Department for
Business, Energy
& Industrial Strategy

Summary of Responses to the Clean Steel Fund Call for Evidence

Putting the steel sector on a path consistent with net zero

December 2020

TOGETHER FOR OUR PLANET

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Executive Summary

Steel is a strategically important industry for the UK. Previous stakeholder engagement highlighted that there is potential for decarbonisation and identified the barriers that prevent the investment in, and take up of, new greener technologies and processes. In response, the Government announced the £250 million Clean Steel Fund and call for evidence on 28th August 2019 to provide a long-term signal of support to the steel sector and its decarbonisation efforts.

Published on 29th August 2019, the Clean Steel Fund (CSF) call for evidence sought views on fourteen questions covering five themes:

- Why is a Clean Steel Fund needed?
- What are the barriers to decarbonising the steel sector?
- What could a Clean Steel Fund support?
- What are the technology options for clean steel?
- What are the next steps in further engagement with stakeholders on design of the Fund?

The call for evidence received 29 responses from a range of stakeholders including UK Steel, GREENSTEEL Council, Liberty Steel, Tata Steel, the British Ceramic Confederation, as well as several academics. The main issues raised fall into three categories: energy prices and other barriers, timing of the Fund, and decarbonisation technology options.

Energy prices

It was clear from the responses that though the Fund is a very welcome addition to the policy environment, it is not a universal solution to all the issues the sector faces and other significant shorter-term difficulties. The global economic environment is especially challenging for the steel sector and the relatively high costs of electricity in the UK mean that this is felt even more keenly by UK steel producers. This also makes it difficult for companies to justify spending money on decarbonisation projects, many of which are likely to raise operational costs, at least in the short-term. Lack of investment in the UK steel sector has meant that UK steel companies have fallen behind their international counterparts. They will need make significant changes to equipment and processes in order to decarbonise.

Timing of the Fund

Although the Fund is needed by the steel sector, several factors mean that it would help if funding started to be released only from 2023 onwards:

- The sector needs time to develop plans for decarbonising.
- Currently, the technologies required for carbon capture usage and storage (CCUS) and low carbon hydrogen production are not ready for implementation. In the Prime Minister's 10 Point Plan published in November 2020, a £240m investment into new hydrogen production facilities was announced and an extra £200m for the CCUS Infrastructure Fund, totalling this investment to £1bn. It would be advantageous if the CSF coincided with the technological advancements these investment will produce to ensure the steel industry can capitalise on these developments.
- The Fund therefore needs to link up with other policies working in this area such as the Industrial Decarbonisation Challenge clusters mission, Industrial Energy Transformation Fund (IETF) and Net Zero Hydrogen Fund.
- The IETF opened in summer 2020 and steel companies have been able to apply. The IETF currently runs until March 2024 so it would be useful if CSF could then continue providing support to the sector.

Decarbonisation Technologies

On the three main decarbonisation technologies (switching to lower carbon fuels, CCUS; and energy and material efficiency) discussed in the consultation, respondents stated that each of the technologies required further development to reduce the financial and technical risks. There was no clear consensus on which technology would be most suitable to decarbonise the industry, with a range of different solutions required, and a range of views on the most suitable way to proceed.

- CCUS would require a redesign of the blast furnaces to take full advantage of the technology and is expected to become commercially available in the next decade, tying the technology's deployment to investment cycles. Infrastructure would need to be redesigned in line with CCUS requirements to support this.
- Hydrogen steelmaking was discussed as having great potential, both in terms of using hydrogen in a blast furnace, and also in the fossil-fuel-free Direct Reduced Iron process. However, a lack of available hydrogen is currently hindering development.
- Recycling steel using electric arc furnaces (EAF) is proven to increase consumption of scrap steel and to reduce overall CO2 intensities of steel. This option faces the challenge from the industrial price of electricity in the UK, which is currently relatively high.
- Energy efficiency measures are in use, with remaining energy efficiency projects having too high a minimum rate of return to be constructed without additional support.

As such, the responses suggest that the Fund should be technology neutral, allowing a broad range of projects and technologies to apply, with the aim of progressing each of the three options towards the long-term decarbonisation of the sector.

This call for evidence closed on 21st November 2019. The responses received therefore do not consider the Coronavirus outbreak or the ensuing economic downturn in 2020. This has had a significant impact on the steel sector and BEIS is aware that the Clean Steel Fund will be operating in a changed environment.

Introduction

Scope of this summary of responses

This document summarises the responses to the Clean Steel Fund (CSF) call for evidence. It is not an expression of future Government policy, nor is it a formal government response, rather it is a summary of the views and evidence collected in the Autumn 2019 exercise. A large amount of evidence was received or referred to, which is informing plans for the Clean Steel Fund.

Many interesting views and opinions were submitted, for which the Department for Business, Energy and Industrial Strategy (BEIS) is grateful. BEIS has considered all responses seriously, even if individual comments are not quoted here. Similarly, the inclusion or mention of responses within this document does not mean BEIS will necessarily adopt those proposals.

Background to call for evidence

Steel is a strategically important industry for the UK. Steel production is energy and emissions intensive with production responsible for 14.4%[1] of total industrial emissions in 2018. Previous government programmes, such as the Industrial Fuel Switching programme[2], have highlighted the potential for decarbonisation in the steel sector and highlighted the barriers that prevent the adoption of new, lower carbon technologies and processes.

To catalyse transformation, the government announced the £250 million Clean Steel Fund and call for evidence on 28th August 2019 to provide a long-term signal of support to the steel sector and its decarbonisation efforts. The call for evidence sought views and supporting evidence to develop the detailed design of the Fund, including on barriers to realising clean steel ambitions, and the opportunities to be gained in overcoming these.

Respondents were asked for their views on fourteen consultation questions covering five themes:

- Why is a Clean Steel Fund needed?
- What are the barriers to decarbonising the steel sector?
- What could a Clean Steel Fund support?
- What are the options for clean steel?
- What are the next steps in further engagement of stakeholders while designing the Fund?

[1] 2018 UK greenhouse gas emissions by Standard Industrial Classification, Total GHG (24.1-3), BEIS
[2] 'Industrial Fuel Switching competition', BEIS, 2019 (viewed on 18 November 2019)

Scale of the response

Responses were received by email and online form. In addition, materials from discussions with stakeholders that took place during the consultation period have also been included. No specific consultation events or workshops were arranged as part of the call for evidence.

In total, we received 29 responses to the consultation.

Structure of this document

Summaries of the most common themes in the responses start on page 9 and conclude on page 32. These sections report on responses received from individuals and on all submissions received from organisations. There was substantial overlap between responses given to certain questions.

Section 8 outlines the next steps following the call for evidence. Annex A provides an overview of the profile of respondents, where known.

Why Is A Clean Steel Fund Needed?

On 27 June 2019, the UK government set a legally binding target to achieve net zero greenhouse gas emissions across the UK economy by 2050. To achieve this target, action will be needed across hard-to-abate energy intensive industrial sectors, including steel, which constitutes a vital part of the UK's industrial manufacturing base.

Recognising the challenge of decarbonising the UK economy while minimising energy costs, in 2015 the government worked closely with each of the energy intensive industrial sectors to agree decarbonisation and energy efficiency roadmaps to 2050. Following this, the government announced several industrial decarbonisation and energy efficiency policies to help deliver reduce industrial emissions (Annex B), including a £250 million Clean Steel Fund.

The scale of the decarbonisation challenge is significant for the steel sector. The integrated steel works in Scunthorpe and Port Talbot are the two largest industrial sources of UK carbon emissions and overall the steel sector contributes 14.4% to total industry emissions (10.4 MtCO2e in 2018)[3].

Steel is a key industrial sector of vital importance for the UK economy and a fundamental material input to a variety of industries including construction, automotive, defence and renewables. The sector directly employs around 34,000 people[4] and supports up to a further 40,000 jobs[5] through its supply chains. In 2018, the UK steel sector contributed £2 billion in gross value added[6] and exported goods and services worth around £5.0 billion[7].

A vibrant steel sector is also of wider strategic importance for the UK which is heavily reliant on domestic steel to deliver many of our largescale infrastructure projects, including Cross-Rail, Hinkley Point C and the maintenance and upgrading of the UK motorway network. These known sources of steel demand create a clear market opportunity for domestic producers and enable the UK government to deliver numerous infrastructure-related policy initiatives.

Globally, there is increasing interest in how to transition to low carbon steel. With longstanding expertise in steel making, the UK is well positioned to demonstrate international leadership in clean steel and realise domestic growth and export opportunities in products and technical know-how.

[3] 2018 UK greenhouse gas emissions by Standard Industrial Classification, Total GHG (24.1-3), BEIS
[4] Industry (241, 242, 243) - Business Register and Employment Survey (BRES): Table 2, ONS, 2018 (revised)
[5] ONS supply chain jobs multiplier, ONS, 2015
[6] GDP output approach – low-level aggregates, CVM £Millions (24.1-3), ONS
[7] Publication tables, UK trade in goods, CPA (08), Exports 2018 Q1-Q4 (24.1-3), ONS

Question 1 - Strengths of the UK Steel Sector

The UK steel sector has a number of strengths identified above, are there any others that we have not identified?

Summary of responses

Fifteen responses provided answers regarding further strengths of the UK Steel sector, many of which reiterated strengths identified in the Call for Evidence document. Other strengths included: the importance of the steel sector to the UK's manufacturing base; the depth of knowledge, skills and research capabilities available in the sector; and the flexibility and universality of UK supply chains.

Key themes identified

A common response was the importance of the steel sector to the UK's manufacturing base, as well as the opportunities that will be presented in future. Seven respondents identified the steel sector as strategically important to either the overall economy or to specific sectors. Many of these also noted that there were opportunities for the sector to innovate or be a key part of a more innovative UK manufacturing sector.

This is linked to a number of responses which stressed the depth of knowledge, skills and research capabilities available in the UK steel sector, with the Material Processing Institute and the Steel and Metals Institute named as good examples. Further responses highlighted the well paid, skilled jobs that the steel sector supports and the way that the steel sector has supplied highly skilled individuals who have had a positive impact on many aspects of the UK economy. Several respondents also stressed the social benefits (high quality training and employment of people in disadvantaged regions) as strengths of the UK steel industry.

UK supply chains were also mentioned as a strength of the steel industry. One respondent stressed the flexibility and universality of UK steel manufacturers, who can tailor their products quickly to the needs of a wide range of clients. Another noted that the call for evidence had missed the opportunities presented to UK steel manufacturing by the aerospace and energy sectors, which require specific, high performance characteristics. The same response also noted the UK steel industry would play a critical role in the development of the hydrogen economy, beyond decarbonising the steel sector. Another response stressed the possibility of using hydrogen created by electrolysis for purposes beyond energy within the sector (for example, as a reducing agent) and another noted that the steel industry supplies many parts for the wider low carbon economy.

On sustainability, some respondents highlighted that the opportunities presented by recycling, using renewable energy, had not been emphasised enough in the call for evidence. They noted that the UK had opportunities to add further value by recycling more steel. Three responses specifically mentioned the value of steel to the circular economy and three others stated that significant quantities of scrap steel are unnecessarily exported.

Beyond these themes other suggestions included:

- Using the UK's strong position in renewable energy for EAF production to produce low carbon steel.
- Taking advantage of the proximity of some sites in the sector to the North Sea, both in terms of access to renewable energy for the production of hydrogen, and for CCUS.
- Making clear the underlying value of steel, with its "multiplicity of uses and endless recyclability", which they believed would be hard to replace in the medium to long term (at least '30 years').
- Referring to the analysis in "Capacities and Capabilities of the UK Steel industry" [2017], which identified particular product strengths in rail, wire rod, and some coated products (and by implication relative weakness in many other products, with a declining market share and a negative trade balance).

Question 2 – Opportunities For A Clean Steel Sector

Are there any further opportunities, not already identified, from a UK clean steel sector?

Summary of responses

There were 15 responses to this question. Three main themes emerged. First, that the industry could do more to utilise recycled steel and existing technologies to reduce emissions. Second, that the industry could be working closer with other industrial areas to develop greener supply chains and decarbonised industrial clusters. Finally, that the UK's heavy reliance on imports was damaging the sector's ability to decarbonise and that domestic investments are integral for the UK to take advantage of decarbonising technology.

Key themes identified

Some respondents felt there was significant scope for the steel sector to better utilise existing assets whilst decarbonising and supporting renewables (for example, using the flexibility of EAF to balance electricity network demand). Respondents also argued that the UK exports six million tonnes of steel scrap but produces a similar quantity of primary iron from imported ores. They suggested that EAF would reduce the need for import, and emissions, though noted unsuitability of recycled steel for some uses. Taking advantage of this domestically produced scrap, respondents argued, could revitalise an industry that has been in steady decline. CCUS and hydrogen may not be available when the scheme starts so respondents argued that steel recycling may hold more promise in the short-term.

Reusing steel offers further opportunities: it could save £300/tonne in construction projects. This could be boosted by materials tracking and testing and designing steel which can be dissembled and repurposed.

Respondents noted there was opportunity for government to take advantage of synergies provided by local/regional effects like clustering and sector-coupling.

Opportunities here include:

- Deep integration with other industries as a potential user and supplier of hydrogen.
- Developing new low carbon industries and supply chains for CO2 and derivative products and associated new skills and jobs, particularly with integrated blast furnaces.
- Partnering with other foundation industries to innovate material recycling across supply chains. For example, horizontal integration would be possible with the chemical sector to convert emissions with green hydrogen.
- Regional opportunities were noted for South Wales and the east coast of England. A major opportunity exists via industrial clusters, particularly through hydrogen and CO2 networks, storage with hydrogen, chemical, cement, steel and oil industries. Further opportunities include retaining skilled jobs and preserving the wider manufacturing base.

On heat, respondents said that heat capture, utilisation, and networking have significant potential but require economically viable technical solutions for heat recovery and storage. Examples include the implementation of Organic Rankine Cycles[8] for producing power from low grade waste heat. Respondents noted that utilising waste heat could benefit communities but would require the Government to initiate these projects.

On the overall aim of the fund, CO2 emissions were noted as the focus, but respondents said that reducing energy or electricity demand was also an opportunity to reduce CO2 emissions. Respondents noted that the UK is the greatest importer of CO2 emissions in the G7, despite decreased domestic emissions, with falling use of domestic steel and reliance on imports a significant factor. The implication was that the UK should consider measuring its consumption emissions and setting targets on this basis rather than by production. One respondent argued that over-reliance on imports was damaging the UK's ability to decarbonise. There was potential for the UK to spearhead low-carbon production which could be implemented worldwide and would be financially beneficial for the sector. Failure to invest in this would mean the UK would miss this opportunity and could result in the UK turning to other countries for solutions. Some respondents felt that increasing domestic production increases steel security.

On investment and competitiveness, respondents noted how much of UK steel equipment is legacy and not fit for current uses. Low carbon product was noted as an opportunity for a differentiated product, gaining a competitive advantage in a global market over carbon-intensive production. Developing this is considered an opportunity for innovation by some respondents. Developing green technologies, and commercialising and exporting the IP, can place the UK as a world leader once again. The UK's wider talent in universities, which collaborate with industry, as well as expertise in design and engineering put the UK in a good position to develop steel decarbonising technologies. The steel sector presents an opportunity for growth, and clean steel is a necessary step for this.

[8] The Organic Rankine Cycle is based on the principle whereby a liquid is heated, causing it to evaporate and the resulting gas is used to turn an engine connected to a generator, creating power.

Question 3 – Wider Benefits Of A Clean Steel Fund

What other wider benefits could the Fund deliver?

Summary of responses

Fifteen responses were provided, with two themes identified by numerous respondents. First, the CSF could act as an opportunity to reduce emissions from a wider range of industries than just steel. The second theme identified was the potential wider benefits for the UK's climate action policies, with specific focus on circular economies and renewable electricity, as well as climate leadership.

Key themes identified

The main theme from these responses was industrial synergies. Several respondents suggested that the CSF could be utilised to reduce emissions from a wider range of industries than just steel, specifically by focusing on developing renewable electricity supplies. Responses suggested that the UK's high electricity prices have long made it difficult for UK based plants to compete with their international rivals who benefit from lower prices. Respondents suggested that if the Fund were to be used to reduce the price of electricity in the UK, the benefits would extend beyond the steel industry to UK industry as a whole.

Some respondents also remarked that as part of a wider industrial approach the UK could increase the levels of scrap steel available for recycling. This, if combined with lower electricity prices, was considered an attractive business proposition by several respondents.

A similar theme was the potential wider benefits the CSF could deliver for the UK's climate action policies, as well as the UK's role as a leader for climate change action. Specific focus was placed on the importance of circular economies and renewable electricity. Additionally, some respondents also stressed the importance of developing low-carbon hydrogen.

Other wider benefits included:

- The role the CSF could play in helping develop CCUS in the UK. Steel sites could act as anchor points in a CCUS network whilst presenting opportunities to learn important lessons for developing green hydrogen.
- The CSF could support the development of low carbon supply chains, with one respondent noting that it could act as a cornerstone for the UK's industrial strategy.
- One respondent argued that as new technologies may be better suited to developing specialised steel production, as opposed to bulk steel making, the Fund could help develop a UK steel industry focussed on producing high-end products for aerospace and other specialised sectors. These products have lower CO2 output and would strengthen the industry as it would face less competition from abroad and would operate with high profit margins.

- The CSF investment would boost UK R&D spending and help future proof an industry facing deep economic challenges.

Question 4 – Market Creation

How could the UK government facilitate creation of a market for low carbon steel?

Summary of responses

There were 18 responses to this question. Overall, there was consensus amongst respondents that the government needs to introduce new policies to facilitate the creation of a market for low carbon steel because existing policies are insufficient for a market to emerge on its own. There was also broad consensus that a framework of policies will need to be put together to create a stable policy environment for a market for clean steel to thrive. There were concerns in most responses around international competitiveness and the need to bridge the gap between the UK and countries where the costs of producing steel are lower. Several respondents cited the high cost of decarbonisation for industry as a barrier to investment in decarbonising technologies and indicated that they would like to see policies that incentivise investment.

Key themes identified

Nine responses related to public procurement being used to create demand for clean steel, this being by far the most popular suggestion. Suggestions included redefining procurement processes to recognise environmental impact alongside other benefits, setting fixed targets for clean steel in public infrastructure projects and requiring companies to meet certain requirements (for example, publishing sustainability performance data) for their products to be used.

There were 6 responses that suggested a carbon border tax to allow UK steel to continue to be competitive in global markets. According to these respondents, there are currently no policies in place that sufficiently protect UK steelmakers against being outcompeted by high carbon imported steel, and therefore no incentive to invest in decarbonisation technologies if the deployment of these technologies increases operational costs. They therefore support the idea of an adjustment at the UK border which penalises high carbon steel in order to level the playing field with countries where there are lower carbon costs for operators.

Four responses included references to how government funding could be used to support the steel industry, including mandating the use of British steel in any investments the governments makes and ensuring that the government invests only in projects that align with the Climate Change Act and the Paris Agreement.

Carbon reporting or the publication of sustainability performance data was also referred to in four responses. Respondents argued that this data could be used for thresholds in public procurement, as well as to enable consumers to make informed decisions.

Other responses tackled subjects such as the issue of defining low carbon steel, research, development and deployment of decarbonising technologies, industry standards and the importance of a hydrogen economy to create certainty for steelmakers.

What Are The Barriers To Decarbonising The Steel Sector?

In the call for evidence, we highlighted three main barriers to decarbonising the steel sector.

Technology barriers

There are technological barriers that hamper investment in steel decarbonisation projects. Steel decarbonisation technologies, which wholly decarbonise steel making, are at varying stages of readiness for large-scale industrial deployment, with some commercially ready and others still undergoing experimental development. It may be up to ten years until some are ready to be commercially deployed at a large industrial site in the UK. Cost-effectiveness of projects is maximised where investment is aligned with the long capital replacement cycles seen in the steel sector. This means major equipment may only be replaced once or twice between now and 2050 and, therefore, early policy signals that encourage consideration of appropriate decarbonisation pathways for specific sites are desirable.

As with any new technology deployed in industry, it is important that there is commercial scale demonstration in order to provide assurance around performance and cost. Where technology aims to reduce greenhouse gas emissions there is an additional layer of confidence needed to ensure that technology can be used to reduce emissions in a cost-effective way.

There may be broader technological barriers to deployment, such as the availability of fuels and feedstocks or the requirement of a CO2 transport and storage network, in the case of CCUS.

High cost of decarbonisation

The Committee on Climate Change estimates a total annual cost of £8 billion to cut emissions from industry to 10 MtCO2e[9] in line with its Further Ambition Scenario[10]. Costs to achieve decarbonisation in industry are (1) the capital costs of installing equipment to enable deep decarbonisation, such as CCUS; (2) potentially higher operating costs to decarbonise, for example through operating CCUS or switching to low carbon fuels which may, in the near term, cost more than high carbon alternatives.

Inability to pass costs through to end users

The steel sector is particularly exposed to international competition. Certain steel products are a commodity, which means they are priced globally and that suppliers are price takers. This

[9] Net Zero: The UKs contribution to stopping global warming, The Climate Change Committee
[10] Net Zero Advisory Group to the Committee on Climate Change, The Climate Change Committee

can mean that steel suppliers often operate on reduced profit margins, with difficulty to pass through costs onto end users. Furthermore, the UK steel sector can also be affected by international differential carbon costs and market developments.

The impact on profitability of the international market has potential to reduce the capital available for the sector to invest in decarbonisation projects.

Question 5 – Barriers To Investment

Have we identified the most significant barriers to investment in decarbonisation of steel production? Are there others we should consider?

Summary of responses

There were 17 responses to this question addressing at least one barrier to investment. Of those, 6 responses focussed on the challenging business environment in the UK for steel producers, namely the comparatively high electricity price; 6 responses cited the potential mismatch between replacement cycles and the emergence of viable decarbonising solutions; and 8 responses emphasised the role that future policies should play in supporting the sector's decarbonisation and ensuring steel producers can pass through associated costs to end users.

Key themes identified

Common themes and topics identified were the high cost of electricity in the UK; an unacceptable risk-to-value ratio facing early adopters of decarbonising technology; inadequate hydrogen, renewable energy and CCUS infrastructure; and an unsupportive policy environment.

Respondents noted that the single most important barrier to investment in decarbonisation solutions is the poor health of the UK steel sector and the consequent lack of available capital for anything but essential or mandatory projects. They stated that as decarbonising projects bear significantly more risk than business-as-usual projects, these developments achieve a low rank in companies' project pipelines.

There was considerable focus on the challenging business environment facing UK steel producers, with a particular focus on the high price of electricity in the UK, and to a lesser extent, business rates. This was perceived as the most important barrier to investment in decarbonisation projects, where greater risk can lead to these projects being ranked lower in companies' project pipelines.

Another key barrier to investment was the perceived absence of policy frameworks. Respondents felt that there was a need for policy to promote certain technological pathways, to set emissions targets and to provide certainty around project economics. Protecting industry from competitors not subject to decarbonisation pressures (for example, border adjustment tax), and encouraging investment in supportive infrastructure (renewable power, hydrogen production, CCUS infrastructure) were also recognised as areas policy frameworks should address.

Business environment

Respondents stressed that the high cost of electricity in the UK represents a major barrier to investment in the UK steel sector in general, and particularly to investment in decarbonising technology. Decarbonising options such as the construction of EAF production capacity and hydrogen steelmaking would lead to increased electricity consumption and raise the share of electricity in the cost base. High electricity prices would thus impede investment in decarbonising solutions and would place the UK steel industry at a comparative disadvantage relative to other countries.

The energy price disparity between the UK and European countries is considered by respondents to be one of the primary impediments to investment in the UK steel industry, and the chief source of the UK's operating cost disadvantage. Some respondents committed to reinvesting savings arising from lower electricity prices into their businesses, including decarbonisation projects.

Technology

On technology, respondents addressed three main challenges: (1) the varying degrees of readiness of competing technology pathways; (2) the availability of supportive infrastructure and feedstock; and (3) the risk of technology lock-in arising from the potential misalignment of replacement cycles with the emergence of commercially viable low-carbon technologies.

None of the respondents indicated a strong preference for one low-emission pathway over another. This appears to reflect both the underdevelopment of key technologies and the industry's distance from investment in low emissions steelmaking processes. Technology pathways cited included EAF production powered by clean energy sources, hydrogen-based steelmaking, and the incorporation of carbon capture and storage technology within existing fossil fuel powered primary steelmaking processes.

Respondents highlighted several challenges associated with the adoption of EAF technology: the relatively high electricity price in the UK; an insufficiency of clean energy sources; and the inability of current EAF technology to produce certain grades of steel. While hydrogen reduction was regarded by respondents as a promising pathway for low carbon steelmaking, the technology was seen to be in its infancy, and consequently, the cost of 'at scale' deployment was not understood at the time. According to one respondent, several technological challenges remain unresolved including an understanding of how to handle significantly greater gas volumes for combustion, burner design, metallurgical impact, and the management of combustion by-products. Finally, CCUS technology is farther advanced than hydrogen reduction but technical gaps were still thought to exist.

The infrastructure necessary to support the wide-scale adoption of low emissions steelmaking technologies was considered by respondents to be insufficient on the basis that EAF technology requires greater renewable power sources; hydrogen reduction requires hydrogen production and distribution capacity on a significant scale; and CCUS is dependent on the establishment of an economy-wide commercial carbon transport and storage infrastructure.

Respondents felt that the emergence of commercially viable low-carbon technologies could be misaligned with replacement cycles, leading to a risk of technological lock-in. This misalignment may force companies to adopt the economically and technologically viable solutions that exist at the time a replacement cycle commences. Should this occur prior to the emergence of the optimal decarbonising solution, technology that achieves only incremental gains on carbons emissions could be locked in.

Policy

Comments on policy focussed on: (1) the need for policy certainty; (2) the need for policy to ensure that the capital and operating costs associated with decarbonisation do not disadvantage UK steel producers; (3) the need for policy to encourage investment in upstream and downstream supporting infrastructure; and (4) the need for an industrial policy that supports steel production in the UK. It was suggested that an industrial policy that addresses these challenges is critical if the industry is to generate enough profit to support further investment.

Respondents emphasised the imperative for policy to establish a 'level playing field' with international competitors and imported steel. This includes policy that leads to 'fair' electricity pricing in the UK, as well as the possible introduction of a border adjustment tax to prevent high-emission imported steel undercutting low-emission steel produced in the UK. One respondent also noted that the current EU ETS allowance scheme does not reward increased scrap usage and that this should be reflected in future policy.

Policy and market frameworks for linked sectors were considered necessary in order to encourage investment across the decarbonisation supply chain. This should include a clear hydrogen policy and market framework with associated business models to support investment in large-scale hydrogen production, distribution and storage capacity. Policy on industrial CCUS should be accelerated with industry and government agreeing to a set of key principles underpinning the CCUS business models and committing to a development timeline that aligns with CCUS project timelines.

Exemplar projects and research identified

HIsarna project, the Netherlands

The HIsarna project is being developed by Tata Steel and Rio Tinto and is part funded by the European Union, the Dutch Economics Ministry and the European Research Fund for Coal and Steel. ArcelorMittal, ThyssenKrupp, Voestalpine and technology supplier Paul Wurth are also working on HIsarna technology. The project was initiated 15 years ago and investment to date amounts to €75 million. The pilot plant at Tata's Ijmuiden plant has a production capacity of 60,000t/annum of liquid steel, compared to 10,000t/day at Blast Furnace 7 at Ijmuiden.

HIsarna is a substitute for the blast furnace process. To make liquid iron in a blast furnace iron ore and metallurgical coal (the raw materials) need to be pre-processed into sinter (lumps of iron ore) and pellets (small balls of iron ore) and cokes. The HIsarna process will make this obsolete. In the HIsarna installation the raw materials can be injected as powders, directly

converting them into liquid iron. If HIsarna can be successfully developed at an industrial scale, future production of steel with a 20% smaller carbon footprint will be possible. Using carbon capture and storage or carbon capture and utilisation can lead to an 80% smaller carbon footprint. (The HIsarna technology does not use hydrogen, despite the name).

Tata Steel have stated that if the technology can be proven at scale, it will take ten years to reach the stage of commercial use, although proof of concept still appears to be several years away. This technology cannot be retrofitted to existing production sites but is a replacement technology that will be rolled out in new greenfield situations. In addition to the €75 million investment to date, the project is expected to incur at least an additional €325 million before proof of concept is established.

HYBRIT project, Sweden

HYBRIT is one of the most ambitious projects in the industry to make use of hydrogen reduction in steel making. SSAB, LKAB and Vattenfall in Sweden are developing HYBRIT with the aim of creating the world's first fossil-free steel-making technology. Work began on the construction of the pilot plant during the summer of 2018 and the total cost for the pilot phase is estimated to be SEK 1.4 billion (~ £112 million). The Swedish Energy Agency previously contributed SEK 60 million to the pre-feasibility study and a four-year-long research project.

Instead of using metallurgical coke as the main reductant, HYBRIT will use hydrogen gas. Hydrogen gas reacts with the iron oxides in iron ore to form water instead of carbon dioxide. Hydrogen gas is produced by electrolysis of water using fossil-free electricity. The project developers estimate that steel produced by the HYBRIT technology would result in a 20-30% increase in the cost of producing crude steel, based on current prices for coking coal, electricity and emission rights.

Question 6 – Making Decarbonisation Investment Decisions

How are investment decisions on decarbonisation projects made in your organisation? What evidence is required to support decisions?

Summary of responses

There were 7 responses to this question. Of those, four emphasised the internal competition for capital facing all new projects and the return on investment threshold projects must meet. Three mentioned the importance of government funding aligning with project timescales; and two responses highlighted a stable policy framework as a pre-condition for decarbonisation investments.

Key themes identified

Echoing the responses from the barriers to investment section, respondents insisted that a stable policy framework was a pre-condition for decarbonisation projects to be considered. One respondent argued that policies and regulatory mechanisms should be ready for

implementation as soon as technology demonstrations have taken place, to avoid early market failure.

Respondents stressed the importance of funding availability aligning with replacement cycles and the emergence of commercially viable decarbonisation technologies. One respondent suggested that the Industrial Energy Transformation Fund (IETF) and the CSF should run sequentially to ensure that steel companies who have utilised the IETF for Front End Engineering Design (FEED) studies can then apply for funding for project deployment under the CSF.

The requirement for decarbonisation projects to meet internal return on capital thresholds was a central issue in most responses. Decarbonisation projects compete with essential replacement projects for internal funding, so the mitigation of project investment risk and extension of financial assistance are regarded as critical enablers of decarbonisation investment. Moreover, to be effective, it was stated that the application windows for funding schemes must align with internal project evaluation, deployment and funding application timescales. Stressing the competition for scarce capital, one respondent underscored that decarbonisation investments would only be undertaken at financially resilient operations.

A major steel producer provided a detailed timeline of typical project decision-making and execution. The lead time between project identification and an investment decision is roughly 18 months. To secure internal funding for a project, submissions need to be made six to eight months prior to the beginning of the next financial year. To prepare for submission, companies would need to have identified the project, conducted a pre-engineering study (FEED), and tender for suppliers, which all can take between six months and a year for large projects. The window for installation may be narrow. Depending on the nature of the project, there may only be a few opportunities for the installation (for example, two days per year when the plant is undergoing maintenance).

Question 7 – Supporting Boards To Agree Decarbonisation Projects

What would help your Boards to agree to decarbonisation projects?

Summary of responses

There were 9 responses to this question. Of those, two responses mentioned the need for funding support; six discussed the importance of a clear, stable and supportive policy framework to incentivise investment in decarbonisation and to protect the steel sector from high-emission steel imports; and four underscored the imperative of a more supportive business environment for UK steel producers, namely, lower electricity prices and business rates.

Key themes identified

The responses to this question reiterated many of the points raised in questions five and six. To improve the chances of decarbonisation projects being sanctioned by company boards, companies suggested that a more supportive business environment, including lower electricity

prices; a supportive and coherent economy-wide industrial strategy; and a clear policy framework would incentivise and de-risk decarbonisation investments.

Respondents would like to see significant funding being made available to support the development and deployment of decarbonisation technologies, beyond state aid intervention limits. Two respondents suggested that government should provide 100% of the funding for project R&D. Respondents focussed particularly on the imperative for a policy framework that creates an enabling environment for investments in decarbonisation solutions and supportive infrastructure across the supply chain (CCUS, hydrogen, renewable power) while simultaneously protecting the industry from low-emission steel imports. Suggestions of protective policy measures included a carbon border adjustment tax, product standards and public procurement targets.

One respondent argued that diverging approaches to decarbonisation among industry participants posed a significant risk to the steel sector. Some businesses were pursuing incremental gains through improvements in energy or material efficiency while others were prioritising transformational projects that depend on the availability of renewable power and green hydrogen capacity. It was argued that uncertainty on the potential for different decarbonisation technologies may hinder the adoption of transformative decarbonisation solutions. The respondent suggested that interim sustainability targets and initiatives designed to promote certain technologies would help reduce investment risk and improve the likelihood of achieving emissions reduction targets.

What Could A Clean Steel Fund Support?

Existing policies to enable energy efficiency and decarbonisation projects in the steel sector may not be sufficient to achieve the levels of decarbonisation required to meet our 2050 target, given the scale of steel projects, and long lead in times and payback periods. (See Annex B for a list of existing policies).

Navigating these challenges will require partnership between government, the steel industry and its customers. This will inform the continued development of a supportive policy environment accompanied, where appropriate, by Government investment to increase investor confidence and leverage private sector funding.

To support the transition to clean steel in the UK we have identified two key objectives for the Fund that will inform future detailed design. These are:

- To transition to lower carbon steel production through new technologies and processes, placing the sector on a pathway consistent with the UK Climate Change Act (net zero emissions by 2050);
- To maximise longevity and resilience in the UK steel sector by building on longstanding expertise and skills and harnessing clean growth opportunities.

Our expectation is that the Fund will provide a proportion of the investment for projects, with the rest funded by industry.

Question 8 – Fund Objectives

Have we correctly identified the objectives for the Clean Steel Fund?

Summary of responses

Twenty participants made substantive comments regarding the objectives of the CSF and 2 agreed without comment. Many of the responses broadly agreed with the objectives. Suggestions for improvements detailed that the Fund should narrow its objectives and should be clear on the importance of retaining and promoting competitiveness. Further work should be carried out to better define steel processes suitable for decarbonisation. It was also suggested that the Fund should support existing technologies as well as new ones, and that, although the objectives were largely correct, the way towards achieving them needed better defining.

Key themes identified

Multiple respondents suggested that the Fund narrow its objectives and focus on fuel switching, increased recycling and large-scale energy storage to encourage use of renewables in steel making. Contrastingly, one response said that the UK should not focus only on recycling but must retain primary steel production. Three respondents suggested a focus on developing hydrogen to decarbonise steel, one of which suggested that fuel switching (preferably using hydrogen) should be the only focus of the CSF.

Four respondents agreed with the objectives but also stressed that competitiveness should be retained and promoted. In addition to this, one respondent highlighted the Fund could invest in decarbonising supply chains, noting that the production of mineral lime has few options for decarbonisation. Another respondent suggested that without speeding up the decarbonisation of the industry, we could lose first mover benefits and damage UK competitiveness. To mitigate this, they suggested developing pilot projects in the early 2020s which would require earlier funding than is currently envisaged.

Two respondents suggested clarifying that the Fund would support existing as well as new technologies. In addition, there was a suggestion that the definition of partners should be expanded to include energy suppliers, steel recycles, steel technology providers, academics, and certification and verification bodies.

Finally, one respondent considered it important that the CSF is compatible with the wider decarbonisation landscape and able to part-fund other projects (such as CCUS infrastructure).

Question 9 – Maximising Societal Benefits

How can we maximise broader societal benefits, alongside value for money, in the design of the Fund?

Summary of responses

There were 17 responses to this question, which focused on the wider benefits to the steel sector, jobs and sustainability. Numerous respondents referenced the number of highly skilled jobs in the steel industry and supply chains and the comparatively high wages of those jobs. In addition to this, multiple respondents mentioned the wider societal benefits from supporting the steel sector as well as the ‘economic and social sense’ of supporting the Port Talbot and Scunthorpe sites.

Key themes identified

Multiple respondents highlighted the highly skilled, and well-paid, jobs in the steel industry and associated supply chains. Related to this one respondent suggested local procurement of equipment as one way to support skills development. Others mentioned the opportunity for job creation as a result of this Fund but urged adequate policy to overcome short- and medium-term risks.

One respondent stated the importance of delivering the Fund as soon as possible, implying that 2024 was too late and that implementation should be brought forward. Another respondent argued that maximising value for money of the Fund would be dependent on the timing, recommending opening for applications in Q1 2023.

Other responses included the following statements:

- It makes economic and societal sense to retain the two remaining blast furnace sites in Port Talbot and Scunthorpe, with the latter particularly well suited to demonstrate CCUS given the local expertise and geography.

- A ‘whole systems approach’ should be taken to maximise value for money and the impact of the CSF. Additionally, the Fund should look at full supply chain emissions to drive environmental benefits further.
- This Fund is an ideal opportunity to promote a more positive future for steel and a positive contribution to economic and environmental sustainability.
- Criteria related to human rights, fair labour practices and ethical business practices should be included in social value calculations to inform funding decisions.
- The UK should ‘lead not follow’ in order to derive benefit from the intellectual property rights and drive inward investment in the UK.
- The UK Government should show flexibility with state aid to provide higher levels of aid in areas of high socio-economic deprivation.

Options For Clean Steel

There are three broad options for reducing emissions and realising clean growth opportunities in both primary and secondary steel production:

- Switching to lower carbon fuels: The emissions intensity of both primary and secondary steel production routes can be reduced if the sector shifts away from high carbon fuels and processes to lower carbon alternatives such as natural gas and, over time, to low and zero carbon using hydrogen, biomass and electricity (which will be close to zero carbon in 2050). Each fuel brings both opportunities and challenges.

- Carbon capture, usage and storage (CCUS): To date, much of the thinking for decarbonisation of steel has focused on capturing the carbon dioxide emitted from the various production processes, known as Industrial Carbon Capture. However, the large number of different emission sources can present a challenge with implementing CCUS in existing steelworks and prove expensive.

New types of blast furnace are being developed which improve the efficiency of the process and make it easier to capture carbon dioxide at a lower cost. Another consideration is that CCUS systems, where the carbon dioxide is not then used, require a carbon dioxide transport and storage network. As major steelmaking sites in the UK are located predominantly near industrial clusters, they could be well-placed when these carbon dioxide transport networks are set up.

- Energy and material efficiency: Many opportunities for improving energy efficiency have been realised, but there are still opportunities (such as improved heat recovery) for further efficiency savings across the sector. Any new technology or process should also be designed to ensure it is energy efficient in a range of future scenarios (such as switching to hydrogen). Considering this, the Fund could support energy efficiency projects alongside deeper decarbonisation measures.

Material efficiency based on a circular economy approach would involve using steel more efficiently throughout its lifespan, this reducing the need for primary steel. This could be achieved through improved and light-weight product design or increasing the quality of recycled steel (by resuing, remanufacturing, and better sorting scrap.) However, not all steel can be recycled and an ongoing demand for some primary steel production will remain.

Many of the solutions for decarbonising steel production are expensive and so a Clean Steel Fund would need to maximise its impact in enabling a transition to a clean steel industry by building on existing funds such as the IETF and ISCF.

Question 10 – Technology Availability And Costs

What estimates do you have on the costs and availability of these three technology options for reducing emissions?

Question 11 – Technology Availability And Investment Cycles

How does the availability of these technologies align with your refurbishment/replacement cycles?

Question 12 – Considering Other Technology Options

Are there any other technology options that we should consider? What evidence do you have to support this, including on costs and availability?

There were 29 responses to these three technology-based questions. The summary of responses to these three questions have been collated instead of addressing the questions individually, reflecting the responses received.

CCUS

Eight responses discussed the possibility of CCUS in the steel industry. Some respondents reported doubts over the validity of CCUS for the sector as part of long-term deep decarbonisation plans, while others stated that location would be key to industrial CCUS, with clusters being essential to make it economically viable. Respondents noted that the process should be studied as a whole (for example capture and onsite transport, transport through shared infrastructure, sequestration/storage in the North Sea) to fully assess the impacts, for example, on product quality.

Some respondents said that the costs of CCUS in the steel sector were unclear, with the Arcelor Mittal 2019 climate action report suggesting that production prices would be 35-55% higher if CCUS were used in the steel industry. Some suggested that due to the high cost associated with new CCUS-ready blast furnaces, the primary focus should instead be on retrofitting CCUS to existing blast furnaces, with hydrogen considered a longer-term option compared to a post-combustion retrofit CCUS. Waste gases were suggested as having the best potential for CCUS due to their carbon-heavy composition. A CCUS requirement across multiple emissions sources on the same site was considered to risk increasing costs by up to ten times the current CO2 price (for example >€250/t CO2abated).

One respondent reported that there is currently an operating CCUS facility at Al-Reyedah in Dubai, which stores 800,000 tons of CO2 per year from a steel facility.

Fuel switching

Thirteen responses discussed fuel switching to some degree, with the majority focussed on long-term fuel switching to hydrogen, though considering alternatives such as natural gas and biomass. Natural gas was not considered a viable short-term emissions mitigation strategy due to technology lock-in, Blast Furnace replacement cycles are too long and this would not be

compatible with Net Zero. Switching to natural gas was not considered economically viable with current coal/gas prices. Respondents considered using biomass as the fuel to heat and reduce iron ore should be in the context of other uses of biomass, and supply and demand issues, and that fuel switching should be considered for kiln reheat furnaces, not just for the blast furnaces.

Respondents suggested that when considering fuel switching to hydrogen, several different technological options were factored into decisions. They noted that combining a hydrogen-based reductant with coke in the blast furnace would reduce emissions, bearing in mind current best practice includes use of waste plastic in addition to coking coal. Costs of using hydrogen were estimated to be 60-90% higher per tonne of steel produced.

Respondents noted that costs for hydrogen use were not sufficiently well understood to develop robust business cases, but would require a suitable carbon price to make it viable. Hydrogen was not considered available at the scale required to decarbonise the industry, with large scale electrolysers required to produce the required volumes of H2. It was estimated that a 600MW electrolyser would cost £600 million and allow a potential reduction of 2MtCO2e. Longer term, respondents suggested that industry should move to hydrogen direct reduced iron (DRI), like the pilot H2 DRI project in Hamburg. Another respondent stated that any kind of fuel switching to hydrogen would require major overhauls of equipment and sites, leading to high business risk and costs of conversion.

Energy and material efficiency

Nine responses discussed arc furnaces for increasing material efficiency. Some claimed that energy and material efficiency in the sector is mature, with further gains only possible through support to meet the minimum rate of return. It was suggested that the IHRS and IETF should be used to address cost barriers for future energy efficiency projects, which can be difficult and expensive to implement retrospectively.

Respondents noted opportunities for resource efficiency to reduce the need for primary steel production via scrap recycling in an EAF, which is a mature technological process and can be used as a way of moving towards zero carbon. It was noted that reduction of overall virgin steel requirements can be achieved through better material efficiency and increases to product lifetimes as part of a more circular economy. Furthermore, it was suggested that the use of EAF can reduce carbon intensities to 280-750kg/tonne steel while being cost effective and that, while the UK has an effective market for scrap steel, the price of scrap currently is too low and does not reflect sorting costs or removal of impurities.

One respondent noted current investment cycles are around 40 years, meaning investment would be required within 2020-2027. Another estimated that a three million tonne mini-mill would cost £800 million, based on a recent announcement by Steel Dynamic Inc. in the US for a new build.

Other

- Respondents emphasised the importance of engaging equipment manufacturers for all technology solutions to accelerate development, while remaining technology neutral, and suggested the government should be responsible for stimulating demand.
- A carbon budget that decreases over time was suggested to promote near-term deep decarbonisation measures and demand reduction. Some respondents advised that the cost of new blast furnaces would likely prohibit new UK-build, with new capacity likely to be satisfied by EAF.
- A lack of renewable electricity and hydrogen was expected to slow industry decarbonisation, but disclosure of carbon intensities of products could help drive consumer demand to low carbon products, creating a market for them.
- Costs of decarbonisation were thought likely to exceed existing return-on-investment metrics within the industry so would require government support to make viable. For example, the Material Economics 2019 report[11] suggested that production costs for hydrogen or CCUS steel could increase current prices by up to 20%. The paper also suggested that an increase in investment of up to 65% during the decarbonisation period would be required for the sector, which was only considered achievable with government support.
- Clean steelmaking solutions require significant pre-engineering work to determine the Capex and Opex costs based on the technologies discussed, with current estimates accurate to +/- 40%, which presents a major investment risk to these projects. This is in the context that the running costs for a site at £40/tonne liquid steel comes to around £140 million per year, so such wide ranges pose considerable financial risk.

[11] Industrial Transformation 2050, Material Economics

Question 13 – Other Supporting Policies To Consider

Are there any additional policies that government should consider to support the steel sector in the shift to decarbonisation pathway?

Summary of responses

There were 20 responses to this question. A broad range of issues were identified that needed to be addressed alongside direct support for the sector to enable decarbonisation. The focus of responses was mostly on international competition in the steel sector, and the perceived need for a carbon border tax to address this and incentivise the production of lower carbon steel.

A number of responses further highlighted that assessing the relative carbon footprint of steel imports from different countries could help to determine an effective solution, as well as to understand how offshoring might be driving an increase in global CO2 emissions.

Key themes identified

Five respondents considered carbon border taxes to be a particularly effective solution to support steel decarbonisation in the UK by providing a level playing field. Responses highlighted that in many markets outside the EU there are limited carbon or environmental taxes, lowering the cost of steel production in those markets. International competition and the risk of offshoring were raised as major issues that limit investment in low carbon steelmaking, as any investment would put the UK sector at a competitive disadvantage.

Similarly, respondents raised the impact of higher UK electricity prices on steelmaking costs, particularly EAF. One stakeholder noted that if the cost of electricity in the UK was addressed, use of EAF would be likely to increase, which would provide a direct pathway to decarbonising the sector in line with the net zero target. Further benefit could be realised as the sector could become more competitive and attract more investment.

One response highlighted research carried out by UK Steel in their annual ‘Energy Price Gap’ report. 2019 results show the average electricity price UK steel producers typically face in 2019/20 is £50 per megawatt-hour (MWh) compared to the estimated German price of £31/MWh and French price of £28/MWh. The response concludes that UK production sites are therefore paying 62% and 80% more, respectively, than their main competitors.

A number of responses said that increasing or mandating the use of green steel in UK products could drive demand for low carbon steel production. Respondents suggest this could be achieved through a range of approaches:

- Creating a policy to encourage the use of low carbon steel while discouraging use of conventional steel in a range of manufacturing industries, for example offshore wind.
- Favouring low carbon steel in government procurement, including setting a minimum embedded emissions threshold or standard which could increase the proportion of low carbon steel over time.

Other suggested policies included improving scrap recycling and circular economy measures in the UK, to ensure scrap is processed domestically as opposed to being exported.

Further Engagement

We are committed to ongoing dialogue with stakeholders as we continue to design and develop the Fund.

Question 14 – Engaging With Industry

Do you have suggestions on how best we might engage with Industry as we develop the work programme to inform the design of the Clean Steel Fund?

Summary of responses

Thirteen respondents answered this question indicating their willingness to be contacted further as BEIS develops its proposals further.

Key themes identified

Some respondents called for a working group to develop proposals for the Fund and a 10-20 year strategy for the sector. There were also calls for synergies to be found with other initiatives which are supporting a transition to low-carbon steel production. Cooperation between the steel industry, CCUS cluster coordinators and potential hydrogen suppliers was encouraged.

Some respondents raised concerns regarding the array of industrial decarbonisation funding opportunities, which was a cause of confusion. Further clarification or rationalisation into a single funding stream was recommended.

Next Steps

This call for evidence closed on 21st November 2019. The responses received therefore do not consider the Coronavirus outbreak or the ensuing economic downturn in 2020. This has had a significant impact on the steel sector and BEIS is aware that the Clean Steel Fund will be operating in a changed environment. We invite stakeholders to get in touch with further comments and ideas on this subject, using the contact details below.

Transforming the steel sector is a long-term endeavour and the evidence received support wider BEIS policy on industrial decarbonisation, as well as development of the Clean Steel Fund. In Spring 2021, BEIS will publish an Industrial Decarbonisation Strategy, to support manufacturing sectors to reduce emissions in line with the UK's net zero target. This is being developed in dialogue with key sectors, including steel. Meanwhile, steel companies can access several existing sources of support for energy efficiency and decarbonisation, as listed in Annex B.

Contact Details

Enquiries to:

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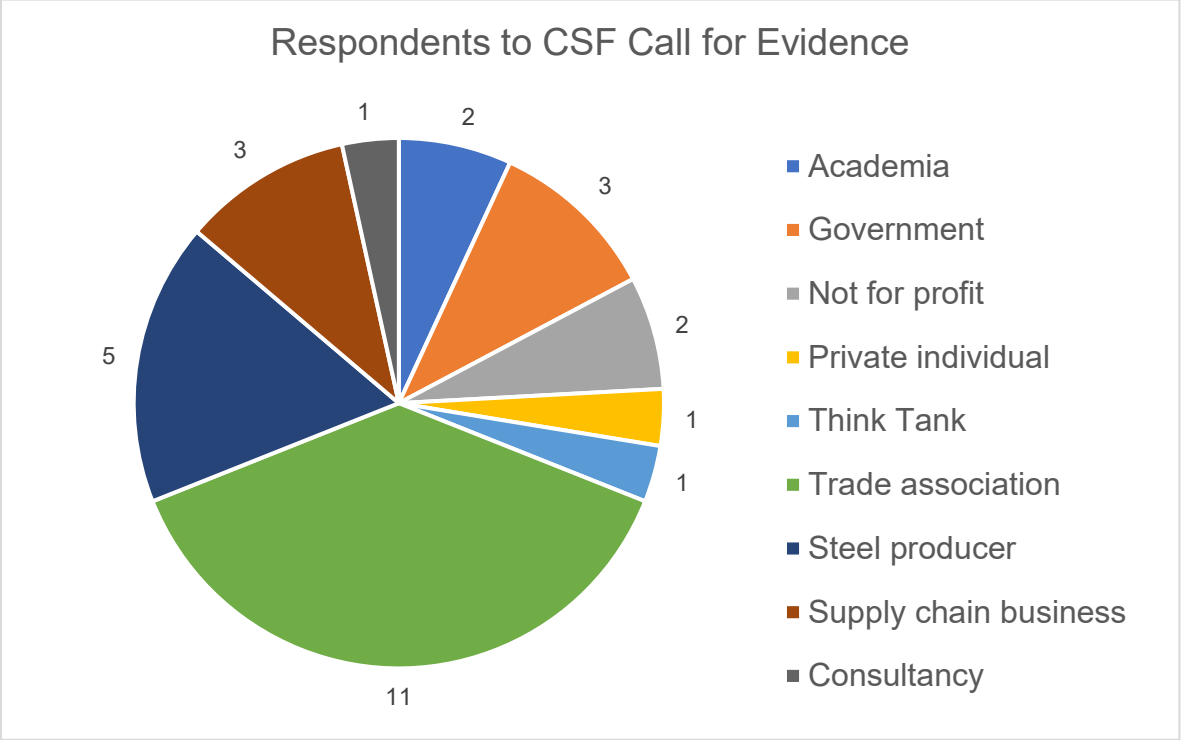
Annex A

Chart 1 – Respondents to CSF call for evidence categorised by organisation type



Annex B

A variety of existing Government policies support energy efficiency and deep decarbonisation across the industrial landscape.

The 10 Point Plan - Announced in November 2020, the 10 Point Plan set out measures to invest in CCUS technology and drive the growth of low carbon hydrogen. This will be supported by investment of up to £500 million for low carbon hydrogen production across the decade with £240m confirmed out to 2025 and an extra £200m investment into the CCS Infrastructure Fund.

Carbon Capture and Utilisation Demonstration (CCUD) innovation programme – This £20m programme is designed to encourage industrial sites to capture carbon dioxide which could then be used in industrial applications, providing a learning opportunity for the development of capture technologies at an intermediate scale.

CCS Infrastructure Fund – This is a £1bn investment to create two carbon capture clusters by the mid-2020s with another two set to be created by 2030 helping to support 50,000 jobs, potentially in areas such as the Humber, North East, North West, Scotland and Wales.

CCUS Innovation Programme – This is a £24 million grant funding programme running until March 2021 supporting projects that develop novel technology and processes that reduce the cost of deploying CCUS.

Clean Steel Fund – The £250 million Net Zero Steel Fund will support the longevity of the steel sector in the UK and help put it on a path to decarbonisation. We are developing proposals in partnership with industry to help overcome some of the challenges facing the sector.

Clean Power and Heat Generation – A number of policies incentivise the deployment of efficient Combined Heat & Power (CHP). These include tax exemptions from the Climate Change Levy and Carbon Price Support and subsidies for biomass-fuelled CHP such as the Renewable Heat Incentive (RHI) and Contracts for Difference. The RHI also funds biomass heat-only plants (for example, biomass boilers). The RHI is available in England, Scotland and Wales. It is no longer open to new applications in Northern Ireland.

Climate Change Agreements (CCAs) – These agreements between the Government and firms encourage improvements in energy efficiency across 53 industrial sectors, in return for significant discounts on the Climate Change Levy (CCL), a tax on non-domestic energy use.

Climate Change Levy (CCL) – the CCL operates across UK agricultural, commercial, industrial and the public service sectors and encourages businesses to be more energy efficient and reduce their greenhouse gas emissions by taxing energy use.

Energy Technology List (ETL) – The ETL is a part of the Enhanced Capital Allowances scheme and is a free-to-use list. It lists plant and machinery equipment of a high energy

efficiency standard, covering 16 separate technology categories, providing a benchmark for top performance through regular, independent evaluations.

The Emissions Trading System (ETS) – Industry, aviation and the power sector currently pay for their carbon emissions through an EU emissions trading system. The UK is leaving the EU ETS at the end of 2020. The Government has published the design of a UK ETS, which could be linked to the EU system if it suits both sides' interests, and consulted on a Carbon Emissions Tax, to ensure continuity of carbon pricing in all scenarios. Either policy will provide a smooth transition for business. The Government will provide clarity on which option will replace the EU ETS as soon as possible before the end of the year.

Heat Networks Investment Project (HNIP) – HNIP is a £320 million BEIS-led scheme that operates across England and Wales. It is designed to create the conditions for a self-sustaining heat networks market that contributes to the decarbonisation of the UK energy system by 2050.

Industrial Decarbonisation Challenge – Up to £170 million of ISCF funding has been allocated to kick-start the delivery of the Industrial Clusters Mission. This will support the delivery of projects that can help to decarbonise an industrial cluster, as well as planning and research activity led by the Industrial Decarbonisation Research and Innovation Centre, which was launched in February 2020.

Industrial Energy Transformation Fund (IETF) – The UK Government announced £315 million of funding in the 2018 Autumn Budget. The funding is available over the period to 2024.

BEIS will manage the IETF, with £289 million to invest in England, Wales and Northern Ireland. The Scottish Government will administer £26 million for investment in Scotland and will publish its plans for the funding in due course.

IETF aims to support industries in lowering energy bills and emissions, as well as bring down the costs of deep decarbonisation technologies, through the issuing of grants to fund projects. It is running from 2020 to March 2024. The steel sector is eligible to apply.

Industrial Fuel Switching Competition – This identifies and tests the processes and technologies required for industries in the UK to switch to low-carbon fuels.

Net Zero Hydrogen Fund – This £240 million fund will support the commercial scale demonstration and deployment of low carbon hydrogen production at scale and will explore how hydrogen could be used as a flexible, low carbon energy carrier and will help us understand how businesses could adopt it. This fund will open for applications at the end of 2021.

Non-domestic Renewable Heat Incentives (RHI) Scheme – the Non-Domestic RHI provides quarterly payments over 20 years, based on the amount of heat generated, to increase the uptake of renewable heat by businesses, the public sector and non-profit organisations operating in England, Scotland, and Wales.

Annex C - Glossary

BEIS	Department for Business, Energy and Industrial Strategy
CCUS	Carbon Capture Usage and Storage
CO2	Carbon dioxide
CO2e	Carbon dioxide equivalent
CSF	Clean Steel Fund
DD	Deep Decarbonisation
DRI	Direct Reduced Iron
EAF	Electric Arc Furnace
EE	Energy Efficiency
ETS	Emissions Trading System
EU	European Union
FEED	Front-End Engineering Design
ICC	Industrial Carbon & Capture
IHRS	Industrial Heat Recovery Support Programme
ISCF	Industrial Strategy Challenge Fund
MtCO2e	Million Tonnes of Carbon Dioxide equivalent
ONS	Office for National Statistics
R&D	Research and Development
SDI	Steel Dynamics Inc

This publication is available from: www.gov.uk/government/consultations/creating-a-clean-steel-fund-call-for-evidence

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