Beating the odds

Tim Parker considers the UK-specific issues in the steel industry and possible survival options.

Freshly rolled steel in the hot rolling mill

worldsteel / Seong Joon Cho

For the first time in years, steel is making prime-time news headlines. Sadly, it is doing so because escalating capacity closures and job losses – with the threat of more to come – are touching a political nerve. Foremost in the spotlight is the Port Talbot steelworks in South Wales. The UK's last remaining works making flat rolled steel by the integrated route, smelting iron in blast furnaces and refining it to steel in basic oxygen steelmaking (BOS) furnaces. Port Talbot's owner, the India-based Tata industrial group, is pulling out of its financially underperforming UK steel business. A buyer for Port Talbot must be found to forestall closure, with the Government likely to shoulder part of the legacy and operating costs.

Among the prospective bidders is international commodities trader and manufacturer Liberty House Group, owned by the Gupta family. In nearby Newport, the family has already taken over a mini-mill remelting steel scrap in an Electric Arc Furnace (EAF) – and is investing in local renewable power generation capacity. Other units of the former British Steel (later renamed Corus), most of which Tata bought in 2007, include the Scunthorpe works, which is being acquired by Greybull Capital. They also include Teesside Cast Products in Redcar, which shut in 2015 after repeated failed attempts to revamp its business model by focusing on the supply of semi-finished steel for rerolling overseas – a fate that also overtook the independent Sheerness mini-mill when it tried the same strategy a few years earlier.

The UK's share of West European hot rolled steel production dropped from 11–6% between 1990–2014. More and more of the steel that we use in the UK comes from abroad, but most of these imports have been coming from Europe, putting into perspective the argument that China is to blame for UK mill closures (although, unquestionably, China has greatly contributed to world oversupply). The EU origin of the steel we import begs a question. Shouldn't our EU neighbours be weighed down with similar production costs and just as vulnerable to world oversupply as we are? And if not, why not?

Why not?

The UK's steelmaking facilities are not the most modern but nor are they likely to require sustaining capex on a different scale from neighbouring markets. While steel scrap, the main raw material for mini-mills, has recently been overpriced on the world market relative to the iron ore smelted by integrated steelworks, costs for raw materials tend to be broadly similar internationally. The UK is at no particular disadvantage in terms of access to scrap, of which it is a net exporter. As for labour costs, they are unlikely to vary hugely across Western Europe and typically account for less than 5% of total costs of production.

However, the above, reasonably level playing field gives way to a drastically different picture when we turn to energy costs and, specifically, electricity – gas prices are now fairly comparable across Europe, the UK having lost its former advantage from peak production of North Sea gas.

UK wholesale power prices to heavy industry are rising to a degree unmatched elsewhere and, given the UK's looming generation capacity crunch, could be on track to do so further in the coming years. However, a more immediate problem is apparent in the network costs (transmission and distribution) component of the electricity charges, which in the UK is increasing out of all proportion to comparable markets.

The age, condition and relatively high maintenance costs of the UK power transmission network are likely to be a significant contributor to the UK's network cost premium. According to IEA data, losses between generation and final consumption in the UK averaged close to 8% in 2012 – higher than Italy (7%), France and the USA (between 6% and 7%), Belgium and Australia (around 5%), and best-in-class Germany (around 4%).

To illustrate the consequences of this, we have used the benchmark EU BREF (best available technique reference) documentation in conjunction with published cost curve data for European mills to estimate the typical energy unit consumption of Polish, Spanish and Turkish (very much a part of the European steel market) steel mills. When this unit consumption was combined with the differing unit costs of power shown in Figure 2, the resulting heat maps were obtained that can be seen in Figures 3 and 4.

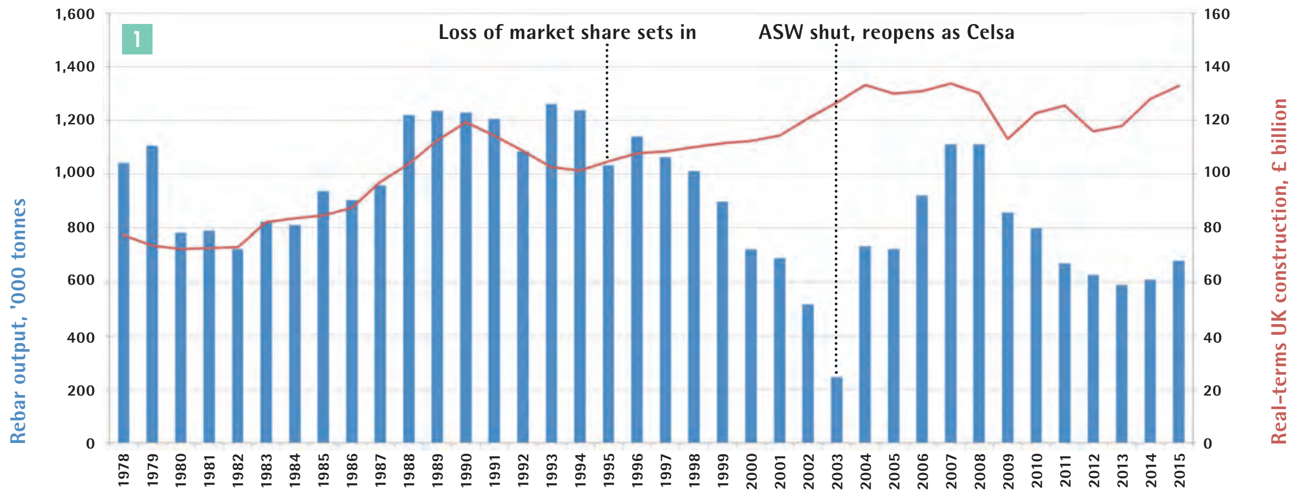
They show – from a UK standpoint – how the three peer countries are likely to compare on electricity cost competitiveness, for both BOS and EAF operations. The trend over 2008–2014 is one of increasing cost disadvantage for the UK, with the EAF operations in both Poland and Turkey having an edge of €30 in combined basic energy plus network costs per tonne of steel made, relative to their UK peers. The network costs alone disadvantage the UK EAF operators by a minimum of €10. The worsening trend is similar, but its impact considerably more moderate, for BOS operations (a combined electricity cost penalty for the UK of up to €8/t by 2014).

By comparison, the taxes component of power costs appears small but is expected to rise to the extent that it incorporates increasing costs of the UK and wider European carbon abatement agenda on power prices for industry.

European carbon leadership

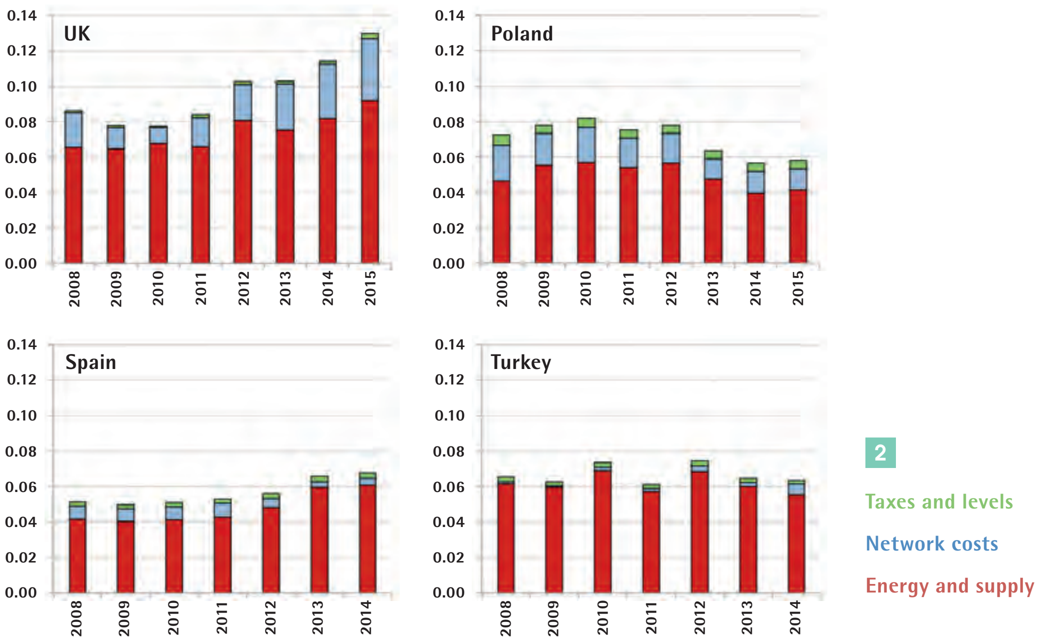
While a global carbon tax is perceived as the only true way to combat climate change, the localised European Emissions Trading Scheme (ETS) has been an admirable attempt to date. Installations failing to limit their greenhouse gas emissions to performance benchmarks have to buy carbon credits at a price derived by cap and trade market dynamics.

The scheme has had a difficult start to life – hampered first by an over-generous introduction of freely allocated carbon credits (Phase 1, 2005–2007), then by an unforeseen stock piling of surplus carbon credits because of the global industry downturn (Phase 2, 2008–2012). In Phase 3 (2012–2020), we are seeing a persisting surplus of credits, because the expectations of the ETS's designers and overseers (the EU Commission) of a rapid rebound in steel output and demand for credits have not been borne out. Demand has failed to soak up the surplus carbon credits in circulation, failing to drive up the carbon price through auctions.



1

UK production of rebar against underlying UK construction activity, highlighting the competitiveness crisis besetting UK steelmaking.
Source: ISSB, Office of National Statistics, McLellan calculations



2

Power price for major industrial users, UK versus European peers (Euro /kWh)
Source: Eurostat

3

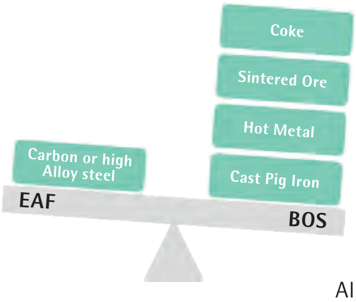
		EAF						
		2008	2009	2010	2011	2012	2013	2014
Differential energy cost to UK (€/t of production)	Poland	9.1	2.7	3.4	3.9	11.7	14.3	23.4
	Spain	12.2	12.6	13.9	11.5	17.3	6.3	9.6
	Turkey	3.2	4.2	0.4	6.0	8.4	10.1	17.0
Differential network cost to UK (€/t of production)	Poland	-1.7	-4.6	-7.7	-0.8	1.1	8.4	10.7
	Spain	7.0	2.7	0.6	4.9	8.8	13.9	16.1
	Turkey	11.2	6.8	4.3	9.1	10.5	14.6	15.1

UK strength vs weakness map relative to Europe – energy costs for EAF Operations
Source: McLellan estimates

4

		BOS						
		2008	2009	2010	2011	2012	2013	2014
Differential energy cost to UK (€/t of production)	Poland	1.0	-0.6	-0.5	-0.3	1.4	2.2	4.4
	Spain	3.8	3.8	4.2	3.7	5.1	2.9	3.7
	Turkey	2.0	2.1	1.5	2.5	3.3	3.5	5.0
Differential network cost to UK (€/t of production)	Poland	-0.8	-1.4	-2.2	-0.5	-0.1	1.6	2.1
	Spain	1.8	0.8	0.3	1.3	2.1	3.2	3.7
	Turkey	2.6	1.6	1.0	2.1	2.4	3.4	3.5

UK strength vs weakness map relative to Europe – energy costs for BOS Operations
Source: McLellan estimates



Above: **EU ETS grouping for steel industry free allocation in Phase 3.** *Note: both hot metal and its cold/solidified equivalent, cast pig iron, are subject to specific carbon emission limits, above which their manufacture and use will require the purchasing of auctioned carbon allowances.*

All this has led to a much lower carbon price across Phase 3 than was intended – simply not affecting operators' choices, especially for high-quality and alloy steel producers. Here, volatility in chrome and nickel prices can mean price ranges in the hundreds rather than the lows of €2-3/t that we have seen for carbon credits in Phase 3. Attempts to fix the system 'on the go' have foundered – the EU courts have turned down the Commission's attempt to permanently remove credits from those available for auction and thus tighten the market.

In Phase 4 (2021–2030), the EU promises it will be 'increasing the pace of emission cuts'. Phase 3 saw an annual EU-wide carbon ceiling reduction of 1.74%. This will be ramped up to 2.2% in Phase 4, while the technological benchmarks that determine the emissions threshold above which permits have to be bought will be made more demanding. This leads many observers to believe Phase 4 will see a tightening of the screws, finally forcing the price up to the €30-40/t range initially considered by the policy makers as high enough to induce the operators to make technology changes to reduce carbon emissions.

The ETS impacts almost every process step prior to the BOS furnace when compared with the single step of the EAF (see Figure 5), so the raw material will have an inherent carbon cost when it arrives at the BOS plant as hot metal (liquid iron) or iron castings (pig iron). With the long-term aim to remove free allocation, the ETS will impact the BOS operation for approximately two tonnes of carbon per tonne of production against a 0.2–0.3 tonnes carbon benchmark for EAF. Crudely speaking, this could add a further €65-70/t on the cost of BOS route steel production.

In respect of carbon abatement, UK energy intensive industries are being asked to make additional sacrifices. The UK has unilaterally taken on additional obligations on heavy industry to pay for carbon emissions, with a carbon price support (CPS) component added to the EU-ETS carbon price to achieve a UK carbon floor price (CFP).

Government had targeted a price of £30 per tonne of CO_2 by 2020, but with the EU ETS carbon price so low this would have left UK industry unacceptably penalised relative to mainland Europe. This has forced the government to temporarily cap the CPS at £18/tCO_2 over 2016–2020. Whitehall has introduced further measures to alleviate the burden on UK energy-intensive industry at risk of 'carbon leakage' (loss of business to competitors not similarly burdened) of the so-called indirect carbon costs – those incurred and passed on by power generators.

Technical options for the UK

It is clear that energy and carbon cost hamper EAF and BOS operations respectively, but the emergence of technology and applied renewable energy sources may help the situation.

Bearing in mind that the UK has a good availability in several regions of high-quality, locally sourced scrap, advances in micro-mill technology (a smaller scale of operation relative to the mini-mill) may support the sustainability of commodity long products manufacturing. Such advances include:

- Continuous scrap feeding supports flat-bath EAF operations, reducing the incidence of disturbance to local electrical distribution networks, such as harmonic voltage distortion and visible voltage fluctuations (flicker), and lowering the demand for strong network grid connections
- Reduced power-off time due to the EAF roof remaining more static during operations, resulting in reduced heat losses during the process cycle
- Waste heat from the EAF can preheat scrap prior to charging and therefore reduce the energy input required to melt the raw material
- The smaller size of the plant footprint reduces the cost of implementation and increases the choice of possible sites
- Lower annual tonnages allow for localised steel production and distribution of commodity grades
- Induction-based equalisation furnaces minimise the reliance on natural gas reheating furnaces
- Near-net-shape casting forms the semi finished product closer to the finished product, to reduce the number of rolling passes needed to complete the shape
- Continuous or endless rolling results in more constant rolling mill electrical loads compared with conventional on/off rolling sequences.

Life off the grid?

As mentioned, near the Newport mini-mill that it manages, the Gupta family has also acquired energy assets in form of the 360MW Uskmouth power station, with plans to run it on biomass. The group has announced ambitions to carry out an 'eight-figure investment' in the development of tidal lagoon power in the UK and India. This would include several proposed installations in South Wales of which one, at an early stage of planning, is in the Severn Estuary at Newport itself.

The growing competitive burden of UK power network costs seen earlier suggests to us that the higher transmission and distribution costs and carbon costs become as a share of overall UK power costs, the greater the chance that steel operations limited to rerolling could represent an economically sustainable option for UK steel suppliers. With their lesser power requirements, rerolling operations supplied from local, renewable power sources might not provide the proverbial silver bullet – given the likelihood of escalating generation costs – but could greatly improve the odds for smaller-scale steel suppliers focused on a localised market radius. If so, a 'distributed steel' model, paralleling the trend towards distributed energy, could be part of the long-term survival options for UK steel.

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