TESTIMONY BEFORE THE

UNITED STATES HOUSE OF REPRESENTATIVES
SELECT COMMITTEE ON ENERGY INDEPENDENCE AND GLOBAL WARMING

SUBMITTED BY

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HEARING ON:

CONSTRUCTING A GREEN TRANSPORTATION POLICY: TRANSIT MODES AND INFRASTRUCTURE

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Good morning Chairman Markey, Ranking Member Sensenbrenner, and Members of the Committee. It is a privilege to appear before you today. My name is Erika Guerra, and I am responsible for Government Affairs and Corporate Social Responsibility at Holcim (US) Inc, a subsidiary of Holcim Ltd. Holcim (US), which has numerous facilities across the United States, produces cement -- the key ingredient that provides concrete with its unique properties, creating a durable and sustainable construction material.

I am here to testify to the benefits of increasing the use of concrete in reducing greenhouse gas emissions. Innovation is key to reducing CO_2 emissions. Holcim invests heavily in research and development with a focus on optimizing our processes and creating products that provide better performance with fewer natural resources. Holcim is committed to reducing its net CO_2 emissions per ton of cement on an ongoing basis.

I commend you Mr. Chairman, and the Committee, for your leadership in promoting innovative solutions to reduce the environmental impact of infrastructure construction by reducing domestic energy use and greenhouse gas (GHG) emissions.

Holcim as a Respected Leader in the Building Materials Industry

Headquartered in Waltham, Massachusetts, Holcim (US) Inc. is a leader in the US cement industry. Holcim produces and supplies more than 13.5 million tons of cement and cementitious products annually to 44 states. More than 3,000 Holcim (US) employees[1] generate over $1.5 billion in annual revenue. Over the last five years, we have invested in excess of $2 billion, upgrading and expanding our U.S. facilities, including the investment in our new plant in St. Genevieve County near St. Louis, Missouri.

Our parent company, Holcim Ltd is a global leader in the building materials sector, supplying over 150 million tons of cement and almost 200 million tons of aggregates annually, in more than 70 countries, on all continents. Holcim is considered a leader in sustainable development and for the last four years has been recognized as the "Leader of Industry" by the Dow Jones Sustainability Index for the building materials sector. Holcim seeks to minimize the environmental impact of its operations, and views its commitment to sustainable development as instrumental to its future prosperity. Specifically, Holcim is keenly aware of the specific challenges connected to climate change, and supports the social and political imperative for action on this pressing issue. In fact, Holcim Ltd is already engaged in mandatory greenhouse gas reduction regimes with 27 cement production facilities in 10 countries operating within the European Union Emission Trading System (EU-ETS).

[1] 2008 Figures

The Role of Cement and Concrete

Very little construction activity can be undertaken without the use of concrete. Having been used for millennia, it is quite literally the building block of modern society, and is the second most used commodity in the world after water.

Cement is the critical component of concrete, which is an environmentally responsible building product used to build and repair our country's vital infrastructure, the backbone of economic growth. When considering the lifetime environmental impact of a building material – extraction, production, construction, operation, demolition and recycling – concrete is an excellent choice. Because of the long useful life of structures and roads built of concrete, the energy consumption and GHG emissions related to its manufacture are significantly less than other construction materials. In addition, concrete pavements provide for significantly better vehicle fuel efficiency, and due to its light finished color, less electrical energy is needed for nighttime illumination. Nearly 50 percent of our product has an end use in the public sector in roads, airports, bridges, hospitals and schools.

It is important to distinguish cement from concrete. Concrete is the mixture we form into roads, bridges, buildings, and other structures. Cement is a powder that, when combined with water and aggregates, becomes the glue that binds the gravel and sand together and gives concrete its strength and rigidity. Cement is an energy-intensive material to manufacture. However, it only constitutes approximately 15 percent of concrete's volume. More importantly, concrete has eco-efficient properties that provide unparalleled sustainable benefits which overcome any drawbacks from the energy intensive manufacture of cement, the critical component of concrete.

The Portland Cement Association (PCA) expects that the combination of moderate economic and population growth will fuel an increase in cement demand over the next 20 years. Population in the United States is expected to grow by 63 million persons by 2030 compared to 2007 levels. The anticipated increase in domestic population will result in additional demand for housing, commercial buildings, public buildings and infrastructure – all boosting demand for cement consumption.[2] To meet this demand, further large-scale investment in cement supply must materialize to feed the United States' expected future consumption, either by means of further investment in domestic plants, import facilities or both.

Currently, there is no practical substitute for this versatile and durable construction material. As the key ingredient in concrete, cement is therefore a vital requirement of modern society, but its manufacture is a resource and energy-intensive process. Nevertheless, the sustainability of concrete can be further improved upon by mitigating the environmental impacts associated with cement manufacture. That is why eco-efficiency and sustainable development is at the core of our business, manufacturing more cement while using fewer resources and producing less waste and pollution per ton of product.

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[2] Ed Sullivan (2008) Portland Cement Association Cement Forecast

Manufacture of Cement

Cement is produced from naturally available raw materials such as limestone, shale, clay and sand. Our plants are strategically located based on the local availability of these ingredients. These minerals are ground to a powder before being heated in large rotary kilns to temperatures as high as 3,400 degrees Fahrenheit. This intense heat fuses the materials into nodules of an intermediate product known as clinker, which when cooled is ground with a small amount of gypsum to produce the gray powder known as portland cement. Different types of portland cement are manufactured for different applications by making small adjustments to the chemical components.

The GHG emission profile of cement manufacturing is driven by two manufacturing reactions. Firstly, common to all cement production is the chemical reaction that occurs when the calcium carbonate ($CaCO_3$) in limestone is heated, breaking down into lime (CaO) and carbon dioxide (CO_2). This calcination process accounts for half of all the GHG emissions associated with cement production. As limestone is the key ingredient in cement manufacturing, and CO_2 is released in a fixed ratio with the quantity of limestone used, the majority of CO_2 emissions are a direct consequence of the chemical reaction that is fundamental to the cement manufacturing process. Secondly, the intense process temperatures required are achieved by the combustion of fuels, which along with indirect emissions associated with the electricity used, account for the remaining 50 percent of GHG emissions.[3] As a result, the cement sector is a tangible contributor to global GHG emissions, producing around 4% of global GHG emissions and 5% of global CO_2 emissions.[4]

There is no doubt that portland cement manufacturing uses substantial amounts of energy, both thermal and electrical. In fact, energy is the largest cost component, and the domestic cement industry is one of the largest industrial consumers of fossil fuels. Nevertheless, the fact remains that the process emissions are completely unrelated to energy use, and account for the greatest proportion of the overall GHG emissions profile of cement manufacture. Therefore, novel strategies, beyond energy efficiency and adoption of low-carbon energy sources, must be employed to significantly reduce the GHG emissions associated with the manufacture of cement.

[3] 40 percent of GHG emissions for the manufacture of cement are attributed to fuel combustion and 10 percent is due to electricity use and transport.

[4] Bradley et al (2007) Slicing the Pie: Sector based approaches to International Climate Agreements, World Resources Institute, Washington, D.C.

Mitigating the Environmental Footprint of Cement and Concrete

Holcim has identified three principal levers central to our organization's ability to meet the challenge of future regulation of greenhouse gases, namely:

- Increased thermal and electrical energy efficiency through capital investment and process innovation;
- Reduced thermal CO_2 intensity through the use of alternative fuels, such as waste-derived fuels and biomass, replacing traditional fossil fuels, and;
- Reduced percentage of clinker in cement through the addition of supplemental cementitious materials.

Each of these three levers has an important emission reduction potential when evaluated across Holcim's entire portfolio of capital assets.

In applying the latest technology, there is potential for substantial global emissions reductions to be achieved through a shift away from old technologies such as wet kilns and vertical shaft kilns. However, the domestic potential is limited as no vertical shaft kilns are in operation here in the United States, and the shift from wet kilns to dry kilns has been underway for several years as companies invest in the face of increased energy costs.

The use of alternative fuels in place of fossil-based fuels can also lead to substantial emissions reductions, although their use is limited by local availability and policy constraints.[5] There is a potential to reduce the CO_2 emissions profile by replacing traditional fossil fuels such as coal with alternative energy sources such as scrap tires, plastics, biomass, and other waste derived fuels. The International Energy Agency estimates that globally around 2% of fuel used for clinker production in 2005 was from such alternative sources and that increased use of those fuels could reduce CO_2 emissions by around 100Mt to 200Mt per year on a global basis.[6]

Similarly, the use of supplementary cementitious materials (SCMs) can be an effective means to reduce the emissions associated with cement manufacture. Blending clinker with other cementitious materials reduces the use of the emissions-intensive clinker. Depending on the local availability of these cementitious materials and local cement standards and building codes, the reductions can be significant.

While improved energy efficiency and increased thermal substitution are undeniably important strategies, the focus of my testimony today will be on the use of supplementary cementitious materials (SCMs). Holcim believes that this is the most effective means to reduce the

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[5] Refer to U.S. EPA Draft Report "Cement Sector Trends in Beneficial Usa of Alternative Fuels and Raw Materials" for a thorough analysis of opportunities for increased utilization of beneficial use materials.

[6] J. Stephenson (2009). OECD General Secretariat. Roundtable on Sustainable Development. Post Kyoto Sectoral Agreements: A constructive o complicate way forward?

greenhouse gas footprint of cement, because, as SCM use increases in cement manufacturing, both process and fuel emissions are substantially reduced.

Current Situation on Specifications on SCM

The production of clinker is the major source of CO_2 emissions from cement manufacturing. In the United States, clinker makes up approximately 90 percent of Ordinary Portland Cement (OPC).[7] This high percentage of clinker in cement is not due to performance requirements, but rather prescriptive specifications for OPC which call for a minimum clinker content. The prevailing standards allow up to 5 percent clinker substitution with uncalcined limestone. However, by further substituting SCMs such as blast furnace slag, fly ash, natural pozzolans, or additional limestone for a greater portion of the clinker, a cement of equal performance characteristics can be made with a lower CO_2 footprint. This clinker substitution may occur at the cement plant by inter-grinding the supplemental cementitious materials (SCMs) with the clinker, as a direct replacement. Europe, Asia, and Latin America predominantly produce cements with lower percentages of clinker than in the United States, which reduces the GHG emission per ton of cement produced in those regions. However, obstacles exist in the United States that inhibit the domestic demand of blended cements.

Under direction from Section 6017(a) of the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users, the United States Environment Protection Agency conducted "a study to determine the extent to which procurement requirements, when fully implemented . . . may realize energy savings and environmental benefits attainable with substitution of recovered mineral components in cement used in cement or concrete projects."[8]

In its subsequent analysis, the EPA, in conjunction with the U.S. Departments of Transportation and Energy, found that SCM use yields positive environmental benefits, including energy savings, through lower resource consumption. In fact, EPA's life cycle analysis indicated that substitution resulted in significant reduction in greenhouse gas emissions, criteria air pollutants, and energy and water use. Nevertheless, the EPA report also found the existence of significant barriers to increased use of SCMs and greater realization of energy savings and environmental benefits. Obstacles to the increased use of SCMs in cement and concrete projects include technical barriers; legal, regulatory, and contractual barriers; and economic barriers. These categories can include a range of specific issues that have the potential to limit the use of SCMs.

For example, regulatory barriers may include certain state and local-level regulations and procedures governing the use of SCMs in various applications. Technical issues that limit the use of SCMs include:

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[7] OPC – Ordinary Portland Cement as defined by standard by ASTM C-150

[8] USEPA in conjunction with USDOT and USDOE (2008). Study on Increasing the Usage of Recovered Mineral Components in Federally Funded Projects Involving Procurement of Cement or Concrete to Address the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users

- the variability of standards for use of SCMs in portland cement and concrete and operational constraints with materials not typically used as SCMs;
- variation in SCM properties; and
- the availability of consistent, high-quality materials.

Potential economic factors limiting SCM substitution include:
- the SCM value to the supplier,
- transportation costs,
- the market price of SCMs, and
- disposal costs.

I would like to highlight a handful of the findings from the EPA-led analysis; specifically, those barriers that Holcim has found to be the most problematic in our continued efforts to reduce the greenhouse gas intensity of cement manufacture through the effective use of SCMs.

Acceptance of Materials Specifications

One of the most significant technical barriers related to performance-based specifications is gaining their acceptance over existing prescriptive materials specifications. Domestic standard-setting bodies have given some consideration to performance-based specifications; for example, the relatively new ASTM C1157 standard allows for performance-based cement blends, allowing higher clinker substitution as long as all technical requirements are met. Nevertheless, these high quality cements that achieve comparable performance are not readily used. For example, many state departments of transportation (DOTs) do not accept performance-based specifications for transportation infrastructure even when these cements meet all technical requirements. However, performance-based specifications may be accepted for other applications, often within the same state. In addition, there are multiple standard setting bodies creating the possibility of differences between the standards developed by each entity. This leads to a lack of uniformity in the acceptance, specification, and utilization of SCMs among state DOTs, even in neighboring States.

Bidding Procedures and Contractual Constraints

There are other legal, regulatory and contractual barriers; one having a significant impact on the use of blended cements is the bidding procedure and contractual rigidity associated with procurement of portland cement and other SCM-related products. Contracts generally discourage changes in cement mix design. To counter these concerns and provide a consistent product, a contractor will usually default to a portland-only mix or one that contains less of the SCM.

We recognize the efforts from greenbuilding code specifications as well as the acceptance of certain state DOTs of performance based cements; however, acceptance does not necessarily translate to use in infrastructure projects. An effective GHG reduction method through the consumption of blended cement calls for national acceptance of performance-based standards, and a preference for the use of these products led by Federal and State Governments.

Reducing GHG through the implementation of performance-based cement standards

The use of supplemental cementitious materials has the potential to significantly reduce the carbon intensity of cement manufacture. The main barrier to the use of these materials in cement is the nature of prevailing technical standards which prescribe the composition of cement needed to achieve required performance. An alternative approach is to use technical standards which are less prescriptive and more reliant on the required performance (performance based standards). Holcim encourages the development of unified performance-based specifications, with support from ASTM and AASHTO that ensure cement produced in the United States meets all technical requirements while affording producers the opportunity to innovate and develop new products.

Conclusions

As one of the largest producers of cement in the United States, Holcim (US) Inc. offers the following recommendations as the Committee considers legislation to further enhance the sustainability of our nation's infrastructure by mitigating the environmental impacts associated with its construction and repair:

- Public Policy should encourage the development of novel strategies beyond energy efficiency and traditional fuel substitution are needed to significantly reduce the greenhouse gas emissions associated with the manufacture of cement, an essential construction material vital to infrastructure development.
- The use of supplementary cementitious materials in cement production is a recognized GHG reduction strategy in Europe and Latin America, having been found to yield significant positive environmental benefits. New policy should explicitly encourage the use of SCMs.
- Future policy should direct that performance-based specifications be adopted to facilitate product innovation within the cement sector. New products, such as blended cements that incorporate supplementary cementitious materials, reduce the environmental impacts associated with concrete use while ensuring high performance and durability.

I sincerely thank you, Mr. Chairman, Ranking Member Sensenbrenner and Members of the Committee for your time, and I again appreciate this opportunity to speak about the linkages between infrastructure development and the global challenge of climate change.

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