



Energy research Centre of the Netherlands

Technology Oriented Agreements: five examples

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Outline

Five examples of possible TOAs

- Cement production
- Ammonia production
- Carbon efficiency in cars
- Bioethanol from sugarcane in sub-Saharan Africa
- CO₂ capture and storage

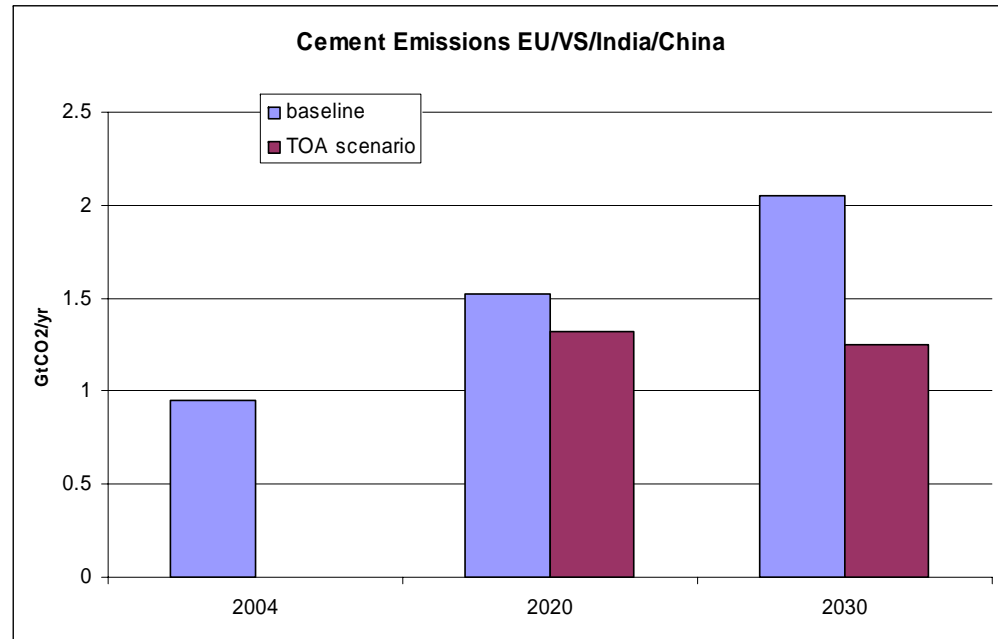
Cement production (context)

- 5.5% of global CO₂ emissions (1.9 GtCO₂ 2004)
- Large number of plants, mostly large-scale
- Rapid increase in production in DCs
- Emissions: process and energy related
- Mitigation options
 - state-of-the-art dry kilns
 - alternative fuels
 - blended cements
 - CCS

Cement production TOA

Cement TOA between US, EU, India, China (type 2, 4)

- Technology mandates or tCO₂/t cement targets for Annex-I
- No-lose targets with emission trading for non-Annex I
- Technology transfer fund
- CCS after 2020

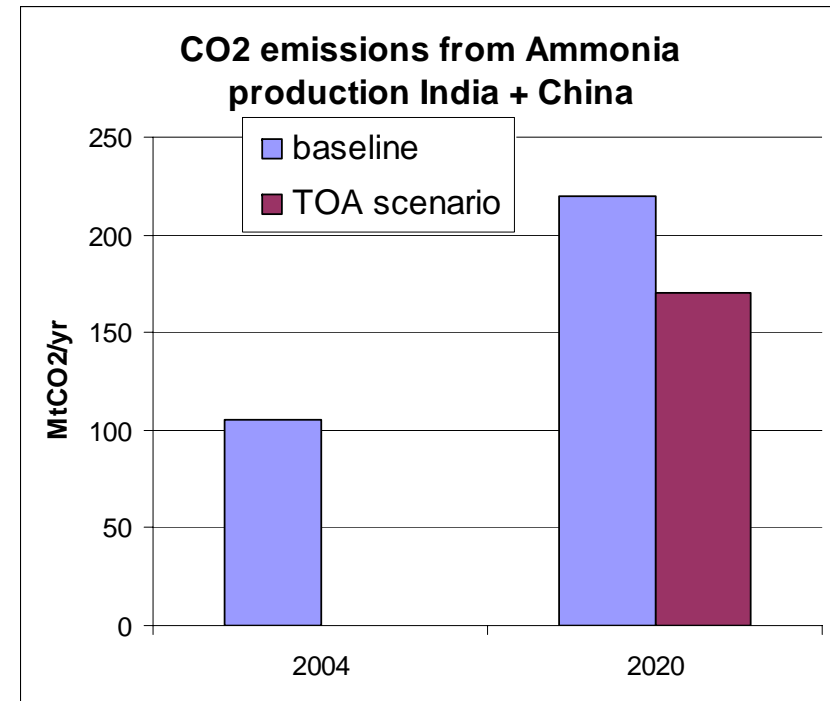


Ammonia production (context)

- Global emissions ca. 300 MtCO₂
- Limited number of plants
- Growth mostly in developing countries
- Average energy efficiency improvement up to 30% possible

Ammonia production TOA

- TOA between EU and China/India
- Upgrading of installed capacity
- BAT technology for all new capacity until 2020
- Technology transfer between EU and China/India, including emission trading

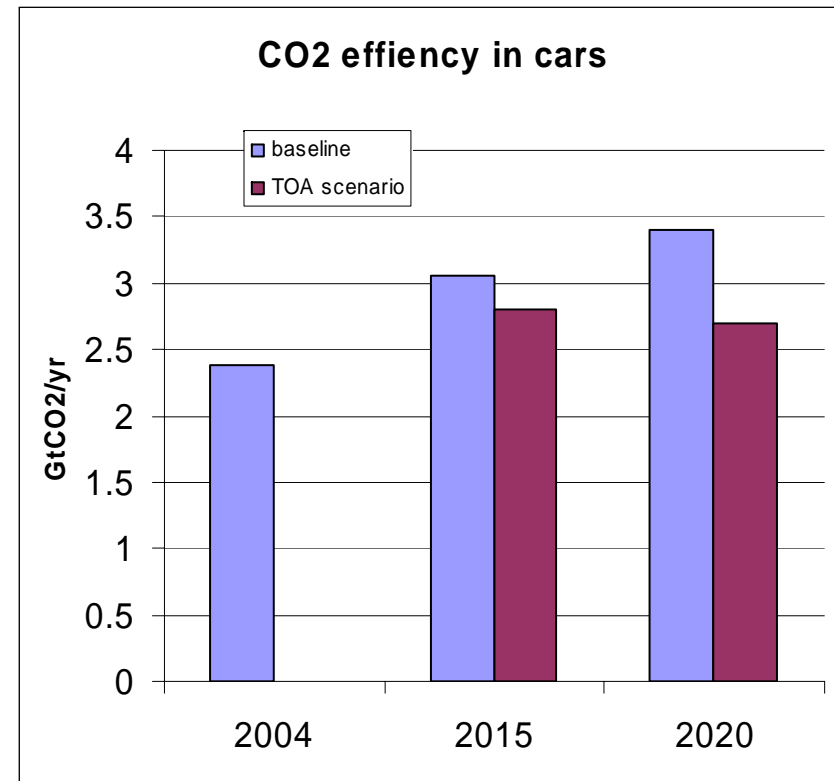


Carbon-efficiency in cars (context)

- Global transport emissions 2004: 5.3 GtCO₂
- Light duty vehicles appr. 45%
- Energy efficiency improvement of new vehicles of 50% possible by 2020
- Until 2020, 500 million vehicles will be added/replaced
- CO₂ reduction in 2020: 26% (0.7 GtCO₂)

Carbon-efficiency in cars TOA

- Major car manufacturer countries involved: China, EU, India, Japan, South Korea, US
- Agreed target of 80 gCO₂/km for all new person cars in 2020 (fuel efficiency and biofuels)
- Incentives for fuel efficiency and biofuels beyond standards



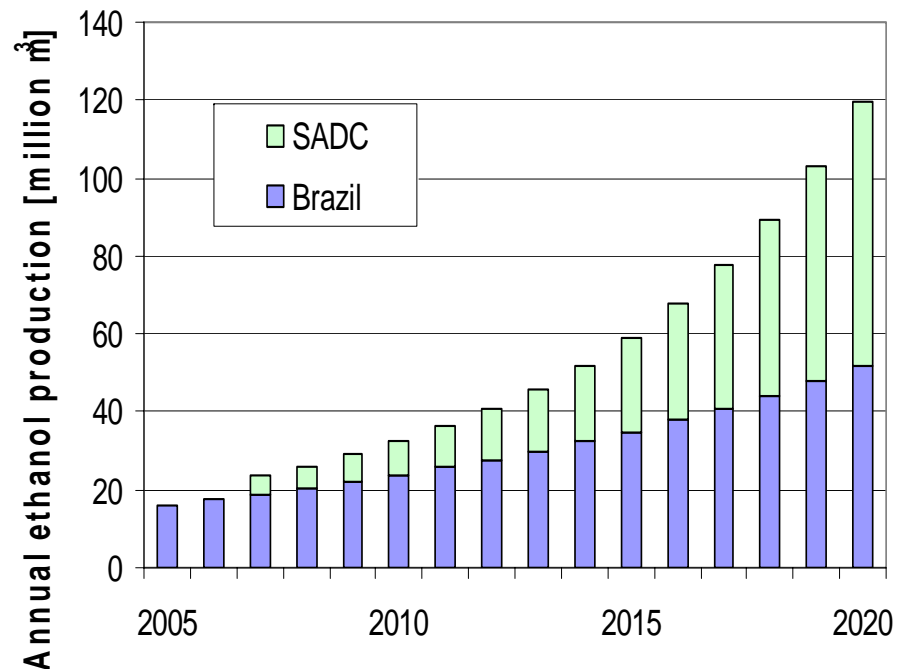
Sugarcane-based bioethanol (context)

- Increase in demand for biofuels in EU cannot be met by domestic production
- Brazilian ethanol based on sugar cane interesting
 - export
 - GHG balance
- Export potential in sub-Saharan Africa (Southern Africa Development Community)
 - land availability
 - suitability for sugar cane

Sugarcane-based bioethanol

Bioethanol between EU, Brazil and Sub-Saharan Africa (type 3,4)

- Brazil provides technology and experience
- Sub-Saharan Africa suitable; both meteorological conditions are good, and much wasteland is available
- EU finances and provides guaranteed market
- Ca. 90 MtCO₂/yr emission reduction in 2020



CO₂ capture and storage (context)

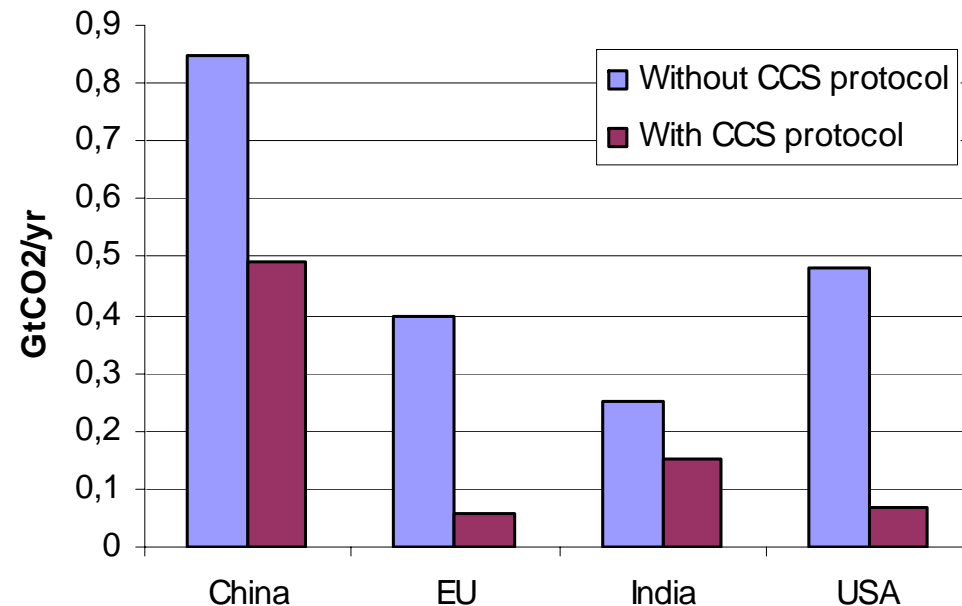
- Focus on power sector
- Increase in capacity mostly fossil-based
 - more than 1000 GW additions/replacement between 2013 – 2020 expected in China, India, EU and US
- Costs between 25 and 50 US\$/tCO₂
- CO₂ storage potential assumed to be sufficient

CO₂ capture and storage TOA

CO₂ capture and storage
between US, EU, China, India
(elements of type 3 and 4)

- Annex I: CCS on all new power capacity, with flexibility where to install up to 50% of new capacity
- Non-Annex I: 50% of all new power capacity with CCS
- Technology transfer fund for non-Annex I
- Emission reduction 1.3 GtCO₂/yr in 2020

Annual average CO₂ emissions from new power capacity, 2013-2020



Conclusions

Five examples of TOAs

- Industry, electricity and transport sector
- Elements of RD&D, technology transfer, mandates, incentives and standards
- Scope and emission reduction potential differs
 - Potential larger after 2020
- But: are they politically feasible?

Thank you

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