

A circular transition for the UK steel industry: The impacts of utilising domestic scrap and increased secondary steel production

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CircularMetal



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Context

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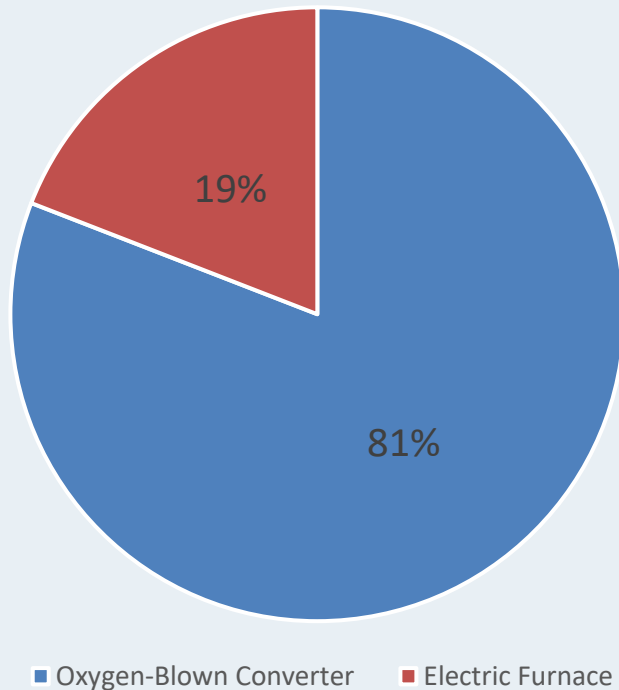
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However, the **UK has a comparative advantage** in both abundant **scrap** supply - it currently exports around 75% of its scrap steel - and also **a low-carbon electricity** supply.

What impact would swapping primary for secondary steel production have on the UK economy and what is the role of different policies in achieving this?

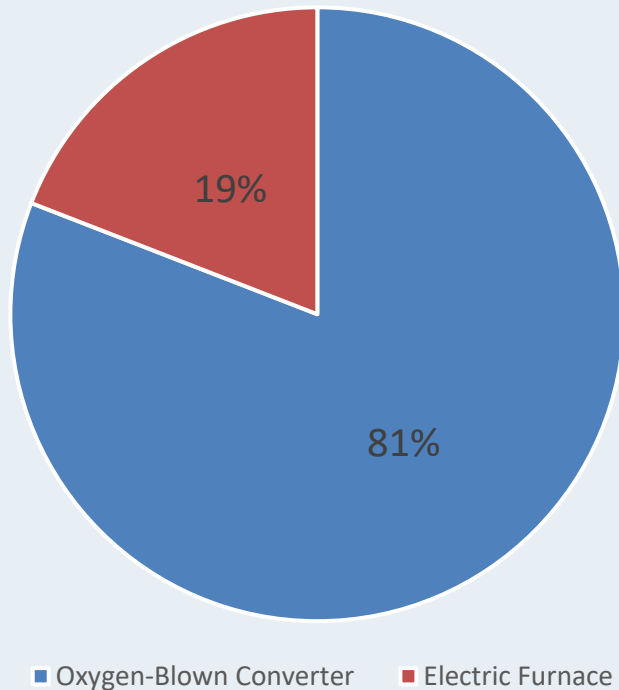
Percentage of UK steel production by type 2020



Year	BF-BOF share	EAF share	Total Production (Mt crude steel)	Apparent steel use (Mt)
2021	81.7%	18.3%	7.2	10.8
2020	80.9%	19.1%	7.1	9.0
2019	78.8%	21.2%	7.2	10.2
2018	77.8%	22.2%	7.3	10.8

Source: World Steel Association (2022)

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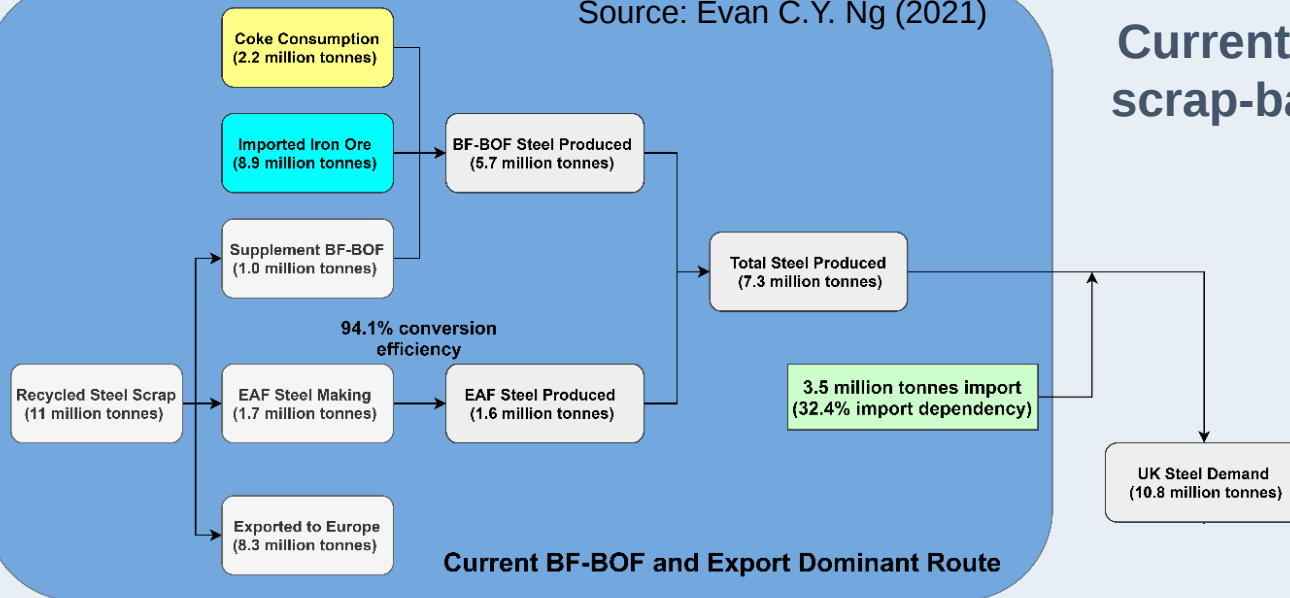
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UK produces around 11 Mt scrap steel per year – of which 2.7 Mt used domestically (over 75% exported)

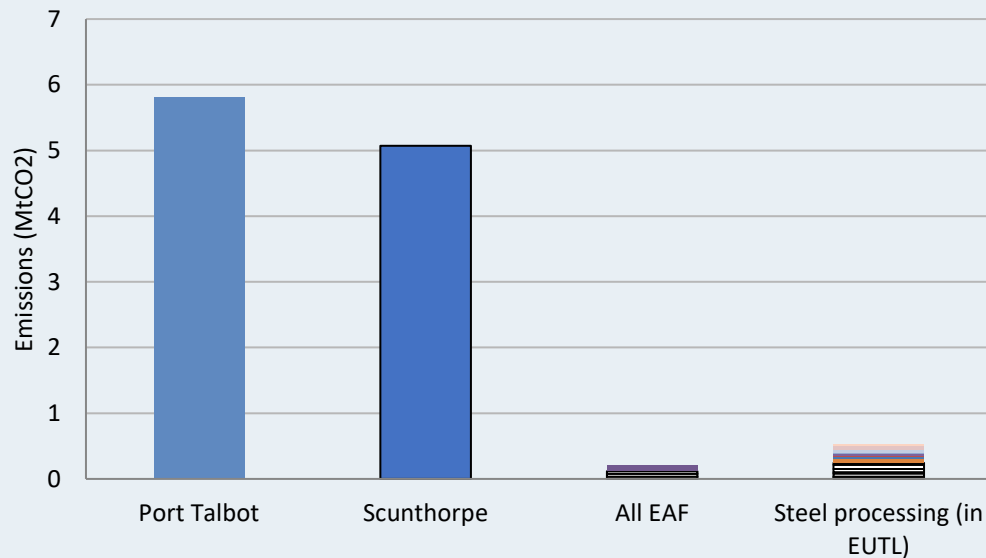
Source: Evan C.Y. Ng (2021)

Current UK steel production and scrap-based EAF dominant route



Capacity/production	2018	Capacity utilization
EAF Capacity	2.5	
EAF production	1.6	64%
BOF Capacity	8.5	
BOF production	5.7	67%
Scrap recycling capacity	11 Mt/year	
Scrap recycling	7.3 Mt/year	66%

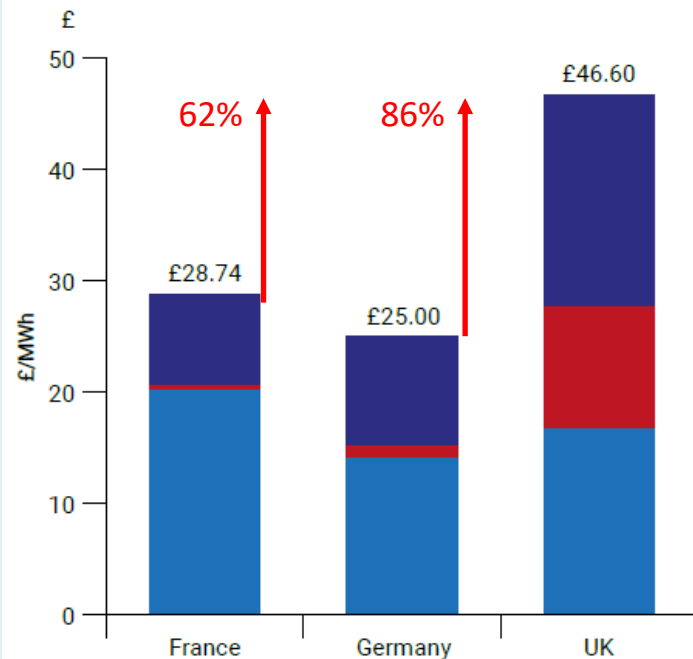
UK steel sector emissions by site/type for 2018



Source: Ember Steel Production Dataset (2020)

Figure 1: Energy prices for steel producers in France, Germany, and the UK (2020/21)

■ Wholesale costs (excl. carbon costs) ■ Network costs
■ Policy costs incl. carbon costs, after exemptions

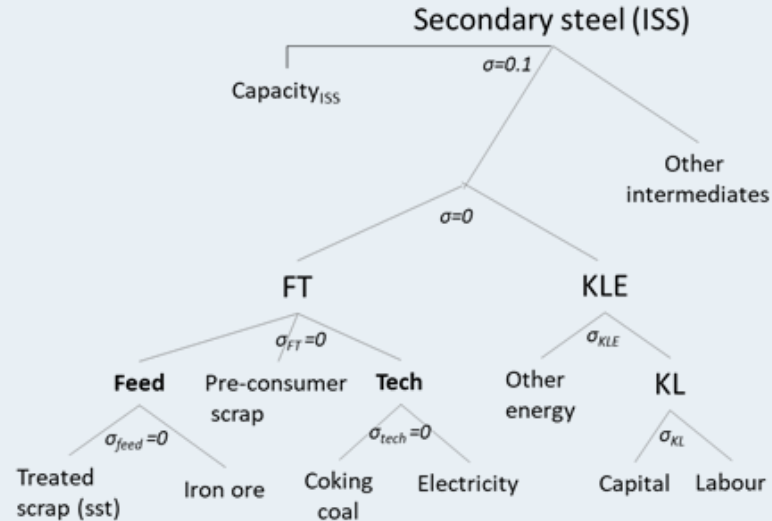
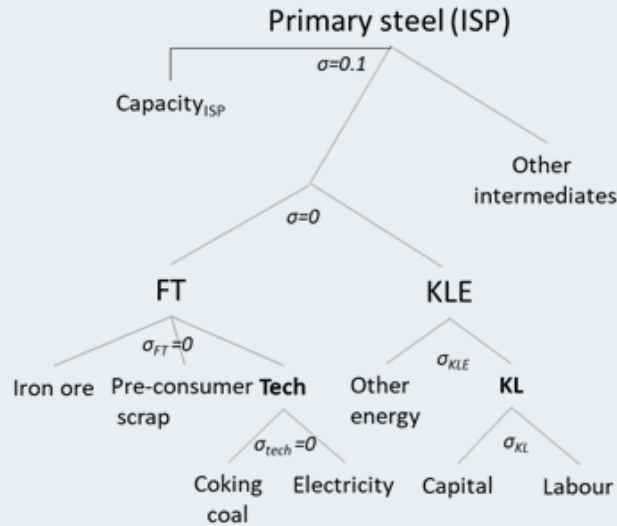


Source: UK Steel

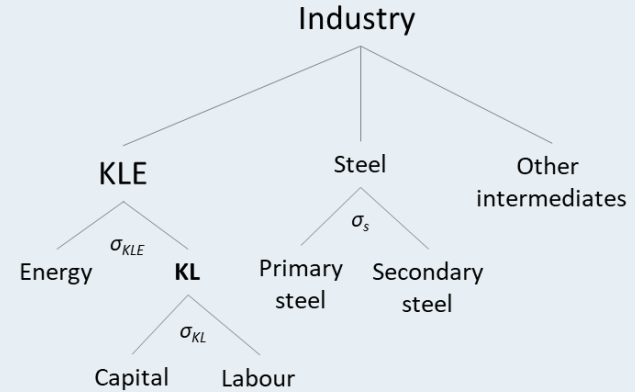
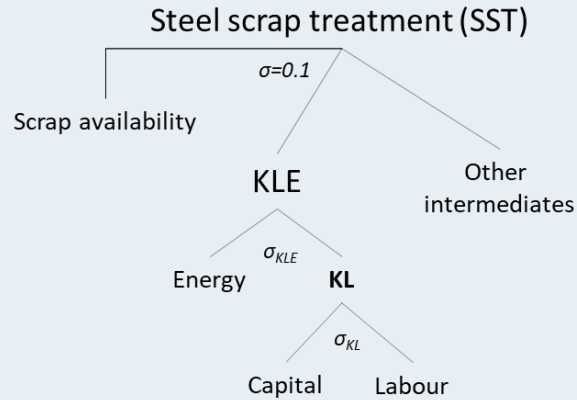
Global CGE model
Recursive dynamic
Based in GTAP9-Power 2011
Steel in a circular economy context

19 Regions		33 Sectors	
AFR	Africa	AGR	Agriculture and food
AUS	Australia	I_M	Iron mining
CAN	Canada	O_M	Other minerals mining
CHI	China	WOP	Wood products
CSA	Central and South America	PPP	Paper products publishing
EEU	Eastern Europe	CRP	Chemical rubberplastic prods
FSU	Former Soviet Union	ISP	Primary steel
IND	India	ISS	Secondary steel
JPN	Japan	SST	Steel scrap treatment
MEA	Middle-east	NFM	Non-ferrous metals
MEX	Mexico	NMM	Non-metallic minerals
ODA	Other Developing Asia	MTP	Metal products
SKO	South Korea	MVT	Motor vehicles and transport equipment
USA	USA	ELE	Electronic equipment
WEU	Western Europe	MAE	Machinery and other equipment
RUS	Russia	OMA	Other manufacture
IDN	Indonesia	COA	Coal
BRA	Brazil	OIL	Crude oil
UK	United Kingdom	GAS	Gas
		P_C	Petroleum & Coke
4 Endowments		TnD	Transmission and distribution
LND	Land	NUP	Nuclear power
LAB	Labor	CFP	Coal-fired power
CAP	Capital	GFP	Gas-fired power
RES	Natural Resources	WIP	Wind power
		HYP	Hydroelectric power
		OFP	Oil-fired power
		OTP	Other power
		SOP	Solar power
		RCY	Recycling
		CNS	Construction
		TRA	Transport
		SER	Service

Modelling framework



Modelling framework

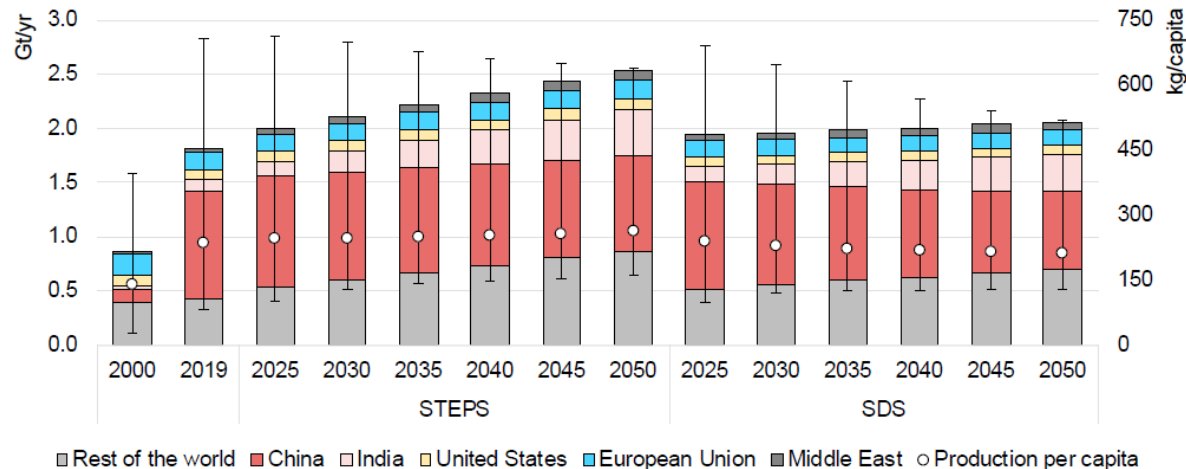


Iron and Steel Technology Roadmap, IEA (2022)

STEPS: Stated Policies Scenario

- Steel production grows from around 1.9 Gt in 2019 to over 2.5 Gt in 2050
- Driven by rising demand in emerging economies
- China dominance declines from just over 50% today to 35% in 2050.

Figure 2.4 Regional steel production and production per capita by scenario

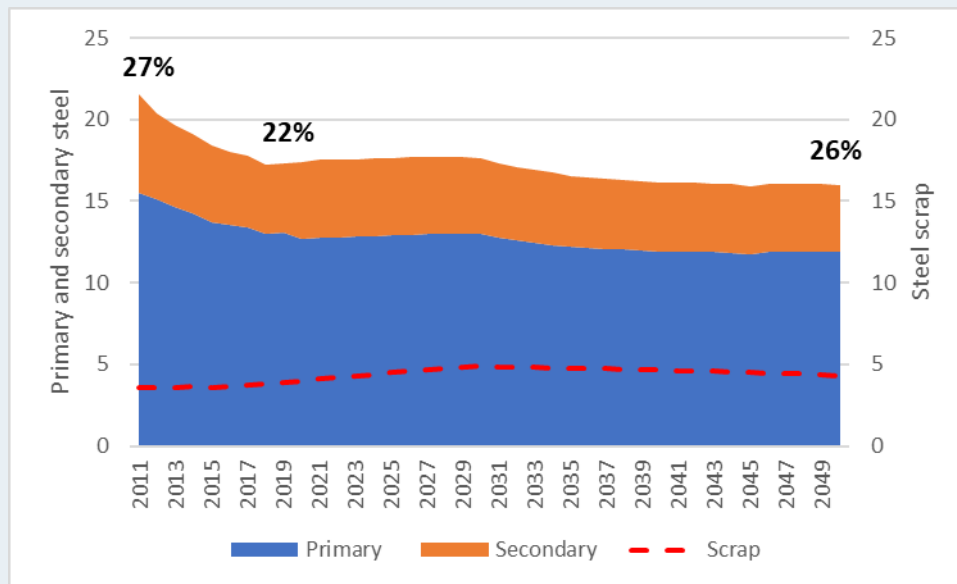


Source: IEA (2020)

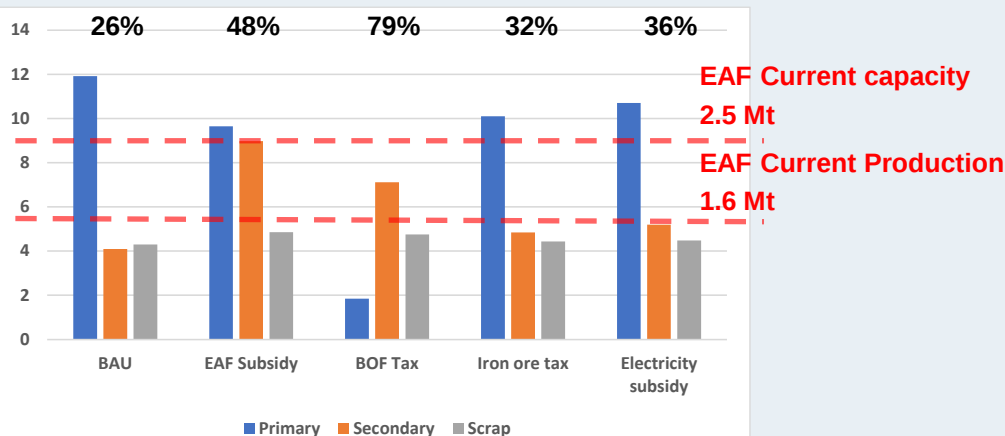
Climate and circular economy scenarios

Scenario	Climate action	Circular steel policies
BAU	SSP2 – NDC	STEPS
EAF subsidies	SSP2 – NDC	11% subsidy to secondary steel to achieve current EAF full capacity
BOF taxes	SSP2 – NDC	30% tax on primary steel production
Iron ore tax	SSP2 – NDC	30% tax on iron ore imports
Price subsidy	SSP2 – NDC	50% Electricity price subsidy to secondary production

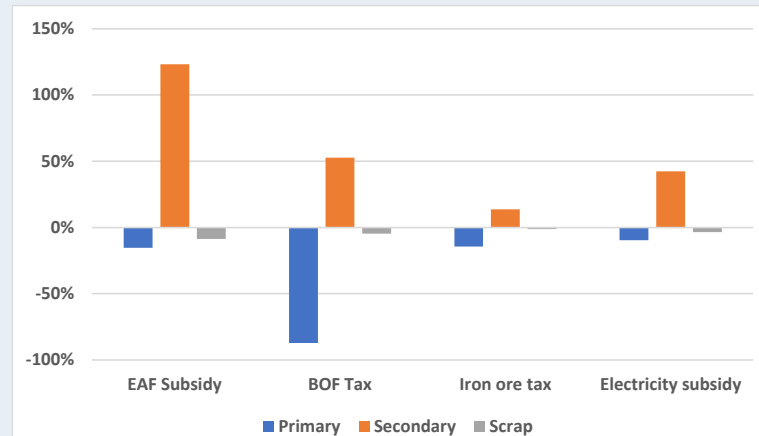
BASELINE – UK steel production (million USD)



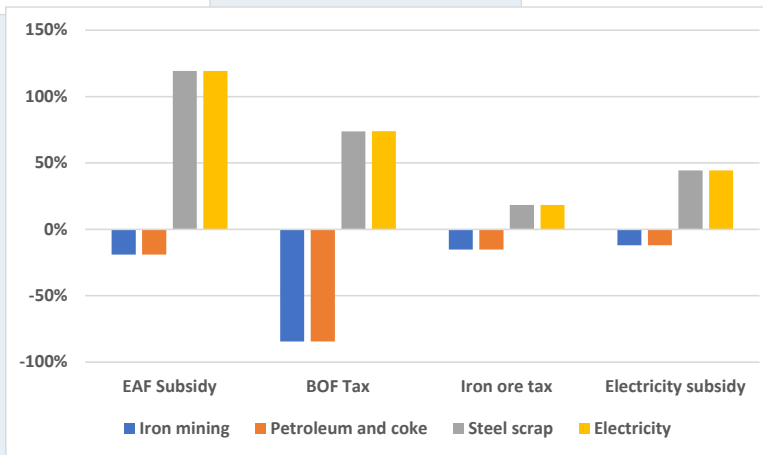
UK - steel production in 2050 by scenario (million USD)



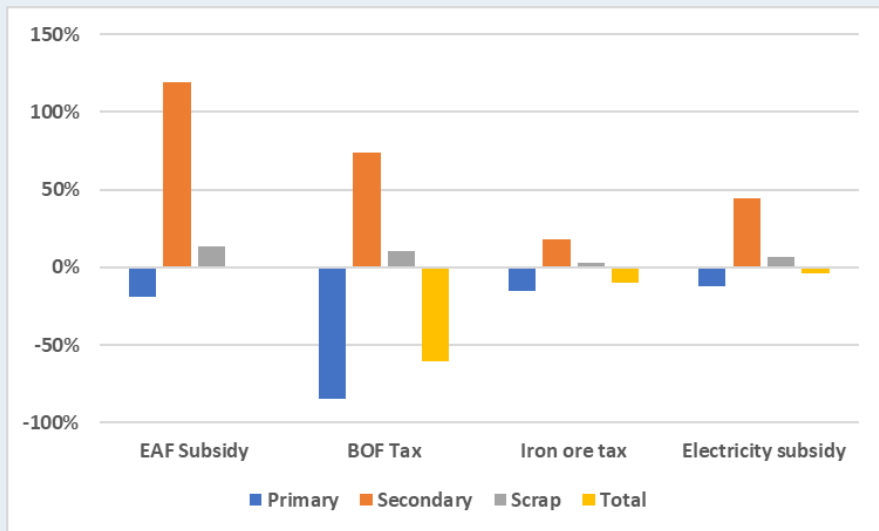
UK - Change in exports in 2050 by scenario (wrt bau)



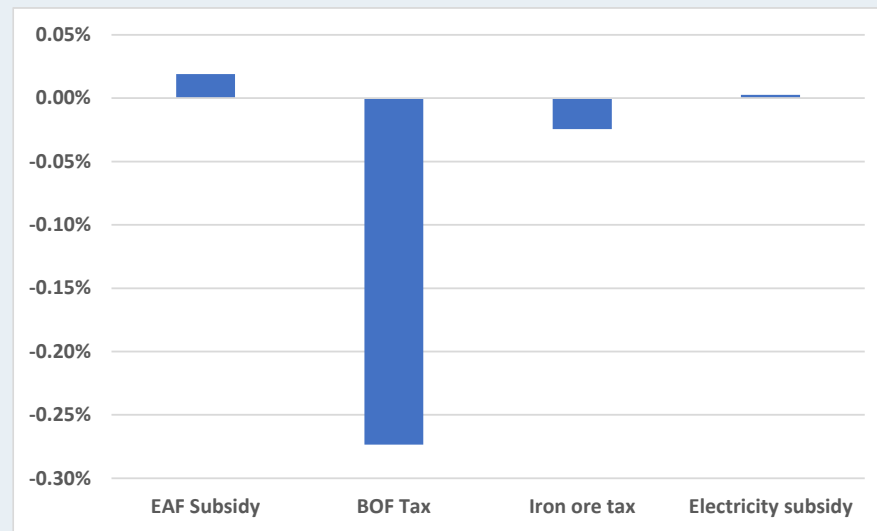
UK - Change in steel inputs in 2050 by scenario (wrt bau)



UK - Change in sectoral emissions in 2050 by scenario (wrt BAU)



UK - Change in GDP in 2050 by scenario (wrt BAU)

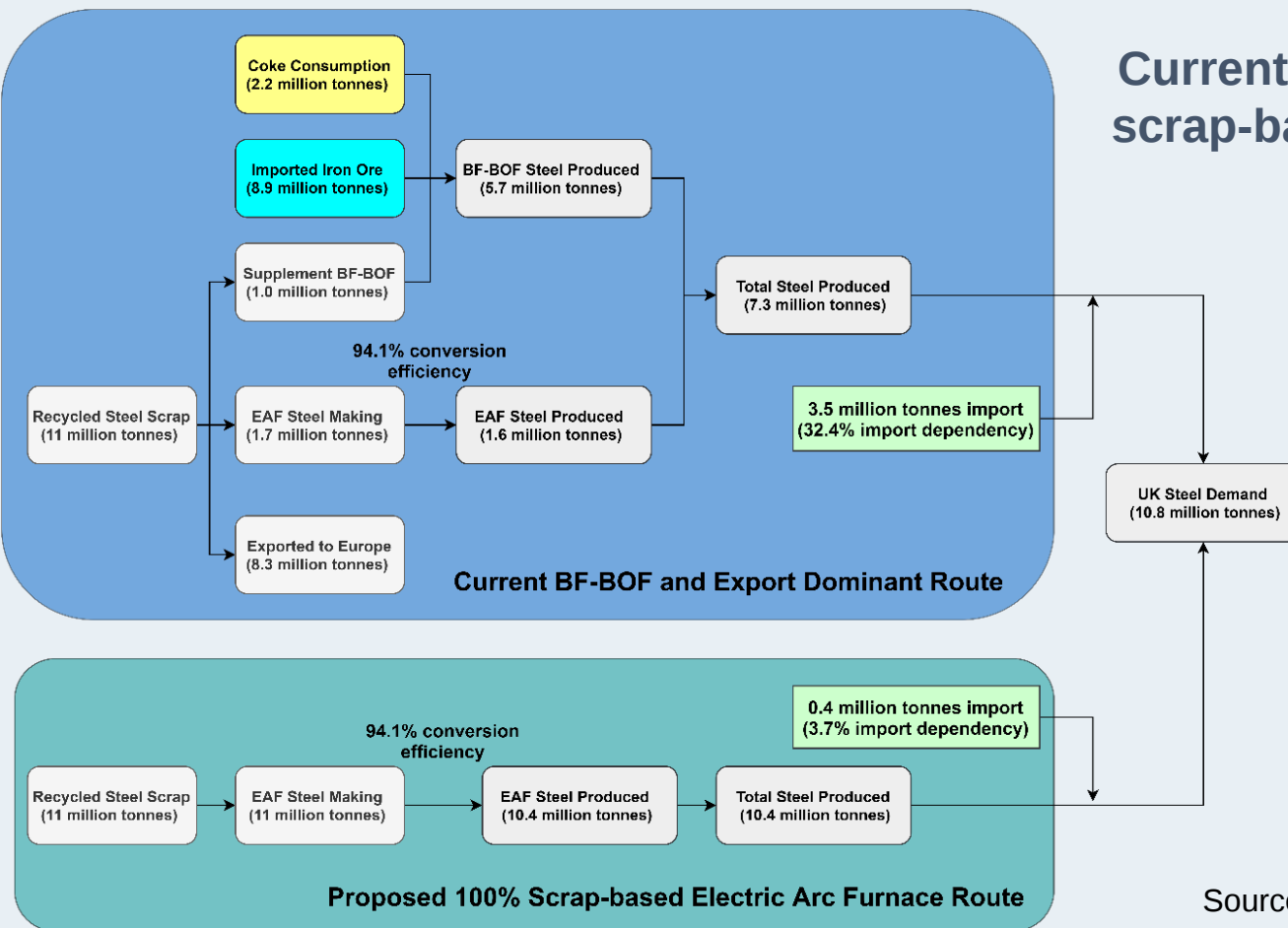


Conclusions

- A shift from primary to secondary production **might be the medium-term** strategy for the UK steel industry. However, with current EAF installed capacity gains in CO₂ reductions is limited
- If EAF facilities operate a full capacity, the secondary production in 2050 increases from 26% to **50%**
- A higher secondary production requires **investments in downstream facilities** and a larger demand
- In the **long-term**, a greater use of domestic UK scrap would require an **expansion of the current EAF facilities**.
- Long-term strategies to decarbonise the steel sector should focus on **advanced technologies** such as hydrogen-based steel production and CCUS facilities

Thank you!

Current UK steel production and scrap-based EAF dominant route



Source: Evan C.Y. Ng (2021)