FOE/JB3

Town and Country Planning Act 1990 (as amended)

Application by West Cumbria Mining Limited

Proposal: Development of a new underground metallurgical coal mine and associated development

Site: Former Marchon Site, Pow Beck Valley and area from Marchon Site to St Bees Coast, Whitehaven, Cumbria

Planning Inspectorate reference: APP/H0900/V/21/3271069

Cumbria County Council reference: 4/17/9007

REBUTTAL PROOF OF EVIDENCE

OF

PROFESSOR JOHN BARRETT

Date: 10 September 2021

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Appendices

1. Introduction

1.1. I have been asked by Friends of the Earth to act as an expert witness and prepare this rebuttal proof of evidence. This rebuttal responds to the proof of evidence Ms Caroline Leatherdale dated 10 August 2021 [**WCM/CL/1**] and to the rebuttal proof of evidence of Ms Leatherdale dated 31 August 2021 [**WCM/CL/3**]. The fact I have not responded to all the evidence contained in these documents does not mean I necessarily agree with that evidence. This rebuttal is further to my own proof of evidence dated 10 August 2021 [**FOE/JB1**].

1.2. The evidence which I have prepared and provide for in this rebuttal proof is true, and I confirm that the opinions expressed are my true and professional opinions.

1.3. For ease I adopt the headings used by Ms Leatherdale in part 2 of her rebuttal proof of evidence, but only for her 'Point A' to 'Point C'. I do not respond to 'Point D', but that is only because I understand others are submitting evidence on the topics covered under that heading.

2. Point A: Hydrogen switching is required by the steel sector to achieve the Balanced Net zero pathway.

2.1. In my proof of evidence I stated:

> "3.4.6: To achieve the Balanced Net Zero Pathway [**BNZP**], the UK steel industry would need to undergo substantial fuel-switching to hydrogen feedstocks in the near future."

2.2. Responding to this Ms Leatherdale concludes, at paragraphs 2.5 of her rebuttal, that it is "*incorrect to assume that substantial hydrogen switching is a prerequisite of the BNZP with a consequent implication for demand for coking coal*".

2.3. I believe this statement is not consistent with the newly published "UK Hydrogen Strategy", published in August 2021, by the UK Government (**Appendix 1 FOE/JB3/1**). In the Ministerial statement at page 2 the Minister states (with emphasis added):

> "This new, low carbon hydrogen could help provide cleaner energy to power our economy and our everyday lives – from cookers to distilleries, film shoots to power plants, waste trucks to <u>steel production</u>, and 40 tonne diggers to the heat in our homes."

2.4. The Strategy also states on page 54:

> "The greatest potential demand for low carbon hydrogen in 2030 arises from sectors such as chemicals and steel.
>
> As set out in the Industrial Decarbonisation Strategy, decarbonising the steel sector will be essential to the decarbonisation of UK industry. The main options for doing so include using electric arc furnace technology coupled with hydrogen direct reduced iron, or CCUS"

2.5. In the Balanced Net Zero Pathway, hydrogen use is prioritised where there are ready opportunities for retrofit, therefore the potential for hydrogen use in steelmaking receives limited attention in the CCC analysis. There is evidence that CCUS would similarly require significant structural change in the steel industry before it could become operational. For instance, the *Summary of Responses to the Clean Steel Fund Call for Evidence* (BEIS, December 2020) (**Appendix 2 [FOE/JB3/2]**) states at page 5 that "*CCUS would require a redesign of the blast furnaces to take full advantage of the technology* […] *tying the technology's deployment to investment cycles*."

2.6. At paragraph 2.19.2. of her rebuttal Ms Leatherdale recognises the role of hydrogen in future decarbonisation, identifying that government commitments include: "*Developing a revenue mechanism that will support business models for both industrial carbon capture and low carbon hydrogen projects.*"

2.7. There is broad support for hydrogen demonstration and deployment in UK Government policy. The UK Government's July 2020 green recovery funding package (worth £350m) (**Appendix 3 [FOE/JB3/3]**) cited investment to "*cut emissions in heavy industry by supporting the transition from natural gas to clean hydrogen power, and scaling up carbon capture and storage (CCS) technology*". The Ten Point Plan of November 2020 (page 2) (**Appendix 4 [FOE/JB3/4]**) also allocated £240m to hydrogen production facilities in a new Net Zero Hydrogen Fund, the design of which BEIS is now consulting upon (**Appendix 5 [FOE/JB3/5]**).

2.8. Further UK Government support for hydrogen development is evident in the following:

2.8.1. Low Carbon Hydrogen Production Fund (2020 – present): a fund worth £70m for 3 hydrogen production projects, and 4 fuel switching demonstration projects[1].

2.8.2. Low Carbon Hydrogen Supply Competition (2018-2020): £33m competition funding to develop low-carbon hydrogen[2].

3. Point B: Cumulative emissions associated with the domestic use of the coking coal from the mine could equal 27.4 MtCO2e, and international supply could result in 183.8 MtCO2e; and Point C: Carbon Capture and Storage (CCS) is unproven.

3.1. Ms Leatherdale, at paragraph 2.6 of her rebuttal, re-states the Applicant's position that the GHG emissions associated with the burning of the coking coal for steel production should not be considered as part of the environmental effects of the Proposed Development for the purposes of EIA. I understand this would be a matter for legal submissions and so I do not comment on it any further here.

3.2. Leaving aside any such legal questions, I refer back to my original proof of evidence that demonstrates the additionality of the GHG emissions. Specifically I refer to section 7 of my proof of evidence [**FOE/JB1**] that demonstrates the net additional emissions associated with the Proposed Development.

3.3. In her rebuttal proof, Ms Leatherdale states:

> "2.8. I note that Professor Barrett has chosen to apply the 2021 BEIS emissions factor for steel manufacture from coke. This factor is designed to reflect the existing GHG emission performance of the steel sector. Applying the 2021 BEIS factor to model future UK steel GHG emissions, in the context of economy wide decarbonisation is therefore highly conservative and unrepresentative.
>
> 2.9. I have noted in my proof (paragraphs 5.15 to 5.16) that the CCC have modelled through the BNZP a route to decarbonising the steel sector which assumes CCS to

[1] C Garvey, A. and Taylor, P. 2020. *Industrial Decarbonisation Policies for a UK Net Zero Target. Centre for Research into Energy Demand Solutions*. Oxford, UK. ISBN: 978-1-913299-05-7 CC (2021). Table 4, page 20.
[2] *Ibid.*

abate GHG emissions from steel manufacture using metallurgical coal. The emissions factor that would apply in the future would therefore be significantly smaller than the 2021 BEIS emissions factor adopted by Professor Barrett to estimate the GHG emissions from UK steel manufacture using metallurgical coal. Similar arguments would also apply to non-UK steel manufacture as other countries seek to decarbonise their economies."

3.4. The GHG emissions would stay the same irrespective of whether CCS is installed or not. The difference is whether the emissions are released in the atmosphere or captured and stored. While this might sound pedantic, it is extremely important, as to ensure that the GHG emissions are not released into the atmosphere, CCS (an unproven technology at scale) would need to be in place. If CCS is not in place, the emission factor from BEIS is entirely appropriate and accurate.

3.5. Recent evidence from Welsby *et al*. (2021) suggests that 90% of European coal is unburnable by 2050 to remain consistent with the 1.5°C temperature pathway (**Appendix 6 [FOE/JB3/6]**). This is an update from the McGlade and Ekins paper I quoted at paragraph 7.19 of my original proof of evidence. The main underlying reason for the different is a more stringent carbon budget is applied consistent with 1.5^{o}C.

3.6. Even if there is deployment of CCS at scale in the medium-term, this ignores the role of cumulative emissions; CCS cannot remove the emissions from the combustion of metallurgical coal that have predated the development of removal technologies. The importance of this is discussed further in paragraph 3.8 below.

3.7. In relation to CCS specifically, while I recognise that CCS is an important technology for the future, my statement remains true; it is currently an unproven technology at scale. I believe there are three key points that need to be considered. These being:

3.7.1. Strong inter-sectoral competition for any CCS capacity in the future creates considerable uncertainty

A number of sectors will be reliant on CCS technology to mitigate GHG emissions in the future. There is likely to be strong competition with the cement and chemical sectors making it extremely difficult to predict the CCS market and, with any confidence, determine which sectors will have functioning CCS technology by what date. I also note the speculative nature of CCS policy in the UK where past commitments by the UK Governments have been made and withdrawn.

3.7.2. Failure of CCS over the past three decades

A new peer-reviewed publication entitled, *"What went wrong?" Learning from three decades of carbon capture, utilisation and sequestration (CCUS) pilot and demonstration projects"* in the journal, "Energy Policy" highlights that most CCUS projects initiated in the past three decades have failed[3]. The paper highlights a number of reasons including incorrect plant sizes, poor support mechanisms and poor mitigation of risks. I believe that it would be incorrect to assume a fully functioning CCS system in place in the UK in the short term. There are significant risks and uncertainties involved. This is recognised by the CCC who acknowledge that:

> "*There have been no GHG removals recorded to date in the UK via the engineered GHG removal technologies*" (CCC, The Sixth Carbon Budget: Greenhouse Gas Removals, page 5) (**Appendix 7 [FOE/JB3/7]**).

3.7.3. This lack of availability of CCS is not consistent with the urgent need to reduce GHG emissions

3.8. In my original proof of evidence, at paragraph 3.4.1, I highlighted that current global carbon GHG emissions will exceed carbon budgets to limit global temperature rise by 1.5°C in around 2031. Therefore, to remain within global targets, rapid reductions in GHG emissions are required in the short term (i.e. the next 10 years). This is why the UK Government have established an interim carbon budget where GHG emissions need to be reduced by 78% by 2035 based on 1990 levels. While the climate crisis is often framed as a long term problem to be solved by 2050; this is incorrect. It is the short term cumulative build-up of GHG emissions that links to temperature increases and subsequently global heating. This is important, because many of the statements made in Ms Leatherdale's rebuttal proof refer to carbon dioxide removal technologies (CDR), namely CCS that **are** currently unavailable and will not be available before 2031 at the earliest. Therefore, the contribution of CCS is inconsistent with the need for short term rapid reductions in GHG emissions to align the UK with binding global targets.

[3] Wang N., Akimoto K., Nemet G. (2021) What went wrong?" Learning from three decades of carbon capture, utilisation and sequestration (CCUS) pilot and demonstration projects, Energy Policy 158 (2021) 112546