



World Business Council for
Sustainable Development

DRAFT SUMMARY (28th May 2008)

Future Technologies in the Cement Sector

Cement Sustainability Initiative (CSI) Workshop and Dinner Monday, 19 May 2008

WBCSD North America Office
German Marshall Fund, 1700 18th Street, Washington DC, 20009

Event participants:

- Over 40 experts including three cement equipment suppliers (FLSmidth, KHD Humbolt Wedag and Polysius)
- CSI members and industry associations from Europe, India, Japan and the Americas
- Other leading organizations and policy makers: International Finance Corporation (World Bank Group); International Energy Agency; CCAP (US based think tank); Environmental Protection Agency; Columbia University; Ministry of the Environment Japan (METI), World Resources Institute
- (Full participants list annexed).

Event background and purpose:

Together with a handful of other industries, the cement industry is in the spotlight of the current international climate change agenda to develop solutions to reduce harmful greenhouse gas (GHG) emissions. Markets in developing countries are growing, new plants are being built using best available technologies leading to high expectations for GHG reductions. However, research shows that new technologies are not being developed as rapidly as desired nor do they have the expected climate impacts.

The CSI's Task Force Climate Protection offered this international platform to industry specialists, equipment suppliers and academic institutions to exchange views and experience on the future technology needs of the cement sector and to better understand what different parties are doing or could be doing to address GHG emissions, resource and energy efficiency.

The objective of the workshop was to discuss future technology needs, highlight current developments, and identify key action needed to move forward.

Main topics of discussion:

While the workshop focused on what action points are needed by all stakeholders to move towards effective carbon emissions reductions through technology development in the cement sector, this summary is limited to the morning's discussion with the cement suppliers, being the highlight of the event. The three supplier presentations focused on current technology developments and their impressions of the energy and climate discussions for the cement sector. Noteworthy points in this context:

- The goal should be to use *all* waste energy *all* the time, e.g. through cogeneration or district heating – that the industry needs a ‘new concept’ for itself
- General agreement about the importance of academia both in future discussions and for enhanced R&D
- Based on the history of technology development in the sector, there was general agreement that at least 20-25 years would be needed to deploy new best available technology world-wide and even then, the impact on absolute emissions reductions will not be immediate because of the lag-time inherent in most technology development and deployment curves
- Energy efficiency alone is not sufficient to reach emissions targets
- There is no break-through technology available to meet potential targets
- A figure of potential and achievable absolute emissions reductions through existing and new technologies in the cement sector is absolutely required, but not available (yet)
- Industry needs a longer term vision – technology roadmaps and strategy should extend at least to 2050, similar to the scenarios developed by the oil and gas sector
- Industry should collaborate internally and not duplicate research efforts
- Carbon capture and storage (CCS) is one of the key options that the cement sector needs to explore with all parties, but it is likely that only 10% of cement plants (the largest) could be attached to a CCS facility. Many of the options are not viable for the sector because of operational or cost implications. More research is urgently needed, and messages to policy-makers, other sectors and financial institutions should be developed
- Industry should be more specific about what it needs from governments
- China and India *must* be part of the dialogue on technology development and deployment
- Financing options for technology development are available for the industry, for example co-financing projects with the IFC, and innovative financing tools are continually being developed
- Leakage and competitive issues are more important than previously thought for all industries

Generally the participants enthusiastically participated in the discussion. There was good representation at senior levels, including from Japan, India, and APP. Future dialogues, which all supported, should include Chinese colleagues.

Follow-up and outcomes:

The group agreed it would like to see a further workshop focusing on the same issues in China, planned for late autumn 2008, to coincide with a planned APP capacity-building meeting, or to link to events organized by the International Energy Agency, specifically related to a potential cement technology roadmap, the WBCSD/CSI/WRI GHG Protocol or energy efficiency data.

There are steps that can be taken to spread current best practice more widely, and the CSI should work towards these. In future discussions, it may be productive to consider approaching the issue from a product standpoint i.e. considering the possibility of making stronger materials that provide the same function as concrete, but with less mass and less clinker. There was also a request for collaboration and an alignment of messages between different members and associations, particularly in developing countries and in the US.

All presentations and detailed minutes are available from Caroline Twigg: twigg@wbcSD.org , or on the CSI website members’ corner (with the exception of the International Energy Agency presentation).

Annexed: agenda and list of participants with contact email

Attached: presentations from FLSmidth, Polysius, KDH Humbolt Wedag, Columbia University

DRAFT MINUTES

(28th May 2008)

Future Technologies in the Cement Sector

Cement Sustainability Initiative (CSI) Workshop and Dinner **9am, Monday, 19 May 2008**

WBCSD North America Office, German Marshall Fund, 1700 18th Street
Washington DC, 20009

1) Setting the scene: The cement plant in 2030

CSI members from Portland Cement Association (PCA), Cement Australia and Taiheiyo Cement Corporation provided overviews of the cement sector in their regions, and the enabling factors and barriers shaping the future of the industry there.

The **US overview** covered changes in US supply balance (consumption has overtaken production and this trend is set to continue), successes and details from US voluntary programs, and the promotion of sector-based outcomes. Regarding the policy context, the speaker discussed the AB32 Bill in California, the industry determination to avoid policies that create leakage through trade, the need to reconcile state and regional initiatives with the federal program, and the endorsement of mandatory GHG data collection and reporting. PCA participates in the White House Climate VISION program, EPA's Energy Star program, and is developing Energy Performance Indicators with the EPA.

The **Australia overview** focused on changes in climate change politics and policy, specifically focusing on the situation prior and during the election period in 2007. Since November 2007, Australia has assumed strong international leadership on climate change. The introduction of emissions trading in 2010 is expected to lead to significant economic and structural reform.

In the **APP overview**, the presenter outlined two focus areas: a) clean technology (Centre of Excellence in Beijing), and b) benchmarking (using CSI Protocol to set national benchmarks and targets).

Reactions to the presentations included:

- Comment on the vision being short-term in the industry – the International Energy Agency (IEA) are working on a 2050 vision and would like industry input
- Discussion of the (in)consistency between new US policy and what has come before i.e. inconsistency between the voluntary initiative and the overriding goal
- General agreement that governments and industry encourage the APP discussion, and that the process itself is important. China is expressing strong support with the APP approach to this sector's needs (but there was no workshop representation from China).

2) Presentations from technology suppliers

FLSmith and KDH Humbolt Wedag provided overviews of technology options and developments including alternative raw materials and fuels, conversion of old plants to new technology, power consumption possibilities, alternative clinker, and cogeneration. The suppliers' role is seen as supporting the permit process for the industry, understanding regulatory requirements, and transferring technology from other sectors. The agencies' role is to influence public perception through facts, promote an increase in cement additives, and encourage new technology development.

Polysius outlined a 'new concept' for the industry. Polysius stated that the goal should be to use *all* waste energy *all* the time, for example through drying, cogeneration, district heating, and oxygen enrichment. They focused on the need for technology application to be tailored to the specific characteristics of individual plants, and saw the suppliers' role as producing model concepts to be taken to companies for tailoring.

Selected discussion and reactions:

- Industry is seeking to quantify concrete emission reduction potential per best available or potential new technologies, but so far with little success
- All agreed about the key role of academia both as a key driver for creative R&D contributions and scaling up of pilot projects
- Leakage and competitive issues are more important in the energy and climate discussions than previously publicly admitted
- At least 20-25 years would be needed to further deploy best available technologies
- No best available technology or energy efficiency improvements alone will allow to reach future policy targets

3) Carbon Capture and Storage (CCS)

Heidelberg Cement and Columbia University presented on the potential of large emission reductions through CCS use in the future.

- CCS is a future key technology for the cement sector, but little is yet known about operational, legal and financial issues
- Some CCS technologies are not applicable for the cement sector (see presentations)
- Only about 10% of current cement plants can be linked to CCS, so the current numbers used by the International Energy Agency and others need to reflect such limitations
- More research and cross-sectoral collaboration is urgently needed
- Carbon neutral electricity will be achieved before carbon neutral cement
- Cement industry actually has the lowest average emission per source therefore cement plants will want to piggy back on others' pipelines
- Oil and gas sector currently have an issue with sulfur emissions, which they don't know how to remedy – the cement industry must be ready to address this also

4) Technology development and deployment and funding the gap

The **International Finance Corporation (IFC)** explained their view that technology development and deployment is not an issue of funding but of priorities. The IFC's view is that the cement industry is working with the lowest common denominator – making small steps which are well-researched and have a significant impact, but which are nevertheless timid for the industry (in response anti-trust rules were given as the reason for this from the CSI). The IFC would like to hear more from industry about how it can help to develop and deploy best available and future technologies in developing countries, notably China and India.

The **Environmental Protection Agency (EPA)** presented its emphasis on the polluter-pays principle, and explained its initiative to make all emission information available online for communities, which empowers communities to lobby plants near them – the EPA wants to see the cost of the product reflect the social cost it incorporates. The EPA stated that it viewed the CSI member companies as leaders in their field, and that it did not want to focus its efforts on enforcements of their operations, but that not all companies have such high standards. But most importantly it is key for industry to be able to state in simple and clear language what it requires from governments and why.

5) Encouraging R&D and innovation, and the role of Sectoral Approaches

The **International Energy Agency (IEA)** presented their scenario work on industry roadmaps and invited the cement sector, through the CSI, to work towards a cement technology roadmap with them

in the near future. The roadmaps that the IEA has been developing already with other sectors tend to focus on specific industries and look into the regional potential for technology uptake, the pathways to make uptake feasible, the key technology targets, timeframes, policy needs, and what areas they see for technology cooperation across sectors.

The IEA explained the two scenarios it is investigating, on a mandate from the G8 – the ACT scenario analysis (emissions stabilization) and BLUE MAP (emissions reduction) both reaching to 2050. Its roadmaps show the power sector must make the largest emission reductions, but *all* countries, particularly the major emerging economies, must contribute to reach the targets set. The IEA agreed with suppliers earlier that the potential for energy efficiency alone to have the reductions needed is not adequate. Their initial analysis shows the cost for CCS is higher than initially thought, and many technologies in BLUE MAP do not yet exist yet so their targets are optimistic.

Their data shows that 450 million tones would be saved today if every plant moved to best available technology immediately, and that CCS is inevitable if following BLUEMAP scenario, which does not include lifestyle changes.

The **Centre for Clean Air Policy (CCAP)** presented on the potential role of a Sectoral Approach for cement sector emissions reductions. Their work has shown that in the six largest emitting sectors, only a small number of countries account for most of that sector's emissions. CCAP recommends the cement sector builds on what developing countries are already doing: building approaches from the bottom up and investing in pilot projects with governments to explore the possibilities and incentives needed for scaling up.

CCAP states that the sector needs a package of technology finance and assistance incentives but suggest it could be reasonably easy if prioritized (e.g. setting aside 5% of Annex 1 countries' allowance value for advanced technology deployment would create US\$21 billion a year). It believes that the Department of Energy's spending in the US is set to decrease considerably, both absolutely and in relation to other R&D areas. They conclude that a post-2012 mitigation framework must provide a structure for developed countries to provide targeted financing for development.

CCAP also explained their partnership with the European Union's DG Enterprise (with CEPS, CCC, IDDRI and ZDW) to show 'proof of concept' (analytically, financially, politically) as to whether Sectoral Approaches should be part of a post 2012 framework, and if yes, how this can be achieved. It will consider 4 sectors in 3 countries (iron and steel, cement, aluminum, electric power, in China, Brazil, Mexico) and will feed into COP and UNFCCC discussions.

Discussion followed about incentivizing developing countries which already have high standard plants (e.g. Brazil, Mexico), and whether the larger goal of climate change could be better achieved without a focus on developed countries incentivizing countries to be more competitive. Since technology transfer is not a key issue for CSI companies, the points remain on main messages to policy-makers on the issues of incentivising business investments in innovative technologies.

6) Moving forward

CSI members shared their reflections on the day's discussion, including, but not limited to the following:

- There is a trend in Japan to merge the waste management and cement sectors, an approach from Asia but not being seen in China. The APP sees its collaboration as a good opportunity to share best practice, set targets and identify country barriers. CSI and APP present good potential to continue and expand collaboration in the future
- India shows an increased need for R&D on low energy cement and nanotechnology. Many opportunities exist that have not been explored to the full. This includes R&D on alternative fuel technologies
- The cement sector faces a common set of challenges around the world – including for example an inability to implement technologies as fast as the industry would want. Collaborative efforts like the CSI, APP, CEMBUREAU, JCA etc. should be used to disseminate common approaches

- There was a strong call not to duplicate research but to collaborate, for example investigating CCS potential together
- China is developing their technologies faster than elsewhere – it is not a case of ‘helping’ China, but collaborating with their governments and small and medium sized enterprises
- R&D needs to be enhanced in the cement industry
- Leakage is an issue also in the cement sector
- The cement sector needs to be involved in the discussions on a price of carbon and where this money should be spent, e.g. on tools that will help to scale up efforts
- It is unlikely that there will be a breakthrough technology for clinker production, but there *are* opportunities in concrete technology (not discussed at the workshop)
- Wish for a second workshop connecting to the Chinese cement industry, in collaboration with the APP Centre of Excellence in Beijing and forthcoming meetings in November 2008 in Beijing. This workshop should also include suppliers, and would discuss cement production as well as clinker production, with a focus on specific technologies.

List of organizations that presented and topics covered

Requests for the following presentations can be made to Caroline Twigg: twigg@wbcsd.org. For CSI members: all available presentations can be downloaded at the CSI member’s corner.

- US perspectives on climate change, Portland Cement Association (PCA)
- View from Australia, Cement Australia
- Views from the APP, Taiheiyo Cement Corporation and JCA
- Overview on technology development and implementation, FLSmidth attached
- Chances and limitation of technology developments, Polysius attached
- KHD Humbolt Wedag: attached
- Drivers of the US market, Holcim
- Drivers of the Indian market, Shree Cement
- CCS, Heidelberg Cement and ECRA
- CCS, Columbia University attached
- Technology development and deployment: financing the gap, IFC
- Technology development and deployment, EPA
- Encouraging R&D through technology roadmaps, IEA not available
- How can a Sectoral Approach encourage more R&D and implementation of innovative technologies? CCAP

AGENDA

Together with a handful of other industries, the cement industry is in the spotlight of the current international climate change agenda to develop solutions to reduce harmful greenhouse gas (GHG) emissions. Markets in developing countries are growing, new plants are being built using best available technologies leading to high expectations for GHG reductions. However, research shows that new technologies are not being developed as rapidly as desired or do not have the expected climate impacts.

Our roundtable dialogue offers an international platform for about 30 industry specialists, equipment suppliers and academic institutions to exchange views and experience on the future technology needs of the cement sector and to better understand what different parties are doing or could be doing to address GHG emissions, resource and energy efficiency.

The objective of the workshop is to discuss future technology needs, highlight current developments, and identify key action needed to move forward. This will certainly touch upon how industry sectoral approaches could encourage more efficient program designs and energy efficiency target implementation or facilitate the research and development possibilities for innovative technologies.

08.30-09.00	<p>Registration and coffee</p> <p><u>INNOVATION AND TECHNOLOGY – The needs and opportunities in the US</u></p>
09.00-10.00	<p><u>Setting the Scene: The Cement Plant in 2030</u> Cement production now and in 2030. Technology and innovation opportunities and needs. Current technology developments. Enabling factors and barriers.</p> <ul style="list-style-type: none"> • US perspectives on climate change. Andy O'Hare, Portland Cement Association (PCA) • Views from Australia, Stuart Ritchie, Cement Australia • Views from the APP, Toshio Hosoya (JCA) / Yoshito Izumi (Taiheiyo Cement) <p>Presentations and moderated discussion Moderator: Howard Klee, WBCSD</p>
10.00-12.30	<p><u>Innovation and Technology Development</u> What are cement industry, equipment suppliers and institutes doing to address GHG emissions? What is the potential of new technologies for the cement sector? Panel discussion featuring: raw materials for cement production, kiln technologies, waste heat recovery, fuels, and grinding.</p> <ul style="list-style-type: none"> • Overview on technology development and implementation. Steven Miller, FLSmidth • Chances and Limitations of Technology Developments, Uwe Maas, Polysius • Heiko Schuermann, KHD Humbolt Wedag AG • Drivers of the US market. Rob Davies, Holcim • Drivers of the Indian market. Rakesh Bhargava, Shree Cement <p>Short presentations and moderated panel discussion Moderator: Rob van der Meer, HeidelbergCement</p>
12.30-13.30	<p>Lunch</p>
13.30-14.30	<p><u>Carbon Capture and Storage in the Cement Sector</u> Status, potential, cost and other challenges. Incentives, policies needed.</p> <ul style="list-style-type: none"> • Rob van der Meer, HeidelbergCement • Frank Zeman, Columbia University

	<p>Presentations and discussion Moderator: Stefanie Held</p>
14.30-15.30	<p><u>Technology Development and Deployment and Financing the Gap</u> Financing innovative technologies and technology transfer: approaches, challenges, incentives, policies needed.</p> <ul style="list-style-type: none"> • Michel Folliet, IFC • Suzanne Giannini-Spohn, EPA <p>Presentations and discussion Moderator: Stefanie Held</p> <p>Coffee</p>
15.30-15.45	<p><u>TECHNOLOGY AND POLICY</u></p>
15.45-16.45	<p><u>Encouraging R&D and innovation, and the role of sectoral approaches</u></p> <ul style="list-style-type: none"> • Encouraging R&D and innovation through technology roadmaps: view from the IEA. Cecilia Tam, IEA • How can a sectoral approach encourage more research and development and implementation of innovative technologies? Dan Klein, CCAP <p>Panelists and discussion Moderator: Stefanie Held</p>
16.45-17.30	<p><u>Moving Forward</u> Key actions by the private and public sectors and financial institutions</p> <ul style="list-style-type: none"> • Andy O'Hare, Portland Cement Association (PCA) • Yoshito Izumi, Taiheiyo Cement Corporation • Rob van der Meer, Heidelberg Cement
17.30-18.00	<p><u>Closing: Reactions and Challenges</u> (all)</p>
18.00	<p>Close of meeting</p>
19.00	<p><u>Drinks reception and Dinner</u> Equinox Restaurant, 818 Connecticut Avenue, NW Washington DC 20006</p>

PARTICIPANTS

Curtis Lesslie	Ash Grove	curtis.lesslie@ashgrove.com
John Archer	Cement Association of Canada	jarcher@cement.ca
Stuart Ritchie	Cement Australia	Stuart.Ritchie@cemaust.com.au
Lluís Santapau	Cementos Molins Industrial	lsantapau@cmi.cemolins.es
Marco Bedoya	CEMEX	marco.bedoya@cemex.com
Carlos Medina	CEMEX	carlos.medina@cemex.com
Kevin Kelley	CEMEX	kevinc.kelley@cemex.com
Dan Klein	CCAP	dklein@21st-strategies.com
Paulo Rocha	Cimpor	Procha@cimpor.pt
Frank Zeman	Columbia University	fsz1@columbia.edu
P V Kiran Ananth	CII	kiran.ananth@ciionline.org
Eamon Geraghty	CRH	egeraghty@crh.ie
Suzanne Giannini-Spohn	EPA	giannini-spohn.suzanne@epa.gov
Gary Molchan	Essroc, Italcementi Group	Gary.Molchan@Essroc.com
Steven Miller	FLSmidth	steven.miller@flsmidth.com
Ole Mogenson	FLSmidth	om@flsmidth.com
Timothy Matz	Heidelberg Cement	tmatz@htcnam.com
Rob van der Meer	Heidelberg Cement	rob.vandermeer@heidelbergcement.com
Rob Davies	Holcim Cement	rob.davies@holcim.com
Erika Guerra	Holcim Cement	erika.guerra@holcim.com
Heiko Schuermann	KHD Humboldt Wedag AG	Schuermann.H@khd.de
Thomas Binninger	Humboldt Wedag, Inc	tbinninger@humboldt-wedag.com
Cecilia Tam	IEA	cecilia.tam@iea.org
Michel Folliet	IFC	mfolliet@ifc.org
Jigar Shah	IFC	JShah2@ifc.org
Nina Zegger	IFC	NZegger@ifc.org
Manuela Ojan	Italcementi	m.ojan@italcementi.it
Toshio Hosoya	Japan Cement Association	toshio-hosoya@jcassoc.or.jp
Craig Campbell	Lafarge	Craig.Campbell@lafarge-na.com
Masanori Iwasaki	METI of Japan	iwasaki-masanori@meti.go.jp
Andre De Fontaine	Pew Centre	defontainea@pewclimate.org
Uwe Maas	Polysius	uwe.maas@thyssenkrupp.com
Uwe Eschenhorst	Polysius	EschenhorstU@polysius.com
Andy O'Hare	Portland Cement Association (PCA)	aohare@cement.org

Rakesh Bhargava	Shree Cement	bhargavr@shreecementltd.com
M K Singhi	Shree Cement	singhimk@shreecementltd.com
Yoshito Izumi	Taiheiyo Cement Corporation	yoshito_izumi@taiheiyo-cement.co.jp
Scott Manning	Titan America	smanning@titanamerica.com
Stefanie Held	CSI, WBCSD	held@wbcSD.org
Howard Klee	CSI, WBCSD	klee@wbcSD.org
Caroline Twigg	CSI, WBCSD	twigg@wbcSD.org