July 2021
Version 2.0

MISSION POSSIBLE PARTNERSHIP

Steeling Demand: Mobilising buyers to bring net-zero steel to market before 2030

Breakthrough Energy

MATERIAL ECONOMICS

Energy Transitions Commission

Supported by Breakthrough Energy

An analysis by Energy Transitions Commission and Material Economics for the Mission Possible Partnership's Net-Zero Steel Initiative

Steeling Demand: Mobilising buyers to bring net-zero steel to market before 2030

Steeling Demand: Mobilising buyers to bring net-zero steel to market before 2030 demonstrates that demand signals from steel buyers to steel manufacturers can help unlock investment decisions. Such signals will secure the next generation of breakthrough technologies needed for primary steel to become truly net-zero emissions. This is significant in an industry that globally accounted for 2.6 Gt of direct CO_2 emissions in 2019, representing about one-quarter of industrial CO_2 emissions and 7% of total energy sector emissions (including process emissions). This report provides the guidance needed to the critical stakeholders in the automotive, construction, renewable energy and white goods sectors on how to seize the associated commercial opportunity for steel buyers in being early movers and actively participating in the commercialisation of low-CO_2 primary steel production technologies.

This report was developed by the Energy Transitions Commission and Material Economics on behalf of the Net-Zero Steel Initiative, part of the Mission Possible Partnership. This work was supported by Breakthrough Energy.

The Energy Transitions Commission (ETC)

ETC is a global coalition of leaders from across the energy landscape committed to achieving net-zero emissions by mid-century, in line with the Paris climate objective of limiting global warming to well below 2°C and ideally to 1.5°C.

Our Commissioners come from a range of organisations – energy producers, energy-intensive industries, technology providers, finance players and environmental NGOs – which operate across developed and developing countries and play different roles in the energy transition. This diversity of viewpoints informs our work: our analyses are developed with a systems perspective through extensive exchanges with experts and practitioners.

Material Economics

Material Economics is a management consultancy firm advising leading businesses on how to reduce their environmental footprints and become more circular. The firm has published leading reports on climate change, heavy materials, and the circular economy, and has experience from more than 100 sustainability-related strategy projects in sectors such as heavy industry, buildings, finance, transportation, manufacturing, and food.

Breakthrough Energy

Founded by Bill Gates, Breakthrough Energy is dedicated to helping humanity avoid a climate disaster. Through investment vehicles, philanthropic programs, policy advocacy, and other activities, we're committed to scaling the technologies we need to reach net-zero emissions by 2050.

Mission Possible Partnership

Led by the ETC, RMI, the We Mean Business Coalition, and the World Economic Forum, the Mission Possible Partnership (MPP) is an alliance of climate leaders focused on supercharging the decarbonisation of seven global industries representing 30 percent of emissions – aluminium, concrete, chemicals, steel, aviation, shipping, and trucking. Without immediate action, these sectors alone are projected to exceed the world's remaining 1.5°C carbon budget by 2030.

MPP brings together the world's most influential leaders across finance, policy, industry and business. MPP is focused on activating the entire ecosystem of stakeholders across the entire value chain required to move global industries to net-zero.

Net-Zero Steel Initiative

Global carbon emissions from iron and steel production are currently around 2.3Gt per annum – or about 7% of global energy system emissions. Business-as-usual scenarios suggest that this could rise to 2.8Gt per annum by 2050. Multiple technology pathways to decarbonise steel production are already being developed, but, in a highly competitive sector, market signals are lacking to unlock further investment.

The Net-Zero Steel Initiative aims to mobilise steel industry leaders who want to work together to shape the favourable policy, market and finance environment required to transition to zero carbon emissions in steel.

Learn more at:

www.materialeconomics.com

www.breakthroughenergy.org

www.missionpossiblepartnership.org

www.energy-transitions.org

Executive Summary

Primary low-CO_2 (and eventually CO_2-free) steel production will be essential for all actors in the value chain, spanning steel production and use, in order to reach voluntary and regulatory climate targets by 2030 and beyond. Decarbonising steel is also essential to reach net-zero emissions globally by 2050. From wind turbines to electric vehicles, steel will be an integral enabler of the energy transition but it is also a major part of the embodied carbon in many industrial products today.

The pressure to decarbonise is coming from a combination of factors, including policy action, scrutiny from finance players, and changes in consumer preferences. As pressure grows to deliver deep decarbonisation of production and products, the world needs solutions that reduce emissions associated with carbon-intensive materials such as steel in the short term and provide a foundation for deeper cuts in the 2030s and 2040s.

Early movers in the automotive, construction, renewable energy and white goods sectors can benefit from developing new low-CO_2 steel supply chains. For all these sectors, early action on low-carbon steel is attractive as:

- Steel is a major component of their value-chain emissions.
- They face significant and rising pressure from regulators and customers to decarbonise supply chains.
- Low-CO_2 steel will be a market differentiator in the next decade and it is hard to stand out with incremental CO_2 reductions.
- The premium for low-CO_2 steel is a small share of the total product cost.
- Buyers are sufficiently large to effect change in supply chains.

Corporates will need to be proactive if they want to access the first (likely scarce) volumes of low-CO_2 primary steel, seize early commercial opportunities in premium green markets, and provide differentiation amidst markets characterised by tight operating margins. Acting early will also allow companies to adapt to changing policies, such as anticipated regulations on lifecycle CO_2 emissions, and to market forces, such as rising carbon prices. They will need to engage 'upstream' in a way that is new to many steel buyers, but the potential pay-off is significant. Early movers already include Volvo's partnerships with SSAB, BMW and BHP Ventures' investments in Boston Metal, and Scania, Daimler and Kingspan's partnerships with H2 Green Steel (H2GS). Further examples can be found as more than ten corporates in the construction and renewable energy sectors such as Landsec, Multiplex and Ørsted, have signed up to the Climate Group's SteelZero initiative thereby pledging to secure 100% net-zero steel by 2050 at the latest.

Providing low-CO_2 primary steel to satisfy the demand of early mover corporates will require breakthrough production technologies to be brought to market. This paper explores the types of action required to catalyse investment in these breakthrough technology pathways. This paper shows how demand signals from steel buyers can help unlock these investments for low-CO_2 steel. It explores how such demand signals could be structured while meeting the commercial imperatives of sellers and buyers. It is based on interviews and workshops with more than 50 steel manufacturers, steel users, regulators and finance providers, and extensive analytical work on low-carbon technologies and value-chain dynamics. It provides options to help steel producers and buyers to design green demand signals and quantitatively describes the advantages and disadvantages of each.

The good news is that, compared to just four years ago, these breakthrough technologies have been validated. Nearly all major producers, as well as several new entrants such as Boston Metal and H2GS, are developing low-CO_2 production technologies at an increasing pace.

By 2030, if the right conditions are in place, current corporate announcements suggest 20 Mt of low-CO_2 steel could be available to the market – equal to approximately two-thirds of the steel used by the EU automotive sector. The recently released IEA's 'Net Zero by 2050' global roadmap to net-zero[i] includes the ambitious target volume of 180 Mt of low-CO_2 by 2030 requiring urgent action from all stakeholders.

These volumes will only be realised by 2030 if investment, supported by the business case illustrated in this report, takes place in the next five years. Today, the higher cost of low-CO_2 production, the so-called green premium, is the primary reason holding back the development and deployment of low-CO_2 steel technology. With no adequate package of policies (e.g., contracts for differences) yet in sight, steel manufacturers need an understanding that the green premium will be covered in part (or fully) to underpin investment in low-CO_2 steel production routes; otherwise, producers may delay vital investment decisions. Such a delay would make corporate emissions targets harder to reach and present a headwind to both steel manufacturers and buyers.

Defining 'low-CO_2' steel will also provide clarity to the supply chain, and accelerate the transition to a lower-carbon steel sector. Several steel producers are gradually transitioning to a portfolio of lower-carbon assets while exploring breakthrough production technologies that could enable production at near-zero emissions. Many of the proposed low-CO_2 steel production projects can achieve a footprint of close to 0.1 tonne of CO_2 per tonne of steel – a reduction of 95%. For buyers, few other Scope 3 emissions reductions will offer the combination deep emissions abatement potential, expected time-to-market and marketable value. An ambitious definition of low-CO_2 steel, pushing the footprint close to zero emissions will provide a product that can be clearly communicated to end customers and gives the suppliers clarity on a market for low-CO_2 steel.

How to unlock the opportunity:

- **Provide certainty of future demand:** From the demand side, buyers' commitments that are firm and precise (on volume, specifications and price) will do most to unlock investment. A short-term purchasing model is unlikely to sufficiently de-risk investments by producers in low-CO_2 steel assets; procurement models will need to adapt tenors to provide longer-term certainty. Ideally, offtake agreements would match the tenor of associated debt financing.

- **Cover an initial green premium:** First-of-a-kind investments in breakthrough steel production will cost 15-40% more per tonne of steel, depending on the technology employed and local market circumstances. While suppliers should carry some price risk, buyers will have to pay more if investments are to be viable.

- **Matching supply and demand in specifications and location:** Low-CO_2 steel supply and demand must match, not only in terms of aggregate volumes but also in terms of geography and steel grades, in order for the new trade flows to increase smoothly.

There are multiple ways to design, structure and deliver demand signals in order to underpin and bring-forward low-CO_2 steel investment. They range from direct offtake agreements to broader public commitments to procure specific volumes of low-CO_2 steel. They can be broadly grouped into three forms, although they are not mutually exclusive and steel buyers may find that the most suitable strategy evolves over time.

- **Direct demand signals** include bilateral offtake agreements, which define the terms of the transaction many years into the future. They can be complemented by co-investment, which enables producer and buyer to share risks and rewards. Direct demand signals are relevant for buyers that directly procure large amounts of steel, such as major automotive OEMs, renewable energy OEMs, and large industrial manufacturers. Precise and defined, direct offtake agreements are likely to be the most impactful way to catalyse the necessary investment in breakthrough technologies.

- **Future purchase commitments** are commitments to purchase low-CO_2 steel, ideally with specificity on timing and volume, but which are not directed to a specific producer. Such forward commitments can be deployed by companies who procure steel directly but face significant uncertainty in precise the location and volume of their demand, such as construction companies. To maximize the potential impact at scale, these commitments should be aggregated, possibly via a buyers' campaign like SteelZero.

i International Energy Agency (2020), Net-zero by 2050

- **Indirect demand signals** are a commitment to decarbonize supply chains. These much broader signals can be sent by a wider pool of organisations, including investors and funds and end-user markets. Such a signal does not provide certainty of offtake to a steelmaker and is insufficient to underpin a business case for investment. If significant volumes of aggregated demand can be demonstrated, it could give steel producers and their financiers sufficient confidence in the scale of future addressable markets in order to unlock and bring forward the investment.

These challenges present a significant business opportunity and the next five years will be critical for investment. Long steel project lead times, mounting regulatory interest in and pressure on supply chain emissions and shifting consumer preferences mean that the time to act is now. The opportunity is clear and practical options are available for setting up demand signals. It would benefit steel manufacturers, buyers and regulators to engage even more ambitiously to move the steel industry across the low-carbon tipping point and realise the commercial and environmental opportunities.

- **Steel buyers**
  - For large, direct steel buyers: Build systematic understanding of the options and costs related to Scope 3 emissions abatement options, and engage in using significant predictable demand to unlock upstream investments and accelerating the transition to net-zero.
  - For steel buyers not engaged in direct bilateral negotiations: Engage in the buyers' club initiatives that will be set up for low-CO_2 steel (e.g., SteelZero), and commit to as large volumes as possible.

- **Steel producers**
  - Engage with high-volume customers in order to establish the necessary supply chain collaborations. This is a new, complex and more strategic type of customer relationship than for conventional steel transactions and will likely require senior engagement to get right.
  - Define the specifications in conjunction with consumers required to underpin investment in breakthrough low-CO_2 steel, and work with steel buyers and regulators to establish and adopt a common and workable definition of 'low-CO_2' steel.

- **Policymakers and public organisations**
  - Continue to provide a supportive R&D environment to foster innovation and technology cost reduction in the steel sector.
  - Use public procurement to incubate early markets for low-CO_2 steel between 2025 and 2030. For example, the public sector is typically a very large buyer of construction steels.
  - Lower the risk for first-mover investments into low-CO_2 steel. Investments will carry considerable risks that come with making early commitments and will be challenging to negotiate. Policy can help by assuming a portion of that risk through a combination of financial products and policy such as carbon contracts for differences (CCfDs) to reduce the uncertainty associated with the future price of carbon.
  - Set lifecycle emissions standards for key steel-using products, to drive the necessary technology deployment and uptake.

- **Steel end-consumers**
  - Advocate and opt, where possible, for products containing low-CO_2 steel over comparable products, and demand greater transparency on lifecycle and embodied emissions in consumer products.

July 2021
Version 2.0

MISSION POSSIBLE PARTNERSHIP

Steeling Demand: Mobilising buyers to bring net-zero steel to market before 2030

Breakthrough Energy

MATERIAL ECONOMICS

Energy Transitions Commission

Supported by Breakthrough Energy

An analysis by Energy Transitions Commission and Material Economics for the Mission Possible Partnership's Net-Zero Steel Initiative