

Solarpower 2004

- San Francisco 19 Oct 2004
-
-



Experience with the German Performance-Based Incentive Program

Gerhard Stryi-Hipp
managing director
German Solar Industry Association (BSi)
www.bsi-solar.de

German Photovoltaic Market Development



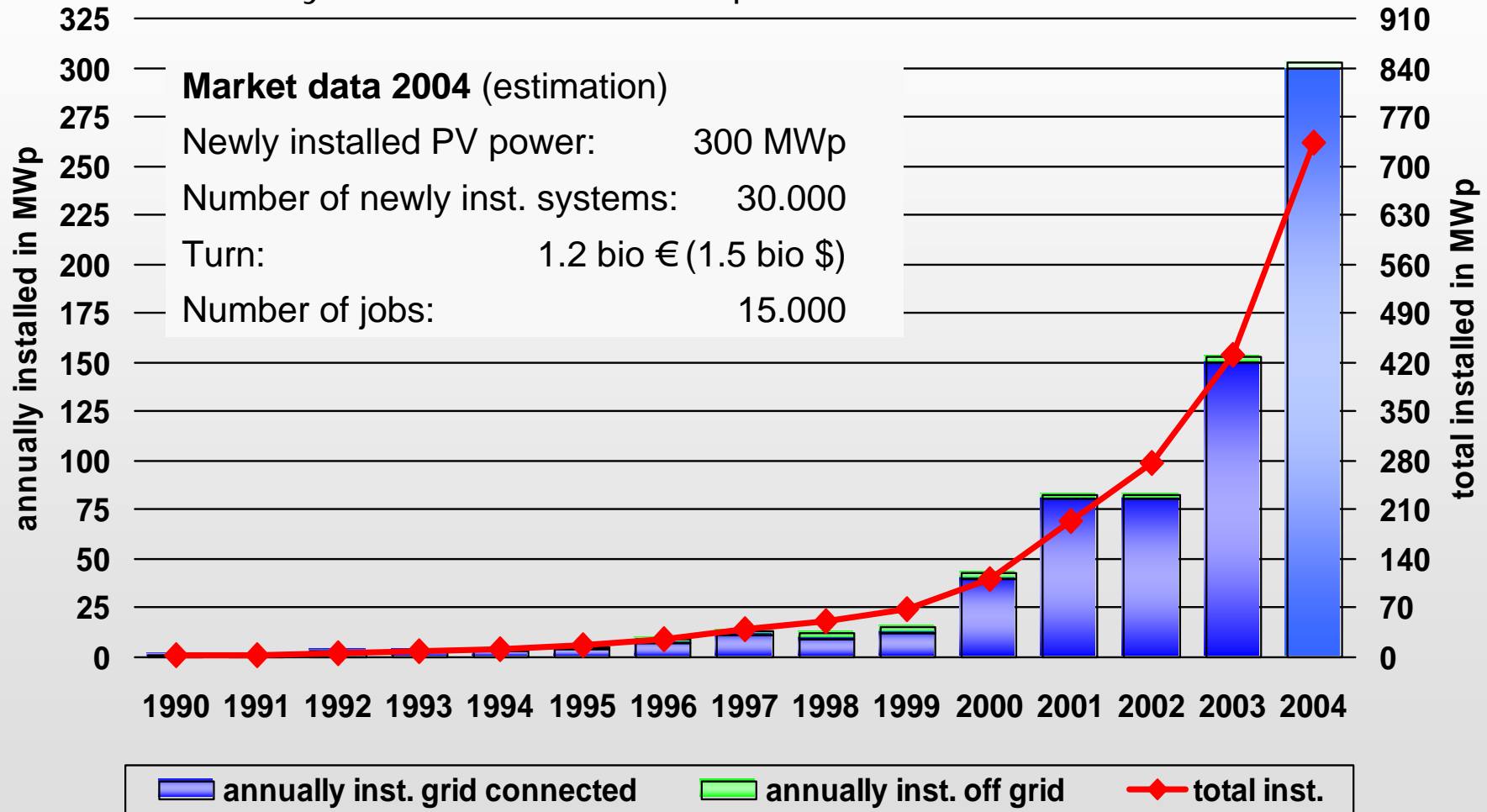
Since 1999, the German photovoltaic market has been growing rapidly due to the **market stimulation policy of the German government**

- 1999** Start of the 100.000 Roofs Programme
- 2000** Coming into force of the Renewable Energy Sources Law (EEG)
- 2003** 100,000 Roofs Program (HTRP) ended successfully, 346 MWp were installed from 1999 to 2003
- 2004** Increase of the feed-in tariff (EEG), 300 MWp are expected to be installed in 2004, demand exceeds supply of PV systems

Development of the German PV Market



Annually and total installed PV power

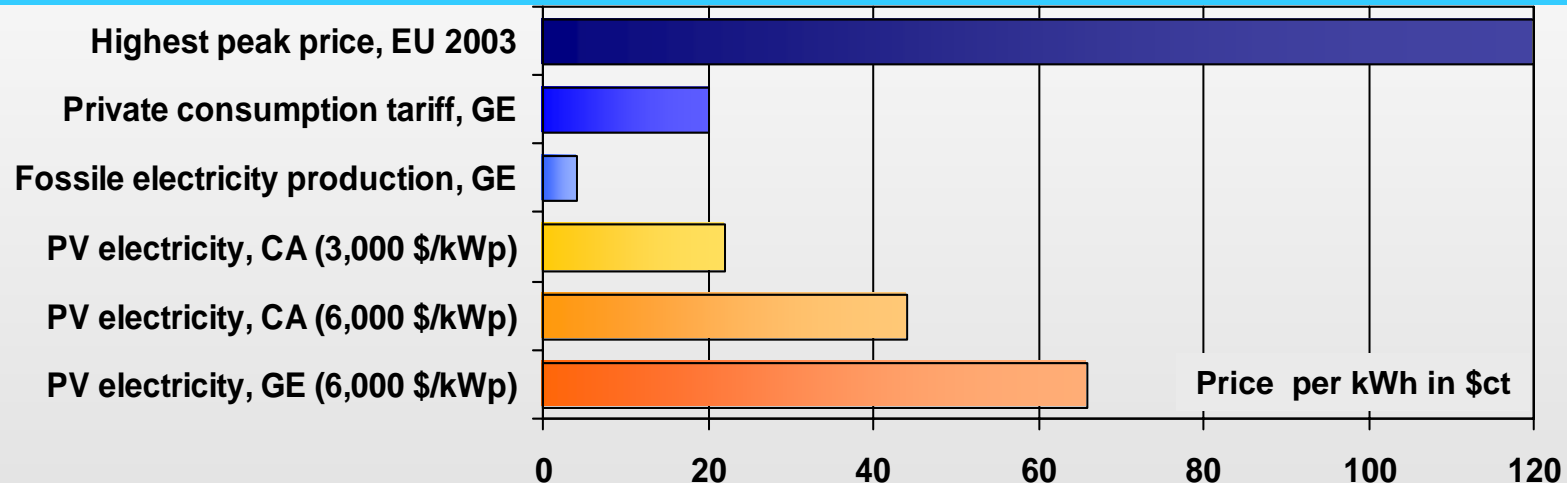


Arguments against PV are not convincing



AGAINST

1. PV electricity **seems to be very expensive**
2. PV **can not cover our electricity demand**, because it is only available, when the sun is shining



ANSWERS

1. PV is in some regions **already competitive** with high tariffs
We can reduce the costs of PV electricity significantly
2. PV power is **produced during peak demand hours**
RES mix with demand side management can cover 100% of demand

German Photovoltaic Policy Strategy



Time to act (Chancellor Schröder at renewables 2004)

- Fossil energy sources are limited, price is growing fast
- Drastic consequences of global climate change
- Electrification of rural areas needed to reduce poverty
- Using renewables avoids wars for fossil fuels

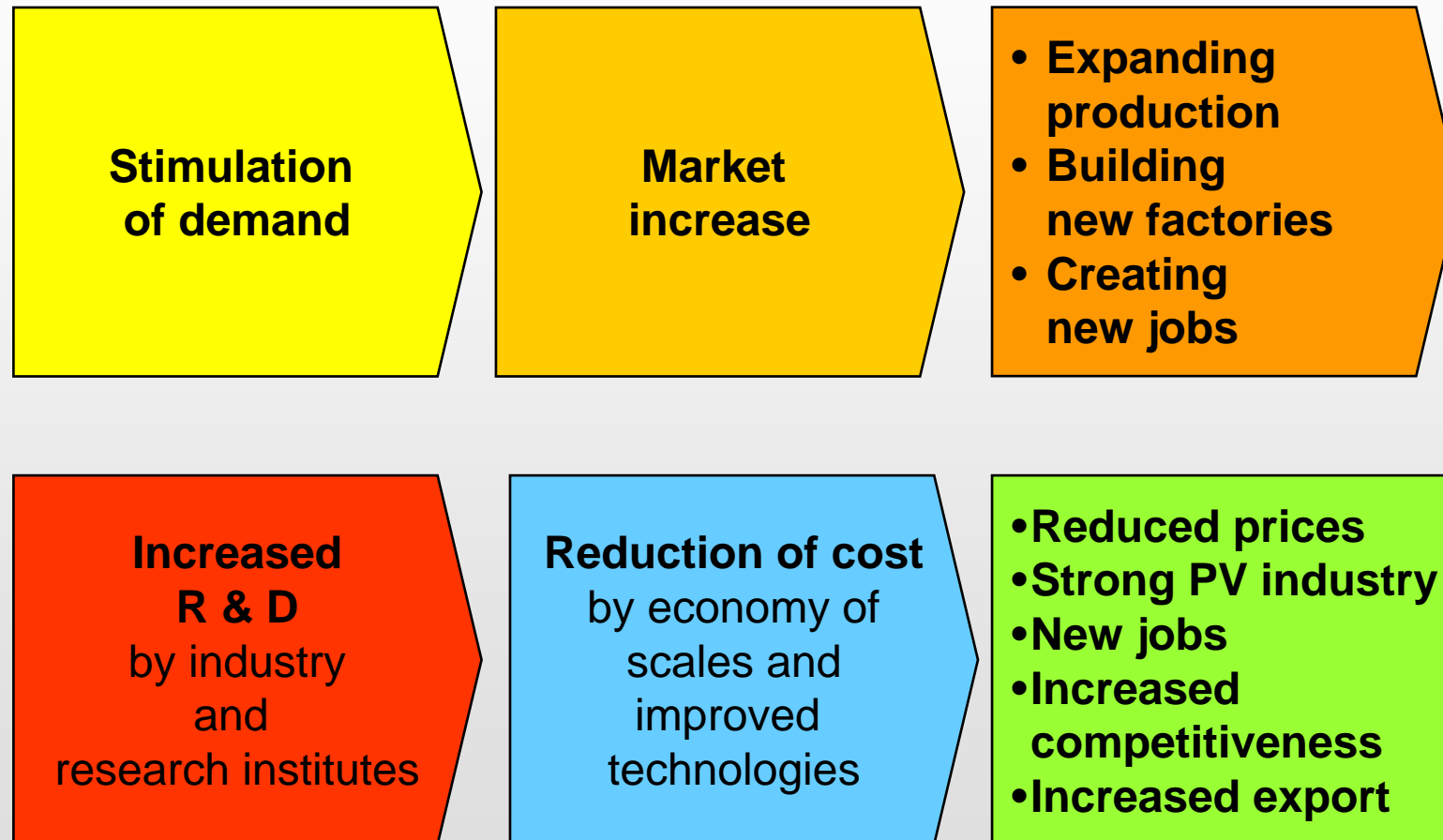
=> Only RES offer a sustainable energy supply

- The mixture of RES can deliver the energy needed in tomorrow's world
- PV plays an important role in all sustainable energy scenarios

The process of building up the PV-market and significantly reducing the costs **will take several decades. It has to start now** in order to

- **provide solar electricity in due time**
- **in sufficient amounts and**
- **at acceptable costs.**

Market Entrance Strategy



100,000 Roofs Programme (HTRP)



- Start: 1 January 1999
- Aim: Installation of 100,000 PV systems with 300 MWp
- Loans at a “reduced” interest rate of 0% for PV systems
- In addition, payment of the last instalment was remitted (12.5% of the total investment)
- Total subsidy rate: about 35%
- The loans were given by the German KfW (Kreditanstalt für Wiederaufbau, Reconstruction Loan Corporation) on request to the investor via his own bank
- Total subsidies within the HTRP: about one billion euros

Innovative Aspects of HTRP

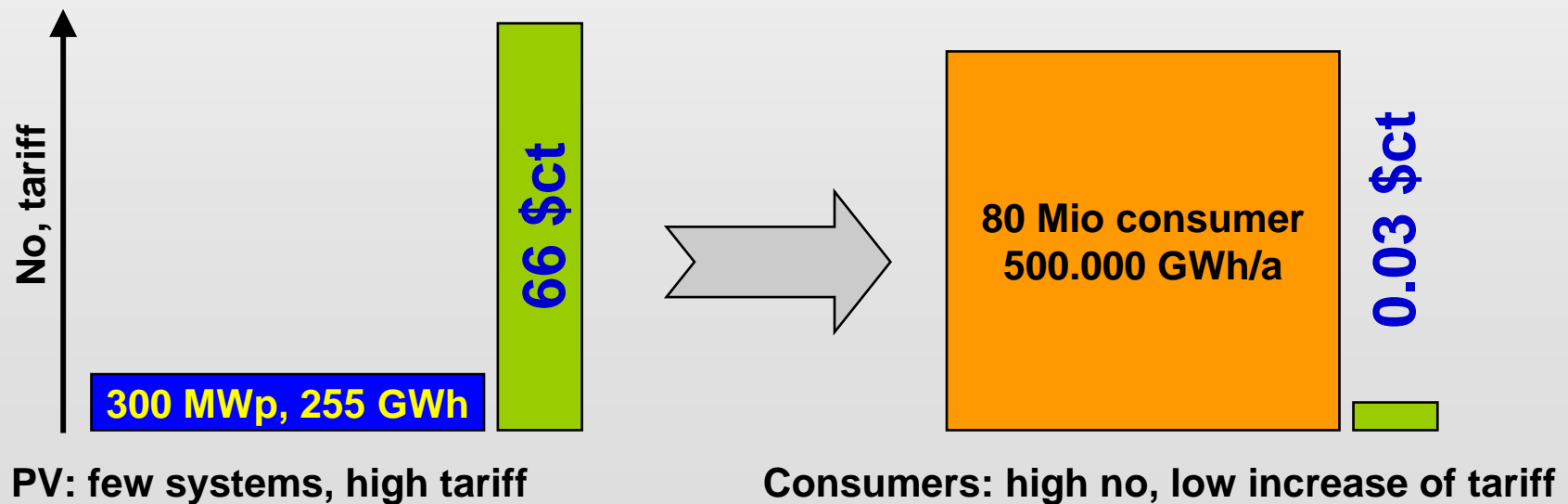


- The total financial volume of the program was very high compared to the market dimension of about 10 MWp in 1998
=> **long-term perspective** over 6 years for market and industry
- The program provided for an annually growing loan budget
=> **market growth possible** through the program
- Use of existing bank structures
=> **efficient administration**
- The payment of subsidies was distributed over the whole period of payment of the instalments
=> **only low subsidy budget necessary per year**

Stimulate the PV Market with a Cost-effective Feed-in Tariff



- If it is from **public interest**, that PV electricity to be part of our electricity mix, then it is only fair and necessary that **PV electricity has to be paid full cost**
- The additional costs has to be paid by all consumer
 - ⇒ The **additional costs are very low per kWh**
 - ⇒ The 300 MWp in Germany newly installed PV-power leads to additional costs of 0.03 \$ct per kWh



Renewable Energy Sources Law (EEG)



In April 2000, the EEG as a follow-up of to the first Feed-in Law came into force in order to increase the attractiveness of PV investments:

Utilities are committed to

- connecting RES systems to the grid
- favouring the feed-in of electricity from RES
- purchasing the electricity from RES with fixed tariffs over a fixed time period.

Feed-in tariff for electricity from PV

- 99 Pfennig (0.51 € / 0.62 \$) per kWh feed-in into the grid
- Granted for 20 years
- PV systems installed in 2002 receive 0.481 € (0.59 \$) per kWh
- PV systems Installed in 2003 receive 0.457 € (0.56 \$) per kWh (5% reduction compared to the previous year, respectively)
- Feed-in tariff limited to a total of 350 MWp;
phase-out until end of the year following achievement of the target;
then, the parliament will have to decide over a new tariff.

Change of Guidelines of HTRP in 2000



As a consequence of the coming into force of the EEG, the HTRP was changed in May 2000 accordingly:

Reduction of the subsidy

- Interest rate was increased to 1.9%
- The payment of the last instalment was not remitted any longer
- The amount of the loan was limited to 6,900 € (8,400 \$) per kWp for the first 5 kWp and to 3,450 € (4,200 \$) per kWp for every kWp exceeding 5 kWp.

Market development goals were raised

- Duration was reduced in order to allow a faster market growth.
 - 2000: 50 MWp
 - 2001: 65 MWp
 - 2002: 80 MWp
 - 2003: 95 MWp

2003: Aims of HTRP fulfilled



Market development

- Market size increased more than tenfold from 12 MWp (1999) to more than 150 MWp (2003)
- 75.318 applications and 65.740 allowances with 345.5 MWp, investment: € 1.72 billion (\$ 2.1 billion)

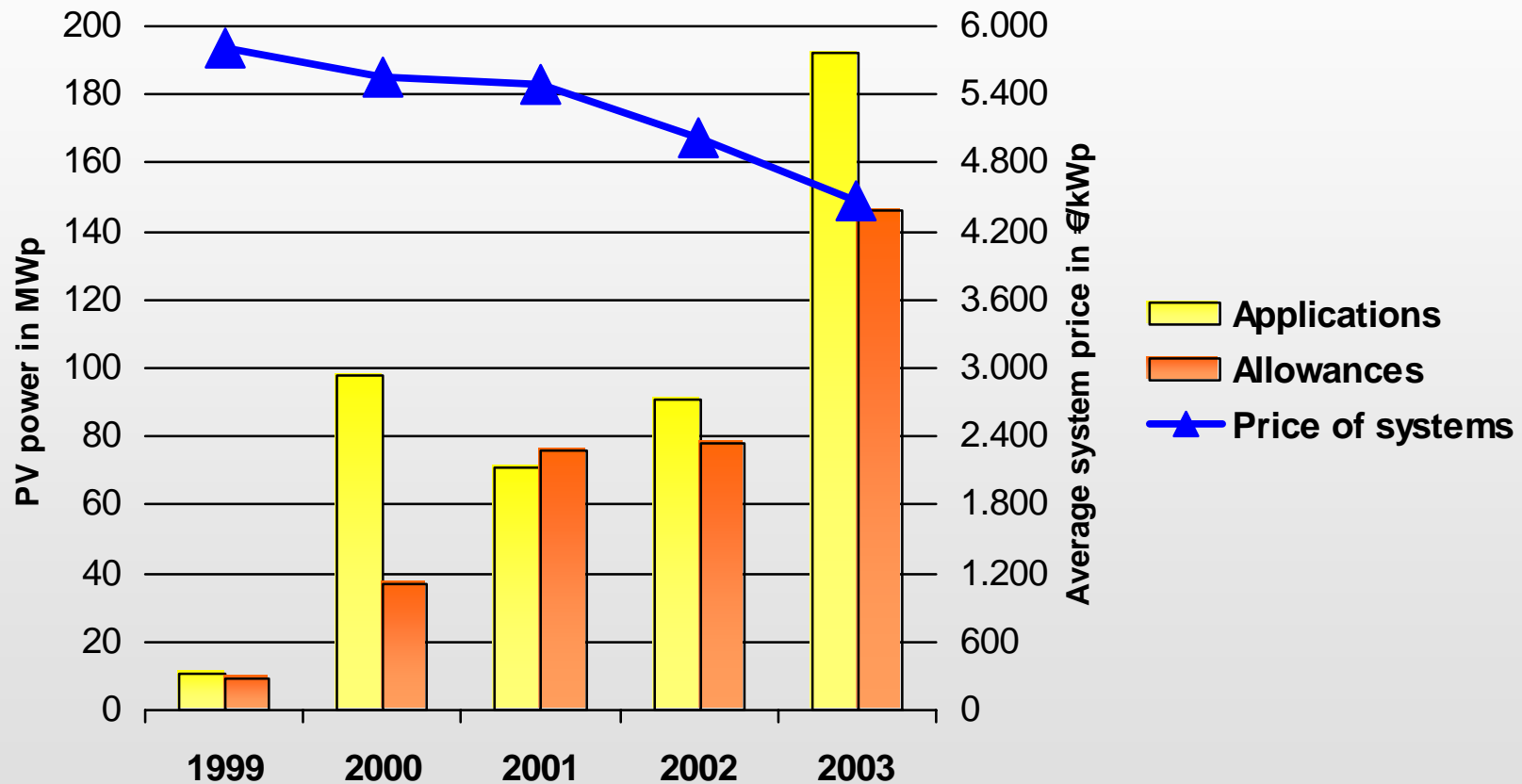
Price reduction

- Price reduced by more than 20%

Building up a PV industry

- Enlargement of existing and building up of new production capacities at all production steps:
 - silicon, wafer, solar cells, modules, thin-film modules, inverters and every kind of BOS components
- More than one billion € invested in production equipment

Applications, Allowances and Price Development in HTRP 2000-2003



German PV Production Companies



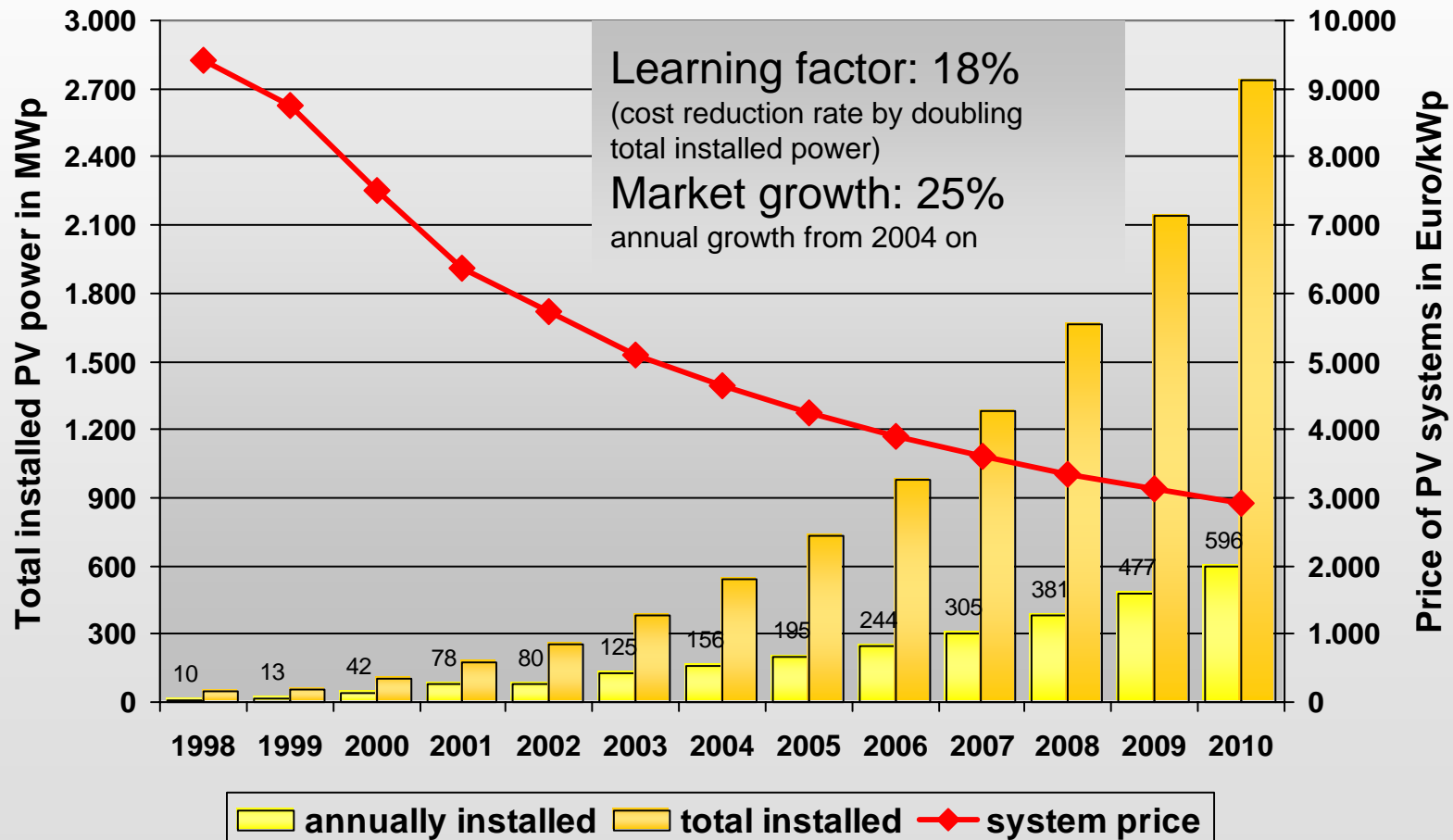
Silicon	Wafer	Solar Cells	Modules	Special Modules	Inverters/ Batt. Chargers
Wacker Chemie	ASI Intertech	Deutsche Cell	GSS	ASS	Aixcon
PV Silicon	Deutsche Solar	Ersol	RWE Schott Solar	Glaswerke Arnold	Dorfmüller
	PV Silicon	RWE Schott Solar	SMD	Saint Gobain	Kaco
Feed Stock	RWE Schott Solar	Shell Solar	Scheuten	Sunovations	Karschny
PV Silicon		Sunways	Solar-Fabrik	Sunware	Siemens
		Q-Cells	Solara	Webasto	SMA
			Solarwatt	Solarc	Solar Konzept
			Solon	Solarnova	Solon
			Sunset		Sputnik
				Thin-film modules	Sun Power
					Sunways
				Antec	Steca
				Sulfurcell	Ufe
				Würth	Würth
				RWE Schott Solar	

Between 1999 and 2003 more than one billion Euros were invested in new production lines

Learning Curve PV: Cost Reduction only with Growth of Market Volume



Expected cost development on basis of expected market development



New Feed-in Tariffs 2004



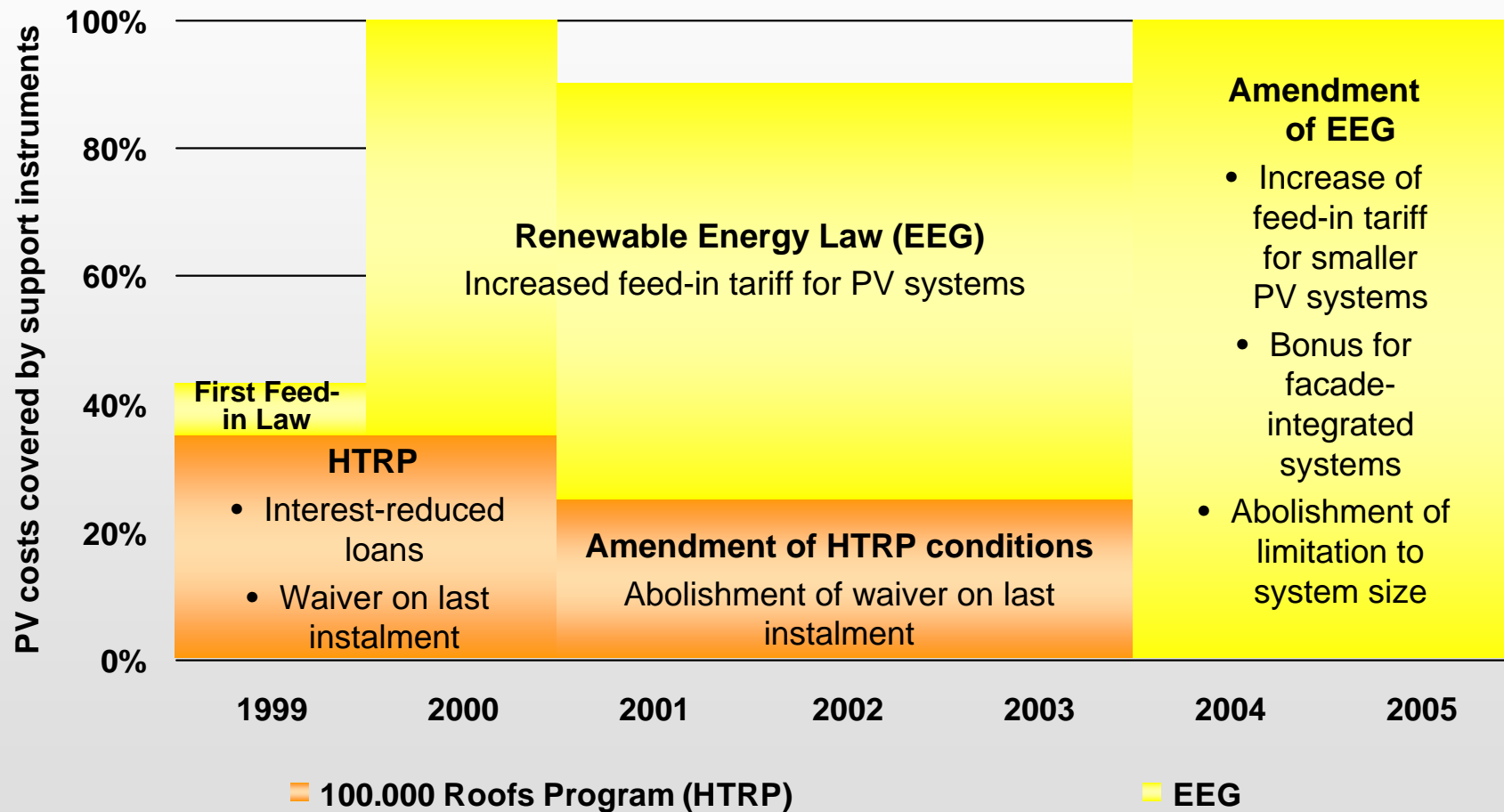
„PV-Vorschaltgesetz“ (preliminary act), starting 1 January 2004 adopted on 1 August 2004 through the EEG amendment

Feed-in tariff per kWh	< 30 kWp	30 – 100 kWp	> 100 kWp
On top of buildings	0.574 € (0.70 \$)	0.546 € (0.67 \$)	0.540 € (0.66 \$)
Façade-integrated	+ 0.05 € (0.06 \$)		
Free-range	0.457 € (0.56 \$) no limit to system size		

Development of PV-Market Entrance Instruments in Germany



From interest-reduced loans to feed-in tariff only



Summary



- Since 1999, the German government has been following a **consequent market launch strategy for PV.**
- By **market-pull effect**, huge investments of more than one billion € in new PV factories were triggered.
- A **PV industry is being built up** with thousands of new jobs.
- R&D have been intensified and **technology have been developed.**
- **Germany has conquered the second position** behind Japan out of all PV markets worldwide.
- A **feed-in tariff system seems to be the most effective instrument** to build up the PV-market.
- The strategy of **reaching a targeted market growth** by limiting the market through a subsidy programme (HTRP) has been very successful. At the same time, a cost-oriented feed-in tariff system was established, which has made investments in PV much more attractive.
- From January 2004 on, the market has proven to be ready for the **feed-in tariff system as the only subsidy instrument.**