

Solar Power International 08  
Panel „Technology & Regulation: How to do it Right“  
16th October 2008, San Diego, California, USA



# Regulation by the Feed-in Tariff: Experiences from Germany



**Gerhard Stryi-Hipp**

Managing Director

German Solar Industry Association (BSW-Solar)

Stralauer Platz 34, 10243 Berlin, Germany

Tel. +49 30 2977788 0, Fax +49 30 2977788 99

[www.bsw-solar.de](http://www.bsw-solar.de), [stryi-hipp@bsw-solar.de](mailto:stryi-hipp@bsw-solar.de)





## **German Solar Industry Association** *Bundesverband Solarwirtschaft – BSW-Solar*

**TASK** Represent the German solar industry  
in the solar thermal energy and photovoltaic sectors

**VISION** A worldwide sustainable energy supply provided by  
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  
business

**HEADQUARTERS** Berlin



## Feed-in tariffs: The Basic Idea

### Key question:

Which energy sources shall be used **in the future**?  
=> which power stations must be installed **today**?

**Usually: Utilities decide on the types of power stations depending on their economic interests**

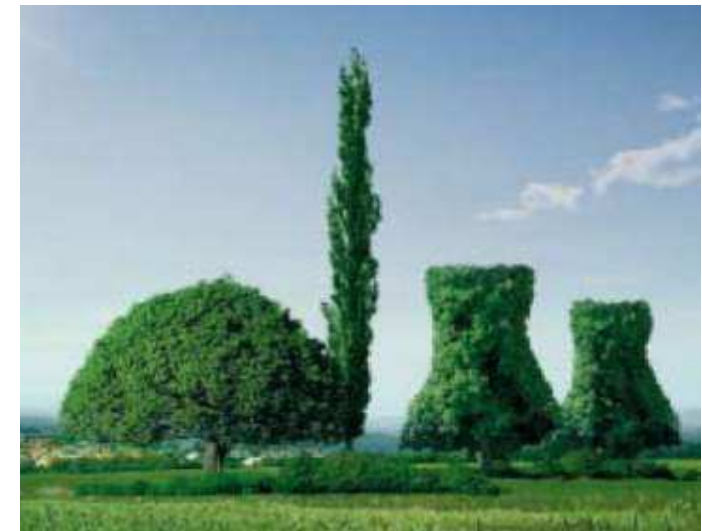
- because they are doing the investments/bear the risks

If governments want to influence the future mix of energy sources, they have generally **two options**:

**Oblige the utilities to invest in specific technologies => RPS**

Target: guarantee, that a specific amount of electricity is produced with renewables

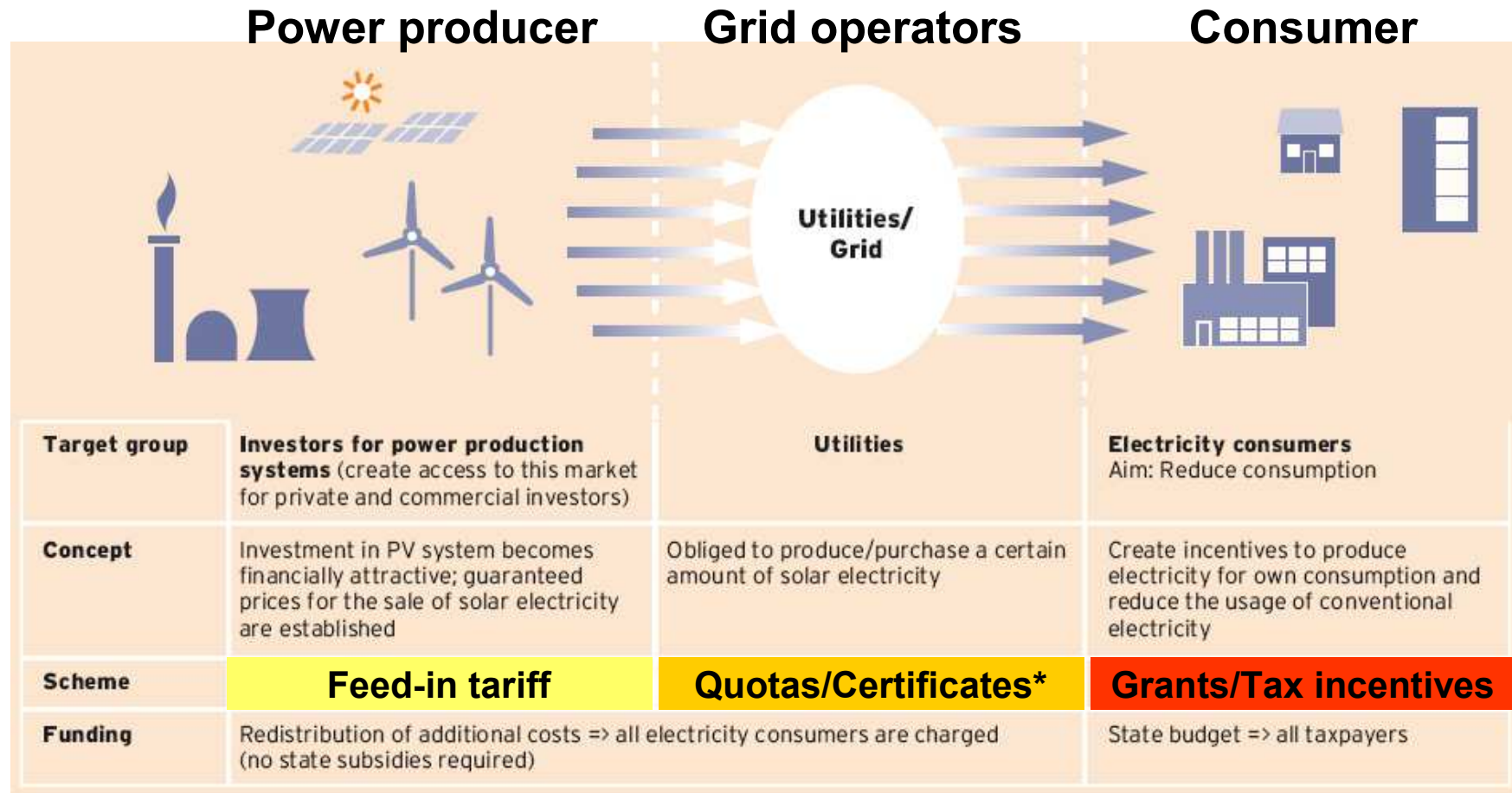
**Attract new investors to invest in the desired energy technology => Feed-in tariffs**  
Target FITs: Make investments in renewables financially attractive and secure for everybody





## Different strategies are available to support PV market development

- the appropriate instrument depends upon different target groups

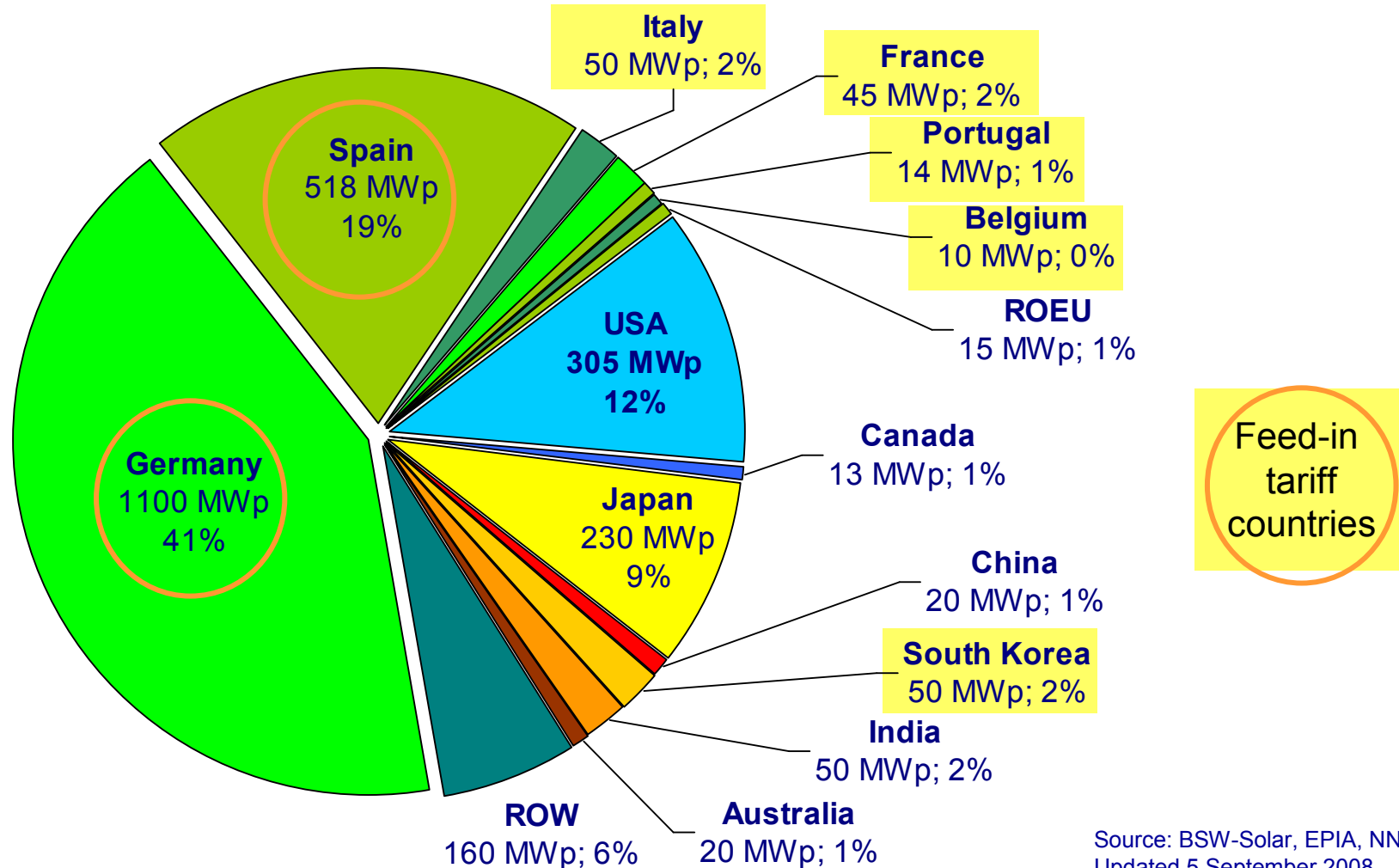


\* USA: Renewable Portfolio Standard - RPS



# Photovoltaic World Market

## Newly installed PV Power in 2007: 2.6 GWp



Source: BSW-Solar, EPIA, NNPVA  
Updated 5 September 2008





# Feed-in tariffs: Case study of Germany

## Small, Medium and Large Rooftop Installations



Image: SMA



Image: Wagner & Co



Image: Frankensolar

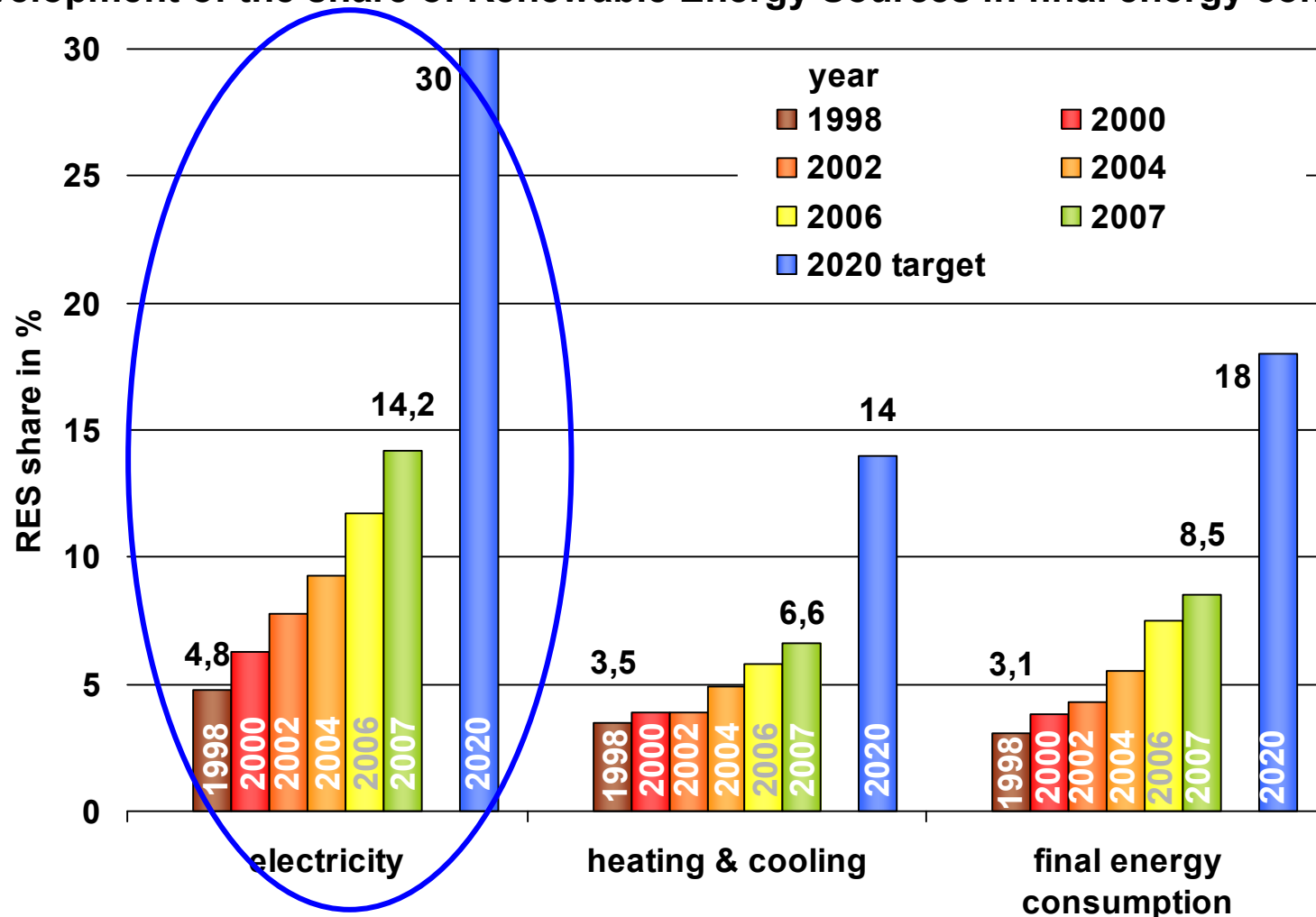


Image: Solar-Fabrik



## Basis of the German Success in Renewable Energy Sources: Continuous Policy to Increase the Share of RES

Development of the share of Renewable Energy Sources in final energy consumption



Source: German Federal Ministry for Environment, March 2008

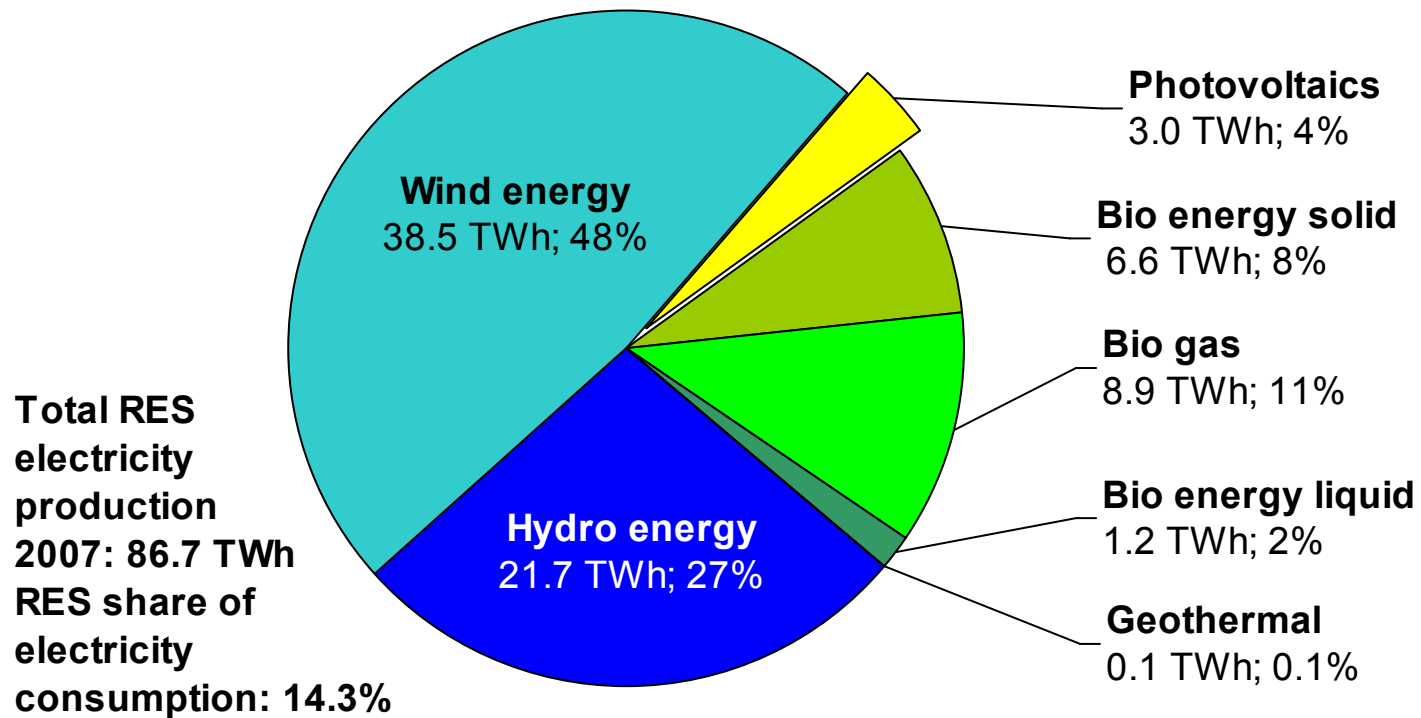


# Share of Solar Electricity in Germany

## Share of PV electricity

- of electricity consumption 2007: 0.6% (2006: 0.44%)
- of renewable energy electricity 2007: 3.5% (2006: 3.1%)

Distribution of Renewable Energy Electricity Production in Germany 2007



Source: BEE, Jan 2008





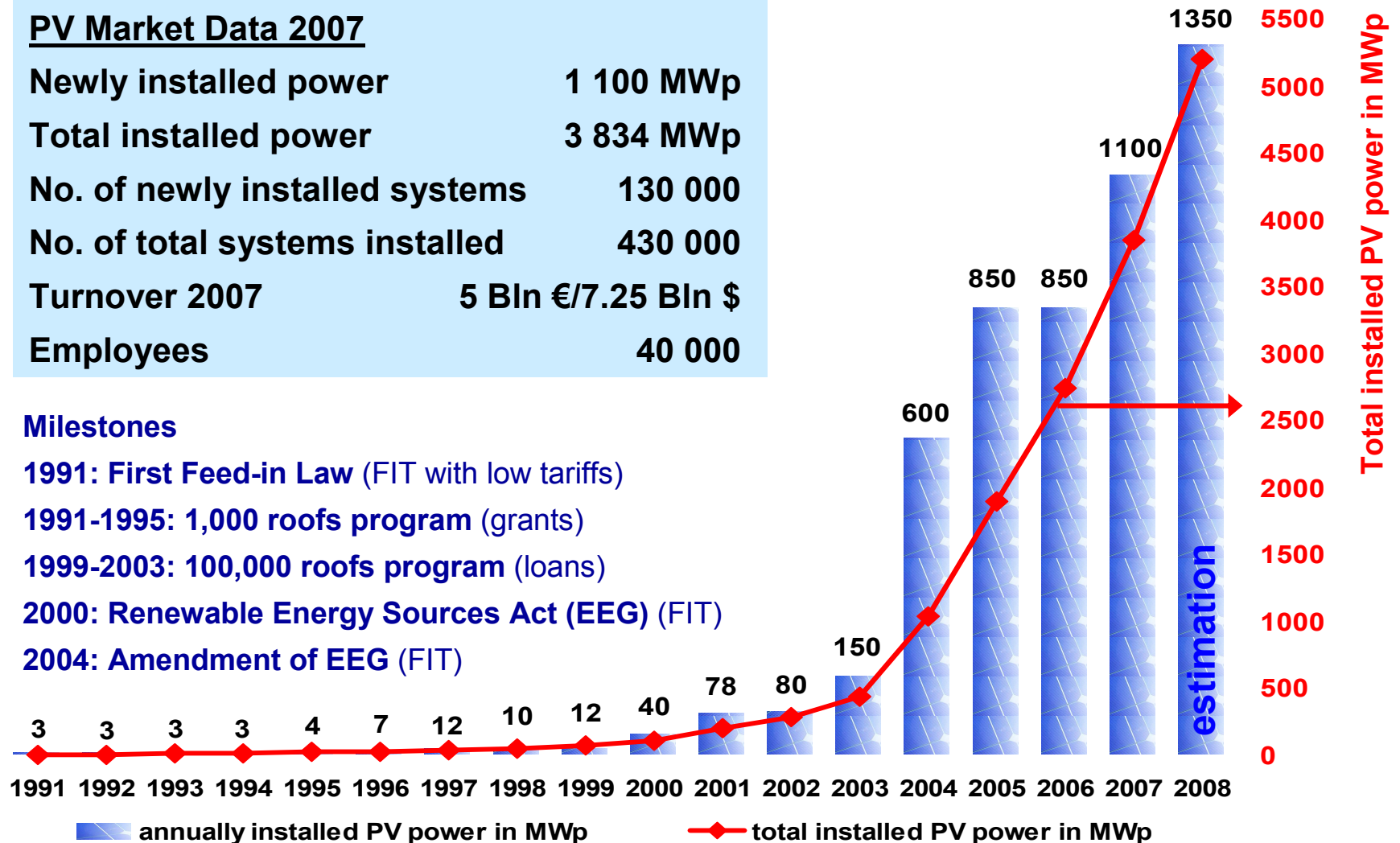
# Development of the German PV market

## 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 2007	5 Bln €/7.25 Bln \$
Employees	40 000

## Milestones

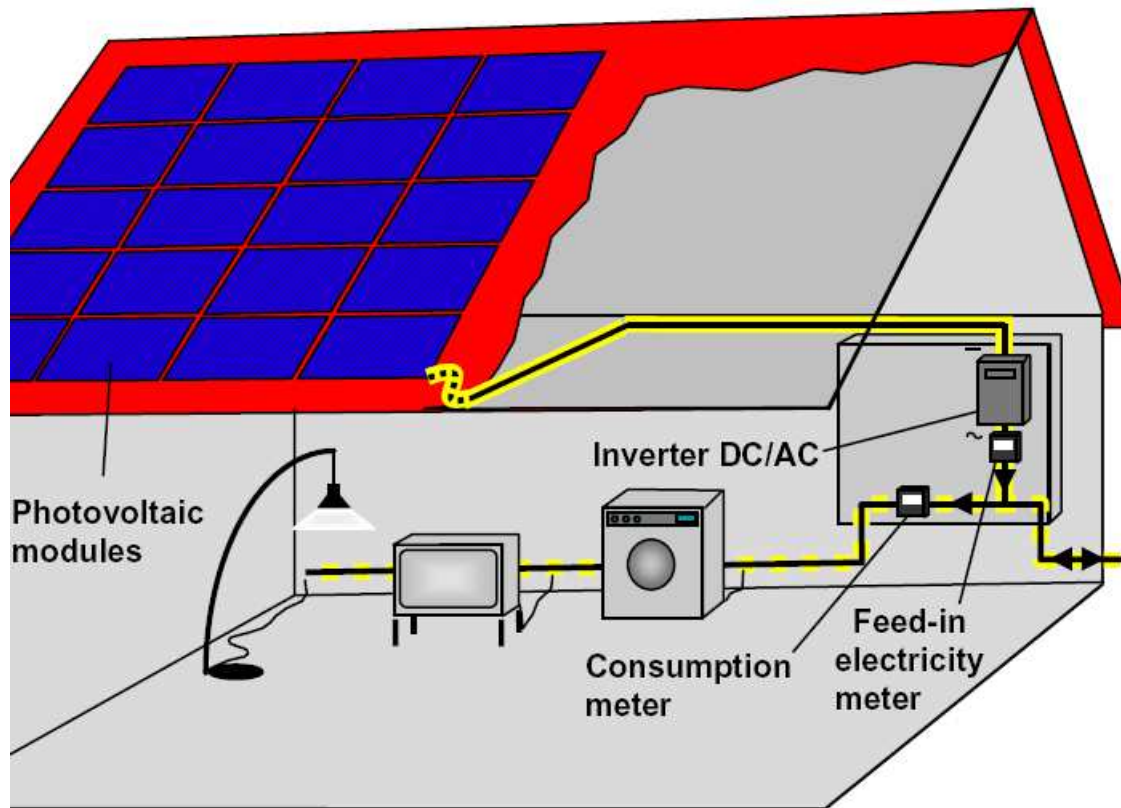
- 1991: First Feed-in Law (FIT with low tariffs)
- 1991-1995: 1,000 roofs program (grants)
- 1999-2003: 100,000 roofs program (loans)
- 2000: Renewable Energy Sources Act (EEG) (FIT)
- 2004: Amendment of EEG (FIT)





## Grid-Connected PV Systems in Germany

Each kWh of solar electricity produced is fed into the grid,  
sold to the utility and paid at a fixed price



### Typical data of a small PV system (per kWp)

Investment costs: **4,373 €**  
(\$6,400)

Annual production of  
solar electricity: **900 kWh/a**

Feed-in tariff: **0.467 €/kWh**  
(\$0.67/kWh)  
paid over 20 years

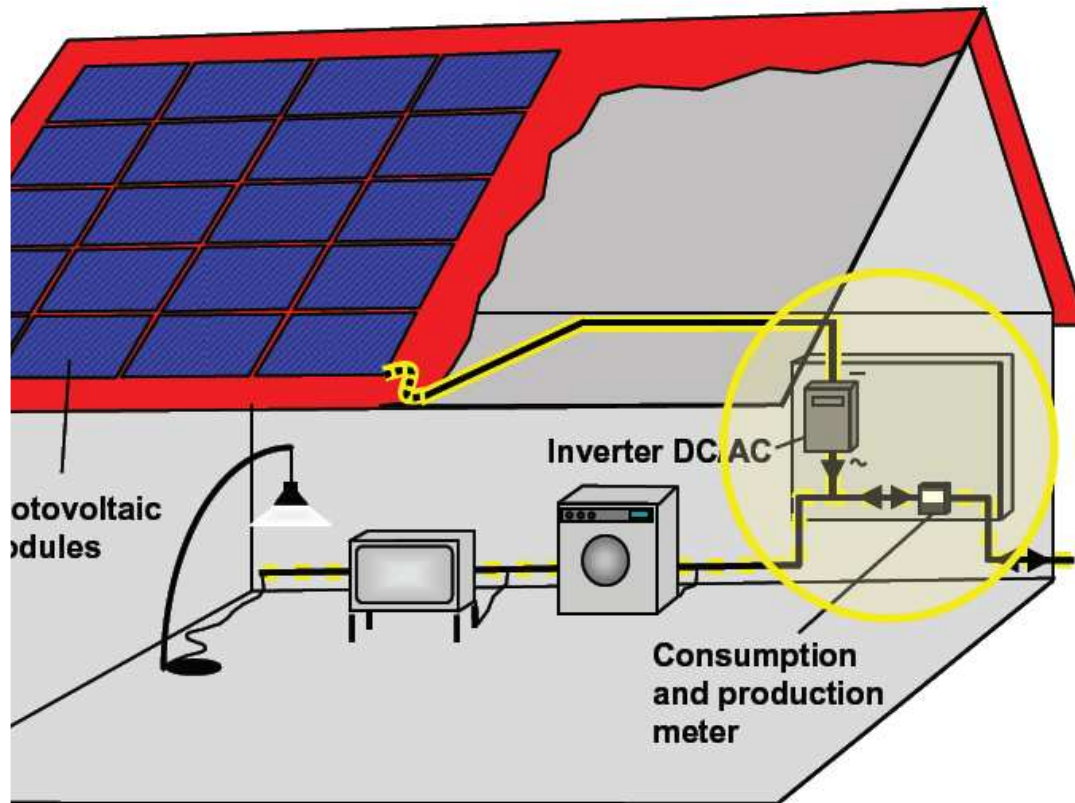
Feed-in payment: **420 €/a**  
(\$610/a)

Interest rates (KfW): **5.2%/a eff**

\$1 = 0.69 €

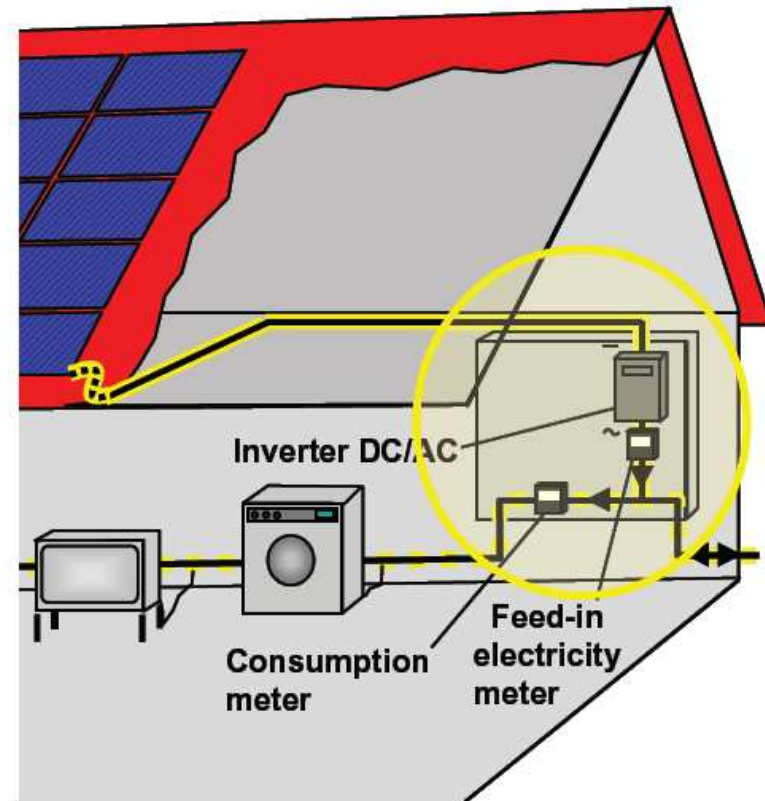


## Two ways of connecting PV systems to the grid



### USA: Net-metering

Solar electricity is used for personal consumption first, only excess electricity is fed into the grid



### Germany: Feed-in tariff

Solar electricity is exclusively fed into the grid

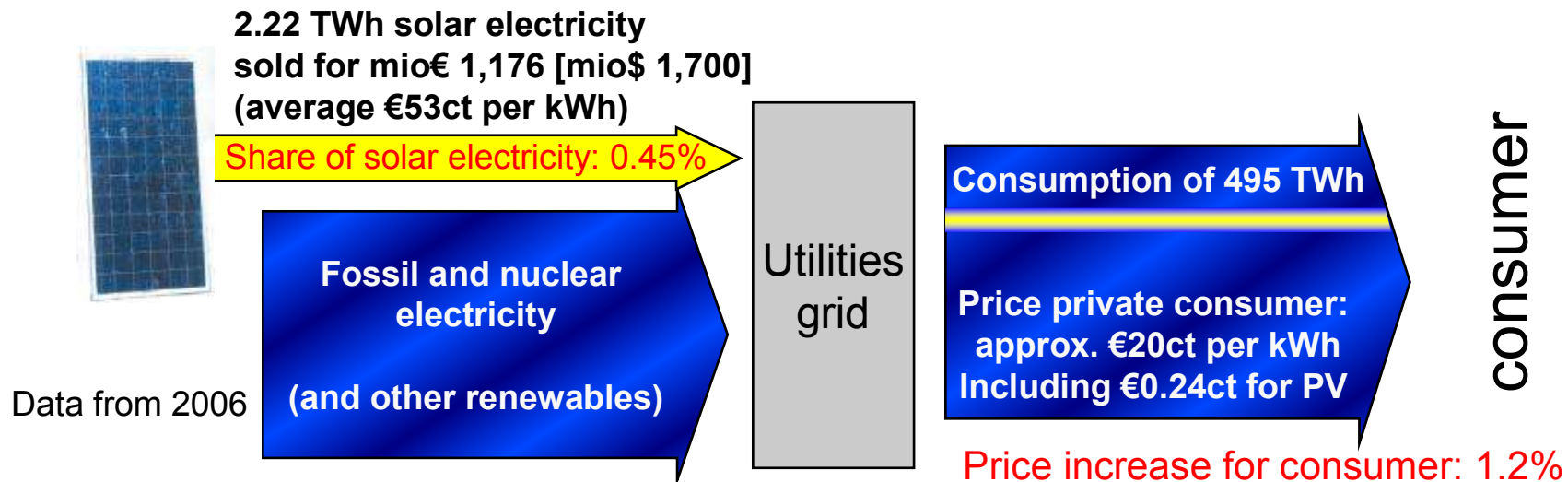
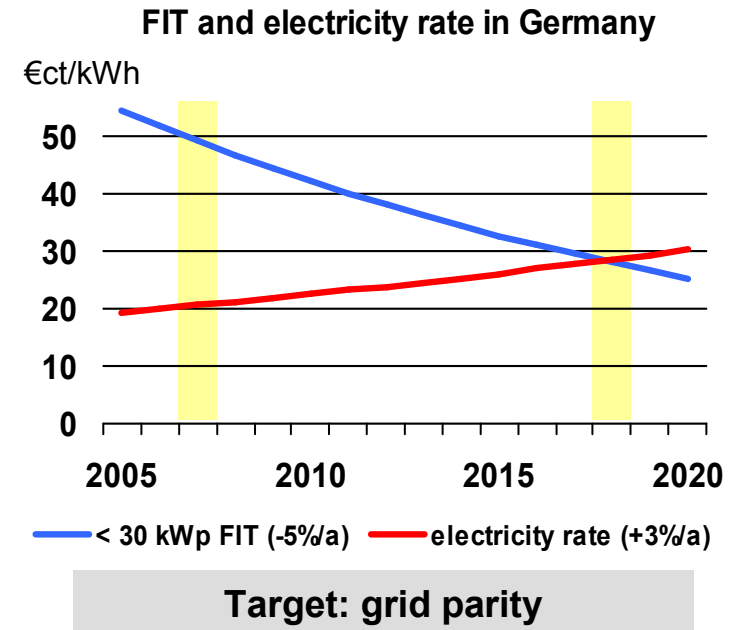




## How does the German Feed-in Law (EEG) work?

### Principles

- **Priority connection** for all PV systems granted
- Each solar kWh **must be purchased** by the utility
- **Fixed feed-in tariff payment over 20 years**
- **Reduction of the feed-in tariff each year by 5%** for newly installed PV systems







## 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	<b>€ct 46.75</b> \$ct 67.8	<b>€ct 44.48</b> \$ct 64.5	<b>€ct 43.99</b> \$ct 63.8
Façade-integrated	<b>additional €ct 5</b> \$ct 7.25		
Open land (ground-mounted)	<b>€ct 35.49</b> \$ct 51.5		



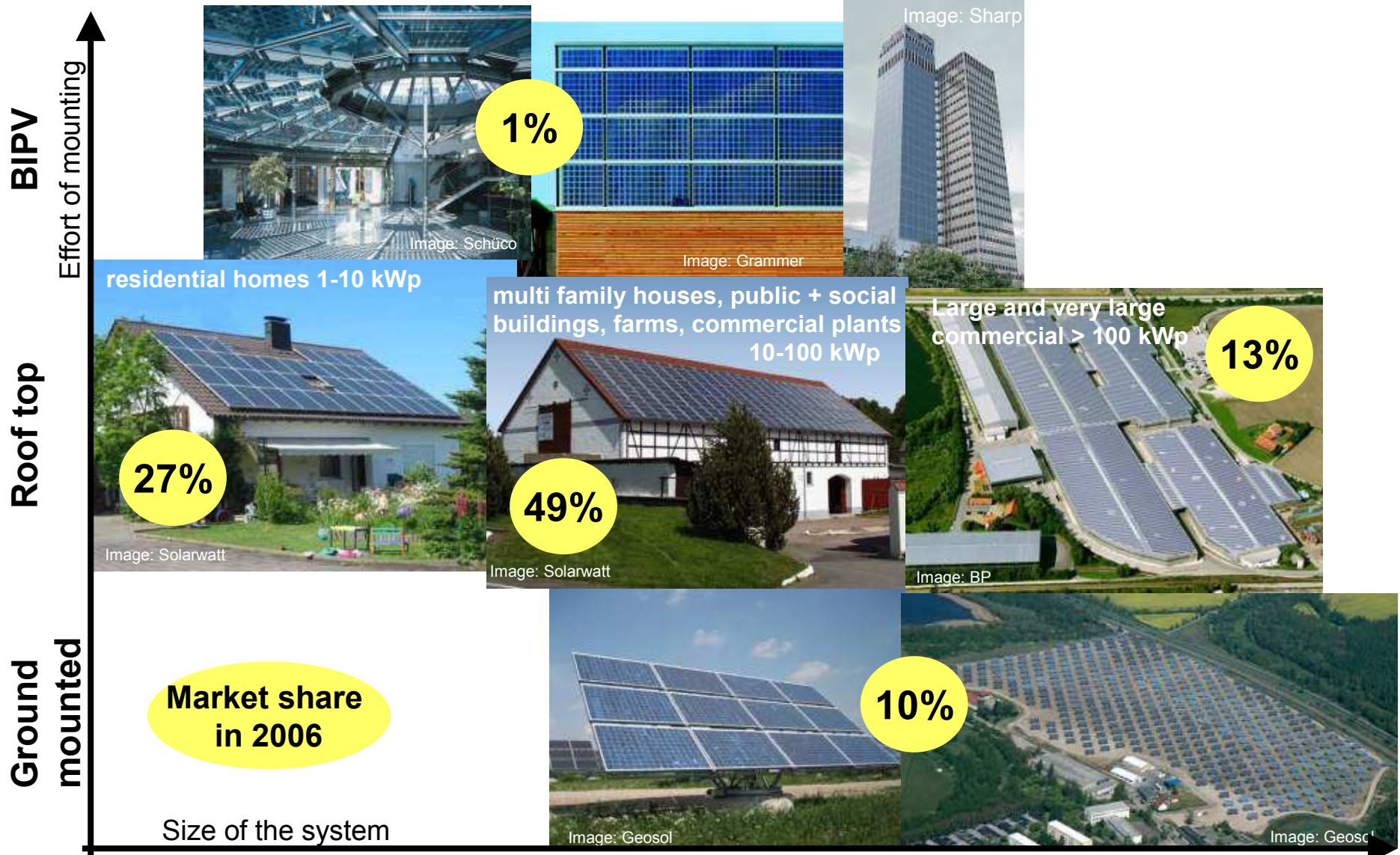
Image: Solar-Fabrik



Image: Degussa



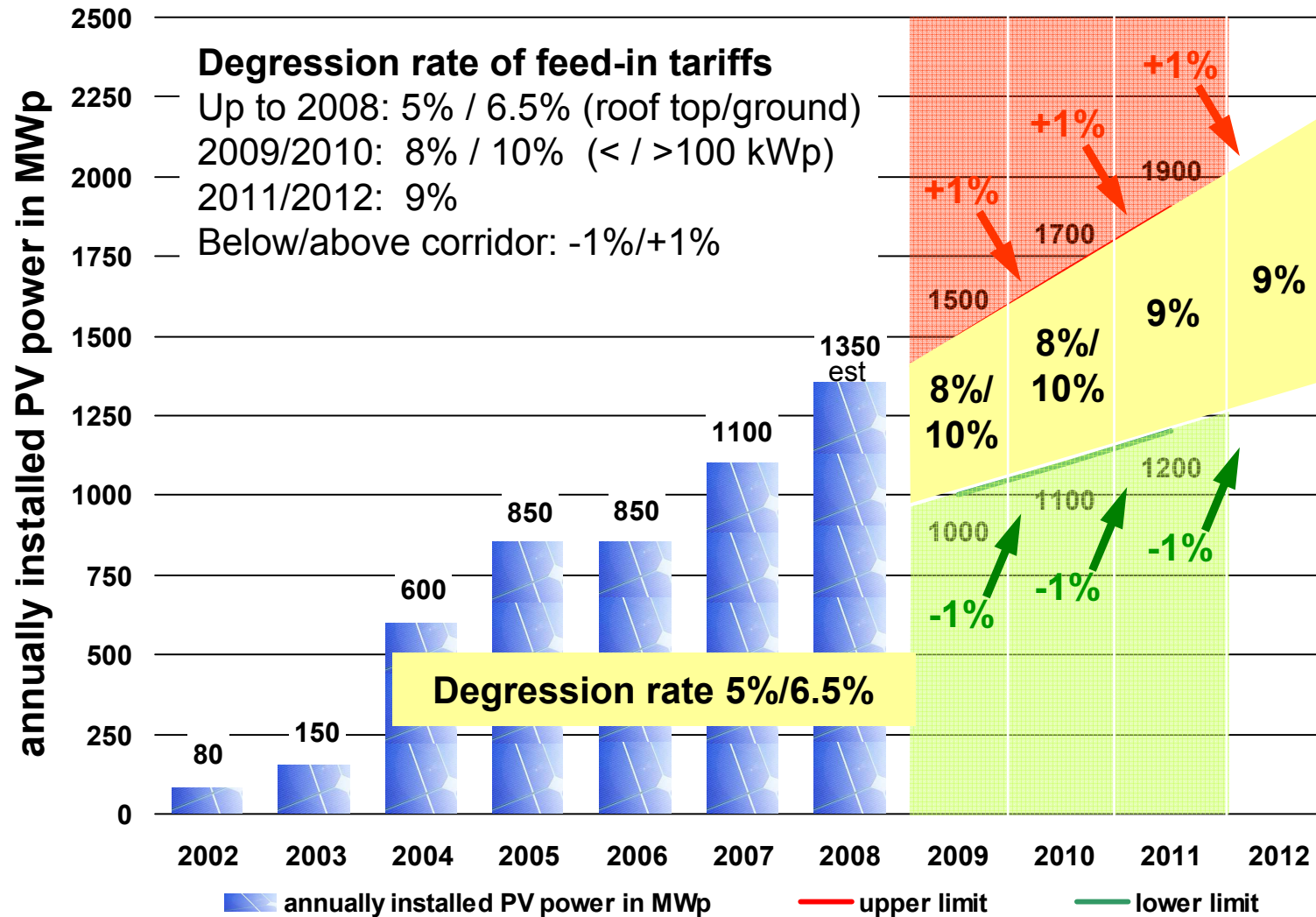
# Germany: Market Segments of on-grid PV Systems







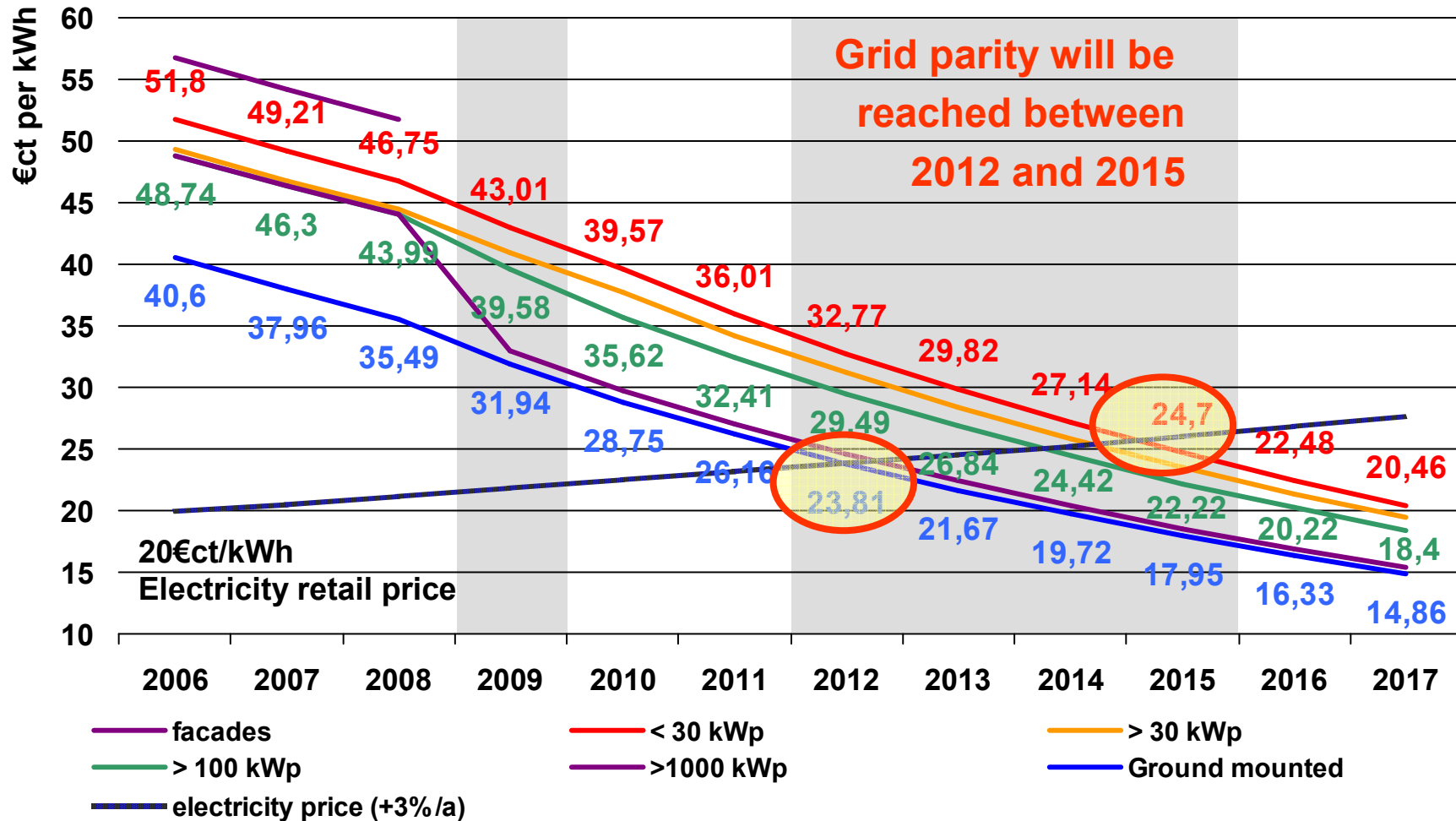
## Amendment of the EEG from June 2008: Feed-in Tariffs for PV will be reduced faster as of 2009





# Feed-in Tariffs for PV within the German EEG

Based on degression rates decided on June 6th, 2008







## Photovoltaic market entrance strategy

### 1. Create PV demand by:

- Granting the right of solar electricity production and grid connection
- Making solar electricity production financially attractive

### 2. Building up:

- PV market
  - PV production
  - Installation capacities
- Reduction of costs**  
**Less energy imports**  
**Creation of jobs**

### 3. PV will become:

- **Cost-competitive**
- **An important pillar of the sustainable energy system**

## First results

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

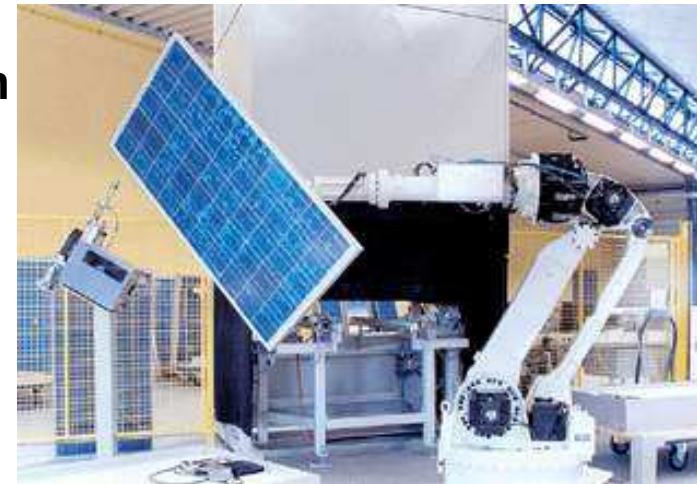


Image: Aleo



## Feed-in tariff schemes are proven to be a very powerful instrument

### STRENGTHS

- Investments in PV systems are financially attractive  
**=> Profit is the driver of the PV market**
- Investment security enables everybody to become a PV power producer  
**=> New actors are entering the power market (competition)**
- The additional costs are distributed to all electricity consumers  
**=> Small contribution of individuals / „polluter-pays-principle“**
- The additional costs are distributed over a long period (e.g. 20 years)  
**=> Only the kWh produced is remunerated (output-oriented)**
- PV price reduction triggered by degressive feed-in tariffs  
**=> The industry is forced to reduce the price for PV systems**
- Each RES technology can be supported individually (technology specific support)  
**=> The profit is technology-independent, if the tariff is calculated carefully**

### WEAKNESSES

- It is difficult to limit market growth without disturbing the market development  
**=> A strategy is needed if market development exceeds the expectations**
- The costs are growing continuously until the payment period of the first plants ends  
**=> A realistic calculation of the additional costs is recommended**

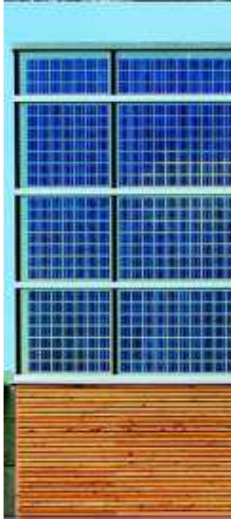


## Important Aspects of the FIT-schemes

- **No market disruption**
  - There are no administrative barriers
- **Simplicity**
  - Transparent and simple rules for everybody involved
- **Very low transaction costs**
  - No administration by the government, the utility sector has to organize the payments by itself
- **Fostering standardization of systems**
  - The feed-in tariffs creates competition in the market  
=> The industry is reducing costs by standardization
- **Fostering high system performance**
  - The investor is only paid for the produced kWh
- **Preserving technological neutrality**
  - The feed-in tariff can be different for different renewable technologies (solar, wind,...), but should be the same for different PV-technologies (crystalline, thin film,...)



## Conclusions



- **Feed-in tariff (FIT) schemes are proven to be very powerful instruments to increase the share of renewable energy sources**
- **FITs are the drivers of the strong European PV markets in Germany, Spain, Italy and France**
- **FITs have to be calculated carefully in order to avoid overreactions of markets**
- **The market development is difficult to control if a FIT is established**
  - => positive as long as the aim is to grow the market as fast as possible**
  - => strategies have to be developed, if market growth should be limited**







*PV facade with green solar cells, sports stadium Tübingen*

Image: Suntechnics, Sunwa

**Thank you very much for your attention**