EU–CHINA BRIDGE

Building Roadmaps to Industrial Decarbonisation and Green Economy through EU-China Cooperation

Green Steel, Shared Rules?

A Closer Look at Low-Carbon Steel Labels in China and Europe

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Key Messages

- **China and Germany have developed voluntary low-carbon steel labels** that are already operational and used for certification in China and across Europe. The two label systems are broadly comparable in technical terms. Both support a transition towards deeply decarbonised primary steel and renewable-powered scrap-based production, though important differences remain in system boundaries and emissions-accounting methodologies.
- **This technical comparability reflects the fact that steel decarbonisation is advancing in both China and Europe, with broadly similar technological pathways emerging**. Greater alignment between the standards could facilitate trade, improve communication between market actors and give investors clearer signals about which decarbonisation routes are likely to remain credible and commercially viable across markets. International efforts to improve transparency and interoperability should therefore be supported.
- However, **whether low-carbon steel labels can support international trade and cooperation will depend on wider geoeconomic and political conditions.** Rising trade tensions, persistent EU concerns about Chinese overcapacity, and the prospect of faster low-carbon capacity expansion in China all pose challenges for European producers. Efforts to improve standards interoperability can help build common ground, but they must be accompanied by broader European policy measures to strengthen the competitiveness of domestic green steel production.
- **Definitions of low-emission steel, including the new EU-level definition currently being developed, need to be ambitious and consistent in order to enable the emergence of lead markets**. Currently, a new definition is being developed under the EU Ecodesign Regulation for application in public procurement and funding programmes across Europe in the context of the proposed Industrial Accelerator Act. Given the historic approach of Ecodesign regulation, it remains unclear how EU-level standards will relate to the existing voluntary labels in terms of methodology and ambition.

1 Introduction

Steel is essential to modern economies, but it is also among the most emissions-intensive industrial sectors. The sector has reached a decisive moment for both climate policy and industrial strategy. The key challenge is no longer identifying pathways to cleaner steel, but creating the investment conditions and demand signals needed to bring them to scale, which is why low-carbon steel standards have become increasingly important.

Low-carbon steel standards provide a framework **for defining, measuring, and recognising low-carbon steel products**, and thus help determine which products and producers qualify for policy support, green procurement and preferential sourcing, and which technologies to invest in. In this sense, standards do more than classify emissions: they help create demand by reducing uncertainty for buyers and de-risking investment in low-carbon production routes.

Globally, a number of standards and initiatives seek to define low-carbon or near-zero steel, with distinct methodologies for accounting greenhouse gas (GHG) emissions and classification. Because steel is one of the world's most heavily traded industrial commodities, this **fragmentation** may create confusion, increase reporting burdens for producers and buyers operating across multiple jurisdictions, and impede trade in low-carbon steel.[1]

This **strengthens the case for greater interoperability** between standards, and, over time, perhaps a higher degree of convergence.[2] At a **minimum, interoperability means that different standards can be technically compared**. In a **stronger form, it may allow them to be treated as equivalent** for particular uses, such as benchmarking or buyer communication. At its **strongest**, it would involve standards owners, regulators, or buyers agreeing to **recognise** the other system's certification for defined purposes.

China and Germany are useful lenses through which to examine the issue. China accounts for around half of global steel production, while Germany is Europe's largest steel producer and an influential actor in the EU debate on steel decarbonisation. The relationship between German and Chinese approaches to low-carbon steel standards therefore matters not only bilaterally, but also for the wider formation of international rules for low-carbon steel.

In China, the China Iron and Steel Association (CISA) developed a methodological framework for assessing decarbonised steel that is intended to classify emissions performance across crude steel and a wider range of finished products (**C2F**). It was developed under the leadership of CISA and China's largest state-owned steelmaker Baowu Group, in close collaboration with steel companies, industrial associations, and research institutes. C2F certificates have so far been issued mainly to large steelmakers.[3] CISA is now seeking to strengthen its policy relevance by upgrading it from an industry association standard into a national standard and by extending it to additional product categories.[4]

In Germany, the Low Emission Steel Standard (**LESS**), launched in Germany in 2024, has emerged as one of the most developed industry-led initiatives. LESS was developed in close alignment with a government-led stakeholder process aimed at creating lead markets for green materials including steel. The process involved industry, government, academia, and civil society. The German Steel Association (Wirtschaftsvereinigung Stahl, WV Stahl) and its member companies co- developed the standard. LESS AISBL, a Brussels-based international non-profit organisation, was subsequently established to oversee its implementation and governance. Steel producers representing around one quarter of EU crude steel output support the standard,

[1] (Ferrero et al., 2022), (ResponsibleSteel, 2025), (International Energy Agency, 2024)

[2] (Ferrero et al., 2022)

[3] (China Metallurgical News, 2025)

[4] (National Public Service Platform for Standards Information, n.d.)

and several companies have already obtained certification for their products.[5]

Both standards build on early conceptual work by the IEA, which proposed a near-zero-emission steel threshold, varying with scrap use.[6] This policy brief examines **how Germany's LESS and China's C2F differ in design**, **how far they could become interoperable in practice, and what that relationship could mean for green steel investment** and **trade** between China and Europe.

[5] https://lowemissionsteelstandard.org/

[6] (International Energy Agency, 2022)

2 Comparing the design features of LESS and C2F

This section compares the core design features of LESS and C2F that shape technical interoperability, especially system boundaries and classification logic.

2.1 System boundaries

A **main difference** between LESS and C2F lies in their **system boundaries**. This matters because system boundaries determine which emissions are counted.

- **Product type**: **C2F** applies to **crude steel** as well as **several finished products**, including rebar, wire rod and bar, structural sections, plate, seamless pipe, and hot-rolled coil. **LESS** is narrower and applies only to **hot-rolled steel**, and further distinguishes between **Quality Steel** and **Structural and Reinforcing Steel.**
- **Scope coverage**: both standards follow a **cradle-to-gate** approach and **cover Scope 1 and Scope 2** emissions, but **differences** emerge in the **treatment of purchased renewable electricity for Scope 2 emissions** and in **the breadth of upstream emissions covered (Scope 3)**. Under **C2F**, Scope 2 includes emissions from purchased electricity and heat, with **recognition of purchased green electricity** through mechanisms such as green power purchase agreements (PPAs), virtual green power purchase agreements (VPPAs), and green electricity certificates. **LESS** also allows **certificate-based treatment of green electricity** and **certain energy inputs** and ties this to officially recognised registers, including guarantees of origin for green power and biogas certificates. Although both standards seek to account for purchased low-carbon energy, they rely on different certification systems and market mechanisms. This may **complicate future efforts at equivalence**, especially if regulators or buyers question the comparability of underlying proof systems.
  The most significant difference lies in **Scope 3. LESS adopts a broader upstream treatment**, incorporating emissions from the provision and transport of energy sources, reducing agents, and material inputs such as scrap, ore, alloying agents, slag formers, refractory materials, and technical gases. LESS is estimated to capture **at least 90 per cent of total emissions** from steel production, and near-zero classification requires verifiable reductions in supply chain emissions.[7,8] By contrast, **C2F** includes a **much narrower set of Scope 3** elements: emissions related to the preparation of energy carriers such as hydrogen and bioenergy, as well as direct and indirect emissions from carbon capture, utilisation and storage (CCUS). This difference is important because **broader Scope 3 inclusion can strengthen the credibility of decarbonisation claims** and extend decarbonisation incentives to upstream industries, but it also **raises the compliance burden** and may make direct comparison more difficult. It also means that threshold values for performance classes cannot be directly compared.
- **Carbon offsets**: **neither standard allows** producers to achieve lower reported emissions through the purchase of carbon credits or mitigation contributions outside the defined production boundary, although LESS permits limited consideration of credits for certain material- and energy-related processes beyond the balance-sheet boundary.

[7] (LESS aisbl, 2026)
[8] (Sach et al., 2024)

Table 1 A brief overview of C2F and LESS design features

Design feature	C2F	LESS
Product scope	Crude steel and several finished products	Hot-rolled steel only: Structural and reinforcing steel and Quality Steel (QST)
Accounting approach	Cradle-to-gate	Cradle-to-gate
Scope coverage	• Scope 1 • Scope 2 • Very limited Scope 3	• Scope 1 • Scope 2 • Scope 3
Carbon offsets	Not permitted	Not permitted

2.2 Sliding Scale and Thresholds

Both C2F and LESS use threshold-based classification systems to distinguish **different emission-intensity levels ($CO2_e$)**. Both standards follow **a "sliding-scale" approach** in which the emission-intensity thresholds are adjusted dynamically based on the share of scrap used in production. This reflects a broader international approach, which recognises that primary and secondary steel production start from different emissions baselines and should not be assessed against a single uniform threshold.

C2F steel products are classified from **Level A to Level E**. For crude steel, the Level A threshold is aligned with the IEA's near-zero category.

LESS classifies both quality steel and structural and reinforcing steel across **six levels**: Near Zero, A, B, C, D and E. Threshold values are adjusted to reflect differences in alloy content and product characteristics. They are also **higher than those proposed by the IEA**, largely because LESS applies a broader system boundary.[9] In addition, the higher values for quality steel reflect the greater emissions typically associated with producing higher-value, more alloy-intensive products.[10]

In both standards, **H_2-DRI-EAF can reach the higher low-carbon classification tiers** under the relevant assumptions. In C2F, recent analysis suggests that, at a 20 per cent scrap share and with near-zero indirect emissions, H_2-DRI-EAF can meet Class B.[11] In LESS, the rulebook places H_2-DRI-EAF under ideal conditions in Level A on the basis of a 20 per cent scrap reference case. **Renewable-powered EAF can also reach the top tier** in both systems.

[9] (LESS aisbl, 2026)

[10] (International Energy Agency, 2024a)

[11] (Rocky Mountain Institute & China Automotive Carbon (Beijing) Digital Technology Center Co., 2025). It is classified as Level B and would still require further emissions reductions, including through technologies such as carbon-free foamed slag, to reach Level A.

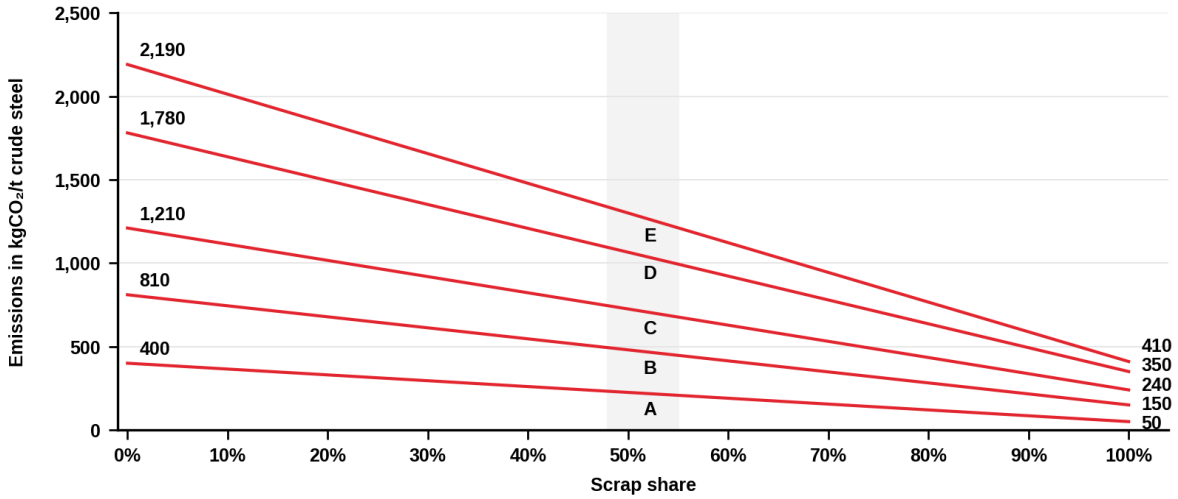

Figure 1 CISA classification system of low-carbon steel (Adapted from National Public Service Platform for Standards Information, n.d.)

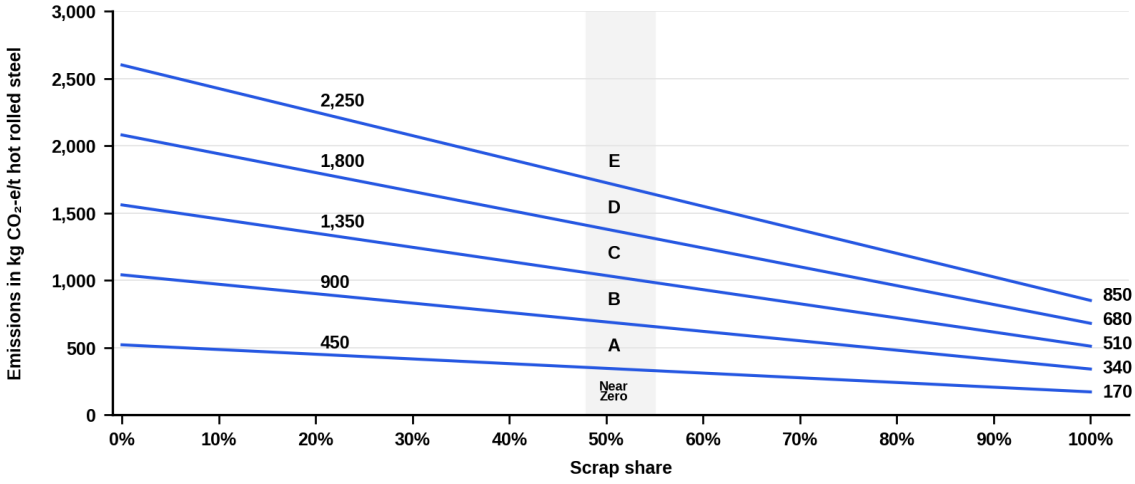

Figure 2 LESS classification system of Quality Steel (Adapted from LESS aisbl, 2026)

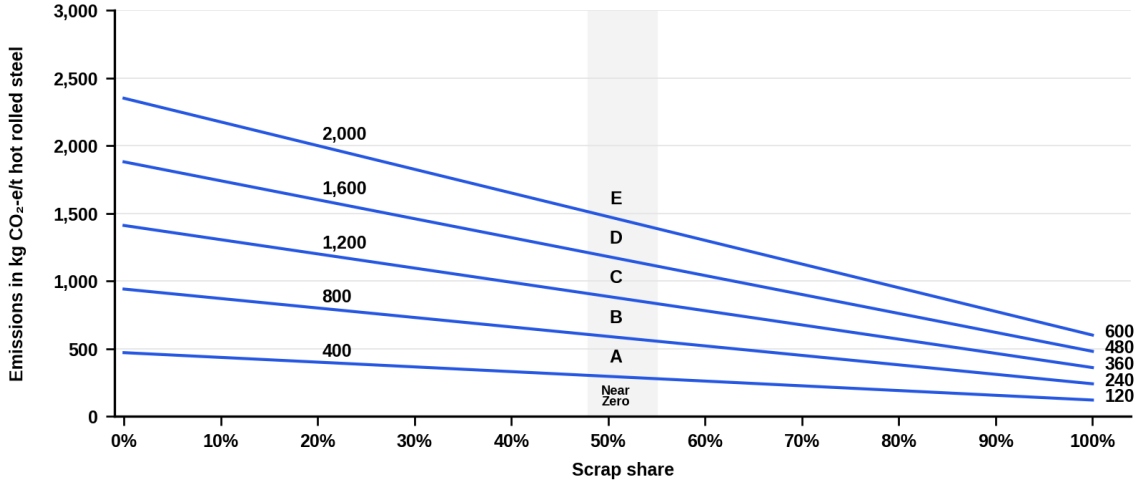

Figure 3 LESS classification system of Structural and Reinforcing Steel (Adapted from LESS aisbl, 2026)

3 Alignment between LESS and C2F and the implications

From a **technical** standpoint, LESS and C2F are **comparable**. The two standards share an important common architecture: both draw on the IEA's emissions measurement logic and both adjust their thresholds to scrap use. That common structure makes comparison possible. However, the two standards diverge in system boundaries, Scope 3 treatment, threshold calibration, and the certificate systems used to verify purchased renewable electricity. Thus, they are **not equivalent on a like-for-like basis** and **full technical interoperability is unlikely in the near term**. **A narrower form of interoperability is more realistic**: a mapping exercise and conversion tools that allow firms, buyers and policymakers to understand how a product classified under one standard would be read under the other. Such comparability would already be **useful for benchmarking and buyer communication across jurisdictions**. However, it will **only be credible** if the **basis for comparison is transparent and auditable**. Several **global alignment efforts** have been moving in this direction. The IEA's work on near-zero emissions steel provides an important reference point by emphasising site- and product-specific measured data, auditable methodologies, and the need for clearer emissions accounting.[12] Those principles have informed the development of both LESS and C2F. The Steel Standards Principles, launched at COP28 in 2023 with the support of ResponsibleSteel and the WTO, reflect the same broad logic.[13] More recently, ResponsibleSteel's agreements with LESS and CISA, announced in November 2025, were particularly significant, because they aim to develop practical interoperability mechanisms between the standards.[14]

These efforts already matter for investment. A workable degree of interoperability would reduce confusion for industrial users, investors and certifiers by making emissions performance more legible across markets. It would also give investors a clearer sense of which decarbonisation pathways are likely to remain credible and commercially viable across markets. Both LESS and C2F incorporate recycling through scrap-adjusted thresholds, and neither is designed to privilege scrap-based production. Instead, the **two standards support a dual-track transition**. They leave room for deeply decarbonised primary steel, including renewable-powered H2-DRI-EAF, to qualify for the top tiers. Renewable-powered EAF with a high scrap share can also reach the top tier, but a higher scrap share is accompanied by a more stringent benchmark.

Interoperability also matters for market access, but the **barriers to trade, especially between China and the EU, are not only technical.** In Europe, the policy objective is to use definitions, procurement rules and related policy tools to create lead markets for low-carbon steel and support investment in decarbonised industrial production. For China, beyond the domestic market, the issue is whether C2F can achieve sufficient recognition in cross-border markets to support buyer communication, certification, and trade in low-carbon steel. That makes interoperability geoeconomically sensitive. Decisions about which standards are accepted in procurement, which claims are trusted by buyers, and which standards can travel across jurisdictions shape competitive advantage as much as they improve transparency. Current alignment efforts are therefore necessary, but **not sufficient, for cross-border market access**.

The near-term objective should be a framework in which different standards can coexist with less frictions and greater trust. Current global alignment efforts are therefore worth continuing. But the next question is more difficult: **whether China and Europe are willing to converge from technical comparability towards conditional, use-specific interoperability**. That question leads to a broader reflection on EU steel competitiveness. On the one hand, any move from comparability to further interoperability will be judged on its effects on competition and industrial resilience. This is particularly important because the EU's wider trade and industrial context is shaped by persistent overcapacity concerns and the prospect of faster low-carbon

[12] (International Energy Agency, 2024b) (International Energy Agency, 2024a)
[13] (ResponsibleSteel, 2023)
[14] (Steel Standards Principles, 2025)

capacity build-out in China. On the other hand, the question of convergence/interoperability has become more acute as Europe's own lead market architecture remains unsettled. Recent developments around the Industrial Accelerator Act illustrate how contested green steel definitions remain. Earlier versions of the proposal envisaged a voluntary green steel label, reportedly based on a sliding-scale approach that would adjust emissions benchmarks for scrap use. However, this did not make it into the final version. Instead, the definition of low-carbon steel is currently being drafted in connection with product-specific requirements under the Ecodesign for Sustainable Products Regulation (ESPR). This may improve regulatory coherence, but it leaves a key methodological issue unresolved. European Ecodesign rules have historically relied on life cycle assessment. Accordingly, the first drafts of the preparatory study for iron and steel intermediate products under the ESPR framework do not consider scrap content when determining performance classes.

It remains uncertain whether the upcoming definition, and the low-carbon public procurement schemes linked to it, will ultimately implement a sliding-scale approach. If not, two further questions arise: what role would LESS play in Europe's lead-market architecture, and would the interoperability agenda with China shift away from mapping labels such as LESS and C2F towards ensuring the comparability of the product-level carbon-footprint accounting systems?

To kickstart the next phase of the industrial transformation, steelmakers need a bankable business case for their investments. Ambitious, credible and trusted standards for low-carbon steel are a necessary precondition for the emergence of functioning lead markets in which green steel can capture a green premium to cover the additional cost associated with low-emission steel making. Although political friction is inevitable, a patchwork of conflicting definitions will only stifle progress. Ensuring these standards work together is the only way to create a global market that functions for producers and policymakers alike.

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