# Written Evidence Submitted by the Mineral Products Association

# (HNZ0025)

## EXECUTIVE SUMMARY

1. To reach net zero whilst remaining cost competitive, UK mineral production relies on secure supplies of affordable energy. To be deployed as a fuel in the mineral products sector, hydrogen will need to be delivered to, or produced on, site in a cost-effective manner that doesn't damage the competitiveness of UK industry operating in international markets, and at volumes that meet the demands of industry.

2. Initial work indicates that conversion of high calcium lime manufacturing to hydrogen is feasible with investment in some plant alterations using currently available technology. Conversion of cement manufacturing to hydrogen is more complex and, as yet, it is not possible to say if this is the most cost-effective and feasible low-carbon fuel but MPA research is encouraging that hydrogen could play at least a small part of the energy mix for cement.

3. It is notable that there has been limited investigation into the use of hydrogen for industrial heat and many programmes and studies focus on production, distribution and domestic appliances. This shortcoming needs to be addressed.

4. Without more information on the large-scale deployment of hydrogen for industrial heat, for example, for processing industrial minerals, for drying aggregates, for curing concrete, or for manufacturing and constructing asphalt, it is not possible to confirm if the use of hydrogen fuel as a replacement for natural gas will be cost-effective or feasible.

## INTRODUCTION TO THE MINERAL PRODUCTS ASSOCIATION

**5.** The Mineral Products Association (MPA) is the trade association for the aggregates, asphalt, cement, concrete, dimension stone, lime, mortar and silica sand industries. With the affiliation of British Precast, the British Association of Reinforcement (BAR), Eurobitume, MPA Northern Ireland, MPA Scotland and the British Calcium Carbonate Federation, it has a growing membership of 520 companies and is the sectoral voice for mineral products. MPA membership is made up of the vast majority of independent SME quarrying companies throughout the UK, as well as the 9 major international and global companies. It covers 100% of UK cement production, 90% of GB aggregates production, 95% of asphalt and over 70% of ready-mixed concrete and precast concrete production. In 2016, the industry supplied £18 billion worth of materials and services to the Economy and was the largest supplier to the construction industry, which had annual output valued at £152 billion. Industry production represents the largest materials flow in the UK economy and is also one of the largest manufacturing sectors.

**6.** Mineral product industries are reliant on access to cost-effective, low-carbon heat sources to ensure sustainable production, for example:

- Achieving the 1,000°C temperatures needed to manufacture cement and lime;
- Raw material processing of industrial minerals, such as dolomite, industrial sand, ball clay and china clay, which can require temperatures up to 1,000°C;
- Manufacturing and constructing with asphalt that forms the backbone of UK highways and must be heated on site;
- Curing concrete and drying aggregates.

7. As energy intensive manufacturing processes, cement and lime production are most affected by the drive for low-carbon manufacturing and are actively investigating new technologies as part of their decarbonisation strategy. For cement and concrete, this was set out in our industry roadmap.[a] These industries are traded internationally, so are vulnerable to displacement by

lower cost competitors, so it is vital that energy costs are internationally competitive to ensure these businesses remain competitive.

8. Producers of industrial minerals and other mineral products are reliant on affordable energy sources available at the point of use. Given the paucity of information on the use of hydrogen in industrial settings, it would be beneficial for the Government to support the examination of the issues of hydrogen adaptation in the mineral products sector more widely.

## RESPONSE TO CALL FOR EVIDENCE QUESTIONS

**The suitability of the Government's announced plans for "Driving the Growth of Low Carbon Hydrogen", including:**

- **the focus, scale and timescales of the proposed measures;**
- **how the proposed measures—and any other recommended measures—could best be co-ordinated;**
- **the dependency of the Government's proposed plans on carbon capture and storage, any risks associated with this and how any risks should be mitigated; and**
- **potential business models that could attract private investment and stimulate widespread adoption of hydrogen as a Net Zero fuel;**

9. Decarbonisation of fuel supplies is an important aspect of decarbonisation of mineral products, especially energy-intensive cement and lime production. As a substantial consumer of natural gas, the potential for ready deployment within the lime sector is significant. Importantly for the lime sector, hydrogen meets the strict product specifications that mean products can be used in water treatment and pharmaceuticals and so appears to be a realistic option for a low-carbon fuel.

10. Deployment of hydrogen in the cement sector, which requires higher temperatures for manufacturing than the high calcium lime sector, is less straightforward. Currently, cement manufacturing does not use natural gas in large quantities to fire its kilns so conversion to hydrogen is more complex.

11. For cement and lime manufacturing, for industrial mineral processing, and for other mineral products, a consistent and readily available supply is required to sustain fuel-switching to hydrogen. Any low-carbon production technology is appropriate if the hydrogen supply can meet quality, volume, pressure and cost expectations. Where these criteria can be met, it's important that industry, with few alternative options for decarbonisation, is prioritised for hydrogen supply over other users such as home heating or personal transport which would likely be easily served with electric solutions.

12. Considerable decarbonisation has been witnessed in the power generation sector largely due to the subsidies provided by Government. Now that the costs of renewables are competitive with other forms of generation there is a strong argument to shift the support from the largely captive power market to internationally vulnerable industrial production. This support could be used to help industrial sites adapt to be "hydrogen-ready" and be used to protect against any ongoing high infrastructure costs that are passed on in energy bills to ensure UK industry remains competitive during the low-carbon transition.

**The progress of recent and ongoing trials of hydrogen in the UK and abroad, and the next steps to most effectively build on this progress;**

---

[a] https://www.thisisukconcrete.co.uk/TIC/media/root/Perspectives/MPA-UKC-Roadmap-to-Beyond-Net-Zero_October-2020.pdf

13. It is notable that many of the recent and ongoing trials of hydrogen are focussed on national supply and domestic appliances, there is only limited investment in the use of hydrogen for industrial purposes. This needs to be addressed if there is to be an effective transition to a low-carbon economy which is reliant, in whole or in part, on hydrogen fuels.

14. Hydrogen is attractive as a net zero fuel for the cement and lime industries provided it can be produced by low-carbon methods and made available on site at prices that don't render UK industry uncompetitive in international markets. Cement and lime production rely on access to affordable heat energy for their continuous, high temperature operations. Our members are keen to further decarbonise and MPA are currently leading two projects to demonstrate the use of hydrogen in cement manufacturing and in lime manufacturing under the BEIS Energy innovation Programme[b]. Alongside investigating the use of hydrogen, other options such as electrification, are being explored. However, for lime kilns in particular, these options are less developed and would likely require greater changes manufacturing plant than the use of hydrogen.

15. For the lime industry, hydrogen is proposed as a 100% replacement for natural gas, and in the cement industry, as a partial replacement for coal. These demonstration projects will allow the lime and cement industries in the UK to analyse hydrogen's suitability as a fuel in manufacture. As capital intensive industries with long-lived assets, this early work is vital to ensure these sectors are adaptable for a hydrogen economy in the longer term. Beyond this work, additional trials with hydrogen will be required before it can be commercially deployed. The current lack of UK hydrogen supplies and its high cost has been a challenge during current demonstration projects and Government support will be required to ensure a cost effective supply of UK produced hydrogen is available for further demonstrations and trials.

16. The current Government focus on national supply and domestic appliances, provides little comfort or direction for industrial sectors, including cement and lime, that currently rely on natural gas or other fossil fuels in their high capital, long-lived assets. It would be beneficial for the Government to support the examination of the issues of hydrogen adaptation in the mineral products sector more widely, as there are many geographically diverse gas-using operations where any changes to the composition of gas supplied could cause impacts. Care must be taken to avoid unintended consequences in the longer term.

17. Looking more broadly at hydrogen:

- Further investment is required by Government into scaling up production of blue hydrogen to make it more cost effective and improving the technology for production of green hydrogen. This will also likely lead to more accurate information on the associated costs of hydrogen production which can then inform any hydrogen business models required.

- A decision is required as soon as possible on the repurposing of the gas network to hydrogen to provide industry with visibility on when sites will need to be adapted and so that work on pipelines can be started where required. New pipelines (for hydrogen or $CO_2$) will need planning permission and Government should look at how the planning process can be streamlined to enable a quick turnaround of applications.

**The engineering and commercial challenges associated with using hydrogen as a fuel, including production, storage, distribution and metrology, and how the Government could best address these;**

[b] BEIS, Industrial Fuel Switching competition phase 3: successful projects - https://www.gov.uk/government/publications/industrial-fuel-switching-to-low-carbon-alternatives/industrial-fuel-switching-demonstration-successful-projects-phase-3

18. Cement and lime manufacturing use bespoke technologies specifically developed to maximise the efficiency of production, including of energy – the largest operating cost. New plant requires hundreds of millions of pounds worth of investments and is in operation for decades. The long investment required to support industrial mineral production is reflected in the extended land-banks provided for in National Planning Policy Framework to ensure security of supply. Thus, early visibility on the future of industrial heat is vital to the mineral products sector.

19. In the UK, high purity limes are required to service diverse markets, such as in mortars and renders, iron and steel manufacturing, soil stabilisation, emissions control from power stations and industry, water and wastewater treatment, and pharmaceuticals and cosmetics. To meet the demands of these markets, UK lime is manufactured from high purity limestone. Natural gas is currently the preferred fuel as it introduces few impurities and is readily available through the gas transmission system. It also has lower carbon emissions when compared to solid fuel alternatives. As a clean-burning fuel, hydrogen is an attractive potential replacement for natural gas in lime manufacturing.

20. For both the cement and lime industries, conversion to hydrogen would reduce $CO_2$ emissions by around a third. However, as the manufacturing of cement and lime relies on the thermal decomposition – calcination - of limestone (calcium carbonate), capturing the $CO_2$ from manufacturing plants will remain an important aspect of achieving net zero emissions. An advantage of using clean burning fuels such as hydrogen will be that a cleaner stream of $CO_2$ may be produced that will be more suitable for capture without further processing.

21. For other mineral product sectors, developments of gas burners and boilers across other industrial sectors will have equal applicability, but deployment at scale will need to be proven and deployment on mobile equipment will need to be considered.

**The infrastructure that hydrogen as a Net Zero fuel will require in the short- and longer-term, and any associated risks and opportunities;**

22. To be a feasible fuel for use in industry, hydrogen needs to be available in the same way that natural gas is currently. For example, cement manufacturing is a continuous process that runs for around a year without stopping, lime manufacturing has longer runs with five to ten years between kiln stops. Industrial mineral processes using high temperatures operate with few stops. Supply interruption is damaging to assets and causes the manufacturing process to break down (e.g. resulting in clogging of output ports such that major refits are needed before start-up), and as such, is a major cost risk. Thus, conversion of these assets to hydrogen fuel will require supply guarantees to eliminate the risks of both damaged assets and stranded assets.

23. If available at an affordable price through a gas grid, there is potential for hydrogen to be cost-effective and feasible solution for the heat needs of mineral products industries.

24. In relation to safety, Governments and stakeholders will need to work together to develop regulations that enable the production, transport, and storage of hydrogen whilst maintaining safety.

**Cost-benefit analysis of using hydrogen to meet Net Zero as well as the potential environmental impact of technologies required for its widespread use;**

25. For the high calcium lime industry, the initial feasibility work by the sector suggests that all natural gas consumption could be replaced by hydrogen. In 2019, the sector used around 4,275,000 GJ of energy around 121 million cubic metres of natural gas. Given the heating value of hydrogen is around one third that of natural gas, lime manufacturers will require three times the volume of hydrogen, at three times the flow rate, to achieve the same energy input.

26. Although the demonstration projects are ongoing, and despite the sector-specific nature of lime kilns, the MPA does not foresee excessive capital costs associated with any change from natural gas to hydrogen in lime manufacturing, and so it is the need for affordable and available supplies that will be the constraint on the sector. The only alternative fuel that could be deployed with similarly low conversion costs by the lime sector is biogas (probably with less cleaning than is required for grid injection as biomethane). However, at present biogas is preferentially subsidised for other uses (e.g. electricity generation) so there is no commercial incentive to use this gas as a fuel for lime manufacturing despite the increased thermal efficiency.

27. Theoretically, the cement industry could support maximum consumption of around 250,000 tonnes of hydrogen per year. However, this needs to be confirmed by the MPA research trials – a consumption level of 150,000 tonnes per year is more likely. For this to be actualised, the cost of hydrogen delivered to site would need to be comparable to the commodity and transportation costs of current fuels.

28. Costs of deployment across other mineral product sectors are, as yet, unknown but are likely to vary between mineral types depending on the processes being employed, as well as the location of the plant.

**The relative advantages and disadvantages of hydrogen compared to other low-carbon options (such as electrification or heat networks), the applications for which hydrogen should be prioritised and why, and how any uncertainty in the optimal technology should be managed.**

29. To achieve net zero carbon emissions, cement and lime manufacturers will be reliant on replacing current fuels with affordable low or zero carbon energy sources, potentially including hydrogen. However, in both these industries the thermal processing of calcium carbonate produces $CO_2$ and, as such, there will be an ongoing requirement for CCUS deployment in these sectors to achieve net zero emissions even with the use of low-carbon fuels. Consequently, there is a need to develop low-carbon hydrogen supply in parallel to carbon capture utilisation and storage infrastructure and, importantly there is a need to recognise that low-carbon hydrogen production will not alone decarbonise industry.

30. Prioritisation of the use of zero-carbon energy sources, including hydrogen, should factor in the availability and appropriateness for different uses of alternatives such as electricity or biogas. For example, home heating or personal transport would likely be as easily served with electric solutions, which is not currently an option for cement and lime which could use hydrogen. The perverse incentivisation of biogas away from industrial use into electricity is a compelling example of why this approach to prioritisation should be followed.

31. Care must be taken not to separate the industrial decarbonisation technology levers in policy development. The Concrete and Cement roadmap to beyond net zero, for example, uses seven levers to get to net negative emissions. Industrial businesses require holistic policies that give them the flexibility to choose the right technological investment to suit their production needs. Knowledge gathering has progressed with the cost challenge task force on CCUS and the CCUS Advisory Group (CAG) but inevitably uncertainties persist across different technology options. As such the development of business models and support measures for low-carbon industrial technology need to encompass options for fuel switching and carbon capture to retain business choice.

***(January 2021)***