



CLIMATE LEADERSHIP

— Report to Minister —



Letter to the Minister

November 20th, 2015

Dear Minister Phillips,

Alberta's Climate Leadership Discussions were an unprecedented opportunity for a province-wide conversation about climate change mitigation and Alberta's future in a lower-carbon world.

As individuals and as a panel, we remain overwhelmed by the response to this opportunity. We would like to sincerely thank every person who took the time to participate in these remarkable discussions. We heard from a wide range of Albertans - from workers and labour leaders, farmers, academics, students, seniors and many more. We had the opportunity to engage with Aboriginal communities and organizations, who shared their unique perspective and connection to the land. We spoke with industry representatives who were ready to do their part to foster a greener tomorrow. We had over 900 people attend our public information and engagement sessions and received over 500 submissions.

It has been a privilege to learn from Albertans, to discuss and debate ideas, and to work together to help shape a 'Made in Alberta' climate change strategy.

We would also like to acknowledge the work of the Climate Change Secretariat within Alberta Environment and Parks, which executed an ambitious agenda to bring Albertans together to discuss this important issue, coordinated internal and external expertise for the panel, and generally made it possible for us to work with full focus on the task at hand.

Throughout this process, we have endeavoured to honour Albertans' vision for leadership in a lower-carbon future. We believe this report will provide the Government of Alberta with comprehensive advice and effective policy options to help the province reduce greenhouse gas emissions and take action on climate change. An ambitious and effective climate strategy will provide Alberta with credibility on the global stage at the upcoming 21st Conference of the Parties (COP) in Paris and in our upcoming national discussions on climate change and will ensure that our province is positioned as a policy leader on climate change mitigation.

Thank you for this opportunity to contribute to the discussion on and understanding of how Alberta, a leading energy-producing jurisdiction, can also be a leader in action on climate change.

Sincerely,

Andrew Leach

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Executive Summary

Alberta's response to climate change will determine our province's future. As a jurisdiction rich in fossil fuels, and where the energy sector plays such a large role in our economy, the implications of climate policies – be they provincial, national or international – are significant. They will impact employment, future economic growth and stability, the government's ability to pay for social services, and Albertans' prosperity, opportunities and health. Meeting global climate change goals means decreasing the use of coal and oil, and increasing use of natural gas and renewable energy. It means market demand will rise for low- and no-carbon energy sources and fall for high-cost and emissions-intensive resources. Technologies capable of separating economic growth from energy use and energy production from carbon emissions will prosper. This is the future for which Alberta must prepare.

The Alberta Climate Leadership Panel (further, the Panel) believes that what follows is a policy architecture which prepares Alberta for this global transition. Alberta is an export-oriented economy and changes to greenhouse gas policies will inevitably have an impact. However, it is important to note that we are already experiencing real impacts from the status quo. Alberta has arguably paid a steep price for the perception that our economy, resources and investment climate are not compatible with action on climate change. As the world moves to reduce emissions, we must move to position the Alberta economy for success amidst national and international efforts to combat climate change. We must demonstrate how an energy-producing jurisdiction can implement climate policy that reduces emissions, protects the competitiveness of key industries and spurs innovation.

Our proposed approach creates an integrated framework that accelerates carbon emissions reductions in the short-term, and provides a solid foundation in the longer term for creating a competitive and diversified lower-carbon economy. Our proposed policy architecture reflects Alberta's current situation and specific emissions profile, but also stands up to comparison with other leading jurisdictions in North America and elsewhere.

The Panel recommends that the Government of Alberta broaden and improve its existing carbon pricing regime, and complement carbon pricing with additional policies to reduce the emissions intensity of our electricity supply and our oil and gas production, to promote energy efficiency, and to add value to our resources through investments in technological innovation. To ensure this policy is progressive and protects the competitiveness of Alberta's core industries, we have recommended a consumer credit which will offset the impact of this policy package for households and allocations of emissions credits for industrial emitters.

We have taken great care to ensure this is a progressive policy that offsets impacts on most Alberta households and small businesses, while protecting our core industries and supporting the transition needs of affected workers and communities. To ensure our policies remain competitive, we are also recommending periodic reviews to assess and adjust to changing global commodity markets and climate policies. A successful response to climate change in Alberta must be undertaken in partnership with Aboriginal communities. This has been a priority for the Panel and we propose several specific initiatives.

Below, each of our core policy framework elements is presented, followed by discussion on aggregate impacts and mitigation strategies for those adversely affected.

CARBON COMPETITIVENESS REGULATION

Carbon pricing provides the backbone of our proposed architecture. Putting a price on emissions leverages the power of markets to deploy both technologies and behavioral changes to reduce emissions over time. Carbon pricing is the most flexible and least-cost way to reduce emissions as it encourages reductions in emissions to occur in whichever ways best suit individual processes, abilities and circumstances for households and businesses, while not forcing specific technologies, actions or outcomes.

Our proposed Carbon Competitiveness Regulation would:

- a) broaden the carbon pricing signal in Alberta to cover approximately 90% of the province's emissions, up from less than 50% today;
- b) provide a consumer rebate to mitigate the impacts of carbon pricing on low- and middle-income Albertans, fund complementary emissions-abatement programs and, where applicable, support a sound and just transition for labour and communities and strategies to protect small- and medium-sized businesses;
- c) improve the mechanism by which trade-exposed industries are protected to ensure their competitiveness while encouraging and rewarding top performance;
- d) increase stringency at the same pace as peer and competing jurisdictions; and
- e) avoid the transfer of wealth outside of Alberta.

Specific recommendations include:

- 1. For large industrial facilities, the existing Specified Gas Emitters Regulation (SGER) should be replaced in 2018 with a Carbon Competitiveness Regulation (CCR), in which a carbon price is applied to industrial emissions. Sector-specific, output-based allocations of emissions rights should be used to mitigate competitiveness and employment impacts in trade-exposed sectors and to protect electricity consumers from significant and unnecessary rate increases.**

All emissions from facilities with emissions over 100,000 tonne/year will effectively be priced, but facilities will be allocated emissions rights in proportion to output or value added. The compliance options under SGER would be maintained (emissions permits could be acquired either through the purchase of credits from other emitters or through the use of Alberta-based offsets, or through the payment of a carbon levy). The output-based allocations would reflect top-quartile performance or better, and would decrease over time at 1-2% per year, to reflect expected energy efficiency improvements. Similar facilities which fall below the 100,000 tonne/year threshold would be permitted to opt-in to the large final emitter treatment, rather than the end-use emissions price (explained below), if it is advantageous for them to do so.

- 2. For end-use emissions, a broad-based carbon price (economy-wide pricing) should be applied under the Carbon Competitiveness Regulation, requiring distributors of transportation and heating fuels to acquire emissions permits in recognition of the emissions their products will create when combusted.**

This proposed treatment is similar to the systems now in place in Quebec and California, and soon to be in place in Ontario. Compliance options for end-use emissions would be the same as under the SGER (explained above). Large final emitters would be able to adjust their calculation of required emissions permits so they are not covered twice.

3. The carbon price will have a ceiling, set by price at which emissions permits can be acquired from the government through the payment of a levy.

All emissions in the economy should face a \$30/tonne ceiling price by 2018. The price should increase over time in real terms (e.g. inflation plus 2%), as long as similar prices exist in peer and competitor jurisdictions.

4. Revenues from the carbon price should be used for defined purposes.

The program as suggested would lead to net revenues reaching approximately \$3 billion by 2018 once the end-use emissions pricing has been fully phased-in, and potentially rising to over \$5 billion by 2030.

The Panel recommends that this revenue be used for four purposes.

- a) To offset impacts on low and middle income households by providing them with a bi-annual consumer rebate, equal to the expected annual cost of the carbon price for an average Albertan as well as through measures to protect adversely affected small- and medium-sized businesses;
- b) To *double-down* on additional carbon emissions reductions by investing in the complementary policies listed below to reduce emissions intensity of our electricity and oil and gas production, to increase the pace of technological innovation and thus add value to our resources, and to improve the energy efficiency and resilience of our homes, businesses, and communities;
- c) To support transition needs of workers and communities and to enable full inclusion of Aboriginal communities in climate change mitigation and adaptation; and
- d) To provide incremental fiscal capacity for other government priorities including infrastructure,

COMPLEMENTARY POLICIES

We recommend that the carbon pricing system be complemented by four key policy initiatives. Each of these, as well as the initiatives for full Aboriginal participation discussed below, would be financed through revenues from carbon pricing, while still leaving revenues available for other government priorities including infrastructure and deficit reduction.

Electricity – Phasing Out Coal, Phasing in Renewables

Alberta generates much of its electricity from coal. In fact, Alberta currently has the highest rate of coal-fired electricity of any province. Though a cheap source of power, coal-fired electricity contributes not only to greenhouse gas emissions, but also affects air quality and directly impacts the health of Albertans.

The Panel recommends an integrated electricity policy package, which will phase out coal-fired power in Alberta by 2030 and replace at least 50-75% of retired coal generation with renewable power, increasing the overall share of renewables to 30% while retaining Alberta's competitive electricity market structure.

The key elements of this package are:

- a) Carbon prices with output-based allocations provided based on *good as best gas* performance.
- b) A commitment to a phase out of coal by 2030, implemented in collaboration with federal government regulations and in consultation with the Alberta Electrical System Operator (AESO) as well as affected firms.
- c) Increased renewable generation capacity, with expansion linked to the phase-out of coal, supported by a clean power call through which the government will provide partial, long-term revenue certainly for renewable power at the lowest overall cost to consumers.

With these policy parameters in place, the architecture would yield cumulative emissions reductions of 67 Mt between now and 2030, and emissions in 2030 will be at least 14 Mt below what is forecast under the status quo.

Oil and Gas – Pricing Carbon and Reducing Emissions from Methane

The oil and gas and oil sands sectors combined account for almost 50% of Alberta's emissions, roughly half from oil sands and half from other sources of production. The oil and gas industry is also the largest source of methane emissions in Alberta, responsible 70% of total provincial methane emissions in 2013. Methane doesn't stay in the atmosphere as long as CO₂, but it is a more potent greenhouse gas, with impacts over 25 times higher per unit of mass. In addition, it has adverse effects on local air quality.¹ The International Energy Agency (IEA) lists reducing methane emissions from the oil and gas sector as one of five urgent 'game-changing' measures that could contribute to achieving the 2°C ambition.²

The Panel recommends a hybrid regulatory and market-based approach to reduce emissions from oil and gas operations in the province, with a particular focus on methane emissions, as follows:

- a) Application of the carbon pricing regime (outlined above) to oil and gas with output-based allocations to protect competitiveness and employment in production and processing sectors.
- b) New regulatory measures for management of fugitive methane emissions in design and operation of new facilities and for leak detection and repair in all facilities.
- c) A time-limited, multi-stakeholder initiative on methane emissions reduction and verification that would provide market-based incentives for equipment upgrades of pneumatic controllers, pneumatic pumps and other sources of vented emissions in existing facilities.

For the oil sands sector, the Panel recommends an output-based allocation of emissions credits that reflects top quartile performance in *in situ* and mined production of bitumen, as well as the parallel *good-as-best gas* standard for electricity. This would decrease over time at 1-2% per year to reflect expected energy efficiency improvements. It will help drive emissions down to equal or better than other sources of oil. Cogeneration of steam and electricity will be rewarded if and only if it improves overall emissions efficiency of production, as output-based allocations will be provided both for bitumen and electricity production.

Conventional oil and gas emissions would also be covered by carbon pricing. Producers who can aggregate wells or batteries and gas processing facilities below the 100,000 tonne per year large final emitter threshold could opt-in to the large final emitters treatment as an alternative to being subject to the end-use emissions regime to receive the same competitiveness protection as their larger competitors. Where wells are not aggregated and covered under the large emitters treatment, carbon pricing apply to most combustion and process emissions, while fugitive emissions would be covered by a regulatory approach.

For upgrading and refining, each facility's allocation should be determined according to the methodology used by the European Union and the Western Climate Initiative (the Solomon Complexity-Weighted Barrel) or similar approach. This approach will ensure that greenhouse gas policy in Alberta does not encourage shifting processing activity outside the province. Further, insofar as integration improves

¹ <http://www3.epa.gov/climatechange/ghgemissions/gases/ch4.html>

² International Energy Agency, *Energy and Climate Change, World Energy Outlook Special Report 2015*

efficiency of final product production, our proposed approach will provide a competitive advantage for such activities.

On methane, the Panel found significant common ground between industry and environmental groups, and recommends that government encourage this collaboration through a multi-stakeholder initiative which would administer a market-based approach through which offset credits could be provided to facilities which implement new technology to replace pneumatic devices and other sources of fugitive emissions before they are regulated to do so. We recommend that the government begin phasing-in mandatory replacement regulation without offset credit after 5 years to reduce emissions from facilities which have not taken early action. The Panel recommends that this multi-stakeholder process be combined with regulatory requirements for new well design and operation as well as for leak detection and repair for fugitive emissions. The Panel recommends that the government set an initial methane-specific target of a 12 Mt CO₂ equivalent reduction in methane emissions by 2030 (a 40% reduction from 2013 levels), and consult with the proposed multi-stakeholder initiative to confirm this target by the end of 2016. If the multi-stakeholder process is unable to deliver on expected reductions, the acceleration of regulatory controls should be considered.

This combined approach to carbon pricing and methane management in oil and gas is expected to yield significant emissions reductions in oil and gas in Alberta - approximately 12 Mt of emissions reductions below what would be expected under the status quo by 2020 and 20 Mt below status quo policies by 2030. This would still imply expected growth in oil and gas emissions in the province of 55% above 2005 levels by 2030.

Energy Efficiency and Energy-Resilient Communities

Energy efficiency is an important way for all Albertans to contribute to reduced greenhouse gas emissions. Energy efficiency is essentially a low-cost, underdeveloped energy resource. Our proposed policy architecture targets some of Alberta's most cost-effective emission reduction opportunities, while improving the quality of homes and workplaces. Evidence suggests that there are constraints to individuals and businesses taking advantage of opportunities to improve energy efficiency, even where the financial case is compelling. Energy efficiency programs help energy users break through barriers to adopting these cost-effective measures.

The Panel heard broad interest in micro-scale generation from individuals, cooperatives and municipalities. We also heard strong support for a new class for slightly larger scale community generation, as a way to encourage alternative energy technologies well-suited to community energy systems. We were however cautioned that any new, community scale generation regulation would depend on careful assessment of criteria, eligible technologies, impacts on the stability of the grid and conditions for market integration.

Energy efficiency goes beyond the efficiency of appliances, buildings or vehicles. The design of cities and neighbourhoods matters profoundly. Urban form, once set, is hard to change and has consequences for future energy use and urban well-being well beyond this century. Creating mixed-use urban neighbourhoods, with choices for public transit and active mobility, is a key strategy in reducing emissions in the long-term, and a critical focus for empowering the role for Alberta's municipal governments. Alberta's municipal governments have a key role in climate leadership, and many municipalities already have detailed plans to reduce emissions and improve community energy use.

The Panel recommends a provincial energy efficiency and community-based energy program, complemented with regulations and other partnerships that empower climate action at the local level. Specifically, we recommend:

- a) Implementation of a new, integrated energy efficiency and community-scale energy program, governed by rigid controls to ensure cost-effective emission reductions without regressive outcomes;
- b) A complementary regulatory agenda for building energy performance reporting and disclosure requirements, updated building codes and standards, and a renewed regulatory standard for distributed and small-scale community generation; and
- c) Fostering municipal partnerships for climate leadership through changes to the Municipal Government Act, data coordination and capacity building, and increased infrastructure investment to support infrastructure such as transit-oriented development, active transportation options, public transit, and district energy.

Successful implementation of these initiatives (based on a \$125M/year investment) could yield emission reductions of up to 1.5 MT/year by 2020, and up to 3 MT/year by 2030; customer energy savings exceeding program investments, of up to \$200 million per year in early years and growing to \$500 million in later years; and roughly 3,000 new local jobs in sectors such as skilled trades, construction, retail sales, professional services and manufacturing.³

Technology and Innovation

The Panel believes that investment in technology and innovation is of strategic importance to accelerating emissions reductions and strengthening the province's position in global energy markets.

Even as the world acts on climate change, there will continue to be significant demand for oil and gas for mobility, heat and power. Alberta's challenge is to position ourselves as a preferred, low-cost and low-emissions supplier amidst the market shifts now underway. This means it is critical that the Alberta government work with the private sector and other parties to enable development and deployment of new technologies in the longer term that can limit growth in oil sands emissions beyond 2030 and deliver on the goal of *good as conventional* emissions intensity as soon as possible.

Framing our challenge as being *carbon competitive* captures both the need to reduce emissions from our energy system and continue to be cost competitive. The Alberta government's role as agent for the Alberta public, the owners of the resource, implies a higher level of engagement in research and development than would be typical for a government looking at a traditional business operating in their jurisdiction. Alberta's fossil fuel resources will have lower value if we cannot develop them with lower emissions impact, and if we do not develop processes and technologies which allow their conversion to higher-value products designed for other purposes, including carbon fibre, plastics, and other non-combustion supply chains. It is also important to recognize that new low-emissions technologies are not just about fossil fuels, and that oil and gas technology is not just about oil sands. In a carbon-constrained world, low-carbon technologies and resources will have increasing value, and our technology agenda should recognize this.

³ Cost savings of \$200-\$500 million per year and 3,000 new jobs are extrapolated from Dunsky Energy Consulting "GHG savings and energy efficiency high-level opportunity analysis in Alberta", 2015.

We recommend:

- a) A strategic review and enhancement of spending on energy technology and innovation as it relates to climate change. This should include a re-design of the Climate Change and Emissions Management Corporation (or a successor) allowing it to take more risk.
- b) Allowing currently-approved but not-yet-constructed projects to seek amendments to their approvals to accommodate new technology or improved designs which mitigate greenhouse gas emissions.
- c) A requirement for a Climate Mitigation and Adaptation Plan as a condition for new project approvals.

Full Inclusion of Aboriginal Peoples

In addition to these measures, we have integrated throughout our recommendations, and addressed specifically, the importance of full inclusion of Aboriginal peoples in action on climate change. We recommend concrete partnerships with First Nations and Métis communities on renewable energy and energy efficiency. We also recognize the importance of protecting vulnerable and remote communities, including First Nations and Métis communities and settlements, from the impacts of carbon pricing.

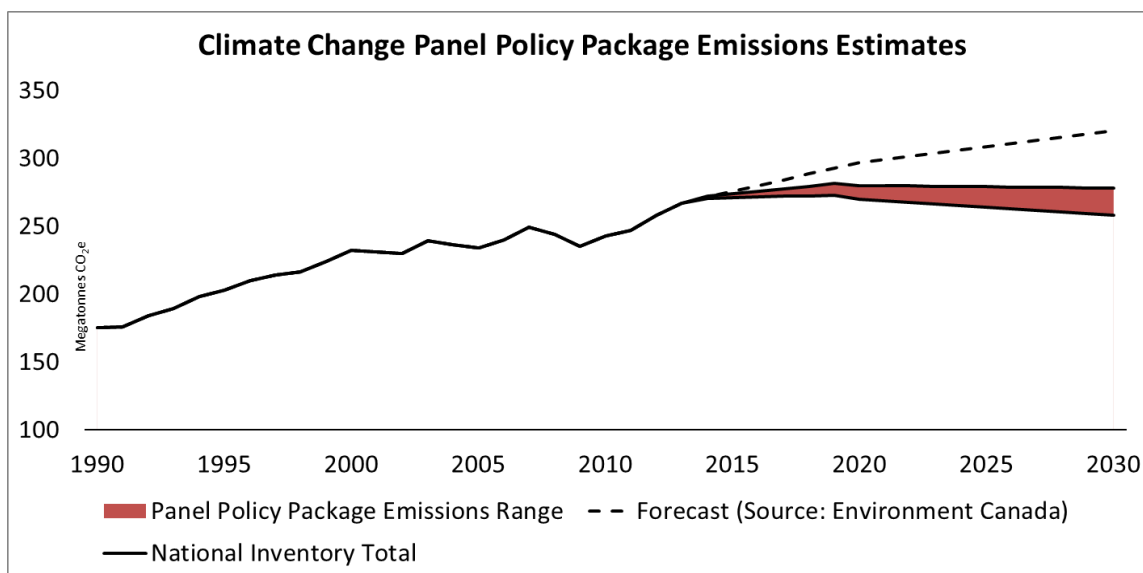
We recommend that government assist in the development of a centre of Aboriginal peoples' knowledge which can act as an important information resource as Aboriginal peoples partner with the province on a government-to-government basis in implementing Alberta's climate change policies, including essential future work on climate change adaptation.

OUTCOMES AND IMPACTS

Alberta's emissions are challenging to reduce for three primary reasons. First, our population and economic growth rates, as well as our incomes, have grown faster than other provinces, and emissions tend to be correlated with population, income and wealth. Second, our large, anchor industries are emissions-intensive and consist of long-lived assets (oil sands plants, gas plants, chemical production, refineries, etc.) which can improve performance over time, but not as rapidly as other sectors with shorter asset lives. Finally, our choice of fuels for electricity generation drives emissions. Alberta's economy uses a lot of electricity for many of the same reasons stated above, and we generate a substantial share of our electricity from fossil fuel sources, notably coal. For all of these reasons, absent further action, Alberta's emissions are currently on a trajectory to grow from 267 MT in 2013, to 297 MT in 2020, and to 320 MT in 2030.

Implementation of our full policy framework will accelerate emissions reductions in some sectors in the short-term, while providing the basis for longer-term emissions reductions in those sectors that require more time and investment to accomplish this transition. Our policy architecture is expected to reduce emissions from current trends by approximately 20 Mt by 2020, and approximately 50 Mt by 2030. This would roughly stabilize emissions, by 2030, just above current levels at approximately 270 Mt.

The graphic below shows Alberta's emission trajectory under the Panel's recommended policy architecture.



Many will look at these emissions reductions and claim that our policies will not place Alberta on a trajectory consistent with global 2°C goals, and in some sense this is true – the policies proposed for Alberta in this document would not, if applied in all jurisdictions in the world, lead to global goals being accomplished. However, more stringent policies in Alberta would come at significant cost to the province due to lost competitiveness, with negligible impact on global emissions due to carbon leakage. As a panel, we have looked at this challenge and concluded that while we do not have an architecture that, in the short-term, will be consistent with meeting global goals, the approach we are proposing will position Alberta to make a meaningful contribution in the longer-term. In the meantime, imposing policies in Alberta that are more stringent than what we have suggested is not tenable, until our peer and competitor jurisdictions adopt policies that would have a comparable impact on their industrial sectors. Comparable policies being in place in other jurisdictions would negate competitiveness concerns and would allow increasing stringency of policies in Alberta, while not sacrificing wealth and prosperity to emissions leakage. We have concluded that, while Alberta must be prepared to further increase the stringency of its policies if others act, the policy package we have proposed is the most stringent approach we felt we could recommend in the absence of that action.

Locally, there will be concerns with respect to the impacts of these policies on our economy and on employment. Greenhouse gas policies are often painted as win-win yet, at the granular level, they may not be. In an export-oriented province like Alberta, emissions control policies will not make everyone better off. There will be trade-offs and transitions resulting from any policy which alters the way our economy values carbon emissions. Those with better technology, more willingness to adapt and a comparative advantage in low carbon resource extraction and infrastructure will benefit. Those without those advantages, or those who choose not to engage in emissions reduction opportunities, will not.

In order to address unintended, disproportional and undesirable impacts, our policy architecture protects the competitiveness of trade-exposed industries and provides for low and in many cases positive overall impacts on vulnerable populations, consumers and businesses.

Alberta's economy is far more dependent on emissions-intensive and trade-exposed industries than other economies in Canada, and we have drawn on best international practices to mitigate competitive and employment impacts in these sectors and to preserve the competitiveness of our economy today, while ensuring a carbon-competitive future. Output-based allocations of emissions credits reduce the average cost of complying with greenhouse gas policies, keeping activity here in Alberta, while ensuring that top-performing facilities are rewarded. With these policies in place, investments in new facilities which meet or exceed globally-credible performance benchmarks including in oil and gas will be more attractive than ever. Regarding electricity, we have proposed policies that will protect electricity consumers from significant and unnecessary rate increases.

Our proposals have been designed to work within Alberta's competitive electricity market structure, to limit impacts on pool prices and minimize government financial obligations. These measures represent a multi-billion dollar recognition of the importance of keeping jobs and economic activity in Alberta, relative to the imposition of a broad-based carbon tax which would shift more of this activity elsewhere.

Our proposal is also focused on protecting the consumer. Without our proposed consumer credits in place, the average Alberta household would likely see additional costs of approximately \$40/month in 2018, rising to \$80/month in 2030 assuming increases. Energy efficiency incentives and financing can reduce consumer energy bills, and programs can be tailored for the distinct needs of low-income households. However, these programs will not provide a sufficient counteraction to the new costs imposed on Albertans. Because of this, we propose a consumer rebate to households in the bottom 60% of income which would be sufficient to offset the impact of carbon pricing on them, which we recommend be provided via a twice-yearly consumer credit. We also recommend that the government examine means to similarly protect the most impacted small and medium-sized business through similar mechanisms.

We've also proposed protection and transition funding for displaced workers and affected communities and funds to ensure that new opportunities created by climate policy are taken advantage of by providing necessary skills training. In each of these areas, we have emphasized the need for a strong government commitment to engaging with workers and their organizations, and to including Aboriginal peoples in programs providing protection for vulnerable communities and in the opportunities provided by skills training.

It is important to note that the climate policy tools we have identified can be 'scaled' up or down to achieve desired outcomes. It is also important to note that turning one policy dial will inevitably have an effect on others. Our goal was to recommend a climate policy architecture that can be adapted to unanticipated situations that will inevitably arise in a world in which the pace of change in energy systems is occurring faster than most forecasts and models can anticipate. We recommend that the government establish a process of periodic review of provincial climate policy in order to assess and adjust to the impact that changing global commodity markets, and changing global climate policy, are having on the social, economic and environmental aspirations of Albertans.

Our recommendations seek to help reframe the conversation on climate leadership to focus more on the policies and actions that can drive energy solutions in Alberta and elsewhere. We believe this will prove to be a far more powerful platform for engaging with Albertans and with the rest of the world. We hope you agree.

Overview

WHAT WERE WE ASKED TO DO?

Our panel was tasked with providing advice to the Government of Alberta to inform the development of a comprehensive climate change strategy.

We were responsible for reviewing Alberta's existing climate change policies, engaging with Albertans and providing the Minister of Environment and Parks with advice on a comprehensive set of policy measures to reduce Alberta's greenhouse gas (GHG) emissions.

While this report provides a summary of our advice and the rationale for it, the process involved on-going engagement with government officials over several months. The process was highly interactive.

The primary purpose of this report is share information with Albertans and to provide a window into our process.

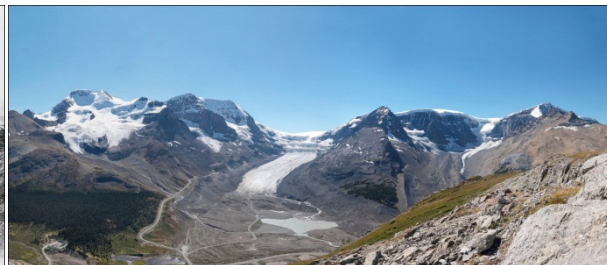
WHY WERE WE ASKED TO DO IT?

Climate change is one of the great challenges facing us today, and directly affects the health, environment and economy of our province. The consequences of a changing climate are already being experienced around the world and right here at home.

Athabasca Glacier, 1918⁴



Athabasca Glacier, 2011⁵



The Government of Alberta has stated that it intends to develop and implement a climate change strategy that will bring our province into a new era of responsible energy development, build a greener and more prosperous economy, and protect the health and quality of life of all Albertans.

Alberta is already part of a global movement of jurisdictions that are taking action on climate change. The upcoming COP21 World Summit on Climate Change in Paris in December 2015 will bring nations from around the world together to agree on a common framework to achieved further reductions in greenhouse gas emissions. Alberta will be there and will play an important role in Canada's national delegation.

This report is intended to help government shape a clear, ambitious and informed climate change policy that positions our province's economy for long-term success in a lower-carbon world.

There will be more work ahead, in particular regarding adaptation to climate change.

⁴ A.O. Wheeler, 1918, Interprovincial Boundary Survey, Wilcox Ridge #1

⁵ Mountain Legacy Project, 2011, mountainlegacy.ca

METHODOLOGY AND APPROACH

From late August to early-October, the Panel engaged with:

- the public, both online and in community open houses;
- technical stakeholders including representatives from potentially-affected industries, environmental groups, municipalities, academics, think tanks, labour; and
- members of Aboriginal communities.

A [discussion document](#) was published online to help inform and shape the province-wide discussion. Additionally, government hosted a website which allowed members of the public and other stakeholders the opportunity to provide submissions directly to the panel.

Public Engagement

An online survey encouraged thousands of Albertans to participate in the climate change discussion. Over 25,000 responses were collected. This analysis was supported by representative sample polling to provide an unbiased sense of the opinions of Albertans. This parallel process was helpful, as the online survey was more likely to attract people who were already engaged in the subject matter (and thus represents a selected sample).

In addition, public open houses were held in Calgary and Edmonton, to provide an in-person opportunity for Albertans to interact with panel members and to provide input on priorities and outcomes for government to consider in addressing climate change. More than 920 people attended the public open houses.

The Panel also received 535 online submissions, including submissions from members of the public, industry, non-governmental organizations and academics. The content and format of submissions also varied, including emails, letters, reports and articles. All submissions were reviewed and posted on the [Climate Leadership Discussions website](#).

Technical Engagement

The Panel held 10 sessions with approximately 350 stakeholders representing diverse perspectives across multiple sectors of Alberta's economy, each a full day or more. Sessions were designed to provide stakeholders with an opportunity to share their perspectives on key areas including: buildings and houses, with a focus on energy efficiency; agriculture and forestry; the role of municipalities, with a focus on transportation; electricity; oil and gas; other industrial emitters; innovation and technology and economy-wide approaches for greenhouse gas reductions.

These forums provided us with the opportunity to participate in a dynamic discussion with stakeholders from a wide range of perspectives, including representatives from the private sector, think tanks, environmental organizations, academia and municipal governments.

Aboriginal Engagement

The Panel held meetings with Aboriginal peoples in Calgary, Edmonton and Fort McMurray. There were 47 participants in all representing thirty Aboriginal communities and organizations. At these sessions, participants shared in discussions exploring outcomes, priorities and community interests related to climate change and Aboriginal peoples. Many perspectives and ideas were shared, including comments

related to Treaty and Aboriginal rights, education, cumulative impacts, climate change adaptation, environmental policies and the impacts on future generations.

Our advice in this report is based on what we heard throughout the engagement process, as well as information shared by the Government of Alberta and the collected experience and expertise of our panel.

ENGAGEMENT SUMMARY

The Climate Leadership Discussions provided the Panel with the opportunity to hear from thousands of Albertans. Our advice to government was informed and inspired by what we heard throughout this process.

A series of summary reports, based on the Climate Leadership Discussions, has been prepared and is available as a supplement to our advice to government. These reports reflect the wide range of engagement methods and tools, and summarize the input that we received online, and through the public, Aboriginal and technical engagement streams.

The reports can be found at: <http://alberta.ca/climate/leadership-discussion.cfm>

What We Heard

Throughout the Climate Leadership Discussions, Albertans shared their vision for the province's future in a lower-carbon world. A wide array of opinions, ideas and concerns were shared in the public, technical and Aboriginal engagements, and in online and written submissions.

In the public open houses, Albertans shared ambitious goals and a vision for a greener future, but also concerns about the state of Alberta's economy and the impact of new policies. During the technical engagement process, stakeholders were supportive of policies that would help reduce emissions by improving current programs and policies but the levels of ambition expressed varied significantly. Some were much more concerned with current economic conditions and the potential negative impacts of greenhouse gas policies, while others saw these same policies as a means to improve those economic conditions. The online survey demonstrated the more polarized views of engaged citizens, while polling showed the wider population to be more pragmatic and diverse in opinions and beliefs. The online submissions provided diverse and detailed ideas and policy proposals – the sheer volumes and quality of responses provided a very important resource for the Panel.

Throughout the entire engagement process, we heard from Albertans who expressed a desire to be seen as responsible environmental citizens on the world stage, and who acknowledged this would mean the province's carbon policies and practices would have to change. Many Albertans were keen to take personal action in their own homes and daily choices. But, we also heard from skeptics – a few who are not convinced that climate change is a problem to be solved by reducing greenhouse gases, and others more concerned that efforts from Alberta will have costs to the province which outweigh the benefits.

We heard from First Nations and Métis communities and organizations on a variety of issues, but many comments we received centred on the impacts these communities will feel from climate change rather than on efforts to mitigate climate change – something we encourage government to address alongside the implementation of their response to our proposals.

Concerns about the impacts of climate change, as well as the other environmental impacts of energy development, were constant throughout our process. Many argued that the mitigation of greenhouse gas emissions cannot be separated from policies designed to ensure clean air, land and water and to

preserve biodiversity. Cumulative effects on the landscape were a consistent point of intervention. To many of the people we engaged with, climate leadership means a province that they can be proud to pass on to the generations to come. For many, that kind of leadership will not be measured solely by an emissions inventory.

We also heard from those who were bullish on technology and its ability to solve Alberta's greenhouse gas challenges. These interventions were as diverse as they were frequent, from large companies looking to deploy proven technologies more rapidly in Alberta all the way to individual entrepreneurs with a prototype in their garage. As a panel, we could likely have filled our days entirely with presentations on new technology and there may have still been some left waiting – we learned about a lot of new initiatives and just about as many new acronyms.

An important part of our process was our engagement with staff from the Alberta Public Service. Throughout our process, we engaged with government departments, sharing our insights on the advice being provided to government while profiting from their expertise in their respective areas. In the weeks before our first public sessions, we heard presentations and attended briefings on every sector of Alberta's economy, their emissions profile and the potential for reductions. It would simply have been impossible to provide this report and our advice without the benefit of their engagement, expertise and dedication to their roles.

From the beginning, we've engaged with our elected officials. From day one, our mandate was wide-open: what should Alberta do about climate change? No policy parameters, specific targets, or levels of ambition were imposed on us, with the exception of four areas for which we were asked to examine potential policy options: reduce emissions, improve energy efficiency, accelerate the phase out of coal, and increase the deployment of renewable power.

Throughout, we've had multiple discussions with the most senior officials in government, ministers and their staff, and the Premier. Many panel members also had the opportunity to engage with other members of the legislative assembly, members of parliament and representatives of the federal government. As with all aspects of this process, the input we've received was diverse and reflected the challenge of this file. The government provided us with a unique opportunity to provide on-going feedback and advice, rather than a typical panel report to which a government would then respond.

Finally, we had the benefit of engagement with our panel colleagues currently studying royalties and preparing to deliver their recommendations. Their engagement, expertise, and dedication to their roles was an asset to us, and we hope that we were able to provide them with some useful information for their process as well.

At the end of this process, our conclusion is that, while many Albertans are ready and willing to be a part of a greener future, many also remain uncertain about what the future holds and the trade-offs implicit in carbon policy. The engagement of all Albertans will be crucial to the success of a provincial climate change strategy and we hope that, through our process, our discussions and debates, we've laid the groundwork for this to happen. For our province to demonstrate true climate leadership, all Albertans will need to be part of the solution. The more Albertans can see that their voices have shaped the policy, the better.

WHAT CLIMATE LEADERSHIP MEANS TO THE PANEL

Andrew Leach, Panel Chair

Climate leadership is a challenging mandate, in particular for an energy-producing and fossil-fuel-rich jurisdiction. Coal, oil, and natural gas are each abundant in Alberta, and new technologies have made many of these resources available at lower cost than we would previously have thought possible. This leaves Albertans with a choice not faced in the same way by other jurisdictions: aggressive action on climate change means foregoing what for decades has been our comparative advantage, or at a minimum acknowledging that the sustainability of our comparative advantage depends on the development of new technologies to bring our resources to market in ways which have less impact.

I've always defined climate leadership as actions which, if imposed across the world, would see the world on track to meet global goals. If anything, this process has led me to temper this standard with an acknowledgement that Alberta cannot act alone – without comparable action from other jurisdictions, Alberta will be significantly disadvantaged. The policy package we've put forward, I believe, accomplishes this – it places Alberta among the leaders in terms of policies in place today, provides a clear schedule for increasing stringency over time, but also links those increases to actions from our peers.

Angela Adams

As a Métis Woman from Fort McMurray I have seen the prosperity that results from resource development and good jobs. But there is a right way and a wrong way to achieve that prosperity. Pollution and the irrevocable loss of important habitat can result from rushed development that doesn't consider balanced objectives for the region.

As Albertans, we have a unique opportunity to study and recalibrate how to build a cleaner Alberta while ensuring our children and grandchildren will enjoy the same prosperity that we enjoyed until recently.

As a panel member I did not have the vast technical knowledge of others, but I do bring experience from the industrial workplace in a northern community and I believe we must work together in a partnership with the Government, industry, and all stakeholders to ensure we in Alberta do our fair share to slow climate change.

Climate change leadership means taking bold action that reduces harm to the planet, prioritizes existing jobs, and makes meaningful plans to transition workers with minimal disruption to communities.

Stephanie Cairns

Alberta climate leadership presents a profound design challenge. This came home to me again and again through the course of our Panel process, as I assimilated Alberta's very distinctive emissions profile and unique electricity market.

These challenged my preconceptions of what an ambitious climate policy should include. A province with over half the emissions coming from trade-exposed industries with price-inelastic emissions requires a very different policy design than a province dominated by transportation and building emissions. It influences which carbon pricing instrument is used, which complimentary programs are emphasized, and the focus for innovation.

I was deeply struck over the course of the Panel process by how much our conversations were shaped by the unequivocal political direction to discuss *how*—not *whether*-- to position Alberta for long-term success in a lower carbon world. This framing invited a wide range of Albertans to bring forward a vision that looks to households, communities, and small to medium sized entrepreneurs to step up to find solutions alongside the province's large final emitters. It reinforced to me that collective leadership, and ownership,

of the province's emissions challenge must be a new but integral part of the province's approach to climate leadership. Made in Alberta, calling on all Albertans.

Linda Coady

As someone who has spent her career working inside large organizations that are dealing with change, I see both the challenge and the opportunity presented by climate leadership as a call for groups on all sides of the issues involved to come together in new and different ways.

This is why listening and discussing climate and energy issues with Albertans was an essential starting point for everything that followed in the development of this report.

Our panel heard that complete consensus on everything is not possible. However, the response to the engagement process we undertook provided ample evidence that many Albertans are ready to contribute as individuals, as organizations and as sectors to create a sustainable and prosperous low carbon future.

Moreover, there is a strong belief that now is the time to do so. There is broadly-based understanding in our province that climate leadership is more than grand statements. Albertans know that at a minimum, climate leadership requires new policies, new business practices, new behaviours, new technologies and new relationships.

They know it means our province must move forward based on an honest and clear-eyed assessment of how far and how fast we can go to ensure an energy system transition that is orderly, fair and inclusive. They believe, as do I, that this will require being clear about how to make the most of today's energy systems to help create the energy systems of tomorrow.

Gordon Lambert

It was a great privilege to engage with my fellow panelists and Albertans on this very important issue of global climate change and Alberta's desire for leadership. The quality of engagement by Albertans and other experts across Canada in this process was inspirational.

Climate Leadership means a combination of three essential elements. They are Goals and Outcomes, Policies and Actions that make those Goals and Outcomes plausible and finally committing Resources both human and financial to support the Policies and Actions to achieve the Goals. In combination these three elements define an overall level of ambition and create a solid platform for substantive progress. My desire in serving on the panel was to work with my colleagues to define advice to our elected government that encompasses all three elements for Alberta.

Doing any one element in isolation is easy. Doing all three in a coherent manner is hard work and requires deep insight and knowledge. Unfortunately it is all too common that Goals and Outcomes are declared in isolation of the other two elements, or with the other two elements defined but never as boldly as the Goals and Outcomes require. Aspirational Goals can spur innovation but impossible Goals create cynicism and undermine credibility and trust on an issue where we need deep and broad engagement of all civil society. We need to get off the track of defining Leadership only using Goals.

The advice we have set out defines a change journey. This change journey is about transforming over time how we produce and use energy. We may disagree on the pace and scale of change but the reality is that this change journey is not optional to us. Change in



our energy system is being made every day by decisions that are large and small and that are made by each of us as part of civil society.

We have to make a strategic choice. We can be passive takers of policies and actions of others outside of Alberta, we can play defence by talking slower and more loudly, or we can decide to play offense and create the future we aspire to. That means designing for the 21st century where climate change is simply part of the world we need to design for. I believe offense is the only choice. It means that we get used to being uncomfortable. It means complacency is our worst enemy. It means using our very best ideas, actions and choices to create the future we want for this and future generations.



Climate Policy Landscape

Alberta's action on climate change will not take place in a vacuum - what happens globally, both politically and economically, will determine its relative success. Climate policy is an evolving global issue and understanding where Alberta's climate policies fit in a global and national context is important. However, the impacts of climate policy will be felt here at home, so a thorough understanding of the provincial, labour and Aboriginal context will be equally crucial to making informed decisions and setting up our province for success.

GLOBAL CONTEXT

Nations around the world are taking action to reduce greenhouse gas emissions, although not enough action at present to reach generally agreed-upon global goals.

In December 2015, the 21st Conference of the Parties (COP) to the United Nations Framework Convention on Climate Change (UNFCCC) meetings in Paris, will aim to achieve a legally binding and universal agreement, with the goal of keeping global warming below 2°C.⁶ In advance of the meeting, countries - including Canada - have submitted Intended Nationally Determined Contributions (INDCs), which establish intended outcomes from proposed domestic policies. If all targets in the INDC's submitted to date are met, it would imply significant decreases in global emissions below current policy trends. However, these decreases would still be insufficient to place the world on a path consistent with the 2°C goal.

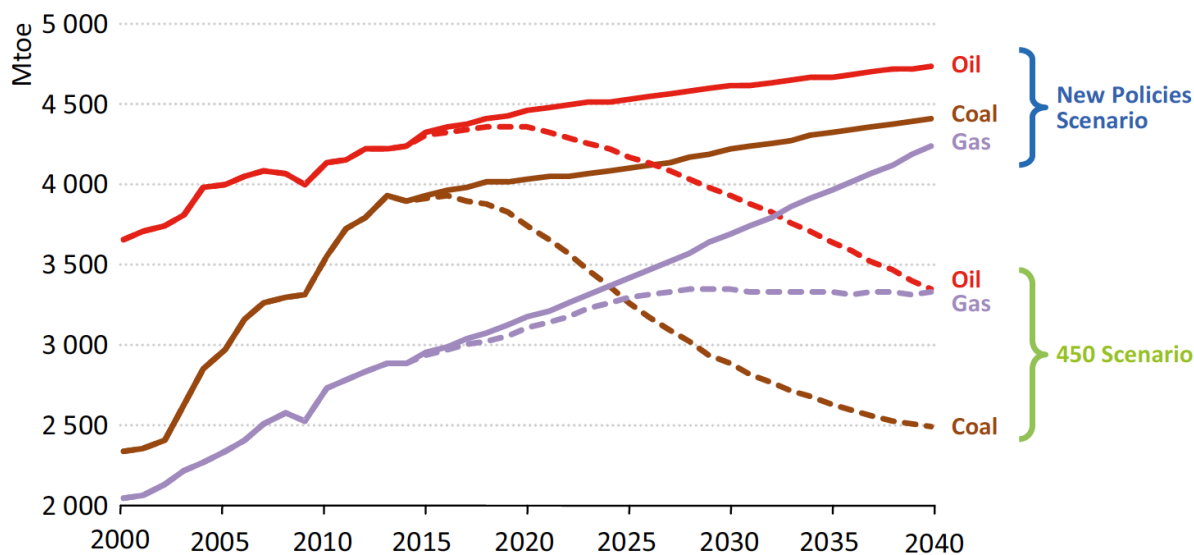
The UNFCCC Synthesis report on the INDC's states that to maintain a 50% probability of keeping climate change to less than 2°C, cumulative carbon emissions after 2011 should not exceed 1300 gigatonnes of carbon dioxide equivalent (GtCO₂e).⁷ If all countries met their INDC commitments, cumulative emissions between 2011 and 2030 would be 748 GtCO₂e, 57% of this total carbon budget. As such, while the 2°C target remains possible if emissions follow the targets set out under the submitted INDCs, meeting it would require rapid (and, absent dramatic technology breakthroughs, likely prohibitively expensive) future emissions reductions. There will be significant pressure, both in the lead-up to and the aftermath of the Paris COP 21 meetings, for countries to implement policies which meet or exceed their INDC commitments and to establish conditions for deeper reductions in emissions in the post-2030 period.

⁶ <http://www.cop21paris.org/about/cop21>

⁷ http://unfccc.int/focus/indc_portal/items/9240.php

Meeting a 2°C transition will require a significant change in energy use globally, but perhaps not as dramatic or as quickly as some might think. In the recently-released 2015 World Energy Outlook from the International Energy Agency (IEA), the global supply of coal, oil, and natural gas in scenarios reflecting some additional action on greenhouse gases (New Policies) and aggressive action to meet a 2°C goal (450 ppm) are explored.⁸

Energy supply in million tonnes of oil equivalent (Mtoe) from oil, gas, and coal under New Policies and 450ppm scenarios from the International Energy Agency World Energy Outlook 2015



As this figure shows, a global 2°C transition would imply eventual decreases in coal, oil, and natural gas use, but the transitions do not all involve decreases beginning at the same time or at the same rate. In a world with coordinated 2°C policies, we should expect that natural gas consumption will increase significantly above today's levels and remain there through the next three decades, while coal would ideally decline quickly from today's levels. Oil's transition would likely lie between the two, with relative stability in the near term at today's levels, followed by a decline to 2008 levels before 2030 and an accelerating decline rate over the next decade to 2040. Underlying all of this would be a significant push for energy efficiency, with total global energy consumption held close to today's levels despite increasing population and economic growth. With these conditions in place, global emissions would peak by 2020 and decline rapidly to close to half today's levels by 2040. In the IEA's 450ppm scenario, roughly a 2°C trajectory, global emissions would be 20% above 1990 levels by 2030, and 9% below 1990 levels by 2040.

Importantly, according to the IEA, a 2°C policy path is not inconsistent with significant investments in any of the major fossil fuel categories, including oil and gas. In fact, they estimate that almost \$20 trillion will still be invested globally, between now and 2040, to meet oil and gas demand under their 450ppm scenario. They estimate that a further \$50 trillion will be invested globally in cleaner electricity supply and end-use efficiency. Global markets for all forms of energy supply and technology will present opportunities for Alberta as the world acts on climate change.

⁸ <http://www.worldenergyoutlook.org/>

The global energy transition to a carbon-constrained world is unlikely to be as planned or well-coordinated as an IEA scenario. In all likelihood, we will see a patchwork of global policies and significant differences in responses over time and across countries. For a small, open economy like Canada's, and in particular for an energy-exporting province like Alberta, a lack of clarity about future policies makes planning very difficult. As Alberta has seen on a number of fronts, the impacts of policies which directly target Alberta resources can be far more significant than a broader policy which creates a level playing field. While the Panel can bring no more certainty to the future of the global energy transition and the nature of future carbon constraints, we feel certain that the status quo is not an option, and that planning as though it were will lead to sub-optimal decisions in the long term. The broad trends of the IEA scenarios do, however, inform the future for which Alberta needs to plan.

NATIONAL CONTEXT

Canada's emissions reductions challenge is significant. Canada's emissions have grown over the past two decades, and are expected to continue to grow over time without significant policy intervention or changes in economic growth. In Canada's 6th National Communication to the United Nations, our most recent official assessment of our future emissions trends, Environment Canada projected that emissions would rise from 726 Mt in the 2013 emissions inventory to approximately 815 Mt in 2030, or 11% above 2005 levels.⁹

In advance of COP21, the Government of Canada has proposed a commitment in its INDC to reduce greenhouse gas emissions to 30% below 2005 levels - to 523 Mt - by 2030. Canada's new Environment Minister recently confirmed that these actions would represent the minimum that Canada would expect to deliver through new greenhouse gas policies and actions.¹⁰ Canada's existing INDC represents a commitment to significant new policy actions and/or significant purchases of international offsets. More stringent targets would increase the scope and stringency of required policies.

The most recent public projections for the policies required to meet Canada's INDC target are those published by [Carbon Management Canada](#) as part of the Deep Decarbonization Pathways project, which formed part of a submission to the Panel. The Phase 2 report from Carbon Management Canada concluded that, "Canada's INDC...is likely to be dependent on a suite of aggressive provincial policies and new federal policies." The Carbon Management Canada forecast suggests, with recent declines in oil prices and overall economic growth rates, current policies would lead to 2030 emissions of 740 Mt, compared to 815 Mt in the most recent National Communication cited above. Their analysis suggests that, to get on a trajectory which meets Canada's targets, a policy package would need to be imposed as follows:

The main elements of the policy package:

1. *Best-in-class regulations requiring the use of zero or near-zero emission technologies in the buildings, transport and electricity sectors, applied to all new installations and retrofits.*
2. *Mandatory 99% controls for all landfill and industrial methane sources (landfill, pipelines, etc.). Any remaining emissions would be charged as per the following policy.*
3. *A hybrid carbon-pricing policy, differentiated by heavy industry and the rest of the economy:*
 - a. *A tradable GHG performance standard for heavy industry (including electricity), evolving from 25% below 2005 emissions levels in 2020 to 90%*

⁹ Canada's 6th National Communication to the United Nations Framework Convention on Climate Change.

¹⁰ <http://www.cbc.ca/news/politics/catherine-mckenna-paris-talks-tory-target-1.3311482>

below 2005 levels by 2050, using output-based allocations to address competitiveness concerns.

- b. A flexible carbon price covering the rest of the economy, rising to CDN \$50 by 2020 and then in \$10 annual increments to 2050 (with) the funds recycled to lower personal and corporate income taxes.*
- 4. A land-use policy package that values the net carbon flows of large parcels of land.¹¹*

This is by no means the only policy package which could be used to meet Canada's targets, but it provides useful context for the environment in which the Panel's work is being conducted. In order to meet its national commitments, Canada will require significant policy action over-and-above that which is in place today, and Alberta would be significantly impacted by any effort to achieve these targets. The status quo is not an option for Alberta if Canada is to meet its current targets or make any credible global commitments.

ALBERTA CONTEXT

Alberta is in a unique position. Our energy industry is the source of a significant amount of provincial and national revenue and employment. However, the emissions from both industrial activity and from our growing population have led to significant increases, over historic levels, at a time when global pressure to reduce emissions is growing. Our electricity sector accounts for 65% of all coal power production in the country. The relative emissions intensity of Alberta's oil sands has become a focal point, and was most recently cited by the U.S. State Department as material to its decision that the Keystone XL pipeline was not in the U.S. national interest.¹² Increasingly, Alberta is seen as the reason for Canada not meeting its greenhouse gas commitments, and it is certainly the case that growth in Alberta emissions accounts for the lion's share of Canada's emissions growth and Alberta's emissions are a large share of Canada's total emissions.

The [Keystone XL pipeline] would facilitate transportation into our country of a particularly dirty source of fuel.

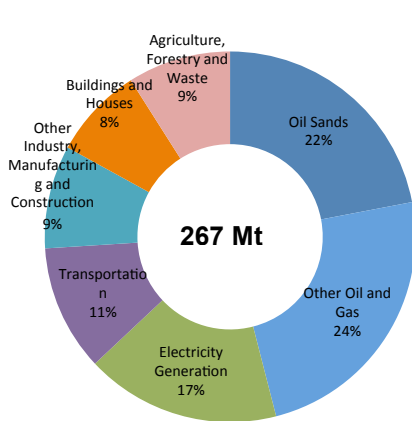
- Statement by US Secretary of State John Kerry on the rejection of the Keystone XL pipeline

In the most recent inventory data available, Alberta's emissions of 267 Mt in 2013 accounted for approximately 37% of Canada's total emissions, and this number and share is expected to grow. While Canada's emissions are expected to increase by 16 % from 2013 levels by 2030, Alberta's emissions are expected to grow by 20%. If these projections hold, the 53 Mt of growth in Alberta emissions would account for 60% of the total growth in Canadian emissions.

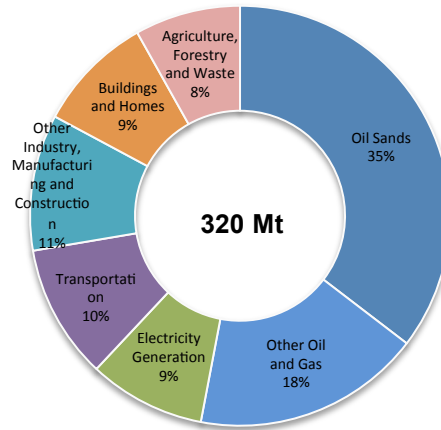
¹¹ Carbon Management Canada DDDP Report, with slight adaptation.

¹² <http://www.state.gov/secretary/remarks/2015/11/249249.htm>

Breakdown of Alberta Emissions (Source: Environment Canada)



267 Mt - Alberta's 2013 Emissions



320 Mt - Alberta's Projected 2030 Emissions

Aggressive greenhouse gas policy in Alberta is also complicated by the structure of our economy. As the graphic above shows, a substantial share of our emissions are from oil and gas and other large industrial sources – sectors which are generally considered trade-exposed. In fact, Canada's EcoFiscal Commission recently reported that 18% of Alberta's economy would qualify, under internationally-recognized standards, as being both emissions-intensive and trade-exposed (compared to 2% in B.C. and Ontario and 1% in Quebec).¹³ This means that, for these sectors, unduly aggressive actions taken to reduce emissions in Alberta may not lead to real emissions reductions. Instead, they could lead to emissions leakage, with production and the prosperity and employment it brings simply shifting to other jurisdictions without stringent GHG policy, and continuing to produce emissions. This would negatively affect Alberta's economy, but not make an impact on global greenhouse gas emissions.

Recent economic circumstances also make greenhouse gas emissions policy challenging. The drop in oil prices over the last 18 months has had significant impacts in Alberta. Unemployment rates have risen to 6.6%, up from 4.7% in December 2014. EI claims are up by 86% since December 2014, and GDP is forecast to contract by 1% in 2015. Government revenue has also suffered, with the province recently announcing a \$6.1 billion deficit, with non-renewable resource revenues forecast to fall by \$6.2 billion and corporate income taxes by \$1.1 billion (relative to 2014-2015). While these impacts will reduce projected growth in emissions, in some cases they also exacerbate the competitiveness effects noted above.

While Alberta is accustomed to the ups and downs of oil and gas prices, the advent of shale gas in the United States has kept natural gas prices low for years. Recent major tight oil developments, combined with increased output from the Middle East, threaten to do the same for the price of oil. The rapid decline in the price of both of these commodities has resulted in job losses and project delays and cancellations across the province. The prospect of long-term low prices will mean that, for our province to be successful in a world that is oversupplied with fossil fuels, Alberta companies will need to find innovative ways to reduce their costs.¹⁴ Fostering innovative ways to reduce input fuels, increase efficiency and reduce fugitive losses will not only reduce carbon - it will be essential to the long-term competitiveness of Alberta's resources.

¹³ <http://ecofiscal.ca/competitiveness>

¹⁴ <http://theamericanenergynews.com/energy-news/oil-sands-need-to-cut-costs-compete-with-american-shale-capp>

Alberta's context must also include discussion of the province's previously announced emissions target – a commitment in the 2008 Climate Change Strategy to reduce emissions substantially, to 200Mt below business-as-usual by 2050.

As the 2008 report from Alberta's Auditor General confirms, these targets were based on a computer model under the assumptions that Alberta's policies would include, "an escalating economy-wide carbon charge increasing from \$15/tonne (now), to \$30/tonne in 2020, \$60/tonne in 2030, and \$100/tonne in 2050 (...) and a strict regulation that all large, new industrial facilities are required to incorporate carbon capture and storage by 2015 wherever possible."¹⁵ The latter part of those assumptions, a requirement to adopt carbon capture and storage in industrial facilities, was supposed to have led to the lion's share of reductions posited in the target by 2050 but neither these regulations nor the modeled carbon price were imposed.

Modeling work provided to the Panel suggests that, while Alberta's emissions trajectory is lower than it was estimated to be when the 2008 targets were set (due to reductions in the pace of growth in oil sands and the collapse in natural gas prices among other factors), meeting Alberta's long-term 2008 targets would require policies outside the scope of stringency that we are prepared to recommend. For example, a submission to the Panel from the Canadians for Clean Prosperity showed a carbon price imposed across the economy of \$30 per tonne, increasing to \$100/tonne plus inflation by 2030. Even with this policy imposed, their estimates suggest that Alberta's emissions trajectory would remain above the trajectory proposed by the 2008 Climate Change Strategy. These results are consistent with all other work we have seen in terms of the magnitude of policies required to drive the scale of emissions reductions contemplated in the 2008 Strategy.

	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Projection from 2008 business as usual	272	280	288	296	304	311	313	315	317	319	321	323	325	327	328	329
Projection based on current policy & forecast	262	267	273	279	285	287	285	284	283	281	280	279	279	279	278	278
Proposed carbon fee				\$ 30	\$ 35	\$ 40	\$ 45	\$ 50	\$ 55	\$ 60	\$ 65	\$ 70	\$ 78	\$ 85	\$ 93	\$ 100
Projected emissions with carbon fee				268	273	274	271	268	265	264	262	260	258	256	254	250
Target emissions	247	250	253	255	258	261	259	256	254	252	249	247	245	242	240	238

Emissions and carbon price modelling submitted to the panel by Canadians for Clean Prosperity

While carbon prices of this magnitude are consistent with a 2°C global emissions policy, a unilateral imposition of these policies would have a meaningful impact on Alberta's competitiveness and would likely result in substantial emissions leakage, reducing the real emissions reductions such a policy would achieve. As discussed in later sections of this report, it is our belief that Alberta's policies should be positioned to increase in stringency, along with those of our peer and competitor jurisdictions. To do so in the absence of parallel policies elsewhere would be a losing strategy for our province.

A successful climate policy must recognize this context, and focus on policies that will drive emissions reductions while not unnecessarily damaging Alberta's economy.

¹⁵ http://www.oag.ab.ca/webfiles/reports/oct_2008_report.pdf

LABOUR CONTEXT

In addition to the impacts of climate policies on emissions and on economic growth, government must also give careful consideration to the impacts of climate policy here and abroad on workers and communities.

“The principle of Just Transition assumes that the burden of emissions-reduction should be shared equally across society, not unfairly targeting workers in specific areas of the labour market.”

- Alberta Federation of Labour

The climate policy architecture we have put forward is based on the assumption that Alberta can't pursue unilateral or arbitrary targets for emissions reduction because doing so would unduly impact our economy in ways that would be felt through job losses and wage decreases.

Alberta's domestic climate change policies can mitigate some of these risks, but as the world acts on climate change, it's very possible that global market changes will create major transition impacts here. That is why Alberta needs climate policy that can preserve existing employment by ensuring existing industries remain amidst the global shift to low carbon energy, create new employment opportunities, and ensure that substantial new costs are not imposed on Albertans.

While we often hear about the impact of greenhouse gas policies on *jobs* in the aggregate, understanding and mitigating impacts in specific sectors will be much more important to a successful policy implementation. There are many sectors in which employment will likely expand as a result of climate policy. These include energy efficiency retrofitting, renewable energy, and transit expansion and sustainable transportation infrastructure. But the policies we propose will also drive workforce change that will be less positive for some workers and communities. Examples include employment reduction caused by the phase out of coal-fired electricity or potential impacts on high-emissions oil production.

To stay ahead of these and other challenges, the Panel recommends early identification of workforce impacts related to energy transition, and early preparation of planning, training and transition program options.

We recommend that revenue from carbon pricing be invested in ensuring that transitions for workers and communities are appropriately managed through training and matching displaced workers with new opportunities. New employment opportunities in low carbon energy and infrastructure can represent a much-needed contribution to economic diversification, but will require training investments. In order to prepare for these investments, we recommend that the government undertake a detailed study of potential labour market impacts at the community level, and assess the degree to which different transition strategies may apply.

Just transition programs need to be tailored to the circumstances of workers and their communities, and their selection, design and implementation will require participation of all those involved. Workers, unions, communities and firms will need to be engaged by government to develop specific programs that can include skills development and training, income support and relocation assistance, as well as working with the federal government on pension bridging and benefits programs for displaced workers.

The Canadian Labour Congress (CLC) submission to our panel provided examples of how trade unions are activating on building renovation and maintenance programs that are making material contributions to climate protection and sustainable development. The CLC emphasized the importance of engaging workers and their unions in climate and energy transition.

“The commitment of this government must be to not only listen, but to meaningfully engage the people of this province, particularly where such engagement opens the door to the fundamental change in socio-economic patterns and personal lifestyles.”

- Canadian Labour Congress

We should worry as much about the competitiveness of our human resources in a carbon constrained world as much or more than we worry about the competitiveness of our natural resources. A well-implemented transition strategy which matches affected workers with new opportunities and the training they need to excel in them will be crucial to a positive outcome of Alberta’s approach to climate change.

ABORIGINAL CONTEXT

Protecting Treaty and Aboriginal rights is both a requirement and an opportunity for development of Alberta’s new climate policy. Our panel has taken this into consideration when drafting our advice to government.

Aboriginal people and communities are particularly vulnerable to the impacts of climate change, as well as the impacts of industrial development of their lands. While the former is largely outside of the scope of our work – the scale of Alberta’s emissions, in a global context, are too small to tie any meaningful change in overall climate experienced here – the latter is a core consideration in much of what we’ve brought forward to government.

Before speaking to mitigation, a word on adaptation and impacts is important here. Given their relationship with the land the Assembly of First Nations has been advised that, “it is expected that First Nations will experience the impacts of climate change in ways that most non-Aboriginal Canadians will not, due to a heavy reliance on the environment, their locations, their economic situations.”¹⁶

The Alberta Government has made a renewed relationship with Aboriginal peoples a priority, and has asked all government departments to integrate the tenets of the United Nations Declarations on the Rights of Aboriginal Peoples (UNDRIP) into actions and policies. With respect to the policies, programs, and mechanisms suggested here, the most relevant Articles from UNDRIP are likely Articles 29 and 32 which state:

Article 29.1: Aboriginal peoples have the right to the conservation and protection of the environment and the productive capacity of the lands or territories and resources. States shall establish and implement assistance programmes for Aboriginal people for such conservation and protection, without discrimination;

and

Article 32.1. Aboriginal peoples have the right to determine and develop priorities and strategies for the development or use of their lands or territories and other resources.

Article 32.2. States shall consult and cooperate in good faith with the Aboriginal peoples concerned through their own representative institutions in order to obtain

¹⁶ Centre for Aboriginal Environmental Resources, "How Climate Change Uniquely Impacts the Physical, Social and Cultural Aspects of First Nations" Prepared for Assembly of First Nations, March 2006
www.afn.ca/uploads/files/env/report_2_cc_uniquely_impacts_physical_social_and_cultural_aspects_final_001.pdf.

their free and informed consent prior to the approval of any project affecting their lands or territories and other resources, particularly in connection with the development, utilization or exploitation of mineral, water or other resources.

Article 32.3. States shall provide effective mechanisms for just and fair redress for any such activities, and appropriate measures shall be taken to mitigate adverse environmental, economic, social, cultural or spiritual impact.

In the Panel's interactions with Aboriginal peoples, in specific engagement sessions held in Calgary, Edmonton and Fort McMurray, at our public sessions, and in several technical stakeholder sessions, the principles laid out above were frequently brought to our attention. Therefore, we feel it is important to re-state their importance here.

While we have included recommendations regarding Aboriginal communities as part of our proposed policy framework we also feel it is important to note that much more needs to be done to ensure meaningful Aboriginal inclusion in decision making on climate and energy issues. Our panel believes it is critical that new climate policies, and the changes they bring to Alberta, remain the subject of genuine engagement with Aboriginal communities and organizations, and that this engagement be continuous throughout the process, including implementation and monitoring. This will require a defined process in which government works directly with Aboriginal communities and knowledge systems as defined by those communities.

Policy Architecture

In response to the context above, we propose a policy architecture which we believe positions Alberta as a policy leader among energy-producing jurisdictions and prepares the province to be competitive and prosperous in a carbon-constrained world. The fundamental tenet of this architecture is the recognition that greenhouse gas emissions are an unpriced externality (i.e. emissions impose costs not paid for by the emitter), and that enabling the market to creatively solve this problem is the most economically efficient and fairest way to achieve reductions.

Carbon pricing provides the backbone of our proposed architecture – it puts a price on emissions and thus leverages the power of the market to deploy both technologies and behavioral changes to reduce emissions over time. Putting a price on emissions leverages the power of markets to deploy both technologies and behavioral changes to reduce emissions over time. Carbon pricing is the most flexible and least-cost way to reduce emissions as it encourages reductions in emissions to occur in whichever ways best suit individual processes, abilities and circumstances for households and businesses, while not forcing specific technologies, actions, or outcomes.

Pricing carbon emissions can help to achieve reductions at lowest cost, can contribute to global emissions reductions, and can help position Canadian firms to compete in a cleaner global economy.

- Canada's Ecofiscal Commission¹⁷

Our proposed carbon pricing approach:

- 1. Broadens the carbon pricing signal in Alberta beyond large industrial emitters to previously uncovered sectors of the economy including end-use emissions from transportation and heating fuels and flaring of gases associated with fossil fuel production and processing.**
- 2. Improves the mechanism by which trade-exposed sectors are protected, to prevent emissions leakage while encouraging and rewarding top performance;**
- 3. Ensures that similar industrial facilities have the option to be treated similarly;**
- 4. Sends a signal that, as long as greenhouse gas emissions policies in peer and competing jurisdictions increase in stringency, Alberta's policies will do the same; and**
- 5. Provides resources to protect vulnerable communities and fund complementary emissions-abatement programs.**

¹⁷ <http://ecofiscal.ca/>

In addition to our carbon pricing approach, we propose four major policy options for government, each of which will be complementary to the carbon pricing regime, and for which any incremental costs are to be funded from carbon revenues.

We recommend that the government complement the carbon pricing policy with:

- 1. An integrated electricity policy package which will phase out coal-fired power in Alberta by 2030 and provide an opportunity for the replacement of at least 50-75% of retired coal generation with renewable power, while retaining Alberta's competitive electricity market structure;**
- 2. A provincial energy efficiency and community-based energy program which is governed by rigid controls to ensure cost-effective emission reductions without regressive outcomes;**
- 3. A hybrid regulatory and market-based approach to reduce methane emissions from oil and gas operations in the province; and**
- 4. An updated technology and innovation investment program and technology-friendly regulatory approach which will ensure that Alberta's publicly-owned natural resources retain maximum value in a carbon-constrained world.**

We have taken great care to ensure this is a progressive policy that offsets impacts on the majority Alberta households and small businesses, while protecting our core industries and supporting the transition needs of affected workers and communities. To ensure our policies remain competitive, we are also recommending periodic reviews to assess and adjust to changing global commodity markets and climate policies. Finally, a successful response to climate change in Alberta must be undertaken in partnership with our Aboriginal communities and this has been a priority for the panel for which also we propose several specific initiatives.

The full suite of Panel advice is outlined below.

CARBON COMPETITVENESS REGULATION

Policy Recommendations

- 1. For large industrial facilities, the existing Specified Gas Emitters Regulation (SGER) should be replaced with a Carbon Competitiveness Regulation (CCR) in which a carbon price is applied and sector-specific output-based allocations are used to mitigate competitiveness impacts on trade-exposed sectors and to protect electricity consumers from significant and unnecessary rate increases.**

Under the proposed program:

- All emissions from facilities with emissions over 100,000 tonnes/year will effectively be priced, but facilities will be allocated emissions rights in proportion to output or value-added. Firms will thus face a lower average cost of emissions than they would without the output-based allocation, but will still have an incentive to reduce emissions, either to avoid paying a carbon levy, or to profit from the sale of unused emissions allocations.
 - The output-based allocations would reflect top-quartile performance or better, and would decrease over time at 1-2% per year to reflect expected energy efficiency improvements.
 - Similar facilities (e.g. gas processing plants and oil and gas production facilities) which fall below the 100,000 tonnes/year threshold would be permitted to opt-in to the large final emitter treatment rather than the end-use emissions price if it is advantageous for them to do so.
- 2. For end-use emissions, a broad-based carbon price should be applied. It will require distributors of transportation and heating fuels to acquire emissions permits in recognition of the emissions their products will create when combusted. Emissions from other sources, including landfills and flaring, not covered by the large final emitter treatment should also be included**

- Emissions permits could be acquired either through the purchase of credits from other emitters, through the purchase of Alberta-based offsets, or through the payment of a carbon levy to the government.
- Firms would not be covered twice, so large final emitters would be able to exempt emissions from fuels for which a carbon price had already been applied at the point of distribution from their calculation of required emissions permits
- The proposed treatment of emissions from transportation and heating fuels, with emissions permit requirements imposed at the distribution level, is similar to the systems now in place in Quebec and California and proposed for Ontario.
- Pricing should be phased in, with lower prices applied to end-use emissions in 2016 and 2017

Relevant Policy – Carbon Pricing

Alberta's existing carbon pricing system currently covers large emitters, which make up nearly half of Alberta's total emissions.

The Specified Gas Emitters Regulation (SGER) is a hybrid carbon pricing system based on rewarding emissions intensity reductions. It has elements similar to a carbon tax and elements similar to cap and trade.

The regulation currently requires facilities that emit 100,000 tonnes of CO₂e or more per year to reduce their emissions intensity by 12% below a historical baseline. This reduction requirement will increase to 15% in 2016 and to 20% in 2017.

Facilities that are unable to meet their annual intensity target may comply by using performance credits purchased from other firms or banked from previous years; purchasing emissions offsets; or by paying a carbon levy into a government fund at the set price per tonne of carbon dioxide.

Facilities that reduce emissions intensities below their target are able to generate emissions performance credits, which are tradable or which may be banked for future years.

The price per tonne emitted above this baseline will increase from \$15 in 2015 to \$20 in 2016 and \$30 in 2017.

3. The carbon price will have a ceiling set by the rate at which emissions permits can be acquired from the government through the payment of a levy

- The levy should reach a common price of \$30/tonne for both large industrial emitters and end-use emitters by 2018.
- The price should increase over time in real terms (e.g. inflation plus 2%) as long as emissions prices in Alberta do not significantly exceed those in comparable/competitor jurisdictions and as long as they are not above current estimates of the social cost of carbon or an applicable national carbon pricing standard, whichever is greater.¹⁸

4. Revenues from the carbon price should be used in three broad areas:

- protecting vulnerable communities;
- *doubling-down* on carbon emissions reductions including investments in energy efficiency, technology development and deployment, renewable energy and green infrastructure; and
- providing incremental fiscal capacity for government priorities, be they infrastructure spending, tax reductions, deficit reductions or other programs.

Why This Approach?

Economics tells us that the most cost-effective emissions reductions will be achieved through an economy-wide price on carbon. While carbon pricing is generally seen as the backbone of cost-effective greenhouse gas policy, Alberta's current carbon policy places a price on only about 45% of the province's emissions, compared to up to 85% in other Canadian provinces. The emissions the current policy targets are among the most expensive potential emission reductions in Alberta's economy. The current treatment for industrial emissions also provides imperfect incentives to design and build new, top-performing facilities.

Relevant Policy – Carbon Pricing

Alberta currently has no explicit carbon price on emissions for more than 50% of the economy, including heating and transportation fuels.

Most other jurisdictions with carbon pricing have a price on these emissions, including Quebec, B.C., and California.

“Carbon pricing is increasingly emerging as a central policy instrument for reducing GHG emissions, with support from a broad range of influential entities, such as the World Bank, the Organization for Economic Co-operation and Development, the International Monetary Fund, and the Canadian Council of Chief Executives. (...) Carbon pricing provides emitters with the flexibility to identify least-cost ways to reduce emissions. It also generates revenue that governments can use to drive additional environmental or economic benefits. And, over time, carbon pricing will also drive more innovation, further reducing costs.”

- Canada's EcoFiscal Commission

¹⁸ The social cost of carbon, as defined by the U.S. Environmental Protection Agency, is, “an estimate of the economic damages associated with a small increase in carbon dioxide (CO₂) emissions, conventionally one metric ton, in a given year.” See <http://www3.epa.gov/climatechange/EPAactivities/economics/scc.html>

The policy architecture we've proposed rectifies these two issues by expanding coverage of carbon pricing to include end-use emissions and by improving the design of the policy applied to emissions-intensive and trade-exposed sectors as well as to electricity. These are each imposed by relying on design principles already in use in Quebec and California through a cap-and-trade system.

End-use Emissions Pricing

For Alberta's policy package to be credible in comparison to other global greenhouse gas pricing regimes, the other 55% of emissions in the economy should fall under a pricing regime as well.

“An efficient way to quickly target a significant and growing amount of end-use emissions would be the application of a natural gas, electricity, gasoline and diesel carbon price at the point of sale. There are various mechanisms for levying a carbon price, which combined with revenue recycling through reduced personal income taxes, could protect lower income Albertans while sending a clear price signal to change choices and energy use habits.”

- Suncor Energy submission to the Panel

For the Panel, the extension of the carbon price to the broader economy is one we came to see as a necessary condition for any policy change and not a decision we took lightly. This policy change was advocated for in many submissions to the Panel, and was discussed at length in our technical sessions.

We feel that for Alberta to truly lead on climate mitigation, we must bring all emissions in our economy under a carbon policy. We are a fast-growing, well-off, northern jurisdiction with a resource-based economy. This means we have higher emissions per capita than other jurisdictions. There is a global cost associated with those emissions wherever they occur in our economy. We cannot only apply a price on our large emitters while placing no constraints on the rest of the economy. Including all emissions under the carbon pricing policy allows for the lowest cost emissions reductions to be acted on, which benefits the whole economy. Many of these lower-cost reductions are found in the buildings and transport sectors previously exempt from carbon pricing.

“We endorse the position of economists from across the political spectrum who state that a strong and simple carbon price is the most efficient way to reduce emissions. (...) A carbon fee applied to both consumers and industry is the lowest cost policy alternative to affect economy-wide behaviour change. By setting a price on carbon consumers and industry respond by purchasing less energy-intensive goods and using energy more efficiently. The choice is in the hands of the individual or business. Corporate and consumer behaviors change, real emission reductions are seen, costs to the taxpayer are lowered and money is reinvested in the economy.”

- Canadians for Clean Prosperity submission to the Panel

While it is generally acknowledged in the academic economics literature and by policy-engaged think-tanks across the political spectrum that carbon pricing is the most cost-effective means to reduce emissions, support for it is by no means universal. Because carbon emissions are part of the production process for so many of the products we consume, and because we use carbon fuels for so much of how we move and how we heat our homes, carbon prices will make things more expensive. Yet the carbon prices contemplated in this report will not drive radical changes in prices, behaviour, or emissions in short order, simply because we are not proposing radical policies, but a managed transition.

Carbon pricing provides the incentive for consumers and firms to change their behaviour and to reduce emissions. Carbon prices at the levels contemplated in this report will change people's behaviour at the margin. It will create a competitive advantage for lower carbon products and means of production and in so doing will drive innovation to create new technologies to capitalize on these advantages.

We are proposing a policy which places similar trade-offs on our consumption decisions with respect to carbon emissions as are currently in place in many jurisdictions, including Quebec, California, B.C., and the European Union. People in these jurisdictions continue to live lives reasonably similar to Albertans, while taking a little more careful account of their emissions footprints.

Extending carbon pricing to the broader economy is not just a matter of homes and automobiles – the incentives for emissions reductions provided by carbon pricing will extend to cover all gas processing in the province. It will also include flaring from oil and natural gas wells and emissions from landfills which account for a significant share of our footprint today. While many of these emissions have been priced to date, that price has been felt through the potential to receive and sell emissions offsets for reductions achieved in these facilities. With the changes we suggest, those who have taken early action will have received credit for doing so through the offset protocol in place since 2007, while remaining emissions from all sources will now face a price.

Treatment for Large Final Emitters

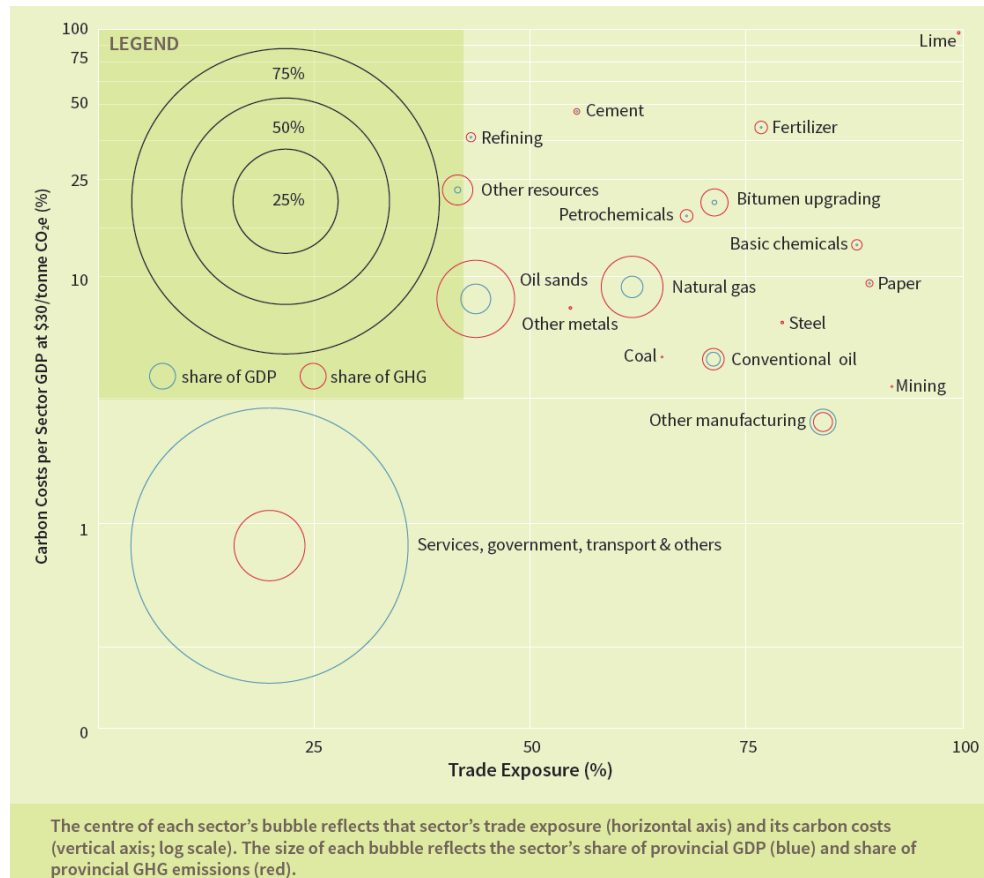
We tend to focus on oil sands and electricity as our large emitters, but the range of facilities is more diverse, and also includes fertilizer and petrochemical facilities, cement plants, and many other industrial operations in the province. Emissions from these facilities have been priced since 2007 under the Specified Gas Emitters Regulation, and the policy package we propose improves on that treatment.

The principle reason to have a separate treatment for large emitters is not because they are large emitters but because they tend to be trade-exposed facilities. Recent analysis by Canada's EcoFiscal Commission, shown in the Figure below, characterizes the emissions-intensive and trade-exposed industries in Alberta compared to other sectors of the economy.¹⁹ Oil sands, upgrading, refining, petrochemicals and natural gas production and processing all rank highly on both measures. Conventional oil production ranks lower in terms of its emissions cost exposure (conventional barrels are generally lower emissions than oil sands barrels and overall value tends to be higher) but its trade exposure is higher than others, as the produced product is highly fungible. The emissions pricing regime we propose for large emitters recognizes the fact that much of Alberta's industrial sector faces significant trade-exposure, and emissions policies which impose high average costs of production here could shift activity and prosperity to other locations with no real impact on emissions.

“A cap-and-trade system can directly address the impact of a carbon price on trade-exposed industries by providing operators in the industry with a free allocation of emissions permits. Provided the allocation is not significantly beyond what the operator would otherwise emit this will encourage a facility to control its emissions without imposing a significant negative impact on its competitiveness. A reduction incentive is also provided when the facility has the option of selling its permits in the emissions trading market. Protecting trade-exposed industries with a carbon tax, alternatively, can be more difficult”.

-Sarah Dobson and Jennifer Winter, University of Calgary, submission to the Panel

¹⁹Beale, Beugin, Dahlby, Drummond, Olewiler, and Ragan. (November 2015) “Provincial Carbon Pricing and Competitiveness Pressures. Guidelines for Business and Policymakers. Canada's Eco-Fiscal Commission.



Emissions intensity and trade exposure (EITE) across industries in Alberta. Sectors with trade exposure above 15% and carbon costs above 5% of sector GDP above are considered EITE sectors.
Source: Canada's EcoFiscal Commission. Modelling by Navius Research.

While existing assets are fixed and unlikely to relocate or shut down under reasonable carbon policy, Alberta's domestic policy on greenhouse gases could have a substantial impact on investments in new and expanded resource production, as well as impacting decisions on well abandonment in the conventional oil and gas fields. Further, greenhouse gas policies have the potential to significantly affect resource processing activity, including upgrading, refining and gas processing, as well as downstream activities such as the location of petrochemical facilities. While global greenhouse gas policies, as they tighten, will constrain global demand for resources, domestic policy which serves to shift production activity to other jurisdictions would impose disproportionately large costs on Alberta for minimal, real emissions reductions. In the panel's view, this does not constitute optimal greenhouse gas emissions policy.

“Until the U.S. adopts a broad, greenhouse gas (GHG) regulation covering all sectors, additional GHG compliance costs in Canada represent a competitive drag on Canadian industries.”

- Imperial Oil submission to the Climate Change Panel

With these conditions in mind, our proposed carbon pricing architecture is structured to create incentives for both on-going and design phase improvements, without enabling significant emissions leakage to other jurisdictions – an outcome which would drive prosperity from Alberta for no net reduction in global emissions. The use of output-based allocations of emissions permits lowers the average cost of compliance for trade-exposed sectors, while ensuring that the carbon price provides a reward for all emissions reductions achieved, except for those which occur due to decreases in production.

We have also proposed an output-based allocation system for electricity based on a *good-as-best gas* standard. While electricity is not trade-exposed, a price applied without allocations in the electricity sector would lead to significant price increases and increase the burden on our revenue recycling regime to protect vulnerable consumers, communities and businesses. Input provided to the panel suggests that we can impact dispatch decisions in the electricity market in essentially the same way as would a carbon tax on every tonne with the imposition of our system. The treatment we propose is what is used in California. Under its cap-and-trade program, it provides an allocation of emissions credits to utilities to defray price increases which would otherwise occur as a result of emissions permit requirements in the electricity sector. These treatments ensure that Alberta businesses which rely on electricity as an important input are not put at a competitive disadvantage through rapid price changes.

Improvements relative to the Specified Gas Emitters Regulation (SGER)

For industrial emitters, our proposed architecture addresses four key flaws in Alberta's current carbon policy, the SGER, while maintaining protection for trade-exposed industries which make up a large share of Alberta's economy.

First, under the SGER, each facility's allocation of emissions is set based on its own historic emissions-intensity. While this means the policy places a relatively similar burden on all operations, it implicitly grants the rights to more emissions to facilities which have historically had higher emissions, and creates less incentive for new facilities to adopt the most stringent emission reduction technologies. In other words, it rewards that which it is meant to reduce. By moving to a sector-wide output-based allocation, the most emissions-efficient production will have an advantage, and that advantage will occur whether the facility was designed and built with lower emissions standards, or if the facility improves its performance over time.

Second, under the SGER, specific reduction requirements (or the share of emissions granted freely to facilities) do not reflect specific sector competitiveness concerns, emissions reduction potential or sector-specific performance goals – the same allocation rule applies across the board. Large emitters do not all have the same potential to reduce emissions, nor do they face the same level of international competition. The proposed CCR architecture would allow the government to periodically review allocations, on a sector basis, to ensure that the appropriate balance between creating a material incentive to address emissions and maintaining competitiveness/preventing emissions leakage, has been maintained.

Third, the 100,000 tonne cut-off in the current regulation is such that similar facilities find themselves above and below the threshold, especially in the case of natural gas processing and thermal heavy oil production. Under the previous policies, with no coverage for emissions from end-use, smaller facilities were simply exempt from greenhouse gas policies. Under our proposed architecture, firms are either covered based on their end-use emissions or through the large final emitters treatment, but not both. We recommend that an option be provided to opt-in for firms who wish to incur the costs of emissions reporting and verification under the large final emitters treatment, and that these firms be provided with an output-based allocation of free emissions to match their in-province competitors.

Finally, the SGER has not historically contained a commitment to price or stringency increases over time, and the current schedule of increased price and stringency extends for only two years. We recommend that government implement a schedule for annual price increases at 2% above inflation and for annual allocation decreases at 1-2% per year, subject to a comparison of Alberta policies with other jurisdictions. A clear commitment to prices over time provides a strong signal for long-term investments in abatement technology.

“When you’re making investments in very expensive technologies you tend to like carbon taxes because you do get price certainty for carbon.”

– Jack Mintz, former director, University of Calgary’s School of Public Policy²⁰

We believe that our proposed architecture is the best way to address greenhouse gas emissions, while accounting for Alberta’s current economic circumstance. This is not to suggest that the proposed architecture represents weak policy – quite the opposite is true. It represents an approach which is currently applied in other leading jurisdictions in the world (although some of those jurisdictions have a lower price on carbon than we propose for Alberta).

The Carbon Price

A carbon pricing architecture depends, more than anything else, on the price applied. Here, the panel heard from a variety of stakeholders, many advocating for applying significantly higher prices than those in place today in Canada, across the entire economy. Others felt that the increases already applied in June 2015 were as far as the province should go. As a panel, we’ve considered multiple scenarios and consider the currently-announced increase in price to \$30/tonne by 2018 to be sufficient. However we recommend that government commit to increasing that price by 2% per year above inflation so long as prices increase in comparable jurisdictions (including jurisdictions which host competitors to our resource production), to match Alberta’s prices.

“We recommend a carbon price starting at \$40 per tonne of CO₂ emitted in 2016, with a schedule for increasing it by \$10 per tonne annually over the first 10 years of the policy. This is generally the level of stringency necessary for Alberta to make a fair contribution to Canada’s international commitments.”

- Pembina Institute submission to the Panel

Our closest geographic comparisons – B.C. and Saskatchewan- provide carbon price bookends. While B.C. has an economy-wide carbon price at \$30/tonne, Saskatchewan does not price carbon emissions at this point. Each of these jurisdictions are peers in terms of wealth and economic activity, and each are competitors for many of our resource activities. It is generally expected that B.C. will increase its price, although no specific plans have been announced.

The other Canadian comparisons are Quebec and (soon-to-be) Ontario, which are partners with California in the Western Climate Initiative (WCI). While Alberta does not compete directly with Ontario and Quebec for investment in most key industries, these provinces do provide a barometer for ambition in terms of carbon pricing, and their architecture is very similar to what we are proposing.

²⁰ Michael Ganly. (2013) The Business Case for Putting a Price on Carbon, Alberta Venture, April 2, 2013

At present, carbon prices in the WCI are at the floor price of \$15 per tonne, and while they are expected to rise post-2018, prices will be determined by the level of emissions allocations provided into the system. Recent analysis by Dave Sawyer at EnviroEconomics estimates that the price of emissions in the WCI will rise to \$17.16/tonne by 2020.²¹

Finally, while Canadian provinces represent an important point of comparison, much of the competition for investment in our resource industries comes from outside of Canada. Many of these jurisdictions have no prices on emissions, although some, including the U.S., are implementing regulatory controls or partial emissions-pricing systems.

The other points of reference for emissions prices in Alberta should be the prices which would be required globally to meet a 2°C goal as well as the price which, if applied today, would internalize the marginal social costs of carbon emissions. We should also have as a point of reference the price which would be required to meet Canada's national target as expressed under Canada's INDC submitted in advance of the Paris COP21 meetings.

The Environmental Protection Agency (EPA) and other U.S. agencies (the Interagency Working Group) provide the most comprehensive estimate of the current social cost of carbon emissions, which they provide for a variety of discount rates and damage probabilities. Their central estimate, which uses a 2.5% discount rate, pegs the social cost of carbon emissions today at \$62 per tonne, increasing to \$69 per tonne by 2020 and \$110 per tonne in 2050, each in 2014 inflation-adjusted U.S.-dollar terms.²²

The International Energy Agency pegs the carbon price required as part of their 450ppm scenario to accomplish 2°C goals at \$20/tonne in 2020, rising to \$100/tonne by 2030 and \$140/tonne in 2040, again in 2014 inflation-adjusted U.S.-dollar terms.²³

Finally, as discussed earlier, recent analysis by Carbon Management Canada defined a policy for Canada's INDC which included an economy-wide carbon price at CDN \$50/tonne by 2020, with higher prices applied through a cap-and-trade program on industrial emissions.

Each of these are higher than the price we propose for Alberta today, which is why we maintain that Alberta's price should rise, in real terms, in line with prices imposed in other jurisdictions. If the world acts on climate change, effective prices on emissions everywhere will need to rise. This will negate the competitiveness and emissions leakage concerns which weighed heavily on our work and allow Alberta's prices to increase as well.

Emissions Offsets

Alberta's current emissions regulations extend prices to sectors not covered by the Specified Gas Emitters Regulation (SGER) through the possibility to certify and sell emissions offsets in recognition of emissions reductions. The offset protocols will need to be altered should the province adopt a broader carbon pricing program as many of the sectors now eligible for offsets would have emissions priced. We recommend that existing certifications be honoured according to the terms of the protocols as appropriate. Sectors for which offset protocols would need to see changes include but are not limited to flaring in oil and gas, landfill methane, and emissions from building heating and cooling systems. Emissions offsets should remain a tool for compliance with our emissions regulatory package on a scale

²¹ Dave Sawyer, The Cost and GHG Implications of WCI Cap and Trade in Ontario April 13, 2015 <http://www.enviroeconomics.org/#!/The-Cost-and-GHG-Implications-of-WCI-Cap-and-Trade-in-Ontario/c1uze/552bd8930cf21933cd596d58>

²² Interagency Working Group on Social Cost of Carbon, United States Government, Technical Update of the Social Cost of Carbon for Regulatory Impact Analysis - Under Executive Order 12866 - May 2013 Revised July 2015

²³ World Energy Outlook, 2015, p42.

limited to uncovered sectors. We recommend an expansion of the use of this tool to provide leverage for investments in methane reduction from oil and gas.

While the removal of some offset provisions will be unpopular with some stakeholders, the offset program provided an incentive to take early action to reduce emissions, and that will be its own reward under our new policy. These emissions will still be priced and, rather than revenue from offsets, the return on investment will be in the form of an avoided cost which will be borne by competitors who did not take earlier action to reduce emissions.

Treatment of Cogeneration

“Expand the use of efficient heat and power cogeneration which provides low price, base load power to support the retirement of coal facilities, while reducing the carbon intensity of our electricity system.”

– MEG Energy Submission to the Panel

One of the most frequent areas of stakeholder feedback in both the oil and gas and electricity sectors was with respect to the role of cogeneration. Under the current policy framework, which uses facility-level benchmarks, cogeneration is disadvantaged without credits. A facility with cogeneration, which would generally be more efficient than one relying on either site-generated or grid-generated electricity and separately-produced or procured heat, would still be required, under the existing system, to reduce emissions heat intensity by 20% from initial levels. Most stakeholders acknowledged that this provides a disincentive to make substantial investments in efficiency improvements from combined heat and power. As a result, the existing policy includes a credit for cogeneration which attempts to quantify what emissions-intensity would have been at a particular oil sands facility had the facility not deployed cogeneration, and use that as the basis of comparison to actual emissions – the facility is judged against a hypothetical outcome. Stakeholders differed substantially in their engagement with the Panel was in what that hypothetical should be. Some argued that there should be less credit given, stating that many facilities would build cogeneration regardless of the incentive. Others argued the credit should be more generous, since excess electricity sold to the grid was effectively displacing coal power.

A key advantage of the use of output-based allocations for all facilities is that it eliminates the need for this counter-factual policy. Output-based allocations provide all facilities with an equal allocation based on output, not one determined their own, historic performance.

Under the proposed architecture, cogeneration would have a clear reward if it does, in fact, reduce total emissions associated with the combined output from the facility and electricity production. Rather than an explicit credit, having emissions credits allocated on an output basis implicitly rewards lower intensity production of both products simultaneously and that reward will be anchored in the carbon price.

Stakeholders felt strongly that any greenhouse gas policy should reward efficiency while being technology-neutral, and that the rewards should be tied to actual performance, not to performance relative to a potentially overly generous hypothetical. The proposed output-based allocation accomplishes both of these.

“The current policy for cogeneration under SGER needs to be corrected to eliminate the preferential treatment of cogeneration. There is no scientific or economic basis to treat cogeneration differently from other thermal generation. Regardless of the GHG framework that GOA ultimately chooses, any framework must treat emissions from cogeneration consistently with emissions from other sources.”

- Capital Power submission to the Panel

In its submission, the In Situ Oil Sands Alliance asks for a policy which, “treats carbon as carbon and does not discriminate across sectors,” – a sentiment which was echoed consistently in many other submissions. Output-based allocations applied in both electricity and oil sands implies that efficiency gains will be rewarded on exactly that basis – a tonne saved in the co-production of electricity and heat will be rewarded at the carbon price, just as will a tonne saved from energy efficiency in other forms.

“Cenovus recommends the government establish an economy-wide carbon pricing system...to affect behaviour change among all emitters in the province not covered by the large emitter policy. A portion of the revenue from this mechanism could be recycled back to low-income households to mitigate the impact. The remaining funds should be dedicated to climate change mitigation, including developing technology to reduce, and eventually eliminate, GHG emissions from the end use of oil.”

- Cenovus Energy submission to the Panel

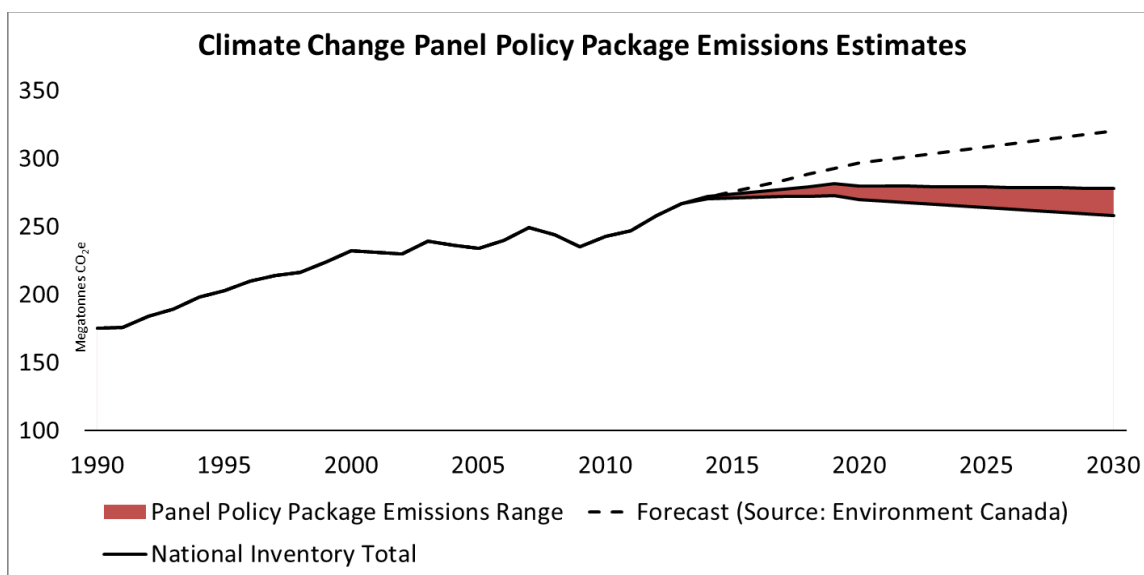
Potential Outcomes

The expected outcomes of our carbon pricing and complementary policy approach are divided into two broad categories – first, the overall financial outcomes and revenue recycling decisions and second the induced emissions reductions expected from the combined programs.

Emissions Reductions

In terms of emissions reductions, with prices beginning at \$30 per tonne and increasing at 2% above inflation, the potential for emissions reductions from carbon pricing is significant, although varying across sectors. The expectation, based on modeling from Alberta Environment and Parks, is that the proposed policies would lead to emissions reductions of approximately 20 Mt below a continuation of current policies in 2020, and approximately 50 Mt below a continuation of current policies in 2030. A significant share of these reductions are due to complementary policies in greening electricity, energy efficiency, and methane emissions reductions financed by revenues from the carbon pricing program and discussed in further detail in sections to follow. This would roughly stabilize emissions, by 2030, at just above current levels, at approximately 270 Mt.

The graph below shows Alberta's emission trajectory under the Panel's recommended policy architecture.



Many will look at these emissions reductions and claim that our proposed policies will not place Alberta on a trajectory consistent with global 2°C goals, and in some sense this is true – the policies proposed for Alberta in this document would not, if applied in all jurisdictions in the world, lead to global goals being accomplished.

However, more stringent policies in Alberta would come at significant cost to the province due to lost competitiveness with negligible impact on global emissions. As a panel, we have looked at this challenge and concluded that while we do have an architecture which will be consistent with meeting global goals as long as Alberta's peer and competitor jurisdictions act on climate change with similar policies, imposing policies at these levels is not tenable until our peer and competitor jurisdictions take similar actions. Comparable policies being in place in other jurisdictions would negate competitiveness concerns and would allow increasing stringency of policies in Alberta, while not sacrificing wealth and prosperity to emissions leakage rather than real emissions reductions.

We've concluded that, while Alberta must be prepared to increase the stringency of its policies if others act, the policy package we have proposed is the most stringent approach we could recommend in the absence of that action.

Use of Revenue

We expect the program as proposed would substantially increase Alberta's revenues from carbon pricing. With net revenues, after accounting for foregone corporate taxes and royalties, it could exceed \$3 billion by 2018, once the end-use emissions pricing has been fully phased-in, and potentially reach over \$5 billion by 2030, assuming that other jurisdictions' carbon prices and policies increase in stringency sufficiently to allow Alberta to avoid significant emissions leakage effects from increasing domestic prices and decreasing domestic output-based allocations.

We have proposed three priority areas for the allocation of net revenues from carbon pricing: 'doubling-down' on emissions reductions, protecting vulnerable Albertans, and providing resources for other government priorities including increased savings and/or deficit reduction.

"Doubling down" on emission reductions

The panel's proposed complementary policies to double down on emission reductions are detailed throughout our report. A portion of carbon revenue should be directed to implement these policies, with approximate allocations recommended as follows:

- Approximately \$30 million per year initially, but rising over time as additional renewable energy credits are purchased by government. Exact values will depend on evolution of power prices and cost decreases in renewable energy technology.
- Approximately \$125 million/year plus inflation at full deployment for energy efficiency and energy resilient communities, based on comparable expenditures per capita for similar programming in other jurisdictions.
- Significant incremental investments in municipal low-carbon initiatives such as public transit, active mobility, and district energy subject to further evaluation of required incremental expenditures relative to existing programs.
- Significant incremental investments in new technology research, development and deployment subject to completed evaluation of existing government expenditures.

Protecting vulnerable Albertans

Low- and middle-income consumers spend a greater share of their income on energy and so carbon pricing, if imposed without protections for low-income consumers, will be regressive. The carbon price included in basic energy services will represent a greater portion of household expenditures for low-income households than for higher income households.

Based on 2013 data from the Statistics Canada Survey of Household Expenditures (the most recent data available), Alberta households in the bottom 20% of income spent almost 8% of their annual expenditures on electricity, heating fuel and transportation fuel. The top 20% of households by income saw the same expenditures account for just over 4% of their total. However, higher income households spent more than 2.5 times as much on these goods in total compared to the bottom 20% and almost 1.5 times as much as the average-income Alberta household. This discrepancy in the exposure to potential price changes across income groups is a frequent criticism of carbon policy.

Relevant Policy – Revenue Recycling

Under the historical SGER regulatory structure, annual compliance payments averaged \$77M/year over the 2007-2014 period.

Historically, these funds have been invested in - or 'recycled to' - the Climate Change and Emissions Management Corporation (CCEMC). This corporation funds initiatives that aim to reduce greenhouse gas emissions or improve Alberta's ability to adapt to climate change.

“Our recommendation is a carbon tax, applied to all emissions in the province and with a revenue recycling guarantee to minimize any negative impacts on households, firms and the province’s economy as a whole”.

- Sarah Dobson and Jennifer Winter, University of Calgary, submission to the Panel

We do expect consumer prices to increase as a result of our proposed policies. At the proposed price of \$30/tonne by 2018, Albertan consumers will face an additional total cost of 7 cents per litre for gasoline, and \$1.68/ GJ for natural gas, comparable to prices faced today by consumers in B.C., along with small changes in the price of electricity, for a total annual cost to an average household of approximately \$500 in 2018 rising to \$900 per year in 2030, assuming Alberta’s carbon price increases at 2% above inflation.²⁴ With these changes implemented, gasoline and diesel prices will likely still be below 2014 levels in 2018, and electricity and natural gas prices will feel the equivalent of a return to last year’s prices from this year’s. Despite being relatively small, these costs will, as discussed above, have the greatest impact on the disposable income of lower- and middle-income Alberta residents. Energy efficiency incentives and financing can reduce consumer energy bills, and programs can be tailored for the distinct needs of low-income households. However, these programs will not provide a sufficient counteraction to the anticipated price increases which will occur as a result of these policies.

For this reason, we have recommended that government provide an annual consumer rebate to Alberta households to offset the impact of carbon policy on their budgets and provide similar support for adversely-affected small- and medium-sized businesses. The transfer could be implemented through a number of mechanisms including tax credits, quarterly cheques and/or rebates on monthly utility bills. If the transfers reflect the average impact of the policies, more than 50% of Albertans will be better than off they would have been otherwise. This is possible because the distribution of energy consumption skews toward higher incomes. We recommend that, in advance of determining the specific amount for the initial transfer and on an ongoing basis, that government update, where possible, the estimates of average costs to ensure they reflect the most up-to-date information available. Higher carbon prices would require more revenue devoted to this program, and vice versa.

The transition needs of the workers and communities whose jobs are lost, both due to accelerating the phase-out of coal-fired electricity and due to other abrupt and unforeseen transitions, should be supported through the carbon revenue envelope. We have not calculated a specific amount for this portfolio, although given the aggressive protection for trade-exposed industries, we expect employment impacts overall to be limited.

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Contribution to the broader economy

Commitments to fund specific policy initiatives proposed by the panel account for approximately 20% of the carbon revenue in 2018, increasing slightly over time as the call on revenues from the renewable energy program rise. We also expect that a further, significant share will be devoted to technology

²⁴ These figures were consistent across values provided to the Panel from various sources including Alberta Environment and Parks and a submission from the University of Calgary’s Dobson and Winter. Using an NEB emission factor of 0.056 t CO₂e /GJ, a \$30/t price equates to \$1.68 t/GJ. Also based on the National Inventory Report, the compound emission factor for Alberta natural gas is 1939.355 t CO₂e/m³, which with a lower heating value (LHV) of 34.57 GJ / E3M3 from the same reference and \$30/t CO₂e equates to \$ 1.68 / GJ.

research, development and deployment and to green infrastructure, but a substantial share of the carbon pricing revenues may remain unallocated based on the implementation of our recommendations.

Any remaining balance should be directed to decreasing the net economic impacts of the carbon price on the economy as a whole. This could be done by allocating the revenue to across the board tax reductions, or by allocating it to general revenue in lieu of other tax increases.

Here, the economics literature is clear that collecting revenues through carbon charges is less distortionary than other taxes in the system, but the overall use of incremental revenue is beyond the scope of the panel. However, it's important that it be recognized that new compliance costs will lead to loss of some government revenue from income taxes and royalties (because compliance costs are deductible business expenses for tax and oil sands royalty purposes), and so this should be reflected in any estimates of incremental impacts to general revenue. We have estimated our incremental impacts accounting for this offset to the extent possible.

Impacts On, and Opportunities for, Individuals and Businesses

As discussed above, the broadening of the carbon price is the key measure recommended by our panel and the one which will have the most direct impact on Albertans. Overall, we expect impacts, without any changes in behavior, of approximately \$40 per month on an average-income Alberta household, increasing over time to \$80 per month by 2030. We recommend that these impacts to be offset by a consumer rebate. With such a rebated in place, the net impact to roughly 60% of the households in Alberta will be positive. Higher-income households, which tend to use more energy, or lower income households with higher relative energy footprints will face a net loss.

The impacts on businesses are more complex to assess. For households, it is generally the case that energy use rises with the size and income or wealth of the household. A household with more people will, all else being equal, use more energy. Well-off people tend to own larger houses, make more use of personal transportation than public transportation, and tend to drive larger vehicles. For businesses, this relationship is not as clear: larger or more profitable businesses do not necessarily use more energy than smaller or less profitable businesses. Our proposed policies will have impacts on businesses which depend on their energy intensity, not their size of profitability, and some will be impacted positively through new demands for their products and services while others will see cost increases.

We have proposed one important mechanism in our architecture which defrays many of these concerns – an output-based allocation for electricity producers which will mitigate electricity pool price impacts while imposing an effective price on carbon on dispatch decisions. If a carbon price were imposed on every tonne of emissions from electricity generators, much higher pool price impacts would be observed, and this would affect businesses in a more direct manner.

Businesses will be affected by the increase in natural gas and transportation fuel costs. Businesses which are substantially emissions-intensive, such as oil and gas producers and processors, could be eligible for an opt-in to the large final emitters treatment to defray some of these costs, but a challenge remains for other businesses. As a panel, we have no clear solution to this – in part it is a natural consequence of internalizing the external cost of carbon emissions. We encourage the government to examine as part of its evaluation of priorities mechanisms, which can reduce impacts on businesses while not providing an implicit emissions recognition (which would counteract the impacts of the carbon price). Other jurisdictions, including British Columbia, have used fiscal policy tools such as reduced tax rates to counteract these impacts, increasing net profitability of businesses while maintaining the incentive to reduce emissions coming from the carbon price.

Impacts on Large Emitters

Large emitters - including oil sands, electricity, gas processing and other industrial facilities - comprise half of Alberta's emissions. If Alberta is to achieve significant emissions reductions, policies applied to large final emitters (LFEs) will be an important part of an effective climate change strategy.

A defining characteristic of many of Alberta's large final emitters is trade-exposure. If aggressive carbon policy in Alberta is not accompanied by similar actions in other jurisdictions with which Alberta competes in global markets, it is not likely to result in real emissions reductions. Instead, it will result in emissions leakage to those other jurisdictions – a loss of economic activity without meaningful impact on global emissions. We have proposed output-based allocations to mitigate these effects, but there will remain some facilities which will be disadvantaged if they produce much higher emissions-intensity output than their provincial competitors.

Our proposed carbon pricing architecture will create incentives for ongoing and design phase improvements, without enabling emissions leakage to other jurisdictions. However, a price on emissions will still imply that less advanced, older, or more emissions-intensive processes will be disadvantaged, as will operations in challenging conditions or without access to fuel-switching alternatives.

In general terms, the net impacts on industries in general and facilities in particular will depend on:

1. The choice of the standard by which output-based allocations are determined. For example, a top quartile provincial performance benchmark will imply that 75% of emitting facilities in the province will face a net cost if they do not change their processes;
2. The potential for emissions intensity improvements. A facility which has substantial opportunity to improve performance at a cost of less than the carbon price may be able to improve profitability overall while reducing emissions through the sale of credits, while facilities with limited potential for improved performance may face an on-going new cost of operation;
3. The ability to pass costs through to consumers and/or the relative position of the operation in terms of global competition. In some cases, our facilities will face higher costs but are currently relatively low-cost sources of global production in traded commodities, while for others the opposite is true. For those already-marginal facilities, increases in costs could have material impacts on the viability of operations.

In sections below on oil and gas and electricity, we discuss specific sector-level outcomes.

Overall, we have proposed a policy package which allows government to mitigate impacts of trade exposure on Alberta facilities, but does not protect facilities with high relative emissions-intensity as generously as would have been the case under the status quo. Our policy proposal also mitigates impacts of electricity costs on businesses including large emitters. However, our policy does not guarantee that all business models will remain as viable as would have been the case under the status quo.

Interactions with Other Proposed Policies

For individuals and other small emitters, the most important interaction is between the carbon price and the deployment of additional funding and information-provision programs for energy efficiency, as well as the value of additional green infrastructure. As carbon costs increase, consumers and firms will require and demand information on the energy consumption of the appliances they purchase, the cars they drive, and the buildings in which they live and work. There may also be a role for government assistance to solve liquidity problems and landlord/tenant split incentives, which can prevent optimal investments in energy-saving building improvements. More access to green infrastructure, including public transit and enhanced opportunities for active transportation including cycling and walking infrastructure, will allow consumers to both adapt to and mitigate the impact of the carbon price on their standard of living.

There is also an important role for enhanced energy efficiency programming to help consumers and firms adapt to carbon pricing. To this end, the panel has recommended that significant portions of the revenue collected from the carbon price be deployed in these areas, driving energy efficiency in the broader economy and enhancing green infrastructure. We also recommend strongly that the government roll out an aggressive regulatory agenda including the adoption of up-to-date energy codes for buildings and the labeling of building energy use so that residential buyers and renters and commercial lease holders can make more informed decisions with respect to energy. These changes, combined with the carbon price, will create an important market for energy efficient technology in the residential and transportation sectors – an important benefit of the policies.

Carbon pricing in the large final emitters sector will enhance and complement other policies recommended in this report. Carbon pricing makes coal power generation less competitive, makes renewable energy more competitive, and provides incentives for the reduction of methane and other greenhouse gas emissions from vents and flares in the oil and gas sector.

The increased price on carbon also provides a stronger incentive for energy efficiency, reducing the burden on government incentive programs to deploy more efficient solutions in industrial settings. Finally, the increased price and long-term stability of the carbon pricing signal allows for investments in offset-generating activities, including those related to oil and gas methane reductions, to have a clear market in which to sell generated credits.

The programs supported by revenue from carbon pricing drive roughly one quarter of the 2030 emission reductions expected from the Panel's proposals. These policies play a critical role in supporting an accelerated deployment of low-carbon technologies at the household, community and industrial scale (for energy efficiency, renewable energy, and green infrastructure) and the technological innovation required to shift to lower carbon energy production to maximize the value of our resource endowments in a carbon-constrained world.

Finally, as discussed in the revenue section, carbon compliance costs and increased fuel costs will impact corporate taxes and royalties by reducing the base on which these revenues are collected. This will be partially offset by increased income for business which sell products or services for which these policies will increase demand, for sellers of offsets, for renewable power generators, and for firms can generate emissions credits through top-quartile or better performance will see increased revenues.

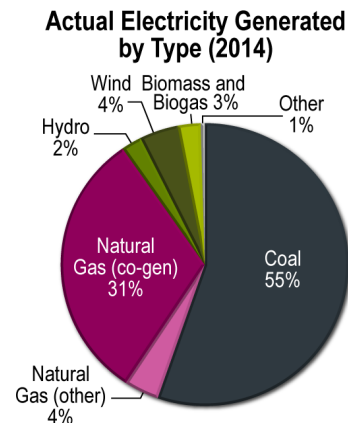
CARBON PRICING AND COMPLEMENTARY POLICIES: ELECTRICITY

Alberta's electricity sector directly contributes 17% of Alberta greenhouse gas emissions, with emissions from electricity generation on industrial sites adding a further 2%. While electricity is a significant contributor to emissions in our province, the combined effects of technological improvement in renewables, inexpensive natural gas and federal coal power regulations is such that the level and share of electricity's contribution to Alberta's emissions is expected to drop between now and 2030.

Alberta generates much of its electricity from coal. We currently have the highest share of coal-fired electricity generation of any province. Though an inexpensive source of power, coal-fired electricity not only contributes to greenhouse gas emissions, it affects air quality and directly impacts the health of Albertans.

An emissions-intensive electricity sector also impedes otherwise-attractive emission reductions elsewhere in the economy, such as electric vehicles, ground source heat pumps and microwave oil sands extraction.

Our panel recommends an integrated approach, combining carbon pricing with an active phase out of coal-fired electricity, while ramping up the supply of renewable electricity, through an auction-based clean power call to provide additional financial support if required. This approach, which leverages Alberta's significant natural gas resources to maintain low electricity prices while reducing emissions, is important in aligning Alberta's energy supply with global requirements to meet climate change goals.



Policy Recommendations

- 1. A modified carbon pricing approach, similar to that in place in Quebec and California, be applied to all large emitters in Alberta, including electricity.**
 - Carbon pricing will include output-based (rather than facility-history-based) allocations of emissions permits, so that improved efficiency (through activities like combined heat and power or renewable generation) will be appropriately rewarded in all contexts.
- 2. Pursue a regulated, accelerated phase out of coal.**
- 3. Increase the capacity of renewable generation in Alberta by linking this capacity expansion to the phase out of coal.**
 - Provide, via a clean power call, a payment for renewable energy attributes which will achieve desired capacity expansion at the lowest unit cost to Albertans.
- 4. Pursue, where appropriate, partnerships with the federal government.**

Why This Approach?

Carbon Pricing with Output-based Allocations

The Panel recommends a carbon pricing system with output-based allocations based on a *good-as-best-gas* standard. Our approach of output-based allocations provided to electricity generators is similar to the allocation of emission credits in the California electricity market; although in the case of California the allocation of emissions credits is provided to retailers or distributors.

Applying a price in this way will ensure that there is a clear advantage for lower-emissions generation, while not creating a significant change in the pool price. Because it has less impact on the marginal cost of clean, gas-fired generation, we expect our proposed system to have a lower impact on the pool price of power than would a continued implementation of the Specified Gas Emitters Regulation, at least most hours of the day. We also expect that our proposed system will impact dispatch decisions (which plants are run at which times) in much the same way that a carbon tax would do, but with fewer carbon costs being passed through to electricity consumers.

The carbon price and output-based allocations will also provide a reward for low-emissions and zero-emissions generation, provided these sources are not accessing credits in other means. We do not recommend facilities receive allocations if they are already receiving offset credits or renewable energy credits under separate arrangements.

Implementation of a Regulated Coal Phase Out

The Panel recommends that government pursue a predictable phase out of coal-fired power, should it determine that this will not occur solely as a result of the combined effects of carbon pricing, renewables policy and air quality regulations and federal end-of-life performance standards for coal plants.

This will accomplish two objectives. First, efforts to phase out coal are consistent with the broad evidence that, globally, coal-fired electricity generation is not compatible with action on climate change. Second, Alberta's natural gas resources provide a low-cost, viable alternative which complements renewable sources. Finally, combustion of coal for power generation results in significant human health and environmental quality impacts outside the scope of this review, but which would be mitigated by an accelerated phase out.

We recommend that the government pursue a flexible regulatory shutdown, implemented in collaboration with the federal government and in consultation with the Alberta Electrical System Operator (AESO). The rapid retirement of coal in too short a period of time could lead to significant system reliability risks, but with appropriate lead time and a clear capacity retirement schedule, the market will see the opportunity for the construction of alternative generation sources which will ensure reliable electricity supply for Albertans.

Importance of an integrated solution

The Panel's recommendation is that Alberta should pursue an integrated approach to the electricity system and not look at any one of these proposed changes in a vacuum.

The carbon price provides the core of our approach - it discourages the dispatch of emissions-intensive generation, and thus renewables and gas more attractive than they would be without carbon pricing, while changing the dispatch order of higher carbon sources like coal.

Significant expansion of renewables will still likely come at an added cost, but this cost will be much smaller with carbon pricing, as well as when linked to a parallel phase-out of coal generation, as the phase-out creates a larger potential market for renewable generation.

Similarly, the combination of carbon pricing, renewables policies, and regulations mandating air quality controls and shutdown dates for coal plants make it likely that coal power will be largely phased out before 2030 without significant government intervention, leaving a smaller gap to be closed by any regulatory solution.

For new generation to be built in Alberta's market, government must be willing to allow prices to provide the signal that new generation, or the retrofit of existing coal assets to gas-fired generation, will be profitable. As discussed below, our recommendations are designed to be compatible with the electricity market, and part of that market is the requirement that prices be allowed to rise when necessary to indicate the value of new generation.

We recognize that the implied carbon cost of a regulated coal power shutdown will be higher than the costs imposed on other sectors. However, as we discuss below, we believe that the cumulative benefits of such a strategy outweigh the incremental costs. We also recognize, and discuss below, potential government responsibilities both to ensure a just transition for affected workers and to ensure that investor confidence in Alberta is maintained through appropriate compensation to investors in coal generating assets which will be affected.

Acceleration of Renewable Generation

Alberta has some of the best solar resources in Canada and over one-third of Alberta's land base has wind energy sources suitable for wind energy production.

Renewable energy has rapidly become cost-effective, with the International Energy Agency's most recent World Energy Outlook predicting that renewables will overtake coal as the world's largest source of electricity in the 2030s. In spite of this worldwide growth, renewables like wind and solar are challenged in Alberta's market structure, in part because their combined generation tends to lower the market prices during periods when they are providing power.

"The biggest story is in the case of renewables. It is no longer a niche. Renewable energy has become a mainstream fuel, as of now."

- Fatih Birol, Executive Director IEA

To ensure renewables grow as coal is phased out, the Panel also recommends the adoption of a clean power call mechanism to enable increased renewable generation. A clean power call is an open, competitive request for proposals for government support. Through this mechanism, government would commit to an annual schedule of financing availability (e.g. for 350MW of new capacity to be available by 2018) and request proposals from developers for the level of support required, with support provided through the government purchase of the renewable energy attributes of the power. In effect, the government would purchase *renewable energy credits*, or RECs, from the projects on long term contracts.

The Panel's integrated electricity policy package, which will phase out coal-fired power in Alberta by 2030 and replace at least 50-75% of retired coal generation with renewable power, should increase the overall

Relevant Policy - Coal

Combined, federal coal regulations and Alberta's air quality regulations are expected to lead to shut down of all but 6 coal-fired generating units by 2030, leaving 2500 MW remaining in the market out of current capacity of 6289 MW.

- Under the federal coal-fired electricity generating emission regulations, all coal-fired generating units in Alberta are required to meet a stringent emission performance standard at their end of life.
- Alberta standards and regulations require coal generators to meet stringent NO_x and SO₂ emission intensity reduction requirements at a mandated 'end of design life' for each unit (the later of 40 years-of-life or end of its power purchase agreement).
- Generating units must comply with Emissions Management Framework requirements at end of design life by physically complying – through emissions reductions technology – or acquiring emissions credits. Physical compliance is mandatory at 50 years under CASA, or the unit must shut down.

share of renewables to approximately 30% of generation, while retaining Alberta's competitive electricity market structure.

An annual procurement process would take place in which firms would *bid* for these contracts, with the government awarding contracts to those projects requiring the lowest levels of incremental support. The panel recommends, as per the methodology employed in B.C., government set evaluation criteria of bids with respect to factors they consider valuable. In particular, we recommend government introduce a premium in the adjudication of bids for projects that partner with rural, First Nations and Métis communities. These types of partnerships have proven, in Ontario among other examples, to contribute positively to community acceptance of renewable energy projects.

The mechanism would leverage the power of the market to ensure government is providing the minimum level of support required to deploy the desired quantity of renewable energy, while allowing the electricity market price to signal the value of the power produced. Facilities built with this support would still sell power at market prices into the Alberta wholesale electricity market. Projects supported through these mechanisms would not be eligible for incremental revenues from the sale of offsets or renewable energy credits in other jurisdictions, nor would they receive output-based allocations in return for their electricity.²⁵ This would also allow the market to continue to provide a signal of the value of the power provided (solar power would be expected to receive higher power prices as it generates energy during higher-price periods of the day, while wind turbines built in regions with significant wind capacity would expect to receive a significant discount compared to average pool prices).

The Panel recommends a pre-qualification procedure, similar to that now employed in other provinces' competitive renewable procurement processes, be used to ensure bidders are in a position to deliver their projects and are able to provide security to the government in the event they fail to deliver the project on time.

"In Alberta, the levelized cost of solar electricity is fast approaching that of other options. As solar generates during the day when electricity demand is highest and as it can be sited proximal to loads thus avoiding transmission and distribution costs, its value is greater than can be illustrated by a simple cost comparison."

- Canadian Wind Energy & Canadian Solar Industry Association's joint submission to the Panel

The Panel also recommends government impose a collar on the level of support to be offered. Submissions to our panel frequently argued that limited support was required, as technologies were approaching grid parity. It is our expectation that limited, firm revenue sources will be required to induce significant renewable penetration in the province. A price collar on support, at \$35/MWh or below (roughly equivalent to a \$90/tonne of CO₂ premium over gas generation under our system), would limit the government's exposure to high costs of support and would send a signal that renewable energy must be close to competitive in order to merit incremental support.

Finally, the Panel advises that it is crucial for the government to link the quantity of renewable energy capacity eligible to support the phase-out of coal-fired generation. Specifically, government should commit to between 50 and 75% of retired coal-fired generation being replaced with government-backed renewables.

Many proponents indicated to the Panel that renewable power producers, in particular small producers, would be unwilling to share in merchant market risk to build a power plant, or that the rates of return on

²⁵ Alternatively, support could be incremental to output-based allocations provided under the carbon pricing regime, with substantially the same results. The differences would lie in the fact that future revenues from output-based allocations would be riskier than similar revenues from government contracts for renewable attributes.

capital required to take such risks would be much higher than if the plants were backed with a government contract for power or a feed-in-tariff. We saw several disadvantages to this reasoning.

First, this is not exclusive to renewable power producers – small businesses in all areas, including our other resource industries, face higher costs of capital than large producers. Project financing of energy projects will always be difficult if the project is exposed to market prices rather than a government-backed fixed-price contract.

Second, recent wind developments in Alberta have proceeded without long-term contracts for the entire revenue stream, which provides evidence against this view. The two newest wind farms in Alberta receive revenue from the separate sale of renewable energy credits on long-term contracts and the sale of electricity in the Alberta market. They were financed under pricing arrangements very similar to our proposed architecture.

Finally, and perhaps most importantly, a contract for power such as that provided by a feed-in tariff, as was used in Ontario, would remove the incentives provided by the merchant market to build renewable facilities which generate the highest value power, not simply the most power. A government procurement process, based on contracts for power, would likely trigger a land rush in the best wind resources in the province. This could lead to significant value discounts to power produced from those sites, and leaving other viable wind resources, where higher value power could be generated, un-tapped. While, superficially, these contracts might look like better value, they would likely involve the government paying a lower price for a lower value product. It is our belief that the current market provides an important signal for the value of incremental power, and preserving that signal, while providing support for renewables, was crucial in informing our advice.

We do acknowledge this level of support for renewables represents a higher effective carbon price than that placed on other sectors of the economy, and so it does not meet the usual economic test of equivalent marginal costs of carbon across all sectors of the economy. With respect to our recommendations for renewables procurement, we have endeavoured to provide a mechanism which meets a specific government goal at the lowest overall cost.

Compatibility with Alberta's Electricity Market Structure

Alberta's competitive electricity market is unique in Canada. Wholesale prices for electricity are set based on hourly supply and demand in a competitive market. Independent electricity generators *offer* their power into the system at a particular price for each hour, and the price which each firm receives is determined by the *offer price* of the last generating unit dispatched to supply system load in that hour. Consumers will face different prices depending on their annual consumption, whether they are households or businesses, and depending on whether they have signed a contract with a competitive retailer.²⁶ This market structure is very important for understanding the impacts of the policy recommendations we have made.

The recommendations we propose are designed to work within the existing electricity market structure. They are also designed with system reliability in mind. Electricity cannot be stored in meaningful quantities in Alberta today, although many of the submissions we received highlighted technological progress in this area. In addition, Alberta has limited interties to adjacent markets to import or export power in the event of an imbalance. As such, rapid changes, even if relatively small, can have marked impacts on electricity prices and large changes can affect system reliability.

²⁶ According to the Alberta Market Surveillance Administrator, in 2014 43% of residential load, 26% of farm load, 57% of small commercial load, and 91% of large commercial load is procured under arrangements other than the default, regulated rate option pricing.

As a panel, we have relied extensively on analysis provided by the Alberta Electric System Operator to ensure that acting on our advice would not compromise the reliability of electricity supply in the province. While we do propose extensive changes in terms of the pace of both the retirement of coal generation and the construction of new gas and renewable generation over the next 15 years, these changes are not out of scope with comparable outcomes of market changes in many US markets over the past decade.

Leveraging the Advantage of Inexpensive Natural Gas

The availability of inexpensive natural gas for power generation creates the opportunity for significant emissions reductions in the electricity sector, with limited adverse impacts. Combined heat and power systems in industrial applications, including oil sands cogeneration, provide a substantial share of power generation in the province. This is crucial for overall grid stability. Natural gas generation, both from efficient combined-cycle plants like the new Sheppard Energy Centre or the proposed Genessee 4 and 5 units, and new modern peaking plants with rapid start-up times, provide a low-cost alternative to coal generation and an essential complement to wind and other renewables.

Several submissions to the Panel highlighted decisions taken in other jurisdictions with respect to renewable and other alternative supplies. In most, if not all, of these jurisdictions, a lack of access to inexpensive natural gas resulted in higher overall costs of emissions reductions than what is possible in Alberta.

“As a cleaner-burning power source that is both widely available and economic, there exists great potential for natural gas to play an increasing role in providing baseload power while reducing emissions and enabling renewable energy growth across the province.”

- Canadian Association of Petroleum Producers submission to the Panel

If Alberta faced different market conditions with respect to natural gas, our recommendations would be different and the costs of emissions reductions would be higher. With reliable, domestic natural gas supply, our recommendations on emissions policy can be more aggressive. In implementing these policies, Alberta will be leveraging natural gas just as the International Energy Agency makes clear the world will have to do to meet 2°C goals.

Consistent Treatment of Cogeneration and Other Efficiency Improvements

An output-based allocation for electricity (along with similar treatments in other industries such as bitumen production), implies that combined heat and power, or cogeneration, would be de-facto advantaged relative to independent production of both inputs. However, it would not be treated differently from other efficiency improvements which lower emissions output. Specifics of this are discussed in the oil and gas section as most potential new cogeneration is in the oil sands.

Collaboration with the Federal Government

The recently-elected government in Ottawa has announced programs which may provide an avenue for collaboration with Alberta, including a green trust and infrastructure funding. The federal government is also an important partner in regulations on coal-fired power and air pollution generally.

Potential Outcomes

The integrated approach to electricity sector emissions will have financial, reputational and emissions impacts for Alberta.

From a financial perspective, there are three important, direct impacts of our policy proposals:

- impacts on the electricity price;
- impacts on existing generators and potential new investment in the future; and
- government liabilities due to policy changes.

Emissions reductions will depend, in the long term, on the effectiveness of each of the policy options and the final implementation decisions in terms of: the speed of the coal phase out; the level of the carbon price; and the rate at which renewable capacity is added to the system.

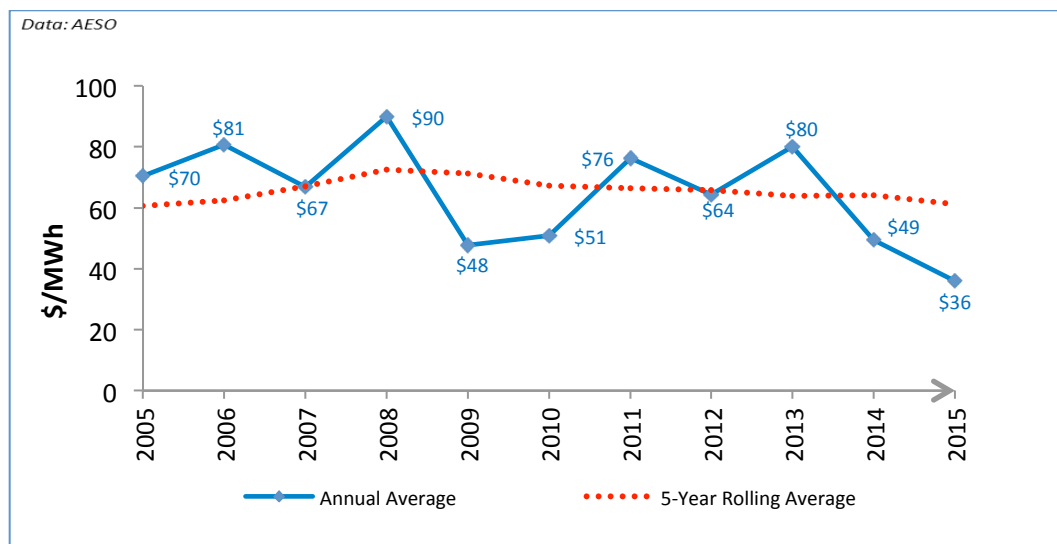
Finally, the reputational impacts are challenging to assess, but are important in understanding the rationale for the Panel's advice.

Electricity Price Impacts

Albertans' electricity bills will be affected by the policies we propose, insofar as they change either the wholesale price of electricity or the cost of transmissions and delivery in the system.

The net pool price impact of these policy changes is challenging to estimate without making very specific assumptions with respect to future technology, gas prices and the response to energy efficiency programming, among other factors. Even with these assumptions, the behaviour of market players, in terms of decisions to build generation, are not easy to predict.

We do know that we are beginning from a low energy price. Electricity wholesale prices are at their lowest levels in years, due to low natural gas prices and an overbuild of generating capacity relative to growth in demand.



Alberta Electricity Wholesale Prices (Not Including Transmission and Distribution)

Consumers in the electricity market have different exposures to changes in price. In the case of some large entities, they may be directly connected to the grid and participate in the wholesale market without an intermediary. Residential consumers, farms, or small businesses using less than 250,000 kWh per year are connected, by default, with pricing determined by the Regulated Rate Option (RRO) rates which

reflect the blended cost of electricity purchased both on the spot market and through hedges. These consumers in Alberta also have a choice of how to purchase their electricity, as they may sign a contract at a fixed or floating price with a retailer.

For our purposes, this blend of potential contract structures for electricity implies that different customers will be affected in different ways by changes in the electricity price, with some more exposed to volatility than others. Over the longer term, prices for all consumers will reflect changes in average pool prices, but some will feel the impacts of these changes more quickly than others.

Conceptually, the expected impacts of our proposed policies on the pool price are relatively straightforward: all else equal, introducing a carbon price - where one previously did not exist - should increase prices, as should removing coal capacity prematurely. Conversely, the addition of renewable generation, the output-based allocations and the construction of new gas generation to fill the void left by coal - and to smooth out the variability of renewables - will lower wholesale prices, or at least limit increases. Relative to previous forecasts, oil sands cogeneration is unlikely to grow as fast as predicted, given reduced sector-wide growth, but slower oil sands growth also contributes to slowed population growth and lower overall load growth than would have otherwise been predicted.

We know electricity bills are expected to increase, even if pool prices do not, as a result of investments made in reinforcing the transmission and distribution systems which are now appearing on consumer's bills. For example, in their last Long-term Transmission Plan, the Alberta Electricity Systems Operator forecast that transmission costs will increase for a typical Alberta home from \$19 per month for transmission today to \$33 per month, in 10 years, proportional to their forecast increase in the overall residential bill. The impacts of transmission cost increases are likely to be larger for large industrial consumers for whom the AESO expects to see increase costs from about \$22 per MWh for transmission to about \$39 per MWh over 10 years.²⁷ There will potentially be some incremental impact on transmission charges resulting from our proposed changes, although much of the transmission capacity to accommodate enhanced renewable supply has already been constructed or planned for southern Alberta and is included in the above cost information. Depending on the specifics of the coal retirement schedule, as well as the geographic and technological dispersion of renewable and other new energy supply, an incremental transmission build and associated costs may impact ratepayers as a result of these policies.

In short, there are a lot of moving parts, so estimates of future pool prices and consumer bill impacts under this proposed policy will likely vary significantly depending on the assumptions underlying the modeling. We have relied on advice and quantitative analysis provided by the Alberta Electricity System Operator and Alberta Energy, as well as on submissions from the major electricity generators in the province, industry associations and potential new entrants. The input we received supports the general conclusions with respect to prices outlined above, and does not predict significant, incremental transmission requirements over-and-above those already planned. We expect negligible changes to electricity prices compared to business as usual for the next several years, with larger potential increases on the order 20% by 2030 predicted under worst case scenario assumptions as coal is phased out. The impact on prices depends mostly on how the market responds with new, gas generation. Given that our carbon pricing program reduces the cost of electricity supplied through new gas generation relative to the status quo, the likelihood of significant wholesale electricity price increases in the longer term is limited.

²⁷ AESO Long Term Transmission Rate Impacts, 2014 (a new study on rate impacts will be released in Q1 2016). http://www.aeso.ca/downloads/Long-term_Transmission_Rate_Impacts.pdf

Combined Impacts on Existing Facilities and New Investments

Potential impacts on new and existing facilities are divided into four categories:

- existing coal generation,
- existing and new gas generation,
- existing and new renewable energy assets, and
- new and existing cogeneration facilities.

Coal plants

Coal generating units will face the most adverse impacts from our policy recommendations.

A carbon price with output-based allocations provided based on a *good-as-best-gas* standard will erode the operating margins of coal plants, and will alter their dispatch decisions likely causing them to produce less through the year. In addition, our recommendation that government actively pursue an accelerated coal phase out, with a commitment to remove most or all coal power from Alberta's system by 2030, may imply that lifespans of some coal-fired plants will be truncated.

A significant source of uncertainty during our work was the cumulative effect of carbon pricing, air quality regulations and the existing end-of-life conditions imposed by federal coal regulations on the viability of coal assets in the province. The impact of air quality regulations, both the existing Emissions Management Framework requirements and any incremental requirements imposed as a result of deteriorating air quality in certain regions of the province, remains in dispute. Many submissions from existing generators evaluated impacts of carbon pricing policies under the assumption air quality regulations would be weakened, altered, or removed in tandem with new carbon regulations, which is not our recommendation. However, without full information on their combined impacts, it is impossible for us to accurately assess the incremental impact of our proposed policy suite.

Gas plants

Gas plants become a more important part of Alberta's electricity market under our proposed policies.

Overall, we expect the impact of our policy architecture on the returns earned by new and existing gas generators to be small, but we expect there to be more gas generation in the market over time. The carbon price, applied relative to a *good-as-best-gas* standard, does not materially increase the costs of gas generation – in fact, it has less impact on the cost of gas generation than a continuation of the status quo. The renewable policies proposed are not expected to materially change the duration curve of prices, and thus have limited impact on the viability of a new or existing gas generator. Insofar as it does have an effect, natural gas generators with heat rates higher than *best gas* will face higher marginal costs and will be disadvantaged relative to more efficient generation. Coal retirements create an added market for gas power, but the competitive nature of the market implies returns to new and existing generation will be limited by potential new entry.

Cogeneration

Cogeneration was a difficult topic for the Panel. Under the current framework, cogeneration is provided credits which approximate the emissions saved through enhanced efficiency, by comparing actual emissions from a facility with a calculated hypothetical level of emissions which would have occurred had heat and power been generated separately using natural gas. Under our proposed architecture, this treatment is no longer required, since the combined production of two products (for example, in the case of oil sands, bitumen and electricity), - would, when combined with the output-based allocation for each

product, lead to an emissions allocation for the facility as a whole. If the application of cogeneration does, indeed lead to lower total emissions, then the facility would be rewarded with a lower total emissions credit shortfall (or perhaps, surplus credits) as a result. This equalizes the treatment of cogeneration with that of combined-cycle gas. In the case of combined cycle gas, what would otherwise be waste heat is used in a secondary process to generate more electricity. In cogeneration, that heat is used as steam or process heat. In both cases, the advanced efficiency would lead to lower total emissions per unit output, and both would be rewarded.

The main difficulty with assessing the role of cogeneration is related to the potential growth in oil sands production. Many submissions which were bullish on the future of cogeneration were similarly bearish on the future of oil sands growth. One does not happen without the other, so in this sense the growth of cogeneration is more a function of the price of oil than of electricity prices or greenhouse gas policy.

Renewable power

Renewables will be challenged in Alberta's market in part because renewables tend to lower their own market prices, and the low price gas prices will keep market prices from rising significantly.

Submissions to the Panel indicated new wind generation requires an average revenue between \$60 and \$80/MWh. However, wind normally sells for a discount in the Alberta power market – in the two years ended October 2014, the average price captured by wind power was \$44.53/MWh compared to \$68.23/MWh across the system – although plants located in areas with less wind generation tend to earn higher prices. With these 30-40% discounts, wind power cannot compete with new gas power plants or with existing gas power. Solar power, despite the fact that it generally correlates better with periods of higher-priced electricity than does wind, would still likely require prices well-above \$100/MWh to guarantee construction of new projects. As a result, any substantial new renewable generation in Alberta will likely require incremental financial support.

“Wind energy tends to capture revenues below pool values, because wind resources supply into the market in a correlated way, and so even paying average pool prices for wind power would result in a significant loss over time.”

- Capital Power submission to the Panel

Our proposed financial support for renewables involves the procurement of technology-neutral renewable energy credits from renewable power projects, by the government, using revenues from the carbon pricing regime. This means of support complements Alberta's electricity market, since it would allow the electricity price to signal a commercial value of the power while providing the incremental revenue required justifying development. We expect the auction format suggested for this support would defray many concerns of interveners with respect to the large out-of-market payments for renewables – a competitive auction will ensure that the minimum payment required to deploy the desired level of capacity is provided. As such, new renewable energy producers should expect higher returns than they would enjoy with only the market price as revenue, but not excess returns above their opportunity costs of capital. Renewable producers face no obligation to participate in the government procurement process if they are able to secure higher value for their renewable energy attributes through sales to other jurisdictions. In other words, the types of transactions which have led to the construction of the two most recent wind farms built in Alberta would still be available and would not be materially affected by the proposed policy architecture. Furthermore, any additional renewable energy project could enter the market at any time if pool prices or bilateral contracts on their own made it commercially attractive.

Emissions Reductions

Emissions reductions resulting from these policies will depend on the specific implementation of the policy architecture, as well as on the impact of the implementation of air emissions policies both provincially and federally. However, our best estimate for the impact of the proposed policies is cumulative emissions reductions of approximately 67 Mt between now and 2030, with emissions in 2030 at least 14 Mt below what is forecast under the status quo.

Positive and Negative Community Impacts

The policies we propose will see more rapid coal retirement than would otherwise occur, and more rapid construction of new generation to replace that capacity. These transitions will have positive and negative impacts on workers and communities. In areas where coal generation is the key community industry, there will be a negative impact felt sooner than would otherwise be the case, although it is important to note many coal-fired units in Alberta are slated to retire in the next 15 years under federal policies absent any incremental action in Alberta. We have recommended the government develop well-funded transition strategies to ensure that the effects of these transitions on communities are minimized.

The policies we propose will also lead to development in different regions of the province and transition strategies may be important here too. While economic activity and new investment is positive, a key determinant in developing our renewables policies was avoiding a concentrated land rush in certain areas, but some development pressure in areas not accustomed to it is inevitable and these should be managed as carefully as possible to maintain community buy-in. There is also an important role here for collaboration and partnership with Aboriginal communities, on whose traditional lands much of this new development will occur.

Integration with Global Climate Change Goals

The Panel's mandate on electricity generation provides an opportunity for a significant symbolic move on climate change, in addition to the pursuit of the most cost-effective emissions reductions. This is not simply a statement of the economics of the second best – an optimal conditional on a constraint – it's a statement of the reality that action on climate change in the global context involves a significant component of reputational leverage and give-and-take.

Globally, Alberta must be seen as a partner in a lower-carbon world, not an impediment to it. We can agree on the desirability of a shift to a global, lower-carbon future, and we can credibly argue that such a future does not necessarily mean less oil or less gas production from Alberta. As the world transitions to a lower carbon future, the International Energy Agency projects that deep reductions in the near term use of coal will be most important to meeting global climate change objectives, and the recommendations from the panel clearly point Alberta's climate policy in that direction.

In the longer term, in order for Alberta's hydrocarbon resources to compete for a share of a shrinking global market, our resources will have to be both lower cost and lower emissions than our competitors. There will also be an important role for the overall perception of Alberta as a global partner in driving to a lower-carbon future. We are confident the policies established in this plan create that impression. If we cannot make it work here, it will be hard to argue that others should make a coal-phase-out work under much more challenging price and terms of trade conditions.

While the implementation of better design principles in carbon pricing and an accelerated coal phase out will provide both emissions and reputational benefits for Alberta, the reverse risks are true for deployment of renewables. When compared to other leading jurisdictions, the Panel's policies would likely lead to lower penetration rates of 25-30% renewable generation by 2030. This must be understood in the context of Alberta's inherent comparative advantages and our terms of trade. In many jurisdictions, the decision to procure renewables is one which hedges the economy against volatile and expensive imports of

natural gas and other fuels. In Alberta our natural gas resource already provides the province with a very strong hedge against the impacts of higher gas prices – we benefit from them on the whole due to wealth and terms of trade impacts. This, and natural gas' ability to facilitate the integration of renewables, must be seen as an advantage for Alberta as we join the global transition to a lower-carbon future.

Government Financial Obligations

The proposed renewables policy will create a new financial obligation for the provincial government. Based on submissions to the Panel, it is our expectation that incremental renewable energy support will be required at a scale of \$25-35/MWh initially, with potential for decreases over time. The total obligations will depend on both the speed of coal retirements and the costs of renewable technology. Also, appreciation in pool prices will be offset by lower financing requirements for new renewables, and new renewable power will lower electricity prices, all else equal, which will have implications across the economy.

The coal-phase out may also create government obligations for compensation depending on the specific application of policy. A 2030 coal phase out could significantly reduce the operating lives of several facilities, including two plants which began operations in 2006 and 2011 and can operate through 2056 and 2061 respectively under the existing federal coal regulations. The government has made clear commitments not to strand investor capital, and so compensation for plant owners will be important for maintaining investor confidence if stringent, coal-specific regulations are imposed. However, analysis provided to the panel was ambiguous with respect to the combined impacts of federal end-of-life regulations, provincial and federal air quality rules, on-going low gas prices, carbon prices, and renewables policies on the expected operations of these and other coal facilities over time. Without a clear understanding of how these policy decisions impact coal retirements, it is difficult to determine what additional policies and actions are required to ensure that Alberta no longer relies on coal power after 2030.

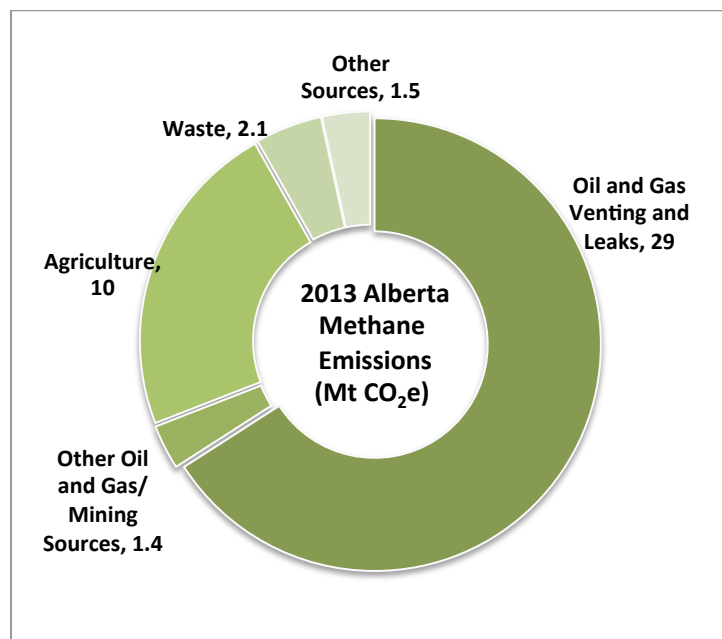
Some Alberta communities will be negatively impacted by the phase out of coal-fired electricity as discussed above, and government should be prepared to provide appropriate adjustment programs. These programs should be developed in a collaborative manner on a community-by-community basis.

CARBON PRICING AND COMPLEMENTARY POLICIES: OIL AND GAS

As with the electricity sector, the Panel is proposing an integrated policy approach to emissions from Alberta's oil and gas sector, which accounts for almost 50% of Alberta's emissions, with roughly half of this from oil sands and half from other sources of production.

The primary tool in our approach is the carbon pricing regime detailed above, which affects the oil and gas sector both through the treatment of large final emitters, which includes many of the province's production and processing facilities, as well as the end-use emissions pricing which we recommend should capture emissions from flaring in oil and natural gas production and processing in the province. Combined, this would mean that 84% of Alberta's oil and gas emissions would be subject to carbon pricing in 2020.

We are also recommending a separate, targeted approach to methane emission reductions which combines regulatory tools and a multi-stakeholder collaboration that would provide an early-compliance option enabled through our carbon pricing regime. The latter approach would allow emissions policy to reach fugitive emissions not covered by carbon pricing.



Like carbon dioxide (CO₂), methane (CH₄) is a greenhouse gas, but it is estimated that the comparative impact of methane on climate change is more than 25 times greater than the equivalent mass of CO₂ over a 100-year period.²⁸

Methane is a significant contributor to greenhouse gas emissions in Alberta, and the oil and gas sector is responsible for over 70% of those emissions today. The province has already introduced measures to control methane emissions, and emissions have decreased, but significant opportunity exists to achieve further reductions in the near term while maintaining the competitiveness of our energy industry and leveraging our proposed carbon pricing regime.

²⁸ See the US Environmental Protection Agency <http://www3.epa.gov/climatechange/ghgemissions/gases/ch4.html>

Context – Methane Emissions

The number of oil and gas facilities in Alberta is significant. There are approximately 160,000 active wells, over 20,000 oil and gas batteries (field storage and processing), 584 gas plants and over 415,000 km of pipelines regulated by the Alberta Energy Regulator.

There are over 1000 companies - both large and small - in operation in the province's oil and gas sector.

Production is highly concentrated among large firms. Approximately ½ of all conventional oil and natural gas production comes from about a dozen operators.

Approximately 19 large to medium - sized oil companies account for over 86% of all routine venting in the province, with the remainder associated with production at facilities owned by smaller companies.

Policy Recommendations

1. **Application of a carbon pricing regime to oil and gas with output-based allocations for trade-exposed production and processing sectors**
2. **New regulatory measures for management of methane emissions in design and operation of new facilities and for leak detection and repair (LDAR) in all facilities**
3. **A time-limited multi-stakeholder initiative on methane reduction and verification that would provide market-based incentives for equipment upgrades of pneumatic controllers, pneumatic pumps and other sources of vented emissions in legacy (existing) facilities**

Why this approach?

Carbon pricing provides an incentive to reduce emissions in circumstances where they can be readily measured, reported, and priced. In other cases, such as fugitive emissions, a regulatory approach may work best. Through our deliberations, we've determined that a hybrid approach of regulatory and market-based incentives will provide the best overall results from the oil and gas sector. Below, we detail the motivation and implications for the choices we've made in this integrated, sector-wide approach.

Carbon Pricing Program

The carbon pricing program is described in general terms above, but in this section, we provide some justification and recommendations for specific decisions within the oil and gas sector including the design of output-based allocations and the provision of an opt-in program.

Output-based allocations in oil and gas

As detailed in our proposed carbon pricing approach, the Panel's recommended framework would see a policy similar to that applied in Quebec and California under the Western Climate Initiative (WCI), in which all emissions face a price, but facilities are allocated some emissions credits on the basis of output to defray risks of emissions leakage and to preserve employment in Alberta rather than creating an incentive for relocation abroad. Rather than having an aggregate cap and allowing the market for emissions to determine the price as in a cap-and-trade program, the price of emissions would be set by government. Firms would also be able to purchase emissions credits from other facilities or purchase offsets as defined by the offset protocols in place in any given year, or they could pay a levy to the government, which effectively places a ceiling on emissions permit prices.

The advantages of this, relative to the current system, are that it provides incentives for innovation and deployment of cleaner technology and it does not materially alter the returns to projects currently planned – in fact, returns will improve as long as projects meet or exceed top-quartile performance and improve that performance over time.

Context – Oil Sands

As a panel, we developed the following defining principles for the application of our proposed carbon pricing model to oil sands:

1. Greenhouse gas policy for oil sands must enable and reward innovation.
2. Greenhouse gas policy must recognize the trade exposure of the oil sands sector and design must prevent emissions leakage.
3. Greenhouse gas policy for oil sands must consider the current state of the industry and the long-run implications of policy choices today on economic activity within the province.
4. Greenhouse gas policy for oil sands must reward best-in-class emissions-intensity performance, regardless of the underlying factors which contribute to that performance.
5. Complementary policies should promote innovation and new technology development and deployment in Alberta to both lower emissions and lower production costs to maintain a globally carbon competitive oil sector in Alberta.

For the oil sands sector, our panel recommends that government consider an allocation of emissions permits reflecting top quartile performance in *in situ* and mined production of bitumen, as well as establishing a parallel *good-as-best gas* standard for electricity which would apply to net sales from cogeneration facilities. The combination of these two allocation rules would determine output-based allocations of emissions credits for the majority of oil sands facilities in the province, with additional allocations required for facilities which produce other, marketable products in addition to bitumen and electricity.

Some submissions to the Panel were critical of an output-based allocation approach. In particular, Suncor argued that such an approach would penalize geology rather than reward technology.

“Sub-surface characteristics, and not technology selection, is the primary determinant in the energy intensity of the facility. Without some adjustment to recognize differences in reservoir characteristics, a product standard will create winners and losers based on factors beyond the developer’s control.”

- Suncor submission to the Panel

While it is generally true that emissions intensity reflects geological conditions, the alternative facility-based approach involves providing more emissions allocations to more emissions-intensive production, effectively subsidizing higher-emissions output. Such an approach, in our opinion, does not align with Alberta’s goals of reducing the emissions intensity of production.

Output-based allocations for upgrading and refining

A significant share of Alberta crude is refined and upgraded in Alberta, and these facilities generate significant emissions. The Panel recommends that the carbon pricing architecture be applied to upgrading and refining with output based allocations defined according to the Solomon Complexity-Weighted Barrel or similar approach.

“Our recommended approach for regulating Alberta refineries is to use an established global benchmark. The Solomon Complexity Weighted Barrel (CWB) (Emissions Intensity, kg CO₂/CWB) methodology is the global gold standard utilized by EU and California Cap & Trade regimes. This methodology is credible and transparent, measuring refining GHG emissions intensity and ensuring a level playing field”

- Canadian Fuels Association submission to the Panel

This approach, used in the European Union and under the Western Climate Initiative to allocate emissions permits to refineries, is amenable to Alberta’s market where refineries and upgraders differ significantly in terms of both feedstock and final product. A simple per-barrel allocation of emissions permits would not properly account for complexity in the process of different facilities, while a facility-based standard would not account for overall performance compared to global benchmarks.

It is the Panel’s belief that while greenhouse gas policy should not encourage upgrading and refining per se, it must recognize that processing of oil, perhaps even more so than production of it, qualifies as emissions-intensive and trade-exposed activity. This implies that, in the absence of globally consistent policies, tighter policies in Canada would likely not result in emissions reductions but rather than transfer of emissions, and associated economic activity and employment, to other jurisdictions.

“Where the boundaries are set for a product standard matters and the apparent simplicity of this approach could be undermined through the need to recognize different processing pathways and facility integration. (...) A product standard basis for regulation of extraction would discourage opportunities to remove more carbon during the extraction and early processing phases that could result in significantly less upgrading and refinery conversion intensity and, as a result, lower well-to-tank life cycle emissions. In this respect, a product standard approach may inhibit the ability to “think globally and act locally”.

- Suncor Energy submission to the Panel

In their submission to the Panel, Suncor cited some potential disadvantages to a performance- or output-based approach in production alone (see above), but these concerns are partially mitigated by adopting the approach across both production and upgrading.

While it is true that our recommended process will not recognize avoided emissions which occur outside the province as a result of processing within the province, the combination of a bitumen production-based allocation and a Complexity-Weighted Barrel approach for upgrading and refining will be such that lower-emissions pathways to the final product, with respect to the production and processing which occurs within Alberta, will be advantaged, and production pathways that shift part of all of the processing outside of Alberta will not be materially encouraged.

The advantage of our approach to refining and upgrading, when combined with our approach to production, is analogous to the advantage of the performance-based system for the rewards to cogeneration – efficiency through process integration will be recognized implicitly where it does lead to emissions reductions.

Opt-in program for conventional oil and gas

Conventional oil and gas is a catch-all for a very diverse set of facilities with differing exposure to greenhouse gas emissions policies. In particular, many of the province’s heavy oil resources, while extracted using conventional techniques, have emissions profiles similar to oil sands facilities. Others might be individual legacy wells in remote areas. Others, still, are modern, light-tight oil extraction facilities with emissions as low or lower than most other resources in North America. Similar variation exists on the gas side. As a result, a one-size-fits all program is likely to create significant distortions in the market and may create undesirable outcomes in terms of well abandonment, especially as flaring emissions from small, remote gathering systems are charged carbon emissions levies.

Our recommendation to the province is to allow conventional oil producers who can aggregate wells or batteries in a geographic region the potential to opt in to the large final emitters treatment and for there to be the potential for an output-based allocation to be assigned to these aggregated facilities even if their emissions fall below the 100,000 tonne per year threshold. This will ensure that like facilities are treated similarly, and that there is not a large difference between the costs applied to large and small operations.

Previously, such an opt-in program would not have seen significant uptake, as there was no advantage to being included in the system for a facility which would not otherwise be subject to emissions pricing. With the broadening of the carbon price signal to end-use emissions including flaring, these facilities would be exposed to carbon prices and potentially advantaged by the output-based allocation. However, we do not recommend including facilities by default as there are significant reporting and verification costs

associated with participation in the large final emitters program, and imposing those costs across the conventional oil and gas sector could have undesirable results.

Opt-in program for gas processing

Gas processing in Alberta takes place at large and small facilities and, perhaps more than any other activity, the previous system failed to treat similar processes in a similar way. As with conventional oil and gas, the shift to end-use pricing will imply that smaller gas plants which would previously have been exempt from carbon pricing would now be subject to a price on all emissions. For most of these facilities, being treated under the Large Final Emitter treatment, and thus subject to an output-based allocation will be preferred despite the increased reporting and verification costs, and so we recommend that this option be made available to gas processing facilities.

Methane Management Program

The oil and gas industry is the largest source of methane emissions in Alberta, responsible for 70% (~30 Mt CO₂e) of the total provincial methane emissions in 2013. Emissions peaked at 36 Mt in 1998. However, in 2013, methane emissions from oil and gas were still up 17% over 1990 levels. In comparison, methane emissions from the oil and gas industry in the U.S. have decreased between 13% and 16% since 1990. The U.S. EPA has set a target of reducing methane emissions from oil and gas by 40-45% from 2012 levels by 2025, and has begun to introduce regulations and programs designed to achieve this outcome. The International Energy Agency (IEA) lists reducing methane emissions from the oil and gas sector as one of five urgent 'game-changing' measures that could contribute to achieving the 2°C ambition.²⁹

Input received by the panel on government policies in Alberta to reduce methane emissions focused on the need for:

- regulatory requirements that would raise current standards for performance, monitoring, measuring and reporting; and
- a non-regulatory process that that would provide existing operators with the incentives and the flexibility they require to achieve further reductions in the most cost-effective way in their particular facilities.

The Panel reviewed a range of data and opinion on methane emissions reductions that could be achieved by 2030. In addition, new technologies are emerging that have the potential to further reduce costs while scaling up potential outcomes.

We heard broadly-based agreement among both industry and environmental stakeholders in Alberta that methane reduction represents one of the most cost-effective ways to reduce the province's greenhouse gas emissions in the near term. Industrial and environmental stakeholders believe that the opportunity for methane reduction in Alberta ranges between 7-17 MT CO₂e at a cost of between \$8 and \$25 per tonne.

Relevant Policy – Methane Emissions

Directive 60: Upstream Petroleum Industry Flaring, Incinerating, and Venting 'limits routine venting and flaring during oil production by setting facility level limits including an economic test for conservation'. The Directive also sets a provincial cap for solution gas flaring.

The Directive also requires operators to have leak detection and repair programs in place that meet or exceed industry developed Best Management Practices on fugitive emissions, and work is underway at the national level to establish a new set of fugitive management standards through the Canadian Standards Association.

²⁹ International Energy Agency, *Energy and Climate Change, World Energy Outlook Special Report 2015*

“The investment abatement cost analysis has shown that methane technologies present a relatively attractive opportunity for near term reductions.”

- CAPP submission to the Panel

“The analysis found that across the Canadian oil and gas industry, using proven and available technologies to control fugitive emissions and prevent direct venting of methane can be done for net annualized cost of C\$75.5 million/year. This is approximately 1% of the Canadian oil and gas industry’s annual capital expenditures according to data from the Oil and Gas Journal.”

- Environmental Defence Fund/Pembina submission to the Panel

To put these kinds of reductions in perspective, a 12 Mt reduction in methane emissions by 2030 would be equivalent to cutting by half the projected emissions from buildings and houses in Alberta within that same timeframe.

We expect this to be accomplished through a combined regulatory and market-based approach. Regulation is a good fit for some aspects of methane mitigation, but for the replacement of pneumatic devices before the end of their useful lives, we feel a more innovative approach has significant potential.

We believe there is enough of a consensus between government, industry and environmental organizations on the general size of the opportunity on methane reduction to justify the assumption that a well-designed and executed collaborative initiative would lead to a plan that reconciles current differences in perspectives on applicable targets and would deliver greater emissions reductions than a regulatory approach at lower costs.

As such, we propose the following two measures:

New Regulatory Measures for Methane Management in Design and Operation of New Facilities and for Leak Detection and Repair (LDAR) in All Facilities

These measures would be similar to regulatory approaches in the U.S. and elsewhere in Canada and would impose minimum facility design specifications for new facilities as well as standards for key equipment and operational best practices.

They would also impose standards for controlling fugitive emissions at both new and existing facilities.

A Time-Limited Multi-Stakeholder Collaboration for Equipment Upgrades of Pneumatic Controllers, Pneumatic Pumps and other sources of Vented Emissions in Legacy (Existing) Facilities

This initiative would involve establishment by the Alberta Energy Regulator (AER) of a multi-stakeholder collaboration between government, independent experts, interested companies and environmental organizations for the purpose of developing and overseeing implementation of a multi-year plan for updating/retrofitting of equipment in existing facilities to reduce venting of methane emissions and improve operational efficiency and reliability.

A collaboration of this nature should build on learnings and experience from Alberta’s Clean Air Strategic Alliance (CASA), a multi-stakeholder collaboration established in 1994 to facilitate improvements and new regulation on air quality management in the province. A similar approach to methane reduction would require an accountability structure that is capable of building trust. A *Joint Steering Committee*, made up of government and participating stakeholders, should be established to oversee development of a transparent system for verification, reporting and governance, as well as development and/ or updating of relevant offset protocols to allow time-limited access to incremental revenue from methane offsets,

providing incentive for early action. A *Technical Implementation Team* should be established by the AER and government to support the priorities identified by the Joint Steering Committee and application of new systems and technologies.

The collaborative initiative would be responsible for advising government on targets and timelines and developing protocols for the certification of offsets for early replacement of pneumatic devices. These offsets, and the collaborative program itself, would be time-limited. We recommend that, after 5 years or longer if the collaborative initiative can provide evidence of cost-effectiveness, the government should move to mandated replacement regulation for not-yet-replaced devices. The use of the offset protocol is crucial, since it turns what would otherwise be a cost into an investment with a positive return. This could prevent well abandonment in some cases by providing a stronger business case for continued operation.

The stakeholder collaboration should be structured to provide the basis for development of new regulatory standards that would be introduced at the end of the non-regulatory period to cover non-participating facilities. These regulations could be introduced earlier in the event that a collaborative stakeholder initiative on methane reduction and verification does not produce desired results within necessary timeframes.

Potential Outcomes

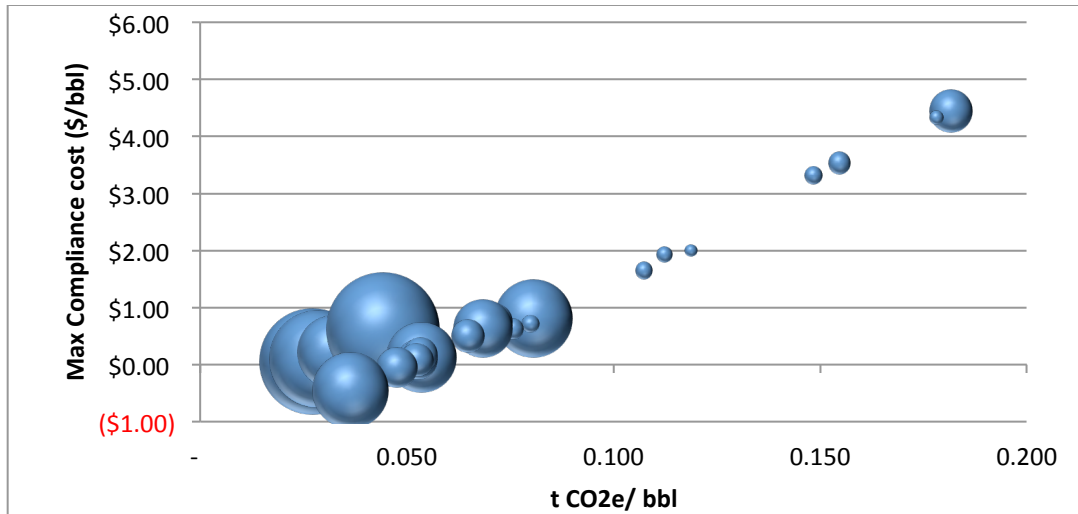
Emissions Reductions

Our panel believes that this approach to methane management would achieve a 12 Mt reduction by 2030. This represents a 40% reduction in methane emissions over a 2013 baseline. When combined with our carbon pricing program applied in oil and gas, we expect a total of approximately 12 Mt of emissions reductions by 2020 and 20 Mt of annual emissions reductions by 2030 over and above what otherwise occur with a continuation of the Specified Gas Emitters Regulation as implemented today. This would still imply substantial expected growth in oil and gas emissions, to 55% above 2005 levels by 2030, but we would expect no further increases absent substantial changes in market conditions.

Compliance Cost Impacts from Carbon Pricing

Existing oil sands projects

Using an output-based allocation at top-quartile performance with a price of \$30 per tonne would approximately double aggregate compliance costs for oil sands producers in 2018 compared to the system in place today. The increase would not be evenly distributed – the performance-based system would see a redistribution of compliance costs toward the higher emissions-intensive facilities. While the higher compliance costs imposed on some facilities will be challenging, it's important to keep in mind that some of these facilities have emissions intensities which are four to five times the emissions intensities of conventional oil production, and it's important that emissions reduction decisions become material for these facilities if oil sands production emissions are to be driven down toward *good-as-conventional* over time.



Expected per barrel GHG compliance costs using an output-based allocation based on top quartile performance in mining and *in situ* respectively at a price of \$30 per tonne. Size of bubbles is proportional to the quantity of bitumen production from modeled facilities. Source: Alberta Environment and Parks

While compliance cost changes in the ranges shown above are significant, the largest changes apply only to a few facilities and the estimates assume that no improvements in emissions intensity performance occur in response to these potential costs. Interventions in our process suggested that myriad opportunities exist for improvements, and deploying these solutions would likely represent a cost-effective alternative to paying these compliance costs in many cases.

New projects in the oil sands

For new projects, the analysis is more complex as the key determinants of an investment decision will be expected product prices, not carbon policy. For new projects with top-quartile or better potential emissions performance, our proposed architecture will improve prospective project economics relative to the status quo, and for best-in-class projects, the new treatment is likely to provide a significant advantage. For new projects with high prospective emissions intensities, or with significant potential risk of such an outcome, this policy will magnify risks and may make these projects unattractive where they would otherwise have been of interest. However, for an industry which faces a label of dirty oil, and which has a stated goal of improving performance to *good-as-conventional*, a carbon policy which advantages potential projects which contribute to needed improvements and disadvantages those which do not seems an acceptable outcome.

For prototypical projects, such as an *in situ* project with a steam:oil ratio of 3 and significant deployment of cogeneration for combined heat and power, we estimate that the impact of these policy changes would be negligible. For more emissions-intensive sites, the increase in the *supply cost*, or the WTI price at which a new project would make a competitive rate of return, is likely on the order of \$0.50-\$1.00 per barrel. For comparison, without the output-based allocations, the impact of a \$30/tonne carbon price on a prototypical site would be \$2 to \$3 per barrel with higher impacts on more emissions-intensive potential projects. As such, our policies provide a strong incentive to develop the best resources and to deploy the best technologies, and will complement a goal to drive oil sands production emissions to *good-as-conventional* over time.

Conventional oil and gas

The changes to Alberta's carbon pricing and regulatory policies which we recommend are such that some smaller facilities, primarily in oil and gas, may be subject to significant compliance costs which could lead to well abandonment. We recommend a three-part approach to address these concerns. First, we suggest that oil and gas facilities, like other, smaller facilities in the province, be invited to opt in to the province's carbon pricing regime for large emitters, if they can pass a test of emissions-intensity and trade-exposure. Second, we are advocating the use of regulatory tools for leak detection and repair – tools which generally involve an economic test for enforcement to ensure that unintended consequences of well abandonment do not occur. Finally, we are providing the opportunity for facilities undertaking early compliance with our methane reduction program to generate emissions offsets which provide a source of revenue to offset incurred capital costs. According to estimates provided to the Panel by the Canadian Association of Petroleum Producers, the \$30/tonne value of offsets will be sufficient to deliver an above-market rate of return on capital deployed to some operators who choose to comply and to significantly defray the costs for others.

Finally, we have been in regular contact with the province's Royalty Review Panel, and where appropriate, they will be accounting for any increases in costs brought about by new greenhouse gas policies in making their recommendations.

Upgrading, refining and gas processing

Upgrading, refining, and gas processing sector compliance costs will depend on the exact specification of the output-based allocation rules applied. For upgrading and refining, benchmarking the performance of individual refineries and upgraders in Alberta against global peers is a frequently-used tool, and operators will have specific experience with the systems employed in Europe, California and Quebec which they can apply in Alberta. We recommend that the government apply a top-decile standard based on global competitors for both refining and upgrading, as there is not a sufficient diversity of facilities in Alberta to establish an informative top provincial quartile.

For gas processing, the most important impact of the policy change will be on small plants, which will face added costs of reporting and verification of emissions for those with emissions below the 50,000 tonne per year cut-off for reporting, as well as any incremental costs applied by the policies. It is expected that all gas processing facilities would opt in to the proposed large emitters treatment in order to qualify for emissions allocations on an output basis rather than paying a carbon price on all emissions.

We recommend that the government carefully assess competitiveness implications, with particular attention to small, regional processing facilities, in determining the output-based allocations. In many regions, the gas processing plants provide both a required service to regional gas wells, as well as inputs to production in the form of industrial gases captured from their processes. As such, policies which render these facilities uneconomic could have a significant impact on regional workers and resource industries.

Incentives for Innovation

“The energy-producing jurisdiction that will succeed will implement policies which give companies the time and space to innovate; produce its resource efficiently – lowering production costs while significantly reducing carbon emissions to the atmosphere; and, create incentives to accelerate the development and deployment of clean technology to solve the emissions challenge throughout the energy value chain, including consumer consumption.”

- Cenovus Energy submission to the Panel

Carbon pricing program

A key attribute of the architecture proposed is that the carbon price is reflected in both rewards to design-phase and reservoir choice decisions. Under the current Specified Gas Emitters Regulation, the average value of an emissions reduction opportunity implemented at the design phase would be less than \$6/tonne because a reduction in emissions-intensity in a new facility implies that facility will have a lower baseline and so will receive proportionally fewer *free* emissions credits over its lifespan. By contrast, with our proposed treatment, an emissions reduction achieved either through design phase changes, reservoir advantages, or through ongoing improvement will be rewarded at the full value of the carbon price, because allocated emissions would not be reduced as a result of the improvement.

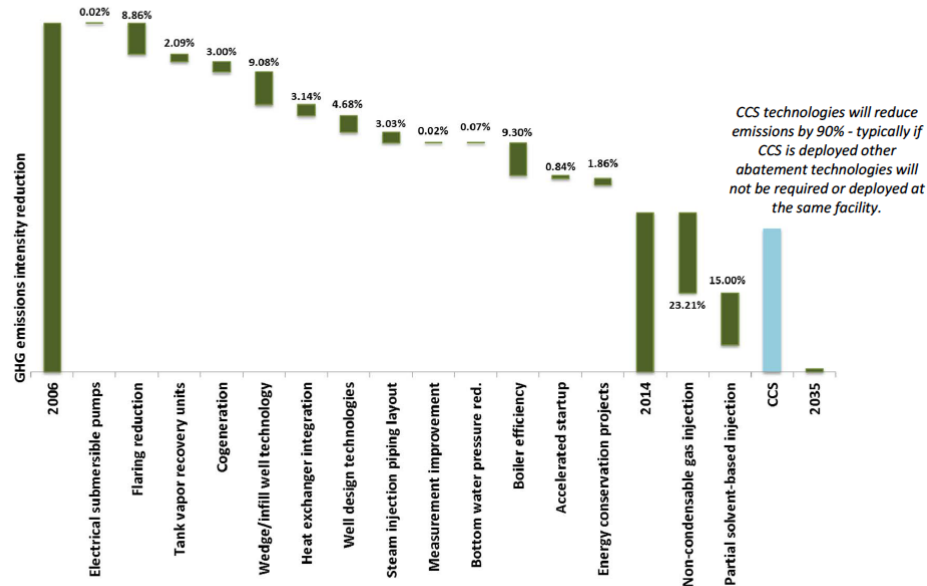
While new projects represent an important avenue for deployment of new technology and for driving oil sands emissions toward *good as conventional*, encouraging improvement in operating projects is crucial as well. Some interventions at our technical sessions suggested that significant improvements in existing facilities are not possible as they have already employed the best-available technology. That has not been proven in the past, with facilities such as Cenovus' Christina Lake and Foster Creek driving down emissions per barrel over more than a decade and, of course, the oft-noted, significant improvements in emissions from mining production between 1990 and 2010.

The adoption of an output-based allocation approach does not alter the existing policy architecture's incentives for ongoing improvement. Whatever carbon price is applied, our proposed policy architecture, the existing SGER, or a carbon tax would provide a similar reward for any reductions in emissions intensity achieved over time - they would price these improvements at the prevailing carbon price - while none would provide a reward for emissions reductions achieved through reduction in production.

Carbon pricing applied to conventional oil and gas also creates similar opportunities for innovation in the reduction of flaring emissions - carbon pricing would provide a much larger potential market for innovative processes to reduce emissions from flared gas or to more economically capture associated gases, eliminating the need for flaring.

GHG emissions intensity reduction

2006 to 2014 reductions collectively amount to 46% improvement in GHG emissions intensity – however, certain technologies may be mutually exclusive in application and reservoir conditions may limit the feasibility of some technologies. The emissions reduction potential of emerging technology is significant but will require a high carbon price at the margin for development and deployment.



Sources of GHG emissions-intensity improvement at Christina Lake. Source: Cenovus Energy, supplied to the Panel.

Methane management program

The methane management program that we have proposed presents significant opportunities for innovation and entrepreneurs to not only reduce methane emissions but to further improve industry efficiency and reliability. It is estimated that both the regulatory and multi-stakeholder components of the policy would trigger a total investment of \$1 billion or more between now and 2030, with economic spillovers, employment and training opportunities in the equipment and service sectors, as well as related improvements in industry efficiency, reliability and competitiveness. Investment in development and deployment of new lower emission technologies will be key to achieving reductions.

Leak detection is anticipated to create employment opportunities and demand new skills. It is estimated that one complete leak detection scan of Alberta's oil and gas facilities would require 111 person-years of employment.³⁰ Replacement of pneumatic controllers and pumps at existing facilities requires facility redesign prior to the change, and engineers, welders and other service personnel will be needed to replace the estimated eligible 245,000 pneumatic devices in the province. Of course, there are trade-offs in that these employment opportunities are enabled by compliance requirements imposed on operators, and so these must not be looked at in a vacuum.

³⁰ Based on information provided by the Industry Operations Branch, Alberta Energy Regulator, March 10, 2015

Alignment with Other Jurisdictions

Carbon pricing

The carbon pricing program we have proposed uses similar architecture to that deployed in the Western Climate Initiative and in the European Union Emissions Trading System, and as such provides for an apples-to-apples comparison in terms of price and coverage of emissions. As proposed, prices in Alberta would be higher for oil and gas emissions and coverage would be comparable relative to both of those programs.

Methane management

The proposed methane management program will also align well with expected US regulations. The U.S. Environmental Protection Agency (EPA) has recently introduced an intention to impose regulations targeting a 40-45% reduction in U.S. emissions from 2012 levels by 2025.

It would also provide an opportunity to align with methane initiatives in other Canadian jurisdictions, most notably in B.C. and possibly Saskatchewan. The latter could provide the opportunity for B.C., Alberta and Saskatchewan to go as a western block to seek alignment with federal regulations and other federal programs that could provide additional support on technology and training opportunities.

When Should These Recommendations be Enacted?

Carbon Pricing

The carbon pricing program under the existing Specified Gas Emitters Regulation is in place until 2017. As specified above, we would recommend that the new architecture be adopted upon the expiry of these regulations.

Methane Management

Action on methane emissions will require the Alberta Energy Regulator, industry and ENGOs to co-develop the parameters for the non-regulatory pre-compliance initiative, including verification, reporting and governance structure, offset protocol and establishment of Technical Implementation Team and baseline information in short order. We recommend that a regulatory framework be introduced by mid-2016, and a non-regulatory initiative should be up and running by the end of 2016.

In parallel with the development of the non-regulatory program, we expect that the Alberta Energy Regulator be directed to develop and/or update regulations for LDAR and that design / equipment / operational standards for new facilities be developed in collaboration with the federal government in alignment with initiatives in the United States.

Interactions with Other Proposed Policies

The Alberta government is presently undertaking a royalty review. We have consulted extensively with the Royalty Panel, and we've each understood that the responsibility of the Climate Leadership panel is to ensure that appropriate carbon policies are in place to secure emissions reductions and reputational benefits, while the responsibility of the Royalty Panel is to ensure that resource policies are optimized, taking account of action on climate change. Where appropriate, we trust that the Royalty Panel will take account of any policies introduced in response to our recommendations and adjust their policy recommendations accordingly.

Regarding our recommendations on methane management, the Government of Alberta will see an impact on royalties as emission compliance costs for natural gas processing facilities reduce royalties payable. As a result, it is estimated that about 12% of the cost of compliance at natural gas facilities will be borne by government. For conventional oil compliance costs are incurred solely by the operator, and would not have a direct royalty impact, although captured methane would be potentially attributable for royalty purposes. We recommend that the government ensure the royalty framework does not provide a material disincentive to deploy technologies to capture methane as an alternative to venting and flaring.

Government needs to be cognizant of potential implications to the sector's competitiveness from increasing costs, as well as the need to manage incremental and/or overlapping costs for methane reduction and the application of carbon pricing to end-use emissions such as flaring. The oil and gas sector is made up of many smaller companies, and careful consideration will be necessary to ensure that we do not create an environment that makes it uneconomical for them to continue to operate. This relates not just to costs imposed directly, but also the impacts of indirect costs felt through electricity prices, which are a significant input cost to many conventional oil and gas operations. Where this is not possible under the proposed carbon policy, the government should ensure that appropriate supports are provided for worker and community transitions.

ENERGY EFFICIENCY AND ENERGY RESILIENT COMMUNITIES

Energy efficiency is an important way for all Albertans to contribute to reduced greenhouse gas emissions. Energy saved (be it power, natural gas or fuel) is, in many cases, less expensive than the total social cost of new energy supply, including co-benefits like the reduction in air pollutants. Saving electricity, for example, also avoids the costs and land-use impacts of transmission and distribution as well as avoiding air emissions from generation.

Energy efficiency is, essentially a low-cost, underdeveloped energy resource. Alberta's new climate change strategy should ensure we look at this resource as an opportunity for enhanced prosperity and well-being.

By fostering energy efficiency and energy resilient communities, Alberta has an opportunity to achieve significant emission reductions, to empower action by individual citizens, small business and communities, and to support the implementation of community energy plans.

Policy Recommendations

1. Implement a new integrated energy efficiency and community-scale energy program. This program should:

- ensure incremental spending on energy efficiency and small-scale community generation meets standard tests for return on public investment;
- investigate the feasibility of a small-scale community generation regulation, to be funded within the same Community Energy Strategy envelope;
- ensure low-income households are not "left behind" in the transition to a lower carbon economy, and have opportunities to adopt the same new energy technologies as higher income households; and
- ensure collaboration with existing municipal programs already in place or in the planning stages.

2. Implement a complementary regulatory agenda which would include:

- building energy performance reporting and disclosure requirements;
- updated building codes and standards; and
- a renewed regulatory standard for distributed and small-scale community generation.

3. Foster municipal partnerships by:

- integrating guidance to municipal governments on climate change in the current review of the Municipal Government Act;
- making high quality data available for community energy and emissions inventories, and work with municipalities to develop and transfer best practices; and
- expanding green infrastructure investments and/or increasing provincial infrastructure grant flexibility to support transit oriented development, active transportation options and public transit.

Why This Approach?

The proposed carbon pricing program should be complemented by a combined energy efficiency program and enhanced regulatory agenda which addresses end-use energy in buildings and houses. Regulation and programming in this sector of the economy falls primarily under provincial or municipal jurisdiction, and so it is an area where provincial government action can have real results.

Alberta's buildings and houses sector represents 8% of Alberta's emissions.³¹ Per capita energy use in this sector is one-third above the Canadian average, the highest in Canada.³² Alberta's homes and commercial/institutional buildings, including a large stock from 1970s, are right-aged for renovation including retrofits. This sector offers a cluster of Alberta's most cost-effective emission reduction opportunities, while contributing to more comfortable homes and workplaces. Evidence presented to the panel suggests that significant opportunities exist in both the commercial and residential sectors offering overall savings and financial payback under a \$30/tonne carbon price, even after factoring in capital costs. However, decades of evidence in energy economics literature suggests that individuals and businesses do not adopt these opportunities even in cases where the financial case is compelling.

With this in mind, an energy efficiency strategy is a key complementary program to our proposed economy-wide carbon price. Energy efficiency programs help ensure that, while energy rates may get higher, energy bills can be lower. They help energy users break through barriers to adopting cost-effective efficiency and conservation measures - barriers such as upfront capital costs, lack of knowledge on best practices and technologies, access to products and services and split incentives between landlord and tenants or builders and future owners. They can also help defray potential competitiveness impacts and job losses which would otherwise result from higher electricity prices.

“While municipalities do have the ability to generate jobs through changing our vehicle fleets, retrofitting buildings, building transit infrastructure, building electric vehicle infrastructure and installing decentralized and district energy systems; they can also directly engage in research and proof of concept projects that accelerate the development and adoption of green technologies and businesses”.

-Calgary Economic Development, submission to the Panel

Energy efficiency goes beyond the efficiency of appliances, buildings, or vehicles and traditional government programming in building retrofits. The design of cities and neighbourhoods matters profoundly, because urban form, once set, is hard to change, and has consequences for future energy use well beyond this century. As cities become more spread out and as housing, jobs, shipping, recreation and community destinations become more dispersed, transportation demand rises and that demand becomes harder to meet with walking, cycling, or public transit. Attracting development to mixed-use and transit/active mobility-oriented neighbourhoods in already-developed urban areas is a key strategy in reducing emissions across the long-term, and a critical focus for empowering the role for Alberta's municipal governments. Contributing to the funding of public transit and active mobility infrastructure is another important strategy.

³¹ Alberta Environment and Parks analysis, based on Environment Canada 2014, Emissions Trends Report, adjusted for 2006 IPCC Guidelines and 2007 IPCC Global Warming Potentials

³² Source: www.cesarnet.ca (2010) From AB government Buildings and houses presentation to the Panel

This is why it is important to foster energy resilient communities. Energy resilient communities are not only about new approaches to using energy more efficiently, they are also about new ways to produce lower-carbon energy at the community level. It's in this spirit that we provide the series of recommend actions listed above and detailed below.

Integrated Energy Efficiency and Community-scale Energy Strategy

Alberta has not seen demand-side management or energy efficiency programs deployed at the scale present in other provinces to date for a few important reasons. Most notably, an integrated approach to energy efficiency is more applicable in a vertically-integrated energy market where a utility can look at the cost and contribution of energy savings, or *negawatts*, as an alternative to spending on new generation or new infrastructure for transmission or distribution. In Alberta's markets for electricity and natural gas, the production, transmission and distribution segments of the market are not vertically-integrated in most cases, and are also separate from retailers with whom direct customer relations exist.

So, for example, in the case of British Columbia, the province can look at investments in energy efficiency in the same way it looks at investments in new generation. In Alberta, the entities which invest in generation are private companies, distinct in most cases from the companies which transmit, distribute and bill consumers for their energy use.

However, we do not see this as an insurmountable barrier to implementing a program which provides value to Albertans – in fact, we see it as potentially well-aligned with recent innovations in the delivery of energy efficiency programs in other jurisdictions.

The Panel has considered the potential for implementation of enhanced energy efficiency programming via existing electricity and gas distribution utility demand-side management programs or via the development of a dedicated *Energy Efficiency Alberta* entity. Such a dedicated entity could deliver programs targeting energy efficiency and distributed electricity generation jointly. We see advantages and disadvantages to both approaches.

A dedicated *Energy Efficiency Alberta* entity, similar to the EfficiencyOne model recently created in Nova Scotia and programs in Vermont among other places, would address the unique structure of the Alberta electricity market. This structure may also be better suited to provide customer-focused, integrated energy efficiency and community scale energy generation services which would look at the entire energy consumption footprint of the client and recommend the best suite of changes, including efficiency updates or distributed generation where appropriate. Such a stand-alone entity would also be better-positioned to offer targeted programs for low-income customers and Aboriginal communities.

However, a new entity would face challenges, due to a lack of existing customer relationships and the fact that it would be working at cross-purposes with existing energy distributors and retailers. The advantage of utility-delivered programs is that they ensure the incentives of the utility are aligned so they benefit from reductions in energy consumption driven by their programs. In the case of a third party, utilities and retailers would potentially have, at best, limited to collaborate and, at worst, an incentive to undermine the work of the energy efficiency utility to preserve market share.

Delivering energy efficiency programming through existing utilities would parallel the approach used in most other jurisdictions, and build on the experience which some Alberta utilities have developed elsewhere. However, creating the appropriate incentives within Alberta's deregulated market structure would be challenging – for example, in a model in which electricity distributors are acting to reduce system demand, they are reducing their own revenues for which they could be compensated, but they would also be eroding margins or altering investment returns for electricity generators.

In either delivery model, it is important to include the return on public investment rigour and performance accountabilities that are standard in other jurisdictions, including a mandate to pursue only opportunities which are cost-effective when counting only incremental improvements attributable to the programs.

Energy efficiency programming should be broadened to include the deployment of community-scale energy systems, where we see technologies evolving at a rapid pace. The growing interest in net zero buildings is proving that dramatic advances in building energy use can be achieved when buildings are conceived of as both users and producers of energy. This insight can be transferred to the retrofit of existing buildings. Integrating services for audits, incentives, financing and installation for the full range of best new building energy technologies (energy efficiency, home battery storage, and community-scale low-carbon energy generation) can reduce the barriers to adoption of these technologies and make them more available to Albertans.

Financing these programs will be important and require significant investments. Unlike energy efficiency programs in other jurisdictions, we recommend that the Alberta government consider the funding of these programs not through an additional rider on utility bills, but through revenues acquired through the carbon pricing program. This would avoid adding a further charge to consumers and would piggyback on the revenue recycling program's implementation of assurances that carbon charges would not be regressive. Financing an energy efficiency program through an on-bill charge carries the same risk of placing an incremental burden on low-income individuals, and financing the program through the Panel's recommended carbon pricing and consumer rebate approach avoids this outcome.

Experience across North America suggests a benchmark for annual energy efficiency investments of 2% of total revenue for electricity and 6% of distribution revenue for gas.³³ If this benchmark is applied, Alberta's annual funding for the new Community Energy Strategy should be in the range of \$125 million per year, or roughly \$30 per person. We have used this figure as an indicative allocation in our Revenue Recycling allocations, although aggressive deployment of distributed generation would likely require more extensive funding.

Simply assuring that low-income Albertans do not pay disproportionately for this programming is not sufficient. Energy efficiency programming should actively target the lowest income Alberta households. For these households, energy costs may be as high as 16% of their disposable income, compared to 4% in top quintile income households.³⁴ Precisely targeted programs aimed at increasing the energy efficiency of the housing occupied by the energy-poor, including municipally- and provincially-subsidized housing, can include purchasing and installation of energy saving technologies at no charge to low-income households, and should be available to all segments of the low-income housing spectrum (single/multi-family building; tenants and homeowners; assisted and affordable housing, etc.) Programming should be designed to avoid creating a moral hazard problem where there is an incentive to delay renovations which would otherwise occur in order to profit from provincial programming.

We recommend that the government consider similar programming for Alberta's First Nations and Métis communities where these can be developed in a collaborative way. While these communities often suffer from the same challenges as low-income Albertans in other areas, they may fall outside the scope of provincial programs.

³³ ATCO Gas submission to the Climate Change Advisory Panel, September 30, 2015.

³⁴ Boyd, Richard. "Energy Poverty: An Agenda for Alberta" (forthcoming). All One Sky Foundation, Calgary .

Regulatory Updates and Changes

Codes and standards

Most buildings built today will likely still be standing in a century from now. This new capital stock needs to be resilient in a lower-carbon future, and adaptable to emerging technologies and rising carbon prices.

Codes and standards ensure new buildings meet a minimum standard of efficiency, and reflect what can be met with broadly accepted, well-tested market technologies. Alberta's recent adoption of the 2011 National Energy Code for buildings is an important, albeit belated, step in this direction. The province should, at minimum, commit to adopting future National Energy Codes as they are released.

“The Province of Alberta has not been as quick as other provinces to update its provincial building code to reflect updates of the federal government’s National Code for Buildings. Alberta’s new Building Code (which came into effect May 1, 2015) is based on a National Code that is already three years old. Moreover, Section 9.36 of the new code (dealing with energy efficiency) will not come into effect until May 2016. The pace of code adoptions may be part of the reason Alberta homes (built from 1990 to 2013) have higher energy use intensities per square meter and per dwelling than comparable buildings in other provinces (adjusted to reflect provincial climate differences).”

- City of Edmonton, submission to the Panel

Some other provinces have already moved to tighter energy codes for buildings. Ontario, for example, requires that all new buildings be 25% more energy efficient than the National Building Code. Alberta has just adopted the 2011 National Building Code, and needs time to adjust. However, we recommend that the government look to implement a trajectory toward higher performance buildings over time and to integrate with other objectives including examination of requirements for solar- or electric-vehicle-ready building requirements. Building codes and standards should represent a ‘backstop’ of minimum performance, and municipal governments should be allowed or encouraged to establish higher local code requirements where doing so aligns with their objectives.

Building energy consumption disclosure

The energy performance of a building is rarely known to potential tenants, lease-holders or buyers, although this performance will affect the costs of occupancy. For this reason, many states, provinces, and cities are adopting or considering consumer information tools, such as building energy benchmarking, building labeling and energy use disclosure requirements for resale of residential homes. These tools offer a simple and effective method for building owners to understand and communicate how well their buildings are performing compared to similar buildings.

“Required public disclosure of building energy efficiency performance (through building labelling or benchmarking) would enable better public tracking and assessment of both new and existing building energy performance.”

- City of Calgary, submission to the Panel

Building energy consumption disclosure is a valuable tool for building occupants, and will also motivate building owners to make energy efficiency investments. For these reasons, Alberta should adopt a commitment to implement building energy performance reporting and disclosure requirements.

Stakeholders should be consulted in the development of these requirements, for input on issues such as:

- how to improve access to data for landlords and building owners;
- scoping of the building types and size thresholds subject to the requirement; and
- a schedule for phasing in of such a program.

There will be costs to the imposition of building labelling requirements, and it is important these requirements be scaled up in line with the capacity to complete assessments as required. While the costs of a residential audit are small (\$200-300) given the scale of real-estate transactions, the capacity must be present to deliver services in a timely manner so that business is not affected. Training programs to deliver these services would be an ideal fit for transition plans imposed in affected industries and communities, as building assessment is a relatively labour-intensive activity.

Renew and update Micro-generation Regulation and investigate the feasibility of a new regulation for small-scale community generation

Alberta's current Micro-Generation Regulation expires at the end of 2015. The Panel heard broad interest in micro-scale generation from individuals, cooperatives and municipalities. We also heard strong support for a new class for slightly larger scale community generation, as a way to encourage alternative energy technologies well-suited to community energy systems.

Examples offered included:

- home energy storage systems
- combined heat and power,
- district energy,
- solar,
- wind,
- geothermal,
- water source cooling,
- sewer heat capture,
- biomass for heating, and
- capturing biogases for transportation, heating and electricity generation.

Unlike the Micro-Generation Regulation, these alternative technologies are not limited to renewable energy, but they are low-emissions.

These technologies would allow all Albertans to take more control of their carbon footprint, with major positive implications for energy resilience at the local scale. Distributed energy and community combined heat and power systems, for instance, allow for a transition away from fossil fuel use and can result in a 30-50 per cent reduction in primary energy consumption.³⁵ These smaller-scale systems produce less power, and will be more expensive per kW than utility scale systems. However, they avoid investments in transmission and distribution, and provide other electricity grid benefits such as reduced network congestion. They also

Context – Micro-generation

- As of June 1, 2015, there were 1208 micro-generation sites in Alberta, with a total capacity of over 9.2 megawatts. 1130 of the sites are solar photovoltaic installations.
- Alberta's current Micro-generation Regulation expires on December 31, 2015.

Context – District Energy

- A Combined Heat and Power (CHP) system produces both electricity and heat. The electricity can be used to service a building or sold into the power pool. The heat can be used to heat water for boilers for a District Energy System. This supplies space heating to multiple building locations from a central energy centre through a network of insulated underground pipes.
- A CHP/District Energy system uses fuel inputs with 80% efficiency, compared to 34% efficiency for a standard power plant.

³⁵ Source: Pat Bohan ENMAX Corporation, "District Energy and Combined Heat and Power", Presentation to Climate Leadership Panel municipal technical session. September 29, 2015

provide opportunities for community economic development. Combined heat and power systems can also provide standby power services in the event of power interruptions, and community resiliency during severe weather emergencies.

The Panel recommends that alongside energy efficiency programming, Alberta investigate the feasibility of a small-scale community generation regulation, to be funded within the same Community Energy Strategy envelope. Impacts on the stability of the electricity grid and conditions for market integration need to be considered. The range of installed capacities for this category, eligible technologies, other criteria for eligibility and regulatory approval processes under this program would need to be developed in consultation with Alberta's municipal governments and other stakeholders to ensure eligible projects are community-based and meeting community energy needs. The model would need to safeguard against potential abuse from utility scale projects coming forward as a series of smaller facilities as a way to sidestep utility regulatory processes. Price support for small-scale community energy, like the spending on energy efficiency, should meet standard tests for return on public investment to ensure these programs do not result in higher delivered energy costs.

We recommend the current Micro-Generation Regulation be extended for a year in the interim.

Fostering Municipal Partnerships

Local governments have direct and indirect influence over a large portion of GHG emissions - from waste, buildings, transportation and urban form. Canada's municipalities have been at the forefront of taking action on climate change, and many Alberta municipalities are already implementing plans to mitigate carbon emissions.

“Compact and smart-growth land-use planning approaches reduce GHG emissions as do community and building orientation design techniques that are responsive to climate.”

- City of Calgary submission to the Panel

The provincial government should collaborate with, support and enable action at the local government level to achieve its emission reduction objectives. Further, we recommend that provincial government initiatives in transportation and other infrastructure decisions be chosen so as to not to interfere with regional plans and objectives relating to climate change and energy use.

The current review of the *Municipal Government Act* should integrate guidance to municipal governments on climate change, and the government should consider requiring GHG targets, policies and actions to be included in Official Plans. The review should also assess whether local government should be given expanded authorities to create alternative transportation infrastructure and energy-efficient housing or more compact neighbourhood design.

The province should support municipal climate efforts by ensuring that high-quality data is available for community energy and emissions inventories, facilitating access to modeling tools and establishing working groups to develop and transfer best practices and strategic guidance.

Transportation emissions make up a large slice of urban emissions: 33% of Calgary's emissions, and 30% of Edmonton's.³⁶ Expanded options for green transportation infrastructure, such as active transportation (walking and cycling), regional transit, bus rapid transit and light-rail transit, require substantial new investments. Municipalities are looking for increased provincial infrastructure grant flexibility to support transit oriented development, active transportation options and transit.

³⁶ Data from City of Calgary submission to the Panel; Edmonton presentation on transportation to the municipalities technical session.

Potential Outcomes

Energy efficiency improvements

With this level of programming in place in combination with the carbon pricing incentives, experience in other jurisdictions suggests Alberta could realize overall improvements in energy efficiency in residential, commercial and institutional buildings of at least a:

- 15% improvement in efficiency of electricity use by 2030; and
- 10% improvement in efficiency of natural gas use by 2030.

Given the extensive list of options provided above, setting an explicit target for energy efficiency improvements will be best done following further research. A specific target or set of measurable outcomes will be important in order to provide a mandate for the energy efficiency programs as well as a stringency test for regulatory initiatives.

Based on information provided from Alberta Environment and Parks as well as information from other jurisdictions, successful implementation of specific education, incentive and financing initiatives through investment of \$125 million could yield:

- emission reductions of up to 1.5 MT/year by 2020, and up to 3 MT/year by 2030;
- customer energy savings, exceeding program investments, of up to \$200 million per year in early years and growing to \$500 million in later years³⁷; and
- roughly 3,000 new local jobs in sectors such as trades, construction, retail sales, professional services and manufacturing.³⁸
- Additional impacts of regulatory changes, building labelling and micro-generation deployment are not included in these figures.

³⁷ These figures are derived from work done by Dunskey Consulting for the Alberta Energy Efficiency Alliance, available here: <http://www.aeea.ca/pdf/energy-efficiency-scenarios-for-alberta.pdf>

³⁸ Ibid.

TECHNOLOGY AND INNOVATION

It is critical for Alberta's climate policies to position the province for success in a carbon-constrained and potentially lower-growth world. In the near to medium term (now to 10+ years), technologies which allow for the production of oil and gas with significantly lower greenhouse gas emissions and energy input costs will be crucial to maintaining the province's resource value.

As detailed in the Climate Policy Landscape section, even as the world acts on climate change, there will be significant demand for oil and gas for mobility, heat and power. Alberta's challenge is to be able to maintain a position of a preferred, low-cost and low-emissions supplier in a potentially shrinking market. Some of this will come through securing efficient market access for our energy products, ensuring that our products are not immediately at a competitive disadvantage. To lower our costs and secure that market access, Alberta needs to demonstrate it is part of the solution to climate change.

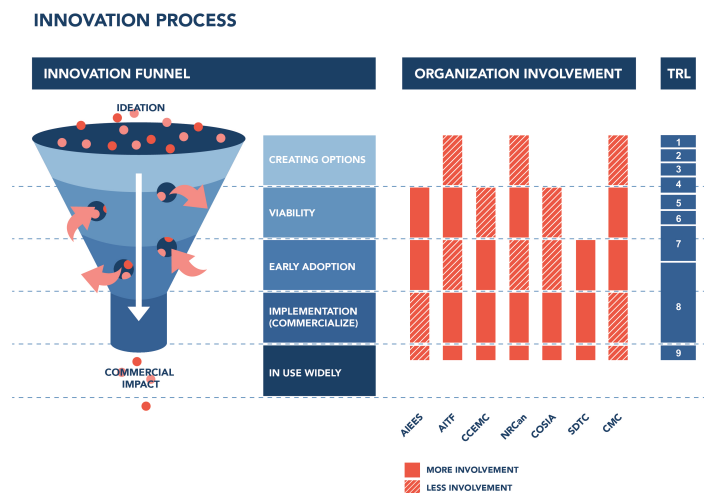
Beyond the near term, in which fossil fuel combustion will remain an important part of global energy demand, Alberta's fossil fuel resources will have lower value if we cannot develop the processes and technologies which allow their conversion to higher-value products designed for other purposes – carbon fibre, plastics, and other non-combustion supply chains.

Of course, new technology is not just about fossil fuels. In a carbon-constrained world, low emissions energy technologies and technologies which mitigate climate change directly will have an increasing value. Some of these technologies are already under development on our university campuses, government research facilities, and by our energy industry.

The strategic choice is clear. Alberta's innovation agenda must be a partner in the development and deployment of new technologies that will maximize the value of all our resources.

Our recommendation is for Alberta to invest in innovation, while re-focusing the Climate Change and Emissions Management Corporation (CCEMC) toward a portfolio-driven funding approach which invests in riskier ventures and re-examine our entire innovation system to ensure it provides the tools for success for a resource-rich province in a carbon-constrained future.

We also encourage the government to reduce barriers to the deployment of new technologies particularly in the oil sands, taking account of the significant inventory of existing project approvals. To that end, we've recommended that new projects be encouraged to adopt new technology with greenhouse gas emissions advantages and that any new project approvals be subject to the development of a satisfactory climate mitigation and adaptation plan.



Policy Recommendations

1. **Systems audit of Alberta's innovation infrastructure as it relates to climate change**
 - a. Re-design the CCEMC or create a successor with a portfolio driven funding approach allowing it to invest in riskier projects; and
 - b. Create of a Task Force with a four month timeframe to re-organize Alberta's innovation system for success.
2. **Ensure that oil sands project approvals inventory does not constitute a barrier to adoption of new technologies**
 - a. Allow currently-approved but not-yet-constructed projects to seek an amendment to their approvals to accommodate for new technology or improved designs which mitigate greenhouse gas emissions.
3. **Require a Climate Mitigation and Adaptation Plan as a condition for new project approvals.**

Why this Approach?

Alberta is experiencing major shifts in oil and gas supply and demand. Low oil and gas prices have created a need to enhance our competitive position in North America and the world. Being a relatively high-cost producer in markets with low prices is not an acceptable economic position for Alberta. The revenues from our non-renewable resources through royalties, corporate taxes and employment are crucial to our financial and social well-being. Alberta has already seen dramatic reductions in revenues as prices have fallen and jobs lost. The world's actions on climate change risk could further compromise Alberta's resource wealth by stranding our resources. The stakes of such an outcome are massive – in 2015, Statistics Canada estimated the total value of oil and gas reserves to be over \$500 billion CDN.³⁹ This value will no doubt have fallen significantly once the decline in prices is fully-reflected in estimates, but the share of Canada's total wealth which is held in resource stocks in Alberta will remain significant. Most of these resources are Crown-owned, and most are held in Alberta, so government needs to act on behalf of all resource owners to optimize value.

If the world moves to significantly reduce carbon emissions, there is unlikely to be a market for high-cost and high-emissions oil despite the remaining significant market overall. This is why we have specified a policy package which, according to our principles, enables and rewards innovation, recognizes best-in class emissions-intensity, and recognizes that, in the long term, carbon competitiveness of our oil sands and other fossil fuel resources will be crucial to Alberta's economy.

However, many participants in our process confirmed the urgent need for accelerating the pace, scale and scope of Alberta's technology and innovation efforts and progress. Throughout the Climate Leadership engagement process, we were told that our province's innovation and technology sector needs to be better focused for success with an emphasis on emissions-reduction. This enhanced focus can be achieved by declaring clear strategic challenges and desired outcomes and by ensuring that resources are delivered to support those goals.

³⁹ Statistics Canada, CANSIM Table 153-0121, Value of selected natural resource reserves, accessed November, 2015.

We heard about the need for improved collaboration among organizations who are part of Alberta's and Canada's innovation ecosystem. This includes universities, research institutions, companies, funders, governments and entrepreneurs. Innovation arises when you find new ways of working across boundaries and breaking down silos.

“A characteristic of successful innovative cultures is recognizing that research and development is a series of steps, often failures, that leads to overall success. Breakthrough technology programs recognize and incorporate the “freedom to fail”.

- Suncor Energy submission to the Panel

We also heard of exciting examples of new technologies and ideas already being explored. For example, radio frequency extraction technology for in-situ oil sands production is currently being piloted and this technology would be 50-75% less GHG-intensive than current techniques, bringing an oil sands barrel in line with much of the world's conventional resource. We heard “moonshot” ideas where the oil sands become a producer of hydrogen, while leaving the carbon in the ground. We also heard examples like carbon fibre where hydrocarbon molecules are used to create value-added products.

While our panel's work did not mandate that we fix the technology and innovation system, we believe that action in this area is of strategic importance to improving and accelerating Alberta's climate change policies. In this regard, framing our challenge as being *carbon competitive* captures both the need to be de-carbonize our energy system but also to be cost competitive.

Re-Imagining Alberta's Innovation Infrastructure

Thinking of the Alberta government as agent of the resource owner implies a higher level of engagement in research and development than would be optimal for a government looking at a traditional business operating in their jurisdiction. As a panel, we encourage the government to set specific goals for Alberta's research infrastructure with respect to the oil sands resource and examine whether the existing infrastructure, which spans universities, colleges, government agencies, and private sector consortiums like the Canadian Oil Sands Innovation Alliance (COSIA) provides the appropriate conditions for success.

We would recommend that goals be established both for short-to-medium term and longer term outcomes as follows:

- Short to Medium Term (now to 10 years)
 - Steam:Oil ratio performance improvement at an accelerated pace in existing SAGD projects.
 - Accelerate energy system design innovations including waste heat recovery and use and new regional and district energy and water systems.
 - In the next 10 years develop and commercially deploy Generation 3.0 technology for in situ production (50-75% net GHG reduction).
- Longer Term (now to 15-20yrs)
 - Fuels derived from oil sands are equal or less GHG intensive relative to North America and global conventional oil alternatives (net atmospheric benefit or not net increase in atmospheric GHG).
 - Transform our technologies for energy value creation from production to end use products such as plastics, carbon fibre, and other uses of our resource base.

As a panel, we are also concerned that government research entities, including the Climate Change and Emissions Management Corporation (CCEMC), may be hamstrung between funding already-promising technologies and deploying proven technologies versus taking risks which may lead to larger wins in the long term.

“The CCEMC mission is to accelerate the achievement of actual and sustainable reductions in greenhouse gas emissions and support climate change adaptation through partnerships and collaboration in the discovery, development and deployment of technology for application in Alberta.”

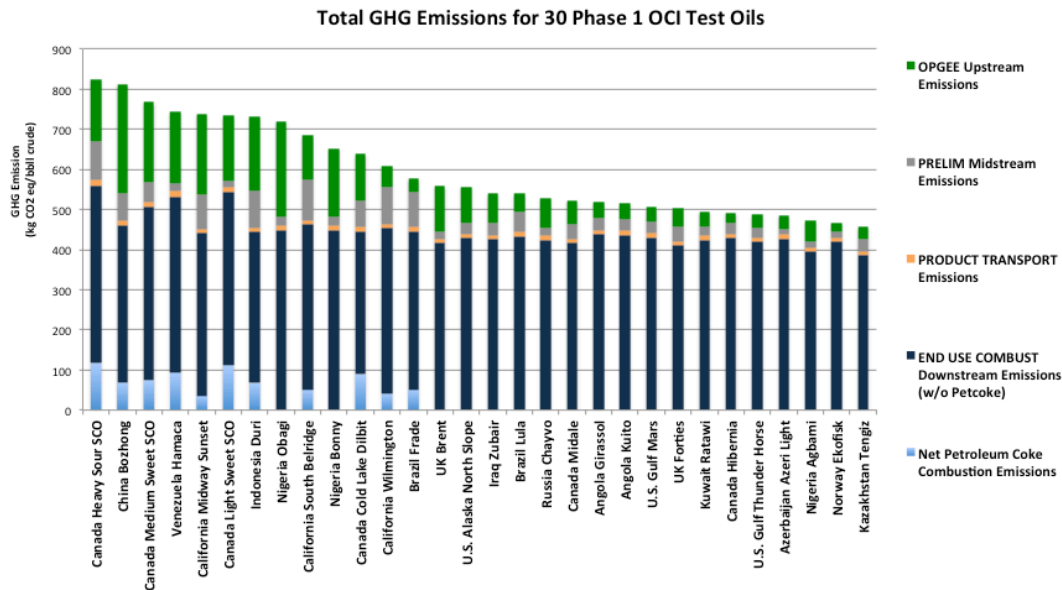
- Climate Change and Emissions Management Corporation

As a resource owner, Albertans have an interest in developing technologies which increase the value of the resource, improving environmental performance, and reducing greenhouse gas emissions. There is a case to be made that funding for risky technologies, which would normally be out of scope for a government, needs to be centre-stage. We are recommending a portfolio driven funding approach with a broader scope. It should include early stage research support, with the expectation that some of these efforts will not be successful. During our process, we were reminded that the oft-cited Alberta Oil Sands Technology and Research Authority (AOSTRA) project led to the development of steam-assisted gravity drainage (SAGD) technology for oil sands - a technology which unlocked billions of barrels of previously inaccessible bitumen. AOSTRA was the home of many failed attempts before finally finding success which has brought decades of prosperity to Alberta.

While we are advocating more risky investments in technology, there still needs to be significant oversight and clear metrics for success in place – while some risky investments in new technologies will fail, it is important that government funding not become the destination of last resort for technologies with a higher likelihood of failure.

Emphasis on low-emissions technologies for oil sands

Among global sources of oil production, oil sands crudes remain relatively emissions-intensive despite significant improvements over time. In the graphic below, recent work by Gordon et al. shows the relative life-cycle emissions associated with oil sands crudes. These findings mirror similar analysis done by Brandt in support of the European Union’s Fuel Quality Directive and by the U.S. State Department in the context of the recent decision on Keystone XL, by IHS CERA as part of their Oil Sands Dialogue, and in the findings by Jacobs Engineering in work commissioned by the Alberta Government via Alberta Innovates.



GHG Emissions for 30 crude oil streams including Canadian oil sands. Source: Gordon et al. (2015)

Life-cycle emissions figures can often hide the challenge of reducing emissions by inflating the totals, making differences in production emissions appear smaller than they are. We often hear that oil sands crudes are 5-15% more emissions-intensive on a life-cycle basis and that tailpipe emissions are 80% of the total. While both of these are generally accurate, combined they imply that to reduce life-cycle emissions by 5-15%, you'd have to reduce production and processing emissions by 25-75%. Meeting industry's aspirational goal of *good-as-conventional* will be a challenge. However, this cannot only be industry's goal – it must be a goal of the resource owner and joint venture partner in the development of the resource, the people of Alberta. While some facilities today have achieved performance which compares to conventional resources in other parts of North America, we still have a long way to go.

“According to IHS/CERA and Jacobs Engineering (working for U.S. DOE), the combination of ExxonMobil-patented paraffinic froth treatment technology and on-site cogeneration enables Kearn diluted bitumen, on a wells-to-wheels basis, to have per barrel GHG emissions comparable to the average of other crudes refined in the U.S.”

- Imperial Oil submission to the Panel

Thinking beyond oil sands, and beyond fossil fuels

Alberta has significant resources outside of the oil sands and it is important to consider the degree to which government research support can play a role in enhancing the value of the Crown-owned resource in these areas as well. We heard, and agree, that attention focussed on reducing emissions intensity of our emissions-intensive resources may have less return on investment than attention on extraction technology for our other resources. Often, the challenges these resource extraction technologies face is are not directly related to greenhouse gas emissions. In many cases, there are technologies which would enable more capture and use of methane (which would otherwise be vented), better management of gases requiring flaring, and applications of alternatives to thermal energy and water for extraction of conventional resources.

“The Last Mile flare gas capture and CNG fuel supply solution captures natural gas that would otherwise be flared (...) and delivers CNG to oil and gas sites to fuel exploration and production operations.”

- Ferus submission to the Panel

We also heard, and agree, that Alberta’s human resources present an important opportunity for advancement in areas not linked to fossil fuels but linked to other energy sources and transformation technologies. Recall that, in its most recent projection, the International Energy Agency estimated that \$50 trillion will be invested globally in cleaner electricity supply and end-use efficiency between now and 2040 as the world acts on climate change. Global markets for all forms of energy supply and technology will present opportunities for Alberta in a carbon constrained world. Our research infrastructure must be prepared to look at how to render Alberta’s resources compatible with the economy of the future, and at how to leverage Alberta’s human resources, educational system, and research infrastructure so they are best-positioned to take advantage of this transition.

Regulatory Changes

Approved project application of new technologies

Many participants in our process raised concerns that, despite the development of new technologies, these technologies were not readily-applied in already-approved projects. This is a particular issue for oil sands, where a substantial inventory of approved-but-not-yet-constructed projects exists. Project proponents will not want to re-open the regulatory proceedings for their project unless the gains to application of a new technology are substantial and justify the regulatory risk, and so the potential exists for sub-optimal development and deployment of emissions-saving technologies.

There is an opportunity for a regulatory process improvement which would complement our proposed carbon pricing system, which rewards design-phase improvements and lower overall emissions intensities in projects. If the government, via the Alberta Energy Regulator, were to allow a low-risk opportunity for amendments to project approvals in the case of emissions-reducing technology, this would lower the regulatory risk of such an application. In making these applications more likely to succeed at lower overall risk to the project, the government will have increased the rewards to innovation for companies who already have a substantial queue of approved projects – a positive feedback loop which would make new technologies more likely to be developed.

Complementary Policy – Climate Mitigation and Adaptation Plans

This recommendation would not require a change in legislation. It would be a change of regulations.

It would be analogous to requirements to include a Reclamation and Remediation Plan for projects to address risks of closure and abandonment. Climate risk has become significant enough to long term projects that it needs to be treated in a similar, explicit manner.

The investment community, as indicated by the Climate Disclosure Project (CDP), already requests company disclosure of climate risk management practices. It is a logical progression to have climate risk be included in review and approval processes.

We envision that this would focus on:

- Direct GHG emissions,
- Design enhancements to minimize GHG emissions intensity,
- GHG Compliance plans for provincial and federal policies,
- New technology/innovation plans, and
- Mitigation plans for climate risks including severe weather, drought conditions, forest fire frequency.

“Companies are hesitant to change an application, to use a better-suited piece of equipment for example, because it will cause delays in the regulatory process”

- Cenovus Energy submission to the Panel

Future project approvals

In the oil sands sector, a substantial inventory of leases exists without approved developments. Given the present pricing environment, there is limited interest in new development permits, but that may change. We recommend that the government direct the Alberta Energy Regulator (AER) to specifically consider greenhouse gas emissions within project approvals, and to design a system by which all new oil sands projects would be required to submit and have approved a Climate Mitigation and Adaptation Plan. This would ensure that best available technology for emissions reductions which is economically and technically viable has been deployed and that the projects have considered potential implications of climate change on their development plans. If this proves cost-effective, it could also be extended to new oil and gas project approvals, though these tend to be smaller in scope. This will enable the Alberta Energy Regulator (AER) to engage with firms on technology opportunities and choices and to evaluate resilience of projects to climate risk and opportunity and to ensure that technologies like those discussed above are deployed as available in both oil sands and conventional oil and gas.

Potential Outcomes

Our recommendations in this section are more qualitative, so it is more challenging to establish specific, expected outcomes. However, a successful innovation infrastructure and complementary regulatory structure in Alberta will enhance the value of our resources, leverage partnerships with industry, academia and other jurisdictions and ensure that Alberta’s economy is as well-positioned as possible for a carbon-constrained world.

When Should These Recommendations be Enacted?

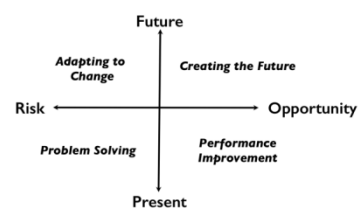
The evaluation of Alberta’s innovation infrastructure is already ongoing and so applying the energy technology add-on to that evaluation should occur as soon as practically possible, and that should include the examination of research and innovation beyond the oil sands sector. The regulatory changes should be enacted as soon as possible in consultation with the Alberta Energy Regulator.

Interactions with Other Proposed Policies

Technology and innovation requires that markets be created for new technologies and opportunities. A carbon price is foundational to creating markets and our proposed carbon pricing architecture enhances the rewards for innovation both at the design phase and on an on-going basis.

The use of performance-based allocation engages creative tension within and between firms. It creates a clear advantage to low emissions intensity facilities, while maintaining a collective interest on making the oil sands resource competitive against other oil resources in the world. Striving to achieve the *good-as-conventional* benchmark over time will cause new technologies to be advanced and deployed. Global markets have also signalled the value of low-emissions resource products and so innovation on this front will allow Alberta’s resources to remain competitive under policies like California’s Low Carbon Fuel Standard and the European Union’s Fuel Quality Directive.

Technology and Innovation Strategic Intent



ABORIGINAL COMMUNITIES

Aboriginal people and communities are particularly vulnerable to the impacts of climate change.⁴⁰ Indeed, many Aboriginal people rely on the land for food and income security - the customary distribution and sharing of harvested food is an important cultural practice, as well as a significant support for the most vulnerable.

Adopting effective climate change policies will help to reduce Alberta's emissions. It also will contribute to building cooperation among jurisdictions and momentum on climate policy development. This will benefit all Albertans, but particularly those most heavily affected by climate change, including Aboriginal communities.

In preparing and implementing new climate policy, Alberta has an opportunity to greatly improve its relationship with Aboriginal people, communities and organizations.

Relevant Policy – UN Declaration of the Rights of Aboriginal Peoples

To fulfill the principles of the UN Declaration, the Alberta government has committed to work with Aboriginal peoples as true partners to ensure that:

- their constitutional rights are protected;
- the air, land and water that all Albertans rely on is protected; and
- they can build more prosperous, self-reliant and culturally strong communities.

Policy Recommendations

- 1. Establish a defined process in which the government works directly with Aboriginal communities and traditional knowledge systems to ensure Treaty and other Aboriginal rights are understood and addressed as policies for climate solutions are refined and implemented.**

This process should be designed to develop

- a better understanding of the direct and cumulative impacts of climate change and climate change mitigation mechanisms (carbon trading, carbon tax, offsets), as well as policies and legislation for both the government and the communities themselves.
 - a resource centre to provide better data and information related to Aboriginal peoples and climate change.
 - a process to make this information available to Aboriginal and non-Aboriginal communities.
- 2. Aboriginal communities should be specifically considered in energy efficiency initiatives, in the development of new low-carbon and renewable energy opportunities and in revenue recycling policies related to carbon pricing.**
 - This should include development of community-based energy plans that can provide the basis for public and private investment in energy security and resilience, as well as opportunities for economic development and diversification.
 - It should also include policies for low income support, energy efficiency upgrades, renewable energy investments and climate monitoring programs.
 - 3. The Government should develop and implement, in full consultation and collaboration with Aboriginal peoples in Alberta, a process that will provide opportunities for Aboriginal leadership on climate change adaptation.**

⁴⁰ Assembly of First Nations, "Honouring Air" www.afn.ca/index.php/en/honoring-air.

Why This Approach?

It is expected that many Aboriginal communities in Alberta will experience the impacts of climate change in ways that most non-Aboriginal Canadians will not, due to factors including their locations, their economic situations and their reliance on the environment. A report prepared for the Assembly of First Nations by the Center for Indigenous Environmental Resources highlights the potential for significant impacts on:

- water quality and quantity;
- landscapes and species;
- land use and traditional activities, including hunting and gathering;
- access to their territories;
- languages and the transmission of culture and Traditional Knowledge;
- community infrastructure; and
- social well-being, diet and health.⁴¹

Ultimately, the effects of climate change may impact the ability of Aboriginal Peoples to exercise Treaty and other Aboriginal rights guaranteed by Canada's Constitution. Protecting Treaty and Aboriginal rights is, in the Panel's opinion, both a requirement and an opportunity for the development of Alberta's new climate policy.

Carbon Pricing

Carbon pricing is an important part of our panel's proposed policy architecture. We recommend that carbon pricing be made consistent with other taxation policies as they relate to Aboriginal communities and their members.

Revenue Recycling

One of the benefits of carbon pricing is that it provides revenues that can be used for a number of purposes.

Our panel believes that Aboriginal communities and their members should be expressly taken into account in those investments, including:

- Aboriginal monitoring of climate impacts;
- Aboriginal community climate adaptation projects;
- energy efficiency upgrades for Aboriginal community housing and off-reserve housing;
- renewable energy projects for Aboriginal communities;
- boosting income supports for lower income people in order to offset potential higher energy costs (in recognition of the fact that Aboriginal people are disproportionately represented among lower income groups);
- transit infrastructure and operating funds (in recognition of the fact that lower income people often rely on public transit).

This list is not complete, and indeed it can only be completed successfully through a process of engagement with Aboriginal communities.

⁴¹ Centre for Aboriginal Environmental Resources, "How Climate Change Uniquely Impacts the Physical, Social and Cultural Aspects of First Nations" Prepared for Assembly of First Nations, March 2006
www.afn.ca/uploads/files/env/report_2_cc_uniquely_impacts_physical_social_and_cultural_aspects_final_001.pdf.

Summary

The policy package we have proposed combines a carbon pricing approach which broadens and improves the carbon pricing system in place in the province today. Bringing approximately 90% of emissions under a carbon pricing program will leverage the market to deliver the lowest-cost emissions reductions possible within our economy, while allowing individuals and firms to make decisions about how best to change behaviour, deploy new technology and improve production processes.

We've recommended that Alberta's carbon price be set at \$30/tonne, a level as high as any jurisdiction in North America today. Alberta should also commit to increasing that price over time, as long as comparable increases occur in other provinces and in other jurisdictions with which we compete for capital investment.

We've recommended that output-based allocations, or emissions permits provided at no charge on the basis of production, be provided to firms in trade-exposed sectors including oil and gas and some processing and manufacturing. Alberta's economy is far more dependent on emissions-intensive and trade-exposed industries than other economies in Canada, and we have borrowed from designs implemented in Quebec and proposed for Ontario which prevent an outcome where climate policies simply lead to relocation of emissions rather than real emissions reductions. We've recommended that the same approach be used in the electricity sector to minimize adverse impacts associated with increased electricity prices.

Climate change policy will not make everyone better off – there will be those who will be made worse off, and we've taken care to provide recommendations to minimize these negative impacts. We've proposed a consumer rebate which would be sufficient to offset the impact of carbon pricing on most households in the bottom 60% of income in Alberta, and would make most low-income Albertans much better off. We've also proposed protection and transition funding for displaced workers and affected communities, as well as funds to ensure that new opportunities created by our proposed policies are taken advantage of by providing necessary skills training. In each of these areas, we've emphasized the need to include Aboriginal peoples in programs providing protection for vulnerable communities and in the opportunities provided by skills training. Finally, we've proposed significant new investments in technology to ensure that our oil and gas resources are not stranded by global action on climate change and the effects that will have on demand for high-emissions and high-cost sources of energy.

Carbon pricing alone will not lead to the optimal climate change policy for Alberta. We've complemented our carbon pricing policy with proposals to green the electricity grid, reduce methane emissions in oil and gas, and promote energy efficiency as well as recommendations for improvements in the innovation infrastructure in Alberta. We've also proposed both concrete and qualitative initiatives for collaboration with Aboriginal peoples.

In the electricity sector, we've proposed that carbon pricing be complemented with specific actions to increase the supply of renewable electricity and accelerate the phase out of coal-fired power, while leveraging the province's abundant natural gas resources.

In the oil and gas sector, we see an opportunity for a collaborative, market-based approach between government, academia, industry and environmental groups in developing a program to reduce methane emissions, over and above that which would be accomplished through carbon pricing and regulatory approaches alone.

The role of technology in each of the sectors above will be crucial, and we've outlined areas where there is a specific role for the Government of Alberta to play in driving innovation. As the agent for Albertans - the owners of the oil and gas resources - the government has a responsibility to engage in research and development in areas which can enhance the value of those resources. We recommend both a modified and broadened strategy to ensure that optimal investment occurs in research, development and deployment of new technologies relevant to Alberta's resource endowments.

The importance of energy efficiency in the mitigation of climate change cannot be overstated: decoupling economic growth and quality of life from energy use will allow deeper emissions reductions at lower costs. In our recommendations, we've proposed the basic architecture for a provincial energy efficiency program which borrows from the most innovative jurisdictions in North America. We've also recommended that controls be put in place to ensure those resources are deployed cost effectively, progressively and, where appropriate, in partnership with Alberta's municipalities and Aboriginal peoples.

Aboriginal engagement was a core element of our mandate, and we've delivered a set of recommendations to the government for improving our province's partnerships around climate change. Our panel believes that Aboriginal communities, organizations and their members should be expressly taken into account in investments devoted both the climate change mitigation and to future work on climate change adaptation. We've explicitly included consideration for impacts on Aboriginal peoples and communities of carbon pricing in our revenue recycling proposals, to ensure that vulnerable communities are not disadvantaged. We've recommended that specific supports be provided in energy efficiency programming, in the oil and gas methane reduction program and in the renewable energy procurement process to ensure that Aboriginal peoples can participate with full agency both in mitigation of existing emissions and in the deployment of new energy technologies in Alberta.

With these recommendations, we feel we have provided a policy package which best suits Alberta's current situation and allows the province to contribute meaningfully to national and international efforts to combat climate change.



Appendix

CONTENTS

1. Glossary
2. Panel Mandate
3. Submissions to the Panel

1. GLOSSARY

Active transportation includes any form of human-powered transportation – walking, cycling, in-line skating or skateboarding. Active transportation could mean walking to a store or to the bus stop, or riding a bike to school or work.

Alberta Energy Regulator (AER) ensures the safe and environmentally responsible development of hydrocarbon resources over their entire life cycle.

Bioenergy is energy derived from biomass.

Biomass comprises the organic materials made from living organisms, such as crops, crop residue, trees, wood and animal residue that have stored sunlight in the form of chemical energy. Biomass can be used directly to produce biofuels or other products or it can be burned to create heat or electricity.

Biosequestration is the capture and storage of carbon dioxide through biological sink processes, including increased photosynthesis through practices such as reforestation, preventing deforestation and land degradation, genetic engineering, enhanced soil carbon storage in agriculture or enhanced production of algae.

Cap and trade describes a set of policies in which government sets a cap on total emissions and establishes allowances to emit up to the cap. Emitters are allowed to buy, sell or bank allowances to meet the emission cap. A cap and trade system has an environmental outcome that is certain (based on the cap). However, the cost of emitting depends on the demand for permits relative to the cap (or supply).

Carbon capture and storage (CCS) is the process of capturing waste carbon dioxide (CO₂) from large point sources, such as fossil fuel power plants, transporting it to a storage site, and depositing it where it will not enter the atmosphere, normally an underground geological formation. The aim is to prevent the release of large quantities of CO₂ into the atmosphere (from fossil fuel use in power generation and other industries).

Carbon leakage occurs when there is an increase in emissions in one jurisdiction as a result of an emissions reduction in a jurisdiction with a strict climate policy. Carbon leakage may occur if an emissions policy raises local costs thereby giving another jurisdiction with a more relaxed policy a trading advantage.

Carbon offsets are voluntary reductions in greenhouse gas emissions, which can then be purchased by another party to offset their emissions levels.

Carbon pricing is a price on carbon emissions that provides a financial incentive for emitters to reduce their emissions. This can spur the adoption of technology, efficiency and conservation, and provides emitters with flexibility to reduce emissions in a way that best suits their individual processes, abilities and circumstances.

Carbon tax system is a tax, fee, or levy payable to the government per tonne of emissions. This price can be applied to all emissions or to a portion of them. A carbon tax has the benefit of providing certainty in terms of cost. One tonne = a set price, such as \$30/tonne. Companies and consumers have the choice to pay the tax or to avoid emissions.

Clean vehicle technology includes hybrid, electric, natural gas, and hydrogen fuel cell vehicles.

CO₂e (carbon dioxide equivalency) is a metric measure used to compare the emissions from various greenhouse gases based upon their global warming potential (GWP).

Cogeneration and combined heat and power is the simultaneous production of electricity and heat from a single fuel source. Cogeneration and combined heat and power systems can range in size from

residential, to community, to industrial scale facilities. Natural gas is a common fuel source, but cogeneration and combined heat and power systems can also operate using other energy sources such as biomass and solar energy.

Conventional crude oil usually refers to light, medium and heavy hydrocarbons like those produced from the Western Canadian Sedimentary Basin, an area that includes Alberta.

COP21 – Conference of the Parties, known as the 2015 United Nations Climate Change Conference, is the annual meeting of all parties to the United Nations Framework Convention on Climate Change. This year, the conference aims to achieve a legally binding and universal agreement on climate change and to keep global warming below 2 °C. COP21 will be held in Paris, France from November 30 to December 11, 2015.

Crude oil is a naturally occurring mixture of hundreds of different hydrocarbon compounds. Crude oils are generally differentiated by their density (heavy or light) and their sulphur content (sweet or sour). Bitumen, or the product derived from Alberta's oil sands, is an extra-heavy, sour crude oil.

Decile is any one of the nine values that divide the sorted data into ten equal parts, so that each part represents 1/10 of the sample or population.

Demand Side Management (DSM) refers to mechanisms such as incentives and education programs designed to modify consumer demand and use of energy.

District energy systems (DS) centralize the production of heating or cooling for a neighbourhood or community. Most district energy systems generate heat at a central plant, or extract heat from other sources. The heat is transferred to a fluid and distributed via underground pipes to buildings where it is used for space and water heating.

Emissions-intensive and trade-exposed (EITE) refers to large industrial emitters with a substantial exposure to emissions costs and that compete at a provincial, national and/or global level and are therefore exposed and vulnerable to competitive market conditions. Exact definitions vary across carbon policy implementation.

Feed-in tariff (FIT) is a contract for renewable energy which sets a long-term (e.g. 20 years) contracted price based on the cost of producing renewable energy, plus a reasonable rate of return.

Flaring is the controlled burning of gases in the course of oil and natural gas production, in maintenance, or in emergency circumstances requiring a release of pressure by removing the gas. Flaring converts methane emissions contained in the gas largely into carbon dioxide. Flaring and venting most often occur where there is a lack of facilities to otherwise capture the natural gas or where it is not economic to do so.

Fugitive emissions are unintentional leaks of greenhouse gases from equipment or pipelines.

Gigajoule is typically used to measure energy content of natural gas, and is equal to one billion joules. A joule is a unit of work or energy. A typical home in Alberta consumes approximately 135 gigajoules of natural gas per year.

Good-as-best-gas standard is a requirement that an emitter produce no more greenhouse gas emissions per unit of production than the cleanest natural gas-fired generation system.

Green/clean power call is a practice that is similar to a reverse auction, where prospective renewable energy providers compete to fill a demand for renewable energy by bidding (low) levels of support required from governments.

Greenhouse gas (GHG) is an atmospheric gas that absorbs and emits heat into the atmosphere. The primary greenhouse gases in the atmosphere are carbon dioxide, methane, nitrous oxide, ozone and

water vapour.

In situ production is used for bitumen deposits buried too deep for surface mining. Steam, sometimes with additives like solvents, is injected through a well into the bitumen deposit to make the bitumen flow to the point it can be pumped to the surface.

Intended Nationally Determined Contributions (INDCs) are agreements that outline a country's commitment along with the actions it will take to address climate change. INDCs signal to the world what a country is willing to do to limit climate change.

Large final emitters are facilities that produce a large amount of direct greenhouse gas emissions. In Alberta, the Specified Gas Emitters Regulation sets this as 100,000 tonnes or more of carbon dioxide equivalent annually.

Lifecycle emissions (from the Greenhouse Gas Protocol) are all the emissions associated with a specific product or process, from cradle to grave, including emissions from obtaining raw materials, manufacturing, transport, storage, sale, use and disposal.

Methane is the main component of natural gas. Methane is an abundant fuel that can be found below ground and under the sea floor. While methane is a useful fuel source, when released directly into the atmosphere it becomes a greenhouse gas.

Micro-generation is the small-scale generation of heat and/or electric power by individuals, small businesses and communities to meet their own needs, as alternatives to traditional centralized grid-connected power.

Megatonne (Mt) = one million tonnes.

Megawatt (MW) is a unit of energy equal to 1,000,000 watts, or 1,000 kilowatts. Electricity generation facilities are often described based on their generating capacity, in megawatts. For example, depending on the technology, a single commercial-scale wind turbine has a capacity of 1 to 4 megawatts (1 to 4 million watts), whereas a rooftop solar panel typically has a capacity of about 250 to 300 watts.

Megawatt hour (MWh) a unit of energy (in millions watts) supplied over time (in hours). One megawatt hour is one million watts of energy supplied for one hour, and a 100 watt light bulb would use 0.876 megawatts of electricity if used consecutively for an entire year. A typical home in Alberta consumes approximately 600 kilowatt hours, or 0.6 megawatt hours per month.

Natural gas is a mixture of hydrocarbons. While mainly methane, other hydrocarbons include ethane, propane and butane. Water, oil, sulphur, carbon dioxide, nitrogen and other impurities may be contained in the gas when it is produced.

Oil sands or bituminous sands are naturally occurring mixtures of sand, clay or other minerals, water and bitumen. Bitumen is heavy and extremely viscous oil that is too thick to flow in its natural state and requires special methods to bring it to the surface.

Output-based allocation is a method of allocating emission permits according to current or historical production.

Pool price is the price of one megawatt hour of electricity at the end of a given hour that is paid to electricity generators for supplying electricity to retailers (such as a local service provider).

Quartile is a statistical term describing a division of observations into four defined intervals based upon the values of the data and how they compare to the entire set of observations.

Refining is the process of converting conventional and synthetic crude oil into oil-based products and petrochemical feedstock.

Renewable Energy Certificates (REC) are financial vehicles which ‘uncouple’ the renewable energy attributes from the power generated by a facility and allows them to be sold separately. Some jurisdictions allow utilities to use RECs to comply with greenhouse gas emissions reductions targets, but they are most often used for compliance with renewable portfolio standards.

Renewable energy comes from resources which are naturally replenished on a human timescale, such as sunlight, wind, rain, tides, waves, and geothermal heat. Alberta has a significant potential for increased renewable energy development across the province.

Revenue recycling involves funds generated from carbon emissions that are returned to the economy to support emission reducing activities at the consumer or industry levels.

Royalties, with respect to Alberta-owned natural resources, are payments that government receives on behalf of Albertans, as the resource owner, for allowing industry to develop and produce those resources.

Sour gas refers to natural gas containing significant amounts of hydrogen sulfide. It is a colourless, flammable gas and is poisonous to humans and animals.

Specified Gas Emitters Regulation (SGER) came into effect in 2007. It requires facilities that emit 100,000 tonnes or more of greenhouse gases a year to reduce their emissions intensity. In Alberta, the marginal price of carbon is set by the province under the SGER, being \$15/tonne today and rising to \$30/tonne in 2017.

Unconventional resources generally refers to differences in the types of source rock that they are found in and the methods used to extract them. For example, unconventional resources require special production methods that fracture the rock to allow oil and gas to flow through, or require the addition of thermal energy for extraction.

Upgrading is the process of converting heavy oil or bitumen into synthetic crude oil so it can be handled by conventional light oil refineries. Upgrading often includes reducing viscosity so that it can be pumped through pipelines, separating out the heaviest hydrocarbons and reducing sulfur, nitrogen and metals as well as sediments and water.

Venting is the direct release of natural gas, which is predominately methane, into the atmosphere without burning. Methane is over 20 times more potent in global warming potential, over a 100-year period, than carbon dioxide. Venting largely occurs during crude oil production but it also occurs throughout the entire oil and gas industry.

West Texas Intermediate (WTI) is the light crude oil benchmark contract for North American markets.

Western Canada Select (WCS) is the heavy crude benchmark contract for western Canada.

Western Climate Initiative (WCI Inc.) is a non-profit corporation that provides administrative and technical services to support the implementation of state and provincial greenhouse gas emissions trading programs. The Board of Directors includes officials from the provinces of Quebec and British Columbia, and the State of California.

2. PANEL MANDATE

SCHEDULE 2

CLIMATE CHANGE ADVISORY PANEL

MANDATE

Overview

The Climate Change Advisory Panel (the Panel) will be responsible for reviewing Alberta's existing climate change policies, engaging with Albertans, and providing the Minister of Environment and Parks with advice on a comprehensive set of policy measures to reduce Alberta's greenhouse gas emissions.

The Panel will provide feedback to the government in the fall of 2015 on what it hears from Albertans about actions to reduce emissions from all sources. This advice will inform the development of a comprehensive plan that demonstrates to the world Alberta's commitment to address climate change.

The Panel's Role

The Panel will engage with the public, technical stakeholders and Aboriginal Peoples and will provide advice to the Minister of Environment and Parks based on what it hears from that process. The Panel will create forums where it can listen to and ask critical questions of Albertans to bring a wide range of perspectives to that advice. Members of the Panel are accountable to the Minister of Environment and Parks.

Desired Outcomes

In October 2015 the Panel will provide comprehensive advice to the Government to inform the development of a new climate change action plan. This advice will reflect:

- o The current knowledge and expertise of the Panel members;
- o What the Panel learns from engaging experts and Aboriginal Peoples; and
- o What the Panel hears from Albertans.

The Panel's advice to the Government will include:

- o An assessment of Alberta's existing greenhouse gas regulations, policies and programs to achieve greenhouse gas reductions;
- o Key themes from engaging Albertans regarding policies and actions to achieve reductions across all sectors of the economy; and
- o Guidance on economic, social and environmental considerations related to a range of possible greenhouse gas reduction goals and specific program and policy actions to support the proposed outcomes.

Resources

The Panel will have full access to the information and resources of the Government of Alberta and, as independent data or information from other jurisdictions is required, the Panel will be provided the resources to obtain it. The Panel will also invite industry, municipalities, experts and Aboriginal Peoples communities to contribute to and engage in the mutual understanding of the complex and varied nature of the topics to be considered.

3. SUBMISSIONS

For the full suite of submissions to the Panel, please visit: <http://alberta.ca/climate/leadership-discussion.cfm>