Electricity Policy Research Group

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The Choice of Instruments

Economics of Climate Change
Washington, 2nd March 2006

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Correcting market failures

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- Internalise CO_2 costs
  - Align market and welfare maximisation
- Technology policy
  - Compensate R&D and learning spill over
- Address barriers
  - Reduce delays before barriers are swept away

Policy instruments to internalise CO_2 costs

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- National level
  - Taxes
  - Cap and Trade programs
  - Voluntary commitment
- The key to success
  - *Loud*: Receive management attention
  - *Long*: Commitment to drive investment decisions
  - *Legal*: Enforcement at firm level

Price matters: Energy intensity response

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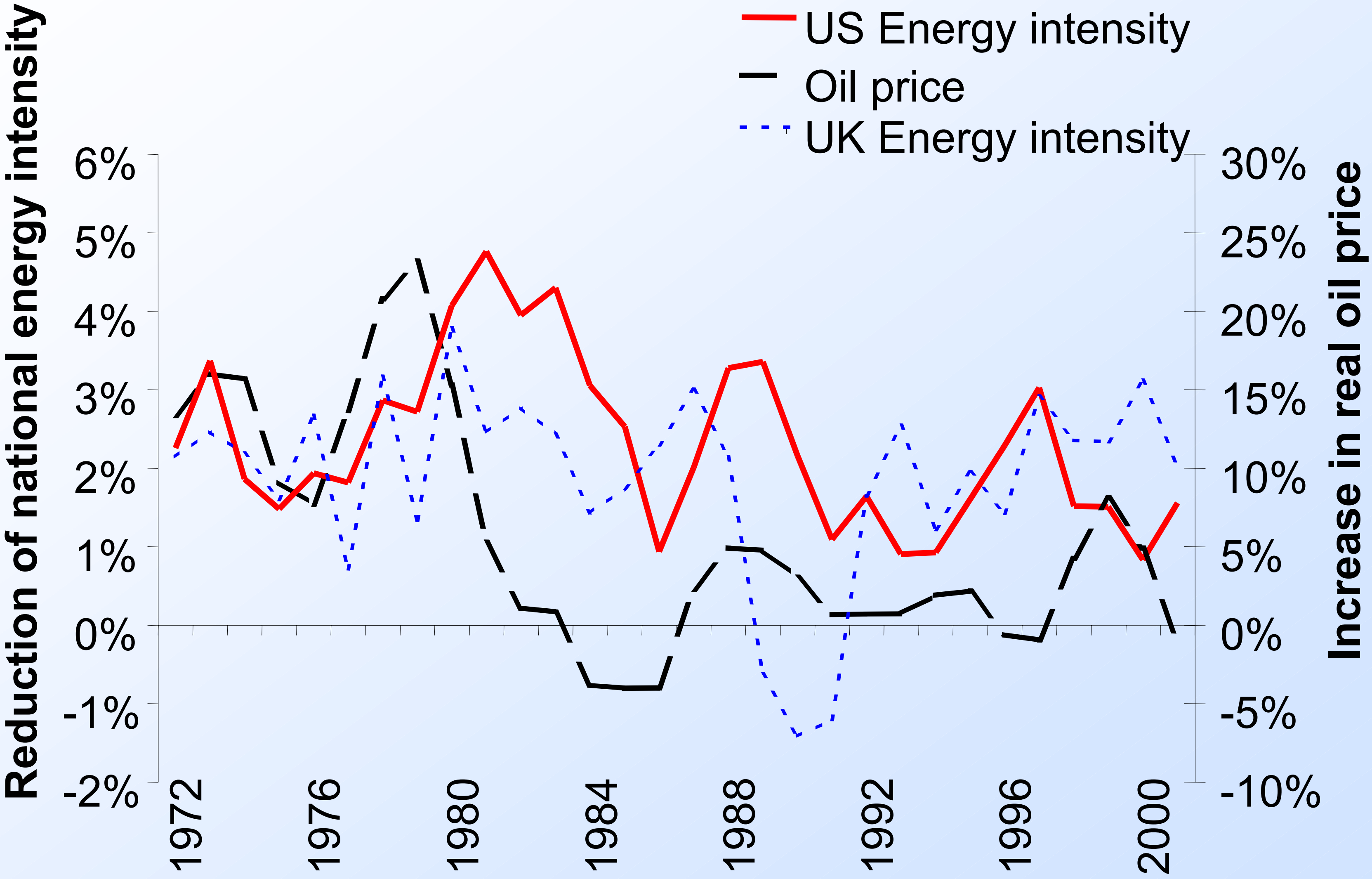
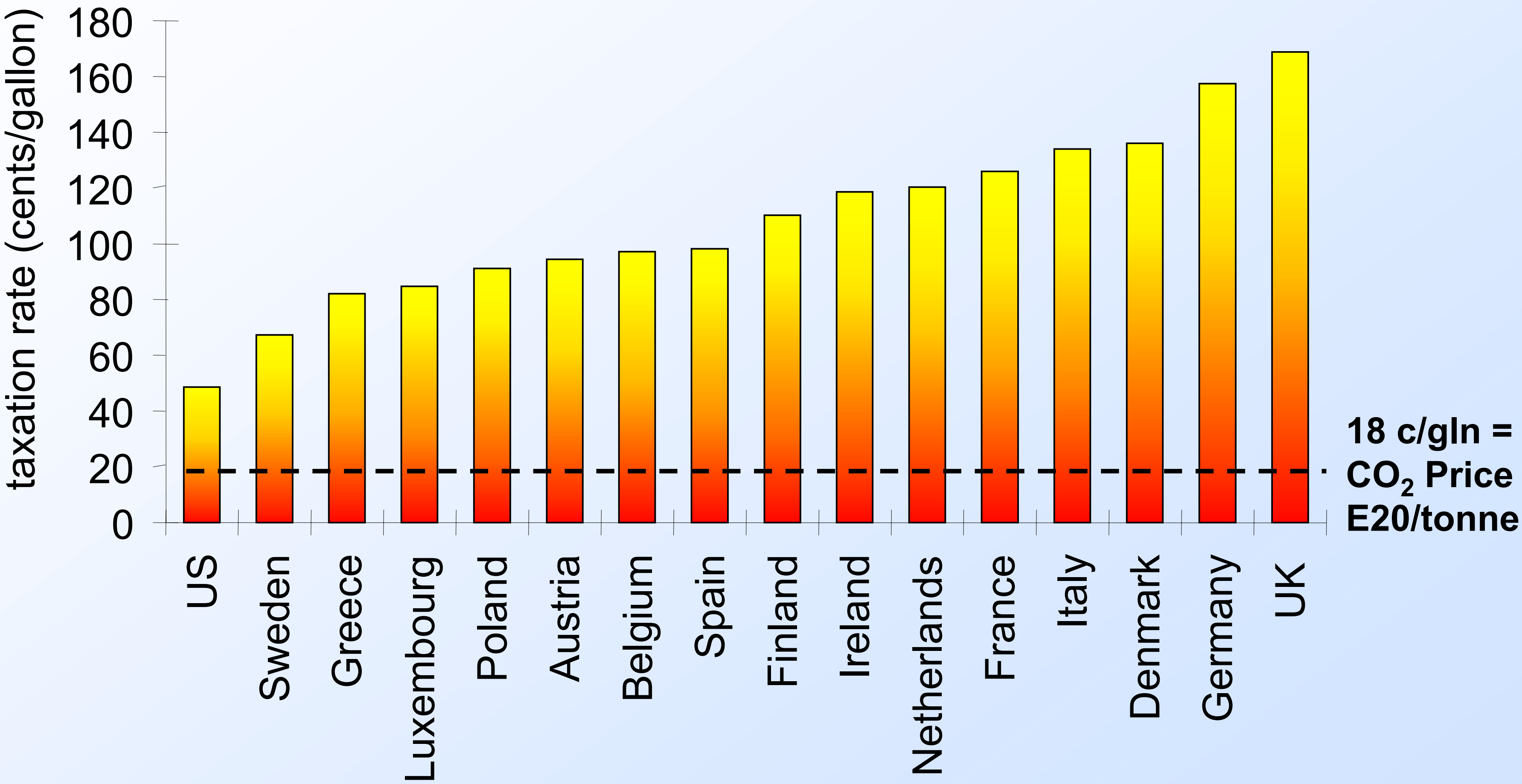


3 year averages are depicted

Example: Gasoline tax



Source: EU Commission 2002, Germany 2003; American Petroleum Institute 2004, Energy Information Administration, 2004

Example: EU Emission Trading Scheme

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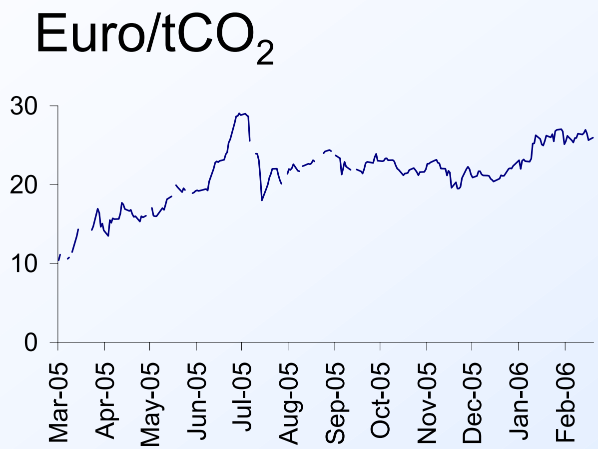
Phase I 2005-07 → Phase II 2008-12 →



Allocation plans by end of 2006

- Large emitters ~ ½ EU emissions are covered
- Current value 50 billion Euro/year
- EU directive requires 95% free allocation (90% phase II)

Allocation matters

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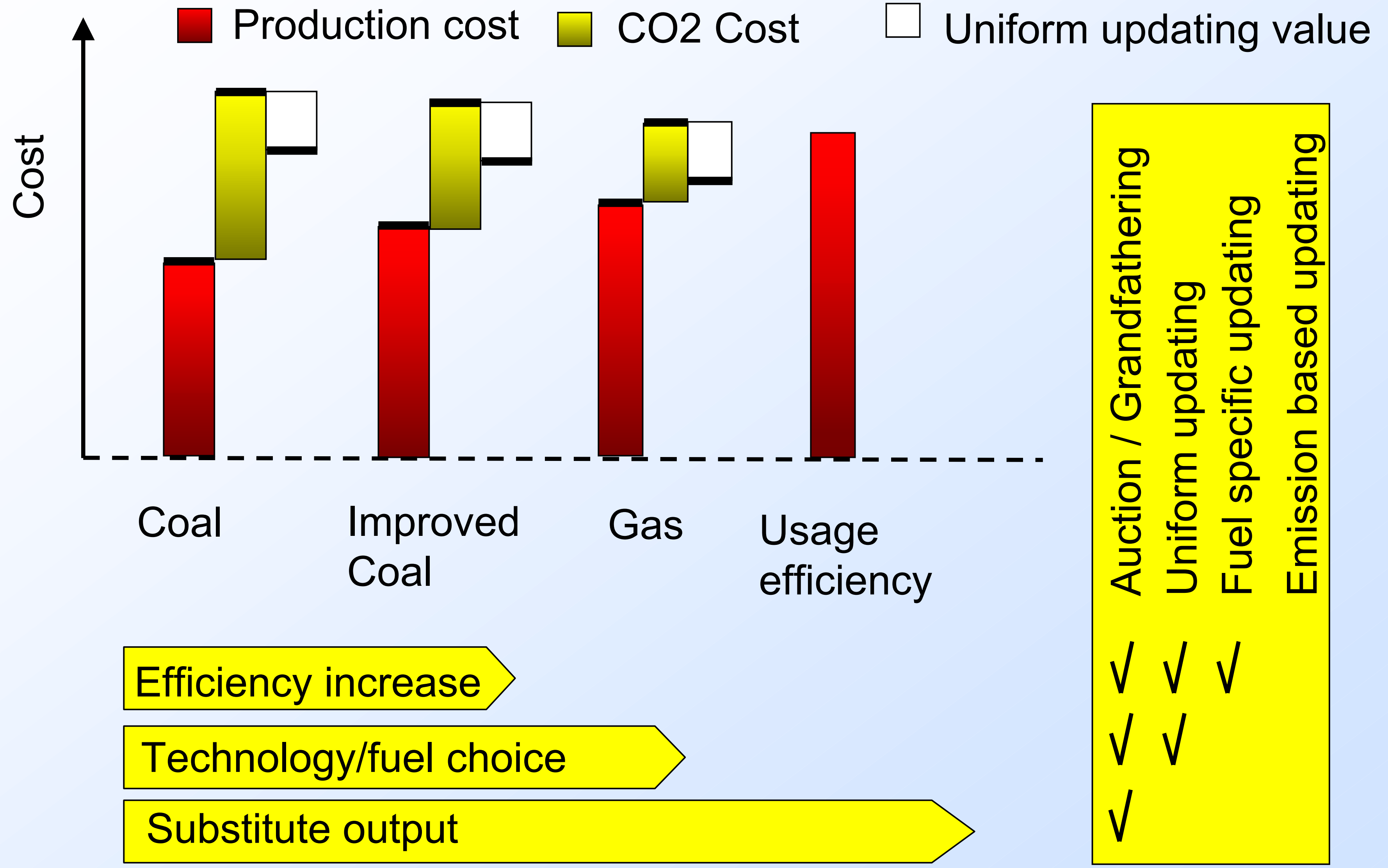

Investment security – challenge for emission trading

Phase I 2005-07 → Phase II 2008-12 → ?

← Return on today's investment

Sustained international cost difference would effect energy intensive industry

	Efficient: Technology	Input choice	Consumption	Trade
Global internalisation	√	√	√	√
Output based benchmark	√			√
Border tax adjustment	√	√	√	√

International instruments

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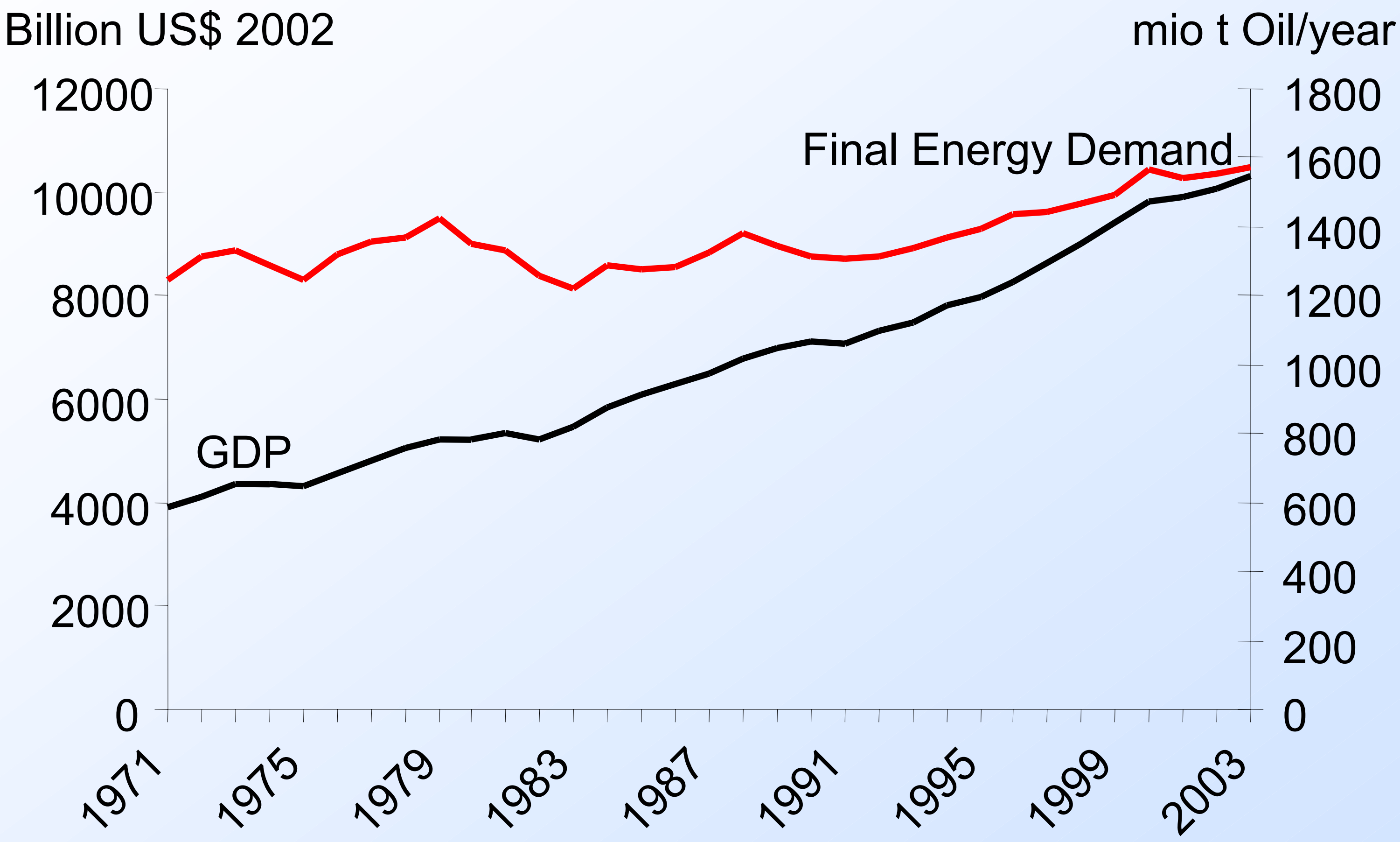
- Address free rider issue
- Enhance commitment of national governments
- Can also translate to economic instruments
  - Absolute target – Kyoto ‘simple’ and translates
  - Intensity based target on annual basis
    - Implies updating and prevents CO2 internalisation
    - GDP only one of drivers for energy demand
    - Pro-cyclical economic instrument
  - Intensity based long-term targets
    - Only a question of framing?

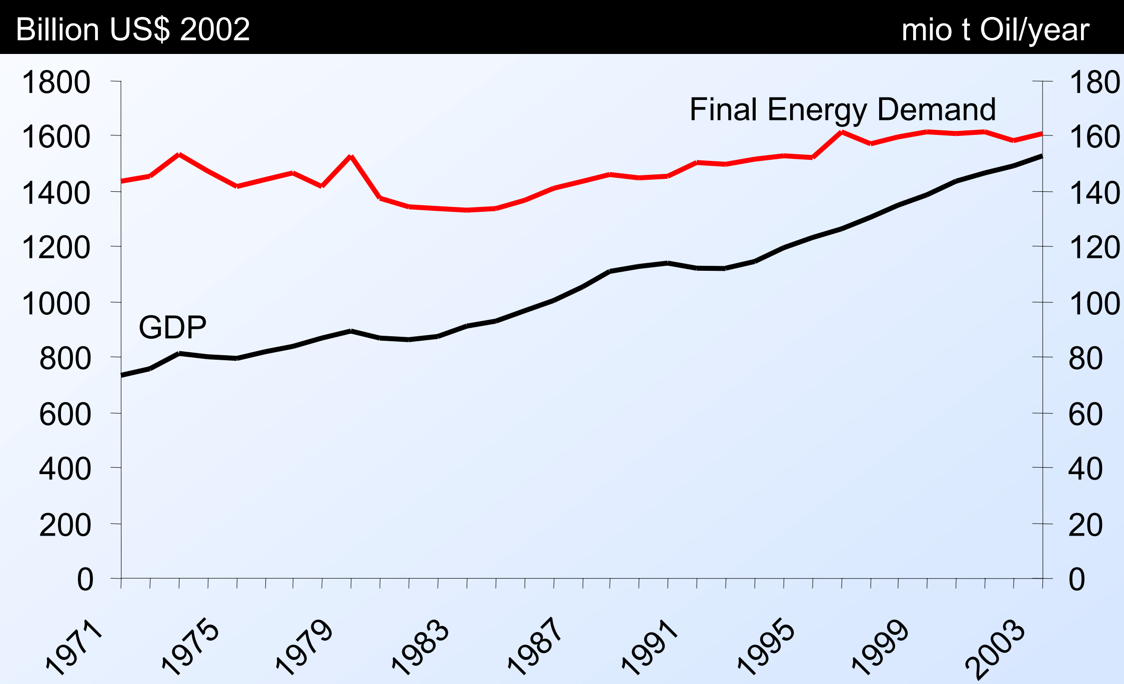
USA: Historic weak link energy - GDP



Source: OECD Energy Balances, 1971-2003, IEA/OECD, Paris.

Total Final Consumption of Energy calculated in Million tonnes of oil equivalent from total supply by fuel source minus losses and transformations.

UK: Historic weak link energy - GDP

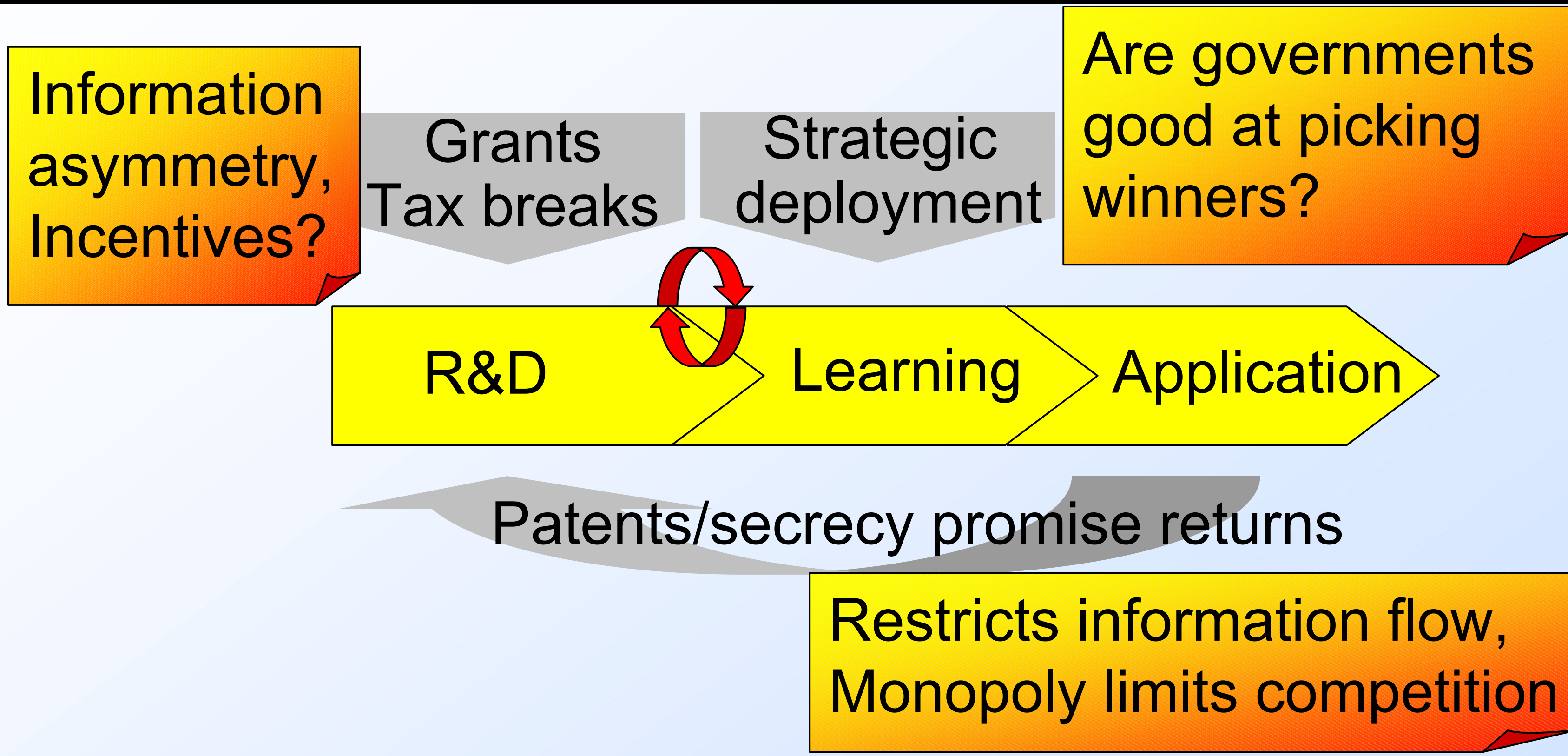


Annual volatilities

Country	*Standard Deviation*		*Intensity ÷ CO_2 Ratio*	*Intensity Correlation with GDP*
	CO_2 Emissions	*Intensity Level*		
United States	2.42	1.56	0.64	−0.02
France	4.60	4.82	1.05	−0.11
Spain	5.37	5.09	0.95	−0.16
Sweden	7.21	7.37	1.02	−0.14
United Kingdom	2.70	2.92	1.08	−0.42
Japan	3.62	3.56	0.98	−0.11

The Case for Intensity Targets, Pizer, RFF, DP 05-02

Why active technology policy?

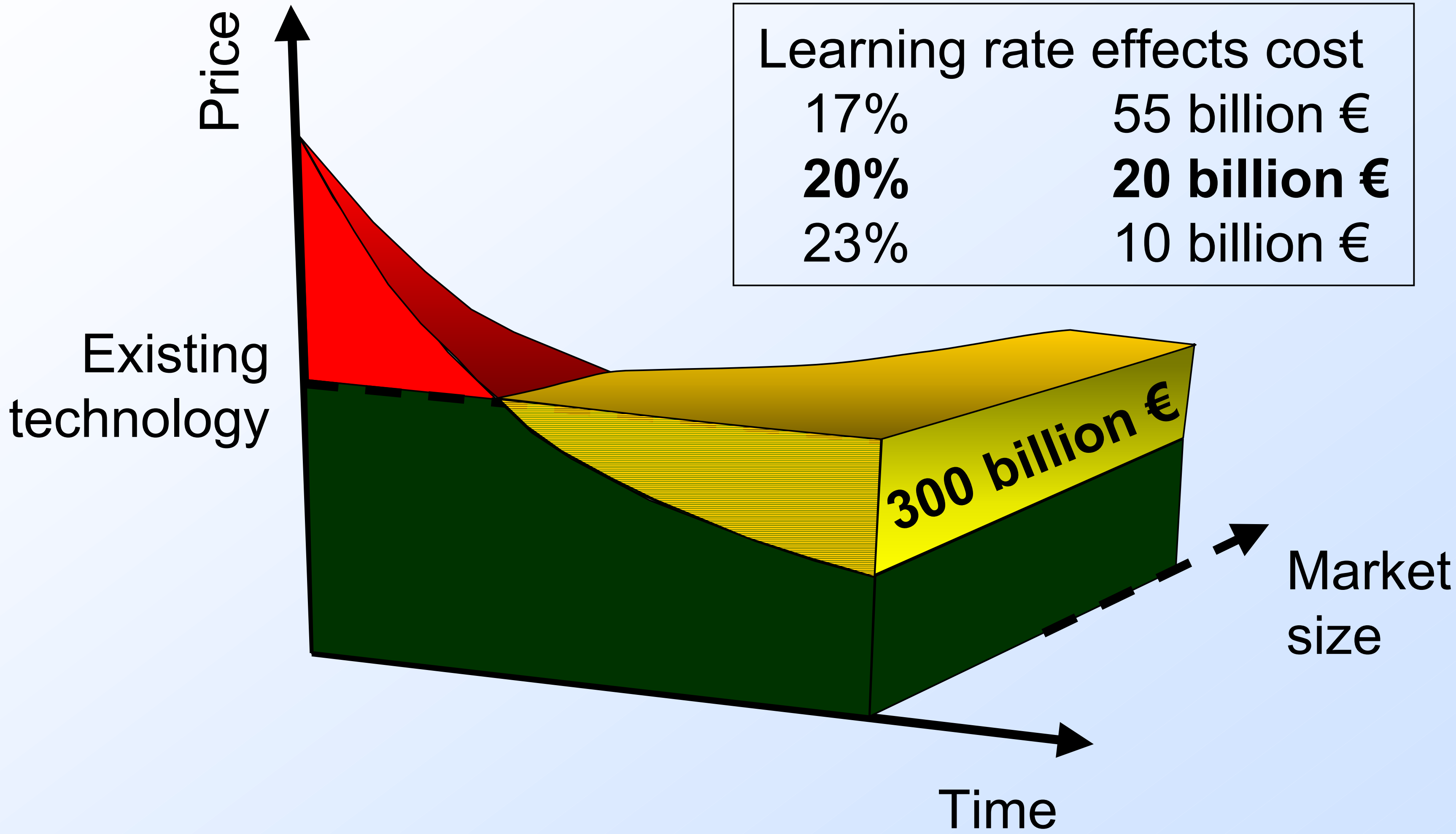


- ‘Pure’ market under-invests in technology
  - R&D and learning spill-over not internalised
- Is government action preferable?

Experience curves motivate strategic deployment

Example Solar PV:

Learning rate	effects cost
17%	55 billion €
20%	**20 billion €**
23%	10 billion €

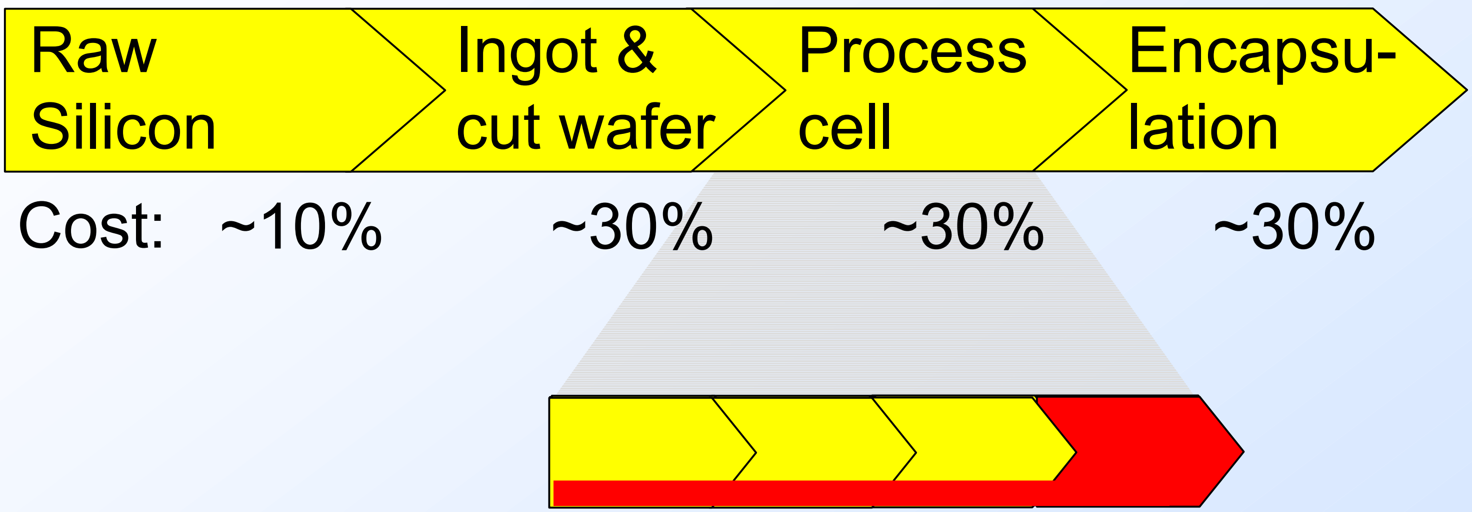


5% discount rate

Why strategic deployment for energy I

- Homogeneous product has (almost) single price
- Regulated markets create risk for high profits

Example: Solar PV production

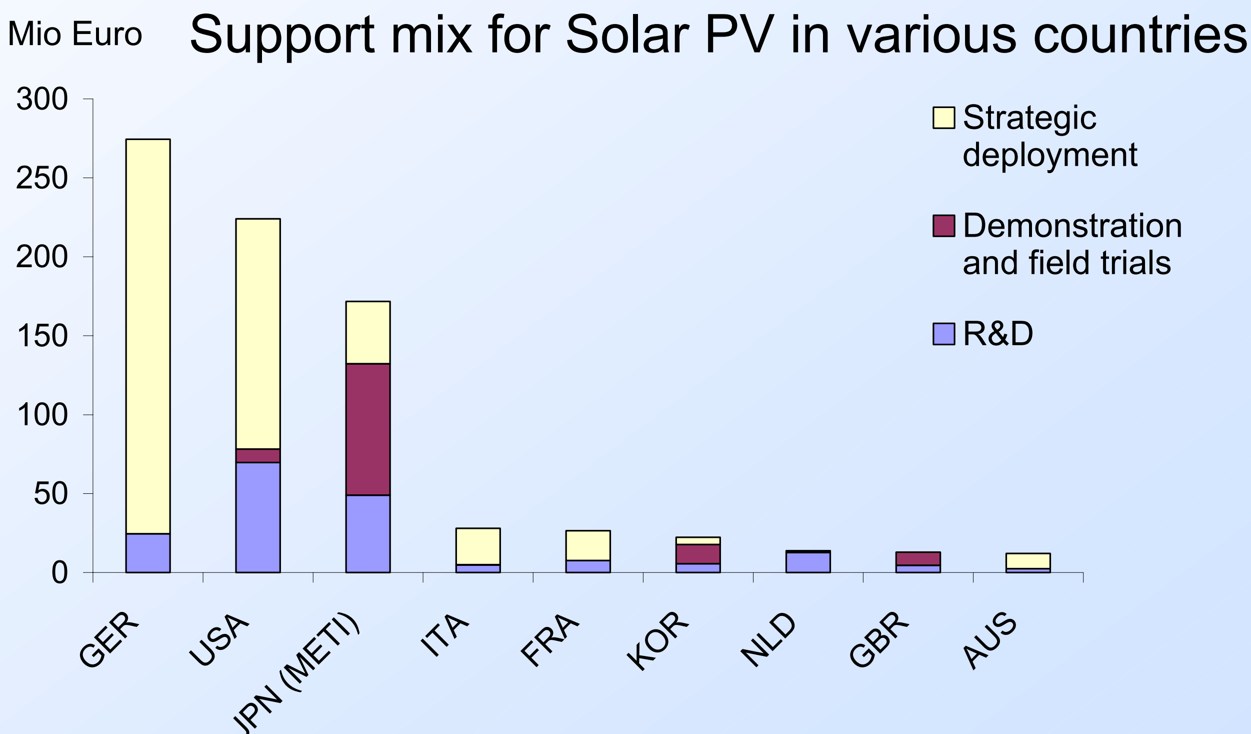


Product innovation: Coating: TiO_2 -> SiN_x

Process innovation: Wafer: 400um -> 200um

Why strategic deployment in energy II

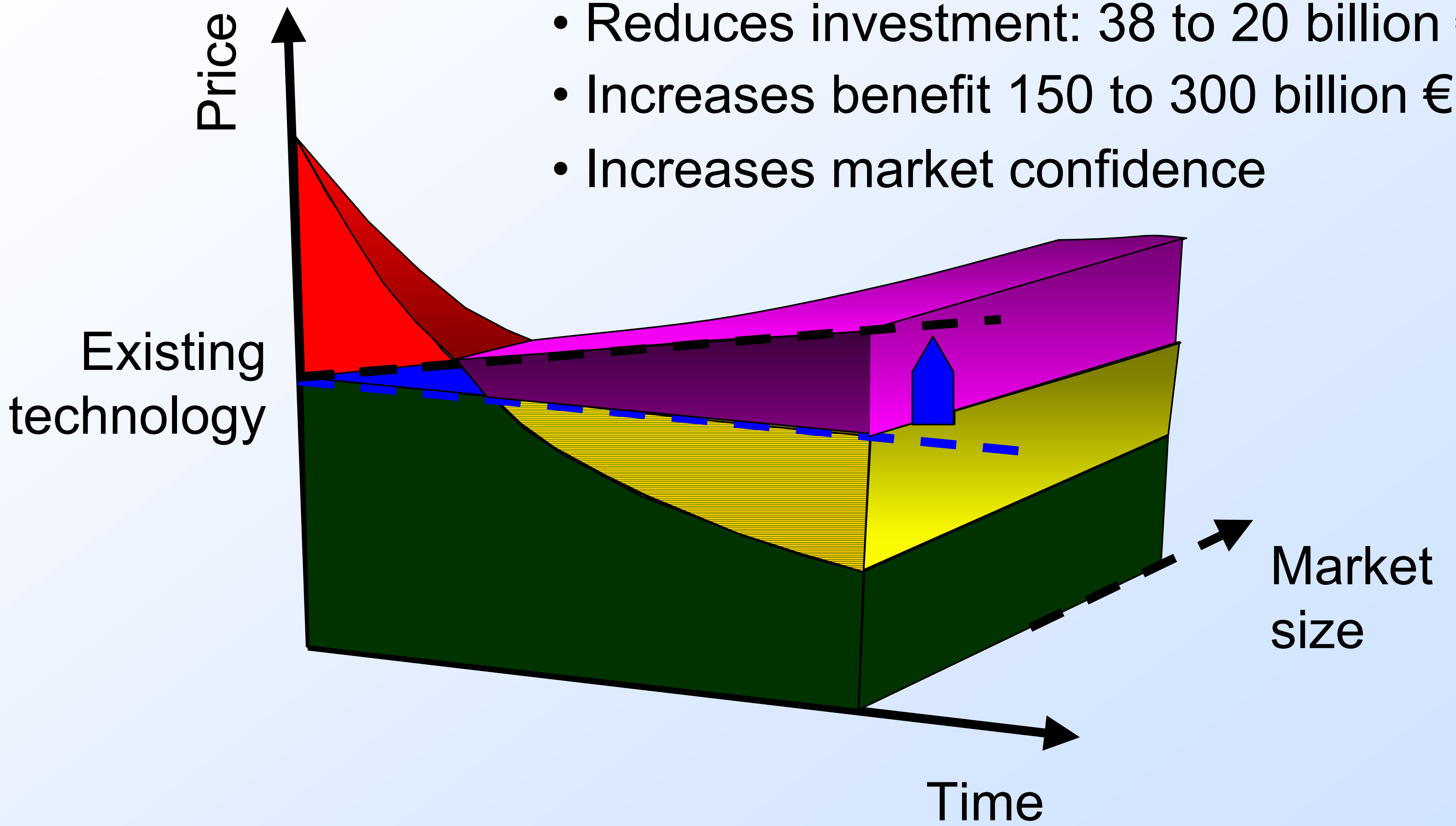
- Complex product
  - Improvements of many technologies required
  - Inputs from many companies beneficial
- Target and incentivise public R&D support



Source: IEA PV Implementing Agreement, at http://www.oja-services.nl/iea-pvps/isr/index.htm

Internalisation of CO2 benefits new technologies

- Reduces investment: 38 to 20 billion €*
- Increases benefit 150 to 300 billion €
- Increases market confidence



* Break even price moves €40/MWh to €50/MWh, 5% discount, 2005-2040

Conclusion

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- Internalisation of CO_2 externalities
- Technology policy
- Address barriers
- Using only subset of policies is inefficient