Electricity Policy Research Group

TSEC

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UNIVERSITY OF CAMBRIDGE

Comparison of Support Schemes for Renewables

Toulouse, January 16th, 2007

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based on paper with Lucy Butler

www.electricitypolicy.org.uk/tsec/2

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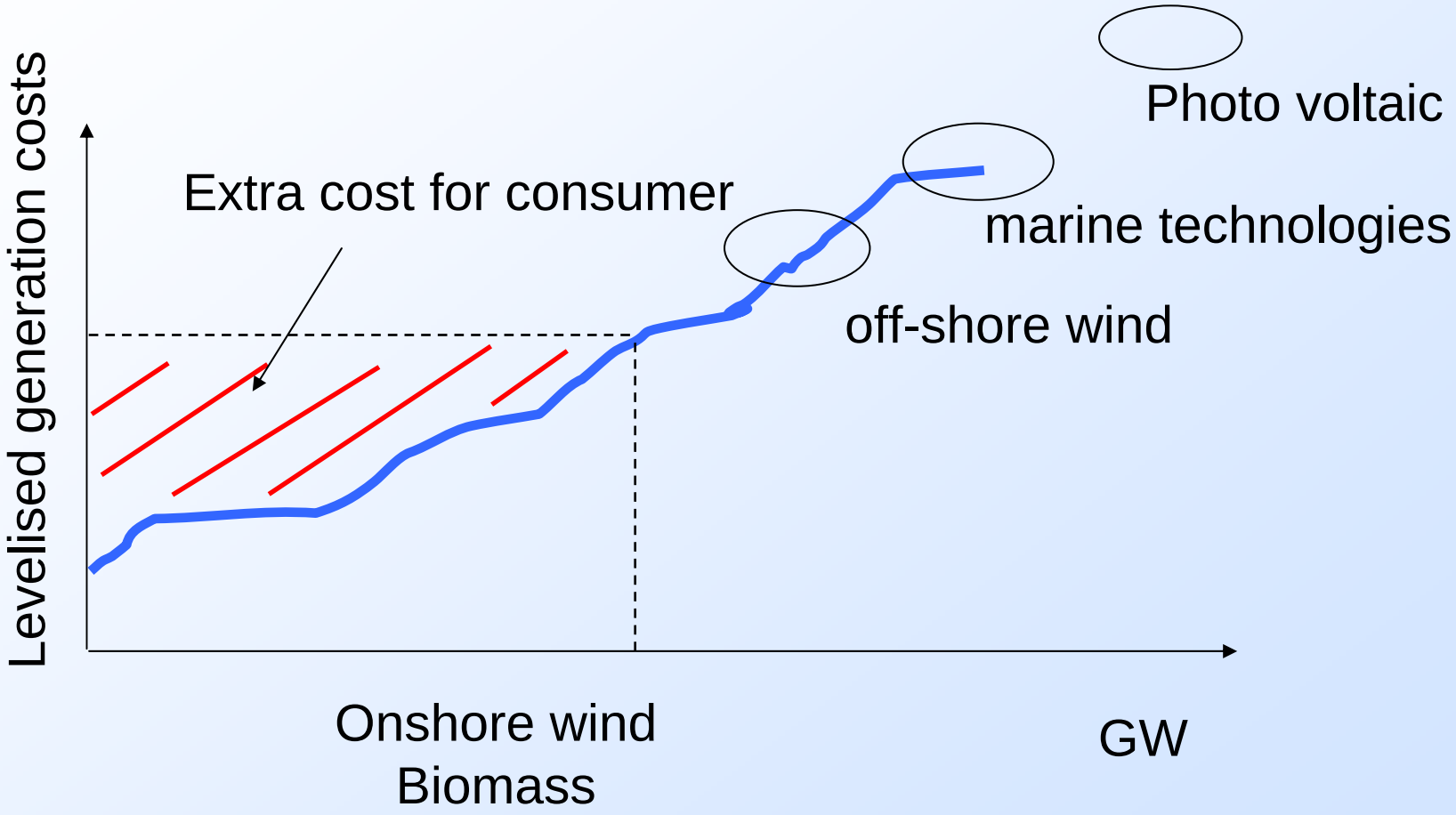
Comparison of Support Schemes for Renewables

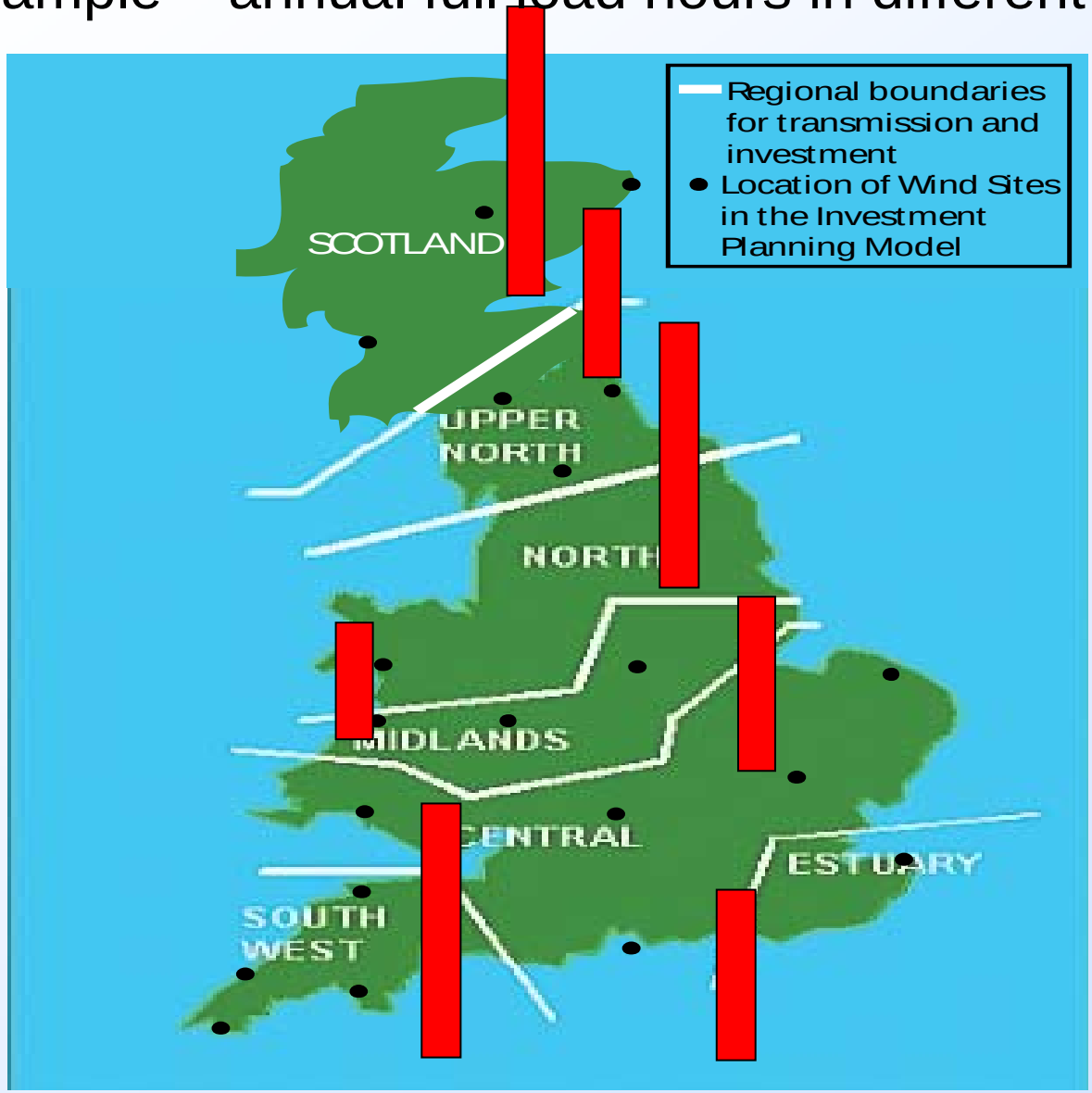
- Challenges
  - Resource differentials
  - Technology mix
  - Regulatory risk
- The Comparison
  - Cost to consumers
  - Barriers for deployment
  - Competition in value chain
- Final note – bigger picture of technology support

Generation costs differ across locations and technologies



Differentiation of support across local resources reduces scarcity rents

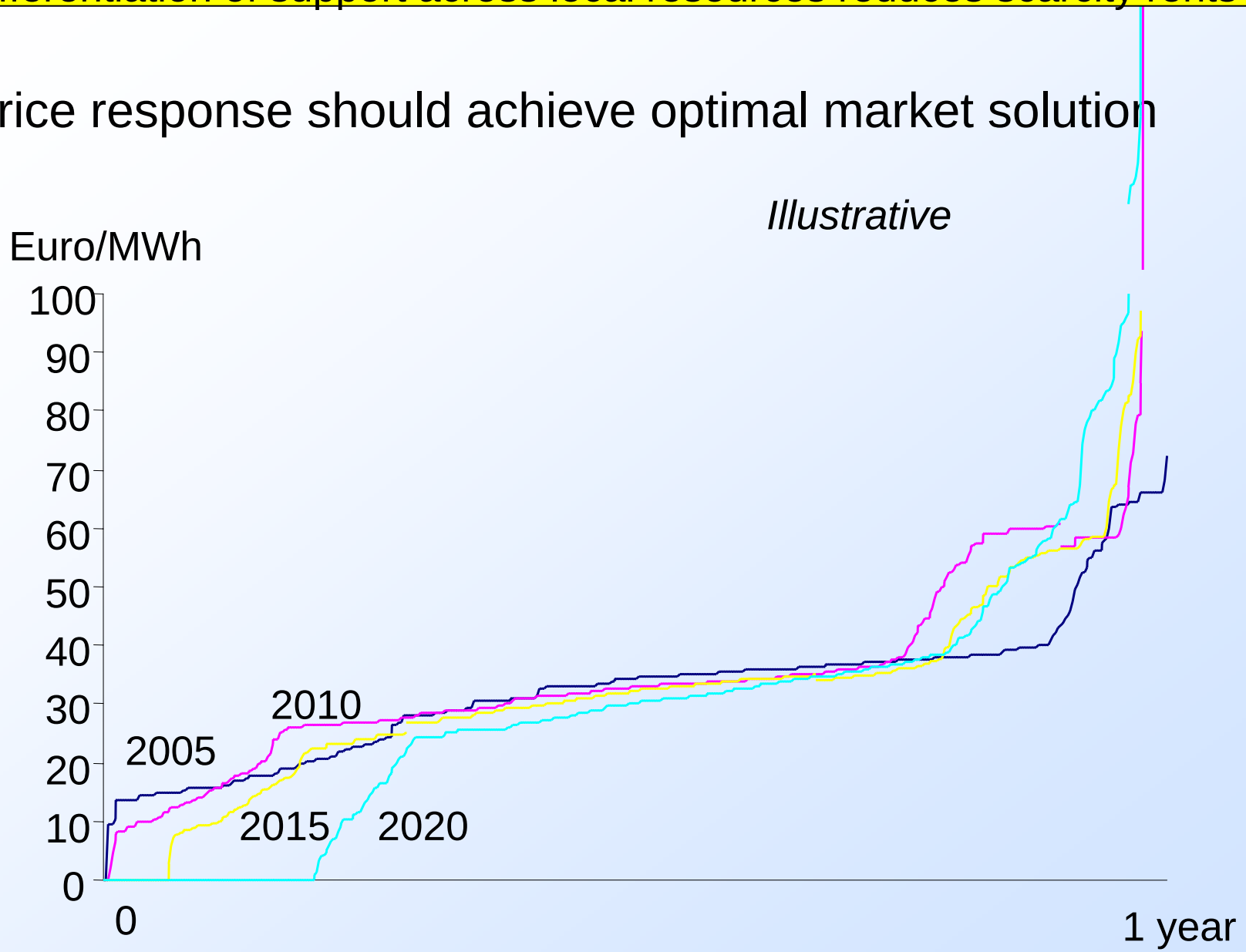
Example – annual full load hours in different UK regions



Wind output

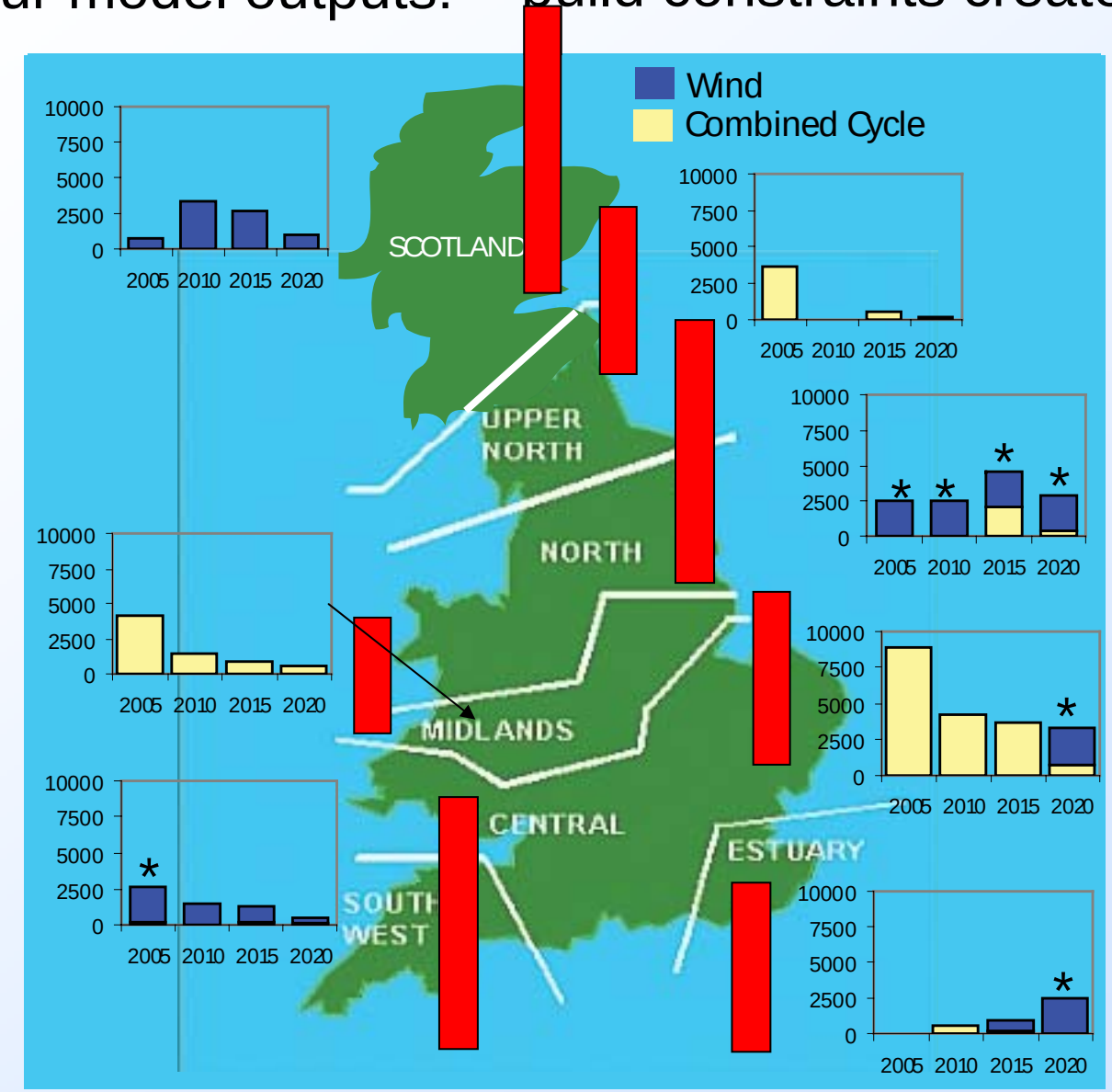
Differentiation of support across local resources reduces scarcity rents

Price response should achieve optimal market solution



Differentiation of support across local resources reduces scarcity rents

Our model outputs: – build constraints create scarcity rent



Wind output
Wind investment
CCGT investment

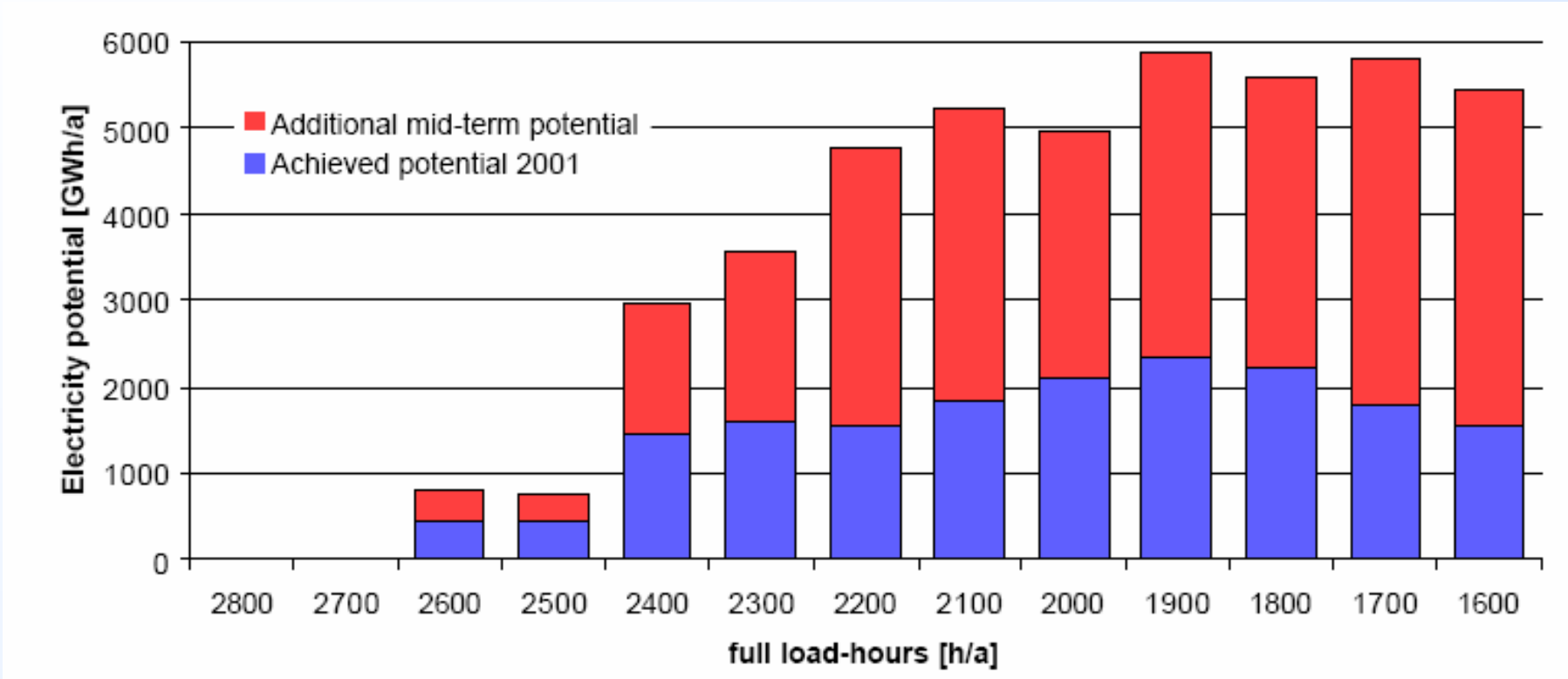
* Regional build constraint binding

Source: Modeling wind in the electricity sector, with, Cust, Keats

Differentiation of support across local resources reduces scarcity rents

Parallel rather than sequential deployment across sites

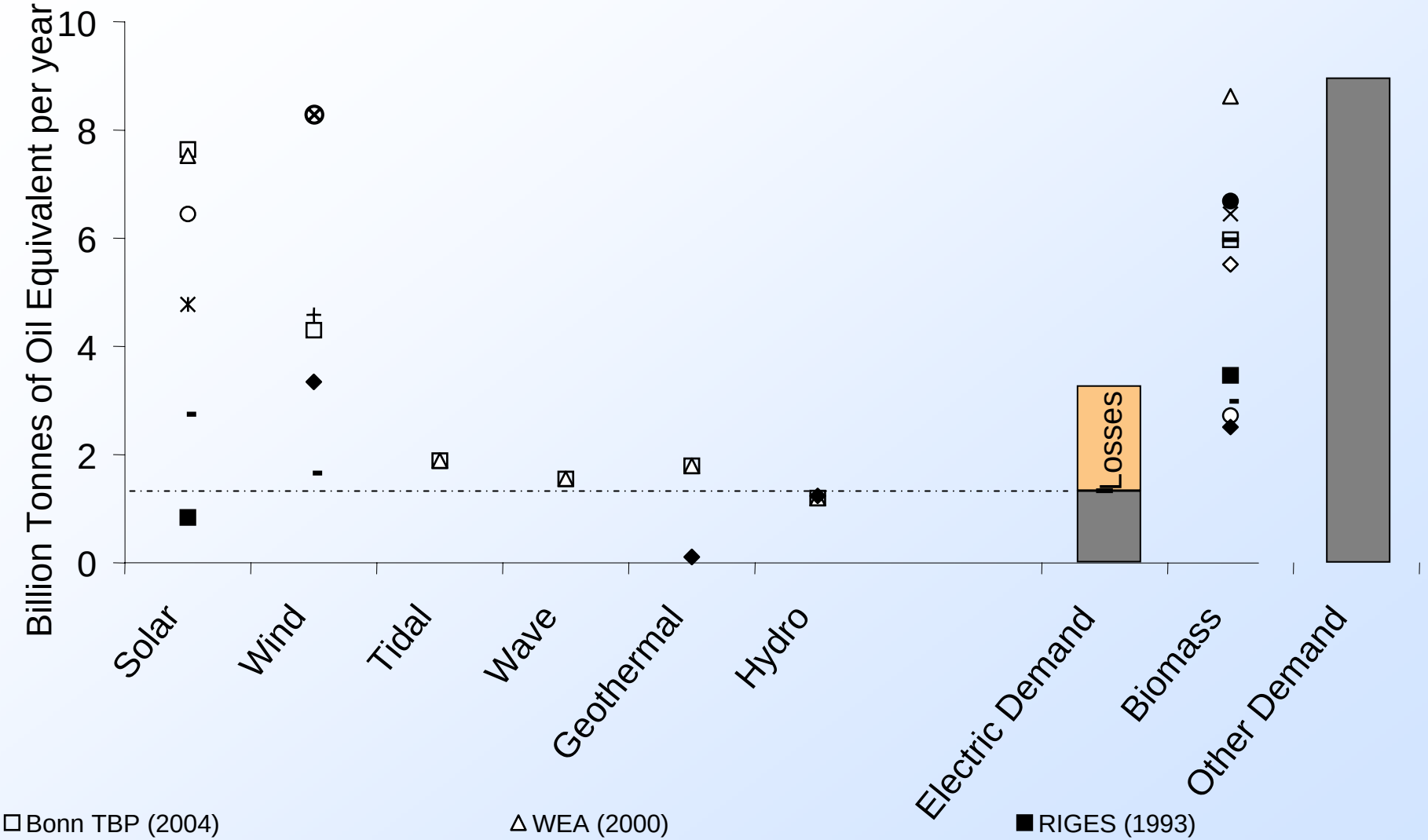
Wider participation facilitated grid integration public acceptance in Germany:



Source: Ragwitz et al, 2004

Differentiation of support across technologies avoids technology lock out

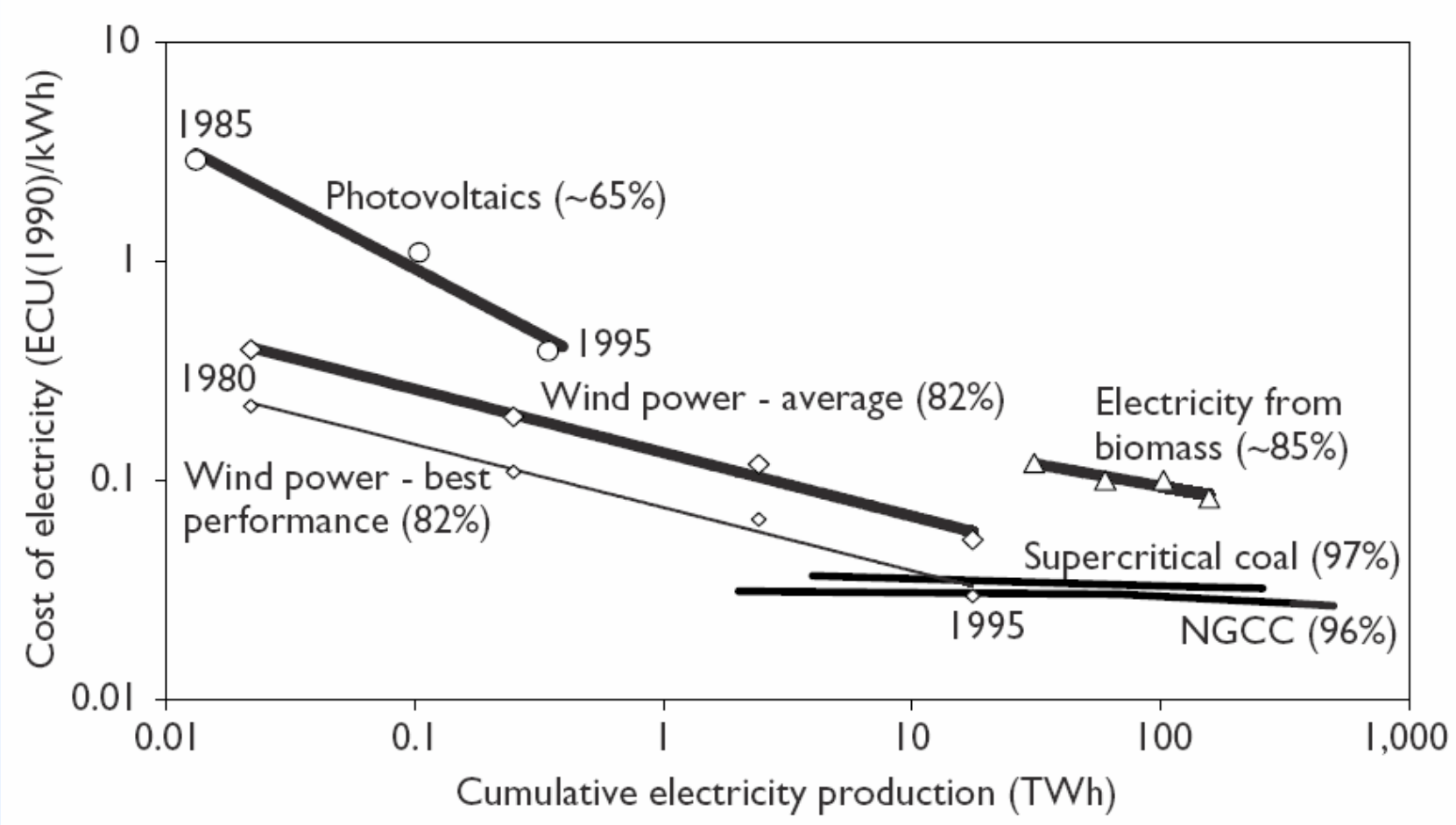
Low Carbon future likely to build on several technologies



Source: Large scale deployment of renewables

Differentiation of support across technologies avoids technology lock out

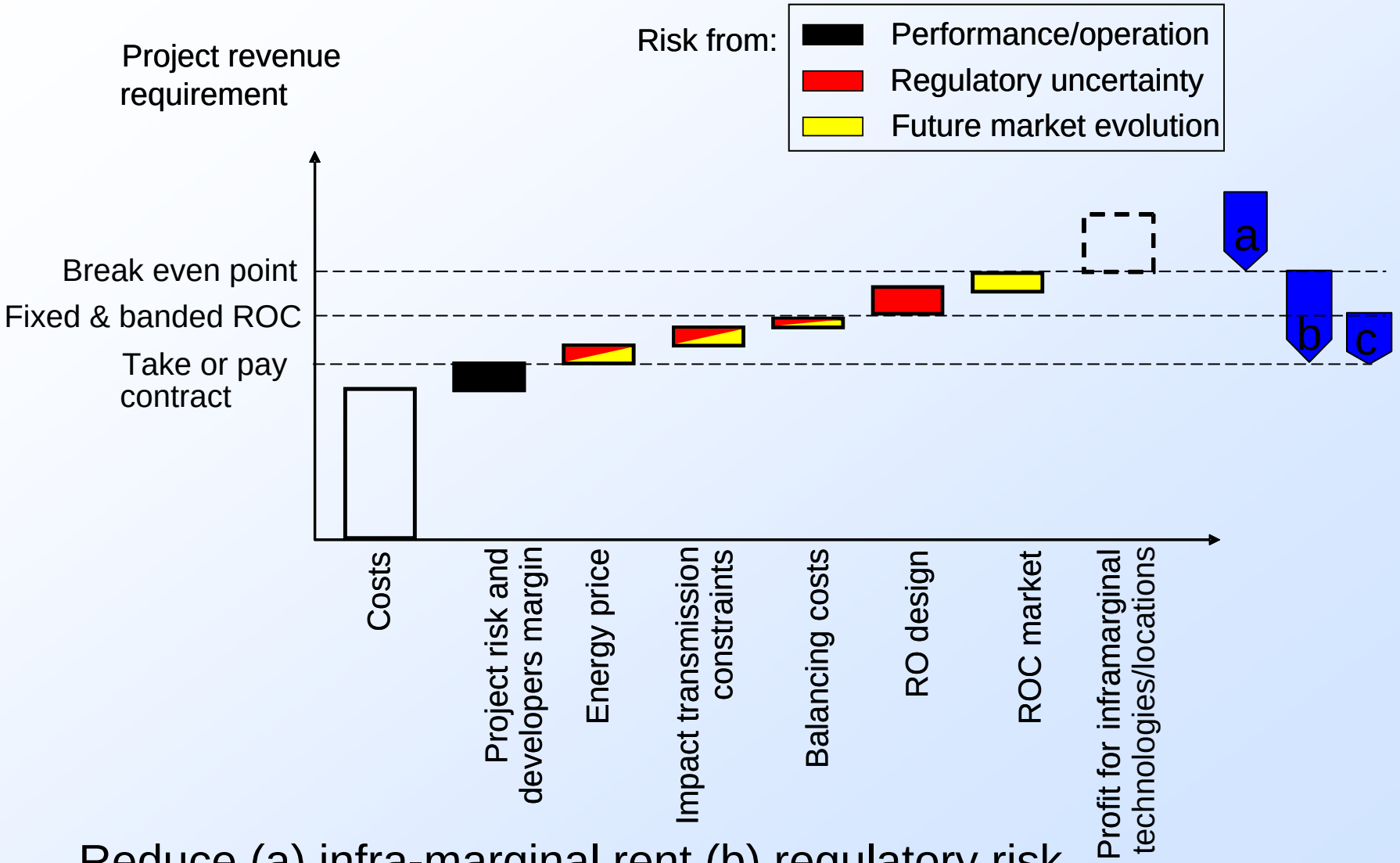
Renewable technologies have to move down learning curve



Source: International Energy Agency (2000) Experience Curves for Technology Policy. Paris.

Addressing regulatory risks reduces financing costs

In the real world, it is all about who carries the risk

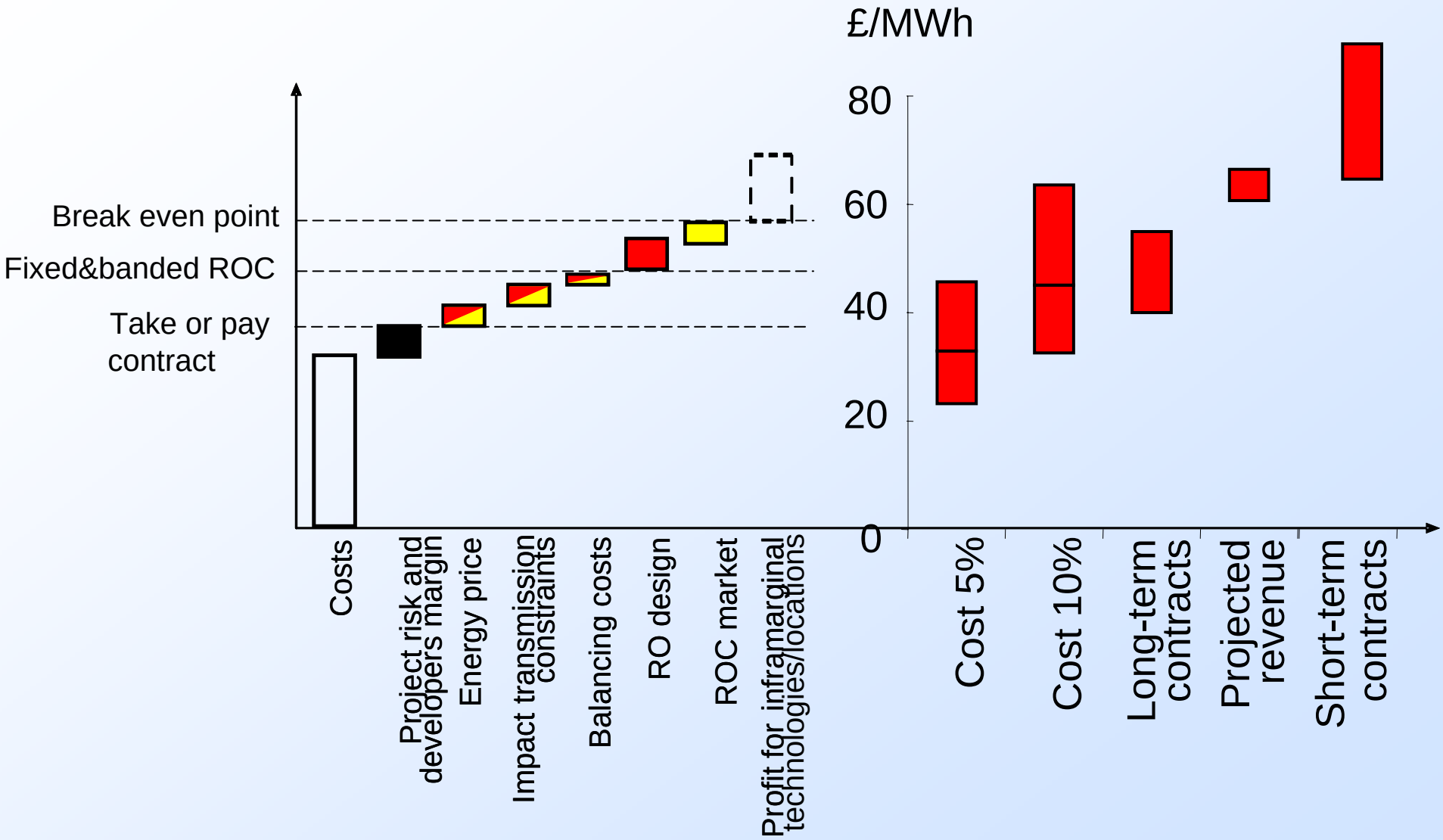


Source: Take-or-pay contracts for Renewables Deployment, with Johnston and Kavali

Reduce (a) infra-marginal rent (b) regulatory risk
(c) re-allocate risk from future technology mix/fuel prices

Addressing regulatory risks reduces financing costs

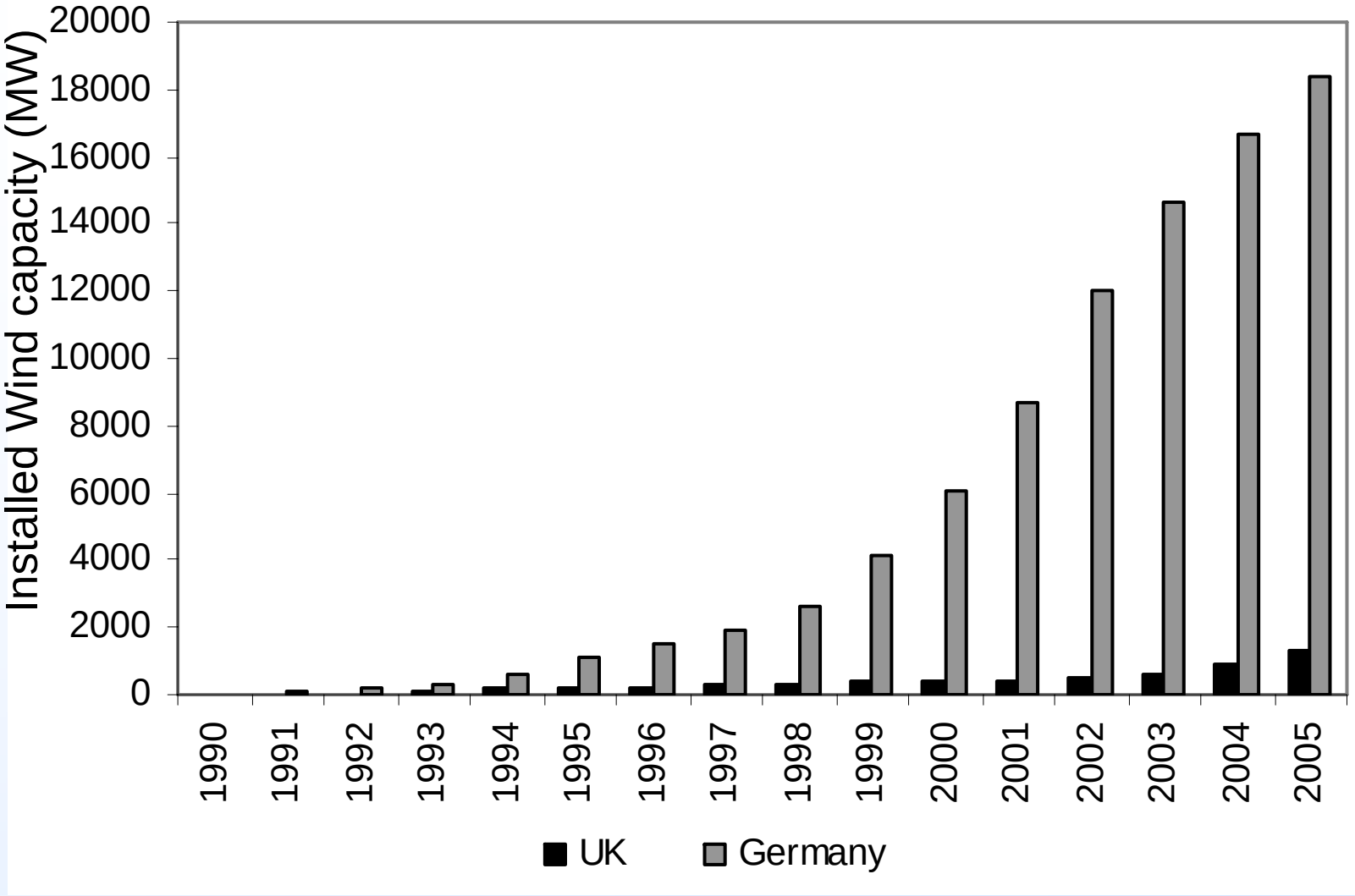
In the real world, it is all about who carries the risk



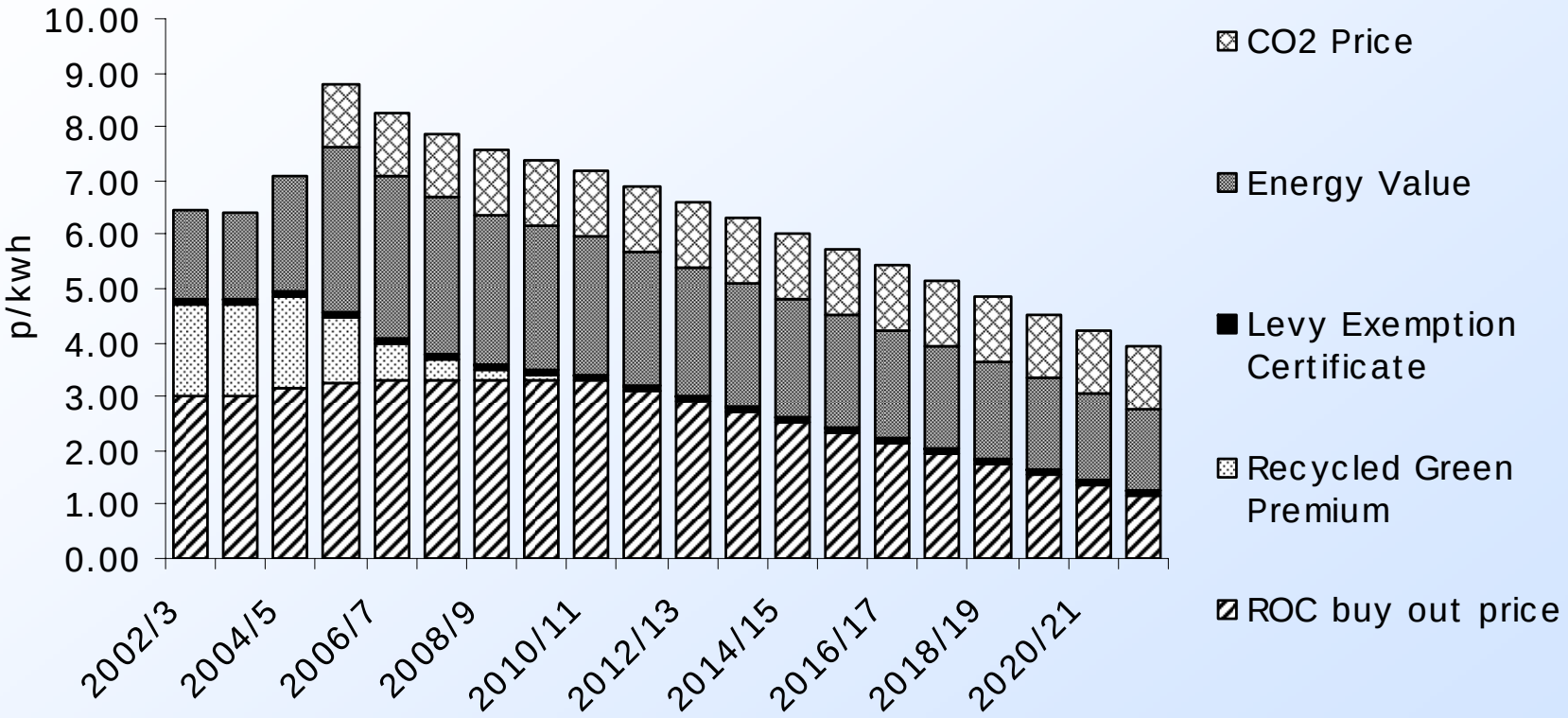
Source: IEA Electricity Generation costs, 2005, (Scottish Renewables Briefing 2003; Oxera 2005; Toke 2005; Van der Linden 2005; SmartestEnergy (Tim Foster) 2006; Tradelink Solutions (Bob Middleton) 2006, Toke 2007

The Comparison - Feed in versus Renewable Obligation Certificate

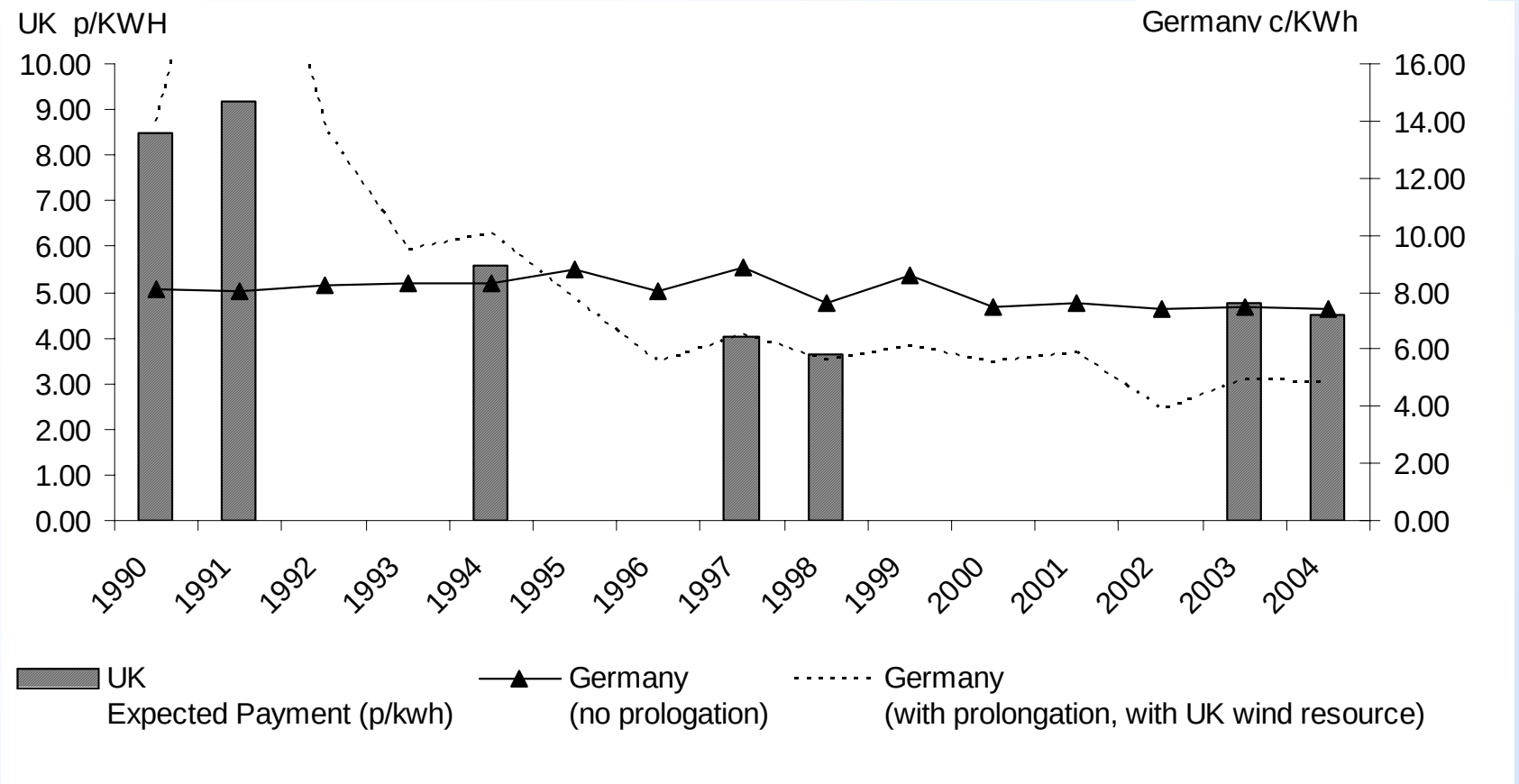
Assessment based on installed capacity



Composition of ROC Price



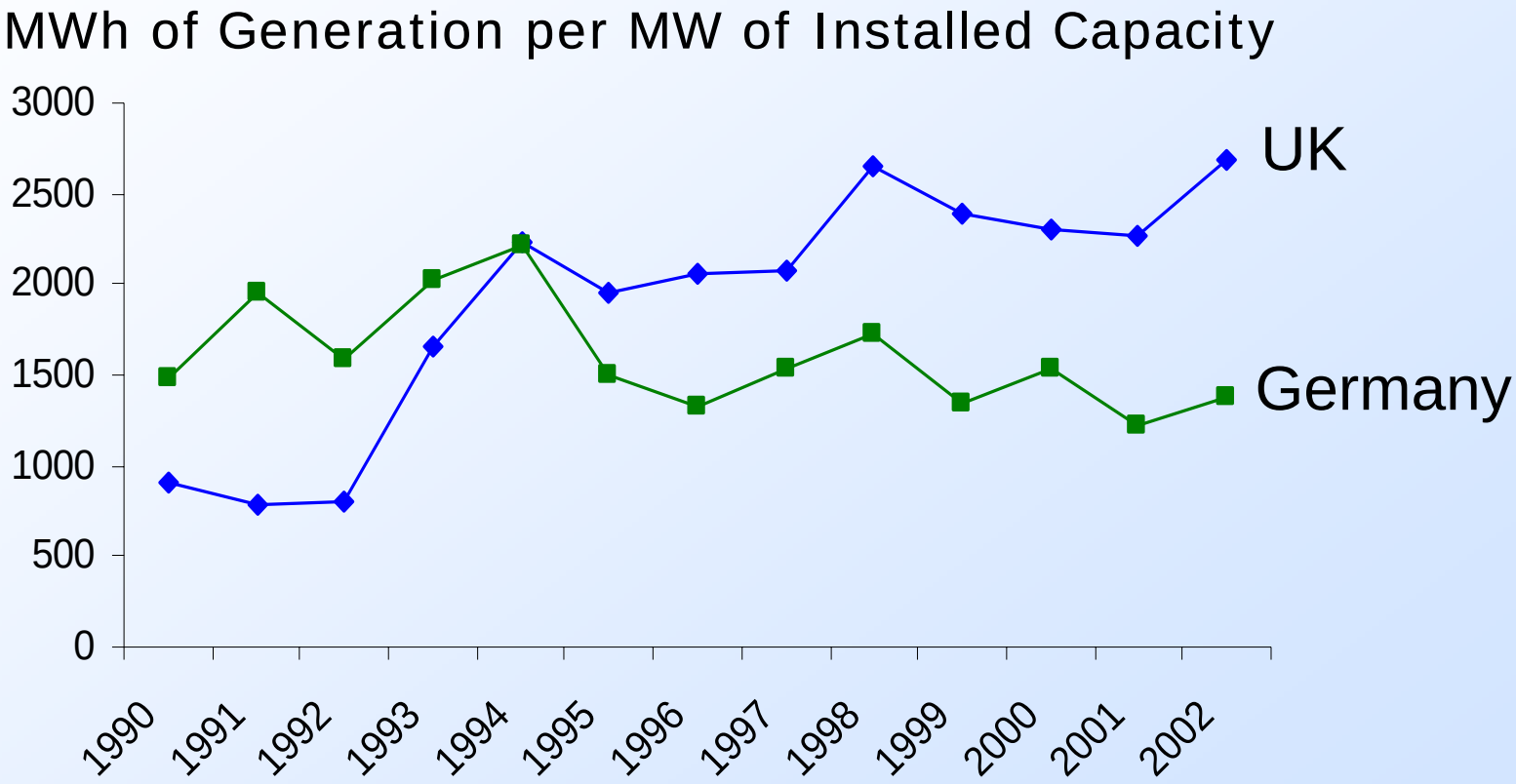
Price of Wind Energy



- Price shown for new build, averaged over 20 year life-time
- UK: assume pool price at end of NFFO
- Germany: assumed high rate under EEG

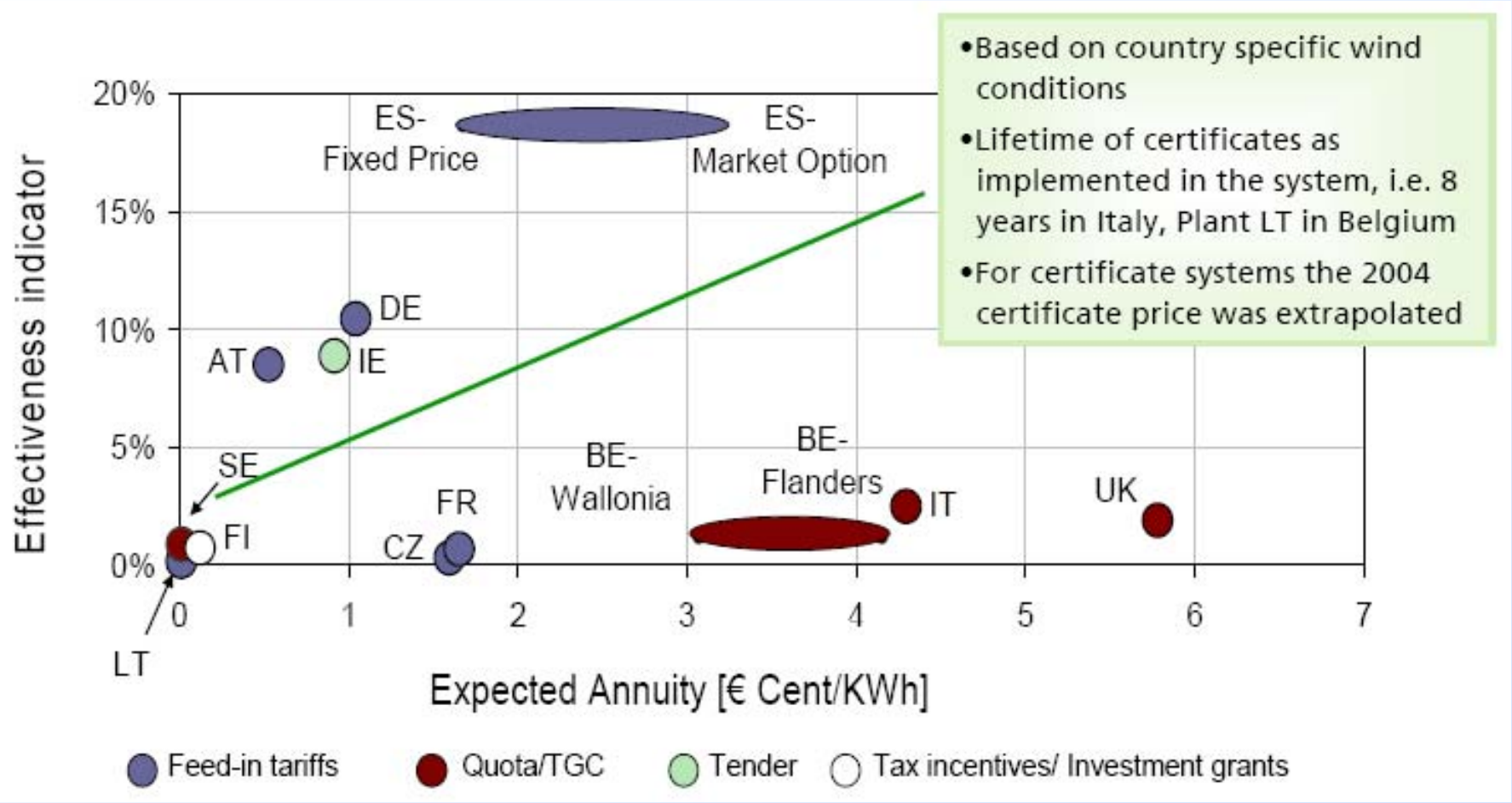
But wind resource differs

Average wind speed of 5.5m/s Germany, 8.3m/s UK*



* Source: Dale e.a. 2004

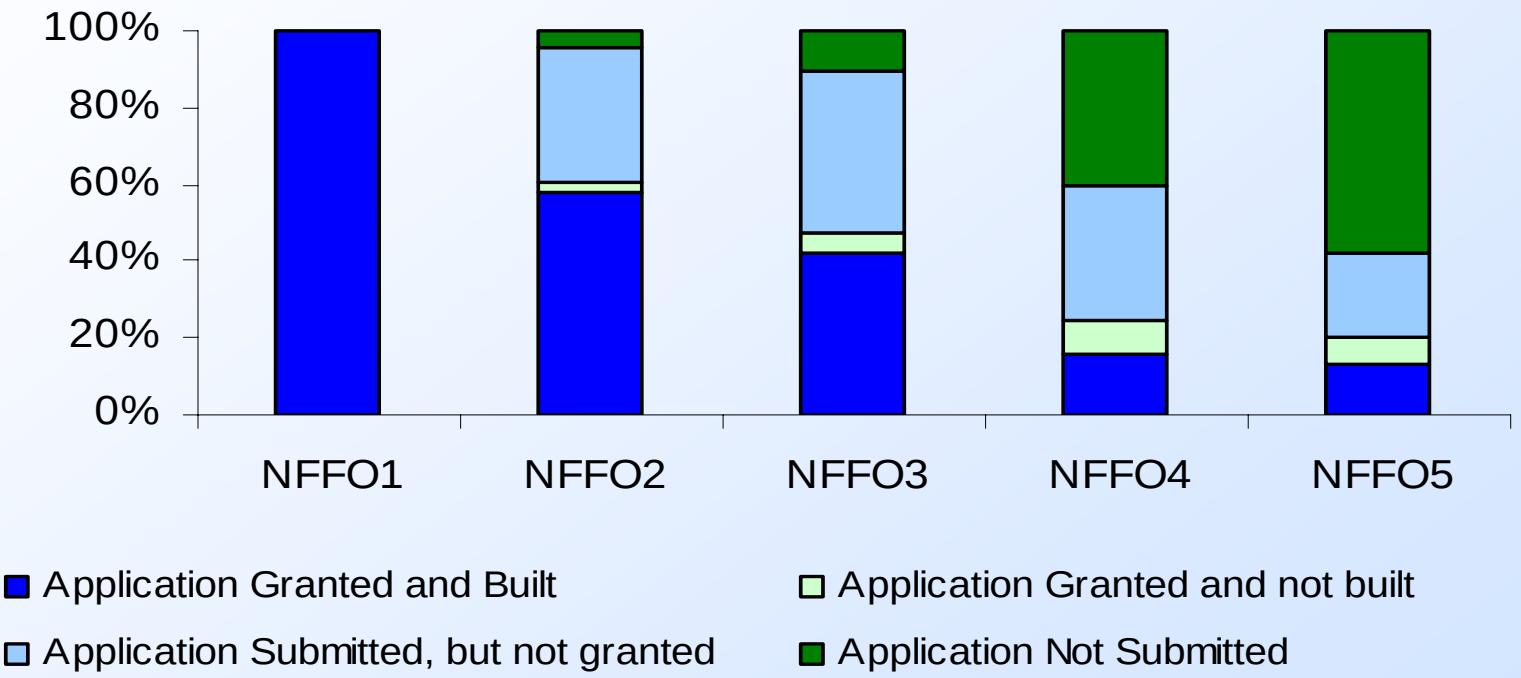
The bigger picture – comparison across Europe



Source: Best practices for the promotion of RES-E in EU-Member States -An evaluation of policy effectiveness and efficiency - Anne Held, Mario Ragwitz, *Dissemination Workshop of OPTRES / Green-Net Vilnius, November 13th 2006*

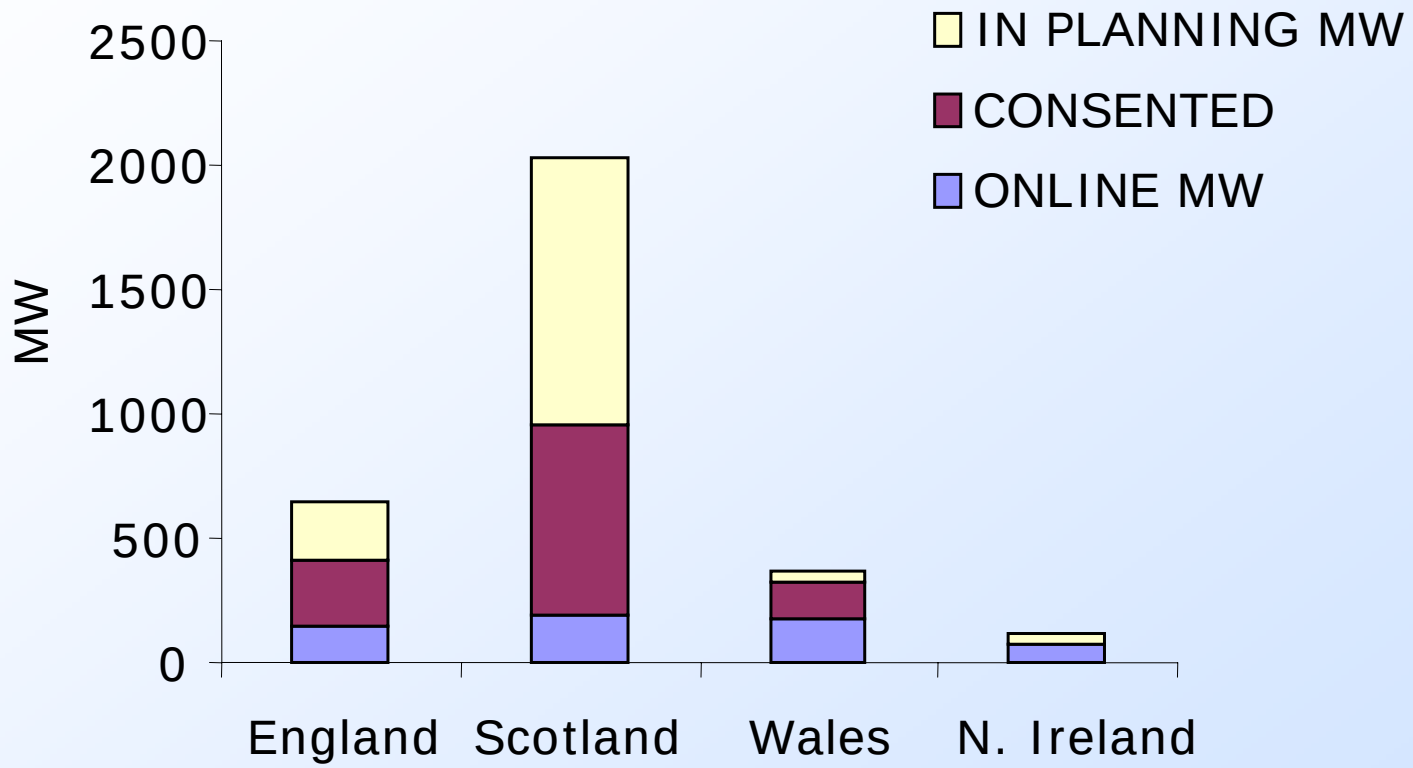
Are missing planning permissions THE obstacle?

State of planning permissions with NFFO projects



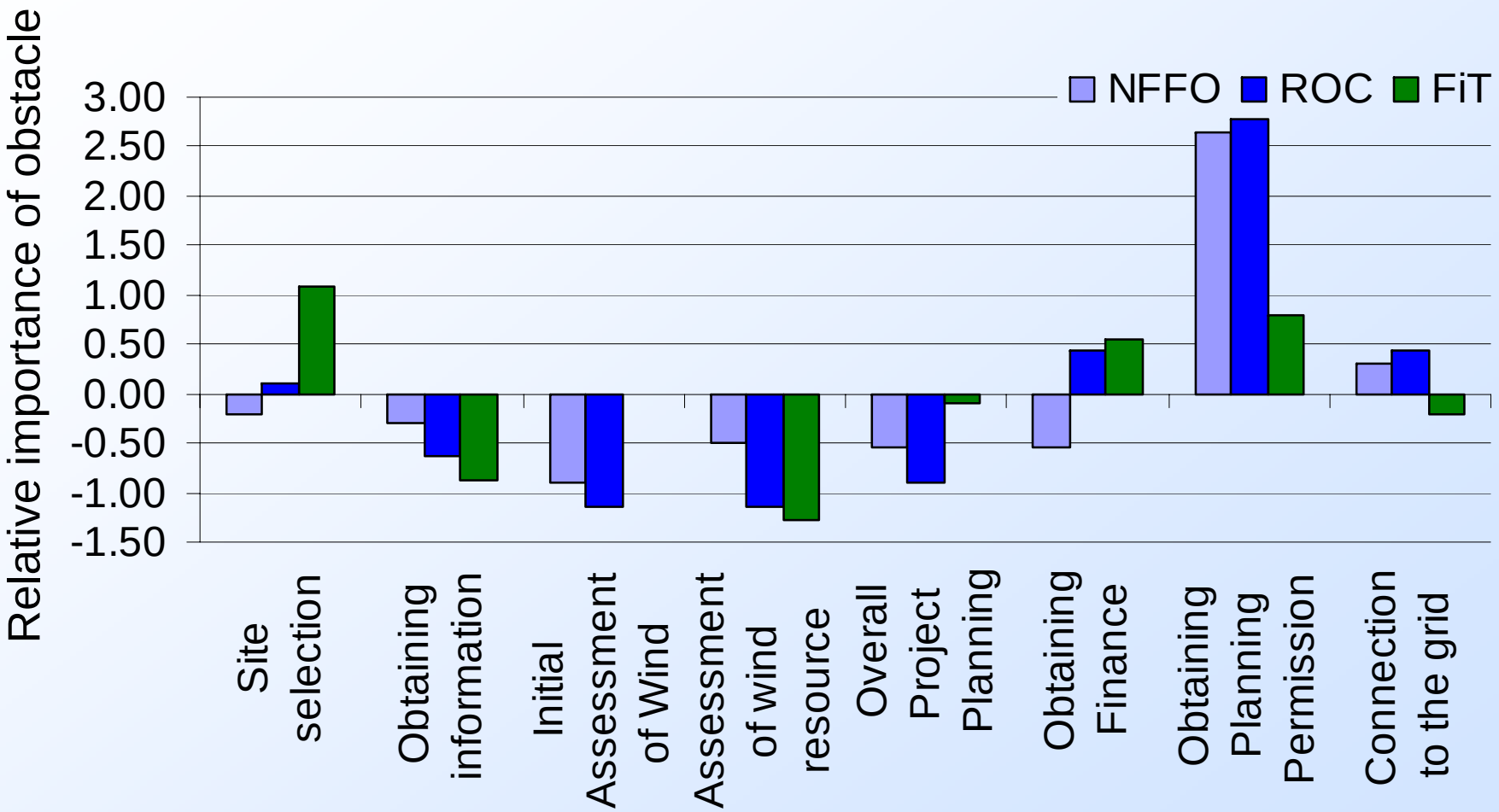
The Comparison - Planning permission

… and state of planning permissions ROCs

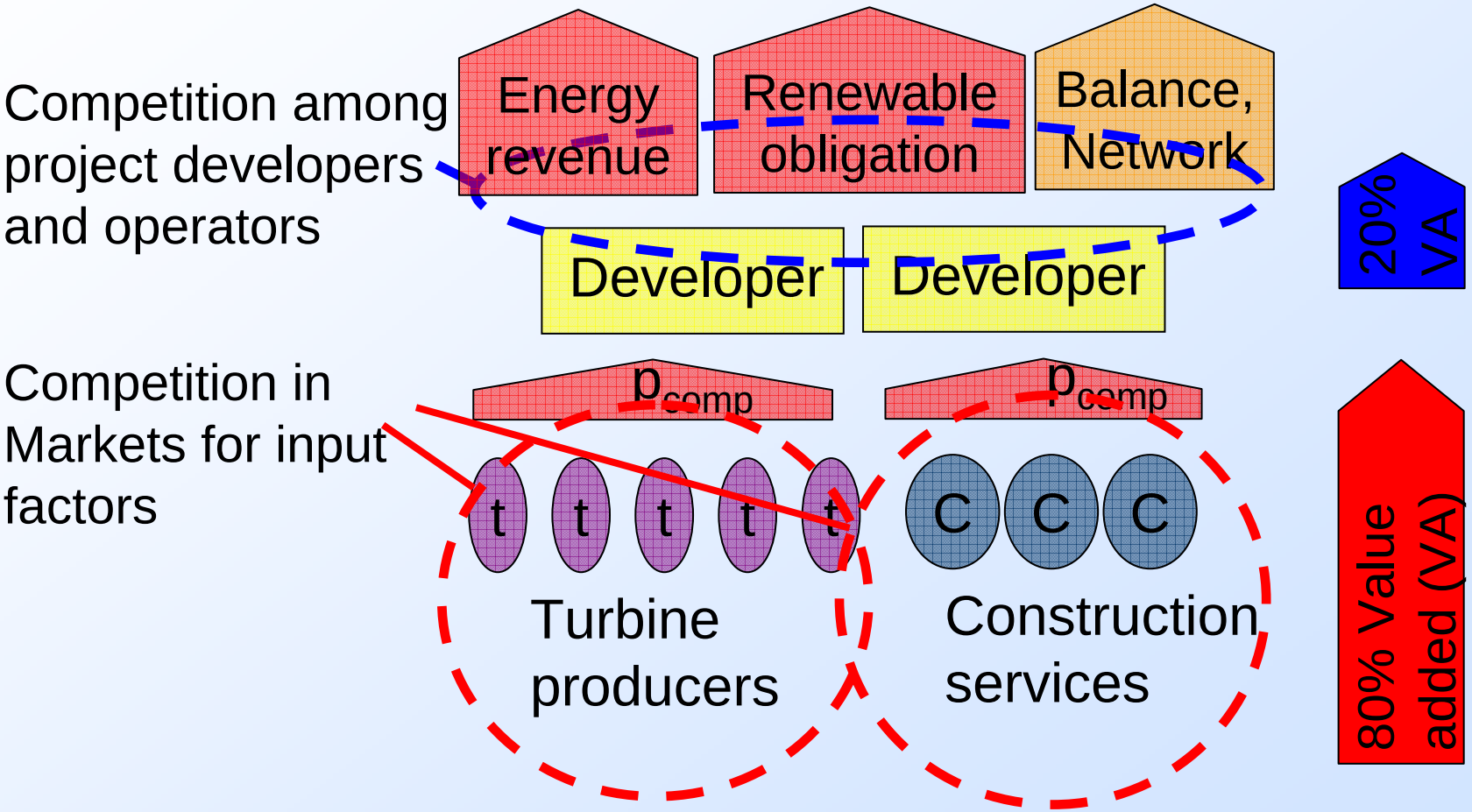


Source: Chris Tomlinson, BWEA, September 2003

How much do obstacles contribute?

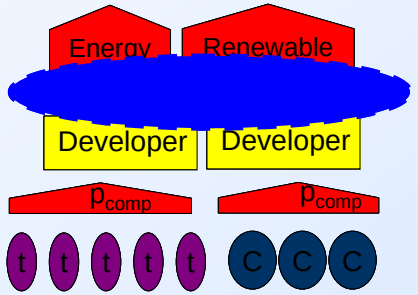


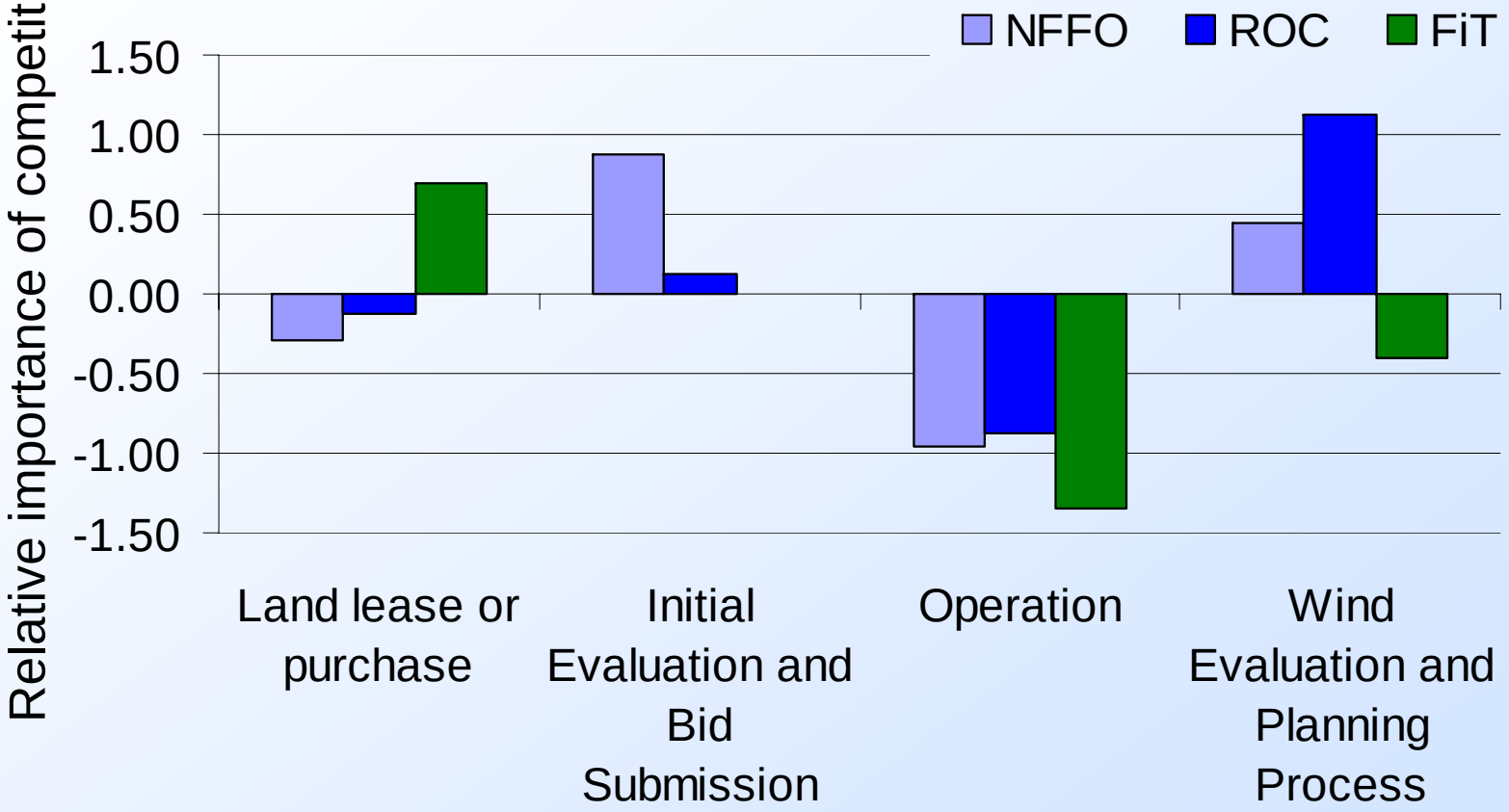
Do we observe competition in the value chain?



The Comparison - Competition in the value chain

Where do developers compete?

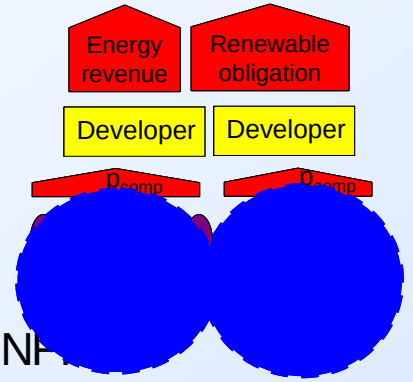


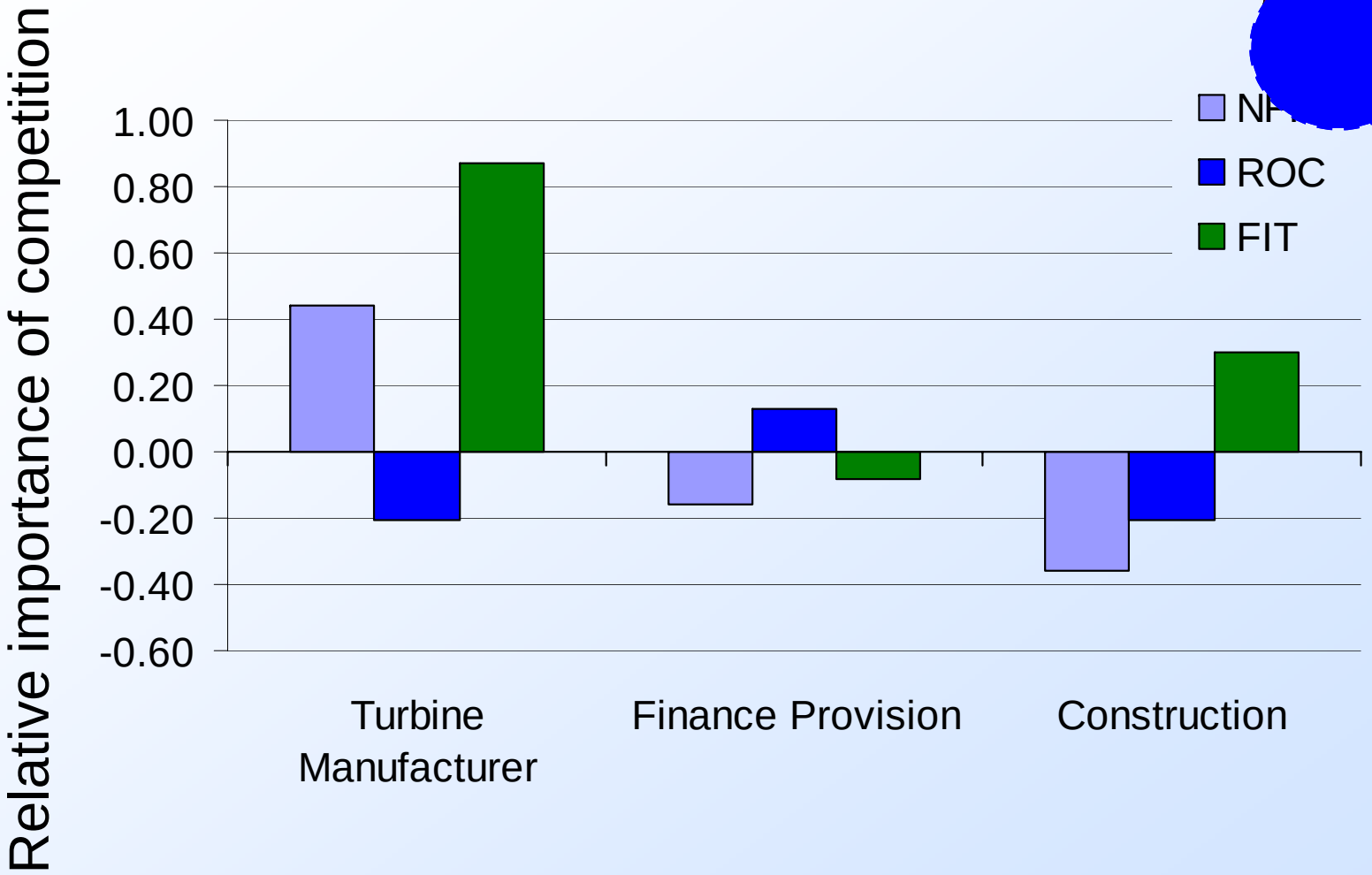


Source: Survey among 23 project developers in Germany and UK

The Comparison - Competition in the value chain

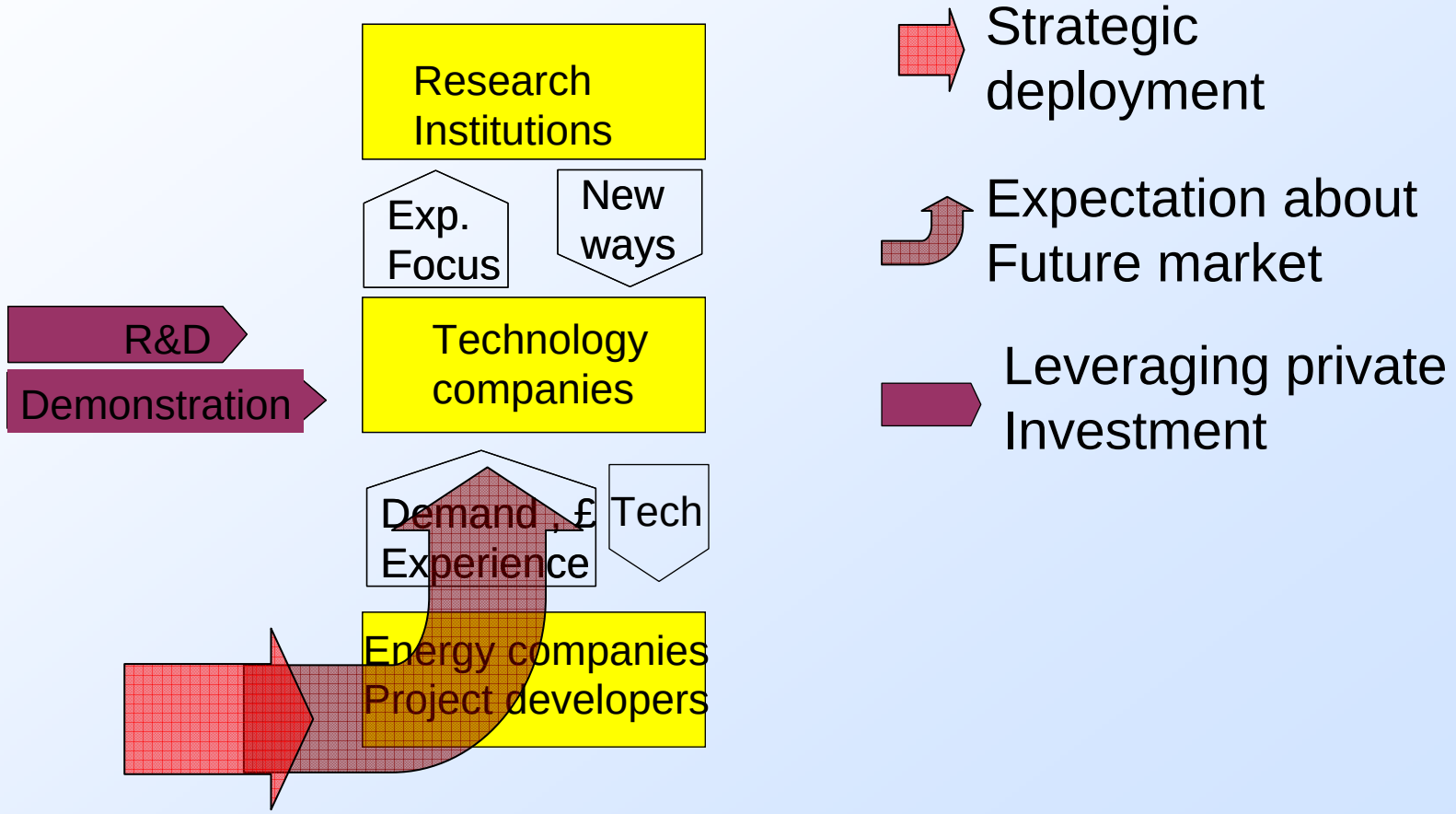
Competition in markets for input factors





Source: Survey among 23 project developers in Germany and UK

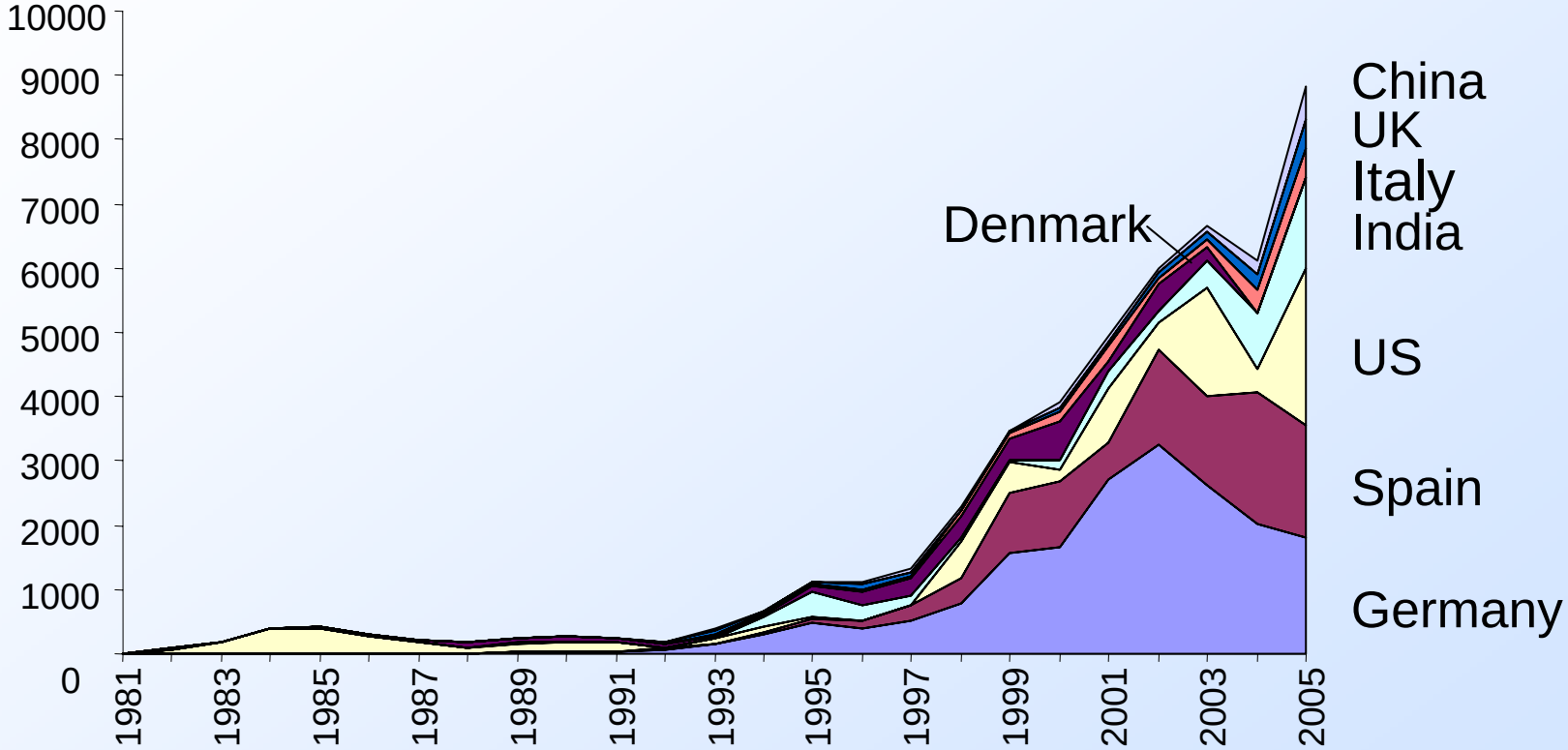
How does strategic deployment work?



Source: Neuhoff/Sellers EPRG 2006

Future demand difficult to predict

Installed wind power per year (MW)



… international markets average over some of national volatility

Source BTM consult, GWEC

Comparison of Support Schemes for Renewables

- Possible objectives for support scheme
  - Minimise rent transfer from resource differentials
  - Ensuring mix of technologies available
  - Minimise exposure of investors to regulatory risk
- Comparison of support schemes illustrate
  - Cost to consumers / MW installed lower with Feed in
  - Feed in allows focusing on Barriers to deployment
  - Understand value chain when evaluating competition
- Many countries supporting many technologies increases confidence in future markets for innovative technologies