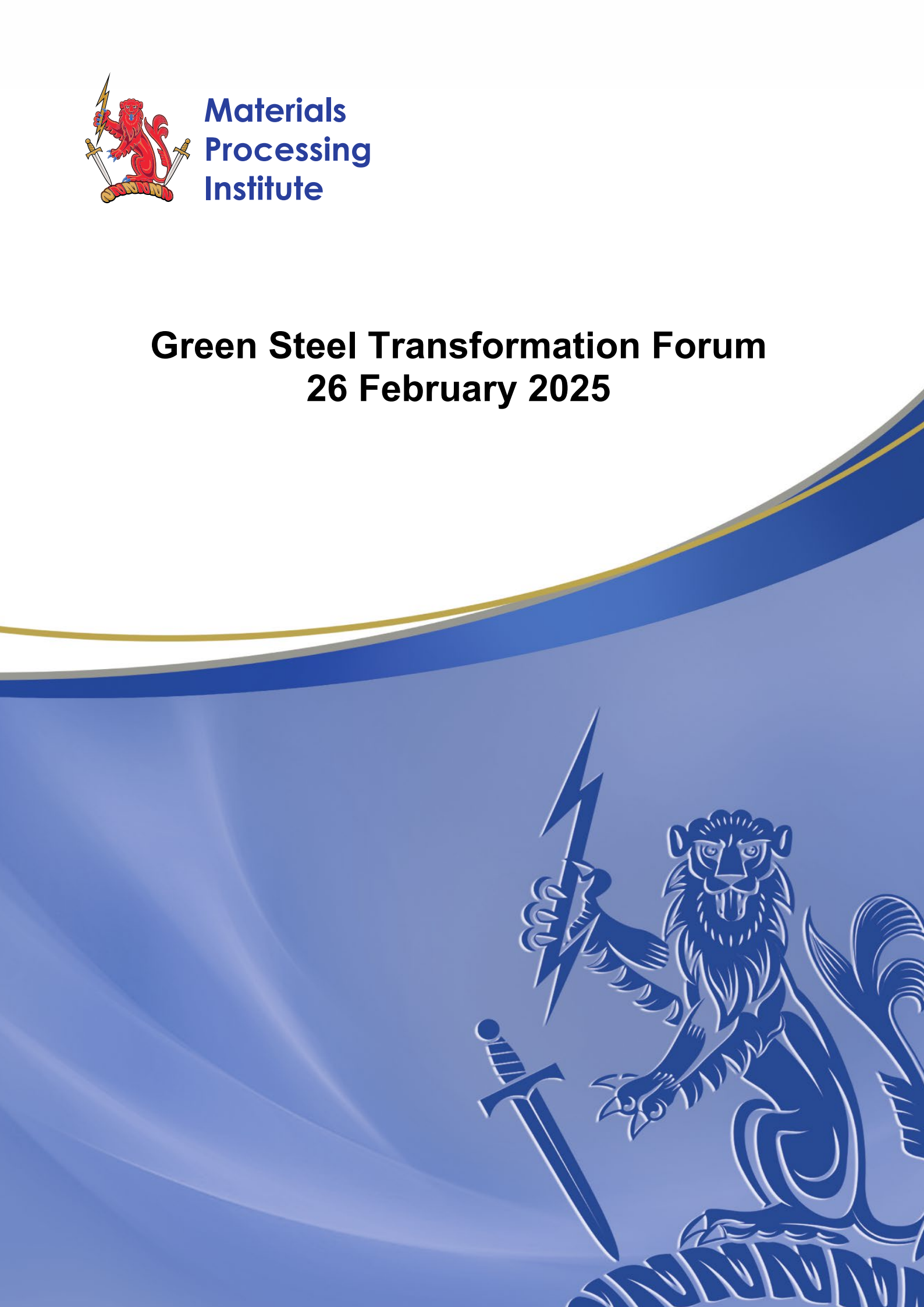
Materials
Processing
Institute

Green Steel Transformation Forum
26 February 2025



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SUMMARY

GREEN STEEL TRANSFORMATION FORUM, 26 FEBRUARY 2025

John Bolton - Co-chair, Steel Council

"We are at a turning point for the steel industry in the UK. Given the changes that are taking place this is all about trying to find a way to secure a future for the steel sector in the UK. The Steel Council has been charged with developing a strategy that lays out a roadmap for the steel sector. It's important to get the views of industry, which is why this forum is being held today to bring the key decision makers within that supply chain from scrap dealers, from steelmakers, from fabricators, all the way through to end users to try and air those differences and start to generate a common understanding of the way forward and the actions that we can take over the next years.

It's important to get the views of as many stakeholders as possible as we're facing a number of challenges so it's essential that the steel strategy reflects a common understanding of the challenge and represents a course of action that all stakeholders can get behind. Today is about continuing that consultation and will help to get a demand led perspective on the questions of green steel products, identify whether there is work to be done to improve understanding and bring those roadmaps and timelines into alignment and hopefully to solve technical problems."

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GREEN STEEL TRANSFORMATION FORUM, 26 FEBRUARY 2025

1. INTRODUCTION

On 26th of February 2025 the Materials Processing Institute (MPI) held its first Green Steel Transformation Forum, at the Armourers' Hall in London. The vision was simple, to convene stakeholders from across the UK steel supply and demand chain to identify common goals, align language and timelines, and understand the next steps that we all need to take to deliver on the demand for Green Steel in the UK. Many participants identified that this was the first time they had been present at a forum which included the whole steel supply chain, from raw materials and production to procurement, end use and recycling.

Steel contributes approximately 8% of global CO_2 emissions, decarbonising steel making is crucial to ensure we can achieve net zero by 2050 thereby aligning with the Paris Agreement and the global Sustainable Development Goals. Prompted by legislation, societal awareness of climate breakdown, and the resultant procurement commitments and increasing demand pressure for lower emission steel products from end users, there is now a steady trend in the steelmaking supply chain to meet this demand for what is broadly described as 'green steel'. To do so requires significant investment over several years in process changes. This can be achieved in a number of ways for example moving away from the use of blast furnaces to electric arc furnaces, utilising natural gas and/or hydrogen instead of coke in the production of iron form iron ore, increasing the use of scrap in production, implementing circular economy strategies for by-products, and potentially even carbon capture and storage operations.

However, in the UK context, demand for green steel is outpacing supply, and effective delivery of a thriving green steel economy for the UK depends on alignment of demand and supply over the next few years:

- The domestic steel sector is in a period of significant transition, with the globally unique move entirely away from coal-based furnaces fed predominantly on iron ore, to 100% electric arc furnace steelmaking which relies predominantly on recycled scrap steel.
- The scrap supply chain needs to adapt to this 5-fold growth in the domestic market;
- The major steelmakers need to adapt to new production paradigms;
- The energy infrastructure and supply markets need to adapt to provide affordable green power;
- And the demand side, particularly in public procurement, needs to retain and support domestic production capability where possible (rather than offshoring supply) by balancing the timing of definitive science-based CO_2 targets with the timing of the supply side decarbonisation.

The main themes of the day and a summary of session conclusions and feedback comments are given below.

Richie Hart - Process Technology Manager, Tata Steel UK

"Today we've seen people all the way through the supply chain and people who are influencing policy. there have been a lot of common views around the need for coordination through that whole chain to get to net zero and really understanding the long-term nature of steel as an industry and how we need consistency to get to 2040 and then 2050 to achieve all of our ambitions."

2. PROGRAMME

The forum was facilitated by MPI and supported by an opening address from Jon Bolton, co-chair of the UK Steel Council, and by short presentations from green steel advocacy group SteelZero, Anglian Water as a major customer and sector leaders in greener procurement, transitioning steel producers Tata Steel, and market analysts Fastmetals.

Giedre Snarskyte – Head of Energy and Sustainability, BHC

"The reason we came here is to better understand how we can help the steel industry industry to align their targets and make sure that the UK is not left behind in the process of decarbonisation. I've met a lot of great people who are really passionate about sustainability and made some great contacts."

3. AIMS

The aims of the day were:

- Understanding each other
- Understanding where to access the body of work that has got us to this point
- Identification of useful next steps or changes, agreement on who and how to start addressing sticking points
- Build the network

Throughout each session, the overarching questions for discussion in each session were:

- What can we do to improve our alignment?
- What is missing? Is there work to do here?

Chris Pilgrim - Knowledge Transfer Manager – Materials, Innovate UK Business Connect

"It's been a really helpful day to understand different perspectives from steel producers all the way through to the end users of steel and understanding the different constraints, the demands on different aspects, basically on how to encourage green steel."

4. SESSION SUMMARIES – A COLLECTION OF DELEGATES' COMMENTS AND WRITTEN BULLET POINTS DURING THE FORUM

4.1 'Real Green Steel' Green Steel Alignment and Strategy

In general, it is acknowledged that the term "Green Steel" is a useful term to communicate the ambition to reduce carbon emissions in the steel industry, but the messaging must be tailored for different audiences. Customer education and knowledge-sharing across both the private and public sectors remains a necessary. It is thought that non-technical audiences respond better to messaging in the broader context e.g. the steel industry contributes 8% of global CO_2 emissions, rather than at a company level. With this in mind, a range of different communication strategies are necessary to reach all corners of the value chain

To begin this process, clarity around the meaning of "Green Steel" remains lacking, a clear definition, including the scope and boundaries of the system and aligned with the Global Sustainable Development Goals, is required to ensure that all stakeholders are aligned. At present, the terms "Green Steel" and "low-carbon steel" seem to be interchangeable with the overall objective of reducing carbon emissions, so all the efforts are pulling in roughly the same direction. Alignment of definitions is needed across the whole value chain that is robust enough to withstand the evolution of targets between now and 2050.

Different definitions for Green Steel and some of the more prominent proposed standards (including the Indian Taxonomy for Green Steel, the first national government policy to define the issue) are summarised in the Appendix to the UK Primary Steelmaking Review 2025, submitted by MPI to DBT in March (see Appendix A).

It is recommended that the UK government support the definition and adoption of a national taxonomy for green steel within public procurement to align with existing emissions reduction targets.

At present, the dialogue is mainly dominated by industry incumbents, therefore supporting the broader ecosystem of SMEs is critical to ensure that real emission reduction can take place.

Andrew Wells - Editorial Director, Ferrous Metals & Mining, Fastmarkets

"I think it's been a fantastic day. Getting all the players from the UK steel value chain in one room together to discuss arguably the most important topic, which is steel decarbonisation. I think what I've learned today is that there is a desire amongst the community to collaborate and work together and learn from each other about each part of the value chain needs."

4.2 A holistic approach to achieving net-zero

Decarbonisation for the UK steel industry is a journey, for which a realistic roadmap is needed imminently to ensure that net-zero is achieved by 2050. Considering the global disruption of the COVID-19 pandemic and international affairs over the past 5 years, the roadmap must also consider how to manage potential future events whilst ensuring a reducing in carbon emissions.

4.2.1 Session 1: Improving Alignment in Green Steel

Key Discussion Points

A. Defining Green Steel

- HMG to establish a clear definition of "Green Steel" aligned with UN sustainability goals.
- Green Steel and low-carbon steel share the same objective of reducing carbon emissions.
- Alignment needed across the whole steel value chain, with the definition evolving over time with set targets.

B. Transition and Decarbonisation

- Decarbonisation is a journey requiring a fair and realistic timeline.
- Low-level steel products need a structured framework for transition.
- Managing conflicts of interest during the transition period is essential.
- A balanced approach is needed between promoting Green Steel and supporting UK steel until the two are aligned.

C. Market and Economic Considerations

- The impact of price differentials between first-life and second-life steel must be addressed i.e. re-used steel sections or products rather than recycling the steel itself.
- Performance metrics should be integrated into embodied carbon ratings.
- The need for a procurement framework involving suppliers and customers.
- A sliding scale mechanism for ‘greenness’ seen as fairer and mitigating the risk of [just under the threshold] higher emission steel dominating the market.

D. Communication and Knowledge Sharing

- "Green Steel" is a useful term to communicate the ambition to reduce emissions, but messaging must be tailored for different audiences.
- Non-technical audiences respond better to broader challenges, such as steel’s contribution to CO_2 emissions.
- The conversation is often dominated by industry incumbents, therefore supporting a broader ecosystem of SMEs is crucial for genuine emission reduction.
- Customer education and knowledge-sharing within both private and public sectors are necessary.

E. Government and Industry Role

- Joined up planning on decarbonisation between UK Government [as a regulator and a customer] and the steel sector
- A consistent legislative framework is required to align the net-zero strategy with industry needs.
- There is an opportunity for the Government, Steel Council, and the wider industry to set and enforce Green Steel standards.

- Consideration of market failures where government intervention may be necessary.

F. Global and Domestic Implications

- Support UK's transition but also consider the impact on the global steel industry.
- Retaining more scrap steel for domestic use is beneficial but affects international supply chains.
- UK steel strategy must reflect the realities of steel production and trade.
- Circularity and resilience in steel supply chains should be emphasised.

Next Steps

- Align the steel value chain across different industries.
- Consider PA 2080 framework, including roles of product suppliers, construction, designers, and asset owners.
- Address the iron supply requirement for steel production.
- Study the South Australian model for Green Iron and Green Steel strategy.
- Break the Catch-22 of demand vs. supply – identify key stakeholders to lead this initiative.
- Develop a Green Steel procurement framework involving suppliers and customers.
- Define timeframes for transition: 2030/2035, 2040, 2050.
- Ensure alignment over time with an informed client base and progressive suppliers.
- Establish a common language for industry-wide collaboration.
- Drive a UK steel strategy that is pragmatic and considers steel production realities.
-

Conclusion

A collaborative, well-aligned approach is required to transition towards Green Steel. While definitions and standards must be clear, the focus should be on well-informed leadership creating actionable steps to drive genuine emission reductions, ensuring economic viability and resilience in steel supply chains. Government, industry, and stakeholders must work together to create a balanced, sustainable, and competitive Green Steel strategy for the UK and beyond.

Ben Evans - Materials Engineer, UK Atomic Energy Authority

"Today's been a fantastic event. We've been discussing what it what green steel really means and looking at breaking down that umbrella term and putting some, some real scientific values in terms of carbon emission, sustainability and recycling, and also maximising, the economic benefits for the UK."

4.2.2 Session 2: Real Timelines

Delegates were asked to consider and share

- What are your key milestones between now and 2050?
- Why do you have those dates in your plan?

And to discuss

- What can we do to improve our alignment?
- What can happen sooner?
- What drives it or slows it down?
- What should be acceptable for later?
- What is missing? Is there work to do here?

Key Milestones and Strategies for Decarbonisation

A. Milestones for Green Steel Transition

2025-2030

- Some participants have committed to 50% reduction in emissions by 2030.
- Grid decarbonisation and alignment of timelines for significant reinforcement is necessary.
- Transition to Electric Arc Furnace (EAF) steelmaking leading to an 82% reduction in greenhouse gases (GHG) by 2029/2030.
- Steel Zero Initiative pushing for mass-market adoption of lower-emission steel. procurement. – but this needs to be done in conversation with suppliers to enable realistic timeline commitments.

Interim targets could therefore be set for 2025, 2030, and 2035

2035-2045

- >75% emission reduction by 2035.
- Tata Steel aims for an 80% emission reduction by 2045.
- Further expansion of the circular economy and material reuse in construction.
- Strengthening the UK's sovereign steel supply chain to ensure resilience.

2050

- Achieving Net Zero across the steel industry.
- Alignment with international targets such as the International Maritime Organisation. (IMO), Science-Based Targets initiative (SbTi), and Steel Zero commitments.

B. Key Challenges & Considerations

Scrap-Based Steel Production

- Evaluating whether a scrap-based approach provides the best value.
- Ensuring a complete and stable scrap supply chain through joint industry efforts.
- Addressing pricing stability and the impact of slow demand cycles.

Productivity & Supply Chain Improvements

- Developing a broad and robust supply chain to support long-term goals.
- Encouraging consistent policy frameworks to create market demand for Green Steel.
- Investing in innovation ecosystems, including start-ups and SMEs, supported by private investment and government-backed off-taker agreements.

Energy & Infrastructure

- Ensuring access to cheap, green energy to support steel production.
- Aligning infrastructure development with sustainability goals.
- Building with UK Green Steel to enhance domestic supply resilience.

C. Strategic Actions for Success

Innovation & Research

- Investing in new technologies to improve productivity and efficiency.
- Encouraging pilot projects and First-of-a-Kind (FOAK) initiatives to bridge the gap between research and large-scale implementation.

Policy & Market Alignment

- Establishing a consistent policy environment to drive investment and demand.
- Managing unintended consequences of transition policies to ensure balanced growth.
- Encouraging a mass-market mindset shift towards low-emission steel procurement by 2030.

Circular Economy & Sustainability

- Strengthening reuse practices in construction to lower environmental impact.
- Addressing the global issue of misalignment in green steel definitions and strategies.
- Ensuring that the transition to Green Steel does not lead to an unintended increase in coke-based steel production.

Conclusion

Achieving Net Zero by 2050 requires a collaborative and strategic approach between industry, government, and investors. By ensuring strong policies, stable supply chains, and sustained investment in innovation, the UK can position itself as a leader in sustainable steel production while securing economic prosperity. The focus should remain on doing the right thing for long-term sustainability, fostering a mindset shift towards Green Steel, and ensuring a secure sovereign supply chain for the future.

Ed Lauer - Head of Strategy, Unimetals Group

"Moving from where the UK is today to where it wants to be, it's a big journey. It's going to be challenging, and it's only going to happen when people are able to share ideas, planning thoughts and with the backing of key stakeholders including government and industry stakeholders. I think today's forum is exactly what we need to be pulling together going forward."

4.2.3 Session 3: Real Markets

Delegates were invited to discuss their experiences and thoughts within the context of:

- High profile 'Steel Charter' signatories and news
- What do we need to know about each other's supply and markets?
- Evolution of the green supply chains
- Energy costs
- Competition for green steel
- Competition for scrap
- Competition for green iron
- Competition from other materials?

Strategic Actions for Green Steel Implementation

A. Commercial Viability & Market Considerations

- Green Steel must be economically viable to ensure industry-wide adoption.
- Rising energy costs pose challenges; base energy affordability is critical.
- Potential shift towards higher-quality steel products to justify costs.
- Logistics and supply chain infrastructure must support the transition.
- The industry faces growing regulatory pressures, necessitating a consistent regulatory framework to prevent uneven application across markets.
- Waste by-products remain expensive to process and require efficient solutions.

B. Addressing the Scrap Supply Challenge

- Despite increasing demand for Electric Arc Furnace (EAF) steel, the UK will likely continue exporting scrap.
- There is competition for high-quality scrap steel, requiring a strategy to retain material within the UK.
- Early competition for supply could impact Green Steel production costs.
- Balance required between carbon reduction and social value targets.

C. Government & Policy Support

- Public procurement mandates should prioritize UK-made steel to stimulate domestic demand.
- A steel 'contract for difference' approach could be trialled to support transition to lower emission domestic production, e.g. similar to the proposed EU 'lead markets' framework[(1)].
- Alignment with international markets on protection measures is necessary to maintain competitiveness.
- Government should underpin business investment plans for critical infrastructure, including a plate mill and offshore wind supply chains.
- The Steel Charter and Public Procurement Notice (PPN) require clearer definitions and enforcement to be effective.

- Legislation should facilitate, rather than hinder, progress—credibility is built through effective policy execution.

D. Innovation & Investment in Supply Chains

- Downstream investment in supply chains must be enabled to support Green Steel adoption.
- UK steel sector needs a clear vision on material movement through the supply chain.
- Lessons can be learned from successful private companies like Heathrow, which effectively integrate supply chains.
- Realistic targets and incremental evolution must guide the transition.
- Circular economy principles should be embedded in steel production to create a truly sustainable supply chain.

E. Overcoming Barriers to Decarbonisation

- Energy price competitiveness is essential to attract investment and maintain global standing.
- The UK faces delays in supply chain decarbonisation due to external events; proactive measures are needed.
- Government must create conditions to incentivize innovation, including funding for startups working on Green Steel solutions.
- Green Iron technology is not yet fully developed, requiring research and strategic support before large-scale implementation.

F. Competition & Global Alignment

- Growing demand for Green Steel may drive up costs, requiring careful market management.
- The UK must balance competition and complementarity with other markets, particularly the EU and emerging global players.
- Decarbonisation challenges must be tackled without compromising the UK's industrial competitiveness.
- The steel sector must release and execute a detailed transition plan, with tension and urgency driving meaningful change.

Conclusion

Building a Resilient Green Steel Industry Delivering Green Steel in the UK requires a cohesive strategy that aligns commercial interests, regulatory frameworks, government support, and industry innovation. Investment in supply chains, clear policy direction, and energy affordability will be crucial in ensuring the UK remains a leader in sustainable steel production. The next steps should focus on strengthening supply chain resilience, enabling investment, and fostering innovation to achieve long-term success.

David Riley - Head of Carbon Neutrality, Anglian Water

"In terms of green steel, when you say that word, it sounds simple. It sounds like something that we can rely on and will happen anyway, but what this event really opens our eyes to is that the green steel, is a complex area. From the views and what I've heard from around the room, from product suppliers, from recycling industry, from other asset owners, is that we need alignment in terms of what demand we will have for green steel. The visions and the targets that we set, and how the supply chain can then respond to those targets in a in a constructive and a consistent way. Having a sovereign, reliable green steel supply chain in the future is really important for us and the targets that we set within Anglian Water and the net zero and carbon neutrality."

5. REFERENCES

(1) https://www.hydrogeninsight.com/industrial/lead-markets-eu-proposes-new-procurement-criteria-to-force-uptake-of-green-hydrogen-based-steel/2-1-1794675

6. CONCLUSIONS AND NEXT STEPS

Delegate feedback has been positive, feeling that this was a worthwhile event and a chance to meet and learn from senior leaders from parts of the supply chain which do not often interact directly. There was a recurring comment from attendees (as well as other invitees and, in later discussions with MPI, European counterparts in the green steel ecosystem) that the forum's 'whole supply chain' approach has been a missing element in the move to a greener steel industry, and that it will be valuable to continue this type of engagement going forward, in order to build a responsive supply base to meet customer demand, and an informed customer base to offtake the steadily decarbonising domestic production. The role of local and national government (as customers for steel as well as legislators), and of R&D and civil society enablers was seen as key in this partnership.

Future events and targeted work to create useable procurement frameworks and promote 2-way education and understanding are therefore planned, with engagement from DBT strongly welcomed.

Antonia Grey - Head of Policy and Public Affairs, British Metals Recycling Association

"It's been a great morning. I think we've got all the players in the room up and down supply chain. So from the scrap processors to the steel makers to the end users, and I think we've probably found out we've got more in common, there's a lot more alignment, and it's made me really optimistic for the future that we can all work together and help deliver on a really thriving national steel industry."

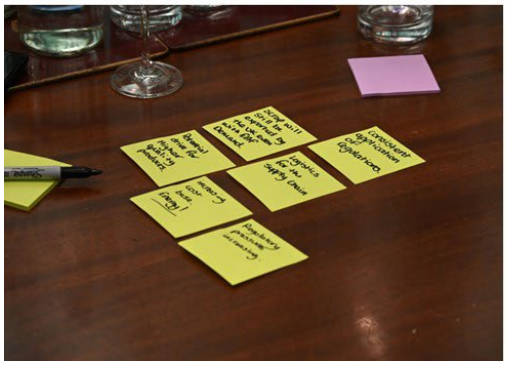
7. FOLLOW-UP AND VIDEO LINKS

Please contact Mark Allan, or Lucy Smith, Materials Processing Institute with any questions or requests for further clarification:

mark.allan@mpiuk.com
lucy.smith@mpiuk.com

To access video interviews from the day, click the following links:

- Introduction - https://www.youtube.com/watch?v=dkTV5HkpF5o
- End Users - https://www.youtube.com/watch?v=idd3kIRvStE
- Scrap Recyclers and Producers - https://www.youtube.com/watch?v=idd3kIRvStE



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WITH THANKS

Senior representatives of the following companies were present and engaged in roundtable discussions as well as focused breakout session:

Anglian Water
BHC Ltd
British Metals Recycling Association
British Steel
Caunton Engineering Limited
CELSA Steel UK
Climate Group
Department of Business and Trade
Dwr Cymru Welsh Water
Fastmarkets
High Value Manufacturing Catapult
Jaguar Land Rover
Liberty Steel UK
Lloyd's Register
S Norton & Co Ltd
Severfield plc
Sheffield Forgemasters Engineering Limited
SteelZero/Climate Group
Tata Steel UK
The Scottish Government
UKAEA
Unimetals
Welsh Government
William Hare Ltd






Jackie Murray – Director - South Wales, High Value Manufacturing Catapult

"Today's forum has explored aspects such as the leadership that's needed for the future and how we really build on and create a prosperous steel industry, how we actually have a really productive steel industry, one that's innovative and has a really strong USP. And then also a sustainable industry, one that meets net zero, but also pollution goals, and the needs of the communities we live in and the jobs that we can create."

APPENDIX

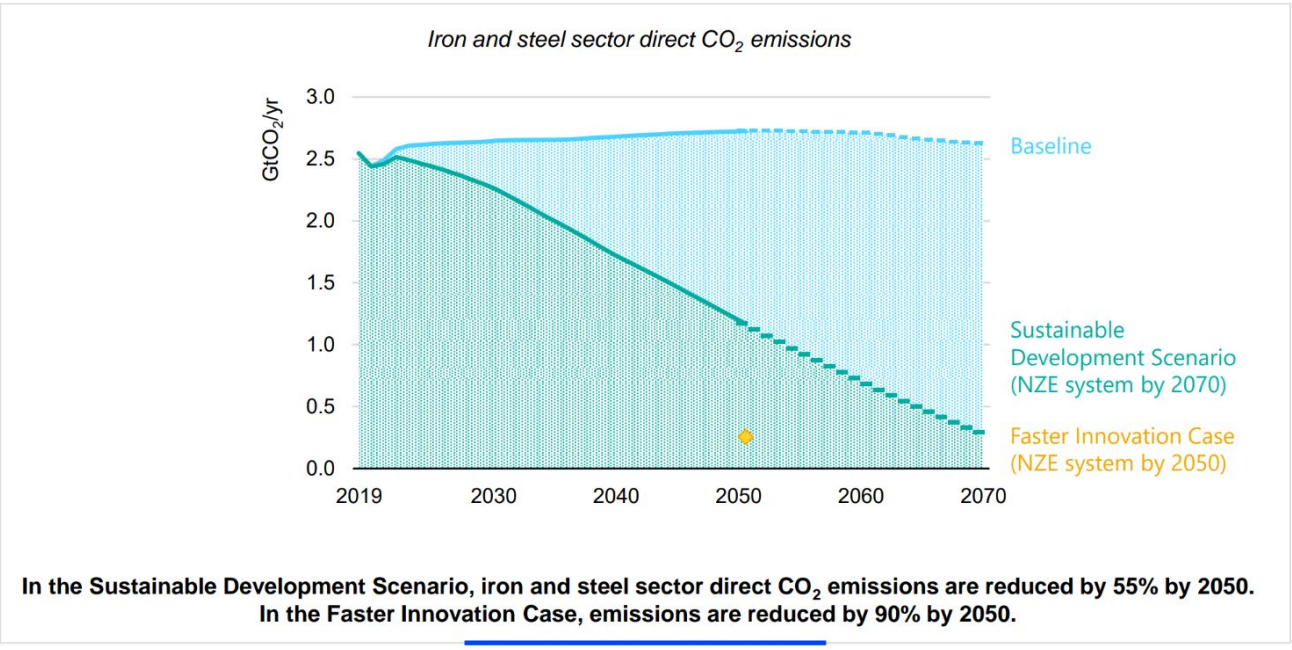
UK PRIMARY STEELMAKING REVIEW 2025 ©MATERIALS PROCESSING INSTITUTE: APPENDIX 4 – SELECTED "GREEN STEEL" CLASSIFICATIONS

Although 'Green Steel' is becoming a recognised catch-all term for steel products claiming or delivering significantly lower net emissions and other environmental impacts than the current average, there is no single universal standard for defining it.

This Primary Steelmaking Review has indicated the general 'green steel' thresholds for net CO_2 emissions most likely to be relevant to UK steelmakers, based on current market understanding.

The foundational framework is the science-based approach to meeting the Paris Agreement as set out in the (2020) International Energy Agency (IEA) Iron & Steel Technology Roadmap (24) which envisages various scenarios emerging from the 2019 global baseline; and the follow-up IEA report (2022), Achieving Net Zero Heavy Industry Sectors in G7 Members (25)

Sustainable steelmaking requires deep CO_2 emission reductions



In the Sustainable Development Scenario, iron and steel sector direct CO_2 emissions are reduced by 55% by 2050. In the Faster Innovation Case, emissions are reduced by 90% by 2050.

Multiple Green Steel standards or definitions

There are currently at least 40 active standards or proprietary definitions in circulation, and several national or regional methodologies for measuring CO_2 emissions for emissions trading or taxation purposes (for example EUTS, UK ETS, Indian ETS, CBAM) as well as international standards for industrial site environmental monitoring (ISO 140001) and energy management systems (ISO 40001, 50001) which define measurement and reporting frameworks.

Some of the most prominent systems for Green Steel definition are outlined below. There is a reasonable degree of compatibility between them, despite differences in methodology, philosophy and boundary definitions.

ResponsibleSteel

A voluntary standard which is currently the only international standard in the market. Includes net CO_2 emissions factors per tonne of crude steel which recognise the but extends the definition of 'responsible' steel into a comprehensive framework. Issues certification with 4 'progress levels' ranging from 1 (signed up to the Standard for reporting but still at a high environmental impact in terms of operations) through to 4 (near zero impact).

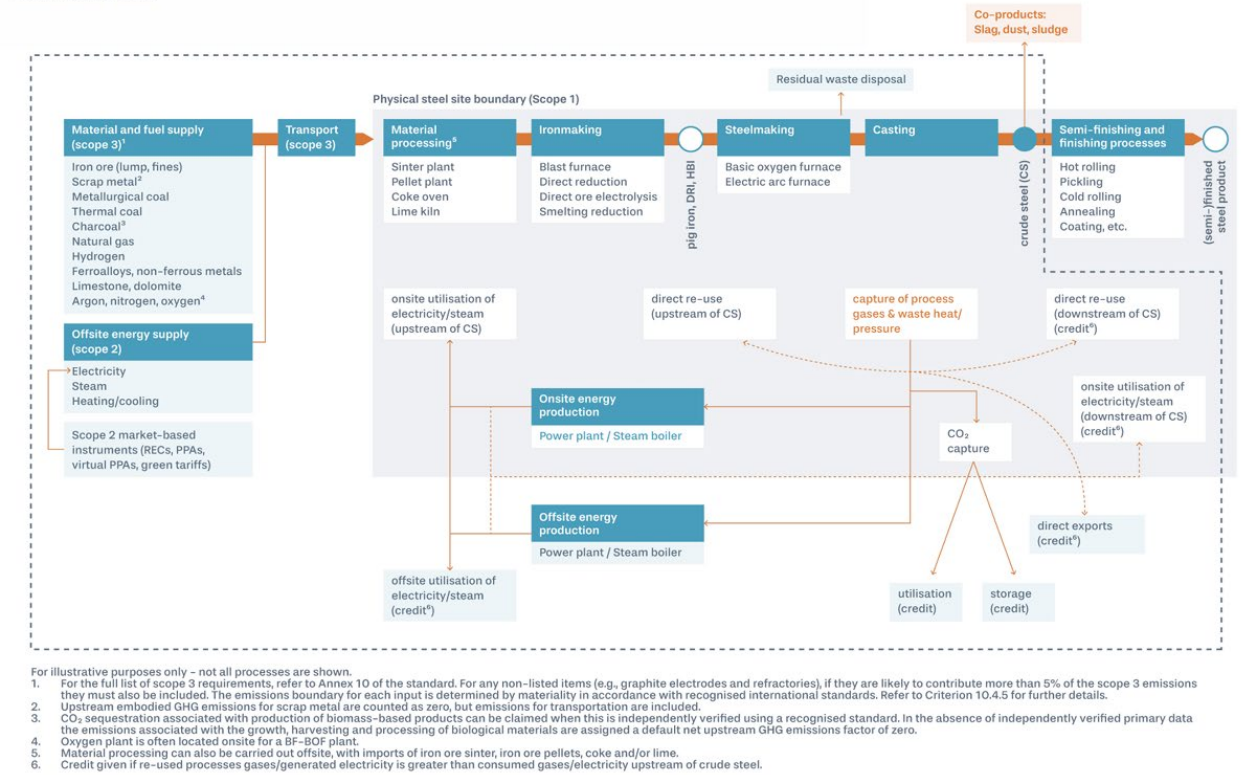
The ResponsibleSteel International Production Standard V2.1 (26) states that the Standard

> "*consists of 13 Principles containing over 500 requirements for the responsible sourcing and production of steel, including some of the most challenging areas of sustainability for steelmakers such as decarbonisation. However, responsiblesteelmaking goes beyond climate change mitigation. That's why the Standard also lays out requirements on labour, human rights, water, biodiversity, and more. We review the Standard at least every five years with the support and input of our members and stakeholders to ensure we continue to drive progress and promote the highest levels of responsibility for steelmaking"*

Within the Standard, Principle 10 addresses CO_2 emissions factors, defining the system boundaries for steelmaking, and setting a threshold equation for each of the 4 Progress Levels based on the proportion of primary iron to scrap, combined with embodied CO_2 of primary iron inputs and best practice in scrap melting.

ResponsibleSteel are developing a guide to show equivalence with other standards, e.g. their (1-4 scale) level 4 is based on the (1-5 scale) IEA Near Zero level.

Figure 3- ResponsibleSteel's Emissions Boundary (under criterion 10.4) for Representation Iron and Steelmaking Sites



For illustrative purposes only – not all processes are shown.
1. For the full list of scope 3 requirements, refer to Annex 10 of the standard. For any non-listed items (e.g., graphite electrodes and refractories), if they are likely to contribute more than 5% of the scope 3 emissions they must also be included. The emissions boundary for each input is determined by materiality in accordance with recognised international standards. Refer to Criterion 10.4.5 for further details.
2. Upstream embodied GHG emissions for scrap metal are counted as zero, but emissions for transportation are included.
3. CO_2 sequestration associated with production of biomass-based products can be claimed when this is independently verified using a recognised standard. In the absence of independently verified primary data the emissions associated with the growth, harvesting and processing of biological materials are assigned a default net upstream GHG emissions factor of zero.
4. Oxygen plant is often located onsite for a BF-BOF plant.
5. Material processing can also be carried out offsite, with imports of iron ore sinter, iron ore pellets, coke and/or lime.
6. Credit given if re-used processes gases/generated electricity is greater than consumed gases/electricity upstream of crude steel.

Figure A4.1: ResponsibleSteel site boundary definitions

Figure 6 – ResponsibleSteel Decarbonisation Progress Levels

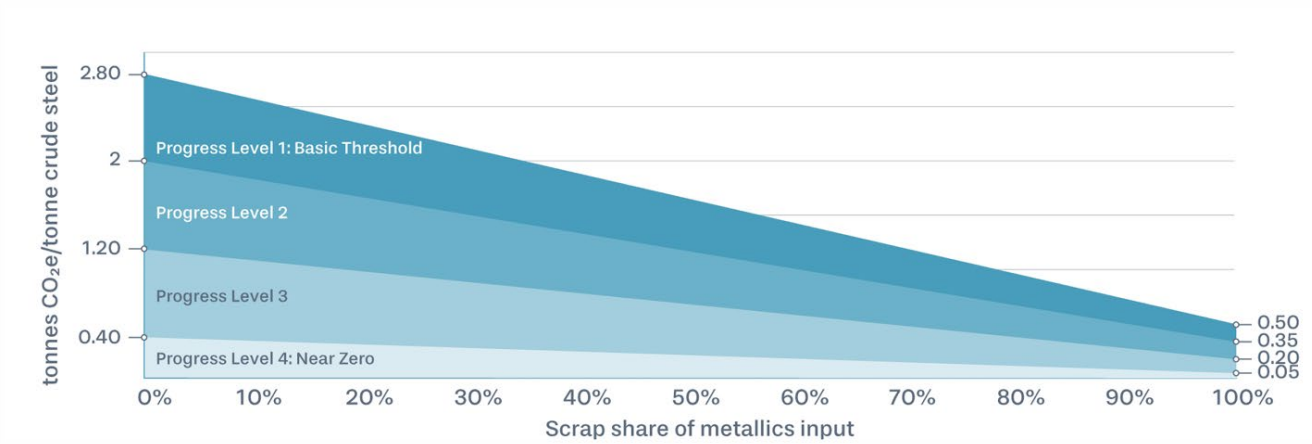


Figure A4.2: Responsible Steel Decarbonisation Progress Levels depending on scrap:metallics ratios

SteelZero

SteelZero (27) is a demand-side initiative, and a partner to Responsible Steel - led by Climate Group with the aim of speeding up the transition to a net zero steel industry. Organisations that join SteelZero make a commitment to procuring, specifying or stocking 100% of their steel requirement by 2050 as net zero steel, with an interim commitment to procure, specify or stock lower emission steel for 50% of their steel requirement by 2030. This interim commitment can be met through one or both of the following pathways:

- Steel produced by a steelmaking site where the steelmaker has a science-based emissions target.
- 'Lower emission steel' (aligning with Responsible Steel Decarbonisation Progress Level 2)

Global Steel Climate Council (GSCC) - Steel Climate Standard

Sets science-based targets and in 2024 published THE STEEL CLIMATE STANDARD Framework for Steel Product Certification and Corporate Science-Based Emissions Targets (28) from which the following descriptions and figures are taken.

The Standard *"measures and reports steel carbon emissions. The framework aims to reduce GHG emissions across the global steel industry, is aligned with a science-based glide path to achieve a 1.5° C scenario by 2050 and requires third-party verification of emissions data and science-based targets."*

The Glide Path approach is shown in Fig A4.3 below and differentiates its limits for meeting the standard between long and flat products, recognising the different process challenges. In all cases, science-based emissions targets (SBET's) are required: "as a first step in the target setting process, a company shall calculate the base year Company Average Steel Emissions Intensity (CASEI) for its steelmaking operations expressed as t CO_2e/t hot rolled steel".

Companies who have invested in decarbonisation and whose CASEI is already ahead of (i.e. below) the global glide path limits are required to set their own maximum limits path at a defined decarbonisation rate which stays ahead of the standard for some years but eventually converges. Companies with higher than glidepath CASEI must embark on a steeper trajectory and converge by 2040.

The standard is site specific and also allows individual products to be certified using an LCA approach, for example if a steelmaker wishes to certify the use of low-emissions inputs (renewable energy, low emission OBMs, high scrap content) when making a particular physical product.

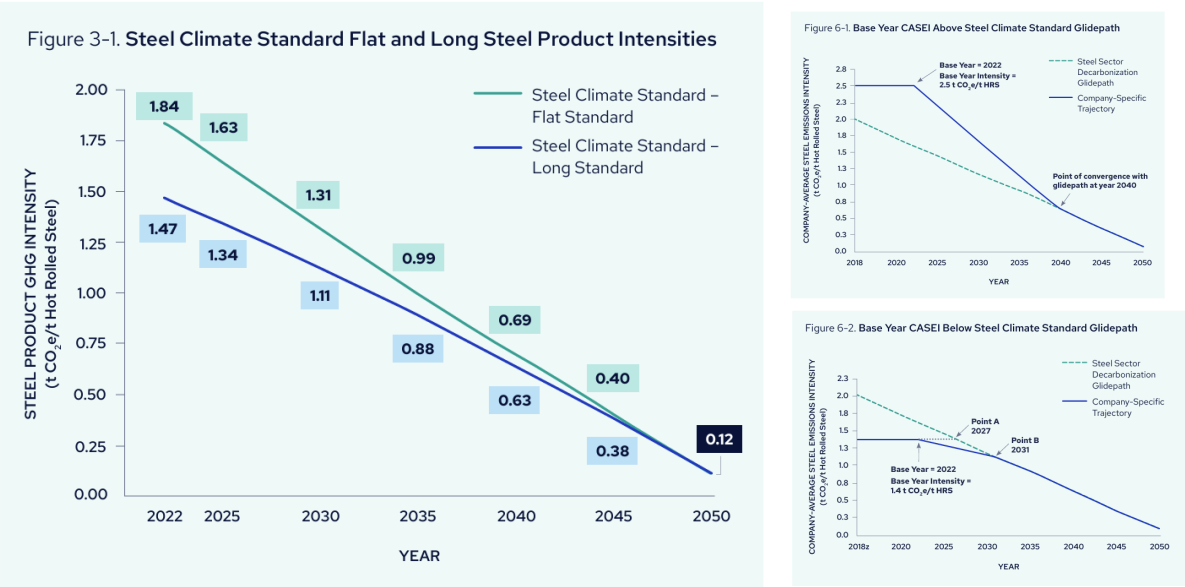


Figure A4.3 – GSCC glidepath and requirements for convergence

LESS (Lower Emissions Steel Standard)

A standard developed by the German Steel sector, based on IEA and similar work, based on existing practices and with a site-specific mass balance approach[1][2]. The example in Fig A4.5 below applies the 5-step standard to a generic 'Quality Steel' made with 50% recycled scrap:

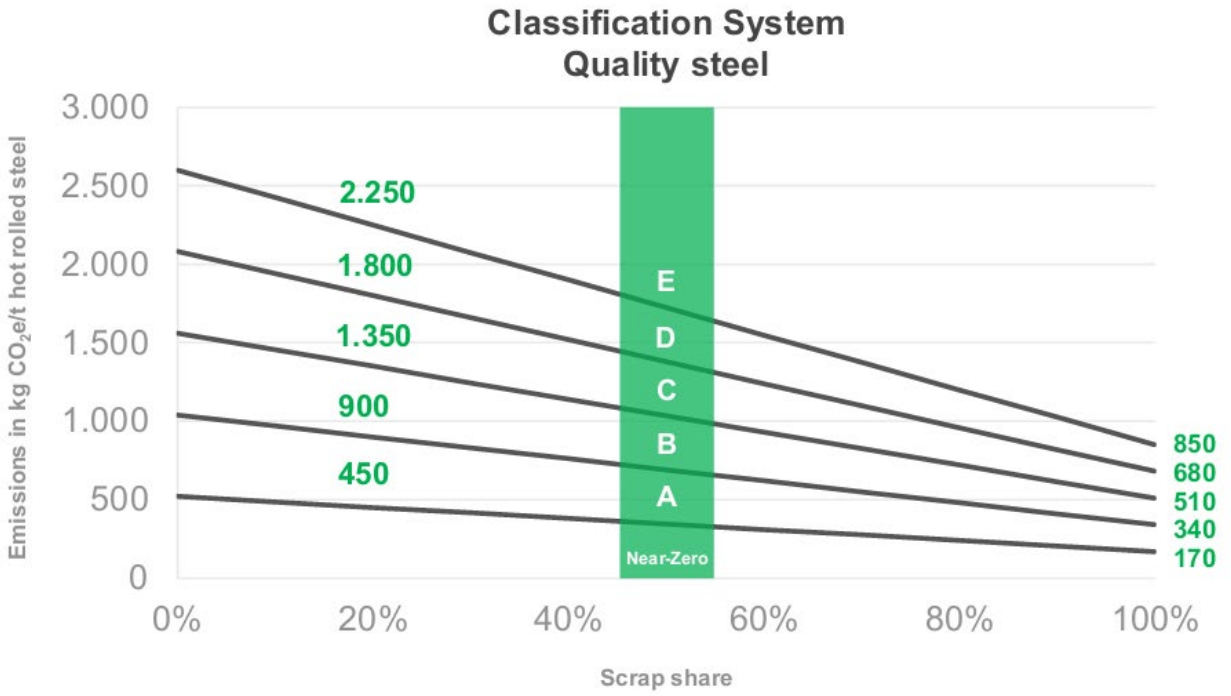


Figure A4.5 – LESS classification system overview including the example of 'Quality Steel'

Taxonomy of Green Steel for India

The Ministry of Steel in India released the world's first national taxonomy for green steel (1) as a mandatory pathway to achieve an emission intensity of **2.2 tCO_2 per tonne by 2030**, and net zero by 2070.

The salient features of green steel taxonomy –

1. **"Green Steel"** shall be defined in terms of percentage greenness of the steel, which is produced from the steel plant with CO_2 equivalent emission intensity less than 2.2 tonnes of CO_2e per tonne of finished steel (tfs). **The greenness of the steel shall be expressed as a percentage, based on how much the steel plant's emission intensity is lower compared to the 2.2 t-CO_2e/tfs threshold**.
2. Based on the greenness, the Green steel shall be rated as follows:

- **Five-star green-rated steel**: Steel with emission intensity lower than 1.6 t-CO_2e/tfs.
- **Four-star green-rated steel**: Steel with emission intensity between 1.6 and 2.0 t-CO_2e/tfs.

[1] https://www.wvstahl.de/wp-content/uploads/20240422_concept-paper_LESS_final.pdf
[2]https://www.wvstahl.de/wp-content/uploads/20240422_Rulebook_Classification-System-for-LESS_v1.0.pdf

- **Three-star green-rated steel**: Steel with emission intensity between 2.0 and 2.2 t-CO_2e/tfs.

Steel with emission intensity higher than 2.2 t-CO_2e/tfs shall not be eligible for green rating.

3. The threshold limit for defining the star rating of Green Steel shall be reviewed every three years.
4. The scope of emissions shall include Scope 1, Scope 2, and limited Scope 3, up to finished steel production. Scope 3 emissions shall include agglomeration (including sintering, pellet making, coke making), beneficiation, and embodied emissions in purchased raw materials and intermediary products, but shall not include upstream mining, downstream emissions and transportation emissions, both within and outside the gates of a steel plant.
5. The National Institute of Secondary Steel Technology (NISST) shall serve as the nodal agency for measurement, reporting, and verification (MRV) as well as for issuing the greenness certificates and star ratings for the steel.
6. The certificate shall be issued on yearly basis (financial year). In case the steel plants opt for MRV more frequently, then the certificate may be issued more than once in a year as per the requirement.

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