April 2016 – Revised

UK Steel

Energy Costs and the Steel Sector: A UK Steel Briefing

Introduction:

1. The announcement that Tata Steel is to put its entire UK operations up for sale has again thrown the crisis faced by the UK, and wider EU, steel sector into the media spotlight. The underlying factors that have contributed to the difficulties facing the global steel sector have been discussed at length; an overcapacity of steel production, a slump in global commodity prices and, a flooding of open markets with below-market price Chinese steel.

2. These factors form the basis of the difficulties the global steel sector is facing, but one must question why companies in the UK have been particularly disadvantaged when trying to weather the storm compared even to their European counterparts. There are a number of exacerbating factors at play in the UK's business environment; for example high environmental costs and business rates, but it is perhaps uncompetitive energy costs, specifically electricity, that stands out most clearly, with steel companies continuing to highlight it as a major ongoing issue.[1]

3. Significant electricity price disparity with competitors in recent years has undermined the sector's ability to operate competitively and, importantly, has diminished the UK's attractiveness as a place for inward investment. What follows is an examination of the issues of energy and steel production and why electricity costs have become a competitive issue.

Context: Steel production and energy costs

4. Steel production is self-evidently an energy intensive process. There are two principle means of producing steel: from iron ore using a blast furnace at an integrated site (like Tata Steel's site in Port Talbot), which consume large amounts of coal, electricity and some natural gas, or by recycling scrap steel in an electric arc furnace (like Tata Steel's plant in Rotherham or Celsa Steel's in Cardiff), which requires extremely large amounts of electricity and more modest amounts of natural gas.

5. The proportion of the total costs of steel production that are attributable to energy vary significantly, from site to site and from country to country. The World Steel Association has recently estimated it as high as 20-40%[2] with the split of energy consumption at an integrated site (blast furnace) being 50% coal, 35% electricity, 5% natural gas and 5% other gases.[3] For an electric arc furnace the figures are approximately 75% electricity and 25% gas[4].

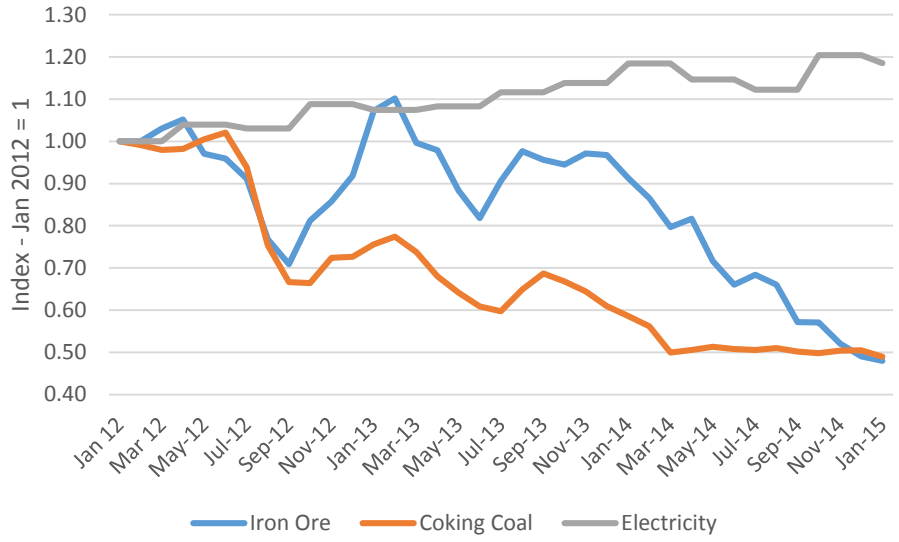
6. It is important to note that when the UK steel sector talks of uncompetitive energy prices it is talking about electricity prices. Coal prices are set on a world market and, excluding state subsidised supplies of coal that some steel companies may be provided with[5], are broadly the same price everywhere. Natural gas prices do vary significantly from region to region, very low prices in the US compared to extremely high ones in Japan for example, but generally speaking as natural gas makes up a small proportion of the energy input of steel production, price differentials would have to grow significantly further before they made a big impact on competitiveness.

7. Electricity on the other hand constitutes a substantial proportion of the energy consumed at an integrated steel plant and the vast majority of the energy consumed at an electric arc furnace.

There are significant national variations in electricity prices influenced by a whole range of factors from fossil fuel prices, to government energy and climate change policy, to the method of distribution of transportation costs.

8. When global commodity prices fall, more static costs with large national or regional variations, such as electricity, begin to play an increasingly important role in the competitiveness of a steel producer as they make up a proportionately larger proportion of total input costs. This is exactly what has happened in recent years, with both iron ore and coking coal prices falling by more than half between January 2012 and January 2015. At the same time electricity prices for extra-large industrial users in the UK increased by 19 per cent.

Chart 1: Index of Iron ore, coking coal and UK industrial electricity prices 2012 to 2015



Source: Index Mundi Prices (iron ore), Industry Sources (coal), and DECC (electricity prices)

9. However, with the costs of raw material for steel production set largely at a global level, and therefore broadly equal for steel producers across the globe, it is perhaps more useful to look at electricity costs in the context of conversion or "controllable" costs, i.e. the cost of converting the raw products into steel. Recent estimates from Strip Products UK (Tata Steel's Port Talbot-based operations) place electricity at 11 per cent of its "controllable" costs and similar estimates from one electric arc furnace producer put this figure at 20 per cent.

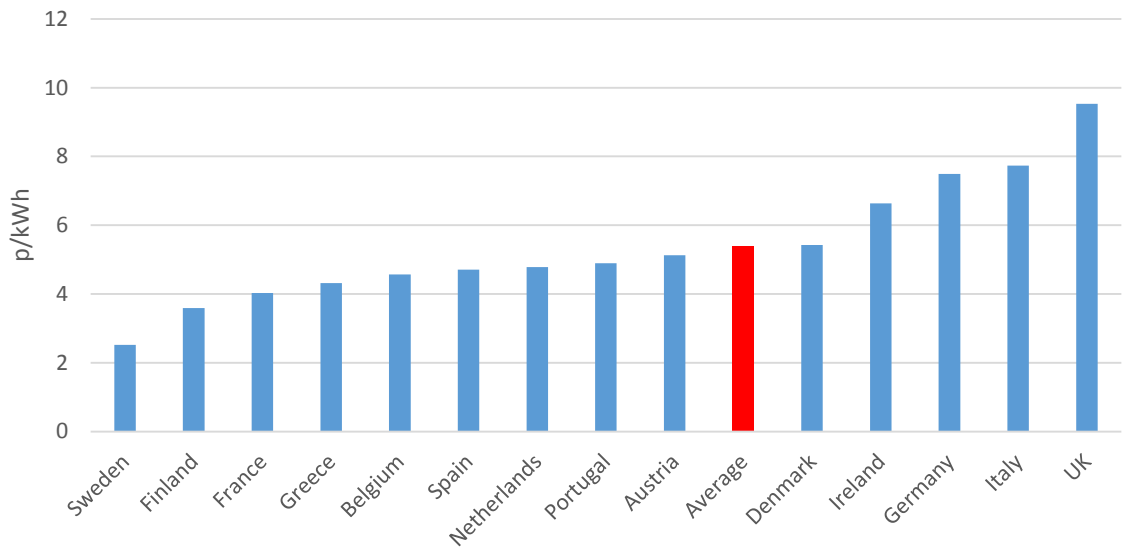
10. An additional means of looking at the issue is in relation to a steel company's Gross Value Added (GVA). The most recent and reliable figures we have come from applications to the UK's "Compensation for the indirect costs of the Renewables Obligation and Feed-in-Tariffs" scheme which opened in January 2016. To gain access to this compensation a company must demonstrate that over the period 2012 to 2014, electricity costs were equivalent to at least 20 per cent of its GVA.[6]

11. All of the UK's steel producers have met this threshold demonstrating an 'electro-intensity'[7] of between 20 and 30 per cent. This particular measure of electro-intensity is useful to us as it takes into account the recent profitability of a steel producer. Again note, as profits margins are squeezed fixed costs with national variations take on a more prominent role and can seriously undermine the competiveness and sustainability producers. Again, this is what has occurred recently.

UK Electricity Prices in Context

12. All of this is critically important within the context of the steel crisis because the UK has the most expensive industrial electricity prices in the EU. Over the period July to December 2015 the headline electricity prices, published by Eurostat, for extra-large industrial energy users showed that the UK's prices were 89% higher than the EU average and 97% higher than that of the EU15.

Chart 2: EU industrial electricity prices for 'extra-large' energy users (including taxes, prior to compensation/exemption measures) - Jul-Dec 2015

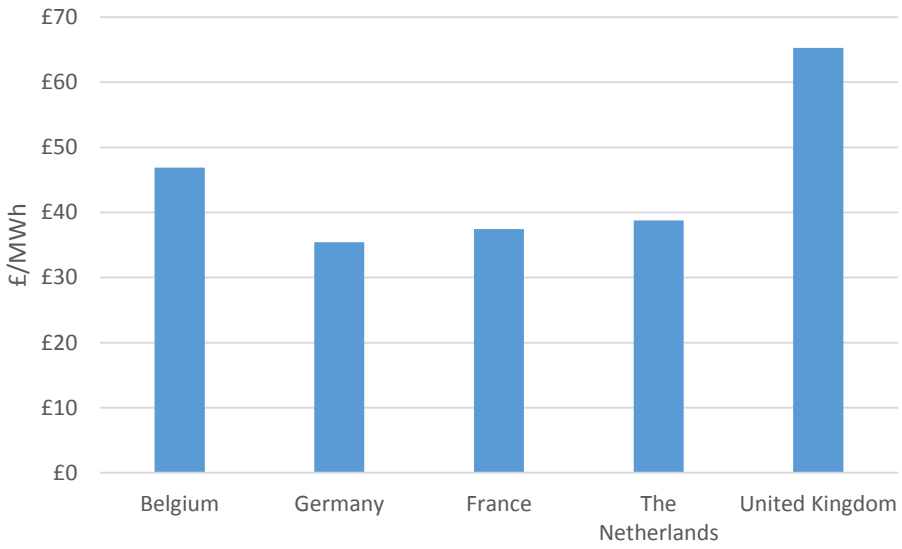


Source: Eurostat data for 'extra-large' energy users of between 70 and 150 GWh per annum[8]

13. However, in comparing electricity prices it is vital that we also consider the range of government interventions that are in place to reduce electricity costs for industry in different EU countries, many of which are not reflected in chart 2 above. For example, France and Germany provide their industrial sectors with varying degrees of reductions on transportation fees whilst France, Germany and the UK have all implemented measures to reduce the cost of government energy and climate change policy that feeds through into electricity bills.

14. An estimate for October 2014 (the most recent comparison data we have available) electricity prices for 'extremely' large energy consumers[9], once all government interventions have been taken into account is as below:

Chart 3: EU industrial electricity prices for 'extremely' large energy consumers in selected EU countries after all government price-reduction interventions – Oct 2014



Source: UK Steel analysis and PWC (2015) *A European comparison of electricity and gas prices for large industrial users*

15. It should be noted that since the above price comparison was made, a number of developments have served to further widen the price disparity experienced by UK consumers: UK energy and climate change policy costs have continued to rise, the French Government has introduced further measures to reduce electricity prices for its industry and wholesale prices in neighbouring, UK interconnected, markets (France, the Netherlands and Ireland) have evolved unfavourably for the UK, as illustrated by figure 1 below.

16. There are a wide range of reasons behind these price differentials and we must note that it is not simply down to the costs of energy and climate change policy. To examine this in more detail we can broadly divide electricity costs into three components:

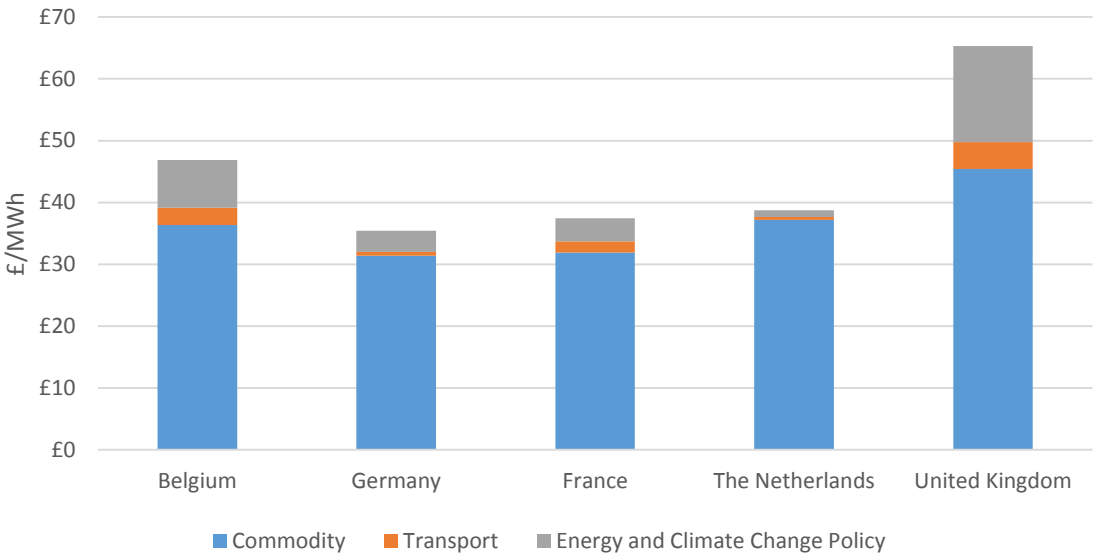
    i. wholesale/commodity costs,

    ii. energy and climate change policy costs (carbon taxes, energy taxes and renewables levies)

    iii. transportation charges (transmission and distribution)

17. Estimates for the breakdown of the electricity prices in Chart 3 by these different components is as displayed below.

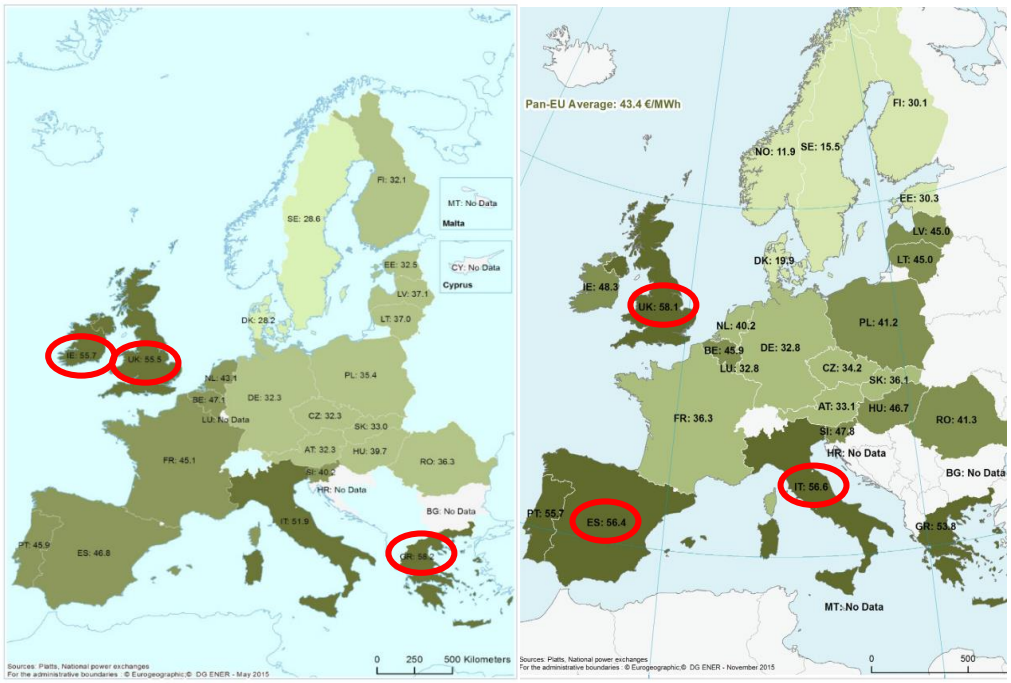
Chart 4: Comparative breakdown of EU industrial electricity prices by component – Oct 2014



Source: UK Steel analysis and PWC (2015) *A European comparison of electricity and gas prices for large industrial users*[10]

18. **Wholesale/commodity costs** are driven both by fossil fuel prices and, crucially, the particular mix of generation technologies in a country. Countries like Sweden that produce the vast majority of their electricity from sources with little or no marginal costs (i.e. once the plant is built it costs comparatively little to produce electricity) such as hydro or nuclear power have low wholesale costs. In contrast the UK relies heavily on coal and gas fired power stations, which means our wholesale costs are largely set by fossil fuel prices and are comparatively higher. Indeed, last year the UK had some of the most expensive wholesale prices in the EU, consistently appearing in the top three.

Figure 1: Comparison of average wholesale baseload electricity prices, Q1 2015 and Q3 2015



Source: EU Commission (2015) *Quarterly report on European Electricity Markets: Issues 1 & 3 2015*

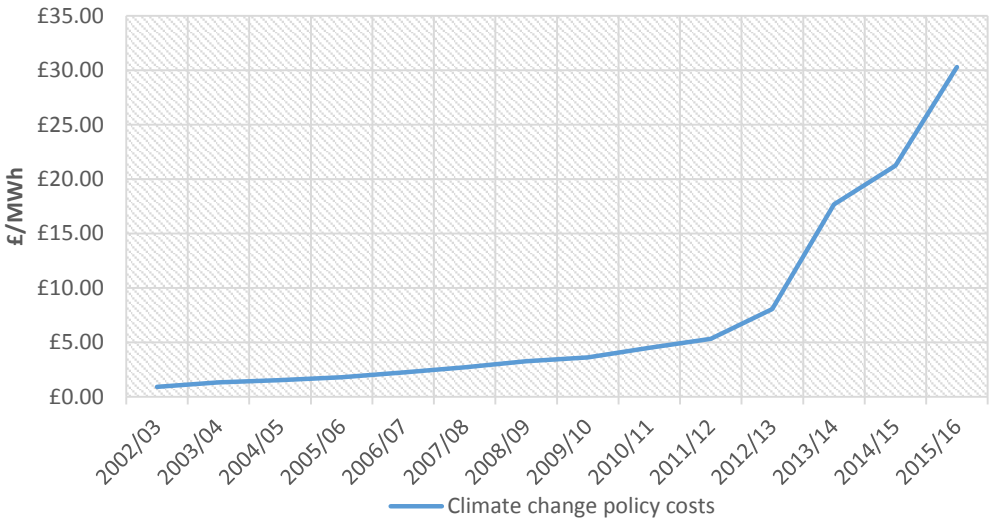
19. Government interventions to reduce/minimise wholesale costs do exist elsewhere in the EU. For example France has implemented a system which provides industrial users with access to electricity from depreciated nuclear power plants at regulated prices[11]. Elsewhere, the Italian Government implemented a 'virtual interconnection' mechanism that provided its industry with electricity at the same price as nearby countries such as Germany, thereby reducing costs for them[12]. These examples do not necessarily serve as policy suggestions for UK government, merely examples of action taken elsewhere. The UK electricity market has its own particularities and we would need to develop our own specific solutions to the problem.

20. Wholesale prices in the UK have fallen in the last year in line with reductions in fossil fuel prices and this should help reduce price disparity to some extent. In the longer term, wholesale prices will be driven down by the changing nature of the UK's electricity grid mix. In the future, when we have more low marginal cost plant on the system, such as wind, solar or nuclear this will act to reduce wholesale prices, but it should be noted that this will increase costs significantly in the 'energy and climate change policy' proportion of electricity bills. Measures must be in place to ensure industry is shielded from increased policy costs to ensure it gains advantage from the reductions in wholesale costs that the energy transition can bring.

21. **Climate change policy costs** have grown significantly in recent years across the EU, driven by both EU directives and domestic policy in individual member states. UK industry has fared particularly badly in this area, both due to the imposition of unilateral measures, like the Carbon Price Floor, but also because the UK Government has historically failed to take into account the industrial impact when devising and implementing climate change policy.

22. There are now six separate policies, schemes and taxes that impact on UK electricity bills making up some 30% of an industrial electricity bill during 2015/16 (see table 1 below). Costs grew slowly following the introduction of the Renewables Obligation (RO) in 2002 but with the gradual expansion of this scheme and the introduction of a number of additional policies in recent years, policy costs have risen considerably since 2012.

Chart 5: Estimated costs of energy climate change policy, prior to compensation, in UK electricity bills 2002/03 to 2015/16



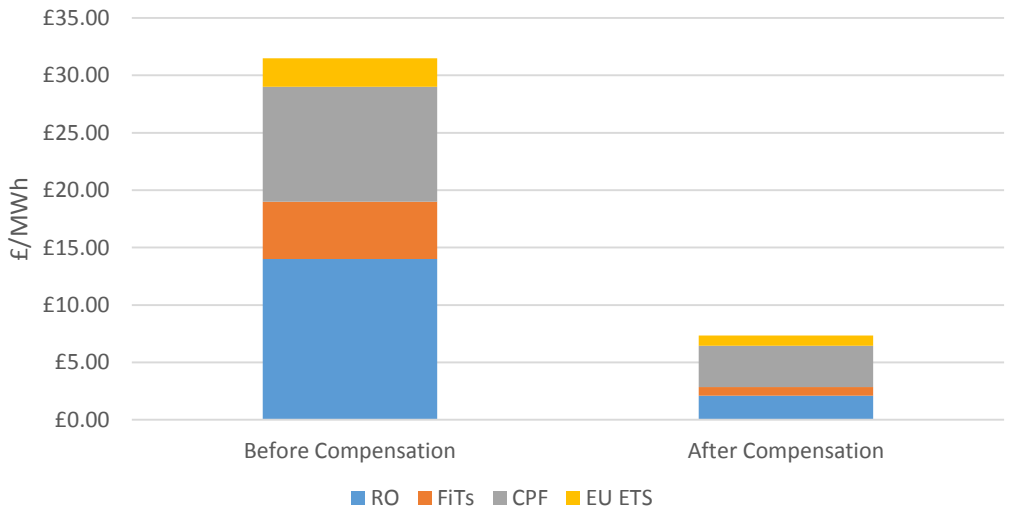
Source: DECC and Ofgem Data, UK Steel analysis

23. Following calls from industry, Government has gradually introduced a number of measures to reduce the impact of these costs. Once these are all in place, we estimate that it will reduce policy costs by just over 75 per cent. This is of course welcome, but the fact remains that action has been slow and industry has had to shoulder these costs for too long in advance of aid being provided. We estimate that since 2002 the steel sector has contributed almost £335 million in energy and climate change policy costs with £250 million of this coming from 2012/13 onwards.[13]

Table 1: UK Climate change policy costs and compensation measures

Policy	Policy Introduced	Cost in 2016/17 (£/MWh)	Protection Measure Introduced
Climate Change Levy (CCL)	2001	£5.50	Discount introduced in 2001 and a complete exemption provided in 2014
Renewable Obligation (RO)	2002	£14	Compensation available from Dec 2015 and exemption available from Apr 2017 (85% reduction in costs)
Feed in Tariffs (FiTs)	2010	£5	Compensation available from Dec 2015 and exemption available from Apr 2017 (85% reduction in costs)
EU Emissions Trading System (EU ETS)	2013 (phase III)	£2.50	Compensation available from 2013 (approx 70% reduction in costs)
Carbon Price Floor (CPF)	2013	£9-10	Compensation available from 2014 (approx. 70% reduction in costs)
Contracts for Difference (CfD)	2016	<£1 (Cost will rise significantly in years to come)	Exemption committed to be in place by April 2017

Chart 6: Estimated costs of climate change policy 2016/17 before and after compensation[14]



Source: UK Steel Analysis

24. Since 2013/14, when measures were first introduced, around £60 million of compensation has been paid to the UK's steel sector in relation to the costs of the EU ETS and Carbon Price Floor. This compares to an estimated gross contribution of £335 million by the sector to date, £220 million of

this since 2013/14. This means steel companies have remained exposed to over 70 per cent of policy costs even since the introduction of compensation measures three years ago.

25. The introduction of a renewables compensation package, starting in April 2016 with payments back dated to December 2015, will significantly improve the situation but will cost Government somewhere in the region of £330 million in 2016/17. It is evident that Government has struggled to commit to providing a long term budget for compensation and this has served to undermine any long term certainty, essential for inward investment, that the measure is meant to achieve.

26. As such, industry called for an exemption from the costs of renewables which the Government committed to at last year's Spending Review and will operate from April 2017. This will alleviate the pressure on the Business Department's budget but will entail a small redistributive impact on other electricity consumers in the order of £1.50/MWh or about £5 per household per year. A consultation on the operation of this scheme was launched on 1st April.[15]

27. However, although we have now reached this more favourable position, UK industry's experience must be contrasted with elsewhere. The German Government, for example, introduced exemptions for the costs of renewables support from the outset of the introduction of such schemes. Industrial concerns and interests were placed at the heart of policy decisions and ensured that Germany was able to have both an ambitious renewables programme and a competitive industrial sector. Although the EU Commission has now requested changes be gradually made to the system of exemptions in operation, the system still benefits almost 2,000 companies to the tune of €5 billion a year.[16] Contrast this with the UK where 53 energy intensive companies have received £160 million over three years.

28. In the UK, once all compensation and exemption measures are in place we estimate that climate change policy costs will be reduced to around 10% of an extra-large industrial user's electricity bill, for those who qualify. State Aid rules largely limit any further reduction of this and it would be contingent upon the UK Government to take action with regards the Carbon Price Floor in order to reduce the impact further. This will be particularly important if the Government is minded to increase the rates of this tax during the 2020s up to the originally planned £70/tonne (2009 prices) by 2030.

29. **Transportation charges** are the proportion of the bill relating to the costs of transporting electricity from generators to consumers. Again these differ from country to country and even within countries depending on factors such as the efficiency of the system, the geography of a country or region and, how those charges are distributed amongst different electricity consumers. As with other elements of the electricity bill some governments have intervened to reduce the level of charges industrial users must pay. In Germany, for example, when an industrial user's consumption exceeds 10 GWh, varying levels of reductions are offered according to their contracted hours of demand utilisation.

Table 2: Electricity grid fee reductions for German industrial electricity consumers

Annual Consumption (GWh)	Annual Consumption (Hrs)	Grid fee Reduction
>10 GWh	> 7000 Hrs	-80%
>10 GWh	> 7500 Hrs	-85%
>10 GWh	> 8000 Hrs	-90%

Source: PWC (2015) *A European comparison of electricity and gas prices for large industrial users*

30. A similar mechanism to reduce grid charges for industrial consumers has also been implemented in France where a 50% reduction has been available since 2014 and up to a 90% since March 2016.

Likewise the Netherlands has provided qualifying industry with up to a 90% reduction in fees since 2014.

31. The UK's Triad system does present large energy consumers with the opportunity to minimise transportation costs through demand management by reducing their consumption during the three half hour periods of peak electricity consumption from November to February each year. However, there is no way of knowing for definite when these periods will fall and industrial consumers have to do their best to predict them and reduce their electricity consumption accordingly. Failing to correctly predict a Triad period could result in significant additional costs running to hundreds of thousands or even millions of pounds. It is also worthwhile mentioning, that there are also considerable operational costs related to load management to avoid operating in these periods.

32. This system has worked well in the past with industry proving very good at predicting when those peak periods would fall. However, there is a growing feeling by many that it is becoming increasingly difficult to predict, particularly as demand side response (DSR) is more widely used and therefore electricity demand is flattening out. For example, in November last year, all indications showed that a Triad period would fall on November 23rd and industry reduced its demand accordingly. This, amongst other factors, resulted in the peak period actually falling two days later on 25th November with demand being less than 38kW higher (less than 0.00008% of demand) than the peak two days earlier.

33. This demonstrates how flat demand has become in recent winters and how difficult it now is to accurately predict peak periods and avoid consuming during them. Moreover, it is worth noting that demand in March 2016 (outside of the Triad period) at times surpassed the 25th November period. Given that the system is meant to capture the peak annual demand, this does pose questions over whether it remains fit for purpose and whether remedies need to be found to ensure greater certainty for industry over these costs.

Conclusion:

34. It is evident that high electricity costs in the UK have served to undermine the competitiveness of the sector in recent years; steel companies do not continue to raise concerns for no reason. This is by no means to claim that it is the source of all the difficulties the sector is facing or that an eradication of the issue would prove to be a panacea for all of the sector woes. It is simply to recognise that within the context of problems faced by the global steel sector, the issue has, and continues to, exacerbate conditions for the UK's steel producers. The UK Government cannot solve all of the sector's problems, but where it has the power to act and the ability to place the sector on a more even footing it has a responsibility to do so.

35. Over the past five years the Government has acted to reduce the impact of climate change costs, it is regrettable that this aid has taken so long to arrive, but with the measures almost all in place for steel producers we must now move forward and consider what further steps can be taken to reduce costs and improve the competitiveness of the sector. As illustrated above, it is not purely climate change costs that make industrial electricity prices in the UK uncompetitive, and we must bear this in mind when finding answers. There are solutions available and it is imperative that the Government continues to work with the sector to identify and ultimately implement them.

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References and notes:

[1] http://www.theguardian.com/business/2016/apr/04/uk-government-must-step-up-response-following-tata-crisis-says-steel-boss
[2] World Steel Association (2015) *Energy use in the steel industry*
[3] Ibid
[4] UK Steel Climate Change Agreement data
[5] https://hbr.org/2008/06/subsidies-and-the-china-price
[6] For the purposes of the compensation scheme GVA is defined as earnings before interest, taxes, depreciation and amortisation (EBITDA) and staff costs including employers' pension and national insurance contributions.
[7] Electro-intensity in this context is electricity costs divided by GVA
[8] Figures for those consuming 70 to 150 GWh a year, but consumption by steel producers is significantly higher than this and as such prices for them will be comparatively lower across the board.
[9] For the purposes of this report 'Extremely' large energy consumer is deemed as those consuming 250 GWh or more a year
[10] For the purposes of this chart, carbon costs (EU ETS and CPF) have been included under "energy and climate change costs" rather than "commodity". In reality the carbon costs like these are embedded in wholesale/commodity costs.
[11] https://clients.rte-france.com/lang/an/clients_producteurs/services_clients/dispositif_arenh.jsp
[12] http://www.icis.com/resources/news/2014/12/03/9844002/2-4gw-on-offer-at-italy-s-virtual-interconnector-auctions/
[13] Estimate based on climate change policy costs detailed in chart 5 and an estimated average annual consumption of 3.2 TWh of imported electricity.
[14] Not including Climate Change Levy, steel companies have either received heavy discounts or a complete exemption since its introduction in 2001
[15] https://www.gov.uk/government/consultations/implementing-an-exemption-for-energy-intensive-industries-from-the-indirect-costs-of-the-ro-and-the-fits.
[16] German Government press release notes that after amendments requested by the EU Commission, the value of industry renewables exemption would reduce by €300 million a year to €4.8 billion in 2015. (In German)