Mineral Products

The economics of emissions reduction

KEY:

RED – NOT VIABLE

ORANGE – REQUIRES SIGNIFICANT FUNDING/INVESTMENT/POLICY

GREEN – VIABLE OPTION, REQUIRES PLANNING, EXISTING POLICY IS SYMPATHETIC TOWARD THESE OPTIONS

	Site level	Cluster level	NI level
Recycling of product materials	Not viable – sites mostly specialising in 1-2 end-products (not suitable for producing aggregate)	With organisation/planning/ dialogue between sites this is possible	GB recycles 75% of total mineral product materials with great success.
Onsite Renewable Generation / Electrification	Avoid non-commodity costs, potential new revenue stream (sell back to grid), lower	Same as at site level, however likely to produce larger benefits due to scale increase and energy shift	Wholesale market volatility and exorbitant prices – very good option for M.P sector to self-sustain (and if not power entirely, at least reduce energy bought at peak-rates).

	overall costs and at predictable prices.	Northern Ireland Elect. Networks control transmission lines to enable this.	
Fuel-switching: Biomass and biofuels	Not viable as yet – requires substantially more R&D even to be implemented widely and successfully even at NI level.	Not viable yet – requires substantially more R&D even to be implemented widely and successfully at NI level.	Finite supply of sustainable biomass. DESNZ: "Current modelling indicates that biomass use combined with BECCS for power, heat and transport contribute the most towards net zero." NI: Biofuels company Renovare Fuels will open a processing plant in Derry (currently pending planning permission) producing around two million litres a year of renewable biofuels out of biogas from landfill waste. Biomass already accounted for 8.6% of energy supply in 2022, although he pointed out that neither it nor carbon capture was a "silver bullet" for achieving net zero.
Fuel-switching: Hydrogen	Economics do not work at small scale/site level.	In theory, hydrogen can power on-site generation units, meeting the electricity demand of the	As per previous cells. Hydrogen fuel-cell engines major expense, risks around transportation, compression[14]

		mining operations. However, much R&D to come to make this economically viable.	
Fuel-switching: electrification	Large grid investments required. Long lead times for electricity grid network updates (NIEN).	Large grid investments required. Long lead times for electricity grid network updates (NIEN).	If mineral products sector turns to electrification as its golden ticket, it will cause electricity demand to sky-rocket. **Challenges[15]:** Large capital expenditures requirements, large infrastructure improvements and BEV technological challenges. Incl. grid connections additional on-site substations and networks, installation or contract renewable-power capacity. Battery technologies to achieve higher density, lower costs, faster charging rates, and larger scale to make electric equipment competitive
CCUS (Carbon Capture, Use and Storage)	Large potential: In-use worldwide and projects popping up.	CCUS will not just involve high capex costs but will also incur considerable ongoing operational costs. CCUS projects in	Significant potential to curb large process emissions?, direct emissions and indirect emissions. *Huge potential for cement industry in particular – final recommendations will be decisive on*

	Can be retro-fitted to existing plants. Significant, and maybe the only option to reduce emissions in cement industry.	the cement and lime sectors indicate that deployment of carbon capture could double the cost of production. If the competitiveness of mineral products is to be maintained, Government support must continue beyond first of a kind projects in clusters to projects at dispersed sites[16].	*CCUS for mineral products sector (LIKELY TO INCLUDE GOVT SUBSIDIES).* **Costs**: vary depending on CO2 concentration in the emissions stream (the more densely concentrated the CO2, the cheaper it is to capture) Few studies on CCUS cost. Potentially £50-100 per tCO2 High design complexity and the high need for customization present obstacles to technological advancement.
Geothermal Energy Production	Need for R&D, research in progress. No short-term vision for implementation at this stage.	NI - favourable geology with significant untapped potential for geothermal energy. Significant potential for the use of both shallow and deep geothermal energy resources for the production of heat, and	COST: resource exploration, drilling, reservoir/plant development, and power generation. Capital costs for conventional geothermal power plants (in the U.S) are approximately $2,500 per installed kilowatt of capacity. NI APPLICATION: GeoEnergy NI Project – June 2023 - £3 million project from the Department for the Economy (DfE) is set to explore the

		possibly electrical power, in Northern Ireland.	potential for geothermal energy in Northern Ireland.
Enhanced Rock Weathering	Viable once R&D has been completed to register all risks.	Viable once R&D has been completed to register all risks.	To be employed in conjunction with other strategies. Not enough silicate rock across UK 9 to meet significant carbon reduction scenarios. Irish company in US using returned concrete instead of Silicate, and then selling carbon credits[17].