Integrated Strategic Energy Technology Plan – SET-Plan Action n° 6

CEMBUREAU contribution to the stakeholder consultation

CEMBUREAU, the European Cement Association, regrets that it has not been listed among the stakeholders invited to respond to this consultation.

As a member of the Public-Private Partnership (PPP) on Sustainable Process Industry (SPIRE) community, CEMBUREAU would like to provide its feedback on the expected outcomes of the SET Plan Action n° 6.

Energy costs in the cement production

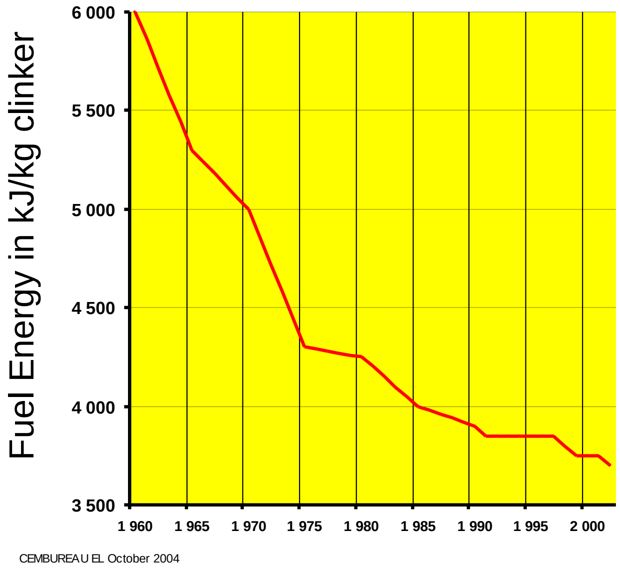
As mentioned in the Draft Issue Paper for the SET-Plan Action n° 6 "Continue efforts to make EU industry less energy intensive and more competitive", cement kilns are among the major heat consuming processes. The share of energy costs in the cement production goes up to 30% of total production costs, therefore, like for Iron & Steel and Petroleum & refineries, the cost of energy being a high share of the value added, it significantly affects the cement sector competitiveness.

Drivers and means to improve energy efficiency in the cement industry

The Draft Issue Paper for the SET-Plan Action n° 6 acknowledges that for decades, EU industry responded to the threat of high and volatile energy prices by becoming more energy efficient. Between 2001 and 2011, the European industry has succeeded to reduce its energy intensity by 19%.

Energy Efficiency (both thermal and electrical) has been a priority since many decades for the cement industry as part of overall business decisions driven by economic and technological needs.

The EU cement industry has indeed been strongly impacted by the recession since 2007. However the slower progress in energy efficiency improvement for the cement industry is in fact not linked to the decrease in industrial activity but is rather linked to the significant challenge for the cement industry that the continuous efforts to increase efficiency are increasingly reaching the boundaries of the technological possibility.



As the Draft Issue Paper says technology is one of the important drivers to improve energy efficiency in industry. However, breakthrough technologies which could lead to a significantly higher thermal efficiency in the cement industry are not in sight. The specific fuel energy demand of clinker burning (as a global weighted yearly average) may decrease from 3,690 MJ/t clinker in 2006 to a level of 3,300 to 3,400 MJ/t clinker in 2030 and to 3200 to 3,300 MJ/t clinker in 2050.

However, without impairing efficiency these specific energy data can be higher if e.g. additional waste heat must be generated for the purpose of cogeneration of electric power. Similar considerations apply if Carbon Capture and Storage would have to be implemented.

For more information, please consult the **ECRA/CSI-Technology Papers**, ***State of the Art-Paper No 1: Thermal efficiency of cement production: state of the art and long-term perspective***.

Use of waste as substitutes for fossil fuels and raw materials in the EU cement industry – co-processing

Thermal energy needs constitute more than two thirds of the overall energy consumed in the cement industry. Co-processing is thus a key economic component of the cement business in terms of fossil fuel savings with the replacement for waste fuels and biomass, and in terms of revenues from the environmentally sound and efficient waste treatment service the cement industry offers in the market.

Roughly 250 cement plants are distributed across the EU, and in virtually all Member States there is at least one cement plant in the territory. The alternative fuel share in the EU cement industry fuel mix is of nearly 40% (biomass included).

A remarkable feature of the cement process is the flexibility to different types of fuels and alternative fuels and materials. As a basic rule, wastes accepted as fuels and/or raw materials must give added value to the cement kiln either as calorific value from waste material or material value from waste material.

The cement industry, in cooperation with the waste management sector, has developed pre-treatment practices, like screening, blending and shredding to produce suitable materials from waste that meet the cement kiln requirements. This close cooperation with the waste industry allows selected waste streams to be converted for use in cement clinker plants kilns. Acceptance of these materials requires strict compliance with the agreed specifications.

Examples of hazardous and non-hazardous wastes used as fuels in the EU cement industry include used tyres, solid recovered fuels, waste solvents, animal meal, municipal sewage sludge, impregnated saw dust, foundry sands, filter cakes and fly ashes. Extensive monitoring of all the input materials is a feature of modern cement production. This high standard of quality control ensures our cement products are manufactured in compliance with European Cement Standards.

In the case of cement kilns burning 1 MJ of waste is as efficient as burning 1MJ of fossil fuel. As a result, more fossil fuels are spared when using the waste as an alternative fuel in cement production. Furthermore, the burning of waste generally leaves behind ashes. In cement production these ashes are fully incorporated in the final product, in effect replacing some of the raw materials that would otherwise have been added to the product.

For more information, please consult the CEMBUREAU brochure **"Sustainable cement production: Co-processing of Alternative Fuels and Raw Materials in the Cement Industry"**.

Technologies

We would like to provide you with the example of a cross-sectoral technology innovation that would bring electric energy savings in the cement industry, and also report on the potential for waste heat recovery which is more challenging in terms of economic feasibility and return.

Sectoral technologies

*Sectoral technologies are tied to **specific materials, processes or practices characterising a given sector**, e.g. the steel or chemical industries, but **also the cement industry**.*

Electric energy demand of the cement production process

Cement performance has an important impact on power consumption. For example, the higher cement's strength development, the finer it typically has to be ground, requiring significantly higher power consumption.

Taking as example the cement dry process, the total power consumption can be assigned to about:

- 5 % for raw material extraction and blending,
- **24 % for raw material grinding,**
- 6 % for raw material homogenisation,
- **22 % for clinker production (incl. solid fuels grinding),**
- **38 % for cement grinding** and
- 5 % for conveying, packing and loading.

As grinding processes consume most of the power in cement manufacturing, grinding technology has a major impact on total electric energy demand.

As one of the sectors united in the SPIRE PPP, the cement industry has strived to have a call for projects on process innovation with breakthrough technology on grinding. Significant opportunities exist to join forces across sectors targeting for research of new design for process and equipment enhancing efficiency (energy, material yield, productivity...) on this field.

For more information, please consult the **ECRA/CSI-Technology Papers**, ***State of the Art-Paper No 2: Electric efficiency of cement production: state of the art and long-term perspective***, and the **SPIRE Roadmap**, ***Key Action 2.4: More efficient systems and equipment***.

Cross-cutting technologies

*Cross-cutting technologies can lead to energy savings and energy efficiency improvements across many sectors when applied. They include e.g. **heat recovery**, energy efficient components (motors, electric drive…); enhanced process control and industrial symbiosis.*

Waste heat recovery in the cement industry

Normally the majority of waste heat emitted from a clinker kiln is used for the drying processes (raw material drying and grinding/milling, slag drying, sand drying, fuel drying and grinding).

The employment of cogeneration plants for steam and electricity or of combined heat and power (CHP) plants is, in principle, applied in cement manufacturing, and excess heat can be recovered from clinker coolers or kiln off-gases for district heating.

There are examples of waste heat recovery from cement plants for power generation in Sweden, Germany and Denmark, and for hot water in Sweden and Germany.

The techniques are applicable as long as sufficient excess heat is available, appropriate process parameters can be met, and economic viability is ensured, which for existing cement plants it is considerably challenging to meet.

Steam or hot water production only makes sense if industrial consumers or district heating exist in the neighbourhood (e.g. Aalborg), efficiency is limited by a low temperature level, investment cost are high for boiler turbine and power generator, economics are ruled by power price/CO_2 price, but can be improved by firing secondary fuels.

For more information, please consult the **ECRA/CSI-Technology Papers*****, Technology Paper No 5: Waste heat recovery***.

Energy Union priorities/Research and Innovation and Competitiveness SET Plan related actions - Additional priority 1: Driving ambition in carbon capture storage and use deployment:

Action 9: Step up research and innovation activities on the application of carbon **capture and storage (CCS)** and the commercial viability of **carbon capture and use (CCU)**.

We would like to draw your attention to the important projects that are being carried out in and by the cement industry which will help the EU meet this Energy Union priority.

Carbon capture and storage (CCS) and carbon capture and use (CCU) in the cement industry

All low-carbon roadmaps require a significant reduction of CO2, also in the cement sector. Correspondingly and according to CEMBUREAU, 60% of cement plants in the EU should be equipped with CCS technology by 2050.

Based on the need to develop this breakthrough technology, the European Cement Research Academy is investigating its technical and economic feasibility in its CCS research project. In the current phase IV of the project an oxyfuel pilot plant is being prepared, taking economic and technical issues into account.

A focus is also being placed on CO_2 reuse in cooperation with the University of Mons.

Please find attached ECRA's poster ***"The cement industry's approach to carbon capture"*** for the **High-Level Conference on Energy-Intensive Industries** on 15 February 2016.

<u>For the main expected outcome: To make specific recommendations on the priorities/targets proposed in the issues paper(s)</u>

a) Do you agree with the targets set in the issue paper?

Through its roadmap, SPIRE aims at integrating, demonstrating and validating systems and technologies capable (across all SPIRE sectors) of achieving two key resource and energy efficiency targets:

1. A reduction in fossil energy intensity of up to 30% from current levels through a combination of, for example, introduction of novel energy-saving processes (including enhanced use of optimisation techniques, monitoring and modelling via ICT tools), process intensification, energy recovery, sustainable water management, cogeneration-heat-power and progressive introduction of alternative (renewable) energy sources within the process cycle.
2. A reduction of up to 20% in non-renewable, primary raw material intensity compared to current levels, by increasing chemical and physical transformation yields and/ or using secondary (through optimised recycling processes) and renewable raw materials. This may require more sophisticated and more processed raw materials.

So the cement industry is prone to contribute to the overall target for the most energy consuming industries as in the table below, as long as conditions for the development of enabling projects are made feasible in the cement industry.

Priorities	***Targets***	***Indicators***
Sector specific R&I: Increasing the energy efficiency of our most energy consuming industries by increasing the cost effectiveness of existing technologies	*By 2030, the energy saving potential related to economically viable technologies (i.e. payback not longer than 5 years) is increased by 30% compared to the potential identified in 2015*	*Economic energy savings potential (payback not longer than 5 years)*

b) Do you think that the level of ambition is correct?

Yes, once again as long as conditions for the development of enabling projects are made feasible in the cement industry.

c) Are there any standing issue(s) in the way to reaching the proposed targets/priorities?

The development of enabling projects needs public and private funds. The EU cement industry is doing its part, but cannot go alone without investment from the EU in these projects.