FALL 2017

EXSHAW PLANT NEWSLETTER

Lower Carbon Fuels Research Project Submitted to Government of Alberta

DID YOU KNOW?

- Using an 80 per cent mixture of Lower Carbon Fuels could result in direct savings of nearly 300,000 tonnes per year of CO_2 from the Exshaw Cement Plant
- 30-40 per cent of a cement plant's direct carbon emissions come from the use of fossil fuels
- Research has indicated that some fuels can reduce carbon emissions by over 90 per cent for every tonne of coal replaced
- Estimating carbon savings depends on current fuel in use, thermal efficiency, amount of fossil fuel replaced, lower carbon fuel mix used, amount of cement produced
- A Human Health Risk Assessment, Air Dispersion Modelling and Traffic Impact Assessment have all found minimal changes with introducing Lower Carbon Fuels. This research is published here: lafargeexshaw.ca/reports.

I am excited to share with you that we have submitted our permit application to the Government of Alberta for our Lower Carbon Fuels Research Project.

We've regularly been asked why we are pursuing this research. While carbon pricing is a very compelling reason for developing the plan to replace fossil fuels, it isn't the only factor. Lafarge has made a global commitment to implement measures to reduce greenhouse gases, and the use of Lower Carbon Fuels is an important tool to reach this goal. By 2030, Lafarge wants to produce 40 per cent less net CO_2 per tonne of cement than in 1990, helping us remain the most CO_2 efficient global business in our sector.

A heartfelt thank you to all members of our Public Advisory Committee (PAC). You have invested lots of time into this project and we appreciate it. Thanks for sticking with us, guiding our work, and challenging us. We are proud of this approach.

Ongoing public input and consultation, with the PAC committee and three community Open House events, has been a critical aspect of this project. It has provided us an opportunity to engage with the community before submitting the permit and allowed us to understand your questions and concerns. It has also given community members the unique opportunity to speak directly with research partners and Lafarge experts.

Once Alberta Environment and Parks deems the application complete, the public has 30 days to file a Statement of Concern. In this newsletter, we've shared some of the frequently asked questions that we've heard. You can also visit our new website, lafargeexshaw.ca for more information. We will continue to keep this website up-to-date throughout the project. If you have any other considerations, please feel free to contact me directly.

All the best,

Jim Bachmann
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Photos (from left): Community members speak with Rustam Punja, Co-Processing Manager with Geocycle, at Lafarge's Lower Carbon Fuels Open House in the Exshaw School Gym. A community feedback board is a showcase for community questions raised during the Open House. Kids play with clay at the arts and crafts table.

What's on your mind? Community questions about the LCF research

To keep neighbouring communities informed, Lafarge Exshaw Cement Plant meets regularly with a Public Advisory Committee, has hosted three Open House events, and shared updates about the Lower Carbon Fuels research project through its website and this seasonal newsletter. Lafarge relies on these communications activities as a forum to answer questions related to emissions, air quality, economics, carbon tax, health impacts, job creation, traffic, storage, and more. For a full list of questions, visit lafargeexshaw.ca/faq.

What low carbon fuels will be researched?

Through this project researchers are analyzing construction renovation/demolition waste, non-recyclable plastic, carpet and textiles, shingles, treated wood products, wood products, rubber and tire fluff. These fuels have been successfully used at other Canadian cement plants.

How much will this reduce greenhouse gas emissions?

Using an 80 per cent mixture of Lower Carbon Fuels could result in direct savings of nearly 300,000 tonnes per year of CO_2 from the Exshaw Cement Plant. If indirect savings (processing, transportation, mining, etc.) are also included, this increases to nearly 774,000 tonnes per year. While sufficient data and research exists today to provide these numbers, it's important to note that there is a research and validation project planned that will assess these estimates. Earlier work has indicated that some fuels—construction, renovation, and demolition materials—can reduce carbon emissions by over 90 per cent for every tonne of coal replaced.

What is the anticipated increase in truck and rail traffic for the delivery of these fuels?

A Traffic Impact Assessment was completed by WorleyParsons in May of 2017 to assess the impacts of traffic related to introducing lower carbon fuels. The Plant anticipates an additional 15 trucks per day for Phase 1 of the project, and 24 trucks per day for Phase 2, a negligible increase (<1-2%) based upon 3rd-party expert WSP. The project is exploring rail delivery in future years as an alternative.

Is Lafarge seeking a permit for processing fuels onsite?

Lafarge is seeking approval from Alberta Environment and Parks to shred lower carbon fuels. This does not include the shredding of treated wood products due to risks raised by the community related to flammability. The processing of materials onsite will require an amendment to the MD of Bighorn's Municipal Development Plan and the Land Use Bylaw. Current plans are that railway ties will be shredded at another location and will meet all necessary requirements for permitting and environmental controls. Lafarge is proposing to build an LCF storage facility with processing capabilities including receiving, sorting, screening, blending, shredding, grinding, de-lumping, magnetic separation, metering, thawing, and other similar fuel processing activities.

If you do not end up burning these fuels, is there no carbon emitted?

If these materials are not used as fuels they may be landfilled or incinerated, producing CH_4 (methane) and CO_2. Replacing traditional fuels with lower carbon fuels produces less CO_2 globally.

What is the cost difference between lower carbon fuels and coal or natural gas?

While a lower cost is anticipated over time, significant investment is required to get the plant ready to use lower carbon fuels. Lafarge and its partners will need to invest over $20 million to build the supply chain and the fuel handling systems required. This investment includes equipment to collect, transport, process, and store the fuel as well as handling and injection equipment. There are also ongoing expenses including maintenance and operating costs, supply chain management, quality control, and compliance with permitting and environmental requirements. As the use of lower carbon fuels is more accepted by industry, the demand may exceed the supply for some streams, which may increase prices. This is partly addressed by having a wide variety of fuel categories tested for future use. Additionally, carbon pricing will raise the price of fossil fuels (coal, natural gas) and lower carbon fuels will be more competitive.

Why were these lower carbon fuels chosen?

The fuel categories selected are based on a market study of what types of materials are available in Alberta. The fuels chosen are currently in use at other cement plants and are predicted to have minimal effects on emissions while producing benefits such as lower carbon emissions, less landfilling, and new jobs.

What are the health impacts related to the different fuels? Long-term and short-term.

A Human Health Risk Assessment outlines the nature and magnitude of short-term and long-term health risks from the use of different lower carbon fuels. The assessment considers inhalation and exposure through food, water, soil and/or skin. The use of lower carbon fuels will not result in significant changes to emissions from the plant.

Will you still burn coal alongside LCF? Or will you continue to use natural gas?

We are permitted to burn both coal and natural gas and will keep the flexibility to run both.

If fuel is only half of the carbon, how will you work towards capturing the rest?

Lafarge is exploring carbon capture and monitoring the research being done by others. Currently the technology is unproven and costly. It remains a future option as development work continues. Lafarge is also exploring low carbon cements, carbon consuming concretes, energy efficiency, and working with our customers to use sustainable building solutions.

Would you be able to create jobs in the Bow Valley processing materials?

There would be four to eight direct jobs at the Lafarge Exshaw Cement Plant involved in the processing of materials. Jobs will be created at all points in the supply chain from collection, processing, equipment sales and maintenance, contractors, and construction activities.

How come we call these low carbon fuels? What is the difference?

Lafarge uses the term lower carbon to highlight that the

For a full list of questions, visit lafargeexshaw.ca/faq.

Photo: Community members speak with Jim Bachmann, Plant Manager, and Reda Anbari, Optimization Manager, at Lafarge's Lower Carbon Fuels Open House.

definition is relative to the fossil fuels replaced. If carbon emissions are lower than traditional fossil fuels, it is considered a lower carbon fuel.

Why can't the plastic be recycled?

Many plastics are collected and recycled with great efficiency. However, some plastics are comprised of mixed materials that are not economically recyclable. Recyclers need to meet strict quality standards for resale. Plastic that gets infused with sand or glass from collection cannot be used and is landfilled. Landfill bound plastics are the target fuel supply stream for the Lafarge Exshaw Cement Plant.

What is in construction waste? Is there asbestos in the fuel?

Construction Renovation and Demolition waste (CRD) includes wood, concrete, asphalt, drywall, metal, roofing material, cardboard, papers, and plastics. Government regulations require a hazard assessment (including asbestos assessment) to be completed before any demolition/construction permit is issued. Asbestos is not known to have been used in any of these materials, except shingles and drywall. Drywall will not compose any portion of the CRD fuel and shingles do not contain asbestos at levels of concern.

Are there concerns about Criteria Air Contaminants (CAC) and other air pollutants?

Overall, emissions are not predicted to change based on recent research and experience at other cement plants. However, research partners will conduct before and after emission testing and these results will be shared with the community. The Exshaw Plant must remain within compliance of government emission limits designed to be protective of human health and the environment.

Has the LCF switch happened anywhere else in Canada?

Lafarge is involved in several research and development programs to convert Canadian cement plants from fossil fuels to lower carbon fuels. Some plants have been using lower carbon fuels for over a decade. The best data is from recent independently funded work at the Bath, Ontario plant and the Brookfield, Nova Scotia plant. Results consistently show insignificant changes in emissions and significant reductions in carbon emissions.

Where do the potential fuels come from?

Lower carbon fuels are typically sourced within a 300-kilometre radius from cement plants to keep transport costs low. Due to this economic reality, most of the fuels will come from Alberta with some sourced from other areas in Western Canada and the northwest region of North America.

Where will the fuels be stored?

Standards dictate that lower carbon fuels must be covered and the design for the low carbon fuel system includes an enclosed storage hall. Consistent fuel supply is necessary for efficient plant operations and interruptions in supply are best addressed by onsite storage.

Will Lafarge smooth over the effects of the LCF Study?

No. Lafarge is only one partner in the study but will actively participate in ongoing research, including the contribution of expertise and other resources. Testing results will be carried out by third parties and reviewed by all project partners independently. Results and their interpretation will be primarily the role of the academic research teams with advice and information provided from all research partners.

THANK YOU TO OUR PUBLIC ADVISORY COMMITTEE

Over the past year you've raised questions and concerns from the community that have challenged our work and made this research project stronger. We appreciate your time and effort.

- Dene Cooper, MD of Bighorn
- Paul Ryan, MD of Bighorn
- Bruce Gleig, Bow Valley Biosphere Institute
- Hal Rhetzher, Bow Valley Clean Air Society
- Aster Wang, Alberta Environment and Parks (Observer)
- Darcy Coombs, Lac Des Arcs community member
- Graham Lock, Lac Des Arcs community member
- Brian Thompson, Exshaw community member
- Michelle Eve, Exshaw Community Association representative
- Phil Brown, Exshaw Plant Millwright, Union representative

For a full list of questions, visit lafargeexshaw.ca/faq.

KEY FINDINGS: HUMAN HEALTH RISK ASSESSMENT AND AIR DISPERSION MODELLING

One of the key questions the research team has been looking to answer this summer, as part of an updated Human Health Risk Assessment (HHRA), is whether introducing lower carbon fuels will result in any change to health risk for the community. Research results show these fuels are not predicted to substantially alter the conclusions of the HHRA conducted in 2009.

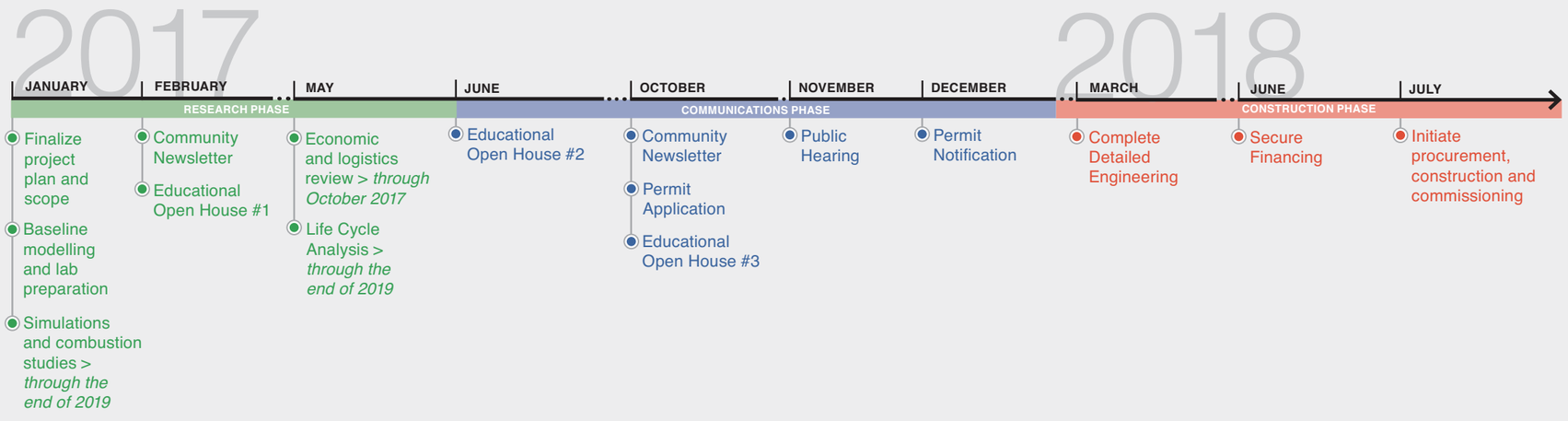
Air Dispersion Modelling has also shown positive findings. The same two pollutants from our 2009 Air Dispersion Modelling (Sulphur Dioxide, Total Particulate Matter) were flagged as having the potential to exceed the Alberta Ambient Air Quality Objectives. All other pollutants were below the provincial regulations.

Over the years, Lafarge has taken considerable steps to address these concerns, both by lowering Sulphur Dioxide emissions limits and by addressing Total Particulate Matter levels through the Fugitive Dust Management Program. Recent highlights of this program are included in this newsletter under Plant Updates.

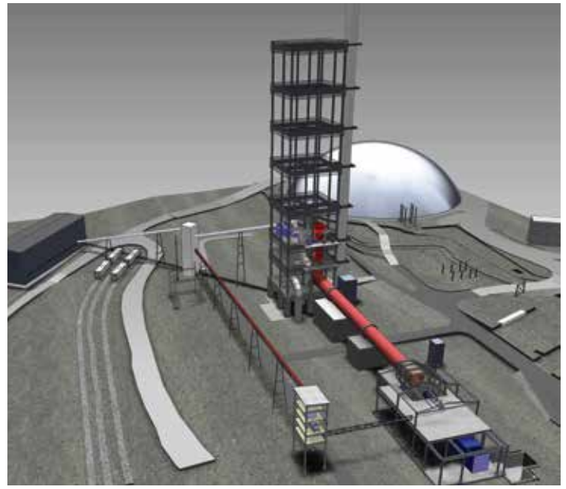
Both of these studies have taken a conservative approach. Third-party providers, Millennium EMS Solutions and WSP, measured the worst-case emissions for each chemical from all eight fuel types, the worst-case meteorological conditions from the past five years, and characteristics were used from the most sensitive individual in the population. These two critical research components are available on our new website, lafargeexshaw.ca/reports.

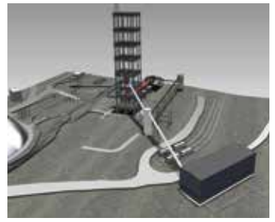
Timeline: what's happened and what's to come?

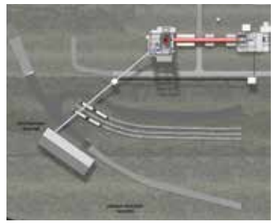
Research will measure environmental qualities associated with the sourcing, processing and full-scale commercial operation of each lower carbon fuel compared to natural gas and other fossil fuels. Advanced computers will simulate any potential atmospheric changes. These predictions will be compared to current operations and provincial air quality objectives and be used to confirm fuel use safety. The project will also measure the benefits of removing materials from landfills, technologies to improve fuel use efficiency, and optimization of the supply chain. Lab simulations, environmental studies, economics and logistics reviews are already underway. All research will be finalized by December 2019.



LOOKING AT TRANSPORTING AND STORING LOWER CARBON FUELS







Photos: 3D renderings show the preferred storage facility and equipment placement option up for consideration.

Lower carbon fuels not only need to get delivered here to Exshaw, they also need to be temporarily stored. The Research Project is working to identify how to safely store fuels at the plant, potential truck or rail traffic changes, and options for pre-processing on site.

Early-stage 3D renderings show a new proposed storage facility and equipment placement option for consideration. Where the new storage equipment will be placed on the site and the equipment needs are all dependent on the fuel source choice.

"This location is preferred due to the proximity to road entrance for onsite vehicle traffic flow. The proposed storage site location is also preferred because of better conveyor access to Kiln 6," said Reda Anbari, Optimization Manager, adding that the size and exact layout of the building is still being determined.

Lafarge has also developed early-stage estimates for the number of delivery trucks associated with the two future phases of the proposed fuel changes. For Phase 1, where LCF account for 50 per cent of total kiln fuel (120,000T/year), Lafarge is estimating 15 inbound trucks per day (310 days/year). For Phase 2, where LCF amounts for 80 per cent of total kiln fuel (200,000T/year), Lafarge is estimating 24 inbound trucks per day (310 days/year). A Traffic Impact Assessment was done in May 2017 to put these changes into context of total local traffic patterns; the project is also exploring rail delivery in future years as an alternative. The Traffic Impact Assessment will be made available here: lafargeexshaw.ca/reports.

Plant Updates

Thanks to input on plant operations from surrounding communities, Lafarge has been able to identify and move forward with the following initiatives:

Photo: New air quality monitor on Windridge Road.

Air Quality Monitoring

- A new air quality monitor on Windridge Road, compliant with provincial government regulations, is now completed and data is available online
- Ambient air reports and data can be viewed on the public air quality website, visit http://airquality.ca/clients/Lafarge_Public/
- Data is verified and displayed in weekly summaries and monthly air quality reports
- Summaries are provided for particulate levels, sulphur and nitrogen dioxide; meteorological summaries are also shown
- Lafarge now has two air quality monitoring stations and three industrial air monitors
- $PM_{2.5}$ continues to remain below Canadian Ambient Air Quality limits and historical levels for all monitors.

Continued on back page.

DISCOVERY CHANNEL CANADA COMES TO EXSHAW

Photos: Plant Manager Jim Bachmann conducts an interview in the EcoDome with Discovery Channel Canada videographers. Camera operators film the delivery process.

Documentary filmmakers from Discovery Channel Canada were onsite this April to produce a series about CP Rail to celebrate Canada 150. The focus on the Lafarge Exshaw Cement Plant was on the importance of red shale in the cement-making process, plant operations, market access, and shipping with a focus on the rail line. The documentary is expected to air this December/January.

Lafarge consumes 70,000 tonnes of red shale each year and receives weekly shipments from CP Rail. It is the main source of alumina in the cement mix and is a key ingredient in the manufacturing process. This mix that includes calcium, silica, alumina, and iron. It is one of the raw materials used along with limestone, sandstone, iron ore, and black shale; representing four per cent of the mix. Over the course of the day, videographers captured employees unloading product from the rail delivery, storage onsite, and how the product is transported to the raw mill.

"Red shale is a crucial component in our cement-making process, it also has the most complicated journey to get here. It's mined in Hat Creek, British Columbia, shipped by rail to Exshaw, unloaded by truck to our storage facility, then added to a cement mix that helps meet the growing infrastructure needs of Western Canadian communities," said Plant Manager Jim Bachmann.

Red shale plays a vital role in the workability of concrete. Use too little in the mix and it sets slowly, too much and it sets too fast. Getting the right mix is paramount and Lafarge invests in the latest technology and qualified staff to ensure the quality of the product.

During the cement-making process, red shale has a huge impact inside the kiln. It enables chemical reactions to occur during the liquid phase of the process. It also helps build a coating inside the kiln to protect the shell from high temperatures that can damage it.

Exshaw plays host to 250 cement industry professionals

As part of the IEEE, I.A.S. Cement conference held in Calgary in May, 250 delegates took a day to head west to the mountains and tour the newly expanded Lafarge Exshaw Cement Plant. Lafarge recently completed major upgrades and an expansion that has increased manufacturing capacity by over 60 per cent.

Delegates were treated to a full tour of the plant and adjacent quarry where the latest cement-making technology was on display. The tour concluded with participants enjoying an Alberta-style beef lunch while overlooking the beautiful view of the Rocky Mountains.

"It was great to hear such positive feedback from fellow cement industry professionals," says Bachmann. "Participants really enjoyed the tour and had great comments about the equipment information we provided, as well as how well maintained and accessible the plant was."

Photo: Lafarge Exshaw Cement Plant staff pose for a photo at the IEEE, I.A.S. Cement conference plant tour.

Plant Updates continued

Photo: Lafarge Education Endowment Recipients Nickolas Kunz (left) and Karey Suchan (right) with Banff Canmore Community Foundation Board of Directors member Kylie McKendrick.

Lafarge Exshaw Cement Plant's newly launched website, lafargeexshaw.ca.

Fugitive Dust Program

- Lafarge has completed 90 per cent of the hydro seeding planned for 2017
- Paving in and around the plant to support dust suppression will be done in the early-fall
- An additional cattle guard dust catchment has been added along the contractor entrance to help reduce the potential for dirt to be tracked onto the 1A Highway
- Overall Fugitive Dust trends are down, below previous low levels in 2012.

Flood Mitigation Support

- Lafarge has completed a project to clear debris from the Exshaw Creek Dam and reinforce the banks of the creek with large rip rap.

Lighting Plan

- Lighting improvement plan is finalized, highlights include timers and automatic shut offs
- Work is scheduled to be completed in the fall.

Noise

- Ongoing, third party noise surveying will continue in the fall.

Education Endowment Fund Recipients

- Congrats to 2017 scholarship winners Nickolas Kunz and Karey Suchan
- Lafarge Exshaw's $315,000 Education Endowment Fund provides two $5,000 scholarships per year to support Exshaw and Lac Des Arcs students' post-secondary education
- Visit www.banffcanmorecf.org for more information.

Lafarge Learning Education Initiatives

- Lafarge is developing the Lafarge Learning: Science, Technology, and Society Program for Grade 7 Students to be trialed this coming school year
- Lafarge Learning: Alberta Rocks and Minerals Program was trialed in 2016; 300 Bow Valley students, teachers and parents from six schools and nine classrooms took part.

FOR MORE INFORMATION

Lafarge in Exshaw would like to keep you in the loop on our activities through the Community Liaison Committee (CLC), website (www.lafargeexshaw.ca) and distribution of this community newsletter.

If you have any questions or concerns, or would like to be added to our Blasting Updates, call 403.673.5220 or email info.exshaw@lafargeholcim.com.