RE-Shaping

Shaping an effective and efficient European renewable energy market

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Key design elements of an effective and efficient RES policy in the EU

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Workshop of the *RE-Shaping project:*

“Shaping an effective and efficient European renewable energy market”

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Climate change: a main driver for technology innovation

- "Climate Change is the greatest environmental challenge of the 21st century" – Tony Blair
- Besides **climate change - security of supply and economic competitiveness** constitute the main challenges in the energy sector
- "**Carbon pricing** alone will not be sufficient to reduce emissions on the scale and pace required … **deployment incentives** for low emission technologies should increase two to five times … **public energy R&D funding** should double" – Stern Review
- An **active innovation policy** in the energy sector can become one of the most important pillars for fulfilling the Lisbon objective for Europe

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What is the objective for policy for renewable energy?

1. RES deployment leading to:
   - Environmental protection
   - Security of supply
   - Economic / rural development / jobs in energy sector
2. Build up of RES industries leading to:
   - Industrial production capacities / jobs in industry
   - Technological and institutional innovation

Challenges and expected effect of RES policies:

- Renewable energies typically show **higher generation costs (presently) and higher learning rates** compared to conventional alternatives
- Renewable energies are **capital intensive**.
- Future **reference final energy prices are subject to substantial uncertainty**.
- **Policy needs to compensate additional generation costs, provide low risk financing, accelerate technological and institutional learning and reduce non-economic barriers.**
- **Costs of the policy should be minimised.**

→ effective and efficient (static & dynamic) policies

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Main policy development on EU level

EU Renewable Energy Directive 2009/28/EC

- New Directive was passed in December 2008
- Targets for 2020:
  - 20% renewable energy in final energy consumption
  - Binding targets for Member States
- National support schemes will remain the cornerstones for the deployment of renewables in Europe
- Flexibility mechanisms between Member States
  - Statistical transfer
  - Joint projects
  - Joint support schemes
  - Physical imports from third countries
- Measures to reduce non-economic barriers (particularly reduce administrative, regulative, grid related barriers)

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Main policy developments on MS level

- Countries start to adapt ambition level of their policies to target level, e.g. banding of quota system in RO, IT and UK, new tariff levels for RES-E in DE, NL and SI, UK feed-in system for RES-H
- MSs start to analyse the impact of specific flexibility measures on their renewable energy sector, first talks between different MSs and between MSs and third countries
- Little progress on the reduction of non-economic barriers
- Financing constraints have been significant during last years and are not resolved for many technologies
- Currently the National Renewable Energy Action Plans under assessment by the EC

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Costs and benefits of RES policies should be continuously monitored

Main elements of costs and benefits

category / **impacts** / **study scope**

1. **System analytical impacts**
   - Benefit
   - Cost
   - + Avoided externalities
   - – Additional generation cost
   - – Transaction costs
   - – Additional cost of control and balancing power
   - – Cost of grid expansion

2. **Price and allocation impacts**
   - Discharging
   - Charging
   - Avoided energy imports
   - Policy costs
   - Merit-order effect
   - Taxation of power
   - Public and private funding, e.g. R&D
   - Special equalisation scheme for electricity-intensive enterprises

3. **Macro economical impacts**
   - Employment
   - GDP, sales
   - Employment and sales
   - Impacts on GDP
   - Energy portfolio effect
   - Impact on innovation

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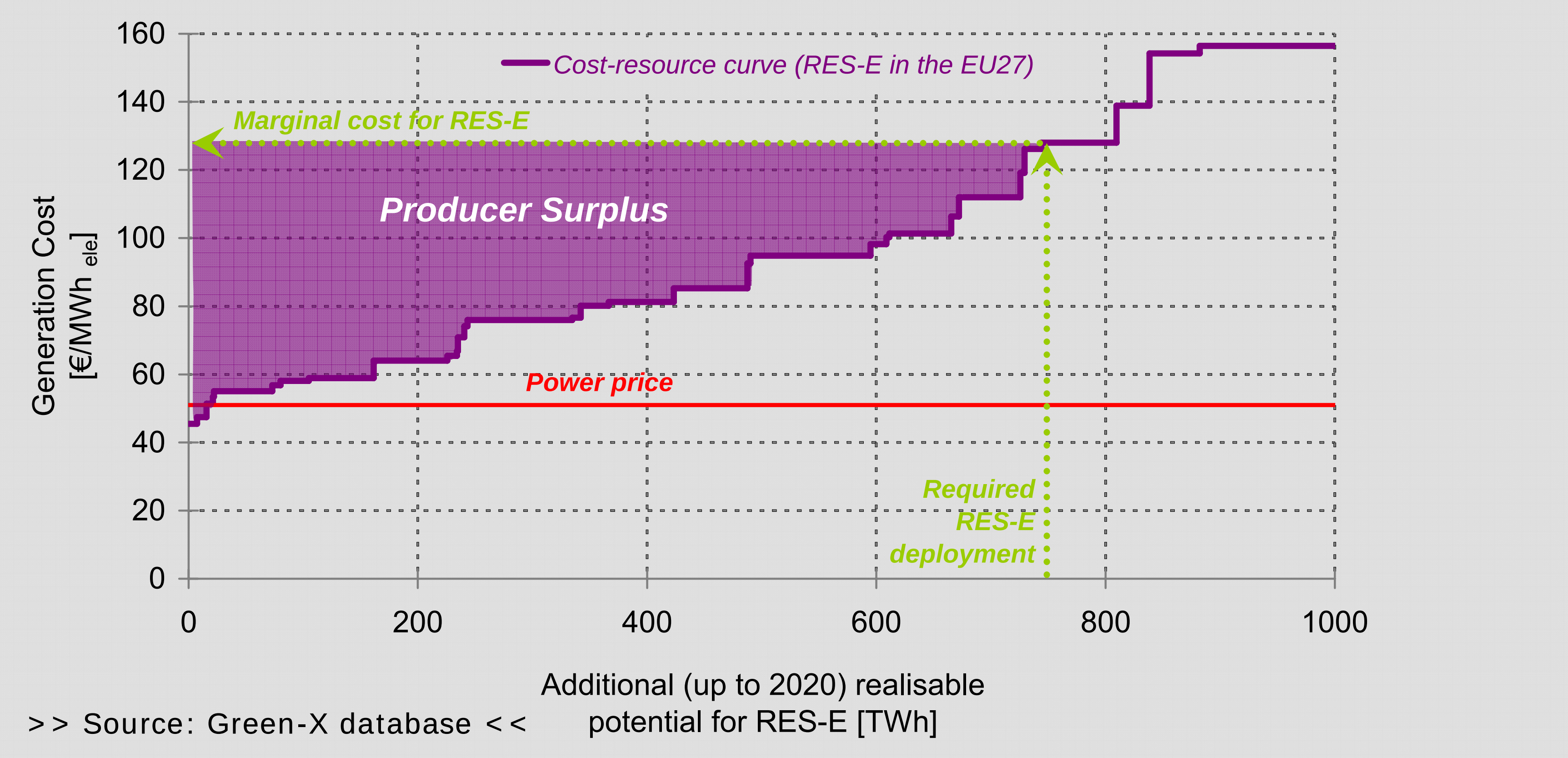
Costs and net macro-economic effects of RES policy in the EU

- Total policy costs of for RES in the EU amounted to about 35 billion € / a or 0,3% of the EU GDP in 2009 (source: RES-financing)
- Additional support of about 35 billion €/a until 2020 is needed to reach the 20% EU-target (source: RE-Shaping)
- Therefore efficient policy schemes are key
- Average annual investments in RES for reaching 20% by 2020 amount to about 70 billion € / a until 2020 (source: RES-financing)
- The net GDP change due to RES policies in 2020 is expected to amount to 0.11% - 0.14% under a BAU scenario and to 0.23% - 0.25% under a policy scenario (20% in 2020) for the EU-27 (source: Employ-RES)

For achieving an ambitious target a portfolio of RES technologies – being in a different stage of development (cost) - is required.

Therefore technology specific support is preferable to reduce policy costs and to incentivise deployment of less advanced technologies.

Technology neutrality leads to high producer surplus



A technology-neutral support leads to high policy costs

→ technology banding has been introduced in UK, Italy and Romania

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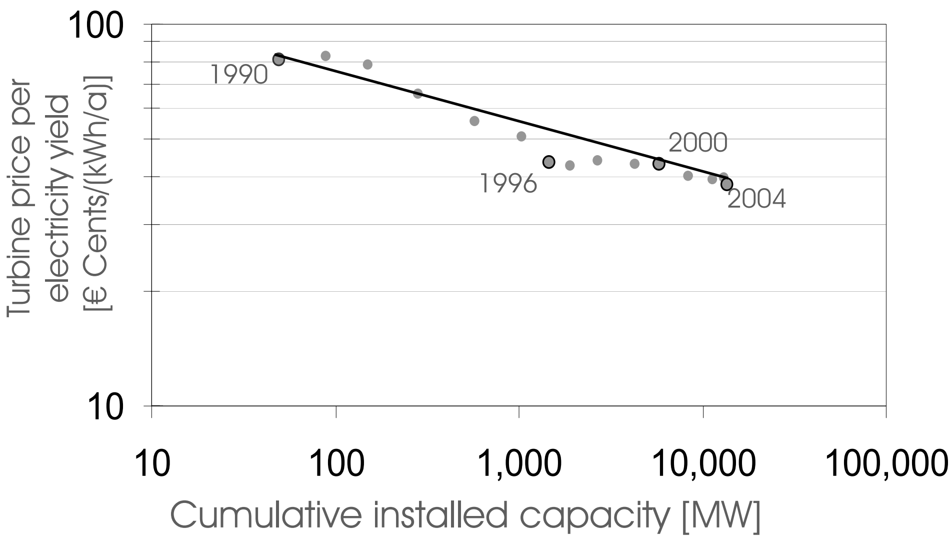
Source: schematic depiction of aggregated cost curve for RES-E technologies at EU level

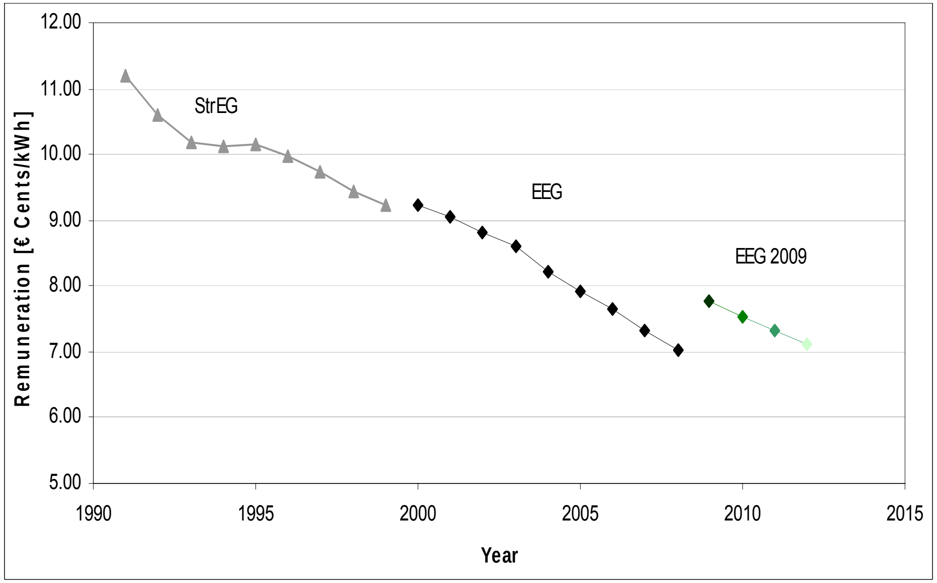
Support levels for **new plants** should be **continuously decreasing**

Tariff degression – Case study Germany

Experience curve for onshore wind energy



Support for onshore wind energy



- Reduction of 53% from 1990 – 2004 (~5% annually)
- High decrease in costs between 1991 and 1996, lower decrease since 1997
- Technology learning overestimated due to decreasing raw material prices

- Reduction of 36% from 1991 – 2011
- Tariff degression of 2% per year

Technology specific support may still lead to high costs if the strongest growth is realised for most innovative technologies.

Therefore a continuous and swift adjustment of support levels is needed

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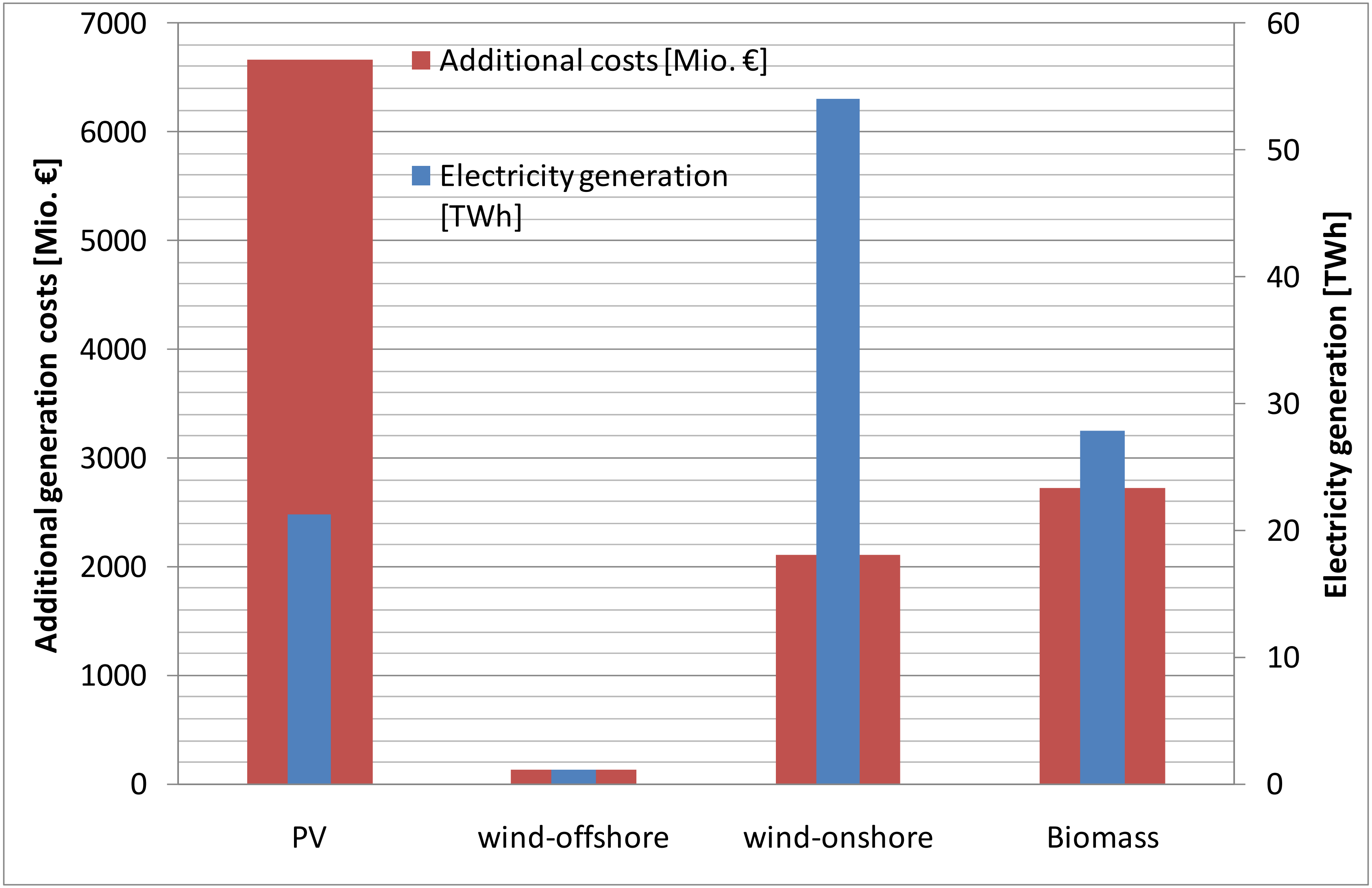
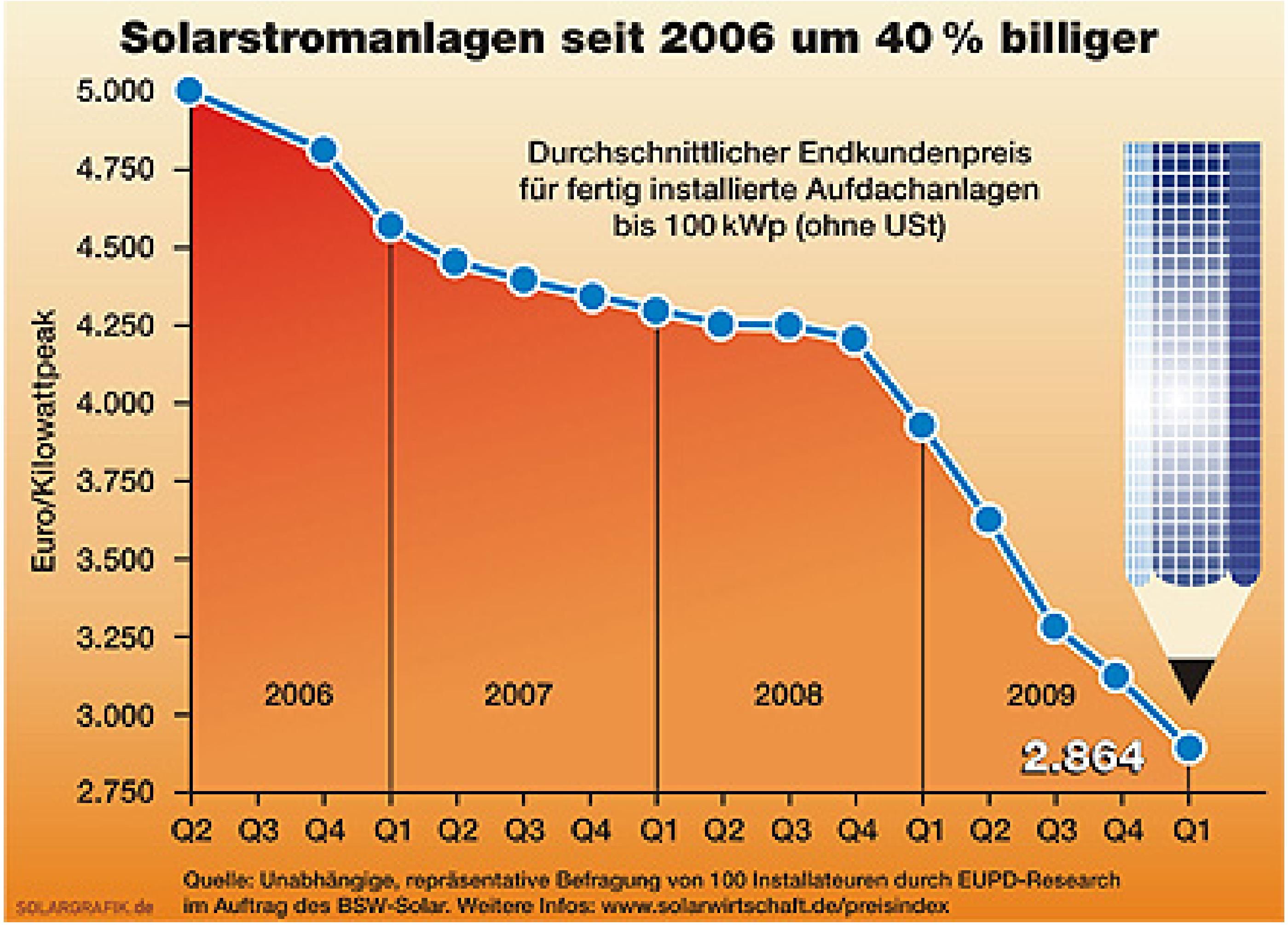
Additional costs and generation for RES-E technologies in Germany



Source: own calculation based on TSO prognosis for 2011

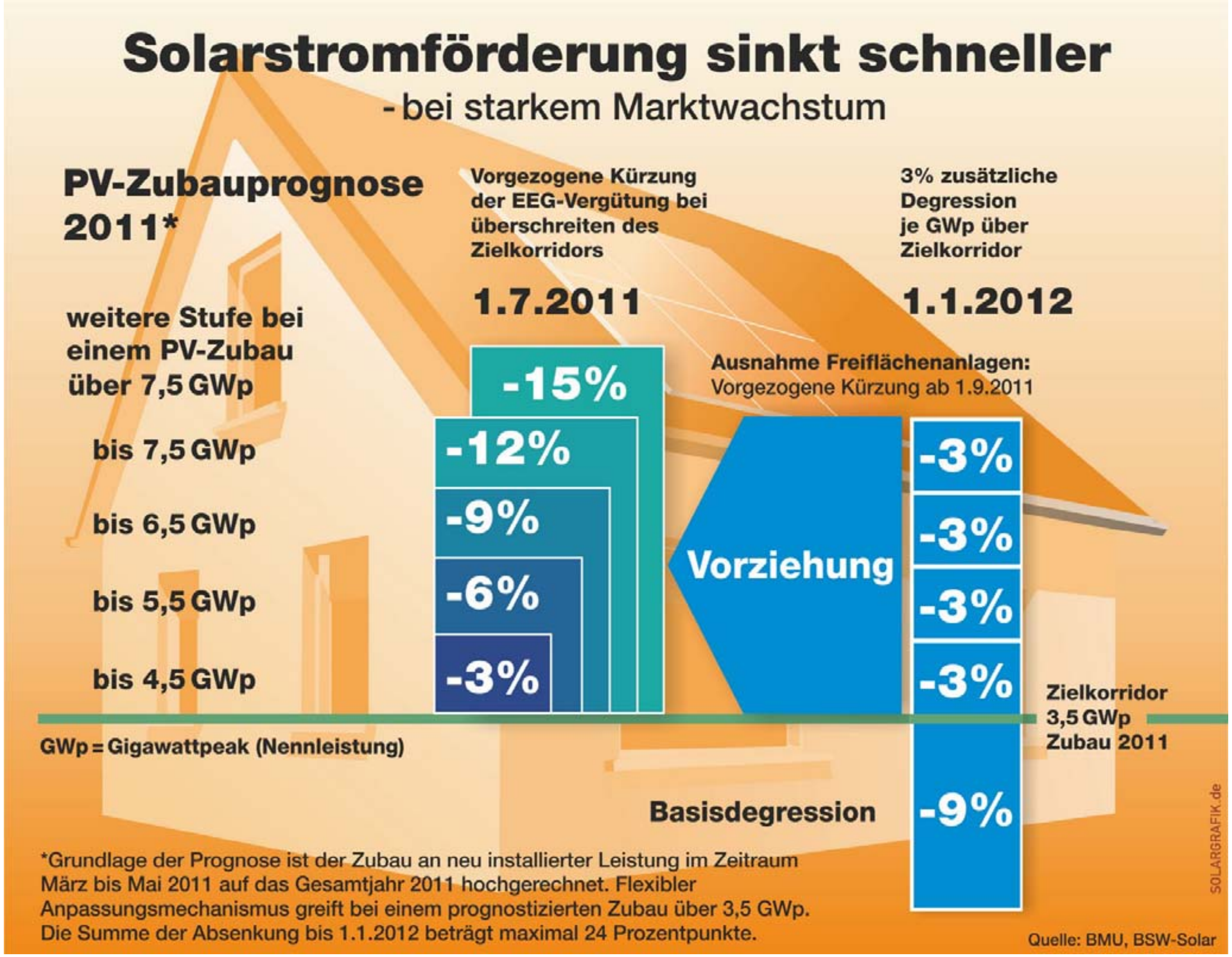
Reduction of average prices for PV-installations in Germany



Source: BSW-Solar based on EUPD-Research

Reduction of PV-support in Germany in 2011

Degression of feed-in tariff depending on market development



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Source: BSW-Solar based on EUPD-Research

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When renewable energy technologies become **mainstream** the **compatibility** with **electricity markets** becomes crucial

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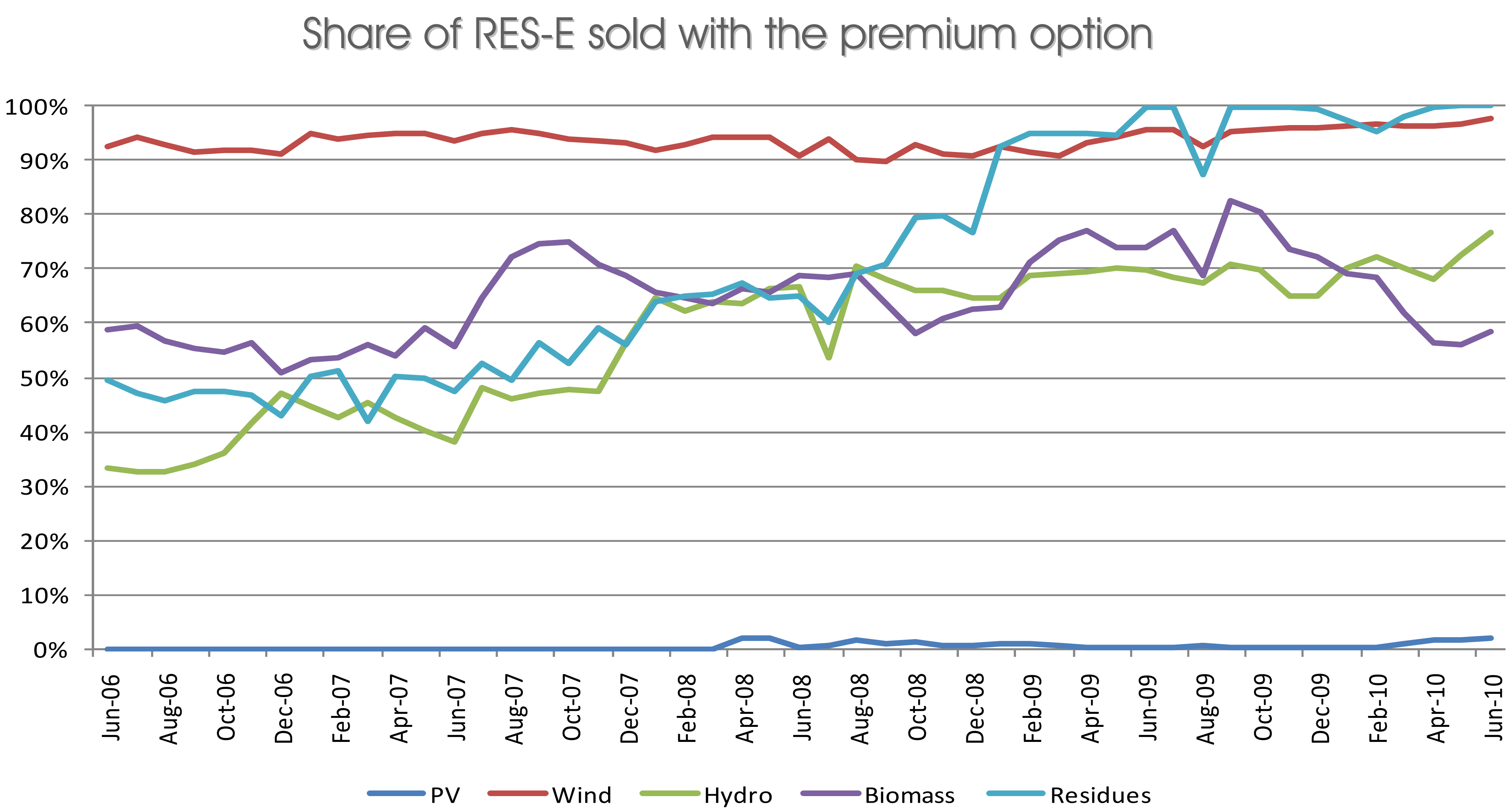
Premium tariff design – Case study Spain



In March 2004 a new premium option was introduced by the RD 436

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Continuous transition between different support schemes

Fixed feed-in premiums

Feed-in premium with electricity price index

Banded quota models

Fixed Feed-in traiffs

Technology neutral quota models

+ low investment risk
+ high technology diversity
+ low windfall profits for mature technologies
+ broad spectrum of investors
- low compatibility with electricity markets

+ high compatibility with electricity markets
+ competition between generators
- high risks and uncertainties (prices and market growth)
- low incentives for less mature technologies
- windfall profits

Non-economic barriers are relevant but the quantitative relation with the effectiveness not yet fully understood

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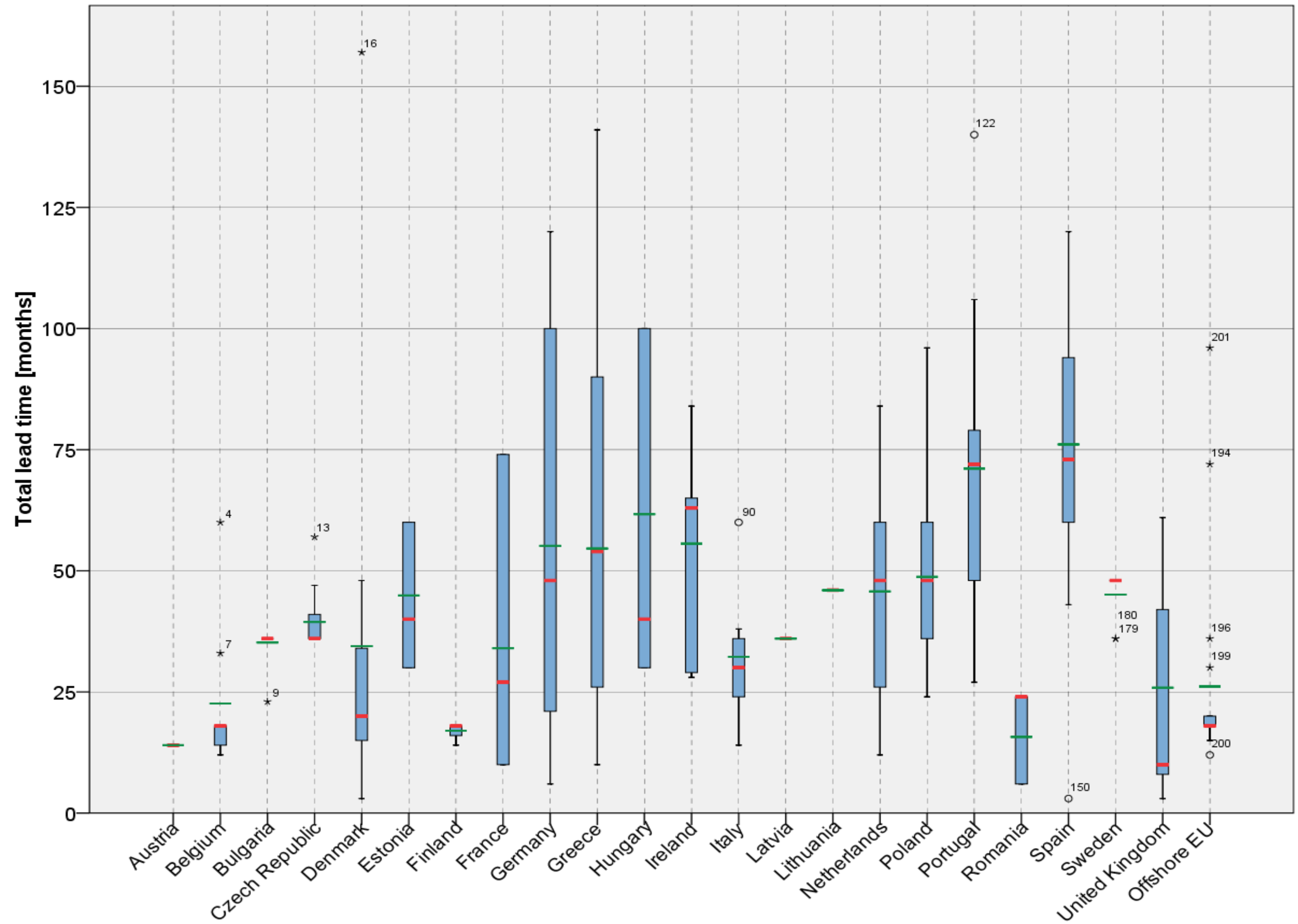
Non-economic barriers show large variety



Source: Wind-Barriers project // shown is the total (administrative and grid related) lead time for wind projects

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Long term effective and efficient policies need to incentivise in particular **technological innovation**

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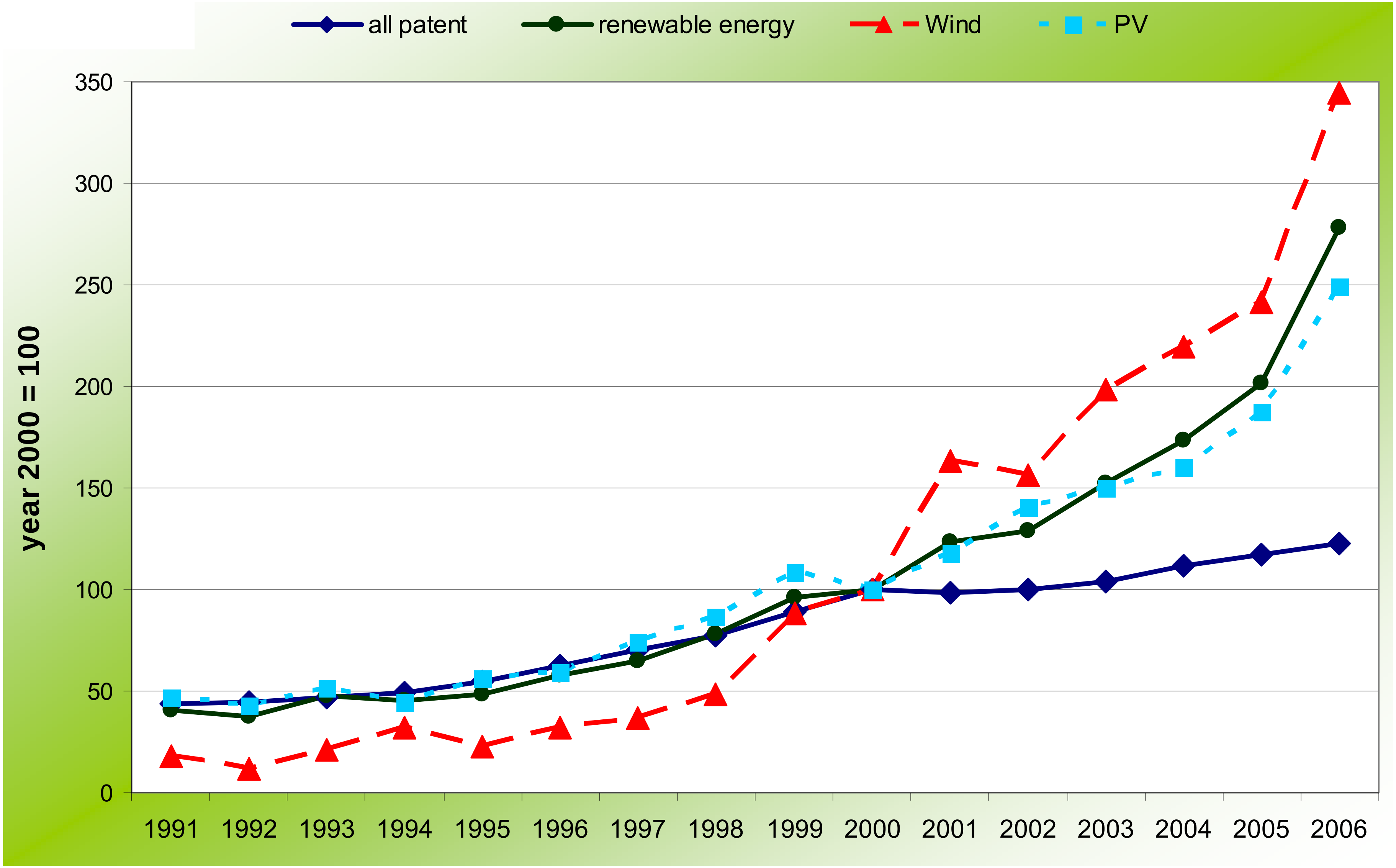
Development of patent activity in renewable energies



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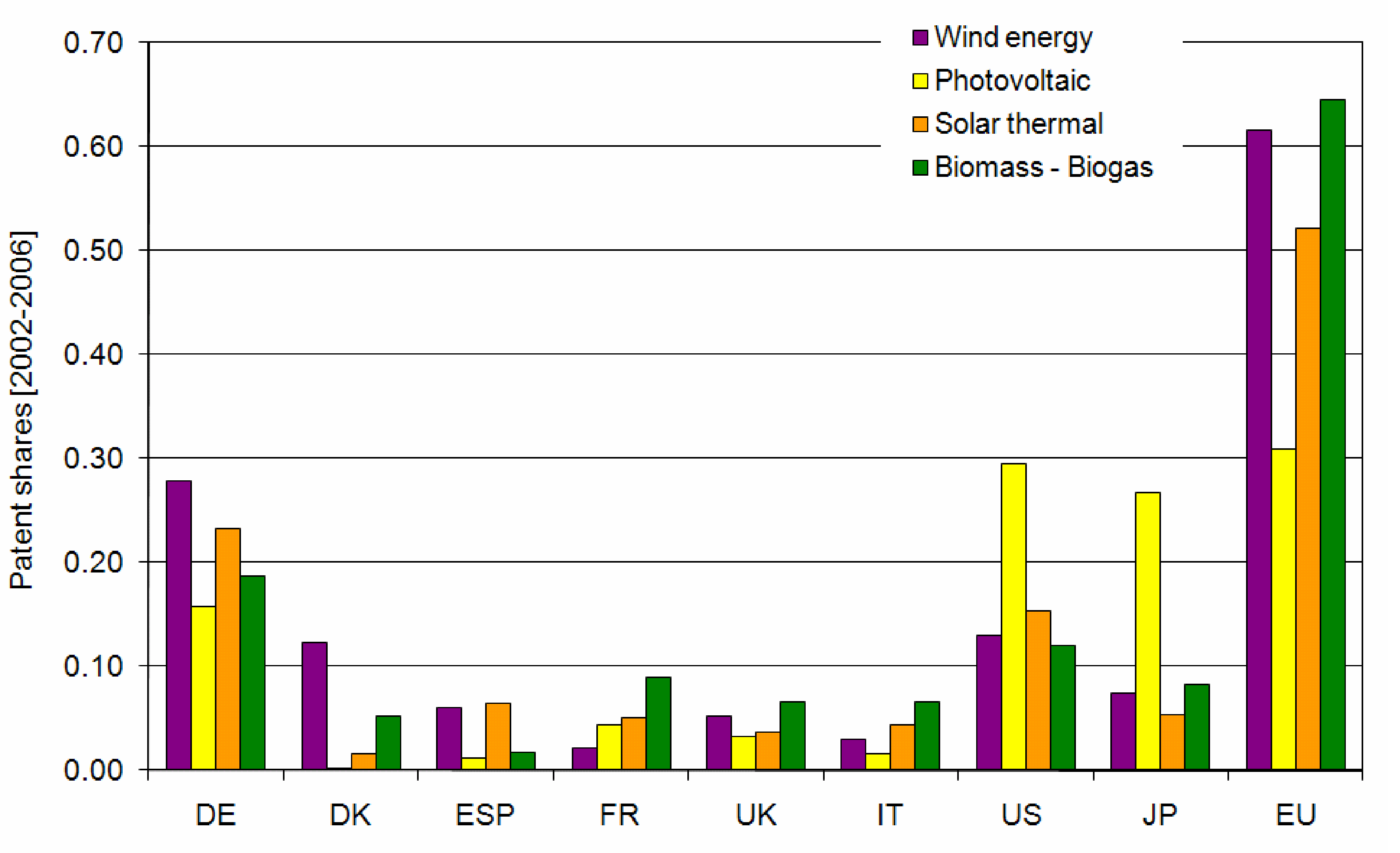
Patent shares in renewable energy technologies



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Specialisation: Relative Patent Activity

RPA indicator: Relative patent activity

$$PRA_{ij} = 100 * \tanh \ln\left(\left(P_{ij} / \sum_{i} P_{ij}\right) / \left(\sum_{j} P_{ij} / \sum_{ij} P_{ij}\right)\right)$$

e.g.

Share of wind patents of a country in all global wind patents

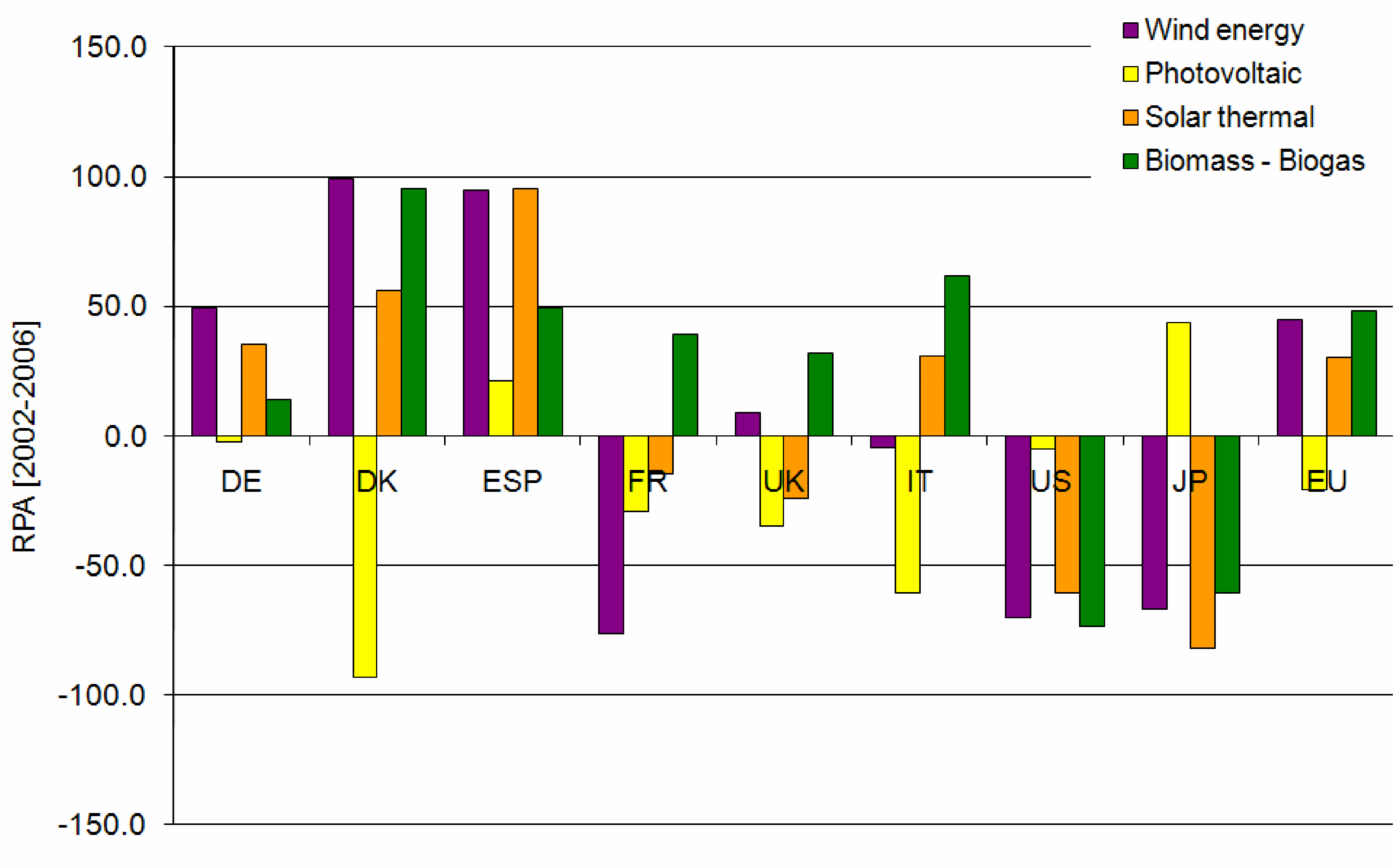
Share off all patents of a country in all global patents

P: number of patents

i: country index

j: technology index

RPA for renewable energy technologies



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Conclusions on RES policy design

- Renewable energy technologies need a long term oriented and risk mitigating deployment policy.
- Instruments should be technology specific to reduce policy costs and to promote less mature technologies.
- Support levels should continuously decrease according to technology learning and need swift adjustments for innovative technologies
- Compatibility with general energy markets should be ensured, when higher market shares of RES are reached.
- Non-economic barriers can have a significant impact on the effectiveness of an instrument and hamper the effectiveness of generally very powerful policy schemes.
- Innovations need long term, stable and degressive support

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