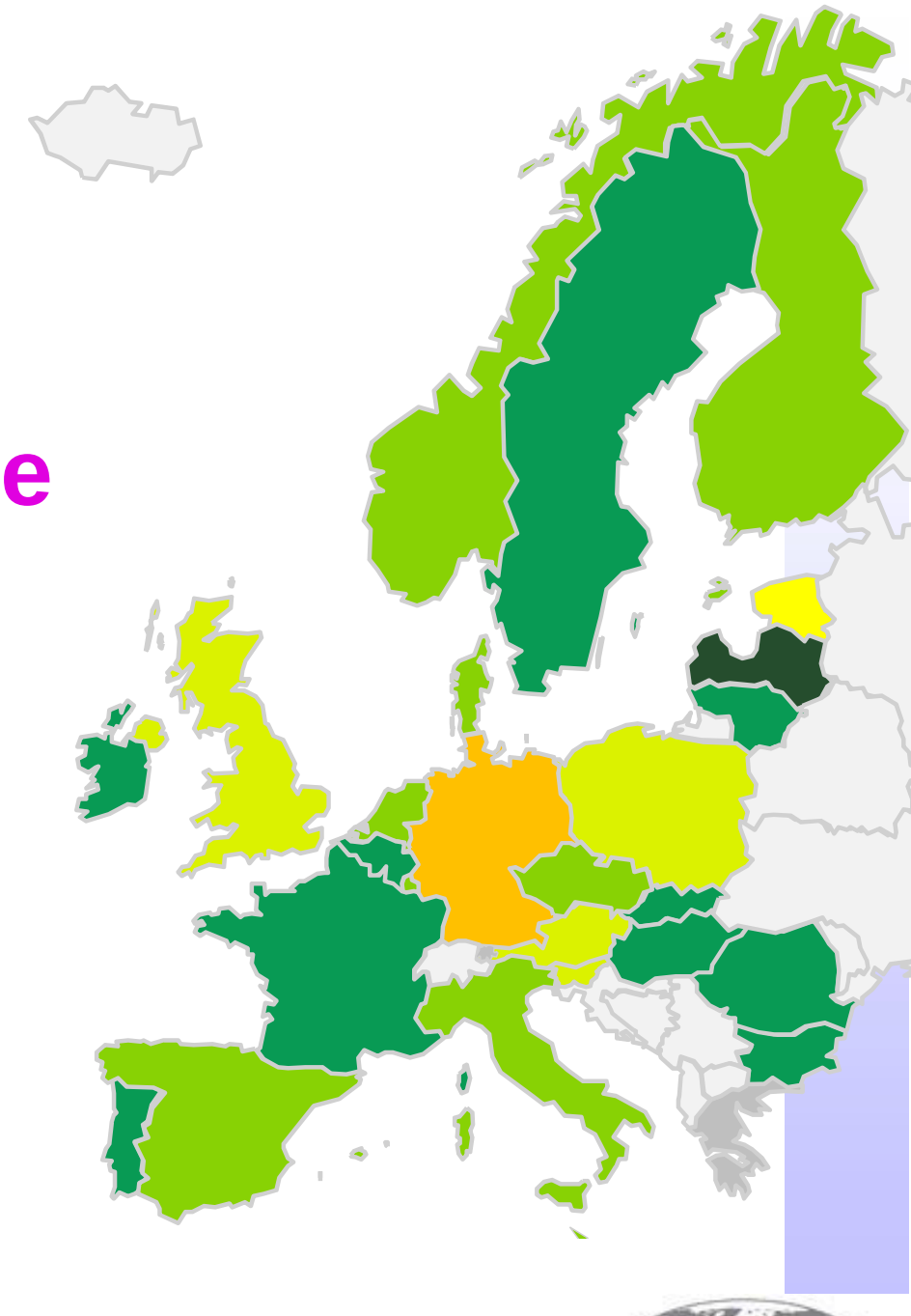
FEEM Seminar
18 April 2013, Venice



Second thoughts after the second trading period of EU ETS

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My agenda

- **Who knows the facts?**
  - ↗ **Monitoring 14.000 installations**
- **What may have gone wrong?**
  - ↗ **It is not only the oversupply of allowances**
- **What could still be done?**
  - ↗ **Facets of a fundamental structural reform**

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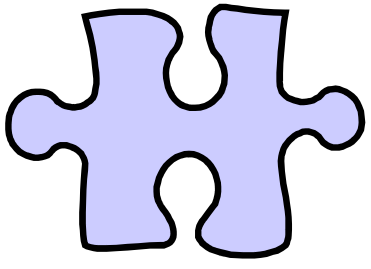

Who knows the facts?

Monitoring more than 14.000 installations

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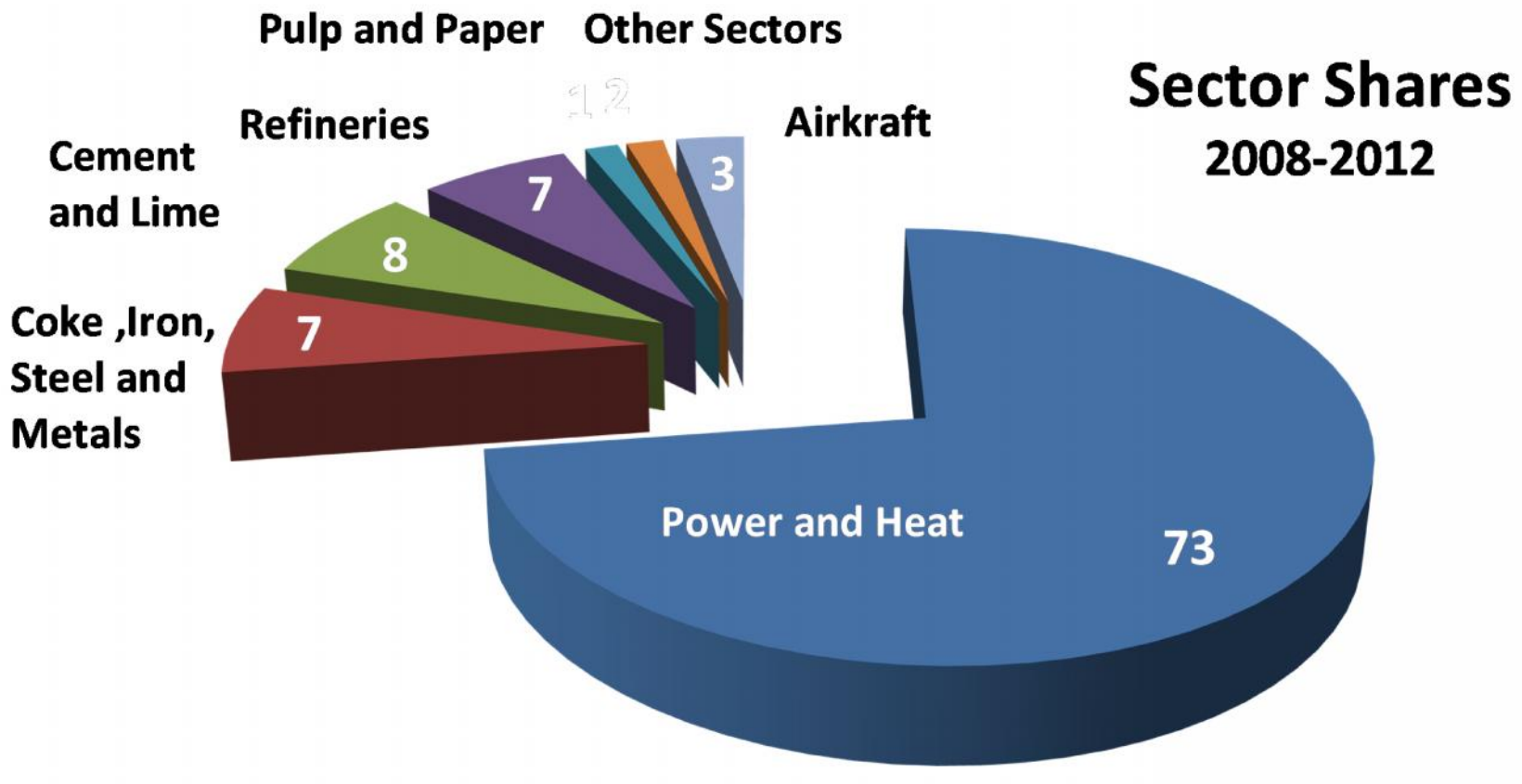
Power sector dominates
Accounts for 73 % of emissions



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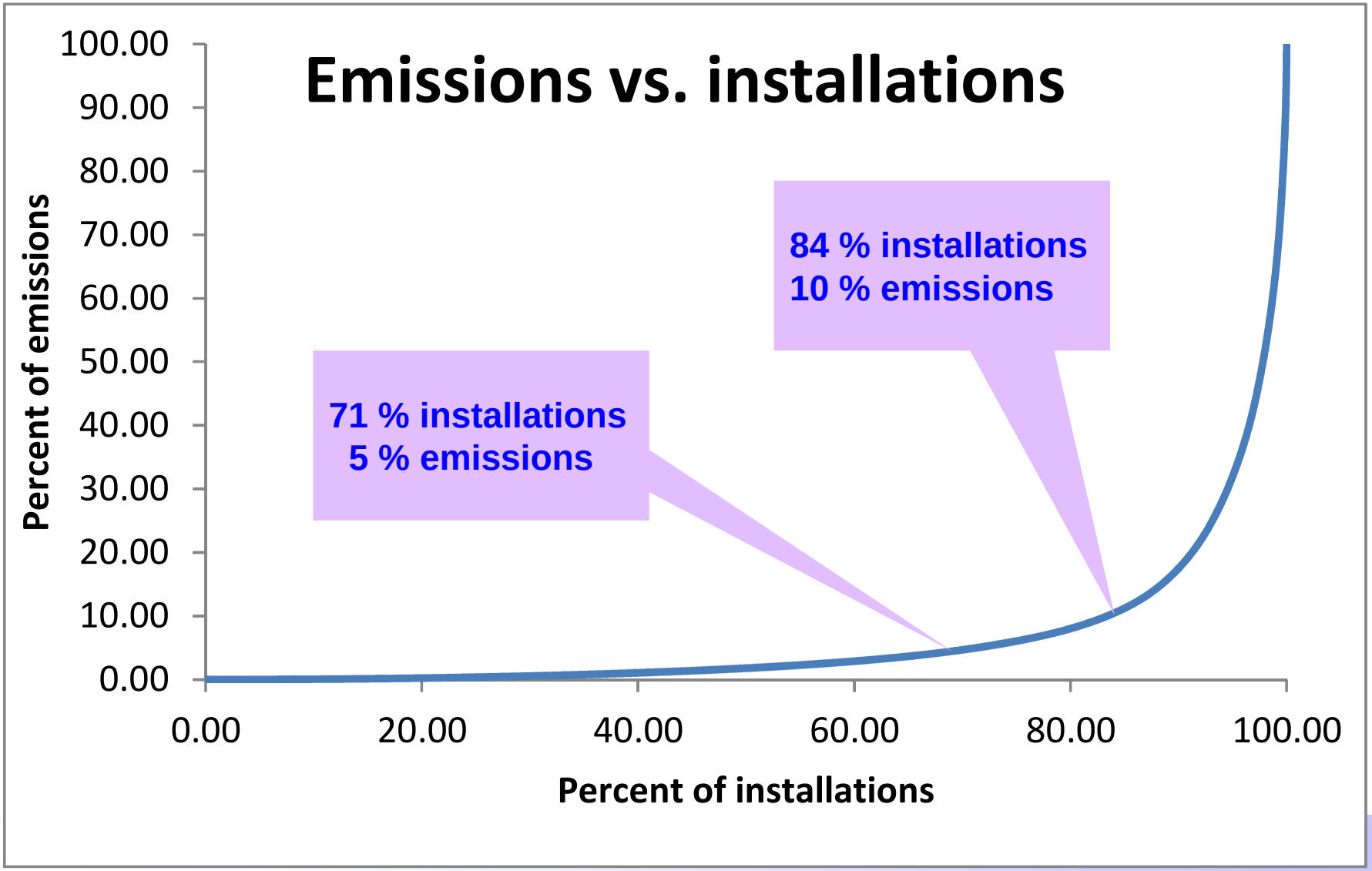
Highly unequal size distribution of installations
84 % installations account only for 10 % emissions



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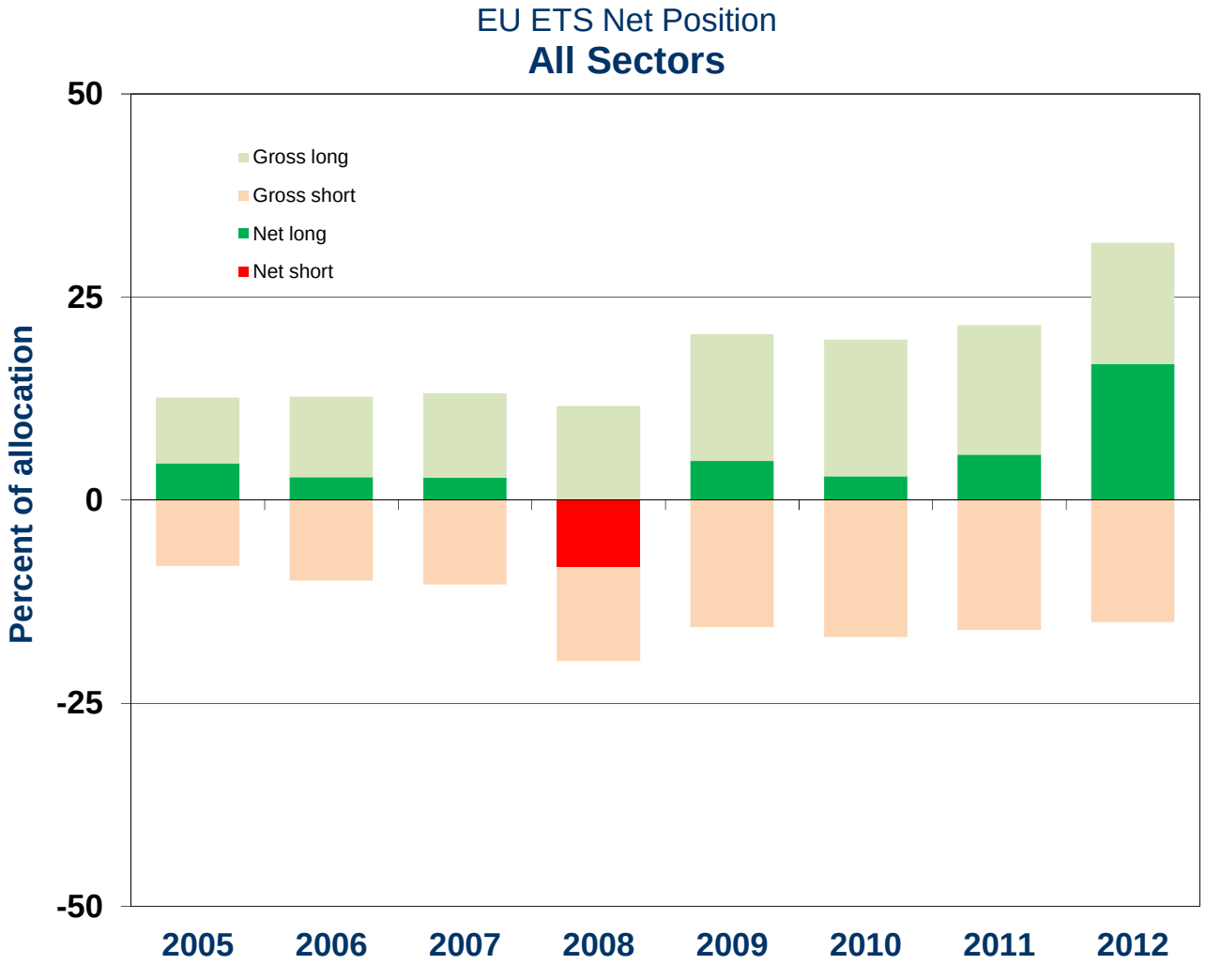
Short and long positions
Overall market

- Only in 2008 the market was in a short position
- The net positions result from a wide variation of long and short positions



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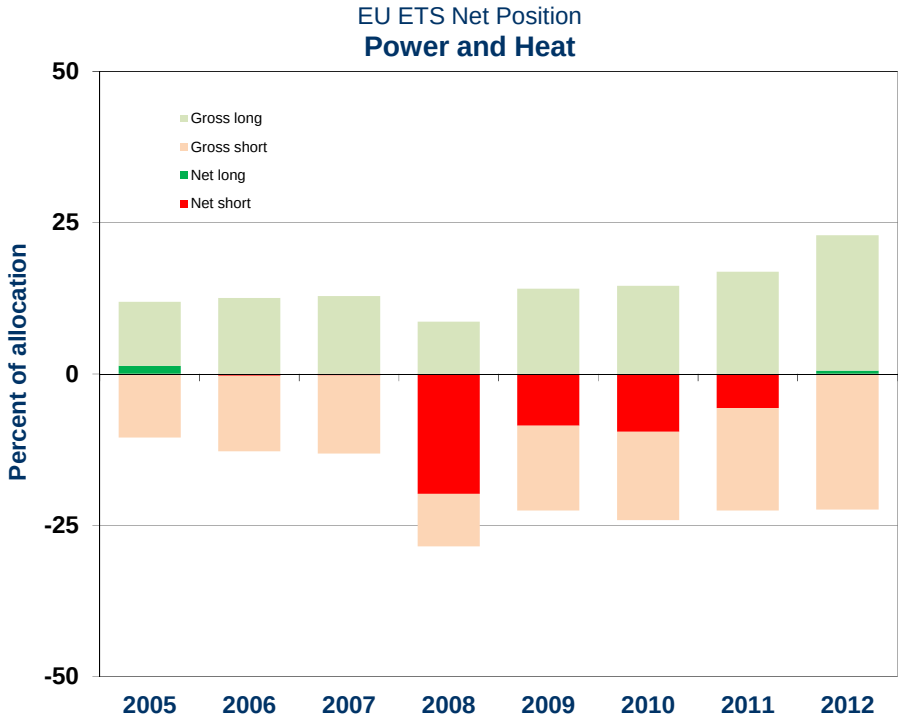
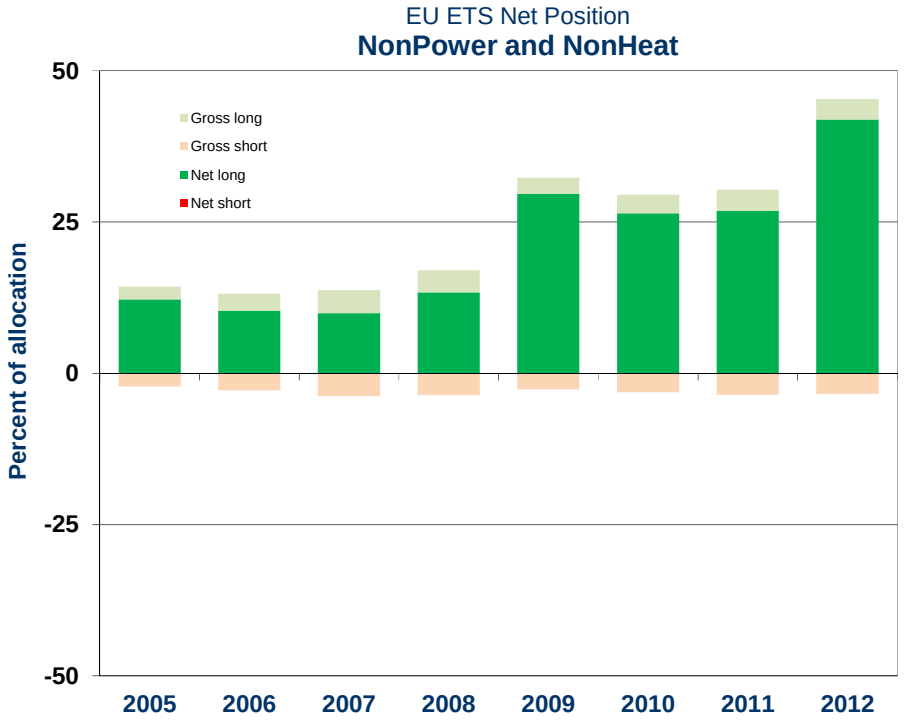
Market fragmentation
Power and NonPower sectors

- Power sector rather short
- NonPower sector was always long
- Differences between trading periods

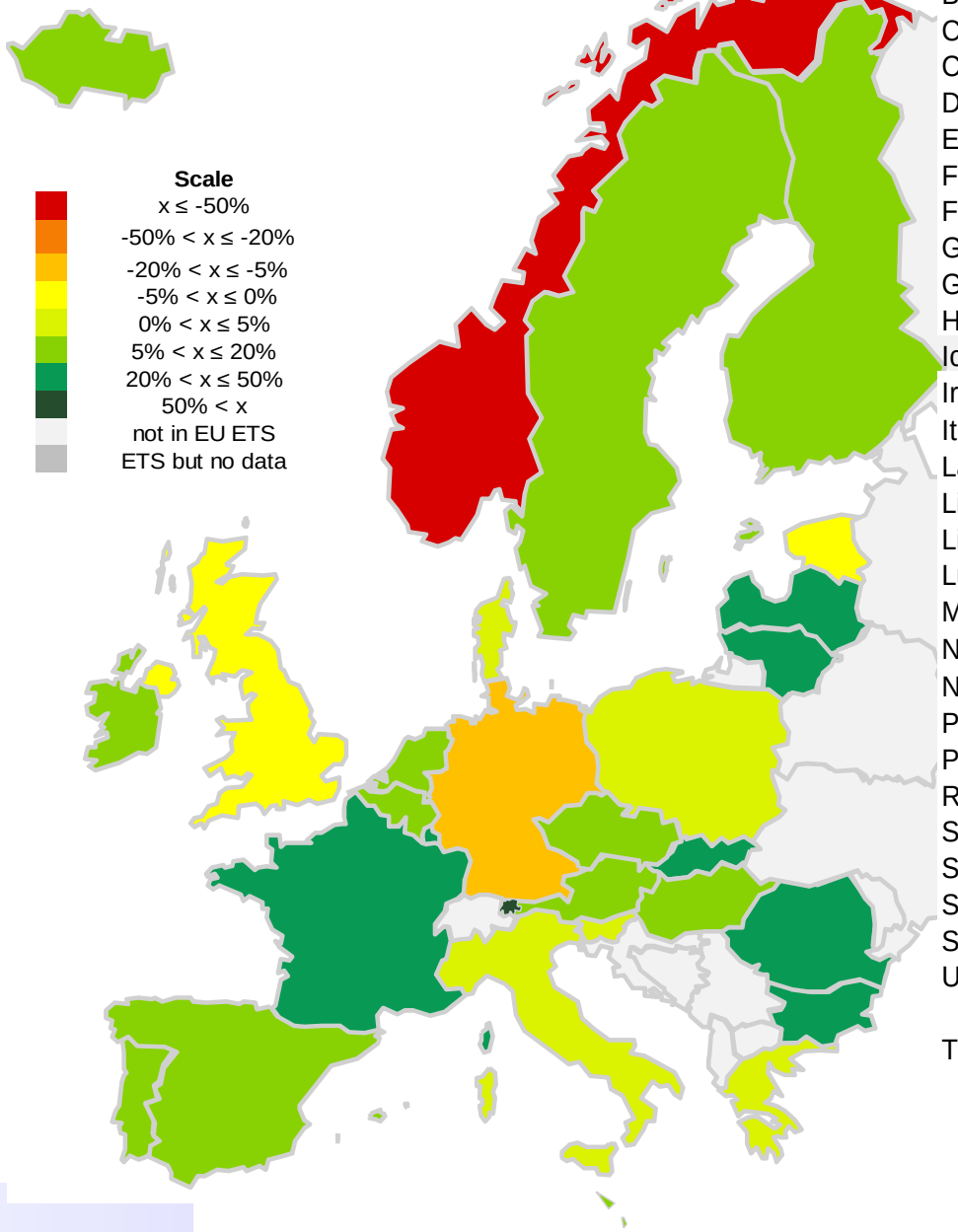




Net positions of countries
2008 - 2012

- **The overall market was long**
- **Country positions differ**

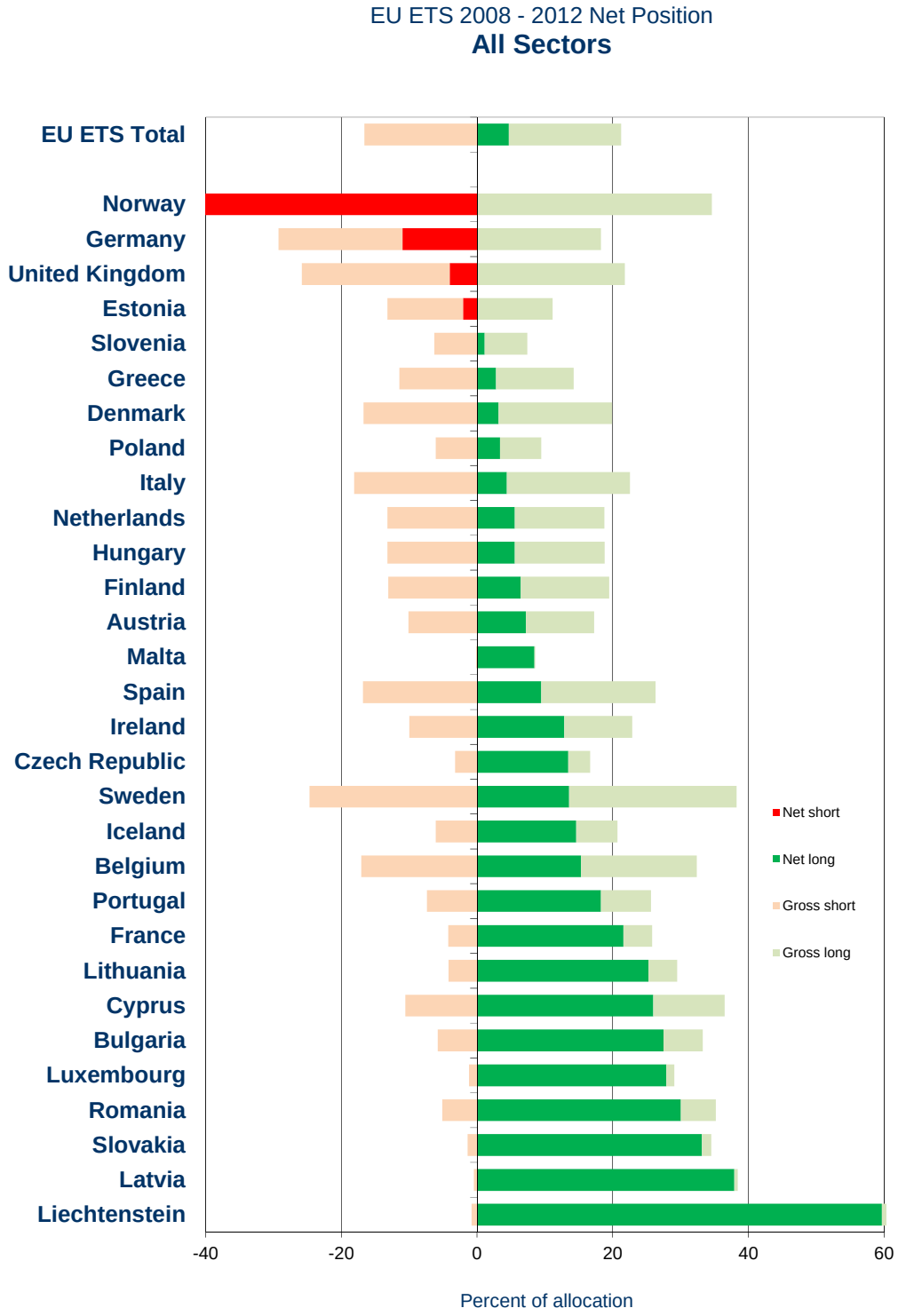
EU ETS Net Positions
All sectors 2008-2012



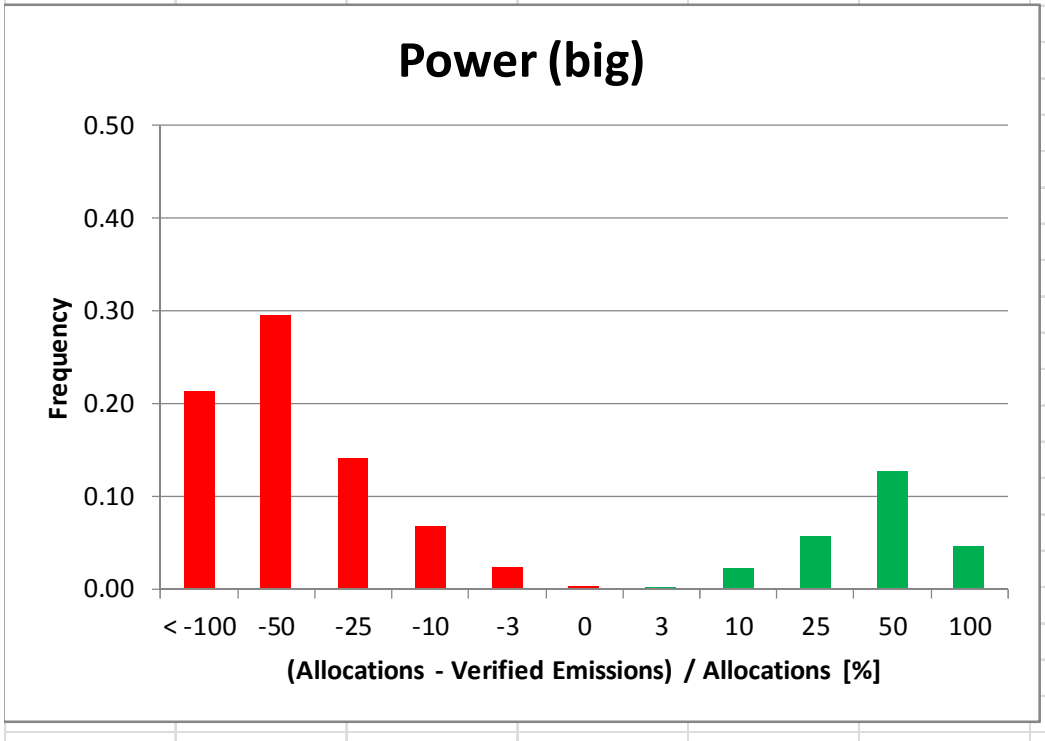
Austria	7.2%
Belgium	15.3%
Bulgaria	27.5%
Cypres	26.0%
Czech Republic	13.4%
Denmark	3.2%
Estonia	-2.1%
Finland	6.4%
France	21.6%
Germany	-11.0%
Greece	2.8%
Hungary	5.6%
Iceland	14.6%
Ireland	12.9%
Italy	4.4%
Latvia	37.9%
Liechtenstein	59.7%
Lithuenia	25.3%
Luxembourg	27.9%
Malta	8.5%
Netherlands	5.6%
Norway	-86.2%
Poland	3.4%
Portugal	18.3%
Romania	30.1%
Slovakia	33.2%
Slovenia	1.1%
Spain	9.5%
Sweden	13.6%
United Kingdom	-4.0%
Total	4.7%

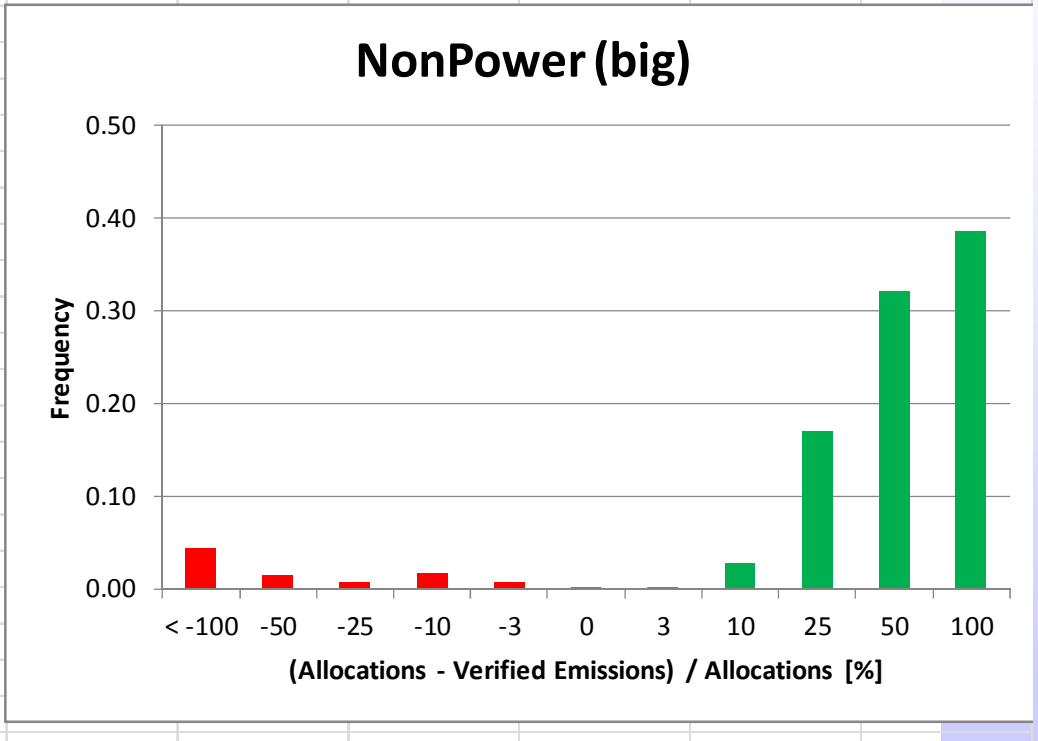
Dispersion of country positions
2008 - 2012

- Only 4 countries are short
- Many countries show wide variation of gross positions



Characteristics of the top 16 % emitters
90 % of emissions





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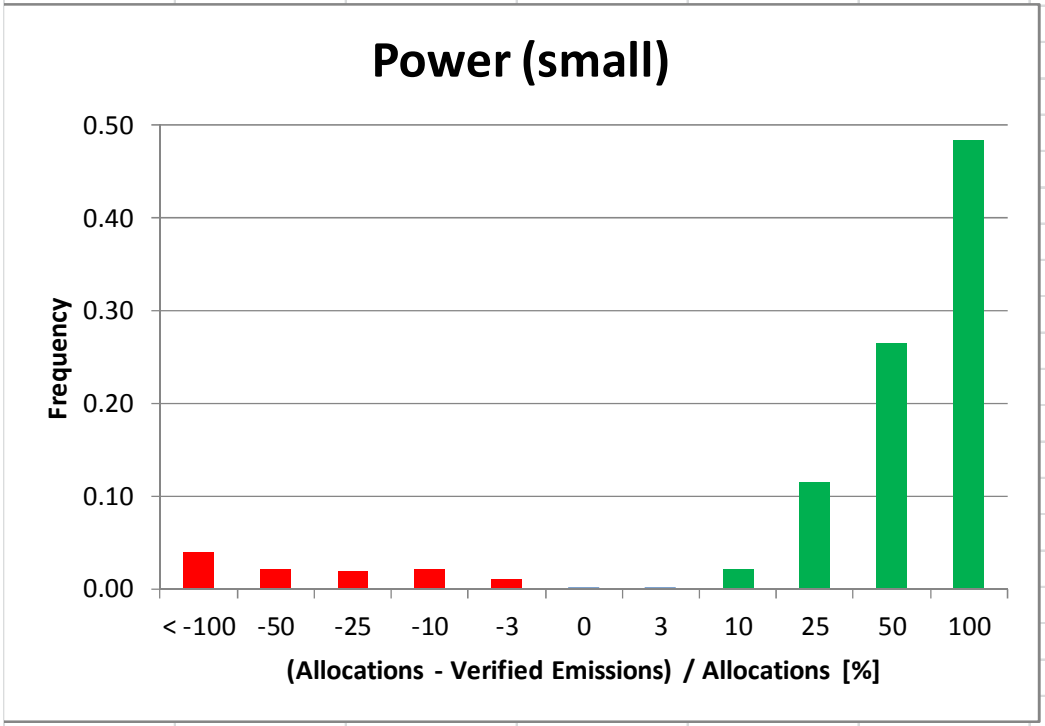

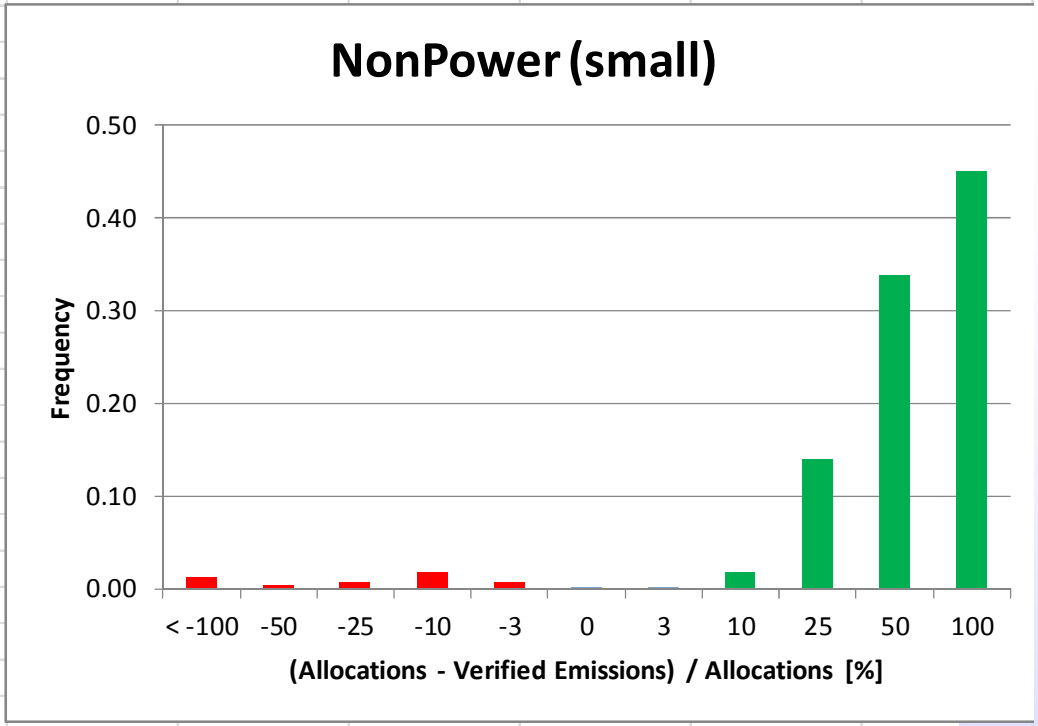

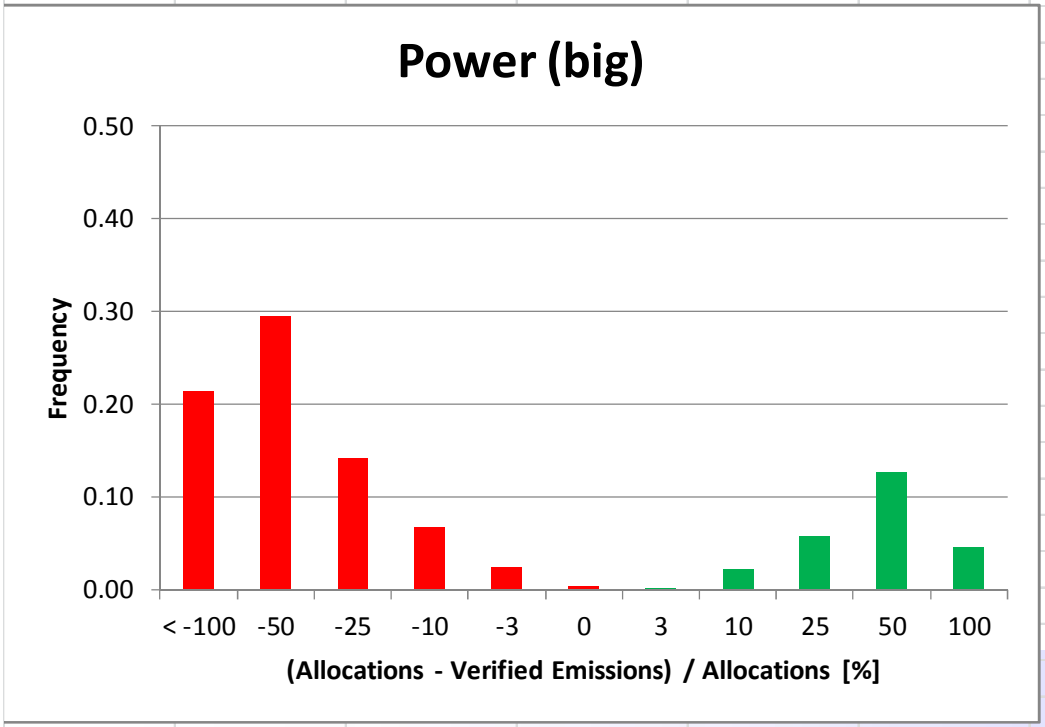

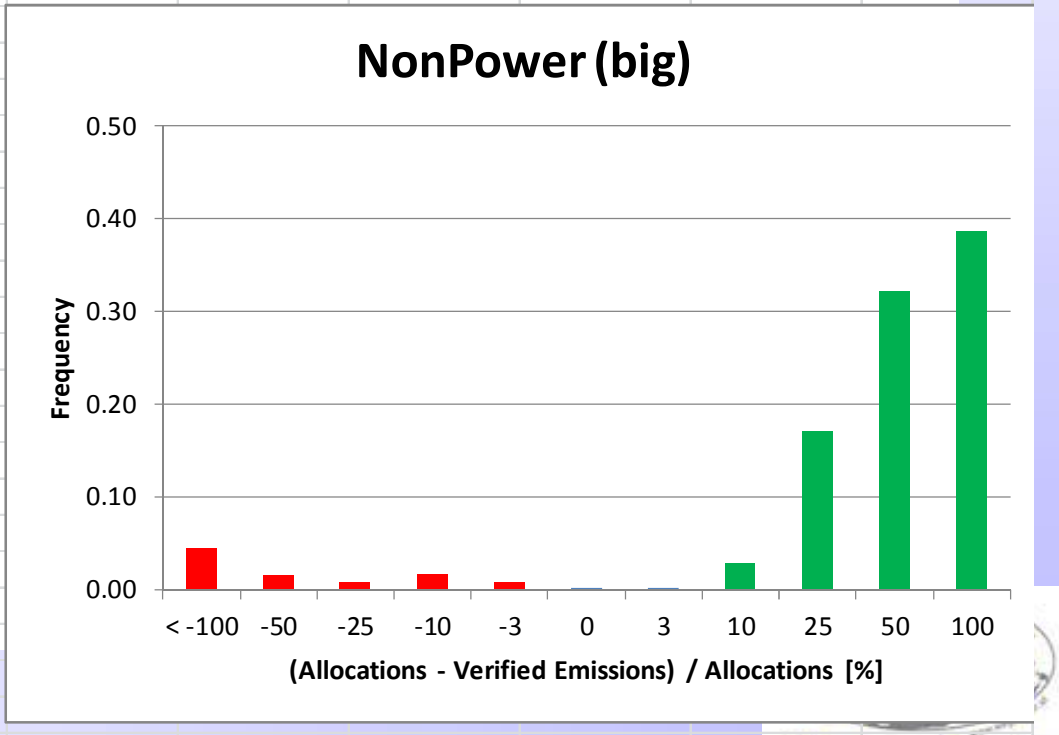

First conclusions from the evidence of a fragmented EU ETS market

- Top 16 % emitters account for 90 % of emissions
  - About ¾ belong to Power sector
- Impact of carbon price on Power sector
  - Add carbon costs to electricity
  - Only a very high carbon price triggers a fuel shift or a switch to renewables
- Impact of carbon price on nonPower sector
  - So far hardly effective because of over-allocations
- Impact of carbon price on small emitters
  - Modest because of rather low impact on production costs

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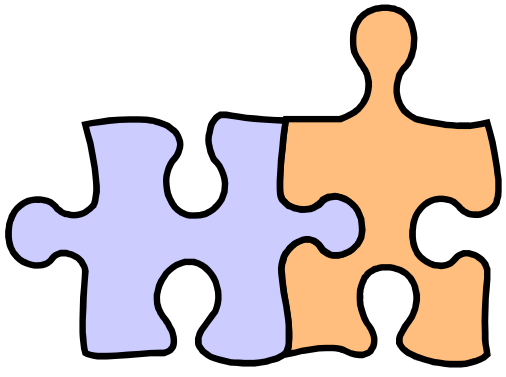

What may have gone wrong

It is not only the oversupply of allowances

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(1)

Rethinking the cap & trade paradigm

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What do we know about marginal abatement costs?

- MAC are the foundations of the cap & trade paradigm
  - They justify cost minimization argument
- Important role given to MAC stems from SO_2 abatement
  - Identifiable because of add-on technologies
- It is rather difficult to identify MAC for CO_2 abatement
  - Mostly integrated not separable technologies
  - Few add-on technologies, e.g. CCS
  - CGE models pretend to know MAC

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Options and cost of CO_2 abatement

Abatement options	Operating decisions no investments	Investment decisions different levels of investments
Change of output		
Change of energy efficiency		
Change of energy mix		

- **What abatement options are available in the operating and investment phase of an installation?**

- **How are operating and investment cost calculated?**
  - ↗ **User cost of capital based on depreciation and interest rates**
  - ↗ **Operating cost based on energy and carbon prices**

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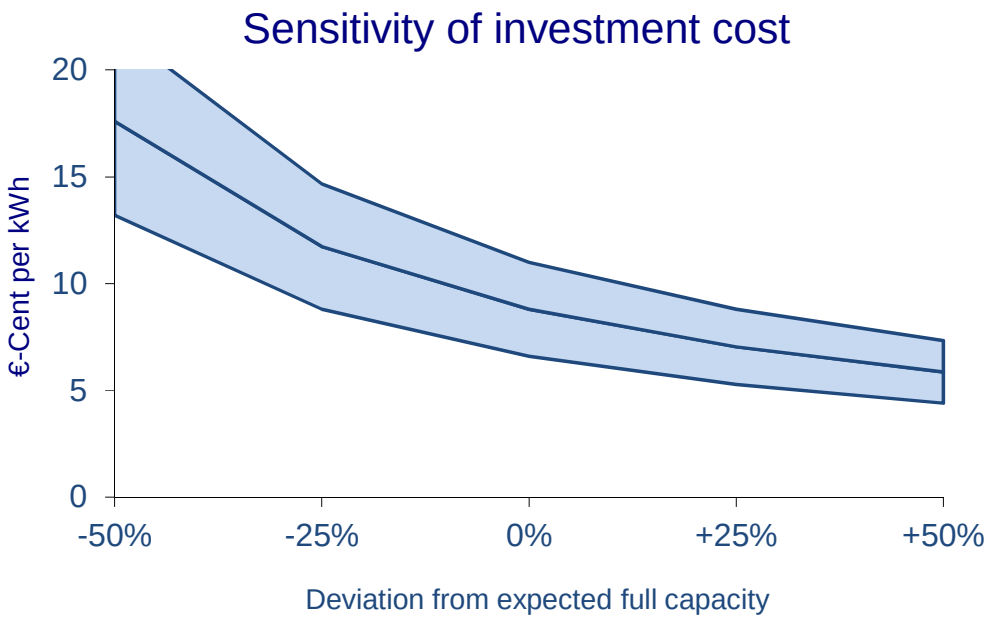
Example 1: Using PV for substituting electricity from coal and gas

Investement		
Investment cost	€ / kWel	1,600
Operating period	Years	20
Interest rate	% p.a.	2.5%
Inlflation rate	% p.a.	-3.0%
Operating		
Operating & Maintainance	% Invest.	1%
Normal capacity in full load hours	h p.a.	1,000
Cost		
Fixed cost per kWh	€ Cent	8.8
Variable cost per kWh	€ Cent	0.0
Total cost per kWh	€ Cent	8.8



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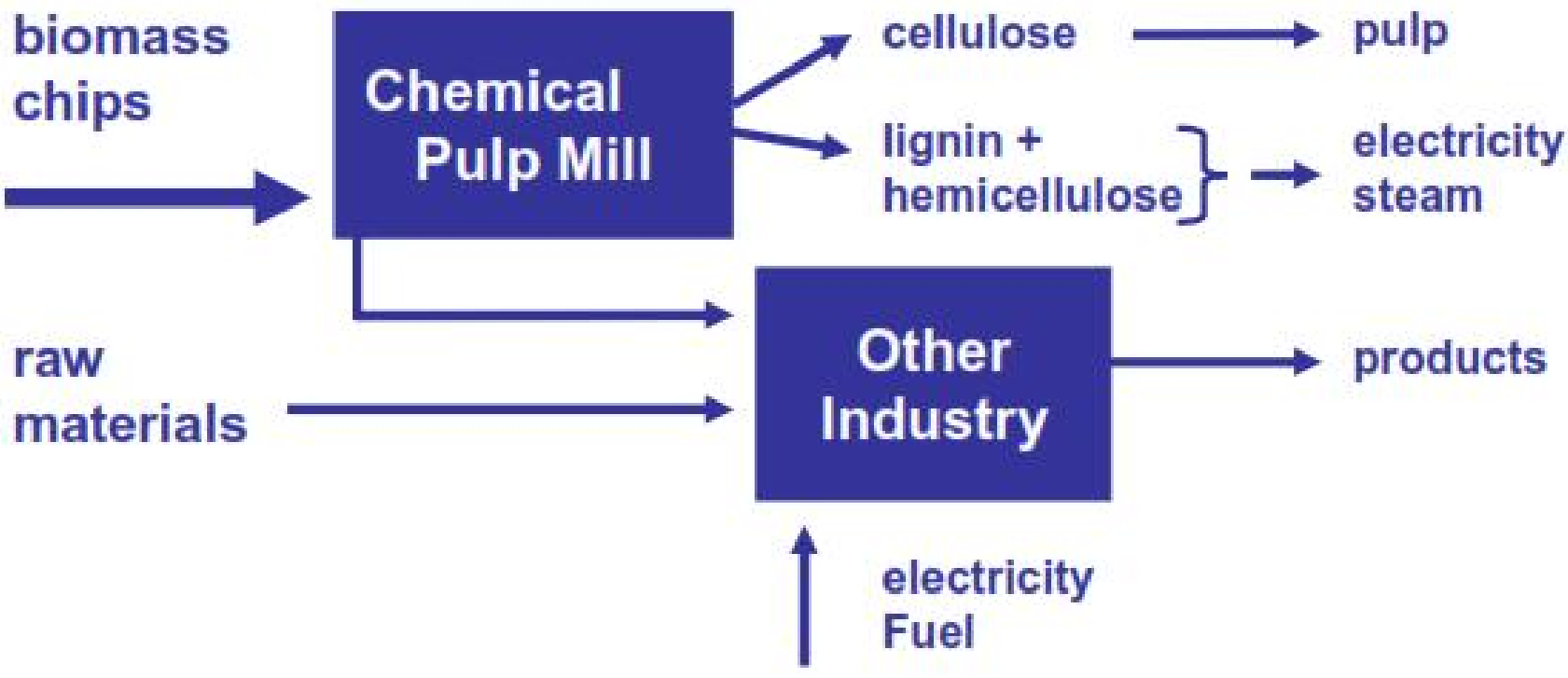
Example 2: From pulp mill to bio-refinery



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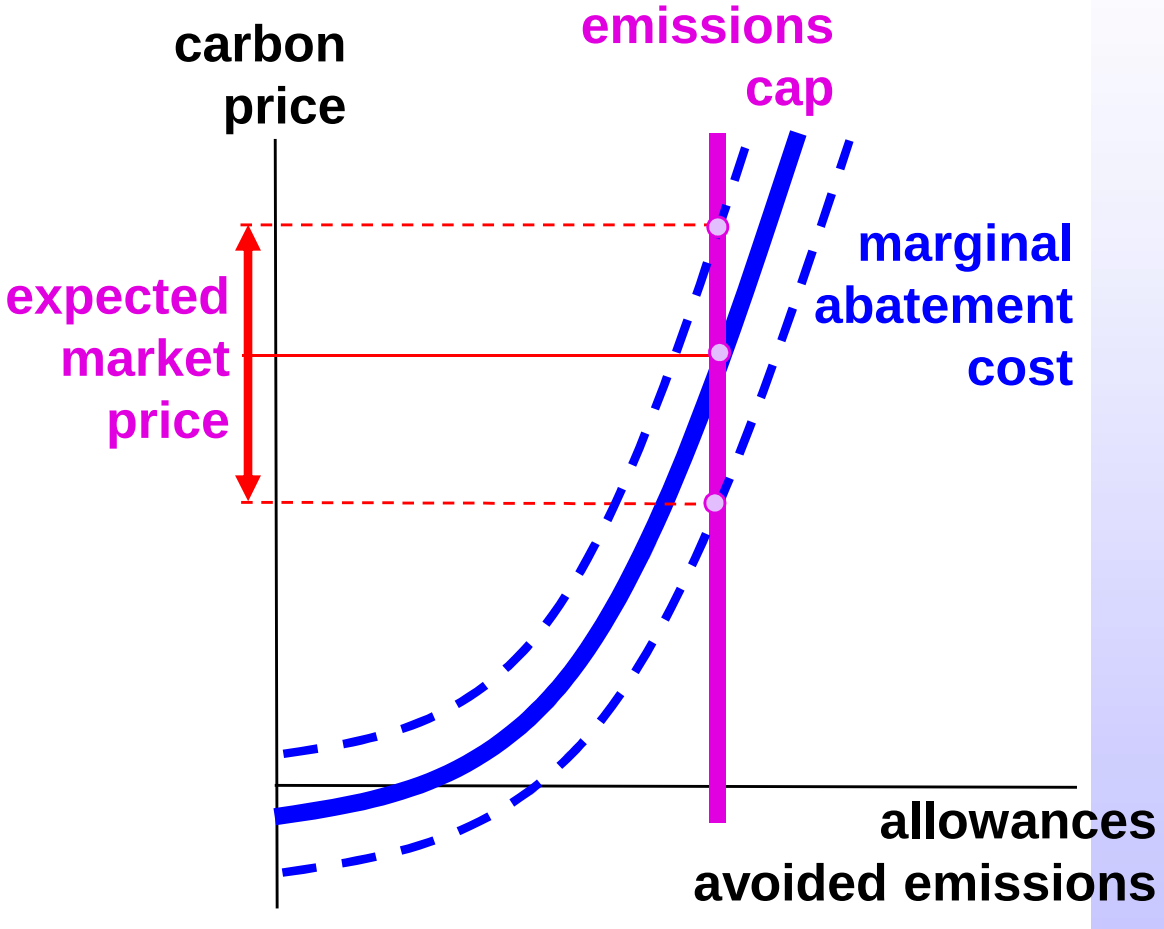
The founding paradigm of cap & trade has turned out being too simplistic

- There is high uncertainty about abatement costs
- Abatement costs vary
  - Interest rates
  - Capital depreciation rates
  - Energy prices
  - Cyclical fluctuations
- Abatement costs may not be unique at all
  - e.g. joint production structures



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(2)

Rethinking the role of carbon prices for technological change

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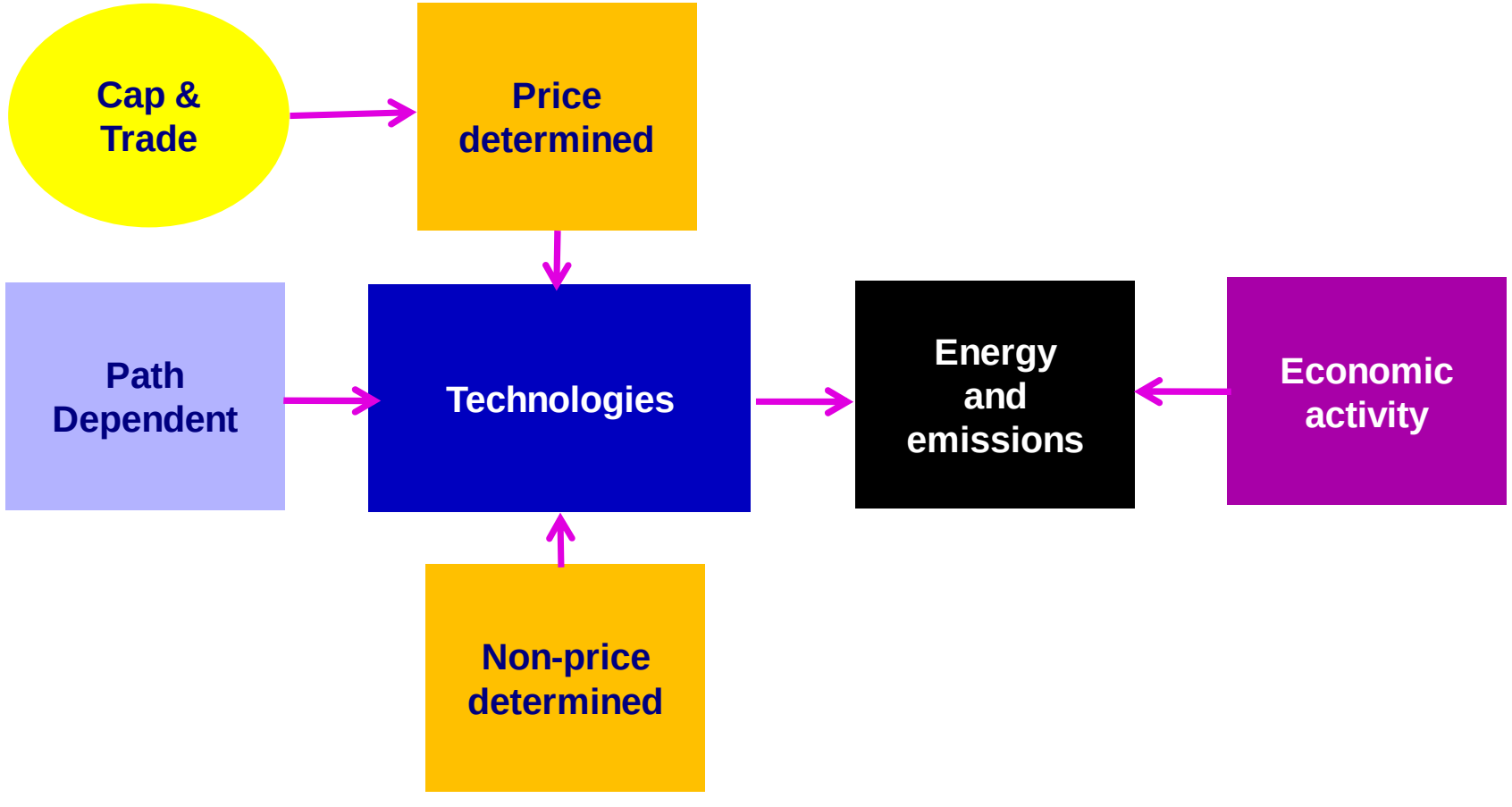
Prices are not the only driver of technical change



The strategic technology policy of China

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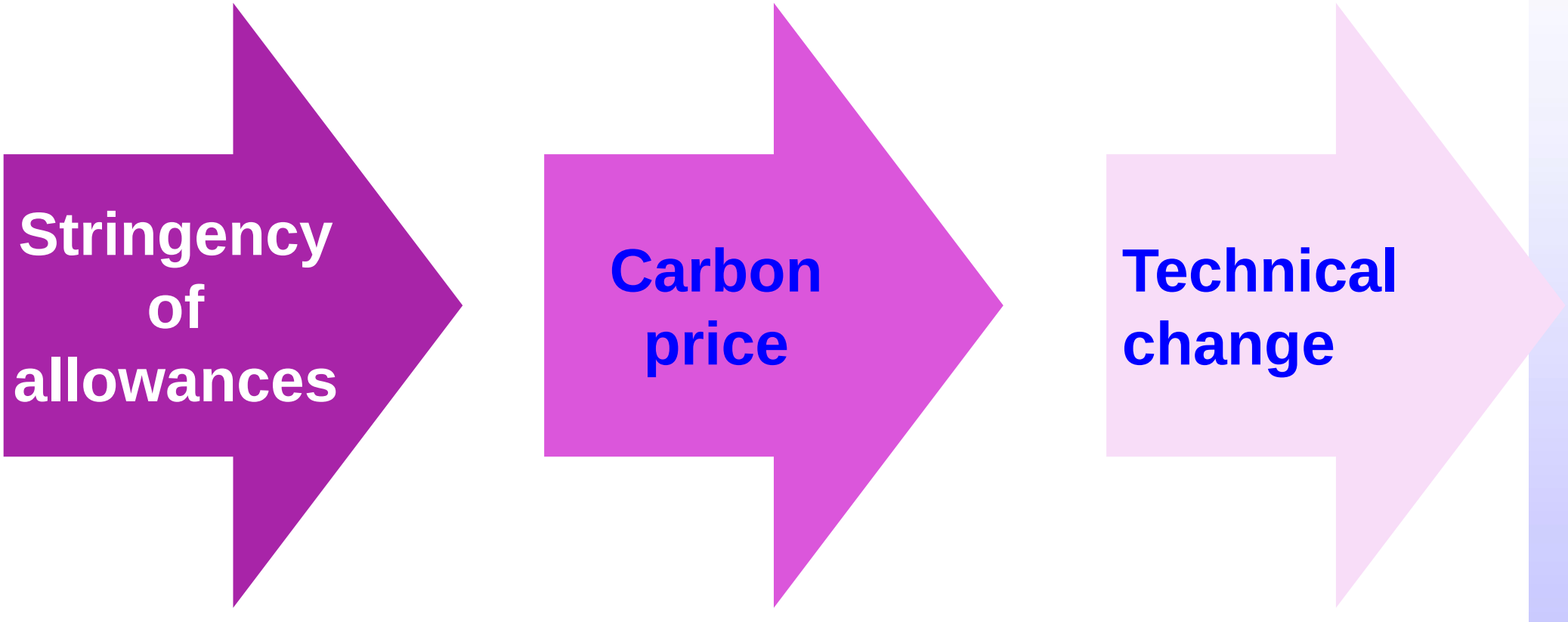
From the stringency of allowances to technical change



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(3)

Interacting and conflicting EU 2020 targets

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EU 2020 targets

- 20 % reduction of GHG emissions
- 20 % share of renewable
- 20 % less end-use energy

- One of these targets is redundant

- Perverse impacts of subsidies for renewables on electricity market
  - ↗ Switch from gas to coal

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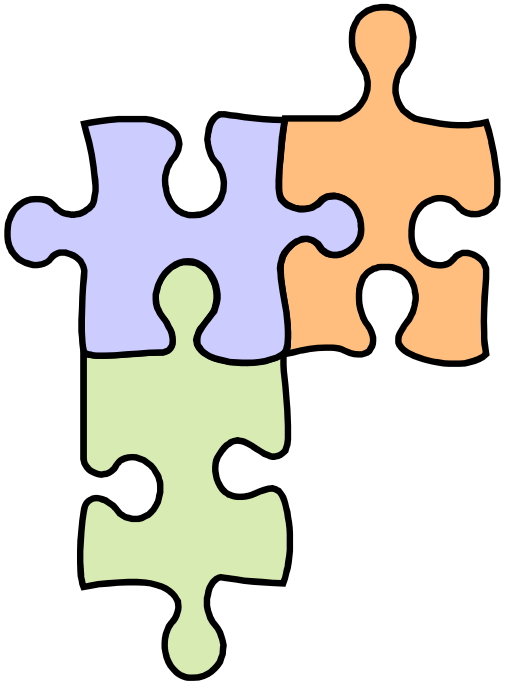

What could still be done

More than backloading and tightening

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Steps for a structural reform of EU ETS

- **Drop up to 84 % of installations**
  - ↗ **This will still leave 90 % of emissions for trading**
- **No discrete trading periods but a long target path (up tp 2050)**
  - ↗ **This will create confidence for investors**
- **Recycle auctioning revenues via a technology fund**
  - ↗ **This will support targeted technology policies**
- **Switch to a self-correcting supply mechanism**
  - ↗ **This will avoid the problems with fixed caps**

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The current fixed cap based mechanism (1)

- **Fixed trading period**
  - ↗ **2013 - 2020**
- **Seemingly fixed cap**
  - ↗ **Uncertainly about offsets and tightening**

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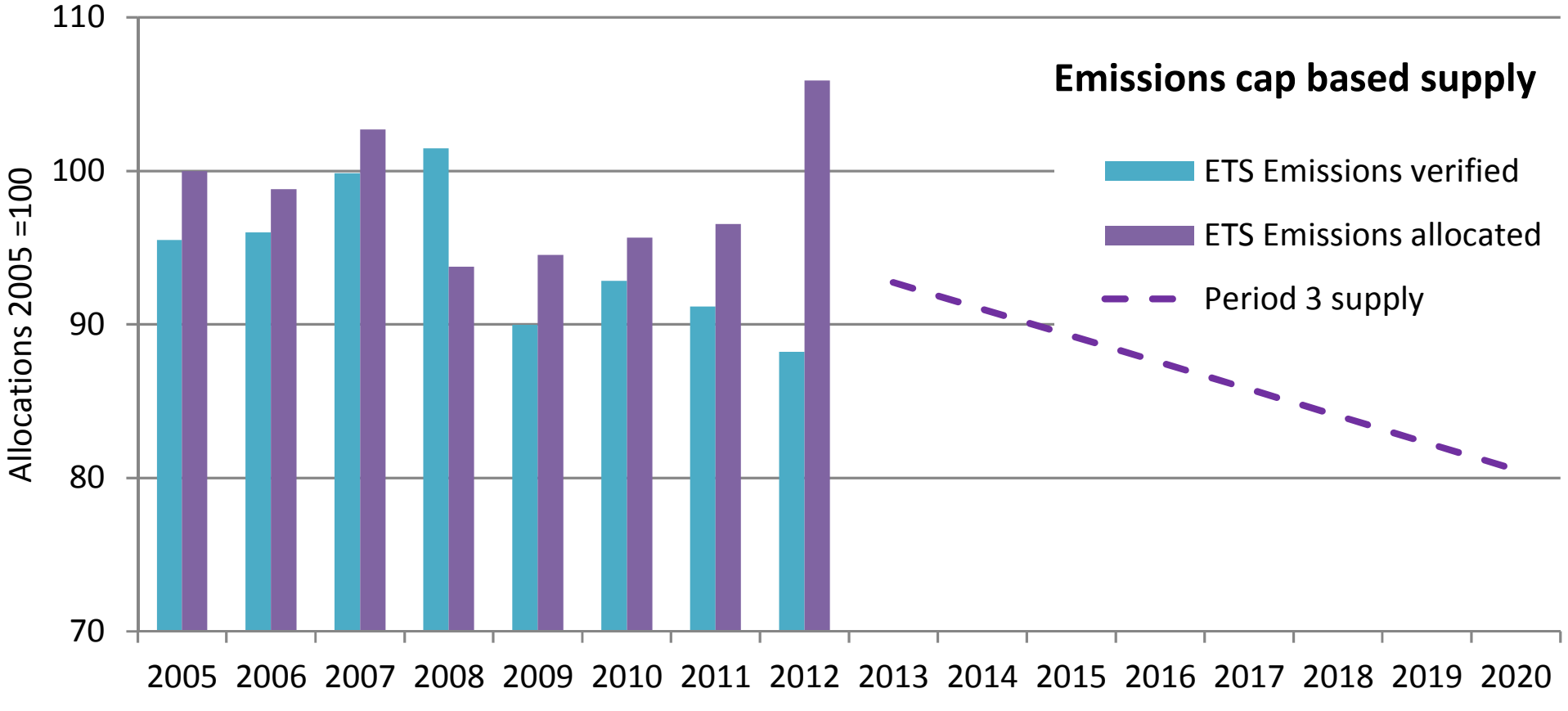
The current fixed cap based mechanism (2)



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An emissions target path based mechanism (1)

- **Long-run emissions path**
  - ↗ **2013 - 2050**

- **Self-adjusting supply of allowances**
  - ↗ **Free and auctioning**

Supply of allowances

The supply in the current period is equal to the notional supply as to the emissions target path plus the compensation of the previous period supply discrepancy

$$S = T - (T_{-1} - E_{-1})$$

S	**supply of allowances**
T	**notional supply as to the emissions target path**
E	**actual emissions**

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An emissions target path based mechanism (1)

- **Long-run emissions path**
  - ↗ **2013 - 2050**
- **Self-adjusting supply of allowances**
  - ↗ **Free and auctioning**

Supply of allowances

The supply in the current period is equal to the notional supply as to the emissions target path plus the compensation of the previous period supply discrepancy

$$S = T - (T_{-1} - E_{-1})$$

S	**supply of allowances**
T	**notional supply as to the emissions target path**
E	**actual emissions**

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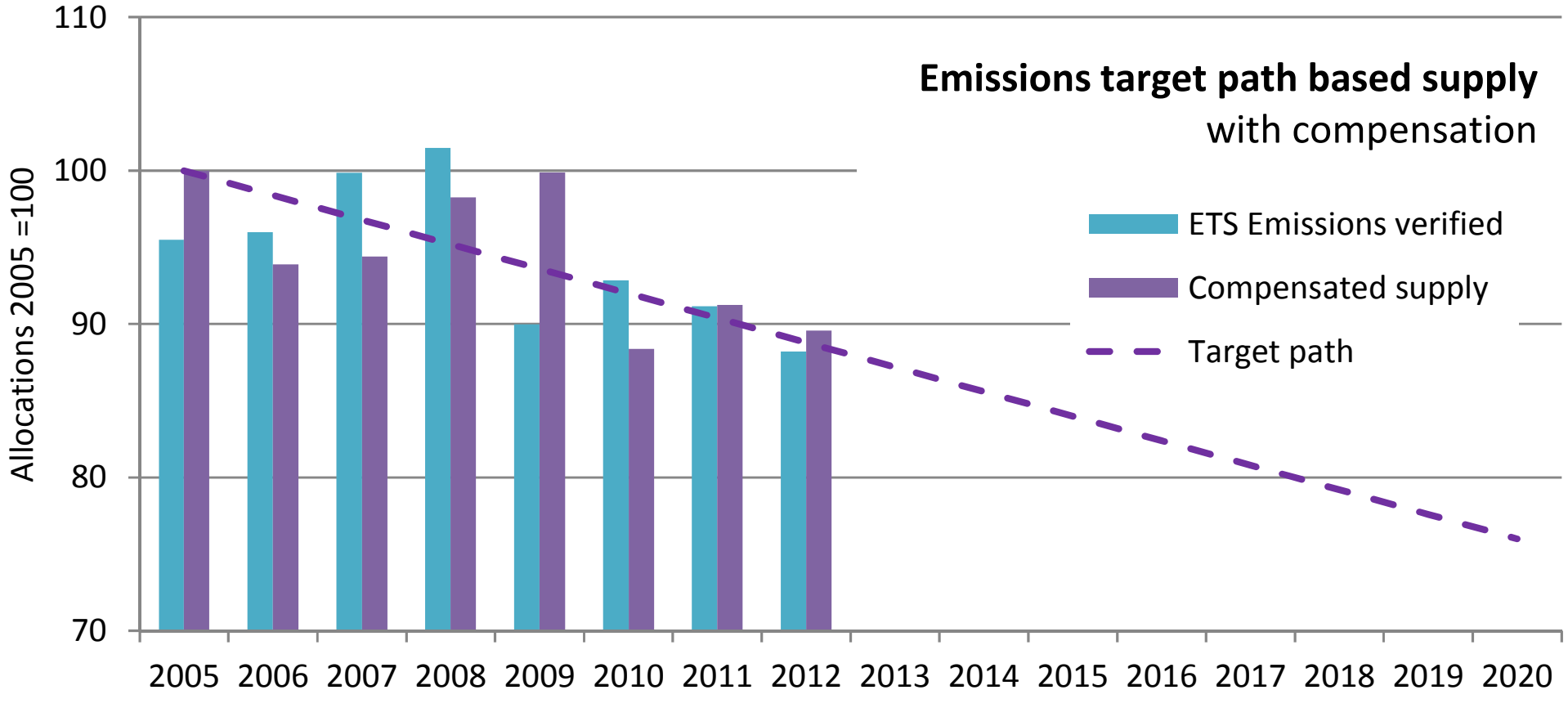
An emissions target path based mechanism (2)



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A carbon intensity path based mechanism (1)

- Long-run carbon intensity path
  - ↗ 2013 - 2050
- Self-adjusting supply of allowances
  - ↗ Free and auctioning

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A carbon intensity path based mechanism (2)

Supply of allowances

The supply in the current period is equal to the notional supply as to the emissions target path plus the compensation of the previous period supply discrepancy. The emissions target path is determined by a notional carbon intensity and actual output (GDP).

$$S = T - (T_{-1} - E_{-1})$$

$$T = I \cdot Q$$

S	supply of allowances
T	notional supply as to the emissions target path
E	actual emissions
I	carbon intensity path (C / Q)
Q	output (GDP)

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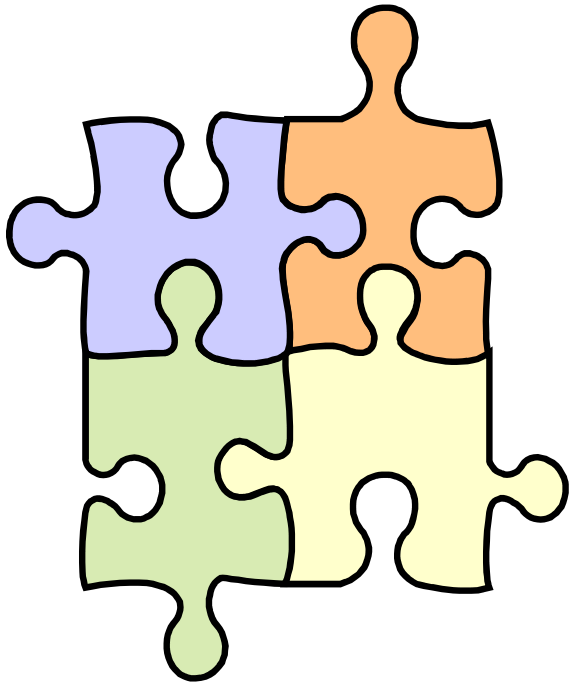

Back to square one

A new framework for EU climate policy

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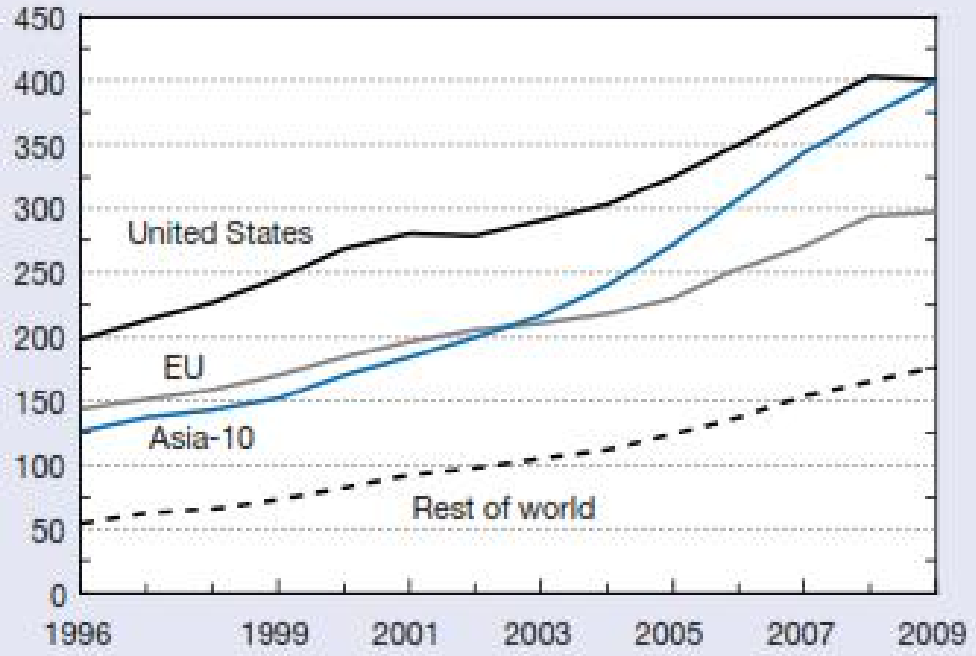
EU needs to become aware of loosing in the global technology competition

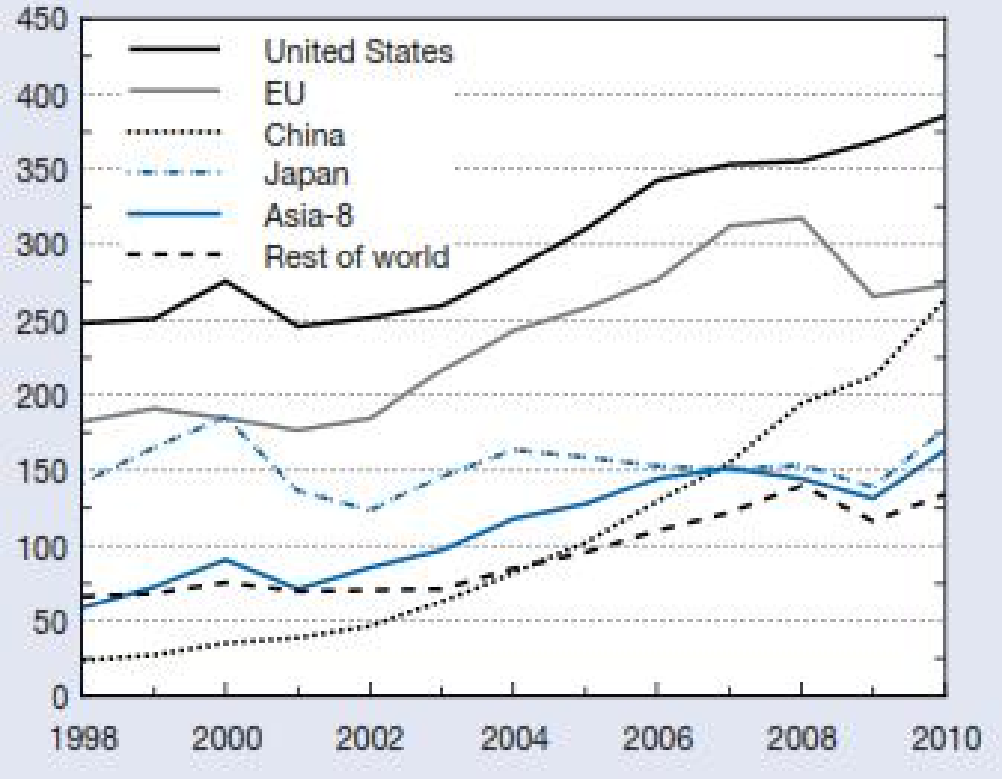
National Science Board (2012): Science and Engineering Indicators

R&D expenditures for United States, EU, and 10 Asian economies: 1996–2009



Asia-10 = China, India, Indonesia, Japan, Malaysia, Philippines, Singapore, South Korea, Taiwan, Thailand; EU = European Union

Value added of high-technology manufacturing industries, by selected region/country: 1998–2010



The technology gap of EU vs. US and China is widening

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EU climate policy needs to be better embedded into targeted technology policies

- Raising the awareness for pushing innovation

- Targeted technology policies
  - New processes – e.g. bio-refineries
  - New materials – e.g. carbon enforces polymers from renewables
  - Integrated processes – e.g. cogeneration of heat and electricity
  - Integrated R & D – e.g. information technologies and microbiology

- Financing issues have been overlooked
  - New long-term financing mechanisms needed
  - New roles for ECB and EIB

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Thank you.

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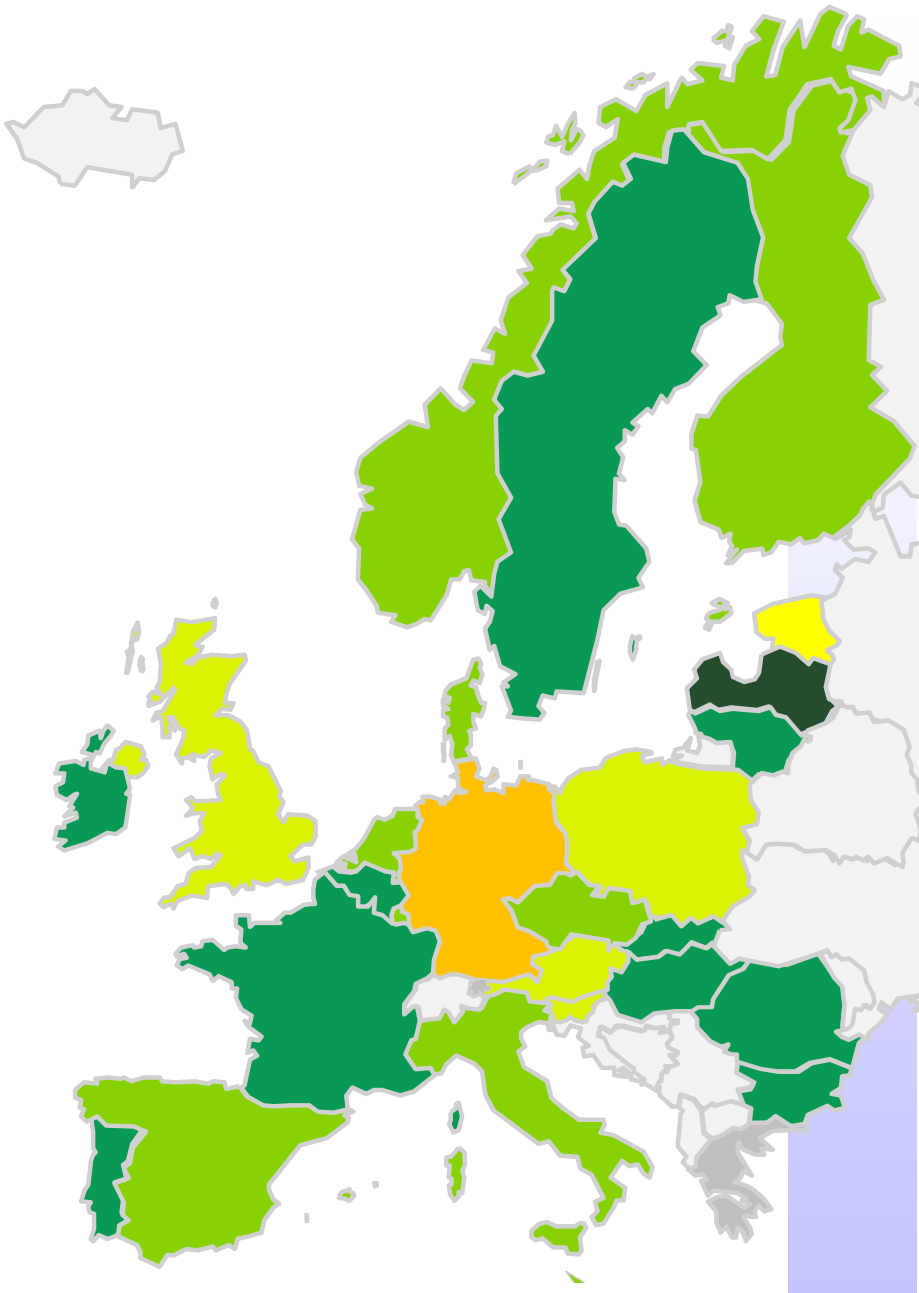

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