



Environmental Cost Model

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Bird's-eye view

- ECM database
 - What?
 - How?
- ECM run
 - What?
 - How?
- Results



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ECM database

What?

→ ECM database
ECM run
Results

- Environmental Cost Model for Flanders, Belgium
 - Industrial emission sources of SO₂, NO_x, VOC, PM (TSP, 10 & 2,5)
 - Multi-pollutant optimization
 - Mixed integer programming
 - Time periods 2010, 2015, 2020



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ECM database

What?

→ ECM database
ECM run
Results

- Currently working on:
 - Time period extension to 2025, 2030
 - Greenhouse gas emissions, reduction measures and interactions with air pollutants
 - Residential and service sector in detail
 - Soft link with Tremove model for transport



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ECM database

What?

→ ECM database
ECM run
Results

→ ECM database:

- Data source: sectoral studies for Flemish government (1999-2005)
- Emissions to air on installation level for Flanders industry
- Abatement measures per emission source with reduction potential, degree of technical implementation



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ECM database

What?

→ ECM database
ECM run
Results

→ Emission sources (industry)

- Individual installations: VMM
Aggregated (sub)sector: reference installation
- Emissions: concentrations, - flow by activity
- > 3.000 emission sources

→ Abatement measures

- End-of-pipe & process-integrated measures
- Costs, economical lifetime, capacity, reduction efficiency
- > 2.100 reduction measures



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ECM database How?

→ ECM database
ECM run
Results

- Markal Answer, but not directly in Answer
 - ECM Access database + VBA script
 - Automated generation of excel answer importfiles
- Advantages:
 - Fixed nomenclature
 - Fixed structure
 - Overcome user input errors
 - Easy aggregations, selective model generation
 - Transparency for client (policy maker)



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ECM database How?

→ ECM database
ECM run
Results

- Disadvantages
 - Fixed structure: raw structure in ECM, 'specialities' directly in Answer
 - Electricity sector modelled in Answer, too complex for fixed ECM structure
 - Access (ECM) → Excel → Access (Answer)



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ECM database How?

ECM database
ECM run
Results



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ECM database How?

ECM database
ECM run
Results



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ECM database

How?

ECM database
ECM run
Results

- Answer importfiles: excel
- Finetuning in Answer, testruns
- Answer generates .dd(s) files

- Typical ECM runs:
 - Cost curves
 - Multi-pollutant optimization (NEC)
 - Greenhouse gas targets and effect on air pollutants



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ECM run

What?

ECM database
ECM run
Results

- ECM run database:
 - Initiate runs starting from .dd(s) files
 - Change 1 or more parameters in each run from within the run database (f.i. MCC)
 - Read results (.ant) in tables in run database
 - Link with ECM database for easy interpretation of results
 - Possibility of doing 100+ runs



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ECM run How?

ECM database
ECM run
Results

Manage runs

MKM

Start runs Clear tables run

Path 'MKM run tables': C:\MKM werkmop\MKM aggregated\MKM

Run 2000 - 2010 Run 2000 - 2020

Run 2000 - 2030 Run 2000 - 2020

OF Kostencurve Run in uitvoering: 1

Emissieplafond

Start run 1

Stop run 100

Locatie van ant-file C:\VanswerV5\Gams_WikPRD\EMISSION ANT

Open 'emission.gen' file aanpassen

Difference runs Clear tables verschil


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Results

ECM database
ECM run
Results

- ECM has been used for:
 - NEC Flanders 2010
 - Emission prognosis Flanders 2020
 - Antwerp Harbour (environmental effect report)
 - Specific IPPC refinery studies (Haifa, Cepsa)
- ECM will be used for:
 - Post Kyoto Flanders


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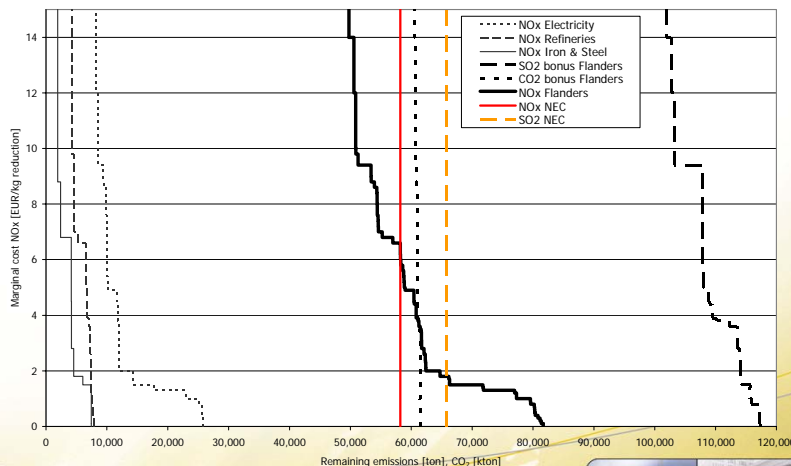
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Results

ECM database
ECM run
Results

NO_x marginal cost curve Flanders
+ cost curves of most important NO_x-sectors
+ bonus effect of NO_x measures on SO₂ and CO₂



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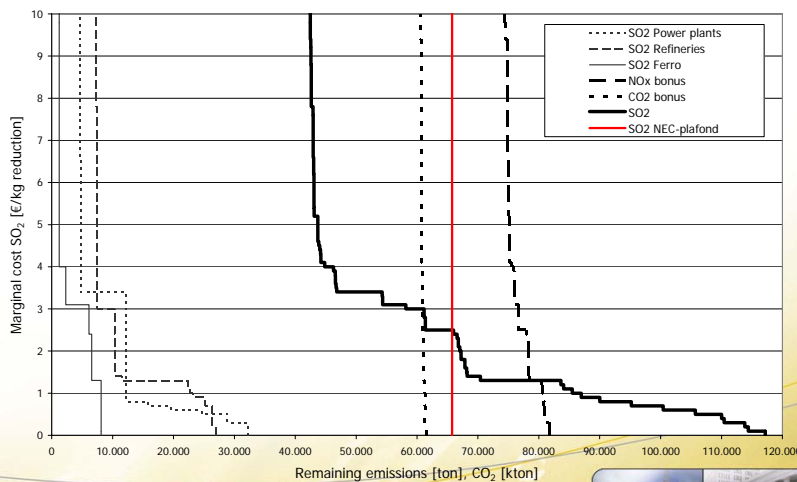
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Results

ECM database
ECM run
Results

SO₂ cost curve Flanders
+ cost curves most important NO_x-sectors
+ bonus effect of SO₂ measures on NO_x and CO₂



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Results

ECM database
ECM run
Results

- Single pollutant realizing emission ceiling
 - NO_x: 6,6 €/kg
 - SO₂: 2,5 €/kg
 - VOC: 3,1 €/kg
- Single pollutant optimization
 - NEC: 112 M€/year
- Multi-pollutant optimization:
 - NEC: 92 M€/year
 - 21% overestimation in single pollutant optimization



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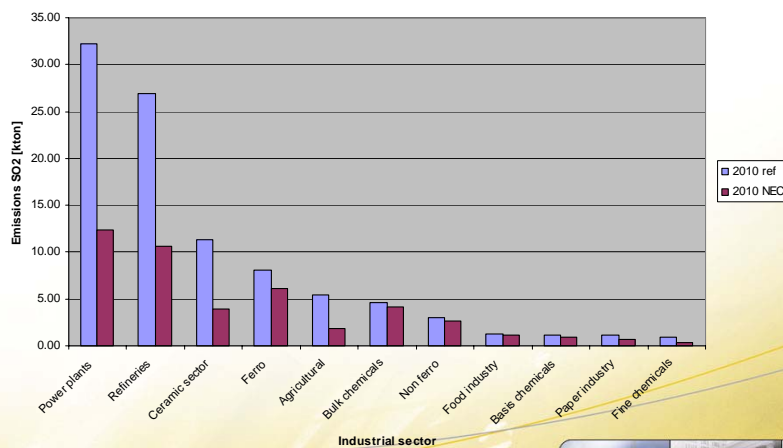
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Results

ECM database
ECM run
Results

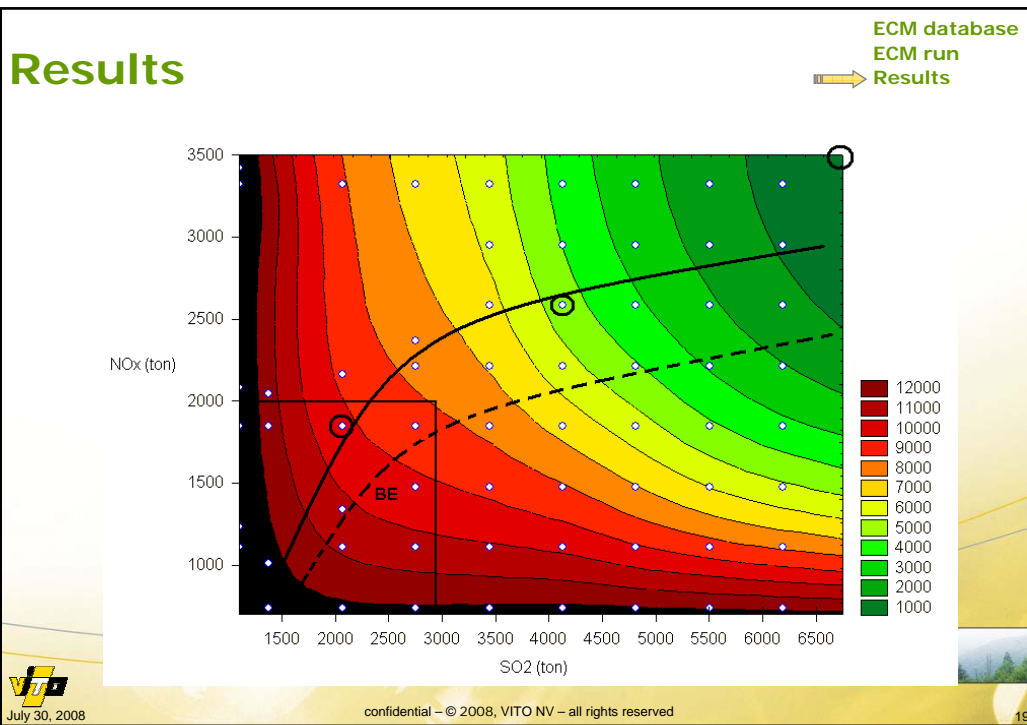
SO₂ emissions industry 2010 reference vs. NEC



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Thank you

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