

Industry Overview

Europe's Metals Industry Under Pressure to Transform

Ambitious climate targets, soaring energy costs and persistent global overcapacity are accelerating the transformation of Europe's metals industry. Supported by the European Union's industrial policy agenda, producers of steel, aluminium and copper are embarking on a technological transition that offers significant opportunities while carrying considerable economic risks. How these transformation pathways are taking shape in practice will be showcased at GIFA, METEC, THERMPROCESS and NEWCAST, the four world-leading trade fairs that make up "The Bright World of Metals", organised by Messe Düsseldorf and taking place in Düsseldorf from 21 to 25 June 2027.

Whether in automotive engineering or mechanical engineering, construction, defence or energy infrastructure, metals are fundamental, indispensable industrial materials for the European Union. Rolled, forged or cast, metal components made of steel, aluminium, copper and other non-ferrous metals are key elements in almost every industrial product. The sector accounts for more than five million jobs in the EU, including suppliers and downstream processing. For the steel industry alone, the European industry association Eurofer puts the number of employees at around 300,000, with a total of 2.5 million jobs dependent on steel. European Metals, the non-ferrous metals counterpart, estimates employment at around 500,000 direct and three million indirect jobs.

The Challenge of Transformation

The European Green Deal commits all 27 EU Member States to achieving climate neutrality by 2050, with some countries, including Germany, aiming to reach this goal as early as 2045. Decarbonising the metals industry, from integrated steelworks to foundries, requires not only substantial investment in electricity grids and hydrogen infrastructure but also significant capital expenditure by the companies

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themselves, despite billions of euros in public funding. Across the sector, from multinational steel producers to medium-sized foundries, companies are united in their core industrial policy demands. They are calling for a secure and affordable energy supply to enable the electrification of production processes, accelerated investment in hydrogen infrastructure and, where technically necessary, carbon capture technologies.

Above all, the industry is seeking a level playing field in global trade. Manufacturers are calling for stronger protection against dumping and unfairly subsidised imports, more consistent enforcement of trade defence instruments, and an effective Carbon Border Adjustment Mechanism (CBAM) for imported products. To support European industry, the European Union has introduced a package of policy measures that includes tighter import quotas and the CBAM. The European Commission is also proposing requirements for the use of low-carbon steel in new vehicles, as well as sustainability criteria for public procurement. Having entered into full application in January 2026, the CBAM is designed to prevent European manufacturers that comply with stringent climate regulations from being undercut by competitors operating under less demanding environmental standards or from relocating production to countries with weaker climate policies, a phenomenon known as carbon leakage. At the same time, the mechanism is intended to encourage producers in third countries to reduce their greenhouse gas emissions. The European and German metals industries broadly support the CBAM as a key instrument in preventing carbon leakage. However, they are calling for its scope to be expanded beyond basic materials to include downstream products.

Views diverge considerably, however, when it comes to the EU Emissions Trading System (EU ETS), the cornerstone of the EU's market-based decarbonisation strategy. ArcelorMittal, thyssenkrupp Steel and voestalpine, together accounting for around 60 per cent of Europe's integrated steel production, are advocating reform of the EU ETS. They argue that rising carbon costs and the gradual phase-out

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of free emissions allowances threaten the competitiveness of European steelmaking. The companies are therefore calling for a freeze on further increases in ETS-related costs until decarbonisation can be achieved under economically viable conditions.

Other steel producers take a markedly different position. Saarstahl Group, Outokumpu, SSAB and Salzgitter argue that weakening the EU ETS would not strengthen Europe's competitiveness but would instead undermine investment certainty. In their view, such a move would penalise early movers and delay the industrial transformation Europe urgently needs. According to these companies, the greatest threat to competitiveness does not stem from carbon pricing itself, but from persistently high electricity prices driven by continued dependence on fossil fuels, insufficient energy infrastructure and global overcapacity in the steel industry.

Germany's foundry industry faces its own set of challenges. High energy costs, growing distortions in international competition, increasing regulatory requirements and persistently weak demand have placed many businesses under severe economic pressure. The German Foundry Association (BDG), representing around 600 iron, steel and non-ferrous foundries, fundamentally supports carbon pricing. However, it argues that existing measures do not provide sufficient protection against carbon leakage.

Foundries currently face a structural disadvantage under the CBAM. Cast components are not yet included in the mechanism's core product scope, leaving European foundries exposed to competition from producers in third countries that are not subject to comparable carbon costs. At the same time, imported metal feedstocks become more expensive because the CBAM raises import costs, increasing production costs for European manufacturers. The industry is therefore calling for foundries to be fully integrated into the CBAM framework. In the case of iron castings, for example, the sector is advocating stronger carbon leakage protection instead of the

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European Commission's proposed 40 to 50 per cent reduction in the EU ETS product benchmark. Such a reduction would significantly increase compliance costs for foundries long before climate-neutral production technologies are commercially available.

Technological Transformation Pathways in the Steel Industry

Within the European Union, the transition from coal-based blast furnace production to hydrogen-based direct reduction (H-DR), combined with electric arc furnace (EAF) steelmaking, is widely regarded as the most promising pathway to decarbonising primary steel production. In this process, hydrogen replaces coke as the reducing agent, removing oxygen from iron ore at temperatures between 800 and 1,000°C. Instead of carbon dioxide, the only by-product is water vapour. The resulting direct reduced iron (DRI), or hot briquetted iron (HBI), is subsequently melted together with scrap in an electric arc furnace to produce crude steel. In practice, however, the transition presents a far more complex picture.

German steelmakers, including Saarstahl, Salzgitter and thyssenkrupp Steel, are pressing ahead with the development of DRI-EAF production routes, supported by multi-billion-euro government funding. By contrast, global steel producer ArcelorMittal has declined €1.3 billion in public subsidies for planned DRI facilities in Bremen and Eisenhüttenstadt, arguing that hydrogen-based steel production currently lacks commercial viability. This assessment is shared by other energy-intensive industries, which question whether sufficient volumes of green hydrogen will be available in Europe at internationally competitive prices for many years to come.

Companies in the Nordic countries take a more optimistic view. Benefiting from abundant renewable electricity, particularly hydropower, they enjoy favourable conditions for the large-scale production of green hydrogen. One of the most ambitious projects is Stegra's new steel plant in northern Sweden, which is set to become the world's first large-scale climate-neutral steelworks. The location

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offers abundant renewable electricity, direct access to the power grid and high-quality iron ore resources, creating ideal conditions for fossil-free steel production.

Powered entirely by renewable electricity, the project's electrolyser will be the largest green hydrogen production facility in Europe. By replacing coal with green hydrogen, Stegra, Europe's first newly built integrated steel plant in more than 50 years, aims to produce five million tonnes of green steel annually by 2030, with long-term production capacity expected to reach up to seven million tonnes per year.

Technological Transformation Pathways in the Aluminium Industry

The aluminium industry is pursuing two distinct production routes, each defining its own pathway to climate neutrality. Primary aluminium, produced through the Hall-Héroult electrolysis process using conventional carbon anodes, remains highly carbon-intensive. Secondary aluminium, by contrast, requires only around five per cent of the energy needed for primary production. However, high-quality recycling depends on the availability of carefully sorted scrap, as different aluminium alloys must be separated to prevent quality losses during remelting. Efficient alloy separation therefore remains one of the industry's key technological challenges.

Norwegian industrial group Hydro is one of the world's leading aluminium producers, covering the entire value chain, from bauxite mining and alumina refining to primary aluminium production, downstream processing, recycling and renewable energy generation. With several production and recycling facilities across Germany, the company has a strong manufacturing presence in Europe. To decarbonise primary aluminium production, Hydro is developing HalZero, an innovative process that eliminates direct carbon emissions by releasing oxygen instead of carbon dioxide. Rather than feeding alumina directly into the electrolysis cell, HalZero first converts

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alumina into aluminium chloride before electrolysis takes place. Within this closed-loop process, chlorine and carbon are continuously recycled. As a result, the process completely avoids direct CO_2 emissions, releasing pure oxygen as its only by-product.

Germany's largest primary aluminium producer, TRIMET Aluminium, is pursuing a different technological approach. The company is developing an electrolysis process based on multiple vertical inert (non-consumable) anodes and cathodes operating in a low-temperature electrolyte at around 800°C. By replacing conventional carbon anodes with inert electrodes, the process also eliminates direct carbon emissions, producing oxygen instead of carbon dioxide. Although both technologies show considerable promise, significant research and development efforts will still be required before they are ready for large-scale industrial deployment.

Technological Transformation Pathways in the Foundry Industry

Europe's approximately 3,500 foundries, the vast majority of them small and medium-sized enterprises (SMEs), are facing a dual challenge: declining structural demand for traditional cast components alongside the urgent need to decarbonise their operations. The shift towards electric mobility is fundamentally reshaping the market. Electric mobility requires significantly fewer cast components than vehicles powered by internal combustion engines, reducing demand for many conventional foundry products. From a technological perspective, the transition to induction furnaces and electric arc furnaces (EAFs) is largely achievable. However, it requires substantial investment in electricity infrastructure, making the availability of competitively priced industrial electricity even more critical.

At the same time, many foundries are family-owned SMEs located in rural regions. In Germany, Europe's largest foundry market in terms of production capacity, many sites still lack the grid infrastructure required for rapid electrification, including high-capacity power connections. Despite these challenges, the industry also sees

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significant growth opportunities emerging from the transformation. The transition to electromobility is creating demand for a new generation of cast components, ranging from electric motor housings and battery enclosures to highly integrated structural castings manufactured using mega- and gigacasting technologies. Additional growth potential is expected from housings for heat pumps, components for wind energy systems and cast products for defence and critical infrastructure projects.

While these new markets are unlikely to fully offset the decline in demand for conventional cast components, they offer foundries important opportunities to diversify their product portfolios and strengthen their long-term competitiveness.

For more information, visit:

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