



Daniel O'Connor | President & Founder Energreen Solutions

Energreen Solutions primed to produce electricity from waste heat

How much is 24 megawatts of electricity? Enough energy to power 23,000 homes. It is also the amount of electricity that could be generated by recovering waste heat at Rio Tinto Alcan's manufacturing facility in Edmonton.

Energreen Solutions and Strathcona Works are teaming up for a cogeneration project that is expected to reduce emissions released from the facility and create new revenue streams. The project estimates greenhouse gas (GHG) reductions greater than 100,000 tonnes of CO₂e per year once implemented.

This promising technology solution is getting a funding boost from ERA's Industrial Efficiency Challenge. The total project value is estimated at \$70 million; ERA is providing \$10 million.

"The Strathcona Works project is one of many similar waste heat to power opportunities that are being developed. This is an exciting project," said Daniel O'Connor, president and founder, Energreen Solutions.

The Rio Tinto facility refines petroleum coke, a process that requires high temperatures. The ERA funded technology takes exhaust from the existing stack and uses it to boil water and create high pressure steam. A steam turbine,

connected to an electric generator, creates the emissions free electricity.

The electricity from the waste heat to power plant will offset higher intensity sources of power from Alberta's electricity grid, providing a steady income stream for the facility. It could also allow for a possible production increase.

"We generate a lot of heat. Our chamber produces energy at a thousand degrees and that would be transferred to this power generation unit," said Luc Côté, Plant Manager, Strathcona Works, Rio Tinto.

"Also, by reducing the temperature of flue gasses, an integrated Flue Gas Desulfurization system and filter can reduce sulphur oxides, nitrogen oxides, and particulate emissions from the facility."

Technologies like waste heat recovery can be adopted across industry sectors, leading to further emissions reduction and economic benefits for Alberta, Canada, and globally.



INDUSTRIAL EFFICIENCY CHALLENGE



Rustam Punja, Co-Processing Manager with Geocycle, and Kate Strachan, Lafarge Exshaw Cement Plant Manager, showcase low carbon fuels to community members during an Open House.

Lafarge targets 40% CO₂ reduction with introduction of low carbon fuels

Lafarge and its research partners are exploring the environmental benefits of introducing lower carbon fuels at its Exshaw Cement Plant. Building off research from four other Canadian facilities, this multi-partner project is the most significant of its kind in Canada.

While Exshaw's newly-modernized kilns are set up to use natural gas, they can be adapted to burn waste-derived fuels. Lafarge wants to replace 30 to 50 per cent of fossil fuel use at Canadian plants with lower carbon options by 2020. Exshaw's new Kiln 6 was designed to use up to 80 per cent.

This was one of 11 projects selected for funding from ERA's Industrial Efficiency Challenge. The total project value is estimated at \$44.3 million; ERA is providing \$10 million.

"This project will go a long way in helping us reach our ambitious corporate goal to produce 40 per cent less net CO₂ per tonne of cement by 2030. The support from ERA not only helps us

move this project forward, but it validates the work done to date," said Kate Strachan, Plant Manager. "Our hope is that any positive results or lessons learned will encourage others in the cement industry to do the same, giving this investment a greater, far-reaching impact."

Lafarge is evaluating eight fuel types, each selected based on a study of availability in Alberta: construction renovation and demolition waste, non-recyclable plastic, carpet and textiles, shingles, treated wood products, rubber, and tire fluff. These fuels are currently in use at other cement plants and are expected to reduce emissions, limit landfilling, and create new jobs.

"We'll need about 150,000 tonnes of lower carbon fuels each year. That will reduce the amount of waste going to the landfill and create around 100 jobs at a Calgary processing facility," said Strachan.

Research has included a Human Health Risk Assessment, Air Dispersion Modelling, Traffic Impact Assessment, and a Life Cycle Analysis to measure emissions associated with sourcing, processing, and full-scale commercial operation of each lower carbon fuel compared to natural gas.

COMMITTED TO CLIMATE ACTION

- ▶ ERA is a key partner in addressing Alberta's climate and economic priorities. We fund and de-risk late-stage technologies to reduce GHG emissions and help create competitive industries in Alberta.
- ▶ Our priority areas of investment allow Alberta to continue to grow its existing industries, as well as help diversify our economy with a lower GHG impact.

CONVENING RESOURCES FOR COLLABORATION

- ▶ The Government of Alberta provides grants to ERA. This funding comes from Alberta's large emitters who choose to pay into the Climate Change and Emissions Management Fund as a compliance option under Alberta's Carbon Competitiveness Incentive Regulation.
- ▶ We work with industry, government, and technology developers to make Alberta a hub for innovative ideas that reduce GHG emissions and improve economic competitiveness.
- ▶ We convene the resources—policy, regulatory, and business development tools—to steward projects toward commercialization.
- ▶ With our stakeholders, we developed a Technology Roadmap to guide investment decisions and inform our portfolio mix.

CREATING JOBS AND DIVERSIFYING THE ECONOMY

Technology is the engine of environmental and economic opportunity.



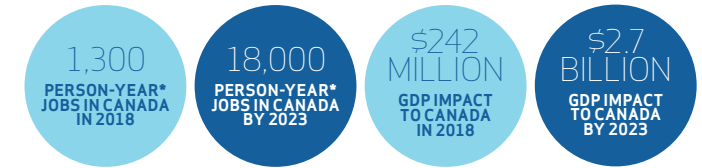
For every ERA dollar we commit to advancing new technologies, more than \$6 has been invested by funding partners.

FUNDING OPPORTUNITY	WHAT'S IT ABOUT?	ERA FUNDING	HIGHLIGHTS
GRAND CHALLENGE	Seeking technologies to transform CO ₂ from waste to value	\$34M	\$10M Grand Challenge winner to be announced in 2019
METHANE CHALLENGE	New methane detection and reduction technologies	\$31M	\$89M total value of projects supported and approximately 60 direct jobs
OIL SANDS INNOVATION	Late-stage, GHG-reducing technologies to help Alberta's oil sands industry remain competitive	\$61M	\$791M total value of 8 projects supported
INDUSTRIAL EFFICIENCY CHALLENGE	Technologies to increase efficiencies for Large Final Emitter (LFE) industrial facilities	\$70M	11 projects funded with a \$267M total project value
BEST CHALLENGE	GHG-reducing technologies in biotechnology, electricity and sustainable transportation	\$100M	Projects funded worth \$600M in total value

ALBERTA

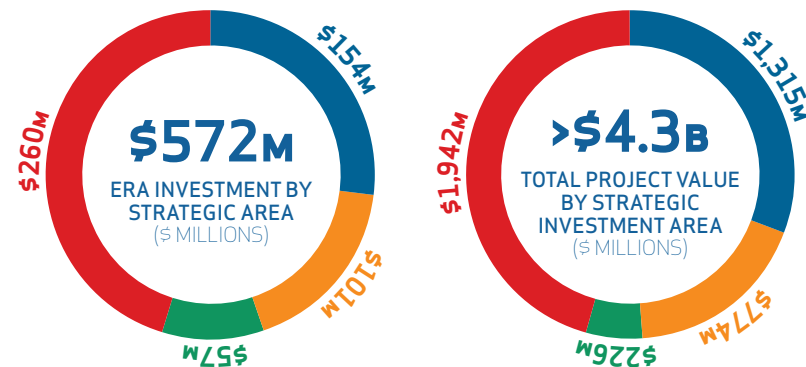


CANADA



*A person-year is equal to one-year of employment for one individual. Please note: economic impact is reported on a calendar year basis, not fiscal year.

INVESTING IN A DIVERSE PORTFOLIO



*In 2012, ERA provided funding for three adaptation projects in consultation with Alberta Environment and Parks.

164 Projects Total
\$572M ERA Funding
\$4.3B Total Project Value

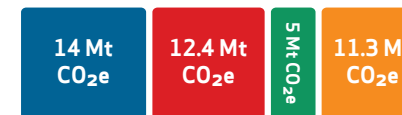
- ▶ Low Emitting Electricity Supply & Demand (26 Projects)
- ▶ Cleaner Oil & Gas (58 Projects)
- ▶ Low Carbon Industrial Processes & Products (34 Projects)
- ▶ Food, Fibre & Bioindustries* (46 Projects)

CUMULATIVE PROJECT EMISSION REDUCTIONS

7.8 Mt CO₂e Total by 2020



42.7 Mt CO₂e Total by 2030



ERA estimates our investments will result in emissions reductions of an average of 3.2 million tonnes of CO₂e per year. This is equivalent to reductions achieved by switching approximately 121.5 million incandescent light bulbs in homes to LEDs, or bringing 678 wind turbines online.

*We have estimated emission reductions for all projects with approved funding commitments and executed funding agreements and assumed the projects will continue successfully and as planned. Should circumstances change for these projects, emission reduction estimates may change materially.