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Materials industry modelling in net-zero emissions scenarios: the case of steel

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Materials industry modelling in net-zero emissions scenarios: the case of steel

WORK IN PROGRESS
findings not final

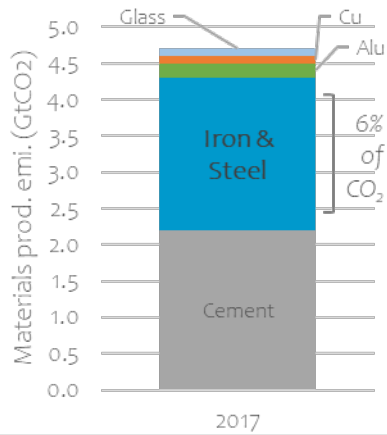
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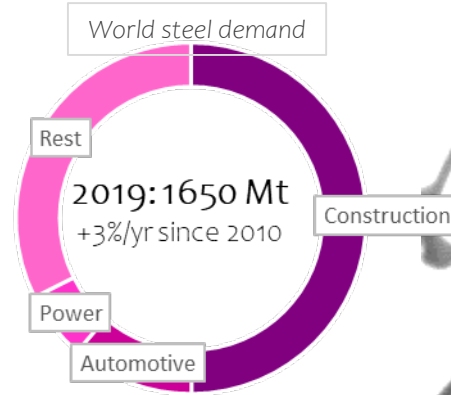
MOTIVATION – OBJECTIVE

- Steel: important role in global emissions
- What transformations towards economy-wide GHG neutrality?



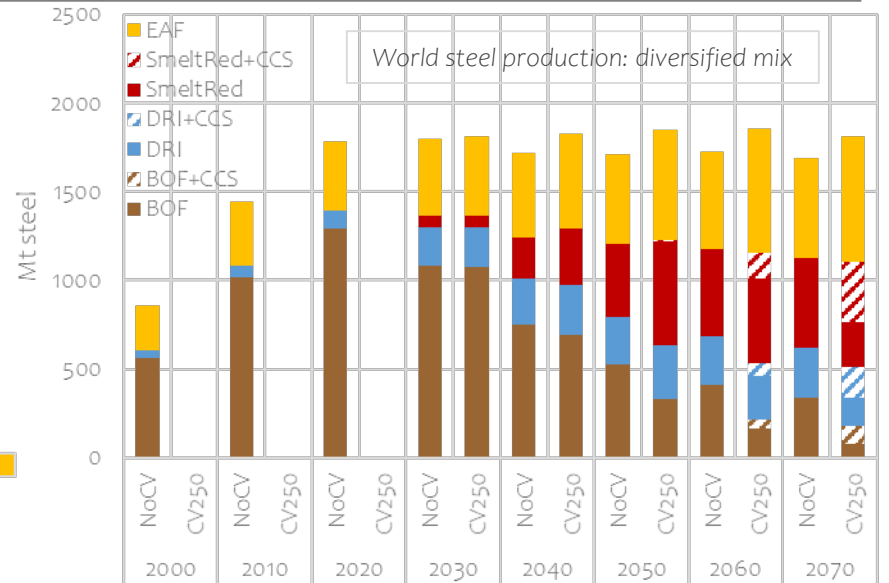
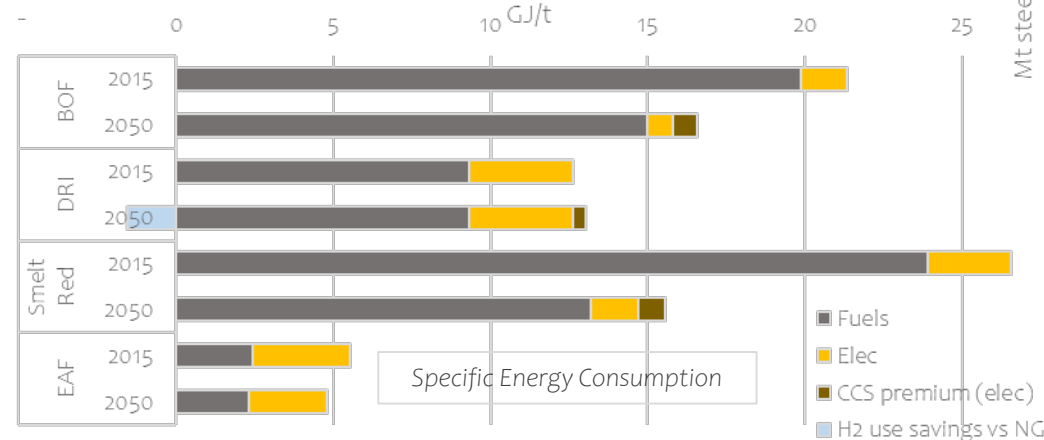
PROJECTING DEMAND

- Steel demand expected to increase, few signs of saturation
- Methods: Intensity of Use, Intensity of Stock, bottom-up individual uses

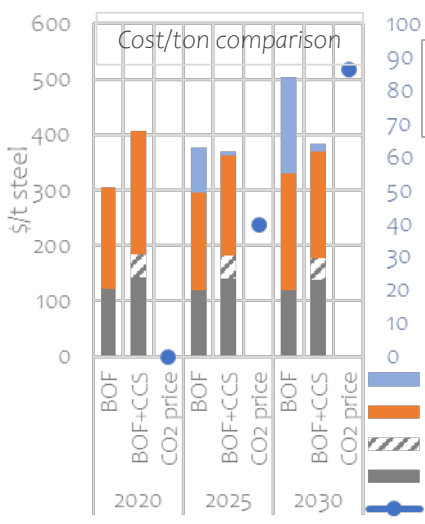


TECHNOLOGIES Low-emissions options:

- CCS retrofit, use of biomass in Blast Oxygen Furnace (BOF) or in Smelting reduction
- Direct-Reduced Iron (DRI) with hydrogen + EAF
- Scrap recycling in electric arc furnace (EAF)

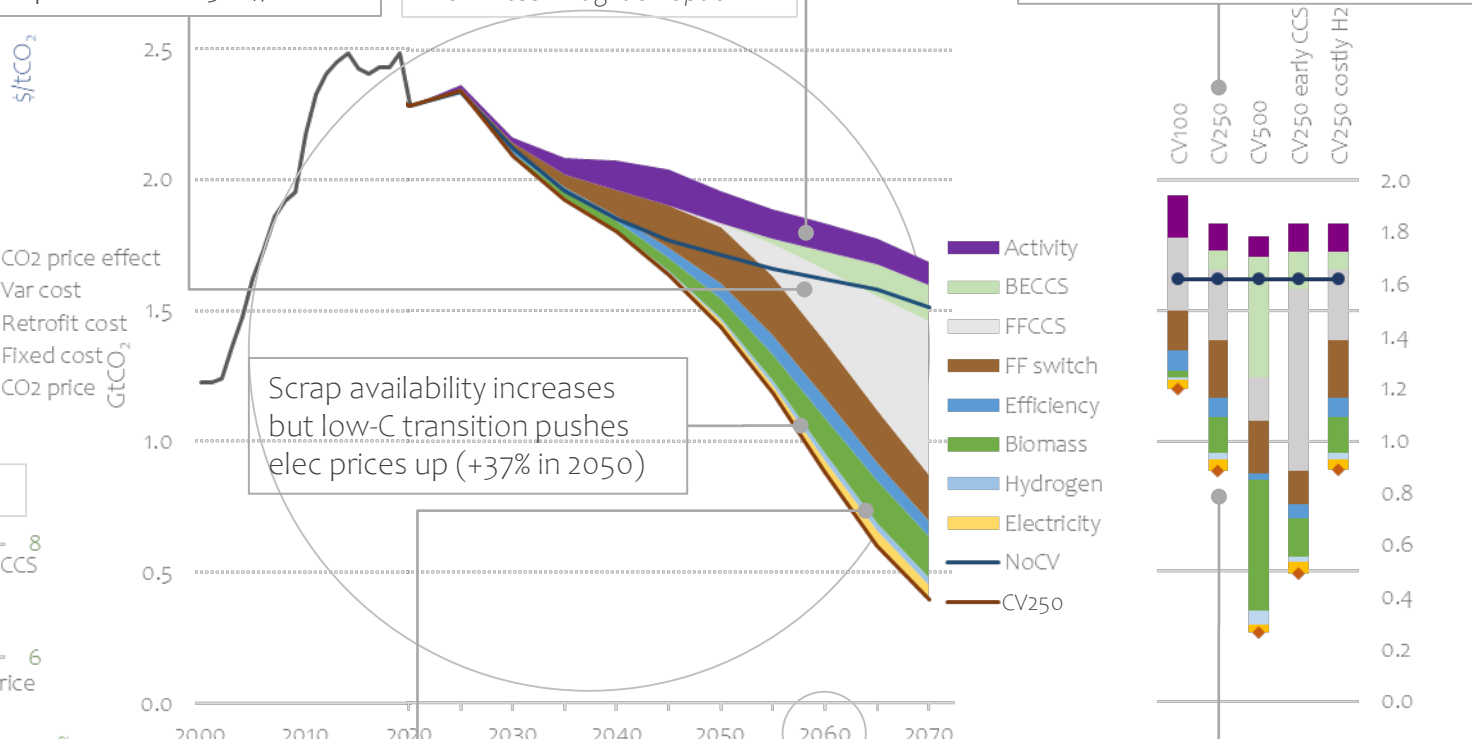
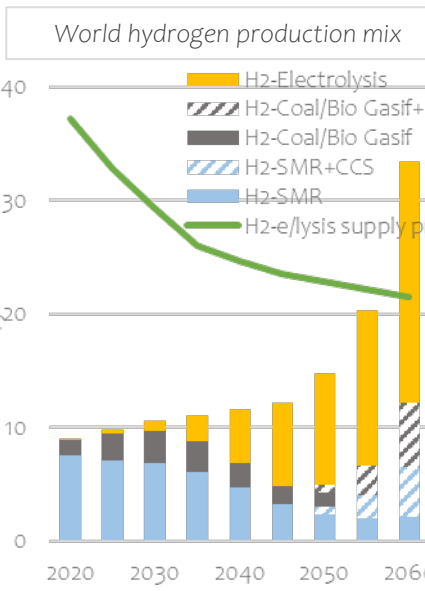


MITIGATION OPTIONS & TRADE-OFFS



2050 rebound: Steel in Power: t/MW 19% lower but 29% more MW installed

CCS retrofit: cost-efficient option from ~ 50 \$/tCO₂



Scrap availability increases but low-C transition pushes elec prices up (+37% in 2050)

DRI: CH₄ vs H₂: mid-term H₂ price driven by fossil-based capacities (N-fertilizer prod.)

CV250 scenario 2060 vs 2019: steel -64%; world -57%

> POLICY PRIORITIES

- Foster circular economy & material efficiency
- Assess (BE)CCS feasibility/desirability
- Invest in H2 electrolysis learning

> FURTHER RESEARCH

- Demand sensitivities coupled w/ construction & cement module
- Trade: import low-C steel vs low-C electrofuels