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CANADIAN ASSOCIATION OF PETROLEUM PRODUCERS

Investment of Carbon Proceeds into Oil and Gas Production Operations:

Making the case for the oil and gas sectors ability to contribute to provincial emissions reductions and economic growth

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Building on leading carbon policy introduced in Alberta more than a decade ago and in parallel with national, provincial and local governments under the Paris Climate Agreement, Alberta has committed to significant economy level policy measures aimed at greenhouse gas emission reductions. Alberta’s Climate Leadership Plan (CLP) defines the path forward and includes four main policy measures:

- Implement a new price on greenhouse gas emissions.
- Phase out pollution from coal-generated electricity and generate 30% of electricity from renewable sources by 2030.
- Cap oil sands emissions at 100Mt CO2.
- Reduce methane emissions from upstream oil and gas production by 45% from 2014 levels by 2025.

The new price on greenhouse emissions included an extension of the Specified Gas Emitters Regulation (SGER) through 2017. Under the SGER large industrial emitters were required to meet a facility level intensity based emissions reduction target and afforded several compliance mechanisms. This resulted in facility level reductions, Alberta offset project deployment, and funds paid by industry of approximately $740M to Alberta’s Climate Change and Emissions Management Fund (the Fund). The Fund proceeds were leveraged across many projects "to identify and accelerate innovative solutions that secure Alberta’s success in a lower carbon economy" including innovative pilot projects put forward by companies and facilities in the oil and gas sector.
Looking beyond 2017, and in sync with the Pan-Canadian Framework on Clean Growth and Climate Change and the Greenhouse Gas Pollution Pricing Act, Alberta has implemented a new mechanism, the Carbon Competitiveness Incentive Regulation (CCIR), to replace the SGER and bring in output-based allocation using product level standards for large industrial emitters. Further, Alberta has imposed an economy-wide carbon levy on fossil fuels of $20/t in 2017, $30/t in 2018, and an intention to gradually increase the price thereafter to $40/t in 2021 and $50/t in 2022 in order to stay in step with the federal carbon pricing backstop. Over the next 3 years, revenue from the CLP, including the carbon levy, is expected to raise $5.4 billion, all of which has been committed to be reinvested in the economy and rebated to Albertans. It is expected that $1.3 billion will come from large industrial emitters via CCIR Fund payments of which $700M is expected from oil and gas sector operations alone.

The CLP and the Climate Change Advisory Panel have correctly asserted that proceeds of carbon must be deployed fairly (across all sectors of the economy) and cost effectively ($/tCO2) in order to drive emissions towards the aggressive 2030 and 2050 emission pathways. To that end, The Canadian Association of Petroleum Producers believes that investing proceeds into the oil and gas will result in; cost effective emissions reductions, deployment of technology, and significant economic benefits for the province.

ICF, a global consulting services company established in 1969 with over 5,000 specialized industry experts, was engaged to assess the abatement opportunity and worthiness of the oil and gas sector to deploy carbon fund investment cost effectively and the shape structure of a carbon proceed funded vehicle should take in Alberta. The main conclusions are provided here and the full analysis and discussion follows.

Between 2018 and 2020 Alberta oil and gas sector’s compliance obligation under the CLR and CCIR could total $700M.
Executive Summary

- Over the next 3 years the oil and gas sector will contribute $700M via the Carbon Competitiveness Incentive Regulation and the economy-wide carbon levy on fossil fuels.

- Global and national energy and deep decarbonisation studies forecast demand for oil and gas will remain relevant / robust beyond 2030 and 2050.

- The billions of dollars of petroleum energy infrastructure deployed in Alberta, enabled with access to a 170 billion barrels of bitumen reserve, will remain productive and competitive in the national, continental and global markets for oil and gas.

- Albertan and Canadian oil and gas operations are a "going concern" – able to continue operating for a period of time that is sufficient to carry out its commitments, obligations, and objectives – and therefore worthy of consideration for capital investment.

THE SCALE OF COMPETITIVENESS PRESSURES FOR CANADIAN PROVINCES, 2015
SOURCE: CANADA’S ECOFISCAL COMMISSION AND NAVIS RESEARCH
According to a recent report published by the Ecofiscal Commission of Canada, Alberta will have the most stringent carbon policy in Canada by 2020. Compliance burden has the potential to weaken this important economic sector. Facilities that are faced with increased operational costs become less competitive / profitable vs. other facilities in jurisdictions with no or less stringent regulation. This can ultimately give rise to "leakage" of production and emissions outside of the province. The figure below illustrates the competitiveness pressures faced by provinces in Canada under a $30/tonne provincial carbon price. This figure was produced in the Ecofiscal Commission 'Choose Wisely' study. The carbon cost for "more exposed" sectors, indicated in red, is greater than 5% of the sector's GDP. The "more exposed" sectors also have a trade exposure >15%. This figure indicates that Alberta and Saskatchewan are more exposed to competitiveness pressures that arise from carbon pricing compared to other provinces.

The oil and gas sector in Alberta and across Canada has significant (tens of millions of tonnes) cost effective (less than $90/t-CO2e) abatement potential that include a range of 'low hanging fruit' that could be implemented in the short, medium and long-term.

Key challenges prevent the sector from deploying potential solutions without incentivization; competition for capital (within and between operations) and the "compliance trap" limiting access to constrained capital as a result of compliance obligations.

As a result of the reasonably young and long lived oil and gas assets, proven cost effective abatement options, and objective of the CLP to deploy carbon proceeds fairly (across all sectors of the economy) the sector is not only worthy of consideration but worthy of allocation of funding and investment.
• Emissions Reduction Alberta (ERA) designed to promote innovative early stage game changing technologies from idea to market and compliance driven action will also drive reduction in prescribed areas. However, a gap exists in incentivizing proven emission reducing actions at scale through a programmatic approach.

• Allocation or recycling carbon revenues collected from the oil and gas sector back into their operations through a perpetual, well-funded, dedicated vehicle is one of the most effective ways to meet objectives related to the transition to a low carbon economy, including those contained in the Alberta Climate Leadership Plan (ACLP).

• As illustrated below several proven measures alone could reduce annual oil and gas emissions by 16.5 Mt-CO2e, or more than 10% of the sector’s current emissions in Alberta.

Recycling carbon revenues could drive significant reduction in emissions within the oil and gas sector from proven measures, cost effectively, within the 2018-2030 time frame.
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1. The Changing Environmental and Energy Landscape

1.1 Evolution of Carbon Policy

Carbon pricing was introduced in Alberta more than a decade ago (2007) with the Specified Gas Emitters Regulation (SGER), a GHG emissions reduction policy targeted at large industrial facilities that emit ≥100,000 tonnes of greenhouse gases each year. Under this emission-intensity based mechanism, large industrial facilities were required to reduce their emissions per unit of production by 12% relative to their historic performance. Where emissions reductions were not attained through improvements made at the facilities, companies could alternatively opt to:

- use emission performance credits generated at facilities that achieve more than the required reductions
- purchase Alberta-based carbon offset credits
- contribute to Alberta’s Climate Change and Emissions Management Fund (“the Fund”)

The facility specific intensity-based emission reduction target based on historic performance is consistent with programs globally and incentivizes reductions at industrial facilities while appreciating the need to avoid leakage and enabling growth in production. However, as shown in Figure 1, SGER facilities achieved the majority of compliance through offsets purchases (20%) and Fund contributions (42%), rather than through facility emission reductions.

From 2007 to 2015, $740M was paid into the Fund. Those proceeds paid into the Fund enabled a diverse portfolio of research and development projects and clean technologies to be deployed as an outcome of the SGER legislation to help innovators bring technologies to commercialization. The mandate of Emissions Reduction Alberta (ERA), which administers the Fund, is “to identify and accelerate innovative solutions that secure Alberta’s success in a lower carbon economy”, focused on transformative technologies in the context of Alberta’s economy and emissions profile. The innovation system priorities that inform ERA’s areas of focus are:

![Figure 1 Total 2007-2015 SGER Abatement and Compliance Actions](image)

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5 Formerly the Climate Change and Emissions Management (CCEMC) Corporation
- Reduced GHG footprint of fossil fuel supply
- Low Emitting Electricity Supply
- Biological Resource Optimization
- Industrial Process Efficiency

The upstream oil and gas industry has a major role to play in achieving these focus areas, and in particular is critical to Alberta’s ability to reduce the footprint of fossil fuel supply and driving industrial process efficiency. As shown in Figure 2 below, the Fund enabled 121 projects, including innovative pilot projects put forward by companies and facilities in the oil and gas sector.

*Figure 2 Investments Enabled through Recycling of SGER Revenues*

The years 2015 and 2016 marked a major milestone in both the global and Canadian climate change policy landscape. The 2015 Paris Agreement, which Canada ratified in 2016, aims to strengthen the global response to the threat of climate change by keeping a global temperature rise this century below 2 degrees Celsius above pre-industrial levels and to pursue efforts to limit the temperature increase even further to 1.5 degrees Celsius. The Paris Agreement requires all Parties to put forward their best efforts through “nationally determined contributions” (NDCs) and to strengthen these efforts in the years ahead. This includes requirements that all Parties report regularly on their emissions and on their implementation efforts. Canada’s Nationally Determined Contribution (NDC) defines a commitment to reduce economy-wide GHG emissions by 30% below 2005 levels by 2030.

On October 3, 2016, as part of the *Pan-Canadian Framework on Clean Growth and Climate Change*, the federal government outlined a benchmark for carbon pricing across all of Canada, including a requirement that carbon pricing should apply to “a broad set of emission sources

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6 Emissions Reduction Alberta, 2016/17 Annual Report, January 29, 2018
throughout Canada with increasing stringency over time” and a federal backstop that would be applied as a price-based system to any jurisdiction that does not meet the benchmark by 2018.

**Two categories of carbon pricing systems are identified:**

*For jurisdictions with an explicit price-based system, the carbon price should start at a minimum of $10 per tonne in 2018 and rise by $10 per year to $50 per tonne in 2022.*

*Provinces with cap-and-trade need (i) a 2030 emissions-reduction target equal to or greater than Canada’s 30 percent reduction target* and (ii) declining (more stringent) annual caps to at least 2022 that correspond, at a minimum, to the projected emissions reductions resulting from the carbon price that year in price-based systems.*

This precipitated climate change policy developments at the Provincial level across Canada, as jurisdictions reviewed, amended or introduced carbon pricing policies to meet the federal benchmark.

Following a change in Provincial government in 2015, Alberta’s Environment Minister announced that the SGER would be extended to 2017 but with more stringent requirements: the intensity reduction requirement was raised from 12% to 20% by 2017 (interim requirement of 15% in 2016), and the cost of Fund credits was doubled from $15/t to $30/t by 2017 (interim levy of $20/t in 2016).* The Government of Alberta subsequently released the Climate Leadership Plan in November 2015, with five main pillars:*11,12

- An economy-wide carbon levy on fossil fuels of $20/t in 2017, $30/t in 2018, and an intention to gradually increase the price thereafter
- An intention to transition the industrial sector emissions carbon pricing policy to sectoral performance-based standards (in place of the facility-specific historic baseline intensity approach of SGER)
- An absolute cap of 100 Mt CO₂e/year on oil sands GHG emissions
- A phase out of coal-fired electricity by 2030 and a target to generate 30% of Alberta’s electricity from renewables by 2030
- A methane reduction initiative to reduce emissions by 45% from 2014 levels by 2025

The new Carbon Competitiveness Incentive Regulation (CCIR), which replaces the SGER and brings in output-based allocation using product level standards, came into effect January 1, 2018. As a result, Alberta’s hybrid carbon pricing policy – a price-based system under the carbon levy, and cap-and-trade-based elements for large industrial emitters through the CCIR – is expected to meet the federal benchmark. The current economy-wide $30 per tonne carbon levy is set to

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8 30% below 2005 emission levels  
9 Direct quote from Pan-Canadian Framework on Clean Growth and Climate Change, Ibid (see footnote 7)  
12 The Government of Alberta’s up to date webpage for the Climate Leadership Plan can be accessed at: <https://www.alberta.ca/climate-leadership-plan.aspx>
increase to $40 a tonne in 2021 and $50 in 2022 in order to stay in step with the federal carbon pricing backstop.

![Figure 3 Timeline of National and Provincial Climate Change Policy Milestones](image)

In order for Alberta to meet 2030 and 2050 emission reduction pathways, and to meet the cap reduction stringency required by the federal backstop, the province will have to significantly lower its contribution to national GHG emission levels. Carbon pricing is not intended to be the lone policy vehicle to drive reductions. To that end, the province has begun investing proceeds of the carbon levy in solutions that reduce emissions and support adaptation and transition to a lower carbon economy in addition to developing more stringent regulations to complement the levy and to work towards achieving reductions in emissions.

Over the next 3 years, revenue from the Climate Leadership Plan, including the carbon levy, is expected to raise $5.4 billion, all of which has been committed to be reinvested in the economy and rebated to Albertans. The process of allocating proceeds into the Alberta economy and to whom the carbon funds are returned is critical to the success of the program. Under the current plan, $1.3 billion is expected to come from CCIR Fund payments – which on an annual basis is 5 times higher than payments made to the Fund under the SGER program up to 2015 (prior to the transitional increases in stringency). Approximately 50% of this revenue will be collected from facilities in the oil and gas sector. With the introduction of the carbon levy along with CCIR, all oil and gas producers will contribute into carbon pricing revenues, including the smallest facilities. As whole, this sector represents almost half of Alberta’s annual GHG emissions as a province, and is therefore a critical sector in which to achieve reductions. Both investment and innovation will be required to drive abatement in this sector and there are cost-effective opportunities to reduce the emissions intensity of fossil fuel production and enable continued production from Alberta’s oil and gas assets whilst bending the emissions curve downwards. Given the long term global demand for petroleum products, and this sector’s importance to Alberta’s economy, the upstream oil and gas sector is a logical target for recycling of carbon pricing revenues in Alberta.

1.2 Global Demand for Fuels and the Impact of Carbon Policy

The expected future global demand for fuels is critical to appreciate in determining whether to invest capital toward abatement and efficiency in the oil and gas industry. If demand for oil was expected to drop to zero over the next 20 years and production halt, then there would be little

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14 There is some phase in while methane reductions are occurring.
incentive, logic or return to make major capital deployment aimed at improving the efficiency of oil and gas producers, since there would be a relatively short timeframe for these investments to return a profit or make an impact on emissions. However, **where global demand for fuels is expected to remain robust for the next 20 to 40 years, oil and gas production is required to meet this demand, and investments to improve the producing assets should be considered.** This section aims to illustrate that there will be global demand for fuels in the long term and Alberta’s significant proven reserves coupled with billions of dollars of petroleum energy infrastructure will be competing for market demand over a long time horizon. And therefore these assets are worthwhile candidates for investment in efficiency and emissions reductions measures. The following section provides context aimed at illustrating that the latter is true.

The International Energy Agency’s (IEA) 2017 World Energy Outlook considers a number of global scenarios out to 2040, and in building their New Policies Scenario they declared that ‘**the era of oil is not over yet**’. This scenario looks to capture the likely impact on the energy sector of today’s policy ambitions, taking into account both announced government plans to combat climate change and the Nationally Determined Contributions made for the Paris Agreement. For example, the New Policies Scenario factors in that both the United Kingdom and France both proposed an outright ban on sales of new diesel and gasoline vehicles by 2040. However, while the scenario predicts global energy needs would rise more slowly than in the past, it still forecasts a 30% increase from 2017 to 2040.

Driving this forecast growth in energy demand are expectations for a global economy growing at an average rate of 3.4% per year, expansion of the population from 7.4 billion today to more than 9 billion in 2040, and a continued trend towards urbanization. For example, the largest single contribution to demand growth, accounting for almost 30% of the predicted increase, is expected to be from India. Overall, developing countries in Asia account for around two thirds of the IEA’s forecast global energy growth, with the rest coming mainly from the Middle East, Africa, and Latin America. So even if demand in North America and Europe decreases as a result of decarbonisation and de-industrialization, global demand for fuels is set to continue to grow.

Figure 4 below shows the forecast changes to global oil demand from the IEA’s New Policies Scenario. Although the source of oil demand growth shifts over time, the exhibit shows **global oil demand still increasing in the 2035-2040 timeframe**, with demand forecast to reach 105 mb/d by 2040. Sectors such as petrochemicals, aviation/shipping, and road freight continue to require more oil in 2040, while passenger vehicles start to convert to EVs in the mid-2020’s, and the electric car fleet manages to grow from around 2 million in 2016 to around 275 million in 2040.

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15 https://www.iea.org/weo2017/
17 https://www.iea.org/weo2017/#section-5-4
The IEA outlook also includes a Sustainable Development Scenario, which works backwards from what the energy sector would need to meet a vision of where the energy sector achieves the objectives of the Paris Agreement, while expanding global access to energy services. This ‘2°C scenario’ would include a significantly more rapid expansion in the global electric car fleet, approaching 900 million cars by 2040, a doubling in efficiency, and major solar PV installations – but this aggressive decarbonisation scenario would also require a significant increase in natural gas demand (+580 bcm) to meet global energy requirements.

This outlook is consistent with the 2018 Energy & Carbon Summary from ExxonMobil. The 2018 Exxon Carbon Summary presents a synopsis of what the academic community has found when considering a 2°C pathway and concluded that such a scenario (shown below in Figure 5) would lower the global demand for total energy, oil, natural gas and coal, but increase nuclear, bioenergy, and non-bio renewables. The persistence of the green and red bands show that oil and natural gas remain important energy sources, even in the aggressive climate policy scenarios with the lowest level of energy demand.

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Although outcomes vary by model, an average of the above 2°C Scenarios highlights the following trends:

- Oil demand is projected on average to decline by about 0.4% per year
- Natural gas demand is expected on average to increase about 0.9% per year
- Coal showing an average decline of about 2.4% per year (~50% decline by 2040)
- Hydro, wind, solar, and bioenergy average increases between 4 and 4.5% per year
- Nuclear energy demand is project to grow about 3% per year

Considering this average of aggressive decarbonisation scenarios, global oil demand is projected to decline from 95 mb/d in 2016, to about 78 mb/d in 2040. Even using the lowest oil demand growth rate among the 2°C Scenarios considered here, oil demand would still be 53 mb/d in 2040.

1.3 Canadian Fuel Demand Context

Shifting the focus to expectations for domestic forward fuel demand in Canada, we can see that while demand is not growing, it remains an important part of the fuel mix, critical to the reliability and affordability of energy supplied to Canada’s residential, commercial and industrial energy end users. The NEB scenarios shown in Figure 6 below predict that Canadian fossil fuel consumption will peak in 2019, but will only drop about 13% by 2040 under their most aggressive decarbonisation scenario.

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20 https://emf.stanford.edu/about
The NEB's Technology scenario considers a $140/tonne carbon price by 2040, significant technological advancements to reduce clean energy costs, and electric vehicles representing around 45% of new passenger vehicles sales by 2040. However, this growth in electricity demand also fuels a need for more natural gas to meet the energy requirements as the dramatic growth in renewables still cannot meet demand. Figure 7 highlights how even if solar capacity jumped to 25 GW in 2040, and wind capacity rose to nearly 31 GW, this increase would only meet a small portion of Canada’s overall energy needs, as shown by the increase in purple bar.
There are many different forecasts of Canada’s long term fuel demand, and given the significant uncertainty in the pathways to decarbonisation, most studies illustrate a wide range of scenarios that could conceivably materialize. Some other forecasts consider options that would involve much more aggressive decarbonisation pathways than the NEB forecast. A key graph from one of the more ambitious projections that was cited in Canada’s Mid-Century Long-Term Low-Greenhouse Gas Development Strategy is presented in Figure 8. This is taken from the Deep Decarbonisation Pathways Project, and shows electricity rising to 43% of total energy by 2050 compared to 25% currently, more than doubling the current supply between now and 2050. But even this ambitious scenario sees limits to electricity’s adoption within the 2050 timeframe, and relies on ‘greening’ the other fuels segment, with carbon capture and ‘renewable fuels’ competing with refined petroleum products and natural gas.

The petroleum based energy infrastructure deployed throughout Canada plays a significant role in overall system (transport and home/building heating) reliability, affordability and sustainability. For example natural gas plays an integral role in home heating, industrial energy and process applications, enabling intermittent renewables and displacing coal fired generation and will for years to come on a global basis. Further, increasing electricity costs and prices (average ~12-20c/kwh for residential customers) vs. natural gas (at ~4-5c/kwh equivalent) will mean that a carbon price over $300/tonne and significant incentives to the residential energy end user would be required to make a home heating electrification measure cost-effective to switch from natural gas furnaces to electric heat pumps. The customer value proposition for electrifying passenger vehicles (EVs) is more compelling, but remains an expensive option for consumers along with barriers to adoption such as electrical distribution system upgrades and charging infrastructure.

While a portion of the population may be willing to make the transition for non-economic value-based reasons, the same cannot be said for Canada’s industrial and manufacturing sectors, which compete in a global market and require low energy costs to maintain competitiveness. This can be seen in North American industrial expansion in response to low continental natural gas prices, an important competitive advantage over their international peers.

**The Canadian economy has come to depend on the symbiotic, affordable, reliable and sustainable energy provided by oil (transport), natural gas (residential, commercial, industrial, and power generation) and non-emitting electrical generating resources (hydroelectric, nuclear, wind, and solar).** That is not to say we won’t all be surprised by the potential speed of change enabled by innovation. Forecasting is challenging. However there is strong evidence that we cannot electrify Canada’s resource based economy and

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residential and commercial heating load by 2050, and that, while renewables and enabling technologies such as storage will undergo massive growth and improvements in efficiency, we will still rely on natural gas as a low-cost fuel source, and to balance out the grid and meet rising electricity demands well beyond 2050.

2. Alberta’s Oil and Gas Industry: A Key Piece in the Puzzle

2.1 Historical Context

Alberta promotes itself as ‘Canada’s energy province’. The province’s vast and diverse energy resource portfolio includes conventional oil, oil sands, conventional natural gas, shale gas, natural gas liquids, and coal. This energy mix has evolved significantly over the past century of development, and Alberta’s production of both conventional oil and gas has peaked and is now on the decline. Conversely, overall growth in provincial oil production is being driven by the oil sands, while Alberta’s unconventional gas industry is being targeted to meet current and future natural gas demands. Technology development through research and development efforts will be critical to drive unconventional gas development to its potential.

The precedent for innovation is nothing new for Alberta’s energy sector, who have a long history of overcoming technological challenges through collaboration. Developing Alberta’s oil sands was a major opportunity, but was also different than all oil production that came before it, and required major technological advancements to unlock their potential. The innovation that made this possible was driven by partnerships between the private sector and government partners, for the benefit of all Albertans. Beyond just technology development, Alberta has had to innovate to overcome many energy industry challenges. The province’s reserves are developed in both challenging and varied conditions, including temperature extremes, permafrost, and vast distances. Alberta has a highly educated workforce, that is skilled in overcoming and adapting to the challenges faced. The Government of Alberta also works with industry to promote continued innovation and technological advancement, with both government and industry investing significantly to advance research and development enhancing the sustainable development of energy resources.

2.2 Current State of the Industry

A profile of Alberta’s GHG emissions is provided below in Figure 9, along with a more detailed breakdown of the upstream oil and gas sector emissions, which currently represents 127 Mt/year.
This mix is expected to continue to evolve, as Alberta has already produced much of its conventional crude oil reserves, but only 5% of its oil sands reserves. With 170 billion barrels of bitumen that could be economically extracted from the oil sands, Alberta has the third largest crude oil resource in the world. In 2016, Alberta produced 2.5 million barrels per day (bpd) of crude oil, with about 78% of that made up of raw bitumen from oil sands.

Alberta also has extensive natural gas resources, including conventional natural gas, and unconventional coalbed methane and shale gas supplies. Reserves of conventional natural gas currently stand at 33 trillion cubic feet (tcf) and 2.4 tcf from coalbed methane, and given the early stage of development of shale gas in Alberta, the reserve potential has not yet been assessed. Current production of natural gas in Alberta is approximately 4 tcf that is transported to both Canadian and US markets.

Over the past five years, the oil and gas sector in Alberta has demonstrated its resiliency and tenacity, continuing production growth despite an economic downturn and a decline in oil prices. The drop in oil prices in 2014 impacted the workforce of Alberta. However, despite the economic downturn, total oil production actually rose 6.7% year-to-date in August 2015, as producers continued to extract through the industry hardships of 2015. The resiliency of the oil sands through the recent price drop is a strong indicator for future production trends. Even in the face of an economic storm, production in the oil sands persistently carries on.

Figure 10 shows the investments being made in Alberta oil and gas over the last ten years. While the totals are decreasing more recently, as major projects that were previously committed-to come online, 2017 still saw more than $20 Billion invested in the sector.

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The long timeframes and continuing investment to develop these projects are acceptable because the oil sands assets are expected to produce oil for 20 to 60 years. With such long project lives, the greater than $200 Billion of investments in the oil sands over the last 10 years, which is shown above in orange, will be expected to continue producing for many decades to come – to service the investments that have already been made in these projects. In line with the major investments, the National Energy Board forecasts expect oil sands production to steadily rise through 2040, as shown in Figure 11. This shows oil sands projects with long lifetimes continuing to come online or ramp up production, but still modest compared to the total oil sands reserves. For example, the highest production forecasts for 2040 shown below equate to approximately 4.4 million barrels per day or 1.6 billion barrels of oil sands production per year, which equates to less than 1% of the currently defined economic reserves (170 billion barrels).

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3. The Opportunity in Oil and Gas

Based on the assertion that Alberta’s oil and gas assets are expected to continue producing well into the future, they are thus worthy of consideration for long term capital investment aimed at operational improvement. Any capital deployed with an objective of improved energy and emissions intensity will yield benefits (ROI) for many years to come.

This investment opportunity and Alberta’s emissions profile is the reason that groups like the Ecofiscal Commission advocate for an industry-centric focus for revenue recycling in Alberta. This group is made up of policy-minded Canadian economists who have come together to plot pathways for Canada’s economic and environmental aspirations to both be met. Their analysis of the various carbon revenue recycling options for Alberta pointed to investments in low-carbon technology and transitional support to industry as two of the highest priorities, as shown in Figure 12.

Figure 12 Revenue Recycling Priorities for Different Provinces

Albertan oil and gas producers will pay hundreds of Millions of dollars every year into the carbon fund over the next 3 years – and as a result of their long term operational horizon should be considered for reinvesting money aimed at complementary measures. With an appreciation that carbon fund proceeds expenditure should be optimized – deployed into the most cost effective (lowest $/tCO2) abatement measures in sectors of the economy with significant abatement potential (MtCO2). Here again Alberta’s oil and gas producers can show that there are plentiful and competitive low-cost (vs other measures) abatement opportunities. These abatement opportunities are discussed and examples illustrated below.

3.1 Low Cost Measures can Drive Major Emission Reductions

Given that the oil and gas sector accounts for roughly one-quarter of Alberta’s annual emissions, it is not surprising that oil and gas production facilities can achieve both significant and cost

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effective emission reductions in the short (2020), medium (2030), and long-term (2050). Previous work\textsuperscript{30} by CAPP has illustrated the potential and cost effectiveness of abatement options afforded to the oil and gas sector, and is summarized by the marginal abatement cost curve (MACC) shown below in Figure 13. The width of the blocks in this diagram indicate how much a particular measure will reduce emissions, while the height indicates the cost of achieving these emissions.

Some of the key takeaways from this diagram and study are the following:

- These 13 measures alone could reduce annual oil and gas emissions by 16.5 Mt-CO$_2$e, or more than 10% of the sector’s current emissions in Alberta
- The majority of these emission reductions would cost less than $90/t-CO$_2$e to achieve
- The opportunities include a range of ‘low hanging fruit’ that could be implemented more quickly, and larger medium- and long-term investments in emission reduction technology
- Another 16 Mt-CO$_2$e/yr of emission reductions are possible for precommercial oil and gas operations under development

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{figure13.pdf}
\caption{Marginal abatement cost curve for the oil and gas industry (conventional oil and gas and in situ oil sands) \textsuperscript{30}}
\end{figure}

In line with some of the measures included in the above MACC curve, the Alberta Government has acknowledged that one of the most cost-effective way to achieve GHG emission reductions in the near future is through targeting methane emissions.\textsuperscript{31} The Pan-Canadian Framework re-emphasized its goal of reducing methane emissions by 40-45% by 2025,\textsuperscript{32} and this goal is shared by the province of Alberta. Environment and Climate Change Canada produced a cost-benefit analysis of investing in methane emission reduction measures from 2018 to 2035. The results

\textsuperscript{30} Costs of GHG Mitigation in Alberta: Marginal Abatement Cost Curve (MACC) Report, Delphi Group, August 2016
showed that the total benefits outweighed total costs by almost $12 Billion over this time period, but also highlighted that industry compliance costs in the 2018-2025 timeframe would be around $2.4 Billion, or roughly 5 times the value of conserved gas in that period. So while the measures may offer cost-effective emission reductions, they will not always offer an adequate payback to industry.

There are significant opportunities, with reasonable rates of return, for Alberta’s oil and gas industry to achieve material reductions in their emissions and increase competitiveness in the global market. These can be win-win opportunities, where emission reduction objectives are supported and operating costs driven down.

**The market is also ready to respond.** Over the past 10 years, Alberta has become a leading expert globally in reducing GHG emissions in the oil and gas sector and improving the efficiency of processes. A good example of this is the Upstream Oil & Gas Handbook compiled by the Petroleum Technology Alliance Canada (PTAC), which seeks to equip operators with the information they need to implement shovel-ready efficiency projects. The investment of carbon proceeds into a sector which already possesses extensive experience and expertise in industry-specific innovative technologies will maximize the impact of these investments.

**The scale of oil and gas operations also provides opportunities for efficiency investment that do not exist in other sectors.** As Alberta’s oil and gas sector has expanded economically so too has its contribution to emissions. Alberta’s roughly 90 largest oil and gas facilities average 760,000 t-CO2e/yr. With an appreciation of scale and opportunity this demonstrates how dollars spent in oil and gas can create competitive returns and help to unlock material step changes in emission reductions in the short, mid and long-term.

### 3.2 Examples of Oil and Gas Progress

This section highlights projects that show the potential for real emission reductions, and provide a template for future success. The three case studies included are for the following projects:

- ConocoPhillips Field GHG Reduction Projects
- Shell Canada Energy Quest Project (CO₂ capture and storage)
- Canadian Natural Resources Limited (CNRL) Natural Gas Conservation

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**PTAC Upstream Oil & Gas Handbook**

Showcases a collection of 79 commercially-demonstrated efficiency products and practices available for the Canadian oil and gas industry.

For each option includes details to help operators make quick decisions, such as a description, site applicability, emissions and energy savings, costs and expected paybacks, reliability, safety, applicable regulatory codes, and vendor information.

Case Study 1: ConocoPhillips Field GHG Reduction Projects

In 2010, ConocoPhillips Canada (CPC), Alberta’s Climate Change & Emissions Management Corp (CCEMC) and Canadian Environmental Technology Advancement Corp. - West (CETAC - WEST) committed to improving energy efficiency and reducing GHG emissions in oil and gas production. Ten technologies were installed across ConocoPhillips operations in Alberta and field-tested over the course of five years. At the time, these novel technologies had not been widely adopted but had the potential to be feasible emission reduction options for the industry as a whole.

By the end of the study, the field trials had surpassed the initial emissions and budget targets. Annual emissions cuts equated to over 90,000 t-CO2e/yr, double the initial target. Average costs were cut to $7 per tonne of GHG reduction, which was half of the initial target. Beyond the significant emissions cuts achieved, implementing the new technologies in the field enhanced asset efficiency and provided lessons learned that can be shared across the industry. The GHG reductions achieved from each field-tested technology along with the associated costs are summarized in Figure 14.33

In this study, the ConocoPhillips team prioritized the reduction of methane emissions, an effort which directly aligned with Alberta’s goal of reducing methane emissions by 45% by 2025 under

the Climate Leadership Plan.\textsuperscript{34} The strongest environmental performances in the study, came from the 1,100 pilot projects that identified high methane emitting equipment and created a low-cost strategy for reducing those emissions quickly. As the strategy matured, the pace of reductions was accelerated.\textsuperscript{35} Overall, high-to-low/no bleed pneumatic controls conversion proved to be superior to the other 9 technologies tested due to its low cost of emission reductions and applicability across the industry. Waste-heat-to-electricity was by far the most expensive technology due to its unsuitability for low-intensity emissions applications. This technology may be more suited for larger applications like the oil sands.\textsuperscript{36}

Valuable organizational and technical lessons were learned from the field-trials. Quarterly meetings amongst the project stakeholders sustained interest in the field projects despite a period of energy price fluctuations and corporate personnel change. The meetings also provided an avenue for expertise sharing, enabling the challenges faced in the field to be overcome.\textsuperscript{35}

The success experienced from these field-trials garnered and enhanced a corporate culture in the oil and gas industry of sharing organizational and technical lessons learned from independent studies. This culture seeks to ensure that a combined effort across the industry to implement economical and effective emissions reduction technologies, will reap benefits for all involved.\textsuperscript{35} While the study demonstrated that low-costs solutions for significant GHG emission reductions are available, even the most cost effective technologies need improved economics (i.e. capital subsidies, rebates, offsets) to enable wide-spread adoption.

For more information, see the full report available at:  

\textbf{Case Study 2: Capturing CO$_2$ from AOSP’s Scotford Upgrader and injecting it deep underground for permanent storage}

Shell’s Carbon Capture and Storage (CCS) project, Quest, was added to the expanded Scotford Upgrader in 2015. This project was the first CCS project applied to the oil sands and was the product of strong collaboration between Shell, the Athabasca Oil Sand Project (AOSP) partners, and the Alberta and Canadian governments.\textsuperscript{37} This project aims to reduce the GHG emissions of the Athabasca Oil Sands Project by approximately 1 million t-CO$_2$/yr.\textsuperscript{38} Emissions reductions are achieved by CCS through capturing CO$_2$ before it is released into the atmosphere and injecting it into suitable underground deposit sites for permanent storage.

CCS is a viable option for achievable GHG emissions in the as it employs technologies that have been used widely in the industry for decades. Quest has demonstrated that significant GHG

\begin{itemize}
  \item \textbf{Company:} Operated by Shell, owned by the Athabasca Oil Sand Project (AOSP), which is owned by CNRL (70%), Chevron Canada (20%), and Shell (10%)
  \item \textbf{Dates:} 2011-present
  \item \textbf{Total Project Cost:} $1310 million
  \item \textbf{Canadian Government Contribution:} $120 million
  \item \textbf{Alberta Government Contribution:} $745 million
  \item \textbf{Emissions Reduction:} 2 million t-CO$_2$/yr
\end{itemize}

emission reductions are achievable with CCS. During its first year of operation, Quest exceeded expectations by capturing and safely storing 1 million t-CO\textsubscript{2} over and above its initial target for the year. As it matures, CCS is becoming increasingly feasible to implement and measures for increasing success and lowering costs have been identified. For example, it was learned through the Quest project that using joint transportation and storage facilities could substantially lower costs. Shell has estimated that if Quest was built again in 2016, construction and operation 2016 would be achievable with a 20-30% reduction in costs largely due to capital efficiency improvements and a lower cost environment.\textsuperscript{37}

Quest has proven that significant, long-term GHG emission reductions can be achieved in the oil sands thanks to Canadian innovation efforts. This success does not have to be limited to the Quest project and can be widely adopted in the oil and gas sector. In 2013, Quest was added to Canada’s Oil Sands Innovation Alliance (COSIA) the Environmental Priority Area (EPA). This contribution allows any member of the GHG EPA to have access to the intellectual property used to develop Quest and apply it to their own oil sands operation.\textsuperscript{38} This guaranteed knowledge sharing platform for best practices ensures a greater potential for GHG emission abatement success for other companies that choose to implement CCS.

**Case Study 3: Canadian Natural Resources Limited (CNRL) Natural Gas Conservation**

Canadian Natural has found that targeting methane emissions is one of the most cost effective GHG emission reduction strategies. Over the past five years, CNRL has put forth significant funds and efforts towards cutting emissions through reducing natural gas venting.\textsuperscript{39} Venting releases methane into the atmosphere which has a global warming potential 25 times greater than CO\textsubscript{2}.\textsuperscript{40} CNRL implemented efficient operational management strategies for over 1,000 compressors used for gas conservation. Natural gas conservation from initial production was achieved through the early tie-in of multi-well pads where solution gas pipelines are installed at the time of drilling. In addition to these actions, CNRL continually improved facility design and processes during periods of low field activity. These efforts resulted in the conservation 18.4 million t-CO\textsubscript{2}e over the course of 5 yrs.\textsuperscript{39}

CNRL has also recently developed a Heavy Oil Greenhouse Gas Reducer (HOGGr) for single well battery (SWB) production. This GHG emission reduction technology targets methane venting. The HOGGr system uses a fan to cool the fire tubes in the production tanks. This cooling


implement regulates the heat transfer between the fire tubes and oil production and allows the burner management system to run for a longer period of time during a 24 hr cycle, reducing methane venting. In 2016, a successful pilot project for the HOGGr was launched by a local vendor. Thirty SWB systems have since been equipped with HOGGr technology by CNRL. As a result of these installations, methane emissions have been reduced, and further exploration will be carried out for the application of HOGGr to existing and future SWB wells.40

While the emissions intensity from the oil sands mining operations has been increasing since 1990, the emission intensity of in-situ operations and bitumen upgrading facilities has been decreasing.41 This trend exhibits the oil and gas industry’s ability reduce GHG emissions through improved operational processes. These three case studies demonstrate the willingness and ability of the oil and gas industry to act. These examples also provide valuable lessons learned and demonstrate that the oil and gas sector is in a good position make significant strides towards attaining 2030 and 2050 GHG emission pathways, and the value which can be unlocked through government collaboration.

3.3 A Strengthened Economy and Job Market

Investing Carbon proceeds into the oil and gas sector will bring about benefits that extend beyond the significant GHG emission reductions in this sector. These additional benefits include strengthening the economy and employment, improving Alberta’s status as an innovation leader, and ensuring that peak demand can still be met as coal is phased out by 2030.

Alberta is still suffering from the devastating effects of the oil crisis of 2014 where plummeting oil prices drove the province’s unemployment rate. Prior to this hit, which impacted the northern oil-rich regions of the province the hardest, Alberta enjoyed unemployment rates significantly lower than the national average and a period of sustained economic growth up until 2014. Figure 15 charts the rise and fall of unemployment rates since 2005.42

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43 Source: Statistics Canada, RBC Economics Research
The correlation between oil price trends and unemployment rates illustrates that the health of Alberta’s economy is heavily dependent on the oil and gas sector. Investments that help innovators in the oil and gas sector overcome the barriers to commercializing new clean technologies, create avenues for reduced unemployment rates in the oil and gas sector. To date, $385 million has been invested in 129 projects through Emissions Reduction Alberta’s (ERA) Fund. Oil and gas targeted projects account for a significant portion of the ERA project portfolio. According to an analysis by Alberta Economic Development and Trade in 2017, cumulatively, ERA projects have supported an average of 1,400 jobs annually in Alberta from 2011 to 2021 which translates to over 15,000 person-year jobs. Many of these new jobs are instilling new skills and practical, first-hand knowledge of forward thinking technologies in the oil and gas sector.

**Strategic investment in emission reduction projects through the Fund has also increased GDP.** Cumulatively, the projects of ERA contribute over $1.8 billion to Alberta’s GDP and $2.3 billion to the country as a whole. For context, Alberta’s total 2016 GDP was $290.6 billion, Canada’s 2016 GDP was 1.53 trillion USD. Since 2009, ERA investments have successfully multiplied in value through innovative projects. Significant value can been generated through investment in innovative projects in strategic areas. For example, Figure 16 illustrates that ERA’s investment of $385 million has resulted in a total value of over $2.6 billion from all project investments. Increased support of innovative projects will build upon the success of ERA’s work, catalyzing economic growth while putting Albertan’s back to work after the 2014 oil crash.

![ERA Project Stats](image)

<table>
<thead>
<tr>
<th><strong>ERA Project Stats</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total Investment in Projects:</strong> $385 million</td>
</tr>
<tr>
<td><strong>GDP value added in AB:</strong> $1.8 billion</td>
</tr>
<tr>
<td><strong>Jobs Added:</strong> 1,400</td>
</tr>
<tr>
<td><strong>Emissions Reduction:</strong> 8 million t-CO2e by 2020</td>
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4. The Challenge in Transitioning to Lower Carbon

Although significant opportunities for the oil and gas sector to reduce carbon emissions exist, and many of these opportunities comparatively are cheaper sources of abatement than other options that exist in the economy, **several key challenges exist that prevent the oil and gas industry from deploying these solutions.**

4.1 Fierce Competition for Capital

The case studies described in Section 3.2 demonstrate the willingness and technological readiness of the oil and gas sector to significantly reduce GHG emissions. Readily deployable emission abatement measures already exist in the industry and the opportunity to reduce emissions in Alberta through targeting the oil and gas sector is significant. But **the capital expenses required remain a major barrier to the velocity and scale of uptake of clean technologies** in the oil and gas sector, and fierce competition for capital amplifies this barrier.

**Even large companies do not have unlimited funds,** and they cannot do everything that might seem like a good idea. The oil and gas sector is also a capital intensive business, where companies devote significant amounts of resources just to maintaining their operations and production levels. Given that capital is constrained, investments in efficiency or carbon abatement projects must compete with other investment options at a company’s disposal, including options to boost production. For large multi-national companies, this also means Alberta projects are competing for the limited available capital against projects across the globe. Companies often have solid production-boosting investment options at their disposal that can achieve very large ROIs, setting the bar high for efficiency and abatement projects, which must also offer a quick payback (< 1 year) to compare favorably in the prioritization process of funding. When the risk of innovative emissions reductions technologies is introduced, this further reduces their attractiveness for capital in comparison to ‘tried and tested’ production investment options. **Overcoming the challenges of competition for capital requires more than just a punishment for not acting.**

4.2 Unintended Consequences of Carbon Pricing

Alberta’s oil and gas sector possesses the willingness and technical expertise to increase efficiency and reduce GHG emissions; these attributes are demonstrated in Section 3. The Alberta Climate Leadership Plan (ACLP) has encouraged the industry to implement positive changes. Unfortunately, the ACLP can also promote unintended consequences that act as barriers to achieving measurable efficiency improvements and GHG emission abatement in the oil and gas sector. These barriers are discussed below.

**Compliance Trap**

Emission reduction measures in the oil and gas sector are capital intensive. With increasingly stringent carbon regulations, facilities are left with constrained capital after complying with the ACLP. Facilities in a position of constrained capital experience compliance cost high enough that they cannot afford to act swiftly to reduce GHG emissions or increase efficiency. Emissions reduction technologies in the oil and gas sector can be cost effective in the long run, but the immediate carbon price can act as an economic barrier to the uptake. The carbon price creates a compliance trap, taking operating revenue away from GHG emission abatement projects and
stalling clean tech innovation in the industry. Carbon pricing can drive industry to avoid implementing abatement technologies in the near term especially when coupled with policy uncertainty. Consequently, the compliance trap leaves the most GHG emission intensive sector in the province\(^{47}\) unable to make significant steps towards decarbonisation and increased efficiency.

**Competitiveness Challenge**

In addition to stalling emission abatement in the oil and gas industry, the compliance burden has the potential to weaken this economic sector. Facilities that are faced with increased operational costs in order to meet policy compliance criteria will become less competitive with other facilities in less stringent jurisdictions. This can give rise to “leakage” of production and GHG emissions outside of the province. According to a recent report published by the Ecofiscal Commission of Canada, Alberta will have the most stringent carbon policy in Canada by 2020. Such stringency acts as a tool to motivate heavy emitters to lower GHG emission reductions within the cap under the desired timeframe. On the other hand, in order to comply with the policy, producers experience challenging operating costs, weakening their ability to compete with producers from other jurisdictions where carbon policies are not as severe. The outcome of this is a loss of production to other jurisdictions and the transfer of GHG emissions to those areas. Figure 17 illustrates the competitiveness pressures faced by provinces in Canada under a $30/tonne provincial carbon price. This figure was produced in the Ecofiscal Commission ‘Choose Wisely’ study. The carbon cost for “more exposed” sectors, indicated in red, is greater than 5% of the sector’s GDP. The “more exposed” sectors also have a trade exposure >15%.\(^{48}\) This figure indicates that Alberta and Saskatchewan are more exposed to competitiveness pressures that arise from carbon pricing compared to other provinces.

![Figure 17 The Scale of Competitiveness Pressures for Canadian Provinces, 2015](image)

Source: Canada’s Ecofiscal Commission and Navis Research

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Solutions for supporting the longevity of Alberta’s oil and gas sector through addressing competitiveness challenges of exposed industries will be discussed in Section 5.

5. The Solution: Transparent Revenue Recycling

Choosing how to allocate revenues from the carbon pricing effectively ($/tCO2) and fairly (across all segments of the economy) is a challenge that must be addressed to significantly reduce carbon emissions and strengthen provincial economies. Recycling carbon revenues collected from the oil and gas sector back into their operations is one of the most effective ways to meet objectives related to the transition to a low carbon economy, including those contained in the Alberta Climate Leadership Plan (ACLP). This section outlines how the development of a transparent framework to re-allocate these revenues back to the oil and gas sector is consistent with these objectives.

While there are many more reasons for the efficacy of revenue recycling in the oil and gas sector, as an ACLP component, this argument is made in the sections below through several high-level points.

- First, it is well-understood that the reinvestment of carbon pricing revenues can significantly boost the overall impact of carbon pricing on long-term emissions reduction, and this report outlines how the oil and gas sector is ideal to achieve this amplified impact.
- Second, carbon pricing comes with several well-known drawbacks, such as the compliance trap, carbon leakage, and decreased competitiveness, all of which can be counteracted by recycling revenue back into the oil and gas sector.
- Third, Canada’s oil and gas sector and the oil and gas production outlook is evidence of an unparalleled innovative system and opportunity that could be optimally leveraged where carbon pricing funds are re-invested into it.
- Forth, a revenue-recycling approach is an excellent basis for establishing a carbon pricing reinvestment strategy that eliminates the effects of policy uncertainty and shifting priorities.
- Finally, technological outcomes advanced through this process could be applied globally, driving abatement and efficiency in Canada and around the world.

Ensuring carbon pricing revenues from the oil and gas sector are paid into a government fund that specifically supports GHG abatement in the province’s oil and gas sector would address key challenges in multiple ways. The main goal of this fund would be to improve the return on investment on various abatement projects focused on energy efficiency, methane emission reduction, and carbon capture and storage, which may otherwise lose out to production investments. This fund would ensure that any monies recycling into the oil and gas sector are consistent with the goals of the carbon-pricing regime. Furthermore, it would leverage capital that would otherwise go to increased production, and ensure oil and gas investments remains in-province while boosting the industry’s competitiveness and reducing its carbon intensity.

Revenue Recycling Examples in other jurisdictions to draw on:

- Ontario provides good examples of such approach in the case of the recent introductions of the SMART Green program and TargetGHG for industrial emitters. The SMART Green program is a partnership between the government and the Canadian Manufacturers and Exporters (CME) designed to assist businesses to invest in equipment
and process upgrades including high-efficiency ovens, dryers, kilns and furnaces. CME’s members will be significantly affected by the province’s cap and trade program, but simultaneously are some of the best candidates for energy efficiency. TargetGHG, operated by Ontario Centres of Excellence, more specifically focuses on technologies that can reduce industrial emissions sufficiently to meet aggressive reduction targets without disadvantaging industry’s competitiveness. Like oil and gas producers, manufacturing companies must prioritize the use of capital to boost production rather than efficiency.

- **Another good example can be drawn from the Puget Sound Large Power User Self-Directed Electricity Conservation program.** This program is one of several energy efficiency programs in the USA which are set up in a way that gives large industrial participants an opportunity to deploy the money collected from them through projects at their own facility. Funding collected from companies that do not implement projects then becomes available to the most cost-effective proposals from other facilities, taking a ‘use it or lose it’ approach to ensure improvements are implemented.

### 5.1 Compounding the Benefits of Carbon Prices

Carbon pricing is a key policy approach to limit emissions reduction; however, **the reinvestment of these funds is what truly determines its effectiveness.** Poorly reinvesting the proceeds of a carbon pricing system can hinder the achievement of the most aggressive emission reduction pathways. This risk is particularly acute in Alberta, given the size of the oil and gas sector. Revenue recycling provides an effective method of leveraging the overall impact of carbon pricing systems by ensuring the largest opportunity is fully utilized.

As outlined in Chapter 3, the oil and gas sector represents a significant opportunity for cost-effective and, more importantly, scalable emissions reduction. To be sure, a range of cost-effective abatement options exist throughout the economy, but failing to develop a revenue recycling framework for the oil and gas sector threatens to leave significant potential on the table, and restrict the province’s ability to meet 2050 emission targets. Indeed, the Ecofiscal Commission, supported by modelling from Navius Research, published Figure 18 illustrating the relative abatement potential of different revenue recycling strategies. As shown, an output-based allocation approach are an important mechanism to maintain competitiveness of the emission intensive trade exposed (EITE) sectors while investments in technology were the most effective form of recycling in terms of GHG abatement, and many of these will be found in the oil and gas sector.
For instance, energy efficiency programs in all sectors are considered highly cost-effective abatement strategies. Among these programs, industrial initiatives tend to provide higher levels of cost-effectiveness as they are better able to leverage program resources by focusing on the largest opportunities. The same principle applies to investment in the oil and gas sector, versus other sectors in terms of GHG abatement. Furthermore, investments in the oil and gas sector tend to be feature long amortization periods, driving higher returns on given investments. In the case of carbon reductions, the value of long-lived savings is even more important. While there may be many smaller and cost-effective options in other sectors of the economy, it is unlikely these will be sufficient to meet 2050 emission reduction pathway.

Innovation is also a factor that must be considered. As noted, the oil and gas sector in Alberta has significant innovative capacity that can drive deep reductions in the emissions of their operations. An unfounded concern with recycling revenues back into the sector that paid them is that it will somehow counteract the incentive to reduce emissions. However, regardless of how this money is recycled, the economic incentive created by a carbon price to reduce emissions remains. This funding can be made available only for specific projects that drive deep emissions cuts through innovative technologies, freeing up funds for short-term cost-effective measures. Therefore, if the funding is recycled properly, it compounds the overall impact of carbon prices on incentives for emissions reduction.

It is likely that the technologies that allow for deep carbon reductions will be developed over the next 2 or 3 investment cycles in the oil and gas sector. These options need to be invested in now in preparation for deployment in existing facilities, as well as at facilities which are brought on with the ability to easily adopt these technologies. Under a revenue recycling framework, it is possible for firms to put an even greater emphasis on the emissions reduction potential of innovative technologies. This drives the industry toward options that maximize the environmental dimension while still supporting a more competitive industry.

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5.2 Mitigate the Drawbacks of the Carbon Compliance Trap

Carbon prices provide clear economic signals to firms to lower their emissions based on cost-effective technology, and the effective reinvestment of the proceeds can compound the impact of this price signal. However, these mechanisms can also create a series of issues, potentially counteracting or cancelling out positive effects. In general, capital is highly constrained in the oil and gas sector and strongly biased toward increased production. Furthermore, there is high worldwide competition for capital in the sector, meaning carbon taxes can induce increased oil production elsewhere, which both negates the benefits of a carbon tax and reduces the competitiveness of the national economy. Revenue recycling can help combat these drawbacks.

As noted, the compliance trap refers to a circumstance where the increased cost of a facility’s operations due to a price signal like a carbon compliance obligation constrains their ability to react to the same price signal. This is particularly acute in the oil and gas sector, given the fierce competition for capital and the resulting focus on boosting production. When assessing investment options, these firms will not limit their analysis of investment returns to a single country, and will compare investments will all options worldwide. Indeed, investment into higher production/new operations more cost-effective than increasing the efficiency of existing operations to counteract lost profits from a carbon price. When the risk of innovative emissions reductions technologies is introduced, this further hamstrings the scope to divert capital to these efforts. Perversely, carbon pricing without revenue recycling can detract from the funding a firm had available to conduct abatement projects in their operations.

A related dimension here is the potential for carbon leakage. Capital is mobile, and increasing the cost of oil sands operations increases the chances that a more lucrative investment opportunity will be taken elsewhere. This is problematic not just from an economic development perspective, but may result in increased oil production where carbon prices are not present. Revenues recycling increases firms’ confidence in the long-term ability to lower emissions at existing and future facilities, and provides targeted funding for short-term investments that maintain the competitiveness of existing and planned operations. Indeed, both the compliance trap and carbon leakage are symptoms of the impact carbon prices can have on the competitiveness of industries, particularly on carbon-intensive ones like oil and gas. In addressing both these challenges through revenue recycling, Alberta would simultaneously counteract anti-competitive effects.

5.3 Leverages a Strong Innovation System

Oil and gas firms have a long history of pioneering best practices in their respective industries, supported by a strong culture of collaboration. Often, such as with the oil sands, this has led to the creation of multiple, large, export-driven industries. Importantly, innovation ecosystems are most effective when leveraged with stable frameworks from all levels of government, such as close collaboration with federal scientific researchers. With the introduction of carbon pricing, revenue recycling is a critical aspect of ensuring innovation systems can adapt to changing contexts while continuing to be a major drivers of economic growth.

For example, Alberta’s innovation system for oil and gas includes government-industry joint planning structures, research chairs, and dedicated government research institutions. The actors within this innovation system coordinate the deployment of billions of dollars a year and are continually updating best practices. Frameworks and mechanisms are also in place to that allow
third parties from around the world to connect into oil sands companies and work with them to develop technologies. Examples include: AI, COSIA, NRCan, ERA, Innovate Calgary, NRC / IRAP, SDTC. Strong governance and oversight is provided, for instance through forums such as the Oil Sands CEO Council. This has resulted in a series of forums such as COSIA and PTAC which have formed the basis for the sector’s strong focus on collaboration.

Carbon pricing will not upend the progress and capabilities of any innovation systems, but failing to recycle revenues extracted from it underutilizes their potential. A platform for continuing to leverage innovation systems must be built on a long-term vision for the use of recycled revenues. This long-term vision will likely be based around a portfolio of opportunities that span from the short-term to the long-term, and the short-term cost-effective to the highly innovative. In developing this portfolio, it will be important for a performance mechanism to be in place to ensure funds are being spent efficiently and effectively, and adjusted over time. The adoption of a revenue recycling framework is an ideal platform on which to articulate a long-term narrative for oil and gas production that can inform the continued development of innovation systems.

5.4 Allocating Carbon Revenues to Drive Long Term Transparent Results

As governments grapple with how to allocate billions in carbon revenue, there is a risk of making poor investments driven by short-term objectives. Going forward it will be important for governments to develop and maintain transparency in how carbon revenues will be allocated if these revenues are to drive significant emissions reductions. This will maximize the ability of all sectors, not just oil and gas, to boost their emissions reduction efforts. Revenue recycling, given a clear vision and investment criteria, is an effective way to provide this certainty.

A key aspect of this is providing a degree of certainty to the allocation process, giving industry confidence that a certain proportion of carbon revenues will be reinvested. While the oil and gas sector will pursue emissions reductions regardless, having certainty that they will receive some level of support for innovative technology will drive the deep reductions needed to meet ACLP objectives. This is especially true of the technologies that can drive deep emissions reductions in the oil and gas sector, which must go through the various levels of technology development before that can be widely deployed for deep emissions reduction. If there is long-term uncertainty about how carbon revenues will be re-invested, it will be harder to justify investment in early-stage research. These technologies must undergo several other stages (i.e. demonstration, early deployment, commercialization) before they can drive reductions, but are associated with significant risk if support for these later stages is uncertain.

Building on this, this certainty must be provided over a clear term, while still allowing for course corrections based on new socio-economic or technical developments. When they do occur, course corrections must be based around a relatively stable long-term framework that guides these decisions. By providing clarity on these timelines and the guiding principles around a long-term vision, all industries will be better able to manage the risk associated with the development and deployment of various emissions reductions technologies. This is especially important in the oil and gas sector due to the long-term nature of both technology development cycles and the amortization period of major investments once the technology is commercialized.
6. Conclusion

The oil and gas sector represents a $120-billion-a-year national industry and a key contributor to Canada’s and Alberta’s economy through capital deployment, development activity, which in turn spurs job creation and economic growth across Canada for all levels of government – including about $19 billion in revenues in 2015 and 533,000 jobs across the nation in 2017. The sector’s continued success is critical.

The oil and gas sector recognizes that production is a major contributor to the national greenhouse gas emissions profile and in the need to reduce the emissions intensity of its operations. At the same time policy solutions need to be adaptive and carefully consider environmental, economic, and social outcomes. For example in Alberta alone, between 2018 and 2020, the oil and gas sector will contribute a potential $700M via the Carbon Competitiveness Incentive Regulation and incremental proceeds as a result of the economy-wide carbon levy on fossil fuels. Despite this significant compliance burden not seen in other jurisdictions, government can take steps to ensure that resource development is both cost and carbon competitive with our largest trading partners where revenues from climate policy are fully recycled back into the economy to incent innovation.

A variety of global and national energy and deep decarbonisation studies forecast demand for oil and gas to remain relevant / robust beyond 2050. While the sector faces headwinds related to costs, regulations, and infrastructure constraints the billions of dollars of petroleum energy infrastructure deployed in Alberta and across Canada, enabled with access to a 170 billion barrels of bitumen reserve, will remain competitive in the national, continental and global markets for oil and gas.

The oil and gas sector in Alberta and across Canada has illustrated significant (tens of millions of tonnes) cost effective (less than $90/t-CO2e) abatement potential that include a range of ‘low hanging fruit’ that could be implemented in the short term, and medium and long-term. However, key challenges can prevent the oil and gas industry from deploying these potential solutions without incentivization including, competition for capital (within and between operations) and the “compliance trap” limiting access to constrained capital.

Allocation of revenues or recycling carbon revenues collected from the oil and gas sector back into their operations through a perpetual, well-funded, dedicated vehicle is one of the most effective ways to meet objectives related to the transition to a low carbon economy, including those contained in the Alberta Climate Leadership Plan (ACLP).