Materials Processing Institute

STEEL DECARBONISATION AND THE JUST TRANSITION: THE BIG 'NET ZERO' PICTURE FOR UK STEEL

A speech given at the All Party Parliamentary Group (APPG) for Steel, Westminster, UK

Tuesday 15 June 2021

Materials Processing Institute

Introduction

Thank you to Stephen Kinnock and the members of the APPG Steel for this invitation to speak about steel decarbonisation and the just transition. Much of what I am about to say references a paper I co-wrote with the Syndex in March, entitled 'Decarbonisation of the Steel Industry in the UK'. This paper is available for download from the website of the Materials Processing Institute.

As most people here know, the organisation I lead, the Materials Processing Institute, was established at an earlier time of crisis in the steel industry. Towards the close of the second world war, just a few days before D-Day, Winston Churchill's government began the process of planning for recovery and established the Institute as a vehicle to support the transformation of the steel industry and the rebuilding of our country.

There are strong parallels here with today, where emerging from a pandemic and needing to rebuild a green and sustainable economy, requires a strong, resilient and zero carbon steel sector. Indeed, the commitments made by G7 leaders this weekend, on COVID recovery, on decarbonisation and on infrastructure, cannot be achieved without the steel industry. More than this the commitments made by the Prime Minister in his ten-point plan for a Green Industrial Revolution, in areas such as offshore wind, electric vehicles, the hydrogen economy and advanced nuclear technology, are all reliant on advanced steel capabilities in the UK.

Achieving these aims requires investment in innovation in the steel and wider metals sector and government is committed to this through the PRISM programme of innovation and research being delivered by the Materials Processing Institute, covering decarbonisation, alongside digitisation and the circular economy. PRISM is the name for an innovation fund awarded to the Materials Processing Institute by the Chancellor in the March 2020 budget. It is funded by InnovateUK and is the £22m referenced in the response of BEIS to the select committee steel inquiry, as core to decarbonising steel in the UK

The strategic importance of domestic steel production has long been understood in terms of defence, but during the pandemic we also saw how we depend on the steel industry for our basic needs, with tinplate from South Wales for canned goods and steel tubes from Corby for beds in Nightingale hospitals. Looking to the future, particularly as global trade becomes less reliable, we need our steel industry to support advanced manufacturing and infrastructure, as government seeks to both decarbonise and invest to level-up, across the country.

It was heartening for me to hear the critical importance of the steel sector confirmed by the Secretary of State, when he and I both gave evidence recently at a BEIS Select Committee hearing. The minister affirmed the strategic importance of steel and said that: ***'Once you are strategically committed to the industry, you have to provide some measure of support. It does not make sense to say that we are strategically committed to this industry and then not support it….'*** . There is cross party agreement here, with Sir Keir Starmer remarking that ***'Steel is not just an industry of our past. It must have a place in our future, too. A robust steel sector enables economic prosperity and growth and it's vital for national security.'***

We need to acknowledge that all governments around the world rightly intervene to support their steel sector and so if we want a sustainable steel industry, then we must use policy to create a level playing field. This morning, I will talk through how we can decarbonise, but also what this means for jobs in steel communities.

[1]'Decarbonisation of the Steel Industry in the UK', March 2021, https://www.mpiuk.com/downloads/industry-papers/SI-Series-Paper-05-Decarbonisation-of-the-Steel-Industry-in-the-UK.pdf

Technology Choices

We know that the steel industry is the largest industrial emitter of carbon dioxide and so measures to reduce those emissions will require a wholesale change in the technology of steel production. Fortunately we already know what the technologies to decarbonise will be a combination of electric arc furnaces, hydrogen, and carbon capture and storage. I estimate the cost of adopting these technologies at around £6bn for the UK industry, in addition to the associated infrastructure. This is not a huge sum in the context of steel. For instance, yesterday Metinvest, a Ukranian producer, announced an investment of $1.2bn in a new rolling facility.

Electric arc furnaces are a proven technology for melting and refining steel. In the mind of many people, these furnaces are intrinsically linked with the recycling of scrap steel and indeed the UK has a big opportunity, as one of the world's largest exporters of scrap steel, to recycle more at home, for our own manufacturing and infrastructure.

It is true that the electric arc furnace still lacks some quality capability, but this is an innovation challenge for Institutes like my own to resolve, rather than a barrier to the technology being introduced. However, for reasons of both steel quality and quantity, the UK cannot survive on recycled steel alone and so we need to be able to use raw materials derived from iron ore.

The electric arc furnace is not capable of dealing with iron ore in its raw form. Currently the task of smelting ore into iron is carried out by the blast furnace, which relies on coking coal and is the major emitter of carbon dioxide. This is where hydrogen has a role to play. By replacing the blast furnace with a Direct Reduction furnace, we can replace coking coal with a gas, such as hydrogen, and produce a raw material that can be fed, alongside scrap, directly into the electric arc furnace. Making this switch will require innovation and we can see this progressing now in other nations around the world, including in China, where the world's first hydrogen reduction furnace will be commissioned this year.

While electric arc furnaces and hydrogen can be quite readily understood, the use of carbon capture presents some choices. Carbon capture could be applied to the electric arc furnace, the direct reduction furnace, hydrogen production and the blast furnace. Emissions from the electric arc furnace are around 15% that of the blast furnace, but nonetheless they will need to be dealt with. There is currently no available technology to do this, but it is something we are considering at the Materials Processing Institute, where we have a pilot scale electric arc furnace. Capturing emissions from the blast furnace is dangerously beguiling. What seems at first the most straightforward solution, risks locking in older technology, that will struggle to compete against more productive plants, operating with the latest advanced automation.

The reason for this is that the most modern steel plants in the world, such as those in North America, operate not only with electric arc furnaces, but advanced downstream processes, that result in up to five times the efficiency of a conventional blast furnace plant. The consequences of this can be seen in a report in the Wall Street Journal last week , where traditional producers, including Cleveland Cliffs and US Steel, are choosing to keep their plants idle emerging from the pandemic, because they cannot compete with newer rivals, despite record steel prices.

Greening our steel industry and at the same time investing in the latest automation and production technology will lead to a requirement for fewer jobs per tonne of steel produced and this is why I believe a Just Transition is an essential part of the Green Industrial Revolution.

[2] 'Steelmakers Keep Old Plants Idle Despite Surging Prices', Wall Street Journal, 10 June 2021, https://www.wsj.com/articles/steelmakers-keep-old-plants-idle-despite-surging-prices 11623322802?redirect=amp#click=https://t.co/RnXJncpUZY

Just Transition

Getting this right makes sound economic sense and it is a matter of social justice, but for me it is also personal. I grew up in the Durham coalfield, where entire communities faced worklessness as we lost the main employer on which my family and our wider community depended. I still live in this community and the long shadow of that devastating economic shock can still be seen today. I do not want to see families in places such as Port Talbot and Scunthorpe suffer these same experiences. Nor do they have to.

Steelworkers understand the impact and the importance of productivity improvements. Since the 1970s, productivity improvements have reduced employment in the UK steel sector by 90%, or 9 out of every ten jobs. New technologies have the potential to reduce this by a further 80%, or four in five jobs. To be clear these figures are about improvements in efficiency, rather than industrial contraction. If we act now, we have the time to phase this transition over a decade, giving workers and the wider community the time to adjust.

Alongside timing we also need to stimulate co-investment in the new, high growth and exporting industries of the green industrial revolution. These industries require a highly skilled workforce and steelworkers have valuable, transferable skills. From electric vehicles, to offshore wind and nuclear, with investment and retraining, our steelworkers can provide the steel on which these industries will rely and the workforce to make them a success.

The improved competitiveness of the UK steel industry can become the foundation of a new era of growth, particularly in downstream activities where thousands of jobs could be created. By taking the needs of individual companies into account alongside the UK's wider industrial strategy, the steel industry can be decarbonised, allowing a smooth and just transition for the workforce.

Materials Processing Institute

Chris McDonald is the Chief Executive Officer of the Materials Processing Institute. The Institute carries out industrial research and innovation in advanced materials, industrial decarbonisation, 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 is often called to commentate in the media on innovation leadership and the steel industry"

Chris McDonald
Chief Executive Officer
Materials Processing Institute

Materials Processing Institute

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, industrial decarbonisation, digital technologies 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

Materials Processing Institute

Materials Processing Institute
Eston Road
Middlesbrough
TS6 6US
United Kingdom

+44 (0)1642 382000
enquiries@mpiuk.com
www.mpiuk.com

1944 - 2019
75
YEARS OF INNOVATION

SPEECHES 15/06/2021