



ESCUELA TÉCNICA SUPERIOR DE INGENIERÍA – ICAI

Marginal abatement costs for CO₂ emissions from industrial sectors in Spain

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The context




- Mitigation costs are a critical element for the negotiation of carbon emissions reduction targets
 - The EU is planning to go for stricter targets (30% for 2020)
- Estimates are available, but usually at a regional level
- But they may be country-specific, particularly for some sectors





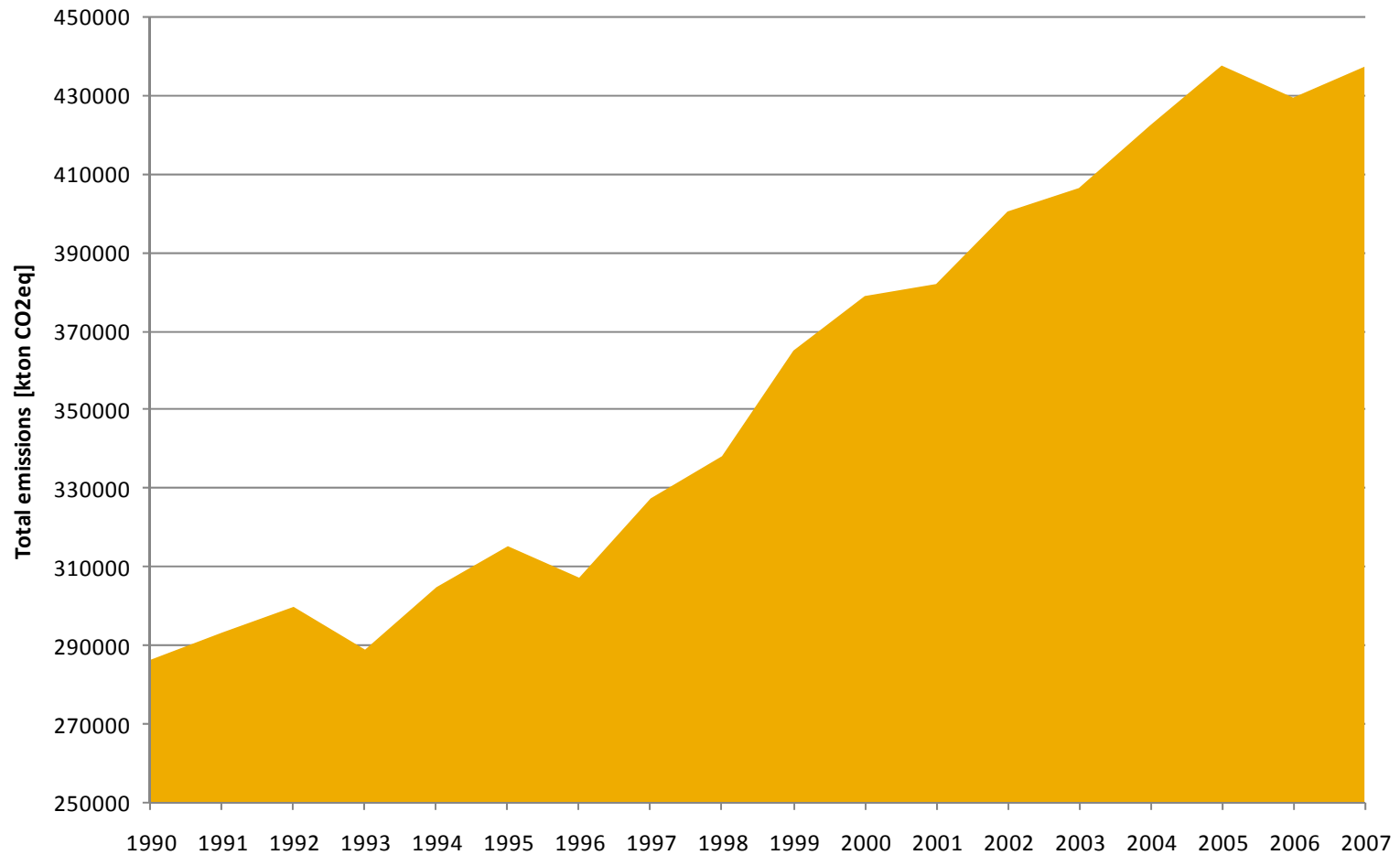
Objectives



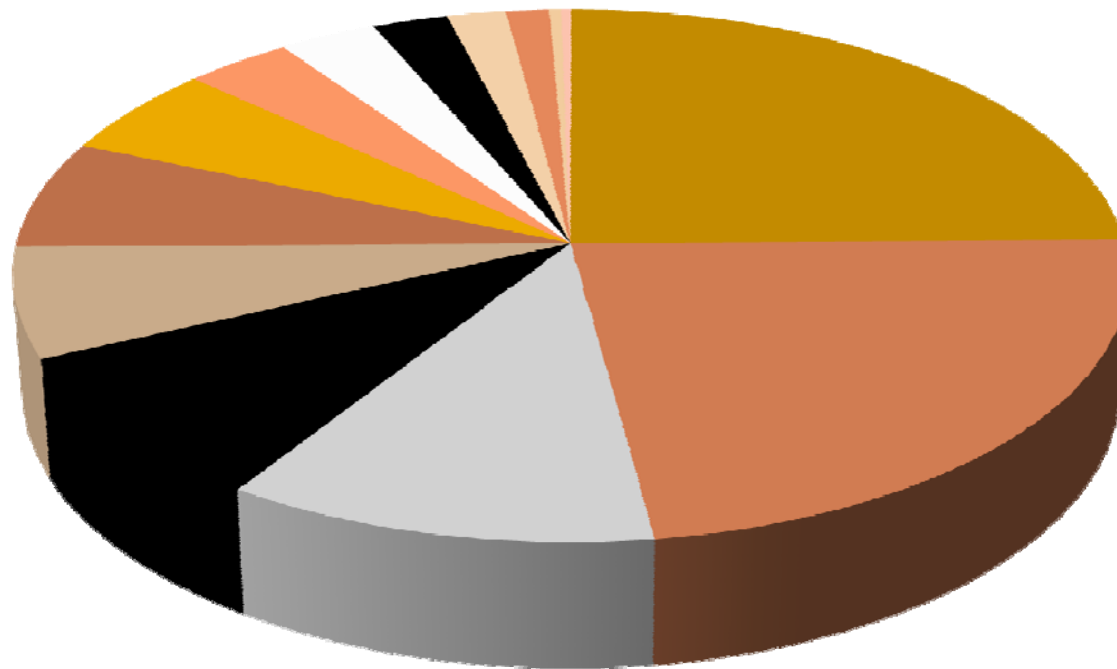
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- To assess the cost of different carbon emissions targets
 - To determine economic potential for reduction
 - To evaluate the cost for Spain of attaining a certain target
 - To help determine the risk of industry reallocation
 - This is work in progress
 - Part of a larger effort, which tries to assess mitigation costs for all sectors



Carbon emissions in Spain: recent trend



Carbon emissions in Spain: distribution



- Power generation
- Road transport
- Industrial combustion plants
- Agriculture
- Non-industrial combustion plants
- Cement industry
- Other transport
- Waste treatment
- Extraction and refining of oil
- Industrial non-combustion processes
- Other sources and sinks
- Steel industry





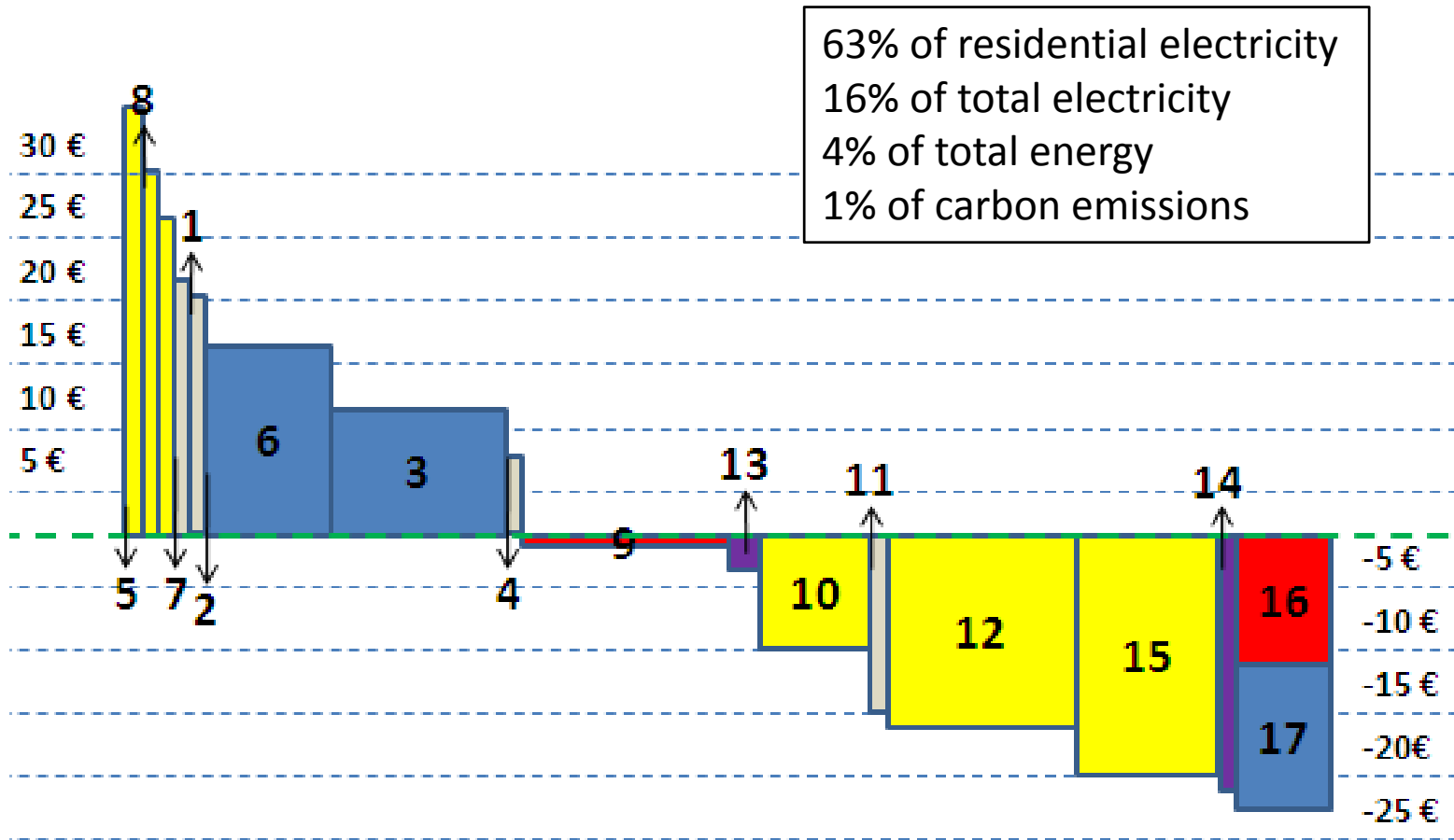
How to produce MAC curves?



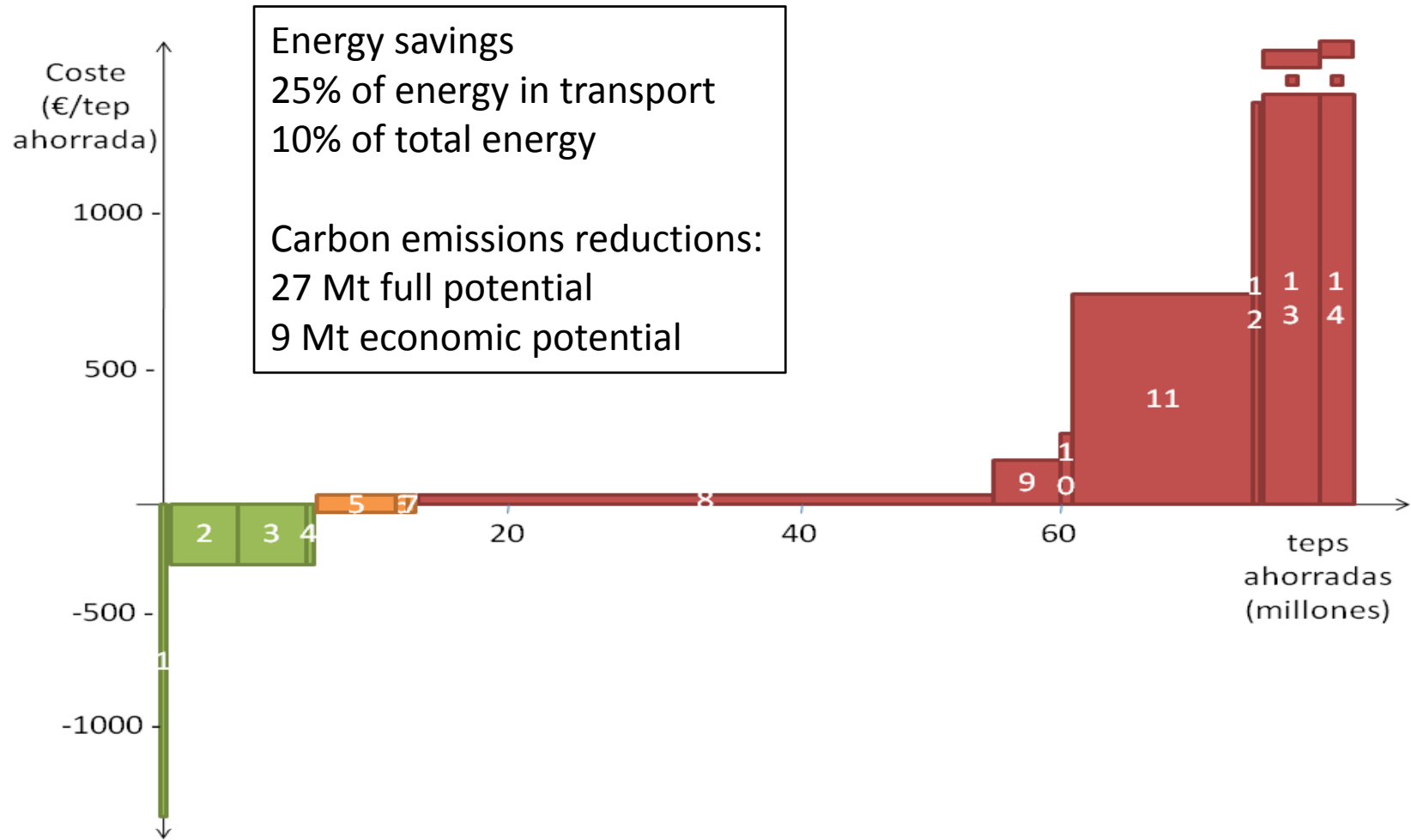
- Expert-based
- Model-based
 - Global E3 models
 - Sectoral models



Expert-based: buildings





Expert-based: road transport





Model-based

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- We consider three sectors
 - Power
 - Cement
 - Steel
 - Together they amount for 33% of total Spanish carbon emissions
 - We plan to add in the future:
 - Refining
 - Industrial thermal plants
- 





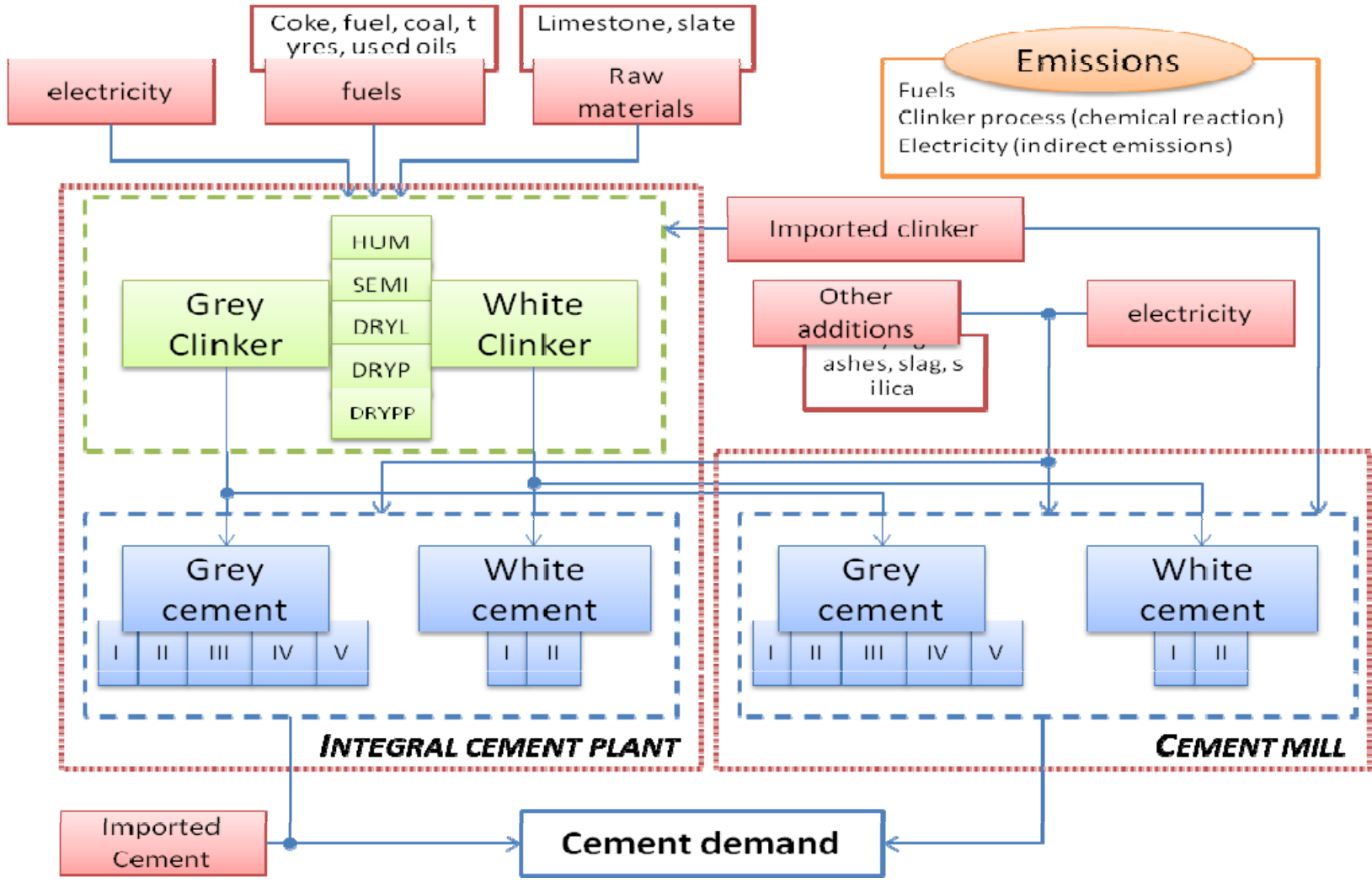
Power model



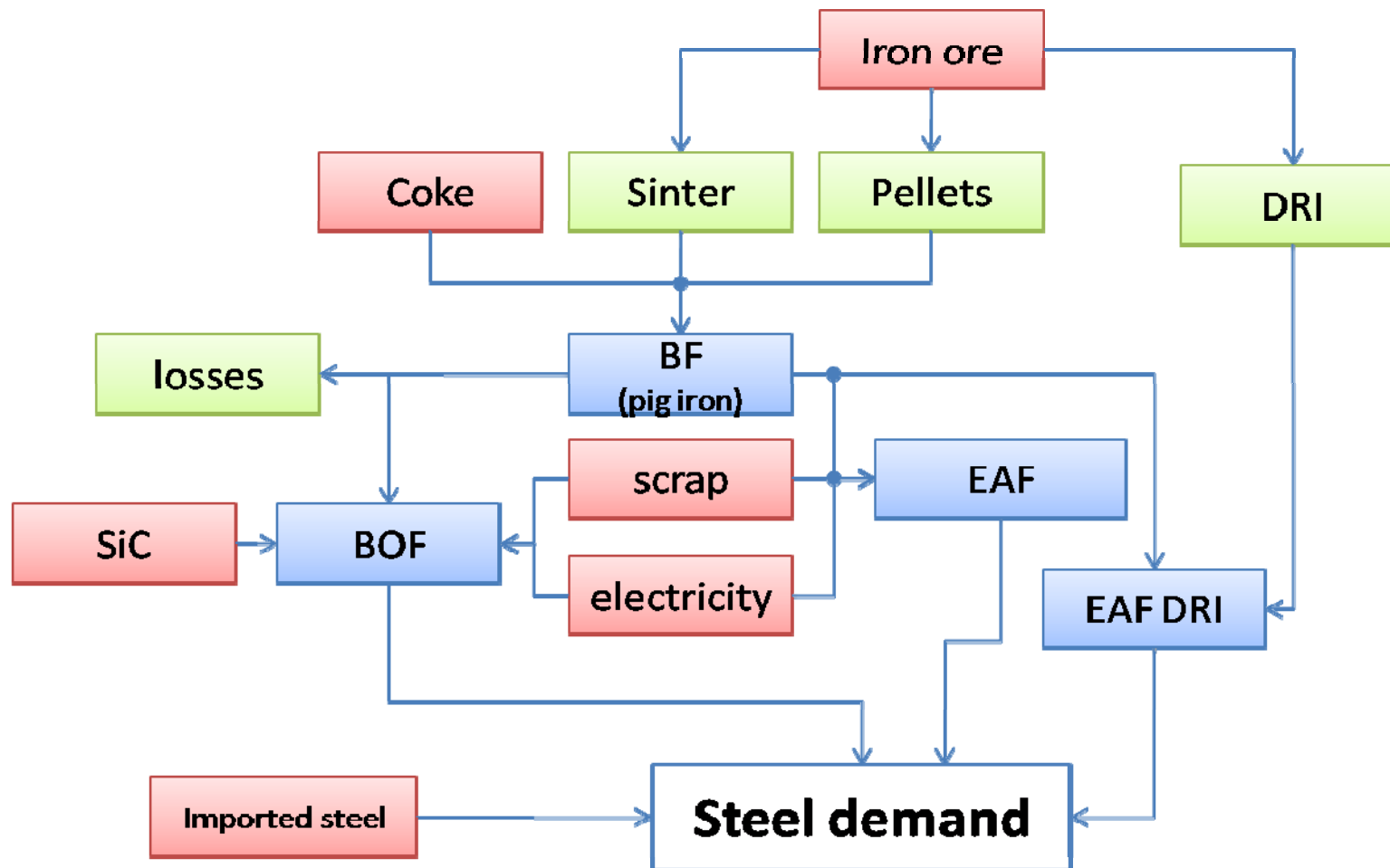
- We use a generation-expansion model already used for other exercises
 - Linear (we don't consider market power)
 - Renewable support policies
 - 14 technologies
 - 2010-2050



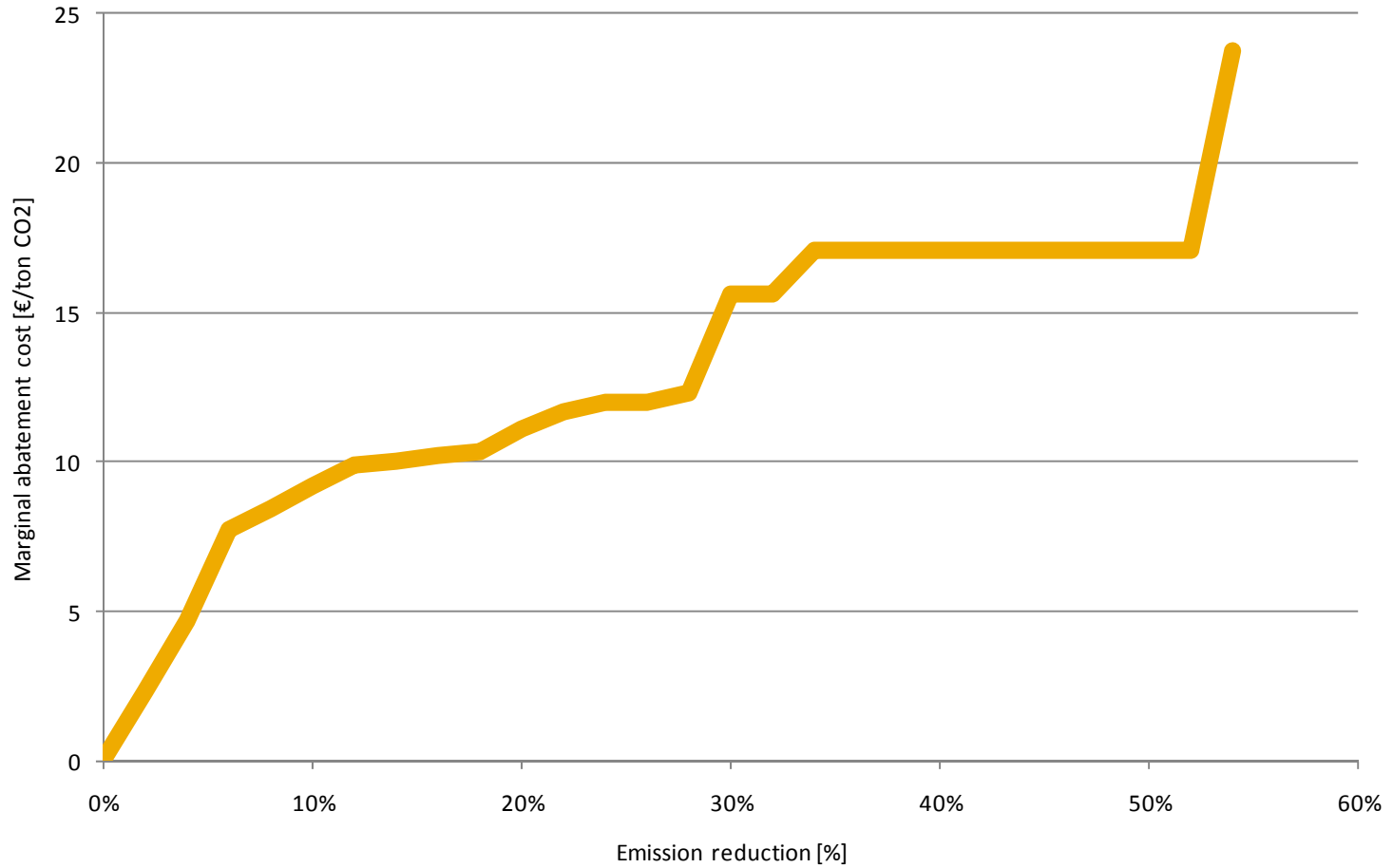
Cement model



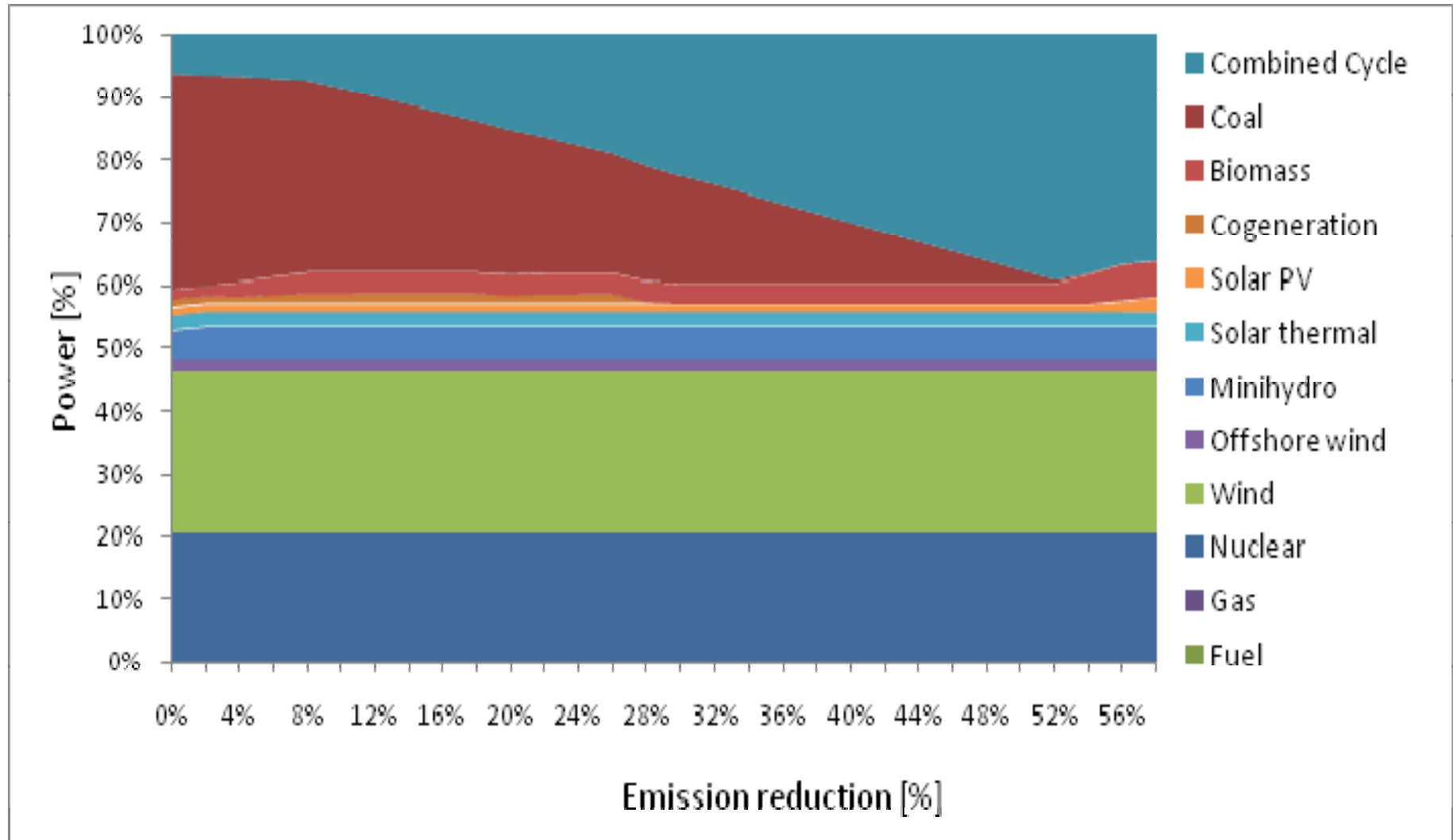
Steel model



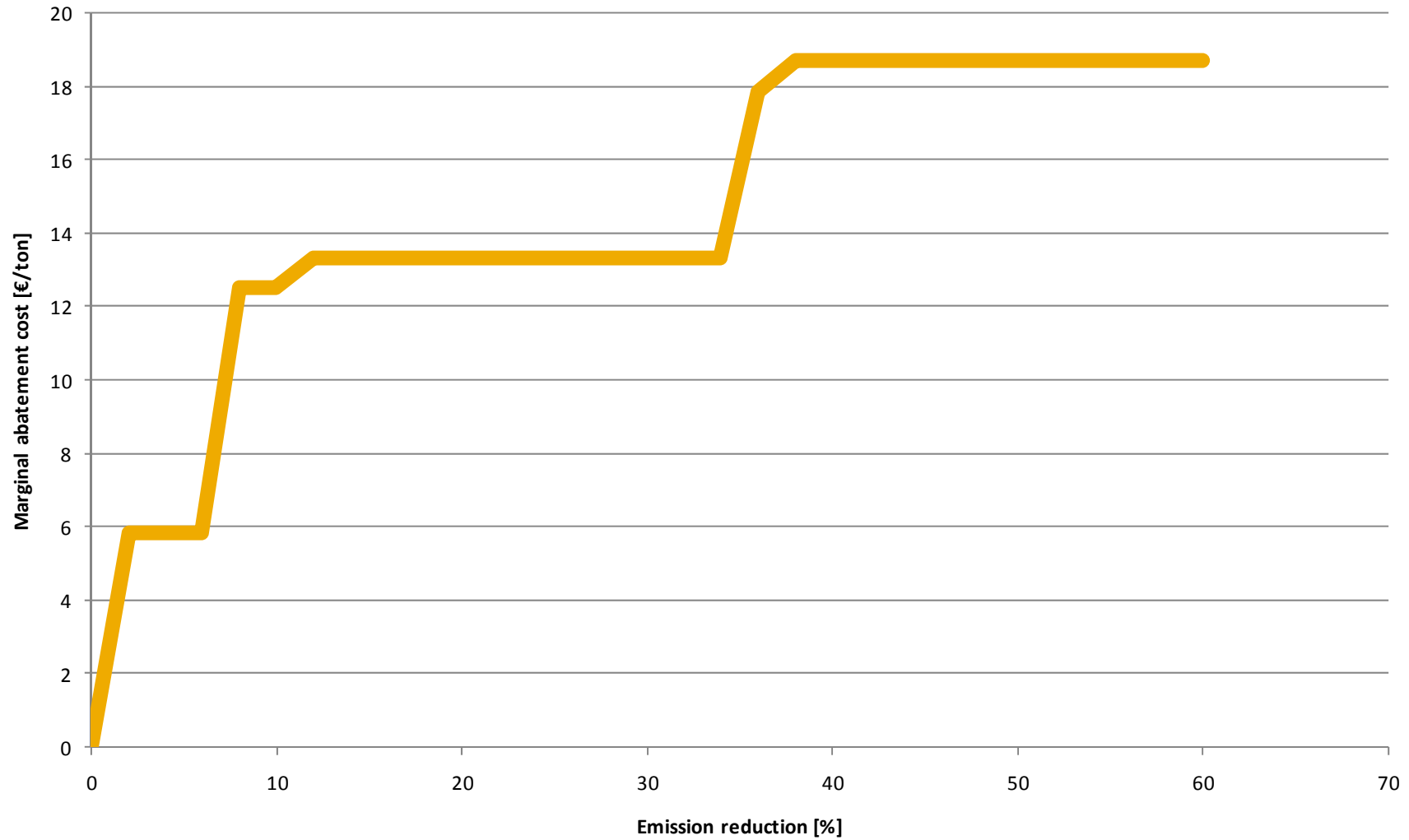
Results: Power emissions



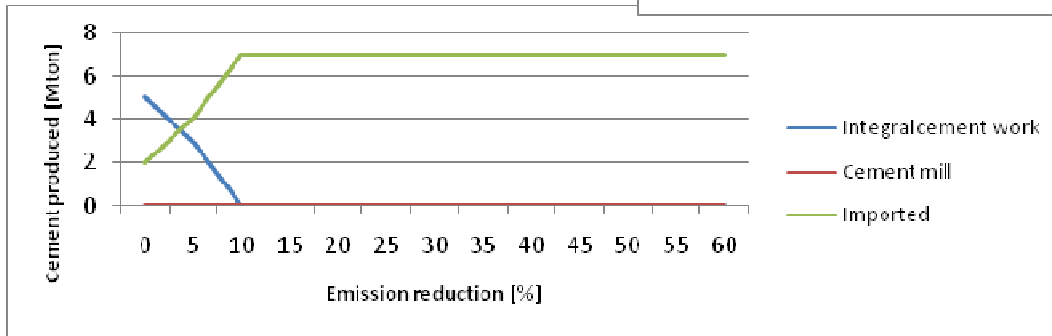
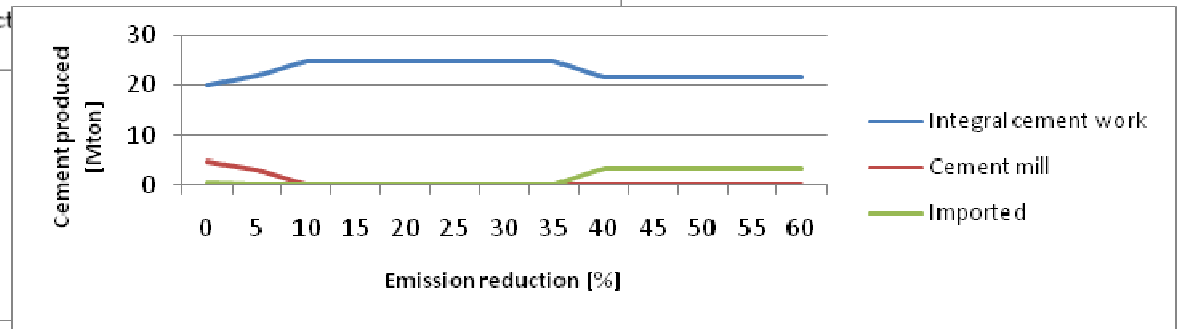
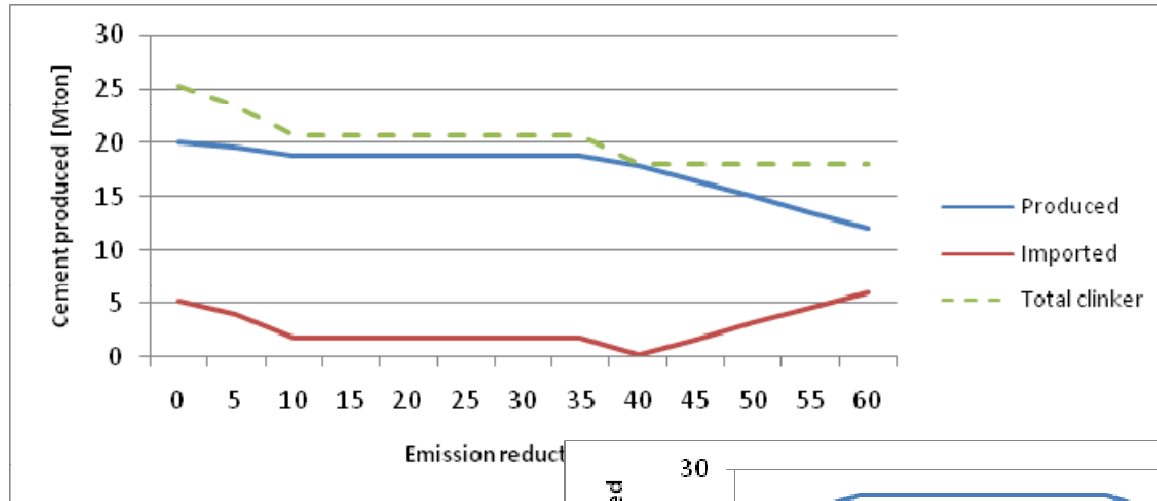
Results: Power production



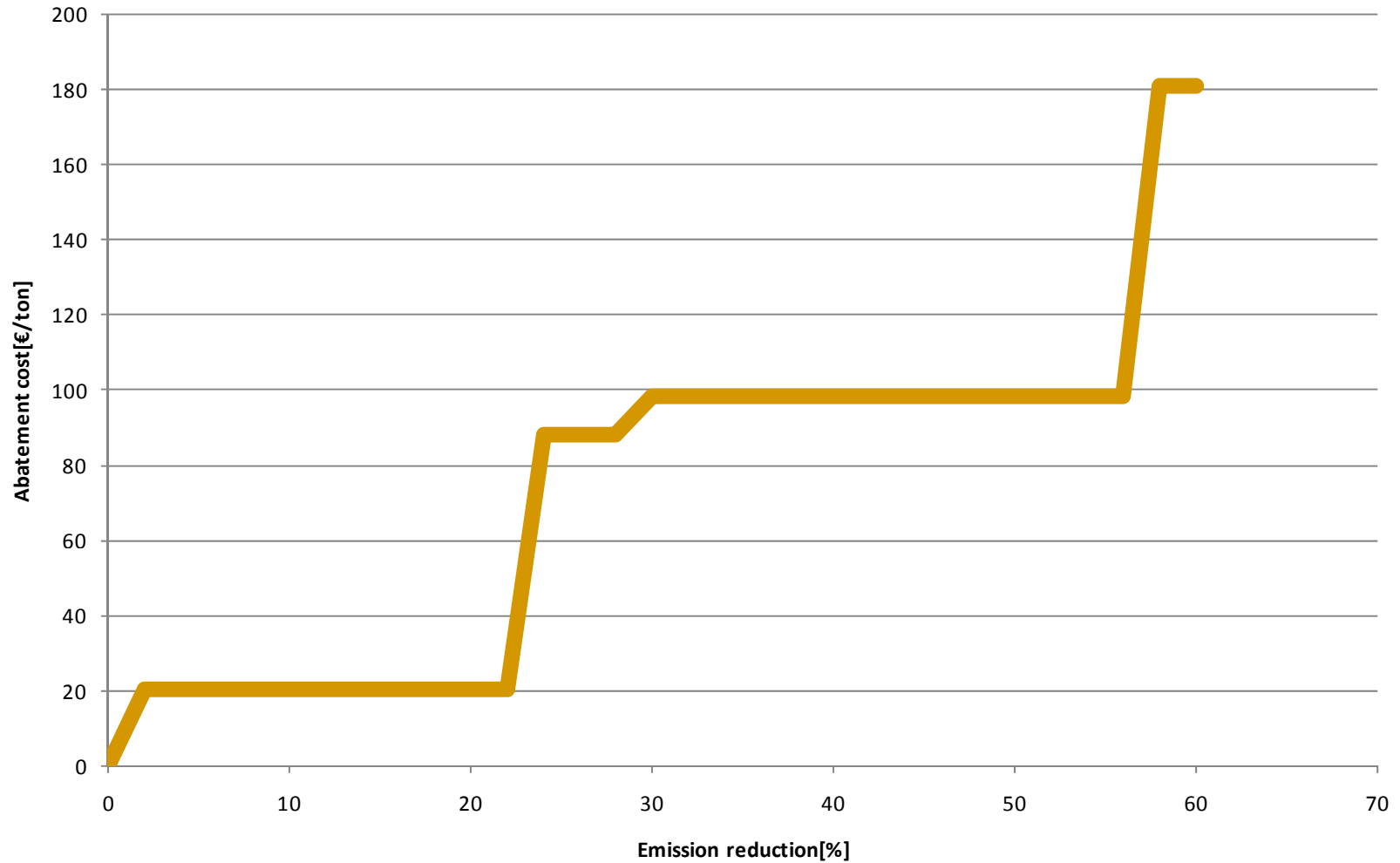
Results: Cement emissions



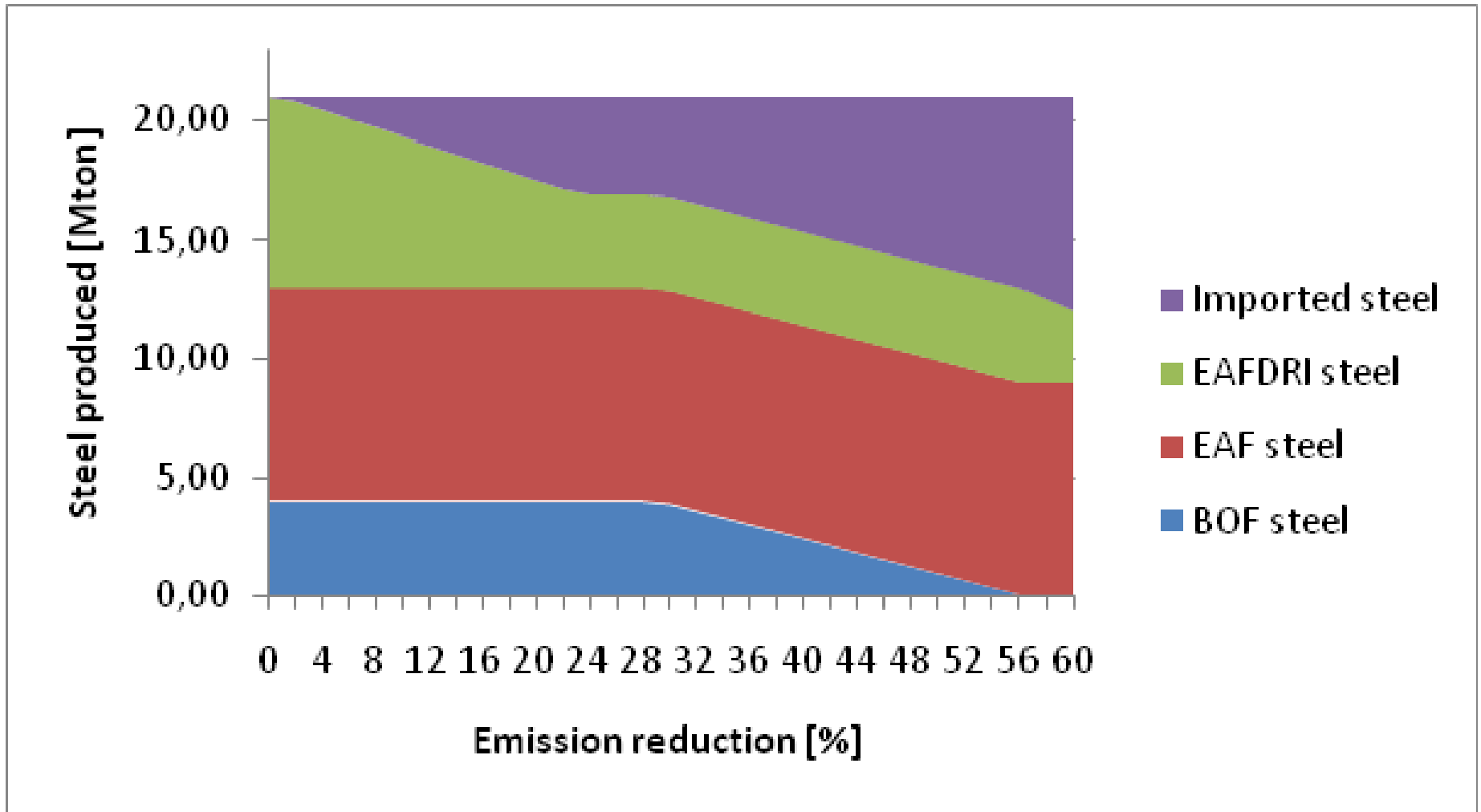
Results: Cement production



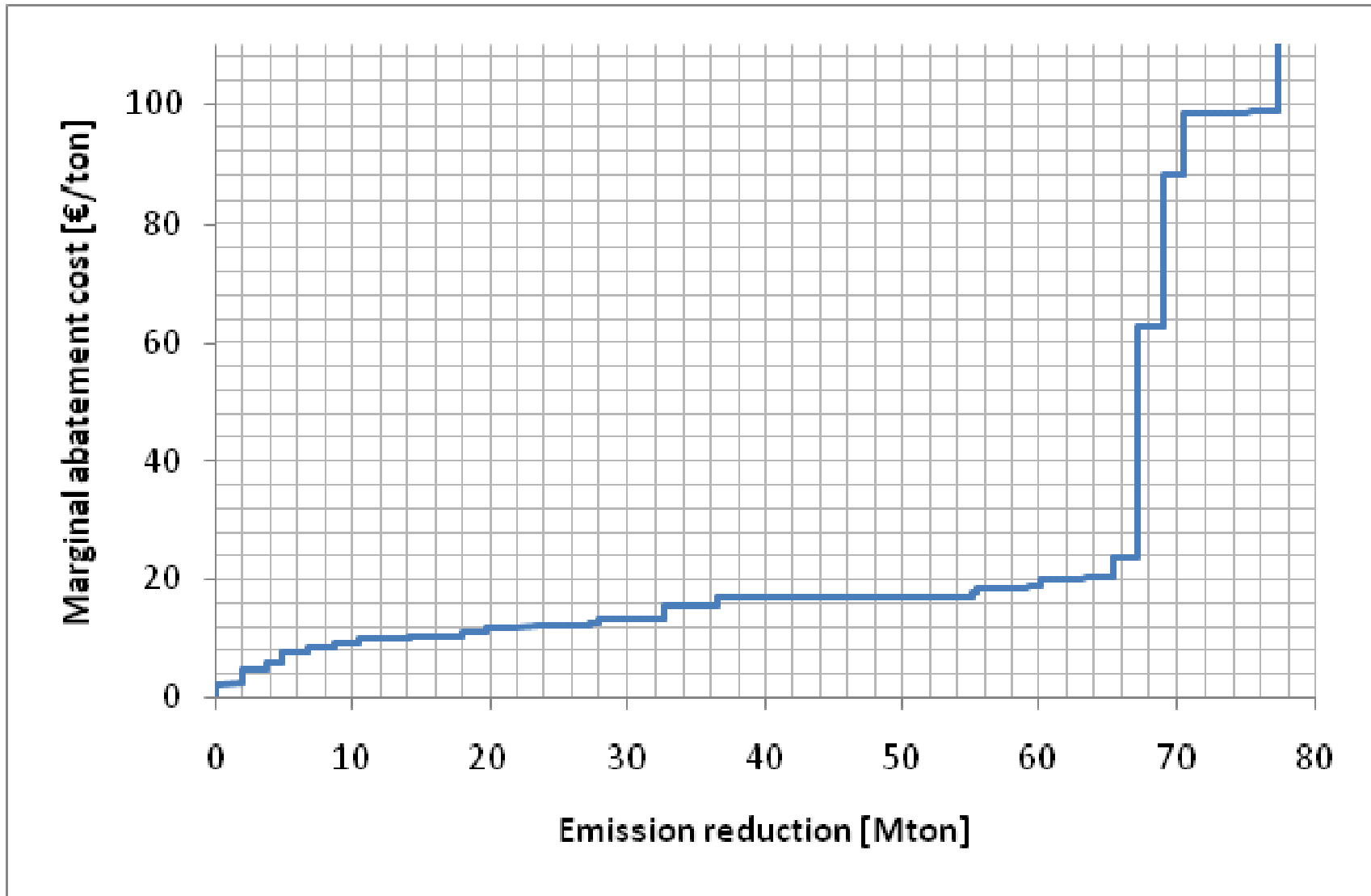
Results: Steel emissions



Results: Steel production



Results: Aggregated MAC curve





Discussion

- Significant reductions may be achieved at a competitive cost
 - These three sectors can contribute more than proportionally
 - Mostly power and cement
- The power sector possibilities are constrained by the RE potential
- Possibility of leakage in the cement and steel sector



Thanks!

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