

WHAT IS LOW CARBON STEEL?

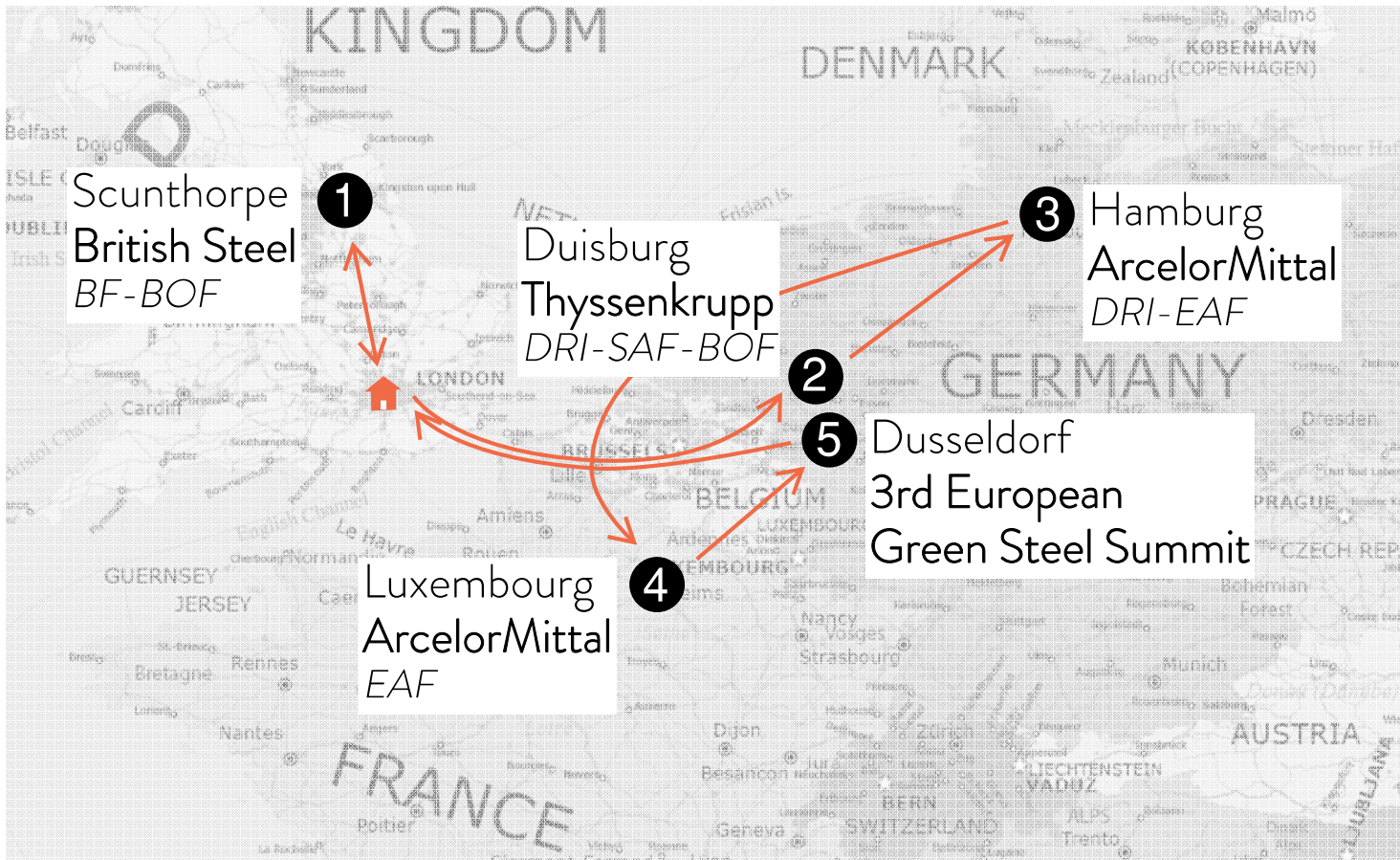
Decarbonising UK Primary Steelmaking Without Deindustrialisation
Lucy Fryer | Pai Lin Li Travel Grant 2024



1. Research Question

Reused and recycled steel alone cannot meet future steel demand. The UK has announced no near-zero primary steelmaking projects.
How can the UK decarbonise primary steelmaking while maintaining a viable domestic steel industry?

2. Travel Itinerary



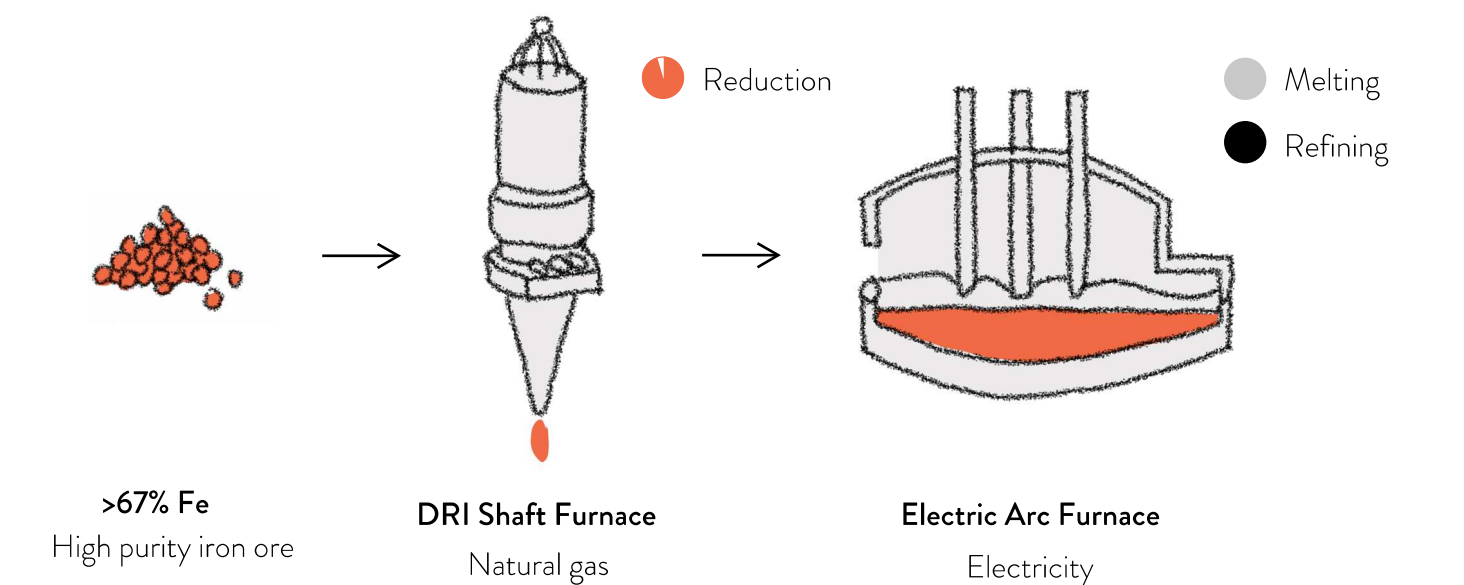
- Four steel plant visits in UK, Germany, and Luxembourg
- Attended the 3rd European Green Steel Conference (March 2025)



3. What Will Replace Blast Furnaces?

Hydrogen Direct Reduction Iron (H-DRI)

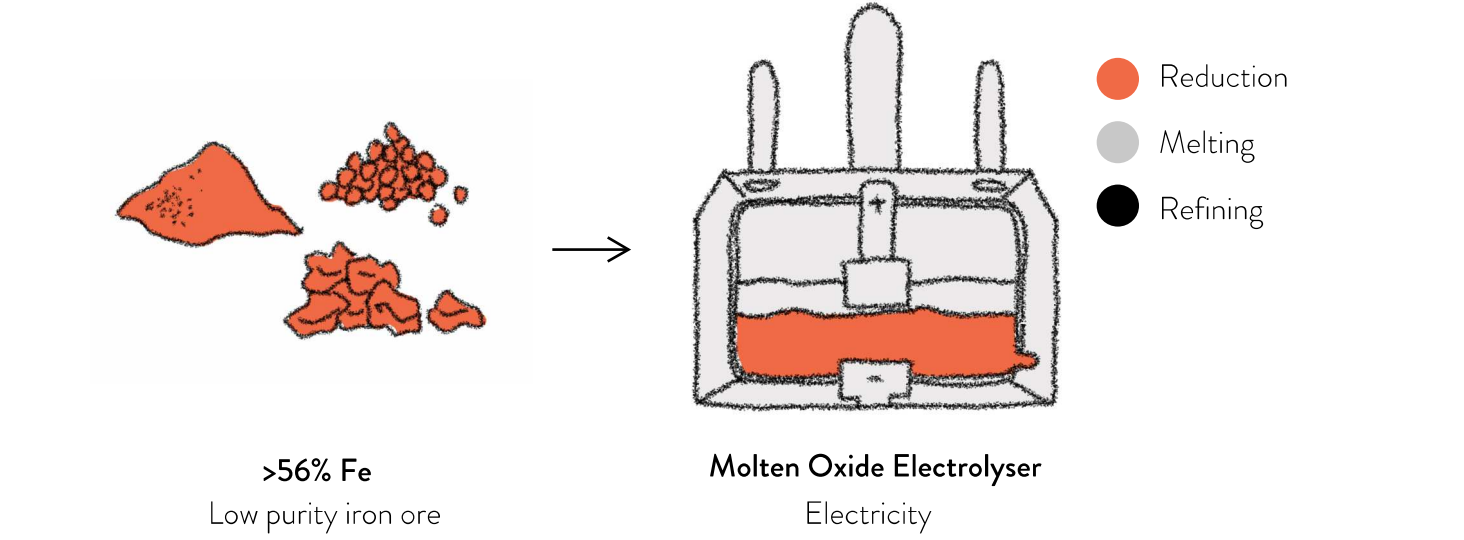
Example: Stegra, Sweden



- ✓ 95% CO₂ reduction
- ✓ Production to start in 2026 - 5Mt by 2030
- ✗ Requires hydrogen infrastructure
- ✗ Requires high-grade ore
- Decoupled iron and steelmaking

Molten Oxide Electrolysis (MOE)

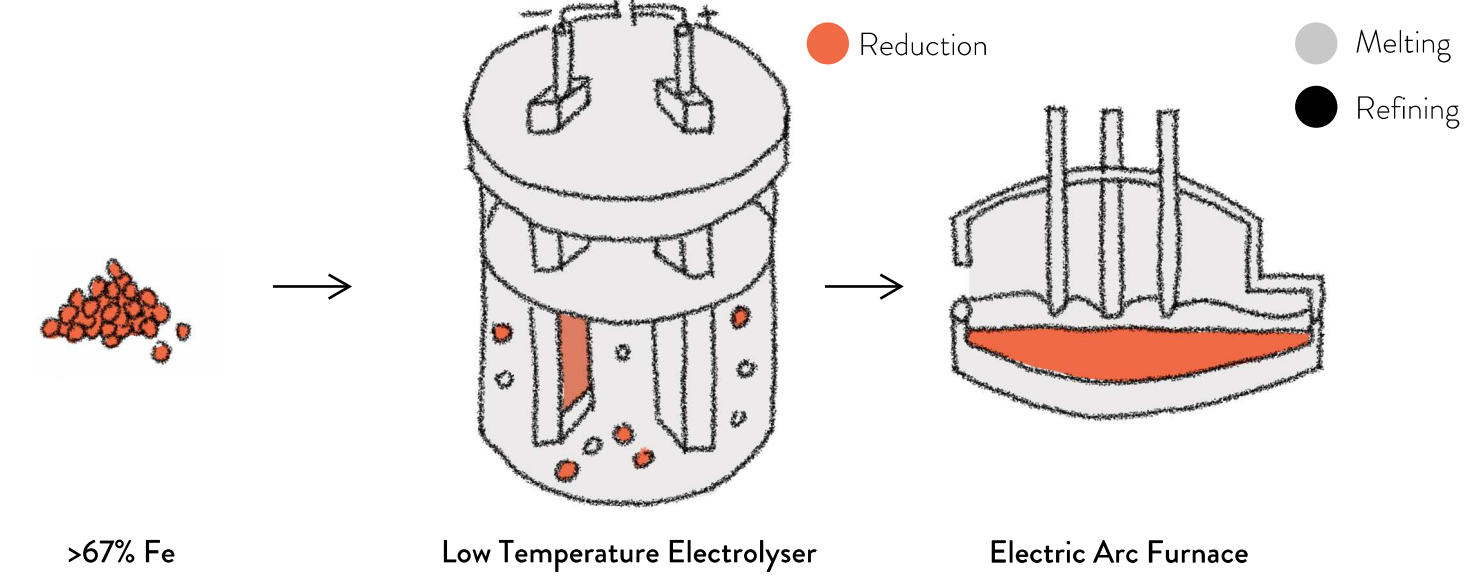
Boston Metal



- ✓ Uses lower-grade ore
- ✓ Zero carbon potential
- ✓ No hydrogen required
- ✗ Market ready after 2030

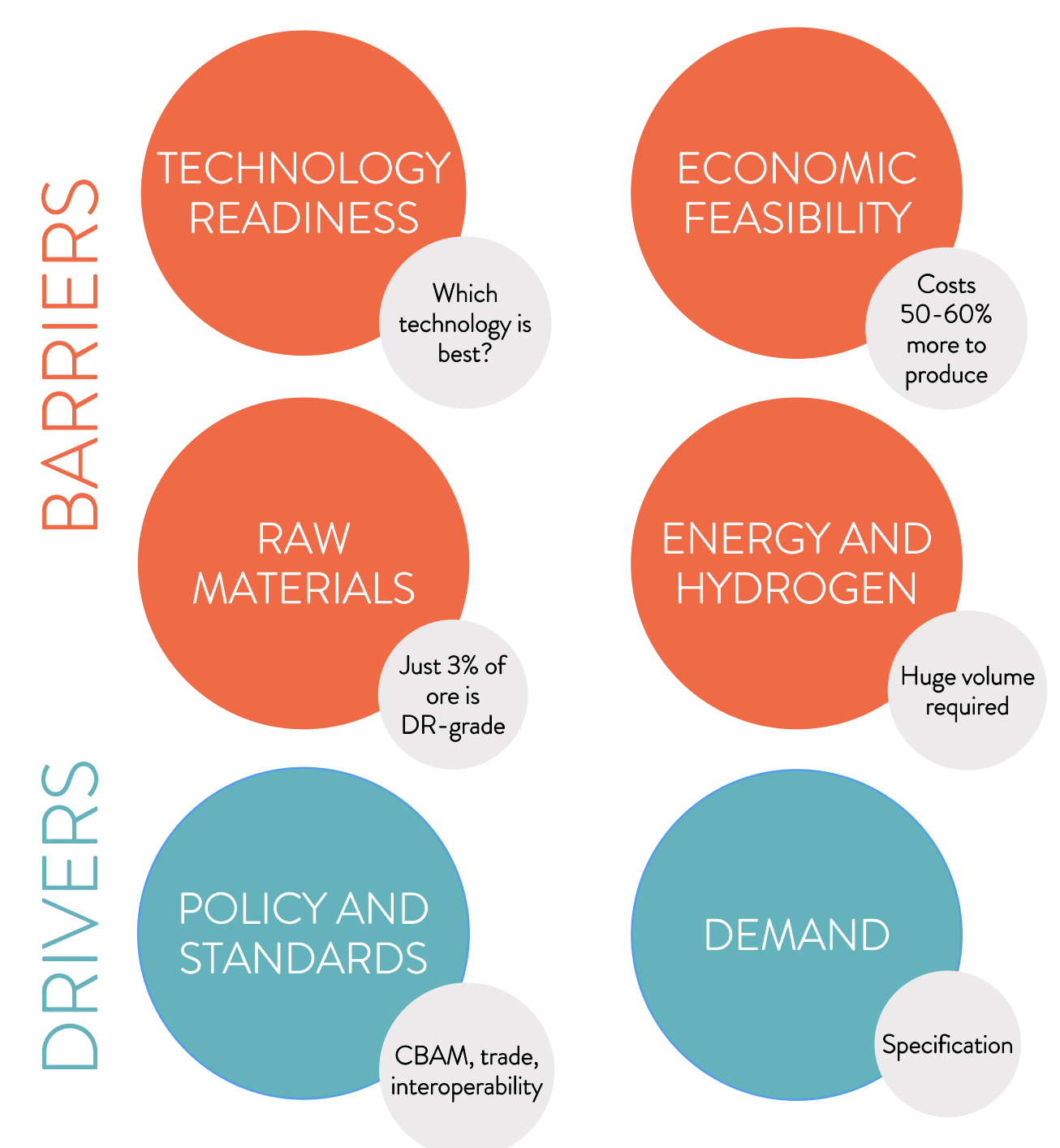
Low Temperature Electrolysis (LTE)

Volteron - John Cockerill



- ✓ Zero carbon potential
- ✓ No hydrogen required
- ✗ Requires high-grade ore
- ✗ Market ready after 2030

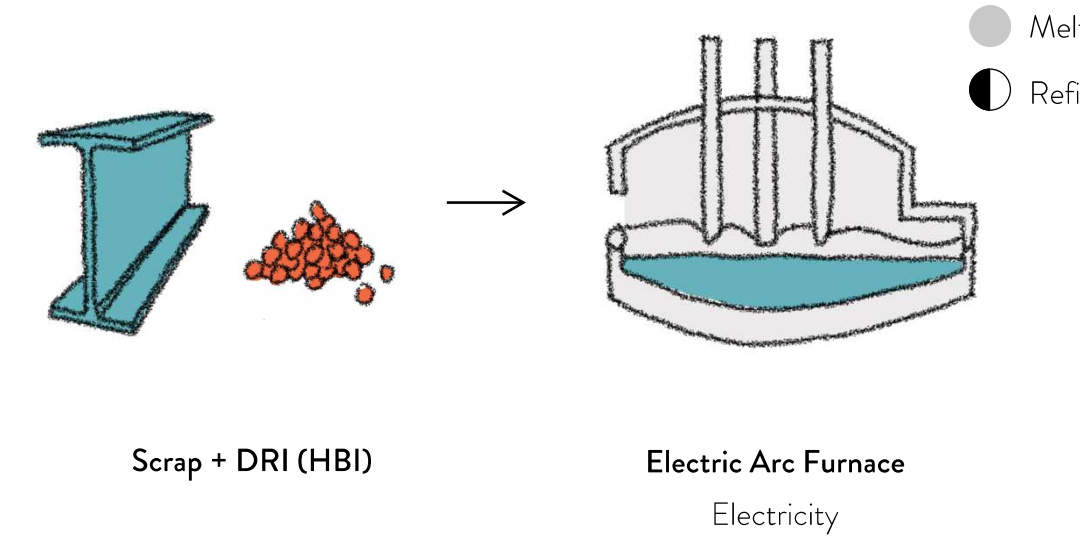
4. Key Low-Carbon Steel Barriers and Drivers



5. Recommended UK Pathway

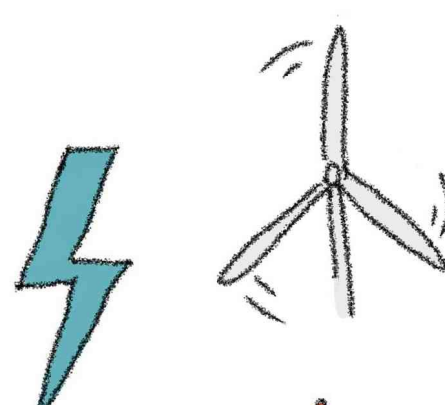
Short Term (2025–2030)

- ✓ Expand EAF production, use UK scrap as feedstock
- ✓ Improve scrap sorting
- ✓ Import low-carbon DRI when available



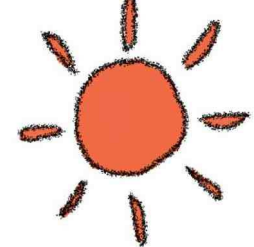
Medium Term (2030–2040)

- ✓ Decarbonise the electricity grid
- ✓ Increase renewable generation
- ✓ Reduce industrial energy cost



Long Term (2040–2050)

- ✓ Implement electrolysis technologies
- ✓ Produce near-zero-emission primary steel
- ✓ Retain domestic steelmaking capability



✓ REDUCE, REUSE, RECYCLE, THEN SPECIFY LOW CARBON USING TABLE BELOW

Table 5 Carbon limits for hot rolled steel products, with the reduction of the limit to 2050 near-zero emission steel

Rolled product	Carbon equivalent emission limit tCO ₂ e/t hot rolled steel product			
	Progress Level 1 (2025)	Progress Level 2 (~2035)	Progress Level 3 (~2042)	Progress Level 4 (2050)
20% scrap steel content				
Rebar	2.417	1.720	1.035	0.330
Wire rod & bar	2.442	1.737	1.045	0.330
Section	2.462	1.743	1.055	0.330
Heavy plate	2.455	1.737	1.050	0.330
Seamless pipe	2.551	1.804	1.105	0.330
Hot rolled coil	2.442	1.732	1.045	0.330
90% scrap steel content				
Rebar	0.807	0.570	0.335	0.090
Wire rod & bar	0.832	0.587	0.345	0.090
Section	0.852	0.593	0.355	0.090
Heavy plate	0.845	0.587	0.350	0.090
Seamless pipe	0.941	0.654	0.405	0.090
Hot rolled coil	0.832	0.582	0.345	0.090