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 Switzerland

2012

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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.

CPV: Concentrating PV

Hybrid system: A system combining PV generation with another generation source, such as diesel, hydro, wind.

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 system 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, electricity utility businesses 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 CHF

PV support measures:

Feed-in tariff	an explicit monetary reward is provided for producing PV electricity; paid (usually by the electricity utility business) at a rate per kWh that may be higher or lower 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 business, usually at a premium price
PV-specific green electricity schemes	allows customers to purchase green electricity based on PV electricity from the electricity utility business, usually at a premium price
Renewable portfolio standards (RPS)	a mandated requirement that the electricity utility business (often the electricity retailer) source a portion of their electricity supplies from renewable energies
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	allows PV customers to incur a zero charge when their electricity consumption is exactly balanced by their PV generation, while being charged the applicable retail tariff when their consumption exceeds generation and receiving some remuneration for excess electricity exported to the grid
Net billing	the electricity taken from the grid and the electricity fed into the grid are tracked separately, and the electricity account is reconciled over a billing cycle
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
Activities of electricity utility businesses	includes 'green power' schemes allowing customers to purchase green electricity, operation of large-scale (utility-scale) 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 23 participating countries are Australia (AUS), Austria (AUT), Belgium (BEL), Canada (CAN), China (CHN), 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, the US Solar Electric Power Association and the US Solar Energy Industries Association are also members. Both Thailand and the International Copper Association are pending members.

The overall programme is headed by an Executive Committee composed of one representative from each participating country or organization, 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 Switzerland National Survey Report for the year 2012. 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

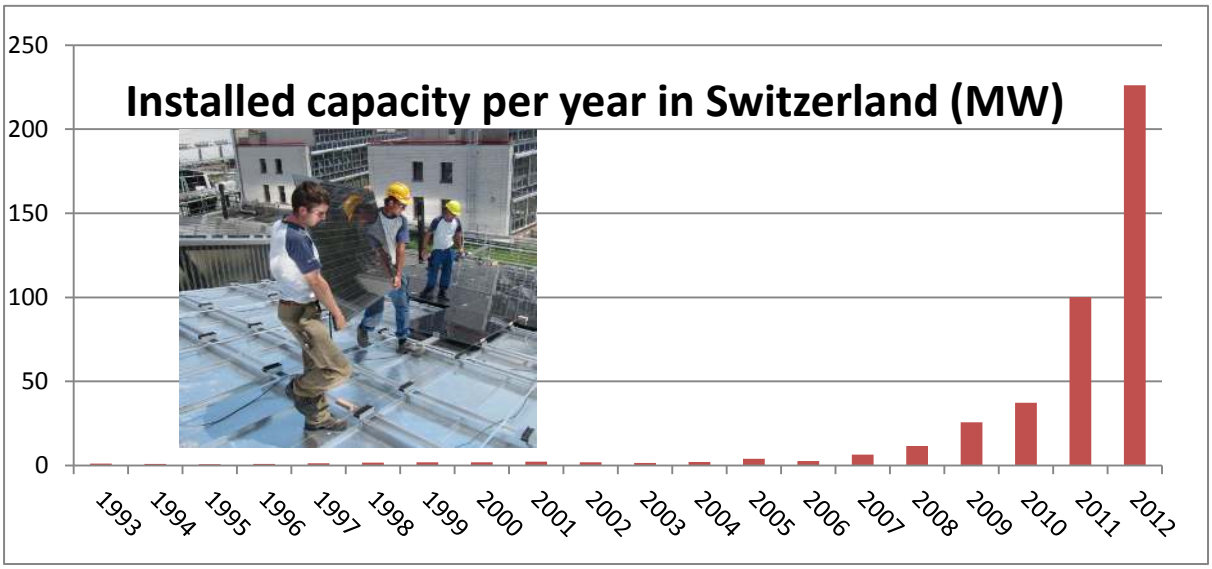
The market in Switzerland doubled to about 226 MW in 2012. This is about 28W per capita and will contribute 0.3% to the domestic electricity production. Cumulative installed capacity reaches almost 440 MW.

This increase is mainly because of a further decrease in investment costs which makes PV become an alternative source for power production despite the limited government funding for the Feed in Tariff scheme.

1.1 Installed PV power

According to market statistics about 226 MW of PV has been installed in Switzerland in 2012.

This is more than what has been grid connected from 1987 until 2011!



1.2 Costs & prices

The FiT scheme reduced the tariffs three times in 2012 in order to adapt to the rapid decrease in module costs. Thus there was also a decrease in installation costs. Lowest production costs came close to 0.20 CHF per KWh.

1.3 PV production

Due to the rapid decrease in crystalline module costs two Swiss manufacturers of thin film modules stopped their production in 2012 (Pramac, VHF Technologies).

Meyer Burger and Sunage are the only remaining manufacturer in Switzerland also with only limited capacity.

1.4 Equipment manufacturer

The big Swiss PV equipment manufacturer Meyer Burger, Oerlikon and Applied HCT Wafering Systems suffered from the overcapacity in cell and module production in China. These led to a sharp drop in demand for new manufacturing equipment.

Oerlikon sold its subsidiary Oerlikon Solar (Thin film production equipment) to Tokyo Electron end of 2012.

1.5 Budgets for PV

With lower costs per kWh for solar electricity the federal government increased the cap for PV within the FiT scheme considerably. This resulted in about 40 Mio CHF of FiT costs for PV in 2012.

Besides this a lot of local and regional utilities pay a premium for solar electricity for plants not eligible for the federal FiT scheme yet (but registered on a waiting list).

Picture 1 Solar Skilift Tenna, Switzerland

THE IMPLEMENTATION OF PV SYSTEMS

1.6 Applications for photovoltaics

PV installations are almost 100% on roof tops. Ground mounted systems may occur sometimes in a backyard of a house but large plants as in other countries are ot seen yet. This is due to landscape protection regulations as well as high costs of land.

About 20-30 % of the installations are so called BIPV type plants taking advantage of higher FiT compared to standard roof top systems.

1.7 Total photovoltaic power installed

Table 1: PV power installed during calendar year 2012 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 2012 (MW)	0,1	0,1	226	0	226
Amount of CPV in the above (MW)	0	(0)	(0)	(0)	0
Amount of PV in hybrid systems (MW)	(0)		>0.1		<0.1

Table 2a: PV power and the broader national energy market.

Total national PV capacity (from Table 2) as a % of total national electricity generation capacity	PV capacity as a % of new electricity generation capacity	Total PV electricity production as a % of total electricity consumption
2.2% Approx. 18 GW of installed capacity, 80% hydropower including pumping storage capacity	60%-70% Approx. 100 MW newly installed non-PV capacity within the FiT scheme	0.5

A summary of the cumulative installed PV Power, from 1992-2012, broken down into four sub-markets is shown in Table 3.

Table 3: The cumulative installed PV power in 4 sub-markets.

	Cumulative installed capacity as of 31 December 2011 (kW)																			
Sub-market	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Stand-alone domestic	1 540	1 675	1 780	1 940	2 030	2 140	2 210	2 300*	2 390*	2 480*	2 570*	2 740*	2 810*	2 930*	3 050*	3 200*	3 800	4 000	4 100	4 200	4 MW
Stand-alone non-domestic	70	100	112	143	162	184	190	200*	210*	220*	230*	260*	290*	320*	350*	400*					
Grid-connected distributed	2200	2900	3 600	4 050	4 850	5 950	7 630	9 420	11 220	13 340	15 140	16 440	18 440	21 240	23 740	30 040	41 540	67 040	104 140	206 700	433 MWW
Grid-connected centralised	900	1 100	1 200	1 350	1 350	1 450	1 470	1 480	1 480	1 560	1 560	1 560	1 560	2 560	2 560	2 560	2 560	2 560	2 560		
TOTAL (kW)	4 710	5 775	6 692	7 483	8 392	9 724	11 500	13 400	15 300	17 600	19 500	21 000	23 100	27 050	29 700	36 200	47 900	73 600	110 900	211 100	437 MW

- Swiss PV market deployment doubled in 2012 to about 226 MW newly installed capacity (28 W/capita). This was driven by another reduction of Feed in Tariffs (FiT) by approx. 30% during 2012. Due to this reduction the federal office of energy could increase the yearly cap for PV.
- Besides the (capped) national FiT scheme there are still many regional, local and utility support schemes either with direct subsidies or FiTs equal or below those on the federal level.
- It becomes widely accepted that PV, besides hydropower, will become the electricity production technology of the future and help to phase out nuclear power at the end of their respective lifetime.
- Simulations show that 100% domestic renewable electricity production can be reached with a mix of hydropower (already 60%) solar and wind.

1.8 PV implementation highlights

More than 11 000 new PV installations only in 2012:

Table 4a: Numbers of plants / building type

Type of buildings	Numbers of PV Plants	average size of PV plant [kW]	Market share (installed capacity)
Single Family Houses	4000	7.5	13%
Multi Family Houses	1000	11.6	5%
Trade and Industry, Business	3600	24.4	39%
Agriculture/Farmer	1700	42.4	32%
Public buildings, public transport	1000	24.0	11%

Source: Markterhebung Sonnenenergie 2012

1.9 Highlights of R&D

Author Stefan Nowak, excerpt from the PVPS Annual Report 2012

Switzerland has a dedicated national photovoltaic RTD programme which involves a broad range of stakeholders in a strongly coordinated approach (www.photovoltaic.ch). This national photovoltaic programme focuses on R&D,D in a system and market oriented approach, from basic research, over applied research, product development, pilot and demonstration projects all the way to accompanying measures for market stimulation. On the technical level, thin film solar cells, their variations and building integration continue to be the topics of highest priority. The programme is organised along the entire value chain and addresses the critical gaps from technology to the market place. Thorough component and system analysis, as well as testing, aim at increasing efficiency and performance. Accompanying measures to raise the quality and reliability of photovoltaic power systems include work on standards and design tools.

In 2012, more than 75 projects, supported by various national and regional government agencies, the European Commission and the private sector, were conducted in the different areas of the photovoltaic energy system. Innovative solutions, market orientation, cost reduction, industrial viability and transfer as well as increased efficiency and reliability are the main objectives of the technical R &D.

For solar cells, the main focus remains on thin film solar cells with projects in a wide variety of materials (amorphous and microcrystalline silicon, compound semiconductors, dye-sensitised and organic solar cells). Work on thin film silicon at the Swiss Federal Institute of Technology (EPFL) in Neuchâtel concentrated on micromorphous solar cells with a particular emphasis on silicon oxide intermediate reflector layers. Significant progress was also

achieved in the area of high-efficiency heterojunction silicon solar cells. Industry co-operation was extended with various companies. A new photovoltaic technology centre will be built up at the laboratories of CSEM (Centre Suisse d'électronique et microtechnique) in Neuchâtel.

With regard to CIGS solar cells, the Swiss Federal Laboratories for Materials Testing and Research EMPA focused the work on high efficiency flexible CIGS cells on plastic and metal foils. As a highlight, a new record efficiency of 20,4 % was announced for CIGS solar cells on plastic substrates (Fig. 2), thus representing a substantial increase of the last record of 18,7 % achieved the year before. This efficiency record is slightly higher than that for CIGS cells on glass and in the range of best multicrystalline silicon solar cells. For dye-sensitised solar cells, work continued at EPFL on new dyes and electrolytes as well as high temperature stability of the devices. An increasing interest for photovoltaic technology can be observed at various research institutions as well as from industry. In line with the international trend to a broader scientific and technological base, increased activities take place in the fields of nanotechnology, chemistry and numerical modelling. On the part of application oriented research, emphasis continues to be given to building integrated photovoltaics (BIPV), both for new solutions involving thin film solar cells as well as for new mounting systems and structures for sloped roofs and facades.

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

More than half of the market stimulation comes from the Feed in Tariff scheme. About 40 Mio CHF has been paid to PV plant owners in Switzerland.

Besides this a number of utilities as well as cantons offer a premium for solar electricity. Overall this might be as high as the federal FiT spending.

Table 5: Public budgets for R&D, demonstration/field test programmes and market incentives.

	R & D	Demo/Field test	Market incentives
National/federal	n/a	n/a	40 Mio CHF for FiT scheme
State/regional	n/a	n/a	Estimate: About 30-40 Mio CHF, at least 50 % from regional and local utilities.
Total			

Please refer also to the Photovoltaic Programme Edition 2012, Summary Report, Project List, available soon at www.photovoltaic.ch

2 INDUSTRY AND GROWTH

2.1 Production of feedstocks, ingots and wafers

Swiss wafers is the only company in Switzerland producing ingots and wafers. They do not disclose any production data.

Table 6: Production information for the year for silicon feedstock, ingot and wafer producers

Manufacturers (or total national production)	Process & technology	Total Production	Product destination (if known)	Price (if known)
Swisswafers	**sc-Si ingots.**	**900 T***	**Export**	**n/a**
	mc-Si ingots			
Swisswafers	**sc-Si wafers**	**Approx. 120 MW***	**Export**	**n/a**
	mc-Si wafers			

*All numbers are estimates, more and detailed information is available from the homepage of Swiss wafers: www.swisswafers.ch

Swiss Wafers AG is specialized in manufacturing silicon wafers for photovoltaic applications (solar cells).

It converts silicon raw material of various specification to mono- and multi-crystalline silicon wafers and supplies them to solar cell producers worldwide. The photovoltaic industry Swiss Wafers AG is one of few independent producers of solar silicon wafers. Since its foundation the company has grown continuously at a fast pace.

2.2 Production of photovoltaic cells and modules

There are only few companies manufacturing modules in Switzerland. Production as well as capacity is limited. Products are mostly sold in niche markets.

Table 7: Production and production capacity information for 2012

Cell/Module manufacturer	Technology (sc-Si, mc-Si, a-Si, CdTe)	Total Production (MW)		Maximum production capacity (MW/yr)	
		Cell	Module	Cell	Module
Wafer-based PV manufactures					
2 SES Solar Inc	sc-Si	-	n/a	n/a	n/a
3 3S PHOTOVOLTAICS	sc-Si, mc-Si	0	Approx. 5-10 MW	0	n/a
4 Sunage SA, Mendrisio	sc-Si	*n/a*		*n/a*	
Total					
Thin film manufacturers					
5 Pramac Suisse SA, Riazzino	a-Si	*production stopped spring 2012*			
6 VHF Technologies SA (Thin Film)	a-Si	Production stopped in 2012			
TOTALS		**n/a**		**0**	

Notes on manufacturers:

No.2: SES Switzerland (formerly SES, Société d'Energie Solaire SA), based in Geneva, produces and sells the "SUNSLATES", "SUNWALL" and "SUNSHADE" lines – standardised building elements for roofing and facades - as well as customer-specific modules. Figures on production are not available. www.sessolar.com

No.3: The 3S PHOTOVOLTAICS, a subsidiary of MEYER BURGER AG , (formerly 3S Swiss Sustainable Solutions) company is an equipment manufacturer for the global PV industry and, as a side business, produces custom laminates up to sizes of 2 x 3.5 m using bought-in cells laminated onto glass. Also, appropriate roof and façade-mounting systems are developed and sold.

No.4: SUNAGE SA was founded in October 2007 in Switzerland . The SUNAGE technology relies upon the certified and reliable process of monocrystalline silicon. The basic module supplies by 220 through 250 Wp in 7 power classes at nearly 50 volts and 5 amps.

No. 5 Pramac produced Micromorph Silicon Module since 2009 with technology from Oerlikon solar. They stopped production im May 2012.

No.6: VHF Technologies produces thin-film amorphous cells on plastic foil (polyimide) substrate. Brand name "Flexcell" owing to its highly flexible PV foil, Flexcell is able to deliver innovative mobile solar chargers and to provide integration solutions for the building industry (Building Integrated Photovoltaics). They stopped production in October 2012.

2.3 Module prices

Module prices decreased throughout the reporting year. By the end of the year some Chinese manufacturer offered modules for less than 0.70 CHF/W where as high efficiency modules sold for up to CHF 2.- / W in small quantities.

Table 8: Typical module prices for a number of years

Year	2004	2005	2006	2007	2008	2009	2010	2011	2012
Standard module price for small systems in the range of 3 to 10 kWp	4.30	4.80	5.20	5.00	5.00	3.80	3.60	2.50	1.30*
Best price, large systems (>100kWp)	4.10	4.60	5.00	4.80	4.80	3.30	2.20	1.30	0.85*

*average prices end of 2012, lower for overseas production, slightly higher for European production

2.4 Manufacturers and suppliers of other components

Switzerland has a strong industry for BOS-components. Among them are the following companies:

Inverters:
Sputnik engineering is one of the world leading manufacturer of Inverters for grid connection applications.
Studer electronics manufactures inverters for standalone systems.

Junction Boxes/connectors:
Multi Contact AG is the leading manufacturer of junction boxes , cables and connectors

Cables:
Huber & Suhner has a variety of dedicated PV cables since more than 20 years

Supporting structures:
montavent offers mounting systems for profiled metal and corrugated roofs.
ALUSTAND has mounting structures for tilted and flat roofs.

Storage batteries:
Leclanché develops and produces amongst others energy storage systems with large format lithium-ion cells.

2.5 System prices

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

Table 9: **Turnkey Prices of Typical Applications**

Category/Size	Typical applications and brief details	Current prices per W
OFF-GRID Up to 1 kW	Holiday houses, traffic control and many other applications	10.00 to 20.00
OFF-GRID >1 kW	Alpine huts, alpine dairies Maximum size for large alpine huts in the range of 10 to 20 kW	8.00 to 15.00
GRID-CONNECTED up to 10 kW	Roof mounted (attached)	3.00 to 4.00
GRID-CONNECTED up to 10 kW	Roof mounted (BIPV)	4.00 to 6.00
ON-GRID >100 kW to 1000 kW	Industry or public building (attached)	2.50
ON-GRID >100 kW to 1000 kW	Industry or public building (BIPV)	3.00 to 3.50

Picture 2 Courtesy BE Netz AG

Table 7a: National trends in system prices (2012)
Prices in CHF / W for 10 - 20 kW flat roof and 3 to 4 kW residential systems

YEAR	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
10-20 kW	13.00	13.00	12.50	11.80	11.00	10.40	10.20	10.10	9.90	9.40	9.20	8.40	7.50	8.5	9.00	9.10	8.70	7.25	6.50	4.5	3.50
3-4 kW	13.40	13.30	13.20	12.80	12.60	12.30	12.30	11.90	12.50	12.20	11.00	9.25	9.10	10.00	10.0	9.65	9.80	8.80	7.00	6.50	5.00

The standard size for single family houses, for many years in the range of 2 to 4 kW, increased in the last couple of years considerably to 5 to 10 kW. The specific costs for systems of 3 kW or less thus remained comparatively high due to fixed costs like administration (grid connection), security issues while working on a roof etc.

2.6

2.7 Labour places

No exact figures are available for the number of persons employed in the PV area. The following figures are an estimate based on installed power, PV industry turnover, imports and budgets for research and development in 2012.

Table 10: Estimated PV-related labour places in 2012

Research and development (not including companies)	200
Manufacturing of products throughout the PV value chain from feedstock to systems, including company R&D	1 000
Distributors of PV products	300
System and installation companies, auxiliary services	3 000
Electricity utility businesses and government	100
Other: Equipment manufacturer along the value chain	4 000
Total	8 600

Picture 3 Solarpark Gams, Courtesy Heizplan AG

2.8 Business value

The value of PV business was approximately 20% lower than the year before. This is mainly due to much less export of equipment for cell and module manufacturing (Meyer Burger, Oerlikon)and only partly compensated with a 50% increase in turnover of the installers.

Total value of PV related manufacturing equipment: approx. 750 Mio CHF

Total value of BOS components and modules: approx. 450 Mio CHF

The total end financial value of PV plant installed is estimated at around CHF 600 Million. This is estimated on the basis of PV power installed in 2012 and average turn-key prices.

As practically all cells and the greater part of PV modules in Switzerland are imported, the added value figure is probably more interesting: This amounts to around CHF 400 million.

Table 11: Value of PV business

Sub-market	**Capacity installed *in 2012* (MW)**	**Price per W** *(from table 7)*	**Value**	**Totals**
Off-grid domestic	*100*	*10*	*1 000 000*	
Off-grid non-domestic	**100**	**10**	*1 000 000*	
Grid-connected distributed	**226 000**	**3.00**	*652 000 000*	
Grid-connected centralized	**0**		*0*	
				654 000 000
Export of PV products				*1 200 000 000**
Change in stocks held *(no information available)*				*0*
Import of PV products				*194 000 000***
Value of PV business				***1 660000 000***

* Inverters, BOS components, manufacturing equipment
(HCT, Oerlikon, Meyer Burger, 3S, Multi Contact, Huber & Suhner, Komax etc.)

** Modules and BOS for Swiss PV installations

3 FRAMEWORK FOR DEPLOYMENT (NON-TECHNICAL FACTORS)

Table 12: PV support measures

	On-going measures	Measures that commenced during 2012
Feed-in tariffs (gross / net?)	Starting in 2009, the Feed in Tariff system is similar to that from Germany with different prices for small and big systems and type of installation, BIPV, roof mounted, ground mounted. Duration of payment: 25 years Cap: Approx. 50 MW in 2012	FiT decreased by approx. 30% for 2012 in 3 steps (1.1.2012, 1.3.2012, 1.10.2012)
Capital subsidies for equipment or total cost	Some cantons with direct subsidies 3 cantons with FiT (Geneva, Basel Stadt, Basel Land)	
Green electricity schemes	Naturemade, certified renewable electricity scheme	
PV-specific green electricity schemes	Solar stock exchange	
Renewable portfolio standards (RPS)	Only on a voluntary basis by some utilities	
PV requirement in RPS	Low, mostly hydro, wind and biomass	
Investment funds for PV	None	
Income tax credits	yes	
Net metering	Some utilities for small installations only	
Net billing	Some utilities for small installations only	
Commercial bank activities e.g. green mortgages promoting PV	none	
Activities of electricity utility businesses	Solar stock exchange, RPS schemes	
Sustainable building requirements	yes	

3.1 Interest from electricity utility businesses

In Switzerland operate about 700 utilities. Most of them serving only one village or town (DSO, Distribution System Operator) and are publicly owned.

For PV, there is only a regulation on a national level which defines how much a utility has to pay for solar electricity as a minimum. A lot of utilities pay a premium which is normally below the national FiT but still helps their local producer to cover at least a part of the production costs.

3.2 Interest from municipalities and local governments

There is an increasing interest by municipalities in Switzerland. For new buildings like schools it becomes almost a must at least to check whether PV is possible on the roof.

Besides this municipalities are increasingly purchasing solar electricity within the framework of switching to 100% renewable electricity for community needs.

3.3 Standards and codes

With a fast growing market there is also more discussion on adapting some codes and standards in order to lower the administrative hurdles for new PV plants.

4 HIGHLIGHTS AND PROSPECTS

Swiss installation market doubled in 2012 to about 226 MW. This is despite a lot of bad news in Swiss newspapers about a bad investment environment for PV in Europe.

The outlook is still promising since Swiss parliament started to prepare an increase of the levy which feeds the FiT scheme. This shall come into effect by 2014.

Overall the market outlook for the next 3 years is quite good. The market players expect a continuous growth between 10 and 30% per year.

ANNEX A: COUNTRY INFORMATION

1) Retail electricity prices (for "normal" power, i.e. not special quality such as hydropower or solar electricity). Average price for end users (household) in 2012: approx. CHF 0, 16 / kWh

Household: Varies greatly according to area and utility. Prices typically:

Night time: CHF 0.08 – 0.12 per kWh

Day time: CHF 0.14 – 0.25 per kWh

Commercial / Public institution: Strongly dependent on consumption and regional utility:

Night time: CHF 0.07 – 0.09 per kWh

Day time: CHF 0.12 – 0.16 per kWh

Industry can mostly negotiate electricity prices depending on demand / supply situation and own power production.

2) Typical household electricity consumption (kWh): Around 5 500 kWh per household in the year 2012. Households account for 30,6 % of Swiss electricity consumption in 2011.

Total per capita electricity consumption in 2010: 7 589 kWh

3) Typical metering arrangements and tariff structures for electricity customers:

- Day-rate and off-peak tariffs for households.
- Special tariffs for interruptible supply (eg for heat pump installations)
- Net-metering for domestic PV installations < 3 kW since Feb. 2010
- Special rates for trade and industry as well as for large-scale consumers

4) Average household income 2010 - brutto: CHF 115 428

5) Typical mortgage interest rate in 2012: 2,00%

6) Voltage (household, typical electricity distribution network): 230V ac

7) Electricity industry structure and ownership: Heterogeneous with both vertically integrated and separate generation, transmission and distribution. Both municipal and state owned as well as private organisations are involved. Trend toward liberalisation and privatization. An electricity industry regulator www.swissgrid.ch is responsible for the high voltage transmission. Approx. 75% of the utilities are public owned.

8) price of diesel fuel (NC) 1.80 CHF

9) Typical values of kWh / kW for PV systems: 950 – 1100 kWh/kW for central plain. Higher in mountainous areas and in southern Switzerland.

(Sources: Swiss Statistical Yearbook, Swiss Federal Office of Energy, Association of Swiss Electricity Utilities, individual utilities, Swiss Solar Power Statistics)