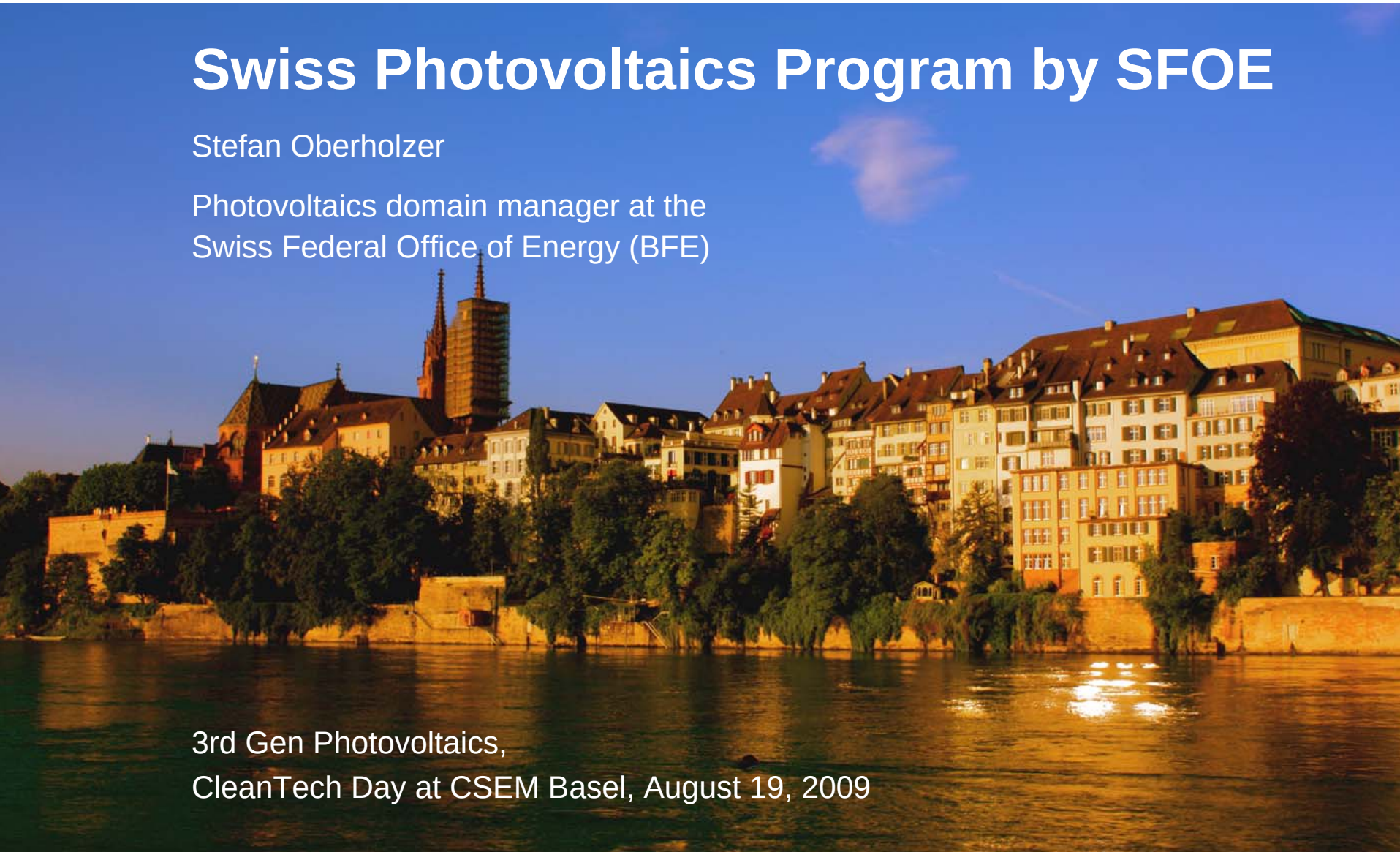
Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Bundesamt für Energie BFE
Office fédéral de l'énergie OFEN
Ufficio federale dell'energia UFE
Swiss Federal Office of Energy SFOE

Swiss Photovoltaics Program by SFOE

Stefan Oberholzer

Photovoltaics domain manager at the
Swiss Federal Office of Energy (BFE)



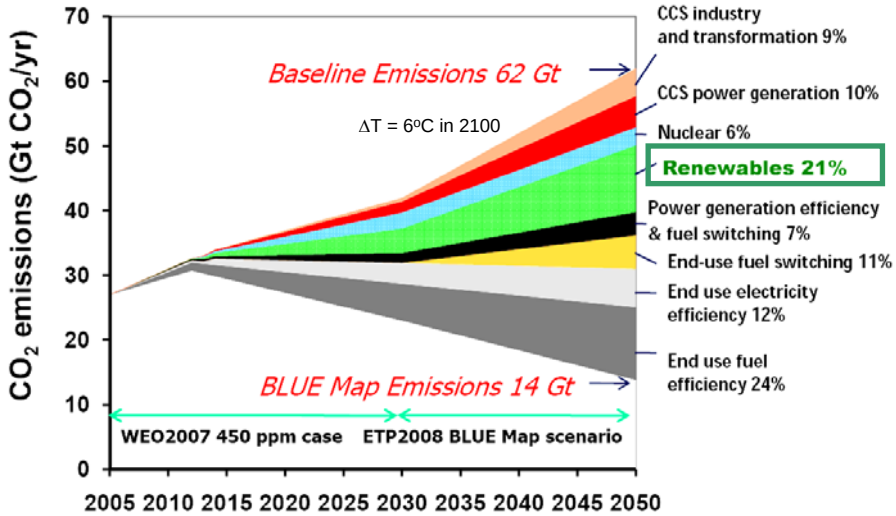
3rd Gen Photovoltaics,
CleanTech Day at CSEM Basel, August 19, 2009

Photovoltaics in actual energy scenarios

ENERGY TECHNOLOGY PERSPECTIVES 2008

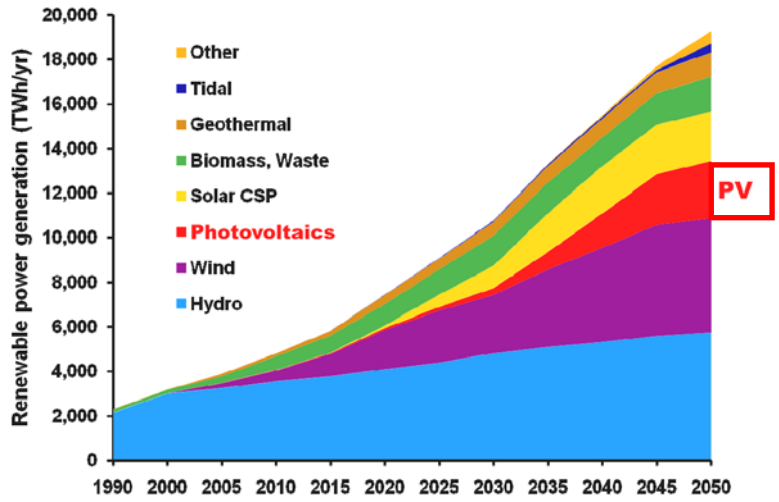
BLUE Map scenario:

minus 50% energy related CO_2
in 2050 compared to 2005



Costs: 200 - 500 \$/tCO_2

growth of renewables

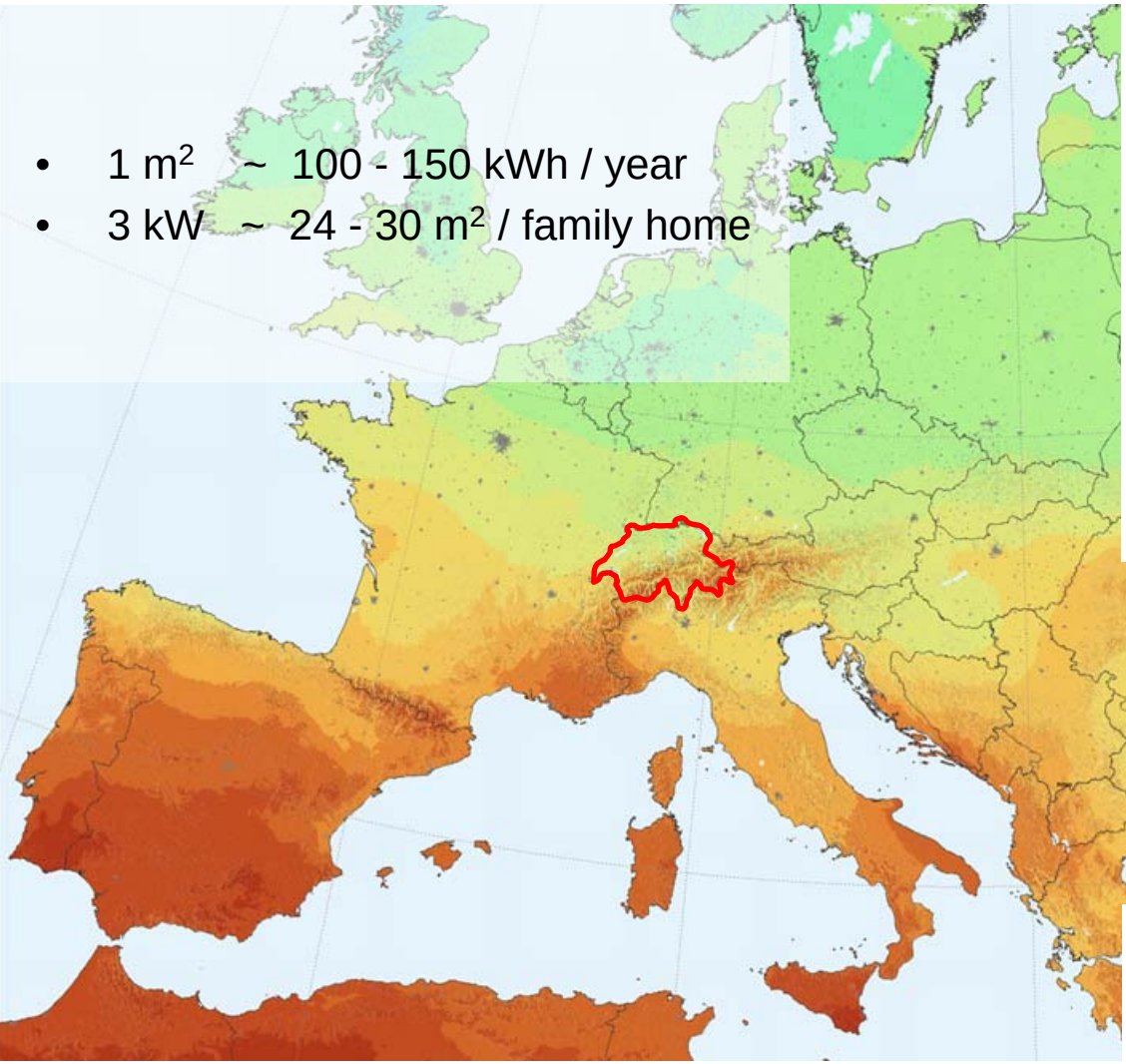


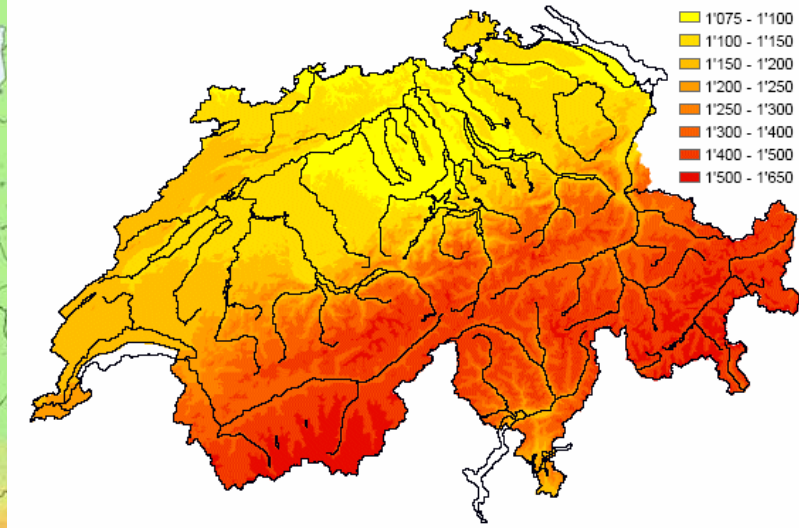
R&D crucial

source: Energy Technology Perspectives 2008
International Energy Agency (2008)

Potential for photovoltaics in Switzerland

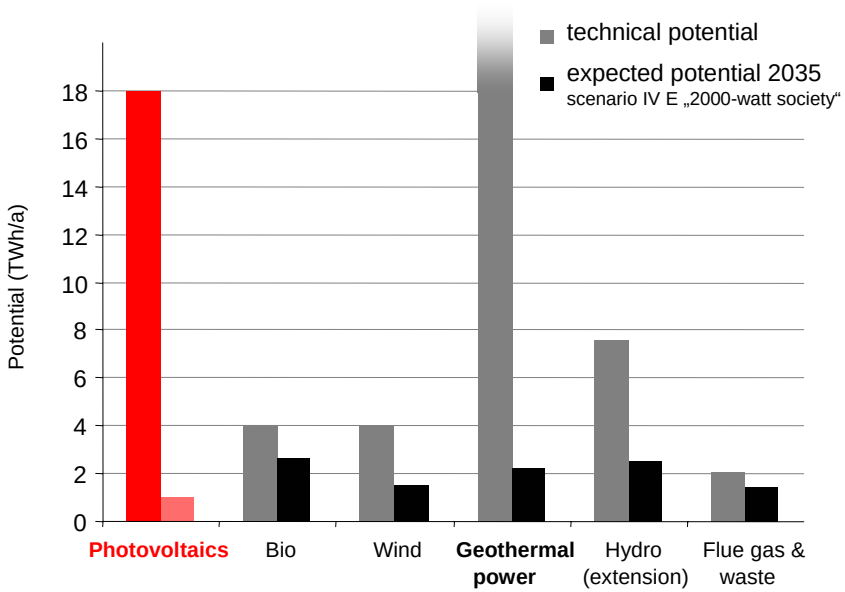
- 1 m^2 ~ 100 - 150 kWh / year
- 3 kW ~ 24 - 30 m^2 / family home





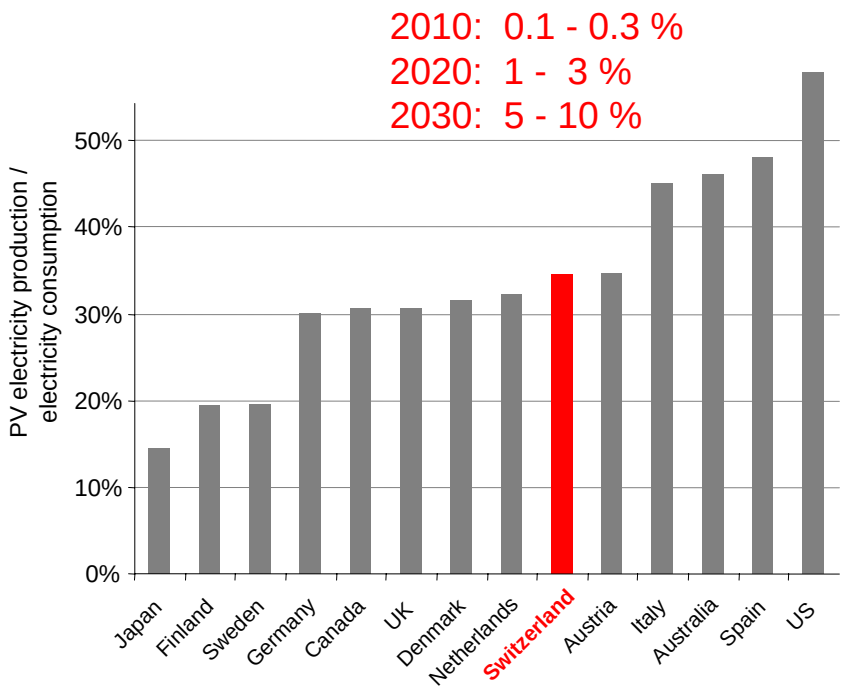
Potential for photovoltaics in Switzerland

potential for renewable energies in Switzerland (electricity)



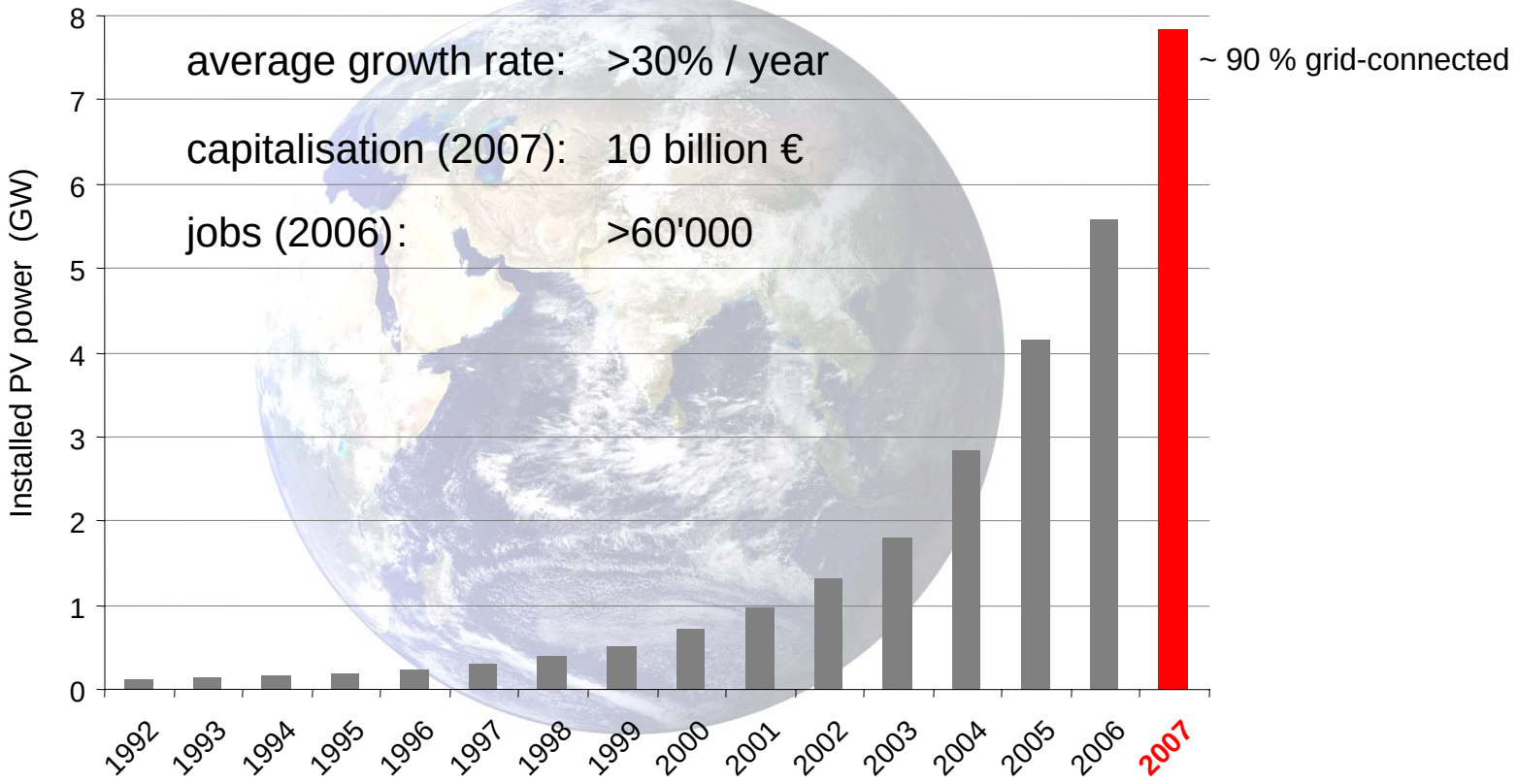
source: Swiss Energy Perspectives for 2035 (SFOE)

BIPV-production / electricity consumption in various countries



source: IEA-PVPS Task 7 (2002)

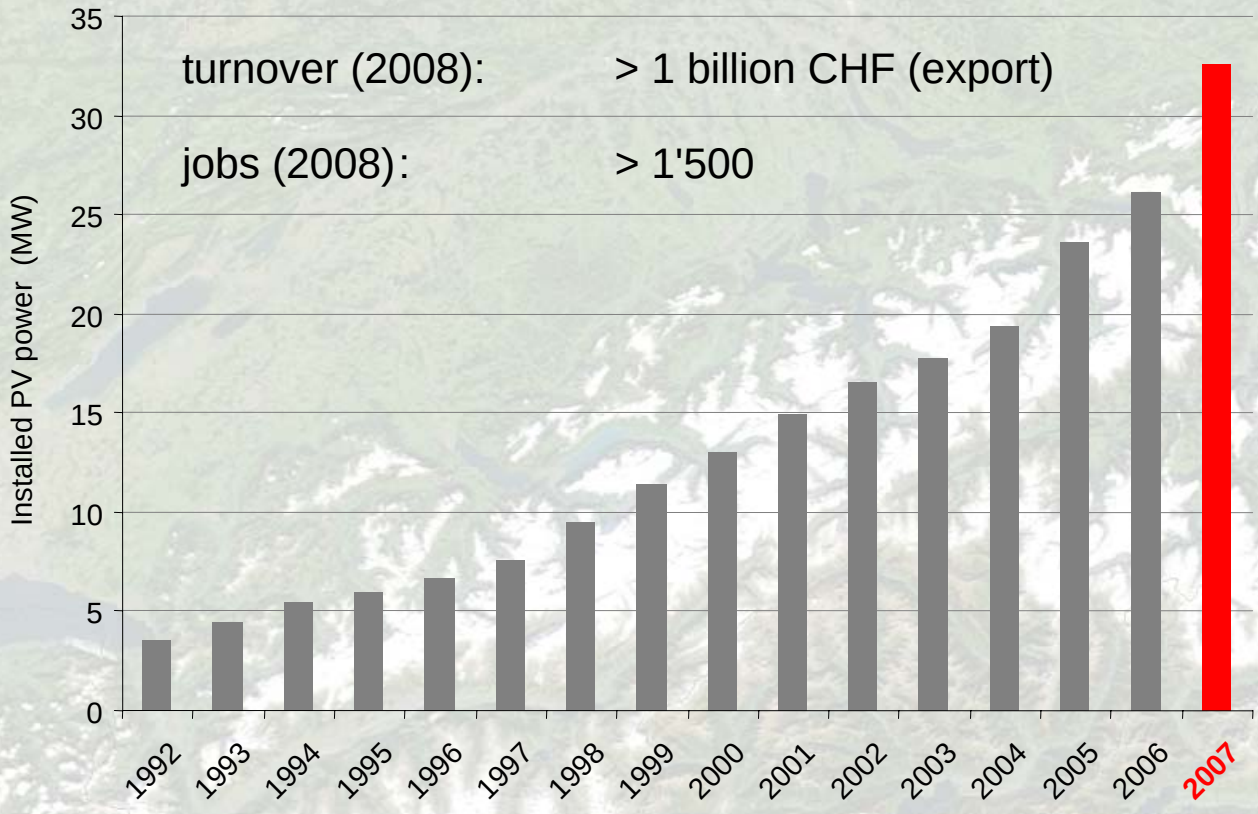
World Market: total installed PV power: ~ 8 GW



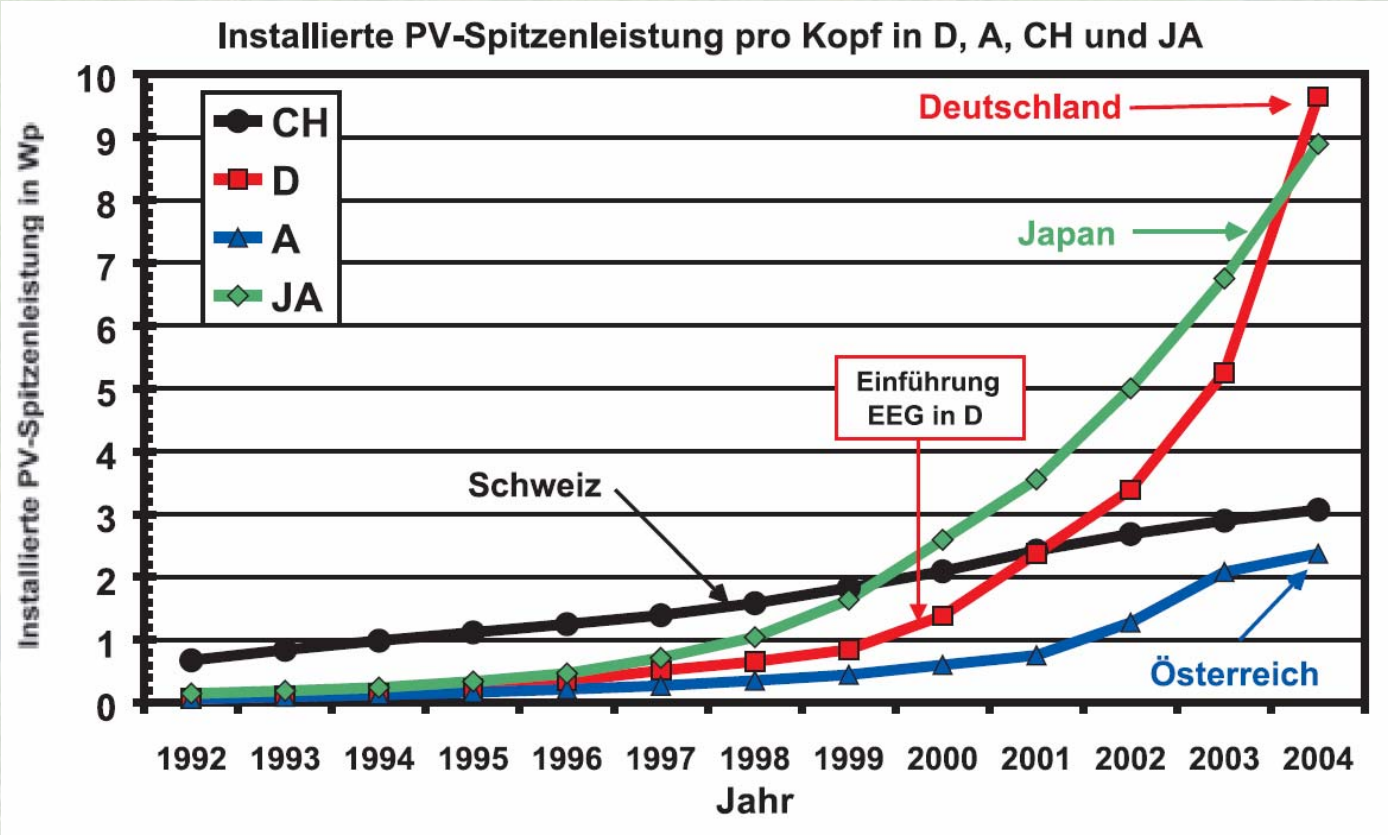
energy: 7 TWh (0.01%)

consumption: 130‘000 TWh

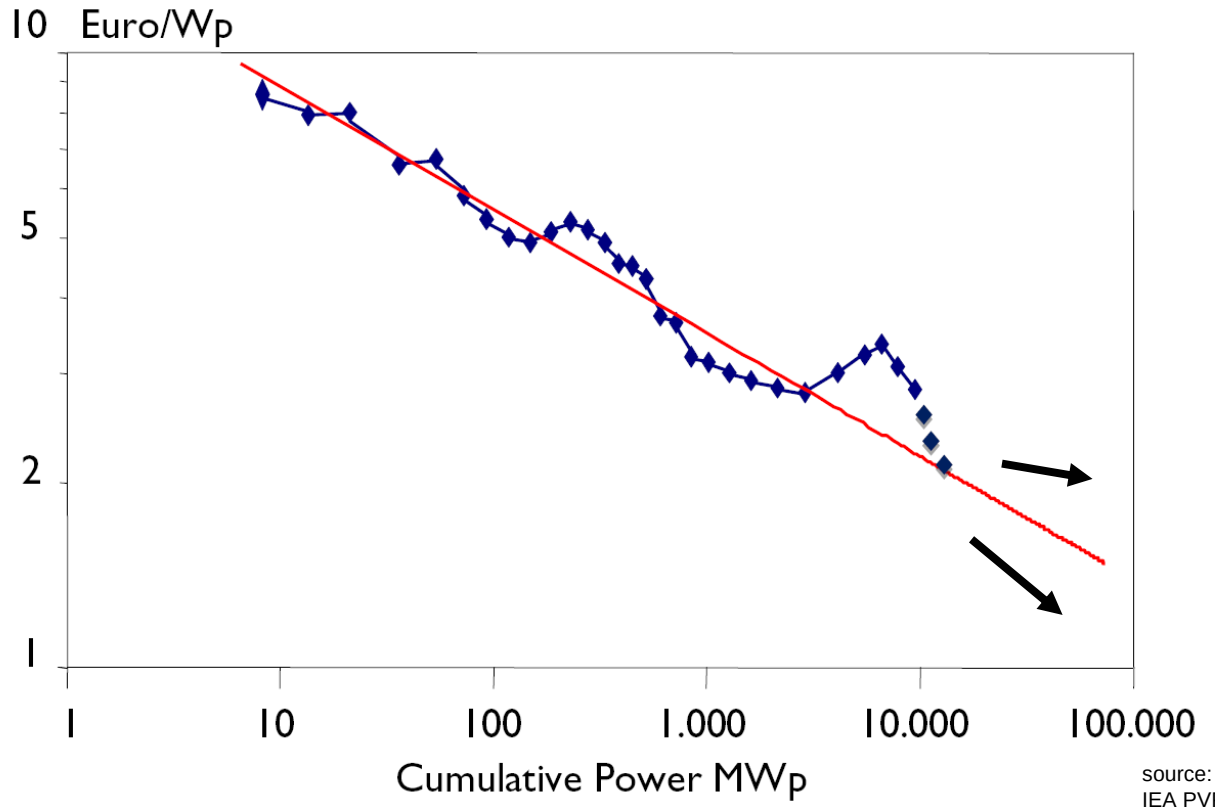
Swiss Market: total installed PV power: ~ 32 MW



Installed PV power per capita



Cost development: experience curve for silicon PV modules



source:
IEA PVPS and Fraunhofer Institute

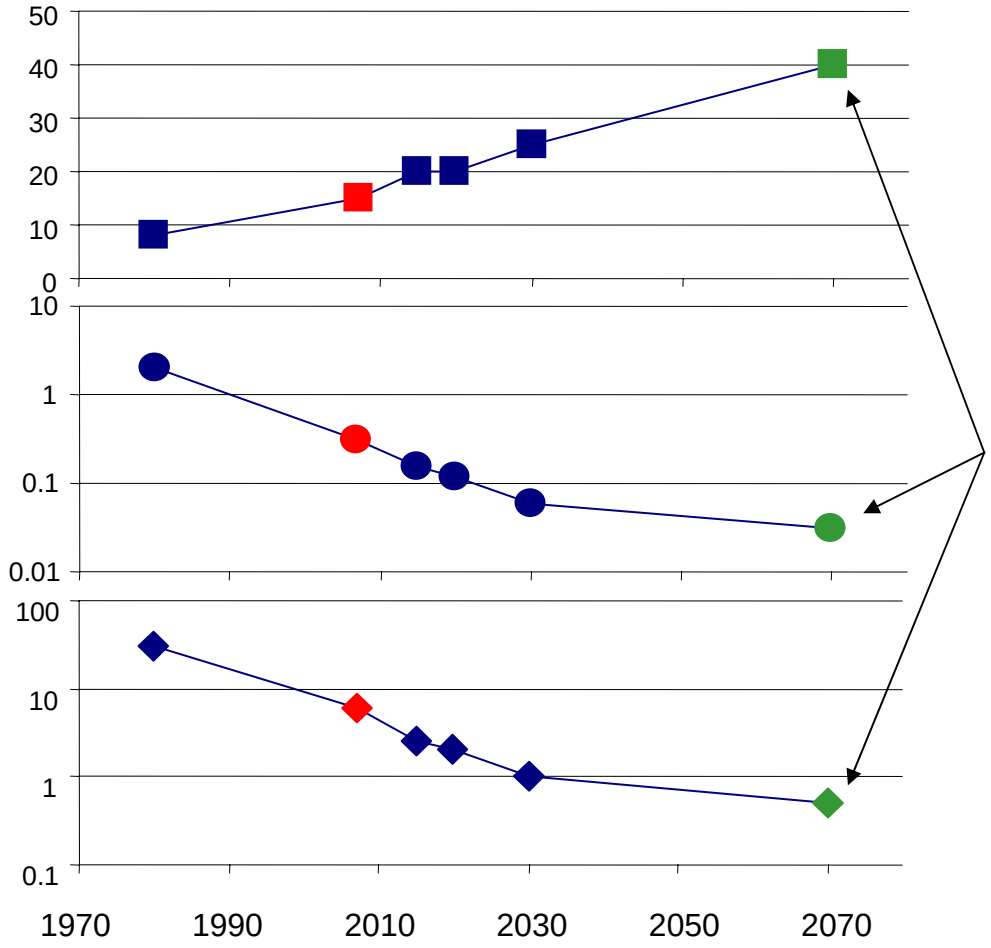
- Price of the technology has decreased by 20% for each doubling of cumulative installed capacity
- Driving forces are: market size, technology improvement, promotion programs

Key figures and targets of PV technology over time

typical commercial flat-plate module efficiencies (%)

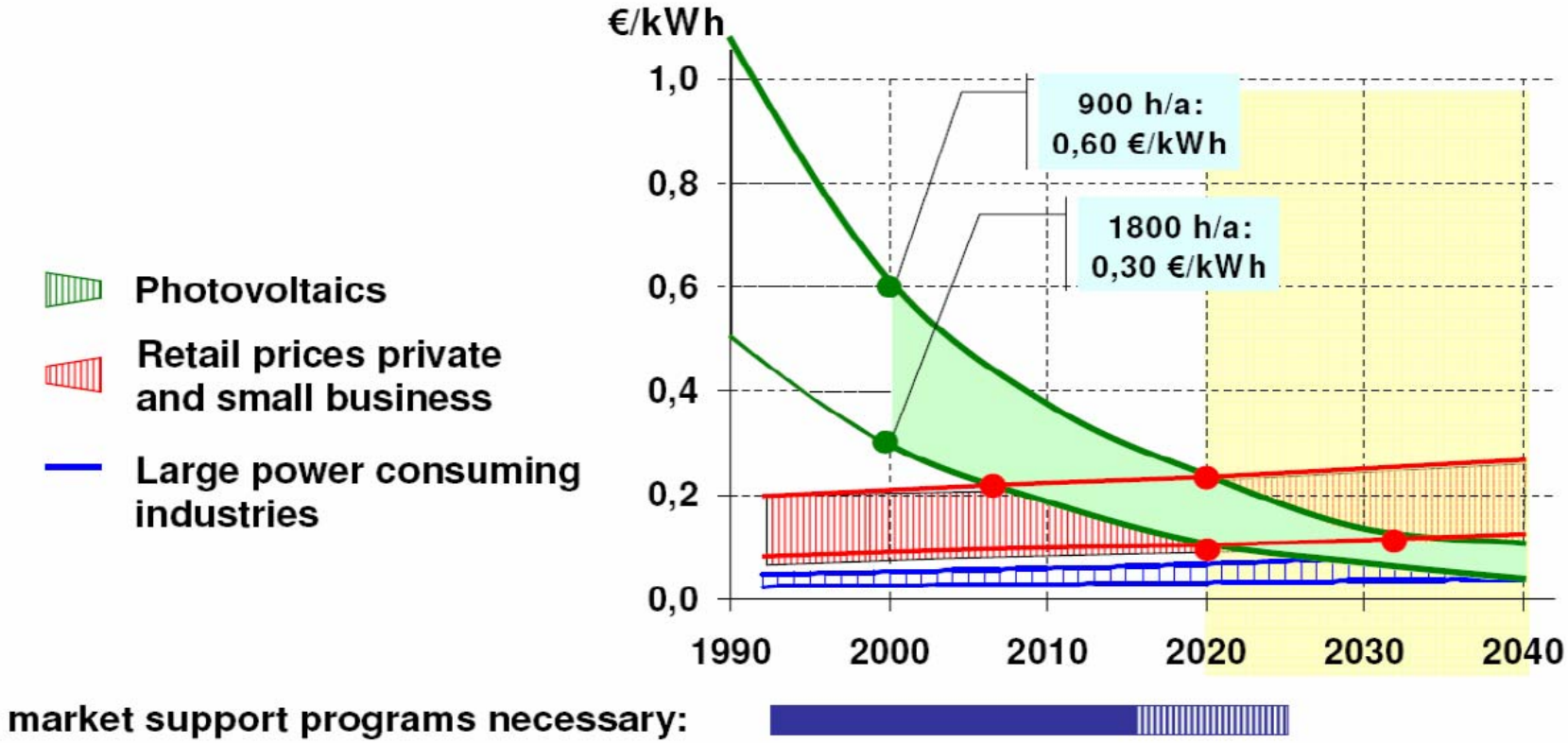
generation costs southern Europe (€/kWh)

turn-key system price (€/Wp)



source:
Strategic Research Agenda for Photovoltaic Solar Energy Technology
European PV Technology Platform

Grid parity



source: Winfried Hoffmann (EPIA)

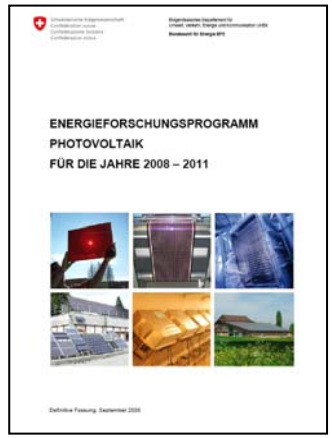
in Switzerland around 2020

Key data of Photovoltaics history in Switzerland

1982	**first grid-connected PV system** in Europe
1985	Swiss Photovoltaics Program of the SFOE
1989	Appearance of first building integrated PV-systems
1991	**„Burgdorf“-model**: for 12 years CHF 1.00 / kWh
1992	PV-demonstrationprogram for schools
1995	Start „Solarstrombörse“
2003	**Growing industrialisation (tech.transfer)**
2008	**Cost-covering remuneration** for feed-in to the electricity grid (KEV)

Swiss Photovoltaics Program

- One of the running programs of the **Swiss Energy Research** coordinated by the Swiss Federal Office of Energy

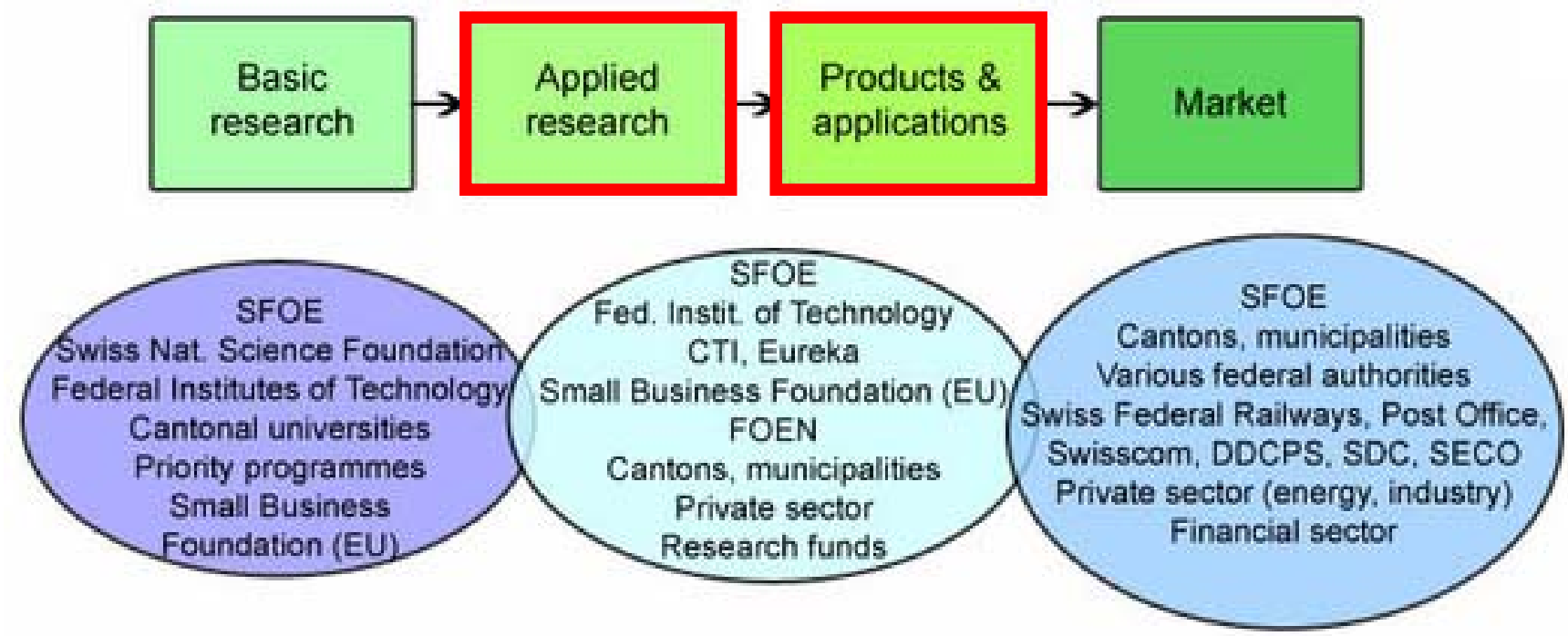


- **Objectives** of the photovoltaics programme are defined in the energy research concept 2008 - 2011 of the **Federal Energy Research Commission (CORE)** .Detailled objectives and the program implementation are described in the **Photovoltaic Concept 2008 - 2011**.

- Main goals for period 2008 - 2011

  - **Lowering the costs**: CHF 3/W_p (module), CHF 5/W_p (systems) (2011)
  - **Increase efficiency** (solar cells)
  - **Lowering material and energy input**
  - **Simplification and standardisation** of electrical system technology
  - Increase of availability and variety of industrial products

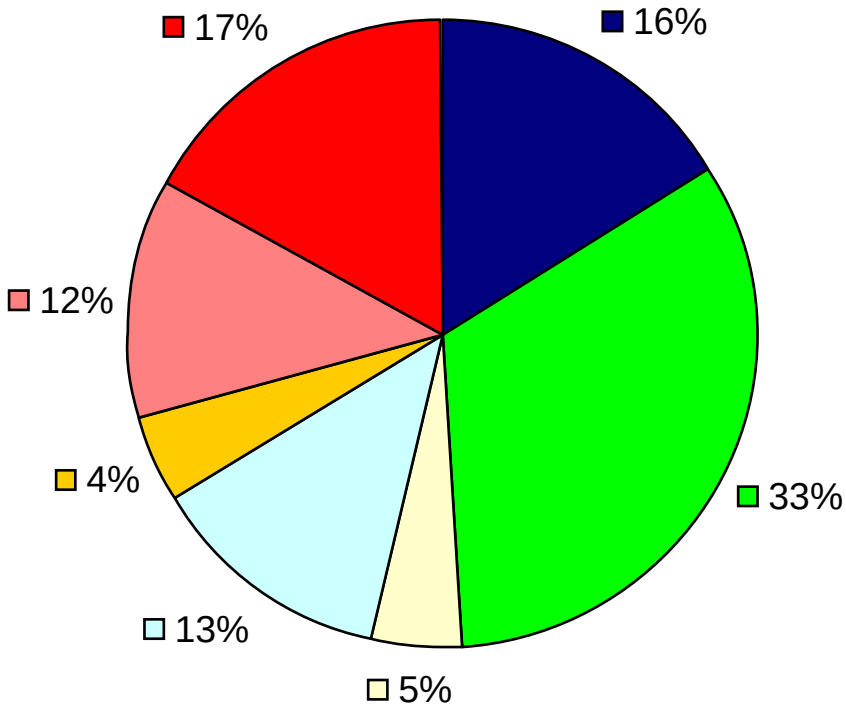
Swiss Photovoltaics Research Program: actors & structure



- ~ **50 projects** (40 research & development, 10 pilot & demonstration)
- **Overall coordination by the Swiss Federal Office of Energy** (SFOE)

Public funding for PV-research

~ 11 Mio CHF (2008)

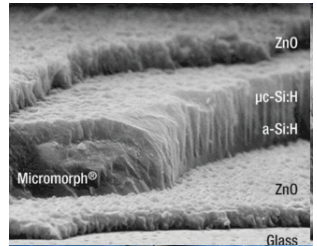


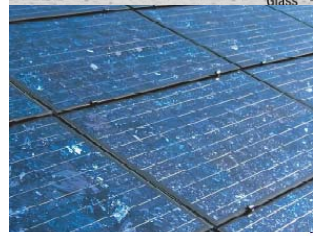
- Swiss Federal Office of Energy
- ETH domain
- Swiss National Science Foundation
- European Union
- State Secretariat for Education and Research
- CTI Innovation Promotion Agency
- Cantons & Communities

Swiss Photovoltaics Research Program: areas

- **Solar cells**
  thin film solar cells (silicon, compound semiconductors, dye senitized)
  organic and polymer solar cells

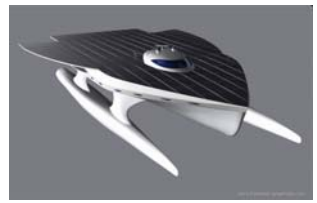
- **Solar modules** and integration into buildings





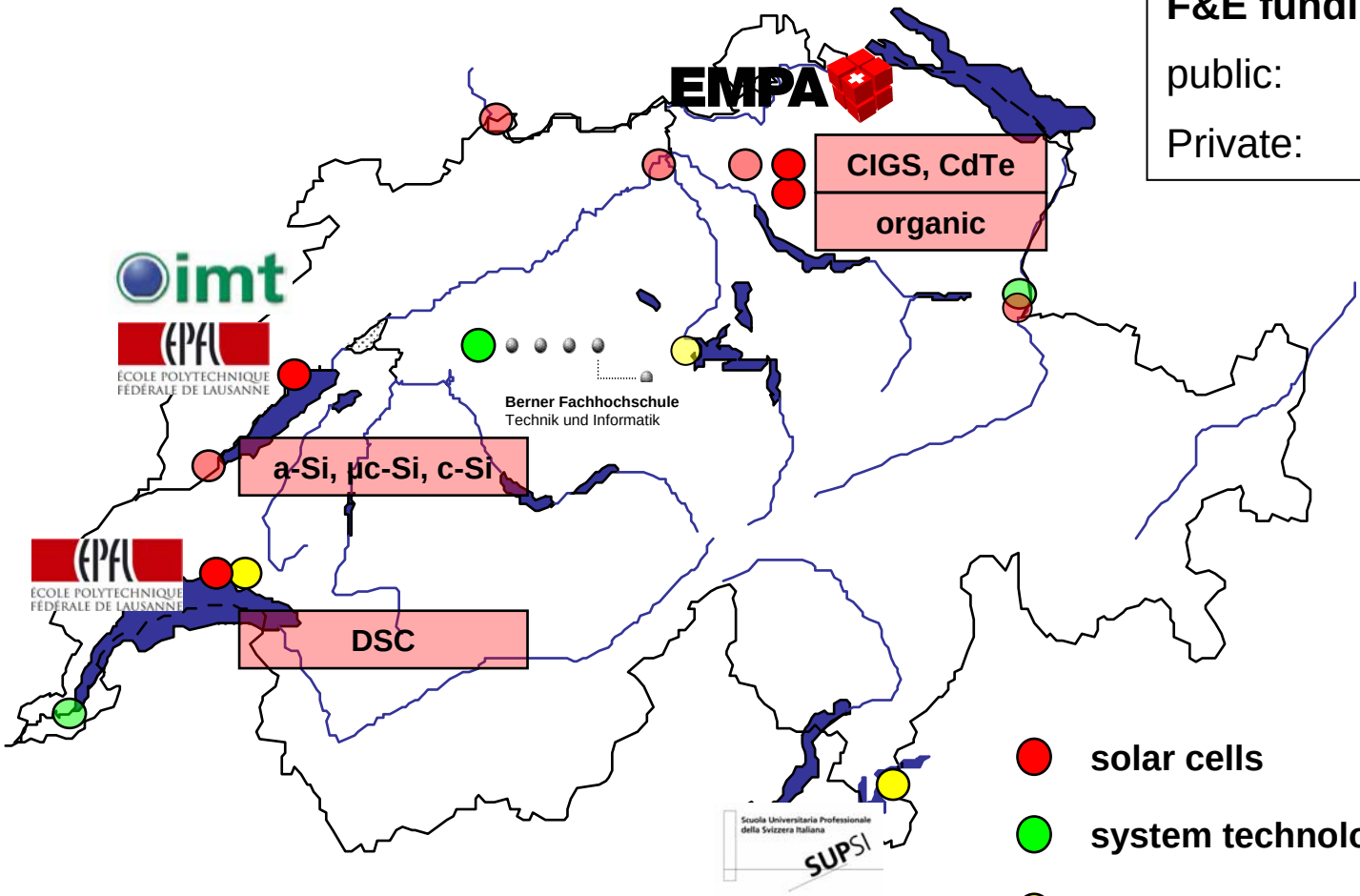
- **Electrical systems technology**
  quality assassment / certification of products (inverters)

- **Related topics**
  instruments for planning and monitoring, environmental aspects
  combining photovoltaics with other form of energies (electric cars …)



- **Institutional co-operation at the international level**
  EU PV-Technology Platform, PV ERA-NET, IEA PVPS, EC, …

PV competences in Switzerland



F&E funding

public: ~ 11 Mio CHF

Private: > 50 Mio CHF

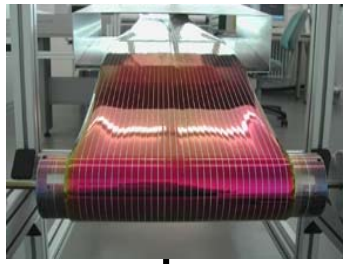
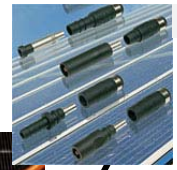
solar cells

system technology

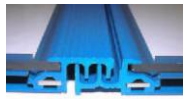
modules & building integrated PV

Swiss industry along the PV value chain







Swiss Wafers AG

oerlikon solar

flexcell

MC

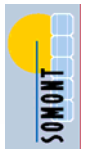
HUBER+SUHNER

PVSYST

Schweizer

Materials	Tooling	Deposition systems	Manu-facturing	Compo-nents	Inverters	Software tools	Mounting systems




APPLIED MATERIALS think it. apply it.

MEYER BURGER SWISS SLICING SYSTEMS

komax

SOMONT

STUDER

Solar Dach

Sarnafil



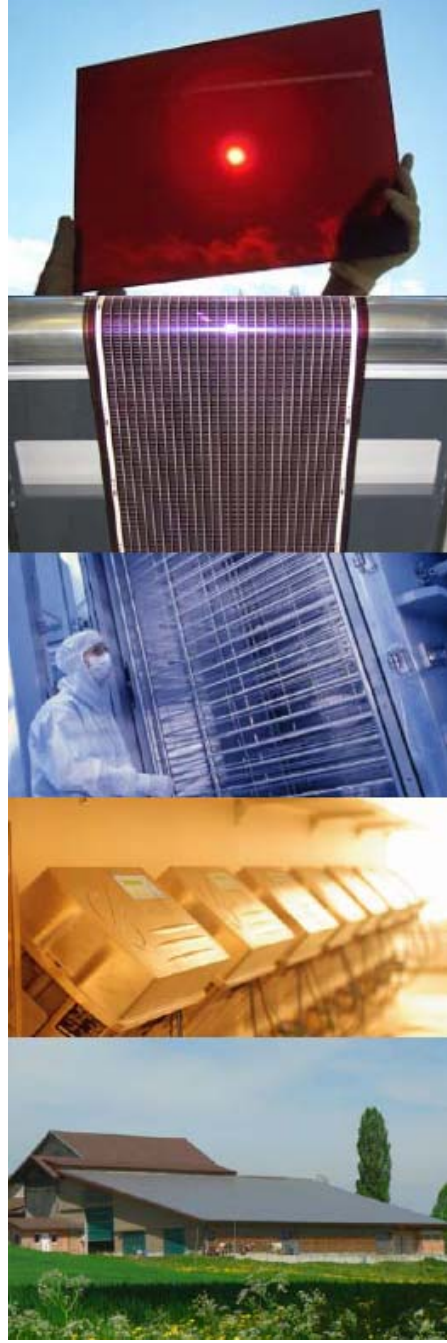
asp

source:
NET AG

turnover (2008) > 1 billion CHF

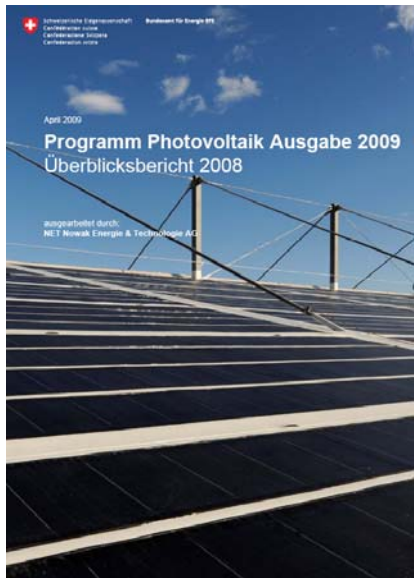
Summary

- **Swiss photovoltaics research and technology are at a high level** when considered at an international scale.
- Good **transfer of the results** of Swiss photovoltaic research into industry
- Photovoltaics offers very interesting opportunities for Switzerland as technology and industry location
- **Swiss photovoltaics industry is continously increasing** (mainly export)
- **Home market conditions have to be improved** to tap the potential of photovoltaics as renewable energy source for Switzerland



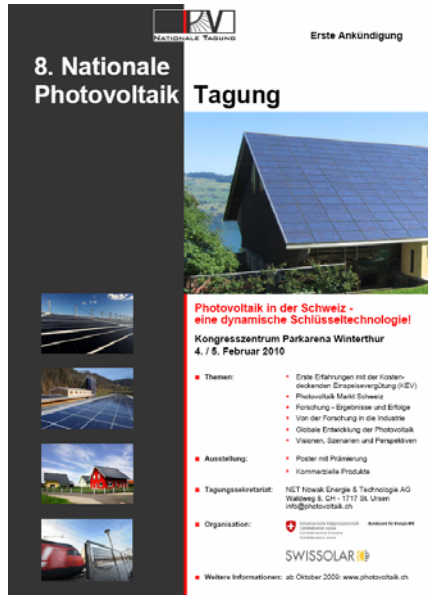
More information

annual report 2008



Photovoltaic
Concept 2008 - 2011

National PVConference
4. & 5.2.2010, Winterthur



http://www.bfe.admin.ch/forschungphotovoltaik/
www.photovoltaic.ch
www.swissolar.ch

Thank you for your attention

Contact

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Urs Wolfer (SFOE PV-market, urs.wolfer@bfe.admin.ch)