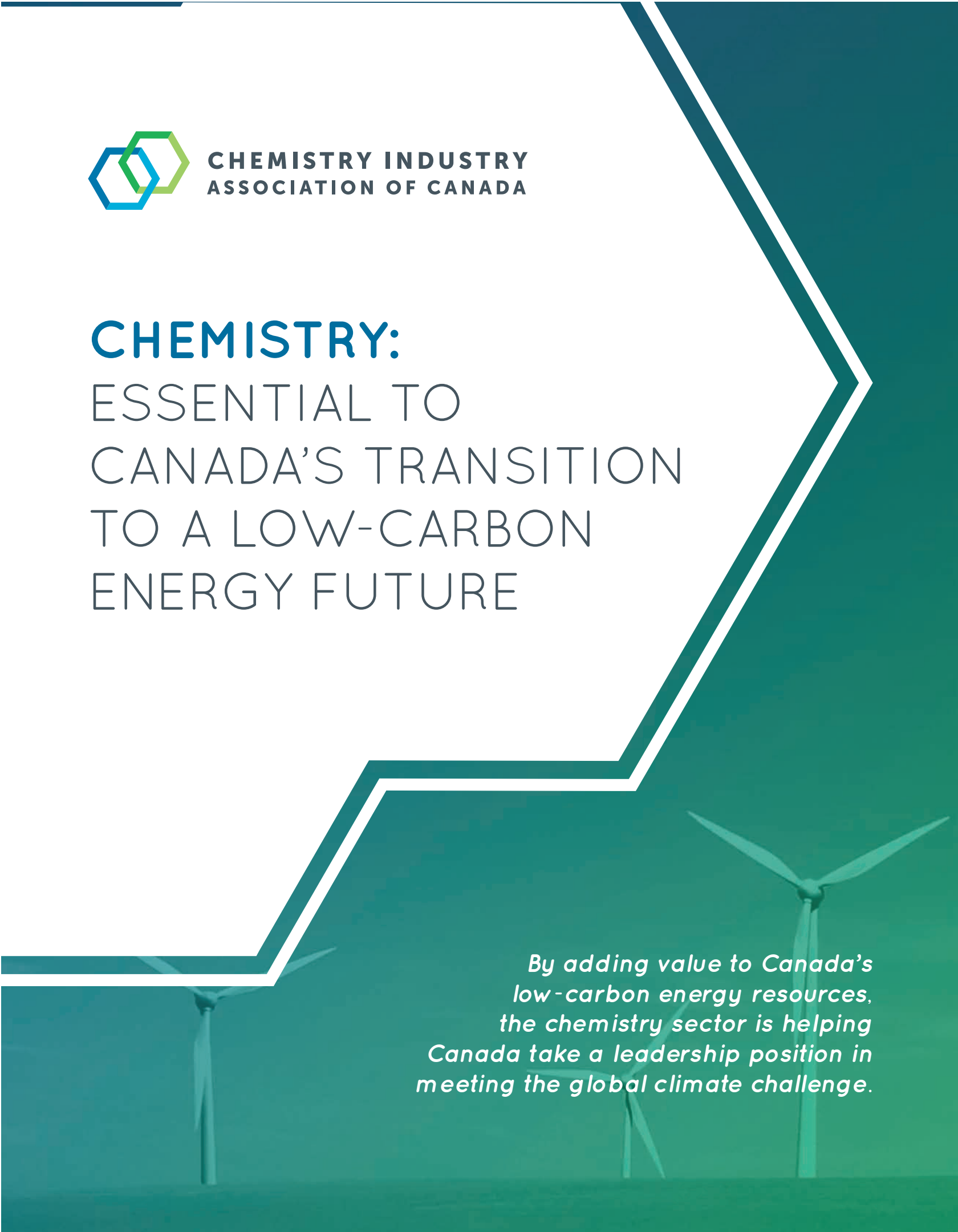
CHEMISTRY INDUSTRY ASSOCIATION OF CANADA

CHEMISTRY: ESSENTIAL TO CANADA'S TRANSITION TO A LOW-CARBON ENERGY FUTURE



By adding value to Canada's low-carbon energy resources, the chemistry sector is helping Canada take a leadership position in meeting the global climate challenge.

ABOUT THIS PAPER

This paper charts a pathway for enabling policies that will leverage Canada's low-carbon global energy advantage. Federal and provincial governments are seeking low-carbon energy solutions as they confront the impacts of climate change. Canada's chemistry sector and its highly skilled workers are uniquely positioned to provide innovative solutions in the fight against climate change.

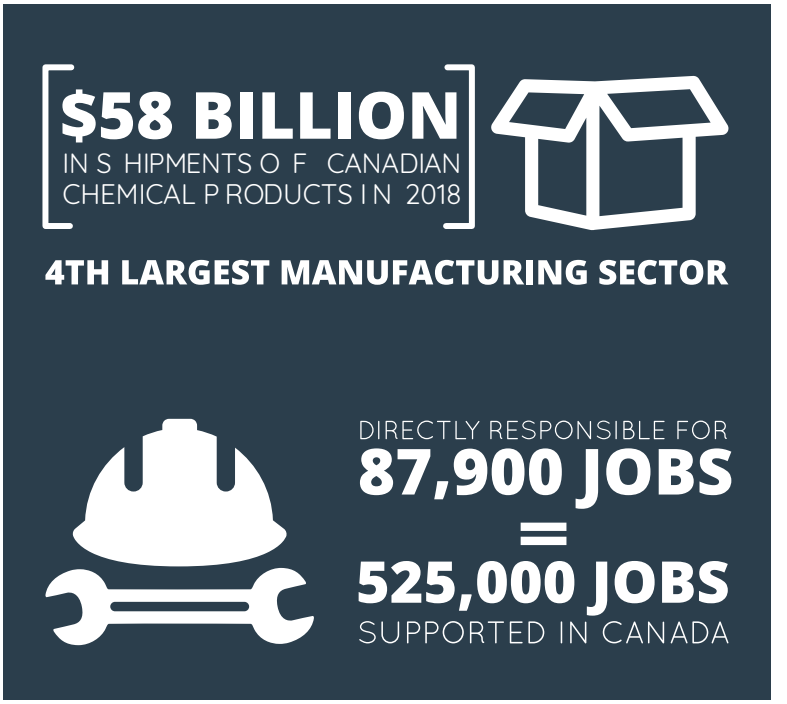
With the right policies and assistance from government, the chemistry sector could attract $25 billion in new investments by 2025. The positive impact of this new investment will not only spur economic growth and drive innovation — it will leverage the already considerable contribution that the Canadian chemistry sector makes in meeting rapidly growing global market demand for chemicals with the lowest carbon production available.

Updated June 2019

CANADIAN CHEMISTRY AND CLIMATE CHANGE 101

KEY TAKEAWAYS

- Globally, chemistry is a $5 trillion industry with annual growth rates nearly double global GDP growth in each of the past 10 years. Analysts forecast a tripling in demand for chemicals over the next 20 years.
- Canada's chemistry sector is well positioned to leverage the country's low-carbon resources — natural gas, hydroelectricity, and biomass.
- More than 95% of all manufactured products rely on chemistry.
- Climate-friendly advances in key sectors would be impossible without chemistry.
- For more than 30 years, Canada's chemistry sector has been a global leader in responsible and sustainable chemical manufacturing.



CHEMISTRY-BASED SOLUTIONS

Addressing the challenge of climate change in Canada and globally depends on chemistry-based solutions. Chemistry is an important part of Canada's energy sector and Canada is recognized as having abundant, low-carbon resources, such as natural gas and natural gas liquids, hydroelectricity and biomass, that can play an important role as chemical feedstocks.

More than 95% of all manufactured products rely on chemistry. Advances in key sectors such as green buildings, sustainable transportation, clean energy and sustainable agriculture would be impossible without chemistry.

From improved building insulation and lighter plastics for automobiles, to the production of solar panels and wind turbines, these and other innovative chemistry products and processes are essential in helping society meet its needs while moving aggressively to a low-carbon economy.

Chemistry's ability to deliver effective, timely solutions today makes it an obvious choice to help lead efforts to meet the aggressive schedule behind the Paris Agreement's 2030 targets. Putting off these solutions will only make things worse. The 2015 synthesis report by the United Nations Framework Convention on Climate Change states that current greenhouse gas (GHG) emissions reductions pledges made by 189 developed and developing countries under the Paris Agreement will be harder and more expensive to reach after 2030[1]. A higher level of GHG emissions reduction in all countries and all sectors is necessary in the first half of the century.

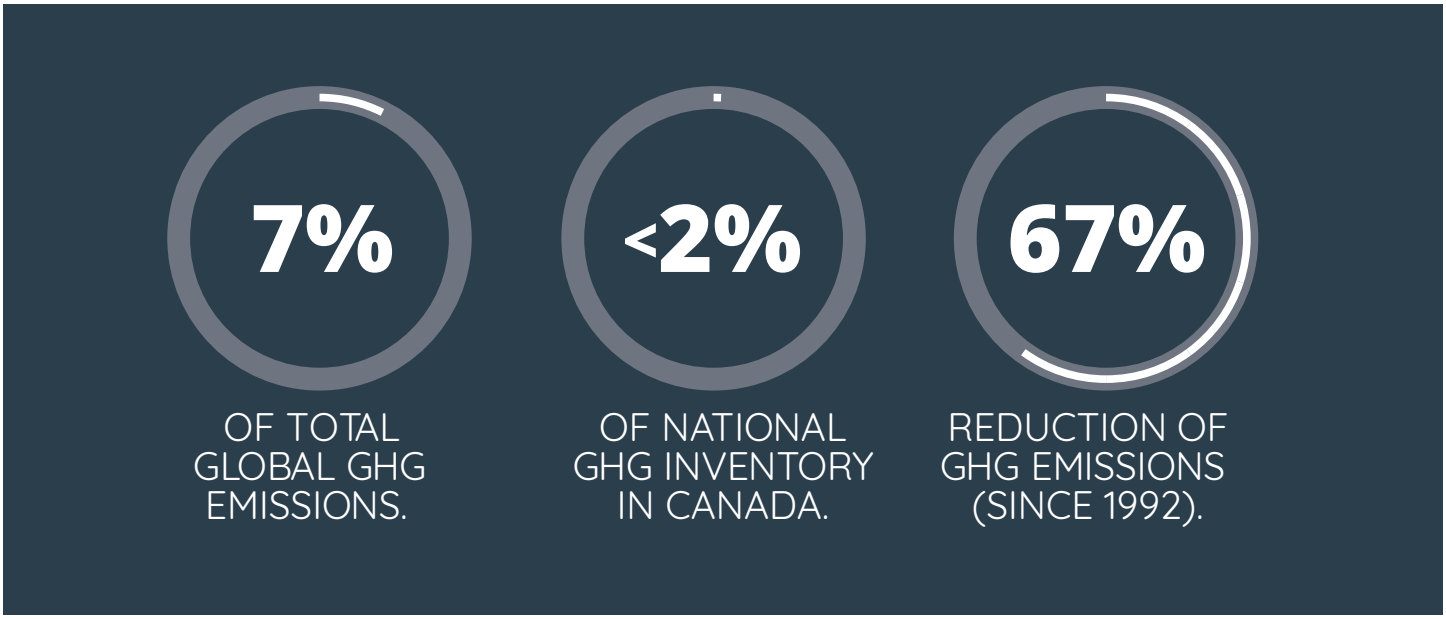
[1]*Synthesis report on the aggregate effect of the intended national determined contributions, UN Framework Convention on Climate Change (2015).*

REDUCING EMISSIONS

Worldwide, the chemical and petrochemical industries are by far the largest industrial energy users, accounting for 10% of total global energy demand[2] — including both energy resources as feedstock and fuels combusted for heat and power. Of this 10% the vast majority of total emissions, upwards of 80%, occurs during the feedstock extraction and manufacturing process, while the remaining 20% comes from associated processes such as feedstock transportation, product transportation and end-of-life management. The fact that over 80% of emissions occur during the manufacturing process is a key reason why using low-carbon feedstock and implementing the best available process technologies play such an important role in determining the overall GHG content of chemistry products. Canada's chemistry industry continues to show global leadership when it comes to its own energy footprint, recognizing its role as both an emitter of GHG emissions and a climate change solutions provider.

Globally, chemical manufacturing contributes 7% of total GHG emissions. In Canada, by contrast, the sector accounts for less than 2% of the national GHG inventory thanks to a commitment to innovation from industry and support from government.

By recognizing products and processes and by implementing best-available technologies during facility upgrades and by using combined heat and electricity applications within production processes, Canada's chemistry sector has been able to reduce its GHG emissions by 67% on an absolute basis since 1992 and by 10% since 2005.



[2] *Technology Roadmap: Energy and GHG Reductions in the Chemical Industry via Catalytic Processes, International Energy Agency, International Council of Chemical Associations, DECHEMA (2013)*

RESPONSIBLE CARE® — ADDRESSING CLIMATE CHANGE IN CANADA AND AROUND THE WORLD

For more than 30 years, Canada's chemistry sector has been at the forefront of the journey toward responsible and sustainable chemical manufacturing. Founded in Canada in 1985, Responsible Care, the Chemistry Industry Association of Canada's UN-recognized sustainability initiative, is now practised in 67 countries. Through Responsible Care, CIAC member-companies have committed to continuous innovation to improve their products, processes and reliability. Their efforts are paying off as Canada addresses the challenge of climate change.

CHEMISTRY — A COMPETITIVE ADVANTAGE IN THE CLEAN ENERGY CHALLENGE

With over 300 projects announced in North America, representing over $300 billion in investment, chemistry is the fastest growing industrial sector on the continent. But so far, Canada has not been able to capture its historical fair share of new investments that would create sustainable jobs and environmental improvements and build the foundation for the development of made in Canada chemistry products and solutions necessary to meet Canada's and the world's clean energy challenge. Investment is key to Canada's transition to a low-carbon future.

ADVANTAGE CANADA! CHEMISTRY AND CANADIAN ENERGY RESOURCES

KEY TAKEAWAYS

- Much of the world's chemistry production is based on crude oil, coal and other high-carbon energy sources.
- Canada's abundant low-carbon resources — natural gas and natural gas liquids, hydroelectricity, and biomass — give its chemistry sector a major built-in advantage over competitors that rely on more carbon intensive feedstocks and energy sources.
- Chemistry is an established sector with a track record of energy efficiency enhancements.

CHEMISTRY AND THE CANADIAN ENERGY ADVANTAGE

Canada's chemistry industry is a world leader in low-intensity carbon chemical production for many reasons. Perhaps the biggest natural advantage the chemistry sector enjoys is access to abundant low-carbon fossil fuel feedstocks. Natural gas is comprised of about 92% methane (CH4) and is used for heating fuel, electricity generation, and even as transportation fuel for vehicles with modified engines. Methane can also be a feedstock for some petrochemical manufacturing[3]. Remaining components of natural gas are called natural gas liquids (NGLs) include ethane, propane, butane and pentanes. These are used as building blocks for plastics and solvents, polypropylene, refrigerants, rubbers and more.

A 2017 study from the Joint Research Centre of the European Commission compared different chemistry production processes and technological options to increase GHG efficiency and found that ethylene production that uses higher-carbon naphtha as a feedstock has an 82% higher GHG emissions factor than ethylene produced from lower-carbon ethane feedstock[4]. Over the years, Canada's chemistry sector has converted its ethylene facilities from naphtha to ethane feedstock and are already benefiting from this lower carbon approach to production.

Methanol is an indispensable chemical used widely in the buildings, transportation, energy, textile and consumer products sectors. While there are novel bio-based sources of methanol, the main pathway for methanol production is via natural gas. In Asia, however, the fastest growing pathway to meet marginal methanol demand is coal-based. From a GHG perspective, that coal-based chemistry results in eight times the emissions of the natural gas-based methanol chemistry in Canada.

Canada also has an abundant supply of low emissions hydroelectricity and huge potential for developing biomass resources to be used as feedstocks and energy sources in chemistry production processes. With large portions of provincial energy grids already carbon-free, chlorine-related chemistries have a near-zero GHG footprint. In other countries, notably in Europe, Asia and the Middle East, high-carbon electricity grids result in higher GHG emissions associated with their chlorine production when compared to Canada.

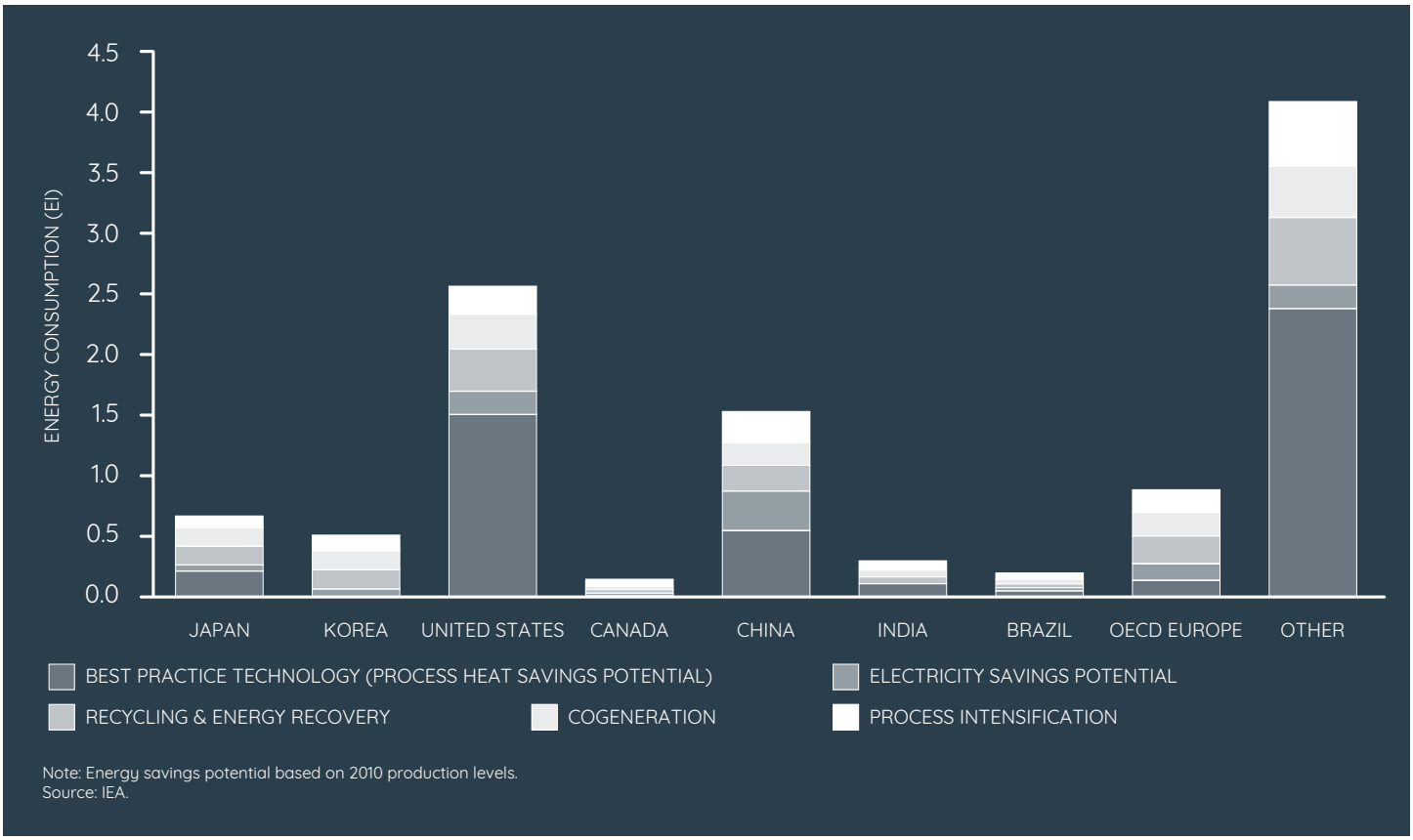
[3]Diversification, Not Decline: Adapting to the New Energy Reality, Energy Diversification Advisory Committee to Alberta's Minister of Energy (2017).
[4]Energy Efficiency and GHG Emissions: Prospective scenarios for the Chemical and Petrochemical Industry, Joint Research Centre Institute for Energy, Transport and Climate, European Commission, p. 65 (2017).

NEW INFRASTRUCTURE TO USE ENERGY WISELY

Canada's modern chemistry facilities with their upgraded equipment, re engineered processes and products, coupled with one of the lowest GHG-intensive national electricity grids, add to the country's carbon competitive advantage. Indeed, a 2013 report from the International Energy Agency and the International Council of Chemistry Associations has shown that compared to the other global jurisdictions Canada's chemistry sector has already many of the best possible technological processes for increasing the efficiency of its operations[5].

CURRENT ENERGY SAVINGS POTENTIAL FROM CHEMICALS AND PETROCHEMICALS, BASED ON BEST PRACTICE TECHNOLOGY DEPLOYMENT

The Canadian chemistry sector has made significant strides in implementing best practice technologies, process improvements, cogeneration, etc., placing it well ahead of many of its competitors that still have room for improvement as depicted below.



The low-carbon characteristics of Canada's natural resources and the innovative processes our sector uses also make it possible for the chemistry sector to contribute to carbon sequestration. For example, a methanol facility in Canada injects CO_2, captured from a neighbouring facility, into its production process to produce a methanol stream with a lower carbon intensity.

[5]Technology Roadmap: Energy and GHG Reductions in the Chemical Industry via Catalytic Processes, International Energy Agency, International Council of Chemical Associations, DECHEMA (2013).

NOVA CHEMICALS AND INTER PIPELINE INVEST IN CANADA'S LOW-CARBON ADVANTAGE

NOVA Chemicals is one of North America's largest producers of polyethylene, the most widely used plastic material in the world. NOVA Chemicals is investing $2 billion in a new polyethylene facility in the Sarnia-Lambton region. The investment will create 2,000 direct and indirect jobs over the first 10 years of the project alone and will result in a further 25% reduction in greenhouse gas emissions intensity from 2016 levels. The Province of Ontario and the federal government contributed $100 million and $35 million respectively to the project.

Inter Pipeline is a major petroleum transportation, storage and natural gas liquids processing business in Calgary. Inter Pipeline is investing $3.5 billion in the construction of a world-scale integrated propane dehydrogenation and polypropylene plant in Alberta. The plant is designed to convert locally sourced, low-cost propane into polypropylene, a high-value, easy-to-transport plastic used in the manufacture of a wide range of finished products, including medical equipment, furniture, storage containers, ropes, roofing membranes and more. The investment is supported by a $200 million royalty credit from the Government of Alberta's Petrochemicals Diversification Program and a $49 million investment from the federal government's Strategic Innovation Fund.

Canada Kuwait Petrochemical Corporation (CKPC) has also moved forward with the construction of a $4.5-billion petrochemical upgrading facility in Sturgeon County, Alberta. CKPC is a joint venture between Pembina Pipeline Corporation and Petrochemical Industries Company K.S.C. of Kuwait. The world-scale, propane dehydrogenation and polypropylene upgrading complex will process about 23,000 barrels of propane per day into polypropylene to make products such as food packaging, auto parts and electronics. The investment is supported by royalty credit from the Government of Alberta's Petrochemicals Diversification Program and $49 million in investment from the federal government's Strategic Innovation Fund.

AHEAD OF THE CURVE: CANADA'S LOW-CARBON ADVANTAGE

In 2017, Cefic, the chemistry association of the European Union produced a report outlining the emission reduction pathways for the European chemistry sector over the long term[6]. In summary, the EU's chemistry sector can significantly reduce its emissions, at enormous cost over the next several decades if it can, first and foremost, move away from crude and into natural gas-based feedstocks, gain access to a carbon-free electricity supply and begin capitalizing on biochemistry opportunities.

The pathway to decarbonize chemistry in Europe and many other global jurisdictions is to make it look more like Canada's chemistry sector.

[6]*Low-carbon energy and feedstock for the European chemical industry, a study by DECHEMA, a member of the European Federation of Chemical Engineering, commissioned by Cefic (2017).*

CHEMISTRY & THE EMERGING LOW-CARBON ECONOMY

KEY TAKEAWAYS

- There is significant potential for emissions reductions in sectors beyond manufacturing (which accounts for more than 30% of GHG emissions) — notably the buildings, transportation, food and renewable energy sectors.
- To achieve the potential of GHG reductions, different business models supported by enabling policy conditions are required.
- Chemistry is a catalyst, uniquely positioned in the value chain between raw natural resources and downstream manufacturing industries selling goods to consumers.

Chemistry contributes to many solutions that increase energy efficiency in multiple sectors and contribute to an increase of renewable energy supply — reducing and avoiding emissions in many supply chains

CHEMISTRY REDUCES GHG EMISSIONS DURING A PRODUCT'S LIFE CYCLE

Research from the International Energy Agency shows that for every unit of GHGs emitted as part of chemical manufacturing, the industry's products and technologies result in a net reduction of 3.1 units of emissions during a product's life cycle — from extraction of feedstock and fuel, through production, ultimate use and end-of-life management.

Using emerging technologies, this ratio increases to more than 4:1. Among the most important emerging technologies helping move the world to a low-carbon economy are in the building, transportation, energy, agricultural, and air conditioning and refrigerant sectors. Studies show that global emissions would be over 9 gigatonnes of CO_2 equivalents-per-year lower if these technologies were used to their full potential right now[7]. That's more than the annual emissions of the United States.

The chemistry sector also has the potential to contribute even more to these and other sectors. The following are just a few examples of the myriad ways chemistry and members of the Chemical Industry Association of Canada are helping move Canada to a low-carbon economy.

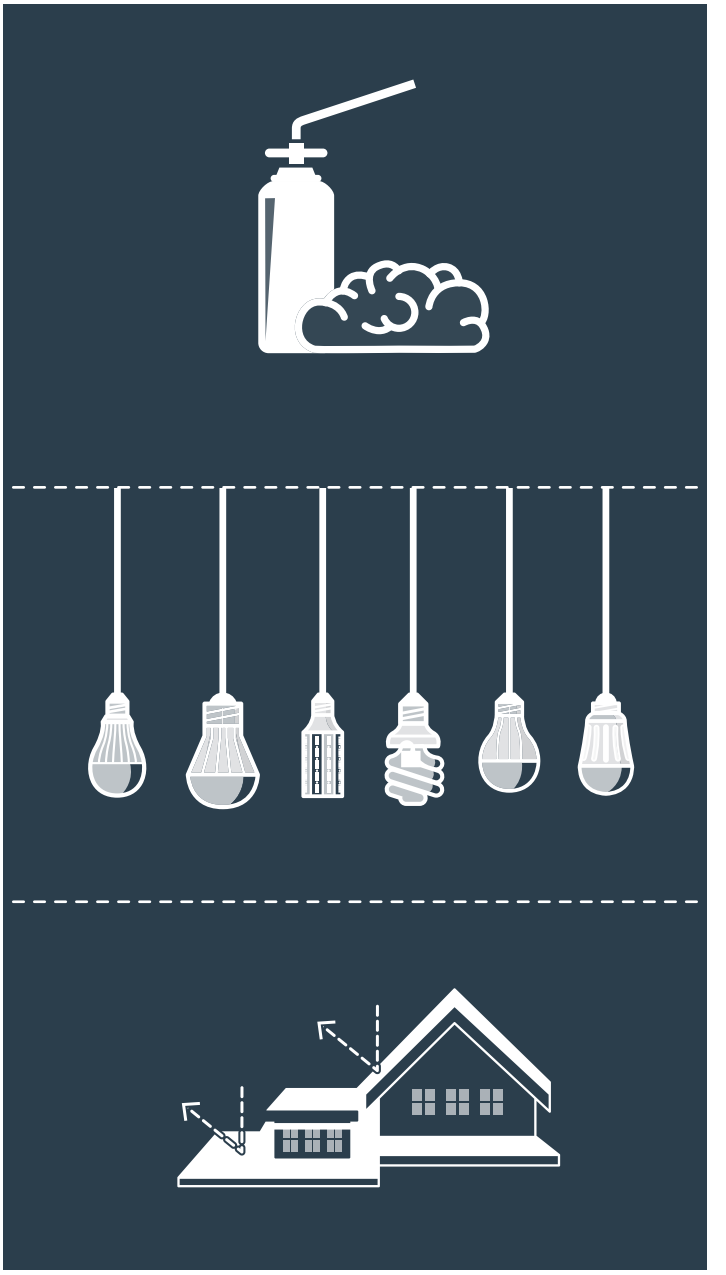
GREEN BUILDINGS

Buildings represent 33% of global energy consumption and CO_2 emissions. In Canada, the building sector is responsible for 40% of GHGs. Insulation, window coatings, reflective roofing and other innovative chemistry-based materials dramatically lower emissions from the building sector by reducing heat loss and the demand for cooling.

[7]Low-carbon energy and feedstock for the European chemical industry, a study by DECHEMA, a member of the European Federation of Chemical Engineering, commissioned by Cefic (2017).

INSULATION

With a combination of better energy efficiency standards and applied chemistry solutions, average energy savings of more than 25% are achievable by using insulation. For example, three key foam insulation materials — expanded polystyrene, extruded polystyrene and polyurethane — have been shown to reduce energy use and avoid 233 tonnes of CO_2 emissions for every tonne emitted in their manufacturing, installation and end-of-life management. (www.dow.com, www.dupont.ca, www.basf.com)



LIGHTING

Advances in light-emitting diode (LED) bulbs, which have four times greater life expectancy, have led to a nearly 40% greater energy efficiency (lumens per watt). Widespread use of LEDs from 2017 to 2027 could save about 348 terawatt hours of electricity, compared with no LED use. This is the equivalent annual electrical output of 44 large electric power plants of 1,000 megawatts each.

REFLECTIVE ROOFS

Made with latex-based coatings, reflective roofs reflect the sun's energy from the roof surface, allowing buildings to retain cool air. Standard or dark roofs can reach temperatures of 65°C or more in the summer sun. A reflective roof under the same conditions can lower the temperature by 10°C, reducing the energy demand for air conditioning. (www.arkema.ca)

SUSTAINABLE INFRASTRUCTURE

The production of concrete contributes to environmental impacts that cannot be ignored. For example, the manufacturing process for the cement used in concrete generates approximately 8% of global CO_2 emissions.

GREEN CONCRETE

Innovations such as BASF's green sense concrete technology, improve the eco-balance and technical performance of concrete and, as a consequence, the structures created with it. This same technology was used in the 541-metre high One World Trade Centre resulting in the savings of over 25 million kilowatt hours of energy, 15 million kilograms of CO_2 equivalent, and 504,000 kilograms of fossil fuels. (www.basf.com)

SUSTAINABLE TRANSPORTATION

Since 1992, GHG emissions from Canada's transportation sector have increased by 33%. Producing lighter vehicles, developing alternative fuels and moving to electric private and public transportation vehicles will depend on advances in materials, fuel and energy storage solutions developed through chemistry.

LIGHTWEIGHTING

Reducing a vehicle's weight by 100 kg cuts its GHG emissions by 10 g/km through improved fuel efficiency. New polymers and high-tech plastics-based solutions, such as glass and carbon fibre, are designed to replace metal in cars and airplanes without compromising performance, comfort or safety.

FUEL ADDITIVES AND SYNTHETIC LUBRICANTS

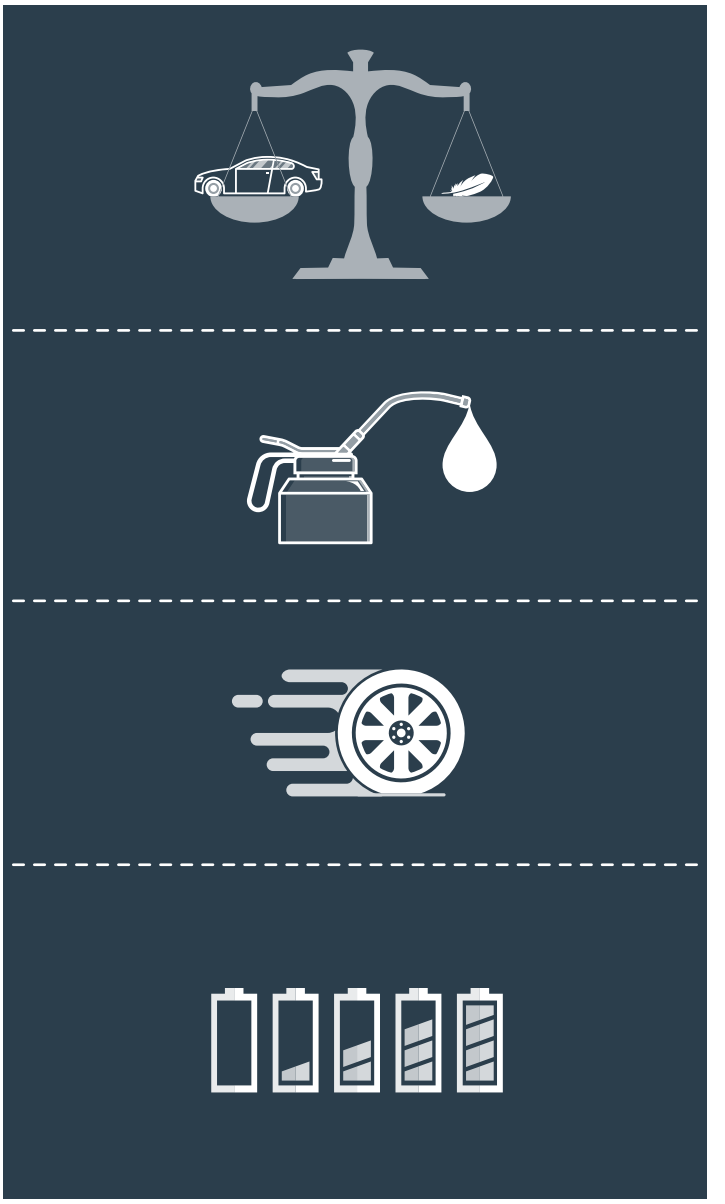
Smarter fuels can improve the efficiency of gasoline and diesel engines by 2% and 5% respectively. (www.imperialoil.ca)

GREEN TIRES

About a quarter of a vehicle's CO_2 emissions are related to tires. Better tires reduce fuel consumption by 5-7% by reducing rolling resistance by up to 30%. (www.arlanxeo.com)

ENERGY STORAGE

Energy storage is critical to the widespread adoption of electric vehicles. Chemistry is helping make storage batteries a reality, so power can be available 24 hours a day. Batteries smooth out the variability of energy flow and store excess energy when demand is low to release it when demand is high. (www.chemtradelogistics.com, www.norfalco.com)

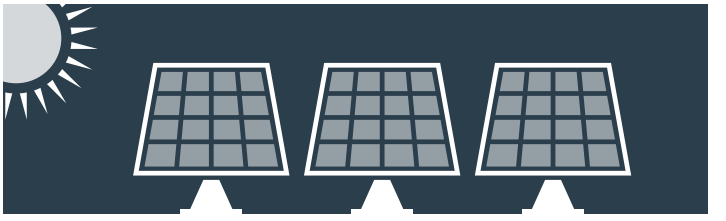


CLEAN ENERGY

Chemistry is a critical part of nearly every renewable power generation source. From the composite materials in wind turbine blades, to solar panels, and even nuclear and hydropower, chemistry is essential.

SOLAR POWER

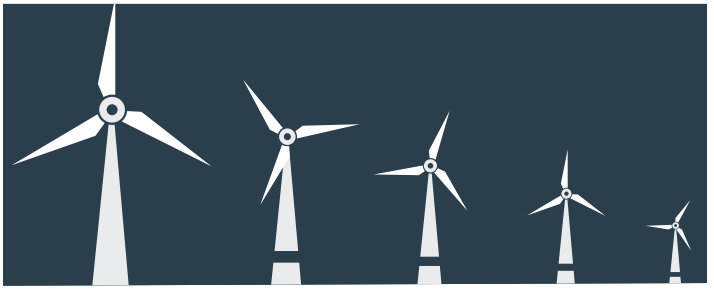
Solar system installations are expected to grow at an average rate of 15% over the next five years. Recent advances in chemistry have transformed solar into a viable commercial energy source. Even considering



the manufacturing and processing stage of solar, the emissions generated are three- to 10-times less carbon intensive than generating the same amount of energy from fossil fuels. (www.dupont.ca)

WIND POWER

Chemistry allows energy producers to use windmill blade components that are lighter, stronger, longer and more cost-effective. In fact, over seven tonnes of plastic resin can be found in a single 17 tonne wind turbine. Blades also require a chemical coating because they are constantly exposed to the weather. (www.akzonobel.com)



SUSTAINABLE AGRICULTURE

Agricultural activities produce significant GHGs — 10% of Canada's greenhouse gas emissions are from crop and livestock production. This doesn't include emissions from the use of fossil fuels and from fertilizer production, according to Agriculture and Agri-Food Canada.

CHEMICAL FERTILIZERS

Using chemical fertilizers and crop protection in farming increases agricultural yields. Higher yields help to avoid GHG emissions by keeping land in production and reducing the need to expand farms onto new lands where carbon would be released through clearing and tilling operations. (www.dupont.ca)

IMPROVED PACKAGING TO REDUCE FOOD WASTE AND GHGs

Roughly one-third of the edible parts of food produced for human consumption get lost or wasted globally. This amounts to 1.3 billion tonnes per year, according to the UN Food and Agriculture Organization (FOA). The FOA estimates that the emissions from food produced and not eaten are about 3.3 billion tonnes of CO_2 equivalent.

Advanced packaging, made possible by chemistry, can help reduce food waste and its related emissions. In addition, using lighter-weight plastic packaging requires anywhere from two to eight times less energy than traditional packaging materials such as glass, paper, steel and aluminum. Because of reduced weight and size, the capacity of every container is increased, resulting in fewer trucks on the road and reduced fuel emissions.

GREENER AIR CONDITIONING AND REFRIGERANTS

Hydrofluorocarbon (HFC) use has accelerated in the past decade as fast-growing countries, such as India and China, have adopted air-conditioning in homes, offices and cars. HFC gases are thousands of times more destructive to the climate than carbon dioxide. New refrigerants, however, have a global warming potential (GWP) less than carbon dioxide (more than a thousand-fold reduction) and can be substituted for higher-GWP refrigerants in many applications, making them the refrigerant of choice for climate-conscious automotive manufacturers worldwide.

KIGALI ACCORD

The members of the Chemistry Industry Association of Canada are proud to be at the forefront of chemistries that will deliver new refrigerants to help achieve the objectives of the Kigali Accord. The accord gradually caps and reduces the use of HFCs beginning in 2019. The accord, signed in 2016, will have the single largest impact on global warming to date. Environment and Climate Change Canada estimates a 0.5°C impact in the country's climate change goals. This is evidence that chemistry is part of the climate change solution. (www.chemours.com)

MANAGING WASTE AND MARINE LITTER

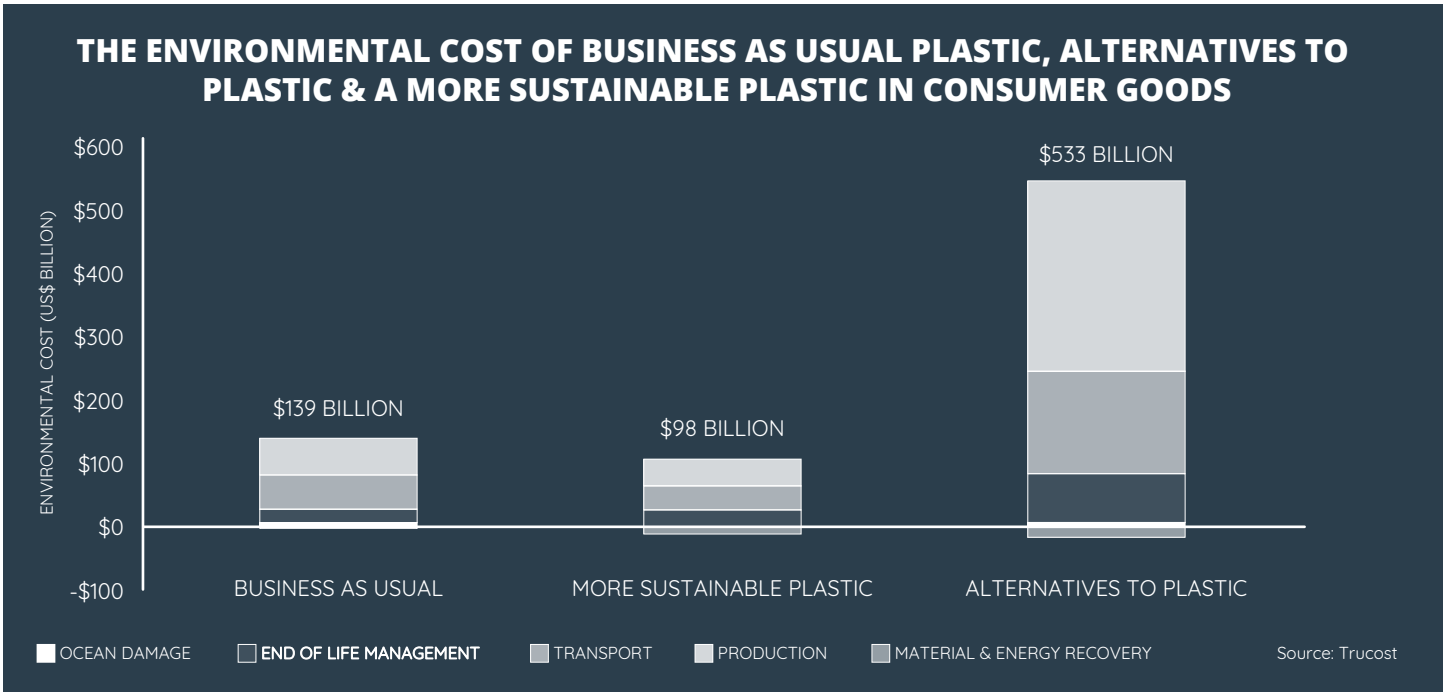
Canada's chemistry industry takes the issue of waste seriously. The chemistry sector supports policies that will help stem the flow of waste products and litter into the world's oceans. However, such policies must be evidence-based, should recognize the geographic location of much of the world's waste sources, particularly marine litter, and should consider the myriad of roles that chemistry products fill in our modern world.

In 2014, the United Nations Environment Programme published a study called Valuing Plastics by Trucost that determined the global natural capital costs to plastics in 16 consumer goods sectors. In 2016, Trucost extended that study by updating it and looking at how to reduce the natural capital costs of plastic including using alternatives[8]. Trucost found that replacing plastics in consumer products and packaging with a mix of alternative materials that provide the same function would actually increase environmental costs from $139 billion to $533 billion annually.

Trucost did identify ways to reduce the environmental costs of plastics, including:

- Improve transportation fuel efficiency $10.6B
- Increase use of lower carbon energy in manufacturing $7.6B
- More efficient packaging design for beverage and food sectors $7.3B
- Improve waste collection and management in Asia $0.1B
- Increase packaging recycling and energy recovery $4.8-$7.9B

[8]*Plastics and Sustainability: A Valuation of Environmental Benefits, Costs and Opportunities for Continuous Improvement, Trucost (2016).*



Efforts to increase recycling rates, implement eco-efficient waste management systems and practices to stem the tide of litter from entering the world's waterways and landfills are important aspects in solving these global problems. Through the Responsible Care ethic, Canada's plastic resin producers are obligated to ensure sound stewardship of resin pellets during manufacture, transport and distribution. They also work with their suppliers and customers to prevent product loss while also working to innovate for new products and processes that add value to society while reducing risks to human health and the environment.

GLOBAL ALLIANCE TO END PLASTIC WASTE

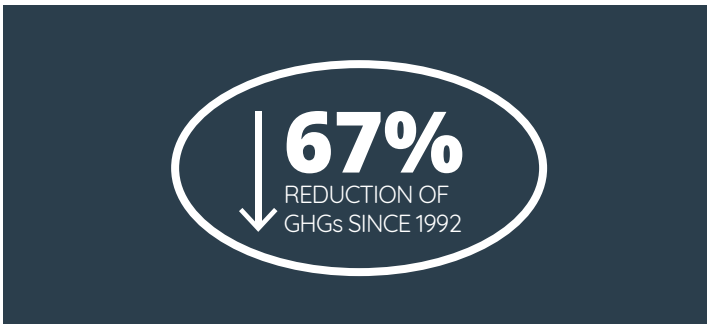
In January 2019, an alliance of global companies from the plastics and consumer goods value chain launched a new organization to advance solutions to eliminate plastic waste in the environment, especially in the ocean, and to do this by transitioning to a circular economy for plastics. The Alliance to End Plastic Waste (AEPW) committed over US$1 billion over the next five years to help end plastic waste in the environment. Made up of nearly 30 members from around the world, the Alliance is a not-for-profit organization that includes companies that make, use, sell, process, collect and recycle plastics, including chemical and plastic manufacturers, consumer goods companies, retailers, converters, and waste management companies. The Alliance will develop and bring to scale solutions that will minimize and manage plastic waste and promote solutions for used plastics by helping to enable a circular economy.

CIAC members NOVA Chemicals, BASF, Dow, P&G, Imperial Oil (via ExxonMobil), and Shell are founding members of the Alliance. For more information, please visit www.endplasticwaste.org

MITIGATION OPPORTUNITIES IN CANADA'S CHEMISTRY SECTOR

KEY TAKEAWAYS

- Canada's chemistry industry is highly innovative and recognized globally as the best in its class in energy efficiency and carbon emissions intensity.
- The sector has reduced its overall greenhouse gas emissions by 67% since 1992 as a result of significant investment, and there's opportunity to do more.



ENERGY EFFICIENCY IS AT THE HEART OF CHEMICAL PRODUCTION

The link between capital investments and emissions reductions is evident in the chemistry sector because the industry has always had energy efficiency as a core element of its business practices. Today, the Canadian chemistry industry is highly innovative and recognized globally as the best in its class in energy efficiency and carbon emissions intensity.

For example, over the last five years in the Sarnia area alone, nearly $1 billion has been spent to convert the chemistry industry from heavier, crude-based feedstocks to lighter natural-gas-based feedstocks. This move cuts the GHG footprint for Sarnia-produced chemical products in half.

Sarnia is also now home to the world's first, commercial-scale bio-based succinic acid production facility. This platform chemical can be used in many of the products consumers use today, including plastics, paints, textiles, food additives and personal care products. Additional bio-based chemistry investments are also being considered for this area to take advantage of the healthy infrastructure and industrial synergies in the chemistry industry.

SUPPORTING THE ENERGY STAR CHALLENGE

Making industry more energy-efficient will help reduce greenhouse gas emissions while creating jobs, improving competitiveness and contributing to Canada's national approach to combating climate change. Through the ENERGY STAR Challenge, Canada's Minister of Natural Resources, the Honourable Jim Carr, has challenged industrial companies and manufacturing plants to improve their productivity, environmental performance and bottom lines by improving their energy efficiency by 10% within five years.

The member companies of the Chemistry Industry Association of Canada are highly supportive of this challenge. They optimize value-add transformation of resources in Canada, avoiding transport emissions, and continue to focus on additional emissions reductions by:

- Investing in new plants and technologies
- Innovating their processes
- Conserving energy through improved energy and emissions tracking
- Investing in combined heat and power facilities
- Replacing higher-carbon fuels
- Replacing or upgrading older boilers and heaters
- Capturing carbon

CIAC MEMBERS STEPPING UP TO MITIGATE CLIMATE CHANGE

FEEDSTOCK SUBSTITUTION

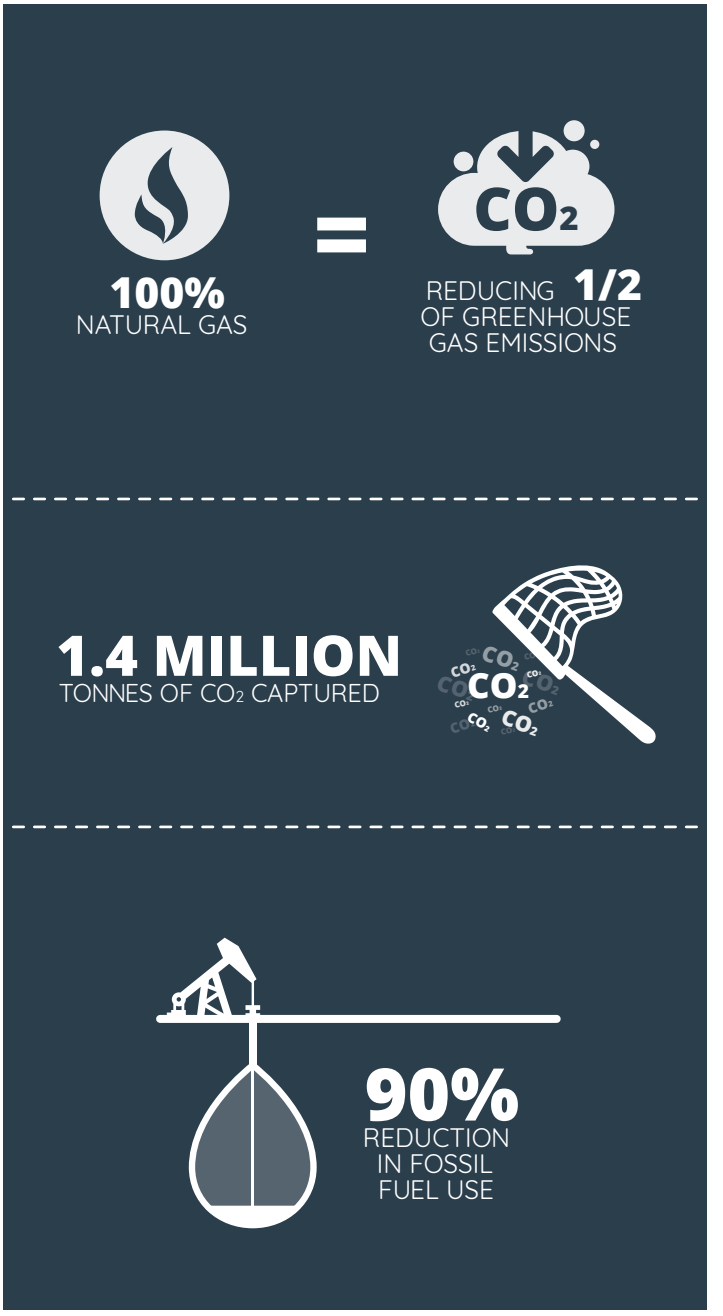
Since 2010, NOVA Chemicals has invested more than $400 million to eliminate the use of crude oil feedstocks at its Corunna, Ontario, ethylene cracker. (A cracker uses steam to produce byproducts.) Now, facility operations are 100% dependent on natural gas liquid (ethane) feedstocks. The switch has resulted in a near halving of energy consumption and greenhouse gas emissions per tonne of production. The significant economic benefit the conversion has provided has led, in part, to a new $2 billion investment in the Corunna site.

CARBON CAPTURE

Since 2006, in collaboration with the oil and gas industry, MEGlobal has captured nearly 1.4 million tonnes of carbon dioxide from its Prentiss, Alberta, operations. The captured emissions are geologically sequestered as part of enhanced oil recovery activities in the region.

FUEL SUBSTITUTION AND ENERGY EFFICIENCY

At ERCO Worldwide's plant in Buckingham, Quebec, hydrogen has historically been vented as a byproduct of manufacturing operations. Following an investment of more than $1 million, the hydrogen is now captured and used as a clean burning substitute fuel in the plant's boiler. This has led to a more than 90% reduction in fossil fuel use and corresponding carbon dioxide emissions from the plant.



Canada's chemistry sector routinely creates integrated clusters to utilize co-products from primary production processes and turns them into high-value products. As an example, CO_2 from MEGlobal plant in Prentiss, Alberta is sent to a nearby Praxair production plant where it is purified for use in industrial and commercial products. Praxair also uses the same site to produce oxygen which is then used back at the MEGlobal facility.

ENERGY EFFICIENCY

Shell Chemicals Canada looked for innovative ways to lower its GHG emissions when designing its new ethylene glycol facility in Scotford, Alberta. The result is a state-of-the-art design that reduces emissions by 38,000 tonnes of CO_2 per year and also lowers capital and operating costs. The energy efficiency measures include a high-efficiency cogeneration plant that satisfies the site's significant requirements for heat and power.

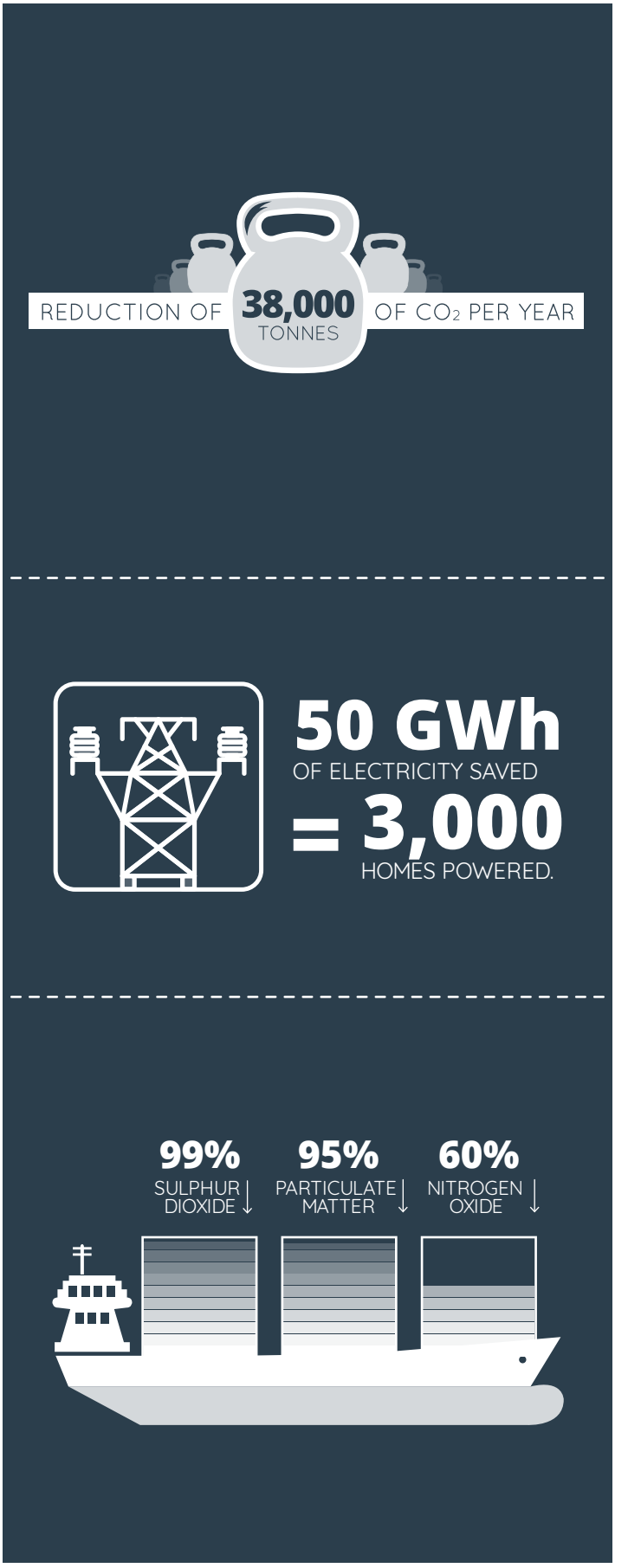
Indeed, cogeneration applications are widely used in Canada's chemistry sector with companies such as NOVA Chemicals, Dow Chemical, MEGlobal, INEOS, ARLANXEO, and Imperial all using forms of combined heat and power units across their integrated chemistry production facilities.

ENERGY IMPROVEMENTS

ERCO Worldwide has also implemented more than 50 energy efficiency projects at its Buckingham, Quebec site that have reduced the plant's electricity consumption by more than 6%. This has saved more than 50 GWh of electricity a year — the amount needed to power 3,000 Quebec households. As a result, the ERCO Worldwide Buckingham site was one of the first industrial facilities in Quebec to be recognized as an "Elite Energy Saver" by Hydro-Québec.

TRANSPORTATION EMISSIONS

Methanex, a Vancouver-based company and the world's largest producer of methanol, delivers its product to its global customers using a fleet of 28 ocean-going vessels operated by its subsidiary, Waterfront Shipping. In 2016 and 2017, Waterfront Shipping took delivery of seven of the first-in-the-world vessels capable of running on methanol as fuel. The vessels are larger and more efficient: when a ship is powered by methanol, its sulphur dioxide emissions are reduced by 99%, nitrogen oxide emissions by 60% and particulate matter by 95%. The introduction of these new vessels saw Methanex marine shipping GHG emissions improve by 5% per tonne of cargo carried.



BIODEGRADABLE PLASTICS

In the 1990s, BASF was the first major plastics manufacturer to develop a biodegradable plastic, called Ecoflex. This certified compostable and biodegradable polymer is an important raw material for many compostable and biobased plastics. It is elastic, water and tear-resistant, processable with conventional film plants (for polyethylene), printable, weldable, and suitable for food contact. Ecoflex breaks down naturally with no accumulation of toxins to the environment. A new BASF product, Ecovio, consists of Ecoflex and a high content of polylactic acid. Ecovio is used in organic waste bags, dual-use bags (shopping, then for organic waste) or agricultural films. Compostable packaging solutions such as paper-coating, shrink films, foam packaging and injection molding products can also be produced with Ecovio. (basf.com)

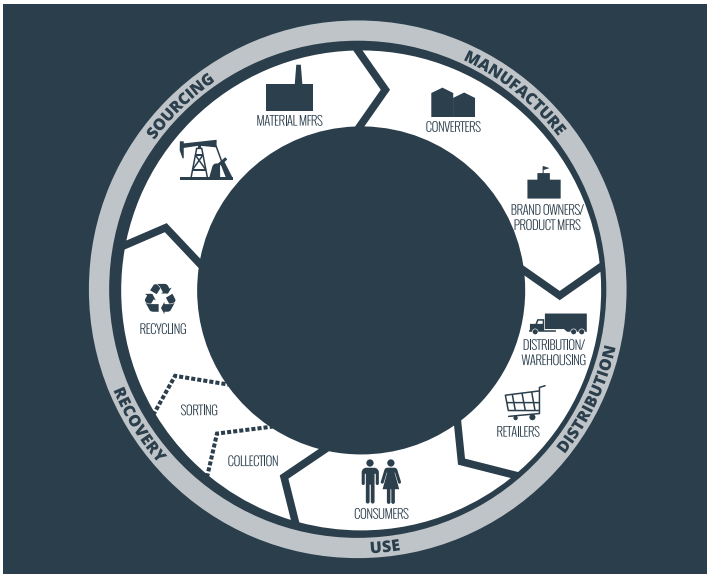
PROCESS CHANGES

Nitrous oxide is a potent greenhouse gas, with a global warming potential per tonne of almost 300 times that of carbon dioxide during a 100-year timescale. BASF has introduced innovative decomposition catalysts in all its plants worldwide where nitrous oxide is created as a byproduct. In 2016 alone, this prevented nearly 20 million tonnes of CO_2 equivalent greenhouse gas emissions.

CHEMISTRY IS ADVANCING THE CIRCULAR ECONOMY

KEY TAKEAWAYS

- The chemistry sector supports the transition from a linear economy to one that prioritizes the extension of product life cycles, extracting maximum value from resources in use.
- CIAC members have announced ambitious targets to reduce plastic waste and help enable a circular economy.
- Canada's chemistry industry operates in key clusters that are well positioned to maximize how resources are used, reused and recycled across supply chains.



CHEMISTRY AND CANADA'S CIRCULAR ECONOMY

Despite the commitment Canadians have made to recycling, we still live in a traditional linear economy, where most of the products we use start as raw materials and are eventually discarded. The chemistry sector is supporting the transition from a linear economy to a circular economy — one that prioritizes the extension of product life cycles, extracting maximum value from resources in use, and then recovering materials at the end of their service life[9].

An important principle of the circular economy is increasing the capture and recovery of materials in waste streams so that they can be recycled and reused in new products. But a circular economy involves far more than recycling — it's a new economic model where, ultimately, waste and garbage are eliminated. The guiding principle is to use products and resources in the best way possible without any loss in value.

CIAC members are taking a three-pronged approach to advancing the circular economy and achieving a zero plastic waste vision. Our companies operate in clusters that help increase efficiency. They are developing products and innovations that will help other sectors advance the circular economy. CIAC members are also rethinking their products and processes so that as much value as possible can be derived from the products they produce.

CIAC MEMBERS ANNOUNCE AMBITIOUS TARGETS TO ENABLE CIRCULAR ECONOMY

In 2018, the Canadian Plastics Industry Association (CPIA) and CIAC announced ambitious targets that underscore their members' commitment to a future without plastic waste. Representing the broad plastics value chain in Canada, CPIA and CIAC and their members announced the following waste reduction targets:

- 100 per cent of plastics packaging being reused, recycled, or recovered by 2040.
- 100 per cent of plastics packaging being recyclable or recoverable by 2030.

See CIAC's report, The Role of Chemistry in a Circular Economy for Plastics for more information.

[9]Plastics and Sustainability: A Valuation of Environmental Benefits, Costs and Opportunities for Continuous Improvement, Trucost (2016).

CLUSTERS, CHEMISTRY AND THE CIRCULAR ECONOMY

Canada's $58 billion chemistry industry operates in every province, with key clusters in Ontario, Alberta and Quebec. These clusters are well positioned to maximize how resources are used, reused and recycled across supply chains.

CIAC members are actively seeking opportunities for their waste to become a secondary raw material for others and to use waste from other companies as a secondary raw material. For example, the excess heat produced in one production facility can be reused as energy in other plants. Off-gas or reaction byproducts from one plant work as raw material for another. This adds up to reducing emissions and waste, while conserving resources.

RETHINKING PRODUCTS AND PROCESSES TO DERIVE AS MUCH VALUE AS POSSIBLE FROM THEM

CIAC members are focused on products that do more with less, use less material and last longer. Converting waste to chemicals or reusing unwanted household paint are just two examples. More specifically, through its Energy Bag Pilot Program in Citrus Heights, California, Dow has helped turn 6,000 pounds of previously non-recycled plastic waste — juice pouches, candy wrappers and plastic dinnerware — into nearly 2000 litres of fuel. Projects such as this could be easily adapted to a Canadian context, reducing waste and reliance on fossil fuels.

Through Responsible Care®, the chemistry industry's commitment to sustainability, CIAC's member-companies commit to continuously improving their manufacturing processes — working to conserve resources, reduce emissions and waste, and make their facilities more efficient and sustainable.

A POLICY ENVIRONMENT TO UNLOCK CHEMISTRY'S FULL LOW-CARBON POTENTIAL

KEY TAKEAWAYS

- If Canada misses out on investment opportunities, production will shift to countries with more carbon-intensive chemical operations, raising GHGs globally.
- Policy-makers need to recognize that Canada's chemistry sector represents the single most important solutions provider to the climate change problem.
- To meet the global climate challenge, Canada must fully develop the potential of the chemistry industry so it can deliver innovations and solutions to effectively reduce emissions both within the industry and throughout the Canadian economy.
- An investment in Canada's chemistry sector is an investment in creating some of the lowest GHG-intensive chemistry products on the planet.
- Avoided emissions, through the use of low-carbon chemistry-derived products and solutions, are the most cost-effective GHG reductions available.

CHEMISTRY CAN GROW THE ECONOMY AND REDUCE GHG EMISSIONS

The chemistry industry understands that it is hard to reconcile the growing demand for its products with the scientific imperative and government objectives calling for reduced GHG emissions from industrial sources. However, it is important that policies around carbon pricing be crafted in a manner so as not to penalize Canadian manufacturers, particularly when their main trading partners are years away from implementing similar policies and operate with a significantly higher carbon footprint. Global competition for investment dollars is fierce, so getting the balance right is key to making the business case for investment in Canada much less challenging. Investors look for long-term certainty, therefore it is critical to create such an investment climate here in Canada.

A recent report by the Canadian Energy Research Institute (CERI) looked at the competitive landscape and compared Canada's chemistry sector with global jurisdictions and found that Canada is near the very top of jurisdictions around the world for investment[10]. Canada has a distinct advantage when it comes to feedstock pricing which allows the sector to achieve higher margins for its products on global markets.[11]

[10]Johnson, L. & Kralovic P., Competitive Analysis of the Canadian Petrochemical Sector, Canadian Energy Research Institute (2016).
[11]Mascarenhas, K., Examining the Expansion Potential of the Petrochemical Industry in Canada, Canadian Energy Research Institute (2015).

To meet the global climate challenge, Canada must encourage investments aimed at fully developing the potential of the chemistry industry so that it can deliver innovations and solutions that effectively reduce emissions both within the industry and throughout the Canadian economy. CIAC member-companies are already doing their part.

Canada is part of a global chemistry industry that is a story of innovation and incredible growth — well in excess of global GDP growth rates. While provinces have prioritized their work with the chemistry sector in order to drive economic growth, Canada has largely been unable to capitalize on a range of opportunities in the absence of dedicated federal support.

INVESTING IN CHEMISTRY IS THE PATH TO A MORE SUSTAINABLE ECONOMY

Investing in the chemistry sector is not just about economics. An investment in Canada's chemistry sector is an investment in creating some of the lowest GHG-intensive chemistry products on the planet. Canada's chemistry products are already 80% less GHG-intensive than those produced in some European or Asian markets, which rely on crude oil as their feedstock. Chemistry is such an integral part of the solution to address the global challenges of the future that it will likely require a tripling of chemical production volumes by 2050. In fact, the federal framework for output-based allocations, if implemented properly using global benchmarking, could be helpful. Carbon policies and rules that serve to encourage development and investment in the chemistry sector in Canada are critical as the country resolutely seeks to transition to a more sustainable economy.

Canada's industry and Canadians overall lose when domestic production and associated emissions are simply moved offshore to other jurisdictions, a phenomenon known as carbon leakage. This is especially true given the early efforts in the country that have made Canada's chemical manufacturing operations among the lowest-emitting plants worldwide. The right carbon policies will allow low-GHG made-in-Canada products to meet global market demand while mitigating climate change impacts.

INNOVATION POLICY

In the chemistry sector, Canada is competing globally for the next wave of investments; for Canada, this means attracting investments. The introduction of the technology-agnostic Strategic Innovation Fund (SIF) in Budget 2017 was a good first step in reorienting and broadening Canada's innovation strategy to win new, incremental investments in very profitable areas of the global economy. SIF recently contributed $35 million to NOVA Chemical's $2.2 billion investments in Alberta and Ontario, as well as $49 million each to the Canada Kuwait Petrochemical Corporation's (CKPC) $4.5 billion petrochemical complex and Inter Pipeline's $3.5 billion integrated propane dehydrogenation and polypropylene plant, both in Alberta.

The recent report from the Parliamentary Standing Committee on Industry, Science and Technology[12] has identified the manufacturing sector as vital to Canada's economic well-being. The report notes the chemistry sector's excellent performance in job creation over the last two decades and the potential for expanding this sector as the shale gas revolution reshapes energy markets. With more than 95% of all manufactured products being touched by chemistry, the sector is a vital component to Canada's manufacturing future and the low-carbon economy.

[12] *The Canadian Manufacturing Sector: Urgent Need to Adapt, Standing Committee on Industry, Science and Technology, Parliament of Canada (2017).*

Recommendations:

- Mitigate investment risks and uncertainty by helping finance innovation and assisting in the commercialization of new and yet commercially unproven technologies, keeping in mind that transformative solutions can deliver reductions over decades of use.
- Chemistry is one of the most innovative sectors of the North American economy, representing nearly one quarter of all new patents. To lead in the new low-carbon economy, Canada will need to support investments into research and the deployment of made-in-Canada chemistry solutions.

Dow Chemical Canada and NOVA Chemicals have recently introduced stand-up pouches for food and consumer product packaging. This seemingly simple design has helped lower the overall amount of packaging materials needed and has helped reduce space in product transportation carriers and on store shelves.

- Through its carbon pricing schemes, Canada will be raising dollars that should be reinvested in the most promising and transformative sectors, the ones with the greatest potential to grow the economy while reducing global emissions. According to research conducted by the International Energy Agency and the consulting firm McKenzie, chemistry is one of the few sectors that shows a clear pathway to absolute economy-wide reductions and as such should be seen as a prime candidate for leveraging carbon pricing funds.

ECONOMIC POLICY

A sound investment climate should include taxation and capital investment measures to encourage value-add resource upgrading and to attract new projects to Canada to directly impact productivity and global competitiveness. This will allow Canadian chemistry companies to compete effectively and capitalize on global opportunities.

The Federal government, in its 2018 Fall Economic Statement, introduced measures to ensure that Canada is a competitive environment for industry investment. They included 100% in year depreciation for purchase of manufacturing and processing equipment and an Accelerated Investment Incentive allowing for quicker expensing of assets that are not covered under the manufacturing and processing equipment initiative.

In Alberta, the Petrochemicals Diversification Program (PDP) had 16 project proposals valued at over $20 billion competing for $500 million in royalty credits in 2015. Two propane to polypropylene projects were selected and approximately $9 billion worth of new investment is currently under construction. In 2018, a second round of PDP funding was announced in addition to a new Petrochemical Feedstock Infrastructure Program (PFIP) worth a combined value of $2.1 billion in investment supports. These initiatives attracted over 20 project proposals valued at over $60 billion. Recent project announcements under these programs include a new Methanol facility in Grande Prairie valued at $3 billion and an Acrylic Acid facility valued at $600 million. To date, the government has funded four projects through royalty credits - including projects from CIAC members Inter-Pipeline and CKPC - collectively valued at $9.6 billion.

Recommendations:

- Increase federal investments in advanced manufacturing through program instruments, matching provincial commitments that have been made in support of projects approaching final investment decisions.
- Spend the National Trade Corridors Fund to facilitate access to markets.
- Introduce a 100% Accelerated Capital Cost Allowance for a minimum of one full business cycle of seven years to specifically apply to upgrading resources used in manufactured products.

These policy tools will help align Canada with its major competitors in the U.S. Gulf Coast. The U.S. recently passed tax reform that has dramatically reduced the statutory U.S. federal tax rate and has implemented a 100% immediate deduction for capital costs which has strengthened the U.S. competitiveness. Incentive packages at the state level can also run into the billions of dollars a few of which are summarized below:

PENNSYLVANIA[13]

Shell Pennsylvania Chemicals was attracted to Pennsylvania to start building its world-scale ethane cracker complex, in part, because of the creation of the Resource Manufacturing Tax Credit in 2012, which was written specifically for a project that purchased ethane for the production of ethylene within Pennsylvania. The total value of the incentive package is estimated to be $1.65 billion between 2017 and 2042. This will be Shell's first completely new site in the United States since the late 1960s.

LOUISIANA[14]

Louisiana Economic Development provides advanced services, long-term tax rebates and credits, and customized incentives to projects that involve major investment and substantial new jobs, particularly in the petrochemicals sector. These services include:

- The industrial tax exemption, which has exempted an estimated $6 billion over 10 years on new investment of $34 billion. Additional funds include the Mega-Project Development Fund, Quality Jobs, and Competitive Projects Payroll Incentive. In addition, customized state and municipal incentives can be made available, such as performance-based grants to offset site, infrastructure and employee relocation costs.
- Workforce solutions, including partnerships with educational institutions and investments in training facilities. Connecting a company with valuable assets and coordinating permitting and start-up activities to ensure operations proceed smoothly and on schedule.
- Aligning state and local resources to identify site locations, upgrade port systems, and offset infrastructure and site costs.

TEXAS[15]

Chapter 313 Agreements: Designed to attract large-scale capital investments, create jobs and provide a net-benefit to the state in the long term. School districts may apply to the state comptroller to limit property taxes project developers pay for 10 years. This has been used to attract major petrochemicals and refining investments and represents a projected tax benefit of several hundred million dollars a year across all industries.
Texas Enterprise Fund: Provides cash grants to companies making a final investment decision in the state.

[13]Diversification, Not Decline: Adapting to the New Energy Reality, Energy Diversification Advisory Committee to Alberta's Minister of Energy, p. 85 (2017).
[14]Ibid. p. 85.
[15]Ibid. p. 86.

These incentives have been provided to major petrochemicals and refining investments in amounts up to $5 million.

Competition for investment in the chemistry sector in North America is fierce. The shale revolution has unlocked a bounty of resources for chemistry companies to manufacture into low-carbon products. As CERI has shown, Canada is an attractive jurisdiction for investment, but we cannot be complacent. Other jurisdictions are moving aggressively to attract investments and we must be competitive if we want to attract world-scale projects.

CLIMATE POLICY

The Chemistry Industry Association of Canada has been actively working with Canada's federal and provincial governments to address the issue of air quality and climate change. CIAC's goal is to see these challenges met with sound practical policies that:

- Improve environmental performance;
- Avoid double-regulation; and
- Maintain Canada's competitiveness.

Canada's chemistry industry is already a world leader in low-intensity carbon chemical production thanks to the abundance of low-carbon feedstocks; modern facilities; upgraded equipment; process and product re-engineering; access to, on average, one of the lowest GHG-intensive national electricity grids; and energy conservation measures. CIAC's members have also taken independent action to reduce their emissions of GHG and air pollutants.

Recommendations:

- Canada should support a carbon policy that recognizes emission-intensive, trade-exposed sectors and encourages investments in the Canadian chemistry sector.
- Given the incredible investments in innovations and technologies to improve performance around air emissions and climate change, Canada's proposed output-based allocation process should focus on benchmarking Canadian chemistry operations and performance against global competitors.
- Recognize the long-term impact from avoided emissions over the life cycle of innovative new products and technologies.
- Leverage the funds collected through specific carbon pricing schemes to participate in public private partnership programs to mitigate the high capital costs associated with low-carbon technology, equipment or infrastructure replacement, new builds or retrofits.
- Include provisions to facilitate trade of Canada's low-carbon chemistry products as part of new free trade discussions

ENERGY POLICY

Canada's chemistry industry relies on a variety of raw materials, called feedstocks, for chemical production. Feedstocks include everything from natural gas to oil, electricity, minerals and biomass.

Natural gas liquids (NGLs), a small but important component of natural gas, contain the key building

blocks needed for petrochemical production: ethane, propane and butane. Canada's petrochemical sector transforms these building-block chemicals into value-added products such as ethylene, polyethylene and ethylene glycol, and uses methane — the main component of natural gas — to manufacture methanol and other chemicals.

Canada's chemistry industry is facing a shortage of domestic NGLs, in part because of the massive growth of shale gas development in the U.S. and the subsequent drop in Canadian gas production because of its inability to reach new markets. A CERI report looking at the expansion potential for Canada's chemistry industry has noted that there is untapped potential to increase the production for NGLs that could support two or three world-scale ethane crackers, while propane markets could also support chemistry sector investments[16]. In 2018, the Government of Alberta announced the Petrochemicals Feedstock Infrastructure Program to help kickstart the building of infrastructure needed to get these vital resources into the hands of Canada's chemistry sector — a very strong statement in support of growing Alberta's chemistry sector.

Recommendations:

- Support the development of the lowest carbon-intensive feedstocks and energy sources, such as shale gas, and allow for their safe and secure transport to chemical facilities.
- Implement policies to extract further value from Canada's NGL resources.

As Canada continues to transition to a low-carbon energy system, three key attributes must remain top of mind. In order to allow the Canadian chemistry sector to expand its role as a low-carbon producer to global markets, the system must be:

Reliable – Chemical operations are particularly sensitive to upset conditions. Outages can result in significant costs as well as potential environmental harm. It is essential that Canada's future electricity system be highly reliable;

Affordable – In some instances, electricity costs can represent up to 70% of all input costs. Additionally, feedstocks (in the form of natural gas liquids) comprise 70% of input costs for a typical ethylene / polyethylene facility. It is essential that Canada's future energy systems continue to be affordable and on par with global competitors; and

Secure – Canada has benefited from having reliable, affordable access to secure energy systems unlike other jurisdictions who are forced to rely on imported energy. Canada's future energy systems must continue to provide domestic security of supply.

TRANSPORTATION POLICY

Rail offers a significantly lighter environmental footprint than truck transportation. Access to a safe, reliable and competitively priced rail service is critical to the success of the Canadian chemistry industry. CIAC member-company executives now identify rail service as a key factor in deciding whether to locate a new facility or expand operations in Canada, second only to feedstock availability. Canada's chemistry industry makes three-quarters of its annual shipments by rail. Chemicals account for nearly 14% of all Canadian rail traffic. For many chemicals, rail has proven to be the safest mode of transportation.
Furthermore, the largest growth markets for future chemistry product demand are not in North America

[16]*Mascarenhas, K., Examining the Expansion Potential of the Petrochemical Industry in Canada, Canadian Energy Research Institute (2015).*
[17]*Ibid. p. 57.*

or Europe. Developing markets in Asia, Latin America and Africa will be the driving force for chemistry products in the future. Canada has shorter maritime routes to Asian markets but getting access to tidewater is imperative. A CERI report has noted access to west coast tidewater is critical for growth in Western Canada's chemistry sector and that declining rail transport[17] service, as well as insufficient pipeline capacity, are currently limiting this growth potential. In central Canada, congestion at border crossings and on rail transportation networks is hampering the flow of cross-border trade. Policies and investments that increase rail service reliability and reduce congestion at major ports and border crossings will help the chemistry sector achieve its potential.

Recommendations:

- Direct the National Trade Corridors Fund to infrastructure projects that reduce congestion at major ports and border crossings.
- Take measures to support infrastructure investments by Canada's railways.

ADVANCING THE CIRCULAR ECONOMY

The circular economy is an alternative to the traditional linear make-use-dispose economic model, which prioritizes the extension of product life cycles, extracting maximum value from resources in use, and then recovering materials at the end of their service life. An important principle of the circular economy is increasing the capture and recovery of materials in waste streams so that they can be recycled and reused in new products and processes.

Recommendations:

- Take leadership to review and revise policies that provide disincentives to the use of waste materials as feedstock.
- Invest in improvements to standardize waste collection and sorting in Canada.
- Develop supportive policy to allow non-recyclable waste to support energy substitution for higher-carbon fuels.
- Establish programs to support research and development that will ensure all plastics are recyclable, recoverable or biodegradable by mid-century.

PROMOTING RESPONSIBLE CARE®

There is tremendous alignment between the principles of Responsible Care and the federal government's broader societal agenda. CIAC members are signatories to Responsible Care — the Association's UN-recognized sustainability initiative. Responsible Care inspires its members to take actions that improve the sustainability of their operations and reduces harm throughout the entire lifecycle of their products. Committing to the ethic and principles of Responsible Care is a condition of membership in CIAC. This commitment extends through to their transportation and service company partners. The Responsible Care Codes influence the decisions CIAC member-companies make every day.

Recommendations:

- Investment and other supports should be tied to companies committed to meeting Canadian's expectations and global standards for social responsibility through participation in initiatives such as Responsible Care.
- In line with the United Nations Environment Programme, recognize and promote Responsible Care so that the Canadian chemistry sector remains a world leader in responsible and sustainable manufacturing and in energy and resources efficiency.

ABOUT CIAC AND CANADA'S CHEMISTRY INDUSTRY

CHEMISTRY INDUSTRY
ASSOCIATION OF CANADA

The Chemistry Industry Association of Canada is the association for Canada's chemistry sector leaders, innovators, solution providers, and world class stewardship pioneers. We share our members' stories with decision-makers at the federal and provincial level to shape public policy that supports innovation, investment, jobs and the environment. We're known for being a pragmatic, policy-based organization that represents members' interests based on solid analysis and scientific data.

As the founders of Responsible Care®, the industry's globally recognized sustainability initiative, our commitment to its ethics and principles means that we are focused on the betterment of society, the environment and the economy and that we do the right thing and are seen to be doing the right thing.

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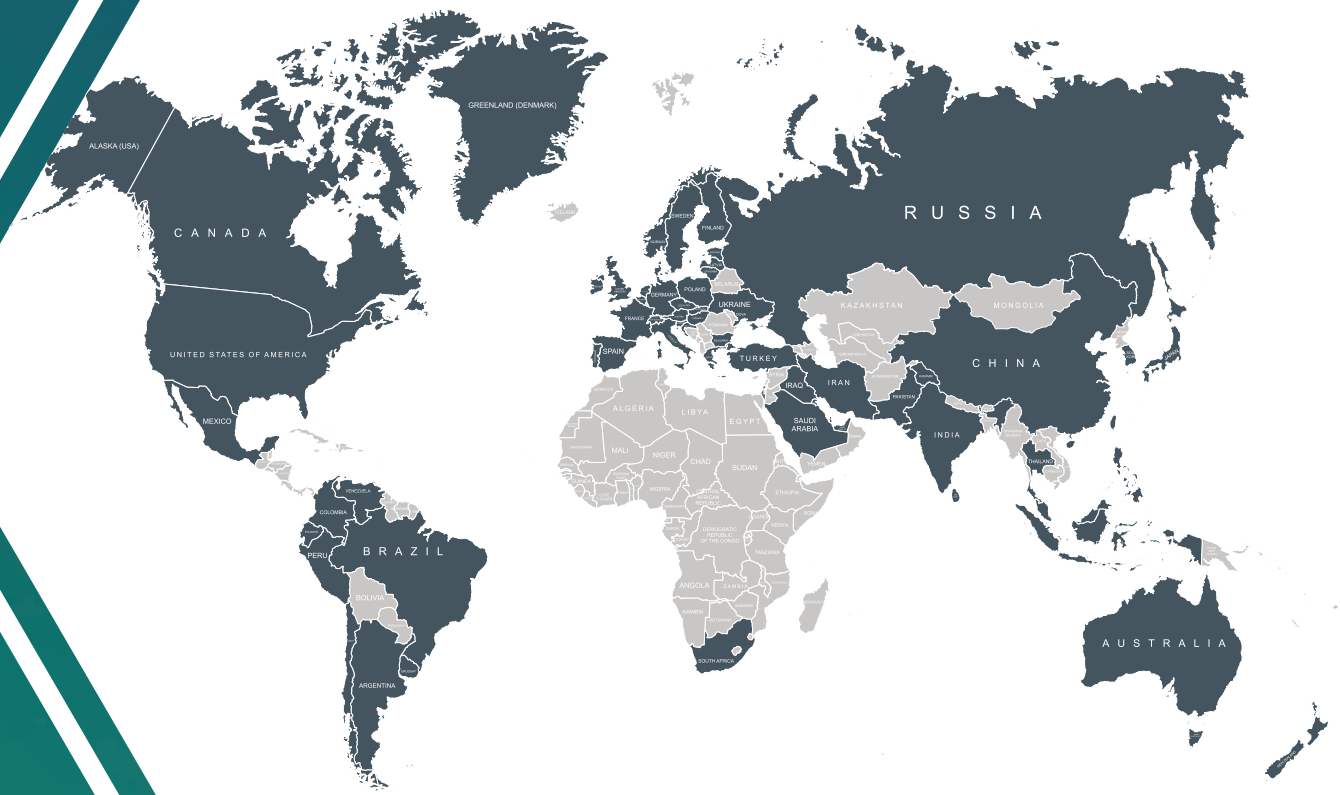

COUNTRIES THAT HAVE ADOPTED RESPONSIBLE CARE®

CHEMISTRY INDUSTRY ASSOCIATION OF CANADA