

The Glencoe Project Cement Market

Executive Summary

The Glencoe project is uniquely positioned to feed into the current and growing US cement import market. The Glencoe plant will become the closest plant to the underserved New England market. Deep water port facilities and proximity will make the Glencoe cement the import of choice in the eastern US coastal markets.

The US cement market is expected to continue to rebound with strong growth in the longer term. The primary drivers will be population growth and infrastructure spending. The US population is expected to grow by over 90 million people between 2020 and 2050. This population increase requires further construction in housing, light and heavy infrastructure as well as highways. At the same time there is little or no growth expected in US domestic cement production. Increased productive capacity will be hindered by strict environmental regulations for new production facilities and higher capital and operating costs for cement producers. This will lead to a continuing ramp up in imports to all US waterborne markets. Figure 1 below shows the Portland Cement Association’s supply gap through 2035, indicating that over 60 million tons of cement will need to be imported per year by 2035.

Consumption in Excess of Long-Term Supply

Thousand Metric Tons

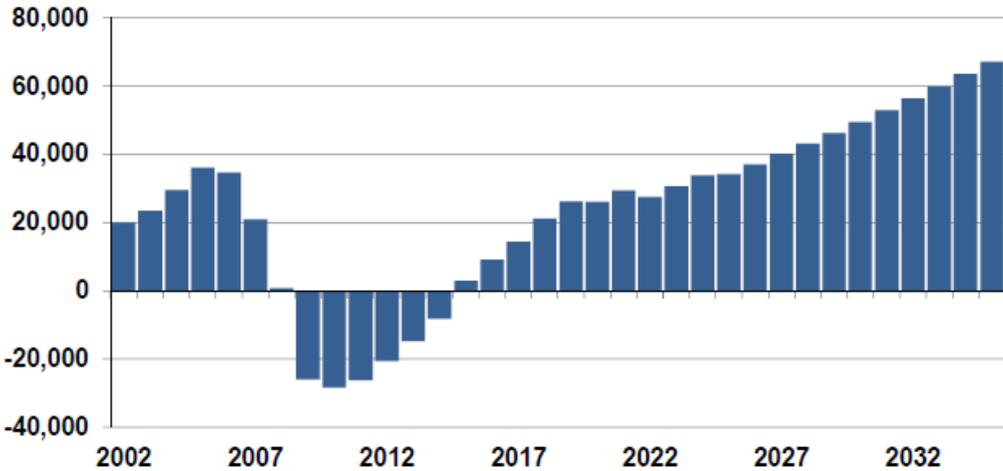


Figure 1: US Portland Cement Association’s estimate of US domestic cement import needs (2014)

The New England market is particularly attractive due to the high concentration of population and the scarcity of cement manufacturing facilities. A large portion of the New England population lives along the sea coast making water borne transport of cement to these markets an effective means of cement delivery. There is only one cement production facility in New England today which is in the state of Maine. This facility produces less than one million tons per year of cement. Other potential markets

include the remaining US East Coast down to Florida. In the 2007 / 2008 period, Florida alone was importing up to 5 million tons per year of cement.

The Atlantic Industrial Minerals, Glencoe Cement Project located in Cape Breton, Nova Scotia is well positioned to serve the Canadian Maritimes and US East Coast markets. Shipping from the straits of Canso positions the new plant as the closest cement importer to the New England and US East Coast markets. Canada has been a preferred importer of cement to the US over the years, due to proximity, reliability, and the stability of the country. Operating as a “Green” cement producer will provide a market pull for the Glencoe product.

Cement Consumption

Cement is an essential building material that is the key active ingredient in concrete. Concrete is consumed in virtually all building construction globally and is the most used commodity in the world after water. It is estimated that some 20 billion tons of concrete is installed every year. The world production of cement is close to 4 billion tons per year with over half of the production currently in China.

The main drivers for cement consumption are new housing, light and heavy infrastructure, and industrial construction. Housing starts can be closely associated with population increase. As the population grows, more housing is required and built. As new neighborhoods develop, light infrastructure such as shopping areas and schools are constructed. Finally heavy infrastructure such as highways and airports are developed. Industrial installations can follow as factories move to where the work force is.

On average 7 new homes are constructed in the US for every increase of 10 people in the population. This number would appear to be on the high side, but also includes replacement houses. Figure 2 documents the annual and average number of US housing starts per person of population growth over a 50 year period.

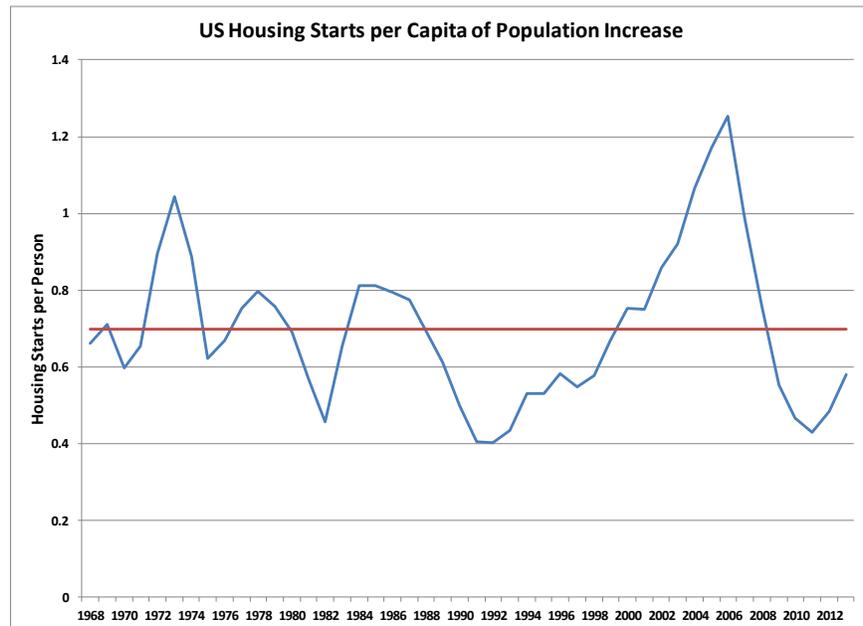


Figure 2: US Housing Starts per Person of Population Growth

Cement Consumption per Capita

The populations of Canada and the US are expected to continue to grow over the next 40 years. Projections from the respective Census Bureaus' indicate a higher growth rate in Canada. However the US population is an order of magnitude larger than Canada, so the increase in terms of number of people in the US is much larger. The population increase between 2015 and 2050 is expected to exceed over 100 million people between the two countries, with approximately a 90 million population increase in the US (total 400 million) and a 20 million population increase in Canada (total 55 million).

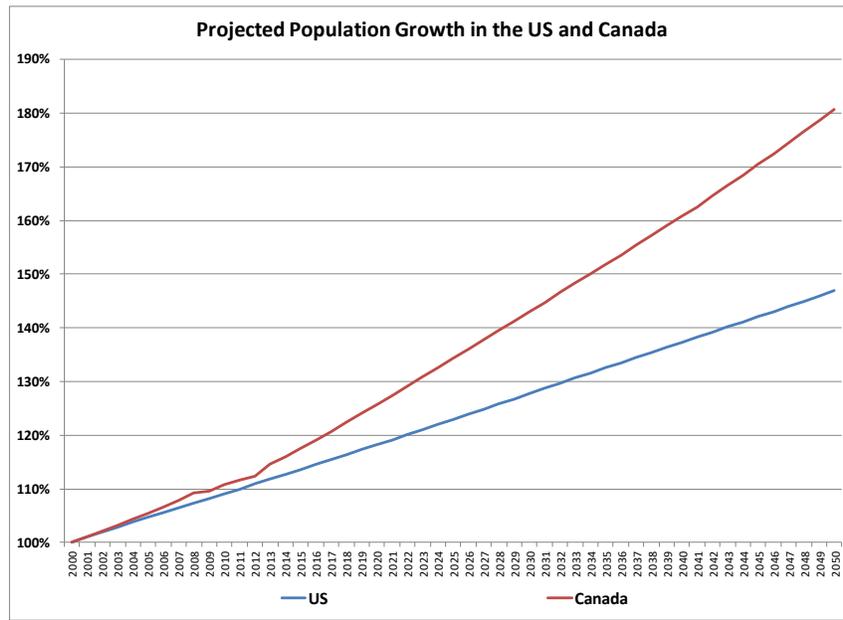


Figure 3: Projected population growth in the US and Canada

Another way to look at cement consumption is on a per capita basis. Most countries have a specific per capita consumption level based on their building practices and available materials. The 50 year average per capita cement consumption for the US is 335 kg per person per year. This is documented in figure 4. The Canadian per capita consumption for the past 10 years is slightly lower and also shown in figure 4 (historic cement consumption numbers for Canada before 2003 were not available).

There are several factors that influence the cement consumption per capita as mentioned above. However, cement and concrete are gaining in popularity as preferred construction materials due to:

- An increased focus on the life cycle carbon footprint of structures,
- An increase in focus on infrastructure and housing resilience in the face of climate change,
- The increase in oil prices that makes asphalt more costly than concrete in road construction, even in first build situation, and
- An increased awareness of the long term benefits of concrete highways.

For these reasons the PCA and others predict an increase in per capita cement consumption going forward.

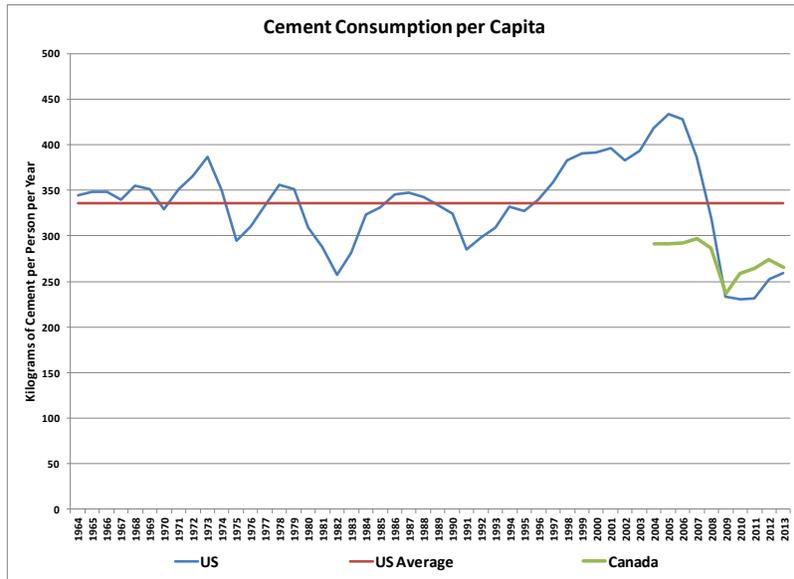


Figure 4: Historic cement consumption per capita for the US and Canada

PER CAPITA CEMENT CONSUMPTION METRIC TONS PER PERSON

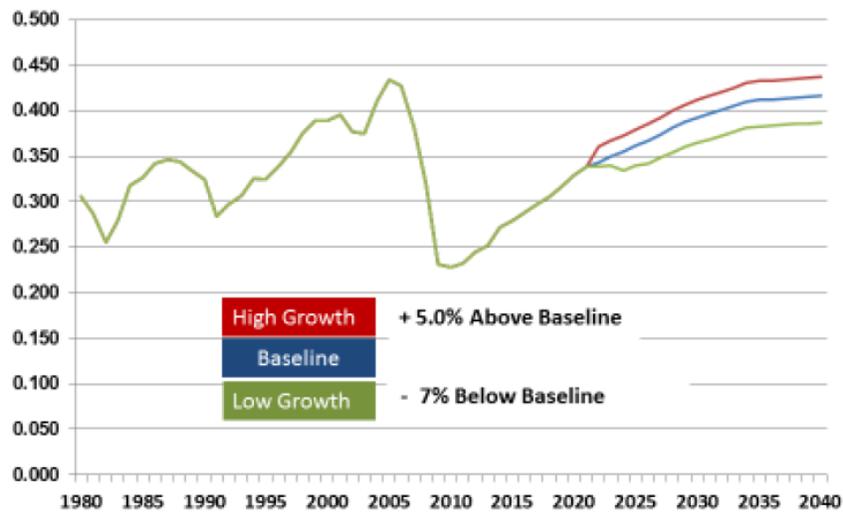


Figure 5: PCA Per Capita Cement Consumption Forecast (PCA 2016)

It can be clearly seen that the population growth in the US and Canada will be key drivers for increased cement consumption. The Portland Cement Association (PCA), an industry funded advocacy group, makes projections on the cement market on a regular basis. Their most recent forecast was released in November, 2016. The PCA projected the long term cement consumption trend as shown in figure 6 below. The current forecast is indicating a total US demand in excess of 160 million tons of cement by 2040 for the base case.

CEMENT CONSUMPTION

MILLIONS OF METRIC TONS

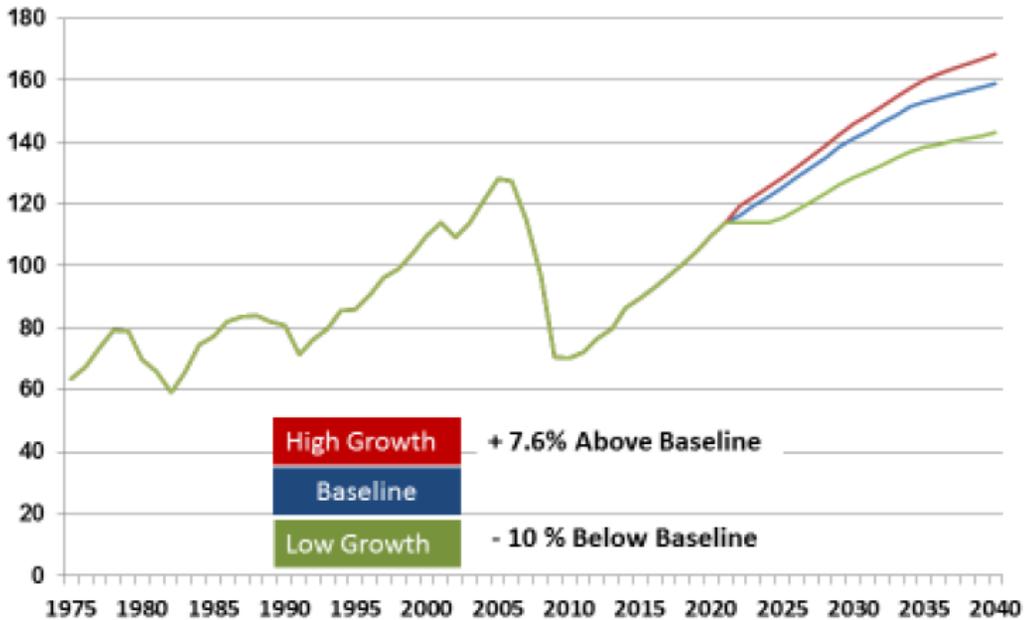


Figure 6: Expected US Portland cement consumption through 2035 (Source PCA 2016)

US Cement Imports

The cement market in Canada is much smaller than in the US with approximately 10 million tons of annual consumption. Canada has traditionally had excess cement production capacity and has been a long term exporter of cement to the US market. The cement industry in Canada is mostly in the Southern part of the country and exports are often railed or trucked to local markets in the northern US States. Cement is shipped from Canada to the US by Great Lakes vessels to the markets on the Great Lakes and Saint Lawrence Seaway. The Canadian industry was not hit nearly as hard as the US cement industry in the most recent recession. Figure 7 indicates the relative change year over year in the US and Canadian cement markets for the last 12 years using 2004 as the base year.

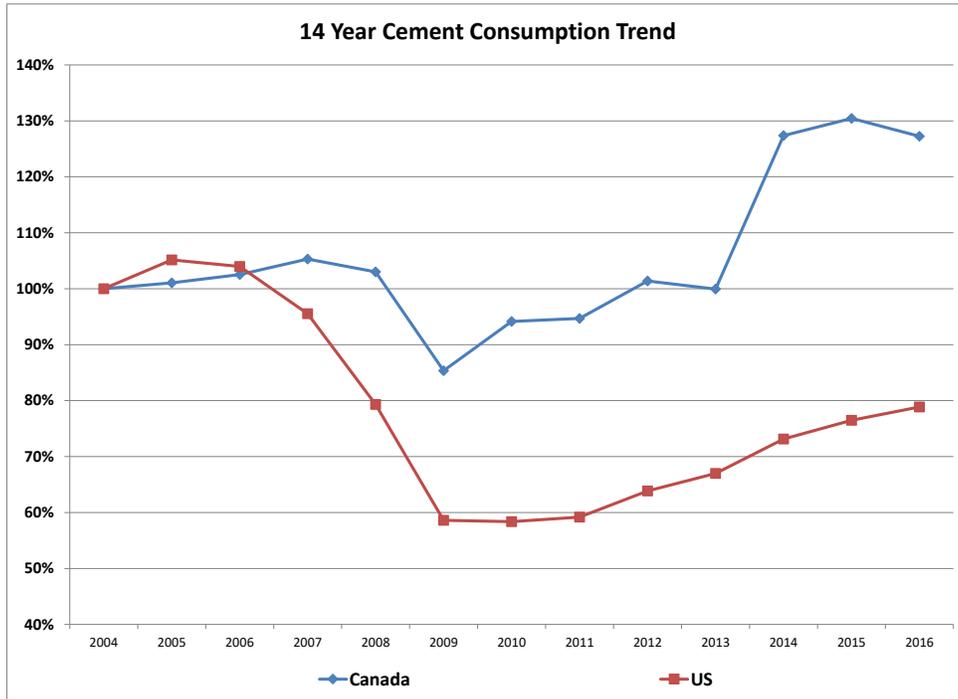


Figure 7: US and Canada Cement Consumption YOY Changes

US domestic Portland Cement Consumption last peaked at 128 million tons in 2005. At this time there was a gap between domestic supply and demand of 33.4 million tons. This supply gap was filled through imported cement from several countries around the world including Canada. Figure 8 indicates other traditional importing and exporting countries and the volumes traded in 2015.

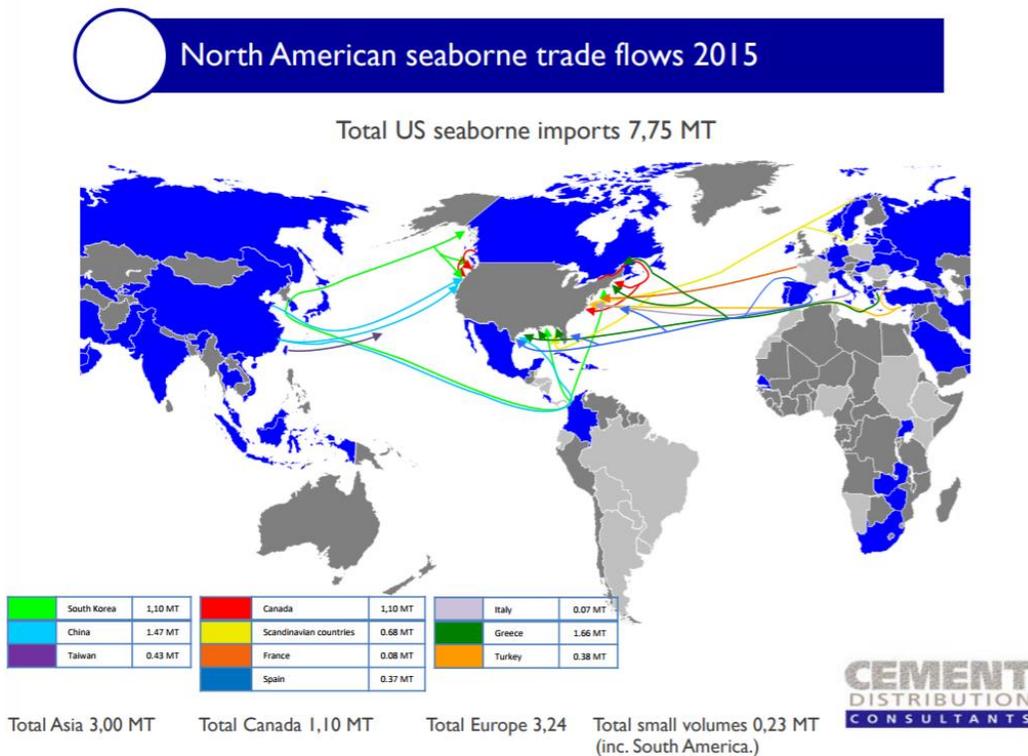


Figure 8: Top exporters of cement to the US in 2015 (Cement Distribution Consultants)

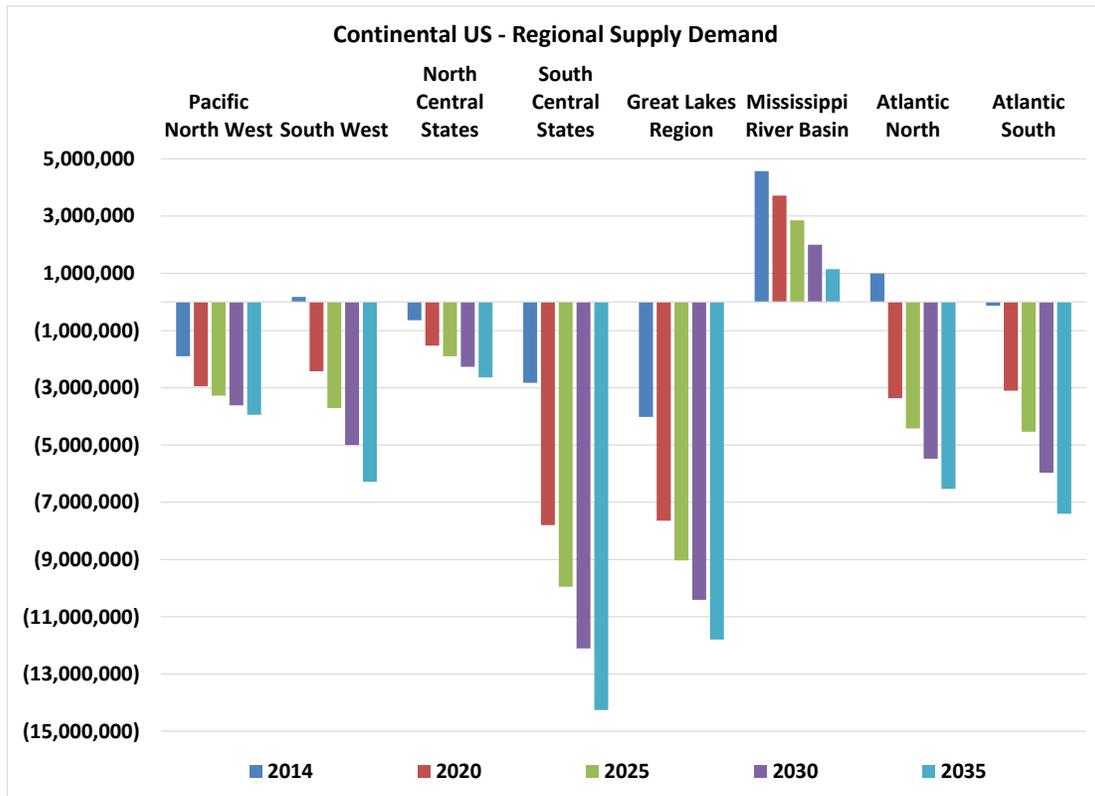


Figure 9: US Regional Import Needs through 2035 (Adapted from Cement Distribution Consultants)

Figure 9 indicates the imbalance in regional supply and demand in the US. This figure is based on the current installed production capacity. It can be seen that only one region in the US will have a sufficient supply of cement to meet its own needs. The Atlantic North and South regions show current and growing requirements for imported cements to meet anticipated markets. The Glencoe project will be the closest cement plant able to meet those growing import needs

Figure 10 indicates the recent US imports showing Canadian imports as a percentage of total US imports. Canada has an advantage over other exporting countries due to:

- Proximity to the US markets
- Consistency of product and supply
- Product quality
- Stability of the country

Cement importers prefer to work with single source suppliers, as that is what their customers prefer (primarily ready mix concrete). Cements from different sources have different characteristics even though they meet a common specification. The differences are enough that the concrete mix designs need to be changed when changing cement sources. Larger differences in cement characteristics mean higher costs to the customers, as concrete mixes need to be redesigned, field tested, and proven. Canadian cement imports have held relatively constant due to the limited ability to supply from the existing Canadian industry.

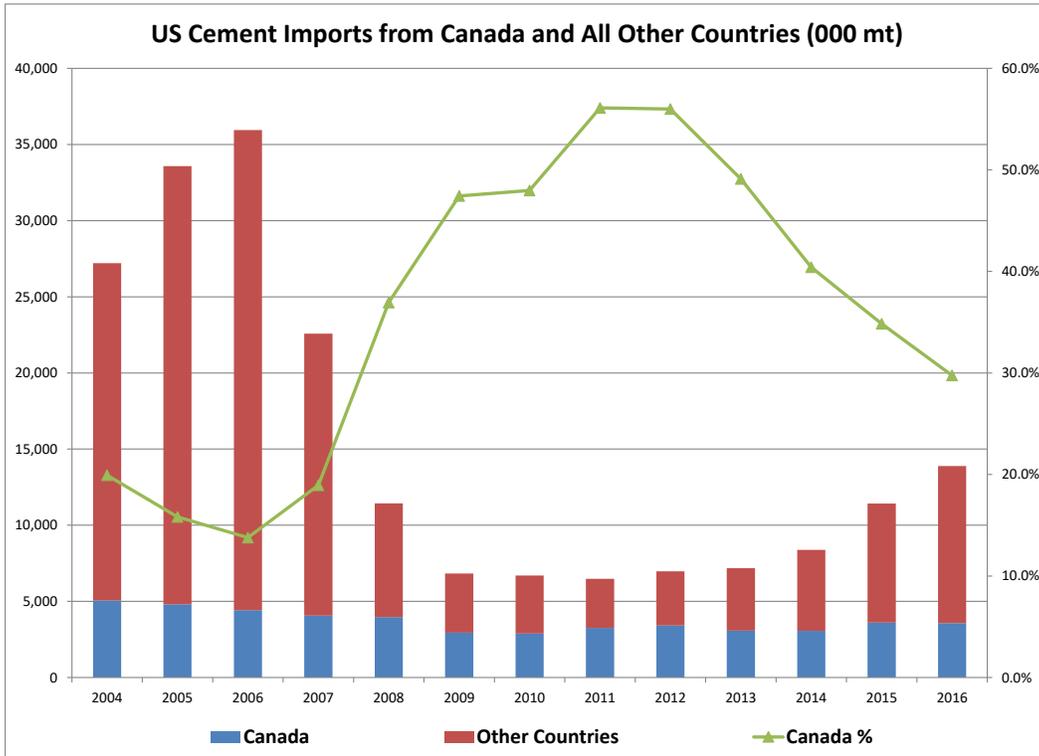


Figure 10: Total US cement imports and share from Canada

The US domestic cement capacity is currently around 100 million tons. Several new projects were brought on line since 2000. However, at least 18 cement plants closed either temporarily or permanently during the most recent recession. The majority of these facilities will remain permanently closed. The PCA has made a projection of the long term gap between domestic supply and consumption as shown in figure 11.

This projection assumes:

- 93% domestic capacity utilization,
- That 50% of announced expansion will materialize,
- That wet kilns will be permanently shutdown, and
- One third of temporarily shutdown plants will stay shut down.

Portland Cement Consumption: Long-Term

Thousand Metric Tons

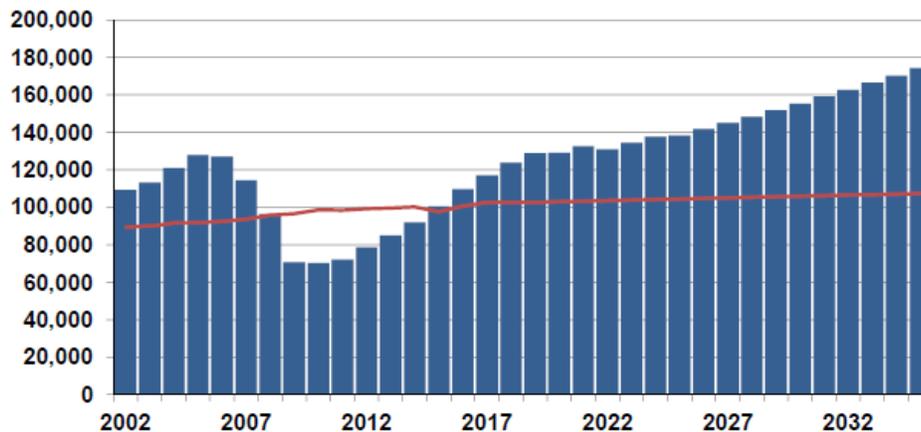


Figure 11: PCA Projection of domestic capacity (red line) and consumption (blue bars) (2014)

The difference between consumption (blue bars) and domestic capacity (red line) in the US defines the needs for imported cement. This can be seen more clearly in the PCAs projection shown in figure 12 below and figure 1 above.

Consumption in Excess of Long-Term Supply

Thousand Metric Tons

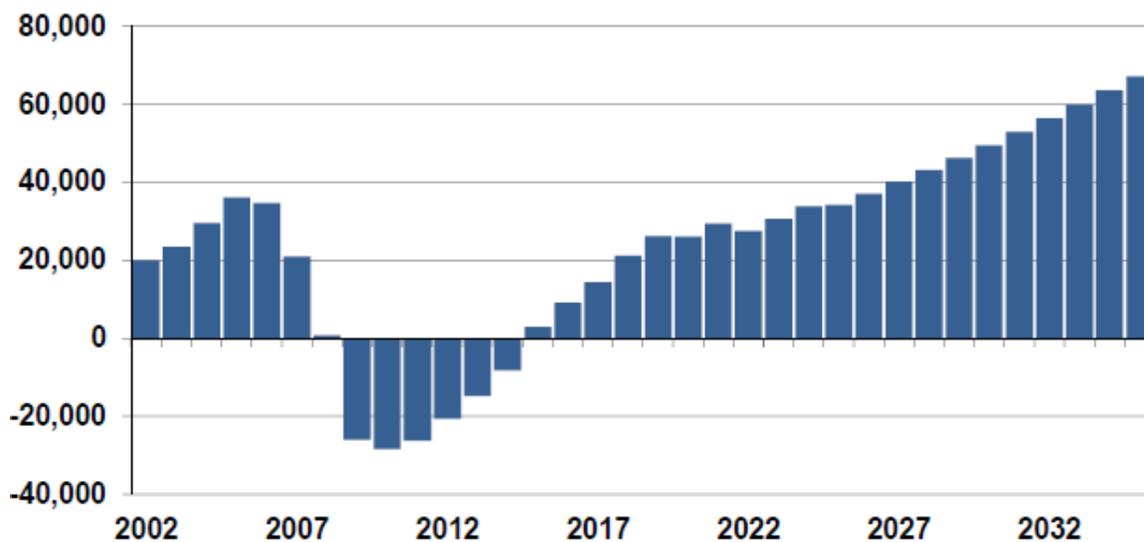


Figure 12: The volume of imports required to meet US domestic consumption (PCA 2014)

The US Market

The traditional New England states consist of Maine, Vermont, New Hampshire, Massachusetts, Rhode Island and Connecticut. In this analysis we have added New York State as both a major consumer and producer of cement. Furthermore, New Jersey has been included as a large portion of the New Jersey market is located around New York City. This area has a population of over 40 million people, (more than all of Canada). At the same time there are only 3 operating cement plants within these states. The implied market for this region based on the average cement consumption per capita of 335 kg per person is approximately 15 million tons today.



Cement Plants

Giant – Thomaston, ME

(2004)

Heidelberg – Glens Falls, NY

(1973)

Lafarge – Ravena, NY (1963)

Closed:

Holcim – Catskill, NY

Heidelberg – Catskill, NY

Projects:

Lafarge – Ravena, NY (2016)

Population (including NY & NJ):

43.9 million

Consumption:

15 million tons (@ 335 kg)

Figure 13: The New England Market showing existing and closed cement plants

Waterborne imports have also been imported all along the eastern seaboard during times of high import activity. For example import volumes in 2006 were:

- Pennsylvania 1.2 million tons
- North Carolina 0.95 million tons
- South Carolina 0.1 million tons
- Florida East Coast 2.3 million tons
- Florida West Coast 3.3 million tons

The projected supply and demand gap for 2020 will be close to the 2006 numbers. This gap is expected to grow by another 50% through 2025 and double again by 2035 according to the PCA projections.

Existing Cement Plants

The Elementia group out of Mexico operates the “Dragon” cement plant in Thomaston, Maine. This is an older plant that was modernized in 2004 with a low NO_x design, four stage precalciner kiln system. The modernization used a portion of the existing long dry kiln, but has a newly installed state of the art

cooler. The plant combines old and new equipment and is rated at around 750,000 tons per year of cement production. Cement is ground in ball mills.

Heidelberg (Lehigh Cement) operates a 1973 vintage 4 stage preheater kiln at Glens Falls, New York, about 50 miles north of Albany. According to the PCA the cement plant is rated at 502,000 tons per year of cement, however the kiln is rated at 586,000 tons of clinker per year (approximately 600,000 tons of cement equivalent). The kiln can produce more clinker than can be ground with the existing ball mills on site and some clinker is hauled off site and ground at another facility which increases costs.

Lafarge's 1963 vintage, 2 wet process kiln cement plant at Ravena, New York has been modernized and now includes a single 6,000 ton per day precalciner kiln with a new raw mill and environmental control systems. The plant still relies on the older ball mills for cement grinding. The modernization project improved the plant's environmental performance and reduced operating costs, but did not increase capacity.

Holcim operated a 1965 vintage wet process cement plant at Catskill, New York. This plant has been permanently closed and was rated at 636,000 tons per year according to the PCA.

Heidelberg (Lehigh Cement) operated a 1960's vintage wet process cement plant also at Catskill, New York. This plant was rated at 490,000 tons per year according to the PCA, and is now permanently closed as well.

Identified Projects

Several projects have been identified in the US eastern seaboard and eastern Canada. The US projects do not represent a large increase in capacity if they are ever fully enacted. The McInnis Cement Port Daniel project is also poised to serve the New England market.

McInnis Cement has completed the construction of a new 2 million ton per year Portland cement manufacturing facility in Port Daniel, Quebec. This new facility also targets the eastern seaboard of the US as well as Eastern Canada. This plant incorporates a state of the art 5 stage precalciner kiln design with vertical mills for raw materials, solid fuels, and cement grinding. The plant is currently being commissioned and has produced and shipped cement.

Holcim has completed a modernization project of their existing facility in Hagerstown, Maryland. This upgrade was the apparent result of a negotiation with the US EPA. The project brings best available technology to the existing plant and results in a modest capacity increase of 0.2 million tons per year. This facility utilizes a five stage precalciner kiln and a vertical mill for raw materials grinding. It is assumed that the existing ball mills are used for cement grinding.

Titan Americas has a permit to construct a new 2.4 million tpy cement manufacturing facility on a brown field site in Castle Haines, North Carolina. The permit has been extended, but little to no work has been completed on the project. The parent company has been hurt by slumping sales in their other key markets of Greece and Egypt. The future of this project is uncertain. This plant is unlikely to disrupt the New England market. The latest information indicates that a cement bagging plant only, will be installed in the coming years. This permit may have expired.

Houston America announced a project in Clinchfield, Georgia but this project has also been on hold for several years now. This plant is also unlikely to disrupt the New England market.

Holcim officially abandoned their “Greenport”, New York project after spending 18 years in attempting to get project permits. This state of the art Greenfield plant was supposed to replace the aging Catskill facility. The company faced strong opposition from local stakeholders. The property has been sold and is being developed for other purposes.

Colacem in Quebec had announced a new plant project several years ago as well. This project slated to be constructed in Eastern Ontario also appears to be dead at this time. There was some local opposition to this project as well.

Overall the Glencoe project targets the East Coast – US market with a focus on the new England states. The only significant threat to this market has been the construction of the McInnis cement plant in Gaspé, Quebec. However, there is sufficient needs for imports that even if 100% of McInnis cement was shipped to the US, the market would still be considerably short of cement.

The Glencoe Project

The Glencoe project consists of constructing a cement manufacturing facility in Cape Breton, Nova Scotia. The project will utilize the extensive limestone reserves on the Glencoe property estimated at over 500 million tons. These reserves are more than sufficient for 100 years of operation of a 2 million ton per year cement plant. The reserves are located on 1,296 hectares of land just off highway 105 approximately 40 km (30 minutes drive) East of Port Hawkesbury. The site has good road access, a rail line runs south of the site and a high voltage power line is available as well.

The clinkering plant could be built near the limestone quarry to optimize transportation costs. The clinkering plant could consist of a state of the art, precalciner kiln system, complete with vertical roller mills for raw material drying and preparation and solid fuel processing. A two-string, five stage preheater would be utilized for maximum fuel efficiency. All the raw materials are available locally, either on the site (limestone) or nearby (shale). The plant could be fired by a combination of solid fuels including coal, coke and wood wastes.

The cement grinding plant could be collocated with the clinkering plant or located at the port. There are pros and cons to each location and the site selection will be finalized as the project develops. The cement grinding facility will utilize vertical cement mills for low power consumption and the best utilization of space. Gypsum (approximately 4% of the product) is available locally and will help to keep raw material costs down. The overall project is expected to cost some \$800 million dollars for the Nova Scotia portion which includes a fully functional cement plant and shipping facilities. Straight operating costs are expected to be in the C\$60/t range with a breakdown as follows:

Variable Costs		
	Raw Materials	\$7.00 / ton
	Power	\$10.00 / ton
	Fuel	<u>\$12.00 / ton</u>
	Subtotal Variable Costs	\$29.00 / ton
Fixed Costs		
	Labor	\$12.00 / ton
	Maintenance	\$12.00 / ton
	Other	<u>\$7.00 / ton</u>
	Subtotal Fixed Costs	\$31.00 / ton
	Total Operating Costs¹	\$60.00 / ton

Cement would be shipped by ocean going vessel to one or more import terminals along the New England sea coast and south. There will be a small local market in Nova Scotia that would be serviced by truck.

Cement was selling for \$111 a ton (US average) in 2016. Cement prices are expected to stabilize around \$110 per ton as imports increase to absorb additional consumption. US cement manufacturing costs are increasing in the wake of the new environmental regulations. Cement companies usually operate with a gross margin in the 25% range when capacity is fully utilized.

Summary and Conclusions

The US cement consumption is climbing out of the worst recession in over 50 years. Cement consumption is expected to continue to grow year over year and possibly by double digits in future years. The delayed comeback has increased pent-up demand and should create an under supply situation in the coming years. Many older, less efficient cement plants have been closed during the recession, the majority of which are not expected to restart again. Some plants that have continued to operate through the recession may not be able to meet the new, much tighter environmental limits the last of which will come into effect in February 2018, possibly causing additional plant closures.

The US EPA has imposed much stricter environmental regulations on the US cement industry. In addition, CO₂ has now been classified as a pollutant in the US. Although the EPA has not taken action to date to control or reduce CO₂ emissions, the ground work has been laid to do so. California has implemented a cap and trade system for CO₂ management and reduction that could still be adapted by other states. It will be very costly to construct new cement plants in the US with these new regulations in place. For these reasons, the PCA is predicting a cap on domestic production of cement of between 100 and 110 million tons per year and a growing need for imports.

The New England market is particularly attractive due to its high population density close to navigable water and the lack of existing cement production facilities. Including New York state and New Jersey, the combined population of over 40 million is greater than all of Canada with a total cement capacity of only around 3.5 million tons today. The northeastern US has been a major importer of cement in the past and appears to be positioned as such in the future as well.

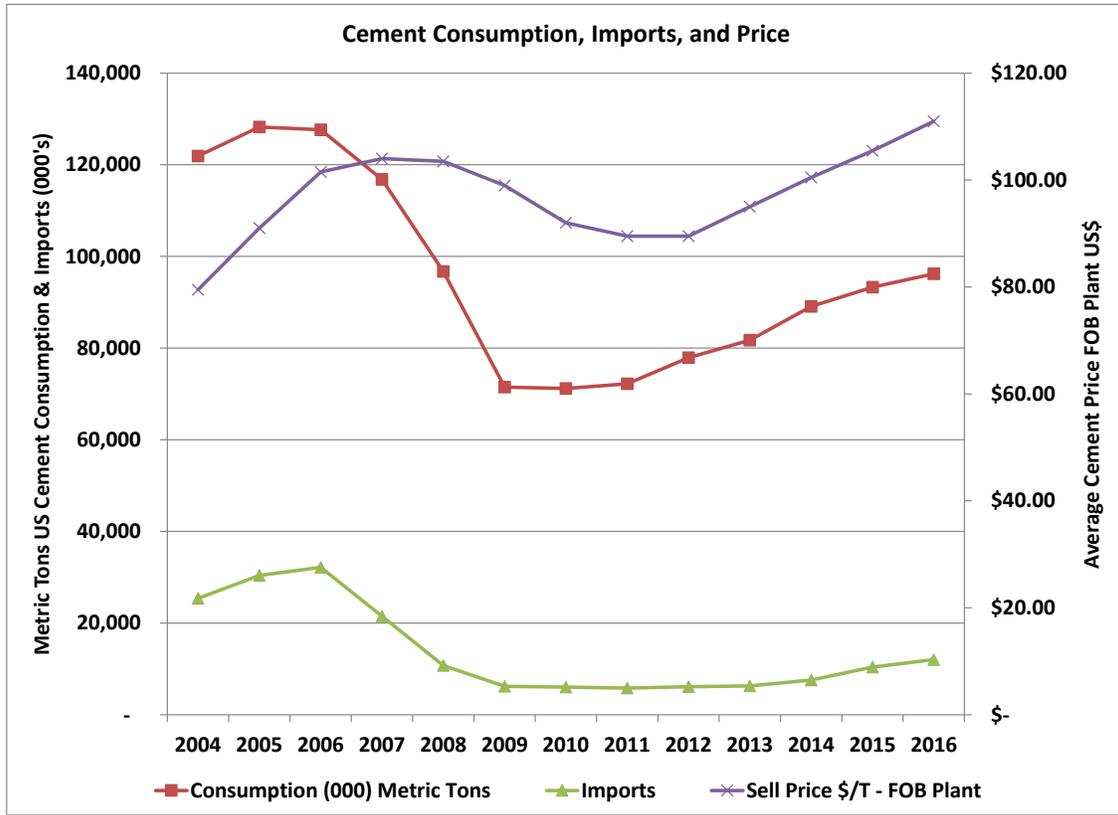
Canada has a favorable position in regards to US imports due to the country's close trade ties, proximity, stable government, and ability to supply a consistently sourced, quality product. The Glencoe project is favorably positioned as the closest plant to the New England market with deep water access. The business model appears to be validated by the McInnis project. The Glencoe project will, however, be closer to market. Both of these projects will incorporate complete new Greenfield projects with all state of the art equipment and the best environmental performance. Many of the existing US cement plants are of older design with less efficient operation and larger carbon footprints.

Undoubtedly there will be a need for vast quantities of imported cement in the US market. This need will become very clear in the years to come. The lead time required to build a cement plant requires early action to be taken to seize the market. The time to build the Glencoe plant is now.

1) Excludes SG&A, amortization, depreciation, and taxes

John Kline is a Chemical Engineer with over 40 years of experience in all aspects of the cement industry. John has lived and worked in the US, Peru, the Philippines, Jamaica, Canada, and France. John spent 21 years with Lafarge prior to his retirement in 2012. The last 18 years with Lafarge were in various executive positions, including; as Vice President of Engineering and Technology, based in Montreal and covering the 14 Lafarge cement plants in the US and Canada, and Vice President of Manufacturing for Lafarge in Western Canada, managing four cement plants.

Appendix:



US Cement market Historical Trends