

Adding Value to Natural Gas

Submission to the Royalty Review Panel

by the Chemistry Industry Association of Canada

October 2015



**CHEMISTRY INDUSTRY
ASSOCIATION OF CANADA**



Responsible Care[®]
Our commitment to sustainability.

Executive Summary

The objective of the Royalty Review is to find opportunities within a royalty framework to optimize the return to Albertans, and support continued industry investment, economic diversification and responsible development. To achieve this, one of the undertakings in the Review is to understand and assess how a royalty regime can generate diversification opportunities such as value-add processing, innovation or other forms of investment.

This submission from the Chemistry Industry Association of Canada (CIAC) is focussed on the pursuit of a value-add integrated economy and specifically the natural gas value chain. The goal is value-add economic diversification; Albertans are looking for opportunities to leverage the royalty system to effectively enable investment opportunities to move natural gas and co-produced molecules up the value chain. Government plays a key role providing the supportive business environment to allow investments, economic growth and value-add jobs to happen in a responsible fiscal and social manner.

Value add based on upgrading, mainly of natural gas and natural gas liquids, but also of all of Alberta resources represents over \$14 billion in annual chemical sales, and \$9 billion in chemical exports from the province. The province of Alberta has realized the value added benefits of the petrochemical industry for a long time and the Province of Alberta and its oil, gas and petrochemicals industries have worked together in the value-added development of Alberta's energy resources, particularly natural gas. Alberta currently has one of the world's largest ethane-based petrochemical facilities at Joffre, and other major petrochemical facilities in the Fort Saskatchewan and southeastern regions, which consume in excess of 21% of Alberta's natural gas production, and add 5, 10, 20 times and more to the value of the original input.

Economic diversification means more than access to and diversity of markets for Alberta energy. Export markets for natural gas are essential but not sufficient. The Alberta chemical industry adds value to natural gas and natural gas liquids (NGLs) through the production of chemicals and polymers. This is done through upgrading the value of the molecules by creating higher value products, providing jobs for highly skilled workers and revenue to governments. The Alberta chemical industry as well provides access to incremental markets which are not constrained by pipeline limitations.

Taking the basic molecules in natural gas such as methane, ethane and propane and moving along value chains into basic petrochemicals takes low value molecules and moves them up the value chain by producing products that are valued based on oil. These higher value products sell into local and global markets based on oil prices. In addition, diversity of markets is improved since the energy products are converted into chemical products which have their own unique market dynamics.

Oil and gas boom and bust cycles often run counter to manufacturing business cycles. The other major benefit from value-add economic diversification is growth stability. A good example of this is the Texas economy which does not experience the abrupt swings of a resource-only economy because it has diversified into high-value manufacturing, including

petrochemicals. Ultimately resource availability, competitiveness and overall profitability will decide what is built, when and where. Alberta is blessed with an abundance of resources and when competitive opportunities exist, relative to other options for investors, some will choose to invest in Alberta to move along energy value chains and add value and diversify the Alberta economy. Albertans will benefit from this diversity.

The Alberta chemical industry through the CIAC's Responsible Care program strives to establish and undertake the highest level of social responsibility in terms of how our operations and products impact environment, employees, customers and other stakeholders. In addition, the products we upgrade and produce result in a lowering of carbon emissions that would otherwise occur at the burner-tip, providing a maybe not so obvious improvement and benefit in the area of climate change.

Albertans are looking for stability, quality of life and opportunity for growth. The chemical sector views itself as a responsible social partner and a solutions provider. CIAC members are committed to be world leaders, from both competitiveness and environmental perspectives. Priorities that do not reinforce each other are going to work against each other – the overall goals must be mutually reinforcing; we must connect the dots.

Recommendations

Overall it is the view of CIAC that in examining the energy sector and developing an energy strategy and Royalty system, Albertans need to broaden the dialogue and consider options to further integrate and leverage our resource-based economy to maximize the benefits of all stakeholders. In summary:

1. Create a culture to facilitate economic value-add manufacturing and resource upgrading by providing a champion in government, and in Cabinet where economic development/diversification can be the focus. Know how and where priorities are in support of or conflict with value-add economic diversification and purpose to be at the top of our game in every aspect of global competitiveness;
2. Focus on improved knowledge and understanding of what is needed to generate responsible value creation – know where we must improve to be globally competitive; and
3. Create opportunity to invest in adding value to resources; the Royalty system can be an effective government tool in providing economic diversity and responsible development.

Table of Contents

Executive Summary2

Table of Contents4

The Royalty Review – Objectives5

Introduction and Scoping6

Background (chemical sector in Canada-energy intense, energy efficient and providing sustainable solutions).....10

Making it Happen15

The Options15

The Recommendation-Pursuit of Economic Diversification17

 What is not helping is hurting18

 What does it take to win?18

 Recommendations.....20

Appendix 1 – Studies Identifying the Opportunity for Resource Upgrading22

Appendix 224

Appendix 326

Appendix 428

Appendix 532

The Royalty Review – Objectives

NOTE: This section is extracted from the government of Alberta website for the Royalty Review (<http://www.energy.alberta.ca/Org/pdfs/RRmandate.pdf>)

Working with stakeholders, the objective of the review is to establish a strong understanding of the energy sector and, based on that, to find opportunities within a royalty framework to optimize the return to Albertans, and support continued industry investment, economic diversification and responsible development.

To achieve that objective, the Royalty Review Panel will undertake to:

1. Understand and assess the current Alberta royalty framework for each of the three distinct sectors in the province's oil and gas industry within the context of capital flows, available economic rent, employment, profitability, product competition for the attraction of capital, and government revenue.
2. Understand and assess how government revenue is generated from oil and gas land sales.
3. Understand and assess how a royalty regime can generate diversification opportunities, such as value-added processing, innovation or other forms of investment. Understand and assess how Alberta's royalty framework compares with other jurisdictions.
4. Understand and assess the trends that are likely to affect the future (short- and long-term) for the three distinct sectors in the province's oil and gas industry, and their implications for government revenue.
5. Develop criteria for assessing the effectiveness of the royalty framework on an ongoing basis.

Developing criteria is an essential step to ensure that the royalty framework is durable and stable over the longer term and responsive to the ups and downs of the marketplace. One of the Panel's goals is to assure Albertans that a good framework has been put in place and they can be confident it will remain so.

In this submission, CIAC is focused on #3 in order to "... find opportunities within a royalty framework to ... support continued industry investment, economic diversification and responsible development". This will, in turn, optimize return to Albertans.

Introduction and Scoping

Resource Stewardship, Responsible Resource Development, Sustainable Development

This Review Panel is the right group to be looking holistically at sustainable economic development in the context of natural gas and in particular in the context of the ongoing North American shale gas revolution. Alberta energy is a source of wealth creation, and actively contributes to quality of life. This can be seen in the unique opportunities facing Alberta's economy, where there are challenges to develop and implement policies that enhance opportunities to extract maximum value from energy resources while achieving environmental sustainability.

Energy comes from many sources, including hydro, wind, solar, oceans (tidal and wave), biomass, uranium, crude oil, natural gas, coal, oil sands – bitumen, and coal bed methane; all are in abundance and all offer opportunities for development and growth. This assessment is focused on the natural gas and natural gas liquids opportunity, but applies to all unconventional gas, oil and liquids (natural gas liquids as a component part of natural gas and associated gas as a component of unconventional oil). As with each resource area, energy offers a portfolio of opportunities in Western Canada and responsibly optimizing these opportunities is a good goal for all Albertans. Alberta is not in this alone, as neighbours such as B.C. and Saskatchewan share in both the challenges, as well as the exponential value-add opportunities they present. But further, Alberta is in a global competition for investments – everyone wants value-add opportunities and investment.

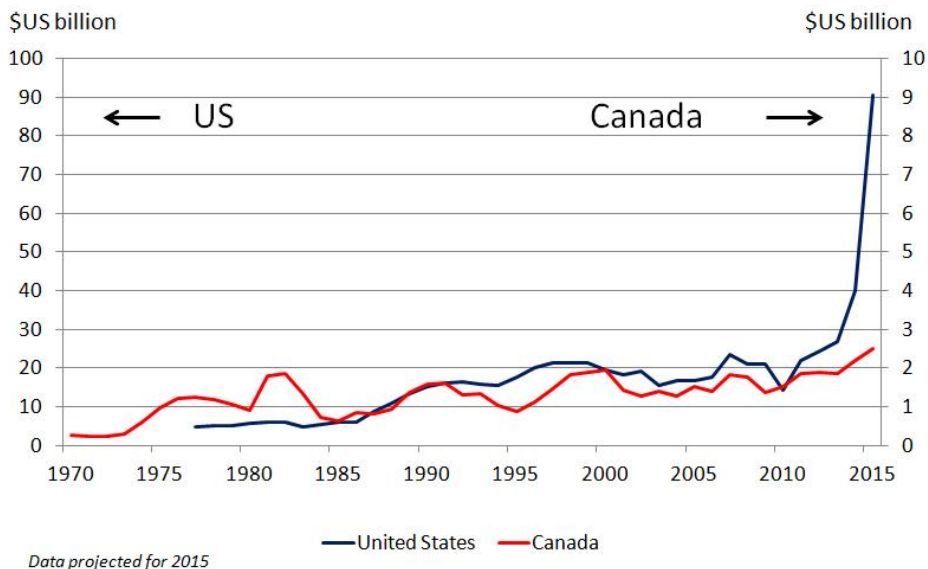
The chemical industry, through the application of chemistry is already adding value and jobs, creating wealth, and diversifying the provincial economy. CIAC recommends an approach that recognizes the importance of responsible energy development and also resource upgrading to create value-added products based on energy inputs. Essentially, we are talking about an “all of the above” approach to economic development which can be applied to the shale gas opportunity, as well as to conventional, associated gas and other types of energy resource developments. While it is imperative that the owners and developers of resources have, in a responsible manner, the ability and right to maximize the value of what they produce it is also an important role for government to create an environment to advance competitive opportunities for upgrading and manufacturing of these resources. Government initiatives and policies directed at this end enable industry to thrive and benefit Albertans and more generally the entire Canadian economy so that both advance in a sustainable manner.

Overall, it is our view that in examining the energy sector and developing an energy strategy and Royalty system, Albertans need to broaden the dialogue and consider options to further integrate and leverage our resource-based economy to maximize the benefits of all stakeholders.

Unconventional energy production and shale gas specifically is providing North America with an economic growth opportunity that has not been seen for several decades. It is important to understand this unique and “one-time” opportunity, to see how it is already making a difference and to realize how we can maximize the value and benefit of the opportunity!

There are three studies (see Appendix 1) which have been done for the US market that have direct bearing on the economic diversification and sustainable development messages. They can be used as examples of how other jurisdictions analyzed the situation and assisted in developing plans and policies to realize goals. At this point in the development of unconventional oil and gas, most upgrading and petrochemical development is happening in the U.S. (see figure 1). It is the purpose of this report to show how some of that development can happen in Alberta. Fundamentally, for the chemical industry, this is the opportunity.

Figure 1: Chemical investment trends – Canada v. US



The three studies demonstrate clearly how moving along the energy value chain is “fueling” a manufacturing renaissance in the U.S. But, the investments are taking place in partnership with government. The U.S. federal, state and municipal governments are investing in infrastructure such as ports and shipping channels, providing tax holidays and actively facilitating site approvals. In turn, the governments are benefitting from the almost \$150 billion in announced and ongoing investments as tax revenues soar.

Recently, the Canadian Energy Research Institute released “*Examining the Expansion Potential of the Petrochemical Industry in Canada*”

(http://www.ceri.ca/index.php?option=com_content&view=article&id=176:ceri-study-153-examining-the-expansion-potential-of-the-petrochemical-industry-in-canada). This report suggests Alberta is firmly in the mix in competing for the next round of global investments in value-add energy products. It suggests that Canada is cost-competitive with the rest of the world, but that there are challenges that need be addressed. But the key message is that Alberta has the resource – natural gas and natural gas liquids are the essential component needed for petrochemical development. The opportunity is here.

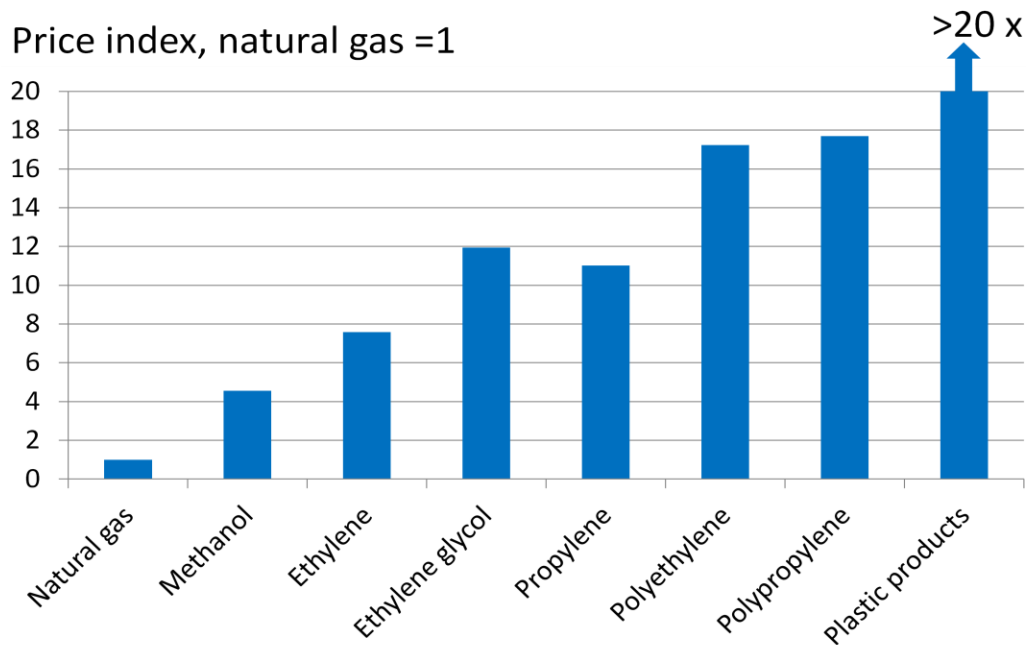
Against a backdrop of lowered energy consumption (as energy) right across North America, the prospect of increased global competitiveness is striking, and exciting. To be clear, Alberta is in competition, not just for gas development and market diversification, but right across energy

value chains and downstream into manufacturing. The allure of attraction of long-term, high-paying manufacturing jobs is strong, so the competition is also strong (see figure 1 earlier).

The chemical industry is already a key contributor to Alberta’s energy value-add strategy. Natural gas liquids, in particular ethane, and natural gas itself (methane) are converted into high value chemicals and fertilizers, \$14 billion in sales this past year, with almost \$9 billion in exports. These are high value jobs; over 1/3 of our employees have university degrees (figure 6). These are jobs that have important multiplier effects within local economies – each chemical job results in another five in related sectors and services (source: Statistics Canada).

Feedstock or raw materials are core to the competitiveness of chemical producers, and its capacity to move along value chains (see figure 2). Alberta has the opportunity to move along energy value chains and provide a significant added value to the benefit of Albertans.

Figure 2:



Source: Chemistry Industry Association of Canada (CIAC)

A new world-scale ethylene/polyethylene complex requires on the order of 80,000-100,000 barrels per day of raw material (ethane). Equally of note, an integrated petrochemical site is a 30, 40 or 50 year investment. Using the USGC expansions and investment in new facilities as examples, a new petrochemical complex, including infrastructure and derivative facilities can cost in the range of US\$ 8 billion. Even an investment on an existing site with infrastructure already in place can approach the US\$5 billion range. With raw material (in this case ethane) at 70% or more of operating costs, clearly supply of feedstock is the first and essential consideration of the investor. Other examples are provided later in this document (page 19).

Today Alberta is heavily reliant on its natural gas industry to market its output but the major export pipelines are operating at only a fraction of their capacity. The problem is market access

– the pipe delivers to locations that are now better served by growing U.S. production. Government policies and programs directed at increasing conversion of the components of natural gas, specifically methane, ethane and propane, into higher-value products can provide diversity and demand for these products. The products produced do not suffer from lack of market access, they do not move by pipeline, they already are moving to many global markets and many of them are sold based on oil-related pricing instead of the very much lower gas prices. This is investing in the petrochemical industry to achieve value creation.

One final “opportunity” is the global challenge of climate change. Alberta’s petrochemical producers consume energy and produce carbon dioxide in the process. But they also capture and sequester carbon into chemical products (e.g., insulation, car parts, counter tops, medical equipment, solar panels). As Albertans devise a climate change strategy we need to take advantage of a sector that prides itself on being a solutions provider. Life cycle analysis of the products produced by the chemical sector globally show that it is the most energy intensive sector of all manufacturing sectors. But, from insulation to light-weighting of auto parts to specialty lubricants, this sector is about providing solutions. While the sector is very energy intensive and is the most traded sector globally, there is opportunity to make products here in Albert from natural gas, rather than elsewhere from oil or coal which might result in a larger global carbon footprint. One example is methane (natural gas) conversion to methanol. If the same methanol is produced in China from coal, it will have a carbon footprint that is eight times larger than doing it here! CIAC urges doing it here with the best technologies and the lowest emitting feedstock, rather than elsewhere – that is responsible resource development.

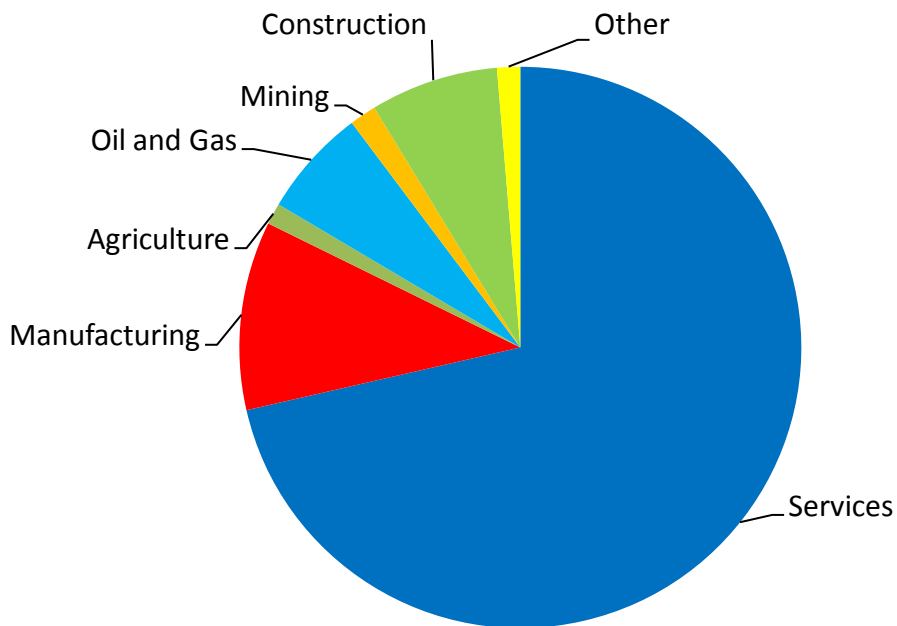
Background (chemical sector in Canada-energy intense, energy efficient and providing sustainable solutions).

This next section describes first the Canadian chemical industry and then goes specifically deeper into the Alberta data and how energy resources and natural gas in particular are a component part of the opportunity for economic diversification. The illustrations and data help to make the case for Alberta economic diversification.

Canada's Economy is Closely Linked to Natural Resources

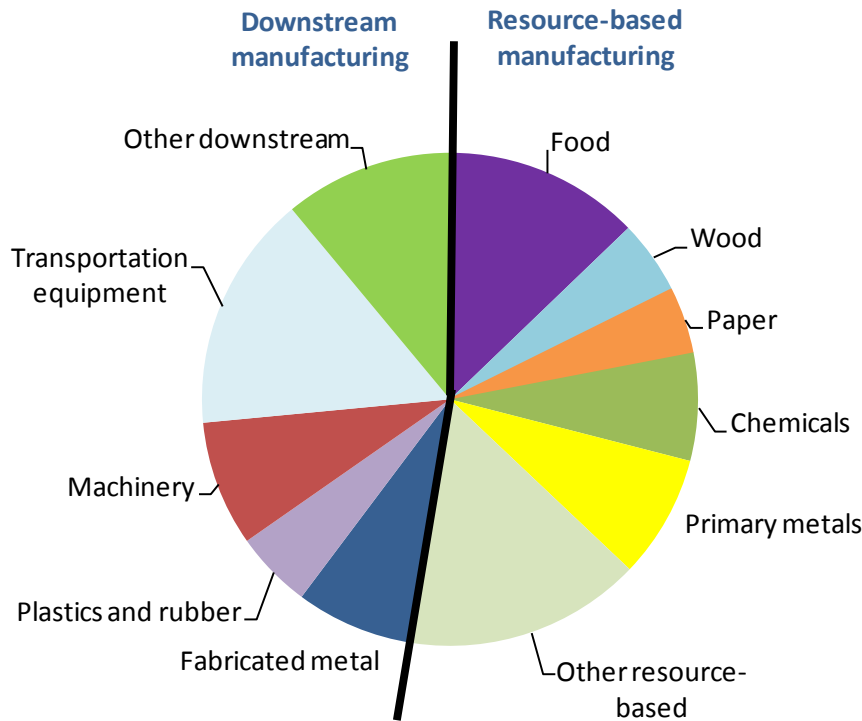
While the Canadian economy is mature and appears to be dominated by the service sector (figure 3) many of these services are related to manufacturing and resource development. Manufacturing is a very important component of our economy and figure 4 further breaks down manufacturing into industries based directly on resource upgrading and other further-downstream industries.

Figure 3: Canadian Economy by Sector, 2014



Source: Statistics Canada

Figure 4: Canadian Manufacturing (GDP Comparison, 2014)



Source: Statistics Canada

A good illustration of the resource-manufacturing linkage is chemical manufacturing which purchases 18% of gas, 5% of oil and 3% of electricity consumed in Canada. Those numbers are higher for gas upgrading in Alberta, exceeding 21%.

The Alberta chemistry industry consumes 21% of domestic gas, adding value here and across the Canadian economy.

In moving along resource value chains, Alberta needs to consider those factors that can enhance our global competitiveness. First, where there are duplicative and sometimes conflicting federal-provincial environmental regulations or significant incremental costs, this discourages potential investors. Regulatory streamlining must be a goal across all sectors of the economy. CIAC recognizes the Alberta Government’s initiative in developing the Integrated Resource Management Framework. In particular, it must be facilitated where business is seeking to add value to resources, including energy and our Responsible Care ethic will ensure we are doing the right thing as we undertake resource upgrading (see Appendix 3).

The CERI petrochemical study referenced earlier confirms that Alberta has abundant supply of competitively-priced raw materials or feedstock to run plants and provide for future growth. North America and central Canada in particular, has been experiencing a serious erosion of its manufacturing base. Adding value to our resources creates jobs and wealth across the economy and can help turn that trend around, starting right here in Alberta.

Manufacturing, a key market for chemical sector output, is a competitiveness concern today. Facilities have been closing and to reverse this trend, we need to attract new investments. Adding value to resources is the essence of the manufacturing sector, which creates jobs and wealth across the country.

Each chemistry industry job results in 5 additional jobs across the Canadian economy.

In the U.S., both governments and industry are aggressively pursuing investment opportunities. Alberta needs to focus its efforts if it wishes to participate in this “value-add” phenomenon.

Competitiveness challenges are being discussed and industry and governments must continue to work together to remove remaining obstacles and on business and policy issues that will stimulate future growth in the chemical sector of our economy.

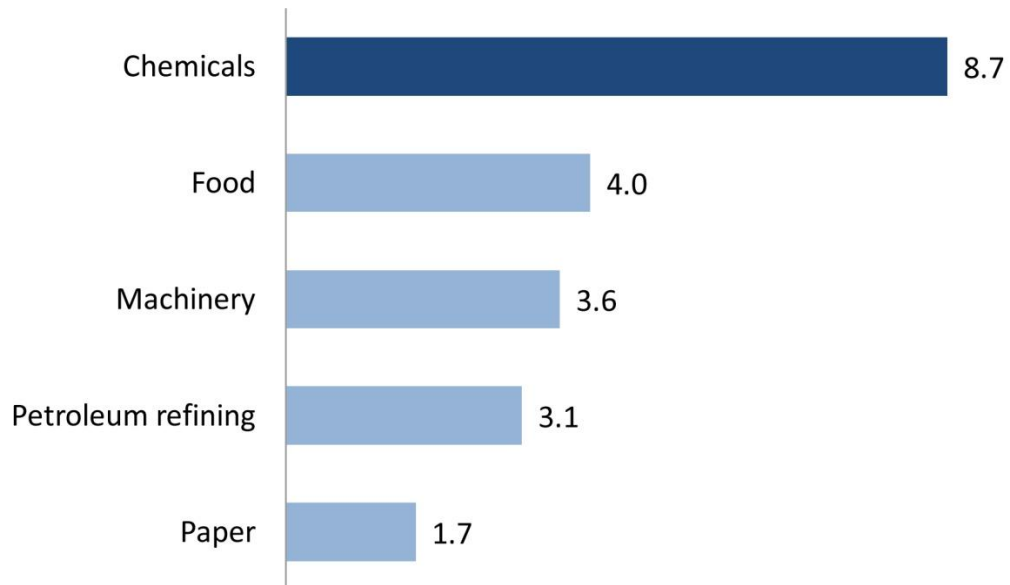
Alberta is a major source of all the necessary ingredients (energy, minerals, skilled workers, stable investment environment) to produce chemicals. Alberta has the potential to become the world’s best upgrader of natural resources into value-added manufactured chemicals for domestic and global markets through several routes, but these require vision at a provincial as well as national level.

The Canadian energy strategy developed by the Council of the Federation articulates an energy vision that includes optimizing and securing opportunities for adding value in the petrochemicals area (see section 9 of the Canadian Energy Strategy (http://www.canadaspremiers.ca/phocadownload/publications/canadian_energy_strategy_eng_fnl.pdf)).

Here in Alberta, an energy strategy must be more than facilitation of energy project approvals and expeditious delivery of our energy to a broader suite of export markets. Our energy extraction and production must serve Albertans well and serve them responsibly.

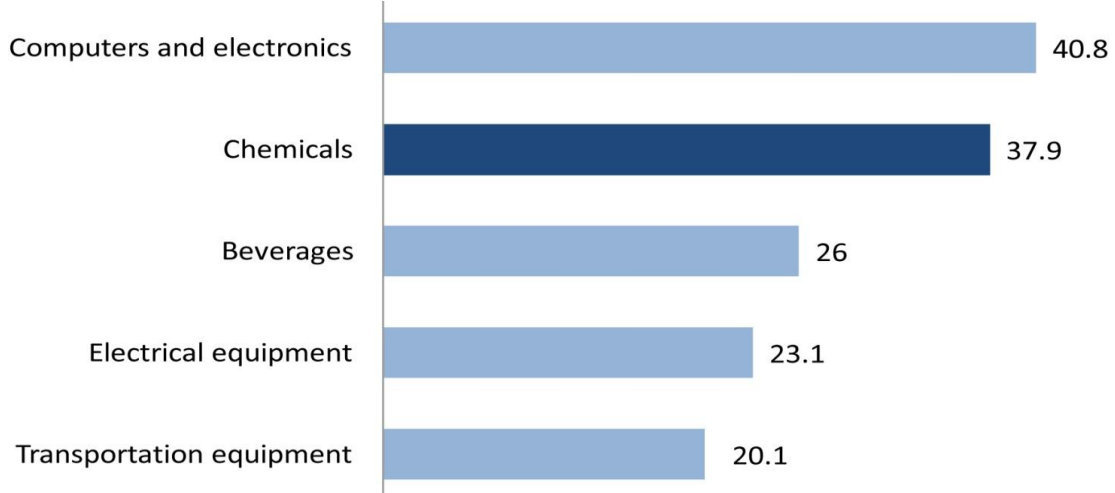
Specifically, in Alberta the chemical sector relies on access to affordable energy to add value and manufacture products for Albertans and for export (see figure 5). These are good jobs; good careers (see figure 6).

Figure 5: Alberta Export Ranking - \$ Billion



Source: Statistics Canada

Figure 6: Percentage of Employees with University Degrees

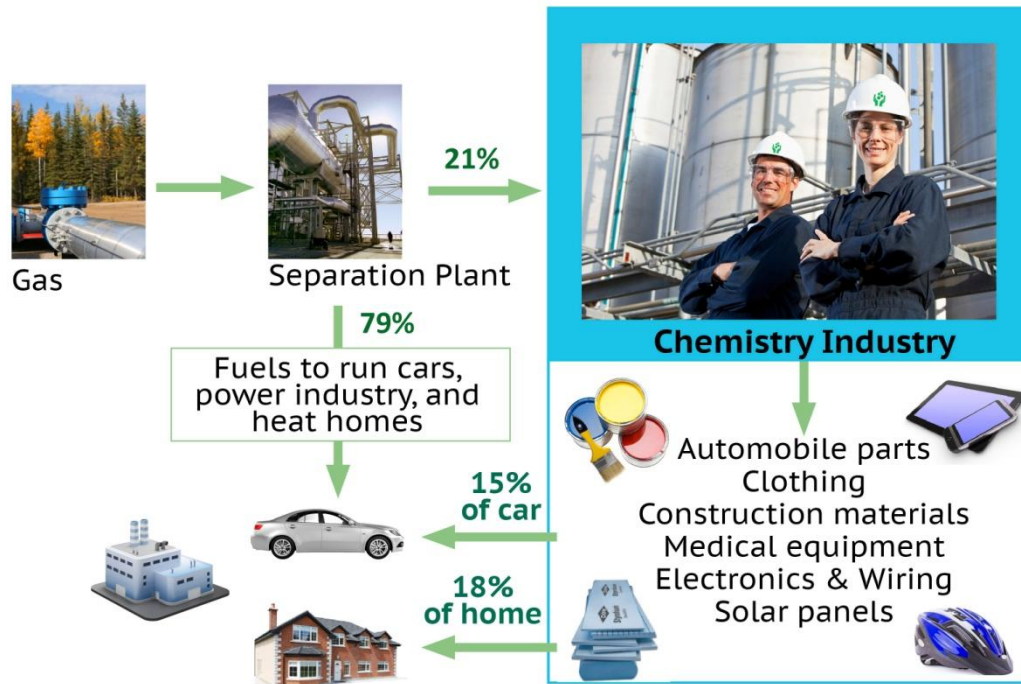


Source: Statistics Canada

Petrochemicals

Chemical companies use energy as both a fuel and as a raw material or feedstock for chemical production. The energy may be oil, gas, electricity or bio-based materials. In the case of natural gas, our impact is significant (see illustration 1).

Illustration 1: Gas-Based Chemistry Value-Chain



For the petrochemical sub-sector, members take components of natural gas and convert them into a broad range of petrochemicals such as methanol, ethylene, ethylene glycol, styrene and polyethylene and beyond into fabricated products and formulations.

Making it Happen

Alberta will need to develop and implement the policies that enhance the opportunities for extracting maximum value from energy resources, while respecting market principles. The 10-year extension announced by the federal government in Budget 2015 for the accelerated capital cost allowance (ACCA) will enhance the competitiveness of value-added projects for Canada.

A diversified economy can smooth out the government revenues, dampen resource-base swings, diversify employment and create career opportunities right across Alberta. In this way, the chemical industry is uniquely positioned to unlock further expansion, investment and wealth creation in the province. By gaining competitive access to new energy and feedstock supply – like those found in Alberta – the Canadian chemistry industry has the potential to supply the world with environmentally sustainable value-add products.

Alberta can supply the world with value-added products

Future feedstock sources could include northern gas and new supplies from B.C., Saskatchewan and Alberta through a “Western Canada Energy Hub”. For a review of competitiveness factors specific to the development of the chemical sector, refer to the Chemistry Industry Association of Canada (CIAC) competitiveness score cards (<http://www.canadianchemistry.ca/index.php/en/fact-sheets-brochures>).

Capital cost disadvantage (high construction costs) and higher transportation costs which are not applied in competing jurisdictions are a few examples of competitive issues beyond raw materials that must be addressed. Corporate tax is another readily measurable competitiveness factor. A recent study by the Canadian Manufacturers and Exporters (CME) “**Why profits are important & higher corporate tax rates are a bad idea**” (<http://cme-mec.ca/uploads/media/5457sq3ke.pdf>) makes the case for lowering corporate tax as a means to enhancing manufacturing and innovation investments in our economy. CIAC has also provided comments on corporate tax in its recent pre-budget submission to the Alberta government (Appendix 4). CIAC is recommending, when fiscal conditions permit, that the corporate income tax for value-add manufacturing (M&P) be set at 10%.

A Broader Dialogue

CIAC believes that energy must remain a matter of Canadian priority, bringing together the federal and provincial governments and all energy stakeholders, with one clear purpose - to bring long-term balance and opportunity for sustained growth to Alberta and Canadian energy markets. A second goal is to competitively add value to our energy resources in the most sustainable way possible to create Canadian wealth and jobs, products that improve everyday living, and reduce our environmental footprint. The chemistry industry is actively engaged in finding solutions; our members are working with partners in the energy sector to address emissions, water use and site remediation issues (see Appendix 2).

The Options

CIAC believes that the government has the ability to make choices within the context of the business environment – choices in “letting the market decide”. First, as the owner of the resource, and in defence of representing the public interest, the government should not apologize for adopting policies that optimize benefits for its citizens.

That does not mean “interfering” with business. A fundamental principle is that ultimately decisions about how Canadian energy resources should be developed, produced and sold are best left to energy markets themselves, both domestic and international, to resolve. Indeed, individual decisions about who and where to sell an individual firm’s energy production to and on what terms will continue to be made by firms involved and different market participants will have different opportunities, with different views on which market opportunities are most favourable for them.

A critical role for governments in this is to ensure that markets are enabled to work efficiently, openly and fairly, while appropriately safeguarding the environment and the rights of all participants. This includes helping ensure that Alberta’s energy supplies are open to global energy markets and also open to value add right here in Alberta. And that in turn means, among other elements, ensuring efficient, fair regulatory processes that can expeditiously provide necessary energy transportation infrastructure developed in a safe, environmentally and socially responsible manner.

The option for Alberta, as the resource owner, is to offer programs to achieve desired outcomes. Examples of this have been demonstrated in the recent past through the creation and use of instruments such as IEEP, BRIK and utilizing Royalties. To the extent that those programs used the royalties portion of government income to encourage further value-added upgrading and did not remove or limit choice, or hinder the market’s ability to operate effectively and competitively, it offered more choices and is an approach the CIAC supports. This is not interfering with the business, it is offering real options that represent public interest and offer a way forward to achieving some additional value add.

There is a portfolio approach to energy development that sees some extraction and export, some upgrading and some further conversion or manufacturing into finished products. Adding “some” further value to “some” basic resources provides a diversity that optimizes opportunities for Albertans. That is portfolio development.

The Recommendation-Pursuit of Economic Diversification

CIAC supports policy initiatives that promote sustainable development of diverse energy supplies, energy conservation, and the concept of using some energy as a feedstock to produce high value-added chemical products. At the same time, energy development, environmental improvements and societal expectations should advance cooperatively and not in conflict. Chemistry solutions can address environmental concerns and issues. Alberta's energy, environmental and societal goals must be mutually reinforcing and take industrial competitiveness, value-added upgrading and sustainability into account.

Chemistry solutions can address Canada's environmental issues.

Energy is a key component of economic well-being and an essential input into an economy. Alberta needs access to markets, but also needs diversity of markets. Adding value to natural gas and NGLs through the production of chemicals and polymers provides significant incremental value creation in Alberta as well as providing access to incremental markets which are not, for example, constrained by inadequate transportation capacity. Adding value further adds to diversity of markets since the energy products are converted into chemical and polymer producing which have their own unique market dynamics, many of which run counter to basic resources such as oil and gas.

The chemical sector is an excellent Alberta example of resource upgrading and value-add manufacturing. With shipments of over \$14 billion, exports of \$9 billion and strong prospects for growth, there is opportunity here for energy value chain developments going forward. North America is experiencing significant chemical sector investments the result of unconventional oil and gas. There are approaching \$150 billion in new capacity underway, announced or anticipated. There is a real opportunity for Albertans and advantage for the Province to see more economic diversification. It can provide buffering and relief from the boom and bust cycles that result from an economy too weighted around resources and related services. The recent downturn in energy prices have curtailed investment and resulted in a loss of employment in the upstream sector, during which the chemical sector has continued to operate at high levels adding value to the Alberta economy.

But attracting a share of new investments will involve hard work by all of us; the competition is very good and competitors for investments are working hard to attract or keep these investments (figure 1). The US Gulf Coast has the same raw materials, it is on tidewater, the construction costs are purported to be lower – we will have to work to win investment opportunity here. In the end, it must be evident that it is more profitable to add value to energy in Alberta than elsewhere.

It is very clear that a healthy and viable oil and gas sector is a requirement to realize a healthy and viable energy value chain. For example, unless natural gas finds new markets we will not see the exploration and extraction that provides opportunity for natural gas liquids to be upgraded into new petrochemical production.

What is not helping is hurting

Added costs of doing business such as the high cost of construction in Alberta, the increase in corporate tax and higher climate change charges make the case for investing in Alberta economic diversification much harder; the aggregate of these measures hurt chances for Alberta to stay in the mix for investment consideration.

We urge government to consider, as fiscal conditions permit, providing choices for investors. Our energy products can be extracted and exported. But with the right conditions, some energy value chain products can be produced here. Alberta must consider ways to encourage investing in value add. For example:

- Programs could be designed to encourage the upgrading of energy materials such as methane and natural gas liquids through the use of the government's share of royalties and taxes (provincial & municipal). These programs could target to encourage new investments through improving availability of competitive valued feedstock. Use of the Royalty system in this manner to further petrochemical investment in the province is not a subsidy - it is deliberately changing where Alberta chooses to share in wealth generation.
- Offer that the 12% corporate income tax rate can be reduced to 10% (the special manufacturing and processing or M&P corporate tax rate) if a company chooses to manufacture products (add value to energy resources) in Alberta; and,
- Ensure that increased climate change charges take account of the holistic impact that the petrochemical industry has on carbon emissions and how similar production is treated in the U.S., our direct and closest competition for new investments in energy value-add. Ultimately, it is important to do some of the upgrading here where we control the environmental performance rather than elsewhere, potentially with higher net emissions (see Appendix 5, CIAC submission to the Leach Panel).

Alberta's chemical sector already takes over 21% of its natural gas consumption and converts these natural gas components into high value manufactured products. The sector provides good careers for Albertans, with each direct job producing another 5 in your communities. Salaries are \$97,000. The chemical sector is the number one value-add manufacturing sector in the province. The opportunity to grow is real and significant. Earlier, reference was made to the increasing investments in petrochemical facilities in North America based on the unconventional energy developments. The investments are important in restoring the health of manufacturing right across the continent and Alberta can be a material part of that growth. But, to date as figure 1 indicates, we have not yet seized the opportunity.

What does it take to win?

There are a number of activities that are necessary to win investments. In the end, it must be as competitive to build and operate value-add resource-based manufacturing facilities here as anywhere else. There are many core factors to achieving global competitiveness and first is a willingness to compete.

In the past, the incremental ethane extraction policy and program (IEEP) successfully leveraged \$350 million in forgone (immediate) revenues by the Province to generate 91,000 incremental barrels of ethane and that resulted in \$1.8 billion in incremental investments in Alberta while it was in place. The measure did not require upgrading, but it offered the choice to pursue

upgrading and helped to offset some of the added costs or competitiveness factors Alberta faced at that time. Redeveloping and creating new concepts that can leverage natural gas and natural gas liquids into value added processes in Alberta offer a real opportunity to achieving further economic diversification for the Alberta economy.

The right focus, on industrial development requires a clear awareness of the competition. What are competing capital costs, are logistics adequate to handle growth here in Alberta, do we have competitive returns for investors, can we build new projects on time and on budget? There are areas where industry and government need to work together. We must be the best we can be if Alberta is to be a location of choice for growth. A new petrochemical facility such as an ethane cracker can mean investments on the order of \$8 billion, with a commitment to be operating and providing value to the Province for 30-40 years and beyond. A dedicated propane to propylene facility with polypropylene and related infrastructure comes in at over \$3 billion. Methane to methanol world scale facilities can cost well over \$1 billion. An economic strategy that rewards value add choices and shares in the up-front risks will be necessary. Everyone will need to be on their best game for this to work. As noted earlier, the competition is very fierce and options exist to add value elsewhere.

Our industry is located across Canada, upgrading and resources

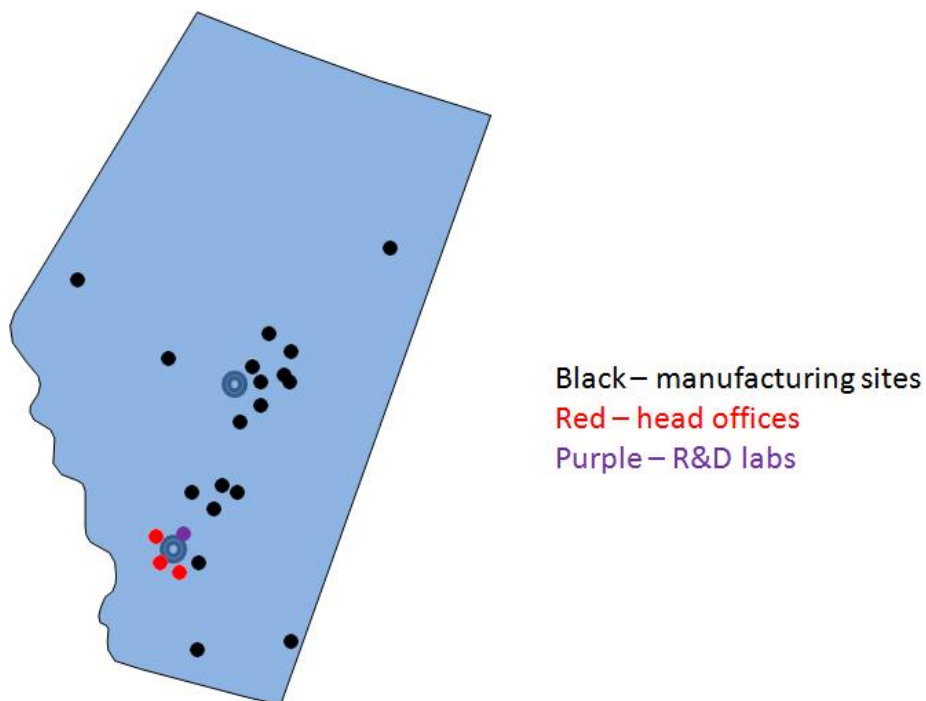
Right up front, CIAC members are offering to work with the Government of Alberta to get the details right. We are prepared to have industry experts work with government experts, to offer choices to industry to realize more value-add resource upgrading and economic diversification in the province.

For Alberta and across Canada, access to affordable and competitively-priced energy drives economic growth and sustains competitive advantage. Figure 7 illustrates where CIAC members are located; where we convert basic resources into products for Canadians and for export. Figure 8 provides some specific detail for Alberta. Competitive and market-based access to natural gas and natural gas liquids for the chemical sector is crucial to Alberta's value-added growth and capacity for further value-added manufacturing.

Figure 7: The Chemical Sector Across Canada



Figure 8: Where is the Chemical Industry in Alberta



Natural gas can be exported, consumed, converted or sequestered into finished goods. CIAC will speak out on behalf of diversity. This is about much more than market diversity; it is about how Canadians can optimize the value of energy and any other resources. Moving along the value chain adds value, wealth and opportunities for good careers – the diversity it presents enables sharing a bigger opportunity. Chemistry can add value across energy and resource value chains beginning here in Alberta, but ultimately clear across this country. Alberta is encouraged to consider policy options that result in moving some of its resource wealth along value chains to enhance economic diversity.

Recommendations

Overall it is the view of CIAC that in examining the energy sector and developing an energy strategy and Royalty system, Albertans need to broaden the dialogue and consider options to further integrate and leverage our resource-based economy to maximize the benefits of all stakeholders. In summary:

1. Create a culture to facilitate economic value-add manufacturing and resource upgrading by providing a champion in government, and in Cabinet where economic development/diversification can be the focus. Know how and where priorities are in support of or conflict with value-add economic diversification and purpose to be at the top of our game in every aspect of global competitiveness;
2. Focus on improved knowledge and understanding of what is needed to generate responsible value creation – know where we must improve to be globally competitive; and
3. Create opportunity to invest in adding value to resources; the Royalty system can be an effective government tool in providing economic diversity and responsible development.

Appendix 1 – Studies Identifying the Opportunity for Resource Upgrading

First, “*America’s New Energy Future: The Unconventional Oil and Gas Revolution and the US Economy Volume 3: A Manufacturing Renaissance*” (<http://www.neb-one.gc.ca/clf-nsi/rpblctn/ctsndrgltn/rrggnmgpnb/xprtsndmprt/xprtmptrtrgltryfrmwrk-eng.html>) is a thought-provoking assessment of opportunity, of a fundamental shift in the U.S., and perhaps by extension, the North American economy. It was released in September 2013 and looks at the “renaissance” from the perspective of a “full set of value chains – upstream, midstream, downstream and energy-related chemical industries – necessary to unlock unconventional oil and natural gas resources”. By 2020, IHS projects that economic contributions from unconventional oil and gas development in the U.S. will grow to 3.3 million new jobs, more than \$125 billion in incremental federal and state tax revenues and more than \$468 billion in annual contributions to GDP, or 3.5%, all by the end of this decade. Against a backdrop of a slow economic recovery and stubbornly high unemployment, the second-order gains by economic sectors that benefit from the unconventional revolution will help the U.S. economy to make progress in the face of steady economic headwinds.

The energy-related chemicals referred to in this study relate to the processing and transformation of natural gas and gas liquids into chemical products. These products include the major commodity petrochemicals that use natural gas and gas liquids as feedstock, such as olefins, methanol, and ammonia. These are in turn, key building blocks for a whole range of downstream industrial inputs and consumer products. And while manufacturing also undergoes economic cycles and downturns, this diversification dampens the much more serious swings of the more basic commodities. This in turn can dampen the impact on government revenues and smooth out public/social planning.

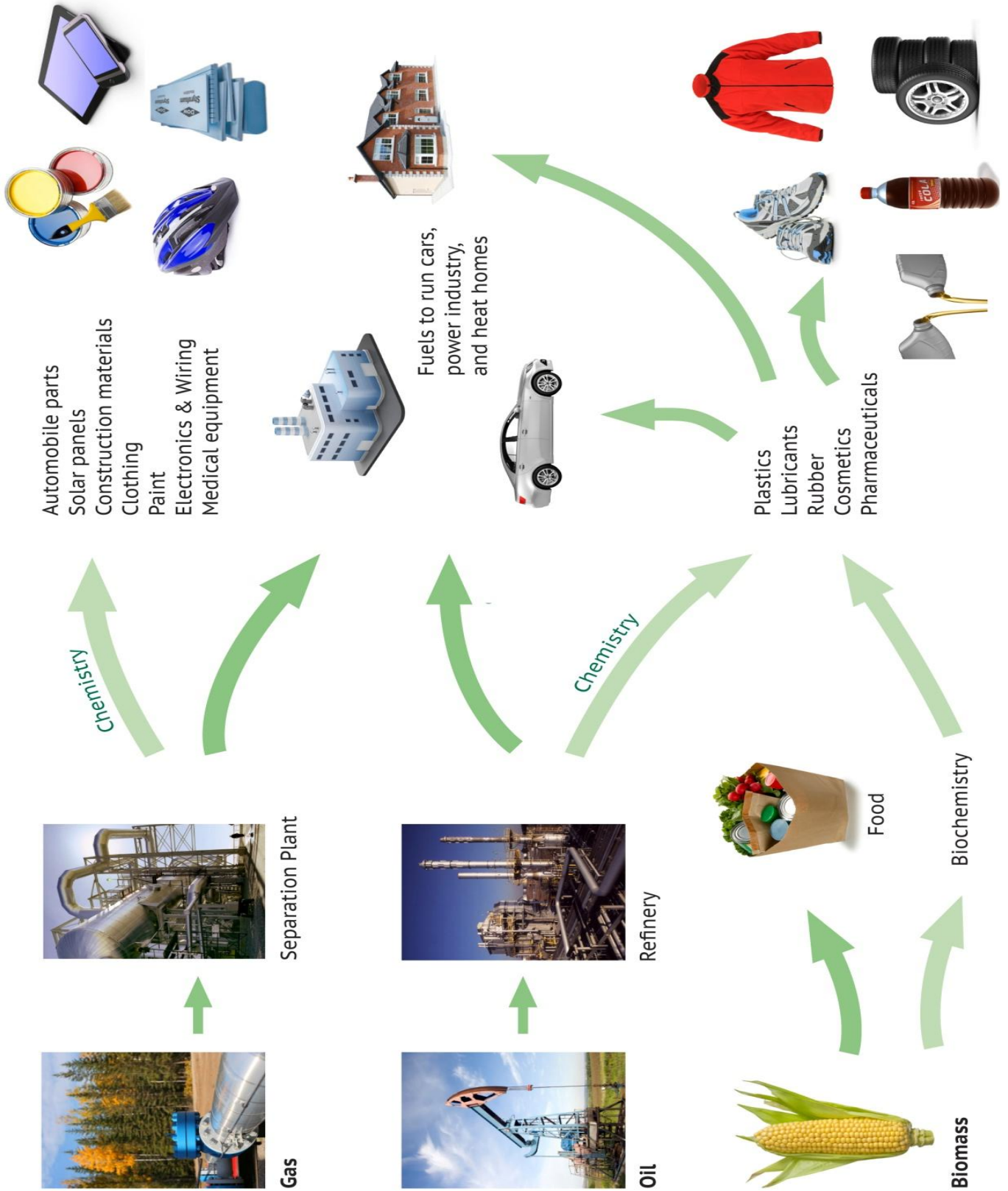
The second study, “*Energy 2020 North America, the New Middle East?*” (<http://www.morganstanleyfa.com/public/projectfiles/ce1d2d99-c133-4343-8ad0-43aa1da63cc2.pdf>) undertaken by Citi GPS (March, 2012), looks at the impact on the North American economies of increasing energy production. And, again, the impacts are profound. One excerpt, from page 75 is particularly informative:

“In a world of high energy prices, the potential economic activity generated by this wave of new hydrocarbon production is extraordinary, and should strongly boost national output, increase incomes, create wealth, stimulate consumption and create jobs. But on top of the direct economic benefits of this production bonanza, there are also the added benefits down the value chain, in areas such as refined products and petrochemicals.

Already, the U.S. producers of ethylene, polyethylene and propylene have benefited greatly from the influx of cheap natural gas and associated ethane, helping the U.S. petrochemical industry become cost-competitive compared to their naphtha-based peers across the Atlantic. Other hydrocarbon and energy-intensive industries such as fertilizer and steel production also should benefit strongly from the production revolution, leading to extra marginal economic output and job creation.”

More recently, *“America’s Unconventional Energy Opportunity”* (<http://www.hbs.edu/competitiveness/Documents/america-unconventional-energy-opportunity.pdf>) was specifically as its subtitle indicates prepared to outline “a win-win plan for the economy, the environment, and a lower-carbon, cleaner energy future”. While aimed at the U.S. economy (and written by a Canadian, Michael Porter), it has very real applications for consideration in Alberta. Where this work goes further than the first two referenced early, is in suggesting unconventional energy resource development can and will deliver real progress in managing environmental risks and challenges without threatening competitiveness. In recommending enhancing economic opportunity this study urges using the unconventional energy growth to spread economic development more broadly throughout the economy. The report suggests growth in the development of efficient energy infrastructure, specifically of adding pipelines, gathering and processing infrastructure. It notes the need for many more trained workers to fill the high-paying middle-skills job needs and if emphasizes a need for better market access for all energy and energy products – how appropriate for Albertans to consider.

Appendix 2



Appendix 3

Responsible Care® - Our Commitment to Sustainability

CIAC is the national trade association of Canadian chemical manufacturers, representing companies that manufacture basic chemicals and resins. Members range from family-owned companies to affiliates of global enterprises. Together, these companies generate revenues of more than \$27 billion, representing over half of the total chemical sector which also includes fertilizers, pharmaceuticals and formulated products.

Responsible Care is the Association's commitment to sustainability – the betterment of society, the environment and the economy. Our member operations are bound and guided by the ethics and principles of Responsible Care. A consequence of these ethics, our members constantly innovate for safer, more environmentally-friendly products and processes, and work cooperatively to identify and eliminate harm throughout the entire life cycle of their products. For a more complete description of the ethic and the membership commitment to sustainable development principles, visit www.canadianchemistry.ca.

Appendix 4



CHEMISTRY INDUSTRY
ASSOCIATION OF CANADA

Priorities for the 2015 and 2016 Alberta Budgets

Realizing our Growth Potential

Submission to the Minister of Finance
September 2015



Responsible Care[®]
Our commitment to sustainability.

Canada's Chemistry Industry

CIAC is the national trade association of Canada's chemistry industry, representing over 50 companies that manufacture industrial chemicals from raw material feedstocks like natural gas, crude oil, minerals and biomass.

Alberta is home to a large proportion of the national industry, with a heavy focus on petrochemicals. Chemical shipments reached a record \$14.3 billion in 2014, making it the 2nd-largest manufacturing sector in the province, and 1st in terms of exports at \$8.7 billion. This industry is an important contributor to Alberta's economy, adding value to our rich endowment of natural resources. We are also an important employer, responsible for 7,850 direct jobs. Chemical industry employees are highly-skilled and well paid, with an average salary of \$97,000. However, Canada's chemical industry comprises less than 2% of the \$5.5 trillion global industry, so we must work hard to attract international investment.

North American development of shale gas resources has resulted in natural gas prices that are among the lowest in the world. This is doubly important to petrochemical companies because natural gas is a both source of energy, and a primary source of feedstock. When compared to many other parts of the world where petrochemicals are derived from crude oil, Albertan petrochemical producers are very competitive.

The American Chemistry Council estimates that US\$140 billion in new chemical industry investments have been announced for North America, driven largely by the shale gas phenomenon. Although only a small portion of this investment is happening in Canada and Alberta, we believe there is strong potential to attract a much larger share. To do so will require that all investment-decision factors be made as attractive as possible.

Action in the following areas would improve the investment prospects.

Taxation

Increasing the provincial corporate tax rate from 10% to 12% will have a material negative impact on companies operating in the province. Further, it will act as a negative consideration when companies are assessing the merits of new investment in Alberta versus other locations. We estimate that this tax increase will cost chemical companies in Alberta over \$35 million per year. While we acknowledge that the province is facing budgetary pressures and everyone needs to make a contribution, we also submit that stimulating economic growth and economic diversification downstream from raw resources are important parts of the solution to this pressure. We recommend that the province look at restoring the 10% corporate tax rate for Manufacturing and Processing (M&P) industries as quickly as possible. A distinct M&P rate has existed in Alberta in the past, and currently exists in Ontario and Saskatchewan.

Accelerated Capital Cost Allowance

The 10-year extension of Accelerated Capital Cost Allowance (ACCA) for new manufacturing machinery announced in federal Budget 2015 represents a big step toward improving the investment climate in Canada. Large chemical projects often take 5+ years from concept to production, so having ACCA in place for an extended period of time allows companies to factor its impact into their site-selection process. CIAC will be tracking investment data over the coming years to monitor the degree to which this measure succeeds in attracting new projects

to Canada. Alberta has always matched federal action on ACCA, and we request that the province do so once again.

Climate change

Climate change is an important issue for the chemistry industry. We have been documenting our voluntary progress in reducing greenhouse gas emissions in Canada for over 20 years. Our industry remains committed to working with the Government to find solutions that address climate change in a manner that preserves industry competitiveness and ensures that Alberta continues to be an attractive place for new investment. New investment is key because it incorporates the latest in technology, leading to improved economics, and improved environmental performance.

Conclusion

North America is experiencing a chemical industry revival. Canada and Alberta are participating in this revival, with strong prospects for even-better performance in the coming years. Canada is well-positioned to reap the benefits that come with major new investments. The competition is intense, so now is the time for all stakeholders to put their best foot forward so that this opportunity is maximized.

Who We Are

The Chemistry Industry Association of Canada (CIAC) is the voice of Canada's chemistry industry. We represent more than 50 chemistry companies and transportation partners across the country - from Canada's largest petrochemical, inorganic and specialty chemical producers, to bio-based manufacturers and chemistry-related technology and R&D companies. The CIAC is also recognized as a world leader in the sustainable stewardship of chemical products through our acclaimed Responsible Care[®] initiative. For more information please see our web site: www.canadianchemistry.ca.

Appendix 5



CHEMISTRY INDUSTRY | **ASSOCIATION CANADIENNE DE**
ASSOCIATION OF CANADA | **L'INDUSTRIE DE LA CHIMIE**

Climate Change Advisory Panel
11th Floor, South Petroleum Plaza
9915-108 Street
Edmonton, AB T5K 2G8

Submitted via e-mail

Dear Members of the Climate Change Advisory Panel,

The Chemistry Industry Association of Canada (CIAC) is pleased to have the opportunity to submit comments on Alberta's Climate Change Leadership discussion paper released on August 14, 2015. Our comments can be summarized as:

- 1) Chemistry sector investment in North America is expected to be \$150 billion in the near future. Alberta members are competing for a portion of it to upgrade old and build new assets, increasing efficiency and reducing emissions intensity.
- 2) The Chemistry industry in Alberta is energy intensive trade exposed (EITE); 70% of the Alberta-manufactured product is exported.
- 3) Incremental carbon costs will be borne by Alberta chemical producers who compete with facilities in jurisdictions that do not have comparable levies or regulations.
- 4) Reaching Final Investment Decision (FID) on a major capital expenditure in the chemistry sector is a long-term process; the Government of Alberta can support investment success by creating a transparent long-term regulatory environment up to and beyond 2020.

CIAC represents the interests of Canada's leading chemistry companies – from petrochemical, inorganic and specialty chemical producers, to bio-based manufacturers and chemistry-related technology and R&D companies in Alberta and across Canada.

CIAC members support the Alberta government's environmental goals and are committed to working with all stakeholders to explore innovative greenhouse gas (GHG) emissions reduction initiatives that support good environmental policy and a competitive business environment. We want to ensure Alberta's chemistry industry continues to contribute to the Province's economic growth and prosperity and to meeting the Government's climate change goals.

805 – 350 RUE SPARKS STREET
OTTAWA, ONTARIO K1R 7S8
613-237-6215 > ciac-acic.ca



Responsible Care

Member-companies of the Chemistry Industry Association of Canada (CIAC) are recognized as global leaders in sustainability. Through Responsible Care® – the Association’s UN-recognized sustainability initiative – we are committed to continuously improving all aspects of our performance. The Responsible Care ethic and principles compel companies to innovate for safer and more environmentally friendly products and processes, and to work to eliminate harm throughout the entire life cycle and value chain of their products.

For more than 20 years, CIAC members across Canada have, through operational efficiencies and product innovation, achieved decreases in carbon dioxide emissions by 37% and overall GHG emissions by 67% (National Emissions Reduction Masterplan). In Alberta, the industry has grown significantly, adding value to the Province’s natural resources, yet managing during the last 10 years to maintain overall GHG emission levels. Beyond GHG emissions, since 1992, CIAC members have cut discharges to water by 98 per cent; emissions of toxins targeted by the Canadian Environmental Protection Act by 89 per cent; emissions of air pollutants such as sulphur dioxide (72 per cent) and reduced incidence of workplace illness and injury by over 70%.

A Value Add Industry

Our members employ chemistry to add value to Canadian resources and to manufacture goods for Canadians and Albertans, which are vital to the economy. Last year, in Alberta, chemical producers manufactured and shipped \$14 billion in chemical goods, exporting \$8.7 billion, while consuming and converting significant quantities of Alberta’s carbon-based resources into high-value manufactured products. On the basis of “value added,” chemicals ranked first among all manufacturing industries in Alberta. Chemistry is an important sector in Alberta, as it provides stable and high-paying employment to 7,850 Albertans and indirectly supports another 40,000 jobs. This industry is not directly affected by fluctuations in the price of oil, in fact operating profits for the industrial chemicals sector remained strong in the first half of 2015 and is forecast to perform well for the rest of the year.

Investment, Growth and Improvement

The chemical industry globally is in a growth phase. More than \$150 billion is expected to be invested in the industry in North America and our members in Alberta are working hard to win some of that investment money for this province. These investments would not only provide increased value add to Alberta’s natural resources, but have enormous spin-off benefits on employment, and taxes, provincially and locally. Spurred by the Responsible Care ethic, the sector has already made considerable investments which have improved efficiency in existing assets and with new investments the next level of efficiency and emissions reductions can be achieved.

Investment decisions for both new builds and plant upgrades are made with a view to the long term and many variables are taken into account. The competition for investments is intensive, and Alberta’s climate policy will be an important factor considered by decision makers when finalizing investment decisions. Costs associated with climate change management that exist in Alberta but do not in other locations, such as our primary competitors in the U.S. Gulf Coast, can sway the balance between selecting one site over another for investment.

Regulatory Certainty

To help secure investments, the Government of Alberta needs to create a transparent, stable and long-term regulatory environment up to and beyond 2020. It can take anywhere from three to six years for a Final Investment Decision (FID) to be made on a major capital expenditure. After that, the construction

and payback period is years long, while the operating lifespan is in the order of decades. The regulatory environment needs to reflect and support those timelines.

Energy Intensive and Trade Exposed

Utilizing a commonly-used Energy Intensive Trade Exposed (EITE) equation, the Alberta advanced chemistry industry can be characterized as moderately emissions intensive and extremely trade exposed.

The following chart enumerates the relative trade intensity and carbon intensity of Alberta’s chemical industry. When viewed through existing formulas for trade intensity (California, the European Union and Australia), Alberta’s chemical facilities are shown to be extremely trade exposed.

Global Model	AB
EU	
Trade intensity, %	69
California	
Carbon intensity, tCO ₂ e/\$M	1790
Trade intensity	69
Australia	
Carbon intensity, tCO ₂ e/\$M	
option 1 based on VA	1790
option 2 based on revenue	690
Trade intensity, %	78

Note - Under these formulas, trade intensity for the EU and California is calculated based on the total value of imports and exports, divided by the total value of shipments and imports. The Australian formula does not include imports in its denominator, and results in a higher trade intensity value for the Alberta chemical industry. The absence of the imports in this formula makes it a better comparator for Alberta, which has very few imports of chemical product.

Operationally World-Class

Globally, Alberta is a major producer of ethylene and a significant global exporter of polyethylene and ethylene glycol. While the ethane to ethylene value chain is used below as an example; other value chains such as natural gas to methanol are equally applicable.

All of the ethylene crackers in Alberta consume ethane stripped from natural gas as the feedstock. In many parts of the world, crude oil-derived naphtha is the primary feedstock for producing ethylene. The GHG emission footprint from the ethane to ethylene process is about half that of naphtha; so on a global basis, the crackers in Alberta are low emission intensity.

Furthermore, almost two-thirds of Alberta’s ethylene capacity is of recent vintage, incorporating the latest in energy efficiency and emission reduction technologies. As well, many emissions-reducing technologies have also been incorporated into older crackers through an ongoing program of investment and modernization.

Carbon Levy

During the September 16th “Other Industry” meeting with the Climate Leadership Panel, the question asked was “What would be the impact on the chemistry sector of a carbon levy at \$30, \$50 or \$100 per tonne of carbon dioxide equivalent?”

CIAC’s individual member-companies can provide specific data on their current emission reduction obligations based on the existing regulations. However, generally, based on certain assumptions, for an

ethylene producer operating in Alberta, the economic cost of carbon levies at those cost-points is estimated to be:

- @\$30/t: 3% of sales or 30% of profits
- @\$50/t: 5% of sales or 50% of profits
- @\$100/t: 10% of sales or 100% of profits

If requested, CIAC can collate additional data for the other types of products which are manufactured in Alberta.

The Alberta petrochemical industry is very export-intensive with 70% of production exported to foreign markets. As such, our sector is price taking, therefore any levy will be borne entirely by the chemical producer who competes with production facilities who do not have any comparable levy or regulation in place.

Transitioning to a low-carbon economy

The chemistry sector is a solutions provider and will be instrumental in helping to build and support a low-carbon future. To achieve a transformed economy, government and the private sector must invest in basic research to lay the foundations for technological innovations that may be 10 years out. CIAC members are continually investing in research and development that will directly benefit tomorrow's low carbon communities. However, longer term transformation will require the support of government. CIAC members are supportive of Alberta's Tech fund to help reinvest back into industry and assist with transformational change to achieve further GHG reductions.

Working Together

While industry was targeted for regulatory compliance in greenhouse gas emissions early on, industry alone cannot achieve the reductions necessary to manage climate change. This responsibility and the associated financial burden must be shared amongst all sectors and all citizens.

The chemistry sector needs to survive and thrive to ensure we continue to play a vital role in Alberta's economic growth and trade agenda. Maintenance of the global competitiveness of the advanced chemical manufacturing sector is of primary importance and any new climate change policies need to find the proper balance between emissions reductions and global competitiveness.

Once again, thank you for the opportunity to comment. CIAC looks forward to collaborating with the Advisory Panel and achieving the Government's climate change goals, while ensuring the industry continues to contribute to the Province's economic growth and prosperity.

Yours truly
Lorna Young
Regional Director, Western Region
Chemistry Industry Association of Canada
lyoung@ciac-acic.ca

Copy Climate Leadership Panel – Andrew Leach
 CIAC – Bob Masterson

For more information:

David Podruzny
Vice-President, Business and Economics
Chemistry Industry Association of Canada (CIAC)
350 Spark Street, Suite 805
Ottawa, ON K1R 7S8
Tel: (613) 237-6215 ext. 229
e-mail: dpodruzny@canadianchemistry.ca

Dan Hall
Alberta Regional Director
Chemistry Industry of Association of Canada (CIAC)
1555058 Alberta Limited
111 Aspen Meadows Court, SW
Calgary, AB T3H 4T2
Tel: (403) 246-2699
e-mail: danhall@shaw.ca