‘Comments to BREF Workprogramme 19th IED-Forum

25/04/2024

Prioritisation of CLM BREF review

The stakeholder groups representing NGOs (EEB) and Industry (ALCCC), **support the prioritisation of the review of the Production of Cement, Lime and Magnesium Oxide BREF (CLM BREF).** [1]

1. Environmental relevance

Cement, Lime and Magnesium production is highly materials, energy and hence pollution intensive. The cement industry is responsible for about 7% of anthropogenic CO2 emissions at global level. The Cement production (clinker route) makes up 8% of all stationary EU ETS GHG emissions, limestone production / calcination of dolomite and magnesia make up about 2% of the total[2]. Together with iron and steel the cement sector ranks worst within the Industrial Emissions Portal, -the energy sector is expected to reduce significantly due to enacted EU coal phase outs. The processes – mainly clinker production- are very air pollutant intensive, mainly in regard to NOx and Mercury (rank 2 (12%) and 3 (14%) .

2. Improvement potential

At global level, the cement industry is committed to achieve climate neutrality by latest 2050, some key players are committed to deliver earlier (by 2030) on GHG emissions reduction but also significant air pollution prevention co-benefits within Europe[3]. Decarbonisation is a clear priority, the common reference point for Portland cement (CEMI) is at 881kg CO2eq/t at global level, for EU based production the average is between 500kgCO2/t - 800 kgCO2/t[4] .

- Hoffman Cement operates commercially operating concrete / cement plants in Bournezeau (FR), the GHG footprint with the alternative clay/activators process (Hoffmann Cement H-IONA) is lowered to 161kg CO2eq/t cement. The main environmental gains result from clinker substitution.
- BRIMSTONE indicates ‘deeply decarbonised’ cement by switch of limestone based process to carbon-free silicate rocks as input material, satisfying the same technical functions as the traditional Portland Cements.
- HOLCIM and LAFARGE have also teamed up for common projects at the La Malle and Saint Pierre La Cour sites (FR). Both full scale projects are in operation from 2021/2023. The main techniques is use of kaolin type clays, use of waste heat and renewable fuels (biomass), they

[1] Not necessarily for the exact same rationale provided in this joint letter.

[2] based on EU ETS (2022) data https://www.eea.europa.eu/data-and-maps/dashboards/emissions-trading-viewer-1

[3] Source https://www.industrytransition.org/content/uploads/2024/01/202401-leadit-green-cement-tech-tracker.xlsx

[4] based on CEMBUREAU (2006), figure 1.19 CLM 2013 BREF, requoted by ‘Marmier A., Decarbonisation options for the cement industry, Publications Office of the European Union, Luxembourg, 2023, doi:10.2760/174037, JRC131246’

claim "close to zero" carbon emissions, other information suggests a -50% GHG emission reduction compared to traditional Portland Cement (~441kg CO2 eq/t)

- Plants using the Limestone Calcinated (kaolonitic) Clay Cement (LC3) route: substitution of clinker to a <50% ratio by calcined clay can already deliver an immediate 40% reduction. Considering that the calcination of clays occurs at lower temperatures (700-800C°) range, an electrification of this process is viable. There are about 20 plants (with 4 million tonnes capacity) already producing LC3 type cement e.g. Colombia, Ivory Coast.

- HOLCIM also indicates that some sites in AT (Reznei) and CZ that are operating close to 100% alternative fuels, at some sites the plants run on 100% renewable energy (Columbia site) through purchasing agreements or on site renewable energy production

- The US IRA pre-listed finance projects for cement and concrete lists 6 projects of which 3 relate to alternative processes, 1 on electrification and two on CCS 1) Brimstone Energy: predicted alternative carbon free silicate rocks as limestone substitute 2) Sublime Systems: electrochemical cement manufacturing 3) National Cement Company of California ('Lebec Net 0 Cement plant project': biomass based fuels combined with LC3 and carbon capture and storage 4) Roanoke Cement Company + 5) Summit Materials: calcinated clay process 6) Heidelberg Materials (Mitchell) : CCS retrofit.

Climate protection is the main driver of industrial transformation within the sector, leading to important air pollution prevention co-benefits. The techniques options considered at the concrete manufacturing level are

- on process change, mainly substitution of clinker process by other less pollution intensive clay / carbon-free calcium silicate rocks or alternative SCM substitute materials
- substitution of fossil-based feedstock use / substitute option for the firing and calcination process
- end of pipe carbon capture techniques such as CCS.

Important improvement potential is also offered by innovative techniques at the product (use) level (concrete). Considering that the EU BREFs also serve as a reference for setting permit conditions / legislation beyond the EU, we expect the improvement potential impact to be higher. By 2030, about 30% of today's cement production plants will reach the end of their lifetimes[5]. Reinvestments into the current CO2-intensive production pathway will lock in further GHG and pollution intensive production up to 2050 and beyond, the EU BREF shall prevent stranded assets.

The 2013 CLM BREF was the very first 'IED BREF' and is thus the most outdated. Reference installation information dates back to before 2008.

a) Alternative techniques for cement production (GHG, air pollutants)

Significant improvements are expected from the process shift to phase out clinker / reduce the clinker ratio significantly. As indicated above, readily available cement production alternatives would reduce the GHG footprint to 161kg CO2eq/t cement with important air emissions prevention co-benefits. Supplementary cementitious materials (SCMs) are readily available, this

[5] Agora Energiewende and Wuppertal Institute, 2021

results in reduced negative impacts through much lower clinker use ratio (see point b). Due to expected phase out of Blast Furnaces (and other fossil fuel combustion for energy generation) cement producers may be vulnerable to use other input material incl. industrial by-products or more wastes to substitute slags from the Blast Furnace route. EAF slags should be available as well as ferro slags and ground glass. This requires an update of the relevant sections of the BREF.

b) Improvement potentials for current (clinker based) cement production (GHG, hg air emissions, and input controls)

Substitution of Fossil based input:

The current BREF states in the energy use figure (2.3.21) very large ranges of limestone calcining ranging from 5-40kWh/tonne and do not set any useful BAT-AEPL. Table 2.11 sets out typical fuel used in a 2003 situation, largely indicating solid fossil fuels (coal) but also fossil gas use. This fuel input information is hence obsolete and not in line with the revised goals of the IED 2.0 and EU Green Deal. We regard these figures as no longer corresponding to BAT, considering that the *use of electricity from fossil free energy sources* is established BAT for related sectors.

The EU ETS benchmarks suggest the current GHG intensity to be 0,766 tCO2eq/t for grey clinker and 0,987tCO2eq/t for white cement clinker. However we regard the EU ETS benchmark design as inadequate.

We expect further GHG performance improvement potential by a considerable increase of the share of renewable electricity, as well as other air pollutants benefits if this energy is generated by non-combustion type of renewables. Holcim reports (pre-stated) on-site renewable energy generation or 100% renewable energy power purchase agreements as a techniques to reduce the process emissions associated footprint for heat generation or firing process.

Due consideration is to be made in case of co-incineration of waste, ensuring that environmental performance standards are not less ambitious than applicable for waste incineration.

Electrification:

Another techniques option is also electrification, suppliers such as Coolbrook/ABB developed "RotoDynamicHeater", (electrified kilns) allowing high heat generated for the production of cement (heat range up to 1700C°) . This technique is also applicable for substitution of other high heat fossil fired kilns/furnaces in the steel and chemicals industry (crackers). The co-benefits are avoidance of air pollutants. Commercial launch is expected for 2025.

The electrification option is foreseen by the company Sublime Systems in Holhoyke (USA), project name "First Commercial Electrochemical Cement Manufacturing".

CC(U)S:

Whilst NGO do not regard CCUS as a 'forward looking BAT', it may have a role for abating GHG "residual emissions" from existing cement kilns during the conversion / decommissioning phase (see point c). CCU comes with a high cost and a number of significant negative cross media effects (energy penalty), it remains an end of pipe technique with remaining infrastructure and safety related challenges. Real applications in the sector are not yet proven but the LeadIt group

transition roadmap tracker database [see footnote 2] suggests at least the following CCUS projects to be commercially operating within a 2026 timescale: Heidelberg Edmonton (US) by 2026 and Brevik (NO) by 2024, Holcim Richmond (Canada) by 2025, Holcim in Höver (DE) by 2026, Lägerdorf by 2029. A 'cryogenic' CCS demonstration project is under construction for the Central plains cement Sugar Creek (US) site expected by 2025. Two sites in China are reported to be in operation with CCS since 2023 (Bbmg corporation and China Resources Cement Hong Kong).

In the absence of measured CO2 capture rate monitoring data and information on associated cross-media effects (including downstream and out of the site boundaries), it is highly questionable if this technique is most effective in delivering by the necessary 2030-2050 transition timescale, also in light of critical infrastructure needs for CCS.

Air pollutants mitigation potential for dust, NOx, SO2 and mercury

The level of <10-20 mg/Nm³ (daily average) **dust** for kiln firing (BAT 17) does not reflect BAT performance and shall be amended to <5mg/Nm³, which is the level expected by state of the art fabric filters. The BAT-AEl for **NOx** (a footnote allows up to 500mg/Nm³ or even up to 800mg/Nm³ for Lepol and long rotary kilns) does not reflect BAT, there is a wide uptake of SCR in the cement sector, demonstrating that NOx emissions can be far less than 200 mg/Nm³, (see 3 BAT 19). This level is also achieved with the less effective SNCR. Ammonia slip up to 50mg/Nm³ (BAT 20) cannot be regarded as state of the art. The BAT-AEL level for **SO2** emissions (BAT21) is providing an obsolete (due to high fossil fuel input) based level of up to 400mg/Nm³. The BREF even states that the use of an abatement technique may not be required. The 50µg/Nm³ for **mercury** (BAT 28) needs a thorough tightening, considering available hg specific abatement techniques, the footnote 2 implies this but the BAT-AEL range is not fit for purpose. The German ELV set back in 2013 (17. BImSchV) already provides a level of 30µg/Nm³ (daily average). A study from the German UBA (68/2021 in German) suggests that levels below 10µg/Nm³ are achieved.

c) Fossil based decommissioning BAT and interim BAT-AE(P)Ls

Due to the conversion of processes many fossil based and energy intensive processes will become obsolete and hence should be subject to "negative BAT". An agreed decommissioning / phase out plan shall detail the minimal performance expectations during the decommissioning phase. Examples are highlighted in point b) above.

Suggested way forward

1. To kick start the review of the CLM BREF without further delay. Integrating new developments within the sector (0 clinker production route and low clinker ratio production route)
2. The issues identified in point b+c would be processed in parallel to developing a new section on and pending data availability on CCUS applications;
3. The TWG to decide, in a later stage, whether certain techniques may be considered as "deep transformation", meaning that – at the very best-case scenario- the implementation deadline for the sector will not be prior to October 2026+8 years = October 2034.