Options to supply the UK steel demand and meet the CO_2 targets

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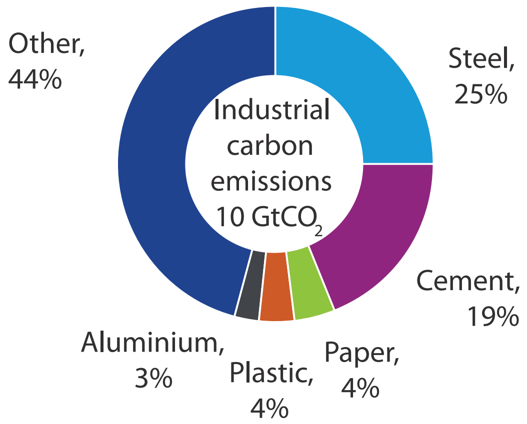
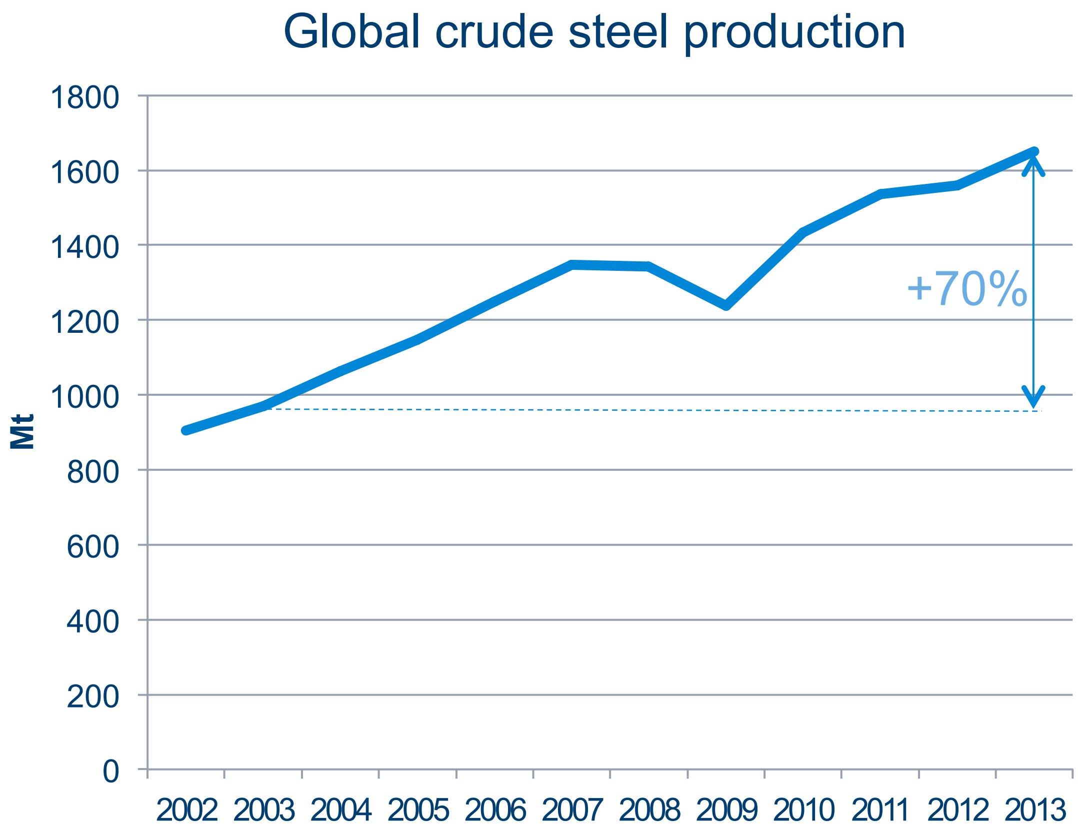
ISIE Conference 2015, Guildford, UK
July 10th, 2015

Steel global production and impacts

Global industrial CO_2 emissions, 2005



(Allwood *et al.*, 2012)



(World Steel Association, 2014)

Reducing steel industrial emissions and supply future demand

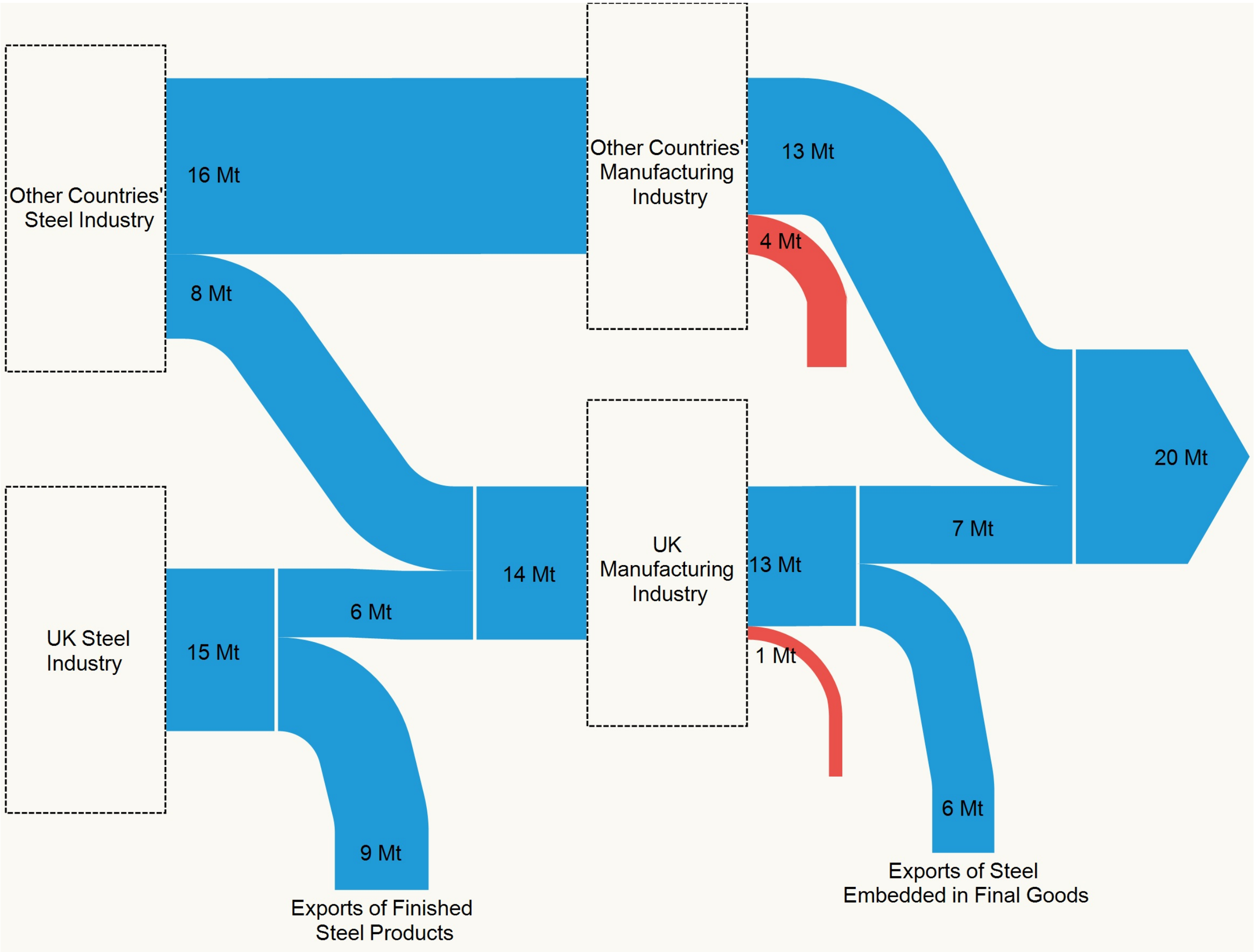
How can steel industry emissions be reduced?

1. Switching to more efficient production routes;
2. Increasing the efficiency of current production routes;
3. Reducing steel demand.

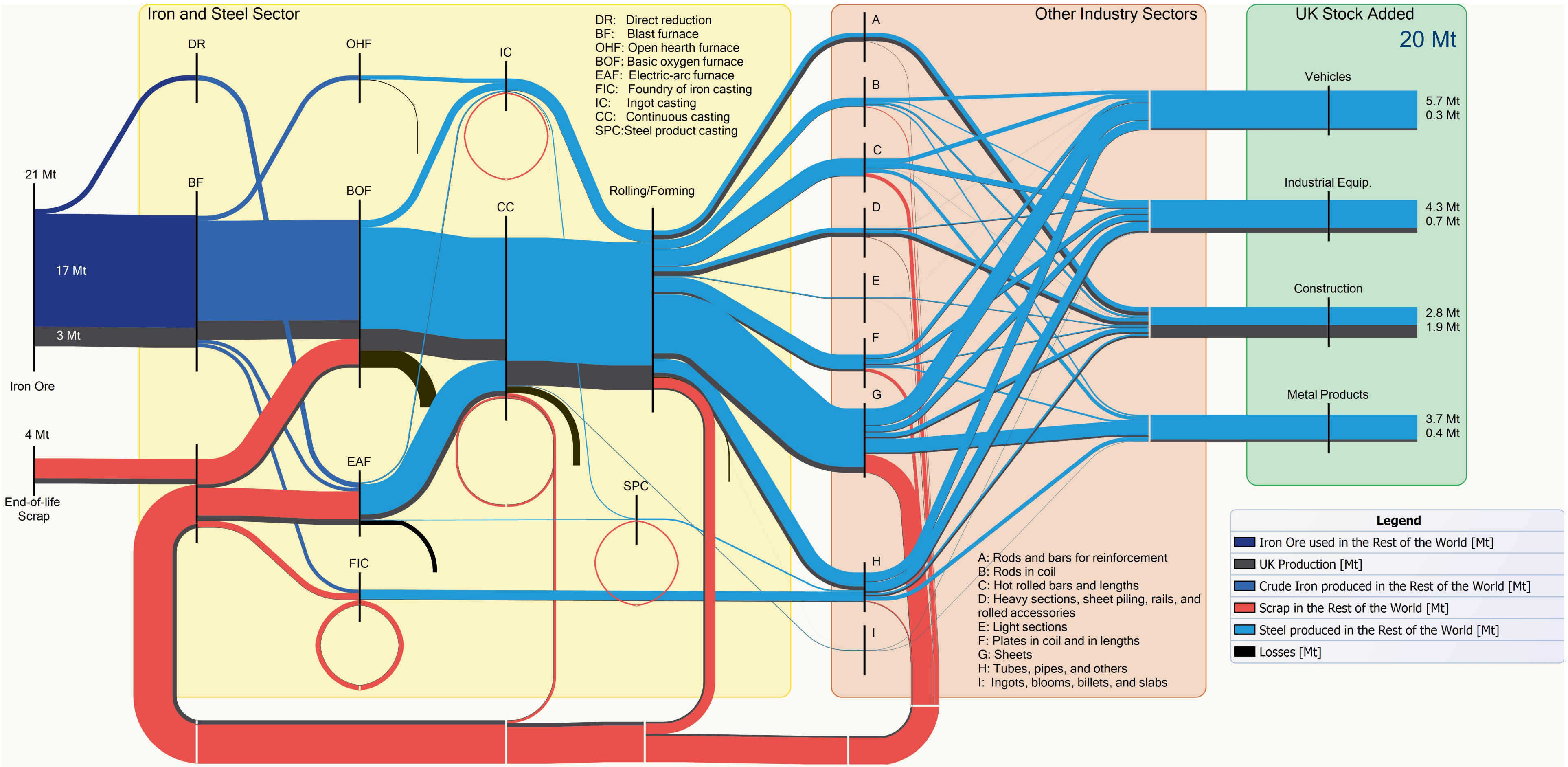
In the UK:

- The Government has committed to a reduction of UK GHG emissions to 80% of the 1990 levels by 2050.
- **How to supply future demand for steel in the UK and meet this climate target?**

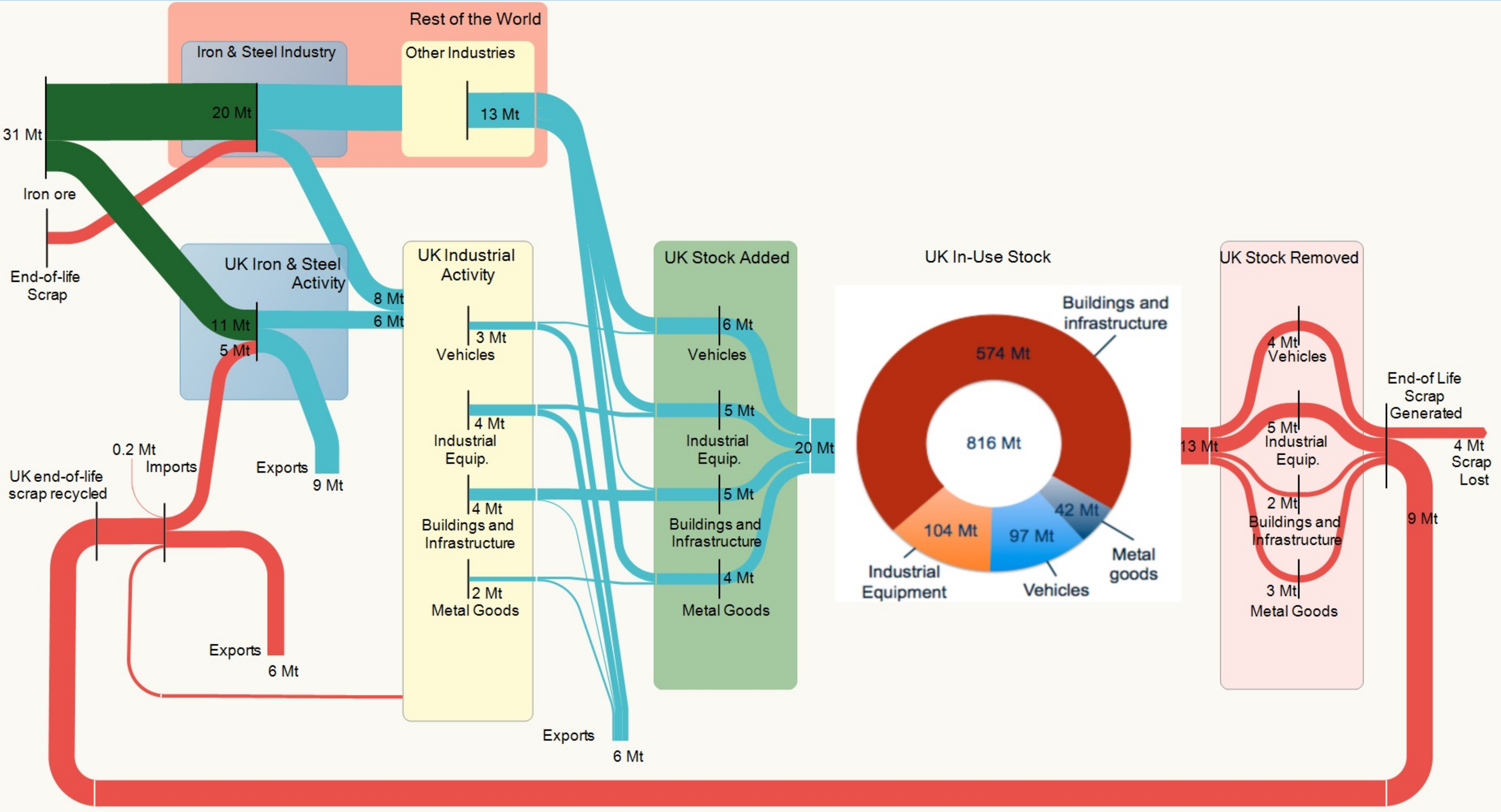
Steel flow to supply the UK demand, 2007



Steel flow to supply the UK demand, 2007



Steel added / removed from in-use stock, UK 2007



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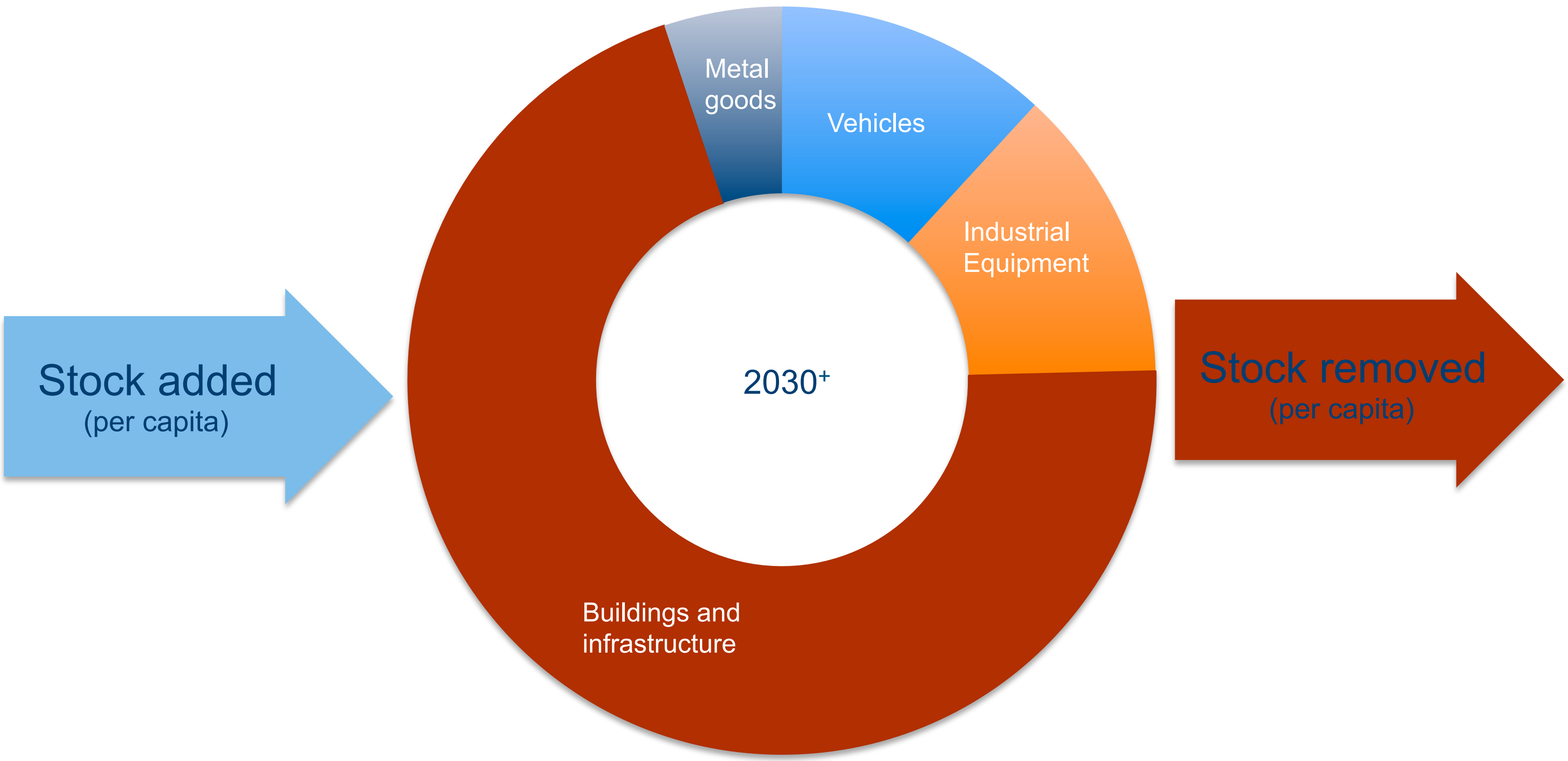
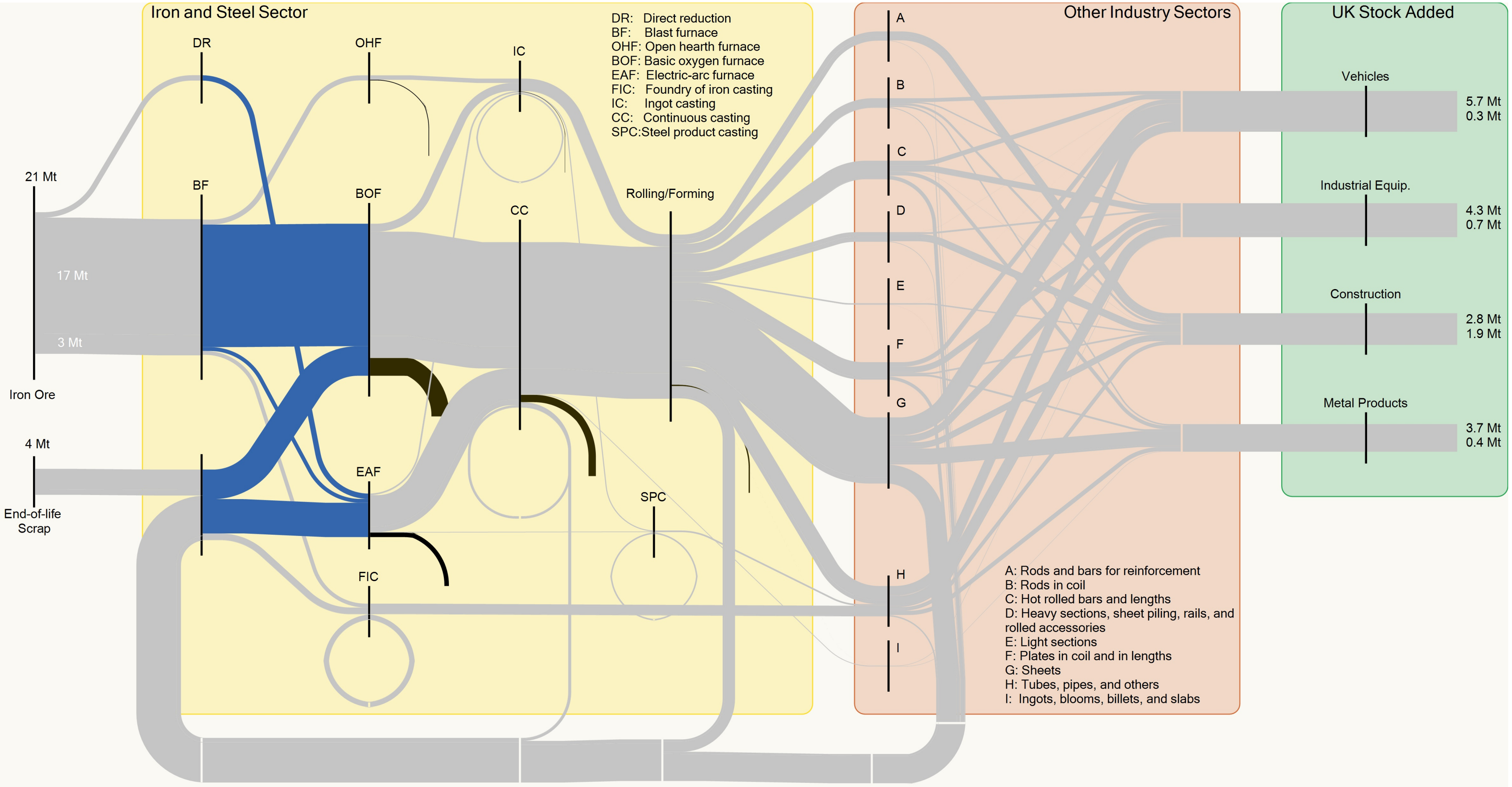
In-use stock saturation



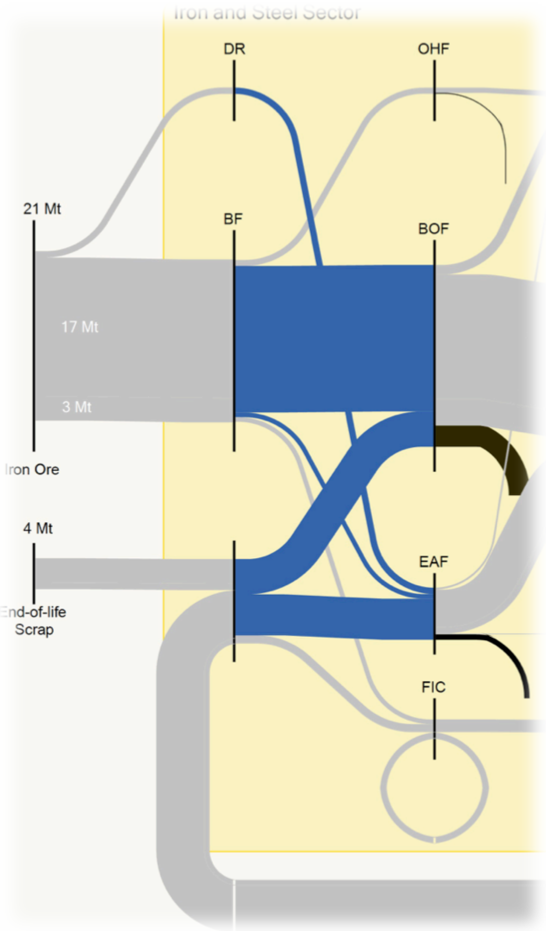
Estimating future UK crude steel demand

Product categories	Saturation stock [tonnes per capita] (Pauliuk et al., 2013)	Average lifetime [years] (Pauliuk et al., 2013)	Demand for new steel additions to stock [Mt]	Demand for crude steel [Mt]
Vehicles	1.3	20	5.4	7.4
Industrial equipment	0.9	30	2.6	3.4
Buildings and infrastructure	10.0	75	13.3	16.4
Metal goods	0.6	15	3.3	4.6
Total	**12.8**		**24.5**	**31.7**

Options for future UK steel production



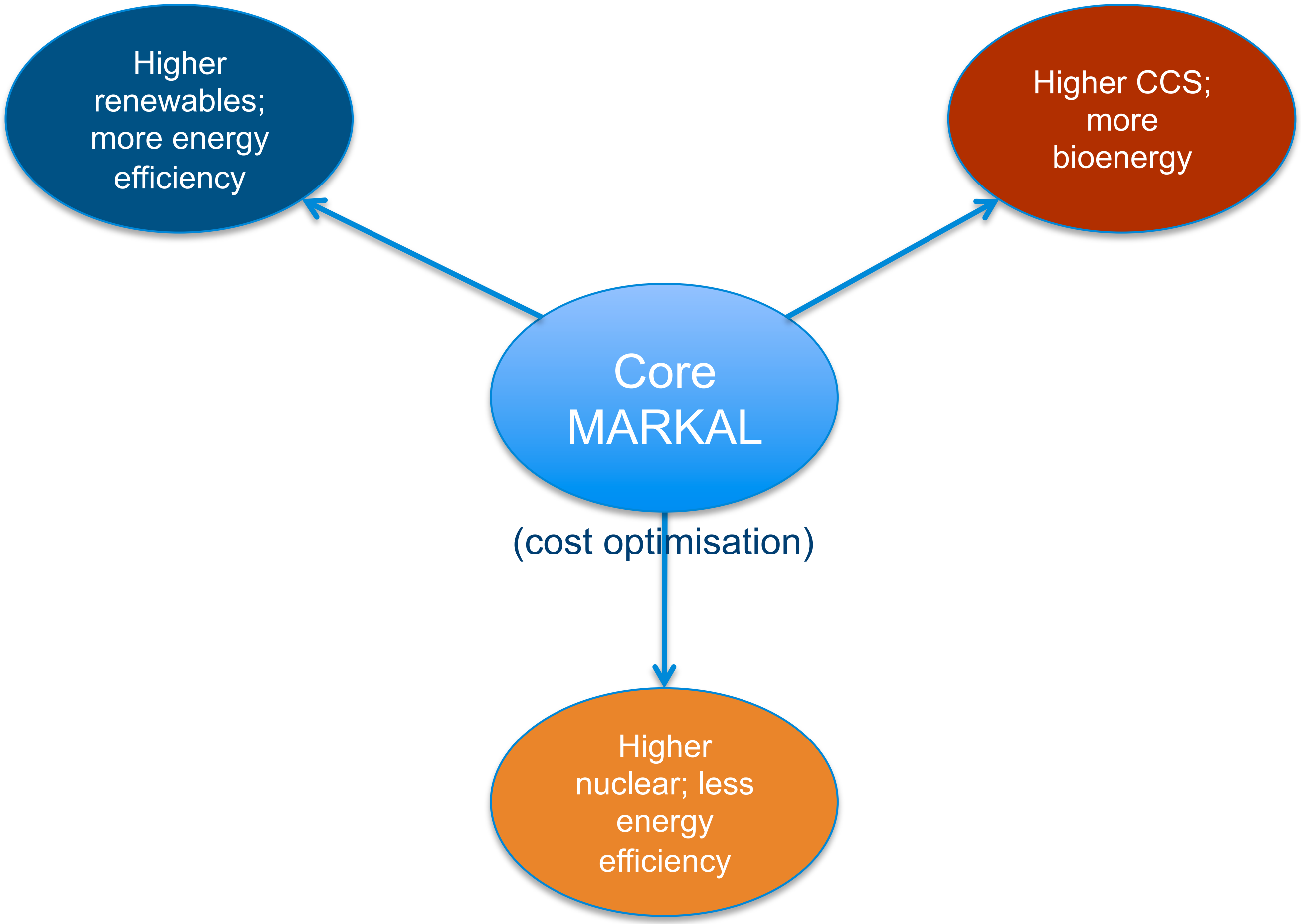
Options for future UK steel production



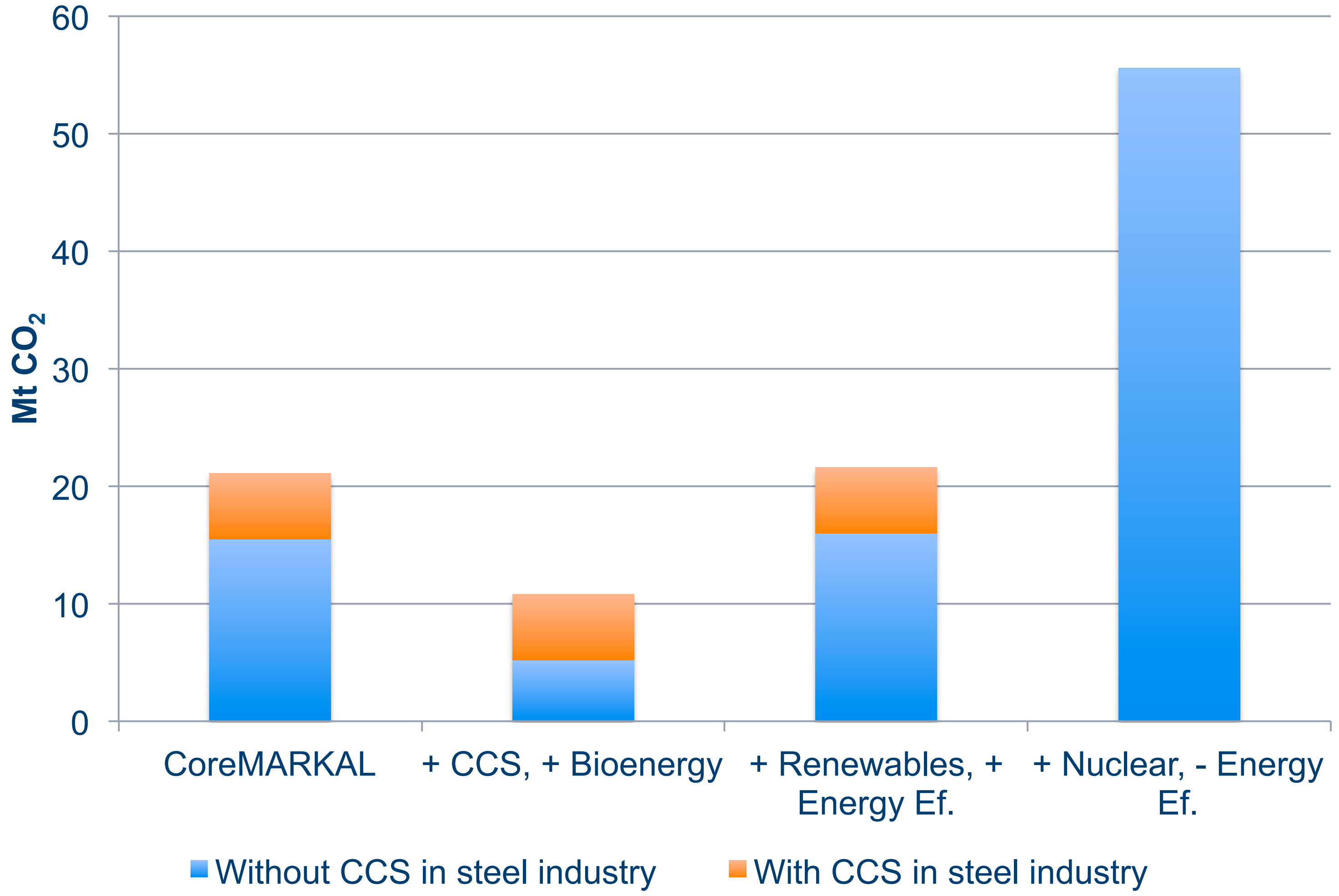
Iron sources	A	B	C	D	E
Hot metal from BF	67%	84%	5%	–	–
DRI	–	–	–	25%	50%
Scrap	33%	16%	95%	75%	50%

UK Carbon Plan Pathways

4 pathways for a low carbon future:



Emissions for the UK steel industry in 2050



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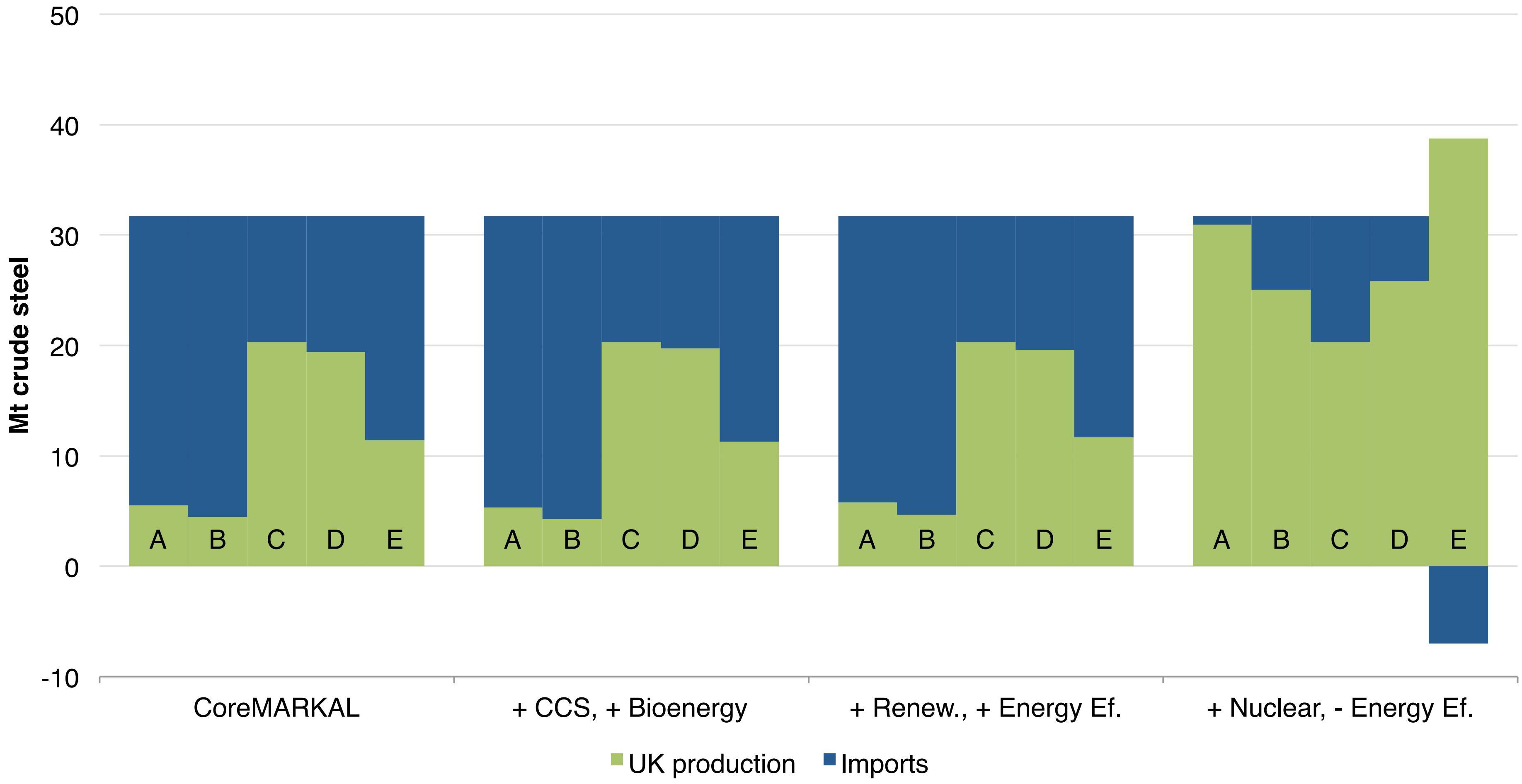
UK Steel scenarios / Energy pathways

	CoreMARKAL	High CCS, more bioenergy	High renewables, more energy efficiency	High nuclear, less energy efficiency
A: Current Scrap / BF – BOF				
B: BF – BOF				
C: 95% Scrap – EAF				
D: 75% Scrap / 25% DRI – EAF				
E: 50% Scrap / 50% DRI – EAF				

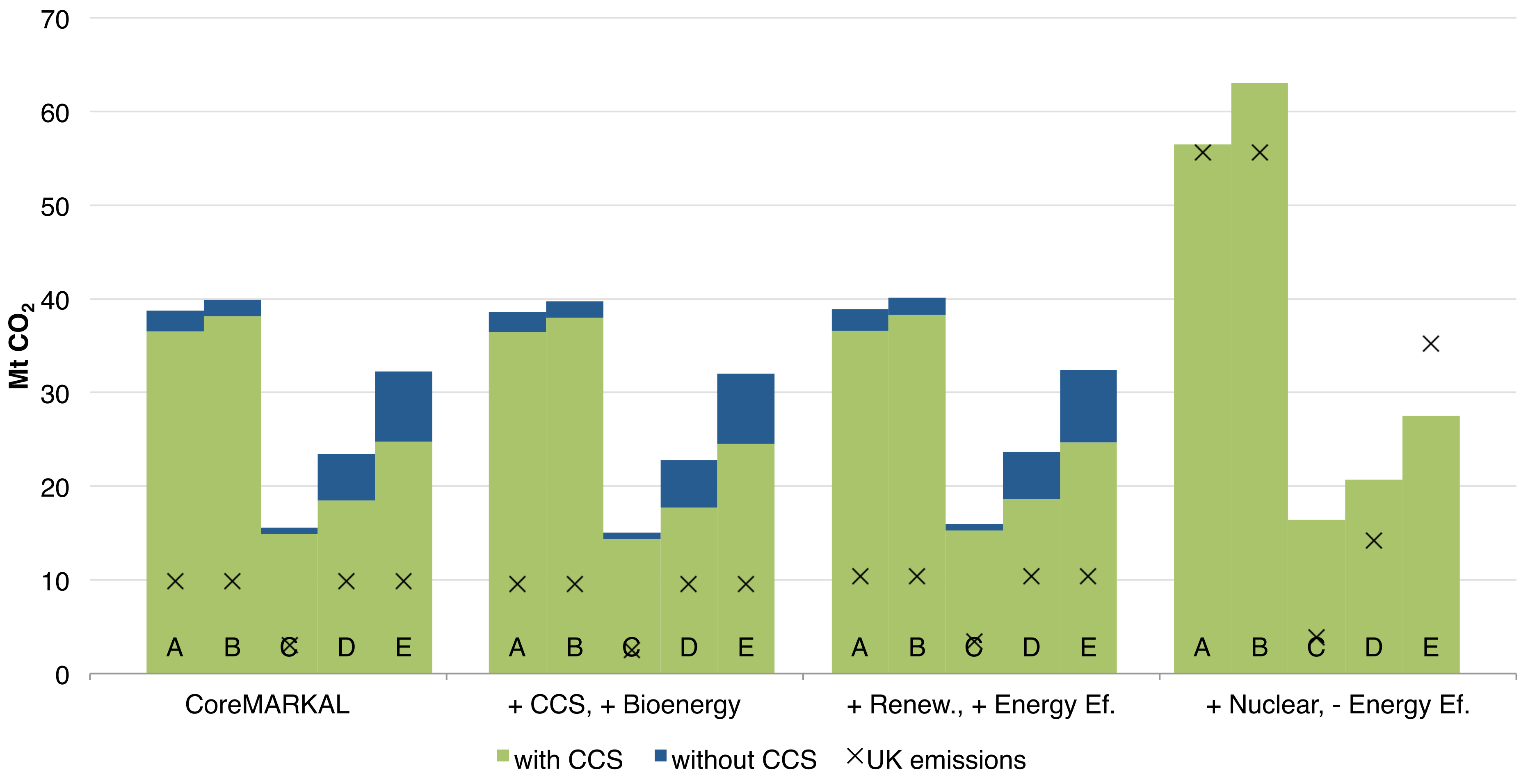
Total CO_2 emissions (in UK or other countries) required to supply UK steel demand in 2050, in terms of:

- UK production / steel imports required;
- Use of CCS in UK steel industry;
- Levels of UK electricity decarbonisation;
- Share of end-of-life scrap recycled;
- Products' lifetime.

UK steel production / steel imports required



Use of CCS in the UK steel industry



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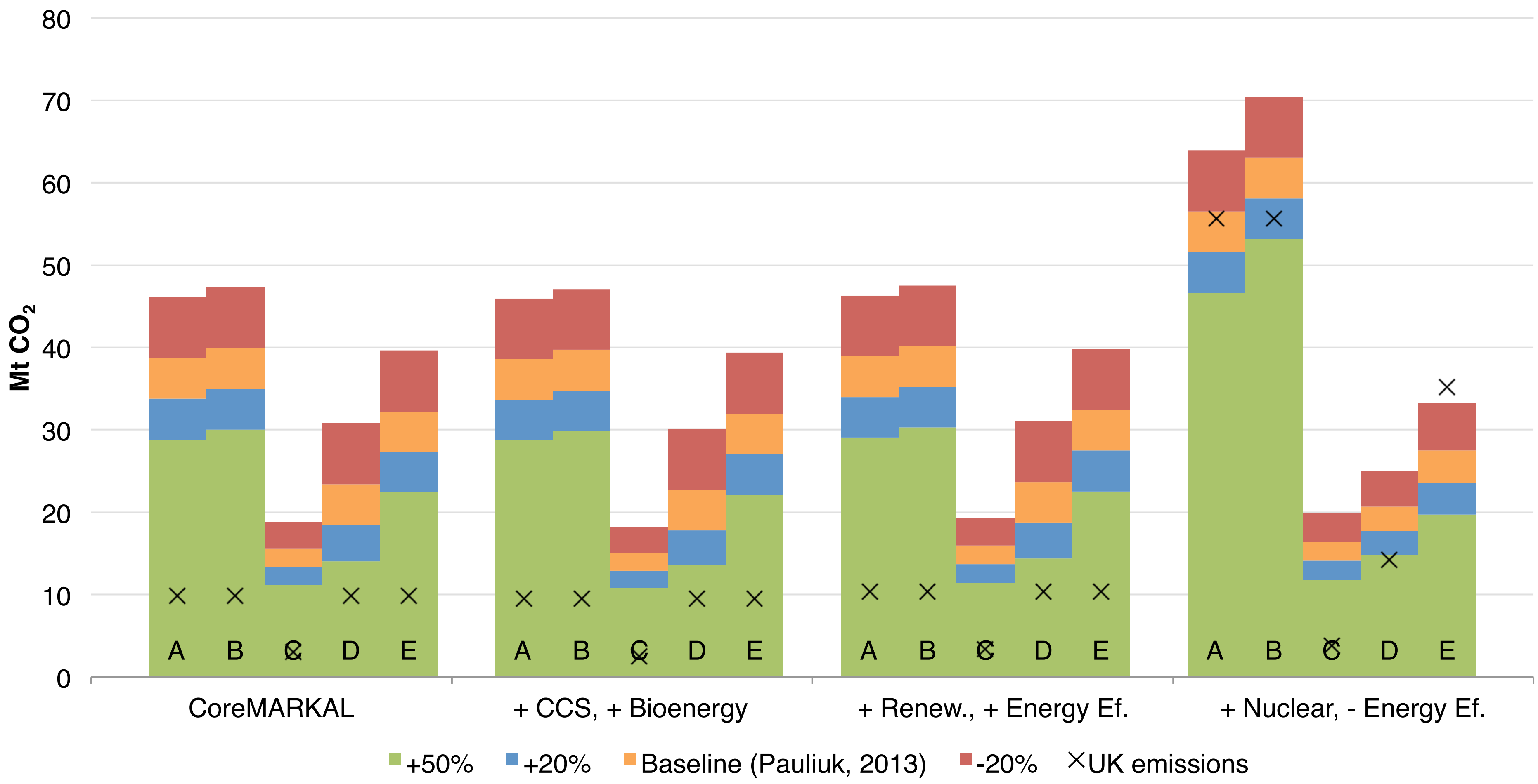
Change in products' lifetime in the UK



Conclusions

Best solutions to **minimise global CO_2 emissions** caused by steel purchased in the UK and to **reduce dependence on imports**:

- Maximise domestic end-of-life scrap in UK steel production;
- Deployment of direct reduced iron – electric arc furnace route in the UK;
- Extending products' lifetime in the UK.

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