Written evidence from Tata Steel UK Limited

Overview

Tata Steel UK (hereafter TSUK) welcomes the opportunity to submit evidence to the Committee's inquiry on green steel. In this submission, we set out in more detail the support the sector needs to innovate and decarbonise in the current economic environment, supporting the Government's wider Net Zero ambitions.

Steelmaking is a foundation industry that will underpin the actions needed to decarbonise the UK economy. By creating the right policy environment, the Government can help to enable a successful and sustainable long-term future for steel in the UK which will, in turn, contribute to the UK's prosperity, its delivery of Net Zero and the Government's 'Levelling Up' agenda.

About Tata Steel

TSUK is the largest UK steelmaker, with an annual turnover in excess of £2bn, providing a vital foundation for many of the UK's key strategic supply chains, particularly in the automotive, construction, engineering and packaging sectors. TSUK is a supplier of high quality steel products and an innovation partner to household names including BMW, JLR, IKEA, Heinz and others. The business is also a partner in major construction and infrastructure projects across the UK and overseas, including publicly procured projects.

TSUK has over 8,000 employees in the UK, including 4,000 workers at its Port Talbot site in South Wales. It also employs 2,500 direct contractors and supports an additional 20,000 jobs in the supply chain. TSUK spends approximately £1bn across its UK supplier base annually. Steel jobs are highly skilled, with salaries up to 36% higher than regional averages in the locations where it has its main UK operations.

TSUK is already a very CO_2-efficient steel company, being towards the upper end of the performance levels reported to worldsteel (the World Steel Association) by its members. TSUK's stated ambition is to produce steel in a CO_2-neutral way by 2050 at the latest, and to have reduced its CO_2 emissions by 30% by 2030 (compared to 2018).

In addition to its steel making facilities in Port Talbot, where it produces flat steel products from fundamental raw materials such as iron ore and coal, TSUK also has a number of manufacturing operations across the UK where it carries out further processing to add functionality and value to its steel. Trostre, in Llanelli, is home to production of tin-plated and chromium-plated steel for packaging customers; Corby and Hartlepool produce tubes for application in construction and engineering; Llanwern, near Newport, produces galvanised strip for the automotive and construction sectors; while Shotton, in Deeside, and Catnic, in Caerphilly, produce a range of high-end building products for the construction sector.

Technologies available to produce "green steel"

It is important to note that the steel sector comprises two distinct sub-sectors, one which produces 'new' steel from iron ore and the other, which recycles end-of-life steel scrap to make new products. Approximately 1.9 Billion tonnes of steel is produced around the globe annually[1], of which ~70% is made through the blast furnace / basic

oxygen steelmaking (BF/BOS) route of production, which is the main technology used worldwide to smelt iron ore and turn it into new steel. The other 30% of global steel production uses electric arc furnace (EAF) technology which is the typical process option for recycling scrap.

In practice, the situation is somewhat more complex, as both scrap and iron ore can be used as feedstocks to BF/BOS and EAF routes of production. Steel produced through the BF/BOS route can typically incorporate 15%-25% recycled content, which is achieved by adding steel scrap to the BOS process. Whilst some EAF production uses steel scrap exclusively as a feedstock, many producers also supplement the scrap charge to EAFs with 'new' iron in the form of products such as direct reduced iron (DRI), pig iron and hot briquetted iron (HBI). These inputs typically exist as solid materials produced from iron ore in blast furnaces or in direct reduction processes where natural gas is a typical chemical reductant.

Some commentators have suggested that steel sector decarbonisation can be accomplished through a rapid transition to steel scrap recycling. Whilst production of new steel from scrap represents a very CO_2-efficient means of production, this alone will be insufficient to address the challenge of sectoral decarbonisation at the global scale given that the amount of scrap arising each year is only sufficient to satisfy approximately 30% of annual demand for new steel. Whilst annual scrap supply is likely to increase over time until a point of equilibrium is reached between scrap arisings and demand for new steel, this is not likely to happen until the end of the century. Indeed, some forecasts suggest that by 2050, global steel demand will still require 1 Billion tonnes of 'new' steel to be made from iron ore each year. An authoritative source in this respect is the International Energy Agency (IEA). In its October 2020 report Iron and Steel Technology Roadmap - Towards more sustainable steelmaking,[2] IEA stated the following "*In the coming decades total scrap availability is expected to increase considerably, driven primarily by the release back into the system of steel stock (end-of-life scrap) that has built up in past decades. Meanwhile, efforts to improve yields will lead to little growth or even a decline in home and prompt scrap. In the Stated Policies Scenario, total iron and steel scrap availability increases by about 70% to reach 1,480 Mt in 2050 (of which 1 400 Mt is available for steel production as opposed to iron foundries). Despite this significant growth, scrap still only accounts for about 45% of inputs into the 2,535 Mt of steel produced in that year, again due to demand growth and the lag in steel stock turnover*."

Thus, decarbonisation of the steel sector at the global level can only be achieved by 2050 if a solution can be found to decarbonise production of steel from iron ore whilst at the same time continuing to ensure that all steel scrap arising be recycled. At the national level, of course, it would be possible to achieve very low level of emissions from the UK steel sector by using EAFs without having to resolve the challenge of decarbonising ore-based production.

With this in mind, the steel industry has already come very close to optimising its carbon intensity with existing technology. Further decarbonisation of steel production will need to be driven by the development of new low-carbon technologies. The UK is fortunate to have all technology options available due to its geography, however this presents its own challenges: The number of options available makes decision making

[1] (https://worldsteel.org/wp-content/uploads/Steel-Statistical-Yearbook-2020-concise-version.pdf)
[2] https://iea.blob.core.windows.net/assets/eb0c8ec1-3665-4959-97d0-187ceca189a8/Iron_and_Steel_Technology_Roadmap.pdf

even more complex and critical and the ultimate selection of technology will depend to a great extent upon the prevailing policy landscape. Indeed, uncertainty over future direction in critical areas of policy presents one of the main obstacles to technology selection. Whilst there are multiple technological pathways for the transition from conventional to low-carbon steel production, more than one of them will require secure and abundant supplies of low-CO_2 hydrogen as well as competitively priced low-CO_2 electricity.

TSUK is currently conducting a detailed evaluation of options for transitioning to a low-CO_2 steelmaking footprint whilst maintaining the product quality required to support its existing UK supply chains. It is considering a wide range of technologies to achieve this and hasn't ruled out any credible option. Candidates include operating existing blast furnaces in conjunction with carbon capture, utilisation and storage (CCUS) technology and/or operation of EAFs fed by scrap and new iron (e.g. DRI). Many EU steel producers have declared their intent to pursue a combination of EAFs and DRI production, the latter using hydrogen to reduce iron ore.

In the Committee on Climate Change's (UKCCC) Sixth Carbon Budget, it set out an ambitious timescale for decarbonisation of the UK steel industry, with a challenge to achieve 'near-zero' emissions from ore-based production by 2035. In order to have a realistic prospect of meeting this level of ambition, action needs to be taken in the intervening period with a view to being fully prepared to enact a transition as soon as technology and the availability at scale of green electricity (etc.) cease to be a barrier to the transition.

Ultimately, no single solution exists for the decarbonisation of steel production.

As large steelworks are often major point sources of CO_2 emissions, they can be viewed as ideal candidates for the deployment of CCUS and could act as an anchor within a wider industrial cluster, helping to reduce the marginal cost of implementation for all users of transport and storage infrastructure. Such clusters can also provide regional 'economies of scale' in relation to production of hydrogen, especially blue hydrogen, the production of which requires the deployment of CCUS.

The alternative to equipping existing BFs with CCUS is to use EAF technology with scrap and/or DRI. Over time, production /procurement of any ore-based feedstocks (e.g. DRI) would migrate to 'green' feedstocks such as green hydrogen DRI, natural gas DRI+CCS, blast furnace pig iron+CCUS or even direct electrolysis of ore as they become available. In respect of steel scrap feedstock, there would ideally be a transition to more processed scrap.

Many of the barriers to implementing these technologies are beyond the direct control of the sector. These barriers include the speed of technological development and the roll out of the necessary external infrastructure for (green) hydrogen, green electricity and CCUS. It should also be noted that switching fuels to directly reduce iron using hydrogen while there is unabated natural gas power generation in the UK does not reduce the UK's carbon footprint overall, so 'greening' the grid is important alongside decarbonisation of industries such as steel. National, private and multi-sectoral partnerships are needed to invest in green electricity generation, green hydrogen and CCUS networks – and no option should be ruled out.

Low-carbon steelmaking vs development of other decarbonising technologies

Almost every aspect of the UK Government's decarbonisation plan is steel intensive – steel will be needed in significant volumes for renewable energy, low-CO_2 transportation, large-scale hydrogen and CCUS infrastructure. Steel is strong, durable and reusable. When steel does come to the end of its life, it is endlessly recyclable. These intrinsic characteristics make it perfectly placed to underpin the UK's circular, low CO_2 economy of the future. It is beyond doubt that the UK will need steel to meet its net-zero targets – the only questions are how and where it will be made.

While certain low-carbon changes can be made to the steelmaking process – such as the introduction of EAFs – a blend of technologies supported by the necessary green infrastructure and policy will be required to produce truly zero-CO_2 steel.

Using responsibly sourced, low CO_2 metals for the UK's transition is important, and the only way to achieve this is with a UK supply chain and supporting policies. However, the infrastructure, both existing and planned, to support the wide-scale adoption of low emissions steelmaking technologies is insufficient. EAF technology requires greater renewable power sources and wider availability of scrap, hydrogen reduction requires domestic green hydrogen production and distribution capacity on a significant scale, and CCUS is dependent on the establishment of an economy-wide commercial carbon transport and storage infrastructure.

Without these proven technologies, a zero-carbon steel industry is not plausible. Without certainty around the implementation of the right infrastructure requirements, there is a risk companies will invest in regions where these aspects are moving quickly.

Fossil fuel feedstock replacement and fossil fuel-free energy throughout the supply chain for steel products

The decarbonisation of the steel making process and the subsequent replacement of fossil fuel feedstock is largely dependent on the availability of green hydrogen and renewable energy.

Fossil fuels, and carbon more fundamentally, play an important role in a blast furnace where their principle function is to act as a chemical reductant. To make liquid iron in a blast furnace, iron ore and metallurgical coal need to be pre-processed into sinter and pellets and coke. As such, the reliable availability of alternatives is crucial to the eventual replacement of fossil fuels throughout the supply chain.

The needs of industrial end users are central to the development of a low carbon hydrogen economy in the UK. Hydrogen represents an option for decarbonising ore-based production but despite the publication of a UK Hydrogen Strategy, substantial uncertainty still remains about whether and when a stable market for 'green' hydrogen will become established. The likelihood that an abundant supply would be available at an affordable price that was competitive with other energy sources remains equally uncertain. Assurance is needed that power prices will be competitive with those of European competitors. Short-term support can be provided that does not conflict with forthcoming UK subsidy control rules. Policy signals can provide mid to long-term confidence that abundant, affordable and competitively priced green electricity will be available.

As such, replacing fossil fuels relies on the availability of green infrastructure and the affordability of alternatives. The Government must ensure both the availability of low-cost renewable hydrogen and the development of a suitable renewable energy network

and grid, which must be capable of supporting the energy and resource intensive requirements of the sector.

Government targets for low-carbon steelmaking in the UK

The decarbonisation of the steel industry is reliant on the necessary sustainable infrastructure being in place to support the transition. As such, it is important that the sector has sufficient clarity and certainty over investment cycles. There is little point in establishing targets without there being in place a strategy to ensure an enabling policy landscape within the relevant timetables. By providing security and certainty around the necessary mechanisms to decarbonise, the industry will be able to move faster to align with the Government's decarbonisation timescales.

The recommended pathway endorsed by the UKCCC through its Sixth Carbon Budget comprises the following elements:

- A 78% reduction in UK territorial emissions between 1990 and 2035.
- UK electricity production to be 'zero carbon' by 2035
- Low-carbon hydrogen scales-up to be almost as large, in 2050, as electricity production is today.[3]

While the assessment by the UKCCC makes some assumptions and would benefit from a location-by-location assessment, overall, it provides a good judgement of the necessary requirements for the UK's net zero future.

Crucially, it is vital that the Government takes these targets into account for the timeline to decarbonise the steel industry. While new technology can be introduced to bring the industry to 'near zero', the remaining picture is reliant on the UK's wider green infrastructure being in place. As such, targets for the steel industry must take into account this reliance and appropriately align with the development of the UK's green infrastructure.

Policy support for UK low-carbon steelmaking

Without policy intervention, steel companies are significantly restricted in their ability to invest in decarbonisation schemes. Policy support is moving in the right direction but falls short of the substantive actions that the industry needs to confidently decarbonise.

For example, all options for decarbonising the steelmaking process will lead to increased electricity consumption. Yet steel companies operating in the UK are subject to significantly higher electricity prices than our European counterparts, typically 86% more than competitors in Germany and 62% than in France[4]. Hydrogen-based steel production would increase the entire sector's electricity demand by over 800% if based on green hydrogen. Lower industrial energy prices in the UK are essential in helping our industry make step changes to decarbonise, a challenge in common with other countries.[5]

The Government needs to accept that a low carbon future will mean short term cost increases for all sectors, rather than picking winners and losers. The Government

[3] UKCCC, Sixth Carbon Budget
[4] UK Steel (February 2021), Closing the Gap
[5] https://www.reuters.com/article/nordics-hydrogen/rpt-high-costs-to-hamper-green-hydrogen-deployment-in-nordics-analysts-idUKL1N2M00CA

needs to think carefully about how it will fund this transition, knowing ultimately this will be to the benefit of the UK and its population once established.

The UK industry has faced long-standing headwinds; addressing the following challenges would level the playing field and help guarantee our long-term sustainability:

Affordable energy & Infrastructure

Industrial decarbonisation relies on abundant, competitively priced (versus that in other countries) low-CO_2 electricity, access to bulk hydrogen and carbon storage infrastructure at competitive prices. The UK steel sector must have the means and assurance of a level playing field, including access to infrastructure and energy that is needed to allow the whole of UK society to successfully decarbonise.

Large-scale public funding will be needed to put in place the enabling infrastructure for the transition to low-CO_2 steelmaking. Government should incentivise technology development for hydrogen and carbon capture, but any new measures to support the funding of business models proposed for their development must allow companies such as ours to be competitive.

Markets for green steel

As a globally traded material, a key consideration for the steel industry over and above the technology transition of individual companies, is the UK's policy framework for decarbonisation within an international context. Steel must compete in a highly competitive global market, and unlike other industries such as the power sector, the steel industry is not able to pass on its costs of decarbonisation (nor indeed, its carbon compliance costs) to customers.

Government intervention to support steelmakers with the additional cost of carbon reduction - such as a "contracts for difference" approach, use of UK ETS revenues or carbon border adjustments – could all make a positive difference. This is particularly significant given that steelmakers anticipate that operational costs would be much higher for a decarbonised steel process than traditional forms of steel production, in addition to significant capex requirements.

Creating markets for green steel should help to protect the investments made by responsible steel companies. Care needs to be taken on definitions so as to avoid unforeseen consequences. TSUK provided a detailed response to the recent BEIS consultation on creating markets for low emissions products setting out its views in this regard.

Whilst demand side mechanisms are clearly a key part of any future policy framework (and, potentially, voluntary initiatives), these alone will not be sufficient to enable steel sector decarbonisation, where barriers such as uncertainty over future green electricity provision and affordability of capital infrastructure require attention.

Increased utilisation of scrap

Using more of the significant, untapped, supply of scrap steel and reshoring steel intensive manufacturing supply chains can significantly boost jobs in the steel sector, leading to the creation of an estimated 7,500 additional high-skilled roles with salaries typically well-above regional averages. TSUK is already a significant steel scrap recycler. Increasing the use of scrap in its processes can reduce the CO_2 impact of steelmaking, but quality is important for operational efficiency and product capabilities.

Role of the Clean Steel Fund in delivering decarbonised fuel capacity in the UK

The clean steel fund (CSF), although welcome, does not match the necessary ambition to secure a thriving low carbon steel sector capable of meeting future demand. The UKCCC estimates a total annual cost of £8 Billion to cut emissions from the UK steel industry to 10 $MtCO_2e$ in line with its Further Ambition Scenario[6]. As such, the £250M allocated to the CSF doesn't come close to overcoming the vast capital requirements associated with decarbonisation.

The UK Government must deliver policy clarity across use cases, which will require direct investment. Other nations are already committing much greater sums to the decarbonisation of their domestic steel sectors.

Currently, the level of funding available to the industry does not match the risk that the sector must take, in the form of significant investment, to decarbonise. Steel must compete in a highly competitive global market, and unlike other industries such as the power sector, the steel industry is not able to pass on the capital investment costs necessary for the transition to net zero.

The level of funding available to the industry needs to align with the level of risk being taken. Currently the risks are high because the green steel market is developing, and the Government does not have the necessary policies in place to support steelmakers. Government should incentivise technology development for hydrogen and carbon capture, but any new measures to support the funding of business models proposed for their development must allow companies such as ours to be competitive.

Establishing a low-carbon steelmaking pilot at a UK site

TSUK supports the implementation of a low-carbon steelmaking pilot in the UK. However, given the high cost of decarbonisation and the lack of sufficient funding for the transition, the priority for investment and capital will likely be focused on guaranteeing the future of the industry through proven technologies.

Furthermore, abundant and reliable low-carbon power is needed to successfully implement a low-carbon steelmaking pilot. While the UK is a leader in this regard for new deployment, especially offshore wind, the UK's current renewable infrastructure is not sufficient to support the implementation of a trial. As such, Scandinavian counties will likely be test bed for these concepts due to the established infrastructure and volumes of available green hydrogen.

The consequences of a failure to invest in alternative technologies on the UK steel sector

The UK is already at risk of being left behind. European competitors have kickstarted the process of decarbonising their domestic steel sectors with significant Government support. The French Government, for example, recently announced plans to inject €5bn in "direct aid" for the deployment of decarbonisation solutions for heavy industry — €4bn of which will be spent on "innovative technologies" such as hydrogen and CCUS.

By giving European competitors a significant first mover advantage, the UK risks missing out on the value a thriving steel sector can bring. The UK has the opportunity

[6] Net Zero Advisory Group to the Committee on Climate Change, UKCCC

to supply the future manufacturing needs of a low-carbon transition. Steel is critical material for the energy/low carbon transition, and using responsibly sourced, low carbon metals for this is transition is important.

Consequently, a failure to invest in domestic green steel production is not just bad for the UK steel sector but bad for the UK and its environmental record. Without a domestic steel sector competitively producing green steel, the UK will inevitably offshore its emissions by importing steel.

The decarbonisation of the sector affords an opportunity for the UK to be global leaders, exporting low carbon steel worldwide. However, this is reliant on the implementation of supportive policies, the availability and certainty of sufficient funding and the development of reliable green infrastructure.

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