

URGENT ACTION ON CLIMATE CHANGE: HYDROGEN FOR STEEL PRODUCTION

A speech given at the All Party Parliamentary Group for Hydrogen, House Of Lords, Westminster

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There can be no better day to stress the need for urgent action on climate change than today, with the UK experiencing record breaking temperatures. We need to move quickly to decarbonise our economy, but whichever way we turn, whether to offshore wind, or electric vehicles, the inescapable reality is that we need ever increasing amounts of basic materials, such as steel.

At the Resolution Foundation last week¹ it was stated that in the next 15 years the world's economy will create at least as much infrastructure as we already have. Most will need concrete and steel - which is why also last week three UK reports were published on steel decarbonisation, from Green Alliance², Bright Blue³ and UK Steel⁴.

These reports rightly point to hydrogen as key to decarbonising the steel sector, through the development of new Hydrogen-Direct Reduced Iron, or DRI, technology.

Hydrogen reduction aims to combine hydrogen with existing natural-gas based technology. It has the potential to replace the blast furnace, which has dominated steelmaking for 200 years, and in so doing eliminate metallurgical coal from ore refining.

The UK is not the only major economy to recognise this opportunity and indeed we are in danger of being left behind.

- > In 2021 HBIS in China started the world's first hydrogen enriched plant.
- > This year Arvedi in Italy became Europe's first Green Steel plant, whilst the continent's largest producer, Arcelor-Mittal announced plans for hydrogen furnaces in Spain in 2025, France in 2027 and Belgium in 2030.
- In Sweden, new start up steel company H2S GreenSteel will be operational in 2024, followed by SSAB a year later.
- In the same year, ThyssenKrupp Steel in Germany will bring on a hydrogen plant as will Salzgitter in 2026. Salzgitter will complete its conversion to hydrogen by 2033, committing an investment of 723m euro. This comes after a German government announcement last year of 8bn Euro investment in hydrogen.

The UK needs to move fast, or risk losing our steelmaking capacity altogether.

That is why I am calling on government to build on their existing investments at the Materials Processing Institute and commit the £14m needed to build a national pilot plant, that will upscale and accelerate the technology needed to commercialise hydrogen steelmaking. Governments in Austria, Sweden and Germany have already invested 50m euros each in national pilot projects.

The UK has one clear advantage here, which is that we can leverage our existing expertise, pilot steelmaking facilities and hydrogen gas networks at the Materials Processing Institute in Redcar, to move more quickly and at lower cost than our European competitors. Such a pilot facility would also enable us to address the use of low quality iron ore, an essential area of research as it is estimated that less than 5% of global iron ore supply is suitable for the hydrogen process.

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The steel industry cannot deliver this alone. As we have seen in other nations, there must be a multi sector approach, working with government that delivers green electricity and industrial quantities of hydrogen, linked through gas networks to the major consumers.

To replace existing coal-based steelmaking with hydrogen steelmaking will increase UK steel electricity consumption from 2TWh to 33TWh, requiring at least a 10% uplift in UK electricity generation. This will require investment from government in the research and development, but also in energy generation and network infrastructure.

The opportunity from this is real, but the threat is real too. If we fail to act, we risk losing vital industries that are essential for the UK economy, defence and our ability to act as an independent nation.

More than this, whatever happens now, man-made climate change has altered our environment for good, but by investing in these technologies as a national priority, we will overcome this most grave and potentially catastrophic challenge.

- ¹ 'Stagnation Nation: Navigating a Route to a Fairer and More Prosperous Britain', Resolution Foundation, July 2022
- $^{\rm 2}\,$ 'Forging the Future: The Path to Greener UK Steel', Green Alliance, July 2022
- $^{\rm 3}\,$ 'Bright Blue report on bridging the gap to commercial clean steel', Bright blue, July 2022
- $^4\,$ 'Net Zero Steel: A Vision for the Future of UK Steel Production', UK Steel, July 2022

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Chris McDonald is the Chief Executive Officer of the Materials Processing Institute. The Institute carries out industrial research and innovation in advanced materials, low carbon energy, digital technologies and the circular economy supporting the materials, processing and energy sectors for over 75 years. Chris led the divestment and return to independent, not-for-profit ownership of the Institute in 2014.

Chris's background is in industrial research and manufacturing, where he has worked internationally. A graduate of Cambridge University, Chris is a Fellow the Institute of Chemical Engineers and of the Institute of Materials, Minerals and Mining. He sits on industrial advisory boards at a number of universities, including Oxford and Sheffield.

Chris has an interest in innovation management and industry dynamics and in addition to leading the Institute, he provides expert opinion and consultancy support to companies, institutes, Governments and public bodies in innovation and technology strategy and management. He also advises on the technical due diligence aspects of mergers and acquisitions.

Chris is prominent in the development of public policy, around innovation, steel, SMEs, where he works to support growth and inward investment. Chris is the policy chair for Innovation and Enterprise for the Federation of Small Businesses, a member of the CBI Regional Council and Shadow Monetary Policy Committee for the North East, the Chair of the UK Metals Council and a member of the Steel Advisory Board for UK Steel (EEF).

Chris is often called to commentate in the media on innovation leadership and the steel industry.

Chris McDonald Chief Executive Officer Materials Processing Institute ⁶ ⁶ Chris is often called to commentate in the media on innovation leadership and the steel industry **?** ⁹





Materials Processing Institute

The Materials Processing Institute is an independent, open access and not-for-profit technology and innovation centre working with industry, government and academia worldwide. Support ranges from small scale, site based investigations, through to long term collaborative research programmes.

The Materials Processing Institute is expert in advanced materials, low carbon energy and the circular economy, specialising in challenging processes, particularly those involving high specification materials, high temperatures and difficult operating conditions.

The Institute has over 75 years' experience as a leading UK technology provider. Extensive materials processing knowledge is supported by state-of-the-art facilities with a broad range of equipment, from laboratories through to demonstration, scale-up and production plant.

Scientists and engineers work with industry and apply their expertise to develop and implement robust solutions to research and development and improvements for products and processes.

Expertise is spread across a wide range of disciplines, including:

- Materials Characterisation, Research and Development
- > Simulation and Design
- > Monitoring, Measurement and Control in Hostile Environments
- > Process Development and Upscaling
- > Specialist Melting and Steel / Alloy Production
- > Engineering / Asset Management
- > Materials Handling
- > Minerals and Ores

Research and project management teams deliver support across a wide range of industrial and manufacturing sectors including:

- > Metals and Metals Manufacture
- > Chemicals and Process
- > Nuclear
- > Oil & Gas
- > Energy
- > Aerospace and Defence
- > Mining and Quarrying





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