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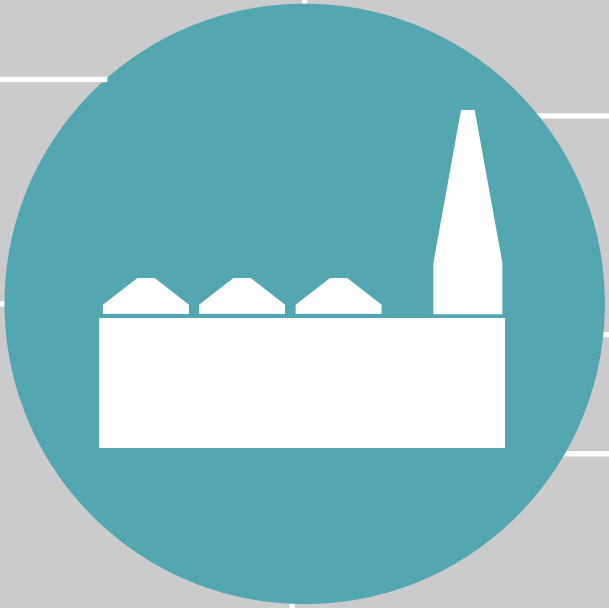
Paying the full price! Efficient pricing of CO_2 abatement along the supply chains for basic materials



ECEEE2016
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Johan Rootzén
Energiteknik
Chalmers

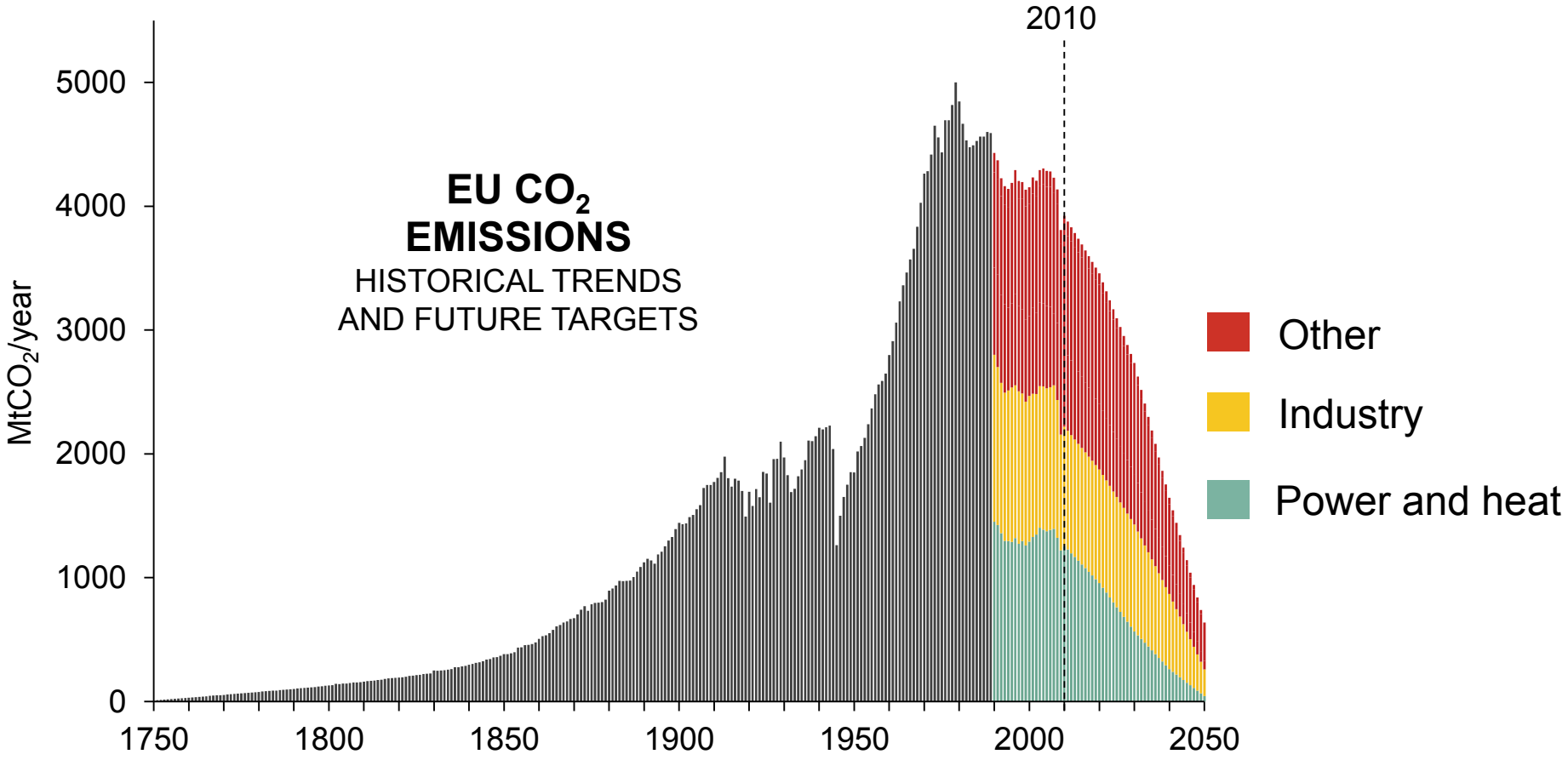
SUMMARY

DECARBONISING THE EU BASIC INDUSTRY

- Available measures will not suffice
- Current market conditions (bleak)
- Climate policy environment (weak)
- Who could/should pay the price of a shift to low-CO2 production processes in the steel and cement industries?

- We do this by looking beyond current market conditions as if mechanisms that would allow steel producer to pass on parts or all of the added costs were in place

BACKGROUND



Data sources: [Boden et al., 2010; EC-JRC/PBL, 2009; European Commission 2011; EEA, 2015]

THE CARBON-INTENSIVE INDUSTRY

10%

OF EU CO_2 EMISSIONS

IRON AND STEEL MANUFACTURING

No. of plants ~35 (>0.5 $MtCO_2$/year)

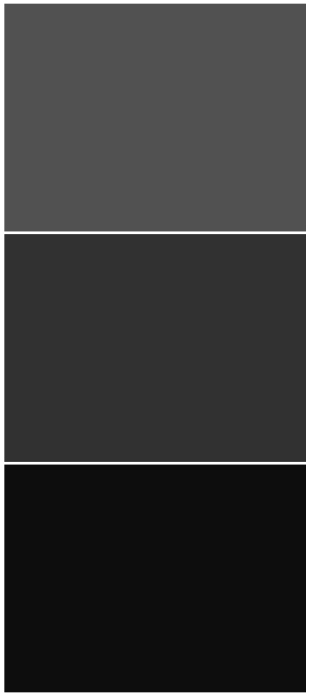
CEMENT PRODUCTION

No. of plants ~150 (>0.5 $MtCO_2$/year)

PETROLEUM REFINING

No. of plants ~85 (>0.5 $MtCO_2$/year)

QUESTIONS ADRESSED



How far can existing abatement measures take us?

What is the potential role for CCS and other emerging low-CO_2 processes?

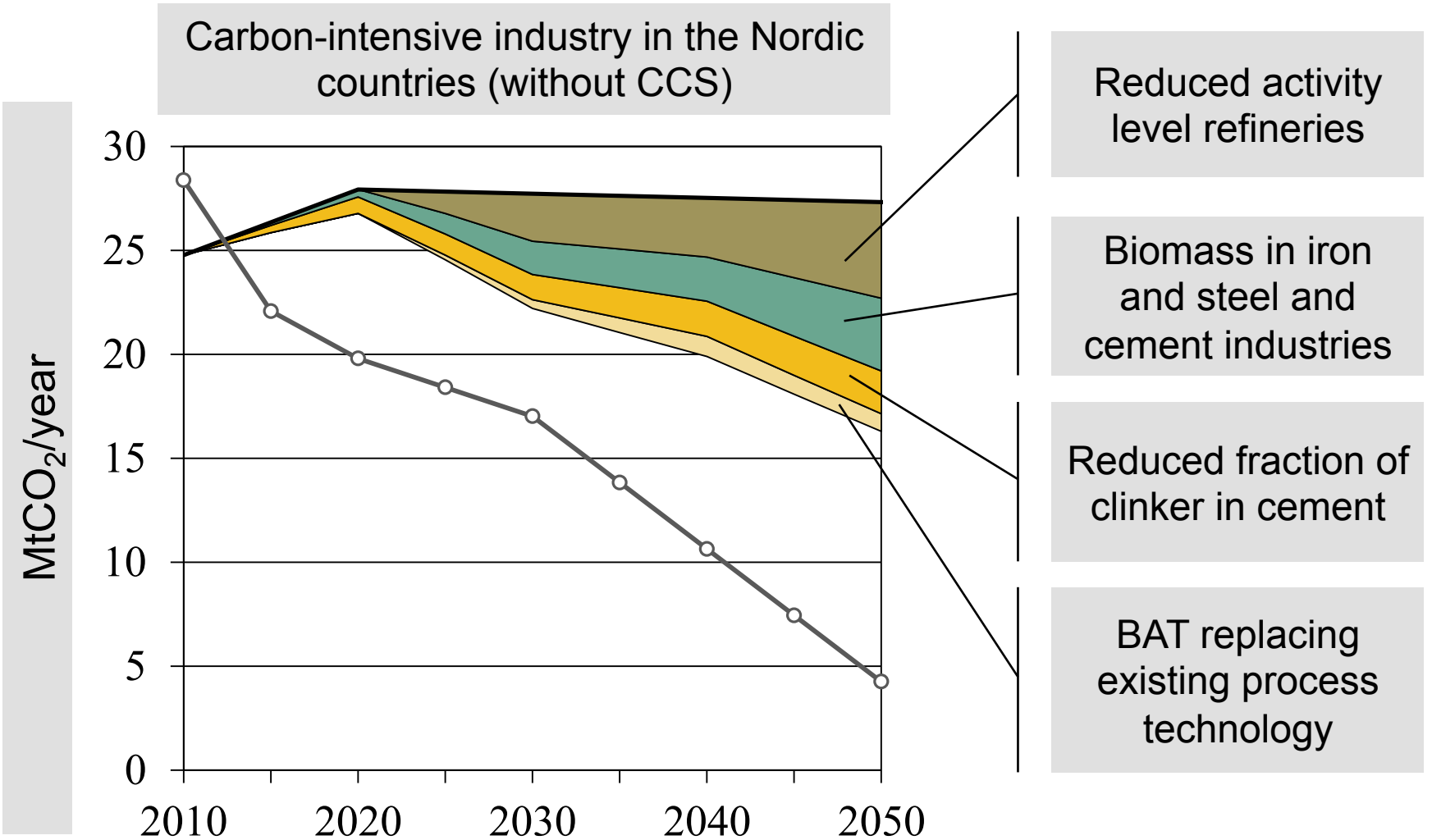
How can we finance the development and implementation new alternative production processes?

How far can existing abatement measures take us?

What is the potential role for CCS and other emerging low-CO_2 processes?

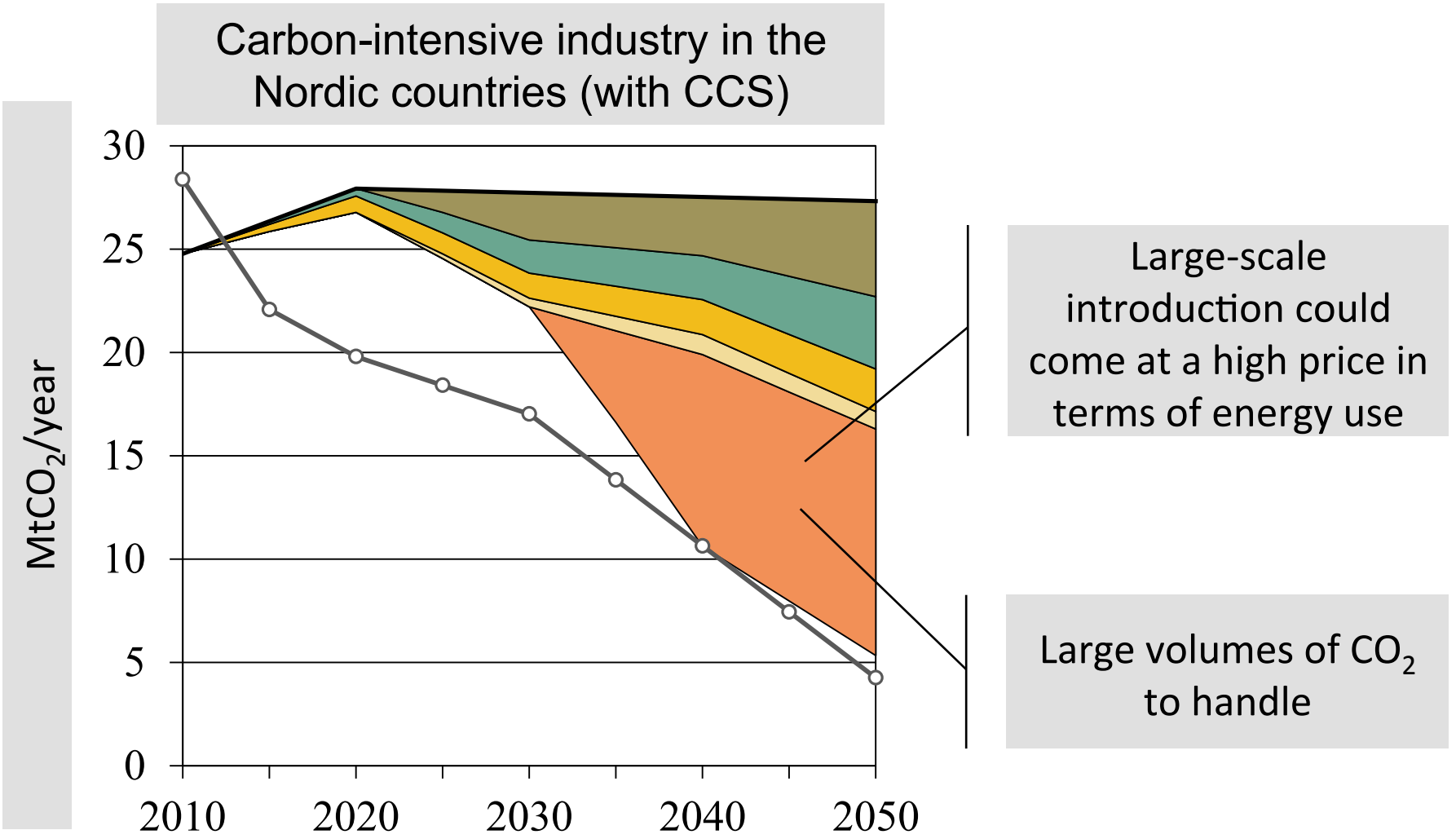
How to finance the development and implementation new alternative production processes?

RESULTS



Existing measures NOT sufficient if to meet 2050 GHG emission targets

RESULTS



With CCS total potential: 85% reduction in Year 2050 relative to 2010

How far can existing abatement measures take us?

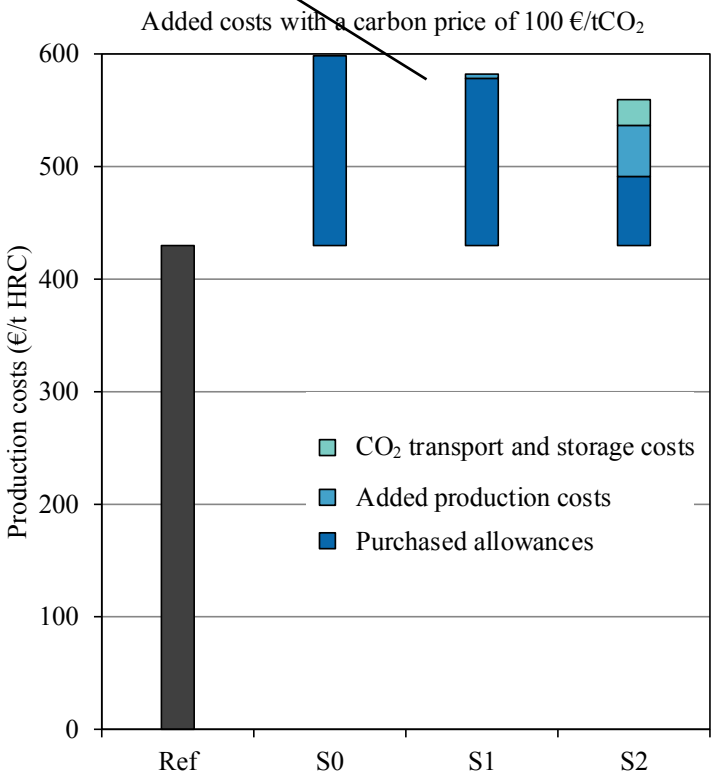
What is the potential role for CCS and other emerging low-CO_2 processes?

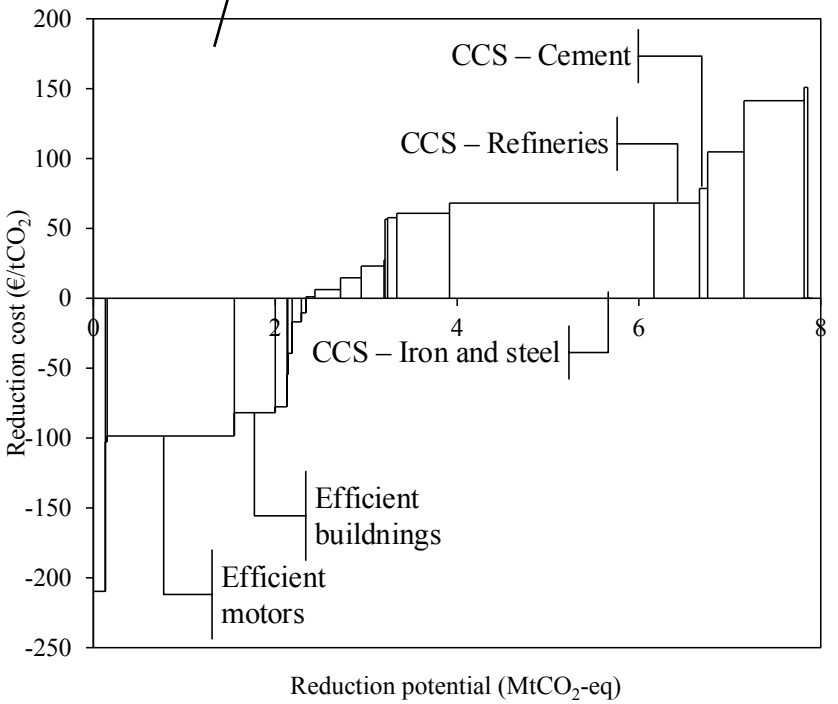
How to finance the development and implementation new alternative production processes?

PERSPECTIVES ON COSTS

X €/t steel

Y €/tCO_2

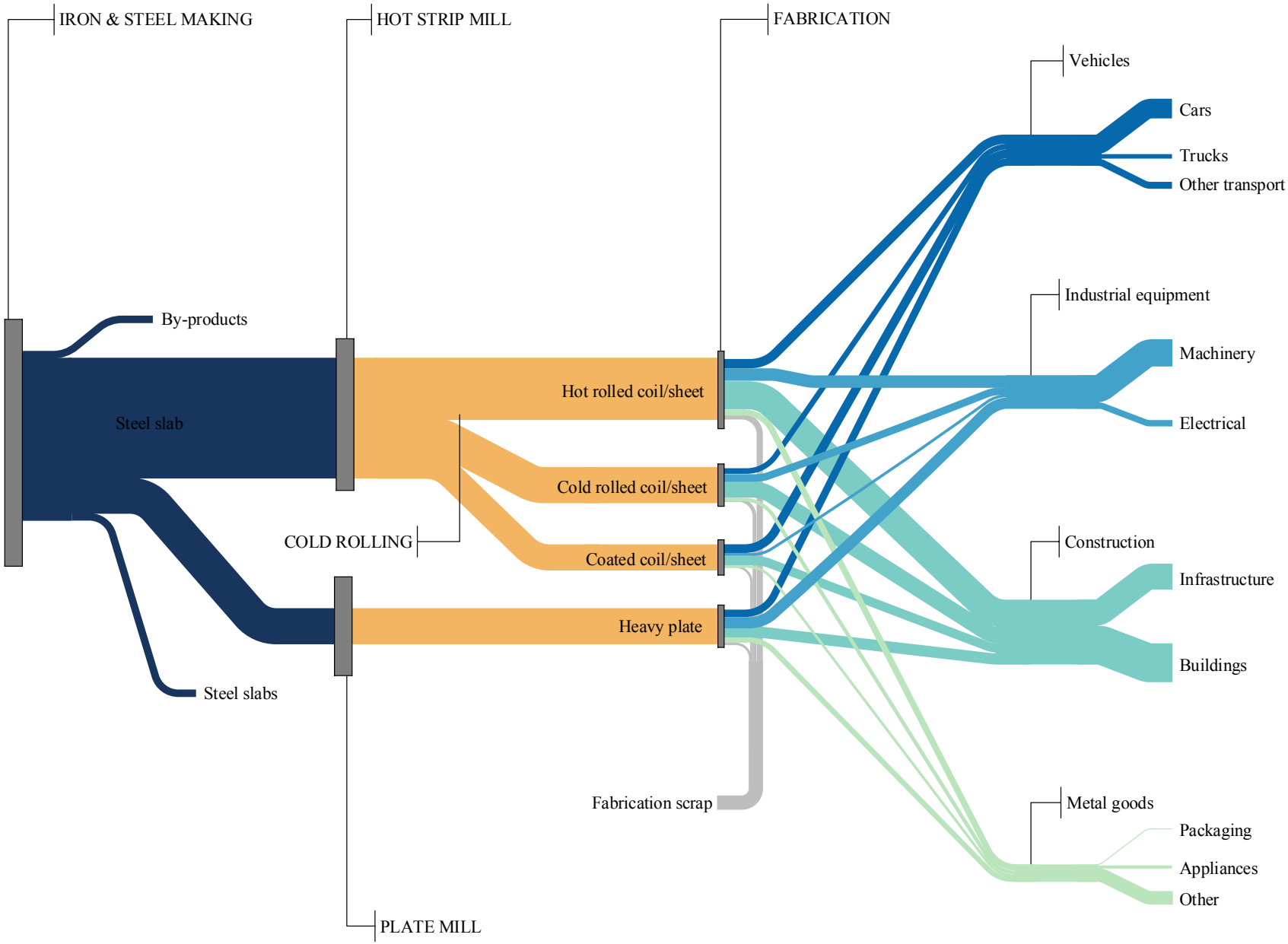




GOAL

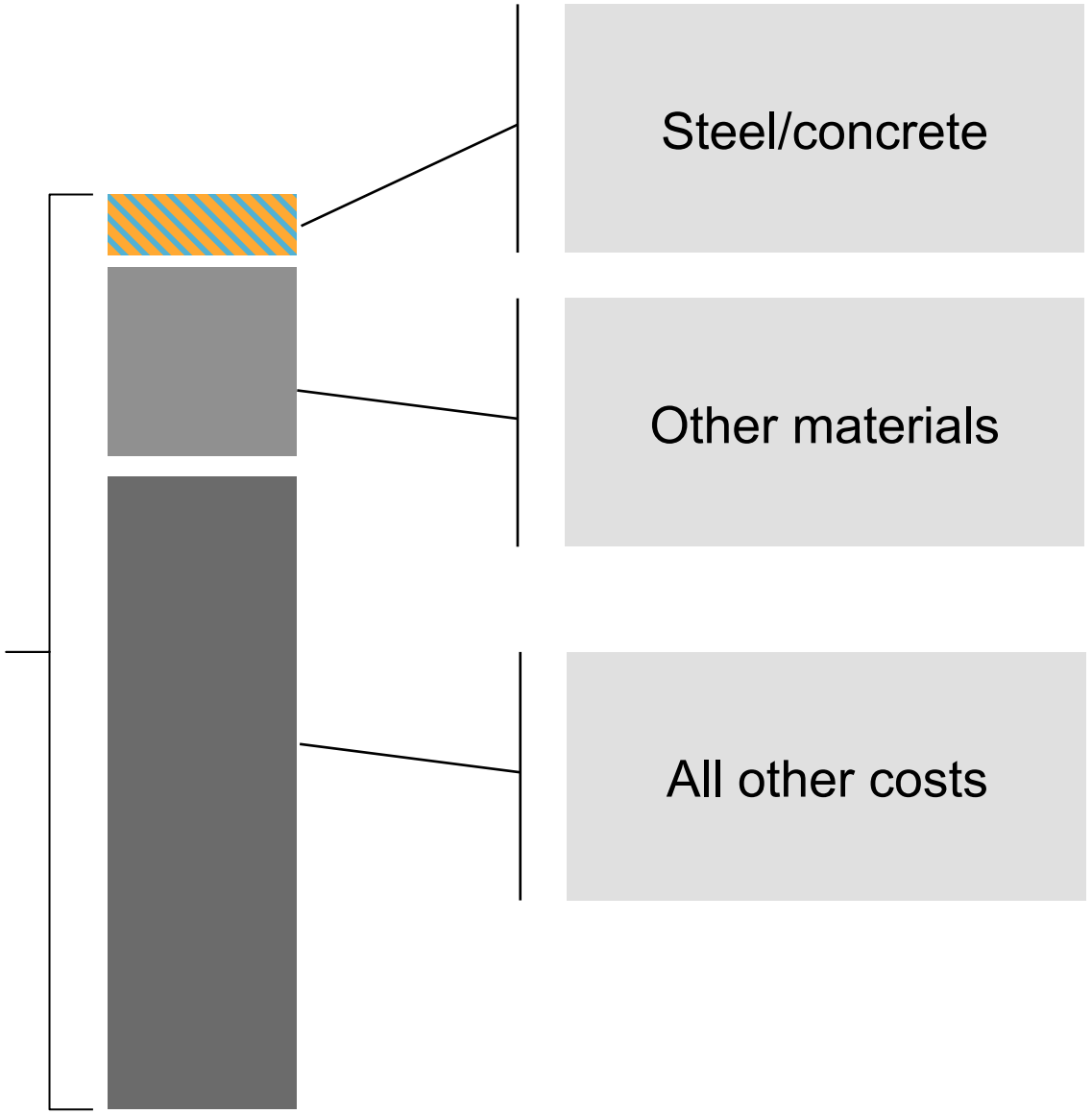
- The ambition has been to explore the magnitude of the cost increases that may occur downstream if and when the steel and cement industries shift to low-CO2, but high-cost, production processes.

- We do this by looking beyond current market conditions (bleak) and the existing climate policy environment (weak) as if mechanisms that would allow steel producer to pass on parts or all of the added costs were in place

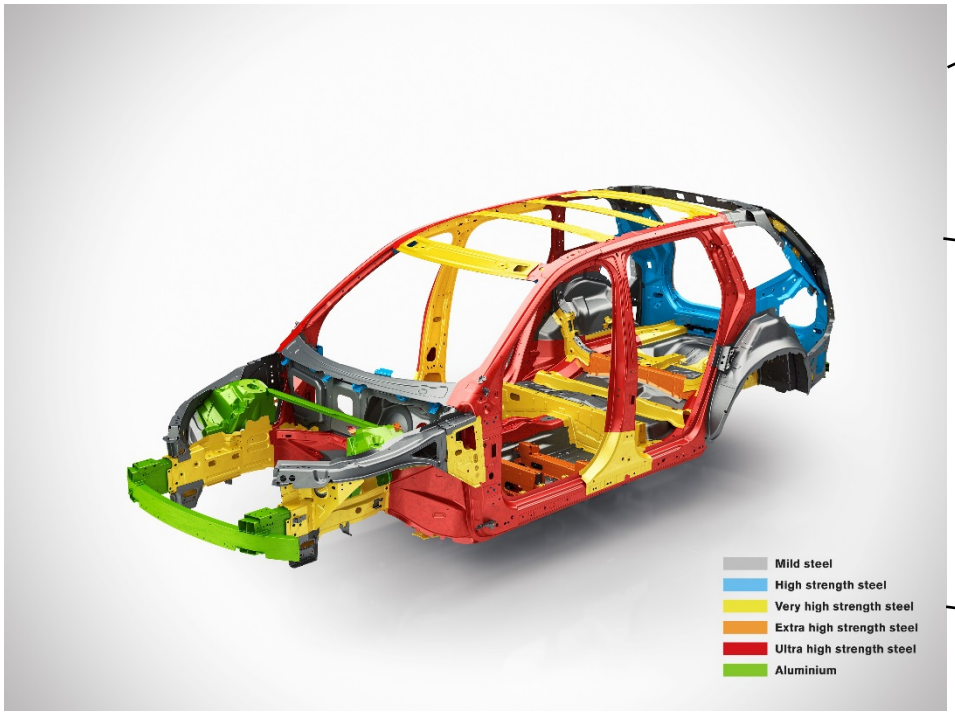

IRON & STEEL MAKING
HOT STRIP MILL
FABRICATION
Vehicles
Cars
Trucks
Other transport
Industrial equipment
Machinery
Electrical
Construction
Infrastructure
Buildings
Metal goods
Packaging
Appliances
Other
By-products
Steel slab
Steel slabs
Hot rolled coil/sheet
Cold rolled coil/sheet
Coated coil/sheet
Heavy plate
COLD ROLLING
PLATE MILL
Fabrication scrap

HYPOTHESIS

Selling price of steel/concrete containing product



STEEL IN A PASSENGER CAR



~60% of the vehicle mass

~6% of the material costs

~2% of the retail price

ANALYSIS APPROACH (PAPER VI)

STEEL PRODUCTION

The sales price depends on the:

- setup of the production process
- carbon price

Amount and mix of steels required depends on the:

- material compositions of the passenger cars considered

COMPONENTS MANUFACTURING

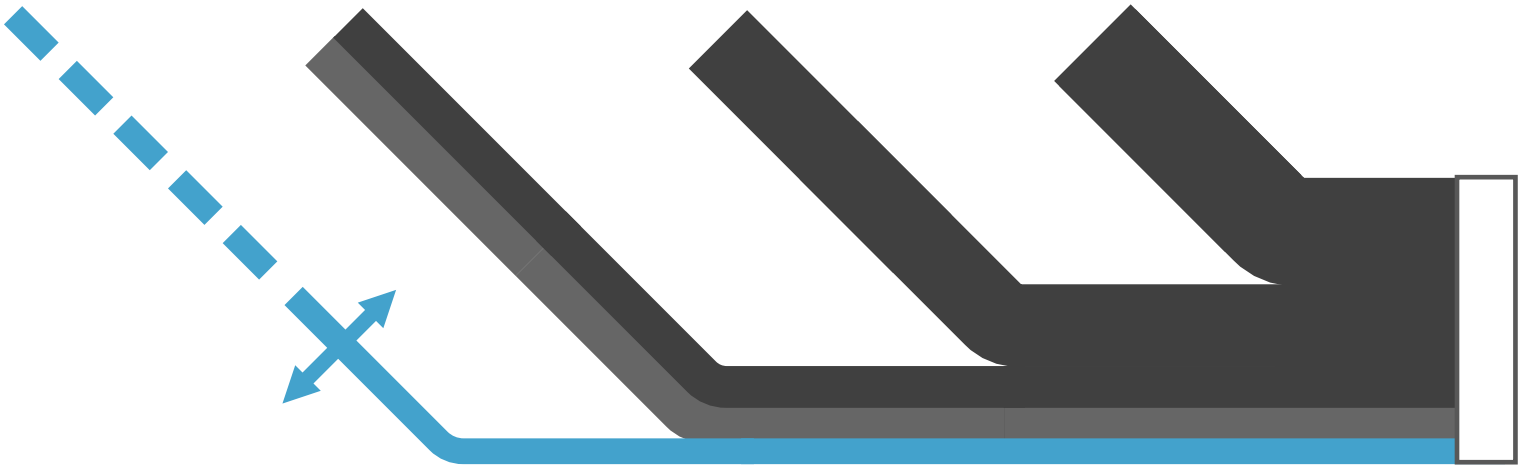
Profit
Overhead costs
Direct manufacturing costs (excl. steel)

CAR MANUFACTURING

Profit
Overhead costs
Direct manufacturing costs (excl. purchased components)

CAR SALES

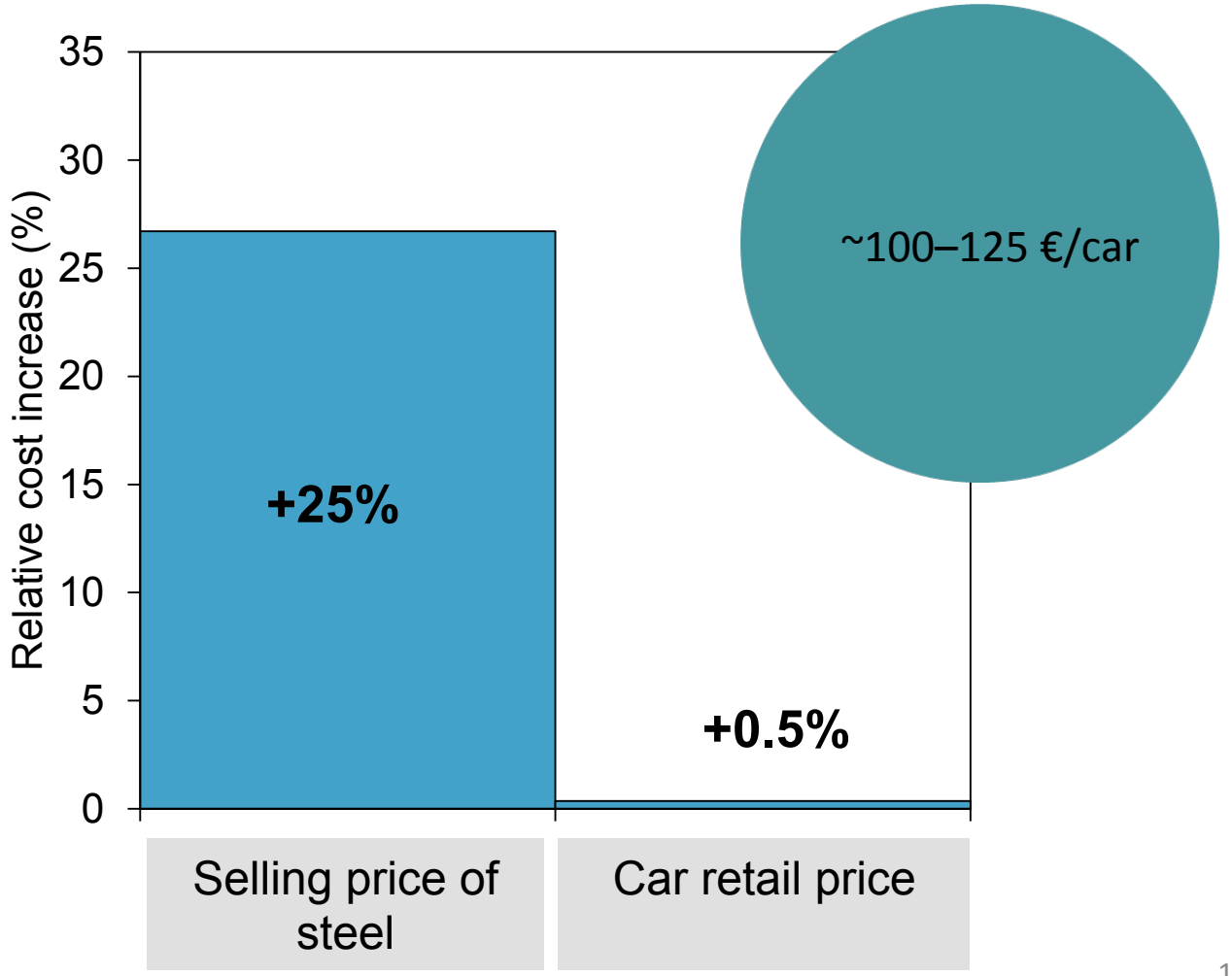
Vehicle tax
Dealer profit
Sales, transport and marketing



RETAIL PRICE

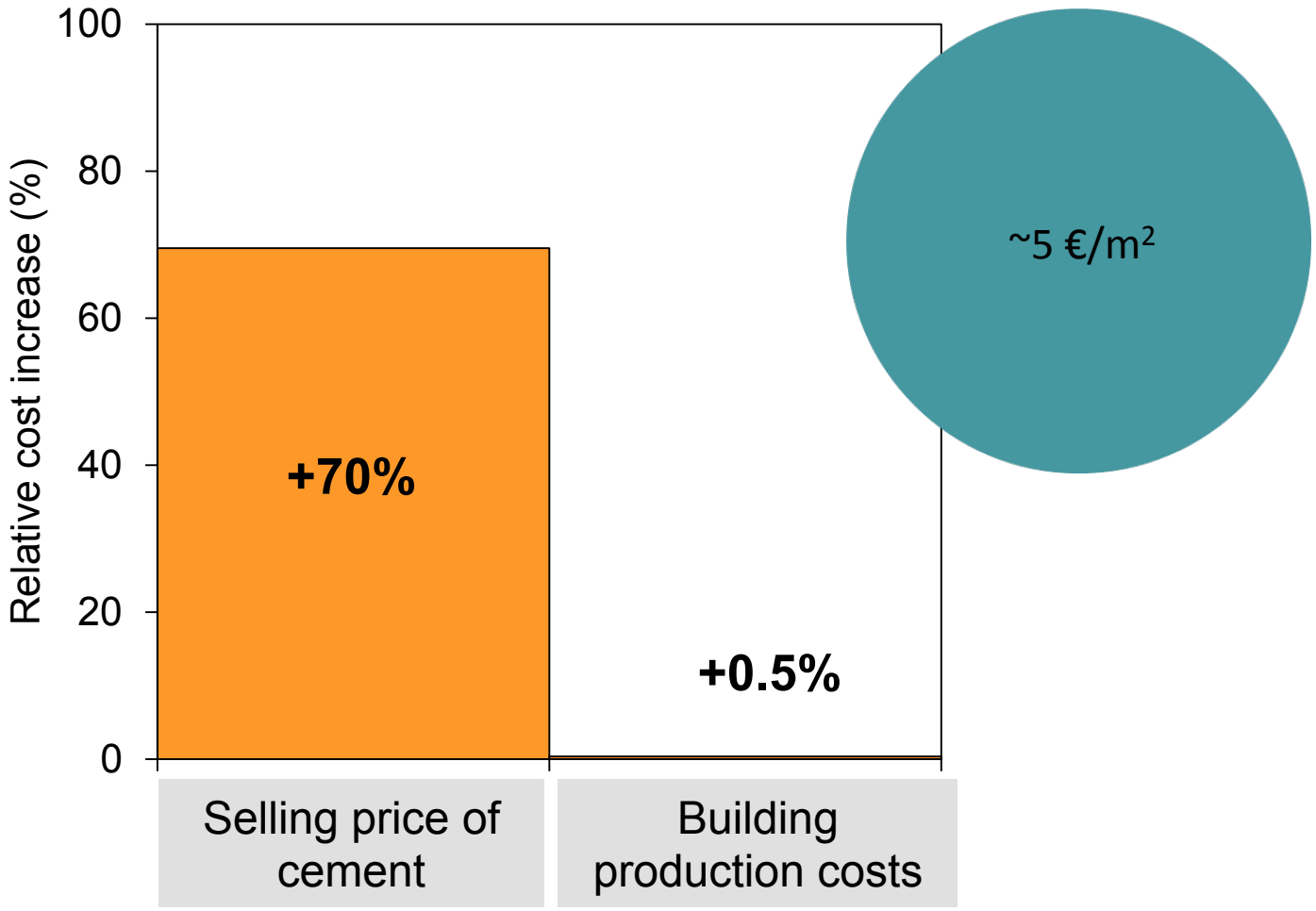
STEEL TO PASSENGER CAR

With investments in BAT/CCS at the steel plant and with the price of CO_2 at 100 €/t



CEMENT/CONCRETE TO RESIDENTIAL BUILDING

With investments in BAT/CCS at the cement plant and with the price of CO_2 at 100 €/t



THE WAY FORWARD

New perspectives on how to support innovation in the basic materials industries. Examples of such innovation support mechanisms includes:

- to include the consumption of cement and other CO_2-intensive commodities in the EU ETS

- the use of sustainable procurement as a tool to create niche markets and to guarantee an outlet for low-carbon cement and steel; and,

- innovative business models that create and capture value for the actors involved in the production, refinement and use of materials like steel and cement.

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THANK YOU!

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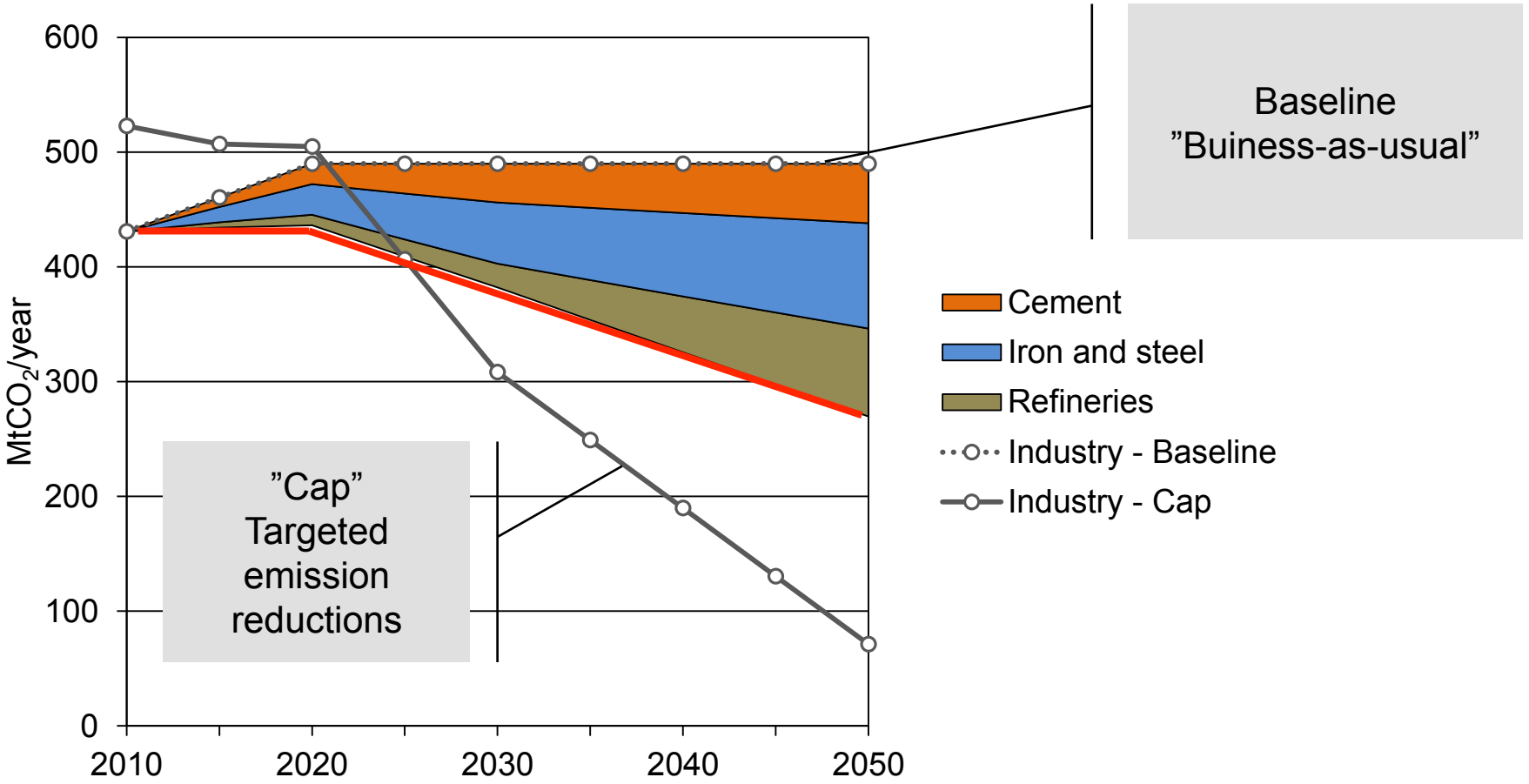
RESULTS

Carbon-intensive industry in the EU27

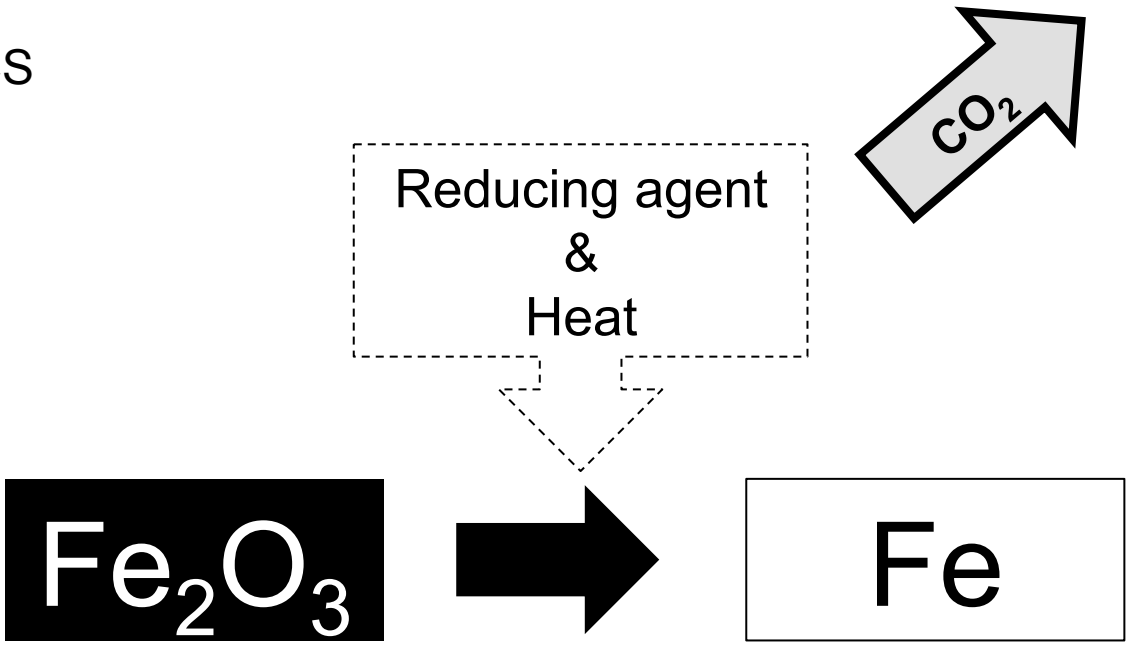
Reduction potential with existing BAT technologies vs emission cap



Existing measures sufficient to meet EU 2020 targets but NOT the targets for 2050

INTEGRATED IRON AND STEEL

BASICS



Specific thermal energy use	
Integrated steel	**GJ/t crude steel**
Existing capacity	17 – 23
BAT	16.5

CEMENT MANUFACTURING

BASICS

FUEL COMBUSTION

CALCINATION

$CaCO_3$ + Heat → CaO + CO_2

CO_2 ~900°C

60%

40%

CO_2

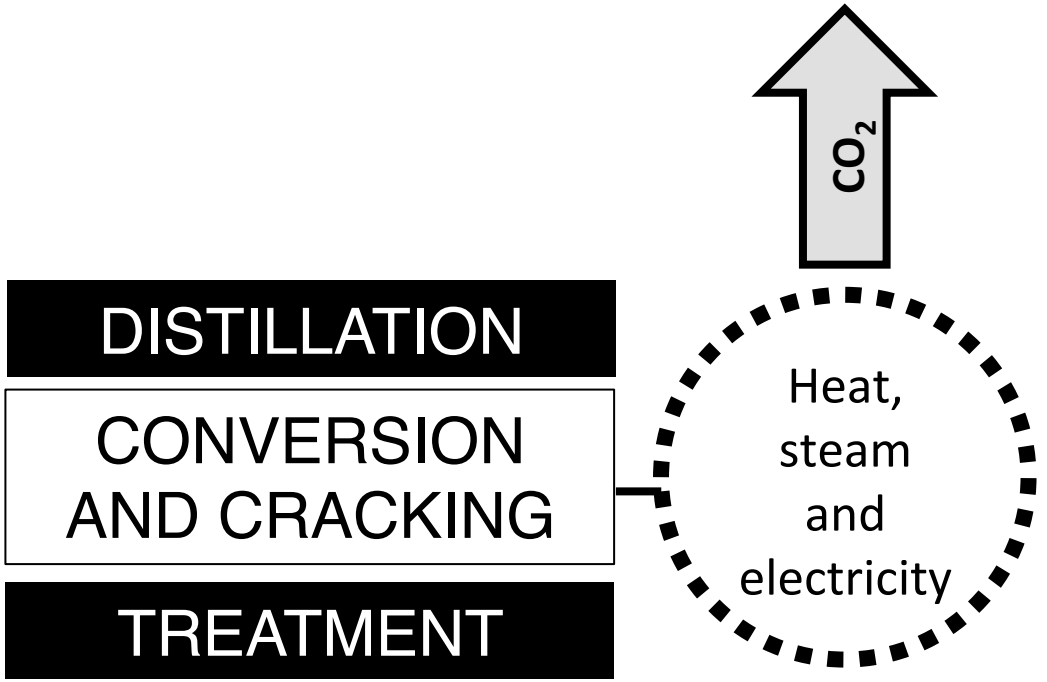
CLINKERISATION

Specific thermal energy use

Cement manufacturing	**GJ/t cement clinker**
Existing capacity	3.6 – 5.7
BAT	3

PETROLEUM REFINING

BASICS



Specific thermal energy use

Petroleum refining	**GJ/t throughput**
Simple	1.7 – 2.8
Complex	2.8 – 3.7

SCENARIO ANALYSIS