IIGCC

Policy paper: Investor priorities for transitioning the European steel sector

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Disclaimer

Introduction

The steel industry is responsible for 7-9% of global CO_2 emissions and around 5% in Europe.[1] Steel is a crucial input to construction, energy infrastructure, machinery, and transport, all strategic sectors that support jobs and economic growth across Europe.

The steel sector's decarbonisation is essential both for the economy-wide shift to net zero and for the alignment of investment portfolios with the transition. Creating a supportive policy environment for the transition of high emitting sectors is critical for achieving Europe's commitment to climate neutrality by 2050.

Investors committed to working towards a net zero and climate resilient future - in line with their fiduciary responsibility to their clients and beneficiaries – see a net zero steel sector as an opportunity for job creation and industrial innovation in Europe. In this context, the European steel industry is facing a historic, strategic turning point with risks and opportunities ahead.

Investors see Europe as well positioned to lead the global transformation of the steel sector. The EU is a large, highly developed economy with generally high-end steel production that can seize the opportunities and show what is possible, paving the way for other regions to follow.

The EU has a window of opportunity to invest in the steel industry's transformation. European steel producers will need to replace a significant amount of their long-lasting assets in the coming years: it is estimated that ~70% of existing EU steel capacity will reach its end-of-life by 2030.[2] Given the typical lifespan of a blast furnace (the mainstay of traditional steel making) is 20 years, decisions made now will shape the trajectory of Europe's steel industry to 2050. This means that to put the industry on a trajectory consistent with reaching net zero decisions have to be made imminently. Reinvestment in current infrastructure risks carbon lock-in and stranded assets. The coming years will determine how orderly - or not - the sector's transition will be.

Action by regulators, policymakers, investors, customers, external stakeholders and steel companies has led all of Europe's leading steelmakers to set net zero targets. However, much more is needed on all fronts to turn these targets into reality.

IIGCC has worked with a group of investors to identify areas for enhanced policy interventions that would most effectively de-risk and support the transition of the European steel sector. This work builds on IIGCC's Global Sector Strategy for the Steel Sector, as well as wider literature.[3]

The areas identified and the underpinning recommendations are intended to serve as a resource to support individual investors' engagement activities in relation to the steel sector. They are intended to provide a reference point for investors to refer to in their economy-wide macro-stewardship activities, direct engagement with policymakers, as well as engagement with companies in the steel sector and value chain. As a basis for discussion, they are presented as high-level topics that need to be addressed rather than prescriptive next steps.

The areas for enhanced policy interventions are:

A	Improve circularity in the steel value chain
B	Develop a clean industrial strategy that delivers clean power at a low price and accounts for the steel sector's capital-intensity
C	Stimulate demand for green steel
D	Manage human capital and the workforce

High-level summary of policy recommendations

Further detail on the following high-level recommendations can be found in the relevant sections of this paper.

A Improve circularity in the steel value chain

1. Incentivise capital investment to switch to electric arc furnace (EAF) production.
2. Introduce enhanced measures to reduce contamination in recycled steel, particularly from copper wires.
3. Implement policies to increase market demand for high-quality recycled steel in the EU and incentivise efforts to improve scrap quality.
4. Align existing EU policies to remove disincentives to increase the use of recycled steel in steel production.
5. Support open and competitive international markets for recycled steel.
6. Incentivise reduced consumption through material substitution and the redesigning of products.

B Develop a clean industrial strategy that delivers clean power at a low price and accounts for the steel sector's capital-intensity

1. Provide a transparent sector roadmap for European steel.
2. Accelerate action to grow Europe's renewable energy infrastructure.
3. Accelerate efforts to boost the development and uptake of renewable hydrogen in Europe.
4. Design, harmonise, and implement carbon contracts for difference support schemes.
5. Clarity on the financial incentives and mechanisms to support the transition from coal-dependent blast furnaces to low-carbon steelmaking by 2050.
6. Transparent standards for a science-based and industry-wide definition for green steel.

C Stimulate demand for green steel

1. Use public procurement of steel as a tool of innovation and industrial strategy to drive volumes of decarbonised steel to market.
2. Establish quota systems to mandate the use of a proportion of green steel in specific products/sectors.
3. Provide financial incentives in the form of point-of-sale subsidies, tax exemptions, post-purchase rebates, or tax credits.
4. Define reporting guidance and requirements for life-cycle emissions standards for key steel-consuming products.

D Manage human capital and the workforce

1. Develop, in close consultation with social partners, communities, and companies, a more detailed framework and roadmap for the steel workforce integrated into a clearer transition pathway for the sector.
2. Integrate just transition planning into national, regional and sectoral plans.

Context: The European steel sector

The steel industry is the EU's highest emitting industrial sector overall. Europe produces c. 152 million tonnes of finished steel per year, equating to around 14% of global production in 2022.[4] The EU is the third largest steel producing market, behind China – which produces over half of the world's steel – followed by India.[5]

The steel sector employs c. 300,000 workers directly in sites located across 22 EU Member States. However, a handful of countries dominate EU steel production in terms of volumes: Germany (26% of EU steel in 2020), Italy (15%), France (8%) and Spain (8%).[6]

At the corporate level, there are similarly a few large players with a significant long tail of smaller producers. The five largest EU headquartered steel-producing companies are: ArcelorMittal (global output c.59 million tonnes in 2022, around half of which is produced in Europe), thyssenkrupp (c. 10 million tonnes), SSAB (c. 7 million tonnes), voestalpine (c. 7 million tonnes), and Salzgitter Group (c. 6 million tonnes).[7]

Economic challenges

In addition to the investments needed to decarbonise, the European steel sector is also facing an extremely competitive international environment. Globally there is a rising imbalance between steelmaking capacity versus demand.[8]

Historically a net exporter, European steel faced a significant and seemingly permanent fall in demand after the 2008 global financial crisis.[9] Since 2016, the EU has been a net importer of finished steel products.[10] EU producers also deal with structurally higher average production costs (e.g. for energy, labour and input materials) compared to other major steel making regions.[11]

Research by Transition Zero covering major steel producing countries shows that in 2021, Germany faced the highest costs globally. Its steelmakers incurred costs that were 46% higher for blast furnace-basic oxygen furnace (BF-BOF) steelmaking and 36% higher for electric arc furnace (EAF) steelmaking than the lowest-cost producer (India).[12] Relatedly, European steel producers in recent years have seen low margins and declining profitability due to higher sensitivity to raw material costs and energy prices.[13]

Two steelmaking routes with very different emissions intensities

About 60% of Europe's steel production capacity is the BF-BOF process for producing primary steel. Given its high emissions intensity, with an average of 1.9 tonne of CO_2 equivalent (tCO_2e) emitted per tonne of BF-BOF steel produced in Europe, this route produces the vast majority of European steel emissions.[14]

The remaining 40% is made through secondary production with EAF using recycled scrap steel. This process is significantly less emissions intensive with the average emission intensity of European scrap-EAF steel today at just 0.2 – 0.3 tCO_2e per tonne of steel produced.[15] This means that on average steel made through the scrap-EAF route produces one-sixth of the CO_2 emitted as compared to the BF-BOF route. As such, one of the most effective pathways to decarbonising European steel production would be to shift to more secondary production from recycled steel. Some net zero scenarios even have the scrap-EAF route becoming dominant in Europe by 2050.[16]

However, global pathways for the steel sector indicate that even if secondary production increases significantly, primary steel making is likely still to be important in 2050 in Europe and the main production route globally.[17] Therefore, it is also important to incentivise the development of primary steelmaking with near-zero emissions in Europe and beyond. This topic is addressed in this paper's section on green industrial strategy.

Product types

While a range of steel products are made in Europe, European steel is mainly a premium market made up of high-quality manufacturing. There are generally two categories of steel products: flat products (e.g. sheets of steel used by the automotive sector) and long products (e.g. rods or beams used in structural applications). In the EU, demand for the former is notably larger than for the latter. In 2022, flat products made up 59% of European market supply and long products 41%.[18] Flat products generally require higher quality steel to make.[19] Producing premium flat steel products via scrap-EAF is more challenging due to the presence of tramp elements in steel scrap meaning it is generally downcycled.[20]

Key off-taking sectors

Construction is the largest single steel consuming sector in Europe, representing 37% of finished steel demand. It requires mainly for long products, potentially making it a strong candidate for growing demand for recycled secondary steel made via scrap-EAF.

The automotive sector is the second largest steel off-taking sector with 17% of total finished steel demand. However, it is the largest end-user of those higher-quality flat steel products that generally require primary steel production.

Policy: what carbon price?

The policy context for decarbonising the steel sector is set by the EU's emissions reductions targets and its carbon pricing regime. The EU's 2050 climate neutrality goal and 2030 55% emissions reduction target require deep and sustained cuts in industrial emissions. The key policy tool to stimulate these is the EU Emissions Trading System (ETS), which sets a price on carbon for in-scope sectors, including steel, through a cap-and-trade system of allowances.

Steel producers have never paid the full ETS carbon price as they have always received a very significant percentage of their required allowances for free. This has largely achieved the aim of shielding the industry from financial costs that would disadvantage it compared to international competitors and risk 'carbon leakage'. However, this free allocation resulted in an undermined price signal and insufficient incentive for the sector to shift to climate neutral technologies. This was especially true when the carbon price was relatively low and volatile.[21]

There is an additional argument made by some that carbon pricing through the ETS is in any case insufficient as a mechanism to drive the development of innovative green technologies for the steel sector. This is because such development typically requires large upfront capital investment that only realises decarbonisation benefits over a long timeframe, whereas the ETS's price signal is only strong enough to incentivise more immediate and gradual reductions.[22]

As such, where a pricing signal could drive substitution to lower-carbon alternatives is to provide an incentive to increase usage of recycled scrap steel. Presently, however, the technicalities of how free allocation has been calculated via technology-specific benchmarks has meant that incremental emissions reductions to pre-existing BF-BOF production methods have been incentivised over a shift to secondary production or the roll-out of breakthrough green steel technologies. Indeed, the latter sometimes fall out of scope of free allocation entirely, disincentivising innovation.

The recent revision of the EU ETS looks to have potentially changed these dynamics. It finally resulted in a decision to phase out free allocations between 2026-2034 and replace it with carbon tariff on imports, known as the Carbon Border Adjustment Mechanism (CBAM). From 2026, EU importers of goods covered by CBAM, including steel, will have to pay a carbon price determined by the weekly average price of ETS allowances.[23] This means that over time both domestic and imported steel will face the full carbon price signal of the ETS, with the intention that this will drive investments in green steel production.

While the practical impact of this shift remains to be seen, the fact that steel producers will eventually have to internalise the cost of carbon at the market rate is an important policy development for the decarbonisation of European steel.

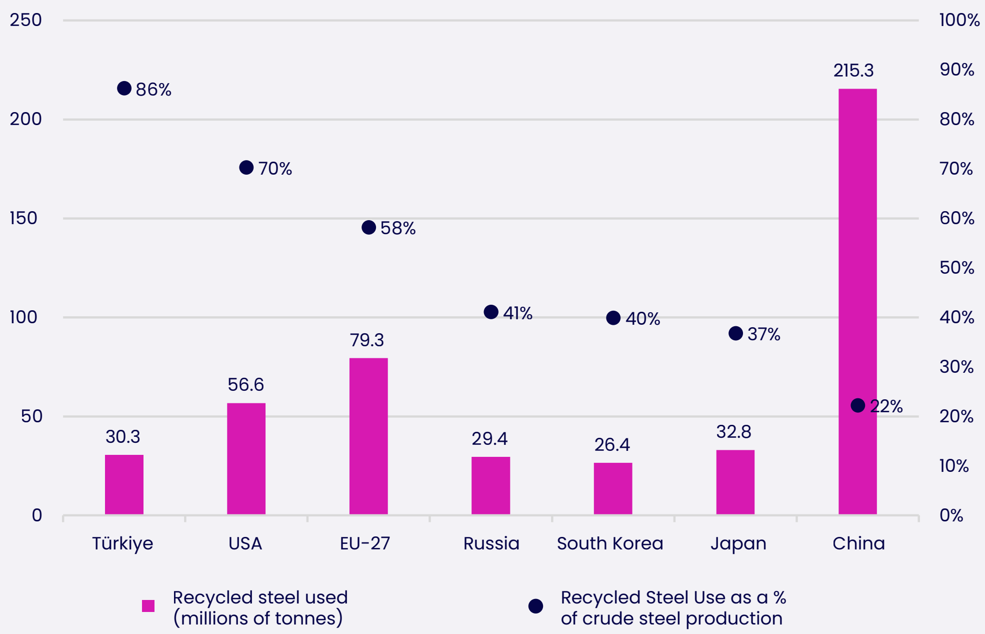
A. Improve circularity in the steel value chain

Increasing the proportion of secondary steel production and maximising the use of recycled steel offers an important and cost-effective lever for emissions reduction.[24] It is also less energy intensive as there is no need for iron ore reduction.[25]

Recycled steel use in the EU

In absolute terms, the EU recycles more steel than other developed markets and has a relatively high recycling rate of around 85% for end-of-life steel.[26] However, it has a significantly lower rate of recycled steel use in crude steel production than both the United States and Türkiye. Moreover, this rate has remained almost unchanged in the EU for the past 17 years.[27]

Recycled steel use in crude steel production 2022



Source: BIR Global facts and figures "World Steel Recycling in Figures 2018~2022"

One consequence of this is that the EU is the largest exporter of recycled steel, the biggest destination for which is Türkiye. This is in part positive as Europe supports the production of lower emissions secondary steel in other markets where domestic scrap supplies may be more limited. However, it also raises the possibility that Europe could reduce its own steel sector emissions further by better integrating domestic scrap steel through recycled steel production.

One study by Material Economics has found that due to an expected saturation of the EU steel stock by the 2050s, the amount of recyclable steel available in Europe could grow to be as large as the EU's annual steel consumption. Thereby, the sector has the potential to become a model for the circular economy.[28] Indeed, if all scrap were of sufficiently high quality, it could theoretically almost displace any requirement for additional primary production.

The challenge of quality

This aggregate picture, however, masks the complexity of the sector and different industrial use case requirements. At present, end-of-life steel is mainly down-cycled into lower quality steel that has more limited end-use applications.

Copper wires are currently the main barrier to producing high-quality steel from recycled scrap and are pervasive in end-of-life products containing steel. Unlike other materials, copper cannot be removed once the scrap is re-melted.[29] As such, addressing copper contamination needs to occur upstream by improving recycling processes.

Concentrations of copper over 0.1% by weight cause hot shortness, a phenomenon resulting in defects that are unacceptable for high-quality flat steel products. The copper tolerance of long steel is higher at 0.4% by weight, making their production with recycled steel easier. Whilst certain flat products can be made from recycled steel, feasibility varies with specific product requirements.

For instance, in the automotive sector the viability of using recycled steel varies with the product's thickness. Products thinner than 5mm, such as a car bonnet, have higher material strength requirements and need to be made from primary steel, whereas thicker products such as the frame of the vehicle can be made from high-quality recycled steel.[30]

This means that measures to improve circularity seem unlikely to be able on their own to take the steel sector all the way to net zero across all product categories. However, a shift to much greater secondary production enabled by measures to improve recycling and material efficiency can significantly reduce its emissions. Additionally, the potential gains could be larger than anticipated as a percentage of steel demand currently met through the primary route seems to be for products with specifications readily achievable through secondary production. However, determining how significant a segment this is requires further analysis.

Priority areas for policy action

To improve circularity in the steel value chain, the policy environment can look to:

1. **Incentivise capital investment to switch to EAF production.** This would help enable lower emission steelmaking and improve circularity. It is unclear why the European steel sector has not invested more in EAF secondary steel production methods up until now, especially when compared to the United States and Türkiye. Disincentives within the EU ETS regime and relatively high electricity prices could be potential reasons.
2. **Introduce enhanced measures to reduce contamination in recycled steel, particularly from copper wires.** Researchers suggest that closed loop recycling which reuses high-quality steel within a single application, e.g. automotives, could prevent scrap steel from being further contaminated.[31]
3. **Implement policies to increase market demand for high-quality recycled steel in the EU and incentivise efforts to improve scrap quality.** This could involve setting product-level recycled steel content targets under the EU Ecodesign for Sustainable Products Regulation or the End-of-Life Vehicles Regulation. Such an approach could set an interim 2030 target to be reviewed and tightened over time as industry investments to improve material sorting and address issues with tramp material contamination progress. The recently announced new Circular Economy Act, with its focus on helping to create market demand for secondary materials, could also play an important role. Measures on whole-life carbon in buildings, potentially through the Construction Products Regulation, may also be relevant given the construction sector's high consumption of long steel products.
4. **Align existing EU policies to remove disincentives to increase the use of recycled steel in steel production.** Any perverse incentives under the EU ETS that favour primary over secondary steel production while free allocation of allowances persists should be immediately addressed.
5. **Support open and competitive international markets for recycled steel.** Complementing internal EU measures should be a continued commitment to open and competitive markets. Avoiding the imposition of tariffs and export limits on scrap steel traded with countries outside of the EU is essential to valuing the use of recycled materials and global steel industry efforts to reduce emissions in line with net zero pathways. Where other markets have imposed their own export limits on steel scrap the EU should use its trade and climate diplomacy levers to push for a level playing field.
6. **Incentivise reduced consumption through material substitution and the redesigning of products.** In addition to increased recycling, encouraging the more efficient use of steel and/or its replacement with lower carbon materials is another avenue to improving circularity. This should consider whole lifecycle emissions to avoid perverse incentives.

B Develop a clean industrial strategy that delivers clean power at a low price and accounts for the steel sector's capital-intensity

Beyond ramping up secondary steel production, there is also a need to decarbonise primary steel. This means that the deployment of new technologies must displace the CO_2-intensive BF-BOF production route as it currently exists.

Technology options: H2-DRI-EAF vs CCS

Two main technologies have been positioned as the main options for reducing emissions from primary steel production: the potentially near-zero emission H2-DRI-EAF (hydrogen - direct reduced iron – electric arc furnace) route using green hydrogen and clean electricity, or the use of carbon capture and storage (CCS) to abate emissions at BF-BOF plants. In the IEA's Net Zero by 2050 scenario, 8% of global steel will be primary steel made via one of these routes by 2030.

In Europe, there are innovative examples of pioneering primary steel production via green hydrogen and electrification. If done with fully decarbonised electricity, this can result in up to 98% lower emissions than business-as-usual BF-BOF production.[32] Some projects are in advanced stages of development, with one site in Sweden having already produced 'green steel' via H2-DRI-EAF in a pilot plant (the HYBRIT collaboration between SSAB, LKAB and Vattenfall) and another expected to soon enable commercial production (H2 Green Steel). The next challenge is scaling up the implementation of these technologies to enable sectoral decarbonisation – an area where many steel companies currently lack action plans.

The CCS route has been historically considered by the European steel industry and many steel companies still see CCS as a potential solution for reducing their carbon emissions. However, for meaningful reductions, CCS would need to be applied to BF-BOF production alongside extensive process modifications to account for the multiple emissions sources in steel plants, representing further costs. Additionally, while the application of CCS can significantly reduce emissions in certain circumstances, the total reductions available are substantially below what the H2-DRI-EAF route can achieve.[33] While there is currently no commonly agreed definition of what constitutes green steel - an issue that needs to be tackled - it is clear that the production of decarbonised steel, the ultimate destination for the primary production route, does not seem possible with CCS alone.

The likely contributions of H2-DRI-EAF and CCS for steel production in Europe can be seen in the commercial scale project pipeline for each. Analysis from Agora Industry indicates that globally since 2020 almost all steel companies that intend to build low-carbon steel plants have gone for developing the H2-DRI-EAF route rather than CCS on coal-based steelmaking, with stark results. The 2030 pipeline for the former route is currently around 94 million tonnes per annum (Mt p.a.) of production capacity whereas for the latter it is at only 1 Mt p.a.[34]

This has led to CCS's potential role in cutting emissions from steelmaking in Europe being increasingly questioned, strongly suggesting that it is being left behind as a solution for the EU's steel sector by H2-DRI-EAF.[35] Further policy clarity on Europe's choice in this area would be helpful in confirming the direction of travel, provide clear signalling to investors and help engagements with steelmakers.

A green energy-intensive transition

Given its significance as an input into both primary H2-DRI-EAF and secondary scrap-EAF steelmaking, the price at which clean electricity is available, both for making hydrogen and for running EAF production, will be one of the most critical factors behind the future competitiveness of the European steel industry. Growing H2-DRI-EAF will require huge amounts of low-carbon hydrogen and electricity on top of the additional renewable energy demand associated with growing secondary production, as recommended in section A.

The price of these inputs (electricity and hydrogen) largely defines the operational costs of green steelmaking. Running H2-DRI-EAF now has a higher cost of production than other steelmaking routes due to costs of raw materials. Affordable hydrogen and renewable energy are therefore key to keeping green steel operational costs manageable, and for allowing for healthy green steel margins.

Hydrogen

Estimates for the European steel sector's future demand for green hydrogen vary significantly based on assumptions including the availability of clean hydrogen and the extent to which increased circularity reduces primary steel demand. Nonetheless, the sector's future requirements can be assumed to be large.

If all current EU primary steel were produced by H2-DRI-EAF, this would require around 5.5 Mt of hydrogen annually. More conservative estimates that account for some hydrogen blending with natural gas and/or large cuts in primary steel production suggest figures of 3.7 – 3.9 Mt of hydrogen a year by 2050. By way of comparison, the European chemical industry, by far the largest consumer of hydrogen, currently uses 9 Mt of (non-renewable) hydrogen each year.[36]

For H2-DRI-EAF steel to have near-zero emissions, the hydrogen used will need to be made with clean electricity, namely renewables or nuclear. To meet anticipated new additional demand from steel and other industries, the EU is prioritising the development of renewable hydrogen and currently aims to produce 10 Mt and import 10 Mt of it each year by 2030 in total for all sectors.[37]

If all the additional hydrogen for H2-DRI-EAF primary steel is to be renewable, this would require significant additional renewable electricity. Making hydrogen via water electrolysis powered by renewable electricity would represent about 75% of total electricity demand for H2-DRI-EAF steel in such a scenario.

Electricity

As with estimated hydrogen demand, there is a wide range of estimated needs for renewable electricity. In a high steel-demand future, H2-DRI-EAF production in Europe could require over 300 Terawatt hours (TWh) of renewable electricity a year. Growing secondary EAF steel production could require an additional 50 TWh. This means that together the European steel sector could account for more than 350 TWh, equal to over 35% of all the renewable electricity produced in the EU in 2019.[38] The steel industry itself has estimated its requirements at up to 400 TWh in total, seven times its current electricity purchase from the grid.[39] Even a lower demand scenario where annual demand is nearer 200 TWh, or more than 20% of all the renewable electricity produced in the EU in 2019, would require a huge increase in renewables.[40]

Simply put, the better its access to cheap and plentiful renewable electricity, the better the sector will be able to compete globally. Additionally, while modelled demand projections for both renewable electricity and green hydrogen can be helpful, they are not sufficient to make investment decisions. Greater certainty is needed on offtakers for both if the required investment is to flow.

A capital-intensive transition

In addition to the scale of renewable energy required, the capital needed to transition Europe's primary steelmaking is immense. Some estimates suggest the capital expenditure could exceed USD 1,200 per metric ton of steelmaking capacity.[41] Others suggest that converting an average European steel plant to H2-DRI-EAF production could require between EUR 3.3 billion (bn) and EUR 7bn of capital expenditure.[42]

The capital intensity stems from redesigning production processes and installing new equipment and materials, as well as shifting the energy source. The H2-DRI-EAF route requires building hydrogen-based steel plants and electric arc furnaces. Hydrogen production, transport and storage alone could account for a significant percentage of the total capital expenditure bill.

Incentives will be needed to spur investments during an initial high-cost period before scale economies emerge. Given the huge sums involved, companies are looking for additional long-term policy commitment that will give them visibility and confidence to invest. For companies, access to finance will require showing investors that a credible transition strategy exists. Additionally, the proportion of public vs private investment needs to be determined. There is a role for both types of investment, and these costs need to be distributed in a fair way. For investors to feel confident in this transition, strong and consistent policy direction is needed in Europe.

Priority areas for policy action

Prioritising the deployment of renewable power and addressing key investment risks now can help Europe develop breakthrough decarbonisation technologies. Commission President von der Leyen has promised a Clean Industrial Deal in the first 100 days of the next Commission mandate, to be underpinned by a new Industrial Decarbonisation Accelerator Act. This offers a key opportunity to do just this. In this regard, an enhanced policy environment can look to:

1. **Provide a transparent sector roadmap for European steel,** with clarity on the future direction of emissions regulations, carbon pricing, the role of CCS, anticipated green hydrogen availability, and the pricing regime for renewable electricity to reduce policy uncertainty. This could include details on the likely future evolutions for key industrial clusters in Europe to provide sufficiently granular information. Companies and investors need this, alongside predictable policies, to make long-term investment decisions.
2. **Stimulate growth in Europe's renewable energy infrastructure.** This includes following through on policies to boost renewable generation capacity, increase storage and prioritising grid expansion and upgrades to accommodate the increased load, ensuring stable delivery to industrial sites.
3. **Boost the development and uptake of renewable hydrogen in Europe.** Encouraging the use of long-term renewable hydrogen offtake agreements between hydrogen suppliers and steel producers would help provide important demand certainty.
4. **Design, harmonise, and implement carbon contracts for difference support schemes** for green hydrogen or green steel itself, providing long-term price certainty at levels to offset any green premium.
5. **Provide clear financial incentives and mechanisms** to support the transition from coal-dependent blast furnaces to low-carbon steelmaking by 2050. This could include tax breaks, grants, preferential loans, and project financing for renewable energy, clean hydrogen, EAF and other green steel technologies.
6. **Set transparent standards for a science-based and industry-wide definition for green steel.** This should be consistent with the EU's emissions reduction goals and the standards being used by investors elsewhere. Currently, there is no universally agreed upon definition for "green steel". This due to the wide range of production methods and materials it covers, the lack of clear criteria across different organisations and countries, the evolving technological standards and environmental benchmarks, and the complex impact assessments needed to determine the total lifecycle. Some parameters of what such a definition should consider are available in IIGCC's Steel Purchaser Framework 2023.[43]

C Stimulate demand for green primary steel

In addition to the steel industry's renewable energy demands and capital intensity, steel purchasers' willingness-to-pay is a well-documented challenge for green steel development. The onus is not solely on governments to subsidise green steel to boost demand, but policy-makers should be asking why the demand is not where it needs to be to set the direction for the private sector. Policy has a key role to play in addressing this.

The green premium

Building and operating green primary steel production plants will cost more than carbon-intensive steel production due to higher capital and operating expenditures, at least in the foreseeable future. Bloomberg New Energy Finance estimates the current cost of green steel at 40% more than unabated production.[44]

Estimates vary on how large of a green premium this will lead to in the price of steel, in part because not all green steel will cost the same to produce. Which policy instruments are introduced and how they interact will also have an impact. The World Economic Forum estimates that using clean hydrogen in production processes comes with an expected green premium of 35% - 70% over conventional BF-BOF production.[45] This figure is higher than both the 25% premium that H2 Green Steel disclosed it will charge and the 20-30% premium range announced by SSAB in 2023.

Applying the lower range of these projections to recent European steel prices suggests that they could add at least an extra EUR 135 to the price of each tonne of hot rolled coil steel.[46] This is greater than the implied cost of carbon was the steel sector subject to the ETS's full price signal currently and not in receipt of free allowances. Taking a projected average of 2024 ETS prices, a carbon price of less than EUR 125 per tonne would apply to each tonne of BF-BOF steel produced with average EU emissions intensity.[47]

The actual green premium will ultimately depend on a number of factors. These include the evolution of input prices at the point of production and how this compares to the carbon price faced by higher emitting steel products as ETS free allocation is phased out. It seems likely, however, that some form of green premium will persist in the coming years. The cost differential will likely be borne by end-use markets in the form of higher steel prices and/or subsidised by governments through financial incentives.

Who pays?

Due to steel's vital role in the global economy, customer demand, support, and acceptance are needed for the success of green primary steel. The shift towards green production technologies will only happen if customers value low-carbon products and are willing – or are incentivised – to pay for decarbonisation. In short, there must be demand.

Some organisations have, for example, called on automakers to drive demand for zero-carbon steel to kickstart the industry transition. They focus specifically on the automotive sector as a lead demand-stimulating market for several reasons. Firstly, it is a major offtaker, responsible for nearly 40% of EU deliveries for strip mill products – a major subset of flat steel – to end-users in 2021-2022.[48] Secondly, steel is a relatively small percentage of the total cost of producing a vehicle, and the cost of procuring green steel can be passed to customers more easily. For example, estimates suggest that green steel would only add 0.9% to the cost of a vehicle, something that could potentially be absorbed relatively easily, especially at the luxury end of the automotive market.[49]

The logic of the auto sector as a lead demand creation market for green steel is strengthened further when the need to decarbonise the automotive sector's value-chain is considered. Embedded emissions from steel are estimated to represent around 16% to 27% of the life cycle emissions for an electric vehicle by 2030.[50] Reducing these will become increasingly important as the sector switches to electric vehicle production and looks for further ways to reduce vehicle life cycle emissions.

This rationale seems to be playing out in the industry. Bloomberg New Energy Finance tracked that 44% of all green steel supply agreements thus far involve the transport sector, with autos and auto suppliers being the leading sub-sectors and accounting for more than a third of the total supply agreements recorded.[51]

On the other hand, European car manufacturers and their suppliers are under intense pressure from major international competitors to reduce prices, which could make absorbing even a relatively small cost increase difficult as they already face higher technology and production costs. One potential approach could be a focus on the high-end auto sector as the early adopter for green steel. There could be a two-speed approach between luxury vehicles and low-to-mid end vehicles that makes the policy more acceptable politically. The EU could then phase in strong sustainability requirements for batteries and key raw materials like steel for all vehicles, so that the embodied carbon of the vehicle is reduced over time.

While these are important steps, further measures are still needed to stimulate sufficient demand to transition the steel sector.

Priority areas for policy action

From the investor perspective there are several policy areas for stimulating demand to bridge the green premium on green steel:

1. **Use public procurement of steel as a tool of innovation and industrial strategy to drive volumes of decarbonised steel to market.** Such strategies, through which governments could mandate or preferentially purchase steel based on carbon-related criteria, could provide partial de-risking of first-of-a-kind steel investments. The EU defines "Green Public Procurement" to consider the life cycle environmental impact. Research suggests that Green Public Procurement could make a significant difference in the context of public vehicle fleets, for example.[52] The recently promised upcoming revision of the Public Procurement Directive offers an important opportunity in this area and could look to draw on IIGCC's Steel Purchaser Framework 2023 for the steel sector.
2. **Establish quota systems,** which would mandate the use of a proportion of green steel in specific products/sectors.
3. **Provide financial incentives** in the form of point-of-sale subsidies, tax exemptions, post-purchase rebates, or tax credits.
4. **Define reporting guidance and requirements for life-cycle emissions standards for key steel-consuming products.** Applying these regulations on only a few steel-using value chains can be a key instrument to fast-track deployment of low-emissions steel and legitimise a differentiated product certification scheme. Building on IIGCC's Steel Purchaser Framework 2023, this could include supporting the disclosure of the average carbon intensity of steel purchased by key offtakers.[53]

Additionally, policymakers should also consider ways to resolve the issue of how to create a global level playing field and create markets for green steel, potentially through international forums or alliances.

D Manage human capital and the workforce

The European steel industry directly employs over 300,000 workers.[54] It is estimated to have already incurred 80,000 job losses, more than one in five workers, between 2009 and 2020 due to broader industry pressures.[55] Thanks to the nature and history of the steel industry, its jobs are often highly concentrated in specific locations. European steel jobs are also heavily unionised, with associated contractual and pay benefits.

Consequently, the steel sector's role in the local communities – and the impact of job losses – can be significant from cultural, economic, and political perspectives. Poorly managed job losses can severely impact a company's licence to operate, particularly as it leaves the potential of whole communities without income.

Given the clear long-term and legally-binding policy signals in Europe, inadequate planning, support and investment leading to continued business-as-usual approaches by the steel sector would likely result – either suddenly or gradually – in a disorderly transition with the loss of industrial production and associated jobs. As such, the greatest employment risk for the European steel sector is a failure to transition at all. This could leave communities without viable employment and income, which can also have political knock-on-effects.

If the European steel industry takes one of the more orderly paths available to it towards net zero, the workforce will still face significant challenges. Though outside the EU, the political tension in the steel sector has been recently exemplified at the Welsh Port Talbot facility. The owner, India-headquartered Tata Steel, has announced that 2,800 roles will be lost as the company transitions its business towards scrap-EAF production, with an economic assessment suggesting that up to 9,500 jobs could be lost when the broader impact is considered on the local economy.[56] This has led to debate between the company, relevant UK trade unions, and the UK Government, with the company's reputation taking a serious hit despite pursuing a decarbonisation goal that would significantly reduce Welsh national emissions.

In the future, the European steel sector could still be a major employer. However, there may be fewer direct jobs in European steel making at similar levels of production. The shift to EAF production routes, with increased automation, digitalisation and electrification, is expected to continue the pre-existing trend of steel production's declining labour intensity. Work and analysis by trade union bodies suggest these changes will also cause the skill requirements for the steel workforce to change, necessitating improvements in workforce skill development and training.[57]

Furthermore, the steel jobs of the future may not be in the same locations as the steel jobs of the past, due to different economic requirements – e.g. the need for accessible and cheap renewable power rather than proximity to coal fields. At worst, sudden job losses could lead to political pushback which will lead to wider disillusionment with European decarbonisation policies. Navigating these changes is vital for the sector's journey to decarbonisation.

European just transition policy – from coal to steel?

Europe's just transition policies are generally comprehensive compared to most other regions.[58] However, despite its long history of cohesion policy, until recently the EU had relatively few programmes focused specifically on a just transition.

The just transition plans that exist, both at the European and national levels, are mainly designed to support areas most affected by the shift away from coal power generation and mining.[59] This is the case even in Spain, the country with the most developed just transition policies in this domain, where support is centred on those impacted by the closure of coal mines and coal-fired thermal power plants.[60]

Europe's just transition policy, including the Just Transition Mechanism under the Green Deal, has also been criticised on several fronts. These include fragmentation, inadequate legislative underpinning, and insufficient funding to meet the scale of transformation facing European workers and communities.[61] Implementation largely rests with Member States.

As such, there does not seem to currently be a clear policy plan, roadmap or support structure for the transition of Europe's steel sector workforce at either the EU or national levels. There are also comparatively few studies on this aspect of the sector's transition.

While there are undoubtably lessons to be learnt from Europe's transition away from coal, the process will not be the same. Whereas coal power is being phased out, there is a clear desire to retain and transition steel production in Europe. However, steel production sites are also often found in historical coal mining regions.[62] This means that communities and local economies affected by the steel sector's transition may already be dealing with similar consequences related to Europe's more advanced transition away from coal power.

Not just policy

While policy is important, how steel companies engage and consult their workforce on their transition plans is also significant. Discussions about improving the policy environment should not detract from the agency of individual steel companies.

There are several recent examples of where effective engagement has led to better outcomes for all stakeholders. These include a December 2023 agreement between the trade union IG Metal and steel manufacturers in North Rhine-Westphalia to protect workers against redundancies during the transition by reducing hours across the workforce rather than terminating individual contracts.[63] In the Netherlands and Sweden, steel companies and unions are working to develop transition pathways for workers, including on reskilling.[64] These can be contrasted with harsher examples that result in significant and sudden job losses, for example at Port Talbot.[65]

Recommendations for policymakers

For an effective transition, policymakers at the EU, national and sub-national levels must enhance their dialogue with companies, workers and communities in the steel sector. This means they should:

1. **Develop, in close consultation with social partners, communities, and companies, a more detailed framework and roadmap for the steel workforce** that should be integrated into a clearer transition pathway for the sector.
2. **Integrate just transition planning into national, regional and sectoral plans.** This should include requiring Member States to embed just transition elements more strongly into their National Energy and Climate Plans. These should emphasise future workforce planning and support in skills development at the national, sectoral and local levels to enable low-carbon steel production to be transitioned in as coal-based production is phased out.

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