

Analysis of the possibilities of SO₂ and NO_x emission trading

TFIAM 38th session

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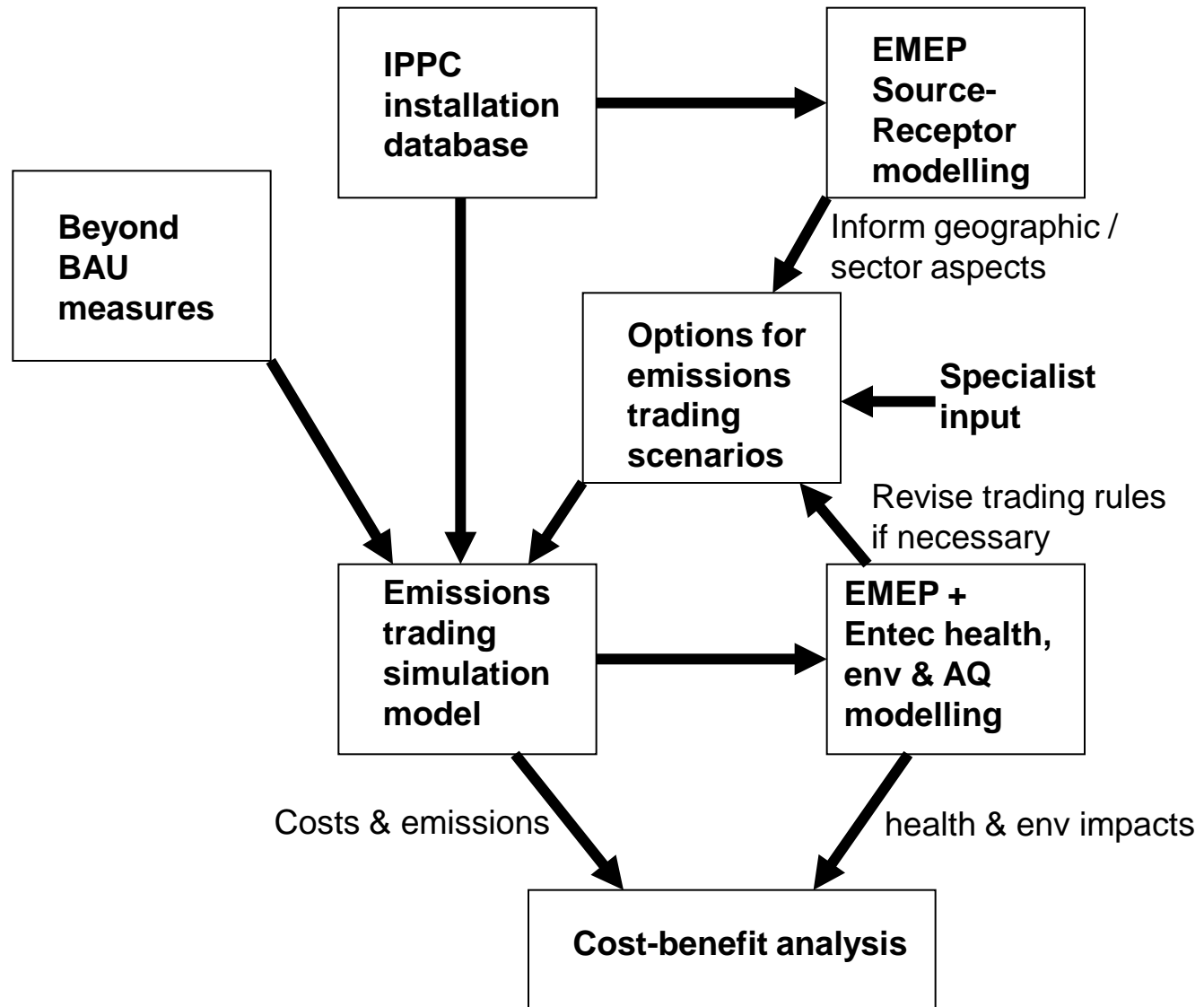
Agenda

- Objectives & overview
- Environmental constraints
- Installation database
- Reference scenario
- Options for trading scenarios
- Models
 - Trading Simulation Model
 - Health & Environmental Modelling
- Results

Objectives of project

- **To assess environmental, economic & social impacts of various possible designs of an ETS for SO₂ and NO_x under certain EU-wide rules for IPPC installations (instead of individual BAT-based permitting)**
- **Health & environmental impacts not to exceed those under current legislation (IPPCD, LCPD, NECD, AQD) and IED Proposal (Reference scenario)**
- **Constraints due to potential NECD 2020 ceilings to be assessed, as well as benefits of flexible ceilings**
- **Provide insight on whether a trading mechanism for SO₂ & NO_x in the EU would be appropriate. If so, under which rules, safeguarding environmental objectives & ensuring practicability & enforceability**

Overview of approach



Environmental constraints

● BAT equivalence

- Emissions trading should not lead to increased overall emissions compared to IED proposal
- Targets equivalent to applying BAT-based permit conditions
- BAT-AEL ranges - different options considered
 - Upper BAT-AELs
 - Intermediate BAT-AELs (Upper -20%)
 - Lower BAT-AELs

● NECD

- 2010 ceilings part of BAU scenario
- Impact of potential 2020 ceilings needs to be considered
 - Assuming IPPC installations meet cost-optimised targets from GAINS
 - Ref scenario emissions (without flexibilities) – 16% NO_x, -6% SO₂ [GAINS optimisation to meet TSAP / GAINS CP]
- Option for flexible national ceilings (+10% NO_x, +20% SO₂)

● Air quality limit values

- IED Proposal requires compliance with AQD limit values
- Assessment against SO₂, NO₂, PM₁₀, PM_{2.5} limit values

Installation database

- **Sectors**

- **Data**

- Source location & stack characteristics
- Current emissions
- Current fuel type and quantity
- BAU abatement installed / planned (LCPD, IPPCD, National legislation, etc)
- Beyond BAU abatement options and costs
- Activity projections (capacity, fuel, GVA)

- **Data sources**

- Consultation with MS and sector specialists
 - MS policy / regulatory contacts
 - EU industry associations
 - BREF review authors
- Databases & studies
 - LCPD inventories; EPER; CoalPower
 - Supporting: other Entec / partner studies, in-house data & contacts; PRIMES (activity trends on basis of GVA or fuel consumption/ capacity)
- Expert knowledge of project team (Entec, Okopol, Garrigues, IHE)

Reference scenario

- **IED Proposal**

- text on which Council reached political agreement June 2009

- **Approach for LCPs**

- Applied 'minimum requirement' ELVs (Annex V)
- Accounted for:
 - Minimum desulphurisation rate option
 - Less stringent ELVs for LCPs at refineries and plants firing gases other than natural gas
- Not accounted for:
 - Derogation for certain district heating plants
 - Low load factor and limited life derogations
 - Transitional National Plan
- If BAU emissions below ELVs, applied BAU emissions

- **Approach for non-LCPs**

- Assumed permit ELVs based on techniques equivalent to Upper BAT-AELs from latest BREFs

Options for trading scenarios (1)

Type of Scheme

- **Cap and Trade (C&T)**

Allocation = Emission rate * Production
(historical)

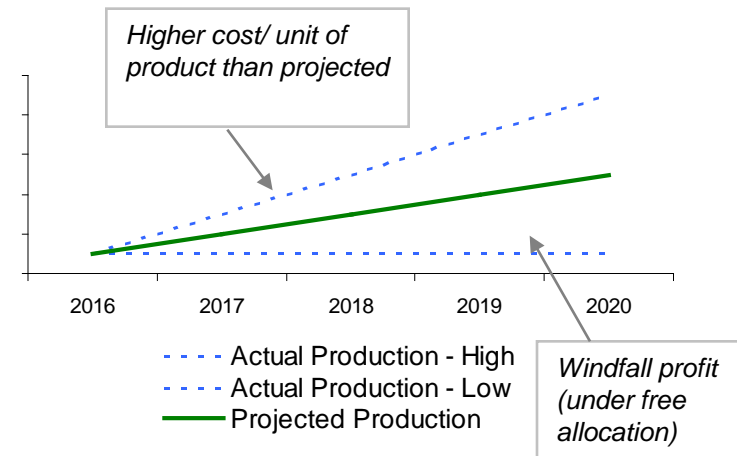
- **Baseline and Credit (B&C)**

Allocation = Emission rate * Production
(actual)

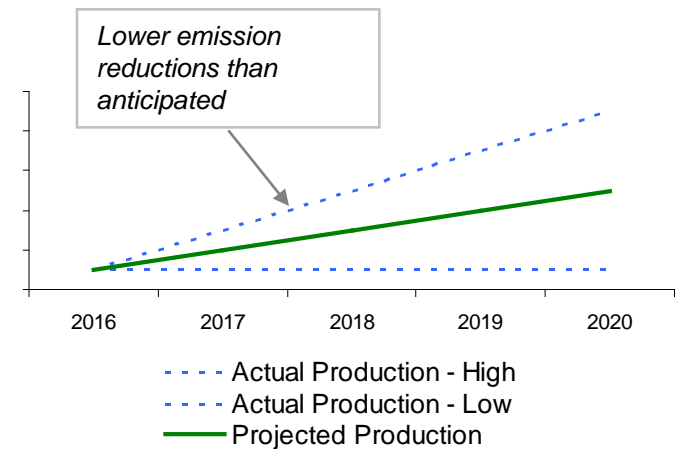
- **Hybrid**

Allocation = Emission rate * Production
* Adjustment Factor
(to achieve emissions target)

Cap & Trade: Design Risks



Baseline & Credit: Design Risks



Options for trading scenarios (2)

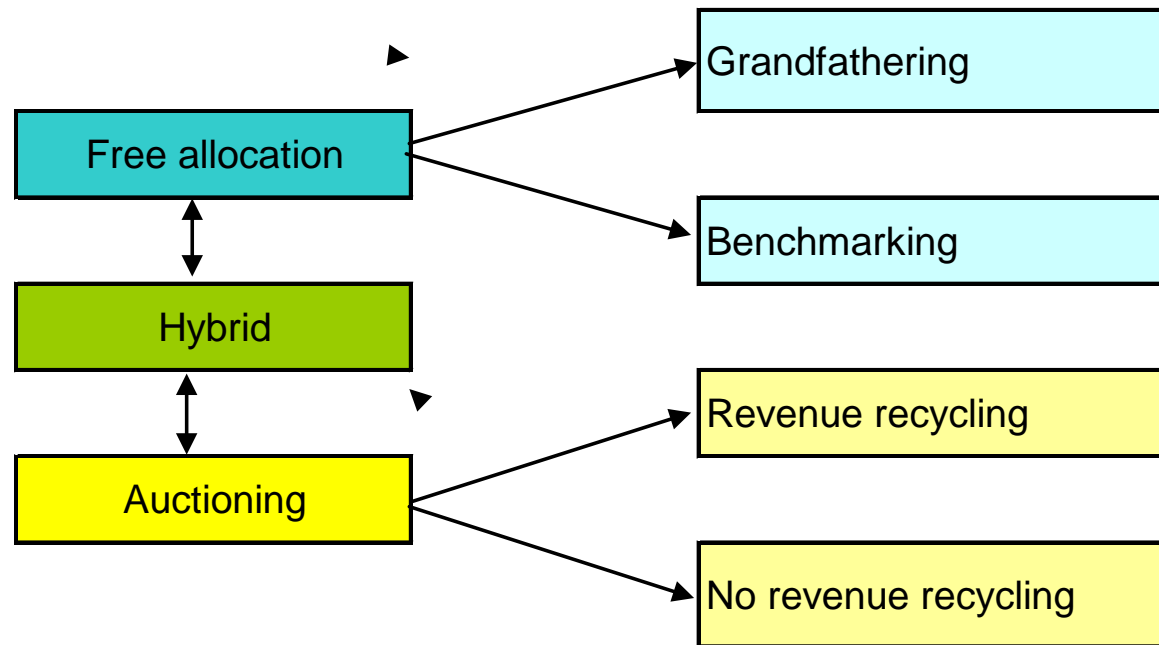
Allocation level

Type of scheme	C&T	B&C
Level	Cap	Performance standard rate (PSR)
Upper BAT-AEL	Yes	Yes
Intermediate BAT-AEL (Upper -20%)	Yes	Yes
Lower BAT-AEL	Yes	Yes
Sum of potential NECD 2020 ceilings	Yes	
Reference scenario emissions	Yes	
Dutch NOx trading scheme approach		Yes

Options for trading scenarios (3)

Allocation Method

- All allocation methods apply to all types of trading schemes



Options for trading scenarios (4)

Sectoral coverage

- All IPPC installations covered by Revised EU ETS
- All IPPC installations covered by Revised EU ETS (excl 20-50 MW combustion installations)
- **Installations that meet specific coverage criteria, eg**
 - Average emissions per installation above certain % of average across all sectors (50% in this study)
 - Total emissions per sector above certain % of emissions from all sectors (1% in this study)

Options for trading scenarios (5)

Trading zones

- **All EU27 Member States together (ie one overall zone)**
- **An intermediate level**
 - Based on large optimal control areas from TNO study: North West, North East and South
- **Each individual Member State (ie 27 individual zones)**

Options for trading scenarios (6)

Other

- **Opt-ins and opt-outs**
- **Banking & borrowing**
- **Phase duration**
- **New entrants & closures**
- **Monitoring, reporting and verification (MRV)**

Trading Simulation Model

Approach to modelling

- **Aims to meet emission limits imposed on it while minimising compliance (abatement) costs**
- **Key inputs**
 - BAU emissions and abatement for each installation
 - Emission limits and reduction requirements:
 - Under ref scenario emission limits apply at installation level
 - Under C&T and B&C overall allowance pool limit applies at trading zone level
 - NECD ceilings apply at MS level (2010 ceilings are BAU; potential 2020 ceilings apply to some scenarios)
 - Beyond BAU emission reduction measures (abatement potential and costs)
- **Key outputs**
 - Abatement measures, emissions reductions and costs at each installation

Health & environmental impact modelling (1)

● EMEP model (Met.no)

– Applications

1. Source–receptor analysis to understand environmental sensitivity and drivers for impacts
2. Detailed AQ, health and env impact modelling of trading scenarios

– Emissions data

- All key pollutants inc SO₂, NO_x and primary PM
- IPPC installations - from database
- Non-IPPC sources – EMEP / TNO estimates

– Outputs:

- 50x50km² for source–receptor analysis;
- 10x10km² for impact modelling
- Includes secondary particulates from SO₂ and NO_x
- Ecosystem damage: exceedances of critical loads
- Health damage: YOLL from PM; O₃; AQ impacts of SO₂, NO₂, PM_{2.5}, PM₁₀
- Areas with exceedances of AQ LVs
- Maps of changes in AQ vs Ref scenario

Health & environmental impact modelling (2)

● Monetary valuation

– Health

● PM related impacts

- Years of Life Lost (YOLL) * valuation (see below)
- Low estimate based around CAFE Value of Life Year (VOLY) €52k
- High estimate based around CAFE Value of Statistical Life (VOSL) €2m

● Ozone related impacts

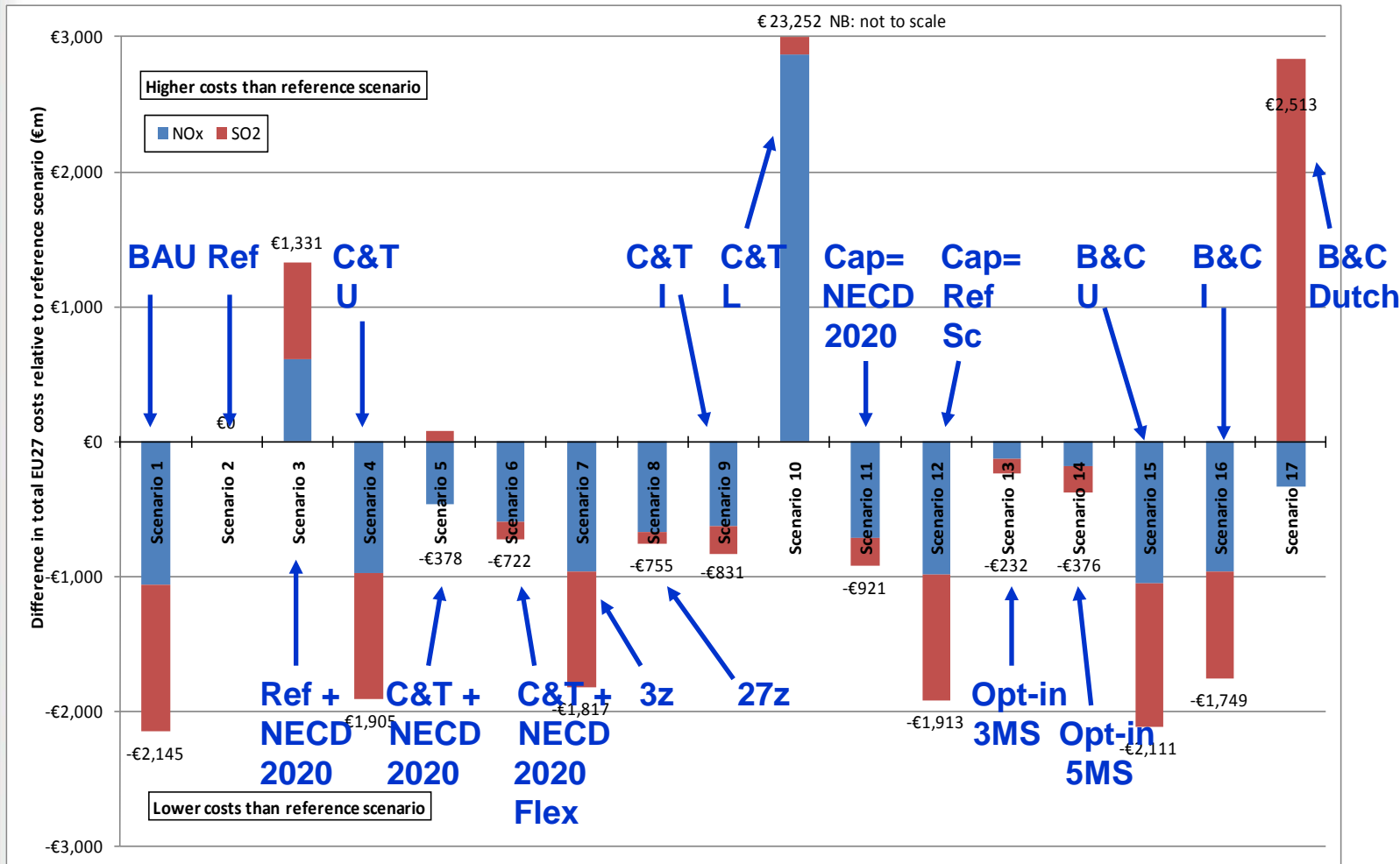
- SOMO35 (Sum of ozone means over 35ppb) * population * valuation factor (0.0027)

– Crops

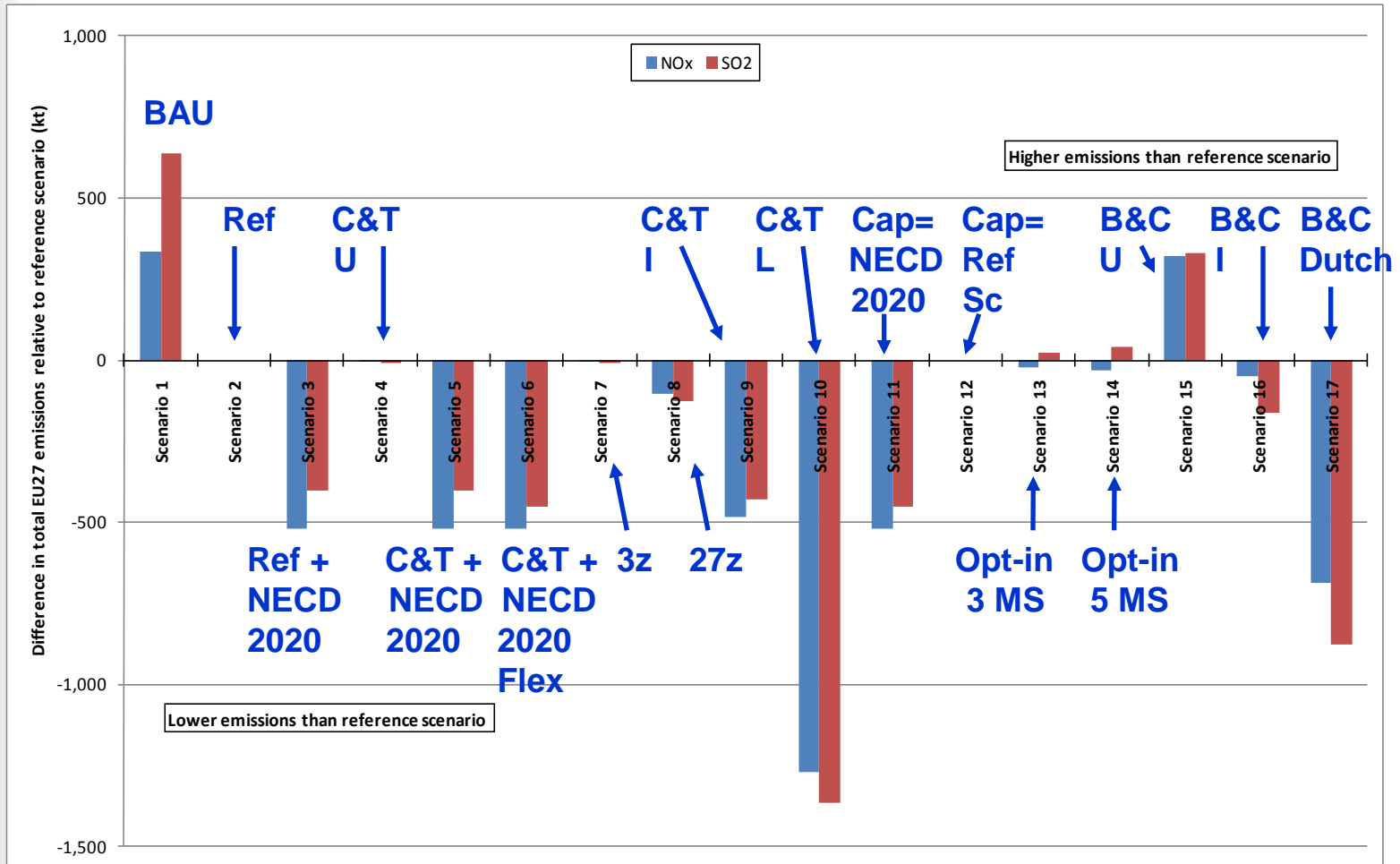
- Ozone (from NO_x) related impacts on crops covered

– Materials

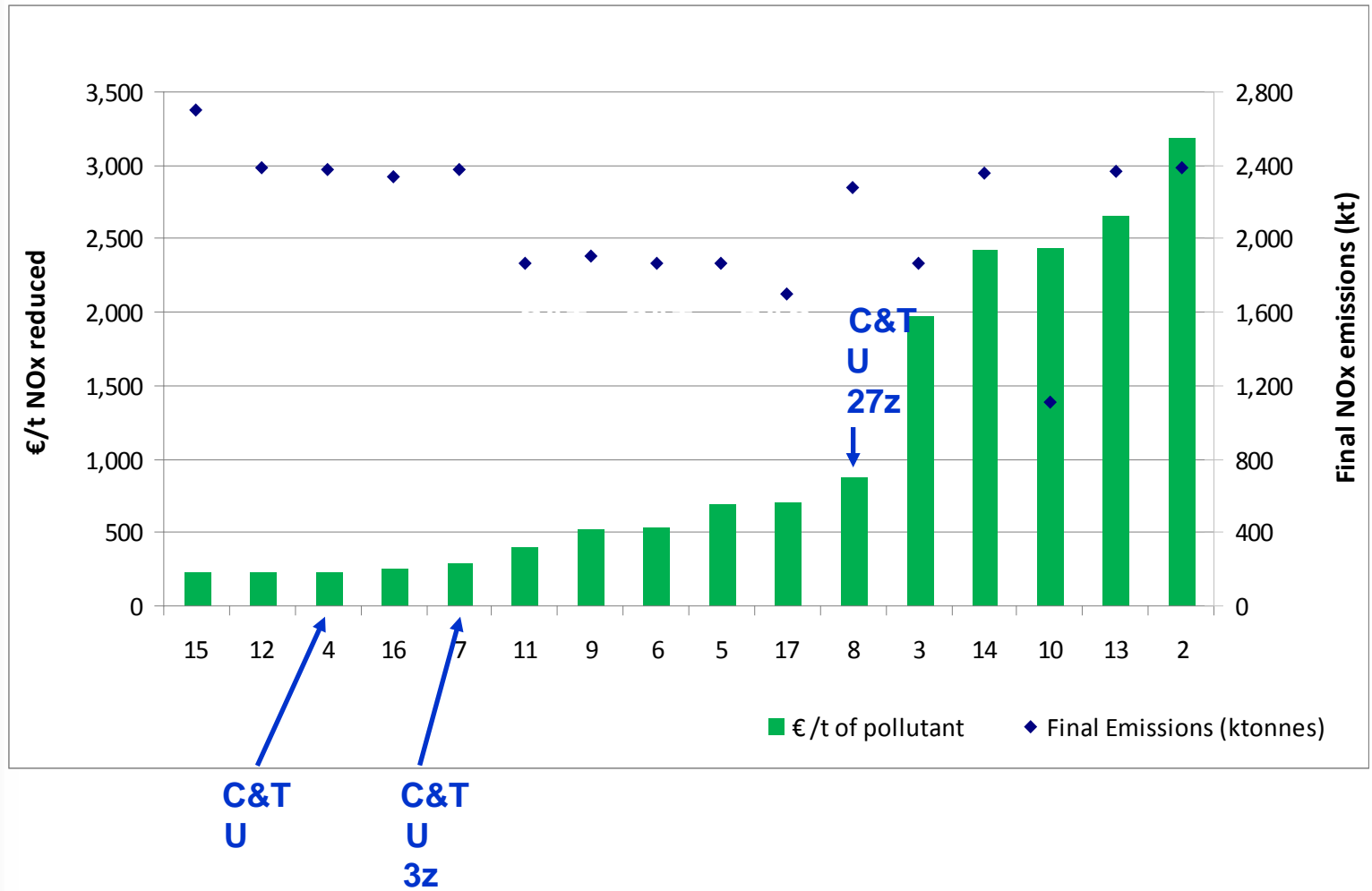
Costs vs reference scenario



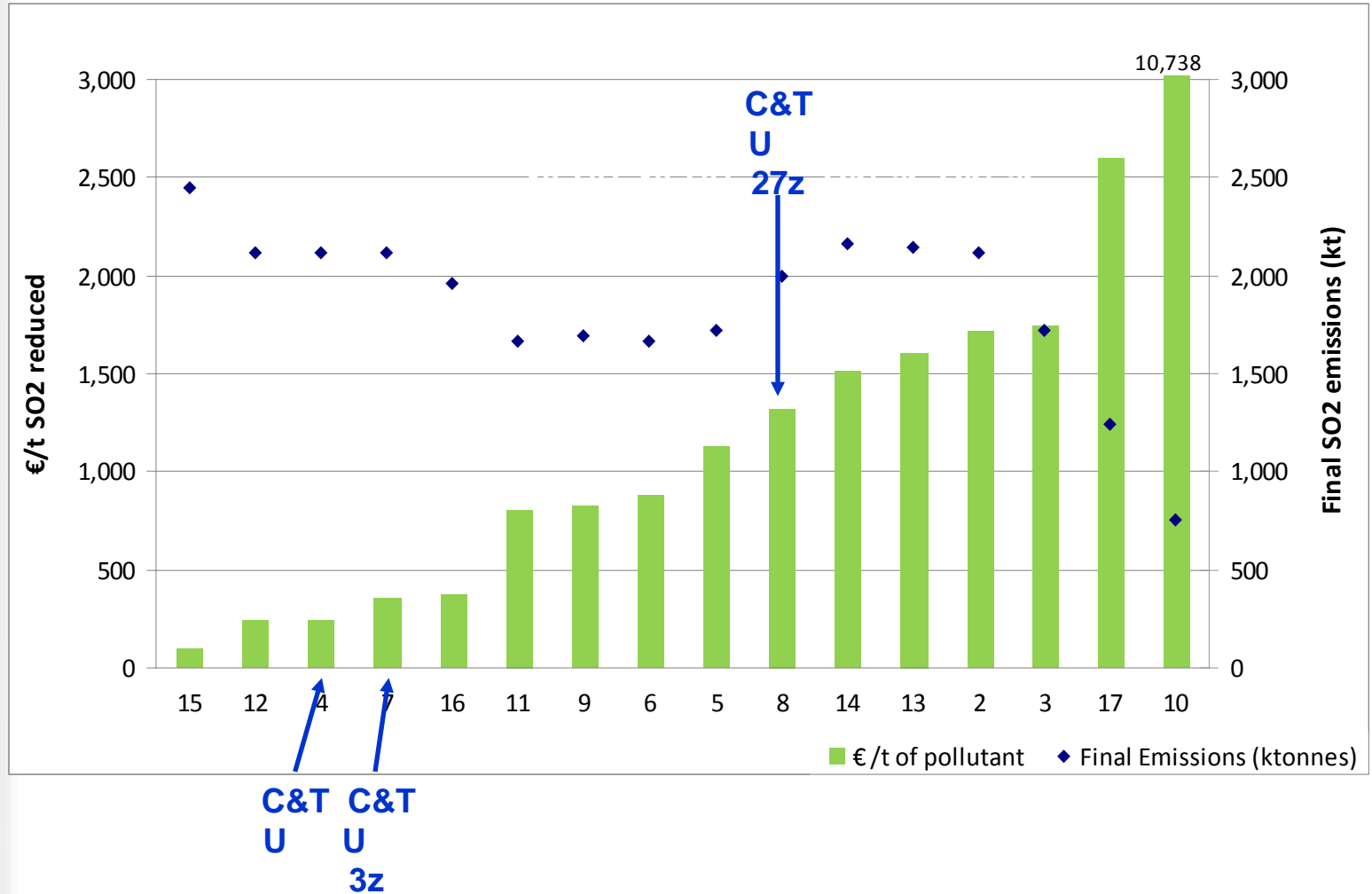
Emissions vs reference scenario



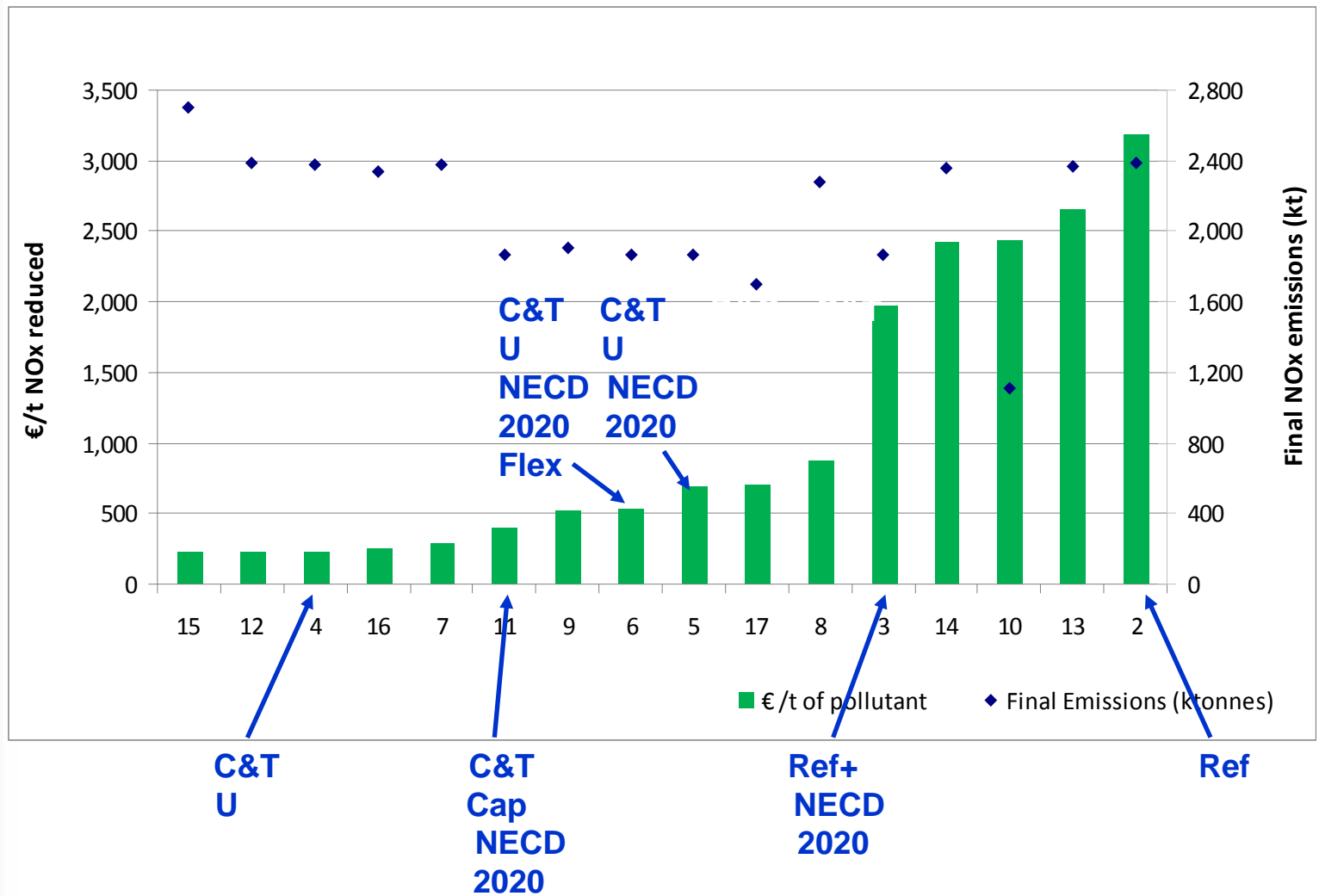
Trading zones - NOx



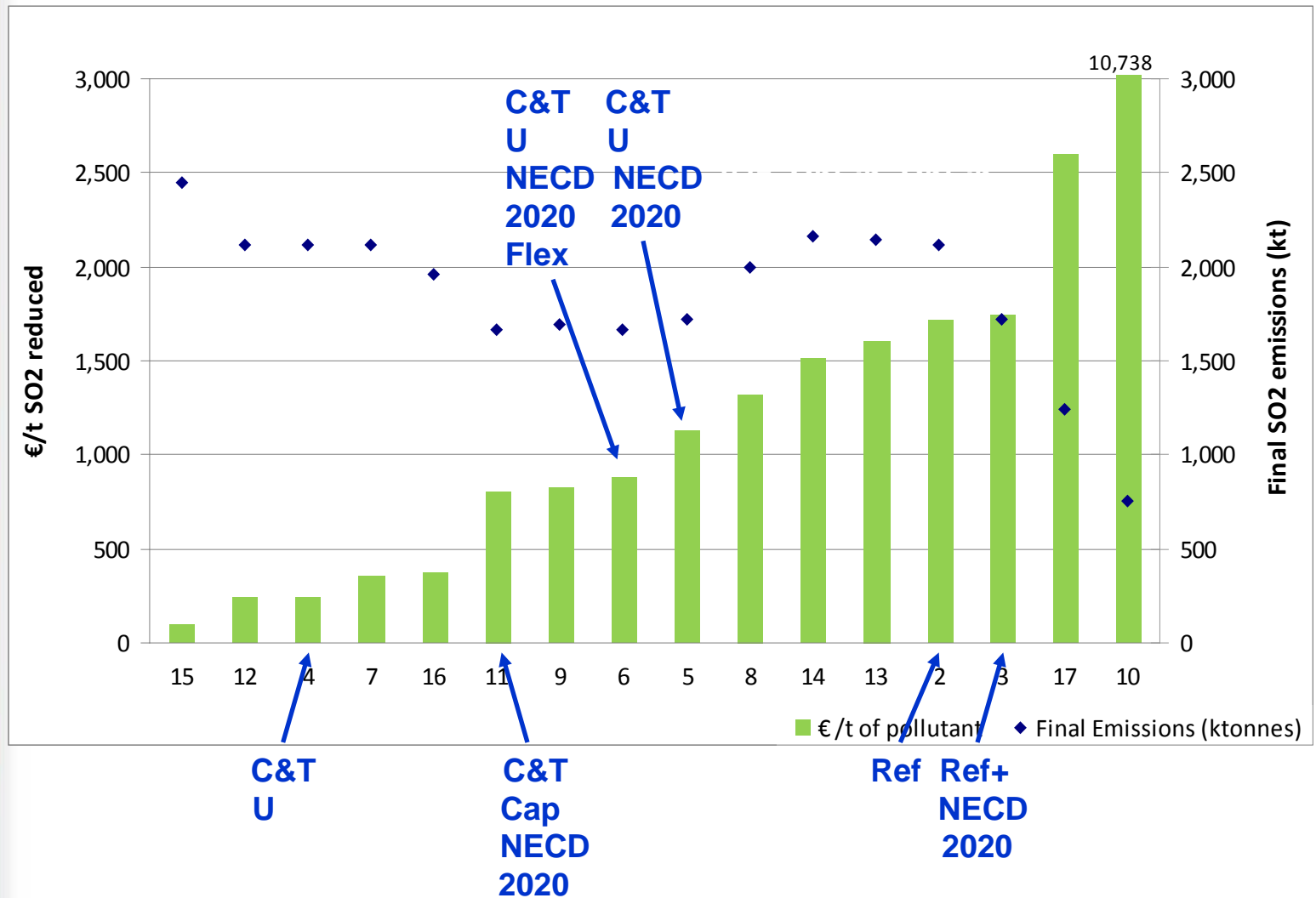
Trading zones – SO2



Impact of NECD 2020 ceilings - NOx



Impact of NECD 2020 ceilings – SO2



Air quality impacts

- Relatively limited impacts on compliance with air quality limit values in comparison to the reference scenario
- All trading scenarios estimated to result in fewer areas of exceedence of AQ limit values compared to BAU
- Maps in Appendix A show areas with increased and decreased (mainly) ambient air concentrations compared to reference scenario
- Under IED Proposal, in event of exceedances, additional measures will be required to safeguard air quality

Sensitivity analysis

- Projected BAU activity growth rates
- BAU & ref scenario abatement assumptions for cement sector
- Costs of key abatement options in ref scenario
- Investment sensitivity analysis
- Impacts of SO₂ and NO_x abatement measures on CO₂ costs

Thank you for your attention

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