Task 1

Exchange and dissemination of information on PV power systems

National Survey Report of PV Power Applications in Switzerland 2010

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On behalf of
Swiss Federal Office of Energy

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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°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.

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(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:

Enhanced 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 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 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 (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

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	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
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

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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 22 participating countries are Australia (AUS), Austria (AUT), 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.

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

This report has been prepared under the supervision of Task 1 by

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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 2010. 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.

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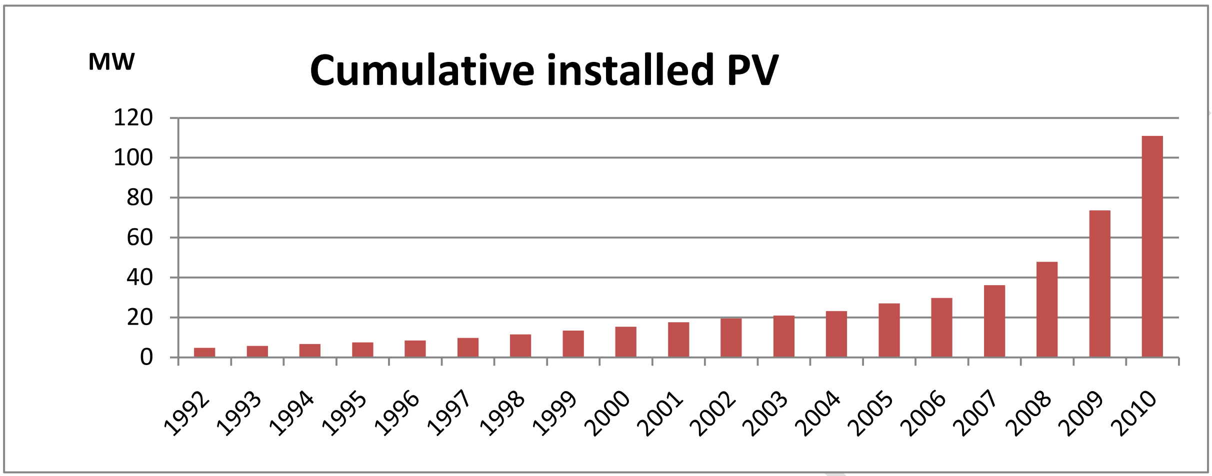
1 EXECUTIVE SUMMARY

1.1 Installed capacity

PV capacity in Switzerland reached 110 MW by the of 2010 (14 W/capita). Within 2 years, since introduction of the Feed in Tariff (FiT) scheme, the capacity has more than doubled.



Most of the Swiss PV industries (mainly equipment manufacturer) increased their turnover compared to 2009. Begin of 2010 the two companies Meyer Burger (wire saws) and 3 S (laminators) merged under the name Meyer Burger AG. Clients profit worldwide from broader product portfolio.

1.2 Costs & prices

The system prices dropped following the global market trend and also due to the decreased feed in Tariffs (minus 18% compared to 2009). Based on a survey done in 2010, the Swiss government decreased the Feed in tariffs for 2011 in average again by 18%. This let to a strong demand towards the end of 2010.

1.3 PV production

Still, there are only few companies with limited production serving only niche markets, in particular modules used in BIPV (Building integrated PV). For BOS components the strong global demand help companies like Multi Contact (junction boxes, connectors), Huber & Suhner (cables, connectors) and Sputnik Engineering (Inverters) to a distinct increase of their volume of business.

1.4 Budget for PV

R D&D budgets haven't increased in 2010 but direct subsidies from cantons increased by more than 50%. This in order to overcome the cap of the Feed in Tariff scheme set by federal legislation.

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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 and all installation and control components for modules, inverters.

For the purposes of this report, PV installations are included in the 2010 statistics if the PV modules were installed between 1 January and 31 December 2010, although commissioning may have taken place at a later date.

2.1 Applications for photovoltaics

In Switzerland, the majority of PV Installations are grid-connected plants, built mostly on the roofs of buildings. Larger installations (> 100 kW) are usually flat-roof mounted on commercial buildings, offices etc. A new market developed in 2009 with tilted roof installations on farmhouses with sizes ranging from 30 up to more than 100 kW.

The size of residential systems increased from a de facto standard in earlier years of 3 kW to up to 15 kW. The trend goes towards using the whole roof facing South (SE to SW) and not only a part of it. This is due to the fact that the Swiss FiT has no upper limits concerning the size of the installation.

2.2 Total photovoltaic power installed

The numbers are derived from the `Markterhebung Sonnenenergie 2010´. For further information see www.swissolar.ch

Table 1: PV power installed during calendar year 2010 in 4 sub-markets (kW).

Sub-market/ application	off-grid domestic	off-grid non-domestic	grid-connected distributed	grid-connected centralized	Total
PV power installed in 2010 (kW)	200 (estimation)		37 100	0	37 300

A summary of the cumulative installed PV Power, from 1992-2010, broken down into four sub-markets is shown in Table 3.

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

Total Swiss PV capacity (from Table 2) as a % of total Swiss electricity generation capacity by the end of 2010	New (2010) PV capacity (from Table 1) as a % of new electricity generation capacity	Total PV energy production as a % of total energy consumption
0.6%	**0.2%**	**0.18%**

Maximum production capacity for Switzerland is 17,8 GW, highest load (2008) 9.8 GW

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

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

*Author's estimates. Exact figures for the proportion of off-grid power for domestic and non-domestic applications are not available

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

1. In June 2010 the Swiss parliament adopted a revision of the energy law increasing the levy on electricity for the Feed in Tariff scheme by 50% to 0,9 CHFcents per Kilowatthour
   Due to this the market has been stimulated and increased by 50% from 25 MW to 37 MW.

2. The PV industry turnover comes close to 2 Billion Swiss francs (1 960 Million CHF) with a growing share stemming from installations in Switzerland.
   While some equipment manufacturer had a steady increase in turnover due to higher demand from the crystalline cell industry those being in the market for thin film production equipment sold much less than in the previous year.

2.4 Highlights of R&DD

(Excerpts from the PVPS annual report Switzerland)

RESEARCH, DEVELOPMENT AND DEMONSTRATION In the third year of the present RTD master plan, around 65 projects, supported by various national and regional government agencies 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. Based on these co-operations, the Oerlikon Solar company announced a new record efficiency of 11,9 % for micromorphous solar cells.

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 17,6 % was announced for CIGS solar cells on plastic substrate. For dye-sensitised solar cells, work continued at EPFL on new dyes and electrolytes as well as high temperature stability of the devices. Exploratory work was undertaken on new solar cell concepts (organic and extremely thin absorber (ETA) cells) at EMPA. An increasing interest for photovoltaic technology can be observed for 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. A dedicated website deals with the topic of BIPV (www.bipv.ch) and includes information about available products.

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With the ongoing market development, quality assurance and reliability of products and systems, as well as standardisation, continue to be of high priority. The Swiss centres of competence at the Technical Universities of Burgdorf and Lugano carefully evaluate products such as PV modules, inverters and new systems. The test infrastructure is continuously expanding and recently includes the largest solar simulator for inverter testing up to 100 kW capacity (Burgdorf, www.pvtest.ch) as well as a new test centre for IEC module certification (Lugano, www.isaac.supsi.ch/pv/labo). Long term experience with the operation of photovoltaic power systems is carefully tracked for a number of grid-connected systems, ranging between 10 and 25 years of operation. Continuous development of system solutions has resulted in a number of industrial products well positioned in the export market.

From vision to reality: The first prototype of the solar powered airplane Solar Impulse (www.solar-impulse.com) by Bertrand Piccard has reached a major milestone by achieving a first 26 hour non-stop flight. On the other hand, the solar powered boat PlanetSolar (www.planetsolar.org) finished its construction phase early in the year and started its world tour in September in Monaco. The boat reached Cancun right in time for the 16th United Nations Climate Change Conference in December 2010.

International co-operation continues to form a strong pillar of the R&D activities with 18 projects running in the 7th framework RTD programmes of the European Union during 2010. During 2010, a second joint call was terminated together with other European PV RTD programmes in the field of grid integration of photovoltaics. The co-operation within the IEA PVPS programme has remained a further strategic activity.

On the programme level, international co-operation is also taking place through the European PV-ERA-NET project (www.pv-era.net), the European Photovoltaic Technology Platform (www.eupvplatform.org) and the European Solar Industry Initiative.

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

Table 4: Public budgets for R&D, demonstration/field test programmes and market incentives. In Mio CHF

	R & D	Demo/Field test	Market incentives
National/federal	n/a yet	n/a yet	FiT for approx. 10 MW of new installations in 2010
State/regional	n/a	n/a	15,4

Please refer also to the Photovoltaic Programme Edition 2010, Summary Report, Project List, available soon www.photovoltaic.ch

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3 INDUSTRY AND GROWTH

3.1 Production of feedstocks, ingots and wafers

There is only one producer of ingots and wafers in Switzerland.

Table 5: Production and production capacity information for the year for silicon feedstock, ingot and wafer producers

Manufacturers	Process & technology	Total Production	Maximum production capacity	Product destination	Price
Swisswafers	sc-Si ingots.	Approx. 900 tonnes	Approx. 1000 tonnes/y	Export	n/a
Swisswafers	mc-Si ingots			Export	n/a
Swisswafers	sc-Si wafers	Approx. 120 MW	Approx. 145 MW/year	Export	n/a
Swisswafers	mc-Si wafers			Export	n/a

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.

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

3.2 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.

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Table 6: Production and production capacity information for 2010 for each manufacturer

Cell/Module manufacturer	**Technology** (sc-Si, mc-Si, a-Si, CdTe)	**Total Production (MW)**		**Maximum production capacity (MW/yr)**	
		Cell	Module	Cell	Module
Wafer-based PV manufactures					
1 Solterra	Modul production stopped in 2009, selling GESOLAR-Modules under own branding				
2 SES Solar Inc	sc-Si	-	n/a	n/a	n/a
3 3S PHOTOVOLTAICS	sc-Si, mc-Si	0	2,5	0	n/a
4 Sunage SA, Mendrisio	sc-Si	*9*		*n/a*	
Total					
Thin film manufacturers					
5 Pramac Suisse SA, Riazzino	a-Si	*n/a (11 MW until May 2010 in total)*		*30 MW*	
6 VHF Technologies SA (Thin Film)	a-Si	2,2 MW		10 MW	
TOTALS		**n/a**		**n/a**	

Notes on manufacturers:

No.1: Solterra stopped their own production in Switzerland in 2009 and distribute GESOLAR (China) modules with SOLTERRA branding.

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 produces Micromorph Silicon Module since 2009 with technology from Oerlikon solar.

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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).

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3.3 Module prices

Table 6 provides year 2010 PV **module prices** (excluding VAT): for small and large (best price) orders.

Table 7: Typical module prices for a number of years

Year	2004	2005	2006	2007	2008	2009	2010
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[1]
Best price, large systems (>100kWp)	4.10	4.60	5.00	4.80	4.80	3.30	2.20

3.4 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

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[1] Photovoltaik (PV) Anlagekosten 2010 in der Schweiz, NET Nowak Energie & Technologie AG, 2010

3.5 System prices 2010

Table 7 gives turnkey system prices (excluding VAT/TVA/sales tax) per Watt for the various categories of installation. Prices do not include recurring charges after installation such as battery replacement (where applicable) or operation and maintenance. Additional costs incurred due to the remoteness of the site or special installation requirements are not included.

Table 8: **Turnkey Prices of Typical Applications 2010 (CHF)**

Category/Size	Typical applications and brief details	Current prices per W[2]
ON-GRID up to 10 kW	Roof mounted (attached)	5.75
ON-GRID up to 10 kW	Roof mounted (BIPV)	7.25
ON-GRID >10 kW to 100kW	Industry, Farmhouse (attached)	4.90
ON-GRID >10 kW to 100kW	Industry, Farmhouse (BIPV)	5.64
ON-GRID >100 kW to 1000 kW	Industry or public building (attached)	4.62
ON-GRID >100 kW to 1000 kW	Industry or public building (BIPV)	5.08

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[2] Photovoltaik (PV) Anlagekosten 2010 in der Schweiz, NET Nowak Energie & Technologie AG, 2010

Table 7a: National trends in system prices (CHF) for on-grid standard installations
(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
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
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

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.

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3.6 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 2010

Table 9: Estimated PV-related labour places in 2010

Research and development (not including companies)	250
Manufacturing of products throughout the PV value chain from feedstock to systems, including company R&D	1 500
Distributors of PV products	150
System and installation companies	1 000
Utilities and government	100
Other: Equipment manufaturer along the value chain	7 000
Total	**10 000**

The estimated turnover of the whole PV industry in Switzerland grew to approx. 2 000 Mio CHF.

3.7 Business value

The value of PV business was approximately the same as the year before with an increase on the installer side and a decrease on the equipment manufacturer side.

Total value of PV related equipment: approx. 1 300 Mio CHF

Total value of BOS components and modules: approx. 600 Mio CHF

The total end financial value of PV plant installed is estimated at around CHF 260 Million. This is estimated on the basis of PV power installed in 2010 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 150 million.

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Table 9: Calculation of value of PV business

Sub-market	Capacity installed *in 2010* (kW)	Price per W (estimated average)	Value	Totals
Off-grid domestic	*100*	*15*	*1 500 000*	
Off-grid non-domestic	*100*	*15*	*1 500 000*	
Grid-connected distributed	*37 300*	*7.00*	*261 000 000*	
Grid-connected centralized			*0*	
Total installed PV				*Ca. 264 000 000*
Export of PV products				*1 900 000 000**
Change in stocks held *(no information available)*				*0*
Import of PV products *(estimate)*				*114 000 000***
Value of PV business				***2 050 000 000***

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

** Modules and BOS for Swiss PV installations

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4 FRAMEWORK FOR DEPLOYMENT (NON-TECHNICAL FACTORS)

Table 10 summarizes **PV support measures** in place during 2010:

Table 10: PV support measures

	On-going measures	Measures that commenced during 2010
Enhanced feed-in tariffs	Starting in 2009, the Feed in Tariff system is similar to that from Germany with different prices for small and bif systems and the art of installation, BIPV, roof mounted, ground mounted. Duration of payment: 25 years Cap: Approx. 30 MW	Parliament adopted increase by 50% in 2010 With this increase the cap will, thanks to decreasing tariffs for PV, be around 200 MW (cumulated) by 2013. FiT decreased by 18% for 2010
Direct capital subsidies	Few cantons with direct subsidies 2 cantons with FiT (Geneva, Basel Stadt)	
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	
Tax credits	Yes	
Net metering		Only with certain utilities due to the new FiT scheme
Net billing		Only with certain utilities due to the new FiT scheme
Commercial bank activities	Low	
Electricity utility activities	Solar stock exchange, RPS schemes	
Sustainable building requirements	Yes	

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4.1 Indirect policy issues

Decreasing module and system costs will lead to an even earlier than expected grid parity for residential customers. With tax rebates this can be already before 2015.

The Plus Energy House is recognized as a building standard of the future with examples already realized in the last couple of years. Since this is done by combining PV with a low energy house with heat pump system more and more advanced architects and engineers start to integrate PV into their building design. In 2010 the new standard for this house has been fixed (Minergie A).

4.2 Standards and codes

Switzerland is very actively engaged in the standardizing work for photovoltaic on a national as well as on a IEC level.

Installers have been trained in new course offered by Swissolar, the Swiss solar industry association. The collaboration with the federal electricity board (ESTI) is well established.

5 HIGHLIGHTS AND PROSPECTS

In June 2010 Swiss parliament revised the existing legislation for the financing of the feed in tariff scheme for renewable electricity production. The levy has been increased by 50% to 0,009 CHF/kWh.

Due to this and much lower system costs, the cap for PV installation is expected to be significantly increased to approx. 200 MW in total.

The installed capacity in 2010 reached a new all time high of more than 37 MW (5 W/capity).

For 2011 to 2013 it is expected, that about 50 to 60 MW per year can be financed with the FiT scheme.

In November 2010 Swiss government announced a further decrease of the feed in tariffs starting Jan. 2011 by 18% in average over all categories.

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ANNEX A: COUNTRY INFORMATION

The Data on PV Installations and plant presented in this report have been collected from federal institutions, manufacturers and their professional associations, engineering and consultancy offices and private and institutional initiators of building projects. Much data is taken from the annual reports of the Swiss Federal Office of Energy.

The Figures presented in this national report come from various sources and exhibit various degrees of accuracy. Key figures such as installed power are correct to about +/- 10%. Data concerning national R+D funding are exact. The figure for regional funding of market-oriented activities and subsidies is the sum on data from the 26 Swiss Cantons.

Price and market figures are based on information provided by manufacturers, and we can therefore not quote any percentages on the accuracy of these data.

As for our own estimates, we have quoted any base data sources and stated any assumptions made directly in the text of the report.

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ANNEX B   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 2010: approx. CHF 0, 16 / kWh

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

Low period: CHF 0.08 – 0.12 per kWh

Peak: CHF 0.14 – 0.25 per kWh

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

Low period: CHF 0.07 – 0.09 per kWh

Peak: 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 2010. Households account for 31,2% of Swiss electricity consumption in 2010.

Total per capita electricity consumption in 2010: 7 639 kWh

Growth of Population: 1% (2009 -> 2010)

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 2008: CHF 109 000

5) Typical mortgage interest rate in 2010: 2,5%

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.

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8) price of diesel fuel (NC) 1.75 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)

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