2nd International Conference on PV Investments
EPIA, Frankfurt/Germany, February 19th, 2008

How is policy shaping market developments: The successful story of Germany

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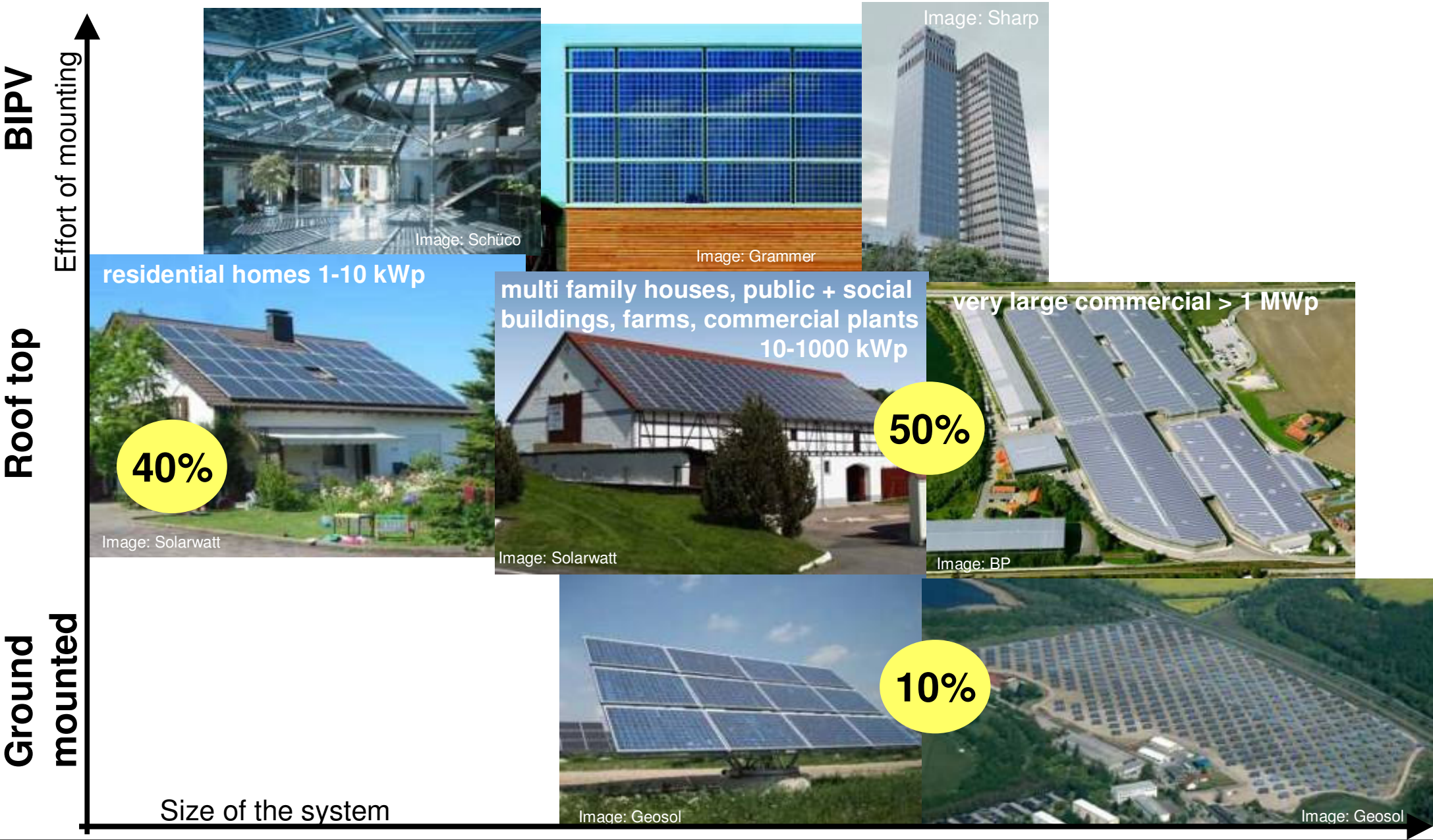
BSW - Bundesverband Solarwirtschaft
German Solar Industry Association

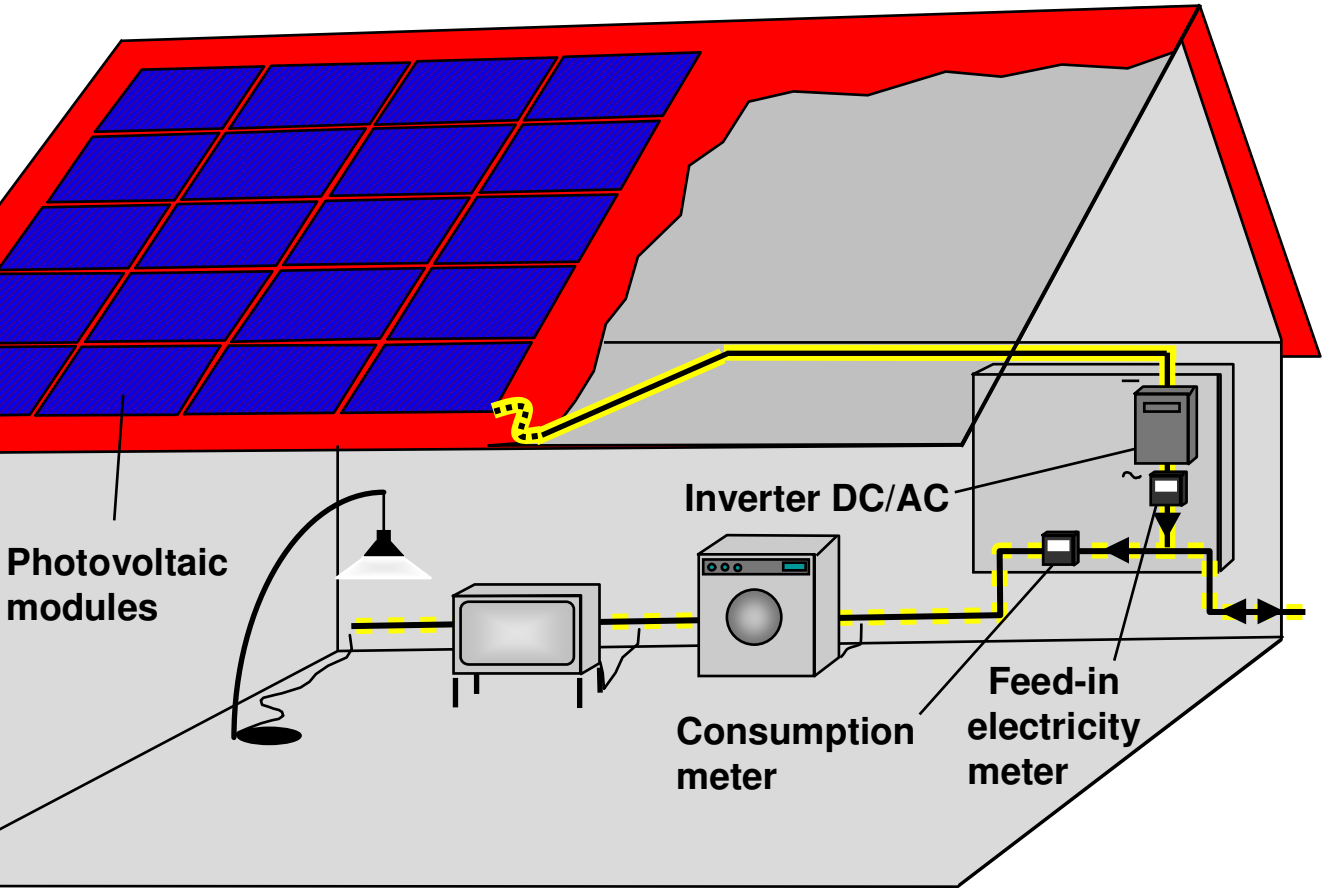
TASK	Representing German solar branch in the solar thermal energy and photovoltaics sectors
VISION	A worldwide sustainable energy supply using solar energy
ACTIVITIES	Lobbying, political advice, public relations, market observation, standardization
TIME	Over 25 years of activity in the solar energy sector
MEMBERS	More than 600 solar producers, suppliers, wholesalers, installers and other companies active in the solar field
HEADQUARTERS	Berlin

Market segments of on-grid PV Systems in Germany



Grid-Connection of PV Systems in Germany

Every kWh of solar electricity produced is fed into the grid, sold to the utility and payed with a fixed price

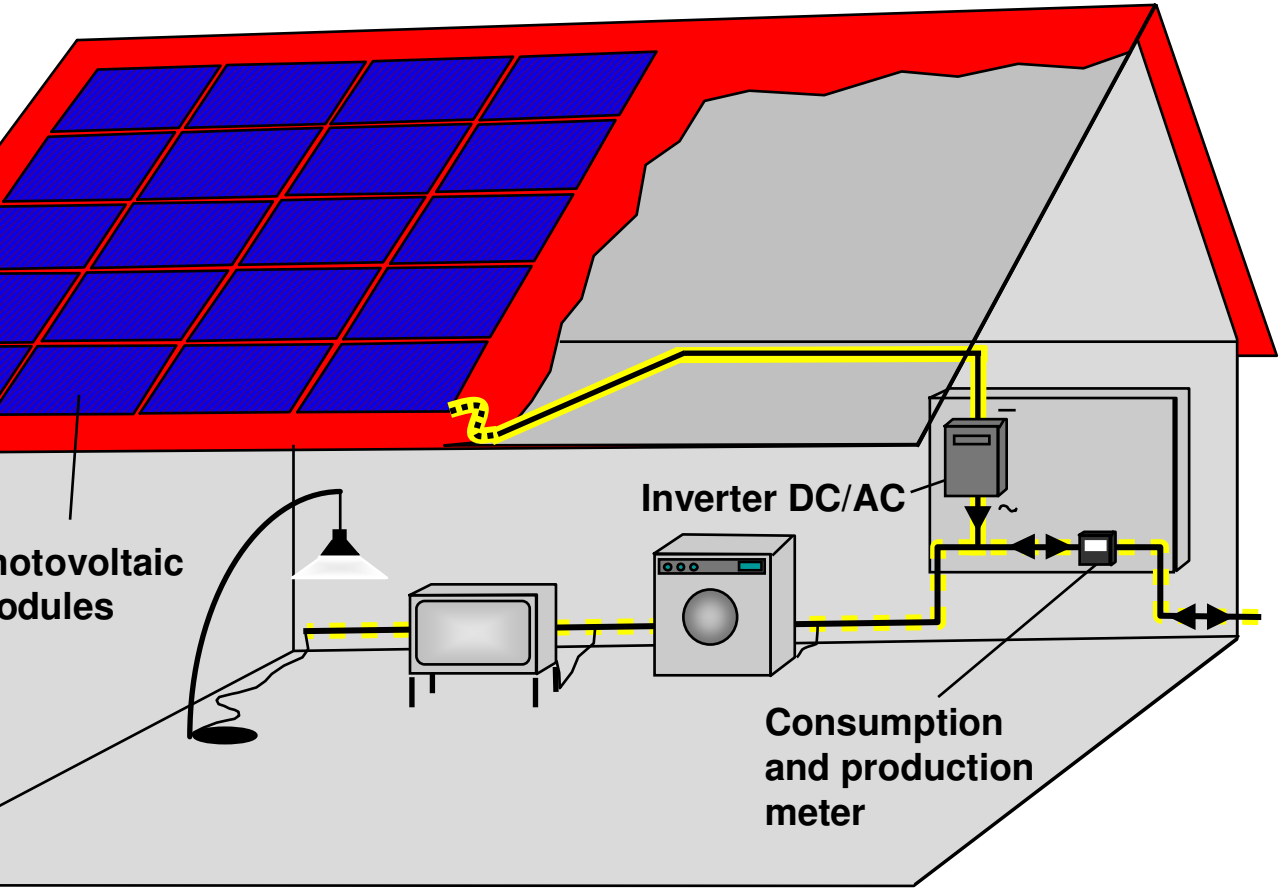


Typical data of a small PV system (per kWp)

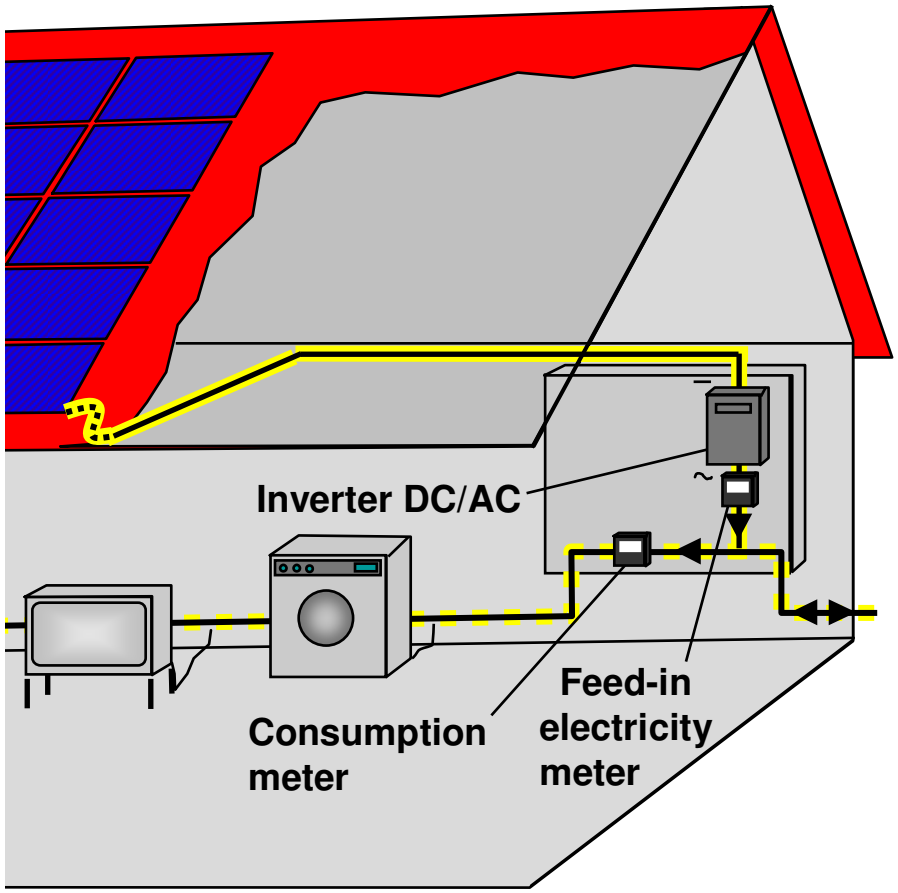
Investment costs:	**4,500 €** (6,525 $)
Annual production of solar electricity:	**900 kWh/a**
Feed-in tariff:	**0.467 €/kWh** (0.67 $/kWh) payed over 20 years
Feed in payment:	**420 €/a** (610 $/a)
Interest rates (KfW):	**5.2%/a eff**

1 $ = 0.69 €

Ways of grid-Connection of PV Systems



USA: Net-metering



Germany: Feed-in tariff

Development of the German PV-market

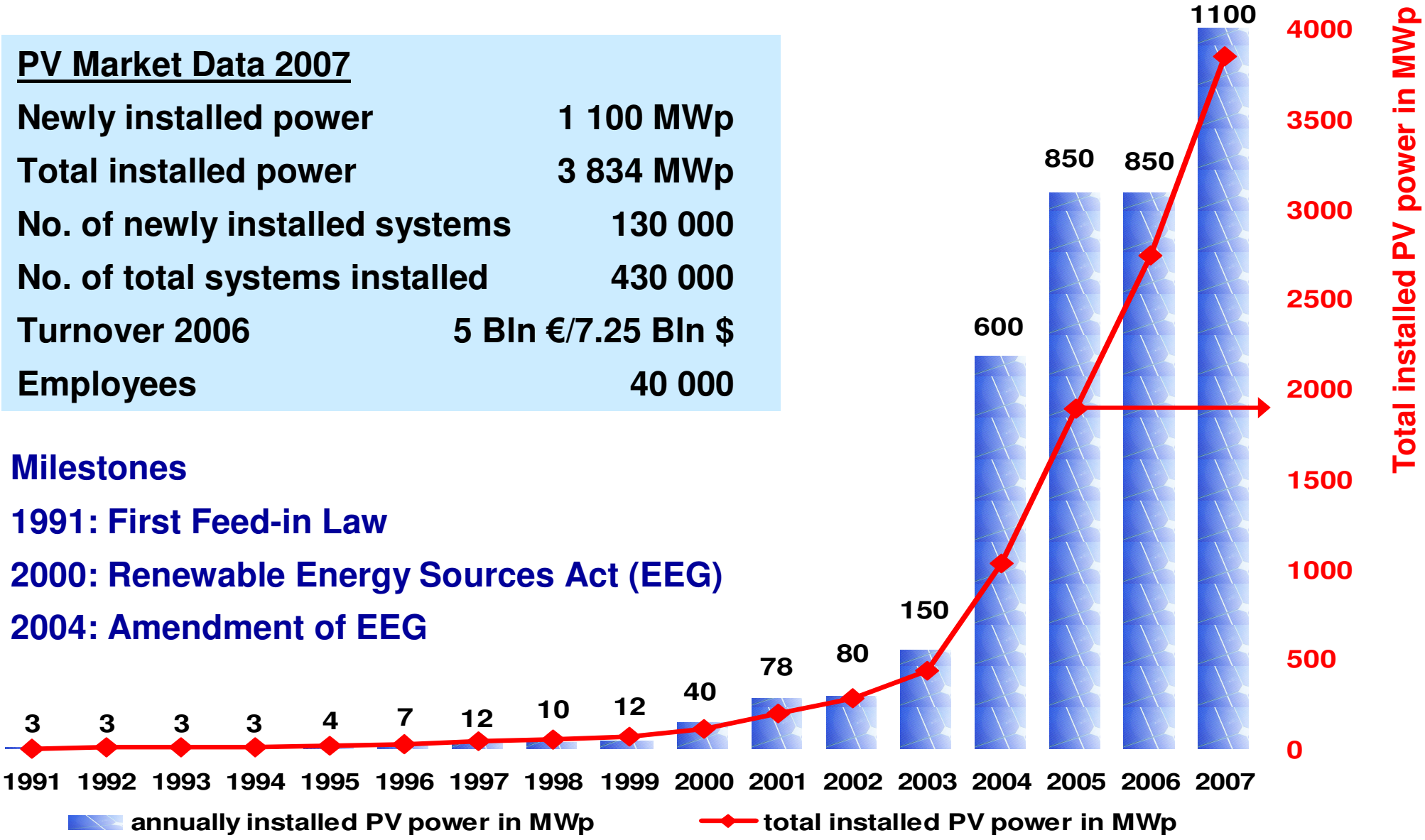
PV Market Data 2007	
Newly installed power	1 100 MWp
Total installed power	3 834 MWp
No. of newly installed systems	130 000
No. of total systems installed	430 000
Turnover 2006	5 Bln €/7.25 Bln $
Employees	40 000

Milestones

1991: First Feed-in Law

2000: Renewable Energy Sources Act (EEG)

2004: Amendment of EEG

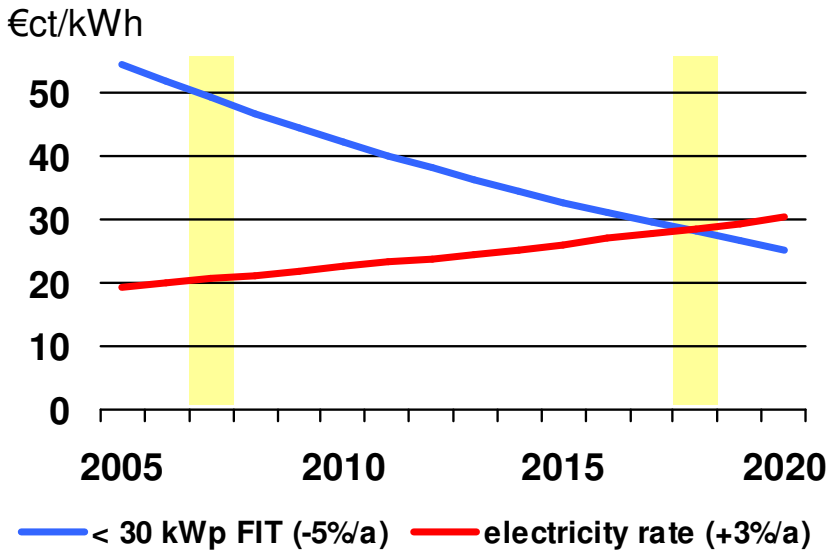


How does the German feed-in law (EEG) work

Principles

- Every PV system **has to be connected** to the grid
- Every solar kWh **has to be bought** by the utility
- **Fixed feed-in tariff over 20 years**
- **Reduction of the feed-in tariff every year by 5%** for newly installed PV systems

FIT and electricity rate in Germany



Grid parity will be reached in 2018

2.22 TWh solar electricity sold for mio€ 1,176 [mio$ 1,700] (average €53ct per kWh)

Share of solar electricity: 0.45%

Fossil and nuclear electricity

(and other renewables)

Utilities grid

Consumption of 495 TWh

Price private consumer: appr. €20ct per kWh Including €0.24ct for PV

consumer

Price increase for consumer: 1.2%

Data of 2006

Feed-in tariffs in Germany 2008

for PV systems installed in 2008,
guaranteed over 20 years

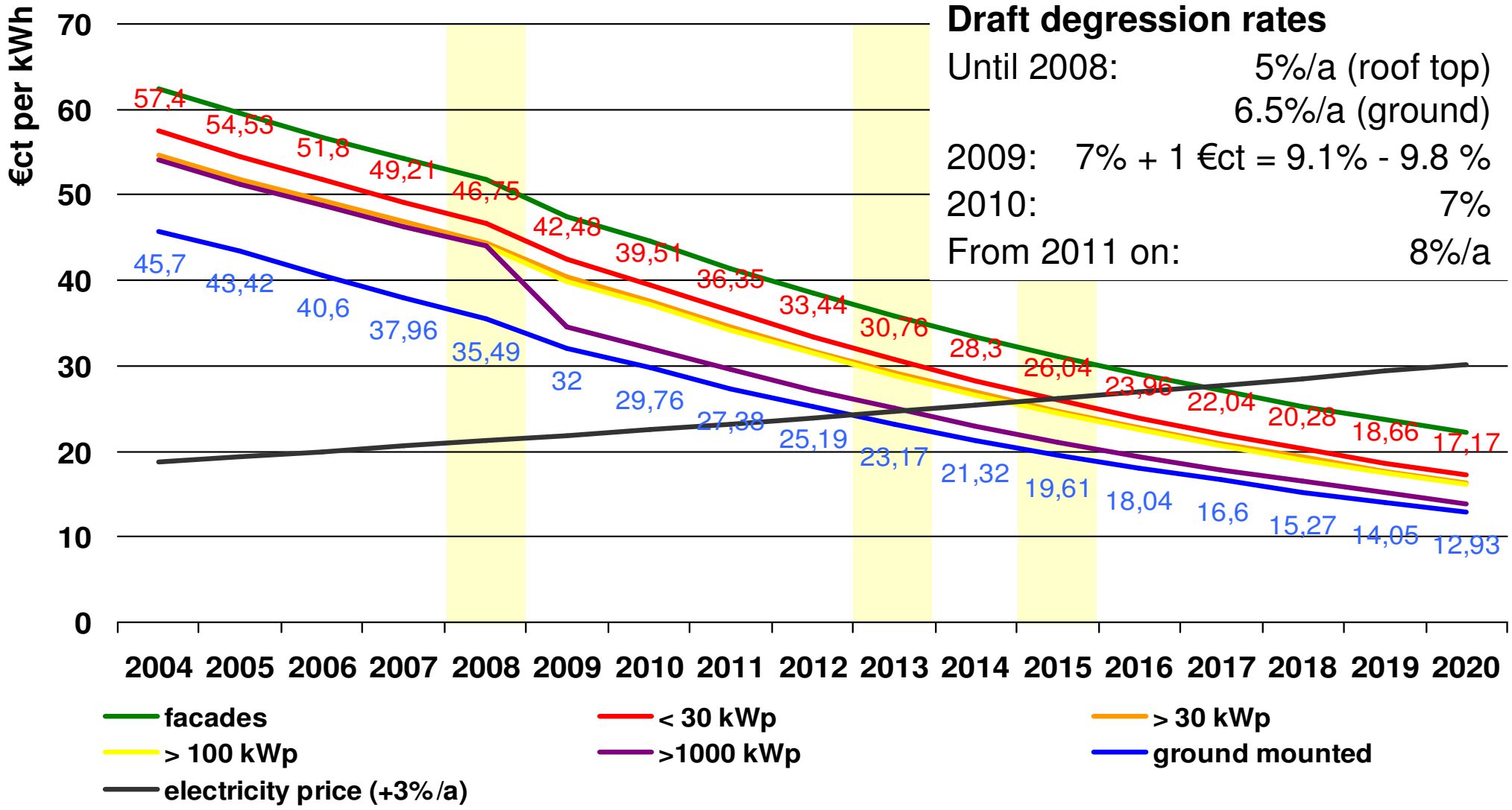
Feed-in tariff per kWh	< 30 kWp	30–100 kWp	> 100 kWp
on buildings and noise protection walls	**€ct 46.75**	**€ct 44.48**	**€ct 43.99**
Façade-integrated	**additional €ct 5**		
Open land (ground-mounted)	**€ct 35.49**		

Image: Solar-Fabrik

Image: Degussa

EEG-Amendment Dec 2007: proposed PV-Feed-in Tariffs

Final decisions on the new feed-in tariffs will probably be taken in summer 2008



Draft degression rates

Until 2008:	5%/a (roof top)
	6.5%/a (ground)
2009:	7% + 1 €ct = 9.1% - 9.8 %
2010:	7%
From 2011 on:	8%/a

Small and Medium Roof-top Installations

Large Roof-top PV-Systems

Image:Solar-Fabrik

Image: BP

400 kWp on the Freiburg Trade Fair Building

3.7 MWp on a factory building in Dingolfing

Examples of ground mounted PV systems


Image:Geosol


Image: Geosol


Image:Phönix


Image: Epuronl

Successful strategy

- **More than €15 billion were invested in PV systems since 2000**
- **More than €3 billion were invested in manufacturing plants since 2000**
- **Drop in costs** for PV systems of
  - approx. 25% from 1999 to 2003
  - 60% from 1991 to 2003
  - **5% annually since mid 2006**

Image: Aleo

Create PV demand by
- Giving the right of solar electricity production and grid connection
- Making solar electricity production financially attractive

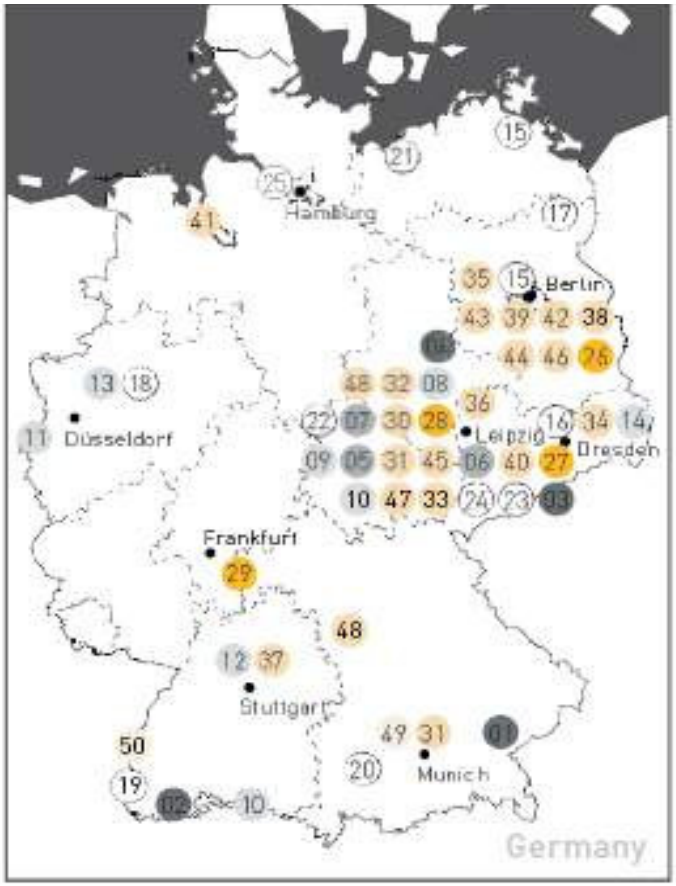
Building up
- PV market
- PV production
- installation capacities

Reduction of costs
Less energy imports
Creation of jobs

PV will become cost competitive
PV will be an important pillar of the sustainable energy system

Production follows the market: PV Component Producer in Germany

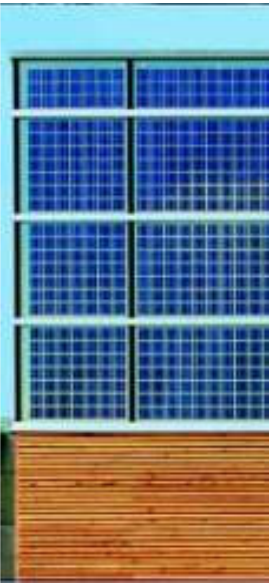
Value chain		Company
Silicon	1	Wacker Chemie
	2	Joint Solar Silicon
	3	Scheuten SolarWorld Solizium
	4	City Solar
Wafers	5	ASi Industries[3]
	6	WPI Wafer Production Int.
	7	PV Silicon
Cells	8	Q-Cells
	9	Ersol Solar Energy
	10	Sunways
	11	Solland Solar Cells
	12	Solarwatt Cells
	13	Scheuten Solar Cells
	14	Arise Technologies
Modules	15	Solon
	16	Solarwatt Solar-Systeme
	17	Aleo Solar
	18	Scheuten Solar Technology
	19	Solar-Fabrik
	20	Systaic
	21	Solara Sonnenstromfabrik
	22	ASS Automotive Solar Systems
	23	Heckert-B.X.T. Solar
	24	GSS
	25	Solarnova
Fully Integrated	26	Conergy
Wafers/Cells/ Modules	27	Solarworld[4]
	28	EverQ
	29	Schott Solar
Thin Films		
poly-Si	30	CSG Solar
a-Si a-Si/µc-Si	31	Ersol Thin Film[3]
	32	Brilliant 234.[5]
	33	Schott Solar
	34	Sunfilm
CIS CIGS CIGSSe	35	Johanna Solar Technology
	36	Avancis
	37	Würth Solar
	38	Odersun
	39	Sulfurcell Solartechnik
	40	Solarion
	41	CIS-Solartechnik
	42	PVflex Solar
	43	Global Solar Energy
	44	Nanosolar
	45	Solibro[5]
CdTe	46	First Solar Manufacturing
	47	Antec Solar Energy
	48	Calyxo[5]
CPV	49	SolarTec
	50	Concentrix Solar



1] Planned
2] Under construction
3] Subsidiary of Ersol
4] Subsidiaries of Solarworld: Deutsche Solar, Deutsche Cell, Solar Factory
5] Subsidary of Q-Cells

Source: IiG research, April 07

Conclusions and Outlook



- The German PV grew in 2007 by 30%
- A PV market growth > 20% is expected in 2008
- Driver of the market is the feed-in tariff system (EEG)
- An amendment of the EEG is under discussion, the parliament has to decide on it in 2008, the degression rate is expected to grow
- Several new PV-production lines are under construction in Germany

„Solar architecture is not about fashion,
it is about survival“ Sir Norman Foster

Thank you very much for your attention

TüArena, Sport stadium, Tübingen, Germany

Image: Suntechnics, Sunways