Encouraging new business models for renewable energy

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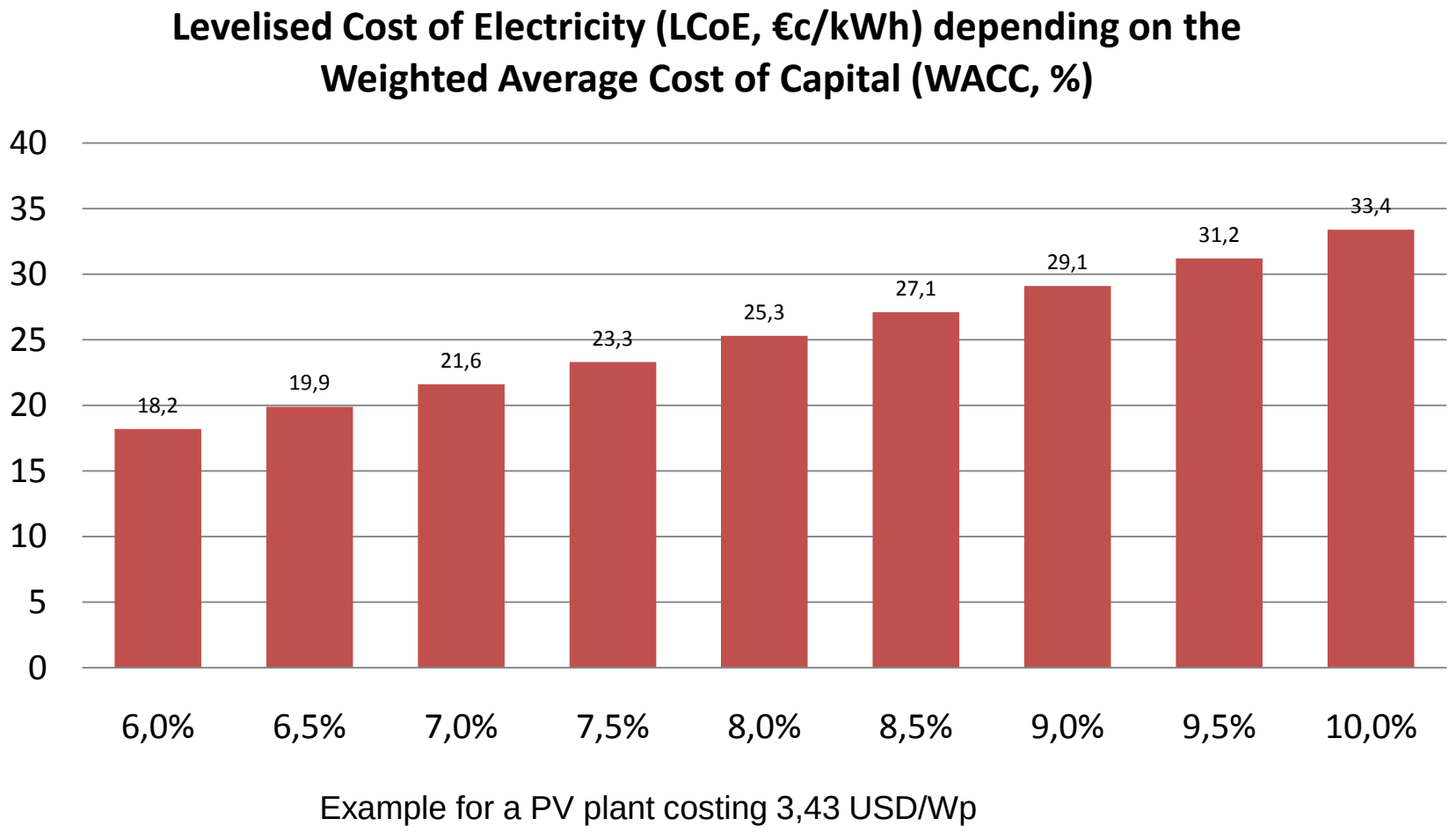
Characteristics of Renewable Energy Investments

- High upfront capital costs / negligible or low running costs
  → financing is important
- Time horizon > 20 years → risk assessment is important
- Rather new and unknown technologies
  → difficult risk assessment for banks and investors
  → experience and high market penetration important
- Standardisation still low
  → high planning costs, specific risk assessment, second hand market difficult, long project duration
- Electricity: small projects, new actors
  → new financing models necessary, new opportunities
- Increasing competitiveness → new markets and opportunities

The impact of interest rates



Example for a PV plant costing 3,43 USD/Wp

Electricity: neglected markets

We have a restricted view of electricity markets and competitiveness of renewable energies:

- A large share of the world population is not connected to electricity grids
- In many parts of the world electricity grids are not reliable – backup systems lead to much higher costs for electricity than official tariffs
- In many countries non-renewable electricity is strongly subsidised – applying world market prices, renewables often would be competitive

→ New business models can create large new markets

New Technologies – New Actors

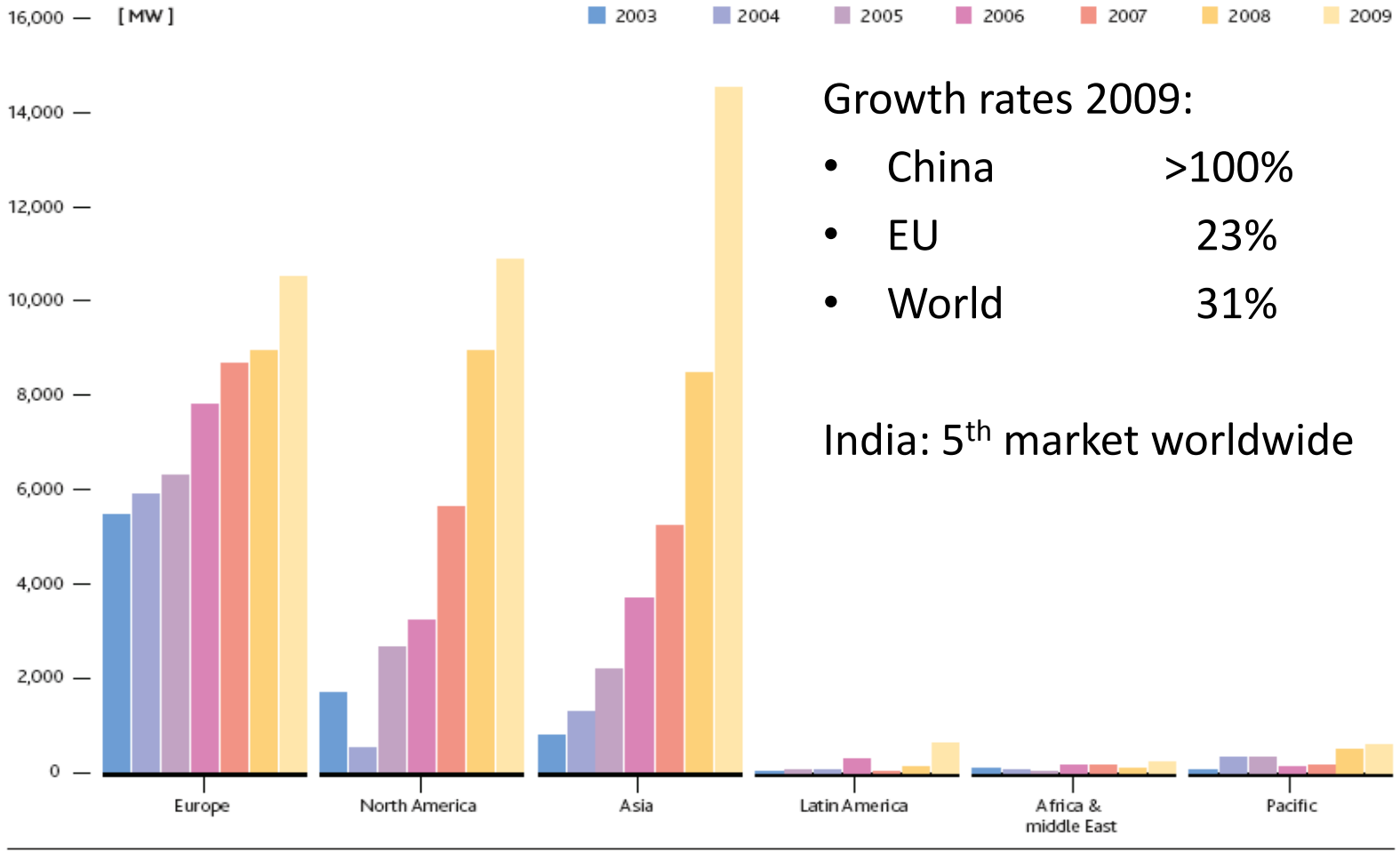
- Conventional power plants (fossil, nuclear):
  - 150 MW … 1200 MW
  - large utilities, often monopolies
- Wind turbines
  - 50 kW … 5 MW, park … 100MW, offshore … 500MW
  - IPPs, industries (captive power generation), utilities
- CSP concentrating solar thermal power
  - >50 MW, storage option
  - IPPs, large industries (captive), utilities
- Photovoltaics
  - 1W … 1 MW, park … 20MW
  - Individuals, commerce, industries, IPPs, utilities

Strategies for opening new markets

- Reducing risks
  → lower capital costs
- Improving knowledge and transparency
  → lower prices, lower capital costs
- Developing business models for new actors
  → new groups of customers

WIND ENERGY: COMPETITIVE IN MANY MARKETS

Wind energy: Newly installed capacity



Growth rates 2009:

- China >100%
- EU 23%
- World 31%

India: 5th market worldwide

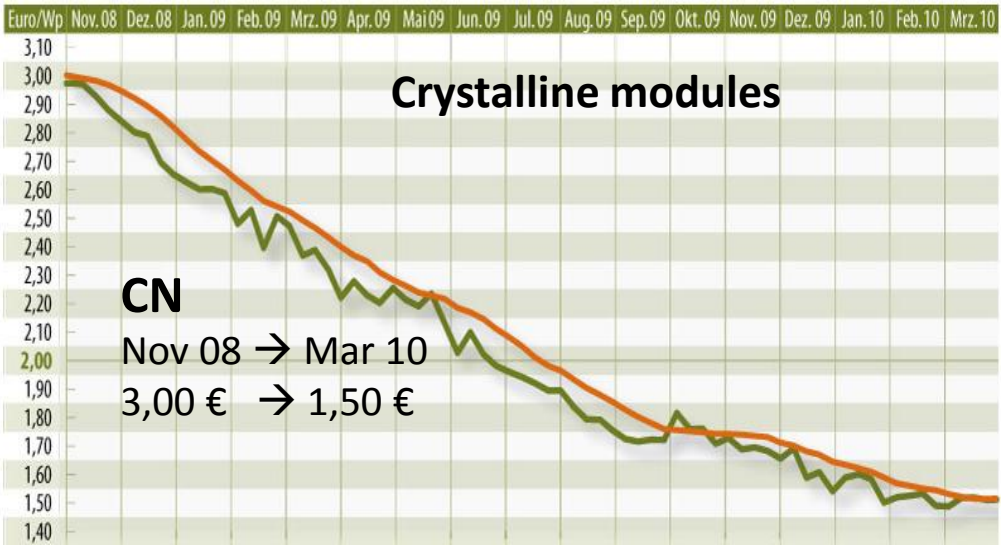
Wind energy: not only for the public grid

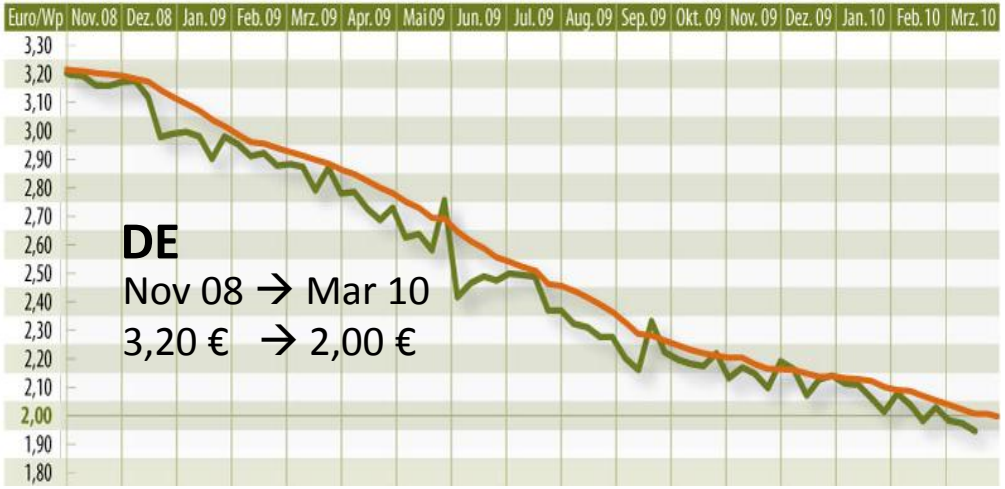
- Competitive in many markets
- Growing size of turbines and wind parks
- Europe: grid: IPPs, offshore: large utilities
- USA: grid: IPPs, utilities
- India: mainly: Industry, captive power gen.
  increasingly also grid: utilities, IPPs
- Chile, Mexico: industries (captive) important
- Egypt, others: new public regimes

PHOTOVOLTAICS:
HUGE POTENTIAL BEFORE GRID PARITY

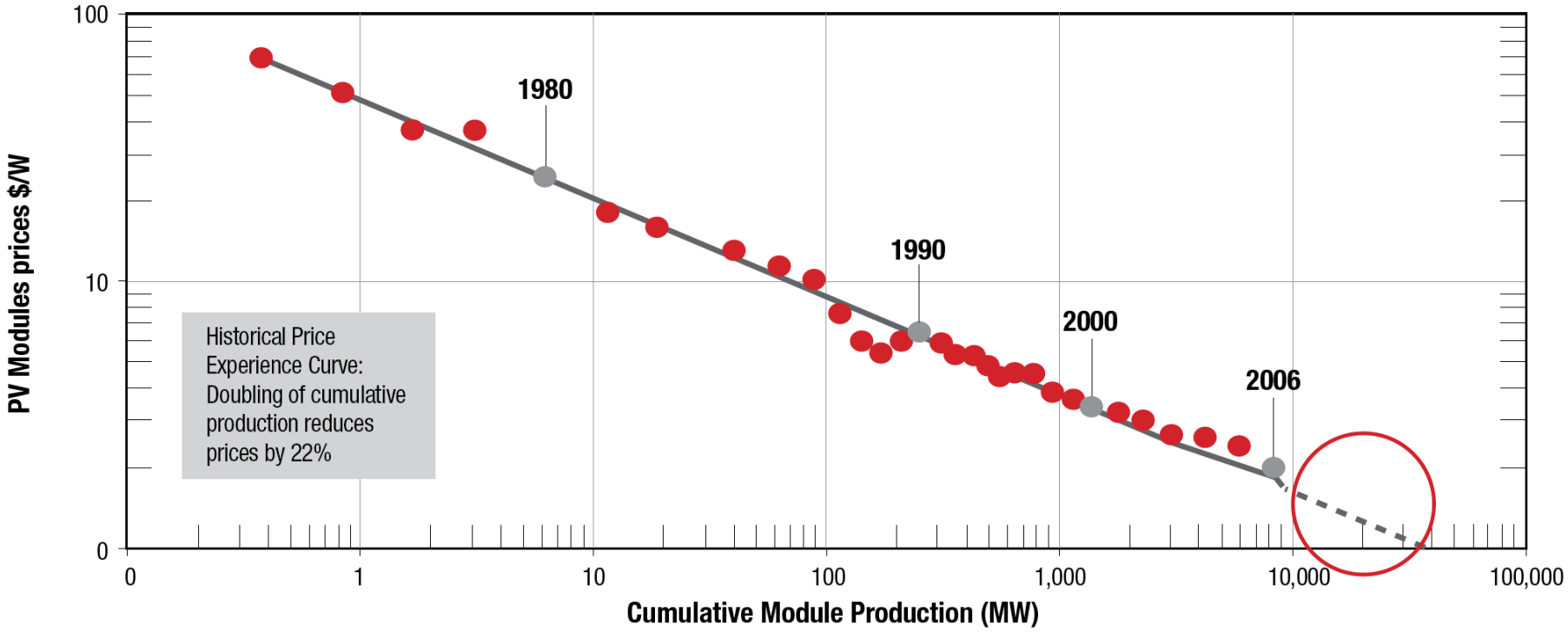
Sudden rapid price decline has changed world PV markets

- Sudden rapid price decline:
  - Sufficient Si supply after completion of new facilities
  - Breakdown of the Spanish market, credit crunch
  - Massive capacity build-up, key-turn factories
  - Determined Chinese strategy to conquer markets
- Prices do not correspond to lowest available production costs. Lowest module production costs:
  - today: around 1€/Wp
  - end 2010: <0,60 €/Wp





The PV learning curve



Sources: EU Joint Research Centre - EIA - National Renewable Energy Laboratory - A.T. Kearney analysis.

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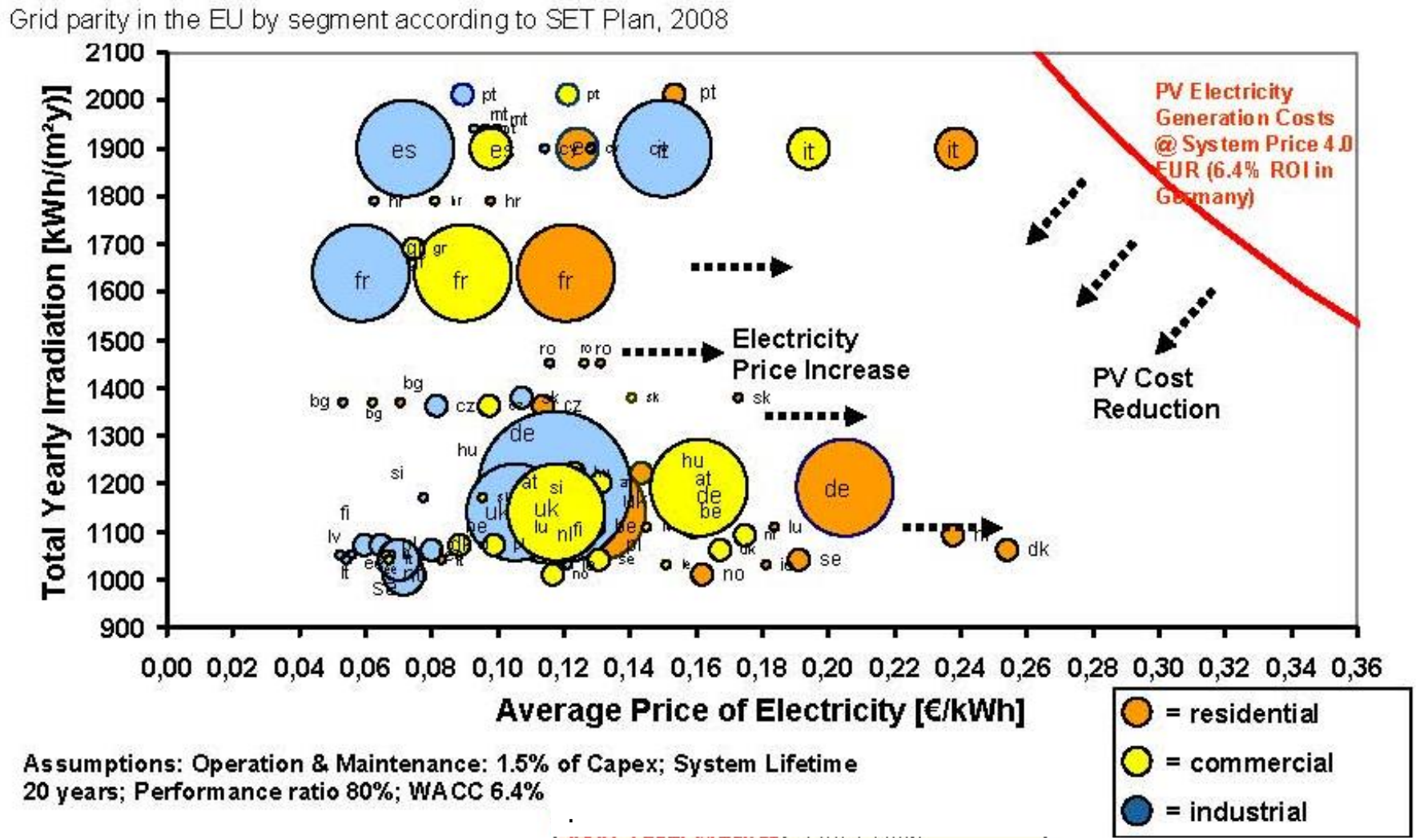
PV grid parity approaching: the situation early 2009



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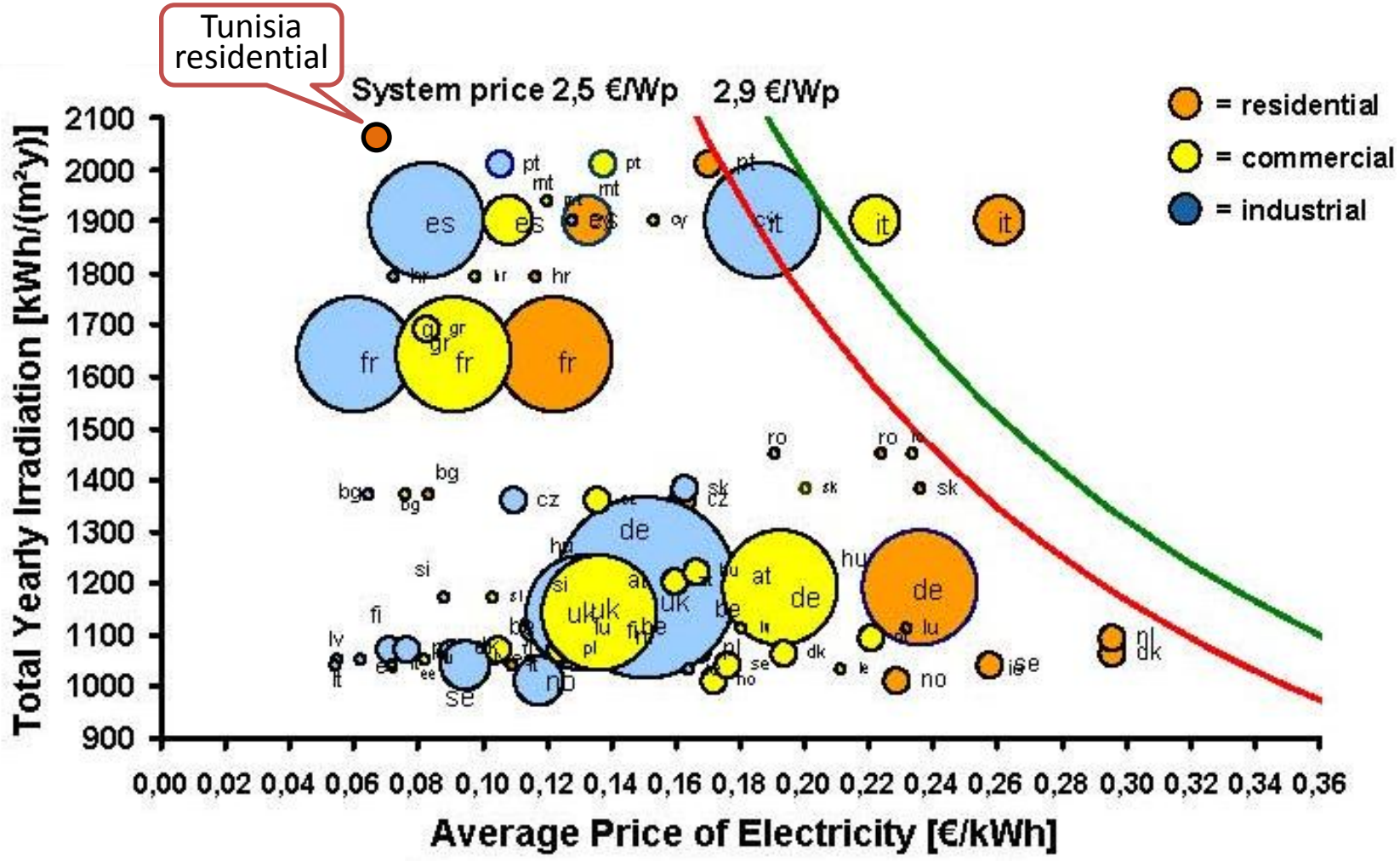
PV grid parity approaching: the situation mid 2010



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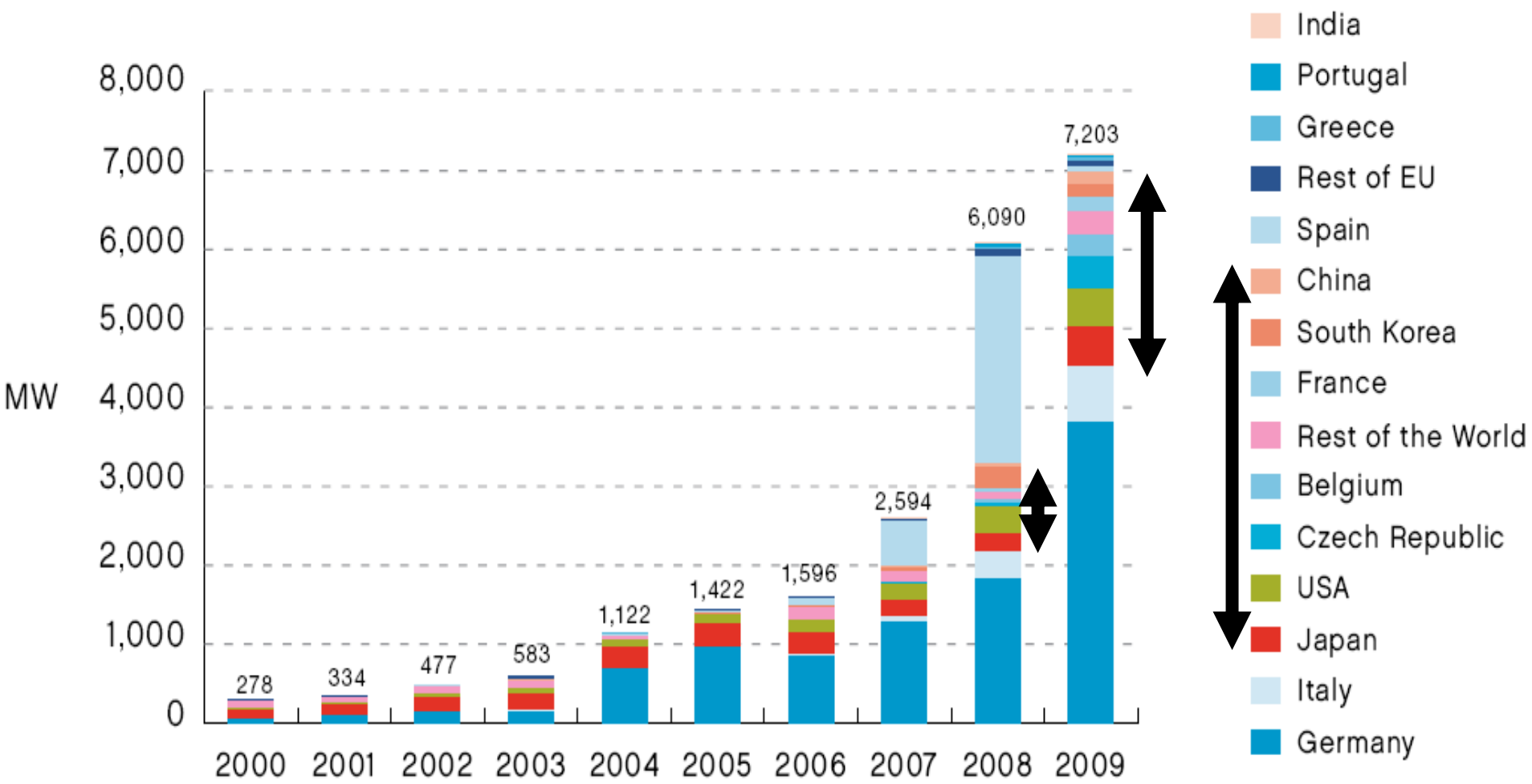
PV: New markets growing fast



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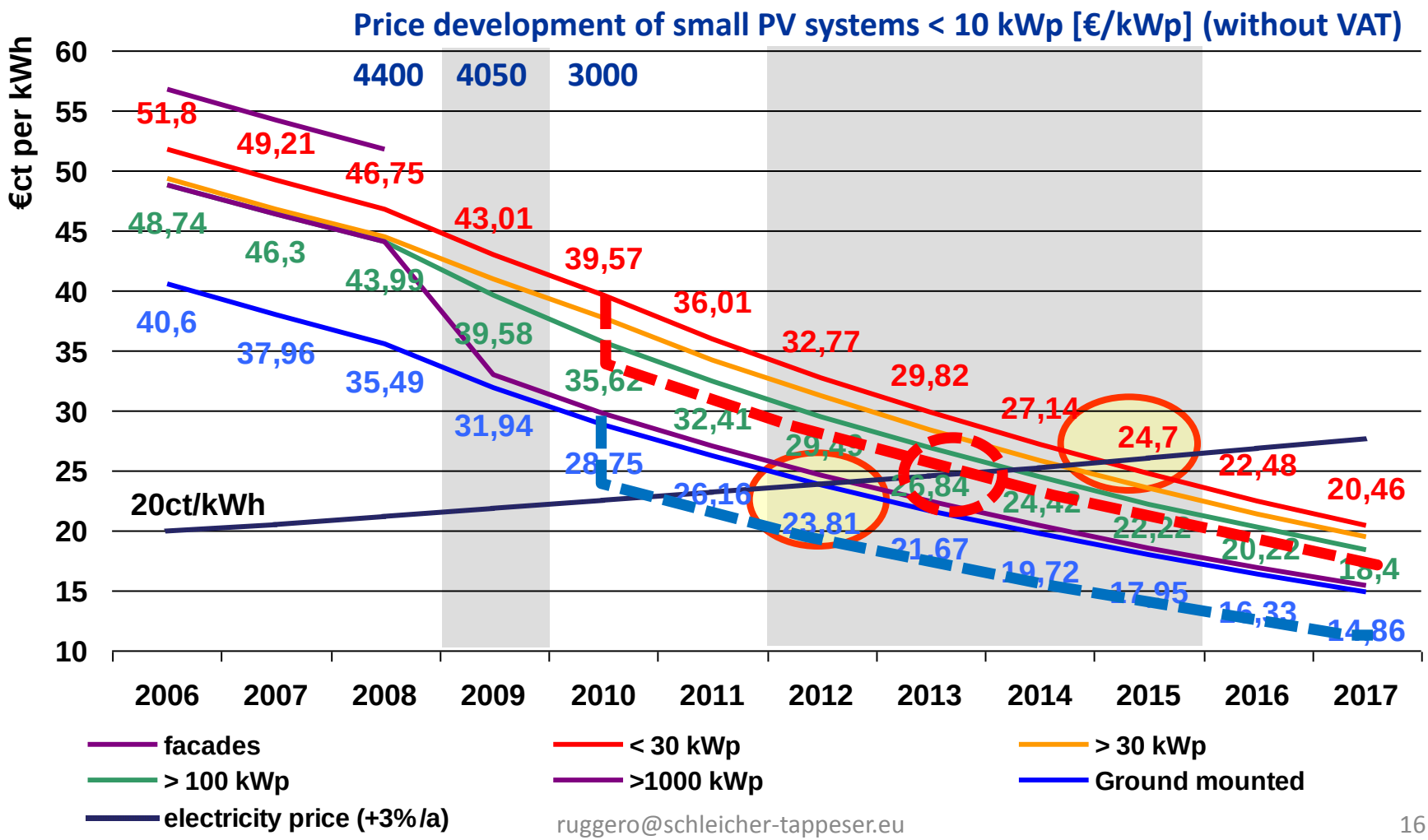
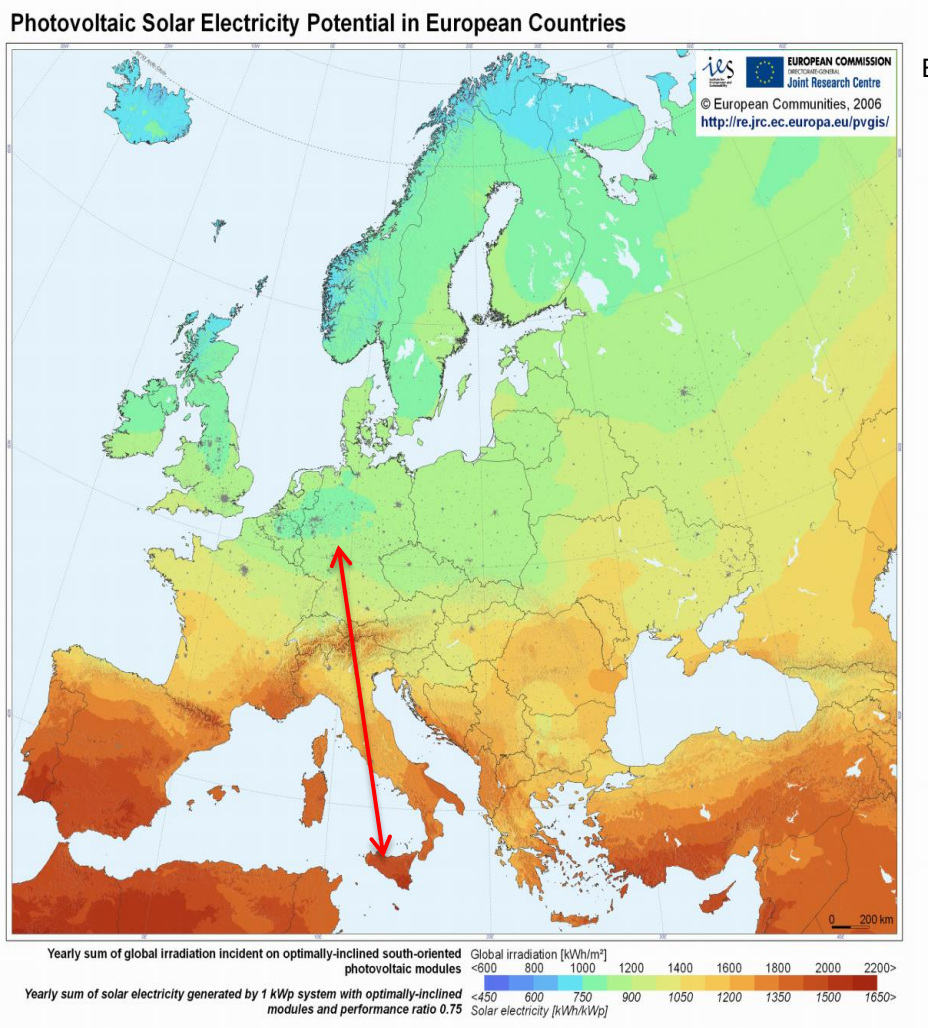
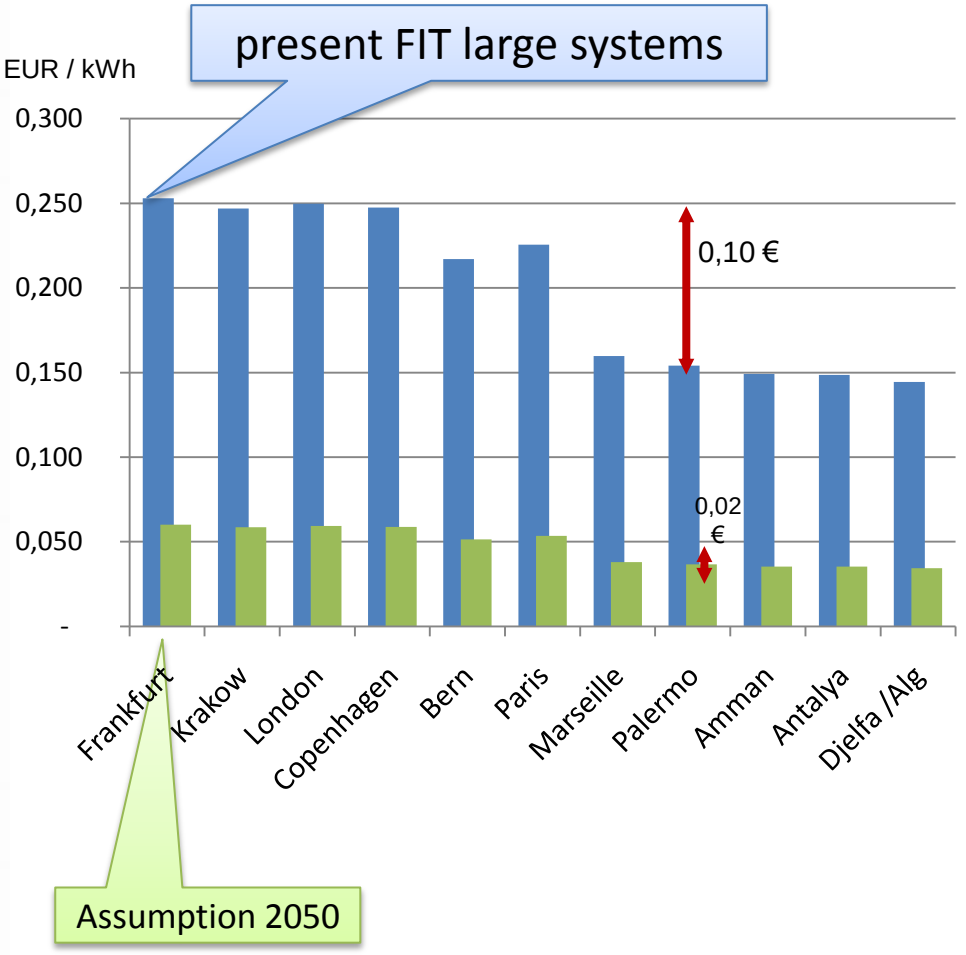
Decrease of feed-in-tariffs for PV in Germany

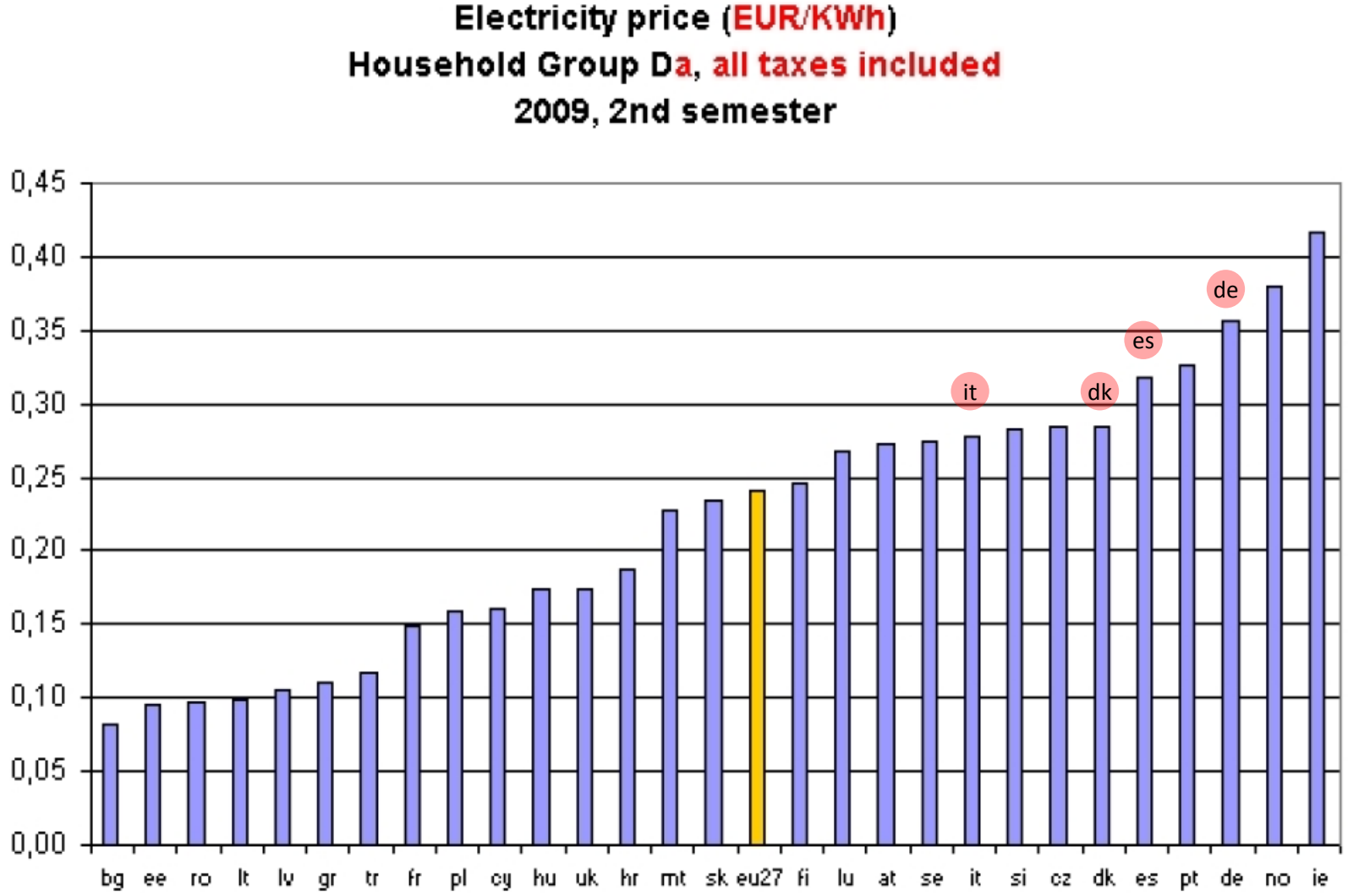


Solar radiation differences

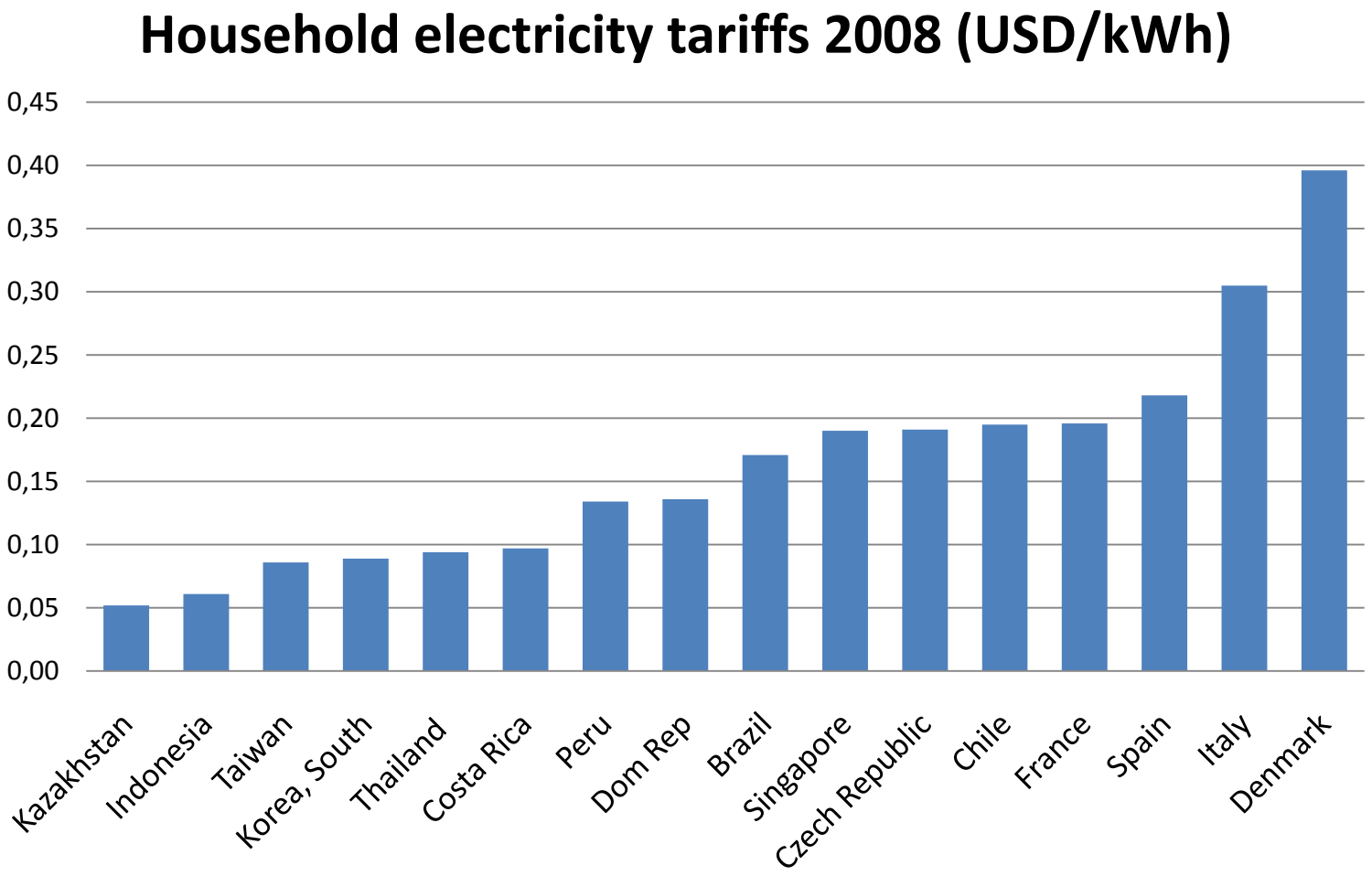




Spread of household electricity prices in the EU



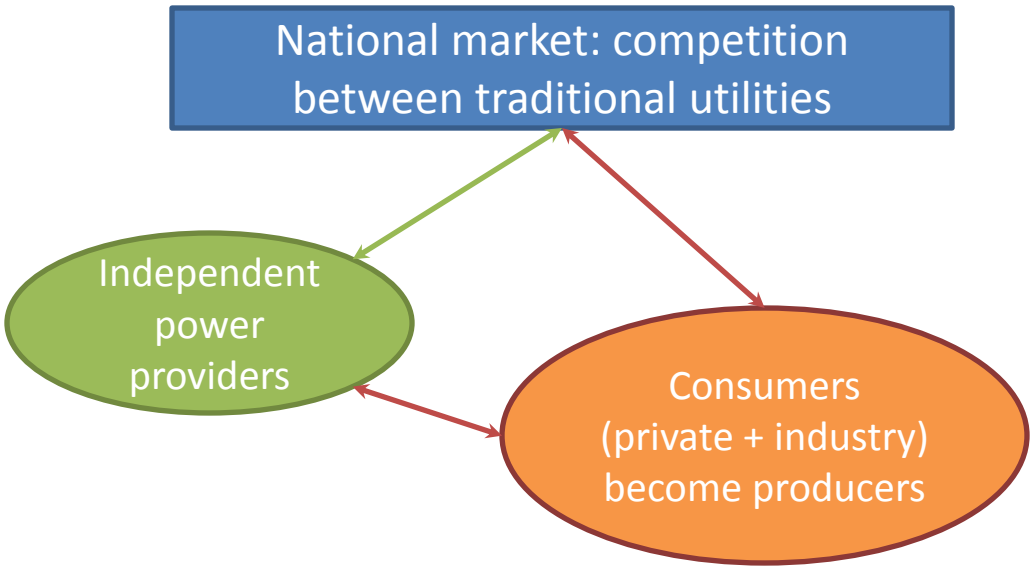
Subsidies keep electricitry tariffs low



CAPTIVE POWER GENERATION

New actors in the game

- New technologies provide an alternative at the level of the wall outlet
- A new market at this level will affect traditional utilities and regulation
- Captive power production will increase, the amount of utility provided electricity will decrease



Growing opportunity: Captive Power Generation in India

- Wind power market mainly driven by captive power for manufacturing industries (70% of customers in 2008)
- 30% of industrial consumption: in-house power plants
- Example: factories in a central Indian city
  - Highly dynamic economic development
  - 12-14h power cuts per day unscheduled for longer periods
  - Electricity tariff: 0,10 €/kWh
  - Cost of back-up diesel power 0,13-0,15 €/kWh (10-12h/day in process industries)
  - High indirect costs and efficiency losses due to power cuts
  - Many factories working at night for avoiding power cuts
- High reliability of sunshine during most of the year → opportunities for PV and CSP ahead

Captive Power for Industries in weak grid areas: challenges

Challenges for developing appropriate business models:

- Find: industries with relatively constant and partially not time-sensitive (heating and cooling) electricity requirements during daytime
- Adapt industrial processes so as to allow for demand side management for optimal use of power generated
- Most interesting: industrial activity areas with a good mix of activities in order to distribute risks
- Requirement: appropriate surfaces for REN nearby. Integrate wind and biomass as available
- Minimise diesel backup requirements
- Find agreements with public utilities for optimal coordination

STANDARDISATION

Standardisation of components and plants

Standardised components:

- Reduce perceived component risks
- Facilitate reselling of used components (second hand market)
- Reduce risk of changes in plant utilisation / configuration

Standardised plants:

- Reduce planning costs, planning risks
- Reduce permitting times

Both:

- Reduce costs and risks
- Improve market transparency
- Improve risk transparency, facilitate risk assessment, improve bankability, reduce capital costs

Integrated functional units with stardardised interfaces

- Integration of control and storage (electricity & heat)
- Adapting functions to fluctuating availability of power
- Optimal dimensioning of components
- Minimisation of installation and maintenance requirements and risks
- Facilitated relocation and reselling

- PV lamps
- Solar refrigeration units
- Solar street lights
- Solar charging stations
- Solar washing machines
- Standard food processing machines (drying, baking...)
- Standard chemical processing units
- Telecommunication equipment

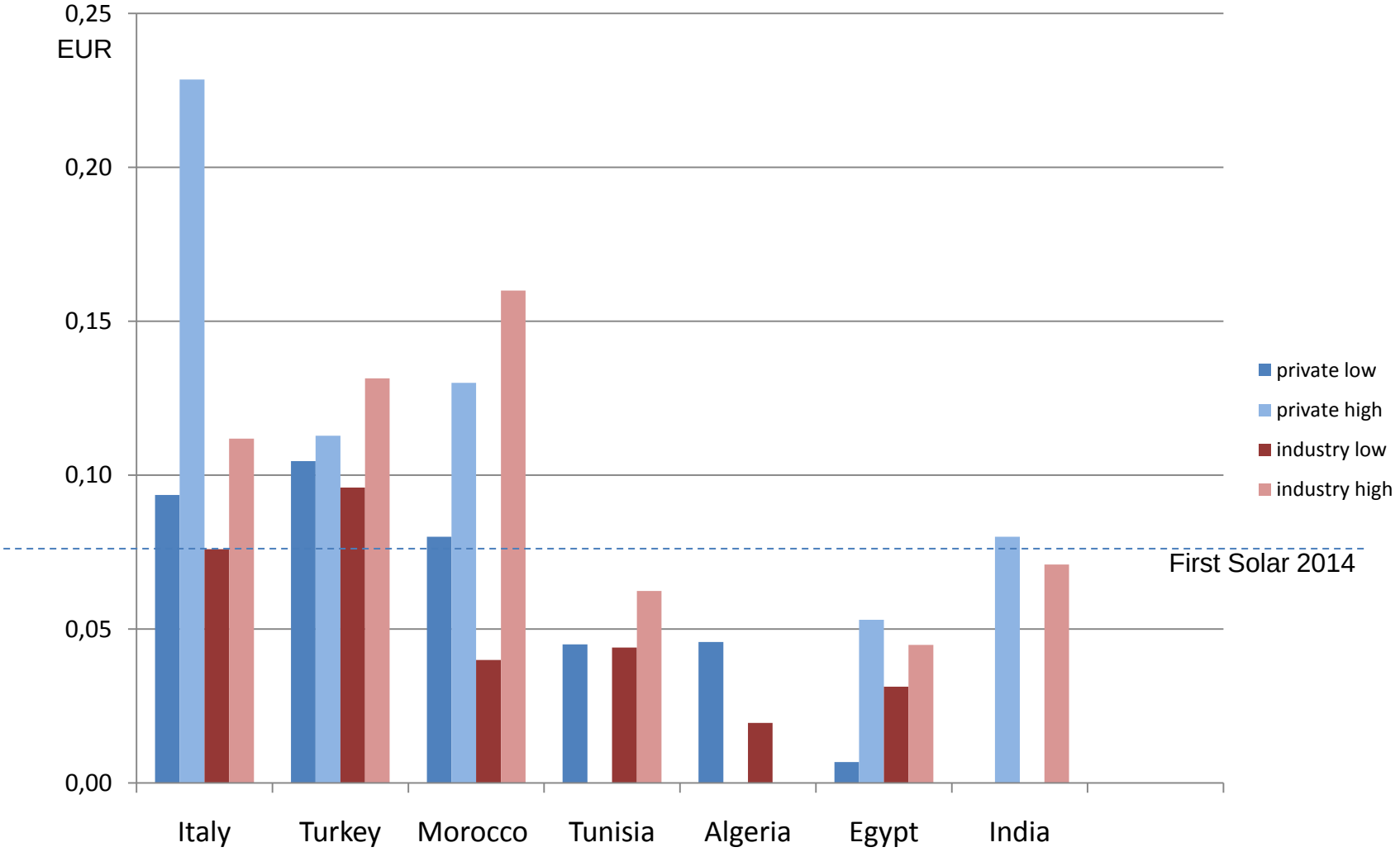
Second-hand markets

- Lower risk of shorter system duration in first-hand markets
- High reselling price requires:
  - sufficient standardisation of components
  - possibility of disassembling the system
  - sufficient volume of the market
  - sufficient transportability of components
  - continuity of warranty obligations

→Lower capital costs, growing first-hand markets since potential is far from being exhausted

COMBINING
GAS AND ELECTRICITY MARKETS

Electricity tariffs Mediterranean



Exporting electricity “by pipeline”

Opportunity for national utilities running on own natural gas:

- Produce additional electricity with wind and PV instead of additional gas turbines
- Buffer variable production with gas-turbines in national grid
- Sell saved natural gas on international markets (via existing pipelines)

→High international gas prices ensure competitiveness

→No immediate need for new grid infrastructure

THANK YOU

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