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EU and Germany's experience with ETS benchmarking

Korea Environment Institute (KEI) / DIW Berlin / Climate Strategies (CS) Workshop

» Experience with Emission Benchmarks – Options for International Coordination «

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Disclaimer

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The European Union Emissions Trading Scheme
At a glance (1)

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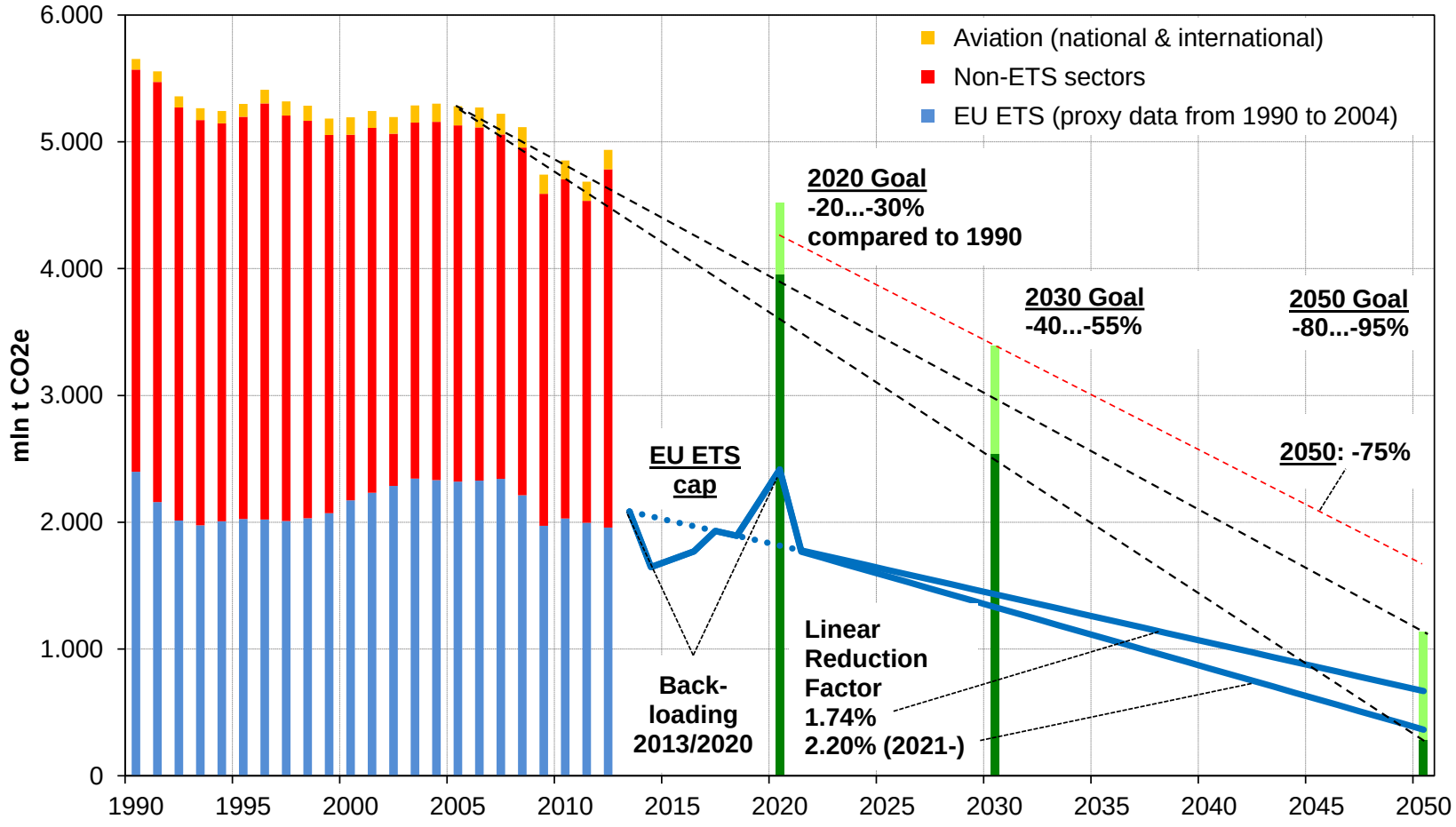
- **Started in 2005**
- **Multi-period scheme (pilot phase 2005-2007, 1st phase 2008-2012, 2nd phase 2013-2020, 3rd phase 2021-2030, etc.)**
- **Regulates ~11,000 installations and aviation activities (45% of GHG-E) in 28 EU states & 3 EFTA states (Norway, Iceland, Liechtenstein)**
- **Increasing level of coordination**
  - Pilot phase: cap-setting and allocation essentially left to the Member States (National Allocation Plan – NAP 1)
  - 1st phase: stronger coordination of cap-setting, less stronger coordination of allocation by the European Commission
  - 2nd phase: transition to European provisions on cap-setting (linear reduction factor) and allocation (auctioning for the power sector /w some exception for Eastern Europe, free allocation based on European benchmarking, European provisions on carbon leakage)
  - 3rd phase: structural reform on cap-setting (tightened linear reduction factor, Market Stability Reserve) and allocation (system-wide adjustments for free allocation etc.)

Long-term framing to enable low-carbon investments
Long-term caps and/or other long-term mechanisms



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The European Union Emissions Trading Scheme
At a glance (2)

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- **Soft updating components**
  - new entrant allocation (for eligible installations) from a New Entrant Reserve (NER)
  - plant closure provisions allowed
  - update of free allocation after 3 years (pilot phase) and 5 years (from 1st phase onwards)
  - other ex post adjustments explicitly prohibited
- **Banking and borrowing**
  - no banking from pilot to 1st phase
  - full banking from 1st phase onwards
  - no borrowing between phases
  - full banking and borrowing within phases (date of allocation before date of surrendering)
- **Limited but generous allowances for the use of offsets for compliance (1st and 1nd phase, main source of surplus = crisis of the EU ETS)**

The European Union Emissions Trading Scheme
In Germany at a glance

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- **Regulates ~1,900 installations with annual CO2 emissions of 461 Mt CO2 (50% of GHG-E), main share of regulated emissions from power sector (~80%) (all data as of 2014)**
- **Allocation approaches improved over time:**
  - Pilot phase: mainly grandfathering
  - 1st phase: more use of auctioning (8%), benchmarking for the power sector (based on fuel-specific benchmarks for Germany)
  - 1st phase: new entrant allocation for power generation, mechanical energy, heat, cement, glass and ceramics based on fuel- and process-specific emission benchmarks standardised load factors
  - 1st phase: bonus/malus provisions for outdated power plants, heat plants and installations producing mechanical energy
  - 2nd phase and beyond: European provisions on full auctioning for the power sector and (product) benchmarking for the other sectors
- **Memo item: compensation for indirect CO2 costs for electricity-intensive companies based on pass-through benchmarks**

Allocation within an GHG ETS
Introduction

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- **Allocation: initial distribution of emission allowances**
- **For all GHG ETS allocation emerged as the key (political) debate**
- **Allocation is a distributional issue**
  - distributional issues drive policy making processes
  - the nature of distributional issues changes over time
- **Underlying motivations for different allocation approaches change over time**
- **Allocation can also have an impact on the efficiency of an ETS**
  - for multi-period schemes with updated allocation
  - for schemes with new entrant allocation
- **Allocation must reflect other design features (coverage, scope, permitting etc.)**

Allocation with an GHG ETS
General design options

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- **General allocation options**
  - free allocation
    - grandfathering (based on emissions)
    - benchmarking (based on activities)
  - auctions and sales
- **(Free) allocation to …**
  - incumbents
  - new entrants
- **Eligible entities for (free) allocation**
  - ETS-regulated entities
  - consumers (of regulated entities) – not for the EU ETS
  - other entities – not for the EU ETS

Allocation with an GHG ETS
Motivations for free allocation

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- **Buy-in of stakeholders (especially relevant for phase-in)**
- **Direct compensation**
  - for regulated entities
  - for downstream-affected entities (e.g. power consumers)
- **Rewarding early action (seems to be a key issue for phase-in)**
  - within a grandfathering approach (special provisions needed)?
  - preferentially with benchmarking approaches!
- **Balance between simplicity and suitability**
  - grandfathering based on emissions is easy but creates distortions (and the need for complementary provisions)
  - benchmarking requires (manageable) efforts but removes distortions and avoids the need for (some) complementary provisions

Allocation with an GHG ETS
Motivations for auctioning

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- **Non-distorted price signal**
  - direct auctioning
  - free allocation to non-ETS-regulated entities is an equivalent
- **Reflecting the ability for CO2 cost pass-through**
  - windfall profits
  - compensation where appropriate
  - the more upstream the less free allocation to regulated entities
  - regulatory framework (e.g. for energy policy)
- **Creating revenues**
  - for the general budget
  - for energy & climate policy activities
  - for direct compensation

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- **Allocation formula**

$$A = AR \cdot BM \cdot AF$$

with

A	(Free) allocation
AR	Activity rate (historic/standardized/planned)
BM	Benchmark
AF	Adjustment factor

- **Assessment**
  - more complex
  - distributional problems depend on benchmark design
  - market transparency could be a problem
  - distortions of the carbon price signal depend on benchmark design

Allocation with an GHG ETS
Motivations for benchmarking

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- **For schemes without (any) and with updating provisions**
  - rewarding early action
  - legitimation for rewarding early action disappears over time
- **For schemes with updating provisions**
  - limiting the distortions of the carbon price signal from updating
  - design of benchmarking (BM) scheme is crucial
    - product-specific (capacity) BM create the least distortions
    - the more fuel- and/or process specific the BM concept is the more price distortions (inefficiencies) must be taken into account
    - the stronger the updating provisions are the more the BM concept matters
  - interactions with cost pass-though (potential perverse incentives)
- **Reminder: the target is preventing (real) carbon leakage (CL)**
- **Reminder: BM is a mechanism for CL-motivated (re)distribution mechanism and not a technology standard**

Carbon leakage
A closer look to the debate

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- **Avoiding carbon leakage is emerging as the key legitimation for free allocation and a series of other (compensation) measures**
- **The generic (academic) view: avoid relocation of production and investment which leads to higher total emissions**
- **The real world (politics) approach: avoid (any) relocation of production and/or investment (jobs! – cf. the trade-exposure only criterion)**
- **The even more complex reality: if production and/or investment is relocated from a capped system (e.g. the EU ETS) to an uncapped economy any relocation may lead to higher total emissions (emissions in the capped system remain constant and the production in the other system will increase if the production is not carbon-free)**
- **Combination of modelling and empirical analysis is essential to assess the reality of carbon leakage and suitability of the countermeasures**
- **For which dimensions coordinated benchmarking can provide solutions**
  - technology specifics!!
  - fuel market environment!?
  - electricity market environment??

Allocation – The pyramid of distortions and the efficiency of the scheme

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CO_2 price signal creates incentives for				Optimal level of		Optimal intensity for	
				demand/ product innovation	**production**	**CO_2 (energy, fuel, other inputs)**	**Energy**
Incentivized optimization is				System-wide		Plant-specific	
Distortion of CO_2 price signal = loss of economic efficiency = higher allowance prices in future				**Comprehen-sive price signal. Least distortion**	**Price signal for optimal production at given demand**	**Price signal for optimal specific CO2 emissions at plant level**	**Price signal for optimal energy efficiency at plant level**
Auctioning				**X***	**X**	**X**	**X**
Free Allocation	No updating	Historic emissions		**(X)**	**X**	**X**	**X**
	Updating (incl. new entrant allocation)	Benchmarks based on	All parameters (products, technology, inputs and/or fuels)	**(X)**	**X**	**X**	**X**
			Capacity only	**(X)**	**(X)**	**X**	**X**
			Product-specific only	**O**	**(X)**	**X**	**X**
			Product- and technology-specific	**O**	**O**	**(X)**	**X**
			Product-, technology- and input-/fuel- specific	**O**	**O**	**O**	**X**
		Historic emissions		**O**	**O**	**O**	**O**

O - not ensured. X - ensured. (X) - ensured in general, but depends also from other factors. X* - ensured in general, if no carbon leakage can be assumed

(Efficiency) interactions between allocation and other design features

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- **Aspects for the impact of allocation on efficiency**
  - direct and indirect updating provisions must be reflected
    - direct updating (ex post-adjustments)
    - base period updating
    - new entrant allocation
    - plant closure provisions
  - to assess (dynamic) efficiency
    - in combination with the design of methods used for free allocation
    - depending on the ‘updating levers’ (e.g. length of trading periods, direct updating, base period adjustments)
    - new entrant allocation has the most significant potential for efficiency losses
  - long-term aspects of allocation must be considered (investment decisions!)

Experiences with benchmarking
The German case study

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- **The benchmarking concept for the 1st phase was mainly based on fuel- and process specifics**
  - electricity generation
    - 365 g CO2 per kWh for gas-fired power plants
    - 750 g CO2 per kWh for coal power plants
  - heat generation
    - 225 g CO2 per kWh for gas-fired plants
    - 345 g CO2 per kWh for other plants
  - other process specifics for cement, glass etc.
- **The fuel- (and process-) specific benchmarks created major distortions for investment decisions in the liberalised power market**
  - (implicit) capacity payment of 55 €/kW for a gas plant (@20 €/EUA)
  - (implicit) capacity payment of >110 €/kW for a coal plant (@20 €/EUA)
- **This benchmarking approach for new entrants created**
  - perverse investment incentives (in favor of carbon-intensive assets)
  - significant competition distortions in the EU internal electricity market

EU ETS: Benchmarking is a feasible allocation approach for all sectors

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- **Experiences on windfall profits and distortions of the carbon price signal triggered significant changes**
- **Transition to full auctioning for the power sector and comprehensive benchmarking for all other sectors (based on product benchmarks)**
  - benchmarks based on 10% best installations
  - 52 product benchmarks
    - coke 1
    - iron & steel 5
    - aluminum 2
    - cement & lime 7
    - glass 4
    - ceramics 6
    - pulp & paper 11
    - chemicals 15
    - refineries 1 (CWT, 64 sub-processes)
  - 1 heat benchmark, based on natural gas as fuel
  - 1 fuel benchmark, based on natural gas

The EU Emissions Trading Scheme
Benchmarking as new approach (1)

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- **Benchmarking is more than benchmarks**

$$A_{free} = A \cdot BM \cdot CLEF \cdot CSCF \cdot [LRF]$$

linear reduction factor (new entrants)

cross-sectoral correction factor (safeguarding the sub-cap for free allocation)

carbon leakage exposure factor 80% → 30% (2020) or 100%

benchmark (10% best installations)

activity: median of 2005-2008 or 2009-2010

The EU Emissions Trading Scheme
Benchmarking as new approach (2)

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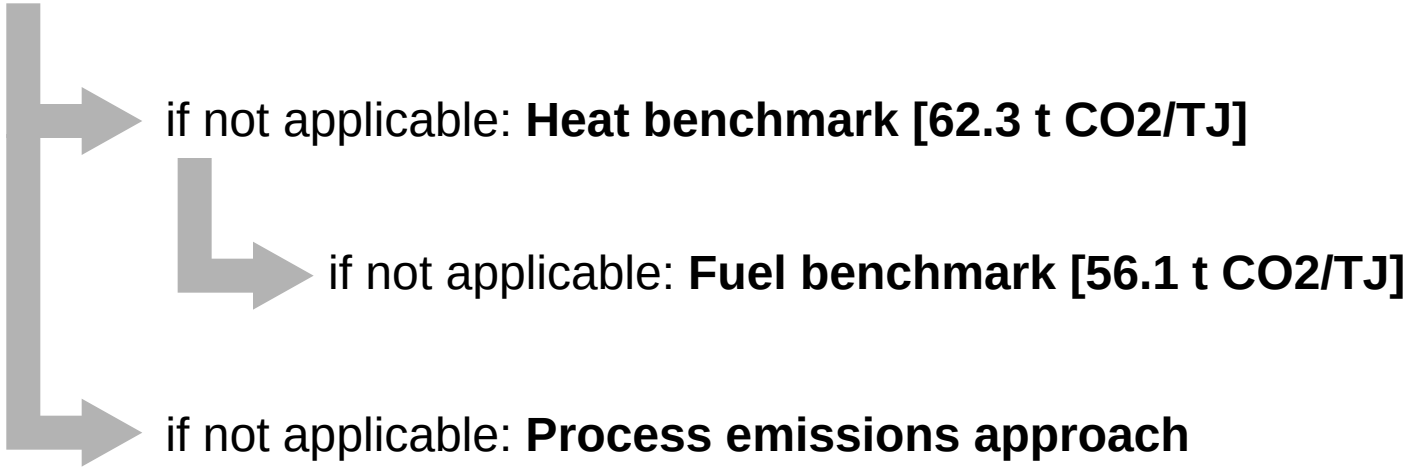
- **Product benchmarks [t CO2/t]** as the general principle



- **Avoiding double counting for cross-boundary heat flows: deduction of free allocation from net heat exporter**
- **Special provision for waste (e.g. blast furnace) gases: full allocation at point of production**

EU ETS: Benchmarking approach
Challenges for construction of benchmark curves

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- **For a certain (significant) range of installations/sectors fuel combustion (= CO2 emissions) can be substituted by import of heat or electricity; this needs to be reflected in the data compilation for the benchmark curves**
  - imported heat and electricity were included in the data compilation
  - standardised emission factors for imported heat (62.3 t CO2/GJ) and electricity (0.465 kg CO2/kWh) were employed
  - key challenge: does the standardised emission factor for electricity meet the reality (EU average?, EU marginal?, marginal for certain regional markets?)
- **Use of waste gas from steel mills etc. for power generation (which receives no free allocation) needed to be reflected for the benchmark curves**
  - emissions from power generation from waste gases (generic assumption: natural gas with adjustments for differences in plant efficiency…) is deducted from total emissions (result: benchmark is lower than emissions from iron ore reduction …)

Iron & steel sector in Germany
Emissions and allocation

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EU ETS: Benchmarking approach
Challenges for allocation (and compensation)

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- **Imported heat and electricity are (partly) reflected for the allocation**
  - if installations in the respective sectors (historically) used imported heat or electricity the benchmark-based allocation is cut back
  - this needs not necessarily to be done (from an economic perspective)
    - if carbon costs would be passed-through for heat and electricity
    - if the standardised emission factors for imported heat and electricity would represent (best) the reality
  - EU decided in favour of a more engineering perspective and targeted compensation for indirect costs from electricity for certain sectors
  - different leakage provisions for (sub-)installations create complexities
- **Compensation benchmarks for energy-intensive industries in DE**
  - based on EU state aid provisions, 16 sectors eligible
  - 85% (2013-2015), 80% (2016-2018), 75% (2019-2020) of 0,76 kg CO2/kWh for electricity benchmark consumption
  - 35 benchmarks and standard methodologies for electricity consumption

Assessment of benchmarking within the EU ETS
Sectoral aggregates

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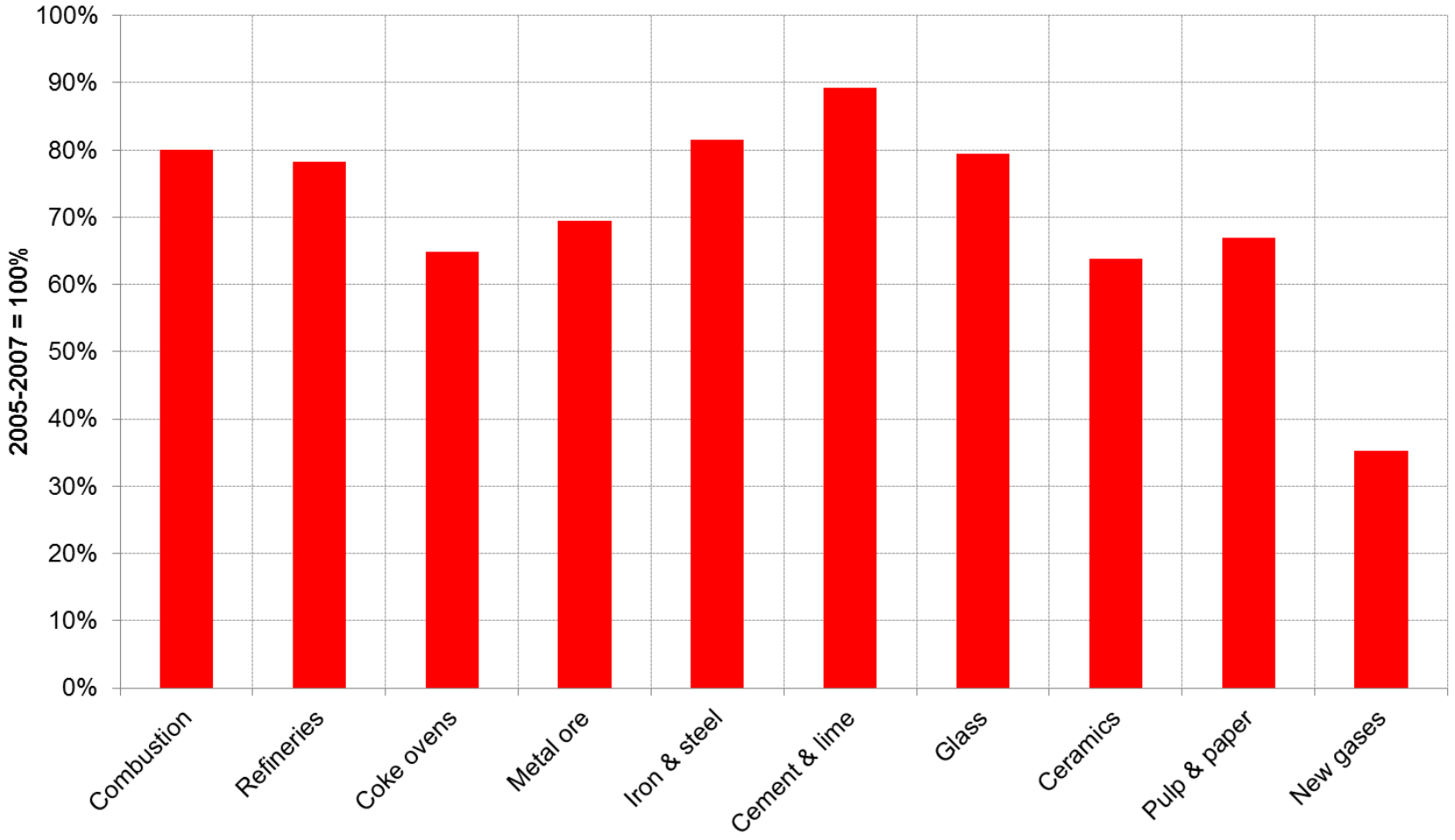

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EU ETS: Benchmarking approach
Summary

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- **Free allocation can significantly distort the carbon price signal (in ETS with significant updating provisions)**
  - the more significant the stronger the updating provisions are
  - incumbent and new entrant installations are of different importance
- **Benchmarking is important to limit (not: to eliminate) these distortions**
  - if the benchmarking scheme is as less specific for the respective installation as possible (fuel, process, load factor)
- **Poorly designed benchmarking approaches (as for Germany in the 1st phase of the EU ETS) can even create perverse incentives**
- **Engineering (non-economic) approaches to deal with imported heat and electricity (which can substitute direct fuel use and CO2 emissions for certain processes) can create significant complexities**
- **Fuel and electricity market specifics may be important for benchmarks**
- **Different adjustment factors for (sub-)installations create complexities**
- **Benchmarking can appropriately address the early action issue**
- **Benchmarking can be used for compensation approaches**

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Thank you very much

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