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Ensuring the Long-term Competitiveness of Romania's Steel Industry

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Ensuring the Long-term Competitiveness of Romania's Steel Industry

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About EPG

EPG is an independent think-tank specialising in energy and climate policy, focusing on the decarbonisation of the Romanian and Central and Southeastern European economies. Founded in 2014, EPG operates as a research institute primarily financed through competitive research grants. Its research aims to promote a constructive, evidence-based dialogue on decarbonisation and economic transformation among decision-makers and the public, both regionally and globally.

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Key findings

- In recent years, Romanian steelmakers have faced the significant challenges felt by all EU industries, grappling with rising energy costs, increased competition from non-EU producers, and fluctuating demand, all of which have put immense pressure on the industry's operations and competitiveness.
- Romania is one of the last remaining countries in Central and Eastern Europe (CEE) with primary steel production, and steelmaking contributes significantly to the national economy and employment.
- The competitiveness of the steel industry is at risk due to high and volatile energy prices, uncertainty around future hydrogen and steel scrap availabilities, constrained capacity to secure financing, and the lack of a green steel market.
- In the long-term, maintaining competitiveness necessarily implies a transition from conventional to low-carbon steelmaking, requiring affordable low-carbon energy, the transformation of production processes and substantial investments.
- With significant renewable energy potential, an important automotive sector, and booming infrastructure development, Romania is well-positioned to advance a transition to competitive low-carbon steel.
- However, it suffers from policy and regulatory bottlenecks, leading to underutilisation of EU funding, high energy prices, and low investment certainty due to lagging national planning for hydrogen infrastructure and supply chains for high-quality steel scrap.
- In the context of major pressure to compete in a low-carbon world, as well as the policy push of the Clean Industrial Deal and forthcoming Steel and Metals Action Plan, Romania must urgently implement key concrete actions to maintain its steel industry.
- These include ramping up renewable electricity deployment, developing hydrogen infrastructure, labelling steel scrap as a critical resource, proactively absorbing and efficiently disbursing EU funding, setting up novel funding and derisking instruments and leveraging private funding, and creating robust lead markets in the construction, automotive, and shipbuilding sectors.

Mesaje cheie

- În ultimii ani, producătorii români de oțel s-au confruntat cu provocări semnificative, similare celor resimțite de majoritatea industriilor din Uniunea Europene (UE), cum ar fi: creșterea prețurilor la energie, concurența sporită din afara UE și cererea fluctuantă - toate acestea exercitând o presiune imensă asupra operațiunilor și competitivității industriei.
- România este una dintre puținele țări din Europa Centrală și de Est care mai are producție primară de oțel, iar aceasta contribuie semnificativ la economia națională și la menținerea locurilor de muncă.
- Competitivitatea industriei siderurgice este amenințată de prețurile ridicate și volatile ale energiei, incertitudinea privind disponibilitatea hidrogenului și a fierului vechi, capacitatea limitată de obținere a finanțării, precum și lipsa unei piețe și a cererii pentru oțelul verde.
- Pe termen lung, menținerea competitivității necesită în mod inevitabil o tranziție de la producția convențională de oțel la cea cu emisii reduse de carbon, ceea ce presupune energie verde la prețuri accesibile, transformarea proceselor de producție și investiții substanțiale.
- Cu un potențial semnificativ în domeniul energiei regenerabile, un sector auto important și dezvoltarea în plină expansiune a infrastructurii, România este bine poziționată pentru a susține tranziția către o industrie siderurgică competitivă cu emisii reduse de carbon.
- Cu toate acestea, România se confruntă cu blocaje la nivel de politici publice și de reglementare, ceea ce duce la subutilizarea fondurilor UE, prețuri ridicate ale energiei și incertitudine în investiții, din cauza întârzierilor în planificarea națională a infrastructurii pentru hidrogen și a lanțurilor de aprovizionare cu fier vechi de înaltă calitate.
- În contextul unei presiuni majore de a concura într-o lume cu emisii reduse de carbon, precum și al impulsului politic generat de Clean Industrial Deal și viitorului Plan de Acțiune pentru Oțel și Metale, România trebuie să implementeze cât mai curând acțiuni concrete esențiale pentru a-și menține industria siderurgică.
- Aceste măsuri includ, printre altele, extinderea rapidă a producției de energie regenerabilă, dezvoltarea infrastructurii pentru hidrogen, clasificarea fierului vechi drept resursă critică, absorbția proactivă și eficientă a fondurilor europene, crearea unor noi instrumente de finanțare și reducere a riscurilor, atragerea investițiilor private, precum și crearea unor piețe solide pentru oțelul verde în sectoarele construcțiilor, industriei auto și construcțiilor navale.

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Introduction

Europe's heavy industry has been significantly affected by the recent energy crisis, with production falling by 10-15% and imports from third countries increasing.[i] The bloc's existing climate commitments and policies, including the EU Emissions Trading System (ETS) and the Carbon Border Adjustment Mechanism (CBAM), have also increased pressure on industry to rapidly lower its emissions. Rising carbon prices under the EU ETS, compounded with significant competition with steel producers from outside of Europe, and geopolitical pressures create a perfect storm of challenges for the EU's steel industry.

In response, the EU is seeking to balance decarbonisation, competitiveness and economic growth by revitalising industrial production. Spurred by the 2024 Draghi report, the bloc is developing policies to address the challenges faced by energy-intensive industries in their efforts to remain competitive in a progressively low-carbon world and reduce dependence on imported fossil fuels. The 2025 EU Competitiveness Compass outlined a strategic direction for ensuring continued competitiveness of key industries and was quickly followed by two key non-legislative documents: the Clean Industrial Deal (CID) and the Affordable Energy Action Plan (AEAP), published in February 2025. The CID sets forth a range of proposed measures, including lowering industrial energy costs, strengthening funding for industrial decarbonisation, developing new supply chains and international partnerships, and creating lead markets for clean industrial products.[ii] The AEAP similarly puts forward some measures aimed to increase access of industrial operators to affordable, clean energy. A range of legislative measures to implement the CID and AEAP are due in 2025 and 2026, including an Industrial Decarbonisation Accelerator Act and an Action Plan for Steel and Metals.

As one of the world's most carbon-intensive industries, steelmaking has been the target of much activity and interest in the implications of its transformation. For primary steelmaking (the production of liquid steel primarily from iron ore, which accounts for approx. 78%[iii] of global steel production), this transformation involves a change of production process. Currently, primary steelmaking is mostly done through the blast furnace – basic oxygen furnace (BF–BOF) process (emitting up to 1.8 tonnes of CO_2 per tonne of crude steel, mostly due to the combustion of metallurgical coal[iv]), or the direct reduced iron – electric arc furnace (DRI–EAF) using natural gas or coal as a reducing agent.[1] The transformation of primary steel production involves replacing conventional processes with lower-emissions ones, including DRI-EAF production using renewable hydrogen as a reduction agent, or EAF production[v] based on steel scrap or imported green iron.[2]

Secondary steel production, in which steel is manufactured in an EAF using recycled steel scrap as the main feedstock,[vi] is a much lower-emissions process, producing approx. 0.7 tonnes of CO_2 per tonne of crude steel.[vii] Most emissions are Scope 2, stemming from

[1] A third primary production route, the open-hearth furnace steelmaking process, has been mostly phased out and replaced by BOF or EAF processes.

[2] Another decarbonisation pathway is maintaining the BF-BOF process and complementing it with carbon capture. However, this is considered to be inefficient by Romanian steelmakers, and is shown to have significant uncertainties associated with its actual emissions impact (Vogl & Åhman, 2019).

electricity use, which can be abated by switching to clean energy sources.[viii] Scope 3 emissions can account for more than 70% of secondary steelmakers' carbon footprint,[ix] and some Romanian steelmakers consulted for this study state that two-thirds of their total emissions fall under this category.

Transforming steelmaking thus requires a portfolio of technological options and is poised to be particularly costly for primary steelmaking, while secondary steelmaking will face challenges of its own in accessing clean energy and high-quality steel scrap. This translates into a particular challenge for Romania, one of the few remaining countries in Central and Eastern Europe (CEE) with primary steel production. Liberty Steel Galați, producing 2.35 Mt of liquid steel using the BF-BOF process, plans to increase its yearly production to 4.1 Mt and fully decarbonise by 2030,[x] switching from BF-BOF to a DRI-EAF process using renewable hydrogen. Romania is also home to several secondary steel producers,[3] altogether producing approximately 580,000 tonnes of liquid steel using the scrap-based EAF route. The cost of doing nothing to meet this transformation challenge is significant; despite a severe contraction since the end of the communist regime, Romania's steel industry is still an important part of the national economy and national workforce. Furthermore, the urgency is clear, as Romanian steelmakers have recently suspended or reduced their operations due to lack of demand[xi] or high energy prices and difficult market conditions. [xii]

The purpose of this publication is to identify the main challenges faced by the Romanian steel sector and propose concrete solutions to be introduced through a stable, long-term political framework built upon cooperation between policymakers and industry. The paper draws on in-depth desk research and informal consultations with the steelmaking and renewables industries in Romania.

[3] Romania's secondary steel producers: ArcelorMittal, Donalam AFV Beltrame, Tenaris Silcotub, and Artrom Steel Tubes.

Improving access to affordable low-carbon electricity

Access to low-cost, clean electricity is a pressing issue for steelmakers given the significant electricity demand of EAFs.[xiii,4] In Romania, electricity demand by the steel industry is projected to increase, as some secondary facilities revive their production. Furthermore, for Liberty Steel Galați to undergo its transformation as planned, it would require additional renewable energy capacities equivalent to 43%-136% of Romania's total installed renewable capacity as of 2024.[xiv] These additional capacities would partially be required for the domestic production of renewable hydrogen, an integral part of Liberty's transformation plan and potentially of some Romanian EAFs, which are looking to replace natural gas with hydrogen for industrial heat production.[xv]

Romania's energy mix is diverse, with a significant proportion of its electricity production coming from nuclear power, hydropower, wind, and solar. Further developments are expected in clean electricity generation; Romania recently committed to develop two additional units at its Cernavodă nuclear power plant,[xvi] held a first Contracts for Difference (CfD) auction to procure 1.5 GW of onshore wind and solar photovoltaic (PV) capacity, with a second 2-GW auction due in late 2025, and passed a law indicating commitment to developing offshore wind power. By 2035, Romania aims to install a total of 9.1 GW of wind power capacity and 14.8 GW of solar power capacity.[xvii] The Dobrogea region in south-eastern Romania, relatively close to the Liberty Galați plant, hosts the Cernavodă nuclear power plant and onshore wind farms, as well as potential for solar PV, renewable hydrogen and offshore wind in the Black Sea. Despite these favourable conditions, challenges persist in Romania regarding both the supply and the pricing of low-carbon electricity, especially in the renewables sector.

The supply of low-carbon electricity is currently limited

For steelmakers to decarbonise competitively, they must be able to connect to renewable energy capacities. However, the availability of large-scale renewables in Romania is challenged by access to the electricity grid by renewables producers.[xviii] Steelmakers can also develop their own renewable capacities for self-consumption, which several are planning for, but this is a capital-intensive and lengthy process,[xix] and is not viable for covering the full electricity consumption needs.

Electricity prices are high and volatile while PPAs are still rare

Despite the opportunities for low-cost renewables in Romania,[xx] domestic steelmakers consider electricity prices too high and the energy market too volatile.[xxi] The volatility of energy prices can be partly addressed through bilateral agreements such as power purchase agreements (PPAs), long-term fixed-price supply agreements (usually a minimum of 5 years) between an electricity producer and a consumer, with stringent conditions that make it

[4] Electricity consumption can account for more than 20% of overall production costs in secondary steelmaking.

difficult to break the contract before its end date. PPAs can offer guarantees of origin (GOs), which prove the renewable sourcing of the purchased electricity.

To enable PPAs, several barriers must be overcome in Romania. One is the lack of regulatory clarity – a perception persists amongst industrial consumers that bilateral contracts are banned in Romania, even though a pre-existing ban was lifted with the adoption of Regulation 2019/943 at the European level, which promoted PPA-type contracts.[xxii] Other obstacles are the perceived high prices of PPAs or the absence of a benchmark that could reveal more information on market pricing trends, increase transparency and facilitate risk assessment.[xxiii] In this context, industrial experience with bilateral agreements in Romania is heterogeneous: some steelmakers have secured bilateral agreements for 100% renewable energy on a short-term trial basis with intended prolongation (perhaps under the shape of a PPA). Others are still waiting for the price to decrease before signing a PPA.[xxiv]

Energy producers also face challenges

At the same time, Romanian energy producers face obstacles in providing lower renewable energy prices to industrial consumers. They argue that renewable energy prices in Romania are high due to structural challenges, including a high degree of state intervention in the energy market.[5] Renewable energy producers also expect increasingly higher demand for PPAs (which can be used to finance investments in new capacities), which in the short term could translate into higher prices given the limited supply of PPAs. Issues around GOs for renewable energy also prevent renewable developers from attracting large-scale financing, since they currently cannot be traded internationally. While national regulatory changes have been ongoing to enable future international trading,[xxv] low demand from industrial consumers limits the incentives for renewable energy producers to obtain and trade GOs.

Recommendations for clean energy

- Address short-term supply constraints by enhancing the deployment of large-scale renewables in Romania, through **collaboration between energy providers, investors and policymakers**[xxvi] to overcome development barriers.
- Proactively implement Romania's obligations under the Net-Zero Industry Act and focus on negotiating the forthcoming Industrial Decarbonisation Accelerator Act to **shorten permitting times** for key renewable energy capacities.
- Set up **state-backed guarantee schemes to de-risk PPAs**. The recent electricity market design reform has made such interventions possible at the EU level,[xxvii] and the Clean Industrial Deal announced the launch of a pilot programme for corporate PPA schemes, counter-guaranteed by the European Investment Bank (EIB). Romania must avail itself of these opportunities, including learning from other countries such as Spain,[xxviii] where state-backed guarantees have been implemented.
- Make GOs internationally tradable, starting with completing the process of joining the **Association of the Issuing Bodies (AIB),** with representation by the Romanian Energy Regulatory Authority.[xxix]

[5] For instance, the withholding tax and taxes on windfall profits of renewable energy producers.

- Urgently **finalise negotiations on the EU Energy Taxation Directive** and **minimise energy taxation levels** to dampen the prices faced by industrial consumers, including steelmakers. In complementarity, **eliminate energy levies that finance policies and measures unrelated to energy** and distortionary subsidies for fossil fuel production.
- Engage in regional cooperation to unlock the cost efficiencies of **integrated, cross-border infrastructure planning** and become a first mover in deploying **flexibility solutions aimed to smooth demand** across the Central and Eastern Europe region.
- Invest in **modernisation and improvement of the national electricity grid**, including energy storage and smart grid technologies, to enable additional renewable capacities and alleviate the pressure of additional demand on transmission and distribution grids.
- Support steelmakers to **connect to the high-voltage network** of Transelectrica, Romania's electricity transmission system operator (TSO).

Accelerating renewable hydrogen production in Romania

One of the most promising pathways to decarbonise primary steel production DRI-EAF pathway using renewable hydrogen as a reducing agent (H2-DRI-EAF). In theory, the conversion from traditional BF-BOF steel production to H2-DRI-EAF production could enable a CO_2 emission reduction of up to 99.6%, down to as little as 0.01 tonnes of CO_2 per tonne of crude steel,[xxx] while still maintaining the large-scale capacities and range of products possible through primary steel production.

There are currently no active commercial-scale DRI-EAF production plants using green hydrogen. Some European facilities (including Thyssenkrupp and Arcelormittal facilities) have announced plans to transition to this production process, and projects have been launched at Stegra[xxxi] and HYBRIT[xxxii]. However, the transformation to H2-DRI-EAF faces important challenges, one of which is the availability of renewable hydrogen. Achieving the necessary hydrogen production scale relies on coherent national policies, public funding, and an increase in renewable energy capacity and hydrogen transport infrastructure.[xxxiii] Secondary steel producers could also benefit from increased availability of renewable hydrogen, as a replacement for natural gas in heat production (see Introduction section).

A steady supply of renewable hydrogen in large volumes comes at a premium cost

According to some Romanian steelmakers, the price differential between hydrogen and natural gas will be an obstacle in the transition to H2-DRI-EAF production. Most transition plans also involve an intermediary step of natural gas-based DRI-EAF production, thus creating a risk of lock-in. In addition, there is an overall lack of clarity about the production and pricing of hydrogen, the regulation of a future hydrogen market, and the development of associated infrastructure.

Given that hydrogen represents a major component of the final cost of green steel (38% to 45%[xxxiv]), clearer cost projections for renewable hydrogen will be crucial to building a business case for green steel production. Literature estimates for renewable hydrogen production costs range as high as €9.1 per kilogram,[xxxv] almost triple the cost estimated in Romania's National Hydrogen Strategy,[xxxvi] which industrial consumers consider too optimistic. Romanian steelmakers argue that a cost of €2.5 per kilogram of hydrogen would be required for them to be competitive, about half of literature estimates for production costs in the EU in 2030.[xxxvii] However, that in the long term, even under a scenario of very high hydrogen costs the transition of primary steel production to H2-DRI-EAF in Romania would reach cost parity with conventional production under projected carbon price increases.[xxxviii]

The ultimate price of renewable hydrogen will depend on several factors, such as the cost of renewable electricity, electrolyser CAPEX and load factor, and hydrogen transport costs if it is purchased. Hydrogen can be produced on-site through mill-site electrolysis or produced off-

site and transported to the steelmaker by various modes[xxxix,6] with different associated costs and technical advantages. The EU aims to decrease the cost of renewable hydrogen considerably by ramping up large-scale deployment, for example through the first EU-wide renewable hydrogen auction in which six hydrogen projects have signed agreements; none of these involve Romania.[xl] A second and third call are due to take place in 2025 under the EU Hydrogen Bank.[xli] The upcoming launch of a Hydrogen Mechanism and pilot corporate PPAs could also lower production costs in the medium term.[xlii]

Steelmakers may need a portfolio of hydrogen options, and large-scale infrastructure buildout is unavoidable

A common dilemma faced by the steel industry, and one of the main reasons for uncertainty around the EU's ambitions regarding renewable hydrogen deployment,[7] is the sheer quantity of renewable electricity required to produce green hydrogen. Other options for low-carbon hydrogen production – also electrolytic, but using electricity from other low-carbon sources, such as nuclear power – are currently recognised at EU level, with further clarification expected from the adoption of a Delegated Act on low-carbon hydrogen. The leaked State Aid framework for supporting the Clean Industrial Deal indicates a preference for renewable hydrogen in industrial decarbonisation supported through state aid measures, but allows for the use of low-carbon hydrogen up to a maximum share equivalent to the share of non-renewable electricity sources in a Member States's electricity mix, plus 25%.[xliii] While the framework is subject to change, it may allow for flexibility in the use of various hydrogen 'colours' by steel producers, an important consideration given the volumes required for transitioning primary steel production to H2-DRI-EAF (in the case of Liberty Steel Galați, 164,000 tonnes/year for producing 4.1 Mt green steel).

Whatever the type of low-carbon hydrogen and where it is produced (mill-site or off-site), Romanian steel producers cannot produce on-site the entire volume of hydrogen required for decarbonising their operations. Therefore, hydrogen transport infrastructure will need to be built out, and is currently lagging in Romania, which is planning to first blend 2% hydrogen in the existing fossil fuel transmission system. This measure risks having marginal emission savings but significant costs.[xliv] There is no guarantee regarding the readiness of the hydrogen infrastructure to supply existing hydrogen-ready EAFs of secondary steel producers, nor the future DRI unit of Liberty Steel Galați. The lack of infrastructure therefore creates a real risk of mismatch between hydrogen supply and demand. A lack of regional cooperation with other Central and Eastern European countries, including cross-border hydrogen transport, also risks oversizing hydrogen transport capacities in Romania if a siloed national approach is followed.

In addition to transport infrastructure, hydrogen storage solutions must also be investigated by future distributors, particularly underground storage which is more feasible than above-ground (tank) storage for large volumes[xlv] (underground storage options include depleted natural gas reservoirs and salt caverns, with the storage cost estimated in Romania's National

[6] Through pipelines using purpose-built hydrogen pipelines or repurposed natural gas pipelines, by ship after liquefaction, or through other energy carriers such as ammonia or synthetic methane (a more expensive option given the need to crack the carriers and re-extract hydrogen at the end of the transport link).

[7] European Court of Auditors, 2024. Renewable hydrogen-powered EU: auditors call for a reality check.

Hydrogen Strategy[xlvi] at €10 and €32 per kg of hydrogen, respectively). A challenge for policy is thus to create a regulatory environment enabling the implementation of cost-effective, socially acceptable hydrogen storage solutions by distributors.[xlvii]

Deploying hydrogen infrastructure will require coordination across all elements of the hydrogen value chain. A first step in this direction is to map the main stakeholders critical to the development of hydrogen industry, including strengthening the dialogue between the gas transmission operator, distribution companies, potential storage providers (including national salt producer Salrom[8]), key industries, including steelmaking, and low-carbon electricity producers to optimise energy use and ensure effective integration across sectors.

Recommendations for hydrogen

- Ensure the adoption of the **National Hydrogen Strategy** and prepare for its implementation paying particular attention to the needs of the steel sector.
- Initiate steps to **build hydrogen infrastructure**, even if this initially involves **converting existing natural gas infrastructure** to facilitate the development of a hydrogen market and enable the hydrogen distribution to the heavy industry.
- Engage in **cooperative efforts across the CEE** region to build out cross-border hydrogen infrastructure and avoid oversizing of transmission capacities due to a siloed national approach.
- **Use the European Hydrogen Bank's 'Auctions-as-a-Service' option** to support the development of green hydrogen and assist interested bidders in the application process for future auctions.[xlviii]
- Invest in technological innovation by **absorbing EU R&D funding.**
- **Mobilise private funding** to reduce the costs of hydrogen for steelmaking and deploy large-scale solutions that could enable local production.[xlix]
- **Coordinate stakeholders** across the production, transport, storage, and consumption parts of the hydrogen value chain to exploit economic synergies, including the potential to co-locate storage in salt caverns with electrolytic[l] hydrogen production.

[8] Salrom is the largest national salt producer, a state-owned company formally known as Societatea Națională a Sării SA.

Enabling the availability of high-quality steel scrap

Steel scrap is becoming a strategic resource for the decarbonisation of steelmaking,[li] with many primary steel producers looking to scrap-based EAF production as an alternative to or a component of their primary production. For the EU, shifting towards using scrap-based EAFs could translate into becoming a net scrap importer by 2030, from exporting approx. 18 million tonnes today.[lii] With the global supply already struggling to meet the increasing demand for high-quality scrap,[liii] the availability of this key input material could prove to be a blocker in the production of low-carbon steel. As of May 2023, 70 countries had imposed scrap export restrictions or bans,[liv] and the Clean Industrial Deal foresees multiple measures on circularity destined to improve the supply of high-quality scrap for low-carbon steelmaking, including an upcoming Circular Economy Act and the establishment of Trans-Regional Circularity Hubs.

Steel scrap demand is likely to increase in Romania

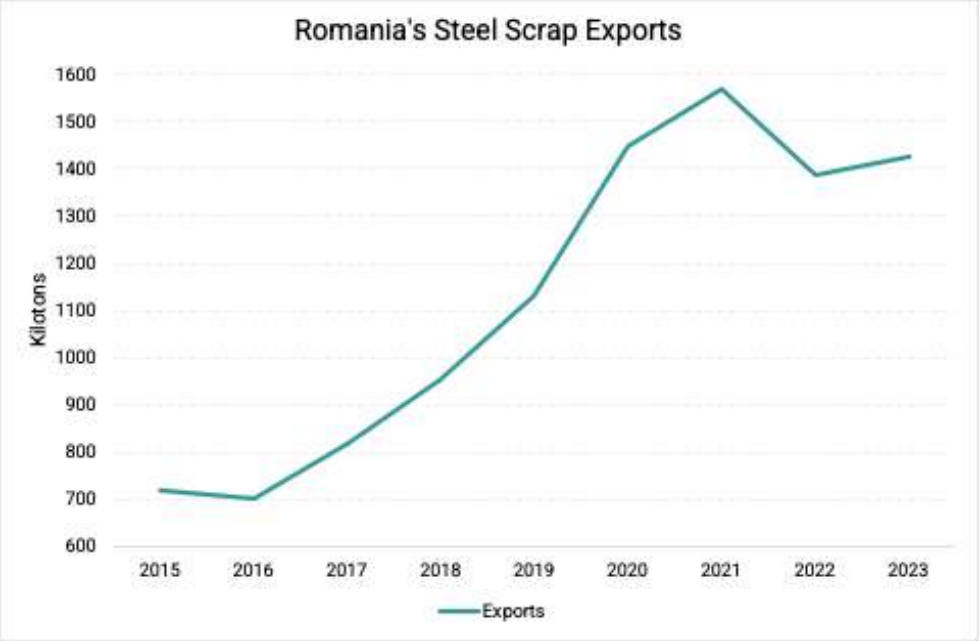
Romania's steel industry currently acquires its scrap steel domestically, but steelmakers argue that future supply is likely to be insufficient, given the transition plan of Liberty Galați which is projected to increase its scrap steel consumption four-fold, equivalent to 80% of Romania's current level of exports.[lv] Increased demand is also expected to come from the secondary steel producers ArcelorMittal Hunedoara and Donalam Târgoviște (formerly COS Târgoviște), which are currently operating significantly below their full capacity.[lvi] The Oțelu Roșu secondary steelmaking facility is also planned to reopen,[lvii] further contributing to increased demand for scrap steel.

Data on steel scrap exports and availability is not granular enough

In this context of increasing demand, Romania's public data on scrap shows steadily increasing exports since 2016[9] (Figure 1) and a relatively steady trade deficit since 2021. The main export destination is Turkey, which receives around two-thirds of Romania's steel scrap exports, followed by the Republic of Moldova (14% of exports).

[9] This includes cast iron scrap, stainless steel scrap, alloy steel scrap, tinned steel scrap, tunings, shaving, chips, milling waste, other waste and scrap, as well as steel remelting scrap ingots.

Figure 1: Romania's Steel Scrap Exports



Source: EPG based on Global Scrap Monitor data[lviii]

Romanian steel producers use a mix of scrap types, with a preference for thick steel scrap, given its higher purity and density, leading to increased energy efficiency. However, its availability on international markets is declining due to an increase in demand driven by the transition to EAFs. Scrap quality is also strongly correlated with the energy efficiency of the EAF process: electricity demand is estimated to be 45% higher for low-quality scrap (with high concentrations of copper and tin) compared to high quality one. [lix]

To facilitate the availability of higher-quality scrap in Romania, it will first be essential to have better data on different types and quality levels of steel scrap. This is a prerequisite for better planning of policies and measures on scrap utilisation. Romania's data on scrap production and exports must be granular and consistent with European standards such as the European Steel Scrap Specification. Currently, data on Romanian scrap categorises 97% of exports as 'other waste and scrap'.

Recommendations for increasing high-quality scrap supply

- Invest in digitalisation and machine learning tools **to develop new systems for data collection**.[lx] For example, the European dataset on scrap classes uses computer vision approaches to provide a foundation for the development of automated scrap classification and inspection systems, as well as intelligent scrap yards.[lxi]
- **Collect more in-depth data on scrap grades** to provide a better overview of what scrap classes are available on the market and in what quantity.
- **Secure supply chains** for high-quality scrap in EAF steelmaking and **invest in pre-treatment facilities** to remove contaminants increase the quality of other scrap available to steelmakers, given the relationship between scrap quality and process efficiency.[lxii]

- **Label scrap as a critical resource** to leverage policies and measures address its potential scarcity as a raw material.
- Proactively engage in the EU's upcoming **Clean Industrial Dialogue on circularity**, as a precursor to the Circular Economy Act, by establishing certified centres for vehicle dismantling and for the recovery of construction and demolition waste including scrap, to maximise material recovery, and by setting national targets for recycling and reuse.

Enhancing funding instruments

The high and complex costs of transforming steelmaking, particularly primary steel production, requires public support measures beyond typical grant programmes, which in Romania may lack appropriate climate conditionalities and are perceived by industrial actors as uncertain, challenging to obtain, and delayed in the release of funding. The recent National Program for Large Industries (2025 – 2030), which includes a state aid scheme of one billion euros for industrial decarbonisation,[lxiii] requires more clarity on eligible investments for the steel industry, and how the state aid will be disbursed. Several actions are needed to increase funding availability and ensure its effective support of low-carbon steelmaking.

The absorption of EU funds must be increased

In general, Romania has a relatively poor track record of absorbing and spending EU funding; for example, only 21% of its allocation under the Recovery and Resilience Facility (RRF) has been disbursed, and only 14% of its targets have been achieved - well below the EU-27 average[lxiv]. At the same time, other EU Member States have successfully leveraged their RRF allocations to support its steel industry (e.g., Sweden and the Stegra low-carbon steel facility).[lxv] This poor absorption also applies to research and development (R&D) funding - Romania currently has no Innovation Fund projects, and has one of the lowest R&D expenditures and intensities on in the EU.[lxvi] Romania could better avail itself of EU R&D funding, for example the recently-launched Research Fund for Coal and Steel (RFCS), which aims to fund breakthrough technologies to decarbonise steelmaking and manage just transition for coal mines.[lxvii] Other important funding streams include the Just Transition Fund, particularly relevant to Liberty Steel Galați, which employs approx. 5,000 people, is a significant contributor to economic activity in this Just Transition region.[lxviii] Increasing absorption rates will be key for future EU funding as well, for example the planned Competitiveness Fund for industrial innovation, including cleantech.[lxix]

The EU ETS can unlock more funding for low-carbon steelmaking in the short term

Revenues from EU ETS allowances are a key source of funding climate change mitigation, including supporting industrial decarbonisation. Beyond generating national revenues which are expected to be used for climate action, ETS allowances are also used to fund the Modernisation and Innovation Funds. The recent Clean Industrial Deal also foresees the use of ETS allowances to fund the Industrial Decarbonisation Bank and disburse technology-neutral funding for industrial emissions reduction, including for steelmaking. Beyond these revenues, which can be used to fund support instruments for low-carbon steelmaking, the phase-out of free allowances for industry (due to complete by 2034) may result in surplus free allowances if steelmakers decarbonise fast enough, which can be sold on the secondary market.[10] For example, if Liberty Steel Galați implements its transition plan as scheduled, it is

[10] Free allowances are being progressively phased out by 2034, and because of how free allowance allocations are estimated (based on historical emissions and a single process benchmark for liquid steel production), if a steelmaker decarbonises before 2034, surplus free allowances can be received. The sooner a steelmaker decarbonises, the more revenue it can gain from trading surplus allowances.

expected to have surplus free allowances during 2026-2032, which could be used to fund the cost of the transition to H2-DRI-EAF.[lxx]

The role of EU ETS funding in decarbonising steelmaking will also be linked to the actual effects of the newly-implemented Carbon Border Adjustment Mechanism (CBAM), currently operating on a trial basis and covering steel products. [lxxi] While steel imports into the EU have been relatively constant over the last decade,[lxxii] a recent surge in global over-supply has stoked fears of the dumping of cheap, carbon-intensive steel on the EU market,[lxxiii] and any changes in trade patterns following the transitional period of CBAM (planned to end in December 2025[lxxiv]) will need to be critically assessed. The Clean Industrial Deal also promises a review of the CBAM, including whether to extend it to downstream sectors (for example, to prevent the import of processed steel products made with carbon-intensive steel, as well as imports of the carbon-intensive steel itself) and how to provide support to EU exporters.[lxxv]

Novel and complementary mechanisms can be essential funding instruments

Novel funding designs instruments could also be employed to ensure the most efficient disbursement of public funding to industrial operators, a key consideration in countries with low fiscal space such as Romania. One option is a Carbon Contracts for Difference (CCfD) scheme, which can de-risk investments in innovative technologies and decarbonisation solutions by guaranteeing a stable carbon price for industrial producers.[lxxvi] CCfDs are complex instruments which can be designed in multiple ways, therefore optimising their design would be crucial to ensuring the best use of public funding for decarbonisation.[lxxvii] While not widely-spread, they are now being deployed in the Netherlands and Germany, and foreseen to be adopted at EU level through the Industrial Decarbonisation Bank.[lxxviii,lxxix]

Regional development funding, which Romania is a major recipient of under the Cohesion Policy, can also be used to incentivise the production of low-carbon construction materials, including green steel to be used in public construction. This can be done through the introduction of climate conditionalities or green public procurement (GPP) criteria on industrial products or infrastructure projects, contributing to more efficient public spending by aligning decarbonisation and development agendas.[lxxx]

Beyond public funding instruments, securing private financing and credit facilities may be crucial to diversify the financing of low-carbon steelmaking. Credit facilities are difficult to access, as banks and other institutions are reluctant to issue credits and guarantees for low-carbon steelmaking due to the high investment risks. By enabling access to affordable credit, banks could play an active role in derisking projects[lxxxi] and focusing on impact investing. To leverage private financing, Romania will also need to keep up with the EU's efforts to unlock financing for industrial decarbonisation, including leaning more on the InvestEU instrument, accessing the forthcoming pilot of the future Industrial Decarbonisation Bank facility and increasing its use of auction-as-a-service mechanisms.

Recommendations for financing and funding

- **Provide certainty through a clear legal framework** anchored in the specific needs of the steelmaking sector.
- Introduce **clear emissions reduction targets and condition the disbursement of state aid schemes** on projects achieving the targets they set out in their applications – including, for example, the use of renewable hydrogen in DRI-EAF steelmaking to avoid lock-in into natural gas-based DRI-EAF as a transitional process.
- Consider **CCfDs as mechanisms** for funding steel decarbonisation efficiently.
- **Incentivise banks to provide more green loans** and play an active role through blended finance, low-interest loans or long-term guarantees.
- **Ensure cohesiveness across policies**, including industrial, R&D, public procurement, and decarbonisation.
- **Take a more active role in the upcoming EU-level negotiations** of the Multiannual Financial Framework to ensure that Romania receives appropriate and efficient funding for industrial decarbonisation through Cohesion Policy and other instruments.

Creating a market for green steel

Although primary and secondary steel producers face significantly different challenges in decarbonisation, both rely on the emergence of strong lead markets for green steel products to mitigate investment risks. Two sectors will be key in coming years, namely construction and automotive. With its booming real estate sector, significant commitments to public infrastructure buildout over the next decade, and a sizeable car industry, Romania is uniquely positioned to launch a market for green steel by boosting demand from these sectors.

One of the most important factors in stimulating market creation is the existence of a clear standard for low-emissions green steel. Building on the 2024 EU Ecodesign for Sustainable Products Regulation (ESPR), which aims to establish requirements for the environmental performance of iron and steel, the Clean Industrial Deal has committed to developing a voluntary label for green steel in 2025, building on the CBAM methodology for assessing embodied carbon in imported steel products. Other key policies, such as the proposed End-of-Life Vehicles Regulation, may provide additional policy push for green steel uptake in automotive manufacturing, by setting targets for recycled steel in new vehicles,[lxxxii] thus driving higher demand for recycled and low-emission materials.

The existence of clear standards is the starting point for driving public and private procurement of clean steel. The Clean Industrial Deal foresees a significant role for public and private procurement in transforming industrial production (including steel) and commits to revising the Public Procurement Directive to mainstream the use of green criteria, enabling private buyer initiatives through clearer labelling, and developing a proposal on the greening of corporate fleets. Member States will also play an important role here, in ensuring that GPP criteria are included and monitored in their national public procurement systems.

Low- and near-zero emission steel standards

There is no universally agreed standard for green steel, despite several being launched in recent years. One of the most common approaches is the 'sliding scale', based on the current share of scrap and/or emissions intensity of crude steel as benchmarks. The International Energy Agency (IEA) was the first to propose near-zero emissions threshold values for steel and cement in 2022, based on its net-zero scenario analyses and a sliding scale approach,[lxxxiii] ranging from 400 kg CO_2 equivalent (CO_2-eq) per tonne of crude steel (for zero scrap use), to 50 kg CO_2eq/t for production using 100% scrap.[lxxxiv] Subsequently, several proposals of near-zero emissions standards have emerged from organisations including ResponsibleSteel –, the German Steel Association, and the Global Steel Climate Council.

Each proposed steel standard uses different system boundaries or weights of circularity (i.e., share of scrap steel) and emissions intensity criteria in setting their thresholds for defining green steel. For example, ResponsibleSteel proposes variable thresholds for embodied greenhouse gas (GHG) emissions that account for the share of scrap input, claiming that increasing the share of scrap is an ineffective way to decarbonise steelmaking given the already constrained availability. Meanwhile, the LESS label proposed by the German Steel

Association sets green standards for semi-finished or even finished steel products, evaluating embodied emissions and scrap shares in hot-rolled steel, rather than liquid steel, and including emissions from downstream processes as well as Scope 2 and Scope 3 upstream emissions.[lxxxv] The Global Steel Climate Council goes even further, proposing two distinct green steel certifications for flat and long hot-rolled steel products,[lxxxvi] manufactured by primary and secondary steelmakers, respectively),[lxxxvii] based on a life-cycle assessment (LCA) approach including upstream activities as far as mining, and downstream as far as recycling.

While there is no consensus among European or international standardisation bodies on green steel standards, the proposals outlined above demonstrate the availability of options, developed in cooperation with the steel industry. They will be important in developing a European green steel label and standard, as anticipated in the Clean Industrial Deal. Until a consensus is reached, the LESS and GSCC methods can serve as general guidelines for steel producers in Romania to develop their decarbonisation plans.

Lead market creation and future demand

Even if a universal green steel standard is agreed, significant action is required to enable lead markets for green steel while cost premiums are still high. Romanian steelmakers estimate a premium of 15% to 30% for green secondary steel, depending on access to affordable clean energy and credit; for primary steel, these range from 30% to 70%, close to international expert projections.[lxxxviii] One instrument that could launch a lead market and help drive down costs is green public procurement (GPP). There is currently no single, binding EU legal framework for GPP – only individual initiatives embedded in various pieces of EU legislation, such as the the Ecodesign for Sustainable Products Regulation, the End-of-Life Vehicles Regulation, the Waste Shipment Regulation, and in national measures, including Romania's National Action Plan for GPP (2025-2030).

Private sector buy-in is also key to launching a market for green steel. As the largest steel-consuming sectors,[11] the construction and automotive industries will play a significant role, and are extremely important sectors for Romania. Romania's shipbuilding sector also contributes to steel demand to a smaller but relevant extent,[12] given that steel accounts for 75%-85% of a vessel's weight.[lxxxix] The country has a long-standing shipbuilding industry, with several shipyards along the Black Sea coast and the Danube River (e.g., Constanța, Brăila, Galați), producing vessels, offshore structures and providing repair services. Private buy-in can be complementary to public procurement: whereas the latter could drive uptake of low-carbon long steel products for public construction alongside private construction companies, automotive manufacturers and shipyards could drive demand for flat products.

The uptake of green steel by public and private buyers hinges on the price differential between green and conventional steel, and on the ability of buyers to pass through this green premium to their consumers. The impact of steel costs on final product prices varies depending on the

[11] In the EU, the construction sector accounts for 35% of steel demand, while car manufacturers use 19% of the European steel supply (Towards competitive and clean European steel, European Commission, 2021).
[12] Shipbuilding typically uses a small proportion of flat steel, mainly in the form of quarto plates, which represented 7% of the EU's annual production of quarto plates in 2022 (EUROFER, 2023).

end-use sector: in industries such as automotive manufacturing (where steel costs make up less than 2% of a car's total price) this impact is relatively low.[13,xc] With the EU's carbon price expected to rise to €311/tCO_2 by 2040[14], using green steel in automaking could become more cost-effective in the long term, and some premium car brands have already signed agreements with future green steel suppliers (e.g., Mercedes-Benz[xci] and Volvo).[xcii]

The cost pass-through of green steel premiums is slightly more challenging in the construction sector:[xciii] a 40% to 70% green steel premium would result in a 2% cost increase for buildings,[xciv] as steel costs make up a higher share of overall construction expenses(ranging from 10% to 40% depending on the building type).[xcv] Even though the construction sector primarily uses long products – where the green steel premium would have a limited impact on the final cost – the industry's thin margins still pose a challenge.[xcvi] As such, the uptake of green steel in construction would be more dependent on public authorities, which in Romania are now mandated to fulfil GPP criteria in progressively higher shares of their procurement for roads and buildings construction projects, starting with a 20% share in 2026.[15]

There is little knowledge regarding the actual willingness to pay a premium for green steel by the automotive and construction industries.[xcvii] Some Romanian steelmakers expect the automotive industry to play a role in the market creation, while others see very little appetite from it given the high competition and low profit margins. On the other hand, Romanian secondary steelmakers anticipate that public infrastructure projects will significantly drive future demand, given the projected public construction projects planned in Romania over the next decade. This will largely depend on the effective implementation of the National Action Plan for GPP 2025-2030 to launch a lead market.

Recommendations for launching a lead market for green steel

- Implement a portfolio of **policy initiatives** (such as GPP), **corporate initiatives** (such as bilateral offtake agreements) and **regulatory tools** (such as labels, standards and emission calculation methods), involving both state and private entities.
- Prohibit price-only approaches and **adopt progressive GPP criteria** for carbon-intensive products, including steel used in public infrastructure projects (e.g. roads, bridges and buildings), and closely follow EU-level changes to procurement approaches and criteria for sustainability, resilience, and minimum EU content in public and private procurement initiatives.

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[13] A modelled carbon price of €100/tCO_2[13] would increase the retail price of a mid-sized European passenger car by less than 0.5%, whereas a green steel premium of 40% to 70% leads to a cost increase of 0.5%-1% per passenger car. (World Economic Forum, 2023)

[14]The CO_2 price is expected to rise to €133/tCO_2 in 2030, €311/tCO_2 in 2040, and €490/tCO_2 in 2050, according to the European Commission's recommended parameters for reporting on GHG projections (WAP trajectory) (The cost of Romania's industrial transition: An assessment of the steel, cement, and chemicals sector, Energy Policy Group, 2024).

[15] In December 2024, the Ministry of Environment published the National Action Plan for GPP (2025-2030), which includes an extensive list of 22 goods, services and works for which green criteria will apply, including for the construction of office buildings and roads.

- Establish **mandatory quotas for green materials** in public procurement and utilise **emission calculation tools** (preparing for the EU's incoming life-cycle analysis tools) to signal that state authorities prioritise the acquisition of low-emission and green products over carbon-intensive ones.
- **Strengthen dialogue and cooperation** between steelmakers, business associations, standardisation bodies and public **entities** responsible for GPP in Romania.
- **Implement intermediary measures for green steel labels and standards** until a consensus is reached, including carbon accounting and reporting tools, requiring bidders to disclose the embodied carbon and other environmental impacts of their materials through EPD or other tools.
- Encourage construction companies to establish **bilateral offtake agreements** with secondary steelmakers, and car companies and shipyards with primary steel producers, to increase certainty of long-term steel demand.

Conclusions

This study highlights several major challenges faced by Romanian steelmakers in transforming their production to ensure continued competitiveness in a low-carbon world. These challenges include high and volatile energy prices, uncertainty around renewable hydrogen and high-quality steel scrap availability, significant capital expenditures and limited access to finance, as well as a lack of clarity with regards to green steel standards, labels and future demand.

To overcome these challenges, this paper presents a series of recommendations that can enable steelmakers and public authorities to cooperate effectively, achieve synergies, transform production processes, and maintain the industry's competitiveness through the swift implementation of legislative proposals. At operator level, steelmakers should secure their renewable energy needs either by investing in on-site production, or proactively securing PPAs. They could also partly meet their renewable hydrogen demand by planning for on-site production. However, the bulk of concrete action needed for the steel transition is within the remit of Romanian decision-makers.

Coherent policymaking and a long-term vision would support the decarbonisation of the steel industry, alongside clear communication, the implementation of support tools (e.g. CCfDs, GPP), the swift disbursement of funds and state aid schemes, as well as the development of labels, standards and demand creation mechanisms. More predictability in national policies governing industrial development will be necessary to ensure the development of medium- and long-term investment strategies on the part of steelmakers. Overall, maintaining the competitiveness of steelmaking is an objective of strategic importance for Romania's autonomy, and potential synergies can turn the challenges of decarbonisation into tangible opportunities.

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