline modules with isolated glass.

SED ProduktionsgesmbH, focuses on the production of PV-roof tiles and small size modules for BIPV applications. The custom laminates produced are directly stuck into standard format tiles made of recycled plastic and can easily replace conventional roofing materials. SED also manufactures PV elements for noise barrier walls. The glassless flexible laminates are mounted on aluminium carriers and fit all custom noise barrier types. Most of the modules produced include cells imported from various countries, such as Germany, Spain, the U.S., Taiwan, China and others. Virtually, the whole production is exported.

Solon-Hilber Technologie, The company produces modules with a yearly capacity of 50 MW and all kind of installation systems/trackers (Tixed Tilt, Single Axis, Dual Axis, Bus Ports and Alpine Solutions). SOLON HILBER also installs turn key projects all over the world. The references are in Europe, USA and Australia with a total capacity of more than 150 MW. The company belongs to the German SOLON SE. Currently more than 200 employees are working in this company.

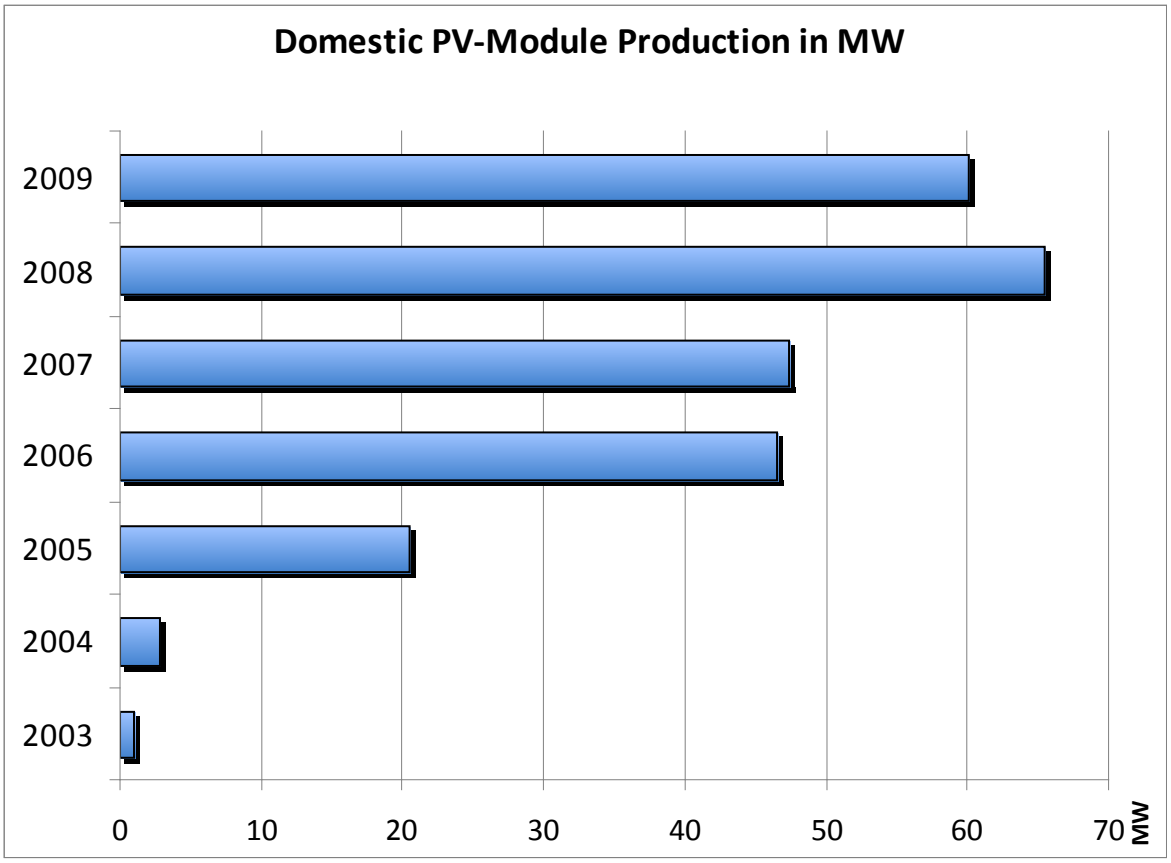


Figure 2: Development of domestic PV module production in Austria since 2003; Data source /graph: Technikum Wien/AIT

In 2008 the first companies started industrial scale production of solar cells, which marks the next step in the development of Austrian PV industry.

Blue Chip Energy GmbH, founded in spring 2006 and since 2007 in a strategic partnership with German SOLON AG, the Dutch company Econcern and I-SolVentures, the venture capital company of SOLON co-founder built up a production for high-efficiency single crystalline silicon solar cells (Blue Chips) in the municipality of Güssing.
The first production line with a capacity of 100 MW/a was installed during the second half of 2008. According to the plans, full production is scheduled to be reached in 2010.

Falconcell Production GmbH is a manufacturer of mono- and multi-crystalline silicon solar cells. Founded in 2006, Falconcell became operational in 2007/2008 with a production capacity of 30 MW. In co-operation with Technical University of Vienna innovative process technologies of more efficient silicium-based solar cells are developed.

Powerquant Photovoltaik GmbH, a spin-off of Technical University of Vienna recently started a pilote production for specific design modules with polycrystalline silicium-based solar cells for individual and optically appealing solutions of building-integrated photovoltaics.

Several companies are performing solar cell R & D and are running pilote productions:

Konarka Technologies, a US-based PV-company is operating a Research and Development centre in Linz, based on the intensive investigation of thin-film Organic Solar Cells at the Johannes Kepler University.

Sunplugged, based in Tyrol, is developing a new type of flexible CIGS Cells. Energy supply for efficient cooling systems on commercial vehicles will be one specific application of this new development.

Total PV cell and module manufacturing in Austria for 2009 together with production capacity information is summarised in Table 5 below.

Table 4: Production and production capacity information for 2009 for each manufacturer

Cell / Module manufacturer	**Technology** (sc-Si, mc-Si, a-Si, CdTe)	**Total Production 2009 (2008) (MW)**		**Maximum production capacity 2009 (2008) (MW/yr)**	
		Cell	Module	Cell	Module
Wafer-based PV manufactures					
BlueChip Energy	sc-Si	3,5	-	15	-
FalconCell	mc-Si	4 (0,8)	-	N/A	-
SOLON Hilber Technologie	mc-Si / sc-Si	-	14 (25)	-	25 (25)
PVT Austria	mc-Si / sc-Si	-	15,0 (10)	-	N/A (N/A)
Energetica Holding GmbH	mc-Si	-	17 (10,75)	-	35 (N/A)
KIOTO Photovoltaics	mc-Si	-	17 (8,0)	-	48 (N/A)
ERTEX Solar	mc-Si / sc-Si	-	0,78 (0,40)	-	N/A (N/A)
SED	mc-Si / sc-Si	-	0,113 (0,033)	-	1.000
Powerquant	mc-Si	-	0,011	-	1
PV Generation Solartechnik GmbH	mc-Si	-	No data (no pro-duction 2008)	-	N/A
Thin film manufacturers					
-	-	-	-	-	-
Cells for concentration					
-	-	-	-	-	-
TOTALS (estimates)		7,5 (N/A)	60,1 (68,5)	N/A	N/A

3.3 Module prices

Table 6 indicates the typical module prices for the year 2009 as quoted by the manufacturers and installation companies. The price range reflects the prices for different module types for typical orders (5+ kW).

Compared to the previous years, module prices dropped considerably in 2009, following the international trend. The average wholesale price in 2009 was 2,175 EUR/W, the average sales-price of Austrian PV module producers was 2,272 EUR/W.

Table 5: Typical module prices for a number of years

Year	2002	2003	2004	2005	2006	2007	2008	2009
Standard module price(s): Typical (EUR/W)	4,50	3,10 – 3,20	3,60 – 3,70	3,60 – 3,90	3,60 – 4,30	3,60 – 4,30	3,00 – 3,50	2,2 – 2,3
Best price (EUR/W)	N/A	N/A	N/A	N/A	N/A	N/A	3,00	2,2
PV module price for concentration (EUR/W)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

3.4 Manufacturers and suppliers of other components

Besides PV-Module and cell production, various other companies are manufacturing components for modules and BOS-components like batteries, inverters, cell-wiring or mounting systems.

Austria has a long tradition as one of the largest inverter producing countries in Europe. Again the large manufacturers could extend their output in 2009 following the overall expansion of the world-wide PV market. In total approximately 146 000 inverters (2008: 77 000) with a capacity (rated AC output capacity) of approximately 1 000 MW (2008: 448 MW) were produced. The increased power of inverters is highlighting the international trend towards larger system sizes.

FRONIUS INTERNATIONAL GmbH. is Austria's only producer of inverters and one of the leading manufacturers in the world of inverters for grid connected PV systems. **Fronius** has been involved in solar electronics since 1992, particularly in the development and production of photovoltaic inverters and. Due to the high demand for photovoltaic systems from countries, such as Germany, Italy, France and the USA, the Austrian-based company is increasing its production capacities. The company has more than 2,500 employees worldwide, 1,900 of whom are based in Austria. 99% of the inverters are exported to more than 30 countries.

Besides inverter manufacturing, Austria hosts some of the largest manufacturers of specialised BOS and other components for the production of 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 colours and are world market leader in this field. They are used to encapsulate standard crystalline as well as thin film solar cells. ISOVOLTA AG is preparing the founding of a new company from its photovoltaics division with the naming of ISOVOLTAIC GmbH which is about to start in January 2010 to become fully operational in July 2010.

SOLON Hilber Technologie GmbH, the world market leader for tracking systems for PV power plants, a 100% subsidiary of German SOLON AG. For 2009 there are no indications about the number of systems produced, but the capacity was reduced to only 16 MW with an export share of 100%. It can be presumed that this important break of market share is linked to the decline of the Spanish PV market.

Ulbrich Austria GmbH, a subsidiary of the U.S. based Ulbrich Specialty Wire Group, which consists of five production facilities in three countries. Ulbrich of Austria is located near Vienna and focuses on producing and selling solarcell tabbing and string interconnect ribbon for the photovoltaic industry with a total capacity of more than 1,5 GW..

PLANSEE SE in Tyrol is a subsidiary of the PLANSEE Group manufacturing refractory metals for diverse applications; more particularly metallic targets for thin film solar cells.

HEI develops and manufactures novel, self-sufficient solar LED-lighting systems with tube-shaped PV panels which are fully integrated to the light pole. The lights are dedicated for professional lighting of roads, squares and pathways. The company started production in 2007 and is now expanding fabrication facilities.

INOVA Lisec is an important producer of glass and insulating glass which is becoming an ever more intelligent building material. The Lisec group offers a complete range of glass production, including flat glass, insulating glass and solar glass. As a pioneer innovation Lisec developed a flat-bed glass tempering furnace. It tempers even glass sheets up to only 2 mm thickness in perfect quality without optical distortions (rollerwaves) which may appear

by horizontal tempering plants with roller transport. Thus, extremely thin special glass for the photovoltaic industry is made of tempered glass regardless their shape and type of surface coating. INOVA Lisec has 1600 employees and an export rate of 98%.

PTS Production Technology Systems in Klagenfurt offers complete turnkey module production systems with their “string@once” technology.

Austrian Institute of Technology, Energy Department, (formerly arsenal research) is known as internationally accredited PV module test institute for crystalline modules (since 2003) according to the IEC/EN 61215, and for thin film modules, according to the IEC/EN 61646 and module safety qualification according to the EN 61730. Another industry related activity at the AIT are PV inverters, in particular their performance (MPP, efficiency aspects) and their grid compatibility (Control, Fault-Ride-Through). The AIT PV inverter laboratory attracts worldwide inverter manufacturers for collaboration.

3.5 System prices

In 2009, turnkey prices for installed PV systems fell slightly compared to the previous years. However, the reduction was still low, following the continued high demand of the European PV market and the stringent supply of PV modules on the world market.

In 2009 turnkey prices for typical on-grid systems varied between 3,9 EUR/W and 4,9 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. The considered installations are domestic rooftop systems.

Remark: Prices for specific building integrated systems are typically considerably higher and depend on the specific case. They are not reported here.

A summary of typical system prices is provided in the following tables.

Table 6: **Turnkey Prices of Typical Applications**

Category / Size	Typical applications and brief details	Current prices EUR / W
OFF-GRID Up to 1 kW	Basic electricity supply for mountain huts.	6 to 15 *)
OFF-GRID >1 kW	AC Electricity supply for larger mountain huts. System size between 1 and 8 kW.	6 to 15 *)
On-Grid 1 kW	Small domestic roof-top system	4,9
ON-GRID Specific case	5 kW roof-mounted system	5,1
ON-GRID 10 kW	Typical roof-mounted system for a multifamily house.	4,3
ON-GRID >10 kW	Larger system for commercial / industrial applications. PV-power plants	3,8 to 5,5
GRID – CONNECTED (centralized, if relevant)	Not relevant in Austria	N/A

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 7a 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 (now 5 kW) since 2001.

Table 7a: National trends in turnkey system prices (EUR / kW) for a typical grid connected PV system

YEAR	2001	2002	2003	2004	2005	2006	2007	2008	2009
Turnkey price EUR/W:	7 500	7 000	6 000	5 500	5 500	5 400	5 400	5 100	4 900

3.6 Labour places

With the continued expansion of their business Austrian PV manufacturers again significantly extended their workforce in 2009. In total it can be estimated that at the end of 2009 2 870 full-time jobs (2008: 1 762 jobs) were directly linked to PV R&D, manufacturing and installation in Austria.

In the various sectors the following figures (Table 8) represent an estimation of existing work places, based on information from the manufacturing companies and R&D institutions.

Table 7: Estimated PV-related labour places in 2009

Research and development (not including companies)	70
Manufacturing of products throughout the PV value chain from feedstock to systems, inverter technologies, including company research	
Distributors of PV products	
System and installation companies	2800
Utilities and government	N/A
Other	N/A
Total	2870

3.7 Business value

The average specific price of a grid-connected photovoltaic plant in Austria decreased from 5,100 Euro/kW to 4,400 Euro/kW, i.e. a reduction of 14%. This observation confirms a high economic learning rate, which is highly correlated to the strongly increasing world market. Austrian photovoltaic R&D is conducted in thin layer technology, grid integration and building integration and especially the latter can represent a very attractive market segment for future development of the Austrian photovoltaic industry.

In 2009 about 20,2 MW (2008:4,7 MW) of PV systems were installed in Austria which represents an important growth and led to a cumulated total installed capacity of 52.6 MWpeak. As a consequence the sum of produced renewable electricity by PV plants in operation amounted to 48.9 GWh in 2009.

The estimated value of the national market increased to about 90 MEUR (2008: 25 MEUR), based on average turnkey prices for off-grid and grid connected systems.

Due to the variety of PV related products manufactured by Austrian industry, no reliable estimation can be provided for the import/export and business value of these products.

Table 9 provides an overview on the estimated value of PV business in Austria, total Export and Import of PV products as well as the domestic market.

Table 8: Value of PV business

Sub-market	**Capacity installed *in 2009* (MW)**	**Price EUR/W** *(from table 7)*	**Value (MEUR)**	**Totals (MEUR)**
Off-grid domestic	**0.25**	**8 (6-15)**	*2*	*2*
Off-grid non-domestic				
Grid-connected distributed	**19,9**	**4,4 (5,1)**	*87,56*	*87,56*
Grid-connected centralized				
Total	**20,15**			*89,56*
Export of PV products *(including information from Tables 4 & 5)*				*N/A*
Change in stocks held *(including information from Tables 4 & 5)*				*N/A*
Import of PV products *(including information from Tables 4 & 5)*				*N/A*
Value of PV business				***N/A***

4 FRAMEWORK FOR DEPLOYMENT (NON-TECHNICAL FACTORS)

Table 10 lists the main support measures (definitions at start of guidelines) for PV which have been effective during 2009 in Austria. Further details on these are to be provided on the following pages.

Table 9: PV support measures

	On-going measures	Measures that commenced during 2009
Enhanced feed-in tariffs	National level, Green Electricity Act	-
Capital subsidies for equipment or total cost	In selected (4 out of 9) provinces.	National level: Short-term initiatives
Green electricity schemes	Various	-
PV-specific green electricity schemes	UZ46, green electricity scheme established on the national level.	-
Renewable portfolio standards (RPS)	-	-
PV requirement in RPS	-	-
Investment funds for PV	-	-
Income tax credits	-	-
Net metering	Selected DNOs	-
Net billing	-	-
Commercial bank activities e.g. green mortgages promoting PV	-	-
Electricity utility activities	-	-
Sustainable building requirements	-	-

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 federal 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.

Due to the fact that the availability of the PV feed-in tariffs was capped to a national limit of 15 MW – which had been reached already during the first weeks after the GEA has become effective – the role of PV in the future electricity scenario was limited from the very beginning.

After a period of about 3 years with no federal support for PV, Austria's parliament passed a revision of the green-electricity act in May 2006, which has been effective since October 2006. After a minor revision in 2007, the latest revision of the Green Electricity Act dates from July 2008 and has become effective in September 2009. It regulates that an annual amount of 2,1 Mio.€ (2008: 1,7 Mio.€) is available for funding new installations. Support for green electricity will be limited to installations > 5kW$_{peak}$ with a runtime of 13 years (before:

10 years + 2 years degressive funding). Installations < 5kW$_{peak}$ may request investment funding, but are excluded of receiving feed-in tariffs.

The key conditions in the framework during 2009 were:

- The GEA 2006 governs the support for green electricity as well as for electricity from combined heat and power generation. Also the larger hydro power plants (50-100 GWh/a) are considered.
- The GEA 2006 sets a target to meet 10% of the public national electricity demand with electricity generated from 'new' renewable energy sources by 2010 RES (not including hydropower) as well as additional 9% by small hydropower until 2008, respectively.
- RES are supported via long-term guaranteed feed-in tariffs to achieve the above mentioned political target quotas. The feed in tariffs are stated by the federal Ministry for Economics and financed by a supplementary charge per "metering point", which depends on the network connection level and a fixed price purchase obligation for electricity dealers.
- In addition specific shares for energy sources are defined. About 30% of the support are dedicated to solid biomass and waste with high share of biomass, additional 30% to biogas. Wind as well shall be supported with 30%. Remaining 10% are reserved for all other sources, including PV, liquid biomass, co-firing power plants and others.
- For installations supported under the feed-in tariff scheme 100% of the source/size specific tariff is paid for the first 10 years. Afterwards, the tariff is cut to 75% in year 11 and finally 50% in year 12. After this period, only the gross sales price for electricity is paid. (GEA revision 2008: 13 years of full support)

Photovoltaic-Feed-in-tariffs for new installations are defined on a yearly basis in a separate Feed-in Decree. According to the 2009 Feed-in Decree tariffs ranged from 45,98 €Cent/kWh for installations < 5kW down to 39,98 €Cent/kWh for >10kW systems and therefore remained approximately on the same level as in 2007:

	2009 (€cent/kWh)	2008 (€cent/kWh)	2007 (€cent/kWh)	2006 (€cent/kWh)
up to 5 kW$_{peak}$	45,98	45,99	46	49
above 5 kW$_{peak}$ up to 10 kW$_{peak}$	39,98	39,99	40	42
above 10 kW$_{peak}$	29,98	29,99	30	32

Besides the federal feed-in tariff scheme, a new initiative was launched by the newly founded national *Fund for Climate and Energy*. The initiative, which provides rebates to newly installed private PV systems up to 5 kW is launched on an intermittent base. In 2009 a total budget of about 19 MEUR was opened, of which 1 MEUR was dedicated to PV components in prefabricated houses.

However, Austrian stakeholders generally do not see these singular, short-term initiatives as an appropriate basis to develop a sustainable domestic PV market. The list of funding applications is already consuming all funds until the year 2011. The opening of additional funding is therefore urgently requested.

Alike the previous year, in 2009 most Austrian provinces were running regional rebate-programmes, aiming to overcome the limitations of federal incentives. Supported by

different promotion mechanisms of the federal provinces and the federal government a new strong market diffusion of photovoltaic systems could be reached in 2009. Generally, the regional support was only granted in case the installation is not supported by the federal feed-in tariff scheme. In total, the provinces promoted through their rebate programmes an installed capacity of approx. 13,8 MW.

In 2009 the following programmes provided support for PV installations:

- Lower Austria is heading the specific support scheme for PV-installations. The incentive is based on a rebate of up to 3 000 EUR per kW installed, which is granted for residential installations up to 5 kW. In 2009 Lower Austria provided support for 1.750 new installations with a cumulated capacity of more than 8,5 MW (2008:1,1 MW).
- Upper Austria comes second with a capacity of 3,3 MW.
- Styria supported around 1 MW
- Vorarlberg provided an incentive which added up to the federal rebate programme funded by the national Fund for Climate and Energy. In 2009, about 0,276 MW were supported.
- Burgenland offered support for a capacity of 235 kW.
- In the capital Vienna, investment subsidies were granted to new installations, with a capacity of 234 kW.

4.1 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. The starting point for evaluating the energy yield and the CO2 reduction by installed PV power is the cumulated installed capacity of 52.596 kWp in the year 2009. Further the emission coefficient of the substituted electrical energy of 431,8 gCO2äqu/kWh is considered and the number of full load operation taken from literature (Fechner et al., 2007). The calculated electricity generated by cumulated Austrian PV installations is 48,9 GWh. Based on these values a CO2 reduction potential of 21.121 tons of CO2equ. can be established.

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. However, currently only 65% of the electricity demand in Austria is covered by RES.

Furthermore, the European 20-20-20 targets are set for the share of RES in the total energy consumption. For Austria, this target has been set from the current 23% to 34% in 2020.

The Austrian Ministry of Transport, Technology and Innovation ordered a revision of the existing national PV technology roadmap in order to explicitly address the 2020 targets.

The revised roadmap was introduced into this process in early December 2009. In this new roadmap, two realistic but ambitious targets were worked out, reaching 5% respectively 8% of the total Austrian electricity consumption to be covered by photovoltaics in 2020, provided the frame conditions will be changed immediately.

4.2 Standards and codes

Generally European PV Standards are likewise applied in Austria. Grid-interconnected PV applications are covered in detail by the new national standard ÖVE E8001-4-712 published in December 2009 (Formerly 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.

5 HIGHLIGHTS AND PROSPECTS

By far the largest share of the Austrian PV production is exported to those European Union countries, where attractive and stable incentives created a substantial market for PV. In spite of the consequences of the economic crisis and the drop of photovoltaic installations in Spain it is expected that an ongoing positive development of the international PV market will provide the basis for growth of the Austrian PV manufacturers and will help to strengthen the position of Austria as an important supplier of components for PV systems.

New industry activities in the field of cell production and further extension of module production and product portfolio clearly document this trend.

5.1 Stakeholder initiatives and awareness raising

The federal association *Photovoltaic Austria* is a corporate, non party association with the aim to improve the framework conditions for photovoltaics implementation in Austria. They have significantly expanded their activities by creating a national network for dissemination of information on PV and initiating awareness raising activities. By fostering political contacts, intensive political lobbying work and press coverage, the association aims at initiating stable and supportive PV market conditions, preferably based on feed in tariffs.

By the end of 2009, more than 100 companies and people involved in the PV business were members of the Association.

The annual National Photovoltaic Conference 2009 (a three days event), organised by some of the main PV stakeholders and supported by the Ministry of Transport, Innovation and Technology, was once again a great success, with more than 350 experts participating. This conference is now established as THE annual come together of the Austrian PV stakeholders. The foundation of the new PV technology platform and the great industrial potential for Austrian companies was discussed this year at the event.

5.2 Market & deployment initiatives

When looking at the domestic market, the situation of PV in Austria remains unsatisfactory mainly because of the complex, unstable and primarily insignificant frame conditions. The 2006 revision of the main nationwide framework, the Green Electricity Act (GEA) currently in force does not provide any substantial support for PV and does not improve the situation in comparison to the period before. Although the 2008 revision of the Green Electricity Act is now effective it is expected that the financial cap is much too low to provide a significant increase of the share of renewables in the Austrian electricity system.

The “new RES” are supported by the GEA, mainly via up to 13 years guaranteed feed-in tariffs which are stated by the federal Ministry for Economics and financed by a supplementary charge on the net-price and a fixed price purchase obligation for electricity dealers.

The main pillars of the new regulation are:
- Annual additional funding volume reduced to 21 MEUR for all renewable energy sources
- Photovoltaics will only receive about 10 % of the support volume
- The duration of the programme is 10 years constant + 2 years declining support

These feed-in-tariffs are exclusively valid for systems > 5kW. Systems up to 5kW can apply for investment cost funding through the Austrian Climate and Energy Fund. This support initiative, launched once a year, will support small systems (private households) and was opened for the first time in August 2008 by one tender with a total budget of about 10 MEUR. The effect was the installation of about 900 PV Systems with a total of about 4 MW. In 2009, the budget was doubled leading to about 7-8 MW of PV installations. This support scheme provided additional financial benefits to building integrated systems (BIPV).

The announced Austrian Climate and Energy Fund' increased budget for 2010 for PV support in the range of 35 MEUR could lead to another 20 MW of installations, since the support per kW installation will be reduced according to the lower PV prices. Besides this, some regional states in Austria have announced increases in their individual PV support budgets, as well.

ANNEX A: REFERENCES, METHODS AND ACCURACY OF DATA

The market statistics on installed capacity, share of grid-connected and off-grid applications as well as the industry data have been collected by Natalie Glück and Hubert Fechner, University of Applied Science Technikum Wien, under the coordination of Peter Biermayr, TU Wien by order of the Federal Ministry for Transport, Innovation and Technology (BMVIT).

The data on installations have been provided by funding organisations on the federal as well as provincial levels. In the annual report ("Innovative Energietechnologien in Österreich, Marktentwicklung 2009") PV applications are divided into off-grid installations (including domestic and non-domestic applications), and grid-connected systems (including centralised and distributed 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.

With the establishment the new organisation managing the feed-in tariff scheme, all statistics on renewable energy installations funded under the feed-in tariff scheme are now reported by OeMAG. Data on the total amount of budget spent for PV feed-in tariffs is provided by OeMAG. However, as a considerable share of new PV installations is installed outside this feed-in tariff framework, data on these systems, which are supported by regional initiatives or other programs, are not included in the national Energy Statistics, since the capacity of these installations is below 1 MW. Thus the installations reported by OeMAG do not provide a complete picture of the situation in Austria.

The uncertainty of the figures related to the installed capacity is estimated to be about ± 10%.

Data on funding for PV R&D is taken from the report "Energieforschungserhebung 2008, Ausgaben der öffentlichen Hand in Österreich, Erhebung für die IEA" compiled by the Austrian Energy Agency by order of the Federal Ministry for Transport, Innovation and Technology (BMVIT).

Industry data on actual production, production capacity, workforce, new products, prices and other market figures is based on information provided by manufacturers, and installation companies. An estimation of the accuracy of these data cannot be provided.

ANNEX B: COUNTRY INFORMATION

This annex provides some background about the national environment in which PV is being deployed. The data are not guaranteed to be 100 % accurate nor intended for analysis, and the reader should do their own research if they require more detailed data.

Electricity in Austria 2008 (Source: VEÖ Association of the Austrian Electricity companies, ZMR)

General data about Austria :

- Territory: 83 850 km2
- Inhabitants (2009): 8,365.505
- Domestic electricity consumption (excl. PS): 67 918,6 GWh
- Electricity consumption per inhabitant: 8,23 MWh/year
- Domestic electricity generation: 64 283,4 GWh

Number and capacity of power plants installed (including estimations):

- 627 (5 194,5 MW) run-of-river plants
- 101 (6 602,1 MW) pumped-storage plants
- 1 777 (12 008,9 MW) (estimated) other hydro-power plants
- 615 (6 441,0 MW) (estimated) thermal power plants
- 2 537 (1 010,5 MW) (estimated) other power plants (wind, PV...)

Number of network levels: 7

- Levels 1-3: high and ultra-high voltage
- Levels 4-5: medium voltage
- Levels 6-7: low voltage

1) retail electricity prices (2008 / 2009)

	Net-price	Energy tax	VAT	Total taxes	Final price
	EUR/kWh	EUR/kWh	EUR/kWh	EUR/kWh	EUR/kWh
Electricity price (Industry)	0,09	0,02	0,02	0,04	0,13
Electricity price (household)	0,14	0,02	0,03	0,05	0,19
Source: E-Control (industry: 2nd half of 2008, household: 1st half of 2009)					

2) Typical annual household electricity consumption:

   4420-5430 kWh (3-person household, Source Statistik Austria www.statistik.at)

3) Typical metering arrangements and tariff structures for electricity customers (for example, interval metering? time-of-use tariff?)

   For normal households: Typically fixed tariff (no time-of-use) or day/night time dependent tariff.

4) Typical household income:

   28.592 EUR per year (2008 data) – according to EU SILC 2008 (Source Statistik Austria www.statistik.at)

5) typical mortgage interest rate:

   N/A

6) voltage (household, typical electricity distribution network)

   Single phase 230 V, 3 phase 400 V; 50 Hz;
   Electricity networks structured in Transmission (220 kV – 400 kV), sub-transmission (110 kV), medium voltage distribution (10 kV – 30 kV), and low voltage distribution (400 V)

7) price of diesel fuel (2007):

	Net-price	Energy tax	VAT	Total taxes	Final price
	EUR/l	EUR/l	EUR/l	EUR/l	EUR/l
Diesel fuel (private use)	0,50	0,36	0,17	0,53	1,03
Source: Statistik Austria www.statistik.at					

8) Typical values of kWh / kW for PV systems in parts of your country
   850 kWh/kWp to 950 kWh/kWp
   Source: Authors estimation.