Benchmark development: UK and EU experience

Workshop on 'Experience with Emission Benchmarks – Options for International Coordination'

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Koreana Hotel, Seoul, South Korea

Alistair Ritchie

ICF International

Agenda

- EU ETS Phases 1 & 2 (2005 to 2012)
  - UK Phase 2 BMs for new entrants
  - EU BMs for N_2O for nitric acid plants
- EU ETS Phase 3 (2013 to 2020)
  - UK research for cement & steel sectors
  - UK & NL research for upstream oil & gas sectors
  - EC Phase 3 BM impact assessment
  - Phase 3 BM process, principles, BMs & allocation
  - Industry examples
- EU ETS Phase 4 (2021 to 2030)
  - EC Phase 4 impact assessment & proposals

UK Phase 2 BMs for new entrants

- Sectors
  - Power & energy (combustion, other generation, LNG imports, gas compressors, onshore terminals, gas storage)
  - Industry (refineries, integrated steelworks, electric arc steelmaking, pulp & paper, cement, lime, gypsum, ceramics, glass)
- Process
  - Review of Phase 1 BMs, data sources & proposals for Phase 2:
    - Emission factors
    - Load factor (capacity utilisation factor) and capacity
  - Stakeholder engagement & peer review
- Evaluation
  - Feasibility: input data verifiable? best practice for NEs? replicability?
  - Incentives for clean technology: differentiation avoided?
  - Competitiveness & impact on innovation: extent of NE needs met & financial impacts
  - Consistency with incumbent allocation

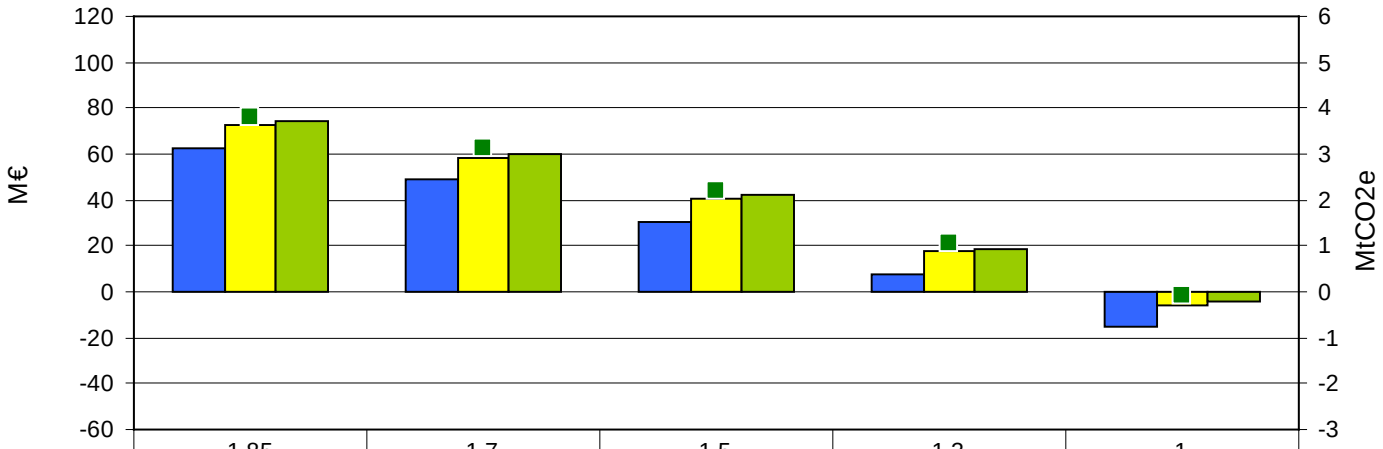
EU Phase 2 BMs for N_2O from nitric acid plants (1)

- Process
  - Review of production processes, production levels & GHG emissions; existing policies; abatement techs
  - Economic modelling of BM options
  - Evaluation (feasibility, env effectiveness, economic impacts)

Current (2008) technology	No of EU prod lines	Current EF (kgN2O/t HNO3)
None	28	3.7 to 12.8
Improved oxidation catalysts	14	3.6 to 9.7
Secondary catalysts	8	0.9 to 2.5
Both of above	4	1.5 to 1.9
Tertiary abatement	7	0.01 to 0.2
Overall	61	4.4

EU Phase 2 BMs for N2O from nitric acid plants (2)

Summary of economic impacts



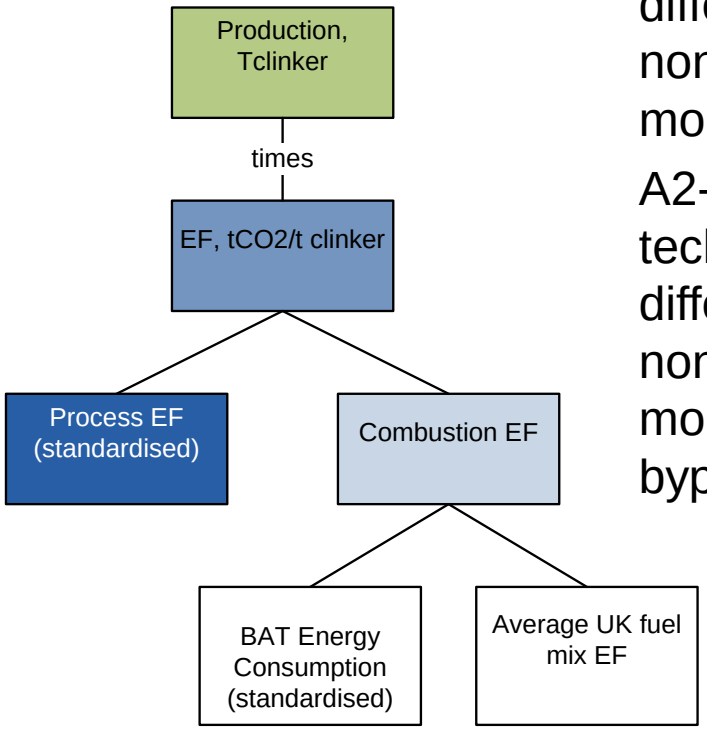
kgN2O/tHNO3	1.85	1.7	1.5	1.3	1
Net Economic Impact, M€	63	49	31	8	-15
Net Econ Impact 2.5	72	59	40	17	-6
Net Econ Impact 1.85	74.0	60.2	41.9	19.0	-3.9
Excess to market, MtCO2e	3.82	3.13	2.22	1.07	-0.08

Benchmarks (kg N2O/t HNO3)

- Phase 2 (UK, NL, AT): 1.5 (2011), 1.3 (2012)
- Phase 3 (EU): 1.0

UK research on suitability of cement & steel Phase 2 New Entrant BMs for Phase 3 (1)

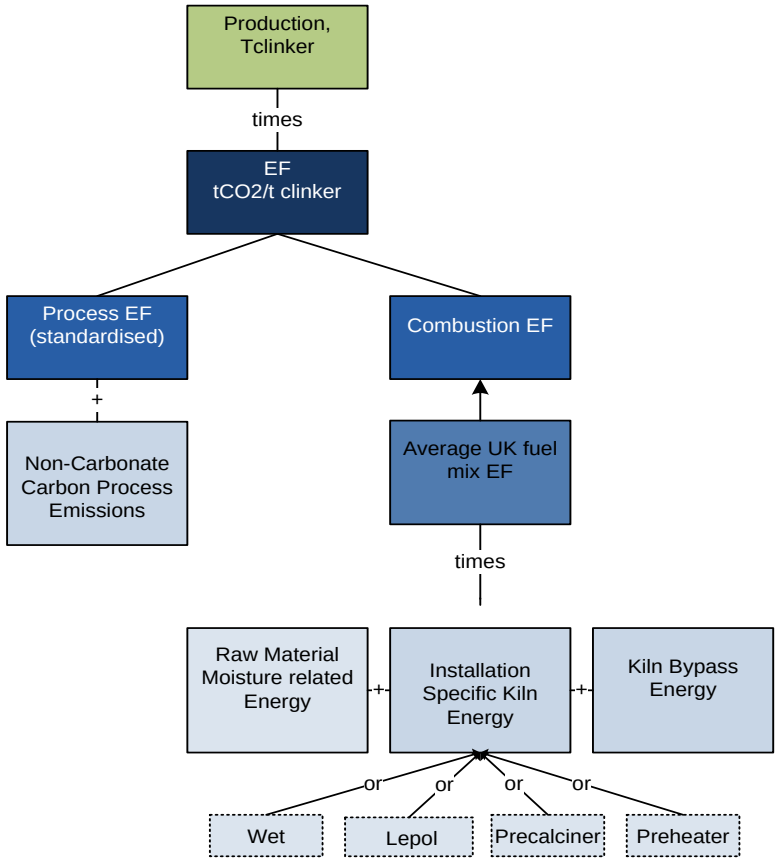
NE BM: no differentiation



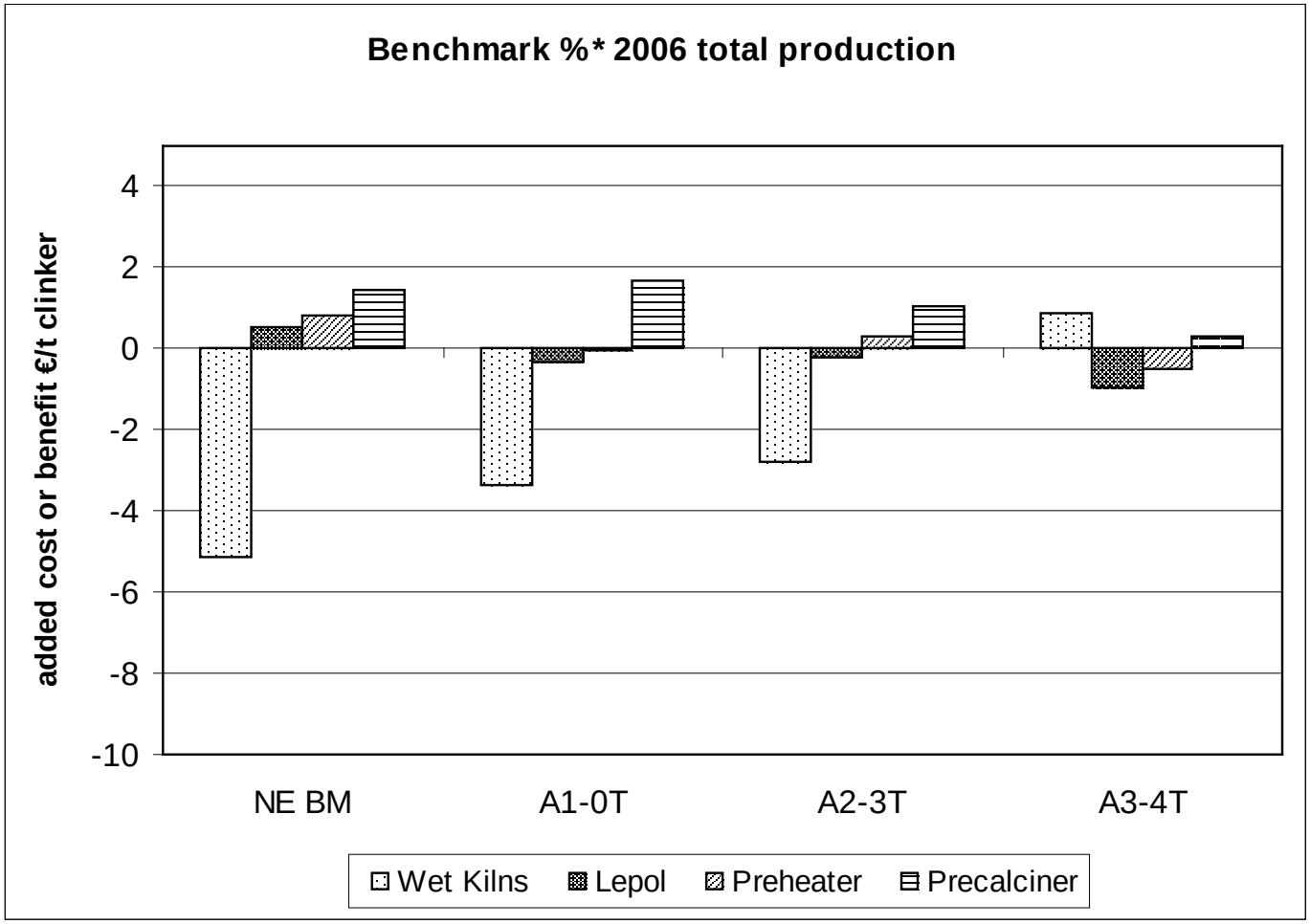
A1-0T: differentiation for non-carbonate C; moisture

A2-3T: 3 technology differentiation plus non-carbonate C, moisture, kiln bypass

A3-4T: 4 technology differentiation plus non-carbonate C, moisture, kiln by-pass



UK research on suitability of cement & steel Phase 2 New Entrant BMs for Phase 3 (2)



UK & NL funded research on BM options for upstream oil & gas sector

- Objective
  - Assess feasibility of developing product BMs for upstream oil & gas sector & review options
- Data collection
  - 182 EU installations in top 6 MSs; 67% provided usable data, 4 wks

Option	Conclusions
1. Single product BM	Simplest but does not correct for significant reservoir specific factors (properties, fluids, location)
2. Single product BM with some site specific factors	No single factor responsible for differences in emissions intensity
3. Differentiated product BM	Inconsistent with approach for other sectors
4. Modular product BM for specific processes	Promising but further data / time required
5. Fallback approaches	Selected option (heat and fuel BMs)

EC Phase 3 BM impact assessment - options

- Historic activity level (HAL)
  - 2005-2007 (av)
  - 2007-2008 (av)
  - 2005-2008 (av)
  - 2005-2008 (drop min av)
  - 2005-2009 (drop min av)
- Heat production BM value
  - Nat gas & 93% efficiency
  - Nat gas & 90% efficiency
  - Biomass
  - Av fuel mix & efficiency (all installations or FB installations; or sectoral)
  - Av of top 10%
- Fuel BM value
  - Natural gas
  - Biomass
  - Av fuel mix (all installations or FB installations; or sectoral)
  - Av of top 10%
- Waste gases
  - No allocation for waste gases
  - Full allocation to producer or user
  - Partial allocation to user
  - Allocation to both (nat gas or coal)
- Effort sharing factors
  - None, installation specific, sector specific, harmonised
- Cement sector
  - clinker, cement, hybrid

EC Phase 3 BM impact assessment - impacts

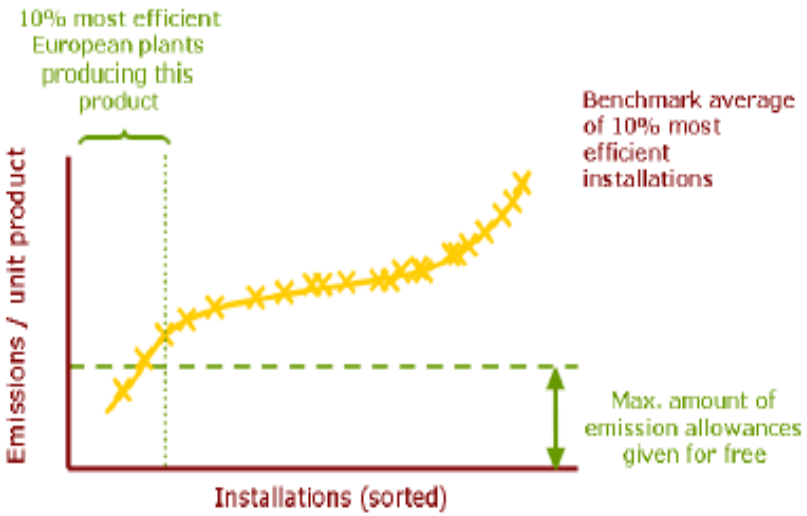
- Allowance allocations vs emissions
- Production cost increases, accounting for assumed cost pass through
- Trade and investment
- GDP
- Industry and consumer prices
- Employment impacts
- Administrative costs

Overall Phase 3 BM development process

- BM development
  - Development of BM principles, including ambition level
  - Assessment and selection of BM products and methodology per product
  - Industry engagement
  - Development of BM data collection, QA/QC & verification procedures
  - Data collection by industry, applying the above rules and requirements
  - Data analysis & development of BMs per product and per fallback option
  - Verification of BMs
  - Impact assessment (cost-benefit analysis) of BM proposals
  - Adoption of BMs
- BM allocation implementation
  - Capacity building processes on BMs and data collection with Member States
  - Implementation of BM allocations (development of National Implementation Measures (NIMs), verification of NIMs)
  - Evaluation of BMs

BM principles and types

- **Principles**
  - One benchmark for one product
  - No corrections for type of technology, fuel, raw material etc
  - Possible where products can be defined & enough installations
  - BM level set at average of top decile performance per product



- **Types**

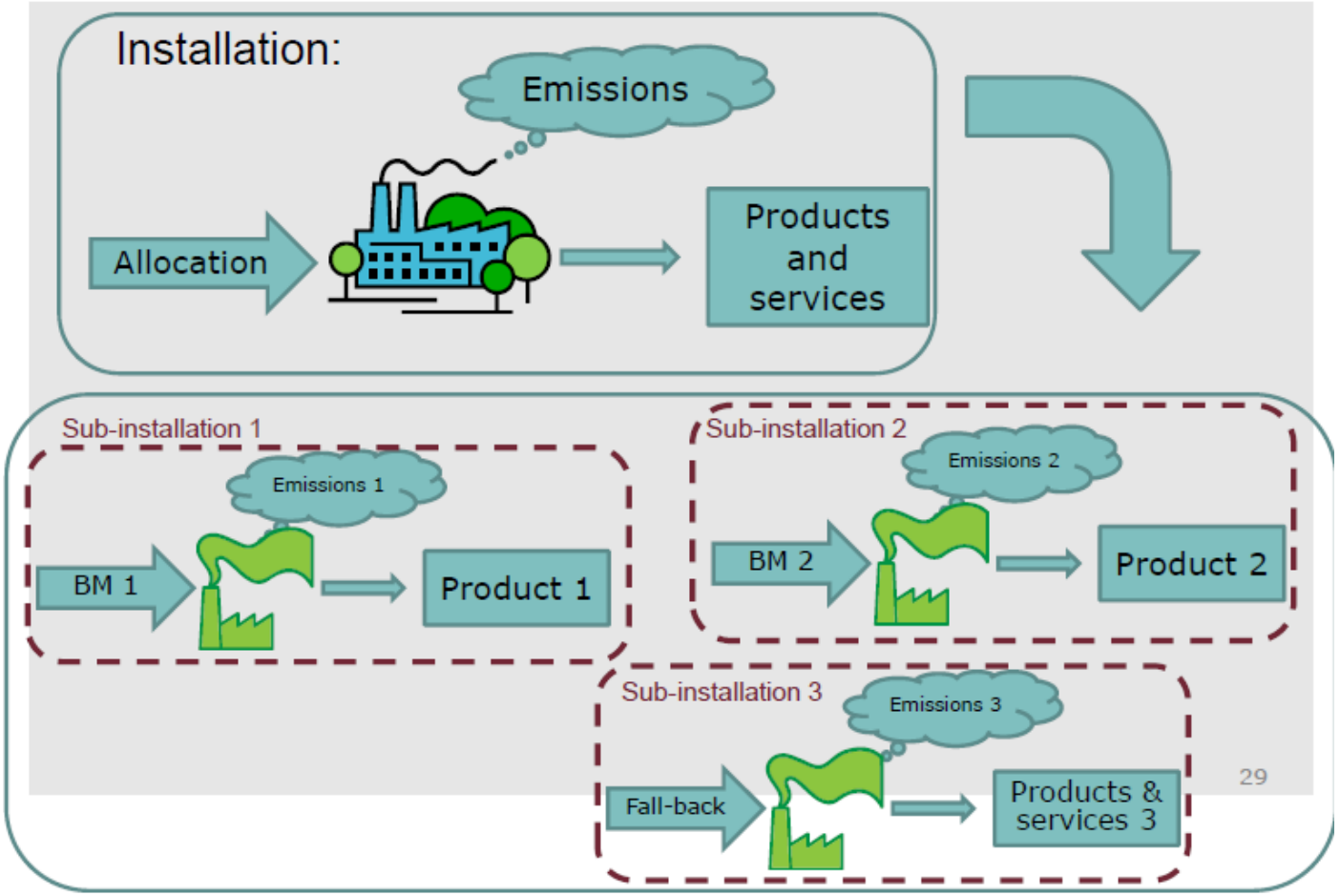
Takes into account	Final energy consumption	Energy conversion efficiency	Fuel choice
Product benchmark	✓	✓	✓
Heat benchmark	X	✓	✓
Fuel benchmark	X	X	✓
Historical emissions	X	X	X

Product benchmarks under EU ETS

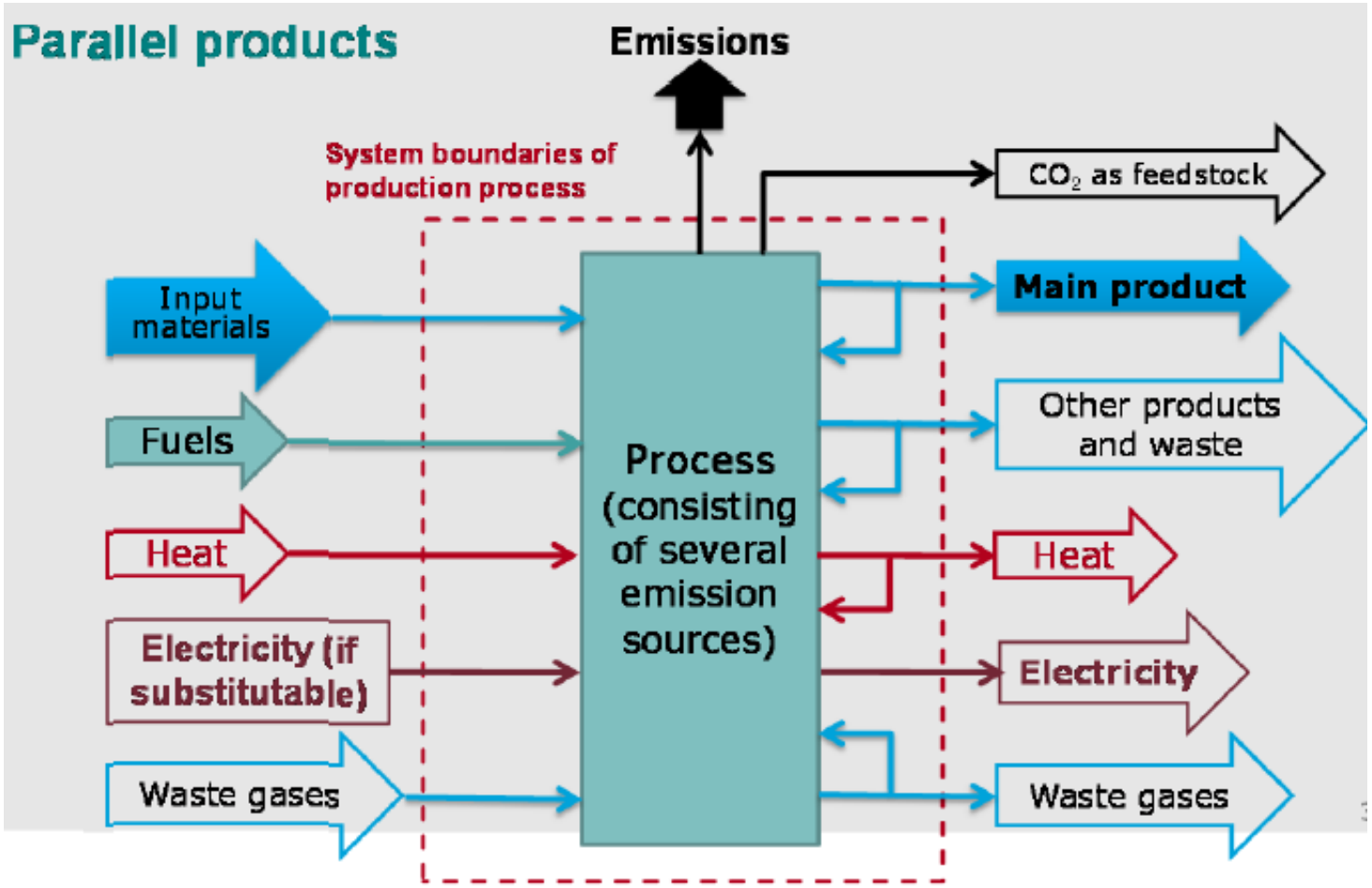
Product	Allowances/t
Coke	0.286
Iron ore pellets	0.019
Sintered ore	0.171
Hot metal	1.328
Pre-bake anode	0.324
Aluminium	1.514
Grey cement clinker	0.766
White cement clinker	0.987
Lime	0.954
Dolime	1.072
Sintered dolime	1.449
Float glass	0.453
Bottles and jars of colourless glass	0.382
Bottles and jars of coloured glass	0.306
Continuous filament glass fibre products	0.406
Facing bricks	0.139
Paving bricks	0.192
Roof tiles	0.144
Spray dried powder for tiles	0.076
Plaster	0.048
Dried secondary gypsum	0.017
Short fibre kraft pulp	0.12
Long fibre kraft pulp	0.06
Sulphite and thermo/mechanical pulp	0.02
Recovered pulp	0.039
Newsprint	0.298

Product	Allowances/t
Coated and uncoated fine paper	0.318
Tissue	0.334
Testliner and fluting	0.248
Uncoated carton board	0.237
Coated carton board	0.273
Nitric acid	0.263
Adipic acid	2.79
Vinyl chloride monomer	0.204
Phenol/acetone	0.266
S-PVC	0.085
E-PVC	0.238
Soda ash	0.843
Refinery products	0.0295
EAF carbon steel	0.285
EAF high alloy steel	0.357
Iron casting	0.325
Mineral wool	0.682
Plasterboard	0.131
Carbon black	1.765
Ammonia	1.612
Steam cracking	0.702
Aromatics	0.0295
Styrene	0.527
Hydrogen	8.85
Synthesis gas	0.242
Ethylene oxide/glycols	0.512*

Sub-installations



Rules needed for complex cases



Initial free allocation

Existing facility

*Initial allocation = BM * Historic Activity Level (2005-8 or 2009-10)*

New or extended facility between 2011 & 2013

*Initial allocation = BM * HAL after establishment or extension*

New entrant facility

*Initial allocation = BM * Expected Activity Level*

New entrant activity level

*Activity level = Initial installed capacity * standard capacity utilisation factor (SCUF)*

Where:

- Initial installed capacity =
  - average of 2 highest monthly production volumes * 12 months, or
  - experimental verification of capacity under supervision of verifier for 48 hours, expressed as daily average * 30 days * 12 months
- SCUF per product = 80-percentile of average annual capacity utilisation factors for all installations producing that product (listed in Commission Decision 2013/447/EU)
- Average annual capacity utilisation factor = average annual production divided by initial installed capacity (from data provided by Member States in their NIMS – National Implementation Measures)

Final allocation

Allocation

=

Benchmark (BM)

X

Activity level

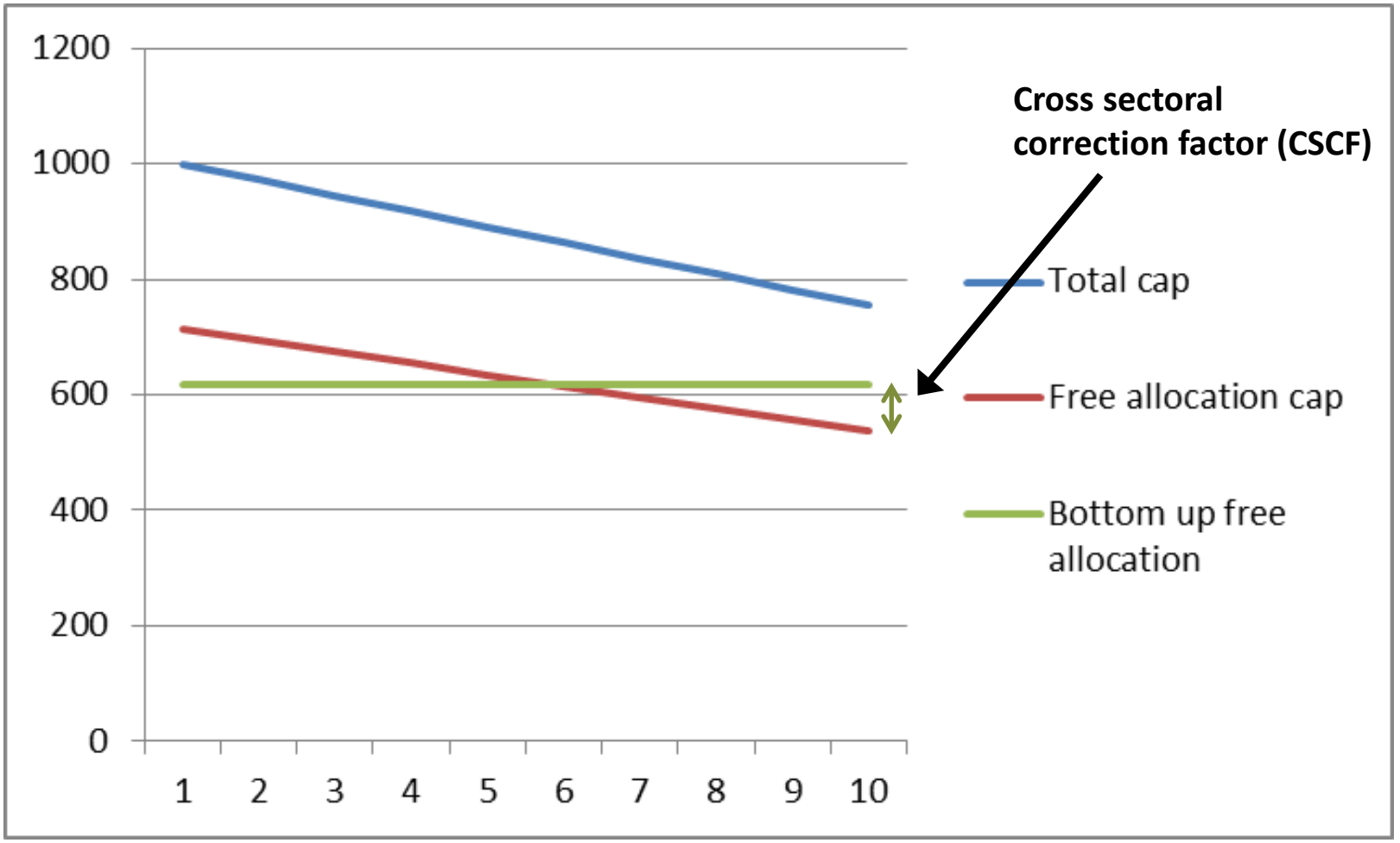
X

Carbon Leakage Exposure Factor (CLEF)

X

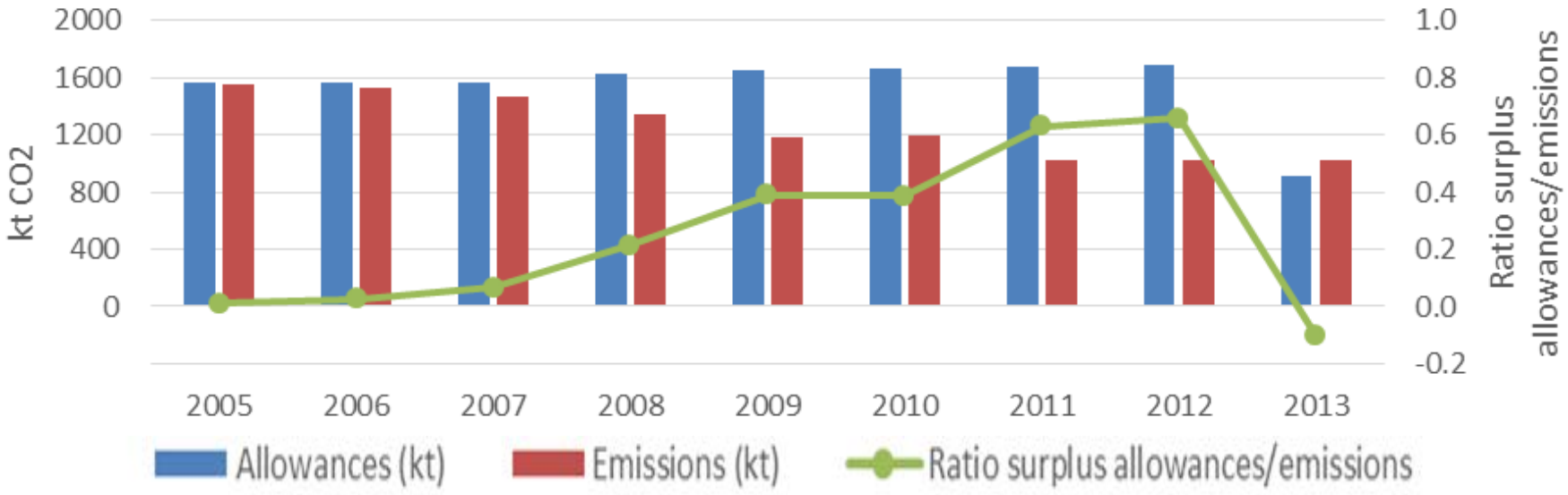
Cross Sectoral Correction Factor (CSCF)

Cross Sectoral Correction Factor



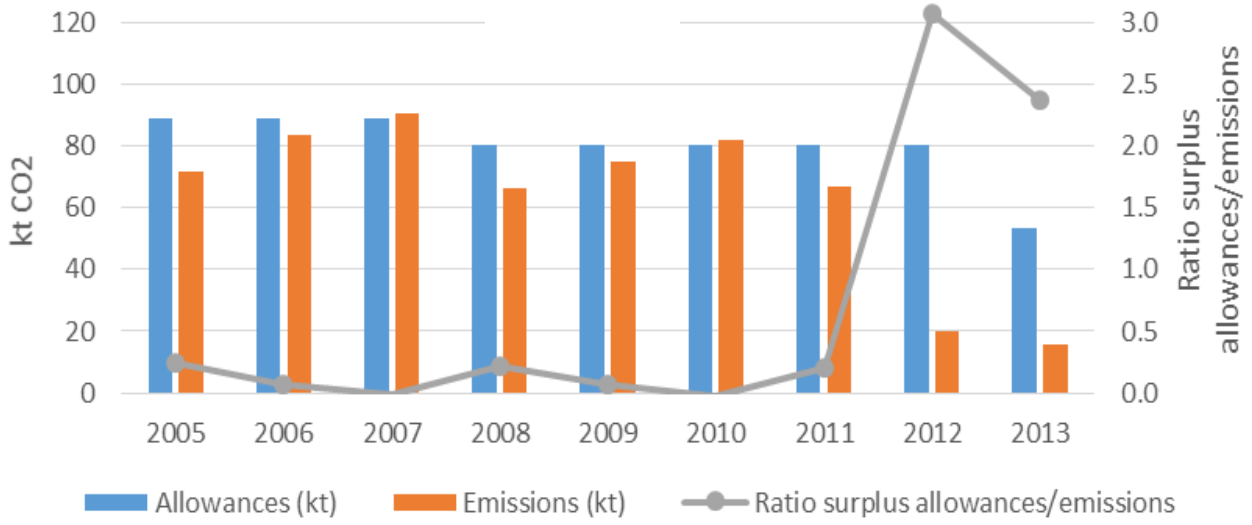
Example - Major EU refinery company

- Continuously improving refinery company can gain advantage with BM based allocation
- 15% reduction achieved since 2010 through:
  - Heat integration to reduce steam consumption
  - Improve heater efficiency, operation of equipment
  - Replacement of old steam turbines by new engine



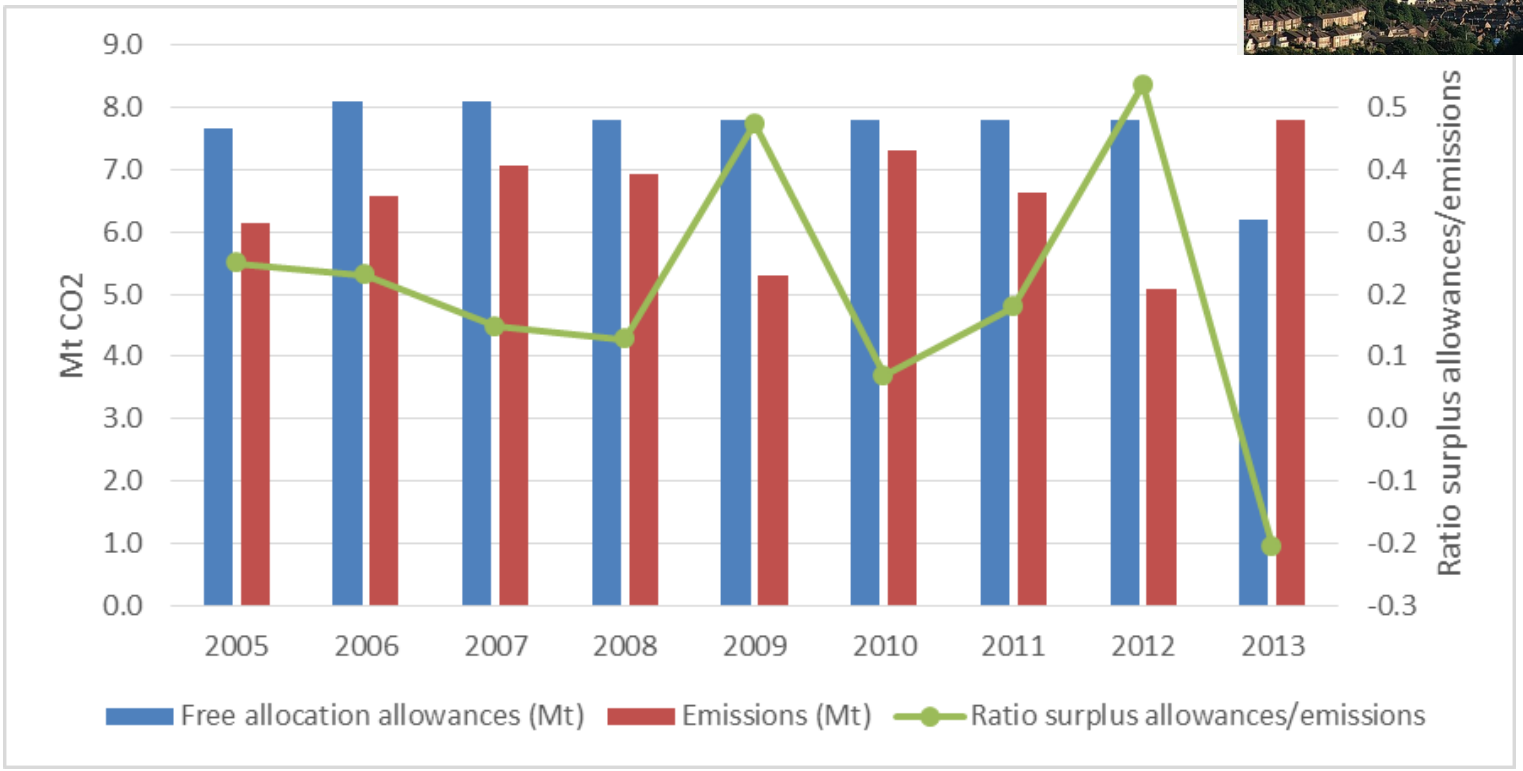
Example – Pulp & paper company

- Pulp & paper company performs well under BM based allocation
- Low GHG emissions intensity → competitiveness
  - Conversion of boilers to be fuelled with wood pellets, lime kilns fuelled with pulverised sawdust pellets
  - Connecting pulp mill to local district heating grid
- Initial driver: Energy costs & process efficiency = initial driver– EU ETS improves financial viability

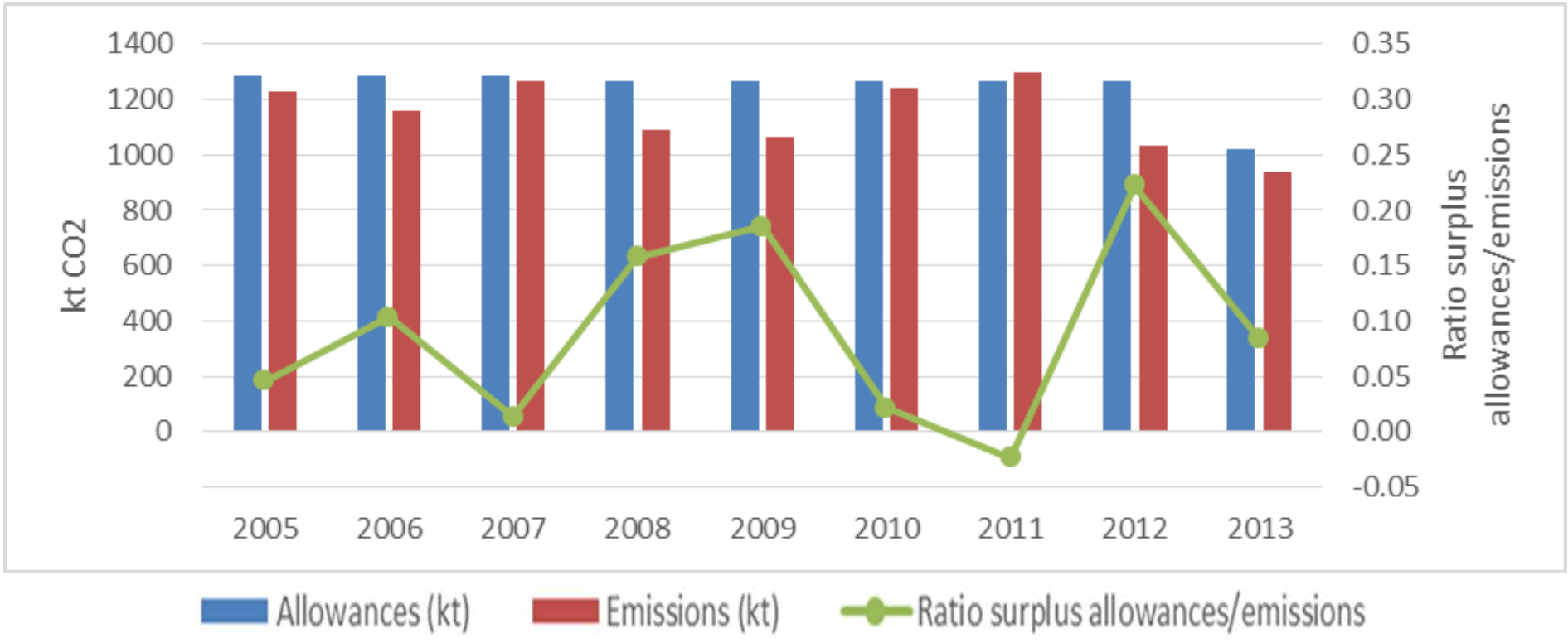


Example – Steel sector

- Average performing steel company goes from surplus of allowances (grandfathering) to deficit (BM)



Example – Cement sector



EC Phase 4 allocation objectives

- Auctioning of allowances remains the general rule, with the share of allowances to be auctioned at least 57% (the 2013-2020 share)
- Free allocation should continue to installations in sectors and sub-sectors at genuine risk of carbon leakage
- Operational objectives of Phase 4 benchmark design:
  - Reflect technological progress in industry sectors
  - Fully preserve incentives for industry to innovate
  - Most efficient installations do not face undue carbon costs leading to carbon leakage
  - Better alignment with production levels
  - Avoid windfall profits
  - No increased administrative complexity

EC Phase 4 impact assessment – options

Policy option package	BM update	Production levels	CL groups & criteria
Baseline (in line with spirit of current rules)	Once before 2021 based on real data	1 NIMs exercise for 10yr yrs	2 groups: 100% - CL exposed 20% - non exposed
Simple	Reduce all BM values by same % (tech improvement)	1 NIMS exercise for 10yr Annual adjustments for sig production changes	No groups (90% for all)
Limited changes	Once before 2021 based on real data	As for 'Simple' except 2 NIMs exercises for 5 yr each	4 groups: 100% - 'very high' 80% - 'high' 60% - 'medium' 30% - 'low'
Targeted	2 updates (before 2021 and mid-term) based on real data	As above	4 groups: 100% - 'very high' 80% - 'high' 30% - 'medium' 30% to zero (2027) – 'low'

EC Phase 4 impact assessment – impact types

- Key BAU trends:
  - energy intensity of production, carbon intensity of fuels and production levels from 2007-8 to 2030 for iron and steel, non-ferrous metals, chemicals, non-metallic minerals (inc cement and glass), pulp and paper, refineries and food & drink.
  - BAU emissions
- Impacts on production costs:
  - Allocation data for each policy option for 2021 to 2030 (EU ETS cap, auction share, NER400 share, free allocation cap, actual free allocation and Cross Sectoral Correction Factor (CSCF))
  - Analysis of deficit in free allocation (% of allowance needs met by free allocation, deficit compared to emissions, difference in deficit compared to baseline, value of deficit, including net value after considering cost pass through, and expressed as % of GVA)
- Impacts on energy prices, employment (from cost pass through & costs absorbed) and administrative costs

EC Phase 4 impact assessment – Administrative cost template

Action		Type of actor	No of actors	Cost per actor				Total annual-ised cost (€m/yr)
				Measurement unit	Cost per unit (€k)	No of units	Cost per actor (€k)	
BM data collection	Develop rules, co-ordination & management	EC	1	FTE				
	Co-ordinate & collate with installations	EU Industry Association	20	Hour				
	Data collection & reporting	Installations	10000	Hour				
BM development	Review BM method	Consultants	1	Project				
	BM development	EU Industry Associations	20	Hour				
	BM verification	EC	1	Project				
NIMS exercise	Develop rules, co-ordination & management	EC	1	FTE				
	Data collection & reporting	Installations	10000	Hour				
	Data verification	Consultants	1	Project				
	Develop BM based allocations	MS Competent Authority	28+	Day				

EC Phase 4 impact assessment – overall

Operational objectives	Baseline	Simple	Limited changes	Targeted
Technological progress reflected	0	-	0	++
Incentives to innovate fully preserved	0	+	0	-
No undue costs for most efficient installations	0	-	++	++
Better alignment with production levels	0	+	++	++
Avoid windfall profits	0	-	+	++
No increased administrative complexity	0	++	-	--

EC proposals

- Benchmarks updated to avoid windfall profits and reflect technological progress
  - Reduce BM value by flat rate across all sectors (1% of the value that was set based on 2007-8 in respect of each year between 2008 and the middle of the relevant period of free allocation)
  - If actual values differ from above annual reduction by >0.5% of the 2007-8 value higher or lower annually, the BM value shall be adjusted to either 0.5% or 1.5% (instead of 1%)
- Closer alignment with production data
  - Additional allocation from new entrants reserve for significant production increases
- More targeted approach to carbon leakage protection measures
  - Sectors / sub-sectors where trade intensity * emission intensity >0.2 deemed at risk of CL, with 100% CL factor up to 2030. Also those where value >0.18 may be in same group on basis of qualitative assessment
  - Other sectors / sub-sectors have 30% CL factor

Key issues

- Operational objectives
- Assessment process
- BM design
  - Dealing with indirect emissions
  - Dealing with small numbers of installations per product
  - Mix of product and fallback BMs
  - New entrant BM activity level
  - Updating for technological progress and production levels
- Consistency
  - Product vs fallback
  - Incumbent vs new entrant
  - Across sectors (esp competing in same market)
  - Across countries / ETSs
- Data collection process
- Stakeholder acceptability

Questions?

Contact

Alistair.ritchie@icfi.com
Tel +44 7876 197824