

# Do we want concrete results on carbon?

In the first of our regular Technically Green columns concerning climate change issues, we see that the cement industry makes a huge contribution to global greenhouse gas emissions – so any concessions that prevent adoption of low-emission technologies are worrying, as this submission to the Federal Government outlines.

**C**ONCESSIONS provided to the emission-intensive, trade-exposed (EITE) sectors must be evaluated to ensure they don't stifle the adoption of, and prevent investment in, low-emission technologies.

Although the rhetoric associated with the design of the Carbon Pollution Reduction Scheme (CPRS) suggests it is meant to promote the cheapest carbon-abatement measures, on closer examination it appears that drafting of the legislation may compromise these aims. While passing enabling legislation and moving forward is critical, specific industry assistance measures require detailed and careful review.

This article reviews the outcomes of the CPRS legislation on the cement sector, one of the largest industrial contributors to global greenhouse emissions. The cement industry is responsible for about 2.5 billion tonnes of carbon dioxide emissions per year, or between 5 per cent and 8 per cent of total global emissions.

In this sector, the Federal Government's designation of clinker as the EITE activity will stall the uptake of low-emission cements.

Industry lobbyists aim to protect traditional high-emission cement production ("clinker") from carbon costs at the expense of cleaner cements. The proposed industry assistance measures will ensure that traditional cement producers are protected at the expense of cleaner alternatives, entrenching this high-emission industry in the Australian economy.

This design flaw can be easily rectified by ensuring that low-emission technologies are given a level playing field that reflects their contribution to emission reduction, and that traditional clinker production is not subsidised over available cleaner cements that don't use clinker.

In introducing the CPRS, Prime Minister Kevin Rudd, together with the Minister for Climate Change and the Treasurer, said that "by harnessing the innovation and efficiency of the market, the Carbon Pollution Reduction scheme will allow Australia to meet these serious targets at the lowest overall cost to our economy".

Through the implementation of a market-based emissions trading mechanism, the CPRS should, with minimal market

intervention, achieve the goal of least-cost abatement.

However, the Government has demonstrated its preparedness to intervene in the mechanisms of a pure emissions trading scheme.

Lobbying has enhanced concerns that a cap on emissions will cause movement of industry offshore to regions where such a cap does not exist. Aware of this, the Government has tried to design the CPRS to "get the balance right. This means securing Australian jobs and assisting households today, while at the same time moving to the low-pollution economy that will create the jobs of the future".

EITE industries operate in highly competitive markets, with Australian firms competing against imports in domestic and export markets. In most cases, EITE industries will not be able to pass on carbon costs associated with their products. The Government aims to protect EITE industries by providing free permits to industries that meet EITE criteria.

The most exposed EITE industries will receive 95 per cent of their required carbon credits free. Therefore, compensation to EITE industries will ensure that Australian firms remain competitive and protect Australian jobs.

But will EITE compensation promote emission reductions from the production or the consumption of these products?

Emission reductions will come from changing the way we do things. As a society we have four ways of reducing emissions:

- by changing the way we produce goods and services
- by choosing to reduce consumption of highly emission-intensive products
- by substituting lower-emission products for high-emission products (the same products, just differentiated by the emission intensity of the production process, or by a substitute product that provides similar utility but is not exactly the same), or
- by offsetting emissions through the planting of trees or sequestering carbon underground.

The mix of emissions reduction options should depend on what is the cheapest abatement measure. In different industries and for different products and services, one of these measures may be more important

than the other. Therefore, as each measure will likely be important, it is imperative that Government intervention in the design of the CPRS does not favour adoption of one of these mechanisms over the other.

The Government intends that the compensation provided to EITE industries will "maximise the incentive to EITE industries to adjust to a carbon-constrained future". But by shielding a sector or an industry from the impact of the CPRS through the provisions of free permits, the Government narrows the band of abatement options.

The provision of free permits for 95 per cent of emissions to an EITE industry effectively means that consumers of these products will see a small, if any, price increase (this is also limited because of the trade-exposed nature of these industries).

Therefore, the price signal required to encourage consumers to choose to reduce consumption, or substitute a high-emission product with a low-emission product with the same or similar utility, does not exist.

## THE GOVERNMENT HAS DEMONSTRATED ITS PREPAREDNESS TO INTERVENE IN THE MECHANISMS OF A PURE EMISSIONS TRADING SCHEME.

This eliminates options 2 and 3 above for reducing emissions.

Furthermore, option 4 is not relevant because emission intensive producers are not required to buy emission permits on market, therefore reducing the size of the market to which an offset generator could sell their excess permits.

Thus, if the Government is to shield an EITE sector from the impact of carbon costs and still meet its CPRS objectives, it needs to define the EITE activity in such a way that producers of cements are sufficiently incentivised to adopt low-emission processes or change input materials (option 1).

The CPRS White Paper proposes that EITE compensation will be provided to all companies that conduct a given activity. The Government will "assess eligibility >>

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>> and provide assistance on the same basis to all entities, new and existing, conducting a given activity”, where “an activity consists of the chemical or physical transformation of inputs to produce a given set of outputs”. Furthermore, the Government proposes that “activities should not be differentiated by the technology employed, the fuel used, the age of the plant, or the quality and types of feedstock used”.

Despite the above aims, it seems that the Government’s application of EITE compensation to the cement sector will not meet these objectives.

The Government appears to have narrowed the industry definition too far and therefore has excluded low-emission cements.

This does not meet the objective of providing assistance on the same bases to all new and existing entities, and does in fact distinguish between the input material and processes used to provide a set of outputs.

Thus, as currently proposed, the EITE compensation in the cement sector will not provide an incentive to adopt low-emission substitutes or to invest in research and design to undertake these activities on a lower-emission basis, actually stifling innovation in these sectors. Cement is the binding agent used to combine sand and aggregates to create concrete.

Concrete is a key building block of modern society and is essential for the building of roads, bridges and buildings.

Traditional Portland Cements are manufactured using a process called calcination, in which limestone is fired with a fossil fuel to form clinker.

Clinker is then ground to a fine powder to form cement. In the calcination process, carbon dioxide is released from the burning of fossil fuels as well as from the chemical conversion of limestone to clinker.

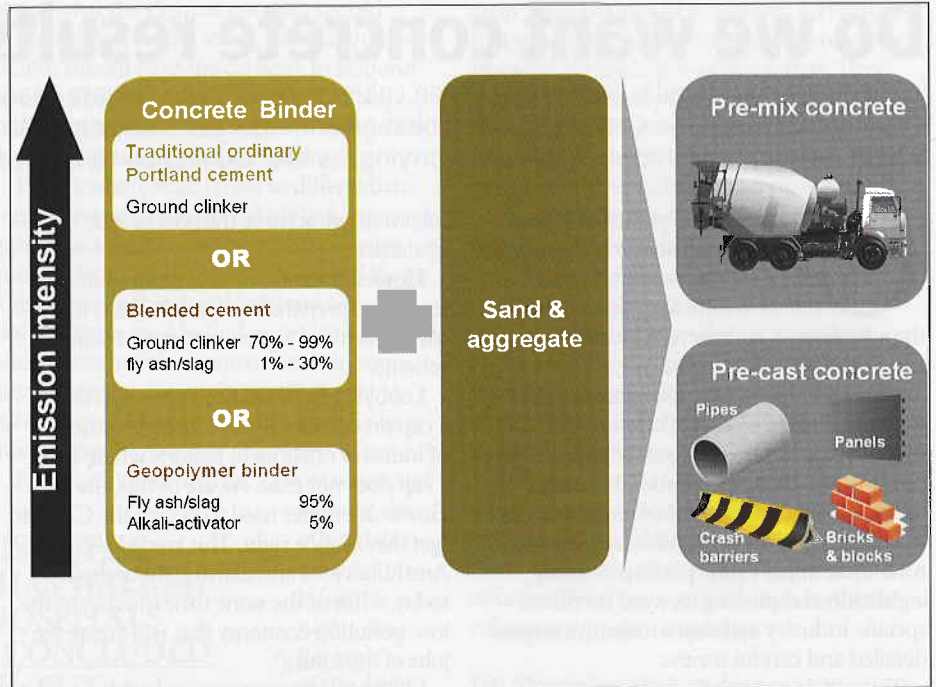
## ASSESSING CLINKER’S EITE STATUS

### Trade exposed

- 15 per cent of clinker is imported into Australia

### Emissions intensive

- CO<sub>2</sub> released through burning of fossil fuel and release during chemical reaction
- 0.9-1 tonnes of CO<sub>2</sub> is released per tonne of clinker produced
- Each tonne of cement sells for between \$120 and \$180
- Meets minimum threshold of >2000t per \$million revenue for 95 per cent compensation



Clinker meets the definition of a highly affected EITE industry and will receive 95 per cent of emission permits free (see Box 1).

## Assessing Clinker’s EITE Status

However, it is an incongruous situation that the Government provides permits to the most pollutive form of cement production and denies permits to cements that are less pollutive. Portland Cements are not the only binding medium that can be used to create concrete.

Blended cements that replace a portion of Portland Cement with fly ash or slag (known as supplementary cementitious materials (“Alternative Materials”)) are a proven effective binder. These are substantially lower in emissions than Portland Cement as each tonne of Alternative Materials used reduces emissions from cement by 0.9-1.0 tonnes.

New technology, currently being commercialised can replace 100 per cent of Portland Cement through use of a geopolymer binder.

These can be up to 80 per cent lower in emissions than Portland Cement.

In 2008, McKinsey reviewed global emission abatement opportunities in the cement industry.

It identified the greatest emission opportunity as the substitution of clinker by Alternative Materials. This is more than two thirds of low-cost abatement opportunities in this sector.

The Australian Cement Industry Federation concurred with this finding: “it is important to note there is no new technology

on the horizon that will enable the industry to significantly reduce its current emissions intensity for clinker. However, opportunities are present for further reductions in the emissions intensity of cement, such as the further addition of supplementary cementitious materials”.

In the way that the Government proposes

## HOW PERMITS ARE CALCULATED

Calculation of free permits to a manufacturer

- Emission intensity baseline x (1 – carbon productivity contribution) x 95 per cent x facility production

Emission intensity baseline

- Set by weighted average direct emissions per unit of production across all production facilities in the years 2006-07 and 2007-08

- Baseline not recalibrated during scheme, except for carbon productivity contribution

Carbon productivity contribution

- Rates of assistance reduced by carbon productivity contribution each year

- Carbon productivity contribution equal to 1.3 per cent per year

Facility production

- Based on previous year’s production
- Over/under production corrected in following year

>> to apply EITE compensation to cement, the provision of 95 per cent free permits will not provide an incentive for the cement industry to actively reduce emissions. Box 2 provides an overview of the number of permits provided to EITE manufacturers will be calculated.

## How the number of free permits are calculated

As Box 2 shows, free permits are provided to a facility owner based on the volume of a particular product produced. Therefore, if a clinker producer were to reduce the volume of clinker produced in a given year, it would reduce the volume of free credits that it is given. A manufacturer has no incentive to reduce demand for clinker and therefore has no incentive to promote the substitution of clinker by Alternative Materials or geopolymers, despite the emission reduction benefits.

In addition, reducing the amount of clinker produced will actually drive up per-unit production costs: lowest production costs occur when a clinker kiln is operated consistently at maximum production. Thus manufacturers are actively incentivised to minimise the volume of Alternative Materials that penetrate the cement market.

While clinker manufacturers are unable to benefit from an incentive to reduce emissions, producers and users of cements do not have an incentive to increase the use of Alternative Materials or alternative cement binder technologies.

The EITE compensation is aimed at ensuring that Australian EITE industries can compete with imports that do not face an emission costs.

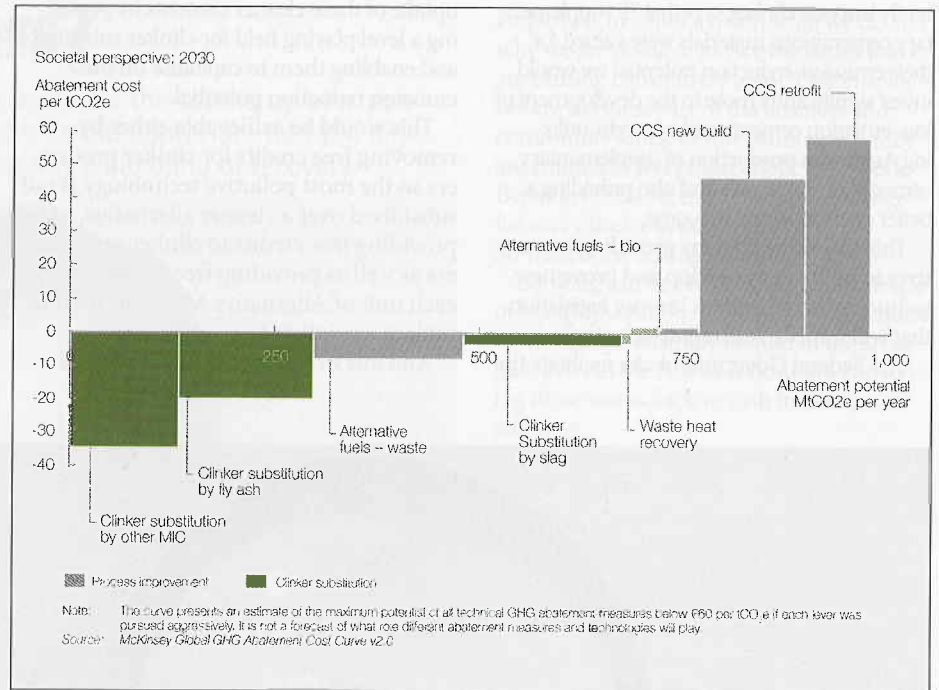
In simple terms, emission-intensive industries will not face a carbon cost under the CPRS and therefore consumers will not see a change in product pricing that reflects a carbon cost.

Thus consumers of cement will not have a pricing incentive to use low-emission cement alternatives.

There is an opportunity for the Government to deliver on its CPRS objectives in the cement industry by broadening the definition of the EITE activity to include use of supplementary cementitious materials.

Substitution of clinker with supplementary cementitious materials clearly will have an emissions reduction benefit. However, unless these materials are credited with their emission-reduction potential, there is unlikely to be any significant adoption of these materials.

Low-emission alternatives should be given a level playing field that truly reflects



their emission reduction potential.

## Global greenhouse gas abatement cost curve for the cement sector in 2030

Australia can increase the utilisation of supplementary cementitious materials without any need for a technical breakthrough. Work undertaken by the WWF-Lafarge Institute shows that world's best practice for the use of supplementary cementitious materials was Brazil with 35 per cent substitution.

Europe has reached 22 per cent. Australia has reached only 16 per cent. Providing an incentive for the use of supplementary should take us to at least world's best practice. New breakthrough technologies are currently in advanced stages of development that will enable 100 per cent replacement of cements by supplementary cementitious materials.

These technologies, broadly known as geopolymer technologies, can create a cement binder that has an 80 per cent reduction in carbon emissions. Geopolymers perform the same as traditional cements and are capable of creating concretes that are the same as, or better than, traditional cement-based concretes. The Geopolymer Alliance, an Australian concrete industry

based research group, noted that "[geopolymer] cements are in many ways superior to conventional cements and bring with them considerable 'greenhouse' credits". However, the Alliance believes that "crediting geopolymer cements with their emission reduction benefits, by allowing them to earn the carbon value from reducing emissions, will provide incentive for industry players to accelerate the development and adoption of

these technologies". Zeobond, a Melbourne firm that is commercialising geopolymers, commented that "many customers, including building and infrastructure

developers, are interested in low-emission alternatives cements", but that "until investment has occurred in the supply chain for these materials, these cement are likely to be slightly more expensive than traditional cements.

Allowing geopolymers to 'earn a carbon credit' or to gain a cost advantage due to their emission-reduction benefit will spur investment in this new supply chain".

Zeobond expects to have low-emission pre-mixed concrete available in Australia this year, and is currently producing pre-cast reinforced structural components. Wagners, an independent cement and concrete company that cur-

**CONSUMERS WILL SEE A SMALL, IF ANY, PRICE INCREASE ... THEREFORE, THE PRICE SIGNAL REQUIRED TO ENCOURAGE CONSUMERS TO REDUCE CONSUMPTION DOES NOT EXIST.**

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>> rently imports clinker, says that "if supplementary cementitious materials were valued for their emission-reduction potential we would invest significantly more in the development of low-emission cements and concrete, utilising Australian production of supplementary cementitious materials and also providing a better environmental outcome.

This should be done by providing incentives to industry to develop and prove new technologies rather than impose legislation that will impede Australian industry?"

The Federal Government can facilitate the

uptake of these cleaner cements by providing a level playing field for clinker substitutes and enabling them to capitalise on their emission reduction potential.

This would be achievable either by removing free credits for clinker producers so the most pollutive technology is not subsidised over a cleaner alternative, or by providing free credits to clinker producers as well as providing free credits for each unit of Alternative Materials used to replace cement.

And this would have the dual effect of

increasing innovation in the cement sector and reducing emissions.

*This article has been summarised from Zeobond's submission to the Department of Climate Change on the treatment of emission intensive trade exposed industries and the use of clinker as the activity designated for compensation under this scheme. Zeobond is a private company focused on the development, commercialisation and manufacturing of geopolymers technology. The full submission is available at [www.zeobond.com/press.htm](http://www.zeobond.com/press.htm).*



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